Engine/Emissions-Diagnosis
1990 Shop Manual

Volume H Car/Truck

Ford

Important Safety Notice

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual doing the work. This Shop Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this Manual must first establish that he compromises neither his personal safety nor the vehicle integrity by his choice of methods, tools or parts.

Notes, Cautions, and Warnings

As you read through the procedures, you will come across NOTES, CAUTIONS, and WARNINGS. Each one is there for a specific purpose. NOTES give you added information that will help you to complete a particular procedure. CAUTIONS are given to prevent you from making an error that could damage the vehicle. WARNINGS remind you to be especially careful in those areas where carelessness can cause personal injury. The following list contains some general WARNINGS that you should follow when you work on a vehicle.

- Always wear safety glasses for eye protection.
- Use safety stands whenever a procedure requires you to be under the vehicle.
- Be sure that the ignition switch is always in the OFF position, unless otherwise required by the procedure.
- Set the parking brake when working on the vehicle. If you have an automatic transmission, set it in PARK unless instructed otherwise for a specific operation. If you have a manual transmission, it should be in REVERSE (engine OFF) or NEUTRAL (engine ON) unless instructed otherwise for a specific operation. Place wood blocks (4" x 4" or larger) to the front and rear surfaces of the tires to provide further restraint from inadvertent vehicle movement.
- Operate the engine only in a well-ventilated area to avoid the danger of carbon monoxide.
- Keep yourself and your clothing away from moving parts, when the engine is running, especially the fan and belts.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe, catalytic converter and muffler.
- Do not smoke while working on a vehicle.
- To avoid injury, always remove rings, watches, loose hanging jewelry, and loose clothing before beginning to work on a vehicle.
- Keep hands and other objects clear of the radiator fan blades. The electric cooling fan on the Escort can start to operate at any time by an increase in underhood temperature, even though the ignition is in the OFF position. Other vehicles with an electric cooling fan can start at any time for the same reason, but only when the ignition switch is in the RUN position. Therefore, care should be taken to ensure that the electric cooling fan motor is completely disconnected when working under the hood.

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Foreword

This 1990 Car Shop Manual provides information covering Emissions for all 1990 Ford Motor Company Passenger Cars and Trucks manufactured in the United States and Canada. Complete emissions related diagnostic procedures for all affected systems or components are covered in this manual.

The descriptions and specifications contained in this manual were in effect at the time this manual was approved for printing. Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design without notice and without incurring obligation.

For service information on specific vehicle lines for Body, Chassis and Electrical; Powertrains; and/or Pre-Delivery and Lubrication, refer to the Passenger Car and Truck Cross Index pages in the front of this manual.

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Service
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Ford Parts and Service Division

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Passenger Car Cross Reference Index

Vehicle Lines	Content
Lincoln Town Car, Crown Victoria/ Grand Marquis	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Mark VII	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Thunderbird/Cougar	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Mustang	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Tempo/Topaz, Escort	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Taurus/Sable	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
Continental	Body, Chassis, Electrical, Powertrain, Maintenance, Lubrication
All Models	Pre-Delivery
NAAO Car & Truck Models	Engine/Emissions Diagnosis
Non-NAAO Cars	Non-NAAO Engine/Emissions Diagnosis

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Truck Cross Reference Index

Vehicle Lines	Content
Econoline, F-Series, Bronco	Body / Chassis / Electrical
Econoline, F-Series, Bronco	Engine
Medium / Heavy Duty B-, C-, F-600 Through 8000 Series	Body / Chassis / Electrical / Engine
Aerostar, Ranger, Bronco II (1 of 2)	Engine / Chassis
Aerostar, Ranger, Bronco II (2 of 2)	Body / Electrical
All Truck Series and Car Models	Pre-Delivery (Volume F)
All NAAO Car and Truck Models	Engine / Emissions Diagnosis

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What's New In This Manual

The following is a list of the modifications to this manual for 1990.

New or Modified Applications

- 1990 1/2 1.9L SEFI MA Escort/Tracer (EDIS Ignition)
- 2.3L EFI MA California — Mustang
- 2.9L EFI Scorpio
- 2.9L EFI MA Ranger/Bronco II
- 3.0L EFI Probe
- 4.0L EFI MA Ranger/Bronco II/Aerostar (EDIS Ignition)
- 4.9L EFI Truck with Electronically Controlled (E4OD) Transmission
- 5.0L SEFI MA California — Lincoln Town Car, Crown Victoria/Grand Marquis (Sedan)

Modified Manual Sections

- A Diagnostic Flowchart has been added to "How to Use This Manual"
- Diagnostic Routines, Section 2, has added On-line Automatic Service Information System (OASIS) reference numbers
- Fuel Delivery Systems, Section 11, has added an In Tank Reservoir (ITR) fuel delivery system
- Ignition Systems, Timing Procedures and Diagnosis, Section 13, has added Electronic Distributorless Ignition Systems (EDIS)
- EEC-IV Monitor Box: Intermittent Fault Diagnosis, Section 18, is included as a part of this manual

New or Modified Pinpoint Tests

- **AA** has been added to diagnose "No Starts" on EDIS applications
- **DA** has been revised to cover all 2-wire temperature sensors (ACT, ECT, and VAT)
- **DR** has been added to diagnose the Cylinder Identification (CID) sensor on 1990 1/2 1.9L SEFI MA Escort/Tracer applications
- **H** has been revised to include 4-wire HEGO sensors
- **KF** has been added to diagnose the Electrodrive Fan (EDF) control on 1990 1/2 1.9L SEFI MA Escort/Tracer applications
- **KH** has been added for Service Pin adjustment on 2.9L EFI Scorpio applications
- **N** and **P** have been revised to include EDIS applications

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Table of Contents

Section Title	Section Number
How to Use This Manual	i
Glossary	ii
Emissions Control Identification/Application	1
Diagnostic Routines	2
Emission Related Components	3
Carburetors, Throttle Bodies, and Injectors	4
Catalyst and Exhaust Systems	5
Exhaust Gas Recirculation (EGR) Systems	6
Evaporative Emission Systems	7
Inlet Air Temperature Systems	8
Positive Crankcase Ventilation (PCV) Systems	9
Thermactor Systems (Secondary Air Injection)	10
Fuel Delivery Systems	11
6.1L/7.0L Heavy Duty Truck "CHECK ENGINE" Light	12
Ignition System, Timing Procedures and Diagnosis	13
How to Use Quick Test	iii
EEC-IV Quick Test Procedures and Appendix	14
EEC-IV Engine Supplement—Passenger Car	15
EEC-IV Engine Supplement—Light Truck	16
EEC-IV Pinpoint Test Procedures	17
EEC-IV Monitor Box: Intermittent Fault Diagnosis	18
Diesel Diagnosis—6.6L and 7.8L Engines	19
Diesel Diagnosis—7.3L Engine	20

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How To Use This Manual

Special Notes:

- This manual is designed to diagnose gasoline and diesel engine systems.
- In each case, begin diagnosis with Section 2, Diagnostic Routines. Section 2 defines the probable causes of the vehicle's symptoms. It functions as a checklist to ensure that all potential causes are reviewed.
- If a diagnostic procedure does not find the solution to a vehicle symptom, it is important to return to Section 2 to review all other possible causes of the symptom.
- Refer to Section 3 for component descriptions and part numbers.
- Component locations can be found in the Electrical and Vacuum Trouble-Shooting Manuals (EVTM's).
- The EEC-IV Diagnostics Sections are interrelated and should be used in conjunction with each other.

Do

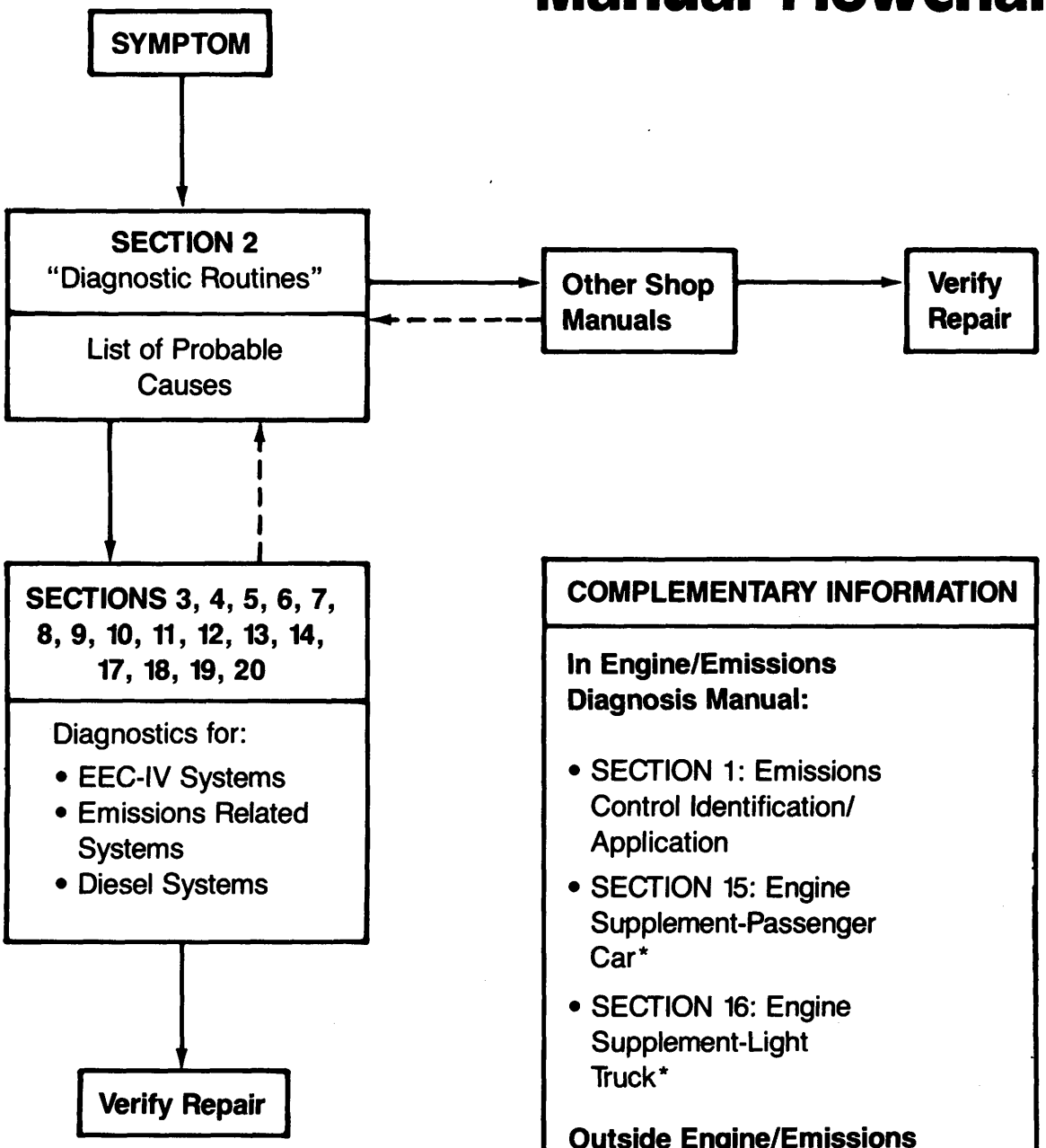
- Refer to Section 1, Emission Control Identification/Application, to identify the emission components on the vehicle. For vehicles with diesel engines, refer to Sections 19 and 20.
- Begin diagnosis with the Diagnostic Routines in Section 2.
- Read all special notes.
- Prevent any unsafe or hazardous conditions by following the notes, cautions and warnings listed at the beginning of this book.
- After service, always verify that the repair corrected the customer complaint.

Don't

- Skip from Section to Section.

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1990 Engine/Emissions Diagnosis Manual Flowchart



COMPLEMENTARY INFORMATION

In Engine/Emissions Diagnosis Manual:

- SECTION 1: Emissions Control Identification/ Application
- SECTION 15: Engine Supplement-Passenger Car*
- SECTION 16: Engine Supplement-Light Truck*

Outside Engine/Emissions Diagnosis Manual:

- Electrical and Vacuum Trouble-Shooting Manuals (EVTM's)
- OASIS Messages
- Technical Service Bulletins (TSB's)

***Includes:**
- **Schematics**
- **Service Code Definitions**
- **Pin Usage Charts**
- **Sensor/Actuator Reference Value Charts**

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Contents

Glossary 1

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Glossary

The glossary is a list of technical terms or acronyms and their definitions. It is not intended to be a dictionary of components and their functions. If you desire a detailed description of a specific component, refer to the related Shop Manual Group.

4EAT: 4-Speed Electronic Automatic Transaxle.

4X4L: 4X4 Low input switch.

A4LD: Automatic 4-Speed Lock-up-converter Drive.

A/C: Air Conditioning.

ACC: A/C Clutch Compressor signal input to the EEC-IV processor relating status of the A/C clutch.

ACCS: A/C Cycling Switch.

A/C P: A/C Pressure Cut-out switch.

A/C DV: Air Cleaner Duct and Valve motor.

ACL: Automatic Adjustable Shock Controller.

A/CL BIMET: Air Cleaner Bimetal sensor.

ACD: Air Conditioner Demand switch.

ACT: Air Charge Temperature sensor or its signal circuit.

ACV: (Thermactor) Air Control Valve.

AHFSS: Air Condition/Heater Function Select Switch input to the EEC-IV processor relating status of the A/C heater function select switch.

AIR BPV: (Thermactor) Air Bypass Valve.

AM1: Thermactor Air Management 1 (TAB).

AM2: Thermactor Air Management 2 (TAD).

AMBIENT TEMPERATURE: Temperature of air surrounding an object e.g., temperature where vehicle is being worked on.

AOD: Automatic Overdrive.

ANTI-BFV: Anti-Backfire Valve.

A/T: Automatic Transmission.

ATDC: After Top Dead Center.

AVOM: Analog Volt-Ohm Meter.

AXOD: Automatic Transaxle Overdrive.

AXOD-E: Automatic Transaxle Overdrive, Electronically Controlled.

BASE IDLE: Idle RPM determined by throttle lever hardset on throttle body while Idle Speed Control is fully retracted and disconnected.

BATT: Battery

BATT(+): Battery positive post or its circuit.

BATT(-): Battery negative post or its circuit.

BOB: (Breakout Box) An EEC-IV test device which connects in series with the processor and the EEC-IV harness and permits measurements of processor inputs and outputs.

BOO: Brake On-Off input to the EEC-IV processor indicating a braking drive mode.

BP: Barometric Pressure sensor or its signal circuit.

BPA: By-Pass Air Solenoid. Used to control idle speed on EFI and SEFI vehicles.

BREAKOUT BOX: A service tool that "tees" in-between the EEC-IV processor and the 60-pin harness connector. The breakout box contains 60 test pins that can be probed for EEC-IV testing.

BTDC: Before Top Dead Center.

BV: Bowl Vent (Carburetor Fuel Bowl)

BVT: Back Pressure Variable Transducer.

CANP: Canister Purge solenoid or its control circuit.

CSE GND: Case Ground (EEC-IV processor case).

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CATALYST: A muffler-like device in the exhaust system containing a monolithic substrate (a ceramic honeycomb structure) that is coated with catalytic metals such as platinum or palladium. When hot exhaust gases come in contact with these metals a chemical reaction takes place to consume unburned hydrocarbon, carbon monoxide and nitrous oxides.

CBD: Closed Bowl Distributor. With this design, the TFI-IV module is electrically connected to the distributor thru a harness connector, not a direct plug in connection.

CCC: Converter Clutch Control solenoid or its control circuit.

CCD: Computer Controlled Dwell.

CCO: Converter Clutch Override output from the EEC-IV processor to the transmission.

CCS: Coast Clutch Solenoid or its control circuit.

CES: Clutch Engage Switch.

CFI: Central Fuel Injection. A computer controlled fuel metering system which sprays atomized fuel into a throttle body mounted atop the intake manifold.

"CHECK ENGINE" OR "SERVICE ENGINE SOON" LIGHT: A dash panel light used either to aid in the identification and diagnosis of EEC system problems or to indicate that maintenance is required on non-EEC equipped vehicles.

CID: Cylinder Identification sensor or its signal circuit.

CLC: Converter Lock-up Clutch.

CLUTCH: Clutch engagement switch or its control circuit.

COC: Conventional Oxidation Catalyst.

COMPUTED TIMING: The total spark advance in degrees before top dead center. Calculated by the EEC-IV processor based on input from a number of sensors.

CONTINUOUS SELF-TEST: A continuous test of the EEC-IV system conducted whenever the vehicle is in operation.

CURB IDLE: Computer controlled Idle rpm.

CWM: Cold Weather Modulator.

DCL: Data Communications Link.

DFS: Decel Fuel Shut-off.

DIS: Distributorless Ignition System (low data rate).

DOL: Data Output Link. Fuel calculation data from the EEC-IV processor to the electronic tripminder.

DPDIS: Dual Plug Distributorless Ignition System.

DPH: Dual Plug Head.

DPI: Dual Plug Inhibit.

DV: Delay Valve.

DVOM: Digital Volt-Ohm Multimeter that displays voltage or resistance measurements in digital form on a liquid crystal display (LCD).

DV TW: Delay Valve Two-Way.

EATC: Electronic Automatic Temperature Control.

E4OD: Electronic 4-Speed Overdrive transmission.

ECA: Electronic Control Assembly.

ECT: Engine Coolant Temperature sensor or its signal circuit.

EDF: Electro-Drive Fan relay or its control circuit.

EDIS: Electronic Distributorless Ignition System (high data rate).

EEC: Electronic Engine Control. A computer controlled system of engine control.

EEGR: Electronic EGR Valve (Sonic).

EFI: Electronic Fuel Injection. A computer controlled fuel system that distributes atomized fuel through an injector located in each intake port of the engine. The fuel injectors are fired using bank-to-bank circuitry.

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EGO: Exhaust Gas Oxygen sensor or its signal circuit.

EGOG: EGO Ground.

EGR: Exhaust Gas Recirculation system designed to allow the flow of inert exhaust gases into the combustion chamber to cool the combustion and thus reduce nitrous oxides in the exhaust.

EGR S/O: EGR Shut Off.

EGRC: EGR Control vacuum solenoid valve or its control circuit.

EGRV: EGR Vent vacuum solenoid valve or its control circuit.

EHC: Exhaust Heat Control vacuum solenoid valve or its control circuit.

ENGINE RUNNING SELF-TEST: A test of the EEC-IV system conducted with the engine running and the vehicle at rest.

EPC: Electronic Pressure Control (used in E4OD transmissions).

ER: Engine Running Self-Test (same as KOER).

ERS: Engine rpm Sensor or its signal circuit.

EVP: EGR Valve Position sensor or its signal circuit.

EVR: EGR Vacuum Regulator solenoid or its control circuit.

FBC: Feedback Carburetor. An MCU controlled fuel system employing a stepper motor or a dithering solenoid that controls fuel/air mixture by bleeding air into the main and idle systems of the carburetor.

FCS: Fuel Control Solenoid or its control circuit.

FI: Fuel Injector or its control circuit.

FIPL: Fuel Injection Pump Lever sensor or its signal circuit.

FLC: Fluid Lock-Up Converter.

FMEM: Failure Mode Effects Management. This alternative strategy protects vehicle function from adverse effects of an EEC component failure.

FP: Fuel Pump relay or its control circuit.

FPM: Fuel Pump Monitor. A circuit in the EEC system used to monitor the electric fuel pump operation on some EEC-IV equipped vehicles.

FTO: Filtered Tach Output. An output from the DIS TFI-IV module which provides a filtered ignition signal to the processor in order to control dwell.

FUEL RICH/LEAN: A qualitative evaluation of air/fuel ratio based on an A/F value known as stoichiometry or 14.7. In the EEC-IV system rich/lean is determined by a voltage signal from the EGO sensor. An excess of oxygen (lean) is an EGO voltage of less than .4 volts, a rich condition is indicated by an EGO voltage of greater than .6 volts.

FWD: Front Wheel Drive.

GND or GRND: A common ground circuit for all vehicle power.

GOOSE: A brief openning and closing of the throttle.

HALL EFFECT: A process where current is passed through a small slice of semi-conductor material at the same time as a magnetic field to produce a small voltage in the semi-conductor.

HBV: Heater Blower Voltage input to the EEC-IV processor reflecting heater blower voltage demand.

HEDF: High speed Electro-Drive Fan relay or its control circuit.

HEGO: Heated EGO sensor or its signal circuit.

HEGOG or HEGO GND: Heated EGO Ground.

HIC: Hot Idle Compensator.

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HLOS: Hardware Limited Operation Strategy. Certain types of computer malfunctions will place the EEC-IV processor into HLOS mode. Output commands are replaced with fixed values.

HO: High Output.

HSC: High Swirl Combustion.

IAS: Inlet Air Solenoid valve or its control circuit.

IBP: Integral Back Pressure.

IDLE LIMITER: A device to control minimum and maximum idle fuel richness. The idle limiter is intended to prevent unauthorized persons from making overly rich idle adjustments.

IDM: Ignition Diagnostics Monitor. A continuous monitor of the ignition input to the EEC-IV processor used to detect intermittent ignition faults.

IGN: Ignition circuit or system.

INJ: Injector (Fuel).

INJ GND: Injector Ground (Fuel).

IRCM: Integrated Relay Control Module.

ISC: Idle Speed Control. Currently there are two types of computer controlled idle speed control: DC motor ISC and air bypass ISC.

ITR: In-Tank Reservoir.

ITS: Idle Tracking Switch. Used on CFI vehicles to inform EEC if the throttle is in contact with the DC motor.

KAM: Keep Alive Memory. A series of vehicle battery powered memory locations in the microprocessor which allows the microprocessor to store input failures identified during normal operation for use in later diagnostic routines and adapts some calibration parameters to compensate for changes in the vehicle system.

KAPWR: Keep Alive Power.

KEY ON ENGINE RUNNING SELF-TEST: A test of the EEC-IV system conducted with power applied and the engine at rest.

KOEO: Key On Engine Off Self-Test.

KOER: Key On Engine Running Self-Test (same as Engine Running (ER) Self-Test).

KS: Knock Sensor or its signal circuit.

L: Liters.

LUS: Lock Up Solenoid.

MA or MAF: Mass Air Flow Sensor or its signal circuit.

MAP: Manifold Absolute Pressure sensor or its signal circuit.

MCU: Microprocessor Control Unit.

MECS: Mazda Equipped Control System.

MIL: (Malfunction Indicator Light) An electric circuit between the EEC-IV processor and the "CHECK ENGINE" or "SERVICE ENGINE SOON" light on the dash panel of EEC-equipped vehicles.

MLP: Manual Lever Position sensor or its signal circuit.

MONITOR BOX: An optional EEC-IV test device which connects in series with the EEC-IV processor and its harness, and permits measurements in various units of processor inputs and outputs.

M/T: Manual Transmission

NDS: Neutral Drive Switch or its signal circuit.

NGS: Neutral Gear Switch or its signal circuit.

NPS: Neutral Pressure Switch or its signal circuit.

OASIS: On-line Automobile Service Information System.

OCC: Output Circuit Check.

OCIL: Overdrive Cancel Indicator Light.

OCS: Overdrive Cancel Switch.

OCT ADJ: Octane Adjust device which modifies spark advance.

OHC: Overhead Cam.

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OPEN CIRCUIT: A circuit which does not provide a complete path for the flow of current.

OSC: Output State Check.

OVERLAY CARD: A plastic card used with the Monitor box to identify EEC-IV signals for each engine. The card also programs the monitor for auto mode measurements.

PCV: Positive Crankcase Ventilation. A system which controls the flow of crankcase vapors into the engine intake manifold where they are burned in combustion rather than being discharged into the atmosphere.

PFE: Pressure Feedback EGR sensor or its signal circuit.

PIP: Profile Ignition Pickup. A "hall effect" vane switch that furnishes crankshaft position data to the EEC-IV processor.

PROCESSOR: EEC-IV Electronic Control Assembly.

PSPS: Power Steering Pressure Switch. An EEC-IV processor input to regulate idle speed based on power steering load demand.

PULSE AIR SYSTEM: Part of the emission control system that utilizes a reed-type check valve which allows air to be drawn into the exhaust system as a result of exhaust pulses.

PVS: Ported Vacuum Switch.

PWR GND: Power Ground.

QUICK TEST: A functional diagnostic test of the EEC system consisting of vehicle preparation and hookup, Key On Engine Off, Engine Running and Continuous Self-Tests.

RECORDER: An optional EEC-IV test device which works jointly with the Monitor box. It allows up to 8 EEC-IV signals to be electronically recorded over a 50 second period.

RELAY: A switching device operated by a low current circuit which controls the opening and closing of another circuit of higher current capacity.

RELIEF VALVE: A pressure limiting valve located in the exhaust chamber of the thermactor air pump. It functions to relieve part of the exhaust airflow if the pressure exceeds a calibrated value.

RWD: Rear Wheel Drive.

SAW: Spark Angle Word. Timing information sent from EEC-IV to the EDIS module. This information is used by the EDIS module to calculate final ignition timing.

SBS: Supercharger Bypass Solenoid or its control circuit.

SC: Super Charged.

SDV: Spark Delay Valve.

SEFI: Sequential Electronic Fuel Injection. A computer controlled fuel system that distributes atomized fuel through an injector located in each intake port of the engine. Each injector is fired separately and has individual circuits.

SELF-TEST: One of three subsets of the EEC Quick Test: Key On Engine Off, Engine Running, and Continuous.

SHO: Super High Output.

SHORT CIRCUIT: An undesirable connection between a circuit and any other point.

SIG RTN: Signal Return circuit for all sensor signals except HEGO.

SIL: Shift Indicator Light. A system that provides a visual indication to the driver of a vehicle when to shift to the next higher gear to obtain optimum fuel economy.

SOLENOID: A wire coil with a moveable core that changes position by means of electro-magnetism when current flows through the coil.

SPOUT: Spark Output Signal from the EEC-IV processor.

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SS1: Shift Solenoid 1 or its control circuit.

SS2: Shift Solenoid 2 or its control circuit.

SS 3/4-4/3: (Shift Solenoid 3/4-4/3) Output from the EEC-IV processor to the transmission that selects 3rd and 4th gears.

STAR: Self-Test Automatic Readout. A testing device in which the EEC and MCU systems output service codes in a digital format.

STI: Self Test Input circuit in the EEC and MCU systems used to initiate Self-Test.

STO: Self Test Output circuit in the EEC and MCU systems that transmits service codes (pulses) to either a VOM or STAR tester.

TAB/TAD: Thermactor Air Bypass/ Thermactor Air Diverter vacuum solenoid valves or their control circuits.

TCP: Temperature Compensated (Acceleration) Pump.

TFI: Thick Film Ignition. An ignition module comprised of a custom integrated circuit, Darlington output device and associated thick film integrated components.

TGS: Top Gear Switch. A lock out mechanism that prevents the SIL from lighting when the vehicle is in top gear.

THERMACTOR: A system for injection of air into the exhaust system to aid in the control of hydrocarbon and carbon monoxides in the exhaust.

THERMACTOR II: See Pulse Air System.

THS: Transmission Hydraulic Switch. An input to the processor that indicates the occurance of a shift between specific gears.

THS 3/2: Transmission Hydraulic Switch 3rd/2nd gear.

THS 4/3: Transmission Hydraulic Switch 4th/3rd gear.

TIMING: Relationship between spark plug firing and piston position usually expressed in crank shaft degrees before (BTDC) or after (ATDC) top dead center of the compression stroke.

TIV: Thermactor Idle Vacuum Valve.

TK: Throttle Kicker vacuum solenoid valve or its control circuit.

TOT: Transmission Oil Temperature Sensor or its signal circuit.

TP: Throttle Position sensor or its signal circuit.

TSP: Throttle Solenoid Positioner.

TTS: Transmission Temperature Switch.

TVS: Temperature Vacuum Switch.

TVV: Thermal Vent Valve.

TWC: Three Way Catalyst.

VAF: Vane Air Flow sensor or its signal circuit.

VAT: Vane Air Temperature sensor or its signal circuit.

VBAT: Vehicle Battery voltage.

VCK-V: Vacuum Check Valve.

VCV: Vacuum Control Valve.

VDV: Vacuum Delay Valve.

VM: Vane Meter.

VOM: Volt-Ohm Meter used to measure voltage and resistance. Readings are indicated by sweep hand on a printed scale rather than a digital display.

VOTM: Vacuum Operated Throttle Modulator.

VPWR: Vehicle Power supply voltage regulated to 10-14 volts.

VR/S: Vacuum Regulator/Solenoid.

VRDV: Vacuum Retard Delay Valve.

VREF: Reference voltage supplied by the EEC-IV processor to some sensors and regulated to 4-6 volts.

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VRESER: Vacuum Reservoir.

VREST: Vacuum Restrictor.

VR or VRS: Variable Reluctance Sensor. A non-contact transducer that converts mechanical motion into electrical control signals.

VRV: Vacuum Regulator Valve.

VSC: Vehicle Speed Control sensor or its signal circuit.

VSS: Vehicle Speed Sensor or its signal circuit.

VVA: Venturi Vacuum Amplifier.

VVC: Variable Voltage Choke relay or its control circuit.

VVV: Vacuum Vent Valve.

WAC: Wide-open throttle A/C Cutoff.

WOT: Wide-Open Throttle.

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SECTION 1

Emission Control Identification/Application

Contents

Vehicle Emission Control Information Decal 1-1

Vehicle Emission Control Information Decal Location 1-2

Emission Control Application:

Car 1-3

Light Truck 1-4

Medium/Heavy Truck 1-5

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Vehicle Emission Control Information Decal

Each vehicle is equipped with a decal (Figure. 1) containing emission control data that applies specifically to that vehicle and engine. The specifications provided on the decal are critical to servicing emissions systems.

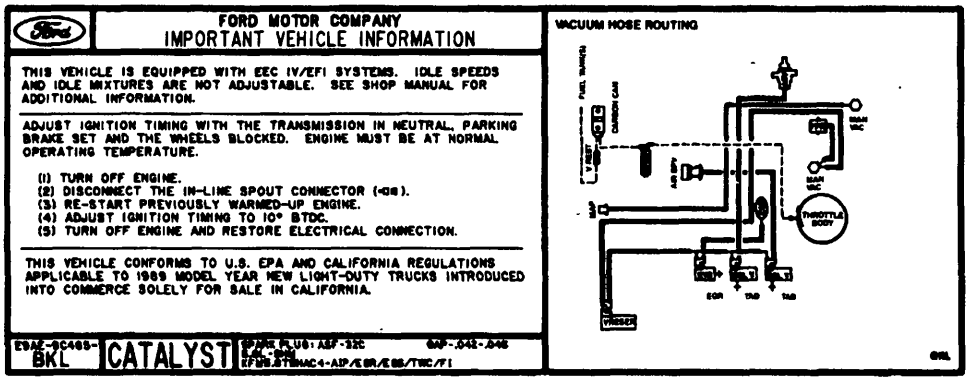


Figure 1 Typical Vehicle Emission Control Information Decal

In addition to the tune-up specifications and procedures, the emission decal shows a color coded schematic of the engine vacuum system. The color coding on the schematic represents the actual color coding on the vacuum hoses. However, there will be instances where an individual hose color will not agree.

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Vehicle Emission Control Information Decal Location

VEHICLE EMISSION CONTROL INFORMATION DECAL LOCATION

VEHICLE	LOCATION
Escort 1.9L	Radiator Sight Shield
Tempo/Topaz 2.3L	Resonator Assembly
Mustang 2.3L, 5.0L	Coil Appearance Cover
Thunderbird/Cougar 3.8L	Radiator Support
Taurus/Sable 2.5L, 3.0L, 3.8L	Radiator Sight Shield
Continental 3.8L	Radiator Sight Shield
Crown Victoria/ Grand Marquis 5.0L, 5.8L	Fan Shroud
Mark VII, Lincoln Town Car 5.0L	Fan Shroud
Ranger, Bronco II, Aerostar All Engines	Radiator Support
Econoline All Engines	Under Hood
F-Series All Engines	Under Hood

Engine Calibration Identification

The Emission Calibration Number Label, which contains the engine calibration number, is located on the driver's side door or door post pillar.

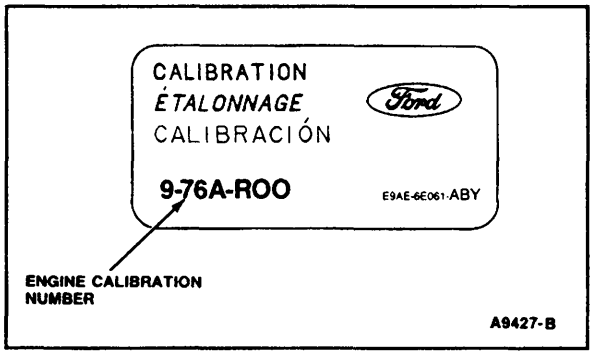


Figure 2 Emission Calibration Number Label

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Emission Control Application

PASSENGER CAR — 50 STATES/CANADA

Engine	Vehicle Application	Catalyst(s) Type	Catalyst(s) Location	Fuel System Type, Mfg	Electronic Eng Ctrl	EGR System	Secondary Air System	Ignition System	Idle Speed Control
1.9L	Escort	TWC	Close Mount	CFI	EEC-IV	PFE	None	TFI-IV	DCM
1.9L	Escort/Tracer	TWC	Close Mount	EFI	EEC-IV	PFE	None	EDIS	BPA
1.9L HO	Escort	TWC COC	DBUB	EFI	EEC-IV	BVT	Dual PA	TFI-IV	BPA
2.3L OHC	Mustang	TWC TWC	TB UB	EFI Calif-MA	EEC-IV	EEGR	None	TFI-IV	BPA
2.3L HSC 49 States/ Canada	Tempo/Topaz	TWC & COC	DBUB	EFI	EEC-IV	PFE	PA	TFI-IV	BPA
California		TWC					MTA		
2.3L HSC Plus 49 States/ Canada	Tempo/Topaz	TWC & COC	DBUB	EFI	EEC-IV	PFE	PA	TFI-IV	BPA
California		TWC					MTA		
2.5L HSC	Taurus	TWC COC	DBUB	CFI	EEC-IV	EEGR	PA	TFI-IV	DCM
2.9L	Scorpio	TWC	DBUB	EFI	EEC-IV	None	None	TFI-IV	BPA
3.0L	Probe	TWC	UB	EFI	EEC-IV	None Calif-PFE	None	TFI-IV Calif-TFI-IV/CCD	BPA
	Taurus	TWC	UE	EFI	EEC-IV				
3.0L SHO	Taurus/Sable	TWC	UE	SEFI-MA	EEC-IV	None Calif-PFE	None	DIS	BPA
3.8L SC	Thunderbird/ Cougar	(2) TWC TWC	TB	SEFI-MA	EEC-IV	PFE	None	DIS	BPA
3.8L	Thunderbird/ Cougar	(2) TWC TWC	TB	SEFI	EEC-IV	PFE	None	TFI-IV/ CBD	BPA
	Continental	(2) TWC TWC	TB UB	SEFI	EEC-IV	PFE	CT	TFI-IV/ CBD	BPA
	Taurus/Sable	(2) TWC TWC	TB UB	SEFI	EEC-IV	PFE	CT	TFI-IV/ CBD	BPA
5.0L	Crown Victoria/ Grand Marquis Ford Police Town Car	(2) TWC (2) COC	TB UB	SEFI Calif Sedans-MA	EEC-IV	EEGR	MTA	TFI-IV	BPA
5.0L HO	Mustang	(2) TWC (2) COC	TB UB	SEFI-MA	EEC-IV	EEGR	MTA	TFI-IV	BPA
	Mark VII	(2) TWC (2) COC	TB UB	SEFI	EEC-IV	EEGR	MTA	TFI-IV	BPA
5.8L	Crown Victoria/ Grand Marquis (Canada) Ford Police	(2) TWC COC	DBUB	7200-VV FBC, Ford	MCU	IBP	MTA	DS II	TSP

ABBREVIATIONS:

BPA = Bypass Air
BVT = Back Pressure Variable Transducer
CCD = Computer Controlled Dwell
CFI = Central Fuel Injection
COC = Conventional Oxidation Catalyst
CT = Conventional Thermactor
DBUB = Dual Brick Underbody
DCM = D.C. Motor
DIS = Distributorless Ignition System (low data rate)
DS-II = Duraspark II
EDIS = Electronic Distributorless Ignition System (high data rate)
EEC-IV = Electronic Engine Control — System-IV
EEGR = Electronic EGR Valve (Sonic)
EFI = Electronic Fuel Injection
EGR = Exhaust Gas Recirculation
HSC = High Swirl Combustion
IBP = Integral Back Pressure
MA = Mass Air
MCU = Microprocessor Control Unit
MFG = Manufacturer
MTA = Managed Thermactor Air
OHC = Overhead Cam
PA = Pulse Air
PFE = Pressure Feedback Electronic
SEFI = Sequential EFI
TB = Toe Board
TFI = Thick Film Ignition
TSP = Throttle Solenoid Positioner
TWC = Three-Way Catalyst
UB = Underbody

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Emission Control Application

LIGHT TRUCK — 50 STATES/CANADA

Engine	Vehicle Application	Catalyst(s) Type	Catalyst(s) Location	Fuel System Type, Mfg	Electronic Eng Ctrl	EGR System	Secondary Air System	Ignition System	Idle Speed Control
2.3L OHC	Ranger	TWC TWC	DBUB	EFI	EEC-IV	EEGR	None	DIS	BPA
2.9L	Ranger/ Bronco II	TWC TWC	(2) SBUB	EFI	EEC-IV	None	None	TFI-IV	BPA
2.9L MA	Ranger/ Bronco II	TWC TWC	UB #1 UB #2	EFI-MA	EEC-IV	None	None	EDIS	BPA
3.0L	Aerostar	TWC TWC	(2) SBUB	EFI	EEC-IV	None	None	TFI-IV	BPA
4.0L MA	Ranger, Bronco II Aeroster	TWC TWC	UB #1 UB #2	EFI-MA	EEC-IV	None	None	EDIS	BPA
4.9L	E-Series/ F-Series Bronco	TWC (2) COC	UB #1 UB #2	EFI	EEC-IV	EEGR	* MTA/ AM1, AM2	TFI-IV	BPA
5.0L	E-Series/ F-Series Bronco	TWC (2) COC	UB #1 UB #2	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA
5.8L	E-Series/ F-Series Bronco	TWC (2) COC	UB #1 UB #2	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA

ABBREVIATIONS:

AM1, AM2 = Air Management 1, 2
BPA = Bypass Air
COC = Conventional Oxidation Catalyst
CT = Conventional Thermactor
DBUB = Dual Brick Underbody
DCM = D.C. Motor
DIS = Distributorless Ignition System (low data rate)
DS-II = Duraspark II
EEC-IV = Electronic Engine Control — System-IV
EEGR = Electronic EGR Valve (Sonic)
EDIS = Electronic Distributorless Ignition System (high data rate)
EFI = Electronic Fuel Injection
MA = Mass Air
MTA = Managed Thermactor Air
NFB = Non-Feedback Carburetor
PFE = Pressure Feedback Electronic
SBUB = Single Brick Underbody
TFI-IV = Thick Film Ignition
TWC = Three-Way Catalyst
UB = Underbody

* All 4.9L light trucks weighing under 8500 lbs. with an automatic transmission calibration use MTA/AM7 only.

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Emission Control Application

MEDIUM/HEAVY TRUCK — 50 STATES/CANADA

Engine	Vehicle Application	Catalyst(s)		Fuel System Type, Mfg	Electronic Eng Ctrl	EGR System	Thermactor System	Ignition System	Idle Speed Control
		Type	Location						
4.9L	E-Series/ F-Series	TWC COC	UB #1 UB #2	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA
5.8L	E-Series/ F-Series	REDOX	UB	EFI	EEC-IV	EEGR	MTA/ AM1, AM2	TFI-IV	BPA
6.1L	F-Series	None	NA	2380EG-2V Holley	None	Ported	CT	DS-II	None
7.0L	F-Series	None	NA	4190EG-4V Holley	None	Ported	CT	DS-II	None
7.5L	E-Series/ F-Series	(3) REDOX	UB	EFI	EEC-IV	EEGR	MTA	TFI-IV/ CBD	BPA

ABBREVIATIONS:

AM1, AM2 = Air Management 1, 2
BPA = Bypass Air
CBD = Closed Bowl Distributor
COC = Conventional Oxidation Catalyst
CT = Conventional Thermactor
DS-II = Duraspark II
EEC-IV = Electronic Engine Control — System-IV
EEGR = Electronic EGR Valve (Sonic)
EFI = Electronic Fuel Injection
EGR = Exhaust Gas Recirculation
MFG = Manufacturer
MTA = Managed Thermactor Air
NA = Not Applicable
REDOX = Reduction-Oxidation
TFI-IV = Thick Film Ignition
TWC = Three-Way Catalyst
UB = Underbody
V = Venturi

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SECTION 2

Diagnostic Routines

Contents

Preface to Diagnostic Routines 2-1

Diagnostic Routine Index 2-2

Diagnostic Routines 2-3

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Diagnostic Routines

PREFACE

The Diagnostic Routines list the components and systems that can contribute to a particular condition in the order of probability, ease of accomplishment, and accessibility. These Routines can be used as check lists for reference in the event of unusual or infrequent causes of malfunction.

It is not necessary that any given order be followed, but it makes good sense for the technician to visually inspect everything that his experience tells him could be the source of the condition before beginning a more involved diagnosis. The effectiveness of every service must be validated.

All references, under the REFERENCE column in each Diagnostic Routine chart, are as follows:

- Group titles reference specific groups shown in the Powertrain, or Body, Chassis and Electrical Shop Manuals.
- Section numbers reference sections in the Engine/Emissions Diagnosis manual.
- Special manual publications are referenced in some cases.
- On-line Automotive Service Information System (OASIS) numbers have been included where applicable.

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Diagnostic Routine Index

GASOLINE ENGINES

Title	Routine	OASIS Number	Page
Cranks Normally But Won't Start	201	610200	2-3
Starts Normally But Won't Run (Stalls)	202	620100	2-4
Cranks Normally But Slow to Start	203	610300	2-5
Rough Idle	204	620800	2-6
Misses Under Load	205	630300	2-7
Low Idle (Stalls on Deceleration or Quick Stop)	206	630103	2-7
Hesitates or Stalls on Acceleration	207	631900	2-8
Backfire (Induction or Exhaust)	208	630600	2-9
Lack of Power	209	630400	2-10
Surges at Steady Speed	210	630200	2-11
High Idle (Engine Diesels)	211	620700, 640100	2-12
Engine Noise	212	4400	2-13
Poor Fuel Economy	213	640200	2-14
High Oil Consumption	214	4101	2-15
Spark Knock/Pinging	215	632500	2-15
Engine Vibrates at Normal/High Speeds	216	7210	2-16
Engine Runs Cold	217	4300	2-16
Engine Runs Hot	218	4300	2-16
Exhaust Smoke	219	—	2-17
Gas Smell	220	—	2-18
"CHECK ENGINE" /"SERVICE ENGINE SOON" Light Always On or Never On "CHECK ENGINE"/"CHECK DCL" Message On	221	—	2-18
State Emission Test Failure	222	—	2-19
Improper Shift	223	5101, 5102	2-21
Shift Indicator Light and Audible Chimes "ON"	224	—	2-21

DIESEL ENGINES

Title	Routine	Page
6.6L and 7.8L Engines		20-1
7.3L Engine (Engine Induced Faults)		21-1
7.3L Engine (Transmission Induced Faults)		
Low Idle (Stalls on Deceleration or Quick Stop)	206	2-7
Hesitates or Stalls on Acceleration	207	2-8
Lack of Power	209	2-10
High Idle (Engine Diesels)	211	2-12
Poor Fuel Economy	213	2-14
Improper Shift	223	2-21

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Diagnostic Routines

201 CRANKS NORMALLY BUT WON'T START

(OASIS #610200)

NOTE: Extended cranking, because of a "No Start" condition, can load the exhaust system with raw fuel, which can ruin the catalytic converter after the engine starts. After the "No Start" condition has been repaired, disconnect the thermactor air supply, run the engine until surplus fuel is used up and reconnect the thermactor air supply.

System	Component	Reference
EEC	Quick Test	Section 14
Ignition	Electrical Connections Secondary Ignition Wires Spark Plugs Fouled Ignition Switch	
	DSII and TFI IV: Ignition Coil Ignition Module Rotor Alignment Distributor Cap, Adapter, Rotor & Stator	**DSII and TFI IV:** Section 13, Ignition/Engine Group
	DIS/EDIS: Single or Dual Hall Crankshaft Sensors Hall Camshaft Sensor DIS/EDIS Ignition Module Coil Pack(s)	**DIS/EDIS:** Section 14, Section 13, Ignition/Engine Group
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Tank (Fuel Supply) Dual Tanks (Selector Switch) Sender Filter Fuel Pressure Regulators for EFI and CFI Injectors Inertia Switch	Visual, Section 11, Fuel/Engine Group
Fuel Charging Assy./Throttle Body/External Carburetor	Electrical Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valve (7200) Throttle Linkages	Visual, Section 4, Fuel/Engine Group
Internal Carburetor	Float/Inlet Needle and Seat Idle Air Bleeds and Fuel Passages	Section 4, Fuel/Engine Group
Basic Engine	Camshaft Timing Compression	Engine Group
EGR	Valve	Section 6
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Exhaust	Catalyst Exhaust	Visually inspect for blockage.

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Diagnostic Routines

202 STARTS NORMALLY BUT WON'T RUN (STALLS)

(OASIS #620100)

System	Component	Reference
Fuel Charging Assy/Throttle Body/External Carburetor	Curb or Fast Idle Speed Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod And Linkage (7200) Choke Pulldown Adjustment & Diaphragm Venturi Valve (7200) Choke Cap Indexing	Visual, Section 4, Fuel/Engine Group
EEC	Quick Test	Section 14
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Tank (Fuel Supply) Sender Filter Fuel Pressure Regulators for EFI and CFI Injectors Inertia Switch	Visual, Section 11, Fuel/Engine Group
Ignition	Electrical Connections Secondary Ignition Wires Ignition Switch DSII and TFI IV: Ignition Coil Ignition Module Rotor Alignment Distributor Cap, Adapter, Rotor & Stator Ballast Resistor DIS/EDIS: Single or Dual Hall Crankshaft Sensors Hall Camshaft Sensor DIS/EDIS Ignition Module Coil Pack(s)	**DSII and TFI IV:** Section 13, Ignition/Engine Group **DIS/EDIS:** Section 14, Ignition/Engine Group
Internal Carburetor	Float/Inlet Needle and Seat Idle Air Bleeds and Fuel Passages	Fuel/Engine Group
Exhaust	Component (Restricted)	Section 5
EGR	Valve	Section 6
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Basic Engine	Camshaft and Valve Train	Engine Group
Induction (Supercharger)	Intercooler Tube (Air Leaks)	Section 8

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Diagnostic Routines

203 CRANKS NORMALLY BUT SLOW TO START

(OASIS #610300)

NOTE: It is a good practice to confirm that the correct starting procedure was being used by the customer before proceeding with diagnosis.

System	Component	Reference
Ignition	Scope Engine for: Spark Plugs, Coil, Secondary Ignition Wires Spark Plugs Fouled DSII and TFI IV: Distributor Cap, Adapter & Rotor DIS/EDIS: Single or Dual Hall Crankshaft Sensors Hall Camshaft Senso DIS/EDIS Ignition Module Coil Pack(s)	 **DSII and TFI IV:** Visual, Section 13, Ignition/Engine Group **DIS/EDIS:** Section 14, Ignition/Engine Group
EEC	Quick Test	Section 14
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Fuel Pressure Regulators for EFI and CFI Sender Filter Injectors	Visual, Section 11, Fuel/Engine Group
Fuel Charging Assy/Throttle Body/External Carburetor	Curb or Fast Idle Speeds Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Choke Cap Indexing Accelerator Pump Venturi Valve (7200) Bowl Vents	Visual, Section 4, Fuel/Engine Group
Internal Carburetor	Float/Inlet Needle and Seat Stepper Motor (7200) Cold Enrichment System (7200)	Visual, Section 4, Fuel/Engine Group
Exhaust	Component (Restricted)	Section 5
Induction and Vacuum Distribution	Vacuum Leaks Air Cleaner Element Restricted	Visual, Audible, Engine Group
Cooling	Electric Fan (Hot Start Only)	Cooling/Engine Group
EGR	Valve	Section 6
PCV	Valve	Section 9
EVAP	Components	Section 7, Fuel/Engine Group
MCU	Component Diagnostics	Special MCU Diagnosis Manual

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Diagnostic Routines

204 ROUGH IDLE

(OASIS #620800)

System	Component	Reference
Cooling	Fan or Electric Fan (Loose or Cracked)	Visual
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor Ignition Timing	Section 13, Ignition/Engine Group
EEC	Quick Test	Section 14
Fuel Charging Assy/Throttle Body/External Carburetor	Curb or Fast Idle Speeds Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valve (7200) Choke Pulldown Bowl Vent	Visual, Section 4, Fuel/Engine Group
Fuel Delivery	Fuel Pressure Regulators EFI/CFI Injectors Fuel Rail	Section 11, Fuel/Engine Group
Carburetor	Idle Mixture	Section 4
Internal Carburetor	Idle, Air Bleeds or Fuel Passages Float/Inlet Needle and Seat Stepper Motor (7200) Hot Idle Compensator (may be external) Altitude Compensator Cold Enrichment System (7200)	Visual, Section 3, Section 4, Fuel/Engine Group
Vacuum Distribution	Vacuum Leaks	Visual and Audible
EGR	Valve Vacuum Regulator	Section 6
Cooling	Thermostat	Cooling/Engine Group
Basic Engine	Compression Valve Train Camshaft Intake Manifold Gaskets	Engine Group
PCV	Valve	Section 9
EVAP	Components	Section 7, Fuel/Engine Group
Exhaust	Pipes, Muffler, Catalyst Resonator, Heat Control Valve	Section 5
Induction (Supercharger)	Intercooler Tube (Air Leaks)	Section 8
MCU	Component Diagnostics	Special MCU Diagnosis Manual

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Diagnostic Routines

205 MISSES UNDER LOAD

(OASIS #630300)

System	Component	Reference
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor Timing	Section 13, Ignition/Engine Group
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Fuel Delivery	Filter Pump Lines Fuel Pressure Regulators EFI/CFI Sender Filter Injectors	Visual, Section 4, Section 11, Fuel/Engine Group
Fuel Charging Assy/Throttle Body/External Carburetor	Electrical and Vacuum Connections Choke and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valves (7200)	Visual, Section 4, Fuel/Engine Group
Internal Carburetor	Basic: Idle, Main, and Accelerator Pump Float/Inlet Needle and Seat Main Metering Fuel Enrichment	Visual, Section 3, Fuel/Engine Group
EGR	Valve	Section 6

206 LOW IDLE (STALLS ON DECEL OR QUICK STOP)

(OASIS #630103)

System	Component	Reference
Fuel Charging Assy/Throttle Body/ExternalCarburetor	Curb or Fast Idle Speed Electrical and Vacuum Connections Throttle Devices Venturi Valve (7200)	Visual, Section 4, Fuel/Engine Group
Internal Carburetor	Idle Airbleeds or Fuel Passages Stepper Motor (7200) Hot Idle Compensator (may be external) Float/Inlet Needle and Seat Cold Enrichment System (7200)	Visual, Section 4, Fuel/Engine Group
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
EGR	Valve	Section 6
Base Transmission (E4OD Only)	Transmission Oil Level Converter Clutch Control Solenoid	Transmission Group

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Diagnostic Routines

207 HESITATES OR STALLS ON ACCELERATION

(OASIS #631900)

System	Component	Reference
EEC	Quick Test	Section 14
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor Ignition Timing	Section 13, Ignition/Engine Group
Fuel Charging Assy/Throttle Body/External Carburetor	Choke Plat and Linkage Electrical & Vacuum Connections Cold Enrichment Rod and Linkage (7200) Accelerator Pump Venturi Valve (7200) Curb or Fast Idle Speeds	Visual, and Section 4
Fuel Delivery	Filter Pump Water/Dirt/Rust Contamination in Fuel Lines Fuel Pressure Regulators for EFI and CFI Sender Filter Injectors	Visual, Section 11, Fuel/Engine Group
Internal Carburetor	VV Diaphragm (7200) Power Valve Stepper Motor (7200) Main System	Section 4, Fuel/Engine Group
Vacuum Distribution	Vacuum Leaks	Visual and Audible
Induction	Air Cleaner Duct, Stove Pipe, and Valve Inter-Cooler Tube (Air Leaks)	Section 8
EGR	Valve	Section 6
PCV	Valve	Section 9
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Exhaust (Restriction)	With Backpressure EGR System	Section 5
Base Transmission (E4OD and A4LD)	Converter Clutch Control Solenoid Converter Clutch Override Converter Clutch	Transmission Group

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Diagnostic Routines

208 BACKFIRE (INDUCTION OR EXHAUST)

(OASIS #630600)

System	Component	Reference
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap and Rotor, Crossed Wires Ignition Timing	Section 13
Vacuum Distribution	Vacuum Hoses, or Connections Leak(s)	Visual and Audible
EEC	Quick Test	Section 14
Thermactor	Thermactor System Components	Section 10
Pulse Air	Pulse Air System Components	Section 10
Basic Engine	Intake Manifold Gaskets Compression Check Camshaft Valves	Engine Group
Exhaust	Components (Restricted)	Section 5
Fuel Delivery	Filter Pump Water, Dirt, Rust, Contamination in Fuel Lines Fuel Pressure Regulators EFI/CFI Injectors Sender Filter	Visual, Section 11, Fuel/Engine Group
External Carburetor	Choke Plate and Linkage	Visual and Section 4
MCU	Component Diagnostics	Special MCU Diagnosis Manual

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Diagnostic Routines

209 LACK OF POWER

(OASIS #630400)

System	Component	Reference
Ignition	Timing	Section 13
EEC	Quick Test	Section 14
Fuel Delivery	Filter Pump Lines Fuel Pressure Regulator EFI/CFI Sender Filter Injectors	Visual, Section 11, Fuel/Engine Group
Fuel Charging Assy/Throttle Body/External Carburetor	Electrical and Vacuum Connections Choke Plate and Linkage Accelerator Pump Venturi Valves (7200) Curb or Fast Idle Speed	Visual, Section 4, Fuel/Engine Group
Internal Carburetor	Float Inlet/Needle and Seat Accelerator Pump Main Metering System Fuel Enrichment Altitude Compensator Stepper Motor (7200) Pullover Rod Sticking (1949)	Visual, Section 4, Fuel/Engine Group
Ignition	Scope Engine For: Spark Plugs, Coil, etc.	Visual, Section 13, Ignition/Engine Group
Exhaust	Components (Restricted)	Section 5
Cooling	Thermostat	Cooling/Engine Group
Vacuum Distribution	Vacuum Leaks	Visual/Audible
Induction	Air Cleaner Duct and Valve and Element	Section 8
EGR	Valve	Section 6
Basic Engine	Compression Check Camshaft Valves	Fuel/Engine Group
Drive Train	Clutch, Automatic Transmission, Brakes	Transmission Group, Driveline Group
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Supercharger	Assembly	Fuel/Engine Group

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Diagnostic Routines

210 SURGE AT STEADY SPEED

(OASIS #630200)

System	Component	Reference
EEC	Quick Test	Section 14
Fuel Delivery	Filter Pump Lines Fuel Pressure Regulator EFI/CFI Sender Filter	Visual, Section 11, Fuel/Engine Group
Fuel Charging Assy/Throttle Body/External Carburetor	Choke Plate and Linkage Electrical & Vacuum Connections Venturi Valves (7200) Curb or Fast Idle Speeds	Visual, Section 4, Fuel/Engine Group
Internal Carburetor	Idle, Main Systems Float/Inlet Needle and Seat Fuel Enrichment Systems Altitude Compensator	Visual, Section 4, Fuel/Engine Group
Ignition	Scope Engine For: Spark Plugs, Coil, Secondary Ignition Wires, etc., Timing	Section 13
Vacuum Distribution	Vacuum Leaks	Visual, Audible
EGR	Valve	Section 6
Induction	Air Cleaner Duct and Element	Visual, Section 8
EVAP	Components	Section 7, Fuel/Engine Group
Basic Engine	Valve Train and Camshaft Intake Manifold Gaskets	Engine Group
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Thermactor	Thermactor System Components	Section 10
Supercharger	Assembly	Fuel/Engine Group

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Diagnostic Routines

211 HIGH IDLE (ENGINE DIESELS)

(OASIS #620700, 640100)

NOTE: If engine idles smoothly after key is turned off, trouble is likely to be in the ignition switch, ignition harness, starter solenoid "IGN" tap, or EEC relay.

System	Component	Reference
Fuel Charging Assy/Throttle Body/External Carburetor	Curb or Fast Idle Speeds Electrical and Vacuum Connections Throttle Positioner or Dashpot Throttle Plate and Linkage Choke Plate and Linkage Fast Idle Linkage Venturi Valves (7200) Speed Control Chain	Visual, Section 4, Fuel/Engine Group
Vacuum Distribution	Vacuum Leaks	Visual and Audible
EEC	Quick Test	Section 14
Induction	Vacuum Leaks	Engine Group
Cooling	Overheating	Routine 218

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Diagnostic Routines

212 ENGINE NOISE

(OASIS #4400)

System	Component	Reference
Squeal, Click, or Chirp	Oil Level (low) Valve Train Drive Belts (loose) Belt Driven Components EEC Solenoids	Visual, Audible, Engine Group, Cooling Group
Rumble, Grind	Belt Driven Components	
Rattle	Component (loose)	Exhaust Group
Hiss	Thermactor System (leak) Vacuum Distribution System (leak) Induction System (leak) Spark Plug (loose)	Visual, Audible, Section 10, Engine Group
	Cooling System (leak)	Visual and Audible
	EVAP System (leak)	Section 7
Snap	Secondary Ignition	Visual and Audible
Rap, Roar	Exhaust System (leak) Pulse Air System (air cleaner)	Visual, Audible, Section 10, Exhaust Group
Knock	Connecting Rod Bearing (worn) Main Bearing (worn) Piston Pin (loose) Piston to Bore Clearance (cold engine)	Engine Group
	Mechanical Fuel Pump	Fuel/Engine Group
	Detonation	Routine 215

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Diagnostic Routines

213 POOR FUEL ECONOMY

(OASIS #640200)

NOTE: Since fuel consumption is drastically increased for city driving, short-run operation, stop and go driving, trailer towing, extended winter warm-up periods, etc., as opposed to "trip" mileage, an attempt should be made to determine these factors when confronted with "poor mileage" conditions. However, since the operator is not always at fault, the following is appended:

System	Component	Reference
Fuel Charging Assy/Throttle Body/External Carburetor	Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Electrical & Vacuum Connections	Visual, Section 4
Fuel Delivery	Fuel Return Line Blocked Fuel Pressure Regulators EFI/CFI	Section 11, Fuel/Engine Group
Induction	Air Cleaner Duct and Valve Air Cleaner Element (Restricted)	Visual, Section 8
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor Ignition Timing	Section 13
Internal Carburetor	Idle, Main Systems Enrichment Systems Float/Inlet Needle and Seat	Section 4, Fuel/Engine Group
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Cooling	Thermostat	Cooling/Engine Group
Factors External to the Engine	Tire Pressure & Type Clutch Operation Converter Clutch Override Automatic Transmission Shift Pattern and Fluid Level Brake Drag Exhaust System Speedometer/Odometer Gear Ratio Axle Ratio Vehicle Load Road & Weather Conditions Aftermarket Add-Ons	Manual and Visual
Base Transmission (E4OD Only)	Converter Clutch Control Solenoid	Transmission Group

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Diagnostic Routines

214 HIGH OIL CONSUMPTION

(OASIS #4101)

NOTE: If the condition cannot be verified, clean engine, if necessary, change oil and filter (at customer's expense), seal and have customer drive 500 miles (804.5 Km) or enough distance to consume two quarts before returning for re-examination.

System	Component	Reference
External Leaks	Rocker Cover Gasket, Crankshaft Seals, Engine Assembly	Visual
Proper Dipstick	Overfilling (sometimes accomplished by the "short stick" gas station procedure).	Manual and Visual
Induction	Air Cleaner Element (Sealing)	Visual, Fuel/Engine Group
PCV	Valve	Section 9
Internal Leaks (blue smoke from tailpipe)	Valve Guides Valve Stem Seals Intake Manifold and Gasket Cylinder Head Drain Passages Piston Rings	Engine Group

215 SPARK KNOCK/PINGING

(OASIS #632500)

NOTE: If the above fails to correct the condition, it is recommended that the owner change his source of fuel and use higher octane fuel.

System	Component	Reference
Ignition	Timing	Section 13
EEC	Quick Test	Section 14
Vacuum Distribution	Vacuum Leaks Spark Delay Valve PVS	Visual, Audible, and Section 3
Cooling	Overheating	Visual, Routine 218
Basic Engine	Oil Level Compression Check Intake Manifold Gasket	Engine Group
Fuel Delivery	Injectors	Section 11
PCV	Valve	Section 9
EGR	Verify correct application, then diagnose.	Section 6
Induction	Air Cleaner Duct and Valve Assembly	Section 8
Thermactor	Thermactor System Components	Section 10
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Base Transmission (E4OD Non-Diesel Only)	Transmission Controls	Transmission Group

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Diagnostic Routines

216 ENGINE VIBRATES AT NORMAL SPEEDS

(OASIS #7210)

System	Component	Reference
Engine Accessories	Fan Belt Driven Components Engine Mounts Engine Vibration Damper	Manual and Visual
Otherwise	Non-Engine Components: Drive Line, Tires, Wheel Balance	Manual and Visual
3.8L Supercharged	Shift Indicator Light and Audible Chime "ON"	Routine 224

217 ENGINE RUNS COLD

(OASIS #4300)

System	Component	Reference
Gauge System	Gauge, Sender	Instruments/Gauge
Cooling	Thermostat	Cooling/Engine Group

218 ENGINE RUNS HOT

(OASIS #4300)

System	Component	Reference
Cooling	Thermostat Coolant Level Radiator or A/C Condenser Pressure Cap and Overflow System External Leaks Belts and Belt Tension Fan and Fan Clutch Electric Fan (If So Equipped)	Visual, Cooling/Engine Group
Gauge System	Gauge, Sender	Instruments/Gauge Group
Vacuum Distribution	Spark Delay Valve	Section 3
EEC	Quick Test	Section 14
Ignition	Timing	Section 13
Basic Engine	Oil Level Internal Leak(s) Core Sand in Head/Block Water Pump	Engine Group
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Brake	Brakes (dragging)	Brake Group

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Diagnostic Routines

219 EXHAUST SMOKE

NOTE: White Smoke is normal during warm-up.

System	Component	Reference
Black Smoke (rich mixture)	Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200)	Section 4, Fuel Group
	Air Cleaner Element (Restricted)	Visual
	Internal Carburetor Components: Basic: Idle, Main and Accelerator Pump Metering Systems Enrichment Systems Fuel Inlet Needle/Seat Float	Visual, Section 4, Fuel/Engine Group
	Fuel Pressure Regulator EFI/CFI Injectors	Section 11, Fuel/Engine Group
	EEC Components	Section 14
	MCU Components	Special MCU Diagnosis Manual
Blue Smoke (burning oil)	PCV Valve	Section 9
	Valve Guides/Stems/Seals Oil Drain Passages in Head	Engine Group
	Rings (not seated, seized, gummed up, worn) Cylinder bores (scuffed)	Engine Group
White Smoke (coolant in combustion)	Thermactor Vacuum Delay Valve (restricted) EGR Cooler Intake Manifold (cracked/porous) Cylinder Head/Gasket (leaks) Block (cracked/porous)	Section 6, Engine Group

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Diagnostic Routines

220 GAS SMELL

System	Component	Reference
Fuel Delivery	Fuel Filter (leaks) Fuel Line to Carburetor (leaks) Injectors (leaking) Fuel Pump (leaks) Fuel Line, Pump to Tank (leaks) Fuel Tank (leaks) Fuel Tank Filler Neck/Cap (leaks) Fuel Return Line (Blocked) Fuel Pressure Regulator EFI/CFI	Visual, Section 11, Fuel/Engine Group
Internal Carburetor	Float/Inlet Needle (stuck)	Section 4, Fuel/Engine Group
EVAP	Carbon Canister, Solenoid, Hoses (leaks)	Section 7, Section 14, Fuel/Engine Group

221 "CHECK ENGINE"/"SERVICE ENGINE SOON" LIGHT ALWAYS ON OR NEVER ON "CHECK ENGINE"/"SERVICE ENGINE SOON"/"CHECK DCL" MESSAGE ON

System	Component	Reference
EEC	Quick Test	Section 14
NON-EEC	6.1L/7.0L Heavy Duty Truck Check Engine Light	Section 12

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Diagnostic Routines

222 STATE EMISSION TEST FAILURE

NOTE: Canada and some states or metropolitan areas in the United States require periodic Idle Emission Tests. All Ford products have been designed to pass these tests. If a Ford product fails an Idle Emission Test, it is probable that 1) The engine temperature was not warm and stabilized prior to the test. 2) The vehicle had idled excessively long prior to the test.

Prior to starting any repairs, complaints of Idle Emission Test failure should be verified.

The following example encompasses most of the emissions measurement modes of the current state idle test procedures:

- Ensure that the engine is at normal operating temperature and that all accessories are turned off.
- Read emissions at idle.
- Run engine at 2500 ± 300 rpm.
- Read emissions within 30 seconds.
- Return engine speed to idle.
- Read emissions within 30 seconds.

If any emission components are replaced, Keep Alive Memory (KAM) should be cleared before repeating State Emission Test procedure. Refer to Quick Test Appendix.

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Diagnostic Routines

222 STATE EMISSION TEST FAILURE (CONTINUED)

System	Component	Reference
EEC	Quick Test	Section 14
MCU	Component Diagnostics	Special MCU Diagnosis Manual
Ignition	Scope Engine For: Spark Plug, Coil, Secondary Wires, Distributor Cap, Adapter and Rotor Timing	Section 13, Ignition/Engine Group
Vacuum Distribution	Vacuum Leaks/Blockage	Visual and Audible
Carburetor	Idle Mixture	Section 4
Fuel Charging Assy/Throttle Body/External Carburetor	Curb or Fast Idle Speeds Electrical and Vacuum Connections Choke Plate and Linkage Cold Enrichment Rod and Linkage (7200) Venturi Valve (7200) Choke Pulldown Bowl Vent	Visual, Section 4, Section 11, Fuel/Engine Group
Internal Carburetors	Idle, Air Bleeds or Fuel Passages Float/Inlet Needle and Seat Stepper Motor (7200) Cold Enrichment System (7200)	Visual, Section 4, Fuel/Engine Group
Fuel Delivery	Injectors Fuel Rail	Section 11, Fuel/Engine Group
EGR	Valve Vacuum Regulator	Section 6
PCV	Valve	Section 9
EVAP	Carbon Canister, Purge Solenoid	Section 7, Fuel/Engine Group
Thermactor	Thermactor Air Dump	Section 10
Exhaust	Pipes, Muffler, Catalyst Resonator, Heat Control Valve	Section 5
Cooling	Unstabilized Engine Temperature	Visual, Routine 218
Basic Engine	Scheduled Maintenance Compression Valve Train Camshaft Intake Manifold Gaskets	Engine Group

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Diagnostic Routines

223 IMPROPER SHIFT

(OASIS #5101, 5102)

System	Component	Reference
Base Transmission (E4OD, A4LD, AXOD Only)	Converter Clutch Control Solenoid Converter Clutch Electronic Pressure Control Solenoid Shift Solenoid #1 Shift Solenoid #2 4 X 4 Low Switch	Transmission Group
EEC (E4OD, A4LD Only)	Quick Test	Section 14

224 SHIFT INDICATOR LIGHT AND AUDIBLE CHIMES "ON"

NOTE: VERIFY THAT THE CUSTOMER HAS READ THE OWNERS MANUAL ON THE NEW 3.8L SC OVERHEAT PROTECTION FEATURE.

The 3.8L SC is equipped with a Shift Indicator Light and Audible Chime that warns the customer when the engine oil or coolant overheats while the vehicle is operated at high speeds (above 100 mph) for extended periods of time. The Shift Indicator Light and Chime will also warn the customer when the engine has reached too high an rpm for that gear. The EEC-IV processor will reduce vehicle speed by limiting fuel to the engine when one of these overheat conditions has been reached. The customer may then notice a loss of power and/or a slight vibration. The Shift Indicator Light will "light" and the Audible Chime will produce a "steady tone" to alert the customer to upshift at this time. Full power will be restored and the Shift Indicator Light and Chimes will turn off when the vehicle returns to normal operating temperatures.

System	Component	Reference
EEC	Shift Indicator Light Bulb "SIL" Dimmer Relay Top Gear Switch	Section 14
3.8L SC Only	Audible Chime System	Thunderbird/Cougar Shop Manual Section 33-50 — Warning Chimes

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SECTION 3

Emission Related Components

Contents

NAME	PART NUMBER	PAGE
Air Charge Temperature Sensor	12A697	3-1
Air Cleaner Cold Weather Modulator	9E862	3-2
Air Cleaner Temperature Sensor	9E607	3-3
Air Cleaner Vacuum Motor	9D604	3-4
Barometric Absolute Pressure Sensor	9F479	3-5
Carbon Canister	9D653	3-6
EGR Valve and Transducer Assembly	9H495	3-7
EGR Valve—Electronic	9F483	3-8
EGR Valve—Integral Back Pressure Transducer	9D448	3-9
EGR Valve—Ported	9D475	3-10
EGR Valve Position Sensor	9G428	3-11
Electronic Control Assembly (FBC/CFI/EFI/SEFI)	12A650	3-12
EGR Vacuum Regulator	9J459	3-13
Engine Coolant Temperature Sensor	12A648	3-14
Exhaust Heat Control Valve	9A427	3-15
Feedback Carburetor Actuator Motor	9C908	3-16
Filter Assembly—Vacuum Vent	9F474	3-17
Fuel-Vapor Separator	9C369	3-18
Heated Exhaust Gas Oxygen Sensor	9F472	3-19
Ignition Barometric Pressure Switch	12A243	3-20
Emission Maintenance Warning (EMW) Module	12B514	3-21
Integral Relay Control Module	12B577	3-22
Knock Sensor	12A699	3-23
Manifold Absolute Pressure Sensor	9F479	3-24
Mass Air Flow Sensor	12B579	3-25

(Continued)

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SECTION 3

Emission Related Components

Contents

NAME	PART NUMBER	PAGE
Pressure Feedback Electronic EGR Valve	9D460	3-26
Pressure Feedback Electronic EGR Transducer	9J640	3-27
Relay Assembly EEC (Power) Time Delay	12A646	3-28
Diode Assembly (Blade Type)	14A604	3-29
EEC Power Relay Location	12A646	3-30
Vacuum Check Valve	12A197	3-31
Vacuum Control Valve	8A564	3-32
Vacuum Delay Valves	9E897	3-34
Vacuum Harness Assembly—Nylon	9E498	3-36
Vacuum Regulator (2-Port)	9F490	3-38
Vacuum Regulator (3 & 4 Port)	9F490	3-39
Vacuum Reservoir	9E453	3-40
Vacuum Restrictor	12A225	3-41
Vane Air Flow Meter	12B259	3-80

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TITLE	BASIC PART NO.	SYMBOL
Air Charge Temperature Sensor	**12A697**	

DESCRIPTION

The sensor provides the Electronic Fuel Injection System with mixture (fuel and air) temperature information. The ACT is used both as a density corrector for airflow calculation and to proportion the cold enrichment fuel flow. This sensor is similar in construction to the Engine Coolant Temperature (ECT) sensor, except it is packaged to improve sensor response time.

The sensor is threaded into a cylinder runner of the intake manifold and provides the fuel strategy with mixture temperature information. The sensor input is used as a density corrector for airflow calculations and to proportion the cold enrichment fuel flow.

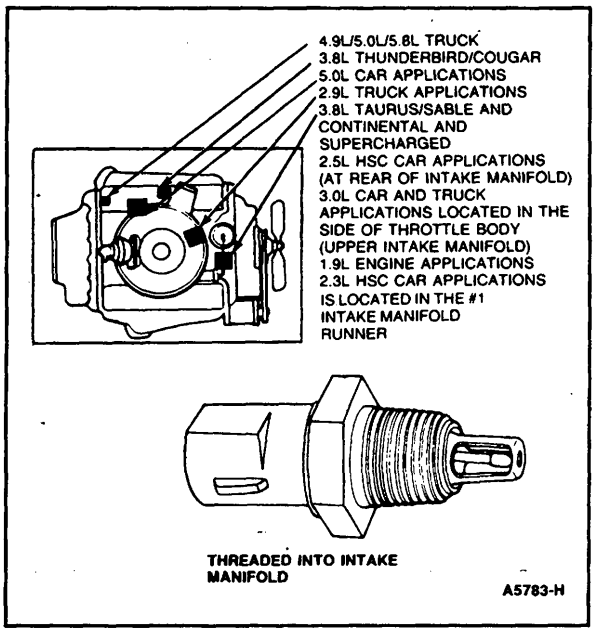


Figure 1 Air Charge Temperature Sensor (ACT)

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TITLE	BASIC PART NO.	SYMBOL
Air Cleaner Cold Weather Modulator	**9E862**	A/CL CWM

DESCRIPTION

A cold weather modulator is sometimes used in addition to the air cleaner temperature control (bimetal) sensor to control the inlet air temperature.

The cold weather modulator traps vacuum in the system, so the door will not switch to cold air when the vacuum drops during acceleration. The cold weather modulator only works when the outside air is cold, (refer to the chart below).

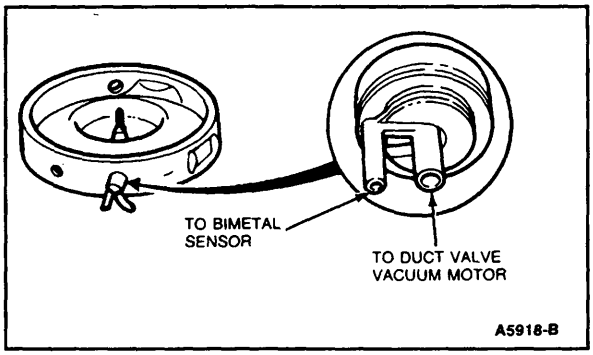


Figure 1 Cold Weather Modulator

Functional Check

A 54 kPa (16 in-Hg) vacuum applied to motor side of the modulator holds or leaks as follows:

COLOR	TYPE	HOLDS	LEAKS
Black	N/O	Below -6.7°C (20°F)	Above 1.7°C (35°F)
Blue	N/O	Below 4.4°C (40°F)	Above 12.8°C (55°F)
Green	N/O	Below 10°C (50°F)	Above 24.4°C (76°F)
Yellow	N/C	Above 18.3°C (65°F)	Below 10°C (50°F)

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TITLE	BASIC PART NO.	SYMBOL
Air Cleaner Temperature Sensor	**9E607**	O A/CL BIMET

DESCRIPTION

The sensor is installed in the cleaner tray or air cleaner line and is subject to temperature changes within the air cleaner. At a given increase in temperature, the sensor bleeds off vacuum, permitting the vacuum motor to open the duct door to allow fresh air in while shutting off full heat.

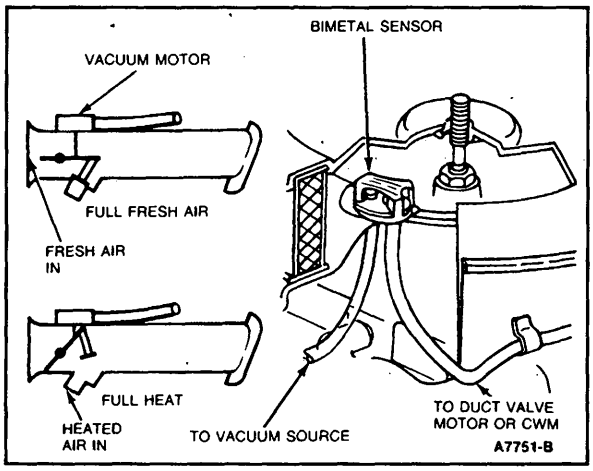


Figure 1 Air Cleaner Temperature Sensor

Functional Check

At an ambient temperature of less than 24°C (75°F), the sensor will allow vacuum to close the duct door to fresh air. The sensor will bleed off vacuum to allow the duct door to open and let in fresh air at or above the following temperatures:

Brown	24°C (75°F)
Pink, black, or red	32.2°C (90°F)
Blue, yellow or green	40.6°C (105°F)

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TITLE	BASIC PART NO.	SYMBOL
Air Cleaner Vacuum Motor	**9D604**	A/CL DV

DESCRIPTION

The air cleaner vacuum motor operates the door within the duct, which allows either warm or cold air to enter the engine, depending upon the temperature within the air cleaner.

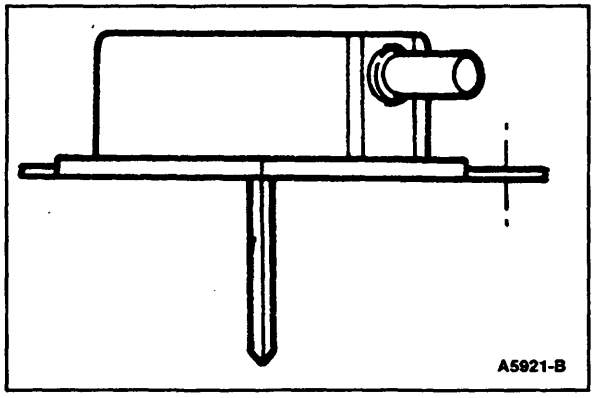


Figure 1 Air Cleaner Vacuum Motor

Functional Check

When a vacuum of 27 kPa (8 in-Hg) or greater is applied to the vacuum motor, the door stem should pull up and stay as long as vacuum is applied to the vacuum motor.

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TITLE	BASIC PART NO.	SYMBOL
Barometric Absolute Pressure Sensor	**9F479**	

DESCRIPTION

The BAP Sensor measures barometric pressure using a frequency. This gives the ECA information on engine load.

It is used as a barometric sensor for altitude compensation, updating the ECA during Key On, Engine Off and every wide-open throttle.

The ECA uses BAP for:

- Spark advance
- EGR flow
- Air/fuel ratio

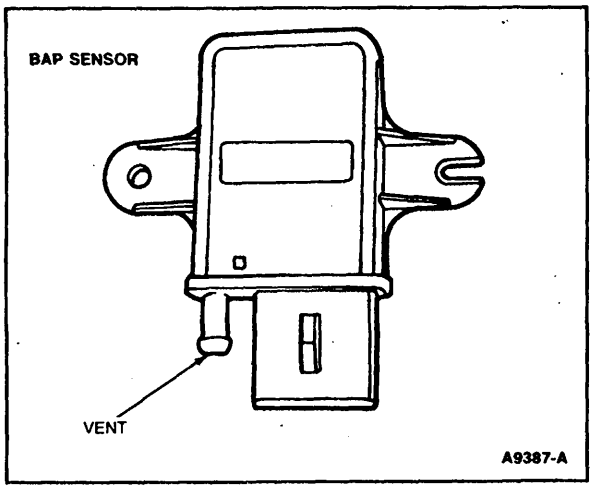
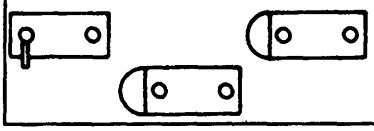


Figure 1 Barometric Absolute Pressure (BAP) Sensor

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TITLE	BASIC PART NO.	SYMBOL
Carbon Canister	**9D653**	

DESCRIPTION

The fuel vapors from the fuel tank and carburetor fuel bowl are stored in the carbon canister until the vehicle is operated, at which time, the vapors will purge from the canister into the engine for consumption. There are two canister sizes, 925 ml and 1400 ml carbon. Canisters are sometimes used in pairs when the vehicle has a large fuel tank or dual fuel tanks or dual carburetor bowls.

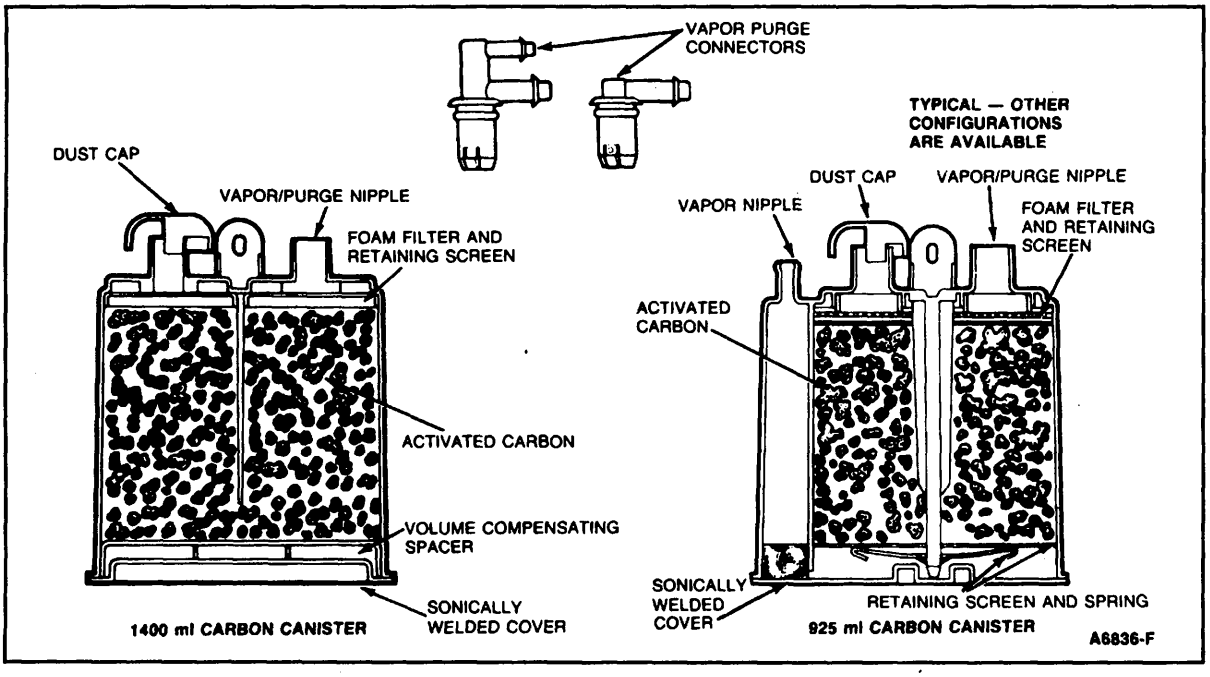


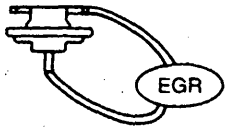
Figure 1 Carbon Canisters

Functional Check

- There are no moving parts and nothing to wear in the canister.
- Check for loose, missing, cracked or broken connections and parts.
- There should be no liquid in the canister.

NOTE: The Evaporative Emission System is outlined in Section 7.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve and Transducer Assembly	**9H495**	

DESCRIPTION

The Valve and Transducer Assembly (9H495) which consists of a modified ported EGR valve and a remote transducer, is used on selected engines (Figure 1). This assembly operates the same as the Integral Back Pressure Transducer EGR Valve (9D448) and is diagnosed and serviced as an assembly only. Valve function checks are the same as those for the Integral Back Pressure Transducer EGR Valve.

When servicing the assembly or any related vacuum harness, it is important to ensure proper orientation of the transducer. The nipple of the transducer attached to the metal tube from the EGR valve base must point straight down after installation. This allows drainage of exhaust gas condensation that may accumulate.

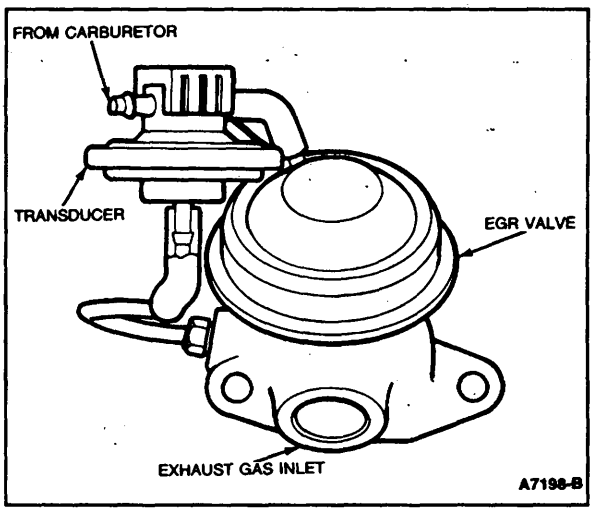


Figure 1 EGR Valve and Transducer Assembly

NOTE: Refer to Section 6, Exhaust Gas Recirculation (EGR) System.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve-Electronic	**9F483**	EGR

DESCRIPTION

The Electronic EGR Valve (Figure 1) is required in EEC systems where EGR flow is controlled according to computer demands by means of an EGR valve position (EVP) sensor attached to the valve.

The valve is operated by a vacuum signal from the dual EGR Solenoid Valves (9D474) or the electronic vacuum regulator (9J459) which actuates the valve diaphragm.

As supply vacuum overcomes the spring load, the diaphragm is actuated. This lifts the pintle off its seat allowing exhaust gas to recirculate (flow). The amount of flow is proportional to the pintle position. The EVP sensor mounted on the valve sends an electrical signal of its position to the Electronic Control Assembly (12A650).

The Electronic EGR Valve Assembly (9F483) is not serviceable. The EVP sensor (9G428) and EGR valve (9H473) must be serviced separately.

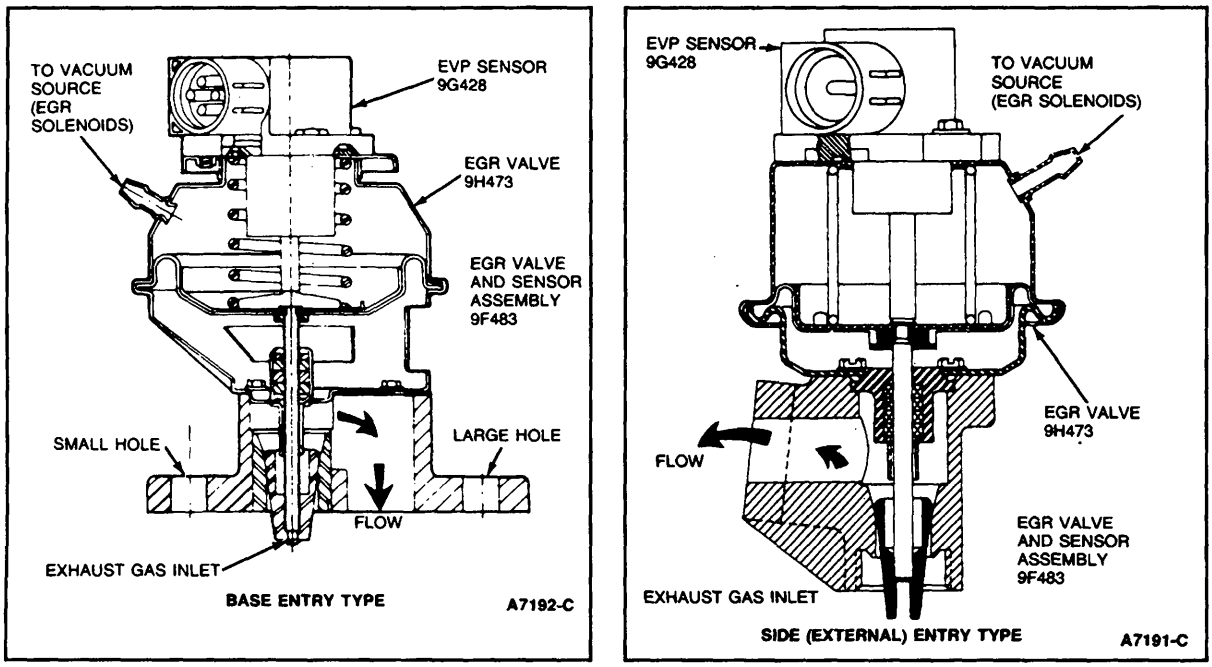


Figure 1 Electronic EGR Valves

NOTE: Verify vacuum routing per the vehicle decal before proceeding to EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve-Integral Back Pressure Transducer	**9D448**	EGR

DESCRIPTION

The Integral Back Pressure Transducer EGR valve combines inputs of back pressure and EGR port vacuum into one unit. The valve requires BOTH inputs to operate. The valve will not operate on vacuum alone. The back pressure valve has two types; poppet and tapered pintle (Figure 1).

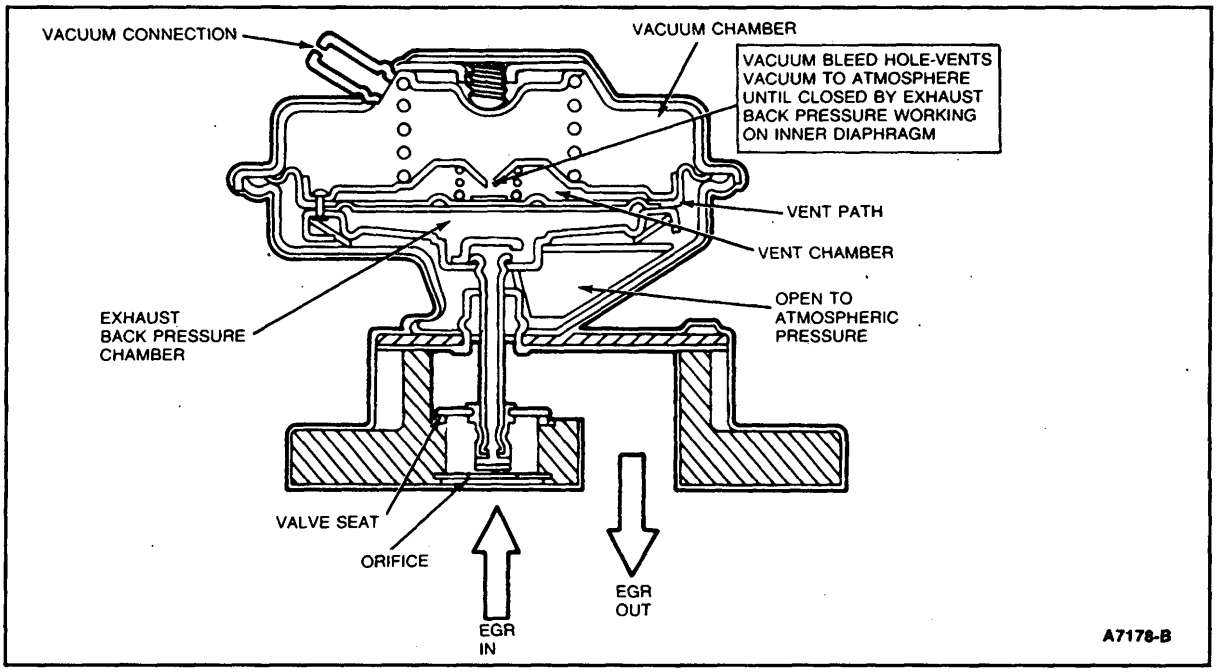


Figure 1 Integral Back Pressure Transducer EGR Valve (9D448)

NOTE: Refer to Section 6, Exhaust Gas Recirculation (EGR) System.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve-Ported	**9D475**	EGR

DESCRIPTION

The Ported EGR Valve is operated by a vacuum signal (only) from the carburetor EGR port signal which actuates the valve diaphragm. As the vacuum increases sufficiently to overcome the power spring, the valve is opened allowing EGR flow. The amount of flow is dependent on the tapered pintle or the poppet position which is a direct result of vacuum signal (Figure 1).

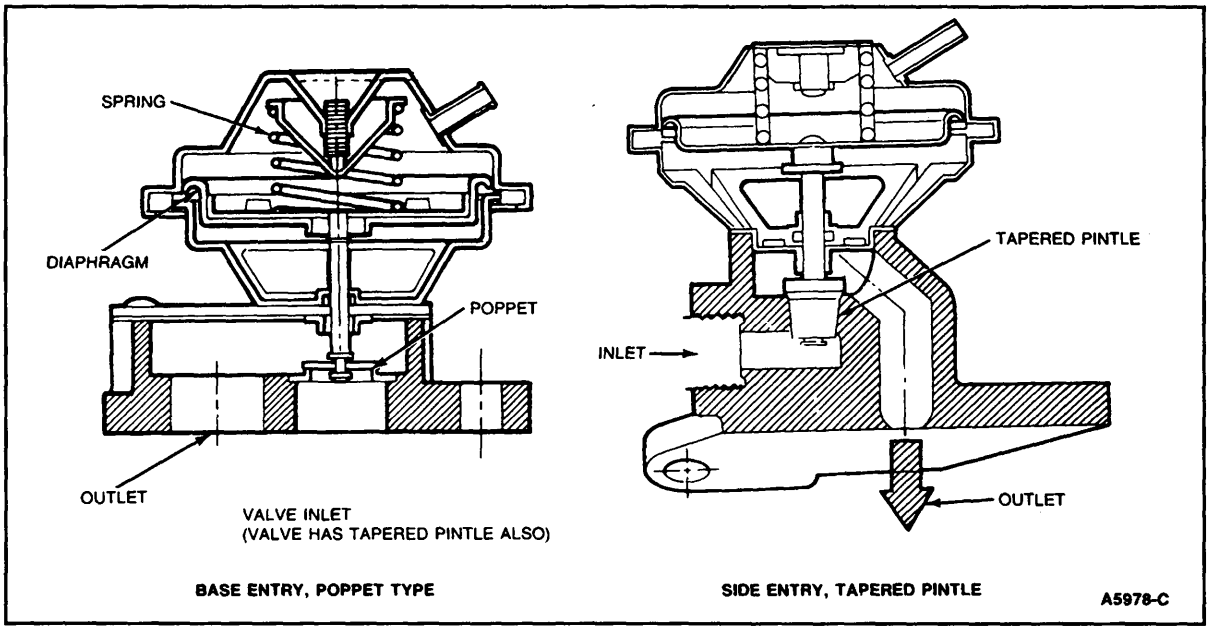


Figure 1 Ported EGR Valve (9D475)

NOTE: Refer to Section 6, Exhaust Gas Recirculation (EGR) System.

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TITLE	BASIC PART NO.	SYMBOL
EGR Valve Position Sensor	**9G428**	EGR

DESCRIPTION

The EVP Sensor provides EEC System with a signal indicating position of the EGR valve.

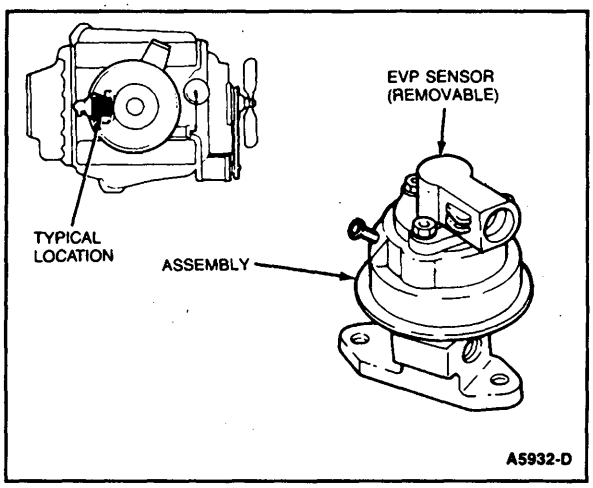


Figure 1 EGR Valve Position (EVP) Sensor

NOTE: Refer to the EEC-IV Quick Test, Section 14.

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TITLE	BASIC PART NO.	SYMBOL
Electronic Control Assembly (FBC/CFI/EFI/SEFI)	**12A650**	

DESCRIPTION

The center of the EEC-IV system is a microprocessor called the Electronic Control Assembly (ECA). The ECA (Figure 1) receives data from a number of sensors and other electronic components (switches, relays, etc.). The ECA contains a specific calibration for optimizing emissions, fuel economy, and driveability. Based on information received and programmed into its memory, the ECA generates output signals to control various relays, solenoids and other actuators.

The ECA in the EEC-IV system is a microprocessor like the one in the other EEC systems. One significant difference is that this ECA has the calibration module located inside the ECA assembly, unlike the EEC-III system.

The ECA is found in different locations, depending on the model. Refer to the chart for locations.

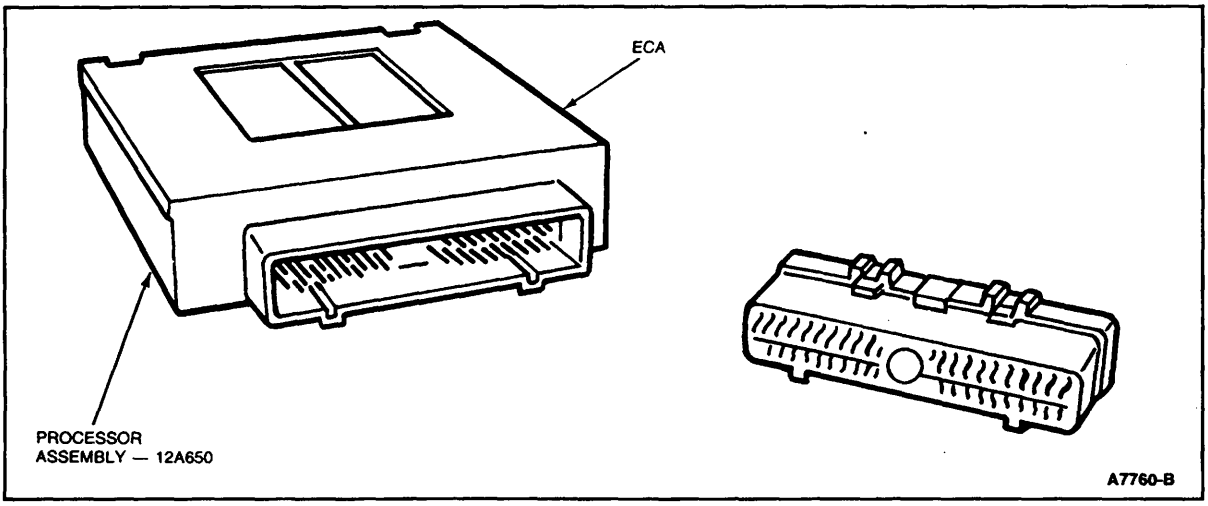
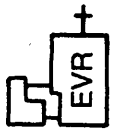


Figure 1 Electronic Control Assembly (ECA)

Vehicle	Location
Mark VII/Continental, Thunderbird/Cougar, Mustang, XR4Ti, Ranger/Bronco II	RH dash panel behind kick panel
Tempo/Topaz, Escort	Under instrument panel left of steering column
Taurus/Sable	Ahead of glove compartment
Lincoln Town Car, Ford Crown Victoria/Mercury Grand Marquis, Aerostar	LH side dash panel in passenger compartment
F-Series/Bronco	LH dash panel behind kick panel
Econoline	RH dash panel under heater blower motor

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TITLE	BASIC PART NO.	SYMBOL
EGR Vacuum Regulator	**9J459**	

DESCRIPTION

The EGR Vacuum Regulator (EVR) is an electromagnetic device which controls vacuum output to the EGR valve. The EVR replaces the EGR Solenoid Vacuum Vent Valve Assembly (9D474). An electric current in the coil induces a magnetic field in the armature. The magnetic field pulls the disk closed, closing the vent and increasing the vacuum level. The vacuum source is manifold vacuum. As the duty cycle is increased, an increased vacuum signal goes to the EGR valve.

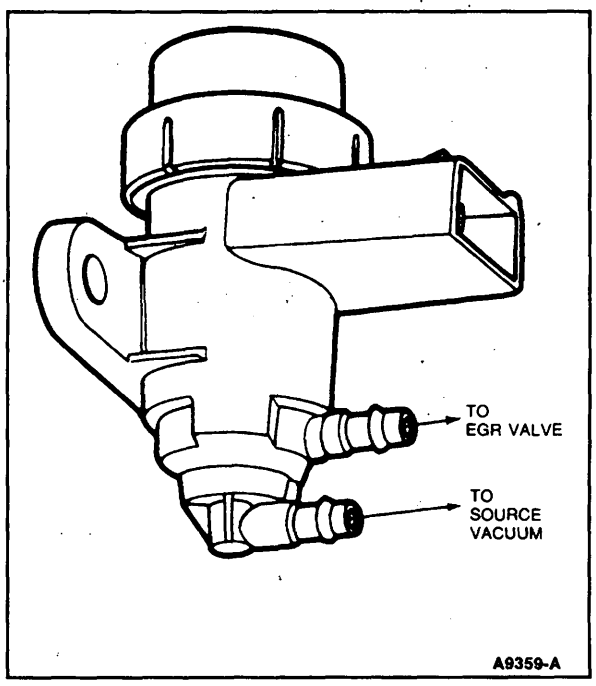


Figure 1 EGR Vacuum Regulator

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TITLE	BASIC PART NO.	SYMBOL
Engine Coolant Temperature Sensor	**12A648**	

DESCRIPTION

The Engine Coolant Temperature (ECT) Sensor (Figure 1) detects the temperature of engine coolant and supplies the information to Electronic Control Assembly (ECA).

The ECT sensor is threaded into the heater outlet fitting or cooling passage on the engine. For engine control applications, the ECT signal is used to modify ignition timing, EGR flow, and air to fuel ratio as a function of engine coolant temperature. On electronic instrument cluster applications, the ECT output is used to control a coolant temperature indicator.

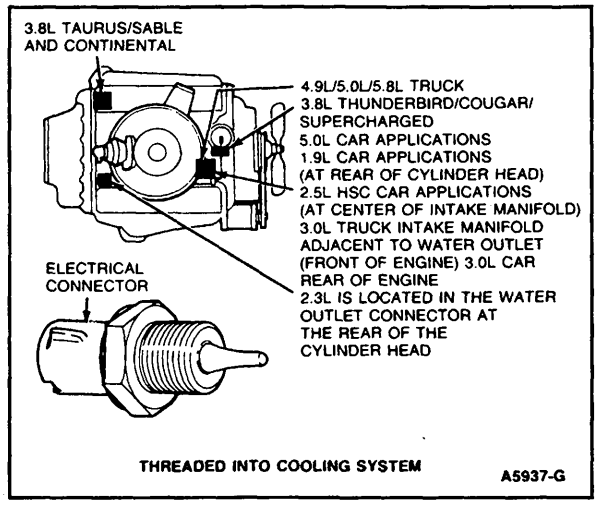


Figure 1 Engine Coolant Temperature (ECT) Sensor

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TITLE	BASIC PART NO.	SYMBOL
Exhaust Heat Control Valve	**9A427**	

DESCRIPTION

The purpose of the Exhaust Heat Control Valve (Figure 1) is to divert hot gases from the exhaust manifold to the intake manifold riser pad. Heat is transferred from the exhaust gas to the riser pad, which in turn heats the incoming fuel/air charge. There are two types currently available; the bimetal spring type and the vacuum actuated type.

Bimetal Type

Refer to Section 5 for a complete description.

Vacuum Operated

The vacuum operated heat valve functions as follows:

- When the engine is started, the valve is closed by intake manifold vacuum acting on the vacuum motor.
- The valve will stay closed until one of two conditions occurs:

1. When the engine coolant temperature reaches a predetermined value, the vacuum supply to the heat valve is shut off by a temperature sensing vacuum switch and the heat valve opens.
2. When the engine speed/load condition causes a drop in intake manifold vacuum below a specific value, the heat valve opens.

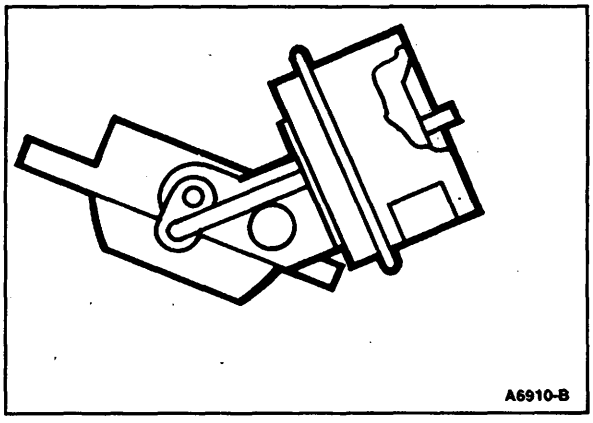


Figure 1 Exhaust Heat Control Valve

Functional Check

Apply 33.77-67.54 kPa (10-15 in-Hg) vacuum to the vacuum motor using a hand vacuum pump, Rotunda 021-00014 or equivalent, and trap for 60 seconds. The valve must close and not leak more than 6.75 kPa (2 in-Hg) and open when the vacuum is released. If it does not operate in this manner, replace the valve.

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TITLE	BASIC PART NO.	SYMBOL
Feedback Carburetor Actuator Motor	**9C908**	

DESCRIPTION

The Actuator (Figure 1) is part of the Carburetor Feedback Control System, used on 7200 model carburetors. The actuator is threaded into the carburetor body and its actuator shaft moves a fuel metering pintle valve to produce a richer or leaner air/fuel mixture at the carburetor. In response to an electronic signal coming from the Exhaust Gas Oxygen (EGO) sensor and conditioned by the EEC (or MCU) System, the actuator shaft moves in and out.

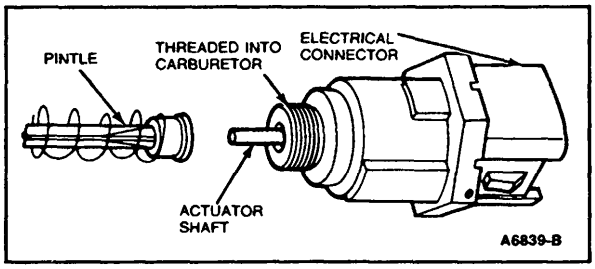


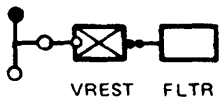
Figure 1 Feedback Carburetor Actuator Motor

Functional Check

1. Remove the FBCA motor from carburetor. Connect wiring harness to FBCA motor; turn ignition switch to RUN to extend shaft. Turn ignition switch to OFF. If FBCA shaft does not extend, replace FBCA motor and retest.
2. Push FBCA motor shaft back in by hand. If shaft will not push in, replace FBCA motor and retest.
3. Remove and clean pintle valve, spring and carburetor passage with choke cleaner and a small brush.
4. Reinstall pintle, spring a FBCA motor. Tighten FBCA motor to 8-10 lb-ft.
5. Retest according to appropriate Quick Test. Refer to Section 14.
6. Check/reset curb idle, if necessary.

NOTE: FBCA motor is partly diagnosed as a part of the 5.8L MCU electronic system. Refer to the 5.8L FBC Police and Canadian Trailer Tow MCU Diagnosis Manual.

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TITLE	BASIC PART NO.	SYMBOL
Filter Assembly— Vacuum Vent	**9F474**	

DESCRIPTION

The Vacuum Vent Filter (Figure 1) is used to filter air being drawn into the vacuum system when a vacuum bleed is required. It is a nylon tee with a restrictor and an open cell foam on one leg.

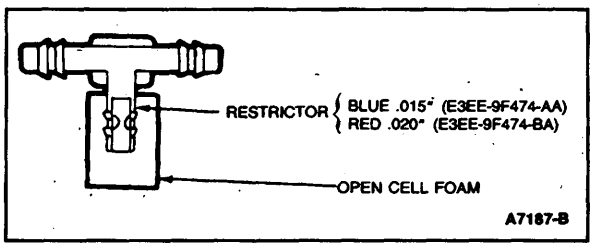


Figure 1 Vacuum Vent Filter Assembly

NOTE: If the filter appears to be dirty, wash it in an appropriate solvent.

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TITLE	BASIC PART NO.	SYMBOL
Fuel-Vapor Separator	**9C369**	SA-FA

DESCRIPTION

The Fuel-Vapor Separator (Figure 1) is used in vacuum systems to prevent fuel migration to a vacuum operated device.

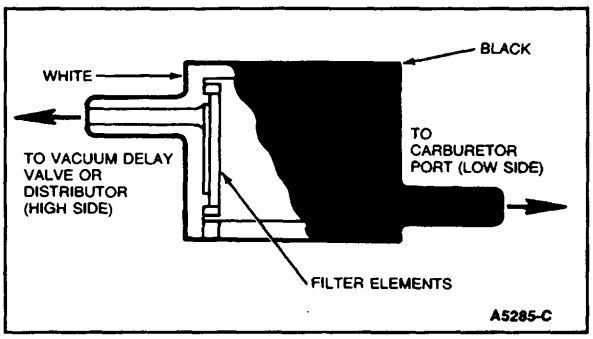


Figure 1 Fuel-Vapor Separator

Functional Check

NOTE: Separator requires positive orientation to ensure that any fuel collected will drain back to the carburetor.

If separator becomes cracked or clogged, replace the separator.

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TITLE	BASIC PART NO.	SYMBOL
Heated Exhaust Gas Oxygen Sensor	**9F472**	

DESCRIPTION

The Heated Exhaust Gas Oxygen Sensor (HEGO) (Figure 1) supplies the ECA with a signal which indicates a rich or lean condition during engine operation.

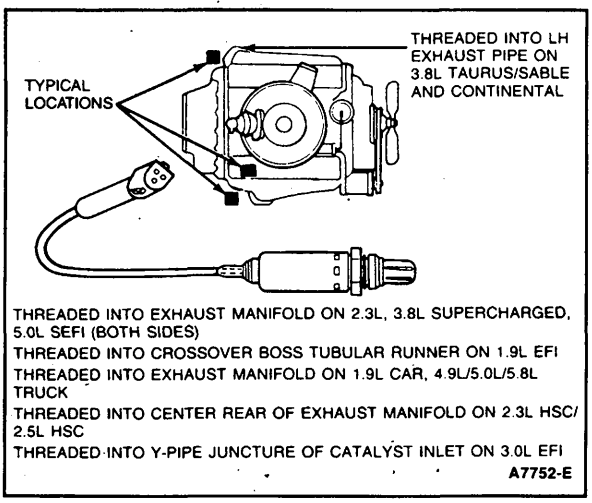


Figure 1 Typical Heated Exhaust Gas Oxygen Sensor (HEGO)

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TITLE	BASIC PART NO.	SYMBOL
Ignition Barometric Pressure Switch	**12A243**	

DESCRIPTION

The Ignition Barometric Pressure Switch (Figure 1) is used to control spark timing and/or other electrical devices in response to changes in barometric pressure (i.e., altitude). When controlling spark timing, the ignition module (12A244) is made to vary the spark timing by an amount determined by calibration resistors in the switch assembly. In normal operation, spark timing is increased for vehicle operation above the switching point (increasing altitude) and retarded for vehicle operation below the switching point (decreasing altitude). When controlling other electrical devices, only On/Off control is provided; with On (switch closed) above the switching point and Off (switch open) below the switching point. Some switch assemblies control both spark timing and another device (dual switch assembly) and other switch assemblies control only one or the other (single switch assembly).

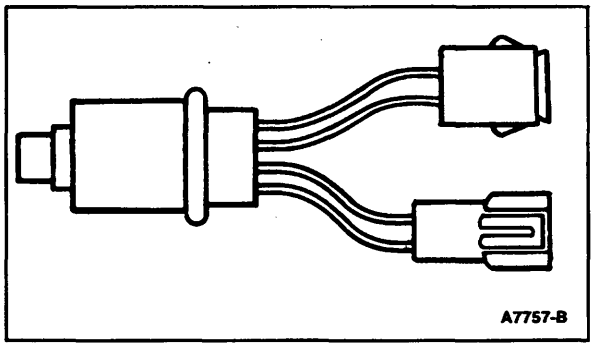


Figure 1 Ignition Barometric Pressure Switch

- Dual switch assembly shown.
- Attaching brackets vary according to installation requirements.
- Connectors may vary.

Part Number	Resistance (Ohms) Below 3,000 Feet	Resistance (Ohms) Above 4,600 Feet
E2AE-12A243-AA	Greater than 200,000	Less than 1
E43E-12A243-AA	2,820-2,920	1,750-1,850
E4DE-12A243-AB	2,560-2,660	1,960-2,060
E4EE-12A243-AA	Greater than 200,000	Less than 1

Either resistance value is correct if altitude is between 3,000 and 4,600 feet.

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TITLE	BASIC PART NO.	SYMBOL
Emission Maintenance Warning (EMW) Module	**12B514**	

DESCRIPTION

The Emission Maintenance Warning (EMW) Module (Figure 1) is mounted in the instrument panel. The EMW function activates the Check Engine Light (CEL) on the instrument panel at 2,000 hours (60,000 miles). The light indicates the emission maintenance should be performed.

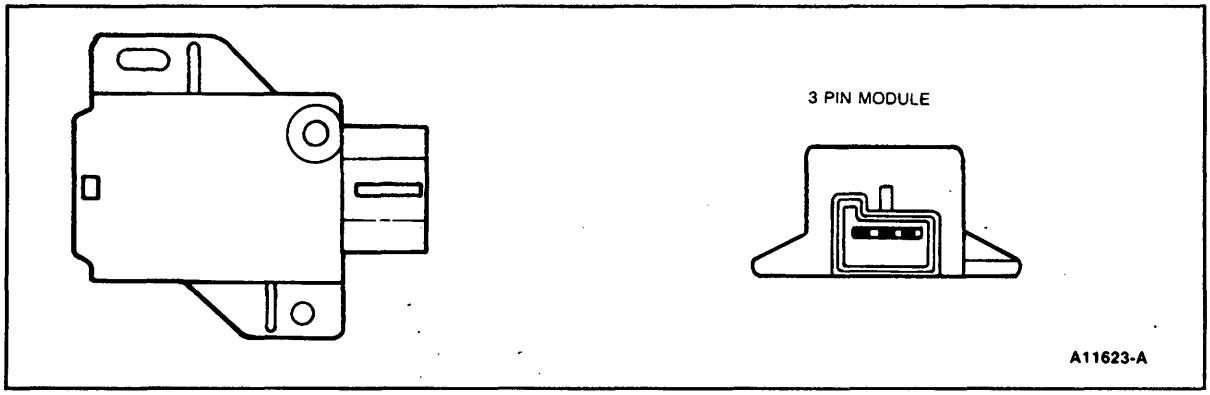


Figure 1 Emission Maintenance Warning (EMW) Module

NOTE: Refer to Section 12 for Pinpoint Testing.

APPLICATIONS:

PART NUMBER	ENGINE	VEHICLE	MODULE
E5TF-12B514-AA	6.1L, 7.0L	F, B, Series Heavy Truck	EMW

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TITLE	BASIC PART NO.	SYMBOL
Integral Relay Control Module	**12B577**	

DESCRIPTION

The Integral Relay Control Module (IRCM) (Figure 1) interfaces with the EEC-IV to provide control of the cooling fan, A/C clutch and the fuel pump. The module also incorporates the EEC power relay to provide power to the EEC-IV system.

The module is designed specifically for underhood application. The limits of operation are as follows:

Operating Temperature ..... -30°C to 100°C
Storage Temperature ..... -40°C to 125°C
Operating Voltage ..... 7 to 17 volts

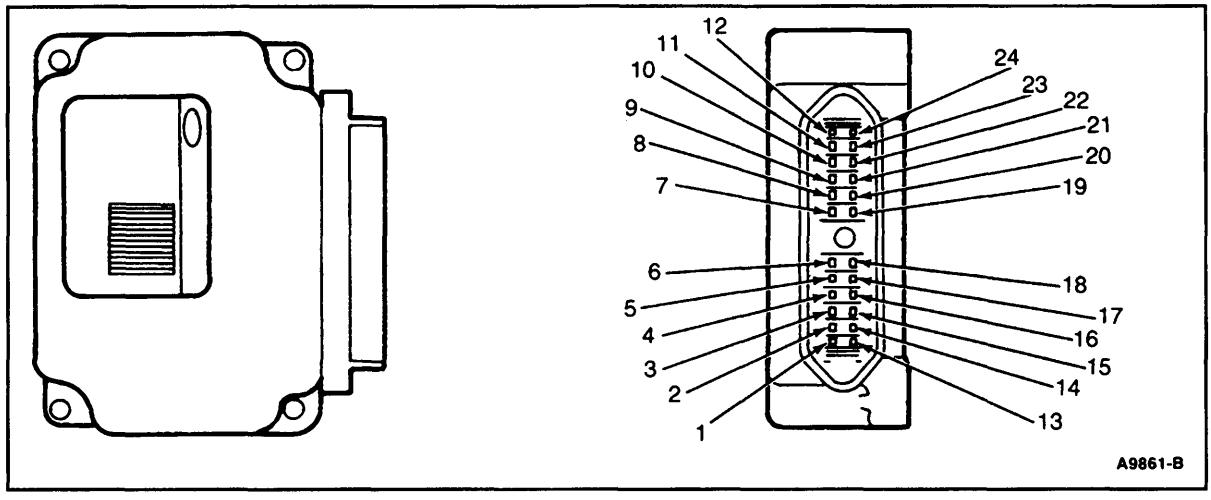


Figure 1 Integral Relay Control Module

Powertrain Model Application	Controller -12B577-	Bracket and Control Assembly — 12B581-	Vehicle Location
2.5L HSC A/T Taurus/Sable	E9DF-BB	E9DF-BB	Radiator Support
3.0L A/T Taurus/Sable	E9DF-DB	E9DF-DB	Radiator Support
3.0L SHO	E9DF-AB	E9DF-DB	Radiator Support
3.8L Supercharged	E9SF-AB	E9SF-AB	Radiator Support
3.8L A/T Taurus/Sable	E9DF-EB	E9DF-EB	Radiator Support

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TITLE	BASIC PART NO.	SYMBOL
Knock Sensor	**12A699**	

DESCRIPTION

The Knock Sensor (Figure 1) is a piezoelectric accelerometer with the sensor designed to resonate at approximately the same frequency as the engine knock frequency. The sensor uses the resonant frequency to mechanically amplify the vibrations. This method allows relatively large signals to be achieved without electrical amplification and with small package size.

The sensor has a thin circular piezoelectric ceramic disk which is bonded to a metal diaphragm. Electrical connections are made through a two pin integral connector.

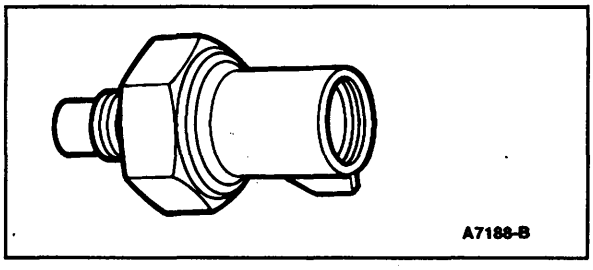
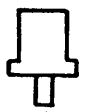


Figure 1 Knock Sensor

Part Number	Resonant Frequency	Color	Planned Usage	Thread
E3AF-AA	5.4K	Black	5.8L Ford/Mercury	1/2-13 UNC
E6TF-AA	6.45K	Black	2.9L Ranger/Bronco II	M10 × 1.5mm-6g
E5TF-BA	6.0K	Black	3.0L Taurus/Sable, Aerostar	M10 × 1.5mm-6g
E9TF-AA	9.5K	White	4.9L 5.0L/5.8L Econoline/Bronco	M12 × 1.5mm-6g
E9SF-AA	5.7K	Gray	3.8L Supercharged T-Bird/Cougar	M10 × 1.5mm-6g
E3SF-AA	5.7K	Gray	2.3L OHC Mustang	M12 × 1.5mm-6g
E5TF-AA	6.0K	Black	3.0L SHO Taurus	M10 × 1.5mm-6g

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TITLE	BASIC PART NO.	SYMBOL
Manifold Absolute Pressure Sensor	**9F479**	

DESCRIPTION

The MAP sensor (Figure 1) measures manifold vacuum using a frequency. This gives the ECA information on engine load.

It is used as a barometric sensor for altitude compensation, updating the ECA during Key On, Engine Off and every wide-open throttle.

The ECA uses MAP for:

- Spark advance
- EGR flow
- Air/fuel ratio

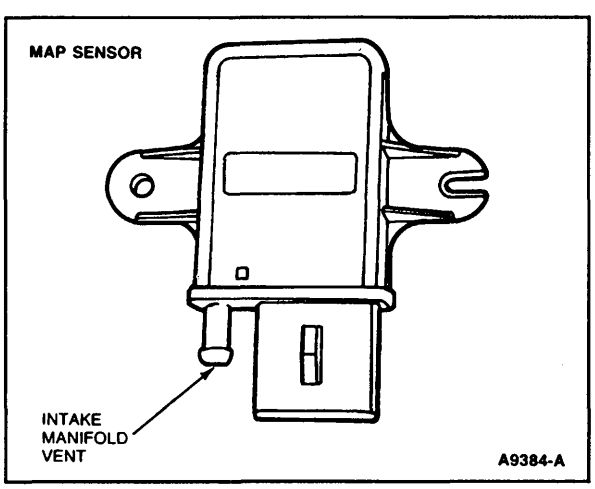


Figure 1 Manifold Absolute Pressure Sensor

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TITLE	BASIC PART NO.	SYMBOL
Mass Air Flow Sensor	**12B579**	

DESCRIPTION

The sensor directly measures the mass of the air flowing into the engine. The sensor output is a D.C. (Analog) signal ranging from about 0.5 volts to 5.0 volts used by the ECA to calculate the injector pulse width for stoichiometry. The sensing element is a thin platinum wire wound on a ceramic bobbin and coated with glass. This "hot wire" is maintained at 200°C above ambient temperature as measured by a constant "cold wire".

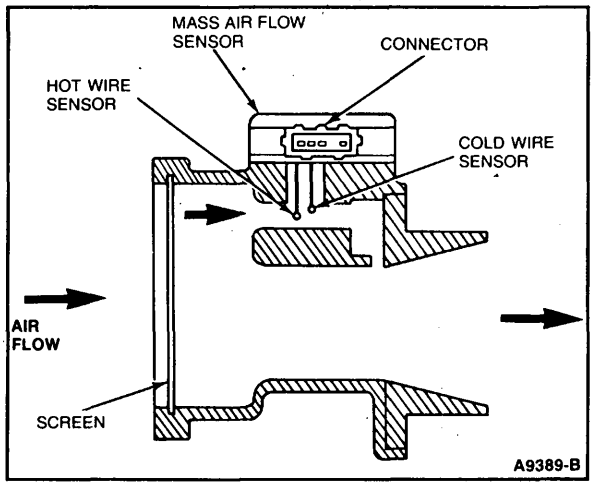


Figure 1 Mass Airflow Sensor Assembly

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TITLE	BASIC PART NO.	SYMBOL
Pressure Feedback Electronic EGR Valve	**9D460**	EGR

DESCRIPTION

The Pressure Feedback Electronic (PFE) EGR valve is a conventional ported EGR valve. The valve is used in conjunction with a pressure transducer (9J460) which supplies pressure feedback to the EEC-IV processor. The EGR flow rate is proportional to the pressure drop across a remotely located sharp edged orifice.

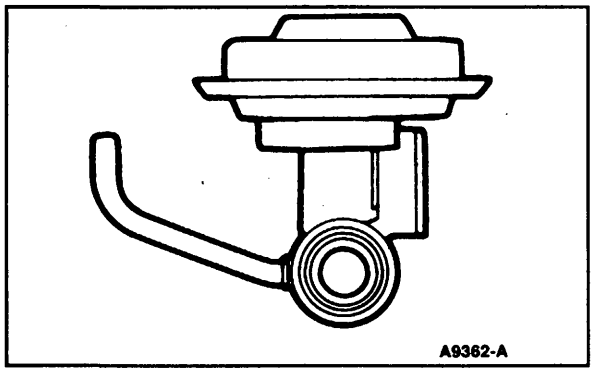
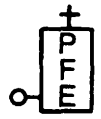


Figure 1 Typical Pressure Feedback Electronic EGR Valve

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TITLE	BASIC PART NO.	SYMBOL
Pressure Feedback Electronic EGR Transducer	**9J460**	

DESCRIPTION

The Pressure Feedback Electronic (PFE) EGR transducer converts a varying exhaust pressure signal into a proportional analog voltage which is digitized by the EEC-IV processor. The EEC-IV processor uses the signal received from the PFE transducer to complete the optimum EGR flow.

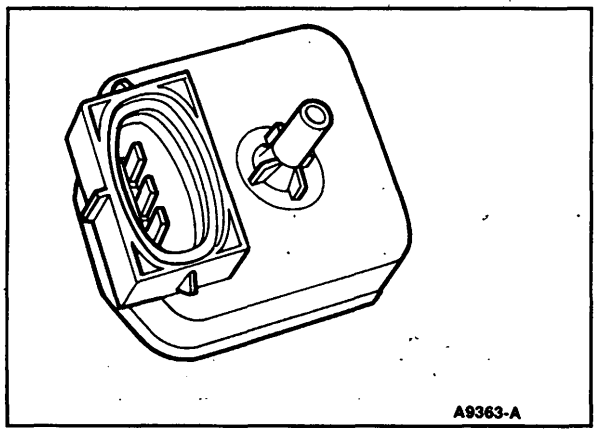


Figure 1 Pressure Feedback Electronic EGR Transducer

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TITLE	BASIC PART NO.	SYMBOL
Relay Assembly EEC (Power) EEC (Power) Time Delay	**12A646**	

DESCRIPTION

There are three types of relays: the STD Power Relay, the Time Delay Power (TDP) Relay and ISO Power Relay. The TDP has a delay of 5 to 10 seconds and is used with an actuator assembly throttle control. STD Power Relay and TDP relay types consist of a movable contact in the normally open position (SPST). Where as ISO Power Relay is SPDT. All STD power relays (except time delay) have the same design with a different bracket attachment. ISO Power Relay is the same as fuel pump and WAC Relays and have different base part numbers.

Function

EEC power relays are in parallel with the ignition switch and provides power to the EEC, STD and Time Delay module. TDP relays also provide reverse battery protection with internal diode and increased load handling to improve ignition switch reliability, where as ISO Power Relay is connected in series with separate stand alone diode, which provides reverse battery protection.

Specifications	Time Delay Power Relay	STD Power Relay	ISO Power Relay
Pull-in Voltage	9V DC max	8.5V DC max	5-9V DC max
Millivolt Drop	15 mv/amp	10 mv/amp	5 mv/amp
Coil Current	220 ma @ 14.4V DC	220 ma @ 12.8V DC	220 ma @ 12.8V DC
Drop-out Voltage	4.5V DC	1-4V DC	1.2V-4V DC

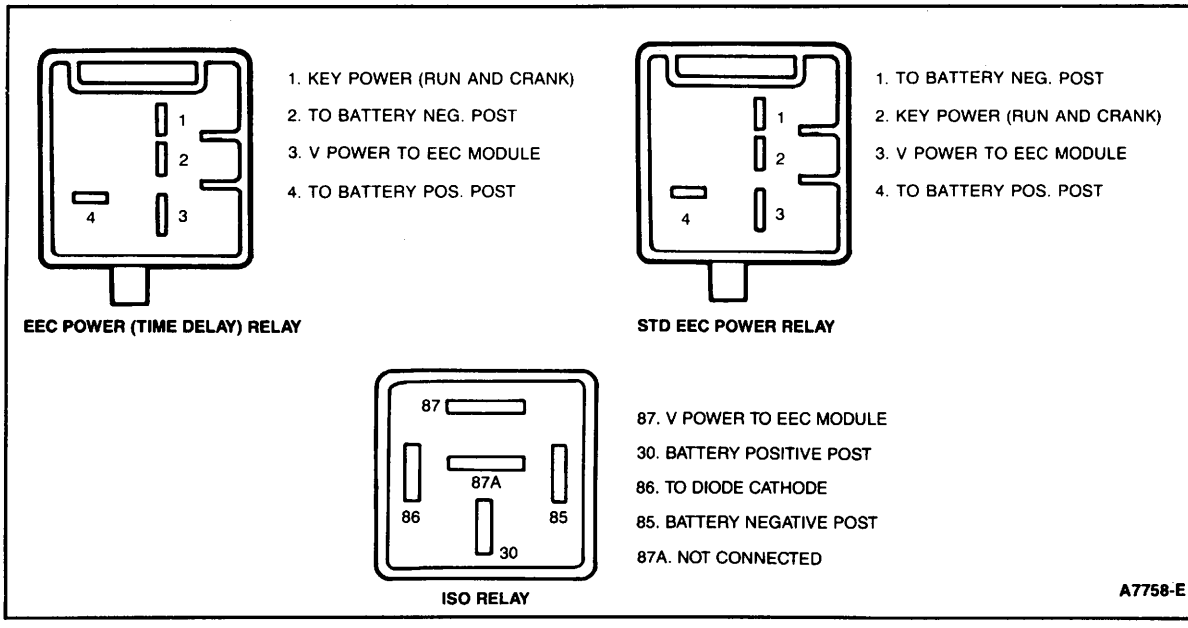


Figure 1 Relay Assembly

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TITLE	BASIC PART NO.	SYMBOL
Diode Assembly (Blade Type)	**14A604**	

DESCRIPTION

The Device is 1 amp, 400V min. glass passivated metalurgically brazed, low leakage rectifier diode.

Function

The diode is in series with EEC power relay coil and provides reverse battery protection.

Specifications		
• Forward Voltage	V_F	0.80V @ I_F = 10ma; 1.15V @ I_F = 1.0 A
• Reverse Current	I_R	100ma @ V_R = 400V; 20ma @ V_R = 10V
• Reverse Breakdown Voltage	V_R	400 @ I_R = 10.0nA

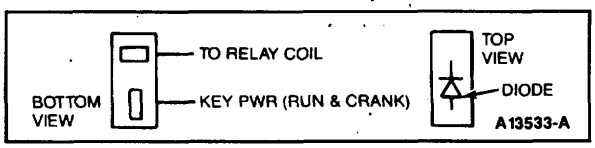


Figure 1 Diode Assy

Part Number	System Location(s)	Location(s)
• F0VF-14AG04-AA	Ford/Mercury 5.0L SFI Lincoln Town Car 5.0L SFI	Engine Compartment Relay Box, attached to vacuum reservoir.

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TITLE	BASIC PART NO.	SYMBOL
EEC Power Relay Locations	**12A646**	

EEC POWER RELAY LOCATION AND APPLICATIONS

PART NUMBER AND RELAY TYPE (Power or Time Delay)	SYSTEM APPLICATION(S)	LOCATION(S)
• E6EF-12A646-B1A/B2A Power Relay (Std.)	Escort/Lynx EXP 1.9L EFI	Passenger compartment under dash on module bracket.
• E3UF-12A646-B1A/B2A Power Relay (Std.)	Mustang 2.3L OHC/5.0L SFI	Passenger compartment on module bracket in right cowl area.
• E3EF-12A646-B1A/B2A Power Relay (Std.)	Tempo/Topaz 2.3L HSC EFI 2.3L HO	Passenger compartment under dash behind glove compartment
• E3AF-12A646-B1A/B2A Power Relay (Std.)	Thunderbird/Cougar 3.8L EFI Ford/Mercury 5.0L SFI Lincoln Town Car 5.0L SFI Mark VIII 5.0L SFI Ranger/Bronco II 2.3L/2.9L Aerostar 3.0L EFI Econo/F-Series/Bronco 4.9L/5.0L/5.8L F-Series/Bronco 7.0L Econoline/F-Series/Heavy Truck 7.5L/7.3L	Engine compartment fuse/relay box Engine compartment doghouse.
• E7EF-12A646-A1A Power Relay (Time Delay)	Escort/Lynx/EXP 1.9L CFI	Passenger compartment under dash on module bracket.
• F0VB-9345-AA Power Relay (ISO)	Ford/Mercury 5.0L SFI Lincoln Town Car 5.0L SFI	Engine compartment relay box; attached to vacuum reservoir.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Check Valve	**12A197**	 VCK-V

DESCRIPTION

A Vacuum Check Valve (Figure 1) blocks airflow in one direction. It allows free airflow in the other direction. The check side of this valve will hold the highest vacuum seen on the vacuum side. If not, replace it.

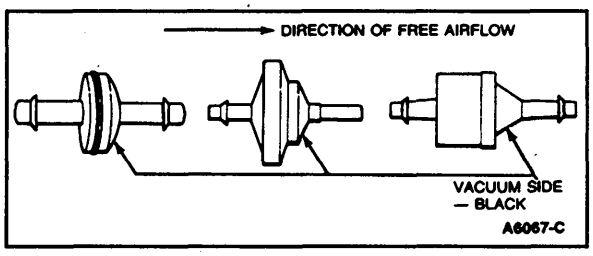
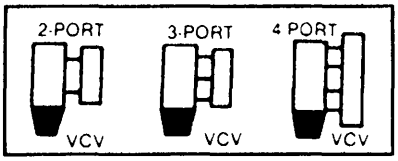


Figure 1 Vacuum Check Valve

Functional Check

Apply 54 kPa (16 in-Hg) vacuum to "check" side of valve and trap. If vacuum remains above 50.6 kPa (15 in-Hg) for 10 seconds, the valve is acceptable.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Control Valve	**8A564 9D473 9F454 12A091**	

DESCRIPTION

The VCV controls vacuum to other emission devices during engine warm-up: the 2-port types simply open when engine coolant reaches their pre-determined calibration temperatures; the 4-port types open likewise, since they are nothing more than two 2-port types in one housing; and the 3-port types switch the vacuum source to the center port from the top or the bottom ports. Electrical switches can be either open or closed until the VCV is fully cycled. Most VCV's respond to a sensing bulb immersed in engine coolant by utilizing a wax pellet principle. The only exception is the 9F454 which operates on a bimetal principle. Vacuum is usually sourced as illustrated in Figure 1.

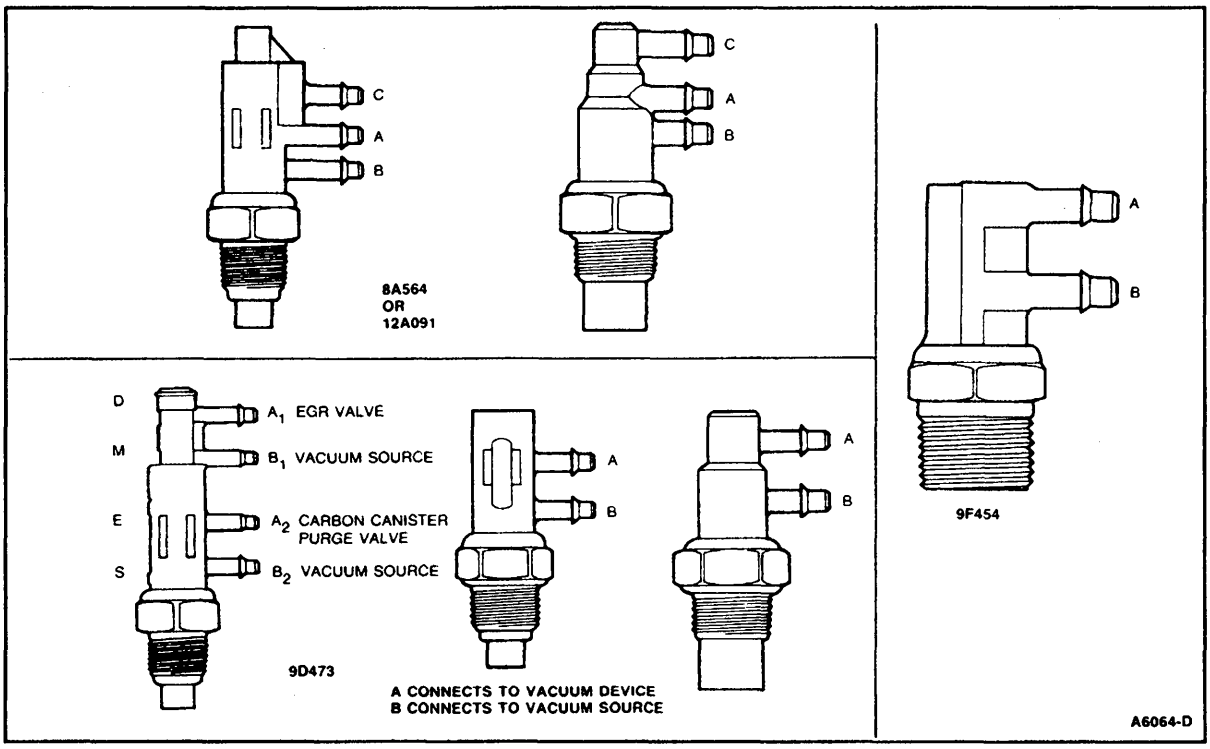
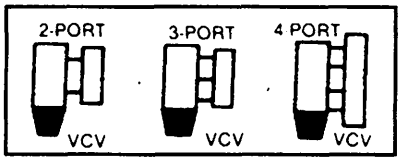


Figure 1 2-, 3-, and 4-Port Vacuum Valves

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Control Valve	**8A564 9D473 9F454 12A091**	

Functional Vacuum Check

1. With a cold engine, passage A to B should be closed and passage A to C should be open.
2. With engine at normal operating temperature, the VCV should be open between A and B and closed between A and C.

   For the 4-port valve, check A_1 to B_1 and A_2 to B_2 separately.
3. If these conditions are not met, replace the VCV Valve.

Electrical Vacuum Switch

The electrical vacuum switch (Figure 2) could be either opened or closed at room temperature. It will be reversed (opened to closed or closed to opened) with the engine at full operating temperature.

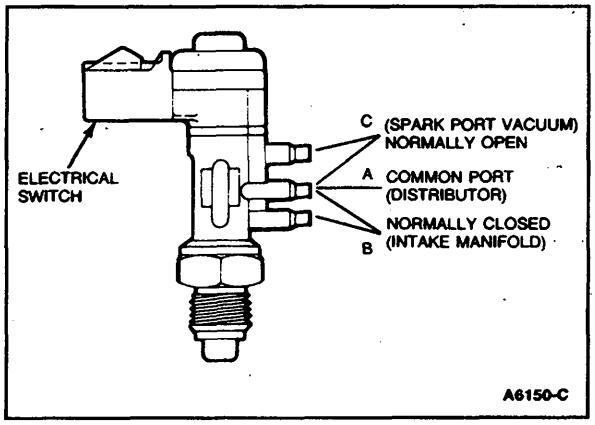
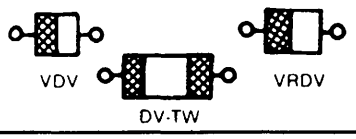


Figure 2 Electrical Vacuum Switch — 8A564

Functional Electrical Check

1. While the engine is cold, measure the continuity across the switch. Compare with specifications.
2. Warm the engine to normal operating temperature.
3. Measure the continuity across the switch. Compare with specifications.
4. The vacuum function is checked as previously described.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Delay Valves	**9E897 12A189 12A208 12A245**	

DESCRIPTION

Vacuum Delay Valves (VDV) are used for a gradual application or release of vacuum to a vacuum-operated device to help control emissions. The four valves currently in use are illustrated below with an arrow to show the direction in which airflow is restricted (Figure 1). Note that, although each valve is named for a given system application, it may be used elsewhere.

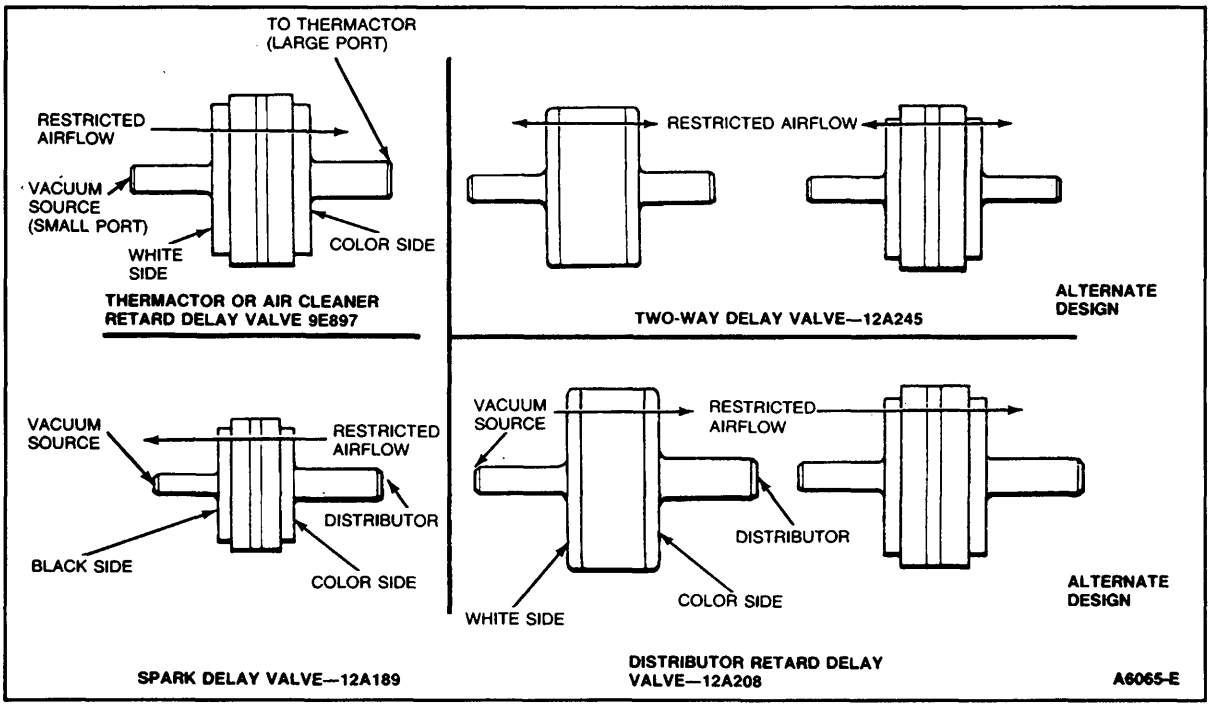
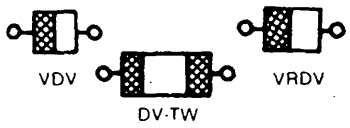


Figure 1 Four Types Of Vacuum Delay Valves

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Delay Valves	**9E897 12A189 12A208 12A245**	

Functional Check

Connect a hand vacuum pump, Rotunda 021-00014 or equivalent, to the VDV as shown in Figure 2 and pump.

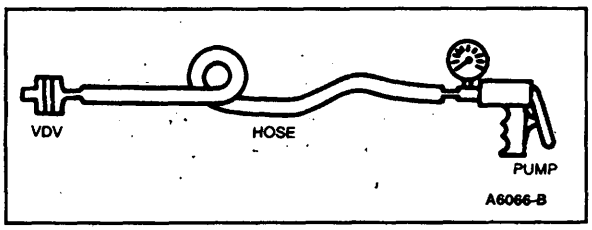
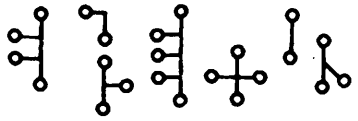


Figure 2 Hand Vacuum Pump Connection

1. Valves with one side black or white and the other side colored are good if vacuum can be built-up in one direction, but not the other direction and if that built-up vacuum can be seen to slowly decrease.
2. Valves with both sides the same color are good if vacuum can be built-up in both directions before visibly decreasing.

   NOTE: Exercise care in order to prevent oil or dirt from getting into the valve.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Harness Assembly — Nylon	**9E498**	

DESCRIPTION

Engine vacuum systems currently use a preassembled harness which features colored nylon vacuum lines. The color is a visual aid both in production and in service. The emission decal on the engine provides a colored schematic of the vacuum hook-up which corresponds with the preassembled harness.

Vacuum hose harnesses (Figure 1) consist of nylon hoses; 0.150-inch outer diameter and 0.090-inch inner diameter bonded to nylon or rubber connectors. Occasionally, a rubber hose may be connected to the harness. The nylon connectors have rubber inserts to provide a seal between the nylon connector and the component connection (nipple).

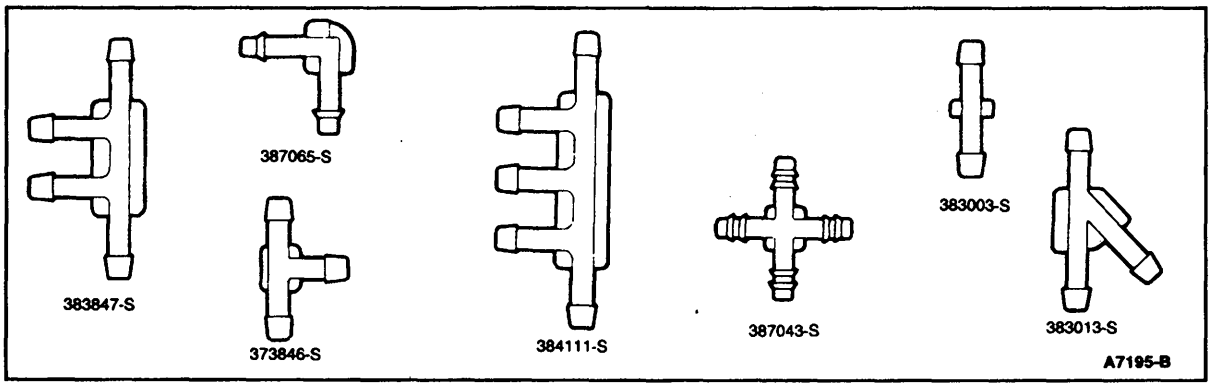


Figure 1 Vacuum Connectors Used With 5/32 Inch Rubber Hose for Service

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Harness Assembly — Nylon	**9E498**	

SERVICE PROCEDURES

If a nylon tube is broken or kinked, and the damaged area is 1/2-inch or more from a connector; the tube can be repaired by cutting out the damaged section, but not more than 1/2-inch, and then installing a rubber union (Figure 2).

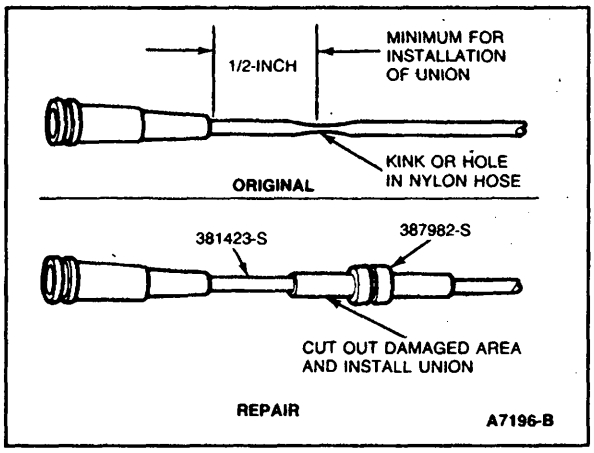


Figure 2 Broken or Kinked Hose Repair

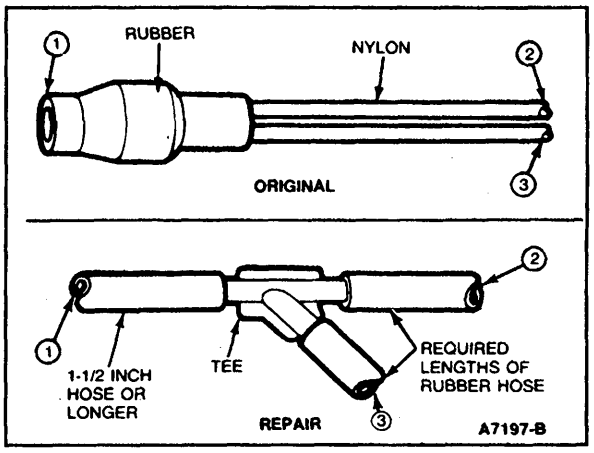


Figure 3 Hose Replacement

If the remaining hose is too short or the damaged portion is more than 1/2-inch: replace the entire hose and connectors with rubber vacuum hoses and a tee. Use existing service stock of 5/32-inch hose, 7/32-inch hose and tees.

NOTE: Circled numbers shown in Figure 3, identify same connection points on both original and repaired harnesses.

CAUTION

Care must be exercised to keep all vacuum parts away from hot components such as EGR tubes and exhaust manifolds. In addition, holes may be worn into the nylon hoses if allowed to rub against rough surfaces.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Regulator (2-Port)	**9F490**	VRV

DESCRIPTION

The two port vacuum regulator (Figure 1) provides a constant output signal when the input signal is greater than a preset level. At a lower input vacuum, the output equals the input.

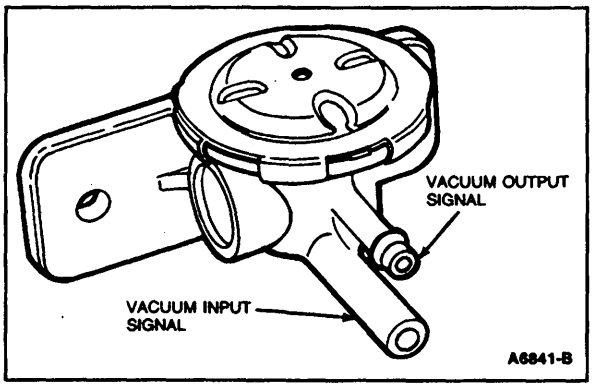


Figure 1 2-Port Vacuum Regulator

Functional Check

1. Remove vacuum line from the barbed output port (Figure 1), and install Rotunda Vacuum Gauge 059-00008 or equivalent.
2. With manifold vacuum at the input port and the engine at idle, the vacuum gauge should read between 35.7-45.9 kPa (10.5-13.5 in-Hg).
3. If the vacuum gauge reading is not within the specification, replace the regulator as required.

NOTE: The two port vacuum regulator is commonly attached to a 90-cubic inch vacuum reservoir.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Regulator (3 & 4 Port)	**9F490**	VRV

DESCRIPTION

The Three-Port (Figure 1) and Four-Port (Figure 2) regulators are used to control the vacuum advance to the distributor. During engine idle conditions, the manifold vacuum signal is reduced to a constant output signal. Off idle, the output signal equals the spark port.

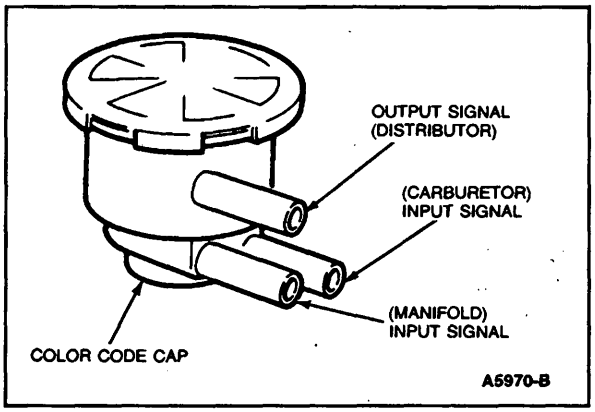


Figure 1 3-Port Vacuum Regulator

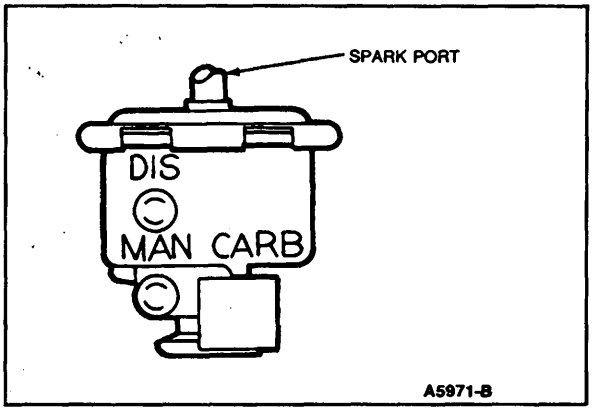


Figure 2 4-Port Vacuum Regulator

Functional Check

1. Remove the vacuum line from distributor port and install a vacuum gauge (Figures 1 and 2).
2. With the engine at idle, the vacuum gauge reading should be within 3.4 kPa (1 in-Hg) vacuum of calibration point.
3. With the color codes different, vacuum readings are identified:
   - Black is 20 kPa (6 in-Hg)
   - Green is 23.6 kPa (7 in-Hg)
   - Red is 27 kPa (8 in-Hg)

   If the color code does not meet the respective vacuum reading, replace as required.

   NOTE: This procedure is applicable to both types of vacuum regulators.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Reservoir	**9E453**	 VRESER VRESER

DESCRIPTION

The Vacuum Reservoir (Figure 1) stores vacuum and provides "muscle" vacuum. It prevents rapid fluctuations or sudden drops in a vacuum signal such as those seen during an acceleration period.

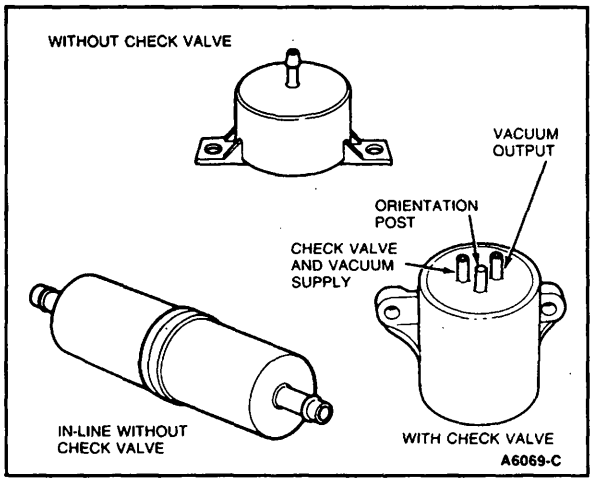


Figure 1 Vacuum Reservoirs

Functional Check

When charged initially with 15 to 20 in-Hg vacuum, vacuum loss shall not exceed .5 in-Hg in 60 seconds. If it does, replace the reservoir.

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TITLE	BASIC PART NO.	SYMBOL
Vacuum Restrictor	**12A225** **9K319**	V REST L REST T REST

DESCRIPTION

This orifice-type flow restrictor (Figure 1) is used in several emission calibrations to control the flow rate and/or timing inactions to the following emission component systems:

a. EGR valve timing — opening and closing

b. Part throttle spark advance

c. Purge system

d. Thermactor system

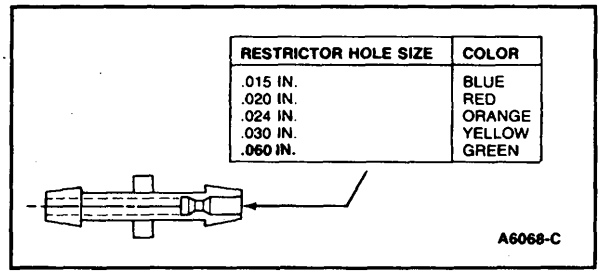


Figure 1 Distributor Vacuum Restrictor

The flow rate through the restrictor is the same in both directions. If it is blocked, replace it.

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TITLE	BASIC PART NO.	SYMBOL
Vane Air Flow Meter	**12B529**	

DESCRIPTION

The Vane Air Flow Meter (Figure 1) measures air flowing into the engine and is mounted between the air cleaner and the air throttle body assembly. The meter contains a movable vane directly connected to an electrical device known as potentiometer. Air, rushing through the Vane Air Flow Meter, changes the position of the vane and the potentiometer. The potentiometer relays vane position information to the EEC-IV module. The EEC-IV module can then translate vane position information into the volume of air flowing into the engine.

Inside the Vane Air Flow Meter is an air temperature sensor. This sensor constantly monitors the temperature of the air flowing into the engine. This information is also transmitted to the EEC-IV module.

The EEC-IV module computes volumetric airflow and air temperature, then adjusts the fuel flow to obtain the optimum air/fuel mixture.

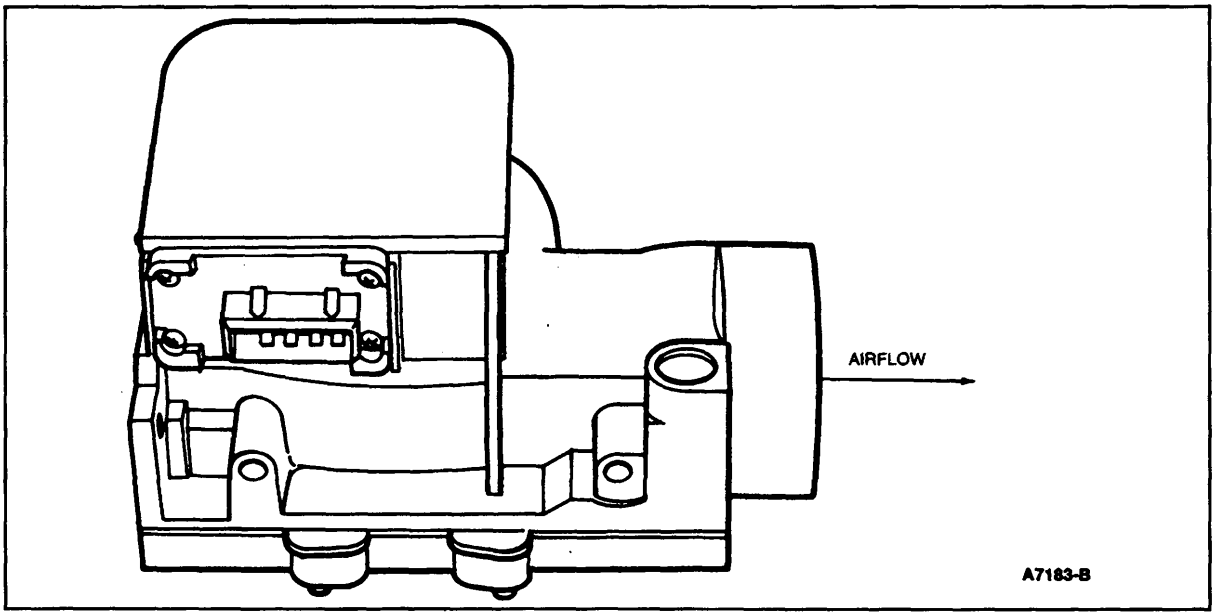


Figure 1 Vane Air Flow Meter

Functional Check

1. Use the Shop Manual for the Vane Air Flow Meter removal procedure.
2. After removing the Vane Air Flow Meter, spray carburetor cleaner on a clean cloth and pass the cloth through the meter to remove oil film buildup. Do not spray inside the Vane Air Flow Meter.
3. Reinstall the Vane Air Flow Meter.
4. Rerun Quick Test. Refer to Section 14.
5. If code is still present, replace Vane Air Flow Meter. Rerun Quick Test.

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SECTION 4

Carburetors, Throttle Bodies and Injectors

Contents

Component Descriptions 4-1

DC Motor-Idle Speed Control Actuator 4-1

Idle Air Bypass Valve Assembly 4-2

Air Throttle Body Assembly 4-3

CFI, EFI & Carburetor System Diagnosis By Symptom 4-4

Throttle Body and Idle Air Bypass Valve Assembly
Cleaning Procedure 4-19

Idle Setting Procedures
For 3.0L Probe, all 4.9L and 5.8L (U/8500 GVW) 4-20

Idle Speed Setting Procedures 4-22

Idle Mixture Setting Procedures 4-37

Cold Enrichment System 4-38

Choke Adjustment Procedure
6.1L and 7.0L Engines Truck, Over 8500 GVW 4-51

Fuel Injector Testing/Cleaning 4-52

Fuel Injector Tester/Cleaner 4-55

EFI Injectors 4-59

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Component Descriptions

DC Motor-Idle Speed Control Actuator — 9N825

The DC-Motor Idle Speed Control Actuator (DC-ISCA) (Figure 1) is mounted to the fuel charging assembly and controls the idle speed including such functions as: high cam rpm, anti-diesel shutoff, dashpot and pre-positioning for next vehicle start. The DC-ISCA is driven by the EEC-IV system and includes an integral Idle Tracking Switch (ITS).

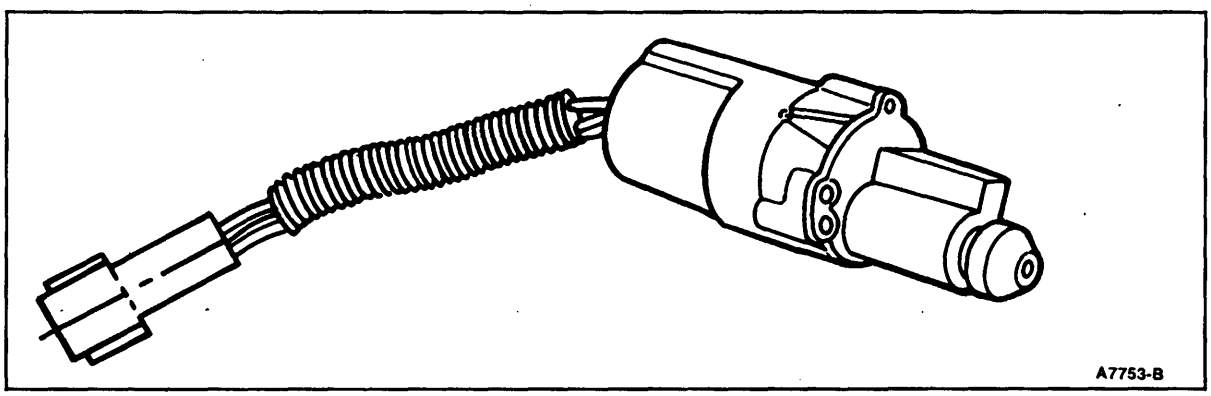


Figure 1 DC Motor-Idle Speed Control Actuator

APPLICATIONS

PART NUMBER	ENGINE	VEHICLE
E90F-9N825-AA	2.5L HSC	Passenger Car
E8DF-9N825-AA	1.9L CFI	Passenger Car

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Component Descriptions

Idle Air Bypass Valve Assembly — 9F715

The Air Bypass Solenoid (Figures 2 and 3) is used to control engine idle speed and is operated by the Electronic Engine Control (EEC) module.

The valve allows air to pass around the throttle plates to control:

- Cold engine fast idle
- No touch start
- Dashpot
- Over temperature idle boost
- Engine idle load correction

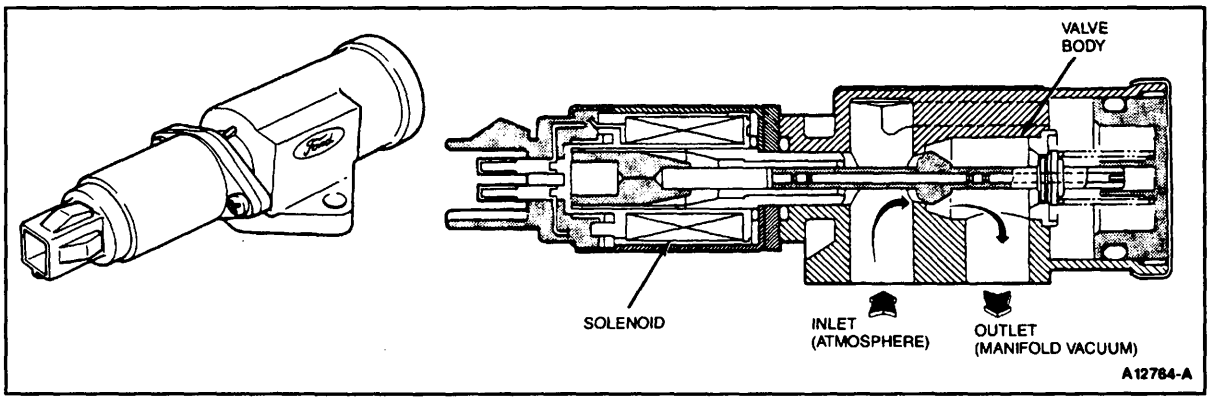


Figure 2 Hirachi Idle Air Bypass Valve Assembly

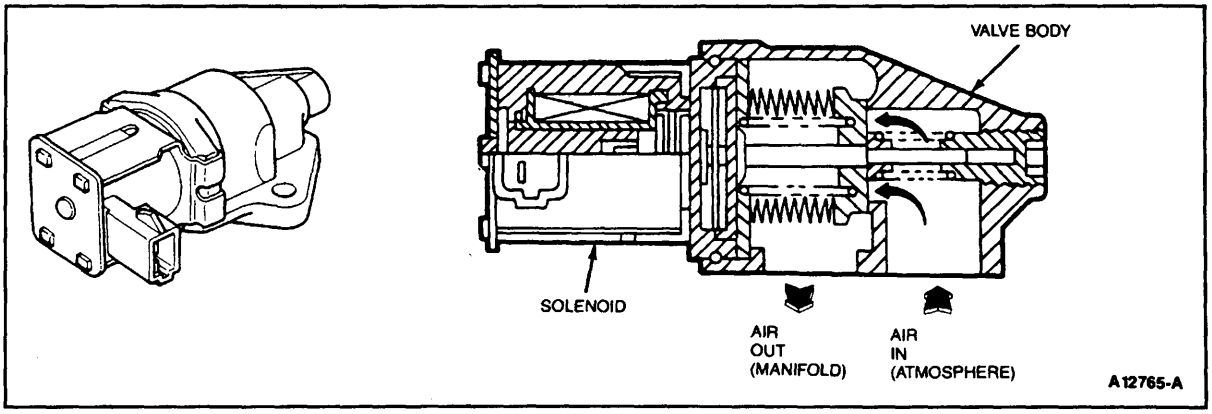


Figure 3 Nippendenso Idle Air Bypass Valve Assembly

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Component Descriptions

Air Throttle Body Assembly — 9E926

The Throttle Body Assembly (Figure 4) controls airflow to the engine through a single or dual butterfly valve. The throttle position is controlled by conventional linkage. The body is a single-piece, die casting of aluminum. It has a single bore with an air bypass channel around the throttle plate.

Other features of the Air Throttle Body Assembly include:

1. An adjustment screw to set the throttle plate stop at a minimum idle airflow position.
2. A pre-set stop to locate the wide-open throttle (WOT) position.
3. A throttle body mounted throttle position sensor (may be mounted elsewhere).
4. A PCV fresh air source upstream of the throttle plate (some applications).
5. Individual vacuum taps for PCV and EGR control signals (some applications).
6. Idle air bypass valve (some applications).

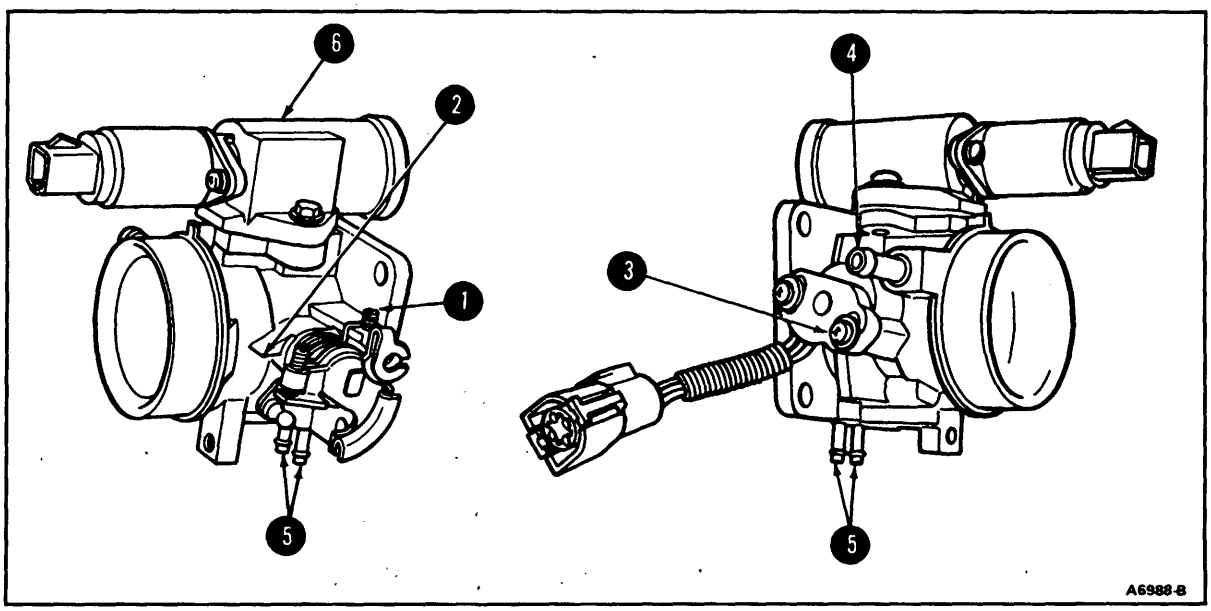


Figure 4 Typical Air Throttle Body Assembly, Maybe of Single or Dual Bore Type

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CFI, EFI & Carburetor System Diagnosis By Symptom

Driveability Symptom Index

	Page
Cranks Normally But Won't Start Hot/Cold	4-5 & 4-9
Starts Normally But Won't Run (Stalls), Hard Start Hot/Cold	4-6 & 4-10
Cranks Normally But Slow to Start, Hard Start Hot/Cold	4-6 & 4-10
Rough Idle Hot/Cold	4-7 & 4-11
Misses Under Load	4-14, 4-15 & 4-16
Low Idle Speed, Stalls on Deceleration or Quick Stop	4-13
Hesitates or Stalls on Acceleration	4-8 & 4-12
Backfire (Induction or Exhaust)	4-5, 4-6, 4-8 & 4-10
Lack of Power	4-14 & 4-16
Surges at Steady Speed	4-17
High Idle Speed, Engine Diesels	4-18
Poor Fuel Economy	4-15
Exhaust Smoke — Black, Flooding	4-17
Gas Smell	4-17
Emission Test Failure	4-7, 4-11 & 4-17

Pre-checks

- Verify battery is fully charged.
- Verify adequate fuel supply in the fuel tank.
- Verify fuse/fuse link integrity.
- Inertia switch set.
- Inspect the fuel lines and fuel tank for deformaties, leaks and kinks.
- Inspect the vacuum lines for leaks — disconnected, kinks, or broken plastic connector.
- Inspect the cooling system to be sure it is filled and free of leakage.
- Inspect the cooling hoses to be sure they are not collapsed, kinked, or leaking.
- Inspect ignition system for crossfire, spark plug wires — coil wire off or loose.
- Inspect ignition system for breakage or other damage.
- Verify ignition timing.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• No Start — Cold • Backfire (Induction or Exhaust)	• Carburetor	• No fuel in carburetor bowl.	• Check by actuating accelerator pump. If no fuel discharge is seen, check fuel delivery system. Refer to Fuel/Engine Shop Manual Group or Section 11.
		• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment clean, service, or replace as required.
		• Venturi valve sticking open, **7200 only.**	• Clean and service as required.
		• Clogged air bleeds or idle passages.	• Clean with solvent and compressed air.
	• CFI/EFI	• Inoperative ISC motor.	• Go to EEC-IV Diagnostics.
		• TP sensor stuck at WOT	• Crank engine with TP sensor disconnected.
		• Plugged, leaking, or inoperative injector. • Insufficient fuel pressure.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure, Page 4-19.
		• Throttle body ISC-BPA contaminated.	• Clean throttle body and ISC-BPA. Refer to Fuel/Engine Shop Manual Group.
		• Throttle plate stop screw backed out.	• Go to adjustment procedure in this Section.
			Return to Routine 201, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Hard Start — Cold • Starts Normally But Won't Run (Stalls) — Cold • Cranks Normally But Slow to Start — Cold • Backfire (Induction or Exhaust)	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment;clean, service or replace as required.
		• Incorrect choke thermostat adjustment, lean or rich.	• Adjust choke. If tamperproof,check for correct assembly.
		• Venturi valve sticking open, **7200 only.**	• Clean and service as required.
		• Accelerator pump not functioning, check visuallyfor fuel discharge.	• Visually check for fuel discharge and serviceas required.
		• Leaking intake manifold or carburetor gaskets.	• Replace leaking gaskets.
		• Feedback motor inoperative, **7200 only.**	• Clean and service as required. Refer to Section 3.
	• CFI/EFI	• ISC inoperative.	• Go to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injector.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body, ISC-BPA contaminated, icing.	• Clean throttle body and ISC-BPA. Refer to Air Throttle Body and Idle Air Bypass Valve cleaning procedure in this Section. For additional information, refer to Fuel/Engine Shop Manual Group.
		• Throttle plate stop screw backed out.	• Go to adjustment procedure in this Section:
			Return to Routine 203, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Rough Idle — Cold • Emission Test Failure	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required. Check choke pull down adjustment. Check voltage to choke cap.
		• Improper idle adjustment.	• Perform idle adjustments.
		• Improper fast idle adjustments.	• Perform fast idle adjustments.
		• Venturi valve sticking open, **7200 only.**	• Clean and service as required.
		• Venturi valve diaphragm leaking, **7200 only.**	• Check and service as required.
		• Feedback motor inoperative, **7200 only.**	• Check and service as required. Refer to Group Fuel/Engine.
		• Metering rod bent, **7200 only.**	• Check and service as required. Refer to Fuel/Engine Shop Manual Group.
		• Air cleaner duct vacuum motor damaged, open to cold air source always.	• Service or replace as required. Refer to Section 3.
		• Improper idle mixture.	• Perform propane check, adjust if out of specification.
	• CFI/EFI	• Plugged, leaking or inoperative injector. • Throttle body, ISC — BPA contaminated, icing.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section. • Refer to Throttle Body and Idle Air Bypass Valve cleaning procedure in this Section.
			Return to Routine 204, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Stall, Stumble, Hesitation — Cold • Hesitates or Stalls on Acceleration • Backfire (Induction or Exhaust)	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service or replace as required. Check choke pulldown. Check voltage to choke cap.
		• Accelerator pump not functioning, check visually for fuel discharge.	• Visually check for fuel discharge and service as required.
		• Low fuel pump delivery.	• Test fuel pump, service or replace as required. Refer to Fuel/Engine Shop Manual Group or Section 11.
		• Feedback motor malfunction, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Clogged fuel filter.	• Clean or replace as required. Find cause.
		• Power valve stuck closed.	• Replace power valve.
		• Improper or obstructed main jets.	• Check, clean, or replace as required. For 7200, replace carburetor.
		• Air cleaner duct vacuum motor damaged open to cold air source.	• Service or replace as required. Refer to Section 3.
		• Venturi Valve Diaphragm failure, **7200 only.**	• Replace diaphragm.
	• CFI-EFI	• TP sensor failure.	• Go to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injectors.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body ISC-BPA contaminated or icing.	• Clean throttle body and ISC-BPA. Refer to Throttle Body and Idle Air Valve Bypass cleaning procedure in this Section. For additional information, refer to Fuel/Engine Shop Manual Group.
		• Throttle plate stop screw backed out.	• Go to adjustment procedure in this Section.
			Return to Routine 202 or 207, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• No Start — Hot • Cranks Normally But Won't Start — Hot	• Carburetor	• No fuel in carburetor bowl.	• Check by actuating accelerator pump. If no fuel discharge is seen, check fuel delivery system. Refer to Fuel/Engine Shop Manual Group or Section 11.
		• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
		• Venturi valve sticking, **7200 only.**	• Clean and service as required.
		• Flooding or loading.	• Check float level, adjust as required.
	• CFI-EFI	• Inoperative ISC motor. • TP sensor stuck at WOT.	• Go to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injector. • Insufficient fuel pressure.	• CFI only — Check for fuel discharge while cranking engine. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
			Return to Routine 201, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Hard Start, Hot • Starts Normally But Won't Run (Stalls) — Hot • Cranks Normally But Slow to Start Hot • Backfire (Induction or Exhaust)	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
		• Incorrect choke, thermostat adjustment, lean or rich.	• Adjust thermostat housing and choke cap. If tamperproof,check for correct assembly.
		• Venturi valve sticking open, **7200 only.**	• Clean and service as required.
		• Bowl vents plugged.	• Check internal vent for adjustment and external ventfor kinked hose.
		• Feedback motor inoperative, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Flooding or loading.	• Check float level, service as required.
		• Leaking intake manifold or carburetor gaskets.	• Replace leaking gaskets.
	• CFI/EFI	• Excessive fuel pressure.	• Clean, service or replace: — Fuel return line. — Fuel pressure regulator. Refer to Section 11.
		• Contaminated fuel pressure regulator valve and seat.	• Clean, service or replace fuel pressure regulator. • Check fuel pressure bleed down after engine has been turned off.
		• Plugged, leaking, or inoperative injector. • Injector O-ring seal leaking.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• ISC inoperative.	• Go to EEC-IV Diagnostics.
			Return to Routine 203, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Rough Idle — Hot • Emission Test Failure	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
		• Venturi valve sticking, **7200 only.**	• Clean and service as required.
		• Improper idle adjustments.	• Perform all idle adjustments.
		• Throttle plates sticking.	• Check and service as required.
		• Choke pulldown diaphragm not functioning.	• Check and service as required.
		• Venturi valve diaphragm leaking, **7200 only.**	• Check and service as required.
		• Improper idle mixture.	• Perform propane check, adjust if out of specification.
		• Clogged air bleeds or air passages.	• Clean with solvent and compressed air.
		• Improper fuel level.	• Adjust float level.
		• Feedback motor, **7200 only.**	• Check for smooth operation. Refer to Section 3.
	• CFI/EFI	• Plugged, leaking or inoperative injector. • Injector O-ring seal leaking.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body ISC-BPA contaminated.	• Clean throttle body and ISC-BPA. Refer to Throttle Body and Idle Air Bypass Valve cleaning procedures in this Section. For additional information, refer to Fuel/Engine Shop Manual Group.
			Return to Routine 204, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Stall, Stumble, Hesitation — Hot • Hesitates or Stalls on a Acceleration-Hot	• Carburetor	• Cold enrichment or choke system not functioning.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
		• Inoperative accelerator pump.	• Visually check for pump shot or fuel siphoning. Service as required.
		• Low fuel pump volume.	• Test pump; fuel delivery system. Refer to Group 24 or Section 11.
		• Feedback motor malfunctioning, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Bowl vents plugged.	• Check internal vent adjustments, external for kinked hoses.
		• Clogged fuel filter.	• Check and replace as required. Check cause.
		• Power valve stuck closed.	• Replace valve.
		• Improper or obstructed main jets.	• Check, clean or replace as required. **For 7200, replace carburetor.**
		• Venturi Valve Diaphragm failure, **7200 only.**	• Replace diaphragm.
		• Carburetor Feedback System Malfunction.	• Refer to appropriate MCU or EEC Diagnostic procedure.
	• CFI/EFI	• TP Sensor Malfunction.	• Go to to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injector.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• Throttle body ISC-BPA contaminated.	• Clean throttle body and ISC-BPA. Refer to Throttle Body and Idle Air Bypass Valve cleaning procedure in this Section. For additional information, refer to Fuel/Engine Shop Manual Group.
			Return to Routine 202 or 207, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Low Idle Speed, Stalls on Decel or Quick Stop	• Carburetor	• Idle speed adjustment.	• Check and adjust as required.
		• Throttle positioner/Dashpot not functioning.	• Check and service as required.
		• Venturi valve sticking, **7200 only.**	• Check and service as required.
		• Feedback motor malfunctioning, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Clogged air bleeds or idle passages.	• Remove and clean with solvent and compressed air.
		• Venturi Valve diaphragm leaks, **7200 only.**	• Replace diaphragm.
		• Leaking intake manifold or carburetor gaskets.	• Replace leaking gaskets.
	• CFI/EFI	• ISC inoperative. • TP Sensor malfunction.	• Go to EEC-IV Diagnostics.
		• Base idle adjustment.	• Go to adjustment procedure.
			Return to Routine 206, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Lack of Power • Misses Under Load	• Carburetor	• Sticking venturi valve or leaking diaphragm, **7200 only.**	• Check, clean and service as required.
		• Venturi valve limiter out of adjustment, **7200 only.**	• Adjust as required.
		• Accelerator pump not functioning or improper adjustment. Check visually for fuel discharge.	• Check and service as required.
		• Control vacuum regulator off specification (high), **7200 only.**	• Check and adjust as required.
		• Plugged pump discharge nozzle.	• Clean nozzle with compressed air.
		• Leaking fuel at pump discharge nozzle screw gasket.	• Replace gasket.
		• Improper float setting.	• Adjust float level.
		• Main metering system plugged, contaminated fuel.	• Clean fuel system as required.
		• Venturi Valve Diaphragm failure, **7200 only.**	• Replace diaphragm.
		• Feedback motor, **7200 only.**	• Check for smooth operation. Refer to Section 3.
		• Fuel filter or fuel delivery lines restricted.	• Check fuel delivery. Refer to Section 11. For further information, refer to Fuel/Engine Shop Manual Group.
		• Carburetor feedback system malfunction.	• Refer to appropriate MCU or EEC Diagnostic procedure.
		• Secondary throttle plates stuck closed.	• Check and service as required. Refer to Fuel/Engine Shop Manual Group.
	• CFI/EFI	• TP sensor malfunction	• Go to EEC-IV Diagnostics.
		• Plugged, leaking, or inoperative injectors. • Fuel pressure regulator failure.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
			Return to Routine 209, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Poor Mileage • Misses Under Load	• Carburetor	• Feedback motor malfunction, **7200 only.**	• Check and service as required. Refer to Section 3.
		• Carburetor feedback system malfunction.	• Refer to appropriate MCU Diagnostic Procedure.
		• Cold enrichment, or choke system malfunctioning.	• Check choke system function and adjustment.
		• Purge vent control valve malfunctioning.	• Check evaporative control valve and evaporative system. Refer to Section 7.
	• CFI/EFI	• Injector O-ring seal leaking	• Perform injector leakage test.
			Return to Routines 213, 219, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Reduced Top Speed/Power • Misses Under Load • Lack of Power	• Carburetor	• Venturi valve sticking, **7200 only.**	• Check, clean and service as required.
		• Incorrect venturi WOT opening, **7200 only.**	• Adjust as required.
		• Binding throttle linkage.	• Clean and service as required.
		• Venturi valve diaphragm leaking, **7200 only.**	• Check and service as required.
		• Low fuel pump volume.	• Test fuel delivery system. Refer to Section 11 or Fuel/Engine Shop Manual Group.
		• Metering rods bent, **7200 only.**	• Service as required.
		• Incorrect float drop.	• Adjust as required.
		• Clogged fuel filter.	• Replace as required. Check cause.
		• Power valve stuck closed.	• Replace power valve.
		• Improper or obstructed main jets.	• Clean or replace as required. **For 7200, replace carburetor.**
		• Inoperative secondary system on two-staged carburetors.	• Check shaft and plate alignment, binding linkage, service as required.
		• Feedback motor inoperative.	• Check for smooth operation. Refer to Section 3.
		• Carburetor feedback system malfunction.	• Refer to appropriate MCU Diagnostic procedure.
	• CFI/EFI	• Plugged, leaking, or inoperative injectors. • Fuel pressure failure.	• CFI only — Check for fuel discharge at injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
		• TP Sensor malfunction.	• Go to EEC-IV Diagnostics.
			Return to Routine 209, Section 2.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Surge at Cruise • Surges at Steady Speed	• Carburetor	• Restricted fuel delivery or fuel filter.	• Replace filter. Refer to Section 11.
		• Improper fuel level.	• Adjust float level and drop, check float hinge pin for binding; service and adjust as required.
		• Low fuel pump volume or pressure.	• Test fuel delivery system. Refer to Section 11 or Fuel/Engine Shop Manual Group.
		• Contaminated fuel.	• Drain fuel, clean as required.
		• Damaged metering rods, **7200 only.**	• Replace.
		• Feedback motor inoperative.	• Check for smooth operation. Refer to Section 3.
		• Blocked air bleeds.	• Clean and service as required.
		• Fuel leaks around carburetor.	• Service as required.
	• CFI/EFI	• Plugged or leaking fuel injectors.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.
			Return to Routine 210, Section 2.

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• Flooding, Black Exhaust Smoke • Gas Smell • Emission Test Failure	• Carburetor	• Float problem.	• Service as required. Refer to Fuel/Engine Shop Manual Group.
		• Damaged fuel inlet or sticking needle.	• Service as required.
		• Excessive fuel pressure.	• Check fuel pressure. • Service fuel return line. Refer to Section 11.
	• CFI/EFI	• Excessive fuel pressure. • Injector stuck open, or O-ring seal leaking.	• CFI only — Check for fuel discharge at the injector. • CFI/EFI — Refer to Section 11 for Electric Fuel Delivery Systems. • EFI only — Go to Fuel Injector Testing/Cleaning procedure in this Section.

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CFI, EFI & Carburetor System Diagnosis By Symptom

SYMPTOM	SYSTEM	POSSIBLE SOURCE	ACTION
• High Idle Speed Engine Diesels or Idles too Fast	• Carburetor	• Not coming off fast idle cam.	• Check linkage for proper operation and adjustment; clean, service, or replace as required.
	• Carburetor CFI/EFI	• Incorrect idle base adjustment.	• Perform all idle adjustments. Go to adjustment procedures in this Section.
		• Vacuum leaks.	• Check all vacuum lines and connections.
		• Throttle plate, ISC-BPA or linkage sticking.	• Visual check for proper operation. • Clean Throttle Body and ISC-BPA. Refer to Air Throttle Body and Idle Air Bypass Valve cleaning procedure in this Section. For additional information, refer to Fuel/Engine Shop Manual Group.
			Return to Routine 211, Section 2.

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Throttle Body and Idle Air Bypass Valve Assembly Cleaning Procedure Using Idle Air Bypass Actuator, Rotunda 113-00009 or Equivalent

1. Remove air duct to Throttle Body Inlet. Disconnect Bypass Valve Signal Lead and attach actuator (Idle Air Bypass Valve Oscillator) harness plug.
2. Start actuator and engine (For vehicles with airflow meters, do not start engine at this time). Spray Carburetor Tune-up Cleaner D9AZ-19579-AA or equivalent, into throttle bore just enough to wet bore, Throttle Plate, and Idle Air Bypass Valve. Cycle oscillator to make sure IABP Valve is open to accept cleaning fluid.
3. Stop engine (where applicable) and actuator and let soak for 15 minutes.
4. At end of 15 minutes, saturate cleaning brush with solvent and articulate brush between bore and plate while holding throttle at wide open; exert some pressure against bore wall and plate surface. Repeat saturating brush and scrubbing for two to three minutes making sure to reach into corners near the throttle shaft ends.
5. Start actuator and engine. Spray Carburetor Tune-up Cleaner into throttle bore to wash away residue (For vehicles with airflow meters, do not start engine at this time and do not spray for longer than six seconds continuous.) On assemblies with attached Bypass Valve, spray cleaner into passage leading to the inlet of the valve while operating oscillator to insure that cleaning fluid reaches the pintle. Before proceeding with next step, insure that throttle closes properly.
6. Replace air duct. If vehicle is not to be driven within a few minutes, run engine at idle for one minute to dry out solvent residue. Operate oscillator at this time to insure solvent flow thru the by-pass valve.
7. Disconnect actuator from IABP Valve and reattach control signal lead.

NOTE:
- **Use wire stem horse hair or nylon bottle cleaner type brush 1 to 1 1/2 inches thick.**
- **Use rubber gloves and eye protection.**
- **Vehicles with air flow meters cannot be run with air duct removed.**

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Idle Setting Procedures

For 3.0L Probe, all 4.9L and 5.8L (U/8500 GVW) E and F-Series:

Note

The curb idle and fast idle RPM are controlled by the EEC-IV processor and the idle rpm control device and cannot be adjusted.

Remember

A change in idle rpm occurred because of a problem elsewhere. You should only enter this procedure after you have eliminated the possible causes listed below:

- Contamination within the throttle bore.
- Contamination within the idle speed control device.
- Contaminated or defected EGO/HEGO sensor.
- Throttle sticking or binding.
- Engine not reaching operating temperature.
- Ignition timing out of specification.
- Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable, etc.).

Verify

- Transmission in PARK or NEUTRAL.
- Parking brakes applied (automatic brake release disconnected where applicable).
- Wheels blocked.
- Cooling system filled.
- Engine at operating temperature.
- Heater and accessories off.
- Throttle lever is resting on the throttle plate stop screw.
- Ignition timing set to specification.
- All engine malfunctions have been resolved.

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Idle Setting Procedures

Procedure

1. Activate Engine Running Self-Test.
2. After service code 11 has been displayed, quickly (within 4 seconds) unlatch and latch the STI button.
3. A single pulse code indicates the entry mode, then observe Self-Test Output (STO) of the STAR tester for:
   - Constant tone, solid Light, or "STO LO" readout means base idle rpm is within range. To exit test unlatch STI button, then wait 4 seconds for reinitialization. (After 10 minutes it will exit by itself.)
   - Beeping tone, flashing light, or "STO LO" readout at (8 Hz) indicates TP sensor out of range due to over adjustment, adjustment may be required.
   - Beeping tone, flashing light, or "STO LO" readout at (4 Hz) indicates base idle rpm is too fast, adjustment is required.
   - Beeping tone, flashing light, or "STO LO" readout at (1 Hz) indicates base idle rpm is too slow, adjustment is required.
4. If adjustment is required refer to possible causes listed above and correct them as required, then continue with Step 5.
5. Refer to figure 4, turn throttle plate stop screw until beeping tone, flashing light or "STO LO" readout is constant.
6. Open throttle to 1500 rpm for 10 seconds, then recheck base idle rpm.

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Idle Speed Setting Procedures

FOR ALL OTHER CFI/EFI SYSTEMS:

Note

The curb idle and fast idle speeds are controlled by the EEC-IV processor and the idle speed control device and cannot be adjusted.

Remember

A change in idle speed occurred because of a problem elsewhere. You should only enter this procedure after you have eliminated the possible causes listed below:

- Contamination within the throttle bore.
- Contamination within the idle speed control device.
- Contaminated or defective EGO/HEGO sensor.
- Throttle sticking or binding.
- Engine not reaching operating temperature.
- Vacuum leaks (air intake manifold, vacuum hoses, vacuum reservoirs, power brake booster where applicable, etc.).

Verify

- Transmission in PARK or NEUTRAL.
- Parking brakes applied (automatic brake release disconnected where applicable).
- Wheels blocked.
- Cooling system filled.
- Engine at operating temperature.
- Heater and accessories off.
- Throttle lever is resting on the throttle plate stop screw (EFI only).
- Ignition timing set to specification.

a. Perform EEC-IV diagnostics and resolve any vehicle malfunction that are indicated by service output codes. (Ignore this step if you were sent here from an EEC-IV Pinpoint Test Step).

b. Engine off, disconnect the negative (-) terminal of the battery for five minutes minimum then reconnect it.

c. Start engine and stabilize for two minutes, then goose engine and let it return to idle, lightly depress and release the accelerator and let engine idle. Does engine idle properly?

NOTE: If electric cooling fan comes on, wait until it turns off.

d. If engine does not idle properly, SHUT ENGINE OFF. Go to the appropriate adjustment procedure page. Follow the procedure from top of the page in sequence to the bottom of the page.

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Idle Speed Setting Procedures

FOR CFI ENGINES:

1. Engine off, remove air cleaner. Connect jumper wire between Self-Test Input (STI) and Signal Return Pin on the Self Test connector (Figure 5).
2. Turn ignition key on but do not start engine. ISC plunger will retract within 10-15 seconds. If ISC plunger does not retract, perform EEC-IV diagnostics.
3. Disconnect vehicle harness from the ISC motor. Turn ignition key off and remove jumper wire.
4. Start engine, check idle rpm. If it is not:
   - 1.9L: 600 + 50 rpm continue with Step 9.
   - 2.5L: ATX 50 rpm less than specified on Decal continue with Steps 5, 6, 7 and 8.
   - 2.5L: MTX 100 rpm less than specified on Decal continue with Steps 5, 6, 7 and 8.
5. Turn ignition key off. Remove CFI assembly from vehicle.
6. Remove the plug that covers the throttle stop adjusting screw (Figure 7).
7. Remove the old throttle stop adjusting screw and install a new screw.
8. Install the CFI assembly. Start engine and let it stabilize.
9. Adjust throttle stop adjusting screw (Figure 6 or 7). Refer to Step 4 for idle rpm.
10. Shut engine off and reconnect vehicle harness to the ISC motor. Reinstall air cleaner.

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Idle Speed Setting Procedures

ADJUSTMENT PROCEDURE FOR PASSENGER CAR	1.9L EFI HO	2.3L EFI HSC	2.3L EFI OHC	2.9L EFI TURBO	3.0L EFI AXOD	3.0L SEFI MA	3.8L SEFI RWD	3.8L SEFI MA/SC	3.8L SEFI AXOD	5.0L SEFI
REFER TO FIGURE —	4	4	4	8	4	9	4	4	4	4
1. Unplug spout line and verify that ignition timing is Base ±2 degrees BTDC (Refer to decal).		X			X	X				
2. Remove PCV hose from intake manifold and plug it. Remove CANP hose from intake manifold and connect Rotunda tool #T89P-9600-AH between PCV and CANP ports.						X				
3. Remove PCV hose at the PCV valve and install .200 inch diameter orifice (Tool T86P-9600-A).		X			X					
4. Disconnect Idle Speed Control-Air Bypass Solenoid.	X	X	X	X	X	X				
5. Start engine and run at: rpm/sec	2000/60	2500/30	1500/30	2000/120	2000/30	IDLE				
6. Place automatic transmission in ..... manual transmission in Neutral	Park	Drive	Park	Park	Drive	Neutral	Park	Park	Park	Park
7. Engine off, back out throttle plate stop screw clear off the throttle lever pad.							X	X	X	X
8. With a .010 in. feeler gauge between the throttle plate stop screw and the throttle lever pad turn the screw in until contact is made then turn it an additional							1.5 turns	1.5 turns	1.5 turns	[1, 2]
9. Check/adjust idle rpm:										
• Loosen the throttle camplate roller bolt				X						
• Turn the throttle plate stop screw to (rpm)	950±50*	A 1025±50 M 1550±50	A 650±25 M 600±25	700±25	760±20	800±30				
• Tighten the throttle camplate roller bolt				X						
See NOTE below. Shut engine off and repeat steps 5, 6, 9.	X					X				
10. Shut engine off and disconnect battery for 5 minutes minimum.					X	X				X
11. Engine off reconnect spout line.		X			X	X				
12. Remove Rotunda tool. Unplug PCV hose. Reconnect CANP and PCV hoses to the intake manifold.					X X					
13. Remove orifice from PCV hose and reconnect to PCV valve.		X			X					
14. Engine off reconnect idle speed control-air bypass solenoid verify the throttle is not stuck in the bore and linkage not preventing throttle from closing.	X	X	X	X	X	X				
15. Start engine and stabilize for 2 minutes then goose engine and let it return to idle, lightly depress and release the accelerator. Let engine idle	X	X	X	X	X	X	X	X	X	X
	If idle problem still exists, Go To Section 2 for other possible causes.									
16. On Automatic Overdrive Transmission (AOD) applications or Automatic Transaxle (AXOD) application check TV adjustment.					X		X		X	X

NOTE For Step 9: After a time, idle speed may change due to strategy parameter.

[1] 1 1/2 turns 5.0L HI Output Engine
[2] 1 7/8 turns 5.0L base Engine
* 650±50 1.9L SEFI MA (CT20)

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Idle Speed Setting Procedures

ADJUSTMENT PROCEDURE FOR TRUCK	2.3L EFI OHC	2.9L EFI	3.0L EFI	4.0L EFI	5.0L EFI	5.8L EFI 0/8500 GVW	7.5L EFI
REFER TO FIGURE —	4	4	4	4	4	4	4
1. With engine off install specified feeler gauge between throttle plate stop screw and throttle lever.					A .050 in. M .030 in.	A .030 in. M .030 in.	
2. Unplug spout line and verify that ignition timing is base ±2 degrees BTDC (Refer to decal).	X				X	X	
3. Disconnect idle speed control-air bypass solenoid.	X	X	X	X	X	X	X
4. With transmission in Neutral or Park:	X	X	X	X	X	X	X
• Run engine at: rpm/sec	2500/30	2500/30	2500/30	2500/30			2500/30
• Let engine idle for 2 minutes					X	X	
5. Place automatic transmission in ..... manual transmission in Neutral.	Park	Park	Drive	Park	Park	Park	Park
6. Check/adjust idle rpm: Turn the throttle plate stop screw to (rpm)	575±25	725 ± 25	A 625±25 M 725±25	675	A 675+50 M 700+50 **See Note Below**	C6 780+50 E4OD 730+50 MAN 730+50	C6 650+50 E4OD 650+50 MAN 650+25
7. Shut engine off and repeat Steps 4, 5, and 6.		X	X	X			
8. Shut engine off and disconnect battery for 5 minutes minimum.		X	X	X	X		
9. Remove feeler gauge from throttle plate stop screw and throttle lever pad.					X	X	
10. Reconnect spout line.	X				X	X	
11. Engine off reconnect idle speed control-air bypass solenoid, verify the throttle is not stuck in the bore and linkage not preventing throttle from closing.	X	X	X	X	X	X	X
12. Start engine and stabilize for 2 minutes then goose engine and let it return to idle, lightly depress and release the accelerator.	X	X	A 720±50 M 800±50	X	X **See Note Below**	X	X
Let engine idle	**If idle problem still exists, Go To Section 2 for other possible causes.**						
13. On Automatic Overdrive Transmission (AOD) applications check TV pressure adjustment.					X		

NOTE: For Step 6, if you must turn the throttle stop screw in, shut engine off, make estimated adjustment. Start engine and repeat Steps 4, 5, and 6 before continuing.

NOTE: For Step 12, a condition may occur where the engine rpm will oscillate. This can be caused by the throttle plates being open enough to allow purge flow. To verify this condition, disconnect the carbon canister purge line and plug it. If purge is present, the throttle plates must be closed until the purge flow induced idle oscillations stop.

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Idle Speed Setting Procedures

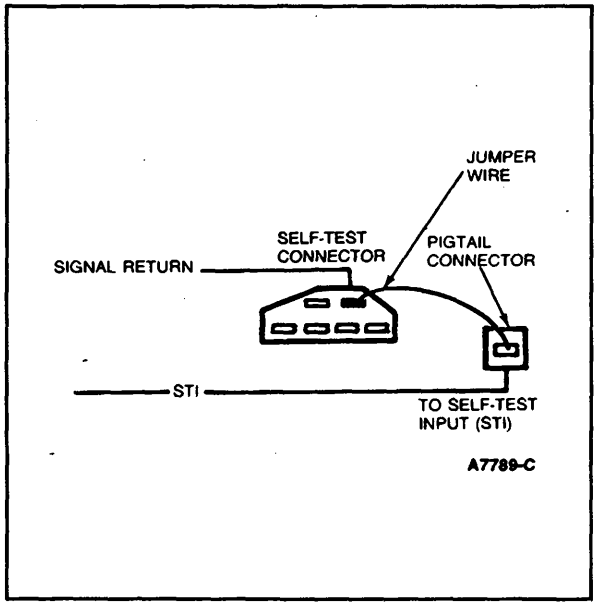


Figure 5 1.9L CFI and 2.5L CFI HSC

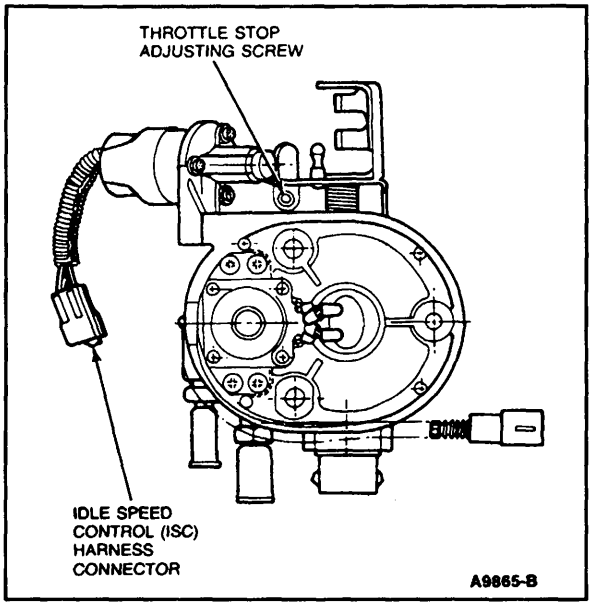


Figure 6 1.9L CFI

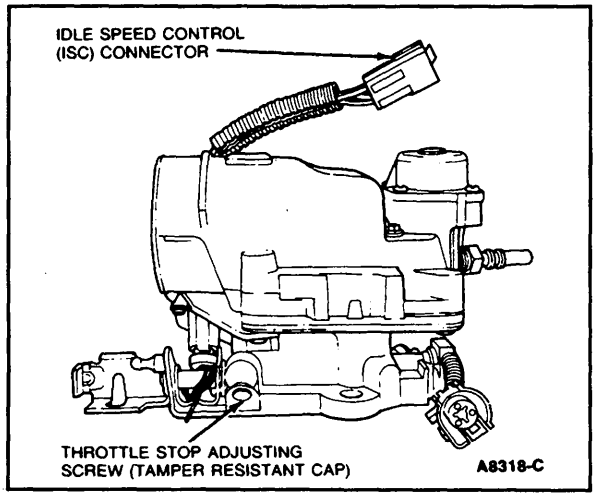


Figure 7 2.5L CFI HSC

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Idle Speed Setting Procedures

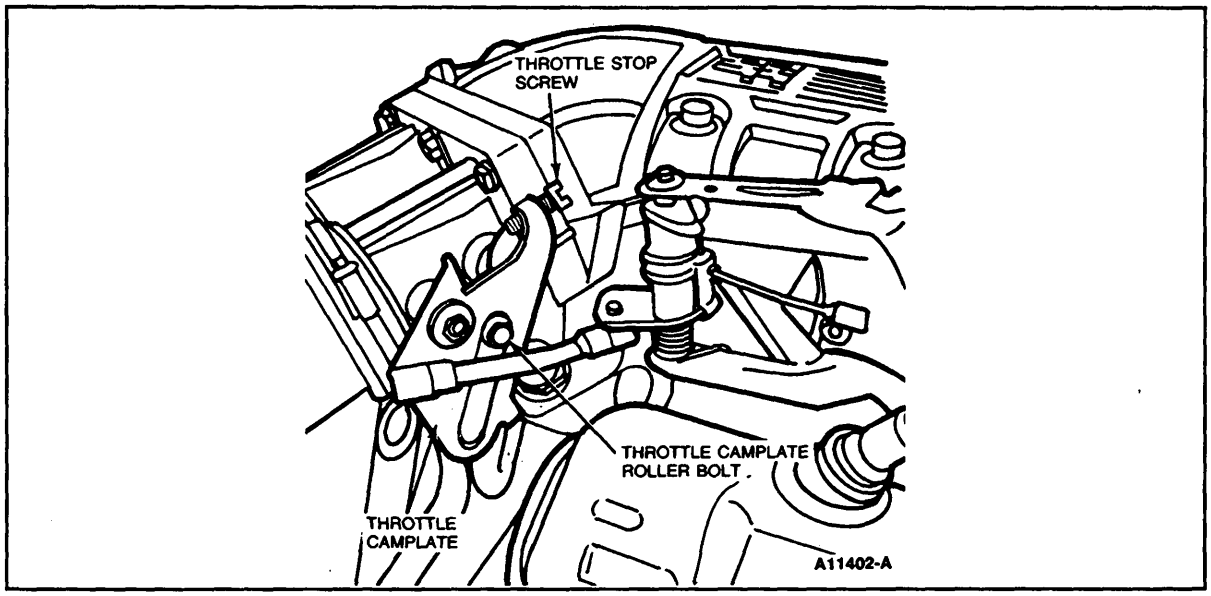


Figure 8 2.9L EFI

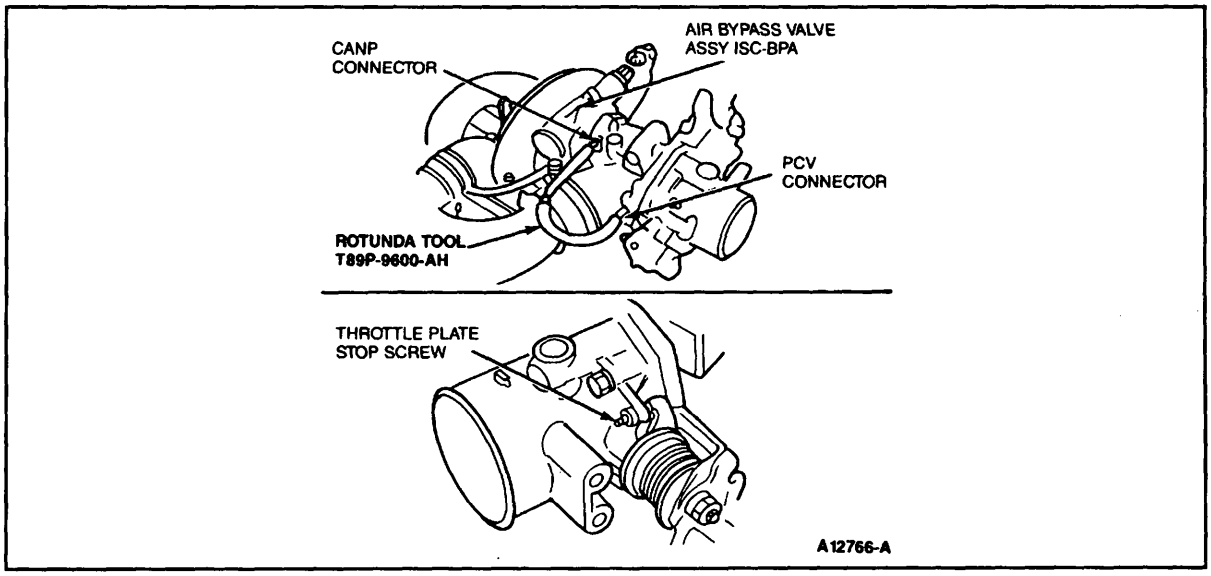


Figure 9 3.0L SEFI MA

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Idle Speed Setting Procedures

5.8L (W) ENGINE W/7200-VV — PASSENGER CAR

Fast Idle RPM

Instructions

1. Place the transmission in NEUTRAL or PARK. Set parking brake and block wheels. If equipped with automatic brake release, disconnect vacuum hose and plug it.
2. Bring engine to normal operating temperature.
3. Place A/C-Heat Selector to the OFF position.
4. Disconnect the vacuum hose at the EGR valve and plug.
5. Place the fast idle adjustment on the second step of the fast idle cam (Figure 10). Check/adjust fast idle rpm to specification.
6. Rev engine momentarily, place fast idle adjustment on the specified step and recheck fast idle rpm.
7. Remove plug from EGR vacuum hose and reconnect.

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Idle Speed Setting Procedures

5.8L (W) ENGINE W/7200-VV — PASSENGER CAR

Curb Idle RPM

Instructions

1. Place the transmission in NEUTRAL or PARK. Set parking brake and block wheels. If equipped with automatic brake release, disconnect the vacuum hose and plug it.
2. Bring the engine to normal operating temperature.
3. Place A/C-Heat selector to the OFF position.
4. Disconnect and plug the vacuum hose at the throttle kicker.
5. Place the transmission in specified position.
6. Check curb idle rpm. If adjustment is required, adjust the curb idle speed screw (Figure 11).
7. Place the transmission in NEUTRAL or PARK. Rev the engine momentarily. Place the transmission in specified position and recheck curb idle rpm and readjust only if required.
8. Apply a slight pressure on top of the nylon nut located on the accelerator pump to take up the linkage clearance.
9. Turn the nylon nut on the accelerator pump rod clockwise until a .010 ± .005 clearance is obtained between the top of the accelerator pump and the pump lever.
10. Turn the accelerator pump rod one turn counterclockwise to set the lever lash preload.
11. Remove the plug from the throttle kicker vacuum hose and reconnect.

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Idle Speed Setting Procedures

5.8L (W) ENGINE W/7200-VV — PASSENGER CAR

Kicker Speed Set

Instructions

1. Place the transmission in NEUTRAL or PARK. Set parking brake and block wheels. If equipped with automatic brake release, disconnect the vacuum hose and plug it.
2. Bring engine to normal operating temperature.
3. Place the A/C-Heat selector in the OFF position.
4. Disconnect and plug the vacuum hose at the VOTM kicker.
5. Connect an external vacuum source providing a minimum of 33.7 kPa (10 in-Hg) to the VOTM kicker.
6. Place the transmission selector in the specified position.
7. Check VOTM kicker speed. If adjustment is required, loosen the saddle bracket hold-down screw, then turn the VOTM kicker speed adjusting screw. After adjustment is made, tighten the saddle bracket hold-down screw (Figure 11).
8. Remove external vacuum source. Remove plug from VOTM kicker hose and reconnect.

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Idle Speed Setting Procedures

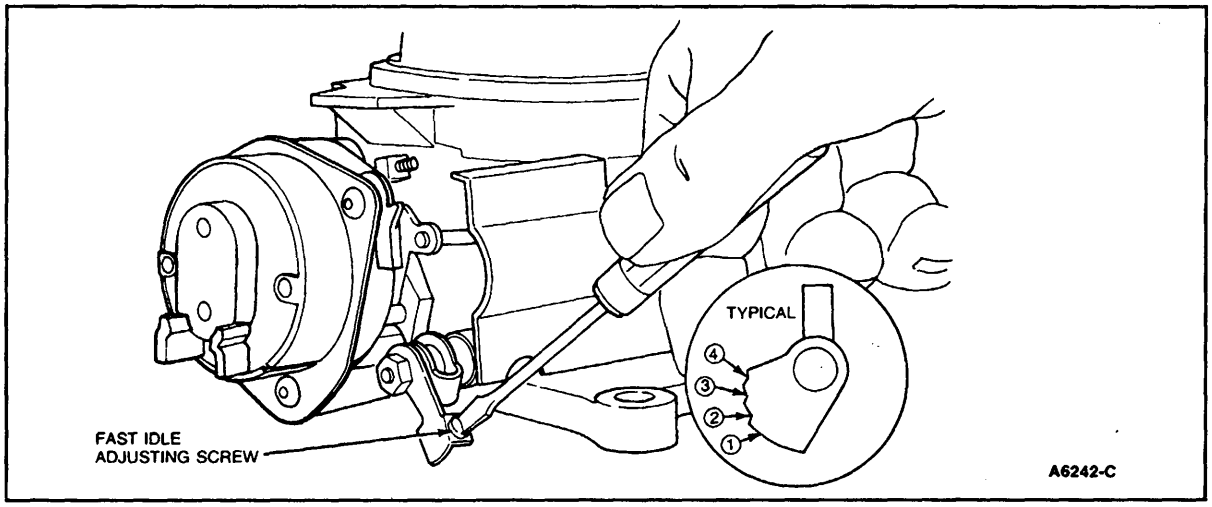


Figure 10 5.8L w/7200-VV Carburetor — Fast Idle RPM Adjustment

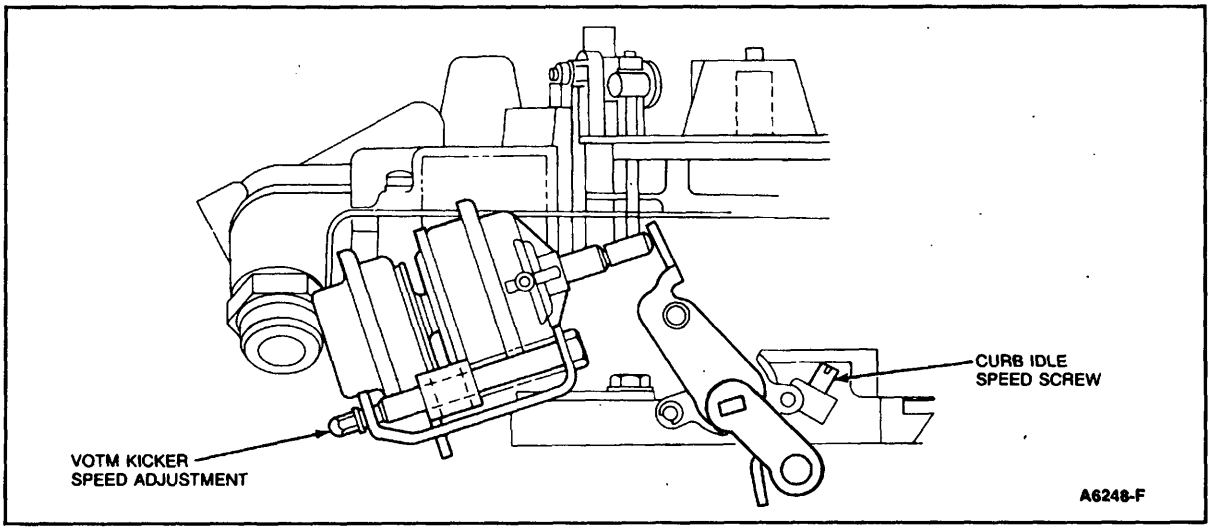


Figure 11 5.8L w/7200-VV Carburetor and VOTM (Kicker) Dashpot

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Idle Speed Setting Procedures

6.1L & 7.0L ENGINES — TRUCK, OVER 8500 GVW

Fast Idle RPM

Instructions	6.1L 2380EG-2V	7.0L 4190EG-4V
1. Stabilize engine temperature.	X	X
2. Place the vehicle in PARK or NEUTRAL, A/C in OFF position, and set parking brake.	X	X
3. Remove air cleaner.	X	X
4. Disconnect and plug evaporative emission purge valve hose.	X	X
5. Disconnect and plug EGR valve vacuum hose.	X	X
6. Bypass vacuum retard delay valve in distributor advance line with vacuum hose.	X	X
7. Depress accelerator pedal fully, pull choke control to full choke and release accelerator pedal.	X	X
8. Check/adjust choke plate pulldown clearance.		
a. Move the choke operating lever to the first detent, Figure	12	16
b. Measure the choke plate pulldown clearance using a size drill. Place the drill between the air horn wall and lower edge of the choke plate.	.200 in	.234 in
c. Adjust the clearance if necessary by bending the choke link, Figure	12	14
9. Check/adjust fast idle rpm. Insert a 0.375-inch gauge between choke plate and air horn in the down-stream side of the choke plate. Adjust fast idle rpm by turning fast idle adjusting screw, Figure	12	15
10. Remove the plug from the EGR vacuum hose and reconnect.	X	X
11. Remove bypass hose and reinstall the vacuum retard delay valve.	X	X
12. Remove the plug from the evaporative emission purge valve hose and reconnect.	X	X
13. Reinstall air cleaner.	X	X

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Idle Speed Setting Procedures

6.1L & 7.0L ENGINES — TRUCK, OVER 8500 GVW

Curb Idle Speed Decel Throttle Control Speed and Anti-Dieseling Set Speed

		6.1L 2380EG-2V	7.0L 4190EG-4V
Instructions			
1.	Stabilize engine temperature.	X	X
2.	Place the transmission in PARK or NEUTRAL, A/C in OFF position and set parking brake.	X	X
3.	Disconnect shed system hose and hot and cold air supply from air cleaner.	X	X
4.	Remove air cleaner.	X	X
5.	Adjust curb idle, if necessary, using the curb idle adjusting screw with transmission in NEUTRAL. Refer to Figure	12	13
6.	Rev the engine momentarily, recheck curb idle and adjust if necessary.	X	X
7.	With solo-pot collapsed (de-energized), set the anti-dieseling speed if necessary by adjusting the screw until specified rpm is attained. Refer to Figure	12	13
8.	Reinstall the air cleaner.	X	X
9.	Reinstall shed system hose and hot and cold air supply systems.	X	X

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Idle Speed Setting Procedures

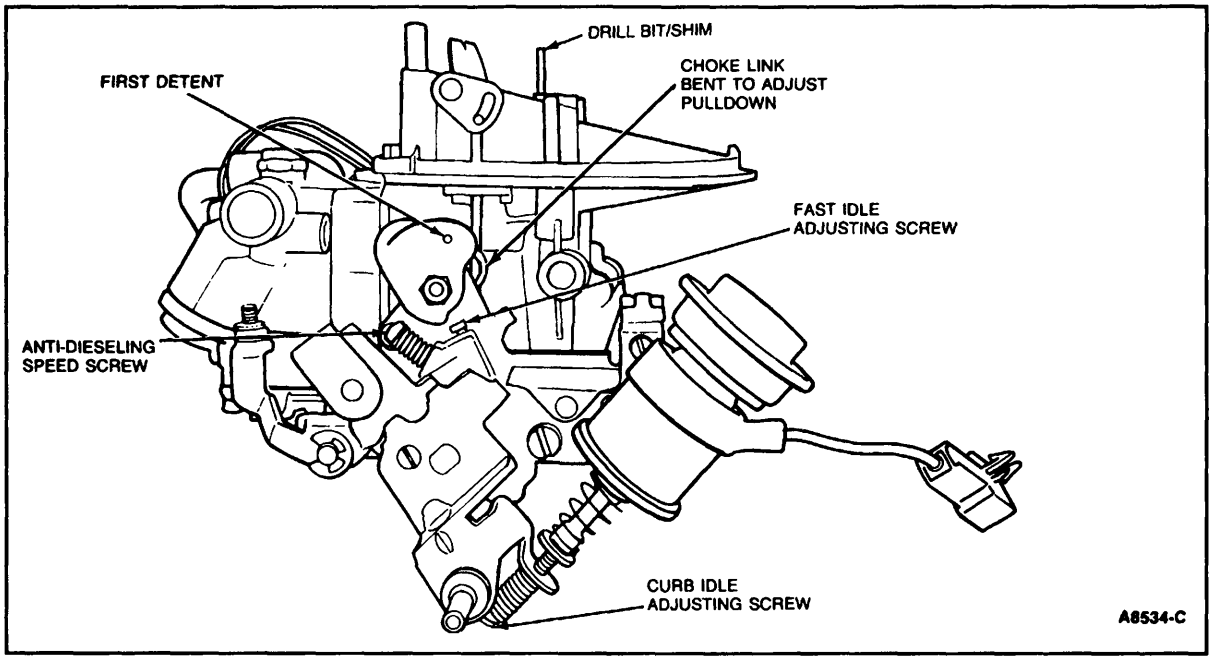


Figure 12 6.1L Engine with 2380 EG 2V-Curb Idle, Anti-Dieseling and Fast Idle Speed Adjustments

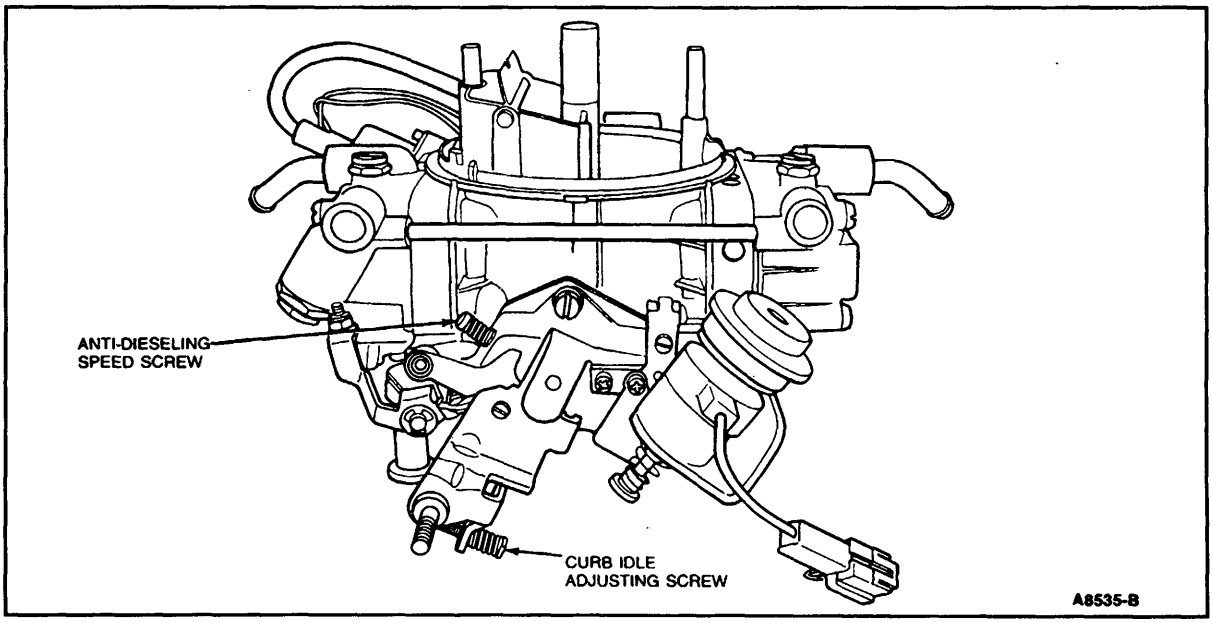


Figure 13 7.0L Engine with 4190 EG-4V-Curb Idle and Anti-Dieseling Adjustments

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Idle Speed Setting Procedures

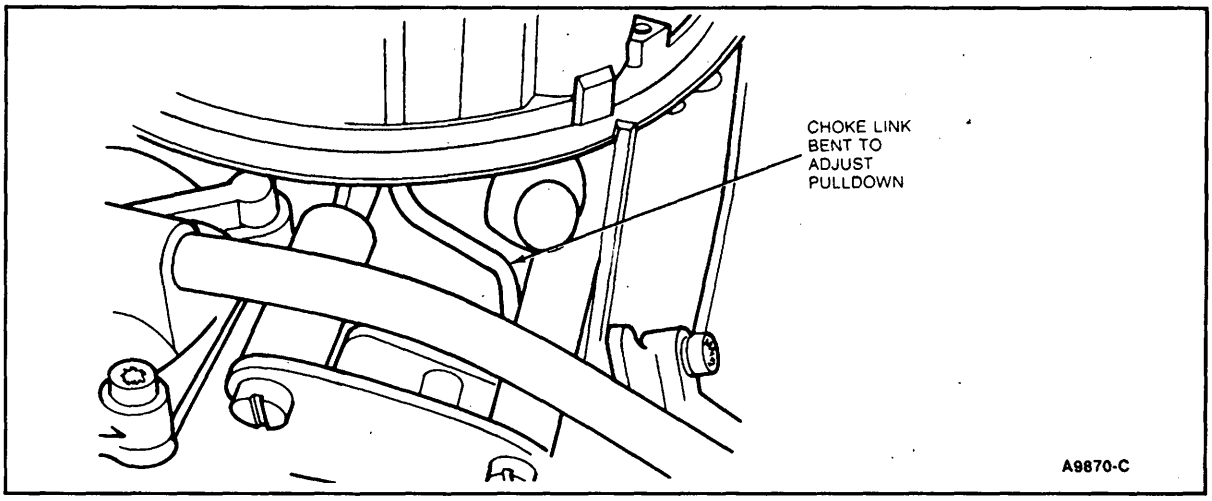


Figure 14 7.0L Engines with 4190 EG-4V — Choke Plate Pulldown Clearance Adjustment

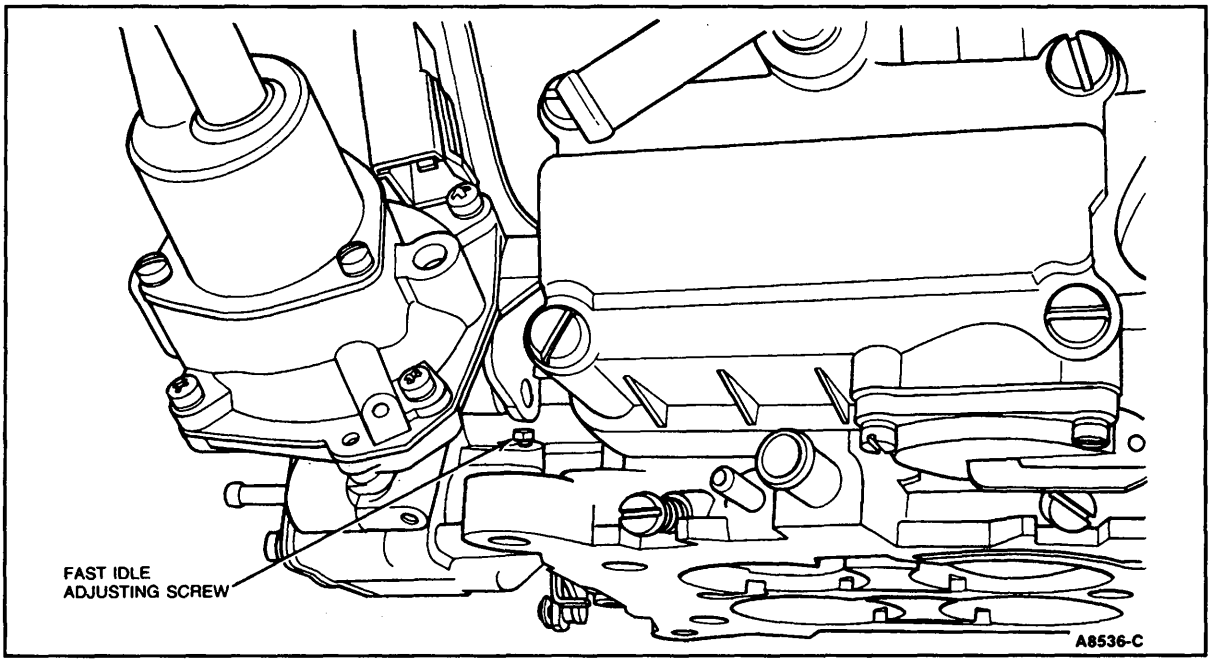


Figure 15 7.0L Engines with 4190 EG-4V-Fast Idle Speed Adjustment

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Idle Speed Setting Procedures

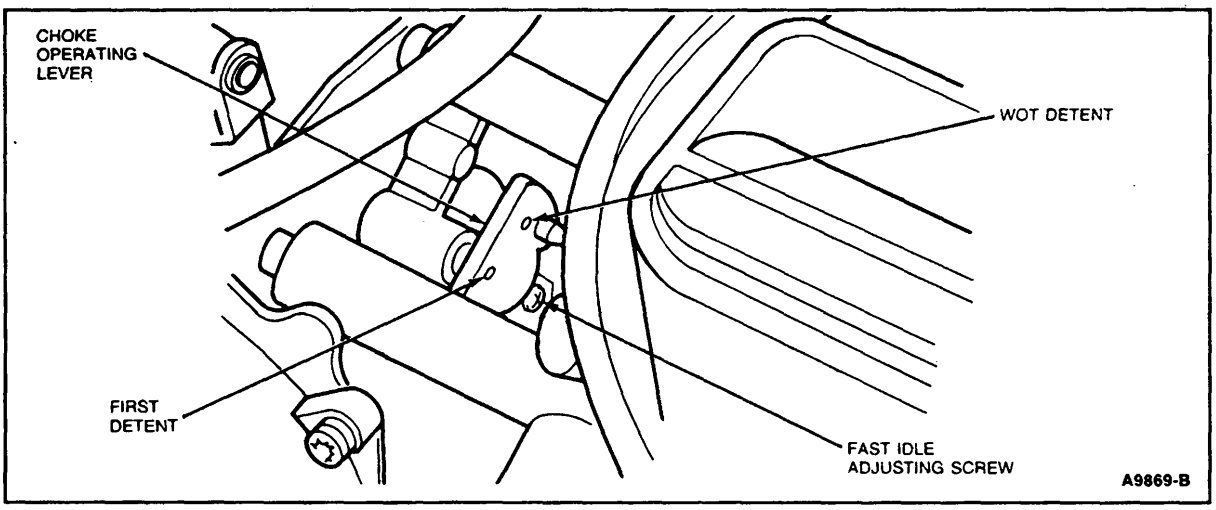


Figure 16 7.0L Engines with 4190 EG-4V — Fast Idle Speed Adjustment

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Idle Mixture Setting Procedures

IDLE FUEL MIXTURE — PROPANE ENRICHMENT METHOD

NOTE: This procedure is for 6.1L and 7.0L 0/8500 GVW Truck gasoline engines with Holley carburetors Model 2380 EG 2V and Model 4190 EG 4V for 1985-1989. If CO and HC are not within specification, go to Diagnostic Routines in Section 2. Also refer to Maintenance Schedule.

1. Start engine and bring to operating temperature with vehicle in NEUTRAL, parking brake on and air cleaner removed.
2. Set ignition timing to specification (Refer to decal).
3. Connect an analog tachometer, Rotunda 059-0001, or an equivalent tachometer.
4. Disconnect the fuel evaporative purge hose from the top of the "F" fitting on the top of the PCV valve. Connect propane enrichment tool Rotunda T75L-9600-A or an equivalent to the top of the PCV F-fitting. Remove the PCV valve from the grommet and vent to atmosphere keeping valve in vertical position. Allow the crankcase vent hose (from the air cleaner top) to vent to underhood air during idle fuel mixture check.
5. Run the engine at 2500 rpm for approximately 15 seconds before each mixture check.
6. Check the engine idle speed, if necessary, set to 800 rpm.
7. With the propane tank in the vertical position, gradually open the propane tool valve and watch for engine speed gain, if any, on the tachometer. When the engine speed reaches a maximum and then begins to drop off, note the amount of speed gain.
8. The specified speed gain is 100-115 rpm. Compare measured speed gain to specified gain. If the measured speed gain is not between 100 to 115 rpm, remove the carburetor and access the idle mixture screws by removing the tamper resistant concealment plugs (see Fuel Group) in the Medium/Heavy Truck Shop Manual, for procedure). When reinstalling the carburetor, be sure to replace **both** the carburetor to spacer **and** spacer to manifold gaskets.
9. Recheck the measured speed gain.
   - If the measured speed gain is higher than the speed gain specification, turn the mixture screws counter-clockwise (out) in equal amounts repeating Steps 5 and 7 until the measure speed gain is in the range of 100-115 rpm.
   - If the measured speed gain is lower than the speed gain specification, turn the mixture screws clockwise in equal amounts repeating Steps 5 and 7 until the measured speed gain is in the range of 100-115 rpm.
10. When the measured speed gain is within the 100-115 rpm range, turn off engine.
11. Reinstall the tamper resistant concealment plugs.
12. Install the PCV valve in the grommet. Remove the Rotunda tool or an equivalent, from the top of the F-fitting. Reinstall the evaporative purge hose at the top of the F-fitting. Reinstall the air cleaner.
13. Restart engine and run at 2500 rpm for 15 seconds. Set curb idle speed on energized solenoid to 850-875 rpm.
14. Turn engine off and remove all test equipment.

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Cold Enrichment System

5.8L (W) ENGINE W/7200-VV — PASSENGER CAR

Cold Enrichment System — Motorcraft 7200-VV

I. Pre-Check Instructions

A. Apply parking brake and block the wheels.

B. Remove the air cleaner assembly and plug the vacuum hose(s) leading to the air cleaner.

1. With the choke cap cool to the touch, turn the ignition key to the RUN position **without** starting the engine for two minutes. The choke cap should not be warm to the touch.

2. Start the engine if the cold enrichment rod is up when the fast idle cam is freed from the fast idle lever. Run the engine; do not exceed three minutes. The cold enrichment rod should seat. Turn the engine off.

C. Manually set the fast idle lever on the specified step (refer to Engine Emission Decal) of the cam, counting the highest step as the first.

D. Start the engine and bring it to normal operating temperature.

E. Open the throttle and check to see if the cam freely falls to the full off position. If it is functioning properly, there should be a definite drop in engine speed when the throttle is released.

F. Turn off the engine.

II. Freedom of Linkage and System Integrity Check

A. Verify that vacuum hoses, solenoid and electric choke wires are properly connected and intact. Check to make sure all carburetor hold-down nuts are tightened to specification. Correct as required.

B. Check all carburetor linkages for freedom of operation. If no binding exists, proceed to Section III. If binding exists, proceed to C.

C. Cold Enrichment Rod (CER) Mechanism Check

1. Check for damaged, foreign, missing and/or misaligned parts. Check for dirt, grease, or any foreign material on moving parts. Service or replace as required.

   If linkage is serviced or replaced, check choke adjustments. Reset if necessary.

2. Remove the retaining E-ring that holds the choke control rod to the choke shaft lever, then disengage the linkage from the lever.

3. Open the throttle slightly and check the choke shaft lever for freedom of movement. The choke cap and the pulldown diaphragm return spring should provide the only resistance, and the choke shaft lever should spring back to the original position. Clean, service or replace as required.

4. To check if the carburetor has a sticking/binding CER, perform the following procedure.

   a. Open the throttle to allow fast idle cam to move to "choke on" position.

   b. Hold the choke pulldown diaphragm in its retracted position.

   c. Push the CER down to its seated position. Feel for any friction/binding.

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Cold Enrichment System

d. Release the CER; it should return to its original position automatically (room temperature or colder).

e. Observe the upward movement of the CER for any indication of sticking/binding.

f. Rotate the CER 90 degrees from its original position and repeat Steps B through E.

NOTE: CER can be rotated using your fingers if the rod is placed in its full up position. The number identification on top of the CER can be used for determining the 90 degree rotation requirement.

g. Rotate the CER another 90 degrees (total of 180 degrees from its original position) and repeat Steps B through E.

5. Verify if the carburetor has a sticking/binding Control Vacuum Regulator (CVR) with the following procedure:

a. Hold the choke pulldown diaphragm in its retracted position.

b. Place the fast idle lever on the highest step of the fast idle cam.

c. Push the CVR down to its seated position. Feel for any friction/binding.

d. Release the CVR, 70°F or warmer, the CVR should lift-off its seat automatically, colder than 70°F, push down on the CER to lift the CVR.

e. Observe the upward movement of the CVR for any indication of sticking/binding.

6. If cam movement is still not free, remove carburetor from vehicle, then remove the throttle body from the carburetor. Remove the choke cap, the choke shaft and lever assembly, and the fast idle cam. Check the surfaces of all parts for grease, foreign material, bends, cracks, or distortion. Clean or replace parts as required. If a new fast idle cam is installed, adjust cam set according to procedure in Section V and tighten to specification.

7. If movement is okay, make sure the choke control rod is connected to the choke shaft lever with the retaining E-ring. If the "CVR" causes binding, replace and reset, as outlined in Section V and Fuel Shop Manual Group.

8. Reinstall the carburetor, as outlined in Section VI.

III. Electric Choke Functional Test

A. Choke Circuit Test

NOTE: Refer to body wiring diagrams for detailed information on electrical circuitry affected in this test. Two different types of circuitry are used. For battery powered choke, the choke cap and the oil pressure switch are connected in series through the wiring harness connectors.

For alternator powered choke, the choke cap wire is connected to the alternator stator terminal connection.

Either type is readily identifiable by visually tracing the routing from the choke cap terminal.

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Cold Enrichment System

To perform continuity tests of Section III Steps A-1 and -2, listed below, disconnect the stator terminal of the alternator for alternator powered choke. Reconnect after completion of testing.

1. Choke Cap Continuity
   a. Turn ignition switch off.
   b. Connect one end of a test lamp to the positive terminal of the battery and the other end to the choke cap terminal. The test lamp should light, indicating continuity. If it **does** light proceed to Step 2, if it **does not,** light continue with Step C.
   c. Connect one end of a jumper wire to the choke cap clamp shroud and the other end to the negative terminal of the battery. Also connect one lead of a test lamp to the positive terminal of the battery and the other lead to the choke cap terminal.
   d. The test lamp should light indicating continuity; if not, connect the jumper wire directly to the choke cap ground; if the lamp lights, correct the poor contact between the choke cap clamp shroud and the choke cap ground. If the lamp does not light, replace the choke cap.
2. Continuity of all other circuit components, battery powered choke.
   a. Turn engine and ignition switch off.
   b. Disconnect oil pressure switch from harness, use a jumper wire in place of the switch to complete the circuit.
   c. Connect one lead of a test lamp to the negative terminal of the battery and the other lead to the choke cap terminal.
   d. Turn the ignition key to the RUN position without starting the engine. The lamp should be lit. If not, locate and service the open circuit by checking fuse, fuse link, connector, etc.
   e. Remove the jumper wire used as a substitute for the oil pressure switch; reconnect the harness lead wire to the oil switch terminal.
   f. Turn the ignition switch to the RUN position without starting the engine. The test lamp should not indicate continuity. If the lamp indicates continuity, the oil pressure switch is defective.
   g. Start the engine. The test lamp should indicate continuity. If the lamp does not indicate continuity, the oil pressure switch is defective.
3. Continuity of all other circuit components, alternator powered choke:
   a. Connect one lead of a test lamp to the choke cap ground and the other lead to the negative terminal of the battery.
   b. Start the engine, the test lamp should indicate continuity. If not, locate and service open circuit between choke cap to alternator stator terminal. If no open circuit is found, check alternator output and service as required.

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Cold Enrichment System

B. Choke Control Diaphragm Check

1. Check for bending, misaligned linkage, broken parts, contamination and/or loose parts. Service as required.

NOTE: The vacuum system used is:

a. **Externally Ported Vacuum With Fuel Separator/Filter:** A vacuum connector tube is provided on the diaphragm cover, and the vacuum line runs directly from this tube to the Fuel Separator/Filter to the manifold vacuum tap.

2. Running Engine Test

Start the engine and watch for the choke diaphragm rod to retract. If the retraction timing is within specification listed in Special Specifications Issue TSB Publications, the choke control diaphragm is functioning properly and no further check is necessary.

If the timing is out of specification or there is no retraction, continue with Step 3.

3. Diaphragm Inspection, Cover Removed.

a. Remove the diaphragm cover and the diaphragm as outlined in the Fuel Shop Manual Group (removal of the carburetor is not necessary, but helpful).

b. Visually inspect the diaphragm. If cut or torn, replace the diaphragm with a new one and assemble it with the original cover on the carburetor and continue with Step C.

If the diaphragm is not cut or torn, replace the cover with a new one and assemble it with the original diaphragm on the carburetor and continue with Step C. Ensure the assembly is sufficiently tight to prevent vacuum bleed-off at diaphragm mounting.

c. Connect a vacuum line from the connector tube on the diaphragm cover to a powered vacuum source. Apply 60 kPa (18 in-Hg) vacuum to the diaphragm and proceed with one of the following substeps, depending upon how the carburetor reacts to the vacuum:

1. It retracts the diaphragm within the specification timing. No further check is necessary since the control diaphragm is functioning properly. Adjust any CER setting affected by component replacement per Section IV, Step B.

2. It does not retract the diaphragm within specification or it does not retract at all. Replace the cover with a new part, assemble* it with the existing diaphragm onto the carburetor, and repeat this test again. Be sure the assembly is sufficiently tight to prevent vacuum bleed-off at diaphragm mounting.

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Cold Enrichment System

C. Choke Cap Resistance Test

1. Connect one lead of an ohmmeter to choke cap terminal and the other lead to choke cap ground. Ensure metal-to-metal contact is achieved (not metal-oxide film-metal) and false readings are prevented. Throughout this test, the ohm reading should be under 30 but never zero. At any point of this test, if the ohm reading is outside this range, start the test all over. If this same improper reading repeats, the choke cap is defective. The cap should be replaced as outlined in the Shop Manual Fuel Group.

2. With the choke cap connected electrically, start the engine and run for three minutes. Shut the engine off. During this three minutes, the CER should remain seated for an engine which was warm at the beginning. This rod should gradually lower to seat for an engine which was cold at the beginning. If the CER does not respond this way, note this fact and continue on with the test.

3. The choke cap should be quite warm to the touch now. Using choke tester, cool the cap down by directing cold air toward the oval-shaped insulator (not the case) around the cap terminal. The ohm reading should gradually vary and eventually a sudden increase is noticeable. Stop the cooling. This sudden increase should take place within 10 minutes since cooling began, if the Rotunda tool is employed at maximum effectiveness and was placed as close to the cap as possible. If this sudden resistance change does not take place within the above time limit, the choke cap is defective and should be replaced as outlined in the Fuel Shop Manual Group. If this sudden change takes place within this time limit, continue on with the testing.

4. Using the choke tester of Step 3 (or equivalent), warm up the cap by directing hot air toward the oval-shaped insulator. The ohm reading should vary gradually and eventually a sudden decrease is noticeable. Stop the warming. This sudden decrease should take place within 10 minutes since warming began, if the tool is employed at maximum effectiveness and was placed as close to the cap as possible.

   If the sudden resistance change does not take place within the above time limit, the choke cap is defective and should be replaced as outlined in the Fuel Shop Manual Group.

   If this sudden change takes place within the time limit, the choke cap has been checked-out all right as far as its resistance is concerned; it generates heat in the way it should.

5. The choke cap test itself is concluded. However, if the CER response in Step 2 is not proper, the procedure shown in Section II should be performed to identify and service the linkage-related problem that causes this improper response.

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Cold Enrichment System

IV. Carburetor Choke Adjustment — CER, CVR Settings

CER 24°C (75°F) Run, CER — 18°C (0°F) Start and Control Vacuum Regulator Setting

A. Cold Enrichment Rod (CER) Adjustment Sequence

NOTE: The CER mechanism affects carburetor air/fuel mixtures throughout engine operation, cold and warm. Several adjustments are required. Although each adjustment does affect a particular phase of operation, and each "maladjustment" can lead to a particular performance symptom, the adjustment procedure must be performed completely and in the following described sequence to provide desired CER performance.

If adjustment cannot be accomplished due to epoxy in the adjustment nut, a new service assembly (9F685) must be installed. Refer to Step B.

1. Remove carburetor from engine.
2. Assemble Dial Indicator Kit TOOL-4201-C or equivalent, to carburetor.

   NOTE: CER adjustment specifications are listed on a tag attached to the carburetor above the choke cap (Figure 26), and published in the Special Specifications Issue TSB Publications.
3. Remove choke diaphragm cover and spring.
4. Remove choke cap according to appropriate instructions.
5. Compress the idle speed positioner where applicable and insert a 5/16-1/2 inch spacer between the positioner stem and the throttle lever contact paddle. Retain in this position with a rubber band. This will locate the fast idle pick-up lever away from the cam and allow the cam to rotate freely.
6. Install Stator Cap T77L-9848-A or equivalent as a weight to rotate bimetal lever counterclockwise (CCW) and seat the CER.
7. Install dial indicator with tip centered on top surface of CER. Set the dial indicator to zero. Raise weight slightly and release to check for accurate zero.

NOTE: This adjustment will be the reference for other adjustments. Be sure dial indicator reading is accurate (Figure 18).

B. Control Vacuum Regulator (CVR) Swivel Assembly Replacement

Refer to Figure 3.

CVR/CER nuts have cylindrical projections above the threads which are filled with epoxy after final adjustment. To adjust, the existing parts must be removed and a new assembly installed. After adjusting, CVR/CER nut cavities must again be filled with epoxy.

1. Remove the E-clip and hinge pin.
2. Turn the CER adjusting nut counterclockwise until nut disengages from rod.
3. Remove the CVR and swivel assembly. Replace with new assembly.
4. The unbroken rod must be in place first before further assembly. Install the assembly and tighten the CER adjusting nut to lower and locate into position. Connect lever to swivel.

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Cold Enrichment System

5. Install the hinge pin and E-clip.
6. For CVR/CER adjustments, refer to Step 3.
7. Fill two nuts and stop screw with MT13 epoxy or equivalent.

NOTE: The rod has an undercut designed to break, if breakage does occur, a new rod assembly must be installed. The upper body must be loosened to position the rod through the opening. Replace the upper body gasket as necessary (Fig. 20).

C. CER Run Position (24°C, 75°F) Adjustment

Refer to Figure 21.

1. Install stator cap and rotate clockwise (CW) to index. Dial should indicate the tag specification for Run at 24°C (75°F) ± 0.010 inch.
2. Adjust by turning choke adjusting nut CW to increase or CCW to decrease height.

D. CER Start (Crank) Position (18°C, 0°F) Adjustment

Refer to Figure 22.

1. Remove stator cap.
2. Rotate choke bimetal lever CW until CER travel stop screw bottoms on choke seal retainer (full travel). Dial should indicate the tag specification for Start at 18°C (0°F) ± 0.005 inch.
3. Adjust by turning CER travel stop screw with 5/64 inch hex wrench, CW to decrease or CCW to increase height.

E. Choke Diaphragm Start (Crank) Position for Warm Engine (24°C, 75°F)

Refer to Figure 23.

1. Push in diaphragm assembly. Dial should indicate the tag specification for Start at 24°C (75°F) ± 0.020 inch.
2. Adjust by rotating the diaphragm assembly CW to decrease or CCW to increase height.

F. Control Vacuum Rod (CVR) Position

Refer to Figures 24 and 25.

1. Seat CER again using stator cap weight and check for zero dial indicator reading. Reset zero position of indicator if required. Remove stator cap weight (Figure 24).
2. Depress the CVR until seated. Dial should indicate the tag specification for CVR ± 0.10 inch.
3. Adjust by holding CVR with 3/8 inch wrench, and turning adjustment with 3/32 inch hex wrench CW to decrease or CCW to increase height (Figure 25).
4. Reinstall original choke diaphragm cover with original spring.

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Cold Enrichment System

G. Choke Diaphragm Run Position for Cold Engine (– 18°C, 0°F)

Refer to Figure 26.

1. Apply vacuum to choke diaphragm cover, or, depress choke diaphragm rod to seated position.
2. Rotate choke bimetal lever CW until choke shaft lever pin contacts fast idle intermediate lever. Dial should indicate the tag specification for Run at 0°F ± 0.005 inch.
3. If an adjustment is required, remove the choke diaphragm cover and install a new cover with the original spring. This is necessary due to tamper-resistant material on the adjustment screw.
4. Adjust by rotating screw in diaphragm housing with 5/64 hex wrench, CW to increase or CCW to decrease height.
5. Apply sealing liquid on adjustment screw to secure adjustment.
6. Install lead ball plug in adjusting screw hole.

H. Fast Idle Cam Setting

Refer to Figure 27.

Position fast idle pick-up lever on second step of fast idle cam against shoulder of high step.

1. Install stator cap and rotate CW until fast idle pick-up lever contacts fast idle cam adjusting screw. Dial should indicate specification 0.360 inch ± 0.005 inch.
2. Adjust by rotating fast idle cam adjusting screw.
3. Remove stator cap.
4. Assemble choke cap, gasket, and retainer with breakaway screws.
5. Remove dial indicator and rubber band.
6. Install carburetor and adjust idle speeds.

V. Post-Check Instructions

A. Inspect the gaskets and sealing surfaces between the carburetor and intake manifold. Service as required.

B. Reinstall the carburetor.

C. Reconnect all wire connections and hoses.

D. Check/adjust engine idle speeds.

E. Reinstall the air cleaner assembly and reconnect pertinent vacuum lines.* Tighten air cleaner wing nuts to specification.

Verify that air cleaner heat riser tube and fresh air pick-up connections are correct.

VI. Removal and Installation of Adjustment Limiting Choke Bimetal Housing and Enrichment Rods

A. Refer to Fuel/Engine Shop Manual Group.

*Refer to the Special Specifications Issue TSB Publications.

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Cold Enrichment System

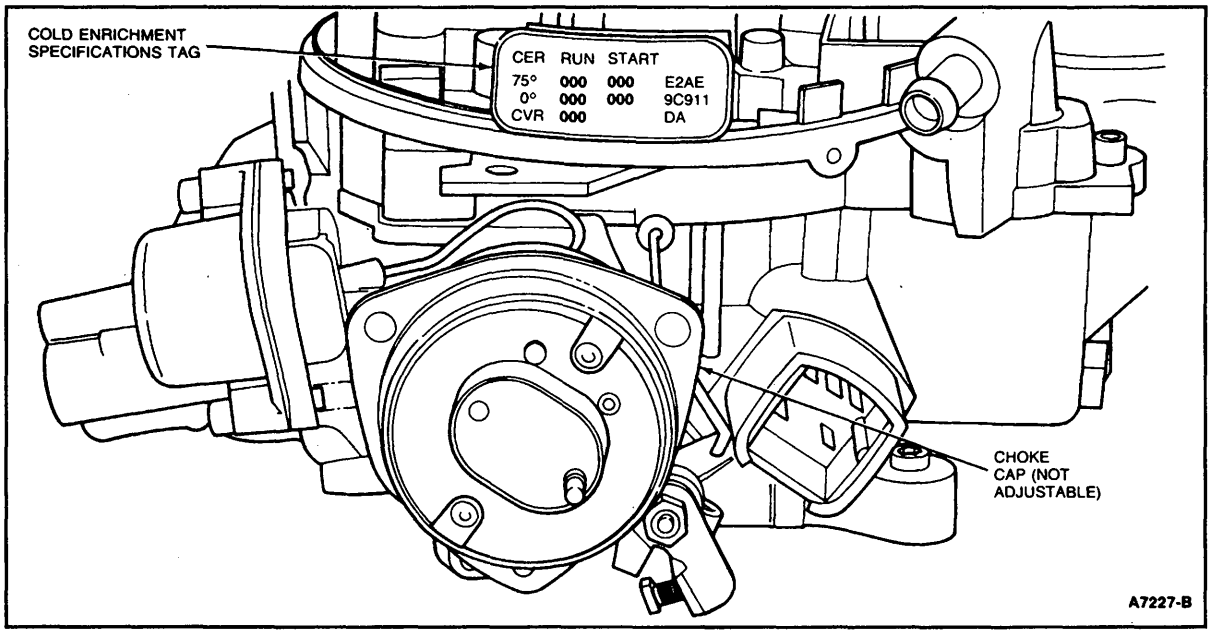


Figure 17 Cold Enrichment Rod (CER) Adjustment Sequence

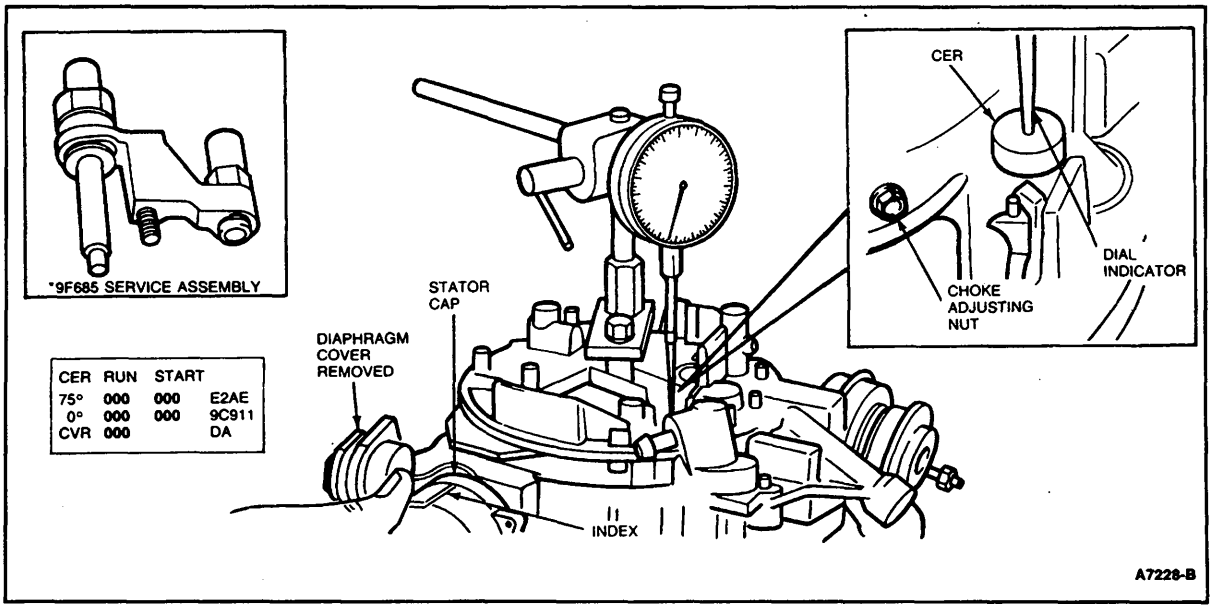


Figure 18 CER Run Position (24°C, 75°F) Adjustment

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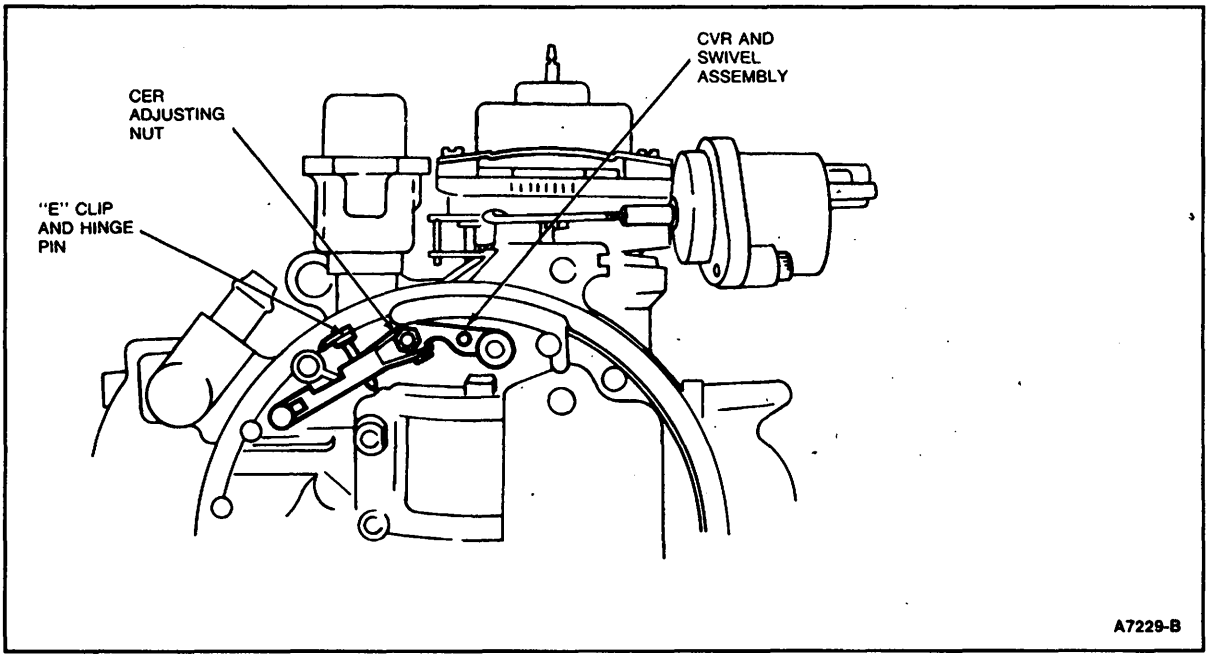


Figure 19 Control Vacuum Regulator (CVR) Swivel Assembly Replacement

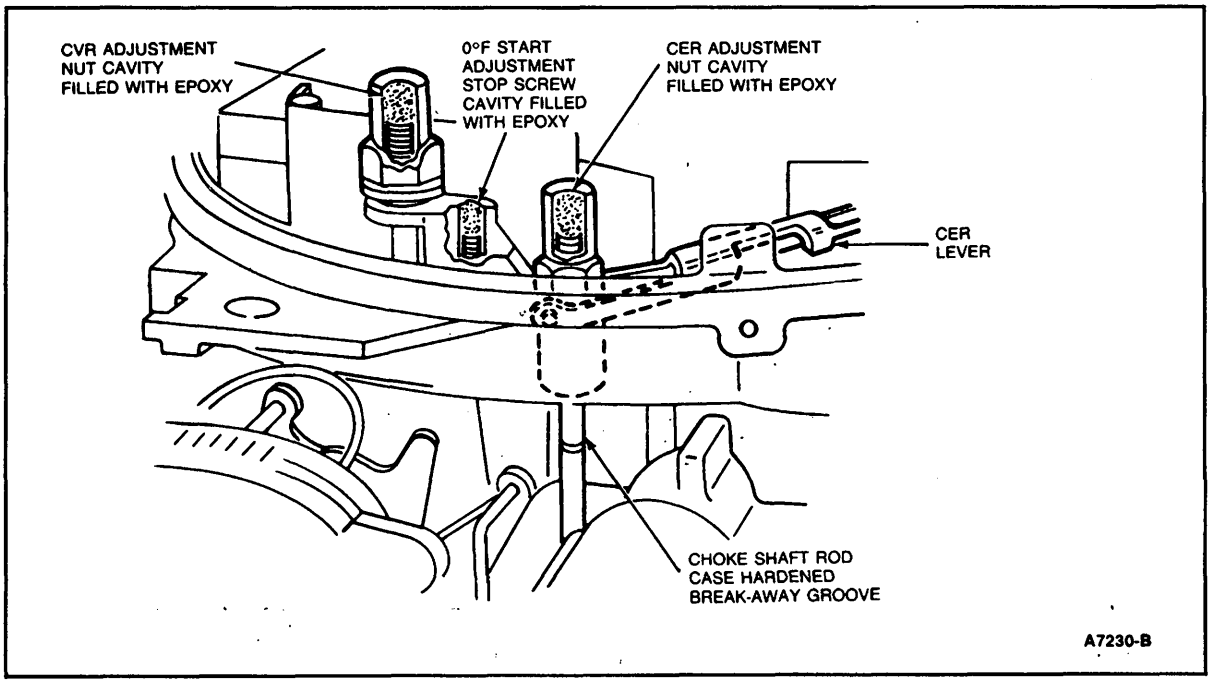


Figure 20 CER/CVR Tamper Resistant Installation

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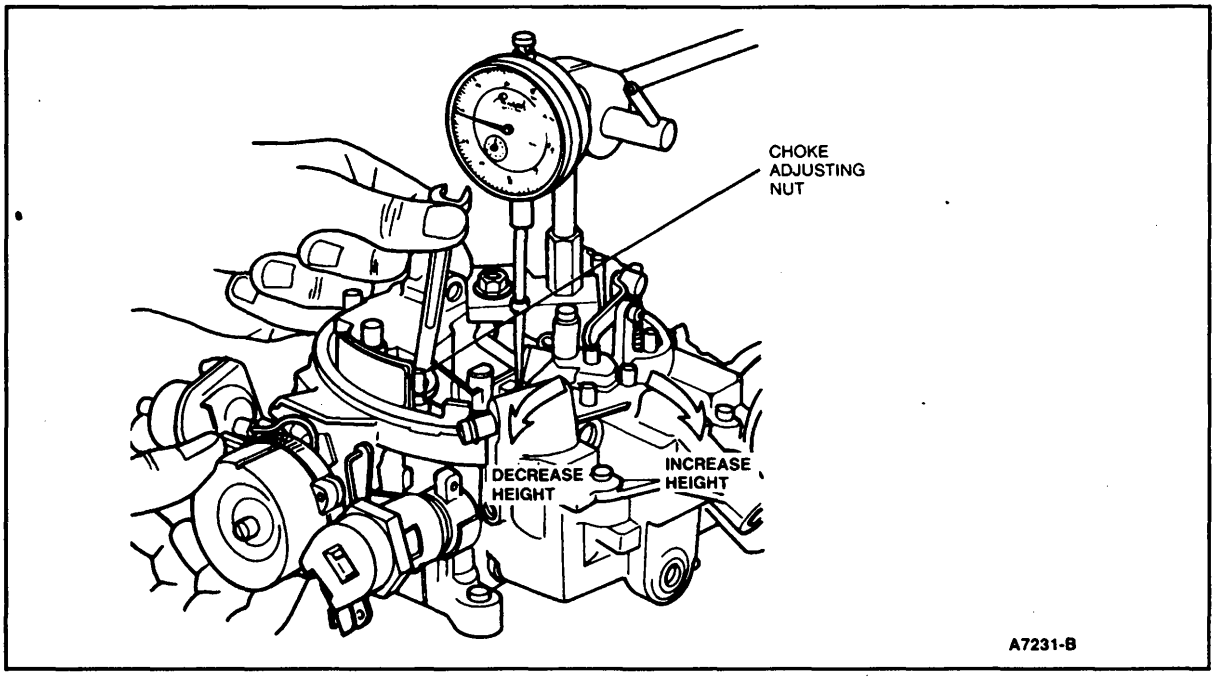


Figure 21 CER Run Position (24°C, 75°F) Adjustment

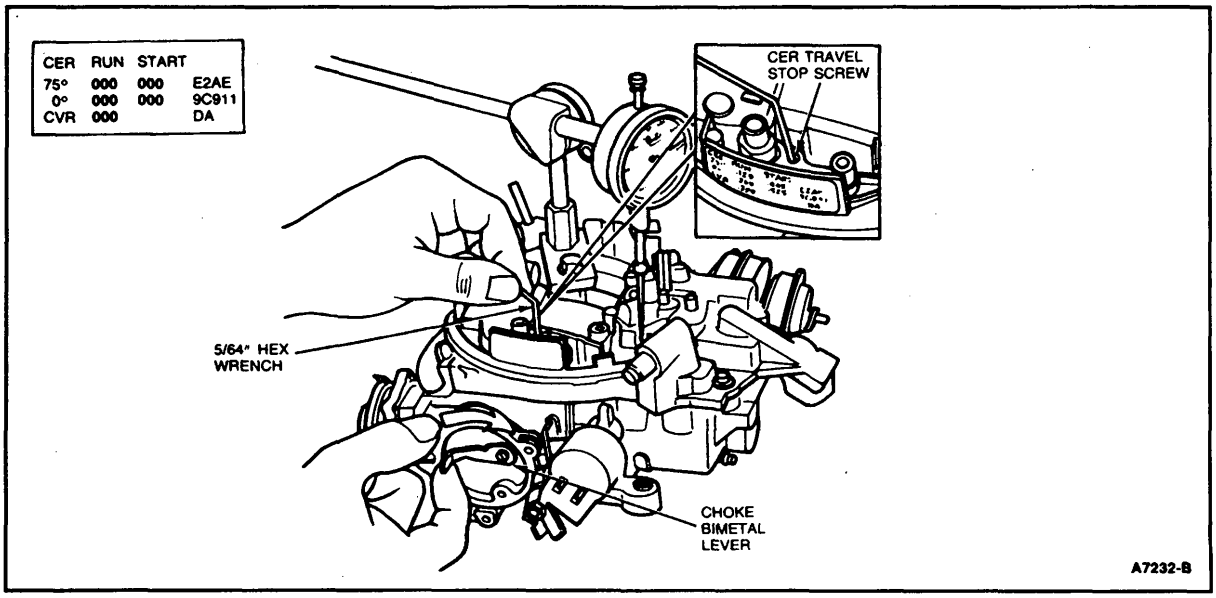


Figure 22 CER Start (Crank) Position (– 18°C, 0°F) Adjustment

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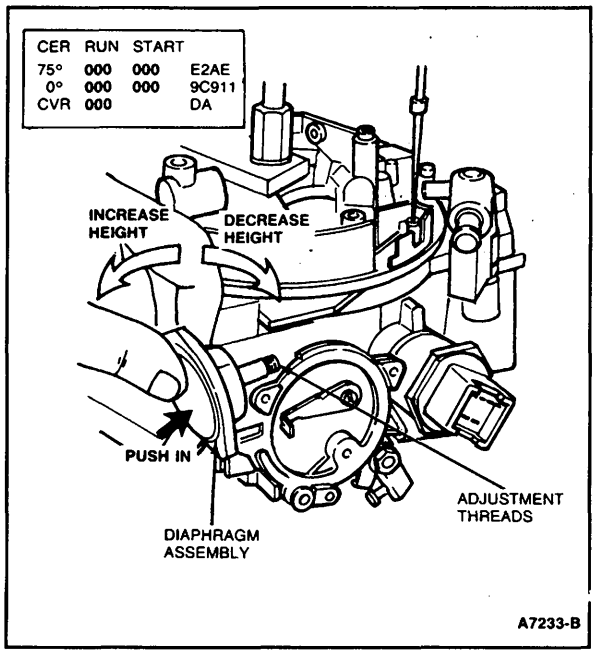


Figure 23 Choke Diaphragm Start (Crank) Position — Warm (24°C, 75°F)

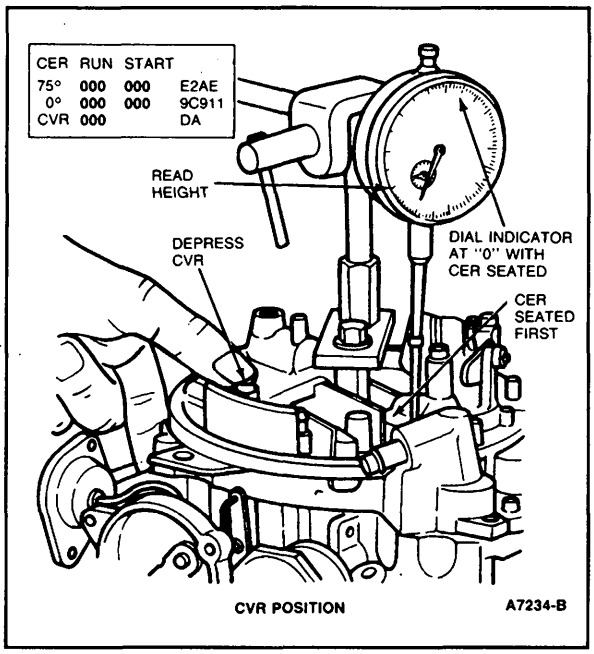


Figure 24 Control Vacuum Rod (CVR) Position — Check

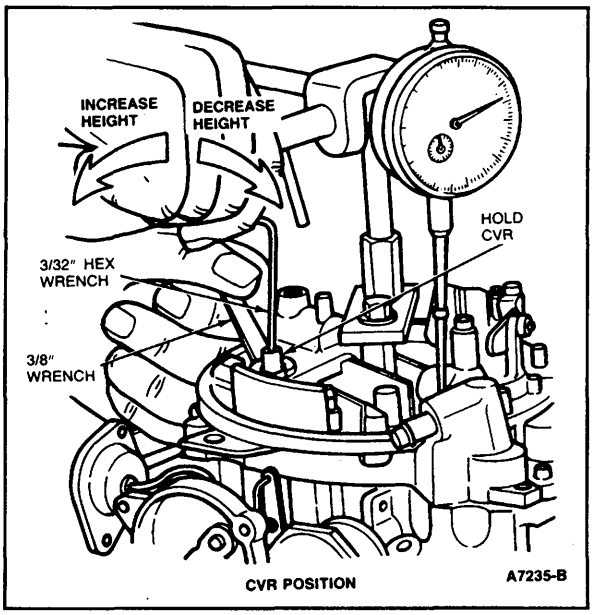


Figure 25 Control Vacuum Rod (CVR) Adjustment

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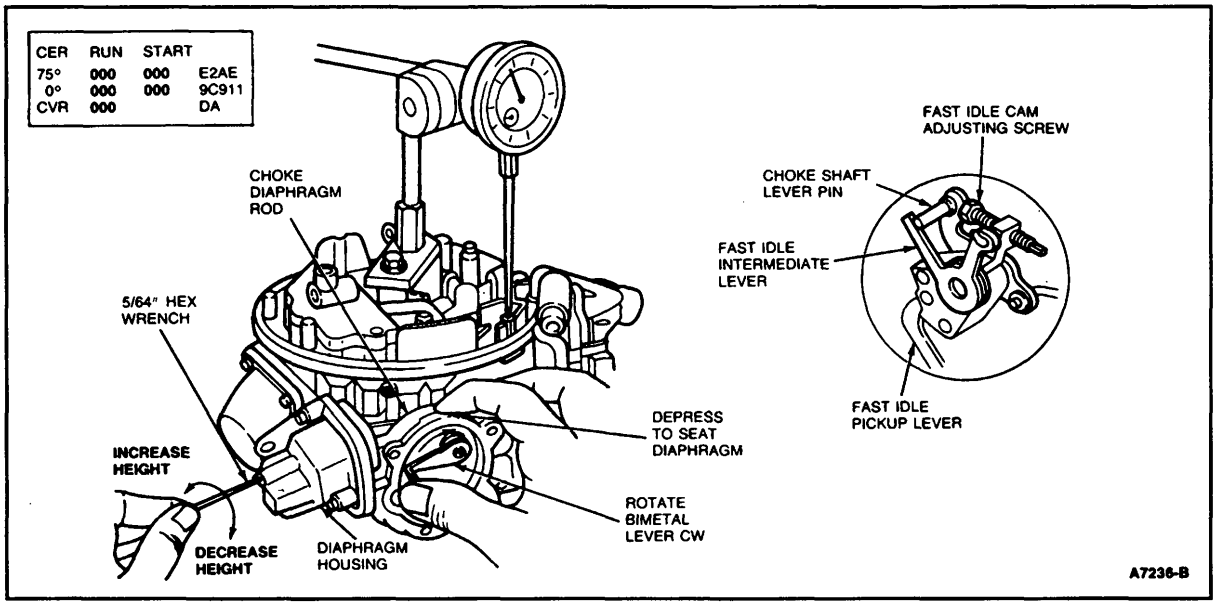


Figure 26 Choke Diaphragm Run Position for Cold Engine (– 18°C, 0°F)

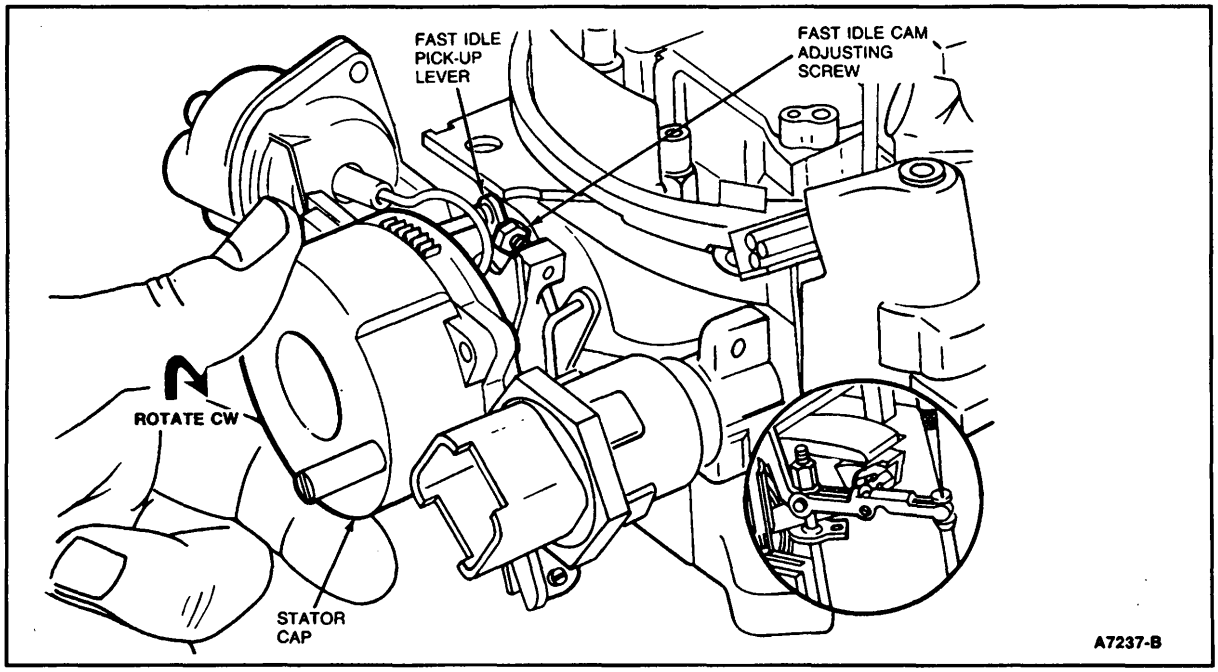


Figure 27 Fast Idle Cam Setting

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Choke Adjustment Procedure

6.1L AND 7.0L ENGINES TRUCK, OVER 8500 GVW

Manual Choke Carburetors Only — Holley 2380EG-2V and 4190EG-4V

I. Pre-Check Instructions

A. Apply parking brake, and block wheels. Manual/Auto transmission in NEUTRAL.

B. Bring the engine to normal operating temperature.

C. Remove the air cleaner assembly.

D. Disconnect choke cable from carburetor.

E. Check all carburetor linkages for freedom of operation. Service, replace or adjust as required.

F. Check for freedom of operation of choke plate for closing and opening in the air horn bore. Correct as required.

G. Reconnect choke cable and check choke plate travel using dashboard control. Depress throttle and pull choke full on. Choke should be fully closed in air horn bore. Depress throttle and push choke in. Choke should be fully open. Correct choke cable adjustment as required.

II. Post-Check Instructions

Reinstall the air cleaner assembly. Tighten the air cleaner wing nut to specification.

*Refer to Fuel Shop Manual Group for additional information.

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Fuel Injector Testing/Cleaning

DESCRIPTION

The Fuel Injector (Figure 28) is a solenoid operated valve that meters fuel flow to the engine. The injector is opened and closed a constant number of times per crank revolution. The amount of fuel is controlled by the length of time it is held open.

The injector is normally closed and is operated by a signal from the Electronic Engine Control (EEC) module.

There are several Deposit Resistant Injector (DRI) designs (Figure 29).

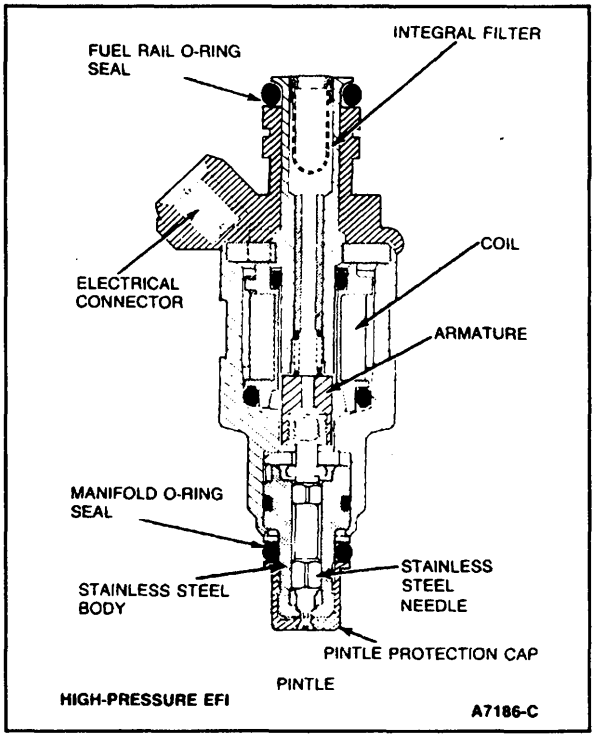


Figure 28 High Pressure Injector

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Fuel Injector Testing/Cleaning

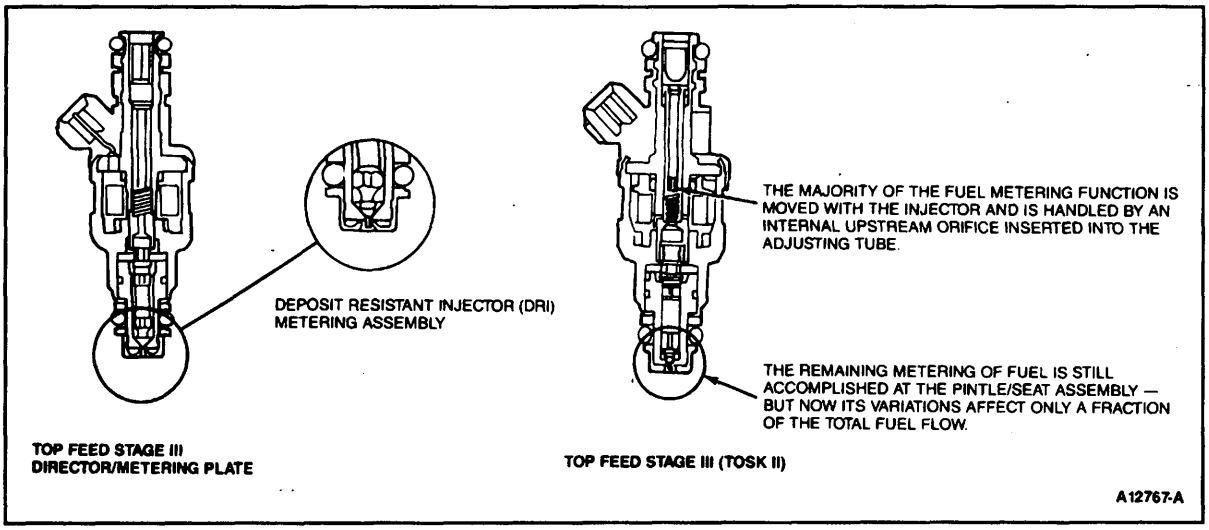


Figure 29 Deposit Resistant Injector (DRI) Designs

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Fuel Injector Testing/Cleaning

High-Pressure, High-Resistance, High-Pressure, Low-Resistance Ported EFI Injectors Only

To help diagnose EFI fuel injector problems, use the following troubleshooting chart along with the Rotunda Fuel Injector Tester/Cleaner 113-00001 or equivalent.

The majority of fuel injector problems are due to plugged injectors caused by fuel deposits. These injectors can be cleaned and restored back to their normal operating condition.

If injectors will not clean, or have another of the listed problems, injectors must be tested before replacement.

FUEL INJECTOR TROUBLESHOOTING CHART

FOR HIGH-PRESSURE, HIGH-RESISTANCE AND HIGH-PRESSURE LOW-RESISTANCE PORTED EFI SYSTEMS ONLY

Symptom	Fuel Injector Failure Mode	Cause	Corrective Action
Rough Idle, Hard Start, Hot/Cold	Lean injector.	Tip deposits. (Plugged) Internal contamination.	Clean injectors. Test/replace if necessary.
	Rich injector.	Stuck open. (Leaks)	Test/replace if necessary.
	Injector will not pulse.	Short or open circuit.	Test/replace if necessary.
Misses Under Load Hesitates or Stalls on Acceleration Backfires Lacks Power Surges at Steady Speed	Lean injector.	Tip deposits. (Plugged) Internal contamination.	Clean injectors. Test/replace if necessary.
Gas Smell	Injector stuck open. Injector leaks internally (into intake manifold). Injector leaks externally.	Internal contamination. Internal contamination. Defective O-Rings.	Test/replace if necessary. Test/replace if necessary. Test/replace if necessary.
NOTE: Test and clean injectors using the Rotunda Tester/Cleaner 113-00001 or equivalent.			

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Fuel Injector Tester/Cleaner

Fuel Injector Tester/Cleaner

The Fuel Injector Tester/Cleaner was designed to facilitate fuel injector servicing by cleaning and/or testing fuel injectors without removing them from the engine.

NO CLEANING SOLVENT IN TANK DURING INJECTOR TESTING

Fuel Injector Cleaning Instructions

1. Turn shutoff valve at the back of test stand to ON (open) position.
2. Filter (use paint-type filter) and pour clean gasoline into tester fuel tank and fill to lower fill line for 8 cylinder vehicles (use less for 4 and 6 cylinder vehicles). Add injector cleaner solvent from lower fill line to upper fill line (7 ounces). Premixed gasoline and cleaner solvent may be used. Mixture: approximately 1 oz. of cleaner solvent to 7 oz. of unleaded gasoline per cylinder.
3. Connect power supply line to vehicle battery (red terminal, positive; black terminal, negative). Red light (on cleaner side) will flash indicating power connection has been made and that the unit is off.
4. Activate the 10 minute timer switch, check pressure gauge. The gauge should read 38-40 psi. If adjustment is necessary, turn shutoff valve to ON (open) position, for resetting of regulator. Remove black cap, back-off locknut, turn screw to obtain proper setting and retighten locknut. Replace cap. Turn unit off.
5. Connect fuel supply hose to outlet and place other end of hose back into tank. Actuate the 10 minute timer switch and turn the flowmeter selector valve to flowmeter No. 1 and then to flowmeter No. 2 and back to flowmeter No. 1. Repeat this procedure several times to eliminate all air from the system. Turn flowmeter selector valve to flowmeter No. 2 for all cleaning applications. This allows maximum flow. Turn unit off.
6. Disconnect engine fuel inlet line at the supply manifold (rail). Connect the supply hose from cleaning equipment to the fuel inlet.
7. Disconnect engine return line at the supply manifold (rail). Plug the return line. Install the U-tube (supplied) between the chassis supply line and the chassis return line.
8. Install the turnbuckle loosely between throttle control rod and suitable hook-up point on vehicle fender wall. Activate the 10 minute timer switch.

   CAUTION

   Be sure vehicle is in PARK or NEUTRAL position, parking brake on and/or wheels blocked front and rear.

   Start engine and check for leaks.
9. When the engine speed has stabilized, set the idle speed to 2000 rpm with the turnbuckle.
10. Reset the remaining 10 minute cycle (automatic). Turn ignition switch to OFF, remove turnbuckle.

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Fuel Injector Tester/Cleaner

11. Disconnect the cleaner supply hose from the fuel supply manifold connection inlet.

    Drain and discard remaining mixture from cleaner fuel tank.

12. Turn power switch off and disconnect power supply. Reinstall vehicle fuel lines. Start the engine and check for leaks.

    Install fuel connector retaining clips (N805522 inlet, N805521 outlet). When reinstalling vehicle fuel lines, lubricate O-rings. Put safety ring onto fuel line connector when reinstalling vehicle fuel lines on late models equipped with spring lock connectors. Safety indicator ring will pop off when connection is properly installed. Check for proper "seating of connection" by using hand force to separate connection, check for leaks.

Fuel Injector Testing

1. Turn manual shutoff valve of test stand panel to OFF (closed) position.
2. Filter (use paint-type filter) and pour clean gasoline into the tester fuel tank, and fill to lower fill line for 8 cylinder vehicles, use less for 4 and 6 cylinder vehicles.

   DO NOT ADD ANY CLEANER SOLVENT IN TANK FOR TESTING.

3. Connect power supply line to vehicle battery (red terminal, positive; black terminal, negative). Red light (on cleaner side) will flash indicating power connection has been made and the unit is off.
4. Activate the 10 minute timer switch, check pressure gauge. The gauge should read 38-40 psi. If adjustment is necessary, turn shutoff valve to ON (open) position, for resetting of regulator. Remove black cap, back-off locknut, turn screw to obtain proper setting and retighten lock nut. Replace cap. Turn unit off.
5. Calibrate the tester using the procedure outlined in the instructions; included with the calibration kit injectors.

NOTE: Calibration decals must be on the flow tubes.

6. Disconnect engine fuel inlet connection at the fuel manifold (rail). Connect the supply hose from testing equipment to the fuel inlet connection.
7. Disconnect engine fuel return connection at the fuel manifold (rail) from fuel return line. Plug the return. Install the U-Tube (supplied) between the chassis supply line and the chassis return line.

   CAUTION

   Be sure vehicle is in PARK or NEUTRAL position, parking brake on and/or wheels blocked front and rear.

   Start engine and check for leaks.

9. Run the engine just long enough (approximately 2 minutes) to eliminate all the air in fuel supply hose and fuel rail. Shut engine off. Do not shut off tester unit.

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Fuel Injector Tester/Cleaner

10. Select the proper flow range. Turn the flowmeter selection valve to
Flowmeter No. 1 for Blue, Grey or Yellow injectors, or
Flowmeter No. 2 for White, Black, Green or Brown injectors.
The flow band colors correspond to the injector top color. (Color may vary slightly between manufacturers.) Flowmeter 2B is now available for newly released injectors.

    Refer to EFI Application Chart.

11. Install the tester injector harness on the vehicle injectors. Match the injector number on the harness to that of the cylinder (or use 10 pin connector FA-412) for 5.0L engine (or 8 pin adaptor harness No. 6222 for 3.8L).

12. Position injector selector switch to each injector number while pressing fuel injector test button.

13. Observe the position of the flowmeter float at eye level when the ball stops rising. A float level within the color code range on the scale indicates a good injector.

14. To confirm initial test readings, a maximum of three testings on the set of the injectors can be performed restarting the engine.

15. **Any injectors removed from an engine should be bench tested to confirm diagnostic conclusions.** A continuity checker FA-407 is provided to check continuity of injector harness leads between the injector and the ECM unit. Disconnect injector and insert continuity checker FR-407 into injector plug. Start engine, observe Continuity checker will blink showing completed circuit for that injector being tested.

NOTE:

a. If the flowmeter readings are high or low on the color code scale, the fuel injectors should be cleaned.

b. If all the readings are high, there may be leaky injectors (one or more). To check for leaky injectors, observe pressure gauge. It should hold pressure with the fuel pump and manual shut off valve. If there is a pressure drop, detect the leaky injector by observing flowmeter (the leaky injector shows less flow). If this is not possible, remove all injectors and test individually. Refer to Bench Testing procedure.

c. If fuel injector cleaning is required, turn manual shutoff valve to the ON position. Refer to Fuel Injector Cleaning Procedure.

d. Testing may be performed before or after cleaning process.

Fuel Injector Bench Testing Procedure

Individual Injector Performance and Leakage Testing.

1. Check that the manual shutoff valve at the back of test stand is in ON (open) position.

2. Fill the Tester/Cleaner fuel tank with several ounces of clean, fresh gasoline.

3. Connect the fuel supply hose FA-402 to the fuel supply outlet and to the Bench Fixture.

4. Insert injector to be tested in Bench Fixture.

5. Connect the No. 1 tester harness connector to the fuel injector. Turn the injector selector switch to No. 1 position.

6. Direct the injector nozzle into the tester fuel tank.

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Fuel Injector Tester/Cleaner

7. Connect the power supply leads to the battery, observing correct polarity.
8. Activate the 10 minute timer switch and check for leaks.
9. Press the injector test switch and the purge switch together for about 30 seconds to eliminate air from the supply hose and injector.
10. No leakage from the fuel injector nozzle tip should be visible. Replace any leaking injector.
11. Press injector test switch to test injector, observe float in flowmeter.
12. Check the flowmeter readings and record all test results.

Factors That Cause False Flow Readings

- Air bubbles in the system fuel lines.
- Excessive amount of cleaner solution in the system.
- Fuel pressure other than recommended 39-40 psi for all high-pressure EFI vehicles. Refer to Section 11 including the fuel pressure regulator diagnostic.
- Low voltage from a weak power source.
- Heat from prolonged engine running. Cool engine before retesting.

Use the following approved solvents: D9AZ-19579-B or E6AZ-19579-C only.

NOTE: All multiport (EFI) injectors should be tested at 40 PSI regardless of vehicle system operating pressure.

Service Maintenance

Periodically the flowmeters need cleaning. Follow the Matheson Instrument instructions enclosed or flush unit with denatured alcohol, allow the fluid to recirculate several minutes, switching flowmeter selection valve from No. 1 to No. 2 several times while unit is operating. Discard fluid. Reflush again using above procedure, discard fluid. Change filter.

To gain access to filter located under the front cover, unscrew and remove the cover access bolts, each side and slide the cover off. Replace filter with in-line type filter. Change filter frequently.

When new injector applications are released, new calibrated flow tubes are available from Triangle Special Products Group. This unit is suitable for conversion for K-Jetronic fuel systems. If K-Jetronic fuel system cleaning is desired, a modification kit is available from Triangle Special Products Group.

NOTE: Triangle Special Products Group (Miller Special Tools) is a division of The Triangle Corporation.

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EFI Injectors

Model Year	Engine Application	Source Source	#/HR	Part Number	Connector Color
1987	1.9L Car	Bosch	(19)	E6EE-9F593-AB	White
	2.3L T/C Car	DKK	(35)	E5ZE-9F593-AB	Brown
	2.3L OHC Car	ND	(14)	E59E-9F593-AB	Gray
	2.3L OHC Truck	ND	(14)	E59E-9F593-AB	Gray
	2.9L Truck	Bosch	(14)	E7DE-9F593-BB	Gray
	3.0L Car	ND	(14)	E59E-9F593-AB	Gray
	3.0L Truck	ND	(14)	E59E-9F593-AB	Gray
	4.9L Truck	Bosch	(14)	E67E-9F593-BB	Gray
	5.0L Car	Bosch/Ford/ND	(14)	E67E-9F593-BB	Gray
	5.0L HO Car	ND	(19)	E6TE-9F593-AB	Yellowish Orange
	5.0L Truck	Bosch/DKK	(19)	E5TE-9F593-BB/AB	Yellowish Orange
	7.5L Truck	Bosch	(24)	E7TE-9F593-BB	
1988	1.9L Car	Bosch	(19)	E6EE-9F593-AB	White
	2.3L T/C Car	DKK	(35)	E5ZE-9F593-AB	Brown
	2.3L Car	ND	(14)	E59E-9F593-AB	Gray
	2.3L HSC Car	Bosch	(14)	*E67E-9F593-BB	Gray
	2.3L Truck	ND	(14)	E59E-9F593-AB	Gray
	2.9L Truck	Bosch	(14)	E7DE-9F593-BB	Gray
	3.0L Car	ND	(14)	E59E-9F593-AB	Gray
	3.0L Truck	ND	(14)	E59E-9F593-AB	Gray
	3.8L Car	Bosch	(14)	E67E-9F593-BB	Gray
	4.9L Truck	Bosch/Ford	(14)	*E67E-9F593-BB	Gray
	5.0L Car	Ford	(14)	E67E-9F593-BB	Gray
	5.0L HO Car	ND/DKK	(19)	E6TE-9F593-AB	Yellowish Orange
	5.0L Truck	Bosch/DKK	(19)	E5TE-9F593-AB	Yellowish Orange
	5.8L Truck	Bosch	(19)	E5TE-9F593-AB	Yellowish Orange
	7.5L Truck	Bosch	(24)	E8TE-9F593-BC	Blue
1989	1.9L Car	Bosch	(14)	E6EE-9F593-AB	White
	2.3L Car	ND	(14)	E59E-9F593-AB	Gray
	2.3L Truck	ND	(14)	E59E-9F593-AB	Gray
	2.3L T/C Car	DKK	(35)	E5TE-9F593-AB	Brown
	2.3L HSC	Bosch	(14)	E67E-9F593-AB	Gray
	2.9L Truck	Bosch	(14)	E67E-9F593-BB	Gray
	3.0L Car	ND	(14)	E59E-9F593-AB	Gray
	3.0L Truck	ND	(14)	E59E-9F593-AB	Gray
	3.8L Car	Bosch	(14)	E67E-9F593-AB	Gray
	3.8L S/C Car	Bosch	(30)	E9SE-9F593-BB	Red
	4.9L Truck	Ford	(14)	E67E-9F593-BB	Gray
	5.0L Car	Ford/ND	(14)	E67E-9F593-BB E59E-9F593-AB	Gray
	5.0L HO Car	DKK	(19)	E6TE-9F593-AB	Yellowish Orange
	5.0L Truck	DKK	(19)	E5TE-9F593-AB	Yellowish Orange
	5.8L Truck	DKK/Bosch	(19)	E5TE-9F593-BB/AB	Yellowish Orange
	7.5L Truck	Bosch	(24)	E8TE-9F593-BB	Light Blue

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EFI Injectors

Model Year	Engine Application	Source Source	#/HR	Part Number	Connector Color
1990	1.9L Car	Bosch	(19)	E6EE-9F593-AB	White
	2.3L Car	ND	(14)	E59E-9F593-AB	Gray
	2.3L Truck	ND	(14)	E59E-9F593-AB	Gray
	2.3L HSC	Bosch	(14)	E67E-9F593-AB	Gray
*DRI	2.3L HSC	ND	(14)	F03E-9F593-AA	Gray
	2.9L Truck	Bosch	(14)	E67E-9F593-BB	Gray
	3.0L Car	ND	(14)	E59E-9F593-AB	Gray
	3.0L Truck	ND	(14)	E59E-9F593-AB	Gray
	3.8L Car	Bosch	(14)	E67E-9F593-BB	Gray
*DRI	3.8L Car	Bosch	(14)	F0SE-9F593-AA	Gray
	3.8L S/C Car	Bosch	(30)	E9SE-9F593-BB	Red
	4.0L Truck	Bosch	(19)	90TF-9F593-AA	Black
	4.9L Truck	Ford	(14)	E67E-9F593-BB	Gray
	5.0L Car	Ford/ND	(14)	E67E-9F593-BB E59E-9F593-AB	Gray
	5.0L HO Car	DKK	(19)	E6TE-9F593-AB	Yellowish Orange
	5.0L Truck	DKK	(19)	E5TE-9F593-AB	Yellowish Orange
	5.8L Truck	Bosch/DKK	(19)	E5TE-9F593-BB/AB	Yellowish Orange
*DRI	5.8L Truck	DKK	(19)	F0TE-9F593-C3A	Yellowish Orange
	7.5L Truck	Bosch	(24)	E8TE-9F593-BB	Lt. Blue

NOTE: * Deposit Resistant Injector

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SECTION 5

Catalyst and Exhaust Systems

Contents

System Description 5-1

Catalytic Converter System 5-1

Exhaust Heat Control Valve 5-2

System Diagnosis 5-3

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System Description

Catalytic Converter System

The engine exhaust consists mainly of Nitrogen (N_2), however, it also contains Carbon Monoxide (CO), Carbon Dioxide (CO_2), Water Vapor (H_2O), Oxygen (O_2), Nitrogen Oxides (NOx), and Hydrogen (H_2) as well as various, unburned Hydrocarbons (HC). Three of these exhaust components — CO, NOx, and HC — are major air pollutants, so their emission to the atmosphere has to be controlled.

The catalytic converter, mounted in the engine exhaust stream, plays a major role in the emission control system. The converter works as a gas reactor, and its catalytic function is to speed up the heat producing chemical reaction between the exhaust gas components in order to reduce the air pollutants in the engine exhaust. The catalyst material, contained inside the converter, is made of a ceramic substrate that is coated with a high surface area alumina and impregnated with catalytically active, precious metals (Figure 1).

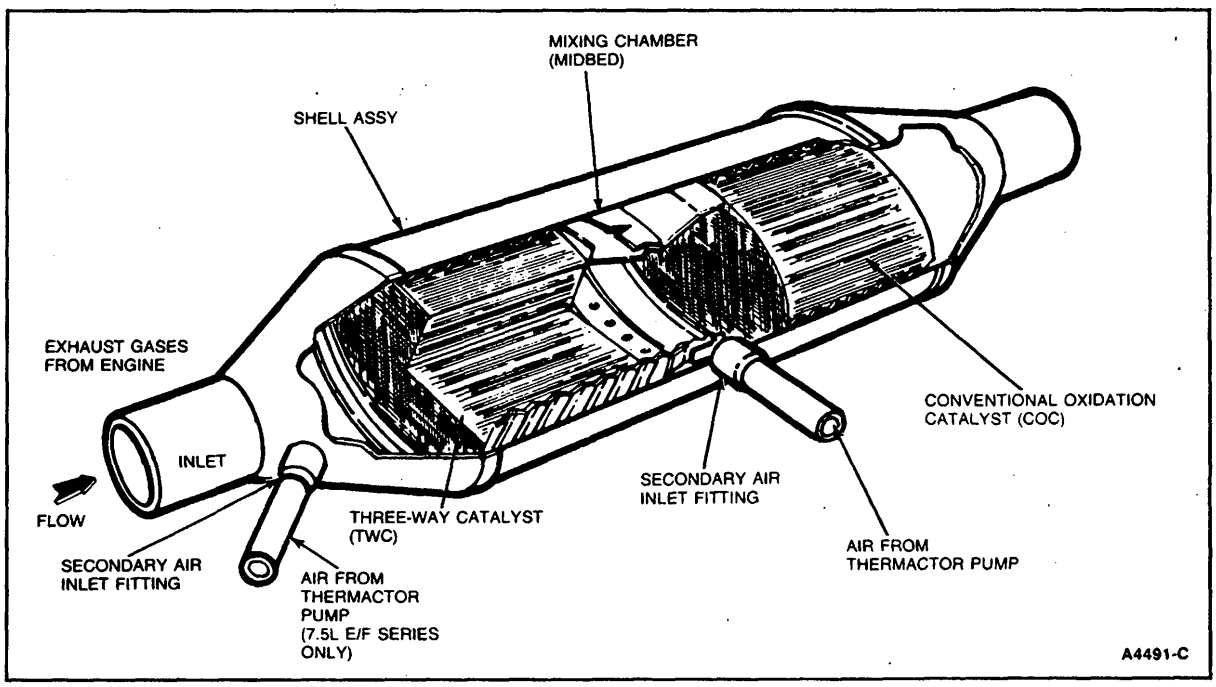


Figure 1 Dual Catalytic Converter

It is the surface of the catalyst material that plays a major role in the heat producing chemical reaction. There are basically three types of catalysts:

1. The conventional oxidation catalyst (COC), containing Platinum (Pt) and Palladium (Pd), is effective for catalyzing the oxidation reactions of HC and CO.
2. The three-way catalyst (TWC), containing Platinum (Pt) and Rhodium (RH) or Palladium (Pd) and Rhodium (RH), is not only effective for catalyzing the oxidation reactions of HC and CO, but it also catalyzes the reduction of NOx.

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System Description

3. The Light Off Catalyst (LOC) is a single-bed converter. It is arranged in series with the main catalytic converter assembly of COC and/or TWC as the aft member(s). This converter is designed to perform the very specialized function of exhaust emission control during engine warm-up when the main converter(s) is not yet at the temperature required for maximum efficiency. The LOC is designed to operate effectively in the high temperature environmental conditions that exist near the manifold flange. The LOC was designed with a minimum heat sink effect and; therefore, provides minimum delay in warm-up of the main catalytic converter(s).

The catalytic converter assembly consists of a structured shell containing a monolithic substrate — a ceramic, honeycomb construction. In order to maintain the converter's feed gas (exhaust) oxygen content at a high level to obtain the maximum oxidation for producing the heated chemical reaction, the oxidation catalyst requires the use of a secondary air source, and this is provided by the pulse air or thermactor air injection systems.

The catalytic converter system is protected by several devices that block out the secondary air supply from the thermactor air injection system when the engine is laboring under any abnormal hot or cold operating situation.

Depending on the engine calibration, these block-out devices are functional under one or more of the following conditions:

- Cold engine operation with rich choke mixture.
- Abnormally high engine coolant temperatures above 107°C (225°F), which may result from a condition such as an extended, hot idle on a hot day.
- Wide-open throttle.
- Engine deceleration.
- Extended idle operation.

A complete description of the design and operation of these block-out devices can be found in Thermactor Systems, Section 10.

Exhaust Heat Control Valve

Exhaust Heat Control Valve, Bimetal Type

The valve is normally in the closed position, engine cold and not running, to divert exhaust gases to the intake manifold riser pad. When the engine is started, the heat from the exhaust gases actuates the bimetal spring which opens the valve. As operating temperatures are reached, the valve will remain open. The valve, when cold, will also open at high engine speeds, due to the action of the exhaust gas on the unbalanced valve plate.

A. Inspect valve assembly for any abnormal condition. Service or replace as necessary.

B. Lubricate the valve with C0AZ-19A501-A or C4AZ-19A501-A graphite lube or equivalent.

C. Check valve and thermostatic spring operation by manually rotating the valve shaft. Valve must be free and return to the closed position when cold (Rotunda Choke Tester Model 090-00001 or equivalent may be used if necessary to cool bimetal).

Vacuum Operated Heat Control Valve

Refer to Components, Section 3 for description and operation.

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System Diagnosis

A restricted or blocked exhaust system usually results in loss or lack of power or popping through the carburetor. Verify that the condition is not caused by ignition or timing problems, then proceed with diagnosis using the following procedure.

TEST STEP	RESULT ▶	ACTION TO TAKE
B0 VISUAL INSPECTION		
• Visually inspect exhaust system. • **Is exhaust system visually OK?**	Yes ▶ No ▶	GO to [B1]. REPLACE any collapsed exhaust components. If problem is not corrected, GO to [B1].
B1 VACUUM TEST		
• Attach vacuum gauge to intake manifold vacuum source. • Hook up tachometer. • Start engine and gradually increase speed to 2000 rpm with transmission in NEUTRAL. • **Is the manifold vacuum above 16 inches of mercury?**	Yes ▶ No ▶	No restriction in exhaust system. REFER to Section 2, Diagnostic Routine 209, Lack of Power. GO to [B2].
B2 VACUUM TEST — EXHAUST DISCONNECTED		
• Turn engine Off. • Disconnect exhaust system at exhaust manifold(s). • Repeat vacuum test. • **Is the manifold vacuum above 16 inches of mercury?**	Yes ▶ No ▶	GO to [B3]. GO to [B4].

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System Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
B3 VACUUM TEST — CATALYTIC CONVERTER(S) ON/MUFFLER(S) OFF		
• Turn engine Off. • Reconnect exhaust system at exhaust manifold(s). • Disconnect muffler(s). • Repeat vacuum test. • **Is the manifold vacuum above 16 inches of mercury?**	Yes ▶ No ▶	REPLACE muffler(s). REPLACE catalytic converter and inspect muffler to be sure converter debris has not entered muffler.
B4 EXHAUST MANIFOLD RESTRICTED		
• Remove the exhaust manifold(s). Inspect the ports for casting flash by dropping a length of chain into each port. **NOTE: Do not use a wire or light to check ports. The restriction may be large enough for them to pass through but small enough to cause excessive back pressure at high engine rpm.** • **Is a restriction present?**	Yes ▶ No ▶	REMOVE casting flash. If flash cannot be removed, REPLACE exhaust manifold(s). REFER to Section 2, Diagnostic Routine 209, Lack of Power.

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SECTION 6

Exhaust Gas Recirculation (EGR) Systems

Contents

System Descriptions 6-1
Vacuum Operated EGR Systems 6-1
Pressure Feedback Electronic (PFE) EGR System 6-1
Electronic EGR System 6-3
Back Pressure Variable Transducer (BVT) EGR System 6-6
Integral Back Pressure Transducer EGR System 6-8
Valve and Transducer EGR System 6-9
Other EGR System Components 6-10
EGR Vacuum Regulator 6-10
EGR Solenoid Vacuum Valve Assembly 6-11
Solenoid Vacuum Valve Assembly 6-11
EGR Load Control (WOT) Valve 6-12
Vacuum Control Valve 6-12
Vacuum Reservoir 6-13
Vacuum Check Valve 6-13
Diagnosis By Symptom 6-14
Functional Diagnosis 6-20
Back Pressure Variable Transducer (BVT) System 6-20
Integral Back Pressure (IBP) Transducer EGR Valve 6-21
Ported EGR Valve 6-22
Electronic EGR (EEGR) Valve 6-23
Valve and Transducer Assembly 6-24

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System Descriptions

VACUUM OPERATED EGR SYSTEMS

The Exhaust Gas Recirculation (EGR) System is designed to reintroduce exhaust gas into the combustion cycle lowering combustion temperatures and reducing the formation of Nitrous Oxide.

There are five basic types of EGR systems:

- The PFE — EGR System (9J460 + 9D475)
- The Electronic EGR Valve (9F483)
- The Back Pressure Variable Transducer (9J431 + 9D475)
- The Integral Back Pressure Transducer EGR Valve (9D448)
- The Valve and Transducer Assembly EGR Valve (9H495)

The amount of exhaust gas reintroduced and the timing of the cycle varies by calibration and is controlled by various factors such as engine speed, engine vacuum, exhaust system back pressure, coolant temperature and throttle angle depending on the calibration. All EGR valves are vacuum actuated. The vacuum diagram is shown on the emission decal for each calibration.

PRESSURE FEEDBACK ELECTRONIC (PFE) EGR SYSTEM

PFE is a subsonic closed loop EGR system that controls EGR flow rate by monitoring the pressure drop across a remotely located sharp-edged orifice. The system uses a pressure transducer (-9J460-) as the feedback device and controlled pressure is varied by valve modulation using vacuum output of the EVR solenoid (-9J459-). With PFE system, the EGR valve only serves as a pressure regulator rather than a flow metering device.

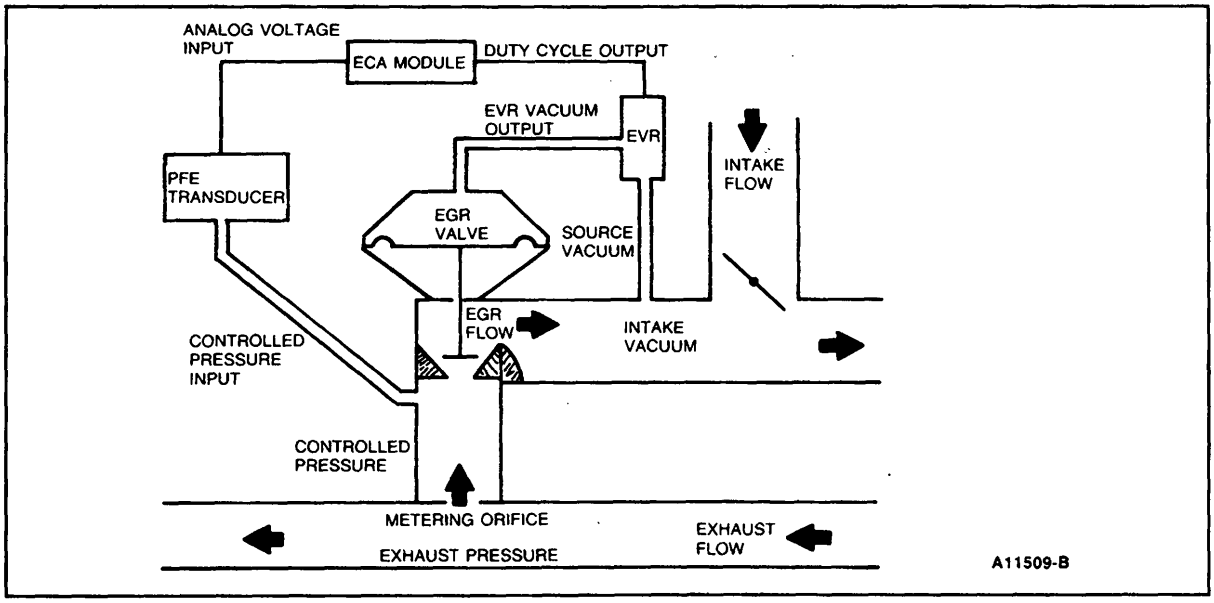


Figure 1 Typical Pressure Feedback Electronic (PFE) EGR System

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System Descriptions

System Components

PFE EGR Valve — 9D460 (9D475)

The Pressure Feedback Electronic (PFE) EGR valve is a conventional ported EGR valve. The service replacement for this valve is (-9D475-) which does not include the pick up tube/plug. The original pick up tube/plug should be used with the new service valve (-9D475-).

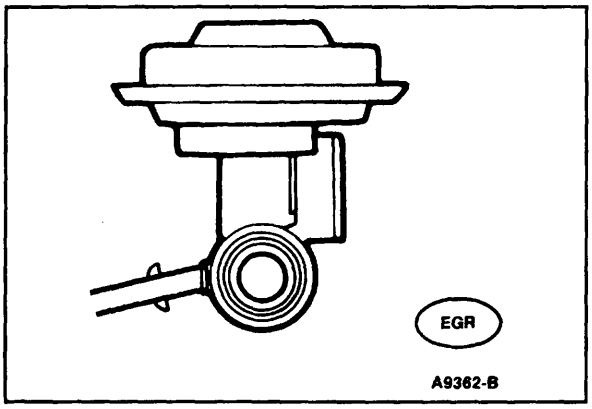


Figure 2 Typical Pressure Feedback Electronic EGR Valve

PFE EGR Transducer — 9J460

The Pressure Feedback Electronic (PFE) EGR transducer converts a varying exhaust pressure signal into a proportional analog voltage which is digitized by the EEC-IV processor. The EEC-IV processor uses the signal received from the PFE transducer to complete the optimum EGR flow.

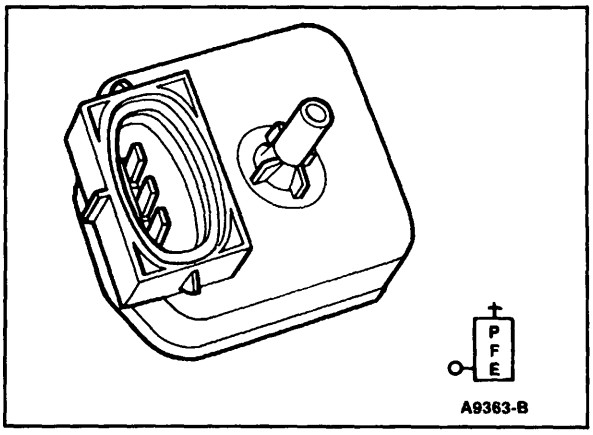


Figure 3 Pressure Feedback Electronic EGR Transducer

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System Descriptions

ELECTRONIC EGR SYSTEM

The Electronic EGR Valve (Figure 4) is required in EEC systems where EGR flow is controlled according to computer demands by means of an EGR Valve Position (EVP) sensor attached to the valve.

The valve is operated by a vacuum signal from the electronic vacuum regulator (9J459) which actuates the valve diaphragm or the dual EGR Solenoid Valves (9D474) on 2.3L passenger cars only.

As supply vacuum overcomes the spring load, the diaphragm is actuated. This lifts the pintle off its seat allowing exhaust gas to recirculate (flow). The amount of flow is proportional to the pintle position. The EVP sensor mounted on the valve sends an electrical signal of its position to the Electronic Control Assembly (12A650).

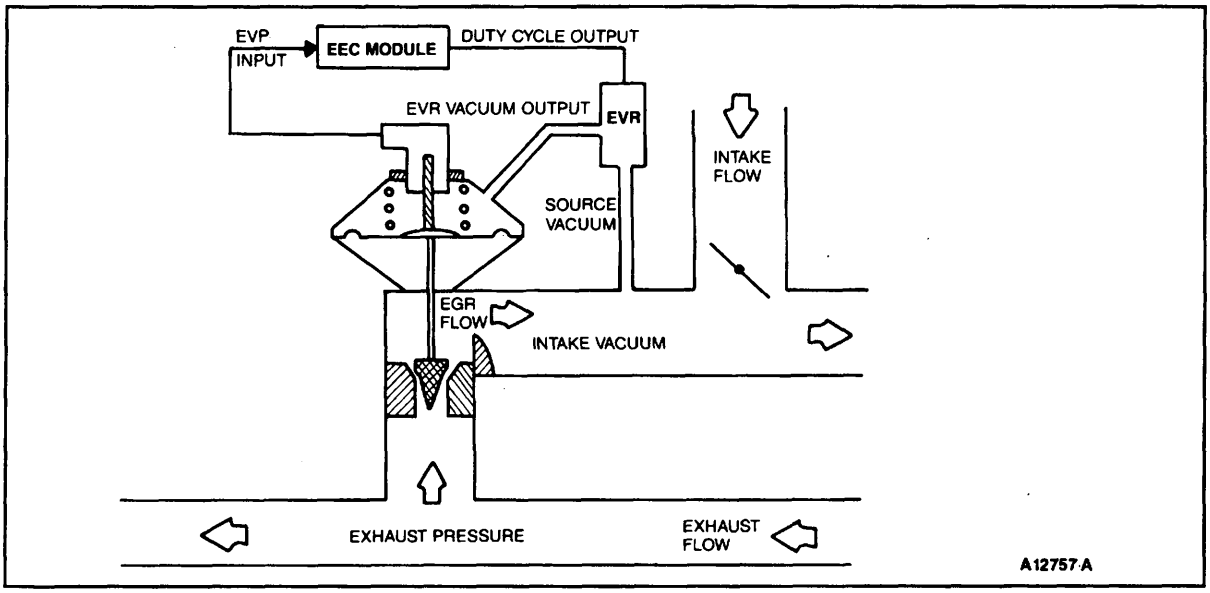


Figure 4 Typical Electronic EGR System

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System Descriptions

SYSTEM COMPONENTS

Electronic EGR Valve — 9F483 (9H473)

The EGR valve for this system is a vacuum operated EGR valve which maintains a service flow in the valve seat/pintle area.

The Electronic EGR Valve Assembly (9F483) is not serviceable. The EVP sensor (9G428) and EGR valve (9H473) must be serviced separately.

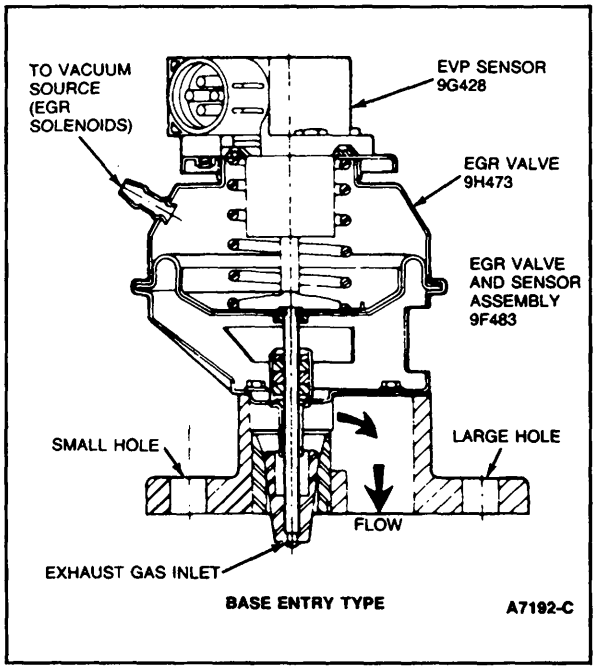


Figure 5 Electronic EGR Valve — 5.0L Passenger Car Only

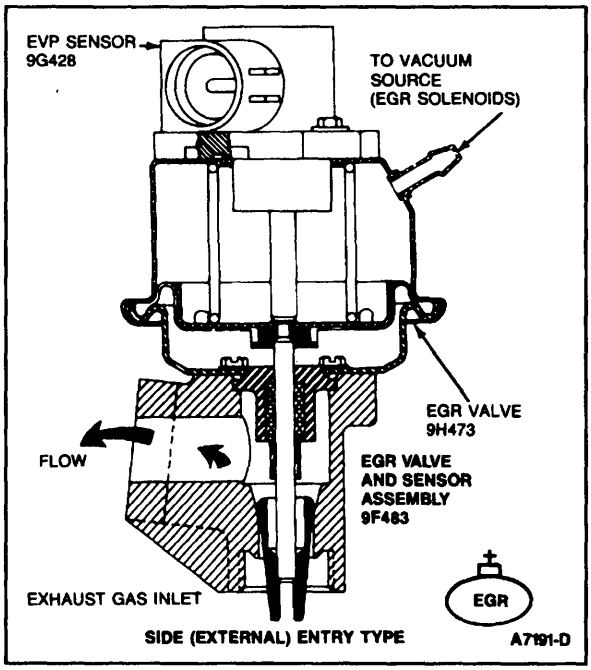


Figure 6 Electronic EGR Valve — All Applications Except 5.0L Passenger Car

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System Descriptions

EGR Valve Position (EVP) Sensor — 9G428

The EVP Sensor provides the EEC System with a signal indicating position of the EGR valve.

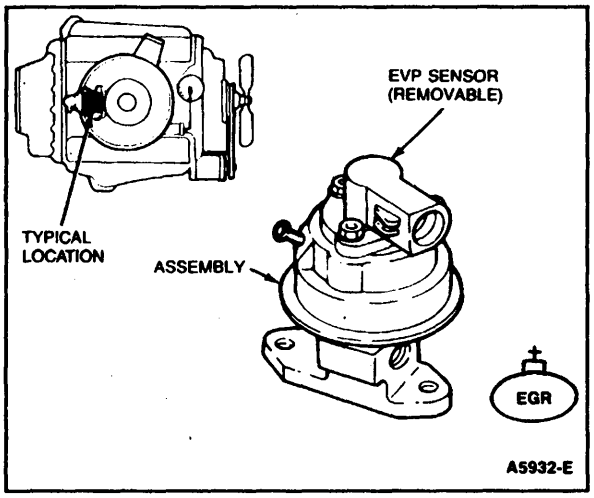


Figure 7 EGR Valve Position (EVP) Sensor

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System Descriptions

BACK PRESSURE VARIABLE TRANSDUCER (BVT) EGR SYSTEM

The BVT system is used on 1.9L EFI H.O. passenger car applications. A typical BVT control system is shown in Figure 8. It consists of three components; a vacuum regulator (9J431), EGR valve (9D475) and a flow control orifice.

The regulator modulates the vacuum signal to the EGR valve using two back pressure inputs. One input is the standard vehicle back pressure and the other is the back pressure downstream of the flow control orifice. The control chamber pickup is in the EGR tube and the flow control orifice is integral with the upstream EGR tube connector.

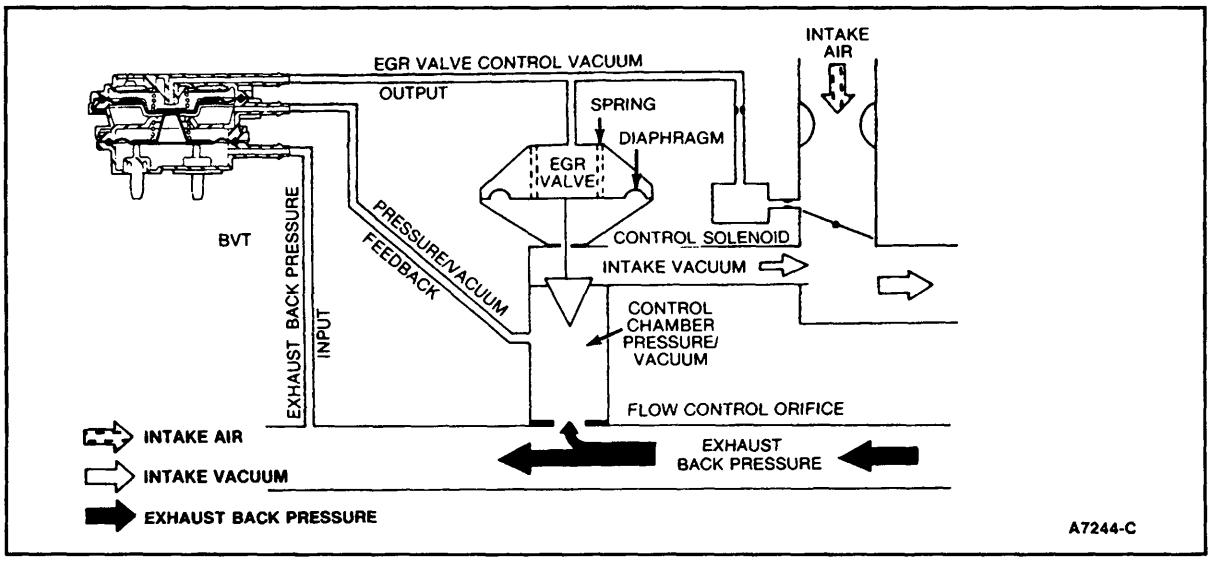


Figure 8 Back Pressure Variable Transducer (BVT) Schematic Diagram

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System Descriptions

System Components

Ported EGR Valve — 9D475

The ported EGR Valve is operated by a vacuum signal which actuates the valve diaphragm. As the vacuum increases sufficiently to overcome the power spring, the valve is opened allowing EGR flow. The vacuum to the EGR valve is controlled using the BVT (9J431).

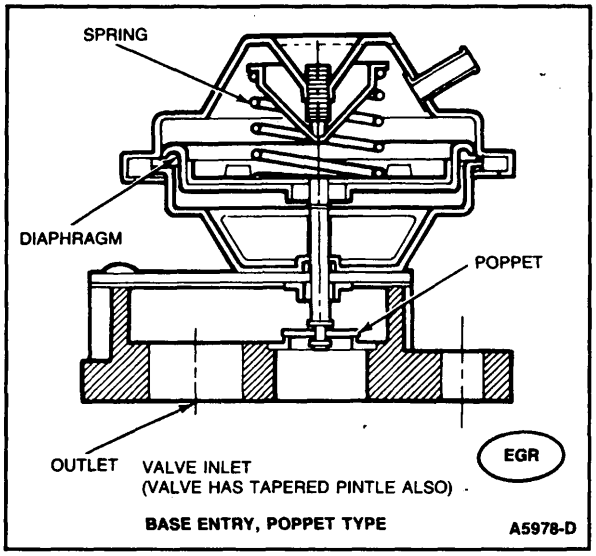


Figure 9 Ported EGR Valve (9D475)

Back Pressure Variable Transducer (BVT) — 9J431

The BVT controls the vacuum input to the EGR valve based on the engine operating condition.

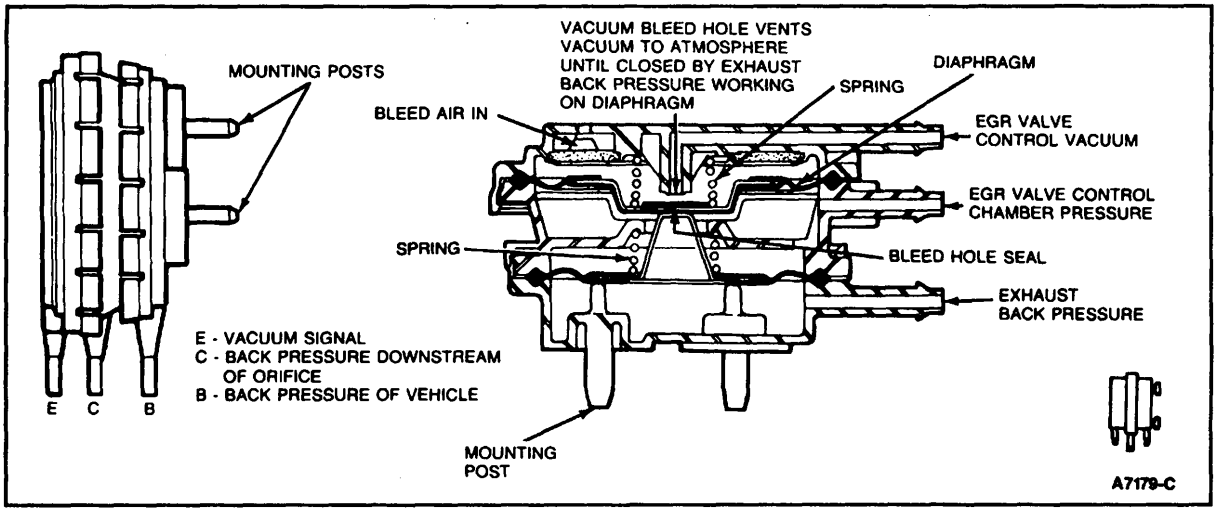


Figure 10 EGR Back Pressure Variable Transducer

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System Descriptions

INTEGRAL BACK PRESSURE TRANSDUCER EGR SYSTEM

System Components

Integral Back Pressure Transducer EGR Valve — 9D448

The Integral Back Pressure Transducer EGR Valve (Figure 11) is used on 5.8L carburetor passenger cars only. It combines inputs of back pressure and EGR port vacuum into one unit. The valve requires BOTH inputs to operate. The valve will not operate on vacuum alone.

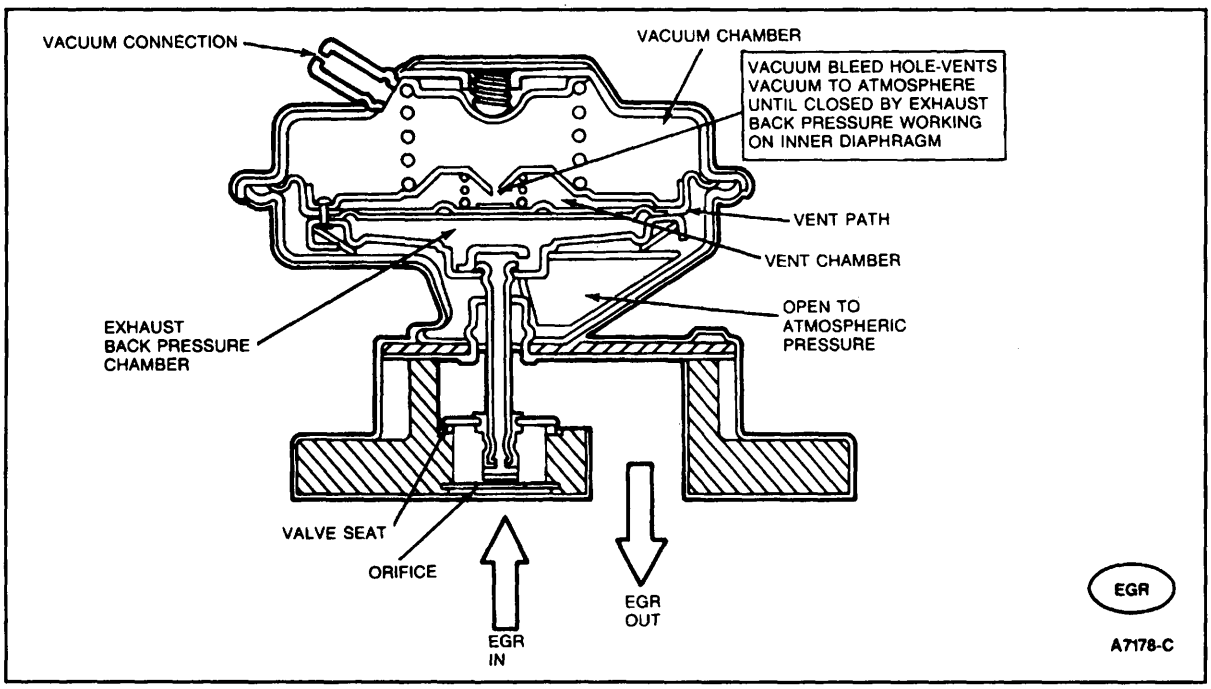


Figure 11 Integral Back Pressure Transducer EGR Valve (9D448)

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System Descriptions

VALVE AND TRANSDUCER EGR SYSTEM

System Component

EGR Valve and Transducer Assembly — 9H495

The Valve and Transducer Assembly (9H495) which consists of a modified ported EGR valve and a remote transducer, is used on 6.1L/7.0L Trucks only (Figure 12). This assembly operates the same as the Integral Back Pressure Transducer EGR Valve (9D448) and is diagnosed and serviced as an assembly only. Valve function checks are the same as those for the Integral Back Pressure Transducer EGR Valve.

When servicing the assembly or any related vacuum harness, it is important to ensure proper orientation of the transducer. The nipple of the transducer attached to the metal tube from the EGR valve base must point straight down after installation. This allows drainage of exhaust gas condensation that may accumulate.

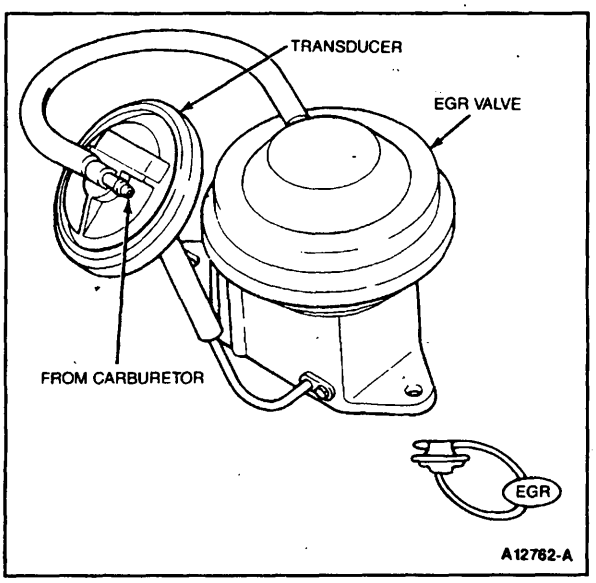


Figure 12 EGR Valve and Transducer Assembly

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System Descriptions

OTHER EGR SYSTEM COMPONENTS

The following components are used in the EGR systems. Detailed descriptions and diagnosis of these components may be contained in other Sections.

EGR VACUUM REGULATOR — 9J459

The EGR Vacuum Regulator (EVR) is an electromagnetic device which controls vacuum output to the EGR valve. The EVR replaces the EGR Solenoid Vacuum Vent Valve Assembly (9D474). An electric current in the coil induces a magnetic field in the armature. The magnetic field pulls the disk closed, closing the vent and increasing the vacuum level. The vacuum source is either manifold or vacuum. As the duty cycle is increased, an increased vacuum signal goes to the EGR valve.

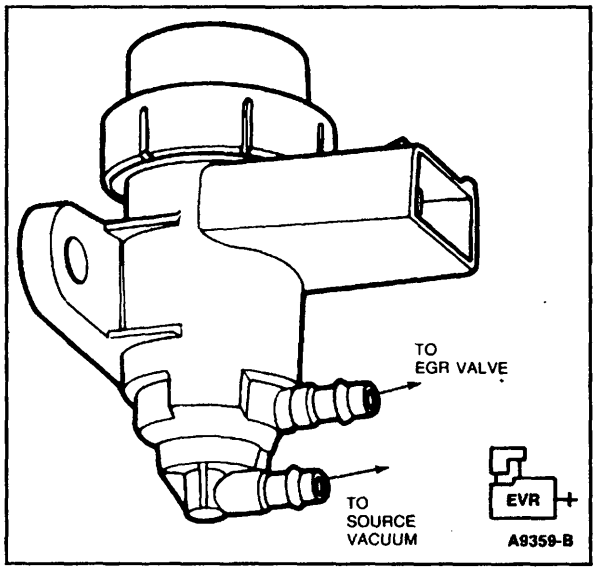


Figure 13 EGR Vacuum Regulator

Diagnosis

Refer to the EEC-IV Quick Test, Section 14.

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System Descriptions

EGR SOLENOID VACUUM VALVE ASSEMBLY — 9D474

The dual EGR Solenoid Valve Assembly is used only in 2.3L Mustang applications to control the vacuum input to the EGR valve.

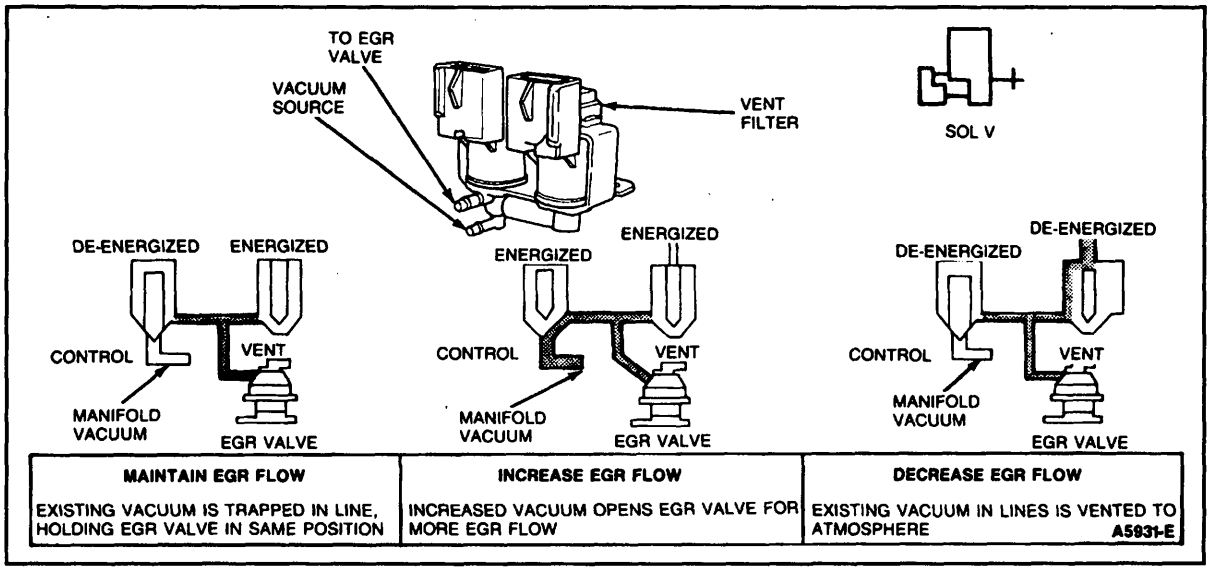


Figure 14 EGR Solenoid Valve Assembly — Dithering Type

EGR SOLENOID VACUUM VALVE ASSEMBLY — 9D474

This Solenoid is used on 1.9L EFI-HO applications to cut off the vacuum to the EGR valve.

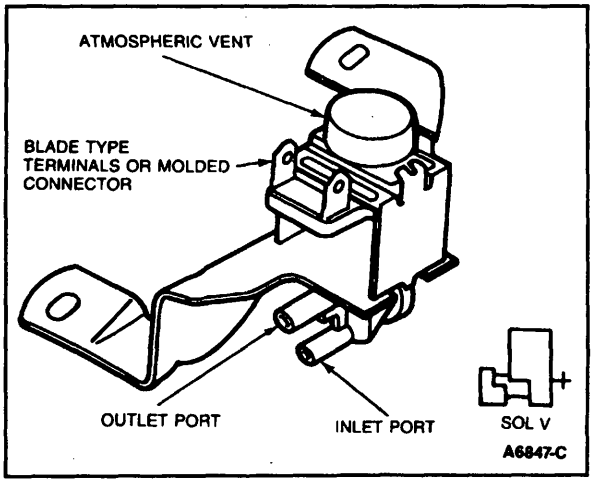


Figure 15 Typical Solenoid Valve Assembly — Normally Closed

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System Descriptions

EGR LOAD CONTROL (WOT) VALVE — 9F424

This valve dumps EGR vacuum at or near WOT and is used on 6.1L/7.0L Truck and 5.8L Police applications.

The normal path between Ports A and B is vented to atmosphere when sufficient vacuum is applied to Port C.

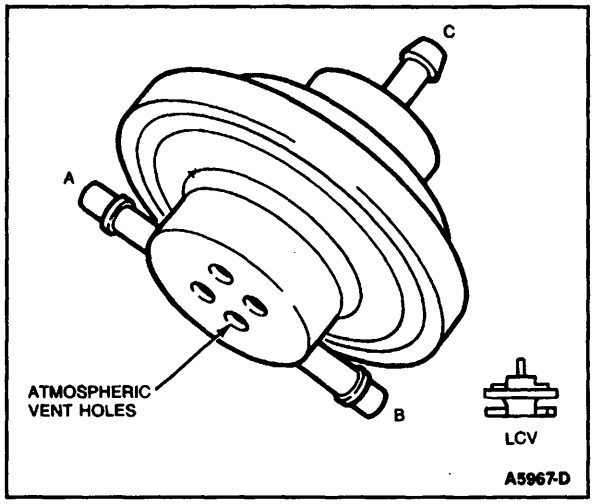


Figure 16 EGR Vacuum Load Control (WOT) Valve

VACUUM CONTROL VALVE — 8A564

The Vacuum Control Valve controls vacuum to the EGR valve during engine warm-up. The Vacuum Control Valve is used only for 5.8L Police and 6.1L/7.0L Truck applications.

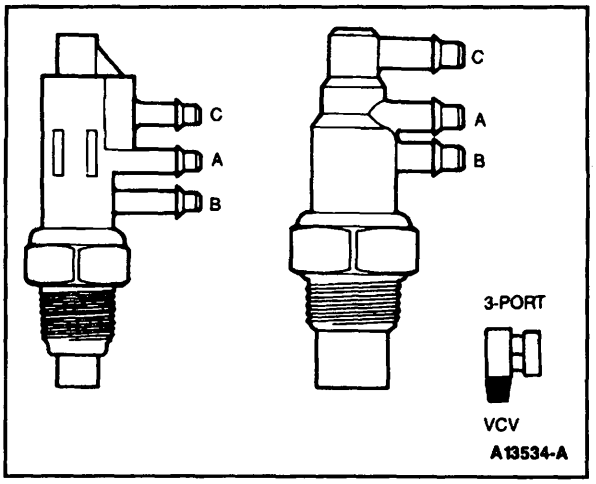


Figure 17 Vacuum Control Valve

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System Descriptions

VACUUM RESERVOIR — 9E453

The Vacuum Reservoir (Figure 18) stores vacuum and provides "muscle" vacuum. It prevents rapid fluctuations or sudden drops in a vacuum signal such as those seen during an acceleration period.

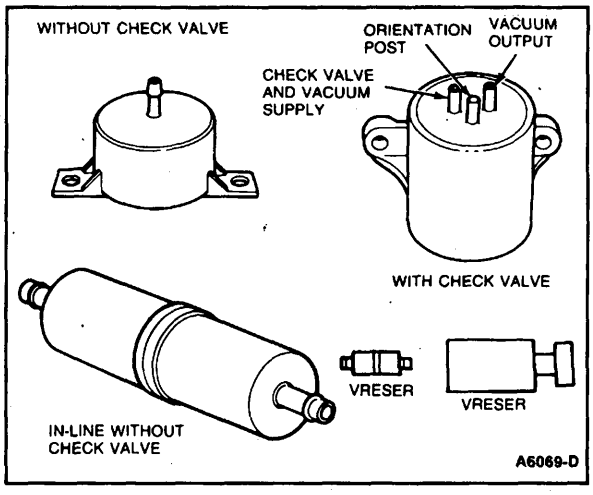


Figure 18 Vacuum Reservoirs

Diagnosis

When charged initially with 15 to 20 in-Hg vacuum, vacuum loss shall not exceed .5 in-Hg in 60 seconds. If it does, replace the reservoir.

VACUUM CHECK VALVE — 12A197

A vacuum check valve (Figure 19) blocks airflow in one direction. It allows free airflow in the other direction. The check side of this valve will hold the highest vacuum seen on the vacuum side. If not, replace it.

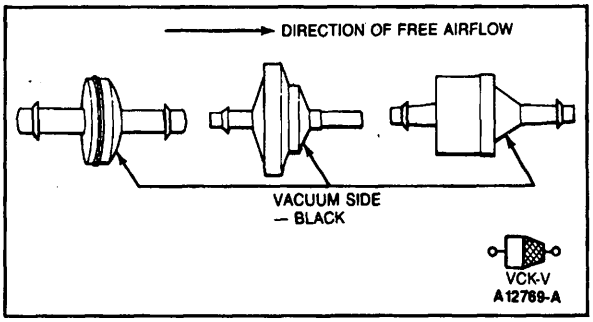


Figure 19 Vacuum Check Valve

Diagnosis

Apply 54 kPa (16 in-Hg) vacuum to "check" side of valve and trap. If vacuum remains above 50.6 kPa (15 in-Hg) for 10 seconds, the valve is acceptable.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Rough Idle Cold	• EGR valve malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR or VCV malfunction.	• Perform EGR or VCV diagnosis.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• EGR valve contamination.	• Clean EGR valve.
	• Curb idle speed too high or low.	• Reset according to Section 4.
• Rough Idle Hot	• EGR valve malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• EGR valve contamination.	• Clean EGR valve.
	• Curb idle speed too high or low.	• Reset according to Section 4.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Rough Running, Surge, Hesitation, Poor Part Throttle Performance —Cold	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR or VCV malfunction.	• Perform EGR or VCV diagnosis.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• EGR valve contamination.	• Clean EGR valve.
	• Ignition timing too low.	• Reset to specification shown on emission decal.
• Rough Running, Surge, Hesitation, Poor Part Throttle Performance —Hot	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR or VCV malfunction.	• Perform EGR or VCV diagnosis.
	• EGR valve contamination.	• Clean EGR valve and if necessary, replace EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• Insufficient exhaust back pressure to activate valve.	• Check exhaust system for leaks.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Engine Stalls On Deceleration — Hot and Cold	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT functional test.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR or VCV malfunction.	• Perform EGR or VCV diagnosis.
	• EGR valve contamination.	• Clean EGR valve and if necessary, replace EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Curb idle speed too low.	• Reset according to Section 4.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Engine Spark Knock or Ping	• EGR malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR or VCV malfunction.	• Perform EGR or VCV diagnosis.
	• Blocked or restricted passages in valve or spacer.	• Clean passages in EGR spacer and EGR valve.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• Insufficient exhaust back pressure to actuate valve.	• Check exhaust system for leaks.
	• Ignition timing too high.	• Reset to specification shown on emission decal.
	• Air cleaner temperature vacuum switch (TVS) malfunction.	• Perform air cleaner temperature switch (TVS) diagnosis, refer to Section 3.
• Engine Stalls At Idle — Cold	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR or PVS malfunction.	• Perform EGR or PVS diagnosis.
	• EGR valve contamination.	• Clean EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Curb idle speed too low.	• Reset according to Section 4.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Engine Stalls At Idle — Hot	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve contamination.	• Clean EGR valve and if necessary, replace EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• Curb idle speed too high or low.	• Reset according to Section 4.
	• Ignition timing too low.	• Reset to specification shown on emission decal.
• Low Power at Wide-Open Throttle	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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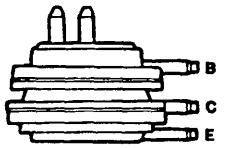
Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Engine Starts But Will Not Run —Engine Hard To Start Or Will Not Start	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR or VCV malfunction.	• Perform EGR or VCV diagnosis, refer to Section 3.
	• EGR valve contamination.	• Clean EGR valve.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
• Poor Fuel Economy	• EGR valve malfunction.	• Perform EGR valve diagnosis.
	• BVT malfunction.	• Perform BVT diagnosis.
	• EGR flange gasket leaking.	• Replace flange gasket and tighten valve attaching nuts or bolts to specification.
	• EGR valve attaching nuts or bolts loose or missing.	• Replace flange gasket and tighten attaching nuts or bolts to specification.
	• EGR solenoid malfunction.	• Run EEC-IV Quick Test. Refer to Section 14.
	• EGR or PVS malfunction.	• Perform EGR or PVS diagnosis.
	• Blocked or restricted EGR passages in valve or spacer.	• Clean passages in EGR spacer and replace EGR valve.
	• Load control (WOT) valve malfunction.	• Perform load control (WOT) valve diagnosis.
	• Vacuum leak at EVP sensor.	• Replace O-ring seal and tighten EVP sensor attaching nuts to specification.
	• Insufficient exhaust back pressure to activate valve.	• Check exhaust system for leaks.
	• Ignition timing too low.	• Reset to specification shown on emission decal.

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Functional Diagnosis

BACK PRESSURE VARIABLE TRANSDUCER (BVT) SYSTEM



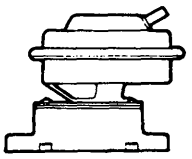
9J431

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is no vacuum to the EGR valve at idle with the engine at normal operating temperature.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Disconnect the Idle Air Bypass Valve (9F715) electrical connector (EFI engines only).
5. Remove vacuum supply hose from the EGR valve nipple. Plug the hose.
6. Start engine, idle with transmission in NEUTRAL, and observe the engine idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the EGR valve vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is fully applied to the EGR valve:
   - If idle speed drops more than 100 rpm or if engine stalls, perform the next step. Otherwise, for vacuum leak at EGR valve, replace the valve.
   - If EGR passages are blocked, clean the EGR valve using (Rotunda) 021-80056 EGR valve cleaner or equivalent.
   - Remove the vacuum from the EGR valve. If idle speed does not return to normal (±25 rpm), check for contamination, clean the valve.
   - If symptom still exists, replace the EGR valve.
9. Reconnect the idle air bypass valve electrical connector.
10. Unplug and reconnect the EGR vacuum supply hose.
11. Disconnect the vacuum connection at the 9J431 Back Pressure Variable Transducer (BVT).
12. Gently blow into the hose to Port C until the relief valve closes and at the same time apply 5-10 inches of mercury vacuum to Port E with a hand vacuum pump. Port E should hold vacuum as long as there is pressure on Port C.
13. Apply a minimum of 5-10 inches of mercury vacuum to Ports B and C using a hand vacuum pump. Ports B and C should hold vacuum.
14. Replace the BVT if any of the Ports do not hold vacuum.
15. Reconnect the vacuum at the BVT.
16. If neither the EGR valve nor the BVT were replaced, the system is OK. Refer to the Diagnostic Routines in Section 2.

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Functional Diagnosis

INTEGRAL BACK PRESSURE (IBP) TRANSDUCER EGR VALVE



9D448

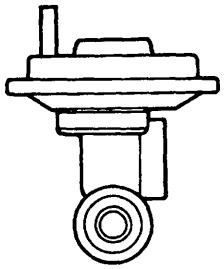
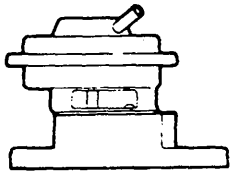
WARNING

DO NOT USE ROTUNDA EGR CLEANER (021-80056) ON THIS VALVE.

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is no vacuum to the EGR valve at idle with the engine at normal operating temperature.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Plug the tailpipe(s) to increase the exhaust system back pressure, leaving a 1/2-inch diameter opening to allow exhaust gases to escape.
5. Remove the vacuum supply hose from the EGR valve nipple. Plug the hose.
6. Start engine, idle with transmission in NEUTRAL, and observe idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the EGR valve vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is applied to the EGR valve and any of the following occur, replace the valve:
   - Engine does not stall.
   - Idle speed does not drop more than 100 rpm.
   - Idle speed does not return to normal (±25 rpm) after the vacuum is removed.
9. If the EGR valve is not replaced, reconnect the idle air bypass valve electrical connector.
10. Unplug and reconnect the EGR vacuum supply hose.
11. Remove the tailpipe plug(s).
12. The EGR system is OK, refer to the Diagnostic Routines in Section 2.

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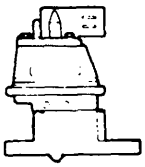
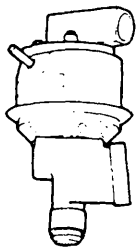
Functional Diagnosis

PORTED EGR VALVE	 9D475/9D460	 9D475

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is no vacuum to the EGR valve at idle with the engine at normal operating temperature.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Disconnect the Idle Air Bypass Valve (9F715) electrical connector (EFI engines only).
5. Remove the vacuum supply hose from the EGR valve nipple. Plug the hose.
6. Start engine, idle with transmission in NEUTRAL, and observe the engine idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the EGR valve vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is fully applied to the EGR valve:
   - If idle speed drops more than 100 rpm or if engine stalls, perform the next step. Otherwise, for vacuum leak at EGR valve, replace the valve.
   - If EGR passages are blocked, clean the valve using Rotunda 021-80056 EGR valve cleaner.
   - Remove the vacuum from the EGR valve. If idle speed does not return to normal (±25 rpm), check for contamination, clean the valve.
   - Make sure there is no sand left in the valve or pick-up tube. Replace the valve if necessary.
9. Reconnect the idle air bypass valve electrical connector.
10. Unplug and reconnect the EGR vacuum supply hose.
11. The EGR system is OK, refer to the Diagnostic Routines in Section 2.

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Functional Diagnosis

ELECTRONIC EGR (EEGR) VALVE	 9F483	 9F483

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is less than 2.5 in-Hg vacuum to the EGR valve at idle with the engine at normal operating temperature.

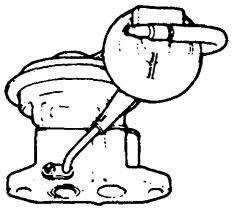
   NOTE: The EVR solenoid has a constant internal leak. You will notice a small vacuum signal. This signal should be less than 1.0 in-Hg at idle.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Disconnect the Idle Air Bypass Valve (9F715) electrical connector (1.9L EFI engines only).
5. Remove the vacuum supply hose from the EGR valve nipple. Plug the hose.
6. Start engine, idle with transmission in NEUTRAL and observe the engine idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the EGR valve vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is applied to the EGR valve and any of the following occur:
   - Engine does not stall.
   - Idle speed does not drop more than 100 rpm.
   - Idle speed does not return to normal (±25 rpm) after the vacuum is removed.

   Then:
   - For vacuum leak at EGR valve, replace the valve.
   - Check for contamination, clean the EGR valve, using Rotunda 021-80056 EGR valve cleaner or equivalent.
   - Make sure there is no sand left in the valve.
   - Replace the EGR valve if necessary.
9. Reconnect the idle air bypass valve electrical connector. Unplug and reconnect the EGR vacuum supply hose.
10. If EGR system is OK, replace EVP sensor if Continuous Code 32 is present. If Continuous Code 32 is not present, go to Diagnostic Routines in Section 2.

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Functional Diagnosis

VALVE AND TRANSDUCER ASSEMBLY



9H495

1. Make certain that all vacuum hoses are correctly routed and securely attached. Replace cracked, crimped or broken hoses.
2. Make certain there is no vacuum to the EGR valve at idle with the engine at normal operating temperature.
3. Install a tachometer, Rotunda 059-00010 or equivalent.
4. Plug the tailpipe(s) to increase the exhaust system back pressure, leaving a 1/2-inch diameter opening to allow exhaust gases to escape.
5. Remove the vacuum supply hose from the Exhaust Back Pressure Transducer nipple and plug the hose. Do not disconnect the transducer from the EGR valve.
6. Start engine, idle with transmission in NEUTRAL, and observe the engine idle speed. If necessary, adjust idle speed according to Section 4.
7. Slowly apply 5-10 inches of mercury vacuum to the Back Pressure Transducer vacuum nipple using a hand vacuum pump, Rotunda 021-00014 or equivalent.
8. When vacuum is applied to the Back Pressure Transducer and any of the following occur:
   - Engine does not stall.
   - Idle speed does not drop more than 100 rpm.
   - Idle speed does not return to normal (±25 rpm) after the vacuum is removed.

   Then:
   - Check for contamination.
   - Disconnect the transducer from the pick-up tube and clean the valve using Rotunda 021-80056 EGR valve cleaner or equivalent.
   - Make sure no sand (grit) is in the valve or pick-up tube.
   - If symptom still exists, replace EGR valve.
   - If there is a vacuum leak at the EGR valve, replace the valve.
9. Reconnect the vacuum supply hose to the Exhaust Back Pressure Transducer, remove the tailpipe plug(s).
10. If EGR system is OK, refer to the Diagnostic Routines in Section 2.

ROTUNDA EQUIPMENT

Model	Description
021-00014	Vacuum Pump
059-00010	Tachometer
021-80056	EGR Valve Cleaner

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SECTION 7

Evaporative Emission Systems

Contents

System Description 7-1

Air Cleaner Purge Evaporative Emission System 7-1

Carbureted Engine Purge System 7-2

EEC-IV Purge System (CFI and EFI) 7-3

Purge Port System 7-4

Combined Purge Port and EEC-IV Purge System 7-5

Diagnosis By Symptom 7-6

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System Description

Air Cleaner Purge Evaporative Emission System

Fuel Tank Venting

Fuel vapors trapped in the sealed fuel tank are vented through the orificed vapor valve assembly in the top of the tank. The vapors leave the valve assembly through a single vapor line and continue to the carbon canister (located in the engine compartment or along the frame rail), for storage, until they are purged to the engine for burning.

Carburetor Venting

If the engine is equipped with a carburetor, the vapors from the fuel bowl are vented to the carbon canister by a second tube to the carbon canister.

NOTE: To ensure efficient flow of vapors, the line from the carburetor bowl should have a continuous downhill slope to the canister.

Canister Purging

Purging the carbon canister removes the fuel vapor stored in the carbon canister. With an air cleaner purge system, vapors flow from the carbon canister to the air cleaner and into the engine.

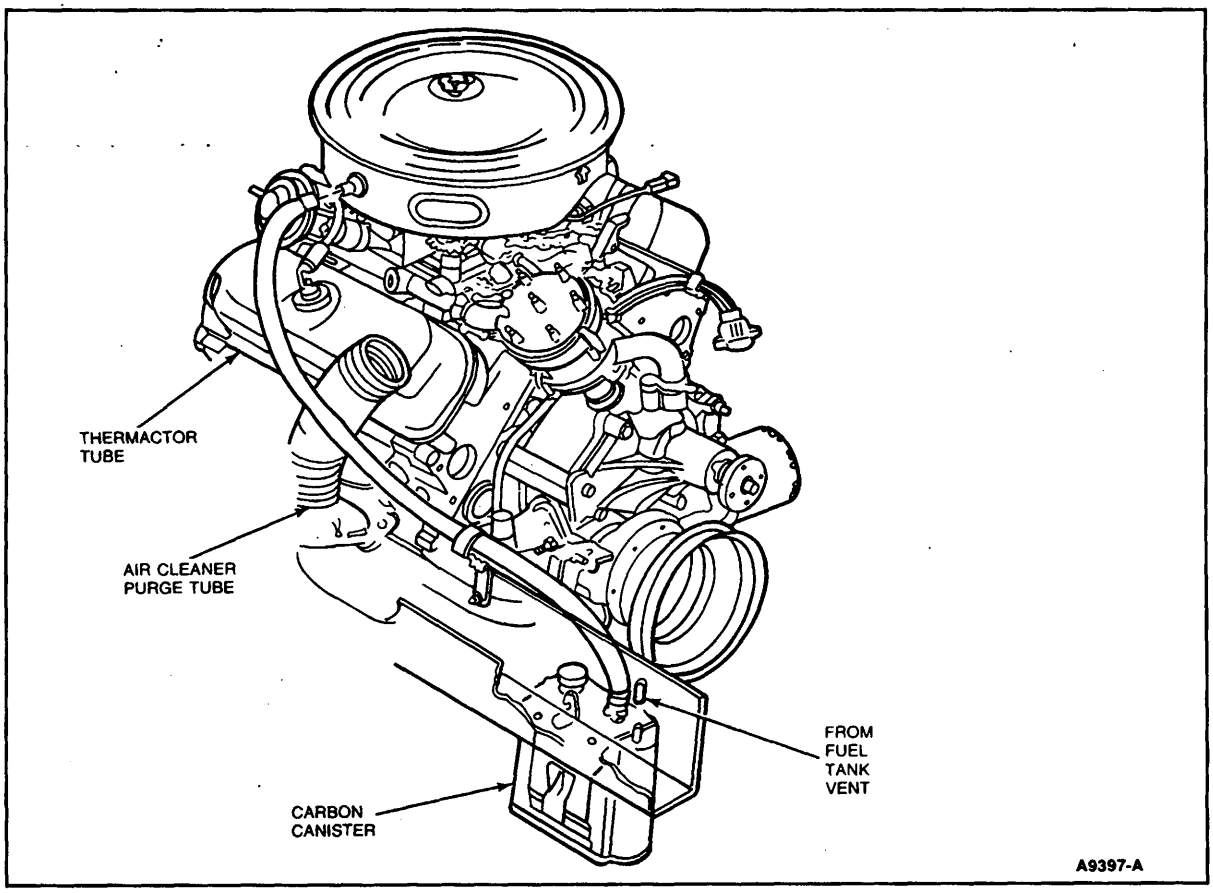


Figure 1 Typical Air Cleaner Purge Evaporative Emission System

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System Description

Carbureted Engine Purge System

Fuel Tank Venting

Fuel vapors trapped in the sealed fuel tank are vented through the orificed vapor valve assembly in the top of the tank. The vapors leave the valve assembly through a single vapor line and continue to the carbon canister (located in the engine compartment or along the frame rail), for storage, until they are purged to the engine for burning.

Carburetor Venting

Carburetor vapors from the fuel bowl are vented to the carbon canister. The flow is controlled by a fuel bowl solenoid vent, thermal vent valve, or vacuum thermal bowl vent valve located in the carburetor bowl vent line.

NOTE: To ensure efficient flow of vapors, the line from the carburetor bowl should have a continuous downhill slope to the canister.

Canister Purging

Purging the carbon canister removes the fuel vapor stored in the carbon canister. The flow of vapors from the canister to the engine is controlled by a purge solenoid or a vacuum controlled purge valve. Purging occurs when the engine is at operating temperature and off idle.

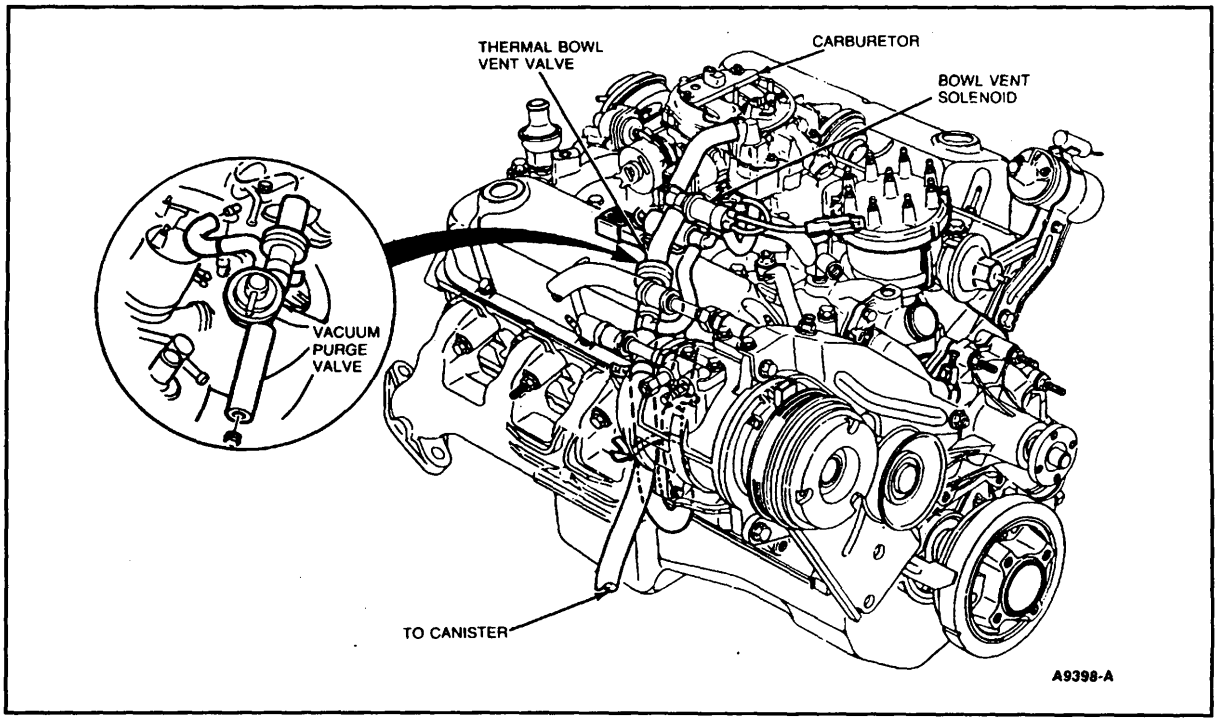


Figure 2 Typical Purge Evaporative Emission for Carbureted Engines

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System Description

EEC-IV Purge System (CFI and EFI)

Fuel Tank Venting

Fuel vapors trapped in the sealed fuel tank are vented through the orificed vapor valve assembly in the top of the tank. The vapors leave the valve assembly through a single vapor line and continue to the carbon canister (located in the engine compartment or along the frame rail), for storage, until they are purged to the engine for burning.

Canister Purging

Purging the carbon canister removes the fuel vapor stored in the carbon canister. With an EEC-IV controlled purge system, the flow of vapors from the canister to the engine is controlled by a purge solenoid or vacuum controlled purge valve. Purging occurs when the engine is at operating temperature and off idle.

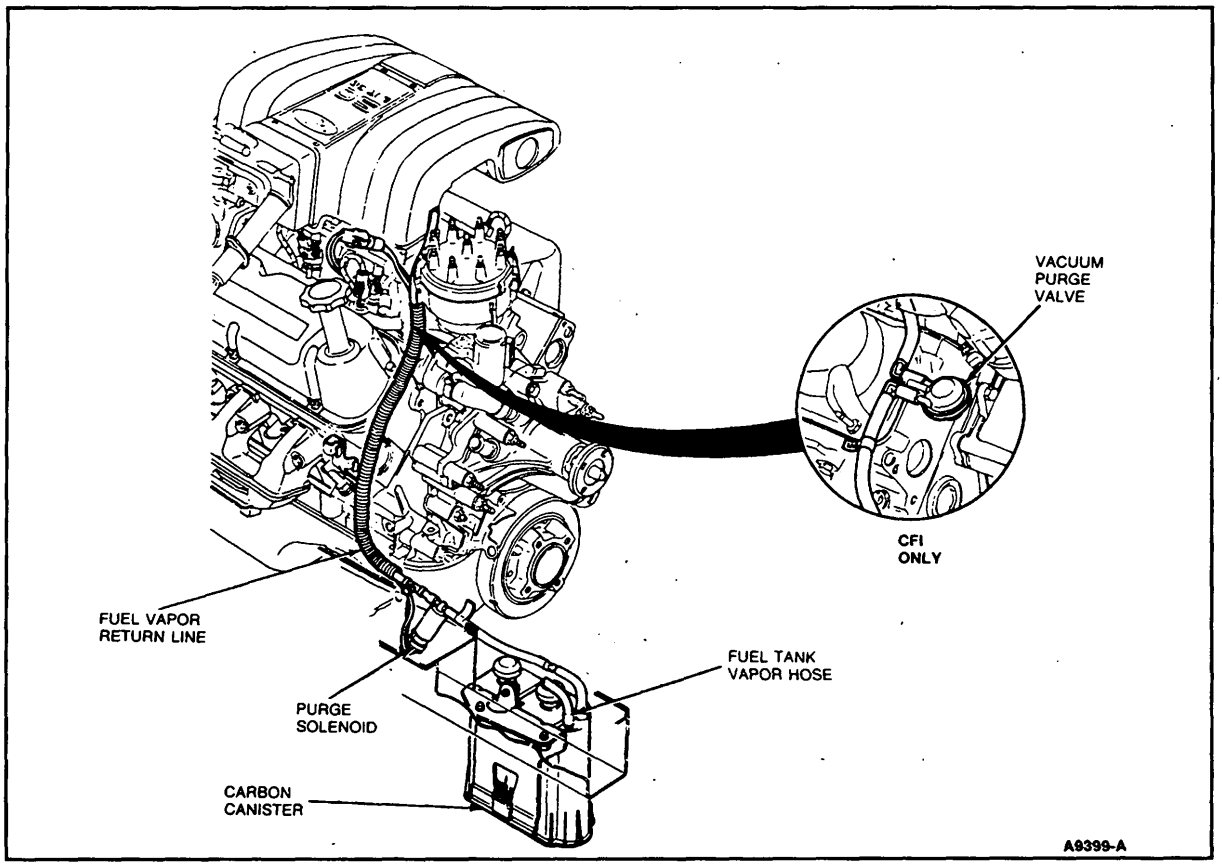


Figure 3 Typical EEC-IV Purge Evaporative Emission System — CFI and EFI

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System Description

Purge Port System

Fuel Tank Venting

Fuel vapors trapped in the sealed fuel tank are vented through the orificed vapor valve assembly in the top of the tank. The vapors leave the valve assembly through a single vapor line and continue to the carbon canister (located in the engine compartment or along the frame rail), for storage, until they are purged to the engine for burning.

Carburetor Venting

If the engine is equipped with a carburetor, the vapors from the fuel bowl are vented to the carbon canister. The flow is controlled by a fuel bowl solenoid vent valve, thermal vent valve, or vacuum thermal bowl vent valve located in the carburetor bowl vent line.

NOTE: To ensure efficient flow of vapors, the line from the carburetor bowl should have a continuous downhill slope to the canister.

Canister Purging

Purging the carbon canister removes the fuel vapors stored in the carbon canister. With a purge port system, the vapors flow from the carbon canister to the carburetor or throttle body.

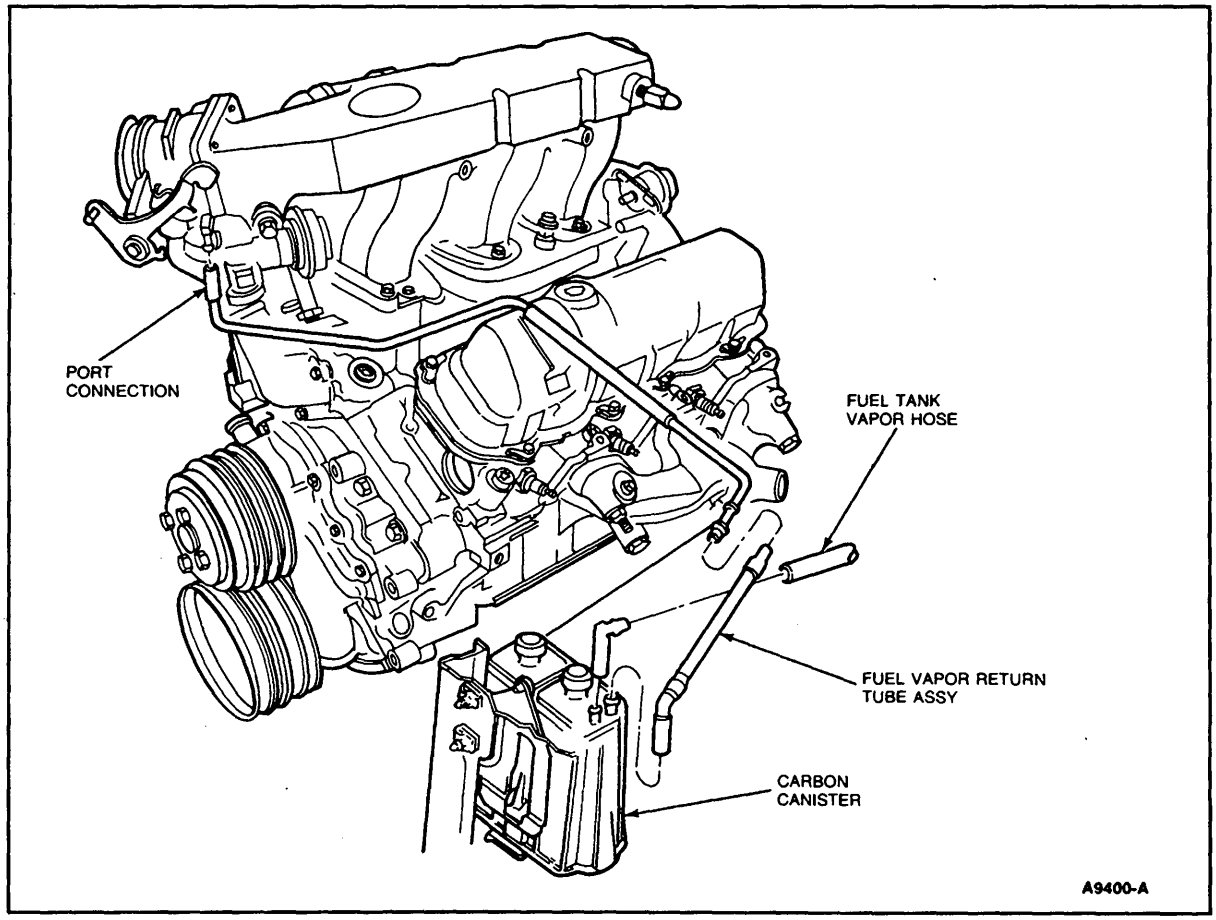


Figure 4 Typical Ported Purge Evaporative Emission System

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System Description

Combined Purge Port and EEC-IV Purge System

Fuel Tank Venting

Fuel vapors trapped in the sealed fuel tank are vented through the orificed vapor valve assembly in the top of the tank. The vapors leave the valve assembly through a single vapor line and continue to the carbon canister (located in the engine compartment or along the frame rail), for storage, until they are purged to the engine for burning.

Canister Purging

Purging the carbon canister removes the fuel vapor stored in the carbon canister. With a purge port system, the vapors flow from the carbon canister to the carburetor or throttle body. With an EEC-IV controlled purge system, the flow of vapors from the canister to the engine is controlled by a purge solenoid or vacuum controlled purge valve. Purging occurs when the engine is at operating temperature and off idle.

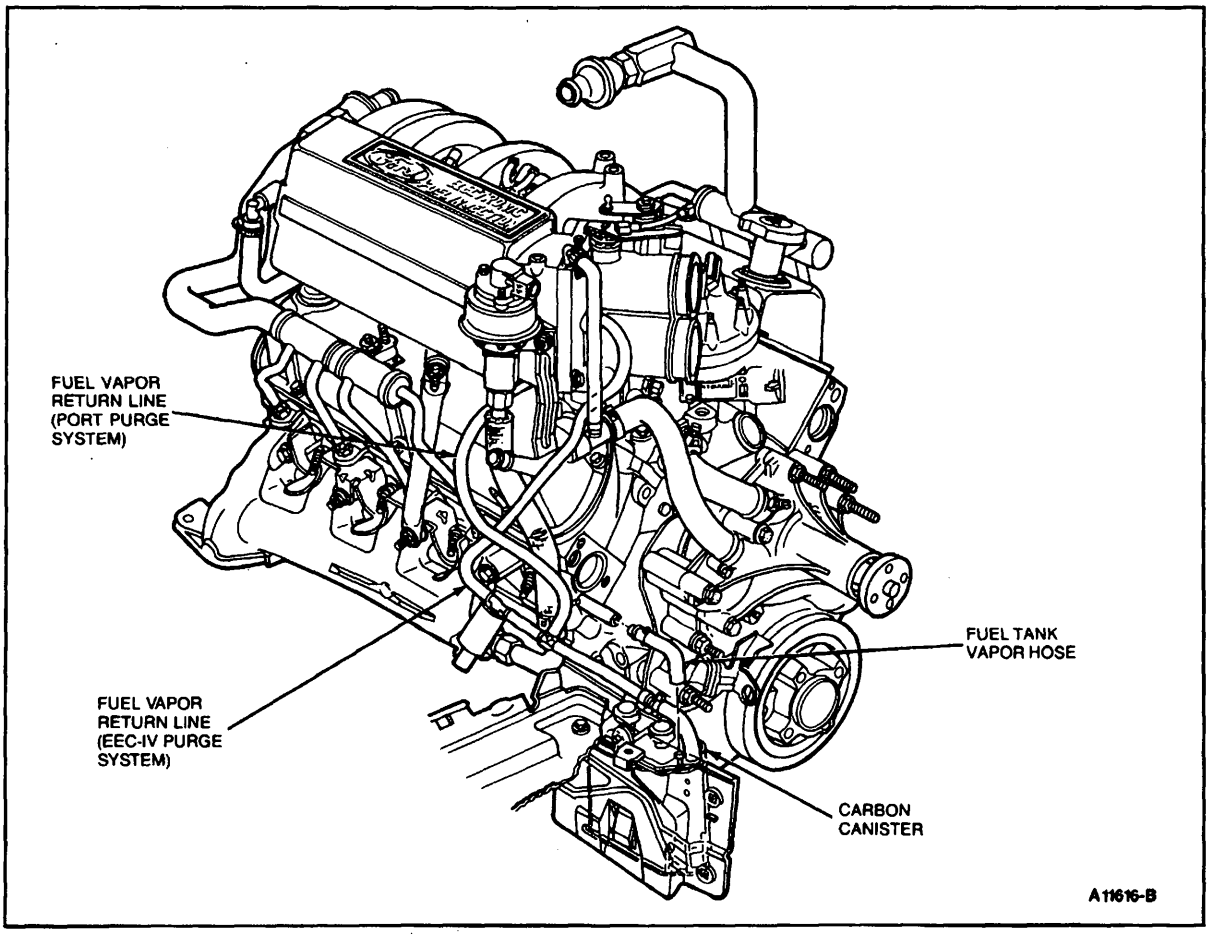


Figure 5 Typical EEC-IV Ported Purge Evaporative Emission System — EFI

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Diagnosis By Symptom

NOTE: If the Evaporative Emission System is functioning properly, return to Section 2 for further driveability complaint diagnosis.

CONDITION	POSSIBLE SOURCE *	ACTION
• Cranks Normally But Slow to Start	1. Thermostatic Bowl Vent Valve or Carburetor Fuel Bowl Thermal Vent Valve malfunction.	• Go to Diagnostic Test [EE1] and/or [EE5] .
• Rough Idle	1. Thermostatic or Vacuum Bowl Vent Valve open or leaking. 2. Canister Purge Regulator Valve open. 3. Carburetor Fuel Bowl Solenoid Vent Valve open. 4. Canister Purge Valve open or leaking.	• Go to Diagnostic Test [EE1] and/or [EE2] . • Go to Diagnostic Test [EE3] . • Go to Diagnostic Test [EE4] . • Go to Diagnostic Test [EE3] .
• Surge at Steady Speed	1. Liquid fuel in Carbon Canister.	• Replace carbon canister. Check fuel tank vent system and carburetor for malfunction.
• Gas Smell	1. Thermostatic Bowl Vent Valve or Carburetor Fuel Bowl Thermal Vent Valve malfunction. 2. Blockage of Carburetor Bowl Vent line. 3. Canister Purge Regulator Valve or Canister Purge Valve malfunction. 4. Carburetor Fuel Bowl Solenoid Vent Valve malfunction. 5. Liquid fuel in Carbon Canister. 6. Fuel Tank Vent System blocked. 7. Hole or cut in Carburetor Bowl Vent Line or Fuel Tank Vent Line.	• Go to Diagnostic Test [EE1] and/or [EE5] . • Check line for blockage and route with downhill slope to canister. • Go to Diagnostic Test [EE6] and/or [EE3] . • Go to Diagnostic Test [EE4] . • Replace Canister. Check fuel tank vent system and carburetor for malfunction. • Check fuel tank vent system. • Visually inspect and replace damaged line.

* System component fault in order of occurrence.

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Diagnosis By Symptom

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
EE1	Thermostatic Bowl Vent Valve	• At a temperature of 120°F or more, the Vacuum Vent Valve (E3EE-9G332-AA) should flow air between carburator port and canister port when no vacuum is applied to vacuum signal nipple. It should not flow air with a vacuum applied at the vacuum signal nipple (Figure 6). At a temperature of 90°F or less, the valve should not flow air or be very restrictive to airflow.

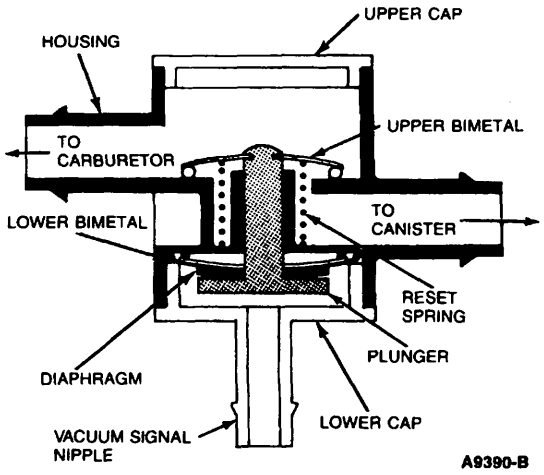
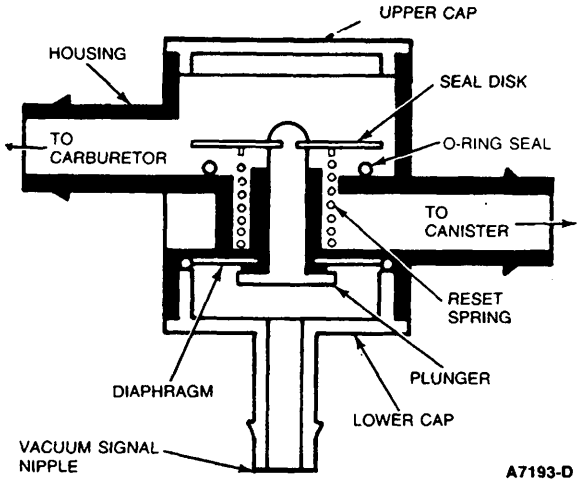


Figure 6 Vacuum/Thermostatic Bowl Vent Valve

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Diagnosis By Symptom

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
EE2	Vacuum Bowl Vent Valve	• The Vacuum Bowl Vent Valve (E3TE-9G332-AA) should flow air between carburetor port and canister port when no vacuum is applied to vacuum signal nipple and should not flow air with a vacuum applied at the vacuum signal nipple (Figure 7).  *Figure 7 Vacuum Bowl Vent Valve*

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Diagnosis By Symptom

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
EE3	Canister Purge Valve	**Important: Never apply vacuum to Port(s) C. Doing so may dislodge internal diaghram and valve will be permanently damaged.** • Application of vacuum to Port A (only) should indicate no flow. If flow occurs, replace valve. • Application of vacuum Port B (only) should indicate no flow, valve should be closed (all valves except E5VE-9B963-AA, E4VE-9B963-AA, E77E-9B963-AA, which should indicate slight flow). If valve flows (except E5VE-AA, E4VE-AA, E77E-AA), replace valve. • After applying and maintaining 54 kPa (16 in-Hg) vacuum to port A, apply vacuum to Port B. Air should pass. (Note: Valves E5VE-AA, E4VE-AA, E77E-AA should indicate higher flow than that indicated in above test.)

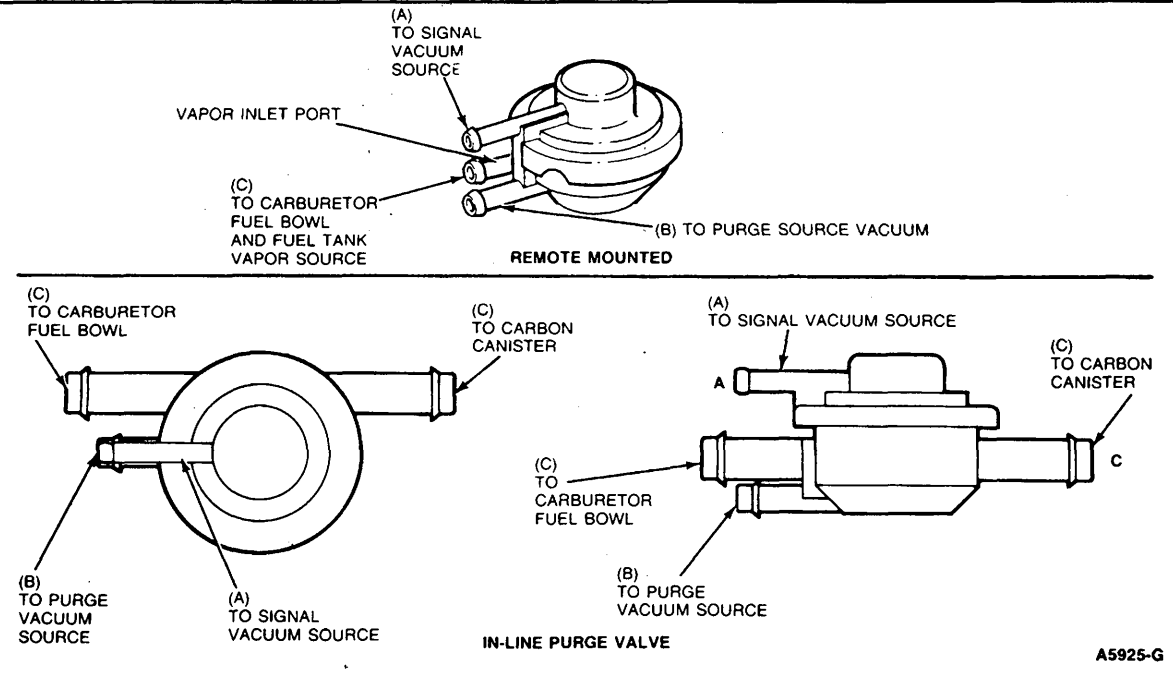


Figure 8 Purge Control Valve

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Diagnosis By Symptom

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
EE4	Carburetor Fuel Solenoid Vent Valve	• Apply 9 to 14 volts DC to the Fuel Bowl Vent Solenoid Valve (9B982). The valve should close, not allowing air to pass. If valve does not close or leaks when voltage and 1 in-Hg vacuum is applied to carburetor port, replace the valve (Figure 9).

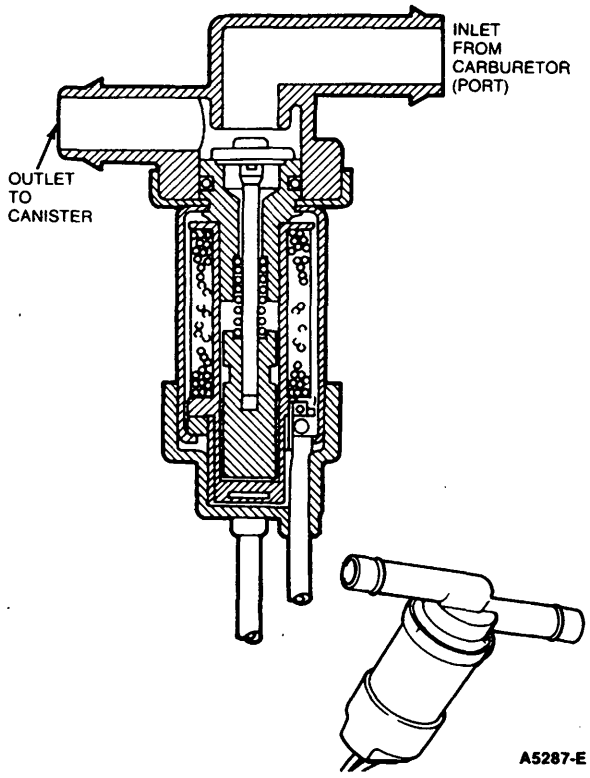
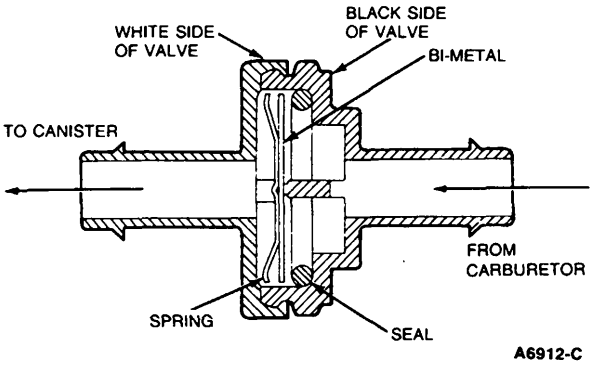


Figure 9 Fuel Bowl Vent Solenoid Valve

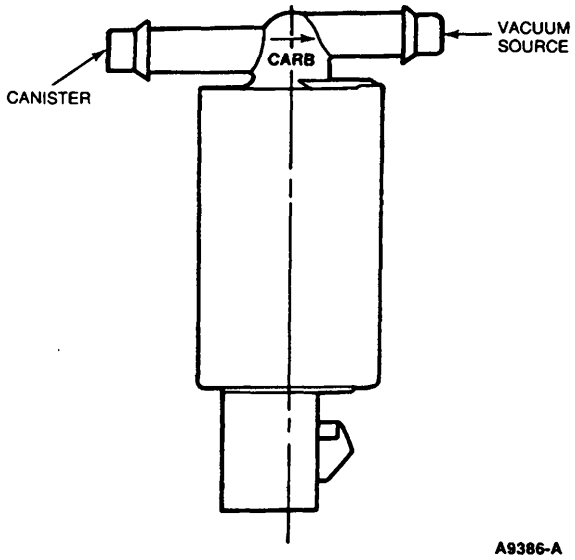
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Diagnosis By Symptom

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
EE5	Carburetor Fuel Bowl Thermal Vent Valve	• Fill a container with water. While using a thermometer to measure the appropriate temperature of the water, submerse the Fuel Bowl Thermal Vent Valve (9E589) in the water for one to two minutes and try to pull air through the valve using a vacuum pump. At 90°F and below, the vent valve is fully closed and at 120°F and above, the vent valve is fully open. At temperatures between 90°F and 120°F, the valve may be open or closed (Figure 10).  *Figure 10 Fuel Bowl Thermal Vent Valve*

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Diagnosis By Symptom

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
EE6	Canister Purge Regulator Valve	• With the Canister Purge Regulator Valve (9C915) de-energized, apply 5 in-Hg to "vaccuum source" port. Valve should not pass air; if it does, replace valve. • While applying 9 to 14 volts DC to valve, the valve will open and pass air. If it does not, replace valve (Figure 11).  *Figure 11 Canister Purge Regulator Valve*

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SECTION 8

Inlet Air Temperature Systems

Contents

System Description 8-1
System Schematics
1.9L CFI, 5.8L (Passenger Car) 8-2
1.9L EFI (Passenger Car) 8-2
1.9L EFI (1990 1/2) 8-3
2.3L EFI (HSC) and 2.3L (OHC) (Mustang) 8-4
3.0L EFI (Taurus/Sable) 8-5
3.8L SEFI (Thunderbird/Cougar) 8-6
3.8L SEFI (Taurus/Sable, Continental) 8-6
3.8L SEFI Supercharged (Thunderbird/Cougar) 8-7
3.8L SEFI Supercharger (Thunderbird/Cougar) 8-8
2.5L CFI (Passenger Car) 8-9
5.0L SEFI (Passenger Car) 8-9
2.9L EFI (Light Truck) 8-10
2.3L EFI Dual Plug (California Only — Light Truck) 8-10
4.0L EFI (Aerostar) 8-10
4.0L EFI (Ranger/Bronco II) 8-11
4.9L EFI, 5.0L EFI, 5.8L EFI, 5.8L E4OD EFI, 7.5L E4OD EFI, 7.5L EFI (F-Series and Bronco) 8-11
4.9L EFI, 5.0L EFI, 5.8L EFI, 5.8L E4OD EFI, 7.5L E4OD EFI, 7.5L EFI (E-Series) 8-11
2.3L EFI Dual Plug (49 States — Light Truck) 8-12
System Diagnosis 8-13
1990 3.8L Supercharged Air Induction (Supercooler and Intercooler) System 8-13
1990 1/2 1.9L EFI (Escort/Tracer) Air Intake System 8-14
All Other Engine Systems 8-15

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System Description

All passenger car and light truck engines are equipped with dry-type air cleaners incorporating a replaceable air filter element. Some air inlet systems use air cleaner assemblies with various sensors, switches and vacuum motors to control inlet air temperature. In addition, there are sometimes different sensors present in the air cleaner for other engine control systems.

Some air inlet systems draw air in from a cool air source only, while the rest regulate the air inlet temperature by drawing air in from a cool air source as well as heated air from a heat shroud which is mounted on the exhaust manifold. The duct and valve system which regulates the air flow from these two sources is located either inside the air cleaner, mounted on the air cleaner, or in one of the remote mounted inlet tubes. The flow is regulated by means of a door that is operated by a vacuum motor. Operation of the motor is controlled by delay valves, temperature sensors and other vacuum control systems. All vary with each application and engine calibration.

The air inlet tube(s) or fresh air tube is used to direct air into the air cleaner. The air cleaner assembly consists of a tray that holds the air filter element, a filter pack to provide filtered air to the crankcase ventilation hose, and a cover that directs air to the outlet tube(s). The air outlet tubes direct filtered air from the air cleaner to the throttle body. For the 7.5L engine, an idle by-pass hose also provides filtered air to the upper intake manifold from the air outlet tube during engine idle.

1990 1/2 1.9L EFI Escort/Tracer Air Intake System

The air intake system consists of the following components:

- A fresh air inlet tube with a side branch resonator.
- An air cleaner assembly that consists of a cover and tray assembly and a filter element attached together with four string clamps. The air cleaner tray is connected to the fresh air inlet tube. The air cleaner cover has a mass air flow sensor attached to it with a gasket and four screws. The cover also has an aircharge temperature sensor attached to it.
- An air outlet tube with hose clamps that connects the air cleaner to the throttle body.

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System Schematics

The following are schematic representations of some 1990 Passenger Car and Truck inlet air systems:

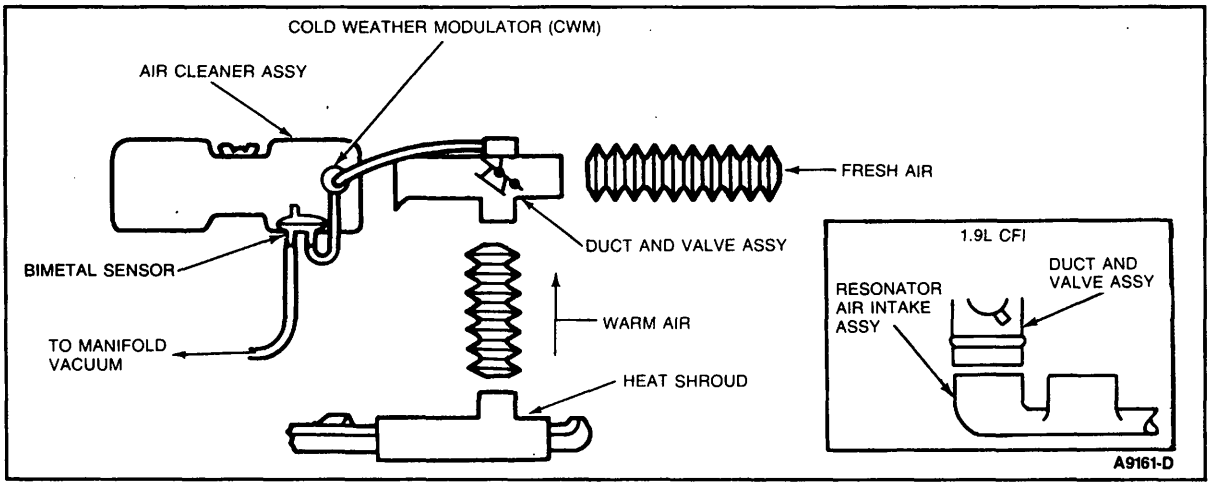


Figure 1 Air Cleaner and Duct System, Carburetor and Throttle Body Applications — 1.9L CFI, 5.8L (Passenger Car)

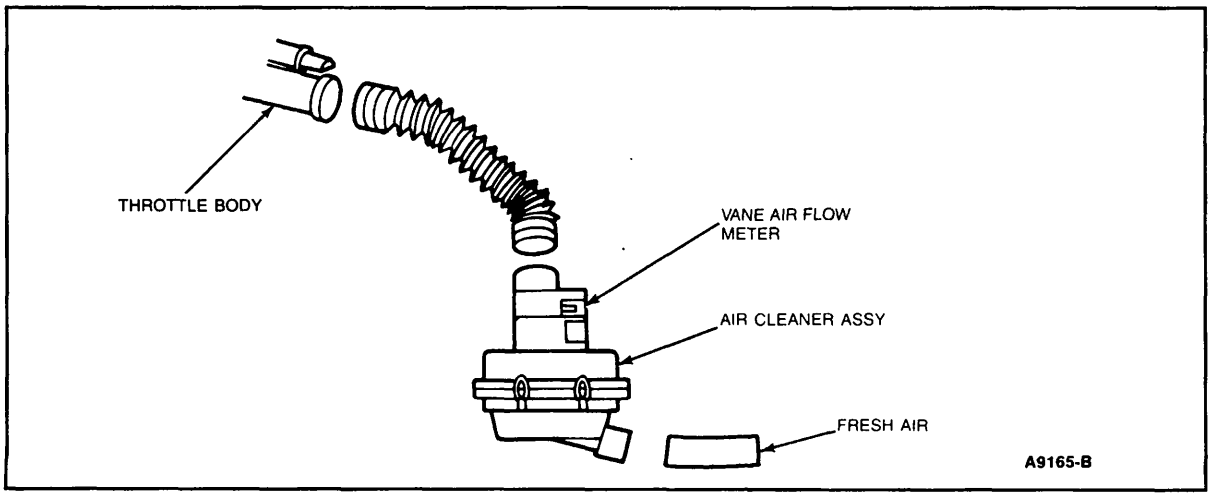


Figure 2 Air Cleaner System — 1.9L EFI (Passenger Car)

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System Schematics

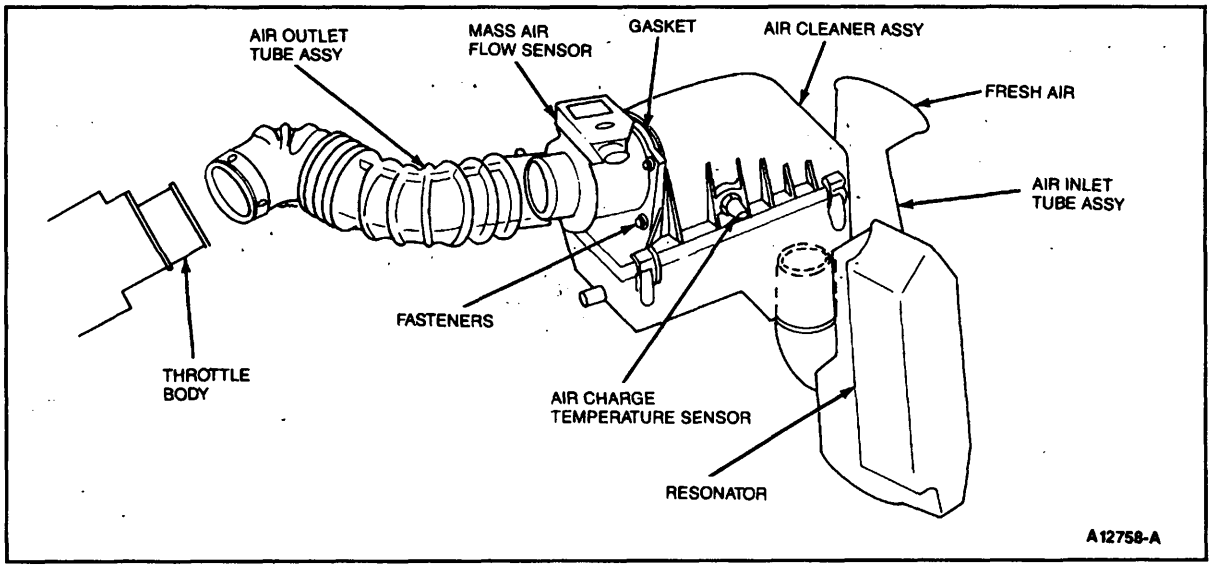


Figure 3 Air Cleaner System — 1.9L EFI Escort/Tracer (1990 1/2)

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System Schematics

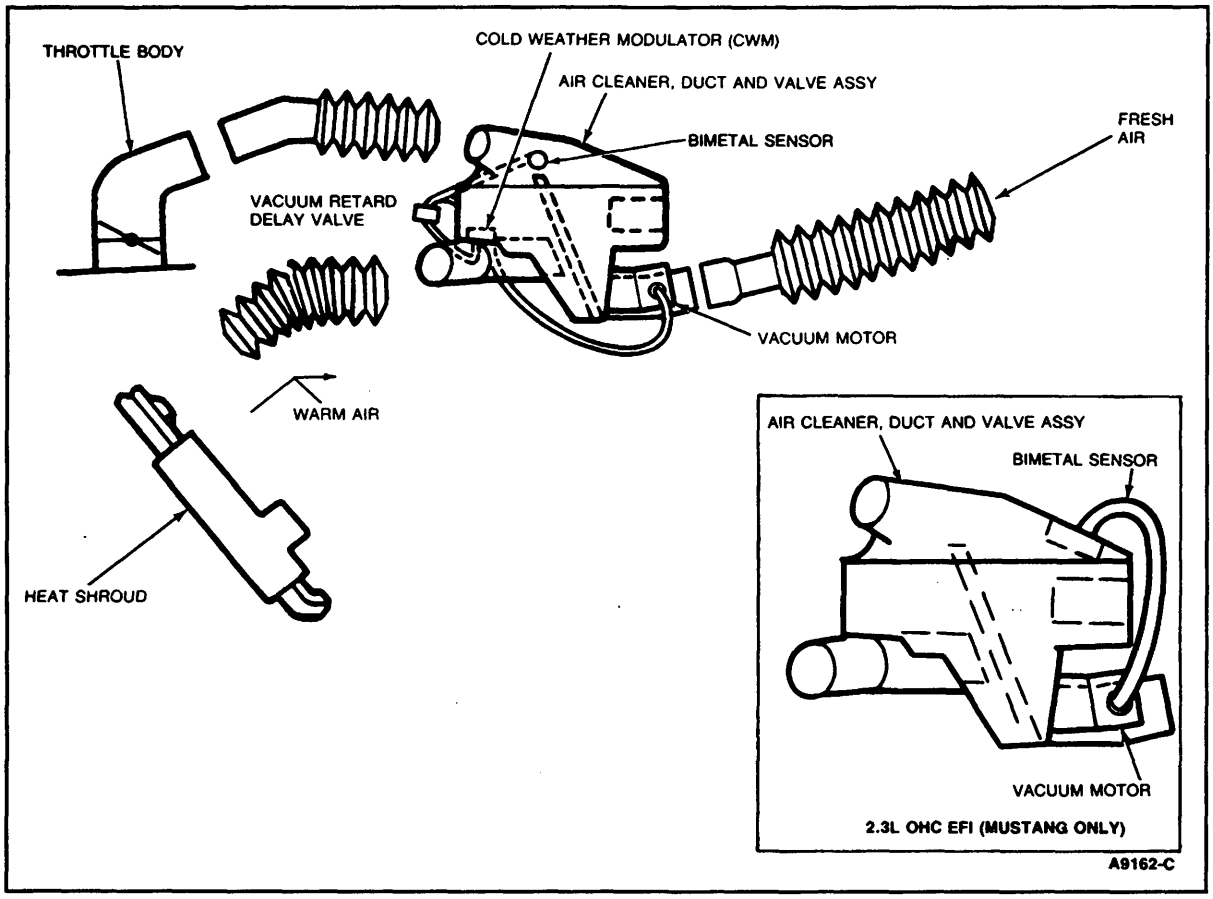


Figure 4 Air Cleaner System — 2.3L EFI HSC (Tempo/Topaz) and 2.3L OHC (Mustang)

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System Schematics

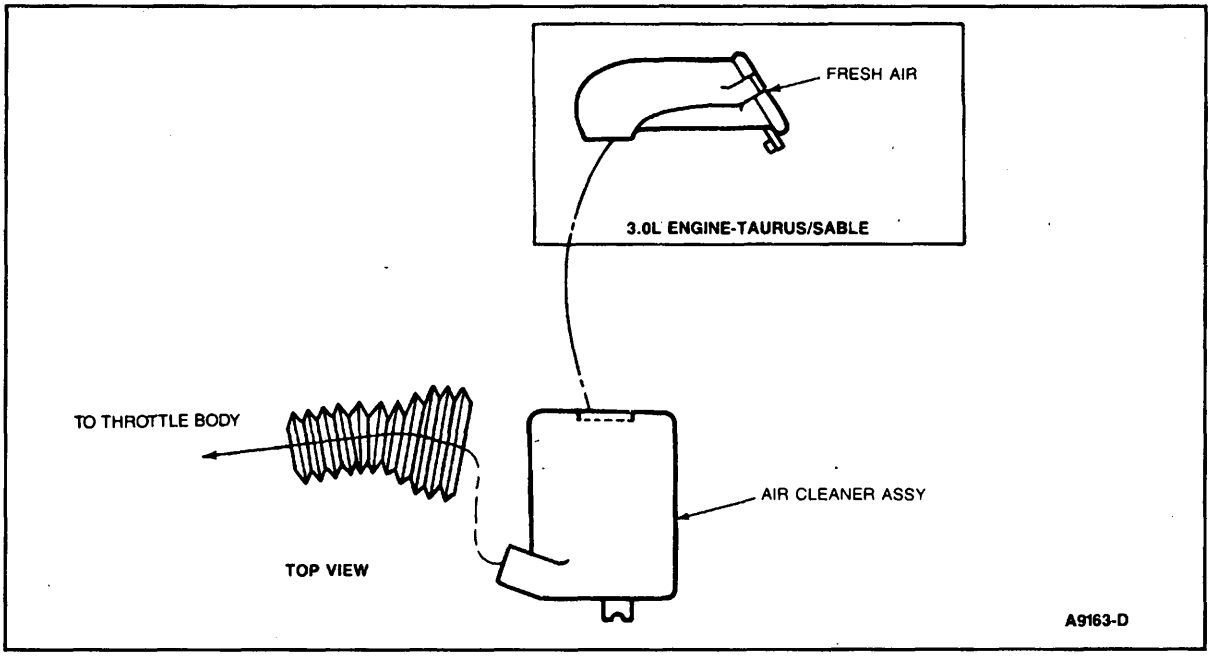


Figure 5 Air Cleaner System — 3.0L EFI (Taurus/Sable)

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System Schematics

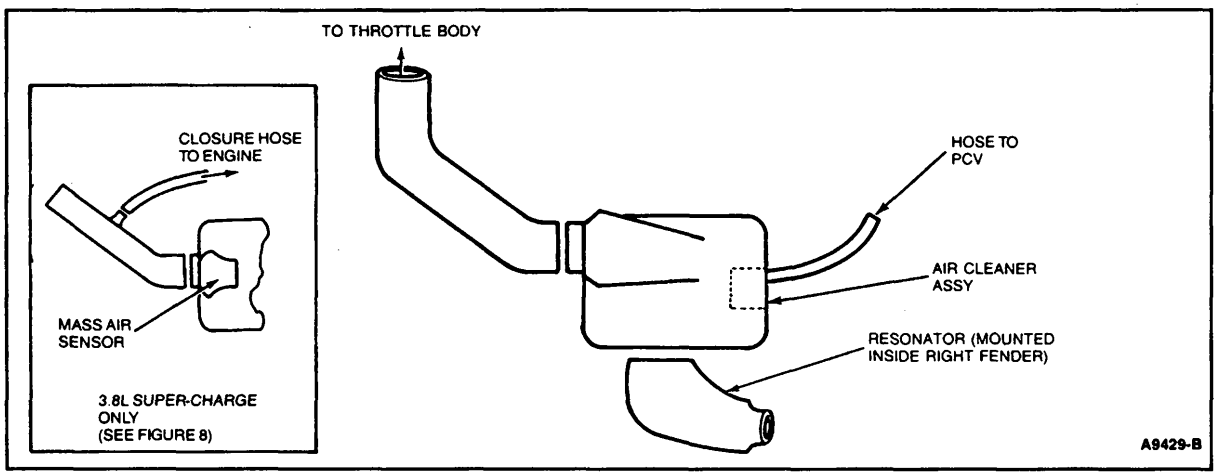


Figure 6 Air Cleaner System — 3.8L SEFI (Thunderbird/Cougar)

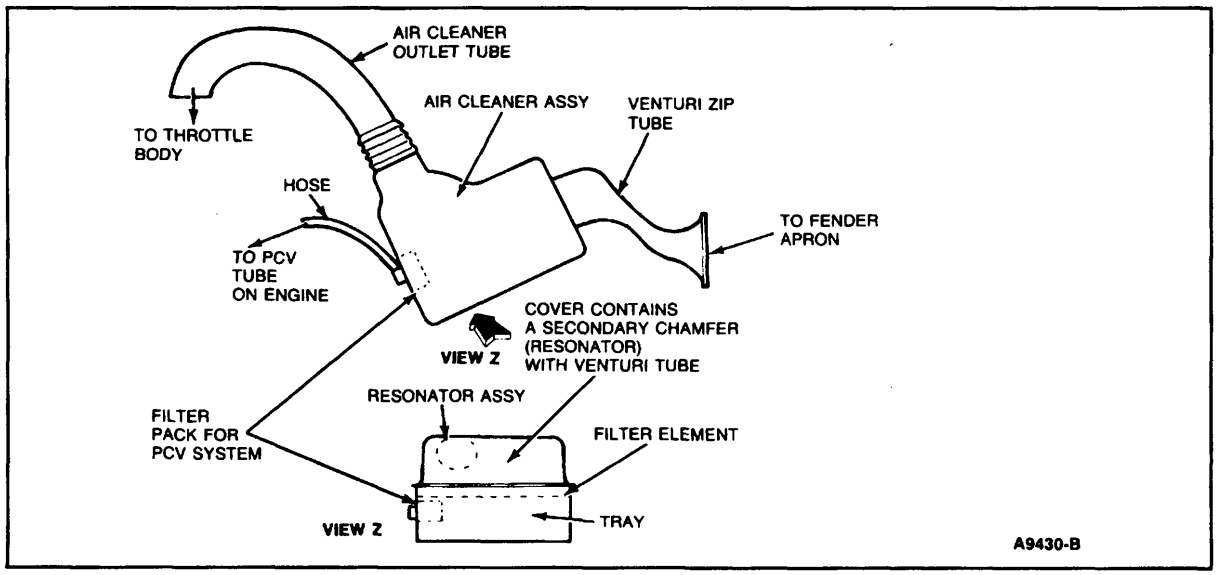


Figure 7 Air Cleaner System — 3.8L SEFI (Taurus/Sable, Continental)

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System Schematics

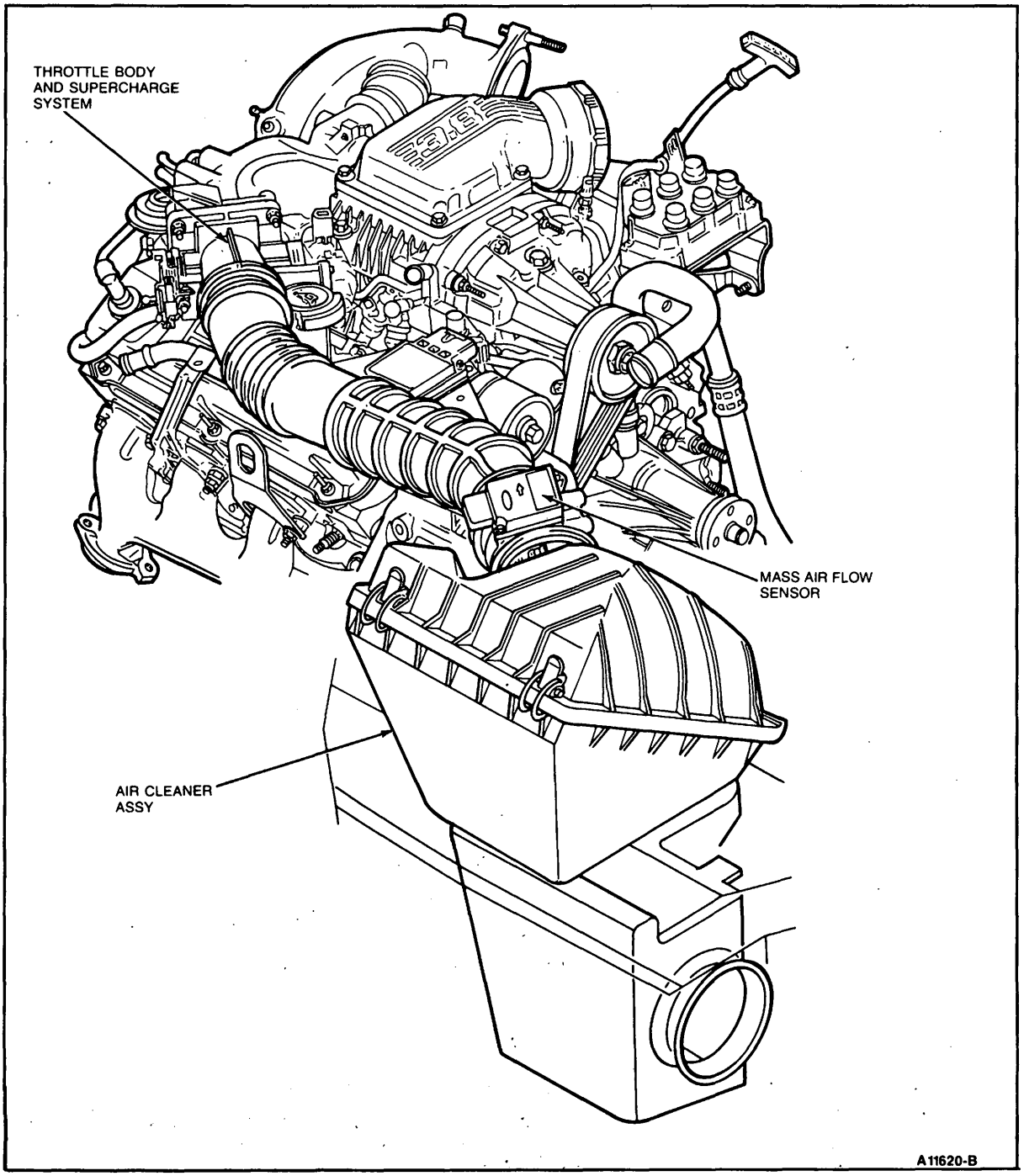


Figure 8 Air Cleaner System — 3.8L SEFI Supercharged (Thunderbird/Cougar)

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System Schematics

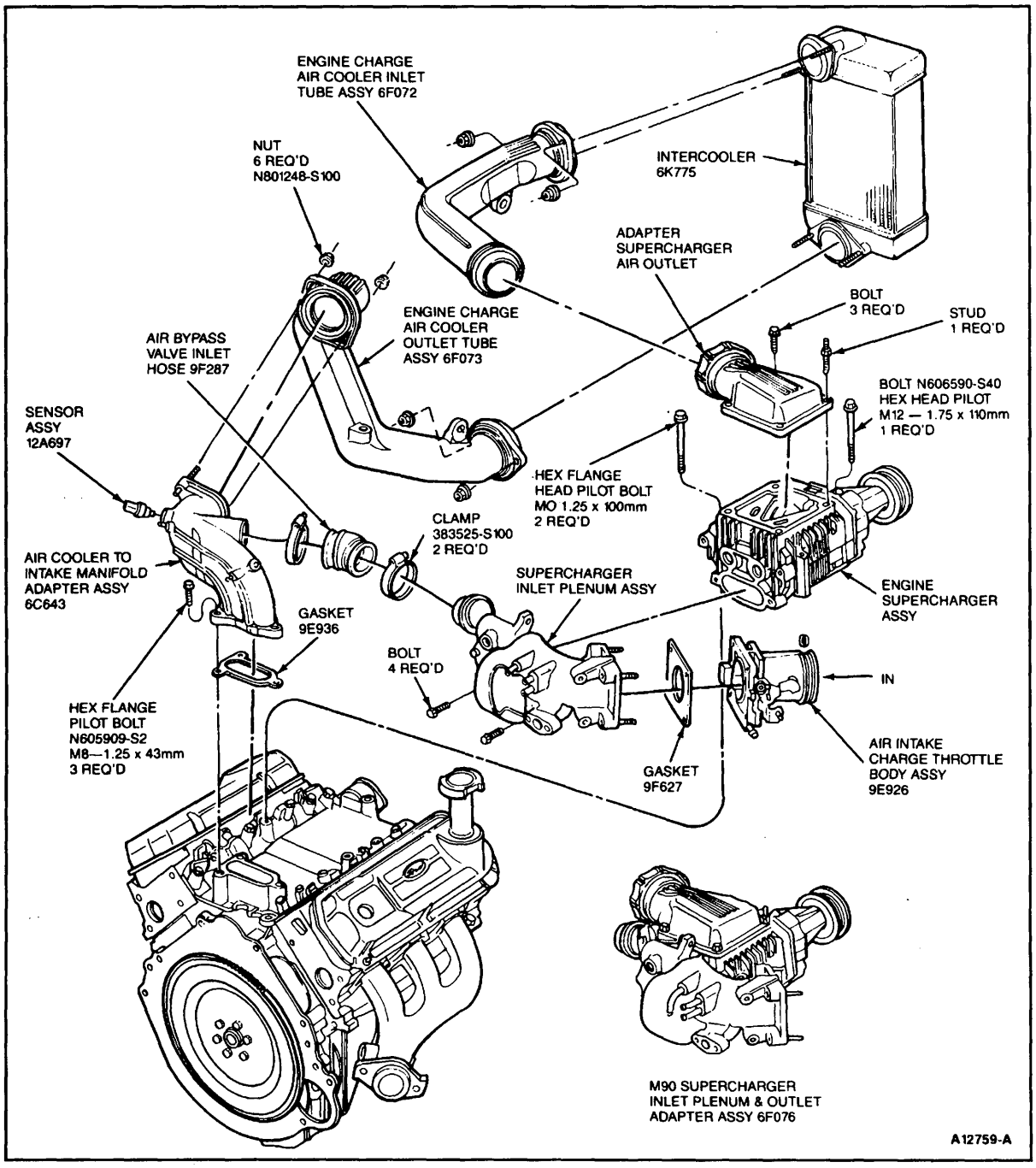


Figure 9 Supercharger Intercooler System — 3.8L SEFI Supercharger (Thunderbird/Cougar)

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System Schematics

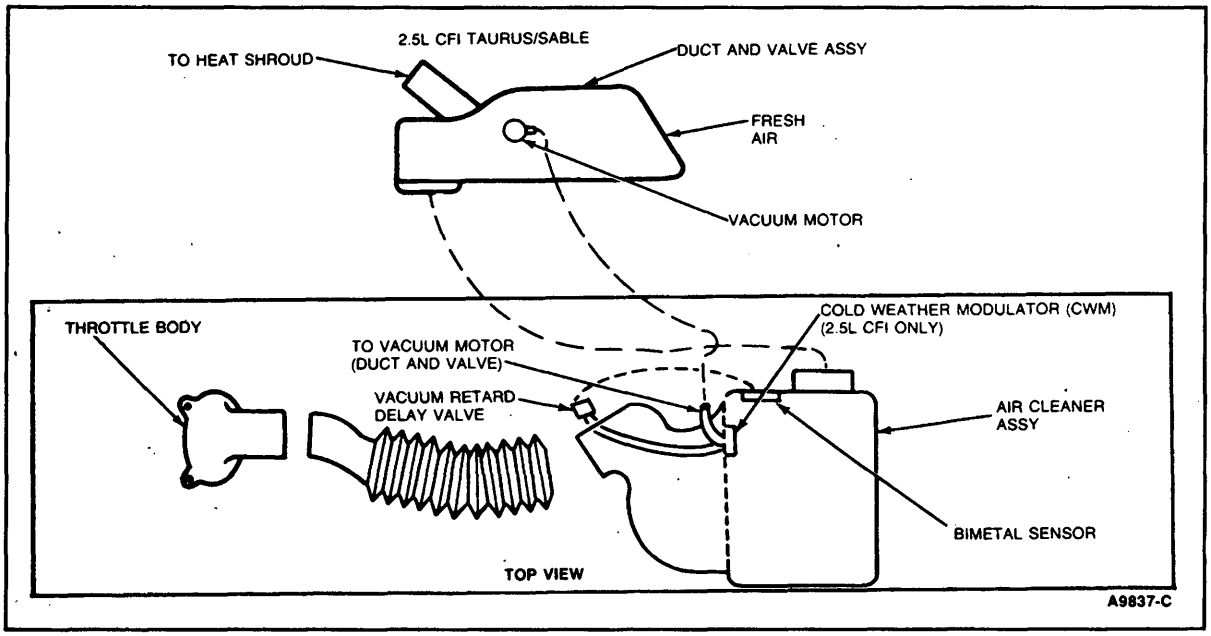


Figure 10 Air Cleaner System — 2.5L CFI (HSC) (Passenger Car)

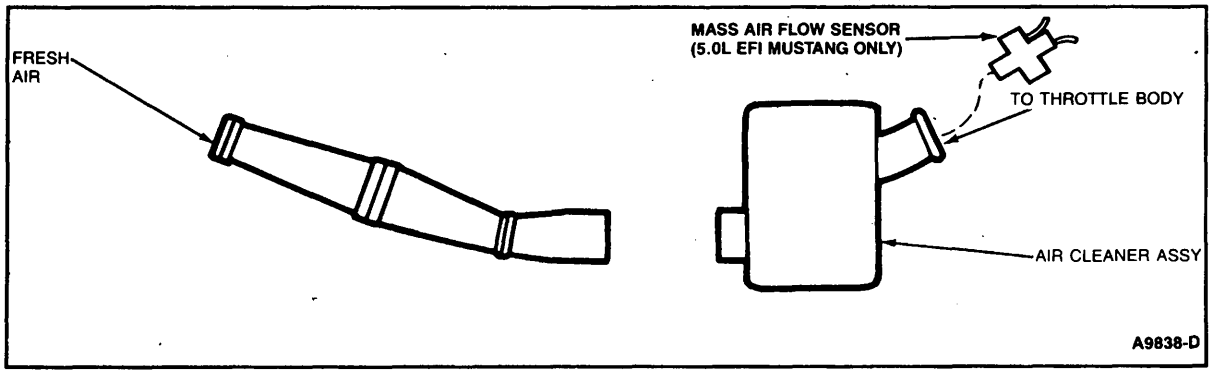


Figure 11 Air Cleaner System — 5.0L SEFI (Mark VII, Mustang, Crown Victoria, Grand Marquis, Lincoln Town Car)

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System Schematics

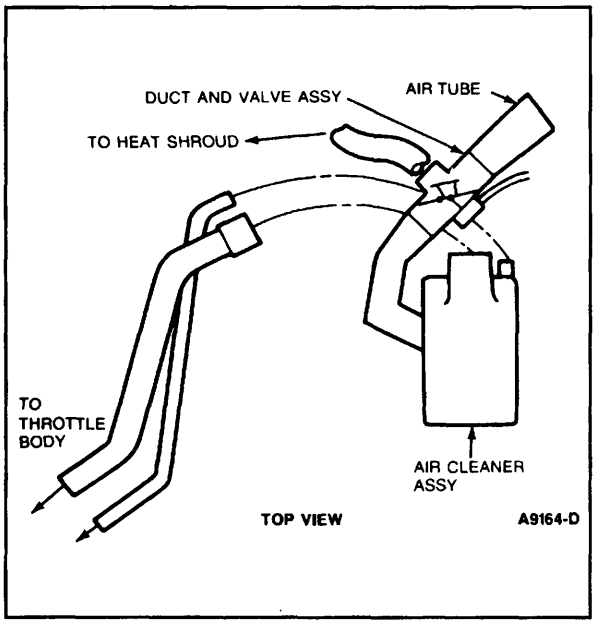


Figure 12 Air Cleaner and Duct System — 2.9L EFI (Light Truck)

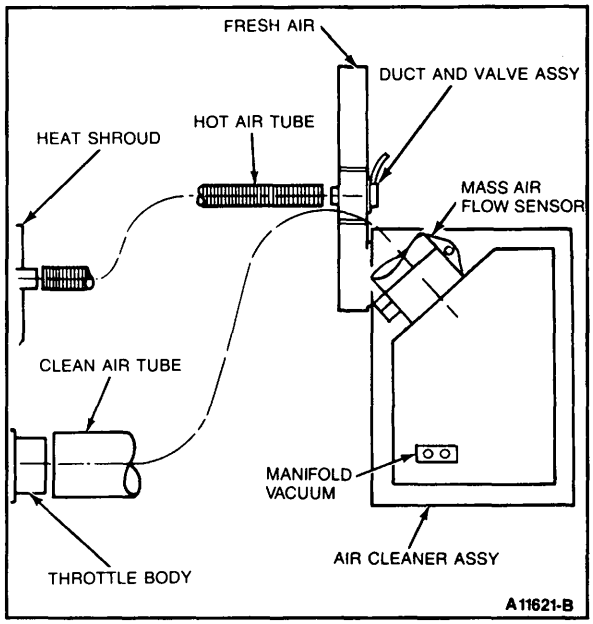


Figure 14 Air Cleaner System — 2.3L EFI Dual Plug (California Only — Light Truck)

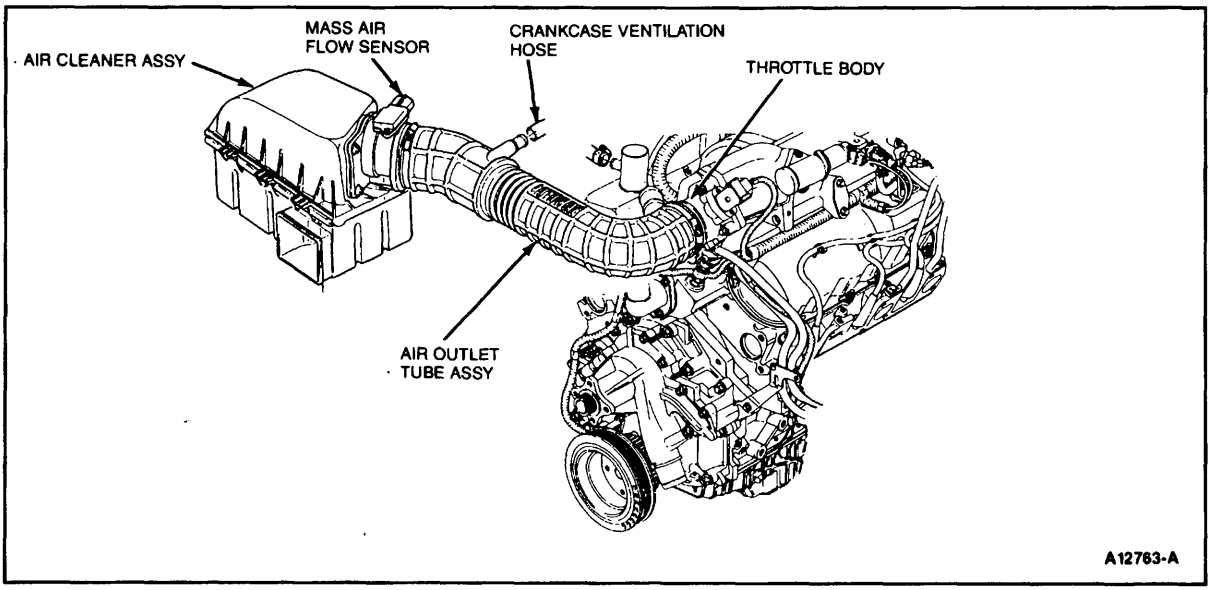


Figure 13 Air Cleaner System — 4.0L EFI (Aerostar)

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System Schematics

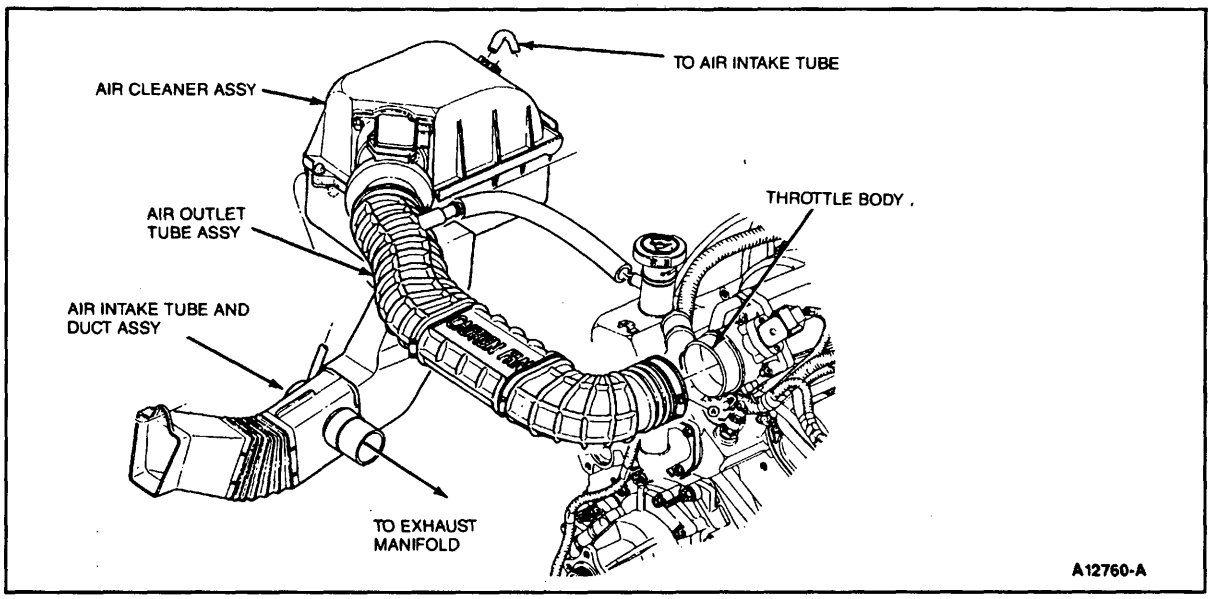


Figure 15 Air Cleaner System — 4.0L EFI (Ranger/Bronco II)

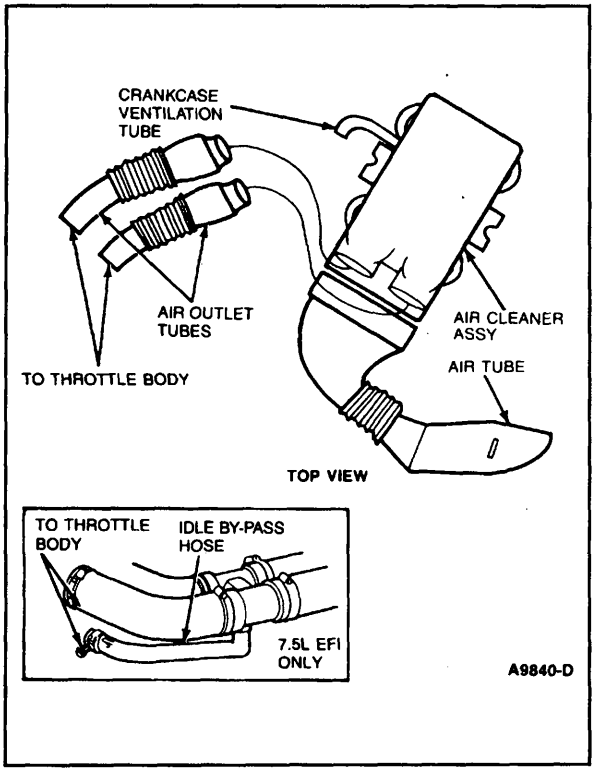


Figure 16 Air Cleaner System — 4.9L through 7.5L E4OD EFI (F-Series or Bronco)

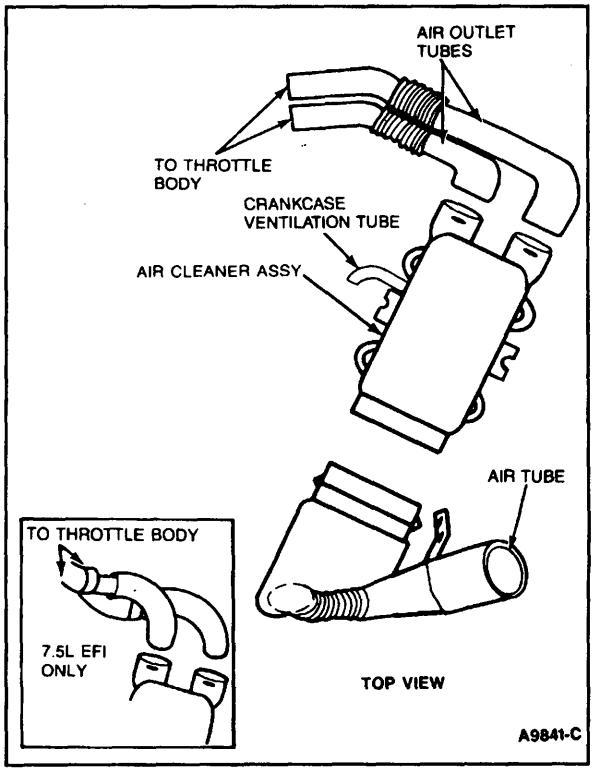


Figure 17 Air Cleaner System — 4.9Lthrough 7.5L E4OD EFI (E-Series)

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System Schematics

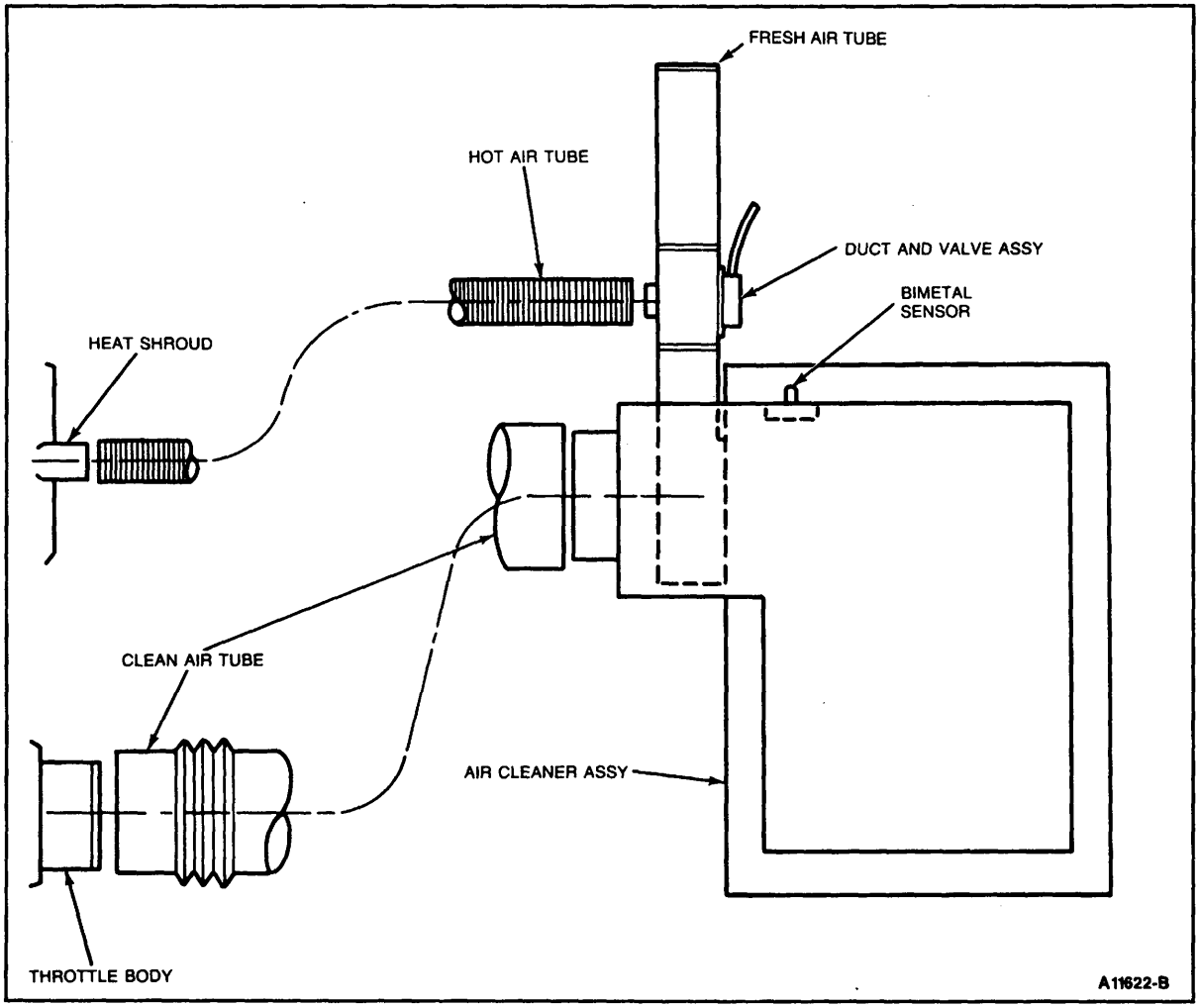


Figure 18 Air Cleaner System — 2.3L EFI Dual Plug (49 States — Light Truck)

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System Diagnosis

1990 3.8L Supercharged Air Induction (Supercharger and Intercooler) System

NOTE: If the Air Induction System is functioning properly, return to Section 2 for further driveability complaint diagnosis.

1. Visually inspect all flange joints for indications of leaks.
2. Connect an EGO Sensor Monitor Box to read the rich/lean state of the EGO sensors.
3. Bring the engine to normal operating temperature.

WARNING

THE VEHICLE MUST BE IN A WELL VENTILATED AREA AWAY FROM ANY SOURCE OF SPARK OR FLAME WHEN USING PROPANE.

4. With the engine idling in Neutral or Park and the parking brake engaged, spray small amounts of propane around the following possible sources of air leaks:
   - Flange joint at the rear of the supercharger.
   - Bypass hose connections at the rear of the supercharger.
   - Flange joint at the supercharger outlet adapter.
   - 4 tube joints at:
     1) Supercharger outlet to the upper tube.
     2) Upper intercooler inlet.
     3) Lower intercooler outlet.
     4) Intake manifold adapter inlet.
   - Intake manifold adapter to intake manifold flange.
5. When propane is sprayed near an induction system air leak, the EGO monitor box will indicate "RICH" for one or two seconds, then return to normal switching. When the propane is removed from the leak, the EGO monitor box will indicate "LEAN" after one or two seconds.
6. If a leak is found, the entire system must be disassembled and the sealing surfaces cleaned. Go to Shop Manual Fuel Group for disassembly.

NOTE: It is important that the intercooler tubes seal completely. Make sure there are no foreign particles on the sealing surfaces of the tubes. The engine uses a "Mass Air flow" system to calculate fuel flow. Any leak will cause poor operation and performance. Use only Teflon Tape (ESE-M4G169-B) to seal the system.

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System Diagnosis

1990 1/2 1.9L EFI (Escort/Tracer) Air Intake System

NOTE: If the Air Intake System is functioning properly, return to Section 2 for further driveability complaint diagnosis.

1. Visually inspect that the air outlet tube is properly attached to the Mass Air Flow sensor and the throttle body with the hose clamps.
2. Check that the Mass Air Flow sensor is properly attached to the cover with a gasket and four screws.
3. Check the air inlet tube connection to the tray.

NOTE: Check for cracks in the tube and leaks in the entire system.

All Other Engine Systems:

NOTE: If the Air Intake System is functioning properly, return to Section 2 for further driveability complaint diagnosis.

CONDITION	POSSIBLE SOURCE	ACTION
Cranks normally but slow to start.	1. Air filter restricted	• Go to Diagnostic Test IA4.
Hesitates or stalls on acceleration.	1. Vacuum motor inoperative	• Go to Diagnostic Test IA2.
	2. Air cleaner duct and valve door not operating properly	• Go to Diagnostic Test IA5.
	3. CWM inoperative	• Go to Diagnostic Test IA1.
	4. Bimetal sensor inoperative	• Go to Diagnostic Test IA3.
Lack of power.	1. Vacuum motor inoperative	• Go to Diagnostic Test IA2.
	2. Air cleaner duct and valve door not operating properly	• Go to Diagnostic Test IA5.
	3. CWM inoperative	• Go to Diagnostic Test IA1.
	4. Bimetal sensor inoperative	• Go to Diagnostic Test IA3.
	5. Air filter element restricted	• Go to Diagnostic Test IA4.
	6. Collapsed air inlet and outlet tubes	• Service or replace.
Poor fuel economy.	1. Air cleaner duct and valve door stuck in "hot air" position	• Go to Diagnostic Test IA5.
	2. CWM inoperative	• Go to Diagnostic Test IA1.
	3. Bimetal sensor inoperative	• Go to Diagnostic Test IA3.
	4. Air filter element restricted	• Go to Diagnostic Test IA4.

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System Diagnosis

All Other Engine Systems (continued):

CONDITION	POSSIBLE SOURCE	ACTION
High oil consumption.	1. Air intake system sealing integrity	• Check hoses that connect the air cleaner to the engine (check for holes or cracks) and ensure clamps are to proper torque.
	2. Air filter element sealing	• Check the air filter gasket sealing area and the clean side of the air cleaner housing for excessive dirt. Replace components as required.
Spark knocking.	1. Air cleaner duct and valve door stuck in hot air position	• Go to Diagnostic Test IA5.
	2. CWM inoperative	• Go to Diagnostic Test IA1.
	3. Bimetal sensor inoperative	• Go to Diagnostic Test IA3.
Air Induction Noise.	1. Loose air intake tube, outlet tubes, or air cleaner cover	• Connect or tighten screw(s) as necessary.
	2. Intake or outlet tube cracks or holes	• Service or replace.
Engine Failure or Reduced Performance.	1. Unfiltered air from air outlet tubes, air cleaner cover, idle by-pass hose or crankcase ventilation hose	• Connect or tighten screws. Service as necessary.

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System Diagnosis

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
IA1	Air Cleaner Cold Weather Modulator	• Hold the Air Cleaner Cold Weather Modulator (9E862) in the closed palm of hand for about 15 minutes. Check chart below for leaks using a vacuum pump at 54kPa (16 in-Hg) applied vacuum. Place the Modulator in a container of ice water for 30 to 40 minutes. Check chart below for holding vacuum using a vacuum pump at 54 kPa (16 in-Hg) applied vacuum (Figure 1).

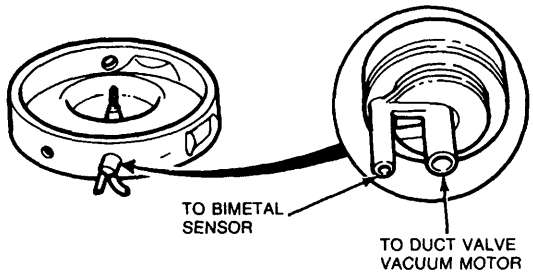
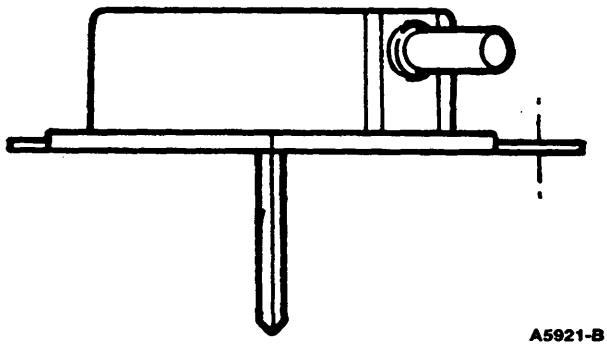


Figure 1 Cold Weather Modulator

COLOR	TYPE	HOLDS	LEAKS
Black	N/O	Below -6.7°C (20°F)	Above 1.7°C (35°F)
Blue	N/O	Below 4.4°C (40°F)	Above 12.8°C (55°F)
Green	N/O	Below 10°C (50°F)	Above 24.4°C (76°F)
Yellow	N/C	Above 18.3°C (65°F)	Below 10°C (50°F)

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System Diagnosis

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
IA2	Air Cleaner Vacuum Motor	• When a vacuum of 27 kPa (8 in-Hg) or greater is applied to the vacuum motor, the door stem should pull up and stay as long as vacuum is applied to the vacuum motor (Figure 2).  *Figure 2 Air Cleaner Vacuum Motor*

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System Diagnosis

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
IA3	Air Cleaner Temperature Sensor (Bimetal Sensor)	• Bring the temperature of the Air Cleaner Temperature Sensor (9E607) below 24°C (75°F) and apply 27 kPa (8 in-Hg) of vacuum with a vacuum pump at the vacuum source port of the sensor. Does the duct door stay closed? If not, replace the sensor (Figure 3).

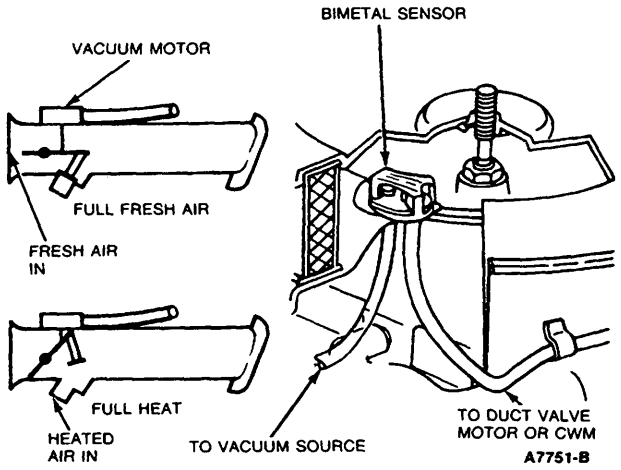


Figure 3 Air Cleaner Temperature Sensor

- The sensor will bleed off vacuum to allow the duct door to open and let in fresh air at or above the following temperatures:

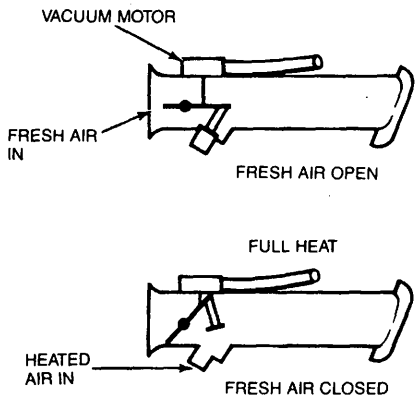
Brown	24°C (75°F)
Pink, black or red	32.2°C (90°F)
Blue, yellow or green	40.6°C (105°F)

CAUTION

Do not cool bimetal sensor while the engine is running. If refrigerant R-12 is drawn into the intake system while the engine is running, poisonous phosgene gas will be exhausted into the test area. Perform this test only in a well-ventilated area.

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System Diagnosis

DIAGNOSTIC TEST NUMBER	SOURCE COMPONENT	DIAGNOSTIC ACTION
IA4	Air Cleaner Filter Element	• Remove the Air Cleaner Filter Element from the Air Cleaner Assembly. Inspect for heavy contamination. If the filter cannot be cleaned by shaking and applying vacuum, replace the filter element.
IA5	Air Cleaner Duct and Valve System	• If the duct door is in the closed to fresh air position, remove the hose from the Air Cleaner Vacuum Motor. The door should go to the open to fresh air position. If it sticks or binds, service or replace as required. If the door is in the open to fresh air position, check the door by applying vacuum of 27 kPa (8 in-Hg) or greater to the Air Cleaner Vacuum Motor. The door should move freely to the closed to fresh air position. If it binds or sticks, service or replace as required. **NOTE: Make sure the Vacuum Motor is functional before changing the Duct and Valve System.**  A12761-A

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SECTION 9

Positive Crankcase Ventilation (PCV) Systems

Contents

System Description 9-1

Diagnostics — Typical PCV System (All except 1.9L CFI) 9-2

Diagnostics — 1.9L CFI PCV System 9-4

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System Description

TYPICAL POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

The Positive Crankcase Ventilation (PCV) system (Figure 1) cycles crankcase gases back through the engine where they are burned. In a typical system, the PCV valve regulates the amount of ventilating air and blow-by gas to the intake manifold and prevents backfire from traveling into the crankcase. The PCV valve should be mounted in a vertical position (Figure 1). On some engine applications, the PCV system is connected with the evaporative emission system.

1.9L CFI Positive Crankcase Ventilation (PCV) System

The Positive Crankcase Ventilation (PCV) vent system for the 1.9L CFI engine (Figure 2) does not depend on a flow of scavenging air, as do all other Ford engines, but evacuates crankcase vapors that are drawn into the intake manifold in metered amounts through a Dual Orifice Valve Assembly. A small orifice is connected to the intake manifold at all times. A larger orifice, controlled by a throttle body port signal, opens to the intake manifold during part throttle and WOT operation. If the availability of crankcase vapor is low (at idle for instance), air may be drawn along with crankcase vapor through the smaller orifice. If the availability of crankcase vapor is high (at high-speed operation) crankcase vapor is delivered to the intake manifold through both orifices. If the amount of crankcase vapor available exceeds that which can be handled by the two orifices, the excess flow is routed to the air cleaner. The Dual Orifice Valve is the critical point of this system.

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Positive Crankcase Ventilation (PCV) System	Diagnostic Test	PCV

DIAGNOSTICS — TYPICAL PCV SYSTEM (ALL EXCEPT 1.9L CFI)

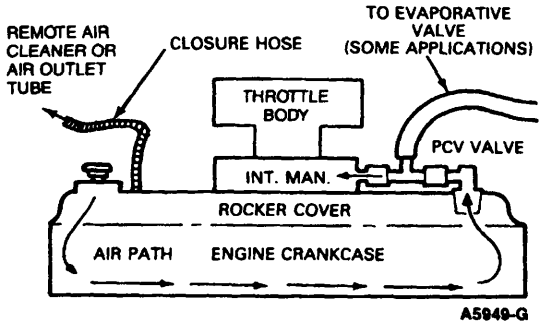


Figure 1 Typical PCV System (Except 1.9L with CFI)

Set parking brake and block wheels. Place transmission/transaxle in NEUTRAL or PARK. Place the A/C-Heat selector in the OFF position. Go to PCV Test Step 1.

TEST STEP	RESULT ▶	ACTION TO TAKE
PCV1 STUCK PCV VALVE CHECK		
• Remove PCV valve from rocker cover grommet. • Shake the PCV valve. • **Does the PCV valve rattle when shaken?**	Yes ▶ No ▶	REINSTALL PCV valve. GO to **PCV2**. PCV valve is sticking. REPLACE PCV valve.
PCV2 PCV SYSTEM CHECK		
• Start engine and bring to normal operating temperature. **For 2.3L HSC, 2.5L, 2.9L TRK and 4.9L:** • Remove the corrugated hose from the oil separator nipple. • Place a stiff piece of paper over the nipple end. Wait one minute. **For all others:** • Disconnect hose from remote air cleaner or air outlet tube (tube connecting mass air meter and throttle body). • Place a stiff piece of paper over the hose end. Wait one minute. • **Does the vacuum hold the paper in place?**	Yes ▶ No ▶	System is OK. RECONNECT hose. GO to Section 2 for other possible causes of vehicle symptoms. System is plugged or Evaporative Emission Valve is leaking (if equipped). GO to **PCV3**.

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Positive Crankcase Ventilation (PCV) System	Diagnostic Test	PCV

TEST STEP	RESULT ▶	ACTION TO TAKE
PCV3 EVAPORATIVE EMISSION SYSTEM CHECK		
• Disconnect evaporative hose (if equipped), cap the connector, and retest. • Place a stiff piece of paper over the hose/nipple, as in **PCV2** . Wait one minute. • **Does the vacuum hold the paper in place?**	Yes ▶	GO to Evaporative Emission System, Section 7.
	No ▶	CHECK for vacuum leaks/obstruction in the system: oil cap, PCV valve, hoses, cut grommets (oil separator on 2.3L, HSC, 2.5L, 2.9L TRK and 4.9L) and rocker cover for bolt torque/gasket leak. SERVICE as necessary.

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Positive Crankcase Ventilation (PCV) System	Diagnostic Test	PCV

DIAGNOSTICS — 1.9L CFI PCV SYSTEM

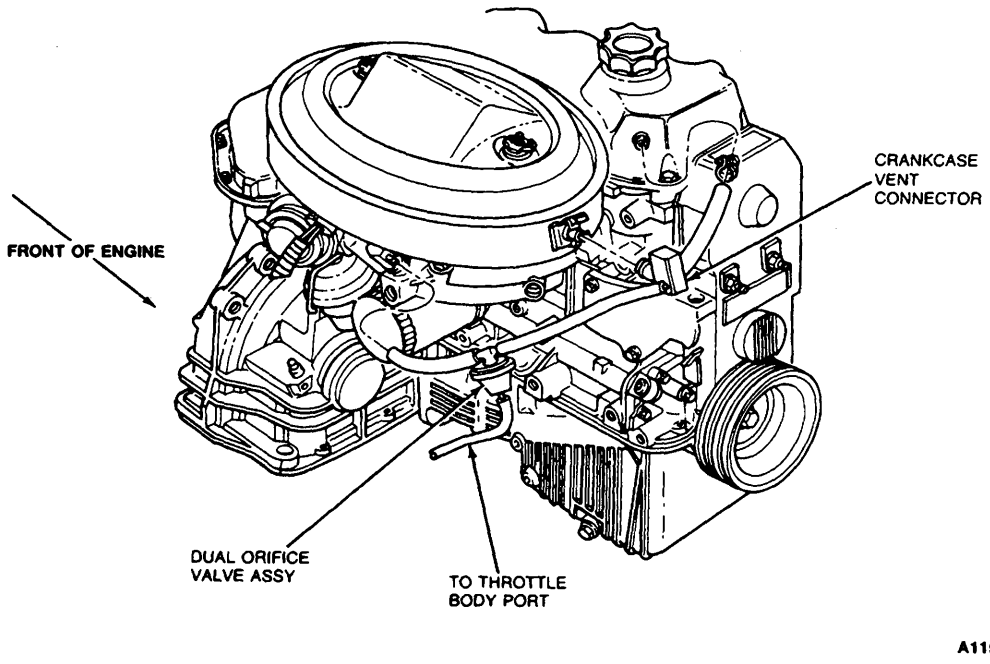


Figure 2 1.9L CFI Engine PCV System

Set parking brake and block wheels. Place transmission/transaxle in NEUTRAL or PARK. Place the A/C-Heat selector in the OFF position. Bring engine to normal operating temperature and GO to PCV Test Step 1.

TEST STEP	RESULT ▶	ACTION TO TAKE
PCV1 1.9L CFI HIGH-SPEED PCV CHECK		
• Remove vacuum control hose at the dual orifice valve assembly (located at the throttle body port).	Yes ▶	High-speed PCV system is OK. GO to **PCV2** .
• Apply manifold vacuum to port.		
• **Is there significant change in engine rpm?**	No ▶	REPLACE the dual orifice valve assembly.

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Positive Crankcase Ventilation (PCV) System	Diagnostic Test	PCV

TEST STEP	RESULT ▶	ACTION TO TAKE
PCV2 1.9L CFI LOW-SPEED CHECK		
• Remove crankcase vent connector from side of air cleaner. • Place a stiff piece of paper over crankcase vent connector nipple. Wait for one minute. • **Does vacuum hold paper in place?**	Yes ▶	Low-speed PCV system is OK. GO to Section 2 for other possible causes of vehicle symptoms.
	No ▶	GO to **PCV3**.
PCV3 CRANKCASE VENT CONNECTOR CHECK		
• Remove vacuum hose (small port) at crankcase vent connector. • Place a stiff piece of paper over vacuum hose. • **Does vacuum hold the paper in place?**	Yes ▶	REPLACE crankcase vent connector.
	No ▶	GO to **PCV4**.
PCV4 DUAL ORIFICE VALVE ASSEMBLY CHECK		
• Remove dual orifice valve assembly from system. • Check for blockage through valve. • **Is valve clear of blockage?**	Yes ▶	GO to Section 2 for other possible causes of vehicle symptoms.
	No ▶	REPLACE dual orifice valve assembly.

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SECTION 10

Thermactor Systems (Secondary Air Injection)

Contents

System Descriptions 10-1
Thermactor Air Injection System 10-1
Managed Air Thermactor System 10-5
Pulse Air System (Thermactor II) 10-11
Diagnosis By Symptom 10-14
Functional Diagnosis 10-18
Thermactor Air Pump Drive Belt Adjustment 10-18
Air Supply Pump 10-19
Air Silencer/Filter (Air Pump and Pulse Air Inlet) 10-20
Air Bypass Valves 10-21
Air Check Valve 10-23
Air Supply Control Valve 10-24
Air Control Valve (Switch-Relief) 10-25
Air Pump Resonator 10-27
Combination Air Bypass/Air Control Valve 10-28
Dual Thermactor Air Control Solenoid Valve 10-30
Solenoid Vacuum Valve Assembly 10-31
Thermactor Idle Vacuum Valve 10-32
Vacuum Control Valve 10-33
Vacuum Check Valve 10-35
Vacuum Reservoir 10-36
Pulse Air Valve 10-37

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System Descriptions

THERMACTOR AIR INJECTION SYSTEM

The Thermactor (air injection) Exhaust Emission Control System reduces the hydrocarbon and carbon monoxide content of exhaust gases by continuing the combustion of unburned gases after they leave the combustion chamber by injecting fresh air into the hot exhaust stream leaving the exhaust ports or into the catalyst. At this point, the fresh air mixes with hot exhaust gases to promote further oxidation of both the hydrocarbons and carbon monoxide, thereby reducing their concentration and converting some of them into harmless carbon dioxide and water.

During some modes of operation (Hwy Cruise/WOT), the thermactor air is dumped to atmosphere to prevent overheating in the exhaust system.

A typical Air Injection System consists of:

- Air Supply Pump and Centrifugal Filter or Remote Filter
- Air Bypass Valve
- Check Valves
- Air Manifold
- Air Hoses
- Air Control Valve

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System Descriptions

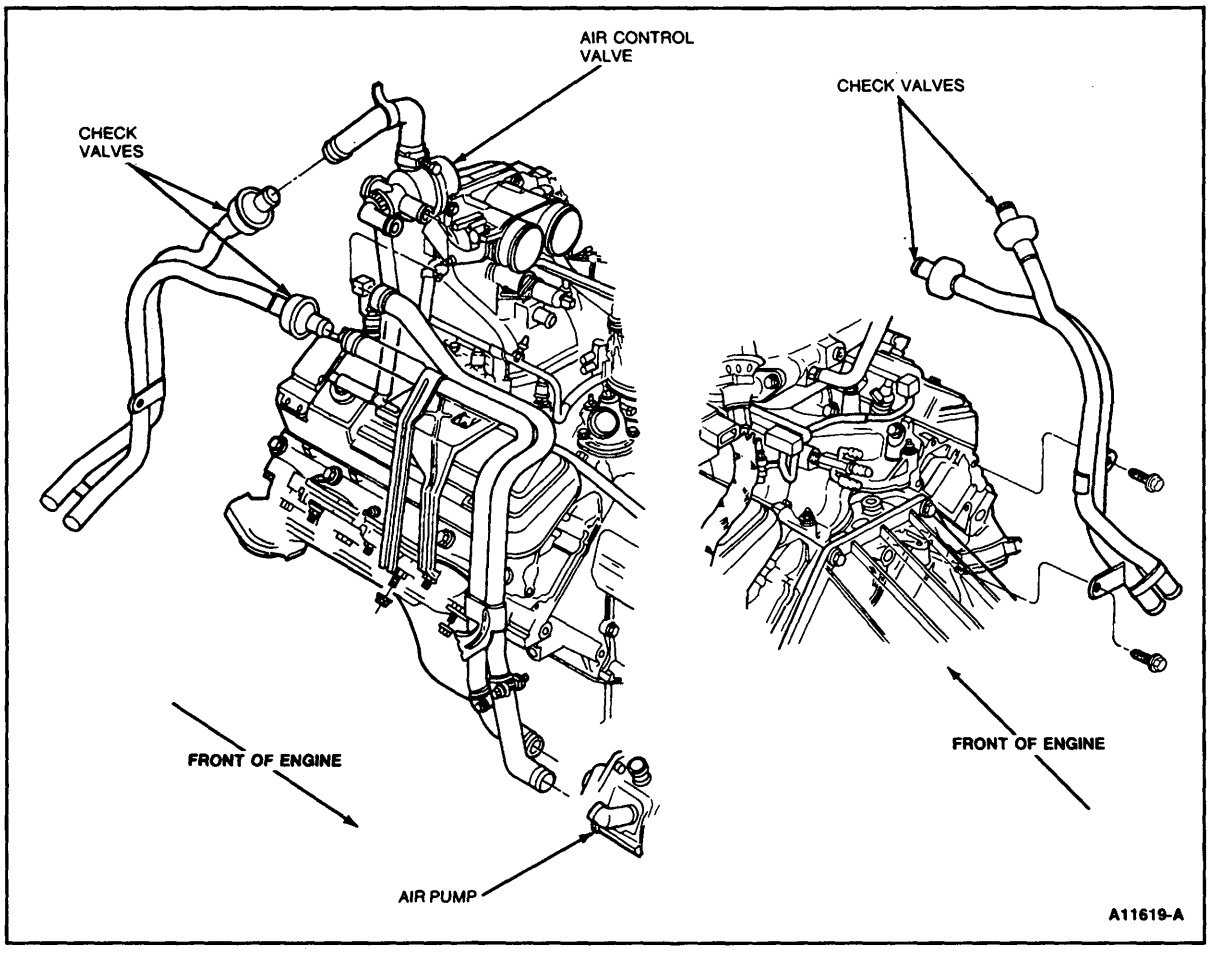


Figure 1 7.5L EFI Thermactor System — F-Series with E4OD

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System Descriptions

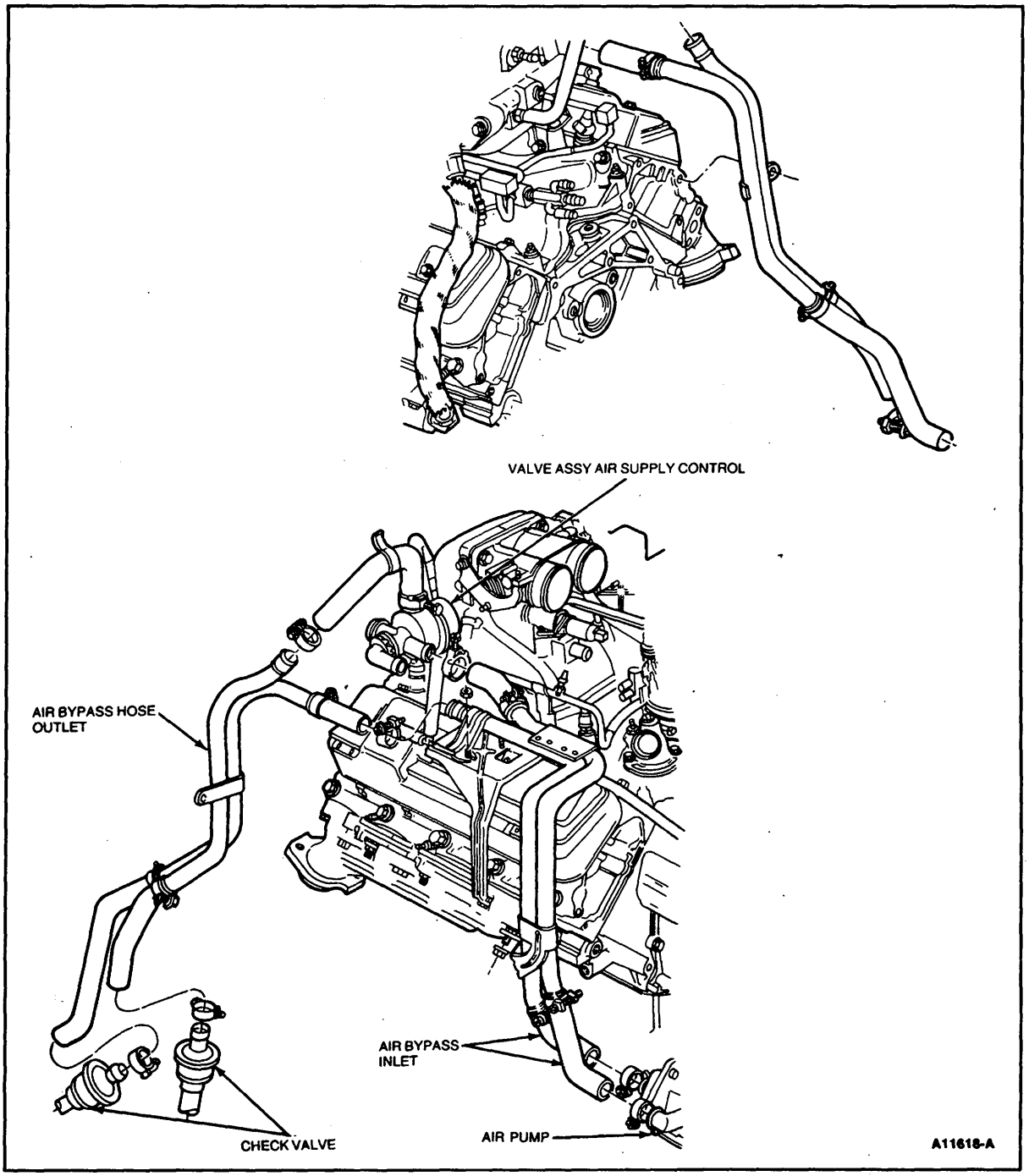


Figure 2 Dual Outlet Air Pump System — 7.5L EFI All GVW Auto/Manual Except F-Series with E40D

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System Descriptions

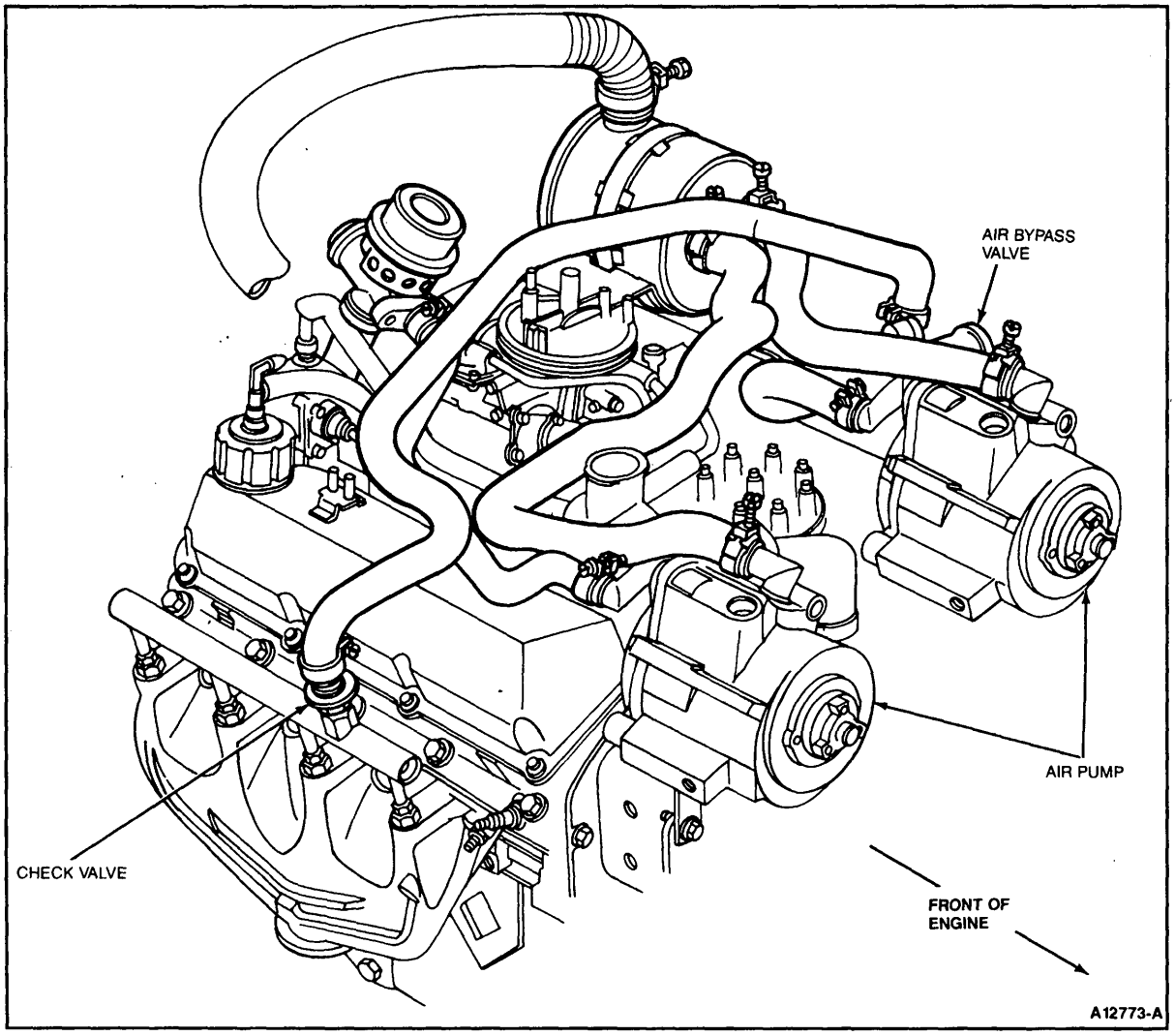


Figure 3 Dual Air Pump System — 6.1L/7.0L Engines

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System Descriptions

MANAGED AIR THERMACTOR SYSTEM

The Managed Air Thermactor System (Figure 4) is utilized in electronic control systems to divert thermactor air either upstream to the exhaust manifold check valve or downstream to the rear section check valve and dual bed catalyst. The system will also dump thermactor air to atmosphere during some operating modes.

An air control valve (9F491) is used to direct the air either upstream or downstream. An air bypass valve (9B289) is used to dump air to atmosphere (Figure 4).

Examples of other Managed Air Thermactor Systems are shown in Figures 5, 6, 7, 8, 9, 10, 11, 12 and 13.

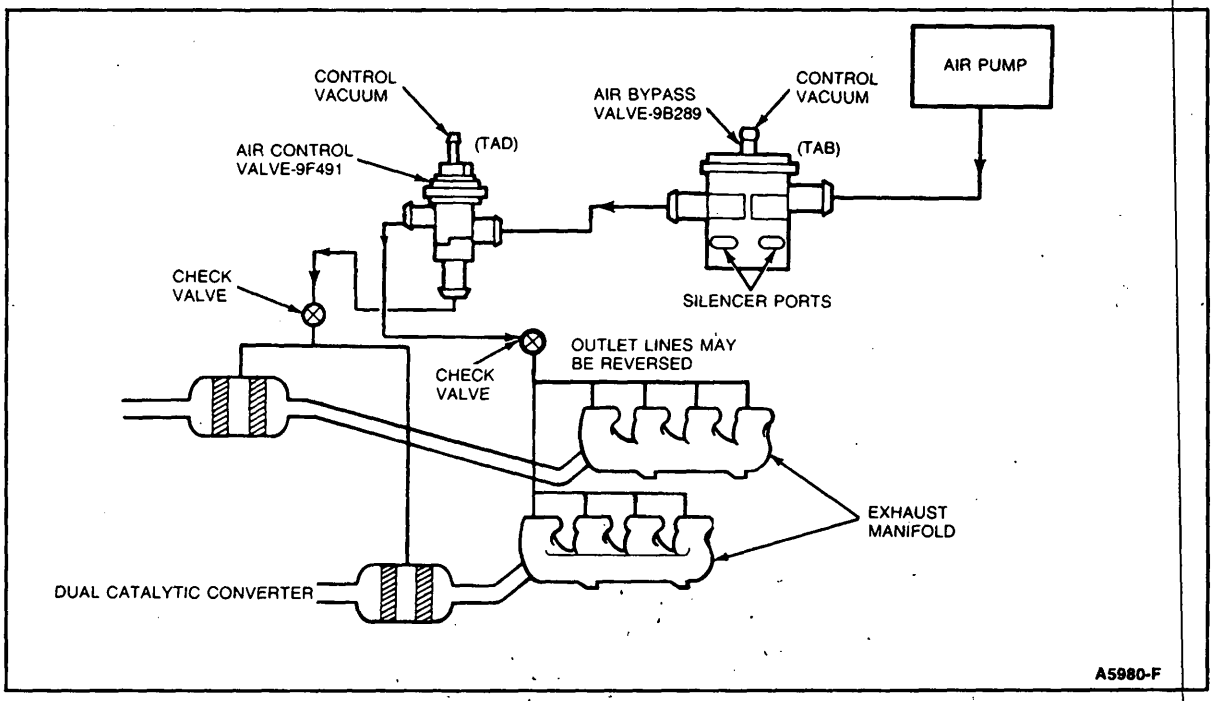


Figure 4 Typical Managed Air Thermactor System

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System Descriptions

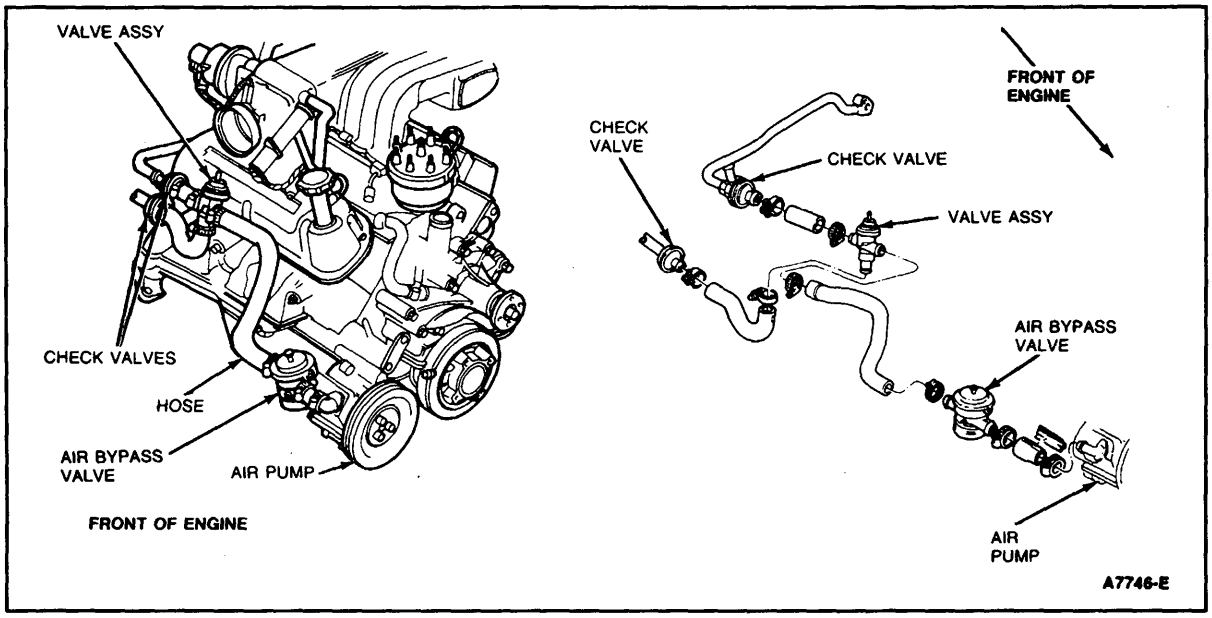


Figure 5 Locations of Thermactor Valves — 5.0L Mustang/Mark VII

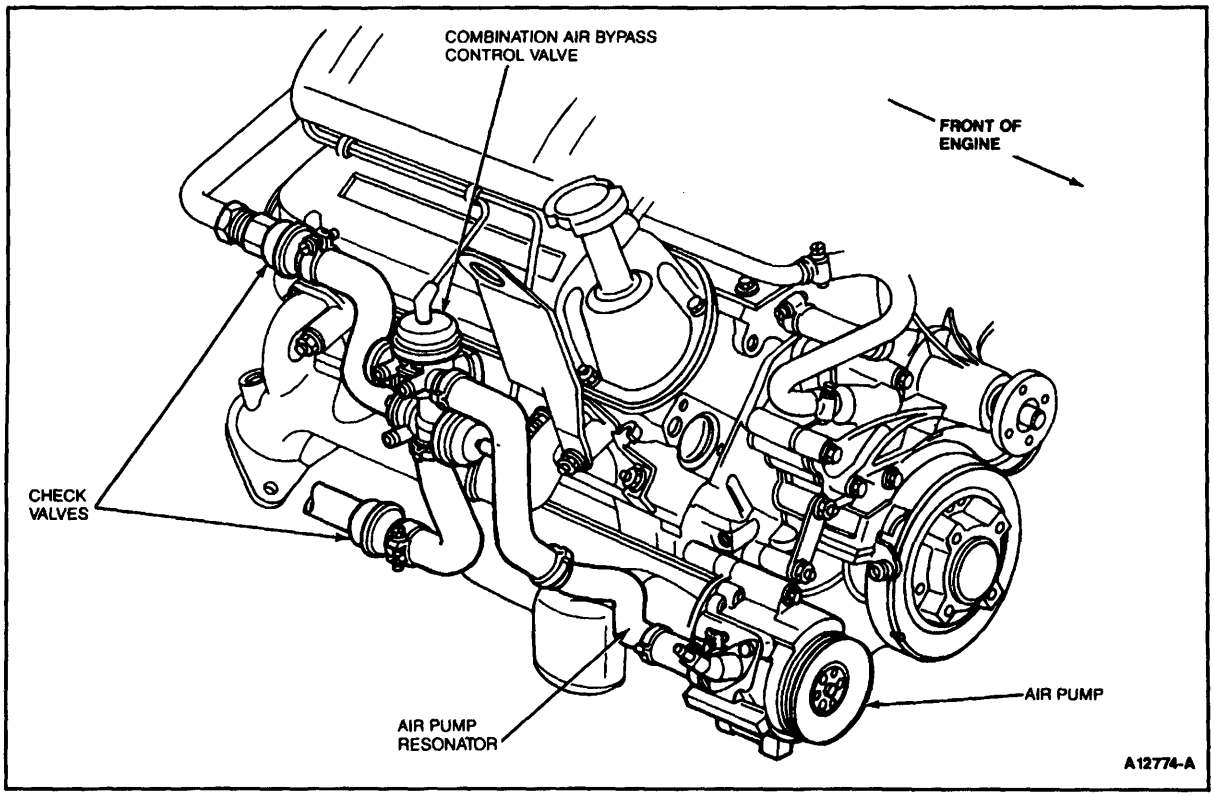


Figure 6 Locations of Thermactor Valves — 5.0L Lincoln Town Car, and Ford Crown Victoria/ Mercury Grand Marquis

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System Descriptions

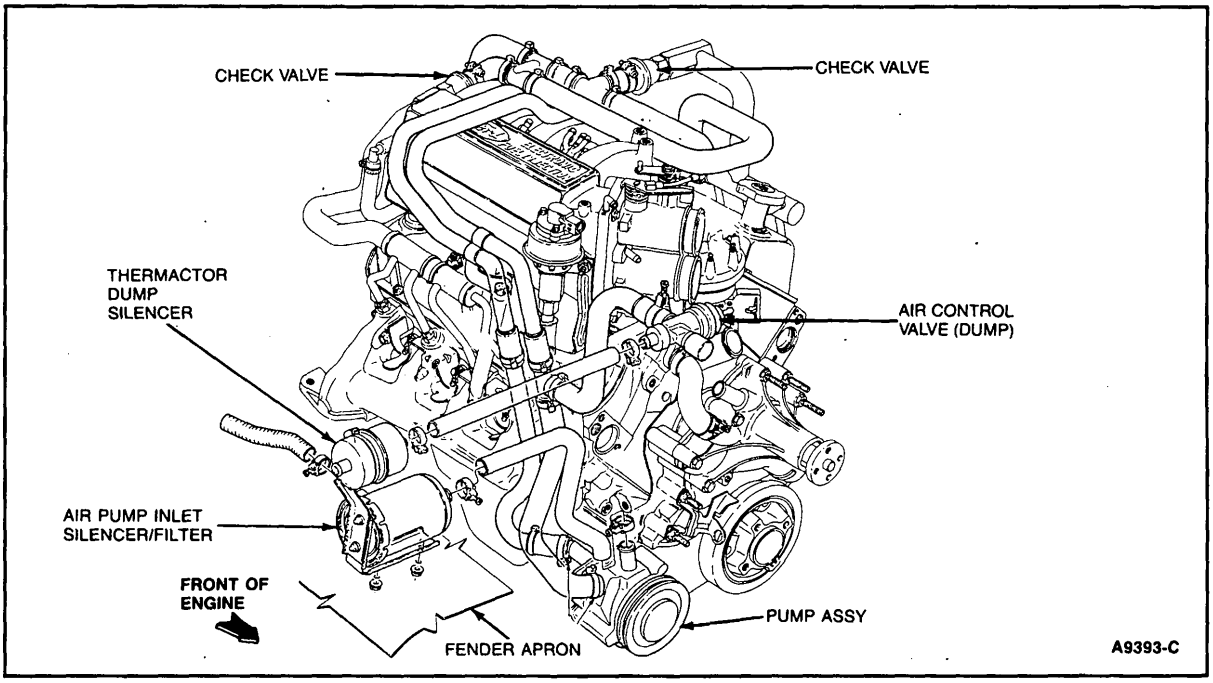


Figure 7 5.8L EFI 0/8500 GVW F-Series

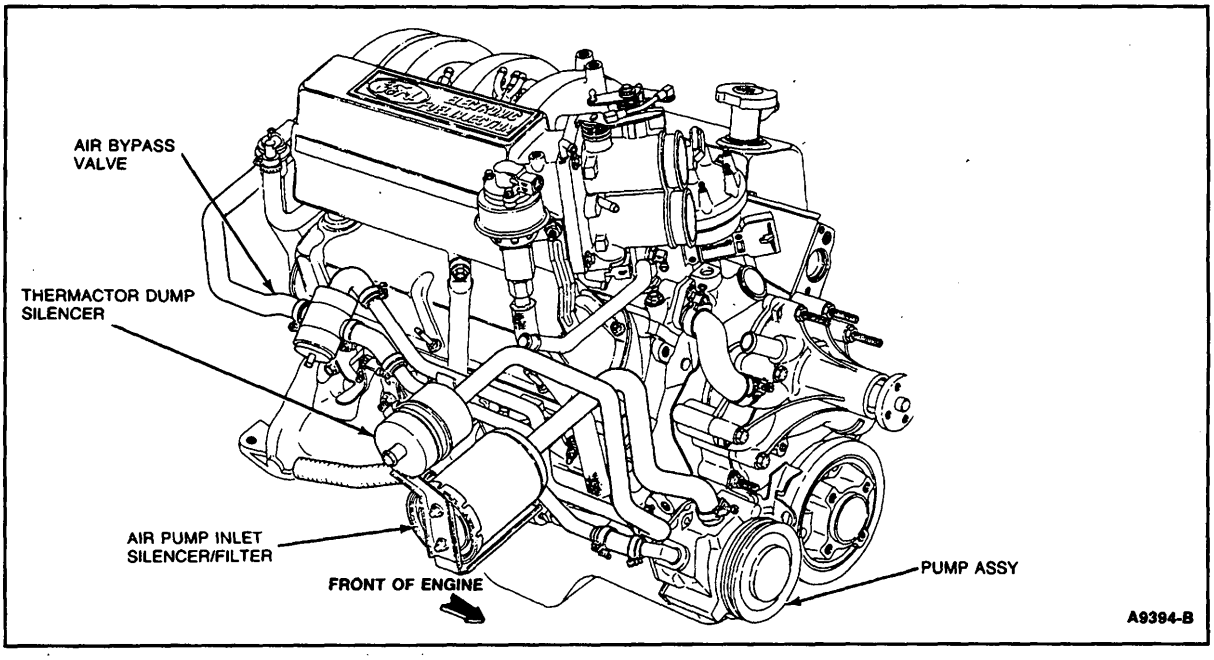


Figure 8 5.8L EFI U/8500 GVW F-Series/Bronco

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System Descriptions

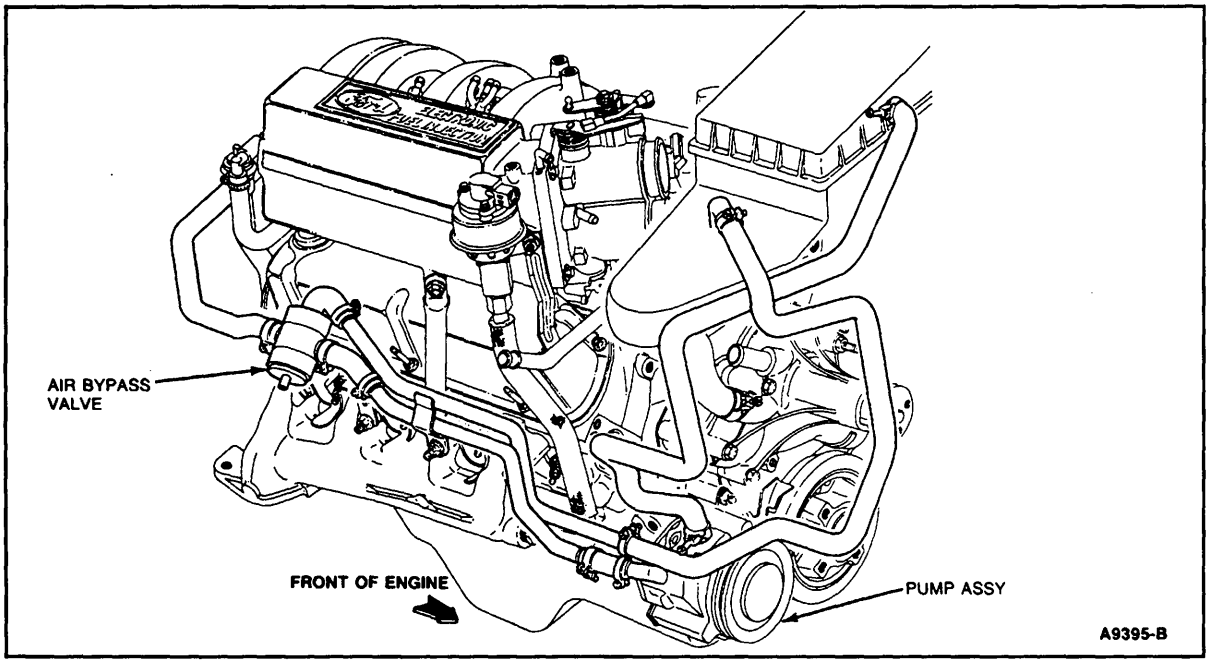


Figure 9 5.8L EFI U/8500 GVW E-Series

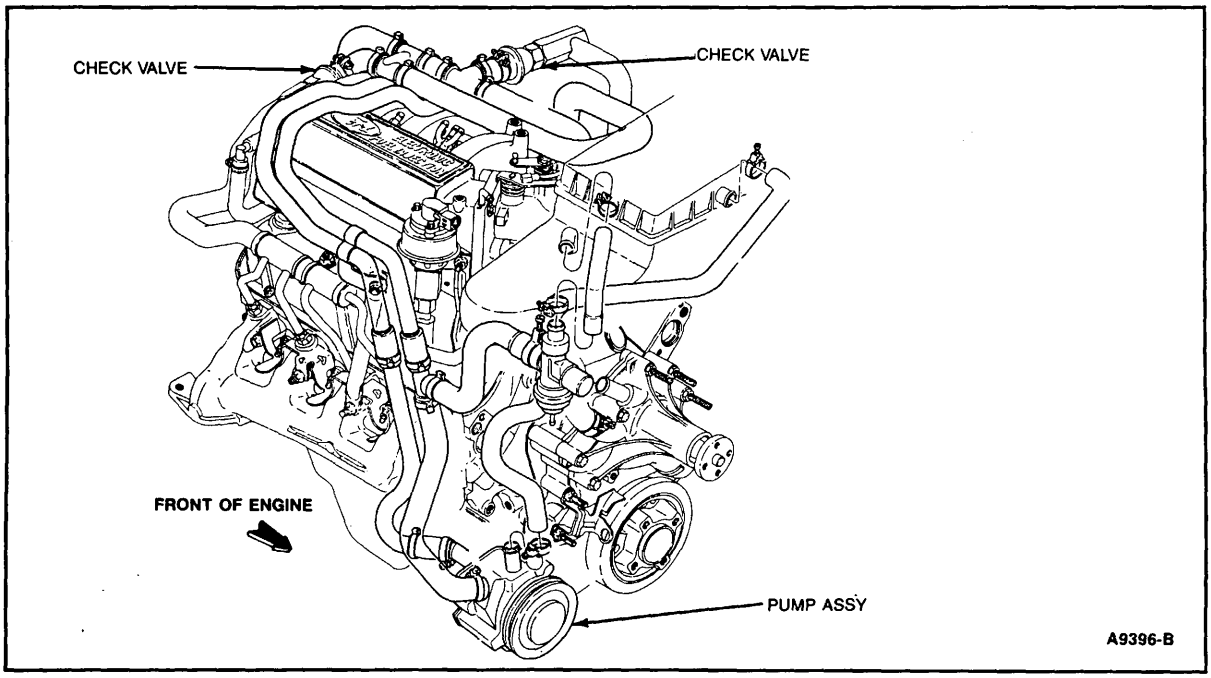


Figure 10 5.8L EFI 0/8500 GVW E-Series

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System Descriptions

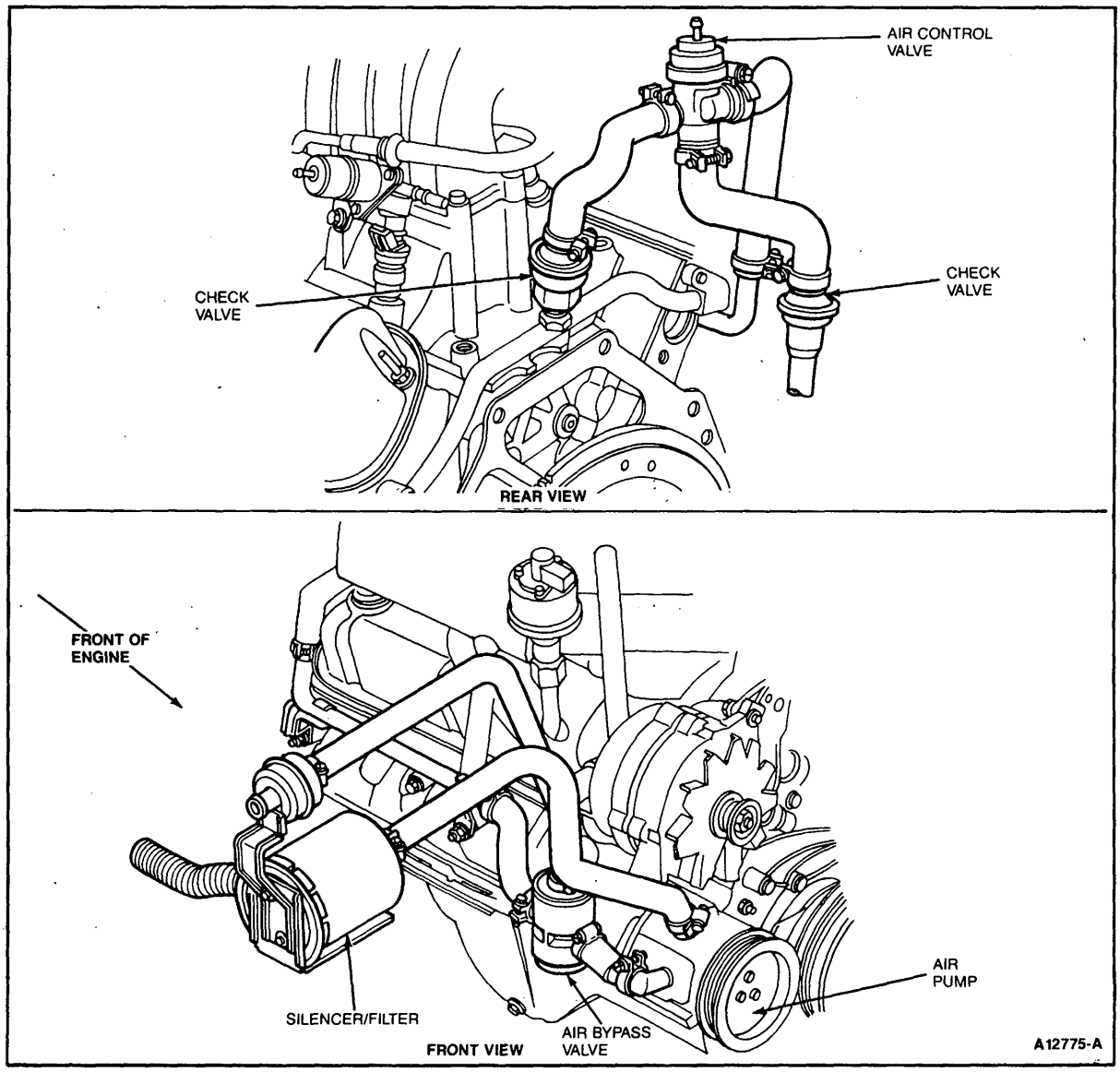


Figure 11 5.0L F-Series and Bronco

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System Descriptions

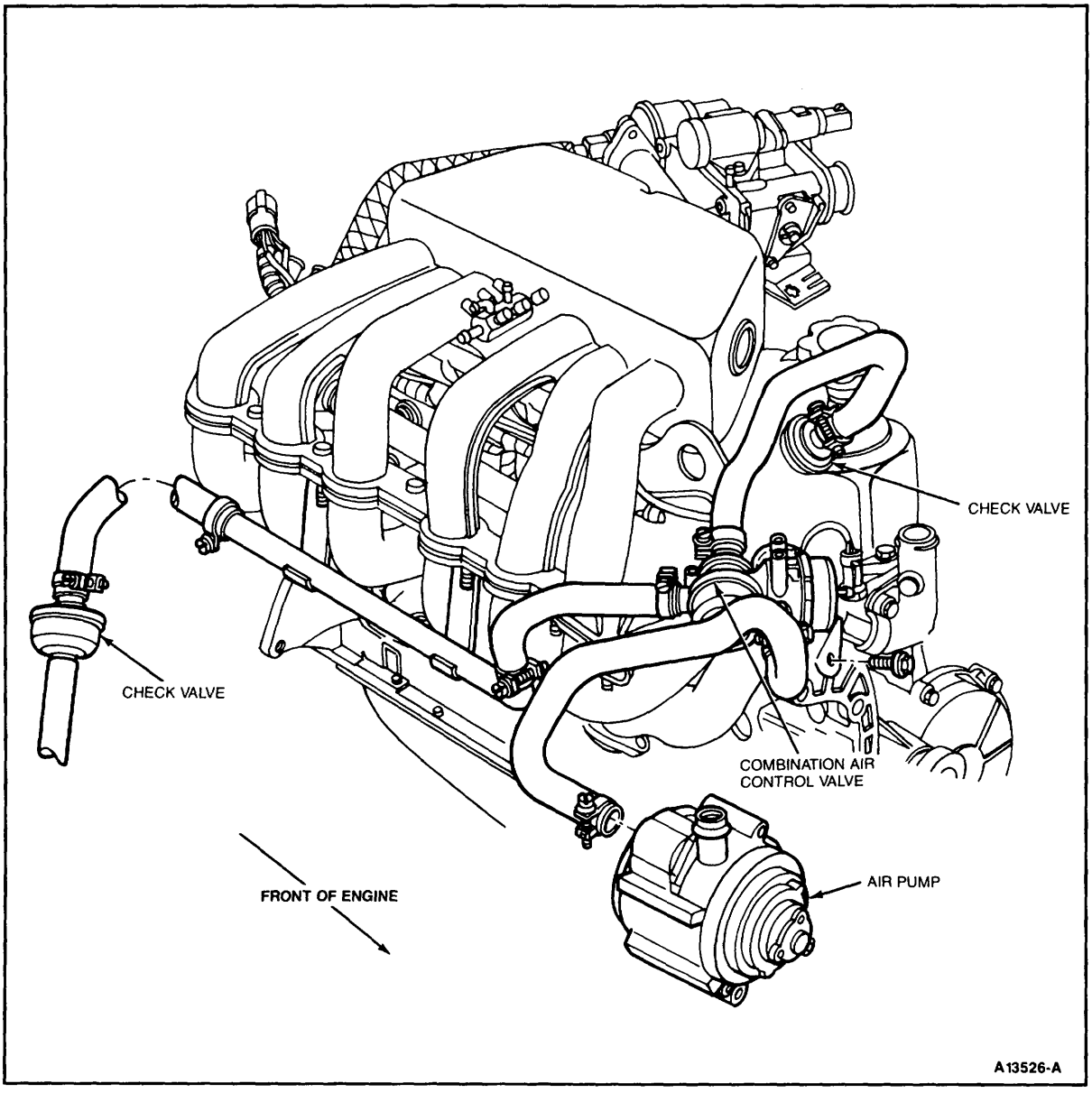


Figure 12 4.9L A/T O/8500 GVW and M/T

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System Descriptions

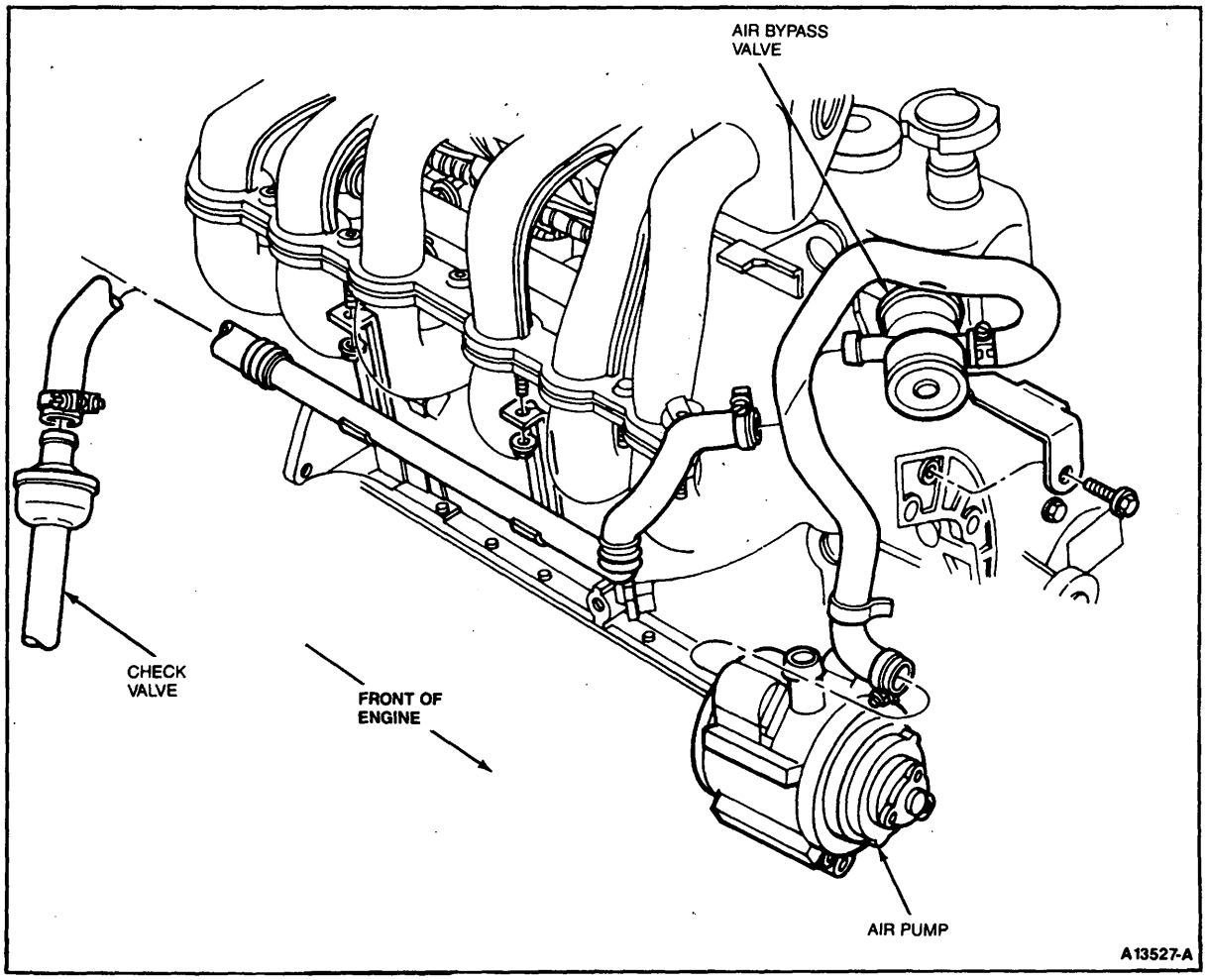


Figure 13 4.9L A/T U/8500 GVW

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System Descriptions

PULSE AIR SYSTEM (THERMACTOR II)

Some engines are equipped with an air injection system called Pulse Air or Thermactor II. The system does not use an air pump. The system uses natural pulses present in the exhaust system to pull air into the catalyst through pulse air valves. The pulse air valve is connected to the catalyst with a long tube and to the air cleaner and silencer with hoses.

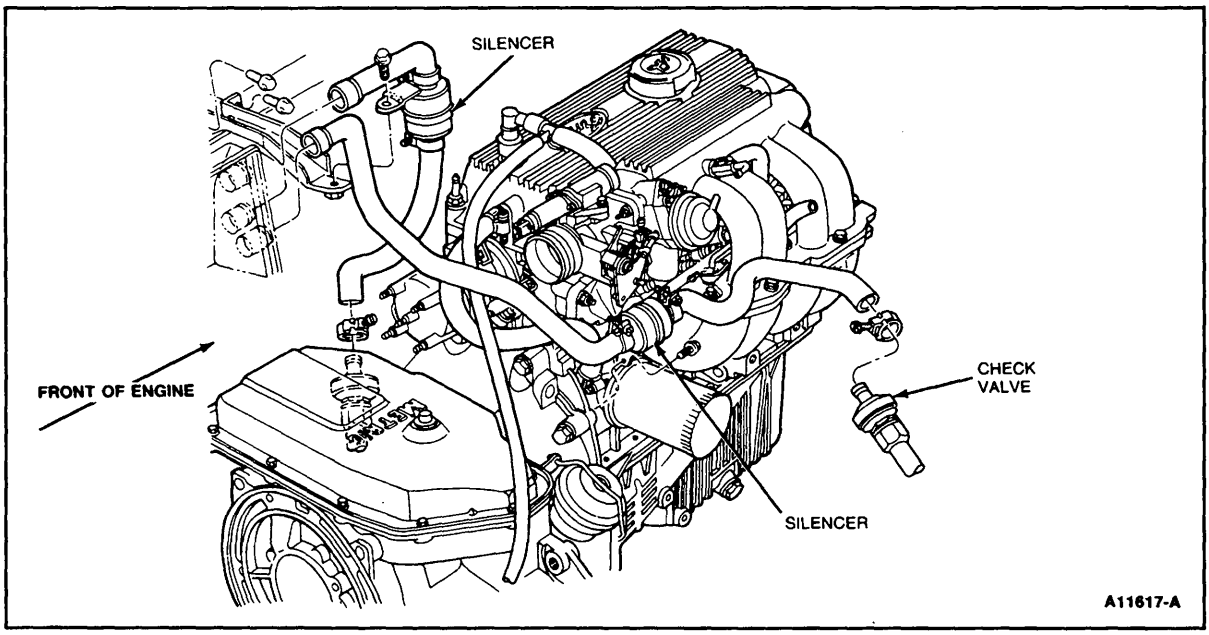


Figure 14 1.9L EFI HO Escort — (50 States)

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System Descriptions

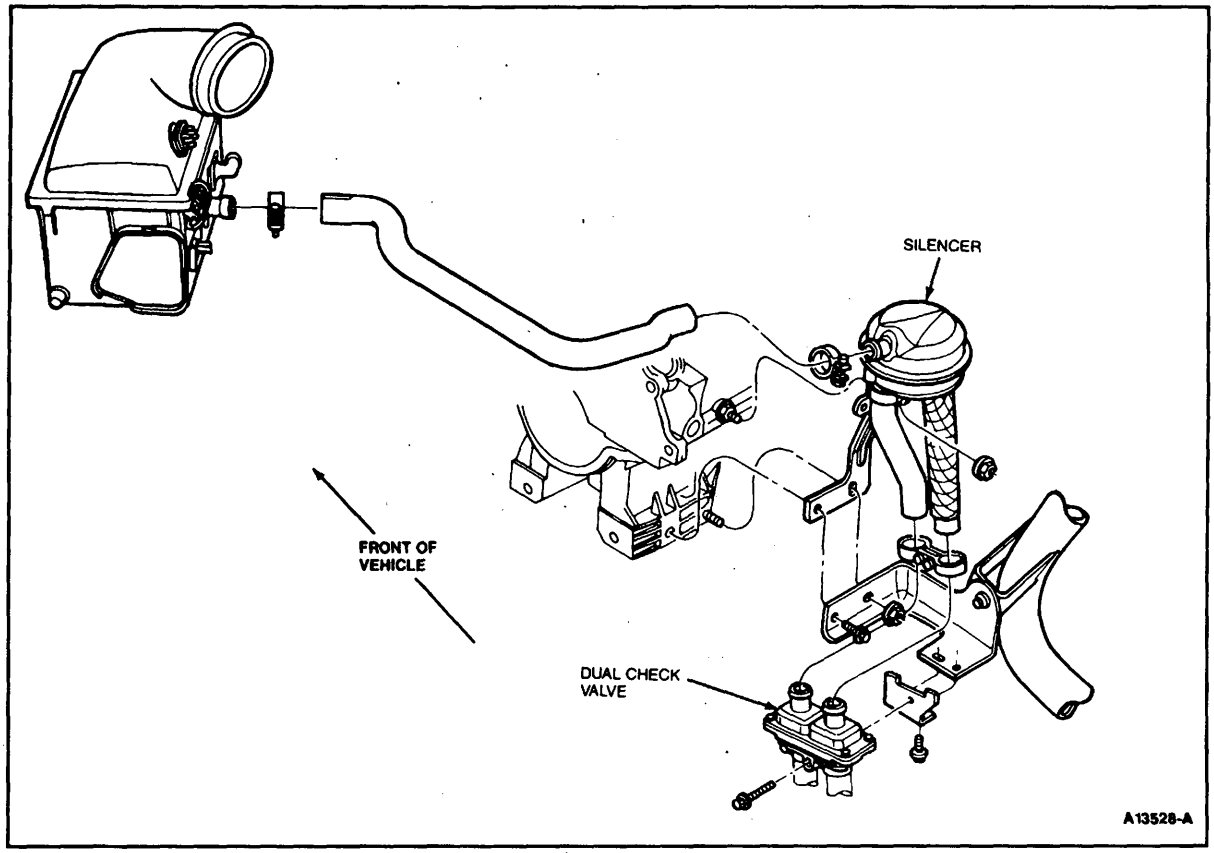


Figure 15 2.5L Taurus

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System Descriptions

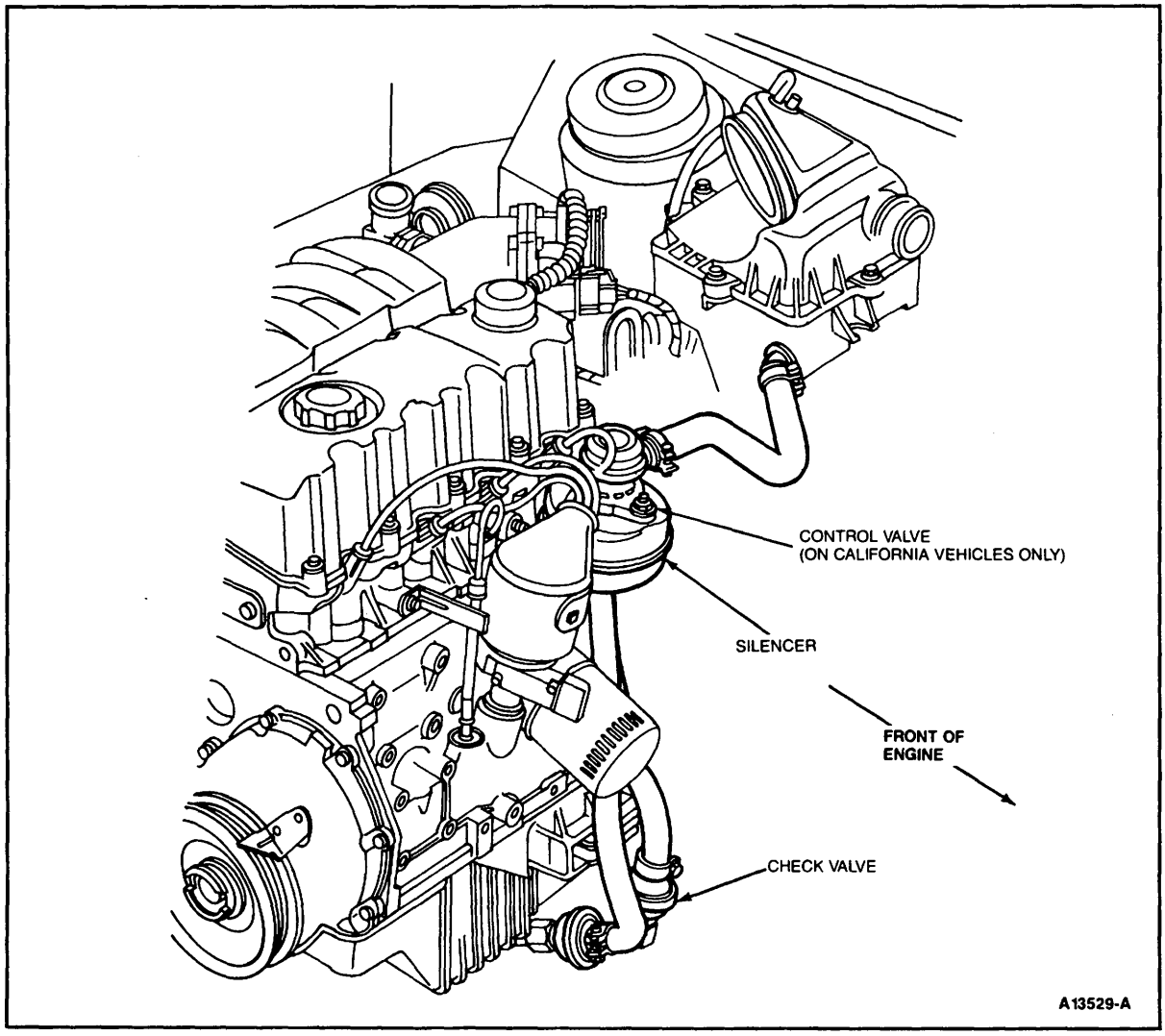


Figure 16 2.3L Tempo/Topaz

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Backfire (Exhaust)	• Air bypass valve malfunction • Air control valve malfunction • Combination air bypass/control valve malfunction • Thermactor solenoid valve malfunction • Thermactor idle vacuum valve malfunction • Exhaust manifolds or pipes loose	• Perform bypass valve diagnosis • Perform air control valve diagnosis • Perform combination valve diagnosis • Perform solenoid diagnosis • Perform TIV diagnosis • Inspect and tighten nuts or bolts to specification.
• Surge at Steady Speed	• Air control valve malfunction • Combination air bypass/control valve malfunction • Thermactor solenoid malfunction	• Perform control valve diagnosis • Perform combination valve diagnosis • Perform solenoid diagnosis
• Engine Noise - (Hiss) • Engine Noise - (Rap, Roar)	• Thermactor hose leaks or disconnect • Thermactor hose or valves leak exhaust	• Visual inspection of hoses and connections • Visual inspection of hoses and valves. Perform air check valve diagnosis
• Poor Fuel Economy	• Air control valve malfunction • Combination air bypass/control valve malfunction • Thermactor solenoid valve malfunction • Disconnected vacuum or electrical connections for thermactor components	• Perform air control valve diagnosis • Perform combination valve diagnosis • Perform solenoid diagnosis • Visual inspection
• Exhaust Smoke (White)	• Disconnected vacuum or electrical connections for thermactor components • Air bypass valve malfunction • Air control valve malfunction • Combination air bypass/control valve malfunction • Thermactor solenoid valve malfunction	• Visual inspection • Perform bypass valve diagnosis • Perform air control valve diagnosis • Perform combination valve diagnosis • Perform solenoid diagnosis
• State Emission Test Failure	• Disconnected vacuum or electrical connections for thermactor components • Air bypass valve malfunction • Air control valve malfunction • Combination air bypass/control valve malfunction • Thermactor solenoid valve malfunction	• Visual inspection • Perform bypass valve diagnosis • Perform air control valve diagnosis • Perform combination valve diagnosis • Perform solenoid diagnosis
• Rolling Idle	• Thermactor solenoid valve malfunction • Disconnected vacuum or electrical connections for thermactor components • Air bypass valve malfunction • Air control valve malfunction • Combination air bypass/control valve malfunction	• Perform solenoid diagnosis • Visual inspection • Perform bypass valve diagnosis • Perform air control valve diagnosis • Perform combination valve diagnosis

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Diagnosis By Symptom

THERMACTOR SYSTEM NOISE TEST

CAUTION

Do not use a pry bar to move the air pump for belt adjustment.

NOTE: The thermactor system is not completely noiseless. Under normal conditions, noise rises in pitch as engine speed increases. To determine if noise is the fault of the air injection system, disconnect the belt drive (only after verifying that belt tension is correct), and operate the engine. If the noise disappears, proceed with the following diagnosis.

Diagnosis

SYMPTOM	POSSIBLE SOURCE	ACTION
• Excessive Belt Noise	• Loose belt.	• Tighten to specification using Tool T75L-9480-A or equivalent to hold belt tension and Belt Tension Gauge T63L-8620-A or equivalent. **CAUTION: Do not use a pry bar to move air pump.**
	• Seized pump.	• Replace pump.
	• Loose pulley.	• Replace pulley and/or pump if damaged. Tighten bolts to 13.6-17.0 N•m (120-150 lb-in).
	• Loose or broken mounting brackets or bolts.	• Replace parts as required and tighten bolts to specification.
• Excessive Mechanical Noise, Chirps, Squeaks, Clicks or Ticks	• Overtightened mounting bolt.	• Tighten to 34 N•m (25 lb-ft).
	• Overtightened drive belt.	• Same as loose belt.
	• Excessive flash on the air pump adjusting arm boss.	• Remove flash from the boss.
	• Distorted adjusting arm.	• Replace adjusting arm.
	• Pump or pulley mounting fasteners loose.	• Tighten fasteners to specifications.

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Diagnosis By Symptom

SYMPTOM	POSSIBLE SOURCE	ACTION
• Excessive Thermactor System Noise (Putt-Putt, Whirling or Hissing)	• Leak in hose.	• Locate source of leak using soap solution and replace hoses as necessary.
	• Loose, pinched or kinked hose.	• Reassemble, straighten or replace hose and clamps as required.
	• Hose touching other engine parts.	• Adjust hose to prevent contact with other engine parts.
	• Bypass valve inoperative.	• Test the valve.
	• Check valve inoperative.	• Test the valve.
	• Restricted or bent pump outlet fitting.	• Inspect fitting and remove any flash blocking the air passage way. Replace bent fittings.
	• Air dumping through bypass valve (at idle only).	• On many vehicles, the thermactor system has been designed to dump air at idle to prevent overheating the catalyst. This condition is normal. Determine that the noise persists at higher speeds before proceeding.
	• Air dump through bypass valve (decel and cruise).	• On many vehicles, the thermactor air is dumped in the air cleaner or in remote silencer. Make sure hoses are connected and not cracked.
	• Air pump resonator leaking or blocked.	• Check resonator for hole or restricted inlet/outlet tubes.
• Excessive Pump Noise (Chirps, Squeaks and Ticks)	• Worn or damaged pump.	• Check the thermactor system for wear or damage and make necessary corrections.
• Engine noise-(Rap or Roar)	• Hose disconnected.	• Audible and visual inspection to assure all hoses are connected.
• State Emissions Test Failure	• Restricted hose.	• Inspect hoses for crimped and/or kinked hoses.
	• Plugged pulse air silencer.	• Remove inlet hose and inspect silencer inlet for dirt and foreign material. Clean or replace silencer as appropriate.
	• Pulse air valve malfunction, leaking or restricted.	• Perform pulse air check valve diagnosis.
	• Pulse air control valve malfunction.	• Perform pulse air control valve diagnosis.

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Functional Diagnosis

THERMACTOR AIR PUMP DRIVE BELT ADJUSTMENT

On most applications, drive belt adjustment for the Air Pump is accomplished by adjusting other component position (example-idler and alternator). For those applications that utilize an automatic tensioner, no adjustment is necessary. For those applications requiring Air Pump movement to adjust belt tension, procede with the following:

1. Check all air pump pulleys and mounting bolts, and tighten to specification, if required.
2. Install the belt tension gauge (Tool T63L-8620-A or equivalent) on the drive belt, and check the tension. Compare the belt tension to the specified belt tension and adjust as necessary.
3. If adjustment is necessary, loosen the air pump mounting and adjusting arm bolts, move the air pump toward or away from the engine until the correct tension is obtained. Use air pump belt tensioning tool (Tool T75L-9480-A or equivalent) to hold belt tension while tightening the mounting bolts. Install the tension gauge and check the belt tension.

CAUTION

Do not use a pry bar.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Supply Pump	**9A486**	

DESCRIPTION

The Air Supply Pump is a belt-driven, positive displacement, vane-type pump that provides air for the Thermactor system. It is available in 19 and 22 cubic inch sizes, either of which may be driven with different pulley ratios for different applications. Pumps receive air from a remote silencer filter on the rear side of the engine air cleaner attached to the pumps' air inlet nipple or through an impellor-type centrifugal filter fan.

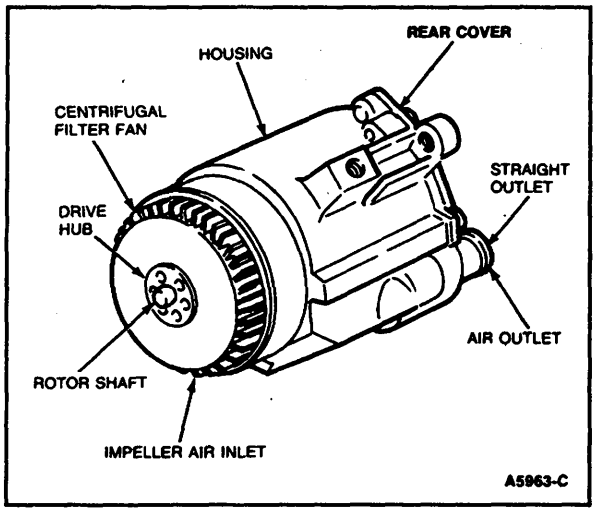


Figure 17 19 Cubic Inch Thermactor Air Supply Pump — Car

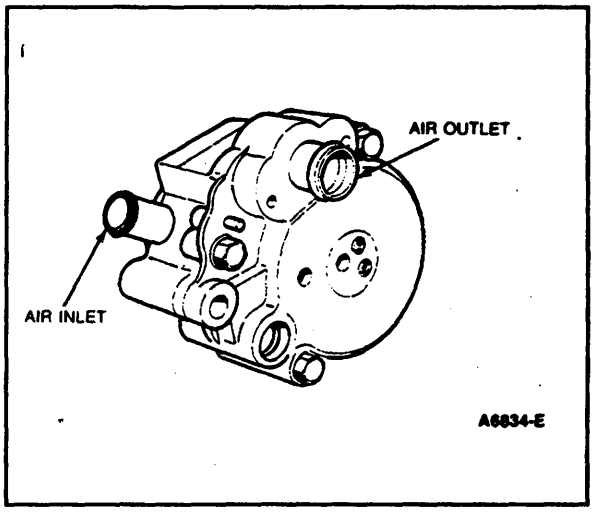


Figure 18 19 and 22 Cubic Inch Thermactor Air Supply Pump — Trucks

Functional Check

1. Check belt tension and adjust to specification.
2. Disconnect air supply hose from bypass control valve.
3. The pump is operating satisfactorily if airflow is felt at the pump outlet and the flow increases as the engine speed is increased.

CAUTION

Do not pry on the pump to adjust belt. The aluminum housing is likely to collapse. See Air Pump Drive Belt Adjustment.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Silencer/Filter (Air Pump and Pulse Air Inlet)	**9G427 9H467**	SILN

DESCRIPTION

The Air Silencer is a combustion silencer and filter for air supply pumps that are not equipped with an impeller-type centrifugal air filter fan or for Pulse Air (Thermactor II) systems. The air silencer is mounted in a convenient position in the engine compartment and is connected to the air supply pump or pulse air valve inlet by means of a flexible hose.

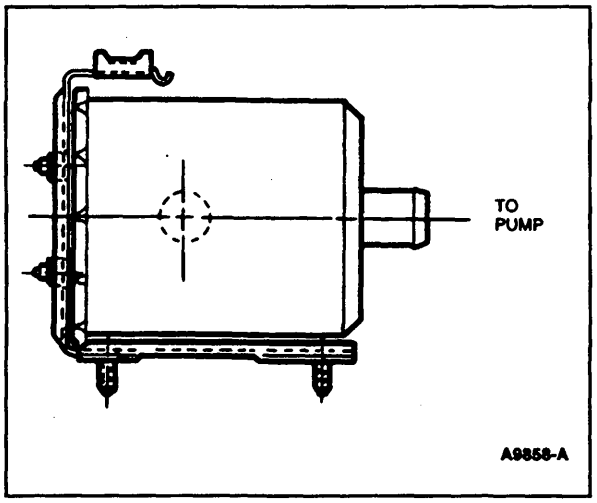


Figure 19 Air Silencer - 9H467, Typical

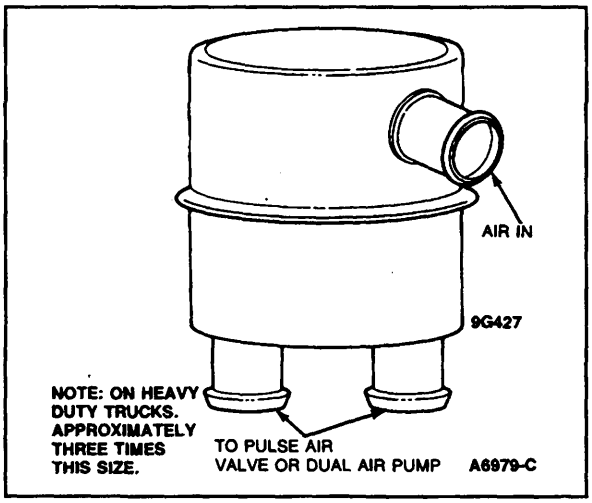
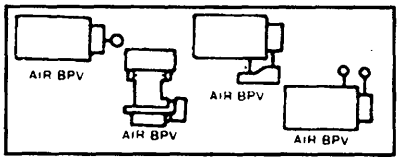


Figure 20 Air Silencer - 9G427, Typical

Functional Check

1. Inspect hoses and air silencer for leaks.
2. Disconnect hose from air silencer outlet, remove silencer and visually inspect for plugging.
3. The air silencer is operating satisfactorily if no plugging or leaks are encountered.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Bypass Valves	**9B289**	

DESCRIPTION

There are two general groups of Air Bypass Valves, normally closed and normally open. Normally closed valves supply air to the exhaust system with medium and high applied vacuum signals during normal (engine at normal operating temperature) modes. With low or no vacuum applied, the pumped air is dumped through the silencer ports of the valve or through the dump port.

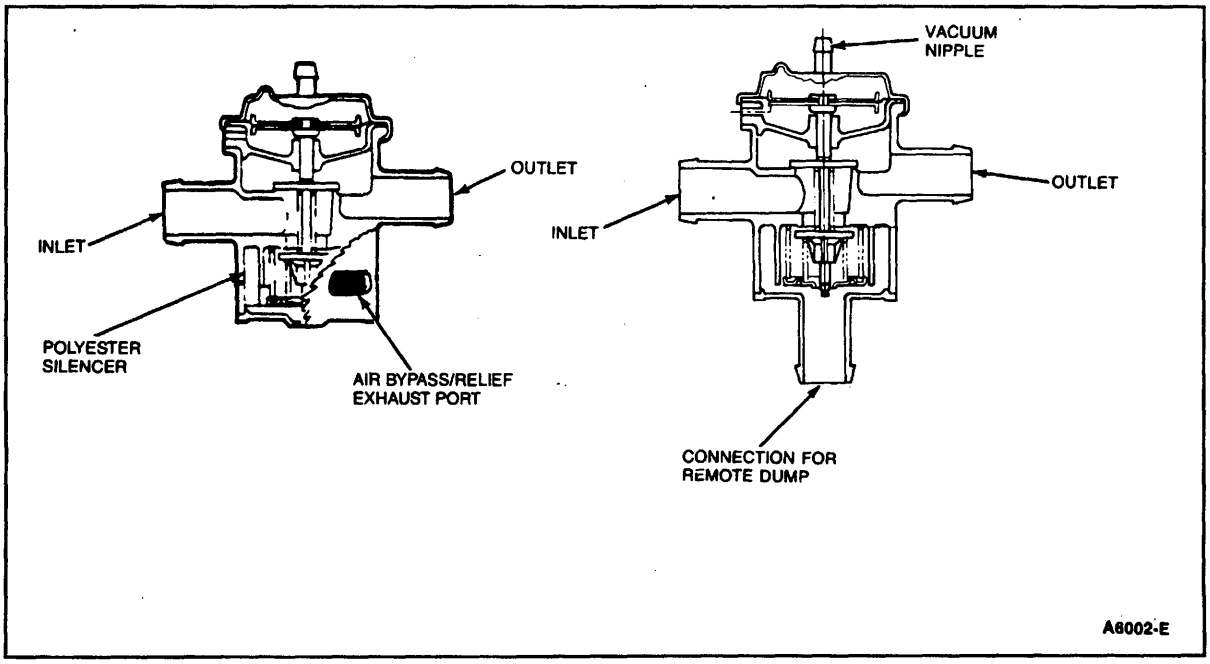


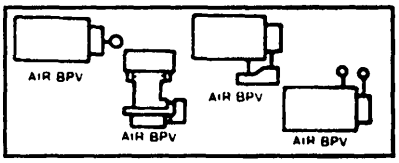
Figure 21 Normally Closed Air Bypass Valves

Normally Closed Bypass Valves (9B289)

Functional Check

1. Disconnect the air supply hose at the valve outlet.
2. Remove vacuum line to check to see that a vacuum signal is present at the vacuum nipple. There must be a vacuum present at the nipple before proceeding.
3. With the engine at 1500 rpm and the vacuum line connected to the vacuum nipple, air pump supply air should be heard and felt at the air bypass valve outlet (Figure 21).
4. With the engine at 1500 rpm, disconnect the vacuum line. Air at the outlet should be significantly decreased or shut off. Air pump supply air should be heard or felt at the silencer ports, or at the dump port.
5. If the normally closed air bypass valve does not successfully complete the above tests, check the air pump. If the air pump is operating satisfactorily, replace the air bypass valve.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Bypass Valves	**9B289**	

Normally Open Air Bypass Valves without Vacuum Vent

Heavy Truck Applications

Normally Open Valves without a Vacuum Vent provide a timed dump of air for two seconds nominal when a sudden high vacuum of about 68 kPa (20 in-Hg) is applied to the signal port. This prevents backfire during deceleration.

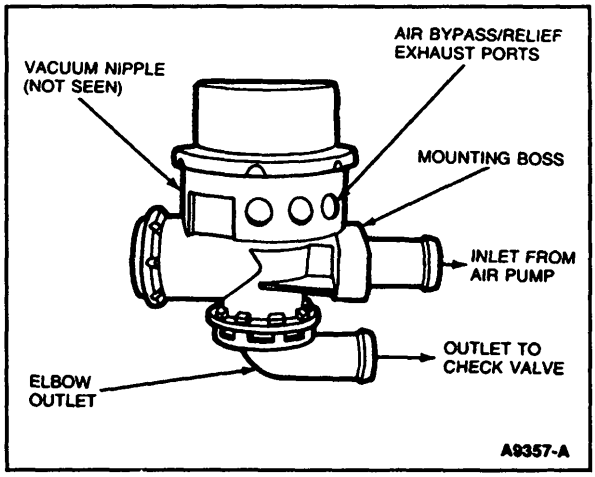


Figure 22 Normally Open Without Vacuum Vent

Functional Check

1. Disconnect the air supply line at the valve outlet (Figure 22).
2. Carefully disconnect the vacuum line at the vacuum nipple.

CAUTION

The vacuum port may break if care is not taken.

3. With the engine at 1500 rpm, air should be heard and felt at the valve outlet.
4. Connect a direct vacuum line that is free from restrictions from any manifold vacuum source to the vacuum nipple on the air bypass valve. Air at the outlet should be momentarily decreased or shut off.
5. Air pump supply air should be heard or felt at silencer ports (Figure 22) during the momentary dump. Restore all original connections. If any of the above tests are not satisfactorily completed, check the air pump. If the air pump is operating satisfactorily, replace the air bypass valve.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Check Valve	**9A487**	

DESCRIPTION

The Air Check Valve (Figure 23) is a one-way valve that allows thermactor air to pass into the exhaust system while preventing exhaust gases from passing in the opposite direction.

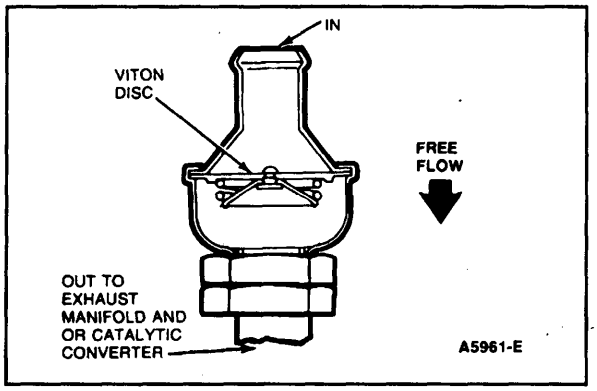


Figure 23 Air Check Valve

Functional Check

- Visually inspect the thermactor system hoses, tubes, control valve(s) and check valve(s) for leaks that may be due to backflow of exhaust gas. If holes are found and/or traces of exhaust gas products are evident, the check valve may be suspect.
- As shown in the above illustrations, the valves should allow free flow of air in the direction of the arrow only. The valve(s) should check (or block) the free flow of exhaust gas in the opposite direction.
- Replace the valve if air does not flow as indicated or if exhaust gas backflows opposite of the direction of the arrow.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Supply Control Valve	**9F491**	

DESCRIPTION

The Air Supply Control Valve (Figure 24) is used in the Thermactor (Secondary Air) System.

The Air Control Valve directs air pump output to the exhaust manifold or downstream to the catalyst system depending upon the engine control strategy. It may also be used to dump air to the air cleaner or dump silencer.

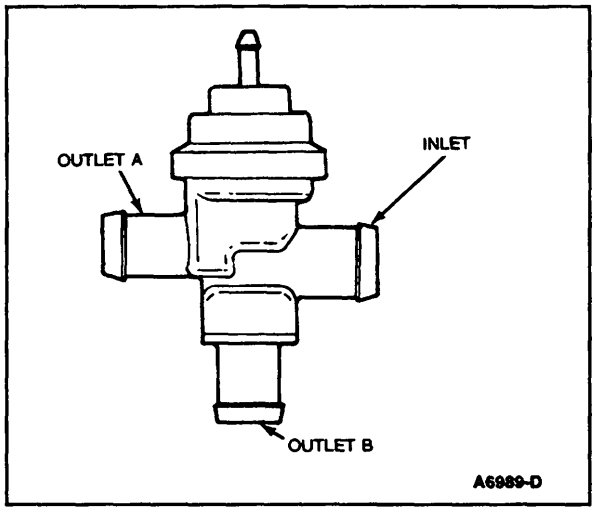
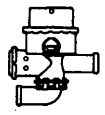


Figure 24 Air Control Valve

Functional Check

1. Verify that airflow is being supplied to the valve inlet by disconnecting the air supply hose at the inlet and verifying the presence of airflow with the engine at 1500 rpm. Reconnect the air supply hose to the valve inlet.
2. Disconnect the air supply hose at outlets A and B (Figure 24).
3. Remove the vacuum line at the vacuum nipple.
4. Accelerate the engine to 1500 rpm. Airflow should be heard and felt at outlet B with little or no airflow at outlet A (Figure 24).
5. With the engine at 1500 rpm, connect a direct vacuum line from any manifold vacuum fitting to the air control valve vacuum nipple. Airflow should be heard and felt at outlet A with little or no airflow at outlet B.
6. If airflow is noted in Steps 4 and 5, valve is O.K. Reinstall clamps and hoses and return to Diagnosis By Symptom or Diagnostic Routines.
7. If valve does not pass Step 4 and/or 5, replace valve.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Control Valve (Switch-Relief)	**9F491**	

DESCRIPTION

The Air Supply Control Valve is used in the Thermactor (Secondary Air) System.

The Air Control Valve directs air pump output to the exhaust manifold or downstream to the catalyst system depending upon the engine control strategy. The air control valve may be used as a Thermactor bypass valve (Figure 26), directing air to the catalyst/exhaust system or to a remote air dump location depending on engine control strategy. A pressure relief valve also provides air pump protection in the event of excessive exhaust back pressure or system blockage.

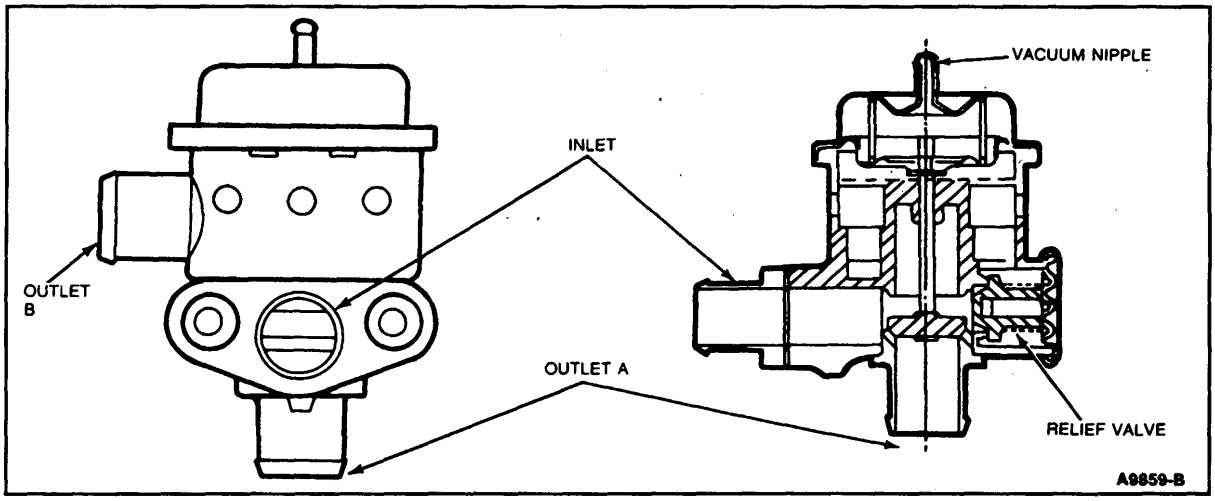


Figure 25 Air Control Valve (Switch-Relief)

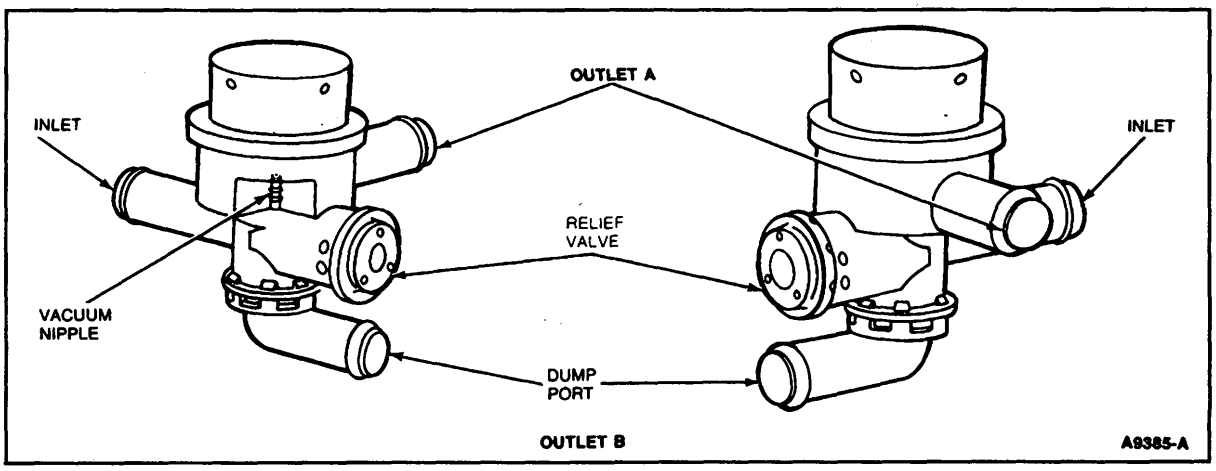
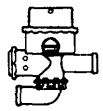


Figure 26 Air Control Valve (Thermactor Bypass Type)

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Control Valve (Switch-Relief)	**9F491**	

Functional Check

1. Verify that airflow is being supplied to the valve inlet by disconnecting the air supply hose at the inlet and verifying the presence of airflow with the engine at 1500 rpm. Reconnect the air supply hose to the valve inlet.
2. Carefully disconnect the air supply hoses at outlets A and B (Figure 25 or Figure 26).
3. Carefully remove the vacuum line at the vacuum nipple.

CAUTION

The vacuum port may break if care is not taken.

4. Accelerate the engine to 1500 rpm. Airflow should be heard and felt at outlet B with little or no airflow at outlet A (Figure 25 or Figure 26).
5. With the engine at 1500 rpm, connect a direct vacuum line from any manifold vacuum fitting to the air control valve vacuum nipple. Airflow should be heard and felt at outlet A with little or no airflow at outlet B.
6. Restore all connections. If conditions above are not met, replace the air control valve.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Air Pump Resonator		

DESCRIPTION

The Air Pump Resonator (Figure 27) reduces air dump noise during cold start and some cruise modes.

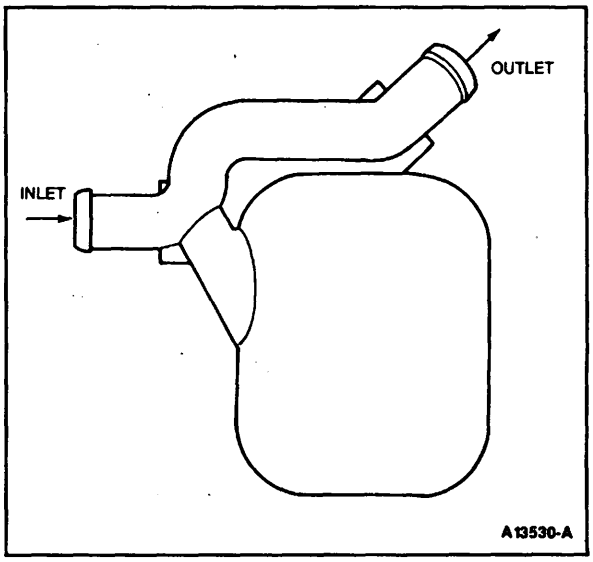


Figure 27 Air Pump Resonator

Functional Check

1. Visually inspect for holes.
2. Remove hoses and check for blocked/restricted ports.
3. Replace Resonator if part has holes or ports are blocked/restricted.
4. Reconnect hoses, install clamps, and tighten to specification.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Combination Air Bypass/Air Control Valve	**9F491**	ACV

DESCRIPTION

The Combination Air Control/Bypass Valve (Figure 28) combines the secondary air bypass and air control functions. The valve is located in the air supply line between the air pump and the upstream/downstream air supply check valves.

The air bypass portion controls the flow of thermactor air to the exhaust system (air control portion of the valve) or allows thermactor air to be bypassed to atmosphere. When air is **not** being bypassed, the air control portion of the valve switches the air injection point to either an upstream or downstream location.

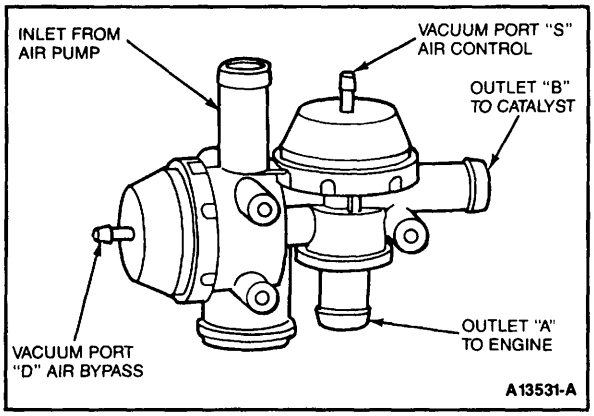


Figure 28 Combination Air Bypass/Air Control Valve

Functional Check

Normally closed, Figures 28 and 29.

1. Disconnect hoses from outlets A and B.
2. Disconnect and plug vacuum line to port D.
3. With engine operating at 1500 rpm, airflow should be noted coming out of the bypass vents.
4. Reconnect vacuum line to port D, and disconnect and plug vacuum line to port S. Ensure vacuum is present in the line to vacuum port D.
5. With engine operating at 1500 rpm, airflow should be noted coming out of outlet B (no airflow should be detected at outlet A).

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Combination Air Bypass/Air Control Valve	**9F491**	ACV

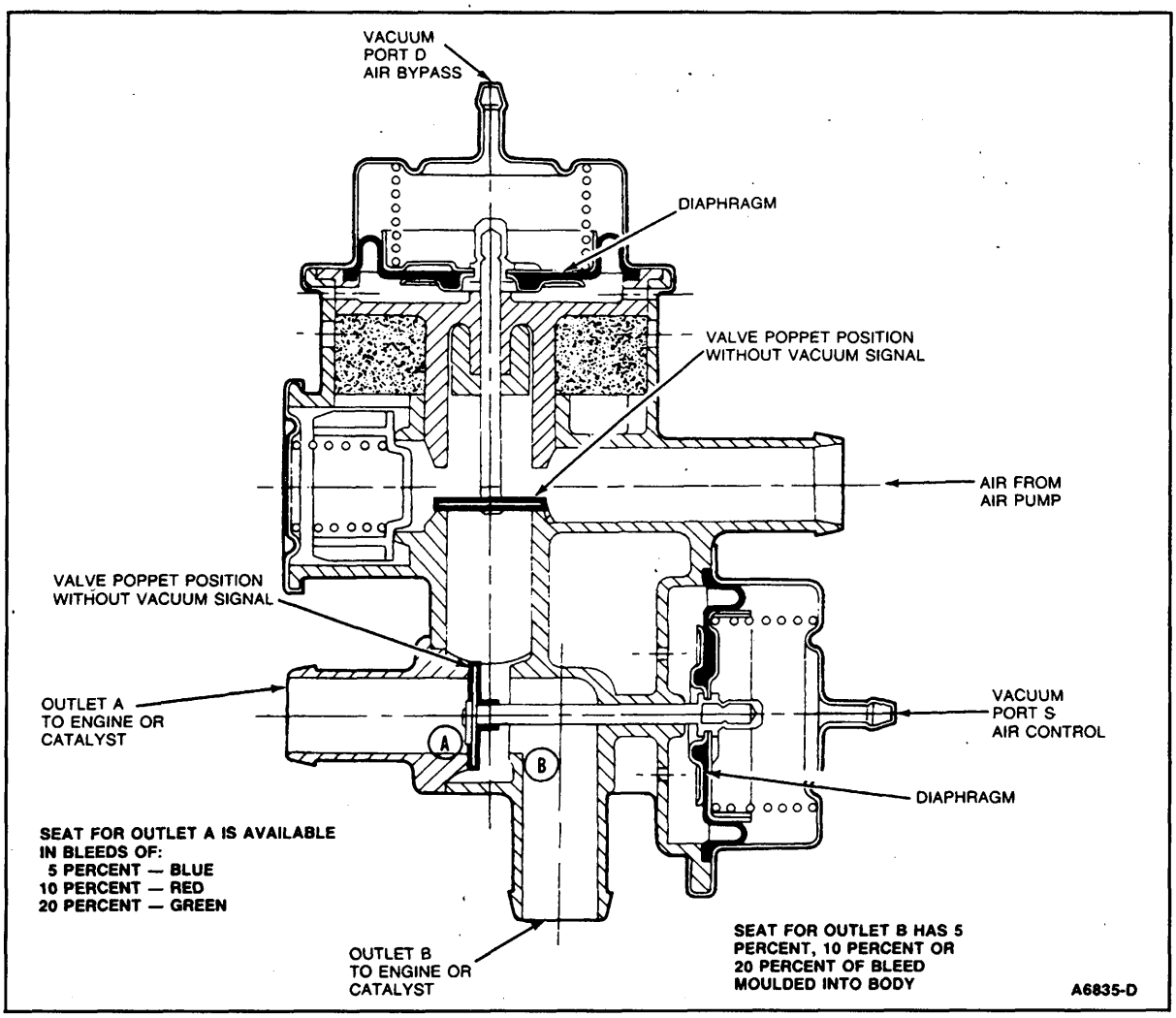
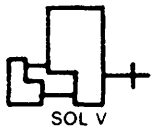


Figure 29 Valve Assembly Exhaust Air Supply Control (Normally Closed) with Bleed

6. Apply 27-34 kPa (8-10 in-Hg) vacuum to port S. With engine operating at 1500 rpm, airflow should be noted coming out of outlet A.

7. If the valve is the bleed type, some lesser amount of air will flow from outlet A or B, and the main discharge will change when vacuum is applied to port S.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Dual Thermactor Air Control Solenoid Valve	**9H465**	

DESCRIPTION

The Dual Thermactor Air Control Solenoid Valve (Figure 30) assembly consists of two normally closed solenoid vacuum valves (TAB and TAD), one controlling the thermactor air bypass valve and the other the thermactor diverter valve. Both are vented when de-energized, sourced by the intake manifold vacuum reservoir and controlled by an EEC system (they are also discussed in the EEC and MCU Systems diagnostic procedures). Also used on 2 wheel drive/4 wheel drive vehicles and single solenoids for EGR shutoff.

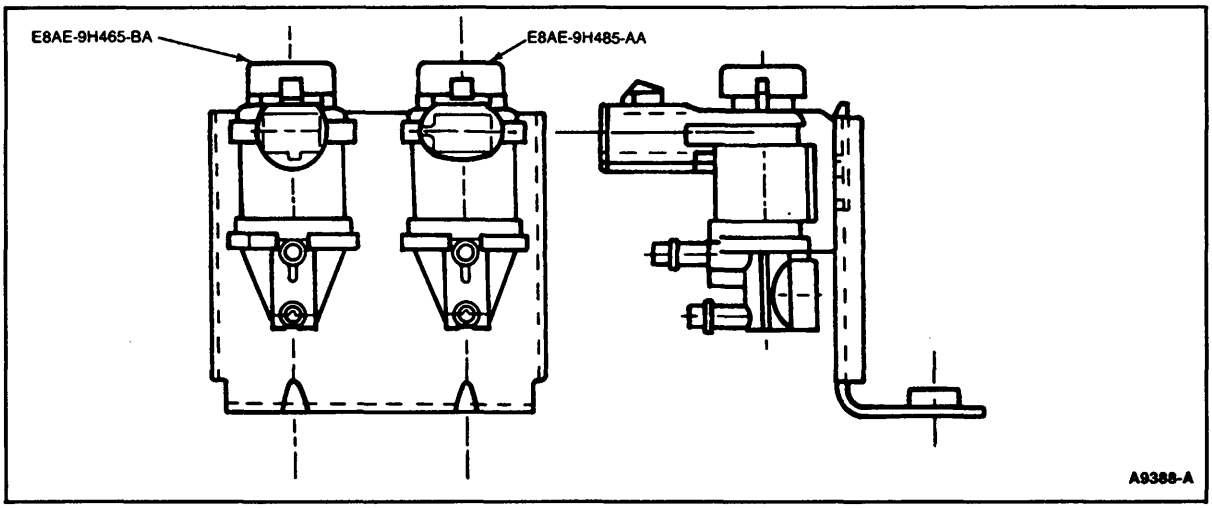


Figure 30 Dual Thermactor Air Control Solenoid Valve

DIAGNOSIS

For diagnostics, refer to the EEC-IV Quick Test, Section 14.

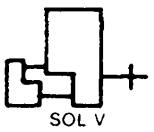
The function of each valve can be determined by externally energizing with vacuum sourced and output gauged. (Refer to Solenoid Vacuum Valve, NC).

The resistance of each solenoid should be between 51 and 108 ohms when checked at the coil terminals. If the resistance is not within these values, the solenoid should be replaced.

NOTE: The valves can be expected to have a very small leakage rate when energized or de-energized. This leakage is not measurable in the field and is not detrimental to valve function.

Thermactor Air Strategy		
Thermactor Air States	**TAB Solenoid**	**TAD Solenoid**
Upstream	On	On
Downstream	On	Off
Bypass	Off	Off
TAB - Thermactor Air Bypass TAD - Thermactor Air Diverter		

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Solenoid Vacuum Valve Assembly	**9D474**	

DESCRIPTION

Normally Closed

The Normally Closed Solenoid Valve Assembly (Figure 31) consists of two vacuum ports with an atmospheric vent. The valve assembly can be with or without control bleed. The outlet port of the valve is opened to atmospheric vent and closed to the inlet port when de-energized. When energized, the outlet port is opened to the inlet port and closed to atmospheric vent. The control bleed is provided to prevent contamination entering the solenoid valve assembly from intake manifold.

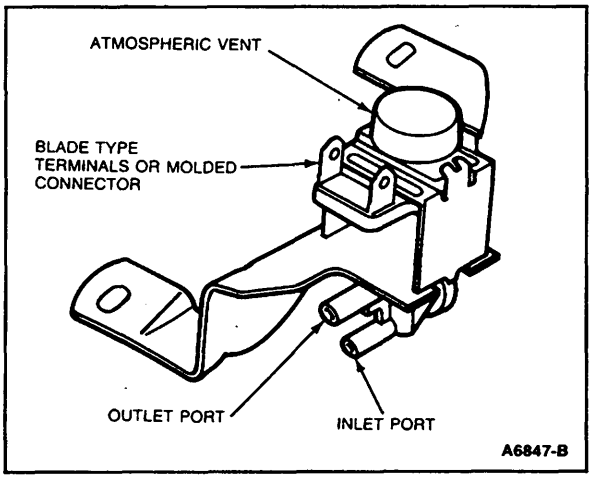


Figure 31 Typical Solenoid Valve Assembly — Normally Closed

DIAGNOSIS

The ports should flow air when the solenoid is energized.

The solenoid resistance when checked at the terminals should be between 51 and 108 ohms. If the solenoid resistance is not within these values, the solenoid should be replaced.

Refer to the EEC-IV Quick Test, Section 14.

NOTE: The valve can be expected to have a very small leakage rate when energized or de-energized. This leakage is not measurable in the field and is not detrimental to valve function.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Thermactor Idle Vacuum Valve	**9G328**	VAC / IVV

DESCRIPTION

The TIV Valve (Figure 32) vents the vacuum signal to the atmosphere when the preset manifold vacuum or pressure is exceeded. It is used to divert Thermactor airflow during cold starts to control exhaust backfire.

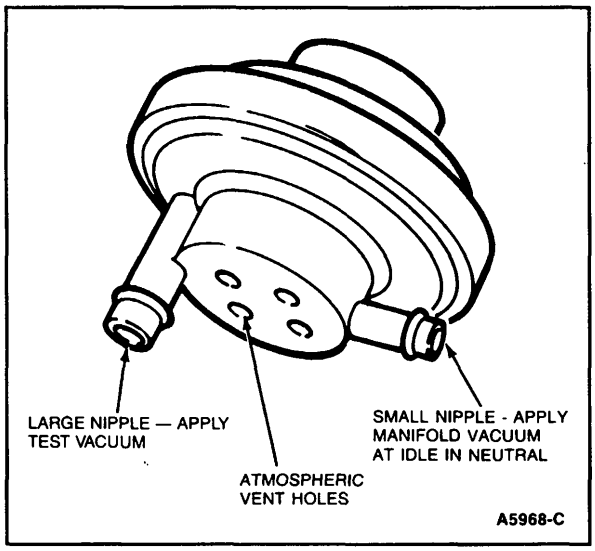


Figure 32 Thermactor Idle Vacuum Valve

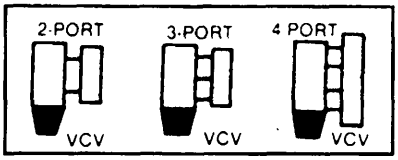
Functional Checks

TIV Valves with code words ASH or RED on decal:

1. With the engine at idle, in NEUTRAL, apply vacuum to small nipple and place fingers over the TIV Valve atmospheric vent holes (Figure 1). If no vacuum is sensed, the TIV is damaged and must be replaced.
2. While the engine is still idling in NEUTRAL, apply vacuum shown below, to the TIV Valve large nipple from a test source. If vacuum is still sensed when placing fingers over vent holes, the TIV is damaged and must be replaced.
3. If TIV meets both requirements, disconnect the TIV small nipple from manifold vacuum and the TIV large nipple from the test vacuum. Reconnect the TIV valve to original hoses or connectors.

TIV Decal Code Mode	Vacuum kPa (in. Hg.)
Ash	5.1 (1.5) — 10 (3.0)
Red	11.8 (3.5) — 15.2 (4.5)

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Vacuum Control Valve	**8A564 9D473 12A091**	

DESCRIPTION

The VCV controls vacuum to other emission devices during engine warm-up: the 2-port types simply open when engine coolant reaches their pre-determined calibration temperatures; the 4-port types open likewise, since they are nothing more than two 2-port types in one housing; and the 3-port types switch the vacuum source to the center port from the top or the bottom ports. Electrical switches can be either open or closed until the VCV is fully cycled. The VCV's respond to a sensing bulb immersed in engine coolant by utilizing a wax pellet principle. Vacuum is usually sourced as illustrated in Figure 33.

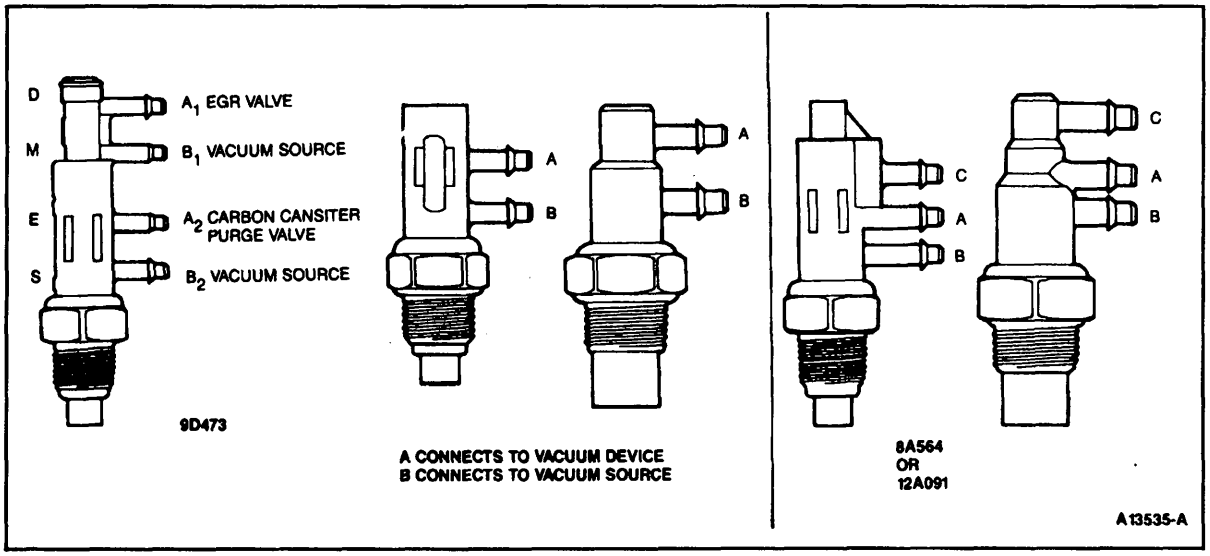


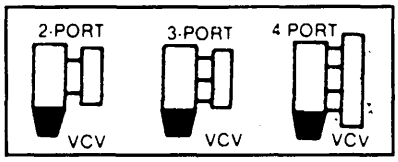
Figure 33 2-, 3-, and 4-Port Vacuum Valves

Functional Vacuum Check

1. With a cold engine, passage A to B should be closed and passage A to C should be open.
2. With engine at normal operating temperature, the VCV should be open between A and B and closed between A and C.

   For the 4-port valve, check A_1 to B_1 and A_2 to B_2 separately.
3. If these conditions are not met, replace the VCV Valve.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Vacuum Control Valve	**8A564 9D473 12A091**	

Electrical Vacuum Switch

The Electrical Vacuum Switch (Figure 34) could be either opened or closed at room temperature. It will be reversed (opened to closed or closed to opened) with the engine at full operating temperature.

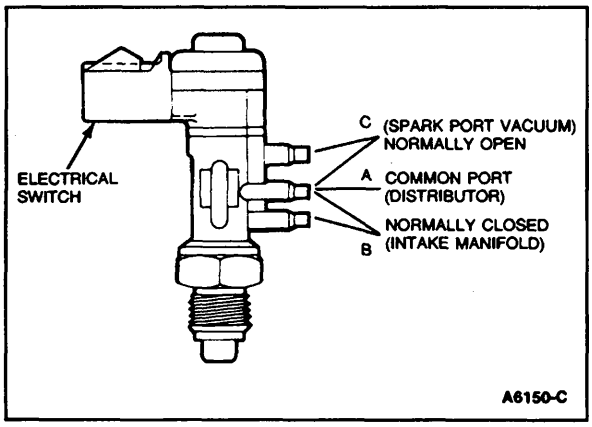


Figure 34 Electrical Vacuum Switch — 8A564

Functional Electrical Check

1. While the engine is cold, measure the continuity across the switch. Compare with specifications.
2. Warm the engine to normal operating temperature.
3. Measure the continuity across the switch. Compare with specifications.
4. The vacuum function is checked as previously described.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Vacuum Check Valve	**12A197**	VCK-V

DESCRIPTION

A Vacuum Check Valve (Figure 35) blocks airflow in one direction. It allows free airflow in the other direction. The check side of this valve will hold the highest vacuum seen on the vacuum side. If not, replace it.

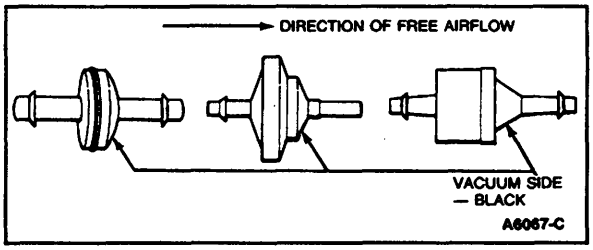
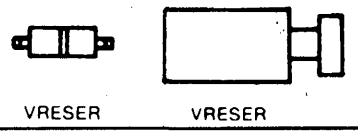


Figure 35 Vacuum Check Valve

DIAGNOSIS

Apply 54 kPa (16 in-Hg) vacuum to "check" side of valve and trap. If vacuum remains above 50.6 kPa (15 in-Hg) for 10 seconds, the valve is acceptable.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Vacuum Reservoir	**9E453**	 VRESER VRESER

DESCRIPTION

The Vacuum Reservoir (Figure 36) stores vacuum and provides "muscle" vacuum. It prevents rapid fluctuations or sudden drops in a vacuum signal such as those seen during an acceleration period.

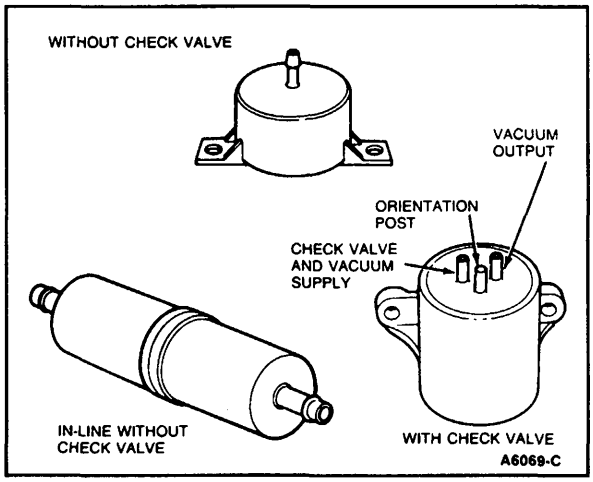


Figure 36 Vacuum Reservoirs

DIAGNOSIS

When charged initially with 15 to 20 in-Hg vacuum, vacuum loss shall not exceed .5 in-Hg in 60 seconds. If it does, replace the reservoir.

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TITLE	BASIC PART NO.	SYMBOL
Functional Diagnosis: Pulse Air Valve	**9A487**	

DESCRIPTION

The Thermactor II (Pulse Air) Control Valve is normally closed. Without vacuum signal from the solenoid, the flow of air is blocked.

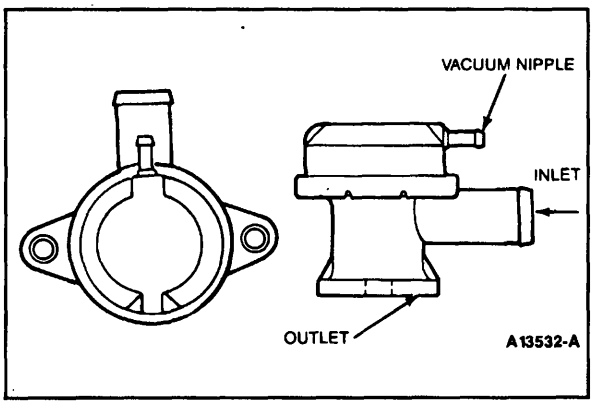


Figure 38 Thermactor II (Pulse Air) Control Valve

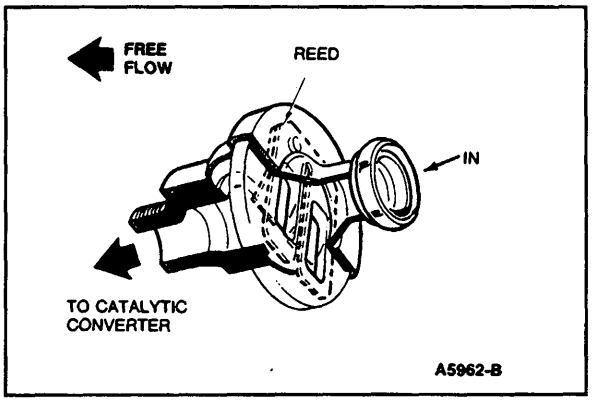


Figure 39 Pulse Air Valve Thermactor II

Functional Check

1. Visually inspect the thermactor system hoses, tubes, control valve(s) and check valve(s) for leaks that may be due to backflow of exhaust gas. If holes are found and/or traces of exhaust gas products are evident, the check valve may be suspect.
2. As shown in the above illustrations, the valves should allow free flow of air in the direction of the arrow only. The valve(s) should check (or block) the free flow of exhaust gas in the opposite direction.
3. Replace the valve if air does not flow as indicated or if exhaust gas backflows opposite of the direction of the arrow.
4. Remove inlet hose.
5. With engine at normal operating temperature and at idle in NEUTRAL air should be drawn into the valve.
6. Remove the vacuum line and air flow should stop.
7. If these conditions are met, valve is operating properly.
8. If these conditions are not met, verify that vacuum is present at the valve and see solenoid valve check or Quick Test if vacuum is not present.
9. If vacuum is present but no air flows, check Pulse Air Check Valve, Silencer Filter, and air cleaner for blocked or restricted passages.
10. If vacuum is present and no blocked or restricted passages are found, replace valve.

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SECTION 11

Fuel Delivery Systems

Contents

Notes, Cautions and Warnings 11-1

Mechanical Fuel Delivery Systems: System Diagnosis 11-3

Electric Fuel Delivery Systems: System Descriptions 11-5

Electric Fuel Delivery Systems: System Diagnosis 11-22

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Notes, Cautions and Warnings

Note

This test is intended to diagnose the following symptoms:

- Cranks normally but won't start
- Starts normally but won't run (stalls)
- Cranks normally but slow to start
- Misses under load
- Hesitates or stalls on acceleration
- Backfire (induction or exhaust)
- Lack of power
- Surges at steady speed
- Poor fuel economy
- Gas smell

Pre-checks:

- Verify battery is fully charged.
- Check for adequate fuel supply in fuel tank.
- Verify fuse/fuse link integrity.
- Inertia switch is set.
- Verify engine at operating temperature, transmission in NEUTRAL or PARK and brakes applied.
- Inspect all hoses, fuel lines and fuel tanks for deformities, kinks and leaks.
- Check fuel pump and fuel line connections for fuel leaks.
- Check fuel pressure regulator CFI/EFI area for fuel leaks.

NOTE: For additional information, refer to Fuel/Engine Group in the Car or Truck Shop Manual.

SPECIAL SERVICE TOOLS

TOOL NO.	DESCRIPTION
014-00447	Fuel Pressure Testing Kit
007-00001	Digital Volt-Ohm Meter (DVOM)
021-00037	Vacuum Tester
059-00008	Vacuum and Pressure Tester
113-00001	Fuel Injector Tester/Cleaner
—	Mechanics Stethoscope

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Notes, Cautions and Warnings

CAUTION

Use care to prevent combustion from fuel spillage. No smoking, open flames or any kind of arcing.

WARNING

Fuel in the fuel system remains under high pressure even when the engine is not running. To avoid injury or fire, release the fuel pressure from the fuel system before disconnecting any fuel line. To release the pressure from the system perform the following:

- **Connect the Rotunda Fuel Pressure Testing Kit, No. 014-00447 or equivalent at the Schrader valve located on the fuel rail, with the Testing Kit valve closed.**
- **Gradually open the Testing Kit valve to relieve fuel pressure in the vehicle fuel system and drain the fuel into a suitable container or return it to the fuel tank.**
- **To avoid unnecessary fuel spillage and fire hazard at any time fuel lines are disconnected, the ignition switch should be in the OFF position unless fuel pump operation is required for test purposes.**

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Mechanical Fuel Delivery Systems: System Diagnosis

MFD

TEST STEP	RESULT ▶	ACTION TO TAKE
MFD1 CHECK FUEL PRESSURE		
• Install fuel pressure gauge at the carburetor. • Reconnect fuel line. • Start and run engine at 1500 rpm for 30 seconds. • With engine at idle, read the fuel pressure gauge. **NOTE: If you are here for a no start, just crank the engine and read the fuel pressure gauge 6.0 psi at 10 second cranking.** • **Is fuel pressure within 6.0-8.0 psi?**	Yes ▶ No ▶	GO to [MFD2]. GO to [MFD3].
MFD2 CHECK FUEL VOLUME		
• Disconnect primary side of ignition coil. • Disconnect fuel line at the carburetor. • Slide a flexible fuel resistant hose onto the disconnected fuel line and hold it into a clear plastic fuel resistant container. • Verify smallest diameter in fuel line is greater than 0.22 inch. • With a remote starter button, crank the engine. • **Is the volume 0.3 pint/10 seconds?** • Save fuel in container for [MFD6].	Yes ▶ No ▶	REPLACE fuel filter and, or SERVICE carburetor. RECONNECT ignition coil. Go to [MFD6].
MFD3 CHECK AUXILIARY FUEL SUPPLY		
• Use an auxiliary fuel supply and route the flexible fuel line under the fender or bumper to the inlet side of the fuel pump. • Repeat Test [MFD1] and [MFD2]. • **Is fuel pressure at least 6.0 psi and fuel volume 0.3 pint/10 seconds?**	Yes ▶ No ▶	RECONNECT the fuel line at the fuel pump. GO to [MFD4]. REPLACE fuel pump and fuel hose.

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Mechanical Fuel Delivery Systems: System Diagnosis

MFD

TEST STEP	RESULT ▶	ACTION TO TAKE
MFD4 CHECK FUEL LINE		
• Disconnect the fuel line at the tank. • Connect auxiliary fuel supply to the fuel line. • Repeat Test **MFD1** and **MFD2**. • **Is fuel pressure at least 6.0 psi and fuel volume 0.3 pint/10 seconds?**	Yes ▶ No ▶	GO to **MFD5**. BLOW OUT fuel line. SERVICE fuel line. REPLACE flexible hoses.
MFD5 CHECK FUEL TANK SENDER UNIT		
• Drain fuel tank, but not completely. • Disconnect fuel return line if applicable. • Disconnect fuel sender unit. • Disconnect evaporative system from fuel tank. • Lower the fuel tank and remove sender unit. • Inspect sender unit for being bent, blocked or rusted through. • **Is fuel sender unit defective?**	Yes ▶ No ▶	REPLACE the fuel sender unit. GO to **MFD6**.
MFD6 CHECK FUEL CONTAMINATION		
• Check remaining fuel in the tank for contamination. • Check the fuel sample from test **MFD2** for contamination. • **Is the fuel contaminated?**	Yes ▶ No ▶	DUMP/FLUSH the fuel tank. BLOW OUT the fuel lines. REPLACE fuel filters. CLEAN out carburetor. Problem may be elsewhere. GO to Section 2.

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Electric Fuel Delivery Systems: System Descriptions

EFD

VEHICLE APPLICATION

F-, E-Series: 4.9L, 5.0L, 5.8L, 7.5L EFI
Bronco: 4.9L, 5.0L, 5.8L EFI
Ranger, Bronco II: 2.3L, 2.9L, 4.0L EFI
Aerostar: 3.0L, 4.0L EFI
Passenger Car: All with EFI/CFI

Types of Systems

Fuel delivery systems using Electronic Fuel Injection (EFI) differ in their design and arrangement, depending upon the vehicle and model year. To clarify understanding and to simplify diagnostic instruction they are classified by Types 1 through 5, as shown in the System Schematics, are listed as follows:

Type 1 Single Tank, Single Pump
Type 2 Single Tank, Dual Pump
Type 3 Dual Tank with Electric Selector Valve
Type 4 Dual Tank with Mechanical Selector Valve/Reservoir
Type 5 Dual Tank with Pump Sender In-Tank-Reservoir (ITR).

For supplying the fuel injectors continuously with clean fuel at a controlled high pressure, all such systems require a high-pressure fuel pump with discharge check valve, a reservoir near the pump inlet, a fine mesh fuel filter, a pressure regulator, a fuel supply and return system, a fuel tank, and a fuel supply manifold or fuel rail connected to the fuel injectors. The Electronic Control Assembly (ECA) controls power input to the fuel delivery system and provides correct timing for the fuel injectors.

Low-Pressure Fuel Pump

All fuel systems with EFI require a high-pressure pump, but some are two-pump systems having a primary, or low pressure in-tank pump for supplying fuel to the reservoir (Types 2, 3, & 4 Systems). The Low-Pressure Pump rests in a sump, or depression, in the fuel tank. A nylon screen protects the low-pressure pump inlet from contaminating particles, but allows the passage of small amounts of water which may accumulate in the fuel tank sump. When dual tanks are used, each tank is equipped with its own low-pressure pump, making a total of three pumps in the system, two low-pressure and one high-pressure.

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Electric Fuel Delivery Systems: System Descriptions

EFD

High-Pressure Fuel Pump

Type 1 Systems use a single pump, wherein the low-pressure in-tank pump is not used, but is replaced by a High-Pressure In-Tank Pump. It is capable of pumping in excess of 60 liters (16 gal.) of fuel per hour at a working pressure of 270 kPa (39.2 psi) and has an internal pressure relief valve, set to 850 kPa (123 psi) to protect against over-pressure due to fuel flow restriction. It also has a discharge check valve (to maintain system pressure during shutdowns and to minimize starting problems) and an inlet screen for protection.

Types 2, 3, and 4 Systems use two pumps with a low-pressure in-tank pump, a High-Pressure In-Line Pump mounted inside the left frame rail and a reservoir in-line between the two. Other High-Pressure Pumps used in these systems are 80 liter (21 gal) and 100 liter (26 gal) minimum per hour capacities, depending upon the vehicle application. These pumps also have internal relief valve and discharge check valve.

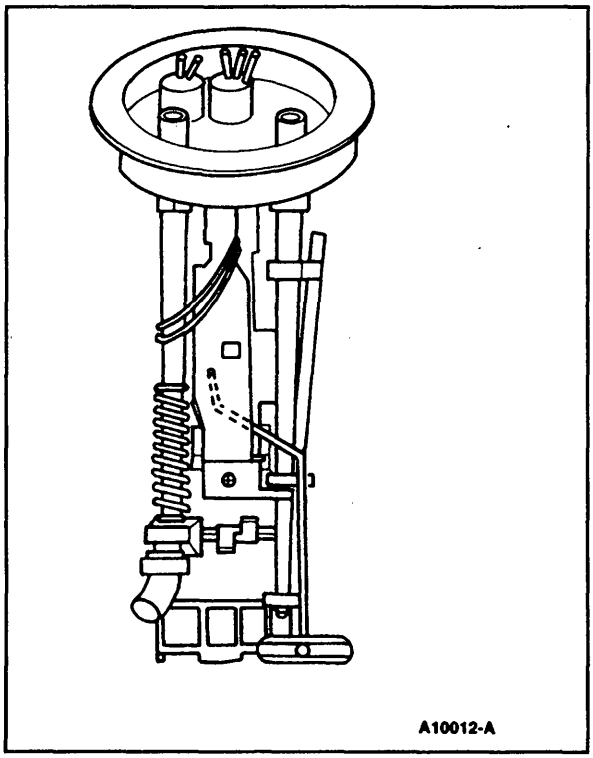


Figure 1 High-Pressure and In-Tank Fuel Pump

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Electric Fuel Delivery Systems: System Descriptions

EFD

Reservoirs and Filters

Fuel reservoirs are used to prevent fuel flow interruptions during extreme vehicle maneuvers with low tank fill levels. In-line reservoirs (Types 2, 3, & 4) are frame mounted and are always located between the low and high-pressure pumps. If the high-pressure pump is located in-tank (Type 1 and 5), the reservoir is either molded or welded into the tank or into the fuel pump and sender plastic housing. In-line reservoirs are of two types, the standard single function design used with Types 2 and 3 Systems or the dual function design having the integral mechanical selector valve (Type 4 System). The standard single function reservoir, used on Type 2 and 3 systems, may contain a fine mesh in-line filter located between the high-pressure pump and the fuel rail. Simultaneously, a fine screen was added to the high-pressure pump inlet.

Selector Valves (Dual Tank Only)

Selector valves are used on F- and E-series and on Ranger vehicles equipped with dual fuel tanks (Types 3 and 4 Systems). A driver operated selector switch controls the Selector Valve for switching the fuel supply from one tank to the other. Two types of valves are used, electrical (Type 3) or mechanical (Type 4). The electric valve, when energized by the selector switch, moves its valve to shut off the supply and return lines from one tank and to open the lines to the other tank. Simultaneously the in-tank pump and fuel level sender are turned off for one tank and energized for the other. The Mechanical Selector Valve is contained within the six-port reservoir assembly (the so-called "dual function reservoir"), is identified in these diagnostics as "Mechanical Selector Valve/Reservoir", and is used in the Type 4 system only. It switches fuel supply and return lines from one tank to the other in response to fuel pressure from in-tank pumps acting on its actuating diaphragm. The diaphragm switches tank connections under 2 psi of fuel pressure acting on its upper side for the front tank and on its lower side for the rear tank. Good valve functioning depends upon proper operation of the in-tank low-pressure pumps. In all dual tank vehicles, excess fuel not used by the engine is returned to the same tank from which it was pumped.

Dual Tank with Pump Sender In-Tank-Reservoir (ITR) Only

High Pressure Fuel Pump

Type 5 systems use a High Pressure Fuel Pump inside the fuel tank similar to a Type 1 pump. Type 5 systems have a reservoir built onto the pump and sender assembly instead of being part of the tank. In the event of a two tank system, the sender assembly handles the switching of the High Pressure Fuel through internal valves. If you have a type 5 system with two tanks and one tank overfills during use (return line returns fuel to wrong tank) it will be necessary to change the pump and sender unit in the tank that overfills. The fuel pump is capable of pumping in excess of 125 liters (33 gal.) of fuel per hour at a working pressure of 270 kPa (39.2 psi). These pumps also have internal pressure relief and discharge check valves.

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Electric Fuel Delivery Systems: System Descriptions

EFD

Shuttle Selector Valve

The Shuttle Selector Valve opens the return line to the tank when the diaphragm force, resulting from the fuel pressure applied to the shuttle diaphragm, exceeds the opposing spring force. Thus, the return flow is directed to the appropriate tank on vehicles equipped with dual tanks.

Supply Check Valve

The Supply Check Valve, which is normally closed, opens when the outlet pressure from the energized pump exceeds the opposing check valve spring force. When the pump is de-energized (i.e., engine is shutoff), the supply check valve closes to maintain pump prime and fuel supply line pressure.

Venturi Jet Pump

A portion of the high pressure flow from the pump is diverted to operate the Venturi Jet Pump. The Venturi Pump draws fuel from the tank into the ITR reservoir to augment the engine return flow. This process ensures an adequate fuel supply to the pump during extreme vehicle maneuvers and steep vehicle attitudes with low-tank fill levels.

The inlet of the Venturi Pump has a nylon filter on it to prevent dirt and other particulate matter from entering the system. Any water accumulation in the fuel tank can pass through the filter without restriction.

NOTE The ITR is not a separately serviceable component.

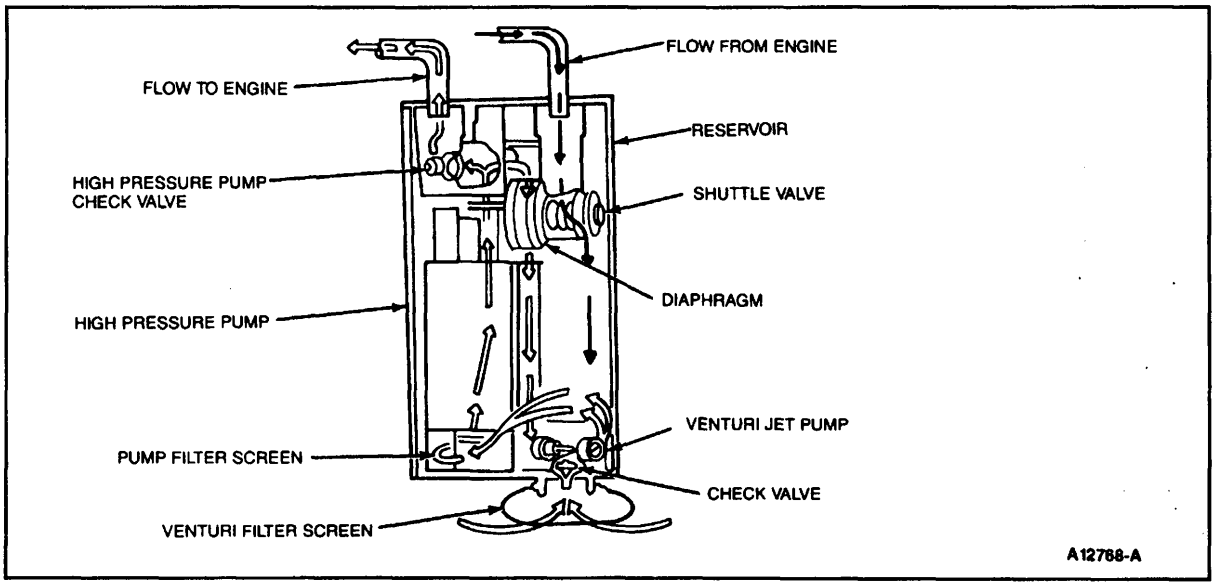


Figure 2 Pump Sender In-Tank-Reservoir (ITR) Components and Flow Path

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Electric Fuel Delivery Systems: System Descriptions

EFD

Fuel Pressure Regulator — EFI System

The Fuel Pressure Regulator (Figure 3) is attached to the fuel supply manifold assembly down stream of the fuel injectors. It regulates the fuel pressure supplied to the injectors. The regulator is a diaphragm-operated relief valve. One side of the diaphragm senses fuel pressure and the other side is subjected to intake manifold vacuum. The nominal fuel pressure is established by a spring preload applied to the diaphragm. Balancing one side of the diaphragm with manifold vacuum maintains a constant fuel pressure drop across the injectors. Fuel in excess of that used by the engine is bypassed through the regulator and returns to the fuel tank.

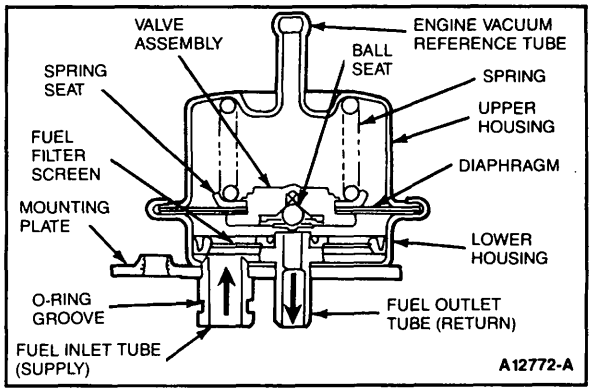


Figure 3 Fuel Pressure Regulator

Test Point

A pressure test point, equipped with a Schrader fitting, is provided in the engine fuel rail for the purpose of relieving pressure in the fuel system and for measuring the injector supply pressure for service and diagnostic work. Refer to Notes, Cautions and Warnings.

Fuel Pump Circuit Operation

When the ignition is switched to the ON position, it turns the EEC Power Relay on. The EEC Power Relay provides power to the Electronic Control Assembly (ECA) and the control side of the fuel pump relay. Power for the fuel pump(s) is supplied through a fuse link or high current fuse attached to the starter solenoid (battery side). From the fuse link or high current fuse current flow is through the fuel pump relay and inertia switch to the fuel pumps(s). The inertia switch is a safety device used to shut off the fuel pump(s) in the event of a collision. If the inertia switch is "tripped" it must be reset by depressing the white or red button on the top of the switch. The fuel pump relay is controlled by the ECA.

When the ignition switch is turned to the ON position, the fuel pump(s) will operate. If the ignition switch is not turned to the START position the ECA will shut the fuel pumps off after approximately one second. The ECA will operate the fuel pump(s) when the ignition is in the START position to provide fuel while cranking.

After the engine starts, the ECA will continue to operate the fuel pump(s) unless the engine stops or engine speed drops below 120 rpm, or the inertia switch is "tripped".

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Electric Fuel Delivery Systems: System Descriptions

EFD

Inertia Switch

The Inertia Switch (Figure 4) is used in conjunction with an electric fuel pump. The purpose of the Inertia Switch is to shut off the fuel pump in the event of an accident. It consists of a steel ball held in place by a magnet. When a sharp impact occurs, the ball breaks loose from the magnet, rolls up a conical ramp and strikes a target plate which opens the electrical contacts of the switch and thereby shuts off the electric fuel pump. Once the switch is open, it must be manually reset before restarting the vehicle. The location of the switch is discussed in the Owner's Manual.

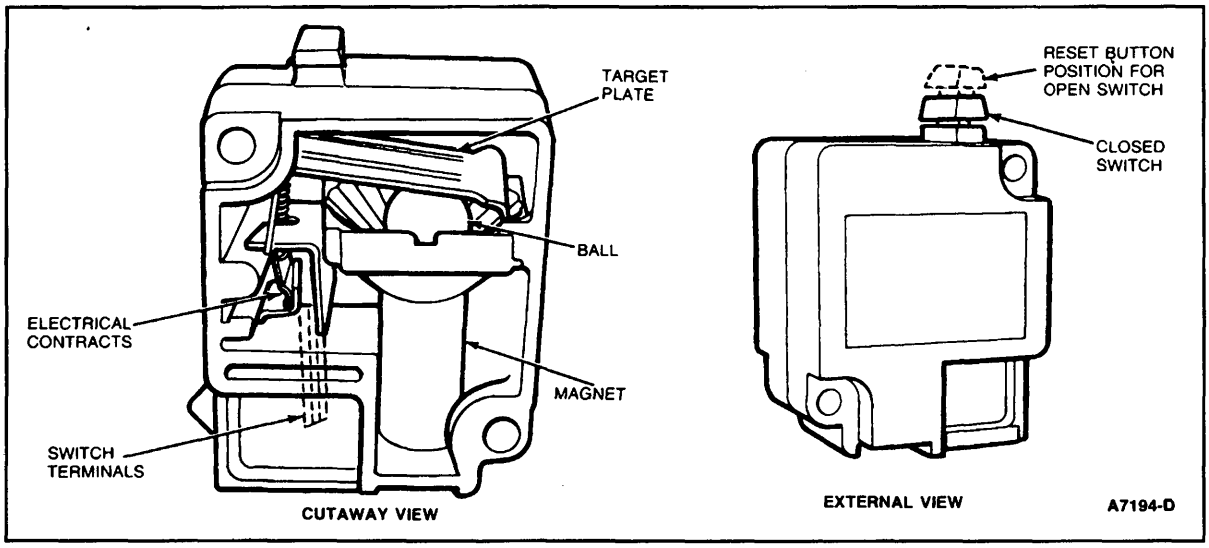


Figure 4 Inertia Switch

Reset Instructions

1. Turn ignition to OFF.
2. Check for leaking fuel in the engine compartment, fuel lines and tank(s).
3. If no fuel leak is apparent, reset the switch by pushing the reset button on the top of the switch (Refer to Owner's Manual).
4. Turn ignition switch to START for a few seconds, then to OFF.
5. Again, check for leaking fuel.

WARNING

IF YOU SEE OR SMELL GASOLINE AT ANY TIME OTHER THAN DURING FUELING, DO NOT RESET THE SWITCH.

Functional Check

Push down on the reset button to make sure the switch is closed.

Use DVOM, Rotunda 007-00001 or equivalent, with LOS button On and measure voltage across both terminals of the inertia switch. If DVOM reading is greater than 0.3V, replace the inertia switch.

NOTE: In the closed position, the button can be depressed an additional 1/16-inch against a spring. This is a normal condition and does not adversely effect the switch operation.

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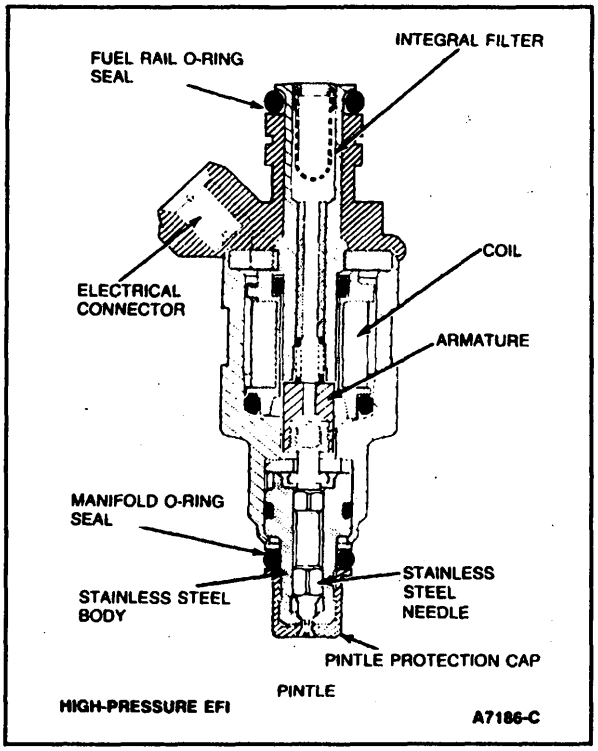
Electric Fuel Delivery Systems: System Descriptions

EFD

Fuel Injector

The Fuel Injector (Figure 5) is a solenoid operated valve that meters fuel flow to the engine. The injector is opened and closed a constant number of times per crank revolution. The amount of fuel is controlled by the length of time it is held open.

The injector is normally closed and is operated by a signal from the Electronic Engine Control (EEC) module.



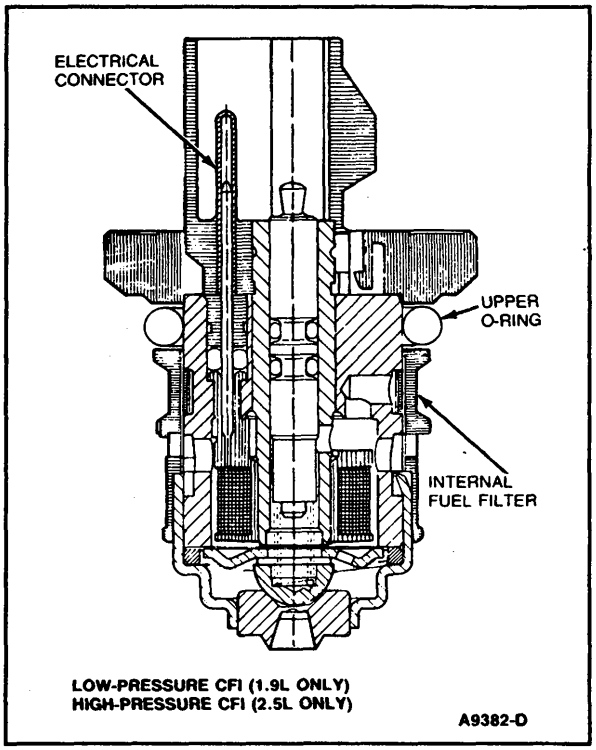


Figure 5 Fuel Injectors

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Electric Fuel Delivery Systems: System Descriptions

EFD

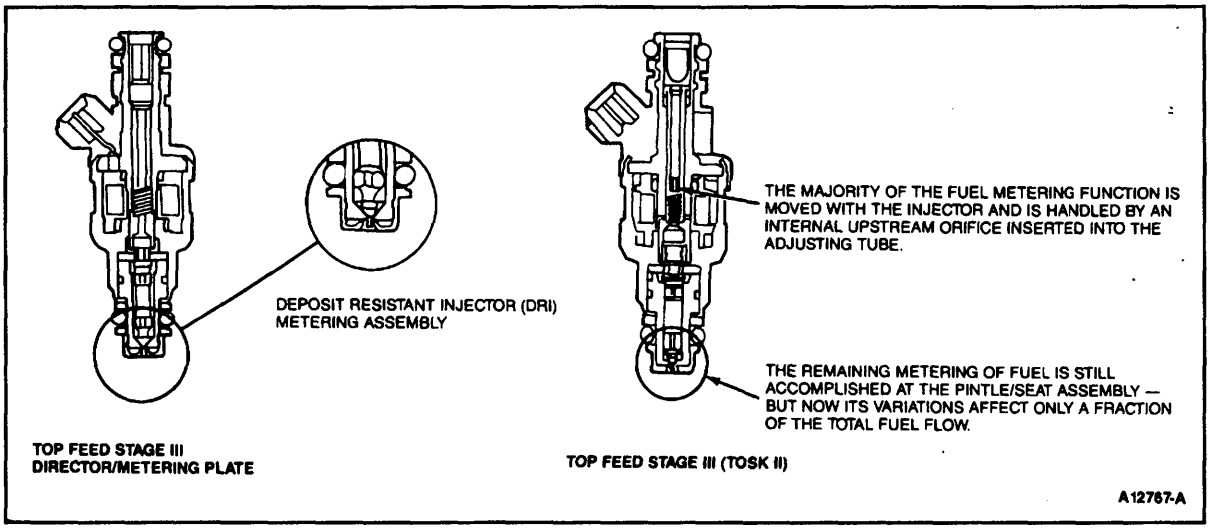


Figure 6 Deposit Resistant Injector (DRI) Designs

NOTE: Low-pressure injectors have low coil resistance. High-pressure injectors can have either high or low coil resistance. Function can be adversely affected by using the wrong injectors.

NOTE: Do not apply battery voltage directly to the injector electrical connector terminals. The solenoid may be damaged internally in a matter of seconds.

For EFI injectors, refer to Section 4, Fuel Injector Testing/Cleaning.

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Electric Fuel Delivery Systems: System Descriptions

EFD

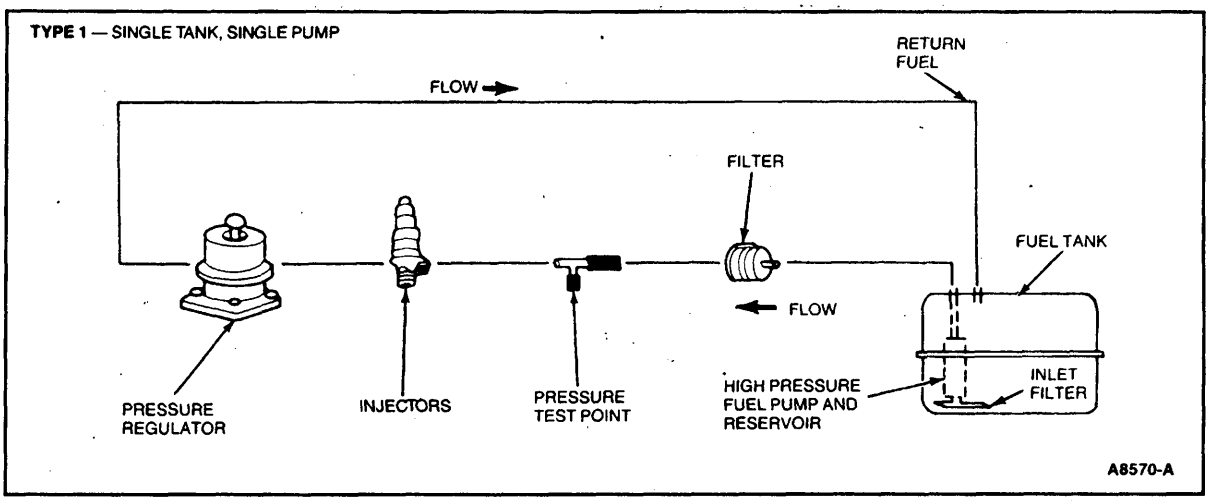


Figure 7 Type 1 — Single Tank, Single Pump

VEHICLE APPLICATION
Passenger Car EFI/CFI.
Aerostar, EFI.
Ranger, Bronco II, 1989 and later model years, and F-Series/Bronco 90 model year.

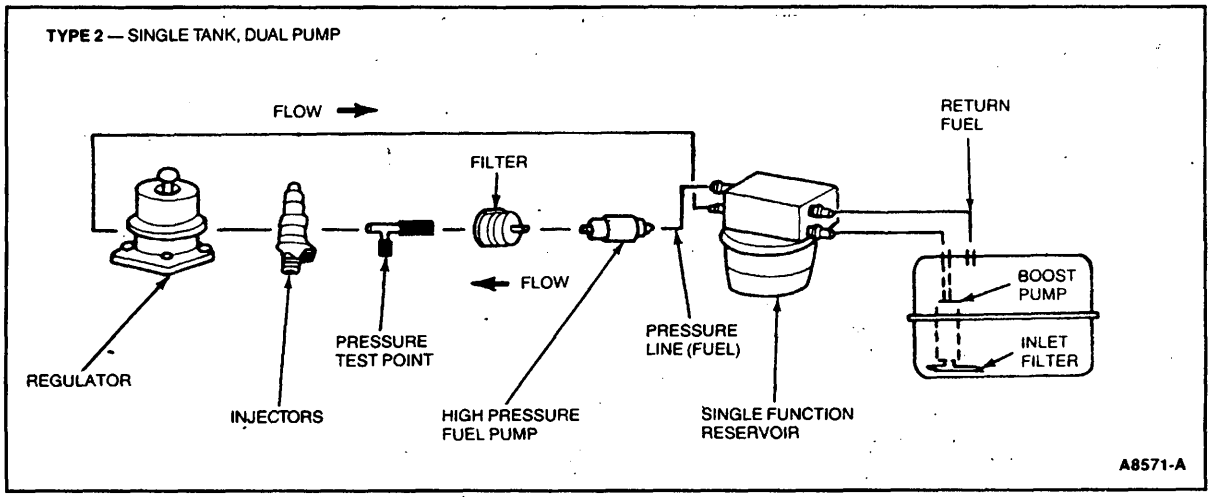


Figure 8 Type 2 — Single Tank — Dual Pump

VEHICLE APPLICATION
F-Series/Bronco, 1985-89 model years, EFI.
Ranger/Bronco II, 1985-89 model years, EFI.

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Electric Fuel Delivery Systems: System Descriptions

EFD

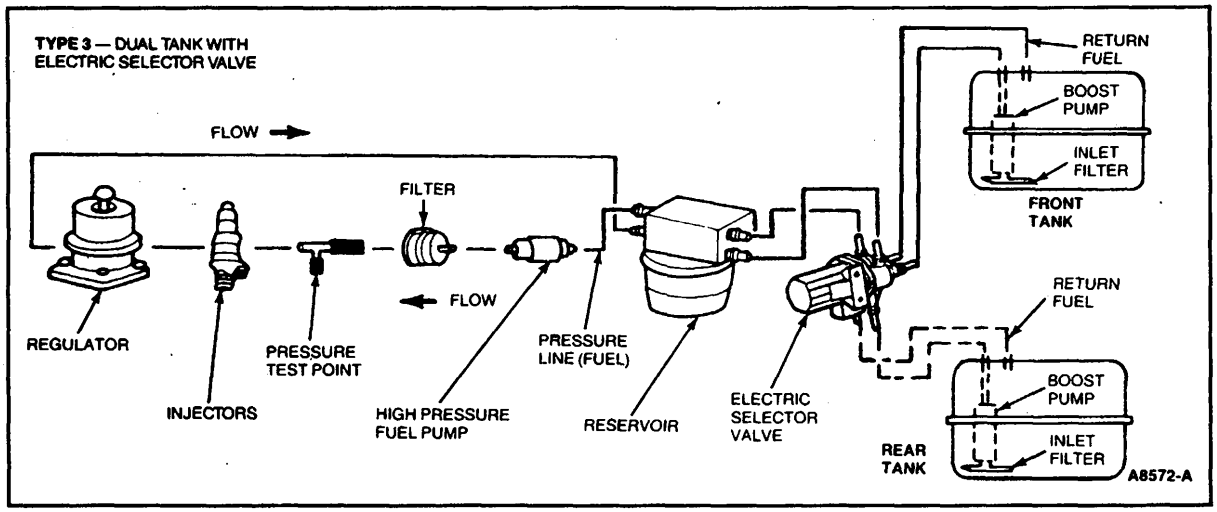


Figure 9 Type 3 — Dual Tank with Electronic Selector Valve

VEHICLE APPLICATION

F-Series 1985 model year, EFI.
E-Series 1986-87 model years, EFI.
Ranger 1985-88 model years, EFI.

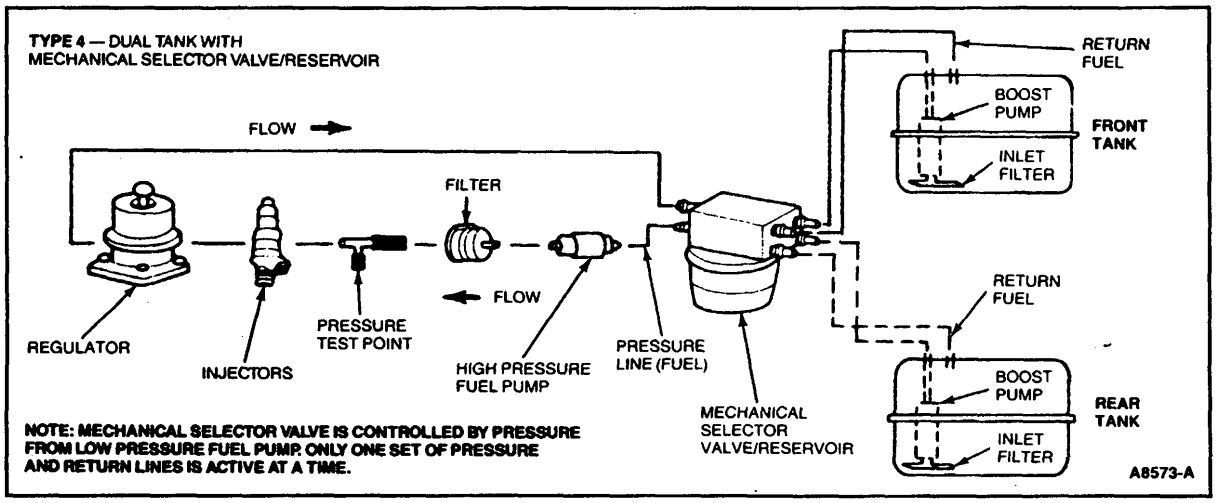


Figure 10 Type 4 — Dual Tank with Mechanical Selector Valve/Reservoir

VEHICLE APPLICATION

E-Series 1988 and later model years, EFI.
F-Series 1986-89 model years, EFI.

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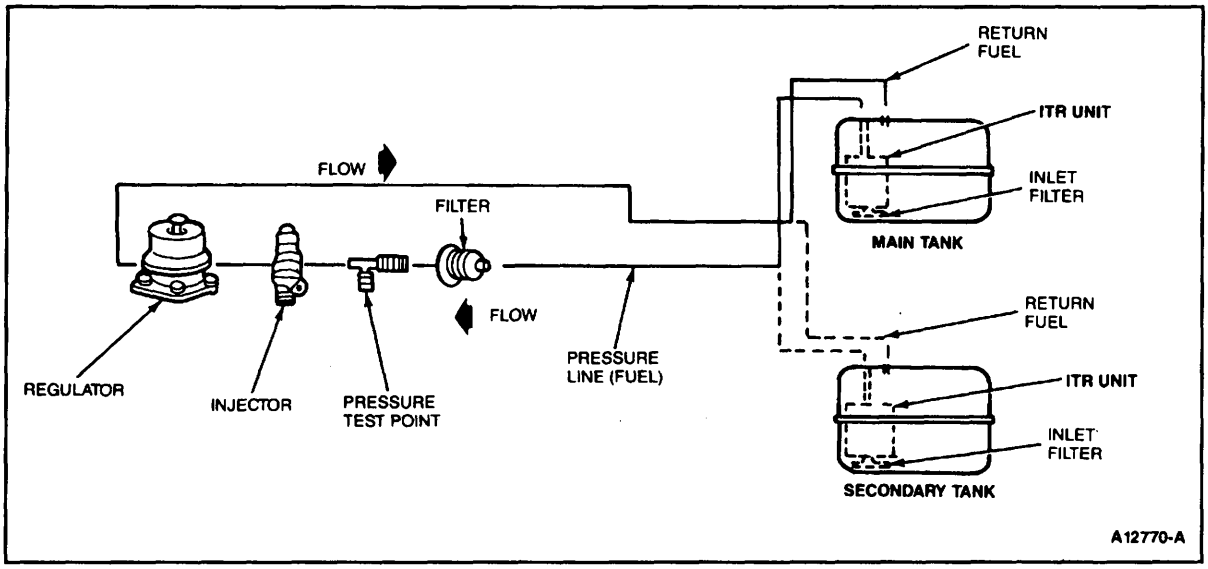


Figure 11 Type 5 — Dual Tank, Single Pump System In-Tank-Reservoir (ITR) Only

VEHICLE APPLICATION

F-Series — 1990 Model Year EFI

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Electrical Schematic

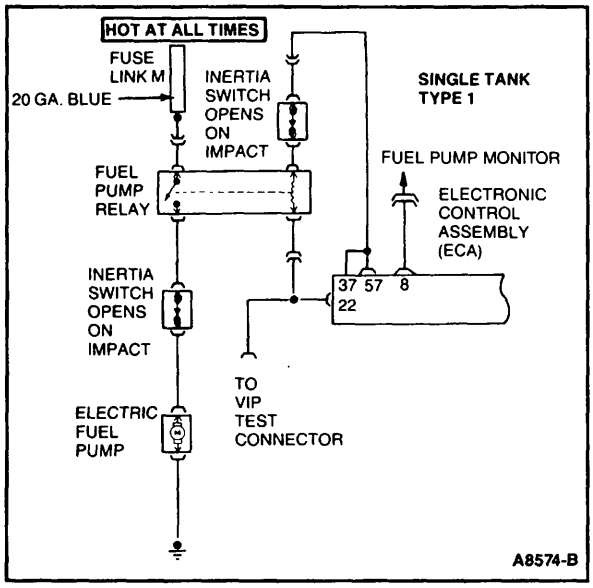


Figure 12 Type 1 — Single Tank

VEHICLE APPLICATION

Passenger car EFI/CFI, except 3.0L SHO

Aerostar, 1986 1/2 and later model years, EFI

Ranger/Bronco II, 1989 model year, EFI

* Inertia switch located in line with fuel pump on 1989 Bronco II and 1986 1/2-89 Aerostar.

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Electrical Schematic

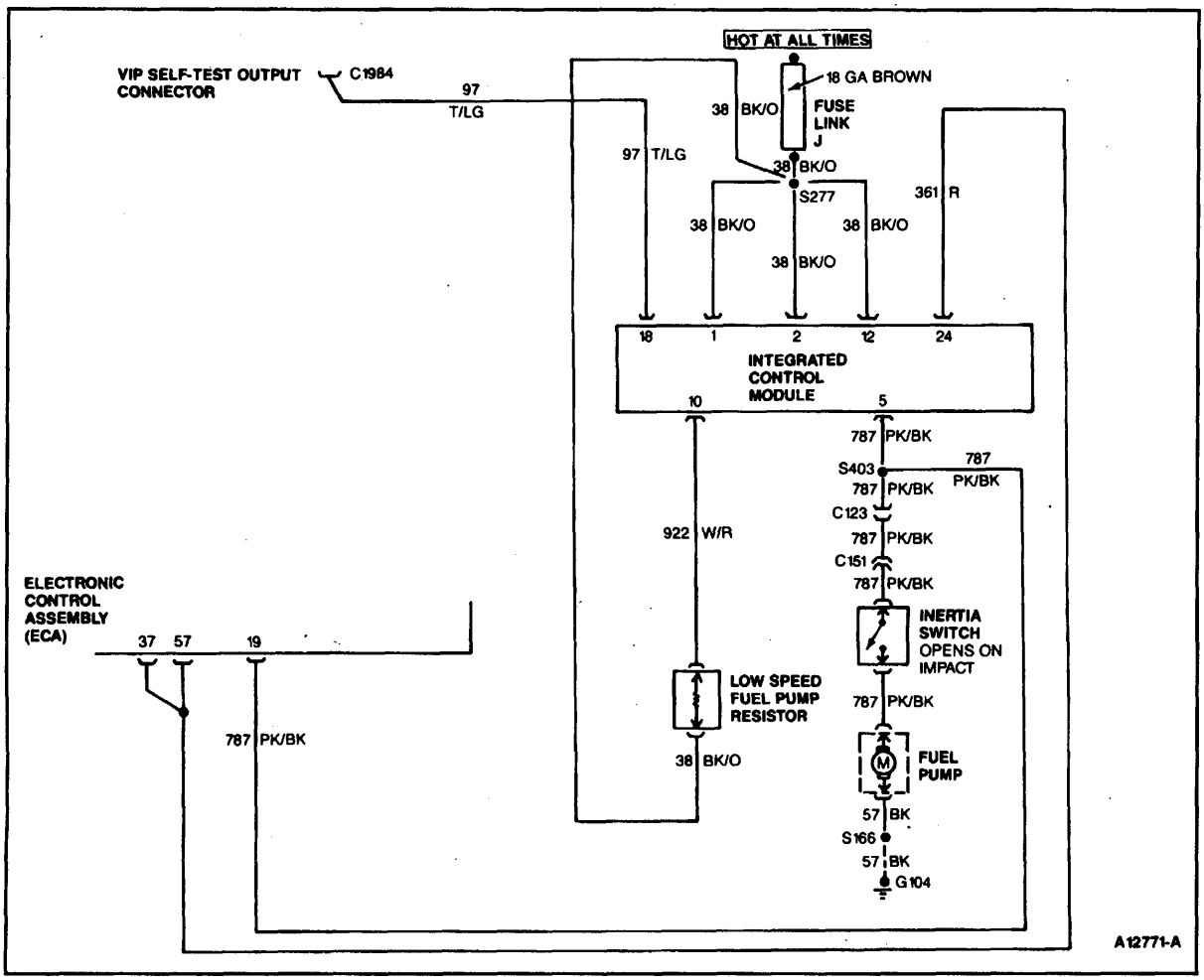


Figure 13 Type 1 — Single Tank

VEHICLE APPLICATION

3.0L SHO Taurus/Sable 1990.

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Electrical Schematic

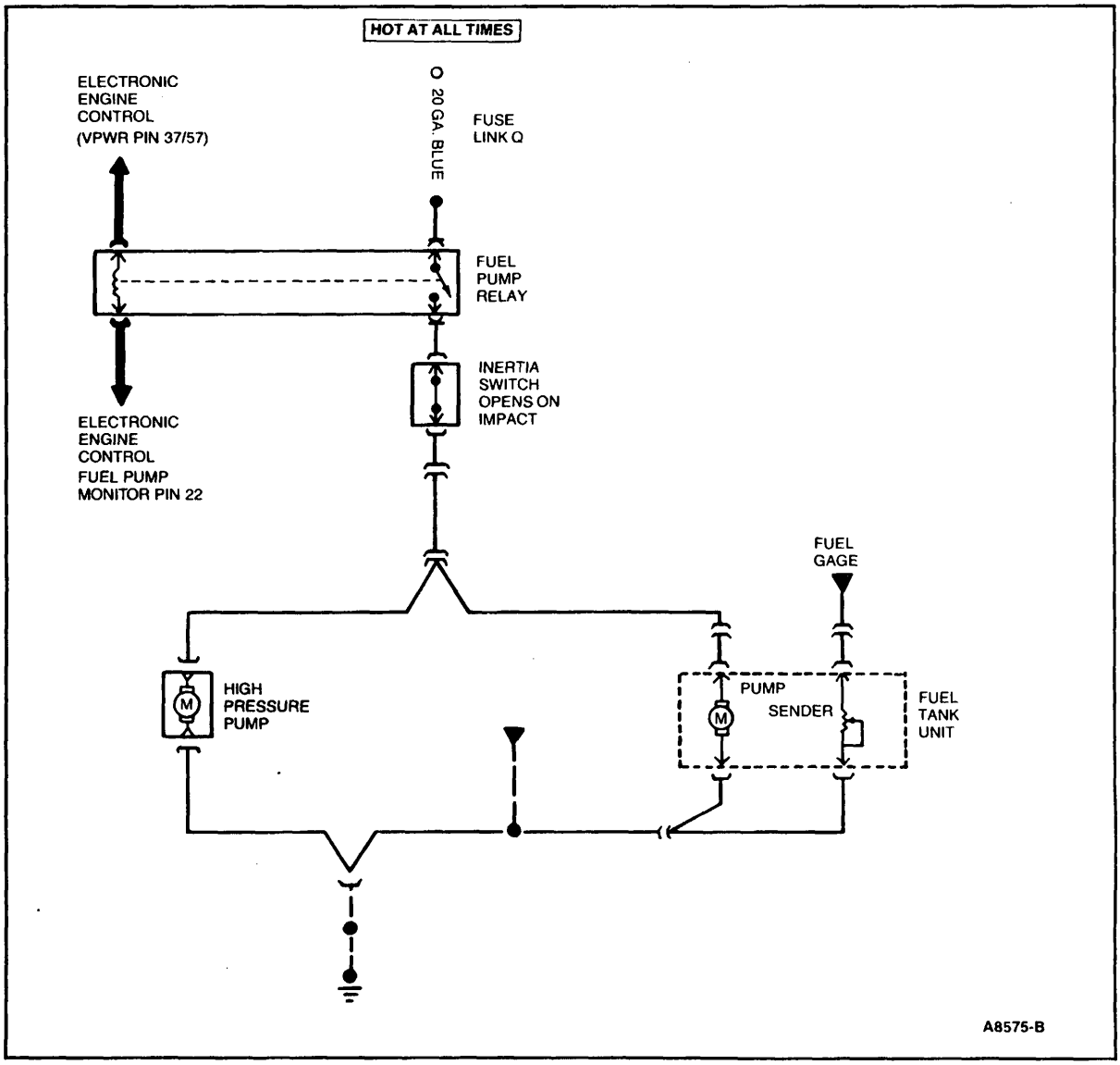


Figure 14 Type 2 — Single Tank

VEHICLE APPLICATION

E-Series, 1986-89 model year, EFI.
F-Series, Bronco, 1985-89 model years, EFI.
Ranger, 1985-1989 model years, EFI.
Aerostar, early 1986 model year, EFI.
Bronco II 1985-88 model year, EFI.

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Electrical Schematic

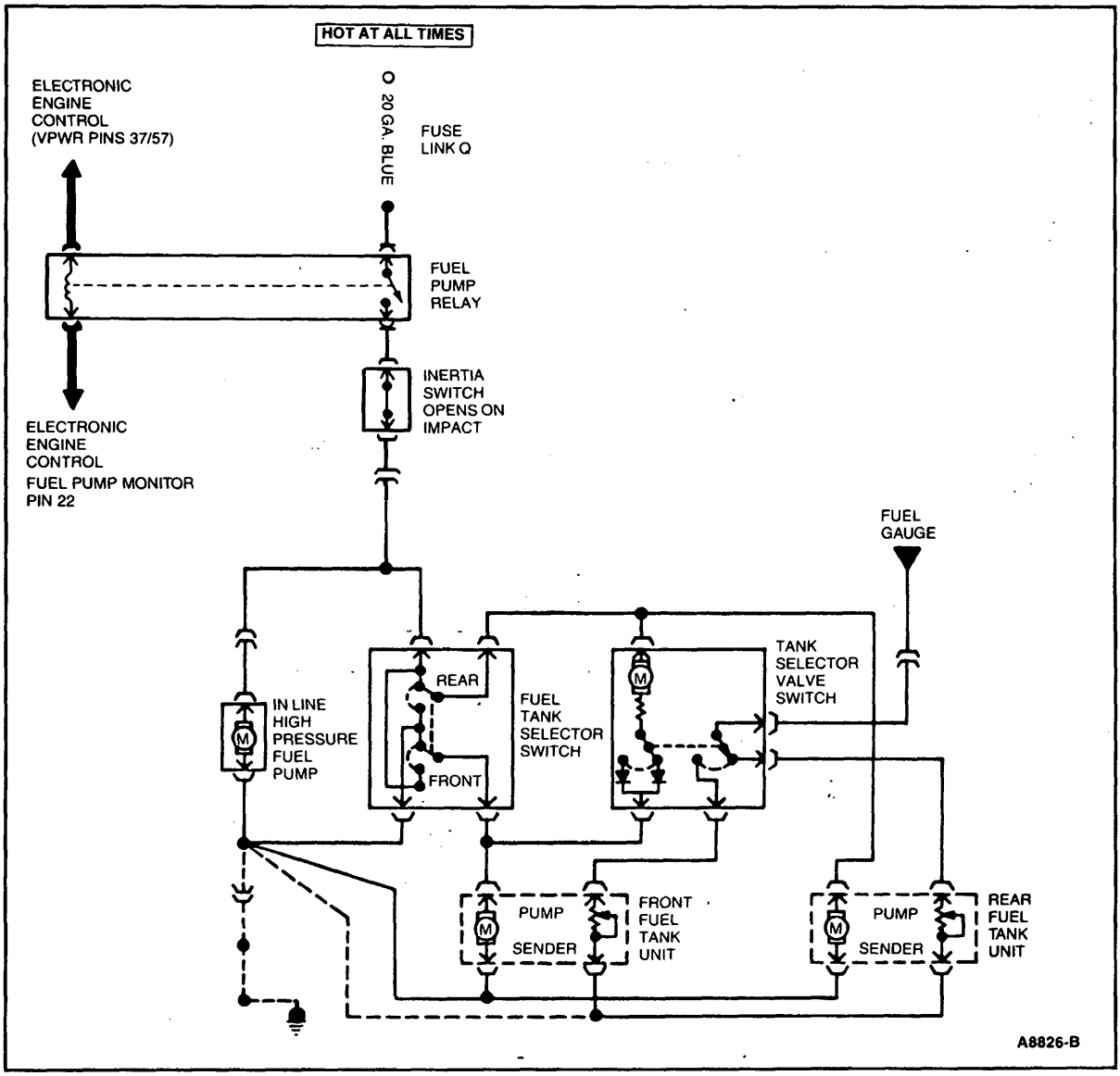


Figure 15 Type 3 — Dual Tanks

VEHICLE APPLICATION

F-Series 1985 model year, EFI.
E-Series 1986-87 model years, EFI.
Ranger 1985-88 model years, EFI.

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Electrical Schematic

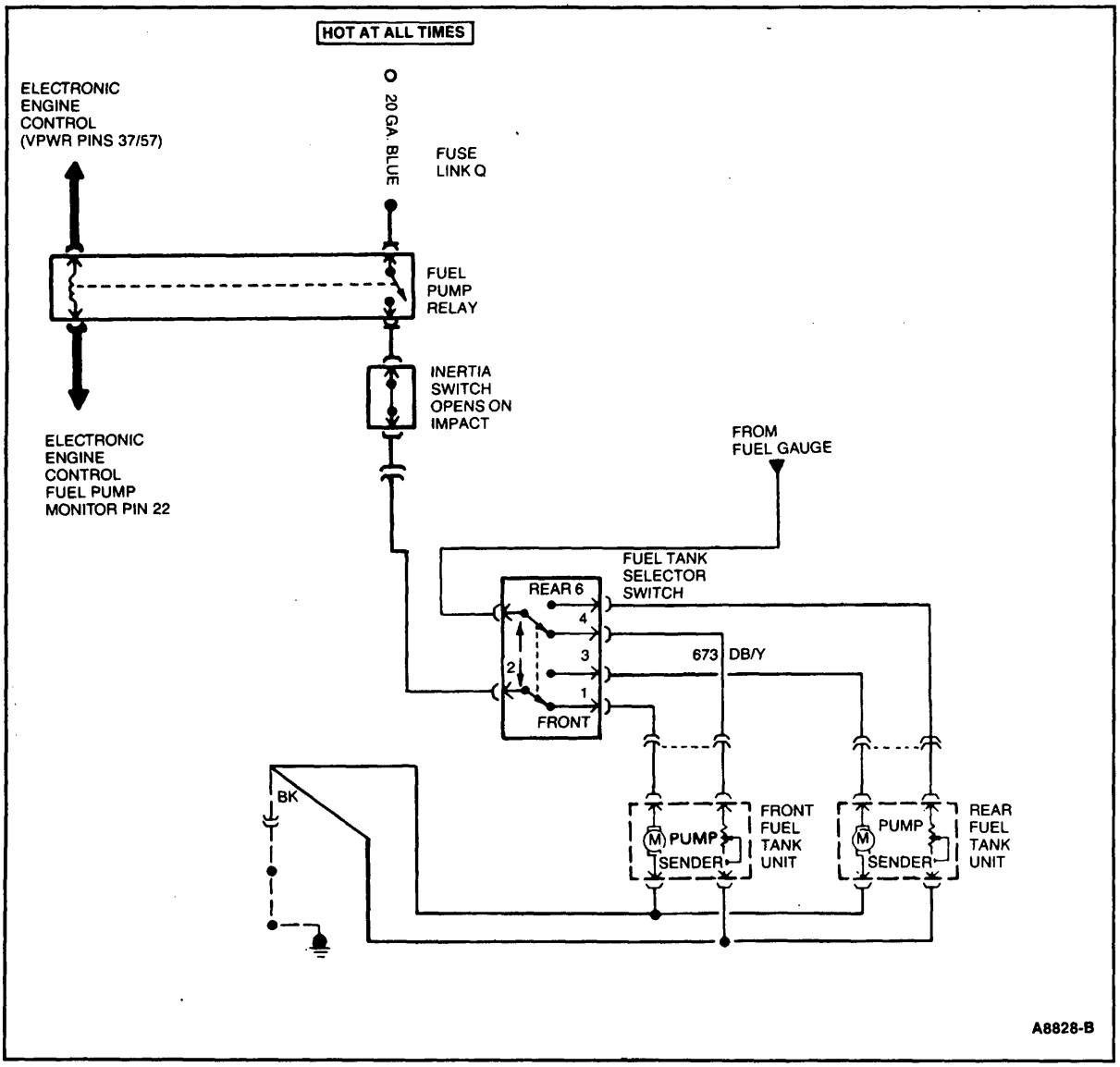


Figure 16 Type 4 — Dual Tanks

VEHICLE APPLICATION

E-Series 1988 and later model years, EFI.

F-Series 1986 to 1989 model years, EFI.

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Electrical Schematic

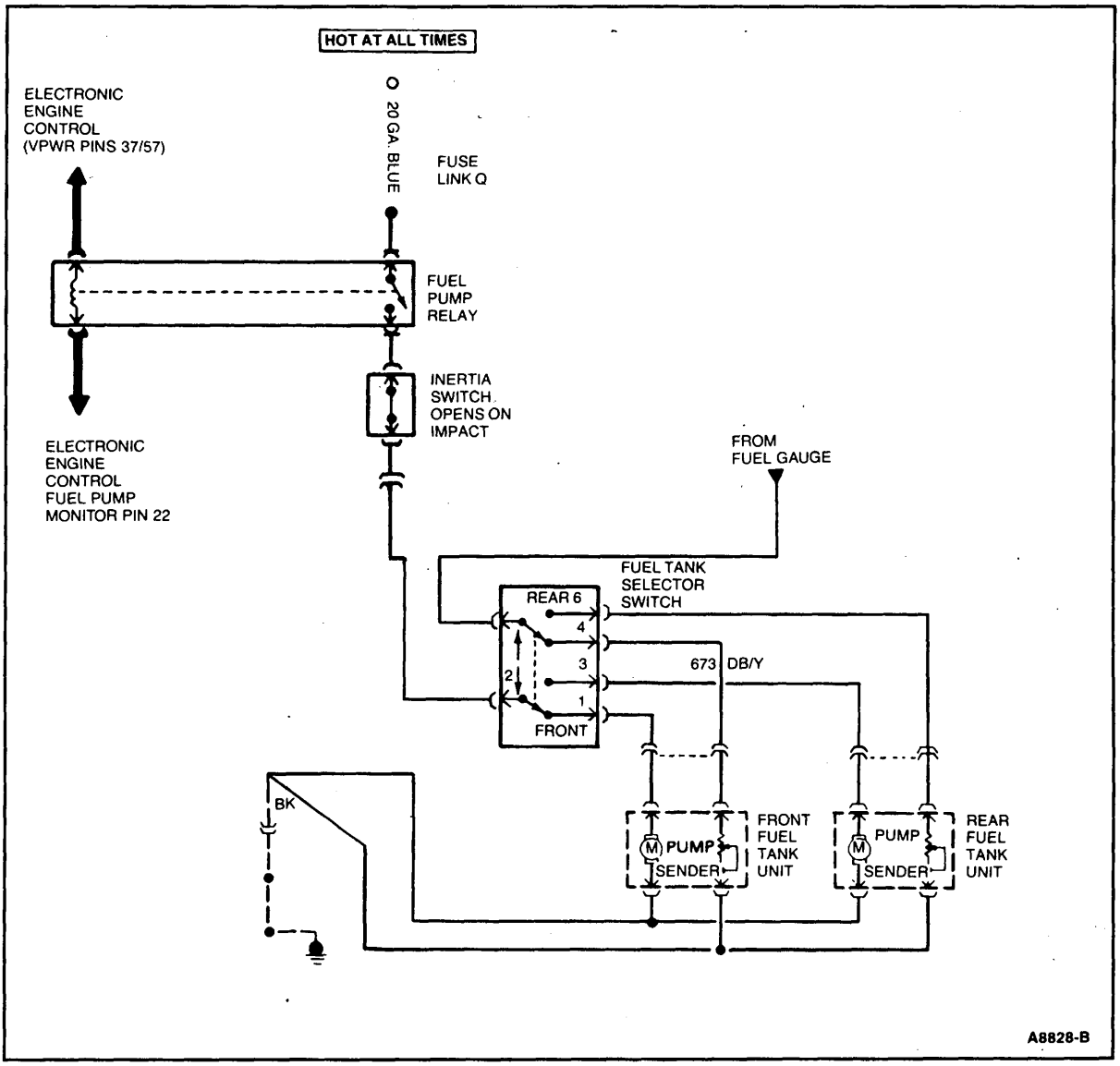


Figure 17 Type 5 — Dual Tanks

VEHICLE APPLICATION

F-Series 1990 model year, EFI.

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FUEL PRESSURE SPECIFICATION TABLE

	1990 Passenger Car Engines				
	1.9L/2.5L CFI	2.3L HSC EFI	3.0L SHO SEFI	3.8L SC SEFI	All Other Applications
ENGINE RUNNING	13 – 17 PSI 90 – 120 kPa	45 – 60 PSI 310 – 415 kPa	28 – 33 PSI 193 – 227 kPa	30 – 40 PSI 210 – 280 kPa	30 – 45 PSI 210 – 310 kPa
KEY ON ENGINE OFF	13 – 17 PSI 90 – 120 kPa	50 – 60 PSI 345 – 415 kPa	30 – 45 PSI 210 – 310 kPa	35 – 40 PSI 240 – 280 kPa	35 – 40 PSI 240 – 280 kPa

	1990 Light Truck Engines	
	4.9L EFI	All Other Applications
ENGINE RUNNING	45 – 60 PSI 310 – 415 kPa	30 – 45 PSI 210 – 310 kPa
KEY ON ENGINE OFF	50 – 60 PSI 345 – 415 kPa	35 – 45 PSI 240 – 310 kPa

NOTE: Except for CFI systems; maximum fuel pressure is obtainable at WOT or the vacuum hose removed from the fuel pressure regulator.

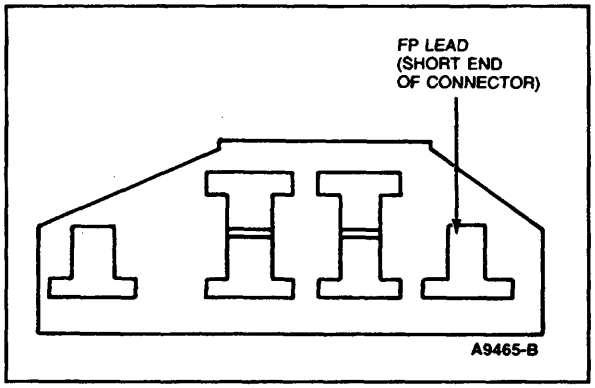


Figure 1 Self Test Connector

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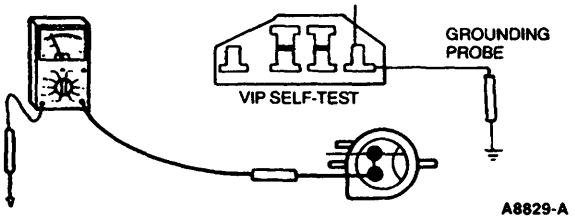
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD1 SYSTEM INTEGRITY CHECK (ALL TYPES)		
• Visually inspect the complete fuel delivery system, including fuel tank lines, reservoir, filter, pumps, injectors, pressure regulator, battery, electrical lines and connectors for leakage, looseness, cracks, pinching, kinking, corrosion, grounding, abrasion, or other damage caused by accident, collision, assembly or usage. • Verify that the battery is fully charged. • Check the engine fuse integrity. • Check for sufficient fuel in the fuel tanks. • **Is the system free of any evidence of leakage, damage, or any other cause for concern?** **WARNING** **BEFORE SERVICING OR REPLACING ANY COMPONENTS IN THE FUEL SYSTEM, REDUCE THE POSSIBILITY OF INJURY OR FIRE, AS OUTLINED UNDER "NOTES, CAUTIONS AND WARNINGS".**	Yes ▶ No ▶	GO to EFD2. REPAIR or REPLACE as required.
EFD2 FUEL INJECTION PRESSURE TEST (ALL TYPES)		
• Key Off • Ground the fuel pump lead of the Self-Test connector (Figure 1 on next page) through a jumper at the FP lead. • Before releasing fuel system pressure at the Schrader fitting, observe the Warning Instructions to avoid fuel spillage and injury. • Install the fuel pressure tester. • Key On, Engine Off, to operate the fuel pump(s). • Verify that the observed fuel pressure is within specified limits for the engine being checked. • Specification: Fuel System Pressure (Key On, Engine Off) Refer to "Fuel Pressure Specification Table." • **Is the fuel pressure within specification?**	Yes ▶ No ▶	For type 1 or 5: GO to EFD47. For all other types: GO to EFD40. If zero, GO to EFD3. If low, GO to EFD26. If high, GO to EFD38.

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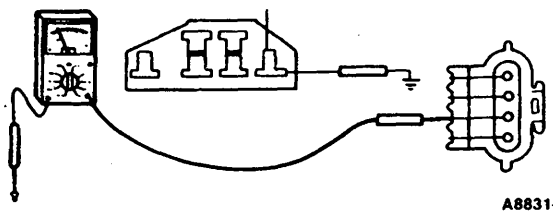
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD3 VERIFICATION OF SYSTEM TYPE		
• Verify if vehicle is a single pump system (Type 1) or dual pump (types 2, 3, 4, 5) system. Type 1 - Single Tank, Single Pump. Type 2 - Single Tank, Dual Pump. Type 3 - Dual Tank, Dual Pump Electrical Selector Valve. Type 4 - Dual Tank, Dual Pump Mechanical Selector/Reservoir. Type 5 - Dual Tank, Single Pump (ITR)	Single Pump (Type 1) ▶ Dual Pump (Types 2, 3, 4) ▶ Dual Tank Single Pump (Type 5) ▶	GO to EFD16 . GO to EFD4 . GO to EFD6 .
EFD4 VOLTAGE CHECK AT H.P. PUMP (TYPES 2, 3, 4)		
• Key Off. • Battery fully charged. • Ground the fuel pump lead of the VIP Self-Test connector as shown. • Key On, Engine Off. • Disconnect electrical high-pressure fuel pump at connector. • DVOM on 20 volt scale. • Measure the voltage on the harness side as shown. • **Is the voltage greater than 10.5 volts?** 	Yes ▶ No ▶	GO to EFD5 . GO to EFD19 .

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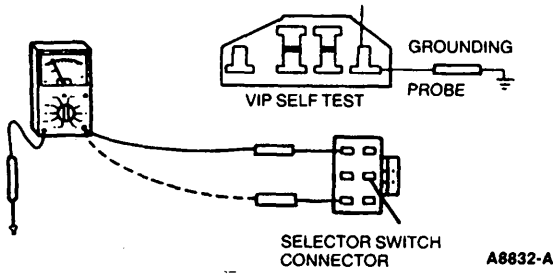
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD5 HIGH PRESSURE PUMP GROUND CHECK (TYPES 2, 3, 4)		
• Key Off. • Disconnect high-pressure pump at connector. • DVOM on 200 ohm scale. • Measure the resistance from the black wire to ground as shown. • **Is the resistance less than 5 ohms?**  A8830-A	Yes ▶ No ▶	Go to EFD6. REPAIR black wire from high-pressure pump to ground as required.
EFD6 LOW PRESSURE PUMP VOLTAGE CHECK (TYPES 2, 3, 4, 5)		
• Battery fully charged. • Ground the fuel pump lead of the VIP Self Test connector as shown. • Key On, Engine Off. • Place selector switch in "F" position if equipped with dual tank. • Disconnect the front fuel tank electrical connector. • DVOM on 20 volt scale. • Measure the voltage on the power supply lead to fuel pump as shown. • **Is the voltage greater than 10.5 volts?** • Repeat procedure with selector switch in "R" position and measure voltage at rear tank sender/ pump unit connector.  A8831-A	Yes ▶ No ▶	GO to EFD9. For type 4 or 5, GO to EFD7. For type 3, GO to EFD12. For type 2, REPAIR wire from low pressure fuel pump to inertia switch as required.

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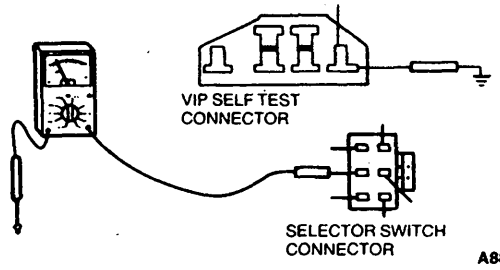
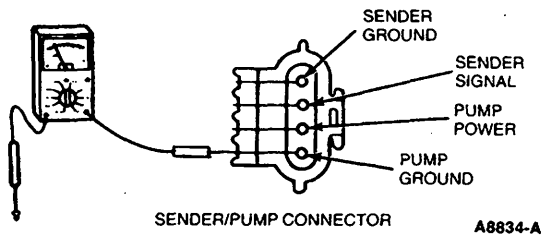
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD7 VOLTAGE CHECK AT SELECTOR SWITCH (TYPE 4 OR 5)		
• Key Off. • Battery fully charged. • Ground fuel pump lead of the VIP Self-Test connector as shown. • Key On, Engine Off. • Place selector switch in "F" position • DVOM on 20 volt scale. • Measure voltage at pin 1 of the selector switch as shown. • **Is the voltage greater than 10.5 volts?** • Repeat with selector switch in "R" position for AFT axle tank and measure voltage on Pin 3 as shown.  	Yes ▶ No ▶	REPAIR wire from selector switch to front tank pump. GO to **EFD8** .

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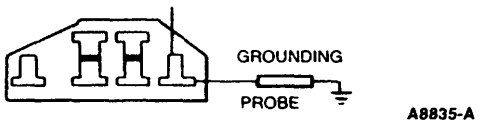
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD8 VOLTAGE CHECK OF SUPPLY TO SELECTOR SWITCH (TYPE 4 OR 5)		
• Key Off. • Battery fully charged. • Ground fuel pump lead of the VIP Self-Test connector as shown. • Key On, Engine Off. • Disconnect selector switch. • DVOM on 20 volt scale. • Measure voltage at Pin 2 of selector switch as shown. • **Is the voltage greater than 10.5 volts?**  	Yes ▶ No ▶	REPLACE selector switch. SERVICE wire from selector switch to inertia switch.
EFD9 LOW PRESSURE PUMP(S) GROUND CHECK (TYPES 2, 3, 4, 5)		
• Key Off. • Disconnect electrical connector from front fuel tank. • DVOM on 200 ohm scale. • Measure the resistance from the tank connector to ground as shown. • **Is the resistance less than 5 ohms?** • Repeat for rear tank.  	Yes ▶ No ▶	For types 2, 4 or 5, GO to **EFD27**. For type 3, GO to **EFD10**. REPAIR wire from fuel pump/sender connector to ground.

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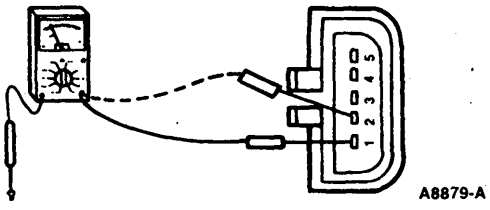
TEST STEP	RESULT ▶	ACTION TO TAKE
EFD10 FUEL PUMP(S) OPERATIONAL AUDIBLE CHECK (TYPE 3)		
• Key Off. • Battery fully charged. • Ground the fuel pump lead of the VIP Self-Test connector as shown. • Verify that there is a good electrical connection to the fuel pump/sender unit. • Key On, Engine Off. • Listen to fuel pump(s). • **Are the fuel pump(s) running?**  	Yes ▶ No ▶	GO to EFD11. REPAIR fuel pump/ sender unit.
EFD11 SELECTOR VALVE FUNCTION CHECK (TYPE 3)		
• Remove selector valve from vehicle. • Verify selector valve operation by chart shown. • **Does the selector valve operate properly?**	Yes ▶ No ▶	GO to EFD27. REPLACE selector valve.

Valve Position	Selector Valve Elec. Table					Fuel Flow		
	Apply Voltage At Pins		Measure Resistance On Pins			Check Flow of Ports		
	1	2	3	4	5	Front Port	Pump Port	Rear Port
Front	(-)	(+)	Less than 1.0 OHM		Open	Connected		Blocked
Rear	(+)	(-)	Open	Less Than 1.0 Ohm		Blocked	Connected	

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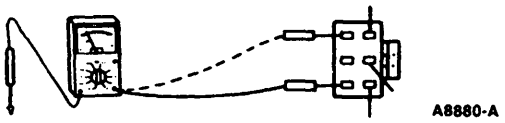
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD12 VOLTAGE CHECK AT SELECTOR VALVE (TYPE 3)		
• Key Off. • Battery fully charged. • Ground the fuel pump lead of the VIP Self-Test Connector. • Selector switch in front position. • Disconnect selector valve connector. • Key On, Engine Off. • DVOM or 20 volt scale. • Measure voltage on Pin 1 at selector valve as shown. • Key Off. • DVOM on 200 ohm scale. • Measure resistance from Pin 2 to ground as shown. • **Is the voltage greater than 10.5 volts and the resistance less than 1 ohm?** • Repeat with selector switch in rear position and measure voltage on Pin 2 of the selector valve/ switch and resistance from Pin 1 to ground.  A8879-A	Yes ▶ No ▶	REPAIR wire(s) from selector valve/switch to low pressure pump. REPAIR ground wire circuit to selector switch, and/or GO to **EFD13**.

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TEST STEP	RESULT ▶	ACTION TO TAKE
EFD13 VOLTAGE CHECK AT SELECTOR SWITCH (TYPE 3) • Key Off. • Battery fully charged. • Ground fuel pump lead of the VIP Self Test connector. • Key On, Engine Off. • DVOM on 20 volt scale. • Selector switch in front position. • Measure voltage on Pin 2 at the fuel tank selector switch as shown. • **Is the voltage greater than 10.5 volts?** • Repeat with switch in rear position and measure voltage on Pin 1 selector switch as shown.  A8880-A	Yes ▶ No ▶	REPAIR wire(s) from selector switch to selector valve. GO to EFD14.
EFD14 RESISTANCE CHECK AT SELECTOR SWITCH (TYPE 3) • Key Off. • Disconnect selector switch from harness. • DVOM on 200 ohm scale. • Check resistance from selector switch connector to ground as shown. • **Is the resistance less than 1 ohm?**  A8881-A	Yes ▶ No ▶	GO to EFD15. REPAIR open wire from switch to ground.

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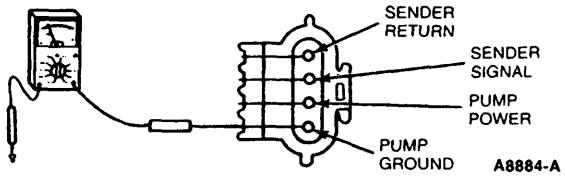
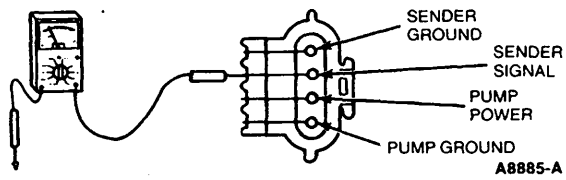
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD15 VOLTAGE CHECK AT SELECTOR SWITCH (TYPE 3)		
• Ground fuel pump lead of the VIP Self-Test connector. • Key On, Engine Off. • DVOM on 20 volt scale. • Measure the voltage at the selector switch as shown. • **Is the voltage greater than 10.5 volts?**  A8882-A	Yes ▶ No ▶	REPLACE switch. REPAIR wire from inertia switch to selector switch.
EFD16 PUMP OPERATION CHECK, AUDIBLE (TYPE 1 AND 5)		
• Key Off. • Battery fully charged. • Ground the fuel pump lead of the VIP Self-Test connector. • Verify that a good electrical connection is made to the pump/sender unit. • Key On, Engine Off. • Listen to fuel pump. • **Is the fuel pump running?**	Yes ▶ No ▶	GO to EFD27. GO to EFD17.

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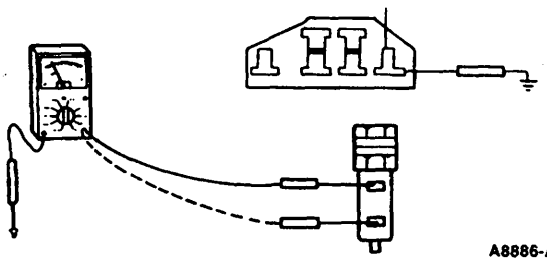
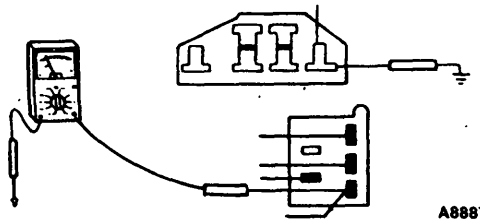
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD17 HIGH-PRESSURE PUMP GROUND CHECK (TYPE 1 AND 5)		
• Key Off. • Disconnect pump/sender unit connector. • DVOM on 200 ohm scale. • Measure the resistance of the wire to ground as shown. • **Is the resistance less than 1 ohm?**  	Yes ▶ No ▶	GO to **EFD18**. REPAIR open wire to ground.
EFD18 VOLTAGE CHECK AT HIGH-PRESSURE PUMP (TYPE 1 AND 5)		
• Key Off. • Battery fully charged. • Disconnect pump/sender assembly connector. • Ground the fuel pump lead of the VIP Self-Test connector. • Key On, Engine Off. • DVOM on 20 volt scale. • Measure the voltage at the fuel pump/sender unit as shown. • **Is the voltage greater than 10.5 volts?**  	Yes ▶ No ▶	REPLACE pump/sender assembly. GO to **EFD19**.

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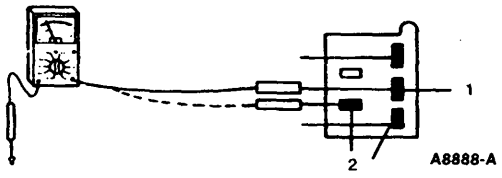
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD19 VOLTAGE CHECK AT INERTIA SWITCH (ALL TYPES) • Key Off. • Battery fully charged. • Ground fuel pump lead of the VIP Self-Test connector as shown. • Key On, Engine Off. • Inertia switch connected. • Measure the voltage at the inertia switch as shown. • DVOM on 20 volt scale. • **Is the voltage greater than 10.5 volts at both pins?** • Repeat for opposite pin of inertia switch as shown.  A8886-A	Yes ▶ No ▶	For Type 5: GO to **EFD7**. For all other Types: REPAIR the wire from the inertia switch to the high-pressure pump. RESET or REPLACE inertia switch as required. GO to **EFD20**.
EFD20 VOLTAGE CHECK AT SWITCHED SIDE OF F.P. RELAY (ALL TYPES) • Key Off. • Battery fully charged. • Ground fuel pump lead of the VIP Self-Test connector as shown. • Key On, Engine Off. • DVOM on 20 volt scale. • Measure the voltage at the fuel pump relay as shown. • **Is the voltage greater than 10.5 volts?**  A8887-A	Yes ▶ No ▶	REPAIR brown wire from fuel pump relay to inertia switch. GO to **EFD21**.

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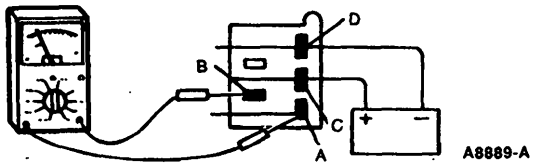
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD21 POWER SUPPLY CHECK TO F.P. RELAY (ALL TYPES)		
• Key Off. • Battery fully charged. • Disconnect fuel pump relay. • Key On, Engine Off. • DVOM on 20 volt scale. • Measure the voltage on the red, and black/yellow or yellow wires of the fuel pump relay connector as shown. • **Is the voltage on these wires greater than 10.5 volts?** 	Yes ▶ Red No ▶ Yellow No ▶ Black/yellow No ▶	GO to **EFD23**. REPAIR wire from fuel pump relay to EEC power relay. GO to **EFD22**. REPAIR black/yellow wire from Power Distribution Box to Fuel Pump Relay and/or REPLACE 30 amp high current fuse in Power Distribution Box (position no. 1).
EFD22 VOLTAGE CHECK AT PIN 1 OF EEC-IV (ALL TYPES)		
• Key Off. • Battery fully charged. • Remove EEC-IV processor. • Install EEC-IV breakout box, Rotunda Tool Number T83L-50-EEC-IV or EEC-IV Monitor, Rotunda Tool Number 007-00018. • Measure the voltage at Pin 1 of the breakout box, or: • With EEC-IV Monitor install the appropriate overlay according to engine and year. • Place selector switch "A" on the arrow that points at selector switch "B". Place selector switch B on KAPWR1. Turn EEC-IV Monitor power on, read the voltage of pin 1 on the LCD display. • **Is the voltage greater than 10.5 volts?**	Yes ▶ No ▶	REPAIR wire from fuel pump relay to battery (+). GO to Quick Test, Section 14.

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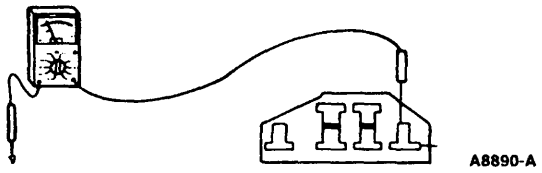
EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD23 FUEL PUMP RELAY OPERATION CHECK (ALL TYPES)		
• Remove relay from vehicle. • Connect a +12v supply to terminal "C" as shown. • Ground terminal "D" as shown. • DVOM on 200 ohm scale. • Measure the resistance between terminals "A" and "B" as shown. • **Is the resistance lower than 1 ohm with the power applied and greater than 10,000 ohms with power removed from terminal "C"?**  A8889-A	Yes ▶ No ▶	GO to EFD24. REPLACE fuel pump relay.
EFD24 VOLTAGE CHECK AT PIN 22 (ALL TYPES)		
• Key Off. • Battery fully charged. • Remove EEC-IV processor. • Install breakout box, Rotunda Tool Number T83L-50-EEC-IV, or EEC-IV Monitor, Rotunda Tool Number 007-00018 or equivalent. • Key On, Engine Off. • DVOM on 20 volt scale. • Measure the voltage on Pin 22 of the breakout box, or: • With the EEC-IV Monitor, install the appropriate overlay according to engine size and year. Place selector switch "A" on Pin 22, "FP", turn EEC-IV Monitor power on and read voltage on Pin 22 from LCD readout. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to Quick Test, Section 14. GO to EFD25.

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EFD

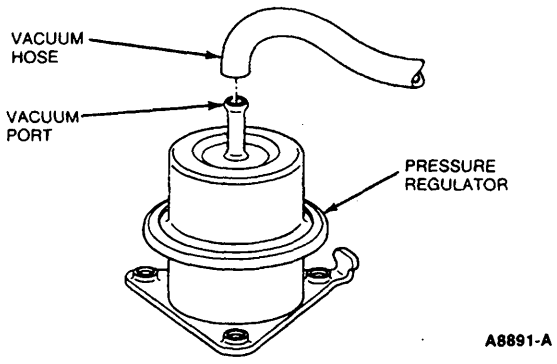
TEST STEP	RESULT ▶	ACTION TO TAKE
EFD25 VOLTAGE CHECK AT T/LG WIRE ON VIP (ALL TYPES) • Key Off. • Battery fully charged. • EEC-IV processor disconnected. • Key On, Engine Off. • DVOM ohm 20 volt scale. • Measure the voltage on the fuel pump lead of the VIP Self Test connector as shown. • **Is voltage above 10.5 volts?**  A8890-A	Yes ▶ No ▶	REPAIR Tan/Light Green wire from EEC-IV to fuel pump relay. REPAIR Tan/Light Green wire from fuel pump relay to EEC-IV and from fuel pump relay to VIP connector.
EFD26 FUEL PUMP LOW VOLTAGE CHECK (All TYPES) • Ground the FP lead of the Self Test connector using a jumper, as in Test Step **EFD2**. • Connect the DVOM at the high-pressure fuel pump terminal (PK/BK). • **Is the voltage at the fuel pump within 0.5 volt of the battery?**	Yes ▶ No ▶	GO to **EFD27**. GO to **EFD3**.
EFD27 HIGH-PRESSURE FUEL FILTER CONDITION CHECK (ALL TYPES) • Observe Warning-Instructions to avoid fuel spillage and injury. • Check the condition of the high-pressure fuel filter and check the customers service records versus the maintenance schedule. • Types 2 and 3 systems, check also the condition of the fuel filter contained in the in-line reservoir, if so equipped. • **Is the fuel filter free of contamination and blockage?**	Yes ▶ No ▶	For CFI systems: GO to **EFD51**. For EFI systems: GO to **EFD28**. SERVICE the filter(s) and RERUN test **EFD2**.

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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD28 PRESSURE REGULATOR DIAPHRAGM CONDITION CHECK (TYPES 1, 2, 3, 4)		
• Key Off. • Connect the Fuel Pressure Test Kit at the Schrader fitting on the rail. Observe Warning-Instructions to avoid fuel spillage and injury. • Start engine and run for 10 seconds. • Stop engine and wait 10 seconds. • Start engine and run for 10 seconds. • Stop engine and remove the vacuum hose from the pressure regulator. • Examine the vacuum port in the pressure regulator for evidence of fuel leakage through the diaphragm. • **Is the vacuum port free of any fuel?**	Yes ▶ No ▶	GO to **EFD29**. REPLACE the pressure regulator and RERUN test **EFD2**.



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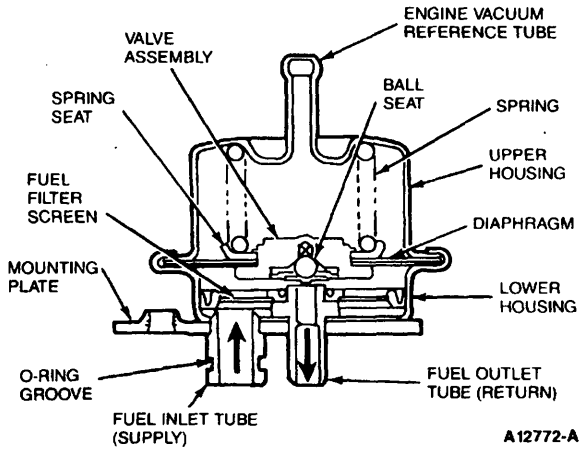
TEST STEP	RESULT ▶	ACTION TO TAKE
EFD29 PRESSURE REGULATOR FUEL PRESSURE LEAKDOWN CHECK (ALL TYPES)		
• With the Fuel Pressure Test Kit still installed on the engine, run the engine for 30 seconds minimum. • Stop the engine and observe the fuel pressure. • **Does fuel pressure drop 5 psi (34 kPa) maximum after 60 seconds?**	No ▶ Yes ▶	GO to **EFD33**. GO to **EFD30**.
EFD30 CHECK FUEL PUMP CHECK VALVE FOR LEAKDOWN		
• Fuel Pressure Test Kit installed. • Disconnect and plug fuel return line at the engine. • Run engine until normal fuel pressure is achieved. • Engine off, observe fuel pressure gauge. • **Is fuel pressure drop greater than 5 psi (34 kPa) after 30 seconds?**	Yes ▶ No ▶	For Types 2, 3, and 4: REPLACE high pressure fuel pump. REMOVE fuel pressure test kit. RECONNECT fuel return line. For Type 1: REPLACE fuel sender/ pump assembly. REMOVE fuel pressure test kit. RECONNECT fuel return line. For Type 5: GO to **EFD31**. REPLACE fuel pressure regulator. REMOVE fuel pressure test kit. RECONNECT fuel return line.
EFD31 CHECK REAR TANK IN-TANK-RESERVOIR (ITR)		
• Fuel return line connected. • Remove the fuel supply line from the sender port of the front tank and install fuel pressure gauge to the fuel line. • Move the tank selector to REAR position. • Key ON, engine OFF. • Wait till fuel pump stops (approximately 1 second). • Key off, observe fuel pressure. • **Does fuel pressure drop?**	Yes ▶ No ▶	REPLACE rear tank ITR. REMOVE fuel pressure gauge. RERUN **EFD2**. REMOVE fuel pressure gauge. RECONNECT fuel supply line to front tank. GO to **EFD32**.

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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD32 CHECK FRONT TANK IN-TANK-RESERVOIR (ITR)		
• Remove the fuel supply line from the sender port of the rear tank and install fuel pressure to the fuel line. • Move the tank selector to FRONT position. • Key On, Engine Off. • Wait until fuel pump stops (approximately 1 second). • Key Off, observe fuel pressure. • **Does fuel pressure drop?**	Yes ▶ No ▶	REPLACE front tank ITR. REMOVE fuel pressure gauge. RERUN [EFD2]. REMOVE fuel pressure gauge. RECONNECT fuel supply line to rear tank. GO to [EFD33].
EFD33 PRESSURE REGULATOR VALVE SEAT LEAKAGE CHECK (ALL TYPES)		
• Observe the Warning-Instructions to avoid fuel spillage and injury. • Remove the fuel pressure regulator. • Inspect the O-ring and the gasket and mounting surfaces for cracks, cuts or other defects that may affect sealing. • Connect the vacuum tester to the fuel return tube (shown below) and apply a 20 in-Hg vacuum. • Verify whether the vacuum retention meets specification of 10 in-Hg maximum loss of vacuum within 10 seconds. • **Does the vacuum drop below 10 in-Hg with 10 seconds?**	Yes ▶ No ▶	REPLACE the regulator. RERUN test [EFD2]. GO to [EFD34].



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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD34 FUEL SYSTEM LEAKAGE RE-CHECK (ALL TYPES)		
• If it is necessary to disconnect any fuel lines, observe the "Notes, Cautions and Warnings" to avoid fuel spillage and injury. • Reinspect the complete fuel delivery system, components and lines for fuel leakage, pinching or kinking that may cause low fuel pressure, as evidenced by fuel odor, spillage, stains or damage caused by accident or collision. • **Is the fuel delivery system free of any apparent defects that may cause low fuel pressure?**	Yes ▶ No ▶	For type 1 and 5, GO to **EFD36**. All other types, GO to **EFD35**. REPAIR or REPLACE components as required. RERUN test step **EFD2**.
EFD35 LOW PRESSURE (IN-TANK) FUEL PUMP FLOW CHECK (TYPES 2, 3, 4)		
• Observe the "Notes, Cautions and Warnings" to avoid fuel spillage and injury. • Connect a jumper to the FP lead of the Self-Test connector and long enough to reach the work area under the vehicle when it is raised. • Key On, Engine Off. • Raise vehicle on a hoist and bring the test lead to a convenient point for grounding. • Disconnect the pump pressure line at the reservoir inlet fitting and place it in a measuring vessel of at least one quart capacity. • Ground the test lead, verify that the pump is running, using a stethoscope if necessary, and that the pump flow meets specification. • Fuel flow specification: 180 m1 (6 oz) per 5 seconds. • **Does the pump flow meet the specification?**	Yes ▶ No ▶	GO to **EFD37**. Pump not running GO to **EFD6**. Flow does not meet specification. SERVICE pump inlet filter or REPLACE pump as required. RERUN test step **EFD2**.

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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD36 HIGH-PRESSURE (IN-TANK) FUEL PUMP FLOW CHECK (TYPE 1 AND 5)		
• Observe the "Notes, Cautions and Warnings" to avoid fuel spillage and injury. • Disconnect the fuel return line at the fuel rail and connect the fuel pressure testing kit. • Provide a measuring vessel (1 quart capacity) and overflow vessel for measuring fuel flow through the test kit. • Connect a jumper to the FP lead of the Self-Test connector. • Key On, Engine Off. • Ground the jumper to run the fuel pump. • Collect the fuel flow into the measuring vessel for 15 seconds. • **Is the fuel flow approximately 250 ml (8.3 oz) per 15 seconds?**	Yes ▶ No ▶	GO to **EFD37**. SERVICE pump inlet screen and rerun test. REPLACE pump as required. RERUN test step **EFD2**.
EFD37 HIGH-PRESSURE PUMP CHECK VALVE LEAKDOWN CHECK (ALL TYPES)		
• Observe the "Notes, Cautions and Warnings" to avoid fuel spillage and injury. • Connect the fuel pressure test kit at the fuel pressure test point. • Connect a jumper to the FP lead of the Self-Test connector. • Key On, Engine Off. • Ground the test lead using the jumper wire to run the fuel pump. • Run the fuel pump for 30 seconds minimum. • Remove the test lead ground and note fuel pressure on the gauge. • Verify whether the fuel pressure remains within the specified 2 psi for 3 minutes after the test lead is ungrounded. • **Does the fuel pressure remain within 2 psi for 3 minutes after the test lead is ungrounded?**	Yes ▶ No ▶	If leakdown rate OK. For type 1 and 5, GO to **EFD47**. All other types, GO to **EFD40**. REPLACE pump. RERUN test step **EFD2**.

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EFD

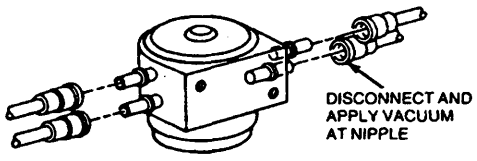
TEST STEP	RESULT ▶	ACTION TO TAKE
EFD38 PRESSURE REGULATOR CHECK FOR HIGH PRESSURE CAUSES (ALL TYPES)		
• Observe the "Notes, Cautions and Warnings" to avoid fuel spillage and injury. • Check leaks in the engine vacuum system due to loose or mis-threaded fittings, cracks, cuts, pinches, or kinks in vacuum lines, or blockages that could cause insufficient vacuum to properly control the pressure regulator. • Check the pressure regulator housing for damage or dents that could cause a higher spring load on the pressure regulator diaphragm. • Check the integrity of the pressure regulator diaphragm per the procedure of test step EFD28. • **Is the fuel system free of defects that could cause the pressure regulator to produce excessive fuel injection pressure? (Refer to Fuel pressure Specification in this Section).**	Yes ▶ No ▶	REPLACE the regulator with a known good regulator. RERUN test step EFD2. If pressure still high, GO to EFD39. REPAIR or REPLACE damaged components as required. RERUN test step EFD2. Proceed with above Action for "yes" result.
EFD39 FUEL RETURN SYSTEM CHECK FOR HIGH PRESSURE CAUSES (TYPES)		
• Observe the "Notes, Cautions and Warnings" to avoid fuel spillage and injury. • Remove the fuel return line at the pressure regulator and at the fuel tank(s). • Provide a suitable fuel receptacle at the tank end(s) of the return lines to avoid fuel spillage. • Check the fuel return system(s) for restriction due to blockage, kinking, or pinching by blowing through it with 5-10 psi regulated shop air. If the system is Type 3 or 4 (dual tanks) switch the fuel selector switch so as to check both return lines. • **Is the fuel return system free of any restriction that could cause excessive fuel injection pressure?**	Yes ▶ No ▶	For type 1 or 5, GO to EFD50. All other types, GO to EFD40. REPAIR defects, CLEAN or REPLACE faulty components as required to remove the causes of high pressure. PROCEED with Action for above "yes" result.

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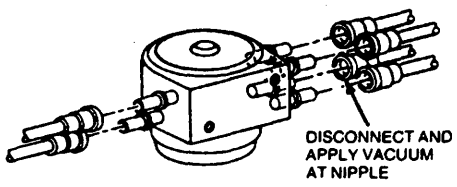
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EFD

TEST STEP	RESULT	ACTION TO TAKE
EFD40 FUEL RESERVOIR ANTI-SIPHON VALVE FUNCTION CHECK (TYPES 2, 3, 4)		
• This test step applies only to Light Truck fuel systems, types 2, 3, and 4 having the in-line reservoir. • Observe the "Notes, Cautions and Warnings" to avoid fuel spillag and injury. • Disconnect the fuel supply line entering the reservoir: For type 2 - from the tank For type 3 - from the electric selector valve For type 4 - from the rear tank • Selector switch in rear tank position (for type 4 system). • Connect the vacuum tester to the same reservoir fuel supply nipple on the reservoir. • Apply a 10 in-Hg vacuum maximum to the fuel supply nipple and observe the vacuum gauge. CAUTION **Any vacuum higher than 10 in-Hg may rupture the diaphragm of the type 4 system reservoir.** • **Does the anti-siphon valve retain a 10 in-Hg vacuum?**	Yes ▶ No ▶	For type 2 GO to EFD47. For type 3 GO to EFD41. For type 4 GO to EFD42. REPLACE the reservoir.



TYPES 2 AND 3 - Fuel Reservoir



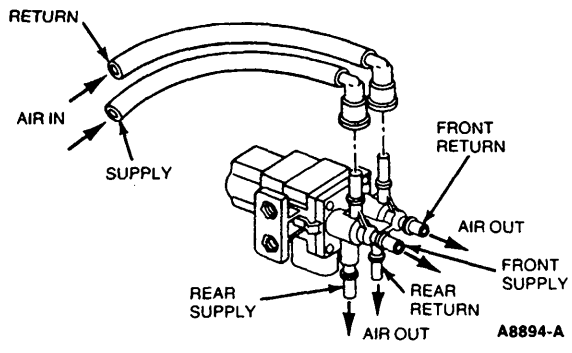
TYPE 4 - Fuel Reservoir A8893-A

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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD41 ELECTRIC SELECTOR VALVE FUNCTION CHECK (TYPE 3)		
• Observe "Notes, Cautions and Warnings" to avoid fuel spillage and injury. CAUTION **To avoid fuel spillage when the selector switch is moved from one tank to the other, disconnect the electrical connections at both in-tank fuel pumps.** • Disconnect all fuel supply lines (3) and return lines (3) from the selector valve. • Prepare two lengths of test hose, fitted with Quick Connectors to fit the selector valve nipples (to avoid nipple damage), one for the supply side nipples, and the other for the smaller return nipples. • Using shop air regulated to 3-5 psi, connect the test hoses to the engine supply and return nipples, check the airflow paths when the selector switch is moved from rear to front tank and vice-versa, and verify that the selector valve functions correctly. • **Does the selector valve function correctly?**	Yes ▶ No ▶	GO to EFD47 . GO to EFD11 .

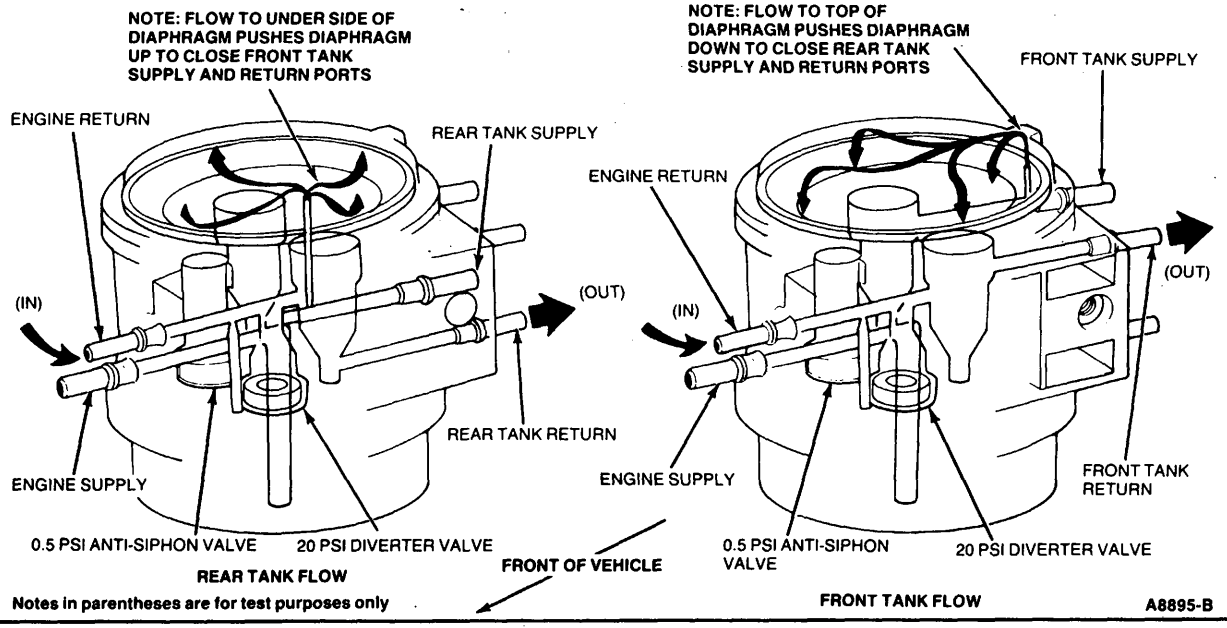


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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD42 MECHANICAL SELECTOR VALVE/RESERVOIR CHECK (TYPE 4)		
For test steps EFD42 and 43.	Yes ▶	GO to **EFD43**.
CAUTION **To avoid fuel spillage with the fuel lines disconnected, disconnect the electric connectors at both in-tank fuel pumps.**	No ▶	Verify the valve is not in a neutral position.
• The following test steps (EFD42 and 43) are required for checking correct function of the mechanical selector valve which is integral with the 6 nipple reservoir. The valve is not serviceable.		
• Remove lines from valve, noting position of lines for correct reinstallation.		
• Provide test hoses as described for test step **EFD38** to avoid nipple damage.		
• Provide shop air reduced to 3-5 PSI AND REGULATED. Air pressure of 2 psi will operate the valve, but PRESSURE GREATER THAN 5 PSI MAY RUPTURE THE INTERNAL DIAPHRAGM.		
• Apply 3-5 psi air pressure to engine (front) side return (smaller size) nipple, and check whether air exits from either fuel return port on the rear (tank) side of the unit.		
• **Does air exit from either of the tank side return ports?**		

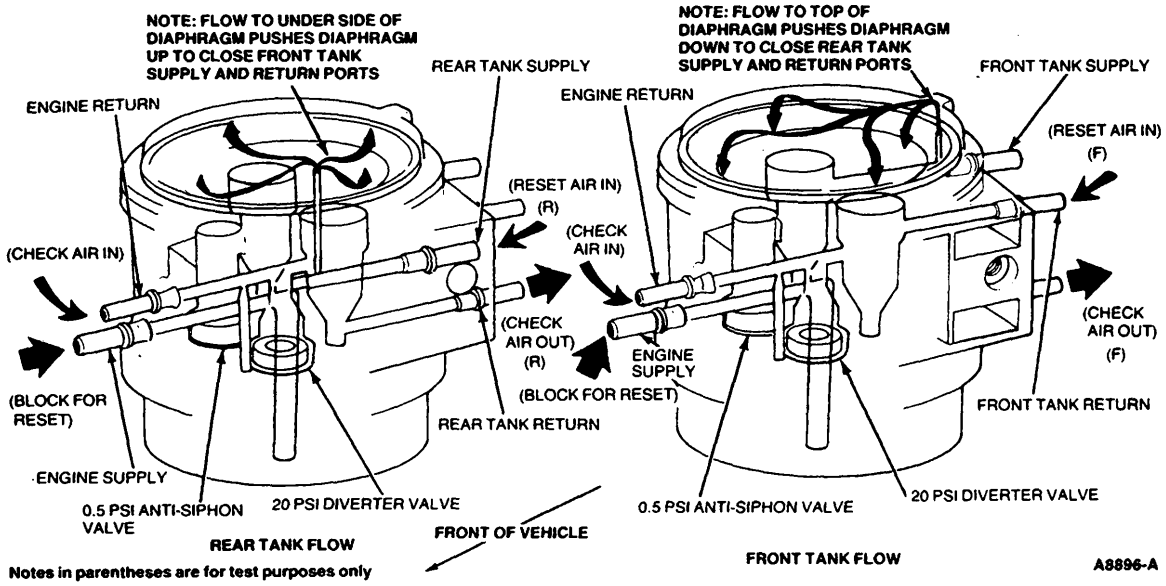


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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD43 MECHANICAL SELECTOR VALVE/RESERVOIR RESET VALVE (TYPE 4)		
• Block fuel supply port (larger nipple) on engine side of unit. • Apply 3-5 psi air pressure to one (F) and then the other (R) tank side supply ports until a clicking sound is heard or felt, indicating a reset. • Remove air from supply port, apply it to the engine side return port and check whether air exits from the tank side return port corresponding to the final supply port after click. • **Does air exit only from the correct (corresponding) tank side return port?**	Yes ▶	GO to **EFD44**.
	No ▶	REPLACE the Mechanical Selector Valve Reservoir (valves stuck).

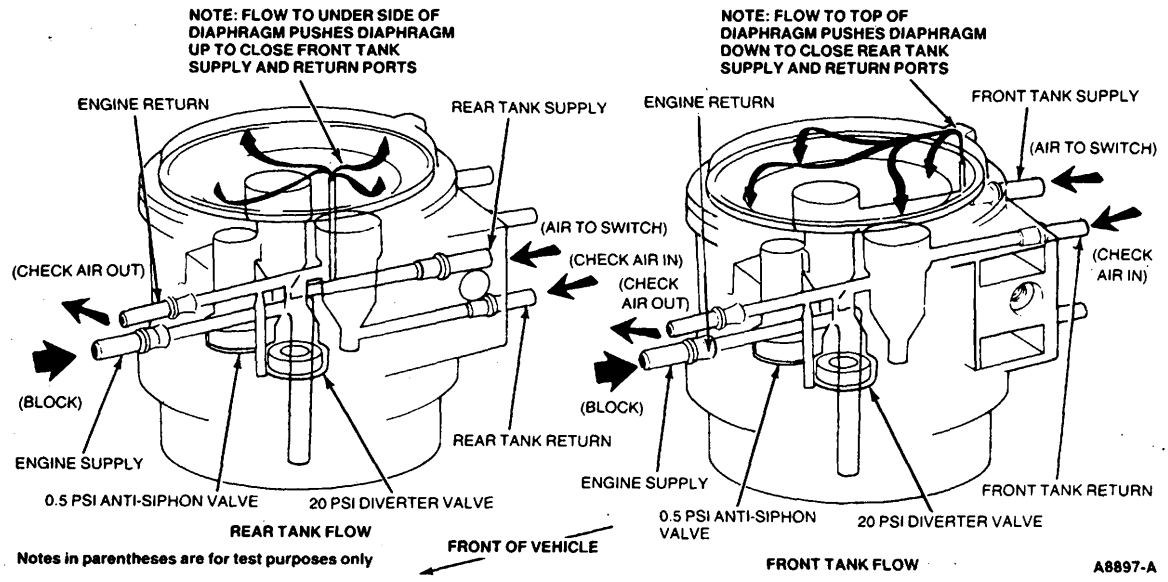


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TEST STEP	RESULT ▶	ACTION TO TAKE
EFD44 MECHANICAL SELECTOR VALVE/RESERVOIR SWITCHING ACTION CHECK (TYPE 4)		
• Block engine side supply port. • Apply 3-5 psi air pressure to the other tank side supply port from the preceding test step, and note a clicking sound when the valve switches to the new selected tank supply pressure. • Remove 3-5 psi air pressure from the supply port, apply it to the corresponding tank side return port and note whether air exits from the engine side return port. • **Does air exit from the engine side return port?**	Yes ▶	GO to **EFD45**.
	No ▶	RECHECK test step **EFD44** front and rear tank ports alternately. If unit still fails test, REPLACE the Mechanical Selector Valve Reservoir.



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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD45 MECHANICAL SELECTOR VALVE/RESERVOIR SUPPLY SIDE LEAKAGE CHECK (TYPE 4)		
• Remove any previously applied blockages. • Apply 3-5 psi pressure to the engine side supply port and note which tank side supply port is open. • Block the open tank side supply port. • Connect the vacuum and pressure tester to the closed tank side supply port and note any pressure on the gauge with air pressure applied. • **Is the supply side free of any internal valve leakage (zero reading on pressure gauge)?**	Yes ▶ No ▶	GO to **EFD46** . REPLACE unit.
EFD46 MECHANICAL SELECTOR VALVE/RESERVOIR RETURN SIDE LEAKAGE CHECK (TYPE 4)		
• Remove any previously applied blockages. • Apply 3-5 psi pressure to the engine side return port and note which tank side return port is open. • Block the open tank side return port. • Connect the vacuum and pressure tester to the closed tank side return port and note any pressure on the gauge with air pressure applied. • **Is the return side free of any internal valve leakage (zero reading on pressure gauge)?**	Yes ▶ No ▶	GO to **EFD47** . REPLACE the selector valve.
EFD47 FUEL INJECTOR FUNCTION CHECK (ALL TYPES)		
• With the engine warmed and idling (or cranking it if does not start) and using a mechanics' stethoscope or equivalent, listen for regularly spaced operating sounds at each fuel injector. • **Is operating sound present?**	Yes ▶ No ▶	GO to **EFD50** . GO to **EFD48** .

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Electric Fuel Delivery Systems: System Diagnosis

EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD48 FUEL INJECTOR RESISTANCE CHECK (ALL TYPES)		
• Observe the "Notes, Cautions and Warnings" to avoid fuel spillage and injury. • Remove the fuel injectors from the engine, if required. • Check the electrical resistance of each injector, using the DVOM, refer to resistance chart. • **Are all the injectors within the resistance specification?**	Yes ▶ No ▶	GO to **EFD49**. REPLACE the faulty injectors, RERUN test step **EFD47**, and if OK, GO to test step **EFD50**.

PASSENGER CAR ENGINES				
VALUES ARE IN OHMS				
1.9L EFI	1.9L/2.5L CFI	2.3L OHC ONLY	3.0L EFI	ALL OTHER ENGINES WITH EFI
2.0 TO 2.7	1.0 TO 2.0	15.0 TO 18.0		13.0 TO 16.0

LIGHT TRUCK ENGINES	
VALUES ARE IN OHMS	
2.31/3.0L EFI	ALL OTHER ENGINES WITH EFI
15.0 TO 18.0	13.0 TO 16.0

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Electric Fuel Delivery Systems: System Diagnosis

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TEST STEP	RESULT ▶	ACTION TO TAKE
EFD49 FUEL INJECTOR ELECTRICAL SIGNAL CHECK (ALL TYPES)		
• Check the electrical continuity of the injector harness between each injector and the ECA as follows: • Disconnect the injector lead and insert the continuity checker No. FA-407 (from the Rotunda Fuel Injector Tester/Cleaner) into the injector lead plug. • Start the engine. • Observe whether the continuity checker blinks (showing a completed circuit for the injector being tested). • Repeat the check for each injector. • **Do all injector circuit leads show continuity?**	Yes ▶ No ▶	GO to **EFD50**. CHECK for 12 volts at each injector lead. REPAIR or REPLACE leads as required. REFER to Quick Test, Section 14 of this manual.
EFD50 FUEL INJECTOR FLOW AND LEAKAGE CHECK (ALL TYPES) EFI ONLY		
• Observe the "Notes, Cautions and Warnings" to avoid fuel spillage and injury. • Using the Fuel Injector Tester Cleaner as described in Section 4 of this manual and accompanying instruction, clean, test and reclean as required, the fuel injectors and verify that the flow rate for the injector group is within specification, using the color range on the Tester flow meter corresponding to the injector top color. • Verify the injector color for the engine by the Injector Application chart, Section 4 of this manual. • With the Tester/Cleaner still installed on the fuel system note any significant pressure loss due to injector leakage when the tester pump is turned off. • Check the fuel injectors individually for leakage as required using the Injector Bench Fixture and the Fuel Injector Bench Testing Procedure associated with the Rotunda Tester/Cleaner as required and verify that each injector leakage rate is within specification (1 drop/min. maximum). • **Is the flow rate for the injector group and the leakage rate for individual injectors within specification?**	Yes ▶ No ▶	GO to Section 2. REPLACE the damaged injectors as required. RERUN test **EFD50**.

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Electric Fuel Delivery Systems: System Diagnosis

EFD

Fuel Pressure Regulator Description for CFI System

The Pressure Regulator is integral to the fuel charging main body and is located near the rear of the air horn. It is located so as to nullify the effects of supply line pressure drops. Its design is such that it is not sensitive to back pressure in the return line to the tank.

One function of the Pressure Regulator is to maintain fuel supply pressure upon engine and fuel pump shutdown. The regulator functions as a downstream check valve and traps the fuel between itself and the fuel pump. The maintenance of fuel pressure upon engine shutdown precludes fuel line vapor formation and allows for rapid restarts and for stable idle operation immediately thereafter.

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD51 CHECK FUEL PRESSURE		
• Disconnect electrical connection to inertia switch. • Crank engine for five seconds to reduce fuel pressure in the fuel charging system. • Install fuel pressure gauge. • Reconnect electrical connection to inertia switch. • Start and run engine. • Stabilize fuel pressure. • Key Off. • **Does fuel pressure drop?**	Yes ▶ No ▶	GO to **EFD52**. GO to **EFD34**. Also REFER to Fuel/Engine Shop Manual Group.
EFD52 CHECK VACUUM BLEED DOWN		
• Remove fuel inlet and outlet lines at fuel charging assembly. • Connect hand held vacuum pump to the fuel charging assembly fuel inlet side. • Apply 15-20 in-Hg vacuum. • Vacuum should not drop more than 10 in-Hg in 10 seconds. • **Is vacuum drop greater than 10 in-Hg in 10 seconds?**	Yes ▶ No ▶	GO to **EFD53**. Injector/O-Ring regulator seat/valve system OK. GO to **EFD34**.
EFD53 CHECK VACUUM BLEED DOWN		
• Refer to Test Step **EFD52**. • Cap/plug the fuel outlet line. • Repeat Test Step **EFD52**. • **Is vacuum drop greater than 10 in-Hg in 10 seconds?**	Yes ▶ No ▶	GO to **EFD54**. SERVICE fuel pressure regulator. REFER to Fuel/Engine Shop Manual Group.

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EFD

TEST STEP	RESULT ▶	ACTION TO TAKE
EFD54 CHECK INJECTOR		
• With the injector in the fuel charging assembly: • Plug the injector tip outlet with finger. • Repeat Test Step **EFD52** . • **Is vacuum drop greater than 10 in-Hg in 10 seconds?**	Yes ▶	REPLACE the injector O-Rings - 2. REPEAT test step **EFD54** .
	No ▶	REPLACE injector. REFER to Fuel/Engine Shop Manual Group.

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SECTION 12

6.1L/7.0L Heavy Duty Truck— "CHECK ENGINE" Light

Contents

System Description 12-1

Vehicle Application, Description and Operation 12-1

When to Use This Diagnostic Procedure 12-1

System Schematic 12-2

System Diagnosis 12-3

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System Description

VEHICLE APPLICATION

NOTE: This applies to only 1990 49 State 6.1L and 7.0L heavy duty trucks (gasoline engines only). All other vehicle applications with "CHECK ENGINE" Light concerns, go to Quick Test, Section 14.

DESCRIPTION AND OPERATION

The "CHECK ENGINE" Light (CEL) System on the 6.1L and 7.0L heavy duty trucks consists of an instrument panel mounted amber lens with the words "CHECK ENGINE" printed on it. It is electrically connected to an Emission Maintenance Warning (EMW) module located under the instrument panel. The purpose of the system is to alert the customer that 60,000 mile emission system maintenance is required on the vehicle. Specific emission system maintenance requirements are shown in the vehicle Owner Guide (Medium and Heavy Duty Truck).

The EMW module actually measures accumulated vehicle ignition Key On time and is designed to continuously close an electrical circuit to the CEL after 2000 hours of vehicle operation. Assuming an average vehicle speed of 30 mph, the 2000 hours equates to 60,000 miles of vehicle operation. Actual vehicle mileage intervals will vary considerably as individual driving habits vary.

Note that when the ignition key is initially placed in the ON position, the EMW module will activate the CEL for 2 to 5 seconds to indicate proper function of the system. When approximately 60,000 miles of vehicle operation is reached, the CEL will remain on continuously, indicating that emission system maintenance is required. After the vehicle's emission system maintenance has been performed, the technician should reset the EMW module for another 60,000 mile period.

WHEN TO USE THIS DIAGNOSTIC PROCEDURE

Emission maintenance should be performed if the "CHECK ENGINE" Light is on continuously and either of the following is true:

- Mileage is between 45,000 and 75,000 miles with no previous emission maintenance.
- Mileage is greater than 105,000 miles.

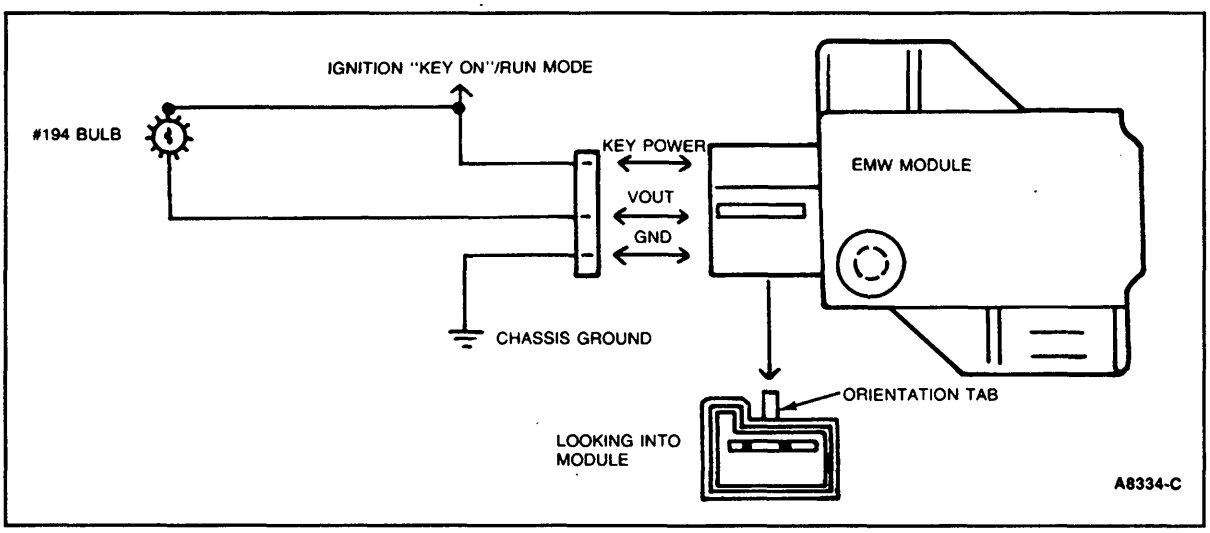
Use this procedure only when the specified mileage does not apply or if the EMW module cannot be reset after emission maintenance is completed.

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System Description

SYSTEM SCHEMATIC

6.1L and 7.0L Heavy Duty Trucks "CHECK ENGINE" Light (CEL)



NOTE: All other engine/vehicle applications with "CHECK ENGINE" Light concerns, go to Quick Test, Section 14.

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System Diagnosis	Pinpoint Test	CE

NOTE: This applies to only 1990 49 State 6.1L and 7.0L heavy duty trucks (gasoline engines only). All other vehicle applications with "CHECK ENGINE" Light concerns, go to Quick Test, Section 14.

TEST STEP	RESULT ▶	ACTION TO TAKE
CE1 VERIFY "CHECK ENGINE" LIGHT (CEL) STATUS		
• Key off. • Turn key to ON position. • **Does CEL come on for 2-5 seconds and go off?**	Yes ▶ No ▶	System OK. GO to CE2.
CE2 CHECK EMW MODULE POWER		
• EMW module connected. • Key on, engine off. • DVOM, Rotunda 007-00001 or equivalent, on 20 volt scale. • Measure voltage between KEY POWER and GND circuits at the EMW module. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to CE3. SERVICE open in KEY POWER or GND circuit.
CE3 CHECK EMW MODULE OUTPUT		
• Key off. • EMW module connected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between KEY POWER and VOUT circuits at the EMW module. • **Is voltage greater than 10.5 volts for 2-5 seconds and then drops to less than 4.0 volts?**	Yes ▶ No ▶	GO to CE4. GO to CE5.

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System Diagnosis	Pinpoint Test	CE

TEST STEP	RESULT ▶	ACTION TO TAKE
CE4 CHECK CONTINUITY OF KEY POWER AND VOUT CIRCUITS		
• Key off. • Disconnect EMW module. • DVOM 200 ohm scale. • Measure resistance between KEY POWER circuit at the EMW module vehicle harness connector and CEL bulb. • Measure resistance between VOUT circuit at the EMW module vehicle harness connector and CEL bulb. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE bulb. RECONNECT EMW module. REPEAT **CE1**. SERVICE open circuit. RECONNECT EMW module. REPEAT **CE1**.
CE5 CHECK VOUT CIRCUIT FOR SHORTS TO GROUND OR POWER		
• Key off. • Disconnect EMW module. • Disconnect CEL bulb. • DVOM on 200,000 ohm scale. • Measure resistance between VOUT circuit at the EMW module vehicle harness connector and battery negative post and battery positive post. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	RECONNECT all components. If light is always on in **CE1**, GO to Table 2. If light is always off in **CE1**, GO to Table 1. SERVICE short circuit. RECONNECT all components. REPEAT **CE1**.

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System Diagnosis

Table 1

"CHECK ENGINE" LIGHT NEVER ON:

NOTE: This applies to only 1990 49 state 6.1L and 7.0L heavy duty trucks (gasoline engines only). All other vehicle applications with "CHECK ENGINE" Light concerns, go to Quick Test, Section 14.

SITUATION	ACTION TO TAKE
0 to 15,000 Miles	REPLACE EMW module with 2000 hour "time out" module. No emission maintenance required.
15,000 to 45,000 Miles	REPLACE EMW module with pretimed 1000 hour module. No emission maintenance required.
45,000 to 75,000 Miles (no previous emission maintenance was done).	REPLACE EMW module with 2000 hour "time out" module. Perform required emission maintenance.
60,000 to 75,000 Miles (previous emission maintenance has been done).	REPLACE EMW module with 2000 hour "time out" module. No emission maintenance required.
75,000 to 105,000 Miles	REPLACE EMW module with pretimed 1000 hour module. No emission maintenance required.
Greater than 105,000 Miles	REPLACE EMW module with 2000 hour "time out" module. Perform required emission maintenance.

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System Diagnosis

Table 2

"CHECK ENGINE" LIGHT ALWAYS ON:

NOTE: This applies to only 1990 49 state 6.1L and 7.0L heavy duty trucks (gasoline engines only). All other vehicle applications with "CHECK ENGINE" Light concerns, go to Quick Test, Section 14.

SITUATION	ACTION TO TAKE
0 to 15,000 Miles	RESET EMW module*. No emission maintenance required.
15,000 to 45,000 Miles	RELACE EMW module with pretimed 1000 hour module. No emission maitenance required.
45,000 to 75,000 Miles (no previous emission maintenance was done).	RESET EMW module*. Perform emission maintenance.
60,000 to 75,000 miles (previous emission maintenance has been done).	RESET EMW module*. No emission maintenance required.
75,000 to 105,000 Miles	REPLACE EMW module with pretimed 1000 hour module. No emission maintenance required.
Greater than 105,000 Miles	RESET EMW module*. Perform emission maintenance.

***Refer to Table 3 for reset procedure. If not resettable type module, replace with 2000 hour "time out" EMW module. If any module cannot be reset as described in Table 3, replace with a 2000 hour "time out" EMW module.**

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System Diagnosis

Table 3

RESET PROCEDURE:

The timer may be reset either before or after the timeout period has been exceeded. The procedure is the same for either condition.

Step 1

Turn the ignition switch to the OFF position.

Step 2

Lightly push the shank end of a No. 2 or 7/32 inch drill bit through the .2 inch diameter hole with the sticker labeled 'RESET', lightly press down and hold. Go to Step 3.

Step 3

Still pressing the drill bit down, turn the ignition switch to the RUN position. The CEL will then light and should remain lit for as long as the drill bit is pressed down. Hold the drill bit down for approximately five seconds. Go to Step 4.

Step 4

Remove the drill bit. The lamp should go out within approximately 2 to 5 seconds indicating a reset has occurred. If the lamp does not go out then begin again with Step 1. Turn the ignition switch to the OFF position and go to Step 5.

Step 5

Turn the ignition switch to the RUN position. The CEL will light for approximately 2 to 5 seconds and will then go out. This verifies that a proper reset of the EMW module has been accomplished. If the CEL remains on, then the proper reset has not occurred and the reset procedure should be repeated. Turn the ignition switch to the OFF position.

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SECTION 13

Ignition Systems, Timing Procedures and Diagnosis

Contents

Ignition System Applications 13-1

TFI IGNITION SYSTEM:

Initial Timing Set Procedure 13-2

Spark Timing Advance — EEC-IV 13-4

Spark Timing Advance — Non EEC 13-7

Symptom Index 13-15

Ignition System Diagnostic Procedures — TFI 13-15

- Part 1 (Secondary) 13-16
- Part 2 (Primary)
  - Duraspark II 13-24
  - TFI-IV 13-42
  - TFI-IV With Computer Controlled Dwell (CCD) 13-42
  - TFI-IV Closed Bowl Distributor 13-55
  - Intermittent Diagnosis Procedure 13-72

DISTRIBUTORLESS IGNITION SYSTEM (DIS)

Ignition System Diagnostic Procedures (DIS)

- 2.3L EFI Truck (Dual Plug) 13-76
- 3.0L SHO SEFI and 3.8L SC SEFI 13-122

ELECTRONIC DISTRIBUTORLESS IGNITION SYSTEM (EDIS)

- 4.0L EFI Truck (EDIS) 13-165

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Ignition System Applications

PASSENGER CAR ENGINES	IGNITION SYSTEM
1.9/2.3L HSC/2.5L/5.0L	TFI-IV
2.3L OHC Mustang — 49 States	TFI-IV
3.0L Taurus/Sable — 49 States	TFI-IV
2.3L OHC Mustang — California	TFI-IV with Computer Controlled Dwell (CCD)
3.0L Taurus/Sable — California	TFI-IV with Computer Controlled Dwell (CCD)
3.0L Probe	TFI-IV with Computer Controlled Dwell (CCD)
*3.0L SHO	Distributorless (DIS)
*3.8L SC	Distributorless (DIS)
3.8L	TFI-IV Closed Bowl Distributor
5.8L	Duraspark II

TRUCK ENGINES	IGNITION SYSTEM
*2.3L	Distributorless (DIS)
2.9/3.0/4.9/5.0/5.8L	TFI-IV
*4.0L	Electronic Distributorless (EDIS)
7.0L	Duraspark II
7.5L	TFI-IV Closed Bowl Distributor

*Refer to the separate Distributorless Ignition Section for these applications.

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Initial Timing Set Procedure

PRELIMINARY NOTE

The procedure described below for setting initial timing is to be used under normal circumstances. If problems are encountered setting initial timing using this procedure, the spark timing procedure that follows should be used to diagnose the problem.

Procedure	Non-EEC	EEC-IV
① Place transmission in PARK or NEUTRAL, A/C and heater in OFF position.	X	X
② Remove vacuum hoses from the distributor vacuum advance connection at the distributor and plug the hoses.	X	
③ Connect an inductive timing light, Rotunda 059-00006 or equivalent.	X	X
④ Connect a tachometer, Rotunda 059-00010 or equivalent.	X	
⑤ Disconnect the single wire in-line spout connector or remove the shorting bar from the double wire spout connector.		X
⑥ If the vehicle is equipped with a barometric pressure switch (-12A243-) disconnect it from the ignition module and place a jumper wire across the pins at the ignition module connector (yellow and black wires).	X	
⑦ Start the engine and allow it to warm up to operating temperature.	X	X
⑧ With engine at timing rpm if specified, check/adjust initial timing to specification.	X	X
⑨ Reconnect single wire in-line spout connector or reinstall the shorting bar on the double wire spout connector. Check timing advance to verify distributor is advancing beyond the initial setting. If it is not, refer to Section 14 Quick Test 04.		X
⑩ Remove test instruments.	X	X
⑪ Unplug and reconnect vacuum hoses.	X	
⑫ Remove jumper from ignition connector and reconnect if applicable.	X	

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SPARK TIMING ADVANCE

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Spark Timing Advance
EEC-IV Equipped Vehicles

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Small straight pin.
- Volt/Ohm Meter Rotunda 014-00407.

NOTES

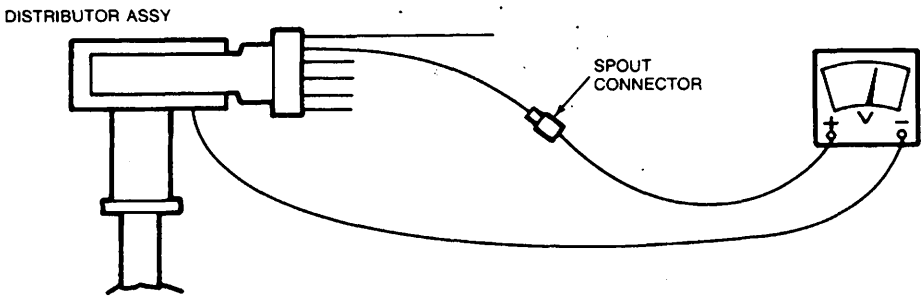
- This procedure is applicable to all EEC-IV equipped vehicles.
- Spark Timing Advance is controlled by the EEC system. This procedure checks the capability of the ignition module to receive the spark timing command from the EEC module.

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Spark Timing Advance — EEC

Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Key in OFF position. 2. Disconnect the pin in-line connector near the TFI module (SPOUT).	Yes ▶	TFI is OK. GO to EEC Diagnosis, Section 14 Computed Timing.
3. Attach the negative (–) VOM lead to the distributor base. 4. Start the engine and measure the battery voltage at idle. 5. Measure the voltage on the TFI module side of the pin in-line connector. 6. **Is the result between 30 percent and 60 percent of battery voltage?**	No ▶	GO to Test 2.



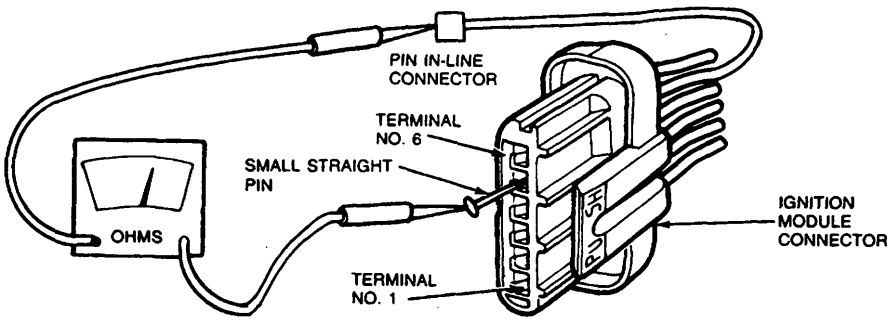
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Spark Timing Advance — EEC

Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from ignition module. Inspect for dirt, corrosion and damage. **NOTE: PUSH connector tabs to separate.** 2. Using small straight pin inserted into connector terminal 5, measure resistance between the terminal and the TFI module side of the pin in-line connector. 3. **Is the result less than 5 ohms?**	Yes ▶ No ▶	REPLACE the TFI module. SERVICE the wiring between the pin in-line connector and the TFI connector.



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Spark Timing Advance
Non-EEC Equipped Vehicles

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Inductive Timing Light, Rotunda 059-00006.
- Tachometer, Rotunda 099-00003.
- Vacuum Gauge, Rotunda 059-00008.

NOTES

- This procedure is not applicable to EEC-IV equipped vehicles.
- This procedure checks the operation of the centrifugal and vacuum advance mechanisms in the distributor. It is also to be used to check the operation of the retard feature of the (-12A244-) Ignition Module.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1		
• Disconnect and plug distributor vacuum hose(s). • Connect timing light and tachometer.	▶	GO to Step 2.
STEP 2		
If Ignition Module (-12A244-) is used: • Disconnect two wire connector (YELLOW and BLACK wires). • Jumper pins in module connector. • If (-12A244-) Ignition Module not used, skip this Step.	▶	GO to Step 3.
STEP 3		
• Start and warm-up engine. • Check that engine speed is at or below timing rpm.* • **Is engine speed at or below timing rpm*?**	Yes ▶ No ▶	OK. GO to Step 4. RESET rpm below timing rpm. GO to Step 4.

* Refer to Vehicle Emission Control Information Decal.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 4		
• **Positive-Buy timing?**	Yes ▶	GO to Step 5.
	No ▶	GO to Step 6.
STEP 5		
• Check initial timing. **NOTE: Record reading for later use.** • **Is timing within ± 4 degrees of required?***	Yes ▶	GO to Step 7.
	No ▶	RESET timing. REMOVE or deface positive buy label. GO to Step 7.
STEP 6		
• Check initial timing. **NOTE: Record reading for later use.** • **Is timing within ± 2 degrees of required?***	Yes ▶	GO to Step 7.
	No ▶	RESET timing. GO to Step 7.

* Refer to Vehicle Emission Control Information Decal.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 7		
• **Basic Part No. (-12A244-) on ignition module?**	Yes ▶	REMOVE jumper in two wire connector. RECONNECT two wire connector. GO to Step 8.
	No ▶	GO to Step 11.
STEP 8		
• Check initial timing at timing rpm. • **Is timing the same as Step 5 or 6?**	Yes ▶	DISCONNECT two wire connector (YELLOW and BLACK wires) at ignition module. GO to Step 9. **NOTE: Engine may die when connector is separated due to excessive spark retard. If this happens spark retard operation is OK. RECONNECT two wire connector, GO to Step 11.**
	No ▶	REFER to the MCU Diagnosis Manual then return to Step 2.
STEP 9		
• Check initial timing at timing rpm. • **Is timing retarded from Step 8?**	Yes ▶	Retard operation OK. REMOVE vacuum gauge and RECONNECT vacuum hose (if used). GO to Step 11.
	No ▶	GO to Step 10.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 10		
• Substitute new ignition module. • Connect two wire (RED and WHITE wires) and four wire connectors. • Jumper pins in two wire (YELLOW and BLACK wires) connector. • Check initial timing at timing rpm. • **Is timing the same as Step 5 or 6?**	Yes ▶	RETURN to Step 8. **NOTE: If ignition module substitution appears to correct problem, RECONNECT original module and REPEAT this Step to verify service.**
	No ▶	REPEAT Step 10.
STEP 11		
• Increase engine speed to 2,500 rpm. • Check spark timing. • Return to idle rpm. **NOTE: Refer to the Service Performance Manual for total advance at 2,500 rpm/vacuum advance disconnected under the correct engine calibration for specification.** • **Is timing within specification?**	Yes ▶	GO to Step 12.
	No ▶	REPLACE distributor. REPEAT this Step.
STEP 12		
• Check initial timing at timing rpm. • **Is timing the same as Step 5 or 6?**	Yes ▶	Distributor mechanical advance mechanism OK. GO to Step 13.
	No ▶	REPLACE distributor. RETURN to Step 11.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 13		
• Install distributor vacuum **advance** hose without spark delay valve if used. • Increase engine speed to 2,500 rpm, hold for 60 seconds. • Check spark timing. • Return to idle rpm. **NOTE: Refer to the Service Performance Manual for total advance at 2,500 rpm/vacuum advance connected under the correct engine calibration for specification.** • **Is timing within specification?**	Yes ▶ No ▶	Distributor vacuum advance mechanism OK. REFER to Section 3. CHECK operation of spark-delay valve if used. GO to Step 17. GO to Step 14.
STEP 14		
• Install vacuum gauge in vacuum advance hose, using tee connector. • Increase engine speed to 2,500 rpm, hold for 60 seconds. • Check for presence of vacuum. • Return to idle rpm. • **Was a minimum of 51 kPa (15 in-Hg) vacuum obtained?**	Yes ▶ No ▶	INSPECT diaphragm for vacuum leaks and stator assembly for sticking/binding. SERVICE/REPLACE as necessary. RETURN to Step 13. GO to Step 15.
STEP 15		
• Check engine for vacuum lockout devices. (Refer to Vehicle Emission Control Information Decal) • **Does engine have lockout devices?**	Yes ▶ No ▶	GO to Step 16. SERVICE vacuum source. RETURN to Step 13.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 16		
• Disconnect and plug distributor vacuum advance hose. • Attach vacuum hose between distributor vacuum advance diaphragm connection and manifold vacuum. • Increase engine speed to 2,500 rpm. • Check spark timing. • Return to idle rpm. **NOTE: Refer to the Service Performance Manual for total advance at 2,500 rpm/vacuum advance connected under the correct engine calibration for specification.** • **Is timing within specification?**	Yes ▶ No ▶	SERVICE vacuum source. DISCONNECT manifold vacuum. REMOVE vacuum gauge and tee. RETURN to Step 13. INSPECT diaphragm for leaks and stator assembly for sticking/ binding. SERVICE/REPLACE as necessary. DISCONNECT manifold vacuum. RECONNECT normal vacuum source. RETURN to Step 13.
STEP 17		
• **Does distributor have dual diaphragm?**	Yes ▶ No ▶	GO to Step 18. Spark timing systems OK.

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Spark Timing Advance — Non-EEC

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 18		
• Disconnect and plug vacuum hose to vacuum advance connection on diaphragm. • Connect vacuum hose to retard connection on diaphragm. • Check spark timing at idle rpm. • **Is timing retarded from Step 5 or 6?**	Yes ▶ No ▶	Spark timing systems OK. RECONNECT vacuum hose to vacuum advance connection. GO to Step 19.
STEP 19		
• Install vacuum gauge in vacuum hose to retard connection on diaphragm. • Check for presence of vacuum at idle rpm. • **Is a minimum of 15 kPa (15 in-Hg) vacuum obtained?**	Yes ▶ No ▶	REPLACE distributor diaphragm assembly. RETURN to Step 18. SERVICE vacuum source. RETURN to Step 18.

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Diagnostic Procedures

PRELIMINARY NOTES

The engine analyzer is used to diagnose problems in the secondary side of the ignition system. This is covered in Part 1, which is common for all 1989 ignition systems (except distributorless ignition).

For problems in the primary side of the ignition system, there is a separate Part 2 for each of the three basic types of ignition systems.

The beginning point for Ignition System Diagnosis is the Symptom Index. This will direct you to the proper part for your engine symptom.

If after completing a Part 1 or Part 2 diagnosis and a problem has not been solved, the problem is either an intermittent one or is not in the ignition system. If you suspect it to be intermittent, refer to intermittent diagnosis. Otherwise return to the Diagnostic Routines, (Section 2), for additional assistance.

SYMPTOM INDEX

ENGINE SYMPTOM	START AT
• CRANKS NORMALLY BUT WON'T START	PART 2
• STARTS NORMALLY BUT WON'T RUN (STALLS)	PART 2
• CRANKS NORMALLY BUT SLOW TO START	PART 1
• ROUGH IDLE	PART 1
• ENGINE MISS	PART 1
• POOR FUEL ECONOMY	PART 1

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PART 1

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Preliminary Checkout & Equipment

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Spark Tester, Special Service Tool D81P-6666-A. See **NOTE.**
- Engine Analyzer, Rotunda 002-00373.
- Volt/Ohm Meter, Rotunda 014-00407.

NOTE

- A spark plug with a broken side electrode **is not** sufficient to check for spark and may lead to incorrect results.

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Ignition Coil Secondary Voltage	Part 1	Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
• **Will engine start and run?**	Yes ▶	Test Result OK. GO to Part 1, Test 2.
	No ▶	INSPECT ignition coil for damage, carbon tracking. MEASURE resistance of ignition coil wire. REPLACE if greater than 7,000 ohms per foot. GO to Part 2, Test 1.

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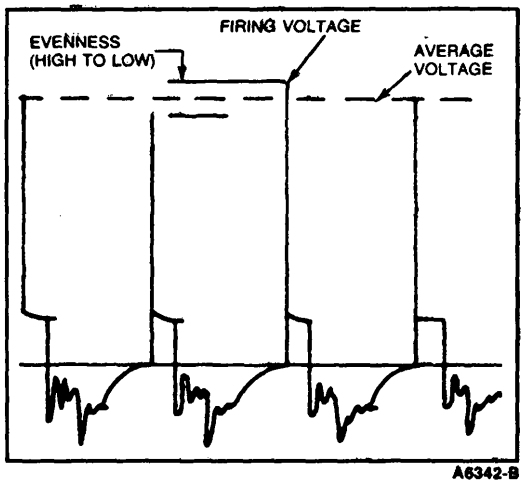
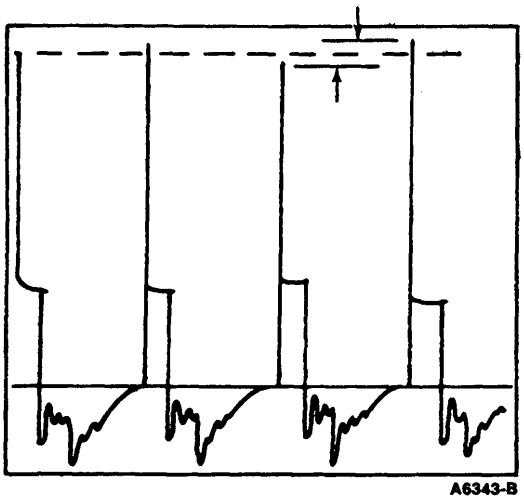
Secondary Display	Part 1	Test 2

NOTE: If this portion of the diagnostic procedure is to provide accurate results, it is essential that the calibration of your engine analyzer be maintained. Refer to your equipment manual. If this is not available, an estimate of the calibration can be made by connecting the spark tester (D81P-6666-A or equivalent) to a properly operating ignition system and measuring the firing voltage of the spark tester only. Do not include the firing voltage of the rotor-to-cap gap. The spark tester firing voltage should be approximately 28 KV.

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect engine analyzer to view **parade** display of ignition system secondary. 2. While **slowly** increasing engine rpm from idle to 2,000 rpm, compare engine analyzer display to the following illustrations. The illustrations shown are four cylinder but are typical for all engines. 3. Disconnect engine analyzer.		

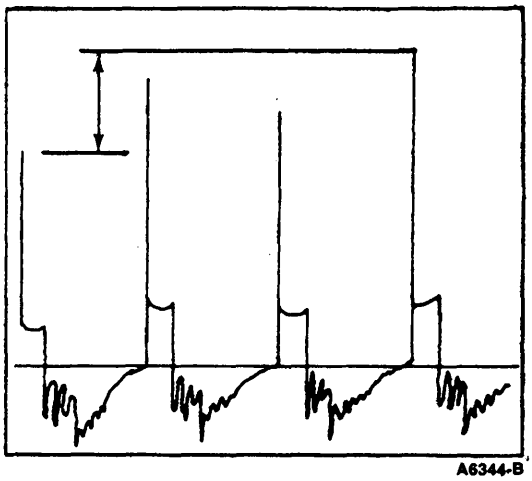
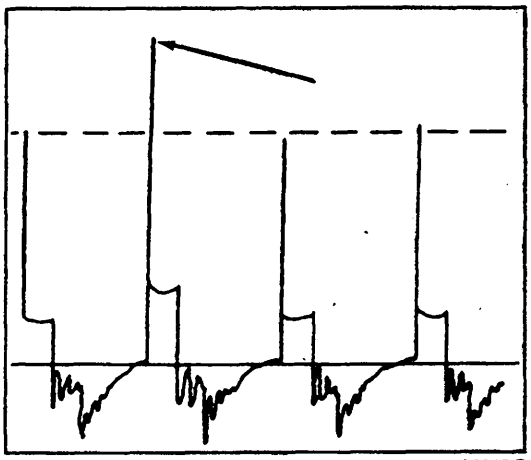
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Secondary Display — Continued	Part 1	Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
	The average value of spark plug firing voltage: 15 KV or less with evenness of spark plug firing voltage: 5 KV or less ▶	These are normal values for a properly operating ignition system.
	The average value of spark plug firing voltage: greater than 15 KV with evenness of spark plug firing voltage: 5 KV or less ▶	**Problems affecting all cylinders:** CHECK ignition coil wire for proper installation in coil and distributor cap. MEASURE resistance of ignition coil wire. REPLACE if greater than 7,000 ohms per foot. Wide spark plug gaps — all cylinders, (usually from worn electrodes due to high mileage). INSPECT cap and rotor for problems causing excessive cap-to-rotor gap.

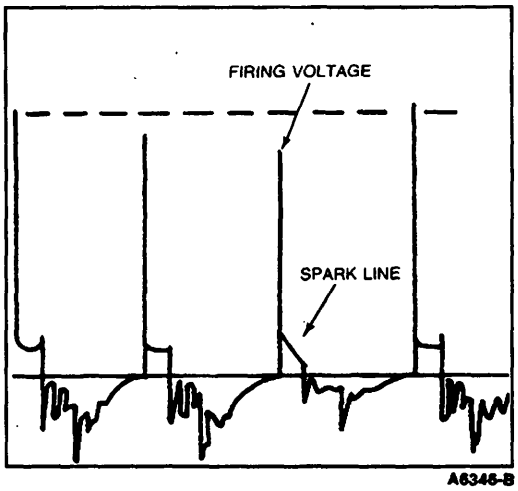
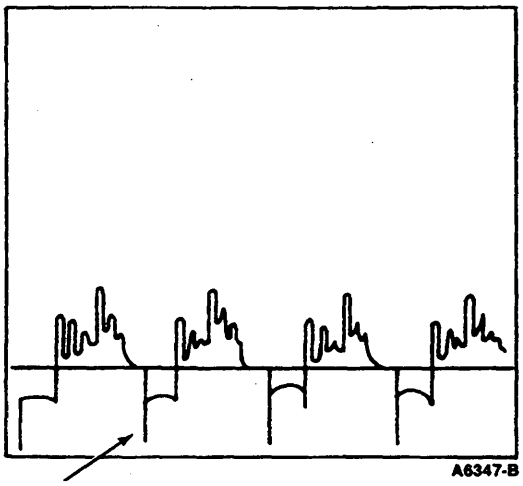
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Secondary Display — Continued	Part 1	Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
 A6344-B	Evenness of spark plug firing voltage: greater than 5 KV ▶	**Problems affecting some cylinders:** Wide spark plug gap(s) or worn electrode(s). Improperly installed cap, adapter, or rotor.
 A6345-B	Consistently high spark plug firing voltage in one or more cylinders ▶	Spark plug wire(s) not firmly connected to distributor cap or spark plug. Disconnected spark plug wire(s). Wide spark plug gap(s). Open plug wire(s). GO to Part 1, Test 3.

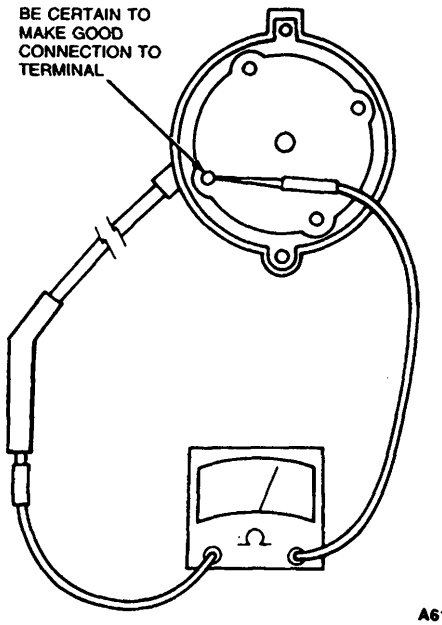
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Secondary Display — Continued	Part 1	Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
	Consistently low spark plug firing voltage or sloping spark line in one or more cylinders ▶	Fouled spark plug(s). Narrow spark plug gap(s). Spark plug wire(s) grounding on engine. Inspect for damage. Carbon tracking in cap and adapter.
	Spark plug firing voltage negative going ▶	Ignition coil primary circuit reversed. CHECK wiring harness for ignition coil primary circuit. If OK, REPLACE ignition coil.

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Spark Plug Wire Resistance | Part 1 | Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Remove distributor cap from distributor. 2. Check for spark plug wires firmly seated on cap. 3. Disconnect spark plug end of suspect wire(s). 4. Measure resistance from terminal in cap to spark plug terminal. 5. Reinstall distributor cap and connect spark plug wire to spark plug. CAUTION **Do not, under any circumstances, puncture a spark plug wire when measuring resistance. Measure only as instructed.** 6. **Was resistance less than 7,000 ohms per foot?**  A6166-C	Yes ▶ No ▶	Spark plug wire resistance OK. REPLACE spark plug wire(s).

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PART 2
DURASPARK II
IGNITION SYSTEM

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Preliminary Checkout, Equipment & Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

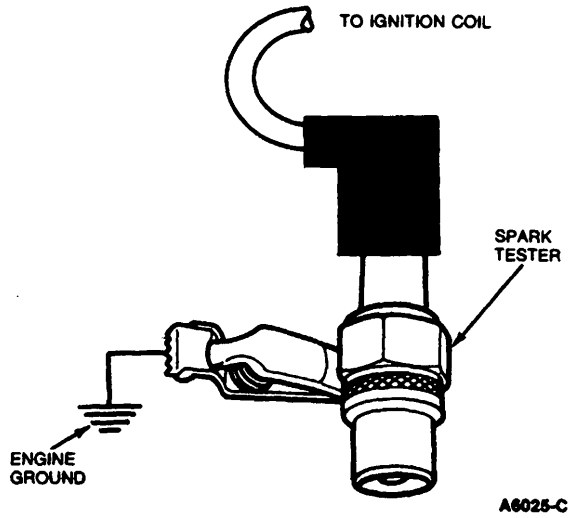
- Spark Tester, Special Service Tool D81P-6666-A. See **NOTE.**
- Volt/Ohm Meter Rotunda 014-00407.
- 12 Volt Test Lamp.
- Small straight pins (2).

NOTES

- A spark plug with a broken side electrode **is not** sufficient to check for spark and may lead to incorrect results.
- All wire colors referred to in this part relate to the colors of the ignition module wires. When working with a wiring harness, the wires must be traced back to the ignition module for proper color identification.
- When instructed to inspect a wiring harness, both a visual inspection and a continuity test should be performed.
- When making measurements on a wiring harness or connector, it is good practice to wiggle the wires while measuring.

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Start Circuits	DS II	Part 2 Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect spark tester between ignition coil wire and engine ground. 2. Crank engine using ignition switch. 3. **Were sparks present?**  	Yes ▶	GO to Part 2, Test 2.
	No ▶	MEASURE resistance of ignition coil wire. REPLACE if greater than 7,000 ohms per foot. INSPECT ignition coil for damage, carbon tracking. CRANK engine to verify distributor rotation. REFER to Ignition/Engine Shop Manual Group (Engine Group for Compact Truck) and SERVICE as required. GO to Part 2, Test 5.

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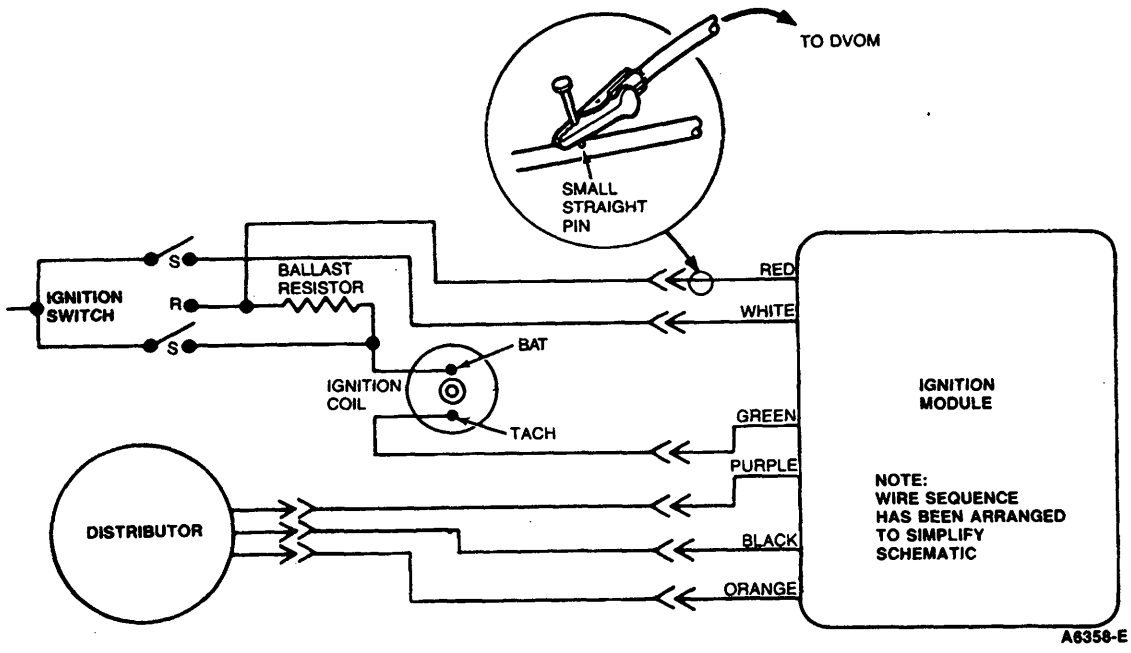
Run Circuits	DS II	Part 2 Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Turn ignition switch from OFF to RUN to OFF position several times. 2. Spark should occur each time switch goes from RUN to OFF position. 3. Remove spark tester, reconnect coil wire to distributor cap. 4. **Were sparks present?**	Yes ▶	INSPECT distributor cap, adapter, rotor for cracks, carbon tracking. CHECK for roll pin securing armature to sleeve in distributor. CHECK that ORANGE and PURPLE wires not crossed between distributor and ignition module. If ignition module has Basic Part No. (-12A244-), GO to Spark Timing Advance to check spark retard operation.
	No ▶	GO to Part 2, Test 3.

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Module Voltage	DS II	Part 2 Test 3

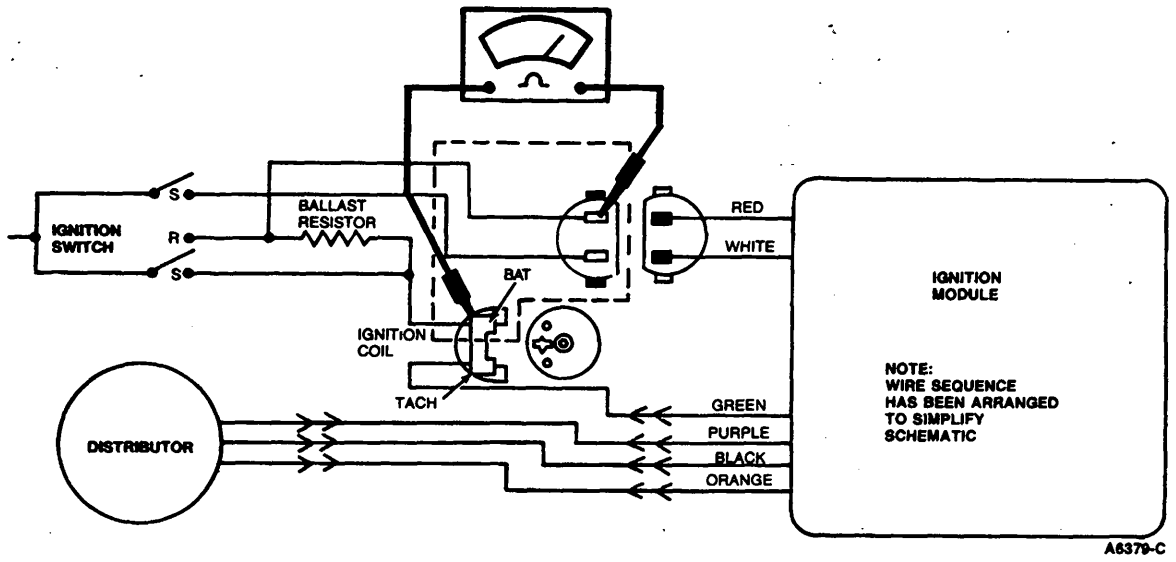
TEST STEP	RESULT ▶	ACTION TO TAKE
• Turn ignition switch off. 1. Carefully insert small straight pin in RED module wire. **CAUTION** **Do not allow straight pin to contact electrical ground.** 2. Attach negative (−) VOM lead to distributor base. 3. Measure battery voltage. 4. Measure voltage at straight pin with ignition switch in RUN position. 5. Turn ignition switch to OFF position. 6. Remove straight pin. 7. **Is voltage 90 percent of battery voltage or greater?**	Yes ▶ No ▶	GO to Part 2, Test 4. REFER to vehicle wiring diagram. INSPECT wiring harness between module and ignition switch. Damaged or worn ignition switch. REFER to Charging/Electrical Shop Manual Group (Electrical Power Supply System Group 14 for Compact Truck).



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Ballast Resistor	DS II	Part 2 Test 4

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate and inspect ignition module two wire connector with RED and WHITE wires. 2. Disconnect and inspect ignition coil connector. 3. Measure ballast resistor between BAT terminal of ignition coil connector and wiring harness connector mating with RED module wire. 4. Reconnect all connectors. 5. **Was the resistance 0.8 to 1.6 ohms?**	Yes ▶ No ▶	REPLACE ignition module. REPLACE ballast resistor.



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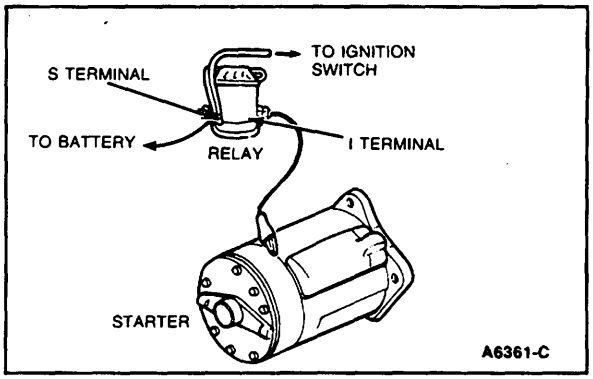
Supply Voltage Circuits | DS II | Part 2 Test 5

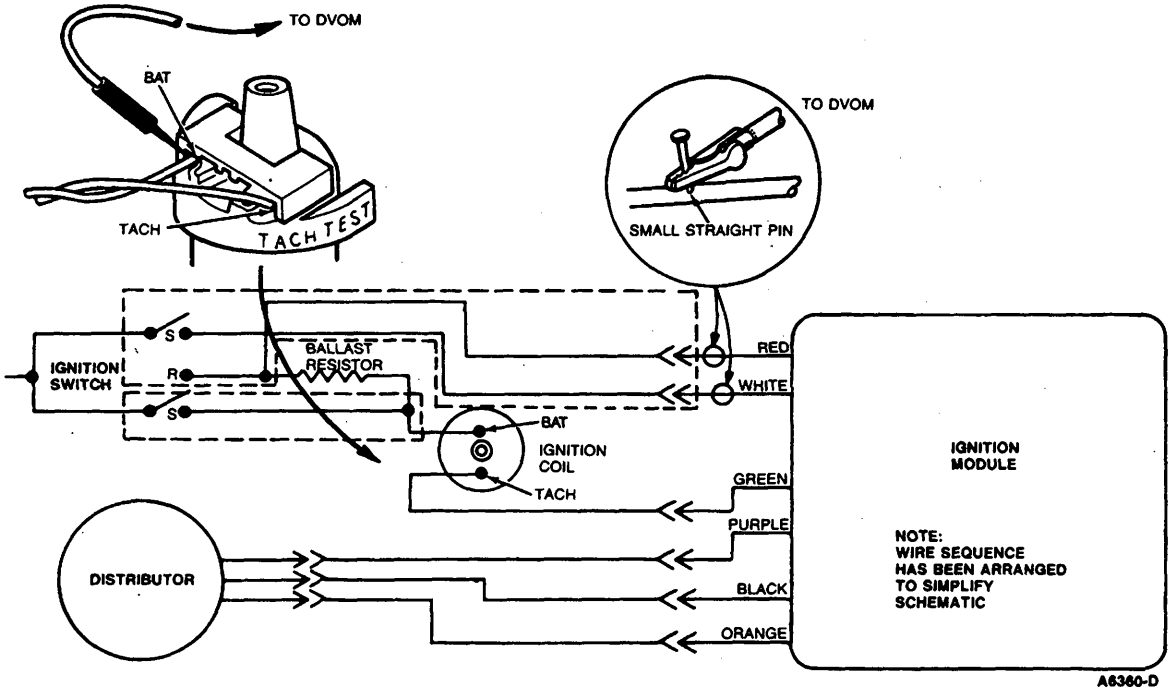
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Remove SPARK TESTER, reconnect coil wire to distributor cap. 2. If starter relay has I terminal, disconnect cable from starter relay to starter motor. 3. If starter relay does not have I terminal, disconnect wire to S terminal of starter relay. 4. Carefully insert small straight pins in RED and WHITE module wires. **CAUTION** **Do not allow straight pins to contact electrical ground.** 5. Measure battery voltage. 6. Following table below, measure voltage at points listed with ignition switch in position shown. **NOTE: Attach negative (-) VOM lead to distributor base. Wiggle wires in wiring harness when measuring.** 7. Turn ignition switch to OFF position. 8. Remove straight pins. 9. Reconnect any cables/wires removed from starter relay. 10. **Is voltage 90 percent of battery voltage or greater?**	Yes ▶	Test result OK. GO to Part 2, Test 6.
	No ▶	REFER to vehicle wiring diagram. INSPECT wiring harness and connector(s) in faulty circuit(s). Damaged or worn ignition switch. REFER to Charging/Electrical Shop Manual Group (Electrical Power Supply System Group 14 for Compact Truck). Radio interference capacitor on ignition coil.

Wire/ Terminal	Circuit	Ignition Switch Test Position
Red	Run	Run
White	Start	Start
'Bat' Terminal Ignition Coil	Ballast Resistor Bypass	Start

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Supply Voltage Circuits — Continued	DS II	Part 2 Test 5

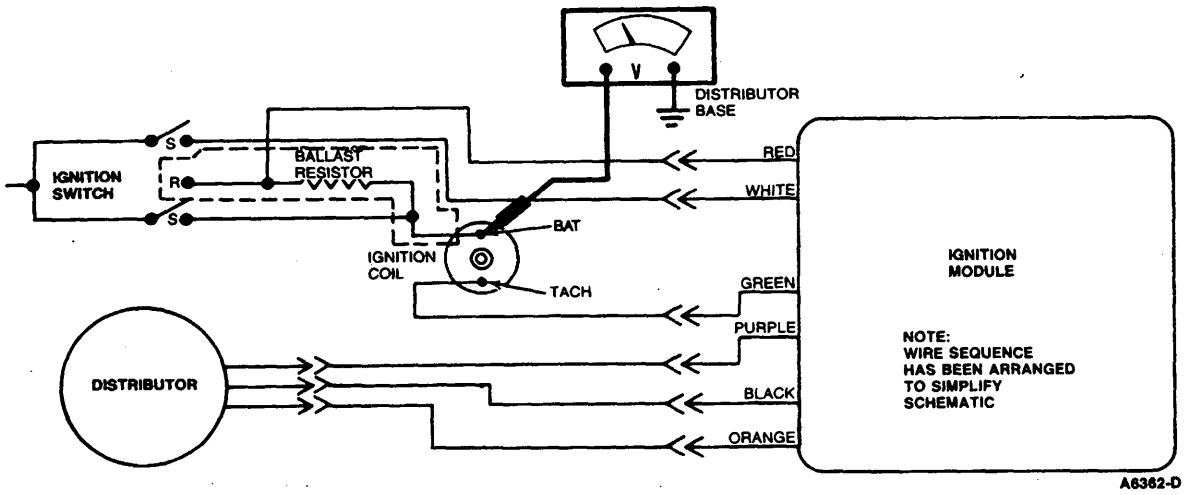




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Ignition Coil Supply Voltage	DS II	Part 2 Test 6

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach negative (−) lead of VOM to distributor base. 2. Turn ignition switch to RUN position. 3. Measure voltage at BAT terminal of ignition coil. 4. Turn ignition switch to OFF position. 5. **Was the voltage 6 to 8 volts?**	Yes ▶ No ▶	GO to Part 2, Test 7. GO to Part 2, Test 12.



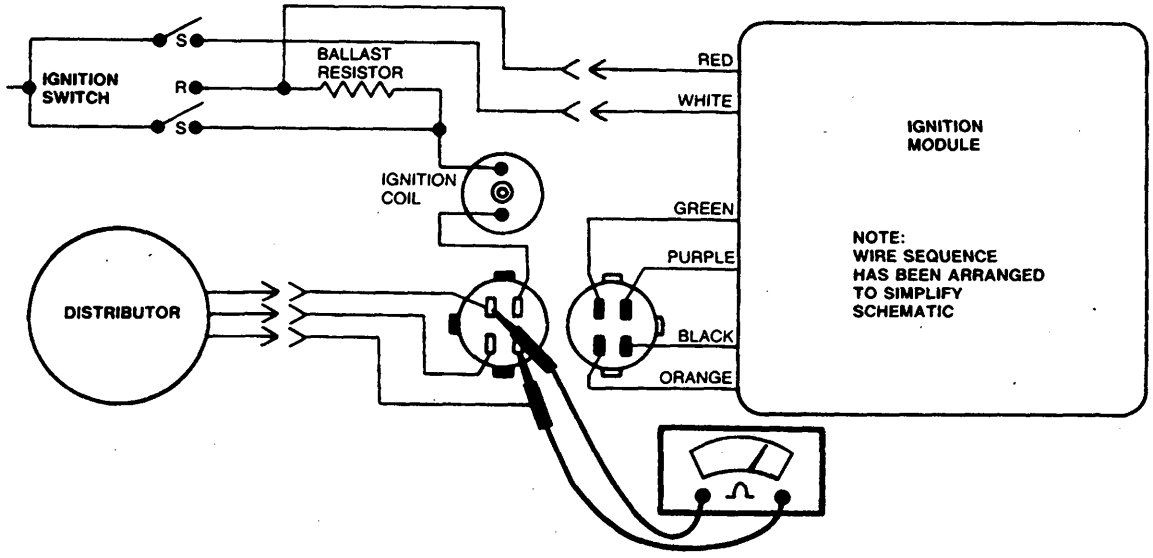
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Distributor Stator Assembly and Wiring Harness

DS II

Part 2 Test 7

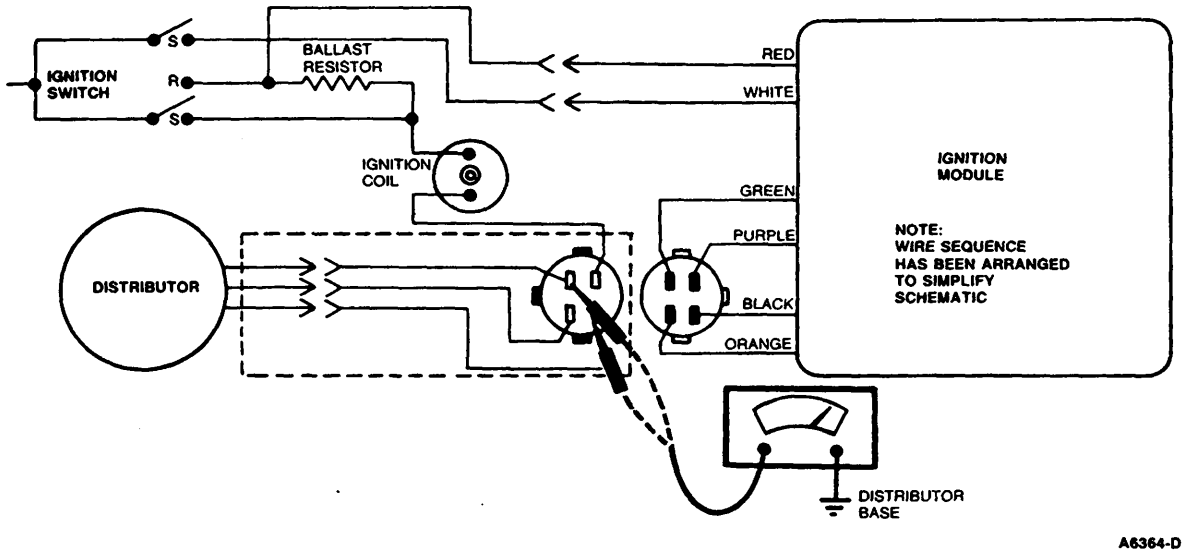
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate ignition module four wire connector. Inspect for dirt, corrosion, and damage. 2. Measure stator assembly and wiring harness resistance between wiring harness terminals mating with ORANGE and PURPLE module wires. **NOTE: Wiggle wires in wiring harness when measuring.** 3. **Was the resistance 400 to 1,300 ohms?**	Yes ▶	Test result OK. GO to Part 2, Test 8.
	No ▶	GO to Part 2, Test 11.



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Ignition Module to Distributor Stator Assembly Wiring Harness	DS II	Part 2 Test 8

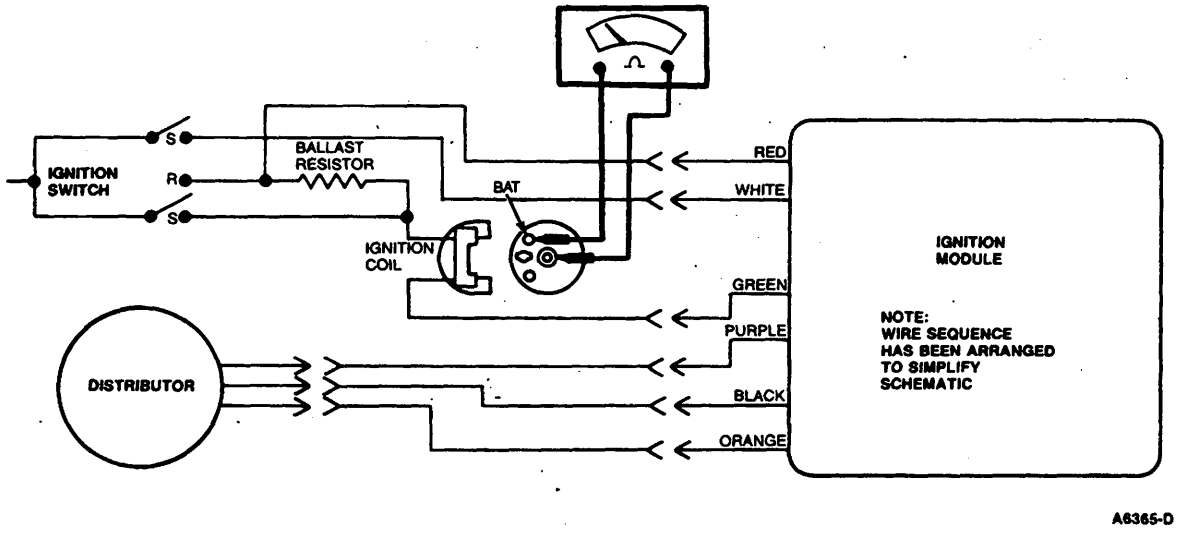
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach one VOM lead to distributor base. 2. Alternately measure resistance between wiring harness terminals mating with ORANGE and PURPLE module wires and ground. 3. Reconnect four wire connector. 4. **Was the resistance greater than 70,000 ohms?**	Yes ▶ No ▶	TEST result OK. GO to Part 2, Test 9. INSPECT wiring harness between module connector and distributor, including distributor grommet.



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Ignition Coil Secondary Resistance	DS II	Part 2 Test 9

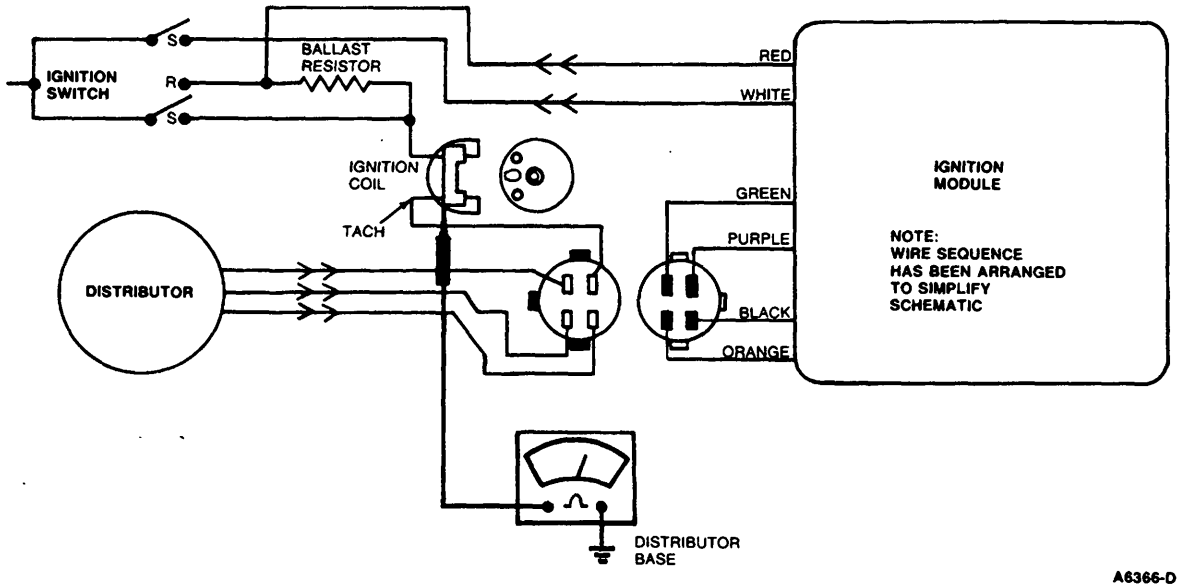
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect and inspect ignition coil connector and coil wire. 2. Measure secondary resistance from BAT terminal to high voltage terminal. 3. Reconnect ignition coil wire. 4. **Was the resistance 7,700 to 10,500 ohms?**	Yes ▶ No ▶	Test result OK. GO to Part 2, Test 10. REPLACE ignition coil.



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Module to Coil Wire	DS II	Part 2 Test 10

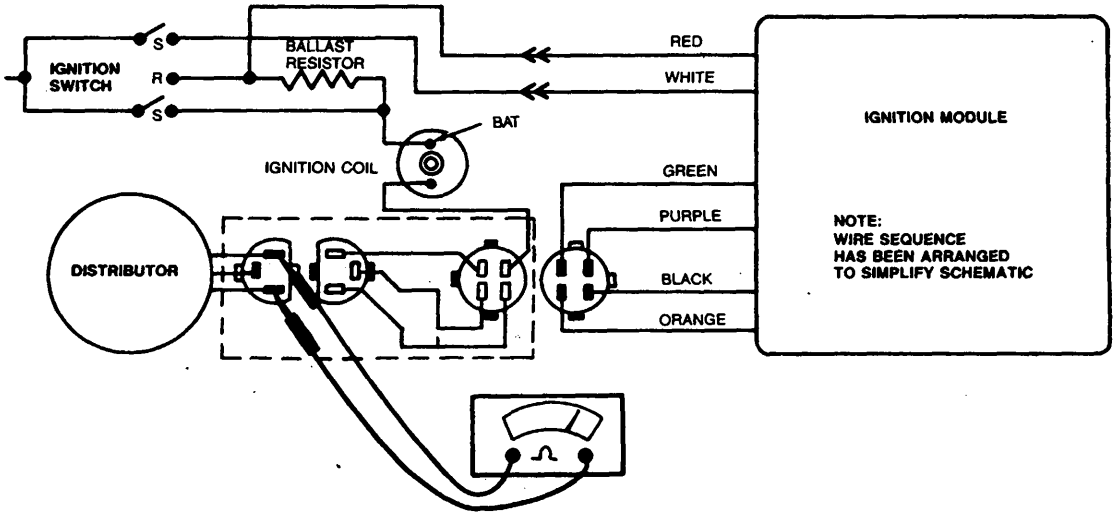
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate and inspect ignition module four wire connector and ignition coil connector from coil. 2. Connect one lead of VOM to distributor base. 3. Measure resistance between TACH terminal of ignition coil connector and ground. 4. Reconnect ignition module and coil connectors. 5. **Was the resistance greater than 100 ohms?**	Yes ▶ No ▶	REPLACE ignition module. INSPECT wiring harness between ignition module and coil.



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Distributor Stator Assembly	DS II	Part 2 Test 11

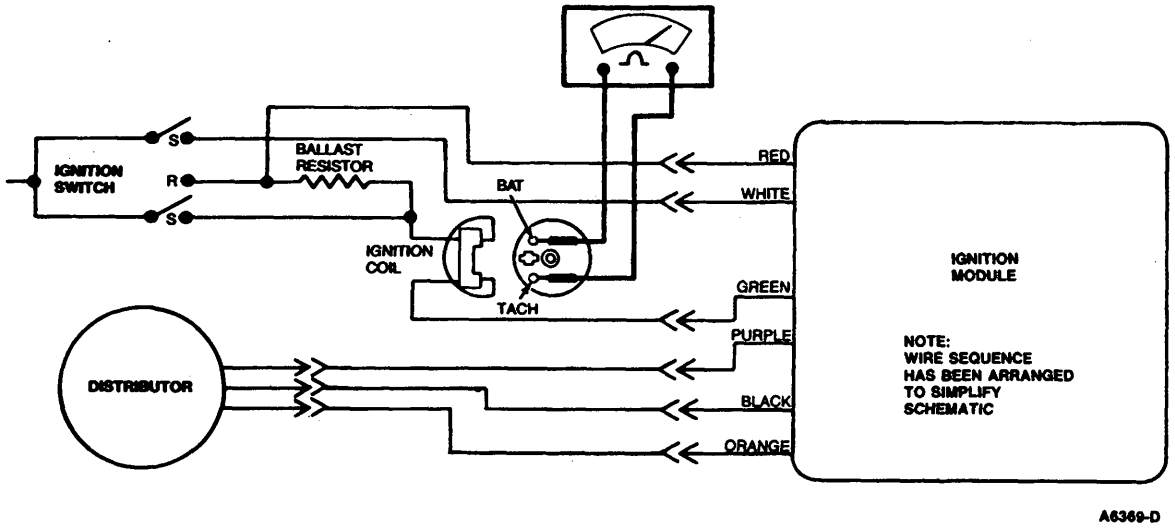
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate distributor connector from harness. Inspect for dirt, corrosion, and damage. 2. Measure stator assembly resistance across ORANGE and PURPLE wires at distributor connector. 3. Reconnect distributor and module connectors. 4. **Was resistance 400 to 1,300 ohms?**	Yes ▶ No ▶	Test result OK. INSPECT wiring harness between distributor and ignition module. REPLACE stator assembly.



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Ignition Coil Primary Resistance	DS II	Part 2 Test 12

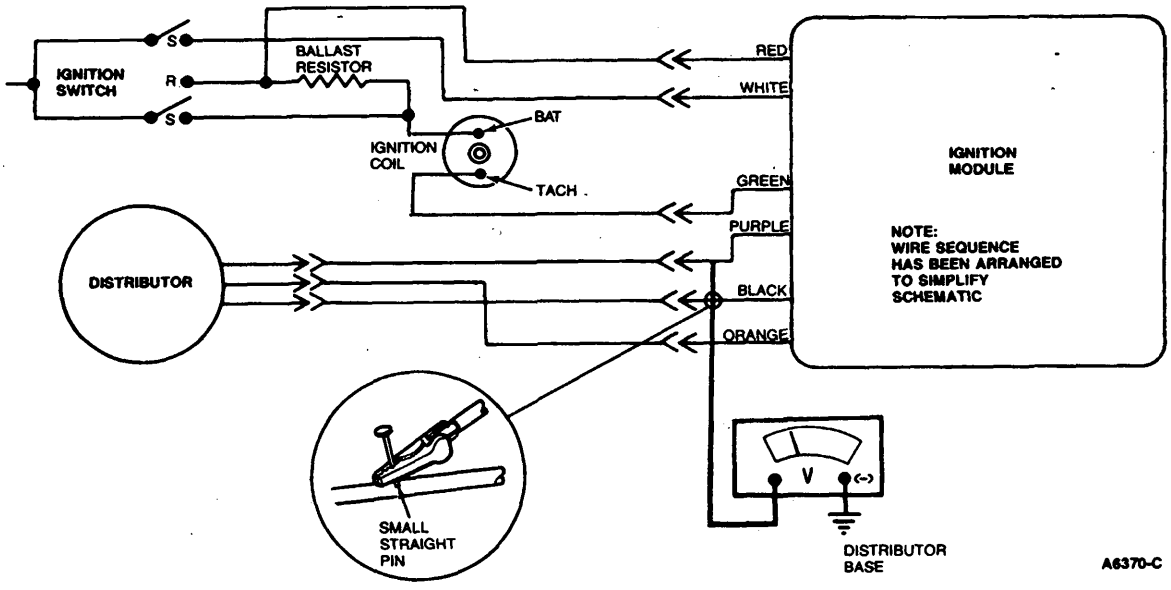
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect ignition coil connector. 2. Measure primary resistance from BAT to TACH terminal. 3. Reconnect ignition coil connector. 4. **Was resistance 0.8 to 1.6 ohms?**	Yes ▶ No ▶	Test result OK. GO to Part 2, Test 13. REPLACE ignition coil.



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Primary Circuit Continuity	DS II	Part 2 Test 13

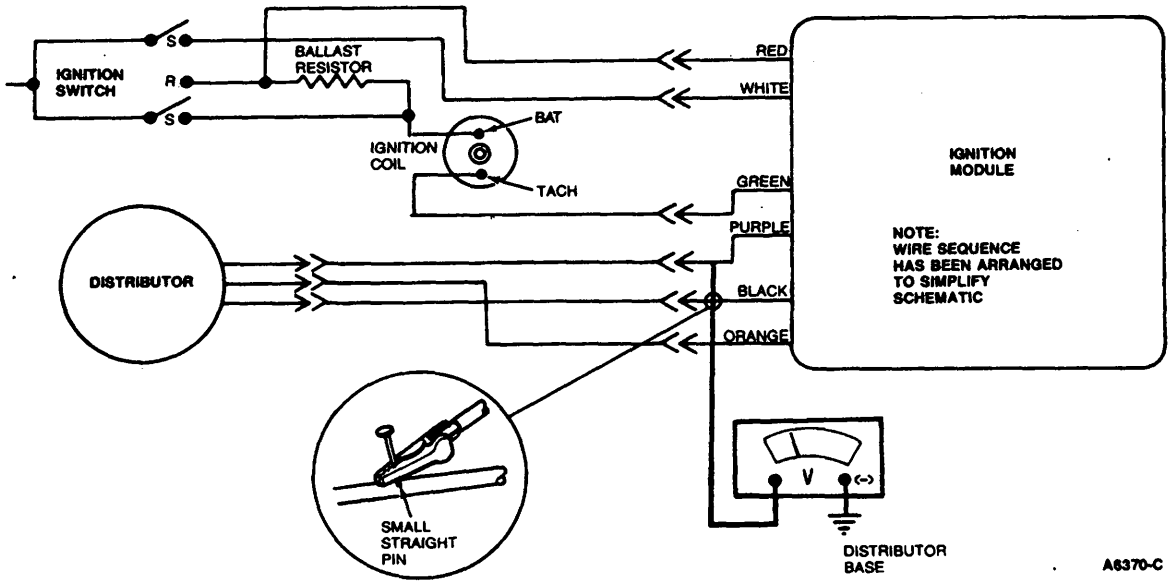
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Carefully insert small straight pin in module GREEN wire. CAUTION **Do not allow straight pin to contact electrical ground.** 2. Attach negative (–) VOM lead to distributor base. 3. Turn ignition switch to RUN position. 4. Measure voltage at GREEN module wire. 5. Turn ignition switch to OFF position. 6. Remove straight pin. 7. **Was voltage greater than 1.5 volts?**	Yes ▶ No ▶	GO to Part 2, Test 14. INSPECT wiring harness and connectors between ignition module and coil.



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Ground Circuit Continuity	DS II	Part 2 Test 14

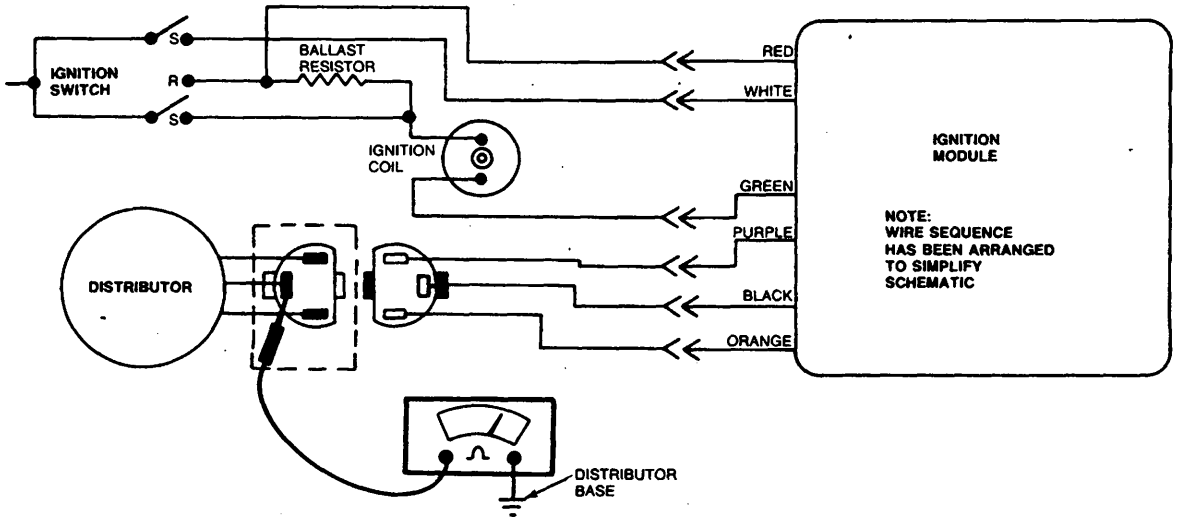
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Carefully insert small straight pin in module BLACK wire. CAUTION **Do not allow straight pin to contact electrical ground.** 2. Attach negative (–) VOM lead to distributor base. 3. Turn ignition switch to RUN position. 4. Measure voltage at BLACK wire. 5. Turn ignition switch to OFF position. 6. Remove straight pin. 7. **Was voltage greater than 0.5 volts?**	Yes ▶ No ▶	GO to Part 2, Test 15. REPLACE ignition module.



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Distributor Ground Circuit Continuity	DS II	Part 2 Test 15

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate distributor connector from harness. Inspect for dirt, corrosion, and damage. 2. Attach one lead of VOM to distributor base. 3. Measure resistance by attaching other VOM lead to BLACK wire in distributor connector. **NOTE: Wiggle distributor grommet when measuring.** 4. Reconnect distributor connector. 5. **Was resistance less than 1 ohm?**	Yes ▶ No ▶	Test result OK. INSPECT wiring harness and connectors between distributor and ignition module. INSPECT ground screw in distributor.



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PART 2
TFI-IV
IGNITION SYSTEM
AND
TFI WITH COMPUTER
CONTROLLED DWELL
(CCD)

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Preliminary Checkout, Equipment & Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, and burned, overheated, loose or broken conditions.
- Check that the TFI module is securely fastened to the distributor base.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Spark Tester, Special Service Tool D81P-6666-A. See **NOTES.**
- Volt/Ohm Meter Rotunda 014-00407.
- 12 Volt Test Lamp.
- Small straight pin.
- Remote Starter Switch.
- TFI Ignition Tester, Rotunda 105-00002.
- E-core Ignition Coil E73F-12029-AB.
- Ignition coil secondary wire E43E-12A012-AB.

NOTES

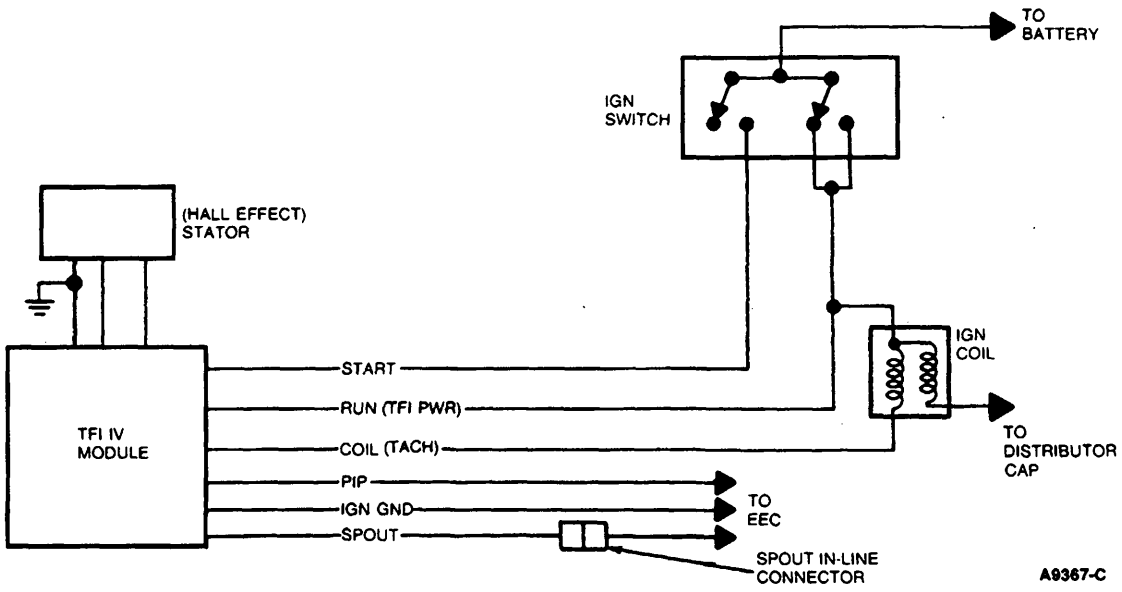
- A spark plug with a broken side electrode **is not** sufficient to check for spark and may lead to incorrect results.
- When instructed to inspect a wiring harness, both a visual inspection and a continuity test should be performed.
- When making measurements on a wiring harness or connector, it is good practice to wiggle the wires while measuring.
- References to pin-in-line connector apply to a shorting bar type connector used to set base timing.
- This procedure is intended to identify faulty components or wiring while the fault is present. If the complaint is of an intermittent condition, refer to Intermittent Diagnosis.

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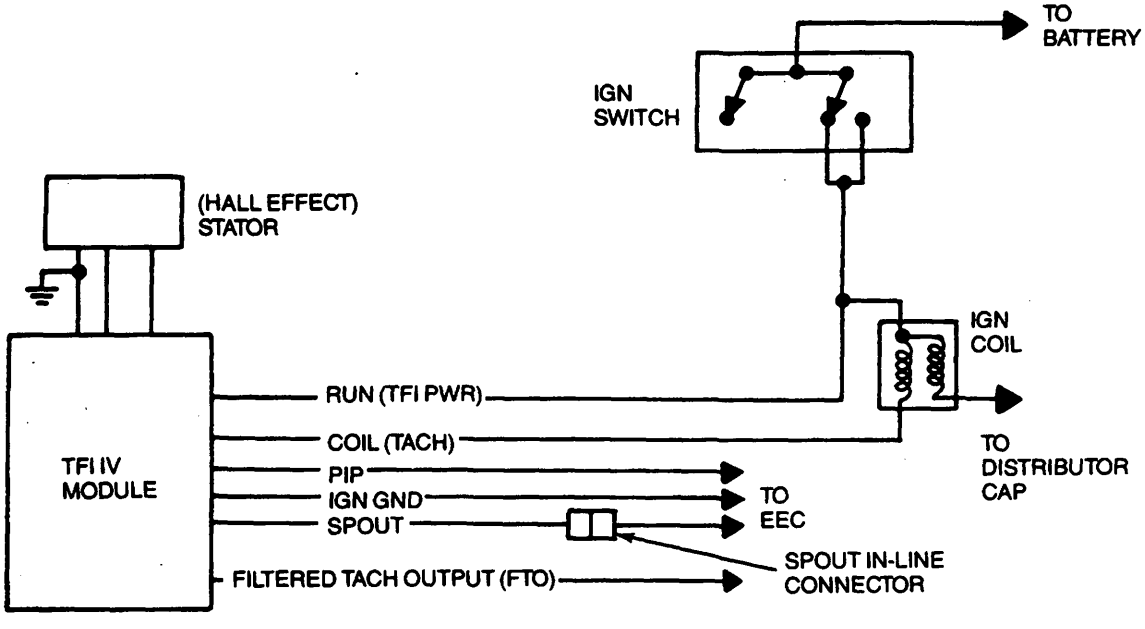
Functional Schematic

TFI-IV And TFI-IV With CCD

The TFI-IV system electrical schematic is shown below. For detailed information, refer to the vehicle wiring diagram.

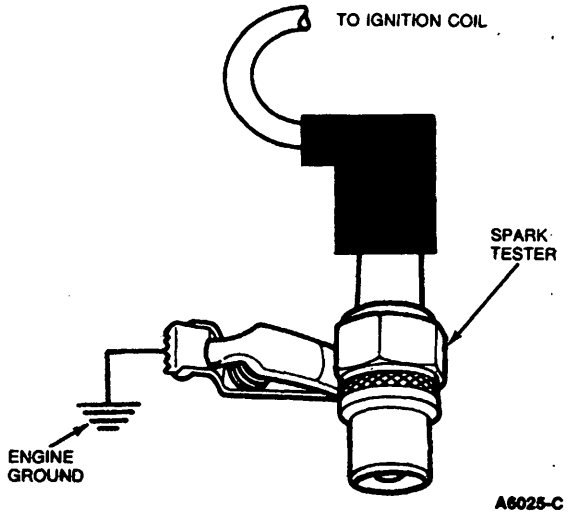


The TFI-IV with CCD system electrical schematic is shown below. For detailed information, refer to the vehicle wiring diagram.



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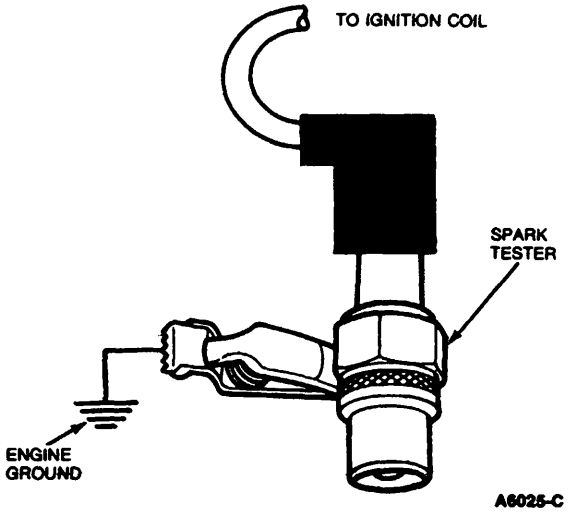
Ignition Coil Secondary Voltage (Crank Mode)	TFI-IV And TFI With CCD	Part 2 Test 1

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect spark tester between ignition coil wire and engine ground. 2. Crank engine. 3. Turn ignition switch to the OFF position. 4. **Was spark present?**  	Yes ▶	Test result OK. INSPECT distributor cap and rotor for damage/carbon tracking. If engine starts, GO to Part 1, Test 2, otherwise GO to Test 2.
	No ▶	INSPECT ignition coil for damage/carbon tracking. CRANK engine to verify distributor rotation. Refer to Ignition/Engine Shop Manual Group (Engine Group 3 for Compact Truck) and SERVICE as required. GO to Test 4.

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Ignition Coil Secondary Voltage (Run Mode)	TFI-IV And TFI With CCD	Part 2 Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Place the transmission shift lever in the PARK (A/T) or NEUTRAL (M/T) position and set the parking brake. CAUTION **Failure to perform this step may result in the vehicle moving when the starter is subsequently engaged during the test.** 2. Disconnect wire at S terminal of starter relay. 3. Attach remote starter switch. 4. Turn ignition switch to the RUN position. 5. Crank the engine using remote starter switch. 6. Turn ignition switch to the OFF position. 7. Remove remote starter switch. 8. Reconnect wire to S terminal of starter relay. 9. **Was spark present?**	Yes ▶	Test result OK. Problem is not in the ignition system. RETURN to Diagnostic Routines, Section 2, to identify possible cause.
	No ▶	GO to Test 3.



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Wiring Harness	TFI-IV And TFI With CCD	Part 2 Test 3

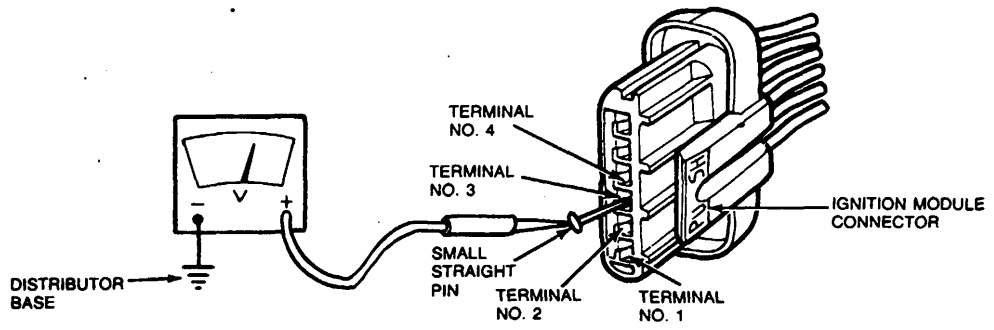
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from ignition module. Inspect for dirt, corrosion, and damage. **NOTE: Push connector tabs to separate.** 2. Verify that the wire to the S terminal of starter relay is disconnected. 3. Attach negative (−) VOM lead to distributor base. 4. Measure battery voltage. 5. Following the appropriate table below, measure connector terminal voltage by attaching VOM to small straight pin inserted into connector terminal and turning ignition switch to position shown. **CAUTION** **Do not allow straight pin to contact electrical ground.** 6. Turn ignition switch to OFF position. 7. Remove straight pin. 8. Reconnect wire to S terminal of starter relay. 9. **Was the value at least 90 percent of battery voltage in each case?**	Yes ▶ No ▶	REPLACE TFI module. INSPECT for faults in wiring harness and connectors. REFER to vehicle wiring diagram for appropriate circuit. Damaged or worn ignition switch. REFER to Charging/Electrical Shop Manual (Electrical Power Supply System Group for Compact Truck).

TFI without CCD

Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start
#4	Start Circuit	Start

TFI with CCD

Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start



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Stator — TFI	TFI-IV And TFI With CCD	Part 2 Test 4

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Place the transmission shift lever in the PARK (A/T) or NEUTRAL (M/T) position and set the parking brake. CAUTION **Failure to perform this step may result in the vehicle moving when the starter is subsequently engaged during the test.** 2. Disconnect the harness connector from the TFI module and connect the TFI tester. 3. Connect the red lead from the tester to the positive (+) side of the battery. 4. Disconnect the wire at the S terminal of the starter relay, and attach remote starter switch. 5. Crank the engine using the remote starter switch and note the status of the two LED lamps. 6. Remove the tester and remote starter switch. 7. Reconnect the wire to the starter relay and the connector to the TFI. 8. **Did the PIP light blink?**	Yes ▶ No ▶	GO to Test 6. REMOVE distributor cap and VERIFY rotation. If OK, GO to Test 5.

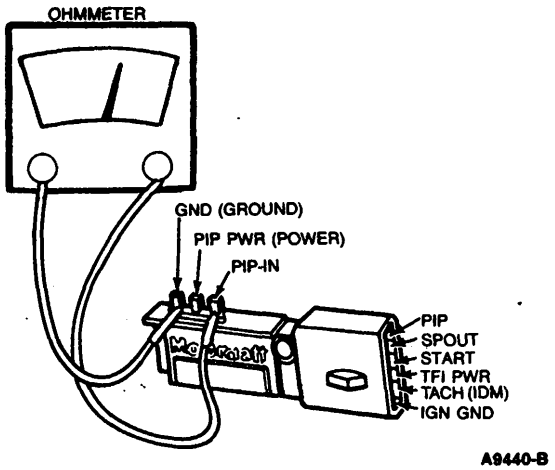
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Stator — TFI-IV	TFI-IV And TFI With CCD	Part 2 Test 5

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Remove the distributor from the engine and the TFI module from the distributor. 2. Measure resistance between TFI module terminals as shown below.	Yes ▶	Replace stator.
	No ▶	Replace TFI.

Measure Between These Terminals	Resistance Should Be
GND — PIP In	Greater than 500 Ohms
PIP PWR — PIP IN	Less than 2K Ohms
PIP PWR — TFI PWR	Less than 200 Ohms
GND — IGN GND	Less than 2 Ohms
PIP In — PIP	Less than 200 Ohms

3. **Are all these readings as specified?**



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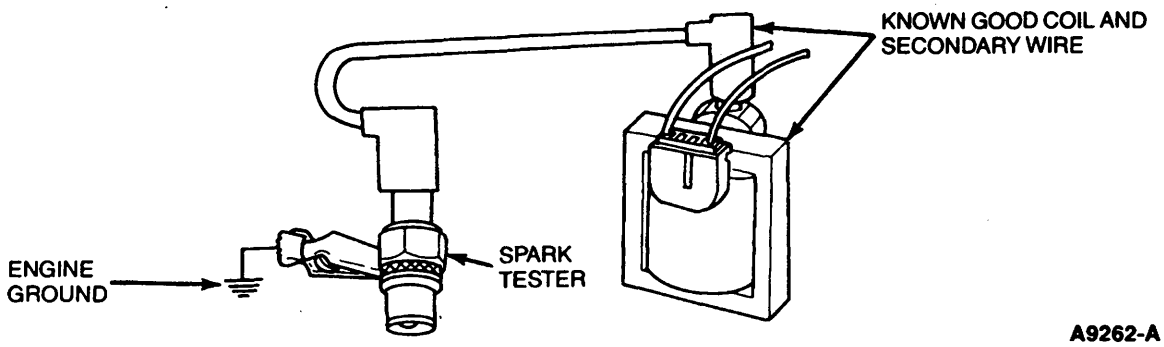
TFI Module	TFI-IV And TFI-IV With CCD	Part 2 Test 6

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Use status of Tach light from Test 4. 2. **Did the Tach light blink?**	Yes ▶	GO to Test 7.
	No ▶	REPLACE TFI module and CHECK for spark using the method described in Test 1. If spark was not present REPLACE the coil also.

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Ignition Coil and Secondary Wire	TFI-IV And TFI With CCD	Part 2 Test 7

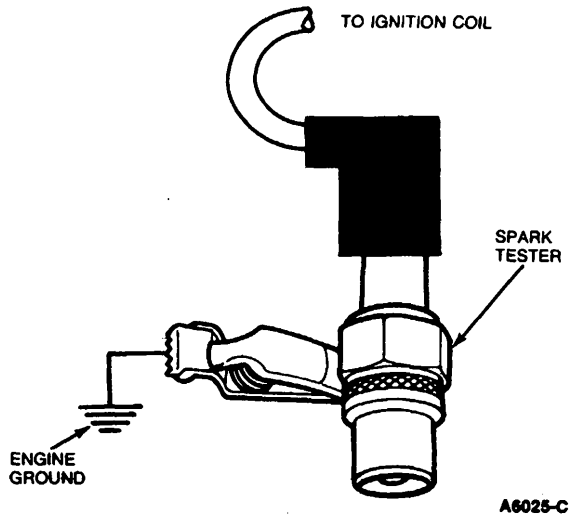
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect ignition coil connector. Inspect for dirt, corrosion and damage. 2. Connect the ignition coil connector to a known good ignition coil. 3. Connect one end of a known good secondary wire to the spark tester. Connect the other end to the known good ignition coil. **CAUTION** **DO NOT HOLD THE COIL while performing this test. Dangerous voltages may be present on the metal laminations as well as the high voltage tower.** 4. Crank engine. 5. Turn ignition switch to OFF position. 6. **Was spark present?**	Yes ▶	MEASURE resistance of the ignition coil wire (from vehicle). REPLACE if greater than 7,000 ohms per foot. If OK, REPLACE ignition coil.
	No ▶	RECONNECT coil connector to the vehicle coil and spark tester to vehicle secondary wire and GO to Test 8.



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EEC-IV — TFI-IV	TFI-IV And TFI-IV With CCD	Part 2 Test 8

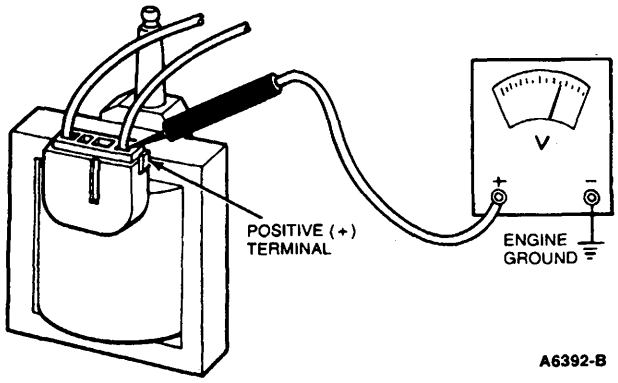
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect pin-in-line connector near the distributor. 2. Crank engine. 3. Turn ignition switch to OFF position. 4. **Was spark present?**	Yes ▶	CHECK PIP and Ignition ground wires for continuity. SERVICE as necessary. If OK, GO to EEC-IV Diagnosis.
	No ▶	GO to Test 9.



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Ignition Coil Supply Voltage	TFI-IV And TFI-IV With CCD	Part 2 Test 9

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach negative (-) VOM lead to distributor base. 2. Measure battery voltage. 3. Turn ignition switch to RUN position. 4. Measure voltage at POSITIVE (+) terminal of ignition coil. 5. Turn ignition switch to OFF position. 6. **Was the value 90 percent of battery voltage or more?**	Yes ▶ No ▶	GO to Test 10. INSPECT and SERVICE wiring between ignition coil and ignition switch. REFER to vehicle wiring diagram. Worn or damaged ignition switch. REFER to Charging/Electrical Shop Manual Group (Electrical Power Supply System Group for Compact Truck).



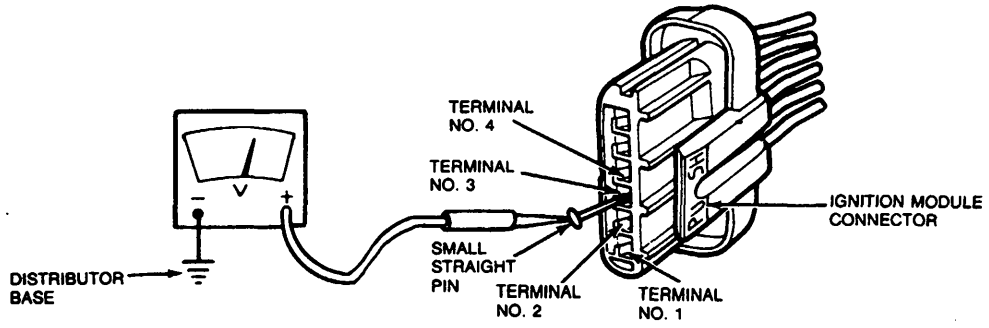
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Wiring Harness	TFI-IV	Part 2 Test 10

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from ignition module. Inspect for dirt, corrosion, and damage. **NOTE: Push connector tabs to separate.** 2. Disconnect the wire at S terminal of starter relay. 3. Attach negative (–) VOM lead to distributor base. 4. Measure battery voltage. 5. Following the appropriate table below, measure connector terminal voltage by attaching VOM to small straight pin inserted into connector terminal and turning ignition switch to position shown. **CAUTION** **Do not allow straight pin to contact electrical ground.** 6. Turn ignition switch to OFF position. 7. Remove straight pin. 8. Reconnect wire to S terminal of starter relay. 9. **Was the value at least 90 percent of battery voltage in each case?**	Yes ▶	INSPECT for faults in wiring between the coil and TFI module terminal No. 2 or any additional wiring or components connected to that circuit. REFER to vehicle wiring diagram.
	No ▶	INSPECT for faults in wiring harness and connectors. REFER to vehicle wiring diagram for appropriate circuit. Damaged or worn ignition switch. REFER to Charging/Electrical Shop Manual Group (Electrical Power Supply System Group for Compact Truck).

TFI without CCD		
Connector Terminal	**Wire/Circuit**	**Ignition Switch Test Position**
#3	Run Circuit	Run and Start
#4	Start Circuit	Start

TFI with CCD		
Connector Terminal	**Wire/Circuit**	**Ignition Switch Test Position**
#3	Run Circuit	Run and Start



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PART 2
TFI-IV
CLOSED BOWL
DISTRIBUTOR

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Preliminary Checkout, Equipment & Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, and burned, overheated, loose, or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- Spark Tester, Special Service Tool D81P-6666-A. See **NOTES.**
- Volt/Ohm Meter Rotunda 014-00407.
- 12 Volt Test Lamp.
- Small straight pin.
- Remote Starter Switch.
- TFI Ignition Tester, Rotunda 105-00003.
- E-Core Ignition Coil E73F-12029-AB.
- Ignition Coil Secondary Wire E43E-12A012-AB.

NOTES

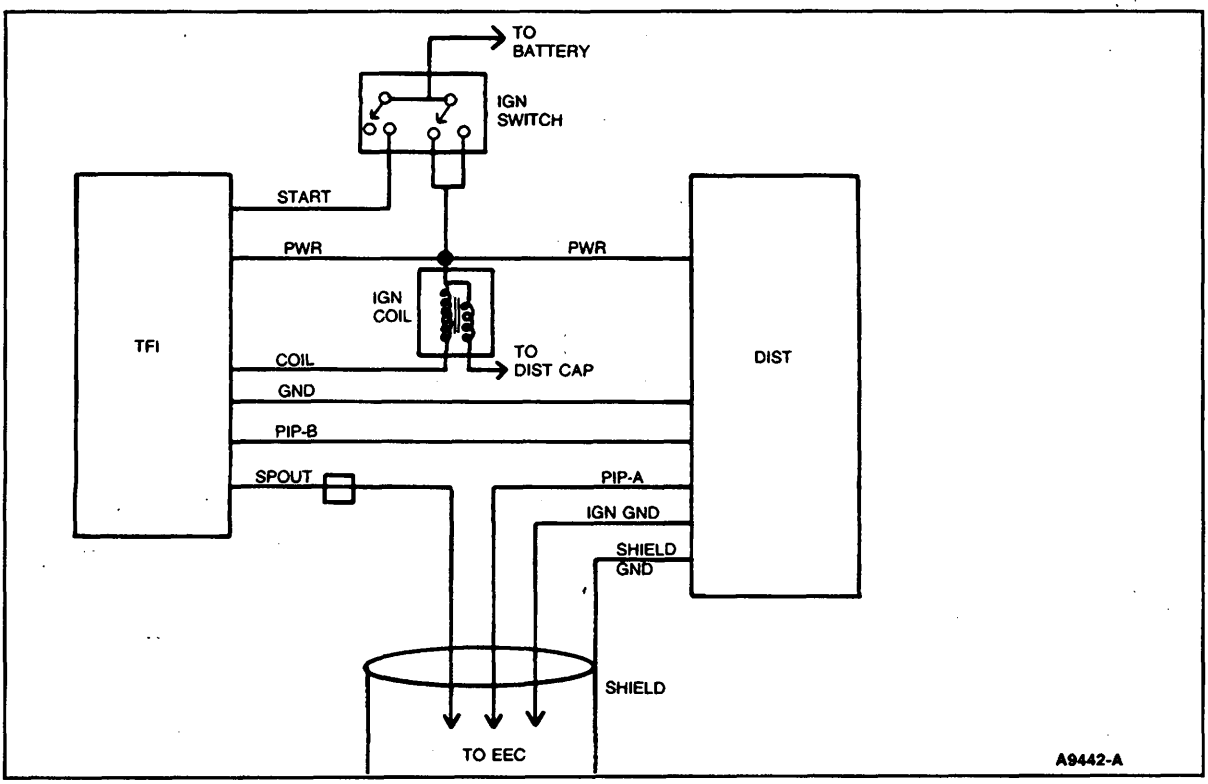
- A spark plug with a broken side electrode **is not** sufficient to check for spark and may lead to incorrect results.
- When instructed to inspect a wiring harness, both a visual inspection and a continuity test should be performed.
- When making measurements on a wiring harness or connector, it is good practice to wiggle the wires while measuring.
- References to pin-in-line connector apply to shorting bar type connector used to set base timing.
- This procedure is intended to identify faulty components or wiring while the fault is present. If the complaint is of an intermittent condition refer to Intermittent Diagnosis.

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Functional Schematic

TFI-IV Closed Bowl Distributor

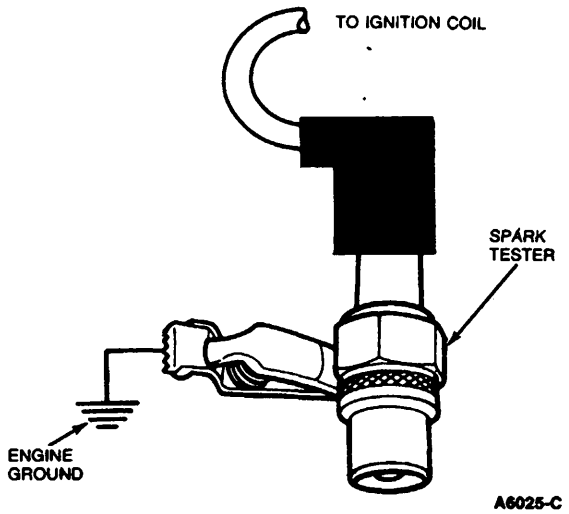
The TFI-IV Closed Bowl Distributor system electrical schematic is shown below. For detailed information, refer to the vehicle wiring diagram.



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Ignition Coil Secondary Voltage — Crank Mode	TFI-IV Closed Bowl Distributor	Part 2 Test 1

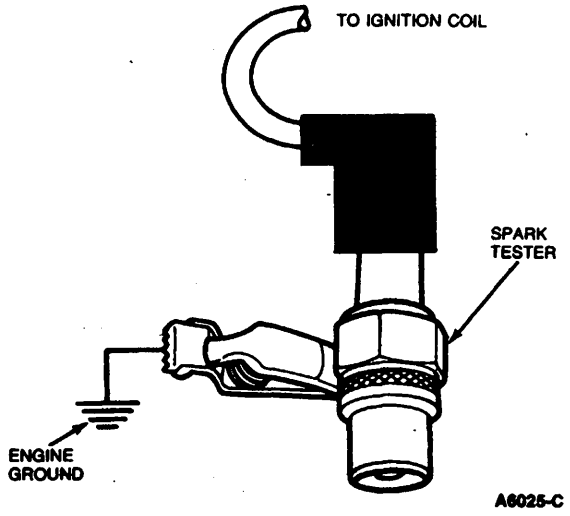
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect spark tester between ignition coil wire and engine ground. 2. Crank engine. 3. **Was spark present?**	Yes ▶	Test result OK. INSPECT distributor cap and rotor for damage/carbon tracking. If engine starts, GO to Part 1, otherwise GO to Test 2.
	No ▶	INSPECT ignition coil for damage/carbon tracking. Crank engine to verify distributor rotation. REFER to Ignition/ Engine Shop Manual Group (Engine Group for Compact Truck) and SERVICE as required. GO to Test 4.



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Ignition Coil Secondary Voltage — Run Mode	TFI-IV Closed Bowl Distributor	Part 2 Test 2

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Place the transmission shift lever in the PARK (A/T) or NEUTRAL (M/T) position and set the Parking Brake. CAUTION **Failure to perform this step may result in the vehicle moving when the starter is subsequently engaged during the test.**	Yes ▶	Test result OK. Problem is not in the ignition system primary circuit components. RETURN to the Diagnostic Routines to identify other possible causes.
2. Disconnect wire at S terminal of starter relay. 3. Attach remote starter switch. 4. Turn ignition switch to RUN position. 5. Crank the engine using remote starter switch. 6. Turn ignition switch to OFF position. 7. Remove the remote starter switch. 8. Reconnect wire to S terminal of starter relay. 9. **Was spark present?**	No ▶	GO to Test 3.

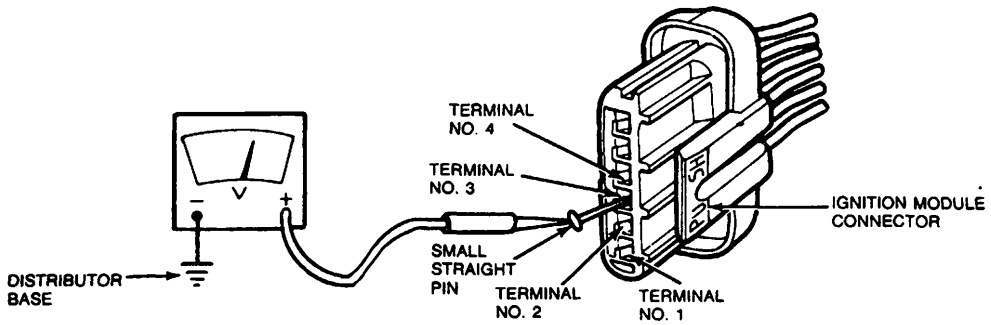


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Wiring Harness	TFI-IV Closed Bowl Distributor	Part 2 Test 3

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from ignition module. Inspect for dirt, corrosion, and damage. **NOTE: Push connector tabs to separate.** 2. Disconnect wire at S terminal of starter relay. 3. Attach negative (–) VOM lead to distributor base. 4. Measure battery voltage. 5. Following table below, measure connector terminal voltage by attaching VOM to small straight pin inserted into connector terminal and turning ignition switch to position shown. **CAUTION** **Do not allow straight pin to contact electrical ground.** 6. Turn ignition switch to OFF position. 7. Remove straight pin. 8. Reconnect wire to S terminal of starter relay. 9. **Was the voltage measured greater than 90 percent of battery voltage in each case?**	Yes ▶ No ▶	REPLACE the TFI module. INSPECT for faults in wiring harness and connectors. REFER to vehicle wiring diagram for appropriate circuit. Damaged or worn ignition switch. REFER to Charging/Electrical Shop Manual Group (Electrical Power Supply System Group for Compact Truck).

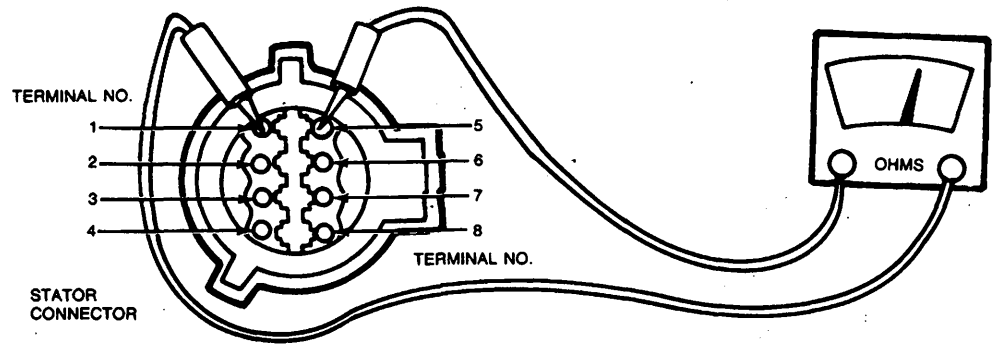
Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start
#4	Start Circuit	Start



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Stator	TFI-IV Closed Bowl Distributor	Part 2 Test 4

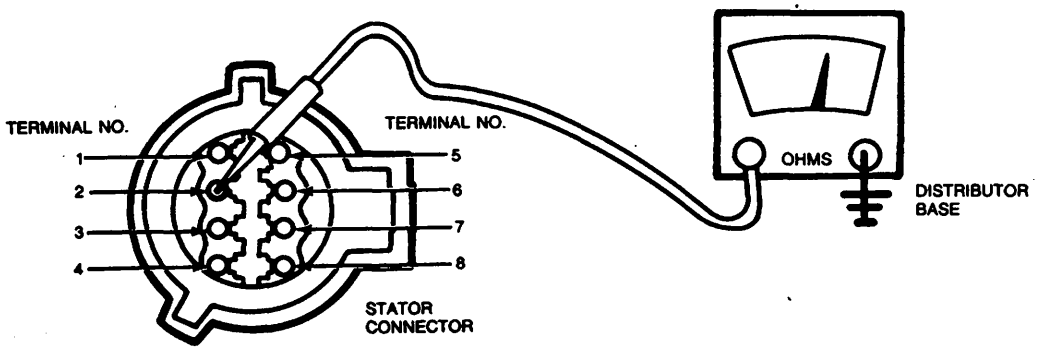
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from the distributor. Inspect for dirt, corrosion and damage. 2. Measure resistance between the stator connector terminals 1 and 5. 3. **Was the resistance between stator terminals 1 and 5 less than 5 ohms?**	Yes ▶ No ▶	GO to Test 5. REPLACE the stator.



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Stator	TFI-IV Closed Bowl Distributor	Part 2 Test 5

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Measure resistance between stator connector terminal 2 and the distributor base. 2. Measure resistance between stator connector terminal 6 and the distributor base. 3. **Was the resistance less than 1 ohm in each case?**	Yes ▶	GO to Test 6.
	No ▶	INSPECT the retaining screws to stator in the distributor bowl. If OK, REPLACE the stator.



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Stator	TFI-IV Closed Bowl Distributor	Part 2 Test 6

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Place the transmission shift lever in the PARK (A/T) or NEUTRAL (M/T) position and set the parking brake. CAUTION **Failure to perform this step may result in the vehicle moving when the starter is subsequently engaged during the test.** 2. Disconnect the harness connector from the TFI module and connect the TFI-IV tester to the stator and TFI module. 3. Connect the red lead from the tester to the positive (+) side of the battery. 4. Disconnect the wire at the S terminal of the starter relay, and attach remote starter switch. 5. Crank the engine using the remote starter switch and note the status of the two LED lights. 6. Remove the tester and remote starter switch. 7. Reconnect the wire to the starter relay. 8. **Did the PIP light blink?**	Yes ▶ No ▶	RECONNECT harness connectors to TFI module and distributor, then GO to Test 7. REPLACE the stator.

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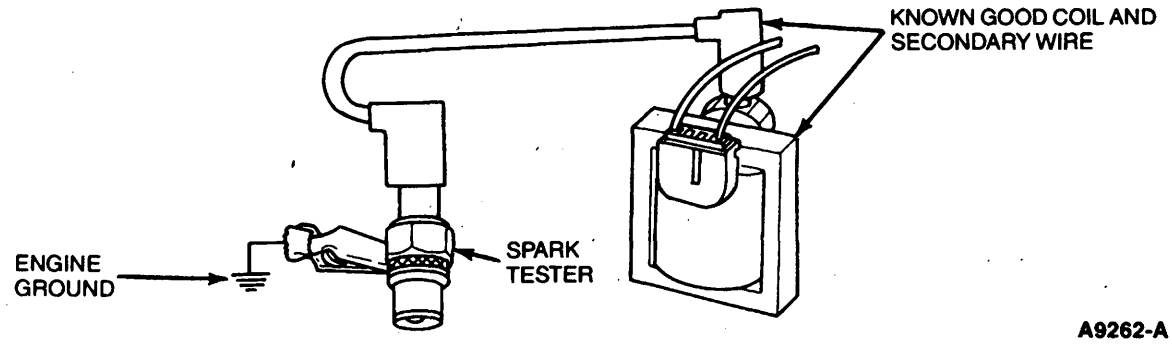
TFI Module	TFI-IV Closed Bowl Distributor	Part 2 Test 7

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Use status of Tach light from Test 6.	Yes ▶	GO to Test 8.
2. **Did the Tach light blink?**	No ▶	REPLACE the TFI module and CHECK for spark using the method described in Test 1. If spark is not present REPLACE the coil also.

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Ignition Coil And Secondary Wire	TFI-IV Closed Bowl Distributor	Part 2 Test 8

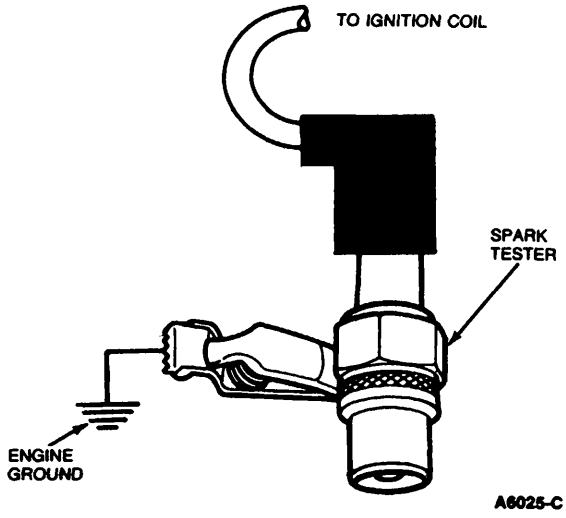
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect ignition coil connector. Inspect for dirt, corrosion and damage. 2. Connect the ignition coil connector to a known good ignition coil. 3. Connect one end of a known good secondary wire to the spark tester. Connect the other end to the known good ignition coil. CAUTION **DO NOT HOLD THE COIL while performing this test. Dangerous voltages may be present on the metal laminations as well as the high voltage tower.** 4. Crank engine. 5. Turn ignition switch to OFF position. 6. **Was spark present?**	Yes ▶ No ▶	MEASURE resistance of the ignition coil wire (from vehicle), if greater than 7,000 ohms per foot. If OK, REPLACE ignition coil. RECONNECT coil connector to the vehicle coil and spark tester to vehicle secondary wire and GO to Test 9.



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EEC-IV — Wiring	TFI-IV Closed Bowl Distributor	Part 2 Test 9

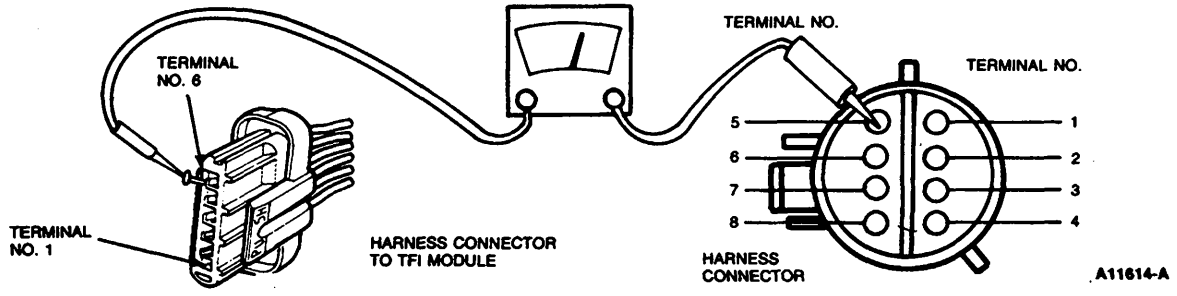
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect the in-line connector near the TFI module. 2. Crank the engine. 3. **Was spark present?**	Yes ▶	Check PIP-A and IGN GND signal wires for continuity to EEC. SERVICE as necessary. If OK, GO to EEC-IV Diagnostics.
	No ▶	GO to Test 10.



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Wiring Harness	TFI-IV Closed Bowl Distributor	Part 2 Test 10

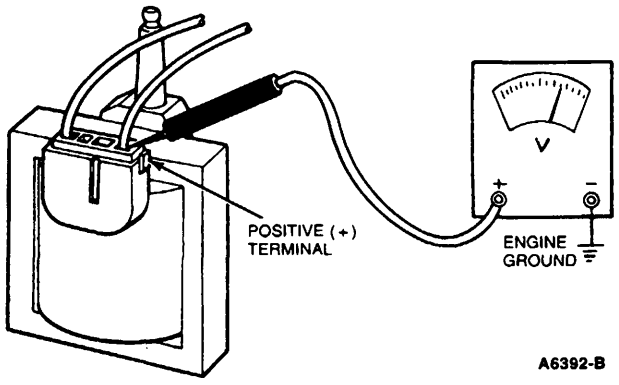
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Separate wiring harness connector from distributor and from the TFI module. 2. Measure resistance between terminal No. 5 of the harness connector which connects to the distributor and terminal No. 6 of the harness connector which connects to the TFI module by inserting a small straight pin. 3. **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Test 11. INSPECT and SERVICE wiring between the distributor and TFI module (PIP-B circuit).



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Ignition Coil Supply Voltage	TFI-IV Closed Bowl Distributor	Part 2 Test 11

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach negative (−) VOM lead to distributor base. 2. Measure battery voltage. 3. Turn ignition switch to RUN position. 4. Measure voltage at positive (+) terminal of ignition coil. 5. Turn ignition switch to OFF position. 6. **Was the voltage at coil positive terminal at least 90 percent of battery voltage?**	Yes ▶	INSPECT ignition coil harness connector for dirt, corrosion, and damage. INSPECT ignition coil terminals for dirt, corrosion, and damage. GO to Test 12.
	No ▶	INSPECT and SERVICE wiring between ignition coil and ignition switch. REFER to vehicle wiring diagram. Worn or damaged ignition switch. REFER to Charging/Electrical Shop Manual Group (Electrical Power Supply System Group for Compact Truck).



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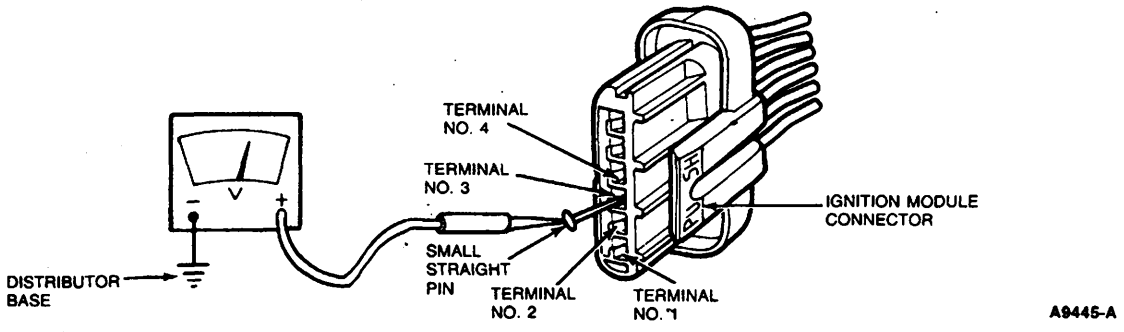
TFI Supply Voltage

TFI-IV Closed Bowl Distributor

Part 2 Test 12

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Disconnect wire at S terminal of starter relay. 2. Attach negative (–) VOM lead to distributor base. 3. Measure battery voltage. 4. Following table below, measure connector terminal voltage by attaching VOM to small straight pin inserted into connector terminal and turning ignition switch to position shown. **CAUTION** **Do not allow straight pin to contact electrical ground.** 5. Turn ignition switch to OFF position. 6. Remove straight pin. 7. Reconnect wire to S terminal of starter relay. 8. **Was the voltage measured in each case greater than 90 percent of battery voltage?**	Yes ▶ No ▶	Test result OK. GO to Test 13. INSPECT for faults in wiring harness and connectors. REFER to vehicle wiring diagram for appropriate circuit. Damaged or worn ignition switch. REFER to Charging/Electrical Shop Manual Group (Electrical Power Supply System Group for Compact Truck).

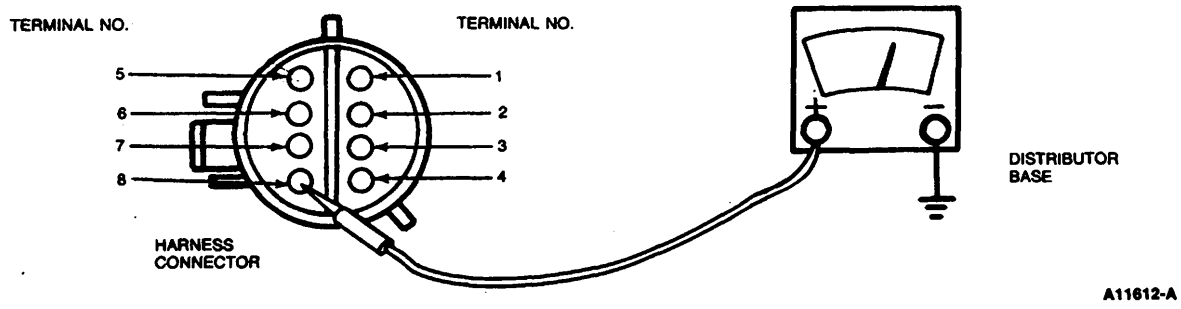
Connector Terminal	Wire/Circuit	Ignition Switch Test Position
#3	Run Circuit	Run and Start
#4	Start Circuit	Start



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Stator Supply Voltage	TFI-IV Closed Bowl Distributor	Part 2 Test 13

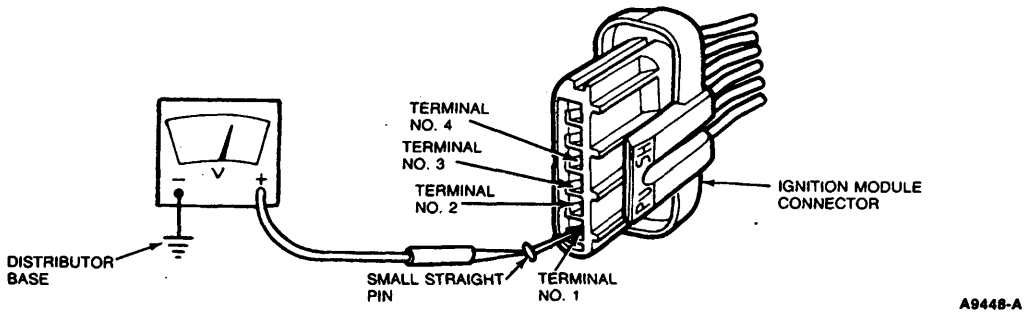
TEST STEP	RESULT ▶	ACTION TO TAKE
1. Attach negative (-) VOM lead to distributor base. 2. Measure battery voltage. 3. Turn ignition switch to RUN position. 4. Measure voltage at terminal 8 of the harness connector which connects to the stator. 5. Turn ignition switch to the OFF position. 6. **Was the result greater than 90 percent of battery voltage?**	Yes ▶ No ▶	GO to Test 14. INSPECT and SERVICE wiring between stator and ignition switch. REFER to vehicle wiring diagram. Worn or damaged ignition switch. REFER to Charging/Electrical Shop Manual Group (Electrical Power Supply System Group for Compact Truck).



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Wiring Harness	TFI-IV Closed Bowl Distributor	Part 2 Test 14

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Reconnect the wiring harness connector to the distributor. 2. Measure resistance between the distributor base and terminal No. 1 of the harness connector at the ignition module. 3. **Is the resistance less than 1 ohm?**	Yes ▶	INSPECT for faults in wiring between the coil and TFI module terminal No. 2 or any additional wiring or components connected to that circuit. REFER to vehicle wiring diagram.
	No ▶	INSPECT and SERVICE wiring between the harness connector at the ignition module and the harness connector at the distributor (GND circuit).



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INTERMITTENT DIAGNOSIS PROCEDURE

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Preliminary Checkout and Notes

NOTES

- This procedure begins with an owner complaint that the engine stops at unexpected times but can be restarted. In situations like this there are two things that are very important. The technician must obtain as much information directly from the owner about the conditions under which the problem occurs, and the service history of the vehicle must be thoroughly reviewed to avoid repeat replacement of good components. For example, replacing a stator assembly a second time will not correct a problem if the problem is actually in another area.
- Two testers are available for assistance with intermittent diagnosis. **Rotunda Ignition System Tester D80L-50-BIT** is used to diagnose problems in the primary circuit of the Duraspark ignition systems. It provides a means to direct the technician to a specific area in the primary circuit. **Rotunda Ignition System Tester 007-00008** provides a quick means of separating primary ignition system problems from fuel, carburetion, EGR or other system problems causing similar vehicle symptoms. It can be used on most ignition systems. It will detect any primary ignition system problem, but it is particularly useful in detection of intermittent problems.

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.

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Intermittent Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1		
• Talk to owner.	▶	Symptoms.
STEP 2		
• Review vehicle service history.	▶	Number of previous repairs and components replaced.
STEP 3		
• **Is a Rotunda Ignition System Tester model, 007-00008 or equivalent available?**	Yes ▶	FOLLOW test procedure instructions supplied with tester.
	No ▶	GO to Step 4.
STEP 4		
• **Will engine start?**	Yes ▶	GO to Step 5.
	No ▶	GO to Ignition System Diagnostic Procedure, Part 2, Test 1 for engine ignition system (Duraspark II, or TFI-IV).
STEP 5		
• Engine at idle, raise hood, shake wiring harness and pull wires at connectors for ignition components. **Does engine quit?**	Yes ▶	SERVICE wiring harness or connector.
	No ▶	GO to Step 6.
STEP 6		
• Engine at idle, close hood, A/C On, blower on medium speed: allow engine to run for 15 minutes. **Does engine quit?**	Yes ▶	GO to Step 10.
	No ▶	GO to Step 7.

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Intermittent Diagnosis

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 7		
• Engine off, hood closed, hot soak for 10 minutes. **Will engine restart?**	Yes ▶ No ▶	GO to Step 8. GO to Ignition System Diagnostic Procedure, Part 2, Test 1 for engine ignition system (Duraspark II, or TFI-IV).
STEP 8		
• Engine at idle, raise hood, shake wiring harness and pull wires at connectors for ignition components. **Does engine quit?**	Yes ▶ No ▶	SERVICE wiring harness or connector. GO to Step 9.
STEP 9		
• Road test. **Does engine quit?**	Yes ▶ No ▶	GO to Step 10. Test complete. (Problem not duplicated).
STEP 10		
• Raise hood, shake wiring harness, pull wires at connectors, separate and reconnect connectors for ignition components. **Does engine start?**	Yes ▶ No ▶	SERVICE wiring harness or connector. GO to Ignition System Diagnostic Procedure, Part 2, Test 1 for engine ignition system (Duraspark II, or TFI-IV).

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IGNITION SYSTEM DIAGNOSTIC PROCEDURE (DIS) 2.3L EFI TRUCK (DUAL PLUG)

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Index: 2.3L EFI Truck (Dual Plug) DIS

NOTE: Start all diagnostics with Section 14 (EEC-IV Quick Test) first. The tests in this Section are dependent on results from tests conducted in Section 14.

Subject	Page
Preliminary Checkout, Equipment and Notes	13-78
DIS Diagnostic Cable	13-79
2.3L EFI Truck (Dual Plug) DIS Module and Pin-Out	13-80
2.3L EFI Truck (Dual Plug) DIS Wiring Schematic	13-81
DIS Schematic and Breakout Box Overlay Acronyms	13-82
Crankshaft Sensor Description	13-83
2.3L EFI Truck (Dual Plug) DIS System Description	13-84
2.3L EFI Truck (Dual Plug) DIS Block Diagram	13-85
2.3L EFI Truck (Dual Plug) DIS Waveforms	13-86
2.3L EFI Truck (Dual Plug) DIS Component Location	13-87
2.3L EFI Truck (Dual Plug) DIS Pinpoint Test Diagnostics	13-88

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Preliminary Checkout, Equipment and Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, damaged pins, loose or broken conditions. Check sensor shield connector. Make sure DIS module mounting screws are tight.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT (Required)

Obtain the following test equipment or an equivalent:

- DIS Diagnostic Cable (Rotunda 007-00044) (refer to Figure 1).
- Spark Tester, Neon bulb type (Special Service Tool D89P-6666-A).
- Volt/Ohm Meter (Rotunda 014-00407 or equivalent).
- Remote starter switch.
- EEC-IV breakout box (Rotunda T83L-50-EEC-IV).
- Spark Tester, Gap type (Special Service Tool D81P-6666-A). A spark plug with a broken side electrode is not sufficient to check for spark and may lead to incorrect results.
- Inductive Timing Light (Rotunda 059-00006). Do not use "advance knob" if timing light has one (it will not work correctly with DIS Ignition Systems).

EQUIPMENT (Recommended)

- Dis Module Tester (DMT) Rotunda 007-00071. This tester contains 12 LEDS, 12 Test Jacks and a built-in interface cable that allows the tester to monitor all DIS module signals.
- DIS Coil/Sensor Tester (CST) Rotunda 007-00072. This tester is similar to the DIS Module Tester (DMT) except it allows monitoring of signals at the sensor and coils.
- LED test lamp. A 12 volt test lamp should not be used to test circuit signals. It will load the circuit and may cause erroneous measurements or improper DIS/EEC-IV operation. (ie., engine stall).

NOTES

- When making measurements on a wiring harness, both a visual inspection and a continuity test should be performed. Inspect the connector pins for damage (corrosion, bent or spread pins, etc.) when directed to remove a connector.
- Spark timing adjustments are not possible.
- When making voltage checks a GROUND reading means any value within a range of 0 to 1 volt. Also BAT+ readings mean any value that falls within a range of BAT+ to 2 volts less than BAT+.
- When making voltage checks and a reference to ground is made use either the negative battery lead or cast iron on the engine. BAT+ means the positive battery cable at the battery.
- When using the spark plug firing indicator, place the grooved end as close as possible to the plug boot. Very weak flashing may be caused by a fouled plug.

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DIS Diagnostic Cable

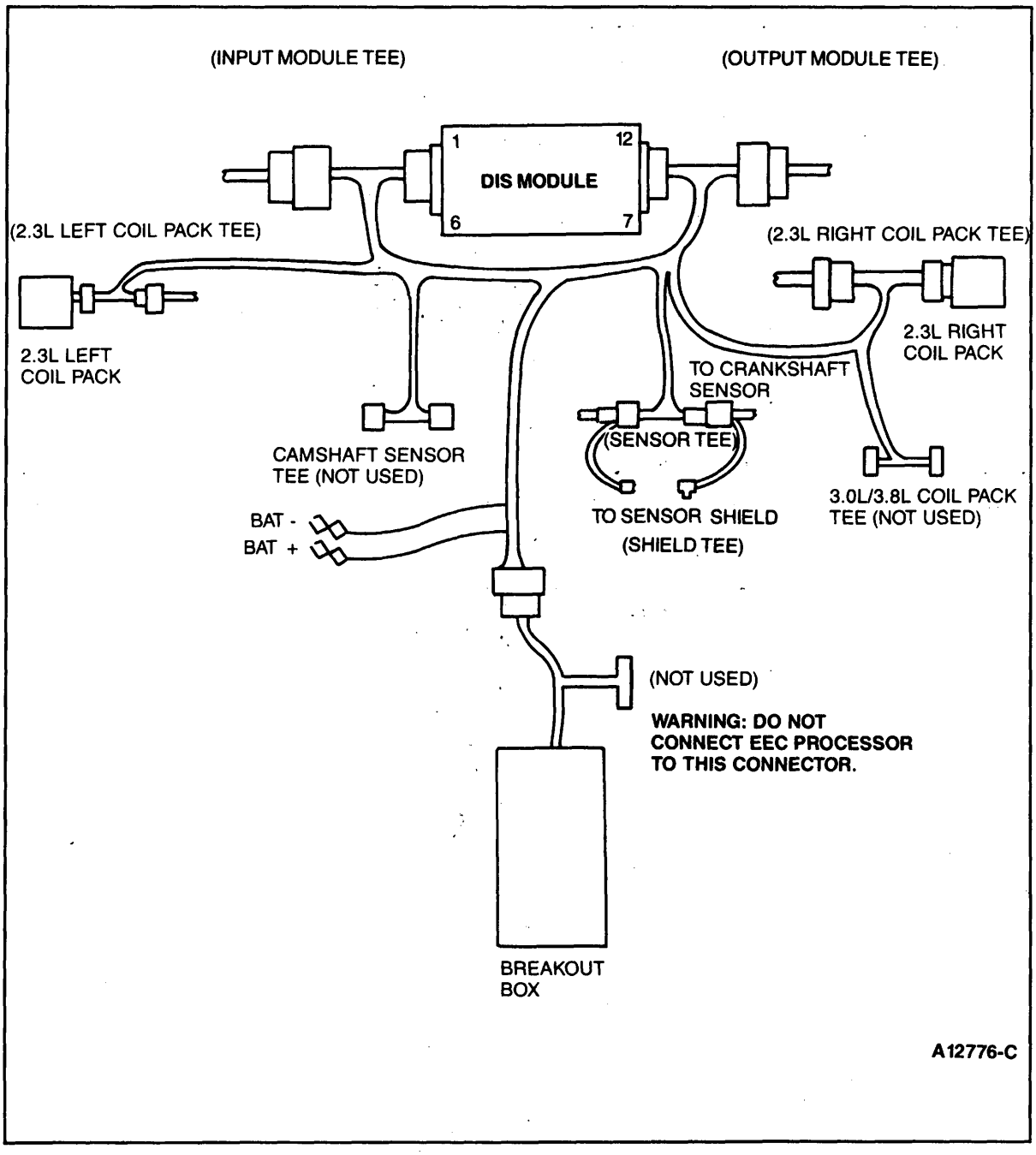


Figure 1 2.3L EFI Truck (Dual Plug) DIS Hook-Up

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2.3L EFI Truck (Dual Plug) DIS Module and Pin-Out

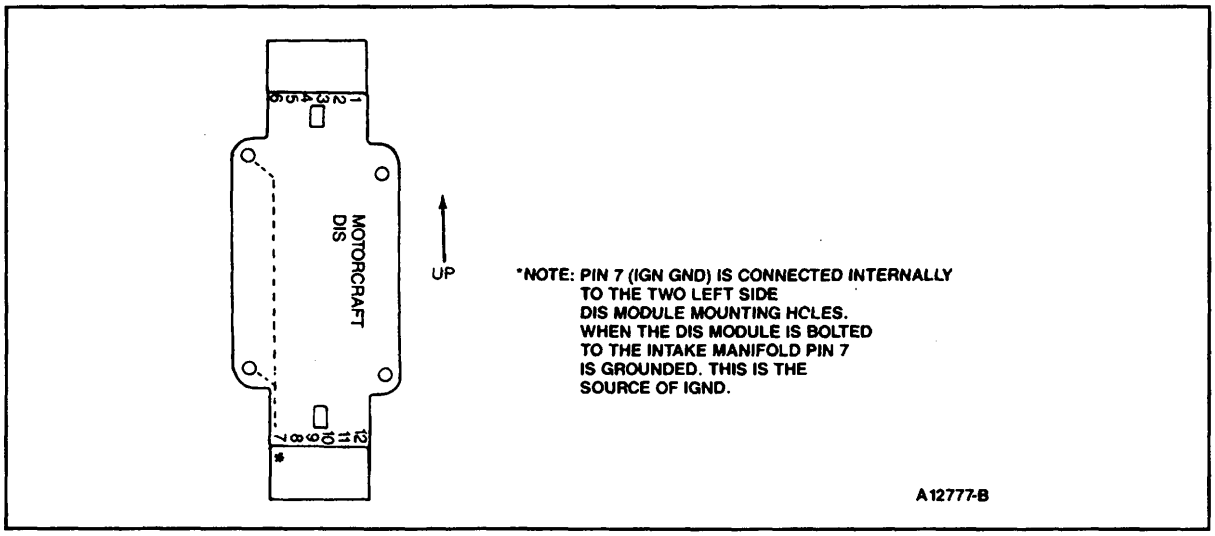


Figure 2 2.3L EFI Truck (Dual Plug) DIS Module and Pin-Out

PIN #	2.3L EFI Truck (Dual Plug)
1	VBAT
2	CID
3	PIPD Out
4	PIP In
5	SPOUT
6	DPI
7	IGN GROUND
8	COIL 3
9	COIL 4
10	COIL 2
11	COIL 1
12	IDM

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2.3L EFI Truck (Dual Plug) DIS Wiring Schematic

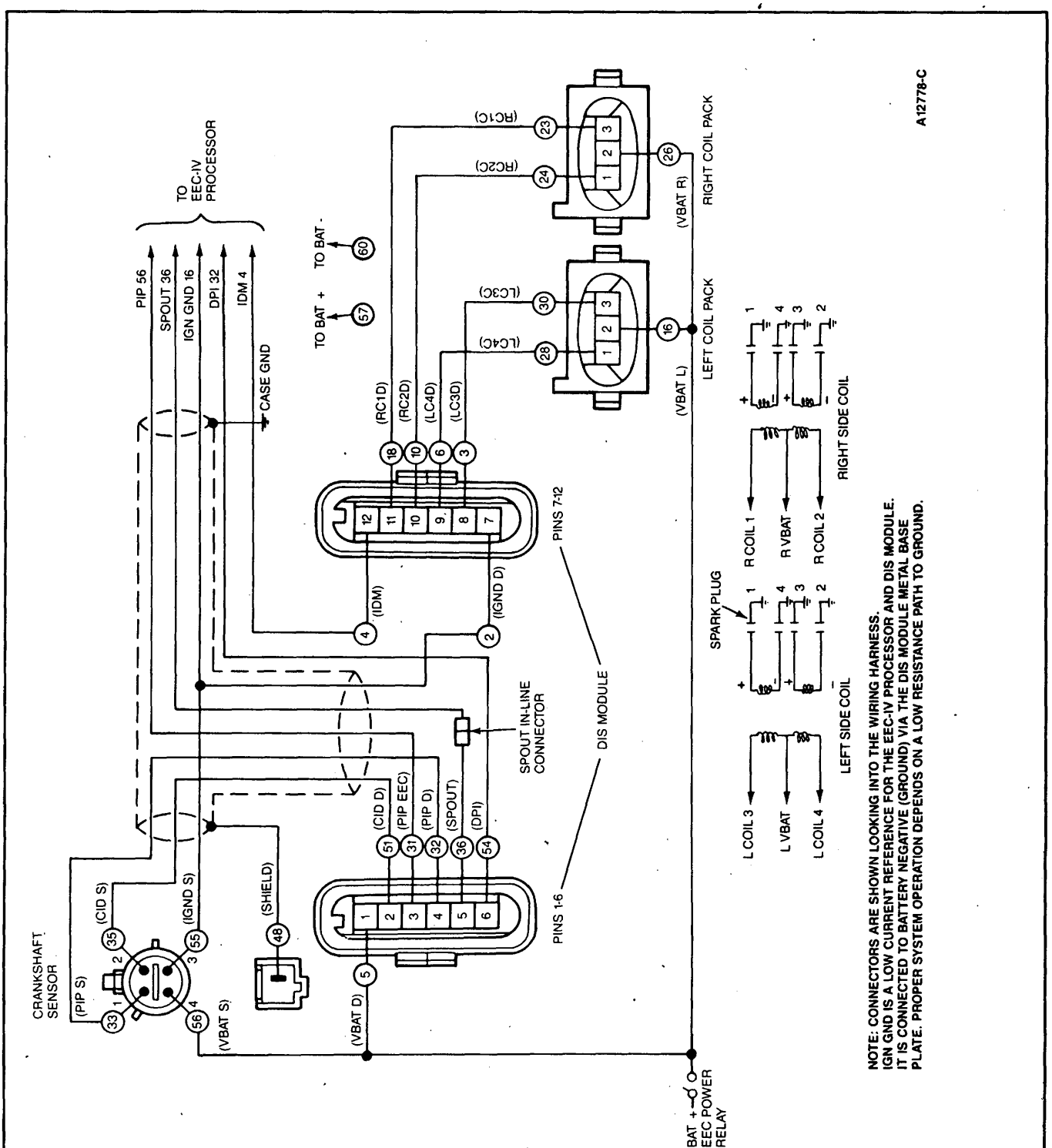


Figure 3 2.3L EFI Truck (Dual Plug) DIS Wiring Schematic

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DIS Schematic and Breakout Box Overlay Acronyms

There is a logic to the names on the Schematic and Overlays for the DIS DIAGNOSTIC HARNESS that will help you.

DIS Acronyms

PIP	Profile Ignition Pickup (Crankshaft Sensor signal).
CID	Cylinder IDentification.
SPOUT	SPark OUT (EEC Spark control signal).
IDM	Ignition Diagnostic Monitor (Diagnostic signal to EEC-IV).
BAT +	Battery Positive.
BAT –	Battery Negative.
IGGND	Low current ground reference.
DPI	Dual Plug Inhibit (High — Right Plugs fire; Low — Both Sides fire).
RC1, RC2	Right Coil Drive (For Coils 1 and 2 right side of engine).
LC1, LC2	Left Coil Drive (For Coils 1 and 2 left side of engine).

Overlay Designators

On the Schematic and Overlays, each of these signals is identified along with a suffix letter that tells you where the measurement is being taken. The key to these letters is:

Prefix	"J" is a breakout box jack.
Suffix	"D" is at the DIS Module.
Suffix	"S" or "PS" or "CS" is at the sensor, "P" for PIP, "C" for CID.
Suffix	"EEC" is at the signal source (the sensor) except PIPEEC which comes from the DIS Module.
Suffix	"C" is at the coil.

A couple of examples:

RCID	means	Right Coil, number "1", at the DIS Module Terminal.
RCIC	means	Right Coil, number "1", at the Coil Terminal.
VBAT PS	means	VBAT at the PIP Sensor.
VBAT D	means	VBAT at the DIS Module.

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Crankshaft Sensor Description

The Dual Hall crankshaft sensor contains two Hall digital output devices (PIP, CID) in one package. The sensor is located on a bracket mounted near the crankshaft damper.

Two rotary vane cups (or wheels) are mounted on the damper and are used to trigger the Hall sensors. The vane cups are made of ferrous metal. When the window of a cup is in the air gap between the Hall device and the permanent magnet, a magnetic flux field is completed from the magnet through the Hall device and back to the magnet. This condition results in a low (0 volt) output signal (Figure 4). As the crankshaft turns, a tooth on the cup will move into the air gap. The magnet field will be shunted by the tooth (Figure 5) preventing it from reaching the hall device and the output signal will change from a low to a high (VBAT).

The PIP cup has two teeth resulting in two positive going edges each revolution of the crankshaft, and the CID cup has one tooth and generates one positive edge revolution of the crankshaft. CID is used by the DIS module to enable it to select the proper coil to fire. The EEC IV processor tells the DIS module when to fire but the DIS module has to select one of the two coils based on CID signal (which two of four coils if in the DPI mode).

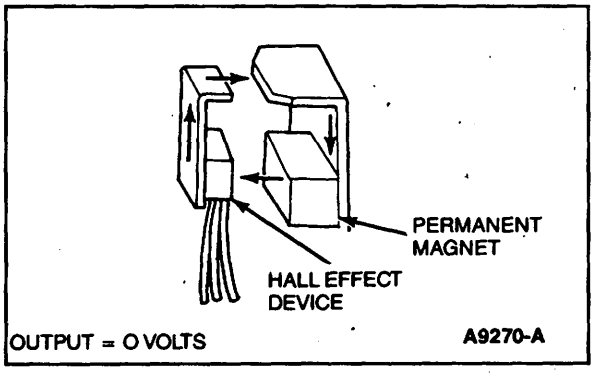


Figure 4 Magnetic Flux Field

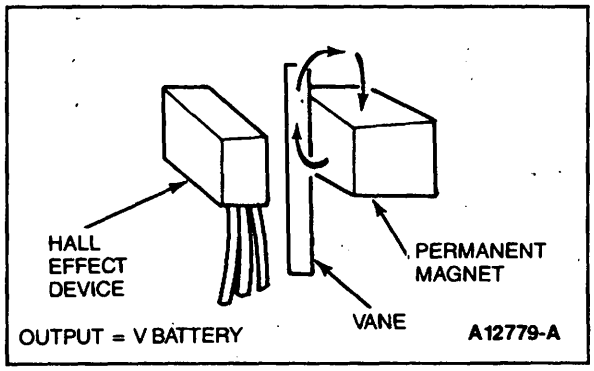


Figure 5 Hall Effect Device Response to Vane

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2.3L EFI Truck (Dual Plug) DIS System Description

The 2.3L EFI Truck (Dual Plug) Distributorless Ignition System (DIS) (refer to Figure 6) consists of a crankshaft mounted Dual Hall Sensor, two 4-tower DIS coil packs, and a DIS ignition module.

The DIS eliminates the need for a distributor by using multiple ignition coils. Each coil fires two spark plugs at the same time. The plugs are paired so that as one fires during the compression cycle the other fires during the exhaust stroke. The next time the coil is fired, the plug that was on exhaust will be on compression and the one that was on compression will be on exhaust (the spark in the exhaust cylinder is wasted but little of the coil energy is lost). Two coils are mounted together in a "coil pack". Each coil pack has two tach wires, one for each coil. Since there are two plugs per cylinder, two coil packs are required. One is called the Right Coil Pack (on right side of engine) and the other, the Left Coil Pack (left side). The Right Coil Pack and plugs operate continuously but the Left Coil Pack and plugs may be switched on or off by the EEC-IV processor. The EEC-IV processor computes the spark angle and dwell for the ignition system.

The Crankshaft Sensor is a dual digital output Hall device that responds to two rotating metallic shutters mounted together on the crankshaft. The PIP output is a 50 percent duty cycle signal that provides base spark timing information. The other signal (CID) is required so that the DIS module "knows" which coil to fire. CID is high (VBAT) half of the crank revolution (180 degrees) and low (0 volts) for the other (refer to Figure 7).

The EEC-IV processor determines spark angle using the PIP signal to establish base timing. Spout is sent from the EEC-IV processor to the DIS module and serves two purposes; the leading edge fires the coil and the trailing edge controls the dwell time. This feature is called CCD or computer controlled dwell.

The Ignition Diagnostic Monitor (IDM) is an output from the DIS module to the EEC-IV processor Module that provides diagnostic information about the ignition system for Self-Test.

Dual Plug Inhibit (DPI) allows the EEC-IV processor to switch the ignition system from single to dual plug operation.

During crank the vehicle is in the single plug mode (only the plugs on the right side of the engine are firing). The EEC-IV processor sends a command to the DIS module to switch to the Dual plug mode (both plugs in each cylinder are firing) when the engine has started.

If the CID circuit fails, the DIS module will randomly select one of the two coils to fire. If hard starting results, turning the key off and then cranking again will result in another "guess." Several attempts may be needed until the proper coil is selected, allowing the vehicle to be started and driven until repairs can be made. The Failure Mode Effects Management (FMEM) system will keep the vehicle drivable in the event of EEC-IV system or ignition failures that would otherwise prevent spark angle or dwell commands. The EEC-IV processor opens the SPOUT line and the DIS module fires the coils directly from the PIP output. This results in a fixed spark angle of 10 degrees and fixed dwell.

The 2.3L EFI (Dual Plug) DIS component locations are shown in Figure 8.

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2.3L EFI Truck (Dual Plug) DIS Block Diagram

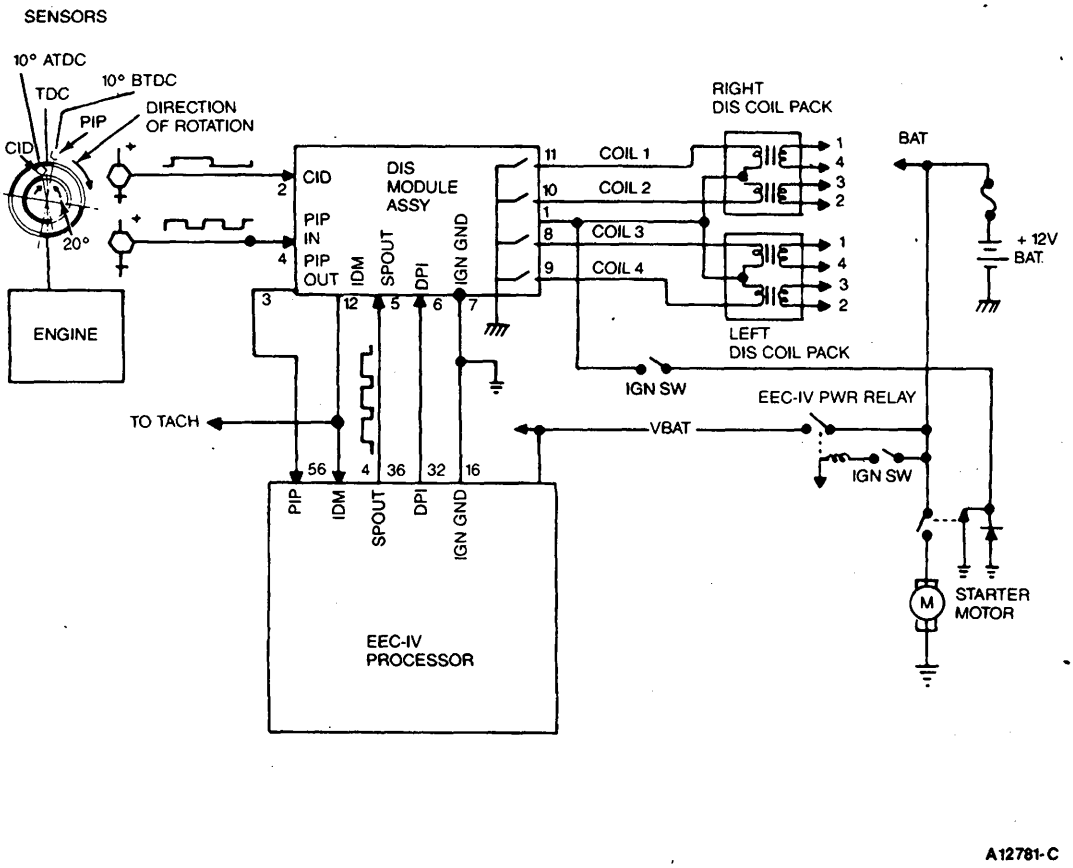


Figure 6 2.3L EFI Truck (Dual Plug) Distributorless Ignition System (DIS)

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2.3L EFI Truck (Dual Plug) DIS Waveforms

Timing Diagram

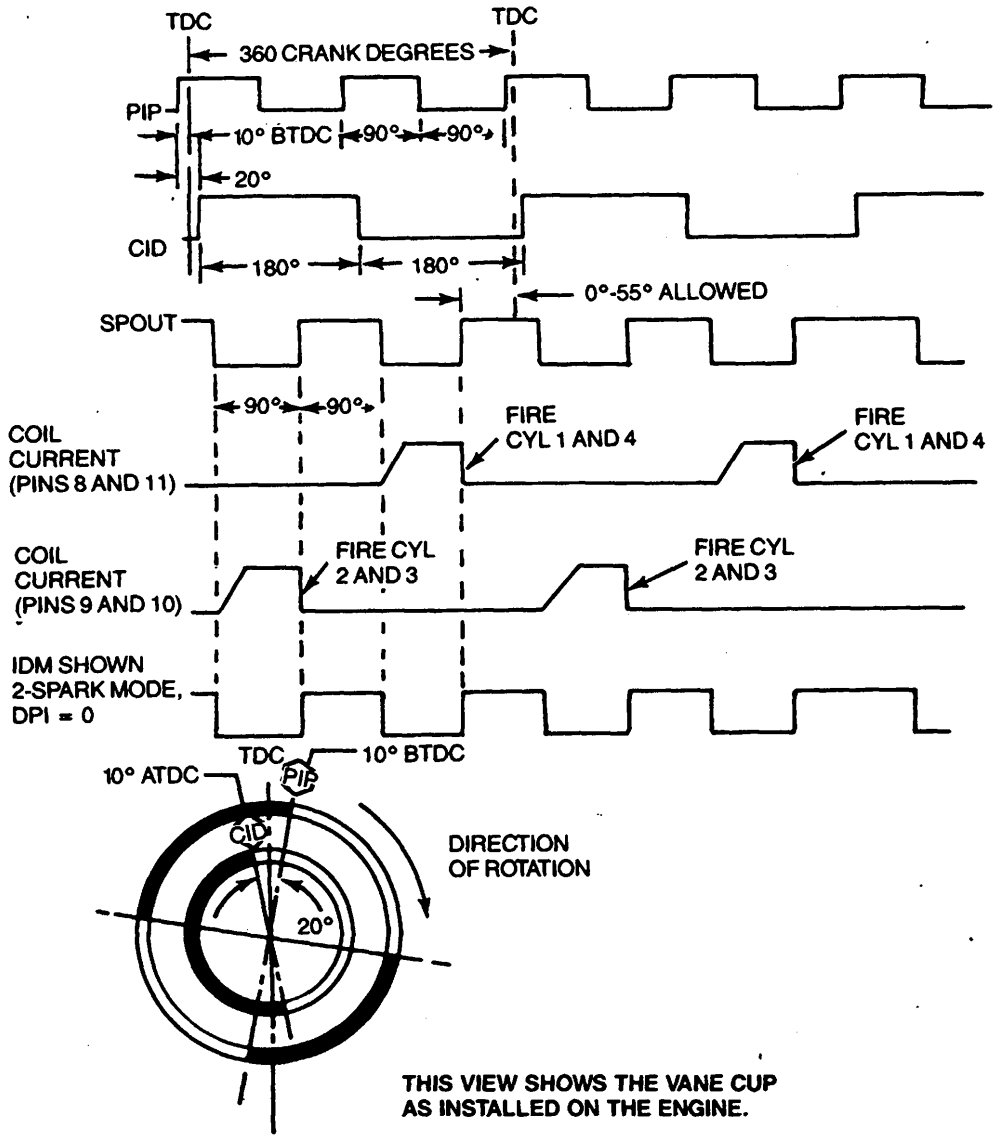


Figure 7 2.3L EFI Truck (Dual Plug) DIS Waveforms

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2.3L EFI Truck (Dual Plug) DIS Component Location

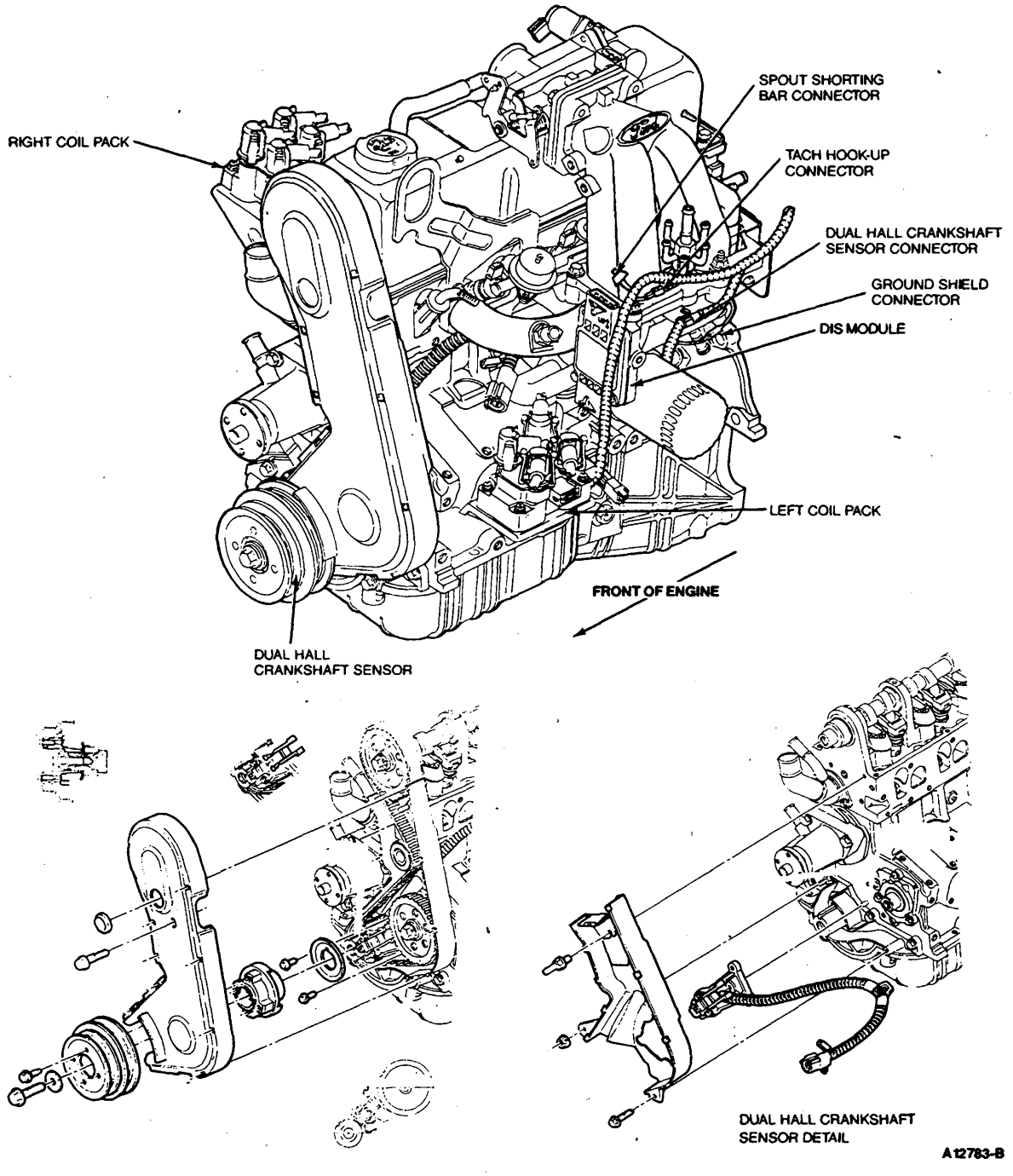


Figure 8 2.3L EFI Truck (Dual Plug) DIS Component Location

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2.3L EFI Truck (Dual Plug) DIS Pinpoint Test Diagnostics

Pinpoint Test

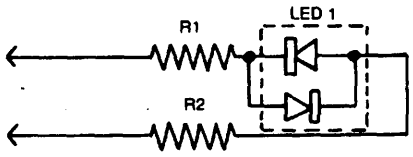
Index

CAUTION

A 12 volt Test Lamp should not be used to test circuit signals. It will load the circuit and may cause erroneous measurements or improper DIS/EEC-IV operations (ie. Engine stall).

Note

- Use a VOM or the LED test lamp circuit (Figure 1) in the following Pinpoint Test Procedures. The LED Test Lamp is more convenient and faster to use.
- If a VOM is used, correct Test Lead Polarity must be followed. The red lead is (+) positive and the black lead is (−) negative.
- To check PIP or CID, the engine is "Bumped" with the starter while watching the voltmeter. Both the CID and PIP signals are digital and should switch between VBAT and ground as the engine turns. To see the signal change, using the VOM, the engine must be turned in very short bursts.
- If an LED Test Lamp is used, wire the LED as shown below:



THE LED TEST LAMP IS "ON" IF EITHER THE RED OR GREEN LED IS LIT.

LED 1	RADIO SHACK	276-012 DUAL LED
R1	RADIO SHACK	271-019 470Ω
R2	RADIO SHACK	271-019 470Ω

A12748-A

Figure 1

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2.3L EFI Truck (Dual Plug) DIS Pinpoint Test Diagnostics

Pinpoint Test

Index

TEST STEP	RESULT ▶	ACTION TO TAKE
These diagnostics were written to catch "Hard faults"; intermittent failures will be difficult or impossible to diagnose using these procedures.		
• Engine No Start	→	GO to A1.
• Engine runs with:		
— Continuous Memory Code 19	→	GO to B1.
— Continuous Memory Code 28	→	GO to B1.
— Continuous Memory Code 48	→	GO to C1.
— Continuous Memory Code 18	→	GO to D1.
— Continuous Memory Code 88	→	GO to E1.
— lack of power drive complaint	→	GO to F1.
— engine running Code 18	→	GO to F1.
— misfire under load	→	GO to G1.
— intermittent miss or stall	→	GO to H1.

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2.3L EFI Truck (Dual Plug) DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A1 PERFORM EEC-IV QUICK TEST		
• Refer to Section 14 and perform EEC-IV Quick Test. • **Are any service codes (KOEO, KOER or Continuous Memory) present?**	Yes ▶ No ▶	SERVICE any EEC-IV code first. If still no start, GO to A2. GO to A2.
A2 CHECK FOR SPARK DURING CRANK		
• Using a Neon Bulb Spark Tester (D89P6666-A), check for spark at each right side spark plug wire while cranking. • **Was spark present on all right side spark plug wires and consistent (one spark per crank revolution)?**	Yes ▶ No ▶	GO to A3. GO to A5.
A3 CHECK DIS MODULE PIP OUT		
• Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Connect LED test lamp between (+) J31 (PIP EEC) and (–) J60 (BAT–). • Crank engine. • **Does LED test lamp blink continuously during crank?**	Yes ▶ No ▶	GO to A4. REPLACE the DIS module and RERUN Quick Test.
A4 CHECK PIP OUT CONTINUITY		
• Key off. • Disconnect EEC-IV processor. • Measure the resistance between Pin 56 of the EEC-IV vehicle harness connector and J31 (PIP EEC). • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Section 17, Pinpoint Test Step A. SERVICE open circuit. RECONNECT the EEC-IV processor and RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A5 DETERMINE MISSING SPARK COMBINATION		
• **Was spark missing from BOTH cylinders 1 and 4 plug wires?** or • **Was spark missing from both cylinders 3 and 2 plug wires?**	Yes ▶ No ▶	GO to A7. GO to A6.
A6 CHECK PLUGS AND WIRES		
• Check spark plug wires for insulation damage, looseness, shorting or other damage. • Remove and check spark plugs for damage, wear, carbon deposits and proper plug gap. • **Are the spark plugs and wires OK?**	Yes ▶ No ▶	REINSTALL the plugs and wires. GO to A7. SERVICE or REPLACE the damaged part, then RERUN Quick Test.
A7 CHECK DIS MODULE VBAT		
• Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Connect LED Test Lamp between (−) J2 (IGN D) and (+) J5 (VBAT D). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	GO to A8. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
A8 CHECK DIS MODULE IGNITION GROUND		
• Key off. • **Is the resistance between J2 (IGND-D) and J60 (BAT−) less than 5 ohms?**	Yes ▶ No ▶	GO to A10. GO to A9.
A9 CHECK DIS MODULE MOUNTING SCREWS		
• Check DIS module mounting screws for corrosion or looseness. • **Are the mounting screws clean and tight?**	Yes ▶ No ▶	REPLACE DIS module and RERUN Quick Test. TIGHTEN, CLEAN or REPLACE mounting screws. CLEAN mounting area on DIS module. RERUN Quick Test

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2.3L EFI Truck (Dual Plug) DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A10 CHECK RIGHT COIL PACK CIRCUITS		
• Key on. • Connect LED test lamp between the two pairs of Test Jacks given below. Note if the LED test lamp is on or off each time. • Check between (+) J18 (RC1D) and (−) J60 (BAT−). • Check between (+) J10 (RC2D) and (−) J60 (BAT−). • **Was LED test lamp on both times?**	Yes ▶ No ▶	GO to A14. GO to A11.
A11 RIGHT COIL FAULT — ISOLATE DIS MODULE		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • Repeat test procedure in A10. • **Was the LED test lamp on both times?**	Yes ▶ No ▶	REPLACE the DIS module and RERUN Quick Test. GO to A12.
A12 CHECK RIGHT COIL PACK VBAT		
• Connect LED test lamp between (+) J26 (VBAT R) and (−) J60 (BAT−). • **Is LED test lamp on?**	Yes ▶ No ▶	GO to A13. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
A13 CHECK RIGHT COIL CIRCUIT		
• Connect LED test lamp between (+) J23 (RC1C) and (−) J60 (BAT−). • Connect LED test lamp between (+) J24 (RC2C) and (−) J60 (BAT−). • **Was LED test lamp on both times?**	Yes ▶ No ▶	One or both coil wires are shorted to VBAT. Service connectors and harness. RERUN Quick Test. REPLACE right coil pack and RERUN Quick Test.
A14 CHECK PIP D AT DIS MODULE		
• Connect LED test lamp between (+) J32 (PIP D) and (−) J60 (BAT−). • Crank engine. • **Does LED test lamp blink continuously during crank?**	Yes ▶ No ▶	GO to A15. GO to A19.

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2.3L EFI Truck (Dual Plug) DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A15 CHECK DIS MODULE COIL DRIVERS		
• Connect LED test lamp between each of the two pairs of test points given below. Crank the engine each time. See if LED test lamp blinks continuously during crank. • Check between (+) J18 (RC1D) and (–) J60 (BAT–). • Check between (+) J10 (RC2D) and (–) J60 (BAT–). • **Does LED test lamp blink each time?**	Yes ▶ No ▶	GO to A16. REPLACE the DIS module and RERUN Quick Test.
A16 CHECK RIGHT COIL PACK VBAT		
• Connect LED test lamp between (+) J26 (BAT R) and (–) J60 (BAT–). • **Is LED test lamp on?**	Yes ▶ No ▶	GO to A17. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
A17 CHECK RIGHT COIL CIRCUIT		
• Connect LED test lamp between each of the two test point pairs listed below. • Check to see if LED test lamp is on or off at each step. • Check between (+) J23 (RC1C) and (–) J60 (BAT–). • Check between (+) J24 (RC2C) and (–) J60 (BAT–). • **Was LED test lamp on in both steps?**	Yes ▶ No ▶	GO to A18. One or both coil wires shorted to ground. Coil pack may be damaged. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
A18 CHECK RIGHT COIL CIRCUIT		
• Repeat test procedure in Step A17 and Crank engine each time. • **Did LED test lamp blink continuously during crank?**	Yes ▶ No ▶	REPLACE the right coil pack and RERUN Quick Test. One or both coil wires are open. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A19 ISOLATE DIS MODULE FROM PIP D		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Connect LED test lamp between (+) J32 (PIP D) and (-) J55 (IGND S). • **Does LED test lamp blink continuously during crank?**	Yes ▶ No ▶	GO to A26. GO to A20.
A20 CHECK CRANKSHAFT SENSOR VBAT		
• Key on. • Connect LED test lamp between (+) J56 (VBAT S) and (-) J2 (IGND D). • **Is LED test lamp on?**	Yes ▶ No ▶	GO to A21. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
A21 CHECK CRANKSHAFT SENSOR IGNITION GROUND		
• Key off. • Disconnect EEC-IV processor. • Disconnect diagnostic cable connector from crankshaft sensor. • **Is the resistance between J55 (IGND S) and J60 (BAT-) less than 5 ohms?**	Yes ▶ No ▶	GO to A22. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
A22 CHECK CRANKSHAFT SENSOR PIP S		
• Connect EEC-IV processor. • Connect diagnostic cable connector to crankshaft • Connect LED test lamp between (+) J33 (PIP S) and (-) J2 (IGND D). • **Does LED test lamp blink continuously while the engine is cranked?**	Yes ▶ No ▶	PIP is open between sensor and DIS module. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test. GO to A23.

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2.3L EFI Truck (Dual Plug) DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A23 CHECK PIP CIRCUIT FOR SHORT TO GROUND		
• Key off. • Disconnect diagnostic cable connector from crankshaft. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Connect LED test lamp between (-) J33 (PIP S) and (+) J57 (BAT+).	Yes ▶	PIP is shorted to ground between the sensor and the DIS module. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
• Key on. • **Is LED test lamp on?**	No ▶	GO to A24.
A24 CHECK PIP CIRCUIT FOR SHORT TO VBAT		
• Connect LED Test Lamp between (+) J33 (PIP S) and (-) J60 (BAT-). • **Is LED test lamp on?**	Yes ▶	PIP is shorted to VBAT between the sensor and DIS module. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
	No ▶	GO to A25.
A25 CHECK CRANKSHAFT VANE		
• **Does the crankshaft vane move through the sensor air gap when the engine is cranked?**	Yes ▶	REPLACE crankshaft sensor and RERUN Quick Test.
	No ▶	Refer to Shop Manual, Compact Truck Group 03.
A26 ISOLATE EEC-IV PROCESSOR FROM PIP CIRCUIT		
• Key off. • Reconnect diagnostic cable connector to DIS module (Pins 1-6). • Disconnect EEC — IV processor. • **Does LED test lamp blink continuously when the engine is cranked?**	Yes ▶	REPLACE the processor. RERUN Quick Test.
	No ▶	GO to A27.

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2.3L EFI Truck (Dual Plug) DIS No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A27 CHECK PIP EEC CIRCUIT FOR SHORT TO VBAT		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Connect LED test lamp between (+) J31 (PIP EEC) and (-) J60 (BAT-). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	PIP EEC is shorted to BAT. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test. GO to **A28**.
A28 CHECK PIP EEC CIRCUIT FOR SHORT TO GROUND		
• Connect LED test lamp between (-) J31 (PIP EEC) and (+) J57 (BAT+). • **Is LED test lamp on?**	Yes ▶ No ▶	PIP EEC is shorted to ground. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test. REPLACE DIS module and RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 28: CID Failure, IDM Low or Right Coil Pack Failure

Pinpoint Test **B**

TEST STEP	RESULT ▶	ACTION TO TAKE
B1 VERIFY "HARD CRANK"		
• **Does the vehicle require more than one or two attempts to start and when it will not start, is the cranking speed erratic?**	Yes ▶	GO to B2.
	No ▶	GO to B8.
B2 CHECK CID SIGNAL AT DIS MODULE		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 2.3L DP overlay. • Connect LED test lamp between (+) J51 (CID D) and (−) J2 (IGND D). • Start engine. • **Does LED test lamp blink continuously?**	Yes ▶	REPLACE DIS module and RERUN Quick Test.
	No ▶	GO to B3.
B3 ISOLATE DIS MODULE FROM CID CIRCUIT		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Crank the engine. • **Does LED test lamp blink continuously during crank?**	Yes ▶	REPLACE DIS module and RERUN Quick Test.
	No ▶	GO to B4.
B4 CHECK CRANKSHAFT SENSOR CID SIGNAL OUTPUT		
• Key off. • Reconnect diagnostic cable connector to DIS module (Pins 1-6). • Connect LED test lamp between (+) J35 (CIDS) and (−) J60 (BAT−). • Start the engine. • **Does LED test lamp blink continuously?**	Yes ▶	CID circuit is open. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
	No ▶	GO to B5.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 28: CID Failure, IDM Low or Right Coil Pack Failure

Pinpoint Test **B**

TEST STEP	RESULT ▶	ACTION TO TAKE
B5 CHECK CID FOR CIRCUIT SHORT TO GROUND		
• Key off. • Disconnect diagnostic cable connector from crankshaft sensor. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Connect LED test lamp between (−) J51 (CID D) and (+) J57 (BAT+). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	CID is shorted to ground. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test. GO to B6.
B6 CHECK CID FOR SHORT TO VBAT		
• Connect the LED test lamp between (+) J51 (CID D) and (−) J60 (BAT−). • **Is the LED test lamp on?**	Yes ▶ No ▶	CID is shorted to VBAT. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test. GO to B7.
B7 CHECK CID VANE		
• **Does the CID vane move through the sensor air gap when the engine is cranked or running?**	Yes ▶ No ▶	REPLACE crank sensor and RERUN Quick Test. REFER to Shop Manual Compact Truck Group 03.
B8 CHECK DPI SIGNAL AT DIS MODULE		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Key on. • Connect LED Test Lamp between (+) J54 (DPI) and (−) J60 (BAT−). • **Is LED test lamp on?**	Yes ▶ No ▶	GO to B11. GO to B9.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 28: CID Failure, IDM Low or Right Coil Pack Failure

Pinpoint Test **B**

TEST STEP	RESULT ▶	ACTION TO TAKE
B9 ISOLATE DIS MODULE FROM DPI CIRCUIT		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	GO to **B10**. REPLACE DIS module and RERUN Quick Test.
B10 ISOLATE EEC-IV PROCESSOR FROM DPI CIRCUIT		
• Key off. • Disconnect EEC-IV processor. • Connect LED test lamp from (+) J54 (DPI) and (-) J60 (BAT-). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	DPI is shorted to VBAT. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test. REPLACE the processor. RERUN Quick Test.
B11 CHECK IDM SIGNAL AT DIS MODULE		
• Connect LED test lamp between (+) J4 (IDM) and (-) J60 (BAT-). • Start engine. • **Does LED test lamp blink continuously?**	Yes ▶ No ▶	IDM OK at DIS module. REPLACE processor. RERUN Quick Test. GO to **B12**.
B12 ISOLATE EEC-IV PROCESSOR FROM IDM CIRCUIT		
• Key off. • Disconnect EEC-IV processor. • **Does LED test lamp blink continuously when the engine is cranked?**	Yes ▶ No ▶	The processor is holding J4 (IDM) low. REPLACE the processor. RERUN Quick Test. GO to **B13**.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 28: CID Failure, IDM Low or Right Coil Pack Failure

Pinpoint Test **B**

TEST STEP		RESULT ▶	ACTION TO TAKE
B13	CHECK IDM CIRCUIT FOR SHORT TO GROUND		
• Key off. • Disconnect HEGO sensor. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • **Is resistance between J4 (IDM) and J60 (BAT−) less than 10K ohms?**		Yes ▶	IDM is shorted to ground between the DIS module and processor. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
		No ▶	REPLACE the DIS module and RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 48: Left Coil Pack Failure or IDM Open or High

Pinpoint Test **C**

TEST STEP	RESULT ▶	ACTION TO TAKE
C1 CHECK FOR SPARK — LEFT SIDE		
• Using a Neon Bulb Spark Tester (D89P-6666-A), check for spark at each left spark plug wire with the engine running. • **Was spark present at one or more plugs?**	Yes ▶ No ▶	GO to C2. GO to D1.
C2 CHECK DIS MODULE IDM OUTPUT SIGNAL		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Connect LED test lamp between (+) J4 (IDM) and (−) J60 (BAT−). • Start engine. • **Does LED test lamp blink continuously?**	Yes ▶ No ▶	GO to C3. GO to C4.
C3 CHECK IDM CIRCUIT CONTINUITY TO EEC-IV PROCESSOR		
• Key off. • Disconnect EEC-IV processor. • **Is the resistance between Pin 4 (IDM) of the EEC-IV vehicle harness connector and J4 (IDM) less than 5 ohms?**	Yes ▶ No ▶	IDM OK in DIS System. REPLACE processor. RERUN Quick Test. IDM circuit is open. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
C4 ISOLATE EEC-IV PROCESSOR FROM IDM CIRCUIT		
• Key off. • Disconnect EEC-IV processor. • **Does LED test lamp blink continuously during crank?**	Yes ▶ No ▶	The processor is shorting IDM. REPLACE the processor. RERUN Quick Test. GO to C5.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 48: Left Coil Pack Failure or IDM Open or High

Pinpoint Test **C**

TEST STEP	RESULT ▶	ACTION TO TAKE
C5 CHECK IDM CIRCUIT FOR SHORT TO VBAT		
• Key off. • Disconnect HEGO sensor. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • Disconnect LED test lamp. • **Is the resistance between J4 (IDM) and J5 (VBAT D) less than 10K ohms?**	Yes ▶	IDM is shorted to VBAT. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
	No ▶	GO to C6.
C6 CHECK IDM CIRCUIT FOR SHORT TO GROUND		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • **Is the resistance between J4 (IDM) and J60 (BAT-) less than 10K?**	Yes ▶	IDM is shorted to ground. CHECK connectors. SERVICE or REPLACE the harness. RERUN Quick Test.
	No ▶	REPLACE DIS module and RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 18: Coil Failure

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D1 CHECK SPARK — ALL WIRES		
• Using the Neon Spark Tester (D89P-6666-A), check for spark at each plug wire with the engine running. • **Was spark present at ALL spark plug wires?**	Yes ▶ No ▶	GO to E1. GO to D2.
D2 CHECK SPARK — RIGHT SIDE		
• **Was spark present on ALL right side spark plug wires?**	Yes ▶ No ▶	GO to D3. GO to D10.
D3 LEFT SPARK FAULT — ISOLATE PLUGS/WIRES		
• **Was spark missing from BOTH cylinders 1 and 4 or BOTH cylinders 2 and 3?**	Yes ▶ No ▶	GO to D5. GO to D4.
D4 LEFT SPARK FAULT — CHECK PLUGS AND WIRES		
• Check left spark plug wires for insulation damage, looseness, shorting or other damage. • Remove and check left spark plugs for damage, wear, carbon deposits and proper air gap. • **Are the spark plugs and wires OK?**	Yes ▶ No ▶	REINSTALL the plugs and RECONNECT the plug wires. GO to D5. REPLACE or SERVICE the damaged component and RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 18: Coil Failure

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D5 LEFT SPARK FAULT — CHECK MODULE OUTPUT		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Disconnect diagnostic cable connector from DIS vehicle harness connector (Pins 7-12). • Connect a jumper between J55 (IGND S) and J60 (BAT−). • Connect a jumper between J54 (DPI) and J55 (IGND S). • If spark was missing from cylinders 1 and 4, connect LED test lamp between (+) J5 (VBAT D) and (−) J3 (LC3D). • If spark was missing from cylinders 2 and 3, connect LED test lamp between (+) J5 (VBAT D) and (−) J6 (LC4D). • **Does LED test lamp blink continuously when the engine is cranked?**	Yes ▶ No ▶	GO to D6. REPLACE the DIS module and RERUN Quick Test.
D6 LEFT SPARK FAULT — CHECK LEFT COIL PACK VBAT		
• Key off. • Remove jumpers. • Reconnect diagnostic cable connector to DIS module (Pins 7-12). • Connect LED test lamp between (+) J15 (BAT L) and (−) J60 (BAT−). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	GO to D7. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 18: Coil Failure

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D7 LEFT SPARK FAULT — ISOLATE LEFT COIL PACK		
• Key off. • Disconnect HEGO sensor. • Disconnect diagnostic cable connector from the left coil pack. **For spark missing from cylinders 1 and 4:** — Connect LED test lamp between (+) J57 (BAT+) and (−) J30 (LC3C). **For spark missing from cylinders 2 and 3:** — Connect LED test lamp between (+) J57 (BAT+) and (−) J28 (LC4C). • Crank the engine. • **Does LED test lamp blink continuously during crank or when running?**	Yes ▶ No ▶	REPLACE the left coil pack and RERUN Quick Test. GO to D8.
D8 LEFT SPARK FAULT — CHECK FOR OPEN		
• Disconnect diagnostic cable connector from DIS module (Pins 7-12). **For spark missing from cylinders 1 and 4:** — **Is the resistance between J3 (LC3D) and J30 (LC3C) less than 5 ohms?** **For spark missing from cylinders 2 and 3:** — **Is the resistance between J6 (LC4D) and J28 (LC4C) less than 5 ohms?**	Yes ▶ No ▶	GO to D9. Circuit is open between the left coil pack and the DIS module. SERVICE harness and connectors. RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 18: Coil Failure

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D9 LEFT SPARK FAULT — CHECK FOR SHORTS		
For spark missing from cylinders 1 and 4: — **Is the resistance between J3 (LC3D) and J57 (BAT−) less than 10K ohms?** **For spark missing from cylinders 2 and 3:** — **Is the resistance between J6 (LC4D) and J57 (BAT−) less than 10K ohms?**	Yes ▶ No ▶	Circuit is shorted to VBAT between the DIS module and coil pack. SERVICE harness and connectors. RERUN Quick Test. Circuit is shorted to ground between the DIS module and coil pack. SERVICE harness and connectors. RERUN Quick Test.
D10 RIGHT SPARK FAULT — CHECK MODULE OUTPUT		
• Key off. • Disconnect HEGO sensor. • Install diagnostic cable. • Disconnect diagnostic cable connector from DIS harness (Pins 7-12) • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Connect a jumper between J55 (IGNDS) and J60 (BAT−). **For spark missing from cylinders 1 and 4:** — Connect LED test lamp between (−) J18 (RC1D) and (+) J57 (BAT+). **For spark missing from cylinders 2 and 3:** — Connect LED test lamp between (−) J10 (RC2D) and (+) J57 (BAT+). • **Does LED test lamp blink continuously when the engine is cranked?**	Yes ▶ No ▶	GO to D11. REPLACE DIS module and RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 18: Coil Failure

Pinpoint Test **D**

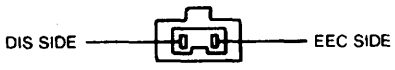
TEST STEP	RESULT ▶	ACTION TO TAKE
D11 RIGHT SPARK FAULT — ISOLATE RIGHT COIL PACK		
• Key off. • Disconnect diagnostic cable connector from the right coil pack. **For spark missing from cylinders 1 and 4:** — Connect LED test lamp between (−) J23 (RC1C) and (+) J57 (BAT+). **For spark missing from cylinders 2 and 3:** — Connect LED test lamp between J24 (RC2C) (−) and J57 (BAT+). • **Does the LED test lamp blink continuously when the engine is cranked?**	Yes ▶ No ▶	REPLACE the right coil pack. RERUN Quick Test. GO to D12.
D12 RIGHT SPARK FAULT — CHECK FOR OPEN		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). **For spark missing from cylinders 1 and 4:** — **Is the resistance between J18 (RC1D) and J23 (RC1C) less than 5 ohms?** **For spark missing from cylinders 2 and 3:** — **Is the resistance between J10 (RC2D) and J23 (RC1C) less than 5 ohms?**	Yes ▶ No ▶	GO to D13. Circuit is open between the DIS module and coil pack. SERVICE harness and connectors. RERUN Quick Test.
D13 RIGHT SPARK FAULT — CHECK FOR SHORTS		
• Disconnect HEGO sensor. **For spark missing from cylinders 1 and 4:** — **Is the resistance between J18 (RC1D) and J60 (BAT−) less than 10K ohms?** **For spark missing from cylinders 2 and 3:** — **Is the resistance between J10 (RC2D) and J60 (BAT−) less than 10K ohms?** • Connect diagnostic cable connector to DIS module (Pins 7-12).	Yes ▶ No ▶	Circuit is shorted to ground between DIS module and coil pack. SERVICE harness and connectors. RERUN Quick Test. Circuit is shorted to VBAT between the DIS module and coil pack. SERVICE harness and connectors. RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 88: DPI Open, IDM Open Or Spout High

Pinpoint Test **E**

TEST STEP	RESULT ▶	ACTION TO TAKE
E1 ISOLATE SPOUT HIGH		
• Key off. • Disconnect HEGO sensor. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Connect LED test lamp between (+) J36 (SPOUT) and (−) J60 (BAT−). • **Does LED test lamp blink continuously when engine is cranked or when engine is running?**	Yes ▶ No ▶	GO to E2. Spout fault. GO to E3.
E2 ISOLATE DPI OPEN		
• Using a Neon Spark Tester (D89P-6666-A), Check for spark at each left side plug wire with the engine running. • **Was spark present at one or more wires?**	Yes ▶ No ▶	GO to E6. GO to E11.
E3 SPOUT HIGH — ISOLATE SPOUT TO EEC		
• Key off. • Remove spout harness jumper plug from SPOUT vehicle harness connector. • Connect LED test lamp between (−) J60 (BAT−) and (+) EEC side of SPOUT vehicle harness connector. • **Does LED Test Lamp blink continuously when engine is started?**	Yes ▶ No ▶	GO to E5. GO to E4.

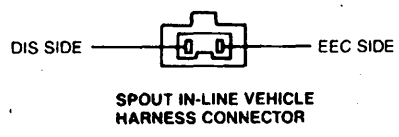
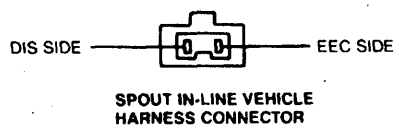


SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 88: DPI Open, IDM Open Or Spout High

Pinpoint Test **E**

TEST STEP	RESULT ▶	ACTION TO TAKE
E4 SPOUT HIGH — CHECK FOR SHORT TO VBAT		
• Key off. • Disconnect BAT + cable. • Disconnect EEC-IV processor. • **Is the resistance between J57 (VBAT+) and the spout vehicle harness connector (EEC side) more than 10K ohms?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A	Yes ▶ No ▶	Circuit is shorted to VBAT between EEC-IV processor and spout connector. SERVICE harness and connectors. RERUN Quick Test. REPLACE processor. RERUN Quick Test.
E5 SPOUT HIGH — CHECK FOR SHORT TO VBAT		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • **Is the resistance between J57 (BAT+) and the spout harness connector (DIS side) less than 10K ohms?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A	Yes ▶ No ▶	Circuit is shorted to VBAT between DIS module and spout connector. SERVICE harness and connectors. RERUN Quick Test. REPLACE DIS module and RERUN Quick Test.
E6 IDM OPEN — CHECK DIS MODULE IDM OUTPUT		
• Connect LED Test Lamp between (+) J4 (IDM D) and (−) J60 (BAT −). • Crank or start engine. • **Does LED test lamp blink continuously?**	Yes ▶ No ▶	GO to E7. GO to E8.
E7 IDM OPEN — CHECK IDM CIRCUIT CONTINUITY		
• Key off. • **Is the resistance between Test Pin 4 (IDM) at the EEC-IV vehicle harness connector and J4 (IDM) at the DIS connector less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. IDM circuit is open between the DIS module and the processor. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 88: DPI Open, IDM Open Or Spout High

Pinpoint Test **E**

TEST STEP	RESULT ▶	ACTION TO TAKE
E8 IDM OPEN — ISOLATE EEC-IV PROCESSOR		
• Key off. • Disconnect EEC-IV processor. • Crank engine. • **Does LED test lamp blink continuously?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. GO to E9.
E9 IDM OPEN — CHECK FOR SHORT TO GROUND		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • Remove the LED test lamp. • **Is resistance between J4 (IDM) and J60 (BAT-) less than 5 ohms?**	Yes ▶ No ▶	IDM circuit is shorted to ground between DIS module and processor. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test. GO to E10.
E10 IDM OPEN — CHECK FOR SHORT TO VBAT		
• **Is resistance between J4 (IDM) and J57 (BAT+) less than 5 ohms?**	Yes ▶ No ▶	IDM circuit is shorted to VBAT between DIS module and processor. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test. REPLACE DIS module. RERUN Quick Test.
E11 DPI OPEN — CHECK CONTINUITY		
• Key off. • Install diagnostic cable. • Disconnect diagnostic cable connector from DIS module (Pins 1-6) • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Disconnect EEC-IV processor. • **Is resistance between Test Pin 32 (DPI) at the EEC-IV vehicle harness connector and J54 (DPI) less than 5 ohms?**	Yes ▶ No ▶	GO to E12. DPI is open between the DIS module and the processor. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Continuous Memory Code 88: DPI Open, IDM Open Or Spout High

Pinpoint Test **E**

TEST STEP	RESULT ▶	ACTION TO TAKE
E12 DPI OPEN — CHECK FOR SHORT TO VBAT		
• **Is resistance between J54 (DPI) and J57 (BAT+) less than 10K ohms?**	Yes ▶	DPI is shorted to VBAT between the DIS module and processor. CHECK connectors, SERVICE or REPLACE the harness. RERUN Quick Test.
	No ▶	GO to **E13**.
E13 DPI OPEN — ISOLATE EEC PROCESSOR		
• Connect a jumper between J54 (DPI) and J60 (BAT-) **CAUTION** **Do not jumper J54 to VBAT+ or BAT+ or the DPI circuit in the EEC-IV processor will be damaged.** • Start the engine. • **Is there spark at any left plug wire?**	Yes ▶	REPLACE processor. RERUN Quick Test.
	No. ▶	REPLACE DIS module. RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Engine Running Code 18/ No Codes and Lack of Power

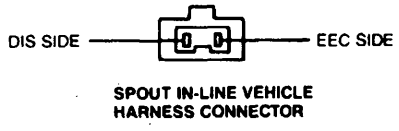
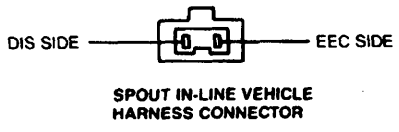
Pinpoint Test **F**

TEST STEP	RESULT ▶	ACTION TO TAKE
F1 CHECK TIMING AT IDLE		
• Key off. • Install timing light. • Engine running at normal operating temperature. • Transmission out of gear. • Check the timing. • **Is the timing greater than 19° BTDC?**	Yes ▶ No ▶	Refer to Shop Manual, Compact Truck Group 03. GO to F2.
F2 TIMING FAULT — CHECK SPOUT FUNCTION		
• Key off. • Disconnect HEGO sensor. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 2.3L overlay. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Connect LED test lamp between (+) J36 (SPOUT) and (−) J60 (BAT−). • **Does LED test lamp blink continuously during crank or engine running?**	Yes ▶ No ▶	REPLACE DIS module and RERUN Quick Test. If problem still exists, REPLACE the processor. RERUN Quick Test. GO to F3.
F3 SPOUT FAULT — ISOLATION		
• Key off. • Remove SPOUT harness jumper plug from SPOUT vehicle harness connector. • Connect diagnostic cable connector to DIS module (Pins 1-6). • Connect LED test lamp between (−) J60 (BAT−) and (+) EEC side of spout vehicle harness connector. • **Does LED Test Lamp blink continuously when engine is started?** • Connect diagnostic cable connector at DIS module (Pins 1-6).  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A	Yes ▶ No ▶	GO to F6. GO to F4.

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2.3L EFI Truck (Dual Plug) DIS Engine Running Code 18/ No Codes and Lack of Power

Pinpoint Test **F**

TEST STEP	RESULT ▶	ACTION TO TAKE
F4 SPOUT FAULT — CHECK CONTINUITY		
• Key off. • Disconnect EEC-IV processor. • **Is the resistance between Pin 36 (SPOUT) at the EEC-IV vehicle harness connector and the EEC side of the spout harness connector less than 5 ohms?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A	Yes ▶ No ▶	GO to F5. Circuit is open between the spout connector and processor. SERVICE harness and connectors. RERUN Quick Test.
F5 CHECK SPOUT FOR SHORT CIRCUIT FOR SHORT TO GROUND		
• Key off. • Disconnect EEC-IV processor. • **Is resistance between J60 (BAT−) and the EEC side of the spout connector less than 10K ohms?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A	Yes ▶ No ▶	Circuit is shorted to ground between the processor and SPOUT connector. SERVICE as necessary. RERUN Quick Test. REPLACE the processor. RERUN Quick Test.
F6 CHECK SPOUT CIRCUIT CONTINUITY		
• Key off. • **Is the resistance between J36 (SPOUT) and the DIS side of the spout connector less than 5 ohms?**	Yes ▶ No ▶	GO to F7. Circuit is open between the DIS module and SPOUT connector. SERVICE harness and connectors. RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Engine Running Code 18/ No Codes and Lack of Power

Pinpoint Test **F**

TEST STEP		RESULT ▶	ACTION TO TAKE
F7	CHECK SPOUT CIRCUIT FOR SHORT TO GROUND		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 1-6) • **Is resistance between J60 (BAT−) and J36 (SPOUT) less than 10K ohms?**		Yes ▶	Circuit is shorted to ground between the DIS module and SPOUT connector. SERVICE harness and connectors. RERUN Quick Test.
		No ▶	REPLACE DIS module and RERUN Quick Test.

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2.3L EFI Truck (Dual Plug) DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)	Pinpoint Test	G

PRELIMINARY NOTES

The engine analyzer is used to diagnose problems in the secondary side of the ignition system.

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- DIS Adapter Rotunda (Rotunda 007-00044).
- Engine Analyzer, Rotunda 002-00373.

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2.3L EFI Truck (Dual Plug) DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)	Pinpoint Test	G

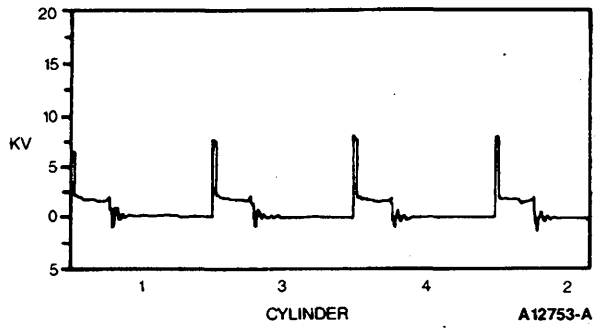
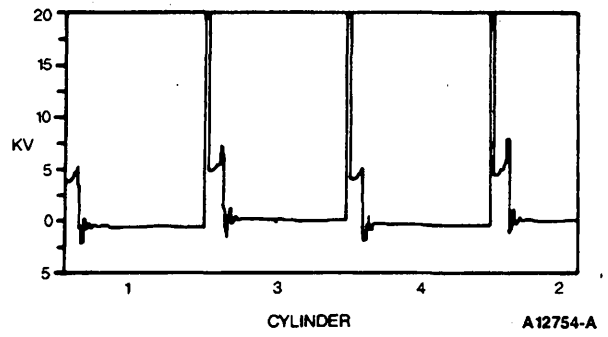
NOTE: If this portion of the diagnostic procedure is to provide accurate results, it is essential that the calibration of your engine analyzer be maintained. Refer to your equipment manual. If this is not available, an estimate of the calibration can be made by connecting the spark tester (D81P-6666-A or equivalent) to a properly operating ignition system and measuring the firing voltage of the spark tester only. Do not include the firing voltage of the rotor-to-cap gap. The spark tester firing voltage should be approximately 28 KV.

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect engine analyzer to view **parade** display of ignition system secondary. 2. While **slowly** increasing engine rpm from idle to 2,000 rpm, compare engine analyzer display to the following illustrations. The illustrations shown are four cylinder but are typical for all engines. 3. Disconnect engine analyzer.		

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2.3L EFI Truck (Dual Plug) DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)

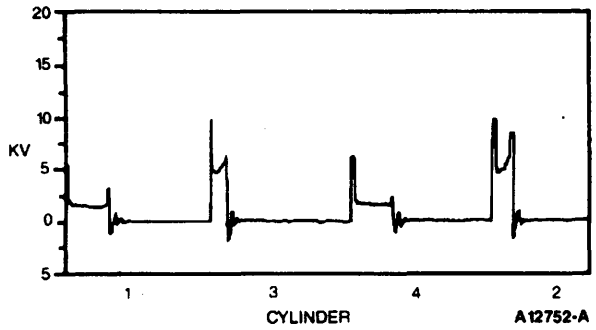
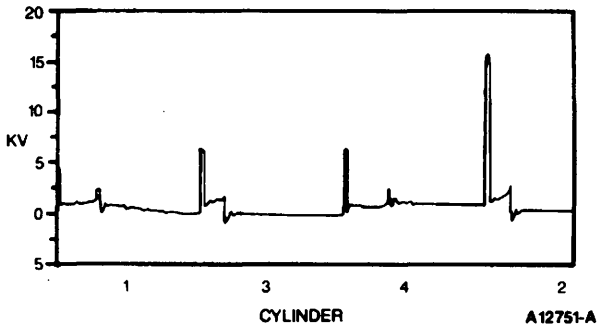
Pinpoint Test **G**

TEST STEP	RESULT ▶	ACTION TO TAKE
	The average value of spark plug firing voltage: 15 KV or less with evenness of spark plug firing voltage: 5 KV or less ▶	These are normal values for a properly operating ignition system.
	The average value of spark plug firing voltage: greater than 15 KV with evenness of spark plug firing voltage: 5 KV or less ▶	**Problems affecting all cylinders:** CHECK ignition coil wires for proper installation in coil. MEASURE resistance of ignition wires. REPLACE if greater than 7,000 ohms per foot. Wide spark plug gaps — all cylinders (usually from worn electrodes due to high mileage).

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2.3L EFI Truck (Dual Plug) DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)

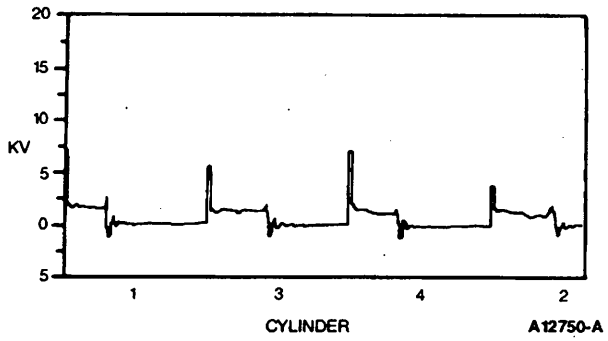
Pinpoint Test **G**

TEST STEP	RESULT ▶	ACTION TO TAKE
	Evenness of spark plug firing voltage: greater than 5 KV ▶	**Problems affecting some cylinders:** Wide spark plug gap(s) or worn electrode(s).
	Consistently high spark plug firing voltage in one or more cylinders ▶	Spark plug wire(s) not firmly connected. Disconnected spark plug wire(s). Wide spark plug gap(s). Open plug wire(s).

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2.3L EFI Truck (Dual Plug) DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)

Pinpoint Test **G**

TEST STEP	RESULT ▶	ACTION TO TAKE
	Consistently low spark plug firing voltage or sloping spark line in one or more cylinders ▶	Fouled spark plug(s). Narrow spark plug gap(s). Spark plug wire(s) grounding on engine. Inspect for damage.

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2.3L EFI Truck (Dual Plug) DIS No Codes — Intermittent Diagnosis

Pinpoint Test **H**

TEST STEP	RESULT ▶	ACTION TO TAKE
H1		
• Talk to owner.	▶	Symptoms.
H2		
• Review vehicle service history.	▶	Number of previous REPAIRS and components REPLACED.
H3		
• **Will engine start?**	Yes ▶	GO to Step **H4**.
	No ▶	GO to Step **A1**.
H4 SHAKE TEST		
• Engine at idle, Raise hood, Shake wiring harness and Pull wires at connectors for ignition components. • **Does engine quit?**	Yes ▶	SERVICE wiring harness or connector. CHECK DIS Mounting Bolts.
	No ▶	GO to Step **H5**.
H5 TEMPERATURE CHECK		
• Engine at idle, close hood, A/C ON, blower on medium speed. Allow engine to run for 15 minutes. • **Does engine quit?**	Yes ▶	GO to Step **H9**.
	No ▶	GO to Step **H6**.
H6 HOT SOAK CHECK		
• Engine off, Hood closed, hot soak for 10 minutes. • **Will engine restart?**	Yes ▶	GO to Step **H7**.
	No ▶	GO to Step **A1**.
H7 HOT SHAKE CHECK		
• Engine at idle, Raise hood, Shake wiring harness and Pull wires at connectors for ignition components. • **Does engine quit?**	Yes ▶	SERVICE wiring harness or connector.
	No ▶	GO to Step **H8**.

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2.3L EFI Truck (Dual Plug) DIS No Codes — Intermittent Diagnosis

Pinpoint Test **H**

TEST STEP	RESULT ▶	ACTION TO TAKE
H8 ROAD CHECK		
• Road test. • **Does engine quit?**	Yes ▶ No ▶	GO to Step H9. Test complete.
H9 ROAD SHAKE CHECK		
• Raise hood, Shake wiring harness, Pull wires at connectors, Separate and Reconnect connectors for ignition components. • **Does engine quit?**	Yes ▶ No ▶	SERVICE wiring harness or connector. GO to Step A1.

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IGNITION SYSTEM DIAGNOSTIC PROCEDURE (DIS) 3.0L SEFI SHO AND 3.8L SEFI SUPERCHARGED

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Index: 3.0L SEFI SHO and 3.8L SEFI SC DIS

NOTE: Start all diagnostics with Section 14 (EEC-IV Quick Test) first. The tests in this section are dependent on results from tests conducted in Section 14.

Subject	Page
Preliminary Checkout, Equipment and Notes	13-124
DIS Diagnostic Cable	13-125
3.0L SEFI SHO and 3.8L SEFI SC DIS Module and Pin-Out	13-126
3.0L SEFI SHO DIS Wiring Schematic	13-127
3.8L SEFI SC DIS Wiring Schematic	13-128
DIS Schematic and Breakout Box Overlay Acronyms	13-129
Camshaft and Crankshaft Sensor Description	13-130
3.0L SEFI SHO and 3.8L SEFI SC DIS System Description	13-131
3.0L SEFI SHO and 3.8L SEFI SC DIS Block Diagram	13-132
3.0L SEFI SHO and 3.8L SEFI SC DIS Waveforms	13-133
3.0L SEFI SHO DIS Component Location	13-134
3.8L SEFI SC DIS Component Location	13-135
3.0L SEFI SHO and 3.8L SEFI SC DIS Pinpoint Test Diagnostics	13-136

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Preliminary Checkout, Equipment and Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, damaged pins, loose or broken conditions. Check sensor shield connector. Make sure DIS module mounting screws are tight.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT (Required)

Obtain the following test equipment or an equivalent:

- DIS Diagnostic Cable (Rotunda 007-00044) (refer to Figure 1).
- Spark Tester, Neon bulb type Special Service Tool (D89P-6666-A).
- Volt/Ohm Meter (Rotunda 014-00407 or equivalent).
- Remote starter switch.
- EEC-IV breakout box (Rotunda T83L-50-EEC-IV).
- Spark Tester, Gap type (Special Service Tool D81P-6666-A). A spark plug with a broken side electrode is not sufficient to check for spark and may lead to incorrect results.
- Inductive Timing Light (Rotunda 059-00006 or equivalent). Do not use "advance knob" if timing light has one (it will not work correctly with DIS Ignition System).

EQUIPMENT (Recommended)

- Dis Module Tester (DMT) Rotunda 007-00071. This tester contains 12 LEDS, 12 Test Jacks and a built-in interface cable that allows the tester to monitor all DIS module signals.
- DIS Coil/Sensor Tester (CST) Rotunda 007-00072. This tester is similar to the DIS Module Tester (DMT) except it allows monitoring of signals at the sensor and coils.
- LED test lamp. A 12 volt test lamp should not be used to test circuit signals. It will load the circuit and may cause erroneous measurements or improper DIS/EEC-IV operation. (ie., engine stall).

NOTES

- When making measurements on a wiring harness, both a visual inspection and a continuity test should be performed. Inspect the connector pins for damage (corrosion, bent or spread pins, etc.) when directed to remove a connector.
- Spark timing adjustments are not possible.
- When making voltage checks a GROUND reading means any value within a range of 0 to 1 volt. Also BAT(+) readings mean any value that falls within a range of BAT + to 2 volts less than BAT +.
- When making voltage checks and a reference to ground is made use either the negative battery lead or cast iron on the engine. BAT(+) means the positive battery cable at the battery.
- When using the spark plug firing indicator, place the grooved end as close as possible to the plug boot. Very weak flashing may be caused by a fouled plug.

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DIS Diagnostic Cable

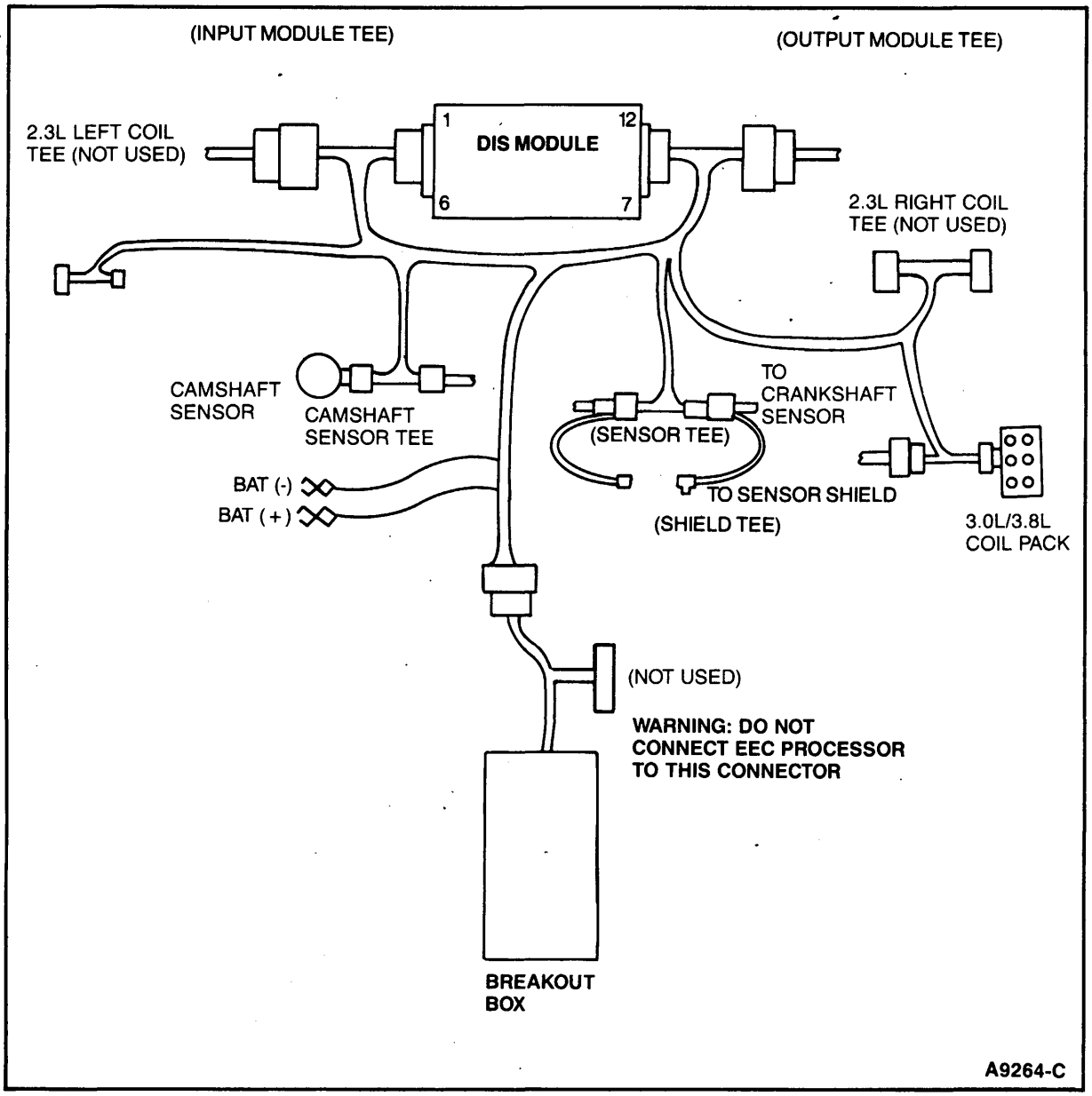


Figure 1 3.0L SEFI SHO and 3.8L SEFI SC DIS Hook-Up

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3.0L SEFI SHO and 3.8L SEFI SC DIS Module and Pin-Out

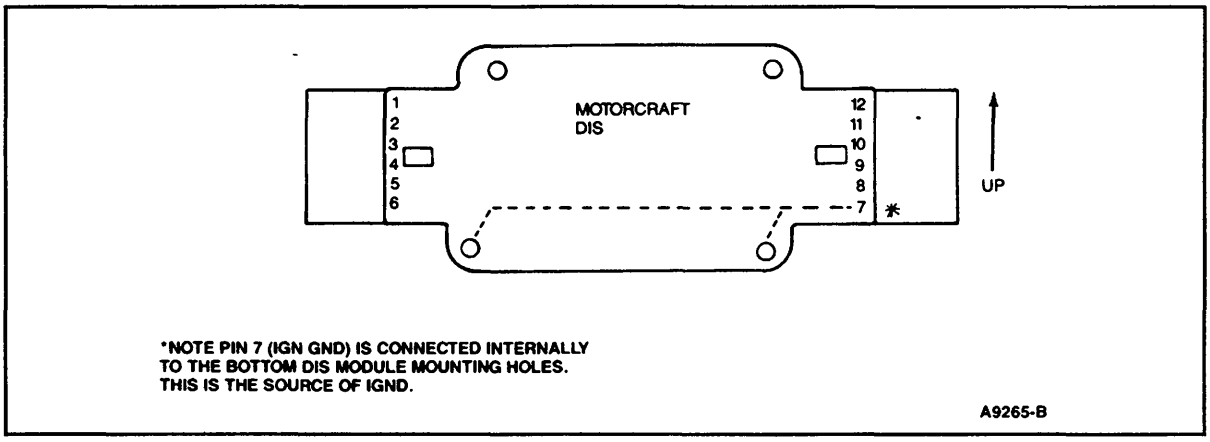


Figure 2 3.0L SEFI SHO and 3.8L SEFI SC DIS Module and Pin-Out

PIN #	3.0L SEFI SHO and 3.8L SEFI SC
1	VBAT
2	CID
3	—
4	PIP In
5	SPOUT
6	—
7	IGND
8	COIL 1
9	COIL 3
10	—
11	COIL 2
12	IDM

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3.0L SEFI SHO DIS Wiring Schematic

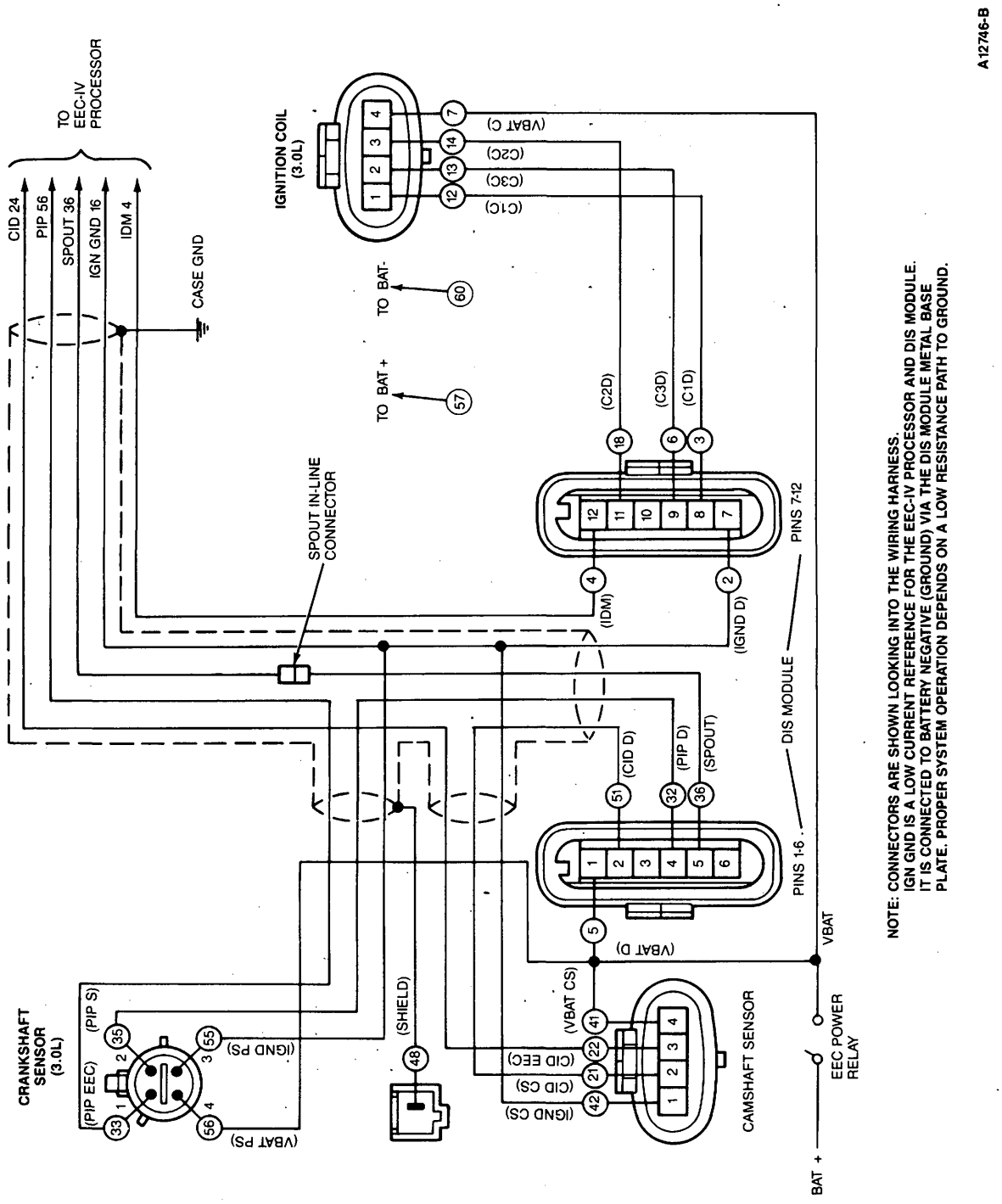


Figure 3 3.0L SEFI SHO DIS Wiring Schematic

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3.8L SEFI SC DIS Wiring Schematic

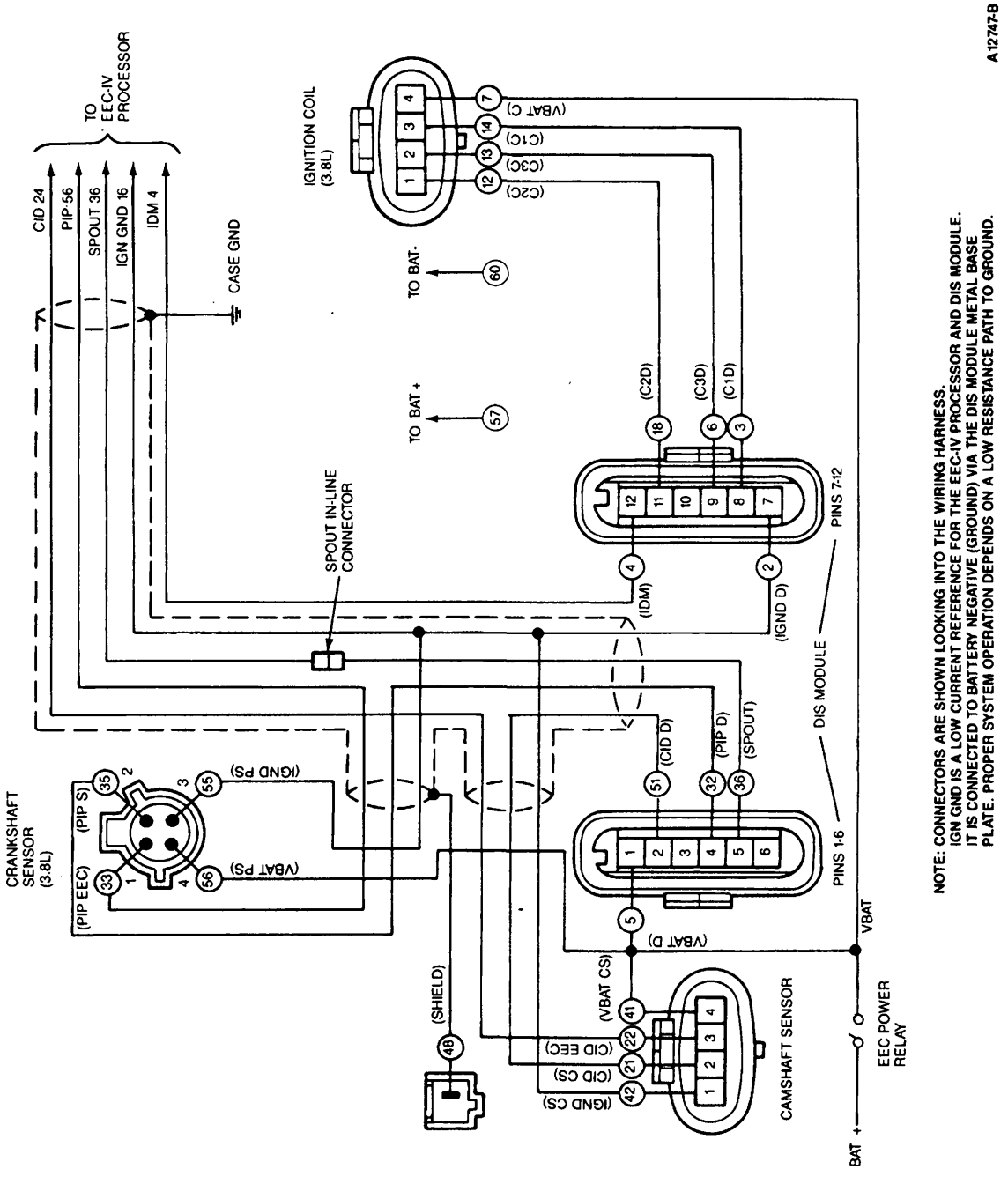


Figure 4 3.8L SEFI SC DIS Wiring Schematic

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DIS Schematic and Breakout Box Overlay Acronyms

There is a logic to the names on the Schematic and Overlays for the DIS DIAGNOSTIC HARNESS that will help you.

DIS Acronyms

PIP	Profile Ignition Pickup (Crankshaft Sensor signal).
CID	Cylinder IDentification.
SPOUT	SPark OUT (EEC Spark control signal).
IDM	Ignition Diagnostic Monitor (Diagnostic signal to EEC-IV).
BAT+	Battery Positive.
BAT –	Battery Negative.
IGGND	Low current ground reference.
DPI	Dual Plug Inhibit (High — Right Plugs fire; Low — Both Sides fire).
C1, C2, C3	Coil Drive (For Coils 1, 2, and 3).

Overlay Designators

On the Schematic and Overlays, each of these signals is identified along with a suffix letter that tells you where the measurement is being taken. The key to these letters is:

Prefix	"J" is a breakout box jack.
Suffix	"D" is at the DIS Module.
Suffix	"S" or "PS" or "CS" is at the sensor, "P" for PIP, "C" for CID.
Suffix	"EEC" is at the signal source (the sensor).
Suffix	"C" is at the coil.

A couple of examples:

VBAT PS	means	VBAT at the PIP Sensor.
VBAT D	means	VBAT at the DIS Module.

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Camshaft and Crankshaft Sensor Description

The Camshaft and crankshaft sensors used on the 3.0L SHO and 3.8L SC vehicles are digital Hall devices (Figure 5). The 3.0L SHO Camshaft sensor is located on the right end of the rear cylinder head close to cylinder 1. In the 3.8L SC, the Camshaft sensor is in the location normally used for the distributor. The Camshaft sensor is the same in both cases but the mounting adaptor is different. A rotary vane cup (or wheel), made of ferrous metal (Figure 6), is used to trigger the Hall effect switch located in each of the sensors. The camshaft cup has one tooth and is driven by the camshaft. The signal from the Camshaft sensor has one positive-going edge once every two crank revolutions (one cam revolution). The crankshaft cup has three teeth and the Crankshaft sensor generates three positive (PIP) edges every revolution of the crankshaft.

When the window of the vane cup is between the magnet and Hall effect device, a magnetic flux field is completed from the magnet through the Hall effect device and back to the magnet (Figure 7), the output signal will be low (0 volts). However, when the vane tooth moves into the gap between the Hall effect device and the magnet, the flux lines are shunted through the vane and back to the magnet (Figure 8) and the output will change from a low to high (VBAT).

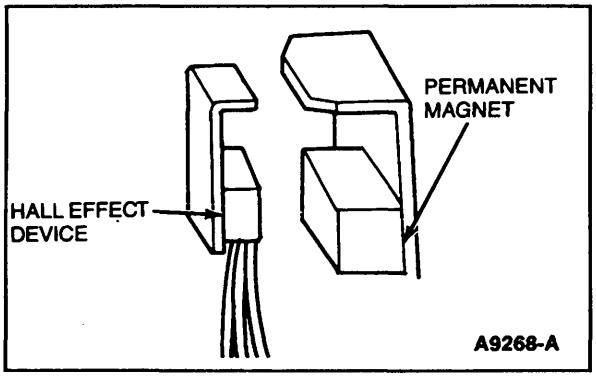


Figure 5 Hall Effect Device

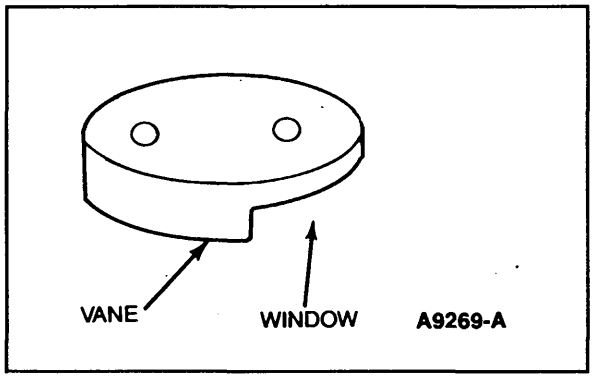


Figure 6 Rotary Vane Cup — CAM Sensor

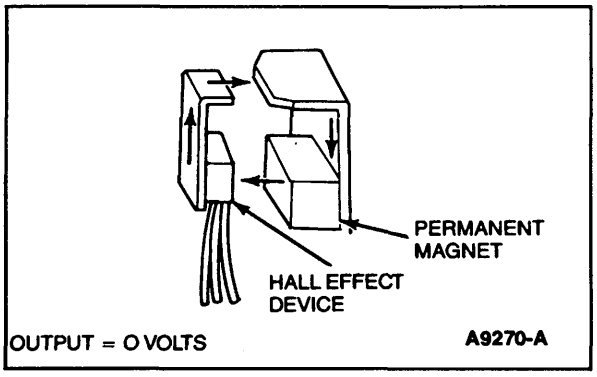


Figure 7 Magnetic Flux Field

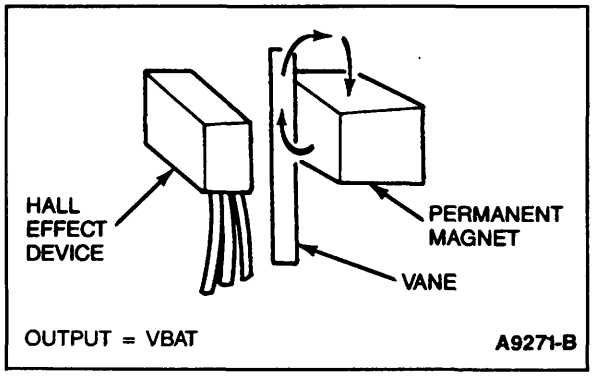


Figure 8 Hall Effect Device Response to Vane

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3.0L SEFI SHO and 3.8L SEFI SC DIS System Description

The 3.0L SEFI SHO and 3.8L SEFI SC Distributorless Ignition System (DIS) (refer to Figure 9) consists of a crankshaft mounted Hall (PIP) Sensor, a camshaft driven Hall (CID) sensor, a 6 tower DIS coil pack, and a DIS ignition module.

The DIS eliminates the distributor by using multiple ignition coils. Each coil fires two spark plugs at the same time. The plugs are paired so that as one fires during the compression cycle the other fires during the exhaust stroke. The next time the coil is fired the plug that was on exhaust will be on compression and the one that was on compression will be on exhaust (the spark in the exhaust cylinder is wasted but little of the coil energy is lost). Three coils are mounted together in a "coil pack". The coil pack has three tach wires, one for each coil. The crankshaft sensor is a digital output Hall device (PIP) that responds to a rotating metallic vane mounted on the crankshaft damper assembly.

The 3.0L SHO DIS CID signal is generated by a Hall device mounted at the end of the rear camshaft. The vane cup has one tooth and is driven by the camshaft. The 3.8L SC DIS camshaft sensor is a Hall device but it is mounted in the normal distributor location.

The PIP output is a 50 percent duty cycle signal that provides base spark timing information. The CID signal output is also a 50 percent duty cycle signal and is required so that the DIS module knows which coil to fire and for fuel timing in the EEC-IV processor. CID is high (VBAT) half of the cam revolution (180 degrees) and low the other half (refer to Figure 10).

The EEC-IV processor determines spark angle using the PIP signal to establish base timing. Spout is sent from the EEC-IV processor to the DIS module and serves two purposes: the leading edge fires the coil and the trailing edge controls the dwell time. This feature is called CCD or computer controlled dwell.

The Ignition Diagnostic Monitor (IDM) is an output from the DIS module that provides diagnostic information concerning the ignition system to the EEC-IV processor for self-test and is also the input signal for the vehicle tachometer. If the CID circuit fails and an attempt to start the engine is made, the DIS module will randomly select one of the three coils to fire. If hard starting results, turning the key off and then cranking again will result in another "guess." Several attempts may be needed until the proper coil is selected allowing the vehicle to be started and driven until repairs can be made. The Failure Mode Effects Management (FMEM) system attempts to keep the vehicle driveable in spite of certain EEC-IV system failures that prevent the EEC-IV processor from providing spark angle or dwell commands. The EEC-IV processor opens the SPOUT line and the DIS module fires the coils directly from the PIP input. This results in a fixed spark angle of 10 degrees and fixed dwell.

The 3.0L SEFI SHO and 3.8L SEFI SC DIS component locations are shown in Figures 11 and 12.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Block Diagram

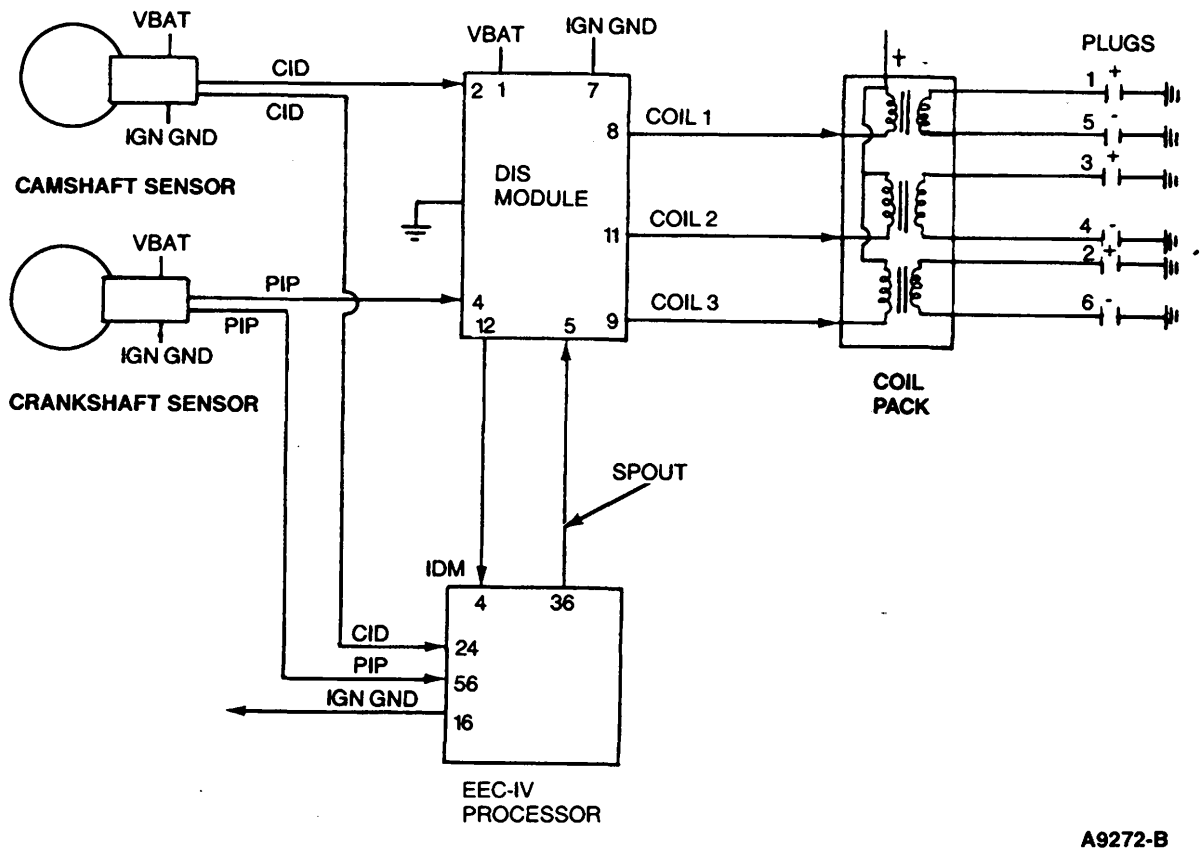


Figure 9 3.0L SEFI SHO and 3.8L SEFI SC Distributorless Ignition System (DIS)

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3.0L SEFI SHO and 3.8L SEFI SC DIS Waveforms

Timing Diagram

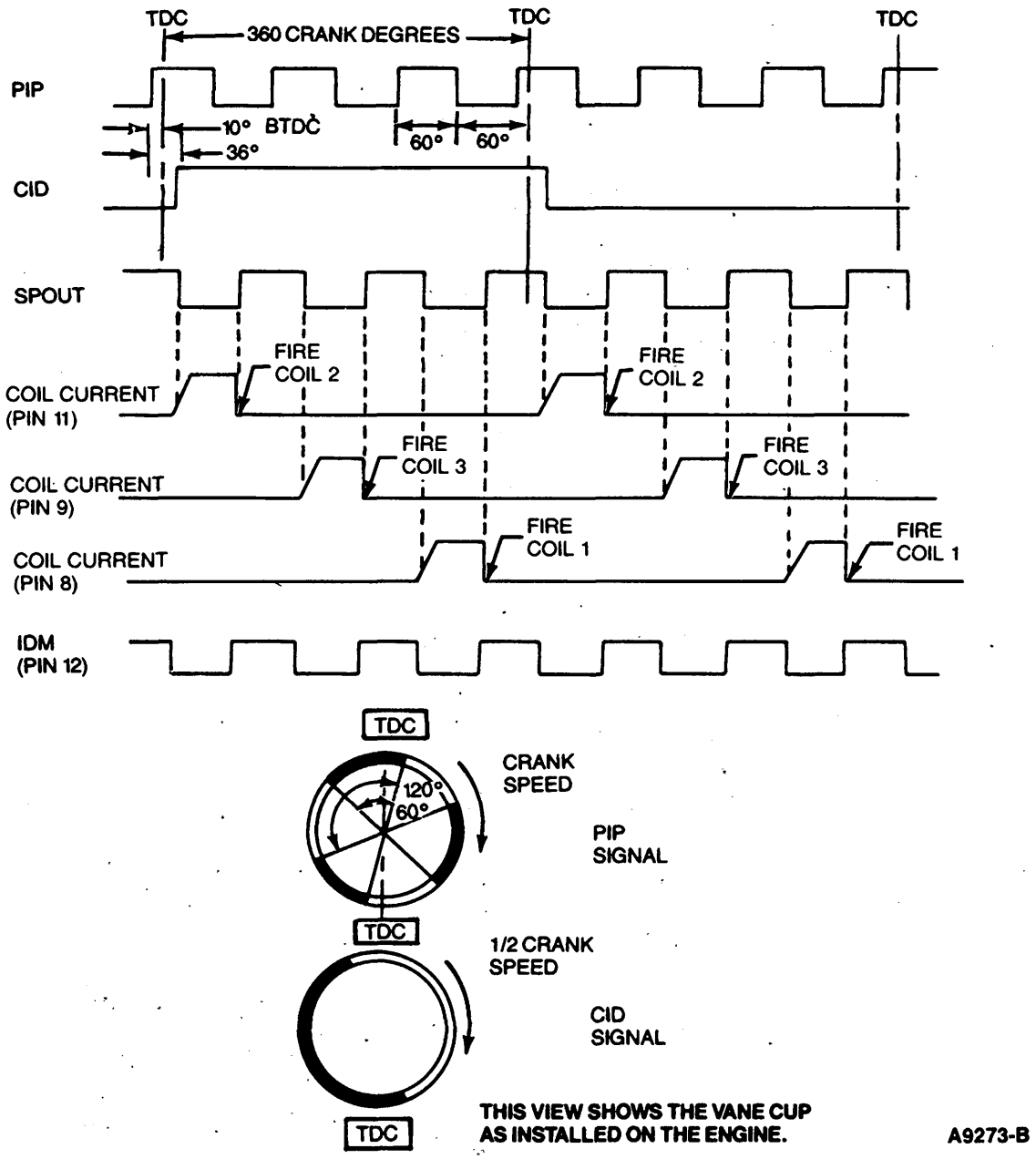


Figure 10 3.0L SEFI SHO and 3.8L SEFI SC DIS Waveforms

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3.0L SHO DIS Component Location

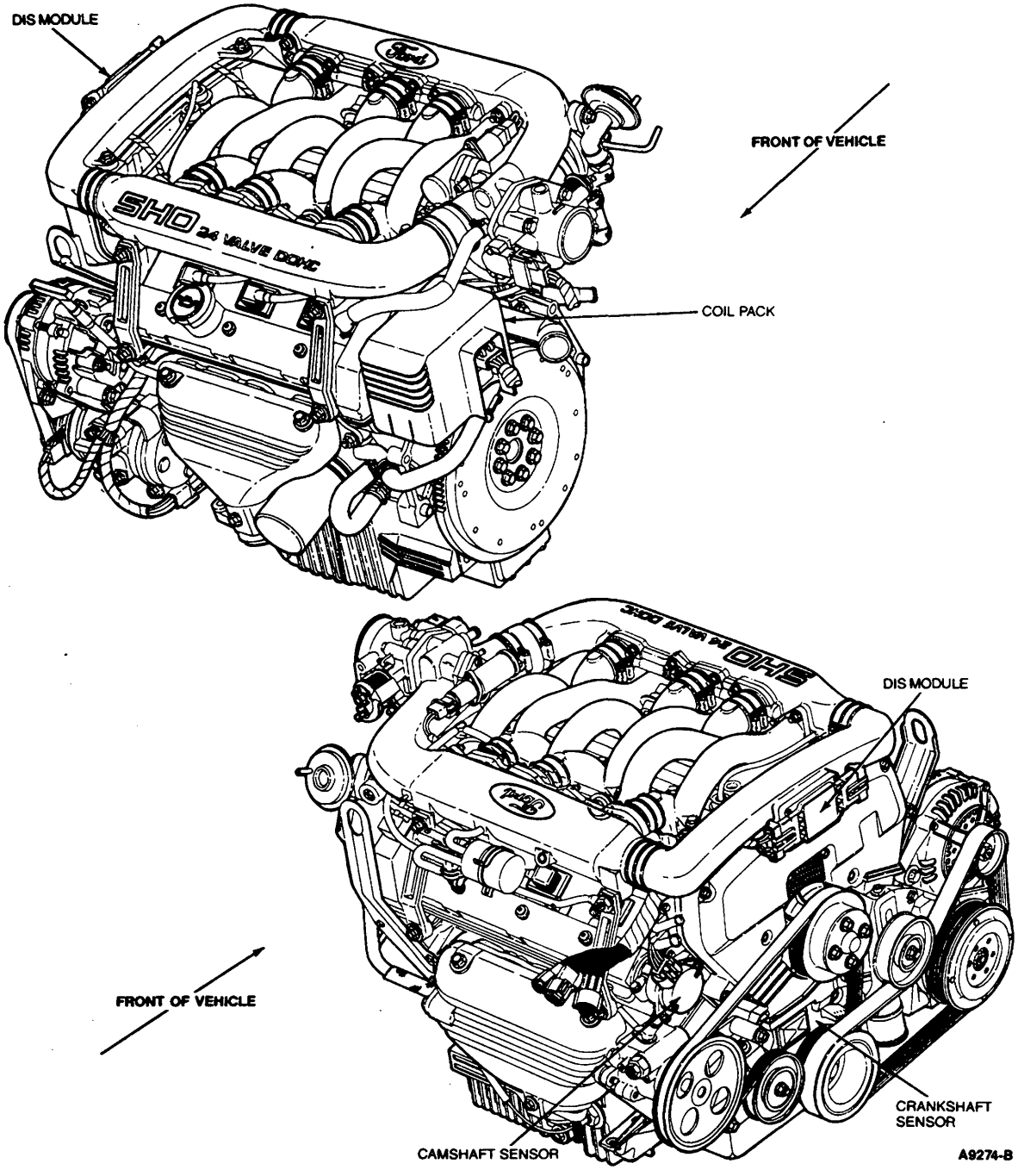


Figure 11 3.0L SHO DIS Component Location

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3.8L SC DIS Component Location

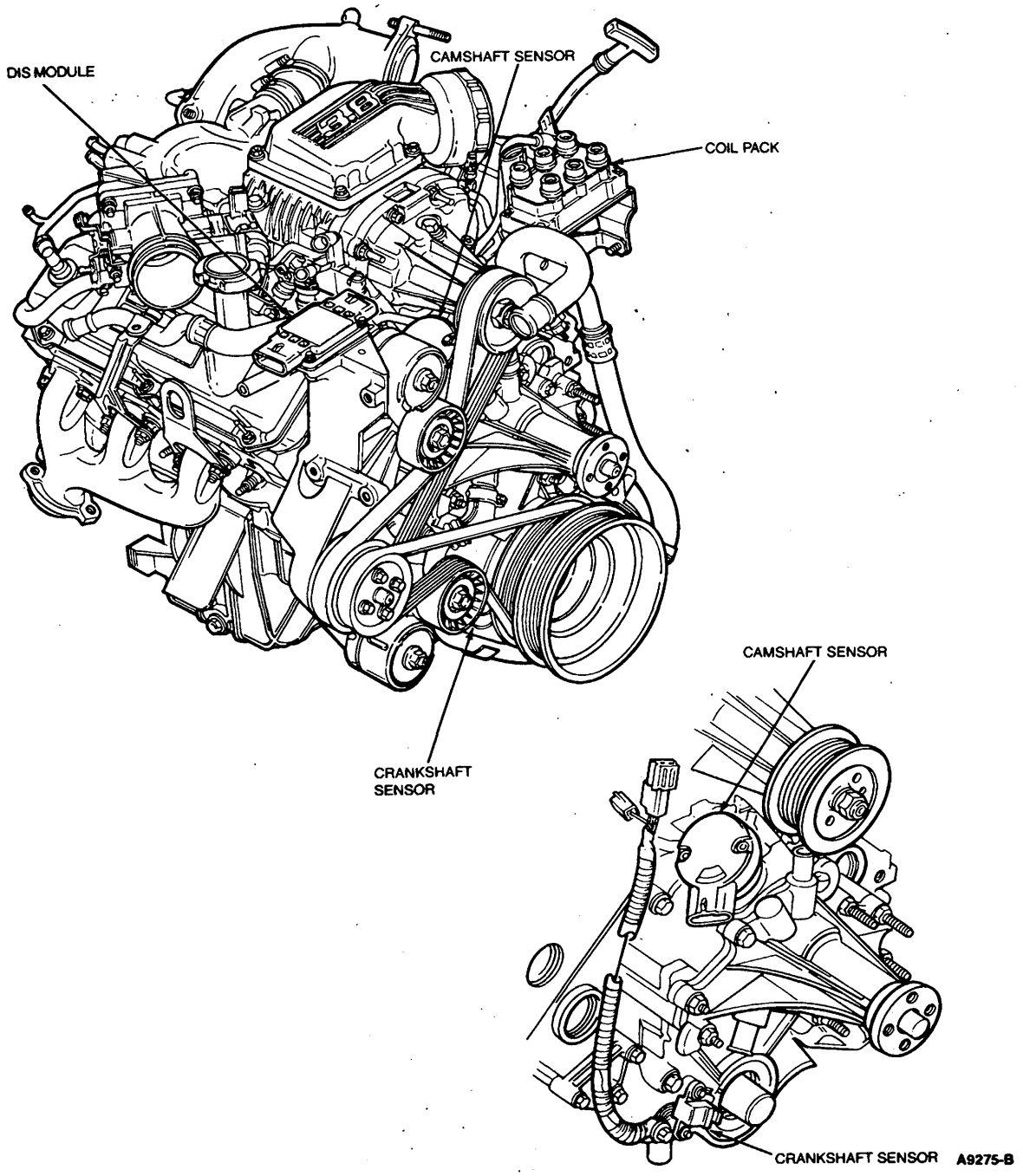


Figure 12 3.8L SC DIS Component Location

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3.0L SEFI SHO and 3.8L SEFI SC DIS Pinpoint Test Diagnostics

Pinpoint Test

Index

CAUTION

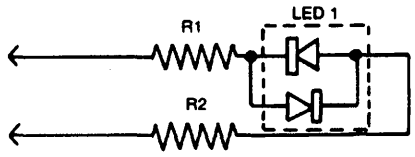
A 12 volt Test Lamp should not be used to test circuit signals. It will load the circuit and may cause erroneous measurements or improper DIS/EEC-IV operation (ie., engine stall).

Note

- Use VOM or LED test lamp circuit (Figure 1) in the following pinpoint test procedures. The LED test lamp is more convenient and faster to use.
- If a VOM is used, correct test lead polarity must be followed. The red lead is (+) positive and the black lead is (-) negative.

To check PIP or CID the engine is "Bumped" with the starter while watching the voltmeter. Both the CID and PIP signals are digital and should switch between VBAT and Ground as the engine turns. To see the signal change using the VOM the engine must be turned in very short bursts.

- If an LED test lamp is used, wire the LED as shown below:



THE LED TEST LAMP IS "ON" IF EITHER THE RED OR GREEN LED IS LIT.

LED 1	RADIO SHACK	276-012 DUAL LED
R1	RADIO SHACK	271-019 470Ω
R2	RADIO SHACK	271-019 470Ω

A12748-A

Figure 1

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3.0L SEFI SHO and 3.8L SEFI SC DIS Pinpoint Test Diagnostics

Pinpoint Test | Index

TEST STEP	RESULT ▶	ACTION TO TAKE
These diagnostics were written to catch "Hard faults"; intermittent failures will be difficult or impossible to diagnose using these procedures.		
• Engine No Start:	→	GO to A1.
— With Continuous Memory Code 14	→	GO to A3.
• Engine Runs With:		
— Continuous Memory Code 18	→	GO to B1.
— Continuous Memory Code 19	→	GO to C1.
— Continuous Memory Code 45, 46 or 48	→	GO to D1.
— Hard to start	→	GO to E1.
— Continuous Memory Code 49	→	GO to F1.
— Engine Running Code 18	→	GO to F1.
— Misfire under load	→	GO to G1.
— Intermittent stall	→	GO to H1.

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3.0L SEFI SHO and 3.8L SEFI SC DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A1 PERFORM EEC-IV QUICK TEST		
• Refer to Section 14 and perform EEC-IV Quick Test. • **Are any service codes (KOEO, KOER or Continuous Memory) present?**	Yes ▶ No ▶	SERVICE any EEC-IV code first. If still no start, GO to A2. GO to A2.
A2 CHECK FOR SPARK DURING CRANK		
• Using a Neon Bulb Spark Tester (D89P-6666-A), check for spark at all spark plug wires while cranking. • **Was spark present on ALL spark plug wires and consistent (one spark per crankshaft revolution)?**	Yes ▶ No ▶	GO to A3. GO to A5.
A3 CHECK PIP EEC AT CRANKSHAFT SENSOR		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 3.0L/3.8L overlay. • Connect LED test lamp between (+) J33 (PIP EEC) and (–) J60 (BAT–). • Crank engine. • **Does LED test lamp blink continuously during crank?**	Yes ▶ No ▶	GO to A4. REPLACE crankshaft sensor and RERUN Quick Test.
A4 CHECK PIP EEC AND IGND TO EEC-IV CONTINUITY		
• Key off. • Disconnect EEC-IV processor from vehicle harness connector. • Disconnect diagnostic cable connector from DIS module (Pins 1-6 and Pins 7-12). • Measure resistance between Test Pin 56 (PIP) of the EEC-IV vehicle harness connector and J33 (PIP EEC). • Also measure the resistance between Test Pin 16 (IGN GND) of the EEC-IV vehicle harness connector and J55 (IGND PS). • **Are both measurements less than 5 ohms?**	Yes ▶ No ▶	GO to Section 17, Pinpoint Test Step A1. SERVICE open circuit. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A5 DETERMINE MISSING SPARK COMBINATION		
• **Was spark missing from BOTH cylinder 1 and 5 plug wires?** or • **Was spark missing from BOTH cylinder 2 and 6 plug wires?** or • **Was spark missing from BOTH cylinder 3 and 4 plug wires?**	Yes ▶ No ▶	GO to A7. GO to A6.
A6 CHECK PLUGS AND WIRES		
• Check spark plug wires for insulation damage, looseness, shorting or other damage. • Remove and check spark plugs for damage, wear, carbon deposits and proper plug gap. • **Are spark plugs and wires OK?**	Yes ▶ No ▶	REINSTALL plugs and wires. GO to A7. SERVICE or REPLACE damaged component. RERUN Quick Test.
A7 CHECK DIS MODULE VBAT		
• Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 3.0L/3.8L overlay. • Connect LED test lamp between (−) J2 (IGND D) and (+) J5 (VBAT D). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	GO to A8. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
A8 CHECK DIS MODULE IGNITION GROUND		
• Key off. • Measure resistance between J60 (BAT−) and J2 (IGND D). • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to A10. GO to A9.
A9 CHECK DIS MODULE MOUNTING SCREWS		
• Check DIS module mounting screws for corrosion or looseness. • **Are mounting screws clean and tight?**	Yes ▶ No ▶	REPLACE DIS module. RERUN Quick Test. CLEAN, REPLACE or TIGHTEN mounting screws. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A10 CHECK ALL COIL PACK CIRCUITS		
• Key on. • Connect LED test lamp between three pairs of Test Jacks given below. Note if LED test lamp is on or off each time. • Check between (+) J3 (C1D) and (−) J60 (BAT−). • Check between (+) J18 (C2D) and (−) J60 (BAT−). • Check between (+) J6 (C3D) and (−) J60 (BAT−). • **Was LED test lamp on for all three checks?**	Yes ▶ No ▶	GO to A15. GO to A11.
A11 ISOLATE DIS MODULE SHORT(S)		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • Connect a jumper wire between J2 (IGND D) and J60 (BAT−). • Repeat test procedure in Test Step A10. • **Was LED test lamp on for all three checks?**	Yes ▶ No ▶	REPLACE the DIS module. RERUN Quick Test. REMOVE jumper wire. GO to A12.
A12 CHECK COIL PACK VBAT C		
• Key off. • Reconnect diagnostic cable connector to DIS module (Pins 7-12). • Connect LED test lamp between (+) J7 (VBAT C) and (−) J60 (BAT−). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	GO to A13. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A13 CHECK IGNITION COIL CIRCUIT		
• Key on. • Connect the LED test lamp between three pairs of test jacks given below. Note if LED test lamp is on or off for each one. **For 3.0L SEFI SHO:** — Check between (+) J12 (C1C) and (−) J60 (BAT−). — Check between (+) J13 (C3C) and (−) J60 (BAT−). — Check between (+) J14 (C2C) and (−) J60 (BAT−). **For 3.8L SEFI SC:** — Check between (+) J12 (C2C) and (−) J60 (BAT−). — Check between (+) J13 (C3C) and (−) J60 (BAT−). — Check between (+) J14 (C1C) and (−) J60 (BAT−). **— Was LED test lamp on for all three checks?**	Yes ▶ No ▶	CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test. GO to A14.
A14 ISOLATE HARNESS SHORTS		
• Key off. • Disconnect diagnostic cable connector from coil pack. • Connect a jumper between J57 (BAT+) and J7 (VBAT C). • Repeat test procedure in Test Step A13. • **Was LED test lamp on for all three checks?**	Yes ▶ No ▶	REMOVE jumper wire. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test. Remove jumper wire. REPLACE coil pack. RERUN Quick Test.
A15 CHECK PIP IN TO DIS MODULE		
• Connect LED test lamp between (+) J32 (PIP D) and (−) J60 (BAT−). • **Does LED test lamp blink when engine is cranked?**	Yes ▶ No ▶	GO to A16. GO to A22.
A16 CHECK SPOUT AT DIS MODULE		
• Connect LED test lamp between (+) J36 (SPOUT) and (−) J60 (BAT−). • **Does LED test lamp blink when engine is cranked?**	Yes ▶ No ▶	GO to A17. GO to A19.

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3.0L SEFI SHO and 3.8L SEFI SC DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A17 CHECK DIS MODULE COIL DRIVERS		
• Connect LED test lamp between each of three pairs of test points given below. Note if lamp blinks continuously for each during crank. • Check between (+) J3 (C1D) and (−) J60 (BAT−). • Check between (+) J18 (C2D) and (−) J60 (BAT−). • Check between (+) J6 (C3D) and (−) J60 (BAT−). • **Did LED test lamp blink during all three checks?**	Yes ▶ No ▶	REPLACE coil pack. RERUN Quick Test. GO to **A18**.
A18 ISOLATE COIL PACK FROM SYSTEM		
• Key off. • Disconnect diagnostic cable connector from coil pack vehicle harness connector. • Connect the LED test lamp between each of three pairs of test points given below. Note if lamp is on for each one with key on. • Check between (+) J3 (C1D) and (−) J60 (BAT−). • Check between (+) J18 (C2D) and (−) J60 (BAT−). • Check between (+) J6 (C3D) and (−) J60 (BAT−). • **Was any LED test lamp on?**	Yes ▶ No ▶	CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test. REPLACE DIS module. RERUN Quick Test.
A19 ISOLATE EEC-IV PROCESSOR FOR SPOUT FAULT		
• Key off. • Disconnect EEC-IV processor. • Connect the LED test lamp between (+) J36 (SPOUT) and (−) J60 (BAT−). • **Does LED test lamp blink continuously while engine is cranked?**	Yes ▶ No ▶	Processor is shorting SPOUT. REPLACE processor. GO to **A20**.
A20 CHECK SPOUT CIRCUIT FOR SHORT TO VBAT		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Connect LED test lamp between (+) J36 (SPOUT) and (−) J60 (BAT−). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	Spout short to VBAT. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test. GO to **A21**.

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3.0L SEFI SHO and 3.8L SEFI SC DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A21 CHECK SPOUT CIRCUIT FOR SHORT TO GROUND		
• Connect LED test lamp between (–) J36 (SPOUT) and (+) J57 (BAT+). • Key on. • **Is LED test lamp on?**	Yes ▶	Spout short to ground. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
	No ▶	REPLACE DIS module. RERUN Quick Test.
A22 ISOLATE DIS MODULE PIP		
• Key off. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Connect LED test lamp between (+) J32 (PIP D) and (–) J60 (BAT–). • **Does LED test lamp blink continuously when engine is cranked?**	Yes ▶	REPLACE DIS module. RERUN Quick Test.
	No ▶	GO to **A23**.
A23 CHECK SENSOR VBAT		
• Key off. • Reconnect Diagnostic Cable connector to DIS module (Pins 1-6). • Connect LED test lamp between (+) J56 (VBAT PS) and (–) J2 (IGND D). • Key on. • **Is LED test lamp on?**	Yes ▶	GO to **A24**.
	No ▶	CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
A24 CHECK SENSOR IGNITION GROUND		
• Key off. • Measure resistance between J55 (IGND PS) and J2 (IGND D). • Is resistance less than 5 ohms?	Yes ▶	GO to **A25**.
	No ▶	CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
A25 CHECK PIP S AT CRANKSHAFT SENSOR		
• Connect LED test lamp between (+) J35 (PIP S) and (–) J2 (IGND D). • **Does LED test lamp blink continuously when engine is cranked?**	Yes ▶	CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
	No ▶	GO to **A26**.

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3.0L SEFI SHO and 3.8L SEFI SC DIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A26 CHECK PIP S FOR SHORTS TO GROUND • Key off. • Disconnect diagnostic cable connector from crankshaft sensor. • Disconnect diagnostic cable connector from DIS module (Pins 1-6). • Connect LED test lamp between (−) J35 (PIP S) and (+) J57 (BAT+). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	PIP S is shorted to ground between sensor and DIS module. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test. GO to **A27**.
A27 CHECK PIP S FOR SHORTS TO VBAT • Connect LED test lamp between (+) J35 (PIP S) and (−) J60 (BAT−). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	PIP S is shorted to VBAT between sensor and DIS module. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test. GO to **A28**.
A28 CHECK PIP EEC FOR SHORT TO GROUND • Key off. • Disconnect EEC-IV processor from vehicle harness. • Connect LED test lamp between (−) J33 (PIP EEC) and (+) J57 (BAT+). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test. GO to **A29**.
A29 CHECK PIP EEC FOR SHORTS TO VBAT • Connect LED test lamp between (+) J33 (PIP EEC) and (−) J60 (BAT−). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test. GO to **A30**.

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3.0L SEFI SHO and 3.8L SEFI SC DIS No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A30 CHECK CRANKSHAFT VANE		
• **Does crankshaft vane move through sensor air gap when engine is cranked?**	Yes ▶	REPLACE crankshaft sensor. RERUN Quick Test.
	No ▶	Refer to Engine Shop Manual Group.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Code 18: IDM Failure Or CID Continuous Memory Code 49: Spout IDM Error

Pinpoint Test **B**

TEST STEP	RESULT ▶	ACTION TO TAKE
B1 VERIFY ERRATIC CRANK		
• **Is vehicle hard to start (i.e., requires more than one attempt to start and/or cranking speed erratic)?**	Yes ▶	GO to [B2].
	No ▶	GO to [B5].
B2 CHECK — CID AT DIS MODULE		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 3.0L/3.8L overlay. • Connect the LED test lamp between (+) J51 (CID D) and (−) J60 (BAT−). • **Does LED test lamp blink continuously when engine is cranked or started?**	Yes ▶	REPLACE DIS module. RERUN Quick Test.
	No ▶	GO to [B3].
B3 CID FAULT — CHECK CID AT SENSOR		
• Key off. • Connect the LED test lamp between (+) J21 (CID CS) and (−) J60 (BAT−). • **Does LED test lamp blink continuously when engine is cranked or started?**	Yes ▶	CID circuit is open between the camshaft sensor and DIS module. CHECK connectors or SERVICE harness. RERUN Quick Test.
	No ▶	GO to [B4].
B4 CID FAULT — CHECK CAMSHAFT SENSOR VANE		
• Key off. • Remove camshaft sensor. • **Does camshaft vane move through sensor air gap when engine is cranked?**	Yes ▶	REPLACE camshaft sensor. RERUN Quick Test.
	No ▶	Refer to Engine Shop Manual Group.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Code 18: IDM Failure Or CID Continuous Memory Code 49: Spout IDM Error	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B5 IDM FAULT — CHECK DIS MODULE IDM OUTPUT		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 3.0L/3.8L overlay. • Connect LED test lamp between (+) J4 (IDM) and (−) J60 (BAT−). • **Does LED test lamp blink continuously when engine is cranked or started?**	Yes ▶ No ▶	GO to B6. GO to B7.
B6 IDM FAULT — CHECK IDM CONTINUITY		
• Key off. • Disconnect EEC-IV processor. • **Is resistance between Test Pin 4 (IDM) at EEC-IV vehicle harness connector and J4 (IDM) less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. IDM is open between DIS module and processor. SERVICE harness and connectors. RERUN Quick Test.
B7 IDM FAULT — ISOLATE EEC-IV PROCESSOR		
• Key off. • Disconnect EEC-IV processor. • **Does LED test lamp blink continuously when engine is cranked?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. GO to B8.
B8 IDM FAULT — CHECK FOR SHORT		
• Key off. • Disconnect HEGO sensor. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • Measure resistance between J4 (IDM) and J60 (BAT−). • Measure resistance between J4 (IDM) and J2 (IGND D). • Measure resistance between J4 (IDM) and J5 (VBAT D). • **Is each resistance less than 10K?**	Yes ▶ No ▶	IDM is shorted to BAT or ground between DIS module and processor. SERVICE harness and connectors. RERUN Quick Test. REPLACE DIS module. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Code 18: IDM Failure Or CID Continuous Memory Code 49: Spout IDM Error	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B9 IDM FAULT — CHECK FOR SHORT TO VBAT		
• **Is resistance between J4 (IDM) and J57 (BAT+) less than 10K ohms?**	Yes ▶	IDM is shorted to ground between DIS module and processor. SERVICE harness and connectors. RERUN Quick Test.
	No ▶	REPLACE DIS module. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Code: 19 CID to EEC Failure

Pinpoint Test **C**

TEST STEP	RESULT ▶	ACTION TO TAKE
C1 CHECK CID EEC AT CAMSHAFT SENSOR		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 3.0L/3.8L overlay. • Connect LED test lamp between (+) J22 (CID EEC) and (−) J60 (BAT−). • **Does LED Test Lamp blink continuously during crank or when engine is running?**	Yes ▶ No ▶	GO to C2. GO to C3.
C2 CHECK CID TO EEC CONTINUITY		
• Key off. • Disconnect EEC-IV processor. • **Is resistance between J22 (CID EEC) and Test Pin 24 (CID) at EEC-IV vehicle harness connector less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. CID is open between DIS module and processor. SERVICE harness and connectors. RERUN Quick Test.
C3 CHECK CID DIS AT CAMSHAFT SENSOR		
• Connect LED test lamp between (+) J21 (CID CS) and (−) J60 (BAT−). • **Does LED test lamp blink continuously during crank or when engine is running?**	Yes ▶ No ▶	CID is open between J21 (CID CS) and J22 (CID EEC). REPLACE camshaft sensor. RERUN Quick Test. GO to C4.
C4 CHECK CAMSHAFT SENSOR VBAT		
• Connect LED test lamp between (+) J41 (VBAT CS) and (−) J60 (BAT−). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	GO to C5. VBAT fault at sensor. SERVICE connectors and harness. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Code: 19 CID to EEC Failure

Pinpoint Test **C**

TEST STEP	RESULT ▶	ACTION TO TAKE
C5 CHECK CAMSHAFT SENSOR IGNITION GROUND		
• Key off. • **Is resistance between J42 (IGND CS) and J60 (BAT−) less than 5 ohms?**	Yes ▶ No ▶	GO to C6. IGND open at sensor. SERVICE connectors and harness. RERUN Quick Test.
C6 ISOLATE DIS MODULE		
• Key off. • Disconnect diagnostic cable connector from DIS module connector (Pins 1-6). • Connect the LED test lamp between (+) J22 (CID EEC) and (−) J60 (BAT−). • **Does LED test lamp blink continuously during crank or when engine is running?**	Yes ▶ No ▶	REPLACE DIS module. RERUN Quick Test. GO to C7.
C7 ISOLATE EEC-IV PROCESSOR		
• Key off. • Leave LED test lamp connected between (+) J22 (CID EEC) and (−) J60 (BAT−). • Disconnect EEC-IV processor. • **Does LED test lamp blink continuously during crank or when engine is running?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. GO to C8.
C8 CHECK CID EEC FOR SHORT TO GROUND		
• Key off. • Disconnect HEGO sensor. • Disconnect LED test lamp. • Disconnect diagnostic cable connector from camshaft sensor. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • Measure resistance between J2 (IGND D) and J22 (CID EEC). • Measure resistance between J60 (BAT −) and J22 (CID EEC). • Measure resistance between J22 (CID EEC) and J5 (VBAT D). • **Is each resistance less than 10K ohms?**	Yes ▶ No ▶	CID EEC is shorted to VBAT or ground between sensor and EEC-IV processor. SERVICE connectors and harness. RERUN Quick Test. GO to C9.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Code: 19 CID to EEC Failure

Pinpoint Test **C**

TEST STEP	RESULT ▶	ACTION TO TAKE
C9 CHECK CID CS FOR SHORT TO GROUND		
• Key off. • Measure resistance between J2 (IGND D) and J21 (CID CS). • Measure resistance between J60 (BAT−) and J21 (CID CS). • Measure resistance between J21 (CID CS) and J5 (VBAT D). • **Is each resistance less than 10K ohms?**	Yes ▶	CID CS is shorted to VBAT or ground between sensor and DIS module. SERVICE connectors and harness. RERUN Quick Test.
	No ▶	GO to C10.
C10 CHECK CID VANE		
• Remove camshaft sensor. • **Does vane move through air gap when engine is cranked?**	Yes ▶	GO to C11.
	No ▶	Refer to Engine Shop Manual Group.
C11 CHECK FOR CAMSHAFT SENSOR DAMAGE		
• Inspect camshaft sensor and vane for damage or corrosion. • **Is unit OK?**	Yes ▶	REPLACE camshaft sensor. RERUN Quick Test.
	No ▶	REPLACE or SERVICE as required. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Codes 45, 46 or 48: Coil 1, 2 or 3 Failure

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D1 CHECK DIS MODULE DRIVERS		
• Key off. • Install diagnostic cable. • Disconnect diagnostic cable connector to DIS Module vehicle harness connector (Pins 7-12). • Connect a jumper between J2 (IGND D) and J55 (IGND PS). **For Code 45:** — Connect LED test lamp between (-) J3 (C1D) and (+) J57 (BAT+). **For Code 46:** — Connect LED test lamp between (-) J18 (C2D) and (+) J57 (BAT+). **For Code 48:** — Connect LED test lamp between (-) J6 (C3D) and (+) J57 (BAT+). • **Does LED test lamp blink continuously when engine is cranked?**	Yes ▶ No ▶	REMOVE jumper wire. GO to D2. REMOVE jumper wire. REPLACE DIS module. RERUN Quick Test.
D2 CHECK HARNESS TO IGNITION COIL		
• Key off. • Reconnect diagnostic cable connector to DIS Module vehicle harness connector (Pins 7-12). • Disconnect diagnostic cable connector from coil pack. **For 3.0L SEFI SHO:** — Code 45: Connect LED test lamp between (-) J12 (C1C) and (+) J57 (BAT+). — Code 46: Connect LED test lamp between (-) J14 (C2C) and (+) J57 (BAT+). — Code 48: Connect LED test lamp between (-) J13 (C3C) and (+) J57 (BAT+). **For 3.8L SEFI SC:** — Code 45: Connect LED test lamp between (-) J14 (C1C) and (+) J57 (BAT+). — Code 46: Connect LED test lamp between (-) J12 (C2C) and (+) J57 (BAT+). — Code 48: Connect LED test lamp between (-) J13 (C3C) and (+) J57 (BAT+). • **Does LED test lamp blink continuously when the engine is cranked?**	Yes ▶ No ▶	GO to D3. GO to D4.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Codes 45, 46 or 48: Coil 1, 2 or 3 Failure

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D3 CHECK VBAT AT COIL PACK		
• Key off. • Reconnect coil pack. • Connect LED test lamp between (+) J7 (VBAT C) and (−) J60 (BAT−). • Key on. • **Is LED test lamp on?**	Yes ▶ No ▶	REPLACE coil pack. RERUN Quick Test. VBAT open at coil pack. SERVICE harness and connectors. RERUN Quick Test.
D4 CHECK DIS MODULE TO COIL PACK CONTINUITY		
• Key off. **For 3.0L SEFI SHO:** — Code 45: Measure resistance between J3 (C1D) and J12 (C1C). — Code 46: Measure resistance between J18 (C2D) and J14 (C2C). — Code 48: Measure resistance between J6 (C3D) and J13 (C3C). **For 3.8L SEFI SC:** — Code 45: Measure resistance between J3 (C1D) and J14 (C1C). — Code 46: Measure resistance between J18 (C2D) and J12 (C2C). — Code 48: Measure resistance between J6 (C3D) and J13 (C3C). • **Is each resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to D5. Circuit is open between DIS module and coil pack. SERVICE connectors and harness. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Continuous Memory Codes 45, 46 or 48: Coil 1, 2 or 3 Failure

Pinpoint Test **D**

TEST STEP		RESULT ▶	ACTION TO TAKE
D5	CHECK FOR SHORT TO GROUND IN HARNESS		
• Key off. • Disconnect HEGO sensor. • Disconnect diagnostic cable connector from DIS module (Pins 7-12). • Disconnect diagnostic cable connector from coil pack. **For Code 45:** — Measure resistance between J3 (C1D) and J5 (VBAT D). **For Code 46:** — Measure resistance between J18 (C2D) and J5 (VBAT D). **For Code 48:** — Measure resistance between J6 (C3D) and J5 (VBAT D). • **Is each resistance less than 10K ohms?**		Yes ▶ No ▶	Circuit is shorted to VBAT between DIS module and coil pack. SERVICE connectors and harness. RERUN Quick Test. Circuit is shorted to ground between DIS module and coil pack. SERVICE connectors and harness. RERUN Quick Test.

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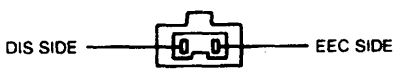
3.0L SEFI SHO and 3.8L SEFI SC DIS No Codes — Engine Hard to Start

Pinpoint Test **E**

TEST STEP	RESULT ▶	ACTION TO TAKE
E1 CHECK CID TO DIS MODULE AT CAMSHAFT SENSOR		
• Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 3.0L/3.8L overlay. • Connect LED test lamp between (+) J21 (CID CS) and (−) J60 (BAT−). • **Does LED test lamp blink continuously during crank or engine running?**	Yes ▶ No ▶	GO to E2. REPLACE camshaft sensor. RERUN Quick Test.
E2 CHECK CID CS AT DIS MODULE		
• Key off. • Connect LED test lamp between (+) J51 (CID D) and (−) J60 (BAT−). • **Does LED test lamp blink continuously during crank or engine running?**	Yes ▶ No ▶	REPLACE DIS module. RERUN Quick Test. Circuit is open between camshaft sensor and DIS module. SERVICE connectors and harness. RERUN Quick Test.

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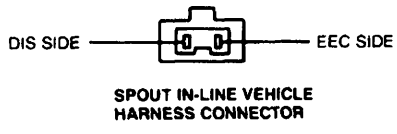
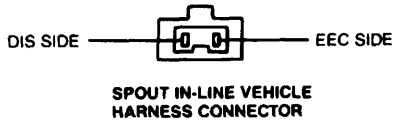
3.0L SEFI SHO and 3.8L SEFI SC DIS Engine Running Code 18 or Continuous Memory Code 49: Spout Open, Short to VBAT Or Short to Ground	Pinpoint Test	F

TEST STEP	RESULT ▶	ACTION TO TAKE
F1 CHECK FOR SPOUT SIGNAL AT DIS MODULE • Key off. • Install diagnostic cable. • Connect diagnostic cable to breakout box. • Use 3.0L/3.8L overlay. • Connect LED test lamp between (+) J36 (SPOUT) and (−) J60 (BAT−). • **Does LED test lamp blink continuously when engine is cranked or when engine is running?**	Yes ▶ No ▶	REPLACE DIS module. RERUN Quick Test. GO to F2.
F2 CHECK FOR SPOUT SIGNAL AT SPOUT IN-LINE CONNECTOR • Key off. • Remove SPOUT in-line connector plug from SPOUT in-line connector. • Connect the LED test lamp between (−) J60 (BAT−) and (+) SPOUT in-line connector (EEC Side). • **Does LED test lamp blink continuously when engine is started?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A	Yes ▶ No ▶	GO to F5. GO to F3.
F3 CHECK SPOUT CIRCUIT CONTINUITY BETWEEN EEC-IV PROCESSOR AND SPOUT IN-LINE CONNECTOR • Key off. • Disconnect EEC-IV processor. • Measure resistance between Test Pin 36 (SPOUT) of processor vehicle harness connector and SPOUT in-line connector (EEC Side). • **Is resistance less than 5.0 ohms?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A	Yes ▶ No ▶	GO to F4. Circuit is open between spout in-line connector and EEC-IV processor. SERVICE harness and connectors. RERUN Quick Test.

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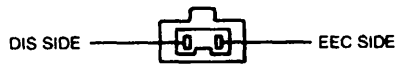
3.0L SEFI SHO and 3.8L SEFI SC DIS Engine Running Code 18 or Continuous Memory Code 49: Spout Open, Short to VBAT Or Short to Ground

Pinpoint Test **F**

TEST STEP		RESULT ▶	ACTION TO TAKE
F4	CHECK SPOUT CIRCUIT FOR SHORTS TO VBAT AND GROUND BETWEEN EEC-IV PROCESSOR AND SPOUT IN-LINE CONNECTOR		
• Key off. • Disconnect HEGO sensor. • Disconnect EEC-IV processor. • Measure resistance between J5 (VBAT D) and SPOUT in-line connector (EEC Side). • Measure resistance between J60 (BAT –) and SPOUT in-line connector (EEC Side). • **Is either resistance less than 6K ohms?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A		Yes ▶ No ▶	SPOUT circuit is shorted to VBAT or ground between SPOUT in-line connector and EEC-IV processor. SERVICE connectors, SERVICE/ REPLACE harness. RERUN Quick Test. GO to F5.
F5	CHECK SPOUT CIRCUIT CONTINUITY BETWEEN DIS MODULE AND SPOUT IN-LINE CONNECTOR		
• Key off. • Measure resistance between J36 (SPOUT) and SPOUT in-line connector (DIS side). • **Is resistance less than 5.0 ohms?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A		Yes ▶ No ▶	GO to F6. Circuit is open between SPOUT in-line connector and DIS module. SERVICE connector, SERVICE/ REPLACE harness. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Engine Running Code 18 or Continuous Memory Code 49: Spout Open, Short to VBAT Or Short to Ground	Pinpoint Test	F

TEST STEP		RESULT ▶	ACTION TO TAKE
F6	CHECK SPOUT CIRCUIT FOR SHORTS TO VBAT AND GROUND BETWEEN DIS MODULE AND SPOUT IN-LINE CONNECTOR		
• Key off. • Disconnect Diagnostic Cable connector from DIS module (Pins 1-6). • Measure resistance between J5 (VBAT D) and SPOUT in-line connector (DIS Side). • Measure resistance between J60 (BAT –) and SPOUT in-line connector (DIS Side). • **Is either resistance less than 6K ohms?**  SPOUT IN-LINE VEHICLE HARNESS CONNECTOR A12755-A		Yes ▶	SPOUT circuit is shorted to BAT+ or ground between SPOUT in-line connector and DIS module. SERVICE connectors, SERVICE/ REPLACE harness. RERUN Quick Test.
		No ▶	REPLACE DIS module. RERUN Quick Test.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)	Pinpoint Test	G

PRELIMINARY NOTES

The engine analyzer is used to diagnose problems in the secondary side of the ignition system.

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly routed and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, burned, overheated, loose or broken conditions.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT

Obtain the following test equipment or an equivalent:

- DIS Adapter Rotunda 007-00044.
- Engine Analyzer, Rotunda 002-00373.

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3.0L SEFI SHO and 3.8L SEFI SC DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)	Pinpoint Test	G

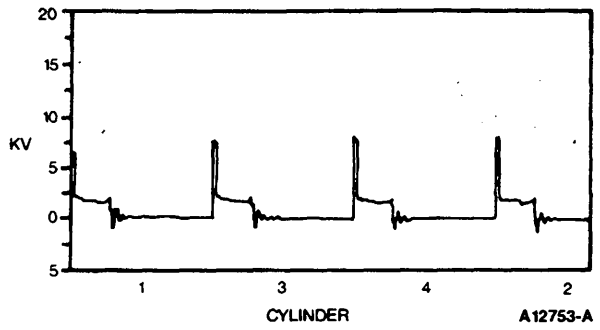
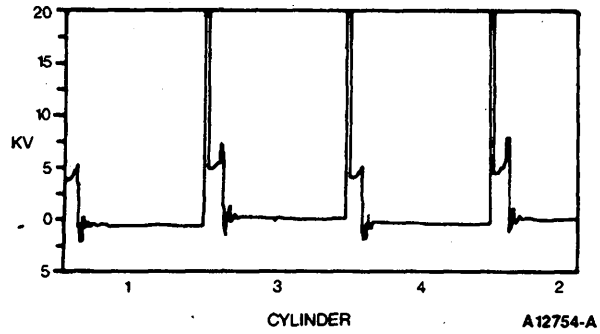
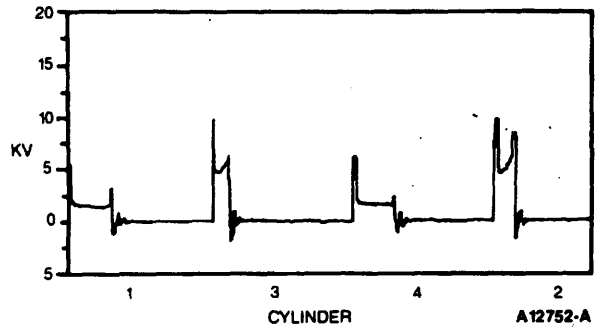
NOTE: If this portion of the diagnostic procedure is to provide accurate results, it is essential that the calibration of your engine analyzer be maintained. Refer to your equipment manual. If this is not available, an estimate of the calibration can be made by connecting the spark tester (D81P-6666-A or equivalent) to a properly operating ignition system and measuring the firing voltage of the spark tester only. Do not include the firing voltage of the rotor-to-cap gap. The spark tester firing voltage should be approximately 28 KV.

TEST STEP	RESULT ▶	ACTION TO TAKE
1. Connect engine analyzer to view **parade** display of ignition system secondary. 2. While **slowly** increasing engine rpm from idle to 2,000 rpm, compare engine analyzer display to the following illustrations. The illustrations shown are four cylinder but are typical for all engines. 3. Disconnect engine analyzer.		

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3.0L SEFI SHO and 3.8L SEFI SC DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)

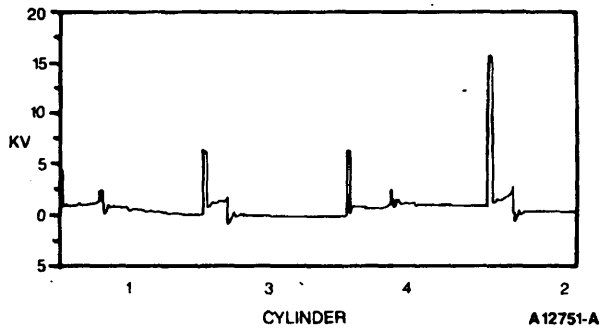
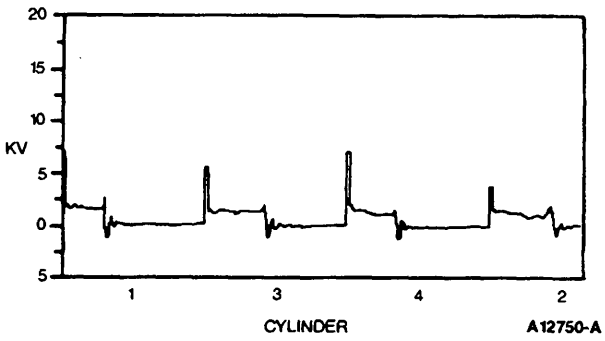
Pinpoint Test **G**

TEST STEP	RESULT ▶	ACTION TO TAKE
	The average value of spark plug firing voltage: 15 KV or less with evenness of spark plug firing voltage: 5 KV or less ▶	These are normal values for a properly operating ignition system.
	The average value of spark plug firing voltage: greater than 15 KV with evenness of spark plug firing voltage: 5 KV or less ▶	**Problems affecting all cylinders:** CHECK ignition coil wires for proper installation in coil. MEASURE resistance of ignition wires. REPLACE if greater than 7,000 ohms per foot. Wide spark plug gaps — all cylinders (usually from worn electrodes due to high mileage).
	Evenness of spark plug firing voltage: greater than 5 KV ▶	**Problems affecting some cylinders:** Wide spark plug gap(s) or worn electrode(s).

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3.0L SEFI SHO and 3.8L SEFI SC DIS Misfire Under Load (Bad Plugs, Wires or Short to Ground)

Pinpoint Test **G**

TEST STEP	RESULT ▶	ACTION TO TAKE
	Consistently high spark plug firing voltage in one or more cylinders ▶	Spark plug wire(s) not firmly connected. Disconnected spark plug wire(s). Wide spark plug gap(s). Open plug wire(s).
	Consistently low spark plug firing voltage or sloping spark line in one or more cylinders ▶	Fouled spark plug(s). Narrow spark plug gap(s). Spark plug wire(s) grounding on engine. Inspect for damage.

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3.0L SEFI and 3.8L SEFI SC DIS No Codes — Intermittent Diagnosis

Pinpoint Test **H**

TEST STEP	RESULT ▶	ACTION TO TAKE
H1		
• Talk to owner.	▶	Symptoms.
H2		
• Review vehicle service history.	▶	Number of previous repairs and components replaced.
H3		
• **Will engine start?**	Yes ▶	GO to H4.
	No ▶	GO to A1.
H4 SHAKE TEST		
• Engine at idle, Raise hood, Shake wiring harness and Pull wires at connectors for ignition components. • **Does engine quit?**	Yes ▶	SERVICE wiring harness or connector. CHECK DIS mounting bolts. RERUN Quick Test.
	No ▶	GO to H5.
H5 TEMPERATURE CHECK		
• Engine at idle, Close hood, A/C ON, Blower on medium speed. Allow engine to run for 15 minutes. • **Does engine quit?**	Yes ▶	GO to H9.
	No ▶	GO to H6.
H6 HOT SOAK CHECK		
• Engine off, hood closed, hot soak for 10 minutes. • **Will engine restart?**	Yes ▶	GO to H7.
	No ▶	GO to A1.
H7 HOT SHAKE CHECK		
• Engine at idle, raise hood, shake wiring harness and pull wires at connectors for ignition components. • **Does engine quit?**	Yes ▶	SERVICE wiring harness or connector. RERUN Quick Test.
	No ▶	GO to H8.

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3.0L SEFI and 3.8L SEFI SC DIS No Codes — Intermittent Diagnosis

Pinpoint Test **H**

TEST STEP	RESULT ▶	ACTION TO TAKE
H8 ROAD CHECK		
• Road test • **Does engine quit?**	Yes ▶	GO to H9.
	No ▶	Test complete.
H9 ROAD SHAKE CHECK		
• Raise hood, Shake wiring harness, pull wires at connectors, separate and reconnect connectors for ignition components. • **Does engine quit?**	Yes ▶	SERVICE wiring harness or connector. RERUN Quick Test.
	No ▶	GO to A1.

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IGNITION SYSTEM DIAGNOSTIC PROCEDURE (EDIS) 4.0L EFI TRUCK

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Index: 4.0L EFI Truck EDIS

NOTE: Start all diagnostics with Section 14 (EEC-IV Quick Test) first. The tests in this Section are dependent on results from tests conducted in Section 14.

Subject	Page
Preliminary Checkout, Equipment and Notes	13-167
EDIS Diagnostic Cable	13-168
4.0L EFI Truck EDIS Module and Pin-Out	13-169
4.0L EFI Truck EDIS Wiring Schematic	13-170
EDIS Schematic and Breakout Box Overlay Acronyms	13-171
4.0L EFI Truck EDIS System and Component Description	13-172
4.0L EFI Truck EDIS Block Diagram	13-175
4.0L EFI Truck EDIS Waveforms	13-176
4.0L EFI Truck EDIS Component Location	13-177
4.0L EFI Truck EDIS Pinpoint Test Diagnostics	13-178

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Preliminary Checkout, Equipment and Notes

CHECKOUT

- Visually inspect the engine compartment to ensure all vacuum hoses and spark plug wires are properly and securely connected.
- Examine all wiring harnesses and connectors for insulation damage, and burned, overheated, damaged pins, loose or broken conditions. **Check sensor shield connector.** Make sure EDIS Module mounting screw is tight.
- Be certain the battery is fully charged.
- All accessories should be off during diagnosis.

EQUIPMENT (Required)

Obtain the following test equipment or an equivalent

- EDIS Diagnostic Cable (Rotunda 007-00059) (refer to Figure 1).
- Spark Tester, Neon bulb type (OTC D89P-6666-A).
- Volt/Ohm Meter (Rotunda 014-00407).
- Remote starter switch.
- EEC-IV breakout box (Rotunda T83L-50-EEC-IV).
- Spark Tester, Gap type (Special Service Tool D81P-6666-A). A spark plug with a broken side electrode is not sufficient to check for spark and may lead to incorrect results.
- Inductive Timing Light (Rotunda 059-00006).

NOTES

- When making measurements on a wiring harness, both a visual inspection and a continuity test should be performed. Inspect the connector pins for damage (corrosion, bent or spread pins, etc.) when directed to remove a connector.
- Spark timing adjustments are not possible.
- When making voltage checks a GROUND reading means any value within a range of 0 to 1 volt. Also VBAT readings mean any value that falls within a range of VBAT to 2 volts less than VBAT.
- When making voltage checks and a reference to ground is made use either the negative battery lead or cast iron on the engine. BAT+ means the positive battery cable at the battery.
- When using the spark plug firing indicator, place the grooved end as close as possible to the plug boot. Very weak or no flashing may be caused by a fouled plug.
- LED test lamp. A 12 volt test lamp should not be used to test circuit signals. It will load the circuit and may cause erroneous measurements or improper EDIS/EEC-IV operation. (ie., engine stall).

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EDIS Diagnostic Cable

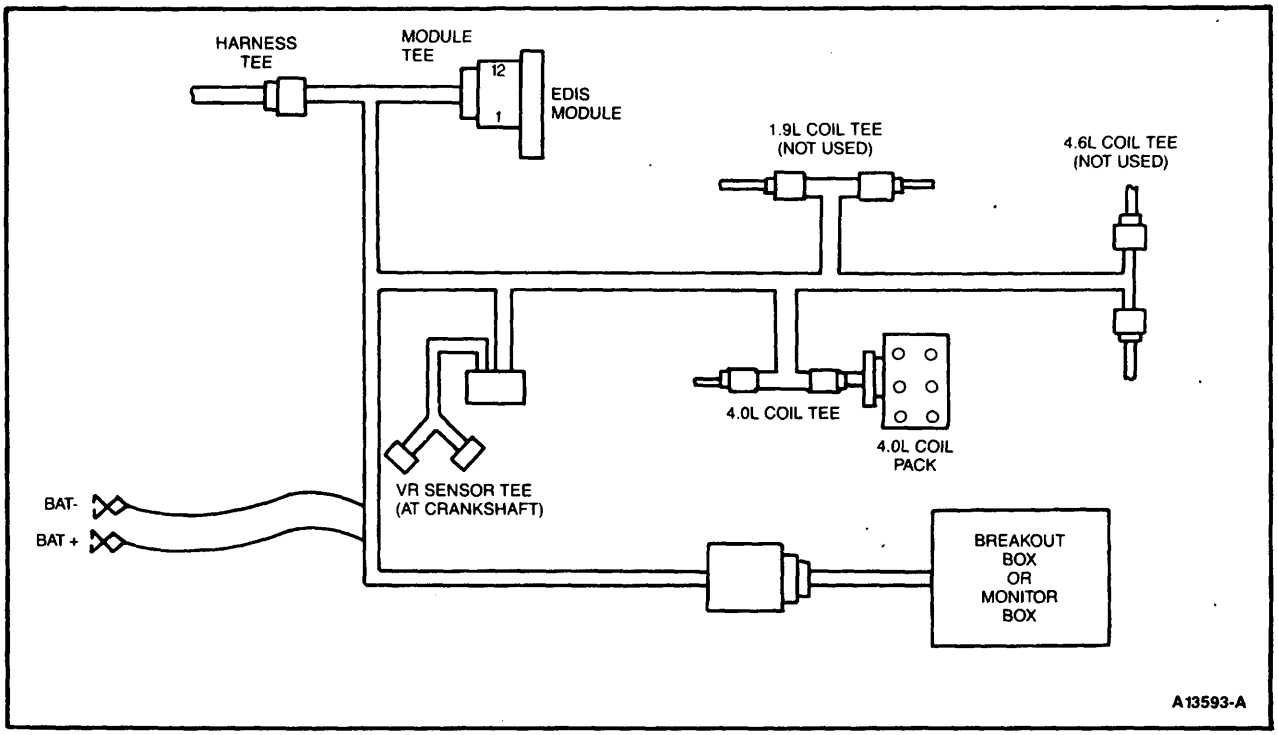


Figure 1 4.0L EFI Truck EDIS Hook-Up

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4.0L EFI Truck EDIS Module and Pin-Out

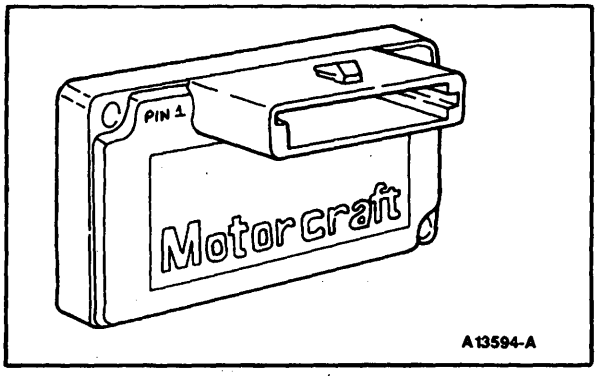


Figure 2 4.0L EFI Truck EDIS Module and Pin-Out

Pin Number	4.0L EDIS
1	PIP
2	IDM
3	SAW
4	IGN GND
5	VRS –
6	VRS+
7	VRS Shield
8	VBAT
9	GND
10	Coil 1
11	Coil 3
12	Coil 2

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4.0L EFI Truck EDIS Wiring Schematic

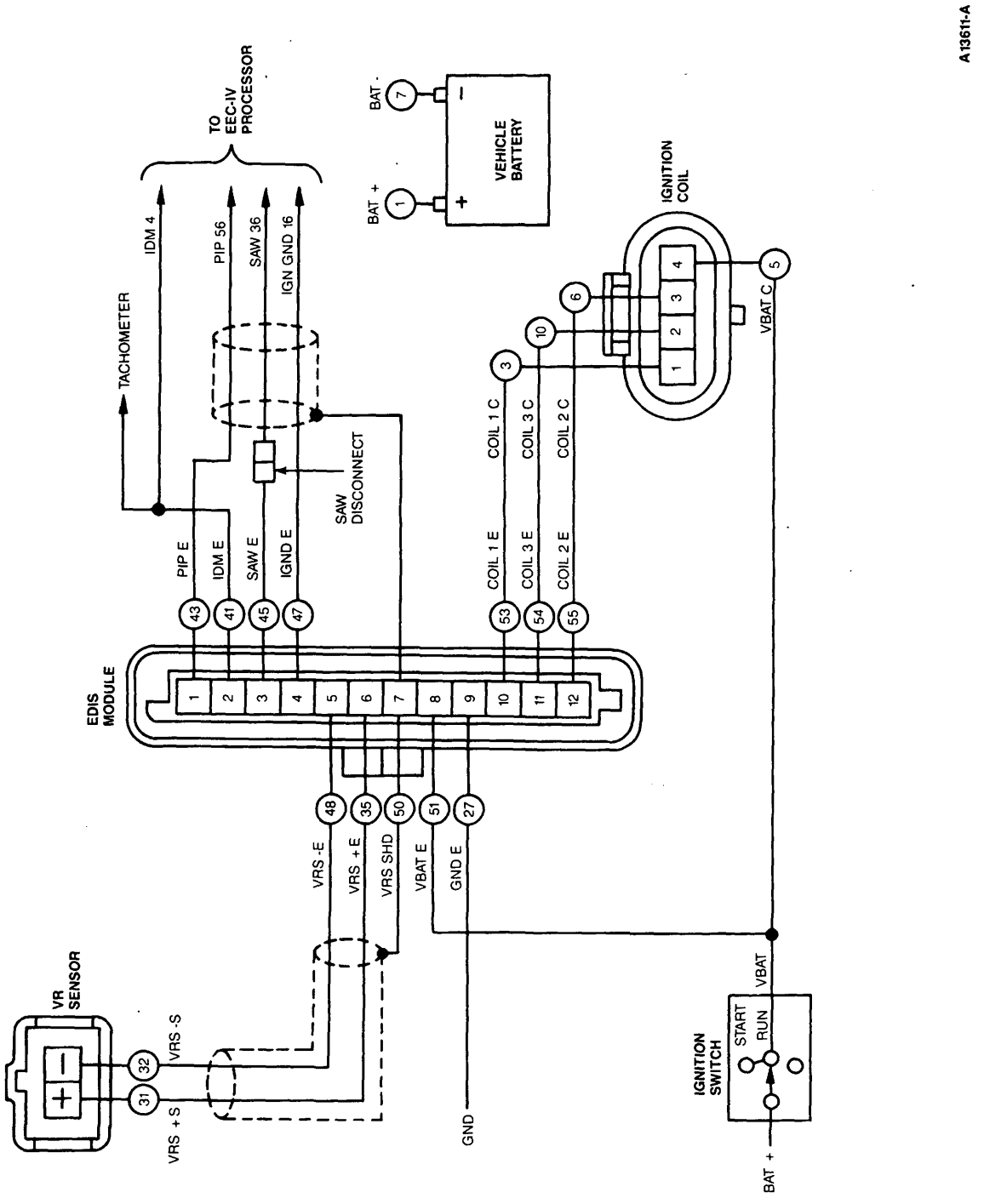


Figure 3 4.0L EFI Truck EDIS Wiring Schematic

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EDIS Schematic and Breakout Box Overlay Acronyms

There is a logic to the names on the Schematic and Overlays for the EDIS DIAGNOSTIC HARNESS that will help you.

EDIS Acronyms

PIP	Profile Ignition Pickup (EDIS output signal).
IDM	Ignition Diagnostic Monitor (Diagnostic signal to EEC-IV).
SAW	Spark Angle Word (EEC Spark control signal).
IGND	Ignition Ground (Low current ground reference).
VRS –	Variable Reluctance Sensor Negative:
VRS+	Variable Reluctance Sensor Positive.
VRS Shield	Variable Reluctance Sensor Shield.
BAT+	Battery Positive.
GND or BAT –	Battery Negative.
VBAT	Ignition Power to component.
C1, C2, C3	Coil Drive (For Coils 1, 2 and 3).

Overlay Designators

On the Schematic and Overlays, each of these signals is identified along with a suffix letter that tells you where the measurement is being taken. The key to these letters is:

Prefix	"J" is a breakout box jack.
Suffix	"E" is at the EDIS Module.
Suffix	"S" is at the sensor.
Suffix	"C" is at the coil.

A couple of examples:

VBAT C	means	VBAT at the Coil.
VBAT E	means	VBAT at the EDIS Module.

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4.0L EFI Truck EDIS System and Component Description

SYSTEM DESCRIPTION

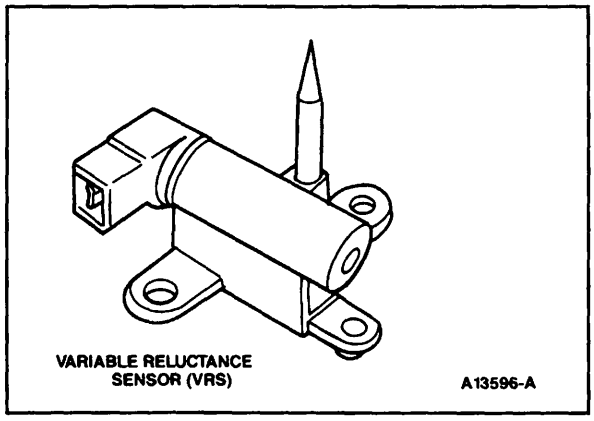
The 4.0L EFI Truck Electronic Distributorless Ignition System (EDIS) consists of a Variable Reluctance Sensor (VRS), an EDIS Ignition Module, an EEC IV processor and one 6-Tower Coil Pack.

The Electronic Distributorless Ignition System (EDIS) operates by sending crankshaft position information from the VR sensor to the EDIS module. The module generates a PIP signal and sends it to the EEC-IV processor. The processor responds with a Spark Angle Word (SAW) signal containing advance or retard timing information back to the EDIS module. The module processes the VRS and SAW signals and decides which coils to fire. In addition; the module generates an Ignition Diagnostic Monitor (IDM) signal to the processor which is used to indicate a failure mode and also provide a tach output signal.

COMPONENT DESCRIPTION

VR Sensor

The VR sensor is a passive electromagnetic device which senses movement of a 36 minus one-tooth wheel located behind the crankshaft pulley. An A/C voltage signal is generated which increases with engine rpm and provides basic spark timing information to the EDIS module.



VARIABLE RELUCTANCE SENSOR (VRS) A13596-A

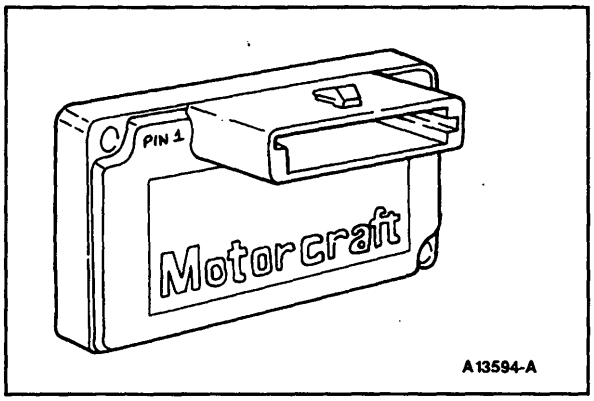
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4.0L EFI Truck EDIS System and Component Description

COMPONENT DESCRIPTION

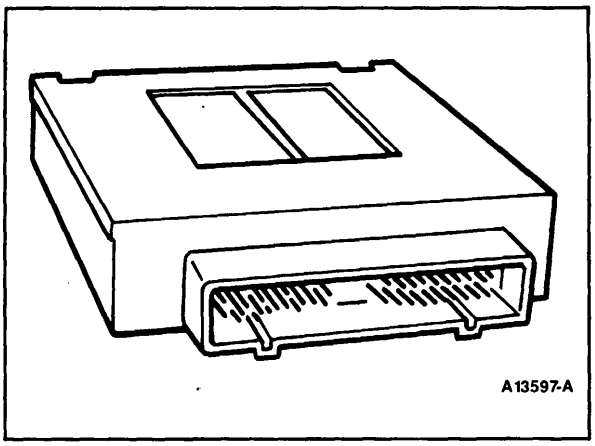
EDIS Module

The EDIS module is a microprocessor based device with coil drivers which make decisions about spark timing and coil firing. The module turns the coils on and off at the correct time and in the proper sequence based on information from the VR sensor and a pulse width modulated signal (SAW) generated from the EEC-IV processor. The module receives VRS and SAW signals and produces PIP and IDM output signals which are sent to the EEC-IV processor.



EEC-IV Processor

The EEC-IV processor receives IGN GND and PIP signals from the EDIS module then generates a SAW output signal based upon fuel, air and other sensor information. An IDM signal is received from the EDIS module to determine if a failure mode should be recorded.



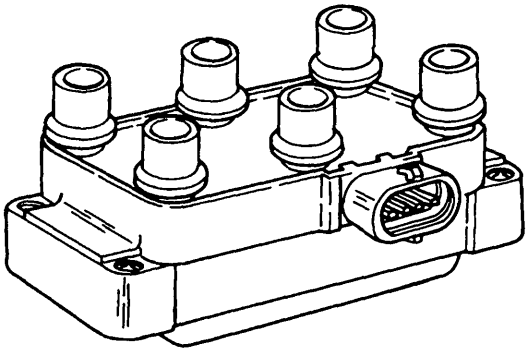
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4.0L EFI Truck EDIS System and Component Description

COMPONENT DESCRIPTION

Coil Pack

The coil receives active low signals from the EDIS module and fires two spark plugs at once, one is for the cylinder which is to be fired (on compression stroke) and the other goes to the mating cylinder which is on the exhaust stroke. The next time the coil is fired the situation is reversed. The next pair of spark plugs will fire according to the engine firing order etc.



COIL PACK

A13598-A

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4.0L EFI Truck EDIS Block Diagram

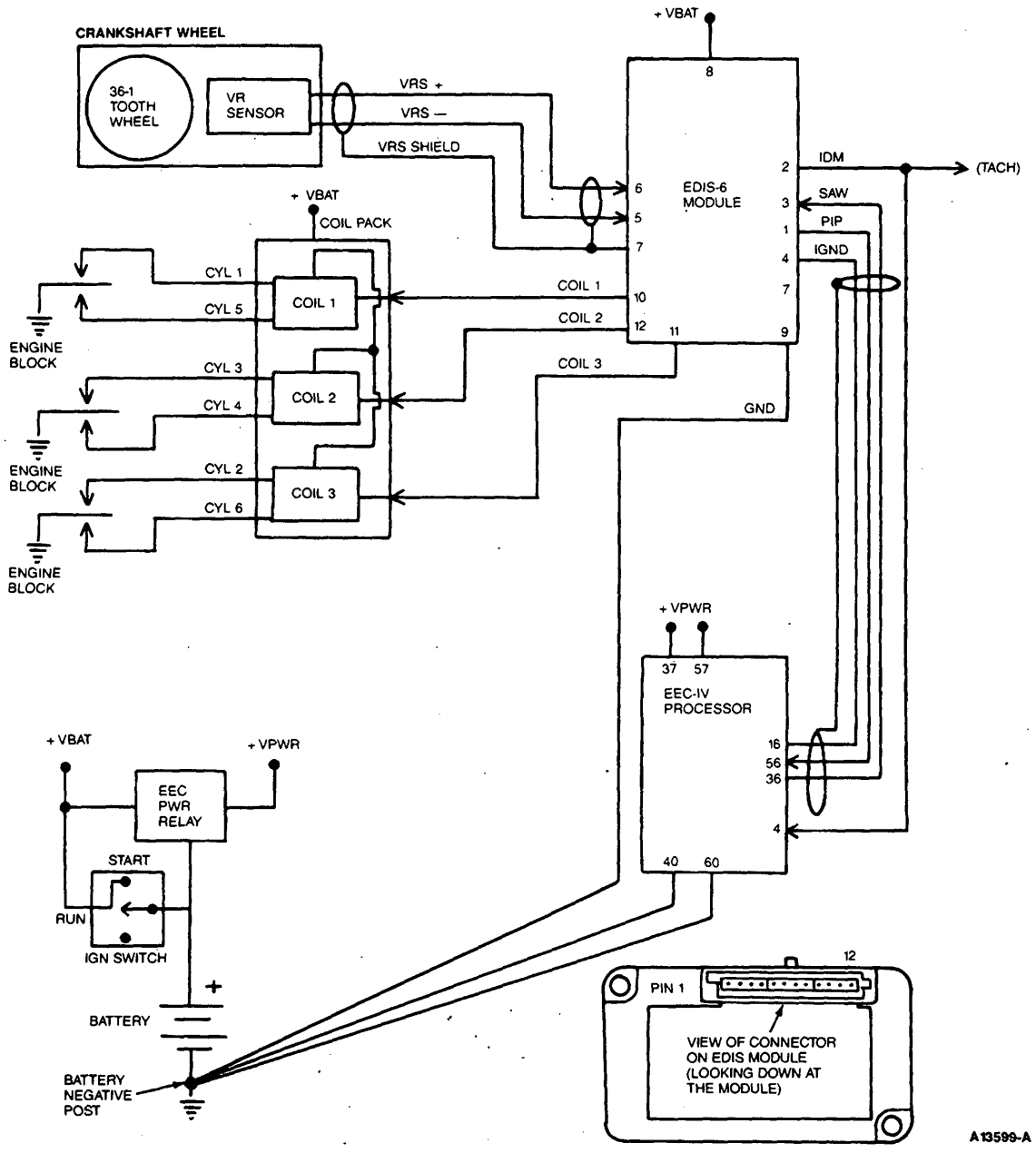


Figure 4 4.0L EFI Truck EDIS

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4.0L EFI Truck EDIS Waveforms

Timing Diagram

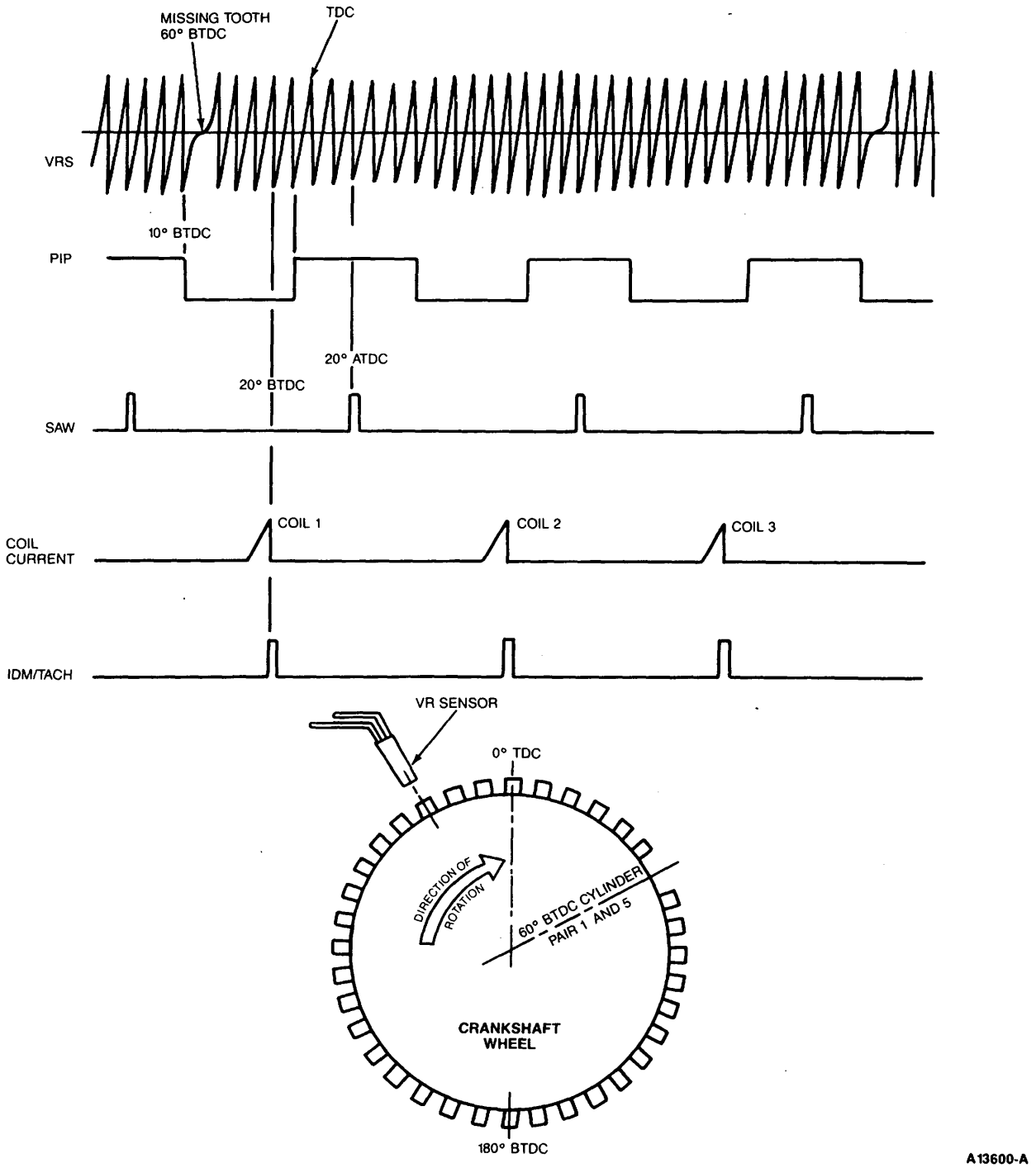
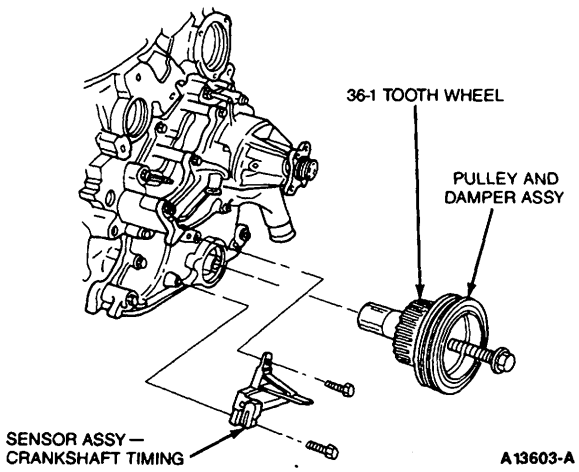


Figure 5 4.0L EFI Truck EDIS Waveforms

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4.0L EFI Truck EDIS Component Location

VARIABLE RELUCTANCE SENSOR LOCATION



EDIS MODULE LOCATION

Ranger/Bronco II

Aerostar

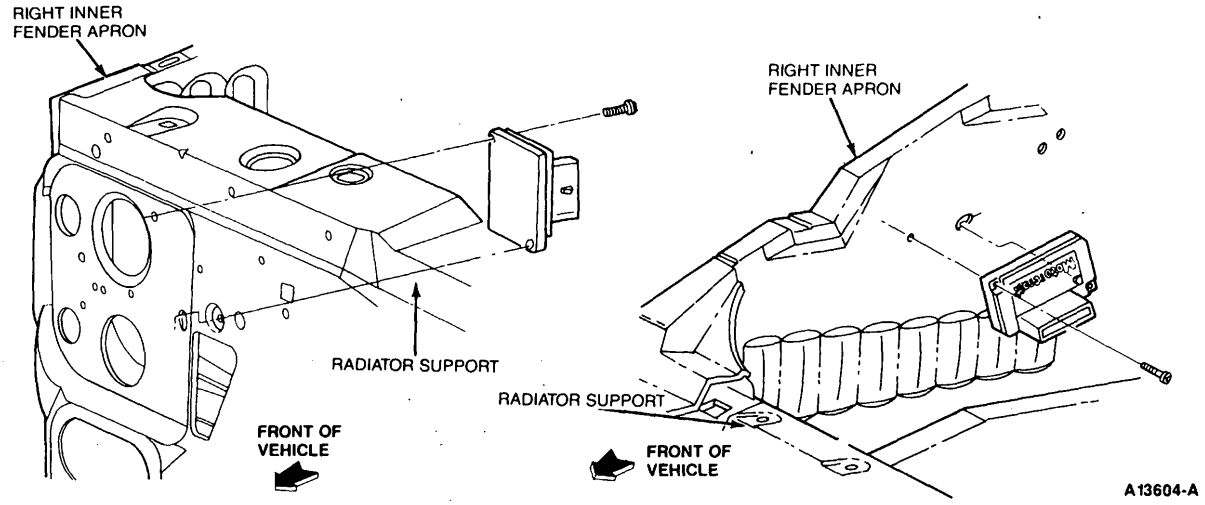


Figure 6 EDIS Component Locations

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4.0L EFI Truck EDIS Pinpoint Test Diagnostics

Pinpoint Test	Index

No Start with:

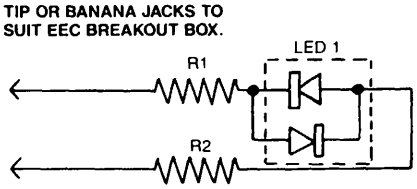
— No service code	Go to A
— Continuous Memory Code 14	Go to A
— Continuous Memory Code 18	Go to A12
— Key On Engine Off Code 16	Go to A14

Engine Running with:

— Key On Engine Off Code 16 or Continuous Memory Code 18 and/or Check Engine Light On	Go to B
— Continuous Memory Code 45 and/or "Check Engine" Light On	Go to C
— Engine Running Code 18 and/or Lack of Power	Go to D
— Engine Miss Drive Complaint (and no service code)	Go to 3.0L/3.8L G
— Engine Intermittent Drive Complaint (and no service code)	Go to 3.0L/3.8L H

Using the LED Test Lamp

You may use the LED test lamp (see circuit below) to supplement the DVOM. It will save time when checking the PIP and coil circuits.



LED 1	RADIO SHACK	276-012 DUAL LED
R1	RADIO SHACK	271-019 470Ω
R2	RADIO SHACK	271-019 470Ω

A13605-A

Use the LED test lamp to check power, PIP and Coil circuits.

The LED test lamp is "on" if LED 1 shows green or red.

Using a DVOM

If using a DVOM to check the PIP signal, the engine must be turned very slowly (bumped) with the starter. This is a digital signal and should switch from ground (0 VDC to .5 VDC) to BAT+ (8 VDC to 14 VDC) or BAT+ to ground. When using the DVOM correct test lead polarity must be used. The red lead is + (positive) and black lead is – (negative).

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4.0L EFI Truck EDIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A1 PERFORM EEC-IV QUICK TEST		
• Refer to Section 14 and perform EEC-IV Quick Test. • **Has Quick Test been performed?**	Yes ▶ No ▶	GO to A2. GO to Section 14 first and perform Quick Test.
A2 CHECK FOR SPARK DURING CRANK		
• Using a Neon Bulb Spark Tester (OTC D 89P-6666-A), check for spark at all spark plug wires while cranking. • **Was spark present on ALL spark plug wires and consistent (one spark per crankshaft revolution)?**	Yes ▶ No ▶	GO to A3. GO to A10.
A3 CHECK PIP AT EDIS MODULE		
• Key off. • Install EDIS diagnostic cable to breakout box. • Use EDIS 6 overlay. • Connect LED test lamp between J43 (PIP E) and J7 (GND). • **Does the LED test lamp blink continuously during crank?**	Yes ▶ No ▶	GO to A4. GO to A7.
A4 CHECK PIP CONTINUITY TO EEC		
• Key off. • Disconnect the EEC processor. • **Is the resistance between J43 (PIP E) and Pin 56 (PIP) of the EEC connector less than 5 ohms?**	Yes ▶ No ▶	GO to A5. SERVICE open circuit. RECONNECT the EEC processor and RERUN Quick Test.
A5 CHECK IGND AT EDIS		
• Key off. • **Is the resistance between J47 (IGND E) and J7 (BAT −) less than 5 ohms?**	Yes ▶ No ▶	GO to A6. REPLACE EDIS module and RERUN Quick Test.

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4.0L EFI Truck EDIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A6 CHECK IGND CONTINUITY TO EEC		
• Key off. • **Is the resistance between J47 (IGND E) and Pin 16 (IGN GND) of the EEC connector less than 5 ohms?**	Yes ▶	REPLACE EDIS module. RUN Quick Test.
	No ▶	SERVICE open circuit. RECONNECT EEC and RERUN Quick Test.
A7 CHECK PIP AT EDIS MODULE/ISOLATE EEC		
• Key off. • Disconnect the EEC processor. • Crank the engine. • **Does the LED test lamp blink continuously during crank?**	Yes ▶	REPLACE EEC processor. RERUN Quick Test.
	No ▶	GO to **A8**.
A8 CHECK PIP CIRCUIT FOR SHORT TO GROUND		
• Key off. • Disconnect the EDIS module from the EDIS diagnostic cable. • Disconnect the HEGO sensor. • **Is the resistance between J43 (PIP E) and J7 (BAT−) less than 5 ohms?**	Yes ▶	PIP is shorted to ground in harness. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
	No ▶	GO to **A9**.
A9 CHECK PIP CIRCUIT FOR SHORT TO POWER		
• **Is the resistance between J43 (PIP E) and J51 (VBAT E) less than 5 ohms?**	Yes ▶	PIP is shorted to power in harness. CHECK connectors, SERVICE or REPLACE harness. RUN Quick Test.
	No ▶	REPLACE EDIS module. RERUN Quick Test.

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4.0L EFI Truck EDIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A10 DETERMINE MISSING SPARK PATTERN		
• **Is spark missing from BOTH cylinder 1 and 5 plug wires?**	Yes ▶	GO to A12.
or		
• **Is spark missing from BOTH cylinder 2 and 6 plug wires?**	No ▶	GO to A11.
or		
• **Is spark missing from BOTH cylinder 3 and 4 plug wires?**		
A11 CHECK PLUGS AND WIRES		
• Check spark plug wires for insulation damage, looseness, shorting or other damage.	Yes ▶	REINSTALL plugs and wires. GO to A12.
• Remove and check spark plugs for damage, wear, carbon deposits and proper plug gap.		
• **Are spark plugs and wires OK?**	No ▶	SERVICE or REPLACE damaged component. RERUN Quick Test.
A12 CHECK VBAT C AT COIL		
• Key off.	Yes ▶	GO to A13.
• Install EDIS diagnostic cable to breakout box.		
• Use EDIS 6 overlay.	No ▶	SERVICE open circuit. RECONNECT the EEC processor and RERUN Quick Test.
• Connect the LED test lamp between J5 (VBAT C) and J7 (BAT-).		
• Key On.		
• **Is the LED test lamp on and bright?**		
A13 CHECK COIL FOR FAILURE		
• Connect LED test lamp between J7 (BAT-) to each coil - J3, J6 and J10, one at a time.	Yes ▶	GO to A14.
• Key on.	No ▶	REPLACE Coil pack. RERUN Quick Test.
• **Is the LED test lamp on and bright?**		
A14 CHECK GND CONTINUITY TO EDIS MODULE		
• Key off.	Yes ▶	GO to A15.
• **Is the resistance between J27 (GND E) and J7 (BAT-) less than 5 ohms?**	No ▶	SERVICE open circuit. RECONNECT EEC and RERUN Quick Test.

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4.0L EFI Truck EDIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A15 CHECK GND IN EDIS MODULE		
• Key off. • **Is the resistance between J27 (GND E) and J47 (IGND E) less than 5 ohms?**	Yes ▶ No ▶	GO to A16. REPLACE EDIS module. RERUN Quick Test.
A16 CHECK VBAT E AT EDIS MODULE		
• Connect the LED test lamp between J51 (VBAT E) and J7 (BAT-). • Key on. • **Is the LED test lamp on and bright?**	Yes ▶ No ▶	GO to A17. SERVICE open circuit. RECONNECT the EEC processor and RERUN Quick Test.
A17 CHECK VRS AMPLITUDE AT EDIS MODULE		
• **Is the A/C voltage between J35 (VRS+ E) and J48 (VRS- E) more than 1 volt when the engine is cranked?**	Yes ▶ No ▶	GO to A18. GO to A19.
A18 CHECK VRS BIAS AT EDIS MODULE		
• Key on. • **Is the DC voltage between J35 (VRS+ E) and J27 (GND E) between 1.0 and 2.0 volts?**	Yes ▶ No ▶	REPLACE EDIS module. RERUN Quick Test. GO to A28.
A19 CHECK VRS CRANKING VOLTAGE AT EDIS		
• Key off. • Disconnect the EDIS module from the EDIS diagnostic cable. • **Is the A/C voltage more than 1 volt when the engine is cranked?**	Yes ▶ No ▶	REPLACE EDIS module. RERUN Quick Test. GO to A20.
A20 CHECK VRS CRANKING VOLTAGE AT SENSOR		
• Key off. • Disconnect the VRS engine harness from the EDIS diagnostic cable. • **Is the A/C voltage between J32 (VRS- S) and J31 (VRS+ S) more than 1 volt when the engine is cranked?**	Yes ▶ No ▶	GO to A22. GO to A21.

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4.0L EFI Truck EDIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A21 CHECK VR SENSOR AND CRANKSHAFT WHEEL		
• Check the crankshaft data wheel for damage. • Check the air gap. • **Is the air gap correct and is the crankshaft data wheel OK?**	Yes ▶	REPLACE VR sensor. RERUN Quick Test.
	No ▶	REPAIR or REPLACE bad parts. SET air gap.
A22 CHECK VRS+ CIRCUIT FOR OPEN		
• Key off. • Reconnect the EDIS diagnostic cable. • **Is the resistance between J35 (VRS+ E) and J31 (VRS+ S) less than 5 ohms?**	Yes ▶	GO to **A23**.
	No ▶	SERVICE open circuit in VRS+ harness. RERUN Quick Test.
A23 CHECK VRS- CIRCUIT FOR OPEN		
• Key off. • **Is the resistance between J32 (VRS- S) and J48 (VRS – E) less than 5 ohms?**	Yes ▶	GO to **A24**.
	No ▶	SERVICE open circuit in VRS- harness. RERUN Quick Test.
A24 CHECK VRS- CIRCUIT FOR SHORT TO POWER		
• Key off. • Disconnect the HEGO sensor. • **Is the resistance between J48 (VRS- E) and J51 (VBAT E) greater than 10K ohms?**	Yes ▶	GO to **A25**.
	No ▶	SERVICE short circuit in VRS- harness. RERUN Quick Test.
A25 CHECK VRS- CIRCUIT FOR SHORT TO GROUND		
• **Is the resistance between J48 (VRS- E) and J7 (BAT-) greater than 10K ohms?**	Yes ▶	GO to **A26**.
	No ▶	SERVICE short circuit in VRS- harness. RERUN Quick Test.

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4.0L EFI Truck EDIS No Start

Pinpoint Test **A**

TEST STEP	RESULT ▶	ACTION TO TAKE
A26 CHECK VRS+ CIRCUIT FOR SHORT TO GROUND		
• **Is the resistance between J35 (VRS+ E) and J7 (BAT-) greater than 10K ohms?**	Yes ▶	GO to A27.
	No ▶	SERVICE short circuit in VRS+ harness. RERUN Quick Test.
A27 CHECK VRS+ CIRCUIT FOR SHORT TO POWER		
• **Is the resistance between J35 (VRS+ E) and J51 (VBAT E) greater than 10K ohms?**	Yes ▶	VRS+ is shorted to VRS-. SERVICE short in harness. RERUN Quick Test.
	No ▶	SERVICE short circuit in VRS+ harness. RERUN Quick Test.
A28 CHECK VRS BIAS AT EDIS MODULE		
• Key off. • Disconnect the VR sensor from the EDIS diagnostic cable. • Key on. • **Is the DC voltage between J35 (VRS+ E) and J7 (BAT-) between 1.0 and 2.0 volts?**	Yes ▶	REPLACE VR sensor. RERUN Quick Test.
	No ▶	GO to A29.
A29 CHECK VRS+ CIRCUIT FOR SHORT TO POWER		
• Key off. • Disconnect the EDIS module from the EDIS diagnostic cable. • Disconnect the HEGO sensor. • **Is the resistance between J35 (VRS+ E) and J51 (VBAT E) greater than 10K ohms?**	Yes ▶	GO to A30.
	No ▶	VRS+ is shorted to power in harness. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
A30 CHECK VRS+ CIRCUIT FOR SHORT TO GROUND		
• **Is the resistance between J35 (VRS+ E) and J7 (BAT-) greater than 10K ohms?**	Yes ▶	GO to A31.
	No ▶	SERVICE short circuit in VRS+ harness. RERUN Quick Test.

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4.0L EFI Truck EDIS No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A31 CHECK VRS – CIRCUIT FOR SHORT TO POWER		
• **Is the resistance between J48 (VRS – E) and J51 (VBAT E) greater than 10K ohms?**	Yes ▶	GO to **A32**.
	No ▶	SERVICE short circuit in VRS – harness. RERUN Quick Test.
A32 CHECK VRS – CIRCUIT FOR SHORT TO GROUND		
• **Is the resistance between J48 (VRS – E) and J7 (BAT –) less than 5 ohms?**	Yes ▶	SERVICE short circuit in VRS – harness. RERUN Quick Test.
	No ▶	REPLACE EDIS module. RERUN Quick Test.

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4.0L EFI Truck EDIS KOEO Code 16, Continuous Memory Code 18 and/or "Check Engine" Light On: IDM Failure	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B1 CHECK IDM CONTINUITY TO EEC		
• Key off. • Install EDIS diagnostic cable to breakout box. • Use EDIS 6 overlay. • Disconnect the EEC processor. • **Is the resistance between J41 (IDM E) and Pin 4 (IDM) of the EEC connector less than 5 ohms?**	Yes ▶ No ▶	GO to **B2**. SERVICE open in IDM circuit. RERUN Quick Test.
B2 CHECK IDM CIRCUIT FOR SHORT TO GROUND		
• Key off. • Disconnect the EDIS module from the EDIS diagnostic cable. • Disconnect the HEGO sensor. • **Is the resistance between J41 (IDM E) and J7 (BAT-) greater than 10K ohms?**	Yes ▶ No ▶	GO to **B3**. IDM is shorted to ground in harness. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
B3 CHECK IDM CIRCUIT FOR SHORT TO POWER		
• **Is the resistance between J41 (IDM E) and J51 (VBAT E) greater than 10K ohms?**	Yes ▶ No ▶	REPLACE EDIS module. RECONNECT EEC processor. RERUN Quick Test. If fault persists, REPLACE EEC processor and RERUN Quick Test. IDM is shorted to power in harness. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.

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4.0L EFI TRUCK EDIS Continuous Memory Code 45 and/or "Check Engine" Light On: Coil Failure

Pinpoint Test **C**

TEST STEP	RESULT ▶	ACTION TO TAKE
C1 CHECK FOR COIL SIGNALS AT EDIS		
• Key off. • Install EDIS diagnostic cable to breakout box. • Use the EDIS-6 overlay. • Key on. • Connect LED test lamp from J51 (VBAT E) to each coil - J53, J54 and J55, one at a time. • **Does the lamp turn on brightly for each coil?**	Yes ▶ No ▶	GO to C6. GO to C2.
C2 CHECK EDIS COIL AT CRANK		
• Crank engine. • **Does lamp blink at each coil during crank?**	Yes ▶ No ▶	GO to C3. GO to C4.
C3 CHECK COIL CONTINUITY TO EDIS MODULE		
• Key off. • Disconnect EDIS module from the EDIS diagnostic cable. • Disconnect the coil pack from the EDIS diagnostic cable. • **Is the resistance between J3 and J53, J6 and J55, J10 and J54 less than 5 ohms?**	Yes ▶ No ▶	REPLACE coil pack. RERUN Quick Test. SERVICE open circuit in coil harness. RERUN Quick Test.
C4 CHECK COIL FOR SHORT TO POWER		
• Key off. • Disconnect the coil pack from the EDIS diagnostic cable. • Crank the engine. • **Does lamp blink at any coil during crank?**	Yes ▶ No ▶	REPLACE coil pack. RERUN Quick Test. GO to C5.
C5 CHECK COIL CIRCUITS FOR SHORT TO POWER		
• Key off. • HEGO disconnected. • Disconnect EDIS module from EDIS diagnostic cable. • **Is the resistance between J51 (VBAT E) and each coil - J3, J6 and J10 - greater than 10K ohms?**	Yes ▶ No ▶	REPLACE EDIS module. RERUN Quick Test. SERVICE short to power in coil harness RERUN Quick Test.

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4.0L EFI TRUCK EDIS Continuous Memory Code 45 and/or "Check Engine" Light On: Coil Failure

Pinpoint Test **C**

TEST STEP	RESULT ▶	ACTION TO TAKE
C6 CHECK COIL FOR SHORT TO GROUND		
• Key off. • Disconnect the coil pack from the EDIS diagnostic cable. • Key on. • Connect LED test lamp from J7 (BAT-) to each coil - J53, J54 and J55, one at a time. • **Does the lamp turn on for each coil?**	Yes ▶ No ▶	GO to C7. REPLACE coil pack. RERUN Quick Test.
C7 CHECK COIL CIRCUITS FOR SHORT TO GROUND		
• Key off. • Disconnect the EDIS module from the EDIS diagnostic cable. • Key on. • Connect LED test lamp from J7 (BAT-) to each coil - J53, J54 and J55, one at a time. • **Does the lamp turn on for each coil?**	Yes ▶ No ▶	SERVICE short circuit in coil harness. RERUN Quick Test. REPLACE EDIS module. RERUN Quick Test.

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4.0L EFI Truck EDIS Engine Running Code 18: SAW Failure

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D1 CHECK FOR SPARK AT WIRES		
• Engine on. • Using a Neon Bulb Spark Tester (OTC D 89P-6666-A), check for spark at all spark plug wires. • **Was spark present on ALL spark plug wires and consistent (one spark per crankshaft revolution)?**	Yes ▶ No ▶	GO to D2. GO to D6.
D2 CHECK TIMING WITH TIMING LIGHT		
• Install timing light. • Start engine and warm to normal engine temperature. • Transmission out of gear. • **Is the spark angle greater than 19 degrees BTDC?**	Yes ▶ No ▶	REFER to engine diagnostics in Shop Manual. GO to D3.
D3 CHECK SAW CONTINUITY TO EEC		
• Key off. • Install EDIS diagnostic cable but do not connect the EDIS module or coil pack to the cable. • Connect the cable to the breakout box. • Use the EDIS 6 overlay. • Disconnect the EEC processor. • **Is the resistance between J45 (SAW E) and Pin 36 (SAW) of the EEC connector less than 5 ohms?**	Yes ▶ No ▶	GO to D4. SERVICE open in SAW circuit. RECONNECT the EEC processor and RERUN Quick Test.
D4 CHECK SAW CIRCUIT FOR SHORT TO GROUND		
• Key off. • HEGO disconnected. • **Is the resistance between J45 (SAW E) and J7 (BAT -) greater than 10K ohms?**	Yes ▶ No ▶	GO to D5. SAW is shorted to ground in harness. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.

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4.0L EFI Truck EDIS
Engine Running Code 18: SAW Failure

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D5 CHECK SAW CIRCUIT FOR SHORT-TO-POWER		
• **Is the resistance between J45 (SAW E) and J51 (VBAT E) greater than 10K ohms?**	Yes ▶	REPLACE EDIS module. RECONNECT EEC processor. RERUN Quick Test. If fault persists, REPLACE EEC processor and RERUN Quick Test.
	No ▶	SAW is shorted to ground in harness. CHECK connectors, SERVICE or REPLACE harness. RERUN Quick Test.
D6 CHECK PLUGS AND WIRES		
• Check spark plug wires for insulation damage, looseness, shorting or other damage. • Remove and check spark plugs for damage, wear, carbon deposits and proper plug gap. • **Are spark plugs and wires OK?**	Yes ▶	REPLACE coil pack.
	No ▶	SERVICE or REPLACE damaged component. RERUN Quick Test.

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HOW TO USE QUICK TEST

SPECIAL NOTES:

- START with Section 14, EEC-IV Quick Test Procedures and Appendix when directed here by Section 2, Diagnostic Routines.
- Sections 15 and 16, Engine Supplement Sections for Passenger Car and Truck, contain EEC-IV system electrical schematics, circuit numbers, wire colors, pin usage applications and Quick Test code definitions.
- Section 17 contains the EEC-IV Pinpoint Tests.
- Refer to Sections 1 and 3 to identify the emission components on your vehicle.
- An open is defined as any resistance reading greater than 5 ohms unless otherwise specified.
- A short is defined as any resistance reading less than 10,000 ohms to ground, unless otherwise specified.
- Quick Test results are dependent on the proper operation of base engine components. It may be necessary to correct any defects in these areas before the EEC-IV system will pass Quick Test. (Refer to Section 2, Diagnostic Routines, for service).
- When more than one service code is received, always start service with the first code received.
- Before using a Pinpoint Test always read the information on the cover page(s) (i.e. Notes, Remember and Pinpoint Test Schematic).
- When using a Pinpoint Test, follow each step in order. After completion, verify that all components are properly reconnected and rerun Quick Test or verify that the drive complaint has been eliminated.
- "RERUN Quick Test" means return to Section 14 and run Quick Test Steps 1.0 thru 9.0.

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HOW TO USE QUICK TEST

- The standard Ford color abbreviations are:

BK	**Black**	**N**	**Natural**
BL	**Blue**	**O**	**Orange**
BR	**Brown**	**PK**	**Pink**
DB	**Dark Blue**	**P**	**Purple**
DG	**Dark Green**	**R**	**Red**
GY	**Gray**	**T**	**Tan**
GR	**Green**	**W**	**White**
LB	**Light Blue**	**Y**	**Yellow**
LG	**Light Green**		

Where two colors are shown for a wire, the first color is the basic color of the wire. The second color is the stripe marking.

For example:

BR/O is a brown wire with an orange stripe.

- OPTIONAL USE OF THE EEC-IV MONITOR BOX:

An EEC-IV Monitor Box can be used as a substitute for the EEC-IV Breakout Box during Pinpoint Testing. The EEC-IV Breakout Box and Monitor Box are pin for pin compatible when referencing the 60 pin connector. For Monitor Box operation, refer to Section 18.

DO

- Turn the key off and isolate both ends of a circuit whenever checking for shorts or continuity.
- Disconnect solenoids and switches from the harness before measuring for continuity, resistance or energizing by way of a 12 volt source.
- When disconnecting connectors, inspect for damaged or pushed-out pins, corrosion, loose wires, etc. Service as necessary.

DON'T

- Go to the Pinpoint Test Section unless directed by the Quick Test procedures. (Not following Quick Test procedures may produce incorrect results and replacement of non-defective components.)
- Replace any parts unless directed by a test procedure.
- Measure voltage or resistance directly at the processor connector.

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SECTION 14

EEC-IV Quick Test Procedures and Appendix

Contents

QUICK TEST

Quick Test: Special Notes 14-1

Quick Test 14-2

Step 1.0 Visual Check 14-2

Step 2.0 Vehicle Preparation and Equipment Hookup 14-2

Step 3.0 Perform Key On Engine Off Self-Test 14-3

Step 3.1 Check for Continuous Memory Service Codes 45, 46 and 48 14-4

Step 4.0 Computed Timing Check 14-4

Step 5.0 Perform Engine Running Self-Test 14-5

Step 6.0 Key On Engine Off Code Charts 14-6

Step 7.0 Engine Running Code Charts 14-8

Step 8.0 Continuous Memory Code Charts 14-11

Step 9.0 Diagnosis By Symptom 14-14

APPENDIX

Self-Test

Visual Check 14-20

Vehicle Preparation and Equipment Hookup 14-21

Key On Engine Off Self-Test 14-23

Engine Running Self-Test 14-24

Continuous Memory Self-Test 14-25

(Continued)

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SECTION 14

EEC-IV Quick Test Procedures and Appendix

Contents

Self-Test Description 14-26
Code Output Format 14-28
Continuous Self-Test 14-29
Self-Test With STAR Tester 14-30
Self-Test With Analog Voltmeter 14-33
Self-Test With "Check Engine" or "SERVICE ENGINE SOON" Light (MIL) 14-34
Self-Test With Message Center (Continental Only) 14-35
Self-Test With Overdrive Cancel/Transmission Malfunction Indicator Light — OCIL/TMIL 14-36
Diagnostic Aids
Continuous Monitor Test (Wiggle Test) 14-37
How To Clear Continuous Memory Codes 14-38
How To Clear Keep Alive Memory (KAM) 14-38
Output State Check 14-38
Cylinder Balance Test 14-39
Failure Mode Effects Management (FMEM) 14-41
"CHECK ENGINE" or "SERVICE ENGINE SOON" Light (Malfunction Indicator Light) 14-42
"Check Engine"/"Check DCL" Message (Data Communications Link) 14-44
Test Equipment 14-45

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QUICK TEST: Special Notes

- This diagnostic procedure is used **ONLY** on vehicles equipped with fourth generation Electronic Engine Controls (EEC-IV).
- The QUICK TEST procedure should be used **ONLY** when the Diagnostic Routines, Section 2 directs you here.
- The Key On Engine Off and Engine Running Self-Tests detect faults that are present at the time of testing. Intermittent faults that have occurred in the last * 40 warm-up cycles are detected during Continuous Self-Test and stored in the EEC-IV memory.
- Vehicles with a "CHECK ENGINE" or "SERVICE ENGINE SOON" light concern must run Quick Test and address all service codes present.
- If all phases of the Quick Test, including Diagnosis By Symptom in Quick Test Step **9.0**, result in a PASS, it is likely that the problem is non-EEC-IV related and will be found elsewhere. You should return to the Diagnostic Routines in Section 2.
- When directed to a Pinpoint Test always read the cover page(s) for special notes and look carefully at the Pinpoint Test Schematic.
- After service, rerun Quick Test to ensure that service was effective.

* 80 warm-up cycles for some applications.

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EEC-IV Quick Test — Procedures and Appendix

TEST STEP	RESULT ▶	ACTION TO TAKE
1.0 VISUAL CHECK • Check vacuum hoses for damage and proper connection. • Check EEC-IV system wiring harness for proper connections. **NOTE: If additional information is required on Visual Checks, refer to Quick Test Appendix.** • Are all visual checks OK?	Yes ▶ No ▶	GO to Quick Test Step 2.0 . SERVICE as necessary.
2.0 VEHICLE PREPARATION AND EQUIPMENT HOOKUP • Apply parking brake. • Place shift lever firmly in PARK (NEUTRAL for manual transmissions). • Block drive wheels. • Turn off all electrical loads. • Connect appropriate test equipment to the Self-Test connector in order to run Self-Test. **NOTE: If additional information is required for Vehicle Preparation and Equipment Hookup, refer to Quick Test Appendix.** • Is vehicle prepared to run Self-Test?	Yes ▶ No ▶	GO to Quick Test Step 3.0 . REPEAT this test step.

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EEC-IV Quick Test — Procedures and Appendix

TEST STEP	RESULT ▶	ACTION TO TAKE
3.0 PERFORM KOEO SELF-TEST		
• Start engine and idle until vehicle is at operating temperature. **NOTE: If engine does not start or stalls after starting, continue to perform KOEO Self-Test.** • For 4.9L only, depress clutch for entire test step. • For 7.3L diesel only, depress throttle for entire test step. • Key off, wait 10 seconds. • Activate Self-Test. • Key on, engine off. **NOTE: If additional information is required for KOEO Self-Test, refer to Quick Test Appendix.** • Record all KOEO and Continuous Memory Codes received. • Is a PASS code "11" present in KOEO? (11,11-10-any code) **NOTE: The first two "11's" are PASS codes from KOEO. The "10" is considered the separator code between KOEO and Continuous Memory.**	Yes ▶	**If "CHECK ENGINE" or "SERVICE ENGINE SOON" light is on:** GO to Continuous Memory code charts, Quick Test Step [8.0], before addressing any other symptoms. **If engine runs rough or idles rough:** GO to Pinpoint Test Step [S2], except DIS/EDIS vehicles, GO to Quick Test Step [3.1]. **If engine is a no start:** GO to Pinpoint Test Step [A1], except EDIS vehicles, GO to Pinpoint Test Step [AA1]. **If these symptoms are not present:** GO to Quick Test Step [4.0], except 7.3L diesel, GO to Quick Test Step [5.0].
	No ▶	**If KOEO service codes are received:** GO to KOEO code charts, Quick Test Step [6.0]. **If no service codes are received:** GO to Pinpoint Test Step [QA1].

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EEC-IV Quick Test — Procedures and Appendix

TEST STEP	RESULT ▶	ACTION TO TAKE
3.1 CHECK FOR CONTINUOUS MEMORY SERVICE CODES 45, 46, AND 48		
• For DIS/EDIS vehicles only. • Were Continuous Memory service codes 45, 46, or 48 received during KOEO Self-Test?	Yes ▶	**For 1.9L MA:** GO to Pinpoint Test Step N17. **For 4.0L MA:** GO to Pinpoint Test Step N15. **For DIS:** GO to Pinpoint Test Step N13.
	No ▶	GO to Pinpoint Test Step S2.
4.0 COMPUTED TIMING CHECK		
• Key off, wait 10 seconds. • Activate Engine Running Self-Test. • Start engine. **NOTE: If additional information is required for Engine Running Self-Test, refer to Quick Test Appendix.** **If engine starts but stalls or stalls during Self-Test, GO to Pinpoint Test Step S1.** **Engine Running Service Code 98 indicates vehicle is in Failure Mode Effects Management (FMEM) and DID NOT PASS KOEO On-Demand/Continuous Memory Self-Test. Engine Running Self-Test cannot be performed while in FMEM. Go to Continuous Memory code charts, Quick Test Step 8.0.** • Check computed timing after the last service code has been displayed. The timing will remain fixed for two minutes, unless Self-Test is deactivated. **NOTE: Computed timing is equal to base timing plus 20 degrees BTDC with 3 degrees tolerance. See vehicle decal for correct base timing.** • Is computed timing within specs?	Yes ▶	Go to Quick Test Step 5.0.
	No ▶	GO to Pinpoint Test Step P2.

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EEC-IV Quick Test — Procedures and Appendix

TEST STEP	RESULT ▶	ACTION TO TAKE
5.0 PERFORM ENGINE RUNNING SELF-TEST		
• Deactivate Self-Test. • Activate Engine Running Self-Test. • Start engine and idle until vehicle is at operating temperature. **NOTE: If additional information is required for Engine Running Self-Test, refer to Quick Test Appendix.** • Record all service codes displayed. **NOTE: Engine Running Service Code 98 indicates vehicle is in Failure Mode Effects Management (FMEM) and DID NOT PASS KOEO On-Demand/Continuous Memory Self-Test. Engine Running Self-Test cannot be performed while in FMEM. Go to Continuous Memory code charts, Quick Test Step [8.0].** • **Is a PASS Code (11) received during Engine Running Self-Test?**	Yes ▶	**If any Continuous Memory service codes were received in Quick Test Step [3.0]:** GO to Continuous Memory code charts Quick Test Step [8.0]. **If a Continuous Memory PASS Code (11) was received in Quick Test Step [3.0] and no symptoms are present:** EEC-IV diagnostic testing is complete. **If a Continuous Memory PASS Code (11) was received in Quick Test Step [3.0] and symptoms are present:** GO to Diagnosis By Symptom chart Quick Test Step [9.0].
	No ▶	**If Engine Running service codes are received:** GO to Engine Running code charts, Quick Test Step [7.0]. **If no service codes are received:** GO to Pinpoint Test Step [QA1].

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QUICK TEST STEP: Key On Engine Off Code Charts

6.0

6.0 PASSENGER CAR SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction														
	1.9L EFI	1.9L CFI	1.9L MA SEFI	2.3L OHC EFI	2.3L MA EFI	2.3L HSC EFI	2.5L CFI	2.9L EFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
13 GO to ▶	—	KB1	—	—	—	—	KB1	—	—	—	—	—	—	—	—
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
19 GO to ▶	—	—	QD5	QD5	QD5	QD5	—	QD5	QD5	QD5	QD5	QD5	QD5	QD5	QD5
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1
22 GO to ▶	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH1	KB12	DH1	DH1	DH1	DH1	KB12	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1
24 GO to ▶	—	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1
26 GO to ▶	DK1	—	DC1	—	DC1	—	—	—	—	DC1	—	—	DC1	—	DC1
28 GO to ▶	DA1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31 GO to ▶	—	DL1	DL1	DD2	DN1	DL1	DN1	—	DL1	DL1	DL1	DL1	DL1	DN1	DN1
32 GO to ▶	—	—	—	—	DN25	—	DN25	—	—	—	—	—	—	DN25	DN25
34 GO to ▶	—	DL8	DL8	—	DN20	DL8	DN20	—	DL8	DL8	DL8	DL8	DL8	DN20	DN20
35 GO to ▶	—	DL5	DL5	—	DN5	DL5	DN5	—	DL5	DL5	DL5	DL5	DL5	DN5	DN5
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10
52 GO to ▶	—	—	—	FF1	FF1	FF1	FF1	—	FF1	FF1	FF1	—	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3
54 GO to ▶	—	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10
56 GO to ▶	DK10	—	DC20	—	DC20	—	—	—	—	DC20	—	—	DC20	—	DC20
57 GO to ▶	—	—	—	—	—	—	—	KH1	—	—	—	—	—	—	—
58 GO to ▶	DA10	KB5	—	—	—	—	KB5	KH5	—	—	—	—	—	—	—
59 GO to ▶	—	—	—	—	—	—	—	KH10	—	X97	T70	—	—	—	—
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20
62 GO to ▶	—	—	—	—	—	—	—	—	T60	—	—	—	—	—	—
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10
64 GO to ▶	—	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20
66 GO to ▶	DK20	—	DC10	—	DC10	—	—	—	—	DC10	—	—	DC10	—	DC10
67 GO to ▶	FA1	FA1	FA1	FA1	FA1	FA1	FA1	FA1	T80	FA1	T81	FA1	FA1	FA1	FA1
68 GO to ▶	DA20	KB9	—	—	—	—	KB9	—	—	—	T90	—	—	—	—
69 GO to ▶	—	—	—	—	—	—	—	—	—	—	T75	—	—	—	—
73 GO to ▶	—	KB20	—	—	—	—	KB20	—	—	—	—	—	—	—	—
79 GO to ▶	—	—	FA10	—	FA10	—	—	—	—	FA10	FA10	FA10	FA10	FA10	FA10
81 GO to ▶	—	—	—	—	—	—	—	—	—	KT1	—	—	—	KC8	KC8
82 GO to ▶	—	—	—	—	—	KC8	—	—	—	—	—	—	—	KC8	KC8
83 GO to ▶	—	—	KF1	DD17	—	—	X30	—	X30	X15	X30	—	X30	—	—
84 GO to ▶	—	DL11	DL11	DD17	DN10	DL11	DN10	—	DL11	DL11	DL11	DL11	DL11	DN10	DN10
85 GO to ▶	—	KD6	—	—	KD6	KD6	KD6	KD6	KD6	KD6	KD6	KD6	KD6	KD6	KD6
86 GO to ▶	—	—	—	—	TB1	—	—	—	—	—	—	—	—	—	—
87 GO to ▶	—	J7	J7	J7	J7	J7	X15	J7	X15	X15	X15	J7	J7	J7	J7
88 GO to ▶	—	—	KF1	—	—	—	X80	—	X80	X80	X80	—	X80	—	—
89 GO to ▶	—	—	—	TB1	TB1	—	—	TB1	T50	—	T50	—	—	—	—
93 GO to ▶	—	KB11	—	—	—	—	KB11	—	—	—	—	—	—	—	—
95 GO to ▶	J20	J20	J20	—	J20	J20	X90	—	X90	X90	X90	J20	J20	J20	J20
96 GO to ▶	J6	J30	J30	—	J30	J30	X95	—	X95	X95	X95	J30	J30	J30	J30
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1														

DAVE GRAHAM INC. 2012
ALL RIGHTS RESERVED

QUICK TEST STEP: Key On Engine Off Code Charts

6.0

6.0 LIGHT TRUCK SERVICE CODE CHART

Key On Engine Off Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	2.9L MA EFI	3.0L EFI	4.0L MA EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
15 GO to ▶	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3	QB3
16 GO to ▶	—	—	—	—	N2	—	—	—	—	—
19 GO to ▶	QD5	QD5	QD5	QD5	QD5	QD5	QD5	QD5	QD5	QD5
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1	DF1
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
26 GO to ▶	DC1	—	DC1	—	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
34 GO to ▶	DN20	—	—	—	—	DN20	DN20	DN20	—	DN20
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
47 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
51 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
52 GO to ▶	FF1	—	—	FF1	—	FF1	FF1	—	—	—
53 GO to ▶	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DH3	DQ2	DH3
54 GO to ▶	DA10	DA10	DA10	DA10	DA10	DA10	DA10	DA10	—	DA10
56 GO to ▶	DC20	—	DC20	—	DC20	TC40	—	TC40	TC40	TC40
61 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
63 GO to ▶	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DH10	DQ10	DH10
64 GO to ▶	DA20	DA20	DA20	DA20	DA20	DA20	DA20	DA20	—	DA20
66 GO to ▶	DC10	—	—	—	—	TC50	—	TC50	TC50	TC50
67 GO to ▶	FA1	FA1	FA1	FA1	FA1	FA1	FA1	FA1	FA1	FA1
79 GO to ▶	—	—	FA10	—	FA10	—	—	—	—	—
81 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	—
82 GO to ▶	—	—	—	—	—	KC8	KC8	KC8	—	KC8
84 GO to ▶	DN10	—	—	—	—	DN10	DN10	DN10	—	DN10
85 GO to ▶	—	—	—	KD6	KD6	KD6	—	KD6	—	KD6
86 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
87 GO to ▶	J7	J7	J7	J7	J7	J7	J7	J7	—	J7
89 GO to ▶	TB1	TB1	TB1	TB1	TB1	—	—	—	—	—
91 GO to ▶	—	—	—	—	—	TC17	—	TC17	TC17	TC17
92 GO to ▶	—	—	—	—	—	TC17	—	TC17	TC17	TC17
93 GO to ▶	—	—	—	—	—	TC17	—	TC17	TC17	TC17
94 GO to ▶	—	—	—	—	—	TC17	—	TC17	TC17	TC17
95 GO to ▶	J20	J20	J20	J20	J20	J20	J20	J20	—	J20
96 GO to ▶	J30	J30	J30	J30	J30	J30	J30	J30	—	J30
97 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
98 GO to ▶	—	—	—	—	—	TC17	—	TC17	TC17	TC17
99 GO to ▶	—	—	—	—	—	TC17	—	TC17	TC17	TC17
NO CODES ▶ CODES NOT LISTED ▶	Go To Pinpoint Test Step QA1									

DAVE GRAHAM INC. 2012
ALL RIGHTS RESERVED

QUICK TEST STEP: Engine Running Code Charts

7.0

7.0 PASSENGER CAR SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction														
	1.9L EFI	1.9L CFI	1.9L MA SEFI	2.3L OHC EFI	2.3L MA EFI	2.3L HSC EFI	2.5L CFI	2.9L EFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
12 GO to ▶	KE1	KB23	KE1	KE1	KE1	KE1	KB23	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1
13 GO to ▶	KE15	KB1	KB15	KE15	KE15	KE15	KB1	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15
16 GO to ▶	KE22	KB30	—	KE1	—	—	KB30	—	—	—	—	—	—	KE1	KE1
17 GO to ▶	KE26	KB30	—	—	—	—	KB30	—	—	—	—	—	—	—	—
18 GO to ▶	P1	P1	P1	—	P1	P1	—	P1	P1	P1	P1	P1	P1	P1	P1
19 GO to ▶	KE25	KB26	—	—	—	—	—	—	—	—	—	—	—	—	—
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1
22 GO to ▶	DF1	DF7	DF1	DF7	DF1	DF7	DF7	DF7	DF7	DF1	DF7	DF7	DF1	DF7	DF1
23 GO to ▶	DH1	KB12	DH1	DH1	DH1	DH1	KB12	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1
24 GO to ▶	—	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1
25 GO to ▶	—	—	—	DG1	DG1	—	—	—	DG1	DG1	—	—	DG1	—	—
26 GO to ▶	DK1	—	DC1	—	DC1	—	—	—	—	DC1	—	—	DC1	—	DC1
28 GO to ▶	DA1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31 GO to ▶	—	DL21	DL21	DD1	DN1	DL21	DN1	—	DL21	DL21	DL21	DL21	DL21	DN1	DN1
32 GO to ▶	—	DL20	DL20	DD11	DN25	DL20	DN25	—	DL20	DL20	DL20	DL20	DL20	DN25	DN25
33 GO to ▶	—	DL30	DL30	DD11	DN40	DL30	DN40	—	DL30	DL30	DL30	DL30	DL30	DN40	DN40
34 GO to ▶	—	DL25	DL25	DD11	DN50	DL25	DN50	—	DL25	DL25	DL25	DL25	DL25	DN50	DN50
35 GO to ▶	—	DL25	DL25	DD30	DN5	DL25	DN5	—	DL25	DL25	DL25	DL25	DL25	DN5	DN5
41 GO to ▶	H11	H11	H1	H11	H11	H11	H11	H11	H11	H1	H1	H1	H1	H1	H1
42 GO to ▶	H23	H23	H1	H23	H23	H23	H23	H23	H23	H1	H1	H1	H1	H1	H1
44 GO to ▶	—	—	—	—	—	—	—	—	—	—	—	—	—	KC1	KC1
45 GO to ▶	—	—	—	—	—	—	—	—	—	—	—	—	—	KC1	KC1
46 GO to ▶	—	—	—	—	—	—	—	—	—	—	—	—	—	KC1	KC1
47 GO to ▶	KE20	—	—	—	—	—	—	—	—	—	—	—	—	—	—
48 GO to ▶	KE21	—	—	—	—	—	—	—	—	—	—	—	—	—	—
52 GO to ▶	—	—	—	—	FF5	FF5	FF5	—	FF5	FF5	FF5	—	FF5	—	—
55 GO to ▶	—	QE1	—	—	—	—	QE1	—	—	—	—	—	—	—	—
56 GO to ▶	—	—	DC20	—	DC20	—	—	—	—	DC20	—	—	DC20	—	DC20
58 GO to ▶	—	KB5	—	—	—	—	KB5	—	—	—	—	—	—	—	—
66 GO to ▶	—	—	DC10	—	DC10	—	—	—	—	DC10	—	—	DC10	—	DC10
67 GO to ▶	—	FA1	—	—	—	—	—	—	—	—	—	—	—	—	—
68 GO to ▶	—	KB9	—	—	—	—	KB9	—	—	—	T90	—	—	—	—
72 GO to ▶	—	—	DC1	DF10	DC	DF10	—	DF10	DF10	X10	—	—	X10	—	—

(Continued)

DAVE GRAHAM INC. 2012
ALL RIGHTS RESERVED

QUICK TEST STEP: Engine Running Code Charts

7.0

7.0 PASSENGER CAR SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction														
	1.9L EFI	1.9L CFI	1.9L MA SEFI	2.3L OHC EFI	2.3L MA EFI	2.3L HSC EFI	2.5L CFI	2.9L EFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
73 GO to ▶	DH20	—	DH20	DH20	DH20	DH20	—	DH20	DH20	DH20	—	—	DH20	—	—
74 GO to ▶	—	—	FD10	FD1	FD10	—	FD10	—	FD10	FD10	FD10	FD10	FD10	FD10	—
75 GO to ▶	—	—	—	FD5	—	—	—	—	—	—	—	—	—	FD5	—
76 GO to ▶	DK30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
77 GO to ▶	M1	—	M1	M1	M1	M1	—	M1	M1	M1	—	M1	M1	M1	M1
84 GO to ▶	—	DL11	—	—	—	—	—	—	—	—	—	—	—	—	—
85 GO to ▶	—	KD6	—	—	—	—	—	—	—	—	—	—	—	—	—
87 GO to ▶	—	J7	—	—	—	—	—	—	—	—	—	—	—	—	—
91 GO to ▶	—	—	—	—	—	—	—	H1	—	H1	H1	H1	H1	H1	H1
92 GO to ▶	—	—	—	—	—	—	—	H1	—	H1	H1	H1	H1	H1	H1
94 GO to ▶	—	—	—	—	—	—	—	—	—	—	—	—	—	KC1	KC1
98 GO to ▶	GO TO QUICK TEST STEP 3.0														
99 GO to ▶	—	KB29	—	—	—	—	KB29	—	—	—	—	—	—	—	—
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1														

DAVE GRAHAM INC. 2012
ALL RIGHTS RESERVED

QUICK TEST STEP: Engine Running Code Charts

7.0

7.0 LIGHT TRUCK SERVICE CODE CHART

Engine Running Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	2.9L MA EFI	3.0L EFI	4.0L MA EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
12 GO to ▶	KE1	KE1	KE1	KE1	KE1	KE1	KE1	KE1	—	KE1
13 GO to ▶	KE15	KE15	KE15	KE15	KE15	KE15	KE15	KE15	—	KE15
16 GO to ▶	KE1	—	—	—	—	—	—	—	—	—
18 GO to ▶	P1	—	P1	—	—	P1	P1	P1	—	P1
21 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
22 GO to ▶	DF7	DF7	DF7	DF7	DF7	DF7	DF7	DF7	DF7	DF7
23 GO to ▶	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DH1	DQ1	DH1
24 GO to ▶	DA1	DA1	DA1	DA1	DA1	DA1	DA1	DA1	—	DA1
25 GO to ▶	—	DG1	—	—	—	DG1	DG1	—	—	—
26 GO to ▶	DC1	—	DC1	—	DC1	TC30	—	TC30	TC30	TC30
31 GO to ▶	DN1	—	—	—	—	DN1	DN1	DN1	—	DN1
32 GO to ▶	DN25	—	—	—	—	DN25	DN25	DN25	—	DN25
33 GO to ▶	DN40	—	—	—	—	DN40	DN40	DN40	—	DN40
34 GO to ▶	DN50	—	—	—	—	DN50	DN50	DN50	—	DN50
35 GO to ▶	DN5	—	—	—	—	DN5	DN5	DN5	—	DN5
41 GO to ▶	H11	H11	H11	H11	H11	H11	H11	H11	—	H11
42 GO to ▶	H23	H23	H23	H23	H23	H23	H23	H23	—	H23
44 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
45 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	KC1
46 GO to ▶	—	—	—	—	—	KC1	KC1	KC1	—	—
52 GO to ▶	FF5	—	—	FF5	—	FF5	FF5	—	—	—
56 GO to ▶	DC20	—	DC20	—	DC20	—	—	—	—	—
65 GO to ▶	—	—	—	—	—	TC10	—	TC10	TC10	TC10
66 GO to ▶	DC10	—	DC10	—	DC10	—	—	—	—	—
72 GO to ▶	DF10	DF10	DF10	DF10	DF10	DF10	DF10	DF10	—	DF10
73 GO to ▶	DH20	DH20	DH20	DH20	DH20	DH20	DH20	DH20	—	DH20
74 GO to ▶	FD10	FD10	FD10	FD10	FD10	FD10	—	FD10	FD10	FD10
77 GO to ▶	M1	M1	M1	M1	M1	M1	M1	M1	—	M1
98 GO to ▶	GO TO QUICK TEST STEP 3.0									
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

DAVE GRAHAM INC. 2012
ALL RIGHTS RESERVED

QUICK TEST STEP: Continuous Memory Code Charts

8.0

8.0 PASSENGER CAR SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction														
	1.9L EFI	1.9L CFI	1.9L MA SEFI	2.3L OHC EFI	2.3L MA EFI	2.3L HSC EFI	2.5L CFI	2.9L EFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
13 GO to ▶	—	KB90	—	—	—	—	KB90	—	—	—	—	—	—	—	—
14 GO to ▶	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1	N1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	N4	N4	N3	N4	N4	N4	N4	—	N4	N3	N4	N4	N3	N4	N4
19 GO to ▶	—	—.	DR1	—	—	—	—	—	—	N10	—	—	N10	—	—
22 GO to ▶	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
23 GO to ▶	—	KB97	—	—	—	—	KB97	—	—	—	—	—	—	—	—
26 GO to ▶	DK98	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29 GO to ▶	—	—	DP1	—	DP1	DP1	DP1	DP10	T1	DP1	T1	DP1	DP1	DP1	DP1
31 GO to ▶	—	DL90	DL90	DD90	DN91	DL90	DN91	—	DL90	DL90	DL90	DL90	DL90	DN91	DN91
32 GO to ▶	—	DL94	DL94	—	DN90	DL94	DN90	—	DL94	DL94	DL94	DL94	DL94	DN90	DN90
33 GO to ▶	—	DL97	DL97	—	DN95	DL97	DN95	—	DL97	DL97	DL97	DL97	DL97	DN95	DN95
34 GO to ▶	—	DL93	DL93	—	DN98	DL93	DN98	—	DL93	DL93	DL93	DL93	DL93	DN98	DN98
35 GO to ▶	—	DL90	DL90	—	DN93	DL90	DN93	—	DL90	DL90	DL90	DL90	DL90	DN93	DN93
38 GO to ▶	—	KB91	—	—	—	—	KB91	—	—	—	—	—	—	—	—
39 GO to ▶	—	—	—	—	—	—	—	—	T30	—	T30	—	—	—	—
41 GO to ▶	H30	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29
42 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
43 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45 GO to ▶	—	—	N17	—	—	—	—	—	—	N13	—	—	N13	—	—
46 GO to ▶	—	—	N17	—	—	—	—	—	—	N13	—	—	N13	—	—
48 GO to ▶	—	—	—	—	—	—	—	—	—	N13	—	—	N13	—	—
49 GO to ▶	—	—	—	—	—	—	—	—	—	P10	—	—	P10	—	—
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90
53 GO to ▶	DH90	KB93	DH90	DH90	DH90	DH90	KB93	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90
54 GO to ▶	—	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90
56 GO to ▶	DK90	—	DC20	—	DC20	—	—	—	—	DC20	—	—	DC20	—	DC20
57 GO to ▶	—	—	—	—	—	—	—	—	T40	—	T40	—	—	—	—
58 GO to ▶	DA90	—	—	—	—	—	—	—	—	—	—	—	—	—	—
59 GO to ▶	—	—	—	—	—	—	—	—	T20	X95	T20	—	—	—	—
61 GO to ▶	DA93	DA93	DA93	DA93	DA93	DA93	DA93	DA93	DA93	DA93	DA93	DA93	DA93	DA93	DA93
63 GO to ▶	DH94	KB97	DH94	DH94	DH94	DH94	KB97	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94
64 GO to ▶	—	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90
65 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—	—	—

(Continued)

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QUICK TEST STEP: Continuous Memory Code Charts

8.0

8.0 PASSENGER CAR SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction														
	1.9L EFI	1.9L CFI	1.9L MA SEFI	2.3L OHC EFI	2.3L MA EFI	2.3L HSC EFI	2.5L CFI	2.9L EFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
66 GO to ▶	DK93	—	DC10	—	DC10	—	—	—	—	DC10	—	—	DC10	—	DC10
67 GO to ▶	FA1	—	FA1	—	FA1	—	—	—	—	FA1	—	—	FA1	—	—
68 GO to ▶	DA90	—	—	—	—	—	—	—	—	—	T90	—	—	—	—
69 GO to ▶	—	—	—	—	—	—	—	—	T10	—	T10	—	—	—	—
70 GO to ▶	—	—	—	—	—	—	—	—	—	—	ML25	—	—	—	—
71 GO to ▶	QD1	KB92	—	—	—	—	KB92	—	—	—	ML25	—	—	—	—
72 GO to ▶	QD4	—	—	—	—	—	—	—	—	—	ML25	—	—	—	—
83 GO to ▶	—	—	—	—	—	—	—	—	—	X15	—	—	—	—	—
85 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
86 GO to ▶	H30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
87 GO to ▶	—	J95	J95	—	J95	J95	X104	J95	X104	X104	X104	J95	J95	J95	J95
91 GO to ▶	—	—	—	—	—	—	—	H29	—	H29	H29	H29	H29	H29	H29
95 GO to ▶	J90	J90	J90	—	J90	J90	X100	—	X100	X100	X100	J90	J90	J90	J90
96 GO to ▶	J93	J93	J93	—	J93	J93	X102	—	X102	X102	X102	J93	J93	J93	J93
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1														

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QUICK TEST STEP: Continuous Memory Code Charts

8.0

8.0 LIGHT TRUCK SERVICE CODE CHART

Continuous Memory Service Code	Pinpoint Test Step Direction									
	2.3L EFI	2.9L EFI	2.9L MA EFI	3.0L EFI	4.0L MA EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
14 GO to ▶	N1	N1	N1	N1	Sec 13	N1	N1	N1	DJ1	N1
15 GO to ▶	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1	QB1
18 GO to ▶	Sect 13	N4	N4	N4	N3	N4	N4	N4	—	N4
19 GO to ▶	Sect 13	—	—	—	—	—	—	—	—	—
22 GO to ▶	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90	DF90
28 GO to ▶	N3	—	—	—	—	—	—	—	—	—
29 GO to ▶	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1	DP1
31 GO to ▶	DN91	—	—	—	—	DN91	DN91	DN91	—	DN91
32 GO to ▶	DN90	—	—	—	—	DN90	DN90	DN90	—	DN90
33 GO to ▶	DN95	—	—	—	—	DN95	DN95	DN95	—	DN95
34 GO to ▶	DN98	—	—	—	—	DN98	DN98	DN98	—	DN98
35 GO to ▶	DN93	—	—	—	—	DN93	DN93	DN93	—	DN93
41 GO to ▶	H29	H29	H29	H29	H29	H29	H29	H29	—	H29
45 GO to ▶	—	—	—	—	N15	—	—	—	—	—
48 GO to ▶	N3	—	—	—	—	—	—	—	—	—
49 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
51 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
53 GO to ▶	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DH90	DQ90	DH90
54 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
56 GO to ▶	DC20	—	DC20	—	DC20	TC90	—	TC90	TC90	TC90
59 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
61 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
62 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
63 GO to ▶	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DH94	DQ94	DH94
64 GO to ▶	DA90	DA90	DA90	DA90	DA90	DA90	DA90	DA90	—	DA90
66 GO to ▶	DC10	—	DC10	—	DC10	TC90	—	TC90	TC90	TC90
67 GO to ▶	—	—	FA1	—	FA1	TC90	—	TC90	TC90	TC90
69 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
87 GO to ▶	J95	J95	J95	J95	J95	J95	J95	J95	—	J95
88 GO to ▶	N20	—	—	—	—	—	—	—	—	—
95 GO to ▶	J90	J90	J90	J90	J90	J90	J90	J90	—	J90
96 GO to ▶	J93	J93	J93	J93	J93	J93	J93	J93	—	J93
99 GO to ▶	—	—	—	—	—	TC90	—	TC90	TC90	TC90
NO CODES ▶ CODES NOT LISTED ▶	Go to Pinpoint Test Step QA1									

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QUICK TEST STEP: Diagnosis By Symptom | 9.0

9.0 DIAGNOSIS BY SYMPTOM

SPECIAL NOTES:

- Verify that a **Pass Code 11** was received in Key On Engine Off, Engine Running and Continuous Self-Tests before continuing with this test.
- If a symptom is present and the EEC system is suspected, Go to part **B** of Diagnosis By Symptom. If the EEC system is not suspected, GO to Section 2, Diagnostic Routines.

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QUICK TEST STEP: Diagnosis By Symptom | 9.0

9.0 PASSENGER CAR DIAGNOSIS BY SYMPTOM

Symptom	Pinpoint Test Step Direction														
	1.9L EFI	1.9L CFI	1.9L MA SEFI	2.3L OHC EFI	2.3L MA EFI	2.3L HSC EFI	2.5L CFI	2.9L EFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
Engine runs rough or misses Lack of power Rough idle Erratic rpm Surges Hesitation	S2	S2	S2*	S2*	S2	S2	S2	S2	S2	S2*	S2	S2	S2**	S2	S2*
Stalls in Self-Test Engine stalls	S1	S1	S1	S2	S1	S1	S2	S1	S1	S1	S1	S1	S1	S1	S1
Stall during parking maneuvers	—	FF3	—	FF3	FF3	—	FF3	KH12	FF3	FF3	FF3	—	—	—	—
Surges with A/C on at idle	—	—	—	KM30	KM30	KM30	—	—	—	—	—	—	—	—	—
A/C does not cut off under WOT conditions	KM15	KM15	KM15	KM15	KM15	KM15	X52	—	X52	X52	X52	KM15	X52	KM15	KM15
A/C not functioning	KM1	KM1	KM1	KM1	KM1	KM1	X50	—	X50	X50	X50	KM1	X50	KM1	KM1
A/C compressor runs continuously	—	—	—	KM35	KM35	—	—	—	—	—	—	—	—	—	—
High idle speeds on each restart may be accompanied by spark knock for up to 3-5 minutes after a start	KA1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Low idle with A/C On	FA11	FA11	FA11	FA11	FA11	FA11	FA11	KH12	FA11	FA11	FA11	FA11	FA11	FA11	FA11
High idle in Drive, automatic trans. only	—	—	—	—	—	—	FA20	FA20	—	—	—	FA20	—	—	—

(Continued)

* Verify that MAF sensor is properly connected.

** If engine idles rough, go to Section 8 and check for intercooler leaks.

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QUICK TEST STEP: Diagnosis By Symptom | 9.0

9.0 PASSENGER CAR DIAGNOSIS BY SYMPTOM

Symptom	Pinpoint Test Step Direction														
	1.9L EFI	1.9L CFI	1.9L MA SEFI	2.3L OHC EFI	2.3L MA EFI	2.3L HSC EFI	2.5L CFI	2.9L EFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
Shift indicator light always On or Off	KL1	KL1	KL1	—	—	KL1	KL1	—	—	—	—	—	KL1	—	KL1
"CHECK ENGINE" or "SERVICE ENGINE SOON" light always on	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1	ML1
"CHECK ENGINE" or "SERVICE ENGINE SOON" light never on	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5	ML5
"CHECK ENGINE"/ "CHECK DCL" Message On	—	—	—	—	—	—	—	—	—	—	ML25	—	—	—	—
"CHECK ENGINE" Message On	—	—	—	—	—	—	—	—	—	—	ML20	—	—	—	—
"CHECK ENGINE" or "SERVICE ENGINE SOON" light on intermittently	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10	ML10
"CHECK ENGINE" or "SERVICE ENGINE SOON" light flashing with erratic idle	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15	ML15
Lack of power at wide open throttle	—	—	—	—	—	—	—	—	—	KT6	—	—	—	—	—
Lack of cruise control and decel stalls	—	—	—	—	—	—	DP1	—	—	—	—	—	—	—	—
Vehicle tachometer not operating	—	—	—	—	—	—	—	—	—	N3	—	—	N3	—	—
Transmission will not shift into overdrive	—	—	—	—	TB1[1]	—	TB1[1]	—	—	—	—	—	—	—	—
No transmission lock-up. Cruise rpm slightly higher than normal (about 300 rpm)	—	—	—	—	TB[2]	—	TB1[2]	—	—	—	—	—	—	—	—

(Continued)

[1] Use Code 86 Diagnosis

[2] Use Code 89 Diagnosis

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QUICK TEST STEP: Diagnosis By Symptom | 9.0

9.0 PASSENGER CAR DIAGNOSIS BY SYMPTOM

Symptom	Pinpoint Test Step Direction														
	1.9L EFI	1.9L CFI	1.9L MA SEFI	2.3L OHC EFI	2.3L MA EFI	2.3L HSC EFI	2.5L CFI	2.9L EFI	3.0L EFI	3.0L SHO SEFI	3.8L AXOD SEFI	3.8L RWD SEFI	3.8L SC SEFI	5.0L SEFI	5.0L MA SEFI
Stumble after hot restart	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20	H20
Engine will not restart	—	QE1	—	—	—	—	QE1	—	—	—	—	—	—	—	—
Fuel pump runs with engine off	—	—	—	J22	—	—	X14	J22	X14	X14	—	—	J22	J22	—
Gasoline fumes under hood	KD1	KD1	—	—	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1	KD1
Black Exhaust Smoke	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29	H29
Spark knock	KA1 or SEC. 6	—	KP1	DG1 or SEC. 6	DG1 or SEC. 6	—	—	KH3	DG1 or SEC. 6	KP1	—	—	KP1	—	—
No engine cooling fan	—	—	KF10	—	—	—	X40 MTX ONLY	—	—	X40	—	—	—	—	—
Low speed cooling fan does not operate High speed cooling fan does not operate Low or high speed cooling fan does not operate	—	—	KF10	—	—	—	X19 CLC ONLY	—	X19	—	X19	—	X19	—	—
Low or high speed cooling fan always on	—	—	KF25	—	—	—	X35	—	X35	X35	X35	—	X38	—	—
High Boost Pressure	—	—	—	—	—	—	—	—	—	—	—	—	KS6	—	—

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QUICK TEST STEP: Diagnosis By Symptom | 9.0

9.0 LIGHT TRUCK DIAGNOSIS BY SYMPTOM

Symptom	Pinpoint Test Step Direction								
	2.3L EFI	2.9L EFI	3.0L EFI	4.0L MA EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
Engine runs rough or misses Surges Lack of power Rough idle Erratic rpm	S2	S2*	S2	S2*	S2	S2	S2	—	S2
Engine Stalls Stalls in Self-Test	S1	S1	S1	S1	S1	S1	S1	—	S1
Stall during parking maneuvers	FF3	FF3	FF3	—	FF3	FF3	—	—	—
A/C Compressor runs continuously	KM35	—	—	—	FA18	—	—	—	—
Surges with A/C on at idle	KM30	—	—	—	—	—	—	—	—
A/C does not cut off under WOT conditions	KM15	KM15	KM15	—	—	—	—	—	—
A/C not functioning	KM1	KM1	KM1	KM1	FA17	FA17	FA17	FA17	FA17
Low idle with A/C On	FA11	FA11	FA11	FA11	FA11	FA11	FA11	—	FA11
"CHECK ENGINE" or "SERVICE ENGINE SOON" light always on	ML1	ML1	ML1	ML1	ML1	ML1	ML1	—	ML1
"CHECK ENGINE" or "SERVICE ENGINE SOON" light never on	ML5	ML5	ML5	ML5	ML5	ML5	ML5	—	ML5
"CHECK ENGINE" or "SERVICE ENGINE SOON" light on intermittently	ML10	ML10	ML10	ML10	ML10	ML10	ML10	—	ML10
"CHECK ENGINE" or "SERVICE ENGINE SOON" light flashing with erratic idle	ML15	ML15	ML15	ML15	ML15	ML15	ML15	—	ML15
Stumble after hot restart	H20	H20	H20	H20	H20	H20	H20	—	H20

(Continued)

* Verify that MAF sensor is properly connected.

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QUICK TEST STEP: Diagnosis By Symptom | 9.0

9.0 LIGHT TRUCK DIAGNOSIS BY SYMPTOM

Symptom	Pinpoint Test Step Direction								
	2.3L EFI	2.9L EFI	3.0L EFI	4.0L MA EFI	4.9L EFI	5.0L EFI	5.8L EFI	7.3L DIESEL	7.5L EFI
Fuel pump runs with engine off	J22	—	—	—	—	—	—	—	—
Gasoline fumes under hood	—	—	KD1	KD1	KD1	—	DK1	—	KD1
Exhaust Order Black Smoke	H29	H29	H29	H29	H29	H29	H29	—	H29
Spark knock	SEC. 6 or KP1	—	—	—	DG1 or SEC. 6	DG1 or SEC. 6	—	—	—
Poor idle quality Rolling idle Shifts harshly Poor fuel economy	—	—	DP1	—	—	—	—	DJ1	—
High idle A/C not functioning	—	—	—	—	FA15	FA15	—	—	FA15
Overdrive Cancel Indicator (OCI) light always off (E4OD only)	—	—	—	—	TC13	—	TC13	TC13	TC13
Hard to Start (cold)	N25	—	—	—	—	—	—	—	—
Tachometer Inoperative (Vehicles with Tachometer)	—	—	—	—	—	—	—	DJ1	—
4 x 4 Low Indicator Light Always Off (always on with sluggish shift) — E4OD Only	—	—	—	—	TC11	—	TC11	TC11	TC11
Tachometer indicates a low vehicle rpm	—	—	—	—	—	—	—	DJ1	—

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APPENDIX: Visual Check

SPECIAL NOTES:

- Correct results of the QUICK TEST are dependent on the proper operation of related non-EEC-IV components.
- It may be necessary to disconnect or disassemble harness connector assemblies to do some of the inspections. Pin locations should be noted before disassembly.

VISUAL CHECK

1. Inspect the air cleaner and inlet ducting.
2. Check all engine vacuum hoses for damage, leaks, cracks, blockage, proper routing, etc.
3. Check EEC-IV system wiring harness for proper connections, bent or broken pins, corrosion, loose wires, proper routing, etc.
4. Check the processor, sensors and actuators for physical damage.
5. Check the engine coolant for proper level.
6. Check the transmission fluid level and quality.
7. Make all necessary repairs before continuing with QUICK TEST.

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APPENDIX: Vehicle Preparation and Equipment Hookup

SPECIAL NOTES:

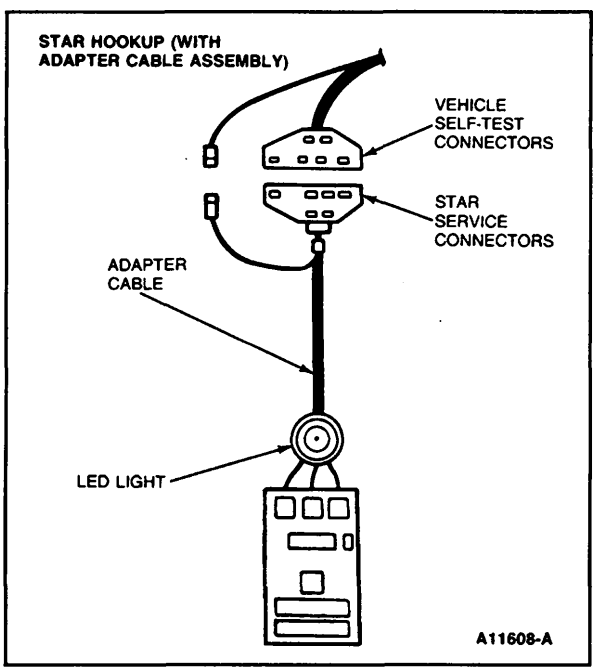
- Refer to the illustrations for Self-Test connector pin orientation and VOM and STAR hookup.
- After the equipment is properly hooked up, proceed to Quick Test Step 3.0 .

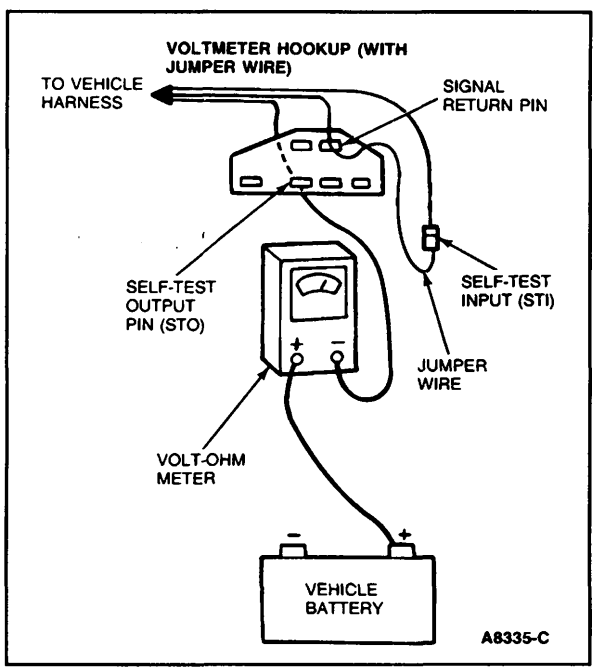
VEHICLE PREPARATION

1. Perform **ALL** safety steps required to start and run vehicle tests - apply parking brake, place shift lever firmly into PARK position (NEUTRAL on manual transmission), block drive wheels, etc.
2. Turn off **ALL** electrical loads — radios, lights, A/C-heater blower fans, etc.

USING THE STAR TESTER

1. Turn the ignition key off.
2. Connect the color coded adapter cable to the STAR tester.
3. Connect the adapter cable leads to the proper Self-Test connectors.
4. Connect the timing light.





USING AN ANALOG VOLT/OHM METER (VOM)

1. Turn the ignition key off.
2. Set the VOM on a DC voltage range to read from 0 to 15 volts.
3. Connect the VOM from the battery positive post to the Self-Test Output pin of the large Self-Test connector.
4. Connect the timing light.

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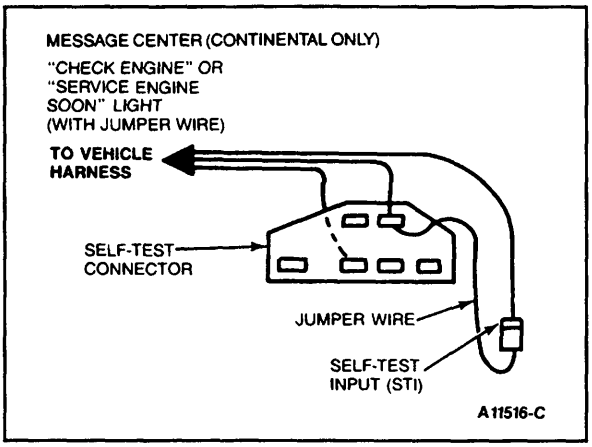
APPENDIX: Vehicle Preparation and Equipment Hookup

USING THE "CHECK ENGINE" or "SERVICE ENGINE SOON" LIGHT (MIL)

No special equipment hookup is required.

USING THE MESSAGE CENTER ON CONTINENTAL APPLICATIONS ONLY

No special equipment hookup is required.



USING THE OVERDRIVE CANCEL INDICATOR LIGHT (OCIL)/TRANSMISSION MALFUNCTION INDICATOR LIGHT (TMIL) ON 7.3L DIESEL ENGINES ONLY

No special equipment hookup is required.

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APPENDIX: Key On Engine Off Self-Test

PERFORMING THE KEY ON ENGINE OFF SELF-TEST

SPECIAL NOTES:

- It may be necessary to service non-EEC-IV faults before running Quick Test. Refer to Section 2.
- Continuous Memory Codes recorded in this step will be used for diagnosis in Step [5.0] after a PASS code 11 is received in both the Key On Engine Off and the Engine Running Self-Tests.
- Deviation from this procedure may cause the output of false codes.
- Refer to Quick Test Appendix for further information on how to read code output.
- On all vehicles equipped with a **4.9L ENGINE**, the clutch must be depressed during the Key On Engine Off Self-Test.
- On all vehicles equipped with a **7.3L DIESEL ENGINE**, the throttle must be depressed (WOT) during the entire Key On Engine Off Self-Test.

HOW TO RUN THE KEY ON ENGINE OFF SELF-TEST

[DO]

- Verify that the vehicle has been properly prepared according to **QUICK TEST STEPS** [1.0] and [2.0].
- Start engine and run until at operating temperature.
- Turn engine off and wait 10 seconds.
- Activate Self-Test.
  - — STAR Tester: Latch the center button in the down position.
  - — Analog VOM: Jumper STI to SIG RTN at the Self-Test connectors.
  - — "CHECK ENGINE" or "SERVICE ENGINE SOON" Light (MIL): Jumper STI to SIG RTN at the Self-Test connectors. Service Codes will be flashed on the "Check Engine" or "SERVICE ENGINE SOON" Light.
  - — Message Center (Continental Applications Only): Refer to Appendix: Self-Test.
- Place ignition key in the ON position.
- For 7.3L Diesel vehicles only, depress the throttle.
- Record all service codes displayed.

[DON'T]

- Depress throttle during Key On Engine Off Self-Test on gasoline engine applications.

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APPENDIX: Engine Running Self-Test

PERFORMING THE ENGINE RUNNING SELF TEST

SPECIAL NOTES:

- If the engine starts but stalls, or stalls during Self-Test, Go to Pinpoint Test Step [S1].
- On vehicles equipped with the Brake On/Off Switch (BOO), the brake pedal MUST be depressed and released AFTER the ID code.
- On vehicles equipped with the Power Steering Pressure Switch (PSPS), within 1 to 2 seconds after the ID code, the steering wheel must be turned at least one-half turn and released.
- On vehicles equipped with E4OD transmission, the Overdrive Cancel Switch (OCS) must be cycled after the ID code.
- The Dynamic Response code is a single pulse (or a 10 code on the STAR Tester) that occurs 6-20 seconds after the engine running identification code. (See APPENDIX: Code Output Format.)
- When the Dynamic Response code occurs, perform a brief wide-open throttle.

HOW TO RUN THE ENGINE RUNNING SELF-TEST

DO

- Deactivate Self-Test.
- Start and run engine at 2,000 rpm for two minutes. This action warms up the EGO sensor.
- Turn engine off, wait 10 seconds.
- Activate Self-Test.
- Start engine.
- After the ID code, depress and release the brake pedal if appropriate. See Special Note above.
- After the ID code, within 1 to 2 seconds, turn the steering wheel at least one-half turn and then release it, if appropriate. See Special Note above.
- If a Dynamic Response Code occurs, perform a brief wide-open throttle (WOT).
- Record all service codes displayed.

DON'T

- Depress the throttle unless a Dynamic Response Code is displayed.

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APPENDIX: Continuous Memory Self-Test

CONTINUOUS MEMORY CODES

SPECIAL NOTES:

- If Continuous Memory is a PASS Code 11 and a symptom is present, GO to Quick Test Step [9.0].

DETERMINING THE CONTINUOUS MEMORY CODES TO BE SERVICED

- Refer to the Continuous Memory Codes recorded in Quick Test Step [3.0].
- The cause of some of the Continuous Memory Codes may have been eliminated during either Key On Engine Off or Engine Running Self-Test service. To address the remaining Continuous Memory codes, go to Quick Test Step [8.0]. If none, clear Continuous Memory.

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APPENDIX: Self-Test Description

The Self-Test is divided into three specialized tests: Key On Engine Off Self-Test, Engine Running Self-Test, and Continuous Self-Test. The Self-Test is not a conclusive test by itself, but is used as a part of the functional Quick-Test diagnostic procedure. The processor stores the Self-Test program in its permanent memory. When activated, it checks the EEC-IV system by testing its memory integrity and processing capability, and verifies that various sensors and actuators are connected and operating properly.

The Key On Engine Off and Engine Running Self-Tests are functional tests which only detect faults present at the time of the Self-Test. Continuous Self-Test is an ongoing test that stores fault information for retrieval at a later time.

KEY ON ENGINE OFF SELF-TEST

At this time, a test of the EEC-IV system is conducted with power applied and engine at rest.

For Self-Test to detect errors in the Key On Engine Off Self-Test mode, the fault must be present at the time of testing. For intermittents, refer to Continuous Memory Codes.

SEPARATOR PULSE

A single 1/2 second separator pulse is issued 6-9 seconds after the last Key On Engine Off Test code. Then, 6-9 seconds after the single 1/2 second separator pulse, the Continuous Memory Codes will be issued.

CONTINUOUS MEMORY CODES

Continuous Memory Codes are issued as a result of information stored during continuous Self-Test, while the vehicle was in normal operation. These codes are displayed only during Key On Engine Off testing and after the separator code.

NOTE: The separator code and Continuous Memory Codes follow Key On Engine Off Testing codes ONLY.

ENGINE RUNNING SELF-TEST

At this time, a test of the EEC-IV system is conducted with the engine running. The sensors are checked under actual operating conditions and at normal operating temperatures. The actuators are exercised and checked for expected results.

ENGINE IDENTIFICATION CODES (ID CODES)

Engine ID codes are issued at the beginning of the Engine Running Self-Test and are one-digit numbers represented by the number of pulses sent out. For gasoline engines, the engine ID code is equal to one-half the number of engine cylinders (i.e. 2 pulses = 4 cylinders). For the 7.3L Diesel engine, the ID code = 5. These codes are used to verify the proper processor is installed and that the Self-Test has been entered.

DYNAMIC RESPONSE CHECK

The dynamic response check verifies the movement of the TP, VAF, MAF and MAP sensors during the brief Wide-Open Throttle (WOT) performed during the Engine Running Self-Test. The signal for the operator to perform the brief WOT is a single pulse or 10 code on the STAR Tester.

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APPENDIX: Self-Test Description

POWER STEERING PRESSURE SWITCH TEST

On vehicles equipped with Power Steering Pressure Switch (PSPS), the steering wheel must be turned one-half turn and released AFTER the ID Code has been displayed. This tests the ability of the EEC-IV system to detect a change of state in the Power Steering Pressure Switch.

BRAKE ON/OFF SWITCH TEST

On vehicles equipped with Brake ON/OFF Switch (BOO), the brake pedal MUST be depressed and released AFTER the ID Code has been displayed. This tests the ability of the EEC-IV system to detect a change of state in the Brake ON/OFF Switch.

OVERDRIVE CANCEL SWITCH TEST

On vehicles equipped with Overdrive Cancel Switch (OCS), the switch must be cycled after the ID code has been displayed. This tests the ability of the EEC-IV system to detect a change of state in the Overdrive Cancel Switch.

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APPENDIX: Code Output Format

SERVICE CODES

The EEC-IV system communicates service information through the Self-Test service codes. These service codes are two-digit numbers representing the results of Self-Test.

The service codes are transmitted on the Self-Test output (STO) line found in the vehicle Self-Test connector. They are in the form of timed pulses, and are read by the technician on a voltmeter, STAR tester, "CHECK ENGINE" or "SERVICE ENGINE SOON" Light (MIL) or on the Continental message center.

SELF-TEST OUTPUT CODE FORMAT KEY ON ENGINE OFF AND CONTINUOUS MEMORY CODES

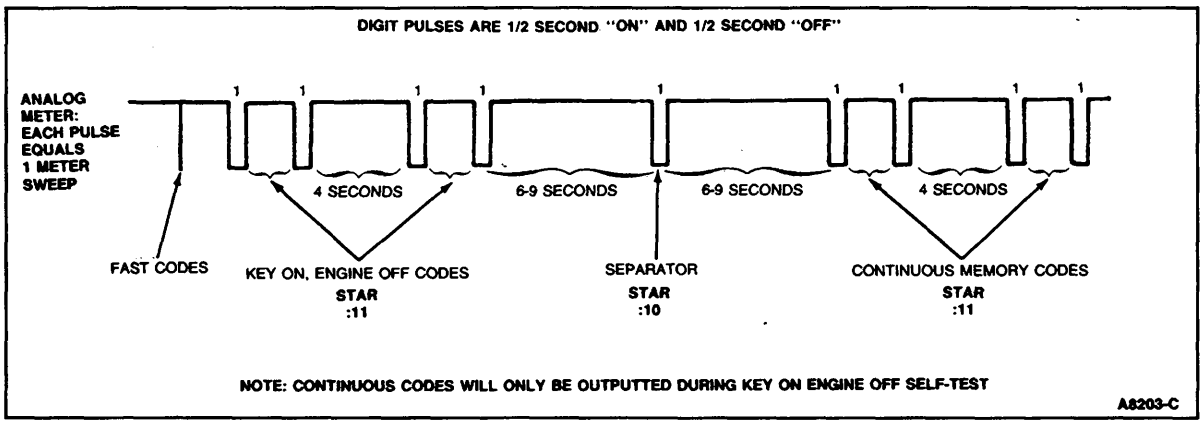


Figure 1 Key On Engine Off and Continuous Memory Code Format

SELF-TEST OUTPUT CODE FORMAT ENGINE RUNNING CODES

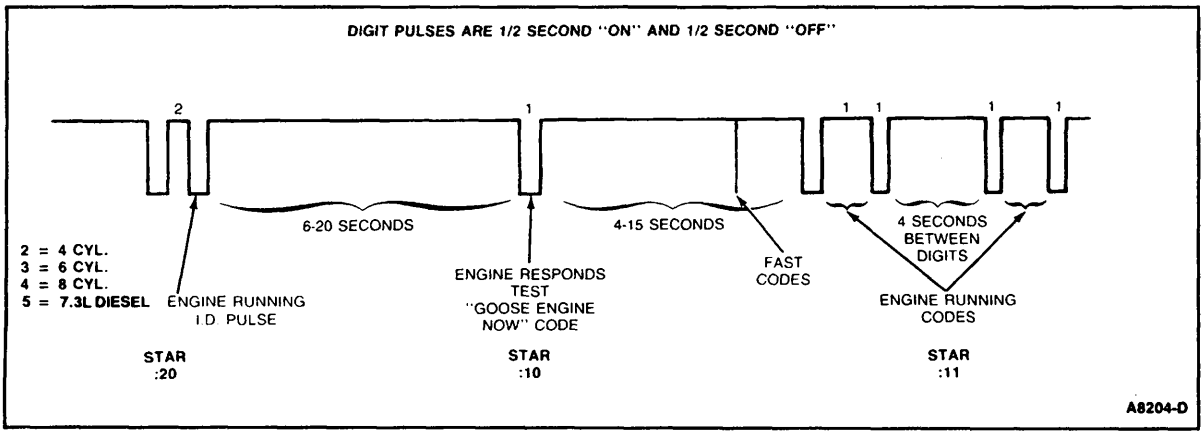


Figure 2 Engine Running Self-Test Code Format

Fast Codes

Fast codes are issued prior to regular service codes. These codes contain the identical information as the regular service codes but are transmitted at 100 times the normal rate. These codes are interpreted by special equipment at the end of the assembly line by the Body and Assembly Division.

Some meters in service detect these codes as a short burst of information (slight meter deflection).

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APPENDIX: Continuous Self-Test

The Continuous Memory service codes are separated from the Quick Test Key On Engine Off codes by a single separator pulse, Figure 3.

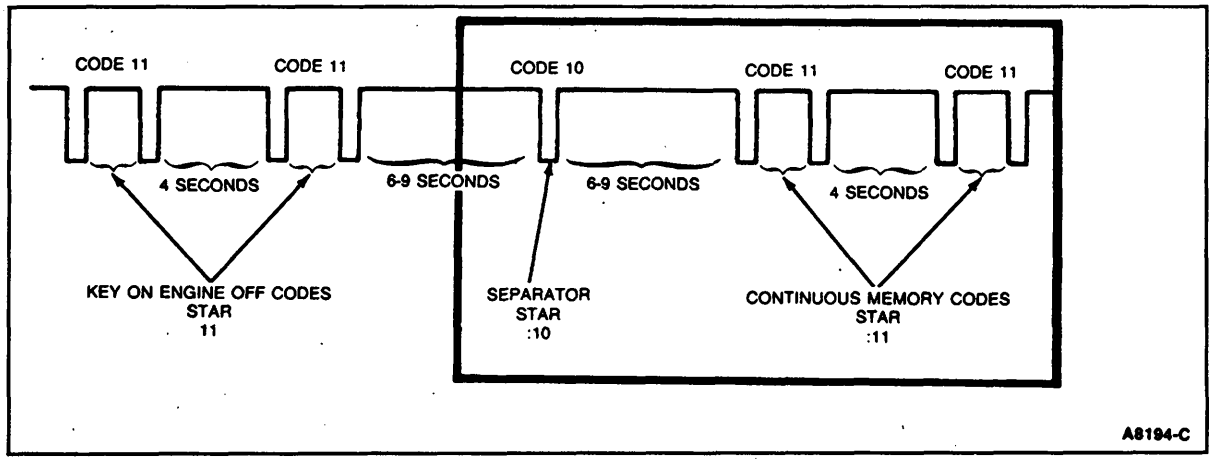


Figure 3 Continuous Memory Code Format

During this mode of testing the EEC-IV Processor continuously monitors inputs for opens and shorts. The Continuous Memory Codes must be retrieved within* 40 engine temperature warm up cycles. On the 41st or 81st Engine Temperature cycle, the service code will be automatically erased. The Continuous Memory Codes can also be erased by deactivating Self-Test while the service codes are being outputted.

* 80 engine temperature warm up cycles for some applications.

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APPENDIX: Self-Test With STAR Tester

READING CODES — SELF-TEST AUTOMATIC READOUT (STAR) TESTER

After hooking up the STAR tester and turning on its power switch, the tester will run a display check and the numerals 88 will begin to flash in the display window (Figure 4). A steady 00 will then appear to signify that the STAR tester is ready to start the Self-Test and receive the test's service codes.

To receive the service codes, press the push button at the front of the STAR tester. The button will latch down, and a colon will appear in the display window in front of the 00 numerals. The colon **must** be displayed to receive the service codes.

If, for any reason, the technician wishes to clear the display window during the Self-Test, he must turn off the vehicle's engine, press the tester's push button once to unlatch it (colon will disappear), then press the button again to latch down the button (colon will appear again).

The STAR tester will display the last service code received, even after disconnecting it from the vehicle. It will hold the service code on the display until the power is turned off or the push button is unlatched and relatched.

For a detailed description of the STAR tester and the variety of tests that can be run, refer to the instruction manual provided with the tester.

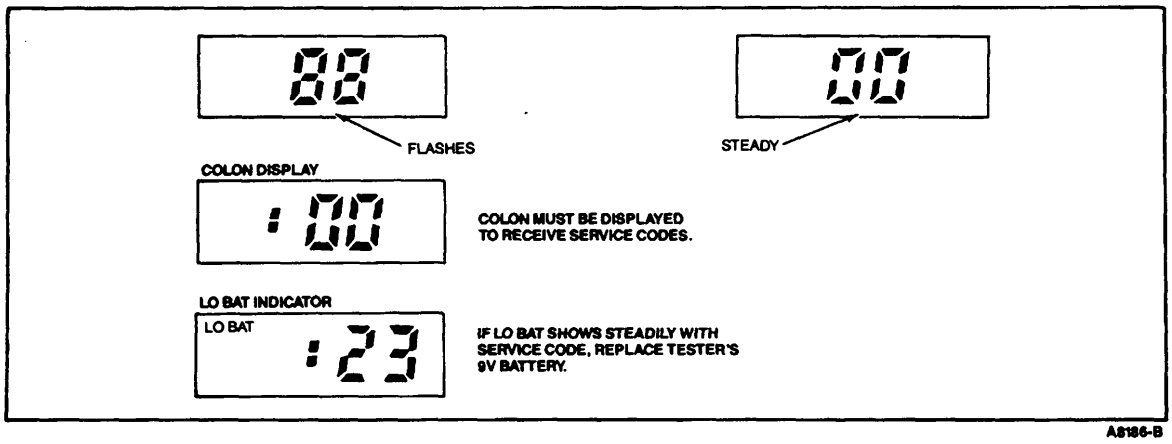


Figure 4 Star Tester Output Code Format

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APPENDIX: Self-Test With SUPER STAR II Tester

The SUPER STAR II Tester can read fast codes as well as slow codes, and can be used on Ford EEC-IV as well as MCU and MECS systems. A built-in Self-Test memory will retain the codes as they are received. The SUPER STAR II tester also contains a beeper for running the wiggle tests.

After hooking up the SUPER STAR II tester and turning it on, the SUPER STAR II will briefly display 888. It will also light all the prompts on the left side of the display and the speaker will beep. When the tester is ready, both the STI-LO and STO-LO will be on, but the readout will be blank if the vehicle key is off.

Key On Engine Off (KOEO) Self-Test

1. Plug in both connectors of the tester to the mating connectors of the vehicle.
2. Determine the type of system you have (EEC-IV or MECS) and set the switch to the proper type.
3. Select fast code mode or slow code mode with the mode selector switch.
4. Turn on the power to the tester.
5. Depress the test button on the tester to the test position.
6. Turn on the vehicle ignition key.

The tester will now read any Self-Test codes in this mode.

Key On Engine Running (KOER) Self-Test

1. Start and warm up the engine until it is at a normal running temperature.
2. Turn the engine off.
3. Depress the test button to the test position, then restart the engine.

The tester will now display an engine I.D. code, and on certain vehicles, a Dynamic Response code. Then, service codes will be displayed.

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APPENDIX: Self-Test With SUPER STAR II Tester

For a detailed description of the variety of tests that can be run with the SUPER STAR II, refer to the instruction manual provided with the tester.

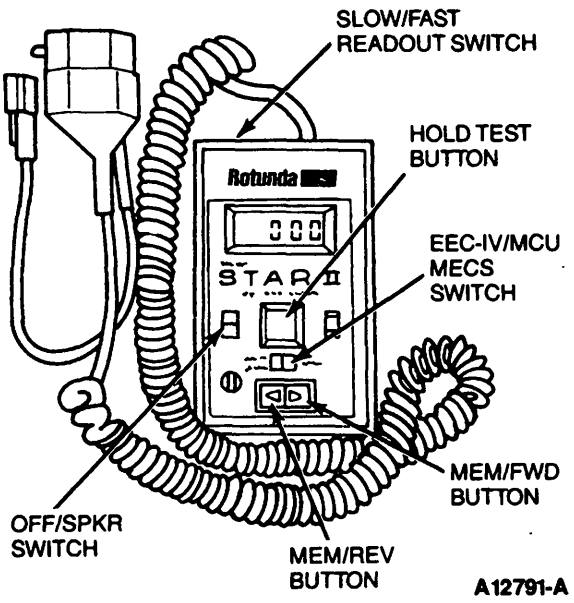


Figure 5 SUPER STAR II Tester

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APPENDIX: Self-Test With Analog Voltmeter

READING CODES — ANALOG VOLTMETER

When a service code is reported on the analog voltmeter for a function test, it will represent itself as a pulsing or sweeping movement of the voltmeter's needle across the dial face of the voltmeter (Figure 6). Therefore, a single-digit number of three will be reported by three needle pulses (sweeps). However, as previously stated, a service code is represented by a two-digit number, such as 2-3. As a result, the Self-Tests service code of 2-3 will appear on the voltmeter as two needle pulses (sweeps), then, after a two-second pause, the needle will pulse (sweep) three times.

The Continuous Memory Codes are separated from the Key On Engine Off codes by a six-second delay, a single half-second sweep, and another six-second delay. They are produced on the voltmeter in the same manner as the Key On Engine Off codes.

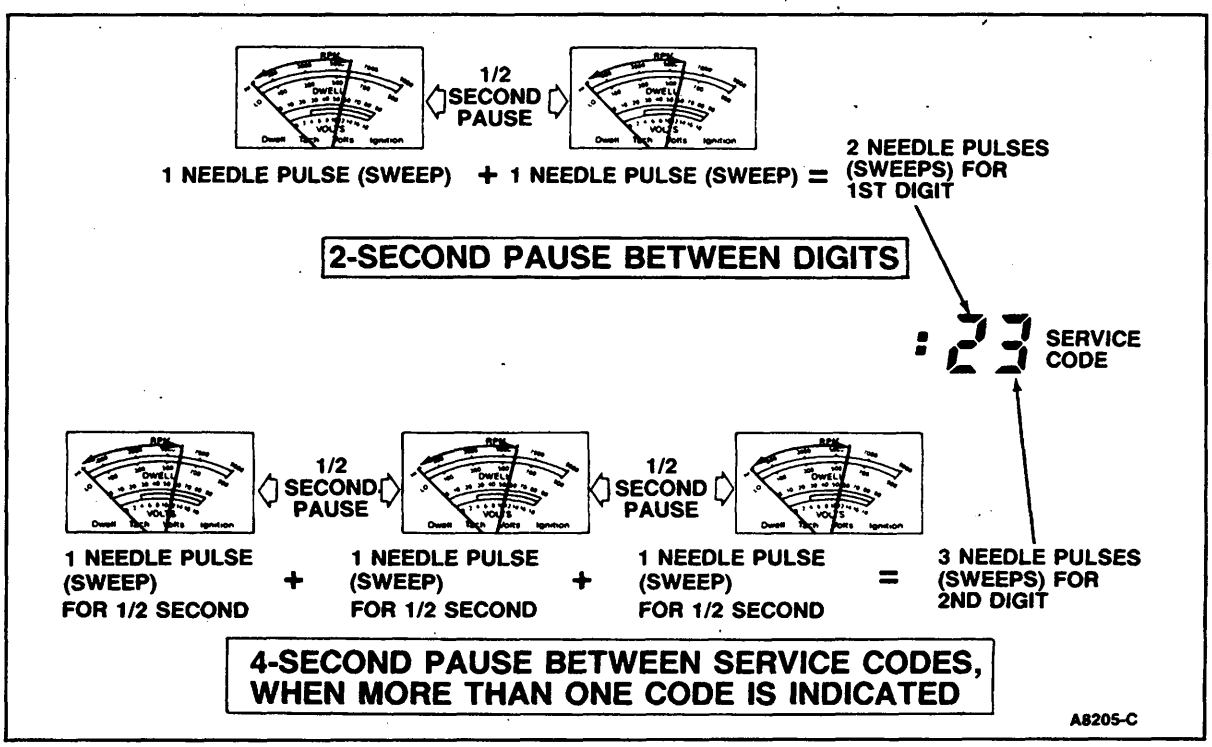


Figure 6 Analog Voltmeter Output Code Format

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APPENDIX: Self-Test With "CHECK ENGINE" or "SERVICE ENGINE SOON" Light (MIL)

READING CODES — "CHECK ENGINE" or "SERVICE ENGINE SOON" LIGHT (MIL)

During Self-Test a service code is reported by the "CHECK ENGINE" or "SERVICE ENGINE SOON" Light. It will represent itself as a flash on the "CHECK ENGINE" or "SERVICE ENGINE SOON" Light display on the dash panel (Figure 7). A single-digit number of three will be reported by three flashes.

However, as previously stated, a service code is represented by a two-digit number, such as 2-3. As a result, the Self-Test service code of 2-3 will appear on the "CHECK ENGINE" or "SERVICE ENGINE SOON" Light display as two flashes, then, after a two-second pause, the light will flash three times.

The Continuous Memory Codes are separated from the Key On Engine Off codes by a six-second delay, a single half-second flash, and another six-second delay. They are produced on the "CHECK ENGINE" or "SERVICE ENGINE SOON" Light display in the same manner as the Key On Engine Off codes.

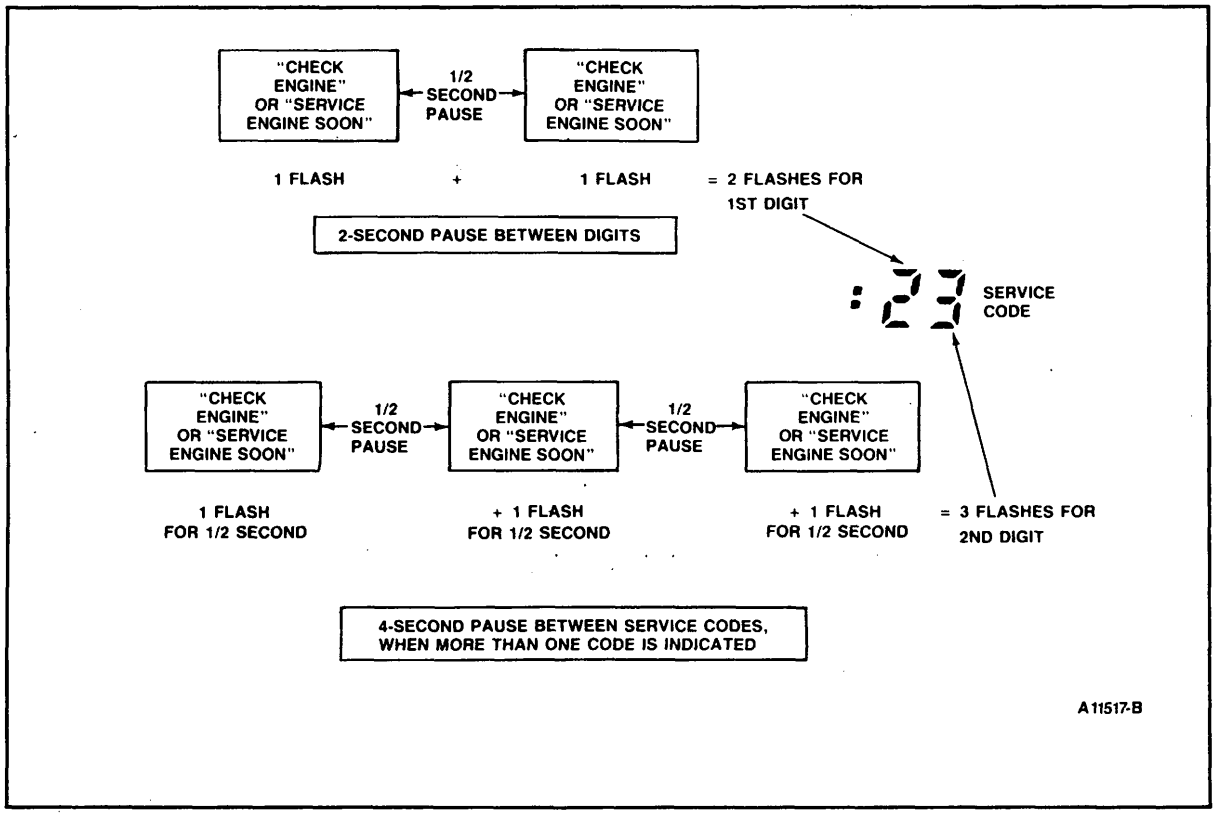


Figure 7 "CHECK ENGINE" or "SERVICE ENGINE SOON" Light Output Code Format

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APPENDIX: Self-Test With Message Center (Continental Only)

HOW TO RUN SELF-TEST USING THE CONTINENTAL MESSAGE CENTER

1. On the Electronic Instrument Cluster, hold in all three buttons (SELECT, RESET and SYSTEM CHECK) at the same time.

2a. Key On Engine Off Self-Test

- While holding in all three buttons, place ignition switch in the ON position. Release buttons.

3. Engine Running Self-Test

- While holding in all three buttons, start engine. Release buttons.

4. Press the SELECT button three times.

5. To initiate Self-Test, jumper STI to SIG RTN at the Self-Test connectors, or use a STAR Tester and latch the center button in the down position.

— Key On Engine Off

- A base readout of 4255 indicates that Self-Test has been entered successfully.

— Engine Running

- A base readout of 4030 indicates the engine ID code (one-half the number of engine cylinders, i.e., 30 → 6 cylinders) and that Self-Test has been entered successfully.

6. Service code output will be the right three digits displayed (e.g. PASS code readout: 4011).

7. To exit Self-Test, turn ignition switch to OFF and remove jumper or unlatch STAR Tester.

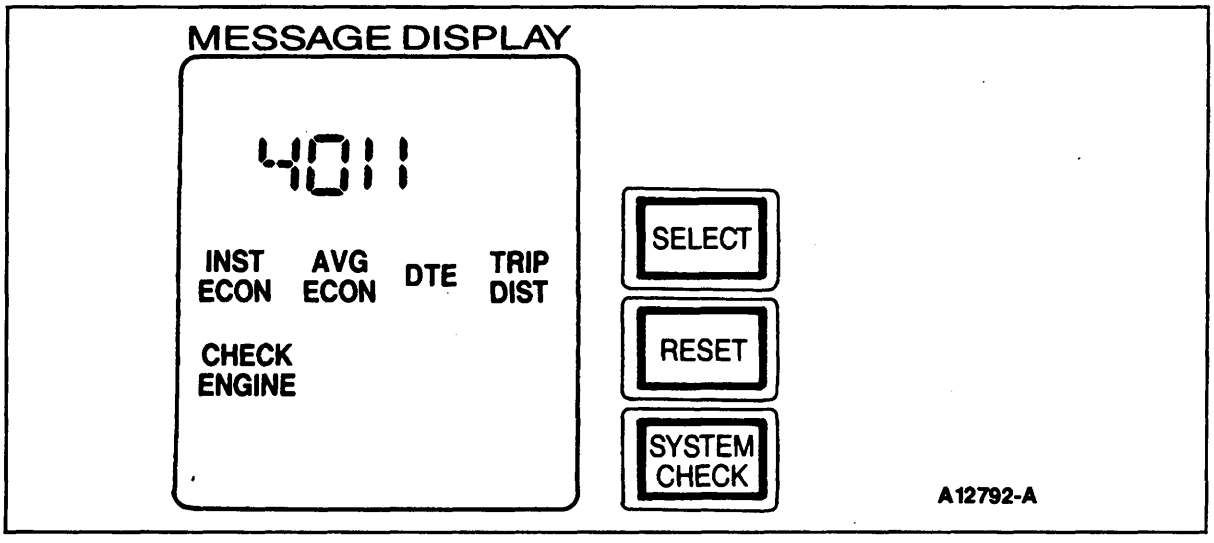


Figure 8 Message Center in Self-Test Mode

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APPENDIX: Self-Test With Overdrive Cancel/Transmission Malfunction Indicator Light — OCIL/TMIL

READING CODES — OVERDRIVE CANCEL/TRANSMISSION MALFUNCTION INDICATOR LIGHT (OCIL/TMIL)

The OCIL/TMIL serves a dual purpose on the 7.3L Diesel vehicle with E40D transmissions.

— The light stays OFF when the Overdrive Cancel Switch (OSC) is toggled once on the instrument panel — indicating that the vehicle can attain the overdrive gear position.

— The light stays ON when the Overdrive Cancel Switch (OSC) is toggled again on the instrument panel — indicating that the vehicle is prevented from shifting into the overdrive gear position.

— If the light flashes, then perform Key On Engine Off Self-Test. A code 99 indicates a fault in the E40D Transmission Electronic Pressure Control (EPC) circuit. **The light under this condition serves as the Transmission Malfunction Indicator Light (TMIL).**

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APPENDIX: Diagnostic Aids

CONTINUOUS MONITOR MODE (WIGGLE TEST)

SPECIAL NOTE:

- The Continuous Monitor Modes allow the technician to **ATTEMPT** to re-create an intermittent fault.

KEY ON ENGINE OFF WIGGLE TEST PROCEDURE

1. Hook up a STAR Tester or VOM as shown in Quick Test Step [2.0].
2. Turn the ignition key to the ON position.
3. Activate, wait 10 seconds, deactivate and reactivate Self-Test.
4. You are now in the Continuous Monitor Mode.
5. Tap, move, and wiggle the suspect sensor and/or harness. When a fault is detected, a Continuous Memory Code will be stored in memory. This will be indicated as follows depending on the type of equipment being used:
   - STAR Tester: Red LED lights and/or continuous tone.
   - "CHECK ENGINE" or "SERVICE ENGINE SOON" Light: Lights
   - VOM: Needle Sweep

ENGINE RUNNING WIGGLE TEST PROCEDURE

1. Hook up a STAR Tester or VOM as shown in Quick Test Step [2.0].
2. Key off, wait 10 seconds.
3. Start the engine.
4. Activate Self-Test, wait 10 seconds, deactivate and reactivate Self-Test. **DO NOT** shut the engine off.
5. You are now in the Engine Running Continuous Monitor Mode.
6. Tap, move, and wiggle the suspect sensor and/or harness. When a fault is detected, a Continuous Memory Code will be stored in memory. This will be indicated as follows depending on the type of equipment being used:
   - STAR Tester: Red LED lights and/or continuous tone.
   - "Check Engine' or "SERVICE ENGINE SOON' Light (MIL): Lights
   - VOM: Needle Sweep

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APPENDIX: Diagnostic Aids

HOW TO CLEAR THE CONTINUOUS MEMORY CODES

NOTE: Do not disconnect battery to clear Continuous Memory Codes. This will erase the Keep Alive Memory (KAM) information which may cause a driveability concern.

1. Run the Key On Engine Off Self-Test according to Quick Test Step 3.0 .
2. When the Service Codes begin to be displayed, deactivate Self-Test:
   - — STAR Tester: Unlatching the center button (up position).
   - — Analog VOM: Remove the jumper wire from between Self-Test Input (STI) connector and the Signal Return Pin of the Self-Test connector.
   - — "CHECK ENGINE" or "SERVICE ENGINE SOON" Light (MIL): Remove the jumper wire from between Self-Test Input (STI) connector and the SIGNAL RETURN pin of the Self-Test connector.
   - — Message Center (Continental Only): Remove the jumper wire from between Self-Test input (STI) connector and the SIGNAL RETURN pin of the Self-Test connector.
3. The Continuous Memory codes will be erased from the processor's memory.

HOW TO CLEAR KEEP ALIVE MEMORY (KAM)

The processor stores information about vehicle operating conditions and uses this information to compensate for component tolerances. When EGR, HEGO, INJECTORS, MAP/BP, TPS or VAF are replaced, Keep Alive Memory (KAM) should be cleared to erase the information stored by the processor from the original component.

To clear KAM: Disconnect the negative side of the battery for a minimum of five minutes.

After KAM has been cleared, the vehicle may exhibit certain driveability concerns. It will be necessary to drive the vehicle 10 miles or more to allow the processor to relearn values for optimum driveability and performance. (Distance is dependent on the vehicle application.)

OUTPUT STATE CHECK

The output state check aids in servicing output actuators associated with the EEC-IV system. It enables the technician to energize and de-energize most of the system output actuators on command. This mode is entered after all codes have been received from Key On Engine Off and Continuous Testing. At this time, leave Self-Test activated and depress the throttle. Each time the throttle is depressed the output actuators will change state from energized to de-energized or from de-energized to energized.

1. Enter Self-Test.
2. Code Output Ends.
3. Do Brief WOT.
4. EEC-IV Output To Actuators Energized.
5. Do Brief WOT.
6. EEC-IV Output To Actuators De-Energized.

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APPENDIX: Diagnostic Aids

CYLINDER BALANCE TEST — SEFI ENGINES

The purpose of the cylinder balance test is to assist the mechanic in finding a weak or non-contributing cylinder. The test is entered by depressing and releasing the throttle within two minutes after the Engine Running Self-Test codes have been output.

Once the test is entered, the idle speed control duty is fixed and the engine is allowed to stabilize. Engine rpm is measured and stored for later use. Next, the fuel is shut off to cylinder number 4, 6 or 8, depending on engine. After a brief stabilization period the engine rpm is again measured and stored. The injector is turned on again and the process is repeated for each of the injectors down to one. At this point, the maximum rpm drop that occurred is selected from the table of rpm drops for each cylinder. This maximum rpm drop is now multiplied by a calibratable percentage. The resulting number (rpm) is now used as the minimum rpm that each cylinder must have dropped to pass this test.

Example: 150 rpm x 65% = 98 rpm

If all cylinders drop at least this amount, then a code 90 is output indicating a pass. No further testing is necessary. If a cylinder did not drop at least this amount, then the cylinder number would be output. For example, 30 for cylinder number 3. This indicates that cylinder number 3 is either weak or non-contributing.

The test can now be repeated a second time if the throttle is depressed and released within two minutes of the last code output. This time the maximum rpm drop that occurs is multiplied by a lower percentage. This number is now used as the minimum rpm drop for each cylinder to pass this test.

Example: 150 rpm x 43% = 65 rpm

If all the rpm drops are greater than 65 rpm, then a code 90 is output. If cylinder number 3 had failed the first level and passed the second, then cylinder number 3 is considered to be weak. If cylinder number 3 again failed, the code 30 would be output again.

The test can be repeated a third time by depressing and releasing the throttle within two minutes of the last code output. This time the maximum rpm drop that results is multiplied by a still lower percentage. This number is now used as the minimum rpm drop for each cylinder to pass this test.

Example: 150 rpm x 20% = 30 rpm

If all the rpm drops are greater than 30 rpm then a code 90 is output. If cylinder number 3 had failed the first and second level, but passed the third, then it is considered to be a very weak cylinder. If cylinder number 3 failed the third level then a code 30 would again be output. In this case, cylinder number three would be considered a non-contributing cylinder.

(Continued)

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APPENDIX: Diagnostic Aids

The Cylinder Balance Test may still be repeated as many times as desired by depressing and releasing the throttle within two minutes of the last code output. All further testing (i.e. 4th, 5th pass) will be done using the third level percentage.

POSSIBLE CODE OUTPUTS (code 30 is used as an example only)

X = no further testing necessary

LEVEL 1	LEVEL 2	LEVEL 3	INDICATION	POSSIBLE EEC CAUSES
90	X	X	Indicates a pass, all cylinders contributing equally.	
30	90	X	Indicates a weak cylinder. Cylinder is firing, but not contributing as much as the others.	• Partially clogged injector • Injector/harness resistance out of specification
30	30	90	Same as above, but more severe.	• Same as above, but more severe
30	30	30	Very weak or dead cylinder.	• Open or shorted circuit • Loss of injector drive signal • Fully clogged injector

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APPENDIX: Diagnostic Aids

FAILURE MODE EFFECTS MANAGEMENT (FMEM)

FMEM is an alternate system strategy in the ECA designed to allow improved vehicle drive should one or more sensor inputs fail.

When a sensor input is perceived to be out-of-limits by the ECA, an alternative strategy will be initiated.

The ECA will substitute a fixed in-limit sensor value and will continue to monitor the faulty sensor input. If the faulty sensor operates within limits, the ECA will return to the normal engine running strategy.

Engine Running Service Code 98 will be displayed when FMEM is in effect.

The "CHECK ENGINE" or "SERVICE ENGINE SOON" Light (MIL)/Message will remain on when FMEM is in effect.

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APPENDIX: Diagnostic Aids

"CHECK ENGINE" OR "SERVICE ENGINE SOON" LIGHT (MALFUNCTION INDICATOR LIGHT) ALL APPLICATIONS EXCEPT CONTINENTAL

The "CHECK ENGINE" or "SERVICE ENGINE SOON" light is intended to alert the driver of certain malfunctions in the EEC-IV system. If the light is on, the driver of the vehicle should take the car in for service as soon as possible.

NOTE: It is not necessary to immediately turn the engine off and have the vehicle towed when the "CHECK ENGINE" or "SERVICE ENGINE SOON" light comes on.

The "CHECK ENGINE" or "SERVICE ENGINE SOON" light will come on while the engine is operating in Failure Mode Effects Management (FMEM) or Hardware Limited Operation Strategy (HLOS) modes. The light will stay on as long as the fault causing it is present.

In FMEM mode, the processor is receiving a sensor signal that is outside the limits set by the calibration strategy. In this mode the processor uses an alternate engine control strategy to maintain reasonable vehicle operation in spite of the fault. Following is a list of system faults which will turn on the "CHECK ENGINE" or "SERVICE ENGINE SOON" light in this mode. The error code associated with this fault is stored in Keep Alive Memory (KAM). If the fault is no longer present, the light will turn off and the vehicle will return to the normal vehicle strategy. The error code stored when the light was on is not erased. This code is one of the Continuous Memory codes, and it can be accessed by running the Key On Engine Off Self-Test.

HLOS mode is used when the system fault(s) is too extreme for the FMEM mode to handle. In HLOS mode, all software operations have stopped and the processor is running on hardware control only. The default strategy for this mode has a minimal calibration strictly to allow the vehicle to operate until it can be serviced.

NOTE: In HLOS mode Self-Test codes will not be output.

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APPENDIX: Diagnostic Aids

HOW THE "CHECK ENGINE" OR "SERVICE ENGINE SOON" LIGHT OPERATES

System OK

The "CHECK ENGINE" or "SERVICE ENGINE SOON" light is turned on as a bulb check when the ignition key is first turned on. The EEC-IV processor turns the bulb off as soon as it receives the PIP (cranking) signal.

System Not OK

If the "CHECK ENGINE" or "SERVICE ENGINE SOON" light should remain on after the vehicle has started, run Quick Test and service any codes. If Self-Test has pass codes, the "CHECK ENGINE" or "SERVICE ENGINE SOON" or light is always on and the vehicle has no drive symptoms, go to Quick Test Step 9.0.

If the "CHECK ENGINE" or "SERVICE ENGINE SOON" light never comes on, go to Quick Test Step **9.0**.

If the vehicle is a no start, go to Pinpoint Test Step **A1**.

The following can activate the "CHECK ENGINE" or "SERVICE ENGINE SOON" light:

"CHECK ENGINE" or "SERVICE ENGINE SOON" Light System Fault(s)		Continuous Memory Codes
ECT	Engine Coolant Temperature	51, 61
ACT	Air Charge Temperature	54, 64
BP	Barometric Pressure	22
MAP	Manifold Absolute Pressure	22
VAF	Vane Air Flow	56, 66
MAF	Mass Air Flow	56, 66
EGO, HEGO	Exhaust Gas O_2	41, 42, 91
PFE	Pressure Feedback EGR	31, 35, 33*
EVP	EGR Valve Position	31, 35, 33*
TP	Throttle Position	53, 63
ITS	Idle Tracking Switch	71
IDM (DPDIS)	Ignition Diagnostic Monitor	18, 28, 48, 88
IDM (DIS)	Ignition Diagnostic Monitor	45, 46, 48
VAT	Vane Air Temperature	58, 68
If D.C. motor does not follow dashpot profile		13

* 1990 1/2 5.0L Truck Only

NOTE: When in Self-Test the "CHECK ENGINE" or "SERVICE ENGINE SOON" light is not limited to Continuous Memory Codes and will also flash the service codes.

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APPENDIX: Diagnostic Aids

"CHECK ENGINE"/"CHECK DCL" MESSAGE (DATA COMMUNICATIONS LINK)

Continental Applications Only

The EEC-IV processor transmits the "CHECK ENGINE" message to the message center through the Data Communications Link (DCL). The message center is used to display the "CHECK ENGINE" and/or "CHECK DCL" messages.

HOW THE "CHECK ENGINE" MESSAGE OPERATES

Service Codes: Service codes can be digitally displayed on the message center when running Self-Test. (See Appendix: Self-Test)

The "CHECK ENGINE" message is activated when the EEC-IV processor switches to an alternate strategy of operation. This process is called Failure Mode Effects Management (FMEM). The "CHECK ENGINE" message is intended to alert the driver of certain malfunctions in the engine control system.

FMEM Mode: The "CHECK ENGINE" message is displayed and accompanied by a one second tone every five seconds. The tone is suppressed after one minute.

The "CHECK ENGINE" message will also be activated during an EEC-IV processor Hardware Limited Operating Strategy (HLOS) mode.

HLOS/DCL Failure: The "CHECK ENGINE" message will be displayed as described in FMEM. In addition, the message "CHECK DCL" will also be displayed.

If the "CHECK ENGINE" and/or "CHECK DCL" message should come on after the vehicle has started, RUN Key On Engine Off Self-Test to completion. If the message continues to remain on, go to Quick Test Step **9.0** .

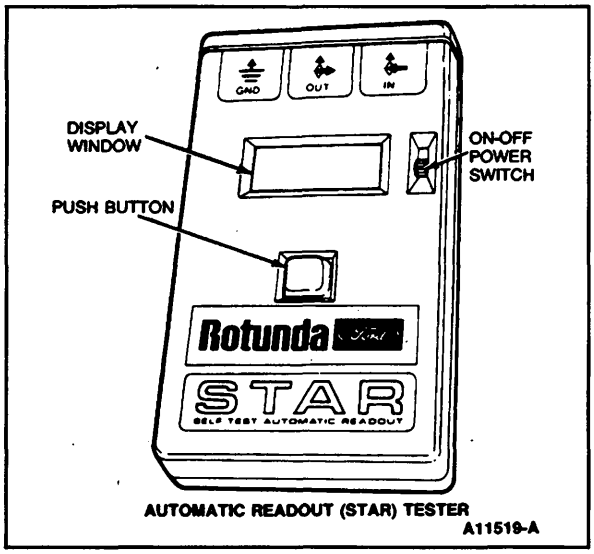
If the vehicle is a no start, go to Pinpoint Test Step **A1** .

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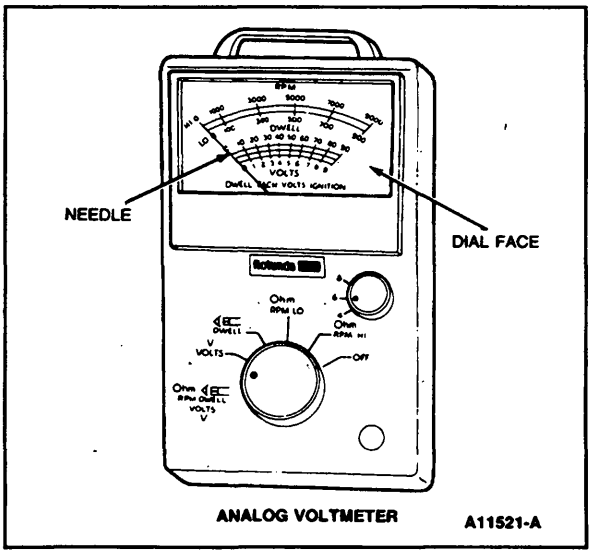
APPENDIX: Test Equipment

EQUIPMENT REQUIRED:

- Self-Test Automatic Readout (STAR), Rotunda No. 007-00004 with cable assembly No. 007-00010. Refer to STAR Tester operation.
- Analog volt-ohmmeter, 0 to 20V DC, (alternate to STAR).

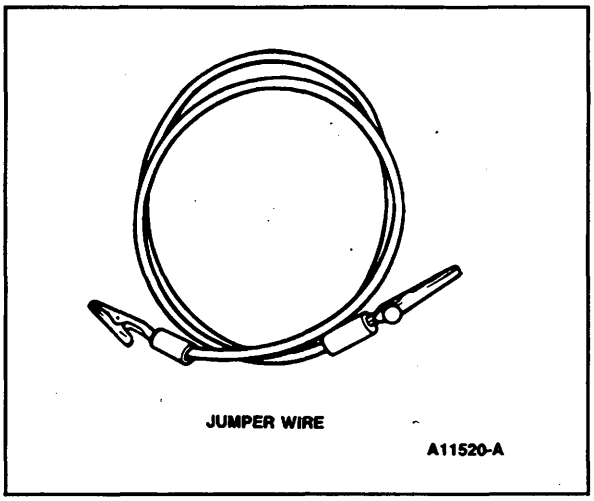


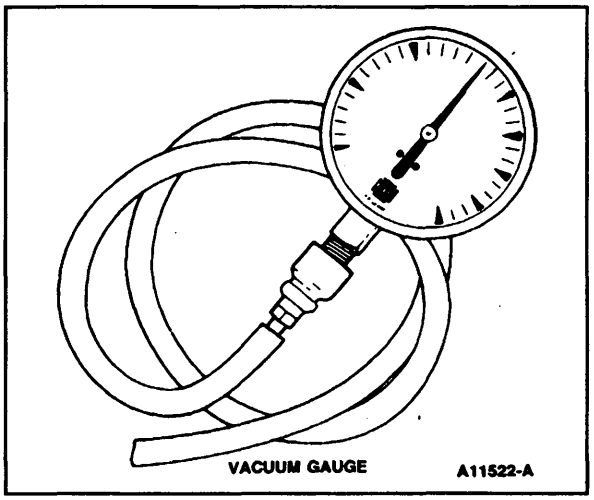
AUTOMATIC READOUT (STAR) TESTER A11519-A



ANALOG VOLTMETER A11521-A

- Jumper wire.
- Vacuum gauge, Rotunda 059-00008 or equivalent. Range 0-30 in-Hg. Resolution 1 in-Hg.

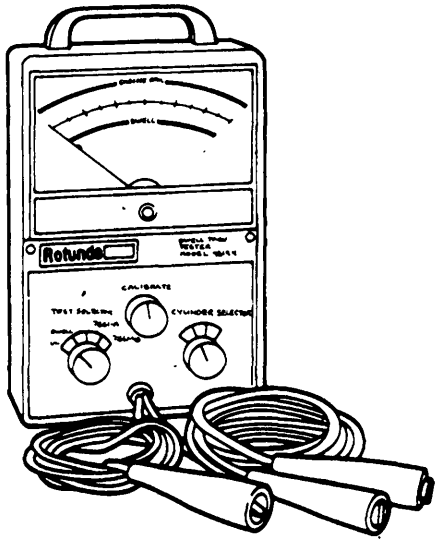

JUMPER WIRE A11520-A


VACUUM GAUGE A11522-A

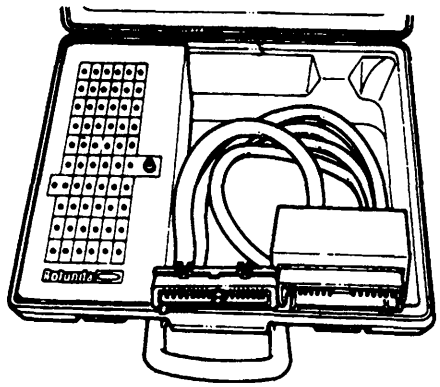
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APPENDIX: Test Equipment (Continued)

- Tachometer, Rotunda No. 059-00010 or equivalent. Range 0-6,000 rpm. Accuracy ± 40 rpm. Resolution 20 rpm.
- Breakout Box, Rotunda 014-00322, Special Service Tool T83L-50-EEC-IV or equivalent.

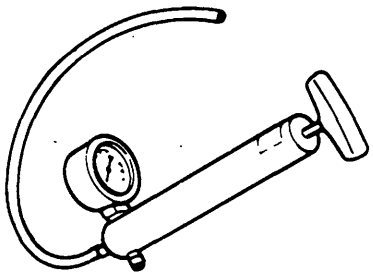


TACHOMETER A11523-A

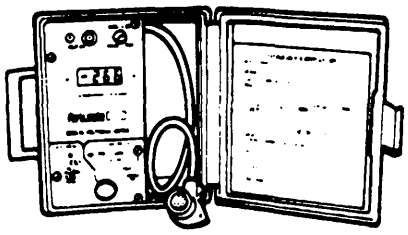


BREAKOUT BOX A11525-A

- Vacuum pump, Rotunda No. 021-00014 or equivalent. Range 0-30 in-Hg.
- Digital volt-ohmmeter, Rotunda No. 014-00407 or equivalent. Input impedance 10 Megaohm minimum.



VACUUM PUMP A11524-A



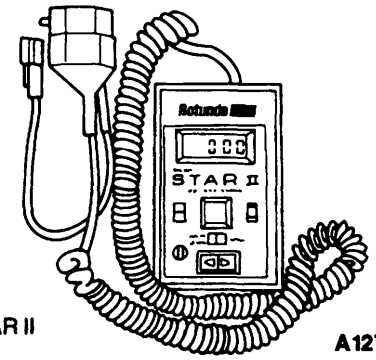
DIGITAL VOLT-OHMMETER A11526-A

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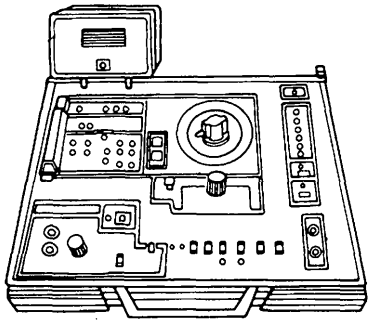
APPENDIX: Test Equipment (Continued)

OPTIONAL EQUIPMENT

- SUPER Self-Test Automatic Readout II, (SUPER STAR II), Rotunda No. 007-00028.
- EEC-IV Monitor Box, Rotunda No. 007-00018.

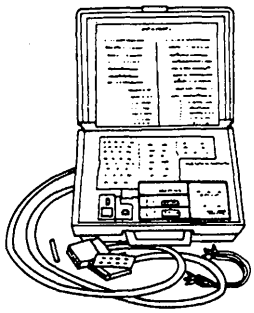


SUPER STAR II A12793-A

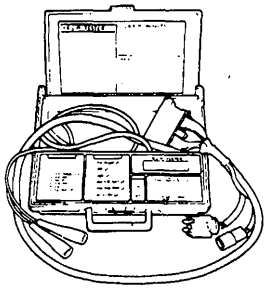


EEC-IV MONITOR BOX A12794-A

- EEC-IV Monitor Recorder, Rotunda No. 007-00021.
- Integrated Relay Controller Module (IRCM) Tester, Rotunda No. 007-00050.



EEC-IV MONITOR RECORDER A12795-A

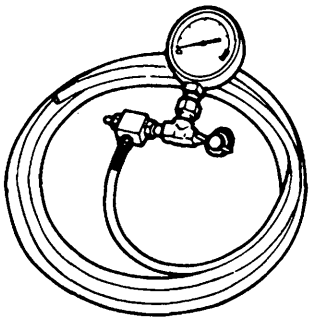


INTEGRATED RELAY CONTROLLER MODULE TESTER A13592-A

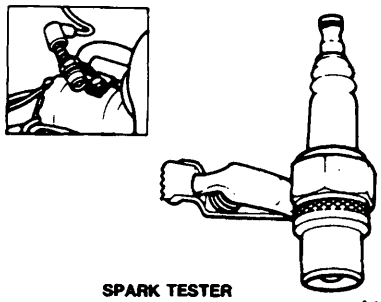
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APPENDIX: Test Equipment (Continued)

- Electronic Fuel Injection Pressure Gauge EFI/CFI only, Tool T80L-9974-A or equivalent. (Use instructions. For specific applications, refer to Fuel/Engine Shop Manual Group)
- Spark tester (optional modified spark plug with side electrode removed). Tool D81P-6666-A or equivalent.

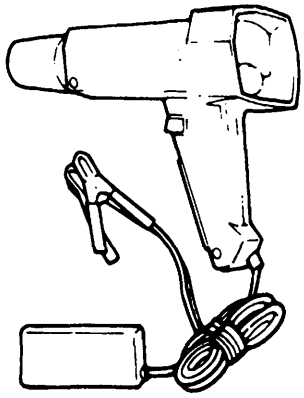


EFI PRESSURE GAUGE A11527-A

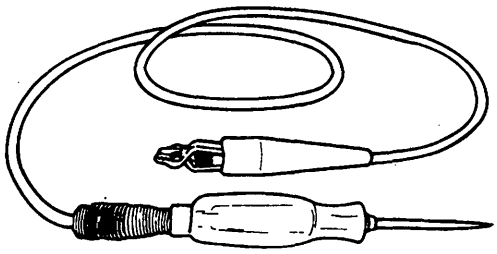


SPARK TESTER A11529-A

- Timing light, Rotunda model 059-00006 or equivalent.
- Non-powered test lamp.



TIMING LIGHT A11528-A



NON-POWERED TEST-LAMP A11530-A

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SECTION 15

EEC-IV—Engine Supplement—Passenger Car

Contents

Diagnostic Sensor/Actuator Reference Values—
Passenger Car 15-1
1.9 EFI
Electrical Schematic 15-3
EEC-IV Module Connector Pin Usage 15-4
Quick Test Codes and Code Definitions 15-5
1.9L CFI
Electrical Schematic 15-6
EEC-IV Module Connector Pin Usage 15-7
Quick Test Codes and Code Definitions 15-8
1.9L MA SEFI
Electrical Schematic 15-9
EEC-IV Module Connector Pin Usage 15-10
Quick Test Codes and Definitions 15-12
2.3L OHC EFI
Electrical Schematic 15-13
EEC-IV Module Connector Pin Usage 15-14
Quick Test Codes and Code Definitions 15-15
2.3L MA EFI
Electrical Schematic 15-16
EEC-IV Module Connector Pin Usage 15-17
Quick Test Codes and Code Definitions 15-18
2.3L HSC EFI
Electrical Schematic 15-19
EEC-IV Module Connector Pin Usage 15-20
Quick Test Codes and Code Definitions 15-21

(Continued)

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SECTION 15

EEC-IV—Engine Supplement—Passenger Car

Contents

2.5L FLC CFI
- Electrical Schematic 15-22
- EEC-IV Module Connector Pin Usage 15-23
- Integrated Controller Schematic 15-25
- Integrated Controller Pin Usage 15-26
- Quick Test Codes and Code Definitions 15-27

2.9L EFI
- Electrical Schematic 15-28
- EEC-IV Module Connector Pin Usage 15-30
- Quick Test Codes and Code Definitions 15-31

3.0L EFI
- Electrical Schematic 15-32
- EEC-IV Module Connector Pin Usage 15-33
- Integrated Controller Schematic 15-36
- Integrated Controller Pin Usage 15-38
- Quick Test Codes and Code Definitions 15-39

3.0L SHO SEFI
- Electrical Schematic 15-41
- EEC-IV Module Connector Pin Usage 15-42
- Integrated Controller Schematic 15-44
- Integrated Controller Pin Usage 15-45
- Quick Test Codes and Code Definitions 15-46

3.8L AXOD SEFI
- Electrical Schematic 15-48
- EEC-IV Module Connector Pin Usage 15-49
- Integrated Controller Schematic 15-51
- Integrated Controller Pin Usage 15-52
- Quick Test Codes and Code Definitions 15-53

(Continued)

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SECTION 15

EEC-IV—Engine Supplement—Passenger Car

Contents

3.8L RWD SEFI

Electrical Schematic 15-55
EEC-IV Module Connector Pin Usage 15-56
Quick Test Codes and Code Definitions 15-58

3.8L SC SEFI

Electrical Schematic 15-59
EEC-IV Module Connector Pin Usage 15-60
Integrated Controller Schematic 15-62
Integrated Controller Pin Usage 15-63
Quick Test Codes and Code Definitions 15-64

5.0L SEFI/5.0L MA SEFI

Electrical Schematic 15-66
EEC-IV Module Connector Pin Usage 15-70
Quick Test Codes and Code Definitions 15-78

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Diagnostic Sensor/Actuator Reference Values

Car

NOTES:

- The chart below contains typical component values.
- Values measured in the field may differ slightly from those shown.
- Do not compare reference values found on this chart with monitor-box data. Monitor-box data is measured with respect to a different reference level in some cases.
- Breakout box pin number assignments differ from vehicle to vehicle. Refer to the Pin Usage Chart applicable to the vehicle being serviced for the correct pin assignments.
- Each vehicle application will not have all components listed below.

Pre-condition the engine in the following manner before recording any values:

— The engine should be at a normal operating condition.

— Start and run engine at 2000 rpm for two minutes.

	INPUTS	Breakout Box Pin Numbers (+)	(-)	Key Off Throttle Closed (ohms)	Key On Eng. Off (volts)	Hot Idle (volts)
*	Clutch Engage Switch (CES) ①	30	40	—	—	—
	Coil Tach Signal (IDM)	4	16	21.8 K	8.0 to 10.0	8.0 to 12.0
*	Distributor Position (PIP) ②	56	16	1.1 K to 2.1 K	—	3.0 to 7.0
	EGR Valve Position (EVP)	27	46	480 to 650	0.30 to 0.45	0.30 to 0.45
*	Engine Coolant Temperature (ECT) ③	7	46	1.7 K to 3.6 K	—	0.31 to 1.0
	(Heated) Exhaust Gas Oxygen (H)EGO	29	46	>1.5 M	<0.4	0.0 to 0.9
*	Knock Sensor (KS) ④	23	46	4.5 K to 6.5 K	—	—
*	Manifold Pressure (MAP) Barometric Pressure (BP) ⑤	45	46	—	—	—
*	Mass Air Flow (MAF) ⑥	50	40	—	—	—
*	Neutral/Drive Switch (NDS) ⑦	30	40	—	—	—
*	Power Steering Pressure Switch (PSPS) ⑧	24	46	—	—	—
	Pressure Feedback EGR (PFE)	27	46	—	3.0 to 3.5	3.0 to 3.5
	Reference Voltage (VREF)	26	46	—	5.0±5%	5.0±5%
	Throttle Position (TP)	47	46	0.5 K to 1.2 K	0.7 to 1.3	0.7 to 1.3
*	Vehicle Speed Sensor (VSS) ⑨	3	6	190.0 to 240.0	—	—
	OUTPUTS					
*	Canister Purge (CANP) ⑩	37	31	60.0 to 70.0	0.0	0.0
	Computed Spark Advance (DIS)	36	16	—	9.0 to 12.5	8.5 to 9.5
	Computed Spark Advance (TFI)	36	16	—	0.0	5.0 to 7.0
	Spark Angle Word (SAW)	36	16	—	—	0.5 to 0.7
	EGR Valve Regulator (EVR)	37	33	40.0 to 50.0	0.0 (OFF)	0.0 (OFF)
	Fuel Pump Relay (FP)	37	22	—	0.0 (OFF)	VBAT (ON)
*	Idle Speed By Pass (IBA)	37	21	9.5 to 11.5	0.0 (OFF)	2.0 to 5.5
*	Injectors Bank #1 ⑪	37	58	—	0.0	—
*	Injectors Bank #2 ⑪	37	59	—	0.0	—

*** Numbers to the right of these inputs/outputs refer to explanations on next page.**

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Diagnostic Sensor/Actuator Reference Values

Car

Explanations —

① If the clutch pedal is down, the switch is closed.
If the clutch pedal is up, the switch is open.

② For applications containing TFI-IV systems only.

③ Engine coolant temperature must be within the 180-240°F (82-116°C) temperature range before measurements are taken.

④ The Knock Sensor output voltage is a variable signal of 300 mV or greater, depending on the severity of engine knock; background noise is not part of the sensor output.

⑤ Refer to the Altitude vs. Voltage Chart in Pinpoint Test DF, Section 17 for proper operating values.

⑥ Refer to the MAF Sensor Data Chart in Pinpoint Test DC for proper operating valves.

⑦ The NDS is open in any gear, but closed in neutral or park.

⑧ If power steering pressure rises above a specified limit, the switch contacts will open and the ECA will adjust idle speed to compensate for the extra load placed on the engine.

⑨ If vehicle is not moving, the speed sensor output to the processor will be zero. The vehicle must be moving for the speed sensor to provide information to the processor.

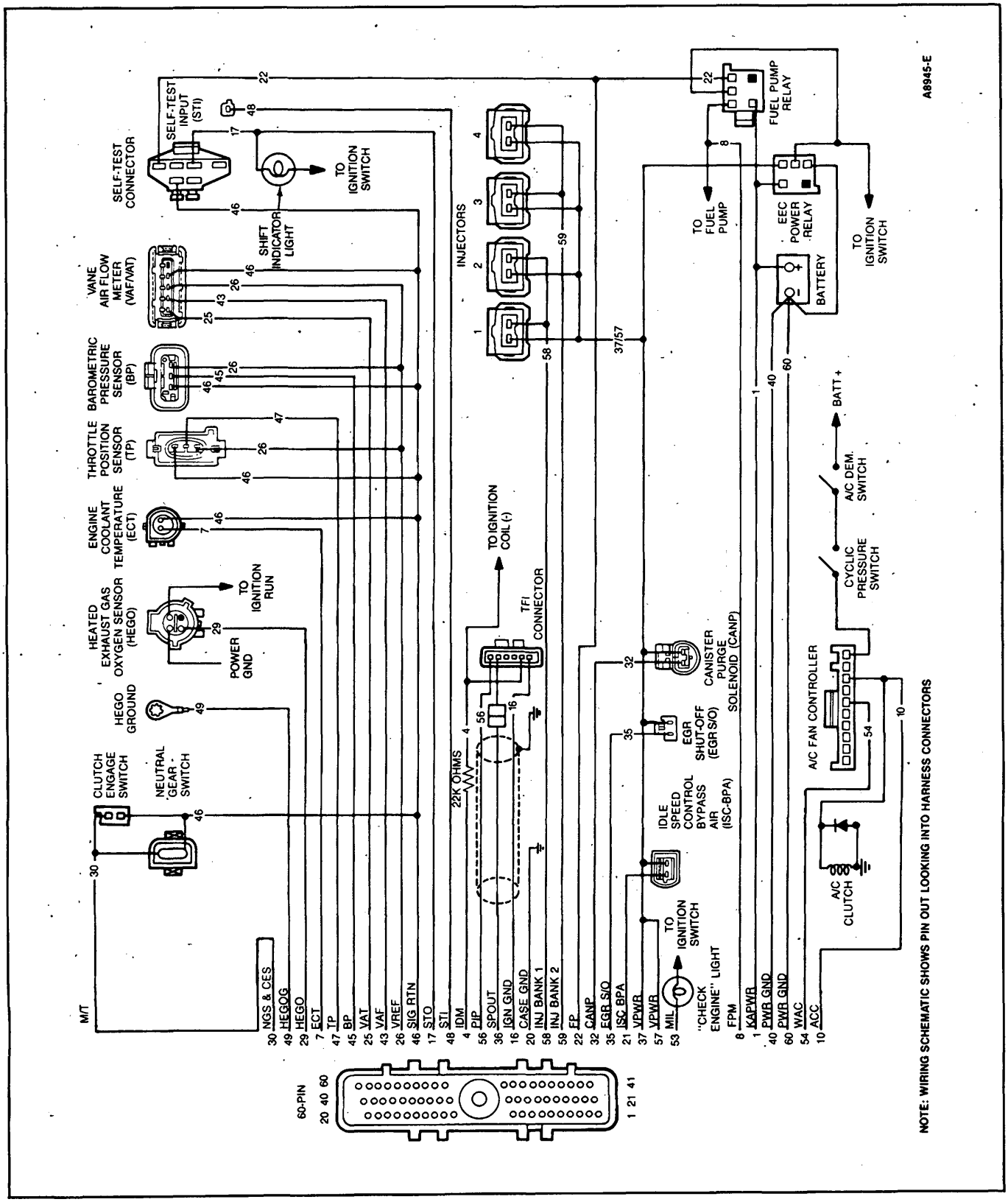
⑩ Not all applications will use Pin 31 for canister purge. Refer to appropriate Vehicle Pin Usage Chart.

⑪ Refer to the Injector Resistance Chart in Pinpoint Test H, Section 17 for the proper resistance values.

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Electrical Schematic

1.9L EFI



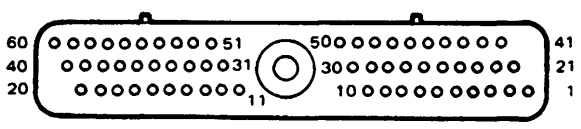
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EEC-IV Module Connector Pin Usage

1.9L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
7	354	LG/Y	Engine Coolant Temperature	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Clutch Compressor	ACC
16	259	BK/O	Ignition Ground	IGN GND
17	224	T/LB	Self-Test Output and Shift Indicator Light	STO and SIL
20	57	BK	Case Ground	CSE GND
21	68	O/BK	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Vane Air Temperature	VAT
26	351	O/W	Reference Voltage	VREF
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	614	GY/O	Neutral Drive Gear Switch and Clutch Engage Switch	NDS and CES
32	101	GY/Y	Canister Purge Solenoid	CANP
35	362	Y	Exhaust Gas Recirculation Shut Off	EGR S/O
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	200	W/BK	Vane Air Flow	VAF
45	358	LG/BK	Barometric Pressure	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
53	201	T/R	"CHECK ENGINE" Light	MIL
54	73	O/LB	Wide Open Throttle A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pickup	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector Bank 1	INJ Bank 1
59	96	T/O	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

1.9L EFI

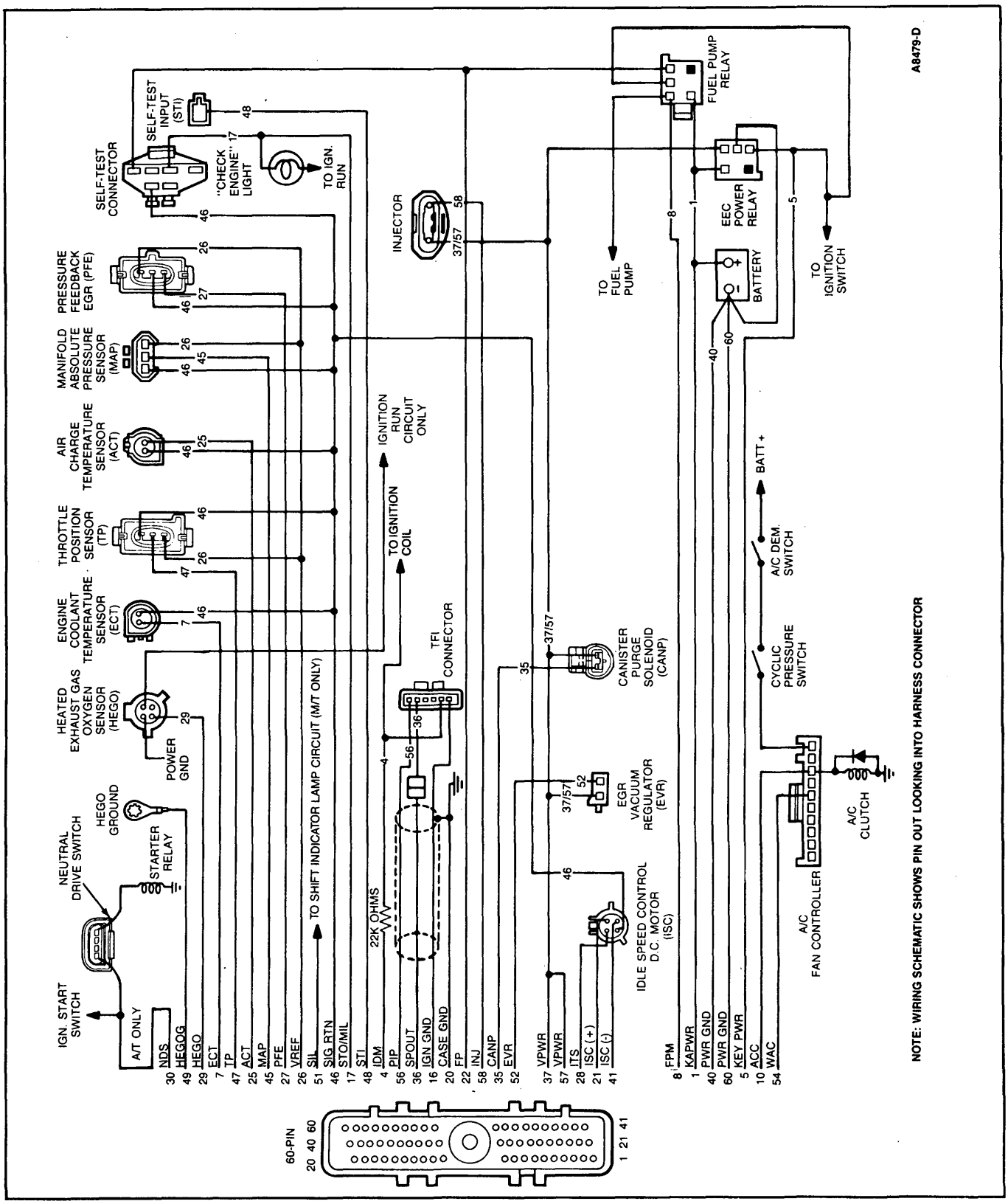
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	RPM unable to achieve Self-Test upper limit
13 r ▶	RPM unable to achieve Self-Test lower limit
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
16 r ▶	Idle rpm high with ISC off
17 r ▶	Idle rpm low with ISC off
18 r ▶	SPOUT circuit open
18 c ▶	IOM circuit failure/SPOUT circuit grounded
19 r ▶	Rpm dropped too low during ISC off test
21 or ▶	ECT out of Self-Test range
22 orc ▶	BP out of Self-Test range
23 or ▶	TP out of Self-Test range
26 or ▶	VAF out of Self-Test range
28 or ▶	VAT out of Self-Test range
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected — indicates lean
42 r ▶	HEGO sensor circuit indicates system rich
42 c ▶	No HEGO switch detected — indicates rich
43 c ▶	HEGO lean at wide open throttle
47 r ▶	Measured airflow low at base idle
48 r ▶	Measured airflow high at base idle
51 oc ▶	ECT indicated −40°F/circuit open
53 oc ▶	TP circuit above maximum voltage
56 oc ▶	VAF circuit above maximum voltage
58 oc ▶	VAT indicated −40°F/circuit open
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
65 c ▶	Never went to closed loop fuel
66 oc ▶	VAF circuit below minimum voltage
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C on
67 c ▶	Clutch switch circuit failure
68 oc ▶	VAT indicated 254°F/circuit grounded
71 c ▶	Software reinitialization detected
72 c ▶	Power interrupt/reinitialization detected
73 r ▶	Insufficient TP change during Dynamic Response Test
76 r ▶	Insufficient VAF change during Dynamic Response Test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
85 c ▶	Adaptive fuel lean limit reached
86 c ▶	Adaptive fuel rich limit reached
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

1.9L CFI



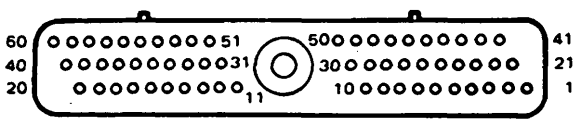
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EEC-IV Module Connector Pin Usage

1.9L CFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	16	R/LG	Key Power	KPWR
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Clutch Compressor	ACC
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output/"CHECK ENGINE" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	376	BR/W	Idle Speed Control (DC Motor)	ISC (+)
22	97	T/LG	Fuel Pump Relay	FP
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
28	265	LG/W	Idle Tracking Switch	ITS
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	614	GY/O	Neutral Drive Switch (A/T Only)	NDS
35	101	GY/Y	Canister Purge Solenoid	CANP
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
41	264	W/LB	Idle Speed Control (DC Motor)	ISC (-)
45	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return (Ground)	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
51	224	T/LB	Shift Indicator Light (M/T Only)	SIL
52	362	Y	EGR Vacuum Regulator Solenoid	EVR
54	73	O/LB	WOT A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Fuel Injector	INJ
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

1.9L CFI

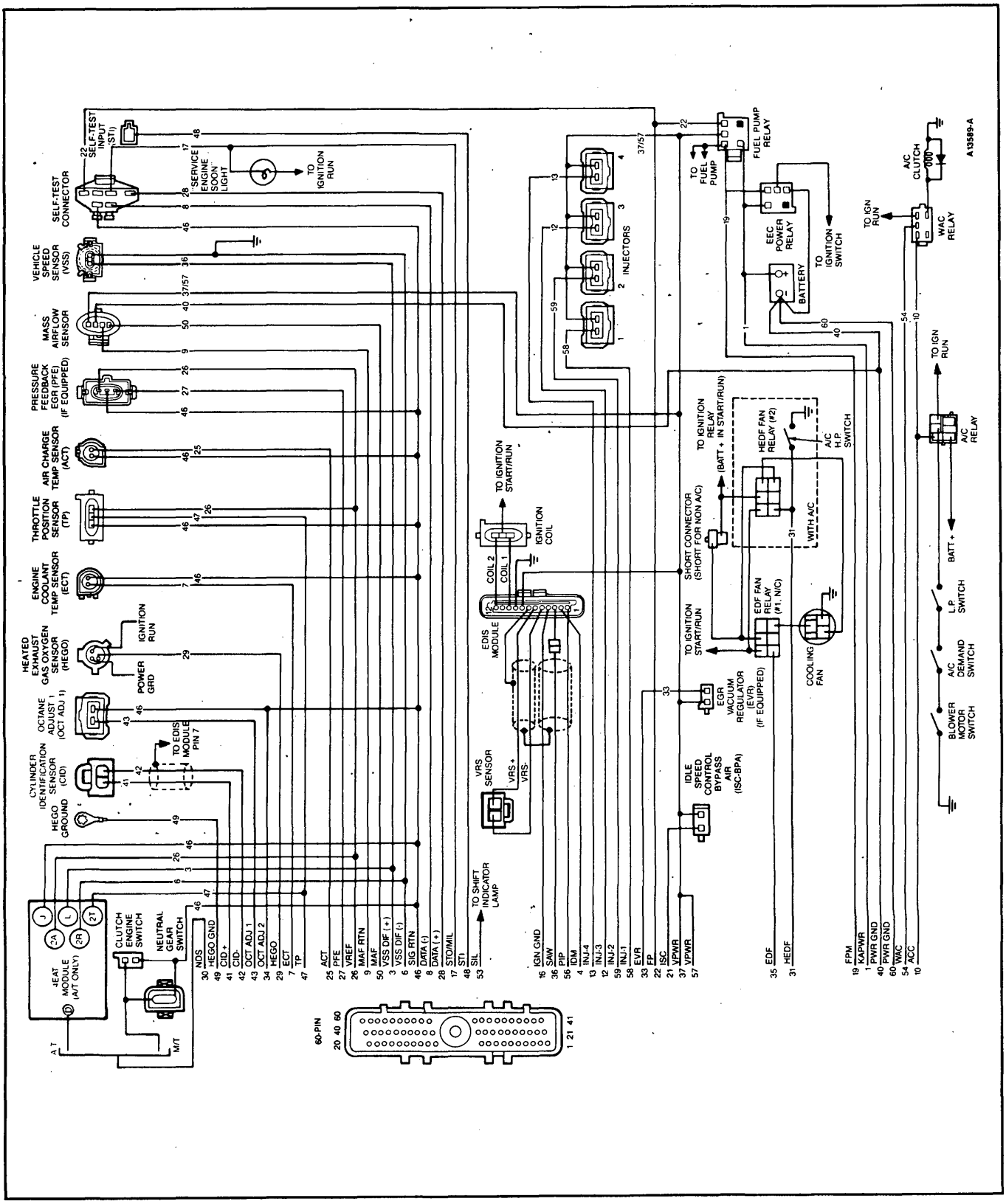
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 o ▶	D.C. motor movement not detected
13 r ▶	Cannot control rpm during Self-Test low rpm check
13 c ▶	D.C. motor did not follow dashpot
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	Keep Alive Memory (KAM) test failed
16 r ▶	Idle rpm high with ISC retracted (OFF)
17 r ▶	Idle rpm low with ISC retracted (OFF)
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 r ▶	Rpm for EGR test not achieved
21 or ▶	ECT sensor input is out of Self-Test range
22 orc ▶	MAP sensor input is out of Self-Test range
23 orc ▶	TP sensor input is out of Self-Test range
24 or ▶	ACT sensor input is out of Self-Test range
31 orc ▶	PFE circuit is below minimum voltage
32 rc ▶	EPT circuit voltage low (PFE)
33 rc ▶	EGR valve opening (PFE) not detected
34 o ▶	Defective PFE sensor
34 rc ▶	EPT sensor voltage high (PFE)
35 orc ▶	PFE circuit is above maximum voltage
38 c ▶	Idle Tracking Switch (ITS) circuit open
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switching detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT sensor circuit open
53 oc ▶	TP sensor input is greater than Self-Test maximum
54 oc ▶	ACT sensor circuit open
55 r ▶	Keypower circuit open
58 o ▶	Idle Tracking Switch (ITS) circuit open
58 r ▶	Idle Tracking Switch (ITS) closed/circuit grounded
61 oc ▶	ECT sensor input is less than Self-Test minimum/circuit grounded
63 oc ▶	TP sensor input is less than Self-Test minimum
64 oc ▶	ACT sensor input is less than Self-Test minimum/circuit grounded
67 or ▶	Neutral Drive Switch (NDS) circuit open; A/C input high
68 o ▶	Idle Tracking Switch (ITS) closed/circuit grounded
68 r ▶	Idle Tracking Switch (ITS) circuit open
71 c ▶	Idle Tracking Switch (ITS) shorted to ground on pre-position
73 o ▶	Insufficient throttle position change
84 or ▶	EGR Vacuum Regulator (EVR) circuit failure
85 or ▶	Canister Purge (CANP) circuit failure
87 orc ▶	Fuel pump primary circuit failure
93 o ▶	TP sensor input low at maximum D.C. motor extension
95 oc ▶	Fuel pump circuit open – ECA to motor ground
96 oc ▶	Fuel pump circuit open – battery to ECA
98 r ▶	Hard fault is present
99 r ▶	EEC system has not learned to control idle, ignore Codes 12 and 13
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

1.9L MA SEFI



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EEC-IV Module Connector Pin Usage

1.9L MA SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	330	BL/R	Keep Alive Power	KAPWR
3	159	W/BK	Vehicle Speed Sensor (+)	VSS (+)
4	153	R	Ignition Diagnostic Monitor	IDM
6	57	BL	Vehicle Speed Sensor (-)	VSS (-)
7	62	BL/W	Engine Coolant Temperature	ECT
8	121	Y/BK	Data Communications Link (-)	DATA (-)
9	87	GR/Y	Mass Air Flow Return	MAF RTN
10	707	GR/BK	A/C Clutch	ACC
12	105	Y/O	Injector 3	INJ 3
13	115	GR/O	Injector 4	INJ 4
16	78	R/BL	Ignition Ground	IGN GND
17	129	Y/BK	Self-Test Output/"SERVICE ENGINE SOON" Light	STO/MIL
19	102	BK/PK	Fuel Pump Monitor	FPM
21	83	BL/O	Idle Speed Control — Bypass Air	ISC — BPA
22	103	LG	Fuel Pump	FP
25	109	W/GR	Air Charge Temperature	ACT
26	85	R/W	Reference Voltage	VREF
27	145	BL/Y	Pressure Feedback EGR (if EGR equipped)	PFE
28	122	Y/BL	Data Communications Link (+)	DATA (+)
29	118	GR/BL	Heated Exhaust Gas Oxygen Sensor	HEGO
30	82	BR/Y	Neutral Drive Switch (A/T only)	NDS
30	82	BR/Y	Neutral Gear Switch and Clutch Engage Switch (M/T only)	NGS & CES
31	866	R/BK	High Electro Drive Fan	HEDF
33	108	W/BL	EGR Vacuum Regulator (if EGR equipped)	EVR
34	63	LG/BK	Octane Adjust 2	OCT ADJ 2
35	719	Y/W	Electro-Drive Fan	EDF
36	156	LG/W	Spark Angle Word	SAW
37	101	W/R	Vehicle Power	VPWR
40	999	BK/GR	Power Ground	PWR GND
41	128	O	Cylinder Identification (+)	CID (+)
42	127	BL/GR	Cylinder Identification (-)	CID (-)
43	171	GR/W	Octane Adjust 1	OCT ADJ 1
46	63	LG/BK	Signal Return	SIG RTN
47	71	BR/W	Throttle Position Sensor	TP

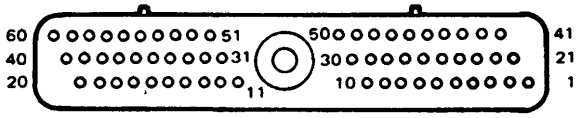
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EEC-IV Module Connector Pin Usage

1.9L MA SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
48	119	LG/Y	Self-Test Input	STI
49	59	BK	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
50	143	BR/BK	Mass Air Flow	MAF
53	154	LG/R	Shift Indicator Light	SIL
54	702	BL/BK	WOT A/C Cut-out	WAC
56	69	GR/W	Profile Ignition Pick-up	PIP
57	101	W/R	Vehicle Power	VPWR
58	106	Y	Injector 1	INJ 1
59	116	GR/R	Injector 2	INJ 2
60	999	BK/GR	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

1.9L MA SEFI

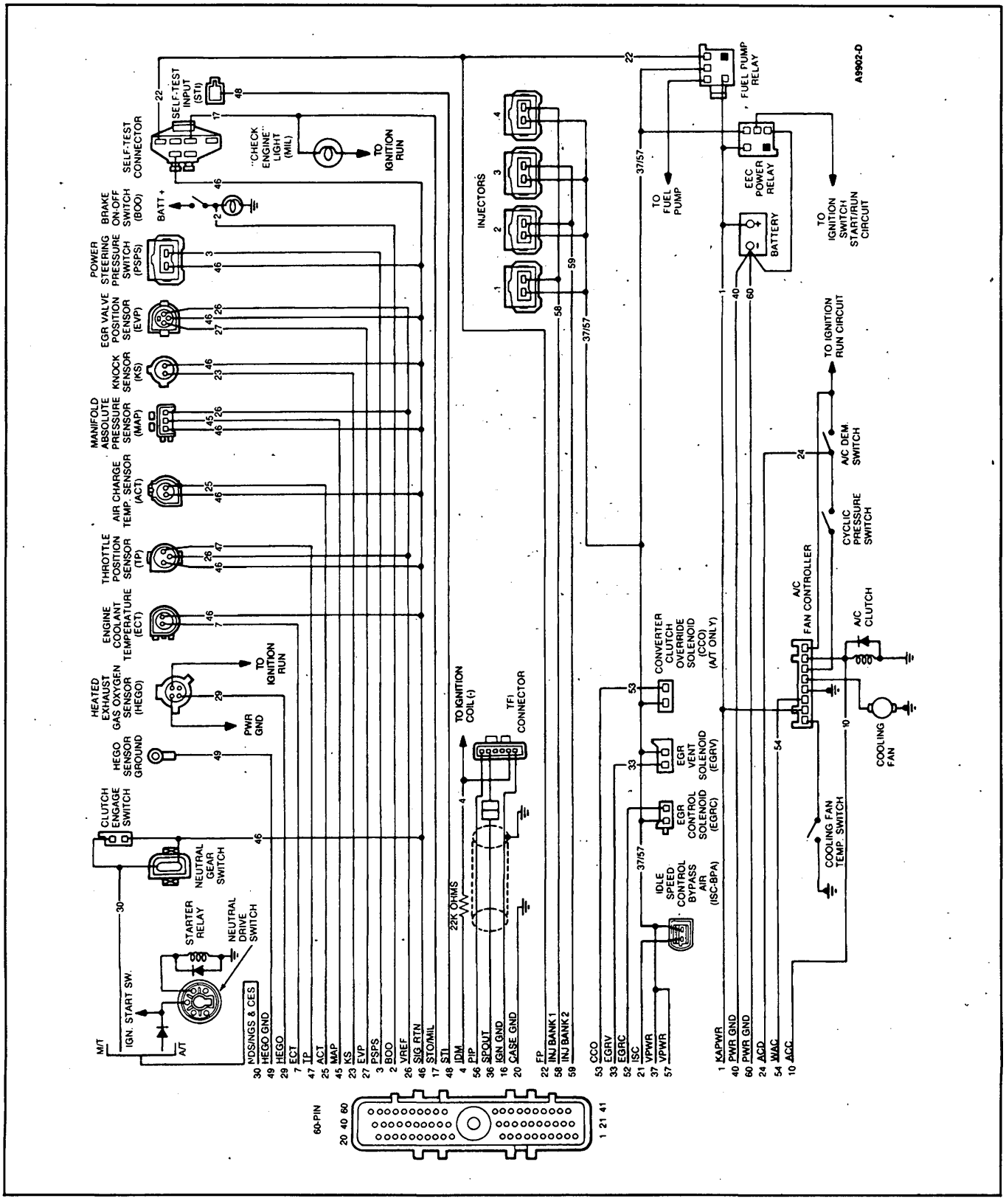
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	Spark Angle Word (SAW) circuit failure
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
19 c ▶	CID circuit failure
21 or ▶	ECT out of Self-Test range
23 or ▶	TP out of Self-Test range
24 or ▶	ACT out of Self-Test range
26 or ▶	MAF out of Self-Test range
29 c ▶	Insufficient input from Vehicle Speed Sensor (VSS)
31 orc ▶	PFE circuit below minimum voltage
32 rc ▶	PFE circuit voltage low
33 rc ▶	EGR valve opening not detected
34 o ▶	PFE sensor voltage out of range
34 rc ▶	Exhaust Pressure high/PFE circuit voltage high
35 orc ▶	PFE circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
45 c ▶	Coil 1 primary circuit failure
46 c ▶	Coil 2 primary circuit failure
51 oc ▶	ECT indicated -40°F/circuit open
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated -40°F/circuit open
56 orc ▶	MAF circuit above maximum voltage
61 oc ▶	ECT indicates 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicates 254°F/circuit grounded
66 rc ▶	MAF below minimum voltage
67 or ▶	Neutral Drive Switch (NDS) circuit open
67 c ▶	Clutch switch circuit failure
72 r ▶	Insufficient MAF change during Dynamic Response Test
73 r ▶	Insufficient throttle position change during Dynamic Response Test
74 r ▶	Brake ON/OFF circuit failure/not actuated during Self-Test
77 r ▶	Brief WOT not sensed during Self-Test/operator error
79 o ▶	A/C ON/defrost on during Self-Test
83 o ▶	High Speed Electro Drive Fan (HEDF) circuit failure
84 or ▶	EGR Vacuum Regulator (EVR) circuit failure
87 oc ▶	Fuel pump primary circuit failure
88 o ▶	Electro Drive Fan (EDF) circuit failure
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
98 r ▶	Hard fault is present - FMEM mode
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

2.3L OHC EFI



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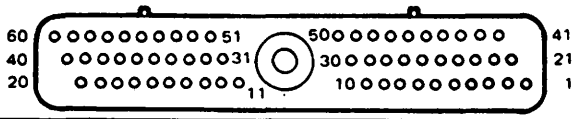
EEC-IV Module Connector Pin Usage

2.3L OHC EFI

MUSTANG

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	330	Y/LG	Power Steering Pressure Switch	PSPS
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
7	354	LG/Y	Engine Coolant Temperature	ECT
10	347	BK/Y	A/C Clutch Compressor	ACC
16	259	BK/O	Ignition Ground	IGN GND
17	657	T	Self-Test Output/"CHECK ENGINE" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	264	W/LB	Idle Speed Control — Bypass Air	ISC — BPA
22	97	T/LG	Fuel Pump	FP
23	310	Y/R	Knock Sensor	KS
24	348	LG/P	A/C Demand	ACD
25	162	LG/R	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	771	P/Y	Neutral Drive Switch (A/T Only)	NDS
30	771	P/Y	Neutral Gear Switch and Clutch Engage Switch (M/T Only)	NGS & CES
33	360	DG	Exhaust Gas Recirculation Vent	EGRV
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	362	Y	Exhaust Gas Recirculation Control	EGRC
53	237	O/Y	Clutch Converter Override (A/T Only)	CCO
54	73	O/LB	W.O.T. A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector Bank 1	INJ Bank 1
59	95	T/R	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.3L OHC EFI

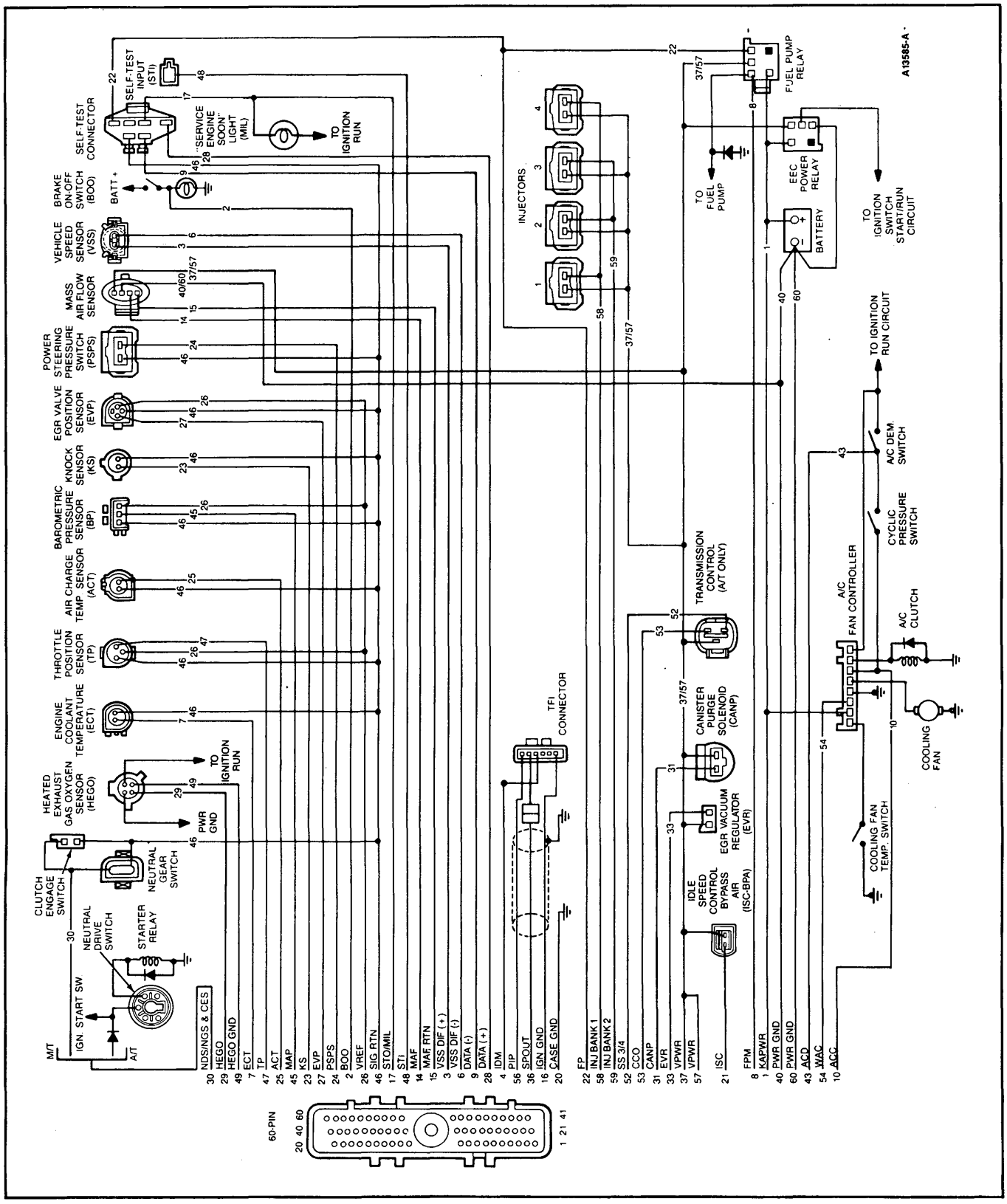
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
16 r ▶	Rpm too low to perform EGO test
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	ECT out of Self-Test range
22 orc ▶	MAP out of Self-Test range
23 or ▶	TP out of Self-Test range
24 or ▶	ACT out of Self-Test range
25 r ▶	Knock not sensed during Dynamic Response Test
31 orc ▶	EVP circuit below minimum voltage
32 r ▶	EGR not controlling
33 r ▶	EGR valve not returning to closed position
34 r ▶	EGR valve opening not detected
35 r ▶	Rpm too low to perform EGR test
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT indicated – 40°F/circuit open
52 o ▶	PSPS circuit open
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated – 40°F/circuit open
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C ON
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit open/not actuated during test
75 r ▶	Brake On/Off (BOO) circuit closed/ECA input open
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
83 o ▶	EGRC solenoid circuit failure
84 o ▶	EGRV solenoid circuit failure
87 o ▶	Fuel pump primary circuit failure
89 o ▶	Converter Clutch Override (CCO) circuit failure
98 r ▶	Hard fault is present – FMEM mode
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

2.3L MA EFI



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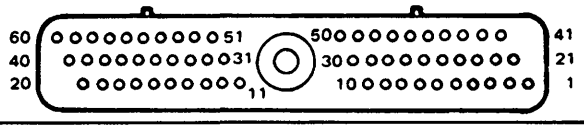
EEC-IV Module Connector Pin Usage

2.3L MA EFI

MUSTANG

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BY/O	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
9	701	W/P	Data Communications Link (-)	Data (-)
10	883	PK/LB	A/C Cyclic Switch	ACCS
14	967	DB/O	Mass Air Flow	MAF
15	968	T/LB	Mass Air Flow Return	MAF RTN
16	259	BK/O	Ignition Ground	IGN GND
17	657	T	Self-Test Output/"SERVICE ENGINE SOON" Light	STO/MIL
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control — Bypass Air	ISC — BPA
22	97	T/LG	Fuel Pump	FP
23	310	Y/R	Knock Sensor	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	162	LG/R	Air Charge Temperature	ACT
26	351	O/W	Voltage Reference	VREF
27	352	BR/LG	EGR Valve Position	EVP
28	702	W/BK	Data Communications Link (+)	Data (+)
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	771	P/Y	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge	CANP
30	771	P/Y	Neutral Gear Switch and Clutch Engage Switch (M/T Only)	NGS & CES
33	360	DG	EGR Vacuum Regulator	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	348	LG/P	A/C Demand	ACD
45	358	LG/BK	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGOG
52	435	Y/LB	Shift Solenoid (A/T Only)	SS 3/4
53	77	DB/Y	Clutch Converter Override (A/T Only)	CCO
54	73	O/LB	W.O.T. A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector Bank 1	INJ Bank 1
59	95	T/R	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.3L MA EFI

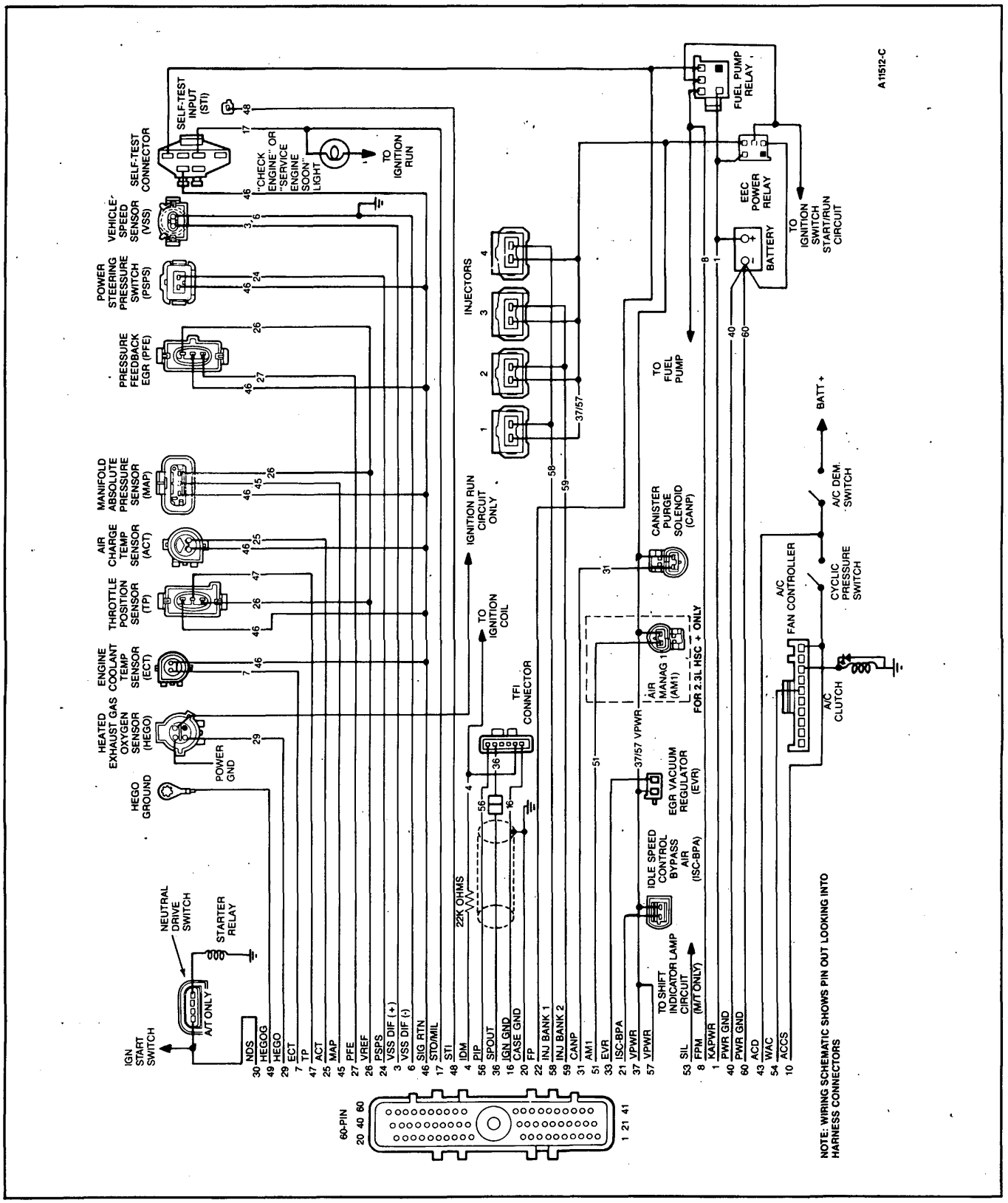
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failure
15 c ▶	ECA Keep Alive Memory (KAM) test failed
16 r ▶	Rpm to low to perform EGO test
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	ECT out of Self-Test range
22 orc ▶	BP out of Self-Test range
23 or ▶	TP out of Self-Test range
24 or ▶	ACT out of Self-Test range
25 r ▶	Knock not sensed during Dynamic Response Test
26 or ▶	Mass Air Flow out of Self-Test range
29 c ▶	Insufficient input from VSS
31 orc ▶	EVR circuit below minimum voltage
32 orc ▶	EVP voltage below closed limit
33 rc ▶	EGR valve opening not detected
34 orc ▶	EVP voltage above closed limit
35 orc ▶	EVP circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT indicated – 40°F/circuit open
52 o ▶	PSPS circuit open
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated – 40°F/circuit open
56 oc ▶	Mass Air FLow circuit above maximum voltage
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
66 rc ▶	Mass Air Flow circuit below minimum voltage
67 o ▶	Neutral Drive Switch (NDS) circuit open
72 r ▶	Insufficient MAF change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure/not actuated during test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
79 o ▶	A/C on/defrost on during Self-Test
84 o ▶	EVR solenoid circuit failure
85 o ▶	CANP solenoid circuit failure
86 o ▶	3-4 Shift Solenoid circuit failure
87 o ▶	Fuel pump primary circuit failure
89 o ▶	Converter Clutch Override (CCO) circuit failure
95 oc ▶	Fuel Pump Secondary Circuit failure
96 oc ▶	Fuel Pump Secondary Circuit failure
98 r ▶	Hard fault is present — FMEM mode
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

2.3L HSC EFI



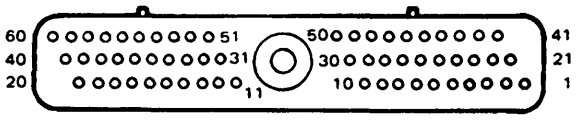
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EEC-IV Module Connector Pin Usage

2.3L HSC EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor (+)	VSSDIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor	VSSDIF (-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
10	198	T/Y	A/C Cycling Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output/"CHECK ENGINE" or "SERVICE ENGINE SOON" Light	STO/MIL
20	57	BK	Case Ground	CASE GND
21	376	BR/W	Idle Speed Control — Bypass Air	ISC — BPA
22	238	O/LB	Fuel Pump Relay	FP
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	614	GY/O	Neutral Drive Switch (A/T Only)	NDS
30	614	GY/O	Clutch Engage Switch	CES
31	101	GY/Y	Canister Purge Solenoid	CANP
33	362	Y	EGR Vacuum Regulator Solenoid	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	348	LG/P	A/C Demand	ACD
45	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return Ground	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGOG
51	100	W/R	Air Management 1 (HSC +)	AM 1
53	224	T/LB	Shift Indicator Light	SIL
54	73	O/LB	WOT A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector Bank 1	INJ Bank 1
59	96	T/O	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.3L HSC EFI

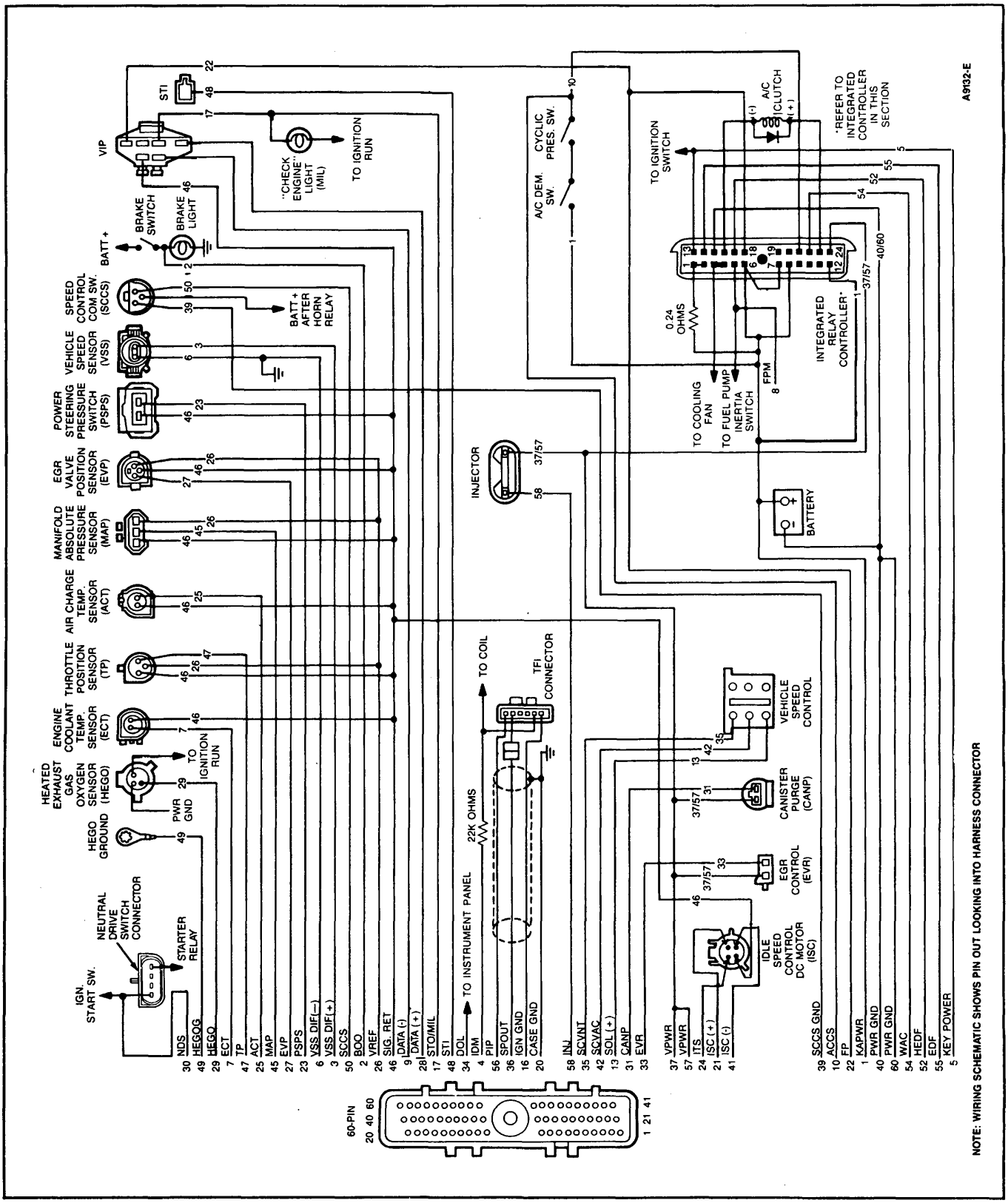
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ROM test failure
15 c ▶	Keep Alive Memory (KAM) test failure
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	ECT sensor input is out of Self-Test range
22 orc ▶	MAP sensor input is out of Self-Test range
23 or ▶	TP sensor input is out of Self-Test range
24 or ▶	ACT sensor input is out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	PFE circuit is below minimum voltage
32 rc ▶	PFE circuit voltage low
33 rc ▶	EGR valve opening not detected
34 o ▶	PFE sensor voltage out of range
34 rc ▶	Excessive exhaust back pressure/PFE circuit voltage high
35 orc ▶	PFE circuit is above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switching detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT sensor circuit open
52 o ▶	PSPS circuit is open
52 r ▶	PSPS always staying open or closed
53 oc ▶	TP sensor input is greater than Self-Test maximum voltage
54 oc ▶	ACT sensor circuit open
61 oc ▶	ECT sensor circuit grounded
63 oc ▶	TP sensor input is less than Self-Test minimum voltage
64 oc ▶	ACT sensor circuit grounded
67 o ▶	Neutral Drive Switch (NDS) circuit open; A/C ON
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
82 o ▶	Air Management 1 (AM1) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
95 oc ▶	Fuel pump circuit open/ECA to motor ground
96 oc ▶	Fuel pump circuit open/battery to ECA
98 r ▶	Hard fault is present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

2.5L FLC CFI



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EEC-IV Module Connector Pin Usage

2.5L FLC CFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	16	R/LG	Key Power	KPWR
6	563	O/Y	Vehicle Speed Sensor (-)	VSS (-)
7	354	LG/Y	Engine Coolant Temperature	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
9	695	BK/O	Data (-)	Data (-)
10	883	PK/LB	A/C Cycling Switch	ACCS
13	144	O/Y	Vehicle Speed Control Solenoid	SOL (+)
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Out/"Check Engine" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	382	Y/BK	Idle Speed Control (DC Motor)	ISC (+)
22	97	T/LG	Fuel Pump	FP
23	330	Y/LG	Power Steering Pressure Switch	PSPS
24	209	W/R	Idle Tracking Switch	ITS
25	357	LG/P	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position	EVP
28	696	O/BK	Data (+)	Data (+)
29	94	DG/P	Heated Exhaust Gas Oxygen (Sensor)	HEGO
30	199	LB/Y	Neutral Drive Switch	NDS
31	101	GY/Y	Canister Purge Solenoid	CANP
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
34	305	LB/PK	Data Output Link	DOL
35	146	W/PK	Speed Control Vent (Solenoid)	SCVNT
36	324	Y/LG	Spark Out	SPOUT
37	361	R	Vehicle Power	VPWR
39	461	O	Speed Control Command Switch Ground	SCCS GND

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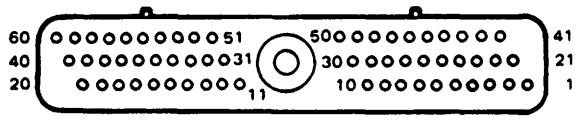
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EEC-IV Module Connector Pin Usage

2.5L FLC CFI

Pin	Circuit	Wire Color	Application	Abbreviations
40	60	BK/LG	Power Ground	PWR GND
41	377	W	Idle Speed Control — (DC Motor)	ISC (-)
42	145	GY/BK	Speed Control Vacuum (Solenoid)	SCVAC
45	358	LG/BK	Manifold Absolute Pressure (Sensor)	MAP
46	359	BK/W	Signal Return (Ground)	SIG RTN
47	355	DG/LG	Throttle Position (Sensor)	TP
48	200	W/BK	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen (Sensor) Ground	HEGO GND
50	151	LB/BK	Speed Control Command Switch	SCCS
52	639	PK	High Electro Drive Fan	HEDF
54	331	R	Wide Open Throttle (WOT) A/C Cut Off	WAC
55	197	T/O	Electro Drive Fan (Low)	EDF
56	349	DB	Profile Ignition Pick-up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector	INJ
60	60	BK/LG	Power Ground	PWR GND

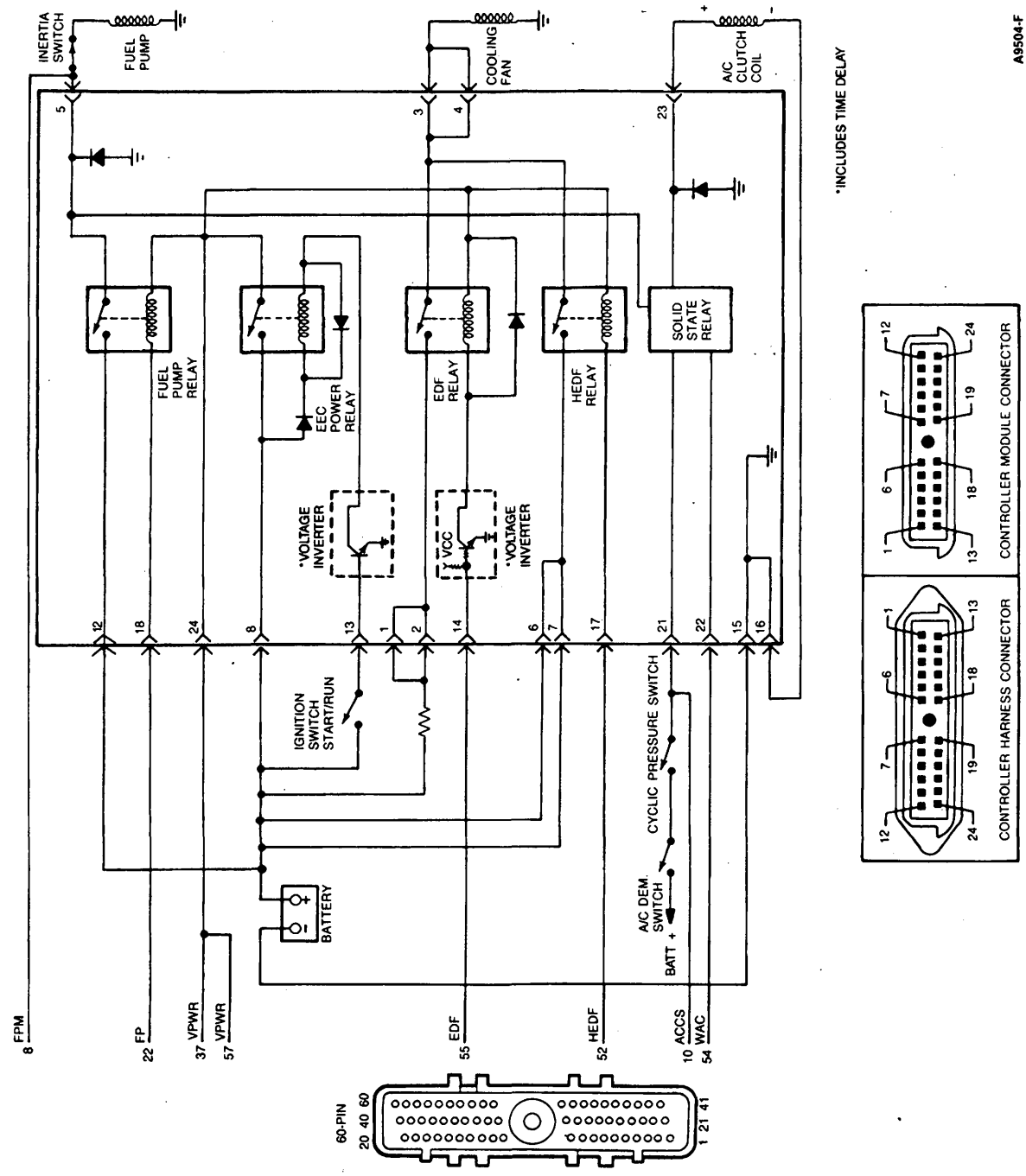
Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Integrated Controller Schematic

2.5L FLC CFI



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Integrated Controller Pin Usage

2.5L FLC CFI

Pin	Circuit	Color	Application	Abbreviations
1	181	BR/O	EDF Power Into Controller	Batt (+)
2	181	BR/O	EDF Power Into Controller	Batt (+)
3	228	BR/Y	H/EDF Power to Fan	PTF
4	228	BR/Y	H/EDF Power to Fan	PTF
5	787	PK/BK	Power to the Pump	PTP
6	38	BK/O	HEDF Power Into Controller	Batt (+)
7	38	BK/O	HEDF Power Into Controller	Batt (+)
8	37	Y	Battery Voltage (Power Relay)	Batt (+)
12	38	BK/O	Power to WOT A/C Cutoff	PT/WAC
13	16	R/LG	Keypower	KPWR
14	197	T/O	EDF Circuit	EDF
15	60	BK/LG	Vehicle Ground	PWR GND
16	57	BK	A/C Ground	A/C GND
17	639	PK	HEDF Circuit	HEDF
18	97	T/LG	Fuel Pump Circuit	FP
21	883	PK/LB	A/C Power	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	A/C Power to Clutch Coil	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

2.5L FLC CFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 o ▶	D.C. motor movement not detected
13 r ▶	Cannot control rpm during Self-Test low rpm check
13 c ▶	D.C. motor does not follow dashpot
14 c ▶	PIP circuit failure
15 o ▶	ECA ROM test failure
15 c ▶	ECA Keep Alive Memory (KAM) test failed
16 r ▶	Idle rpm high with ISC retracted/off
17 r ▶	Idle rpm low with ISC retracted/off
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
21 or ▶	ECT sensor out of Self-Test range
22 orc ▶	MAP sensor out of Self-Test range
23 orc ▶	TP sensor out of Self-Test range
24 or ▶	ACT sensor out of Self-Test range
29 c ▶	Insufficient input from Vehicle Speed Sensor (VSS)
31 orc ▶	EVP circuit below minimum voltage
32 orc ▶	EVP voltage is below closed limit
33 rc ▶	EGR valve opening not detected
34 orc ▶	EVP voltage above closed limit
35 orc ▶	EVP circuit above maximum voltage
38 c ▶	Idle Tracking Switch (ITS) circuit open
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT sensor indicated −40°F/circuit open
52 o ▶	PSPS circuit is open
52 r ▶	PSPS circuit did not change states
53 oc ▶	TP sensor circuit above maximum voltage
54 oc ▶	ACT sensor indicated −40°F/circuit open
55 r ▶	Keypower circuit open
58 o ▶	Idle Tracking Switch circuit open
58 r ▶	Idle Tracking Switch closed/circuit grounded
61 oc ▶	ECT sensor indicated 254°F/circuit grounded
63 oc ▶	TP sensor circuit below minimum voltage
64 oc ▶	ACT sensor indicated 254°F/circuit grounded
67 o ▶	Neutral Drive Switch (NDS) circuit open; A/C ON
67 c ▶	Clutch switch circuit failure
68 o ▶	Idle Tracking Switch (ITS) failed closed/circuit grounded
68 r ▶	Idle Tracking Switch (ITS) circuit failed open

(Continued)

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Quick Test Codes and Code Definitions

2.5L FLC CFI

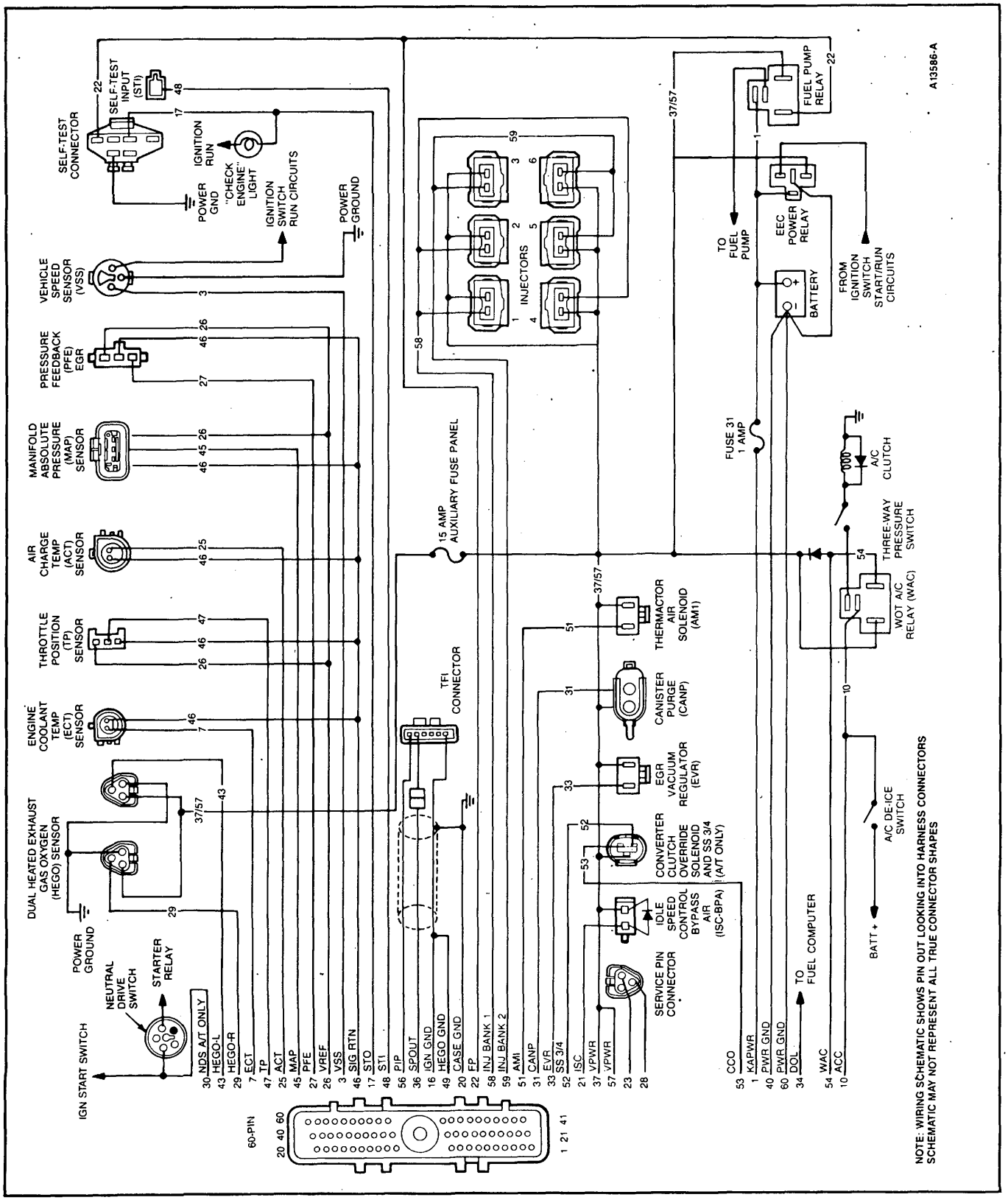
SERVICE CODE	SERVICE CODE DEFINITION
71 c ▶	Idle Tracking Switch (ITS) Shorted-To-Ground on pre-position
72 c ▶	Power interrupt/reinitialization detected
73 o ▶	Insufficient throttle position change
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during Self-Test
83 o ▶	High speed electro drive fan (HEDF) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Primary fuel pump circuit failure
88 o ▶	Electro-drive fan (EDF) circuit failure
93 o ▶	TP sensor input low at maximum D.C. motor extension
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
99 r ▶	EEC system has not learned to control idle, ignore Codes 12 and 13
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

2.9L EFI



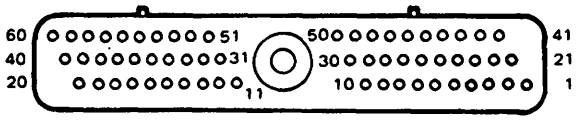
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EEC-IV Module Connector Pin Usage

2.9L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	54-28	BK/BL	Keep Alive Power	KAPWR
3	2	Y/BR	Vehicle Speed Sensor (Hall Effect)	VSS
7	31B-75	BR/GN	Engine Coolant Temperature	ECT
10	54-47	BK/Y	A/C Clutch	ACCS
15	31B-28	BR/BL	3/4 Shift Solenoid	3/4 SS
16	31-29	BR	Ignition Ground	IGN GND
17	31B-40	BR/GR	Self-Test Output	STO
18	54-6	BK/R	Brake ON/OFF	BOO
19	54-50	BK/GR	Kick Down Switch	KDS
20	31-49	BR	Case Ground	CSE GND
21	31B-73	BR/Y	Idle Speed Control (Bypass Air)	ISC-BPA
22	9-25	BL/R	Fuel Pump	FP
23	—	—	Octane Adjust	OCT ADJ.
25	31B-17	BR/Y	Air Charge Temperature	ACT
26	31B-20	BR/BK	Reference Voltage	VREF
28	31-29	BR	Idle Adjust	IDLE ADJ.
29	9-40	BL/W	Heated Exhaust Gas Oxygen Sensor – Right	HEGO – R
30	31B-30	BR/W	Neutral Drive Switch (Auto Trans Only)	NDS
31	31B-10	BR/W	Canister Purge Solenoid	CANP
34	31B-34	BR/Y	Data Output Link	DOL
36	9-18	BL/R	Spark Output	SPOUT
37	16-6	BK	Vehicle Power	VPWR
40	31-29	BR	Power Ground	PWR GND
43	9-39	BL/BK	Heated Exhaust Gas Oxygen Sensor – Left	HEGO – L
45	31B-76	BR/Y	Manifold Absolute Pressure (Sensor)	MAP
46	31-75	BR	Signal Return	SIG RTN
47	31B-13	BR/GR	Throttle Position (Sensor)	TP
48	9-20	BL/GR	Self Test Input	STI
49	31-31	BR	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
53	31B-39	BR	Converter Clutch Override	CCO
54	31B-35	BR/GR	Wide-Open Throttle (WOT) A/C Cutoff	WAC
56	9-17	BL/Y	Profile Ignition Pickup	PIP
57	15-6	BK	Vehicle Power	VPWR
58	31-73	BR	Injector Bank 1	INJ Bank 1
59	31-74	BR	Injector Bank 2	INJ Bank 2
60	31-29	BR	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.9L EFI

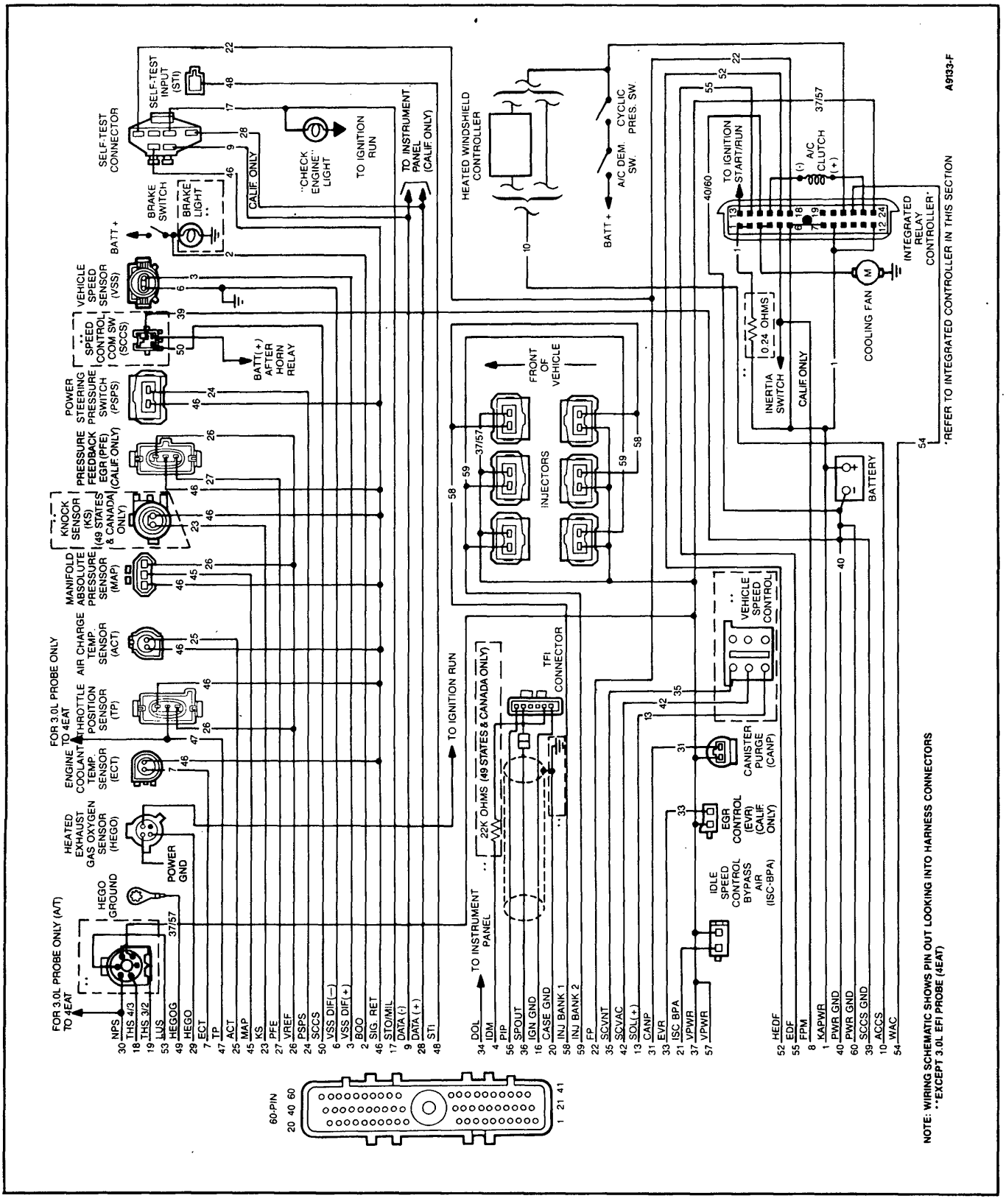
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Unable to control rpm during Self-Test high rpm check
13 r ▶	Unable to control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA ROM test failure
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
19 o ▶	Failure in EEC internal voltage
21 or ▶	ECT sensor out of Self-Test range
22 orc ▶	MAP sensor out of Self-Test range
23 or ▶	TP sensor out of Self-Test range
24 or ▶	ACT sensor out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switching detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT sensor indicates 254°F/circuit grounded
53 oc ▶	TP sensor circuit above maximum voltage
54 oc ▶	ACT sensor indicates – 40°F/circuit open
57 o ▶	Octane Adjust service pin in use
59 o ▶	Idle Adjust service pin in use
61 oc ▶	ECT sensor indicated 254°F/circuit grounded
63 oc ▶	TP sensor circuit below minimum voltage
64 oc ▶	ACT sensor indicated 254°F/circuit grounded
67 o ▶	Neutral Pressure Switch (NPS) circuit open; A/C ON
72 r ▶	Insufficient MAP output change during Dynamic Response Test
73 r ▶	Insufficient TP output change during Dynamic Response Test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Primary fuel pump circuit failure
89 o ▶	Clutch converter override (CCO) circuit failed
91 r ▶	HEGO sensor indicates system lean
91 c ▶	No HEGO switching detected
92 r ▶	HEGO sensor indicates system rich
98 r ▶	Hard fault is present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

3.0L EFI



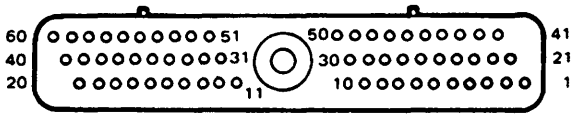
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EEC-IV Module Connector Pin Usage

3.0L EFI

Probe Pin	Circuit	Wire Color	Application	Abbreviations
1	84	BL/R	Keep Alive Power	KAPWR
3	241	BK/R	Vehicle Speed Sensor (+)	VSS DIF (+)
4	730	GR	Ignition Diagnostic Monitor	IDM
6	247	BK/BL	Vehicle Speed Sensor (-)	VSS DIF (-)
7	724	Y/R	Engine Coolant Temperature Sensor	ECT
8	703	W/BL	Fuel Pump Monitor	FPM
9	742	O	Data Communications Link (-)	DATA (-)
10	176	PK/BK	A/C Cycling Switch	ACC
16	750	W	Ignition Ground	IGN GND
17	727	W/BL	Self-Test Output/"CHECK ENGINE" Light	STO/MIL
21	710	W/R	Idle Speed Control-Bypass Air	ISC-BPA
22	179	BL/GR	Fuel Pump	FP
24	718	BR/R	Power Steering Pressure Switch	PSPS
25	726	Y	Air Charge Temperature Sensor	ACT
26	813	LG/R	Reference Voltage	VREF
27	725	Y/BL	Pressure Feedback EGR (California only)	PFE
28	741	O/Y	Data Communications Link (+)	DATA (+)
29	94	GR/R	Heated Exhaust Gas Oxygen Sensor	HEGO
30	716	R/BL	Neutral Drive Switch (A/T)	NDS
30	716	R/BL	Neutral Gear and Clutch Engage Switch (M/T)	NGS and CES
31	709	W/BK	Canister Purge Solenoid	CANP
33	708	W	EGR Vacuum Regulator Solenoid (California only)	EVR
34	777	BK/GR	Data Output Link	DOL
36	752	R	Spark Output	SPOUT
37	702	R/BK	Vehicle Power	VPWR
40	61	BK/W	Power Ground	PWR GND
45	711	W/GR	Manifold Absolute Pressure Sensor	MAP
46	829	LG/Y	Signal Return Ground	SIG RTN
47	815	LG/BK	Throttle Position Sensor	TP
48	200	W/R	Self-Test Input	STI
49	89	BK/LG	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	177	PK	High Electro-Drive Fan	HEDF
54	175	R	Wide Open Throttle A/C Cut-off	WAC
55	178	Y/GR	Electro Drive Fan (Low)	EDF
56	751	BK	Profile Ignition Pick-up	PIP
57	702	R/BK	Vehicle Power	VPWR
58	706	Y	Injector Bank 1	INJ Bank 1
59	705	Y/BK	Injector Bank 2	INJ Bank 2
60	60	BK/Y	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

3.0L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	648	R/LB	Ignition Diagnostic Monitor (California only)	IDM
4	11	DG/Y	Ignition Diagnostic Monitor (49 States & Canada)	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	787	PK/BK	Fuel Pump Monitor (California only)	FPM
9	915	PK/LB	Data Communications Link (-) (California only)	DATA (-)
10	585	P	A/C Cycling Switch (with heated Windshield)	ACCS
10	883	PK/LB	A/C Cycling Switch (w/o heated Windshield)	ACCS
13	144	O/Y	Vehicle Speed Control Solenoid	SOL (+)
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output/"Check Engine" Light	STO/MIL
18	315	DG/P	Transmission 4/3 Switch	THS 4/3
19	237	O/Y	Transmission 3/2 Switch	THS 3/2
20	57	BK	Case Ground	CSE GND
21	68	O/BK	Idle Speed Control - Bypass Air	ISC - BPA
22	97	T/LG	Fuel Pump	FP
23	310	Y/R	Knock Sensor (49 States & Canada)	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR (California only)	PFE
28	914	T/O	Data Communications Link (+) (California only)	DATA (+)
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	480	P/Y	Neutral Pressure Switch	NPS
31	101	GY/Y	Canister Purge Solenoid	CANP
33	360	DG	EGR Vacuum Regulator Solenoid (California only)	EVR
34	305	LB/PK	Data Output Link	DOL
35	146	W/PK	Speed Control Vent Solenoid	SCVNT

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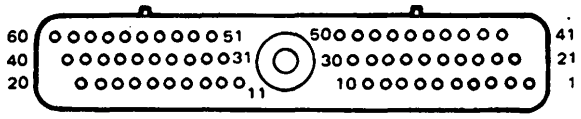
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EEC-IV Module Connector Pin Usage

3.0L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
39	461	O	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	Power Ground	PWR GND
42	145	GY/BK	Speed Control Vacuum Solenoid	SCVAC
45	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return Ground	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	200	W/BK	Self Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
50	151	LB/BK	Speed Control Command Switch	SCCS
52	639	PK	High Electro Drive Fan	HEDF
53	224	T/LB	Lock-Up Solenoid (Transmission)	LUS
54	331	R	Wide Open Throttle (WOT) A/C Cut Off	WAC
55	197	T/O	Electro Drive Fan (Low)	EDF
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	95	T/R	Injector Bank 1	INJ Bank 1
59	96	T/O	Injector Bank 2	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GND

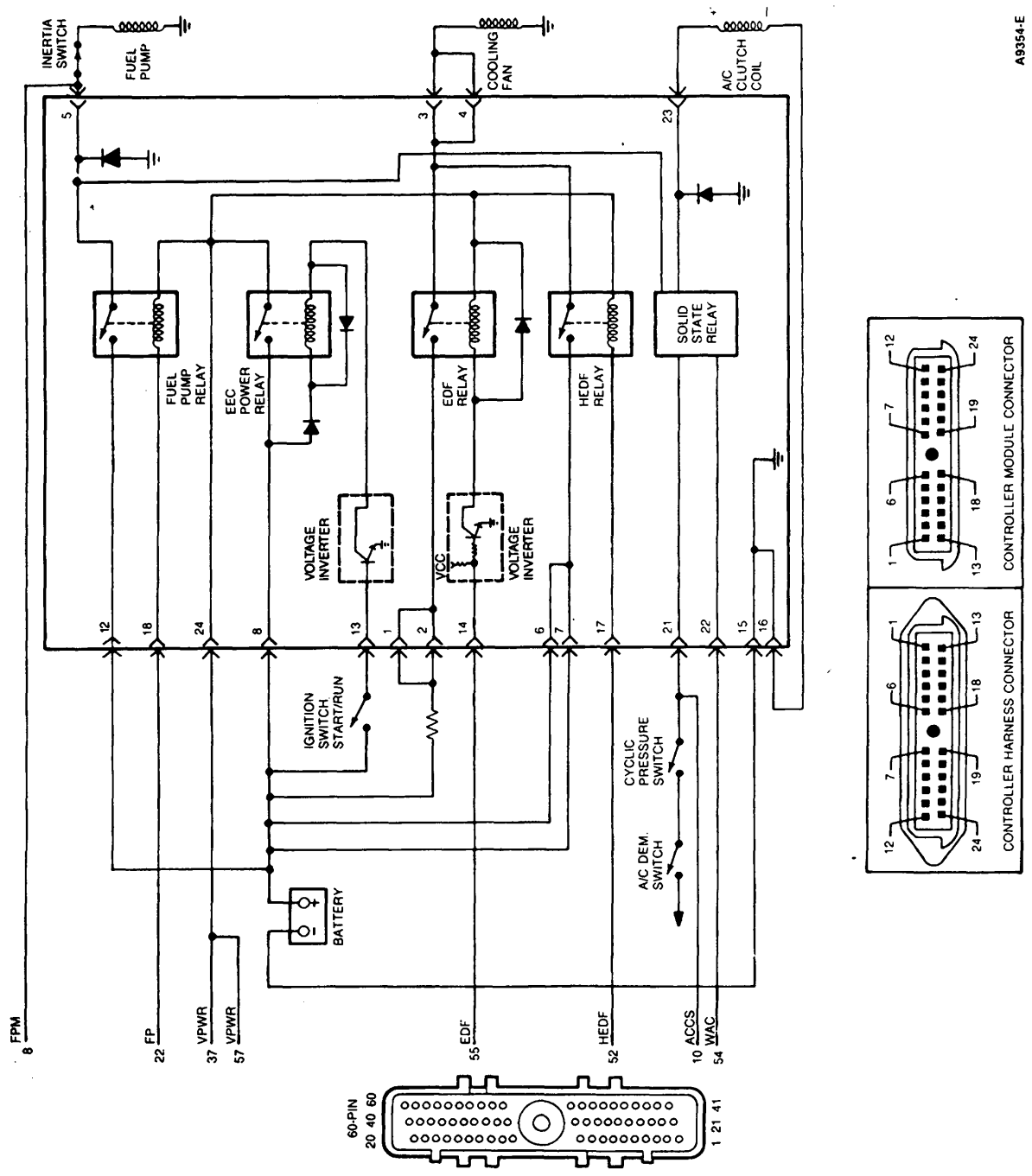
Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Integrated Controller Schematic

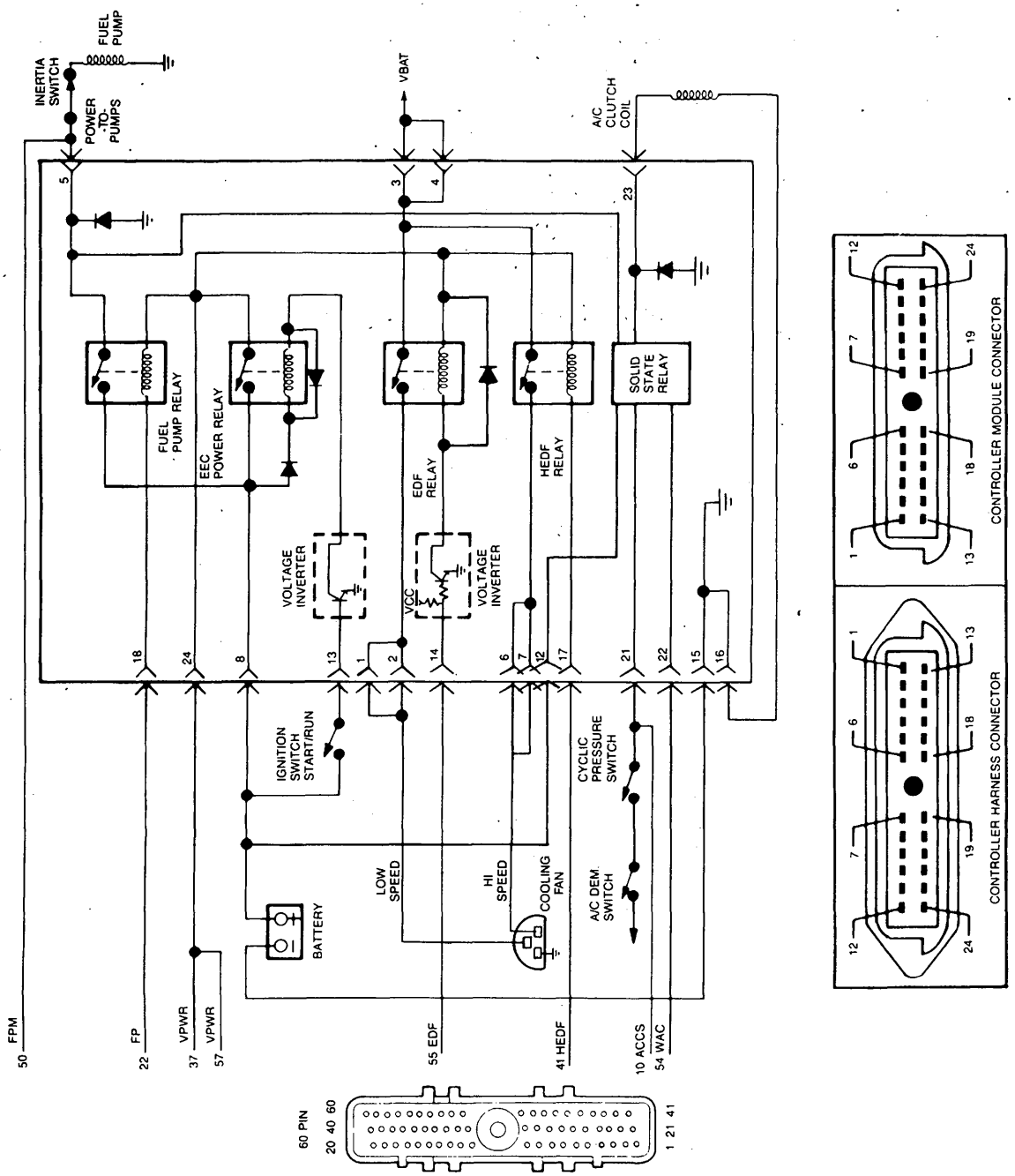
3.0L EFI



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Integrated Controller Schematic

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Integrated Controller Pin Usage

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Pin	Circuit	Color	Applications	Abbreviations
1	181	BR/O	Power to EDF Relay	PT/EDF
1	181	BR/O	Power to Cooling Fan (Probe Only)	PTF
2	181	BR/O	Power to EDF Relay	PT/EDF
2	181	BR/O	Power to Cooling Fan (Probe Only)	PTF
3	228	BR/Y	Power to Cooling Fan	PTF
3	228	BR/Y	Power to Fan Relays (Probe Only)	PTR
4	228	BR/Y	Power to Cooling Fan	PTF
4	228	BR/Y	Power to Fan Relays (Probe Only)	PTR
5	787	PK/BK	Power to Fuel Pump	PTP
6	38	BK/O	Power to HEDF Relay	PT/HEDF
6	38	BK/O	Power to Cooling Fan (Probe Only)	PTF
7	38	BK/O	Power to HEDF Relay	PT/HEDF
7	38	BK/O	Power to Cooling Fan (Probe Only)	PTF
8	37	Y	Battery to EEC Relay	BATT (+)
12	38	BK/O	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Key Power	KEY PWR
14	197	T/O	EDF Circuit	EDF
15	60	BK/LG	Power Ground	PWR GRD
16	57	BK	A/C Clutch Ground	PWR GRD
17	639	PK	HEDF Circuit	HEDF
18	97	T/LG	Fuel Pump	FP
21	883	PK/LB	A/C Cyclic Switch	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	Power to A/C	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

3.0L EFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ROM test failure
15 c ▶	Keep Alive Memory (KAM) test failure
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	ECT sensor input is out of Self-Test range
22 orc ▶	MAP sensor input is out of Self-Test range
23 or ▶	TP sensor input is out of Self-Test range
24 or ▶	ACT sensor input is out of Self-Test range
25 r ▶	KS sensor signal is not sensed during Dynamic Response Test
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	PFE circuit is below minimum voltage
32 rc ▶	PFE circuit voltage low
33 rc ▶	EGR valve opening (PFE) not detected
34 o ▶	PFE sensor voltage out of range
34 rc ▶	Excessive exhaust back pressure/PFE circuit voltage high
35 orc ▶	PFE circuit is above maximum voltage
39 c ▶	AXOD lock-up failed
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switching detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT sensor circuit open
52 o ▶	PSPS circuit is open
52 r ▶	PSPS always staying open or closed
53 oc ▶	TP sensor input is greater than Self-Test maximum voltage
54 oc ▶	ACT sensor circuit open
57 c ▶	AXOD Neutral Pressure Switch (NPS) circuit failed open
59 c ▶	AXOD 4/3 pressure switch circuit failed open
61 oc ▶	ECT sensor circuit grounded
62 o ▶	AXOD 4/3 or 3/2 pressure switch circuit grounded
63 oc ▶	TP sensor input is less than Self-Test minimum voltage
64 oc ▶	ACT sensor circuit grounded
67 o ▶	Neutral Pressure Switch (NPS) circuit closed; A/C ON
69 c ▶	AXOD 3/4 pressure switch circuit failed open
72 r ▶	Insufficient MAP output change during Dynamic Response Test

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

3.0L EFI

SERVICE CODE	SERVICE CODE DEFINITION
73 r ▶	Insufficient TP output change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during Self-Test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
83 o ▶	High speed electro drive fan (HEDF) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
88 o ▶	Electro-drive fan (EDF) circuit failure
89 o ▶	Lock-Up Solenoid (LUS) circuit failure
95 oc ▶	Fuel pump circuit open/ECA to motor ground
96 oc ▶	Fuel pump circuit open/Battery to ECA
98 r ▶	Hard fault is present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

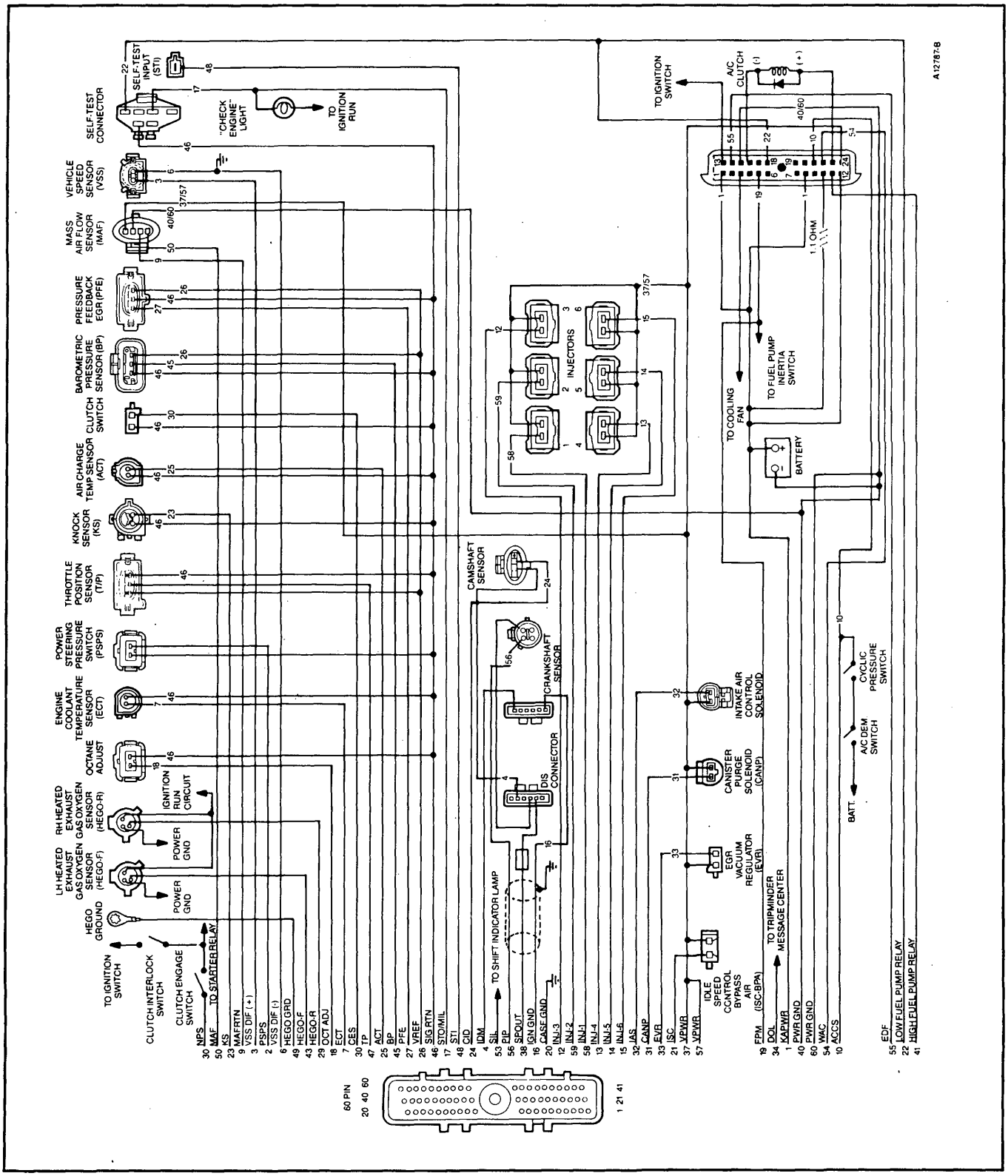
KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

3.0L SHO SEFI

TAURUS



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EEC-IV Module Connector Pin Usage

3.0L SHO SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	330	Y/LG	Power Steering Pressure Switch	PSPS
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	395	GY/O	Ignition Diagnostic Monitor	IDM
5	810	R/LG	Brake On/Off	BOO
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature	ECT
9	968	T/LB	Mass Air Signal Return	MAF RTN
10	883	PK/LB	A/C Clutch Signal	ACCS
11	144	O/Y	Vehicle Speed Control Solenoid	SOL (+)
12	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	Injector #5	INJ 5
15	560	LG	Injector #6	INJ 6
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output/"Check Engine Light"	STO/MIL
18	929	PK	Octane Adjust	OCT ADJ
19	787	PK/BK	Fuel Pump Monitor	FPM
20	57	BK	Case Ground	CASE GND
21	68	O/BK	Idle Speed Control Bypass Air	ISC
22	97	T/LG	Low Fuel Pump Relay	LFP
23	310	Y/R	Knock Sensor	KS
24	795	DG	Cylinder Identification Sensor	CID
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
28	151	LB/BK	Speed Control Command Switch	SCCS
29	94	DG/P	Heated Exhaust Gas Oxygen - Rear	HEGO - R

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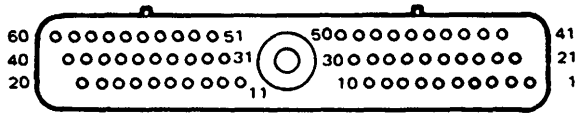
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EEC-IV Module Connector Pin Usage

3.0L SHO SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
30	480	P/Y	Clutch Switch	CES
31	101	GY/Y	Canister Purge	CANP
32	965	LG/P	Intake Air Control Solenoid	IAC
33	360	DG	EGR Valve Regulator	EVR
35	146	W/PK	Speed Control Vent (Solenoid)	SCVNT
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
39	461	O	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	Power Ground	PWR GND
41	926	LB/O	High Fuel Pump Relay	HFP
43	90	DB/LG	Heated Exhaust Gas Oxygen – Front	HEGO – F
45	358	LG/BK	Barometric Absolute Pressure	BAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	200	W/BK	Self-Test Input	STI
49	89	O	Heated EGO Sensor Ground	HEGO GND
50	967	DB/O	Mass Air Flow Sensor	MAF
51	145	GY/BK	Speed Control Vacuum (Solenoid)	SCVAC
54	331	R	Wide Open Throttle A/C Cutoff	WAC
55	197	T/O	Electro-Drive Fan	EDF
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector #1	INJ 1
59	556	W	Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

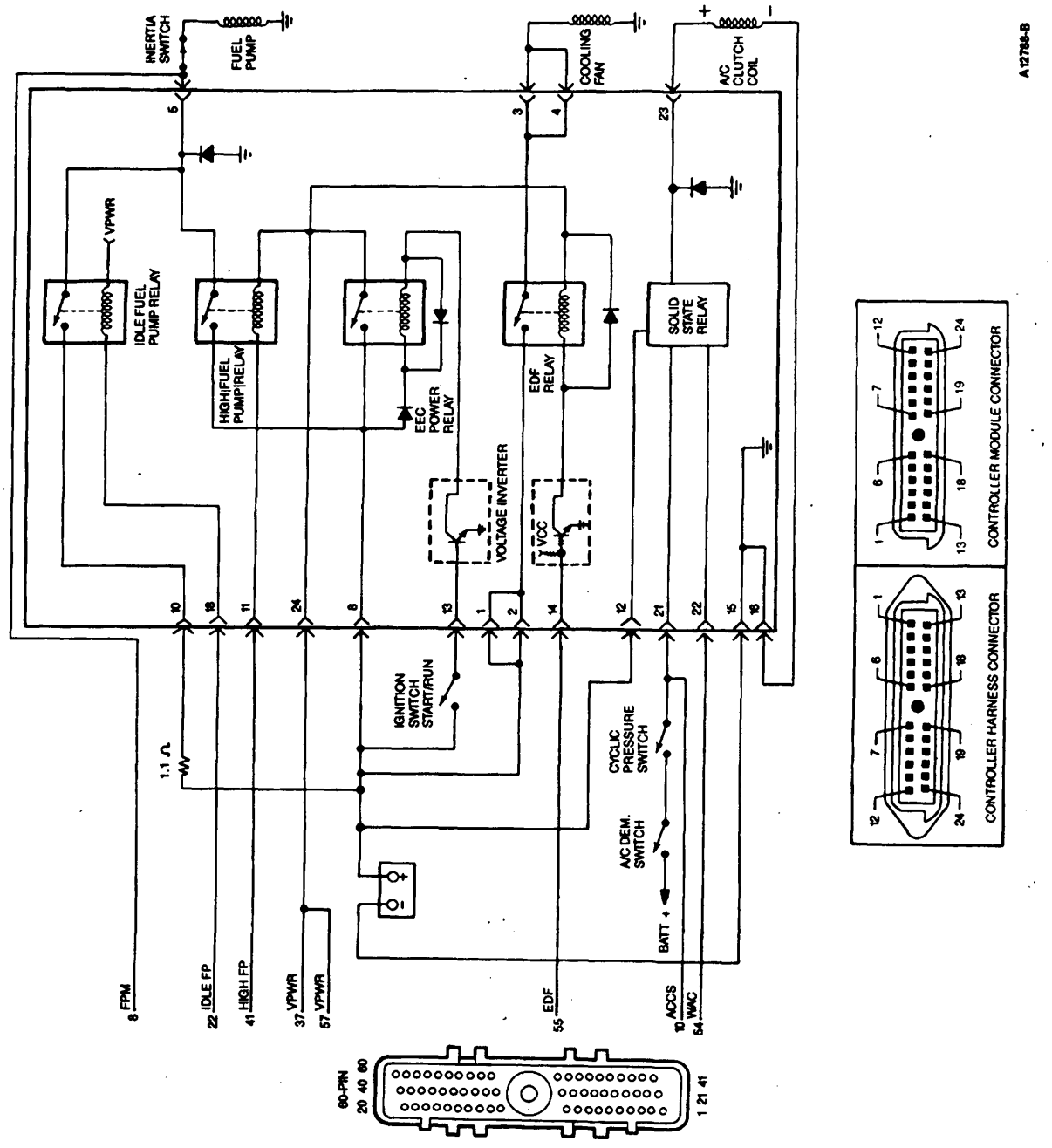
Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Integrated Controller Schematic

3.0L SHO SEFI



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Integrated Controller Pin Usage

3.0L SHO SEFI

Pin	Circuit	Color	Applications	Abbreviations
1	38	BK/O	Power to EDF Relay	PT/EDF
2	38	BK/O	Power to EDF Relay	PT/EDF
3	181	BR/O	Power to Cooling Fan	PTF
4	181	BR/O	Power to Cooling Fan	PTF
5	787	PK/BK	Power to Fuel Pump	PTP
8	37	Y	Battery to EEC Relay	BATT (+)
10	922	W/R	Power to Low Fuel Pump Relay	PT/LFP
11	926	LB/O	High Fuel Pump	H/FP
12	38	BK/O	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Key Power	KEY PWR
14	197	T/O	EDF Circuit	EDF
15	57	BK	Power Ground	PWR GRD
16	57	BK	A/C Clutch Ground	PWR GRD
18	97	T/LG	Low Fuel Pump	L/FP
21	883	PK/LB	A/C Cyclic Switch	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	Power to A/C	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

3.0L SHO SEFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Unable to control rpm during Self-Test high rpm check
13 r ▶	Unable to control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA ROM test failure
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure SPOUT circuit grounded
19 c ▶	CID circuit failed
21 or ▶	ECT sensor out of Self-Test range
22 oc ▶	BP sensor out of Self-Test range
23 or ▶	TP sensor out of Self-Test range
24 or ▶	ACT sensor out of Self-Test range
25 r ▶	KS sensor not sensed during Dynamic Response Test
26 or ▶	MAF sensor out of Self-Test range
29 c ▶	Insufficient input from Vehicle Speed Sensor (VSS)
31 orc ▶	PFE circuit below minimum voltage
32 rc ▶	PFE circuit voltage low
33 rc ▶	EGR valve opening not detected
34 o ▶	PFE sensor voltage out of range
34 rc ▶	Exhaust back pressure high/PFE circuit voltage high
35 orc ▶	PFE circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean (rear HEGO)
41 c ▶	No HEGO switching detected (rear HEGO)
42 r ▶	HEGO sensor circuit indicates system rich (right HEGO)
45 c ▶	Coil 1 primary circuit failure
46 c ▶	Coil 2 primary circuit failure
48 c ▶	Coil 3 primary circuit failure
49 c ▶	SPOUT signal defaulted to 10 degrees BTDC/SPOUT circuit open
51 oc ▶	ECT sensor indicated 254°F/circuit grounded
52 o ▶	PSPS circuit is open
52 r ▶	PSPS circuit did not change states
53 oc ▶	TP sensor circuit above maximum voltage
54 oc ▶	ACT sensor indicates -40°F/circuit open
56 oc ▶	MAF sensor input is greater than maximum voltage
59 oc ▶	Low speed fuel pump circuit open (battery to ECA)
61 oc ▶	ECT sensor indicated 254°F/circuit grounded
63 oc ▶	TP sensor circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
66 c ▶	MAF sensor input is less than minimum voltage
67 o ▶	Neutral Pressure Switch (NPS) circuit closed; A/C ON

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

3.0L SHO SEFI

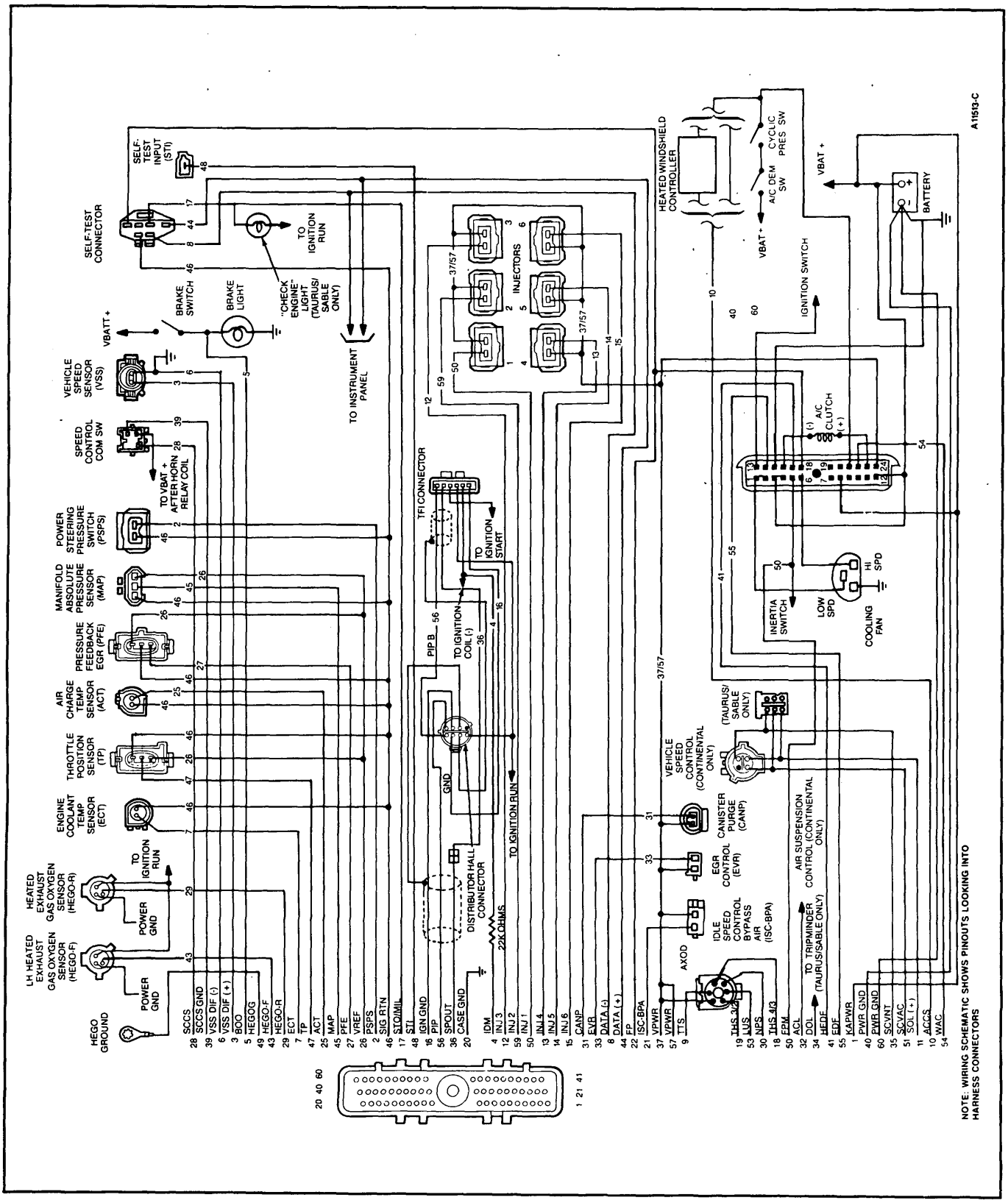
SERVICE CODE	SERVICE CODE DEFINITION
72 r ▶	Insufficient MAF output change during Dynamic Response Test
73 r ▶	Insufficient TP output change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during Self-Test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
79 o ▶	A/C on/Defrost on during Self-Test
81 o ▶	IAS circuit failure
83 oc ▶	Low speed primary fuel pump circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Primary fuel pump circuit failure
88 o ▶	Electro-Drive Fan (EDF) circuit failure
91 r ▶	HEGO sensor indicates system lean (front - HEGO)
91 c ▶	No HEGO switching detected (front - HEGO)
92 r ▶	HEGO sensor indicates system rich (front - HEGO)
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	High speed fuel pump circuit open
98 r ▶	Hard fault is present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

3.8L AXOD SEFI



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EEC-IV Module Connector Pin Usage

3.8L AXOD SEFI

Pin	Car Lines				Application	Abbreviations
	Taurus/Sable		Continental			
	Crt.#	Wire Color	Crt.#	Wire Color		
1	37	Y	37	Y	Keep Alive Power	KAPWR
2	330	Y/LG	330	Y/LG	Power Steering Pressure Switch	PSPS
3	150	DG/W	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	810	R/LG	810	R/LG	Brake On/Off	BOO
6	563	O/Y	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	695	BK/O	695	BK/O	Data Communications Link (-)	DATA (-)
9	854	GY/W	854	GY/W	Transmission Temperature Switch	TTS
10	585	P	585	P	A/C Cycling Switch (w/htd. windshield)	ACCS
10	883	PK/LB	348	LG/P	A/C Cycling Switch (w/o htd. windshield)	ACCS
11	144	O/Y	144	O/Y	Vehicle Speed Control Solenoid	SOL (+)
12	557	BR/Y	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	559	T/LB	Injector #5	INJ 5
15	560	LG	560	LG	Injector #6	INJ 6
16	350	GY	350	GY	Ignition Ground	IGN GND
17	201	T/R	201	T/R	Self-Test Output/"CHECK ENGINE" Light	STO/MIL
18	315	DG/P	315	DG/P	Transmission 4/3 Switch	THS 4/3
19	237	O/Y	237	O/Y	Transmission 3/2 Switch	THS 3/2
20	57	BK	57	BK	Case Ground	CASE GND
21	68	O/BK	68	O/BK	Idle Speed Control - Bypass Air	ISC - BPA
22	97	T/LG	97	T/LG	Fuel Pump	FP
25	357	LG/P	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	351	O/W	Reference Voltage	VREF
27	352	BR/LG	352	BR/LG	Pressure Feedback EGR	PFE
28	151	LB/BK	151	LB/BK	Speed Control Command Switch	SCCS
29	90	DB/LG	90	DB/LG	Heated Exhaust Gas Oxygen Sensor - Rear	HEGO - R
30	480	P/Y	480	P/Y	Neutral Pressure Switch	NPS
31	101	GY/Y	101	GY/Y	Canister Purge Solenoid	CANP
32	—	—	637	LG	Air Suspension Control	ACL
33	360	DG	360	DG	EGR Vacuum Regulator Solenoid	EVR
34	305	LB/PK	—	—	Data Output Line	DOL
35	146	W/PK	146	W/PK	Speed Control Vent Solenoid	SCVNT

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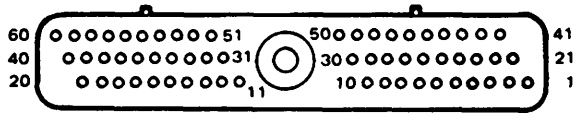
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EEC-IV Module Connector Pin Usage

3.8L AXOD SEFI

Pin	Car Lines				Application	Abbreviations
	Taurus/Sable		Continental			
	Crt.#	Wire Color	Crt.#	Wire Color		
36	324	Y/LG	324	Y/LG	Spark Output	SPOUT
37	361	R	361	R	Vehicle Power	VPWR
39	461	O	461	O	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	60	BK/LG	Power Ground	PWR GND
41	639	PK	639	PK	High Electro Drive Fan	HEDF
43	94	DG/P	94	DG/P	Heated Exhaust Gas Oxygen Sensor – Front	HEGO – F
44	696	O/BK	696	O/BK	Data Communications Link (+)	DATA (+)
45	358	LG/BK	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	359	BK/W	Signal Return Ground	SIG RTN
47	355	DG/LG	355	DG/LG	Throttle Position Sensor	TP
48	200	W/BK	200	W/BK	Self Test Input	STI
49	89	O	89	O	Heated EGO Ground	HEGO GND
50	787	PK/BK	787	PK/BK	Fuel Pump Monitor	FPM
51	145	GY/BK	145	GY/BK	Speed Control Vacuum Solenoid	SCVAC
53	224	T/LB	224	T/LB	Lock-Up Solenoid (Transmission)	LUS
54	331	R	331	R	Wide Open Throttle (WOT) A/C Cut Off	WAC
55	197	T/O	197	T/O	Electro Drive Fan — Low	EDF
56	349	DB	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	361	R	Vehicle Power	VPWR
58	555	T	555	T	Injector #1	INJ 1
59	556	W	556	W	Injector #2	INJ 2
60	60	BK/LG	60	BK/LG	Power Ground	PWR GND

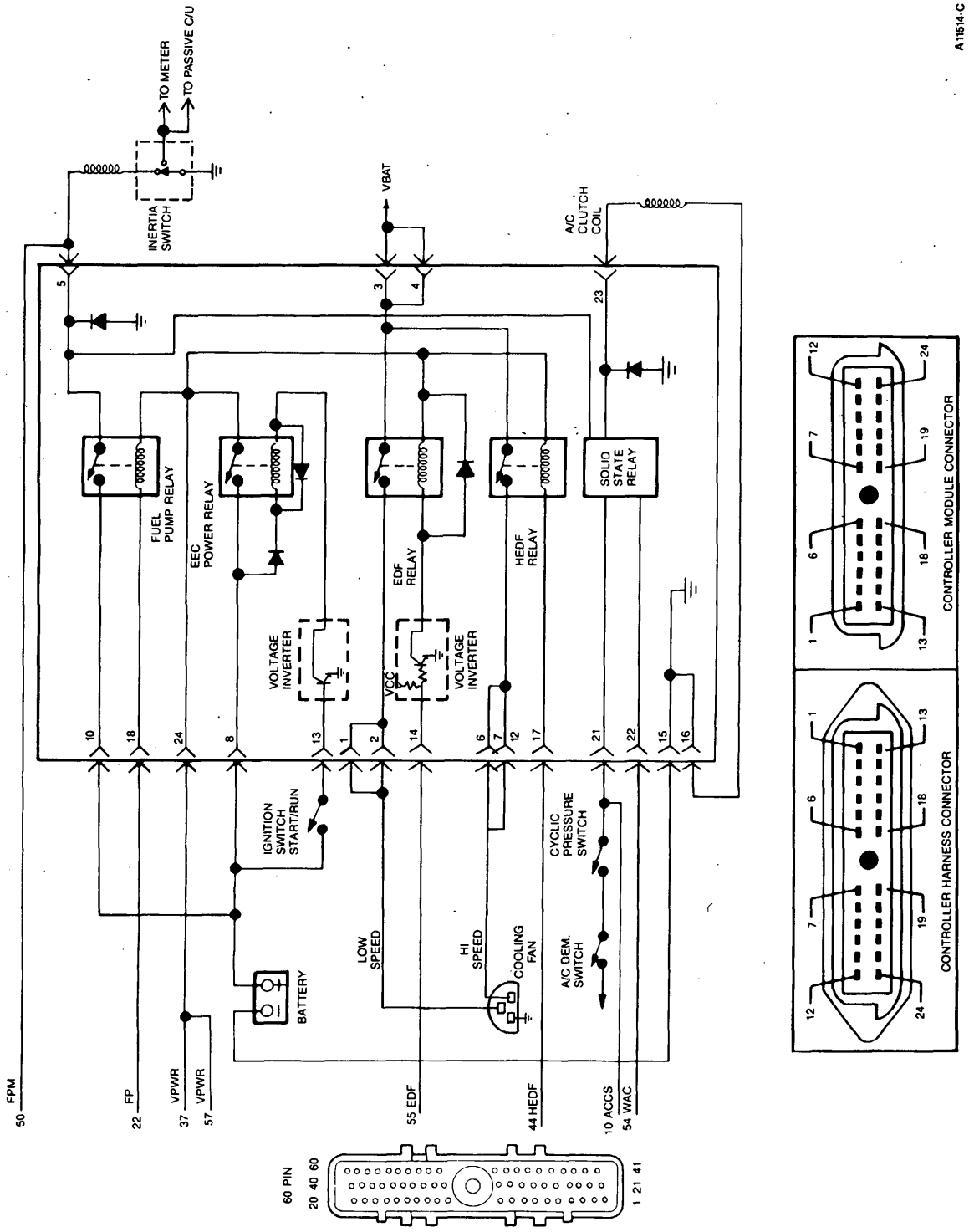
Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Integrated Controller Schematic

3.8L AXOD SEFI



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Integrated Controller Pin Usage

3.8L AXOD SEFI

Pin	Circuit	Color	Applications	Abbreviations
1	181	BR/O	Power to EDF Cooling Fan	PT/EDF
2	181	BR/O	Power to EDF Cooling Fan	PT/EDF
3	38	BK/O	Power to Cooling Fan Relay	PTF
4	38	BK/O	Power to Cooling Fan Relay	PTF
5	787	PK/BK	Power to Fuel Pump	PTP
6	228	BR/Y	Power to HEDF Cooling Fan	PT/HEDF
7	228	BR/Y	Power to HEDF Cooling Fan	PT/HEDF
8	37	Y	Battery to EEC Cooling Fan	BATT (-)
12	38	BK/O	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Key Power	KEY PWR
14	197	T/O	EDF Circuit	EDF
15	60	BK/LG	Power Ground	PWR GRD
16	321	GY/W	A/C Clutch Ground	PWR GRD
17	639	PK	HEDF Circuit	HEDF
18	97	T/LG	Fuel Pump	FP
21	348	LG/P	A/C Cyclic Switch	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	Power to A/C	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

3.8L AXOD SEFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ROM test failure
15 c ▶	Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	ECT sensor input is out of Self-Test range
22 orc ▶	MAP sensor input is out of Self-Test range
23 or ▶	TP sensor input is out of Self-Test range
24 or ▶	ACT sensor input is out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	PFE circuit is below minimum voltage
32 rc ▶	PFE circuit voltage is low
33 rc ▶	EGR valve opening (PFE) is not detected
34 o ▶	PFE sensor voltage out of range
34 rc ▶	Excessive exhaust back pressure/PFE circuit voltage high
35 orc ▶	PFE circuit is above maximum voltage
39 c ▶	AXOD lock-up failed
41 r ▶	HEGO sensor circuit indicates system lean (right HEGO)
41 c ▶	No HEGO switching detected (right HEGO)
42 r ▶	HEGO sensor circuit indicates system rich (right HEGO)
51 oc ▶	ECT sensor circuit open
52 o ▶	PSPS circuit is open
52 r ▶	PSPS always staying open or closed
53 oc ▶	TP sensor input is greater than Self-Test maximum voltage
54 oc ▶	ACT sensor circuit open
57 c ▶	AXOD Neutral Pressure Switch (NPS) circuit failed open
59 o ▶	AXOD 4/3 pressure switch circuit failed closed
59 c ▶	AXOD 4/3 pressure switch circuit failed open
61 oc ▶	ECT sensor circuit grounded
63 oc ▶	TP sensor input is less than Self-Test minimum voltage
64 oc ▶	ACT sensor circuit grounded
67 o ▶	AXOD Neutral Pressure Switch (NPS) circuit failed closed/A/C ON
68 orc ▶	AXOD Transmission Temperature Switch (TTS) failed open
69 o ▶	AXOD 3/2 pressure switch circuit failed closed
69 c ▶	AXOD 3/4 pressure switch circuit failed open

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

3.8L AXOD SEFI

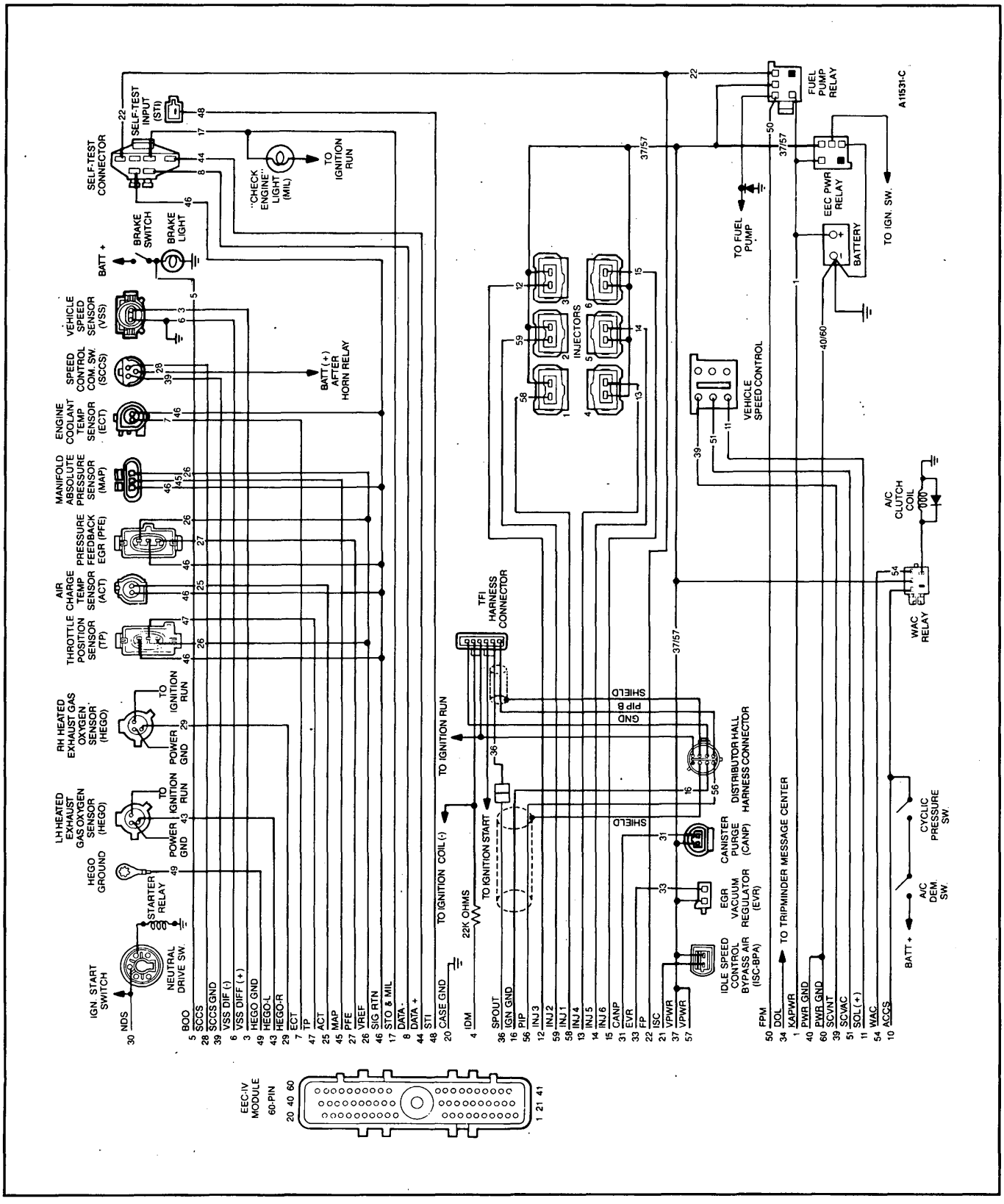
SERVICE CODE	SERVICE CODE DEFINITION
70 c ▶	ECA data communications link (DCL) circuit failure
71 c ▶	Cluster Control Assembly (CCA) circuit failed
72 c ▶	Message Center Control Assembly (MCCA) circuit failed
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during Self-Test
79 o ▶	A/C on/Defrost on during Self-Test
83 o ▶	High speed electro drive fan (HEDF) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
88 o ▶	Electro-Drive Fan (EDF) circuit failure
89 o ▶	Lock-Up Solenoid (LUS) circuit failure
91 r ▶	HEGO sensor circuit indicates system lean (left HEGO)
91 c ▶	No HEGO switching detected (left HEGO)
92 r ▶	HEGO sensor circuit indicates system rich (left HEGO)
95 oc ▶	Fuel pump circuit open/ECA to motor ground
96 oc ▶	Fuel pump circuit open/Battery to ECA
98 r ▶	Hard fault present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

3.8L RWD SEFI



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EEC-IV Module Connector Pin Usage

3.8L RWD SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	511	LG	Brake On/Off	BOO
6	359	BK/W	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature	ECT
8	696	O/BK	Data Communications Link (-)	DATA (-)
10	883	PK/LB	A/C Cycling Switch	ACCS
11	144	O/Y	Vehicle Speed Control Solenoid	SOL (+)
12	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	Injector #5	INJ 5
15	560	LG	Injector #6	INJ 6
16	259	BK/O	Ignition Ground	IGN GND
17	382	Y/BK	Self-Test Output and "Check Engine" Light	STO/MIL
20	57	BK	Case Ground	CSE GND
21	69	R/LG	Idle Speed Control - Bypass Air	ISC - BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
28	151	LB/BK	Speed Control Command Switch	SCCS
29	96	T/O	Heated Exhaust Gas Oxygen Sensor - Right	HEGO - R
30	32	R/LB	Neutral Drive Switch	NDS
31	101	GY/Y	Canister Purge	CANP
33	360	DG	EGR Vacuum Regulator	EVR
34	305	LB/PK	Data Output Link	DOL
35	146	W/PK	Speed Control Vent Solenoid	SCVNT
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
39	57	BK	Speed Control Ground	SCGND
40	60	BK/LG	Power Ground	PWR GND

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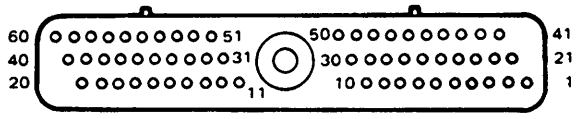
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EEC-IV Module Connector Pin Usage

3.8L RWD SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
43	95	T/R	Heated Exhaust Gas Oxygen Sensor - Left	HEGO - L
44	695	BK/O	Data Communications Link (+)	DATA (+)
45	356	DB/LG	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return	SIG/RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO G
50	787	PK/BK	Fuel Pump Monitor	FPM
51	145	GY/BK	Speed Control Vacuum Solenoid	SCVAC
54	73	O/LB	W.O.T. A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector #1	INJ 1
59	556	W	Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

3.8L RWD SEFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	ECT out of Self-Test range
22 orc ▶	MAP out of Self-Test range
23 or ▶	TP out of Self-Test range
24 or ▶	ACT out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	PFE circuit below minimum voltage
32 rc ▶	PFE circuit voltage low
33 rc ▶	EGR valve opening NOT detected
34 o ▶	PFE sensor voltage out of range
34 rc ▶	Exhaust pressure high/PFE circuit voltage high
35 orc ▶	PFE circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean (right HEGO)
41 c ▶	No HEGO switch detected (right HEGO)
42 r ▶	HEGO sensor circuit indicates system rich (right HEGO)
51 oc ▶	ECT indicated – 40°F/circuit open
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated – 40°F/circuit open
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
67 o ▶	Neutral Drive Switch (NDS) circuit open
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during Self-Test
79 o ▶	A/C on/Defrost on during Self-Test
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
91 r ▶	HEGO sensor circuit indicates system lean (left HEGO)
91 c ▶	No HEGO switching detected (left HEGO)
92 r ▶	HEGO sensor circuit indicates system rich (left HEGO)
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
98 r ▶	Hard fault is present — FMEM mode
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

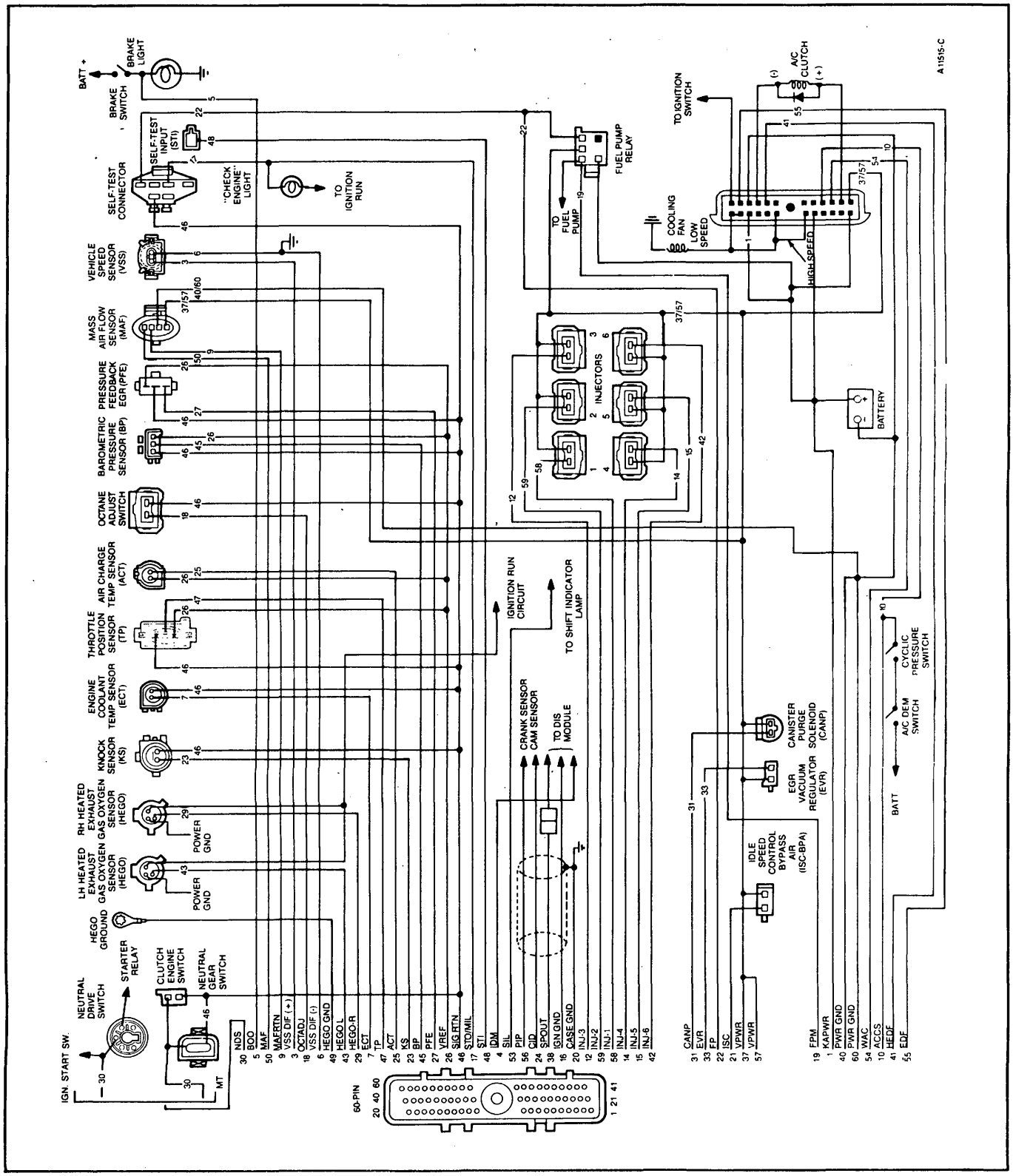
KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

3.8L SC SEFI

THUNDERBIRD/COUGAR



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EEC-IV Module Connector Pin Usage

3.8L SC SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	275	Y	A/C Pressure Cut-Off Switch	APCS
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostics Monitor	IDM
5	511	LG	Brake On/Off	BOO
6	359	BK/W	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
9	968	T/LB	Mass Air Signal Return	MAFRTN
10	883	PK/LB	A/C Clutch Signal	ACCS
11	144	O/Y	Vehicle Speed Control Solenoid	SOL (+)
12	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	Injector #5	INJ 5
15	560	LG	Injector #6	INJ 6
16	796	LB	Ignition Ground	IGN GND
17	382	Y/BK	Self-Test Output/"Check Engine Light"	STO
18	359	BK/W	Octane Adjust	OCTADJ
19	787	PK/BK	Fuel Pump Monitor	FPM
20	57	BK	Case Ground	CASE GND
21	69	R/LG	Idle Speed Control	ISC
22	97	T/LG	Fuel Pump	FP
23	310	Y/R	Knock Sensor	KS
24	795	DG	Cylinder Identification Sensor	CID
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	Pressure Feedback EGR	PFE
28	151	LB/BK	Speed Control Command Switch	SCCS
29	96	T/O	Heated Exhaust Gas Oxygen Sensor - Right	HEGO - R
30	32	R/LB	Neutral Drive Switch	NDS
31	101	GY/Y	Canister Purge	CANP
32	836	O/W	Air Suspension Control	ACL
33	360	DG	EGR Valve Regulator	EVR
35	146	W/PK	Speed Control Vent Solenoid	SCVNT

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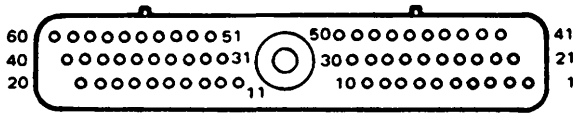
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EEC-IV Module Connector Pin Usage

3.8L SC SEFI

Pin	Circuit	Wire Color	Application	Abbreviations
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
39	465	W/LB	Speed Control Command Switch Ground	SC GND
40	60	BK/LG	Power Ground	PWR GND
41	639	PK	High Electro Drive Fan	HEDF
43	95	T/R	Heated Exhaust Gas Oxygen Sensor – Left	HEGO – L
45	356	DB/LG	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return Ground	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	Self-Test Input	STI
49	89	O	HEGO Sensor Ground	HEGO GND
50	967	DB/O	Mass Air Flow Sensor	MAF
51	145	GY/BK	Speed Control Vacuum (Solenoid)	SCVAC
53	462	P	Shift Indicator Light	SIL
54	331	R	Wide Open Throttle A/C Cut Off	WAC
55	197	T/O	Electro-Drive Fan	EDF
56	349	DB	Profile Ignition Pick-up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector #1	INJ 1
59	556	W	Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

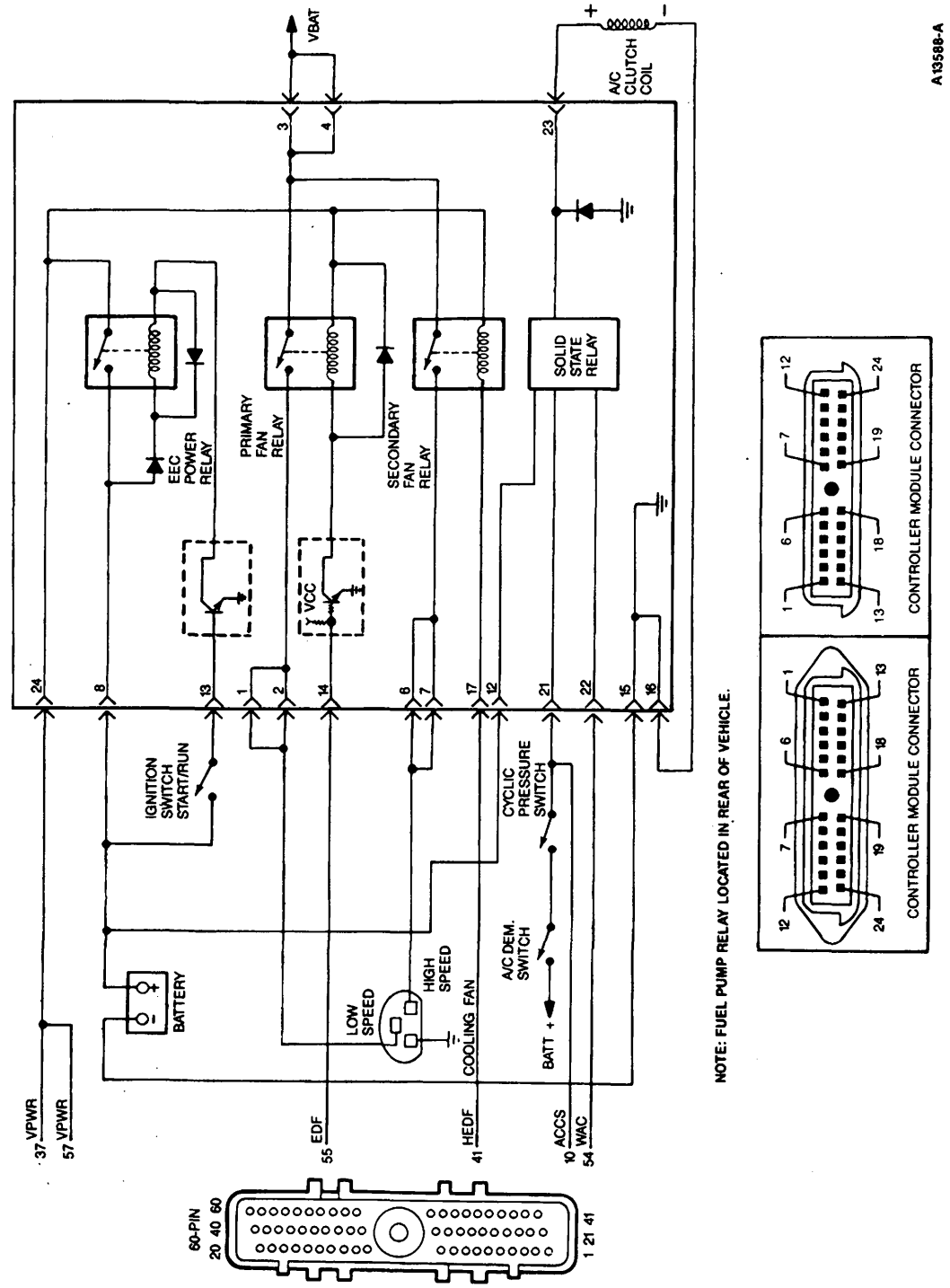
Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Integrated Controller Schematic

3.8L SC SEFI



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Integrated Controller Pin Usage

3.8L SC SEFI

Pin	Circuit	Color	Applications	Abbreviations
1	228	BR/Y	Low Speed Fan	PT/EDF
2	228	BR/Y	Low Speed Fan	PT/EDF
3	038	BK/O	Vehicle Power	PTF
4	038	BK/O	Vehicle Power	PTF
6	181	BR/O	High Speed Fan	PT/HEDF
7	181	BR/O	High Speed Fan	PT/HEDF
8	37	Y	Battery to EEC Relay	BATT (+)
12	175	BK/Y	Power to WOT A/C Cut Off	PT/WAC
13	16	R/LG	Key Power	KEY PWR
14	197	T/O	EDF Circuit	EDF
15	57	BK	Power Ground	PWR GRD
16	321	W/P	A/C Clutch Ground	PWR GRD
17	639	PK	HEDF Circuit	HEDF
21	883	PK/LB	A/C Cyclic Switch	ACCS
22	331	R	WOT A/C Cut Off	WAC
23	347	BK/Y	Power to A/C Clutch Coil	PTAC
24	361	R	Vehicle Power	VPWR

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Quick Test Codes and Code Definitions

3.8L SC SEFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Unable to control rpm during Self-Test high rpm check
13 r ▶	Unable to control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA ROM test failure
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 c ▶	CID circuit failed
21 or ▶	ECT sensor out of Self-Test range
22 oc ▶	BP sensor out of Self-Test range
23 or ▶	TP sensor out of Self-Test range
24 or ▶	ACT sensor out of Self-Test range
25 r ▶	KS sensor not sensed during Dynamic Response Test
26 or ▶	MAF sensor out of Self-Test range
29 c ▶	Insufficient input from Vehicle Speed Sensor (VSS)
31 orc ▶	PFE circuit below minimum voltage
32 rc ▶	PFE circuit voltage low
33 rc ▶	EGR valve opening not detected
34 o ▶	PFE sensor voltage out of range
34 rc ▶	Exhaust back pressure high/PFE circuit voltage high
35 orc ▶	PFE circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean (right HEGO)
41 c ▶	No HEGO switching detected (right HEGO)
42 r ▶	HEGO sensor circuit indicates system rich (right HEGO)
45 c ▶	Coil 1 primary circuit failure
46 c ▶	Coil 2 primary circuit failure
48 c ▶	Coil 3 primary circuit failure
49 c ▶	SPOUT signal defaulted to 10 degrees BTDC/SPOUT circuit open
51 oc ▶	ECT sensor indicated 254°F/Circuit grounded
52 o ▶	PSPS circuit is open
52 r ▶	PSPS circuit did not change states
53 oc ▶	TP sensor circuit above maximum voltage
54 oc ▶	ACT sensor indicates -40°F/Circuit open
56 oc ▶	MAF sensor input is greater than maximum voltage
61 oc ▶	ECT indicated 254°F/Circuit grounded
63 oc ▶	TP sensor circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/Circuit grounded
66 c ▶	MAF sensor input is less than minimum voltage
67 o ▶	Neutral Drive Switch (NDS) circuit closed; A/C ON
67 c ▶	Clutch switch circuit failure

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KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definitions

3.8L SC SEFI

SERVICE CODE	SERVICE CODE DEFINITION
72 r ▶	Insufficient MAF output change during Dynamic Response Test
73 r ▶	Insufficient TP output change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure — not actuated during Self-Test
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
79 o ▶	A/C on/Defrost on during Self-Test
82 o ▶	Supercharger bypass circuit failure
83 o ▶	High speed electro-drive fan circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Primary fuel pump circuit failure
88 o ▶	Electro-Drive Fan (EDF) circuit failure
91 r ▶	HEGO sensor indicates system lean (left HEGO)
91 c ▶	No HEGO switching detected (left HEGO)
92 r ▶	HEGO sensor indicates system rich (left HEGO)
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
98 r ▶	Hard fault is present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

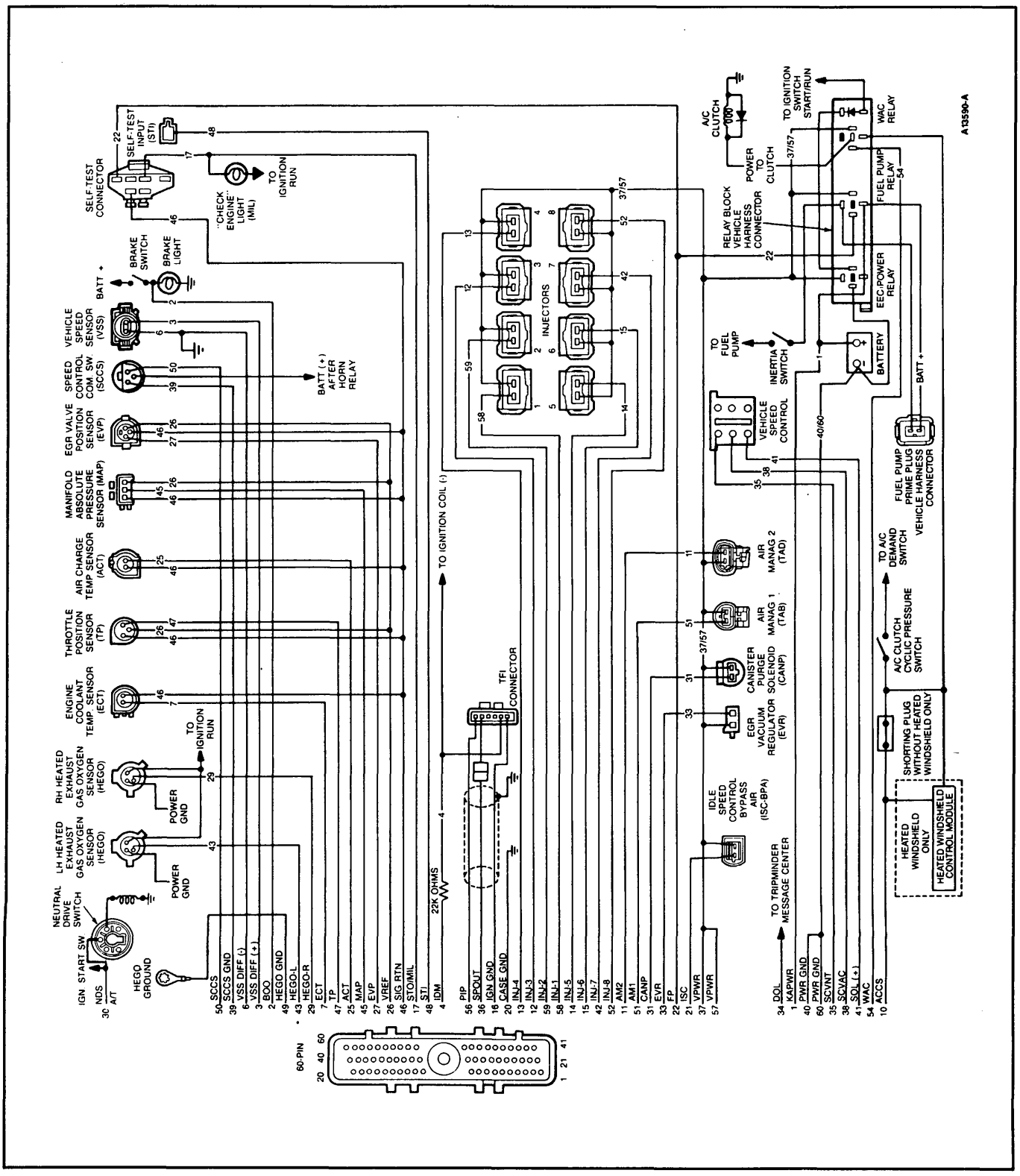
KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

5.0L SEFI

NON MASS AIR: CROWN VICTORIA, GRAND MARQUIS

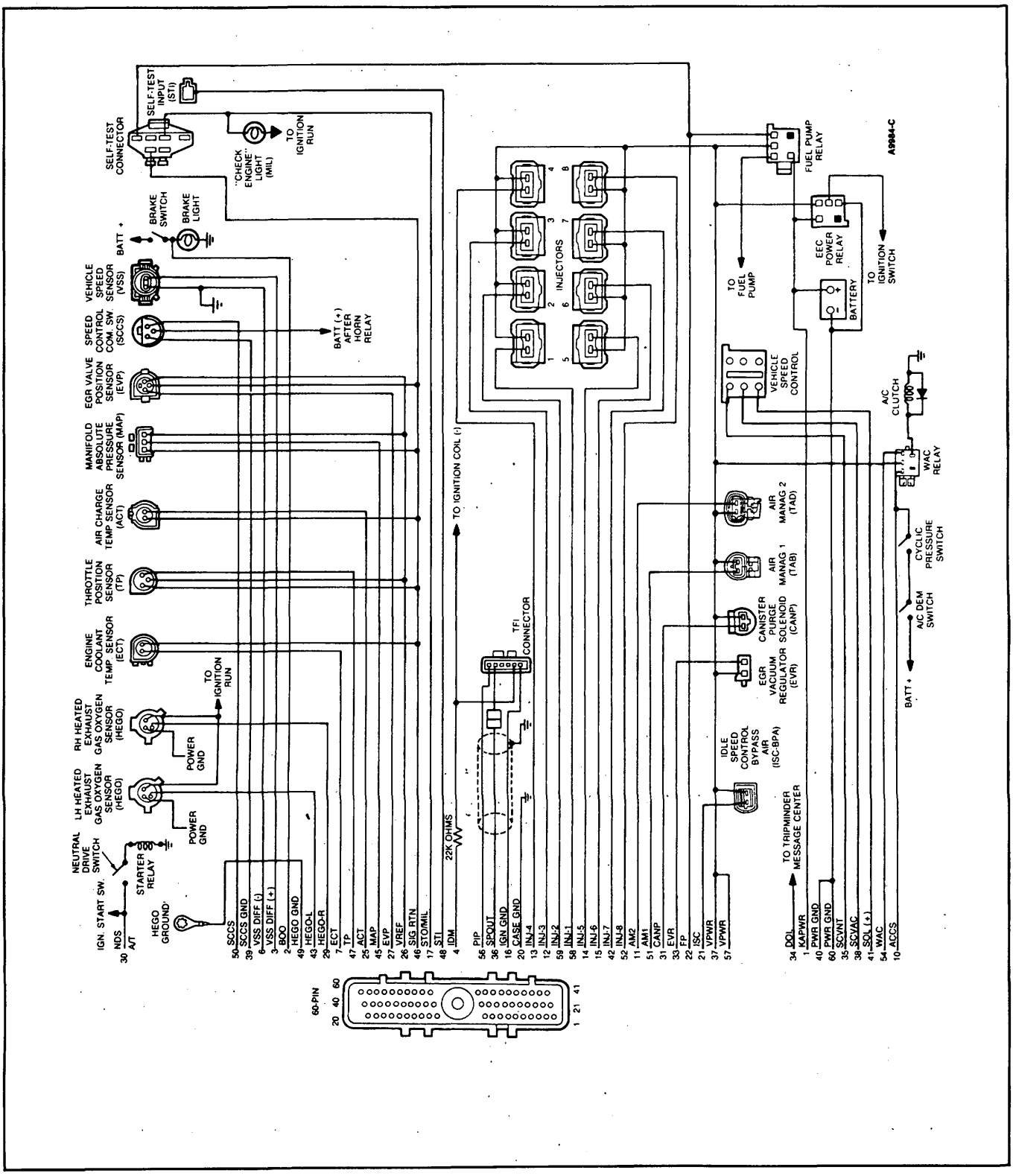


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Electrical Schematic

5.0L SEFI

MARK VII

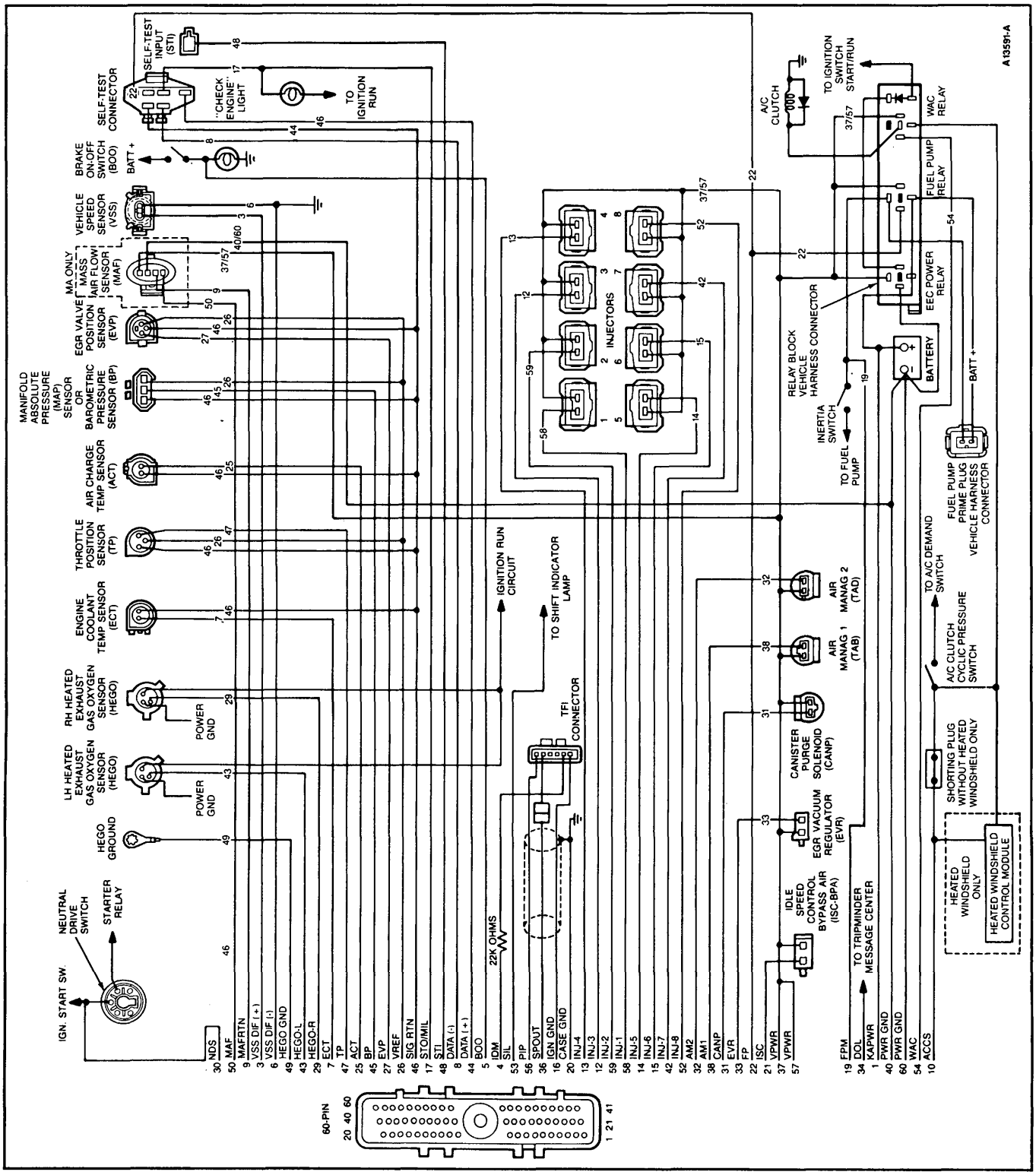


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Electrical Schematic

5.0L MA/ NON MA

MASS AIR: CROWN VICTORIA/GRAND MARQUIS, TOWN CAR
NON MASS AIR: TOWN CAR

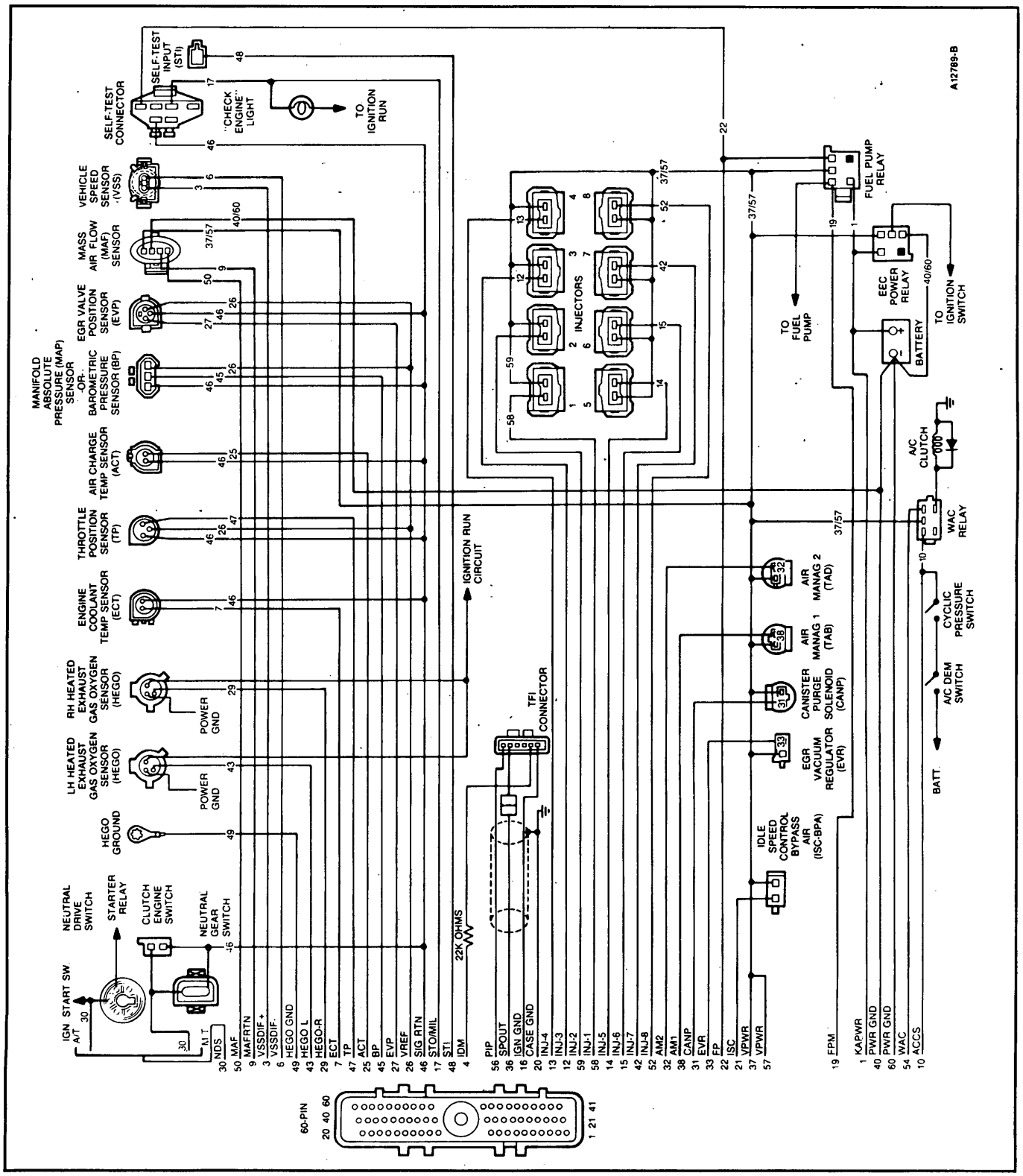


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Electrical Schematic

5.0L MA SEFI

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EEC-IV Module Connector Pin Usage

5.0L SEFI

NON MASS AIR: CROWN VICTORIA, GRAND MARQUIS, MARK VII

Pin	Car Lines				Application	Abbreviations
	Mark VII		Crown Victoria/ Grand Marquis			
	Crt.#	Wire Color	Crt.#	Wire Color		
1	38	BK/O	37	Y	Keep Alive Power	KAPWR
2	511	LG	511	LG	Brake On/Off	BOO
3	150	DG/W	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	683	P/LB	359	BK/W	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	354	LG/Y	Engine Coolant Temperature	ECT
10	348	LG/P	883	PK/LB	A/C Cycling Switch	ACCS
11	99	LG/BK	99	LG/BK	Air Management 2	AM2
12	557	BR/Y	557	BR/Y	Injector #3	INJ 3
13	558	BR/LB	558	BR/LB	Injector #4	INJ 4
14	559	T/LB	559	T/LB	Injector #5	INJ 5
15	560	LG	560	LG	Injector #6	INJ 6
16	259	BK/O	259	BK/O	Ignition Ground	IGN GND
17	382	Y/BK	201	T/R	Self-Test Output/"CHECK ENGINE" Light	STO/MIL
20	57	BK	57	BK	Case Ground	CASE GND
21	264	W/LB	264	W/LB	Idle Speed Control - Bypass Air	ISC-BPA
22	97	T/LG	97	T/LG	Fuel Pump	FP
25	357	LG/P	357	LG/P	Air Charge Temperature	ACT
26	351	O/W	351	O/W	Reference Voltage	VREF
27	352	BR/LG	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	94	DG/P	Heated Exhaust Gas Oxygen Sensor - Right	HEGO-R
30	33	W/PK	33	W/PK	Neutral Drive Switch	NDS
31	101	GY/Y	101	GY/Y	Canister Purge	CANP
33	360	DG	360	DG	EGR Valve Regulator	EVR
34	305	LB/PK	305	LB/PK	Data Output Line	DOL
35	146	W/PK	146	W/PK	Speed Control Vent (Solenoid)	SCVNT
36	'324	Y/LG	324	Y/LG	Spark Output	SPOUT
37	361	R	361	R	Vehicle Power	VPWR
38	145	GY/BK	916	LG	Speed Control Vacuum (Solenoid)	SCVAC

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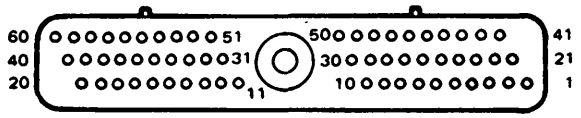
EEC-IV Module Connector Pin Usage

5.0L SEFI

NON MASS AIR: CROWN VICTORIA, GRAND MARQUIS, MARK VII

Pin	Car Lines				Application	Abbreviations
	Mark VII		Crown Victoria/ Grand Marquis			
	Crt.#	Wire Color	Crt.#	Wire Color		
39	199	LB/Y	679	GY/BK	Speed Control Command Switch Ground	SCCS GND
40	60	BK/LG	60	BK/LG	Power Ground	PWR GND
41	144	O/Y	144	O/Y	Vehicle Speed Control Solenoid	SOL (+)
42	561	T/O	561	T/O	Injector #7	INJ 7
43	90	DB/LG	90	DB/LG	Heated Exhaust Gas Oxygen Sensor - Left	HEGO - L
45	356	DB/LG	358	LG/BK	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	355	DG/LG	Throttle Position Sensor	TP
48	209	W/R	200	W/BK	Self-Test Input	STI
49	89	O	89	O	Heated EGO Ground	HEGO GND
50	151	LB/PK	151	LB/BK	Speed Control Command Switch	SCCS
51	100	W/R	100	W/R	Air Management 1	AM1
52	562	LB	562	LB	Injector #8	INJ 8
54	73	O/LB	73	O/LB	Wide Open Throttle A/C Cut Off	WAC
56	349	DB	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	361	R	Vehicle Power	VPWR
58	555	T	555	T	Injector #1	INJ 1
59	556	W	556	W	Injector #2	INJ 2
60	60	BK/LG	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

5.0L MA SEFI

MASS AIR: CROWN VICTORIA/GRAND MARQUIS

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor (+)	VSS (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
5	511	LG	Brake ON/OFF	BOO
6	359	BK/W	Vehicle Speed Sensor (-)	VSS (-)
7	354	LG/Y	Engine Coolant Temperature	ECT
8	695	BK/O	Data (-)	Data (-)
9	968	T/LB	Mass Air Signal Return	MAF RTN
10	883	PK/LB	A/C Clutch Signal	ACCS
12	557	BR/Y	Fuel Injector #3	INJ 3
13	558	BR/LB	Fuel Injector #4	INJ 4
14	559	T/LB	Fuel Injector #5	INJ 5
15	560	LG	Fuel Injector #6	INJ 6
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Out and Malfunction Light	STO and MIL
19	461	O	Fuel Pump Monitor	FPM (-)
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control Bypass Air	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temp	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor - Right	HEGO - R
30	33	W/PK	Neutral Drive	NDS
31	101	GY/Y	Canister Purge	CANP
32	99	LG/BK	Thermactor Air Diverter (AM2)	TAD
33	360	DG	EGR Valve Regulator	EVR
36	324	Y/LG	Spark Out	SPOUT
37	361	R	Vehicle Power	VPWR
38	100	W/R	Thermactor Air Bypass (AM1)	TAB
40	60	BK/LG	Power Ground	PWR GND

(Continued)

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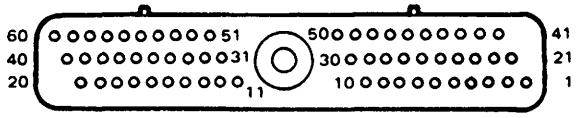
EEC-IV Module Connector Pin Usage

5.0L MA SEFI

MASS AIR: CROWN VICTORIA/GRAND MARQUIS

Pin	Circuit	Wire Color	Application	Abbreviations
42	561	T/O	Fuel Injector #7	INJ 7
43	90	DB/LG	Heated Exhaust Gas Oxygen Sensor – Left	HEGO – L
44	696	O/BK	Data (+)	Data (+)
45	358	LG/BK	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TPS
48	200	W/BK	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
50	967	DB/O	Mass Air Flow	MAF
52	562	L/B	Fuel Injector #8	INJ 8
54	73	O/LB	W.O.T. A/C Cut Off	WOT A/C
56	349	DB	Profile Ignition Pick Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Fuel Injector #1	INJ 1
59	556	W	Fuel Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

5.0L MA SEFI

MASS AIR: MUSTANG

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor (+)	VSS (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS (-)
7	354	LG/Y	Engine Coolant Temperature	ECT
9	968	T/LB	Mass Air Signal Return	MAF RTN
10	883	PK/LB	A/C Clutch Signal	ACCS
12	557	BR/Y	Fuel Injector #3	INJ 3
13	558	BR/LB	Fuel Injector #4	INJ 4
14	559	T/LB	Fuel Injector #5	INJ 5
15	560	LG	Fuel Injector #6	INJ 6
16	259	BK/O	Ignition Ground	IGN GND
17	657	T	Self-Test Out and Malfunction Light	STO and MIL
19	787	PK/BK	Fuel Pump Monitor	FPM (-)
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control Bypass Air	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temp	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor - Right	HEGO - R
30	771	P/Y	Neutral Gear SW. M.T.	NGS
30	771	P/Y	Neutral Drive With Automatics	NDS
31	101	GY/Y	Canister Purge	CANP
32	99	LG/BK	Thermactor Air Diverter (AM2)	TAD
33	360	DG	EGR Valve Regulator	EVR
36	324	Y/LG	Spark Out	SPOUT
37	361	R	Vehicle Power	VPWR
38	100	W/R	Thermactor Air Bypass (AM1)	TAB
40	60	BK/LG	Power Ground	PWR GND

(Continued)

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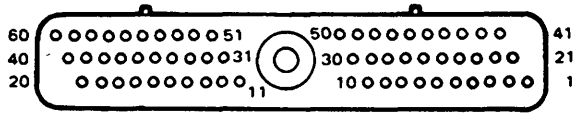
EEC-IV Module Connector Pin Usage

5.0L MA SEFI

MASS AIR: MUSTANG

Pin	Circuit	Wire Color	Application	Abbreviations
42	561	T/O	Fuel Injector #7	INJ 7
43	90	DB/LG	Heated Exhaust Gas Oxygen Sensor – Left	HEGO – L
45	358	LG/BK	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TPS
48	201	T/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
50	967	DB/O	Mass Air Flow	MAF
52	562	LB	Fuel Injector #8	INJ 8
54	73	O/LB	W.O.T. A/C Cut Off	WOT A/C
56	349	DB	Profile Ignition Pick Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Fuel Injector #1	INJ 1
59	556	W	Fuel Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

5.0L MA /NON MA SEFI

TOWN CAR

Pin	Circuit	Wire Color	Application	Abbreviations
1	554	Y/BK	Keep Alive Power	KAPWR
3	136	Y/LB	Vehicle Speed Sensor (+)	VSS (+)
4	20	W/LB	Ignition Diagnostic Monitor	IDM
5	475	DG/W	Brake ON/OFF	BOO
6	875	BK/LB	Vehicle Speed Sensor (-)	VSS (-)
7	354	LG/Y	Engine Coolant Temperature	ECT
8	915	PK/LB	Data (-)	Data (-)
9	968	T/LB	Mass Air Signal Return (California only)	MAF RTN
10	585	PK	A/C Clutch Signal	ACCS
12	557	BR/Y	Fuel Injector #3	INJ 3
13	558	BR/LB	Fuel Injector #4	INJ 4
14	559	T/LB	Fuel Injector #5	INJ 5
15	560	LG	Fuel Injector #6	INJ 6
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Out and Malfunction Light	STO and MIL
19	787	PK/BK	Fuel Pump Monitor	FPM (-)
20	57	BK	Case Ground	CASE GND
21	265	LG/W	Idle Speed Control Bypass Air	ISC-BPA
22	926	LB/O	Fuel Pump	FP
25	357	LG/P	Air Charge Temp	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor - Right	HEGO - R
30	33	W/PK	Neutral Drive With Automatics	NDS
31	101	GY/Y	Canister Purge	CANP
32	274	O	Thermactor Air Diverter (AM2)	TAD
33	360	DG	EGR Valve Regulator	EVR
34	205	DB/LG	Data Output Link	DOL
36	395	GY/O	Spark Out	SPOUT
37	361	R	Vehicle Power	VPWR
38	275	Y	Thermactor Air Bypass (AM1)	TAB
40	60	BK/LG	Power Ground	PWR GND

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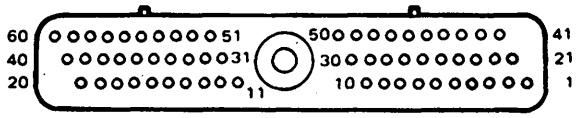
EEC-IV Module Connector Pin Usage

5.0L MA /NON MA SEFI

TOWN CAR

Pin	Circuit	Wire Color	Application	Abbreviations
42	561	T/O	Fuel Injector #7	INJ 7
43	74	DG/Y	Heated Exhaust Gas Oxygen Sensor – Left	HEGO – L
44	223	T/LG	Data (+)	Data (+)
45	358	LG/BK	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TPS
48	209	W/R	Self-Test Input	STI
49	394	GY/LB	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
50	967	DB/O	Mass Air Flow (California only)	MAF
52	562	LB	Fuel Injector #8	INJ 8
54	73	O/LB	W.O.T. A/C Cut Off	WOT A/C
56	349	DB	Profile Ignition Pick Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Fuel Injector #1	INJ 1
59	556	W	Fuel Injector #2	INJ 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

5.0L

ALL 5.0L PASSENGER CAR

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
16 r ▶	Rpm too low to perform EGO test
18 r ▶	SPOUT circuit open
18 c ▶	IDM circuit failure/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	ECT out of Self-Test range
22 oc ▶	MAP/BP out of Self-Test range
23 or ▶	TP out of Self-Test range
24 or ▶	ACT out of Self-Test range
26 or ▶	MAF out of Self-Test range (MA only)
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	EVP circuit below minimum voltage
32 orc ▶	EVP voltage below closed limit (SONIC)
33 rc ▶	EGR valve opening not detected (SONIC)
34 orc ▶	EVP voltage above closed limit (SONIC)
35 orc ▶	EVP circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean (right HEGO)
41 c ▶	No HEGO switch detected (right HEGO)
42 r ▶	HEGO sensor circuit indicates system rich (right HEGO)
44 r ▶	Thermactor air system inoperative (right side)
45 r ▶	Thermactor air upstream during Self-Test
46 r ▶	Thermactor air not bypassed during Self-Test
51 oc ▶	ECT indicated - 40°F/circuit open
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated - 40°F/circuit open
56 oc ▶	MAF circuit above maximum voltage (MA only)
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
66 c ▶	MAF circuit below minimum voltage (MA only)
67 o ▶	Neutral Drive Switch (NDS) circuit open
74 r ▶	Brake ON/OFF (BOO) circuit open/not actuated during Self-Test
75 r ▶	Brake ON/OFF (BOO) circuit closed/ECA input open
77 r ▶	Brief WOT not sensed during Self-Test/Operator error
79 o ▶	A/C on/Defrost on during Self-Test
81 o ▶	Air Management 2 (AM2) circuit failure
82 o ▶	Air Management 1 (AM1) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Fuel pump primary circuit failure
91 r ▶	HEGO sensor circuit indicates system lean (left HEGO)
91 c ▶	No HEGO switching detected (left HEGO)
92 r ▶	HEGO sensor circuit indicates system rich (left HEGO)
94 r ▶	Thermactor air system inoperative (left side)
95 oc ▶	Fuel pump secondary circuit failure
96 oc ▶	Fuel pump secondary circuit failure
98 r ▶	Hard fault is present - FMEM mode
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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SECTION 16

EEC-IV—Engine Supplement — Light Truck

Contents

Diagnostic Sensor/Actuator Reference Values — Truck 16-1

2.3L EFI

Electrical Schematic 16-3

EEC-IV Module Connector Pin Usage 16-5

Quick Test Code and Code Definitions 16-6

2.9L EFI

Electrical Schematic 16-7

EEC-IV Module Connector Pin Usage 16-8

Quick Test Code and Code Definitions 16-9

2.9L MA EFI

Electrical Schematic 16-10

EEC-IV Module Connector Pin Usage 16-11

Quick Test Code and Code Definitions 16-12

3.0L EFI

Electrical Schematic 16-13

EEC-IV Module Connector Pin Usage 16-14

Quick Test Code and Code Definitions 16-15

4.0L MA EFI

Electrical Schematic 16-16

EEC-IV Module Connector Pin Usage 16-17

Quick Test Code and Code Definitions 16-19

(Continued)

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SECTION 16

EEC-IV—Engine Supplement — Light Truck

Contents

4.9L EFI

Electrical Schematic 16-20

EEC-IV Module Connector Pin Usage 16-21

Quick Test Code and Code Definitions 16-25

5.0L EFI

Electrical Schematic 16-27

EEC-IV Module Connector Pin Usage 16-28

Quick Test Code and Code Definitions 16-30

5.8L EFI

Electrical Schematic 16-31

EEC-IV Module Connector Pin Usage 16-32

Quick Test Code and Code Definitions 16-36

7.3L E4OD Diesel

Electrical Schematic 16-38

EEC-IV Module Connector Pin Usage 16-39

Quick Test Code and Code Definitions 16-41

7.5L EFI

Electrical Schematic 16-42

EEC-IV Module Connector Pin Usage 16-43

Quick Test Code and Code Definitions 16-47

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Diagnostic Sensor/Actuator Reference Values

Truck

NOTE:

- The chart below contains typical component values.
- Values measured in the field may differ slightly from those shown.
- Do not compare reference values found on this chart with monitor-box data. Monitor-box data is measured with respect to a different reference level in some cases.
- Breakout box pin number assignments differ from vehicle to vehicle. Refer to the Pin Usage Chart applicable to the vehicle being serviced for the correct pin assignments.
- Each vehicle application will not have all components listed below.
- Pre-condition the engine in the following manner before recording any values:
  - — The engine should be at a normal operating condition.
  - — Start and run engine at 2000 rpm for two minutes.

	INPUTS	Breakout Box Pin Numbers (+)	(-)	KEY OFF Throttle Closed (ohms)	Key On Eng. Off (volts)	Hot Idle (volts)
*	Clutch Engage Switch (CES) ①	30	40	—	—	—
	Coil Tach Signal (IDM)	4	16	21.8 K	8.0 to 10.0	8.0 to 12.0
*	Distributor Position (PIP) ②	56	16	1.1 K to 2.1 K	—	3.0 to 7.0
	EGR Valve Position (EVP)	27	46	480 K to 650K	0.30 to 0.45	0.30 to 0.45
*	Engine Coolant Temperature (ECT) ③	7	46	1.7 K to 3.6 K	—	0.31 to 1.0
	(Heated) Exhaust Gas Oxygen (H) EGO	29	46	> 1.5 M	< 0.4	0.0 to 0.9
*	Knock Sensor (KS) ④	23	46	4.5 K to 6.5 K	—	—
*	Manifold Pressure (MAP) Barometric Pressure (BP) ⑤	45	46	—	—	—
*	Mass Air Flow (MAF) ⑥	50	40/60	—	—	—
*	Neutral/Drive Switch (NDS) ⑦	30	40	—	—	—
*	Power Steering Pressure Switch (PSPS) ⑧	24	46	—	—	—
	Pressure Feedback EGR (PFE)	27	46	—	3.0 to 3.5	3.0 to 3.5
	Reference Voltage (VREF)	26	46	—	5.0 ± 5%	5.0 ± 5%
	Throttle Position (TP)	47	46	0.5 K to 1.2 K	0.7 to 1.3	0.7 to 1.3
*	Vehicle Speed Sensor (VSS) ⑨	3	6	190.0 to 240.0	—	—
	OUTPUTS					
*	Canister Purge (CANP) ⑩	37	31	60.0 to 70.0	0.0	0.0
	Computed Spark Advance (DIS)	36	16	—	9.0 to 12.5	8.5 to 9.5
	Computed Spark Advance (TFI)	36	16	—	0.0	5.0 to 7.0
	EGR Valve Regulator (EVR)	37	33	40.0 to 50.0	0.0 (OFF)	0.0 (OFF)
	Fuel Pump Relay (FP)	37	22	—	0.0 (OFF)	VBAT (ON)
*	Idle Speed Bypass (IBA) ⑪	37	21	9.5 to 11.5	0.0 (OFF)	2.0 to 5.5
*	Injectors Bank #1 ⑫	37	58	—	0.0	—
*	Injectors Bank #2 ⑫	37	59	—	0.0	—
	Spark Angle Word (SAW)	36	16	—	—	0.5 to 0.7

*** Numbers to the right of these inputs/outputs refer to explanations on next page.**

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Diagnostic Sensor/Actuator Reference Values

Truck

Explanations —

① If the clutch is pedal down, the switch is closed. If the clutch is pedal up, the switch is open.

② For applications containing TFI-IV systems only.

③ Engine coolant temperature must be within the 180-240°F (82-116°C) temperature range before measurements are taken.

④ The Knock Sensor output voltage is a variable signal of 300 mV or greater, depending on the severity of engine knock; background noise is not part of the sensor output.

⑤ Refer to the Altitude vs. Voltage Chart in Pinpoint Test DF, Section 17 for proper operating values.

⑥ Refer to the MAF Sensor data chart in Pinpoint Test DC for proper operating values.

⑦ The NDS is open in any gear, but closed in neutral or park.

⑧ If power steering pressure rises above a specified limit, the switch contacts will open and the ECA will adjust idle speed to compensate for the extra load placed on the engine.

⑨ If vehicle is not moving, the speed sensor output to the processor will be zero. The vehicle must be moving for the speed sensor to provide information to the processor.

⑩ Not all applications will use pin 31 for canister purge. Refer to appropriate vehicle pin usage chart.

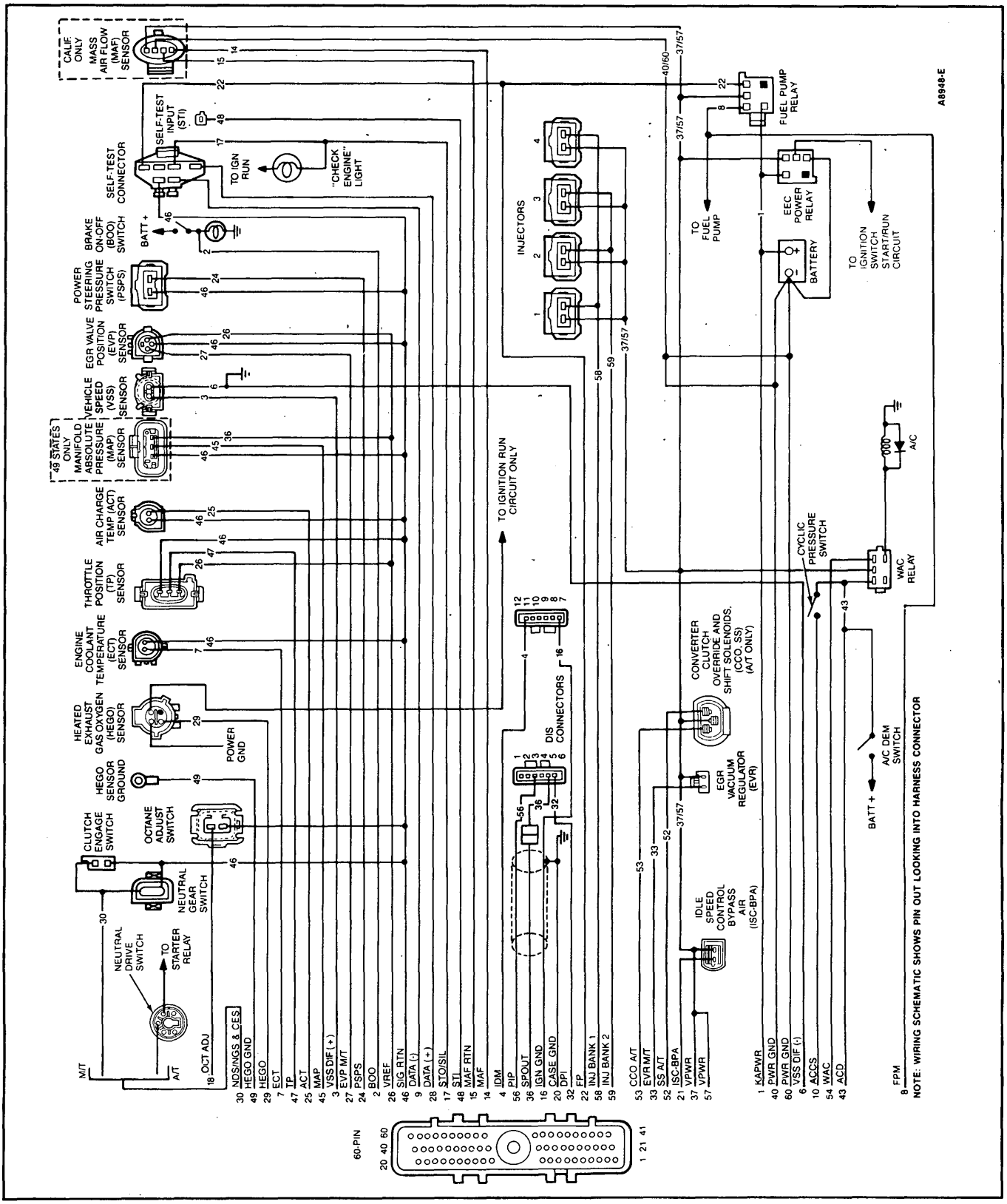
⑪ Idle Speed Bypass resistance is typically 9.5 to 11.5 ohms, except on 5.0L F-Series, the resistance range is 17 to 21 ohms.

⑫ Refer to the Injector Resistance Chart in Pinpoint Test H, Section 17 for the proper resistance values.

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Electrical Schematic

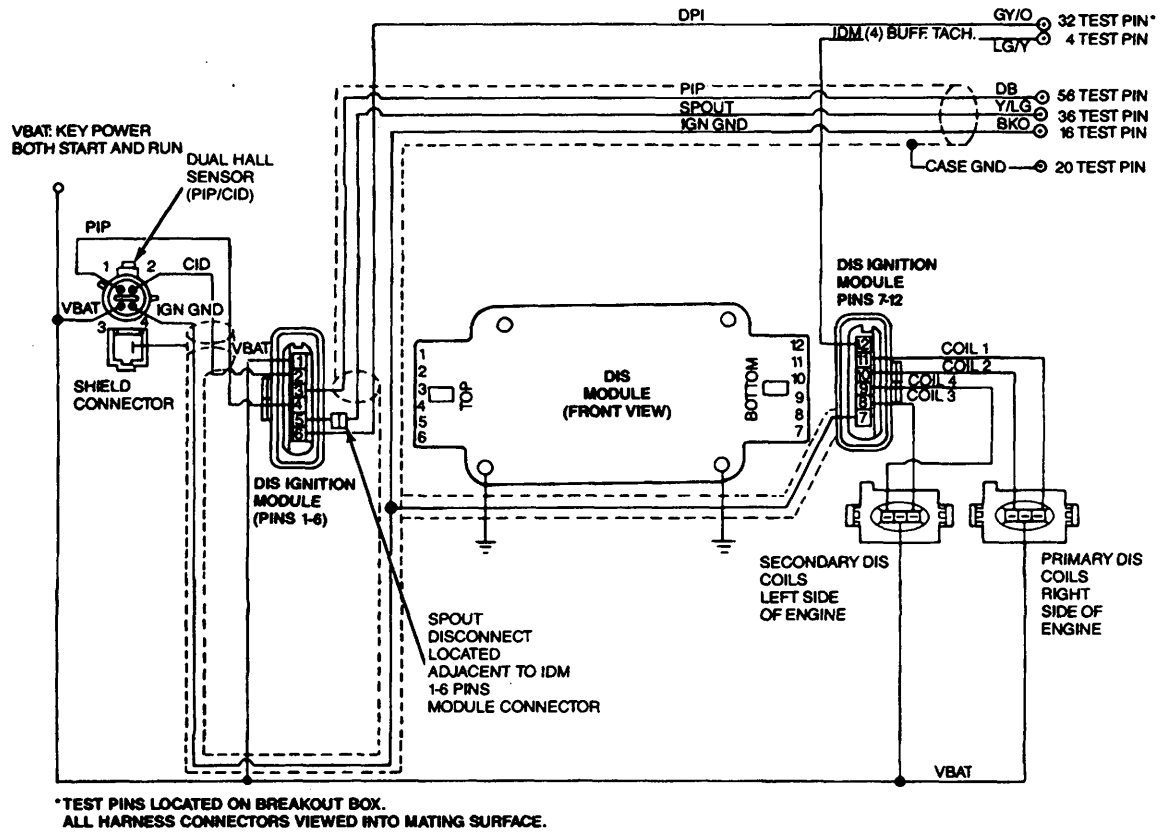
2.3L EFI



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Distributorless Ignition System (DIS) Electrical Schematic

2.3L EFI



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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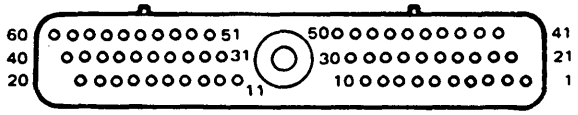
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EEC-IV Module Connector Pin Usage

2.3L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	554	Y/BK	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF(+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF(-)
7	354	LG/Y	Engine Coolant Temperature	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
9	96	T/O	Data (-)	Data (-)
10	198	T/Y	A/C Cycle Pressure Switch	ACCS
14	967	DB/O	Mass Air Flow Signal (California Only)	MAF
15	968	T/LB	Mass Air Flow Signal Return (California Only)	MAF RTN
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output	STO
18	240	W/R	Octane Adjust Switch	OCT ADJ
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	310	Y/R	Air Charge Temperature	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position (M/T Only)	EVP
28	95	T/R	Data (+)	Data (+)
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	200	W/BK	Neutral Drive Switch (A/T Only)	NDS
30	200	W/BK	Neutral Gear Switch and Clutch Engage Switch (M/T Only)	NGS/CES
32	395	GY/O	Dual Plug Inhibit	DPI
33	360	DG	Exhaust Gas Recirculation Valve Regulator (M/T Only)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
43	348	LG/P	A/C Demand	ACD
45	356	DB/LG	Manifold Absolute Pressure (49 States Only)	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	224	T/LB	Shift Solenoid (A/T Only)	SS
53	332	W	Clutch Converter Override (A/T Only)	CCO
54	462	P	W.O.T. A/C Cut Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector (Bank 1)	INJ Bank 1
59	556	W	Injector (Bank 2)	INJ Bank 2
60	60	BK/LG	Power Ground	PWR GRD

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definitions

2.3L EFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	Erratic IDM input to processor
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Coolant Temp (ECT) out of Self-Test range
22 orc ▶	Manifold Absolute Pressure (MAP) out of Self-Test range
23 or ▶	Throttle Position (TP) out of Self-Test range
24 or ▶	Air Charge Temp (ACT) out of Self-Test range
28 c ▶	Loss of IDM — right side
29 c ▶	Insufficient input from Vehicle Speed Sensor (VSS)
31 orc ▶	EVP circuit below minimum voltage
32 orc ▶	EVP voltage below closed limit
33 rc ▶	EGR valve opening not detected
34 orc ▶	EVP voltage above closed limit
35 orc ▶	EVP circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
48 c ▶	Loss of IDM — left side
51 oc ▶	ECT indicated -40°F/circuit open
52 o ▶	Power Steering Pressure Switch (PSPS) circuit open
52 r ▶	PSPS circuit did not change states
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated -40°F/circuit open
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C on
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure/not actuated during Self-Test
77 r ▶	Operator error (Dynamic Response/Cylinder Balance Tests)
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
86 o ▶	Shift Solenoid (SS) circuit failure
87 oc ▶	Primary Fuel Pump circuit failure
88 c ▶	Loss of Dual Plug Input control
89 o ▶	Clutch Converter Override (CCO) circuit failure
95 oc ▶	Fuel Pump circuit open - ECA to motor ground
96 oc ▶	Fuel Pump circuit open - battery to ECA
98 r ▶	Hard fault present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

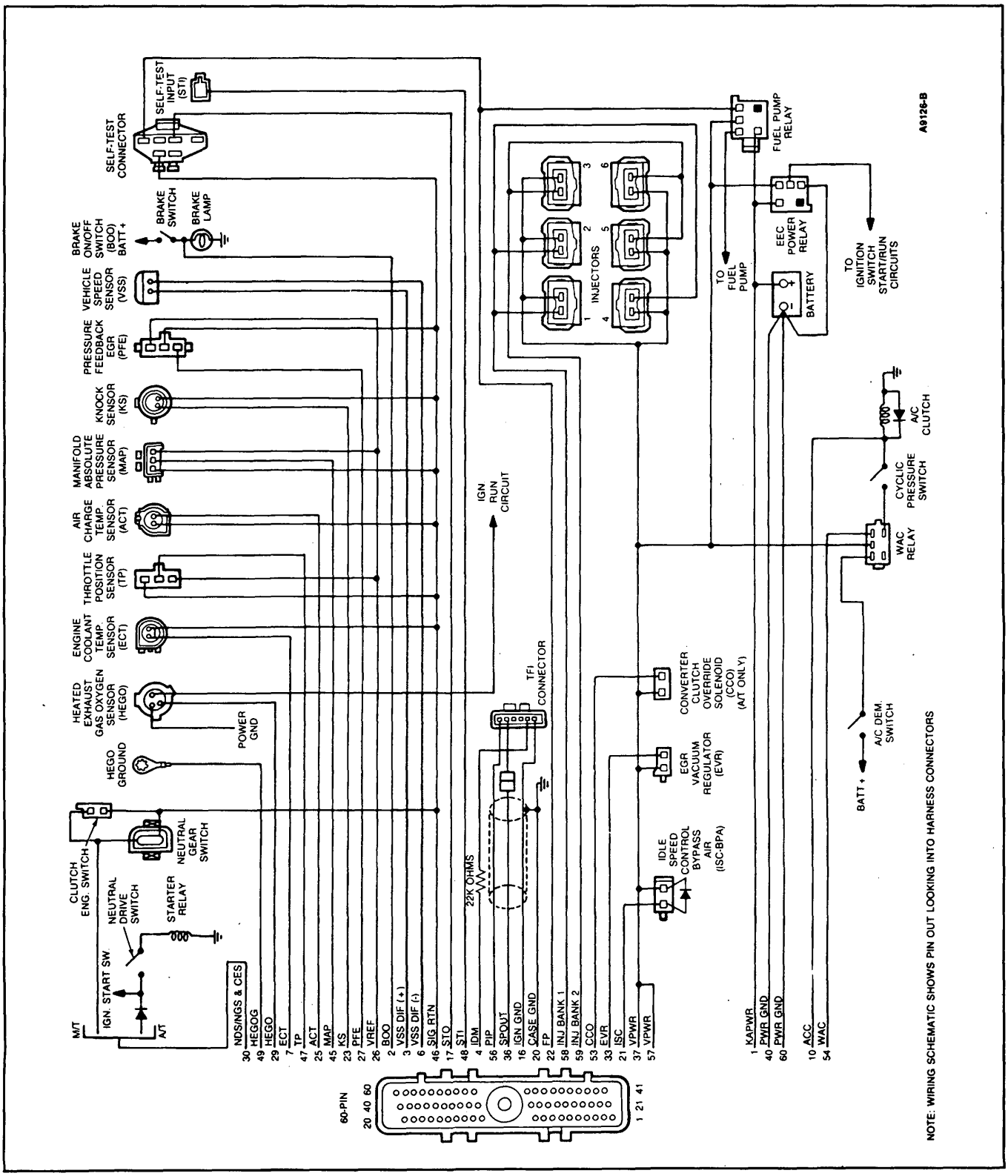
KEY: o = Key On Engine Off (KOEO) r = Engine Running c = Continuous Memory

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Electrical Schematic

2.9L EFI

RANGER/BRONCO II (49 STATES)



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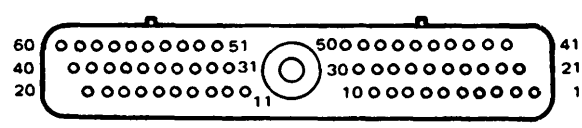
EEC-IV Module Connector Pin Usage

2.9L EFI

RANGER/BRONCO II (49 STATES)

Pin	Circuit	Wire Color	Application	Abbreviations
1	554	Y/BK	Keep Alive Power	KAPWR
2	511	LG	Brake On-Off (A/T Only)	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temp. Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	198	T/Y	A/C Cycle Pressure Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temp. Sensor	ACT
26	351	O/W	Reference Voltage	VREF
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	200	W/BK	Neutral Drive Switch (A/T Only)	NDS
30	200	W/BK	Clutch Interlock Switch (M/T Only)	CIS
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	356	DB/LG	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	224	T/LB	Shift Solenoid (A/T Only)	SS
53	332	W	Clutch Converter Override (A/T Only)	CCO
54	462	P	W.O.T. A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Bank 1 Injector (Controls Engine Cylinder Numbers 1, 2 and 4)	INJ BANK 1
59	556	W	Bank 2 Injector (Controls Engine Cylinder Numbers 3, 5 and 6)	INJ BANK 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

2.9L EFI

RANGER/BRONCO II (49 STATES)

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	Loss of IDM input to Processor/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Coolant Temp (ECT) out of Self-Test range
22 orc ▶	Manifold Absolute Pressure (MAP) out of Self-Test range
23 or ▶	Throttle Position (TP) out of Self-Test range
24 or ▶	Air Charge Temp (ACT) out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT indicated – 40°F/circuit open
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated – 40°F/circuit open
61 oc ▶	ECT indicated 250°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C on
67 c ▶	Clutch Switch circuit failure
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure/not actuated during Self-Test
77 r ▶	Operator error (Dynamic Response/Cylinder Balance Tests)
86 o ▶	Shift Solenoid (SS) circuit failure
87 oc ▶	Primary Fuel Pump circuit failure
89 o ▶	Clutch Converter Override (CCO) circuit failure
95 oc ▶	Fuel Pump circuit open – ECA to motor ground
96 oc ▶	Fuel Pump circuit open – battery to ECA
98 r ▶	Hard fault present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

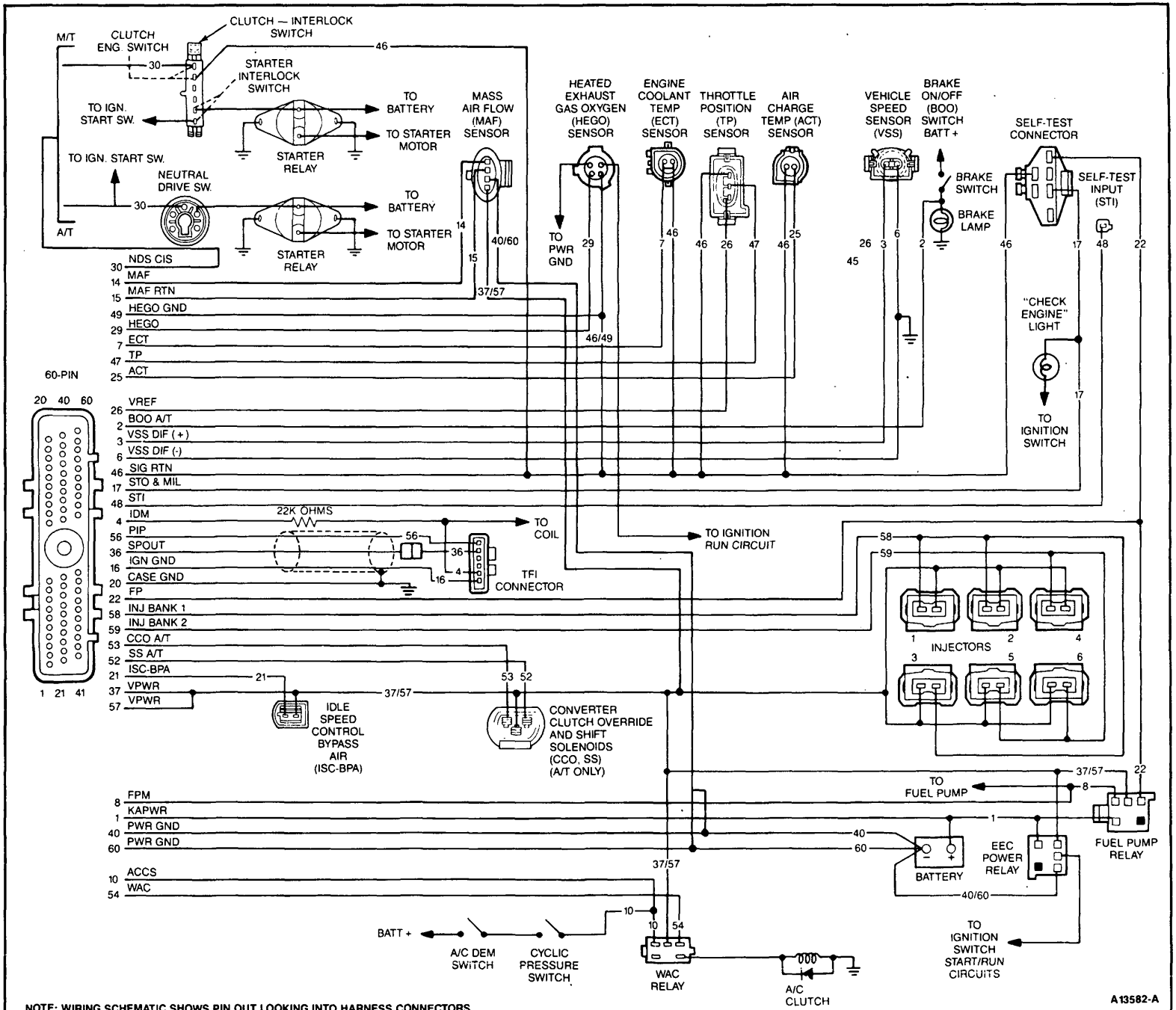
KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

2.9L MA EFI

RANGER/BRONCO II (CALIFORNIA)



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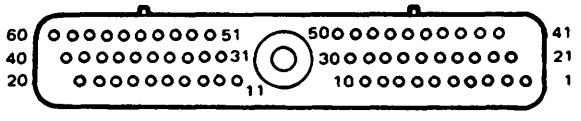
EEC-IV Module Connector Pin Usage

2.9L MA EFI

RANGER/BRONCO II (CALIFORNIA)

Pin	Circuit	Wire Color	Application	Abbreviations
1	554	Y/BK	Keep Alive Power	KAPWR
2	511	LG	Brake On-Off (A/T Only)	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temp. Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
9	96	T/O	Data Communication Link (-)	Data (-)
10	198	T/Y	A/C Cycle Pressure Switch	ACCS
14	967	DB/O	Mass Air Flow Sensor	MAF
15	968	T/LB	Mass Air Flow Return	MAF RTN
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temp. Sensor	ACT
26	351	O/W	Reference Voltage	VREF
28	95	T/R	Data Communication Link (+)	Data (+)
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	200	W/BK	Neutral Drive Switch (A/T Only)	NDS
30	200	W/BK	Clutch Interlock Switch (M/T Only)	CIS
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	224	T/LB	Shift Solenoid (A/T Only)	SS
53	332	W	Clutch Converter Override (A/T Only)	CCO
54	462	P	W.O.T. A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector (Bank 1 — Controls Engine Cylinder Numbers 1, 2 and 4)	INJ BANK 1
59	556	W	Injector (Bank 2 — Controls Engine Cylinder Numbers 3, 5 and 6)	INJ BANK 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

2.9L EFI

RANGER/BRONCO II (CALIFORNIA)

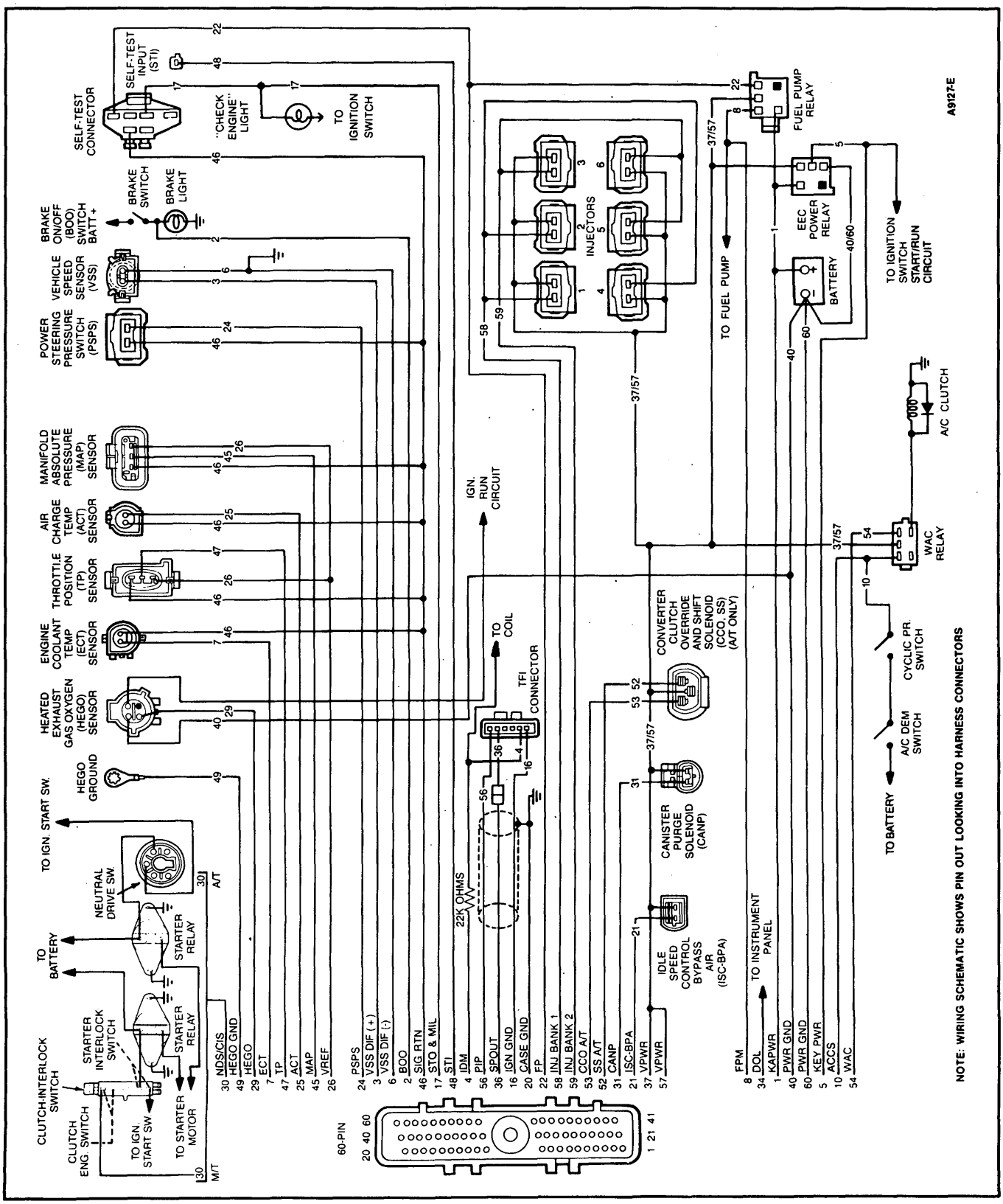
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	Loss of IDM input to Processor/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Coolant Temperature (ECT) out of Self-Test range
23 or ▶	Throttle Position (TP) out of Self-Test range
24 or ▶	Air Charge Temperature (ACT) out of Self-Test range
26 or ▶	Mass Air Flow (MAF) out of Self-Test range
29 c. ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT indicated – 40°F/circuit open
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated – 40°F/circuit open
56 oc ▶	MAF circuit above maximum voltage
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
66 c ▶	MAF circuit below minimum voltage
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C on
67 c ▶	Clutch Switch circuit failure
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure/not actuated during Self-Test
77 r ▶	Operator error (Dynamic Response/Cylinder Balance Tests)
79 o ▶	A/C on/Defrost on during Self-Test
86 o ▶	Shift Solenoid circuit failure
87 oc ▶	Primary Fuel Pump circuit failure
89 o ▶	Clutch Converter Override (CCO) circuit failure
95 oc ▶	Fuel Pump circuit open – ECA to motor ground
96 oc ▶	Fuel Pump circuit open – battery to ECA
98 r ▶	Hard fault present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

3.0L EFI



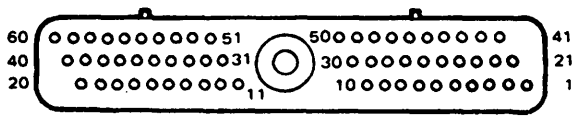
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EEC-IV Module Connector Pin Usage

3.0L EFI

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	810	R/LG	Brake ON-OFF	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	398	BK/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycle Pressure Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	68	O/BK	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	199	LB/Y	Clutch Interlock Switch (M/T Only)	CIS
30	199	LB/Y	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge	CANP
34	305	LB/PK	Data Output Link	DOL
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	356	DB/LG	Manifold Absolute Pressure Sensor	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	224	T/LB	Shift Solenoid (A/T Only)	SS
53	332	W	Converter Clutch Override (A/T Only)	CCO
54	321	GY/W	W.O.T. A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 — Controls Engine Cylinder Numbers 1, 2 and 3)	INJ BANK 1
59	95	T/R	Injector (Bank 2 — Controls Engine Cylinder Numbers 4, 5 and 6)	INJ BANK 2
60	60	BL/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

3.0L EFI

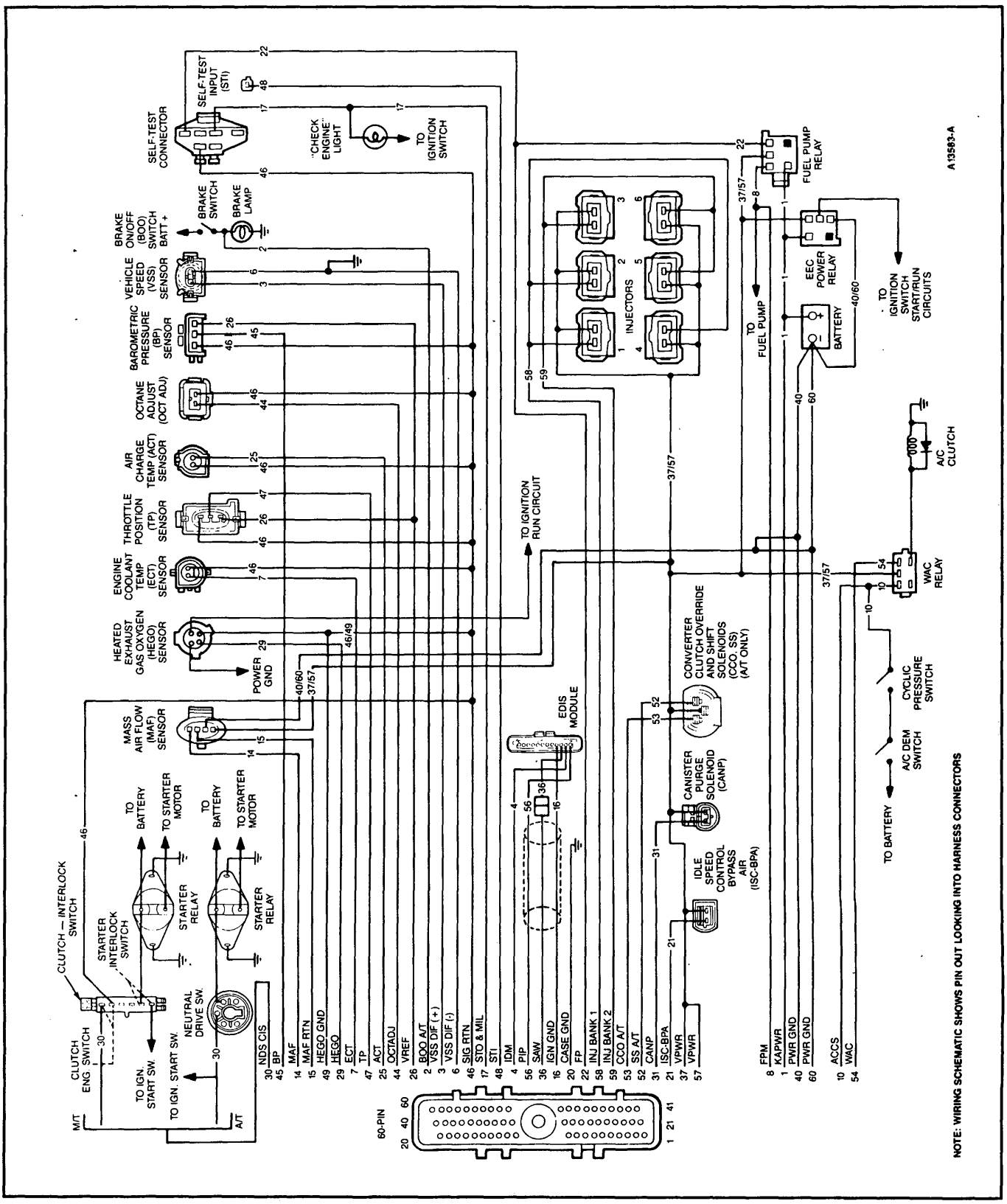
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	Loss of IDM input to Processor/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Coolant Temperature (ECT) out of Self-Test range
22 orc ▶	Manifold Absolute Pressure (MAP) out of Self-Test range
23 or ▶	Throttle Position (TP) out of Self-Test range
24 or ▶	Air Charge Temperature (ACT) out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
51 oc ▶	ECT indicated – 40°F/circuit open
52 o ▶	Power Steering Pressure Switch (PSPS) circuit open
52 r ▶	PSPS circuit did not change states
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated – 40°F/circuit open
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C on
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure/not actuated during Self-Test
77 r ▶	Operator Error (Dynamic Response/Cylinder Balance Tests)
85 o ▶	Canister Purge (CANP) circuit failure
86 o ▶	Shift Solenoid (SS) circuit failure
87 oc ▶	Primary Fuel Pump circuit failure
89 o ▶	Clutch Converter Override (CCO) circuit failure
95 oc ▶	Fuel Pump circuit open – ECA to motor ground
96 oc ▶	Fuel Pump circuit open – battery to ECA
98 r ▶	Hard fault present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

4.0L MA EFI



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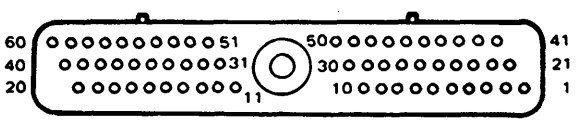
EEC-IV Module Connector Pin Usage

4.0L MA EFI

AEROSTAR

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	810	R/LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Engine rpm Sensor (+)	RPMS (+)
6	398	BK/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	787	PK/BK	Fuel Pump Monitor	FPM
9	695	BK/O	Data Communications Link (-)	DATA (-)
10	347	BK/Y	A/C Cycling Switch	ACCS
14	967	DB/O	Mass Air Flow Sensor	MAF
15	968	T/LB	Mass Air Flow Return	MAF RTN
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	68	O/BK	Idle Speed Control (Bypass Air)	ISC - BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
28	696	O/BK	Data Communications Link (+)	DATA (+)
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	199	LB/Y	Clutch Interlock Switch (M/T Only)	CIS
30	199	LB/Y	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge	CANP
34	305	LB/PK	Data Output Link	DOL
36	324	Y/LG	Spark Angle Width	SAW
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
44	974	O	Octane Adjust	OCT ADJ
45	356	DB/LG	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	224	T/LB	Shift Solenoid (A/T Only)	SS
53	332	W	Clutch Converter Override (A/T Only)	CCO
54	321	GY/W	WOT A/C Cut-Off	WAC
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 - Controls Engine Cylinder Numbers 1, 2 and 3)	INJ BANK 1
59	95	T/R	Injector (Bank 2 - Controls Engine Cylinder Numbers 4, 5 and 6)	INJ BANK 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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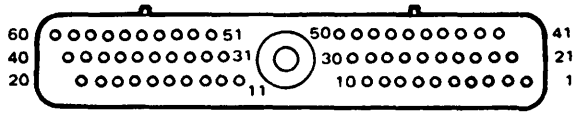
EEC-IV Module Connector Pin Usage

4.0L MA EFI

RANGER/BRONCO II

Pin	Circuit	Wire Color	Application	Abbreviations
1	554	Y/BK	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Engine rpm Sensor (+)	RPMS (+)
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
9	96	T/O	Data Communications Link (-)	DATA (-)
10	198	T/Y	A/C Cycling Switch	ACCS
14	967	DB/O	Mass Air Flow Sensor	MAF
15	968	T/LB	Mass Air Flow Return	MAF RTN
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
20	327	BK/O	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC - BPA
22	97	T/LG	Fuel Pump	FP
25	357	LG/P	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
28	95	T/R	Data Communications Link (+)	DATA (+)
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	200	W/BK	Clutch Interlock Switch (M/T Only)	CIS
30	200	W/BK	Neutral Drive Switch (A/T Only)	NDS
31	101	GY/Y	Canister Purge	CANP
36	324	Y/LG	Spark Angle Width	SAW
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
44	240	W/R	Octane Adjust	OCT ADJ
45	356	DB/LG	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Sensor Ground	HEGO GND
52	224	T/LB	Shift Solenoid (A/T Only)	SS
53	332	W	Clutch Converter Override (A/T Only)	CCO
54	462	P	WOT A/C Cut-Off	WAC
56	363	BK/LBB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector (Bank 1 - Controls Engine Cylinder Numbers 1, 2, and 3)	INJ BANK 1
59	556	W	Injector (Bank 2 - Controls Engine Cylinder Numbers 4, 5, and 6)	INJ BANK 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

4.0L MA EFI

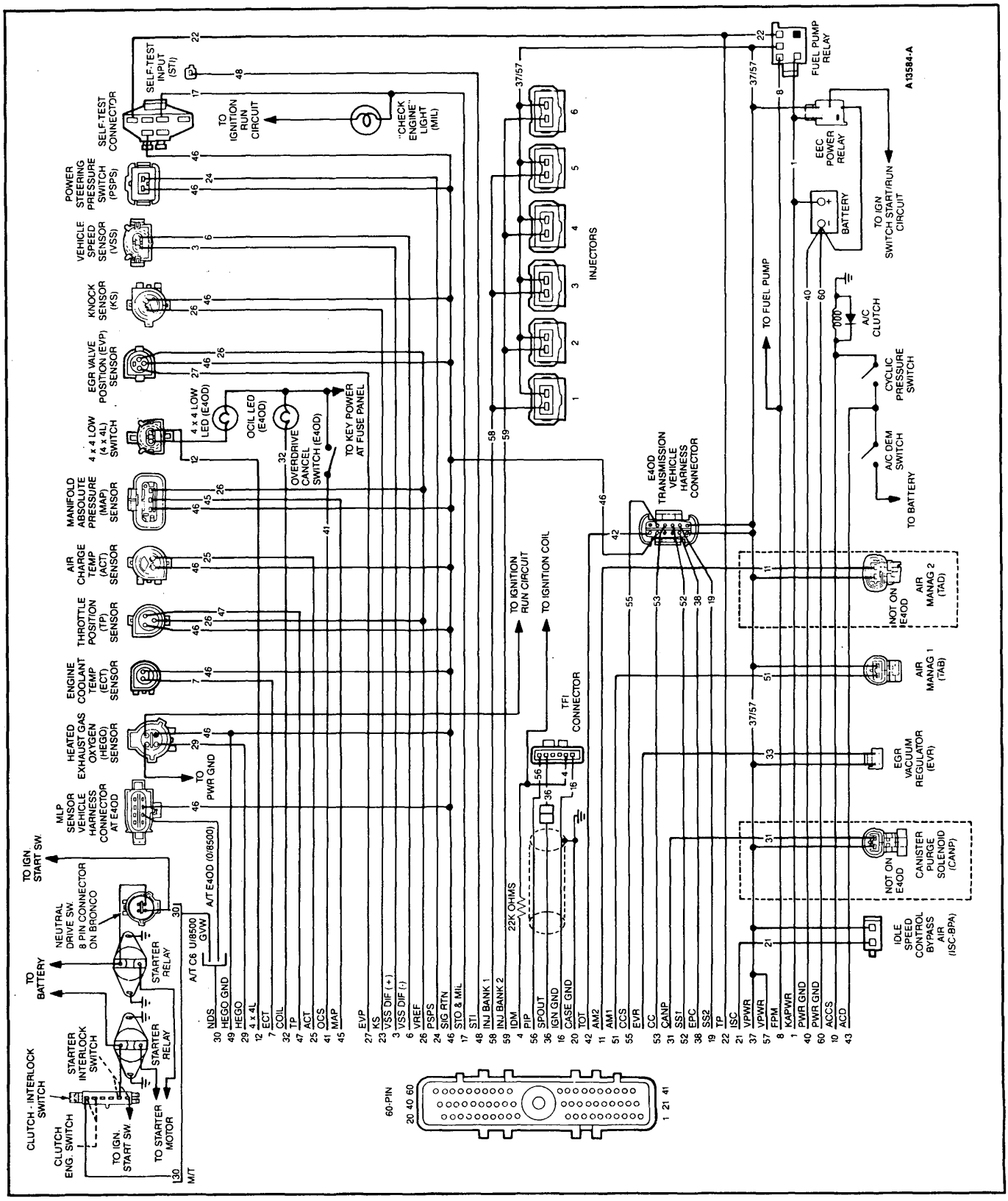
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
16 o ▶	Ignition Diagnostic Monitor (IDM) signal not received
18 r ▶	SAW circuit failure
18 c ▶	Loss of IDM input to processor/IDM circuit failure
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Coolant Temp (ECT) out of Self-Test range
22 orc ▶	Barometric Pressure (BP) out of Self-Test range
23 or ▶	Throttle Position (TP) out of Self-Test range
24 or ▶	Air Charge Temp (ACT) out of Self-Test range
26 or ▶	Mass Air Flow (MAF) out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
45 c ▶	Coil 1, 2, or 3 failure
51 oc ▶	ECT indicated – 40°F/circuit open
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated – 40°F/circuit open
56 oc ▶	MAF circuit above maximum voltage
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
66 c ▶	MAF circuit below minimum voltage
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C on
67 c ▶	Clutch Switch circuit failure
72 r ▶	Insufficient MAF change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit failure/not actuated during Self-Test
77 r ▶	Operator error (Dynamic Response/Cylinder Balance Tests)
79 ▶	A/C ON/Defrost ON during Self-Test
86 o ▶	Shift Solenoid (SS) circuit failure
87 oc ▶	Primary Fuel Pump circuit failure
89 o ▶	Clutch Converter Override (CCO) circuit failure
95 oc ▶	Fuel Pump circuit open-ECA to motor ground
96 oc ▶	Fuel Pump circuit open-battery to ECA
98 r ▶	Hard fault present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

4.9L EFI



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EEC-IV Module Connector Pin Usage

4.9L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (E4OD Only)	BOO
3	679	GY/BK	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	T	Ignition Diagnostic Module	IDM
6	676	PK/O	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/B	Engine Coolant Temperature Sensor	ECT
8	238	DG/Y	Fuel Pump Monitor	FPM
9	695	BK/O	Data Communications Link (-) (California Only)	Data (-)
10	347	BK/Y	A/C Clutch	ACC
11	200	BR	Air Management 2 (except E4OD)	AM2
12	784	LB/BK	4 x 4 Low Switch (E4OD Only)	4 x 4L
16	259	BK/O	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
19	315	P/O	Transmission Shift Solenoid #2 (E4OD Only)	SS2
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control (Bypass Air)	ISC - BPA
22	926	LB/O	Fuel Pump	FS
23	99	LG/B	Knock Sensor	KS
24	330	Y/LB	Power Steering Pressure Switch	PSPS
25	310	G/Y	Air Charge Temperature Sensor	ACT
26	351	BR/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
28	696	O/BL	Data Communications Link (+) (California Only)	Data (+)
29	74	GY/LB	Heated Exhaust Gas Oxygen Sensor	HEGO
30	481	GY/Y	Neutral Drive Switch (C6 A/T Only)	NDS
30	199	LB/Y	Manual Lever Position Sensor (E4OD Only)	MLP
31	101	GY/Y	Canister Purge Solenoid (except E4OD)	CANP
32	911	W/LG	Overdrive Cancel Indicator Light (E4OD Only)	OCIL
33	360	BR/PK	EGR Vacuum Regulator Solenoid	EVR

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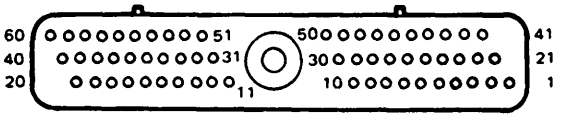
EEC-IV Module Connector Pin Usage

4.9L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
36	929	PK	Spark Output	SPOUT
37	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
38	925	W/Y	Electronic Pressure Control Solenoid (E4OD Only)	EPC
40	570	BK/LG	Power Ground	PWR GND
41	224	T/W	Overdrive Cancel Switch (E4OD Only)	OCS
42	923	O/BK	Transmission Oil Temperature (E4OD Only)	TOT
43	348	LG/P	A/C Demand	ACD
45	358	LG/BK	Manifold Absolute Pressure	MAP
46	359	GY/R	Signal Return	SIG RTN
47	355	GY/W	Throttle Position Sensor	TP
48	209	W/P	Self-Test Input	STI
49	89	O	Heated Exhaust Oxygen Ground	HEGO GND
51	190	W/O	Air Management 1	AM1
52	562	LB	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR/O	Converter Coast Solenoid (E4OD Only)	CCS
56	395	DB	Profile Ignition Pick-Up	PIP
57	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
58	555	T	Injector Bank 1 (Controls Engine Cylinder Numbers 1, 3, and 5)	INJ BANK 1
59	556	W	Injector Bank 2 (Controls Engine Cylinder Numbers 2, 4 and 6)	INJ BANK 2
60	570	BK/W	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

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E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (E4OD Only)	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
9	695	BK/O	Data Communications Link (-) (California Only)	Data (-)
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	W/BK	Air Management 2	AM2
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
19	315	DG/P	Transmission Shift Solenoid #2 (E4OD Only)	SS2
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
23	99	LG/B	Knock Sensor	KS
24	330	Y/LB	Power Steering Pressure Switch	PSPS
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
28	696	O/BK	Data Communications Link (+) (California Only)	Data (+)
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	912	BR/W	Neutral Drive Switch	NDS
30	912	LB/W	Manual Lever Position Sensor (E4OD Only)	MLP
31	101	GY/Y	Canister Purge Solenoid	CANP
32	911	LG/W	Overdrive Cancel Indicator Light (E4OD Only)	OCIL
33	360	DG	EGR Vacuum Regulator (Solenoid)	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
38	199	LB/Y	Electronic Pressure Control-Solenoid (E4OD Only)	EPC
40	60	BK/LG	Power Ground	PWR GND
41	224	T/LB	Overdrive Cancel Switch (E4OD Only)	OCS
42	923	O/BK	Transmission Oil Temperature Sensor (E4OD Only)	TOT

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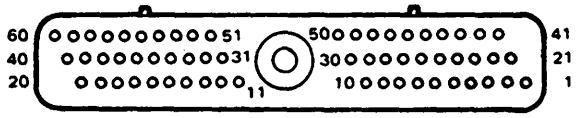
EEC-IV Module Connector Pin Usage

4.9L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
43	348	LG/P	A/C Demand	ACD
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGO GND
51	190	W/R	Air Management 1	AM1
52	237	O/Y	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR	Converter Coast Solenoid (E4OD Only)	CCS
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
58	96	T/O	Injector Bank 1 (Controls Engine Cyl. Nos. 1, 3, and 5)	INJ BANK 1
59	95	T/R	Injector Bank 2 (Controls Engine Cyl. Nos. 2, 4, and 6)	INJ BANK 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

4.9L EFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	Loss of IDM input to processor/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Cooling Temperature (ECT) sensor out of Self-Test range
22 orc ▶	Manifold Absolute Pressure (MAP) sensor out of Self-Test range
23 or ▶	Throttle Position (TP) sensor out of Self-Test range
24 or ▶	Air Charge Temperature (ACT) sensor out of Self-Test range
26 or ▶	Transmission Oil Temperature (TOT) sensor out of Self-Test range (E4OD)
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	EVP circuit below minimum voltage
32 orc ▶	EVP voltage below closed limit
33 rc ▶	EGR valve opening not detected
34 orc ▶	EVP voltage above closed limit
35 orc ▶	EVP circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
44 r ▶	Thermactor air system inoperative
45 r ▶	Thermactor air upstream during Self-Test
46 r ▶	Thermactor air not bypassed during Self-Test
47 o ▶	4 x 4 switch is closed (E4OD)
49 c ▶	1-2 shift error (E4OD)
51 oc ▶	ECT indicated - 40°F/circuit open
52 o ▶	Power Steering Pressure Switch (PSPS) circuit open
52 r ▶	PSPS circuit did not change states
53 oc ▶	TP sensor above maximum voltage
54 oc ▶	ACT indicated - 40°F/circuit open
56 oc ▶	TOT indicated - 40°F/circuit open (E4OD)
59 c ▶	2-3 shift error (E4OD)
61 orc ▶	ECT indicated 254°F/circuit grounded
62 c ▶	Converter clutch error (E4OD)
63 orc ▶	TP circuit below minimum voltage
64 orc ▶	ACT indicated 254°F/circuit grounded
65 r ▶	Overdrive Cancel Switch (OCS) not changing state (E4OD)
66 oc ▶	TOT indicated 290°F/circuit grounded (E4OD)
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C on

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definition

4.9L EFI

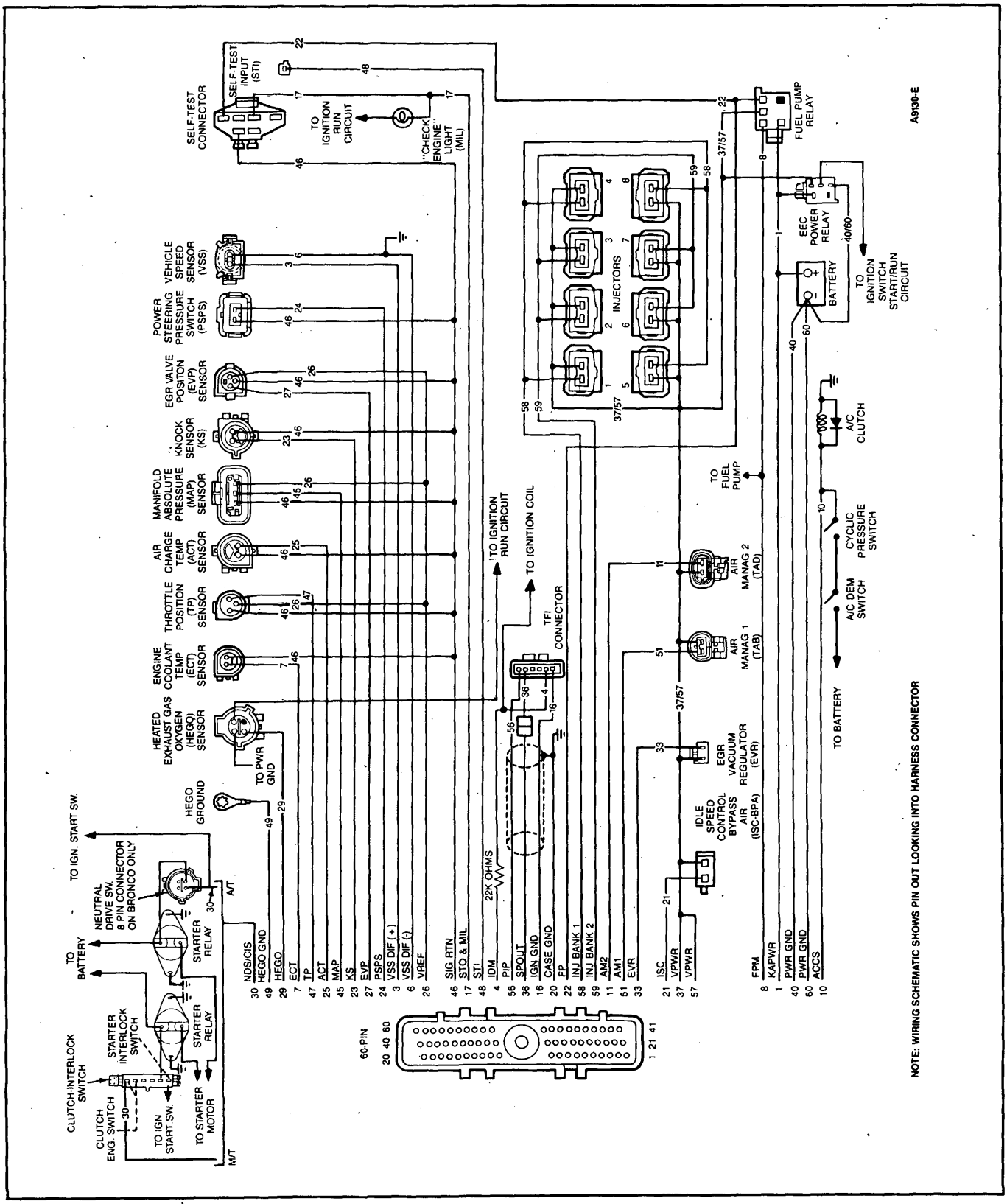
SERVICE CODE	SERVICE CODE DEFINITION
67 oc ▶	Manual Lever Position (MLP) sensor out of range/A/C on (E4OD)
69 c ▶	3-4 shift error (E4OD)
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit open/not actuated during Self-Test
77 r ▶	Operator error (Dynamic Response/Cylinder Balance Tests)
81 o ▶	Air Management 2 (AM2) circuit failure
82 o ▶	Air Management 1 (AM1) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Primary Fuel Pump circuit failure
91 o ▶	Shift Solenoid 1 (SS1) circuit failure (E4OD)
92 o ▶	Shift Solenoid 2 (SS2) circuit failure (E4OD)
93 o ▶	Coast Clutch Solenoid (CCS) circuit failure (E4OD)
94 o ▶	Converter Clutch Control (CCC) solenoid circuit failure (E4OD)
95 oc ▶	Fuel pump circuit open – ECA to motor ground
96 oc ▶	Fuel pump circuit open – battery to ECA
97 o ▶	Overdrive Cancel Indicator Light (OCIL) circuit failure (E4OD)
98 o ▶	Electronic Pressure Control (EPC) driver open in ECA (E4OD)
98 r ▶	Hard fault present
99 oc ▶	Electronic Pressure Control (EPC) circuit failure (E4OD)
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Services codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

5.0L EFI



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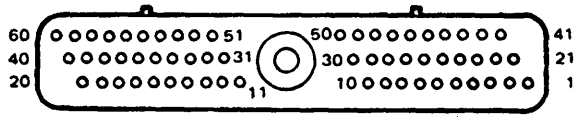
EEC-IV Module Connector Pin Usage

5.0L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
3	679	GY/BK	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	T/Y	Ignition Diagnostic Monitor	IDM
6	676	PK/O	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/R	Engine Coolant Temperature Sensor	ECT
8	238	DG/Y	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	BR	Air Management 2	AM2
16	259	O	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control (Bypass Air)	ISC — BPA
22	926	LB/O	Fuel Pump	FP
23	310	Y/R	Knock Sensor	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	743	GY	Air Charge Temperature Sensor	ACT
26	351	BR/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	74	GY/LB	Heated Exhaust Oxygen Sensor	HEGO
30	199	LB/Y	Neutral Drive Switch	NDS
33	360	BR/PK	EGR Vacuum Regulator Solenoid	EVR
36	929	PK	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	570	BK/W	Power Ground	PWR GND
45	358	LG/BK	Manifold Absolute Pressure	MAP
46	359	GY/R	Signal Return	SIG RTN
47	355	GY/W	Throttle Position Sensor	TP
48	209	W/P	Self-Test Input	STI
49	89	O	Heated Exhaust Oxygen Ground	HEGO GND
51	190	W/O	Air Management 1	AM1
56	395	GY/O	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	555	T	Injector (Bank 1 — Controls Engine Cylinder Numbers 1, 4, 5 and 8)	INJ BANK 1
59	556	W	Injector (Bank 2 — Controls Engine Cylinder Numbers 2, 3, 6 and 7)	INJ BANK 2
60	570	BK/W	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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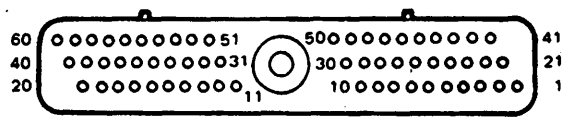
EEC-IV Module Connector Pin Usage

5.0L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor(-)	VSS DIF(-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	W/BK	Air Management 2	AM2
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
23	99	LG/BK	Knock Sensor	KS
24	330	Y/LG	Power Steering Pressure Switch	PSPS
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	912	LB/W	Neutral Drive Switch	NDS
33	360	DG	EGR Vacuum Regulator Solenoid	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
40	60	BK/LG	Power Ground	PWR GND
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGO GND
51	190	W/R	Air Management 1	AM1
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 — Controls Engine Cyl. Numbers 1, 4, 5 and 8)	INJ BANK 1
59	95	T/R	Injector (Bank 2 — Controls Engine Cyl. Numbers 2, 3, 6 and 7)	INJ BANK 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

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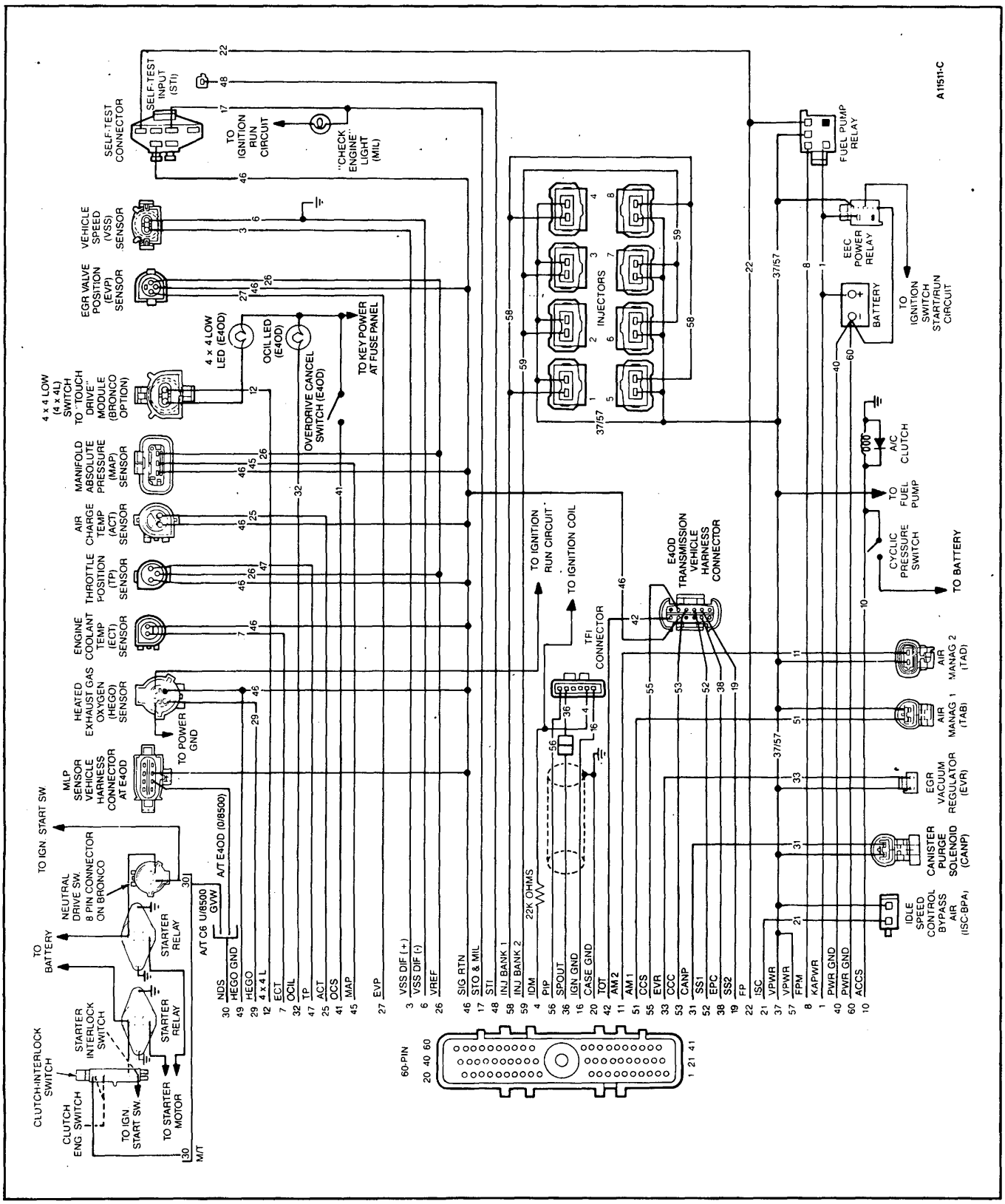
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	Loss of IDM input to Processor/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Coolant Temperature (ECT) out of Self-Test range
22 orc ▶	Manifold Absolute Pressure (MAP) out of Self-Test range
23 or ▶	Throttle Position (TP) out of Self-Test range
24 or ▶	Air Charge Temperature (ACT) out of Self-Test range
25 r ▶	Knock not sensed during Dynamic Response Test
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	EGR Valve Position (EVP) circuit below minimum voltage
32 orc ▶	EVP voltage below closed limit
33 rc ▶	EGR valve opening not detected
34 orc ▶	EVP voltage is above closed limit
35 orc ▶	EVP circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switch detected
42 r ▶	HEGO sensor circuit indicates system rich
44 r ▶	Thermactor air system inoperative
45 r ▶	Thermactor air upstream during Self-Test
46 r ▶	Thermactor air not bypassed during Self-Test
51 oc ▶	ECT indicated −40°F/circuit open
52 o ▶	Power Steering Pressure Switch (PSPS) circuit open
52 r ▶	PSPS circuit did not change states
53 oc ▶	TP circuit above maximum voltage
54 oc ▶	ACT indicated −40°F/circuit open
61 oc ▶	ECT indicated 254°F/circuit grounded
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
67 o ▶	Neutral Drive Switch (NDS) circuit open/A/C ON
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
77 r ▶	Operator Error (Dynamic Response/Cylinder Balance Tests)
81 o ▶	Air Management 2 (AM2) circuit failure
82 o ▶	Air Management 1 (AM1) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
87 oc ▶	Primary Fuel pump circuit failure
95 oc ▶	Fuel Pump circuit open – ECA to motor ground
96 oc ▶	Fuel Pump circuit open – battery to ECA
98 r ▶	Hard fault present
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

5.8L EFI



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EEC-IV Module Connector Pin Usage

5.8L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (E4OD Only)	BOO
3	679	GY/BK	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	T/Y	Ignition Diagnostic Monitor	IDM
6	676	PK/O	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/R	Engine Coolant Temperature Sensor	ECT
8	238	DG/Y	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	BR	Air Management 2	AM2
12	784	LB/BK	4 x 4 Low Switch (E4OD Only)	4 x 4L
16	259	O	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
19	315	P/O	Transmission Shift Solenoid #2 (E4OD Only)	SS2
20	57	BK	Case Ground	CASE GND
21	264	LB/W	Idle Speed Control (Bypass Air)	ISC — BPA
22	97	LB/O	Fuel Pump	FP
25	310	GY	Air Charge Temperature Sensor	ACT
26	351	BR/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	74	GY/LB	Heated Exhaust Oxygen Sensor	HEGO
30	481	GY/Y	Neutral Drive Switch (C6 A/T Only)	NDS
30	199	LB/Y	Manual Lever Position Sensor (E4OD Only)	MLP
31	101	GY/Y	Canister Purge Solenoid	CANP
32	911	W/LG	Overdrive Cancel Indicator Light (E4OD Only)	OCIL
33	360	BR/PK	EGR Vacuum Regulator Solenoid	EVR

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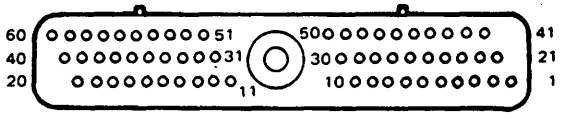
EEC-IV Module Connector Pin Usage

5.8L EFI

F-SERIES/BRONCO

Pin	Circuit	Wire Color	Application	Abbreviations
36	929	PK	Spark Output	SPOUT
37	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
38	925	W/Y	Electronic Pressure Control Solenoid (E4OD Only)	EPC
40	570	BK/LG	Power Ground	PWR GND
41	224	T/W	Overdrive Cancel Switch (E4OD Only)	OCS
42	923	O/BK	Transmission Oil Temperature (E4OD Only)	TOT
45	358	LG/BK	Manifold Absolute Pressure	MAP
46	359	GY/R	Signal Return	SIG RTN
47	355	GY/W	Throttle Position Sensor	TP
48	209	W/P	Self-Test Input	STI
49	89	O	Heated Exhaust Oxygen Ground	HEGO GND
51	190	W/O	Air Management 1	AM1
52	562	O/Y	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR/O	Converter Coast Solenoid (E4OD Only)	CCS
56	395	GY/O	Profile Ignition Pick-Up	PIP
57	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
58	555	T	Injector Bank 1 (Controls Engine Cylinder Numbers 1, 4, 5 and 8)	INJ BANK 1
59	556	W	Injector Bank 2 (Controls Engine Cylinder Numbers 2, 3, 6 and 7)	INJ BANK 2
60	570	BK/W	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

5.8L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (E4OD Only)	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature Sensor	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
11	200	W/BK	Air Management 2	AM2
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
18	223	T/LG	Inferred Mileage Sensor (49 States)	IMS
19	315	DG/P	Transmission Shift Solenoid #2 (E4OD Only)	SS2
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	912	BR/W	Neutral Drive Switch	NDS
30	912	LB/W	Manual Lever Position Sensor (E4OD Only)	MLP
31	101	GY/Y	Canister Purge Solenoid	CANP
32	911	LG/W	Overdrive Cancel Indicator Light (E4OD Only)	OCIL
33	360	DG	EGR Vacuum Regulator Solenoid	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
38	199	LB/Y	Electronic Pressure Control Solenoid (E4OD Only)	EPC
40	60	BK/LG	Power Ground	PWR GND
41	224	T/LB	Overdrive Cancel Switch (E4OD Only)	OCS
42	923	O/BK	Transmission Oil Temperature Sensor (E4OD Only)	TOT

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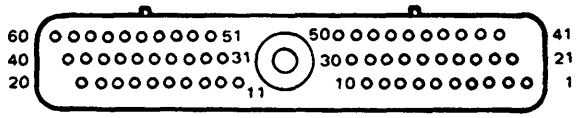
EEC-IV Module Connector Pin Usage

5.8L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
45	356	DB/LG	Manifold Absolute Pressure	MAP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGO GND
51	190	W/R	Air Management 1	AM1
52	237	O/Y	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR	Converter Coast Solenoid (E4OD Only)	CCS
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
58	96	T/O	Injector Bank 1 (Controls Engine Cyl. Nos. 1, 4, 5, and 8)	INJ BANK 1
59	95	T/R	Injector Bank 2 (Controls Engine Cyl. Nos. 2, 3, 6, and 7)	INJ BANK 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

5.8L EFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 r ▶	SPOUT circuit open
18 c ▶	Loss of IDM input to processor/SPOUT circuit grounded
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Cooling Temperature (ECT) sensor out of Self-Test range
22 orc ▶	Manifold Absolute Pressure (MAP) sensor out of Self-Test range
23 or ▶	Throttle Position (TP) sensor out of Self-Test range
24 or ▶	Air Charge Temperature (ACT) sensor out of Self-Test range
26 or ▶	Transmission Oil Temperature (TOT) sensor out of Self-Test range (E4OD)
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	EVP circuit below minimum voltage
32 orc ▶	EVP voltage below closed limit
33 rc ▶	EGR valve opening not detected
34 orc ▶	EVP voltage above closed limit
35 orc ▶	EVP circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switching detected
42 r ▶	HEGO sensor circuit indicates system rich
44 r ▶	Thermactor air system inoperative
45 r ▶	Thermactor air upstream during Self-Test
46 r ▶	Thermactor air not bypassed during Self-Test
47 o ▶	4 x 4 switch is closed (E4OD)
49 c ▶	1-2 shift error (E4OD)
51 oc ▶	ECT indicated – 40°F/circuit open
53 oc ▶	TP above maximum voltage
54 oc ▶	ACT indicated – 40°F/circuit open
56 oc ▶	TOT indicated – 40°F/circuit open (E4OD)
59 c ▶	2-3 shift error (E4OD)
61 oc ▶	ECT indicated 254°F/circuit grounded
62 c ▶	Converter clutch error (E4OD)
63 oc ▶	TP circuit below min. voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
65 r ▶	Overdrive Cancel Switch (OCS) not changing state (E4OD)
66 oc ▶	TOT indicated 290°F/circuit grounded (E4OD)
67 o ▶	Neutral Drive Switch (NDS) circuit open; A/C ON (Manual)

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definition

5.8L EFI

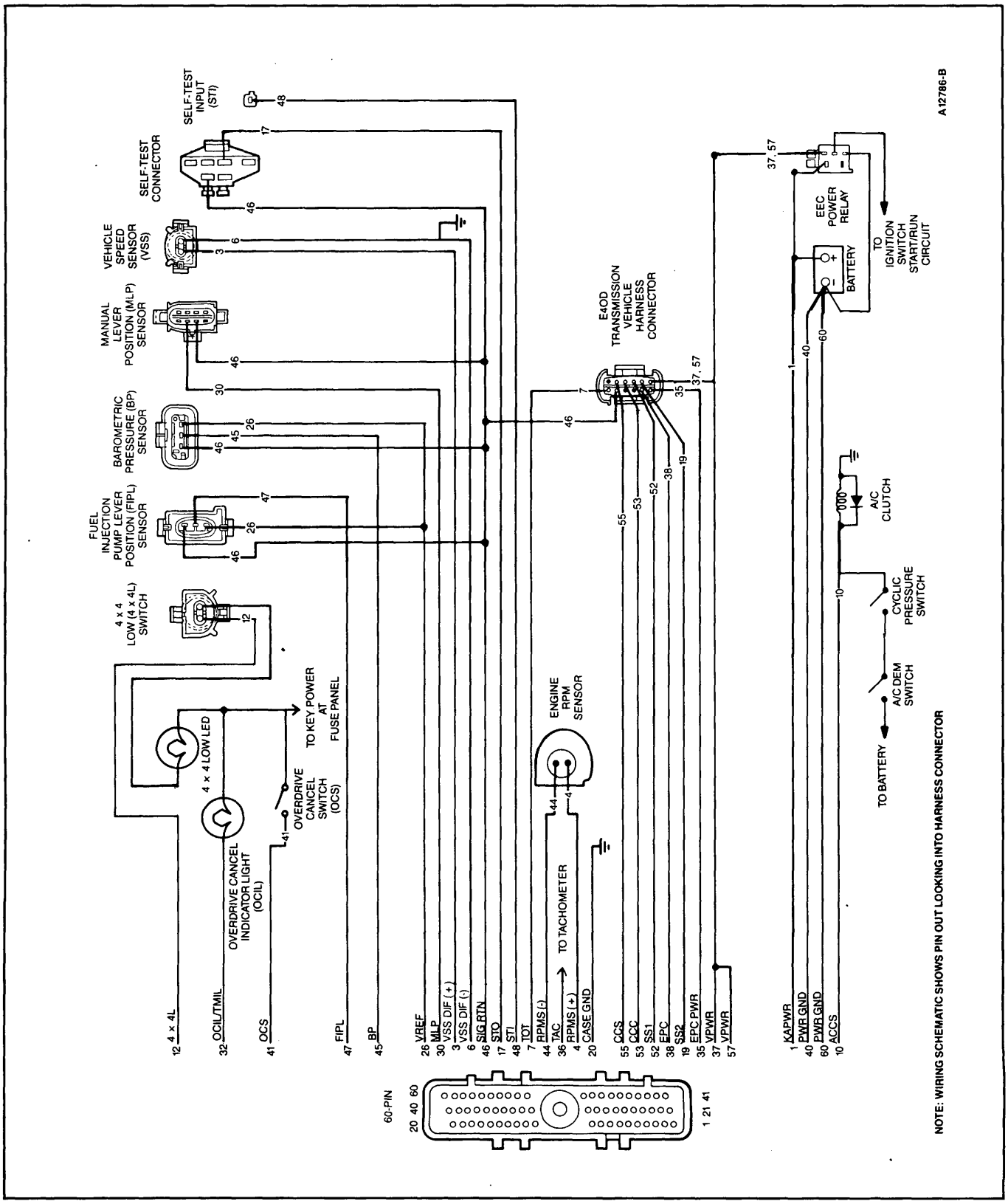
SERVICE CODE	SERVICE CODE DEFINITION
67 oc ▶	MLP sensor out of range; A/C ON (E4OD)
69 c ▶	3-4 shift error (E4OD)
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit open — not actuated during Self-Test
77 r ▶	Operator error Dynamic Response Test
81 o ▶	Air Management 2 (AM2) circuit failure
82 o ▶	Air Management 1 (AM1) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Primary fuel pump circuit failure
91 o ▶	Shift Solenoid 1 (SS1) circuit failure (E4OD)
92 o ▶	Shift Solenoid 2 (SS2) circuit failure (E4OD)
93 o ▶	Coast Clutch Solenoid (CCS) circuit failure (E4OD)
94 o ▶	Converter Clutch Control (CCC) solenoid circuit failure (E4OD)
95 oc ▶	Fuel Pump circuit open - ECA to motor around
96 oc ▶	Fuel Pump circuit open - battery to ECA
97 o ▶	Overdrive Cancel Indicator Light (OCIL) circuit failure (E4OD)
98 o ▶	Electronic Pressure Control (EPC) driver failure in processor (E4OD)
98 r ▶	Hard fault present
99 oc ▶	Electronic Pressure Control (EPC) circuit failure (E4OD)
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Services codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

7.3L E4OD Diesel



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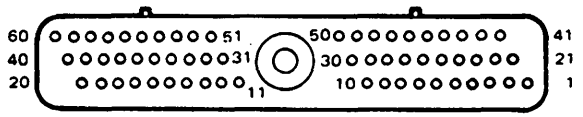
EEC-IV Module Connector Pin Usage

7.3L E4OD DIESEL

F-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off	BOO
3	679	GY/BK	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	T/Y	Engine RPM Sensor (+)	RPMS (+)
6	676	PK/O	Vehicle Speed Sensor (-)	VSS DIF (-)
7	923	O/BK	Transmission Oil Temperature Sensor	TOT
10	347	BK/Y	A/C Cycling Switch	ACCS
12	784	LB/BK	4 x 4 Low Switch	4 x 4L
17	658	PK/LG	Self-Test Output	STO
19	315	P/O	Transmission Shift Solenoid #2	SS2
20	57	BK	Case Ground	CASE GND
26	351	O/W	Reference Voltage	VREF
30	199	LB/Y	Manual Lever Position Sensor	MLP
32	911	LG/W	Overdrive Cancel Indicator Light	OCIL
			Transmission Malfunction Indicator Light	TMIL
35	912	W/R	Electronic Pressure Control Power	EPCPWR
36	648	W/PK	Tachometer (Spark Output)	TAC
37	361	R	Vehicle Power	VPWR
38	925	W/Y	Electronic Pressure Control	EPC
40	570	BK/W	Power Ground	PWR GND
41	224	T/W	Overdrive Cancel Switch	OCS
44	644	DG/N	Engine RPM Sensor (-)	RPMS (-)
45	358	LG/BK	Barometric Pressure Sensor	BP
46	359	GY/R	Signal Return	SIG RTN
47	355	GY/W	Fuel Injection Pump Lever Sensor	FIPL
48	209	W/P	Self-Test Input	STI
52	237	O/Y	Transmission Shift Solenoid #1	SS1
53	480	P/Y	Converter Clutch Control Solenoid	CCC
55	924	BR/O	Converter Coast Solenoid	CCS
57	361	R	Vehicle Power	VPWR
60	570	BK/W	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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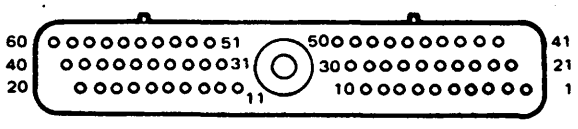
EEC-IV Module Connector Pin Usage

7.3L E4OD DIESEL

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	349	DB	Engine RPM Sensor (+)	RPMS (+)
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	923	O/BK	Transmission Oil Temperature Sensor	TOT
10	347	BK/Y	A/C Cycling Switch	ACCS
17	201	T/R	Self-Test Output	STO
19	315	DG/P	Transmission Shift Solenoid #2	SS2
20	57	BK	Case Ground	CASE GND
26	351	O/W	Reference Voltage	VREF
30	912	LB/W	Manual Lever Position Sensor	MLP
32	911	LG/W	Overdrive Cancel Indicator Light	OCIL
			Transmission Malfunction Indicator Light	TMIL
35	925	Y/W	Electronic Pressure Control Power	EPCPWR
36	648	R/LB	Tachometer (Spark Output)	TAC
37	361	R	Vehicle Power	VPWR
38	199	LB/Y	Electronic Pressure Control	EPC
40	60	BK/LG	Power Ground	PWR GND
41	224	T/LB	Overdrive Cancel Switch	OCS
44	60	BK/LG	Engine RPM Sensor(-)	RPMS(-)
45	356	DB/LG	Barometric Pressure Sensor	BP
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Fuel Injection Pump Lever Sensor	FIPL
48	100	W/R	Self-Test Input	STI
52	237	O/Y	Transmission Shift Solenoid #1	SS1
53	480	P/Y	Converter Clutch Control Solenoid	CCC
55	924	BR	Converter Coast Solenoid	CCS
57	361	R	Vehicle Power	VPWR
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

7.3L E4OD DIESEL

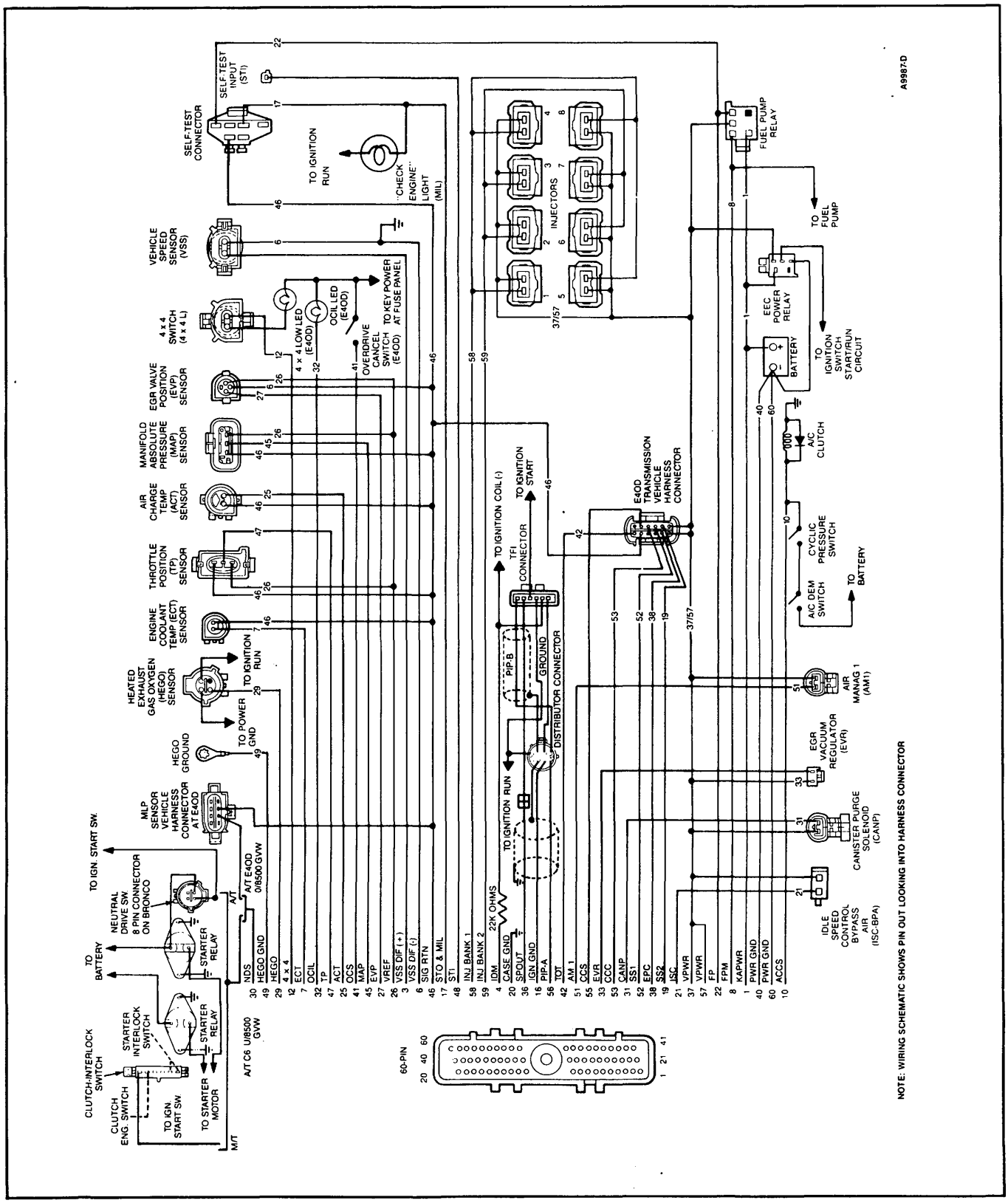
SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
14 c ▶	Engine rpm sensor (rpms) circuit fault
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
19 o ▶	Failure in ECA internal voltage
22 orc ▶	Barometric Pressure (BP) out of Self-Test range
23 or ▶	Fuel Injection Pump Lever (FIPL) out of Self-Test range
26 c ▶	Transmission Oil Temp (TOT) out of Self-Test range
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
47 o ▶	4 x 4 switch is closed
49 c ▶	1-2 Shift error
53 oc ▶	Fuel Injection Pump Lever (FIPL) circuit above maximum voltage
56 oc ▶	Transmission Oil Temp (TOT) indicated -40°F/circuit open
59 c ▶	2-3 Shift error
62 c ▶	Converter Clutch error
63 oc ▶	Fuel Injection Pump Lever (FIPL) circuit below minimum voltage
65 r ▶	Overdrive Cancel Switch (OCS) circuit did not change states
66 oc ▶	Transmission Oil Temp (TOT) indicated 290°F/circuit grounded
67 oc ▶	Manual Lever Position (MLP) sensor out of range/A/C ON
69 c ▶	3-4 Shift error
74 r ▶	Brake On/Off (BOO) circuit open/not actuated during Self-Test
91 o ▶	Shift Solenoid 1 (SS1) circuit failure
92 o ▶	Shift Solenoid 2 (SS2) circuit failure
93 o ▶	Coast Clutch Solenoid (CCS) circuit failure
94 o ▶	Converter Clutch Control (CCC) Solenoid circuit failure
97 o ▶	Overdrive Cancel Indicator Light (OCIL) circuit failure
98 o ▶	Electronic Pressure Control (EPC) driver open in ECA
99 oc ▶	Electronic Pressure Control (EPC) circuit failure
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Electrical Schematic

7.5L EFI



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EEC-IV Module Connector Pin Usage

7.5L EFI

F-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	37	Y	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off (E4OD Only)	BOO
3	679	GY/BK	Vehicle Speed Sensor (+) (E4OD Only)	VSS DIF (+)
4	11	T/Y	Ignition Diagnostic Monitor	IDM
6	676	PK/O	Vehicle Speed Sensor (-) (E4OD)	VSS DIF (-)
7	354	LG/R	Engine Coolant Temperature Sensor	ECT
8	238	DG/Y	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
12	784	LB/BK	4 x 4 Low Switch (E4OD Only)	4 x 4L
16	259	O	Ignition Ground	IGN GND
17	658	PK/LG	Self-Test Output and "CHECK ENGINE" Light	STO and MIL
19	315	P/O	Transmission Shift Solenoid #2 (E4OD Only)	SS2
20	57	BK	Case Ground	CASE GND
21	264	W/LB	Idle Speed Control (Bypass Air)	ISC — BPA
22	926	LB/O	Fuel Pump	FP
25	743	GY	Air Charge Temperature Sensor	ACT
26	351	BR/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	74	GY/LB	Heated Exhaust Oxygen Sensor	HEGO
30	481	GY/Y	Neutral Drive Switch	NDS
30	199	LB/Y	Manual Lever Position Sensor (E4OD Only)	MLP
31	101	GY/Y	Canister Purge	CANP
32	911	W/LG	Overdrive Cancel Indicator Light (E4OD Only)	OCIL
33	360	BR/PK	EGR Vacuum Regulator (Solenoid)	EVR
36	929	PK	Spark Output	SPOUT
37	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
38	925	W/Y	Electronic Pressure Control Solenoid (E4OD Only)	EPC

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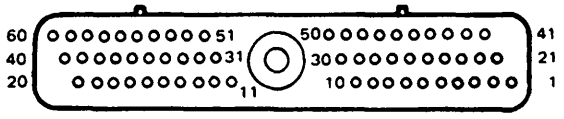
EEC-IV Module Connector Pin Usage

7.5L EFI

F-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
40	570	BK/W	Power Ground	PWR GND
41	224	T/W	Overdrive Cancel Switch (E4OD Only)	OCS
42	923	O/BK	Transmission Oil Temperature Sensor (E4OD Only)	TOT
45	358	LG/BK	Manifold Absolute Pressure	MAP
46	359	GY/R	Signal Return	SIG RTN
47	355	GY/W	Throttle Position Sensor	TP
48	100	W/P	Self-Test Input	STI
49	89	O	Heated Exhaust Oxygen Ground	HEGO GND
51	190	W/O	Air Management 1	AM1
52	237	O/Y	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR/O	Converter Coast Solenoid (E4OD Only)	CCS
56	395	GY/O	Profile Ignition Pick-Up	PIP
57	361	R	Electronic Pressure Control Power/Vehicle Power	EPCPWR/VPWR
58	555	T	Injector (Bank 1 Controls Engine Cylinder Numbers 1, 4, 5 and 8)	INJ BANK 1
59	556	W	Injector (Bank 2 Controls Engine Cylinder Numbers 2, 3, 6 and 7)	INJ BANK 2
60	570	BK/W	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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EEC-IV Module Connector Pin Usage

7.5L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
1	38	BK/O	Keep Alive Power	KAPWR
2	511	LG	Brake On/Off	BOO
3	150	DG/W	Vehicle Speed Sensor (+)	VSS DIF (+)
4	11	DG/Y	Ignition Diagnostic Monitor	IDM
6	563	O/Y	Vehicle Speed Sensor (-)	VSS DIF (-)
7	354	LG/Y	Engine Coolant Temperature	ECT
8	238	O/LB	Fuel Pump Monitor	FPM
10	347	BK/Y	A/C Cycling Switch	ACCS
16	259	BK/O	Ignition Ground	IGN GND
17	201	T/R	Self-Test Output and "CHECK ENGINE" Light	STO/MIL
19	315	DG/P	Transmission Shift Solenoid #2 (E4OD Only)	SS2
20	57	BK	Case Ground	CASE GND
21	67	GY/W	Idle Speed Control (Bypass Air)	ISC-BPA
22	97	T/LG	Fuel Pump	FP
25	310	Y/R	Air Charge Temperature Sensor	ACT
26	351	O/W	Reference Voltage	VREF
27	352	BR/LG	EGR Valve Position Sensor	EVP
29	94	DG/P	Heated Exhaust Gas Oxygen Sensor	HEGO
30	912	LB/W	Manual Lever Position Sensor (E4OD Only)	MLP
31	101	GY/Y	Canister Purge	CANP
32	911	LG/W	Overdrive Cancel Indicator Light (E4OD Only)	OCIL
33	360	DG	EGR Vacuum Regulator Solenoid	EVR
36	324	Y/LG	Spark Output	SPOUT
37	361	R	Vehicle Power	VPWR
38	199	LB/Y	Electronic Pressure Control Solenoid (E4OD Only)	EPC
40	60	BK/LG	Power Ground	PWR GND
41	224	T/LB	Overdrive Cancel Switch	OCS
42	923	O/BK	Transmission Oil Temperature Sensor (E4OD Only)	TOT
45	356	DB/LG	Manifold Absolute Pressure	MAP

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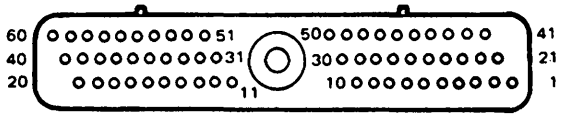
EEC-IV Module Connector Pin Usage

7.5L EFI

E-SERIES

Pin	Circuit	Wire Color	Application	Abbreviations
46	359	BK/W	Signal Return	SIG RTN
47	355	DG/LG	Throttle Position Sensor	TP
48	100	W/R	Self-Test Input	STI
49	89	O	Heated Exhaust Gas Oxygen Ground	HEGO GND
51	190	W/R	Air Management 1	AM1
52	237	O/Y	Transmission Shift Solenoid #1 (E4OD Only)	SS1
53	480	P/Y	Converter Clutch Control Solenoid (E4OD Only)	CCC
55	924	BR	Converter Coast Solenoid (E4OD Only)	CCS
56	349	DB	Profile Ignition Pick-Up	PIP
57	361	R	Vehicle Power	VPWR
58	96	T/O	Injector (Bank 1 Controls Engine Cylinder Numbers 1, 4, 5 and 8)	INJ BANK 1
59	95	T/R	Injector (Bank 2 Controls Engine Cylinder Numbers 2, 3, 6 and 7)	INJ BANK 2
60	60	BK/LG	Power Ground	PWR GND

Pin locations given for reference only. Probing 60 pin connector with DVOM probe will result in permanent damage to the pin connectors. Always probe as directed, using the Breakout Box.



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Quick Test Codes and Code Definition

7.5L EFI

SERVICE CODE	SERVICE CODE DEFINITION
11 orc ▶	System PASS
12 r ▶	Cannot control rpm during Self-Test high rpm check
13 r ▶	Cannot control rpm during Self-Test low rpm check
14 c ▶	PIP circuit failure
15 o ▶	ECA Read Only Memory (ROM) test failed
15 c ▶	ECA Keep Alive Memory (KAM) test failed
18 c ▶	SPOUT circuit grounded
18 r ▶	SPOUT circuit open
19 o ▶	Failure in ECA internal voltage
21 or ▶	Engine Cooling Temperature (ECT) sensor input is out of Self-Test range
22 orc ▶	Manifold Absolute Pressure (MAP) sensor input is out of Self-Test range
23 or ▶	Throttle Position (TP) sensor input is out of Self-Test range
24 or ▶	Air Charge Temperature (ACT) sensor input is out of Self-Test range
26 or ▶	Transmission Oil Temperature (TOT) sensor input is out of Self-Test range (E4OD)
29 c ▶	Insufficient input from the Vehicle Speed Sensor (VSS)
31 orc ▶	EVP circuit below minimum voltage
32 orc ▶	EVP voltage below closed limit
33 rc ▶	EGR valve opening not detected
34 orc ▶	EVP voltage above closed limit
35 orc ▶	EVP circuit above maximum voltage
41 r ▶	HEGO sensor circuit indicates system lean
41 c ▶	No HEGO switching detected
42 r ▶	HEGO sensor circuit indicates system rich
44 r ▶	Thermactor air system inoperative
47 o ▶	4 x 4 switch is closed (E4OD)
49 c ▶	1-2 shift error (E4OD)
51 oc ▶	ECT indicated -40°F/circuit open
53 oc ▶	TP above maximum voltage
54 oc ▶	ACT indicated -40°F/circuit open
56 oc ▶	TOT indicated -40°F/circuit open (E4OD)
59 c ▶	2-3 shift error (E4OD)
61 oc ▶	ECT indicated 254°F/circuit grounded
62 c ▶	Converter clutch error (E4OD)
63 oc ▶	TP circuit below minimum voltage
64 oc ▶	ACT indicated 254°F/circuit grounded
65 r ▶	Overdrive Cancel Switch (OCS) not changing state (E4OD)
66 oc ▶	TOT indicated 290°F/circuit grounded (E4OD)
67 oc ▶	Manual Lever Position (MLP) sensor out of range; A/C on (E4OD)
67 o ▶	Neutral Drive Switch (NDS) circuit open; A/C ON (Manual/C6)
69 c ▶	3-4 shift error (E4OD)

(Continued)

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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Quick Test Codes and Code Definition

7.5L EFI

SERVICE CODE	SERVICE CODE DEFINITION
72 r ▶	Insufficient MAP change during Dynamic Response Test
73 r ▶	Insufficient TP change during Dynamic Response Test
74 r ▶	Brake On/Off (BOO) circuit open - not actuated during Self-Test
77 r ▶	Operator error Dynamic Response Test
82 o ▶	Air Management 1 (AM1) circuit failure
84 o ▶	EGR Vacuum Regulator (EVR) circuit failure
85 o ▶	Canister Purge (CANP) circuit failure
87 oc ▶	Primary fuel pump circuit failure
91 o ▶	Shift Solenoid 1 (SS1) circuit failure (E4OD)
92 o ▶	Shift Solenoid 2 (SS2) circuit failure (E4OD)
93 o ▶	Coast Clutch Solenoid (CCS) circuit failure (E4OD)
94 o ▶	Converter Clutch Control (CCC) solenoid circuit failure (E4OD)
95 oc ▶	Fuel pump circuit open ECA to motor ground
96 oc ▶	Fuel pump circuit open battery to ECA
97 o ▶	Overdrive Cancel Indicator Light (OCIL) circuit failure (E4OD)
98 o ▶	Electronic Pressure Control (EPC) driver failure in Processor (E4OD)
98 r ▶	Hard fault is present
99 oc ▶	Electronic Pressure Control (EPC) circuit failure (E4OD)
NO CODES ▶	Unable to initiate Self-Test or unable to output Self-Test codes
CODES NOT LISTED ▶	Service codes displayed are not applicable to the vehicle being tested

KEY: o = Key On Engine Off (KOEO) r = Engine Running (ER) c = Continuous Memory

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SECTION 17

EEC-IV Pinpoint Test Procedures

Contents

Pinpoint Test Index 17-1

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Pinpoint Test Index

PINPOINT TEST LETTER	PINPOINT TEST TITLE	PAGE NUMBER
A	EEC-IV No Start	17-2
AA	EEC-IV No Start (EDIS)	17-11
B	Vehicle Battery	17-17
C	Reference Voltage	17-23
	SENSOR INPUTS	
DA	Temperature Sensor Test ACT, ECT and VAT	17-29
DC	Mass Air Flow (MAF) Sensor	17-40
DD	EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)	17-48
DF	Manifold Absolute Pressure (MAP)/Barometric Pressure (BP) Sensor	17-60
DG	Knock Sensor	17-72
DH	Throttle Position (TP) Sensor	17-76
DJ	Engine RPM Sensor (Diesel)	17-91
DK	Vane Air Flow (VAF) Sensor	17-94
DL	Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)	17-107
DN	EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid	17-125
DP	Vehicle Speed Sensor (VSS)	17-142
DQ	Fuel Injection Pump Lever (FIPL) Sensor	17-149
DR	Cylinder Identification (CID) Sensor	17-161
	ADDITIONAL INPUTS	
FA	Neutral Drive Switch A/C Input	17-165
FD	Brake On/Off (BOO)	17-179
FF	Power Steering Pressure Switch (PSPS)	17-191
	FUEL CONTROL SYSTEMS	
H	Fuel Control	17-197
J	Fuel Pump Circuit	17-228
	PROCESSOR OUTPUTS	
KA	EGR On/Off Control	17-246
KB	DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI	17-250
KC	Air Management System (AM1/AM2)	17-267
KD	Canister Purge (CANP)	17-274
KE	Idle Speed Control (Bypass Air)	17-280
KF	Electro Drive Fan (EDF)/High Electro Drive Fan (HEDF)	17-290
KH	Service Pin Adjustment	17-303
KL	Shift Indicator Light (SIL)	17-306
KM	WOT A/C Cutout (WAC) A/C Demand	17-312
KP	Octane Adjust	17-328
KT	Intake Air Control Valve (IAC) System	17-330
M	Dynamic Response Test	17-335
ML	"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message	17-337
N	Ignition/Erratic Diagnostic Monitor (IDM)	17-346
P	Spark Timing Check	17-365
QA	No Codes/Codes Not Listed	17-374
QB	Key On Engine Off and/or Continuous Memory Service Code 15	17-379
QC	Output State Check Not Functioning	17-382
QD	Re-Initialization Check	17-384
QE	Key Power Check	17-388
S	System Check	17-391
T	Transmission — AXOD	17-397
TB	Transmission — A4LD	17-414
TC	Transmission — E4OD	17-418
X	Integrated Controller	17-445

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EEC-IV No Start	Pinpoint Test	A

Note

You should enter this Pinpoint Test only when Quick Test has been successfully completed and the engine is still a no start or when directed here from Section 13.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuel: quantity and quality
- Ignition: general condition, moisture, cracks, damage, etc.
- Engine: internal, valves, timing belt, camshaft
- Starter and battery circuit
- Dual hall sensor
- TFI or DIS module
- Distributor
- Camshaft sensor (CID)
- Single hall crankshaft sensor (PIP)
- Ignition coil or DIS coil

This Pinpoint Test is intended to diagnose only the following:

- Spark (as related to EEC-IV)
- Harness circuits: PIP, SPOUT, IGN GND, VPWR
- Processor assembly (-12A650-)

NOTE: This pinpoint test is intended to diagnose TFI ignition systems, Closed Bowl Distributor (CBD) with remote mount TFI systems and Distributorless Ignition Systems (DIS).
To identify your system, please refer to the application chart below.

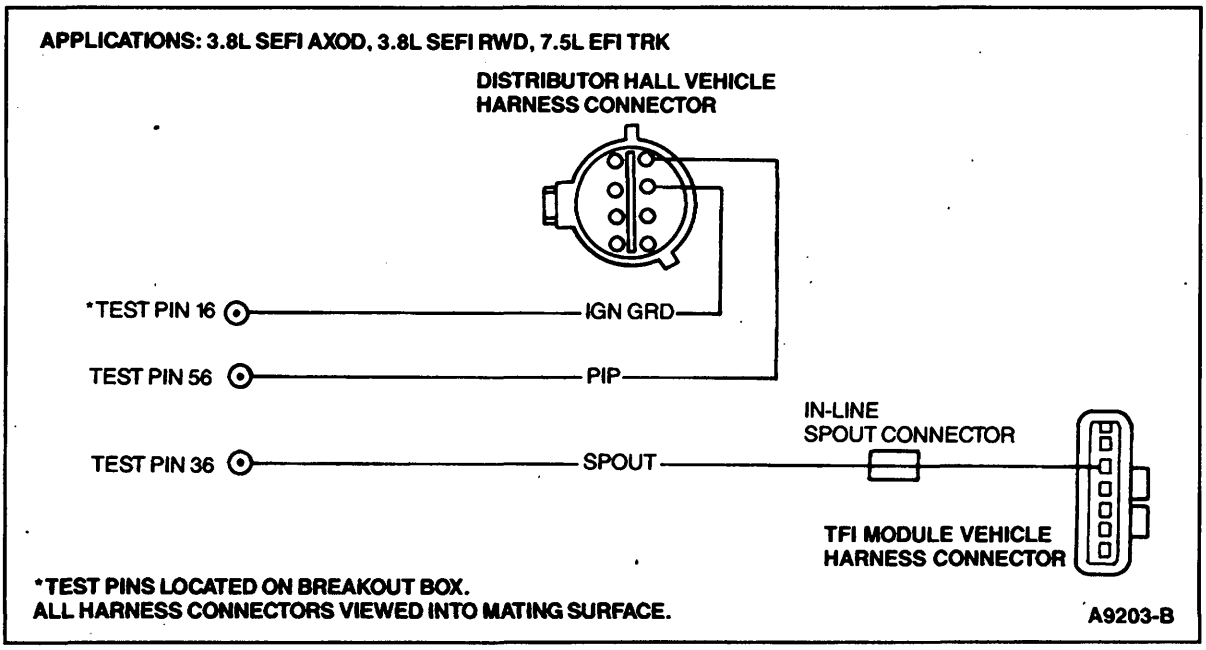
IGNITION SYSTEM APPLICATION CHART:

Ignition Connector	Vehicle Application
DIS Connector (Pins 1-6 and 7-12)	2.3L EFI Truck, 3.0L SHO, 3.8L SC
Distributor Hall Connector and TFI Connector (used for closed bowl distributor, remote mount TFI systems)	3.8L RWD, 3.8L AXOD, 7.5L Truck
TFI Connector	All Others

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EEC-IV No Start	Pinpoint Test	A

Pinpoint Test Schematic



TFI Module Location

Application	Location
3.8L SEFI AXOD	Cowl
3.8L SEFI RWD	Radiator Support
7.5L EFI TRK	Distributor

Test Pin 16 IGN. GND

Application	Wire Color
3.8L SEFI AXOD	GY
3.8L SEFI RWD 7.5L EFI TRK E-SERIES	BK/O
7.5L EFI TRK F-SERIES	O

Test Pin 36 Spout

Application	Wire Color
7.5L TRK F-Series	PK
All Others	Y/LG

Test Pin 56 PIP

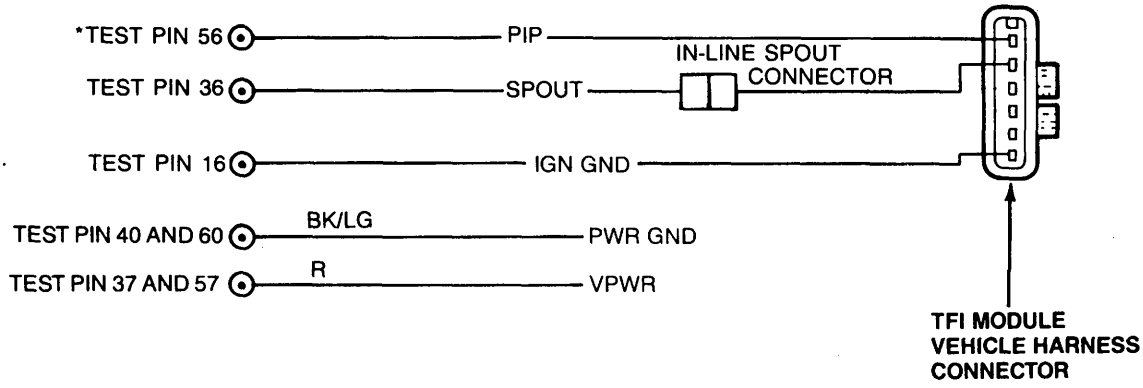
Application	Color
7.5L TRK F-Series	GY/O
All Others	DB

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EEC-IV No Start	Pinpoint Test	A

Pinpoint Test Schematic

ALL OTHER TFI APPLICATIONS



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

NOTE: WHEN BREAKOUT BOX IS INSTALLED, ENSURE THAT TIMING SWITCH IS IN "COMPUTED" POSITION UNLESS OTHERWISE NOTED.

A9576-D

Test Pin 56 PIP

Application	Wire Color
5.8L F-Series/Bronco 5.0L F-Series/Bronco	GY/O
3.0L Probe	BK
2.9L Scorpio	BL/Y
All Others	DB

Test Pin 36 SPOUT

Application	Wire Color
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco	PK
3.0L Probe	R
2.9L Scorpio	BL/R
5.0L Lincoln Town Car	GY/O
All Others	Y/LG

Test Pin 16 IGN GND

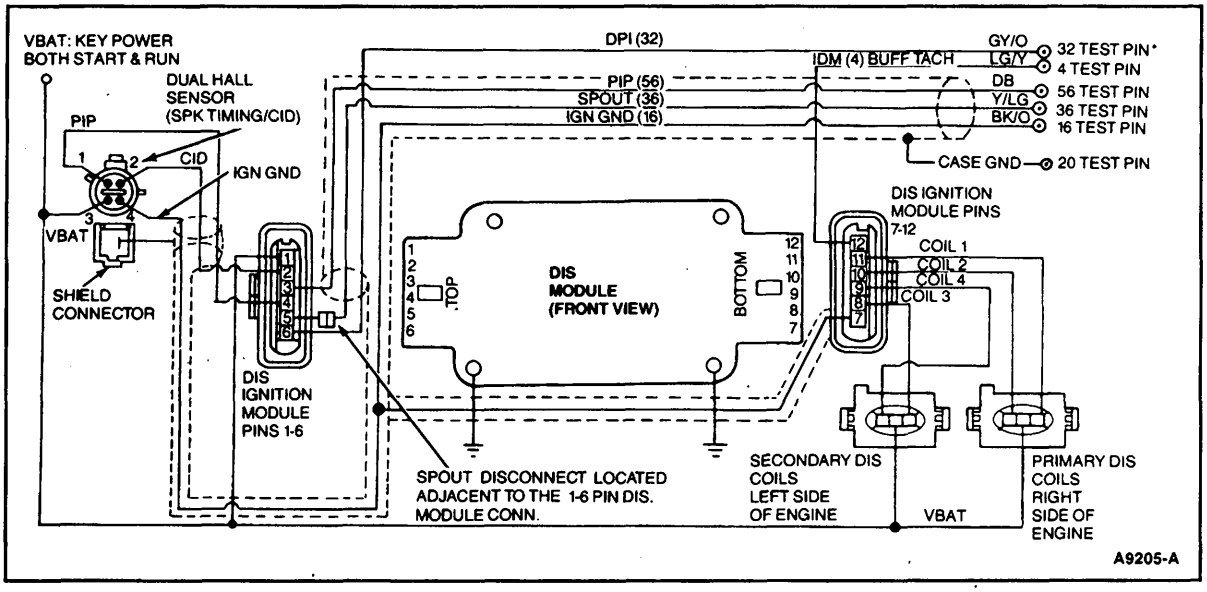
Application	Wire Color
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco	O
3.0L Probe	W
2.9L Scorpio	BR
All Others	BK/O

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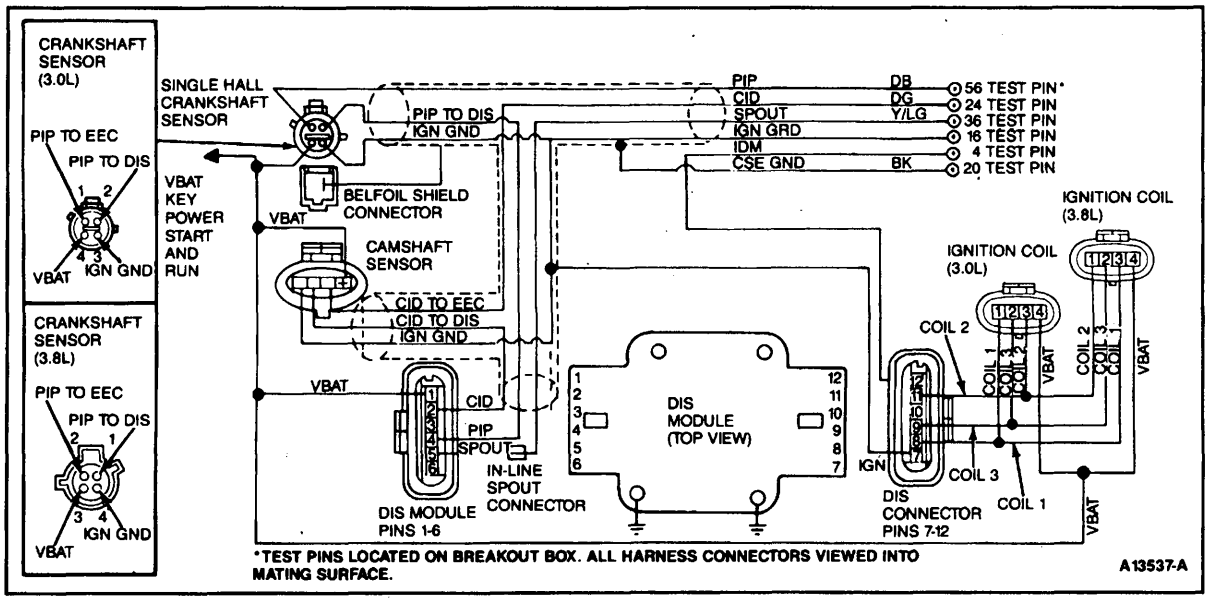
EEC-IV No Start	Pinpoint Test	A

Pinpoint Test Schematic

2.3 OHC EFI Truck



3.0L SHO SEFI MA and 3.8L SEFI SC



Test Pin 4	IDM
3.0L SHO MA	GY/O
3.8L SC MA	DG/Y

Test Pin 16	IGN. GND
3.0L SHO MA	BK/O
3.8L SC MA	LB

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EEC-IV No Start	Pinpoint Test	A

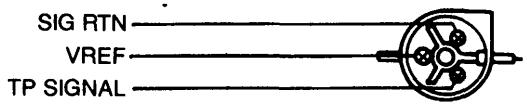
WARNING

STOP THIS TEST AT THE FIRST SIGN OF A FUEL LEAK AND SERVICE AS REQUIRED.

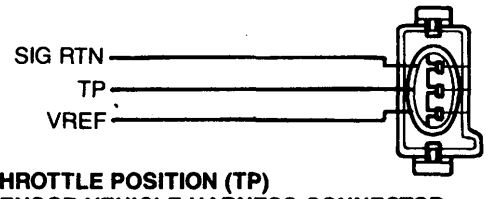
CAUTION

No open flame — No smoking during fuel delivery checks.

TEST STEP	RESULT ▶	ACTION TO TAKE
A1 ATTEMPT TO CRANK ENGINE		
NOTE: For DIS vehicles, if continuous memory code 19 is present, go to Pinpoint Test Step N1. • **Does engine crank?**	Yes ▶ No ▶	GO to A2. REFER to Starting/ Engine Shop Manual Group.
A2 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
NOTE: Verify fuel pump inertia switch is set (button pushed in). Refer to Owner's Guide for location. • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Disconnect TP sensor. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the TP sensor vehicle harness connector. • **Is voltage between 4.0 volts and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP sensor. GO to A3. GO to Pinpoint Test Step C1.



ALTERNATE THROTTLE POSITION SENSOR VEHICLE HARNESS CONNECTOR



THROTTLE POSITION (TP) SENSOR VEHICLE HARNESS CONNECTOR

A13613-A

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EEC-IV No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A3 CHECK FOR SPARK AT PLUGS		
• Disconnect the spark plug wire to any accessible cylinder (on 2.3L DIS truck, disconnect exhaust side spark plug only.) • Connect spark tester between spark plug wire and engine ground. • Crank engine and check for spark. • Reconnect the spark plug wire to the spark plug. • **Was spark present and consistent?**	Yes ▶ No ▶	GO to A12. **For DIS vehicles:** GO to A5. **For all others:** GO to A4.
A4 CHECK FOR SPARK AT COIL		
• Remove high tension coil wire from distributor and install spark tester. • Check for spark while cranking. • Reconnect high tension coil wire to distributor. • **Was spark present during crank?**	Yes ▶ No ▶	REFER to Section 13, Part 2 for TFI cap, rotor and wires diagnosis. GO to A5.
A5 CHECK CONTINUITY OF GND CIRCUIT		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Disconnect TFI module or DIS module (pins 7-12). (For 3.8L AXOD, 3.8L RWD and 7.5L truck, disconnect distributor hall connector.) • Measure resistance between Test Pin 16 at the breakout box and TFI, distributor hall or DIS vehicle harness connector IGN GND circuit. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to A6. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
A6 ISOLATION OF PROBLEM TO SPOUT CIRCUIT		
• Reconnect TFI module or DIS module (pins 7-12). (For 3.8L AXOD, 3.8L RWD and 7.5L truck, reconnect distributor hall connector.) • Breakout box installed. • Connect processor to breakout box. • Timing switch to "Dist" position on breakout box. • Attempt to start vehicle. • **Does the vehicle start?**	Yes ▶ No ▶	Timing switch to "Computed" position on breakout box. GO to A10. GO to A7.

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EEC-IV No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A7 CHECK SPOUT SIGNAL		
• Key on, engine off. • Breakout box installed, processor connected. • Timing switch to "Computed" position on breakout box. • DVOM on 20 volt scale. • Measure voltage between Test Pin 36 at the breakout box and battery negative post during crank. • **Is voltage between 3.0 and 6.0 volts?**	Yes ▶ No ▶	EEC system OK. REMOVE breakout box. RECONNECT all components. REFER to Section 13 for TFI or DIS diagnosis. GO to **A8**.
A8 CHECK SPOUT AND PIP CIRCUITS FOR SHORTS TO POWER AND GROUND		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. **For 3.8L SC or 3.0L SHO:** — Disconnect crankshaft sensor. **For 2.3L Truck:** — Disconnect DIS module (pins 1-6) connector. **For 3.8L AXOD, 3.8L RWD and 7.5L Truck:** — Disconnect distributor hall connector. **For all others:** — Disconnect TFI module. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 36 (SPOUT) and Test Pins 16, 20, 40, 46, 60 (short to GROUND), 26, 37, 57 (short to POWER) and 56 (short to PIP) at the breakout box. • Measure resistance between Test Pin 56 (PIP) and Test Pins 16, 20, 40, 46, 60 (short to GROUND), 26, 37, 57 (short to POWER). • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **A9**. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If vehicle does not start, GO to **A9**.

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EEC-IV No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A9 ISOLATE SHORT(S) IN PROCESSOR		
• Key off, wait 10 seconds. • Breakout box installed. • Reconnect processor to breakout box. • TFI module or DIS module (Pins 1-6) disconnected. (For 3.8L AXOD, 3.8L RWD and 7.5L truck TFI, distributor hall connector disconnected.) • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 36 (SPOUT) and Test Pins 37 and 57 (short to POWER) also, Test Pins 40 and 60 (short to GROUND) at the breakout box. • Measure resistance between Test Pin 56 (PIP) and Test Pins 37 and 57 (short to POWER). Also Test Pins 40 and 60 (short to GROUND) at the breakout box. • **Is each resistance greater than 500 ohms?**	Yes ▶ No ▶	RECONNECT all components. GO to A10. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
A10 CHECK PIP SIGNAL		
• Key off. • Breakout box installed, processor connected. • DVOM to 20 volt scale. • Measure voltage between Test Pin 56 and Test Pin 16 at the breakout box. (For 2.3L DIS truck, switch timing switch to "Dist" position on breakout box.) • Crank engine, record reading. • **Is voltage between 3.0 and 7.0 volts?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. GO to A11 (for 2.3L DIS truck, switch timing switch to "Computed" position on breakout box.)
A11 CHECK CONTINUITY OF PIP CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. **For 3.8L SC or 3.0L SHO:** — Disconnect crankshaft sensor. **For 2.3L Truck:** — Disconnect DIS module (pins 1-6) connector. **For 3.8L AXOD, 3.8L RWD and 7.5L Truck:** — Disconnect distributor hall connector. **For all others:** — Disconnect TFI module. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 56 at the breakout box and PIP circuit at the following connectors as appropriate: TFI, distributor hall, PIP sensor, or 2.3L TK DIS PIP circuit. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REFER to Section 13 for TFI or DIS diagnosis. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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EEC-IV No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A12 SPOUT SIGNAL VERIFICATION		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Ensure timing switch is in "Computed" position on breakout box. • DVOM on 20 volt scale. • Measure voltage between Test Pin 36 and Test Pins 40 and 60 at the breakout box during crank. • **Is voltage between 3.0 and 6.0 volts?**	Yes ▶ No ▶	GO to A20. GO to A8.
A20 CHECK FUEL PRESSURE		
WARNING **IF FUEL STARTS LEAKING, TURN KEY OFF IMMEDIATELY. NO SMOKING.** • Connect fuel pressure gauge. • Note initial pressure reading. • Observe pressure gauge as you pressurize fuel system. (Turn key to RUN for 1 second, then turn key to OFF. Wait 10 seconds. Repeat 5 times.) • **Does fuel pressure increase?**	Yes ▶ No ▶	**For all EFI and SEFI:** GO to Pinpoint Test Step S1. **For all CFI:** GO to Pinpoint Test Step S2. TURN key OFF and GO to A21.
A21 CHECK INERTIA SWITCH RESISTANCE		
• Key off. • Disconnect fuel pump inertia switch. Refer to Owner Guide for location. • DVOM on 200 ohm scale. • Measure the resistance of the fuel pump inertia switch. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	**For 2.5L HSC-CFI, 3.0L EFI and 3.8L AXOD EFI passenger car:** GO to X11. **For all others:** GO to J1. VERIFY inertia switch is reset. If switch will not reset, REPLACE switch. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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EEC-IV No Start (EDIS)	Pinpoint Test	AA

Note

You should enter this Pinpoint Test only when Quick Test has been successfully completed and the engine is still a no start or when directed here from Section 13.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuel: quantity and quality
- Ignition: general condition, moisture, cracks, damage, etc.
- Engine: internal, valves, timing belt, camshaft
- Starter and battery circuit
- Variable Reluctance sensor (VRS)
- EDIS module
- Distributor
- Single hall crankshaft sensor (PIP)
- Coil Packs

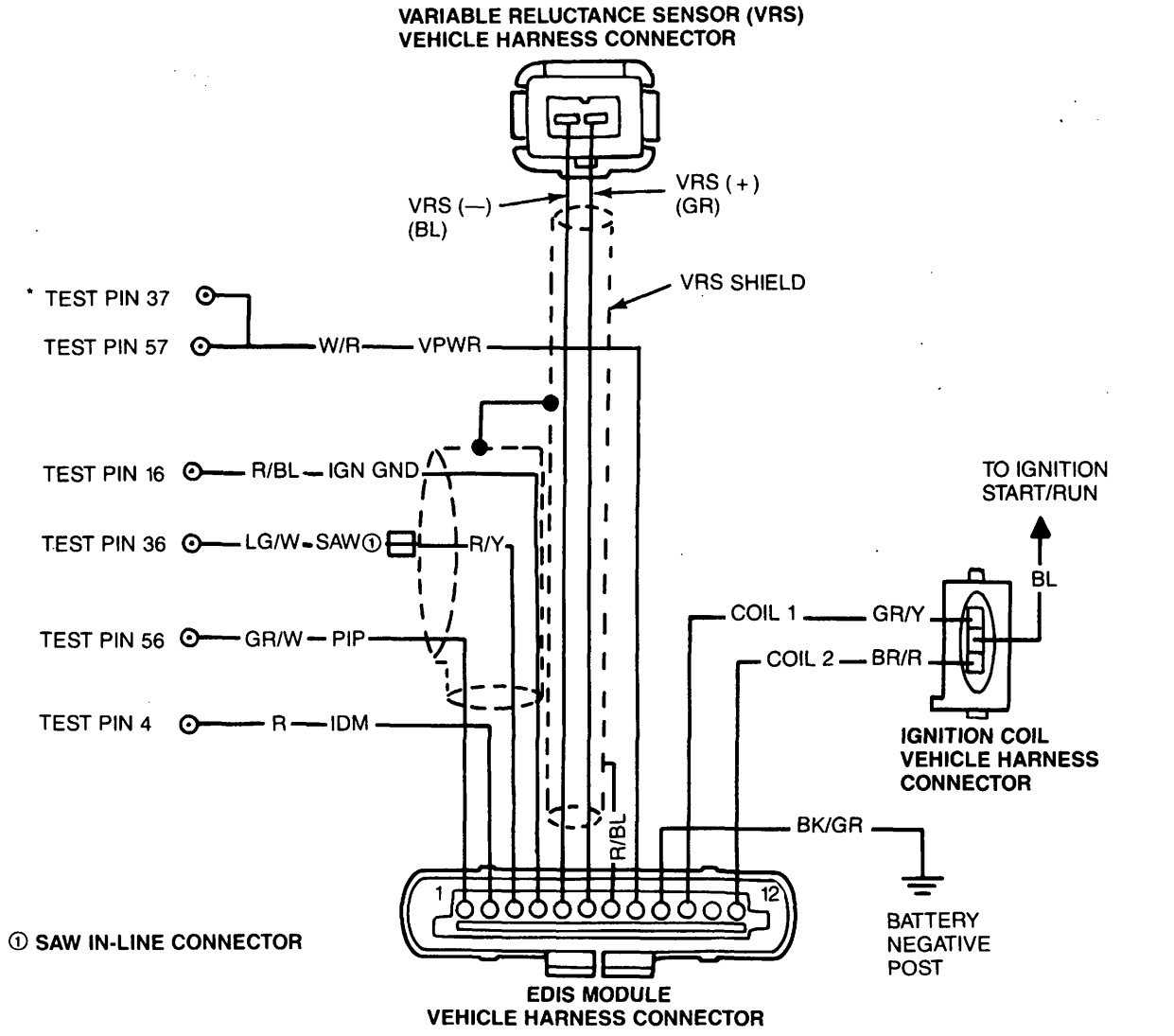
This Pinpoint Test is intended to diagnose only the following:

- Spark (as related to EEC-IV)
- Harness circuits: PIP, IGN GND, VPWR
- Processor assembly (-12A650-)

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EEC-IV No Start (EDIS)	Pinpoint Test	AA

1.9L MA SEFI (EDIS)



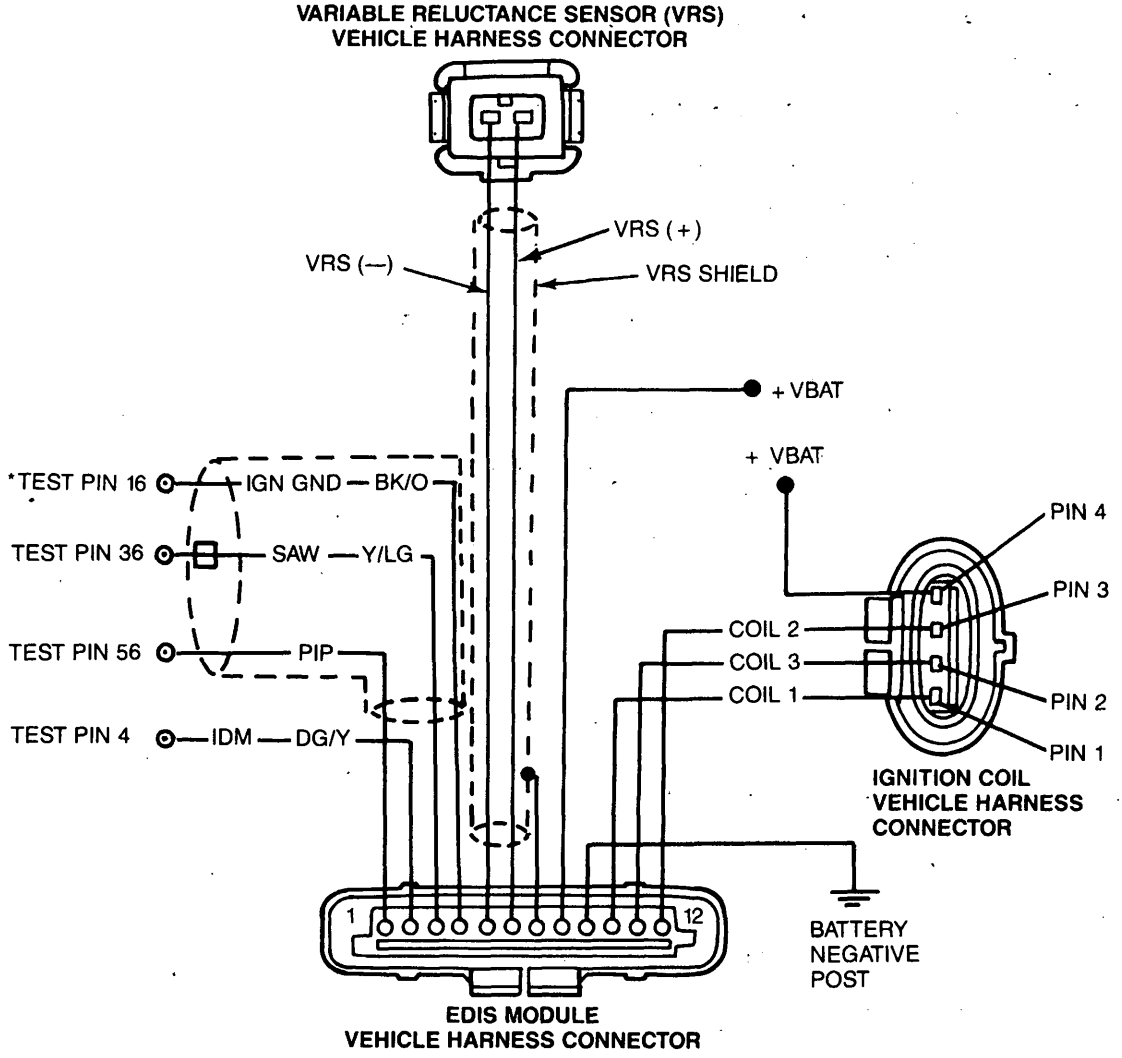
*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13559-A

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EEC-IV No Start (EDIS)	Pinpoint Test	AA

4.0L MA EFI Truck (EDIS)



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13560-A

Test Pin 56	PIP
4.0L Aerostar	DB
4.0L Ranger/Bronco II	BK/LB

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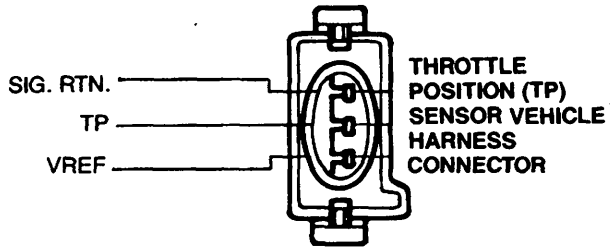
EEC-IV No Start (EDIS)	Pinpoint Test	AA

WARNING

STOP THIS TEST AT THE FIRST SIGN OF A FUEL LEAK AND SERVICE AS REQUIRED.

CAUTION

No open flame — No smoking during fuel delivery checks.

TEST STEP	RESULT ▶	ACTION TO TAKE
AA1 ATTEMPT TO CRANK ENGINE		
NOTE: Verify fuel pump inertia switch is set (button pushed in). Refer to Owner's Guide for location. • **Does engine crank?**	Yes ▶ No ▶	GO to **AA2**. REFER to Starting/ Engine Group in Shop Manual.
AA2 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
• Key off, wait 10 seconds. • DVOM on 20 volt scale. • Disconnect TP sensor. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the TP sensor vehicle harness connector. • **Is voltage between 4.0 volts and 6.0 volts?**  A11502-C	Yes ▶ No ▶	RECONNECT TP sensor. GO to **AA3**. GO to Pinpoint Test Step **C1**.
AA3 CHECK FOR SPARK AT PLUGS		
• Disconnect the spark plug wire to any accessible cylinder. • Connect spark tester between spark plug wire and engine ground. • Crank engine and check for spark. • Reconnect the spark plug wire to the spark plug. • **Was spark present and consistent?**	Yes ▶ No ▶	GO to **AA4**. REFER to Section 13 for EDIS diagnosis.

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EEC-IV No Start (EDIS)	Pinpoint Test	AA

TEST STEP	RESULT ▶	ACTION TO TAKE
AA4 CHECK CONTINUITY OF IGNITION GROUND CIRCUIT		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Disconnect EDIS module. • Measure resistance between Test Pin 16 at the breakout box and IGN GND circuit at the EDIS module vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to **AA5**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
AA5 CHECK PIP CIRCUIT FOR SHORTS TO POWER AND GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • EDIS module disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 56 (PIP) and Test Pins 16, 40, 46, 60 (short to GROUND), 26, 37, 57 (short to POWER). • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **AA6**. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test, if vehicle does not start. GO to **AA6**.
AA6 ISOLATE SHORT(S) IN PROCESSOR		
• Key off, wait 10 seconds. • Breakout box installed. • Reconnect processor to breakout box. • EDIS module disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 56 (PIP) and Test Pins 37, 57 (short to POWER), 40, and 60 (short to GROUND) at the breakout box. • **Is each resistance greater than 500 ohms?**	Yes ▶ No ▶	RECONNECT all components. GO to **AA7**. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
AA7 CHECK PIP SIGNAL		
• Key off. • Breakout box installed, processor connected. • DVOM to 20 volt scale. • Measure voltage between Test Pin 56 and Test Pin 16 at the breakout box. • Crank engine, record reading. • **Is voltage between 3.0 and 7.0 volts?**	Yes ▶ No ▶	GO to **AA9**. GO to **AA8**.

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EEC-IV No Start (EDIS)	Pinpoint Test	AA

TEST STEP	RESULT ▶	ACTION TO TAKE
AA8 CHECK PIP CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Disconnect EDIS module. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 56 at the breakout box and PIP circuit at the EDIS module vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	**If Continuous Memory Code 14 is present:** GO to Section 13 for EDIS diagnosis. **If no Continuous Memory Code 14 is present:** GO to **AA9**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
AA9 CHECK FUEL PUMP		
• **No smoking nearby.** • Connect fuel pressure gauge. • Note intial pressure reading. • Observe pressure gauge as you pressurize fuel system. (Turn key to RUN for 1 second, then turn key to OFF. Wait 10 seconds. Repeat 5 times.) • **Does fuel pressure increase?** **WARNING** **IF FUEL STARTS LEAKING, TURN KEY OFF IMMEDIATELY. NO SMOKING.**	Yes ▶ No ▶	GO to Pinpoint Test Step **S1**. GO to Fuel Group in Shop Manual to check for mechanical problems in fuel system.

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Vehicle Battery	Pinpoint Test	B

Note

You should enter this Pinpoint Test only when directed here from Pinpoint Tests C, J or P.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

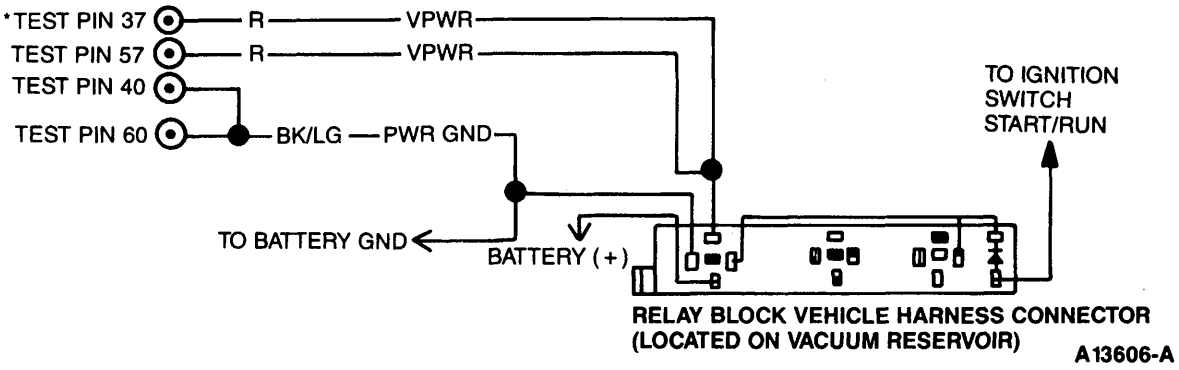
- Ignition Switch
- Battery Cables
- Alternator
- Voltage Regulator
- Ground Straps

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- Harness circuits: SIG RTN, STO, STI, PWR GND, GROUND, VPWR, KAPWR, VREF, IGNITION
- Battery Voltage
- Power Relay (-12A646-)

5.0L SEFI Lincoln Town Car, Crown Victoria/Grand Marquis

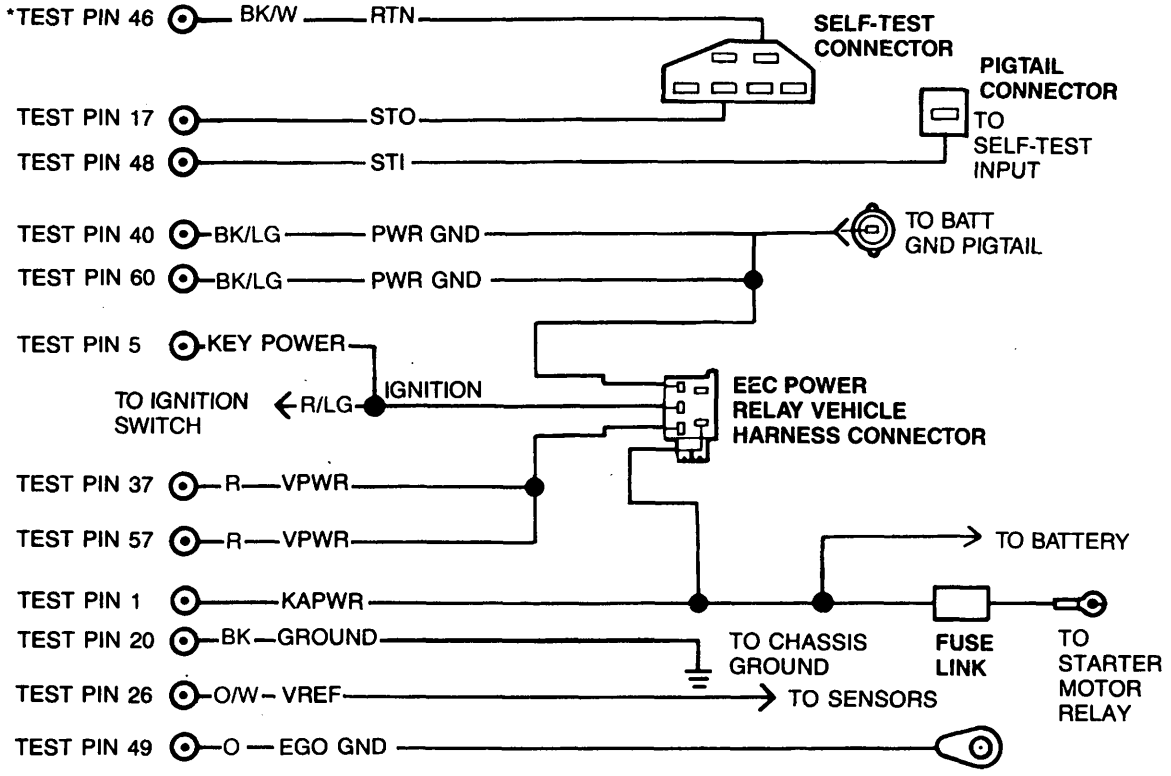
5.0L SEFI MA Lincoln Town Car, Crown Victoria/Grand Marquis



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Vehicle Battery	Pinpoint Test	B

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9577-E

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Vehicle Battery

Pinpoint Test **B**

Test Pin 17 **STO**

Application	Wire Color
Car: 1.9L EFI	T/LB
1.9L MA SEFI 3.8L RWD-SEFI 3.8L SEFI-SC 5.0L SEFI, Mark VII	Y/BK
2.9L Scorpio	BR/G
3.0L Probe	W/BL
2.3L OHC EFI 5.0L MA	T
Truck: F-Series	PK/LG
All Others	T/R

Test Pin 1 **KAPWR**

Application	Wire Color
2.9L Scorpio	BK/BL
1.9L MA SEFI 3.0L Probe	BL/R
Car: 2.3L OHC MA 2.3L OHC, EFI 5.0L SEFI, Mark VII 5.0L SEFI-MA Mustang Truck: E-Series	BK/O
Truck: 2.3L EFI 2.3L MA EFI 2.9L EFI 2.9L MA EFI Car: 5.0L MA SEFI Town Car	Y/BK
All Others	Y

Test Pin 48 **STI**

Application	Wire Color
1.9L MA SEFI	LG/Y
2.9L Scorpio	BL/G
Car: 2.5L CFI CLC 2.5L CFI MTX 3.0L EFI 3.8L SEFI MA 5.0L MA SEFI, Crown Victoria/Grand Marquis	W/BK
5.0L MA SEFI Mustang	T/R
F-Series	W/P
All Others	W/R

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Vehicle Battery	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B1 CHECK BATTERY VOLTAGE • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage across battery terminals. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to B2. SERVICE discharged battery. REFER to Charging/Electrical Group in Shop Manual.
B2 CHECK PWR GND CIRCUIT CONTINUITY • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 200 ohm scale. • Measure resistance between battery negative post and Test Pins 40 and 60 at the breakout box. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to B3. SERVICE open in PWR GND circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
B3 CHECK FOR OPEN BETWEEN SIG RTN AND PWR GND CIRCUITS AT PROCESSOR • Key off, wait 10 seconds. • Breakout box installed, processor connected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 and Test Pins 40 and 60 at the breakout box. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to B4. REPLACE processor. REMOVE breakout box. RERUN Quick Test.

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Vehicle Battery	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B4 CHECK SIG RTN CIRCUIT CONTINUITY • Key off, wait 10 seconds. • Breakout box installed, processor connected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 at the breakout box and SIG RTN circuit in the Self-Test connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT CT processor. GO to [B5]. SERVICE open in SIG RTN circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
B5 CHECK KAPWR CIRCUIT VOLTAGE AT EEC POWER RELAY • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between KAPWR circuit at the EEC power relay vehicle harness connector and battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to [B6]. SERVICE open in KAPWR circuit between EEC power relay and battery positive post. RERUN Quick Test.
B6 CHECK IGNITION CIRCUIT VOLTAGE AT EEC POWER RELAY • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between the battery negative post and IGNITION circuit at the EEC power relay vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to [B7]. SERVICE open in ignition switch circuits. RERUN Quick Test.

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Vehicle Battery	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B7 CHECK PWR GND CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • DVOM on 200 ohm scale. • Measure resistance between PWR GND circuit at the EEC power relay vehicle harness connector and battery negative post. • **Is the resistance less than 10 ohms?**	Yes ▶ No ▶	GO to B8. SERVICE open circuit. RERUN Quick Test.
B8 CHECK VPWR CIRCUIT VOLTAGE AT EEC POWER RELAY		
• Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between battery negative post and VPWR circuit at the EEC power relay vehicle harness connector. • **Is the voltage greater than 10.5 volts?**	Yes ▶ No ▶	SERVICE open or short to ground in VPWR circuit between processor and EEC power relay. RERUN Quick Test. REPLACE EEC power relay. RERUN Quick Test.

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Reference Voltage	Pinpoint Test	C

Note

You should enter this Pinpoint Test only when a check for VREF has failed in the sensor Pinpoint Tests (D-Series) or Pinpoint Tests [A] or [QA].

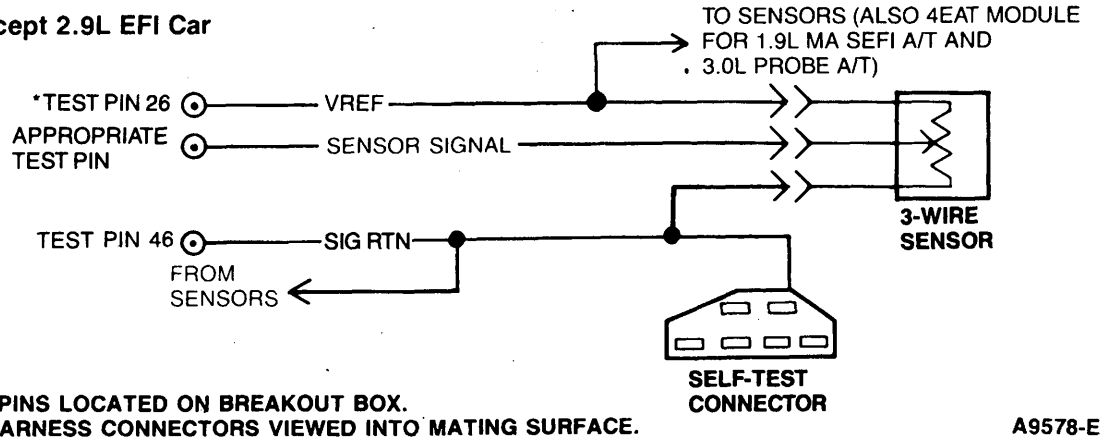
Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor assembly (-12A650-)
- Sensor harness circuits: SIG RTN, VREF

Pinpoint Test Schematic

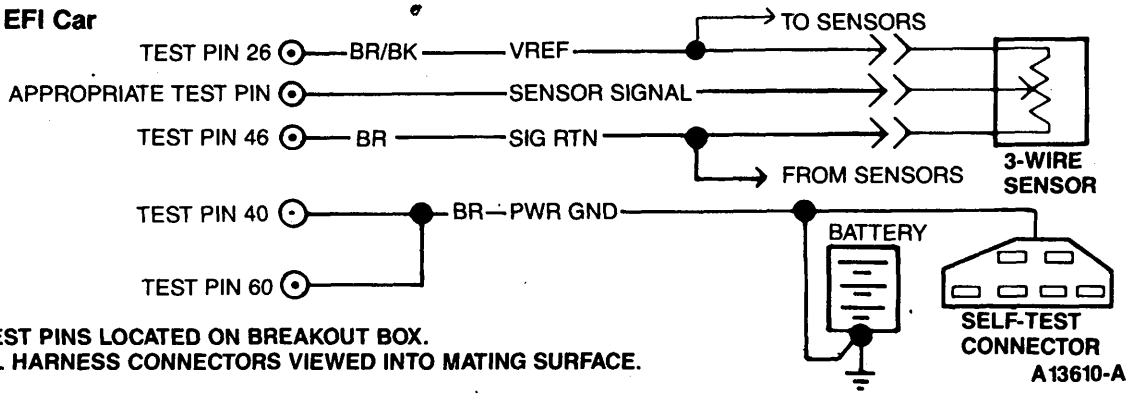
All Except 2.9L EFI Car



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9578-E

2.9L EFI Car



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13610-A

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Reference Voltage	Pinpoint Test	C

Test Pin 26	VREF
Application	**Wire Color**
1.9L MA SEFI	R/W
F-Series/Bronco	BR/W
3.0L Probe	LG/R
All Others	O/W

Test Pin 46	SIG RTN
Application	**Wire Color**
1.9L MA SEFI	LG/BK
F-Series/Bronco	GY/R
3.0L Probe	LG/Y
All Others	BK/W

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Reference Voltage	Pinpoint Test	C

TEST STEP	RESULT ▶	ACTION TO TAKE
C1 CHECK VEHICLE BATTERY POWER CIRCUIT		
• Key off, wait 10 seconds. • Disconnect 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 37 at the breakout box and SIG RTN/PWR GND circuit in the Self-Test connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to C2. RECONNECT sensor (if applicable). **For 2.5L HSC CFI, 3.0L EFI car, 3.0L SHO, 3.8L AXOD and 3.8L S/C:** GO to X1. **For all others:** GO to B1.
C2 CHECK VREF VOLTAGE		
• Key on, engine off. • Breakout box installed, processor connected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **What is the voltage?**	Greater than 6.0 volts ▶ Less than 4.0 volts ▶ Between 4.0 volts and 6.0 volts ▶	GO to C4. GO to C5. GO to C3.
C3 CHECK VREF AND SIG RTN CIRCUITS FOR CONTINUITY		
• Key off. • Sensor that sent you here disconnected. • Breakout box installed. • Disconnect processor. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 26 at breakout box and VREF circuit at vehicle harness connector of the sensor that sent you here. • Measure resistance between Test Pin 46 at breakout box and SIG RTN circuit at vehicle harness connector of the sensor that sent you here. • **Is each resistance less than 5.0 ohms?**	Yes ▶ No ▶	Reference voltage OK. REMOVE breakout box. RECONNECT sensor. RERUN Quick Test. SERVICE open in VREF or SIG RTN circuits. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Reference Voltage — Pinpoint Test C

TEST STEP	RESULT ▶	ACTION TO TAKE
C4 CHECK FOR EXCESS VOLTAGE ON VREF CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Disconnect Star Tester (if applicable). **NOTE: For proper results of this test, the STAR Tester must be disconnected. Due to the circuitry of the STAR Tester and the vehicle, KPWR can be fed to the VREF circuit giving the false indication of a short to power.** • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 at the breakout box and battery ground. • **Is voltage less than 0.5 volts?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT sensor. RERUN Quick Test. SERVICE short to battery power in vehicle harness. REMOVE breakout box. RECONNECT processor and sensor. RERUN Quick Test. If condition persists, REPLACE processor.
C5 CHECK FOR SHORTED THROTTLE POSITION SENSOR		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • Disconnect Throttle Position (TP) sensor from vehicle harness. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶ No ▶	**For vehicles equipped with EVP/PFE sensor:** GO to C6. **For all other vehicles:** GO to C7. REPLACE TP sensor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
C6 CHECK FOR SHORTED EVP/PFE SENSOR		
• Key off, wait 10 seconds. • TP sensor disconnected. • Breakout box installed, processor connected. • Disconnect EVP/PFE sensor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶ No ▶	GO to C7. REPLACE EVP/PFE sensor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Reference Voltage	Pinpoint Test	C

TEST STEP	RESULT ▶	ACTION TO TAKE
C7 CHECK FOR SHORTED MAP/BP SENSOR		
NOTE: For vehicle not equipped with a MAP/BP sensor, go to C10 except 1.9L MA SEFI A/T, go to C9. • Key off, wait 10 seconds. • TP sensor disconnected. • EVP/PFE sensor disconnected, if so equipped. • Breakout box installed, processor connected. • Disconnect MAP/BP sensor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶ No ▶	**For 1.9L EFI:** GO to C8. **For 3.0L Probe A/T:** GO to C9. **For all other vehicles:** GO to C10. REPLACE MAP/BP sensor. REMOVE breakout box. RECONNECT processor and sensor(s). RERUN Quick Test.
C8 CHECK FOR SHORTED VANE AIR FLOW (VAF) SENSOR		
• Key off, wait 10 seconds. • MAP/BP sensor and TP sensor disconnected. • EVP/PFE sensor disconnected, if so equipped. • Breakout box installed, processor connected. • Disconnect Vane Air Flow (VAF) sensor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pin 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶ No ▶	GO to C10. REPLACE VAF sensor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
C9 CHECK FOR SHORTED 4EAT MODULE		
• Key off. • TP sensor disconnected. • MAP/BP, EVP/PFE disconnected, if so equipped. • Breakout box installed, processor connected. • Disconnect both 4EAT(A/T) module vehicle harness connectors. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 26 and Test Pins 46 at the breakout box. • **Is voltage less than 4.0 volts?**	Yes ▶ No ▶	GO to C10. REMOVE breakout box. RECONNECT all components except 4EAT module. GO to Transmission Shop Manual Group to check for shorted circuit in 4EAT system.

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Reference Voltage	Pinpoint Test	C

TEST STEP	RESULT ▶	ACTION TO TAKE
C10 CHECK FOR SHORT TO GROUND IN VREF		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • TP sensor disconnected. • EVP/PFE, MAP/BP, VAF sensor, and 4EAT module disconnected, if so equipped. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 26 and Test Pins 20, 40, 46 and 60 at the breakout box. • **Is any resistance less than 5 ohms?**	Yes ▶	SERVICE short to ground. REMOVE breakout box. RECONNECT all components. CONNECT all sensors. RERUN Quick Test. If original condition still exists, REPLACE processor.
	No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Temperature Sensor Test ACT, ECT and VAT	Pinpoint Test	DA

Note

You should enter this Pinpoint Test only when a Service Code 21, 24, 28, 51, 54, 58, 61, 64 or 68 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Coolant level
- Cooling System
- Electro drive cooling fan
- Water pump drive belt
- Engine operating temperature
- Engine oil level
- Thermostat
- Heat stove duct valve operation
- Air cleaner duct
- Ambient temperature

This Pinpoint Test is intended to diagnose the following:

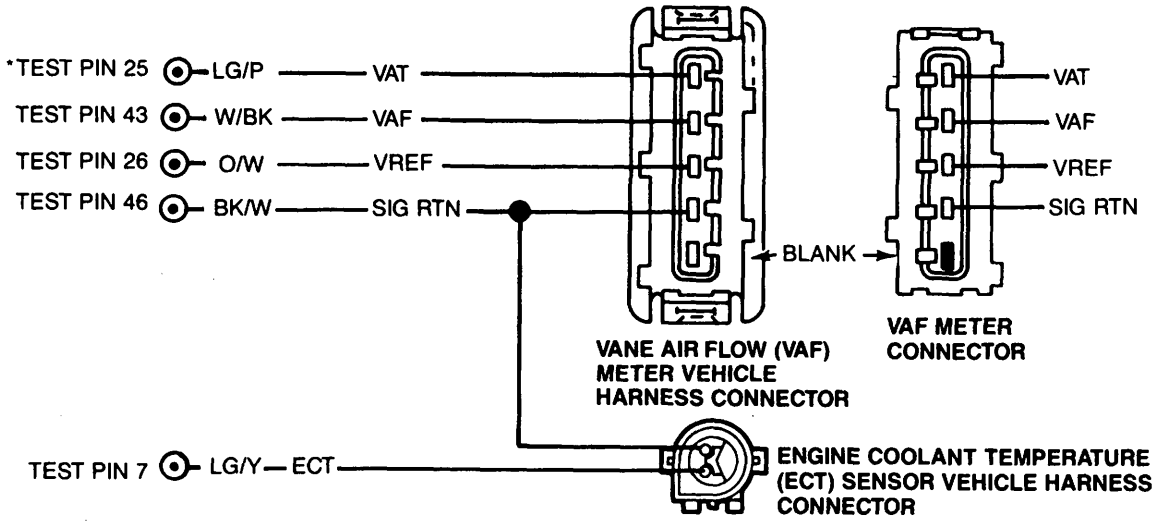
- ACT sensor (-12A697-)
- ECT sensor (-12A648-)
- VAT sensor (-12A529-)
- Harness circuits: ACT, ECT, VAT and SIG RTN
- Processor assembly (-12A650-)

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Temperature Sensor Test ACT, ECT and VAT	Pinpoint Test	DA

Pinpoint Test Schematics

1.9L EFI



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

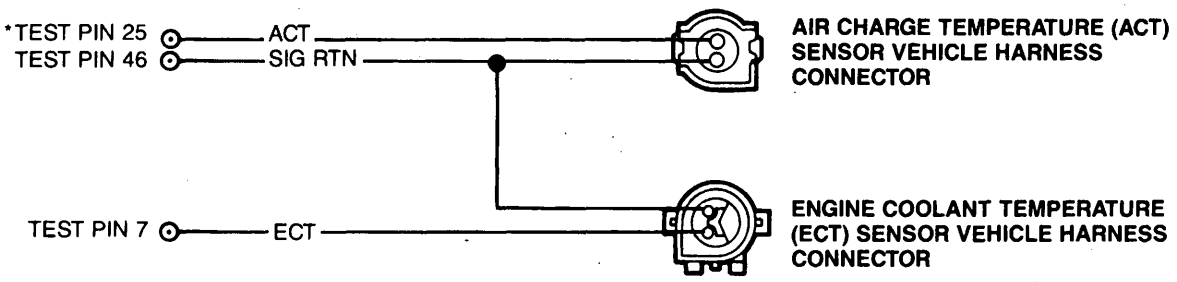
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Temperature Sensor Test ACT, ECT and VAT

Pinpoint Test **DA**

ALL EXCEPT 1.9L EFI



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE. A13539-A

Test Pin 7 ECT

Application	Wire Color
1.9L MA SEFI	BL/W
2.9L EFI	BR/GN
3.0L Probe	Y/R
7.5L, 5.8L, 5.0L F-Series/Bronco	LG/R
4.9L F-Series/Bronco	R
All Others	LG/Y

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/B
2.9L Scorpio	BR
3.0L EFI Probe	LG/Y
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.8L F-Series Diesel	GY/R
All Others	BK/W

Test Pin 25 ACT

Application	Wire Color
Truck: 2.3L,4.9L, 5.8L,7.5L, 5.0L E-Series	Y/R
4.9L, 5.0L, 5.8L, 7.5L F-Series/Bronco	GY
Car: 2.3L OHC, EFI/MA	LG/R
2.9L EFI	BR/Y
3.0L EFI Probe	Y
1.9L SEFI, MA	W/GR
All Others	LG/P

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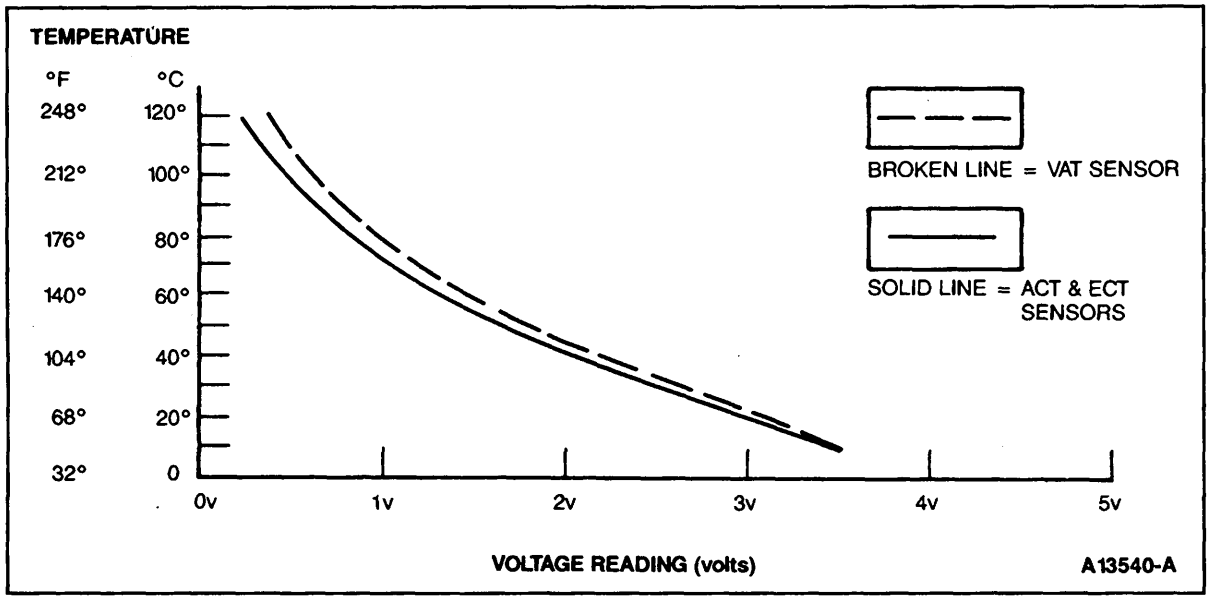
Temperature Sensor Test ACT, ECT and VAT	Pinpoint Test	DA

Notes:

Engine coolant temperature must be greater than 50°F to pass the KOEO test and greater than 180°F to pass the KOER test. To accomplish this, the engine should be at normal operating temperature.

Ambient temperature should be above 50°F to receive acceptable input from the Air Charge and Vane Air Temperature sensors.

Voltage values were calculated for VREF=5.0 volts. These values may vary 15 percent due to sensor and VREF variations.



Temperature		Engine Coolant/Air Charge Temperature Sensor Values		Vane Air Temperature Sensor Values	
°F	°C	Voltage (volts)	Resistance (K ohms)	Voltage (volts)	Resistance (K ohms)
248	120	.27	1.18	0.38	0.11
230	110	.35	1.55	0.46	0.14
212	100	.46	2.07	0.56	0.19
194	90	.60	2.80	0.76	0.25
176	80	.78	3.84	0.95	0.33
158	70	1.02	5.37	1.19	0.44
140	60	1.33	7.70	1.49	0.60
122	50	1.70	10.97	1.84	0.83
104	40	2.13	16.15	2.23	1.18
86	30	2.60	24.27	2.65	1.70
68	20	3.07	37.30	3.07	2.50
50	10	3.51	58.75	3.46	3.77

Additional Data for the VAT Sensor:

Resistance	5800 ohms
At Temperature	32°F

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Temperature Sensor Test ACT, ECT and VAT

Pinpoint Test **DA**

TEST STEP	RESULT ▶	ACTION TO TAKE
DA1 SERVICE CODE 21, 24 OR 28: CHECK OPERATION, INSTALLATION OF TEMPERATURE SENSOR		
Service code 21 (ECT), 24 (ACT or VAT) or 28 (VAT) indicates that the corresponding sensor is out of Self-Test range. Correct range of measure is 0.3 to 3.7 volts. Possible causes: — Low coolant level (ECT). — Ambient temperature below 50°F (ACT). — Faulty harness connector. — Faulty sensor. • Run engine for 2 minutes at 2000 rpm. — **For NO STARTS:** GO to DA3. — **For vehicle STALLS:** GO to S1. • Check that upper radiator hose is hot and pressurized. • Rerun Quick Test. • **Are codes 21, 24, or 28 present?**	Yes ▶ No ▶	GO to DA2. SERVICE other codes as necessary.
DA2 CHECK VREF CIRCUIT VOLTAGE AT THROTTLE POSITION SENSOR		
• Refer to schematic in Pinpoint Test DH. • Key off, wait 10 seconds. • Disconnect TP sensor. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the TP sensor vehicle harness connector. • **Is voltage between 4.0 volts and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP sensor. GO to DA3. GO to Pinpoint Test Step C1.

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Temperature Sensor Test ACT, ECT and VAT

Pinpoint Test **DA**

TEST STEP		RESULT ▶	ACTION TO TAKE
DA3	CHECK RESISTANCE OF TEMPERATURE SENSOR WITH ENGINE OFF		
NOTE: For VAT sensor, verify that the ambient temperature is greater than 50°F. • Key off, wait 10 seconds. • Disconnect suspect temperature sensor. • DVOM on 200,000 ohm scale. • Measure resistance between sensor signal circuit and SIG RTN circuit at the temperature sensor. Refer to the corresponding chart at the beginning of this Pinpoint Test for resistance specifications. • **Is resistance within specifications?**		Yes ▶	**For ACT and ECT sensors:** GO to **DA4**. **For ECT sensor with a NO START:** Do not Service Code 21 at this time, GO to **A1**. **For VAT sensors:** REPLACE processor. RECONNECT vehicle harness. RERUN Quick Test.
		No ▶	**For ACT sensors:** CHECK heat stove duct valve operation. If OK, REPLACE ACT sensor. RECONNECT vehicle harness. RERUN Quick Test. **For ECT sensors:** REPLACE ECT sensor. RECONNECT vehicle harness. RERUN Quick Test. **For VAT sensors:** GO to Section 3, Vane Air Flow Meter sensor diagnosis.

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Temperature Sensor Test ACT, ECT and VAT

Pinpoint Test **DA**

TEST STEP	RESULT ▶	ACTION TO TAKE
DA4 CHECK RESISTANCE OF TEMPERATURE SENSOR WITH ENGINE RUNNING		
NOTE: Engine may have cooled down. Always warm engine before taking ECT sensor resistance measurements. Check for open thermostat. • Key off, wait 10 seconds. • Suspect temperature sensor disconnected. • DVOM on 200,000 ohm scale. • Run engine for 2 minutes at 2000 rpm. • Measure resistance between sensor signal circuit and SIG RTN circuit at the temperature sensor. Refer to the corresponding chart at the beginning of this Pinpoint Test for resistance specifications. • **Is resistance within specification?**	Yes ▶ No ▶	REPLACE Processor. RECONNECT vehicle harness. RERUN Quick Test. **For ACT sensors:** CHECK heat stove duct valve operation. If OK, REPLACE ACT sensor. RECONNECT vehicle harness. RERUN Quick Test. **For ECT sensors:** REPLACE ECT sensor. RECONNECT vehicle harness. RERUN Quick Test.
DA10 SERVICE CODE 51, 54, OR 58: INDUCE OPPOSITE CODE 61, 64, or 68		
Service codes 51(ECT), 54(ACT or VAT) and 58(VAT) indicate that the corresponding sensor signal is greater than the Self-Test maximum. The maximum for ECT and ACT sensors is 4.6 volts. The maximum for VAT sensors is 3.5 volts. Possible causes: — Temperature too low (VAT). — Open in harness (ACT or ECT). — Faulty connection. — Faulty sensor. — Faulty processor. • Key off, wait 10 seconds. • Disconnect suspect temperature sensor. • Connect a jumper wire between the sensor signal circuit and SIG RTN circuit at the temperature sensor vehicle harness connector. • Run Key On Engine Off Self-Test. • **Is Code 61, 64 or 68 present?**	Yes ▶ No ▶	REPLACE suspect sensor. REMOVE jumper wire. RECONNECT vehicle harness. RERUN Quick Test. REMOVE jumper wire. GO to DA11.

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Temperature Sensor Test ACT, ECT and VAT

Pinpoint Test **DA**

TEST STEP	RESULT ▶	ACTION TO TAKE
DA11 CHECK CONTINUITY OF SENSOR SIGNAL AND SIG RTN CIRCUITS		
• Key off, wait 10 seconds. • Suspect temperature sensor disconnected. • Disconnect processor Pin 60 connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between sensor signal circuit at the temperature sensor vehicle harness connector and Test Pin 7 (ECT) or 25 (ACT/VAT) at the breakout box. • Measure resistance between SIG RTN circuit at the temperature sensor vehicle harness connector and Test Pin 46 at the breakout box. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE open circuits. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DA20 SERVICE CODE 61, 64 OR 68: INDUCE OPPOSITE CODE 51, 54, or 58		
Service codes 61(ECT), 64(ACT or VAT) or 68(VAT), indicate that the corresponding sensor's signal is less than the Self-Test minimum. The ACT and ECT sensor minimum is 0.2 volts. The VAT sensor minimum is 0.35 volts. Possible causes: — Temperature too high (VAT). — Grounded circuit in harness (ACT or ECT). — Faulty sensor. — Faulty processor. — Faulty connection. • Key off, wait 10 seconds. • Disconnect vehicle harness from suspect sensor. Inspect for damaged, corroded, pushed out pins of loose wires, etc. Service as necessary. • Run Key On Engine Off Self-Test. • **Is code 51, 54, or 58 present?**	Yes ▶ No ▶	REPLACE sensor. RECONNECT harness. RERUN Quick Test. GO to DA21.

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Temperature Sensor Test ACT, ECT and VAT

Pinpoint Test **DA**

TEST STEP	RESULT ▶	ACTION TO TAKE
DA21 CHECK VREF CIRCUIT VOLTAGE AT THROTTLE POSITION SENSOR		
• Refer to schematic in Pinpoint Test [DH]. • Key off, wait 10 seconds. • Suspect temperature sensor disconnected. • Disconnect TP sensor. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the TP sensor vehicle sensor connector. • **Is voltage between 4.0 volts and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP sensor, GO to [DA22]. GO to Pinpoint Test Step [C1].
DA22 CHECK TEMPERATURE SENSOR SIGNAL CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Suspect temperature sensor disconnected. • Disconnect processor Pin 60 connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 7 (ECT) or 25 (ACT/VAT) and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Temperature Sensor Test ACT, ECT and VAT

Pinpoint Test **DA**

TEST STEP		RESULT ▶	ACTION TO TAKE
DA90	CONTINUOUS MEMORY CODE 51, 54, 58, 61, 64 OR 68: CHECK SENSOR		

Continuous Memory codes 51, 54, and 58, indicate that the sensor signal was greater than the Self-Test maximum of 4.6 volts. The code was generated under normal driving conditions.

Continuous Memory codes 61, 64, and 68, indicate that the sensor signal was less than the Self-Test minimum of 0.2 volts. The code was generated under normal driving conditions.

Sensors	Continuous Memory Codes
ACT	54 and 64
ECT	51 and 61
VAT	54, 58, 64 and 68

Possible causes:

— Faulty sensor.

— Open circuit in harness.

— Grounded circuit in harness.

— Faulty processor.

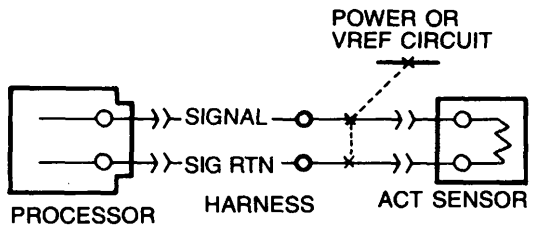
- Enter Key On Engine Off continuous monitor mode. Refer to Quick Test Appendix.
- Observe VOM or STAR LED for indication of a fault while performing the following:

— Tap on the sensor to simulate road shock.

— Wiggle the sensor connector.

- **Is a fault indicated?**

	Yes ▶	DISCONNECT and inspect connectors. If OK, REPLACE the sensor. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	GO to DA91.



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Temperature Sensor Test ACT, ECT and VAT

Pinpoint Test **DA**

TEST STEP	RESULT ▶	ACTION TO TAKE
DA91 CHECK EEC-IV VEHICLE HARNESS		
• Still in Key On Engine Off continuous monitor mode. • Observe VOM or STAR LED for fault indication while performing the following: — Refer to the illustration in Step [DA90]. Grasp the vehicle harness close to the sensor connector. Wiggle, shake, or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake, or bend the EEC-IV system vehicle harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to [DA92].
DA92 CHECK PROCESSOR AND VEHICLE HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor Pin 60 connector. Disconnect sensor connector. Inspect for damage, loose or pushed out pins, loose or poorly crimped wires. • **Are connectors and terminals OK?**	Yes ▶ No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent fault Diagnosis. All others, CLEAR continuous memory (REFER to Quick Test Appendix). RERUN Quick Test. SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Mass Air Flow (MAF) Sensor	Pinpoint Test	DC

Note

You should enter this Pinpoint Test only when a Service Code 26, 56, or 66 is received during Quick Test or you have been directed here from Diagnosis By Symptom.

Remember

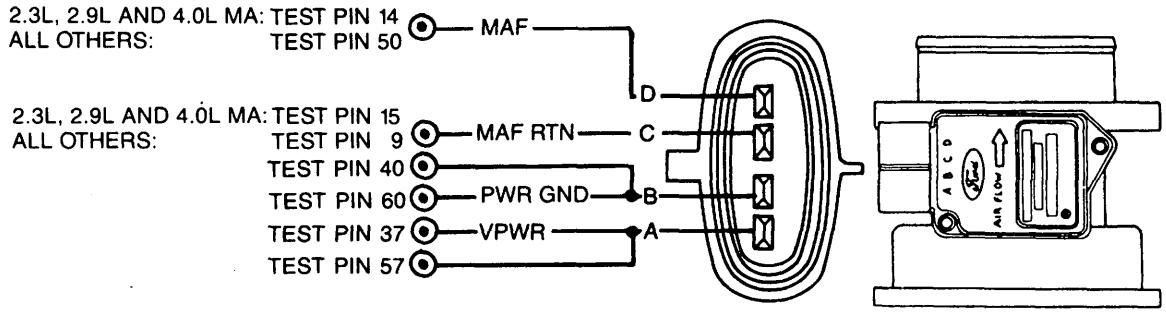
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Air cleaner element
- Inlet air duct
- Throttle body

This Pinpoint Test is intended to diagnose only the following:

- Mass Air Flow sensor (-12B579-)
- Harness circuits: VPWR, PWR GND, MAF and MAF RTN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



MASS AIR FLOW (MAF) SENSOR VEHICLE HARNESS CONNECTOR

*TEST PINS LOCATED ON THE BREAKOUT BOX.
NOTE: ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Mass Air Flow (MAF) Sensor | Pinpoint Test | DC

Test Pin 50 or 14 — **MAF**

Application	Wire Color
1.9L MA SEFI	BR/BK
All Others	DB/O

Test Pin 9 or 15 — **MAF RTN**

Application	Wire Color
1.9L MA SEFI	GR/Y
All Others	T/LB

Test Pin 40/60 — **PWR GND**

Application	Wire Color
1.9L MA SEFI	BK/GR
All Others	BK/LG

Test Pin 37/57 — **VPWR**

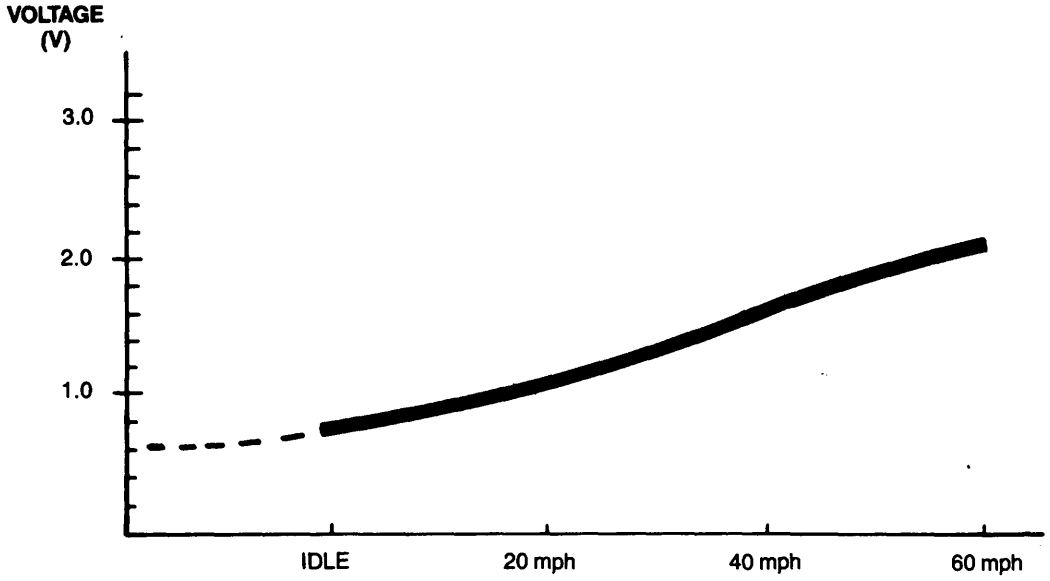
Application	Wire Color
1.9L MA SEFI	W/R
All Others	R

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Mass Air Flow (MAF) Sensor	Pinpoint Test	DC

NOTE: MAF Signal Voltage vs. engine operation condition while engine is at normal operating temperature. These values are typical for automatics, but may vary based on vehicle load and temperature.

MAF Sensor Graph



A8901-B

MAF Sensor Data

Engine Condition	MAF Signal Voltage
IDLE	.60
20 mph	1.10
40 mph	1.70
60 mph	2.10

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Mass Air Flow (MAF) Sensor	Pinpoint Test	DC

TEST STEP	RESULT ▶	ACTION TO TAKE
DC1 SERVICE CODE 26: CHECK VPWR CIRCUIT VOLTAGE		
Service Code 26 indicates that the Mass Air Flow (MAF) sensor is out of Self-Test range. Key On Engine Off Service Code 26 indicates that the MAF Signal was greater than .70 volts during Key On, Engine Off Self-Test. Key On Engine Running Service Code 26 indicates that the MAF Signal was not between .20 and 1.50 volts during Key On Engine Running Self-Test. **NOTE: Service Code 26 could be generated by the garage exhaust ventilation system. Remove ventilation system and properly vent to outside atmosphere before rerunning Self-Test.** Possible causes: — Faulty MAF sensor. — Faulty processor • Key off. • Disconnect MAF sensor. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VPWR circuit at the MAF sensor vehicle harness connector and battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to DC2. RECONNECT MAF sensor. GO to Pinpoint Test Step B1.
DC2 CHECK MAF SENSOR GROUND		
• Key on, engine off. • MAF sensor disconnected. • DVOM on 20 volt scale. • Measure voltage between VPWR circuit and PWR GND circuit at the MAF sensor vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to DC10. SERVICE open PWR GND circuit. RECONNECT MAF sensor. RERUN Quick Test.

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Mass Air Flow (MAF) Sensor	Pinpoint Test	DC

TEST STEP	RESULT ▶	ACTION TO TAKE
DC10 SERVICE CODE 66: CHECK CONTINUITY OF MAF AND VPWR CIRCUITS		
Service Code 66 indicates that the Mass Air Flow (MAF) sensor signal went below .40 volts during normal engine operation (Continuous) or during Self-Test. Possible causes: — Open MAF circuit. — Open VPWR circuit to MAF sensor. — Open PWR GND circuit to MAF sensor. — Open MAF RTN circuit to MAF sensor. — MAF circuit shorted to ground. — Faulty Processor. — Faulty MAF sensor. — Air leak before or after MAF sensor. — MAF sensor disconnected. • Key off. • Disconnect MAF sensor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between VPWR circuit at the MAF sensor vehicle harness connector and Test Pins 37 and 57 at the breakout box. **For 2.3L, 2.9L or 4.0L MA:** • Measure resistance between MAF circuit at the MAF sensor vehicle harness connector and Test Pin 14 at the breakout box. **For all others:** • Measure resistance between MAF circuit at the MAF sensor vehicle harness connector and Test Pin 50 at the breakout box. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DC11. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Mass Air Flow (MAF) Sensor | Pinpoint Test | DC

TEST STEP	RESULT ▶	ACTION TO TAKE
DC11 CHECK MAF CIRCUIT FOR SHORTS TO GROUND AND MAF RTN CIRCUIT		
• Key off. • MAF sensor disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. **For 2.3L, 2.9L or 4.0L MA:** • Measure resistance between Test Pin 14 and Test Pins 15, 40 and 60 at the breakout box. **For all others:** • Measure resistance between Test Pin 50 and Test Pins 9, 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DC12. SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DC12 CHECK CONTINUITY OF PWR GND CIRCUIT		
• Key off. • MAF sensor disconnected. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between PWR GND circuit at the MAF sensor vehicle harness connector and battery negative post. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DC13. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DC13 CHECK CONTINUITY OF MAF RTN CIRCUIT		
• Key off. • MAF sensor disconnected. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. **For 2.3L, 2.9L or 4.0L MA:** • Measure resistance between MAF RTN circuit at the MAF sensor vehicle harness connector and Test Pin 15 at the breakout box. **For all others:** • Measure resistance between MAF RTN circuit at the MAF sensor vehicle harness connector and Test Pin 9 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DC14. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Mass Air Flow (MAF) Sensor

Pinpoint Test **DC**

TEST STEP	RESULT ▶	ACTION TO TAKE
DC14 CHECK MAF CIRCUIT FOR SHORT TO GROUND		
• Key off. • MAF sensor disconnected. • Breakout box installed. • Connect processor to breakout box. • DVOM on 200,000 ohm scale. **For 2.3L, 2.9L or 4.0L MA:** • Measure resistance between Test Pin 14 and Test Pins 15, 40 and 60 at the breakout box. **For all others:** • Measure resistance between Test Pin 50 and Test Pins 9, 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	Go to DC15. REPLACE processor. REMOVE breakout box. RECONNECT MAF sensor. RERUN Quick Test.
DC15 CHECK MAF CIRCUIT OUTPUT		
• Key off. • Reconnect MAF sensor. • Breakout box installed, processor connected. • DVOM on 20 volt scale. • Key on, engine running. **For 2.3L, 2.9L or 4.0L MA:** • Measure voltage between Test Pin 14 at the breakout box and battery negative post. **For all others:** • Measure voltage between Test Pin 50 at the breakout box and battery negative post. • **Is voltage between .20 and 1.50 volts?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. REPLACE MAF sensor. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
DC20 SERVICE CODE 56: RERUN SELF-TEST WITH MAF SENSOR DISCONNECTED		
• Key off. • Disconnect MAF sensor. • Start engine, idle one minute. • Key off. • Rerun Key On Engine Off Self-Test. • **Is Service Code 66 present?**	Yes ▶ No ▶	REPLACE MAF sensor. RERUN Quick Test. GO to DC21.

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Mass Air Flow (MAF) Sensor | Pinpoint Test | DC

TEST STEP	RESULT ▶	ACTION TO TAKE
DC21 CHECK MAF CIRCUIT FOR SHORT TO VPWR		
• Key off. • MAF sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between MAF circuit and VPWR circuit at the MAF sensor vehicle harness connector. • **Is resistance greater than 10,000 ohms?**	Yes ▶	REPLACE processor. REMOVE breakout box. RECONNECT MAF sensor. RERUN Quick Test.
	No ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)	Pinpoint Test	DD

Note

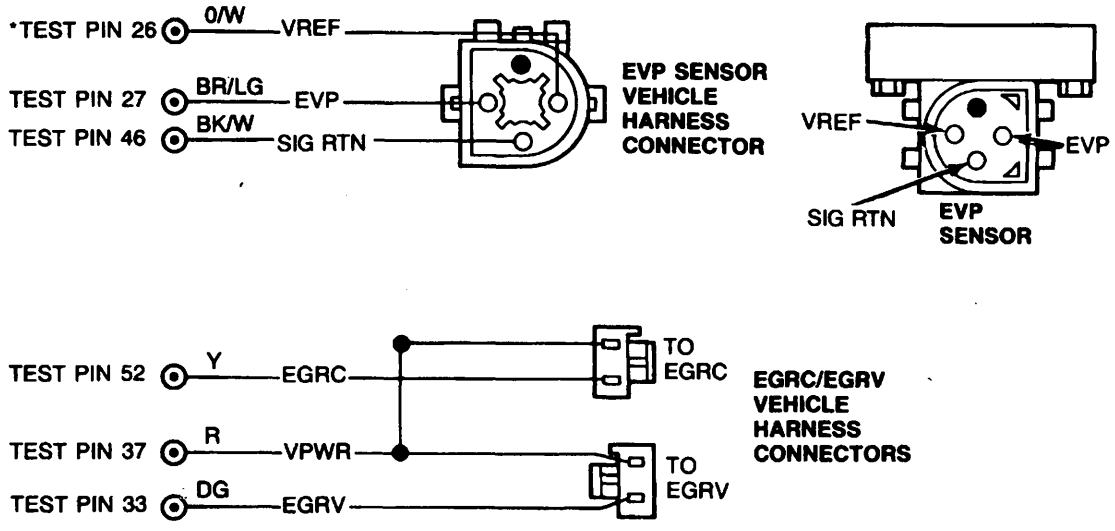
You should enter this Pinpoint Test only when a Service Code 31, 32, 33, 34, 35, 83 or 84 is received during Quick Test.

Remember

This Pinpoint Test is intended to diagnose only the following:

- EVP sensor (-9G428-)
- Harness circuits: EVP, SIG RTN, VREF, EGRV, EGRC, VPWR
- EGRV/EGRC solenoids (-9D474-)
- EGR Valve (-9H473-)
- Processor assembly (-12A650-)
- Vacuum lines (EGRV/EGRC, EGR)

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

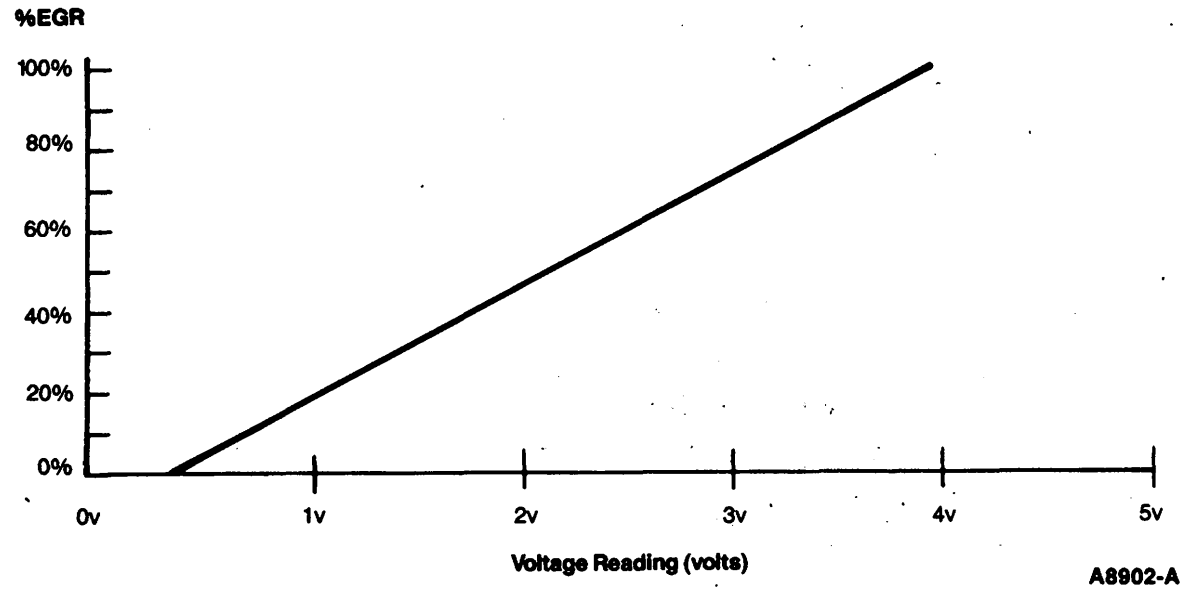
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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)	Pinpoint Test	DD

NOTE: Voltage values calculated for VREF = 5.0 volts (These values may vary ±15 percent due to sensor and VREF variations.)

EVP Sensor Graph



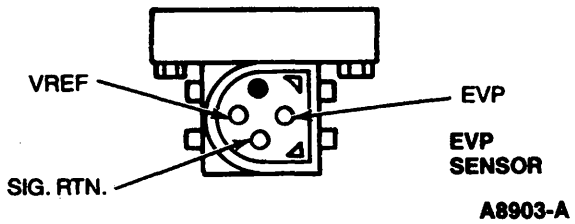
EVP Sensor Data

% EGR	VOLTAGE
0	0.40
10	0.75
20	1.10
30	1.45
40	1.80
50	2.15
60	2.50
70	2.85
80	3.20
90	3.55
100	3.90

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

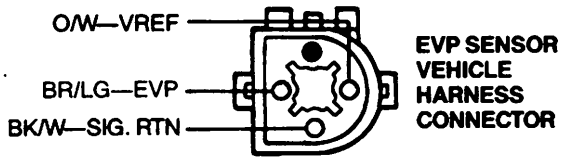
Pinpoint Test **DD**

TEST STEP		RESULT ▶	ACTION TO TAKE
DD1	ENGINE RUNNING SERVICE CODE 31: RUN ENGINE RUNNING SELF-TEST WITH EGR VACUUM SIGNAL LINE DISCONNECTED AT EGR VALVE		
Engine Running Service Code 31 indicates that during the Engine Running Self-Test, the EVP sensor signal to the processor is not in the expected range with the EGR valve closed. Possible causes are: — Faulty EGRC/EGRV solenoids. — Clogged EGRV filter. • Key off. • Disconnect EGR vacuum line at EGR valve and cap EGR vacuum line. • Rerun Engine Running Self-Test. • **Is Code 31 present (ignore all other codes)?**		Yes ▶ No ▶	GO to **DD2**. RECONNECT EGR vacuum line. GO to **DD11**.
DD2	KEY ON ENGINE OFF SERVICE CODE 31: CHECK EVP SENSOR RESISTANCE WHILE APPLYING VACUUM TO EGR VALVE		
Key On Engine Off Service Code 31 indicates that the EVP sensor signal to the processor is not in the expected range with the EGR valve closed. Possible causes are: — Open or shorted circuit. — Faulty EGR valve. — Faulty EVP sensor. — Faulty processor. • Key off. • Disconnect EGR vacuum line at EGR valve and cap EGR vacuum line. • Disconnect EVP sensor. • DVOM on 200,000 ohm scale. • Connect vacuum pump to EGR valve. • Measure resistance between EVP circuit and VREF circuit at the EVP sensor while gradually increasing vacuum to 33 kPa (10 in-Hg). • Observe resistance as vacuum increases.  		Resistance gradually decreases from no greater than 5500 ohms to no less than 100 ohms ▶ Resistance is less than 100 ohms or greater than 5500 ohms ▶ Resistance does not decrease or unable to hold vacuum ▶	RECONNECT EGR vacuum line. GO to **DD3**. REPLACE EVP sensor. RECONNECT EGR vacuum line. RERUN Quick Test. GO to **DD14**.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD3 CHECK VREF CIRCUIT VOLTAGE AT THE EVP SENSOR VEHICLE HARNESS CONNECTOR		
• Key on, engine off. • EVP sensor disconnected. • DVOM on 20 volt scale. • Measure voltage between VREF circuit and SIG RTN circuit at the EVP sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**  A8904-B	Yes ▶ No ▶	GO to DD4. GO to Pinpoint Test Step C1.
DD4 CHECK EVP CIRCUIT CONTINUITY		
• Key off. • EVP sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 27 at the breakout box and EVP circuit at the EVP sensor vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DD5. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD5 CHECK EVP CIRCUIT FOR SHORTS TO VREF CIRCUIT AND GROUND		
• Key off. • EVP sensor disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 27 and Test Pins 26, 40, 46 and 60 at breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DD6. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DD6 SUBSTITUTE EVP SENSOR AND EGR VALVE		
• Key off. • Electrically connect known good EVP sensor and EGR valve assembly. • Breakout box installed. • Connect processor to breakout box. • Perform Key On Engine Off Self-Test. • **Is Code 31 present?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. CONNECT original EVP sensor and EGR valve assembly. RERUN Quick Test. GO to DD7.
DD7 CHECK ORIGINAL EVP SENSOR ON SUBSTITUTED EGR VALVE		
• Key off. • Breakout box installed, processor connected. • Install original EVP sensor on known good EGR valve. • Connect vehicle harness to EVP sensor. • Rerun Key On Engine Off Self-Test. • **Is Code 31 present?**	Yes ▶ No ▶	INSTALL new EVP sensor with original EGR valve. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. REMOVE breakout box. RECONNECT processor. REFER to EGR System, Section 6.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test DD

TEST STEP	RESULT ▶	ACTION TO TAKE
DD11 ENGINE RUNNING SERVICE CODES 32/33/34: CHECK FOR VACUUM CYCLING AT EGR VALVE		
Engine Running Service Codes 32/33/34 indicate that when instructed by the processor, the EGR system was unable to either open the EGR valve (34), hold the valve open (32), or close the valve properly (33). Possible causes are: — Faulty vacuum lines. — Clogged EGRV filter. — Faulty EVP sensor. — Faulty EGR valve. — Faulty EGRC/EGRV solenoids. — Faulty processor. • Key off. • Disconnect EGR vacuum line at the EGR valve. • Connect a vacuum gauge to the EGR vacuum line, leaving the EGR valve disconnected. • While observing vacuum gauge, rerun Engine Running Self-Test. • **During test, does vacuum reading:** — **Increase from less than 1 in-Hg to greater than 5 in-Hg?** — **And, within 10 seconds, return to less than 1 in-Hg?** **NOTE: Disregard code output at this time.**	Yes ▶ No ▶	REMOVE vacuum gauge. GO to **DD13**. **If vacuum did not increase:** REMOVE vacuum gauge. GO to **DD12**. **If vacuum did increase, but did not return to less than 1 in-Hg within 10 seconds:** CHECK EGRV filter for obstructions. SERVICE as necessary. If OK, REPLACE solenoid assembly. RECONNECT all vacuum lines. RERUN Quick Test.
DD12 CHECK VACUUM SUPPLY TO EGRC/EGRV SOLENOIDS		
• Key off. • Disconnect the vacuum source to the EGRC/EGRV solenoids. • Install a vacuum gauge at source vacuum line. • Start engine and check vacuum. • **Is vacuum greater than 33 kPa (10 in-Hg)?**	Yes ▶ No ▶	CHECK vacuum line from EGRC/EGRV solenoids to EGR valve for kinks, obstructions or leaks. If OK, REPLACE solenoid assembly. RECONNECT all vacuum lines. RERUN Quick Test. CHECK source vacuum line to EGRC/EGRV solenoids. SERVICE as necessary. RECONNECT all vacuum lines. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

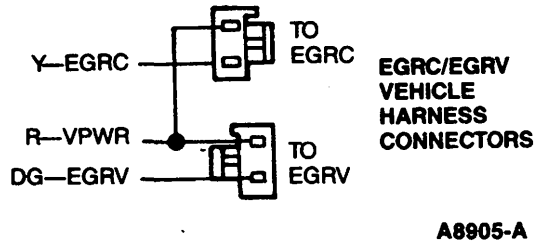
Pinpoint Test **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD13 CHECK EVP SENSOR RESISTANCE WHILE APPLYING VACUUM TO EGR VALVE • Key off. • Disconnect EVP sensor. Inspect for damaged pins, corrosion, and pins pushed out. Service as necessary. • Disconnect EGR vacuum line at EGR valve. • Connect vacuum pump to EGR valve. • DVOM on 200,000 ohm scale. • Measure resistance between EVP circuit and VREF circuit at the EVP sensor while increasing vacuum to 33 kPa (10 in-Hg). • Observe resistance as vacuum increases. • **Does the resistance gradually change between 5500 and 100 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT EVP sensor and EGR vacuum line. RERUN Quick Test. GO to **DD14**.
DD14 MANUALLY EXERCISE EVP SENSOR • Key off. • EVP sensor disconnected. • Remove EVP sensor from EGR valve. • Measure resistance between EVP circuit and VREF circuit at the EVP sensor while gradually applying pressure to EVP sensor shaft. • Observe resistance as shaft is slowly pushed in and slowly released. **NOTE: It is normal for the EVP sensor total resistance to drop below 100 ohms when disconnected from the EGR valve. A defective part will change resistance suddenly between 5500 and 100 ohms.** • **Does the resistance change gradually between 5500 and 100 ohms?**	Yes ▶ No ▶	RECONNECT EVP sensor and EGR supply vacuum line. REFER to EGR System, Section 6. REPLACE EVP sensor. RECONNECT EGR vacuum line. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD17 SERVICE CODE 83/84: CHECK EGRV/EGRC SOLENOID RESISTANCE		
Service Code 83 indicates an EGRC circuit failure. Service Code 84 indicates an EGRV circuit failure. Possible causes are: — Open or shorted circuit. — Faulty EGRC/EGRV solenoid. — Faulty processor. • Key off. • DVOM on 200 ohm scale. • Disconnect EGRC/EGRV solenoids. Inspect for damaged pins, corrosion and pins pushed out. Service as necessary. • Measure resistance between EGRV circuit and VPWR circuit at the EGRV solenoid. • Measure resistance between EGRC circuit and VPWR circuit at the EGRC solenoid. • **Is each resistance between 30 and 70 ohms?**	Yes ▶ No ▶	GO to **DD18**. REPLACE EGRC/EGRV solenoid assembly. RERUN Quick Test.
DD18 CHECK VPWR CIRCUIT VOLTAGE AT EGRC/EGRV SOLENOIDS		
• EGRC/EGRV solenoids disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between battery negative post and VPWR circuit on both EGR solenoid vehicle harness connectors. • **Is each voltage greater than 10.5 volts?**  	Yes ▶ No ▶	GO to **DD19**. SERVICE open circuit. RECONNECT EGRC/EGRV solenoids. RERUN Quick Test.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD19 CHECK CONTINUITY OF EGRC/EGRV CIRCUITS		
• Key off. • EGRC/EGRV solenoids disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 33 at the breakout box and EGRV circuit at the EGRV solenoid vehicle harness connector. • Measure resistance between Test Pin 52 at the breakout box and EGRC circuit at the EGRC solenoid vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **DD20**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DD20 CHECK EGRC/EGRV CIRCUITS FOR SHORTS TO GROUND		
• Key off. • EGRC/EGRV solenoids disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 33 and Test Pins 40, 46 and 60 at the breakout box. • Measure resistance between Test Pin 52 and Test Pins 40, 46, and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **DD21**. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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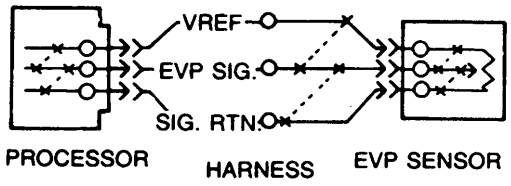
EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV) | Pinpoint Test | DD

TEST STEP	RESULT ▶	ACTION TO TAKE
DD21 CHECK EGRC/EGRV CIRCUITS FOR SHORTS TO POWER		
• Key off. • EGRC/EGRV solenoids disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 33 and Test Pins 37 and 57 at the breakout box. • Measure resistance between Test Pin 52 and Test Pins 37 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code is repeated, REPLACE processor.
DD30 SERVICE CODE 35: CHECK FOR CODE 12		
Service Code 35 indicates that the engine rpm was too low to perform the EGR test. Possible causes are: — Faulty ISC system — Faulty processor • **Is Code 12 also present?**	Yes ▶ No ▶	GO to KE1. GO to DD31.
DD31 RETEST AT 1,500 RPM		
• Key off. • Install tachometer. • Rerun Engine Running Self-Test while maintaining 1,500 rpm. • **Is Code 35 still present (ignore all other codes.)?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. RERUN Quick Test. SERVICE any other codes as necessary.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD90 CONTINUOUS MEMORY CODE 31: EXERCISE EVP SENSOR		
Continuous Memory Code 31 indicates that sometime during vehicle operation, the EVP signal was out of Self-Test range. Possible causes are: — Open or shorted circuit — Faulty EVP sensor • Enter Key On Engine Off Continuous Monitor Mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: • Connect a vacuum pump to the EGR valve. • Very slowly apply 20 kPa (6 in-Hg) vacuum to the EGR valve. • Slowly bleed vacuum off the EGR valve. Lightly tap on EVP sensor (simulate road shock). • Wiggle EVP sensor vehicle harness connector. • **Is a fault indicated?**  A9584-B	Yes ▶ No ▶	GO to DD91. GO to DD92.
DD91 MEASURE EVP SIGNAL VOLTAGE WHILE EXERCISING EVP SENSOR		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Connect a DVOM between Test Pin 27 and Test Pin 46. • DVOM on 20 volt scale. • Re-enter Key On Engine Off Continuous Monitor Mode. • While observing DVOM, repeat Test Step DD90. • **Does the fault occur below 4.25 volts?**	Yes ▶ No ▶	DISCONNECT and INSPECT connector. If connector and terminals are good, REPLACE EVP sensor. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. EGR valve overshoot may have caused Continuous Memory Code 31. Sensor service is not required. To verify vehicle harness integrity, GO to DD92.

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EGR Valve Position Sensor (EVP) Control/Vent (EGRC/EGRV)

Pinpoint Test **DD**

TEST STEP	RESULT ▶	ACTION TO TAKE
DD92 CHECK EEC-IV HARNESS		
• Observe VOM or STAR LED for a fault indication while performing the following: • Referring to the illustration in Step DD90, grasp the harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to DD93.
DD93 CHECK PROCESSOR AND VEHICLE HARNESS CONNECTORS		
• Key off. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶ No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor	Pinpoint Test	DF

Note

You should enter this Pinpoint Test only when a Service Code 22 or 72 is received during Quick Test or if you have been directed here from Pinpoint Test S or Diagnosis By Symptom.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Unusually high/low barometric pressure.
- Kinked or obstructed vacuum lines (MAP).
- Basic engine (valves, vacuum leaks, timing, EGR valve, etc.).

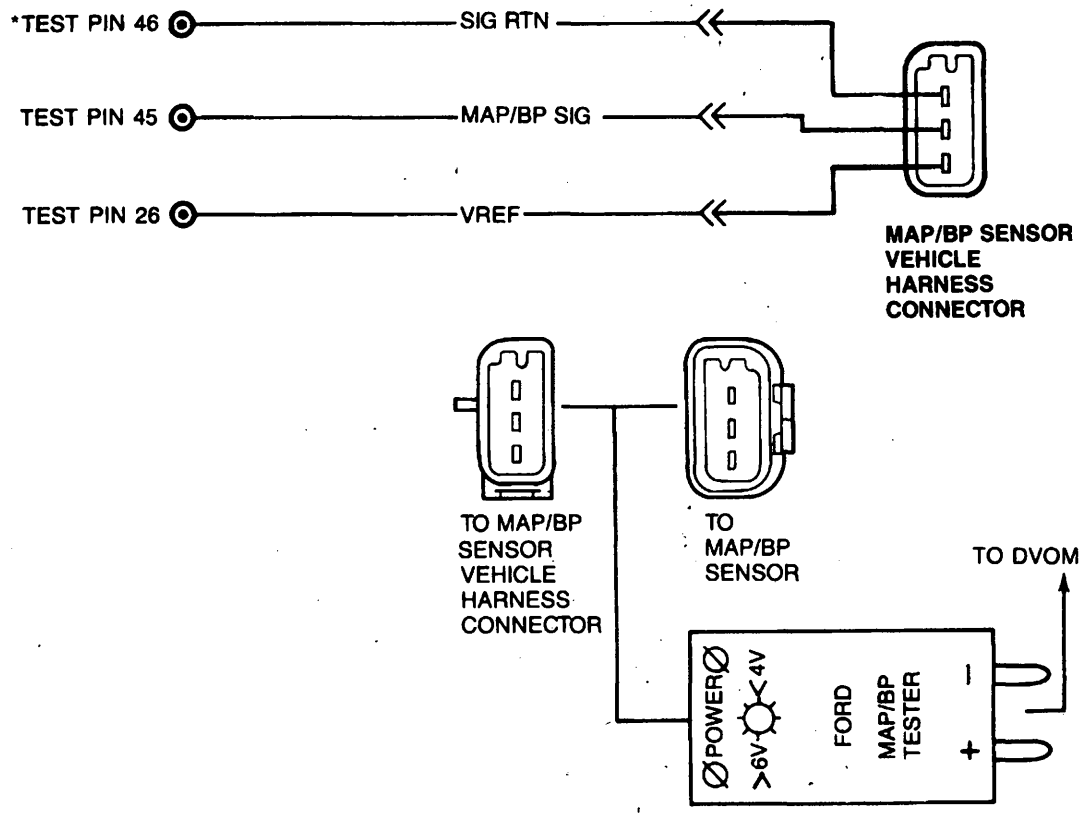
This Pinpoint Test is intended to diagnose only the following:

- MAP/BP sensor (-9F479-)
- Harness circuits: VREF, MAP/BP SIG, and SIG RTN
- Processor assembly (-12A650-)
- MAP vacuum line

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor	Pinpoint Test	DF

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9588-D

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test **DF**

Test Pin 45 **MAP/BP SIG**

Application	Wire Color
2.9L Scorpio	BR/Y
2.3L Ranger/Supercab 2.9L Ranger/Bronco II 3.0L Aerostar 4.0L Aerostar 4.0L Ranger 3.8L SC 3.8L RWD 4.9L E-Series 5.0L E-Series 5.8L E-Series 7.5L E-Series 7.3L E-Series Diesel 5.0L Mark VII	DB/LG
3.0L Probe	W/GR
All Others	LG/BK

Test Pin 46 **SIG RTN**

Application	Wire Color
1.9L MA SEFI	LG/BK
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
3.0L Probe	LG/Y
All Others	BK/W

Test Pin 26 **VREF**

Application	Wire Color
1.9L MA SEFI	R/W
2.9L Scorpio	BR/BK
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.3L F-Series Diesel 7.5L F-Series	BR/W
3.0L Probe	LG/R
All Others	O/W

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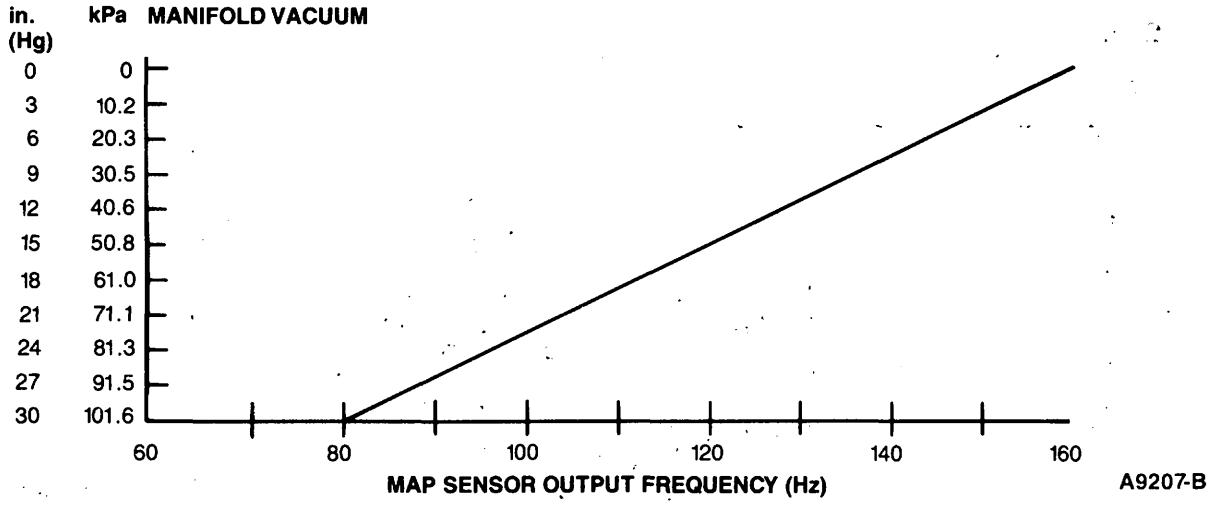
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor

Pinpoint Test

DF

MAP Sensor Graph

NOTE: MAP sensor output frequency versus manifold vacuum data is based on 30.0 in-Hg barometric pressure.



MAP Sensor Data

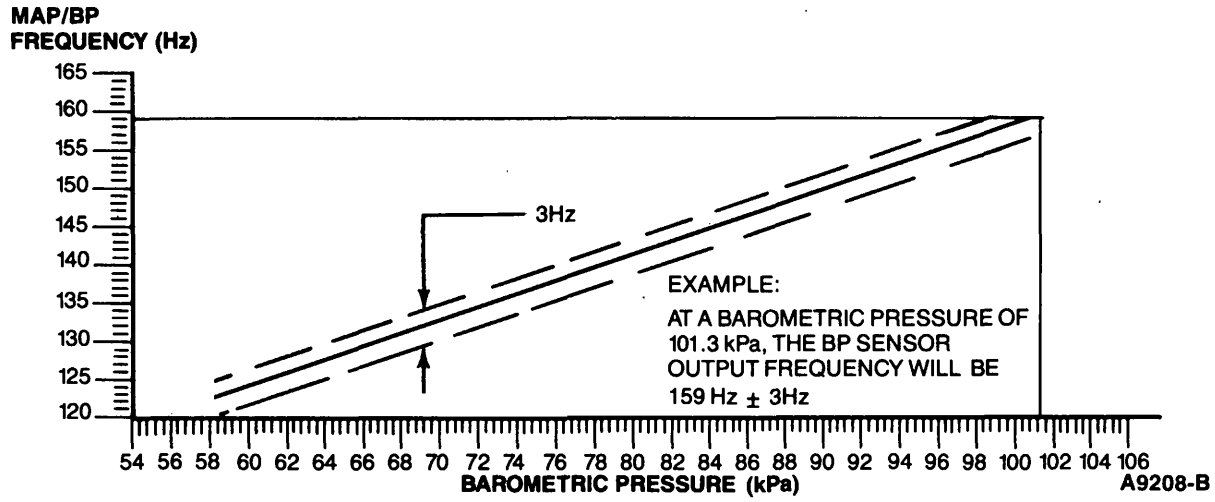
Manifold Vacuum		Frequency
in-Hg	kPa	Hz
0	0	159
3	10.2	150
6	20.3	141
9	30.5	133
12	40.6	125
15	50.8	117
18	61.0	109
21	71.1	102
24	81.3	95
27	91.5	88
30	101.6	80

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor	Pinpoint Test	DF

MAP/BP Sensor Graph (KOEO)

NOTE: Frequency may vary plus or minus 3 Hz from the values given due to sensor variations.



MAP/BP Sensor Data

Barometric Pressure in-Hg	Barometric Pressure kPa	Frequency Hz
17.1	58	122.4
18.3	62	125.5
19.5	66	128.7
20.7	70	131.9
21.8	74	135.1
23.0	78	138.3
24.2	82	141.8
25.4	86	145.4
26.6	90	148.9
27.7	94	152.5
28.9	98	156.1
30.1	102	159.6
31.0	105	162.4

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor | Pinpoint Test | DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF1 SERVICE CODE 22: CHECK FOR POWER TO MAP/BP SENSOR		
Service Code 22 indicates that the Manifold Absolute Pressure (MAP)/Barometric Pressure (BP) sensor is out of Self-Test range. Correct MAP/BP tester range of measurement is typically from 1.4 to 1.6 volts. Possible causes: — MAP/BP SIG circuit open between sensor vehicle harness connector and processor. — MAP/BP SIG circuit shorted to VREF, SIG RTN, or GND. — Faulty MAP/BP sensor. — Vacuum trapped at MAP/BP sensor. — High atmospheric pressure. — Faulty processor. — VREF circuit open at MAP/BP sensor. — SIG RTN circuit open at MAP/BP sensor. • Key off. • Disconnect the MAP/BP sensor from the vehicle harness. • Connect the MAP/BP tester between the vehicle harness connector and the MAP/BP sensor. • Insert MAP/BP banana plugs into DVOM. • Set DVOM to 20 volt scale. **NOTE: Green light on tester indicates VREF is OK (4-6v). Red light (or no light) indicates VREF is either too low or too high.** • Key on. • **Is green light on?**	Yes ▶ No ▶	GO to DF3. GO to DF2.
DF2 CHECK FOR POWER AT SENSOR VEHICLE HARNESS CONNECTOR		
NOTE: Green light reaffirms that VREF is OK (4-6v). Red light (or no light) indicates VREF is either too low or too high. • Key on. • MAP/BP tester connected. • DVOM connected to MAP/BP tester. • Disconnect MAP/BP sensor. • **Is green light on?**	Yes ▶ No ▶	REPLACE MAP/BP sensor. RERUN Quick Test. REMOVE MAP/BP tester. RECONNECT the MAP/BP sensor. GO to Pinpoint Test Step C1.

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor | Pinpoint Test | DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF3 CHECK MAP/BP SENSOR OUTPUT		
NOTE: Measure several known good MAP/BP sensors on available vehicles. The measured voltage will be typical for your location on the day of testing. • Key on. • MAP/BP tester connected. • DVOM connected to MAP/BP tester. • Measure MAP/BP sensor voltage on customer vehicle. • **Is DVOM voltage in range for your altitude?**	Yes ▶	REMOVE MAP/BP tester. GO to **DF4**.
	No ▶	REMOVE MAP/BP tester. GO to **DF5**.
DF4 CHECK CONTINUITY OF MAP/BP SIG CIRCUIT		
• Key off, wait 10 seconds. • MAP/BP sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between MAP/BP SIG circuit at the MAP/BP sensor vehicle harness connector and Test Pin 45 at the breakout box. • **Is resistance less than 5.0 ohms?**	Yes ▶	REPLACE processor. REMOVE breakout box. RECONNECT MAP/BP sensor. RERUN Quick Test.
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

Approximate Altitude (Ft.)	Voltage Output (+/-.04 Volts)
0	1.59
1000	1.56
2000	1.53
3000	1.50
4000	1.47
5000	1.44
6000	1.41
7000	1.39

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor | Pinpoint Test | DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF5 CHECK MAP/BP SIG CIRCUIT FOR SHORTS TO VREF, SIG RTN AND GROUND		
• Key off, wait 10 seconds. • MAP/BP sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 45 and Test Pins 26, 46, 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE MAP/BP sensor. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DF7 ENGINE RUNNING SERVICE CODE 22: CHECK FOR EGR SERVICE CODES		
Service Code 22 (KOER) indicates the MAP/BP signal is out of range for Engine Running Self-Test. Possible causes: — Faulty MAP/BP sensor. — Faulty vacuum hoses. — Excess EGR. • **Are Engine Running Service Codes 31, 32, 33, 34 or 35 present?**	Yes ▶ No ▶	GO to Quick Test Step 7.0 for appropriate Pinpoint Test. GO to DF8.
DF8 CHECK MAP SENSOR OPERATION		
• Key off, wait 10 seconds. • Disconnect vacuum supply hose from MAP sensor. • Install vacuum pump to MAP sensor. • Apply 18 in-Hg vacuum to MAP sensor. • **Does MAP sensor hold vacuum?**	Yes ▶ No ▶	RELEASE vacuum. GO to DF9. REPLACE MAP sensor. CONNECT vacuum supply hose to MAP sensor. RERUN Quick Test.

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor | Pinpoint Test | DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF9 ATTEMPT TO ELIMINATE ENGINE RUNNING SERVICE CODE 22		
• Key off, wait 10 seconds. • Plug MAP sensor vacuum supply hose. • Start engine and maintain 1500 ± 100 engine rpm. • Slowly apply 15 in-Hg vacuum to MAP sensor. • While maintaining rpm, perform Engine Running Self-Test. • **Is Engine Running Service Code 22 still present?** **NOTE: Disregard any other Service Codes at this time.**	Yes ▶ No ▶	REPLACE MAP sensor. CONNECT vacuum supply hose to MAP sensor. RERUN Quick Test. INSPECT vacuum supply hose to MAP sensor. SERVICE as necessary. If OK, SERVICE other Engine Running Service Codes. If none, GO to Diagnostic Routines, Section 2 for a low vacuum problem.
DF10 SERVICE CODE 72: RERUN DYNAMIC RESPONSE TEST		
Service Code 72 indicates that the MAP sensor output did not change enough during the Dynamic Response Test. Possible causes: — System failed to detect partial WOT. — MAP sensor vacuum supply hose improper routing, blockage and/or linkage. — Faulty MAP sensor. • Rerun Engine Running Self-Test. Be sure a complete WOT is performed during the Dynamic Response portion of the test. • **Is Engine Running Service Code 72 still present?**	Yes ▶ No ▶	GO to DF11. SERVICE other Service Codes as necessary. If none, testing complete.
DF11 CHECK VACUUM HOSES		
• Key off. • Check vacuum hoses for proper routing. Refer to VECI decal. Check MAP sensor vacuum supply hoses for disconnections, kinks or blockage. • **Are vacuum hoses OK?**	Yes ▶ No ▶	GO to DF12. SERVICE vacuum hoses as necessary. RERUN Quick Test.

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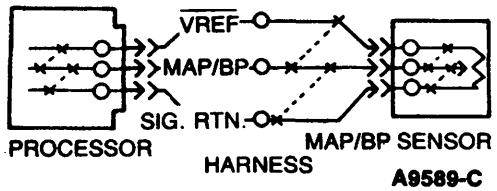
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor | Pinpoint Test | DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF12 CHECK MAP SENSOR OPERATION		
• Key off, wait 10 seconds. • Disconnect vacuum supply hose from MAP sensor. • Install vacuum pump to MAP sensor. • Apply 18 in-Hg vacuum to MAP sensor. • **Does MAP sensor hold vacuum?**	Yes ▶	RELEASE vacuum. REMOVE vacuum pump. RECONNECT vacuum supply hose to MAP sensor. GO to DF13.
	No ▶	REPLACE MAP sensor. RECONNECT vacuum supply hose to MAP sensor. RERUN Quick Test.
DF13 CHECK THAT VACUUM TO MAP SENSOR DECREASES DURING DYNAMIC RESPONSE		
• Key off, wait 10 seconds. • Tee a vacuum gauge in the intake manifold vacuum supply hose at the MAP sensor. • Perform Engine Running Self-Test while observing vacuum. • **Did vacuum decrease by more than 10 in-Hg vacuum during Dynamic Response test?**	Yes ▶	REPLACE MAP sensor. REMOVE vacuum gauge. RERUN Quick Test.
	No ▶	EEC-IV system OK. REFER to Engine Shop Manual Group for probable causes affecting engine vacuum.

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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor | Pinpoint Test | DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF90 CONTINUOUS MEMORY CODE 22: EXERCISE MAP/BP SENSOR		
Continuous Memory Service Code 22 indicates the Manifold Absolute Pressure (MAP)/Barometric Pressure (BP) sensor was out of self-test range. The code was set during normal driving conditions. Correct range of measurement is typically from 1.4 to 1.6 volts. Possible causes: — Faulty MAP/BP sensor. — Faulty EEC-IV vehicle harness. — Faulty MAP/BP sensor vehicle harness connectors and/or terminals. — Unusually high/low barometric pressure. • Using Key On, Engine Off Continuous Monitor Mode, observe VOM or STAR LED for indication of a fault while performing the following: — Connect a vacuum pump to the MAP/BP sensor. — Slowly apply 84 kPa (25 in-Hg) vacuum to the MAP/BP sensor. — Slowly bleed vacuum off the MAP/BP sensor. — Lightly tap on MAP/BP sensor (simulate road shock). — Wiggle MAP/BP connector. • **Is fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE MAP/BP sensor. RERUN Quick Test.
	No ▶	GO to DF91.



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Manifold Absolute Pressure (MAP)/ Barometric Pressure (BP) Sensor | Pinpoint Test | DF

TEST STEP	RESULT ▶	ACTION TO TAKE
DF91 CHECK EEC-IV VEHICLE HARNESS		
• Remain in Key On, Engine Off Continuous Monitor Mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step **DF90**, grasp the vehicle harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Code (REFER to Quick Test Appendix). RERUN Quick Test. GO to **DF92**.
DF92 CHECK PROCESSOR AND VEHICLE HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	No ▶ Yes ▶	SERVICE as necessary. RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Knock Sensor	Pinpoint Test	DG

Note

You should enter this Pinpoint Test only when a Service Code 25 is received during Quick Test or if you have been directed here from Diagnosis By Symptom.

Remember

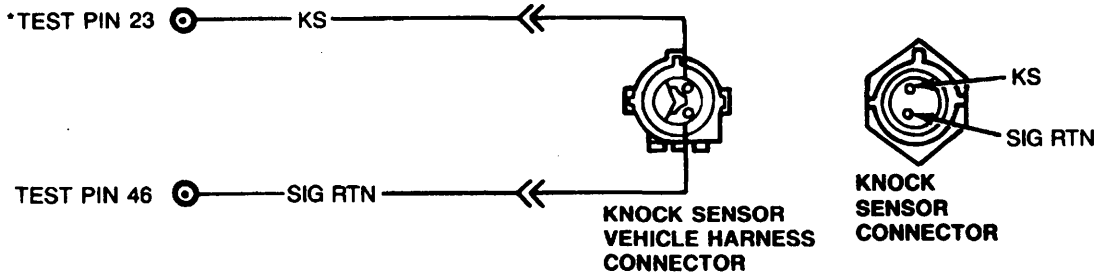
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuel (quality)
- Basic engine
- Spark timing

This Pinpoint Test is intended to diagnose only the following:

- Knock sensor (-12A699-)
- Harness circuits: KS and SIG RTN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE. **A9590-D**

Test Pin 23 — KS

Application	Wire Color
Car: 2.3L OHC MA 2.3L OHC 3.0L SHO-MA 3.8L SC Truck: 4.9L/5.0L F-Series	Y/R
4.9L/5.0L E-Series	LG/BK

Test Pin 46 — SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/BK
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.3L F-Series Diesel 7.5L F-Series/Bronco	GY/R
All Others	BK/W

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Knock Sensor

Pinpoint Test **DG**

TEST STEP	RESULT ▶	ACTION TO TAKE
DG1 SERVICE CODE 25: GENERATE KNOCK MANUALLY		
Service Code 25 indicates that the Knock Sensor (KS) signal to the processor was not sensed during the Dynamic Response Test after the I.D. code in Key On Engine Running Self-Test. Possible causes are: — Faulty Knock Sensor. — Open or shorted harness. — Faulty processor. **NOTE: Since knock conditions are sensitive to fuel, altitude and weather in addition to ignition timing, perform Step DG1 before servicing any components.** • Locate Knock Sensor and prepare to rap/tap on exhaust manifold with a 4 oz. hammer. • Run Engine Running Self-Test (engine must be at operating temperature). • Tap exhaust manifold directly above the knock sensor immediately after the Dynamic Response code is given. **NOTE: It is not necessary to "goose" the throttle. Ignore all other codes except Code 25.** • **Is Service Code 25 present?**	Yes ▶ No ▶	GO to DG2. Knock Sensor system OK. RERUN Engine Running Self-Test and SERVICE any other codes.
DG2 CHECK KS CIRCUIT VOLTAGE		
• Key off, wait 10 seconds. • Disconnect Knock Sensor. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between KS circuit and SIG RTN circuit at the Knock Sensor vehicle harness connector.	Voltage is between 1 and 4 volts ▶ Voltage is less than 1 volt ▶ Voltage is greater than 4 volts ▶	GO to DG6. GO to DG3. GO to DG5.

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Knock Sensor	Pinpoint Test	DG

TEST STEP	RESULT ▶	ACTION TO TAKE
DG3 CHECK CONTINUITY OF KS AND SIG RTN CIRCUITS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Knock Sensor disconnected. • DVOM on 200 ohm scale. • Measure resistance between SIG RTN circuit at the Knock Sensor vehicle harness connector and Test Pin 46 at the breakout box. • Measure resistance between KS circuit at the Knock Sensor vehicle harness connector and Test Pin 23 at the breakout box. • **Is each resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to DG4. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DG4 CHECK KS CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Knock Sensor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 23 and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. GO to DG6. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DG5 CHECK KS CIRCUIT FOR SHORT TO VOLTAGE		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Knock Sensor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 23 and Test Pin 40 at the breakout box. • **Is voltage less than 0.5 volts?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT processor. GO to DG6. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Knock Sensor	Pinpoint Test	DG

TEST STEP	RESULT ▶	ACTION TO TAKE
DG6 TEST PROCESSOR WITH SUBSTITUTE KNOCK SENSOR		
• Key off, wait 10 seconds. • Connect a known good Knock Sensor to the vehicle harness. Do not install this sensor on the engine. • Run Engine Running Self-Test. (Engine must be at operating temperature). • Tap the substitute Knock Sensor with a 4 oz. hammer immediately after the Dynamic Response code is given. **NOTE: It is not necessary to "goose" the throttle. Ignore all other codes except Code 25.** • **Is Service Code 25 present?**	Yes ▶	REPLACE processor. RECONNECT original Knock Sensor. RERUN Quick Test.
	No ▶	INSTALL new Knock Sensor. RERUN Quick Test.

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Throttle Position (TP) Sensor	Pinpoint Test	DH

Note

You should enter this Pinpoint Test only when a Service Code 23, 53, 63 or 73 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Idle speeds/throttle stop adjustment
- Binding throttle shaft/linkage or speed control linkage
- Choke/high cam system, if equipped
- TP sensor may not be seated properly (tightened down)

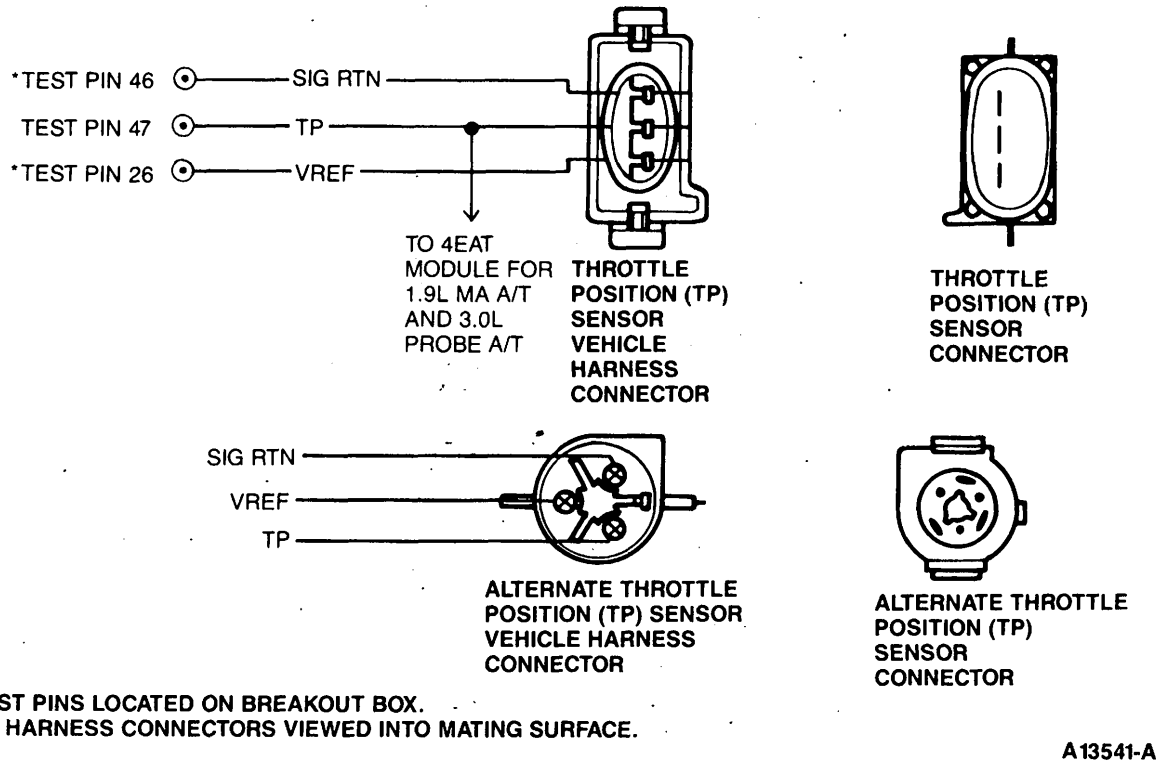
This Pinpoint Test is intended to diagnose only the following:

- Throttle Position (TP) sensor (-9B989-)
- Sensor harness circuits: VREF, TP, and SIG RTN
- Processor assembly (-12A650-)

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Throttle Position (TP) Sensor	Pinpoint Test	DH

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13541-A

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Throttle Position (TP) Sensor

Pinpoint Test | **DH**

Test Pin 46 **SIG RTN**

Application	Wire Color
1.9L SEFI MA	LG/BK
2.9L Scorpio	BR
3.0L Probe	LG/Y
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.3L F-Series Diesel 7.5L F-Series/Bronco	GY/R
All Others	BK/W

Test Pin 26 **VREF**

Application	Wire Color
1.9L SEFI MA	R/W
2.9L Scorpio	BR/BK
3.0L Probe	LG/R
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.3L F-Series Diesel 7.5L F-Series/Bronco	BR/W
All Others	O/W

Test Pin 47 **TP**

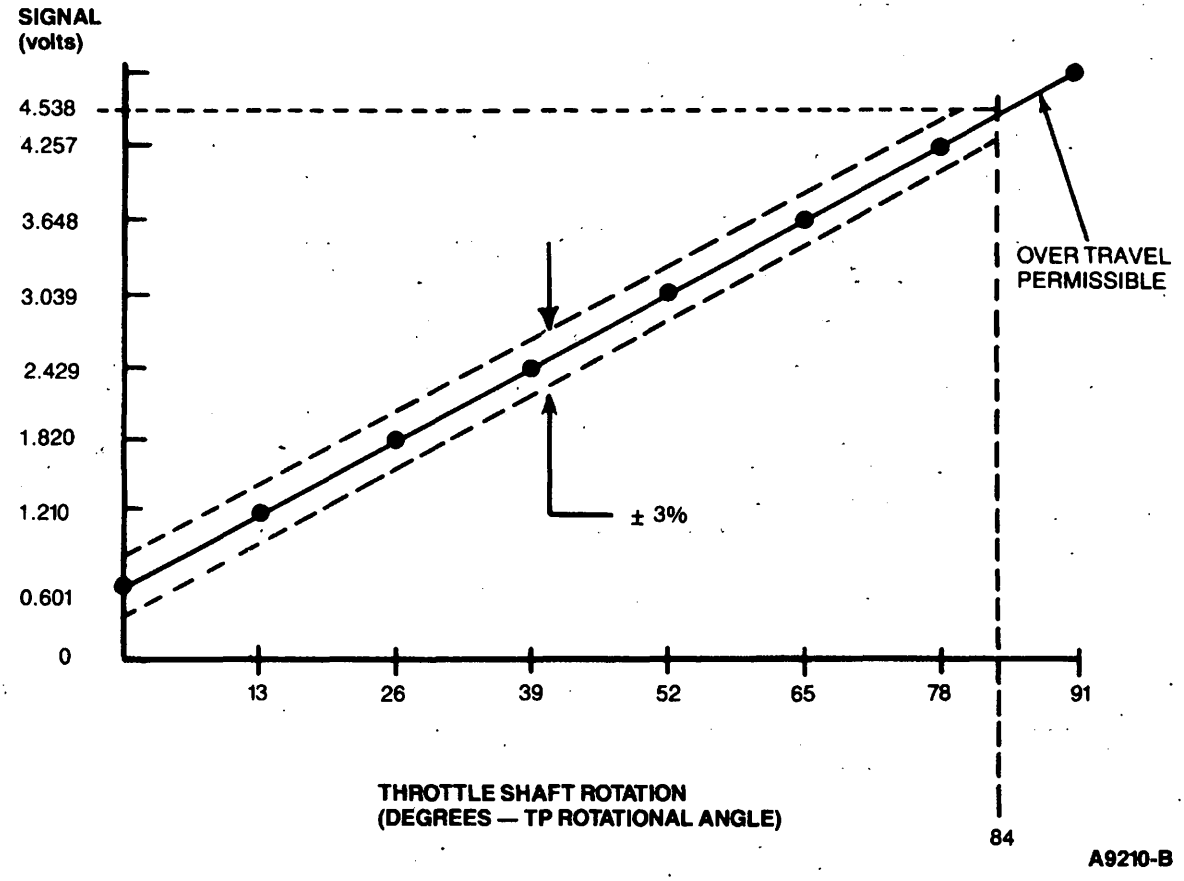
Application	Wire Color
1.9L SEFI MA	BR/W
2.9L Scorpio	BR/BK
3.0L Probe	LG/BK
All F-Series/Bronco	GY/W
All Others	DG/LG

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Throttle Position (TP) Sensor	Pinpoint Test	DH

NOTE: The normal range of the throttle angle measurement for the Throttle Position (TP) sensor is from 0 to 85 degrees. To pass Quick Test, the throttle rotational setting on the TP sensor (Key On Engine Off and Key On Engine Running), and the maximum/minimum TP circuit operating voltage ranges are listed in Table #1 by engine application.

TP Sensor Graph



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Throttle Position (TP) Sensor | Pinpoint Test | DH

Table #1

Throttle Position Sensor Specifications

Throttle Position Sensor Setting (K.O.E.O. and K.O.E.R.)			TP Circuit (Signal) Operating Voltage Range (K.O.E.O.)	
Engine Application	Rotational Degree Range	Voltage Range	Minimum	Maximum
Passenger Car:				
1.9L EFI	4° - 13°	0.80 - 1.20	0.24	4.84
1.9L MA SEFI	3° - 13°	0.70 - 1.20	0.20	4.84
1.9L CFI	0° - 12° (off) 2.5° - 14° (run)	0.49 - 1.15 0.71 - 1.25	0.39	4.84
2.3L OHC	0° - 13.5°	0.59 - 1.22	0.20	4.84
2.3L HSC-EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
2.5L HSC-CFI	1° - 15° (off) 3.5° - 25° (run)	0.66 - 1.30 0.76 - 1.78	0.39	4.84
3.0L EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
3.0L SHO-MA SEFI	0° - 4.5°	0.38 - 0.82	0.23	4.89
3.8L FWD/RWD 3.8L/5.0L SEFI	3° - 13.5°	0.73 - 1.22	0.39	4.84
3.8L SC MA 5.0L MA-SEFI	0° - 13.5°	0.49 - 1.22	0.39	4.84
Truck:				
2.3L DIS-EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
2.9L EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
3.0L EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
4.0L EFI	0° - 13.5°	0.59 - 1.22	0.34	4.84
4.9L EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
5.0L EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
5.8L EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
7.5L EFI	3° - 13.5°	0.73 - 1.22	0.20	4.84
5.8L/7.5L EFI E4OD	3° - 13.5°	0.73 - 1.22	0.34	4.84

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Throttle Position (TP) Sensor | Pinpoint Test | DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH1 SERVICE CODE 23: THE FOLLOWING CHECK MUST BE MADE BEFORE SERVICING THIS CODE		
Service Code 23 indicates that the Throttle Position (TP) sensor's rotational setting may be out of Self-Test range (refer to Table #1). Possible causes are: — Binding throttle linkage. — TP sensor may not be seated properly (tightened down). — Faulty TP sensor. — Faulty processor. • If you are in this Pinpoint Test Step for a Key On, Engine Off Code 23: — Check for Code 68. • If you are in this Pinpoint Test Step for a Key On, Engine Running Code 23: — Check for Codes 31 or 58. • **Are any of the above codes present with Code 23?**	Yes ▶ No ▶	RETURN to the Key On Engine Off or Engine Running Service Code chart and proceed as directed with Codes 68, 31 or 58. GO to **DH2**.
DH2 CHECK FOR STUCK THROTTLE PLATE		
• Visually inspect carburetor/throttle body and throttle linkage for binding or sticking. • Verify the throttle linkage is at mechanical/closed throttle. Check for: binding throttle linkage, speed control linkage, vacuum line/electrical harness interference, etc. • **Does throttle move freely and return to closed throttle position?**	Yes ▶ No ▶	GO to **DH3**. SERVICE as necessary. RERUN Quick Test.

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Throttle Position (TP) Sensor	Pinpoint Test	DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH3 SERVICE CODE 53: ATTEMPT TO GENERATE CODE 63		
Service Code 53 indicates that the Throttle Position (TP) sensor signal is greater than the Self-Test maximum value (refer to Table #1). Possible causes are: — TP sensor may not be seated properly (tightened down). — Faulty TP sensor. — Short to power in harness. — Faulty processor. • Key off, wait 10 seconds. • Disconnect TP sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Disconnect both 4EAT module vehicle harness connectors on 1.9L MA SEFI A/T and 3.0L Probe A/T. • Rerun Key On Engine Off Self-Test. • **Is Code 63 present (ignore all other codes)?**	Yes ▶ No ▶	GO to DH4. GO to DH6.
DH4 CHECK VREF CIRCUIT VOLTAGE		
• Key off, wait 10 seconds. • TP sensor disconnected. • Both 4EAT module vehicle harness connectors disconnected (if applicable). • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the TP sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	**For 1.9L MA SEFI A/T and 3.0L Probe A/T:** GO to DH5. **For all others:** REPLACE TP sensor. RERUN Quick Test. RECONNECT TP sensor. GO to Pinpoint Test Step C1.

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Throttle Position (TP) Sensor	Pinpoint Test	DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH5 CHECK FOR SHORTED 4EAT MODULE		
NOTE: The 1.9L MA SEFI A/T and 3.0L Probe A/T vehicles have a TP circuit input to the 4EAT module. This Test is to verify that the TP circuit is not shorted inside the 4EAT module. • Key off. • Reconnect TP sensor. • Both 4EAT module vehicle harness connectors disconnected. • Rerun Key On Engine Off Self-Test. • **Is code 53 present (ignore all other codes)?**	Yes ▶ No ▶	REPLACE TP sensor. RERUN Quick Test. GO to Transmission Shop Manual Group to check for short in 4EAT system.
DH6 CHECK TP CIRCUIT FOR SHORTS TO POWER		
• Key off, wait 10 seconds. • TP sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 47 and Test Pins 26 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT TP sensor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Throttle Position (TP) Sensor	Pinpoint Test	DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH10 SERVICE CODE 63: ATTEMPT TO GENERATE CODE 53/23		
Service Code 63 indicates that the Throttle Position (TP) sensor signal is less than the Self-Test minimum value (refer to Table #1). Possible causes are: — TP sensor may not be seated properly (tightened down). — Faulty TP sensor. — Open harness. — Grounded harness. — Faulty processor. • Key off, wait 10 seconds. • Disconnect TP sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Jumper VREF circuit to TP circuit at TP sensor vehicle harness connector. • Perform Key On Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to [DH14], except 1.9L MA SEFI A/T and 3.0L Probe A/T, GO to [DH13].** • **Is Code 53/23 present (ignore all other codes)?**	Yes ▶ No ▶	REPLACE TP sensor. REMOVE jumper. RERUN Quick Test. REMOVE jumper. GO to [DH11].
DH11 CHECK VREF CIRCUIT VOLTAGE		
• Key off, wait 10 seconds. • TP sensor disconnected. • DVOM on 20 volt scale. • Key on engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the TP sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to [DH12]. GO to Pinpoint Test Step [C1].

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Throttle Position (TP) Sensor	Pinpoint Test	DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH12 CHECK TP CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • TP sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 200 ohm scale. • Measure resistance between TP circuit at the TP sensor vehicle harness connector and Test Pin 47 at the breakout box. • **Is the resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to **DH14**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DH13 CHECK FOR SHORTED 4EAT MODULE		
NOTE: The 1.9L MA SEFI A/T and 3.0L Probe A/T vehicles have a TP circuit input to the 4EAT module. This Test is to verify that the TP circuit is not shorted inside the 4EAT module. • Key off. • Reconnect TP sensor. • Disconnect both 4EAT module vehicle harness connectors. • Rerun Key On Engine Off Self-Test. • **Is code 63 present (ignore all other codes)?**	Yes ▶ No ▶	DISCONNECT TP sensor. GO to **DH14**. GO to Transmission Shop Manual Group to check for short in 4EAT system.
DH14 CHECK TP CIRCUIT FOR SHORTS TO GROUND		
• Key off, wait 10 seconds. • TP sensor disconnected. • Both 4EAT module vehicle harness connectors disconnected (if applicable). • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 47 and Test Pins 40, 46, and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

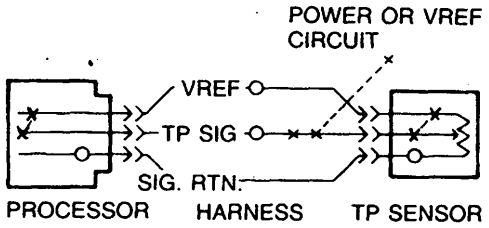
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Throttle Position (TP) Sensor | Pinpoint Test | DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH20 ENGINE RUNNING SERVICE CODE 73: PERFORM PROPER DYNAMIC RESPONSE TEST AT WIDE OPEN THROTTLE		
NOTE: Engine Running Service Code 73 indicates the TP sensor did not exceed 25 percent of its rotation during the Dynamic Response Test. A complete wide open throttle must be performed during the Dynamic Response portion of the test. • Run Key On Engine Running Self-Test. Be sure a complete WOT is performed during the Dynamic Response portion of the test. • **Is Code 73 still present?**	Yes ▶ No ▶	GO to DH21. Unable to duplicate Code 73 at this time. Go to Quick Test Step 5.0 to service other Engine Running Codes. Otherwise, testing completed.
DH21 CHECK TP SENSOR MOVEMENT DURING DYNAMIC RESPONSE TEST		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Connect DVOM to Test Pin 47 and Test Pin 46 at the breakout box. • Rerun Engine Running Self-Test with a proper WOT Dynamic Response portion of the test. • **Does voltage increase to greater than 3.5 volts during the Dynamic Response Test?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. VERIFY TP sensor is properly installed to throttle body. If OK, REPLACE TP sensor. RERUN Quick Test.

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Throttle Position (TP) Sensor | Pinpoint Test | DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH90 CONTINUOUS MEMORY CODE 53: MONITOR TP CIRCUIT UNDER SIMULATED ROAD SHOCK		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed position and lightly tap on TP sensor (simulate road shock). — Wiggle TP harness connector. • **Does VOM or STAR LED indicate a fault?**  A9468-A	Yes ▶ No ▶	GO to DH91. GO to DH92.
DH91 MEASURE THROTTLE POSITION SIGNAL VOLTAGE WHILE EXERCISING TP SENSOR		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • VOM or STAR LED still connected to STO as in previous step. • Connect a DVOM from Test Pin 47 to Test Pin 46 at the breakout box. • DVOM on 20 volt scale. • Key on, engine off. • While observing DVOM, repeat Step DH90. • **Does the fault occur below 4.25 volts?**	Yes ▶ No ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE TP sensor, REFER to Fuel/Engine Shop Manual Group. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. Throttle position sensor overtravel may have caused the Continuous Memory Code 53. VERIFY vehicle harness integrity, GO to DH92.

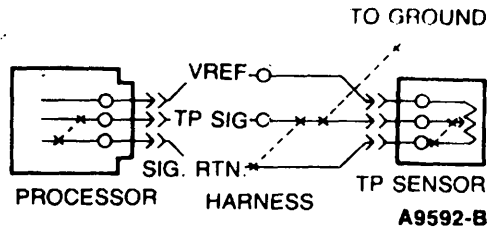
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Throttle Position (TP) Sensor — Pinpoint Test DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH92 CHECK EEC-IV VEHICLE HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DH90, grasp the vehicle harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Does VOM or STAR LED indicate a fault?**	Yes ▶ No ▶	ISOLATE fault. SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to DH93.
DH93 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • **Are connectors and terminals OK?**	No ▶ Yes ▶	SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Throttle Position (TP) Sensor | Pinpoint Test | DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH94 CONTINUOUS MEMORY CODE 63: MONITOR TP CIRCUIT UNDER SIMULATED ROAD SHOCK		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed position. — Lightly tap on TP sensor (simulate road shock). — Wiggle TP harness connector. • **Does VOM or STAR LED indicate a fault?**  A9592-B	Yes ▶ No ▶	INSPECT connectors. If connectors and terminals are good, REPLACE TP sensor, REFER to Fuel/Engine Shop Manual Group. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to DH95.
DH95 CHECK EEC-IV VEHICLE HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DH94 grasp the vehicle harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Does VOM or STAR LED indicate a fault?**	Yes ▶ No ▶	ISOLATE fault. SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to DH96.

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Throttle Position (TP) Sensor	Pinpoint Test	DH

TEST STEP	RESULT ▶	ACTION TO TAKE
DH96 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. • **Are connectors and terminals OK?**	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. RERUN Quick Test.
	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18, EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Engine RPM Sensor (Diesel)	Pinpoint Test	DJ

Note

You should enter this Pinpoint Test only when a Service Code 14 is received during Quick Test or if you have been directed here from Diagnosis By Symptom.

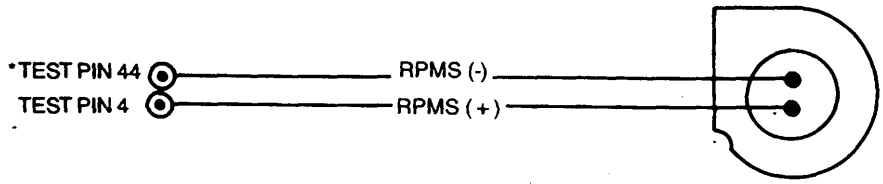
Remember

To prevent the replacement of good components and spending needless time on diagnostics, verify proper Engine RPM sensor installation and complete electrical connection.

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: RPMS(+) and RPMS(-)
- Engine RPM sensor (-17B384-)
- Processor assembly (-12B565-)

Pinpoint Test Schematic



ENGINE RPM SENSOR VEHICLE HARNESS CONNECTOR

***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A12796-B

Test Pin 44	RPMS(-)
Application	**Wire Color**
E-Series:	BK/LG
F-Series:	DG

Test Pin 4	RPMS(+)
Application	**Wire Color**
E-Series:	DB
F-Series:	T/Y

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Engine RPM Sensor (Diesel) | Pinpoint Test | DJ

TEST STEP	RESULT ▶	ACTION TO TAKE
DJ1 CONTINUOUS MEMORY CODE 14: ERRATIC ENGINE RPM SIGNAL		
NOTE: To prevent the replacement of good components, verify proper Engine RPM sensor installation and complete electrical connection. Service Code 14 indicates the Engine RPM signal output was missing pulses while the engine was running. • Check EEC-IV systems harness for: — Loose wires/connectors. — On board transmitter (2-way radio). — On board telephone, etc. • Verify installations have been performed according to manufacturers instructions and specifications regarding routing of antenna and wire leads. • Key off, wait 10 seconds. • Enter Engine Running Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on the Engine RPM sensor. — Wiggle the Engine RPM sensor connector. **NOTE: Continuous Monitor mode may exit while a fault is indicated. You have to reenter to diagnose further.** • **Is a fault indicated?**	Yes ▶ No ▶	SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to DJ2.
DJ2 CHECK EEC-IV VEHICLE HARNESS		
• While still in Continuous Monitor mode from DJ1 observe VOM or STAR LED for a fault indication while performing the following: — Grasp the vehicle harness close to the Engine RPM sensor. Wiggle shake or bend a small section at a time while working your way toward the dash panel and the EEC-IV processor. Isolate the Engine RPM circuit for this test. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to DJ3.

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Engine RPM Sensor (Diesel)	Pinpoint Test	DJ

TEST STEP	RESULT ▶	ACTION TO TAKE
DJ3 CHECK CONTINUITY OF ENGINE RPM SENSOR VEHICLE HARNESS CIRCUITS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Engine RPM sensor. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 4 at the breakout box and RPMS(+) circuit at the Engine RPM sensor vehicle harness connector. • Measure resistance between Test Pin 44 at the breakout box and RPMS(-) circuit at the Engine RPM sensor vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DJ4. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DJ4 CHECK ENGINE RPM SENSOR VEHICLE HARNESS CIRCUITS FOR SHORTS TO POWER OR GROUND		
• Key off. • Breakout box installed, processor disconnected. • Engine RPM sensor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 4 and Test Pins 37/57, 40, and 44 at the breakout box. • Measure resistance between Test Pin 44 and Test Pins 37/57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DJ5. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DJ5 CHECK ENGINE RPM SENSOR RESISTANCE		
• Key off. • Engine RPM sensor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Engine RPM sensor terminals at the RPM sensor. • **Is the resistance between 2,400 and 2,800 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT Engine RPM sensor. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. GO to Instruments/Gauge Shop Manual Group.

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Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

Note

You should enter this Pinpoint Test only when a Service Code 26, 56, 66 or 76 is received during Quick Test.

Remember

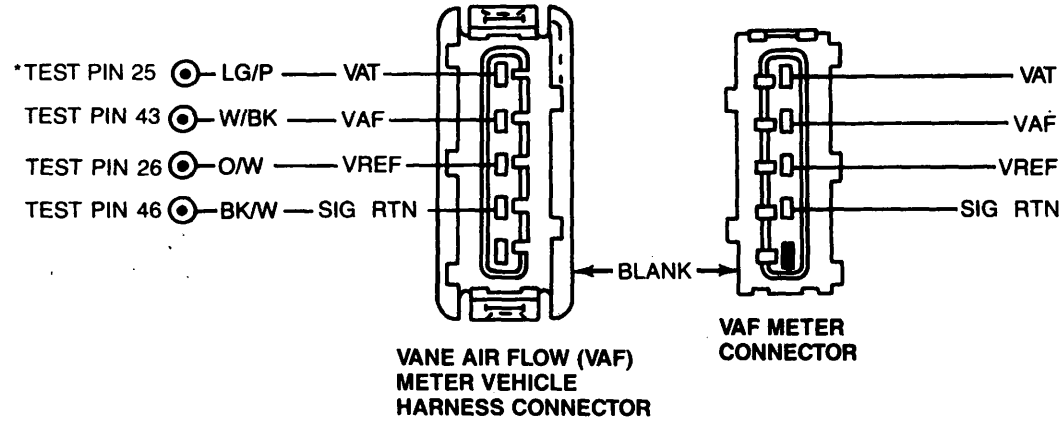
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Check for unmetered air (air leaks) between VAF meter and throttle body
- Vacuum leaks
- Engine sealing (PCV sealing, CANP, valve cover seal, dipstick seated)

This Pinpoint Test is intended to diagnose only the following:

- Vane Air Flow (VAF) meter (-12B529-)
- Processor (-12A650-)
- Harness circuits: VREF, VAF, and SIG RTN

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9593-E

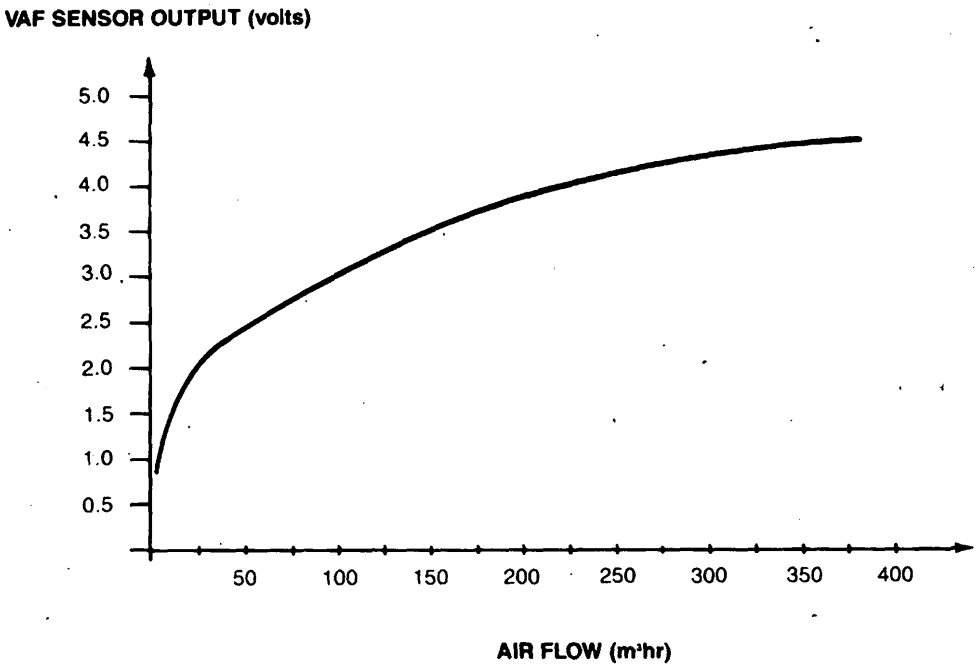
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Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

NOTE: Air flow = Volume of air flowing through VAF meter per hour
As the volume of air flowing through the VAF meter increases, so will the VAF sensor output voltage.

Vane Air Flow Sensor Graph

1.9L EFI Engine



VAF Sensor Data

Air Flow	VAF Sensor Output
m^3/hr	Volt
9	0.80
16	1.35
26	1.85
40	2.25
60	2.65
100	3.15
160	3.60
240	4.0
380	4.5

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Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

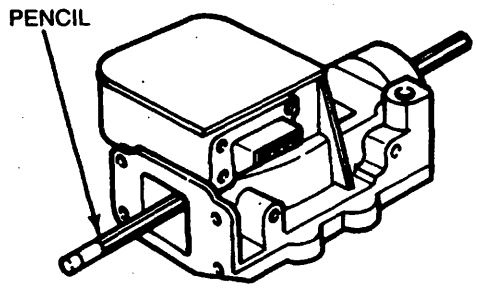
TEST STEP		RESULT ▶	ACTION TO TAKE
DK1	SERVICE CODE 26: CHECK VAF METER FOR CONTAMINATION AND FREEDOM OF MOVEMENT		
Service Code 26 indicates that the Vane Air Flow (VAF) sensor is out of Self-Test range. Correct range of measurement is 0.17 to 0.50 volts (KOEO) or 1.10 to 1.70 volts (KOER). Possible causes: — Faulty VAF meter. — Faulty processor. — Faulty wire harness connections. • Key off, wait 10 seconds. • Remove air cleaner element and check VAF meter for contamination (oil residue, foreign material, etc.) that may impede VAF sensor vane movement. • Rerun Quick Test. • **Is Service Code 26 present?**		Yes ▶	**If you are originally here for a KOEO Service Code 26:** REFER to Section 3, Vane Air Flow Meter Diagnosis. **If you are originally here for an Engine Running Service Code 26:** GO to DK2.
		No ▶	**If you are originally here for a KOEO Service Code 26:** GO to DK2. **If you are originally here for an Engine Running Service Code 26:** Testing is complete.

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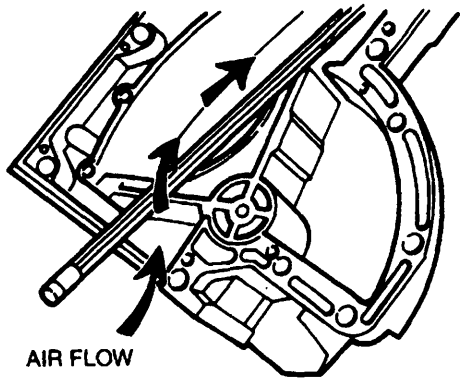
Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK2 CHECK VAF SENSOR		
• Key off. • Check for unmetered air leaks between VAF meter and throttle body. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Place new unsharpened pencil as shown below. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pins 43 and 46 at the breakout box. • **Is voltage between 2.8 volts and 3.7 volts?**	Yes ▶	VAF meter is capable of outputting an acceptable signal. The Code 26 has been caused by incorrect engine speed or an unmetered air leak (vacuum leak). 1.9L EFI, GO to KD 15. All others, SERVICE as necessary. REMOVE breakout box. RERUN Quick Test.
	No ▶	INSPECT VAF meter connectors for bent pins. SERVICE as necessary. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. REPLACE VAF meter if problem still exists.

VAF METER



VAF SENSOR AIR VANE



NOTE: REFER TO COVER PAGE FOR HARNESS CONNECTOR PIN ASSIGNMENTS. A9594-E

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Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK10 SERVICE CODE 56: INDUCE OPPOSITE CODE		
Service Code 56 indicates that the Vane Air Flow (VAF) sensor signal is greater than the Self-Test maximum value of 4.89 volts (KOEO). Possible causes: — Faulty VAF meter. — Faulty processor. — VAF circuit shorted to power; faulty wire harness. • Key off, wait 10 seconds. • Disconnect VAF meter. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Rerun Key On, Engine Off Self-Test. • **Is Code 66 present?**	Yes ▶ No ▶	GO to DK11. GO to DK12.
DK11 CHECK VREF CIRCUIT VOLTAGE		
• Key off, wait 10 seconds. • VAF meter disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the VAF meter vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	REPLACE VAF meter. RERUN Quick Test. GO to Pinpoint Test Step C1.
DK12 CHECK VAF CIRCUIT FOR SHORT TO POWER		
• Key off, wait 10 seconds. • VAF meter disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 43 and Test Pins 26 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT VAF meter. RERUN Quick Test. SERVICE circuit shorts. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Vane Air Flow (VAF) Sensor

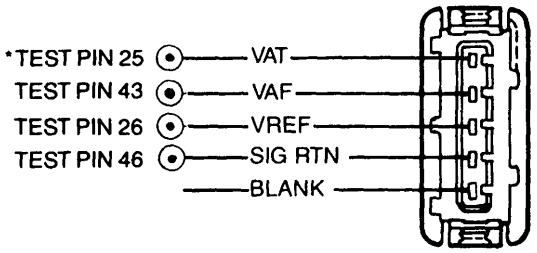
Pinpoint Test **DK**

TEST STEP	RESULT ▶	ACTION TO TAKE
DK20 SERVICE CODE 66: INDUCE OPPOSITE CODE		
Service Code 66 indicates that the Vane Air Flow (VAF) sensor signal is less than the Self-Test minimum of 0.17 volts (KOEO). Possible causes: — Faulty VAF meter. — Lack of continuity between VAF meter vehicle harness connector and processor. — VAF circuit shorted to ground. — Faulty processor. • Key off, wait 10 seconds. • Disconnect VAF meter. • Install jumper wire in VAF meter vehicle harness connector between VREF circuit and VAF circuit. • Perform Key On, Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to DK23.** • **Is Code 56 present?**	Yes ▶ No ▶	REPLACE VAF meter. REMOVE jumper wire. RERUN Quick Test. REMOVE jumper wire and GO to DK21.
DK21 CHECK VREF CIRCUIT VOLTAGE		
• Key off, wait 10 seconds. • VAF meter disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the VAF meter vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to DK22. GO to Pinpoint Test Step C1.

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Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK22 CHECK VAF CIRCUIT CONTINUITY		
• Key off. • VAF meter disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between VAF circuit at the VAF meter vehicle harness connector and Test Pin 43 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **DK23**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DK23 CHECK VAF CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • VAF meter disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between VAF circuit and SIG RTN circuit at the VAF meter vehicle harness connector. • Measure resistance between VAF circuit at the VAF meter vehicle harness connector and battery negative post. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT VAF meter. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.



VANE METER VEHICLE HARNESS CONNECTOR

A8909-B

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Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

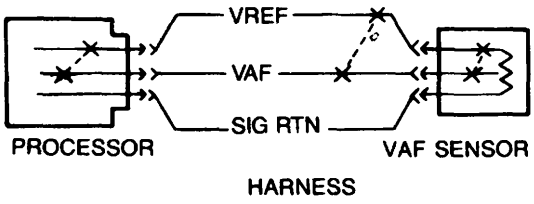
TEST STEP	RESULT ▶	ACTION TO TAKE
DK30 SERVICE CODE 76: CHECK FOR VOLTAGE INCREASE IN VAF SIGNAL DURING DYNAMIC RESPONSE		
Service Code 76 indicates that the VAF output voltage did not change enough during the Dynamic Response Test. Possible causes: — Air cleaner duct obstruction. — Faulty VAF meter. — Faulty processor. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Connect DVOM to Test Pins 43 and 46 at the breakout box. • Perform Engine Running Quick Test while monitoring DVOM. • After dynamic response prompt Code 1(0) operator moves throttle briefly to WOT and back. DVOM should increase more than 2.0 volts from reading before WOT. • Record service codes at end of test. • **Did voltage increase more than 2.0 volts?**	Yes ▶ No ▶	GO to DK31 . CHECK air cleaner duct for obstruction. If OK, REPLACE VAF meter.
DK31 CHECK SERVICE CODES FROM STEP DK 30		
• Check Engine Running service codes recorded in Pinpoint Test Step DK30 . • **Is Code 76 present?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. VAF meter is OK, SERVICE other codes as necessary.

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Vane Air Flow (VAF) Sensor

Pinpoint Test **DK**

TEST STEP	RESULT ▶	ACTION TO TAKE
DK90 CONTINUOUS MEMORY CODE 56: CHECK VAF SENSOR		
Continuous Memory Code 56 indicates that the Vane Air Flow (VAF) sensor signal was greater than the Self-Test maximum value of 4.89 volts. The code was set during normal driving conditions. Possible causes: — Faulty VAF meter. — Faulty VAF meter vehicle harness connectors and/or terminals. — Faulty processor vehicle harness connector and/or terminals. • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on VAF sensor (simulate road shock). — Wiggle VAF vehicle harness connector. • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE VAF sensor. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	GO to **DK91**.



A9595-C

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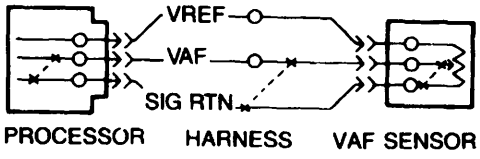
Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK91 CHECK EEC-IV VEHICLE HARNESS		
• Still in Key On, Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step **DK90**, grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to **DK92**.
DK92 CHECK PROCESSOR AND VEHICLE HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶ No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK93 CONTINUOUS MEMORY CODE 66: CHECK VAF SENSOR		
Continuous Memory Code 66 indicates that the Vane Air Flow (VAF) sensor signal was less than the Self-Test minimum of 0.17 volts. The code was set during normal driving conditions. Possible causes: — Faulty VAF meter vehicle harness. — Faulty VAF meter. — Faulty processor assembly. • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Lightly tap on VAF sensor (simulate road shock). — Wiggle VAF vehicle harness connector. • **Is a fault indicated?**	Yes ▶ No ▶	REPLACE sensor. DISCONNECT and INSPECT connectors. If connector and terminals are good, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to **DK94**.



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Vane Air Flow (VAF) Sensor | Pinpoint Test | DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK94 CHECK EEC-IV VEHICLE HARNESS		
• Still in Key On, Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step DK93, grasp the vehicle harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to DK95.
DK95 CHECK PROCESSOR AND VEHICLE HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	No ▶ Yes ▶	SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Vane Air Flow (VAF) Sensor	Pinpoint Test	DK

TEST STEP	RESULT ▶	ACTION TO TAKE
DK98 CONTINUOUS MEMORY CODE 26:		
Continuous Memory Code 26 indicates that sometime during vehicle operation, the VAF signal was out of Self-Test range. Possible causes are: — Contamination. — Unmetered air leaks. — Faulty VAF meter. • Key off. • Inspect integrity of VAF meter and associated air tubes. • Check for unmetered air leaks. • Remove air cleaner element and check for contamination (oil residue, foreign material, etc.) that may impede VAF sensor vane movement. • **Are all the above checks OK?**	Yes ▶	REPLACE VAF meter. RERUN Quick Test.
	No ▶	SERVICE as necessary. RERUN Quick Test.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)	Pinpoint Test	DL

Note

You should enter this Pinpoint Test only when a Service Code 31, 32, 33, 34, 35 or 84 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Damaged EGR valve
- Restricted exhaust system
- Damaged vacuum reservoir or canister

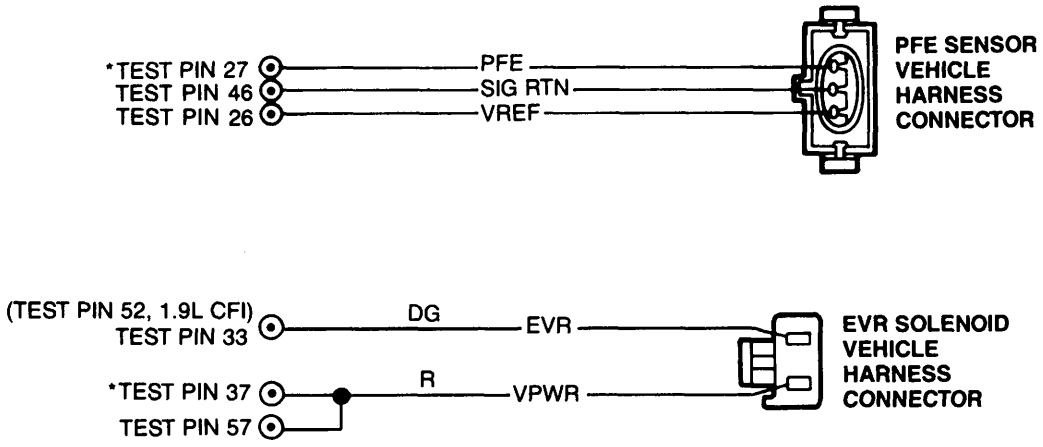
This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: VREF, PFE, SIG RTN, EVR, VPWR.
- PFE sensor (-9D460-)
- EVR solenoid (-9J459-)
- EGR valve assembly
- Processor assembly (-12A650-)
- Vacuum lines/tubes (EVR, PFE)

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)	Pinpoint Test	DL

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9596-E

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

Test Pin 33 (52) EVR

Application	Wire Color
1.9L MA SEFI	W/BL
1.9L CFI 2.3L HSC EFI	Y
2.3L OHC MA 2.5L FLC CFI 3.0L SHO SEFI 3.0L EFI 3.8L AXOD SEFI 3.8L RWD SEFI	DG
3.0L EFI Probe	W
2.3L EFI MA, Truck 5.0L EFI, E-Series	DG
5.0L EFI, F-Series/Bronco	BR/PK

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/B
2.9L Scorpio	BR
3.0L EFI Probe	LG/Y
4.9L E-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
All Others	BK/W

Test Pin 26 VREF

Application	Wire Colors
1.9L MA SEFI	R/W
2.9L Scorpio	BR/BK
3.0L EFI Probe	LG/R
4.9L E-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.3L F-Series Diesel 7.5L F-Series	BR/W
All Others	O/W

Test Pin 27 PFE

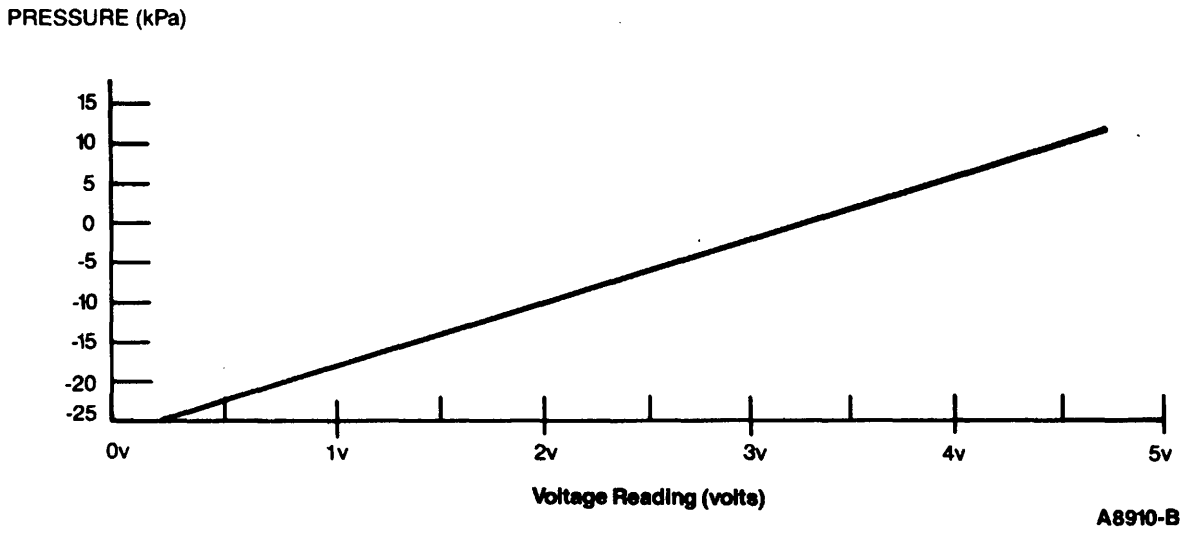
Application	Wire Colors
1.9L MA SEFI	BL/Y
All Others	BR/LG

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)	Pinpoint Test	DL

NOTE: Voltage values calculated for VREF = 5.0 volts. These values may vary ±15 percent due to sensor and VREF variations.

PFE Sensor Graph



PFE Sensor Data

Pressure/Vacuum			
PSI	**in-Hg**	**kPa**	**Voltage**
1.82	3.70	12.5	4.75
1.36	2.79	9.42	4.38
0.91	1.85	6.25	4.0
0.46	0.94	3.17	3.63
0	0	0	3.25
-2.47	-5.03	-17.0	1.22
-3.63	-7.40	-25.0	0.25
CAUTION: To avoid possible sensor damage do not exceed pressure/vacuum range shown when testing.			

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL1 SERVICE CODE 31: INDUCE CODE 35		
Service Code 31 indicates that the Pressure Feedback EGR (PFE) sensor signal is less than the Self-Test minimum value of 0.2 volts. Possible causes are: — Faulty PFE sensor. — Open harness circuits. — Shorted harness circuits. — Faulty processor. • Key off. • Disconnect PFE sensor. • Jumper VREF circuit to PFE circuit at PFE sensor vehicle harness connector. • Perform Key On, Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to Step DL4.** • **Is Code 35 present (ignore all other codes)?**	Yes ▶ No ▶	REPLACE PFE sensor. REMOVE Jumper. RERUN Quick Test. REMOVE jumper. GO to DL2.
DL2 MEASURE VREF CIRCUIT VOLTAGE		
• Key off. • PFE sensor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the PFE sensor vehicle harness connector. • **Is voltage between 4 and 6 volts?**	Yes ▶ No ▶	GO to DL3. GO to Pinpoint Test Step C1.
DL3 CHECK PFE CIRCUIT CONTINUITY		
• Key off. • PFE sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between PFE circuit at the PFE sensor vehicle harness connector and Test Pin 27 at the breakout box. • **Is resistance greater than 5 ohms?**	Yes ▶ No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. GO to DL4.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)	Pinpoint Test	DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL4 CHECK PFE CIRCUIT FOR SHORTS TO GROUND AND SIG RTN		
• Key off. • PFE sensor disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between PFE circuit at the PFE sensor vehicle harness connector and Test Pins 40 and 60 at the breakout box. • Measure resistance between PFE circuit at the PFE sensor vehicle harness connector and Test Pin 46 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DL5 SERVICE CODE 35: INDUCE CODE 31		
Service Code 35 indicates that the Pressure Feedback EGR (PFE) sensor signal is greater than the Self-Test maximum value of 4.8 volts. Possible causes are: — Faulty PFE sensor. — Shorted harness circuits. — Faulty processor. • Key off. • Disconnect PFE sensor. • Rerun Key On, Engine Off Self-Test. • **Is Code 31 present (ignore all other codes)?**	Yes ▶ No ▶	GO to DL6. GO to DL7.
DL6 MEASURE VREF CIRCUIT VOLTAGE		
• Key off. • PFE sensor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the PFE sensor vehicle harness connector. • **Is voltage between 4 and 6 volts?**	Yes ▶ No ▶	REPLACE PFE sensor. RERUN Quick Test. GO to Pinpoint Test Step C1.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL7 CHECK PFE CIRCUIT FOR SHORTS TO POWER		
• Key off. • PFE sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between Test Pin 27 and Test Pins 26, 37 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT PFE sensor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DL8 SERVICE CODE 34: VERIFY ENGINE RUNNING CODES		
Service Code 34 indicates that the Pressure Feedback EGR (PFE) sensor is out of Self-Test range and that the PFE sensor is probably defective. Correct range of measurement is 2.6 to 4.2 volts. Possible causes are: — Faulty PFE sensor. — Obstructed pressure feed tube. — Garage exhaust ventilation system affecting PFE sensor operation. **NOTE: PFE system can sense a lack of pressure in the vehicle exhaust system. An efficient garage exhaust ventilation system that is installed during Key On Engine Off Self-Test may generate a Code 34.** • Remove garage forced ventilation system and properly vent to atmosphere. • Rerun Key On Engine Off Self-Test. • **Is Code 34 present?**	Yes ▶ No ▶	GO to DL9. ADDRESS other codes in Key On Engine Off. If none, CONTINUE with remaining Quick Test.
DL9 CHECK PFE SENSOR PRESSURE INPUT HOSE		
• Remove the pressure input hose from PFE sensor. • Inspect complete tube and PFE sensor inlet for blockage. • **Is blockage present?**	Yes ▶ No ▶	SERVICE as necessary. RERUN Quick Test. RECONNECT pressure input hose. GO to DL10.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) — Pinpoint Test DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL10 MEASURE VREF CIRCUIT VOLTAGE		
• Key off. • Disconnect PFE sensor. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at PFE sensor vehicle harness connector. • **Is voltage between 4 and 6 volts?**	Yes ▶ No ▶	REPLACE PFE sensor. RERUN Quick Test. GO to Pinpoint Test Step **C1**.
DL11 SERVICE CODE 84: MEASURE EVR SOLENOID RESISTANCE		
Service Code 84 indicates a failure in the EGR Vacuum Regulator (EVR) solenoid or circuit. Possible causes are: — Faulty EVR solenoid. — Open harness circuit. — Shorted harness. — Faulty processor. • Key off. • Disconnect EVR solenoid. • DVOM on 200 ohm scale. • Measure EVR solenoid resistance. • **Is solenoid resistance between 30 and 70 ohms?**	Yes ▶ No ▶	GO to **DL12**. REPLACE EVR solenoid. RERUN Quick Test.
DL12 CHECK VPWR CIRCUIT VOLTAGE		
• Key on, engine off. • EVR solenoid disconnected. • DVOM on 20 volt scale. • Measure voltage between battery negative terminal and VPWR circuit at EVR solenoid vehicle harness connector. • **Is voltage less than 10.5 volts?**	Yes ▶ No ▶	SERVICE open circuit. RERUN Quick Test. GO to **DL13**.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)	Pinpoint Test	DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL13 CHECK EVR CIRCUIT CONTINUITY		
• Key off. • EVR solenoid disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 33 (Test Pin 52, 1.9L CFI) at the breakout box and EVR circuit at the EVR solenoid vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **DL14**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DL14 CHECK EVR CIRCUIT FOR SHORTS TO POWER OR GROUND		
• Key off. • EVR solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 33 (Test Pin 52, 1.9L CFI) and Test Pins 37 and 57 at the breakout box. • Measure resistance between Test Pin 33 (Test Pin 52, 1.9L CFI) and Test Pins 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code is repeated, REPLACE processor.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL20 SERVICE CODE 32: VERIFY ENGINE RUNNING CODES		
Service Code 32 indicates that the EGR valve is not fully seated. Possible causes are: — Obstructed vacuum hose. — Contaminated EVR filter. — Faulty EGR valve. — Faulty EVR solenoid. — Garage exhaust ventilation system. **NOTE: PFE system can sense a lack of pressure in the vehicle exhaust system. An efficient garage exhaust ventilation system that is installed during Key On Engine Running Self-Test may generate a Code 32.** • Remove garage forced ventilation system and properly vent to atmosphere. • Rerun Engine Running Self-Test. • **Is Code 32 present?**	Yes ▶ No ▶	GO to DL21. ADDRESS other codes in Engine Running. If none, CONTINUE with remaining Self-Test.
DL21 SERVICE CODE 31: RERUN SELF-TEST WITH EGR VALVE VACUUM LINE DISCONNECTED		
Service Code 31 indicates that the Pressure Feedback EGR (PFE) sensor signal is less than the Self-Test minimum of 3.25 volts. • Key off. • Disconnect EGR valve vacuum line at valve and plug vacuum line. • Perform Engine Running Self-Test. • **Is Code 31 or 32 present?**	Yes ▶ No ▶	GO to DL22. EVR filter or solenoid is contaminated. REPLACE EVR solenoid. RECONNECT all lines. RERUN Quick Test.
DL22 CHECK PFE SENSOR PRESSURE INPUT HOSE FOR BLOCKAGE		
• Key off. • Check PFE sensor pressure input hose for obstructions and/or leaks. • **Are there any obstructions or leaks?**	Yes ▶ No ▶	SERVICE as necessary. RECONNECT all lines and RERUN Quick Test. GO to EGR Diagnosis, Section 6.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL25 SERVICE CODE 34 AND 35: CHECK FOR EXCESSIVE EXHAUST BACK PRESSURE		
Service Codes 34 and 35 indicates that there is excessive exhaust back pressure. Possible causes are: — Restricted exhaust system. — Faulty PFE sensor. • Key off. • Substitute known good PFE sensor in place of original. • Rerun Engine Running Self-Test. • **Is Code 34 or 35 present?**	Yes ▶ No ▶	REINSTALL original PFE sensor. GO to Section 5, Catalyst and Exhaust Systems. Original PFE sensor was the cause of the Service Code 34 or 35. REPLACE PFE sensor. RERUN Quick Test.
DL30 SERVICE CODE 33: VERIFY VACUUM IS PRESENT AT EGR VALVE		
Service Code 33 indicates that the PFE sensor input did not change after the EVR solenoid was instructed by the processor to open the EGR valve. Possible causes are: — Vacuum hose leaks. — Obstructed vacuum hose. — Faulty EVR solenoid. — Faulty PFE sensor. — Faulty EGR valve. — Faulty PCV valve (1.9L CFI only). • Key off, wait 10 seconds. • Tee in a standard vacuum gauge at the EGR valve. • Rerun Engine Running Self-Test while observing vacuum gauge. • **Is vacuum reading less than 1 in-Hg throughout the test (disregard code output)?**	Yes ▶ No ▶	REMOVE vacuum gauge. GO to **DL31**. REMOVE vacuum gauge. GO to **DL36**.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL31 CHECK VACUUM HOSES		
• Key off. • Check the following vacuum hoses for obstructions, cracks or loose connections: — EVR solenoid to EGR valve. — EVR solenoid to source. — EVR solenoid to PCV valve (1.9L CFI only). • **Are vacuum hoses in good condition?**	Yes ▶ No ▶	**For 1.9L CFI:** GO to **DL32**. **For all others:** GO to **DL34**. SERVICE as necessary. RERUN Quick Test.
DL32 CHECK SOURCE LINE VACUUM		
• Key off, wait 10 seconds. • Attach vacuum gauge to source line between throttle body and EVR solenoid at the EVR solenoid. • Start engine. • Run engine at approximately 2000 rpm. • **Is vacuum reading greater than 10 in-Hg?**	Yes ▶ No ▶	GO to **DL35**. GO to **DL33**.
DL33 CHECK PCV VALVE OPERATION		
• Key off. • Disconnect vacuum hose at the PCV valve from the EVR solenoid. • Connect a vacuum pump to the PCV valve. • Slowly apply 10 in-Hg vacuum. • **Does the PCV valve open and maintain vacuum?**	Yes ▶ No ▶	REMOVE vacuum gauge. RECONNECT PCV valve. REPLACE vacuum line to EGR solenoid from throttle body. GO to Section 9 for PCV valve diagnosis.
DL34 CHECK VACUUM TO EVR SOLENOID		
• Key off, wait 10 seconds. • Attach vacuum gauge to source line from manifold. • Start engine and run at idle. • **Is vacuum present?**	Yes ▶ No ▶	GO to **DL35**. REPLACE vacuum line to EVR solenoid. RERUN Quick Test.

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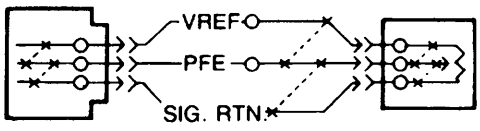
Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL35 CHECK EGR VALVE OPERATION		
• Key off. • Disconnect vacuum hose at the EGR valve. • Connect a vacuum pump to the EGR valve. • While observing the EGR valve, slowly apply 10 in-Hg vacuum. **NOTE: EGR valve should begin to open with a very small amount of vacuum, approximately 1 to 1.5 in-Hg and be fully open with about 4 in-Hg vacuum.** • **Does the EGR valve move freely and smoothly?**	Yes ▶ No ▶	REPLACE EVR solenoid assembly. REMOVE vacuum pump. RECONNECT EGR valve. RERUN Quick Test. GO to Section 6 for EGR valve diagnosis.
DL36 CHECK PFE SENSOR CONTROL PRESSURE INPUT TUBE		
• Key off. • **Is control pressure input tube to PFE sensor cracked, disconnected or obstructed?**	Yes ▶ No ▶	SERVICE as necessary. RERUN Quick Test. GO to **DL37**.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL37 SUBSTITUTE KNOWN GOOD PFE SENSOR		
• Key off, wait 10 seconds. • Substitute known good PFE sensor in place of original. • Rerun Engine Running Self-Test. • **Is Code 33 present?**	Yes ▶	REINSTALL original PFE sensor. GO to Section 6 for EGR valve diagnosis.
	No ▶	Original PFE sensor was the cause of the Service Code 33. REPLACE PFE sensor. RERUN Quick Test.
DL90 CONTINUOUS MEMORY CODE 31 OR 35: EXERCISE PFE SENSOR		
Continuous Memory Codes 31 and 35 indicate that the Pressure Feedback EGR (PFE) sensor signal went either less than (Code 31) or greater than (Code 35) the Self-Test voltage sometime during vehicle operation. Possible causes are: — Damaged connectors and/or terminals. — Open or grounded harness. — Faulty PFE sensor. • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: • Connect a vacuum pump to the PFE sensor. • Slowly apply 5 in-Hg to the PFE sensor. • Slowly bleed vacuum off the PFE sensor. • Lightly tap on PFE sensor (to simulate road shock). • Wiggle PFE sensor vehicle harness connector. • **Is fault indicated?**  A9597-B	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE PFE sensor. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	GO to **DL91**.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR) | Pinpoint Test | DL

TEST STEP	RESULT ▶	ACTION TO TAKE
DL91 CHECK EEC-IV VEHICLE HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step **DL90** grasp the vehicle harness closest to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to **DL92**.
DL92 CHECK PROCESSOR AND VEHICLE HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶ No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL93 CONTINUOUS MEMORY CODE 34: INSPECT PFE SUPPLY TUBE FOR BLOCKAGE		
Continuous Memory Code 34 indicates that at sometime during vehicle operation, the PFE sensor experienced a restriction. • Key off. • Remove PFE sensor and inspect sensor supply inlet for liquids and/or any type of blockage. • Inspect PFE supply tube to EGR valve base for liquids and/or blockage. • **Is supply tube free of any blockage?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	CLEAN and/or SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
DL94 CONTINUOUS MEMORY CODE 32: CHECK EGR VALVE OPERATION.		
Continuous Memory Code 32 indicates that the EGR valve did not reseat fully during vehicle operation. Possible causes are: — Obstructed vacuum hose. — Contaminated EVR filter. — Faulty EGR valve. • Key off. • Connect a vacuum pump to the EGR valve. • Apply 10 in-Hg of vacuum to EGR valve. • While observing EGR valve, release vacuum. • **Does EGR valve function in a smooth manner?** **NOTE: Repeat test if necessary to ensure accurate result.**	Yes ▶	GO to **DL95**.
	No ▶	CLEAR Continuous Memory (REFER to Quick Test Appendix). GO to EGR Valve Diagnosis, Section 6.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL95 INSPECT VACUUM LINES BETWEEN EVR SOLENOID AND EGR VALVE		
• Inspect EGR valve vacuum supply line from EVR solenoid for kinks and/or obstructions. • **Is vacuum supply line to EGR valve free of any obstructions?**	Yes ▶	GO to DL96.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
DL96 INSPECT EVR FILTER		
• Carefully check EVR filter for contamination and/or obstructions. • **Is EVR filter condition acceptable?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	REPLACE EVR filter. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Pressure Feedback EGR (PFE) EGR Vacuum Regulator (EVR)

Pinpoint Test **DL**

TEST STEP	RESULT ▶	ACTION TO TAKE
DL97 CONTINUOUS MEMORY CODE 33: CHECK EGR VALVE OPERATION		
Continuous Memory Code 33 indicates that the EGR valve intermittently did not open when it was required to. Possible causes are: — Faulty EGR valve. — Open or shorted harness. • Key off. • Connect a vacuum pump to the EGR valve. • While observing the EGR valve, slowly apply 10 in-Hg vacuum. **NOTE: EGR valve should begin to open with a very small amount of vacuum, approximately 1 to 1.5 in-Hg, and be fully open with about 4 in-Hg vacuum.** • **Does EGR valve move freely and smoothly?**	Yes ▶ No ▶	GO to **DL98**. CLEAR Continuous Memory (REFER to Quick Test Appendix). GO to EGR Valve Diagnosis, Section 6.
DL98 EVR HARNESS CHECK		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Enter Output State Check. Refer to Quick Test Appendix. • DVOM on 20 volt scale. • Connect DVOM negative test lead to Test Pin 40 at the breakout box and DVOM positive test lead to Test Pin 33. (Test Pin 52 for 1.9L CFI). • Cycle throttle if necessary to indicate greater than 10.5 volts. • Remain at this position. • While observing DVOM, grasp the harness closest to the EVR connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. • Lightly tap EVR solenoid to simulate road shock. • **Does DVOM indicate less than 10.5 volts?**	Yes ▶ No ▶	SERVICE as necessary. REMOVE breakout box. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. REMOVE breakout box. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid	Pinpoint Test	DN

Note

You should enter this Pinpoint Test only when a Service Code 31, 32, 33, 34, 35, 38 or 84 is received during Quick Test or from Pinpoint Test Step S8 .

Remember

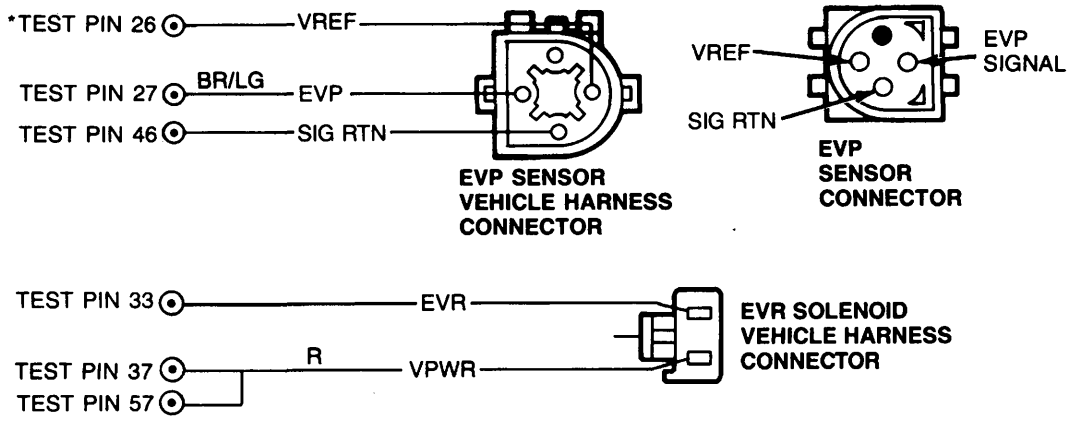
To prevent the replacement of good components, be aware that the following non-EEC area may be at fault:

- Damaged EGR valve

This Pinpoint Test is intended to diagnose only the following:

- EVP sensor (-9G428-)
- Harness circuits: VREF, EVP, SIG RTN, EVR, VPWR
- EVR Solenoid (-9J459-)
- EGR valve assembly
- Processor assembly (-12A650-)
- EGR and EVR vacuum lines

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9599-E

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid	Pinpoint Test	DN

Test Pin 46 SIG RTN

Application	Wire Color
All F-Series/Bronco	GY/R
All Others	BK/W

Test Pin 26 VREF

Application	Wire Color
All F-Series/Bronco	BR/W
All Others	O/W

Test Pin 33 EVR

Application	Wire Color
All F-Series/Bronco	BR/PK
All Others	DG

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN1 SERVICE CODE 31: ATTEMPT TO GENERATE CODE 35		
Service Code 31 indicates that the EGR Valve Position (EVP) sensor signal is less than the Self-Test minimum value of 0.2 volts. Possible causes are: — Faulty EVP sensor. — Open harness. — Grounded harness. — Faulty processor. • Key off, wait 10 seconds. • Disconnect EVP sensor. • Jumper VREF circuit to EVP circuit at the EVP sensor vehicle harness connector. • Rerun Key On Engine Off Self-Test. • **Is Code 35 present (ignore all other codes)?**	Yes ▶ No ▶	REPLACE EVP sensor. REMOVE Jumper. RERUN Quick Test. REMOVE Jumper. GO to **DN2**.
DN2 CHECK VREF CIRCUIT VOLTAGE		
• Key on, engine off. • EVP sensor disconnected. • DVOM on 20 volt scale. • Measure voltage between VREF circuit and SIG RTN circuit at the EVP sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to **DN3**. GO to Pinpoint Test Step **C1**.
DN3 CHECK EVP CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • EVP sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 200 ohm scale. • Measure resistance between EVP circuit at the EVP sensor vehicle harness connector and Test Pin 27 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **DN4**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid	Pinpoint Test	DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN4 CHECK EVP CIRCUIT FOR SHORT TO GROUND		
• Key off. • EVP sensor disconnected. • Breakout box installed. • Disconnect processor. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 27 and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DN5 SERVICE CODE 35: ATTEMPT TO GENERATE CODE 31		
Service Code 35 indicates that the EGR Valve Position (EVP) sensor signal is greater than the Self-Test maximum value of 4.81 volts. Possible causes are: — Faulty EVP sensor. — Short to power in harness. • Key off, wait 10 seconds. • Disconnect EVP sensor. • Rerun Key On Engine Off Self-Test. • **Is Code 31 present (ignore all other codes)?**	Yes ▶ No ▶	GO to DN6. GO to DN7.
DN6 CHECK VREF CIRCUIT VOLTAGE		
• Key on, engine off. • EVP sensor disconnected. • DVOM on 20 volt scale. • Measure voltage between VREF circuit and SIG RTN circuit at the EVP sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	REPLACE EVP sensor. RERUN Quick Test. GO to Pinpoint Test Step C1.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN7 CHECK EVP CIRCUIT FOR SHORT TO POWER		
• Key off. • EVP sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between Test Pin 27 and Test Pins 26 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT EVP sensor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DN10 SERVICE CODE 84: CHECK RESISTANCE OF EVR SOLENOID		
Service Code 84 indicates a failure in the EGR Vacuum Regulator (EVR) solenoid circuit. Possible causes are: — Faulty EVR solenoid — Open harness — Shorted harness — Faulty processor • Key off, wait 10 seconds. • Disconnect EVR solenoid. • DVOM on 200 ohm scale. • Measure solenoid resistance. • **Is resistance within specification per the following chart?**	Yes ▶ No ▶	GO to **DN11**. REPLACE EVR solenoid assembly. RERUN Quick Test.
DN11 CHECK VPWR CIRCUIT VOLTAGE		
• Key on, engine off. • EVR solenoid disconnected. • DVOM on 20 volt scale. • Measure voltage between battery negative post and VPWR circuit at the EVR solenoid vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to **DN12**. SERVICE open circuit. RECONNECT EVR solenoid. RERUN Quick Test.

Engine	Resistance Specification
4.9L and 5.8L U/8500	20 to 45 ohms
7.5L	100 to 135 ohms
All Others	30 to 70 ohms

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN12 CHECK EVR CIRCUIT CONTINUITY		
• Key off. • EVR solenoid disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 33 at the breakout box and EVR circuit at the EVR solenoid vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **DN13**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DN13 CHECK EVR CIRCUIT FOR SHORT TO POWER OR GROUND		
• Key off. • EVR solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 33 and Test Pins 37, 40, 46, 57, and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT EVR solenoid. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code is repeated, REPLACE processor.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN20 SERVICE CODE 34: CHECK FOR SERVICE CODE 84		
Service Code 34 in Key On Engine Off indicates that the EGR valve and/or EGR Valve Position (EVP) sensor is not fully seated in the closed position. The EVP sensor voltage is greater than the closed limit voltage of 0.67 volts. Because of the preload on the installed EVP sensor, it is very difficult to determine whether the EGR valve is seated or the EVP sensor is in contact with the EGR valve stem. Possible causes are: — Poor continuity at EVP sensor. — Non-seated EGR valve. — Faulty EGR valve. — Faulty EVP sensor. • Key off, wait 10 seconds • **Is Code 84 present in Key On Engine Off Self-Test?**	Yes ▶ No ▶	GO to DN10. GO to DN21.
DN21 CHECK EVP SENSOR AND EGR VALVE OPERATION		
• Key off, wait 10 seconds. • Disconnect EVP sensor. • Inspect both the connector on harness and sensor for damaged pins, corrosion, loose wires, etc. Service as necessary. • Remove vacuum line from EGR valve. • Exercise EGR valve by either applying and releasing vacuum with a vacuum pump or depressing and releasing the diaphragm manually. • Reconnect vacuum line to EGR valve and electrical connector to EVP sensor. • Rerun Key On Engine Off and Engine Running Self-Test. • **Is Code 34 still present?**	Yes ▶ No ▶	GO to DN22. The original Code 34 was the result of poor continuity at the EVP sensor connector or binding of the EGR valve stem by contaminants. Testing complete.
DN22 SUBSTITUTE EVP SENSOR ON ORIGINAL EGR VALVE		
• Key off, wait 10 seconds. • Install a known good EVP sensor on original EGR valve. • Perform Key On Engine Off Quick Test. • **Is Code 34 still present?**	Yes ▶ No ▶	GO to Section 6 for EGR valve diagnosis. The original Code 34 was the result of the original EVP sensor. SERVICE EVP sensor as necessary. RERUN Quick Test.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN25 SERVICE CODE 32: CHECK EVP SENSOR AND EGR VALVE OPERATION		
Service Code 32 in Key On Engine Off and Key On Engine Running indicates that the EGR valve and/or EVP sensor voltage is lower than normal in the closed position. The EVP voltage is less than the closed limit voltage of 0.29 volts. Because of the preload of the EVP sensor it is very difficult to determine whether the EGR valve has malfunctioned or the EVP sensor has an abnormally high resistance. Possible causes are: — Poor continuity at EVP sensor connector. — Non-seated EGR valve. — Faulty EGR valve. — Faulty EVP sensor. • Key off, wait 10 seconds. • Disconnect EVP sensor. • Inspect both the connector at harness and sensor for damaged pins, corrosion, loose wires, etc. Service as necessary. • Remove vacuum line from EGR valve. • Exercise EGR valve by either applying and releasing vacuum with a vacuum pump or depressing and releasing the diaphragm manually. • Reconnect vacuum line to EGR valve and electrical connector to EVP sensor. • Rerun Key On Engine Off and Engine Running Self-Test. • **Is Code 32 still present?**	Yes ▶ No ▶	GO to **DN26**. The original Code 32 was the result of poor continuity at the EVP sensor connector or binding of the EGR valve stem by contaminants. Testing complete.
DN26 SUBSTITUTE EVP SENSOR ON ORIGINAL EGR VALVE		
• Key off, wait 10 seconds. • Install a known good EVP sensor on original EGR valve. • Rerun Key On Engine Off Self-Test. • **Is Code 32 present?**	Yes ▶ No ▶	GO to Section 6 for EGR valve diagnosis. The original Code 32 was the result of the original EVP sensor. SERVICE EVP sensor as necessary. RERUN Quick Test.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN40 SERVICE CODE 33: VERIFY VACUUM IS PRESENT AT EGR VALVE		
Service Code 33 in Key On Engine Running indicates that the EVP sensor input did not change after the EVR solenoid was instructed by the processor to open the EGR valve. Because a Code 84 was not received in the Key On Engine Off Self-Test, it is known that the EVR solenoid functions electrically. It is also known that the EVP sensor is in the expected closed valve range because Code 32 and 34 were not received in either Key On Engine Off or Key On Engine Running Tests. Possible causes are: — Vacuum hose leaks — Obstructed vacuum hose — Obstructed EVR solenoid filter — Faulty EGR valve • Key off. • Disconnect vacuum line from EGR valve. • Connect vacuum gauge at open vacuum line. • Rerun Engine Running Self-Test while observing vacuum gauge. • **Is vacuum greater than 1.5 in-Hg (5 kPa)?**	Yes ▶ No ▶	REMOVE vacuum gauge. GO to DN43. REMOVE vacuum gauge. RECONNECT EGR valve vacuum line. GO to DN41.
DN41 VERIFY VACUUM SUPPLY TO EVR SOLENOID		
• Key off. • Disconnect the vacuum source to the EVR solenoid. • Install a vacuum gauge at source vacuum. • Start engine and check vacuum. • **Is vacuum greater than 10 in-Hg (33 kPa)?**	Yes ▶ No ▶	GO to DN42. CHECK source vacuum hose to EVR solenoid. SERVICE as necessary. RERUN Quick Test.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN42 CHECK VACUUM HOSE BETWEEN EVR SOLENOID AND EGR VALVE		
• Carefully check EGR vacuum hose from EGR valve to EVR solenoid for obstructions, cracks, loose connectors, blockage, kinks, leaks, etc. • **Is vacuum hose in good condition?**	Yes ▶	CHECK EVR solenoid filter for obstructions. REPLACE as necessary. If OK, REPLACE EVR solenoid assembly. RECONNECT vacuum hose. RERUN Quick Test.
	No ▶	SERVICE vacuum hose as necessary. RERUN Quick Test.
DN43 CHECK EVP SENSOR AND EGR VALVE OPERATION		
• Key off, wait 10 seconds. • Disconnect EVP sensor. • Inspect both the connector at harness and sensor for damaged pins, corrosion, loose wires, etc. Service as necessary. • EGR valve vacuum line disconnected. • Exercise EGR valve by either applying and releasing vacuum with a vacuum pump or depressing and releasing the diaphragm manually. • Reconnect vacuum line to EGR valve and electrical connector to EVP sensor. • Rerun Key On Engine Off and Engine Running Self-Test. • **Is Code 33 still present?**	Yes ▶	GO to **DN44**.
	No ▶	The original Code 33 was the result of poor continuity at the EVP signal connector or binding of the EGR valve stem by contaminants. SERVICE as necessary. Testing complete.
DN44 VERIFY EGR VALVE VACUUM CONTROL		
• Key off. • EGR valve vacuum disconnected. • Connect vacuum gauge to EGR valve, and apply 2 to 3 in-Hg (6.7 to 10 kPa) for 2 minutes. • **Does EGR valve hold vacuum?**	Yes ▶	RECONNECT EGR valve (vacuum), GO to **DN45**.
	No ▶	GO to Section 6 for EGR valve diagnosis.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid	Pinpoint Test	DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN45 SUBSTITUTE KNOWN GOOD EVP SENSOR ON ORIGINAL EGR VALVE		
• Key off, wait 10 seconds. • Install a known good EVP sensor on original EGR valve. • Rerun Engine Running Self-Test. • **Is Code 33 present?**	Yes ▶	GO to Section 6 for EGR valve diagnosis.
	No ▶	The original Code 33 was the result of the original EVP sensor. SERVICE EVP sensor as necessary. RERUN Quick Test.
DN50 SERVICE CODE 34: CHECK EGR VALVE OPERATION IN ENGINE RUNNING SELF-TEST WITH EGR VACUUM DISCONNECTED		
Service Code 34 in Key On Engine Running indicates that the EVP sensor voltage is greater than the closed limit voltage of 0.67 volts. Possible causes are: — Obstructed EVR solenoid filter — Faulty EVR solenoid — Faulty EGR valve — Faulty EVP sensor • Key off. • Disconnect vacuum hose from EGR valve and plug hose. • Rerun Engine Running Self-Test. • **Is Code 34 present?**	Yes ▶	GO to DN51.
	No ▶	CHECK EVR solenoid filter for obstructions. REPLACE as necessary. If OK, REPLACE EVR solenoid assembly. RECONNECT all vacuum hoses. RERUN Quick Test.
DN51 CHECK EVP SENSOR RESISTANCE WHILE APPLYING VACUUM TO EGR VALVE		
• Key off, wait 10 seconds. • Disconnect EVP sensor. • Disconnect vacuum hose at EGR valve. • Connect vacuum pump to EGR valve. • DVOM on 200,000 ohm scale. • Measure resistance between EVP circuit and VREF circuit at the EVP sensor while increasing vacuum to 10 in-Hg (33 kPa). • Observe resistance as vacuum increases. • **Does resistance decrease gradually from no more than 5,500 ohms to no less than 100 ohms?**	Yes ▶	GO to Section 6 for EGR valve diagnosis.
	No ▶	REPLACE EVP sensor. RECONNECT vacuum hose. RERUN Quick Test.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

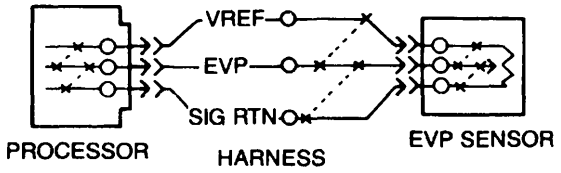
Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN90 CONTINUOUS MEMORY CODE 32: CHECK EVP SIGNAL VOLTAGE WHILE EXERCISING EVP SENSOR		
Continuous Memory Code 32 indicates that the EGR valve was closed further than normal with the engine at stabilized operating temperature and at idle, or that the EVP sensor has failed with an intermittent low voltage spike symptom. Possible causes are: — Faulty EVP sensor. — Faulty EGR valve. — Obstructed vacuum hose. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Disconnect vacuum hose at EGR valve. • Connect a vacuum pump to the EGR valve. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 27 and Test Pin 46 at the breakout box while doing the following: — Slowly increase vacuum at EGR valve to 6 in-Hg (20 kPa), then slowly bleed vacuum off the EGR valve and lightly tap on EVP sensor (simulate road shock). • **Does voltage drop to less than 0.24 volts?**	Yes ▶ No ▶	EGR valve may have caused Continuous Memory Code 32. CLEAR Continuous Memory (REFER to Quick Test Appendix). GO to Section 6 for EGR valve diagnosis. GO to DN91.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN91 CONTINUOUS MEMORY CODE 32/31: CHECK EVP SENSOR WHILE IN CONTINUOUS MONITOR MODE		
Continuous Memory Code 31 indicates that sometime during vehicle operation, the EVP signal was out of Self-Test range. Possible causes are: — Open or shorted circuit. — Faulty EVP sensor. • Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: • Connect a vacuum pump to the EGR valve. • Very slowly apply 20 kPa (6 in-Hg) vacuum to the EGR valve. • Slowly bleed vacuum off the EGR valve. Lightly tap on EVP sensor (simulate road shock). • Wiggle EVP sensor connector. • **Is a fault indicated?**  A13542-A	Yes ▶ No ▶	GO to DN92. GO to DN93.
DN92 MEASURE EVP SIGNAL VOLTAGE WHILE EXERCISING EVP SENSOR		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Connect a DVOM between Test Pin 27 and Test Pin 46 at the breakout box. • DVOM on 20 volt scale. • Re-enter Key On Engine Off Continuous Monitor mode. • While observing DVOM, repeat Test Step DN91. • **Does the fault occur below 4.25 volts?**	Yes ▶ No ▶	DISCONNECT and INSPECT connector. If connector and terminals are good, REPLACE EVP sensor. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to DN93.

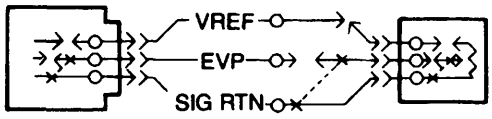
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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN93 CONTINUOUS MEMORY CODE 31 AND/OR 35: CHECK EEC-IV		
Continuous Memory Code 31 indicated an open in the EVP or VREF circuit, or a short to SIG RTN with the engine at stabilized operating temperature and at idle.	Yes ▶	ISOLATE fault and SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	GO to DN94.

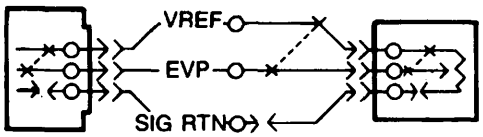
CODE 31:



A9600-D

Continuous Memory Code 35 indicated a short to VREF and/or VPWR, or an open in SIG RTN with the engine at stabilized operating temperature and at idle.

CODE 35:



A9908-C

- Enter Key On Engine Off Continuous Monitor mode.
- Observe VOM or STAR LED for a fault indication while performing the following:
  - — Refer to illustration above by code for possible circuit faults.
  - — Grasp the harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor.
- **Is a fault indicated?**

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid | Pinpoint Test | DN

TEST STEP	RESULT ▶	ACTION TO TAKE
DN94 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. on both the processor and harness connectors. • **Are connectors and terminals OK?**	Yes ▶	For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. If the fault is not identified by the EEC-IV Monitor Box Diagnosis, then CLEAR Continuous Memory (REFER to Quick Test Appendix). GO to Section 6 for EGR valve diagnosis.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
DN95 CONTINUOUS MEMORY CODE 33: LEAK TEST		
Continuous Memory Code 33 indicated that the EGR valve did not open with the engine at stabilized temperature and with an EVR solenoid duty cycle present. Possible causes are: — Obstructed or cracked vacuum hose to EGR valve. — Open circuit. — Faulty EGR valve. • Key off, wait 10 seconds. • Disconnect vacuum hose at EGR valve. • Connect a vacuum pump to EGR valve. • Apply 20 in-Hg (66 kPa) to EGR valve. • **Does EGR valve open and maintain vacuum?**	Yes ▶	REMOVE vacuum pump. RECONNECT EGR valve. GO to DN96.
	No ▶	REMOVE vacuum pump. RECONNECT EGR valve. CLEAR Continuous Memory Code 33 (REFER to Quick Test Appendix). GO to Section 6 for EGR valve diagnosis.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN96 EVR SOLENOID CHECK		
• Use Continuous Monitor mode (Refer to Quick Test Appendix). • Observe VOM or STAR LED for indication of a fault while performing the following: — Grasp the vehicle harness close to the EVR solenoid connector, wiggle, shake or bend a small section of the vehicle harness while working your way to the processor. • Inspect connectors, terminals for obvious damage or faults. • **Are any faults detected?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
DN98 CONTINUOUS MEMORY CODE 34: CHECK EVP RESISTANCE WHILE APPLYING VACUUM TO EGR VALVE		
Continuous Memory Code 34 indicated that the EGR valve was open with the engine at stabilized operating temperature and at idle. Possible causes are: — Faulty EVR filter. — Faulty EVR solenoid. — Faulty EGR valve. • Key off. • Disconnect EVP sensor. • Disconnect vacuum hose at EGR valve. • Connect vacuum pump to EGR valve. • DVOM on 200,000 ohm scale. • Measure resistance between EVP circuit and VREF circuit at the EVP sensor while increasing vacuum to 10 in-Hg (33 kPa). • Observe resistance as vacuum increases. • **Does resistance gradually change from no more than 5,500 ohms to no less than 100 ohms as the vacuum increases?**	Yes ▶ No ▶	REMOVE vacuum pump. RECONNECT all components. CLEAR Continuous Memory Code 34 (REFER to Quick Test Appendix). GO to **DN99**. REMOVE vacuum pump. RECONNECT all components. CLEAR Continuous Memory Code 34 (REFER to Quick Test Appendix). GO to Section 6 for EGR valve diagnosis.

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EGR Valve Position (EVP) Sensor EGR Vacuum Regulator (EVR) Solenoid

Pinpoint Test **DN**

TEST STEP	RESULT ▶	ACTION TO TAKE
DN99 EVR CHECK		
• Key off. • Disconnect vacuum hose from EGR valve and plug hose. • Rerun Engine Running Self-Test. • **Is Code 34 present?**	Yes ▶	CHECK EVR filter for obstructions. REPLACE as necessary. If OK, REPLACE EVR solenoid. RECONNECT all vacuum lines. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Vehicle Speed Sensor (VSS)	Pinpoint Test	DP

Note

You should enter this Pinpoint Test only when Service Code 29 is received during Quick Test or when you have been directed here from Pinpoint Test TC .

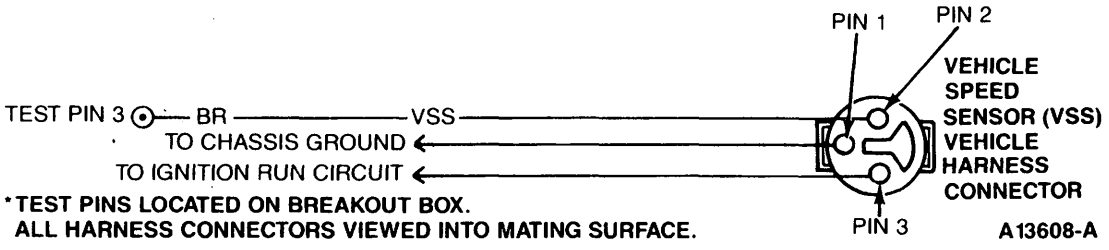
Remember

This Pinpoint Test is intended to diagnose only the following:

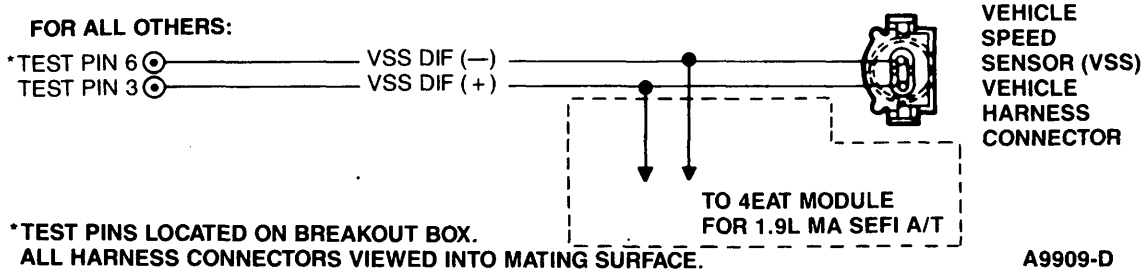
- VSS Harness Circuits
- Vehicle Speed Sensor (-9E731-)
- Processor Assembly (-12A650-)
- Vehicle Speed Sensor, 2.9L Scorpio (-9731-)

Pinpoint Test Schematic

FOR 2.9L SCORPIO



FOR ALL OTHERS



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Vehicle Speed Sensor (VSS) | Pinpoint Test | DP

	Test Pin 3	Test Pin 6
	Wire Colors	
Application	**VSS DIF (+)**	**VSS DIF (-)**
Passenger Car:		
1.9L MA SEFI	W-BK	BL
3.0L EFI Probe	BK-R	BK-BL
5.0L MA SEFI Lincoln Town Car	Y-LB	BK-LB
3.8L SC SEFI 3.8L RWD SEFI 5.0L MA SEFI 5.0L SEFI	DG-W	BK-W
5.0L SEFI, Mark VII	DG-W	P-LB
Truck:		
3.0L EFI, Aerostar 4.0L MA EFI, Aerostar/Ranger	DG-W	BK-Y
4.9L, 5.0L EFI, F-Series/Bronco 5.0L, 5.8L EFI E40D, F-Series/Bronco 5.8L E-Series 7.3L E40D Diesel, F-Series 7.5L EFI, F-Series	GY-BK	PK-O
All Others	DG-W	O-Y

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Vehicle Speed Sensor (VSS)	Pinpoint Test	DP

VEHICLE SPEED SENSOR (VSS) DRIVE CYCLE

- Record and clear EEC-IV Continuous Memory Codes.
- Warm engine to operating temperature.
- Perform the drive cycle below as appropriate for the vehicle being tested.

Automatic Transmission

Place the gear selector in LOW and heavily accelerate to 35 mph, then coast down to an idle and stop the vehicle. Shut engine off.

Manual Transmission

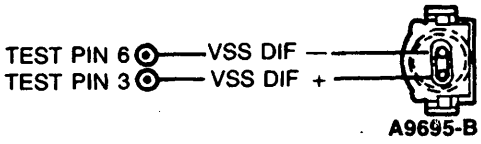
Starting in first gear, shift to second gear and moderately accelerate to 40 mph, then coast down to an idle and stop vehicle. Shut engine off.

Run Key On Engine Off Self-Test and record Continuous Memory Codes.

TEST STEP		RESULT ▶	ACTION TO TAKE
DP1	CONTINUOUS MEMORY CODE 29: ATTEMPT TO GENERATE CODE 29		
Continuous Memory Code 29 indicates that there is insufficient input to the processor from the Vehicle Speed Sensor (VSS). Possible causes are: — Faulty VSS. — Open or shorted circuit(s). — Faulty processor. • Perform Vehicle Speed Sensor Drive Cycle, all vehicles except 2.5L CFI and 3.0L EFI Aerostar. • **FOR 2.5L CFI and 3.0L EFI Aerostar, can drive complaint be verified?** • **ALL OTHERS, did Continuous Memory Code 29 repeat?**		Yes ▶ No ▶	GO to DP2. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix).

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Vehicle Speed Sensor (VSS) | Pinpoint Test | DP

TEST STEP	RESULT ▶	ACTION TO TAKE
DP2 CHECK VEHICLE SPEED SENSOR (VSS) RESISTANCE • Key off, wait 10 seconds. • Disconnect Vehicle Speed Sensor (VSS). • DVOM on 2,000 ohm scale. • Measure resistance across VSS. • **Is resistance between 190 and 250 ohms?**	Yes ▶ No ▶	GO to DP3. REPLACE VSS. REPEAT Test Step DP1, except for 2.5L CFI and 3.0L EFI Aerostar, VERIFY that drive complaint was eliminated.
DP3 CHECK CONTINUITY OF VSS CIRCUITS • Key off, wait 10 seconds. • VSS disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 6 at the breakout box and the VSS DIF(−) circuit at the VSS vehicle harness connector. • Measure resistance between Test Pin 3 at the breakout box and the VSS DIF(+) circuit at the VSS vehicle harness connector.  A9695-B • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DP4. SERVICE open circuit(s). REMOVE breakout box. RECONNECT all components. REPEAT Test Step DP1, except for 2.5L CFI and 3.0L EFI Aerostar, VERIFY that drive complaint was eliminated.

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Vehicle Speed Sensor (VSS)	Pinpoint Test	DP

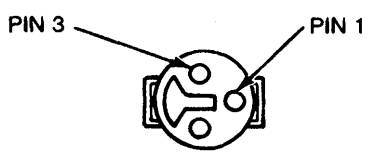
TEST STEP	RESULT ▶	ACTION TO TAKE
DP4 CHECK VSS CIRCUITS FOR SHORTS TO POWER OR GROUND		
• Key off. • VSS disconnected. • Breakout box installed, processor disconnected. • For 1.9L MA SEFI A/T, disconnect both 4EAT module vehicle harness connectors. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 3 and Test Pins 37, 40 and 6 at the breakout box. • Measure resistance between Test Pin 6 and Test Pin 37 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶	**For 1.9L MA SEFI A/T:** GO to DP6. **For all others:** REMOVE breakout box. RECONNECT processor. GO to DP5.
	No ▶	SERVICE short circuits(s). REMOVE breakout box. RECONNECT all components. REPEAT Test Step DP1, except for 2.5L CFI and 3.0L EFI Aerostar, VERIFY that drive complaint was eliminated.
DP5 REPEAT VSS DRIVE CYCLE WITH A KNOWN GOOD VSS INSTALLED		
• Processor connected. • Install known good VSS. • Perform VSS Drive Cycle (Except 2.5L CFI and 3.0L EFI Aerostar) then return to this Step. • **For 2.5L CFI and 3.0L EFI Aerostar, can drive complaint be verified?** • **All others, did Continuous Memory Code 29 repeat?**	Yes ▶	REPLACE processor. REMOVE breakout box. REINSTALL original VSS. REPEAT Test Step DP1, except for 2.5L CFI and 3.0L EFI Aerostar, VERIFY that drive complaint was eliminated.
	No ▶	The original Continuous Memory Code 29 was the result of the original VSS. REPLACE VSS. RERUN Quick Test. (Testing complete for 2.5L CFI and 3.0L EFI Aerostar.)

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Vehicle Speed Sensor (VSS)

Pinpoint Test **DP**

TEST STEP	RESULT ▶	ACTION TO TAKE
DP6 CHECK FOR SHORTED 4EAT MODULE		
NOTE: The 1.9L MA SEFI A/T has a VSS circuit input to the 4EAT module. This test is to verify that the VSS circuit is not shorted inside the 4EAT module. • Key off. • Breakout box installed, processor disconnected. • VSS disconnected. • Reconnect both 4EAT module vehicle harness connectors. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 3 and Test Pins 6, 37, and 40 at the breakout box. • **Is each resistance greater than 500 ohms?**	Yes ▶ No ▶	RECONNECT processor. GO to DP5. GO to Transmission Shop Manual Group to check for short in 4EAT system.
DP10 CONTINUOUS MEMORY CODE 29: CHECK FOR BATTERY		
Continuous Memory Code 29 indicates that there is insufficient input to the processor from the Vehicle Speed Sensor (VSS). Possible causes are: — Faulty VSS. — Open or shorted circuit(s). — Faulty processor. • Turn ignition switch to RUN. • Raise vehicle on hoist. • Disconnect VSS. • DVOM on 20 volt scale. • Measure voltage between Pin 1 and Pin 3 of the VSS vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to DP11. CHECK Fuse 20. If OK, SERVICE open circuit. RECONNECT VSS. RERUN Quick Test.



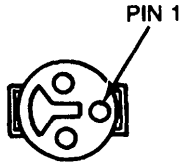
VSS VEHICLE HARNESS CONNECTOR A13543-A

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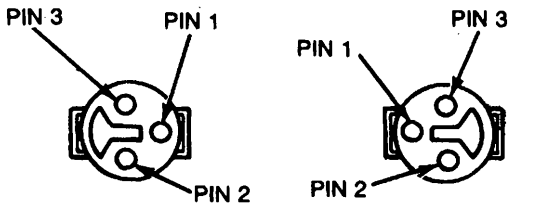
Vehicle Speed Sensor (VSS)

Pinpoint Test **DP**

TEST STEP	RESULT ▶	ACTION TO TAKE
DP11 CHECK GROUND TO VSS		
• Vehicle raised on hoist. • Key off. • VSS disconnected. • DVOM on 200 ohm scale. • Measure resistance between Pin 1 of VSS vehicle harness connector and engine block ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to DP12. SERVICE open in VSS ground circuit. RECONNECT VSS. RERUN Quick Test.
DP12 CHECK VSS OUTPUT VOLTAGE		
• Vehicle raised on hoist. • Turn ignition switch to RUN. • Place transmission in NEUTRAL. • VSS disconnected. • Jumper Pin 1 of harness side of connector to Pin 1 of sensor side of connector, Pin 2 of harness side of connector to Pin 2 of sensor side of connector, and Pin 3 of harness side of connector to Pin 3 of sensor side of connector. • Connect positive lead of DVOM to Pin 2 of sensor side of connector and negative lead of DVOM to Pin 1 of sensor side of connector. • DVOM on 20 volt scale. • Observe voltage while slowly rotating rear tire. • Does voltage rise to above 5.5 volts and fall to below 1.5 volts in a regular cycle?	Yes ▶ No ▶	REPLACE processor. RECONNECT VSS. RERUN Quick Test. REPLACE VSS. RERUN Quick Test.



VSS VEHICLE HARNESS CONNECTOR **A13544-A**



HARNESS SIDE OF CONNECTOR **SENSOR SIDE OF CONNECTOR**

A13545-A

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Fuel Injection Pump Lever (FIPL) Sensor	Pinpoint Test	DQ

Note

You should enter this Pinpoint Test only when a Service Code 23, 53, or 63 is received during Quick Test.

Remember

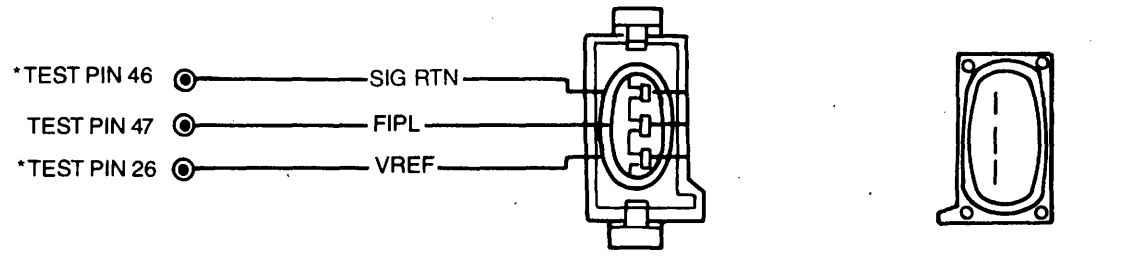
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Idle speeds/throttle stop adjustment.
- Binding throttle shaft/linkage or speed control linkage.
- Choke/high cam system, if equipped.

This Pinpoint Test is intended to diagnose only the following:

- FIPL sensor (-9B989-)
- Sensor harness circuits: VREF, FIPL, and SIG RTN
- Processor assembly (-12B565-)

Pinpoint Test Schematic



FUEL INJECTION PUMP LEVER (FIPL) SENSOR VEHICLE HARNESS CONNECTOR

FUEL INJECTION PUMP LEVER (FIPL) SENSOR CONNECTOR

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A12797-B

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Fuel Injection Pump Lever (FIPL) Sensor

Pinpoint Test **DQ**

Test Pin 26 **VREF**

Application	Wire Color
E-Series:	O/W
F-Series:	BR/W

Test Pin 46 **SIG RTN**

Application	Wire Color
E-Series:	BK/W
F-Series:	GY/R

Test Pin 47 **FIPL**

Application	Wire Color
E-Series:	DG/LG
F-Series:	GY/W

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Fuel Injection Pump Lever (FIPL) Sensor	Pinpoint Test	DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ1 SERVICE CODE 23: CHECK FOR STUCK THROTTLE LINKAGE		
NOTE: If you are directed here because of a Key On Engine Running Code 23, but an Engine ID Code of 5.0 was not received, then go directly to Pinpoint Test Step DJ1. • Visually inspect throttle linkage for binding or sticking. • Verify the throttle linkage is at mechanical/closed throttle. Check for binding throttle linkage, speed control linkage, vacuum line/electrical harness interference, etc. • **Does throttle move freely and return to closed throttle position?**	Yes ▶ No ▶	GO to DQ2. SERVICE as necessary. RERUN Quick Test.
DQ2 SERVICE CODE 53: ATTEMPT TO GENERATE CODE 63		
• Key off, wait 10 seconds. • Disconnect FIPL sensor vehicle harness connector at the Fuel Injection Pump. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Rerun Key On Engine Off Self-Test. • **Is Code 63 present (ignore all other codes)?**	Yes ▶ No ▶	GO to DQ3. GO to DQ4.
DQ3 CHECK VREF CIRCUIT VOLTAGE		
• Key off, wait 10 seconds. • FIPL sensor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the FIPL sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to DQ14 for FIPL sensor adjustment procedures. GO to Pinpoint Test Step C1.

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Fuel Injection Pump Lever (FIPL) Sensor	Pinpoint Test	DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ4 CHECK FIPL CIRCUIT FOR SHORT TO POWER		
• Key off, wait 10 seconds. • FIPL sensor disconnected. • DVOM on 200,000 ohm scale. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wire, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Measure resistance between Test Pin 47 and Test Pins 26 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT FIPL sensor. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components RERUN Quick Test. The original Code 32 was the result of the original EVP sensor. SERVICE EVP sensor as necessary. RERUN Quick Test.
DQ10 SERVICE CODE 63: ATTEMPT TO GENERATE CODE 53/23		
• Key off, wait 10 seconds. • Disconnect FIPL sensor vehicle harness connector at throttle body. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Jumper VREF circuit to FIPL circuit at FIPL sensor vehicle harness connector. • Perform Key On Engine Off Self-Test. **NOTE: If no codes are generated, immediately remove jumper and go directly to DQ13.** • **Is Code 53/23 present (ignore all other codes)?**	Yes ▶ No ▶	REMOVE jumper wire. RECONNECT FIPL sensor. GO to **DQ14** for FIPL sensor adjustment procedures. GO to **DQ11**.
DQ11 CHECK VREF CIRCUIT VOLTAGE		
• Key off, wait 10 seconds. • FIPL sensor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the FIPL sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to **DQ12**. GO to Pinpoint Test Step **C1**.

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Fuel Injection Pump Lever (FIPL) Sensor	Pinpoint Test	DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ12 CHECK FIPL CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • FIPL sensor disconnected. • DVOM on 200 ohm scale. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Measure resistance between FIPL circuit at the FIPL sensor vehicle harness connector and Test Pin 47 at the breakout box. • **Is the resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to **DQ13**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DQ13 CHECK FIPL CIRCUIT FOR SHORTS TO GROUND		
• Key off, wait 10 seconds • FIPL sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 47 and Test Pins 40, 46, and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Fuel Injection Pump Lever (FIPL) Sensor	Pinpoint Test	DQ

DQ14 CHECK FIPL SENSOR ADJUSTMENT

NOTE: Two people are required to perform this procedure.

- Perform Key On Engine Off Self-Test while holding the throttle wide open (WOT).
- After last service code has been displayed, remain in Self-Test.
- While in Self-Test, place 0.515 inch gauge block Rotunda number T83T-7B200-AH between the Fuel Pump Lever Travel Screw and the Gauge Boss (Figure 1 and 2).
- Cycle the Overdrive Cancel Switch (OCS) once.
- Observe Self-Test Output (STO) of the STAR tester for:
  - — Constant Tone, solid Light, or "STO LO" readout means the FIPL adjustment is within range, cycle OCS to get out of this test.
  - — Beeping Tone, Flashing Light, or "STO LO" erratic readout (4 per second) indicates adjustment is required.
  - — Beeping Tone, Flashing Light, or "STO LO" erratic readout (1 per second) indicates adjustment is required.
- If tone is undetectable, FIPL may have worn internal substrate. Check by trying to move sensor.
- If adjustment is required see Figure 3:

1. If FIPL sensor and bracket screws are tight and there are no signs of wear between the mounted parts, loosen FIPL sensor attachment screws and rotate sensor one way or the other until a constant tone, solid light, or "STO LO" readout is obtained. Tighten FIPL sensor attachment screws. REMOVE gauge block; RERUN Quick Test.
2. If bracket shows signs of wear due to movement or vibration, remove epoxy from FIPL bracket screw heads. Loosen those screws and turn the FIPL/bracket assembly to get within range then retighten screws and apply epoxy to screw head. REMOVE gauge block, RERUN Quick Test.
3. If the Service Codes are still present or a steady tone cannot be obtained, REPLACE the FIPL sensor.

WARNING

DO NOT TURN THE FUEL PUMP LEVER TRAVEL SCREW. THIS SCREW HAS BEEN PRESET AND SHOULD NOT BE TAMPERED WITH.

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Fuel Injection Pump Lever (FIPL) Sensor	Pinpoint Test	DQ

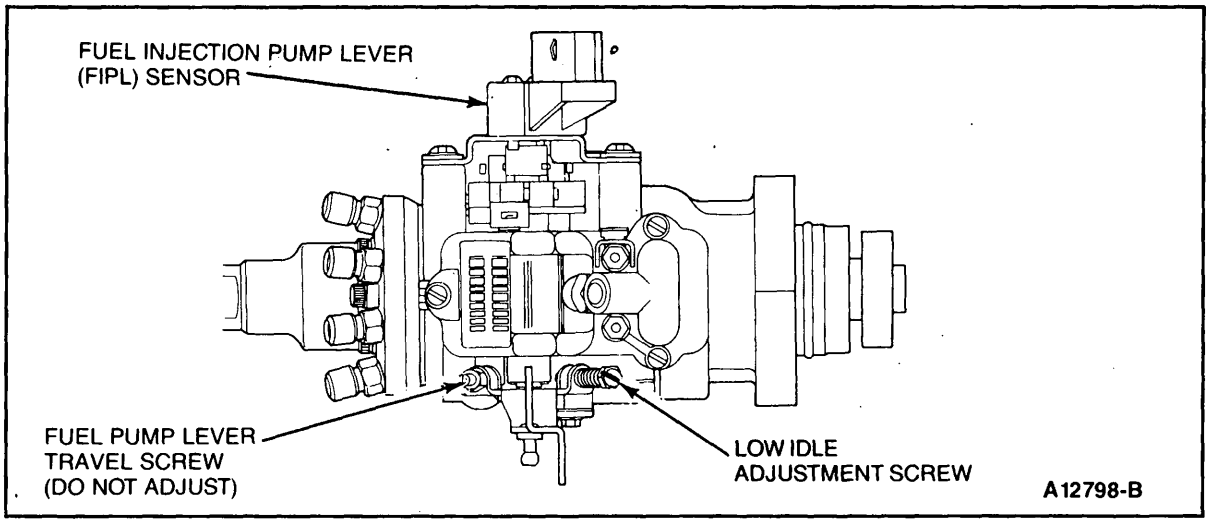


Figure 1 Top View of Fuel Pump

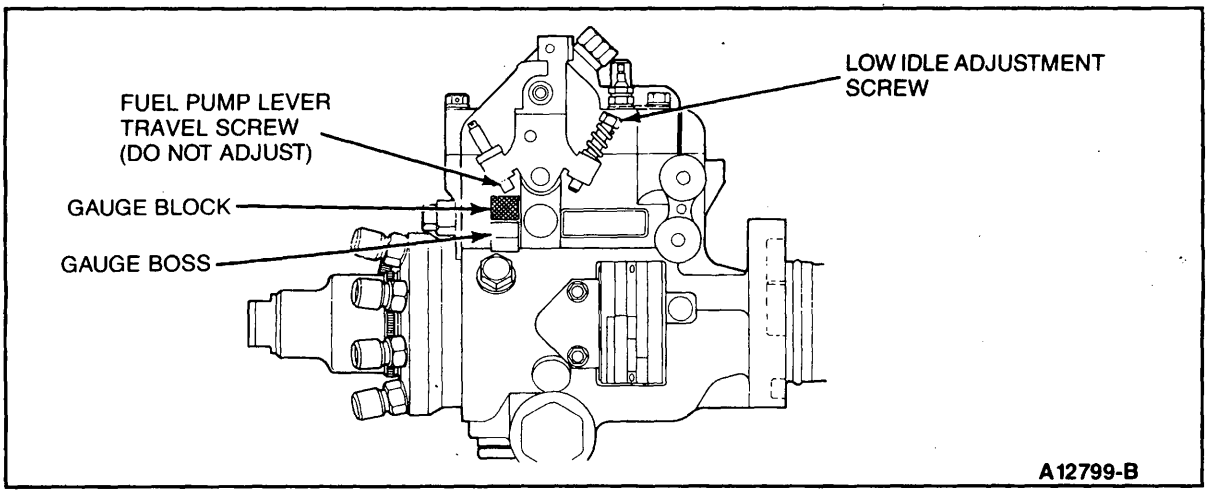


Figure 2 Throttle Side View

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Fuel Injection Pump Lever (FIPL) Sensor	Pinpoint Test	DQ

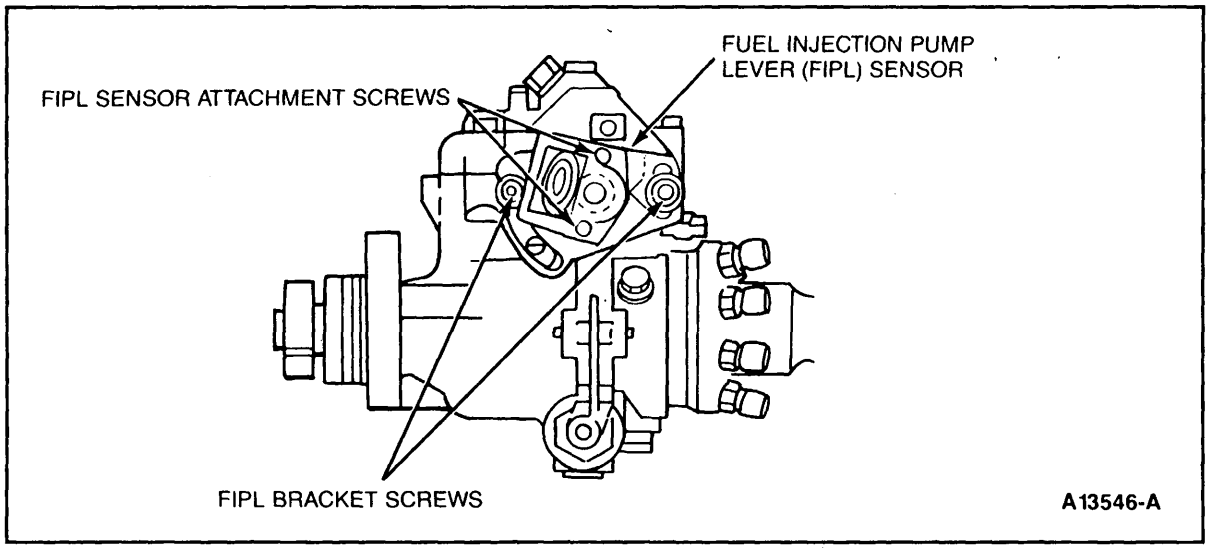
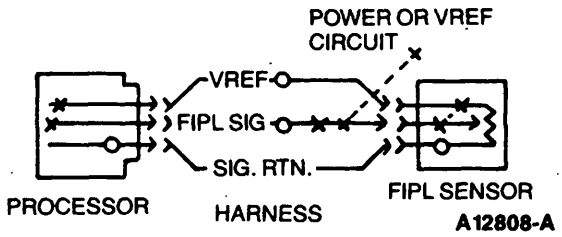


Figure 3 FIPL Side View

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Fuel Injection Pump Lever (FIPL) Sensor | Pinpoint Test | DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ90 CONTINUOUS MEMORY CODE 53: MONITOR FIPL CIRCUIT UNDER SIMULATED ROAD SHOCK		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed position and lightly tap on FIPL sensor (simulate road shock). — Wiggle FIPL harness connector • **Does VOM or STAR LED indicate a fault?**  	Yes ▶ No ▶	GO to DQ91. GO to DQ92.
DQ91 MEASURE FIPL CIRCUIT VOLTAGE WHILE EXERCISING FIPL SENSOR		
• Key off, wait 10 seconds. • VOM or STAR LED still connected to STO as in previous step. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Connect a DVOM from Test Pin 47 to Test Pin 46 at the breakout box. • DVOM on 20 volt scale. • Key on engine off. • While observing DVOM, repeat Step DQ90. • **Does the fault occur below 4.25 volts?**	Yes ▶ No ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, CLEAR Continuous Memory (REFER to Quick Test Appendix). GO to DQ14. VERIFY harness integrity, GO to DQ92.

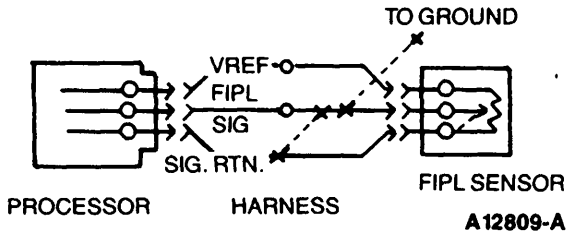
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Fuel Injection Pump Lever (FIPL) Sensor | Pinpoint Test | DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ92 CHECK EEC-IV VEHICLE HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step **DQ90**, grasp the vehicle harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Does VOM or STAR LED indicate a fault?**	Yes ▶ No ▶	ISOLATE fault. SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to **DQ93**.
DQ93 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • **Are connectors and terminals OK?**	Yes ▶ No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Fuel Injection Pump Lever (FIPL) Sensor | Pinpoint Test | DQ

TEST STEP	RESULT ▶	ACTION TO TAKE
DQ94 CONTINUOUS MEMORY CODE 63: MONITOR FIPL CIRCUIT UNDER SIMULATED ROAD SHOCK		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed condition. — Lightly tap on FIPL sensor (simulate road shock). — Wiggle FIPL sensor vehicle harness connector. • **Does VOM or STAR LED indicate a fault?**  A12809-A	Yes ▶ No ▶	INSPECT connectors. If connector and terminals are good, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to **DQ14**. GO to **DQ95**.
DQ95 CHECK EEC-IV VEHICLE HARNESS		
• Still Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in Step **DQ94** grasp the vehicle harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Does VOM or STAR LED indicate a fault?**	Yes ▶ No ▶	ISOLATE fault. SERVICE as necessary. REFER to appropriate figure. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to **DQ96**.

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Fuel Injection Pump Lever (FIPL) Sensor

Pinpoint Test **DQ**

TEST STEP		RESULT ▶	ACTION TO TAKE
DQ96	CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. • **Are connectors and terminals OK?**		Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
		No ▶	SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Cylinder Identification (CID) Sensor	Pinpoint Test	DR

Note

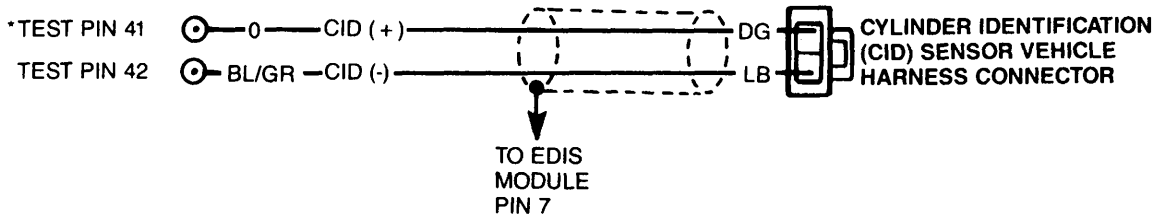
You should enter this Pinpoint Test only when Service Code 19 is received during Quick Test.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: CID(+), CID(-)
- CID Sensor (-6B288-)
- Processor Assembly (-12A650-)

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13547-A

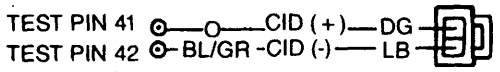
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Cylinder Identification (CID) Sensor	Pinpoint Test	DR

TEST STEP	RESULT ▶	ACTION TO TAKE
DR1 CONTINUOUS MEMORY CODE 19: CHECK CID SENSOR RESISTANCE		
Continuous Memory Service Code 19 indicates an error has been detected in the Cylinder Identification (CID) sensor input signal. The error could be due to a "hard fault" or an intermittent condition. On the 1.9L MA SEFI, the CID sensor is a Variable Reluctance (VR) device and is used for fuel injection synchronization. Possible causes: — Open or shorted harness. — Faulty CID sensor. — Faulty processor. • Key off. • Disconnect CID sensor (located on back of cylinder head by coil pack). • DVOM on 200,000 ohm scale. • Measure resistance of CID sensor. • **Is resistance between 300 and 600 ohms?**	Yes ▶ No ▶	GO to DR2 . REPLACE CID sensor. RERUN Quick Test.

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Cylinder Identification (CID) Sensor	Pinpoint Test	DR

TEST STEP	RESULT ▶	ACTION TO TAKE
DR2 CHECK CONTINUITY OF CID CIRCUITS		
• Key off. • CID sensor disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 41 at the breakout box and CID(+) circuit at the CID sensor vehicle harness connector. • Measure resistance between Test Pin 42 at the breakout box and CID(-) circuit at the CID sensor vehicle harness connector. • **Is each resistance less than 5.0 ohms?**  **CID SENSOR VEHICLE HARNESS CONNECTOR** **A13548-A**	Yes ▶ No ▶	GO to DR3. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DR3 CHECK CID CIRCUITS FOR SHORTS		
• Key off. • Breakout box installed, processor disconnected. • CID sensor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 41 and Test Pins 42, 37, 57, 40, 60 at the breakout box. • Measure resistance between Test Pin 42 and Test Pins 37, 57, 40, 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to DR4. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Cylinder Identification (CID) Sensor	Pinpoint Test	DR

TEST STEP	RESULT ▶	ACTION TO TAKE
DR4 CHECK FOR SHORTS IN PROCESSOR		
• Key off. • Breakout box installed. • Connect processor to breakout box. • CID sensor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 41 and Test Pins 42, 37, 57, 40, 60 at the breakout box. • Measure resistance between Test Pin 42 and Test Pins 37, 57, 40, 60 at the breakout box. • **Is each resistance greater than 500 ohms?**	Yes ▶ No ▶	GO to DR5. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
DR5 CHECK CID SENSOR OUTPUT		
• Key off. • Breakout box installed, processor connected. • Reconnect CID sensor. • DVOM on AC scale (to monitor less than 5.0 volts). • Start engine. • Measure voltage between Test Pins 41 and 42 at the breakout box while vearying engine rpm. • **Does voltage vary?**	Yes ▶ No ▶	GO to DR6. REPLACE CID sensor. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
DR6 ATTEMPT TO REGENERATE CODE 19		
• Key on, engine off. • Clear Continuous Memory (refer to Quick Test Appendix). • Start engine. • Rev engine to greater than 3100 rpm 2 or 3 times. • Key off. • Rerun Key On Engine Off Self-Test. • **Is Continuous Memory Code 19 present?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE CODE 19 is intermittent. INSPECT harness for possible intermittent opens or shorts. SERVICE as necessary. If an EEC-IV Monitor Box is available, REFER to Section 18; EEC-IV Monitor Box: Intermittent Fault Diagnosis.

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Neutral Drive Switch A/C Input	Pinpoint Test	FA

Note

You should enter this Pinpoint Test only when a Service Code 67 or 79 is received during Quick Test or you have been directed here from Diagnosis By Symptom.

Remember

This Pinpoint Test is intended to diagnose only the following:

- A/C input to processor
- Clutch engage switch (-11A152-)
- Neutral clutch switch (-11A152-)
- Neutral drive switch (-7A247-)
- Neutral gear switch (-7A247-)
- Processor (-12A650-)
- Harness circuits: CES, NCS, NDS, NGS, ACC, ACCS and SIG RTN

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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

Test Pin 10 A/C Input

Application	Wire Color
5.0L Mark VII	LG/P
1.9L SEFI MA	GR/BK
2.3L OHC MA 2.5L CFI 3.0L SHO 3.8L SC, RWD 5.0L SEFI MA	PK/LB
1.9L CFI/EFI 2.9L Car 3.0L Truck 4.0L Aerostar 4.9L, 5.0L, 5.8L, 7.5L	BK/Y
2.3L HSC 2.3L Truck 2.9L Truck 4.0L Ranger	T/Y
3.0L Probe	PU/BK

Test Pin 30 NDS

Application	Wire Color
1.9L SEFI MA	BR/Y
5.0L Mark VII Crown Victoria/ Grand Marquis	W/PK
3.8L RWD, SC	R/LB
1.9L CFI/EFI 2.3L HSC	GY/O
2.3L OHC, 2.3L MA 3.0L Car 5.0L Mustang	P/Y
3.0L Probe	R/BL
2.3L Truck 2.9L Truck	W/BK
2.9L Car 4.9L E-Series 5.8L E-Series	BR/W
2.5L CFI 5.0L F-Series/Bronco	LB/Y
5.0L E-Series	LB/W
4.9L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series	GY/Y

Test Pin 46 SIG RTN

Application	Wire Color
1.9L MA SEFI	LG/B
2.9L Scorpio	BR
3.0L Probe	LG/Y
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Deisel	GY/R
All Others	BK/W

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Neutral Drive Switch A/C Input

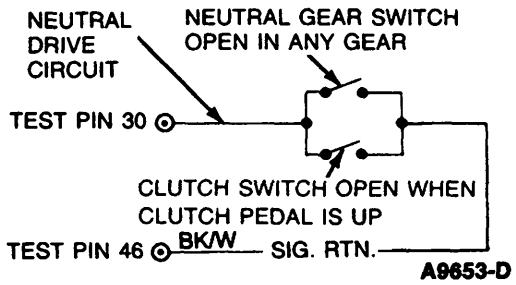
Pinpoint Test **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA1 CODE 67 SYSTEM IDENTIFICATION		
A Code 67 resulted from the voltage being high at: — Pin 10 = A/C input — Pin 30 = Neutral drive while cranking the engine or during KOEO test. Possible causes are: — A/C circuit shorted to power — Neutral clutch/drive circuits open — Neutral clutch/drive switch open — Faulty processor — Starter relay disconnected during Self-Test.		
For Manual Transmissions: 1.9L CFI, 2.5L, 5.0L, 5.8L, 7.5L	→	GO to FA10.
3.0L SHO and 4.9L	→	GO to FA7.
1.9L EFI, 1.9L MA SEFI, 2.3L, 2.9L, 3.8L SEFI Super Charged and 5.0L SEFI Mass Air	→	GO to FA2.
For E40D Transmissions: 4.9L, 5.8L, 7.5L, 7.3L Diesel	→	GO to FA10.
For all other Automatic Transmissions: 1.9L MA SEFI, 3.0L Probe	→	GO to FA13.
For all other engines:	→	GO to FA8.

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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA2 CHECK NEUTRAL GEAR/CLUTCH INPUT		
• Key off, wait 10 seconds. • Verify A/C is off, if so equipped. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 30 and Test Pin 46. 1. With transmission in NEUTRAL and clutch up. 2. With transmission in GEAR and clutch down. • **Is each resistance less than 5 ohms?**  	Yes ▶ No ▶	GO to **FA3**. GO to **FA5**.
FA3 CHECK NEUTRAL GEAR/CLUTCH INPUT INTEGRITY		
• Key off. • Breakout box installed. • Processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 30 and Test Pin 46 at the breakout box with transmission in any GEAR and the clutch pedal up. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	**For vehicles with A/C:** GO to **FA10**. **All others:** REPLACE processor. REMOVE breakout box. RERUN Quick Test. GO to **FA4**.

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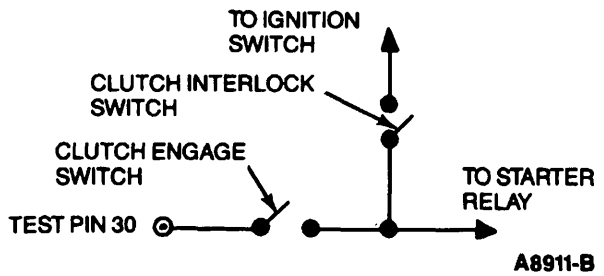
Neutral Drive Switch A/C Input | Pinpoint Test | FA

TEST STEP	RESULT ▶	ACTION TO TAKE
FA4 CHECK FOR SHORT TO GROUND		
• Key off. • Breakout box installed. • Processor disconnected. • Disconnect clutch interlock switch. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 30 and Test Pin 46 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶	**For vehicles with A/C:** GO to FA10. **All others:** REPLACE processor. REMOVE breakout box. RERUN Quick Test.
	No ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
FA5 CHECK NEUTRAL GEAR/CLUTCH SWITCH		
• Key off. • DVOM on 200 ohm scale. • Breakout box installed, processor disconnected • Locate Neutral Gear switch (on transmission) and Clutch switch (at clutch pedal linkage). • Disconnect vehicle harness at both switches and inspect connectors for pushed back pins. • Measure resistance across the Neutral Gear switch terminals with transmission in NEUTRAL and across the Clutch switch terminals with the clutch pedal down. • **Is each resistance less than 5 ohms?**	Yes ▶	GO to FA6.
	No ▶	REPLACE open switch(es). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

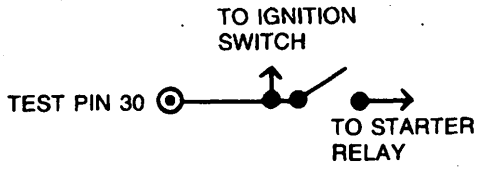
TEST STEP	RESULT ▶	ACTION TO TAKE
FA6 CHECK NEUTRAL GEAR/CLUTCH HARNESS		
• Key off. • DVOM on 200 ohm scale. • Breakout box installed, processor disconnected. • Vehicle harness disconnected at the Neutral Gear switch and Clutch switch. • Measure resistance between Test Pin 30 and the Neutral Gear switch harness connector and between Test Pin 30 and the Clutch switch harness connector. • Measure resistance between Test Pin 46 and the Neutral Gear switch harness connector and between Test Pin 46 and the Clutch switch harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	**For vehicles with A/C:** GO to **FA10**. **For all others:** REPLACE processor. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
FA7 CHECK CLUTCH ENGAGE SWITCH		
NOTE: For 4.9L engines, the clutch pedal must be down during KOEO test; if not, a Code 67 will result. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Clutch pedal down. • Measure resistance between Test Pin 30 and Test Pin 46. • **Is each resistance less than 5 ohms?**  	Yes ▶ No ▶	**For vehicles with A/C:** GO to **FA10**. **For all others:** REPLACE processor. SERVICE open circuit. REMOVE breakout box. RECONNECT all components.

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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA8 CHECK NEUTRAL DRIVE INPUT		
• Key off, wait 10 seconds. • Verify heater control is in OFF position, if so equipped. • Verify transmission is in NEUTRAL or PARK. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor connected. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 30 at the breakout box and chassis ground. • **Is voltage less than 1.0 volt?**	Yes ▶ No ▶	**For vehicles with A/C:** GO to **FA10**. **For all others:** REPLACE processor. Go to **FA9**.



NEUTRAL DRIVE CIRCUIT

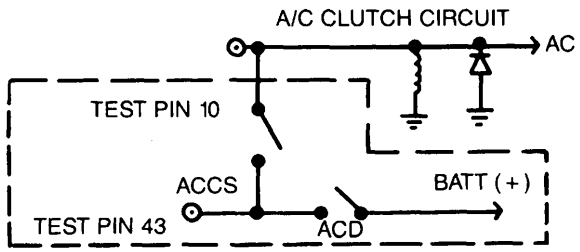
CLOSED IN PARK AND NEUTRAL **A9475-C**

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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA9 CHECK NEUTRAL DRIVE SWITCH		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Locate the Neutral Drive switch. • Disconnect vehicle harness from the Neutral Drive switch and measure resistance across the switch. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE open in vehicle harness Neutral Drive circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. REPLACE Neutral Drive switch. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
FA10 CHECK A/C INPUT		
NOTE: Before entering this test, verify Shift Selector is in PARK for E4OD vehicles only, and A/C selector is off. If A/C was on, rerun Quick Test. If code 67 or 79 is present, continue with this test. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 10 at the breakout box and chassis ground. • **Is voltage greater than 1.0 volt?**	Yes ▶ No ▶	SERVICE short to power in A/C circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. **For vehicles with E40D transmission:** GO to Pinpoint Test Step TC1. **For all others:** REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.



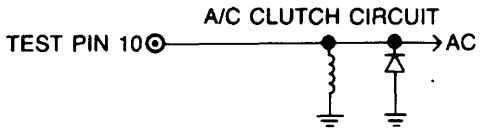
2.3L HSC CAR, 2.3L & 4.9L TRUCK

A13549-A

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Neutral Drive Switch A/C Input | Pinpoint Test | FA

TEST STEP	RESULT ▶	ACTION TO TAKE
FA11 CHECK A/C INPUT CIRCUIT		
NOTE: A low idle with A/C on could be the result of the processor not receiving, or recognizing the A/C input on Pin 10. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • A/C on. • Measure voltage between Test Pin 10 and Test Pin 40. • **Is voltage greater than 10.5 volts?**	Yes ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
	No ▶	SERVICE open in A/C circuit. Refer to the appropriate engine schematic in Engine Supplement Sections. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

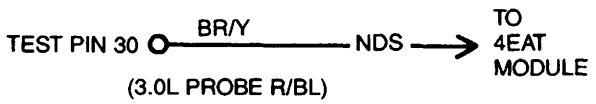


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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

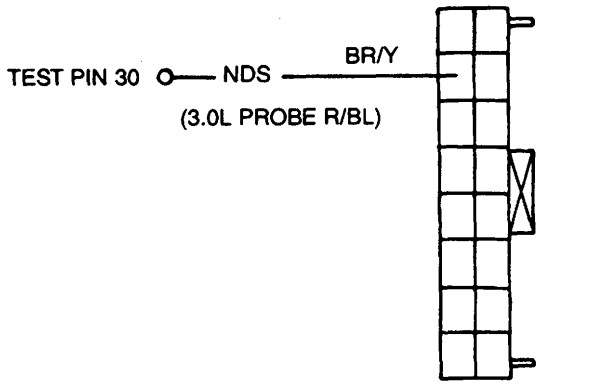
TEST STEP	RESULT ▶	ACTION TO TAKE
FA13 CHECK NEUTRAL DRIVE INPUT		
• Key off. • Verify transmission is in PARK or NEUTRAL. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Disconnect 16 pin connector from the 4EAT module. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 30 at the breakout box and chassis ground. • **Is voltage less than 1.0 volt?**  **A13550-A**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RER UN Quick Test. Key off. GO to **FA14**.

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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

TEST STEP		RESULT ▶	ACTION TO TAKE
FA14	CHECK NDS CIRCUIT CONTINUITY BETWEEN PROCESSOR AND 4EAT MODULE		
• Key off. • 4EAT module 16 pin connector disconnected. • Breakout box installed. • Disconnect processor. • DVOM on 200 ohm scale.		Yes ▶	GO to Transmission Shop Manual Group for 4EAT system diagnosis. REMOVE breakout box and RECONNECT all components when testing is complete.
• Measure resistance between Test Pin 30 at the breakout box and the NDS pin at the 4EAT module vehicle harness connector. • **Is resistance less than 5.0 ohms?**		No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.



4EAT MODULE 16-PIN VEHICLE HARNESS CONNECTOR

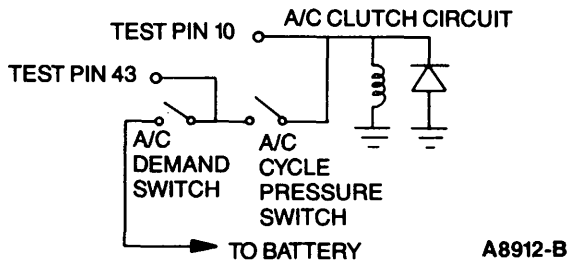
A13551-A

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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA15 CHECK FOR NONFUNCTION A/C WITH HIGH IDLE		
NOTE: A high idle with A/C instrument panel switch on but A/C not functioning could be the result of no signal at A/C clutch. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect A/C clutch connector. • DVOM on 20 volt scale. • Key on, engine off. • A/C on. • Measure voltage between input pin on fan connector and Test Pin 40 at the breakout box. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to **FA16**. SERVICE open in A/C circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.



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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA16 CHECK CONTINUITY OF A/C CLUTCH		
• Key off. • Breakout box installed, processor disconnected. • A/C clutch disconnected. • DVOM on 200 ohm scale. • Measure the resistance across both pins on the A/C clutch. • **Is resistance between 2.14 and 3.34 ohms?**	Yes ▶	Fault was probably due to A/C clutch connector not seated. CHECK for damage or loose pins in clutch connector. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT all components. REFER to Ventilating/Climate Control Shop Manual Group for A/C clutch service.
FA17 CHECK CONTINUITY OF A/C CYCLE PRESSURE SWITCH CIRCUIT		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • A/C cycle pressure switch disconnected. • A/C demand switch on. • DVOM on 200 ohm scale. **For 4.9L only:** • Measure the resistance between Test Pin 43 at the breakout box and battery positive side of the A/C cycle pressure switch connector. **For all vehicles:** • Measure the resistance between Test Pin 10 at the breakout box and negative side of the A/C cycle pressure switch connector. • **Is each resistance less than 5 ohms?**	Yes ▶	EEC-IV system OK. REMOVE breakout box. RECONNECT all components. REFER to Ventilating/Climate Control Shop Manual Group for A/C cycle pressure switch service.
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Neutral Drive Switch A/C Input

Pinpoint Test **FA**

TEST STEP	RESULT ▶	ACTION TO TAKE
FA18 CHECK AC DEMAND/AC CYCLE PRESSURE SWITCH CIRCUIT FOR SHORT TO POWER		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • A/C demand switch off. • DVOM on 20 volt scale. • Key on. • Measure voltage between Test Pin 43 at the breakout box and chassis ground. • **Is voltage greater than 1.0 volts?**	Yes ▶ No ▶	VERIFY operation of A/C demand and A/C cycle pressure switch(s). IF OK, SERVICE short circuit RE-EVALUATE symptom. REMOVE breakout box. RECONNECT processor. REFER to Ventilating/ Climate Control Shop Manual Group A/C Clutch Diagnosis. If OK, REPLACE processor
FA20 CHECK NDS CIRCUIT FOR SHORT TO GROUND OR CLOSED NEUTRAL DRIVE SWITCH		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnect. • Place transmission in DRIVE. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 30 and Test Pin 40/60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to Section 2 for Routine 211, High Idle. SERVICE short circuit or closed neutral drive switch. REMOVE breakout box. RECONNECT processor. RE-EVALUATE symptom.

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Brake On/Off (BOO)	Pinpoint Test	FD

Note

You should enter this Pinpoint Test only when a Service Code 74 or 75 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

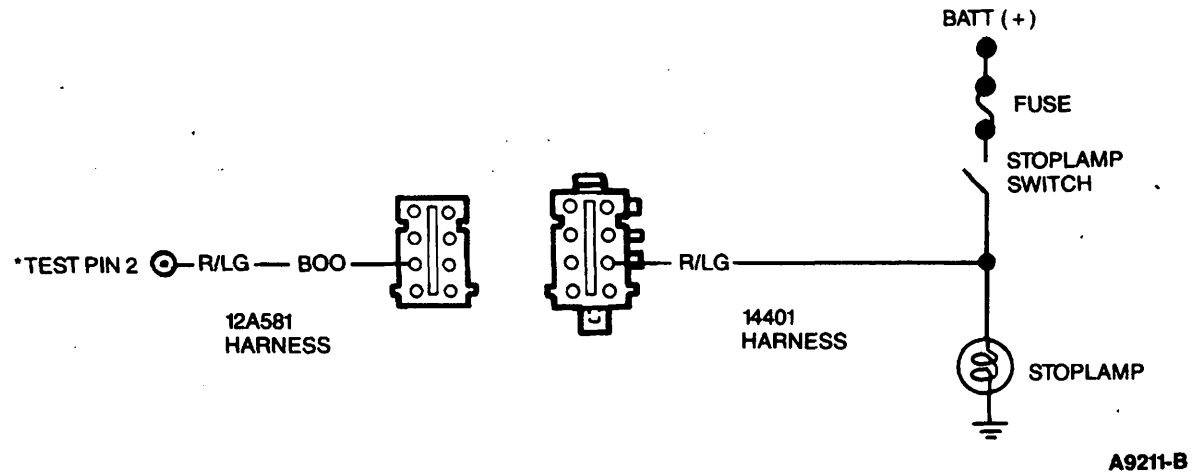
- Brakelamp, Brake switch, and fuse.

This Pinpoint Test is intended to diagnose only the following:

- BOO circuit
- Processor assembly (-12A650-)

Pinpoint Test Schematic

Mustang



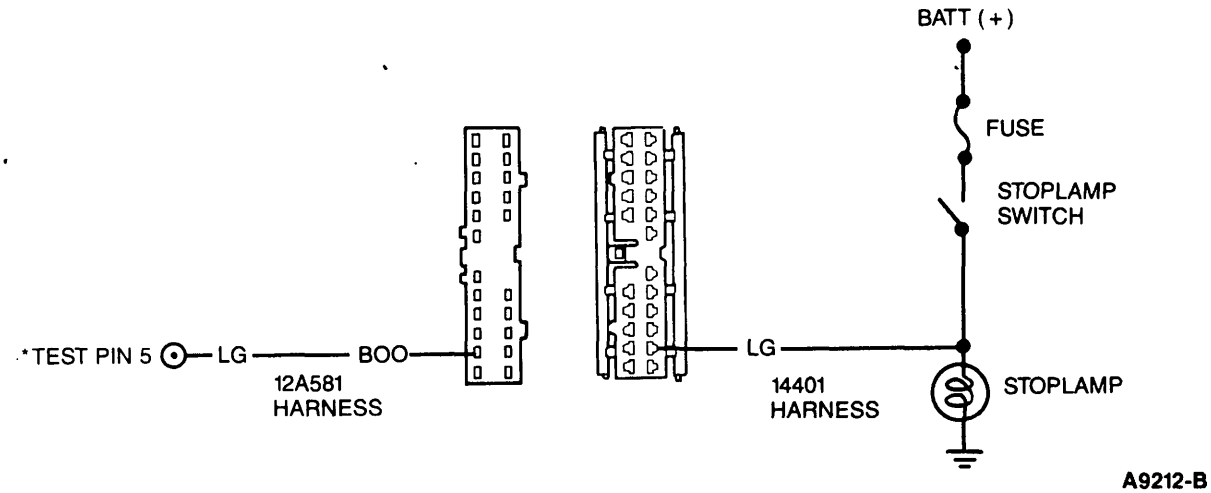
*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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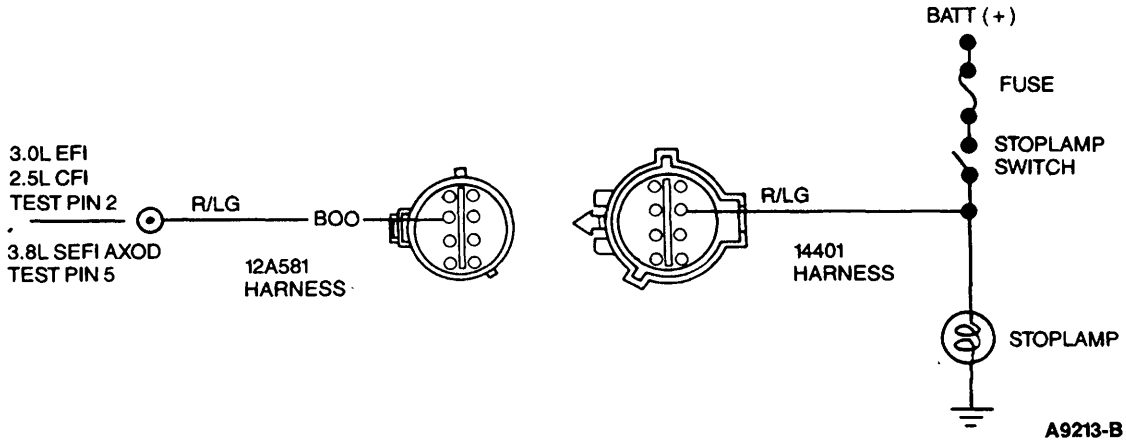
Brake On/Off (BOO)	Pinpoint Test	FD

Pinpoint Test Schematic

Thunderbird/Cougar



Taurus/Sable (Except 3.0L SHO)

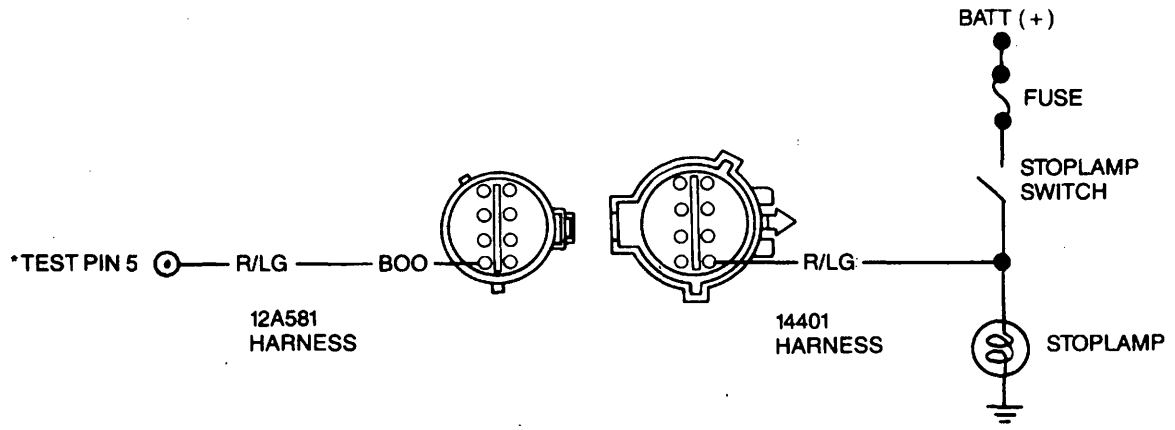


*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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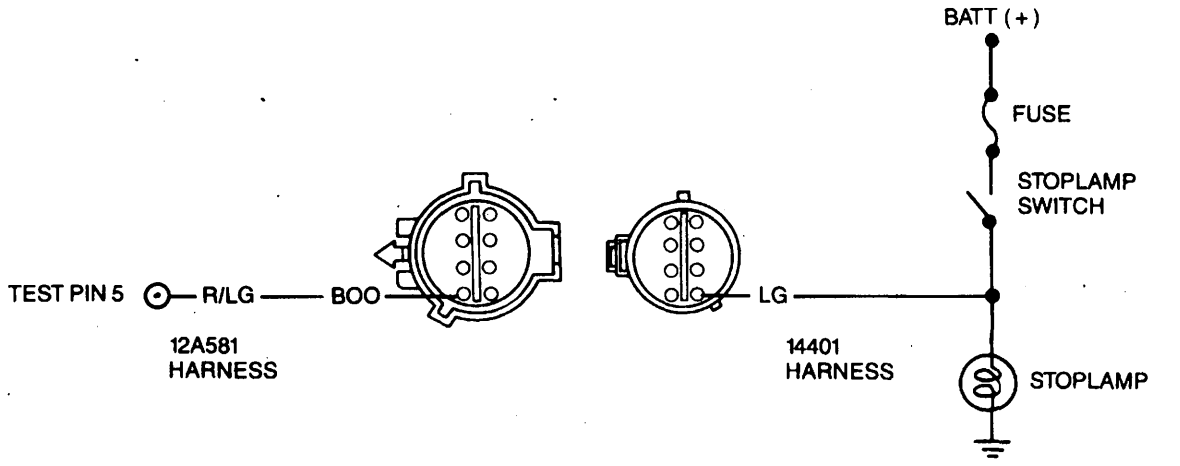
Brake On/Off (BOO)	Pinpoint Test	FD

Taurus/Sable (3.0L SEFI SHO)



A9214-B

Continental (3.8L SEFI AXOD)



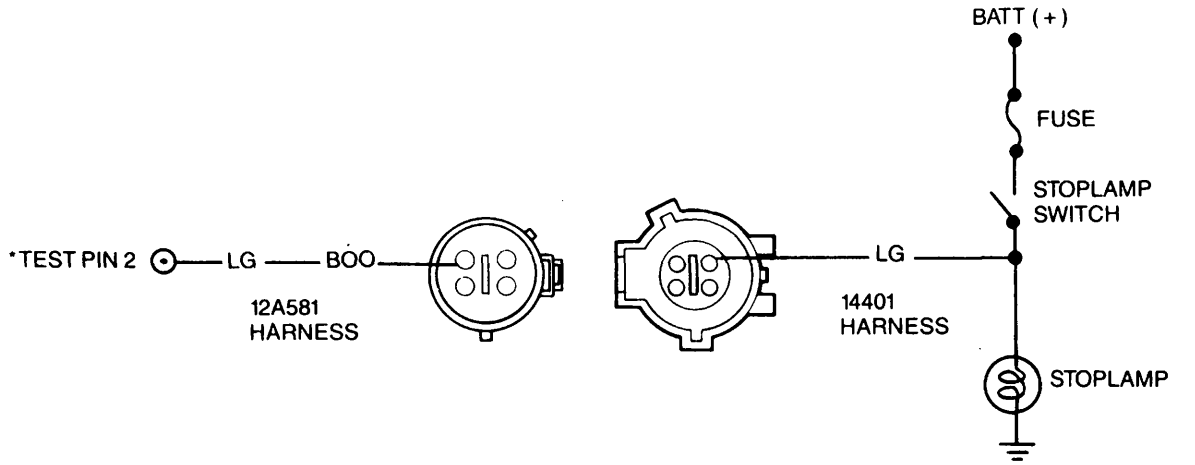
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*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

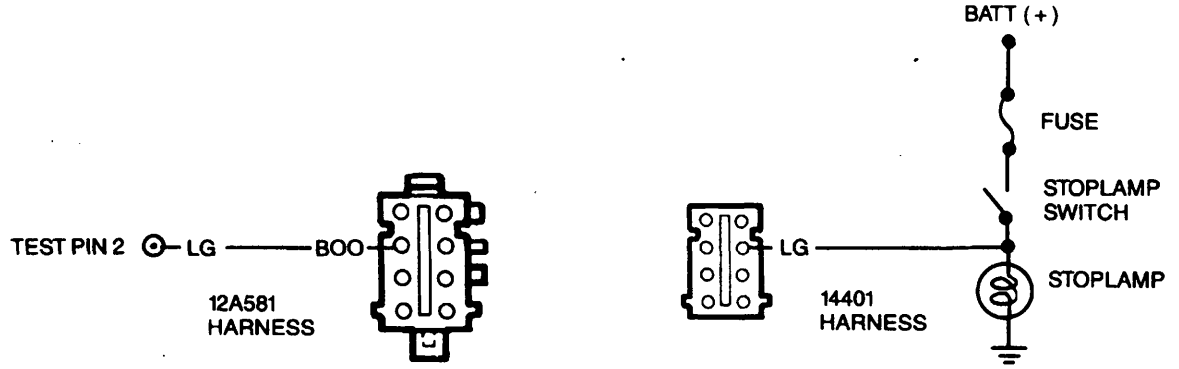
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Brake On/Off (BOO)	Pinpoint Test	FD

Crown Victoria/Grand Marquis



Mark VII

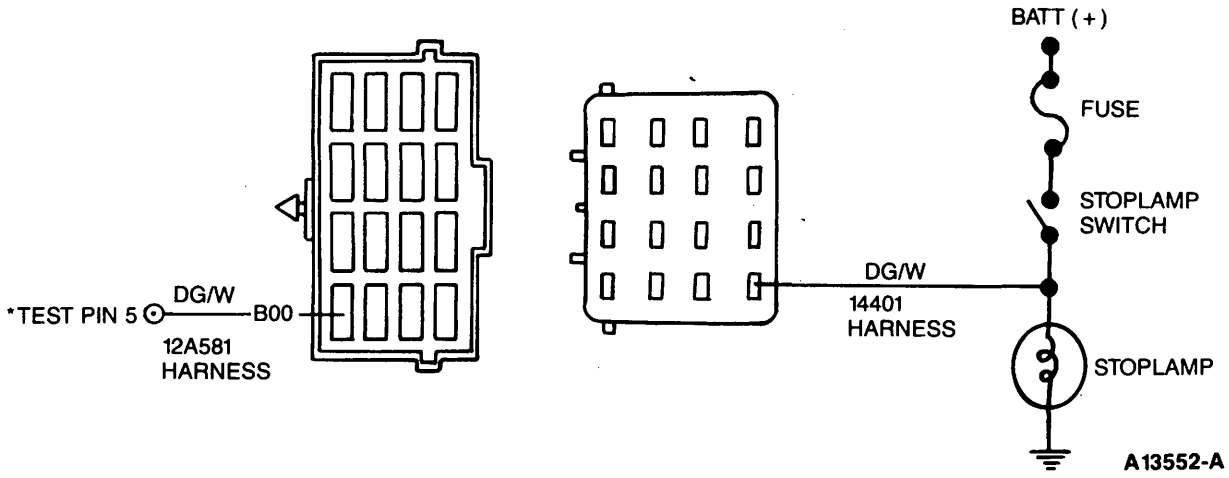


*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

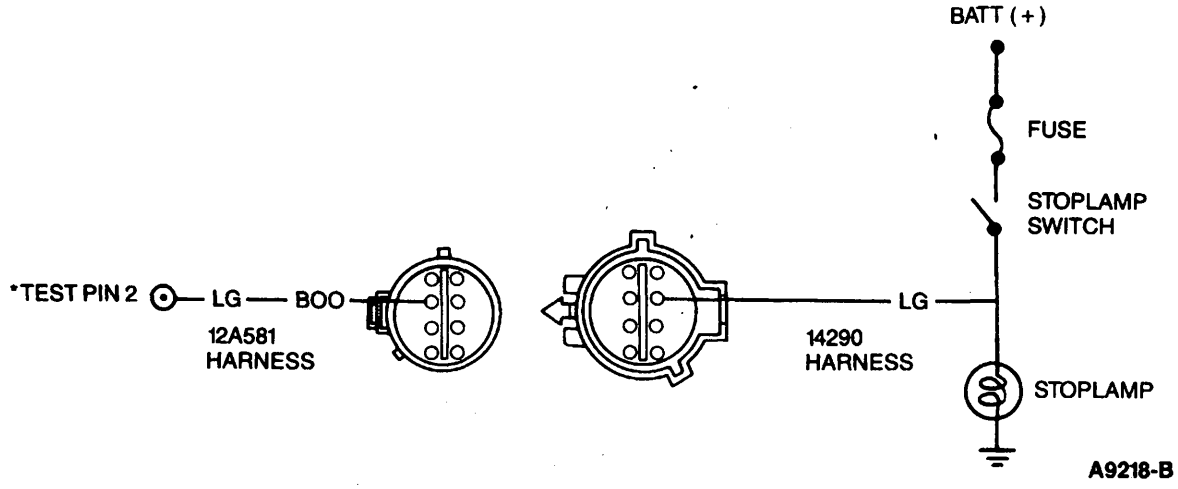
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Brake On/Off (BOO)	Pinpoint Test	FD

Town Car



Bronco II/Ranger (Except 4.0L)

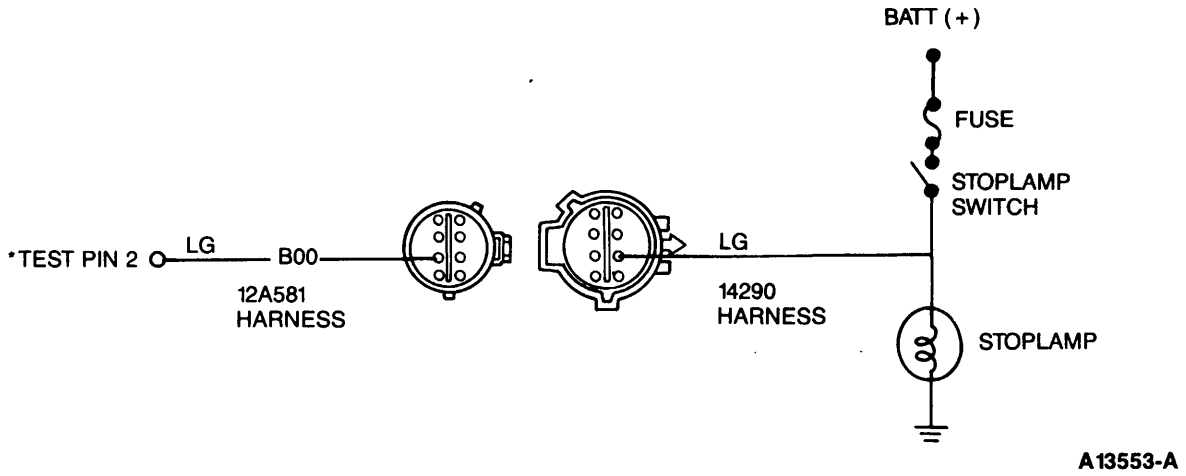


*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

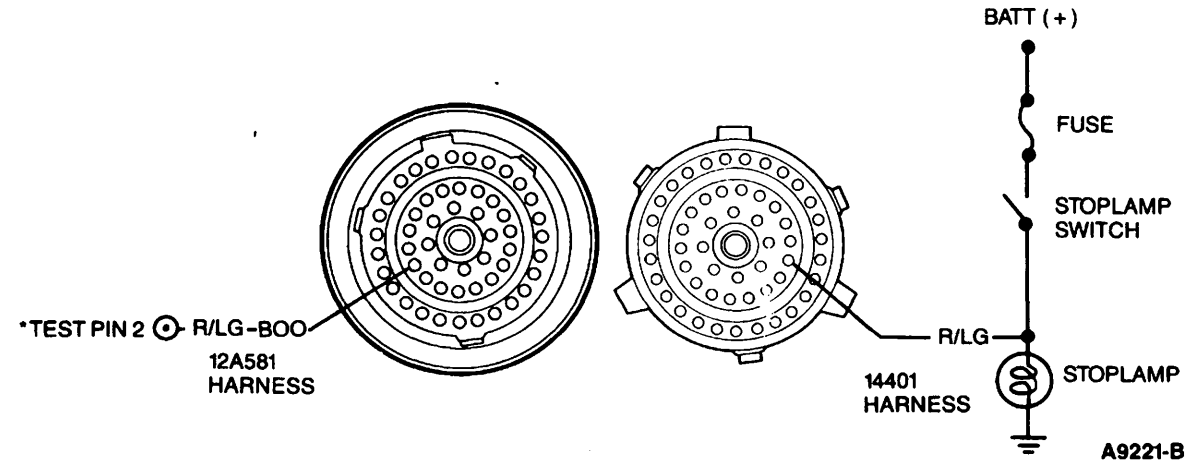
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Brake On/Off (BOO)	Pinpoint Test	FD

Bronco II/Ranger (4.0L)



Aerostar

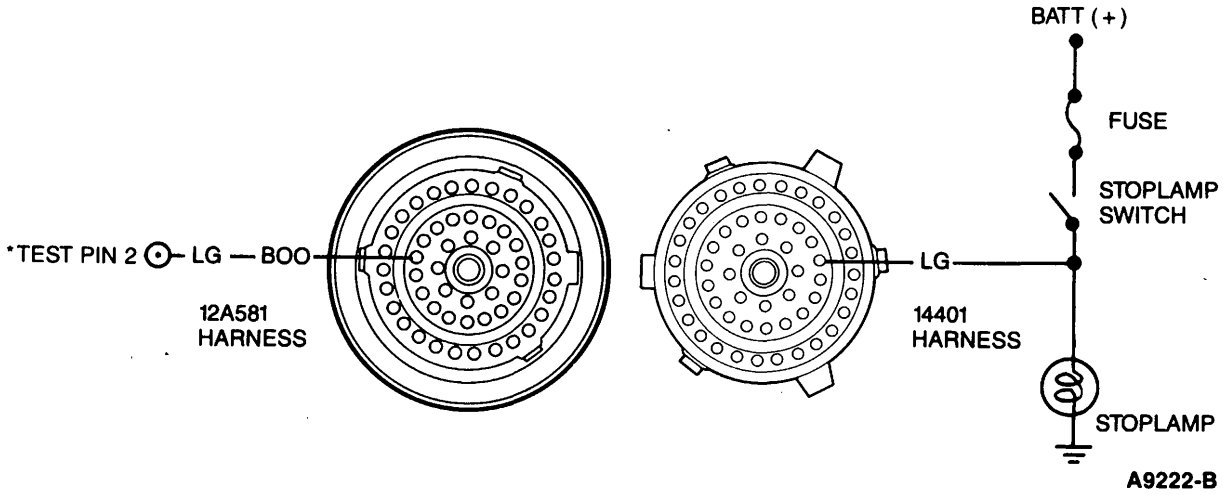


*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

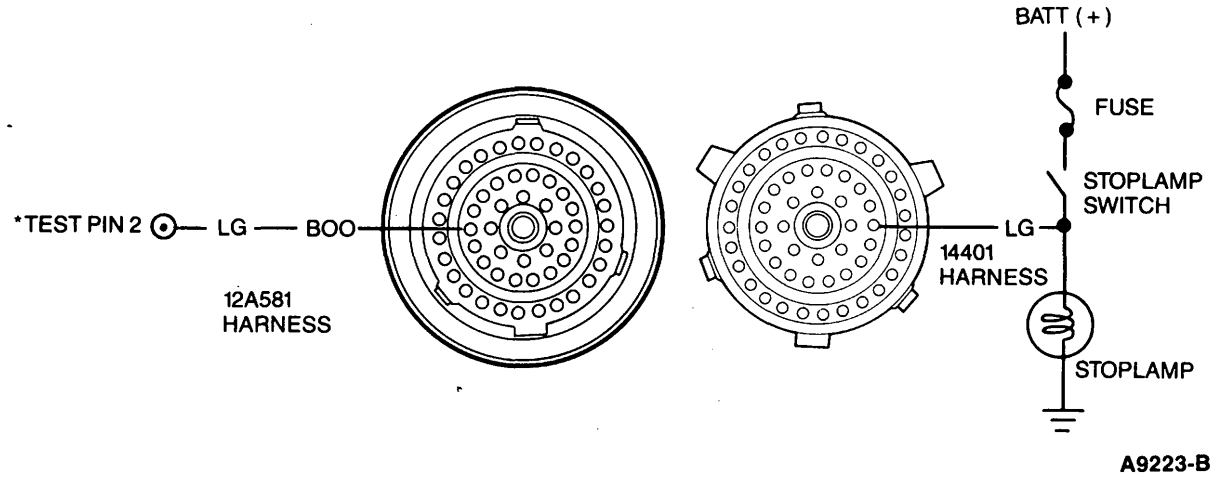
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Brake On/Off (BOO)	Pinpoint Test	FD

E-Series



F-Series/Bronco (Except 7.3L Diesel)

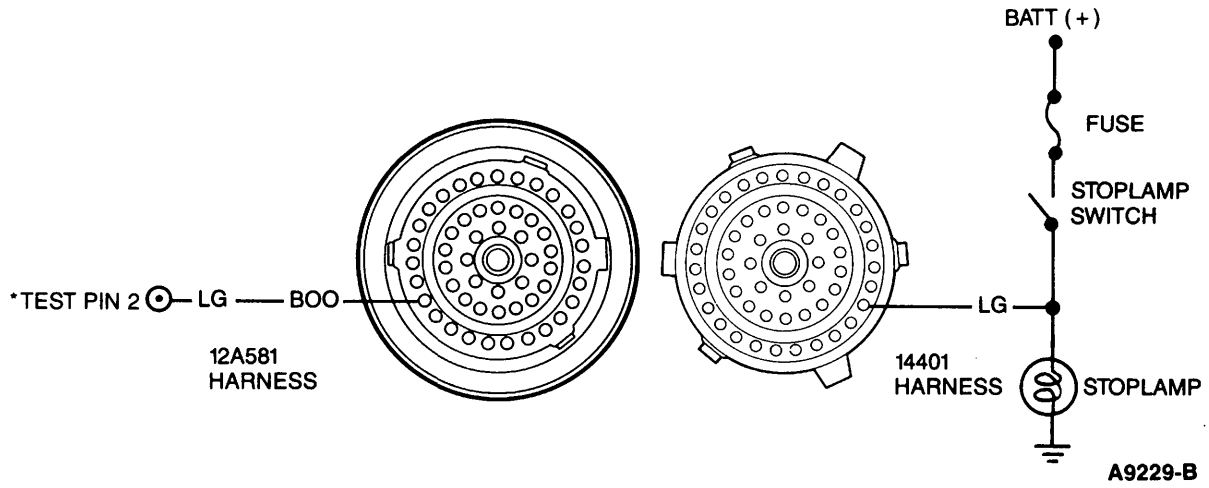


*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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Brake On/Off (BOO)	Pinpoint Test	FD

F-Series/Bronco (7.3L Diesel)



*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACES.

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Brake On/Off (BOO)

Pinpoint Test **FD**

TEST STEP	RESULT ▶	ACTION TO TAKE
FD1 SERVICE CODE 74: VERIFY BRAKE WAS PRESSED		
Service Code 74 indicates that when the brake pedal was depressed during the Engine Running Self-Test, the BOO signal did not cycle high. Possible causes are: — Brake pedal not depressed and released during the Engine Running Self-Test. — Open stoplamp circuit (BATT (+) side of BOO splice). — Short to GROUND. — Faulty processor. • **Did you press brake during the Engine Running Self-Test?** **NOTE: On some vehicles it is necessary to depress and release the brake after the Dynamic Response code 1(0) but before the brief WOT.**	Yes ▶ No ▶	GO to FD2. RERUN Engine Running Self-Test. PRESS brake once during test.
FD2 CHECK FOR BOO CIRCUIT CYCLING		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 2 and Test Pin 40 at the breakout box while depressing and releasing brake. • **Does the voltage cycle?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. GO to FD3.
FD3 CHECK BOO CIRCUIT FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • DVOM on 200,000 Ohm scale. • Disconnect 12A581 to 14401 harness connector shown on pinpoint test FD cover pages. • Measure resistance between Test Pin 2 and Test Pin 40 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to Lighting Shop Manual Group to SERVICE stoplamp circuit. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Engine Running Self-Test.

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Brake On/Off (BOO)	Pinpoint Test	FD

TEST STEP	RESULT ▶	ACTION TO TAKE
FD5 SERVICE CODE 75: CHECK FOR BOO CIRCUIT CYCLING		
Service Code 75 indicates that while the brake pedal was released during the Engine Running Self-Test, the BOO signal was high. Possible causes are: — Brake pedal depressed during entire Engine Running Self-Test. — Open BOO/stoplamp circuit (between processor and stoplamp ground). — Short to POWER. — Faulty processor. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 2 and Test Pin 40 at the breakout box while depressing and releasing the brake. • **Does the voltage cycle?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. GO to FD6.
FD6 CHECK BOO CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • DVOM on 20 volt scale. • Disconnect 12A581 to 14401 harness connector shown on pinpoint test FD cover pages. • Measure voltage between Test Pin 2 at the breakout box and engine block ground. • **Is voltage greater than 1.0 volt?**	Yes ▶ No ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Engine Running Self-Test. GO to FD7.
FD7 CHECK CONTINUITY OF BOO CIRCUIT		
• Key off. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • 12A581 to 14401 harness connector disconnected. • Measure resistance between Test Pin 2 at the breakout box and BOO circuit at the 12A581 harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to Lighting Shop Manual Group to SERVICE stoplamp circuit. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Engine Running Self-Test.

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Brake On/Off (BOO) | Pinpoint Test | FD

TEST STEP	RESULT ▶	ACTION TO TAKE
FD10 SERVICE CODE 74: VERIFY BRAKE WAS PRESSED		
Service Code 74 indicates that when the brake pedal was depressed and released during the Engine Running Self-Test, the BOO signal did not cycle high and low. Possible causes are: — Brake pedal not depressed and released during the Engine Running Self-Test. — Brake pedal depressed during entire Engine Running Self-Test. — Open BOO/stoplamp circuit. — Short to GROUND or POWER. — Faulty processor. • **Did you press brake during the Engine Running Self-Test?** **NOTE: On some vehicles it is necessary to depress and release the brake after the dynamic response code 1(0) but before the brief WOT.**	Yes ▶ No ▶	GO to FD11. RERUN Engine Running Self-Test. PRESS brake once during test.
FD11 CHECK OPERATION OF BRAKE LAMPS		
• Key on. • Check brakelamp operation.	Brakelamps operate normally ▶ Brakelamps never on ▶ Brakelamps always on ▶	GO to FD12. GO to FD13. GO to FD14.
FD12 CHECK FOR BOO CIRCUIT CYCLING		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 2 (Test Pin 5 for all 3.8L, 5.0L, and 3.0L SHO engines) and Test Pin 40 at the breakout box while depressing and releasing brake. • **Does the voltage cycle?**	Yes ▶ No ▶	REMOVE processor. REMOVE breakout box. RERUN Quick Test. SERVICE open in BOO circuit between processor and BOO connection to stoplamp circuit. RERUN Quick Test.

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Brake On/Off (BOO) | Pinpoint Test | FD

TEST STEP	RESULT ▶	ACTION TO TAKE
FD13 CHECK FOR STOPLAMP CIRCUIT POWER TO 14401 or 14290 HARNESS CONNECTOR		
• Key off. • Disconnect connector indicated on Pinpoint Test [FD] Schematic (12A581 harness connector to either 14401 or 14290 harness connector). • DVOM on 20 volt scale. • Measure voltage between BOO circuit on 14401 or 14290 harness connector and chassis ground while depressing the brake. • **Is voltage greater than 10 volts?**	Yes ▶ No ▶	SERVICE open circuit between BOO connection to stoplamp circuit and stoplamp ground. RECONNECT harness connector. RERUN Quick Test. VERIFY operation of brake switch. If OK, SERVICE open circuit between BATT (+) supply to circuit and BOO connection to stoplamp circuit. RECONNECT harness connector. RERUN Quick Test.
FD14 CHECK FOR SHORT TO POWER AT 14401 or 14290 HARNESS CONNECTOR		
• Key off. • Disconnect connector indicated on Pinpoint Test [FD] schematic (12A581 harness connector to either 14401 or 14290 harness connector). • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between BOO circuit on 14401 or 14290 harness connector and chassis ground (brake released). • **Is voltage less than 1.0 volt?**	Yes ▶ No ▶	GO to [FD15]. VERIFY operation of brake switch. If OK, SERVICE short to power. RECONNECT harness connector. RERUN Quick Test.
FD15 CHECK FOR SHORT TO POWER IN PROCESSOR		
• Key off. • Reconnect 12A581 to 14401 or 14290 harness connector. • Disconnect processor. • Key on, engine off. • **Are brake lamps still on?**	Yes ▶ No ▶	SERVICE short to power between processor and 12A581 to 14401 or 14290 harness connector. RERUN Quick Test. REPLACE processor. RERUN Quick Test.

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Power Steering Pressure Switch (PSPS)	Pinpoint Test	FF

Note

You should enter this Pinpoint Test only when a Service Code 52 is received during Quick Test or if you have been directed here from Diagnosis By Symptom.

Remember

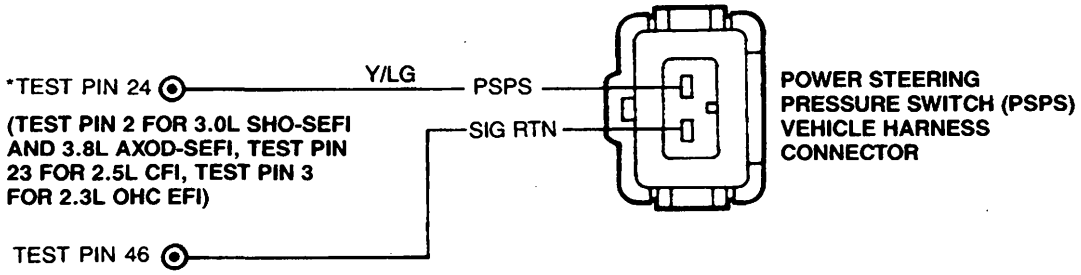
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Idle speed/throttle stop adjustment
- Binding throttle shaft/linkage or speed control linkage

This Pinpoint Test is intended to diagnose only the following:

- Power steering pressure switch (-3N824-)
- Harness circuits: PSPS, and SIG RTN
- Processor assembly (-12A650-)

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9658-E

Test Pin 46 — SIG RTN

Application	Wire Color
All F-Series/Bronco	GY/R
All Others	BK/W

Test Pin 24 (23,2,3) — PSPS

Application	Wire Color
3.0L Probe	BR/R
All Others	Y/LG

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Power Steering Pressure Switch (PSPS) | Pinpoint Test | FF

TEST STEP	RESULT ▶	ACTION TO TAKE
FF1 SERVICE CODE 52: ATTEMPT TO ELIMINATE CODE 52		
NOTE: Some vehicles are equipped with a Power Steering Pressure Switch software strategy, but do not have Power Steering hardware released for the engine/vehicle application. When Service Code 52 is received in Key On Engine Off, check to see if the vehicle is equipped with Power Steering. If not, disregard servicing the Code 52. Return to Quick Test Section to service other codes. Service Code 52 indicates that the Power Steering Pressure Switch (PSPS) circuit is open. Possible causes are: — Faulty PSPS switch. — Open harness. — Faulty processor. • Key off, wait 10 seconds. • Disconnect PSPS. • Jumper PSPS circuit to SIG RTN circuit at the PSPS vehicle harness connector. • Rerun Key On Engine Off Self-Test. • **Is Code 52 still present?**	Yes ▶ No ▶	GO to FF2. REPLACE PSPS. RERUN Quick Test.
FF2 CHECK CONTINUITY OF PSPS CIRCUITS		
• Key off, wait 10 seconds. • PSPS disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 at the breakout box and SIG RTN circuit at the PSPS vehicle harness connector. • Measure resistance between Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI, Test Pin 3 for 2.3L OHC EFI) at the breakout box and PSPS circuit at the PSPS vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Power Steering Pressure Switch (PSPS) — Pinpoint Test FF

TEST STEP	RESULT	ACTION TO TAKE
FF3 CHECK PSPS OPERATION • Key off. • Install tachometer. • Start engine, allow to idle in NEUTRAL/PARK. • Disconnect PSPS. • **Does rpm increase?**	Yes ▶ No ▶	REPLACE PSPS. RE-EVALUATE symptom. GO to FF4.
FF4 CHECK PSPS CIRCUITS FOR SHORTS • Key off, wait 10 seconds. • PSPS disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI, Test Pin 3 for 2.3L OHC EFI) and Test Pin 46 at the breakout box. • **Is resistance less than 10,000 ohms?**	Yes ▶ No ▶	SERVICE short in harness. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom. REPLACE processor. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.
FF5 ENGINE RUNNING SERVICE CODE 52 **NOTE: Some vehicles are equipped with a Power Steering Pressure Switch software strategy, but do not have Power Steering hardware released for the engine/vehicle application. When Service Code 52 is received in Key On Engine Running, check to see if the vehicle is equipped with Power Steering. If not, disregard servicing the Code 52. Return to Quick Test Section to service other codes.** Engine Running Service Code 52 indicates that the Power Steering Pressure Switch (PSPS) did not change states due to the switch staying either open or closed. Possible causes are: — Faulty PSPS switch. — Open or grounded harness circuit. — Faulty processor. • **Did you turn the steering wheel at least one-half turn within 1 to 2 seconds after engine ID code?** **NOTE: Make sure the front wheels are centered (no load condition).**	Yes ▶ No ▶	GO to FF6. RERUN Quick Test.

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Power Steering Pressure Switch (PSPS)

Pinpoint Test **FF**

TEST STEP	RESULT ▶	ACTION TO TAKE
FF6 DETERMINE WHETHER THE PROCESSOR CAN IDENTIFY AN OPEN CIRCUIT		
• Key off, wait 10 seconds. • PSPS disconnected. • Run Key On Engine Off Self-Test. • **Is Code 52 present?**	Yes ▶ No ▶	GO to FF8. GO to FF7.
FF7 CHECK PSPS CIRCUITS FOR SHORTS		
• Key off, wait 10 seconds. • PSPS disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion or loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 46 and Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI, Test Pin 3 for 2.3L OHC EFI) at the breakout box. • **Is resistance 10,000 ohms or less?**	Yes ▶ No ▶	SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
FF8 CHECK PSPS STATE WITH KEY ON ENGINE OFF VS. RUNNING		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Reconnect PSPS. • DVOM on 200 ohm scale. • Key on, engine off. • Measure resistance between Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI, Test Pin 3 for 2.3L OHC EFI) and Test Pin 46 at the breakout box. • Start engine. • **Does resistance remain less than 10 ohms between Key On Engine Off and Engine Running?**	Yes ▶ No ▶	GO to FF9. GO to FF11.

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Power Steering Pressure Switch (PSPS)	Pinpoint Test	FF

TEST STEP	RESULT ▶	ACTION TO TAKE
FF9 CHECK PSPS STATE WITH ENGINE RUNNING NO LOAD VS. LOAD		
• Engine idling. • Breakout box installed, processor connected. • PSPS connected. • Clutch is not depressed on 3.0L SHO-SEFI manual vehicles. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 24 (Test Pin 23 for 2.5L CFI, Test Pin 2 for 3.0L SHO-SEFI and 3.8L AXOD-SEFI, Test Pin 3 for 2.3L OHC EFI) and Test Pin 46 at the breakout box. • Turn the steering wheel at least one-half turn then return. • **Does resistance change from less than 10 ohms to infinity (indicating PSPS opening), then returning to 10 ohms or less when steering wheel is returned to center position?**	Yes ▶ No ▶	PSPS system OK, REMOVE breakout box and RETURN to Quick Test Step 5.0 to continue Diagnostics. GO to **FF10**.
FF10 CHECK FOR PSPS ALWAYS CLOSED VS. POWER STEERING HYDRAULIC PRESSURE WITH ENGINE RUNNING		
• At this point in the Diagnostics there are only two possible causes for the original Code 52 Engine Running: — PSPS (switch) that will not open. — Low available hydraulic pressure. • Key off, wait 10 seconds. • Substitute original PSPS with a known good PSPS. • Run Engine Running Self-Test. (Turn steering wheel at least one-half turn after Engine ID code.) • **Is Code 52 still present?**	Yes ▶ No ▶	GO to Power Steering Pressure Diagnosis Group in Shop Manual, looking for low pressure. Original Code 52 Engine Running was a result of a bad PSPS (switch). REMOVE all equipment and CONTINUE, if necessary, with any other Diagnostics.

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Power Steering Pressure Switch (PSPS)	Pinpoint Test	FF

TEST STEP		RESULT ▶	ACTION TO TAKE
FF11	CHECK FOR PSPS ALWAYS OPEN VS. POWER STEERING HYDRAULIC PRESSURE WITH ENGINE RUNNING		
• At this point in the Diagnostics there are two possible causes for the original Code 52 Engine Running: — PSPS (switch) that always remains open during Engine Running. — Excessively high hydraulic pressure. • Key off, wait 10 seconds. • Substitute original PSPS with a known good PSPS. • Run Engine Running Self Test. (Turn steering wheel at least one-half turn after Engine ID code.) • **Is Code 52 still present?**		Yes ▶	GO to Power Steering Pressure Diagnosis Group in Shop Manual, looking for high pressure.
		No ▶	Original Code 52 Engine Running was a result of a bad PSPS (switch). REMOVE all equipment and CONTINUE, if necessary, with any other Diagnostics.

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Fuel Control	Pinpoint Test	H

Note

You should enter this Pinpoint Test only when a Service Code 41, 42, 65, 85, 86, 91, 92 or 93 is received during Quick Test or when directed here from Diagnosis By Symptom or Pinpoint Test [S].

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Ignition Coil
- Distributor Cap
- Distributor Rotor
- Fouled Spark Plugs
- Spark Plug Wires
- CANP Problems
- PCV Valves (see note below)
- Distributorless Ignition System
- EGR Valve and Gasket
- Air Filter
- Fuel Contamination, Engine Oil
- Poor Power Ground
- Fuel Pressure
- Manifold Leaks, Intake/Exhaust, Intercooler Leaks
- Engine Not at Normal Operating Temperatures

This Pinpoint Test is intended to diagnose only the following:

- HEGO Sensor
- HEGO Signal and Ground Circuit
- HEGO Sensor Connection
- Vacuum Systems
- Fuel Injector
- Processor Assembly
- Harness circuits: HEGO GRD, HEGO, INJ. 1 – 8, VPWR and SIG RTN

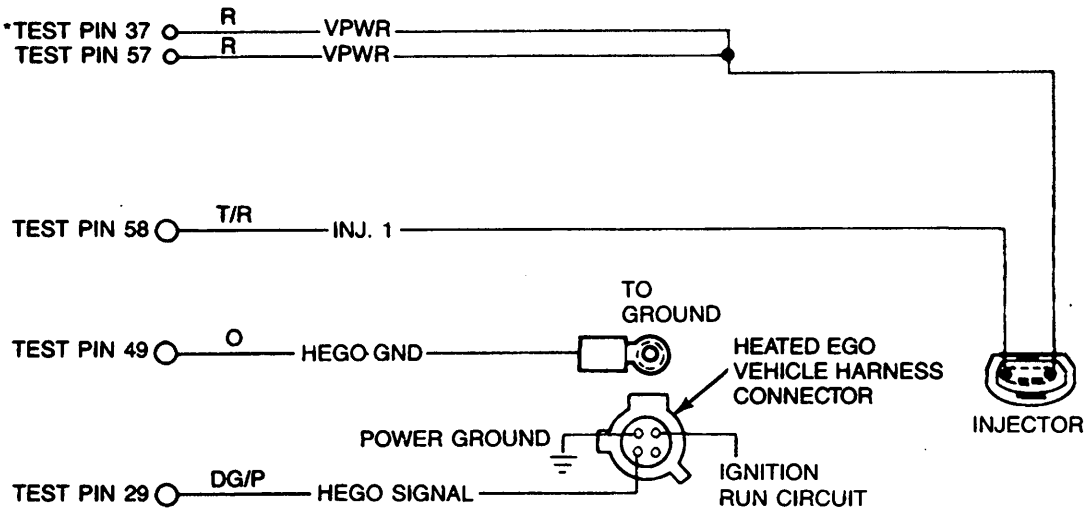
NOTE: Fuel contaminated engine oil may affect 41, 42, 91 and 92 Service Codes, so if it is suspected, remove the PCV from the valve cover, and rerun Quick Test. If the problem is corrected, then change the engine oil and filter.

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Fuel Control	Pinpoint Test	H

Pinpoint Test Schematic

All CFI



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

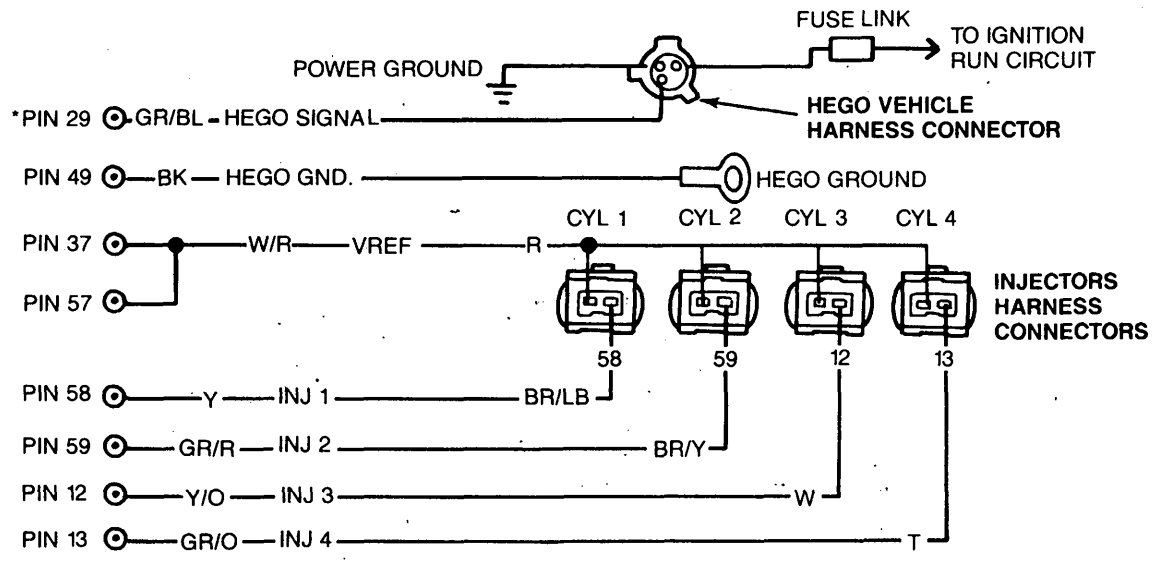
A9472-C

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Fuel Control	Pinpoint Test	H

Pinpoint Test Schematic

1.9L MA SEFI



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

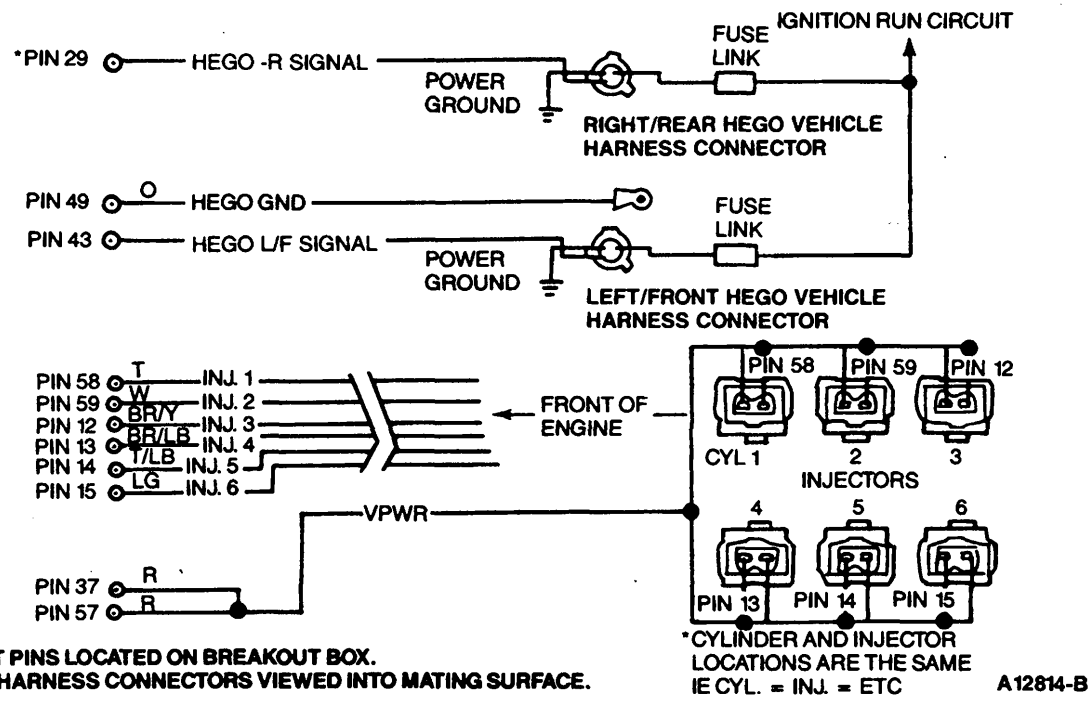
A13567-A

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Fuel Control	Pinpoint Test	H

Pinpoint Test Schematic

3.8L SEFI, 3.8L SC SEFI and 3.0L SHO SEFI



Test Pin 29 — Right HEGO (#1)

Application	Wire Color
3.0L SHO SEFI	DG/P
3.8L AXOD SEFI	DB/LG
All Others	T/O

Test Pin 43 — Left HEGO (#2)

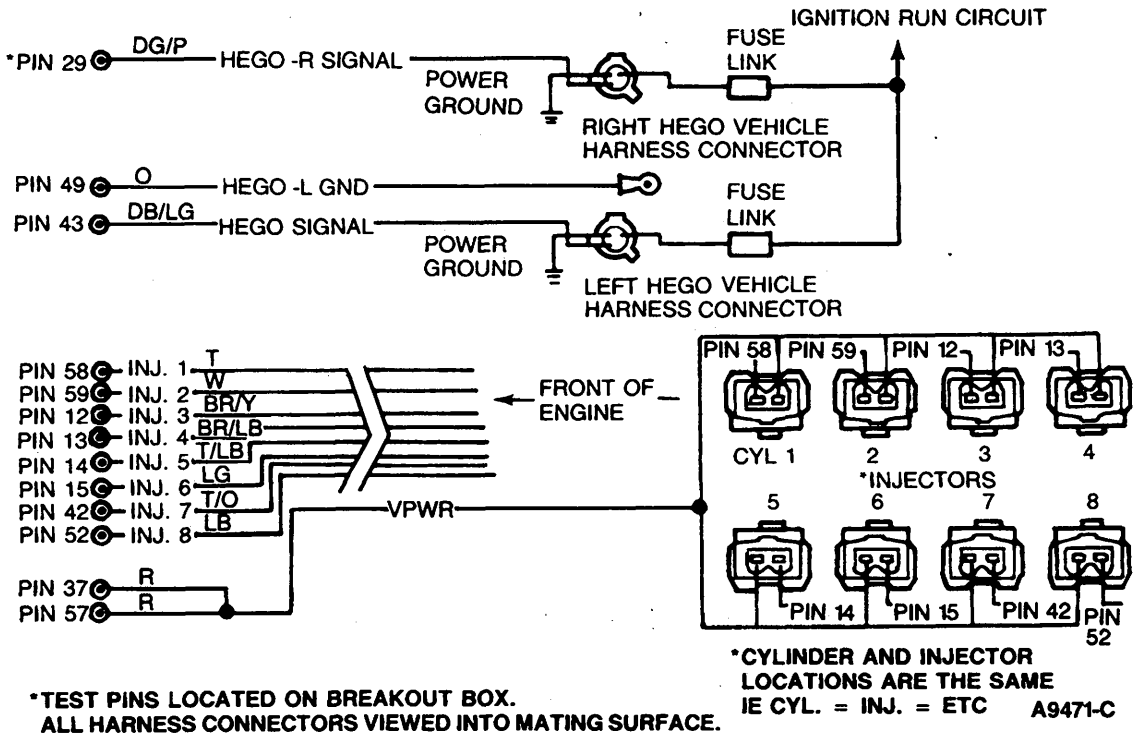
Application	Wire Color
3.0L SHO SEFI	DB/LG
3.8L AXOD SEFI	DG/P
All Others	T/R

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Fuel Control	Pinpoint Test	H

Pinpoint Test Schematic

5.0L SEFI and 5.0L SEFI Mass Air



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

*CYLINDER AND INJECTOR LOCATIONS ARE THE SAME IE CYL. = INJ. = ETC A9471-C

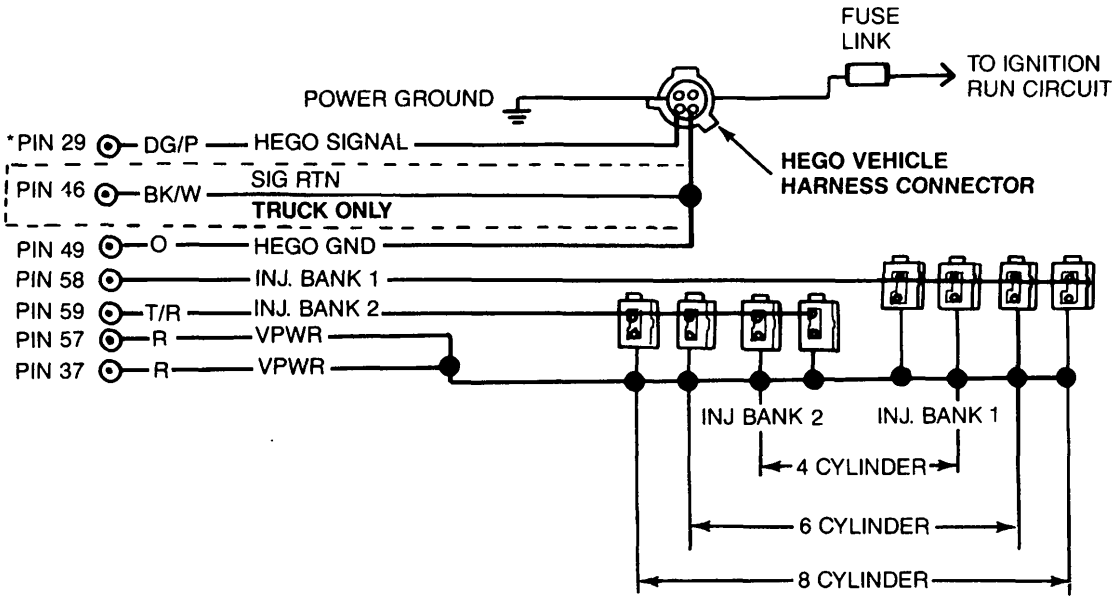
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Fuel Control	Pinpoint Test	H

Pinpoint Test Schematic

2.3L OHC MA CAR

Trucks with 2.3L MA, 2.9L MA, 4.0L, 4.9L and 5.8L Engines



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13568-A

Test Pin 58 INJ BANK 1

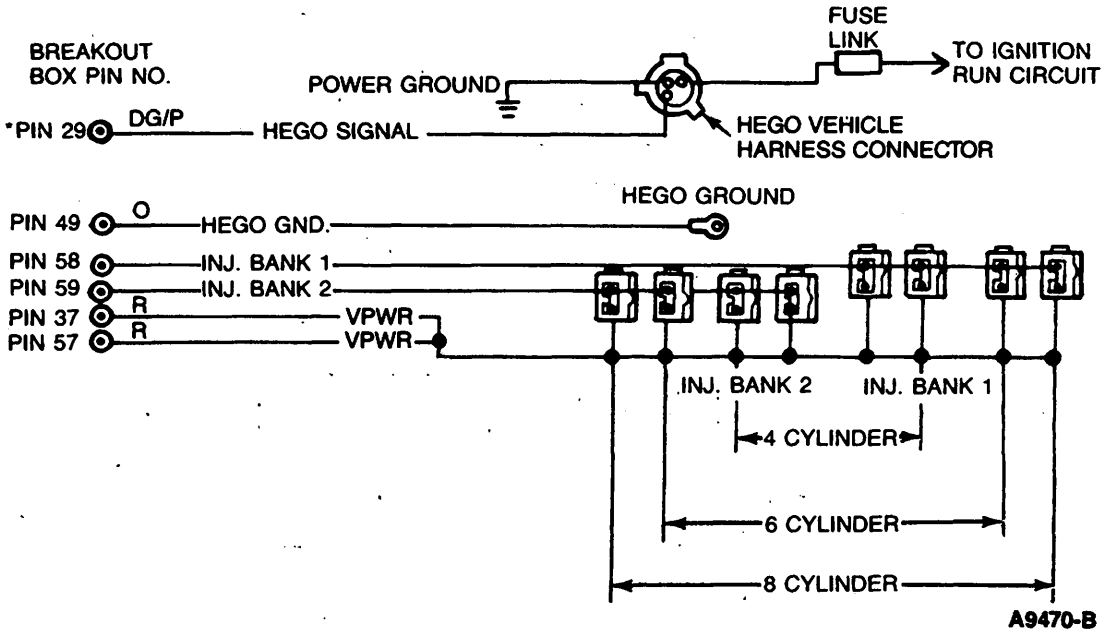
Application	Wire Color
2.3L MA Truck 2.9L MA Truck	LG/W
All Others	T/O

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Fuel Control	Pinpoint Test	H

Pinpoint Test Schematic

All Other EFI



*** TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

Test Pin 58 — INJ BANK 1

Application	Wire Color
2.3L DIS Truck 2.9L Truck	LG/W
1.9L EFI	T/R
All Others	T/O

Test Pin 59 — INJ BANK 2

Application	Wire Color
1.9L EFI	T/O
All Others	T/R

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Fuel Control	Pinpoint Test	H

FUEL PRESSURE SPECIFICATION TABLE

	PASSENGER CAR ENGINES				
	1.9L/2.5L	2.3L	3.0L	3.8L	ALL
	CFI	HSC EFI	SHO SEFI	SC SEFI	OTHER APPLICATIONS
ENGINE RUNNING	13 – 17 PSI 90 – 120 kPa	45 – 60 PSI 310 – 415 kPa	28 – 33 PSI 193 – 227 kPa	30 – 40 PSI 210 – 280 kPa	30 – 45 PSI 210 – 310 kPa
KEY ON ENGINE OFF	13 – 17 PSI 90 – 120 kPa	50 – 60 PSI 345 – 415 kPa	30 – 45 PSI 210 – 310 kPa	35 – 40 PSI 240 – 280 kPa	35 – 40 PSI 240 – 280 kPa

	LIGHT TRUCK ENGINES	
	4.9L EFI	ALL OTHER APPLICATIONS
ENGINE RUNNING	45 – 60 PSI 310 – 415 kPa	30 – 45 PSI 210 – 310 kPa
KEY ON ENGINE OFF	50 – 60 PSI 345 – 415 kPa	35 – 45 PSI 240 – 310 kPa

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Fuel Control	Pinpoint Test	H

INJECTOR BANK RESISTANCE SPECIFICATION TABLE #1

PASSENGER CAR ENGINES			
VALUES ARE IN OHMS			
1.9L EFI	2.3L HSC EFI	2.3L OHC EFI	2.9L/3.0L EFI
1.2 TO 1.8	6.0 TO 8.0	7.0 TO 9.5	5.0 TO 6.5

LIGHT TRUCK ENGINES		
VALUES ARE IN OHMS		
2.3L EFI	2.9L/3.0L 4.9L EFI	5.0L/5.8L 7.5L EFI
7.0 TO 9.5	5.0 TO 6.5	3.0 TO 4.0

SINGLE INJECTOR RESISTANCE SPECIFICATION TABLE #2

PASSENGER CAR ENGINES			
VALUES ARE IN OHMS			
1.9L EFI	1.9L/ 2.5L CFI	2.3L OHC/ 3.0L EFI	ALL OTHER ENGINES WITH EFI
2.0 TO 2.7	1.0 TO 2.0	15.0 TO 18.0	13.0 TO 16.0

LIGHT TRUCK ENGINES	
VALUES ARE IN OHMS	
2.3L/3.0L EFI	ALL OTHER ENGINES WITH EFI
15.0 TO 18.0	13.0 TO 16.0

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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H1 CHECK FUEL PRESSURE		
HEGO Engine Running codes 41 and 91 indicate the system is always lean. HEGO Engine Running codes 42 and 92 indicate the system is always rich. **NOTE: For vehicles with dual HEGOs, codes 41 and 42 refer to right or rear HEGO sensor; codes 91 and 92 refer to left or front HEGO sensor.** • Key off, wait 10 seconds. • Install fuel pressure gauge. • Verify that manifold vacuum is connected to the fuel pressure regulator if applicable. • Start and run engine at idle. • Refer to Fuel Pressure Specification Table. • Is fuel pressure within specification for the engine being tested? **For No Starts:** • If engine will not run, cycle the key off to on several times. • Refer to Fuel Pressure Specification Table. • **Is fuel pressure within specification for the engine being tested?**	Yes ▶ No ▶	GO to H2. GO to Section 11 for Electric Fuel pump and fuel pressure regulator checks.

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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H2 CHECK SYSTEM'S ABILITY TO HOLD FUEL PRESSURE		
• Key on, engine off. • **Does fuel pressure remain at specification for 60 seconds?**	Yes ▶	**For No Starts:** GO to H3. **For Runs Rough, Misses or Fuel Service Code (41, 42, 91, 92):** REMOVE fuel pressure gauge. **For SEFI:** Go to H9. **For All Others:** GO to H4.
	No ▶	**For SEFI:** GO to H9. **All Others:** GO to H6.
H3 FUEL DELIVERY TEST		
NOTE: Verify fuel quality; air and/or water will also pressurize and look like acceptable fuel delivery. • Key off. • Fuel pressure gauge installed. • Pressurize fuel system per step H1. • Locate and disconnect the inertia switch. • Crank engine for 5 seconds. • **Does pressure drop greater than 5 psi. (34 kPa.) by the end of the 5 second crank cycle?**	Yes ▶	The EEC-IV system is not the cause of the No Start. REMOVE the fuel pressure gauge. RECONNECT the inertia switch. REFER to Section 2 for other No Start routines.
	No ▶	REMOVE fuel pressure gauge. RECONNECT inertia switch. GO to H4.

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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H4 CHECK RESISTANCE OF INJECTOR(S) AND HARNESS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. **For EFI:** — Measure resistance of INJECTOR BANK 1 between Test Pin 37 and Test Pin 58 at the breakout box. Record resistance. — Measure resistance of INJECTOR BANK 2 between Test Pin 37 and Test Pin 59 at the breakout box. Record resistance. — Refer to Injector Resistance Specification Table #1. **For SEFI:** — From cylinder balance test: Measure resistance between the suspect INJECTOR circuit Test Pin and Test Pin 37 at the breakout box. Record resistance. — For No Starts: Pick any injector and measure resistance between that INJECTOR circuit's Test Pin and Test Pin 37 at the breakout box. Record resistance. — Refer to Injector Resistance Specification Table #2. **For CFI:** — Measure resistance of INJECTOR circuit between Test Pin 37 and Test Pin 58 at the breakout box. Record resistance. — Refer to Injector Resistance Specification Table #1. • **Is each resistance within specification for the appropriate engine?**	Yes ▶ No ▶	GO to H6. **For EFI** GO to H5. **For SEFI:** SERVICE open or short in VPWR or injector circuit of the suspect injector(s). If OK, REPLACE injector. REMOVE breakout box. RECONNECT processor. RERUN Quick Test and Cylinder Balance Test. **For NO START:** SERVICE open in VPWR circuit. **For CFI:** SERVICE open or short in harness/connector If OK, REPLACE injector. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H5 ISOLATE FAULTY INJECTOR CIRCUIT		
• Key off. • Breakout box installed, processor disconnected. • Disconnect all injectors on suspect bank. • DVOM on 200 ohm scale. • Connect one injector and measure resistance between Test Pin 37 and either Test Pin 58 or 59 as appropriate. • Disconnect that injector and repeat process for each of the remaining injectors. • Refer to Injector Resistance Specification Table #2. • **Is each resistance within specification for the appropriate engine?**	Yes ▶ No ▶	GO to H6. SERVICE open or short in VPWR or injector circuit of the suspect injector(s). If OK, REPLACE injector. REMOVE breakout box. RECONNECT processor and injectors. RERUN Quick Test.
H6 CHECK INJECTOR DRIVER SIGNAL		
Requires standard non-powered 12 volt test lamp. • Key off. • Breakout box installed. • Connect processor to breakout box. **For EFI:** — Connect test lamp between Test Pin 37 and Test Pin 58 at the breakout box. — Connect test lamp between Test Pin 37 and 59 at the breakout box. **For SEFI:** — Connect test lamp between Test Pin 37 and the suspect injectors Test Pin at the breakout box. **For CFI:** — Connect test lamp between Test Pin 37 and Test Pin 58 at the breakout box. • Crank or start engine. **NOTE: Properly operating systems will show a dim glow on the lamp.** • **Is glow on lamp dim?**	Yes ▶ No ▶	**For all SEFI vehicles:** REMOVE breakout box. RECONNECT processor GO to Section 4 for injector testing and cleaning instructions. After any servicing, RERUN Quick Test and Cylinder Balance Test. **For all other engines:** GO To H7. **No light:** VERIFY 12 volt at Test Pins 37 and 57. **Bright light:** CHECK injector circuit for shorts to ground. If system checks OK, REPLACE processor. REMOVE breakout box. RERUN Quick Test.

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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H7 CHECK EXTERNAL SOURCE FOR FUEL PRESSURE PROBLEM		
• Key off. • Pressurize fuel system per Test Step [H1]. **For EFI:** — Visually look for fuel leaking at fuel injector O-rings, fuel pressure regulator, and fuel rails. **For CFI:** — Remove air inlet tube at the fuel charging assembly. — Visually look for fuel leaking at the air horn inlet, fuel injector O-ring, fuel pressure regulator and fuel line to fuel charging assembly. • **Is there a visible leak?**	Yes ▶ No ▶	REMOVE pressure gauge. SERVICE as necessary. REFER to Fuel/Engine Shop Manual Group for service procedure. After servicing leak, RERUN Quick Test. **For EFI:** GO to [H8]. **For CFI:** REMOVE pressure gauge. Fuel delivery system is OK. Problem is in an area common to all cylinders, i.e. fuel injector, air/vacuum leak, fuel contamination, EGR, HEGO GND. CHECK MAP frequency, etc. SERVICE as necessary.
H8 INJECTOR BALANCE TEST		
• Connect tachometer to engine. Run engine at idle. • Disconnect and reconnect the injectors one at a time: Note rpm drop for each injector. • **Does each injector produce at least a 100 rpm momentary drop?** **NOTE: ISC will attempt to re-establish rpm.**	Yes ▶ No ▶	Fuel delivery OK. Problem is in an area common to all cylinders i.e. air/vacuum leak, fuel contamination, EGR, HEGO GND. CHECK MAP frequency etc. SERVICE as necessary. GO to Section 4 for injector testing and cleaning instructions. After any servicing, RERUN Quick Test.

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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H9 CYLINDER BALANCE TEST: SEFI ENGINES ONLY		
The Cylinder Balance Test switches each injector OFF and ON one at a time. Service codes correspond to the cylinder number, (e.g. Service Code 30 indicates a problem with cylinder No. 3, a Service Code 90 indicates a pass.) The Cylinder Balance Test is designed to aid in the detection of a weak or non-contributing cylinder. The Pinpoint Test Steps are designed to isolate only EEC-IV related problems. Refer to Quick Test Appendix for detailed information about Cylinder Balance Test. • Run the Engine Running Self-Test. • After the last repeated code, wait 5-10 seconds. • "Goose" throttle lightly (not wide-open-throttle). • Cylinder Balance Test will be performed. Time of test is approximately 2-3 minutes. • **Is Code 90 present?**	Yes ▶	**For Vehicles With Service Code 41/91:** GO to H11. **For Vehicles With Service Code 42/92:** GO to H23. **For All Others:** Fuel delivery is OK. Problem is in an area common to all cylinders, i.e., air/ vacuum leak, fuel contamination, EGR, HEGO GND, intercooler leaks (3.8L Super-Charge — Section 8). CHECK MAP frequency, etc. SERVICE as necessary.
	No ▶	GO to H4.

CYLINDER BALANCE TABLE
SERVICE CODE VS. CYLINDER

SERVICE CODE	90	10	20	30	40	50	60	70	80	77*
CYLINDER/INJECTOR NUMBER	PASS	1	2	3	4	5	6	7	8	RERUN TEST
BREAKOUT BOX PIN NUMBER		58	59	12	13	14	15	42	52	

* If throttle is touched (moved) during Cylinder Balance Test, Service Code 77 will appear, indicating test was not completed.

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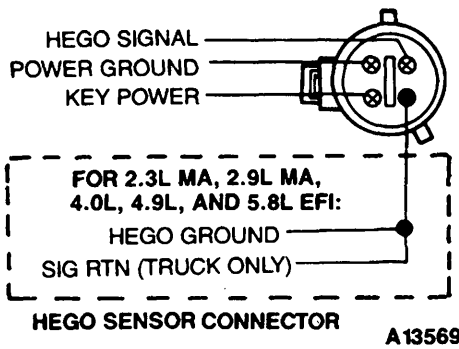
Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H11 SERVICE CODE 41/91: FUEL CONTROL ALWAYS LEAN		
NOTE: For vehicles with dual HEGOs, code 41 refers to the right or rear HEGO sensor. Code 91 refers to the left or front HEGO sensor. HEGO Engine Running codes 41 and 91 indicate the system is always lean. • Run engine at 2000 rpm for 2 minutes. • Key off, wait 10 seconds. • Rerun Engine Running Self-Test. • **Is Code 41/91 present?**	Yes ▶	**For engines with:** — MAP sensors. GO to **H12**. — Vane Air Flow Meters GO to **H13**. — Mass Air Flow Meters GO to **H14**.
	No ▶	GO to **H20**.

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Fuel Control	Pinpoint Test	H

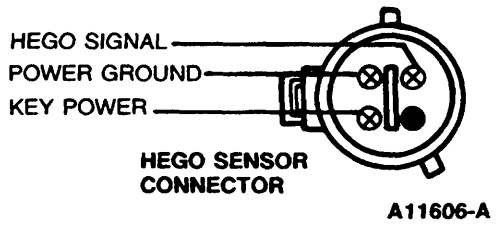
TEST STEP	RESULT ▶	ACTION TO TAKE
H12 CHECK HEGO SENSOR ON ENGINES WITH MAP SENSORS		
NOTE: Vacuum/air leaks in non-EEC-IV areas could also cause Code 41/91. Check for: **— Leaking vacuum actuator (e.g. A/C control motor)** **— Engine sealing** **— EGR system** **— PCV system** **— Lead contaminated HEGO sensor** • Key off. • Disconnect appropriate HEGO sensor from vehicle harness. **For vehicles with 4 wire HEGO:** — Connect DVOM to HEGO SIGNAL and HEGO GND at the HEGO sensor connector. **For all others:** — Connect DVOM to HEGO SIGNAL at the sensor and battery negative post. • Disconnect and plug vacuum line at MAP sensor. • DVOM on 20 volt scale. • Apply 10-14 in. Hg. (33-46 kPa) to MAP sensor. • Start engine and run at approximately 2,000 rpm for 2 minutes. • **Does the DVOM indicate greater than 0.5 volts within 2 minutes?**	Yes ▶	GO to H15.
	No ▶	REPLACE HEGO sensor. RECONNECT MAP sensor vacuum line. RERUN Quick Test.



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Fuel Control	Pinpoint Test	H

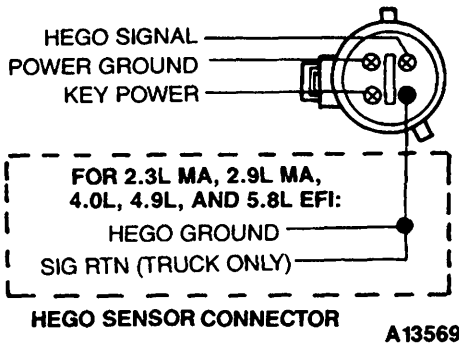
TEST STEP	RESULT ▶	ACTION TO TAKE
H13 CHECK HEGO SENSOR ON ENGINES WITH VANE AIR FLOW AIR METER		
NOTE: Vacuum/air leaks in non-EEC-IV areas could also cause Code 41. Check for: **— Leaking vacuum actuator (e.g. A/C control motor).** **— Engine sealing.** **— EGR system.** **— PCV system.** **— Lead/silicone contaminated HEGO sensor.** **— Unmetered air leak between Vane Air Flow Meter and throttle body.** • Key off. • Disconnect HEGO sensor from vehicle harness • Remove air cleaner to gain access to air meter inlet. Using a standard wood lead pencil, prop the air meter door partway open. • Connect DVOM to HEGO SIGNAL at the sensor connector and battery negative post. • DVOM on 20 volt scale. • Start the engine and run at approximately 2000 rpm for 2 minutes. • **Does the DVOM indicate greater than 0.5 volts within 2 minutes?**	Yes ▶	GO to H15.
	No ▶	REPLACE HEGO sensor. REMOVE pencil from Air Meter. REINSTALL air cleaner. RERUN Quick Test.



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Fuel Control	Pinpoint Test	H

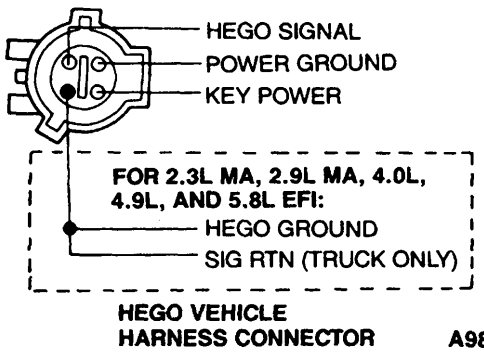
TEST STEP	RESULT ▶	ACTION TO TAKE
H14 CHECK HEGO SENSOR ON ENGINES WITH MASS AIR SENSOR		
NOTE: The purpose of this test is to verify the HEGO sensor can generate greater than 0.5 volts during Engine Running Self-Test. Any Vacuum/air leaks in non-EEC-IV areas could also cause Code 41/91. Check for: — Leaking vacuum actuator (e.g. A/C control motor). — Engine sealing. — EGR system. — PCV system. — Unmetered air leak between Mass Air Flow sensor and throttle body. — Lead contaminated HEGO sensor. • Key off. • Disconnect appropriate HEGO sensor from vehicle harness. **For vehicles with 4 wire HEGO:** — Connect DVOM to HEGO SIGNAL and HEGO GND at the HEGO sensor connector. **For all others:** — Connect DVOM to HEGO SIGNAL at the sensor and battery negative post. • DVOM on 20 volt scale. • Rerun Engine Running Self-Test and monitor HEGO sensor voltage. • **Is the voltage greater than 0.5 volts at the end of Self-Test?**	Yes ▶ No ▶	GO to H15. REPLACE HEGO sensor. RERUN Quick Test.



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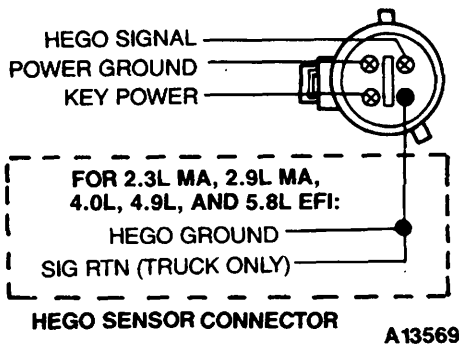
Fuel Control	Pinpoint Test	H

TEST STEP	RESULT	ACTION TO TAKE
H15 CHECK CONTINUITY OF HEGO SIGNAL AND HEGO GROUND CIRCUITS		
• Key off. • Inspect HEGO GND at the engine (3-wire HEGO only). • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • HEGO disconnected. • DVOM on 200 ohm scale. **For truck only with 4 wire HEGO:** — Measure resistance between Test Pin 49 and Test Pin 46 at the breakout box and HEGO GNP at the HEGO vehicle harness connector. **For 2.3L MA Car:** — Measure resistance between Test Pin 49 at the breakout box and HEGO GND at the HEGO vehicle harness connector. **For all others:** — Measure resistance between Test Pin 49 at the breakout box and battery negative post. • Measure resistance between Test Pin 29 at the breakout box and HEGO SIGNAL at the vehicle harness connector. **For vehicles with dual HEGO:** — Measure resistance between Test Pin 43 at the breakout box and HEGO SIGNAL at the vehicle harness connector. • **Is each resistance less than 5.0 ohms?**	Yes ▶	GO to H16.
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT processor, HEGO sensor, and any other components that are disconnected or removed. RERUN Quick Test.



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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H16 CHECK H/EGO CIRCUIT FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • HEGO disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 29 and Test Pins 40 and 49 at the breakout box. **For truck only with 4 wire HEGO:** — Measure resistance between Test Pin 29 and Test Pins 40 and 46 at the breakout box. For Vehicles With Dual HEGO: — Measure resistance between Test Pin 43 and Test Pin 40 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to H17. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and HEGO sensor. RERUN Quick Test.
H17 CHECK HEGO SENSOR FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • HEGO disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between PWR GND and HEGO SIGNAL at the HEGO sensor connector. • **For truck only with 4 wire HEGO:** — Measure resistance between PWR GND, HEGO GND and HEGO SIG at the HEGO sensor connector. • **Is resistance greater than 10,000 ohms?**  HEGO SENSOR CONNECTOR A13569-A	Yes ▶ No ▶	**For Engines With:** — MAP sensor GO to H18. — Vane Air Meter GO to H19. — Mass Air Flow Meter. REMOVE breakout box. RECONNECT HEGO sensor. REPLACE processor, except for 3.8L Super Charged engine, GO to Section 8. If OK, then REPLACE processor. RERUN Quick Test. REPLACE HEGO sensor. REMOVE breakout box. RECONNECT processor, RERUN Quick Test.

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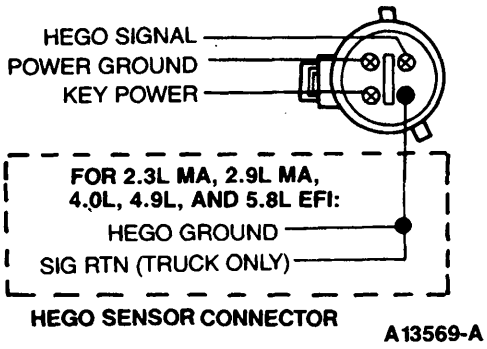
Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H18 ATTEMPT TO ELIMINATE CODE 41 ON ENGINES WITH MAP SENSOR		
• Key off. • Breakout box installed. • Disconnect and plug MAP vacuum line. • Connect processor to breakout box. • Reconnect HEGO sensor. • Start engine and run at approximately 2000 rpm for 2 minutes. Allow engine to return to idle. • Apply 10-14 in-Hg (3-46 kPa) vacuum to MAP sensor. • Rerun Engine Running Self-Test. • **Is Code 41 still present (ignore all other codes)?**	Yes ▶	REMOVE breakout box. RECONNECT MAP sensor vacuum line. If engine runs rough, GO to S2. All others REPLACE processor. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT processor and MAP sensor vacuum line. HEGO sensor input OK. **For SEFI:** Fuel delivery is OK. Problem is in an area common to all cylinders, i.e. air/ vacuum leak, fuel contamination, EGR. CHECK MAP frequency, etc. SERVICE as necessary. **For All Others:** GO to H1.
H19 ATTEMPT TO ELIMINATE CODE 41 ON ENGINES WITH VANE AIR FLOW METER		
• Key off. • Breakout box installed. • Connect processor to breakout box. • Reconnect H/EGO sensor. • Air cleaner removed, pencil inserted in Vane Air Flow meter inlet. • Start engine and run at approximately 2000 rpm for 2 minutes. • Rerun Engine Running Self-Test. • **Is Code 41 present?**	Yes ▶	REPLACE processor. REMOVE breakout box. REMOVE pencil from vane meter. REINSTALL air cleaner. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT processor. H/EGO input circuit OK. GO to H1.

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Fuel Control	Pinpoint Test	H

TEST STEP		RESULT ▶	ACTION TO TAKE
H20	CHECK RESISTANCE OF HEATER ELEMENT ON HEGO		
• Key off. • Disconnect HEGO. • DVOM on 200 ohm scale. • Measure resistance between KPWR circuit and PWR GND circuit at HEGO sensor connector. • Hot to warm resistance specification is 5.0 to 25.0 ohms. • Room temperature resistance specification is 2.0 to 5.0 ohms. • **Is resistance within specification?**		Yes ▶ No ▶	GO to H21. REPLACE HEGO sensor. RERUN Quick Test.

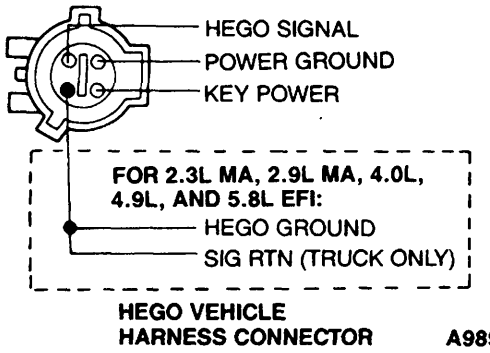


HEGO SENSOR CONNECTOR

A13569-A

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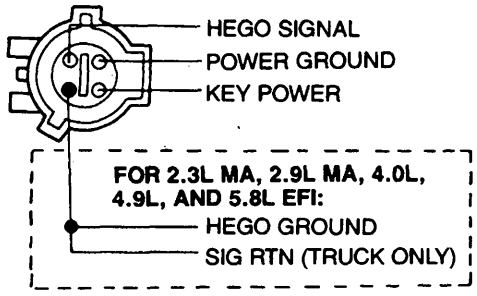
Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H21 CHECK FOR POWER AT HEGO HARNESS CONNECTOR		
• Key on, engine off. • HEGO disconnected. • DVOM on 20 volt scale. • Measure voltage between KEY POWER circuit and PWR GND circuit at the HEGO vehicle harness connector.. • **Is voltage greater than 10.5 volts?**  **HEGO VEHICLE HARNESS CONNECTOR** **A9891-D**	Yes ▶ No ▶	RECONNECT HEGO sensor. HEGO sensor system OK. **For SEFI:** Fuel delivery is OK. HEGO sensor may have cooled prior to Engine Running Self-Test. If symptom persists, problem is in an area common to all cylinders, i.e. air/ vacuum leak, fuel contamination, EGR, MAP. CHECK MAP frequency, etc. SERVICE as necessary. **For All Others:** GO to H1. GO to H22.
H22 CHECK CONTINUITY OF POWER GROUND CIRCUIT		
• Key off, wait 10 seconds. • HEGO disconnected. • DVOM on 200 ohm scale. • Measure resistance between PWR GND circuit at the HEGO vehicle harness connector and battery negative post. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	SERVICE open in KEY POWER circuit. RECONNECT HEGO sensor. RERUN Quick Test. SERVICE open in PWR GND circuit. RECONNECT HEGO sensor. RERUN Quick Test.

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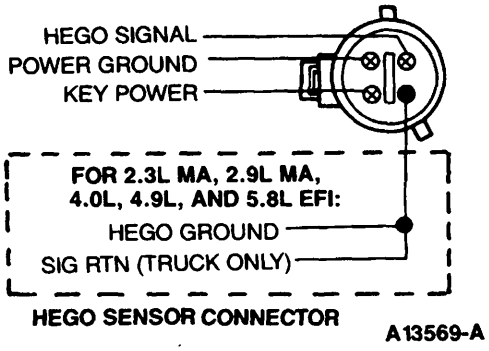
Fuel Control	Pinpoint Test	H

TEST STEP		RESULT ▶	ACTION TO TAKE
H23	SERVICE CODE 42/92: FUEL CONTROL ALWAYS RICH; CHECK HEGO SIGNAL FOR SHORT TO POWER		
NOTE: For vehicles with dual HEGOs, code 42 refers to the right or rear #1 HEGO sensor. Code 92 refers to the left or front #2 HEGO sensor. HEGO Engine Running codes 42 and 92 indicate the system is always rich. • Key off, wait 10 seconds. • Disconnect the appropriate HEGO sensor for Code 42/92. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between HEGO SIG and PWR GND at the HEGO vehicle harness connector. • **Is voltage less than 0.5 volts?**		Yes ▶	GO to H24.
		No ▶	SERVICE HEGO circuit short to power. RECONNECT HEGO sensor. RERUN Quick Test.



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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H24 CHECK HEGO SENSOR FOR SHORT TO IGNITION RUN CIRCUIT		
• Key off. • HEGO disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between KPWR circuit and HEGO SIG circuit at the HEGO sensor connector. • **Is resistance greater than 10,000 ohms?**  	Yes ▶ No ▶	GO to H25 . REPLACE HEGO sensor. RERUN Quick Test.
H25 ATTEMPT TO GENERATE CODE 41/91		
Non-EEC areas could cause a Service Code 42/92. Check for: — Fuel contaminated engine oil — Ignition caused misfire (fouled spark plug) — CANP problems • Key off, wait 10 seconds. • HEGO disconnected. • Jumper HEGO SIG circuit at the HEGO vehicle harness connector to battery negative post. • Rerun Engine Running Self-Test. • **Is Code 41/91 present?**	Yes ▶ No ▶	REMOVE jumper. **For Engines With MAP Sensor:** GO to H26 . **All Others:** GO to H28 . REMOVE jumper. RECONNECT HEGO sensor. DISCONNECT processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. SERVICE as necessary. If OK REPLACE processor. RERUN Quick Test.

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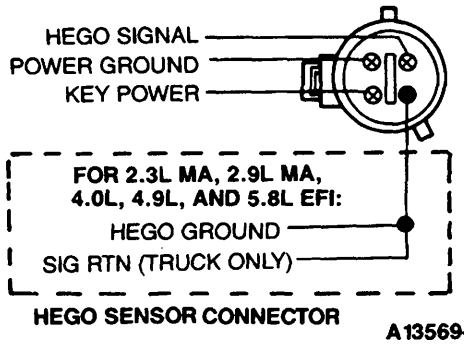
Fuel Control	Pinpoint Test	H

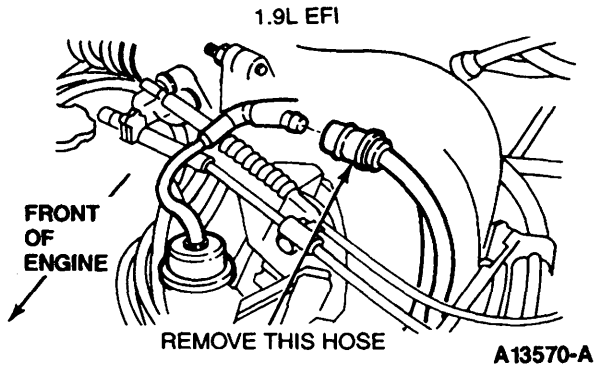
TEST STEP	RESULT ▶	ACTION TO TAKE
H26 CHECK MAP SENSOR FOR VACUUM LEAK		
NOTE: Due to the MAP sensor's large influence on fuel control, there is a possibility that a Code 42/92 could be a result of a MAP problem, even though a Code 22 is not present. Therefore the next two Test Steps will verify proper vacuum to the MAP sensor and its ability to hold vacuum. • Key off, wait 10 seconds. • Disconnect vacuum line from MAP sensor. • Connect a vacuum pump to the MAP sensor and apply 18 in-Hg (60 kPa) vacuum to MAP sensor. • **Does MAP sensor hold vacuum?**	Yes ▶ No ▶	RELEASE vacuum. GO to H27. REPLACE MAP sensor. REMOVE vacuum pump. RECONNECT HEGO sensor. RERUN Quick Test.
H27 CHECK FOR LOSS OF VACUUM TO MAP SENSOR		
• Tee a vacuum gauge into the manifold vacuum line at the MAP sensor • Start the engine and let rpm stabilize. Note vacuum level. • Key off, wait 10 seconds. • REMOVE vacuum gauge and tee and reconnect vacuum line to MAP sensor • Tee in vacuum gauge at a different source of intake manifold vacuum and restart the engine. Note vacuum level. • **Does the vacuum level differ greater than 1 in-Hg?**	Yes ▶ No ▶	INSPECT vacuum lines for leaks, holes, disconnections, kinks, blockages, and proper routing. SERVICE as necessary. REMOVE vacuum gauge and tee. RECONNECT HEGO sensor. RERUN Quick Test. GO to H28.

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Fuel Control	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H28 HEGO SENSOR CHECK		
• Key off, wait 10 seconds. • HEGO sensor disconnected. • Connect DVOM to HEGO SIGNAL at the HEGO sensor connector and to battery negative post. • DVOM on 20 volt scale. • Create a vacuum leak to cause HEGO sensor to go lean. **For 1.9L EFI:** — Disconnect the manifold vacuum hose illustrated below. **For All MA vehicles:** — Disconnect any vacuum hose from the manifold vacuum tree. **For all other applications:** — Disconnect the PCV valve hose from the PCV valve. • Start engine and run at approximately 2000 rpm. • **Does the DVOM indicate less than 0.4 volts within 30 seconds?**	Yes ▶	RECONNECT HEGO sensor and vacuum lines. HEGO sensor is OK. **For SEFI:** Fuel delivery is OK. Problem is in an area common to all cylinders, i.e., air/ vacuum leak, fuel contamination, EGR. CHECK MAP frequency, etc. SERVICE as necessary. **For All Others:** GO to H1.
	No ▶	REPLACE HEGO sensor. RECONNECT vacuum hoses. RERUN Quick Test.





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Fuel Control	Pinpoint Test	H

H29 CONTINUOUS MEMORY CODE 41 OR 91/EXHAUST ODOR, SMOKE:

CODE 41/91 — Indicates that a HEGO circuit has not switched during closed loop fuel control.

NOTE: In this situation, Code 41 or 91 does not necessarily indicate a lean condition.

Before attempting to service a Continuous Memory Code 41 or 91, DIAGNOSE all other driveability complaints first (e.g., rough idle, misses, etc.) using Diagnosis by Symptom.

Symptom:

Exhaust odor, smoke is possible to appear without code 41/91, it is an intermittent fault and could be due to loose HEGO SIG or HEGO GND connection or poor HEGO harness insulation near the exhaust manifold. The processor thinks the system is lean and therefore leads to an over-rich fuel condition.

Some areas to check are:

- HEGO SIG and GND connections.
- HEGO harness insulation near the exhaust manifold.
- Unmetered Air (vacuum leaks/intake air leaks):
  - — Canister purge system.
  - — PCV system.
  - — Engine sealing.
  - — Crimped fuel lines.
  - — Plugged fuel filter.
  - — Fouled fuel injectors.
  - — Air leaks between mass air flow sensor and air outlet tube to throttle body.
- HEGO Fuel Fouled:

  Whenever an over-rich fuel condition has been experienced (fuel fouled spark plugs), make a thorough check of the ignition system. If a HEGO sensor is suspected of being fuel fouled (low output or slow response), run the vehicle at sustained high speed (within legal limits) followed by a few hard accels. This will burn off the HEGO contamination and restore proper HEGO operation.
- Ignition System:

  If engine is always in DEFAULT spark (base timing) refer to Quick Test Step [4.0].
- Improper Fueling:

  Lead fouled HEGO sensor.
- Fuel Pressure:

  Perform Pinpoint Test Steps [H1] and [H2].
- TP Sensor:

  Turn key to RUN position. While moving throttle slowly toward wide-open position, measure voltage between Test Pins 47 and 46 at the breakout box. If the voltage does not increase with the increase of throttle opening, replace TP sensor or linkage as necessary.
- If at this point the driveability concern is still present, perform Pinpoint Test Steps [H3] through [H6].

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Fuel Control	Pinpoint Test	H

H30 CONTINUOUS MEMORY CODE 41, 42, 43, 65, 85, OR 86:

Code 41 — HEGO indicated the fuel system was lean for more than 15 seconds when the fuel system should have been in closed loop fuel control.

Code 42 — HEGO indicated the fuel system was rich for more than 15 seconds when the fuel system should have been in closed loop fuel control.

Code 43 — HEGO indicated the fuel system was lean at WOT for more than 3 seconds.

Code 65 — Never went to closed loop fuel control on HEGO switching.

Code 85 — Adaptive fuel has corrected an excessive rich condition. (Adaptive fuel made the fuel system leaner.)

Code 86 — Adaptive fuel has corrected an excessive lean condition. (Adaptive fuel made the fuel system richer.)

- Before attempting to service a Continuous Memory Code 41, 42, 43, 65, 85, or 86, DIAGNOSE all other driveability complaints first. Examples: rough idle, misses, etc. using Diagnosis By Symptom.
- Whenever an over-rich fuel condition has been experienced (fuel fouled spark plugs), make a thorough check of the ignition system. If a HEGO sensor is suspected of being fuel fouled (low output or slow response), after the vehicle service, run the vehicle at sustained high speed (within legal limits) followed by a few hard accels. This will burn off the HEGO contamination and restore proper HEGO operation.
- The fuel Service Code may help to isolate the cause of the fuel control problem. Some areas to check are:

For Code 41:

- Intermittent HEGO circuit (SIG or GND).
- If Code 65 is also present, service faulty HEGO circuit (SIG or GND).
- If Code 43 is also present, service Code 43 first.
- Vane Air Flow meter indicates low air flow. Check for vacuum leaks, intake air leaks, or a sticking vane caused by contamination or frost.
- Low fuel pressure at WOT.
  - — Low-pressure fuel pump.
  - — Restricted fuel supply (crimped fuel lines or plugged fuel filter or screen at the Fuel Pressure Regulator).
- Low fuel flow at WOT with correct fuel pressure.
  - — Clogged fuel injectors.
  - — Low battery voltage less than 11 volts.

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Fuel Control	Pinpoint Test	H

H30 (CONTINUED)

For Code 42:

- Intermittant HEGO circuit (SIGNAL or GROUND).
- Air Flow indicated by the Vane Air Flow Meter is greater than the actual air flow (causing more fuel to be delivered than necessary). Check for high Vane Air Flow meter voltage output due to a sticking vane caused by contamination.
- Excessive fuel pressure. Check for fuel pressure regulator vacuum line disconnected or kinked fuel return line.
- Excessive fuel flow. Check for damaged or stuck open fuel injector(s).

For Both Codes 41 and 42:

- Intermittant HEGO circuit (SIGNAL or GROUND).
- Sticking Vane Air Flow Meter vane due to contamination.
- Contaminated HEGO sensor (lead or silicone fouled).
- Improper fuel pressure. Check fuel pump and fuel pressure regulator.

For Code 43:

- Low fuel pressure at WOT.
  - — Low pressure fuel pump.
  - — Restricted fuel supply (crimped fuel lines or plugged filter).
- Low fuel flow at WOT with correct fuel pressure.
  - — Clogged fuel injectors.
  - — Low battery voltage less than 11 volts.

For Code 65:

- Check for faulty HEGO circuit (SIGNAL or GROUND).

For Code 85:

- If Code 42 is also present, service Code 42 first.
- Excessive fuel pressure. Check for fuel pressure regulator vacuum line disconnected or kinked fuel return line.
- Excessive fuel flow. Check for damaged fuel injector pintle or injectors stuck open.

For Code 86:

- If Code 41 is also present, service Code 41 first.
- Low fuel pressure
  - — Low pressure fuel pump.
  - — Restricted fuel supply (crimped fuel lines) screen at Fuel Pressure Regulator or plugged filter.
- Low fuel flow with correct fuel pressure
  - — Clogged fuel injectors.
  - — Low battery (fuel injector voltage less than 11 volts).

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Fuel Pump Circuit	Pinpoint Test	J

Note

You should enter this Pinpoint Test only when a Service Code 87, 95 or 96 is received during Quick Test or if you have been directed here from Pinpoint Test [A] or Diagnosis By Symptom.

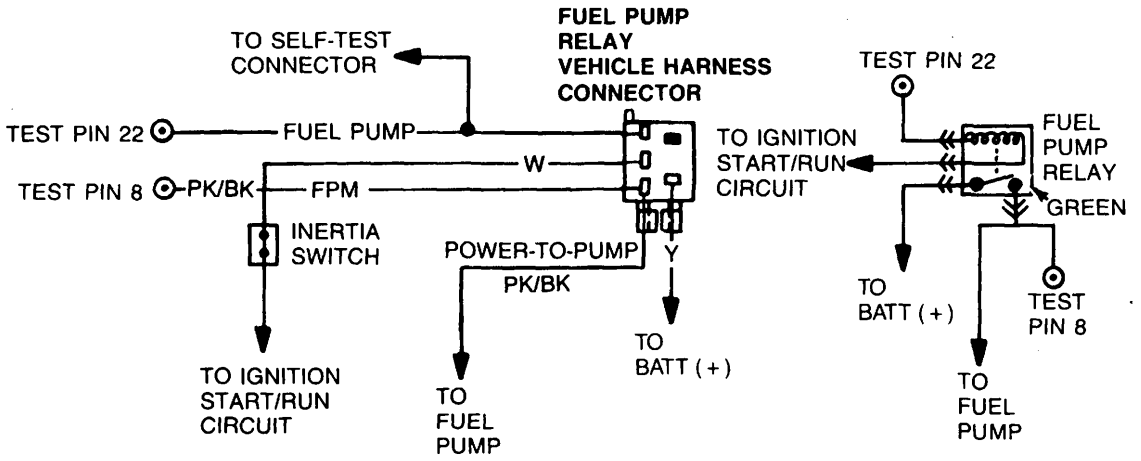
Remember

This Pinpoint Test is intended to diagnose only the following:

- Fuel Pump Relay (-9345-)
- Inertia Switch (-9341-)
- Harness circuits: BATT (+), VPWR, F.P., GND and Power-To-Pump(s)
- Processor Assembly (-12A650-)

Pinpoint Test Schematic

1.9L CFI, 1.9L EFI, 2.3L HSC



A11532-C

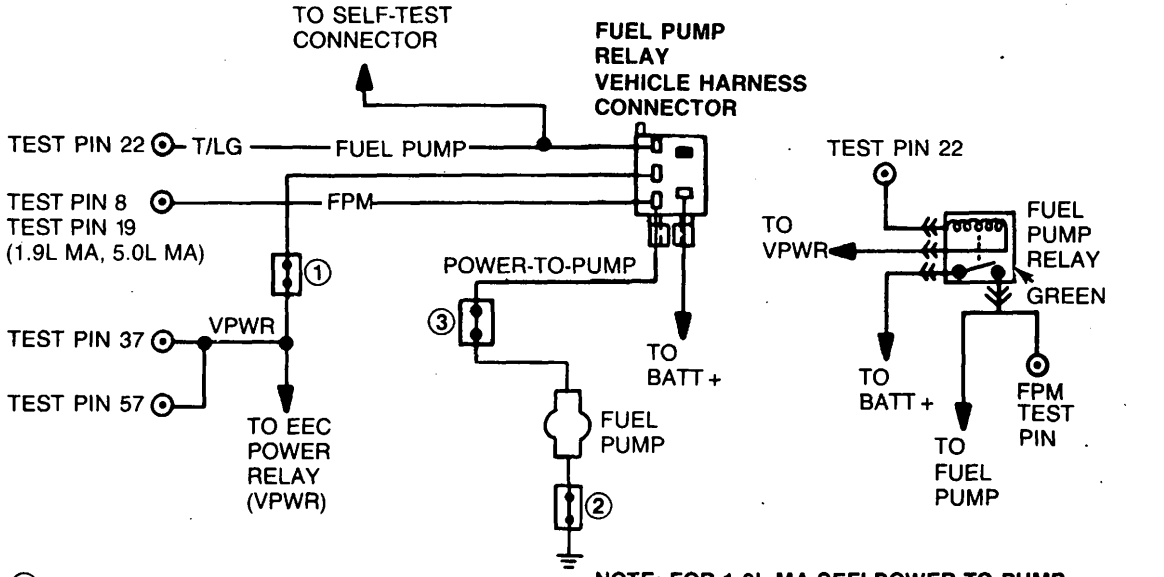
Test Pin 22 Application	Fuel Pump Wire Color
1.9L CFI 1.9L EFI	T/LG
2.3L HSC	O/LB

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Fuel Pump Circuit	Pinpoint Test	J

Pinpoint Test Schematic

1.9L MA SEFI, 2.3L MA EFI, 5.0L SEFI MA MUSTANG, 2.3L TRUCK, 2.9L TRUCK, 3.0L EFI TRUCK, 4.0L EFI



① INERTIA SWITCH LOCATION — MUSTANG
② INERTIA SWITCH LOCATION — 1.9L MA SEFI
③ INERTIA SWITCH LOCATION — ALL OTHERS

NOTE: FOR 1.9L MA SEFI POWER-TO-PUMP AND INERTIA SWITCH CIRCUITS ARE DOUBLED (2-WIRES EACH)

A11533-C

Test Pin 8 (19) FPM

Application	Wire Color
2.3L Truck 2.9L Truck 4.0L Ranger, Bronco II	O/LB
All Others	PK/BK

BATT(+)

Application	Wire Color
2.3L Truck 2.9L Truck 4.0L Ranger, Bronco II	BK/Y
3.0L EFI Truck 4.0L Aerostar	Y
5.0L SEFI MA 2.3L MA EFI Car	O/LB
1.9L MA SEFI	W/GR

POWER-TO-PUMP Circuit

Application	Wire Color
2.3L Truck 4.0L Ranger, Bronco II	O/LB
All Others	PK/BK

Test Pin 37/57 VPWR

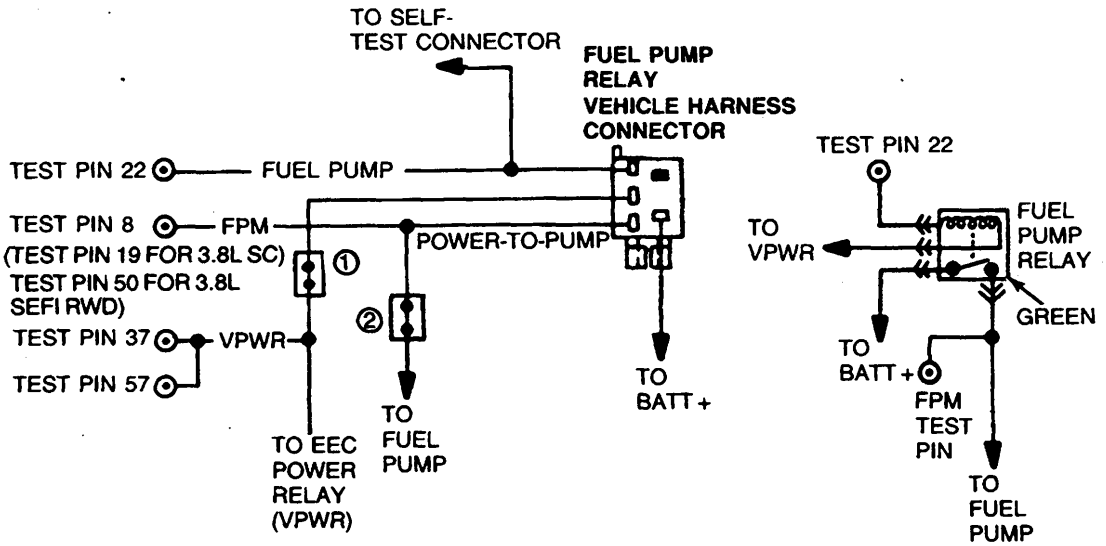
Application	Wire Color
1.9L MA SEFI	W/R
All Others	R

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Fuel Pump Circuit	Pinpoint Test	J

Pinpoint Test Schematic

3.8L SEFI RWD, 3.8L SEFI SC, 4.9L EFI, 5.0L EFI, 5.8L EFI, 7.5L EFI



① INERTIA SWITCH LOCATION—THUNDERBIRD/COUGAR
② INERTIA SWITCH LOCATION—F-SERIES, E-SERIES, BRONCO

A11534-C

TEST PIN 8 (19, 50) POWER-TO-PUMP Circuit

Application	Wire Color
F-Series Bronco	DG/Y
E-Series	O/LB
Thunderbird/Cougar	PK/BK

BATT(+) At Relay

Application	Wire Color
F-Series E-Series Bronco	Y
Thunderbird/Cougar	BK/Y

VPWR at Relay

Application	Wire Color
F-Series E-Series Bronco	R
Thunderbird/Cougar	W

Test Pin 22 FP

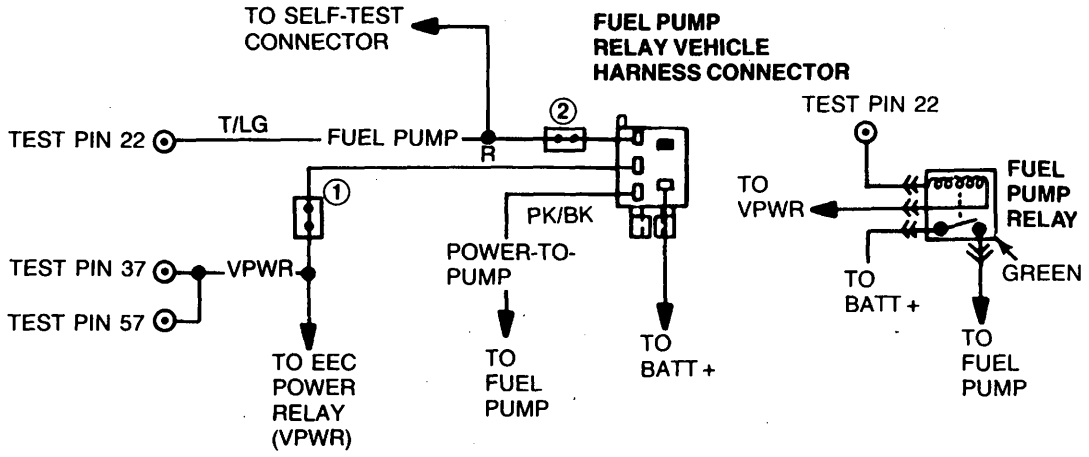
Application	Wire Color
F-Series Bronco	LB/O
All Others	T/LG

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Fuel Pump Circuit	Pinpoint Test	J

Pinpoint Test Schematic

2.3L OHC EFI, CAR, 5.0L SEFI MARK VII



① INERTIA SWITCH LOCATION — MUSTANG
② INERTIA SWITCH LOCATION — MARK VII

A11535-C

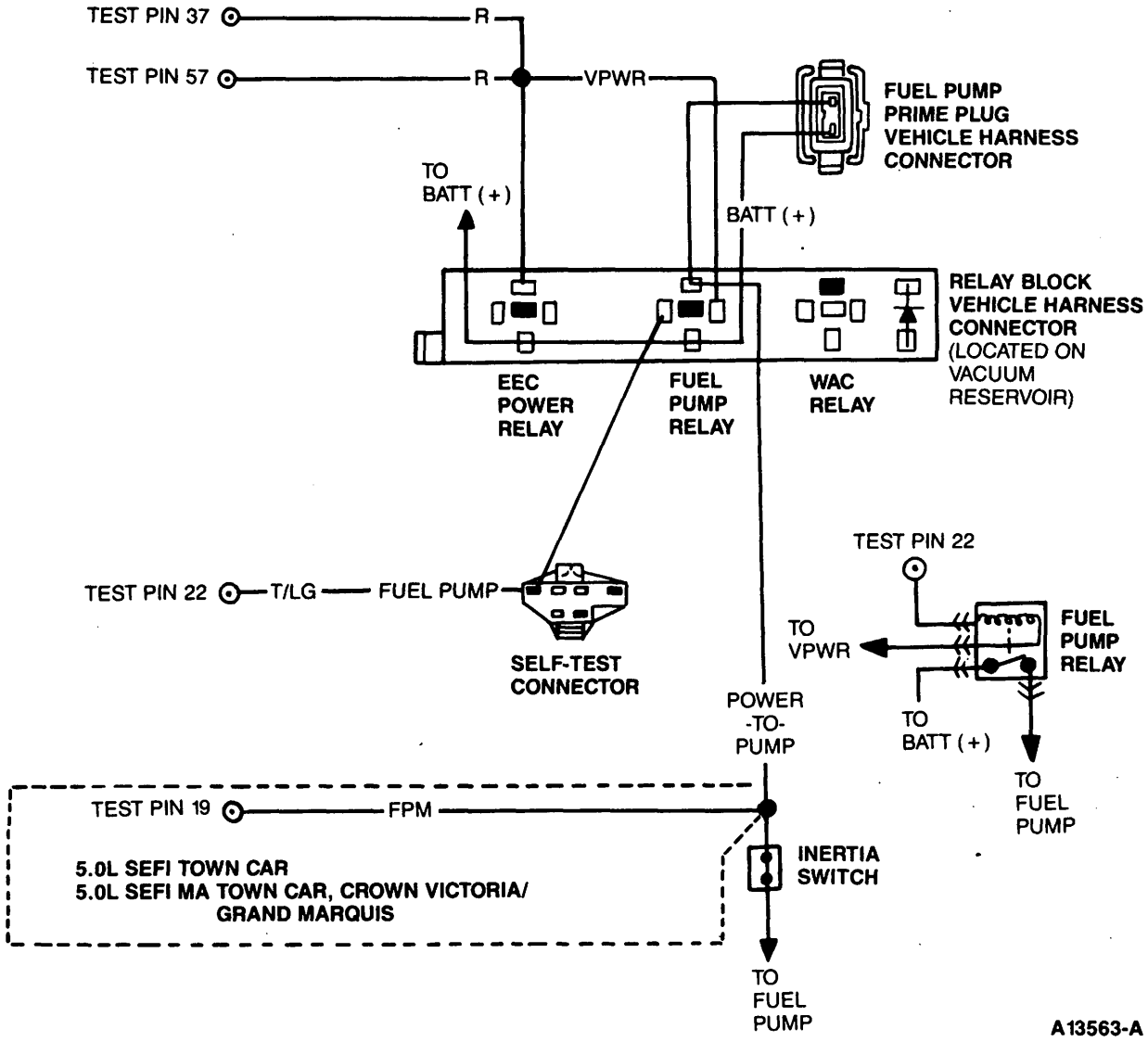
BATT(+) At Relay

Application	Wire Color
Mustang	O/LB
Mark VII	R

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Fuel Pump Circuit	Pinpoint Test	J

5.0L SEFI TOWN CAR, CROWN VICTORIA/GRAND MARQUIS
5.0L SEFI MA TOWN CAR, CROWN VICTORIA/GRAND MARQUIS



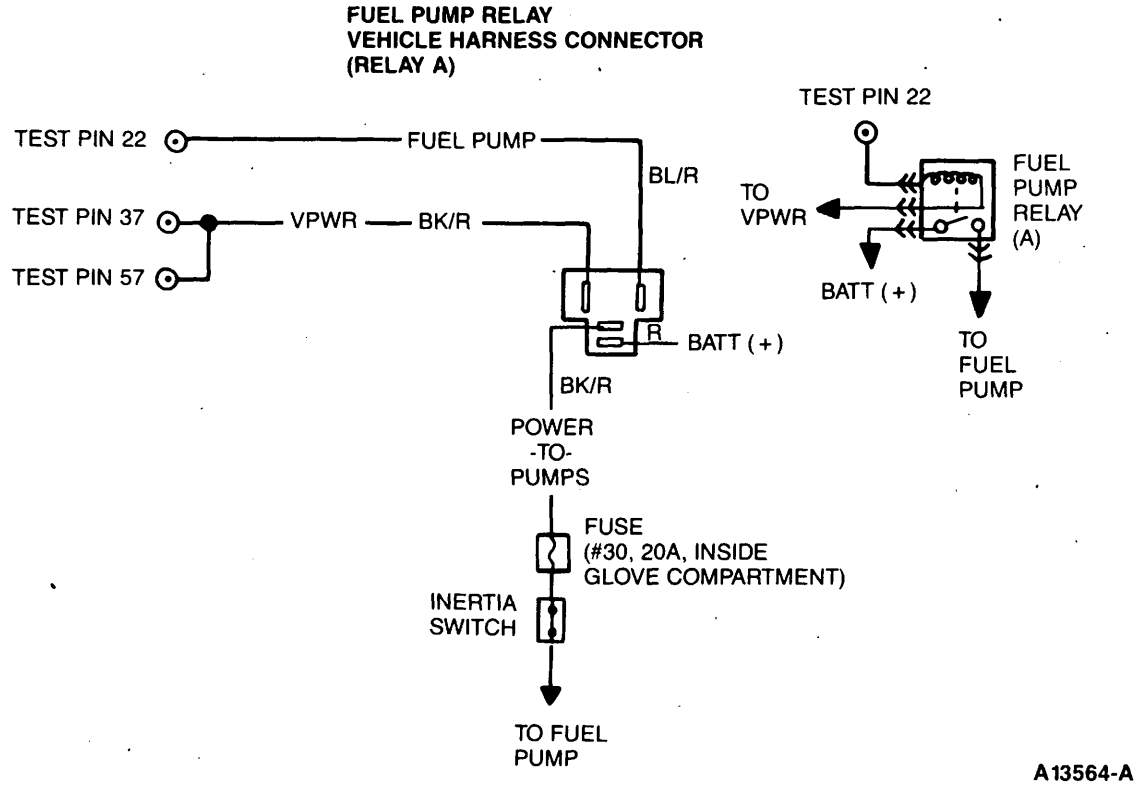
Test Pin 19	FPM
Application	**Wire Color**
Crown Victoria/Grand Marquis	O
Town Car	PK/BK

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Fuel Pump Circuit	Pinpoint Test	J

Pinpoint Test Schematic

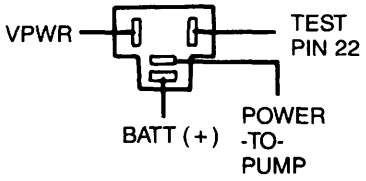
2.9L EFI SCORPIO



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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J1 NO FUEL PUMP PRESSURE: CHECK FOR FUEL PUMP ELECTRICAL OPERATION		
• To check if fuel pump runs, turn key from Off to Run position, repeat several times. (Do not turn to start position.) • **Does fuel pump run briefly each time the key is turned to RUN position?**	Yes ▶ No ▶	GO to Section 11. Also REFER to Fuel/Engine Shop Manual Group. GO to J2.
J2 CHECK FOR VPWR TO PROCESSOR		
• Key off. • Breakout box installed, processor connected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 37 and Test Pin 40 at the breakout box and between Test Pin 57 and Test Pin 60 at the breakout box. • **Are both voltages greater than 10.5 volts?**	Yes ▶ No ▶	**For 2.9L EFI:** GO to J3. **For all others:** GO to J5. GO to B1.
J3 CHECK CONTINUITY BETWEEN FUEL PUMP RELAY AND FUEL CIRCUIT FUSE		
• Key off. • Breakout box installed, processor connected. • Disconnect fuel pump relay. • Disconnect fuel pump circuit fuse (#30). • DVOM on 200 ohm scale. • Measure resistance between Power-To-Pump circuit at fuel pump relay vehicle harness connector and relay side of fuse connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to J4. SERVICE open between fuel pump relay and fuel pump circuit fuse (#30). REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.



FUEL PUMP RELAY VEHICLE HARNESS CONNECTOR A13565-A

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J4 CHECK FOR VOLTAGE TO POWER-TO-PUMP CIRCUIT		
• Key off. • Breakout box installed, processor connected. • Fuel pump circuit fuse (#30) disconnected. • Reconnect fuel pump relay. • DVOM on 20 volt scale. • Measure voltage between relay side of fuel pump circuit fuse connector and chassis ground while cranking engine. • **Is voltage greater than 8.0 volts during crank?**	Yes ▶ No ▶	RECONNECT Fuse. Go to Section 11 for open in Power-To-Pump circuit, fuel pump ground, open in pump, etc. Also, REFER to Fuel/Engine Shop Manual Group. RECONNECT fuse, GO to J6.
J5 CHECK FOR VOLTAGE TO POWER-TO-PUMP(S) CIRCUIT		
• Key on, engine off. • Breakout box installed, processor connected. • DVOM on 20 volt scale. • Measure voltage between chassis ground and Power-To-Pump circuit at fuel pump relay while cranking engine. • **Is voltage greater than 8.0 volts during crank?**	Yes ▶ No ▶	GO to Section 11 for open in Power-To-Pump circuit, fuel pump GND, open in pump, etc. Also REFER to Fuel/Engine Shop Manual Group. GO to J6.
J6 CHECK FOR BATT+ TO FUEL PUMP RELAY		
• Key on, engine off. • Breakout box installed (if applicable), processor connected. • DVOM on 20 volt scale. • Measure voltage between chassis ground and BATT(+) at the fuel pump relay. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	1.9L EFI: GO to J7. ALL OTHERS, GO to J11. SERVICE open in BATT(+) between fuel pump relay and battery positive post (for relay block applications, between fuel pump relay and EEC power relay). REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J7 CHECK FOR VPWR TO FUEL PUMP RELAY		
Service Code 87 indicates a fuel pump primary circuit failure. Possible causes are: — Inertia switch not reset or electrically open (if in primary circuit). — Open or shorted circuit. — Faulty fuel pump relay. — Faulty processor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between chassis ground and VPWR circuit (Ignition start/run circuit for 1.9L EFI, 1.9L CFI and 2.3L HSC) at the fuel pump relay. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to J8. VERIFY inertia switch is reset to On. If switch will not reset, REPLACE switch. If OK, **For 1.9L EFI, 1.9L CFI and 2.3L HSC:** SERVICE open between ignition switch start/run circuit and fuel pump relay. **All others:** SERVICE open in VPWR circuit between the EEC power relay and the fuel pump relay. RERUN Quick Test.
J8 CHECK FUEL PUMP CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between fuel pump circuit at the fuel pump relay and Test Pin 22 at the breakout box. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to J9. SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
J9 CHECK FUEL PUMP CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • Disconnect fuel pump relay. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 22 at the breakout box and battery negative post. • **Is voltage less than 1.0 volt?**	Yes ▶ No ▶	GO to J10. SERVICE short circuit. RECONNECT all components. ATTEMPT to start vehicle. If vehicle fails to start, REPLACE processor. RERUN Quick Test.

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Fuel Pump Circuit

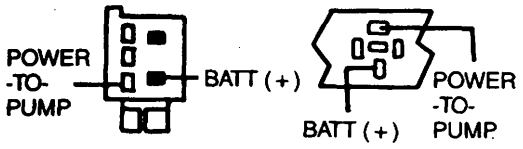
Pinpoint Test **J**

TEST STEP	RESULT ▶	ACTION TO TAKE
J10 CHECK FUEL PUMP CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Fuel pump relay disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 22 and Test Pins 40 and 60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	RECONNECT fuel pump relay. GO to J11. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
J11 CHECK FOR VOLTAGE AT POWER-TO-PUMP(S) CIRCUIT		
• Key off. • Breakout box installed, processor disconnected. • Connect jumper wire from Test Pin 22 to Test Pin 40 or 60 at the breakout box. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between chassis ground and Power-To-Pump circuit at fuel pump relay. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. REPLACE fuel pump relay. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
J20 SERVICE CODE 95: DOES ENGINE START		
Service Code 95 indicates that one of the following has occurred: No Starts: — Inertia switch not reset or electrically open (if in secondary circuit). — Open circuit in or between the fuel pump and FPM circuit connection to the Power-To-Pump circuit. — Poor fuel pump ground Vehicle Starts: — Fuel pump secondary circuit short to power — Fuel pump relay contacts always closed — Open in FPM circuit between processor and connection to the Power-To-Pump circuit. — For 1.9L EFI, fuel pump circuit (pin 22) short to ground. — Faulty processor • **Does the engine start?**	Yes ▶ No ▶	GO to J21. GO to J25.
J21 VERIFY THAT FUEL PUMP IS OFF		
• Key off. • Listen for motor noise from fuel pump. • **Is fuel pump off?**	Yes ▶ No ▶	GO to J23. GO to J22.

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J22 CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED		
• Key off. • Locate and disconnect fuel pump relay. • **Does fuel pump shut off when relay is disconnected?**	Yes ▶	REPLACE fuel pump relay. RERUN Quick Test.
	No ▶	SERVICE short to power in POWER-TO-PUMP/FPM circuit. (For 5.0L, except Mustang, also CHECK fuel pump prime plug circuit. REFER to Schematic). RERUN Quick Test.
J23 CHECK FPM CIRCUIT CONTINUITY		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect fuel pump relay. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 8 (Test Pin 19 for 5.0L, 1.9L SEFI, 3.8L SC; Test Pin 50 for 3.8L SEFI RWD) at the breakout box and Power-To-Pump circuit at the fuel pump relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶	**For 1.9L EFI:** GO to J24. **For all others:** REPLACE processor. REMOVE breakout box. RECONNECT fuel pump relay. RERUN Quick Test.
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.



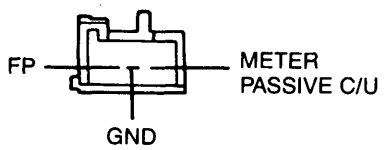
FUEL PUMP RELAY VEHICLE HARNESS CONNECTOR (USE APPLICABLE DRAWING)

A9196-B

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J24 CHECK FUEL PUMP PRIMARY CIRCUIT FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • Fuel pump relay disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 22 and Test Pin 40 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT fuel pump relay. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
J25 CHECK INERTIA SWITCH		
• Key off, wait 10 seconds. • Locate and disconnect fuel pump inertia switch (verify that switch is reset). • DVOM on 200 ohm scale. • Measure resistance of the fuel pump inertia switch. (For 1.9L MA SEFI, measure between GND pin and FP pin). • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	RECONNECT inertia switch. GO to J26. REPLACE or RESET inertia switch. RERUN Quick Test.

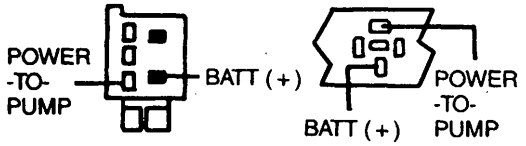


1.9L MA SEFI INERTIA SWITCH A13566-A

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J26 CHECK FOR CONTINUITY BETWEEN FPM CIRCUIT AND GROUND		
• Key off. • Breakout box installed, processor disconnected. • Fuel pump relay disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 8 (Test Pin 19 for 5.0L, 1.9L SEFI, 3.8L S/C; Test Pin 50 for 3.8L SEFI RWD) at the breakout box and battery negative post. • **Is resistance less than 10.0 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT fuel pump relay. RERUN Quick Test. REMOVE breakout box. RECONNECT all components. GO to Fuel/Engine Shop Manual Group, Electric Fuel Pump, for open in Power-To-Pump circuit, poor fuel pump ground, open in fuel pump, etc.
J30 SERVICE CODE 96: CHECK FOR BATT(+) TO FUEL PUMP RELAY		
Service Code 96 indicates a fuel pump secondary circuit failure between the BATT(+) supply and the FPM connection to the Power-To-Pump circuit. Possible causes are: — Open circuit. — Faulty fuel pump relay. — Faulty processor. • Key off, wait 10 seconds. • Locate fuel pump relay. • DVOM on 20 volt scale. • Measure voltage between BATT(+) circuit at the fuel pump relay and battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to J31. SERVICE open in BATT(+) circuit. RERUN Quick Test.



FUEL PUMP RELAY VEHICLE HARNESS CONNECTOR (USE APPLICABLE DRAWING)

A9196-B

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J31 CHECK FOR VOLTAGE AT POWER-TO-PUMP CIRCUIT TO VERIFY FUEL PUMP RELAY OPERATION		
• Key off. • DVOM on 20 volt scale. • Connect DVOM between Power-To-Pump circuit at the fuel pump relay and battery negative post. • Observe DVOM as you activate fuel pump relay (turn key to run for 1 second, then to off for 10 seconds. Repeat 5 times). • **Does voltage measure greater than 10.5 volts for about 1 second after key is turned to RUN position during test?**	Yes ▶ No ▶	**For 3.8L SEFI RWD, 3.8L SEFI SC, 5.0L (except Mustang), 4.9L EFI, 5.0L EFI, 5.8L EFI and 7.5L EFI:** GO to J32. **For all others:** REPLACE processor. RERUN Quick Test. DISCONNECT fuel pump relay. INSPECT for damaged pins, corrosion, loose wires, etc. If OK, REPLACE fuel pump relay. RERUN Quick Test.
J32 CHECK POWER-TO-PUMP CIRCUIT CONTINUITY		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect fuel pump relay. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 8 (Test Pin 19 for 5.0L, 3.8L SC and Test Pin 50 for 3.8L SEFI RWD) at the breakout box and Power-To-Pump circuit at the fuel pump relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT fuel pump relay. RERUN Quick Test. SERVICE open in Power-To-Pump circuit between FPM splice and fuel pump relay. REFER to schematic. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J90 CONTINUOUS MEMORY CODE 95: CHECK EEC-IV HARNESS		
A Continuous Memory Code 95 indicates that one of the following intermittent conditions has occurred: — Open circuit in or between the fuel pump and FPM circuit at the processor (see schematic). — Poor fuel pump ground. — FPM or Power-To-Pump circuit short to power. — Fuel pump relay contacts stuck closed. — Fuel pump circuit activated when processor expected circuit to be off (i.e. fuel system test or prime procedure). • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off.) — Shake, wiggle, bend the Power-To-Pump circuit between the Power-To-Pump pin at the fuel pump relay and the fuel pump. — Shake, wiggle, bend the fuel pump ground circuit from the fuel pump to ground. — Lightly tap the fuel pump to simulate road shock. — For vehicles with the inertia switch in the Power-To-Pump circuit (refer to schematic), lightly tap inertia switch to simulate road shock. • Key off. • Inspect the fuel pump vehicle harness connector and the fuel pump ground for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to J91.

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Fuel Pump Circuit

Pinpoint Test J

TEST STEP	RESULT ▶	ACTION TO TAKE
J91 CHECK FPM CIRCUIT		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Key on, engine off. • Connect a TEST LAMP between Test Pin 8 (Test Pin 19 for 5.0L, 1.9L SEFI, 3.8L SC; Test Pin 50 for 3.8L SEFI RWD.) and Test Pin 37 at the breakout box. • Observe test lamp for an indication of a fault while performing the following (The light will go out when a fault is found, indicating an open): — Shake, wiggle, bend the fuel pump monitor circuit between the fuel pump relay (or splice if applicable, see schematic) and the processor. • **Is fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REMOVE breakout box. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to J92.
J92 CHECK FOR SHORTS TO POWER		
• Key on, engine off. • Breakout box installed, processor disconnected. • Connect a TEST LAMP between Test Pin 8 (Test Pin 19 for 5.0L, 1.9L SEFI, 3.8L SC; Test Pin 50 for 3.8L SEFI RWD) and Test Pin 40. • Observe test lamp for an indication of a fault while performing the following (The light will turn on when a fault is detected, indicating a short to power. Also, if possible, listen for fuel pump turning on.): — Shake, wiggle, bend the fuel pump monitor circuit and Power-To-Pump circuit, especially where they may be in the vicinity of a power circuit. • Lightly tap the fuel pump relay (to simulate road shock). • **Is fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REMOVE breakout box. RECONNECT processor. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor Box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J93 CONTINUOUS MEMORY CODE 96: CHECK FOR CONTINUOUS MEMORY CODE 87		
• **Is Continuous Memory Code 87 also present?**	Yes ▶	GO to J95.
	No ▶	GO to J94.
J94 CHECK EEC-IV HARNESS		
A Continuous Memory Code 96, without the presence of a Continuous Memory Code 87, indicates that during vehicle operation, one of the following has occurred: — Open in the BATT(+) circuit between BATT(+) and the fuel pump relay. — Fuel pump relay contacts opened. — Open in the Power-To-Pump circuit from the fuel pump relay to the FPM splice, if applicable (see schematic). • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off): — Shake, wiggle, bend the BATT(+) circuit from BATT(+) to the fuel pump relay. — Lightly tap the fuel pump relay (to simulate road shock). — Shake, wiggle, bend the Power-To-Pump circuit from the fuel pump relay to the FPM splice, if applicable (See schematic). • Key off. • Inspect the fuel pump relay connectors and BATT(+) connector terminal for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	**For 1.9L EFI:** GO to J95. **For all others:** Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor Box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Fuel Pump Circuit	Pinpoint Test	J

TEST STEP	RESULT ▶	ACTION TO TAKE
J95 CONTINUOUS MEMORY CODE 87: CHECK EEC-IV HARNESS		
A Continuous Memory Code 87 indicates that a fuel pump primary circuit failure has occurred during vehicle operation. Possible causes are: — Open in VPWR circuit between the EEC power relay and the fuel pump relay. — Open coil in fuel pump relay. — Open in fuel pump circuit (Pin 22). — Faulty inertia switch. • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off): — Shake, wiggle, bend the VPWR circuit between the EEC power relay and the fuel pump relay. For vehicles with the inertia switch in the VPWR circuit (refer to schematic), lightly tap the inertia switch to simulate road shock. — Shake, wiggle, bend the EEC-IV vehicle harness fuel pump circuit (Test Pin 22) between the processor and the fuel pump relay. — Lightly tap the fuel pump relay to simulate road shock. • Key off. • Inspect the processor 60 pin connector and the fuel pump relay connectors for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor Box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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EGR On/Off Control	Pinpoint Test	KA

Note

You should enter this Pinpoint Test only when you have been directed here from Diagnosis By Symptom.

Remember

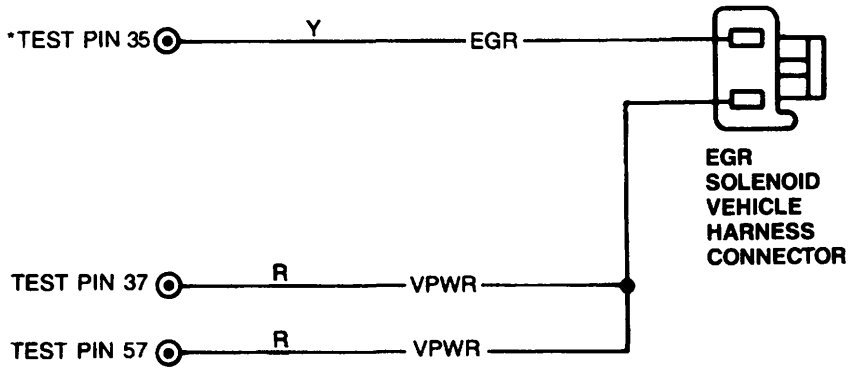
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Air or Vacuum Leaks
- EGR Flow Restrictions
- EGR Valve

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: EGR and VPWR
- EGR Solenoid (-9D474-)
- Presence of Manifold Vacuum
- Processor Assembly (-12A650-)

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9669-E

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EGR On/Off Control

Pinpoint Test **KA**

TEST STEP	RESULT ▶	ACTION TO TAKE
KA1 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
Possible causes: — Faulty EGR On/Off control solenoid. — Faulty EGR solenoid. — Faulty EGR vent solenoid. — Faulty EVP sensor. — Faulty wire harness. — Faulty processor. — Manifold vacuum line blockage and/or leak. **NOTE: Do not use STAR tester for this step, use a VOM/DVOM.** • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Disconnect electrical connector on the speed control servo, if equipped. • Connect DVOM negative test lead to STO at the Self-Test connector and positive test lead to battery positive. • Jumper STI to SIG RTN at the Self-Test connector. • Rerun Key On Engine Off Self-Test until the completion of the Continuous Test Codes. • DVOM will indicate less than 1.0 volts. • Depress and release the throttle. • **Did DVOM reading change to a high voltage reading?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KA2. DEPRESS throttle to WOT and release. If STO voltage does not go high, leave equipment hooked up and GO to Pinpoint Test Step QC1.
KA2 CHECK EGR SOLENOID ELECTRICAL OPERATION		
• Disconnect EGR solenoid. • DVOM on 20 volt scale. • Connect DVOM positive test lead to VPWR circuit on EGR solenoid and negative test lead to EGR output circuit. • While observing DVOM, depress and release the throttle several times to cycle output on and off. • **Does EGR output cycle on and off?**	Yes ▶ No ▶	GO to KA3. REMOVE STI jumper. GO to KA5.

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EGR On/Off Control	Pinpoint Test	KA

TEST STEP	RESULT ▶	ACTION TO TAKE
KA3 CHECK EGR SOLENOID FOR VACUUM CYCLING		
• Reconnect EGR solenoid. • Install vacuum pump to the solenoid vacuum supply port and install a vacuum gauge to the output port. Apply 6 in-Hg minimum. • While cycling outputs on and off (by depressing and releasing throttle) observe the vacuum gage at the output. **NOTE: Maintain vacuum at source.** • **Does output port vacuum cycle on and off?**	Yes ▶ No ▶	GO to KA4. REPLACE solenoid. RERUN Quick Test.
KA4 CHECK MANIFOLD VACUUM LINES FOR BLOCKAGE OR LEAKS		
• Vacuum lines disconnected at solenoid. • Start engine. • Check for vacuum. • **Is vacuum present?**	Yes ▶ No ▶	EEC-IV system OK. GO to Section 6, EGR Systems Diagnosis. SERVICE vacuum source blockage or leak. RERUN Quick Test.
KA5 MEASURE EGR SOLENOID RESISTANCE		
• Key off, wait 10 seconds. • DVOM on 200 ohm scale. • EGR solenoid disconnected. • Measure resistance between EGR circuit and VPWR circuit at the EGR solenoid. • **Is solenoid resistance between 65 and 110 ohms?**	Yes ▶ No ▶	GO to KA6. REPLACE EGR solenoid. RERUN Quick Test.
KA6 CHECK VPWR CIRCUIT VOLTAGE		
• Key on, engine off. • EGR solenoid disconnected. • DVOM on 20 volt scale. • Measure voltage between VPWR circuit at the EGR solenoid vehicle harness connector and battery ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KA7. SERVICE open circuit. RECONNECT EGR solenoid. RERUN Quick Test.

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EGR On/Off Control | Pinpoint Test | KA

TEST STEP	RESULT ▶	ACTION TO TAKE
KA7 CHECK EGR CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • EGR solenoid disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 35 at the breakout box and EGR circuit at the EGR solenoid vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **KA8**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KA8 CHECK EGR CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • EGR solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 35 and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **KA9**. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KA9 CHECK EGR CIRCUIT FOR SHORT TO POWER		
• Key off, wait 10 seconds. • EGR solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 35 and Test Pins 37 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short to power. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code is repeated, REPLACE processor.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

Note

You should enter this Pinpoint Test only when a Service Code 12, 13, 16, 17, 19, 23, 38, 53, 58, 63, 68, 71, 73 or 93 is received during Quick Test or 6.0 or if you have been directed here from Diagnosis By Symptom.

Remember

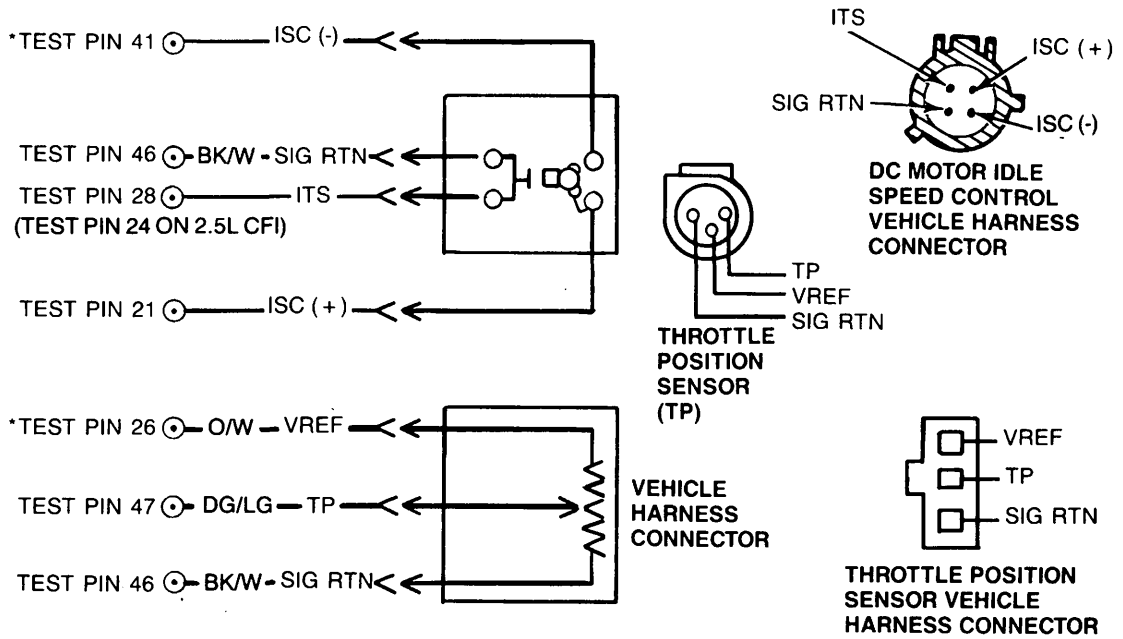
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Throttle stop screw out of adjustment
- Basic engine
- Vacuum leaks
- Throttle sticking

This Pinpoint Test is intended to diagnose only the following:

- DC motor/Idle Tracking Switch assembly (-9N825-)
- Harness circuits ISC(+), ISC(-), ITS, TP, VREF, and, SIG RTN
- Throttle Position sensor (-9B989-)
- EEC-IV processor assembly (-12A650-)

Pinpoint Test Schematic



*TEST PINS LOCATED ON THE BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9918-D

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

Idle Tracking Switch Circuit

1.9L CFI	Pin 28	LG/W
2.5L CFI	Pin 24	W/R

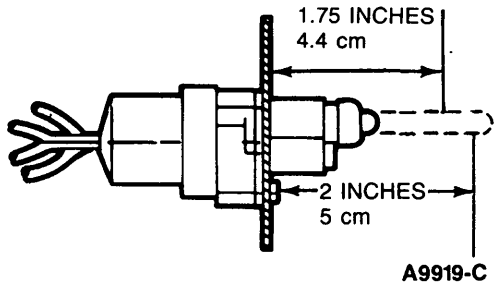
Test Pin 21	ISC(+)
1.9L CFI	BR/W
2.5L CFI	Y/BK

Test Pin 41	ISC(-)
1.9L CFI	W/LB
2.5L CFI	W

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB1 SERVICE CODE 13: CHECK DC MOTOR FOR PROPER OPERATION		
Service Code 13 indicates that an idle speed control rpm management error exists. The engine did not return to a specified lower rpm prior to entering the Dynamic Response Test portion of the Engine Running Self-Test. Possible causes: — Faulty DC motor. — Open circuit in the idle speed control circuits. — Short to ground in the idle speed control circuits. — Short to power in the idle speed control circuits. — Faulty processor. • Key off, wait 10 seconds. • Disconnect DC motor vehicle harness connector. CAUTION **Do not short to other pins when connecting jumper wire.** • Jumper ISC(+) circuit of DC motor to battery positive and ISC(−) circuit of DC motor to battery ground for 4 seconds. • Jumper ISC(+) circuit of DC motor to battery ground and ISC(−) circuit of DC motor to battery positive for 4 seconds. • **Does the DC motor shaft extend to greater than 2 inches (5 cm) and retract to less than 1.75 inches (4.4 cm) from mounting bracket (see below)?**  A9919-C	Yes ▶ No ▶	GO to KB2. REPLACE DC motor. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

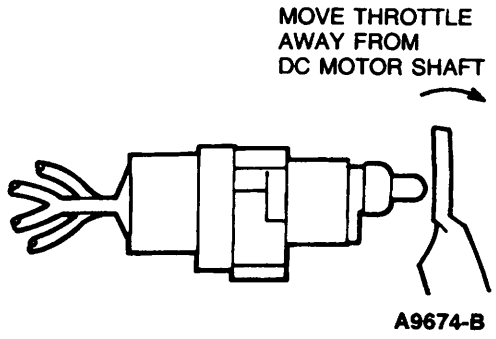
Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB2 CHECK CONTINUITY OF ISC(+) AND ISC(−) CIRCUITS • Key off, wait 10 seconds. • Vehicle harness disconnected from DC motor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 41 at the breakout box and ISC(−) circuit at the vehicle harness connector and between Test Pin 21 at the breakout box and ISC(+) circuit at the vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KB3. SERVICE open circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KB3 CHECK ISC(+) AND ISC(−) CIRCUITS FOR SHORTS TO GROUND • Key off, wait 10 seconds. • Vehicle harness disconnected from DC motor. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 41 and Test Pins 40, 46 and 60 at the breakout box. • Measure resistance between Test Pin 21 and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KB4. SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KB4 CHECK ISC(+) AND ISC(−) CIRCUITS FOR SHORTS TO POWER • Key on, engine off. • Vehicle harness disconnected from DC motor. • Breakout box installed, processor disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 41 and Test Pins 40 and 60 at the breakout box. • Measure voltage between Test Pin 21 and Test Pins 40 and 60 at the breakout box. • **Is each voltage less than 1 volt?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB5 SERVICE CODE 58: CHECK FOR FULL DC MOTOR RETRACTION		
Service Code 58 indicates that the DC motor shaft does not make contact with the throttle lever when the idle speed control DC motor produces a signal to extend the shaft. Possible causes: — Open in the Idle Tracking Switch circuit — Faulty DC motor — Faulty processor • Key off, wait 10 seconds. • Disconnect vehicle harness from DC motor. CAUTION **Do not short to other pins when connecting jumper wire.** • Jumper, at the DC motor connector, ISC(−) circuit to battery positive and the ISC(+) circuit to battery negative for 4 seconds. • **Does the DC motor shaft retract away from the throttle lever as shown?**  A9674-B	Yes ▶ No ▶	GO to KB7. GO to KB6.
KB6 MEASURE DC MOTOR RETRACTION		
• Key off, wait 10 seconds. • Vehicle harness disconnected from DC motor. • DC motor fully retracted. • Measure the distance from the tip of the DC motor shaft to the mounting bracket. Refer to figure in Step KB1. • **Is the distance less than 1.75 inches (4.4 cm)?**	Yes ▶ No ▶	RECONNECT DC motor. GO to Section 4 for throttle stop adjustment procedure. REPLACE DC motor. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB7 CHECK IDLE TRACKING SWITCH STATE		
• Key off, wait 10 seconds. • Vehicle harness disconnected from DC motor. • DC motor fully retracted. • DC motor shaft **NOT** touching the throttle lever. • DVOM on 200 ohm scale. • Measure resistance between ITS circuit and SIG RTN circuit at the DC motor connector. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **KB8**. REPLACE DC motor. RERUN Quick Test.
KB8 CHECK CONTINUITY OF ITS AND SIG RTN CIRCUITS		
• Key off, wait 10 seconds. • Vehicle harness disconnected from DC motor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion or loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 at the breakout box and SIG RTN circuit at the DC motor vehicle harness connector. • Measure resistance between Test Pin 28 (Test Pin 24 on 2.5L CFI) at the breakout box and ITS circuit at the DC motor vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RECONNECT DC motor. RERUN Quick Test. SERVICE open circuit(s). REMOVE breakout box. RECONNECT all components. RECONNECT DC motor. RERUN Quick Test.
KB9 SERVICE CODE 68: CHECK IDLE TRACKING SWITCH STATE		
Service Code 68 indicates that the DC motor shaft is in contact with the throttle lever when the idle speed control DC motor produces a signal to retract the shaft. Possible causes: — Faulty DC motor — Short to ground in the Idle Tracking Switch circuit — Faulty processor • Key off, wait 10 seconds. • Disconnect vehicle harness from DC motor. • DVOM on 200 ohm scale. • Measure resistance between ITS circuit and SIG RTN circuit at the DC motor connector. • **Is the resistance greater than 5 ohms?**	Yes ▶ No ▶	GO to **KB10**. REPLACE DC motor. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB10 CHECK ITS CIRCUIT FOR SHORTS TO GND		
• Key off, wait 10 seconds. • Vehicle harness disconnected from DC motor. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Measure resistance between Test Pin 28 (Test Pin 24 on 2.5L CFI) and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RECONNECT DC motor. RERUN Quick Test. SERVICE damaged circuit(s). REMOVE breakout box. RECONNECT all components. RECONNECT DC motor. RERUN Quick Test.
KB11 SERVICE CODE 93: CHECK THROTTLE LEVER AND LINKAGE		
Service Code 93 indicates that the DC motor is not properly interacting with the throttle linkage. Possible cause: — Faulty DC motor • Key off, wait 10 seconds. • Inspect throttle for freedom of movement to wide-open throttle and for damaged or bent throttle lever. • **Is throttle/throttle linkage functioning properly?**	Yes ▶ No ▶	REPLACE DC motor. RERUN Quick Test. SERVICE as necessary. RERUN Quick Test.
KB12 SERVICE CODE 23: CHECK THROTTLE PLATE FOR CLOSING		
Service Code 23 indicates that the throttle plate is not in the proper position during Self-Test. Possible causes: — Faulty Throttle Position sensor — Open in Throttle Position sensor circuit — Faulty processor • Run Key On Engine Off Self-Test and disconnect DC motor after it is fully retracted. • Key off, wait 10 seconds. • Remove air cleaner from throttle body. • Inspect throttle for freedom of movement and proper closure. • **Does throttle move freely and close without obstruction?**	Yes ▶ No ▶	RECONNECT DC motor. GO to **KB13**. SERVICE as necessary. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

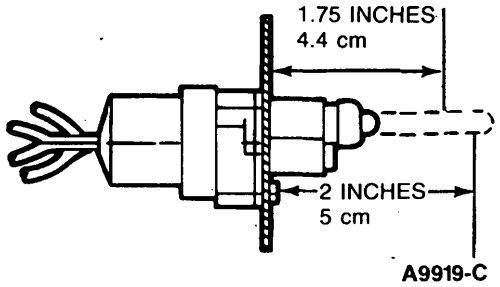
Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB13 CHECK VOLTAGE OF VREF TO SIGNAL RETURN • Key off, wait 10 seconds. • Disconnect TP sensor at the throttle body. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • DVOM on 20 volt scale. • Key on engine off. • Measure voltage between VREF circuit and SIG RTN circuit at the TP sensor vehicle harness connector. • **Is the voltage between 4 and 6 volts?**	Yes ▶ No ▶	RECONNECT TP sensor. GO to KB14. GO to Pinpoint Test Step C1.
KB14 CHECK THROTTLE STOP RPM • Run Key On Engine Off Self-Test and disconnect the DC motor after it has fully retracted and exit Self Test. • Start engine and verify that the throttle stop rpm is less than curb idle rpm. • **Is the throttle stop rpm set below the curb idle rpm?**	Yes ▶ No ▶	REPLACE the TP sensor. RECONNECT DC motor. RERUN Quick Test. RECONNECT DC motor. GO to the adjustment procedure in Section 4. ADJUST throttle stop rpm. RERUN Quick Test.
KB20 SERVICE CODE 73: VERIFY THROTTLE OBSTRUCTION CODE Service Code 73 indicates the processor did not detect a sufficient change in throttle position during the Dynamic Response portion of the Engine Running Self-Test. Possible causes: — Faulty throttle position sensor or sensor circuit — Faulty EGR system — Faulty EGO sensor or sensor circuit — Faulty idle tracking switch circuitry • Rerun Key On Engine Off Self-Test • **Is Code 73 still present?**	Yes ▶ No ▶	REPLACE TP sensor. RERUN Quick Test. SERVICE other codes.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB23 SERVICE CODE 12: CHECK FOR CODES THAT COULD CAUSE CODE 12		
Service Code 12 indicates the system is not capable of raising engine speed above curb idle. • **Are Service Codes 31, 32, 34, 35, 41, or 58 present in Engine Running Self-Test?**	Yes ▶	SERVICE these codes first. GO to Quick Test Step 7.0 for direction.
	No ▶	GO to KB24.
KB24 CHECK FOR STICKING THROTTLE LINKAGE		
• Check the throttle plates and/or linkage for sticking or binding. • Check speed control linkage for proper adjustment. • **Does throttle open and close properly?**	Yes ▶	GO to KB25.
	No ▶	SERVICE as necessary. RERUN Quick Test.
KB25 CHECK DC MOTOR FOR PROPER OPERATION		
• Key off, wait 10 seconds. • Disconnect vehicle harness from DC motor. CAUTION **Do not short to other pins when connecting jumper wire.** • Jumper ISC(+) circuit of DC motor to battery positive and ISC(−) circuit of DC motor to battery ground for 4 seconds. • Jumper ISC(+) circuit of DC motor to battery ground and ISC(−) circuit of DC motor to battery positive for 4 seconds. • **Does the DC motor shaft extend to greater than 2 inches (5 cm) and retract to less than 1.75 inches (4.4 cm) from mounting bracket (see below)?**  	Yes ▶	REPLACE processor. RECONNECT DC motor. RERUN Quick Test.
	No ▶	REPLACE DC motor. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB26 SERVICE CODE 19: CHECK FOR ERRATIC IDLE		
Service Code 19 indicates that the engine does not remain at a specified lower rpm prior to entering the Dynamic Response Test portion of the Engine Running Self-Test. Possible causes: — Faulty MAP/BP sensor or sensor circuit — Faulty EGR sensor or sensor circuit — Faulty EGO sensor or sensor circuit — Faulty Idle Tracking Switch circuit • Engine should be at normal operating temperature. • Deactivate Self-Test. • A/C off. • Run engine for 3 minutes alternating between 30 second idles and 5 second part throttle modes. • **Is the idle erratic at the end of the 3 minute idle/part throttle test?**	Yes ▶ No ▶	GO to KB27. GO to KB28.
KB27 CHECK FOR ADDITIONAL SERVICE CODES IN ENGINE RUNNING SELF-TEST		
WARNING **EXTREME CAUTION MUST BE TAKEN WHEN MAKING INSPECTIONS WITH ENGINE RUNNING.** • With engine at idle, check for vacuum leaks. Service as necessary. • Rerun Engine Running Self-Test. • **Are service codes 22, 31, 32, 34, 35, 41 or 58 present?**	Yes ▶ No ▶	GO to Quick Test Step 7.0 for direction. GO to KB28.
KB28 CHECK FOR PROPER OPERATION OF THROTTLE		
• Inspect the throttle plates and/or linkage for proper function. • **Does the throttle open and close properly?**	Yes ▶ No ▶	REPLACE DC motor. RERUN Quick Test. SERVICE as necessary. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB29 ENGINE RUNNING SERVICE CODE 99: CHECK PROCESSOR FUNCTION		
Service Code 99 indicates the EEC system has not learned to control the engine idle speed. Possible cause: — Faulty processor • With Self-Test deactivated, start the engine. DO NOT touch the throttle. • Let the engine idle for 2 minutes. • Key off, wait 10 seconds. • Run Key On Engine Off Self-Test until the service codes begin to be displayed, then deactivate Self-Test. • Key off, wait 10 seconds. • Rerun Engine Running Self-Test. • **Is Service Code 99 present?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. SERVICE other codes as necessary.
KB30 ENGINE RUNNING SERVICE CODE 16 OR 17: CHECK FOR RELATED MECHANICAL PROBLEMS OR MISADJUSTMENTS		
Service Code 16 could indicate that the accelerator pedal was touched during the Engine Running Self-Test. If Service Code 17 was present, check for electrical loads on the engine, (e.g. A/C or cooling fan on during Self-Test). • Check for vacuum leaks. • Check for throttle plate and/or linkage sticking or binding. • Check for speed control linkage for proper adjustment. • Verify proper base engine timing. • Verify proper throttle stop screw adjustment according to Section 4 of this manual. • **Are all of the above areas okay?**	Yes ▶ No ▶	SERVICE other EEC-IV codes as necessary. SERVICE as necessary. RERUN Quick Test.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

KB90 CONTINUOUS MEMORY CODE 13:

A Continuous Memory Code 13 indicates that sometime in the last 40 warm-up cycles the TP sensor rotation did not follow the reaction of the DC motor when idle speed control was in a dashpot mode. This condition may be caused by:

- The DC motor sticking at part throttle.
- An open in the ITS circuit which, when coupled with other inputs to the processor, causes the EEC-IV system to falsely enter "dashpot mode".
- The TP sensor sticking at part throttle.

Each of these areas may generate Key On Engine Off (KOEO) or other Continuous Memory Codes. Therefore, if service has been made for KOEO code 13 or 58, the Continuous Memory Code 13 can be considered serviced and erased from memory. If a Continuous Memory Code 38 is present along with the Continuous Memory Code 13, service the 38 first.

If these other codes were not present make the following checks:

- Refer to **KB1** and check for FULL travel of the DC motor shaft. Replace the DC motor if full travel is not possible. Leave the motor fully retracted.
- With the DC motor fully retracted and the ITS not touching the throttle lever (ITS closed circuit) check for an intermittent open in the ITS circuit. Turn the ignition key off and install the breakout box. Make the necessary connector/pin inspections. With the DVOM on the 200 ohm scale, monitor between Test Pins 28 (Test Pin 24 on 2.5L CFI) and 46 while tapping, wiggling, bending, etc. the DC motor connector and vehicle harness.

  NOTE: Do not push in the idle tracking switch — While performing this wiggle test

  The DVOM will change from less than 5 ohms to greater than 5 ohms if an open circuit is created. Service as necessary.
- Check for a sticking TP sensor by monitoring TP voltage while moving the throttle from a wide-open position to a closed throttle position. To do this it is necessary to install the breakout box. Make the necessary connector/pin inspections. It is also necessary to fully retract the shaft of the DC motor by placing a jumper between Test Pins 41 and 57. When the motor has fully retracted, disconnect it at the vehicle harness and remove the jumper wire from the breakout box. With the ignition key on and the DVOM on the 20 volt scale, slowly move the throttle from wide-open to closed throttle. The voltage should move from more than 4 volts to less than 1.5 volts. If the TP sensor hangs up in midrange replace it; otherwise no service should be made.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

KB91 CONTINUOUS MEMORY CODE 38:

A Continuous Memory Code 38 indicates that in the last 40 warm-up cycles the Idle Tracking Switch was open (ITS touching the throttle) when the throttle angle was greater than the MAX extension of the DC motor shaft. This could be caused by:

- An open (either intermittent or hard fault) in the ITS circuit.
- Idle Tracking Switch stuck open (pushed in position).

Either of these conditions may cause a code 58 to appear in Key On Engine Off (KOEO). If service has been made for a KOEO code 58, the Continuous Memory Code 38 can be considered serviced and erased from memory.

If KOEO code 58 was not present the following checks can be made:

- With the DC motor fully retracted and the ITS not touching the throttle lever (ITS closed circuit) check for an intermittent open in the ITS circuit. Turn the ignition key off and install the breakout box. Make the necessary connector/pin inspections. With the DVOM on the 200 ohm scale, monitor between Test Pins 28 (Test Pin 24 on 2.5L CFI) and 46 while tapping, wiggling, bending, etc. the DC motor connector and vehicle harness.

  DO NOT PUSH IN THE IDLE TRACKING SWITCH.

  The DVOM will change from less than 5 ohms to greater than 5 ohms if an open circuit is created. Service as necessary. If an open circuit cannot be created, no service should be made.

KB92 CONTINUOUS MEMORY CODE 71:

A Continuous Memory Code 71 indicates that sometime in the last 40 warm-up cycles the Idle Tracking Switch was closed (ITS not touching the throttle lever) when the DC motor was in "preposition" — [after the engine has been running and the ignition key is turned off the DC motor fully retracts and then extends to a predetermined position for the next start-up]. This can be caused by:

- The ITS circuit shorted to GROUND or SIGNAL RETURN (intermittent or hard fault).
- ITS stuck closed (ITS **NOT** in the pushed in position).

Either of these conditions may cause a Key On Engine Off (KOEO) code 68. If service has been made for KOEO code 68, the Continuous Memory Code 71 can be considered serviced and erased from memory.

If KOEO 68 was not present make the following checks:

- Check the ITS circuit for an intermittent short to ground or Signal Return. Turn the ignition key off. Enter the KOEO Continuous Monitor Mode per Quick Test Appendix. Systematically tap, wiggle, or bend the vehicle harness while looking for an indication of a fault. If a fault is created, service as necessary; otherwise no service should be made.

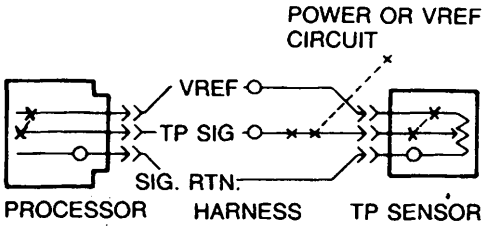
NOTE: Due to the nature of this Test Step, Code 71 will not reappear in memory if a fault is found.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB93 CONTINUOUS MEMORY CODE 53: EXERCISE TP SENSOR		
Continuous Memory Service Code 53 indicates the Throttle Position sensor output signal was higher than the Self-Test maximum of 4.7 volts. Failure mode indicates WOT to processor. Possible causes: — Faulty Throttle Position sensor — Faulty processor — Short to power in throttle position sensor circuit • Enter Key On Engine Off Self-Test. • Use Continuous Monitor Mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Move throttle slowly to WOT position. — Release throttle slowly to closed position and lightly tap on TP sensor (simulate road shock). — Wiggle TP vehicle harness connector. — **Is a fault indicated?**	Yes ▶ No ▶	GO to **KB94**. GO to **KB95**.



A9468-A

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB94 MEASURE THROTTLE POSITION SIGNAL VOLTAGE WHILE EXERCISING TP SENSOR		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Connect a DVOM from Test Pin 47 to Test Pin 46 at the breakout box. • DVOM on 20 volt scale. • Key on, engine off. • While observing DVOM, perform the following: — Move throttle slowly to closed position and lightly tap on TP sensor (simulating road shock). — Wiggle TP vehicle harness and connector. • **Does the fault occur below 4.25 volts?**	Yes ▶ No ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE TP sensor. CLEAR Continuous Memory (REFER to Quick Test Appendix). REFER to Fuel/Engine Shop Manual Group and RERUN Quick Test. Throttle position sensor overtravel may have caused the Continuous Memory Code 53. Sensor service is not required. To verify vehicle harness integrity, GO to **KB95**.
KB95 CHECK EEC-IV HARNESS		
• Enter Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: Referring to the illustration in Step **DH90**, grasp the vehicle harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • ***Is a fault indicated?***	Yes ▶ No ▶	ISOLATE fault and make necessary repairs. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test GO to **KB96**.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB96 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory. REFER to Quick Test Appendix (RERUN Quick Test).
	No ▶	SERVICE as necessary. CLEAR Continuous Memory. REFER to Quick Test Appendix. REPEAT Quick Test.
KB97 CONTINUOUS MEMORY CODES 23 or 63: EXERCISE TP SENSOR		
Continuous Memory Service Codes 23 or 63 indicate the Throttle Position sensor output signal is less than the Self-Test minimum of 0.2 volts. Failure mode indicates closed throttle to the processor. Possible causes: — Faulty Throttle Position sensor — Open in Throttle Position sensor vehicle harness circuits — Short to ground in Throttle Position sensor vehicle harness circuits — Faulty processor • Using Key On Engine Off Continuous Monitor mode, observe VOM or STAR LED for indication of a fault while performing the following: • Move throttle slowly to WOT position. • Release throttle slowly to closed condition. • Lightly tap on TP sensor (simulate road shock). • Wiggle TP vehicle harness connector. • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors. If connector and terminals are good, REPLACE TP sensor. CLEAR Continuous Memory. REFER to Fuel/Engine Shop Manual Group and RERUN Quick Test.
	No ▶	GO to **KB98**.

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DC Motor Idle Speed Control/Idle Tracking Switch and Throttle Position Sensor — 1.9L CFI and 2.5L CFI

Pinpoint Test **KB**

TEST STEP	RESULT ▶	ACTION TO TAKE
KB98 CHECK EEC-IV VEHICLE HARNESS		
• Enter Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: Referring to the illustration in Step DH94, grasp the vehicle harness close to the sensor connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel. Also wiggle, shake or bend the EEC-IV vehicle harness from the dash panel to the processor. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and make necessary repairs. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. GO to KB99.
KB99 CHECK PROCESSOR AND VEHICLE HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. • Inspect both connectors and connector terminals for obvious damage or faults. • **Are connectors and terminals OK?**	Yes ▶ No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Air Management System (AM1/AM2)	Pinpoint Test	KC

Note

You should enter this Pinpoint Test only when a Service Code 44, 45, 46, 81, 82 or 94 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Thermactor System
  - — Belt
  - — Pump
  - — Valve

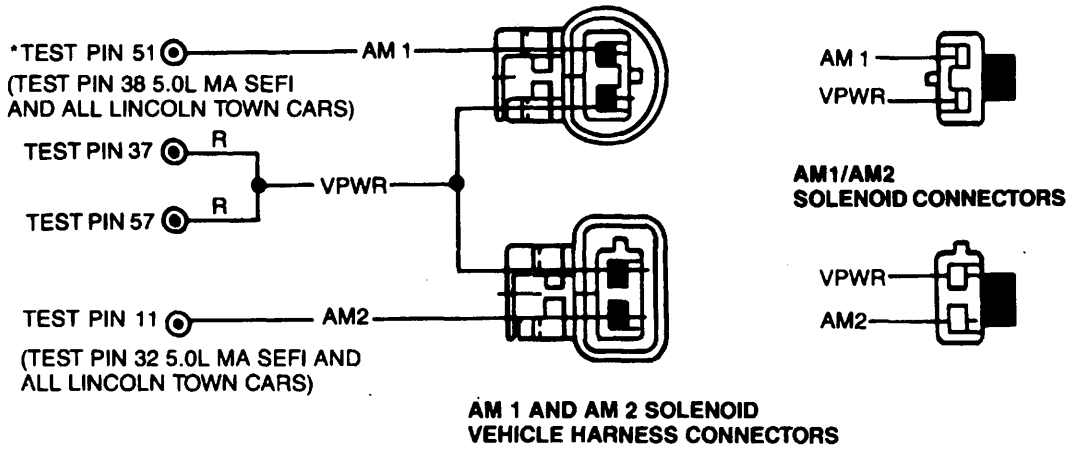
This Pinpoint Test is intended to diagnose only the following:

- AM1 and AM2 Solenoid Valve Assemblies (-9H465-)
- Harness circuits: AM1/AM2 and VPWR
- Vacuum Supply
- Processor Assembly (-12A650-)

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Air Management System (AM1/AM2)	Pinpoint Test	KC

Pinpoint Test Schematic



AM 1 AND AM 2 SOLENOID VEHICLE HARNESS CONNECTORS

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9670-D

	Test Pin 11 or 32 AM2	Test Pin 38 or 51 AM1
Application	**Wire Color**	
Car: 5.0L SEFI 5.0L SEFI MA except Lincoln Town Car	LG/BK	
5.0L SEFI MA Lincoln Town Car	O	Y
2.3L HSC		W/R
Truck: 4.9L, 5.0L, 5.8L, 7.5L E-Series	W/BK	W/R
4.9L, 5.0L, 5.8L, 7.5L F-Series/Bronco	BR	W/O

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Air Management System (AM1/AM2) — Pinpoint Test KC

TEST STEP	RESULT ▶	ACTION TO TAKE
KC1 SERVICE CODES 44 (94), 45 AND 46: VERIFY VACUUM LINE ROUTING		
Service Code 44 (94) indicates that Thermactor Air system is inoperative. Service Code 45 indicates that Thermactor air is flowing upstream when not requested. Service Code 46 indicates that Thermactor is not being bypassed when requested. Possible causes: — Vacuum hoses leaking, blocked, or kinked. — Diverter valve, thermactor pump inoperative. — Air Management Solenoid(s) defective, blocked. • Verify proper vacuum line routing to the AM1/AM2 solenoids and to the bypass diverter valve. Refer to VECI decal. • Check for kinked or blocked vacuum lines. • Check for kinked or blocked air hoses. • Check for disconnected or cracked vacuum lines. • **Were any problems found?**	Yes ▶ No ▶	SERVICE routing or faults. RERUN Quick Test. **For Service Code 44 (94):** GO to KC4. **For Service Code 45:** GO to KC2. **For Service Code 46:** GO to KC3.
KC2 ATTEMPT TO ELIMINATE SERVICE CODE 45 (AM2 ONLY)		
• Disconnect vacuum line on diverter valve and cap vacuum line. • Key off, wait 10 seconds. • Repeat Engine Running Self-Test and record service codes. • **Is Code 45 present?**	Yes ▶ No ▶	EEC-IV system OK. REFER to Section 10 for Thermactor System diagnosis. GO to KC4.
KC3 ATTEMPT TO ELIMINATE SERVICE CODE 46 (AM1 ONLY)		
• Disconnect vacuum line on bypass valve and cap vacuum line. • Key off, wait 10 seconds. • Repeat Engine Running Self-Test and record codes. • **Is Code 46 present?**	Yes ▶ No ▶	EEC-IV system OK. REFER to Section 10 for Thermactor System diagnosis. GO to KC4.

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Air Management System (AM1/AM2)	Pinpoint Test	KC

TEST STEP	RESULT ▶	ACTION TO TAKE
KC4 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
NOTE: Do not use STAR tester for this Step, use a VOM/DVOM. • Key off, wait 10 seconds. • Disconnect electrical connector on the speed control servo; if equipped. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO circuit at the Self-Test connector and positive test lead to battery positive. • Jumper STI circuit to SIG RTN at the Self-Test connector. • Perform Key On Engine Off Self-Test until the completion of the Continuous Memory Test Codes. • DVOM will indicate less than one volt when test is complete. • Depress and release the throttle. • **Does DVOM indicate a change to a high signal voltage?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KC5. DEPRESS throttle to WOT and RELEASE. If STO voltage does not go high, GO to Pinpoint Test Step QC1. Leave equipment hooked up.
KC5 CHECK AM1/AM2 SOLENOID ELECTRICAL OPERATION		
• DVOM on 20 volt scale. • Disconnect AM1 and AM2 solenoids. • Connect DVOM positive test lead to VPWR circuit and negative test lead to AM1 circuit on AM1 solenoid vehicle harness connector. • While observing DVOM depress and release the throttle several times (to cycle output On and Off). • Repeat for AM2 solenoid. Connect positive test lead to VPWR circuit and negative test lead to AM2 circuit on AM2 solenoid vehicle harness connector. • **Does each solenoid circuit cycle On and Off?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KC6. REMOVE jumper. GO to KC9.

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Air Management System (AM1/AM2) — Pinpoint Test KC

TEST STEP	RESULT ▶	ACTION TO TAKE
KC6 CHECK AM1/AM2 SOLENOID FOR VACUUM CYCLING		
• Install vacuum pump to the AM1 solenoid vacuum supply port and install a vacuum gauge to the AM1 output port. • While cycling outputs On and Off (by depressing and releasing throttle), observe the vacuum gauge at the output. **NOTE: Maintain vacuum at source.** • Repeat for AM2 solenoid. Connect vacuum pump to the AM2 solenoid vacuum supply port and connect a vacuum gauge to the AM2 output port. • Cycle output On and Off. • **Does each solenoid cycle vacuum output On and Off?**	Yes ▶ No ▶	GO to KC7. REPLACE solenoid assembly. RERUN Quick Test.
KC7 CHECK AM1/AM2 SOLENOIDS FOR INTERNAL VACUUM LEAKS		
• Vacuum pump connected to the AM1 solenoid supply port. • Vacuum gauge connected to the AM1 solenoid output port. • Apply 15 in-Hg vacuum and observe gauge. • Repeat steps above for AM2 solenoid. • **Does vacuum gauge reading hold for each solenoid?**	Yes ▶ No ▶	SERVICE vacuum source blockage or leakage. RERUN Quick Test. REPLACE solenoid assembly. RERUN Quick Test.
KC8 SERVICE CODE 81 AND 82: CHECK VOLTAGE OF VPWR CIRCUIT		
Service Code 81, 82 indicates that voltage output for Thermactor Air solenoid(s) did not change when activated. Possible causes: — AM1/AM2 circuits shorted to power. — AM1/AM2 circuits open or grounded. — AM1/AM2 solenoid resistance out of range. — Faulty processor. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between AM1 solenoid VPWR circuit and battery ground. • Repeat for AM2 solenoid. • **Is each voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KC9. SERVICE harness circuit open. RECONNECT AM1/AM2 solenoids. RERUN Quick Test.

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Air Management System (AM1/AM2)	Pinpoint Test	KC

TEST STEP	RESULT ▶	ACTION TO TAKE
KC9 MEASURE AM1/AM2 SOLENOID RESISTANCE		
• Key off, wait 10 seconds. • DVOM on 200 ohm scale. • Disconnect AM1 solenoid connector and measure solenoid resistance. • Disconnect AM2 solenoid connector and measure solenoid resistance. • **Is each resistance between 50 and 100 ohms?**	Yes ▶ No ▶	GO to KC10. REPLACE AM1/AM2 solenoid assembly. RERUN Quick Test.
KC10 CHECK CONTINUITY OF AM1 AND AM2 CIRCUITS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 51 (Test Pin 38 for 5.0L MA SEFI and all Lincoln Town Cars) at breakout box and AM1 circuit at vehicle harness connector. • Measure resistance between Test Pin 11 (Test Pin 32 for 5.0L MA SEFI and all Lincoln Town Cars) at the breakout box and AM2 circuit at vehicle harness connector. • **Is each resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KC11. SERVICE harness open circuit. REMOVE breakout box. RECONNECT processor and AM1/AM2 solenoids. RERUN Quick Test.

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Air Management System (AM1/AM2)	Pinpoint Test	KC

TEST STEP	RESULT ▶	ACTION TO TAKE
KC11 CHECK FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • DVOM on 200,000 ohm. • Breakout box installed, processor disconnected. • Disconnect AM1/AM2 solenoids. • Measure resistance between Test Pin 51 (Test Pin 38 for 5.0L MA SEFI and all Lincoln Town Cars) and Test Pins 40, 46 and 60 and between Test Pin 11 (Test Pin 32 for 5.0L MA SEFI and all Lincoln Town Cars) and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **KC12**. SERVICE short to ground. REMOVE breakout box. RECONNECT processor and AM1/AM2 solenoids. RERUN Quick Test.
KC12 CHECK FOR SHORT TO POWER		
• Key off, wait 10 seconds. • DVOM on 200,000 ohm scale. • Breakout box installed, processor disconnected. • AM1/AM2 solenoids disconnected. • Measure resistance between Test Pin 51 (Test Pin 38 for 5.0L MA SEFI and all Lincoln Town Cars) and Test Pins 37 and 57, and between Test Pin 11 (Test Pin 32 for 5.0L MA SEFI and all Lincoln Town Cars) and Test Pins 37 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT AM1/AM2 solenoid. RERUN Quick Test. SERVICE short to power. REMOVE breakout box. RECONNECT processor and AM1/AM2 solenoids. RERUN Quick Test. If code is present, REPLACE processor.

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Canister Purge (CANP)	Pinpoint Test	KD

Note

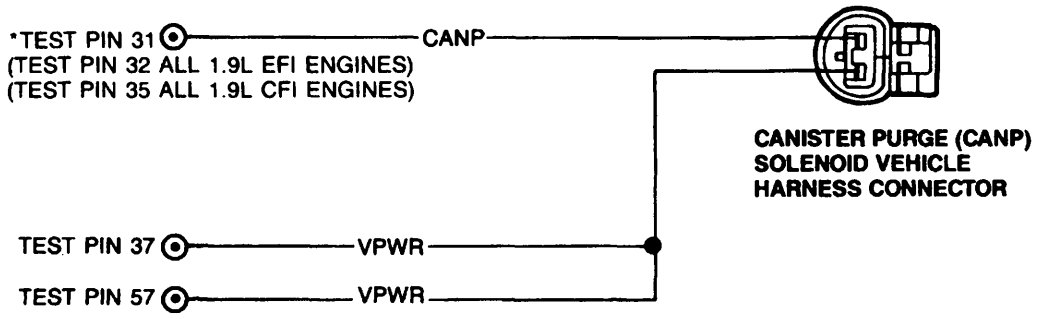
You should enter this Pinpoint Test only when a Service Code 85 is received during Quick Test or if you have been directed here from Diagnosis By Symptom.

Remember

This Pinpoint Test is intended to diagnose only the following:

- CANP solenoid (-9C915-)
- Harness circuits: CANP and VPWR
- Processor assembly (-12A650-)

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9671-E

	Test Pin 31, 32 or 35 CANP	Test Pin 37/57 VPWR
Application	**Wire Color**	**Wire Color**
2.9L Car	BR/W	BK
3.0L Probe	W/BK	BK/W
All Others	GY/Y	R

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Canister Purge (CANP) — Pinpoint Test KD

TEST STEP	RESULT ▶	ACTION TO TAKE
KD1 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
NOTE: Do not use STAR tester for this step, use VOM/DVOM. • Key off, wait 10 seconds. • Disconnect electrical connector on the speed control servo; if equipped. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO circuit at Self-Test connector and positive test lead to battery positive. • Jumper STI circuit to SIG RTN at the Self-Test connector. • Perform Key On Engine Off Self-Test until the completion of the Continuous Test Codes. • DVOM will indicate less than 1.0 volt when test is completed. • Depress and release the throttle. • **Does voltage increase?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KD2. DEPRESS throttle to WOT and release. If STO voltage does not go high, leave equipment hooked up and GO to Pinpoint Test Step QC1
KD2 CHECK CANISTER PURGE (CANP) SOLENOID ELECTRICAL OPERATION		
• Key on, engine off. • Disconnect CANP solenoid. • Connect DVOM positive test lead to VPWR circuit and negative test lead to CANP circuit at the CANP solenoid vehicle harness connector. • DVOM on 20 volt scale. • While observing DVOM depress and release the throttle several times to cycle output. • **Does CANP circuit cycle?**	Yes ▶ No ▶	GO to KD3. REMOVE jumper. GO to KD6.
KD3 CHECK CANP SOLENOID FOR VACUUM LEAKS		
• Key on, engine off. • CANP solenoid disconnected. • Disconnect vacuum hose at CANP solenoid on manifold vacuum side of CANP solenoid. • Apply 16 in-Hg (53 kPa) of vacuum to manifold vacuum side of CANP solenoid. • **Does CANP solenoid hold vacuum for 20 seconds?**	Yes ▶ No ▶	REMAIN in Output State Check. Leave vacuum pump setup in place. GO to KD4. REPLACE CANP solenoid. RERUN Quick Test. If symptom is still present, GO to Section 7, Evaporative Emission System diagnosis.

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Canister Purge (CANP)	Pinpoint Test	KD

TEST STEP	RESULT ▶	ACTION TO TAKE
KD4 CHECK CANP SOLENOID FOR MECHANICAL OPERATION		
• While remaining in output state check, reconnect CANP solenoid. • Apply 16 in-Hg (53 kPa) of vacuum to manifold vacuum side of CANP solenoid. • Depress and release throttle. • **Is vacuum released?**	Yes ▶	CHECK hose from CANP solenoid to canister for cracks, leaks, etc. If OK, REMOVE Jumper from STI to SIGNAL RETURN. GO to **KD5**.
	No ▶	CHECK hose from CANP solenoid to canister for blockage or kinks. If OK, REPLACE CANP solenoid. RERUN Quick Test.
KD5 CHECK FOR VACUUM TO CANP SOLENOID		
• Disconnect vacuum hose at CANP solenoid at manifold vacuum side. • Start engine. • **Is vacuum present at engine vacuum hose?**	Yes ▶	EEC-IV system OK. If a symptom is still present, GO to Section 7, Evaporative Emission Systems Diagnosis.
	No ▶	CHECK vacuum line for proper routing, kinks, leak or blockage. If OK, REFER to Engine Shop Manual Group for probable subjects affecting engine vacuum.

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Canister Purge (CANP)	Pinpoint Test	KD

TEST STEP	RESULT ▶	ACTION TO TAKE
KD6 MEASURE CANP SOLENOID RESISTANCE		
Service Code 85 indicates a failure in the Canister Purge solenoid (CANP) circuit. Possible causes are: — Faulty CANP solenoid — Open harness — Shorted (Power or Ground) harness — Faulty processor. • Key off, wait 10 seconds. • Disconnect CANP solenoid. • DVOM on 200 ohm scale. • Measure CANP solenoid resistance. • **Is resistance between 40 and 90 ohms?**	Yes ▶ No ▶	GO to KD7. REPLACE CANP solenoid. RERUN Quick Test.
KD7 CHECK VOLTAGE OF VPWR CIRCUIT		
• Key on, engine off. • CANP solenoid disconnected. • DVOM on 20 volt scale. • Measure voltage between VPWR at the CANP solenoid vehicle harness connector and battery ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KD8. SERVICE open harness circuit. RECONNECT CANP solenoid. RERUN Quick Test.
KD8 CHECK CONTINUITY OF CANP CIRCUIT		
• Key off, wait 10 seconds. • CANP solenoid disconnected. • Disconnect processor 60 pin connectors. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 31 (Test Pin 35 for 1.9L CFI engines, Test Pin 32 for 1.9L EFI engines) at the breakout box and CANP circuit at the CANP solenoid vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KD9. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Canister Purge (CANP)	Pinpoint Test	KD

TEST STEP	RESULT ▶	ACTION TO TAKE
KD9 CHECK CANP CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • CANP solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 31 (Test Pin 35 for 1.9L CFI engines, Test Pin 32 for 1.9L EFI engines) and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **KD10**. SERVICE short to ground. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KD10 CHECK CANP CIRCUIT FOR SHORT TO POWER		
• Key off, wait 10 seconds. • CANP solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 31 (Test Pin 35 for 1.9L CFI engines, Test Pin 32 for 1.9L EFI engines) and Test Pins 37 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT CANP solenoid. REMOVE breakout box. RERUN Quick Test. SERVICE short to power. REMOVE breakout box. RECONNECT all components. REPEAT Quick Test. If code is repeated, REPLACE processor. RERUN Quick Test.

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Canister Purge (CANP)	Pinpoint Test	KD

TEST STEP		RESULT ▶	ACTION TO TAKE
KD15	CHECK IF CANP WAS CAUSE OF SERVICE CODE 16 OR 26		
• Key off. • Disconnect vacuum hose at CANP solenoid on canister side. • Start engine and let idle. • **Is vacuum present on canister side of canister purge solenoid?**		Yes ▶ No ▶	GO to KD1. **For CODE 26:** CHECK for causes of an incorrect engine speed or a vacuum leak. **For CODE 16:** CHECK for vacuum leaks at injector O-rings, vacuum lines/ fittings, excessive PCV, or inlet pin leak between air meter and throttle body. SERVICE as necessary. RERUN Quick Test.

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Idle Speed Control (Bypass Air)	Pinpoint Test	KE

Note

You should enter this Pinpoint Test only when a Service Code 12, 13, 16, 17, 19, 47 or 48 is received during Quick Test or when directed here from Pinpoint Test [S].

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Engine not up to operating temperature
- Engine over operating temperature
- A/C input (electrical problem)
- Throttle Speed Control Linkage
- Throttle Sticking or Linkage Binding.

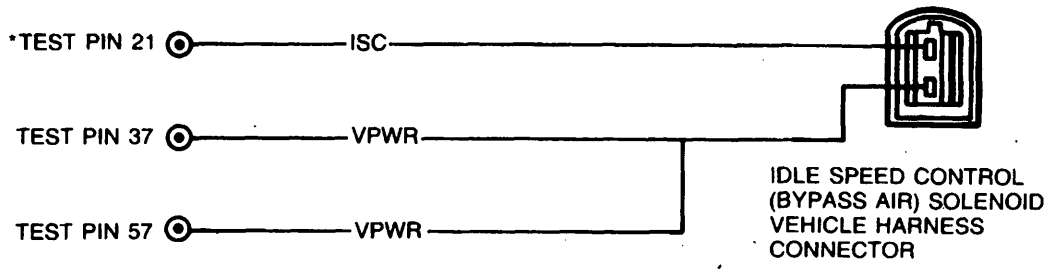
This Pinpoint Test is intended to diagnose only the following:

- Rpm in Self-Test only
- ISC Solenoid (-9F715-)
- Harness circuits: ISC and VPWR
- Processor Assembly (-12A650-)

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Idle Speed Control (Bypass Air)	Pinpoint Test	KE

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE. **A9672-D**

Test Pin 21 **ISC**

Application	Wire Color
1.9L EFI Taurus/Sable Aerostar	O/BK
1.9L MA SEFI	BL/O
Tempo/Topaz	BR/W
Mustang Crown Victoria/ Grand Marquis Mark VII F-Series, Bronco	W/LB
Thunderbird/Cougar	R/LG
Probe	W/R
Ranger/Supercab Bronco II E-Series	GY/W
Scorpio	BR/Y

Test Pin 37 and 57 **VPWR**

Application	Wire Color
1.9L MA SEFI	W/R
Scorpio	BK
Probe	R/BK
All Others	R

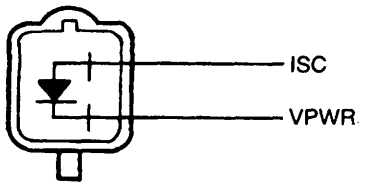
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Idle Speed Control (Bypass Air) — Pinpoint Test KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE1 SERVICE CODE 12: CHECK FOR RPM DROP		
1.9L EFI: Service Code 12 indicates that during Engine Running Self-Test, engine was unable to achieve the Self-Test upper limit. All Others: Service Code 12 indicates that during Engine Running Self-Test, engine rpm could not be controlled within the Self-Test upper limit band. Possible causes are: — Open or shorted circuit — Throttle linkage binding — Improper idle set — Throttle body/ISC solenoid contamination — Items external to Idle Speed Control system that could affect engine rpm. — Faulty ISC solenoid — Faulty processor • Key off. • Connect engine tachometer. • Start engine. • Disconnect ISC harness connector. • **Does rpm drop or stall?**	Yes ▶ No ▶	GO to KE2. GO to KE3.
KE2 CHECK FOR EGR CODES		
• **Are Service Codes 31, 32, 33 or 34 present?**	Yes ▶ No ▶	RECONNECT ISC solenoid. GO to Quick Test Step 7.0 for appropriate Pinpoint Test. GO to KE3.

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Idle Speed Control (Bypass Air) — Pinpoint Test KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE3 CHECK FOR OTHER EEC CODES		
• **Are Service Codes 22, 41, 42, 91 or 92 present?**	Yes ▶	RECONNECT ISC solenoid. **For 1.9L EFI with Code 42 present:** GO to KE4. **For all others:** GO to Quick Test Step 7.0 for appropriate Pinpoint Test.
	No ▶	GO to KE4.
KE4 MEASURE ISC SOLENOID RESISTANCE		
• Key off. • ISC solenoid disconnected. • DVOM on 200 ohm scale. • Measure solenoid resistance. **NOTE: Due to diode in solenoid, place DVOM (+) lead on VPWR pin and (−) lead on ISC pin** • **Is resistance between 7.0 and 13.0 ohms?**  **ISC SOLENOID CONNECTOR** **A9225-A**	Yes ▶ No ▶	GO to KE5. REPLACE ISC solenoid. RERUN Quick Test.
KE5 CHECK FOR INTERNAL SHORT TO ISC SOLENOID CASE		
• Key off. • ISC solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance from either ISC solenoid pin to ISC housing. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KE6. REPLACE ISC solenoid. RERUN Quick Test.

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Idle Speed Control (Bypass Air)

Pinpoint Test **KE**

TEST STEP	RESULT ▶	ACTION TO TAKE
KE6 CHECK VPWR CIRCUIT VOLTAGE • Key on, engine off. • ISC solenoid disconnected. • DVOM on 20 volt scale. • Measure voltage between VPWR circuit at the ISC solenoid vehicle harness connector and battery ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KE7. SERVICE open circuit. RERUN Quick Test.
KE7 CHECK ISC CIRCUIT CONTINUITY • Key off. • ISC solenoid disconnected. • Disconnect processor and inspect both 60 pin connectors for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 21 at the breakout box and ISC circuit at ISC solenoid vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KE8. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KE8 CHECK ISC CIRCUIT FOR SHORT TO GROUND • Key off. • Breakout box installed, processor disconnected. • ISC solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 21 and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KE9. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KE9 CHECK ISC CIRCUIT FOR SHORT TO POWER • Key off. • Breakout box installed, processor disconnected. • ISC solenoid disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 37 and Test Pin 21 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KE10. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code or symptom is still present, REPLACE processor.

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Idle Speed Control (Bypass Air)	Pinpoint Test	KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE10 CHECK FOR ISC SIGNAL FROM THE PROCESSOR		
• Key off. • Breakout box installed. • Reconnect processor to breakout box. • Reconnect ISC solenoid. • DVOM on 20 volt scale. • Connect DVOM between Test Pin 21 and Test Pin 40. • Start engine. • Slowly increase and decrease rpm. • **Does DVOM voltage vary?**	Yes ▶ No ▶	GO to KE11. REPLACE processor. REMOVE breakout box. RERUN Quick Test.
KE11 CHECK BASE IDLE		
• **Is idle speed within specification? (Refer to Section 4)**	Yes ▶ No ▶	**For 3.8L SEFI's:** REPLACE ISC solenoid. RERUN Quick Test. **For all others:** REMOVE ISC solenoid and INSPECT for contamination. CLEAN as necessary. RERUN Quick Test. If code/ symptom is present, REPLACE ISC solenoid. RESET idle to specification. REFER to Section 4 for idle set procedure. RERUN Quick Test. If UNABLE to RESET idle to specification, GO to KE12.

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Idle Speed Control (Bypass Air)	Pinpoint Test	KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE12 CHECK FOR PROBLEMS AFFECTING PROPER ENGINE SPEED		
• Check throttle linkage and/or speed control linkage for binding. • Inspect throttle body for contamination. • Check engine vacuum hoses. Refer to VECI decal. • Check for leaks around ISC solenoid (ex. mounting gasket, etc.). • **Are all the above checks OK?**	Yes ▶	**For 3.8L SEFI's:** REPLACE ISC solenoid. RERUN Quick Test. **For all others:** REMOVE ISC solenoid and INSPECT for contamination. CLEAN as necessary. RERUN Quick Test. If code/ symptom is present, REPLACE ISC solenoid.
	No ▶	SERVICE as necessary. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
KE15 SERVICE CODE 13: VERIFY IDLE SPEED IS WITHIN SPECIFICATION		
1.9L EFI: Service Code 13 indicates that during Engine Running Self-Test, engine rpm did not obtain the Self-Test lower limit. All others: Service Code 13 indicates that during Engine Running Self-Test, Engine rpm could not be controlled within the Self-Test lower limit band. Possible causes are: — Improper idle set. — Vacuum leaks. — Throttle linkage binding. — Throttle plates open. — Improper ignition timing (TFI vehicles only). — Throttle body/ISC solenoid contamination. — ISC circuit short to ground. — Faulty ISC solenoid. • **Is idle speed within specification? (Refer to Section 4)**	Yes ▶	**For 3.8L SEFI's:** REPLACE ISC solenoid. RERUN Quick Test. **For all others:** REMOVE ISC solenoid and INSPECT for contamination. CLEAN as necessary. RERUN Quick Test. If code/ symptom is present, REPLACE ISC solenoid.
	No ▶	RESET idle to specification. REFER to Section 4 for idle set procedure. RERUN Quick Test. If UNABLE to RESET idle to specification, GO to **KE16**.

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Idle Speed Control (Bypass Air)

Pinpoint Test **KE**

TEST STEP	RESULT ▶	ACTION TO TAKE
KE16 CHECK FOR CONDITIONS AFFECTING IDLE		
• Check engine vacuum hoses for leaks. Refer to VECI decal. • Check throttle linkage and/or speed control linkage for binding. • Check that throttle plates are fully closed. • Check for induction system leaks. (ex. ISC solenoid to throttle body gasket.) • Check throttle body for contamination. • Verify base timing is to specification (TFI vehicles only). Refer to VECI decal. • **Are all the above checks OK?**	Yes ▶ No ▶	GO to KE17. SERVICE as necessary. RERUN Quick Test.
KE17 CHECK FOR INTERNAL SHORT TO ISC SOLENOID CASE		
• Key off. • Disconnect ISC solenoid. • DVOM on 200,000 ohm scale. • Measure resistance from either ISC solenoid pin to ISC housing. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KE18. REPLACE ISC solenoid. RERUN Quick Test.
KE18 CHECK ISC CIRCUIT FOR SHORT TO GROUND		
• Key off. • ISC solenoid disconnected. • Disconnect the processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 21 and Test Pins 40, 46 and 60 at the breakout box. • **Are all resistances greater than 10,000 ohms?**	Yes ▶ No ▶	GO to KE19. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Idle Speed Control (Bypass Air) — Pinpoint Test KE

TEST STEP	RESULT ▶	ACTION TO TAKE
KE19 CHECK PROCESSOR OUTPUT		
• Key off. • Breakout box installed. • Reconnect processor to breakout box. • Reconnect ISC solenoid. • DVOM on 20 volt scale. • Connect DVOM between Test Pin 21 and Test Pin 40. • Start engine. • Slowly increase and decrease rpm. • **Does DVOM voltage vary?**	Yes ▶	**For 3.8L SEFI's:** REPLACE ISC solenoid. RERUN Quick Test. **For all others:** REMOVE ISC solenoid and INSPECT for contamination. CLEAN as necessary. RERUN Quick Test. If code/ symptom is present, REPLACE ISC solenoid
	No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test.
KE20 SERVICE CODE 47: CHECK FOR LOW FLOW UNMETERED AIR		
Service Code 47 indicates that the measured airflow at base idle was lower than expected. Possible causes are: — Air/vacuum leaks in fuel charging assembly. — Purge solenoid/injector O-rings. • Check for holes, cracks, and/or disconnections in fuel charging assembly (manifold gaskets, vacuum lines, vacuum tree, etc). • Check for stuck-open purge solenoid and/or injector O-rings. • **Are any faults present?**	Yes ▶	SERVICE as necessary. RERUN Quick Test.
	No ▶	EEC system OK for metered air. GO to Quick Test to service other codes if necessary.
KE21 SERVICE CODE 48: CHECK FOR HIGH FLOW UNMETERED AIR		
Service Code 48 indicates that the measured airflow at base idle was higher than expected. Possible causes are: — Air leaks between Vane Air Flow meter and fuel charging assembly — Loss of ignition/fuel • Check for holes, cracks, and/or disconnections in air cleaner outlet tube (between Vane Air Flow meter and fuel charging assembly). • Check for loss of ignition or fuel on one or more cylinder(s). • **Are any faults present?**	Yes ▶	SERVICE as necessary. RERUN Quick Test.
	No ▶	EEC system OK for metered air. GO to Quick Test to service other codes if necessary.

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Idle Speed Control (Bypass Air)

Pinpoint Test **KE**

TEST STEP	RESULT ▶	ACTION TO TAKE
KE22 SERVICE CODE 16: HIGH ISC RPM		
Service Code 16 indicates that with the ISC off, engine rpm was above a Self-Test limit. Possible causes are: — Improper idle set — Purge solenoid — Air/vacuum leaks • **Is Code 48 present?**	Yes ▶	RESET throttle plate. REFER to Section 4 and VECI decal for curb idle set procedure. RERUN Quick Test. If Code 48 is still present, GO to **KE21**.
	No ▶	GO to **KD15**.
KE25 SERVICE CODE 19: LOW ISC RPM		
Service Code 19 indicates that with the ISC off, engine rpm dropped below a Self-Test limit (usually around 600 rpm). Possible causes are: — Engine not at operating temperature. — Throttle body/air inlet contamination. — Improper idle set. • Key off. • Deactivate Self-Test. • Run engine at 2000 rpm for 2 minutes or until inlet radiator hose is hot and pressurized. • Key off. • Rerun Engine Running Self-Test. • **Does engine stumble and/or is code 19 still present?**	Yes ▶	INSPECT throttle body and air inlet for contamination. SERVICE as necessary. If OK, ADJUST base idle (REFER to Section 4 for procedure). RERUN Quick Test.
	No ▶	SERVICE other codes as necessary.
KE26 SERVICE CODE 17: LOW ISC RPM		
Service Code 17 indicates that with the ISC off, engine rpm was below a Self-Test limit. Possible causes are: — Excessive engine accessory load — Engine not at operating temperature — Throttle body/air inlet contamination — Improper idle set **NOTE: Check and correct excessive engine load problems like cooling fan running, lights on, etc.** • Run engine at 2000 rpm for 2 minutes or until inlet radiator hose is hot and pressurized. • Key off. • Rerun Engine Running Self-Test. • **Is Code 17 still present?**	Yes ▶	INSPECT throttle body and air inlet for contamination. SERVICE as necessary. If OK, ADJUST base idle (REFER to Section 4 for procedure). RERUN Quick Test.
	No ▶	SERVICE other codes as necessary.

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF)	Pinpoint Test	KF

Note

You should enter this Pinpoint Test only when a Service Code 83 or 88 is received during Quick Test or you have been directed here from Diagnosis By Symptom.

Remember

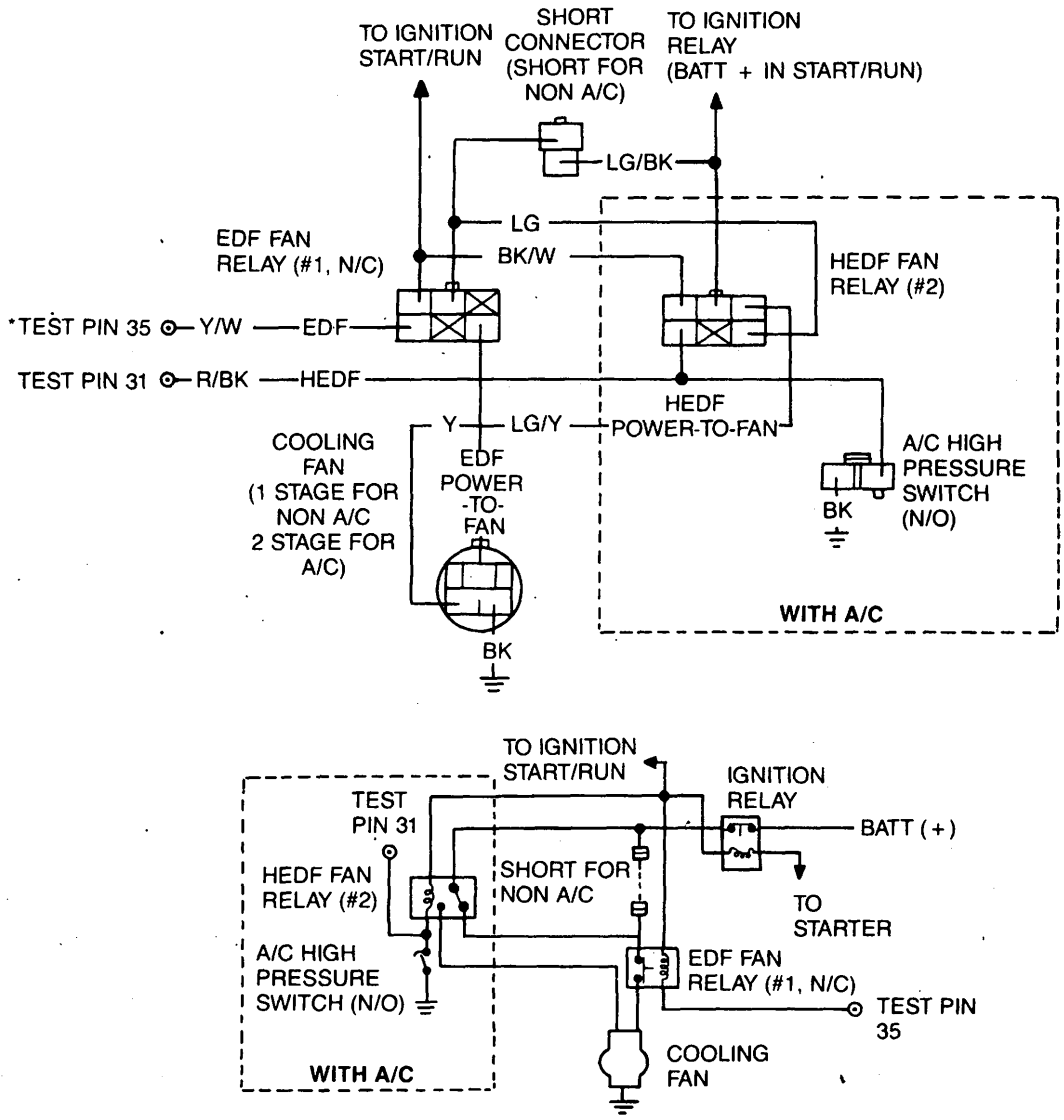
This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: EDF, HEDF, EDF Power-To-Fan, HEDF Power-To-Fan, IGN Start/Run and GND.
- EDF Relay
- HEDF Relay
- Cooling Fan
- Processor assembly (-12A650-)

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF)	Pinpoint Test	KF

Pinpoint Test Schematic



A13571-A

*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF)

Pinpoint Test **KF**

TEST STEP		RESULT ▶	ACTION TO TAKE
KF1	SERVICE CODE 83/88: CHECK FOR IGNITION START/RUN CIRCUIT VOLTAGE AT HEDF/EDF RELAY		
Service Code 83 indicates a HEDF primary circuit failure. Service Code 88 indicates an EDF primary circuit failure. Possible causes are: — Open or shorted circuit. — Faulty fan relay. — Faulty processor. — Faulty A/C high pressure switch (Code 83). **NOTE: During diagnosis, use the chart below to determine the correct pin number, circuit and relay being tested.** • Key off. • Disconnect EDF or HEDF relay. • DVOM on 20 volt scale. • Key on. • Measure voltage between IGN Start/Run circuit at the EDF/HEDF relay vehicle harness connector and chassis ground. • **Is voltage greater than 10.5 volts?**		Yes ▶ No ▶	GO to KF2. SERVICE open circuit. RECONNECT EDF/ HEDF relay. RERUN Quick Test.

Code	Circuit	Test Pin Number	Fan Relay
83	HEDF	31	HEDF(#2)
88	EDF	35	EDF(#1)

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF) — Pinpoint Test KF

TEST STEP	RESULT ▶	ACTION TO TAKE
KF2 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX)		
NOTE: Do not use STAR tester for this Step, use VOM/DVOM. • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Disconnect electrical connector on the speed control servo; if equipped. • Connect DVOM negative test lead to STO at the Self-Test connector and positive test lead to the battery positive post. • Jumper STI to SIG RTN at the Self-Test connector. • Perform Key On Engine Off Self-Test until the completion of the Continuous Memory Codes. • DVOM will indicate less than 1.0 volt when test complete. • Depress and release throttle. • **Does voltage increase to greater than 10.5 volts?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KF3. DEPRESS throttle to WOT and RELEASE. If STO voltage does not go high, leave equipment hooked up and GO to QC2.
KF3 CHECK FOR EDF/HEDF CIRCUIT CYCLING		
• Still in Output State Check. • EDF or HEDF relay disconnected. • DVOM on 20 volt scale. • Connect DVOM positive test lead to the IGN Start/Run circuit and the negative test lead to the EDF or HEDF circuit at the EDF/HEDF relay vehicle harness connector. • While observing DVOM, depress throttle. For EDF, wait until "CHECK ENGINE" light flashes once (10 seconds). For HEDF, wait until "CHECK ENGINE" light flashes twice (15 seconds). Release throttle. EDF/HEDF outputs are now "on". To cycle "off", depress and release throttle. • **Does voltage cycle high and low (about 1 volt change)?**	Yes ▶ No ▶	REPLACE EDF or HEDF relay. REMOVE jumper. RERUN Quick Test. REMOVE jumper. GO to KF4.

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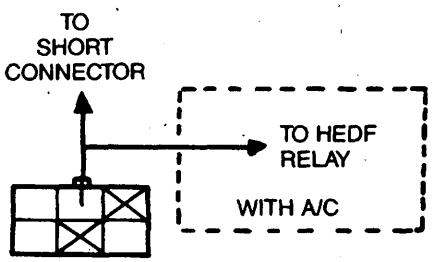
Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF) | Pinpoint Test | KF

TEST STEP	RESULT ▶	ACTION TO TAKE
KF4 CHECK CONTINUITY OF EDF/HEDF CIRCUIT		
• Key off. • EDF or HEDF relay disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. **For Code 83:** — Measure resistance between Test Pin 31 at the breakout box and HEDF circuit at the HEDF relay vehicle harness connector. **For Code 88:** — Measure resistance between Test Pin 35 at the breakout box and EDF circuit at the EDF relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KF5. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KF5 CHECK EDF/HEDF CIRCUIT FOR SHORT TO POWER		
• Key on. • Breakout box installed, processor disconnected. • EDF or HEDF relay disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 31 (HEDF) or 35 (EDF) at the breakout box and battery negative post. • **Is voltage less than 1.0 volts?**	Yes ▶ No ▶	GO to KF6. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code is still present, REPLACE processor.

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF)

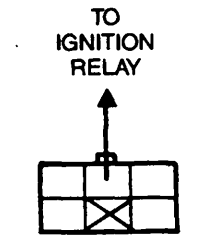
Pinpoint Test **KF**

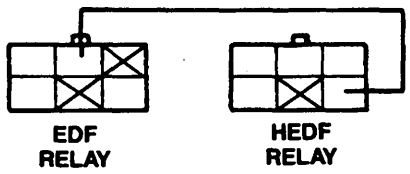
TEST STEP	RESULT ▶	ACTION TO TAKE
KF6 CHECK EDF/HEDF CIRCUIT FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • EDF or HEDF relay disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 31 (HEDF) or 35 (EDF) and Test Pins 40 and 60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. (For Code 83, first VERIFY that A/C high pressure switch is open). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KF10 LOW SPEED (EDF) AND/OR HIGH SPEED (HEDF) COOLING FAN DOES NOT OPERATE: CHECK FOR VOLTAGE TO EDF RELAY		
• Key off. • Disconnect EDF relay. • DVOM on 20 volt scale. • Key on. • Measure voltage between the short connector input pin at the EDF relay vehicle harness connector and battery negative post. • **Is voltage greater than 10.5 volts?**  **EDF RELAY VEHICLE HARNESS CONNECTOR** A13572-A	Yes ▶ No ▶	GO to KF13. **For A/C equipped vehicles:** GO to KF11. **For non A/C vehicles:** VERIFY condition of jumper at short connector and operation of IGN relay. If OK, SERVICE open circuit. RECONNECT EDF relay. RE-EVALUATE symptom.

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF) | Pinpoint Test | KF

TEST STEP	RESULT ▶	ACTION TO TAKE
KF11 CHECK FOR VOLTAGE TO HEDF RELAY		
• Key off. • EDF relay disconnected. • Disconnect HEDF relay. • DVOM on 20 volt scale. • Key on. • Measure voltage between the IGN relay input pin at the HEDF relay vehicle harness connector and battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶	GO to **KF12**.
	No ▶	VERIFY operation of IGN relay. If OK, SERVICE open circuit. RECONNECT EDF and HEDF relays. RE-EVALUATE symptoms.
KF12 CHECK CONTINUITY BETWEEN EDF AND HEDF RELAYS		
• Key off. • EDF and HEDF relays disconnected. • DVOM on 200 ohm scale. • Measure resistance between the HEDF input pin at the EDF relay vehicle harness connector and the output to EDF pin at the HEDF relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶	REPLACE HEDF relay. RECONNECT all components. RE-EVALUATE symptom.
	No ▶	SERVICE open circuit. RECONNECT EDF and HEDF relays. RE-EVALUATE symptom.

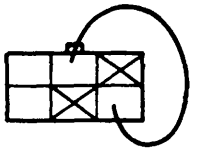
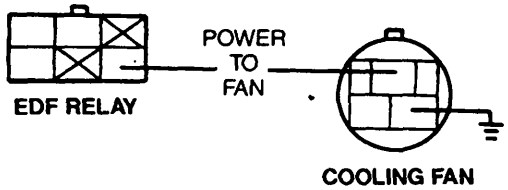




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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF)

Pinpoint Test **KF**

TEST STEP	RESULT ▶	ACTION TO TAKE
KF13 CHECK CIRCUITS FROM EDF RELAY TO FAN		
• Key off. • EDF relay disconnected. • Insert jumper wire from short connector input pin to Power-To-Fan pin at the EDF relay vehicle harness connector. • Key on. • **Does fan run?**  **EDF RELAY VEHICLE HARNESS CONNECTOR** **A13575-A**	Yes ▶ No ▶	**For A/C equipped vehicles:** REMOVE jumper. GO to KF16. **For Non A/C vehicles:** REPLACE EDF relay. REMOVE jumper. RE-EVALUATE symptom. REMOVE jumper. GO to KF14.
KF14 CHECK EDF POWER-TO-FAN CIRCUIT CONTINUITY		
• Key off. • EDF relay disconnected. • Disconnect cooling fan. • DVOM on 200 ohm scale. • Measure resistance between the EDF Power-To-Fan output pin at the EDF vehicle harness connector and the EDF Power-To-Fan input pin at the cooling fan vehicle harness connector. • **Is resistance less than 5.0 ohms?**  **VEHICLE HARNESS CONNECTORS** **A13576-A**	Yes ▶ No ▶	GO to KF15. SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom.

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF)

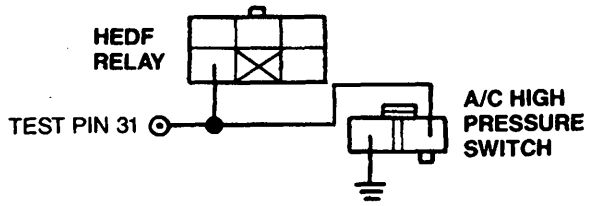
Pinpoint Test **KF**

TEST STEP	RESULT ▶	ACTION TO TAKE
KF15 CHECK COOLING FAN GROUND CIRCUIT		
• Key off. • EDF relay disconnected. • Cooling fan disconnected. • DVOM on 200 ohm scale. • Measure resistance between GND circuit at the cooling fan vehicle harness connector and battery negative post. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE cooling fan. RECONNECT all components. RE-EVALUATE symptom. SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom.
KF16 CHECK CIRCUITS FROM HEDF RELAY TO FAN		
• Key off. • EDF relay disconnected. • Disconnect A/C high pressure (A/C HP) switch. • Insert a jumper wire between the two pins of the A/C HP switch vehicle harness connector. • Key on. • **Does fan run at high speed?**	Yes ▶ No ▶	REPLACE EDF relay. REMOVE jumper. RECONNECT A/C high pressure switch. RE-EVALUATE symptom. REMOVE jumper. RECONNECT EDF relay. GO to **KF17**.

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF) — Pinpoint Test KF

TEST STEP	RESULT ▶	ACTION TO TAKE
KF17 VERIFY CONTINUITY OF CIRCUITS FROM A/C HIGH PRESSURE SWITCH		
• Key off. • A/C HP switch disconnected. • Disconnect HEDF relay. • DVOM on 200 ohm scale. • Measure continuity from GND circuit at A/C HP switch vehicle harness connector and battery negative post. • Measure continuity between output to HEDF relay pin at A/C HP switch vehicle harness connector and A/C HP switch input pin at the HEDF relay vehicle harness connector. • **Is each resistance less than 5.0 ohms?**	Yes ▶	GO to KF18.
	No ▶	SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom. If symptom is still present, continue diagnosis at KF16.



VEHICLE HARNESS CONNECTORS

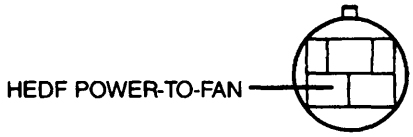
A13577-A

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF)

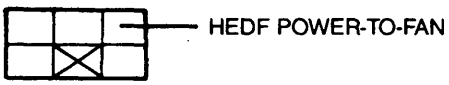
Pinpoint Test **KF**

TEST STEP	RESULT	ACTION TO TAKE
KF18 CHECK HEDF POWER-TO-FAN VOLTAGE AT FAN WITH A/C HP SWITCH GROUNDED		
• Key off. • A/C HP switch disconnected. • Reconnect HEDF relay. • Disconnect cooling fan. • DVOM on 20 volt scale. • Again insert a jumper wire between the two pins of the A/C HP switch vehicle harness connector. • Key on. • Measure voltage between HEDF Power-To-Fan circuit at the cooling fan vehicle harness connector and battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	REPLACE cooling fan. REMOVE jumper. RECONNECT all components. RE-EVALUATE symptom. REMOVE jumper. RECONNECT A/C HP switch. GO to **KF19**.
KF19 CHECK HEDF POWER-TO-FAN CIRCUIT CONTINUITY		
• Key off. • Cooling fan disconnected. • Disconnect HEDF relay. • DVOM on 200 ohm scale. • Measure resistance between the HEDF Power-To-Fan output pin at the HEDF vehicle harness connector and the HEDF Power-To-Fan input pin at the cooling fan vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE HEDF relay. RECONNECT all components. RE-EVALUATE symptom. SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom.



COOLING FAN VEHICLE HARNESS CONNECTOR

A13578-A



HEDF RELAY VEHICLE HARNESS CONNECTOR

A13579-A

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF) | Pinpoint Test | KF

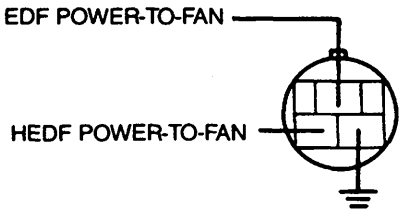
TEST STEP	RESULT ▶	ACTION TO TAKE
KF25 LOW SPEED (EDF) OR HIGH SPEED (HEDF) COOLING FAN ALWAYS ON: VERIFY IGNITION RELAY IS OPENING		
NOTE: Verify that A/C is off during testing. • **Is cooling fan always on with key off, but operating normally with key on?**	Yes ▶	VERIFY that IGN relay contacts are not always closed. If OK, CHECK circuit from IGN relay to fan relay(s) for short to BATT(+).
	No ▶	GO to KF26.
KF26 CHECK FOR EDF RELAY ALWAYS CLOSED		
• Key off. • Disconnect EDF relay. • Key on. • **Does fan continue to run?**	Yes ▶	**For A/C equipped vehicles:** GO to KF27. **For non A/C vehicles:** SERVICE short to power in EDF Power-To-Fan circuit. RECONNECT EDF relay. RE-EVALUATE symptom.
	No ▶	REPLACE EDF relay. RE-EVALUATE symptom.
KF27 CHECK HEDF RELAY		
• Key off. • EDF relay disconnected. • Disconnect HEDF relay. • Key on. • **Does fan continue to run?**	Yes ▶	GO to KF28.
	No ▶	REPLACE HEDF relay. RECONNECT EDF relay. RE-EVALUATE symptom.

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Electro Drive Fan (EDF)/ High Electro Drive Fan (HEDF)

Pinpoint Test **KF**

TEST STEP	RESULT ▶	ACTION TO TAKE
KF28 CHECK EDF POWER-TO-FAN CIRCUIT FOR SHORT TO POWER		
• Key off. • EDF and HEDF relay disconnected. • Disconnect cooling fan. • DVOM on 20 volt scale. • Key on. • Measure voltage between EDF Power-To-Fan circuit at the cooling fan vehicle harness connector and battery negative post. • **Is voltage greater than 1.0 volt?**	Yes ▶	SERVICE Short-To-Power in EDF Power-To-Fan circuit. RECONNECT all components. RE-EVALUATE symptom.
	No ▶	SERVICE Short-To-Power in HEDF Power-To-Fan circuit. RECONNECT all components. RE-EVALUATE symptom.



COOLING FAN VEHICLE HARNESS CONNECTOR

A13580-A

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Service Pin Adjustment	Pinpoint Test	KH

Note

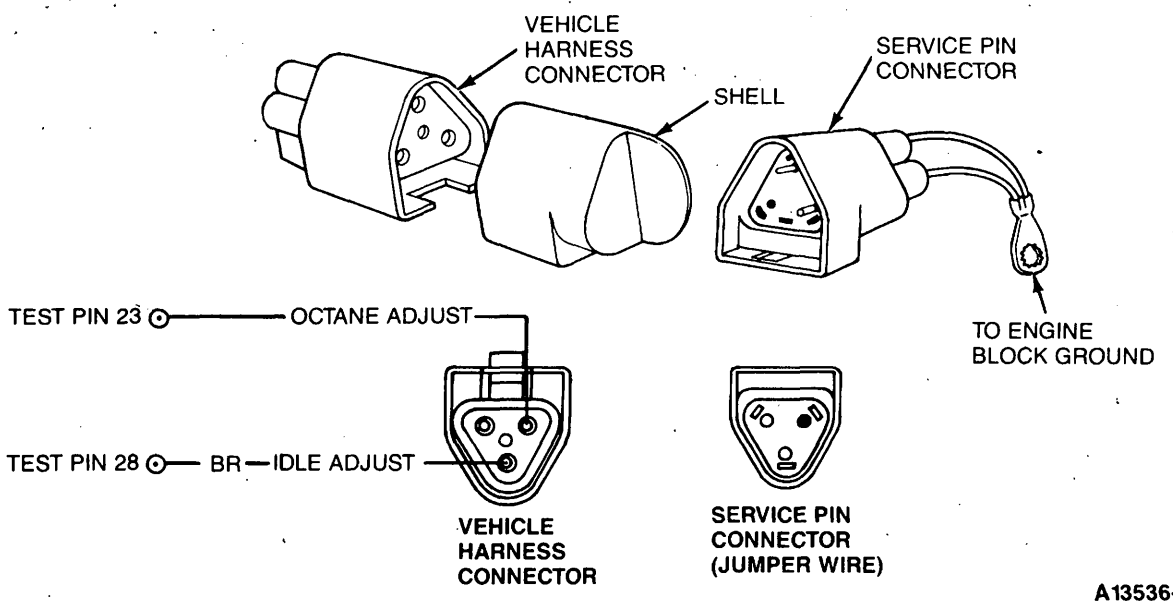
You should enter this Pinpoint Test only when a Service Code 57 or 59 is received during Quick Test or from Diagnosis By Symptom.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: Octane Adjust, Idle Adjust
- Service Pin Connector Shell (Jumper Wire)

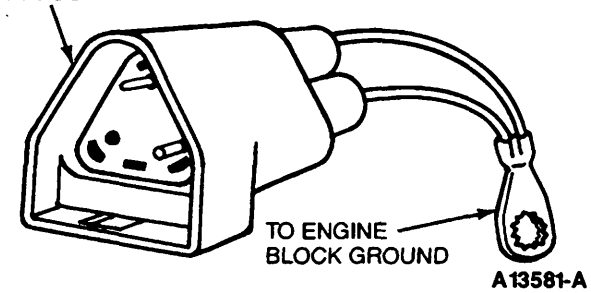
Pinpoint Test Schematic



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Service Pin Adjustment

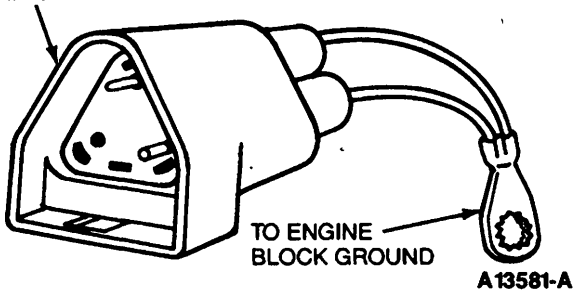
Pinpoint Test **KH**

TEST STEP	RESULT ▶	ACTION TO TAKE
KH1 CHECK IF THE OCTANE ADJUST SERVICE WIRE IS INSTALLED Service Code 57 is not a fault code but an "information" code (exclusive on Scorpio) indicating that Service Pin 23 jumper wire is installed or the circuit is shorted to ground. If additional information is required on the Octane Adjust service pin, refer to KH3. • Locate the 3-pin service connector. • **Is jumper wire installed for Service Pin 23?**	Yes ▶ No ▶	Service Code 57 indicates service pin in use. Do not remove. Testing complete. GO to KH2.
KH2 CHECK FOR SHORT TO GROUND • Key off. • DVOM on 200,000 ohm scale. • Disconnect processor. • Install breakout box, leave processor disconnected. • Measure resistance between Test Pin 23 and Test Pins 20, 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. SERVICE short to ground. REMOVE breakout box. RERUN Quick Test.
KH3 OCTANE ADJUST PIN • The purpose of the Octane Adjust is to produce effective combustion using optimum spark advance. • If the vehicle spark knocks, add a jumper wire from the Octane Adjust circuit of the 3-way service pin connector to the engine block eyelit ground. This will retard spark an additional 4 degrees. Also, a KOEO Service Code 57 will be displayed to indicate that this service pin is in use. • If the vehicle continues to detonate (spark knock) use a higher octane grade of fuel. SERVICE PIN CONNECTOR  TO ENGINE BLOCK GROUND A13581-A		

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Service Pin Adjustment

Pinpoint Test **KH**

TEST STEP	RESULT ▶	ACTION TO TAKE
KH10 CHECK IF THE IDLE ADJUST SERVICE WIRE IS INSTALLED Service Code 59 is not a fault code but an "information" code (exclusive on Scorpio) indicating that Service Pin 28 jumper wire is installed or the circuit is shorted to ground. If additional information is required on the Idle Adjust service pin, refer to KH12. • Locate the 3-pin service connector. • **Is jumper wire installed for Service Pin 28?**	Yes ▶ No ▶	Service Code 59 indicates service pin in use. Do not remove. Testing complete. GO to KH11.
KH11 CHECK FOR SHORT TO GROUND • Key off. • Disconnect processor. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 28 and Test Pins 20, 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. SERVICE short to ground. REMOVE breakout box. RERUN Quick Test.
KH12 IDLE ADJUST PIN • The purpose of the Idle Adjust circuit is to increase vehicle rpm due to additional engine loads. • If the vehicle's curb idle appears to be low during parking maneuvers or vehicle stalls while A/C is on, add a jumper wire from the Idle Adjust circuit of the 3-way service pin connector to the engine block eyelit ground. This will increase idle by 50 rpms in drive. Also, a KOEO Service Code 59 will be displayed to indicate that this service pin is in use. • If vehicle continues to exhibit drive concern, go to Idle Adjust procedure in Section 4. SERVICE PIN CONNECTOR  A13581-A		

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Shift Indicator Light (SIL)	Pinpoint Test	KL

Note

You should enter this Pinpoint Test only when you have been directed here from Diagnosis By Symptom or Pinpoint Test Step QA9 .

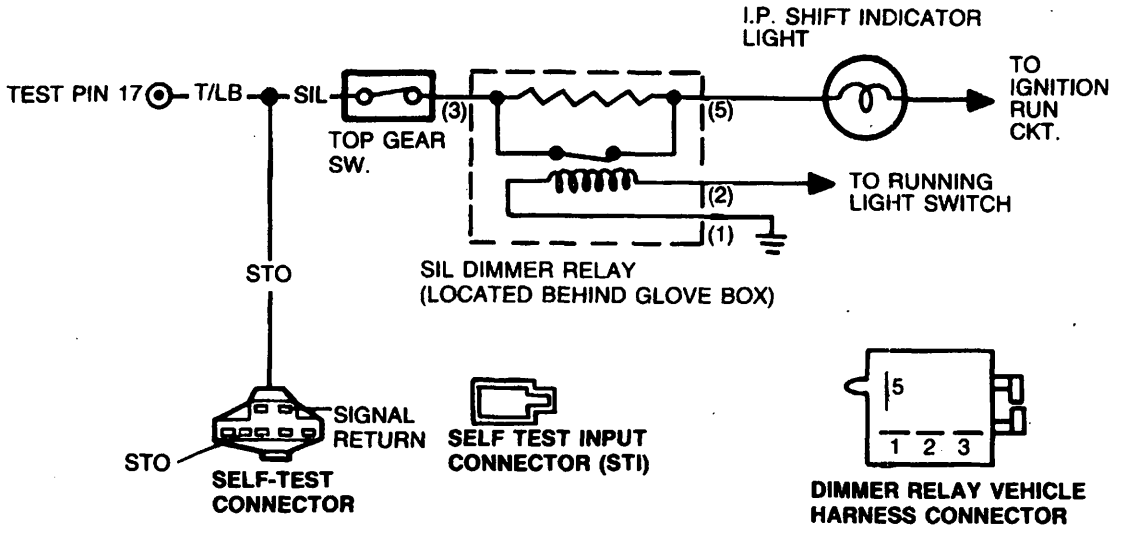
Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: SIL and STO
- Top Gear Switch
- SIL Dimmer Relay
- SIL Bulb and SIL circuit fuse

Pinpoint Test Schematic

1.9L EFI

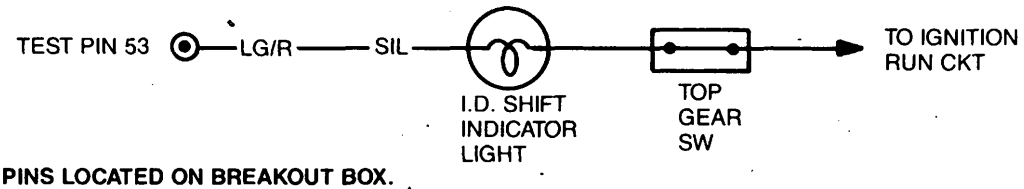


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Shift Indicator Light (SIL)	Pinpoint Test	KL

Pinpoint Test Schematic

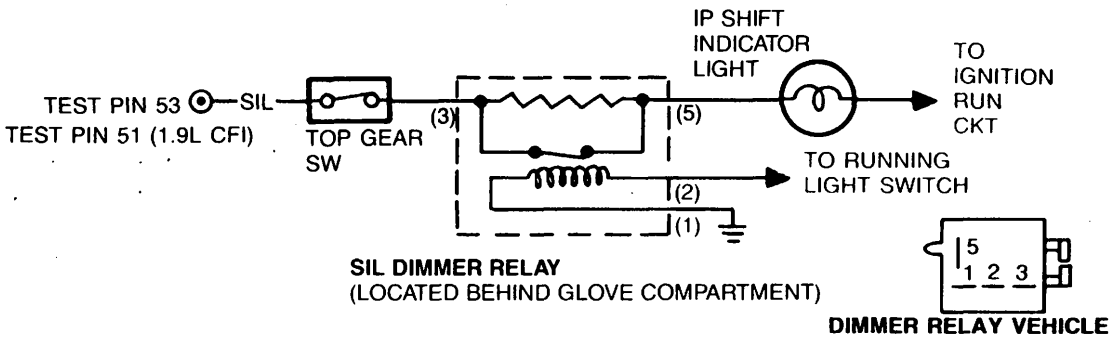
1.9L MA SEFI



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13607-A

ALL OTHERS



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9680-E

Test Pin	Application	Wire Color
51	1.9L CFI	T/LB
53	2.3L HSC	O
	3.8L SC	P

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Shift Indicator Light (SIL)

Pinpoint Test **KL**

TEST STEP	RESULT ▶	ACTION TO TAKE
KL1 CHECK SIL OPERATION		
NOTE: To verify SIL operation, observe the SIL while driving the vehicle. The SIL should turn on when the optimum shift speed is reached in each gear and remain off while in the highest gear. If the SIL is always on, look for a short to ground in the SIL circuit. If the SIL is always off, look for an open in the SIL circuit. • **Is SIL on all the time?**	Yes ▶ No ▶	**For 1.9L MA SEFI:** GO to KL10. **For all others:** GO to KL6. GO to KL2.
KL2 CHECK SIL CIRCUIT FUSE		
• Key off, wait 10 seconds. • Remove SIL circuit fuse (#18 for all except 1.9L MA) and inspect. • **Is fuse OK?**	Yes ▶ No ▶	RECONNECT SIL circuit fuse. GO to KL3. SERVICE short to ground between SIL circuit fuse and SIL bulb. REPLACE SIL circuit fuse. VERIFY SIL operation.
KL3 CHECK SIL BULB		
• Key off. • Remove SIL bulb and inspect. • **Is SIL bulb OK?**	Yes ▶ No ▶	**For 1.9L MA SEFI:** GO to KL15. **For all others:** RECONNECT SIL bulb. GO to KL4. REPLACE SIL bulb. VERIFY SIL operation.
KL4 CHECK SIL DIMMER RELAY CONTINUITY		
• Key off. • Disconnect SIL dimmer relay. • DVOM on 200 ohm scale. • Measure resistance between pins 3 and 5 on SIL dimmer relay. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to KL5. REPLACE SIL dimmer relay. VERIFY SIL operation.

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Shift Indicator Light (SIL) — Pinpoint Test KL

TEST STEP	RESULT ▶	ACTION TO TAKE
KL5 CHECK SIL DIMMER RELAY FUNCTION		
• Key off. • SIL dimmer relay disconnected. • Apply 12 volts across pins 1 and 2 on the SIL dimmer relay. • DVOM on 200 ohm scale. • Measure resistance between pins 3 and 5 on SIL dimmer relay. • **Is resistance between 40 ohms and 55 ohms?**	Yes ▶ No ▶	GO to KL6. REPLACE SIL dimmer relay. VERIFY SIL operation.
KL6 CHECK VOLTAGE AT SIL DIMMER RELAY		
• Key on, engine off. • Disconnect SIL dimmer relay. • DVOM on 20 volt scale. • Measure voltage between pin 5 on the SIL dimmer relay vehicle harness connector and the battery negative post. • **Is voltage greater than 5 volts?**	Yes ▶ No ▶	RECONNECT SIL dimmer relay. GO to KL7. SERVICE circuit between SIL dimmer relay and SIL fuse. VERIFY SIL operation.
KL7 CHECK VOLTAGE AT TOP GEAR SWITCH		
• Key on, engine off. • Disconnect top gear switch. • DVOM on 20 volt scale. • Measure voltage between the SIL dimmer relay side of the top gear switch vehicle harness connector and the battery negative post. • **Is voltage greater than 5 volts?**	Yes ▶ No ▶	GO to KL8. SERVICE circuit between top gear switch and SIL dimmer relay. VERIFY SIL operation.
KL8 CHECK OPERATION OF TOP GEAR SWITCH		
• Key off, wait 10 seconds. • Top gear switch disconnected. • DVOM on 200 ohm scale. • Measure resistance of top gear switch while shifting the transmission from the highest gear to the next lower gear. • **Does circuit open and close?**	Yes ▶ No ▶	GO to KL9. REPLACE top gear switch. VERIFY SIL operation.

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Shift Indicator Light (SIL)

Pinpoint Test **KL**

TEST STEP	RESULT ▶	ACTION TO TAKE
KL9 CHECK CONTINUITY OF SIL CIRCUIT		
• Key off. • Top gear switch disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 53 (Test Pin 51 on 1.9L CFI or Test Pin 17 on 1.9L EFI) at the breakout box and the processor side of the top gear switch vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **KL10**. SERVICE open circuit between the top gear switch and the processor. REMOVE breakout box. RECONNECT all components. VERIFY SIL operation.
KL10 CHECK SIL CIRCUIT FOR SHORT TO GROUND		
• Key off. • Reconnect top gear switch (if applicable). • Shift transmission to highest gear. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 53 (Test Pin 51 on 1.9L CFI or Test Pin 17 on 1.9L EFI) and Test Pin 60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. SERVICE short to ground between top gear switch and processor (on 1.9L EFI, also CHECK STO circuit for short to ground). REMOVE breakout box. RECONNECT processor. VERIFY SIL operation.

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Shift Indicator Light (SIL)

Pinpoint Test **KL**

TEST STEP	RESULT ▶	ACTION TO TAKE
KL15 CHECK FOR VOLTAGE TO SIL SOCKET		
• Key off. • SIL bulb removed. • Transmission in any gear except top gear. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between power contact at SIL socket and chassis ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KL17. RECONNECT SIL bulb. GO to KL16.
KL16 CHECK OPERATION OF TOP GEAR SWITCH		
NOTE: The Top Gear switch is a normally closed switch and is in the ignition RUN circuit to the SIL bulb. The Top Gear switch should be open only when the vehicle is shifted to top gear. • Key off. • Transmission in any gear except top gear. • Disconnect Top Gear switch. • DVOM on 200 ohm scale. • Measure resistance of the Top Gear switch. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	SERVICE open in ignition run circuit to the SIL bulb socket. VERIFY SIL operation. REPLACE Top Gear switch. VERIFY SIL operation.
KL17 CHECK CONTINUITY OF SIL CIRCUIT		
• Key off. • SIL bulb removed. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 53 at the breakout box and SIL circuit contact at the SIL bulb socket. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT SIL bulb. VERIFY SIL operation. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. VERIFY SIL operation.

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WOT A/C Cutout (WAC) A/C Demand	Pinpoint Test	KM

Note

You should enter this Pinpoint Test only when directed here from Diagnosis By Symptom.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Refrigerant charge
- Ambient temperature less than 45°

This Pinpoint Test is intended to diagnose only the following:

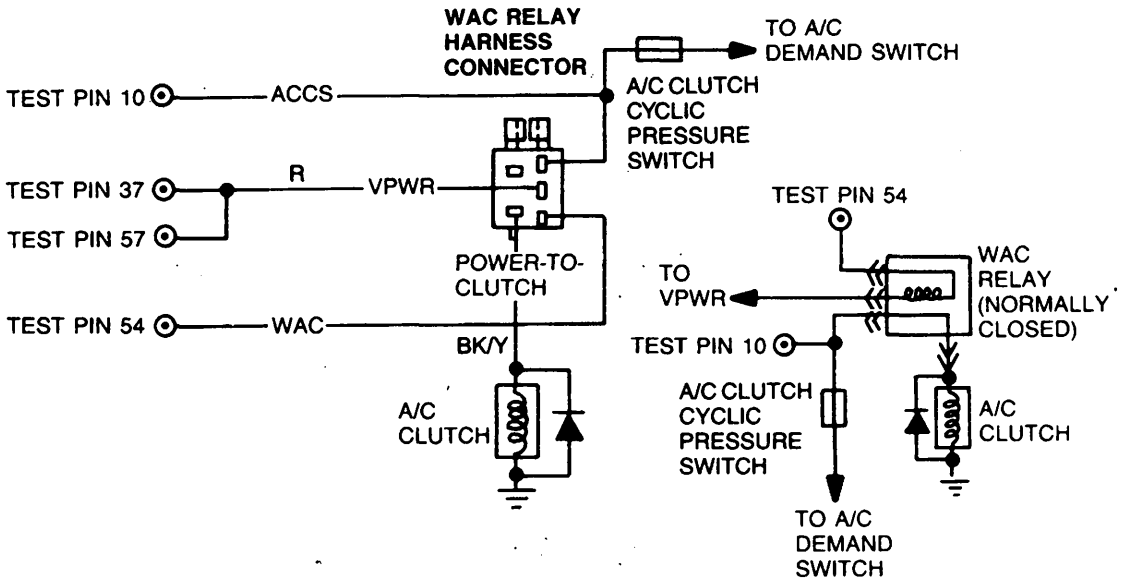
- Harness circuits: WAC, VPWR, GND, POWER-TO-CLUTCH, ACD
- WAC relay (-11433- or -13A025-) or A/C fan controller (-8C619-)
- Processor assembly (-12A650-)

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WOT A/C Cutout (WAC) A/C Demand	Pinpoint Test	KM

Pinpoint Test Schematic

3.8L SEFI RWD, 5.0L SEFI MARK VII, 5.0L SEFI MA MUSTANG, 2.9L TRUCK, 3.0L EFI TRUCK, 4.0L TRUCK



A11536-B

Test Pin 10	ACCS
Application	**Color**
3.8L SEFI RWD 5.0L SEFI MA	PK/LB
2.9L Truck 4.0L Ranger/Bronco II	T/Y
3.0L EFI Truck 4.0L Aerostar	BK/Y
5.0L SEFI	LG/P

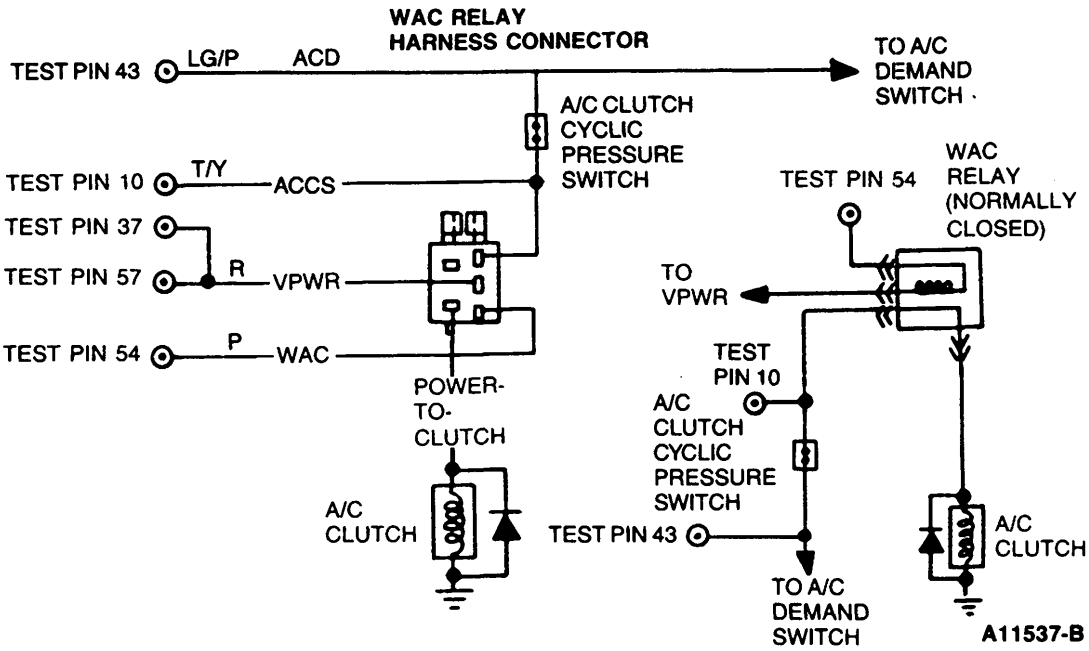
Test Pin 54	WAC
Application	**Color**
3.8L SEFI RWD 5.0L SEFI 5.0L SEFI MA	O/LB
2.9L Truck	P
3.0L EFI Truck	GY/W

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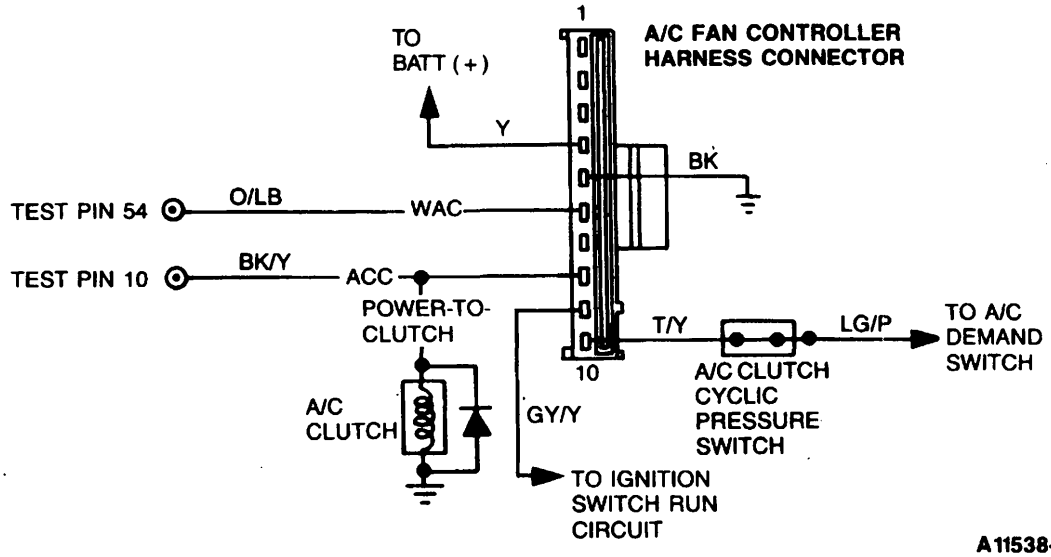
WOT A/C Cutout (WAC) A/C Demand	Pinpoint Test	KM

Pinpoint Test Schematic

2.3L TRUCK



1.9L CFI, 1.9L EFI

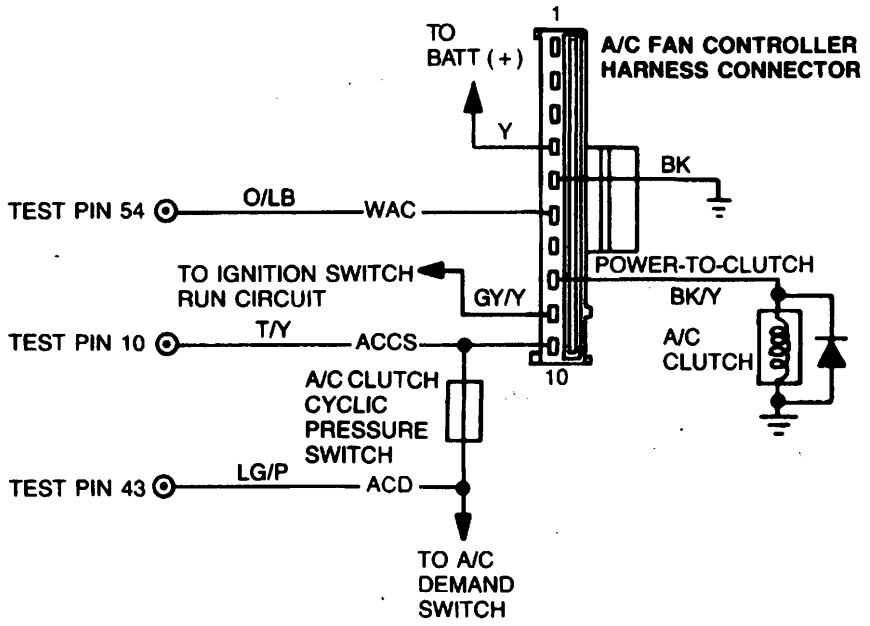


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WOT A/C Cutout (WAC) A/C Demand	Pinpoint Test	KM

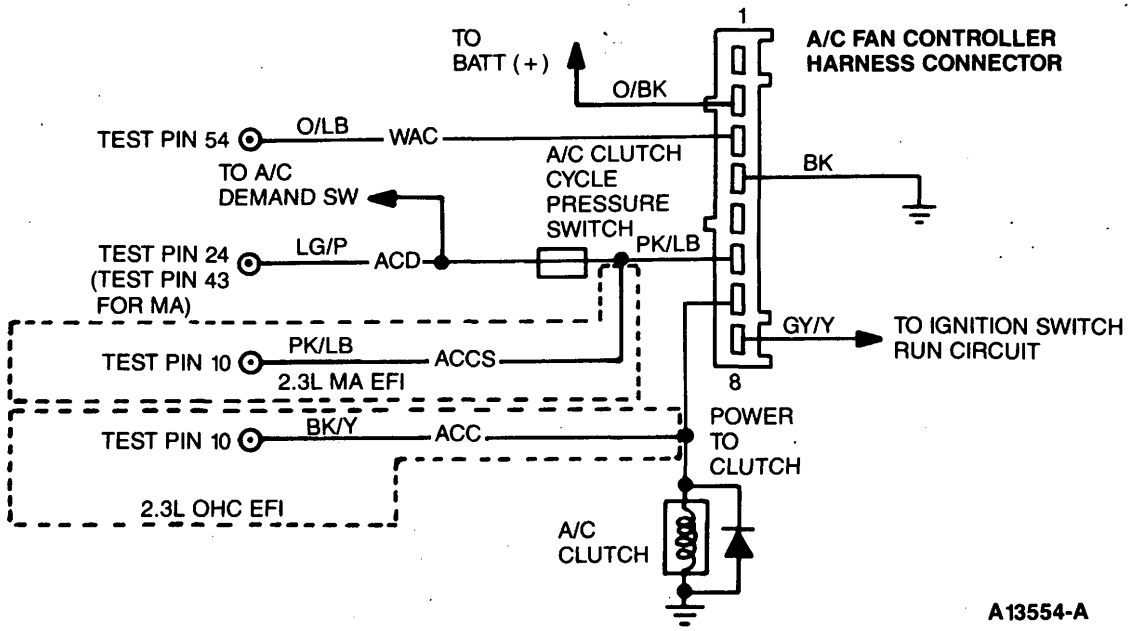
Pinpoint Test Schematic

2.3L HSC EFI



A11539-C

2.3L MA EFI CAR, 2.3L OHC EFI CAR



A13554-A

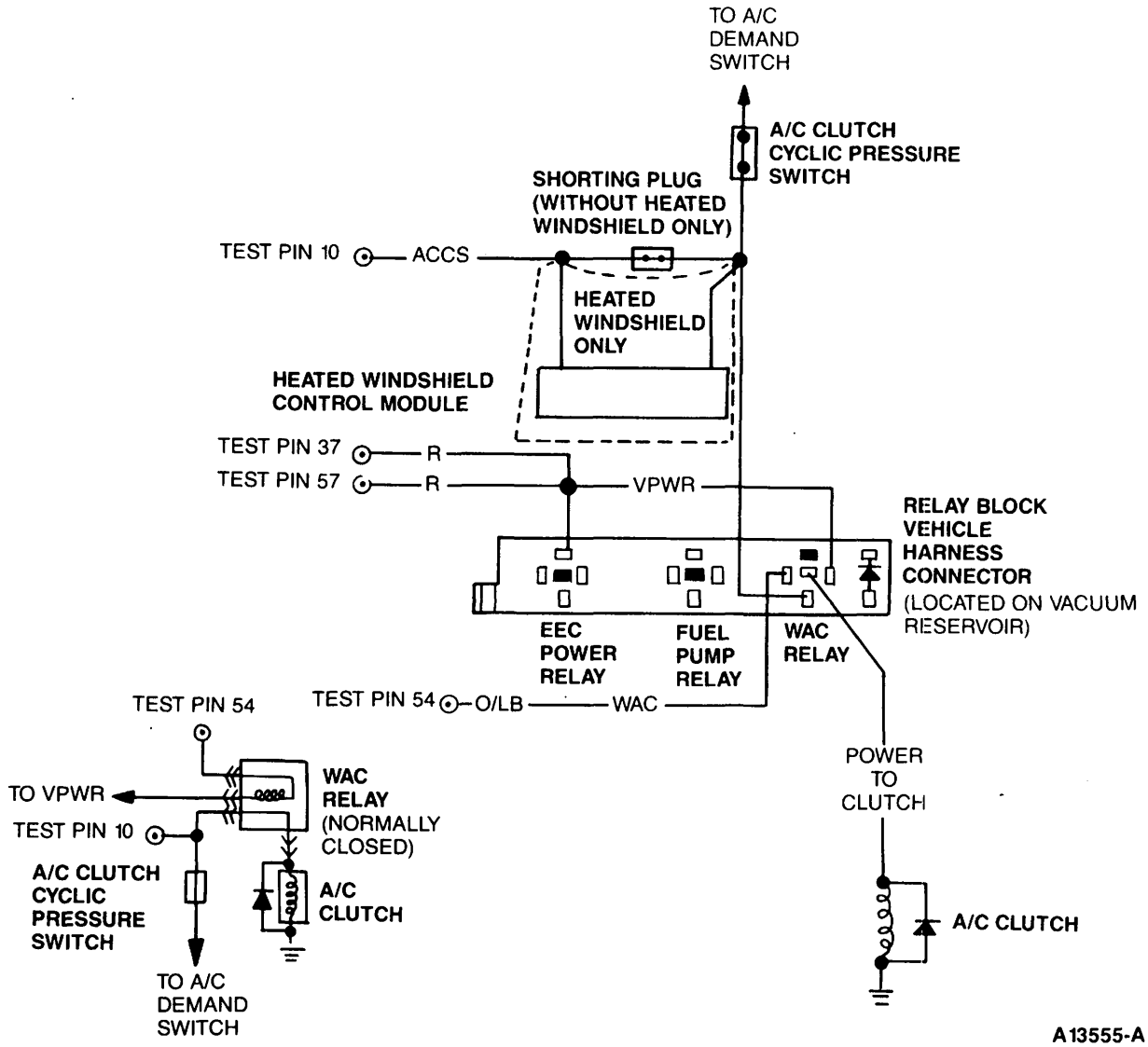
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WOT A/C Cutout (WAC) A/C Demand	Pinpoint Test	KM

Pinpoint Test Schematic

5.0L SEFI TOWN CAR, CROWN VICTORIA/GRAND MARQUIS

5.0L SEFI MA TOWN CAR, CROWN VICTORIA/GRAND MARQUIS



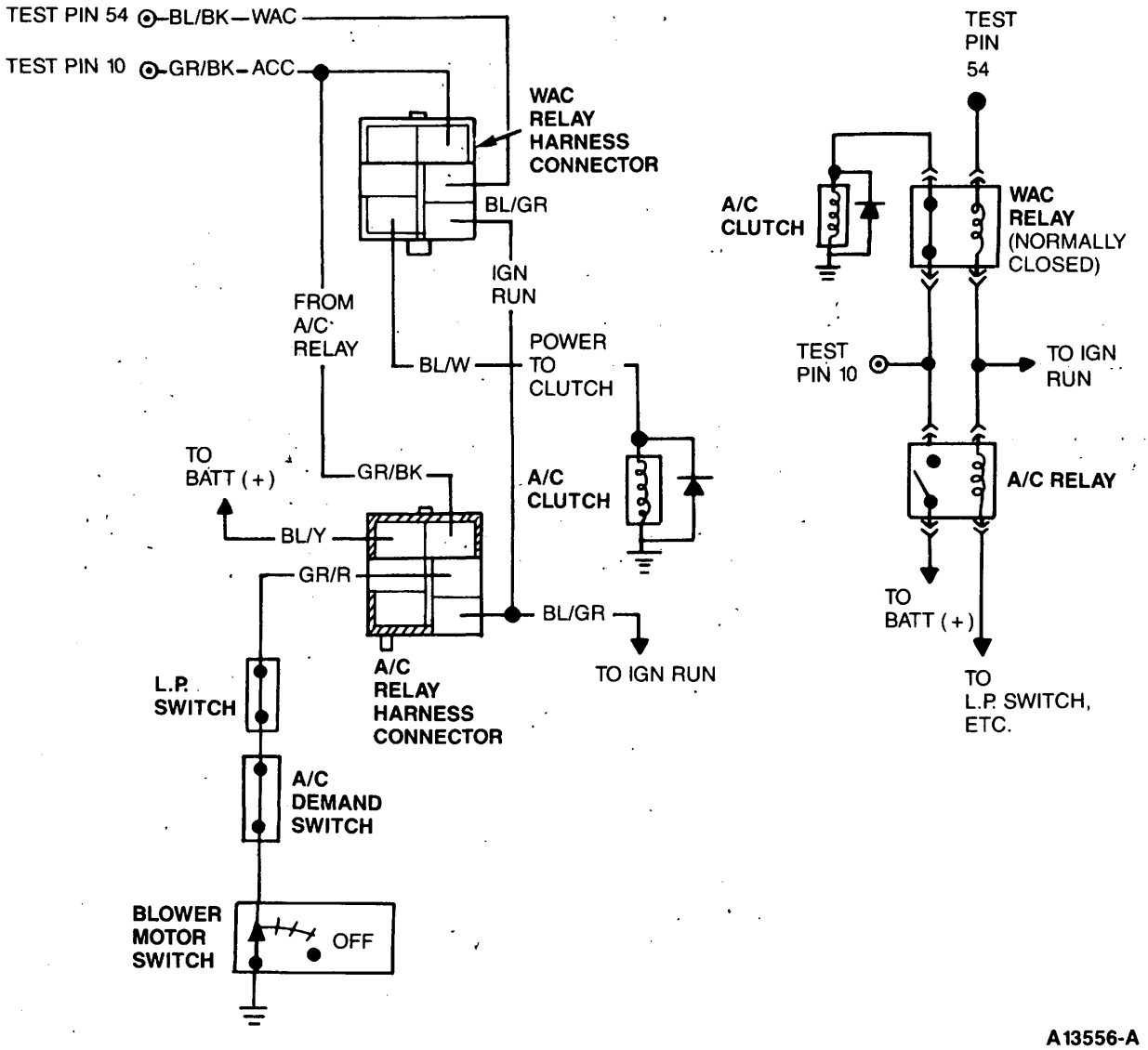
Test Pin 10	ACCS
Application	**Wire Color**
Town Car	PK
All Others	PK/LB

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WOT A/C Cutout (WAC) A/C Demand	Pinpoint Test	KM

Pinpoint Test Schematic

1.9L MA SEFI

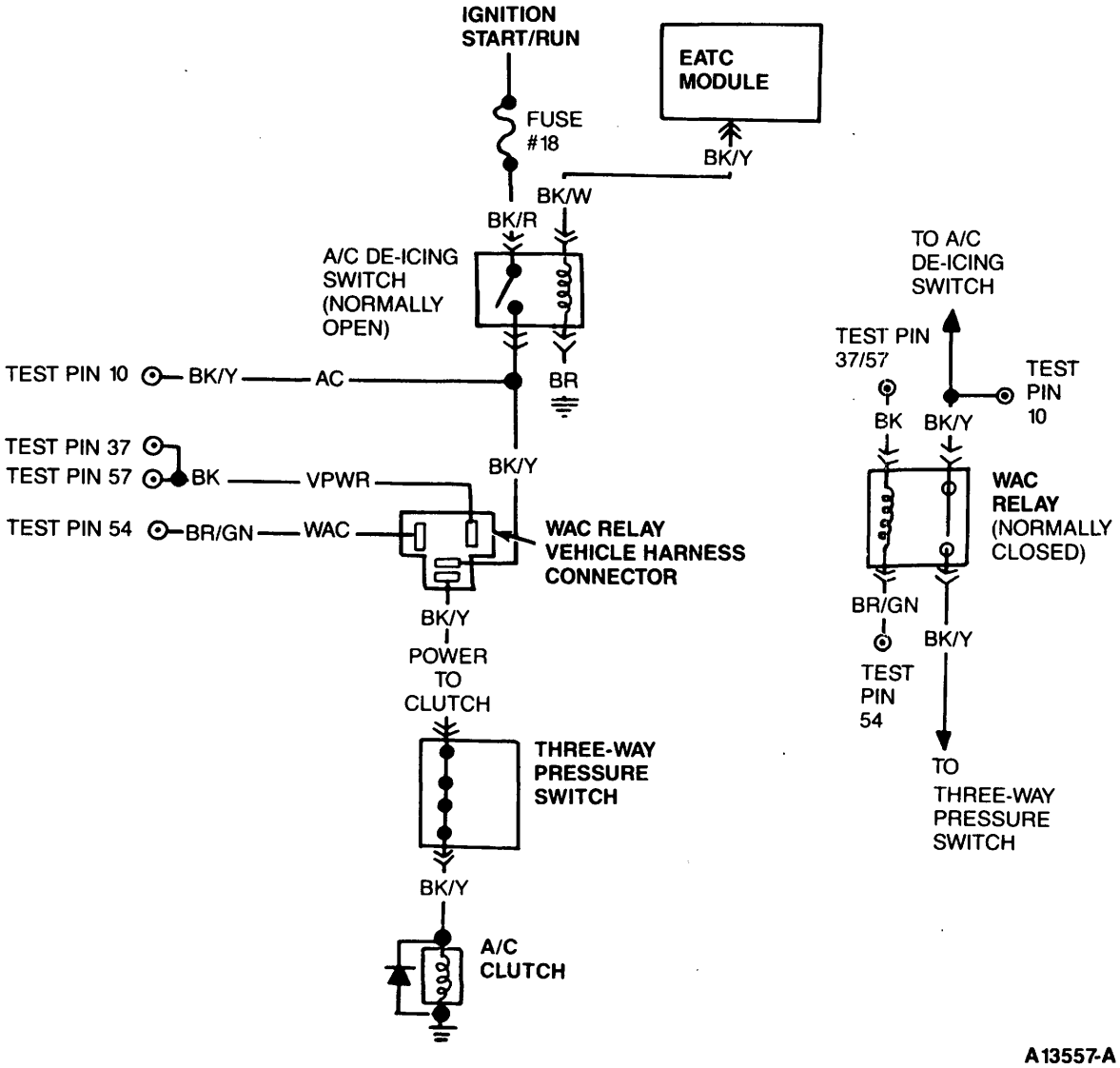


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WOT A/C Cutout (WAC) A/C Demand	Pinpoint Test	KM

Pinpoint Test Schematic

2.9L EFI SCORPIO



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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM1 NO A/C: CHECK FOR VOLTAGE AT A/C CLUTCH		
NOTE: Before proceeding with "NO A/C" diagnostics, verify integrity of related fuses in fuse panel. • Key off. • Disconnect A/C clutch. • A/C demand switch to A/C. • For 1.9L MA SEFI, turn blower motor switch on (any speed). • DVOM on 20 volt scale. • Start engine, wait 10 seconds. • Measure voltage between the power side of the A/C clutch vehicle harness connector and battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	EEC-IV system OK. Refer to Ventilation/ Climate Control Shop Manual Group A/C Diagnosis, to check for poor ground, open circuit in clutch, mechanical problems, etc. GO to KM2.
KM2 CHECK POWER-TO-CLUTCH CIRCUIT CONTINUITY		
NOTE: Applications with WAC relay: 1.9L MA SEFI, 2.9L EFI Car, 3.8L SEFI RWD, 5.0L SEFI, 5.0L SEFI MA, 2.3L TRK, 2.9L TRK, 3.0L EFI TRK, 4.0L TRK. **Applications with A/C fan controller: 1.9L CFI, 1.9L EFI, 2.3L car.** • Key off. • A/C clutch disconnected. • Disconnect WAC relay or A/C fan controller. • DVOM on 200 ohm scale. • Measure resistance between power side of the A/C clutch vehicle harness connector and POWER-TO-CLUTCH pin at the WAC relay or A/C fan controller vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	RECONNECT A/C clutch. GO to KM3. **For 2.9L EFI CAR:** VERIFY operation of Three-Way Pressure switch. REFER to Ventilating/Climate Control Group in Shop Manual, A/C Diagnosis. If OK, SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom. **For all others:** SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

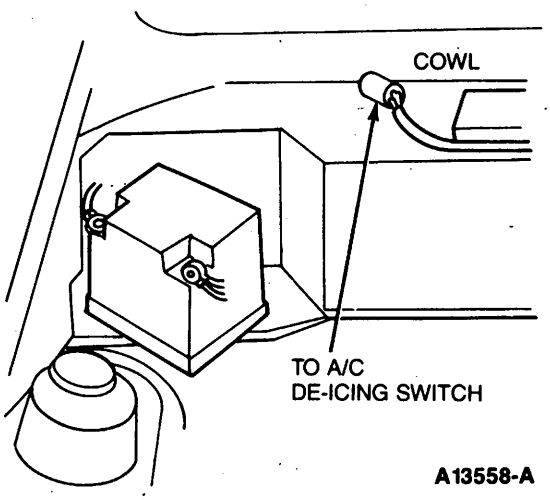
TEST STEP	RESULT ▶	ACTION TO TAKE
KM3 CHECK FOR POWER ON A/C DEMAND CIRCUIT		
• Key on, engine off. • WAC relay or A/C fan controller disconnected. • A/C demand switch to A/C. • DVOM on 20 volt scale. **For 2.9L EFI Car:** — Measure voltage between A/C De-icing switch input at WAC relay vehicle harness connector and chassis ground. **For 1.9L MA SEFI:** — Blower motor switch on (any speed). — Measure voltage between A/C relay input pin at WAC relay vehicle harness connector and chassis ground. **All Others:** — Measure voltage between A/C demand input pin at WAC relay or A/C fan controller vehicle harness connector and chassis ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KM6 . **For 2.9L EFI Car:** GO to KM4 . **For 1.9L MA SEFI:** GO to KM5 . **For all others:** VERIFY operation of A/C clutch cyclic pressure switch and A/C demand switch. REFER to Ventilation/ Climate Control Shop Manual Group. If OK, SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom.

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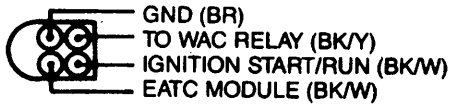
WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM4 CHECK CONTINUITY BETWEEN WAC RELAY AND A/C DE-ICING SWITCH		
• Key off. • WAC relay disconnected. • Disconnect A/C De-icing switch. • DVOM on 200 ohm scale. • Measure continuity between the A/C De-icing switch output to the WAC relay at the A/C De-icing switch vehicle harness connector and the A/C De-icing switch input at the WAC relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶	RECONNECT WAC relay. REFER to Ventilation/Climate Control Shop Manual Group to check for voltage to A/C De-icing switch from ignition switch, proper grounding and operation of A/C De-icing switch, proper input from the EATC module, etc.
	No ▶	SERVICE open circuit. RECONNECT WAC relay and A/C De-icing switch. RE-EVALUATE symptom.



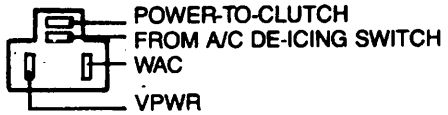
A13558-A



A/C DE-ICING SWITCH HARNESS CONNECTOR

NOTE: THE A/C DE-ICING SWITCH IS A NORMALLY OPEN RELAY

A9199-B



WIDE OPEN THROTTLE A/C CUTOUT (WAC) RELAY HARNESS CONNECTOR

A9200-B

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test | **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM5 CHECK CONTINUITY BETWEEN WAC RELAY AND A/C RELAY		
• Key off. • WAC relay disconnected. • Disconnect A/C relay. • DVOM on 200 ohm scale. • Measure resistance between the A/C relay output to the WAC relay at the A/C relay vehicle harness connector and the A/C relay input at the WAC relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	RECONNECT WAC relay. REFER to Ventilation/Climate Control Shop Manual Group to check for proper input to A/C relay from BATT(+), IGN RUN and A/C demand circuits; proper A/C relay operation, etc. SERVICE open circuit. RECONNECT WAC relay and A/C relay.
KM6 CHECK WAC CIRCUIT FOR SHORT TO GROUND		
• Key off. • WAC relay or A/C fan controller disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. Leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between WAC circuit at the WAC relay or A/C fan controller harness connector and chassis ground. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	**For A/C fan controller applications:** GO to KM7. **For WAC relay applications:** GO to KM9. SERVICE short circuit. RECONNECT all components. RE-EVALUATE symptom.
KM7 CHECK FOR GROUND TO A/C FAN CONTROLLER		
• Key off. • A/C fan controller disconnected. • Processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between ground circuit at A/C fan controller vehicle harness connector and chassis ground. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KM8. SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM8 CHECK FOR VOLTAGE TO A/C FAN CONTROLLER		
• Key on. • A/C fan controller disconnected. • Processor disconnected. • DVOM on 20 volt scale. • Measure voltage between ignition switch RUN circuit at the A/C fan controller vehicle harness connector and chassis ground. • Measure voltage between BATT(+) circuit at the A/C fan controller vehicle harness connector and chassis ground. • **Are both voltages greater than 10.5 volts?**	Yes ▶ No ▶	GO to **KM9**. SERVICE open circuit. RECONNECT all components. RE-EVALUATE symptom.
KM9 CHECK WAC RELAY, A/C FAN CONTROLLER		
• Key off. • Processor disconnected. • Reconnect WAC relay or A/C fan controller. • Disconnect A/C clutch. • DVOM on 20 volt scale. • Key on, engine off. • A/C demand switch to A/C. • For 1.9L MA SEFI turn blower motor switch on (any speed). • Measure voltage between the power side of the A/C clutch vehicle harness connector and the battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	REPLACE processor. RECONNECT A/C clutch. RE-EVALUATE symptom. REPLACE WAC relay or A/C fan controller. RECONNECT all compounds. RE-EVALUATE symptom.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM15 NO A/C CUTOUT AT WOT: ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX) **NOTE: Do not use STAR tester for this Step, use VOM/DVOM.** • Key off, wait 10 seconds. • DVOM on 20 volt scale. • Disconnect electrical connector on the Speed Control servo; if equipped. • Connect DVOM negative test lead to STO at the Self-Test connector and positive test lead to battery positive post. • Jumper STI to SIGNAL RETURN at the Self-Test connector. • Perform Key On Engine Off Self-Test until the completion of the Continuous Memory Codes. • DVOM will indicate less than 1.0 volt when test complete. • Depress and release the throttle. • **Does voltage increase to greater than 10.5 volts?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to KM16. DEPRESS throttle to WOT and RELEASE. If STO voltage does not go high, leave equipment hooked up and GO to Pinpoint Test Step QC2.
KM16 WAC RELAY OR A/C FAN CONTROLLER • WAC relay applications: 1.9L MA SEFI, 2.9L EFI Car, 3.8L SEFI RWD, 5.0L SEFI, 5.0L SEFI MA, 2.3L TRK, 2.9L TRK, 3.0L EFI TRK, 4.0L TRK. • A/C fan controller applications: 1.9L CFI, 1.9L EFI, 2.3L car.	WAC relay ▶ A/C fan controller ▶	GO to KM17. GO to KM22.
KM17 CHECK FOR VPWR TO RELAY • Still in Output State Check. • Disconnect harness from WAC relay. • DVOM on 20 volt scale. • Measure voltage between VPWR circuit (IGN RUN for 1.9L MA SEFI) at the WAC relay vehicle harness connector and chassis ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KM18. SERVICE open in VPWR circuit between power relay and WAC relay (for 1.9L MA SEFI, IGN RUN circuit between WAC relay and joint box). RECONNECT all components and REMOVE jumper. REEVALUATE symptom.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM18 CHECK FOR WAC CYCLING • Still in Output State Check. • Reconnect WAC relay. • DVOM on 20 volt scale. • Connect DVOM positive test lead to the VPWR circuit (IGN RUN for 1.9L MA SEFI) and the negative test lead to the WAC circuit at the WAC relay vehicle harness connector. • While observing DVOM, depress and release throttle several times (to cycle output on and off). • **Does voltage cycle high and low?**	Yes ▶ No ▶	REPLACE WAC relay. REMOVE jumper. RE-EVALUATE symptom. REMOVE jumper. RECONNECT Speed Control servo. GO to **KM19**.
KM19 CHECK WAC CIRCUIT CONTINUITY • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect WAC relay. • Measure resistance between Test Pin 54 at the breakout box and WAC circuit at the WAC relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to **KM20**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.
KM20 CHECK WAC CIRCUIT FOR SHORT TO POWER • Key off. • Breakout box installed, processor disconnected. • WAC relay disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 54 and Test Pins 37 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT WAC relay. REEVALUATE symptom. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom. IF symptom is still present, REPLACE processor.

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WOT A/C Cutout (WAC) A/C Demand	Pinpoint Test	KM

TEST STEP	RESULT ▶	ACTION TO TAKE
KM22 CHECK FOR WAC CYCLING		
• Still in output state check. • Disconnect A/C fan controller. • DVOM on 20 volt scale. • Connect DVOM positive test lead to the Ignition Run circuit and the negative test lead to the WAC circuit at the A/C fan controller vehicle harness connector. • While observing DVOM, depress and release throttle several times (to cycle output on and off). • **Does voltage cycle high and low?**	Yes ▶ No ▶	REPLACE A/C fan controller. REMOVE jumper. RECONNECT Speed Control servo. RE-EVALUATE symptom. REMOVE jumper. RECONNECT Speed Control servo. GO to **KM23**.
KM23 CHECK WAC CIRCUIT CONTINUITY		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • A/C fan controller disconnected. • Measure resistance between Test Pin 54 at the breakout box and WAC circuit at the WAC relay vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to **KM24**. SERVICE open circuit. REMOVE breakout box. RECONNECT processor and A/C fan controller. RE-EVALUATE symptom.
KM24 CHECK WAC CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • A/C fan controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 54 and Test Pins 37 and 57 at the breakout box. • **Are both resistances greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT A/C fan controller. RE-EVALUATE symptom. SERVICE short circuit. REMOVE breakout box. RECONNECT processor and A/C fan controller. RE-EVALUATE symptom. If symptom is still present, REPLACE processor.

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WOT A/C Cutout (WAC) A/C Demand

Pinpoint Test **KM**

TEST STEP	RESULT ▶	ACTION TO TAKE
KM30 CYCLE A/C DEMAND SWITCH		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Connect DVOM positive test lead to Test Pin 43 (Test Pin 24 for 2.3L OHC EFI) and negative test lead to Test Pin 40. • **Does voltage cycle high and low when A/C demand switch is cycled?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. GO to **KM31**.
KM31 CHECK ACD CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 43 (Test Pin 24 for 2.3L OHC EFI) at the breakout box and A/C demand switch. • **Is resistance greater than 5 ohms?**	Yes ▶ No ▶	SERVICE open in ACD circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. EEC-IV system OK. REMOVE breakout box. RECONNECT processor. REFER to Ventilation/Climate Control Group in Shop Manual.
KM35 CHECK ACD CIRCUIT FOR SHORT TO POWER		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect WAC relay (TRK) or A/C fan controller (CAR). • A/C demand switch "OFF". • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 43 (Test Pin 24 for 2.3L OHC EFI) at the breakout box and chassis ground. • **Is voltage less than 1.0 volt?**	Yes ▶ No ▶	EEC-IV system OK. REMOVE breakout box. RECONNECT all components. REFER to Ventilation/Climate Control Group in Shop Manual. VERIFY operation of A/C demand switch. IF OK, SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.

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Octane Adjust	Pinpoint Test	KP

Note

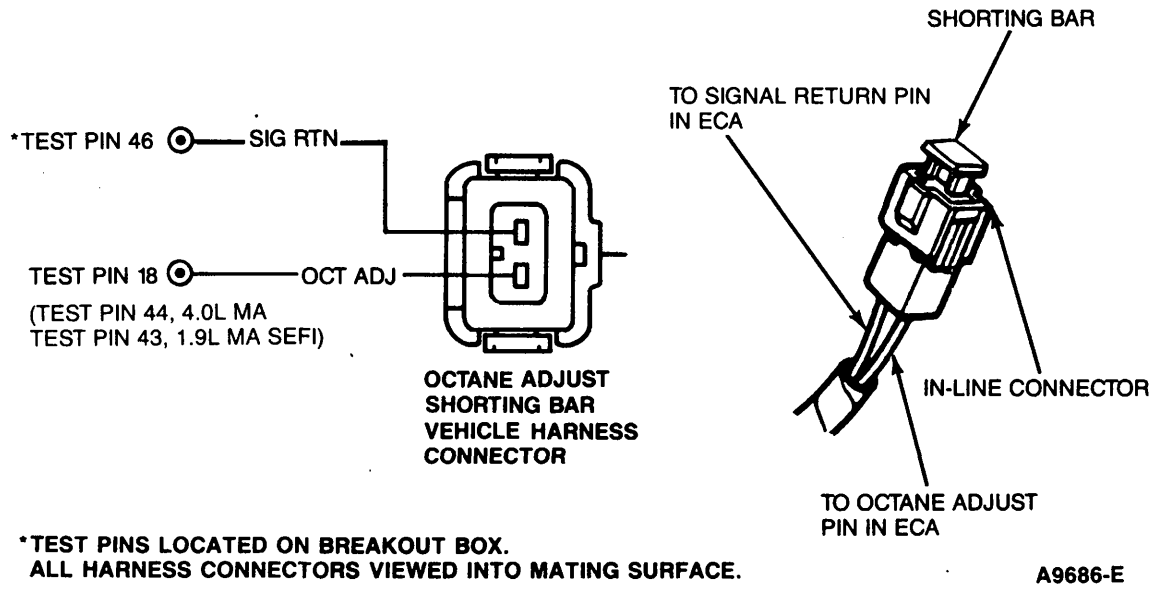
You should enter this Pinpoint Test only when you have been directed here from Diagnosis By Symptom.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: VPWR, Octane Adjust
- Octane shorting bar connector

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9686-E

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Octane Adjust

Pinpoint Test **KP**

Octane Adjust Shorting Bar Locations

Application	Location
1.9L MA SEFI	Near EEC-IV power relay, fuel pump relay and processor in passenger compartment.
2.3L EFI Truck	Passenger side of fender apron, taped to the Self-Test connector.
3.0L SEFI SHO	Driver side of engine, tie wrapped to a bracket above the transmission.
3.8L SEFI SC	Passenger side of engine between shock tower mount and firewall next to Self-Test connector.
4.0L MA EFI Aerostar	Driver side, engine cowl near windshield wiper motor take-out (alongside MAP take-out).
4.0L MA EFI Ranger/ Bronco II	Passenger side of fender apron, taped to the Self-Test connector.

Test Pin 18 (44 and 43) **OCT ADJ**

Application	Wire Color
2.3L EFI Truck 3.0L SEFI SHO 3.8L SEFI SC	BK/W
4.0L Aerostar	O
4.0L Ranger	W/R
1.9L MA SEFI	GR/W

Test Pin 46 **SIG RTN**

Application	Wire Color
1.9L MA SEFI	LG/BK
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
All Others	BK/W

The purpose of the Octane Adjust Shorting Bar is to produce effective combustion using optimum spark advance.

- If the vehicle detonates (spark knock), remove the Octane Adjust Shorting Bar. This will retard spark an additional three to four degrees.
- If the vehicle continues to detonate (spark knock), use a higher octane grade of fuel.

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Intake Air Control Valve (IAC) System	Pinpont Test	KT

Note

You should enter this Pinpoint Test only when a Service Code 81 is received during Quick Test or if you have been directed here from Diagnosis By Symptom.

Remember

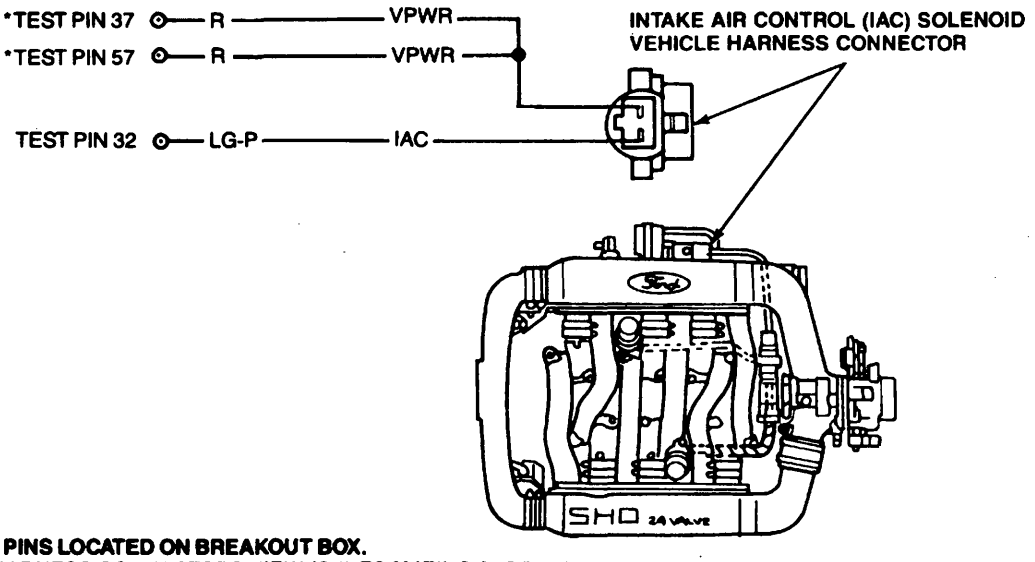
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Vacuum tank leaks
- Vacuum hose leaks

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: VPWR and IAC
- Intake Air Control Assembly (-9H465-)
- Processor Assembly (-12A650-)

Pinpoint Test Schematic



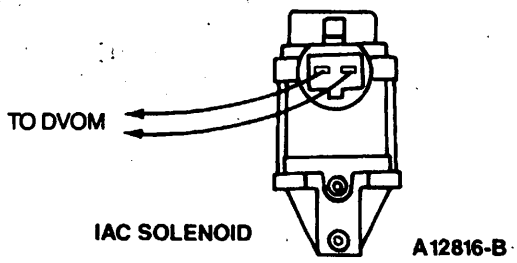
*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Intake Air Control Valve (IAC) System

Pinpont Test | **KT**

TEST STEP	RESULT ▶	ACTION TO TAKE
KT1 SERVICE CODE 81: CHECK IAC SOLENOID RESISTANCE		
Service Code 81 indicates that the Intake Air Control (IAC) solenoid output voltage did not change when activated during Key On Engine Off Self-Test. Possible causes are: — IAC circuit open — IAC circuit short — IAC solenoid disconnected — Processor output driver open/grounded • Key off, wait 10 seconds. • Disconnect IAC solenoid. • DVOM on 200 ohm scale. • Measure resistance between IAC circuit and VPWR circuit at the IAC solenoid. • **Is solenoid resistance between 50 and 100 ohms?**  	Yes ▶ No ▶	GO to KT2. REPLACE IAC solenoid. RERUN Quick Test.
KT2 CHECK VPWR CIRCUIT VOLTAGE		
• Key on, engine off. • IAC solenoid disconnected. • DVOM on 20 volt scale. • Measure voltage between VPWR circuit of IAC solenoid vehicle harness connector and battery negative post. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to KT3. SERVICE open circuit. RECONNECT IAC solenoid. RERUN Quick Test.

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Intake Air Control Valve (IAC) System

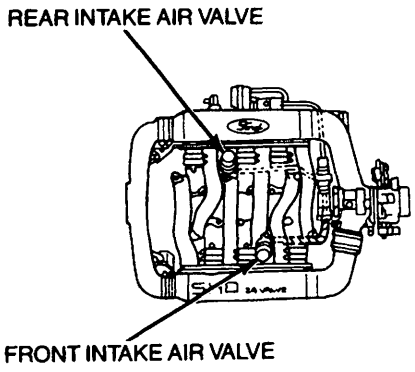
Pinpont Test | **KT**

TEST STEP	RESULT ▶	ACTION TO TAKE
KT3 CHECK IAC CIRCUIT CONTINUITY • Key off, wait 10 seconds. • IAC solenoid disconnected. • Disconnect processor 60 pin connector. Inspect for damaged pins, corrosion, loose wires etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 32 at the breakout box and IAC circuit at the IAC solenoid vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to KT4 . SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KT4 CHECK IAC CIRCUIT FOR SHORT TO GROUND • Key off, wait 10 seconds. • IAC solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 32 and Test Pins 40, 46, and 60 at the breakout box. • **Is each resistance greater than 100,000 ohms?**	Yes ▶ No ▶	GO to KT5 . SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
KT5 CHECK IAC CIRCUIT FOR SHORT TO POWER • Key off, wait 10 seconds. • IAC solenoid disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 32 and Test Pins 37 and 57 at the breakout box. • **Is each resistance greater than 100,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If symptom is still present, REPLACE the processor.

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Intake Air Control Valve (IAC) System

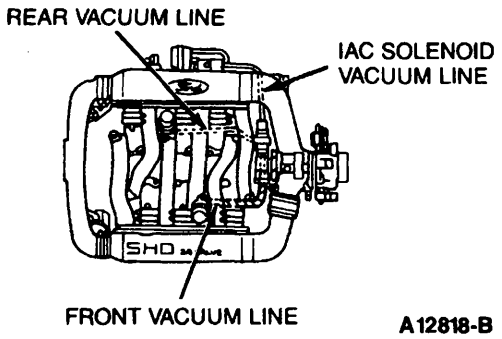
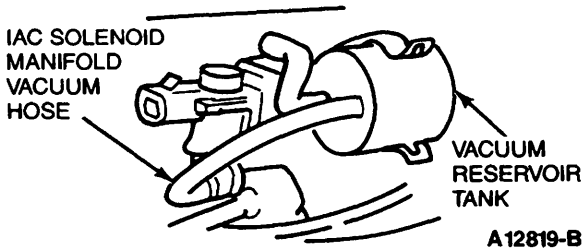
Pinpont Test **KT**

TEST STEP	RESULT ▶	ACTION TO TAKE
KT6 CHECK FRONT AND REAR INTAKE AIR VALVES • Key off. • Disconnect vacuum lines from both intake air valves. • Install vacuum pump at each intake air valve. • Apply 10 in-Hg vacuum to each of the intake air valves. • **Did both intake air valves hold vacuum?**  	Yes ▶ No ▶	GO to KT7. REPLACE intake air valves as necessary. REMOVE vacuum pumps. RECONNECT vacuum lines to both intake air valves. RERUN Quick Test.
KT7 CHECK OPERATION OF BOTH INTAKE AIR VALVES AND LINKAGES • Key off. • Apply 10 in-Hg vacuum to both intake air valves. • **Did both of the valves and valve mechanical linkages move in response to the applied vacuum?**	Yes ▶ No ▶	GO to KT8. SERVICE as necessary. RERUN Quick Test.

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Intake Air Control Valve (IAC) System

Pinpont Test | **KT**

TEST STEP	RESULT ▶	ACTION TO TAKE
KT8 CHECK VACUUM TO BOTH INTAKE AIR VALVES		
• Key off. • Check the vacuum lines from the front and rear intake air valves to the IAC solenoid. Inspect for holes, kinks, disconnections and blockages. • **Are vacuum lines OK?**  	Yes ▶ No ▶	GO to KT9. SERVICE vacuum lines as necessary. RERUN Quick Test.
KT9 CHECK SOURCE VACUUM TO IAC SOLENOID		
• Disconnect IAC solenoid manifold vacuum hose. • Start engine. • Check for vacuum at the disconnected manifold vacuum hose. • **Is vacuum present at the hose?**  	Yes ▶ No ▶	REPLACE IAC solenoid. RERUN Quick Test. INSPECT vacuum supply hose to IAC solenoid. SERVICE as necessary. RERUN Quick Test.

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Dynamic Response Test	Pinpont Test	M

Note

You should enter this Pinpoint Test only when a Service Code 77 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

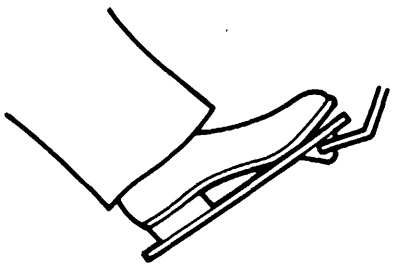
- Operator did not perform a brief WOT after Dynamic Response code.
- Mechanical engine problems; engine did not achieve greater than 2000 rpm.

This Pinpoint Test is intended to diagnose only the following:

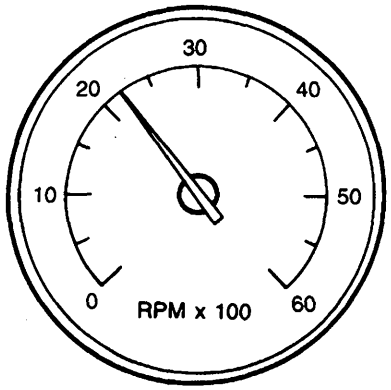
- Throttle movement (greater than 3/4 throttle)
- Vane Air Flow meter (greater than 50 percent open)
- Rpm increase (greater than 2000 rpm)

Pinpoint Test Schematic

OPERATOR PERFORMS BRIEF WOT



RPM INCREASE
GREATER THAN 2000 RPM



A9689-C

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Dynamic Response Test	Pinpont Test	M

TEST STEP	RESULT ▶	ACTION TO TAKE
M1 SERVICE CODE 77: SYSTEM FAILED TO RECOGNIZE BRIEF WOT		
NOTE: A brief snap of the throttle may not be sufficient to pass this test. Be sure to go to WOT and return. • Rerun Engine Running Self-Test. Be sure operator is familiar with the Engine Running format which proceeds as follows: — Start engine. — Activate Self-Test. — ID Code 2 (0); start of test. — Dynamic Response code 1 (0); perform brief WOT. — Testing over. — Service code output begins. • **Is Code 77 still present?**	Yes ▶ No ▶	REPLACE processor. RERUN Quick Test. Dynamic Response Test passed. SERVICE any other service code(s) received as necessary.

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"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message	Pinpoint Test	ML

Note

You should enter this Pinpoint Test only when a Service Code 70, 71, 72 is received during Quick Test or when directed here from Pinpoint Test QA or Diagnosis By Symptom.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuse, bulb or socket.

This Pinpoint Test is intended to diagnose only the following:

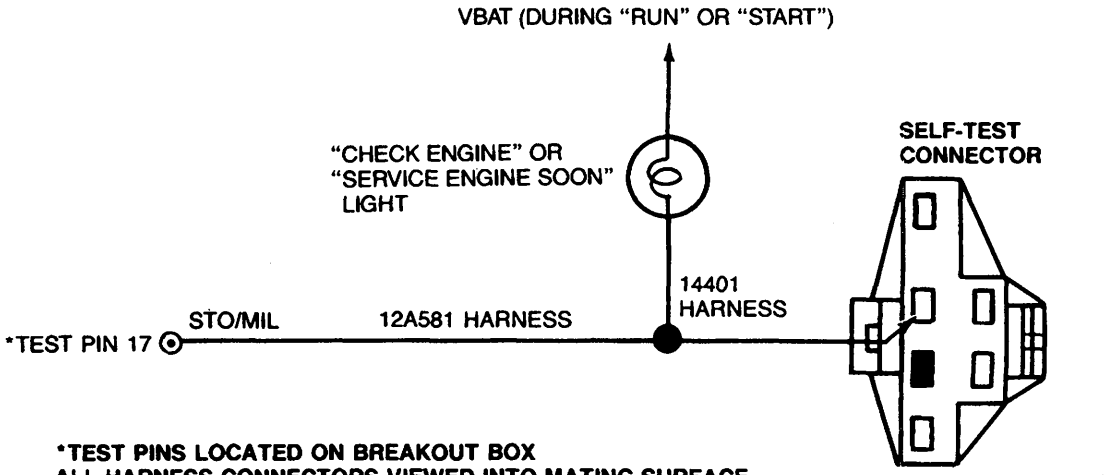
- STO/MIL circuit (All except 1.9L EFI)
- MIL circuit (1.9L EFI only)
- Processor assembly
- Data Communications Link (DCL)

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"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message	Pinpoint Test	ML

Pinpoint Test Schematic

ALL EXCEPT 1.9L EFI



***TEST PINS LOCATED ON BREAKOUT BOX**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE

A9920-D

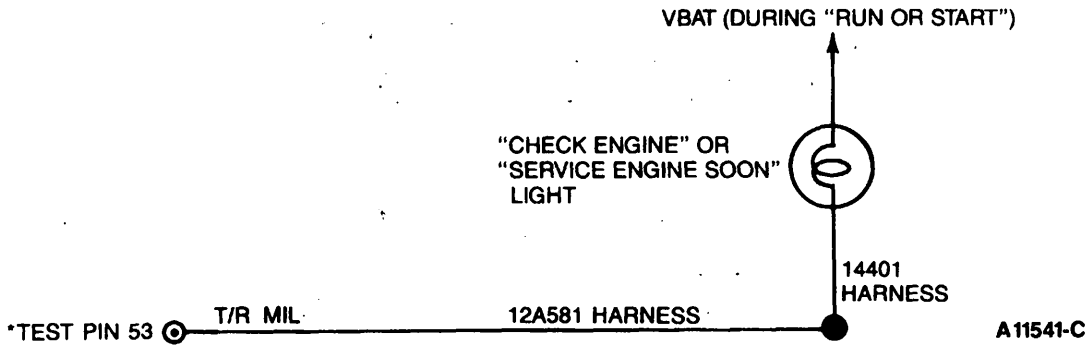
Test Pin 17	STO/MIL
Application	**Wire Colors**
1.9L MA SEFI 3.8L RWD SEFI 3.8L SC SEFI 5.0L SEFI Mark VII	Y/BK
2.3L OHC EFI/MA 5.0L SEFI-MA Mustang	T
2.9L EFI Scorpio	BR/GN
3.0L EFI Probe	W/BL
F-Series/Bronco: 4.9L EFI, 5.0L EFI, 5.8L EFI 7.5L EFI 7.3L Diesel F-Series	PK/LG
All Others	T/R

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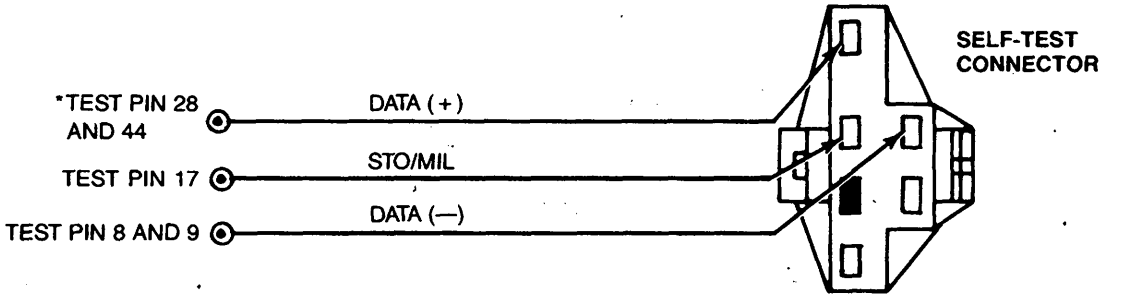
"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message	Pinpoint Test	ML

Pinpoint Test Schematic

1.9L EFI



ALL VEHICLES WITH DATA COMMUNICATION LINKS (DCL)



*TEST PINS LOCATED ON BREAKOUT BOX HARNESS CONNECTOR VIEWED INTO MATING SURFACE.

A11607-C

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"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message	Pinpoint Test	ML

Test Pin 17	STO/MIL
Application	**Wire Color**
1.9L MA SEFI	Y/BK
2.3L OHC MA	T
3.8L RWD SEFI	Y/BK
All Others	T/R

Test Pin 28/44	DATA(+)
Application	**Wire Color**
1.9L MA SEFI	Y/BL
2.3L OHC MA	W/BK
3.0L EFI	T/O
3.8L RWD SEFI	BK/O
4.0L MA EFI, Aerostar 4.0L MA EFI, Ranger	T/R
All Others	O/BK

Test Pin 8/9	DATA(-)
Application	**Wire Color**
1.9L MA SEFI	Y/BK
2.3L OHC MA	W/P
3.0L EFI	PK/LB
3.8L RWD SEFI	O/BK
2.9L EFI MA, Truck 4.0L MA EFI, Ranger	T/O
All Others	BK/O

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"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message

Pinpoint Test **ML**

TEST STEP		RESULT ▶	ACTION TO TAKE
ML1	"CHECK ENGINE" OR "SERVICE ENGINE SOON"		
NOTE: If vehicle will not start go to Pinpoint Test Step A1. • **If any Key On Engine Off service codes or Continuous Memory Codes are present, service before proceeding. If no codes are outputted, continue with this Test Step.** • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 17 (Test Pin 53 on 1.9L EFI) and Test Pin 40 at the breakout box. • **Is resistance less than 5 ohms?**		Yes ▶ No ▶	SERVICE short circuit between Test Pin 17/53 and "CHECK ENGINE" or "SERVICE ENGINE SOON" Light, or between Test Pin 17 and the Self-Test Connector. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. REPLACE processor. REMOVE breakout box. RERUN Quick Test.
ML5	"CHECK ENGINE" OR "SERVICE ENGINE SOON" LIGHT NEVER ON: CHECK CONTINUITY OF STO/MIL CIRCUIT		
NOTE: If vehicle will not start go to Pinpoint Test Step A1. **Refer to Quick Test Appendix for a detailed description of how the "CHECK ENGINE" or "SERVICE ENGINE SOON" light (malfunction indicator light) operates.** • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 17 (Test Pin 53 on 1.9L EFI) and the "CHECK ENGINE" or "SERVICE ENGINE SOON" light. • **Is resistance less than 5 ohms?**		Yes ▶ No ▶	GO to ML6. SERVICE OPEN circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message	Pinpoint Test	ML

TEST STEP	RESULT ▶	ACTION TO TAKE
ML6 CHECK FOR VOLTAGE TO BULB		
• Key off. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage from battery negative post to the "hot" side of the "CHECK ENGINE"/"SERVICE ENGINE SOON" bulb. • **Is the voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to **ML7**. GO to **ML8**.
ML7 CHECK FOR FAULTY BULB/SOCKET		
• Install known good bulb/socket. • Turn key to "RUN" position. • Is "CHECK ENGINE"/"SERVICE ENGINE SOON" light on?	Yes ▶ No ▶	RECONNECT processor. Bulb/socket was faulty. REPLACE processor. VERIFY repair by turning key to "RUN" position.
ML8 CHECK FOR VOLTAGE AT FUSE		
• Key off. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage from battery negative post to the "hot" side of the fuse. • Is the voltage greater than 10.5 volts?	Yes ▶ No ▶	SERVICE fuse or open in circuit. RECONNECT processor. VERIFY repair by turning key to "RUN" position. SERVICE VBAT circuit. RECONNECT processor. VERIFY repair by turning key to "RUN" position.

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"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message	Pinpoint Test	ML

TEST STEP		RESULT ▶	ACTION TO TAKE
ML10	"CHECK ENGINE" OR "SERVICE ENGINE SOON" LIGHT INTERMITTENTLY ON: CHECK FOR INTERMITTENT STO SHORT TO GROUND		
NOTE: If vehicle will not start go to Pinpoint Test Step A1. **The "CHECK ENGINE" or "SERVICE ENGINE SOON" light will come ON when there is a Continuous Memory Code present. Service any Continuous Memory Codes before proceeding.** (See Quick Test Appendix for description of "CHECK ENGINE" or "SERVICE ENGINE SOON" light function.) If no codes are outputted, continue with this Test Step. • Enter Key On Engine Off Continuous Monitor Mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while you wiggle, shake or bend a small section of the EEC-IV system harness in the following locations: — Harness closest to Self-Test connector to the dash panel — Dash panel to the processor — Dash panel to the "CHECK ENGINE" or "SERVICE ENGINE SOON" light • **Is a fault indicated?**		Yes ▶ No ▶	SERVICE short to ground. RERUN Quick Test. UNABLE to duplicate fault at this time. Testing complete.

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"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message	Pinpoint Test	ML

TEST STEP	RESULT ▶	ACTION TO TAKE
ML15 "CHECK ENGINE" OR "SERVICE ENGINE SOON" LIGHT FLASHING WITH ERRATIC IDLE: CHECK FOR STI SHORT TO GROUND		
NOTE: Vehicle symptoms indicate that STI is grounded and the vehicle is actually performing Self-Test without a tester installed. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • DVOM on 200,000 ohm scale. • Measure resistance between the Self-Test Input (STI) connector and engine block ground. • **Is resistance less than 10,000 ohms?**	Yes ▶ No ▶	SERVICE short circuit. RECONNECT processor. VERIFY symptom eliminated. RECONNECT processor. VERIFY symptom. REFER to Section 2 for rough idle routines.
ML20 "CHECK ENGINE" MESSAGE DISPLAYED		
NOTE: If vehicle is a no start, go to Pinpoint Test Step A1. **Refer to Quick Test Appendix for detailed description of how the "CHECK ENGINE" message operates.** • Run Key On Engine Off Self-Test. • **Is result 11-10-11 (Pass Codes)?**	Yes ▶ No ▶	GO to Instruments/ Gauges Shop Manual Group for DCL diagnosis. Self-Test indicates a fault. GO to Quick Test. Start with the first code displayed.

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"CHECK ENGINE" or "SERVICE ENGINE SOON" Light/Message "CHECK ENGINE"/"CHECK DCL" Message

Pinpoint Test **ML**

TEST STEP		RESULT ▶	ACTION TO TAKE
ML25	CONTINUOUS MEMORY CODE 70, 71, 72: "CHECK ENGINE"/"CHECK DCL" MESSAGE DISPLAYED		
Continuous Memory Codes 70, 71 and 72 indicate that a circuit failure has occurred on the Data Communications Link (DCL). These codes can appear alone or in conjunction with one another. The messages "CHECK ENGINE" and/or "CHECK DCL" will also be on. — Code 70 indicates that the EEC IV processor is unable to transmit data. — Code 71 indicates that the Cluster Control Assembly (CCA) is unable to transmit data. — Code 72 indicates that the Message Center Control Assembly (MCCA) is unable to transmit data. **NOTE: If vehicle is a no start, go to Pinpoint Test Step A1.** **Refer to Quick Test Appendix for a detailed description of how the "CHECK ENGINE"/"CHECK DCL" message operates.** • Run Key On Engine Off Self-Test with a STAR tester or volt/ohmmeter. • **Is result 11-10-11 (Pass Codes)?**		Yes ▶ No ▶	GO to Instruments/ Gauges Shop Manual Group for DCL diagnosis. Self-Test indicates a fault. GO to Quick Test. Start with the first code displayed.

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

Note

You should enter this Pinpoint Test only when a Service Code 14, 16, 18, 19, 28, 45, 46, 48 or 88 is received during Quick Test, when directed here from Diagnosis By Symptom or Section 13.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- TFI, DIS or EDIS ignition module
- Ignition coil, DIS or EDIS coil packs
- Spark plugs and high tension cables
- Distributor and PIP sensor
- Arcing of secondary ignition components

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: IGN GND, SPOUT, PIP, IDM, DPI, SAW
- Procesor assembly (-12A650-)

NOTE: This Pinpoint Test is intended to diagnose the EEC portion of TFI Ignition Systems, Closed Bowl Distributor (CBD) with remote mount TFI Systems Distributorless Ignition Systems (DIS), and Electronic Distributorless Ignition Systems (EDIS).
To identify your system, please refer to the application chart below.

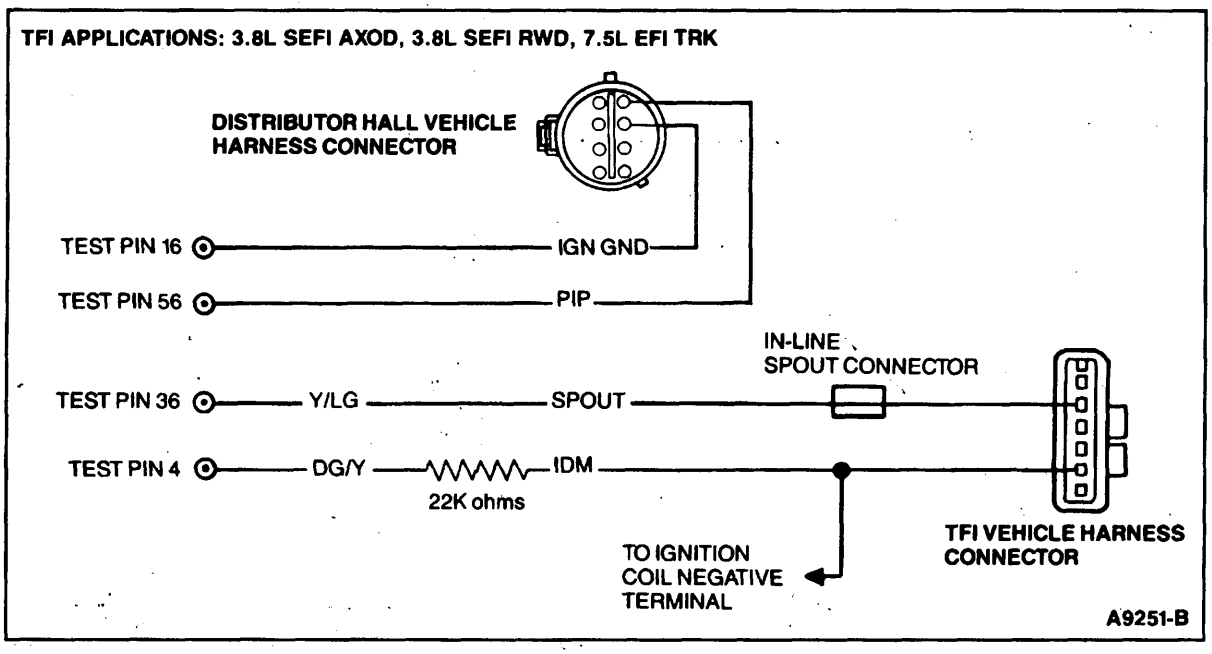
Ignition System Application Chart

Ignition Connector	Vehicle Application
DIS Connector (pins 1-6 and 7-12)	2.3L Truck, 3.0L SHO, 3.8L SC
EDIS Connector (pins 1-12)	1.9L MA SEFI and 4.0L MA
Distributor Hall Connector and TFI Connector (used for Closed Bowl Distributor, Remote Mount TFI Systems)	3.8L RWD, 3.8L AXOD, 7.5L Truck
TFI Connector	All Others

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

Pinpoint Test Schematic



Test Pin 16 — Ignition Ground

Application	Wire Color
3.8L SEFI AXOD	GY
3.8L SEFI RWD 7.5L EFI TRK	BK/O

Test Pin 36 — Spout

Application	Location
F-Series Truck	PK
All Others	Y/LG

TFI Location

Application	Location
3.8L SEFI AXOD	Cowl
3.8L SEFI RWD	Radiator Support
7.5L EFI TRK	Distributor

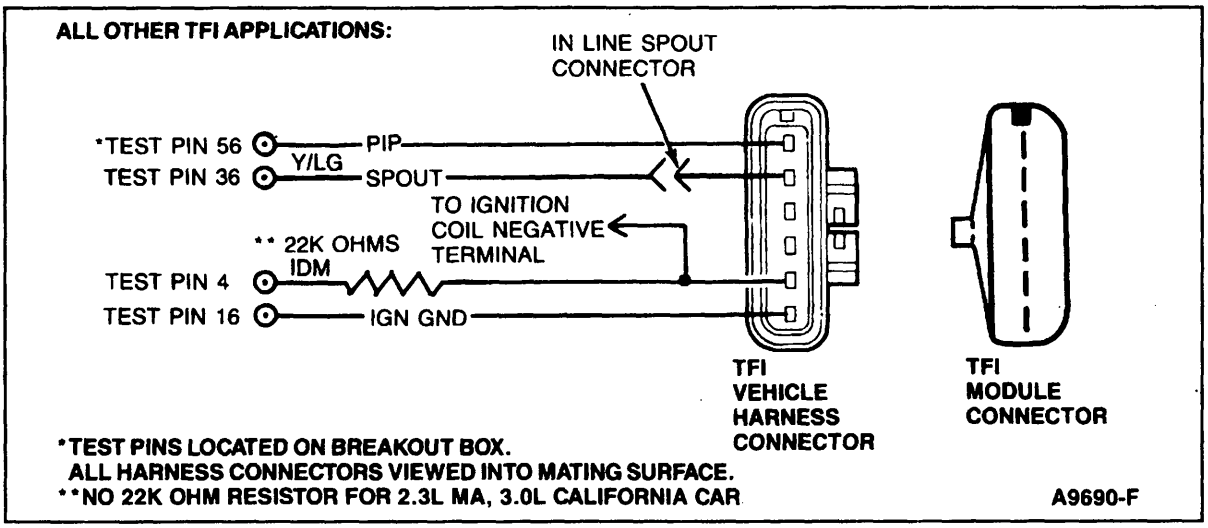
Test Pin 56 — PIP

Application	Location
F-Series Truck	GY/O
All Others	DB

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

Pinpoint Test Schematic



Test Pin 4	IDM
3.0L Car (Calif. only)	R/LB
3.0L Probe	GR
3.0L SHO	GY/O
5.0L MA Lincoln Town Car	W/LB
F-Series/Bronco	T/Y
All Others	DG/Y

Test Pin	Spout/SAW 36
Application	**Wire Color**
2.9L Car	BL/R
3.0L Probe	R
5.0L Lincoln Town Car	GY/O
F-Series Trucks and Bronco	PK
All Others	Y/LG

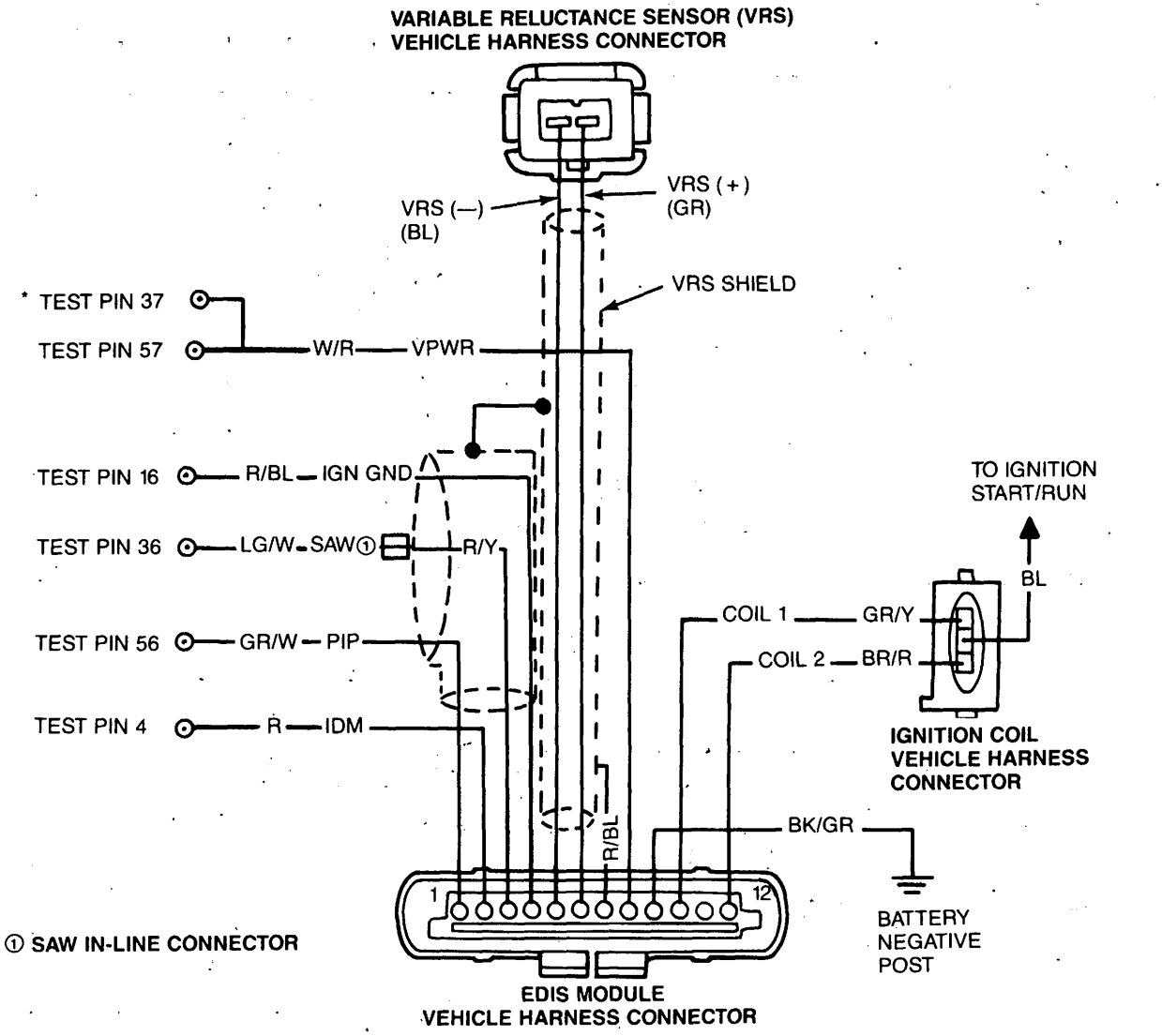
Test Pin 16	Ign. Gnd.
3.0L, 3.8L AXOD	GY
2.3IL Truck, 2.9L Truck	BK
2.3L Merkur	R/O
Probe	W
Scopio	BR
All Others	BK/O

Test Pin	PIP 56
Application	**Wire Color**
2.9L Car	BL/Y
3.0L Probe	BK
F-Series Truck and Bronco	GY/O
All Others	DB

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

1.9L MA SEFI (EDIS)



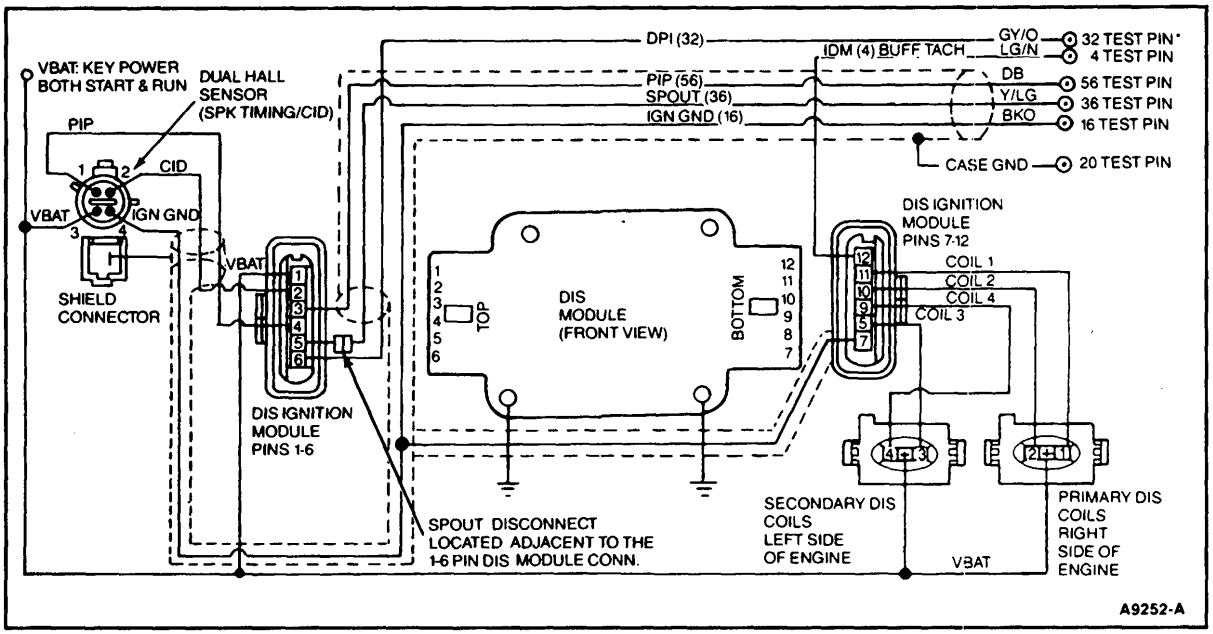
*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13559-A

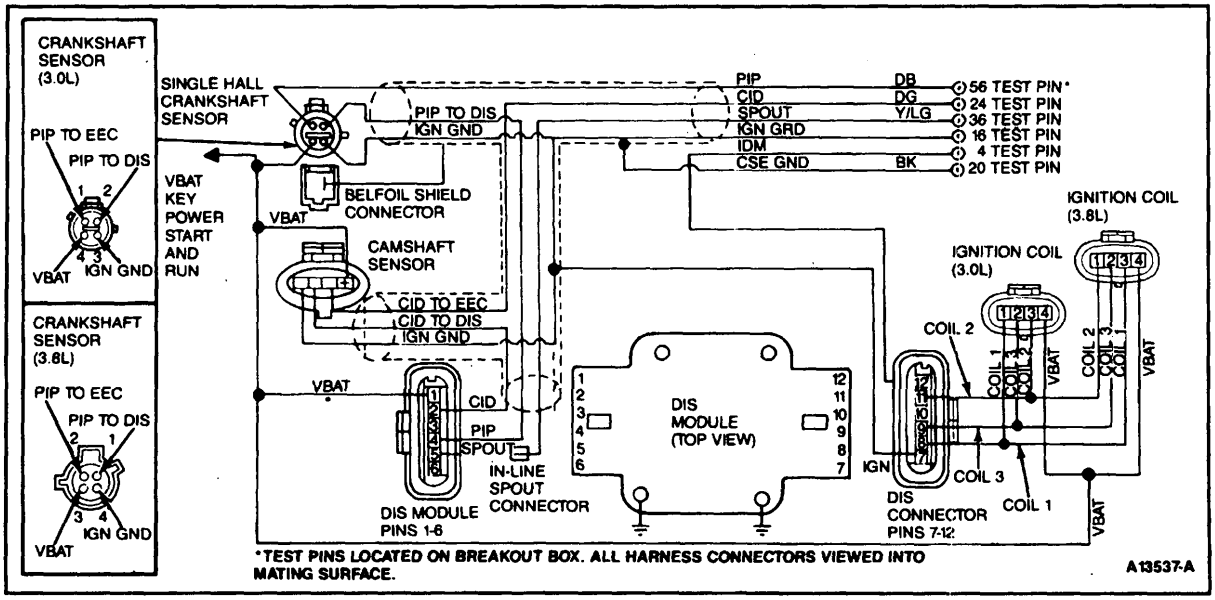
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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

2.3 OHC EFI Truck (DIS)



3.0L SHO SEFI MA and 3.8L SEFI SC (DIS)



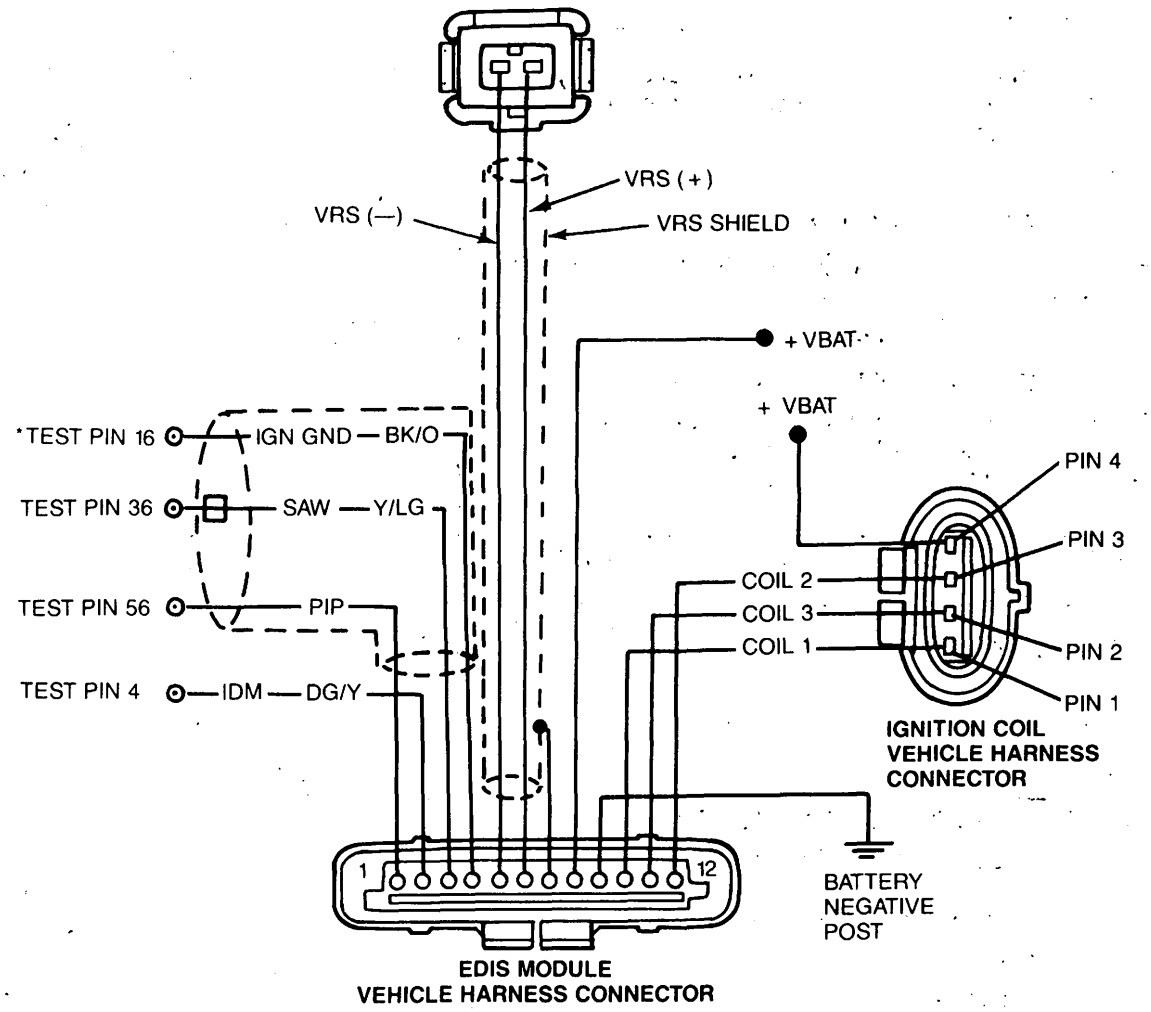
Test Pin 4	IDM
3.0L SHO MA	GY/O
3.8L SC. MA	DG/Y

Test Pin 16	Ign. Gnd.
3.0L SHO MA	BK/O
3.8L SC MA	LB

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

4.0L MA EFI Truck (EDIS)



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A13560-A

Test Pin 56	PIP
4.0L Aerostar	DB
4.0L Ranger/Bronco II	BK/LB

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

TEST STEP	RESULT ▶	ACTION TO TAKE
N1 CONTINUOUS MEMORY CODE 14: ERRATIC IGNITION		
Code 14 indicates two successive erratic profile ignition pickup (PIP) pulses occurred, resulting in a possible engine miss or stall. Possible causes: — Loose wires/connectors. — Arcing secondary ignition components (coil, cap, rotor, wires, plugs, etc.). — On-board transmitter (2-way radio).* • **Are any of the above present?** *Verify all 2-way radio installations. Carefully follow manufacturer's installation instructions regarding the routing of antenna and power leads.	Yes ▶ No ▶	SERVICE as necessary. CLEAR Continuous Memory Code 14. (REFER to Quick Test Appendix.) RERUN Quick Test. GO to N4.
N2 SERVICE CODE 16: IDM CIRCUIT FAILURE (EDIS)		
• **Does engine start?**	Yes ▶ No ▶	GO to N4. GO to Section 13 for EDIS Diagnosis.
N3 CONTINOUS MEMORY CODE 18: CHECK FOR OTHER EEC CODES		
Code 18 indicates a loss of IDM Processor input. Possible causes: — Open harness. — Shorted harness. — DIS module. — Processor. • **Are Continuous Memory Service Codes 45, 46 or 48 present?**	Yes ▶ No ▶	**For DIS:** GO to N13. **For 4.0L EDIS:** GO to N15. **For 1.9L EDIS:** GO to N17. GO to N4.

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

TEST STEP		RESULT ▶	ACTION TO TAKE
N4	CONTINUOUS MEMORY CODE 18, 28 OR 48: CHECK CONTINUITY OF IDM CIRCUIT		
Continuous Memory Code 18 indicates a loss of IDM processor input. Possible causes: — Open harness. — Shorted harness. — TFI or DIS/EDIS module — Processor. Continuous Memory Code 28 indicates IDM processor input always low. Possible causes: — Open harness. — Shorted harness. — CID sensor. — VBAT low at DIS. — DIS module. — Processor. Continuous Memory Code 48 indicates IDM processor input always high. Possible causes: — Open harness. — VBAT open at secondary coil. — VBAT low at secondary coil. **NOTE: It is important to know that on TFI vehicles the IDM circuit has a 22,000 ohm resistor between Test Pin 4 and the Ignition Coil Negative Terminal (except for 2.3L MA, 3.0L California cars).** • Key off, wait 10 seconds. • Disconnect E-core ignition coil on TFI vehicles. For DIS vehicles: disconnect DIS module (pins 7-12). **For EDIS Vehicles:** Disconnect EDIS module. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale.		Yes ▶ No ▶	GO to N5. SERVICE open circuit. REMOVE breakout box. RECONNECT processor. CLEAR Continuous Memory Codes. RERUN Quick Test. RECONNECT E-core ignition coil.

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

TEST STEP	RESULT ▶	ACTION TO TAKE
N4 CONTINUOUS MEMORY CODE 18, 28 OR 48: CHECK CONTINUITY OF IDM CIRCUIT (Continued)		
For TFI Vehicles: • Measure resistance between Test Pin 4 at the breakout box and ignition coil harness connector negative terminal. **For DIS/EDIS Vehicles:** • Measure resistance between Test Pin 4 at the breakout box and DIS module pin 12, EDIS module 2 pin harness connector. • **Is resistance between 20,000 and 24,000 ohms? (For DIS/EDIS and 2.3L MA, 3.0L California cars is resistance less than 5.0 ohms?)**		
N5 CHECK IDM CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • E-core ignition coil disconnected on TFI vehicles. **For DIS vehicles:** DIS module pins 7-12 disconnected. **For EDIS vehicles:** EDIS module disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 4 and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance above 10,000 ohms?**	Yes ▶ No ▶	GO to N6. REMOVE breakout box. SERVICE short to ground in IDM circuit. RECONNECT all components. CLEAR Continuous Memory Code. RERUN Quick Test.
N6 CHECK PROCESSOR FOR SHORT TO GROUND		
• Key off. • Breakout box installed. • Connect processor to breakout box. **For TFI Vehicles:** — E-core ignition coil disconnected. **For DIS Vehicles:** — Disconnect Pins 7-12 at DIS connector. **For EDIS vehicles:** — EDIS module disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 4 and Test Pin 40, 46, and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	**For TFI Vehicles:** RECONNECT E-Core ignition coil. **For DIS Vehicles:** RECONNECT pins 7-12. **For EDIS vehicles:** RECONNECT EDIS module. GO to N7. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM) — Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N7 CHECK IGNITION MODULE		
• Key off, wait 10 seconds. • Deactivate Self-Test. • Enter Engine Running Continuous Monitor Mode. (Refer to Quick Test Appendix.) • Observe VOM or STAR LED for indication of a fault while performing the following: • Lightly tap on TFI or DIS/EDIS ignition (simulate road shock). • Wiggle TFI, both DIS, or EDIS connectors. (For 3.8L AXOD, 3.8L RWD and 7.5L truck, wiggle TFI and distributor hall connectors.) • **Is a fault indicated?**	Yes ▶ No ▶	GO to N8. DISCONNECT and INSPECT connectors. If connector and terminals are good, REMOVE breakout box, RECONNECT all components and GO to Section 13, Ignition Diagnosis. If ignition system checks out OK in Section 13, REPLACE processor.
N8 CHECK EEC-IV HARNESS		
• While still in continuous monitor mode from Step N7, observe VOM or STAR LED for a fault indication while performing the following: • While looking for faults listed in the table below, grasp the harness close to the TFI, both DIS, or EDIS connectors. (For 3.8L AXOD, 3.8L RWD and 7.5L Truck, TFI and distributor hall connectors.) Wiggle, shake or bend a small section of the EEC-IV system harness while working your way to the other ignition system components and to the dash panel. Also wiggle, shake or bend the EEC-IV harness from the dash panel to the processor. Do this test on the circuits listed one at a time if needed to locate a faulty circuit. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and make necessary repairs. REMOVE breakout box. DISCONNECT all components. CLEAR Continuous Memory Code. RERUN Quick Test. GO to N9.

FAULT	BREAKOUT BOX NO.
PIP shorted to ground or open	Test Pin 56
Spout shorted to ground	Test Pin 36
Ign. ground open	Test Pin 16
IDM open or shorted to ground, power	Test Pin 4

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

TEST STEP		RESULT ▶	ACTION TO TAKE
N9	CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. • **Are connectors and terminals OK?**		Yes ▶	**For Continuous Memory Code 14:** Unable to duplicate an erratic ignition fault in the EEC-IV system. REMOVE breakout box. RECONNECT all components. For further diagnosis, GO to Section 13, DIS Diagnosis. **For Continuous Memory Code 18:** REPLACE processor. REMOVE breakout box. RECONNECT all components. Start engine and run for about one minute. RERUN Quick Test. **For Continuous Memory Codes 28 and 48:** REMOVE breakout box. RECONNECT all components. REFER to Section 13, DIS Diagnosis. If ignition system checks out OK in Section 13, REPLACE processor.
		No ▶	SERVICE as necessary. REMOVE breakout box. RECONNECT all components. CLEAR Continuous Memory Codes. (REFER to Quick Test appendix.) RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

TEST STEP	RESULT ▶	ACTION TO TAKE
N10 CONTINUOUS MEMORY CODE 19: CHECK CAMSHAFT SENSOR OUTPUT		
Service Code 19 indicates that one of the two cylinder identification (CID) sensor output signals has failed. One of the outputs is input to the Distributorless Ignition System (DIS). The second output is input to the EEC-IV processor. Each output has a 50 percent duty cycle and an amplitude that varies from 0.4 volts to VBAT. Possible causes: — CID output line to processor open. — CID output line to procesor shorted to ground. — CID output line to processor shorted to power. • Key off. • Disconnect processor 60 pin connector, inspect for damaged or pushed out pins, corrosion, loose wires, etc. • Install breakout box and connect processor to breakout box. • Key on engine running. • DVOM on AC scale. • Measure voltage between Test Pin 24 and GROUND. • **Does voltage vary?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. GO to N11.

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

TEST STEP	RESULT ▶	ACTION TO TAKE
N11 CHECK CID HARNESS FOR CONTINUITY		
• Key off. • Breakout box installed. • Disconnect processor. • Disconnect distributorless ignition module. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 24 at the breakout box and pin 2 (CID) at the DIS module connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **N12**. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
N12 CHECK CID CIRCUIT FOR SHORTS		
• Key off. • Breakout box installed, processor disconnected. • DIS module disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 24 and Test Pin 16, 37, 40 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. GO to Section 13, TFI or DIS diagnosis. SERVICE CID circuit for short to GROUND or POWER. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM) — Pinpoint Test N

TEST STEP		RESULT ▶	ACTION TO TAKE
N13	CONTINUOUS MEMORY CODES 45, 46 OR 48: CHECK CONTINUITY OF COIL CIRCUITS FROM DIS TO COIL PACK		
Service Codes 45, 46 and 48 indicate a fault has been detected by the processor in one of the three coils contained in the ignition coil pack. **NOTE: Codes 45, 46 and 48 refer to faults detected in the circuits related to coils 3, 1 or 2 respectively. Coil 1 provides voltage for cylinder three and four spark plugs. Coil 2 provides voltage for cylinder two and six spark plugs. Coil 3 provides voltage for cylinder one and five spark plugs.** **The IDM pulse train contains a corresponding pulse for each operating coil. In the event that a coil fails, the corresponding pulse will be absent from the IDM pulse train.** Possible causes: — Open in coil circuit from DIS module to coil pack. — Shorts to coil circuit GND or PWR in DIS module. • Key off, wait 10 seconds. • Disconnect DIS module. • DVOM on 200 ohm scale. **For Service Code 45:** • Measure resistance between pin 8 at the DIS module and coil 1 at the ignition coil pack. **For Service Code 46:** • Measure resistance between pin 11 at the DIS module and coil 2 at the ignition coil pack. **For Service Code 48:** • Measure resistance between pin 9 at the DIS module and coil 3 at the ignition coil pack. • **Is each resistance less than 5 ohms?**		Yes ▶ No ▶	GO to N14. SERVICE open circuit. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

TEST STEP		RESULT ▶	ACTION TO TAKE
N14	CHECK COIL PACK CIRCUIT FOR SHORTS TO GROUND AND POWER		
• Key off. • DIS module disconnected pins 7-12. • Disconnect coil pack. • DVOM on 200,000 ohm scale. • Measure resistance between pin 7 and pins 8, 9 and 11 at the DIS module connector. • Measure resistance between pin 1 and pins 8, 9 and 11 at the DIS module connector. • **Is each resistance greater than 10,000 ohms?**		Yes ▶ No ▶	REFER to Section 13 for DIS Diagnosis. SERVICE short circuit. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)

Pinpoint Test N

TEST STEP		RESULT ▶	ACTION TO TAKE
N15	CONTINUOUS MEMORY CODES 45: CHECK CONTINUITY OF COIL CIRCUITS FROM EDIS TO COIL PACK		
Service Code 45 indicates a fault has been detected by the processor in one of the three coils contained in the ignition coil pack. **NOTE: Codes 45 refer to faults detected in the circuits related to coils 3, 1 or 2 respectively. Coil 1 provides voltage for cylinder three and four spark plugs. Coil 2 provides voltage for cylinder two and six spark plugs. Coil 3 provides voltage for cylinder one and five spark plugs. The IDM pulse train contains a corresponding pulse for each operating coil. In the event that a coil fails, the corresponding pulse will be absent from the IDM pulse train.** Possible causes: — Open in coil circuit from EDIS module to coil pack. — Shorts to coil circuit GND or PWR in EDIS module. • Key off, wait 10 seconds. • Disconnect DIS module. • DVOM on 200 ohm scale. • Measure resistance between pin 10 at the EDIS module and the coil 1 pin at the ignition coil pack. • Measure resistance between pin 11 at the EDIS module and the coil 2 pin at the ignition coil pack. • Measure resistance between pin 12 at the EDIS module and the coil 3 pin at the ignition coil pack. • **Is each resistance less than 5 ohms?**		Yes ▶ No ▶	GO to N16. SERVICE open circuit. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM) — Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N16 CHECK COIL PACK CIRCUIT FOR SHORTS TO GROUND AND POWER		
• Key off. • EDIS module disconnected pins 1-12. • Disconnect coil pack. • DVOM on 200,000 ohm scale. • Measure resistance between pin 4 and pins 10, 11 and 12 at the EDIS module connector. • Measure resistance between pin 8 and pins 10, 11 and 12 at the EDIS module connector. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REFER to Section 13 for EDIS Diagnosis. SERVICE short circuit. RECONNECT all components. RERUN Quick Test.
N17 CONTINUOUS MEMORY CODE 45/46: CHECK CONTINUITY OF COIL CIRCUIT FROM EDIS TO COIL PACK		
Service codes 45 (coil 1) and 46 (coil 2) indicate a primary circuit fault has been detected by the processor in the corresponding ignition coil pack. **4 Cylinder EDIS** Plug Firing Order: 1 3 4 2 Coil Pack Number: 1 2 1 2 Possible causes are: — Open or short in coil circuit between the EDIS module and the coil pack. — Faulty coil. — Faulty EDIS. • Key off. • Disconnect EDIS module. • Disconnect coil pack. • DVOM on 200 ohm scale. **For Service Code 45:** • Measure resistance between pin 10 (coil 1) at the EDIS module vehicle harness connector and coil 1 pin at the coil pack vehicle harness connector. **For Service Code 46:** • Measure resistance between pin 12 (coil 2) at the EDIS module vehicle harness connector and Coil 2 pin at the coil pack vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to N18. SERVICE open circuit. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM) — Pinpoint Test N

TEST STEP	RESULT ▶	ACTION TO TAKE
N18 CHECK COIL CIRCUIT FOR SHORT TO GROUND AND POWER		
• Key off. • EDIS module disconnected. • Coil pack disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between pin 9 (BATT GND) and pins 10 (Coil 1) and 12 (Coil 2) at the EDIS module vehicle harness connector. • Measure resistance between pin 8 (VPWR) and pins 10 and 12 at the EDIS module vehicle harness connector. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REFER to Section 13 for EDIS diagnosis. SERVICE short circuit. RECONNECT all components. RERUN Quick Test.
N20 CONTINUOUS MEMORY CODE 88: CHECK CONTINUITY OF DPI CIRCUIT		
Continuous Memory Code 88 indicates an open in the dual plug inhibit (DPI) circuit or an open or short to ground in coil 4. Possible causes: — Open in harness. — Short in harness. — Processor. — DIS module. — Coil 4 failure. • Key off, wait 10 seconds. • Disconnect DIS connector (pins 1-6) • Disconenct Processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between pin 6 at the DIS vehicle harness connector and Test Pin 32 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. REFER to Section 13, DIS Diagnosis. If ignition system checks OK in Section 13, REPLACE processor. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Ignition/Erratic Diagnostic Monitor (IDM)	Pinpoint Test	N

TEST STEP	RESULT ▶	ACTION TO TAKE
N25 HARD TO START: CHECK DPI CIRCUIT FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • Disconnect DIS connector (pins 7-12). • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Insall breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 32 and Test Pins 40 and 60 at the breakout box. • **Is resistance greater than 100,000 ohms?**	Yes ▶ No ▶	Go to **N26**. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
N26 CHECK PROCESSOR FOR SHORT TO GROUND		
• Key off, wait 10 seconds. • DIS connector (pins 7-12) disconnected. • Breakout box installed. • Connect processor to breakout box. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 32 and Test Pins 40 and 60 at the breakout box. • **Is resistance greater than 500 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. GO to Section 13, DIS Diagnosis. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Spark Timing Check	Pinpoint Test	P

Note

You should enter this Pinpoint Test only when checking computed timing, a Service Code 18 or 49 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

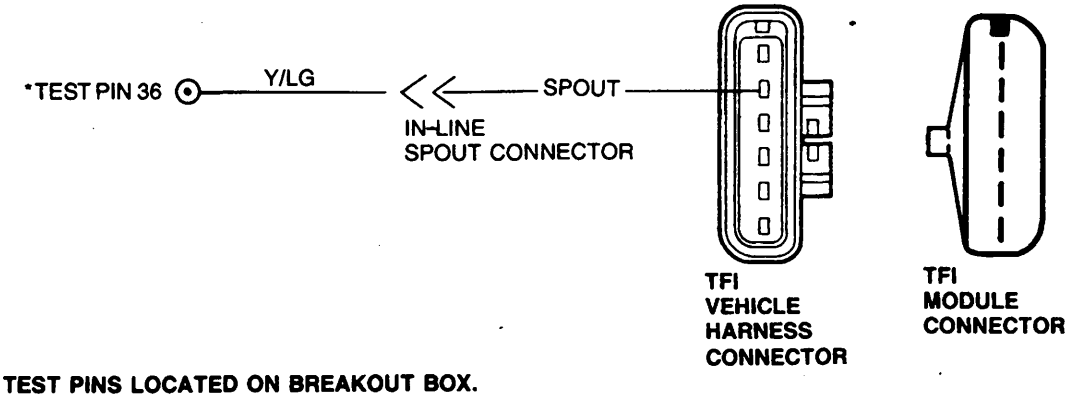
- Base Engine
- Distributor
- TFI, DIS or EDIS Module
- Camshaft Sensor (CID)
- Single Hall Crankshaft Sensor (PIP)
- Dual Hall Sensor

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: SPOUT and SAW
- Base Timing
- Processor Assembly (-12A650-)

Pinpoint Test Schematic

ALL TFI APPLICATIONS



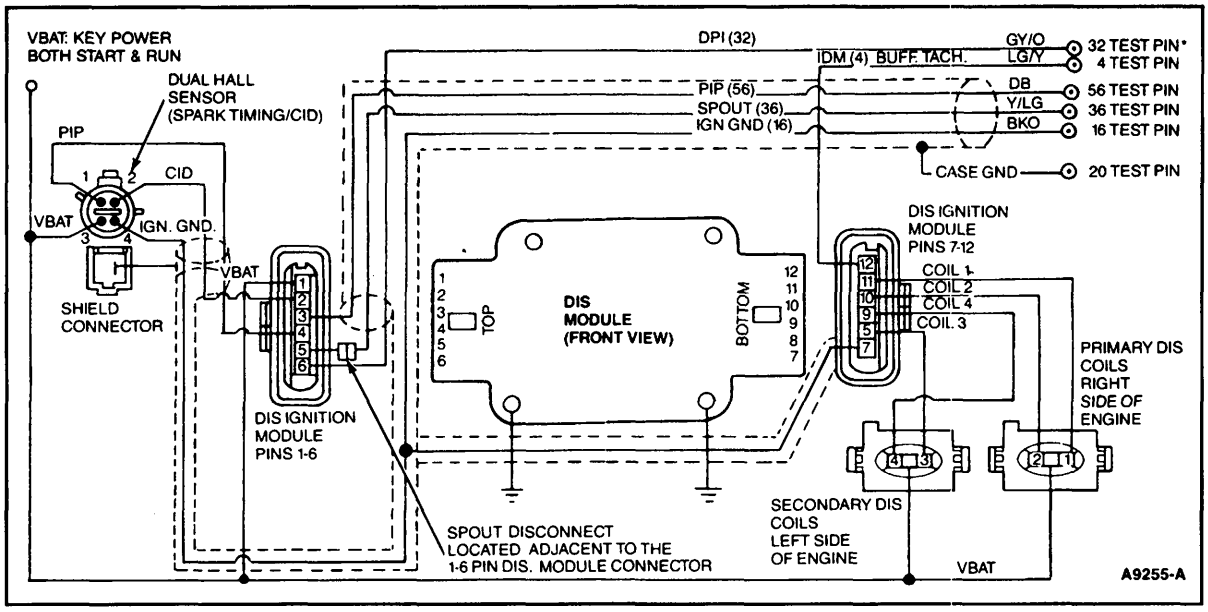
***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A9691-E

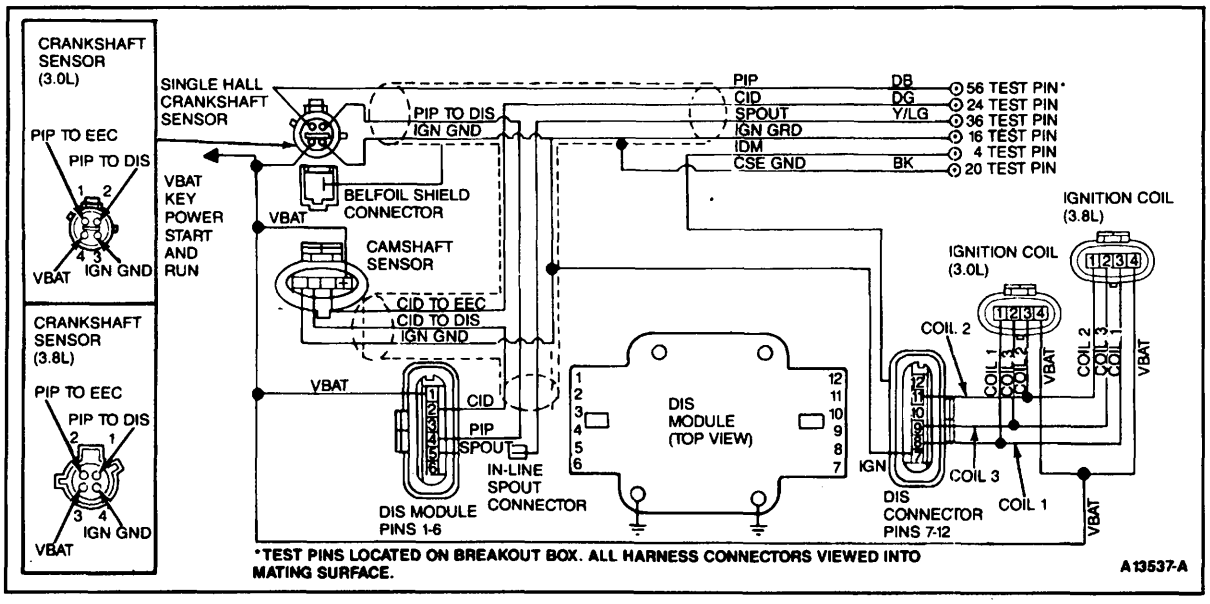
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Spark Timing Check	Pinpoint Test	P

2.3L OHC EFI Truck



3.0L SHO SEFI MA and 3.8L SEFI SC



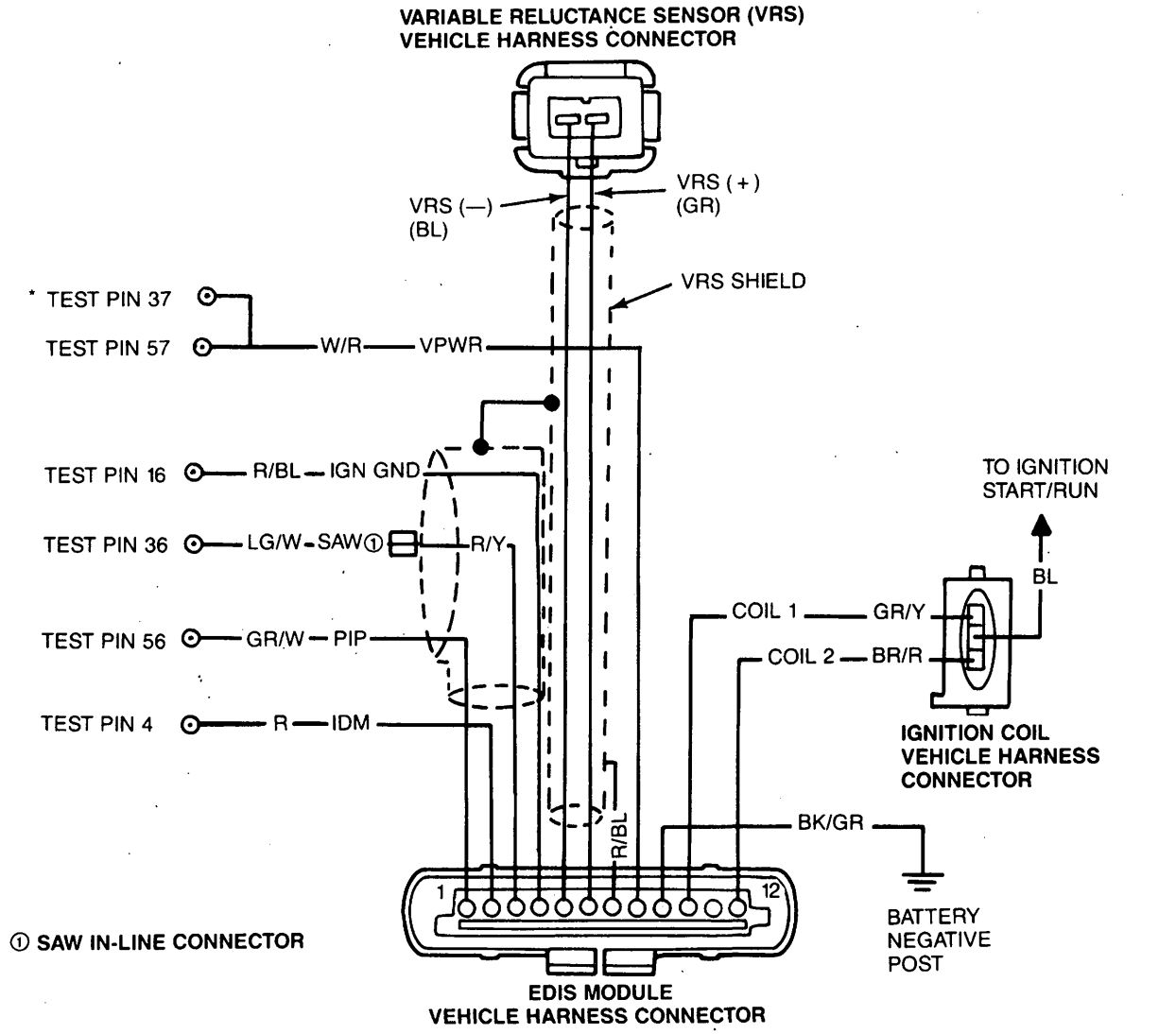
Test Pin 4	IDM
3.0L SHO MA	GY/O
3.8L SC MA	DG/Y

Test Pin 16	Ign Gnd
3.0L SHO MA	BK/O
3.8L SC MA	LB

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Spark Timing Check	Pinpoint Test	P

1.9L MA SEFI



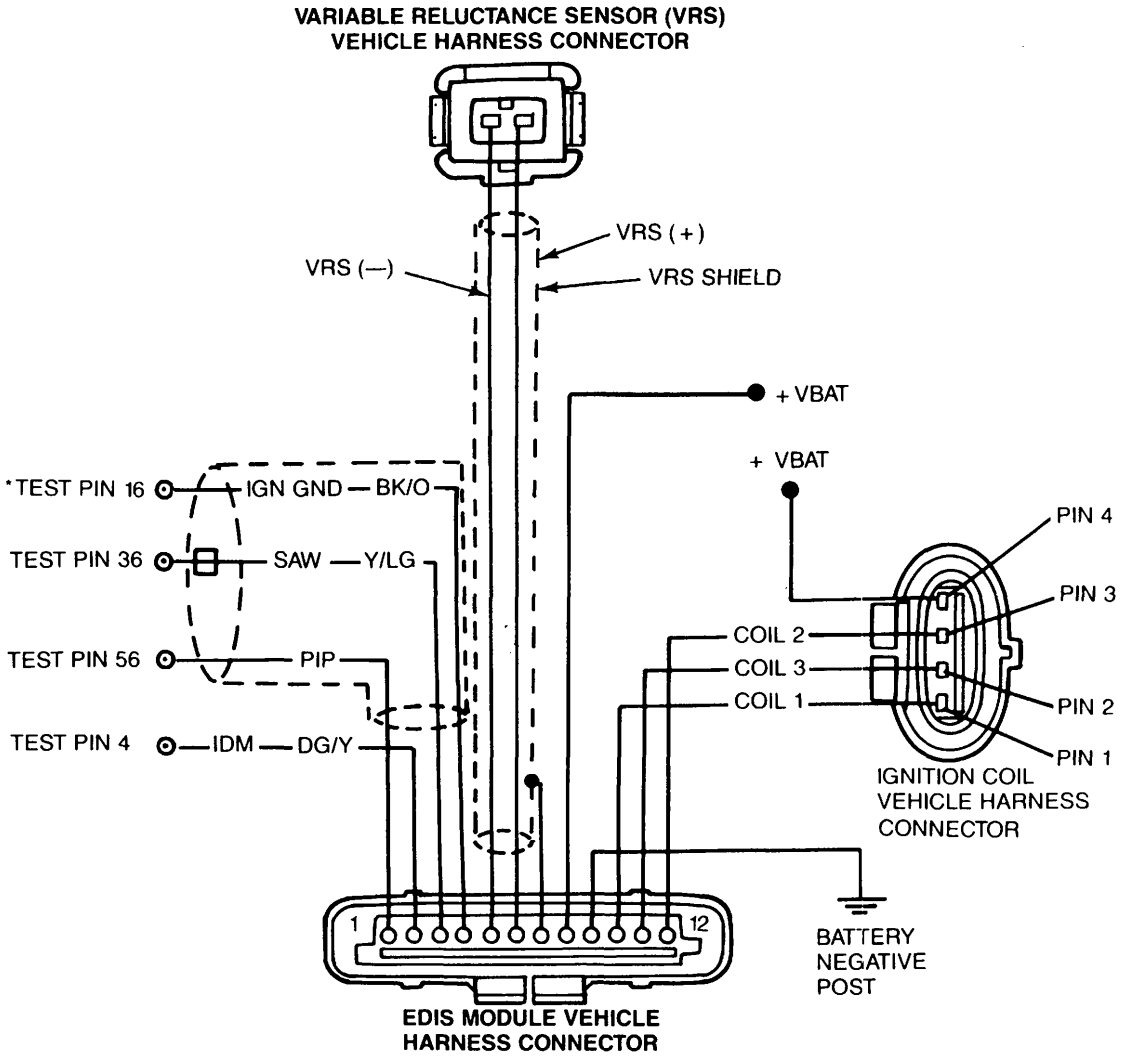
*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Spark Timing Check	Pinpoint Test	P

4.0L MA EFI Truck



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Test Pin 56	PIP
4.0L Aerostar	DB
4.0L Ranger/Bronco II	BK/LB

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Spark Timing Check	Pinpoint Test	P

TEST STEP	RESULT ▶	ACTION TO TAKE
P1 ENGINE RUNNING SERVICE CODE 18: CHECK COMPUTED SPARK TIMING		
For TFI Vehicles: Engine Running Service Code 18 indicates that the SPOUT circuit is open. Possible causes: — Open harness. — Processor. — TFI module. **For DIS Vehicles:** Engine Running Service Code 18 indicates that the SPOUT circuit is either open or shorted to ground. Possible causes: — Open or shorted harness. — Processor. — DIS module. **For EDIS Vehicles:** Engine Running Service Code 18 indicates that the SAW circuit is either open or shorted to ground/ VBAT. Possible causes: — Open or shorted harness. — Processor. — EDIS module. **NOTE: Self-Test locks the computed timing at base timing plus 20 degrees (±3 degrees) during code output and for two minutes after the last service code is outputted. Timing check must be made during this time period. See VECI decal for base timing value.** • Check timing (on 2.3L DIS truck, use exhaust side plug). Record value. • **Is computed timing equal to base timing plus 20 degrees (± 3 degrees)**	Yes ▶ No ▶	GO to Quick Test Step 5.0 . GO to P2 .

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Spark Timing Check	Pinpoint Test	P

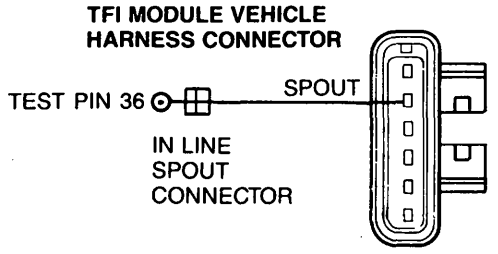
TEST STEP	RESULT ▶	ACTION TO TAKE
P2 CHECK BASE SPARK TIMING		
• Key off. • Locate in-line SPOUT/SAW connector and open this connection. • Start engine. • Check base timing. • **Is base timing within ±3 degrees of value on VECI decal?**	Yes ▶	RECONNECT SPOUT connector. GO to [P3].
	No ▶	**For TFI:** Adjust base timing if necessary. REFER to Section 13 for engine timing instructions. After timing is reset, RECONNECT in-line SPOUT connector and GO to Quick Test Step [4.0]. **For DIS and EDIS:** Base timing is not adjustable. GO to Section 13 or Ignition System Diagnosis.
P3 CHECK FOR POWER TO PROCESSOR		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires. Service as necessary. • Install breakout box, leave processor disconnected. • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between Test Pin 37 and Test Pin 40 at the breakout box. • Measure voltage between Test Pin 57 and Test Pin 60 at the breakout box. • **Is each voltage greater than 10.5 volts?**	Yes ▶	GO to [P4].
	No ▶	**For 2.5L HSC CFI, 3.0L SHO, 3.0L EFI, 3.8L SC, and 3.8L AXOD EFI passenger cars:** GO to Pinpoint Test Step [X1]. **For all others:** GO to Pinpoint Test Step [B1].

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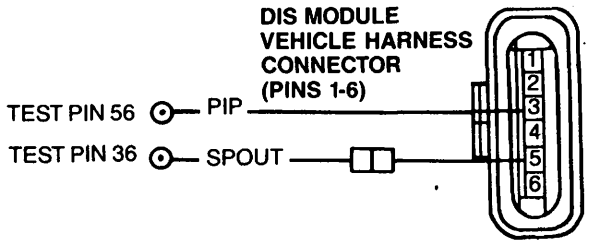
Spark Timing Check

Pinpoint Test **P**

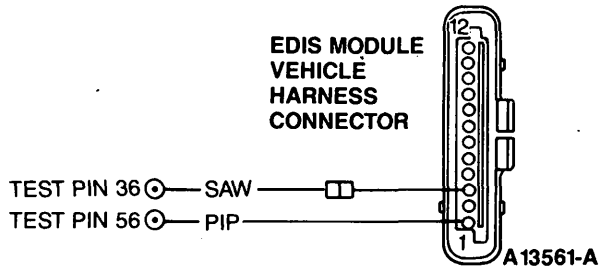
TEST STEP	RESULT ▶	ACTION TO TAKE
P4 CHECK SPOUT/SAW CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Disconnect DIS module (Pins 1-6), TFI module, or EDIS module. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 36 at the breakout box and SPOUT/SAW circuit at the DIS, TFI or EDIS module vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶	**For DIS/EDIS vehicles:** GO to P5. **For TFI vehicles:** GO to P6.
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. CHECK timing per P1.



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Spark Timing Check

Pinpoint Test **P**

TEST STEP	RESULT ▶	ACTION TO TAKE
P5 CHECK SPOUT/SAW CIRCUIT FOR SHORTS TO POWER, GROUND AND PIP		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • DIS module (pins 1-6) or EDIS module disconnected. • DVOM on 200,000 ohm scale. **For Shorts To Ground:** — Measure resistance between Test Pin 36 and Test Pins 16, 20, 40, 46 & 60. **For Shorts To Power:** — Measure resistance between Test Pin 36 and Test Pins 26, 37 & 57. **For Short To PIP Circuit:** — Measure resistance between Test Pin 36 and Test Pin 56. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to P6. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
P6 CHECK SPOUT VOLTAGE AT PROCESSOR		
• Key off, wait 10 seconds. • Breakout box installed. • Connect processor to breakout box. • Reconnect TFI, DIS or EDIS module. • Timing switch to "DIST" position on breakout box. • DVOM on 20 volt scale. • Measure voltage between Test Pin 36 at the breakout box and battery negative post during Engine Running Self-Test. **For EDIS vehicles:** • **Is voltage between 0.6 and 0.8 volts?** **For all others:** • **Is voltage between 4.0 and 10.0 volts?**	Yes ▶ No ▶	EEC system OK. REMOVE breakout box. RECONNECT processor. GO to Section 13 for Ignition System Diagnosis. REPLACE processor. REMOVE breakout box. RERUN Quick Test.

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Spark Timing Check	Pinpoint Test	P

TEST STEP	RESULT ▶	ACTION TO TAKE
P10 CONTINUOUS MEMORY CODE 49: CHECK SPOUT CIRCUIT CONTINUITY		
Service Code 49 indicates the spark timing has defaulted to 10 degrees BTDC. The SPOUT signal has a variable duty cycle with amplitude that varies from 0.4 volts to VBAT. In the event of a SPOUT failure, the DIS module will generate a fixed dwell and constant spark angle based on CID and PIP signals (FMEM mode). Possible causes: — Faulty DIS module — Faulty SPOUT circuit. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Breakout box installed, leave processor disconnected. • Processor disconnected. • Disconnect DIS module (pins 1-6). • DVOM on 200 ohm scale. • Measure resistance between Test Pin 36 at the breakout box and SPOUT circuit at the DIS module vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to P11 . VERIFY in-line SPOUT connector is properly connected. If OK, SERVICE open circuit. RECONNECT all components. RERUN Quick Test.
P11 CHECK SPOUT CIRCUIT FOR SHORT TO POWER AND GROUND		
• Key off, wait 10 seconds. • DIS module disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 36 and Test Pins 16 and 40 at the breakout box. • Measure resistance between Test Pin 36 at the breakout box and battery positive post. • **Is each reistance greater than 10,000 ohms?**	Yes ▶ No ▶	EEC system OK. REMOVE breakout box. RECONNECT all components. GO to Section 13 for TFI or DIS diagnosis. SERVICE SPOUT circuit for short to POWER, or GROUND. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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No Codes/Codes Not Listed	Pinpoint Test	QA

Note

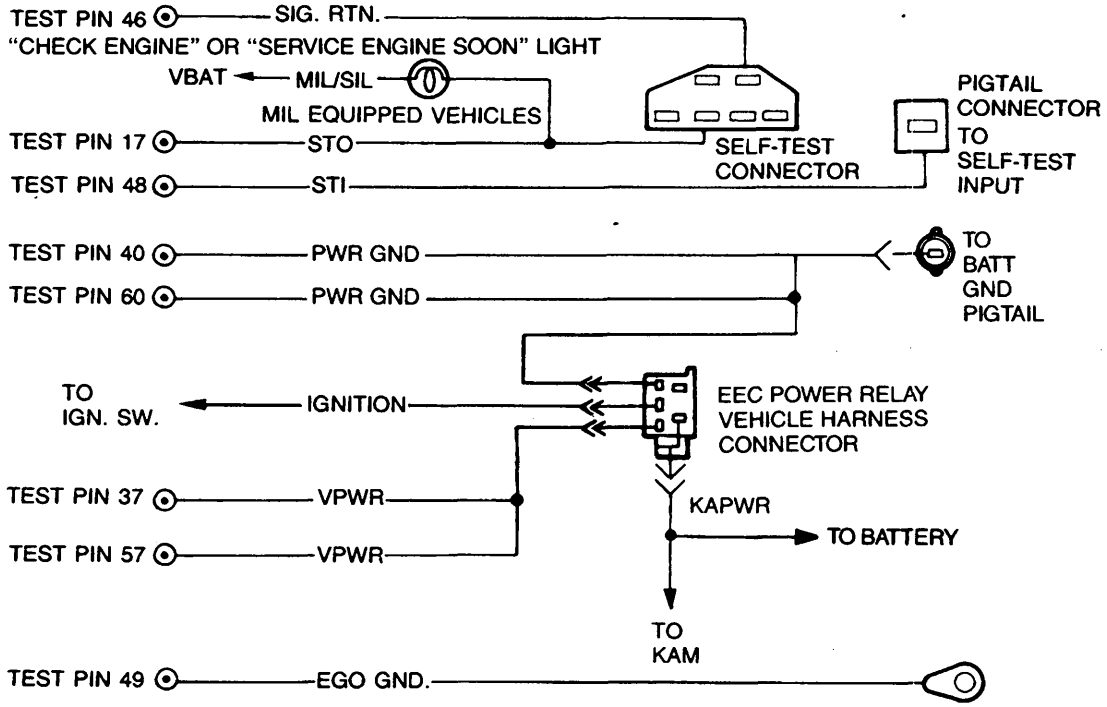
You should enter this Pinpoint Test only when you have been directed here from Quick Test.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- EEC Power Relay (-12A646-)
- Harness Circuits: SIG RTN, STO, STI, VPWR, VREF, PWR GND

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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No Codes/Codes Not Listed

Pinpoint Test QA

Test Pin 17 — **Self-Test Output and "Check Engine" or "Service Engine Soon" Light**

Application	Wire Color
2.9L Scorpio	BR/GN
3.0L Probe	W/BL
5.0L SEFI Mark VII 3.8L RWD SEFI 3.8L SC SEFI 1.9L MA SEFI	Y/BK
5.0L SEFI MA Mustang 2.3L OHC EFI	T
1.9L EFI	T/LB
4.9L EFI F-Series/Bronco 5.0L EFI F-Series/Bronco 5.8L EFI F-Series/Bronco 7.3L Diesel 7.5L F-Series/Bronco	PK/LG
All Others	T/R

Test Pin 48 — **Self-Test Input**

Application	Wire Color
2.9L Scorpio	BL/GN
5.0L MA Mustang	T/R
1.9L MA SEFI	LG/Y
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L Diesel	W/P
3.0L EFI Taurus/Sable 3.8L EFI AXOD 2.5L CFI FLC 2.5L CFI MTX 5.0L SEFI Crown Victoria/Grand Marquis	W/BK
All Others	W/R

Test Pin 37/57 — **VPWR**

Application	Wire Color
1.9L MA SEFI	W/R
2.9L Scorpio	BK
3.0L Probe	R/BK
All Others	R

Test Pin 40/60 — **PWR GND**

Application	Wire Color
1.9L MA SEFI	BK/GR
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L Diesel 3.0L Probe*	BK/W
All Others	BK/LG
* Except 3.0L Probe test pin 60	BK/Y

Test Pin 49 — **EGO GND**

Application	Wire Color
1.9L MA SEFI	BK
2.9L Scorpio	BR
5.0L MA Lincoln Town Car	GY/LB
3.0L Probe	BK/LG
All Others	O

Test Pin 46 — **SIG RTN**

Application	Wire Color
1.9 MA SEFI	LG/B
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L F-Series Diesel	GY/R
3.0L Probe	LG/Y
All Others	BK/W

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No Codes/Codes Not Listed	Pinpoint Test	QA

TEST STEP	RESULT ▶	ACTION TO TAKE
QA1 CHECK VREF VOLTAGE AT SELF-TEST CONNECTOR • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 26 at the breakout box and SIG RTN in the Self-Test connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	GO to QA2 . GO to Pinpoint Test Step C1 .
QA2 CHECK STI CIRCUIT CONTINUITY • Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • DVOM on 200 ohm scale. • Measure resistance between STI in the Self-Test single pin pigtail connector and Test Pin 48 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to QA3 . SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
QA3 CHECK STO CIRCUIT CONTINUITY • Key off. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between STO in the Self-Test connector and Test Pin 17 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	**For 1.9L vehicles:** GO to QA4 . **For all others:** GO to QA5 . SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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No Codes/Codes Not Listed	Pinpoint Test	QA

TEST STEP	RESULT ▶	ACTION TO TAKE
QA4 CHECK EGO GND CIRCUIT CONTINUITY • Key off. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between EGO GND at the engine and Test Pin 49 at the breakout box. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to QA5. SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
QA5 CHECK STO CIRCUIT FOR SHORT TO GROUND • Key off. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between STO in the Self-Test connector and engine block ground. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	SERVICE STO or MIL/SIL circuit for short to ground. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. GO to QA6.
QA6 CHECK IF POWER RELAY IS ALWAYS ON • Key off. • Breakout box installed, processor disconnected. • Connect DVOM to Test Pin 37 or 57 and to Test Pin 40 or 60 at the breakout box. • DVOM on 20 volt scale. • Turn key on and then off. Wait 10 seconds. • **Does voltage change from greater than 10.5 volts to zero volts?**	Yes ▶ No ▶	**For vehicles equipped with MIL (malfunction indicator light displayed as "CHECK ENGINE" or "SERVICE ENGINE SOON" light) or SIL (shift indicator light):** GO to QA8. **For all others:** REPLACE the processor. REMOVE breakout box. RERUN Quick Test. GO to QA7.

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No Codes/Codes Not Listed	Pinpoint Test	QA

TEST STEP	RESULT ▶	ACTION TO TAKE
QA7 CHECK VPWR CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • EEC Power Relay or Integrated Relay Controller disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 37 or 57 and Test Pin 40 or 60 at the breakout box. • **Is voltage greater than 10.5 volts?**	Yes ▶	SERVICE VPWR circuit short to power. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
	No ▶	REPLACE EEC Power Relay or Integrated Relay Controller. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
QA8 MIL AND/OR SIL EQUIPPED VEHICLES		
• **Are any of these conditions present?** • Shift indicator light: — Always ON	→ ▶	GO to KL1.
— Always OFF	→ ▶	GO to KL1.
• Malfunction indicator light: — Always ON	→ ▶	GO to ML1.
— Always OFF	→ ▶	GO to ML5.
• Shift and malfunction indicator lights functioning normally	→ ▶	REPLACE the processor. RERUN Quick Test.

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Key On Engine Off and/or Continuous Memory Service Code 15	Pinpoint Test	QB

Note

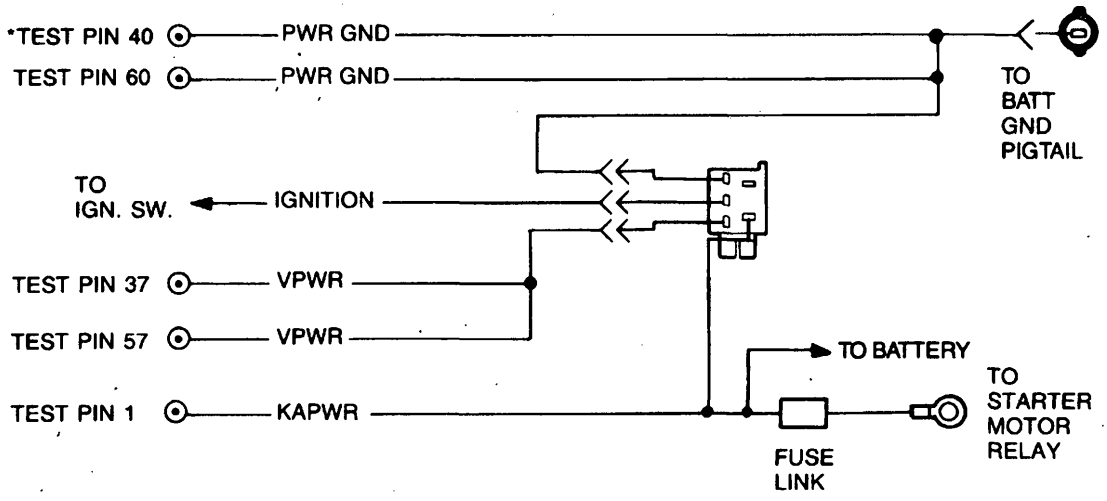
You should enter this Pinpoint Test only when you have been directed here from Quick Test.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- Harness circuits: PWR GND, VPWR, KAPWR, IGNITION

Pinpoint Test Schematic



***TEST PINS LOCATED ON BREAKOUT BOX**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE

A11503-C

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Key On Engine Off and/or Continuous Memory Service Code 15	Pinpoint Test	QB

Test Pin 1 **KAPWR**

Application	Wire Color
2.3L OHC, MA/NON-MA 5.0L SEFI MARK VII 5.0L SEFI-MA 5.0L EFI, E-Series 7.5L E-Series 7.3L E-Series/Diesel 5.8L E-Series 4.9L E-Series	BK/O
2.9L Ranger/Bronco II 4.9L Ranger MA/NON-MA 5.0L Lincoln Town Car 2.3L Ranger/Supercab	Y/BK
1.9L MA SEFI 3.0L Probe	BL/R
2.9L Scorpio	BK/BL
All Others	Y

Test Pin 40/60 **PWR GND**

Application	Wire Color
1.9L MA SEFI	BK/GR
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L Diesel 3.0L Probe*	BK/W
All Others	BK/LG
* Except 3.0L Probe Test Pin 60	BK/Y

Test Pin 37/57 **VPWR**

Application	Wire Color
1.9L MA SEFI	W/R
2.9L Scorpio	BK
3.0L Probe	R/BK
All Others	R

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Key On Engine Off and/or Continuous Memory Service Code 15

Pinpoint Test **QB**

TEST STEP	RESULT ▶	ACTION TO TAKE
QB1 CONDITIONS FOR CONTINUOUS CODE 15		
NOTE: If power is interrupted to the processor, for example when installing a breakout box, a Code 15 may be present. Rerun Self-Test to ensure correct diagnosis. • Clear Continuous Memory Codes (use procedure described in Quick Test Appendix). • Rerun Key On Engine Off Self-Test. • **Is Code 15 present on retest?**	Yes ▶ No ▶	GO to QB2. SERVICE other codes as necessary. If none, testing complete.
QB2 INSPECT ENGINE COMPARTMENT WIRING FOR PROPER ROUTING		
• Inspect EEC wiring for closeness to ignition components or wires (High Electrical Energy Sources). If EEC wiring is close, reroute and rerun Key On Engine Off Self-Test. • **Is Code 15 still present in Continuous Memory?**	Yes ▶ No ▶	GO to QB3. SERVICE other codes as necessary. If none, testing complete.
QB3 CHECK KAPWR CIRCUIT VOLTAGE		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 20 volt scale. • Connect positive test lead to Test Pin 1 and negative test lead to Test Pin 40 or 60 at the breakout box. • Key on, engine off. • **Is voltage less than 10.5 volts?**	Yes ▶ No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. REPLACE processor. REMOVE breakout box. RERUN Quick Test.

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Output State Check Not Functioning	Pinpoint Test	QC

Note

You should enter this Pinpoint Test only when you have been directed here from other Pinpoint Tests.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- Harness circuits: SIG RTN, STO, STI, GND, VPWR, VREF

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Output State Check Not Functioning

Pinpoint Test **QC**

TEST STEP	RESULT ▶	ACTION TO TAKE
QC1 CHECK FOR CODES 23, 53, 63 OR 68		
NOTE: If vehicle is equipped with speed control, the speed control servo must be electrically disconnected. This prevents the speed control system from affecting the throttle plate movement during Output State Check. Rerun Quick Test or Output State Check. • Key off, wait 10 seconds. • Perform Key On Engine Off Self-Test. **NOTE: If additional information is required on Output State Check, refer to diagnostic aids in the Quick Test Appendix.** • **Are any of these codes 23, 53, 63 or 68 present?**	Yes ▶ Code 11 ▶ No Codes ▶	GO to Quick Test and SERVICE appropriate code as instructed. GO to QC2. GO to QA1.
QC2 CHECK THROTTLE LINKAGE		
• Check throttle and throttle linkages for sticking and binding. • **Is throttle OK?**	Yes ▶ No ▶	REPLACE TP sensor. RERUN Quick Test. SERVICE as necessary. RERUN Quick Test.

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Re-Initialization Check	Pinpoint Test	QD

Note

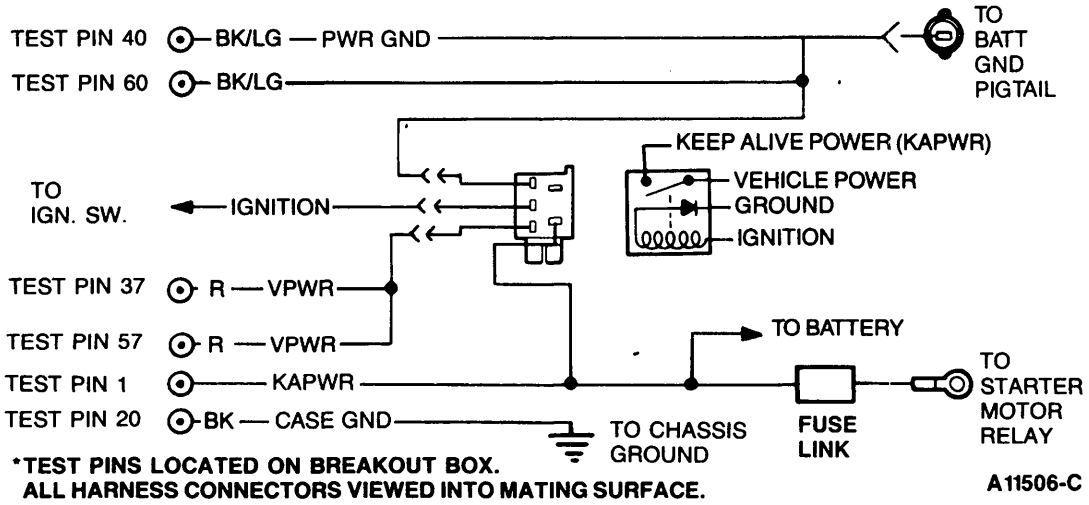
You should enter this Pinpoint Test only when Service Code 71, 72 or 78 is received during Quick Test or you have been directed here from Diagnosis By Symptom.

Remember

This Pinpoint Test is intended to diagnose only the following:

- Processor (-12A650-)
- EEC Power Relay
- Harness circuits: GND, VPWR, IGNITION

Pinpoint Test Schematic



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Re-Initialization Check

Pinpoint Test **QD**

Test Pin 20 **Case GND**

Application	Wire Color
2.9L Scorpio	BR
4.0L MA Ranger	BK/O
All Others	BK

Test Pin 1 **KAPWR**

Application	Wire Color
2.3L OHC, MA/NON-MA 5.0L SEFI MARK VII 5.0L SEFI-MA 5.0L EFI, E-Series 7.5L E-Series 7.3L E-Series/Diesel 5.8L E-Series 4.9L E-Series	BK/O
2.9L Ranger/Bronco II 4.9L Ranger MA/NON-MA 5.0L Lincon Town Car 2.3L Ranger/Supercab	Y/BK
1.9L MA SEFI	BL/R
2.9L Scorpio	BK/BL
All Others	Y

Test Pin 40/60 **PWR GND**

Application	Wire Color
1.9L MA SEFI	BK/GR
2.9L Scorpio	BR
4.9L F-Series/Bronco 5.0L F-Series/Bronco 5.8L F-Series/Bronco 7.5L F-Series 7.3L Diesel 3.0L Probe*	BK/W
All Others	BK/LG
*Except 3.0L Probe Test Pin 60	BK/Y

Test Pin 37/57 **VPWR**

Application	Wire Color
1.9L MA SEFI	W/R
2.9L Scorpio	BK
All Others	R

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Re-Initialization Check

Pinpoint Test **QD**

TEST STEP	RESULT ▶	ACTION TO TAKE
QD1 SERVICE CODE 71 or 72: CHECK FOR SOURCES OF ELECTRICAL NOISE		
A Continuous Memory Code 72 indicates that sometime during the last 40 warm-up cycles, power to the processor was interrupted. A Continuous Memory Code 71 indicates that sometime during the last 40 warm-up cycles the EEC-IV processor software requested re-initialization (the execution of data halted and then re-started from the beginning) which may or may not result in a drive complaint. Possible causes: • Vehicle power interrupted to processor • Noise into processor — Spark plug wires improperly routed or too close to the ignition system — The shielding surrounding the ignition wires pulled back or removed — Electrical, radio, or motor noise — Test Pin 20 (case ground) not grounded to chassis — Diodes open on A/C, ISC, relays **NOTE: After-market installed electrical components may influence the driveability of the vehicle.** • Key off. • Check that the EEC IV wiring and components are greater than 2 inches from secondary ignition wires and ignition coil(s). • Check that the EEC IV wiring and components are greater than 4 inches from distributor, ignition coil tower(s), starter motor and its wiring. • **Are all above conditions satisfied?**	Yes ▶ No ▶	GO to QD2. SERVICE as necessary, RERUN Quick Test.
QD2 CHECK CASE GND CIRCUIT CONTINUITY		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 20 at the breakout box and chassis ground. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	GO to QD3. SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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Re-Initialization Check

Pinpoint Test **QD**

TEST STEP	RESULT ▶	ACTION TO TAKE
QD3 DISCONNECT HARNESS AND CHECK CASE GROUND		
• Key off. • Reconnect processor to breakout box, but disconnect vehicle harness from breakout box. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 20 at the breakout box and metal case of processor. • **Is the resistance less than 5 ohms?**	Yes ▶ No ▶	**For 1.9L EFI:** GO to QD4 . **For 2.5L CFI:** GO to X10 . REPLACE processor. REMOVE breakout box. RERUN Quick Test.
QD4 WIGGLE TEST OF VPWR CIRCUIT		
• Key on, engine off. • Connect STAR or VOM to Self-Test connector. • Self-Test deactivated. • Using Continuous Monitor mode (Engine Running) per Quick Test Appendix observe STAR/VOM for indication of a fault while doing the following: — Shake, bend, and twist the EEC harness from the EEC power relay to the processor. • Is a fault indicated or does Code 71 reappear in Continuous Memory if the Key On Engine Off Self-Test is rerun?	Yes ▶ No ▶	SERVICE intermittent in the VPWR circuit. RERUN Quick Test. INSPECT EEC power relay and harness connectors for damaged pins, loose wires, corrosion, etc. SERVICE as necessary. If OK, REPLACE EEC power relay. RERUN Quick Test.
QD5 SERVICE CODE 19: INTERNAL VOLTAGE		
This Service Code 19 indicates the processor's voltage regulator inability to maintain proper internal voltage, which is necessary for the processor to accurately compute data. • Rerun Key On Engine Off Self-Test. • **Is 19-10-11 present?**	Yes ▶ No ▶	REPLACE EEC processor. RERUN Quick Test. SERVICE other codes. If none, testing complete.

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Key Power Check	Pinpoint Test	QE

Note

You should enter this Pinpoint Test only when a Service Code 55 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

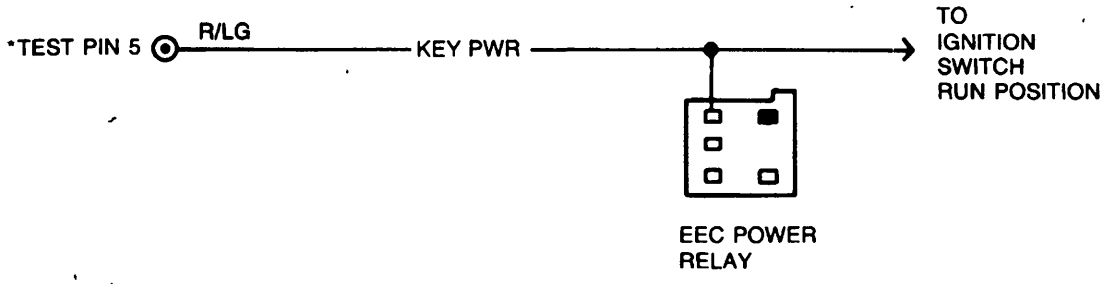
- Charging system under voltage
- Battery charger connected with engine running
- Jump starting

This Pinpoint Test is intended to diagnose only the following:

- Harness Circuit: KEY PWR
- Processor assembly (-12A650-)

Pinpoint Test Schematic

1.9L CFI



***TEST PINS LOCATED ON BREAKOUT BOX**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE

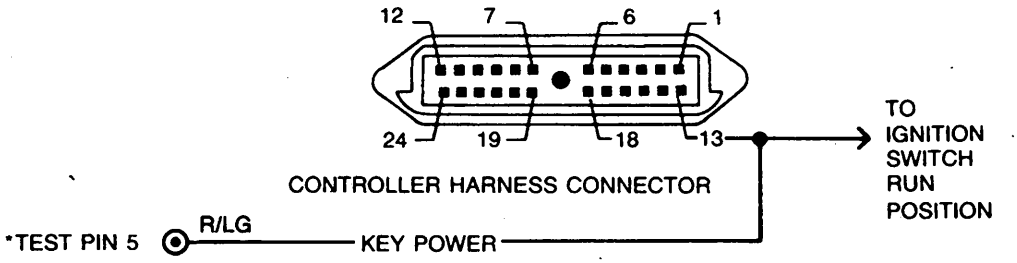
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Key Power Check	Pinpoint Test	QE

Pinpoint Test Schematic

2.5L CFI WITH INTEGRATED CONTROLLER



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Key Power Check	Pinpoint Test	QE

TEST STEP	RESULT ▶	ACTION TO TAKE
QE1 SERVICE CODE 55: CHECK CONTINUITY OF KEY PWR CIRCUIT		
Service Code 55 indicates that the KEY PWR circuit is low. Possible causes: — KEY PWR Circuit shorted to ground — Faulty processor • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect the EEC power relay or integrated controller as appropriate. • DVOM on 200 ohm scale. **For 1.9L CFI:** • Measure resistance between Test Pin 5 at the breakout box and KEY PWR at the EEC power relay vehicle harness connection. **For 2.5L CFI:** • Measure resistance between Test Pin 5 at the breakout box and Pin 5 at the integrated controller vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to QE2. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
QE2 CHECK KEY PWR CIRCUIT FOR SHORT TO GROUND		
• Key off. • EEC power relay or integrated controller disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 5 and Test Pins 40, 46, and 60 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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System Check	Pinpoint Test	S

Note

You should enter this Pinpoint Test only after a Code 11 is received during Quick Test and you have been directed here from EEC-IV No-Start Pinpoint Test Step A20 or Diagnosis By Symptom.

Remember

To prevent the replacement of good components, be aware that the following Non-EEC areas may be at fault:

- Poor power/ground connections
- Ignition system distributor cap, rotor, wires, coil, plugs
- Base engine valves, cam timing, compression, etc.

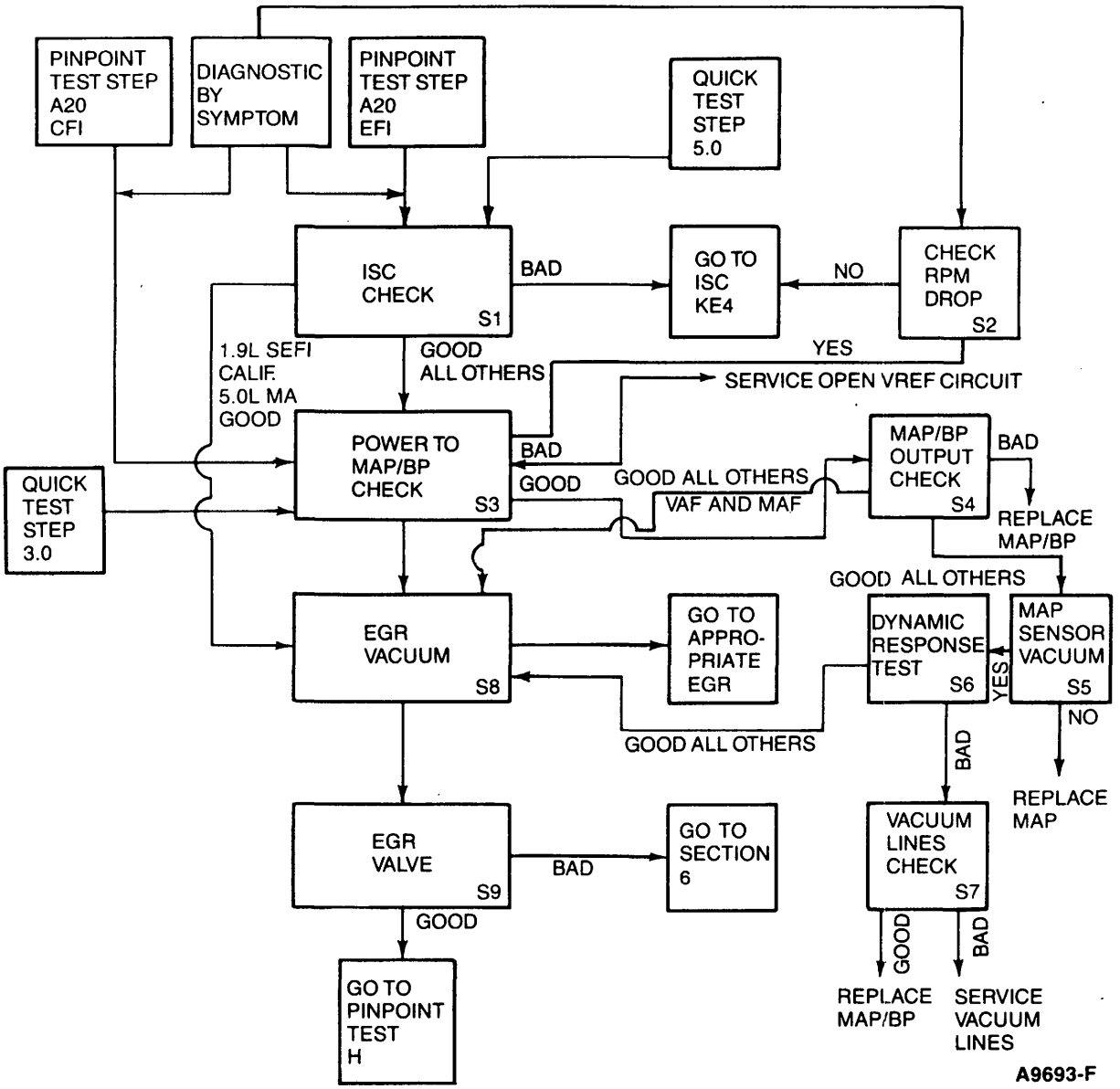
This Pinpoint Test is intended only as a Quick Check for the basic functioning of the following:

- ISC Bypass Air System
- MAP System
- EGR System
- MAF System

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System Check	Pinpoint Test	S

Pinpoint Test Flow Chart



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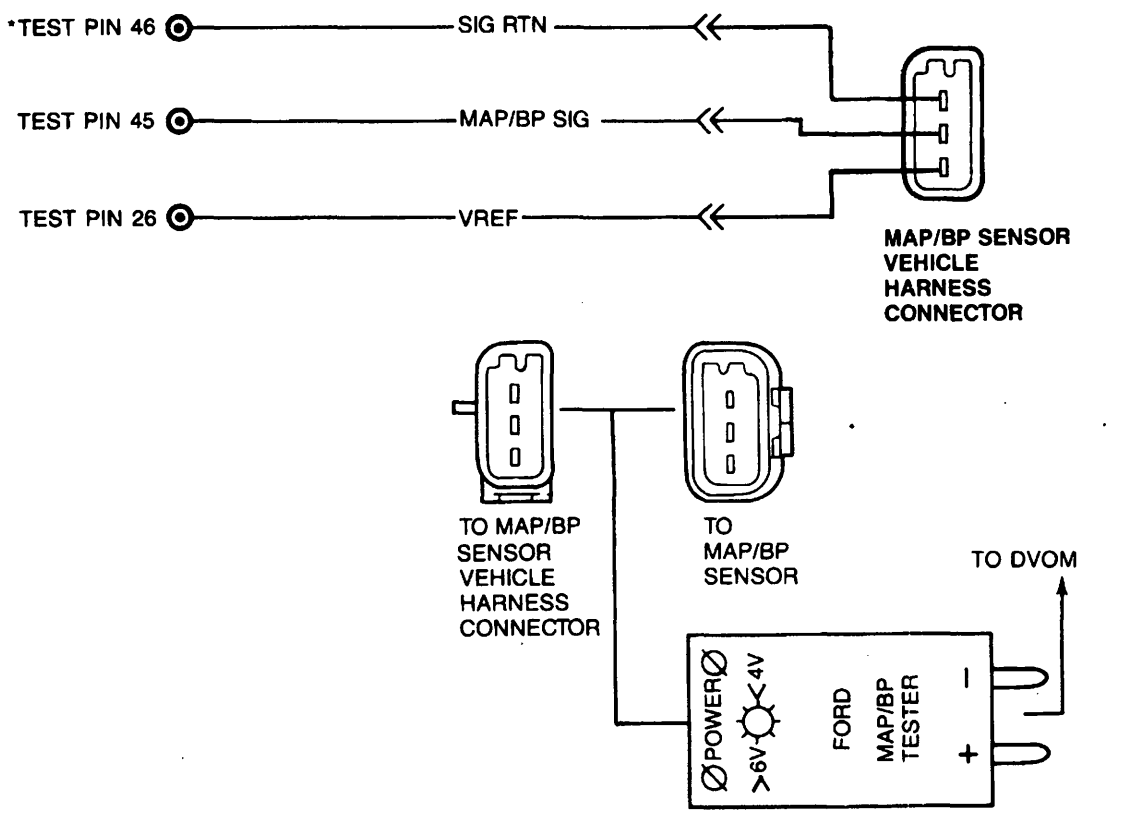
System Check	Pinpoint Test	S

TEST STEP	RESULT ▶	ACTION TO TAKE
S1 ISC-BPA CHECK		
NOTE: This Test Step is for EFI/SEFI vehicles with stalls and or no starts. For CFI vehicles go directly to [S3]. • Attempt to start engine at part throttle. • **Will engine run smooth at part throttle?**	Yes ▶ No ▶	GO to [KE4]. GO to [S3].
S2 CHECK FOR RPM DROP		
NOTE: This Test Step is for EFI/SEFI vehicles only. For CFI vehicles, go directly to [S3]. • Key off. • Connect engine tachometer. • Start engine. • Disconnect ISC solenoid. • **Does rpm drop or stall?**	Yes ▶ No ▶	RECONNECT ISC solenoid. GO to [S3]. GO to [KE4].
S3 POWER TO MAP/BP SENSOR TEST		
NOTE: If the vehicle being checked is not equipped with MAP/BP system hardware go directly to [S8]. Green light on tester indicates VREF is OK. Red Light (or no light) indicates VREF is either too low or too high. • Key off. • Disconnect the MAP/BP sensor from the vehicle harness. • Connect the MAP/BP tester between the vehicle harness and the MAP/BP sensor, (refer to schematic below). • Insert MAP/BP tester banana plugs into DVOM. • Set DVOM to 20 volt scale. • Key on, engine off. • **Is green light on?**	Yes ▶ No ▶	GO to [S4]. SERVICE open VREF circuit. REMOVE MAP/BP tester. RECONNECT MAP/BP. RE-EVALUATE symptom.

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System Check	Pinpoint Test	S

TEST STEP		RESULT ▶	ACTION TO TAKE
S3	POWER TO MAP/BP SENSOR TEST (Continued)		



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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System Check	Pinpoint Test	S

TEST STEP	RESULT ▶	ACTION TO TAKE
S4 MAP/BP TESTER OUTPUT READING		
NOTE: Measure several known good MAP/BP sensors on available vehicles. The measured voltage will be typical for your location on the day of testing. • MAP/BP Tester and DVOM connected. • DVOM or 20 volt scale. • Key on. • **Approximate Altitude (Ft.) / Voltage Output (+/- .04 Volts)** 0 — 1.59 1000 — 1.56 2000 — 1.53 3000 — 1.50 4000 — 1.47 5000 — 1.44 6000 — 1.41 7000 — 1.39 • **Is voltage in range for your altitude?**	Yes ▶ No (Sensor output is out-of-range) ▶	**For vehicles with Vane Air Flow Meters or Mass Air Flow sensors:** GO to S8. **For all others:** GO to S5. REPLACE MAP/BP sensor.
S5 CHECK MAP SENSOR		
• Key off, wait 10 seconds. • Disconnect vacuum line from MAP sensor. • Install vacuum pump to MAP sensor. • Apply 18 in-Hg vacuum to MAP sensor. • **Does MAP sensor hold vacuum?**	Yes ▶ No ▶	RELEASE vacuum. REMOVE vacuum pump. RECONNECT vacuum line to MAP sensor. GO to S6. REPLACE MAP sensor. RECONNECT vacuum line to MAP sensor. RERUN Quick Test.
S6 MAP ENGINE RUNNING RESPONSE TEST		
• Key on • MAP/BP Tester and DVOM connected. • DVOM on 20 volt scale. • Crank engine. • **While cranking, does MAP output voltage change any amount?**	Yes ▶ No ▶	GO to S8. GO to S7.

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System Check	Pinpoint Test	S

TEST STEP	RESULT ▶	ACTION TO TAKE
S7 CHECK VACUUM LINES		
• Check vacuum lines for proper routing. Refer to VECI decal. Check MAP sensor vacuum line for holes, disconnections, kinks or blockage. • **Are vacuum lines OK?**	Yes ▶	REPLACE MAP sensor. REMOVE MAP/BP tester. REEVALUATE symptom.
	No ▶	SERVICE vacuum lines as necessary. RERUN Quick Test.
S8 CHECK EGR VACUUM		
NOTE: If the vehicle being checked is not equipped with EGR system hardware, go directly to H1. The next two test steps will attempt to determine if the EGR system is the cause of the current symptom and/or NO START. • Disconnect vacuum line at EGR valve. Do not plug the vacuum line. • Start engine. **For Drive Symptom:** **— While at idle, is vacuum present at vacuum line?** **For No Start:** **— Does engine start?**	Yes ▶	**For 1.9L EFI:** GO to KA1. **For 2.3L OHC EFI Car:** GO to DD11. **For 2.3L OHC MA EFI, 2.5L HSC CFI, 5.0L SEFI Car and 2.3L OHC EFI 4.9L EFI, 5.0L EFI, 5.8L EFI, 7.5L EFI Truck:** GO to DN42. **For 1.9L CFI, 2.3L HSC, EFI, 2.9L EFI, 3.0L SHO, 3.0L EFI and 3.8L SEFI Car:** GO to DL21.
	No ▶	GO to S9.
S9 CHECK EGR VALVE		
• Inspect EGR valve to ensure proper seating. • **Is EGR valve fully seated (closed)?**	Yes ▶	GO to H1.
	No ▶	GO to Section 6 of this Manual for EGR valve diagnosis.

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Transmission — AXOD	Pinpoint Test	T

Note

You should enter this Pinpoint Test only when Service Code 29, 39, 57, 59, 62, 67, 68, 69 or 89 is received during Quick Test.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Basic AXOD transmission problems

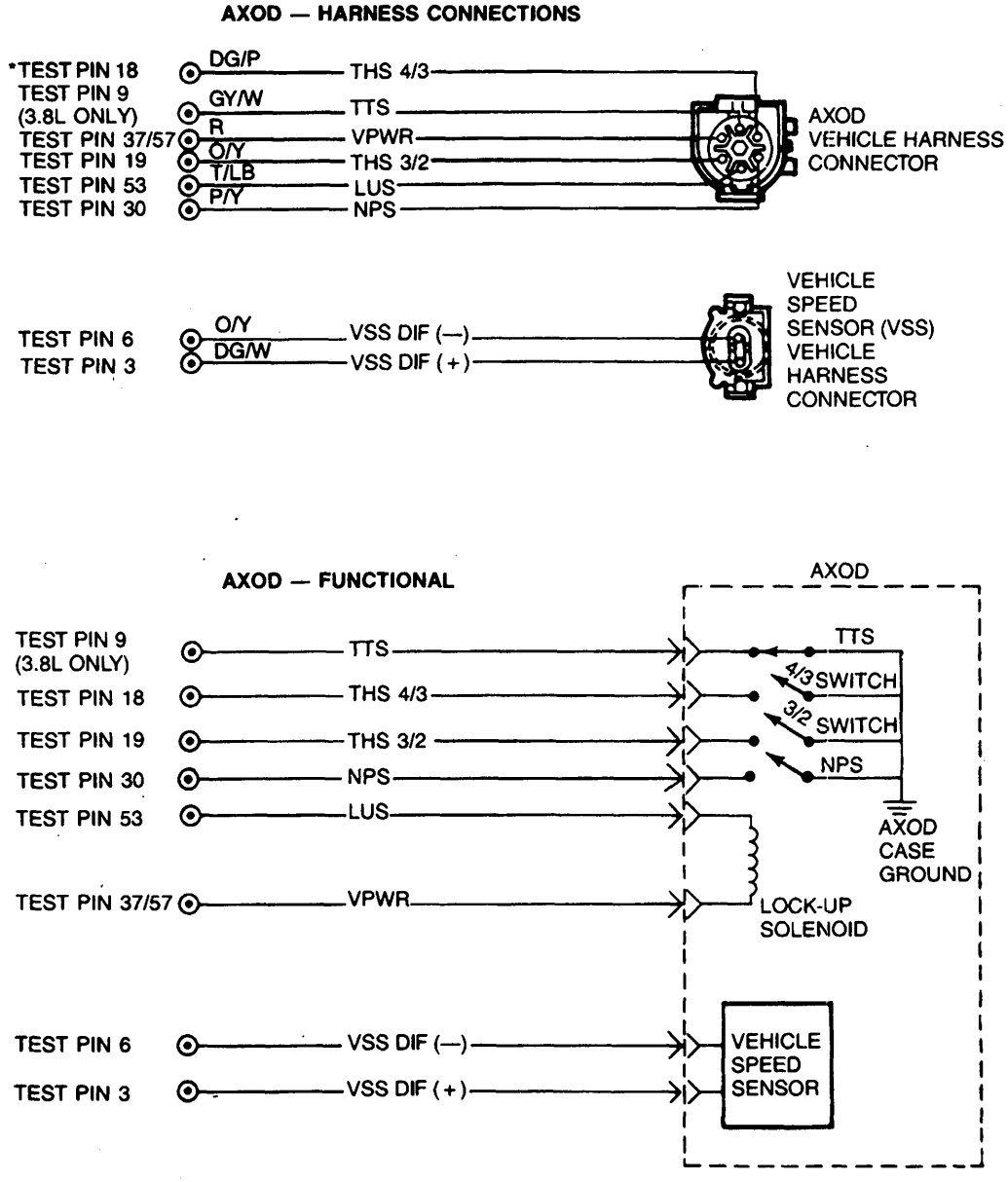
This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: THS 4/3, THS 3/2, TTS, LUS, NPS, VSS DIF(+), VSS DIF(-) and VPWR
- Vehicle Speed Sensor (-9E731-)
- Processor assembly (-12A650-)

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Transmission — AXOD	Pinpoint Test	T

Pinpoint Test Schematic



*TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Transmission — AXOD | Pinpoint Test | T

AXOD Transmission Drive Cycle

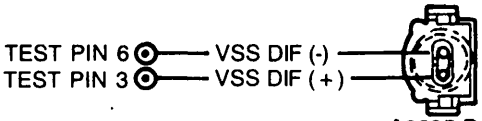
NOTE: All components must be connected when performing this test.

1. Record and clear Continuous Memory Self-Test codes.
2. Warm engine to operating temperature.
3. With transmission in D range, lightly accelerate from a stop to 40 mph to achieve third gear. Hold speed and throttle opening (not closed throttle) steady for 15 seconds minimum (30 seconds above 4000 feet altitude).
4. Shift gear selector to OD range and accelerate lightly from 40 to 50 mph to achieve fourth gear. Hold speed and throttle opening (not closed throttle) steady for 15 seconds minimum in fourth gear.
5. With transmission in fourth gear and steady speed and throttle opening (not closed throttle) lightly apply and release brakes (to light brake lamps) and then hold speed and throttle opening steady for an additional 15 seconds minimum.
6. Brake to a stop and remain stopped for 20 seconds minimum with transmission in OD range.
7. Turn engine off. Run Key On Engine Off Self-Test and record Continuous Memory Codes.

TEST STEP		RESULT ▶	ACTION TO TAKE
T1	CONTINUOUS MEMORY CODE 29: ATTEMPT TO GENERATE CONTINUOUS MEMORY CODE 29		
Continuous Memory Code 29 indicates that there is insufficient input to the processor from the Vehicle Speed Sensor. **NOTE: For 3.0L Probe, GO to DP1.** Possible causes are: — Faulty Vehicle Speed Sensor — Open or shorted circuit — Faulty processor • Perform AXOD Transmission Drive Cycle, then return to this Step. • **Did Continuous Memory Code 29 repeat?**		Yes ▶ No ▶	GO to T2. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Transmission — AXOD	Pinpoint Test	T

TEST STEP	RESULT ▶	ACTION TO TAKE
T2 CHECK CONTINUITY OF VEHICLE SPEED SENSOR (VSS) CIRCUITS		
• Key off. • Disconnect Vehicle Speed Sensor (VSS). • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 3 at the breakout box and VSS DIF(+) circuit at the VSS vehicle harness connector. • Measure resistance between Test Pin 6 at the breakout box and the VSS DIF(−) circuit at the VSS vehicle harness connector.  A9695-B • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to T3. SERVICE open circuit(s). REMOVE breakout box. RECONNECT all components. REPEAT Test Step T1.
T3 CHECK VSS CIRCUITS FOR SHORTS TO POWER OR GROUND		
• Key off. • VSS disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 3 and Test Pins 37, 40 and 6 at the breakout box. • Measure resistance between Test Pin 6 and Test Pin 37 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REMOVE breakout box. RECONNECT all components. GO to T4. SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. REPEAT Test Step T1.

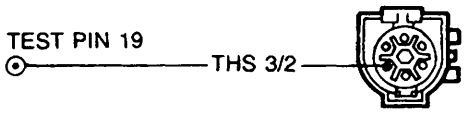
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Transmission — AXOD	Pinpoint Test	T

TEST STEP	RESULT ▶	ACTION TO TAKE
T4 REPEAT DRIVE CYCLE WITH A KNOWN GOOD VSS INSTALLED		
• Substitute VSS with known good sensor. • Processor and VSS connected. • Perform AXOD Transmission Drive Cycle (outlined at the beginning of this Pinpoint Test), then return to this Step. • **Did Continuous Memory Code 29 repeat?**	Yes ▶ No ▶	REPLACE processor. REINSTALL original VSS. REPEAT Test Step [T1]. REPLACE original VSS. RERUN Quick Test.
T10 CONTINUOUS MEMORY CODE 69: ATTEMPT TO GENERATE CONTINUOUS MEMORY CODE 69		
Continuous Memory Code 69 indicates that the AXOD THS 3/2 pressure switch circuit failed open. Possible causes are: — Open or short in THS 3/2 circuit. — Faulty processor. — AXOD THS 3/2 pressure switch problem. • Perform AXOD Transmission Drive Cycle outlined at the beginning of this Pinpoint Test), then return to this Step. • **Did Continuous Memory Code 69 repeat?**	Yes ▶ No ▶	GO to [T11]. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Transmission — AXOD	Pinpoint Test	T

TEST STEP	RESULT ▶	ACTION TO TAKE
T11 CHECK CONTINUITY OF THS 3/2 CIRCUIT		
• Key off. • Disconnect AXOD vehicle harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 19 at the breakout box and THS 3/2 circuit at the AXOD vehicle harness connector. • **Is resistance less than 5 ohms?**  A9696-C	Yes ▶ No ▶	GO to T12. SERVICE open in THS 3/2 circuit. REMOVE breakout box. RECONNECT all components. REPEAT Test Step T10.
T12 CHECK THS 3/2 CIRCUIT FOR SHORT TO POWER		
• Key off. • AXOD vehicle harness disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 19 and Test Pin 37 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to T13. SERVICE short to power in THS 3/2 circuit. REMOVE breakout box. RECONNECT all components. REPEAT Test Step T10.
T13 CHECK PROCESSOR OPERATION		
• Key off. • Reconnect AXOD vehicle harness. • Breakout box installed. • Connect processor to breakout box. • Jumper Test Pin 19 to Test Pin 40 at the breakout box. • Run Key On Engine Off Self-Test. • **Is Code 62 or 69 present?**	Yes ▶ No ▶	REMOVE jumper wire. REMOVE breakout box. RECONNECT processor. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component diagnosis. REPLACE processor. REMOVE jumper wire. REMOVE breakout box. REPEAT Test Step T10.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP		RESULT ▶	ACTION TO TAKE
T20	CONTINUOUS MEMORY CODE 59: ATTEMPT TO GENERATE CONTINUOUS MEMORY CODE 59		
Continuous Memory Code 59 indicates that the AXOD THS 4/3 pressure switch circuit failed open. Possible causes are: — Open or short in THS 4/3 circuit. — Faulty processor. — AXOD THS 4/3 pressure switch problem. • Perform AXOD Transmission Drive Cycle (outlined at beginning of this Pinpoint Test), then return to this Step. • **Did Continuous Memory Code 59 repeat?**		Yes ▶ No ▶	GO to T21. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
T21	CHECK CONTINUITY OF THS 4/3 CIRCUIT		
• Key off. • Disconnect AXOD vehicle harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 18 at the breakout box and THS 4/3 circuit at the AXOD vehicle harness connector. TEST PIN 18 ⊙——— THS 4/3  A9697-B • **Is resistance less than 5 ohms?**		Yes ▶ No ▶	GO to T22. SERVICE open in THS 4/3 circuit. REMOVE breakout box. RECONNECT all components. REPEAT Test Step T20.

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Transmission — AXOD	Pinpoint Test	T

TEST STEP	RESULT ▶	ACTION TO TAKE
T22 CHECK THS 4/3 CIRCUIT FOR SHORT TO POWER		
• Key off. • AXOD vehicle harness disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 18 and Test Pin 37 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to [T23]. SERVICE short to power in THS 4/3 circuit. REMOVE breakout box. RECONNECT all components. REPEAT Test Step [T20].
T23 CHECK PROCESSOR OPERATION		
• Key off. • Reconnect AXOD vehicle harness. • Breakout box installed. • Connect processor to breakout box. • Jumper Test Pin 18 to Test Pin 40 at the breakout box. • Run Key On Engine Off Self-Test. • **Is Code 62 or 59 present?**	Yes ▶ No ▶	REMOVE jumper wire. REMOVE breakout box. RECONNECT processor. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component Diagnosis. REPLACE processor. REMOVE jumper wire. REMOVE breakout box. REPEAT Test Step [T20].

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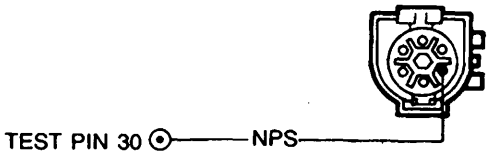
Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T30 CONTINUOUS MEMORY CODE 39: ATTEMPT TO GENERATE CODE 39		
Continuous Memory Code 39 indicates that the AXOD transmission converter bypass clutch (lock-up) is not operating properly. **NOTE: If Continuous Memory Code 59 is also present, go directly to T20.** • Perform AXOD Transmission Drive Cycle (outlined at the beginning of this Pinpoint Test), then return to this Step. • **Did Continuous Memory Code 39 repeat?**	Yes ▶ No ▶	GO to Transmission Group in Shop Manual for AXOD Transmission Electrical Component diagnosis. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
T40 CONTINUOUS MEMORY CODE 57: ATTEMPT TO GENERATE CODE 57		
Continuous Memory Code 57 indicates that the AXOD Neutral Pressure Switch (NPS) has failed open. Possible causes are: — Open or short in NPS circuit. — Faulty processor. — AXOD NPS problem. • Perform AXOD Transmission Drive Cycle (outlined at the beginning of this Pinpoint Test), then return to this Step. • **Did Continuous Memory Code 57 repeat?**	Yes ▶ No ▶	GO to T41. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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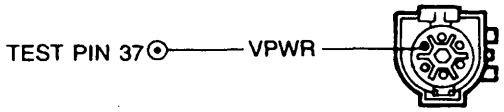
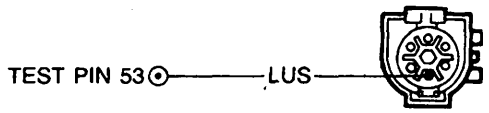
Transmission — AXOD	Pinpoint Test	T

TEST STEP	RESULT ▶	ACTION TO TAKE
T41 CHECK CONTINUITY OF NPS CIRCUIT		
• Key off. • Disconnect AXOD vehicle harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 30 at the breakout box and NPS circuit at the AXOD vehicle harness connector.  A9698-B • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to T42. SERVICE open in NPS circuit. REMOVE breakout box. RECONNECT all components. REPEAT Test Step T40.
T42 CHECK NPS CIRCUIT FOR SHORT TO POWER		
• Key off. • AXOD vehicle harness disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 30 and Test Pin 37 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to T43. SERVICE short to power in NPS circuit. REMOVE breakout box. RECONNECT all components. REPEAT Test Step T40.
T43 CHECK PROCESSOR OPERATION		
• Key off. • Reconnect AXOD vehicle harness. • Breakout box installed. • Connnect processor to breakout box. • Jumper Test Pin 30 to Test Pin 40 at the breakout box. • Run Key On Engine Off Self-Test. • **Is Code 67 present?**	Yes ▶ No ▶	REMOVE jumper wire. REMOVE breakout box. RECONNECT processor. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component diagnosis. REPLACE processor. REMOVE jumper wire. REMOVE breakout box. REPEAT TEST Step T40.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T50 SERVICE CODE 89: CHECK CONTINUITY OF VPWR CIRCUIT		
Service Code 89 indicates that the AXOD transmission Lock-Up Solenoid (LUS) circuit failed - always open or always closed. Possible causes are: — Open or shorted circuit — Faulty processor — AXOD LUS problem • Key off. • Disconnect AXOD vehicle harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 37 at the breakout box and VPWR circuit at the AXOD vehicle harness connector.  A9699-C • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to T51. SERVICE open in VPWR circuit to AXOD. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
T51 CHECK CONTINUITY OF LUS CIRCUIT		
• Key off. • AXOD vehicle harness disconnected. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 53 at the breakout box and LUS circuit at the AXOD vehicle harness connector.  A9700-C • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to T52. SERVICE open in LUS circuit to AXOD. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T52 CHECK LUS CIRCUIT FOR SHORT TO POWER OR GROUND		
• Key off. • AXOD vehicle harness disconnected. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 53 and Test Pins 37 and 40 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to T53. SERVICE short in LUS circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code 89 is still present, REPLACE processor. RERUN Quick Test.
T53 CHECK TOTAL CIRCUIT RESISTANCE		
• Key off. • Reconnect AXOD vehicle harness. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 53 and Test Pin 57 at the breakout box. • **Is resistance between 20 ohms and 40 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. REMOVE breakout box. RECONNECT processor. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component diagnosis.
T60 SERVICE CODE 62: CHECK AXOD VEHICLE HARNESS OPERATION		
Service Code 62 indicates that the AXOD THS 4/3 or 3/2 pressure switch circuit failed closed. Possible causes are: — Short in THS 4/3 or THS 3/2 circuit. — Faulty processor. — AXOD THS 4/3 or THS 3/2 pressure switch problem. • Key off. • Disconnect AXOD vehicle harness. • Run Key On Engine Off Self-Test. • **Is Code 62 still present?**	Yes ▶ No ▶	GO to T61. RECONNECT AXOD vehicle harness. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component diagnosis.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T61 CHECK THS 3/2 AND 4/3 CIRCUITS FOR SHORT TO GROUND		
• Key off. • AXOD vehicle harness disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 18 and Test Pins 40 and 60 at the breakout box. • Measure resistance between Test Pin 19 and Test Pins 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short to ground. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
T70 SERVICE CODE 59: CHECK AXOD VEHICLE HARNESS		
Service Code 59 indicates that the AXOD THS 4/3 pressure switch circuit failed closed. Possible causes are: — Short in THS 4/3 circuit. — Faulty processor. — AXOD THS 4/3 pressure switch problem. • Key off. • Disconnect AXOD vehicle harness. • Run Key On Engine Off Self-Test. • **Is Code 59 still present?**	Yes ▶ No ▶	GO to T71. RECONNECT AXOD vehicle harness. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component diagnosis.
T71 CHECK THS 4/3 CIRCUIT FOR SHORT TO GROUND		
• Key off. • AXOD vehicle harness disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 18 and Test Pins 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT AXOD vehicle harness. RERUN Quick Test. SERVICE short to ground. REMOVE breakout box. RECONNECT AXOD vehicle harness and processor. RERUN Quick Test.

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Transmission — AXOD	Pinpoint Test	T

TEST STEP	RESULT ▶	ACTION TO TAKE
T75 SERVICE CODE 69: CHECK AXOD VEHICLE HARNESS		
Service Code 69 indicates that the AXOD THS 3/2 pressure switch circuit failed closed. Possible causes are: — Short in THS 3/2 circuit. — Faulty processor. — AXOD THS 3/2 pressure switch problem. • Key off. • Disconnect AXOD vehicle harness. • Run Key On Engine Off Self-Test. • **Is Code 69 still present?**	Yes ▶ No ▶	GO to T76. RECONNECT AXOD vehicle harness. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component diagnosis.
T76 CHECK THS 3/2 CIRCUIT FOR SHORT TO GROUND		
• Key off. • AXOD vehicle harness disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 19 and Test Pins 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT AXOD vehicle harness. RERUN Quick Test. SERVICE short to ground. REMOVE breakout box. RECONNECT AXOD vehicle harness and processor. RERUN Quick Test.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T80 SERVICE CODE 67: CHECK VOLTAGE AT NPS INPUT TO PROCESSOR		
Service Code 67 indicates that either the AXOD Neutral Pressure Switch (NPS) circuit failed closed, or the input to the A/C clutch circuit is closed. **NOTE: For 3.0L Probe, go to [FA1].** Possible causes are: — Short in NPS circuit. — Short in A/C clutch circuit (3.0L EFI only). — A/C on during Self-Test (3.0L EFI only). — Faulty processor. — AXOD NPS problem. • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 30 and Test Pin 46 at the breakout box. • **Is voltage less than 4 volts?**	Yes ▶ No ▶	GO to [T81]. GO to Pinpoint Test [FA10].
T81 CHECK NPS HARNESS CIRCUIT FOR SHORT TO GROUND		
• Key off. • Disconnect AXOD vehicle harness. • Breakout box installed. • Disconnect processor. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 30 and Test Pins 40 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to [T82]. SERVICE short to ground in NPS circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T82 PROCESSOR VERIFICATION		
• Key off. • AXOD vehicle harness disconnected. • Breakout box installed. • Reconnect processor to breakout box. • Run Key On Engine Off Self-Test. • **Is Code 67 present?**	Yes ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT all components. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component diagnosis.
T90 SERVICE CODE 68: CHECK CONTINUITY OF TTS CIRCUIT		
Service Code 68 indicates that the AXOD Transmission Temperature Switch (TTS) failed open. Possible causes are: — Open or short in TTS circuit. — Faulty processor. — AXOD TTS problem. • Key off. • Disconnect AXOD vehicle harness. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, *etc.* Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 9 at the breakout box and TTS circuit at the AXOD vehicle harness connector. • **Is each resistance less than 5 ohms?** TEST PIN 9 ⊙——— TTS  A11542-B	Yes ▶	GO to T91.
	No ▶	SERVICE open in TTS circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — AXOD

Pinpoint Test **T**

TEST STEP	RESULT ▶	ACTION TO TAKE
T91 CHECK TTS CIRCUIT FOR SHORT TO POWER		
• Key off. • Breakout box installed, processor disconnected. • AXOD vehicle harness disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 9 and Test Pin 37 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **T92**. SERVICE short in TTS circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
T92 CHECK PROCESSOR OPERATION		
• Key off. • RECONNECT AXOD vehicle harness. • Breakout box installed. • Reconnect processor to breakout box. • Jumper Test Pin 9 to Test Pin 40 at the breakout box. • Run Key On Engine Off Self-Test. • **Is Code 68 still present?**	Yes ▶ No ▶	REPLACE processor. REMOVE jumper wire. REMOVE breakout box. RERUN Quick Test. REMOVE jumper wire. REMOVE breakout box. RECONNECT processor. GO to Transmission Shop Manual Group for AXOD Transmission Electrical Component diagnosis.

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Transmission — A4LD	Pinpoint Test	TB

Note

You should enter this Pinpoint Test only when a Service Code 86 or 89 is received during Quick Test.

Remember

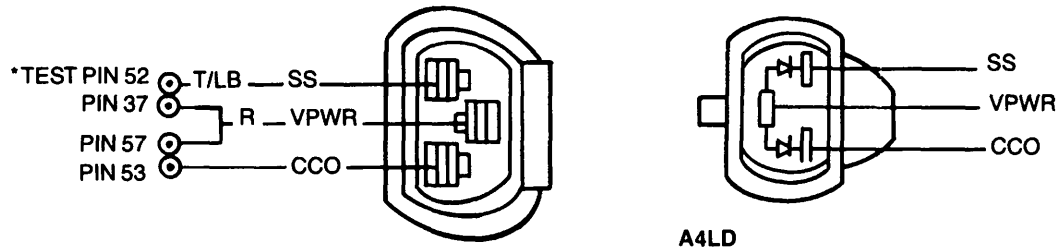
To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Hydraulic brakes
- Emergency brakes
- Internal transmission
- Transmission linkage

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: CCO, SS 3/4-4/3 and VPWR.
- CCO Solenoid (-6916-).
- Shift Solenoid 3/4-4/3 (-6916-).
- Processor Assembly (-12A650-).

Pinpoint Test Schematic



A4LD TRANSMISSION VEHICLE HARNESS CONNECTOR

A4LD TRANSMISSION BULKHEAD CONNECTOR

NOTE: SS 3/4-4/3 IS NOT USED ON 2.3L OHC, 49 STATES MUSTANG

***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE. A9202-B

Test Pin 53	CCO Solenoid
Application	**Wire Color**
Car: 2.3L OHC	O/Y
Truck: 2.3L, 2.9L, 3.0L	W

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Transmission — A4LD

Pinpoint Test **TB**

TEST STEP	RESULT ▶	ACTION TO TAKE
TB1 SERVICE CODE 86 or 89: CHECK RESISTANCE OF SOLENOIDS		
Service Code 86 indicates the processor did not see a voltage drop when the Shift Solenoid (SS) was activated. Service Code 89 indicates the processor did not see a voltage drop when the CCO solenoid was activated. Possible causes are: — CCO/SS resistance out of limits — CCO/SS circuit open or grounded — Faulty processor • Verify Self-Test code match with appropriate transmission solenoid circuit below:	Yes ▶	GO to **TB4**.
	No ▶	GO to **TB2**.

Solenoid	Processor Signal Output Pin	KOEO Self-Test Code
CCO	53	89
SS 3/4	52	86

CCO - Converter Clutch Override
SS 3/4 Shift Solenoid 3/4-4/3

- Key off, wait 10 seconds.
- Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary.
- Install breakout box, leave processor disconnected.
- DVOM on 200 ohm scale.
- Measure the resistance between Test Pin 37/57 , and processor signal output pin (refer to table) at the breakout box.
- **Is the resistance between 26 and 40 ohms?**

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Transmission — A4LD	Pinpoint Test	TB

TEST STEP	RESULT ▶	ACTION TO TAKE
TB2 CHECK CONTINUITY OF VEHICLE HARNESS CIRCUITS		
• Key off. • Breakout box installed, processor disconnected. • A4LD transmission bulkhead connector disconnected. • DVOM on 200 ohm scale. • Measure the resistance between Test Pins 37/57 at the breakout box and VPWR circuit at the A4LD transmission vehicle harness connector. • Measure the resistance between the processor signal output pin (refer to table in TB1) at the breakout box and the same circuit at the A4LD transmission vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to TB3 : SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
TB3 CHECK A4LD TRANSMISSION VEHICLE HARNESS CIRCUITS		
• Key off. • Breakout box installed, processor disconnected. • A4LD transmission bulkhead connector disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between the processor signal output pin (refer to table in TB1) and Test Pins 37/57 at the breakout box. • Measure the resistance between the processor signal output pin (refer to table in TB1) and Test Pins 40, 60 and 46 at the breakout box and chassis ground. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to TB4 . SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — A4LD	Pinpoint Test	TB

TEST STEP	RESULT ▶	ACTION TO TAKE
TB4 CHECK VPWR VOLTAGE TO A4LD TRANSMISSION SOLENOIDS		
• Key off. • Breakout box installed. • Connect processor to breakout box. • A4LD transmission bulkhead connector disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pins 37/57 at the A4LD transmission vehicle harness connector and chassis ground/battery ground. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to TB5. REPLACE processor. REMOVE Breakout box. RECONNECT solenoid(s). RERUN Quick Test.
TB5 CHECK OUTPUT DRIVER SIGNAL		
• Key off. • Breakout box installed, processor connected. • A4LD transmission bulkhead connector disconnected. • Connect test light between Test Pin 37/57 and signal output pin (refer to table in TB1) at the breakout box. • Enter Key On, Engine Off Self-Test. • **Does test lamp flash momentarily then stay off?**	Yes ▶ No ▶	Problem is internal to the transmission. Go to Transmission Group in Shop Manual for A4LD transmission service. REPLACE processor. REMOVE breakout box. RECONNECT solenoid(s). RERUN Quick Test.

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Transmission — E4OD	Pinpoint Test	TC

Note

You should enter this Pinpoint Test only when Service Codes 26, 47, 56, 66, 67, 91, 92, 93, 94, 97, 98 and 99 are received in Quick Test Step 3.0 and/or Service Codes 26 and 65 are received in Quick Test Step 5.0 and/or Service Codes 29, 49, 56, 59, 62, 66, 69 and 99 are received in Quick Test Step 6.0 or when directed here from Diagnosis By Symptom.

Remember

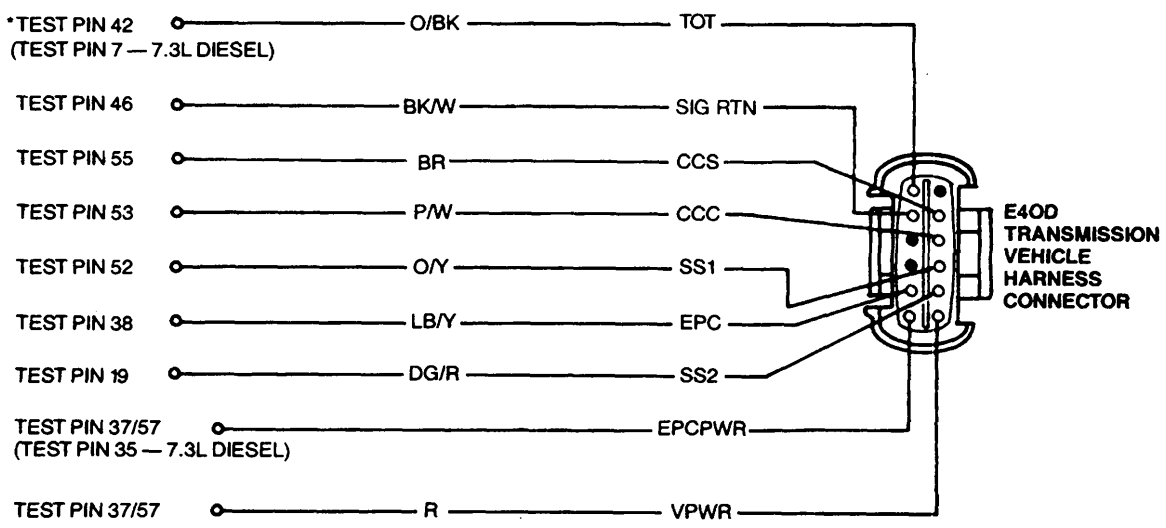
Be aware that the E4OD transmission solenoid assembly (-7G391-) and the Manual Lever Position (MLP) sensor (-7F293-) are not analyzed in this Pinpoint Test diagnostics, but are analyzed in Transmission Shop Manual Group.

This Pinpoint Test is intended to diagnose only the following:

- Harness circuits: CCC, CCS, 4X4 LOW, EPC, OCIL, OCS, SS1, SS2, SIG RTN, TOT, MLP, EPC PWR, and VPWR.
- Processor Assembly (-12A650-) or (-12B565-) on 7.3L Diesel.

Pinpoint Test Schematic

E4OD VEHICLE HARNESS SCHEMATIC



***TEST PINS LOCATED ON BREAKOUT BOX.**
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

A12820-B

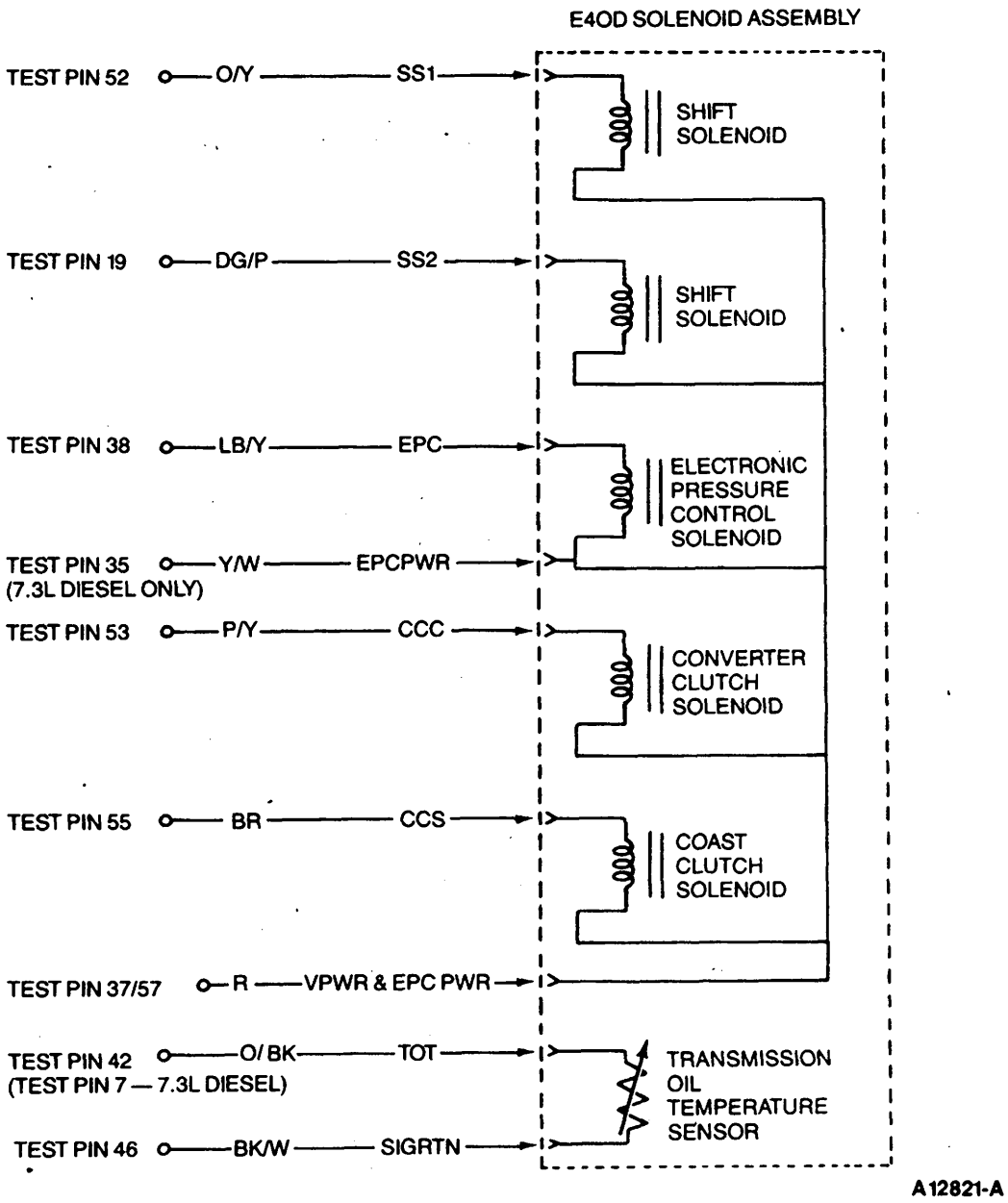
Test Pins 35 & 37/57 EPCPWR

Application	Wire Color
7.3L Diesel	Y/W
4.9L, 5.8L & 7.5L	R or R/W

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Transmission — E4OD	Pinpoint Test	TC

Pinpoint Test Schematic

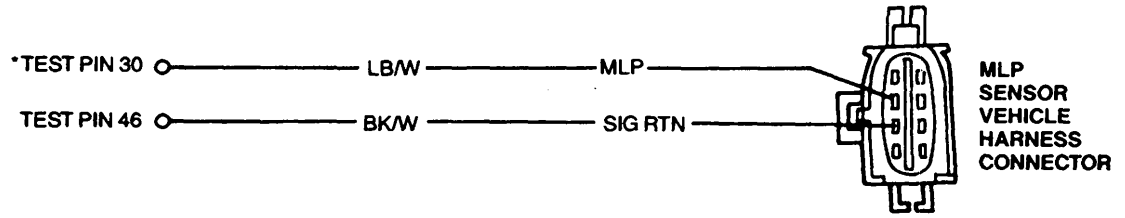


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Transmission — E4OD	Pinpoint Test	TC

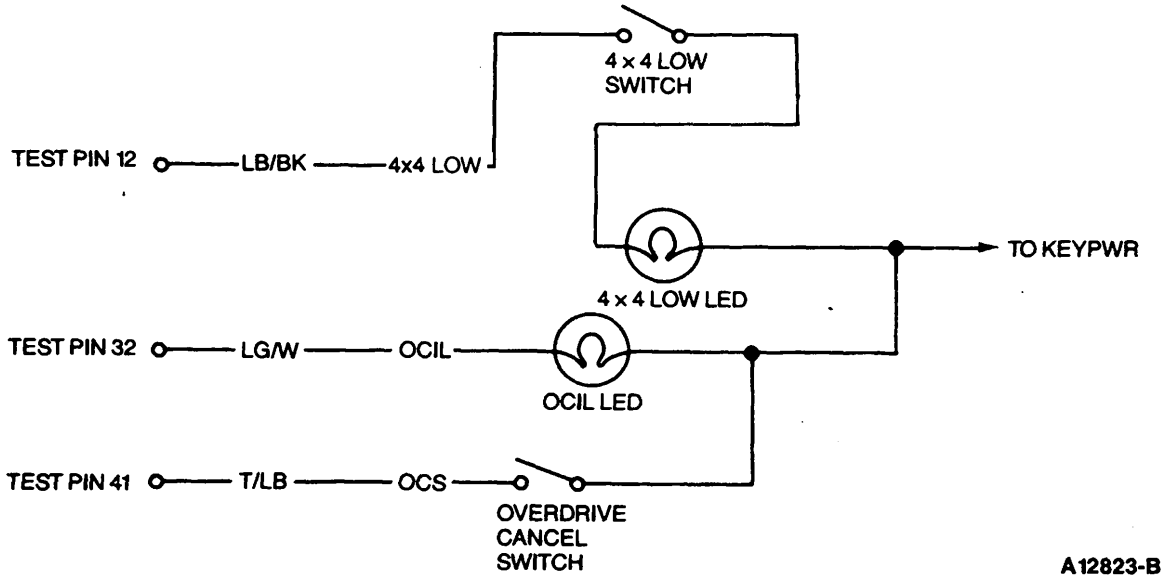
Pinpoint Test Schematic

MANUAL LEVER POSITION (MLP) VEHICLE HARNESS SCHEMATIC



A12822-B

4 x 4 LOW AND OVERDRIVE CANCEL VEHICLE HARNESS SCHEMATIC



A12823-B

* TEST PINS LOCATED ON BREAKOUT BOX.
ALL HARNESS CONNECTORS VIEWED INTO MATING SURFACE.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC1 SERVICE CODE 67: CHECK RESISTANCE OF THE MLP SENSOR		
Service Code 67 indicates that the total resistance within the Manual Lever Position (MLP) sensor is out of Self-Test range when the selector lever is in PARK (correct range is 3770 to 4607 ohms). Possible causes are: — Faulty or misadjusted MLP sensor — Open or shorted harness — Faulty processor • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 10,000 ohm scale. • Unlock steering column, ignition off. • Measure and record resistance between Test Pin 30 and 46 at the breakout box in each selector position while moving the selector from Park to Low and back to Park position. Refer to MLP Sensor Resistance Specification Table #1. • **Is each resistance within specifications?**	Yes ▶ No ▶	GO to TC3. GO to TC2.

Manual Lever Position (MLP) Sensor Resistance Specification Table #1

Transmission Shift Position	Resistance (ohms)	
	Rmin	Rmax
P	3770	4607
R	1304	1593
N	660	807
D	361	442
2	190	232
1	78	95

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC2 CHECK CONTINUITY OF MLP HARNESS CIRCUITS		
• Key off. • Disconnect MLP sensor. • Using a mirror, inspect both ends of the transmission harness connector at the MLP sensor for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Breakout box installed, processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 30 at the breakout box and MLP circuit at the MLP sensor vehicle harness connector. • Measure resistance between Test Pin 46 at the breakout box and SIG RTN circuit at the MLP sensor vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to TC3. SERVICE open circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
TC3 CHECK MLP CIRCUIT FOR SHORTS TO POWER OR GROUND		
• Key off. • Disconnect MLP sensor. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 30 and Test Pins 37 and 57 at the breakout box. • Measure resistance between Test Pin 30 and Test Pins 40, 46 and 60 at the breakout box and between Test Pin 30 at the breakout box and chassis ground. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to TC4. SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — E4OD | Pinpoint Test | TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC4 CHECK PROCESSOR OUTPUT VOLTAGE		
• Key off. • MLP sensor disconnected. • Breakout box installed. • Connect processor to breakout box. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Test Pin 30 and Test Pin 46 at the breakout box. • **Is voltage between 4.75 and 5.25 volts?**	Yes ▶ No ▶	GO to Transmission Group in Shop Manual for MLP adjustment or service. REPLACE processor. REMOVE breakout box. RECONNECT MLP sensor. RERUN Quick Test.
TC10 SERVICE CODE 47, 65, OR 97: VERIFY VEHICLE SELF-TEST STATE		
Service Code 47 indicates that the 4x4 Low selector lever is not in the 4x2 or 4x4 High position (observed in Key On Engine Off Self-Test). An early shift in 4x4 High range is likely. Service Code 65 indicates that Overdrive Cancel Switch (OCS) is not cycled between the engine I.D. code and the "Goose Test" in Key On Engine Running Self-Test. Service Code 97 indicates an Overdrive Cancel Light circuit problem (observed in Key On Engine Off Self-Test). Possible causes are: — Faulty 4x4 Low switch — Faulty OCS switch — Burned out bulb — Open harness — Shorted harness — Faulty processor • Rerun Quick Test. • **Are any of the above codes present?**	Yes ▶ No ▶	**For code 97:** GO to TC12. **For all others:** GO to TC11. Unable to duplicate and/or identify fault at this time. For further diagnosis using EEC-IV monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others CLEAR Continuous Memory (Refer to Quick Test Appendix). RERUN Quick Test.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC11 CYCLE THE APPROPRIATE CIRCUIT: (4x4 LOW OR OVERDRIVE CANCEL) • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Key on, engine off. • DVOM on 20 volt scale. **For 4x4 LOW circuit:** — Measure voltage between Test Pin 12 and Test Pin 40 and 60 at the breakout box while moving the 4x4 select lever between 4x2 and 4x4 Low several times. — Move transfer case lever between 4x2 position several times. **For OSC circuit:** — Measure voltage between Test Pin 41 and Test Pin 40 and 60 at the breakout box while cycling the overdrive cancel switch. — Move the switch toggle on the dash several times. • **Does the voltage cycle?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. **If you were here originally for a driveability symptom only:** GO to TC14. **For All others:** GO to TC12.

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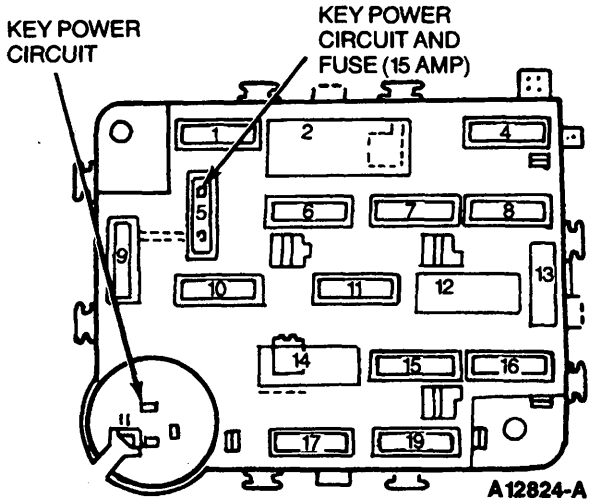
Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC12 CHECK HARNESS CIRCUIT(S) FOR SHORT TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • DVOM on 200,000 ohm scale. **For 4x4 LOW circuit:** — Disconnect 4x4 Low switch. — Measure resistance between Test Pin 12 and Test Pin 40/60 at the breakout box. **For overdrive cancel circuits:** — Disconnect overdrive cancel switch. — Measure resistance between Test Pin 41 and Test Pin 40/60 at the breakout box. — Measure resistance between Test Pin 32 and Test Pin 40/60 at the breakout box. **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	**For original code 47 or 65:** GO to TC15. **For original code 97:** GO to TC13. **For original code 47:** SERVICE short circuit. RERUN Engine Off Self-Test. **For original code 65:** SERVICE short circuit. RERUN Engine Running Self-Test. If code is still present, GO to TC14. **For original code 97:** SERVICE short circuit. RERUN Engine Off Self-Test.
TC13 CHECK KEYPOWER THROUGH OCIL CIRCUIT		
• Key on, engine off. • Breakout box installed, processor disconnected. • DVOM on 20 volt scale. • Measure voltage between Test Pin 32 and Test Pin 40/60 at breakout box. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. GO to TC14.

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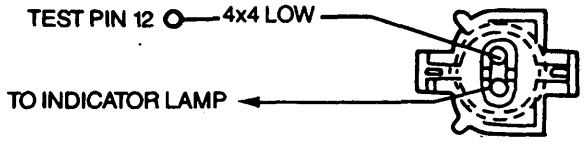
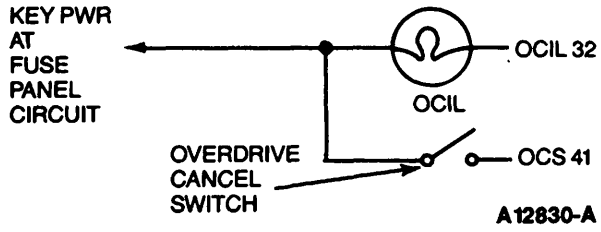
Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC14 CHECK CONTINUITY OF THE VEHICLE HARNESS CIRCUITS		
NOTE: When entering this Test Step with a driveability symptom or a clean Self-Test code; first, disconnect processor 60 pin connector. Inspect for damaged pins, pushed out pins, loose wires, etc. Service as necessary. • Key off. • Breakout box installed, processor disconnected. • Appropriate switch disconnected. • DVOM on 200 ohm scale. **For 4x4 LOW circuit:** — Measure the resistance between keypower at the fuse panel shown below (ohmmeter positive probe) and Test Pin 12 at the breakout box (ohmmeter negative probe). **For OCIL circuit:** — Measure the resistance between keypower at the fuse panel shown below (ohmmeter positive probe) and Test Pin 32 at the breakout box (ohmmeter negative probe). • **Are both resistances less than 5 ohms?**	Yes ▶	GO to TC15.
	No ▶	Inspect for damaged indicator bulb (4x4 Low LED or OCIL) or damaged fuse in fuse panel. If OK, SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.



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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC15 CHECK CONTINUITY OF THE 4X4 LOW OR OVERDRIVE CANCEL SWITCH HARNESS		
• Key off. • Breakout box connected, processor disconnected. • Appropriate switch disconnected. • DVOM on 200 ohm scale. **For 4x4 LOW circuit:** — Measure the resistance between Test Pin 12 at the breakout box and 4x4 low circuit at the 4x4 low switch vehicle harness connector.  4 x 4 LOW SWITCH VEHICLE HARNESS CONNECTOR A12825-A **For OCS circuit:** • Measure the resistance between keypower at the fuse panel shown in Pinpoint Test Step TC14 (ohmmeter positive probe) and the power side of the overdrive cancel switch vehicle harness connector (ohmmeter negative probe). • Measure the resistance between Test Pin 41 at the breakout box and the signal side of the overdrive cancel switch vehicle harness connector.  A12830-A • **Are both the resistances less than 5 ohms?**	Yes ▶ No ▶	Go to TC16. SERVICE open circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC16 CHECK HARNESS CIRCUIT(S) FOR SHORTS TO POWER		
• Key off. • Breakout box installed, processor disconnected. • Appropriate switch disconnected. • DVOM on 200,000 ohm scale. **For 4x4 LOW circuit:** — Measure resistance between Test Pin 12 and Test Pin 37 and 57 at the breakout box. **For overdrive cancel circuits:** — Measure resistance between Test Pin 41 and Test Pins 37 and 57 at the breakout box. — Measure resistance between Test Pin 32 and Test Pins 37 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶	REPLACE damaged switch, either 4x4L range switch or overdrive cancel switch (OCS) due to service code received. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
	No ▶	SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — E4OD | Pinpoint Test | TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC17 SERVICE CODE 91, 92, 93, 94, 98, or 99: CIRCUIT IDENTIFICATION		
Service Code(s) 91, 92, 93, 94 indicates that the appropriate On/Off solenoid below is out of Self-Test range which may induce harsh, early, or late shifts. Correct range measurement is 9.00 to 14.50 volts when On, and less than 1.00 volt when Off. Service Code 98 indicates that the Electronic Pressure Control solenoid may have an inoperative driver in the processor. Service Code 99 indicates that the EPC circuit problem may induce transmission clutch wear and harsh shifts. Possible causes are: — Solenoid resistance is out of limits — Open or grounded harness — Faulty processor • Run Key On Engine Off Self-Test. • Verify code match per following chart: • **Are any of the above codes present?**	Yes ▶	**For 7.3L Diesel E4OD:** GO to TC20. **For all other E4OD:** GO to TC18.
	No ▶	GO to Quick Test for appropriate direction on any other codes.

Solenoid	Processor Signal Test Pin	K.O.E.O. Self-Test Code
SS1	52	91
SS2	19	92
CCS	55	93
CCC	53	94
EPC	38	98/99

SS1 - Shift Solenoid #1
SS2 - Shift Solenoid #2
CCS - Coast Clutch Solenoid
CCC - Converter Clutch Solenoid
EPC - Electronic Pressure Control

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC18 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX) **NOTE: DO NOT perform Output State Check on 7.3L Diesel-E4OD vehicles because damage to transmission and vehicle may occur. This check is for 4.9L, 5.8L/7.5L E4OD VEHICLES ONLY. Do not use STAR tester for this step, use VOM/DVOM.** • Key off, wait 10 seconds. • Disconnect electrical connector on the speed control servo; if equipped. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO circuit at Self-Test connector and positive test lead to battery positive. • Jumper STI circuit to SIGNAL RETURN at the Self-Test connector. • Perform Key On Engine Off Self-Test until the completion of the Continuous Test Codes. • DVOM will indicate less than 1.0 volt when test is completed. • Depress and release the throttle. • **Does voltage increase?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to TC19 . DEPRESS throttle to WOT and Release. If STO voltage does not go high, GO to Pinpoint Test Step QC1 . Leave equipment hooked up.
TC19 CHECK SUSPECT E4OD SOLENOID ELECTRICAL OPERATION • Key on, engine off. • Disconnect transmission bulkhead connector at E4OD solenoids. • Using a mirror, inspect both ends of the connector for damaged or pushed out pins, corrosion, loose wires, ect. Service as necessary. • Connect DVOM positive test lead to VPWR circuit and negative test lead to the processor signal test pin (refer to table in TC17) at the E4OD transmission vehicle harness connector. • DVOM on 20 volt scale. • While observing DVOM, depress and release the throttle several times to cycle output On and Off. • **Does the suspect solenoid output circuit voltage change greater than 1.0 volt?**	Yes ▶ No ▶	GO to Transmission Shop Manual Group for E4OD transmission service. REMOVE jumper. GO to TC20 .

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Transmission — E4OD | Pinpoint Test | TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC20 CHECK E4OD TRANSMISSION SOLENOID RESISTANCE		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Connect transmission bulkhead connector. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 37/57 and processor signal test pin (refer to table in TC17) at the breakout box. • **Is the resistance within specification per the chart below?**	Yes ▶ No ▶	GO to TC22 . GO to TC21 .

Ambient Temperature			Resistance (OHMS)	
°C	°F	Solenoid	MIN	MAX
- 40 to 0	- 40 to 32	SS, CCC, CCS	16.00	20.50
		EPC	3.25	4.25
0 to 110	32 to 230	SS, CCC, CSS	20.50	30.00
		EPC	4.25	6.50

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC21 CHECK CONTINUITY OF E4OD TRANSMISSION SOLENOID HARNESS		
NOTE: When entering this pinpoint test for a 7.3L Diesel, initially use a mirror to inspect both ends of the transmission bulkhead connector for damaged or pushed out pins, corrosion, loose wires, ect. Service as necessary. • Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Disconnect transmission bulkhead connector at E4OD solenoids. • DVOM on 200 ohm scale. • Measure the resistance between the processor signal test pin (refer to table in [TC17]) at the breakout box and the same test pin at the E4OD transmission vehicle harness connector. • Measure the resistance between Test Pin 37/57 (Test Pin 35 for 7.3L Diesel) at the breakout box and both the EPCPWR pin and the VPWR pin at the E4OD transmission vehicle bulkhead harness connector. (Refer to the first Pinpoint Test Schematic in [TC]). • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to [TC22] . SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
TC22 CHECK E4OD SOLENOID HARNESS CIRCUITS FOR SHORTS TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Transmission bulkhead connector disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between the processor signal test pin (refer to table in [TC17]) and Test Pins 40, 46 and 60 at the breakout box and between the processor signal test pin at the breakout box and chassis ground. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to [TC23] . SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC23 CHECK E4OD SOLENOID HARNESS CIRCUITS FOR SHORTS TO POWER		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Transmission bulkhead connector disconnected. • DVOM on 200,000 ohm scale. • Measure the resistance between the processor signal test pin (refer to table in TC17) and Test Pins 37 and 57 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to TC24 . SERVICE short circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
TC24 CHECK VOLTAGE OF VPWR TO E4OD TRANSMISSION SOLENOIDS		
• Key off. • Breakout box installed. • Connect processor to breakout box. • Transmission bulkhead connector disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VPWR circuits (Test Pins 37 and 57) at the E4OD transmission vehicle harness connector and chassis ground or negative battery post. • **Are both voltages greater than 10.5 volts?**	Yes ▶ No ▶	GO to TC25 . REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC25 CHECK SOLENOID DRIVER SIGNAL		
Requires standard non-power 12 volt lamp. • Key off. • Breakout box installed, processor connected. • Bulkhead connector disconnected. • Connect test lamp between Test Pin 37 or 57 and processor signal test pin (refer to table in TC17) at the breakout box. • Key on, engine off (wait 10 seconds). **NOTE: For Pins 38 (EPC) and 52 (SS1), the lamp will be "ON" with key On, ignore this; only concern is the light during Self-Test.** • Now initiate Key On Engine Off Self-Test. • **Does test lamp flash momentarily when Self-Test is initiated and then stay off?**	Yes ▶ No ▶	GO to Transmission Group in Shop Manual for E4OD transmission service. **If test lamp never flashed:** Solenoid Driver open in processor. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. **If test lamp is always on:** Solenoid Driver shorted to ground in processor. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
TC30 SERVICE CODE 26: CHECK TRANSMISSION OIL OPERATING TEMPERATURE		
Service Code 26 indicates that the Transmission Oil Temperature (TOT) sensor is out of Self-Test range. Correct range of measurement is 0.21 to 3.50 volts. Possible causes are: — TOT resistance is out of limits — Faulty processor • Drive vehicle through normal shift cycle in city traffic for 20 to 30 minutes to bring transmission oil temperature to at least 50 degrees Fahrenheit. If outside ambient temperature is less than -2 degrees Fahrenheit the vehicle may require a longer drive warm-up time. • Rerun Quick Test. • **Is code 26 present?**	Yes ▶ No ▶	GO to TC31 . SERVICE other codes as necessary.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP		RESULT ▶	ACTION TO TAKE
TC31	CHECK FOR VREF AT THROTTLE POSITION OR FIPL SENSOR		
• Refer to schematic in Pinpoint Test DH or DQ. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Disconnect TP sensor (FIPL sensor on 7.3L Diesel). • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF and SIG RTN circuits at the TP or FIPL sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**		Yes ▶ No ▶	RECONNECT TP or FIPL sensor. GO to TC32. GO to Pinpoint Test Step C1.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC32 CHECK RESISTANCE OF TOT SENSOR		
NOTE: Transmission oil temperature may have cooled down. The oil temperature must be at a minimum of 50 degrees Fahrenheit before taking TOT resistance measurement. Redrive vehicle if necessary. • Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • DVOM on 200,000 ohm scale. • Key on, engine off. • Carefully touch the transmission oil pan on the driver's side, away from the exhaust system. The transmission oil pan should be warm to the touch. As a guide, "warm to the touch" is about 41-70° degrees C (105-158° degrees F). • Measure the resistance between Test Pin 42 (Test Pin 7 on 7.3L diesel) and Test Pin 46 at the breakout box. Refer to TOT Sensor Resistance Specification Table #2. • **Is the resistance within specification for the appropriate transmission oil temperature?**	Yes ▶ No ▶	GO to **TC33**. REMOVE breakout box. RECONNNECT all components. GO to Transmission Shop Manual Group for transmission service of the TOT sensor.

Transmission Oil Temperature (TOT) Sensor Resistance Specification Table #2

Transmission Oil Temperature		Resistance Range (ohms)
°C	°F	
0 - 20	32 - 58	100K - 37K
21 - 40	59 - 104	37K - 16K
41 - 70	105 - 158	16K - 5K
71 - 90	159 - 194	5K - 2.7K
91 - 110	195 - 230	2.7K - 1.5K
111 - 130	231 - 266	1.5K - 0.8K

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC33 CHECK TOT SENSOR RESISTANCE SHIFT VS OIL TEMPERATURE SHIFT		
NOTE: The TOT sensor may sometimes appear to be within the appropriate resistance specification (0.8K to 100K ohms) and not be in the corresponding temperature range. This increases the chances of not being able to determine the integrity of the TOT sensor. • Check again for the transmission temperature by touching the transmission oil pan. — If it is cold, run the vehicle for a short time to heat it up. — If it is too hot to touch, let the vehicle and transmission cool down. • Measure the TOT sensor resistance again and compare it to the resistance received in Pinpoint Test Step TC32 . • **Did the resistance decrease upon heating the transmission or increase upon cooling down the transmission significantly?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. REMOVE breakout box. RECONNECT processor. GO to Transmission Shop Manual Group for TOT sensor replacement procedures.
TC40 SERVICE CODE 56: ATTEMPT TO GENERATE CODE 66		
Service Code 56 indicates that the Transmission Oil Temperature (TOT) sensor signal is greater than Self-Test maximum value of 4.80 volts. Possible causes are: — Faulty TOT sensor — Open harness — Faulty processor • Key off, wait 10 seconds. • Disconnect transmission bulkhead connector at TOT sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Insert a jumper wire between TOT circuit and SIG RTN circuit at the E4OD transmission vehicle harness connector. • Run Key On Engine Off Self-Test. • **Is code 66 present?**	Yes ▶ No ▶	REMOVE jumper wire. GO to Transmission Shop Manual Group for transmission service of the TOT sensor. REMOVE jumper wire. GO to TC41 .

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC41 CHECK CONTINUITY OF TOT AND SIG RTN CIRCUITS		
• Key off, wait 10 seconds. • Transmission bulkhead connector disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure the resistance between TOT circuit at the E4OD transmission vehicle harness connector and Test Pin 42 (or Test Pin 7 on 7.3L diesel) at the breakout box. • Measure the resistance between SIG RTN circuit at the E4OD transmission vehicle harness connector and Test Pin 46 at the breakout box. • **Are both resistances less the 5 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE open circuit(s). REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
TC50 SERVICE CODE 66: ATTEMPT TO GENERATE CODE 56		
Service Code 66 indicates that the Transmission Oil Temperature (TOT) sensor signal is less than the Self-Test minimum value of 0.15 volts. Possible causes are: — Faulty TOT sensor — Grounded harness — Faulty processor • Key off, wait 10 seconds. • Disconnect transmission bulkhead connector at the TOT sensor. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Run Key On Engine Off Self-Test. • **Is code 56 present?**	Yes ▶ No ▶	GO to Transmission Shop Manual Group for transmission service of the TOT sensor. GO to TC51.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC51 CHECK FOR VREF AT THROTTLE POSITION SENSOR		
• Refer to schematic in Pinpoint Test [DH] or [DQ]. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Disconnect TP sensor (FIPL sensor on 7.3L diesel). • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between VREF and SIG RTN circuits at the TP or FIPL sensor vehicle harness connector. • **Is voltage between 4.0 and 6.0 volts?**	Yes ▶ No ▶	RECONNECT TP or FIPL sensor. GO to [TC52]. GO to Pinpoint Test Step [C1].
TC52 CHECK TOT CIRCUIT FOR SHORTS TO GROUND		
• Key off, wait 10 seconds. • Transmission bulkhead connector disconnected. • Breakout box installed. • Disconnect processor. • DVOM on 200,000 ohm scale • Measure the resistance between Test Pin 42 (or Test Pin 7 on 7.3L diesel) and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC90 MLP, TOT SENSOR AND E4OD SOLENOID DRIVE CYCLE		
• Verify that all components are connected. • Bring engine to operating temperature. • Verify correct transmission fluid level. • Run Key On Engine Off Self-Test and record Continuous Memory Codes. — If codes 49, 59 or 69 are present	→	GO to TC96.
— If codes 49, 59 or 69 are not present, record and clear Continuous Memory Self-Test Codes. • With transmission in D range, and OD enable set: — Drive in city traffic with moderate accelerations. — Hold throttle opening steady while transmission is shifting thorugh all four gears, then hold throttle for an additional 15 seconds. • Apply brakes on coming to a stop and remain stopped for 20 seconds, then repeat drive step above. • Rerun Key On Engine Off Self-Test and record Continuous Memory Codes.		
— For code 11	→	GO to TC91.
— For code 29	→	GO to Pinpoint Test DP1.
— For code 56, 62, 66, 67 and 99	→	GO to TC92.
TC91 ATTEMPT TO GENERATE CONTINUOUS MEMORY CODE 56, 62, 66, 67 and 99		
NOTE: Before performing any procedures in this test step you must complete the drive cycle outlined above. • Take the vehicle on the road again and drive on a rough road for 15 minutes to simulate road shock. • Observe MIL LED while driving for indication of fault. • **Does the MIL flash on and off?**	Yes ▶ No ▶	RETURN vehicle to repair area. GO to TC92. Unable to duplicate fault. Testing is completed.

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Transmission — E4OD

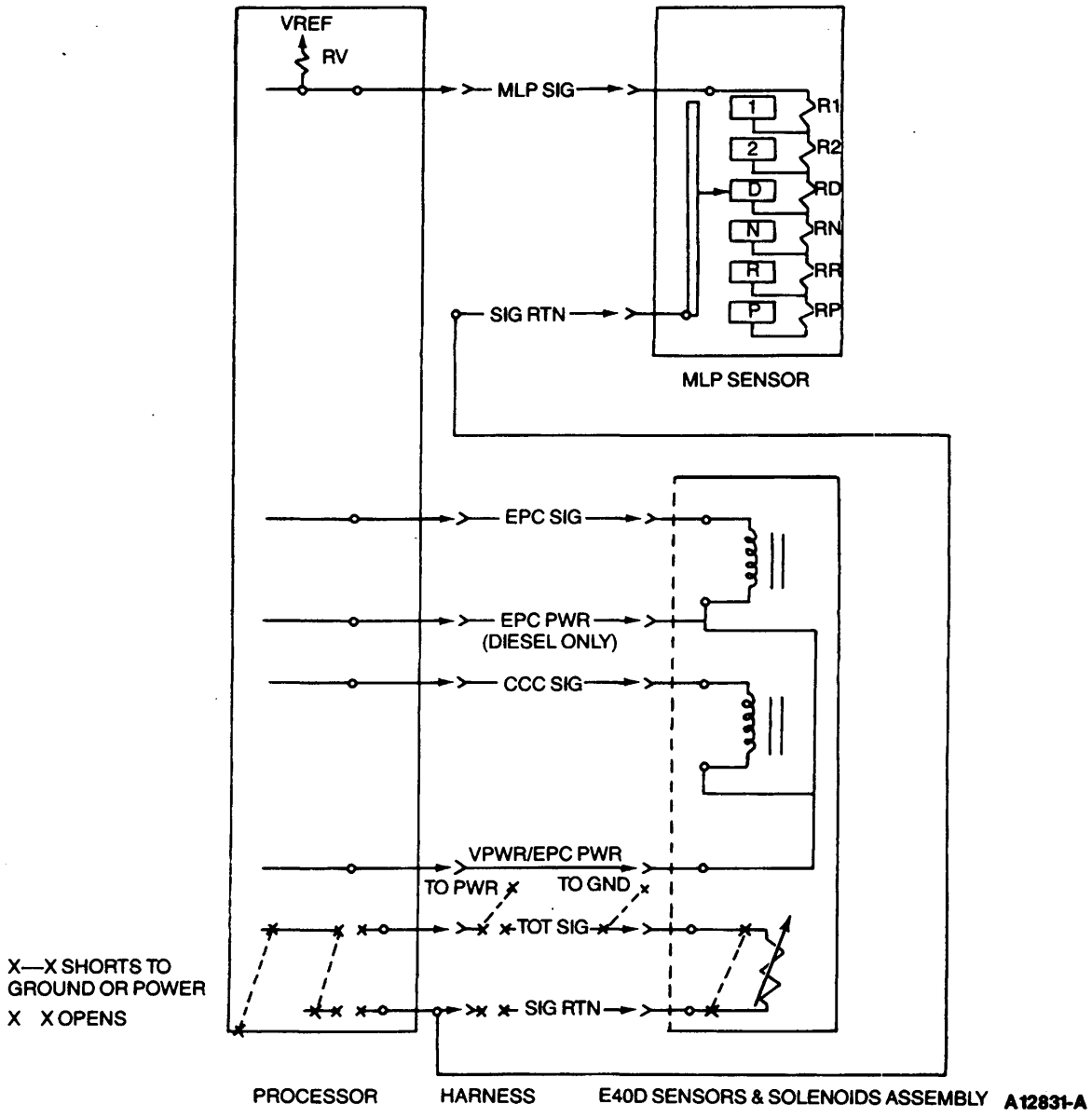
Pinpoint Test **TC**

TEST STEP	RESULT ▶	ACTION TO TAKE
TC92 CHECK CIRCUIT USING KEY ON ENGINE OFF CONTINUOUS MONITOR MODE		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: **For MLP sensor (code 67):** • Lightly tap on MLP sensor (simulate road shock). • Wiggle connector at MLP sensor. **For E4OD transmission solenoids (codes 62 or 99) and Transmission Oil Temperature (TOT) sensor (Codes 56 or 66):** • Wiggle transmission bulkhead connector. • **Is a fault indicated?**	Yes ▶ No ▶	DISCONNECT and INSPECT connectors. If terminals are good, GO to Transmission Shop Manual Group for MLP, TOT sensor(s) or E4OD solenoid service CLEAR Continuous Memory Code(s) (REFER to Quick Test Appendix). Continuous Memory Code testing is complete. GO to **TC93**.
TC93 CHECK EEC-IV VEHICLE HARNESS		
• Still in Key On Engine Off Continuous Monitor mode. • Observe VOM or STAR LED for a fault indication while performing the following: — Referring to the illustration in **TC94**, grasp the harness closest to the sensor/ transmission connector. Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel, processor, and transmission. • **Is a fault indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Code(s) (REFER to Quick Test Appendix). RERUN Quick Test. GO to **TC95**.

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Transmission — E4OD	Pinpoint Test	TC

TC94 SCHEMATIC FOR CONTINUOUS MONITOR MODE ON EEC-IV/E4OD VEHICLE HARNESS



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Transmission — E4OD | Pinpoint Test | TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC95 CHECK PROCESSOR AND HARNESS CONNECTORS		
• Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect both connector terminals for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary, damage or faults. • **Are connectors and terminals OK?**	Yes ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	SERVICE as necessary. CLEAR Continuous Memory Code(s) (REFER to Quick Test Appendix). RERUN Quick Test.
TC96 CONTINUOUS MEMORY CODES 49, 59, 69: FAULT ISOLATION		
Service Code(s) 49, 59, 69 indicates that the transmission went through four improper shifts in an upward or downward gear range (1-2 gear, 2-3 gear, or 3-4 gear and in reverse direction) consecutively over a period of drive time. When changing a gear position either the SS1 or SS2 solenoid remained On or Off an extended amount of time. Possible causes are: — Intermittent harness continuity — MLP sensor out of adjustment — Stuck shift solenoid • Rerun Key On Engine Off Self-Test. • **Do any other codes appear in Key On Engine Off Self-Test in addition to the Continuous Memory Codes 49, 59 or 69?**	Yes ▶	GO to Quick Test to service other codes.
	No ▶	GO to TC97.

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Transmission — E4OD	Pinpoint Test	TC

TEST STEP	RESULT ▶	ACTION TO TAKE
TC97 CHECK CIRCUITS USING KEY ON ENGINE OFF CONTINUOUS MONITOR MODE		
• Enter Key On Engine Off Continuous Monitor mode. Refer to Quick Test Appendix. • Observe VOM or STAR LED for indication of a fault while performing the following: — Wiggle, shake or bend a small section of the EEC-IV system vehicle harness while working your way to the dash panel, processor, and transmission bulkhead connector. • **Is a fault indicated?**	Yes ▶	DISCONNECT and INSPECT connectors and for loose wires. SERVICE as necessary. CLEAR Continuous Memory Code(s). Refer to Quick Test Appendix. Continuous Memory Code testing is completed.
	No ▶	GO to Transmission Shop Manual Group for E4OD (SS1 or SS2) transmission service.

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Integrated Controller	Pinpoint Test	X

Note

You should enter this Pinpoint Test only when service code 72, 78, 82, 83, 87, 88, 95 and 96 are received during Quick Test or if you have been directed here from Pinpoint Test [A], Pinpoint Test [C], or Diagnosis By Symptom.

Remember

To prevent the replacement of good components, be aware that the following non-EEC areas may be at fault:

- Fuel Lines
- Fuel Filters
- Contaminated Fuel
- Fuel Pump
- Ignition Switch
- Battery Cables
- Alternator
- Voltage Regulator
- Ground Straps
- A/C Clutch
- A/C Demand
- Cooling Fan Motor

This Pinpoint Test is intended to diagnose only the following:

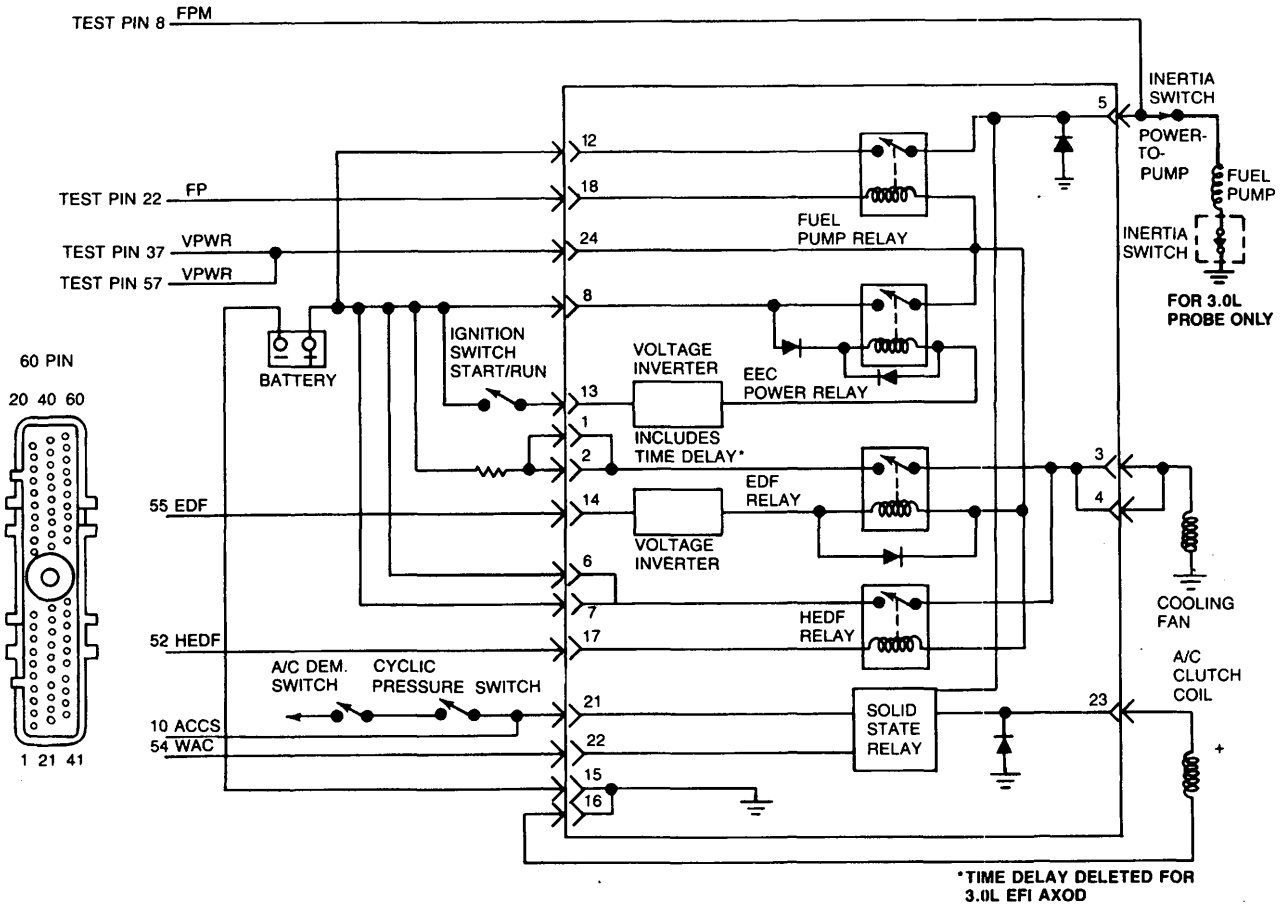
- Integrated Relay Controller Module
  - — Battery Voltage
  - — Power Relay
  - — EDF Relay
  - — HEDF Relay
  - — WAC Relay
  - — Fuel Pump Relay
- Harness circuits: VBAT, VPWR, F.P., GND and PWR to Fuel Pump(s), WAC, ACC, ACCS, Cooling Fan Power, A/C Clutch, Key PWR, PWR to Integrated Controller
- Processor Assembly (-12A650-)
- A/C Demand Switch Input

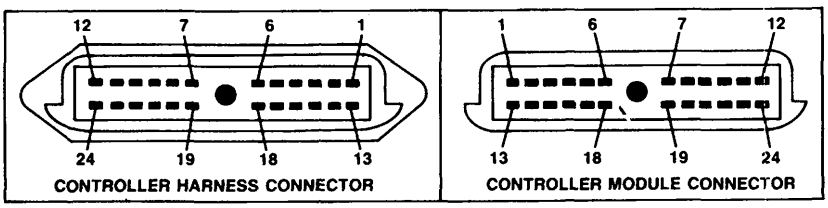
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Integrated Controller	Pinpoint Test	X

Pinpoint Test Schematic

2.5L CFI CLC, 3.0L EFI AXOD and 3.0L Probe





A9968-D

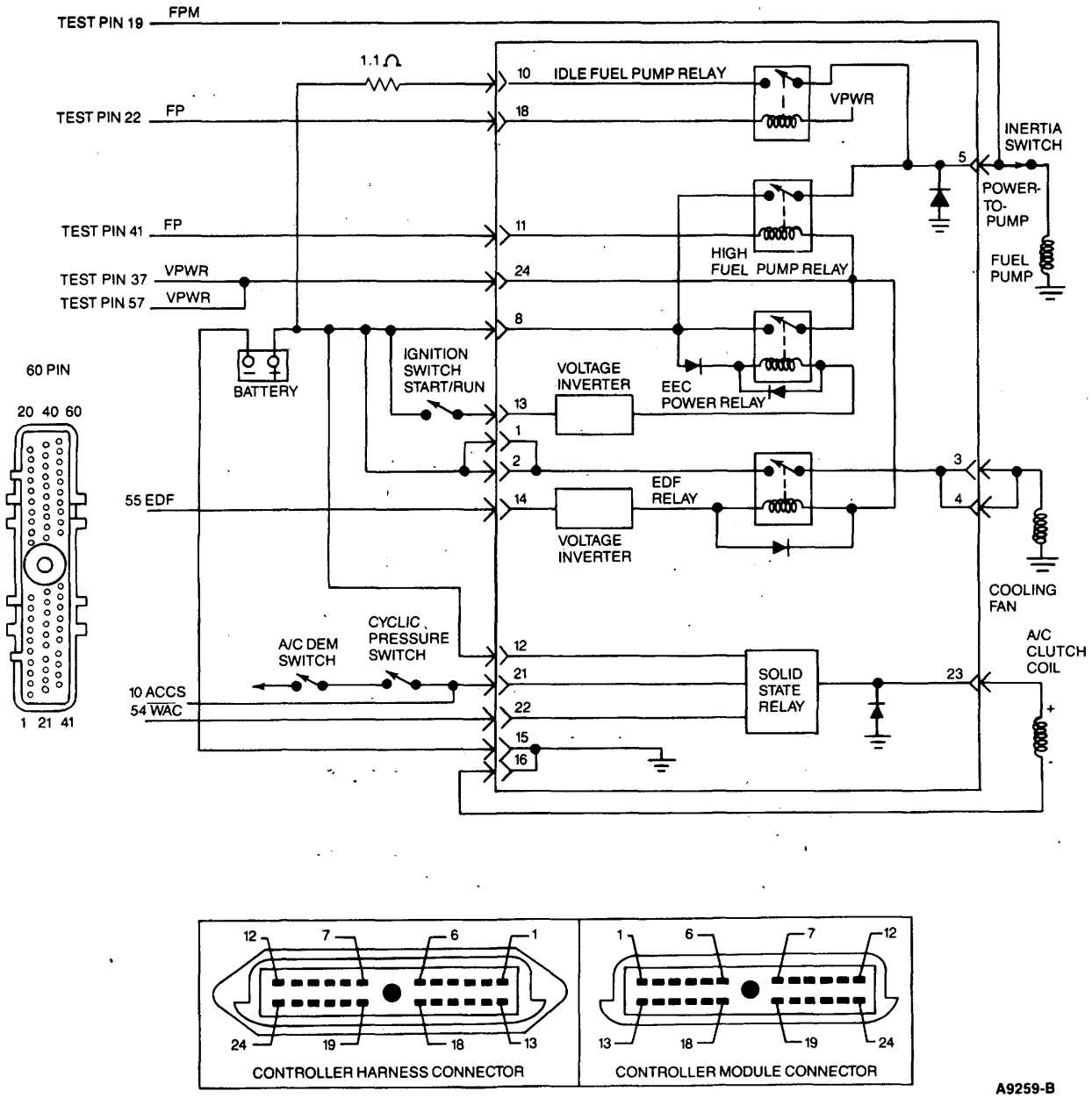
Refer to Engine Supplement Section for Test Pin Usage Chart.

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Integrated Controller	Pinpoint Test	X

Pinpoint Test Schematic

3.0L SEFI Super High Output (SHO)



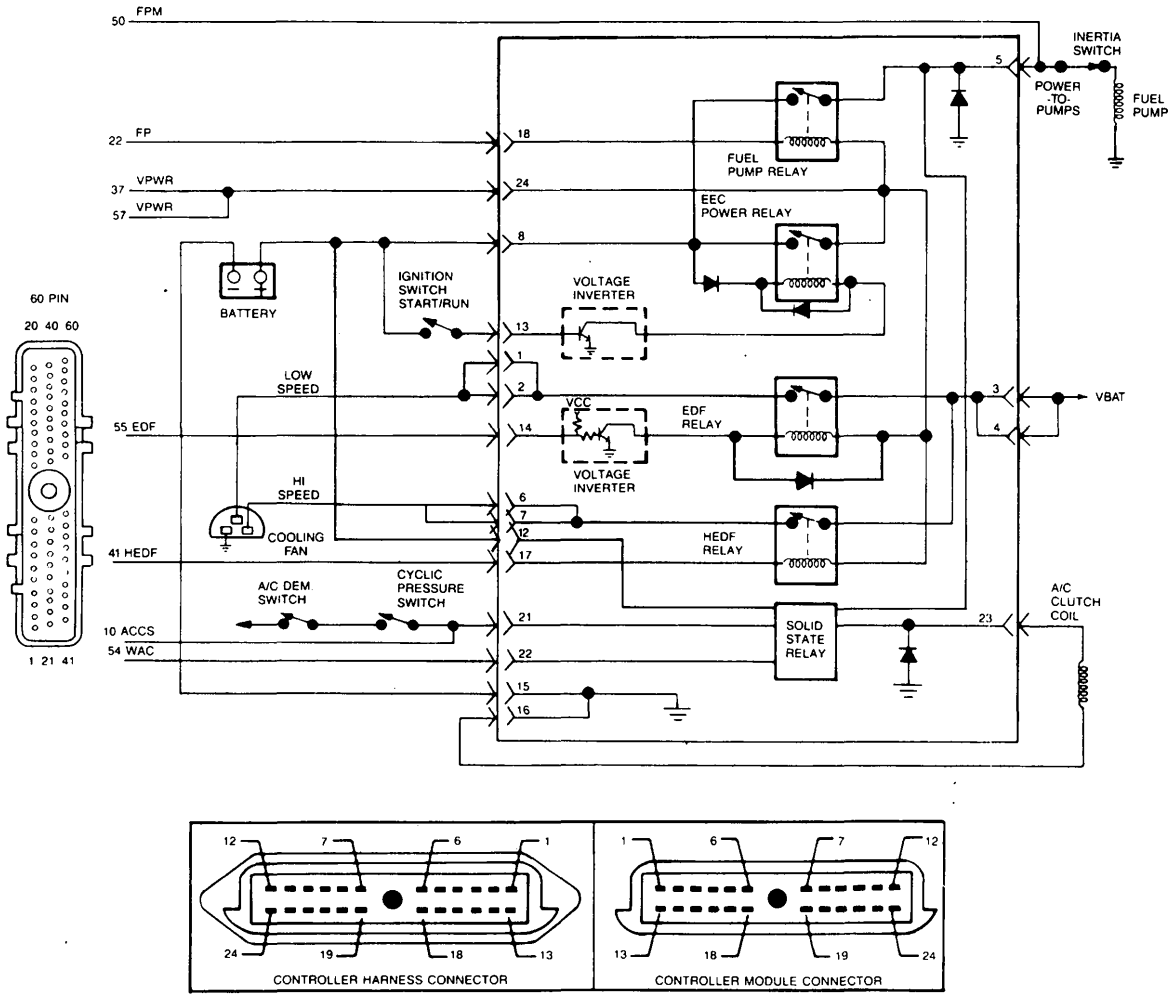
Refer to Engine Supplement Section for Test Pin Usage Chart.

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Integrated Controller	Pinpoint Test	X

Pinpoint Test Schematic

3.8L SEFI AXOD



A13612-A

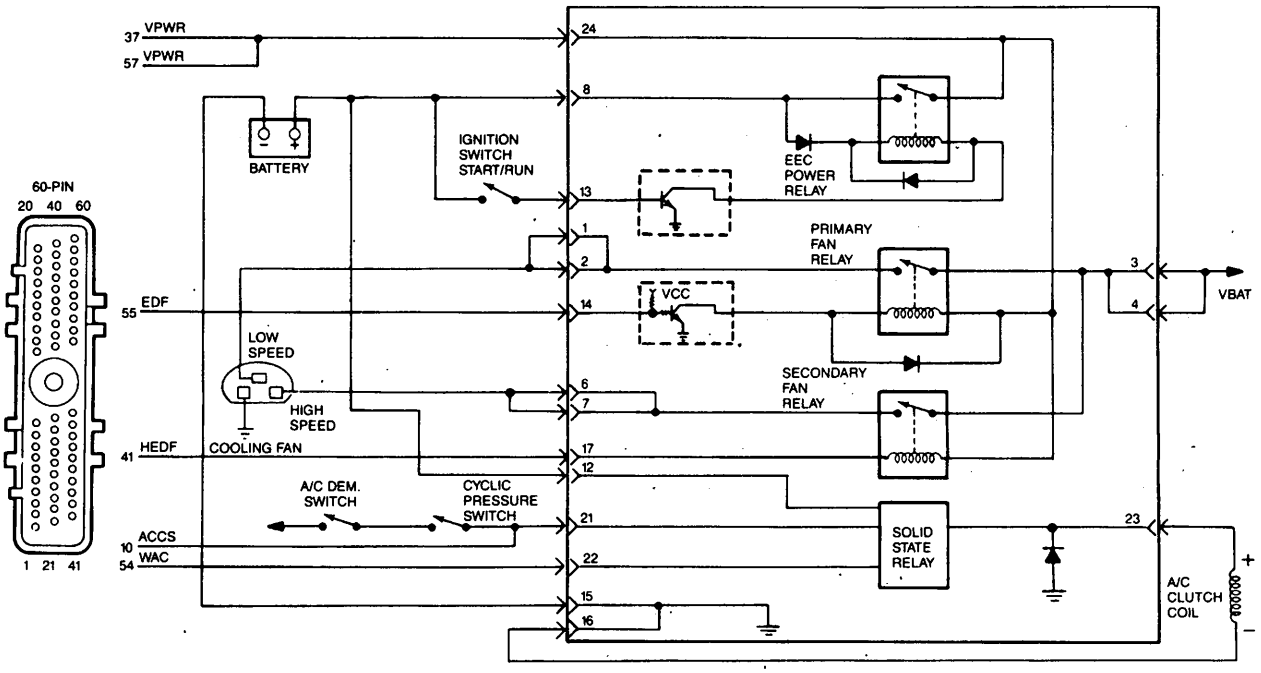
Refer to Engine Supplement Section for Test Pin Usage Chart.

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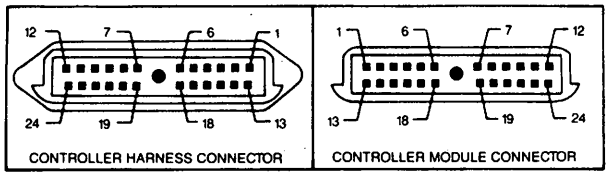
Integrated Controller	Pinpoint Test	X

Pinpoint Test Schematic

3.8L SEFI SUPERCHARGER



NOTE: FUEL PUMP RELAY LOCATED IN REAR OF VEHICLE.



A12790-B

Refer to Engine Supplement Section for Test Pin Usage Chart.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X1 CHECK BATTERY VOLTAGE • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage across battery terminals. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to **X2**. SERVICE discharged battery, REFER to Charging/Electrical Group in Shop Manual.
X2 CHECK BATTERY GROUND • Key on, engine off. • DVOM on 20 volt scale. • Measure voltage between battery negative post and SIG RTN circuit in the Self-Test connector. • **Is voltage greater than 0.5 volts?**	Yes ▶ No ▶	GO to **X3**. GO to **X6**.
X3 GROUND FAULT ISOLATION • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires etc. Service as necessary. • Install breakout box and connect processor to breakout box. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between battery negative post and Test Pins 40 and 60 at the breakout box. • **Is each voltage less than 0.5 volts?**	Yes ▶ No ▶	GO to **X4**. SERVICE open ground circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
X4 PROCESSOR GROUND FAULT ISOLATION • Key off, wait 10 seconds. • Breakout box installed, processor connected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 and Test Pins 40 and 60 at the breakout box. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **X5**. REPLACE processor. REMOVE breakout box. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X5 CHECK SIG RTN CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 46 at the breakout box and SIG RTN circuit at Self-Test connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	System OK. REMOVE breakout box. RECONNECT processor. RERUN Quick Test. SERVICE open circuit. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
X6 MEASURE VOLTAGE AND GROUND TO INTEGRATED CONTROLLER		
• Key off. • Disconnect Integrated Controller. • DVOM on 20 volt scale. • Measure voltage between pin 8 and pin 15 at the Integrated Controller vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to X7. GO to X9.
X7 CHECK KEY POWER TO INTEGRATED CONTROLLER		
• Key off. • Integrated Controller disconnected. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between Pin 13 and Pin 15 at the Integrated Controller vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to X8. SERVICE open between Pin 13 and ignition switch. RECONNECT Integrated Controller. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X8 CHECK VPWR CIRCUIT CONTINUITY		
• Key off. • Integrated Controller disconnected. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. • Measure resistance between Test Pins 37 and 57 at the breakout box and Pin 24 at the Integrated Controller vehicle harness connector. • **Is resistance greater than 5.0 ohms?**	Yes ▶ No ▶	SERVICE open in VPWR circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. REPLACE Integrated Controller. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
X9 MEASURE CONTINUITY OF POWER GROUND TO INTEGRATED CONTROLLER		
• Key off. • Integrated Controller disconnected. • DVOM on 200 ohm scale. • Measure resistance between battery negative post and Pin 15 at the Integrated Controller vehicle harness connector. • **Is resistance greater than 5.0 ohms?**	Yes ▶ No ▶	SERVICE open in battery ground to Pin 15 (Integrated Controller harness connector). RECONNECT Integrated Controller. RERUN Quick Test. SERVICE open in battery positive to Pin 8 (Integrated Controller harness connector). RECONNECT Integrated Controller. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X10 SERVICE CODE 72: CHECK VPWR CIRCUIT FOR INTERMITTENT OPEN		
Service Code 72 indicates that while Key Power was present, VPWR was interrupted or interference from electrical noises caused the processor to reset, resulting in possible stalls, high idle rpm, lack of power on acceleration or other drive symptoms. Possible Causes: — Intermittent open in VPWR circuit from integrated controller to processor. — EEC power relay intermittent malfunction. — Intermittent open in VBAT circuit to integrated controller. — Intermittent open in KEY POWER circuit to integrated controller. — EEC harness too close to the distributor spark plug wires and other vehicle harnesses. • Enter Continuous Monitor Mode (Engine Running) per Quick Test Appendix. Observe VOM or STAR LED for indication of a fault while performing the following: • Shake, bend and twist vehicle harness from Integrated Controller to the processor, to the ignition switch and to battery positive post. • **Is a fault indicated or does Code 72 reappear in Continuous Memory if Quick Test is rerun?**	Yes ▶ No ▶	CHECK for proper routing of EEC harness. SERVICE as necessary. If OK SERVICE intermittent VPWR circuit. RERUN Quick Test. INSPECT component and harness connectors of Integrated Controller and processor, for loose or damaged pins, corrosion, etc. SERVICE as necessary. If OK, ROAD TEST vehicle through a variety of drive modes. If symptom exists, REPLACE Integrated Controller, otherwise testing complete. RERUN Quick Test.
X11 CHECK POWER-TO-PUMP(S) CIRCUIT VOLTAGE		
• Key on, engine off. • Locate and disconnect fuel pump(s). • DVOM on 20 volt scale. • Measure voltage between CHASSIS GROUND and POWER-TO-PUMP(s) circuit at the fuel pump vehicle harness connector during crank mode. • **Is voltage greater than 8.0 volts during crank?**	Yes ▶ No ▶	GO to Fuel/Engine Shop Manual Group, Electric Fuel Pump Diagnosis. GO to X12.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X12 CHECK POWER-TO-PUMP(S) CIRCUIT CONTINUITY		
• Key off. • Disconnect Integrated Controller. • Fuel pump(s) disconnected. • DVOM on 200 ohm scale. • Measure resistance between Pin 5 at the Integrated Controller vehicle harness connector and POWER-TO-PUMP(s) circuit at the fuel pump vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	REPLACE Integrated Controller. RECONNECT all components. RERUN Quick Test. SERVICE open in POWER-TO-PUMP(s) circuit. RECONNECT all components. RERUN QuicK Test.
X14 CHECK POWER-TO-PUMP(S) CIRCUIT FOR SHORTS TO POWER		
• Key off. • Disconnect Integrated Controller. • Disconnect fuel pump(s). • DVOM on 200,000 ohm scale. • Measure resistance between Pin 5 and Pin 24 at the Integrated Controller vehicle harness connector. • Measure resistance between Pin 5 at the Integrated Controller vehicle harness connector and battery positive post. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE Integrated Controller. RECONNECT fuel pump. RERUN Quick Test. SERVICE short circuit. RECONNECT all components. ATTEMPT to start vehicle. If vehicle runs, RERUN Quick Test. If vehicle will not run, REPLACE Integrated Controller. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X15 SERVICE CODE 87/83: CHECK CONTINUITY OF FUEL PUMP CIRCUIT		
Service Code 87 or 83 indicates that the voltage output for the high or low fuel pump circuit did not change when activated during Key On Engine Off Self-Test. Possible causes are: — Open or grounded fuel pump circuit. — Open or grounded processor output driver. • Key off. • Disconnect Integrated Controller. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • DVOM on 200 ohm scale. **For Service Code 87 (except 3.0L SHO):** • Measure resistance between Test Pin 22 at the breakout box and Pin 18 at the Integrated Controller vehicle harness connector. **For Service Code 87 (3.0L SHO):** • Measure resistance between Test Pin 41 at the breakout box and Pin 11 at the Integrated Controller vehicle harness connector. **For Service Code 83 (3.0L SHO):** • Measure resistance between Test Pin 22 at the breakout box and Pin 18 at the Integrated Controller vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to X16. SERVICE open in fuel pump circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X16 CHECK APPROPRIATE FUEL PUMP CIRCUIT FOR SHORTS TO POWER AND GROUND		
• Key off. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohm scale. **For Service Code 87 (except 3.0L SHO):** • Measure resistance between Test Pin 22 and Test Pins 37, 57 and battery positive post and between Test Pin 22 and Test Pins 40, 60 and battery negative post. **For Service Code 87 (3.0L SHO):** • Measure resistance between Test Pin 41 and Test Pins 37, 57 and battery positive post and between Test Pin 41 and Test Pins 40, 60 and battery negative post. **For Service Code 83 (3.0L SHO):** • Measure resistance between Test Pin 22 at the breakout box and Pin 18 at the Integrated Controller vehicle harness connector. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to X17. SERVICE the appropriate fuel pump circuit shorts to power or ground. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code 87 or 83 is still present, GO to X17.
X17 CHECK FUEL PUMP RELAY COIL RESISTANCE		
• Key off. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200 ohm scale. • Measure resistance of Integrated Controller from Pin 18 to 24 or from Pin 11 to 24 as appropriate. • **Is resistance between 65 and 100 ohms?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT Integrated Controller. RERUN Quick Test. REPLACE Integrated Controller. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X18 NO HIGH OR LOW FAN		
• Key off. • Disconnect Integrated Controller. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage between battery negative post and Pins 1, 2, 6 and 7, (for 3.8L, Pins 3 and 4) respectively at the Integrated Controller vehicle harness connector. • **Is each voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to X19. SERVICE open in battery power circuit. RECONNECT Integrated Controller. RE-EVALUATE symptom.
X19 CHECK FAN MOTOR OPERATION		
• Key off. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 6 at Integrated Controller vehicle harness connector. • **Does fan run?**	Yes ▶ No ▶	**For 3.8L:** GO to X20. **For all others:** GO to X25. GO to X21.
X20 CHECK FAN MOTOR OPERATION		
• Key off. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 2 at Integrated Controller vehicle harness connector. • **Does fan run?**	Yes ▶ No ▶	GO to X25. GO to X23.
X21 MEASURE BATTERY VOLTAGE SUPPLY AT FAN — BYPASSING INTEGRATED CONTROLLER		
• Key off. • Disconnect cooling fan. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 6 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage at cooling fan vehicle harness connector. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	REPLACE fan motor. RECONNECT Integrated Controller. RE-EVALUATE symptom. GO to X22.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X22 VERIFY COOLING FAN GROUND		
• Key off. • Cooling fan disconnected. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 6 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage between voltage positive at cooling fan vehicles harness connector and battery negative post. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	SERVICE open in ground circuit to fan. RECONNECT all components. RE-EVALUATE symptom. SERVICE open in power-to-fan circuit from Pin 3 and Pin 4 (for 3.8L, Pin 6 and Pin 7) of Integrated Controller vehicle harness connector to cooling fan vehicle harness connector. RECONNECT all components. RE-EVALUATE symptom.
X23 MEASURE BATTERY VOLTAGE SUPPLY AT FAN-BYPASSING INTEGRATED CONTROLLER		
• Key off. • Disconnect cooling fan. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 2 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage at cooling fan vehicle harness connector. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	REPLACE fan motor. RECONNECT Integrated Controller. RE-EVALUATE symptom. GO to **X24**.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X24 VERIFY COOLING FAN GROUND		
• Key off. • Cooling fan disconnected. • Integrated Controller disconnected. • Jumper Pin 3 to Pin 2 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage between voltage positive at cooling fan vehicle harness connector and battery negative post. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	SERVICE open in ground circuit to fan. RECONNECT all components. RE-EVALUATE symptom. SERVICE open in power-to-fan circuit from Pin 1 and Pin 2 of Integrated Controller vehicle harness connector to cooling fan vehicle harness connector. RECONNECT all components. RE-EVALUATE symptom.
X25 CHECK FAN RUNNING MODE (LOW)		
• Key off. • Disconnect processor. • Reconnect Integrated Controller. • Key on, engine off. • **Does fan run at low speed?**	Yes ▶ No ▶	GO to **X26**. REPLACE Integrated Controller. RECONNECT processor. RE-EVALUATE symptom.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X26 JUMPER HIGH ELECTRIC-DRIVE SIGNAL (HEDF) TO GROUND		
• Key off. • Inspect processor 60 pin connector for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary • Install breakout box, leave processor disconnected. • Integrated Controller connected. • Key on, engine off. • **For 3.8L:** — Jumper Test Pin 41 to Test Pin 40 at breakout box. • **For all others:** — Jumper Test Pin 52 to Test Pin 40 at breakout box. • **Does fan speed change from low to high?**	Yes ▶ No ▶	GO to X27 . REPLACE Integrated Controller. REMOVE breakout box. RECONNECT processor. RE-EVALUATE symptom.
X27 CHECK ECT SENSOR		
• Key off, wait 10 seconds. • Breakout box installed. • Connect processor to breakout box. • Check engine coolant level. • Warm engine to operating temperature before taking ECT resistance measurement. • Key off, wait 10 seconds. • Disconnect ECT sensor. • DVOM on 200,000 ohm scale. • Measure resistance of the ECT sensor. • **Is the resistance between 1500 ohms and 2000 ohms?**	Yes ▶ No ▶	**For 3.8L SEFI SC:** GO to X28 . **For all others:** REPLACE processor. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom. REPLACE ECT sensor. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X28 CHECK A/C PRESSURE SWITCH HARNESS CONTINUITY		
• Key off. • Breakout box installed, processor connected. • Disconnect A/C pressure switch. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 2 at the breakout box and A/C pressure circuit at switch vehicle harness connector. • Measure resistance between Test Pin 46 at the breakout box and SIG RTN circuit at the switch vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	GO to X29. SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
X29 VERIFY HEDF OPERATION		
• Key off. • Breakout box installed, processor connected. • A/C pressure switch disconnected. • Jumper A/C pressure circuit to SIG RTN circuit at the switch vehicle harness connector. • Key on. • **Is HEDF on?**	Yes ▶ No ▶	REPLACE A/C PRESSURE switch. RE-EVALUATE symptom. REPLACE processor. REMOVE breakout box. RERUN Quick Test.
X30 SERVICE CODE 83: CHECK HEDF CONTROLLER RESISTANCE		
Service Code 83 indicates a High Electro Drive Fan (HEDF)/circuit failure. • Key off. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Pin 17 and Pin 24 at the Integrated Controller. • **Is resistance between 50 ohms and 100 ohms?**	Yes ▶ No ▶	GO to X31. REPLACE Integrated Controller. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X31 CHECK HEDF CIRCUIT CONTINUITY		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Integrated Controller disconnected. • DVOM on 200 ohm scale. **For 3.8L:** — Measure resistance between Test Pin 41 at the breakout box and Pin 17 of the Integrated Controller vehicle harness connector. **For all others:** — Measure resistance between Test Pin 52 at breakout box and Pin 17 of Integrated Controller vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to **X32**. SERVICE open in HEDF circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
X32 CHECK HEDF CIRCUIT FOR SHORTS TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohm scale. **For all 3.8L:** — Measure resistance between Test Pin 41 and Test Pin 40 at the breakout box. **For all others:** — Measure resistance between Test Pin 52 and Test Pin 40 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **X33**. SERVICE short to ground in HEDF circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X33 CHECK HEDF CIRCUIT FOR SHORTS TO POWER		
• Key off. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohms scale. **For 3.8L:** — Measure resistance between Test Pin 41 and Test Pin 37 at the breakout box. **For all others:** — Measure resistance between Test Pin 52 and Test Pin 37 at the breakout box. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE Processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. SERVICE short to power. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. If code 83 is still present, REPLACE processor. RERUN Quick Test.
X35 LOW SPEED FAN ALWAYS ON		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure the resistance between Test Pin 55 at the breakout box and Pin 14 at the Integrated Controller vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	GO to X36. SERVICE open in EDF circuit. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.
X36 CHECK EDF CIRCUIT FOR SHORTS TO POWER		
• Key off. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 55 and Test Pin 37 and between Test Pin 55 and battery positive post. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to X37. SERVICE short to power in EDF circuit. GO to X37.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X37 CHECK EDF FOR SHORT TO GROUND		
• Key on, engine off. • Breakout box installed, processor disconnected. • Connect Integrated Controller. • Jumper Test Pin 55 to Test Pin 40 or 60 at the breakout box. • **Does fan continue to run?**	Yes ▶ No ▶	REPLACE controller. REMOVE breakout box. RECONNECT processor. RE-EVALUATE symptom. REPLACE processor. REMOVE breakout box. RECONNECT controller. REEVALUATE symptom.
X38 CHECK A/C PRESSURE SWITCH INPUT		
• Key off. • Disconnect A/C pressure switch. • Key on, engine off. • **Does fan still run?**	Yes ▶ No ▶	RECONNECT A/C pressure switch. GO to **X39**. REPLACE the A/C pressure switch. RE-EVALUATE symptom.
X39 CHECK A/C PRESSURE SWITCH CIRCUIT FOR SHORTS TO GROUND		
• Key on. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 2 and Test Pins 40, 46 and 60 at the breakout box. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to **X35**. SERVICE short circuit. REMOVE breakout box. RECONNECT all components. RE-EVALUATE the symptom.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X40 CHECK FAN VOLTAGE • Key off. • Disconnect Integrated Controller. • DVOM on 20 volt scale. • Measure voltage between battery negative post and Pins 1 and 2 at the Integrated Controller vehicle harness connector. • **Is each voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to X41. SERVICE open in battery power circuit. RECONNECT Integrated Controller. RE-EVALUATE symptom.
X41 CHECK FAN MOTOR OPERATION • Key off. • Integrated Controller disconnected. • Jumper Pin 1 to Pin 3 at Integrated Controller vehicle harness connector. • **Does fan run?**	Yes ▶ No ▶	GO to X42. GO to X43.
X42 CHECK FAN RUNNING MODE • Key off. • Disconnect processor. • Connect Integrated Controller. • Key on, engine off. • **Does fan run?**	Yes ▶ No ▶	GO to X46. GO to X44.
X43 MEASURE BATTERY VOLTAGE SUPPLY AT FAN — BYPASSING INTEGRATED CONTROLLER • Key off. • Disconnect cooling fan. • Integrated Controller disconnected. • Jumper Pin 1 to Pin 3 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage at cooling fan vehicle harness connector. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	REPLACE FAN. RECONNECT all components. RE-EVALUATE symptom. GO to X45.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X44 CHECK EDF CIRCUIT FOR SHORT TO GROUND		
• Key off. • Processor and Integrated Controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance from Pin 14 to Pin 15 at Integrated Controller vehicle harness connector. • **Is resistance greater than 10,000 ohms?**	Yes ▶ No ▶	REPLACE Integrated Controller. RECONNECT processor. RE-EVALUATE symptom. SERVICE short to ground in EDF circuit. RECONNECT all components. RE-EVALUATE symptom.
X45 VERIFY COOLING FAN GROUND		
• Key off. • Cooling fan disconnected. • Integrated Controller disconnected. • Jumper Pin 1 to Pin 3 at Integrated Controller vehicle harness connector. • DVOM on 20 volt scale. • Measure voltage between voltage positive at cooling fan vehicle harness connector and negative battery post. • **Is voltage greater than 8.0 volts?**	Yes ▶ No ▶	SERVICE open in ground circuit to fan. RECONNECT all components. RE-EVALUATE symptom. SERVICE open in power-to-fan circuit from Pin 3 and Pin 4 of Integrated Controller vehicle harness connector to cooling fan vehicle harness connector. RECONNECT all components. RE-EVALUATE symptom.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X46 CHECK ECT SENSOR		
• Key off. • Reconnect processor. • Check engine coolant level. • Warm engine to operating temperature before taking ECT resistance measurement. • Key off, wait 10 seconds. • Disconnect ECT sensor. • DVOM on 200,000 ohm scale. • Measure resistance of the ECT sensor. • **Is the resistance between 1500 ohms and 2000 ohms?**	Yes ▶ No ▶	REPLACE processor. RECONNECT ECT sensor. RE-EVALUATE symptom. REPLACE ECT sensor. RECONNECT all components. RE-EVALUATE symptom.
X50 CHECK FOR VOLTAGE AT A/C CLUTCH		
• Disconnect A/C clutch. • Key on, engine off. • A/C demand switch to A/C ON position. • Start engine. • DVOM on 20 volt scale. • Check voltage at A/C clutch vehicle harness connector. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to Ventilating/ Climate Control Shop Manual Group, A/C Diagnosis. GO to X51.
X51 CHECK FOR CONTINUITY FROM INTEGRATED CONTROLLER TO A/C CLUTCH		
• Key off. • A/C clutch disconnected. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Pin 23 of the Integrated Controller vehicle harness connector and power side of the A/C clutch vehicle harness connector and between Pin 16 of the Integrated Controller vehicle harness connector and ground side of the A/C clutch vehicle harness connector. • **Is each resistance less than 5 ohms?**	Yes ▶ No ▶	RECONNECT Integrated Controller. GO to X52. SERVICE open in power to A/C clutch or ground to A/C clutch. RECONNECT Integrated Controller. RE-EVALUATE symptom.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X52 ENTER OUTPUT STATE CHECK (REFER TO QUICK TEST APPENDIX) **NOTE: Do not use STAR tester for this Step, use VOM/DVOM.** • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box and connect processor to breakout box. • Disconnect electrical connector on the speed control servo; if so equipped. • DVOM on 20 volt scale. • Connect DVOM negative test lead to STO and positive test lead to battery positive. • Jumper STI to SIGNAL RETURN. • Perform Key On Engine Off Self-Test until the completion of the Continuous Test Codes. • DVOM will indicate zero volts. • Depress and release the throttle. • **Did DVOM reading change to a high voltage reading?**	Yes ▶ No ▶	REMAIN in Output State Check. GO to X53. DEPRESS throttle to WOT and RELEASE. If STO voltage does not go high, LEAVE equipment hooked up and GO to Pinpoint Test Step QC1.
X53 CHECK WAC OUTPUT FOR PROPER ELECTRICAL OPERATION • Key on, engine off. • A/C demand switch to A/C ON position. • Breakout box installed, processor connected. • DVOM on 20 volt scale. • Connect DVOM positive test lead to Test Pin 37 and negative test lead to Test Pin 54 at the breakout box. • While observing DVOM, depress and release the throttle several times. • **Does voltage output change?**	Yes ▶ No ▶	GO to X54. GO to X57.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X54 CHECK FOR VOLTAGE AT A/C CLUTCH SWITCH		
• Key on, engine off. • A/C demand switch to A/C ON position. • DVOM on 20 volt scale. • Breakout box installed, processor connected. • Measure voltage between Test Pin 10 and Test Pin 40 at the breakout box. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	GO to X55. GO to X56.
X55 CHECK CONTINUITY OF ACCS CIRCUIT TO INTEGRATED CONTROLLER		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 10 at the breakout box and Pin 21 at the Integrated Controller vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶ No ▶	REPLACE Integrated Controller. REMOVE breakout box. RECONNECT processor. RE-EVALUATE symptom. SERVICE open in ACCS circuit. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.
X56 CHECK ACCS CIRCUIT CONTINUITY		
• Key off, wait 10 seconds. • Breakout box installed, processor connected. • A/C demand switch to A/C ON position. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 10 at the breakout box and A/C demand switch. • **Is resistance less than 5 ohms?**	No ▶ Yes ▶	SERVICE open in circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. EEC-IV system OK. REMOVE breakout box. RECONNECT all components. REFER to Ventilation/Climate Control Shop Manual Group for A/C diagnosis.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X57 CHECK CONTINUITY IN WAC TO INTEGRATED CONTROLLER CIRCUIT		
• Key off, wait 10 seconds. • Breakout box installed. • Disconnect processor. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 54 at the breakout box and Pin 22 at Integrated Controller harness. • **Is resistance less than 50 ohms?**	No ▶ Yes ▶	SERVICE open in WAC circuit. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom. GO to X58.
X58 CHECK WAC CIRCUIT FOR SHORTS TO GROUND		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 54 and Test Pin 40 and between Test Pin 54 and Test Pin 46 and between Test Pin 54 and battery negative post. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to X59. SERVICE shorts to ground in WAC circuit. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.
X59 CHECK WAC CIRCUIT FOR SHORTS TO POWER		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 54 and Test Pin 37 and between Test Pin 54 and battery positive. • **Is each resistance greater than 10,000 ohms?**	Yes ▶ No ▶	GO to X60. SERVICE short to power in WAC circuit. REMOVE breakout box. RECONNECT all components. GO to X60.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X60 CHECK FOR VOLTAGE AT A/C CLUTCH		
• Key off, wait 10 seconds. • Breakout box installed, processor disconnected. • Connect Integrated Controller. • Disconnect A/C clutch. • A/C demand switch to A/C ON position. • DVOM on 20 volt scale. • Key on, engine off. • Measure voltage at A/C clutch harness connection. • **Is voltage greater than 10.5 volts?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom. REPLACE Integrated Controller. REMOVE breakout box. RECONNECT all components. RE-EVALUATE symptom.
X80 SERVICE CODE 88: CHECK EDF PROCESSOR SIGNAL TO INTEGRATED CONTROLLER FOR SHORTS TO GROUND		
For fan always on with Code 88: GO to X82. **For all others:** • Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, and loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 55 and Test Pin 40 at the breakout box. • **Is resistance less than 10,000 ohms?**	Yes ▶ No ▶	SERVICE short to ground in EDF circuit. RECONNECT all components. RERUN Quick Test. GO to X81.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X81 CHECK FAN RUNNING MODE		
• Key off. • Breakout box installed, processor disconnected. • Connect integrated controller. • Key on, engine off. • **Does fan run at low speed?**	Yes ▶	REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
	No ▶	REPLACE Integrated Controller. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
X82 FAN ALWAYS ON WITH CODE 88: CHECK EDF PROCESSOR SIGNAL TO INTEGRATED CONTROLLER CONTINUITY		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, and loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Test Pin 55 at the breakout box and Pin 14 at the Integrated Controller vehicle harness connector. • **Is resistance less than 5 ohms?**	Yes ▶	GO to **X83**.
	No ▶	SERVICE open in EDF circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
X83 CHECK EDF CIRCUIT FOR SHORTS TO POWER		
• Key off. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200,000 ohm scale. • Measure resistance between Test Pin 55 and Test Pin 37, and between Test Pin 55 and battery positive. • **Is each resistance less than 10,000 ohms?**	Yes ▶	SERVICE short to power in EDF circuit, then GO to **X84**.
	No ▶	GO to **X84**.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X84 CHECK EDF CIRCUIT FOR SHORTS TO GROUND		
• Key off. • Breakout box installed, processor disconnected. • Connect Integrated Controller. • Key on, engine off. • Jumper Test Pin 55 to Test Pin 40 or 60 at the breakout box. • **Does fan continue to run?**	Yes ▶ No ▶	REPLACE Integrated Controller. REMOVE breakout box. RECONNECT all components. RERUN Quick Test. REPLACE processor. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
X90 SERVICE CODE 95: CHECK INERTIA SWITCH		
Key On Engine Off Service Code 95 indicates that one of the following has occurred: — Open circuit in or between the fuel pump and FPM circuit (see schematic) — Poor fuel pump ground — FUEL PUMP circuit short to power — Fuel pump relay contacts always closed • Key off, wait 10 seconds. • Locate and disconnect fuel pump inertia switch. • DVOM on 200 ohm scale. • Measure resistance of the fuel pump inertia switch. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	RECONNECT inertia switch. GO to X91. REPLACE or RESET inertia switch. RERUN Quick Test.
X91 VERIFY THAT FUEL PUMP IS OFF		
• Key off. • Listen for motor noise from fuel pump. • **Is fuel pump off?**	Yes ▶ No ▶	GO to X93. GO to X92.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X92 CHECK FOR FUEL PUMP RELAY ALWAYS CLOSED		
• Key off. • Locate and disconnect Integrated Controller. • **Does fuel pump shut off when Integrated Controller is disconnected?**	Yes ▶	REPLACE Integrated Controller. RERUN Quick Test
	No ▶	SERVICE short to power in POWER-TO-PUMP/FPM circuit. RECONNECT Integrated Controller. RERUN Quick Test.
X93 CHECK FPM CIRCUIT CONTINUITY		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between FPM circuit at the breakout box and Pin 5 at the Integrated Controller vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶	GO to X94.
	No ▶	SERVICE open circuit. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
X94 CHECK FOR CONTINUITY BETWEEN FPM CIRCUIT AND GROUND		
• Key off. • Breakout box installed, processor disconnected. • Integrated Controller disconnected. • DVOM on 200 ohm scale. • Measure resistance between FPM circuit at the breakout box and battery negative post. • **Is resistance less than 5.0 ohms?**	Yes ▶	REPLACE processor. REMOVE breakout box. RECONNECT Integrated Controller. RERUN Quick Test.
	No ▶	REMOVE breakout box. RECONNECT all components. GO to Fuel/Engine Shop Manual Group, Electric Fuel Pump for open in Power-To-Pump circuit, poor fuel pump ground, open in fuel pump, etc.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X95 SERVICE CODE 96: CHECK POWER-TO-PUMP(S) CIRCUIT CONTINUITY		
Service Code 96 indicates that when the fuel pump is being activated, power is not being supplied to the fuel pump. • Key off, wait 10 seconds. • Disconnect processor 60 pin connector. Inspect for damaged pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between the FPM circuit at the breakout box and Pin 5 at the Integrated Controller vehicle harness connector. • **Is resistance less than 5.0 ohms?**	Yes ▶ No ▶	GO to X96. SERVICE open in POWER-TO-PUMP circuit between FPM splice and the Integrated Controller. REMOVE breakout box. RECONNECT all components. RERUN Quick Test.
X96 CHECK FUEL PUMP OPERATION		
• Key off. • Breakout box installed. • Connect processor to breakout box. • Connect Integrated Controller. • DVOM on 20 volt scale. • Connect DVOM between FPM circuit and Test Pin 40 at the breakout box. • While observing DVOM, turn key to on. • **Does voltage increase to greater than 9.8 volts for about 1 second after key is turned to on?**	Yes ▶ No ▶	REPLACE processor. REMOVE breakout box. RERUN Quick Test. REPLACE Integrated Controller. REMOVE breakout box. RECONNECT processor. RERUN Quick Test.
X97 MEASURE IDLE FUEL PUMP RELAY POWER CIRCUIT CONTINUITY		
Service Code 59 indicates the idle fuel pump is not receiving the appropriate supplied voltage. • Key off. • Disconnect Integrated Controller. • DVOM on 200 ohm scale. • Measure resistance between Pin 10 at the Integrated Controller vehicle harness connector and battery positive post. • **Is resistance between 1.0 and 1.2 ohms?**	Yes ▶ No ▶	GO to X95. SERVICE Idle Fuel Pump circuit. RECONNECT Integrated Controller. RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X100 CONTINUOUS MEMORY CODE 95: CHECK EEC-IV HARNESS		
A Continuous Memory Code 95 indicates that one of the following intermittent conditions has occurred: — Open circuit in or between the fuel pump and FPM circuit in the processor (see schematic [X]). — Poor fuel pump ground. • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off). — Shake, wiggle, bend the power-to-pump circuit between the Integrated Controller Pin 5 and the fuel pump. — Shake, wiggle, bend the fuel pump ground circuit from the fuel pump to ground. — Lightly tap the inertia switch and the fuel pump to simulate road shock. • Key off. • Inspect the fuel pump electrical connector and the fuel pump ground for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Code 95 (REFER to Quick Test Appendix). RERUN Quick Test. GO to [X101] .

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X101 CHECK FPM CIRCUIT		
• Key off. • Disconnect processor 60 pin connector. Inspect for damaged or pushed out pins, corrosion, loose wires, etc. Service as necessary. • Install breakout box, leave processor disconnected. • Connect a test lamp between FPM circuit and Test Pin 37 at the breakout box. • Key on, engine off. • Observe test lamp for an indication of a fault while performing the following (The light will go out when a fault is found indicating an open): — Shake, wiggle, bend the fuel pump monitor circuit (Pin 8) between the processor and splice into the POWER-TO-PUMP(s) circuit. • **Is fault found/indicated?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. REMOVE breakout box. RECONNECT processor. CLEAR Continuous Memory Code 95 (REFER to Quick Test Appendix). RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor Box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.
X102 CONTINUOUS MEMORY CODE 59 or 96: CHECK FOR CONTINUOUS MEMORY CODE 83 or 87		
• **Is Continuous Memory Code 83 or 87 also present?**	Yes ▶ No ▶	GO to **X104**. GO to **X103**.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X103 CHECK EEC-IV HARNESS		
A Continuous Memory Code 59 or 96, without the presence of a Continuous Memory Code 83 or 87, indicates that during vehicle operation, one of the following has occurred: — Fuel pump relay contacts opened. — Open in the POWER-TO-PUMP(s) circuit from the Integrated Controller Pin 5 to the FPM splice. (See schematic [X]). • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off): — Shake, wiggle, bend the POWER-TO-PUMP circuit from the Integrated Controller to the FPM splice. — Lightly tap the Integrated Controller (to simulate road shock). • Key off. • Inspect the Integrated Controller 24 pin connectors for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶ No ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test. Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor Box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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Integrated Controller	Pinpoint Test	X

TEST STEP	RESULT ▶	ACTION TO TAKE
X104 CONTINUOUS MEMORY CODE 83 or 87: CHECK EEC-IV HARNESS		
A Continuous Memory Code 83 or 87 indicates that one of the following intermittent conditions has occurred: — Open VPWP circuit in the Integrated Controller. — Open coil in fuel pump relay. — Open in fuel pump primary circuit. • Start engine. • Check for engine stall/stumble while performing the following (also, if possible, listen for fuel pump turning off): — Shake, wiggle, bend the EEC-IV Harness fuel pump circuit (Pin 22) between the processor and the Integrated Controller (Pin 18). or: — Shake, wiggle, bend the EEC-IV harness fuel pump circuit (Pin 41) between the processor and the Integrated Controller (Pin 11). — Lightly tap the Integrated Controller (to simulate road shock). • Key off. • Inspect the processor 60 pin connectors and the Integrated Controller 24 pin connector for corrosion, damaged pins, etc. • **Is fault indicated/found?**	Yes ▶	ISOLATE fault and SERVICE as necessary. CLEAR Continuous Memory Service Code(s) (REFER to Quick Test Appendix). RERUN Quick Test.
	No ▶	Unable to duplicate and/or identify fault at this time. For further diagnosis using the EEC-IV Monitor Box, REFER to Section 18 EEC-IV Monitor Box: Intermittent Fault Diagnosis. All others, CLEAR Continuous Memory (REFER to Quick Test Appendix). RERUN Quick Test.

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SECTION 18

EEC-IV Monitor Box: Intermittent Fault Diagnosis

Contents

Diagnostic Flowchart 18-1

Introduction 18-2

Step 1: Visual Check 18-3

Step 2: Vehicle Preparation 18-3

Step 3: Equipment Set-up 18-3

Step 4: Power Check 18-4

Step 5: Monitor Preliminary Check 18-4

Step 6: EEC-IV Power Checks 18-4

Step 7: EEC-IV Ground Checks 18-5

Step 8: Symptom Charts 18-6

Step 9: Road Test 18-21

Step 10: Analyzing Data 18-23

Appendix:

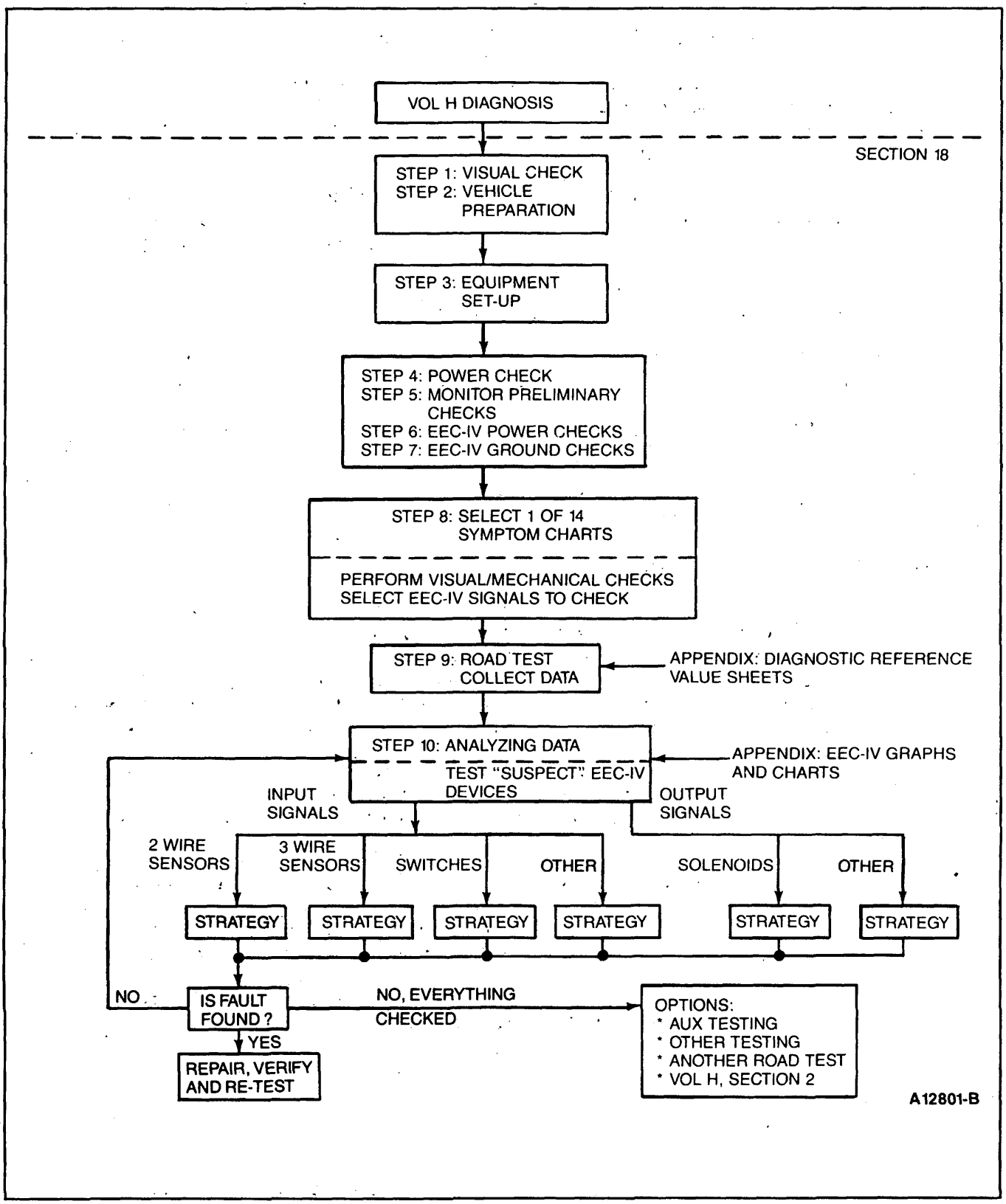
Methods of EEC-IV Monitor Measurements 18-27

Diagnostic Reference Value Sheets 18-30

EEC-IV Graphs & Charts 18-56

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EEC-IV MONITOR: Diagnostic Flowchart



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EEC-IV MONITOR: Introduction

DEFINING INTERMITTENT DRIVEABILITY SYMPTOMS

The EEC-IV Monitor* and the EEC-IV Monitor Recorder* are useful tools for diagnosing intermittent driveability symptoms which are unable to be resolved through the diagnostics in Section 17 Pinpoint testing. This section supports diagnostic procedures and data using the Monitor and Recorder in a symptom-oriented manner.

By definition 'intermittent' is a randomly occurring drive symptom for which no hard codes (KOEO, KOER) are revealed by the STAR tester. Often the Quick Test results in "Pass Codes" while the drive symptom still exists. Other results, such as Continuous Memory Codes, will also apply to the scope of this section.

Before proceeding with the following procedure, be sure that:

- Customary mechanical system tests and inspections reveal nothing. (Remember, mechanical component problems can make a good EEC system react abnormally.)
- Quick Test (Section 14) and associated Pinpoint diagnosis (Section 17) have been completed, but the symptom is still occurring.
- Review of Ford Technical Service Bulletins (TSB's) and inquiry into OASIS turns up no applicable articles.

PURPOSE OF THIS SECTION

The Monitor and Recorder function as a 'window' into the EEC-IV system. Through this 'window' the user is able to view the same sensor values and signals the EEC-IV module is outputting to the actuators. The EEC-IV module uses these values to make decisions which increase engine performance. The Monitor displays these values for both engine off (KOEO) and engine running conditions (KOER). The advantage of the Recorder is the ability to take a 'snapshot' of selected EEC-IV signals which can be stored and reviewed simultaneously.

A basic working knowledge of the EEC-IV system is critical to efficient troubleshooting of the symptom. No diagnostic procedure can account for all the possibilities which can be encountered, therefore this diagnostic procedure only attempts to provide basic steps and methods for isolating possible causes.

The diagnostic procedure used in this section is a symptom-based approach to isolating the faulty system, circuit or sensor. Often a mechanical fault will cause a good EEC-IV system to react abnormally. In those cases, the use of a Monitor with this diagnostic procedure will enhance the opportunity to eliminate possible EEC-IV faults and also locate mechanical faults.

*** NOTE: In this section, the EEC-IV Monitor and EEC-IV Monitor Recorder will be referred to as Monitor and Recorder, respectively.**

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EEC-IV MONITOR: Visual Check, Vehicle Preparation and Equipment Set-up

Step 1-3

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 1 VISUAL CHECK		
• Check vacuum hoses for damage and proper connection. • Check EEC-IV system wiring harness for proper connections. **NOTE: If additional information is required on Visual Check, refer to Section 14 Quick Test Appendix.** • **Are all visual checks OK?**	Yes ▶ No ▶	GO to Step [2]. SERVICE as necessary.
STEP 2 VEHICLE PREPARATION		
• Apply parking brake. • Place shift lever firmly in PARK (NEUTRAL for manual transmissions). • Block drive wheels. • Turn off all electrical loads. • Start engine and run until at operating temperature. (ECT = .6V or 200°F) **NOTE: If additional information is required for Vehicle Preparation, refer to Section 14 Quick Test Appendix.** • **Is vehicle prepared for Equipment Set-up?**	Yes ▶ No ▶	GO to Step [3]. REPEAT Step [2]. **NOTE: If engine does not start or stalls after starting, continue to Step [3].**
STEP 3 EQUIPMENT SET-UP		
• Perform KOEO Self-Test and check for Continuous Memory Codes. These codes must be recorded before disconnecting the EEC-IV harness, otherwise they could be erased. • Key off. • Install Monitor using 10mm wrench or nutdriver. Refer to installation procedure in Monitor Manuals, if needed. • Select proper Monitor overlay card for the appropriate engine. • If a Recorder is available, do not install at this time. • **Is Monitor installed and the connecting cable safely routed away from moving parts and ignition components?**	Yes ▶ No ▶	Proceed with Step [4], Power and Ground Checks. REPEAT Step [3].

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EEC-IV MONITOR: Monitor and EEC-IV Power and Ground Checks

Step 4-6

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 4 POWER CHECK		
• Key off, Monitor power switch Off. • **Is KAPWR (pin 1) green light on?**	Yes ▶ No ▶	GO to Step [5]. REPAIR battery or KAPWR circuit.
STEP 5 MONITOR PRELIMINARY CHECKS		
• Key off, Monitor power switch On. • Perform the following tests to ensure the Monitor is functional: — Light Test — Move Monitor lamp switch to on. **Are all panel lamps lit (including 6 lamps in remote display) and does audible beep sound?** — Remote Display Test. Push button on remote display unit. **Does it read - 1888?** **NOTE: Temperature extremes will affect remote display unit. Above 150°F, a black display will result; at cold temperatures the display will run slow.** • **Are all tests OK?**	Yes ▶ No ▶	GO to Step [6]. Monitor needs to be repaired. REFER to address posted on lid of Monitor.
STEP 6 EEC-IV POWER CHECKS		
• Key on, engine off. • Monitor ON, AUTO mode. • Check the following power signals for the correct value. Refer to Chart 1 - EEC-IV Power Signals. • **Are all power signals at the correct values?**	Yes ▶ No ▶	GO to Step [7]. REPAIR harness connector or other possible faults listed in Chart 1.

Chart # 1
EEC-IV Power Signals

Signal	Value	Possible Fault Location
KAPWR	>10.5v	EEC-IV harness pin 1, vehicle battery.
VPWR	>10.5v	EEC-IV harness pin 37/57, power relay or IRCM, vehicle battery, ignition switch, battery cables.
VREF	4.5 - 5.5v	EEC-IV harness pin 26, EEC-IV processor.
KEYPWR (opt)	>10.5v	EEC-IV harness pin 5, vehicle battery, ignition switch.

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EEC-IV MONITOR: Monitor and EEC-IV Power and Ground Checks

Step 7

TEST STEP	RESULT ▶	ACTION TO TAKE
STEP 7 **EEC-IV GROUND CHECKS**		
• Key on, engine off. • Monitor ON, AUTO mode. • Check the following ground signals for the correct value. Refer to Chart 2 - EEC-IV Ground Signals. • **Are all ground signals at the correct values?**	Yes ▶	GO to Step [8], Symptom Charts.
	No ▶	REPAIR harness, connector or other possible faults listed in Chart 2.

Chart # 2
EEC-IV Ground Signals

SIGNAL	Value	Possible Fault Location
CSE GND	0 ± .5v	EEC-IV harness Pin 20, processor ground strap if applicable.
IGN GND	0 ± .5v	EEC-IV harness Pin 16, TFI-IV, DIS or EDIS ignition systems.
PWR GND	0 ± .3v	EEC-IV harness Pin 40/60, vehicle battery.
SIG RTN	0 ± .5v	EEC-IV harness Pin 46, EEC-IV processor.
HEGO GND	0 ± .5v	EEC-IV harness Pin 49, HEGO sensor.
MAF RTN (opt)	0 ± .5v	EEC-IV harness Pin 9 or 15, MAF sensor, EEC-IV processor.

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EEC-IV MONITOR: Symptom Charts

Step 8

Select the appropriate Symptom Chart as a guide for diagnosing the possible mechanical, electrical or EEC-IV faults. For each symptom, Visual/Mechanical Checks and EEC-IV Checks are listed in a suggested order. Continue to STEP 9 - ROAD TEST SET-UP.

CONTENTS

STARTING/IDLE

No Start (Cranks) 18-7
Stalls at Idle/Engine Will Not Stay Running 18-8
Fast Idle/Slow Idle 18-9
Rough Idle 18-10

ENGINE RUN: STEADY SPEED/ACCELERATION/DECELERATION

Surges 18-11
Poor Power or Sluggish 18-12
Spark Knock 18-13
Stalls at Deceleration/Quick Stop 18-14
Runs Rough: Hesitates 18-15
Misses
Bucks and Jerks
Backfires

EEC-IV RELATED SHIFT SYMPTOMS

Late, Early, Missing or No Shifts 18-16
Hard or Soft Shifts 18-17
Erratic, Hunting Shifts 18-18
No Coastdown, No Overdrive 18-19

OTHER

Check Engine Light On 18-20

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EEC-IV MONITOR: Symptom Charts

No Start

System	Possible Causes	
Fuel	**Visual/Mechanical Checks** • Check fuel pump inertia switch. • Check for fuel contamination/quality. • Check fuel filter.	**EEC-IV Checks** • Fuel Pump System: FP signal FPM signal FP relay • Fuel Injection: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2, .. (SFI)
Ignition	**Visual/Mechanical Checks** • Check distributor cap, adapter and rotor. • Inspect spark plug and plug wires. • Check ignition switch. • Check ignition coil for voltage. • Inspect TFI, DIS or EDIS module for damage. • Check for presence of anti-theft devices.	**EEC-IV Checks** • Ignition System: PIP signal SPOUT signal IGN GND
Power and Grounds	**Visual/Mechanical Checks** • Check for low battery voltage. • Check starter and starter circuit for voltage. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EEC-IV power: VREF VPWR/EEC-IV relay • EEC-IV grounds: SIG RTN PWR GND CSE GND
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear.	**EEC-IV Checks** • TP sensor • MAP/BP sensor • MAF sensor • ISC-BPA solenoid or ISC+
Other	**Visual/Mechanical Checks** • Check engine coolant level. • Check thermostat for proper operation. • Check EGR valve stuck open. • Check for moisture entry into EEC-IV module. • Check camshaft timing and cylinder compression.	**EEC-IV Checks** • ECT sensor • EPC solenoid (E4OD)

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EEC-IV MONITOR: Symptom Charts

Stalls

System	Possible Causes	
Ignition	**Visual/Mechanical Checks** • Check distributor cap, adapter and rotor. • Inspect spark plug and plug wires. • Check ignition switch. • Check ignition coil for voltage. • Inspect TFI, DIS or EDIS module for damage. • Check for presence of anti-theft devices.	**EEC-IV Checks** • Ignition System: PIP signal SPOUT signal IGN GND
Fuel	**Visual/Mechanical Checks** • Check Fuel Pump Inertia switch. • Check for fuel contamination/quality. • Check fuel filter.	**EEC-IV Checks** • Fuel Pump System: FP signal FPM signal FP relay • Fuel Injection: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2 .. (SFI)
Power and Grounds	**Visual/Mechanical Checks** • Check for low battery voltage. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EEC-IV Power: VREF VPWR/EEC-IV relay • EEC-IV Grounds: SIG RTN PWR GND CSE GND
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear.	**EEC-IV Checks** • TP sensor • MAP/BP sensor • MAF sensor • ISC-BPA solenoid or ISC+
Other	**Visual/Mechanical Checks** • Check engine coolant level. • Check thermostat for proper operation. • Check EGR valve stuck open. • Check for moisture entry into EEC-IV module. • Check camshaft timing and cylinder compression.	**EEC-IV Checks** • ECT sensor • EPC solenoid (E4OD) • EGR Systems: EVP or PFE sensor EGR solenoid(s) • PSPS switch • A/C Systems: ACC, ACCS, WAC, or ACD

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EEC-IV MONITOR: Symptom Charts

Fast Idle
Slow Idle

System	Possible Causes	
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear. • Check air filter.	**EEC-IV Checks** • ISC-BPA solenoid or ISC+ • MAP/BP sensor • MAF sensor • TP sensor • ACT sensor or VAT and VAF sensor
Fuel	**Visual/Mechanical Checks** • Check for correct fuel pressure. • Check for fuel contamination/quality. • Check fuel filter.	**EEC-IV Checks** • HEGO sensor • Fuel Injections: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2 .. (SFI)
Ignition	**Visual/Mechanical Checks** • Check for correct base timing. • Check distributor cap, adapter and rotor. • Inspect spark plug and plug wires. • Inspect TFI, DIS or EDIS module for damage.	**EEC-IV Checks** • Ignition System: SPOUT signal SAW signal
Power and Grounds	**Visual/Mechanical Checks** • Check for low battery voltage. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EEC-IV Power: VREF • EEC-IV Grounds: SIG RTN
Other	**Visual/Mechanical Checks** • Check coolant and engine oil levels. • Check thermostat for proper operation. • Check EGR valve sticking. • Check for PCV valve for correct operation. • Check for exhaust blockage.	**EEC-IV Checks** • ECT sensor • EGR Systems: EVP or PFE sensor EGR solenoid(s) • A/C Systems: ACC, ACCS, WAC or ACD • NDS switch • PSPS switch

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EEC-IV MONITOR: Symptom Charts

Rough Idle

System	Possible Causes	
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear. • Check air filter.	**EEC-IV Checks** • ISC-BPA solenoid or ISC+ • MAP/BP sensor • MAF sensor • TP sensor • ACT sensor or VAT and VAF sensor
Fuel	**Visual/Mechanical Checks** • Check for correct fuel pressure. • Check for fuel contamination/quality. • Check fuel filter.	**EEC-IV Checks** • HEGO sensor • Fuel Pump System: FP signal FPM signal FP relay • Fuel Injection: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2 .. (SFI) • CANP solenoid
Ignition	**Visual/Mechanical Checks** • Check for correct base timing. • Check distributor cap, adapter and rotor. • Inspect spark plug and plug wires. • Inspect TFI, DIS or EDIS module for damage.	**EEC-IV Checks** • Ignition System: CID signal
Power and Grounds	**Visual/Mechanical Checks** • Check for low battery voltage. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EEC-IV Power: VREF • EEC-IV Grounds: SIG RTN
Other	**Visual/Mechanical Checks** • Check engine coolant level. • Check thermostat for proper operation. • Check EGR valve sticking. • Check for PCV valve for correct operation. • Check for exhaust blockage.	**EEC-IV Checks** • ECT sensor • EGR Systems: EVP or PFE sensor EGR solenoid(s) • A/C Systems: ACC, ACCS, WAC or ACD

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EEC-IV MONITOR: Symptom Charts

Surges

System	Possible Causes	
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear.	**EEC-IV Checks** • TP sensor • MAP/BP sensor • MAF sensor • ISC-BPA solenoid or ISC+
Fuel	**Visual/Mechanical Checks** • Check for correct fuel pressure. • Check fuel lines for water contamination restrictions.	**EEC-IV Checks** • Fuel Injection: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2 .. (SFI) • HEGO sensor
Ignition	**Visual/Mechanical Checks** • Check for correct base timing. • Inspect TFI, DIS or EDIS module for damage.	**EEC-IV Checks** • Ignition System: PIP signal SPOUT signal
Other	**Visual/Mechanical Checks** • Check EGR valve sticking. • Check for PCV valve for correct operation. • Check for exhaust blockage. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EGR Systems: EVP or PFE sensor EGR solenoid(s) • SBS solenoid

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EEC-IV MONITOR: Symptom Charts

Poor Power or Sluggish

System	Possible Causes	
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear.	**EEC-IV Checks** • TP sensor • MAP/BP sensor • MAF sensor • ISC-BPA solenoid or ISC+
Fuel	**Visual/Mechanical Checks** • Check for correct fuel pressure. • Check fuel lines for contamination or restrictions. • Check for clogged fuel filter.	**EEC-IV Checks** • Fuel Injection: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2 .. (SFI)
Ignition	**Visual/Mechanical Checks** • Check for correct base timing. • Check for wear or corrosion in distributor. • Inspect TFI, DIS or EDIS module for damage.	**EEC-IV Checks** • Ignition System: PIP signal SPOUT signal DPI signal
Other	**Visual/Mechanical Checks** • Check EGR valve sticking. • Check for PCV valve for correct operation. • Check for exhaust blockage. • Inspect electrical connections, wires and harnesses. • Check for partially binding brakes.	**EEC-IV Checks** • EGR Systems: EVP or PFE sensor EGR solenoid(s) • AM1 solenoid • AM2 solenoid • EPC solenoid (E4OD) • CCC solenoid (E4OD)

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EEC-IV MONITOR: Symptom Charts

Spark Knock

System	Possible Causes	
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear.	**EEC-IV Checks** • TP sensor • MAP/BP sensor • MAF sensor • ACT sensor or VAT and VAF sensor
Ignition	**Visual/Mechanical Checks** • Check for correct base timing. • Check for wear or corrosion in distributor. • Inspect TFI, DIS or EDIS module for damage.	**EEC-IV Checks** • Ignition System: PIP signal SPOUT signal
Fuel	**Visual/Mechanical Checks** • Check for correct fuel pressure. • Check fuel lines for contamination or restrictions.	**EEC-IV Checks** • Fuel Injection: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2 .. (SFI)
Other	**Visual/Mechanical Checks** • Check EGR valve sticking. • Check for PCV valve for correct operation. • Check for exhaust blockage. • Check engine coolant level. • Check thermostat for proper operation. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EGR Systems: EVP or PFE sensor EGR solenoid(s) • KS sensor • ECT sensor

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EEC-IV MONITOR: Symptom Charts

Stalls at Deceleration or Quick Stop

System	Possible Causes	
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear.	**EEC-IV Checks** • TP sensor • ISC-BPA solenoid or ISC+ • MAP/BP sensor • MAF sensor • ACT or VAT and VAF sensor
Ignition	**Visual/Mechanical Checks** • Check distributor cap, adapter and rotor. • Inspect spark plug and plug wires. • Check ignition switch. • Check ignition coil for voltage. • Inspect TFI, DIS or EDIS module for damage. • Check for presence of anti-theft devices.	**EEC-IV Checks** • Ignition System: PIP signal SPOUT signal IGN GND
Fuel	**Visual/Mechanical Checks** • Check for correct fuel pressure. • Check Fuel Pump Inertia switch. • Check for fuel contamination/quality. • Check fuel filter. • Check fuel lines for water, dirt or rust.	**EEC-IV Checks** • HEGO sensor • Fuel Pump System: FP signal FPM signal FP relay • Fuel Injection: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2, .. (SFI)
Power and Grounds	**Visual/Mechanical Checks** • Check for low battery voltage. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EEC-IV Power: VREF VPWR/EEC-IV relay • EEC-IV Grounds: SIG RTN PWR GND CSE GND
Other	**Visual/Mechanical Checks** • Check engine coolant level. • Check thermostat for proper operation. • Check EGR valve sticking. • Check for moisture entry into EEC-IV module. • Check camshaft timing and cylinder compression.	**EEC-IV Checks** • ECT sensor • EPC solenoid (E4OD) • EGR Systems: EVP or PFE sensor EGR solenoid(s) • A/C Systems: ACC, ACCS, WAC or ACD

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EEC-IV MONITOR: Symptom Charts

Runs Rough

System	Possible Causes	
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear.	**EEC-IV Checks** • ISC-BPA solenoid or ISC+ • MAP/BP sensor • MAF sensor • TP sensor • ACT sensor or VAT and VAF sensor
Fuel	**Visual/Mechanical Checks** • Check for correct fuel pressure. • Check for fuel contamination/quality. • Check fuel filter.	**EEC-IV Checks** • HEGO sensor • Fuel Pump System: FP signal FPM signal FP relay • Fuel Injection: INJ (CFI) INJ 1, 2 (EFI) INJ 1, 2 .. (SFI)
Ignition	**Visual/Mechanical Checks** • Check for correct base timing. • Check distributor cap, adapter and rotor. • Inspect spark plug and plug wires. • Inspect TFI, DIS or EDIS module for damage.	**EEC-IV Checks** • Ignition System: PIP signal SPOUT signal CID signal
Power and Grounds	**Visual/Mechanical Checks** • Check for alternator/regulator noise interference. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EEC-IV Power: VREF • EEC-IV Grounds: SIG RTN
Other	**Visual/Mechanical Checks** • Check engine coolant level. • Check thermostat for proper operation. • Check EGR valve sticking. • Check for PCV valve for correct operation. • Check for exhaust blockage. • Check camshaft timing and cylinder compression. • Check for broken or weak valve springs.	**EEC-IV Checks** • ECT sensor • EGR Systems: EVP or PFE sensor EGR solenoid(s) • EPC solenoid (E4OD) • CCC solenoid (E4OD)

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EEC-IV MONITOR: Symptom Charts

Late, Early, Missing or No Shifts

System	Possible Causes	
E4OD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check E4OD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • SS1 solenoid • SS2 solenoid • EPC solenoid • CCS solenoid • CCS solenoid • OCS solenoid • MLP sensor
AXOD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check AXOD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • LUS solenoid • NPS switch
A4LD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check A4LD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • CCO solenoid • SS 3/4 solenoid
Other	**Visual/Mechanical Checks** • Check engine coolant level. • Check thermostat for proper operation. • Check for worn, leaking or broken vacuum lines. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • TP sensor • ECT sensor • MAP/BP sensor • MAF sensor • VSS sensor

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EEC-IV MONITOR: Symptom Charts

Hard or Soft Shifts

System	Possible Causes	
E4OD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure.	**EEC-IV Checks** • CCC solenoid • CCS solenoid • MLP sensor • EPC solenoid
Other	**Visual/Mechanical Checks** • Check engine coolant level. • Check thermostat for proper operation. • Check for worn, leaking or broken vacuum lines. • Inspect electrical connections, wires and harnesses. • Check for damage to U-joints.	**EEC-IV Checks** • TP sensor • ECT sensor • MAP/BP sensor • MAF sensor • VSS sensor

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EEC-IV MONITOR: Symptom Charts

Erractic or Hunting Shifts

System	Possible Causes	
E4OD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check E4OD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • SS1 solenoid • SS2 solenoid • CCC solenoid • EPC solenoid • CCS solenoid • OCS switch • MLP sensor
AXOD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check AXOD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • LUS solenoid • NPS switch
A4LD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check A4LD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • CCO solenoid • SS 3/4 solenoid
Other	**Visual/Mechanical Checks** • Check engine coolant level. • Check thermostat for proper operation. • Check for worn, leaking or broken vacuum lines. • Inspect TFI, DIS or EDIS module for damage. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • Ignition System: PIP signal SPOUT signal • TP sensor • ECT sensor • MAP/BP sensor • MAF sensor • VSS sensor

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EEC-IV MONITOR: Symptom Charts

No Coastdown or Overdrive

System	Possible Causes	
E4OD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check E4OD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • OCS switch • SS2 solenoid • MLP sensor • SS1 solenoid
AXOD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check AXOD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • LUS solenoid • NPS switch
A4LD Transmission	**Visual/Mechanical Checks** • Check transmission fluid level. • Check transmission fluid for contamination. • Check for transmission fluid leaks. • Check transmission line pressure. • Check A4LD connector for corrosion, bent pins or damage.	**EEC-IV Checks** • CCO solenoid • SS 3/4 solenoid

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EEC-IV MONITOR: Symptom Charts

"CHECK ENGINE LIGHT" On

System	Possible Causes	
Air/Vacuum	**Visual/Mechanical Checks** • Check vacuum lines for leaks or wear.	**EEC-IV Checks** • TP sensor • MAP/BP sensor • MAF sensor • ACT sensor or VAT and VAF sensor • ITS sensor
Ignition	**Visual/Mechanical Checks** • Check for correct base timing. • Inspect EDIS module for damage.	**EEC-IV Checks** • Ignition System: IDM signal
Fuel	**Visual/Mechanical Checks** • Check for correct fuel pressure. • Check fuel lines for water, dirt, rust or restrictions.	**EEC-IV Checks** • HEGO sensor
Other	**Visual/Mechanical Checks** • Check EGR valve sticking. • Check for PCV valve for correct operation. • Check for exhaust blockage. • Check engine oil quality and level. • Check engine coolant quality and level. • Check thermostat for proper operation. • Check MIL bulb and circuit for correct operation. • Inspect electrical connections, wires and harnesses.	**EEC-IV Checks** • EGR Systems: EVP or PFE sensor • ECT sensor • STO/MIL signal • EEC-IV Power: VREF • EEC-IV Ground: SIG RTN

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EEC-IV MONITOR: Road Test Set-up

Step 9

RECREATING THE SYMPTOM

In order to diagnose driveability concern, one must collect information on how the EEC-IV system is sensing and reacting. After Visual/Mechanical checks are completed and satisfied, the EEC-IV portion of the **Symptom Chart** is diagnosed. Through the use of Monitor and Recorder, these signal lines can be inspected for shorts, opens, component failures or erratic behavior. In addition, the information received from the Monitor and Recorder can reveal the presence of mechanical problems.

ROAD TEST SET-UP

1. Place Monitor (Recorder also, if installed) in convenient location inside the vehicle. Secure cables away from moving engine parts.
2. Check to see if the proper Overlay card is inserted on Monitor.
3. Copy list of EEC-IV sensors and actuators in order given by **Symptom Chart**. These signals will be monitored during the road test.
4. If a Recorder is used, then select the first 8 signals listed in the **Symptom Chart** for Channels 1 to 8. Connect the jumpers from the I/O jacks to the appropriate channels.
5. Select the proper **Diagnostic Reference Value Sheet** in Appendix. This sheet lists EEC-IV sensor and actuator values at various operating conditions. The values given on these sheets are an approximation only.
6. In order for a road test to be performed it is required that another person accompany the driver. The accompanying person can select signals, observe changes and record notes.

USE OF PERIPHERAL INPUTS

Some useful signals which are listed in the **Symptom Chart** may require the use of certain peripherals. These devices can be inserted into the AUX input jacks of the Monitor or the ADAPT 1/ADAPT 2 input jacks of the Recorder. Listed are two types of peripherals and examples of the signals they receive.

Multi-Point Auxiliary Adapter — A/C, Fuel Pump

Electronic Fuel Pressure/Vacuum Adapter — Fuel Pressure, Vacuum

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EEC-IV MONITOR: Road Test

Step 9

ROAD TEST REMINDERS

The purpose of the road test is to recreate the drive symptom by duplicating the conditions that caused it to occur.

Legality/Liability. The **Road Test Procedure** is a suggested but optional part of this section. The liability of this operation is left to the individual who chooses to use it.

Safety. It is important that the road test is performed safely. Use the provided seat belts and operate the vehicle in a safe manner.

ROAD TEST OBSERVATIONS

During the road test various EEC-IV signals are chosen and their values shown. In addition, to this data, certain observations can be made and road tests performed:

EEC-IV Values. Compare road test values at various operating conditions with those listed in the **Diagnostic Reference Values**. Refer to **Appendix: EEC-IV Graphs and Charts** for further detail.

Monitor Lights. Observation of the Monitor lights give quick information about the condition of many EEC-IV signals. For example, these lights can quickly reveal the general status of many signals and tell whether a solenoid or switch is activated. Optional signals are printed in yellow labels.

Wiggle Testing. By using the Monitor Wiggle test in KOER, often an intermittent device or wire will trigger the beeper. The DCV Wiggle mode in particular is very sensitive to sudden, erratic changes in an EEC-IV harness or component.

ROAD TEST PROCEDURE

1. Using the appropriate **Symptom Chart**, select the first listed EEC-IV device on Monitor PIN SELECTOR A.
2. Turn on Monitor and Recorder if used. Start and drive vehicle.
3. If Recorder is installed put FUNCTION switch in RECORD mode and press START RECORD button.
4. Drive vehicle to create conditions so that the symptom occurs.
5. When the symptom occurs, the accompanying passenger should observe changes in selected EEC-IV signal. Information should be recorded onto paper with other specific notes about the symptom, device, or operating conditions. If the Recorder is used, the CAPTURE button should be pressed.
6. Record information about the symptom, operating condition and value of the EEC-IV signal from the Monitor or Recorder (in PLAYBACK mode).
7. If necessary select other EEC-IV signals from the **Symptom Chart** and attempt to recreate the symptom again. Observe and record the results. Continue onto **Step 10** and analyze the data which was collected during the road test.

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EEC-IV MONITOR: Analyzing Data

Step 10

ANALYZING DATA

Once the road test is completed, the results need to be analyzed to locate and repair the exact fault which caused the symptom.

INSIGHTS FROM THE RECORDER

The use of the Recorder greatly enhances the view of the EEC-IV operation during the presence of the symptom and allows a systems approach to the problem.

Look for abnormal behavior or values that are clearly incorrect. Inspect the signals for abrupt or unexpected changes. For example, during a steady cruise most of the sensor values should be relatively stable. Sensors such as TP, MAP and RPM changing abruptly when the vehicle was travelling at a constant speed are clues.

Look for agreement in related signals. For example, if TP is changed during a gentle acceleration, a corresponding change should occur in MAP, RPM and Timing. Compare signals by selecting different channels at a certain time range.

Make sure the signals act in proper sequence. An increase in RPM after the TP is increased is expected. However, if the RPM increases without a TP change then a problem exists.

ANALYZING METHODS

Use any of the following methods to further diagnose a suspected EEC-IV signal or device. Some methods are particular to a certain type of EEC-IV device. Follow the given strategy listed for each type of EEC-IV signal — Refer to the **Appendix: Methods of EEC-IV Monitor Measurement.**

- Change Condition to Cause Response by Input
- Change Input and Verify Output Response
- Check Value
- Click Testing (Solenoids/Relays)
- Coil Resistance (Solenoids/Relays)
- EEC-IV Input Check (STO)
- Harness Opens
- Harness Shorts
- Output State Check (Solenoids/Relays)
- Wiggle Testing (DCV or Ohms)

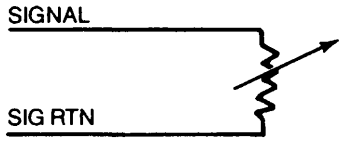
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EEC-IV MONITOR: Analyzing Data

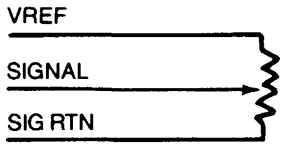
Step 10

ANALYZING DATA: Suggested Strategies for Sensors/Inputs

WIRE SENSORS

Device:	Typical Schematic:	Strategy:
ACT ECT TOT VAT	 A12802-A	Check Value - Cold Check Value - Warm Wiggle Testing (DCV) EEC-IV Input Check (STO) Harness Shorts Harness Opens

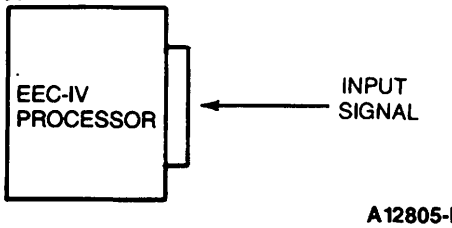
WIRE SENSORS

Device:	Typical Schematic:	Strategy:
EVP FIPL PFE TP VAF	 A12803-A	Check Value Change condition Wiggle Testing (DCV) EEC-IV Input Check (STO) Harness Shorts Harness Opens

SWITCHES

Device:		Typical Schematic:	Strategy:
ACD	OCTADJ	 A12804-A	Check value Change condition Wiggle Testing (DCV) Harness Shorts Harness Opens
BOO	PSPS		
CES	SCCS		
ITS	THS 3/2		
NDS	THS 4/3		
NGS			
NPS	TTS		
OCS	4x4 L		

OTHER INPUT SIGNALS

Device:		Typical Schematic:	Strategy:
BP	MAF	 A12805-B	Check value Change condition * Wiggle Testing (DCV or ohms) Input Check (STO) Harness Shorts Harness Opens **Note: Applies only to BP, MAF and MAP**
CID	MAP		
DPI	MLP		
FPM	PIP		
HEGO	RPMS		
IDM	STI		
IMS	VSS+		
KS			

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EEC-IV MONITOR: Analyzing Data

Step 10

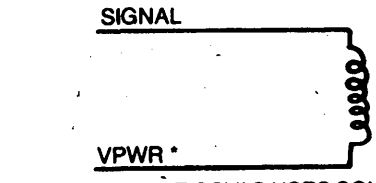
ANALYZING DATA: Suggested Strategies for Actuators/Outputs

SOLENOIDS/RELAYS

Device:

ACC
AM1
AM2
BOOST
CANP
CCC
CCO
CCS
EDF
EGRC
EGRV
EGR S/O
EPC
EVR
FP
HEDF
HFP
IAC
INJ
ISC-BPA
LUS
SBS
SCVAC
SCVNT
SS1
SS2
SS 3/4
VPWR
WAC

Typical Schematic:



*EXCEPT SCVNT, SCVAC USES SOL +

A12806-A

Strategy:

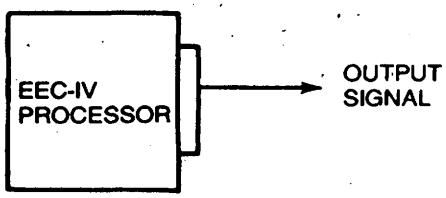
Check Value
Change Input
Click Testing
Wiggle Testing (DCV)
Coil Resistance
Output State Check
Harness Shorts
Harness Opens

OTHER OUTPUT SIGNALS

Device:

ACL
ISC+
MIL
OCIL
SAW
SIL
SPOUT
STO

Typical Schematic:



A12807-B

Strategy:

Check Value
Change Input
Wiggle Testing (Ohms)
Harness Shorts
Harness Opens

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EEC-IV MONITOR: Analyzing Data

Step 10

OPTIONAL DIAGNOSTIC TOOLS

By using the suggested strategies for the "suspect" EEC-IV components the source of the fault can be found. If after following the given methods a fault is not found then a few options still remain.

Follow-up Diagnosis. The Monitor and Recorder can be used to Diagnose EEC-IV signals other than those listed in the chosen **Symptom Chart**. By conducting a thorough investigation of all the EEC-IV signals, the source of the problem can likely be found. Available for auxiliary (AUX) inputs are two peripherals: **Multipoint Auxiliary Adapter (#007-00023)** and the **Electronic Fuel Pressure/Vacuum Adapter (#007-00022).**

Other Diagnostic Tools. If needed, there are other specialized tools that could aid in Diagnose. The **Intermittent Ignition Analyzer (#007-00035)** can be used for TFI-IV systems. If a DIS or EDIS ignition is present, special diagnostic tools are necessary — refer to **Section 13.** Another useful tool is the **Fuel Testing Kit (#113-00004)** used in checking the presence of contaminated fuel.

Section 2. The **Diagnostic Routines, Section 2** of this volume, lists various symptoms and references possible systems and components. Also referenced in this location are other volumes and group numbers.

VERIFICATION

After the vehicle fault has been located and repaired, a verification test needs to be performed. This may require a road test to verify that the symptom is no longer present. It is also important to remember that if any Continuous Memory Codes were present before the symptom was repaired, those codes must be cleared. Refer to **Section 14 Appendix — How to Clear Continuous Memory Codes.**

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APPENDIX: Methods of EEC-IV Monitor Measurements

Described here are ten basic methods to measure and diagnose EEC-IV signals. Other less common methods are detailed in the Monitor manuals.

CHANGE CONDITION TO CAUSE RESPONSE BY INPUT

Purpose: Verify sensor receives and reponds to changes.

1. KOEO or KOER; AUTO or DCV mode.
2. Select sensor on PIN SELECTOR A.
3. Create condition or change in condition.
4. Observe change in sensor value; verify with **EEC-IV Graphs and Charts.**
5. Examples: Move throttle, observe TP increase, MAP increase.
   Warm-up engine, observe ACT, ECT decrease.
   Press brake pedal, observe BOO light.

CHANGE INPUT AND VERIFY OUTPUT RESPONSE

Purpose: Verify EEC-IV module and actuator circuit respond to sensor input.

1. KOEO or KOER; AUTO or DCV mode.
2. Select actuator on PIN SELECTOR A or B.
3. Create change for input device with switchbox or vehicle operation.
4. Observe change (response) in actuator signal, observe light.
5. Examples: Increase throttle (TP), observe SPOUT increase.
   Move EGO switch to LEAN, observe SPOUT increase.
   Turn on A/C at WOT, observe WAC light on and grounded.

CHECK VALUE

Purpose: Activate solenoid or relay from EEC-IV Monitor and observe device.

1. KOEO/KOER; AUTO or DCV mode.
2. Select signal from PIN SELECTOR A or B.
3. Various units used, refer to Meter Function light.

CLICK-TESTING (RELAYS/SOLENOIDS)

Purpose: Activate solenoid or relay from EEC-IV Monitor and observe device.

1. KOEO only; AUTO or DCV mode.
2. Select relay or solenoid signal on PIN SELECTOR A and correct ground on REFERENCE PIN selector.
3. Insert switchbox into SELECTOR PIN jacks.
4. Push small red button to turn on relay or solenoid.
5. Listen for "click" of device turning on, observe signal light turn on.

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APPENDIX: Methods of EEC-IV Monitor Measurements

COIL RESISTANCE (SOLENOIDS/RELAYS)

Purpose: Measure for correct resistance value of device.

1. Key Off only; Ohms mode.
2. Select signal from PIN SELECTOR A.
3. Select correct ground from REFERENCE PIN SELECTOR.
4. Select OHMS RANGE switch.
5. WIGGLE TEST will light and sound; press WIGGLE TEST RESET button
6. Manual Test Light should be blinking; value in ohms units.

EEC-IV INPUT CHECK (STO)

Purpose: Confirm that EEC-IV Processor set 'CHECK ENGINE LIGHT' for certain EEC-IV sensors (refer to CHECK ENGINE Light Symptom Chart).

1. KOEO; DCV mode.
2. Select sensor from PIN SELECTOR A.
3. Set REFERENCE PIN SELECTOR to SIG RTN.
4. Insert switchbox into SELECTOR PIN jacks.
5. Move AIM switch to KEY ON, ENGINE OFF position.
6. Push small red button on switch box and observe STO light turn on and beeper sound as long as button is pressed.
7. Return AIM switch to OFF position.

HARNESS OPENS

Purpose: Check harness for open circuits.

1. Key Off; Ohms mode.
2. Select signal from PIN SELECTOR A.
3. Disconnect sensor/actuator where signal is to be checked.
4. Connect jumper wire from REFERENCE PIN jack (black) to signal pin on harness to be tested.
5. Check for continuity — 0 ohms.

HARNESS SHORTS

Purpose: Check harness for short circuits (to ground or power).

1. Key Off; Ohms mode.
2. Select signal from PIN SELECTOR A.
3. Set OHMS RANGE switch to 200K.
4. Disconnect sensor/actuator to be tested.
5. Optional: Disconnect EEC-IV processor (reconnect Monitor to EEC-IV harness).
6. Select various power or ground signals from REFERENCE PIN SELECTOR. Example: VREF, SIG RTN, PWR GND.
7. Read resistance: 0 or low indicates a short, 10K or higher — no short.

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APPENDIX: Methods of EEC-IV Monitor Measurements

OUTPUT STATE CHECK (SOLENOIDS/RELAYS)

Purpose: Exercise actuator devices after KOEO Self-Test.

1. KOEO; AUTO or DCV mode.
2. Move AIM switch to KEY ON ENGINE ON position and wait for output codes (beeps) to end.
3. Completely depress and release throttle — observe signal light turn on.
4. Completely depress and release throttle — light should turn off.
5. Return AIM switch to OFF position.

WIGGLE TESTING (DCV OR OHMS)

Purpose: Sensitive DCV or ohms testing for intermittent harness or device.

1. Key off only for Ohms Wiggle; KOEO or KOER for DCV Wiggle.
2. Use DCV Wiggle for all actuators, power and ground signals, all sensors which use DCV units in AUTO mode; all others use Ohms Wiggle.
3. Examples: Ohms Wiggle MAP, PIP, INJ; DCV Wiggle - TP, ECT, EVR. DCV Wiggle is more sensitive than the Ohms Wiggle Test.
4. Select signal from PIN SELECTOR A.
5. Select correct ground from REFERENCE PIN SELECTOR.
6. Tap components, flex harness and connectors.
7. Wiggle Test light and beeper will activate when change sensed.

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APPENDIX: Diagnostic Reference Value Sheets

1990 DIAGNOSTIC REFERENCE VALUE SHEETS

Passenger Cars

1.9L EFI HO 18-31
1.9L CFI 18-32
1.9L SEFI 18-33
2.3L EFI OHC 18-34
2.3L EFI OHC MA 18-35
2.3L EFI HSC 18-36
2.5L CFI HO 18-37
2.9L EFI 18-38
3.0L EFI 18-39
3.0L SEFI SHO 18-40
3.8L SEFI AXOD 18-41
3.8L SEFI RWD 18042
3.8L SEFI SC 18-43
5.0L SEFI 18-44
5.0L SEFI 18-45
5.0L SEFI MA 18-46

Trucks

2.3L EFI OHC 18-47
2.9L EFI 18-48
3.0L EFI 18-49
4.0L EFI MA 18-50
4.9L EFI 18-51
5.0L EFI 18-52
5.8L EFI 18-53
7.5L EFI 18-54
7.3L DIESEL E4OD 18-55

NOTES

1. **Diagnostic Reference Values** are based on engine at normal operating temperature (ECT = .5 to .7v/180 to 220°F).
2. **KOEO** and **HOT IDLE** test values are recorded with vehicle in PARK position (A/T) or NEUTRAL position (M/T).
3. Before proceeding with Monitor TIMING checks, Monitor must be calibrated to BASE TIMING. (Adjust BASE TIMING knob on Monitor.) BASE TIMING equals 10 degrees for all vehicles. For EDIS vehicles (4.0L TRK) BASE TIMING is not adjustable.
4. Vehicles with manual transmission (M/T) use 3rd gear for their **30 MPH** valves and 4th gear for their **55 mph** values. Vehicles with automatic transmission (A/T) use D for their **55 mph** values.
5. Reference values shown in chart may differ between vehicles due to various factors: component tolerances, driving conditions, weather, etc. These values were recorded at approximately 600' altitude above sea level and ambient temperatures from 50 to 70 degrees F. Some EEC-IV devices, such as ACT, ECT and EDF are temperature dependent and their values may vary greatly. Other values such as ISC-BPA and INJ are calibration dependent and may vary also.

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APPENDIX: Diagnostic Reference Values

1.9L EFI HO CAR

ESCORT GT/EXP

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	1.0	DCV	1.0	1.2	1.3-1.4	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
VAT	25	2.5	DCV	3.5	3.6	3.8	DCV
BP	45	158	Hz	158	158	158	Hz
IDM	4	0	RPM	950-1050	2200-2300	2800-2900	RPM
PIP	56	0	RPM	950-1050	2200-2300	2800-2900	RPM
HEGO	29	0	DCV	switching	switching	switching	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACC	10	0	DCV	0/VBAT①	0	0	DCV
VAF	43	.3	DCV	.9	2.0-2.3	2.4-2.7	DCV
NGS/CES	30	0	DCV	0	5.0/0②	5.0	DCV
STI	48	5.0	DCV	3.5-5.0	3.5-5.0	3.5-5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT③	DCV	3.6-4.0	4.0-5.0	3.7-5.4	mS
INJ Bank 1	58	VBAT③	DCV	3.6-4.0	4.0-5.0	3.7-5.4	mS
STO	17	VBAT	DCV	VBAT	VBAT	VBAT	DCV
WAC	54	0	DCV	8.0	8.0	8.0	DCV
ISC-BPA	21	VBAT	DCV	12.0	10.0	9.0	DCV
FP	22	VBAT	DCV	.8	.8	.8	DCV
SPOUT	36	0	RPM	950-1050	2200-2300	2800-2900	RPM
CANP	32	VBAT	DCV	VBAT	VBAT	0	DCV
MIL	53	0	DCV	VBAT	VBAT	VBAT	DCV
EGR S/O	35	VBAT	DCV	VBAT	VBAT	0	DCV
OTHER							
IGN TIMING	TIMING			31-34	37-40	40-44	DEG

NOTES: ① **A/C on.**
② **Clutch pedal depressed.**
③ **Monitor in DCV manual mode.**
Reference values shown may vary approximately ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

1.9L CFI CAR

ESCORT

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	1.0	DCV	1.0	1.2	1.5	DCV
PFE	27	3.2	DCV	3.2	3.4	1.8	DCV
ECT	7	.7	DCV	.7	.7	.7	DCV
ACT	25	1.2	DCV	1.2	1.2	1.2	DCV
MAP	45	158	Hz	104	103-113	125-130	Hz
IDM	4	0	RPM	820-900	1450-1500	2650-2800	RPM
PIP	56	0	RPM	820-900	1450-1500	2650-2800	RPM
HEGO	29	0	DCV	switching	switching	switching	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT①	0	0	DCV
NDS (A/T)	30	0	DCV	0	5.0	5.0	DCV
NGS (M/T)	30	0	DCV	0	5.0	5.0	DCV
ITS	28	9.3	DCV	10.5	0	0	DCV
STI	48	5.0	DCV	3.5-5.0	3.5-5.0	3.5-5.0	DCV
ACTUATORS/ OUTPUTS							
INJ	58	VBAT②	DCV	1.5	1.7-2.0	2.2-2.6	mS
EVR	52	VBAT②	DCV	0	0	40-50	%
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
WAC	54	0	DCV	0/7.4①	0	0	DCV
ISC+	21	0	DCV	0	0	0	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SPOUT	36	0	RPM	820-900	1450-1500	2650-2800	RPM
SIL (M/T)	51	VBAT	DCV	VBAT	VBAT	VBAT	DCV
CANP	32	VBAT	DCV	VBAT	VBAT	0-6.0	DCV
OTHER							
IGN TIMING	TIMING			17-21	31-39	40-42	DEG

NOTES: ① – **A/C on.**
② – **Monitor in DCV manual mode.**
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

1.9L SEFI CAR

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47		DCV				DCV
MAF	50		DCV				DCV
PFE	27		DCV				DCV
ECT	7		DCV				DCV
ACT	25		DCV				DCV
IDM	4		RPM				RPM
CID+	41		DCV				DCV
PIP	56		RPM				RPM
HEGO	29		DCV				DCV
FPM	19		DCV				DCV
ACC	10		DCV	①			DCV
VSS+	3		MPH				MPH
OCTADJ1	43		DCV				DCV
OCTADJ2	34		DCV				DCV
NDS (A/T)	30		DCV				DCV
NGS/CES (M/T)	30		DCV		②		DCV
STI	48		DCV				DCV
ACTUATORS/ OUTPUTS							
INJ 4	13	③	DCV				mS
INJ 2	59	③	DCV				mS
INJ 1	58	③	DCV				mS
EVR	33	③	DCV				%
STO/MIL	17		DCV				DCV
HEDF	31		DCV				DCV
WAC	54		DCV				DCV
ISC-BPA	21		DCV				DCV
FP	22		DCV				DCV
INJ 3	12	③	DCV				mS
SAW	36		RPM				RPM
SIL (M/T)	53		DCV				DCV
EDF	35		DCV				DCV
OTHER							
IGN TIMING	TIMING						DEG

NOTES: ① – A/C on.
② – **Clutch pedal depressed.**
③ – **Monitor in DCV manual mode.**
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.
1.9L SEFI IS 1990.5 VEHICLE, VALUES ARE UNAVAILABLE.

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APPENDIX: Diagnostic Reference Values

2.3L EFI OHC CAR

MUSTANG

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.8	DCV	.8	1.0	1.3	DCV
EVP	27	.4	DCV	.4	.6	1.4-2.4	DCV
ECT	7	.8	DCV	.8	.8	.8	DCV
ACT	25	1.2	DCV	1.6	1.8	1.6	DCV
MAP	45	158	Hz	102-104	106-109	125-130	Hz
IDM	4	0	RPM	850-900	1650-1750	2700-2800	RPM
PIP	56	0	RPM	850-900	1650-1750	2700-2800	RPM
KS	23	2.5	DCV	2.5	2.5	2.5	DCV
HEGO	29	0	DCV	switching	switching	switching	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
ACC	10	0	DCV	0/VBAT②	0	0	DCV
PSPS	3	0	DCV	0/10.0 turn	0	0	DCV
ACD	24	0	DCV	0/VBAT②	0	0	DCV
NDS (A/T)	30	0	DCV	0	5.0	5.0	DCV
NGS/CES (M/T)	30	0	DCV	0	5.0/0③	5.0	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	3.7-4.4	5.2-6.0	5.6-7.4	mS
INJ Bank 1	58	VBAT④	DCV	3.7-4.4	5.2-6.0	5.6-7.4	mS
EGRC	52	VBAT④	DCV	0	0	0	%
EGRV	33	VBAT④	DCV	0	98	98	%
STO/MIL	17	.7	DCV	VBAT	VBAT	VBAT	DCV
WAC	54	0	DCV	0	0	0	DCV
ISC-BPA	21	VBAT	DCV	9.0-9.7	9.0-9.3	8.8	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SPOUT	36	0	RPM	850-900	1650-1750	2700-2800	RPM
CCO (A/T)	53	VBAT	DCV	VBAT	.7	.7	DCV
OTHER							
IGN TIMING	TIMING			16-22	22-23	32-35	DEG

NOTES: ① – Brake pedal depressed.
② – A/C on.
③ – Clutch pedal depressed.
④ – Monitor in DCV manual mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

2.3L EFI OHC MA CAR

MUSTANG (CALIFORNIA ONLY)

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
MAF	14	0	DCV	.6	1.3-1.5	1.8-2.2	DCV
TP	47	1.0	DCV	1.0	1.2-1.3	1.5	DCV
EVP	27	.4	DCV	.4	.4	.4-3.0	DCV
ECT	7	.8	DCV	.8	.8	.8	DCV
ACT	25	2.1	DCV	2.4	2.6	2.9	DCV
BP	45	157	Hz	157	157	157	Hz
IDM	4	0	RPM	830-880	1400-1450	2750-2800	RPM
PIP	56	0	RPM	830-880	1400-1450	2750-2800	RPM
KS	23	2.5	DCV	2.5	2.5	2.5	DCV
HEGO	29	0	DCV	switching	switching	switching	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
PSPS	24	0	DCV	0/10.0 turn	0	0	DCV
ACD	43	0	DCV	0/VBAT②	0	0	DCV
NDS (A/T)	30	.7	DCV	.7	5.0	5.0	DCV
NGS/CES (M/T)	30	0	DCV	0	5.0/0③	5.0	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	3.6-3.7	4.5-6.0	6.0-7.2	mS
INJ Bank 1	58	VBAT④	DCV	3.6-3.7	4.5-6.0	6.0-7.2	mS
SS 3/4 (A/T)	52	VBAT	DCV	VBAT	.3	.3	DCV
EVR	33	VBAT④	DCV	0	0	0-50	%
STO/MIL	17	0	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	6.0-VBAT	.2	DCV
WAC	54	0	DCV	0	0	0	DCV
ISC-BPA	21	VBAT	DCV	10.1	9.8	9.2-9.6	DCV
FP	22	VBAT	DCV	.1	.1	.1	DCV
SPOUT	36	0	RPM	830-880	1400-1450	2750-2800	RPM
CCO (A/T)	53	VBAT	DCV	VBAT	VBAT	.3	DCV
OTHER							
IGN TIMING	TIMING			13-14	18	22-25	DEG

NOTES: ① – Brake pedal depressed.
② – A/C on.
③ – Clutch pedal depressed.
④ – Monitor in DCV manual mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

2.3L EFI HSC CAR

TEMPO/TOPAZ

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.9	DCV	.9	1.1-1.3	1.3-1.5	DCV
PFE	27	3.2	DCV	3.2	3.4	2.5-3.5	DCV
ECT	7	.7	DCV	.7	.7	.7	DCV
ACT	25	1.2	DCV	1.2	1.7	2.0-2.4	DCV
MAP	45	158	Hz	107	107-112	120-128	Hz
IDM	4	0	RPM	840-880	1600-2000	2650-2900	RPM
PIP	56	0	RPM	840-880	1600-2000	2650-2900	RPM
HEGO	29	0	DCV	switching	switching	switching	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT①	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
PSPS	24	0	DCV	0/11.0 turn	0	0	DCV
ACD	43	0	DCV	0/VBAT①	0	0	DCV
NDS (A/T)	30	.6	DCV	.6	VBAT	VBAT	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT②	DCV	3.8-3.9	4.0-5.0	5.2-7.0	mS
INJ Bank 1	58	VBAT②	DCV	3.8-3.9	4.0-5.0	5.2-7.0	mS
EVR	33	VBAT②	DCV	0	0	40-50	%
STO/MIL	17	.7	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	.2-VBAT	.2	DCV
WAC	54	0	DCV	0/7.5①	0	0	DCV
ISC-BPA	21	VBAT	DCV	9.9	8.5-9.0	8.5	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SPOUT	36	0	RPM	840-880	1600-2000	2650-2900	RPM
SIL (M/T)	53	VBAT	DCV	VBAT	VBAT	VBAT	DCV
OTHER							
IGN TIMING	TIMING			17-19	27-30	28-32	DEG

NOTES: ① – **A/C on.**
② – **Monitor in DCV manual mode.**
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

2.5L CFI HO CAR

TAURUS

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	1.4	DCV	1.0	1.2	1.4	DCV
SCCS	50	6.7	DCV	6.7	6.7	6.7	DCV
EVP	27	.4	DCV	.4	1.3	3.2	DCV
ECT	7	.7	DCV	.7	.7	.7	DCV
ACT	25	.8	DCV	.7	1.0	1.0	DCV
MAP	45	158	Hz	105	110	123	Hz
IDM	4	0	RPM	820-850	1475-1550	2550-2650	RPM
PIP	56	0	RPM	820-850	1475-1550	2550-2650	RPM
PSPS	23	0	DCV	0/5.0 turn	0	0	DCV
HEGO	29	0	DCV	switching	switching	switching	DCV
BOO	2	0	DCV	VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
ITS	24	VBAT	DCV	VBAT	0	0	DCV
NDS	30	0	DCV	0	VBAT	VBAT	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ	58	VBAT③	DCV	1.6-1.7	2.0-2.1	2.5-2.7	mS
HEDF	52	VBAT	DCV	VBAT	VBAT	VBAT	DCV
EVR	33	VBAT③	DCV	0	40	50	%
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	VBAT	.2	DCV
WAC	54	0	DCV	0/7.7②	0	0	DCV
ISC+	21	0	DCV	0	0	0	DCV
SCVAC	42	VBAT③	DCV	0	0	0	%
FP	22	VBAT	DCV	.8	.8	.8	DCV
SPOUT	36	0	RPM	820-850	1475-1550	2550-2650	RPM
SCVNT	35	VBAT③	DCV	0	98	98	%
EDF	55	0	DCV	8.5	0	0	DCV
OTHER							
IGN TIMING	TIMING			22-25	43-44	43-45	DEG

NOTES: ① **Brake pedal depressed.**
② **A/C on.**
③ **Monitor in DCV manual mode.**
HEGO in 'switching' mode ranges from .2 to .9 DCV. Speed Control (SCCS, SCVAC, SCVNT) is applied for 30 MPH and 55 MPH.
Reference values shown may vary approximately ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

2.9L EFI CAR

SCORPIO

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47		DCV				DCV
ECT	7		DCV				DCV
BOO	18		DCV	①			DCV
ACT	25		DCV				DCV
MAP	45		Hz				Hz
PIP	56		RPM				RPM
OCT ADJ	23		DCV				DCV
HEGO	29		DCV				DCV
KDS	19		DCV				DCV
ACC	10		DCV	②			DCV
VSS+	3		MPH				MPH
HEGO-2	43		DCV				DCV
NDS	30		DCV				DCV
IDLE ADJ	28		DCV				DCV
STI	48		DCV				DCV
ACTUATORS/ OUTPUTS							
SS 3/4	15		DCV				DCV
INJ Bank 2	59	③	DCV				mS
INJ Bank 1	58	③	DCV				mS
STO	17		DCV				DCV
CANP	31		DCV				DCV
WAC	54		DCV				DCV
ISC-BPA	21		DCV				DCV
FP	22		DCV				DCV
SPOUT	36		RPM				RPM
CCO	53		DCV				DCV
OTHER							
IGN TIMING	TIMING						DEG

NOTES: ① – **Brake pedal depressed.**
② – **A/C on.**
③ – **Monitor in DCV manual mode.**
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.
2.9L EFI VALUES ARE UNAVAILABLE.

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APPENDIX: Diagnostic Reference Values

3.0L EFI CAR

TAURUS/SABLE/PROBE

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.8	DCV	.8	.9	1.2-1.4	DCV
SCCS	50	6.7	DCV	6.7	6.7	6.7	DCV
PFE	27	3.2	DCV	3.2	3.4	3.5-3.8	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
THS 4/3 (AXOD)	25	10.0	DCV	11.0	0	0	DCV
ACT	25	1.5	DCV	2.0-2.5	2.0-3.0	2.2-3.2	DCV
MAP	45	158	Hz	108-110	110-114	118-120	Hz
IDM	4	0	RPM	750-850	1300-1500	2500-2800	RPM
PIP	56	0	RPM	750-850	1300-1500	2500-2800	RPM
HEGO	29	0	DCV	switching	switching	switching	DCV
THS3/2(AXOD)	19	10.0	DCV	11.0	0	0	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACC	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
PSPS	24	0	DCV	0/10.0 turn	0	0	DCV
NDS (A/T)	30	0	DCV	0	VBAT	VBAT	DCV
NPS (AXOD)	30	VBAT	DCV	VBAT	VBAT	VBAT	DCV
NGS/CES (M/T)	30	0	DCV	0	5.0/0③	5.0	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	5.8-6.1	7.0-8.0	7.5-10.0	mS
INJ Bank 1	58	VBAT④	DCV	5.8-6.1	7.0-8.0	7.5-10.0	mS
HEDF	52	VBAT	DCV	VBAT	VBAT	VBAT	DCV
EVR	33	VBAT④	DCV	0	0	0-40	%
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	9.0-VBAT	.2-5.0	DCV
WAC	54	0	DCV	0/7.5②	0	0	DCV
ISC-BPA	21	VBAT	DCV	11.0	8.5-9.0	7.5-8.0	DCV
SCVAC	42	VBAT④	DCV	0	0	0	%
FP	22	VBAT	DCV	.8	.8	.8	DCV
SPOUT	36	0	RPM	750-850	1300-1500	2500-2800	RPM
LUS (AXOD)	53	VBAT	DCV	VBAT	.7	.7	DCV
SCVNT	35	VBAT④	DCV	0	97	97	%
EDF	55	0	DCV	0	0/8.0	0/8.0	DCV
OTHER							
IGN TIMING	TIMING			22-25	31-36	35-40	DEG

NOTES: ① - Brake pedal depressed.

② - A/C on.

③ - Clutch pedal depressed.

④ - Monitor in DCV manual mode.

HEGO in 'switching' mode ranges from .2 to .9 DCV. Speed Control (SCCS, SCVAC, SCVNT) is applied for 30 mph and 55 mph.

Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

3.0L SEFI SHO CAR

TAURUS SHO

SENSORS/ INPUTS	Sig. Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.7	DCV	.7	1.0	1.1	DCV
MAF	50	0	DCV	.7	1.2-1.3	1.8-2.0	DCV
PFE	27	3.3	DCV	3.3	3.5	3.5	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	2.5	DCV	3.0	3.3	3.4	DCV
BP	45	157	Hz	157	157	157	Hz
IDM	4	0	RPM	800-850	2000-2100	2750-2800	RPM
PIP	56	0	RPM	800-850	2200-2100	2250-2800	RPM
KS	23	2.5	DCV	2.5	2.5	2.5	DCV
HEGO-R	29	0	DCV	switching	switching	switching	DCV
FPM	19	0	DCV	10.4	10.4	10.4	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
CID	24	VBAT	DCV	5.0-7.0	6.0-6.5	6.0-6.5	DCV
HEGO-L	43	0	DCV	switching	switching	switching	DCV
CES	30	4.7	DCV	4.7	4.7/0③	4.7	DCV
SCCS	28	6.7	DCV	6.7	6.7	6.7	DCV
BOO	5	0	DCV	0/VBAT①	0	0	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ 4	13	VBAT④	DCV	4.0-4.2	4.0-5.0	5.0-5.5	mS
INJ 6	15	VBAT④	DCV	4.0-4.2	4.0-5.0	5.0-5.5	mS
INJ 5	14	VBAT④	DCV	4.0-4.2	4.0-5.0	5.0-5.5	mS
INJ 2	59	VBAT④	DCV	4.0-4.2	4.0-5.0	5.0-5.5	mS
INJ 1	58	VBAT④	DCV	4.0-4.2	4.0-5.0	5.0-5.5	mS
EVR	33	VBAT④	DCV	0	0	0	%
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	0.6.0	.2	DCV
WAC	54	0	DCV	0/7.7②	0	0	DCV
ISC-BPA	21	VBAT	DCV	9.4	8.3-8.5	8.0	DCV
HFP	41	VBAT	DCV	VBAT	VBAT	VBAT	DCV
FP	22	VBAT	DCV	.8	.8	.8	DCV
INJ 3	12	VBAT④	DCV	4.0-4.2	4.0-5.0	5.0-5.5	mS
SPOUT	36	0	RPM	800-850	2000-2100	2750-2800	RPM
IAC	32	.7	DCV	.7	.7	.7	DCV
SCVAC	51	VBAT④	DCV	0	0	0	%
SCVNT	35	VBAT④	DCV	0	98	98	%
EDF	55	0	DCV	0	0	0	DCV
OTHER							
IGN TIMING	TIMING			11-12	35-38	37-37	DEG

NOTES:
① Brake pedal depressed.
② A/C on.
③ Clutch petal depressed.
④ Monitor in DCV manual mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Speed control (SCCS, SCVAC, SCVNT) is applied for 30 MPH and 55 MPH.
Reference values shown may vary approximately ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

3.8L SEFI AXOD CAR

TAURUS/SABLE/CONTINENTAL/TAURUS POLICE

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.9	DCV	.9	1.1	1.3-1.4	DCV
FPM	50	0	DCV	VBAT	VBAT	VBAT	DCV
PFE	27	3.2	DCV	3.2	3.4	3.0-3.3	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
THS 4/3	18	9.5	DCV	11.0	0	0	DCV
ACT	25	.9	DCV	.9	1.8	1.5-1.8	DCV
MAP	45	158	Hz	105	107-108	118-121	Hz
IDM	4	0	RPM	700-730	1450-1600	2500-2600	RPM
PIP	56	0	RPM	700-730	1450-1600		RPM
HEGO-R	29	0	DCV	switching	switching	2500-2600	DCV
THS 3/2	19	9.5	DCV	11.0	0	0	DCV
ACC	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
HEGO-L	43	0	DCV	switching	switching	switching	DCV
NPS	30	4.6	DCV	4.6	0	0	DCV
SCCS	28	6.7	DCV	6.7	6.7	6.7	DCV
BOO	5	0	DCV	0/VBAT①	0	0	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ 4	13	VBAT④	DCV	6.0-6.8	7.0-8.0	9.0-11.0	mS
INJ 6	15	VBAT④	DCV	6.0-6.8	7.0-8.0	9.0-11.0	mS
INJ 5	14	VBAT④	DCV	6.0-6.8	7.0-8.0	9.0-11.0	mS
INJ 2	59	VBAT④	DCV	6.0-6.8	7.0-8.0	9.0-11.0	mS
INJ 1	58	VBAT④	DCV	6.0-6.8	7.0-8.0	9.0-11.0	mS
EVR	33	VBAT④	DCV	0	0	40	%
STO/MIL	17	.7	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	VBAT	.2	DCV
WAC	54	0	DCV	0/7.5②	0	0	DCV
ISC-BPA	21	VBAT	DCV	10.0	8.2-9.5	7.0-9.0	DCV
HEDF	41	VBAT	DCV	VBAT	VBAT	VBAT	DCV
FP	22	VBAT	DCV	.8	.8	.8	DCV
INJ 3	12	VBAT④	DCV	6.0-6.8	7.0-8.0	9.0-11.0	mS
SPOUT	36	0	RPM	700-730	1450-1600	2500-2600	RPM
ACL	32	5.0	DCV	5.0	5.0	5.0	DCV
SCVAC	51	VBAT④	DCV	0	0	0	%
LUS	53	VBAT	DCV	VBAT	VBAT	.9	DCV
SCVNT	35	VBAT④	DCV	0	98	98	%
EDF	55	0	DCV	0	0	0	DCV
OTHER							
IGN TIMING	TIMING			14-16	34-35	35-40	DEG

NOTES: ① - Brake pedal depressed.

② - A/C on.

③ - Monitor in DCV manual mode.

HEGO in 'switching' mode ranges from .2 to .9 DCV.

Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

3.8L SEFI RWD CAR

THUNDERBIRD/COUGAR

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.9	DCV	.9	1.0	1.2-1.3	DCV
PFE	27	3.2	DCV	3.2	3.4	3.6	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	.9	DCV	1.0	2.0	1.6-2.0	DCV
MAP	45	157	Hz	102	105-107	110-115	Hz
IDM	4	0	RPM	700-750	1250-1300	2200-2300	RPM
PIP	56	0	RPM	700-750	1250-1300	2200-2300	RPM
BOO	5	0	DCV	0/VBAT①	0	0	DCV
HEGO-R	29	0	DCV	switching	switching	switching	DCV
VSS+	3	0	MPH	0	30	55	MPH
HEGO-L	43	0	DCV	switching	switching	switching	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
FPM	50	0	DCV	VBAT	VBAT	VBAT	DCV
SCCS	28	6.7	DCV	6.7	6.7	6.7	DCV
NDS	30	0	DCV	0	4.6	4.6	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ 1	58	VBAT③	DCV	6.0-6.2	7.5-9.0	8.0-9.5	mS
INJ 2	59	VBAT③	DCV	6.0-6.2	7.5-9.0	8.0-9.5	mS
INJ 3	12	VBAT③	DCV	6.0-6.2	7.5-9.0	8.0-9.5	mS
INJ 4	13	VBAT③	DCV	6.0-6.2	7.5-9.0	8.0-9.5	mS
INJ 5	14	VBAT③	DCV	6.0-6.2	7.5-9.0	8.0-9.5	mS
INJ 6	15	VBAT③	DCV	6.0-6.2	7.5-9.0	8.0-9.5	mS
EVR	33	VBAT③	DCV	0	0	40	%
STO/MIL	17	.7	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	VBAT	.2-5.0	DCV
WAC	54	0	DCV	0	0	0	DCV
FP	22	VBAT	DCV	10.2-10.5	8.8-9.4	6.0-8.0	DCV
SPOUT	36	0	RPM	700-750	1250-1300	2200-2300	RPM
SCVNT	35	VBAT③	DCV	0	98	98	%
SCVAC	42	VBAT③	DCV	0	0	0	%
OTHER							
IGN TIMING	TIMING			17-20	23-25	27-29	DEG

NOTES: ① - Brake pedal depressed.
② - A/C on.
③ - Monitor in DCV manual mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Speed Control (SCCS, SCVAC, SCVNT) is applied for 30 mph and 55 mph.
Reference values shown may vary approximately ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

3.8L SEFI SC CAR

THUNDERBIRD/COUGAR

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.8	DCV	.8	.9-1.0	1.1-1.2	DCV
MAF	50	0	DCV	.7	1.2-1.3	1.8-2.0	DCV
PFE	27	3.2	DCV	3.2	3.4	3.6-3.7	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	2.0	DCV	2.5	3.0	3.0	DCV
BP	45	158	Hz	158	158	158	Hz
IDM	4	0	RPM	770-800	1500-1550	1800-1900	RPM
PIP	56	0	RPM	770-800	1500-1550	1800-1900	RPM
KS	23	2.5	DCV	2.5	2.5	2.5	DCV
HEGO-R	29	0	DCV	switching	switching	switching	DCV
FPM	19	0	DCV	VBAT	VBAT	VBAT	DCV
ACC	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
CID	24	0/VBAT	DCV	5.0-7.0	5.5-6.0	5.5-6.0	DCV
HEGO-L	43	0	DCV	switching	switching	switching	DCV
NGS/CES (M/T)	30	0	DCV	0	4.8/0③	4.8	DCV
SCCS	28	6.7	DCV	6.7	6.7	6.7	DCV
BOO	5	0	DCV	0/VBAT①	0	0	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ 4	13	VABT④	DCV	4.0-4.4	4.5-5.0	5.7-7.0	mS
INJ 6	15	VBAT④	DCV	4.0-4.4	4.5-5.0	5.7-7.0	mS
INJ 5	14	VBAT④	DCV	4.0-4.4	4.5-5.0	5.7-7.0	mS
INJ 2	59	VBAT④	DCV	4.0-4.4	4.5-5.0	5.7-7.0	mS
INJ 1	58	VBAT④	DCV	4.0-4.4	4.5-5.0	5.7-7.0	mS
EVR	33	VBAT④	DCV	0	0	40	%
SBS	38	VBAT④	DCV	0	0	0	%
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	VBAT	6.0-8.5	DCV
WAC	54	0	DCV	0/7.5②	0	0	DCV
ISC-BPA	21	VBAT	DCV	9.0-9.4	7.6-8.0	7.5	DCV
HEDF	41	VBAT	DCV	VBAT	VBAT	VBAT	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
INJ 3	12	VBAT④	DCV	4.0-4.4	4.5-5.0	5.7-7.0	mS
SPOUT	36	0	RPM	770-800	1500-1550	1800-1900	RPM
ACL	32	5.0	DCV	5.0	5.0	5.0	DCV
SCVAC	51	VBAT④	DCV	0	0	0	%
SIL (M/T)	53	1.7	DCV	VBAT	VBAT	VBAT	DCV
SCVNT	35	VBAT	DCV	0	98	98	%
EDF	55	0	DCV	0	0	0	DCV
OTHER							
IGN TIMING	TIMING			15-17	30-34	34-35	DEG

NOTES: ① Brake pedal depressed.
② A/C on.
③ Clutch pedal depressed.
④ Monitor in DCV Manual Mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Speed Control (SCCS, SCVAC, SCVNT) is applied for 30 MPH and 55 MPH.
Reference values shown may vary approximately ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

5.0L SEFI CAR

MARK VII

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.8	DCV	.8	1.0-1.1	1.2-1.3	DCV
SCCS	50	6.7	DCV	6.7	6.7	6.7	DCV
EVP	27	.3	DCV	.3	.3	.8-1.5	DCV
ECT	7	.7	DCV	.7	.7	.7	DCV
ACT	25	.9	DCV	.9	1.5	1.6	DCV
MAP	45	157	Hz	107-110	105-112	110-118	Hz
IDM	4	0	RPM	690-720	1330-1360	2350-2450	RPM
PIP	56	0	RPM	690-720	1330-1360	2350-2450	RPM
HEGO-R	29	0	DCV	switching	switching	switching	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
HEGO L	43	0	DCV	switching	switching	switching	DCV
NDS	30	0	DCV	0	VBAT	VBAT	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ 4	13	VBAT③	DCV	4.7-5.0	5.0-6.0	6.4-7.8	mS
INJ 6	15	VBAT③	DCV	4.7-5.0	5.0-6.0	6.4-7.8	mS
INJ 5	14	VBAT③	DCV	4.7-5.0	5.0-6.0	6.4-7.8	mS
INJ 2	59	VBAT③	DCV	4.7-5.0	5.0-6.0	6.4-7.8	mS
INJ 1	58	VBAT③	DCV	4.7-5.0	5.0-6.0	6.4-7.8	mS
INJ 8	52	VBAT③	DCV	4.7-5.0	5.0-6.0	6.4-7.8	mS
EVR	33	VBAT③	DCV	0	0	0	%
SCVAC	38	VBAT③	DCV	0	0	0	%
STO/MIL	17	.7	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	6.0-7.0	6.0-7.0	DCV
WAC	54	0	DCV	0/VBAT②	0	0	DCV
ISC-BPA	21	VBAT	DCV	8.8	7.0-8.2	6.8-7.8	DCV
INJ 7	42	VBAT③	DCV	4.7-5.0	5.0-6.0	6.4-7.8	mS
FP	22	VBAT	DCV	.9	.9	.9	DCV
INJ 3	12	VBAT③	DCV	4.7-5.0	5.0-6.0	6.4-7.8	mS
SPOUT	36	0	RPM	690-720	1330-1360	2350-2450	RPM
AM 1	51	VBAT	DCV	0	0	0	DCV
AM 2	11	VBAT	DCV	VBAT	VBAT	VBAT	DCV
SCVNT	35	VBAT③	DCV	0	98	98	%
OTHER							
IGN TIMING	TIMING			24-25	32-34	34-35	DEG

NOTES: ① Brake pedal depressed.
② A/C on.
③ Monitor in DCV manual mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Speed Control (SCCS, SCVAC, SCVNT) is applied for 30 mph and 55 mph.
Reference values shown may vary approximately ± 20% depending on operating conditions and other factors.

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APPENDIX: Diagnostic Reference Values

5.0L SEFI CAR

CROWN VICTORIA/GRAND MARQUIS/LINCOLN TOWN CAR

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	1.0	DCV	1.0	1.1-1.2	1.3-1.4	DCV
MAF⑤	50	0	DCV	1.0	1.5-1.7	2.0-2.5	DCV
EVP	27	.4	DCV	.4	.7-1.0	2.0-3.0	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	.9	DCV	.9	1.0-1.5	1.5-1.8	DCV
MAP	45	158	Hz	105	105	123-125	Hz
BP⑤	45	158	Hz	158	158	158	Hz
IDM	4	0	RPM	700-750	1200-1300	1450-1550	RPM
PIP	56	0	RPM	700-750	1200-1300	1450-1550	RPM
HEGO-R	29	0	DCV	switching	switching	switching	DCV
FPM	19	0	DCV	VBAT	VBAT	VBAT	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
HEGO-L	43	0	DCV	switching	switching	switching	DCV
NDS	30	0	DCV	0	VBAT⑤	VBAT⑤	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ 4	13	VBAT④	DCV	5.7-6.2	6.4-8.0	8.0-10.0	mS
INJ 6	15	VBAT④	DCV	5.7-6.2	6.4-8.0	8.0-10.0	mS
INJ 5	14	VBAT④	DCV	5.7-6.2	6.4-8.0	8.0-10.0	mS
INJ 2	59	VBAT④	DCV	5.7-6.2	6.4-8.0	8.0-10.0	mS
INJ 1	58	VBAT④	DCV	5.7-6.2	6.4-8.0	8.0-10.0	mS
INJ 8	52	VBAT④	DCV	5.7-6.2	6.4-8.0	8.0-10.0	mS
EVR	33	VBAT	DCV	0	40	40-60	%
AM1	38	VBAT	DCV	0	0	VBAT	DCV
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	.2-6.0	.2	DCV
WAC	54	0	DCV	0/VBAT②	0	0	DCV
ISC-BPA	21	VBAT	DCV	10.0-11.5	9.0-9.5	7.5-8.5	DCV
INJ 7	42	VBAT④	DCV	5.7-6.2	6.4-8.0	8.0-10.0	mS
FP	22	VBAT	DCV	.9	.9	.9	DCV
INJ 3	12	VBAT④	DCV	5.7-6.2	6.4-8.0	8.0-10.0	mS
SPOUT	36	0	RPM	700-750	1200-1300	1450-1550	RPM
AM2	32	VBAT	DCV	VBAT	VBAT	VBAT	DCV
SCVAC	51	VBAT ④	DCV	0	0	0	%
SCVNT	35	VBAT ④	DCV	0	98	98	%
OTHER							
IGN TIMING	TIMING			20-23	28-34	32-35	DEG

NOTES: ① - Brake pedal depressed.
② - A/C on.
③ - Clutch pedal depressed.
④ - Monitor in DCV manual mode.
⑤ - MA Vehicles only; NDS value for MA vehicles is 5.0 DCV.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Speed Control (SCCS, SCVAC, SCVNT) is applied 30 mph and 55 mph.
Reference values shown may vary ±20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

5.0L SEFI MA CAR

MUSTANG

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.9	DCV	.9	1.0	1.2-1.3	DCV
MAF	50	f20	DCV	.8	1.4-1.7	2.0	DCV
EVP	27	.4	DCV	.4	.4	1.0	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	.9	DCV	.9	1.1	1.4	DCV
BP	45	158	Hz	158	158	158	Hz
IDM	4	0	RPM	670-700	1400-1500	2100-2500	RPM
PIP	56	0	RPM	670-700	1400-1500	2100-2500	RPM
HEGO-R	29	0	DCV	switching	switching	switching	DCV
FPM	19	0	DCV	VBAT	VBAT	VBAT	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
HEGO-L	43	0	DCV	switching	switching	switching	DCV
NDS (A/T)	30	0	DCV	0	5.0	5.0	DCV
NGS/CES (M/T)	30	0	DCV	0	4.6/0③	4.6	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ 4	13	VBAT④	DCV	4.9-5.2	4.0-6.0	6.8-6.9	mS
INJ 6	15	VBAT④	DCV	4.9-5.2	4.0-6.0	6.8-6.9	mS
INJ 5	14	VBAT④	DCV	4.9-5.2	4.0-6.0	6.8-6.9	mS
INJ 2	59	VBAT④	DCV	4.9-5.2	4.0-6.0	6.8-6.9	mS
INJ 1	58	VBAT④	DCV	4.9-5.2	4.0-6.0	6.8-6.9	mS
INJ 8	52	VBAT④	DCV	4.9-5.2	4.0-6.0	6.8-6.9	mS
EVR	33	VBAT	DCV	0	0	50-60	%
AM1	38	VBAT	DCV	0	0	0	DCV
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	VBAT	9.0-VBAT	DCV
WAC	54	0	DCV	0/VBAT②	0	0	DCV
ISC-BPA	21	VBAT	DCV	9.0-10.0	7.5-7.9	6.0-7.2	DCV
INJ 7	42	VBAT④	DCV	4.9-5.2	4.0-6.0	6.8-6.9	mS
FP	22	VBAT	DCV	.9	.9	.9	DCV
INJ 3	12	VBAT④	DCV	4.9-5.2	4.0-6.0	6.8-6.9	mS
SPOUT	36	0	RPM	670-700	1400-1500	2100-2500	RPM
AM2	32	VBAT	DCV	VBAT	VBAT	VBAT	DCV
OTHER							
IGN TIMING	TIMING			20	35-38	40	DEG

NOTES: ① - Brake pedal depressed.
② - A/C on.
③ - Clutch pedal depressed.
④ - Monitor in DCV manual mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ±20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

2.3L EFI OHC TRUCK

RANGER

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
MAF ⑤	14	0	DCV	.5	1.3-1.4	1.8-2.0	DCV
TP	47	1.0	DCV	1.0	1.2	1.5	DCV
EVP	27	.4	DCV	.4	.7-.9	1.5	DCV
ECT	7	.8	DCV	.8	.8	.8	DCV
ACT	25	1.5	DCV	1.8	2.3	2.2	DCV
MAP	45	158	Hz	105-106	108-112	124-127	Hz
BP ⑤	45	158	Hz	158	158	158	Hz
IDM	4	0	RPM	700-800	1700-2100	2700-3000	RPM
PIP	56	0	RPM	700-800	1700-2100	2700-3000	RPM
HEGO	29	0	DCV	switching	switching	switching	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
PSPS	24	0	DCV	0/10.0 turn	0	0	DCV
NDS (A/T)	30	0	DCV	0	VBAT⑤	VBAT⑤	DCV
NGS/CES (M/T)	30	0	DCV	0	0/VBAT③⑤	VBAT⑤	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	3.6-4.0	4.2-6.0	7.0-9.0	mS
INJ Bank 1	58	VBAT④	DCV	3.6-4.0	4.2-6.0	7.0-9.0	mS
SS 3/4 (A/T)	52	VBAT	DCV	VBAT	VBAT	.5	DCV
EVR	33	VBAT④	DCV	0	0	40	%
STO/MIL	17	.2	DCV	VBAT	VBAT	VBAT	DCV
WAC	54	0	DCV	0/VBAT②	0	0	DCV
ISC-BPA	21	VBAT	DCV	10.6-11.0	9.5-9.8	8.8-9.4	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SPOUT	36	0	RPM	700-800	1700-2100	2700-3000	RPM
DPI	32	11.0	DCV	0	0	0	DCV
OTHER							
IGN TIMING	TIMING			17-22	24-30	27-30	DEG

NOTES: ① - Brake pedal depressed.
② - A/C on.
③ - Clutch pedal depressed.
④ - Monitor in DCV manual mode.
⑤ - Ranger MA vehicles only; NDS and NGS/CES values for MA vehicles is 5.0 DCV.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

2.9L EFI TRUCK

RANGER/BRONCO II

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
MAF ⑤	14	f20	DCV	.8	1.3-1.4	1.9-2.3	DCV
TP	47	1.0	DCV	1.0	1.1-1.2	1.3-1.4	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	1.6	DCV	1.6	2.3	2.6	DCV
MAP	45	158	Hz	106-109	105-115	116-120	Hz
BP ⑤	45	158	Hz	158	158	158	Hz
IDM	4	0	RPM	840-870	1300-1600	2400-2600	RPM
PIP	56	0	RPM	840-870	1300-1600	2400-2600	RPM
HEGO	29	0	DCV	switching	switching	switching	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
NDS (A/T)	30	0	DCV	0	VBAT⑤	VBAT⑤	DCV
NGS/CES (M/T)	30	0	DCV	0	0/VBAT③⑤	VBAT⑤	DC
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	3.3-3.5	3.6-4.6	5.0-6.0	mS
INJ Bank 1	58	VBAT④	DCV	3.3-3.5	3.6-4.6	5.0-6.0	mS
SS 3/4 (A/T)	52	VBAT	DCV	VBAT	VBAT	VBAT	DCV
STO/MIL	17	.7	DCV	VBAT	VBAT	VBAT	DCV
WAC	54	0	DCV	0/VBAT ②	0	0	DCV
ISC-BPA	21	VBAT	DCV	10.0-11.0	9.2-10.2	5.0-6.0	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SPOUT	36	0	RPM	840-870	1300-1600	2400-2600	RPM
OTHER							
IGN TIMING	TIMING			24-27	30-36	34-36	DEG

NOTES: ① – Brake pedal depressed.
② – A/C on.
③ – Clutch pedal depressed.
④ – Monitor in DCV manual mode.
⑤ – MA Vehicles only; NDS and NGS/CES values for MA vehicles is 5.0 DCV.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

3.0L EFI TRUCK

AEROSTAR

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.8	DCV	.8	1.0-1.1	1.3-1.5	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	1.7	DCV	1.8	3.0	3.5	DCV
MAP	45	158	Hz	110-112	115-117	120-126	Hz
IDM	4	0	RPM	750-800	1600-1800	2600-2800	RPM
PIP	56	0	RPM	750-800	1600-1800	2600-2800	RPM
HEGO	29	0	DCV	switching	switching	switching	DCV
BOO	2	0	DCV	0/VBAT ①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT ②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
PSPS	24	0	DCV	0/10.5 turn	0	0	DCV
NDS (A/T)	30	0	DCV	0	VBAT	VBAT	DCV
NGS/CES (M/T)	30	0	DCV	0	0/VBAT③	VBAT	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	5.8-6.0	7.5-8.5	9.5-10.5	mS
INJ Bank 1	58	VBAT④	DCV	5.8-6.0	7.5-8.5	9.5-10.5	mS
SS 3/4 (A/T)	52	VBAT	DCV	VBAT	VBAT	.7	DCV
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	4.0-5.0	.2	DCV
WAC	54	0	DCV	0/VBAT ②	0	0	DCV
ISC-BPA	21	VBAT	DCV	10.6-11.8	9.6-10.0	9.0-9.8	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SPOUT	36	0	RPM	750-800	1600-1800	2600-2800	RPM
CCO (A/T)	53	VBAT	DCV	VBAT	VBAT	.7	DCV
OTHER							
IGN TIMING	TIMING			18-22	32-34	29-35	DEG

NOTES: ① - Brake pedal depressed.
② - A/C on.
③ - Clutch pedal depressed.
④ - Monitor in DCV manual mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ±20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

4.0L EFI MA TRUCK

RANGER/BRONCO II/AEROSTAR

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
OCTADJ	44	0	DCV	0	0	0	DCV
MAF	14	0	DCV	.6	1.3-1.4	1.7-2.0	DCV
TP	47	1.0	DCV	1.0	1.2-1.3	1.4-1.6	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	2.2	DCV	2.6	2.7	2.9	DCV
BP	45	158	Hz	158	158	158	Hz
IDM	4	0	RPM	750-850	1500-1700	1800-2000	RPM
PIP	56	0	RPM	750-850	1500-1700	1800-2000	RPM
HEGO	29	0	DCV	switching	switching	switching	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
NDS	30	0	DCV	0	5.0	5.0	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT③	DCV	3.0-3.2	3.8-4.4	5.0-7.0	mS
INJ Bank 1	58	VBAT③	DCV	3.0-3.2	3.8-4.4	5.0-7.0	mS
SS 3/4 (A/T)	52	VBAT	DCV	VBAT	VBAT	0	DCV
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	7.0-9.0	.2	DCV
WAC	54	0	DCV	0/VBAT②	0	0	DCV
ISC-BPA	21	VBAT	DCV	8.0-12.0	7.3-8.4	5.5-6.8	DCV
FP	22	VBAT	DCV	.1	.1	.1	DCV
SAW	36	0	RPM	750-850	1500-1700	1800-2000	RPM
CCO (A/T)	53	VBAT	DCV	VBAT	VBAT	0	DCV
OTHER							
IGN TIMING	TIMING			10	10	10	DEG

NOTES: ① - Brake pedal depressed.
② - A/C on.
③ - Monitor in DCV manual mode.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

4.9L EFI TRUCK

E and F - SERIES/BRONCO

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	1.0	DCV	1.0	1.2-1.3	1.5-1.6	DCV
EVP	27	.4	DCV	.4	1.5-2.0	2.0-3.0	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	1.2	DCV	1.2	1.6	1.6-2.0	DCV
MAP	45	158	Hz	106	107-112	120-135	Hz
IDM	4	0	RPM	675-725	④	④	RPM
OCS (E40D)	41	0	DCV	0	0	0	DCV
PIP	56	0	RPM	675-725	④	④	RPM
TOT (E40D)	23	1.7	DCV	1.2	1.2	1.2	DCV
KS	25	2.5	DCV	2.5	2.5	2.5	DCV
HEGO	29	0	DCV	switching	switching	switching	DCV
4x4L (E40D)	12	VBAT	DCV	VBAT	VBAT	VBAT	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT①	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
ACD	43	0	DCV	0/VBAT①	0	0	MPH
NDS (A/T)	30	0	DCV	0	5.0	5.0	DCV
MLP (E40D)	30	4.5	DCV	4.5	2.1	2.1	DCV
NGS/CES (M/T)	30	0	DCV	0	5.0/0②	5.0	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT③	DCV	6.4-6.8	7.5-9.5	11.0-12.5	mS
INJ Bank 1	58	VBAT③	DCV	6.4-6.8	7.5-9.5	11.0-12.5	mS
SS1 (E40D)	52	.3	DCV	.4	VBAT	VBAT	DCV
EVR	33	VBAT③	DCV	0	0	0	%
EPC (E40D)	38	7.3	DCV	8.5	8.6	9.0	DCV
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
WAC	54	0	DCV	0/VBAT①	0	0	DCV
ISC-BPA	21	VBAT	DCV	9.8-10.0	7.5-9.0	6.0-8.2	DCV
FP	22	VBAT	DCV	.1	.1	.1	DCV
SS2 (E40D)	19	VBAT	DCV	VBAT	.4	.4	DCV
SPOUT	36	0	RPM	675-725	④	④	RPM
OCIL (E40D)	32	VBAT	DCV	VBAT	VBAT	0	DCV
AM1	51	VBAT	DCV	VBAT	0	0	DCV
AM2	11	VBAT	DCV	VBAT	VBAT	VBAT	DCV
CCC (E40D)	53	VBAT	DCV	VBAT	.4	.4	DCV
CCS (E40D)	55	VBAT	DCV	VBAT	VBAT	.4	DCV
OTHER							
IGN TIMING	TIMING			17-20	24-28	24-30	DEG

NOTES: ① - A/C on.
② - Clutch pedal depressed.
③ - Monitor in DCV manual mode.
④ - RPM values are transmission, axle and tire dependent.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors.

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APPENDIX: Diagnostic Reference Values

5.0L EFI TRUCK

E AND F - SERIES/BRONCO

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.9	DCV	.9	1.0-1.1	1.2-1.3	DCV
EVP	27	.4	DCV	.4	.4-.8	3.0-3.5	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	1.2	DCV	1.2	1.4	1.2	DCV
MAP	45	158	Hz	104-105	107-112	122-124	Hz
IDM	4	0	RPM	700-730	⑤	⑤	RPM
OCS (E4OD)	41	0	DCV	0	0	0	DCV
PIP	56	0	RPM	700-730	⑤	⑤	RPM
TOT	23	1.7	DCV	1.2	1.2	1.2	DCV
KS	23	2.5	DCV	2.5	2.5	2.5	DCV
HEGO	29	0	DCV	switching	switching	switching	DCV
4x4L (E4OD)	12	VBAT	DCV	VBAT	VBAT	VBAT	DCV
BOO (E4OD)	2	0	DCV	0/VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
PSPS	24	0	DCV	0/11.0 turn	0	0	DCV
NDS (A/T)	30	0	DCV	0	VBAT	VBAT	DCV
MLP (E4OD)	30	4.5	DCV	4.5	2.1	2.1	DCV
NGS/CES (M/T)	30	0	DCV	0	0/VBAT③	VBAT	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	5.0-5.7	5.0-7.0	8.8-9.4	mS
INJ Bank 1	58	VBAT④	DCV	5.0-5.7	5.0-7.0	8.8-9.4	mS
SS1 (E4OD)	52	.3	DCV	.4	VBAT	VBAT	DCV
EVR	33	VBAT④	DCV	0	0-50	75-90	%
EPC (E4OD)	38	7.5	DCV	8.5	8.5	9.0	DCV
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
ISC-BPA	21	VBAT	DCV	9.0	5.5-6.0	2.5-4.5	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SS2 (E4OD)	19	VBAT	DCV	VBAT	.4	.4	DCV
SPOUT	36	0	RPM	700-730	⑤	⑤	RPM
OCIL (E4OD)	32	VBAT	DCV	VBAT	VBAT	0	DCV
AM1	51	VBAT	DCV	VBAT	0	0	DCV
AM2	11	VBAT	DCV	VBAT	VBAT	VBAT	DCV
CCC (E4OD)	53	VBAT	DCV	VBAT	.4	.4	DCV
CCS (E4OD)	55	VBAT	DCV	VBAT	VBAT	.4	DCV
OTHER							
IGN TIMING	TIMING			14	28-36	33-42	DEG

NOTES: ① - Brake pedal depressed.
② - A/C on.
③ - Clutch pedal depressed.
④ - Monitor in DCV manual mode.
⑤ - RPM values are transmission, axle and tire dependent.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: Diagnostic Reference Values

5.8L EFI TRUCK

E AND F - SERIES/BRONCO

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	.9	DCV	.9	1.1-1.2	1.3-1.4	DCV
EVP	27	.3	DCV	.3	.4	1.2-16	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	1.3	DCV	1.3	1.4	1.6-2.0	DCV
MAP	45	158	Hz	104-110	107-114	117-120	Hz
IDM	4	0	RPM	750-800	⑤	⑤	RPM
OCS (E4OD)	41	0	DCV	0	0	0	RPM
PIP	56	0	RPM	750-800	⑤	⑤	DCV
TOT (E4OD)	23	1.1	DCV	1.1	1.1	1.4	DCV
KS	23	2.5	DCV	2.5	2.5	2.5	DCV
HEGO	29	0	DCV	switching	switching	switching	DCV
4x4L (E4OD)	12	VBAT	DCV	VBAT	VBAT	VBAT	DCV
BOO (E4OD)	2	0	DCV	0/VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
NDS (A/T)	30	0	DCV	0	VBAT	VBAT	DCV
MLP (E4OD)	30	4.5	DCV	4.5	2.1	2.1	DCV
NGS/CES (M/T)	30	0	DCV	0	0/VBAT③	VBAT	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	5.8-6.4	6.0-8.5	9.0-11.0	mS
INJ Bank 1	58	VBAT④	DCV	5.8-6.4	6.0-8.5	9.0-11.0	mS
SS1 (E4OD)	52	.3	DCV	.4	VBAT	VBAT	DCV
EVR	33	VBAT④	DCV	0	0-30	40	%
EPC (E4OD)	38	7.2	DCV	8.5	8.9	9.0	DCV
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	VBAT	0	DCV
ISC-BPA	21	VBAT	DCV	8.3	5.0-7.0	3.0-4.0	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SS2 (E4OD)	19	VBAT	DCV	VBAT	.4	.4	DCV
SPOUT	36	0	RPM	750-800	⑤	⑤	RPM
OCIL (E4OD)	32	VBAT	DCV	VBAT	VBAT	0	DCV
AM1	51	VBAT	DCV	0	0	0	DCV
AM2	11	VBAT	DCV	VBAT	VBAT	VBAT	DCV
CCC (E4OD)	53	VBAT	DCV	VBAT	0	0	DCV
CCS (E4OD)	55	VBAT	DCV	VBAT	VBAT	VBAT	DCV
OTHER							
IGN TIMING	TIMING			15-18	30-40	37-45	DEG

NOTES:
① - Brake pedal depressed.
② - A/C on.
③ - Clutch pedal depressed.
④ - Monitor in DCV manual mode.
⑤ - RPM values are transmission, axle and tire dependent.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors.

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APPENDIX: Diagnostic Reference Values

7.5L EFI TRUCK

E AND F - SERIES

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
TP	47	1.0	DCV	1.0	1.1-1.3	1.3-1.5	DCV
EVP	27	.4	DCV	.4	.4	.4-4.0	DCV
ECT	7	.6	DCV	.6	.6	.6	DCV
ACT	25	1.2	DCV	1.2	1.5	2.2	DCV
MAP	45	158	Hz	104	108-110	121-126	Hz
IDM	4	0	RPM	700-750	⑤	⑤	RPM
OCS (E4OD)	41	0	DCV	0	0	0	DCV
PIP	56	0	RPM	700-750	⑤	⑤	RPM
TOT (E4OD)	23	1.5	DCV	1.5	1.5	1.4	DCV
KS	23	2.5	DCV	2.5	2.5	2.5	DCV
HEGO	29	0	DCV	switching	switching	switching	DCV
4x4L (E4OD)	12	VBAT	DCV	VBAT	VBAT	VBAT	DCV
BOO (E4OD)	2	0	DCV	0/VBAT①	0	0	DCV
FPM	8	0	DCV	VBAT	VBAT	VBAT	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
NDS (A/T)	30	0	DCV	0	VBAT	VBAT	DCV
MLP (E4OD)	30	4.4	DCV	4.4	2.1	2.1	DCV
NGS/CES (M/T)	30	0	DCV	0	0/VBAT③	VBAT	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
INJ Bank 2	59	VBAT④	DCV	5.7-7.0	6.5-8.5	9.0-11.0	mS
INJ Bank 1	58	VBAT④	DCV	5.7-7.0	6.5-8.5	9.0-11.0	mS
SS1 (E4OD)	52	.3	DCV	.4	VBAT	VBAT	DCV
EVR	33	VBAT④	DCV	0	0	0-60	%
EPC (E4OD)	38	7.3	DCV	8.8	9.0	9.0	DCV
STO/MIL	17	.6	DCV	VBAT	VBAT	VBAT	DCV
CANP	31	VBAT	DCV	VBAT	.2-12.0	.2	DCV
ISC-BPA	21	VBAT	DCV	8.0-10.0	5.0-7.5	3.5-7.0	DCV
FP	22	VBAT	DCV	.9	.9	.9	DCV
SS2 (E4OD)	19	VBAT	DCV	VBAT	.4	.4	DCV
SPOUT	36	0	RPM	700-750	⑤	⑤	RPM
OCIL (E4OD)	32	VBAT	DCV	VBAT	VBAT	0	DCV
AM1	51	VBAT	DCV	0	0	0	DCV
CCC (E4OD)	53	VBAT	DCV	VBAT	.4	.4	DCV
CCS (E4OD)	55	VBAT	DCV	VBAT	VBAT	.4	DCV
OTHER							
IGN TIMING	TIMING			18-20	37-45	38-46	DEG

NOTES: ① - Brake pedal depressed.
② - A/C on.
③ - Clutch pedal depressed.
④ - Monitor in DCV manual mode.
⑤ - RPM values are transmission, axle and tire dependent.
HEGO in 'switching' mode ranges from .2 to .9 DCV.
Reference values shown may vary ± 20% depending on operating conditions and other factors.

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APPENDIX: Diagnostic Reference Values

7.3L DIESEL E4OD Truck

E AND F - SERIES

SENSORS/ INPUTS	Signal Pin #	KOEO	Units	HOT IDLE	30 MPH	55 MPH	Units
FIPL	47	1.2	DCV	1.2	1.8	2.0-2.3	DCV
TOT	7	2.0	DCV	1.4	1.8	1.8	DCV
BP	45	157	Hz	157	157	157	Hz
RPMS	4	0	RPM	650-700	③	③	RPM
OCS	41	0	DCV	0	0	0	DCV
4x4L	12	VBAT	DCV	VBAT	VBAT	VBAT	DCV
BOO	2	0	DCV	0/VBAT①	0	0	DCV
ACCS	10	0	DCV	0/VBAT②	0	0	DCV
VSS+	3	0	MPH	0	30	55	MPH
MLP	30	4.5	DCV	4.5	2.1	2.1	DCV
STI	48	5.0	DCV	5.0	5.0	5.0	DCV
ACTUATORS/ OUTPUTS							
SS1	52	.3	DCV	.4	VBAT	VBAT	DCV
EPC	38	9.0	DCV	8.0	8.0	8.5	DCV
STO	17	VBAT	DCV	VBAT	VBAT	VBAT	DCV
SS2	19	VBAT	DCV	VBAT	.4	.4	DCV
SPOUT	36	0	RPM	650-700	③	③	RPM
OCIL/MIL	32	VBAT	DCV	VBAT	VBAT	0	DCV
CCC	53	VBAT	DCV	VBAT	.4	.4	DCV
CCS	55	VBAT	DCV	VBAT	VBAT	.4	DCV

NOTES: ① - **Brake pedal depressed.**
② - **A/C on.**
③ - **RPM values are transmission, axle and tire dependent.**
Reference values shown may vary ± 20% depending on operating conditions and other factors. RPM values are axle and tire dependent.

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APPENDIX: EEC-IV Graphs and Charts

EEC-IV GRAPHS & CHARTS

ACT 18-57
ECT 18-57
EVP 18-58
FIPL 18-58
Fuel Pressure 18-59
MAF 18-59
MAP/BP 18-60
MLP 18-61
PFE 18-61
TOT 18-62
TP 18-62
VAF 18-63
VAT 18-63

STATIC RESISTANCE VALUES

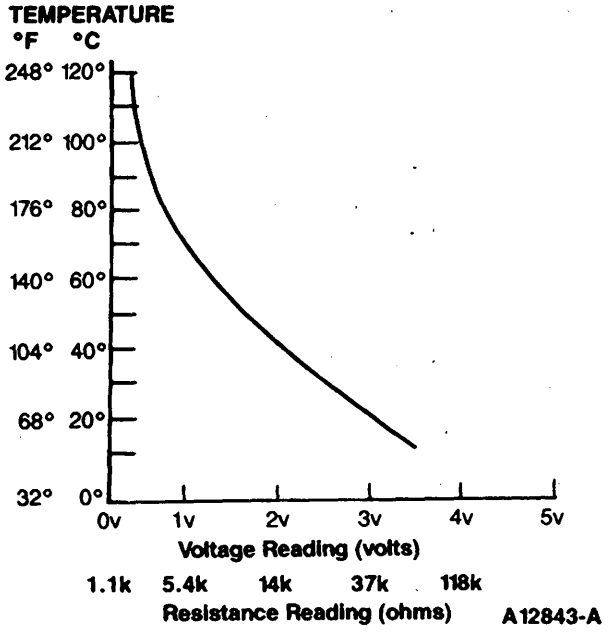
Device	Acceptable Range (Ohms)	Device	Acceptable Range (Ohms)
AM1	50 to 100	IAC	50 to 100
AM2	50 to 100	ISC-BPA	7 to 13
CANP	40 to 90	LUS	20 to 40
CCC	16 to 30	SBS	50 to 100
CCO	26 to 40	SCVAC	40 to 75
CCS	16 to 30	SCVNT	100 to 150
EDF	65 to 110	SS 3/4	26 to 40
EGRC	30 to 70	WAC	50 to 70
EGR S/O	65 to 110	WAC/IRCM	1K min.
EGRV	30 to 70		
EPC	3 to 6.5		
EVR	30 to 70		
FP	40 to 90		
FP/IRCM	65 to 110		
HEDF/IRCM	50 to 100		
Injectors	Refer to Section 17		

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APPENDIX: EEC-IV Graphs and Charts

ACT and ECT

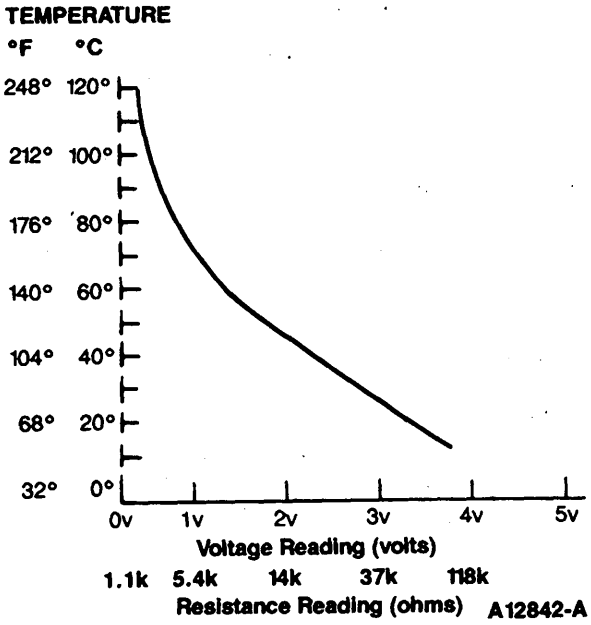
ACT Sensor Graph



ACT SENSOR DATA * Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations).

TEMPERATURE °F	TEMPERATURE °C	VOLTAGE* Volts	RESISTANCE K ohms
248	120	0.28	1.18
230	110	0.36	1.55
212	100	.47	2.07
194	90	.61	2.80
176	80	.80	3.84
158	70	1.04	5.37
140	60	1.35	7.60
122	50	1.72	10.97
104	40	2.16	16.15
86	30	2.62	24.27
68	20	3.06	37.30
50	10	3.52	58.75

ECT Sensor Graph



ECT SENSOR DATA * Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations).

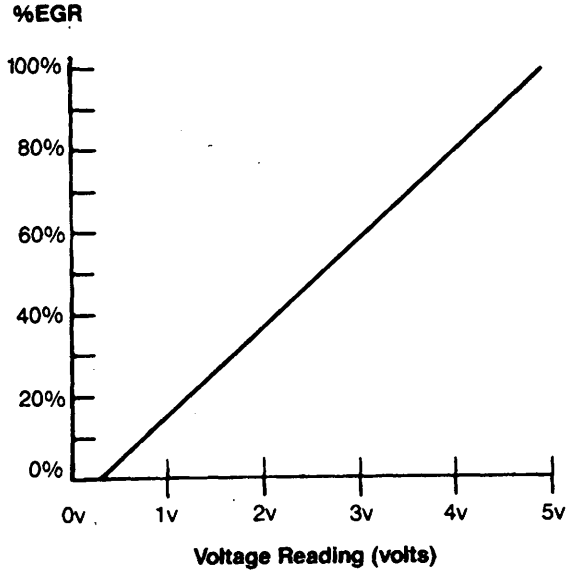
TEMPERATURE °F	TEMPERATURE °C	VOLTAGE* Volts	RESISTANCE K ohms
248	120	0.28	1.18
230	110	0.36	1.55
212	100	.47	2.07
194	90	.61	2.80
176	80	.80	3.84
158	70	1.04	5.37
140	60	1.35	7.60
122	50	1.72	10.97
104	40	12.16	16.15
86	30	12.62	24.27
68	20	13.06	37.30
50	10	13.52	58.75

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APPENDIX: EEC-IV Graphs and Charts

EVP and FIPL

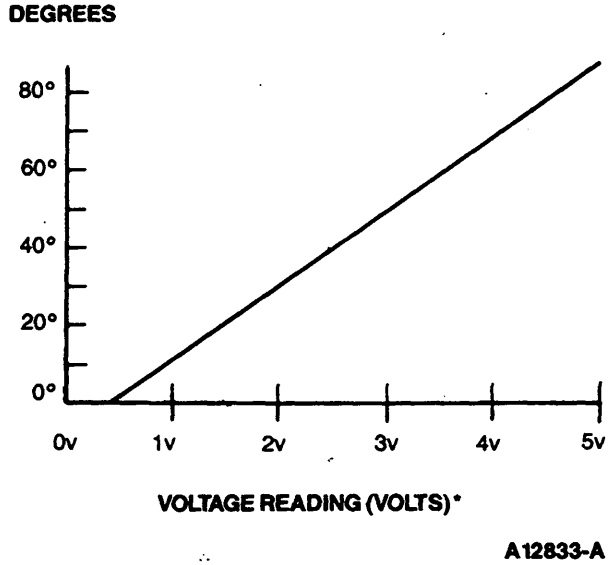
EVP Sensor Graph



EVP SENSOR DATA * Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations).

%EGR	VOLTAGE*
0	0.40
10	0.75
20	1.10
30	1.45
40	1.80
50	2.15
60	2.50
70	2.85
80	3.20
90	3.55
100	3.90

FIPL Throttle Angle



FIPL SENSOR DATA* Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations)

THROTTLE ANGLE DEGREES	VOLTAGE* VOLTS
0	0.50
10	0.97
20	1.44
30	1.90
40	2.37
50	2.84
60	3.31
70	3.78
80	4.24

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APPENDIX: EEC-IV Graphs and Charts

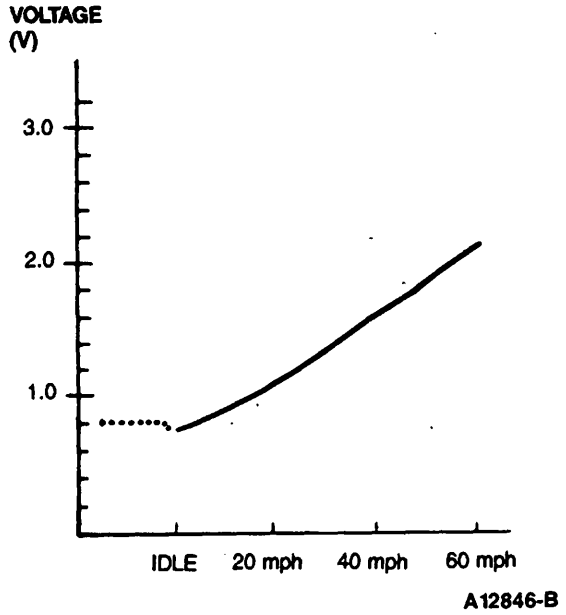
Fuel Pressure, MAF

FUEL PRESSURE SPECIFICATION TABLE

	1990 PASSENGER CAR ENGINES				
	1.9L/2.5L GFI	2.3L HSC EFI	3.0L SHO SEFI	3.8L SC SEFI	ALL OTHER APPLICATIONS
ENGINE RUNNING	13-17 PSI 90-120 kPa	45-60 PSI 310-415 kPa	28-33 PSI 193-227 kPa	30-45 PSI 210-280 kPa	30-45 PSI 210-310 kPa
KEY ON ENGINE OFF	13-17 PSI 90-120 kPa	50-60 PSI 345-415 kPa	30-45 PSI 210-310 kPa	35-40 PSI 240-280 kPa	35-40 PSI 240-280 kPa

	1990 Light Truck Engines	
	4.9L EFI	ALL OTHER APPLICATIONS
ENGINE RUNNING	45-60 PSI 310-415 kPa	30-45 PSI 210-310 kPa
KEY ON ENGINE OFF	50-60 PSI 345-415 kPa	35-45 PSI 240-310 kPa

MAF Sensor Graph



MAF SENSOR DATA* Engine at Normal Operating Temperature.

ENGINE CONDITION	VOLTAGE VOLTS*
IDLE	.8
20 MPH	1.0
40 MPH	1.7
60 MPH	2.1

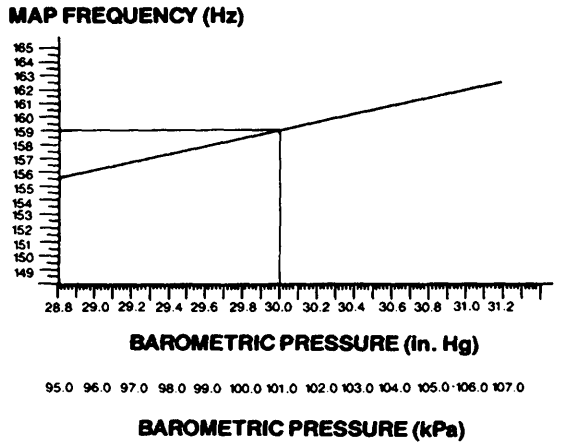
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MAP/BP

BP Sensor Graph

MAP Sensor Graphs: Output Frequency at Key On/Engine Off



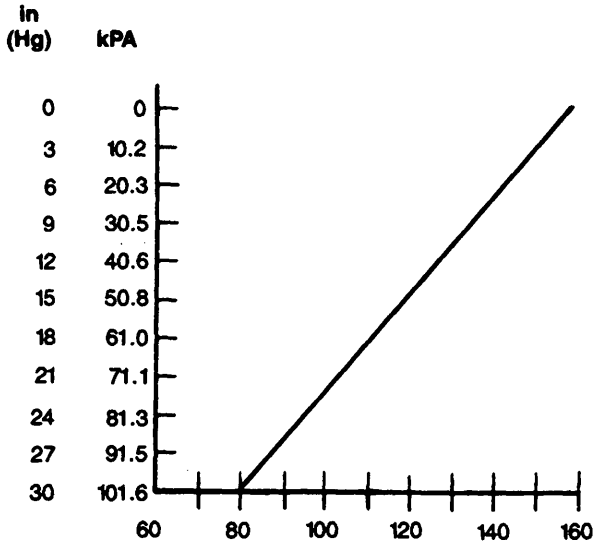
A12835-B

MAP/BP SENSOR DATA:
OUTPUT FREQUENCY AT KOEO

Frequency may vary plus or minus 6 Hz of these values due to sensor variations.

BAROMETRIC PRESSURE		FREQUENCY
in. (Hg)	kPa	Hz *
17.1	58	122.4
18.3	62	125.5
19.5	66	128.7
20.7	70	131.9
21.8	74	135.1
23.0	78	138.3
24.2	82	141.8
25.4	86	145.4
26.6	90	148.9
27.7	94	152.5
28.9	98	156.1
30.1	102	159.6
31.0	105	162.4

Manifold Vaccum



A12836-A

* MAP output frequency versus manifold vacuum data is based on 30.0 in. (Hg) Barometric Pressure.

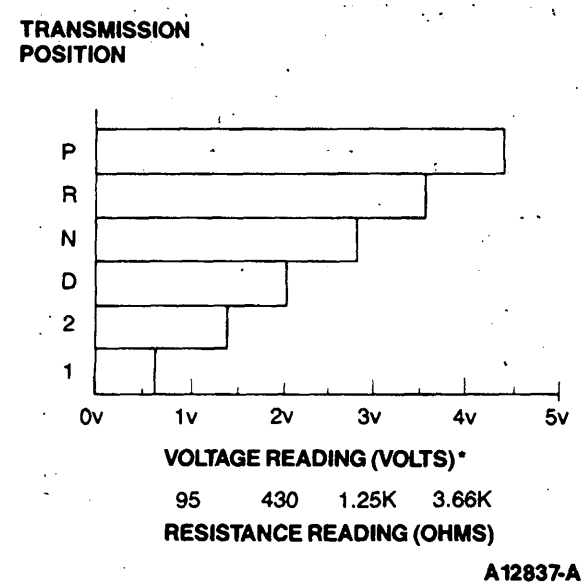
MANIFOLD VACUUM		FREQUENCY
in. (Hg)	kPa	Hz *
0	0	159
3	10.2	150
6	20.3	141
9	30.5	133
12	40.6	125
15	50.8	117
18	61.0	109
21	71.1	102
24	81.3	95
27	91.5	88
30	101.6	80

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APPENDIX: EEC-IV Graphs and Charts

MLP and PFE

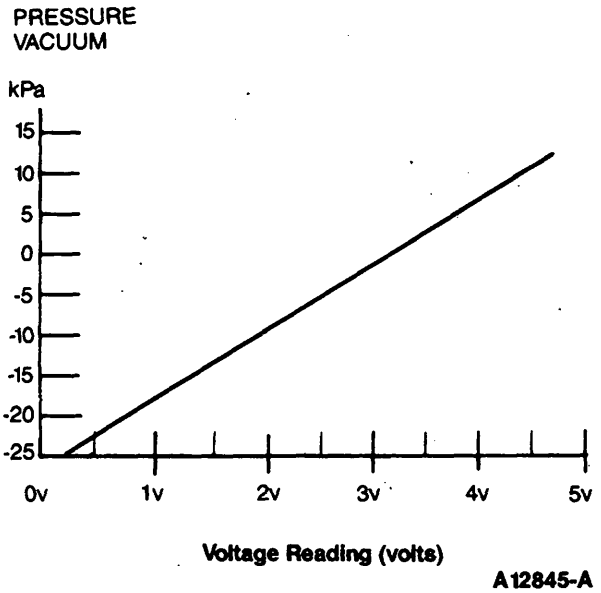
MLP Sensor Graph



MLP SENSOR DATA* Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations)

Transmission Shift Position	Voltage* Volts	Resistance Ohms
P	4.41	4.16K
R	3.60	1.44K
N	2.83	733
D	2.09	401
2	1.37	211
1	.68	81

PFE Sensor Graph



PFE SENSOR DATA* Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations)

PRESSURE/VACUUM			
PSI	in. Hg	kPa	VOLTAGE*
1.82	-	12.5	4.75
1.36	-	9.42	4.38
0.91	-	6.25	4.0
0.46	-	3.17	3.63
0	0	0	3.25
-	5	-17	1.22
-	7.4	-25	0.25

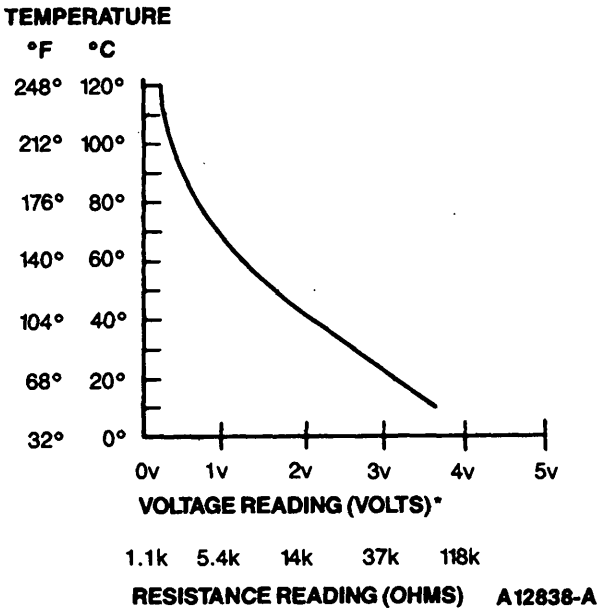
CAUTION: To avoid possible sensor damage do not exceed pressure/vacuum range shown when testing.

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APPENDIX: EEC-IV Graphs and Charts

TOT and TP

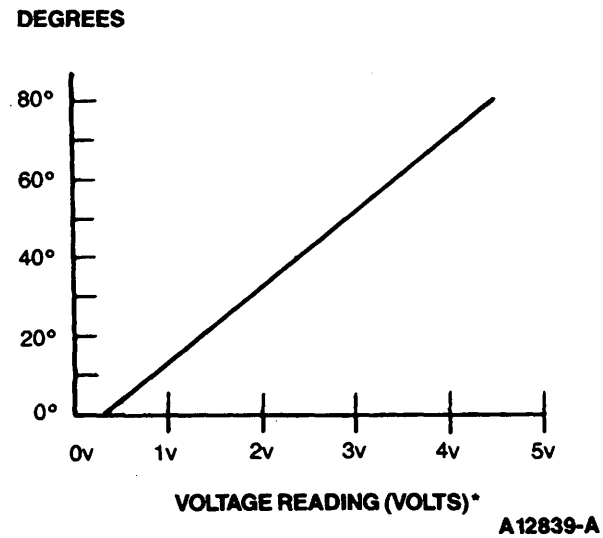
TOT Sensor Graph



TOT SENSOR DATA * Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations)

TEMPERATURE °F	TEMPERATURE °C	VOLTAGE* Volts	RESISTANCE K ohms
248	120	0.28	1.18
230	110	0.36	1.55
212	100	.47	2.07
194	90	.61	2.80
176	80	.80	3.84
158	70	1.04	5.37
140	60	1.35	7.60
122	50	1.72	10.97
104	40	2.16	16.15
86	30	2.62	24.27
68	20	3.06	37.30
50	10	3.52	58.75

Throttle Angle



TP SENSOR DATA * Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations)

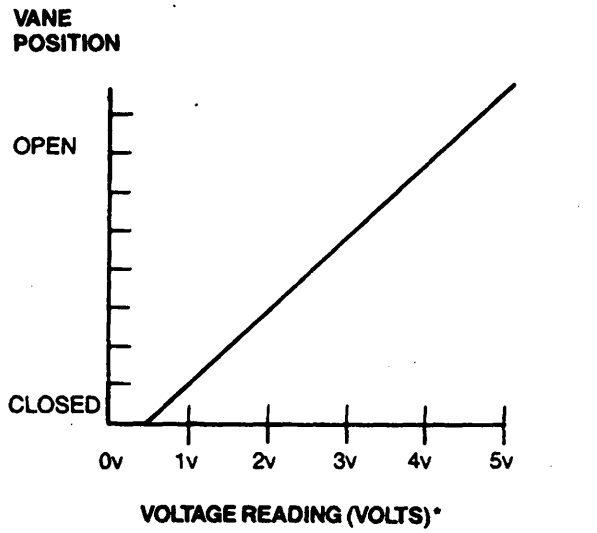
THROTTLE ANGLE DEGREES	VOLTAGE* VOLTS
0	0.50
10	0.97
20	1.44
30	1.90
40	2.37
50	2.84
60	3.31
70	3.78
80	4.24

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APPENDIX: EEC-IV Graphs and Charts

VAF and VAT

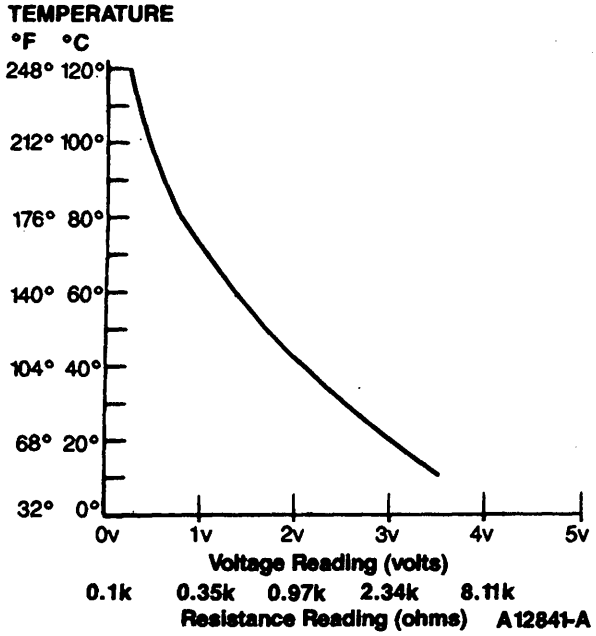
VAF Sensor Graph



VAF SENSOR DATA * Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations)

VANE POSITION	VOLTAGE* VOLTS
Vane Closed	.25v
Vane Full Open	4.50v

VAT Sensor Graph



VAT SENSOR DATA * Voltage values calculated for VREF=5.0v (These values may vary ± 15% due to sensor and VREF variations)

TEMPERATURE °F	TEMPERATURE °C	VOLTAGE* Volts	RESISTANCE K ohms
248	120	0.38	0.11
230	110	0.46	0.14
212	100	0.56	0.19
194	90	0.76	0.25
176	80	0.95	0.33
158	70	1.19	0.44
140	60	1.49	20.60
122	50	1.84	0.83
104	40	2.23	1.18
86	30	2.65	1.70
68	20	3.07	2.50
50	10	3.46	3.77

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SECTION 19

Diesel Diagnosis— 6.6L and 7.8L Ford Diesel Engines

Contents

Preliminary Checkout 19-1

Test Equipment 19-3

Engine Performance Specifications 19-6

Engine Lubrication System 19-7

High and Low Idle Speed Check and Adjustment 19-9

Dynamic Timing 19-11

Static Timing 19-14

Fuel System Description 19-17

Symptom Analysis 19-18

Pinpoint Tests 19-20

Engine Performance Diagnosis Procedure 19-44

Injector Nozzle Testing 19-57

Checking Compression 19-60

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Preliminary Checkout

This Section covers Adjustments, Diagnosis, and Test procedures for the 6.6L and 7.8L Ford Diesel engines. The areas included are the low-pressure fuel system, high-pressure (fuel injection) fuel system, air induction system, turbocharger, lubrication and cooling systems.

Before Starting

Efficient diagnosis must take place in an organized manner with a plan or procedure which starts with the obvious and goes on to the more difficult. Eliminate all the obvious and easy-to-do items first. Do not start by jumping to conclusions. The job worked on last week might have been caused by an entirely different problem than the one today.

Get All The Information Available

Check out all sources of information. Talk to the operator. Sometimes asking a question will cause the operator to remember something that is useful.

The following list is a set of basic questions. Get the answers to these in order to learn what the true complaint is, and what the basic problem is.

Operating Conditions:

1. Did the problem occur suddenly or over a long period of time?
2. Were there any abnormal noises before the failure?
3. Was the engine under heavy or light load? Decelerating or accelerating?
4. Did the water temperature or oil pressure vary?
5. Were weather conditions a factor?
6. What type of road grade was the vehicle on when the trouble was first noticed?
7. How was the trouble first noticed (felt, heard, etc.)?
8. What was the amount of oil consumption? Fuel? Coolant? Had there been a recent change?
9. What was the exhaust smoke like? Light or dense? Color?
10. Does the engine have good throttle response?
11. Is deceleration normal?
12. Does the engine shut off properly?
13. Does the engine start correctly when cold?
14. Does the engine ever miss?
15. What kind of fuel is being used? Grade and source?
16. Does the engine surge at idle or wide-open throttle?
17. Is the engine subjected to periods of extended idling?
18. Has the vehicle or equipment been in an accident or collision?

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Preliminary Checkout

Maintenance History:

1. Has the engine been serviced recently? What was done?
2. Has this complaint occurred before? If so, what was done then?
3. When was the last tune-up?
4. When were the oil and fuel filters last changed?
5. Who normally performs the maintenance and adjustments?
6. Is the maintenance schedule followed closely?
7. How is fuel obtained and stored?
8. What type service designation (SG/CE), and what grade oil is used?
9. How many miles or hours has the engine operated since the last service?

Observed Information:

1. Is the engine clean or dirty?
2. Are the belts in good condition? Loose?
3. Is there evidence of external oil, coolant or fuel leaks?
4. Does the engine appear to have overheated?
5. Are there any make-shift repairs on the engine (loose parts, wired-on parts, etc.)?
6. How does the engine sound at idle?
7. Are any pulleys wobbling?
8. Do any parts appear to have been altered or serviced recently?
9. Are there any aftermarket or unapproved parts on the engine?
10. Have any of the lines been altered or re-routed?
11. Are oil level, coolant level and fuel level satisfactory? (If the problem concerns bearings, notice the condition of the oil.)
12. During disassembly, does the engine have unusual odors, carbon accumulations, dirt or other conditions under the rocker cover?

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Test Equipment

The following test equipment (Figures 1 through 4) is required for adjusting idle speed and timing.

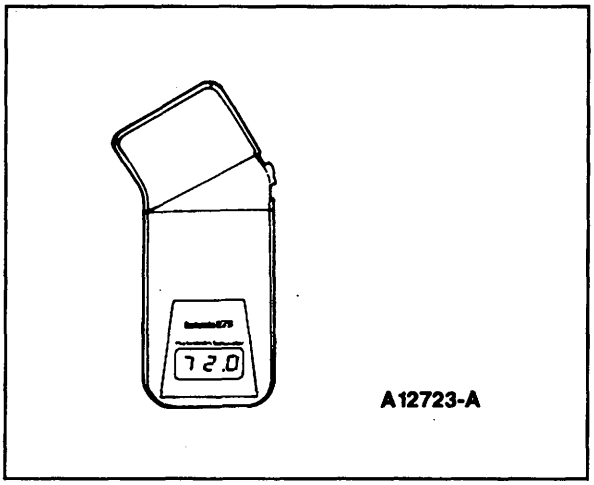


Figure 1 Photoelectric Tachometer, Rotunda 055-00108 Checking Engine

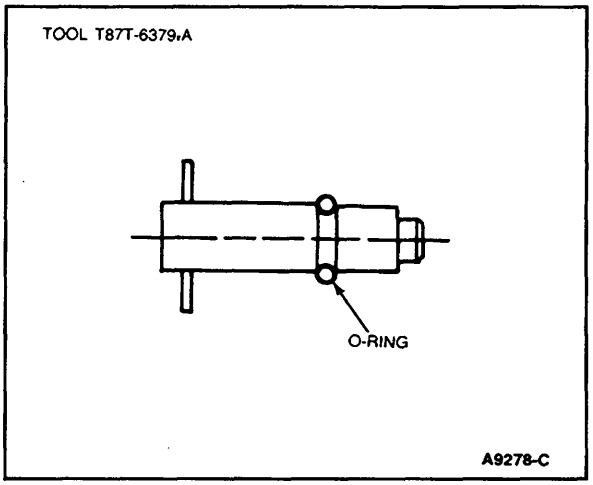


Figure 3 Timing Lock Pin — Damper T87T-6379-A

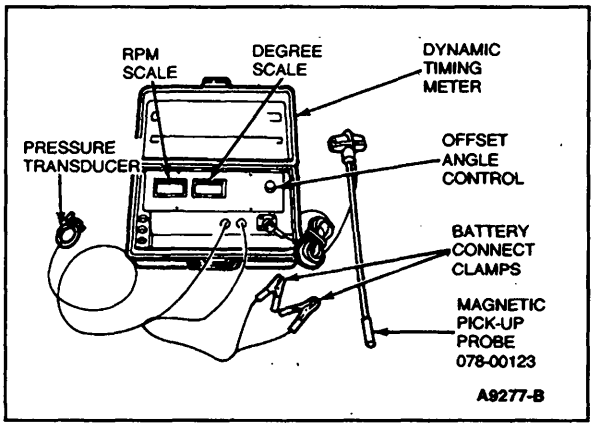


Figure 2 Dynamic Timing Meter, Rotunda 078-00200

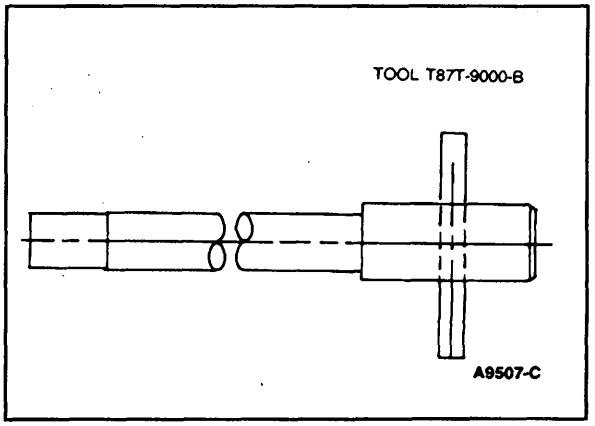


Figure 4 Timing Lock Pin — Injector Pump T87T-9000-B

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Test Equipment

The following test equipment (Figure 5) is required for performing the Engine Performance Diagnostic procedure.

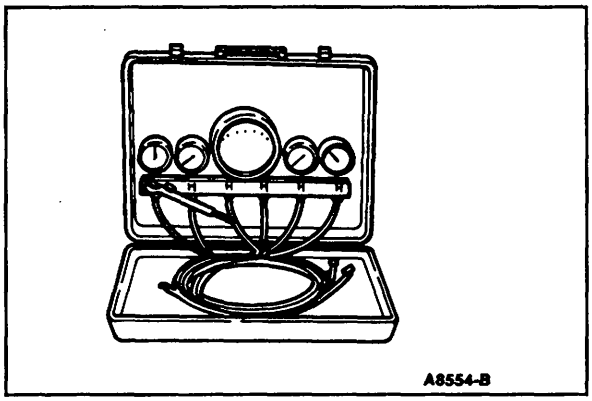


Figure 5 Rotunda 014-00762 Pressure Test Kit Used with Rotunda Adapter Kit 014-00733, 014-00742

The following test equipment (Figure 6) is used to test engine compression.

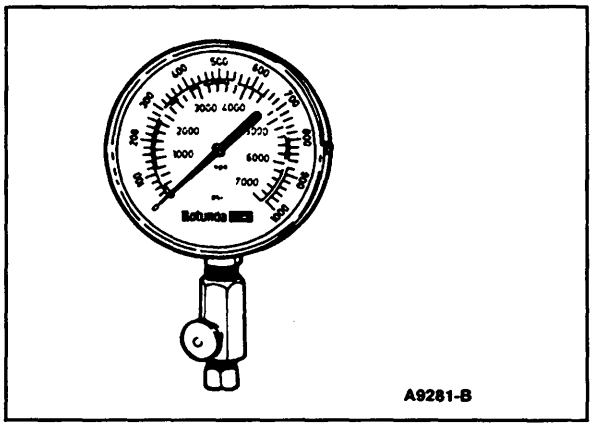


Figure 6 Rotunda Compression Tester 014-00701 Requires Adapter 014-00731

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Test Equipment

The following test equipment (Figure 7) is required for injection nozzle testing and cleaning.

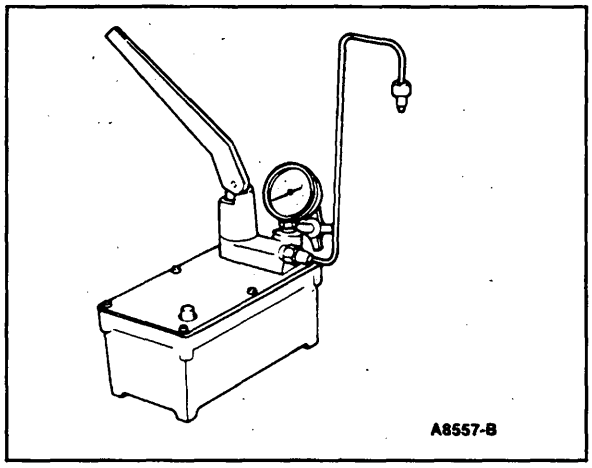


Figure 7 Rotunda Injector Nozzle Tester 014-00300 (Special Service Tool D83T-9000-F)

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1990 Ford Diesel Engine Performance Specifications

	6.6L Turbo			7.8L Turbo					
Engine Horsepower	**165**	**170**	**185**	**185**	**210**	**215**	**215**	**240**	**270**
Engine Certification (States)	50	50	50	50	50	50	50	50	50
Engine Rating (BHP @ 2400 rpm)			185	185	210		215	240	270
Engine Rating (BHP @ 2600 rpm)		165	170			215			
Engine Rating (BHP @ 2000 rpm)									
Firing Order	1-5-3-6-2-4								
Injection Pump Make and Model — Robert Bosch	A-2000	P-3000	A-2000	P-3000	P-3000	P-3000	P-3000	P-3000	
Turbocharger Make and Model — Garret Airesearch	T04E								T45
Injection Nozzle Make	Robert Bosch								
Injection Nozzle Opening Pressure (New) — PSI	3100-3220	3680-3800	3100-3220	3680-3800					
Minimum Allowable *Opening Pressure (Used-Service Check)* — PSI	2870	3390	2870	3390					
Injection Pump Static Timing — BTDC	14°	10°	14°	14°	10°	11°	10°	11°	12°
Injection Pump Dynamic Timing — (No Load) @ 1000 rpm	①	①	①	①	①	①	①	①	①
Low Idle Speed — Man. and Auto. Transmission	700-750								
High Idle Speed	2930-3010	2960-3040	2740-2820	2740-2820	2740-2820	2740-2820	2740-2820	2760-2840	2780-2840
Intake Manifold (Turbo Boost) Pressure — Full Load @ rated rpm	18 ± 1 psi (124 ± 7 kPa) @ 2600 rpm	20 ± 1 psi (138 ± 7 kPa) @ 2600 rpm	18 ± 1 psi (124 ± 7 kPa) @ 2400 rpm	14 ± 1 psi (97 ± 7 kPa) @ 2400 rpm	17 ± 1 psi (117 ± 7 kPa) @ 2400 rpm	16 ± 1 psi (110 ± 7 kPa) @ 2000 rpm	14 ± 1 psi (97 ± 7 kPa) @ 2400 rpm	16 ± 1 psi (110 ± 7 kPa) @ 2400 rpm	22.6 ± 1 psi (152 ± 7 kPa) @ 2400 rpm
Crankcase Pressure (max. allowable), no load	3 in. H_2O (.7 kPa) @ 2600 rpm		3 in. H_2O (.7 kPa) @ 2400 rpm						
Air Filter Restriction @ rated rpm, no load	@ 2600 rpm		@ 2400 rpm						
			(Max) 10 in H_2O (2.5 kPa)						
Fuel Pressure (filter inlet)	(Min) 15 psi (103.43 kPa) (Max) 30 psi (206.85 kPa)								
Fuel Pressure (filter outlet)	(Min) 15 psi (103.43 kPa) (Max) 28 psi (193.06 kPa)								
Pressure Drop Across Fuel Filter	(Max) 7 psi (48.27 kPa)								
Lift Pump Suction @ rated rpm, no load	(Max) 10 in H_2O (2.5 kPa)								
Fuel Return Line Pressure — no load	(Max) 6 psi (41.37 kPa)								
Lubricating Oil Pressure at Operating Temperature	Low Idle: (Min) 15 psi (103 kPa)								
	High Idle: 65-95 psi (488-655 kPa)								

① Not available at time of publication.

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Engine Lubrication System

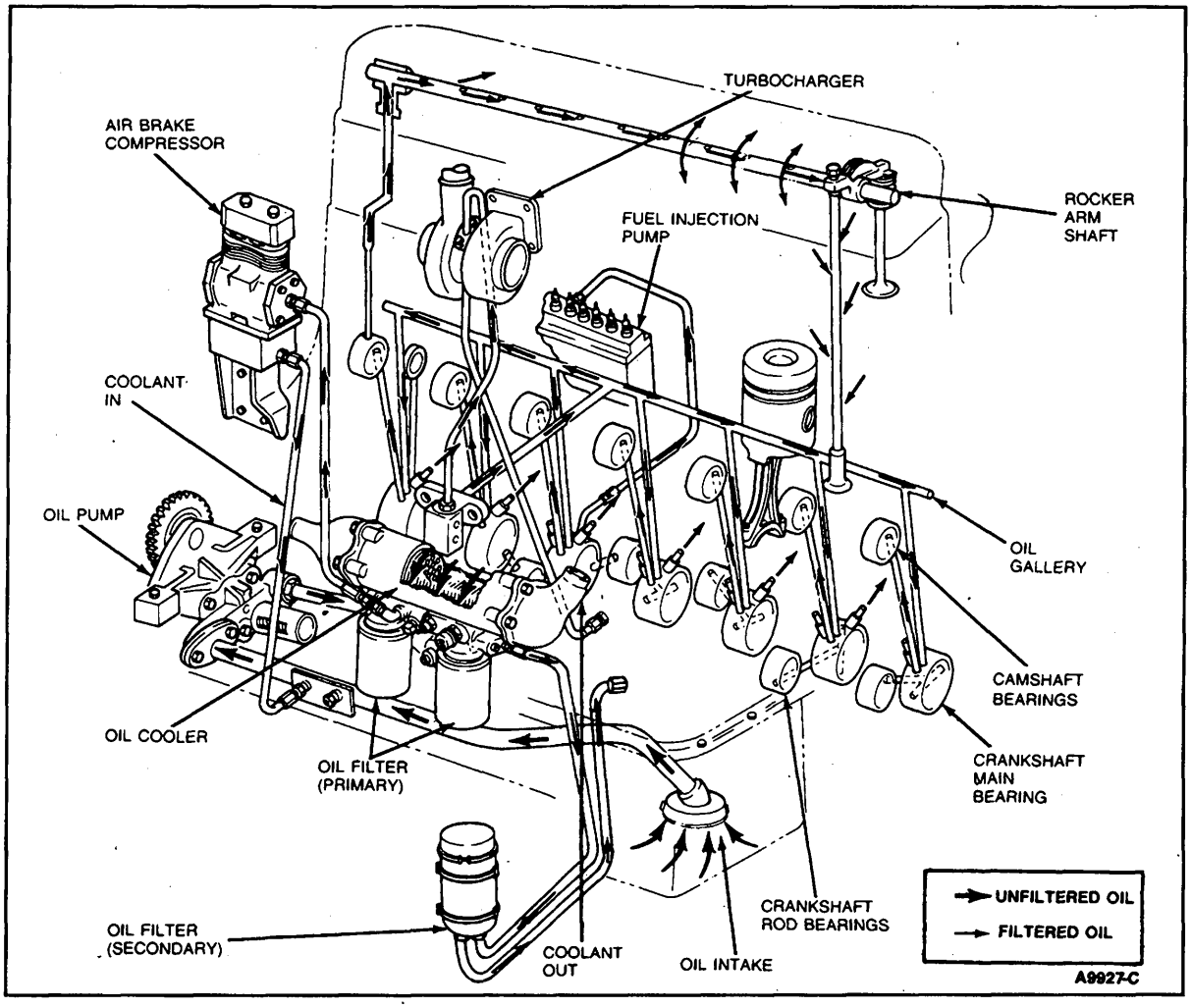


Figure 8 6.6L and 7.8L Ford Diesel Lubrication System

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Engine Lubrication System

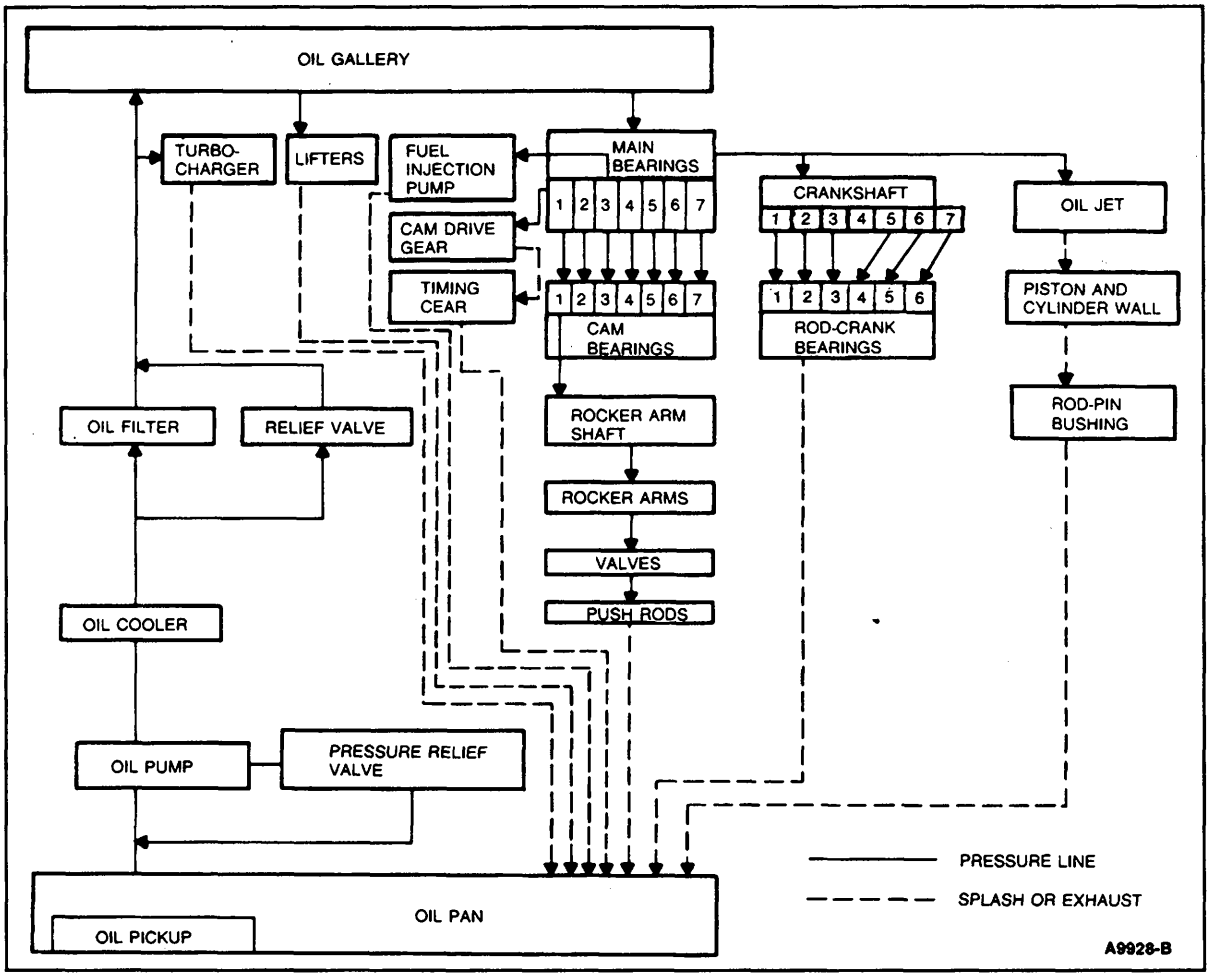


Figure 9 6.6L and 7.8L Ford Diesel Engines

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High and Low Idle Speed Check and Adjustment

1. Clean crankshaft vibration damper and apply reflective tape at point shown in Figure 10.

NOTE: If dynamic timing meter is being used to check engine rpm, application of reflective tape on vibration damper is not necessary. Refer to Dynamic Timing for instructions on meter hookup.

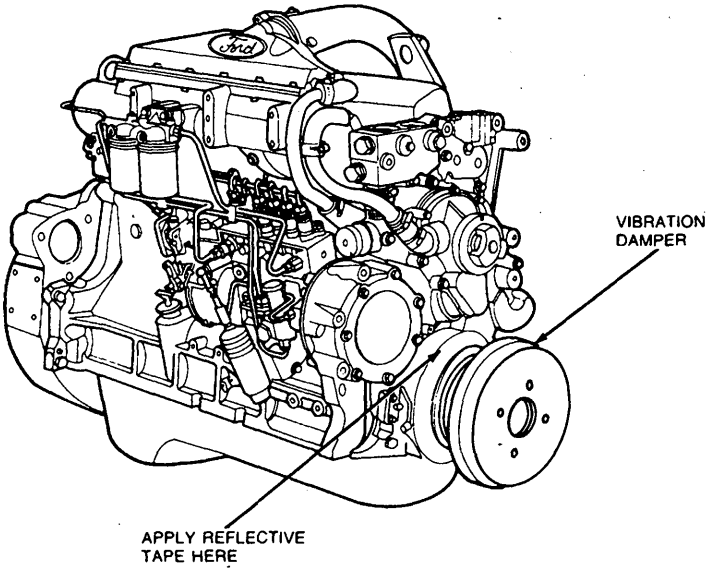


Figure 10 Reflective Tape Application

2. Place transmission in NEUTRAL or PARK and set the parking brake.
3. Bring engine to normal operating temperature. The engine must have been running at least 10 minutes prior to any adjustment.
4. Low idle speed is measured with manual transmission in NEUTRAL and automatic transmission in PARK.
5. Ensure that the throttle lever is against the low idle stop. If not, adjust linkage. Refer to Shop Manual, Section 25-60.

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High and Low Idle Speed Check and Adjustment

6. Check idle speed using Rotunda Photoelectric Tachometer 055-00108 or equivalent. Low idle speed is specified on the Vehicle Emission Control Information (VECI) decal. Turn adjusting screw (Figure 11) counterclockwise to increase speed, clockwise to decrease speed.

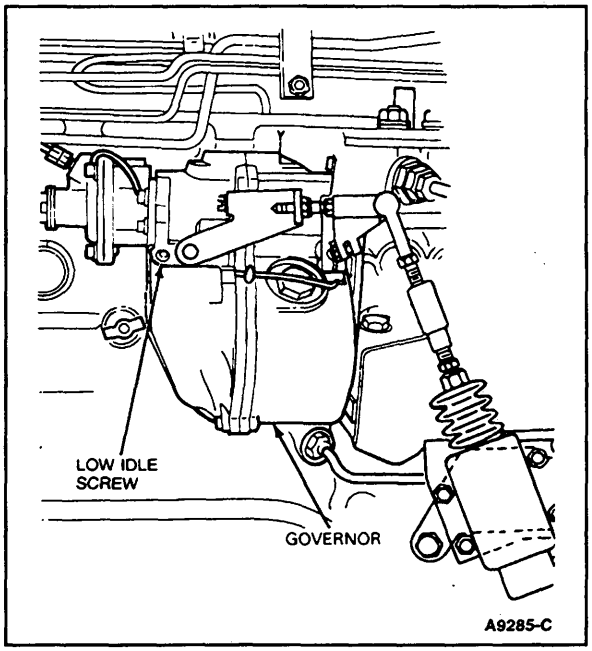


Figure 11 Adjusting Screw

7. Place transmission in NEUTRAL or PARK. Rev engine momentarily. Place transmission in specified gear (automatic transmission only) and recheck curb idle rpm. Adjust if necessary.

8. High idle speed is measured with manual transmission in NEUTRAL and automatic transmission in PARK or NEUTRAL.

9. Ensure that the throttle lever is against the high idle stop when the accelerator pedal is fully depressed. If not, adjust the linkage. Refer to Shop Manual, Section 25-60.

10. Check high idle speed using Rotunda Photoelectric Tachometer 055-00108 or equivalent.

11. If high idle speed is not correct, determine the problem. If the high idle is too low, go to the Engine Performance Diagnosis procedure. If the engine is overspeeding, the fuel injection pump should be sent to an authorized service center for inspection and diagnosis.

CAUTION

High idle speed is not to be adjusted. Breaking the seal on the high idle stop screw will void the warranty.

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Dynamic Timing

Engine timing is verified by using the timing bracket (Figure 12) located beside the crankshaft damper. The timing bracket contains holes for checking dynamic timing and static timing. Positioning of the bracket is very important because if it is loosened or moved, timing will not be correct. The bracket is accurately positioned and chisel marked to the front cover during engine production. These chisel marks must always be aligned. Never loosen or remove the timing bracket.

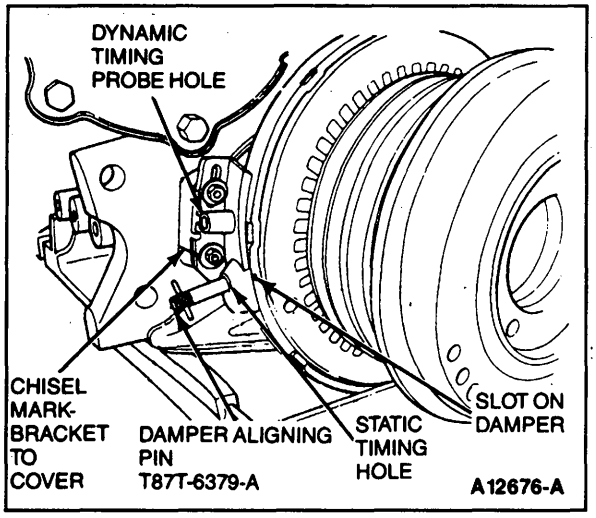


Figure 12 Timing Pin and Probe Bracket

Dynamic timing is used as a quick check of timing. Do not, under any circumstances, change or set engine timing based only on dynamic timing readings. Timing is to be verified and reset only with the Timing Lock Pins T87T-9000-B and T87T-6379-A or equivalent using the static timing method.

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Dynamic Timing

1. With engine stopped, install Rotunda Dynamic Timing Meter 078-00200 or equivalent. Place the magnetic pickup into the timing bracket pointer hole (Figure 13). Attach the connector from the pickup to the meter lead.

   NOTE: To prevent incorrect readings, make sure that the vibration damper grooves are clean and free of debris and rust. The pickup groove in the damper must not be plugged, or readings will be inaccurate.

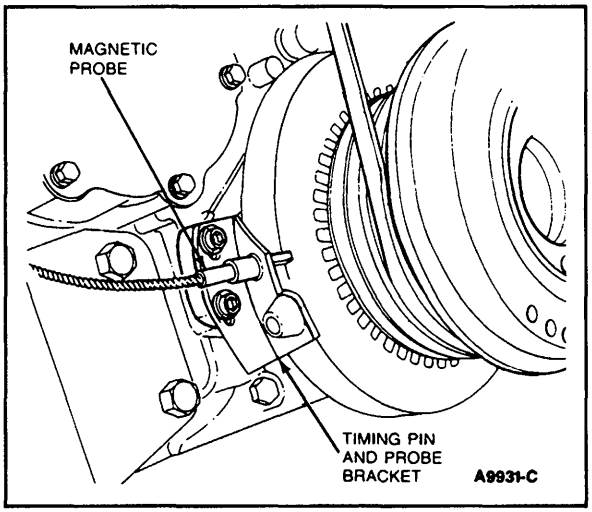


Figure 13 Inserting Magnetic Pickup Into Timing Bracket

2. Attach the pressure transducer to the No. 1 injector line (Figure 14) at the injector. Be sure the injector line is clean and free of paint where transducer is attached. Tighten the thumbscrew on the transducer finger-tight when attaching to the injector line.

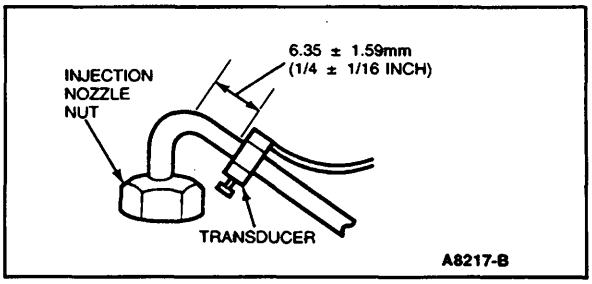


Figure 14 Pressure Transducer Attachment

NOTE: Cracks or other damage to the pressure transducer can cause incorrect timing readings. Follow these procedures carefully when working with pressure transducers.

- Do not over-tighten the transducer; snug fit is all that is needed. Do not use hand tools to tighten.
- Attach the transducer at the same location along the high-pressure line each time a check is made. The timing reading will change if the transducer is placed at a different location along the injector line.

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Dynamic Timing

- The transducer should be dry; wet conditions will give erratic readings. If erratic readings are observed, remove transducer, wipe line and transducer with a clean, dry cloth. Spray the transducer and line with a water-displacing material, and clamp on the injector line.

3. Connect the timing meter to the battery and adjust the offset angle on the meter to zero degrees.

CAUTION

Be sure that all wire leads are located away from the front accessory drive belts and cooling fan.

4. With the transmission in NEUTRAL or PARK and the parking brake set, start the engine. Set the engine speed at 1000 rpm with no load, and observe the timing meter.
5. Check the Engine Performance Specifications for the correct timing specification for the engine being serviced and compare with observed reading.
6. Turn the engine off and remove the dynamic timing components.
7. If timing is off more than 2 degrees and there are indications of incorrect timing, such as poor performance or smoke, check the static timing using the lock pins. If the engine is performing normally and there is no evidence of excessive smoke or poor performance, check all meter connections and, if necessary, have meter calibration verified.

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Static Timing

Pump On Engine (Check Timing)

1. Rotate engine clockwise. Set engine at correct static timing angle with No. 1 piston on the compression stroke. Fit Timing Lock Pin T87T-6379-A through the timing bracket into the correct crankshaft damper groove (Figure 15).

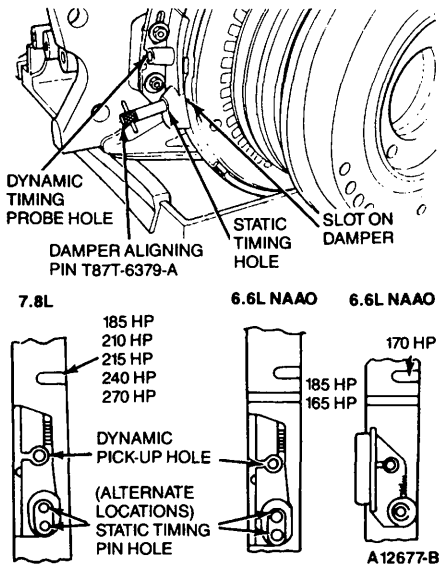


Figure 15 Fitting Timing Pin Into Crankshaft Damper

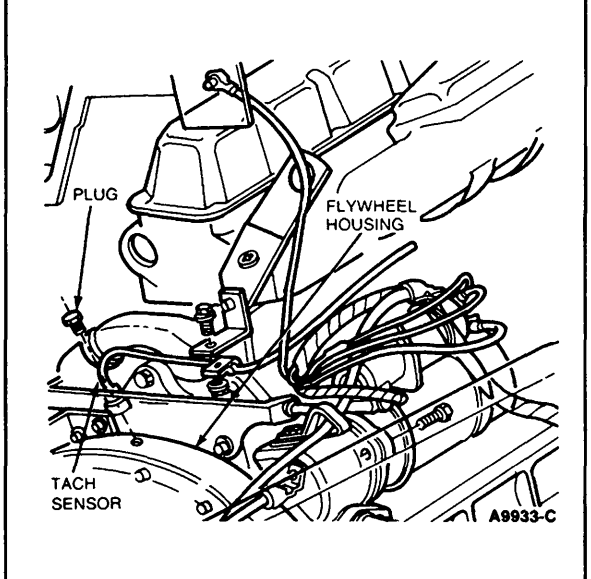


Figure 16 Tach Sensor or Plug Location

NOTE: The proper timing angle on the compression stroke of No. 1 cylinder is indicated by removing No. 1 injector and feeling for compression while turning the engine in the direction of rotation. When compression is felt, continue turning the engine until the alignment pin drops into the appropriate groove in the crankshaft damper cover. This indicates that the engine crankshaft is at the correct static timing angle with No. 1 piston on the compression stroke. Always approach the lock pin groove while turning the engine clockwise to ensure that gear backlash will not affect timing.

NOTE: When unable to access front damper mounting bolt to rotate engine, remove plug or tach sensor at top of flywheel housing to rotate flywheel ring gear with large screwdriver (Figure 16).

CAUTION

Do not, under any circumstances, loosen or remove the timing bracket.

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Static Timing

2. Remove the plug from the injector pump adapter plate timing pin location and install timing lock pin into the adapter plate (Figure 17).
3. It is important that the lock pin seats fully in the slot in the injection pump hub (to within 3mm (1/8-inch) of the shoulder of the lock pin) to shoulder of eccentric pin lock screw. This verifies proper engine timing. If the lock pin is not fully seated the timing will be incorrect.

CAUTION

Do not turn crankshaft with timing lock pins in place.

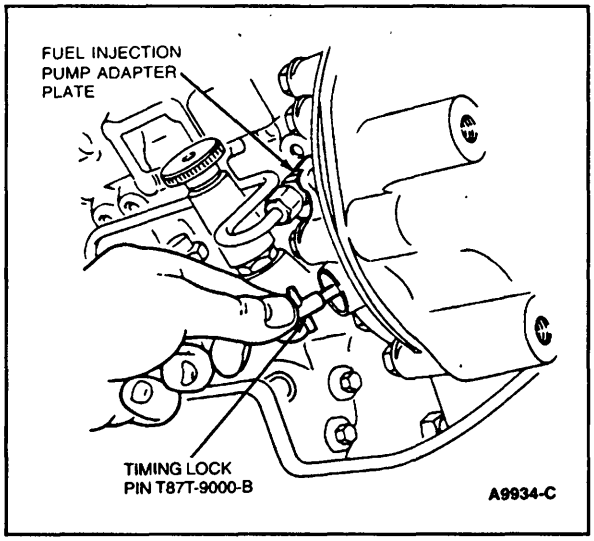


Figure 17 Lock Pin in Adapter Plate Installation

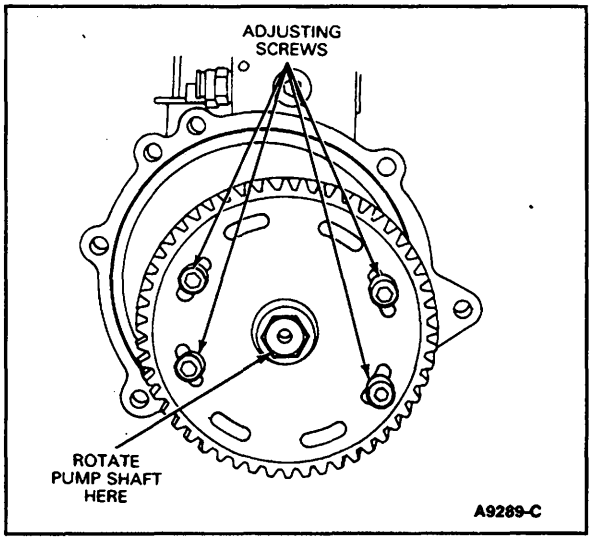


Figure 18 Injection Pump Gear Hub Adjusting Screws

NOTE: To properly adjust timing, be sure the damper timing pin is installed in the proper location with the No. 1 piston on the compression stroke.

4. To adjust timing, loosen the four adjusting screws on the injection pump gear hub (Figure 18). Rotate the pump shaft until the pump timing lock pin can be pushed into position and fully seated.
5. Turn gear counterclockwise by hand to remove backlash (it will move slightly). Tighten the four adjusting screws to 7 N•m (5 lb-ft). Remove the lock pins and tighten the adjusting screws to 22-34 N•m (16-25 lb-ft). Replace plug and sealing washer in adapter plate timing pin hole. Tighten to 9-12 N•m (7-9 lb-ft).
6. Rotate engine counterclockwise 90 degrees and then clockwise to the point where timing lock pin can be inserted in crankshaft damper. Insert timing lock pins into crankshaft damper and into fuel injection pump hub. If pin seats in injection pump gear hub, timing is correct. If it does not seat, repeat timing procedure.

Injection Pump Removed From Engine — Timing Bracket Removed or Loosened

1. Align timing bracket chisel mark with chisel mark on engine front cover. Tighten the timing bracket screw to 9-12 N•m (7-9 lb-ft).

NOTE: If a new timing bracket is being installed, it is necessary to accurately position the timing bracket with the damper timing groove. This requires a special procedure found in Shop Manual, Section 22-12.

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Static Timing

2. Lock the fuel injection pump at port closure by inserting the lock pin into the fuel injection pump adapter housing so that it locks into the slot in the injection pump hub.
3. Set the engine, with No. 1 cylinder on the compression stroke, at static timing angle using the timing bracket and lock pin. Rotate the engine at least 20 degrees counterclockwise, then clockwise until the lock pin in the timing bracket engages the correct groove in the damper cover.
4. Loosen the four adjusting screws on injection pump gear hub.
5. Install the injection pump on the engine and align the adapter bolt holes to holes on engine. Install pump bolts and tighten to 27-34 N•m (20-25 lb-ft).
6. Rotate the pump gear counterclockwise to remove the pump gear backlash. Tighten the four adjusting screws on the hub to 7 N•m (5 lb-ft). Remove the timing lock pin from the pump. Tighten the four adjusting screws to 22-34 N•m (16-25 lb-ft). Install the lock pin hole plug to 9-12 N•m (7-9 lb-ft).
7. Install engine components and check dynamic timing as outlined.

Injection Pump Off Engine — Timing Bracket Undisturbed

- Perform Steps 2 through 7 of Static Timing: Injection Pump Off Engine — Timing Bracket Removed or Loosened.

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Fuel System Description

Figure 19 shows the two sides of the fuel system. In the low-pressure side, fuel pressure does not normally rise above 206 kPa (30 psi). In the high-pressure side, fuel pressure can be over 68,950 kPa (10,000 psi).

In the low-pressure side, fuel is supplied to the injection pump by the lift pump. Fuel flows from the fuel tank to the fuel box, to the lift pump, through the dual filters to the injection pump.

In the high-pressure side, the injection pump plungers raise the pressure to over 68,950 kPa (10,000 psi) and distributes fuel to the injector nozzles by way of the high-pressure fuel lines.

Approximately 40% of the fuel reaching the fuel injection pump and injectors is used for combustion. The remaining fuel cools and lubricates the fuel injection pump and injectors and returns to the fuel tank through a fuel return line.

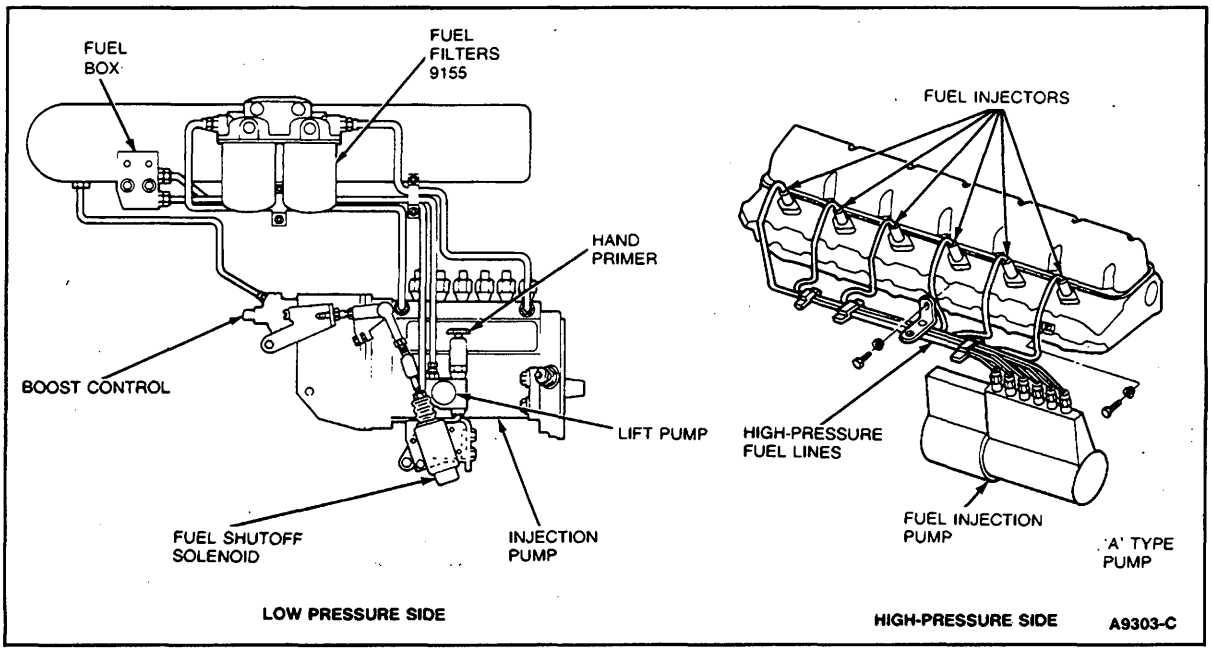


Figure 19 Typical 6.6L, 7.8L Ford Diesel Engine Fuel System

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Symptom Analysis

Consult the Symptom Analysis Pinpoint Diagnosis procedures first. These will direct you to a service to be performed or they will direct you to the Engine Performance Diagnosis procedure.

If the problem is low power and/or increased fuel consumption, go directly to the Engine Performance Diagnosis procedure.

Evaluating "Normal" Diesel Engine Exhaust Smoke

The following is a description of what is "normal" and expected exhaust smoke for a vehicle with a diesel engine. Diesel exhaust smoke can vary in color and consistency. The following chart should help in determining what causes certain types and colors of exhaust smoke and what should be done. Normal diesel exhaust smoke can be classified into two categories according to the color of the smoke.

The first category is blue-white smoke. Blue-white smoke may be observed at all ambient temperatures but should not occur after the vehicle is warmed and being driven. Blue-white smoke may occur after engine warm-up during extended idling due to the combustion chambers cooling down.

NOTE: Chassis fuel system air leaks also may cause continuous heavy blue-white smoke. Service fuel system as required.

The second category of diesel exhaust smoke is black smoke. Black smoke is caused by an overrich mixture, and normally occurs whenever the engine is working hard. The engine works hard when it is going up a steep grade, carrying a heavy load, or during heavy acceleration. More black smoke will be observed when operating the vehicle at higher altitudes because the air is thinner. If black smoke is observed while the engine is idling (at low altitude) or under normal driving conditions, the problem should be diagnosed as soon as possible.

There is a third category of diesel exhaust smoke which is not normal; blue smoke. Blue smoke occurs when oil is entering the combustion chamber and is burning along with the fuel. Smoke of this color usually indicates a definite problem which should be corrected as soon as possible.

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Symptom Analysis

Hard Starting/No Start	Pinpoint Test A
Engine Surges	Pinpoint Test B
Engine Misses	Pinpoint Test C
Excessive Black Smoke	Pinpoint Test D
Fog-Like Exhaust (White or Blue) in Full-Load Range	Pinpoint Test E
Engine Cannot Reach Governed rpm	Pinpoint Test F
Engine Knocks	Pinpoint Test G
Turbocharger Noisy	Pinpoint Test H
Cyclic Sound From Turbocharger	Pinpoint Test J
Oil Leak From Turbocharger Compressor or Turbine Seal	Pinpoint Test K
Low Oil Pressure with Proper Oil Level	Pinpoint Test L
Excessive Oil Consumption	Pinpoint Test M
Fuel Dilution in Lubricating Oil	Pinpoint Test M
Excessive Coolant Temperature-Temperature Above 105°C (220°F)	Pinpoint Test P
Fuel Injection Pump Overheating	Pinpoint Test Q
Low Power	Go to Engine Performance Diagnosis Procedure.
Increased Fuel Consumption	Go to Engine Performance Diagnosis Procedure.

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Hard Starting/No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A0 CHECK STARTING PROCEDURE		
• Check and follow correct starting procedure as outlined in Owner's Manual.	(OK) ▶	RETURN vehicle to customer.
	(OK) ▶	GO to A1.
A1 CHECK CRANKING SPEED		
• Check engine cranking rpm. • Cranking speed should be a minimum of 110 rpm.	(OK) ▶	GO to A2.
	(OK) ▶	SERVICE cranking system. REFER to Shop Manual, Group 28.
A2 CHECK FUEL FLOW		
• Check for fuel in fuel tank. • Loosen one injection line nut slightly while cranking engine. Fuel should discharge. **WARNING** **BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE SKIN POISONING. IF STRUCK BY DIESEL FUEL, SEEK MEDICAL HELP IMMEDIATELY.**	(OK) ▶	GO to A4.
	(OK) ▶	GO to A3.

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Hard Starting/No Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A3 CHECK FUEL SHUTOFF SOLENOID		
• Check fuel shutoff solenoid linkage for binding. • Check fuel solenoid shutoff electrical terminals for dirt or corrosion and loose or broken electrical connections. • With ignition in RUN position, measure voltage at fuel shutoff solenoid. Voltage should be a minimum of 9 volts.	(OK) ▶ (OK) ▶	GO to A4. GO to Fuel Shut-Off Electrical System Diagnosis, Section 33-48. SERVICE or REPLACE linkage or fuel shutoff solenoid. REFER to Shop Manual, Section 25-06. REPEAT Step A2.
A4 CHECK STARTING AID		
• Check that starting aid is operating properly. Refer to Shop Manual, Section 28-12.	(OK) ▶ (OK) ▶	GO to Engine Performance Diagnosis procedure. SERVICE starting aid. REFER to Shop Manual, Section 28-12. REPEAT Step A4. **NOTE: REVIEW proper cold-starting procedure with customer, if necessary.**

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Engine Surges	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B0 CHECK FUEL TANK		
• Check to see if fuel tank is empty or if tank vent is blocked.	(OK) ▶	GO to Engine Performance Diagnosis procedure.
	(OK) ▶	FILL fuel tank. BLEED air from fuel system. CHECK tank vent. REFER to Shop Manual, Sections 25-06 and 25-50.

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Engine Misses	Pinpoint Test	C

TEST STEP	RESULT ▶	ACTION TO TAKE
C0 ISOLATE MISS		
• Loosen each injector nozzle line nut (one at a time) while engine is running. Refer to On-Vehicle Injector Nozzle Testing. **WARNING** **BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE SKIN POISONING. IF STRUCK BY DIESEL FUEL, SEEK MEDICAL HELP IMMEDIATELY.**	Miss not isolated to specific cylinder ▶ Miss isolated to specific cylinder ▶	GO to Engine Performance Diagnosis procedure. GO to C1.
C1 CHECK NOZZLE FUEL DELIVERY		
• Check injector nozzle fuel line(s) for damage or restrictions. • Perform injector nozzle test as outlined under On Bench Injection Nozzle Testing.	(OK) ▶ (OK) ▶	GO to C2. CLEAN or REPLACE restricted or damaged line(s). REFER to Shop Manual, Section 25-06. REPLACE nozzle(s) as outlined under On Bench Injection Nozzle Testing.
C2 CYLINDER COMPRESSION CHECK		
• Perform cylinder compression test as outlined.	(OK) ▶ (OK) ▶	GO to Engine Performance Diagnosis procedure. GO to C3.
C3 CHECK CRANKCASE PRESSURE		
• Perform Engine Performance Diagnosis procedure Test Step **EPC.11B.**	(OK) ▶ (OK) ▶	SERVICE valve train as necessary. REFER to Shop Manual, Section 22-12. OVERHAUL problem cylinder(s). REFER to Shop Manual, Section 22-12.

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Excessive Black Smoke

Pinpoint Test **D**

TEST STEP	RESULT ▶	ACTION TO TAKE
D0 VERIFY SMOKE LEVEL • Verify under what conditions black smoke occurs. **NOTE: Excessive black smoke may be accompanied by poor performance or low power.** **NOTE: Refer to Symptom Analysis.**	Light load or low altitude ▶	GO to D1. **NOTE: For warranty claim approval, Engine Performance Chart must be filled out.**
	Under heavy load ▶	A certain amount of black smoke is normal when going up steep grades, under maximum load, maximum boost, maximum acceleration or at high altitude.
D1 EXHAUST RESTRICTION CHECK • Inspect exhaust system for kinks or restriction. • Disconnect exhaust system at turbo and check performance.	(OK) ▶	GO to D2.
	(OK) ▶	SERVICE or REPLACE exhaust system components as necessary. REFER to Shop Manual, Section 26-01.
D2 CHECK AIR INTAKE RESTRICTION • Perform Engine Performance Diagnosis Test Step **EPC.7.**	(OK) ▶	GO to D3.
	(OK) ▶	REPLACE air filter or other components as required.

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Excessive Black Smoke	Pinpoint Test	D

TEST STEP	RESULT ▶	ACTION TO TAKE
D3 CHECK STATIC TIMING • Check static engine timing as outlined in this manual.	(OK) ▶	GO to Engine Performance Diagnosis Test Step EPC.10.
	(OK) ▶	Set static engine timing as outlined in this manual.
D4 CHECK NOZZLE FUEL DELIVERY • Check injector nozzle fuel line(s) for damage or restrictions. • Perform On-Vehicle Injector Nozzle test as outlined. **WARNING** **BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE SKIN POISONING. IF STRUCK BY DIESEL FUEL, SEEK MEDICAL HELP IMMEDIATELY.**	(OK) ▶	GO to EPC.11.
	(OK) ▶	REPLACE restricted or damaged line(s). REFER to Shop Manual, Section 25-06 or REPLACE nozzle(s) as outlined under On Bench Injection Nozzle Testing. If problem still exists, REPLACE the injection pump. REFER to Shop Manual, Section 25-06. **NOTE: For warranty claim approval, Engine Performance chart must be filled out.**

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Fog-Like Exhaust (White or Blue) In Full-Load Range	Pinpoint Test	E

TEST STEP	RESULT ▶	ACTION TO TAKE
E0 CHECK COOLING SYSTEM • Check to see that engine is reaching operating temperature.	(OK) ▶ (OK) ▶	GO to E2. GO to E1.
E1 THERMOSTAT OPERATION • Remove thermostats and test for proper operation. Refer to Shop Manual, Section 22-12.	(OK) ▶ (OK) ▶	GO to E3. REPLACE thermostat(s). REFER to Shop Manual, Section 22-12. REPEAT Step E0.
E2 EXCESSIVE OIL LEVEL • Check engine oil level indicator for excessive oil fill.	(OK) ▶ (OK) ▶	GO to E3. DRAIN excess oil from oil pan. If problem still exists, GO to E3.
E3 CHECK CRANKCASE BREATHER/ROAD DRAFT TUBE • Check for restricted crankcase breather element or plugged crankcase road draft tube.	(OK) ▶ (OK) ▶	GO to E4. When obstruction is removed, RUN engine for 30 minutes to burn off accumulated oil in exhaust system.
E4 CHECK FUEL RETURN • Perform Engine Performance Diagnosis Test Step **EPC.8E.** **NOTE: If the fuel injection pump overflow valve is stuck shut, it will simulate a clogged fuel return line. To check this valve, measure inlet pressure to the injection pump. If the pressure exceeds 193 kPa (28 psi) at rated rpm the valve must be removed and cleaned or replaced. Refer to Shop Manual, Section 25-06.**	(OK) ▶ (OK) ▶	PERFORM Engine Performance Diagnosis procedure. SERVICE or REPLACE fuel return line(s). REFER to Shop Manual, Section 25-06. REPEAT Step E3.

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Engine Cannot Reach Governed RPM	Pinpoint Test	F

TEST STEP	RESULT ▶	ACTION TO TAKE
F0 VEHICLE OVERLOADED		
• Check to see if vehicle is being overloaded (above specified GVW).	Vehicle is overloaded ▶	INFORM customer to reduce loads.
	Vehicle load normal ▶	GO to F1.
F1 THROTTLE LINKAGE		
• Check throttle adjustment as outlined under Engine Performance Diagnosis Test Step **EPC.3.**	(OK) ▶	PERFORM Engine Performance Diagnosis procedure.
	(OK) ▶	ADJUST the throttle adjustment. REFER to Shop Manual, Section 25-60.

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Engine Knocks	Pinpoint Test	G

TEST STEP	RESULT ▶	ACTION TO TAKE
G0 VEHICLE OVERLOADED		
• Check to see if vehicle is being overloaded (above specified GVW).	Vehicle is overloaded ▶	INFORM customer to reduce load.
	Vehicle load normal ▶	GO to G1.
G1 BELT DRIVE ACCESSORIES		
• Check engine front drive components for proper operation.	OK ▶	GO to G2.
	OK ▶	SERVICE or REPLACE components as necessary. REFER to specific accessory Shop Manual Section.
G2 ENGINE COOLANT TEMPERATURE		
• Verify engine coolant temperature is below 105°C (220°F).	OK ▶	GO to G3.
	OK ▶	GO to Pinpoint Test **Q.**
G3 ISOLATE ENGINE KNOCK		
• Loosen each injector nozzle line nut (one at a time) while running engine. **WARNING** **BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE SKIN POISONING. IF STRUCK BY DIESEL FUEL SPRAY, SEEK MEDICAL HELP IMMEDIATELY.**	Engine knock not isolated to specific cylinder ▶	GO to Engine Performance Diagnosis procedure.
	Engine knock isolated to specific cylinder(s) ▶	GO to G4.
G4 CHECK NOZZLE FUEL DELIVERY		
• Check injector nozzle fuel line(s) for damage or restrictions. • Perform injector nozzle test as outlined under On Bench Injector Nozzle Testing.	OK ▶	GO to Engine Performance Diagnosis procedure.
	OK ▶	SERVICE or REPLACE restricted or damaged line(s). REFER to Shop Manual, Section 25-06 or REPLACE nozzle(s) as outlined under On Bench Injector Nozzle Testing.

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Turbocharger Noisy	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H0 AIR INTAKE OBSTRUCTION • Check for obstruction or restriction in: a. Duct between air cleaner and compressor inlet b. Duct between the compressor outlet and intake manifold c. Intake manifold	(OK) ▶ (OK) ▶	GO to [H1]. REMOVE obstruction or REPLACE damaged parts. REFER to Shop Manual, Section 22-12.
H1 AIR INTAKE LEAKS • Check for air leaks in: a. Duct between the air cleaner and compressor inlet b. Duct between the compressor outlet and intake manifold c. Intake manifold to engine connection d. Air cleaner housing and element	(OK) ▶ (OK) ▶	GO to [H2]. REPLACE seals or tighten fasteners. REFER to Shop Manual, Section 22-12.
H2 EXHAUST SYSTEM RESTRICTION • Check for restricted or damaged exhaust system.	(OK) ▶ (OK) ▶	GO to [H3]. SERVICE or REPLACE exhaust system components. REFER to Shop Manual, Section 26-01.
H3 EXHAUST GAS LEAK • Check for exhaust gas leak at: a. Exhaust manifold-to-engine connection b. Turbine inlet to exhaust manifold c. Turbine housing to center housing d. Turbine outlet to exhaust pipe	(OK) ▶ (OK) ▶	GO to [H4]. REPLACE gaskets or TIGHTEN fasteners. REFER to Shop Manual, Section 25-45.

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Turbocharger Noisy	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H4 COMPRESSOR WHEEL • Check for dirt caked on turbocharger compressor wheel or obvious signs of foreign object ingestion. **NOTE: If there is damage to compressor wheel or turbine wheel, the turbocharger will have to be replaced.**	(OK) ▶ (OK) ▶	GO to H5. CLEAN the compressor wheel with a non-caustic cleaner and soft brush. FIND and CORRECT source of unfiltered air. CHANGE engine oil and oil filter.
H5 TURBOCHARGER • Remove turbocharger from engine. Check turbocharger for damage. Perform bearing clearance inspection. Refer to Shop Manual, Section 25-45.	(OK) ▶ (OK) ▶	INSTALL turbocharger on engine. GO to Step EPC.12. REPLACE turbocharger. REFER to Shop Manual, Section 25-45.

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Turbocharger Noisy or Cyclic Sound From Turbocharger

Pinpoint Test **J**

TEST STEP	RESULT ▶	ACTION TO TAKE
J0 AIR INTAKE DUCT • Check for a restriction in air intake duct into turbo compressor inlet.	(OK) ▶	GO to J1.
	(OK) ▶	REMOVE obstruction or REPLACE damaged parts. REFER to Shop Manual, Section 25-40.
J1 COMPRESSOR WHEEL • Check for dirt caked on compressor wheel of turbocharger.	(OK) ▶	GO to Pinpoint Test Step H5.
	(OK) ▶	CLEAN compressor wheel with a non-caustic cleaner and a soft brush. LOCATE and CORRECT source of unfiltered air. CHANGE engine oil and oil filter.

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Oil Leak From Turbocharger Compressor Or Turbine Seal

Pinpoint Test **K**

TEST STEP	RESULT ▶	ACTION TO TAKE
K0 CHECK AIR INTAKE RESTRICTION • Perform Engine Performance Diagnosis Test Step **EPC.7.**	(OK) ▶ (OK) ▶	GO to **K1**. REPLACE air filter or other components as needed. REFER to Shop Manual, Section 25-40.
K1 EXHAUST SYSTEM RESTRICTION • Inspect exhaust system for kinks or restriction. • Disconnect the exhaust system at the turbo and check performance.	(OK) ▶ (OK) ▶	GO to **K2**. SERVICE or REPLACE exhaust system components as necessary. REFER to Shop Manual, Section 26-01.
K2 EXHAUST GAS LEAK • Check exhaust manifold-to-engine gaskets for leaks at ports.	(OK) ▶ (OK) ▶	GO to **K3**. REPLACE exhaust manifold-to-engine gasket(s). REFER to Shop Manual, Section 22-12.
K3 CHECK TURBINE INLET • Check turbine inlet-to-exhaust manifold gasket for leaks.	(OK) ▶ (OK) ▶	GO to **K4**. REPLACE exhaust manifold-to-turbocharger gasket. REFER to Shop Manual, Section 22-12.
K4 OIL DRAIN LINE OBSTRUCTION • Check oil drain line for restriction.	(OK) ▶ (OK) ▶	GO to **K5**. SERVICE or REPLACE oil drain line. REFER to Shop Manual, Section 25-45.

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Oil Leak From Turbocharger Compressor Or Turbine Seal

Pinpoint Test **K**

TEST STEP	RESULT ▶	ACTION TO TAKE
K5 CRANKCASE VENT OBSTRUCTION • Check crankcase vent tube for damage or restriction.	(OK) ▶	GO to K6.
	(OK) ▶	SERVICE or REPLACE crankcase vent tube. REFER to Shop Manual, Section 22-12.
K6 TURBOCHARGER CENTER HOUSING • Check turbocharger center housing for sludge or coke deposits.	(OK) ▶	GO to K7.
	(OK) ▶	CHANGE engine oil and oil filter. REPLACE turbocharger, if necessary. REFER to Shop Manual, Section 25-45.
K7 EXCESSIVE BLOW-BY • Perform Engine Performance Diagnosis procedure Test Step **EPC.11B.**	(OK) ▶	GO to K8.
	(OK) ▶	SERVICE engine as required. REFER to Shop Manual, Section 22-12.
K8 INTERNAL ENGINE PROBLEM • Perform compression test as outlined.	(OK) ▶	GO to K9.
	(OK) ▶	SERVICE engine as required. REFER to Shop Manual, Section 22-12.

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Oil Leak From Turbocharger Compressor Or Turbine Seal

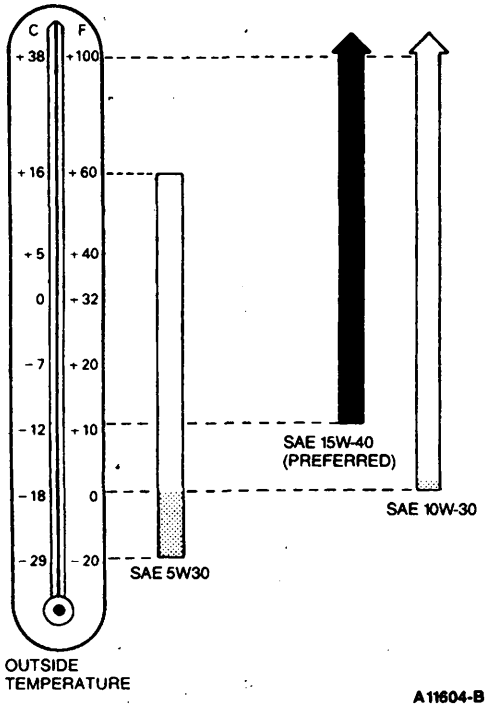
Pinpoint Test **K**

TEST STEP	RESULT ▶	ACTION TO TAKE
K9 COMPRESSOR WHEEL		
• Check for dirt caked on turbocharger compressor or turbine wheel for obvious signs of foreign object ingestion. **NOTE: If there is damage to compressor wheel or turbine wheel, the turbocharger will have to be replaced.**	(OK) ▶	GO to **K10**.
	(OK) ▶	CLEAN compressor wheel with a non-caustic cleaner and soft brush. FIND and CORRECT source of unfiltered air. CHANGE engine oil and oil filter.
K10 TURBOCHARGER		
• Check turbocharger for damage. Perform failure analysis. Refer to Shop Manual, Section 25-45.	(OK) ▶	CHECK for oil leakage from other sources.
	(OK) ▶	REPLACE turbocharger. REFER to Shop Manual, Section 25-45.

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Low Oil Pressure With Proper Oil Level

Pinpoint Test **L**

TEST STEP	RESULT ▶	ACTION TO TAKE
L0 CHECK OIL PRESSURE		
• Remove oil pressure sending unit. Connect Rotunda Pressure Test Kit 014-00762 or equivalent 11706 to engine. Refer to Pressure Test Kit Hook-up, Figure 20. • Run engine until normal operating temperature is reached and check oil pressure. • Engine oil pressure should be 103 kPa (15 psi) minimum at Low Idle — 65-95 psi (488-655 kPa) at High Idle.	(OK) ▶ (OK) ▶	CHECK oil pressure gauge and/or sending unit. REFER to Shop Manual, Section 33-32. INSTALL sending unit. GO to [L1].
L1 CHANGE ENGINE OIL AND FILTER		
• Change engine oil and filter. Use engine oil that meets API specification: SG/CE (recommended), SF/CE or CE. Determine viscosity according to ambient temperature.  • Run engine until normal operating temperature is reached. • Check oil pressure reading.	(OK) ▶ (OK) ▶	RETURN vehicle to customer. GO to [L2].

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Low Oil Pressure With Proper Oil Level

Pinpoint Test **L**

TEST STEP	RESULT ▶	ACTION TO TAKE
L2 CHECK OIL PUMP DRIVE GEARS • Remove oil pan. • Check oil pump drive gears for damage or wear. • Check drive gear backlash. Refer to Shop Manual, Section 22-12.	(OK) ▶ (OK) ▶	GO to L3. REPLACE oil pump drive gears. REFER to Shop Manual, Section 22-12.
L3 CHECK OIL PUMP INLET TUBE • Check oil pump inlet tubes for cracks. • Check that oil pump inlet tube attaching bolts are tightened to specification. Refer to Shop Manual, Section 22-12.	(OK) ▶ (OK) ▶	GO to L4. REPLACE oil pump inlet tube or TIGHTEN attaching bolts to specification. REFER to Shop Manual, Section 22-12. CHECK engine oil pressure.
L4 CHECK OIL PRESSURE TUBE • Check oil pressure tube for cracks. • Check that oil pressure tube attaching bolts are tightened to specification. Refer to Shop Manual, Section 22-12.	(OK) ▶ (OK) ▶	SERVICE or REPLACE oil pump assembly as necessary. REFER to Shop Manual, Section 22-12. REPLACE oil pressure tube or REPLACE oil pressure tube-to-engine block gasket and TIGHTEN attaching bolts to specification. REFER to Shop Manual, Section 22-12.

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Excessive Oil Consumption

Pinpoint Test **M**

TEST STEP	RESULT ▶	ACTION TO TAKE
M0 LEAK CHECK • Visually inspect for external oil leaks.	(OK) ▶	GO to [M1].
	(OK) ▶	SERVICE oil leaks. RETURN vehicle to customer.
M1 CHECK AIR INLET SYSTEM • Check for air cleaner restriction and check air induction system for leaks. Perform Engine Performance Diagnosis Test Step **EPC.11B.**	(OK) ▶	GO to [M2].
	(OK) ▶	SERVICE or REPLACE air inlet system components. REFER to Shop Manual, Section 22-12.
M2 VERIFY PROBLEM • Change the oil. Use oil that meets API specification: SG/CE (recommended), SF/CE or CE. Determine viscosity according to ambient temperature as shown on chart in Pinpoint Test Step **L1.** • Determine oil consumption rate and trend at: 1610 km (1000 miles/50 hours) or 8047 km (5000 miles/250 hours). • Record amount of make-up oil added during test period.	Oil consumption less than 0.95L (1 quart) per 483 km (300 miles) ▶	RETURN vehicle to customer. Oil consumption is normal.
	Oil consumption more than 9.5L (1 quart) per 483 km (300 miles) ▶	GO to [M3].
M3 CHECK VEHICLE LOAD • Determine if abnormally heavy loads are being pulled by vehicle (above specified GVW).	Vehicle load normal ▶	GO to [M4].
	Vehicles overloaded ▶	INFORM customer to reduce loads.
M4 CHECK VEHICLE OPERATION • Check for improper operation (i.e., allowing engine to lug in incorrect gear range) resulting in oil consumption.	Truck being driven correctly ▶	GO to [M5].
	Engine being lugged ▶	INFORM customer to REVIEW operator habits to be sure engine is not being lugged.

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Excessive Oil Consumption	Pinpoint Test	M

TEST STEP	RESULT ▶	ACTION TO TAKE
M5 CHECK AIR CLEANER RESTRICTION		
• Perform Engine Performance Diagnosis Test Step **EPC.7.** Restriction should be less than 2.5 kPa (10 in) H_2O.	Air cleaner restriction within specification ▶	GO to **M6**.
	Pulls over oil through turbocharger compressor seal ▶	REPLACE element. REPEAT **M5**.
M6 CHECK CRANKCASE BREATHER/ROAD DRAFT TUBE		
• Check for restricted crankcase breather element or plugged crankcase road draft tube. • Check crankcase pressure step **EPC.11B.**	(OK) ▶	GO to **M7**.
	(OK) ▶	SERVICE or REPLACE breather element or vent. RUN engine for 30 minutes to burn off accumulated oil in exhaust system.
M7 CHECK AIR COMPRESSOR		
• Check air compressor for worn rings causing oil to leak into air system. Refer to Shop Manual, Section 12-40.	(OK) ▶	GO to **M8**.
	(OK) ▶	SERVICE or REPLACE air compressor. REFER to Shop Manual, Section 12-40.
M8 CHECK VALVE GUIDES/SEALS		
• Check for worn engine valve guide seals or valve guides. Refer to Shop Manual, Section 22-12.	(OK) ▶	GO to **M9**.
	(OK) ▶	CLEAN, INSPECT and REPLACE as necessary. REFER to Shop Manual, Section 22-12.
M9 CHECK COMPRESSION		
• Perform engine compression test as outlined.	(OK) ▶	RETURN vehicle to customer.
	(OK) ▶	SERVICE engine as necessary. REFER to Shop Manual, Section 22-12.

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Fuel Dilution in Lubricating Oil

Pinpoint Test **N**

TEST STEP	RESULT ▶	ACTION TO TAKE
N0 VERIFY THE PROBLEM		
• Determine if there is fuel present in lubricating oil. **NOTE: If fuel is present, oil will have the odor of diesel fuel.**	No dilution ▶	RETURN vehicle to customer.
	Fuel diluted ▶	CHECK to see if vehicle has been idled for excessive periods. CHECK for internal fuel injection pump or injection nozzle leakage. REFER to Shop Manual, Section 25-06.

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Excessive Coolant Temperature Temperature Above 105°C (220°F)

Pinpoint Test **P**

TEST STEP	RESULT ▶	ACTION TO TAKE
P0 VERIFY CONDITION		
• Determine conditions when overheating occurs. **NOTE: Ambient temperatures above 43°C (110°F) may cause engine temperatures to exceed 105°C (220°F).**	Ambient temperature above 43°C (110°F) ▶	INFORM customer that condition is normal.
	Ambient temperature below 43°C (100°F) ▶	GO to P1.
P1 VERIFY OPERATION		
• Check operator's driving habits (running in improper gear ranges, etc).	(OK) ▶	GO to P2.
	(OK) ▶	INFORM customer to REVIEW operator driving habits.
P2 CHECK ACCESSORIES		
• Check that all accessory equipment is approved. • Check accessory drive belt tension. Refer to Shop Manual, Section 27-06.	(OK) ▶	GO to P3.
	(OK) ▶	ADJUST belt tension or REPLACE belts. INFORM customer accessories are not approved.
P3 CHECK ENGINE		
• Check that engine is clean. • Check for engine coolant and/or oil leaks.	(OK) ▶	GO to P4.
	(OK) ▶	CLEAN engine. SERVICE engine coolant and/or oil leaks as necessary.
P4 CHECK ENGINE COOLANT		
• Check coolant condition. Refer to Shop Manual, Section 27-02.	(OK) ▶	GO to P5.
	(OK) ▶	DRAIN, FILL and BLEED the coolant system using the specified coolant and coolant conditioner. REFER to Shop Manual, Section 27-02.

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Excessive Coolant Temperature Temperature Above 105°C (220°F)

Pinpoint Test **P**

TEST STEP	RESULT ▶	ACTION TO TAKE
P5 CHECK RADIATOR, HOSES, CLAMPS • Check radiator cap for proper operation. • Check that correct hoses are installed and are properly clamped. • Check that radiator is correct for vehicle and is clean and unobstructed by bent fins, pinched tubes or foreign objects. • Check that correct fan is properly installed.	(OK) ▶ (OK) ▶	GO to **P6**. SERVICE or REPLACE components as necessary. REFER to Shop Manual, Group 27.
P6 CHECK WATER PUMP • Check water pump for worn bearings or coolant leaks.	(OK) ▶ (OK) ▶	GO to **P7**. SERVICE or REPLACE water pump. REFER to Shop Manual, Section 22-12.
P7 CHECK THERMOSTATS • Check thermostats for proper operation. Refer to Shop Manual, Section 22-12.	(OK) ▶ (OK) ▶	GO to **P8**. REPLACE thermostats. REFER to Shop Manual, Section 22-12.
P8 CHECK STATIC TIMING • Check injection pump static timing as outlined.	(OK) ▶ (OK) ▶	GO to **P9**. ADJUST static timing as outlined.

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Excessive Coolant Temperature Temperature Above 105°C (220°F)	Pinpoint Test	P

TEST STEP	RESULT ▶	ACTION TO TAKE
P9 CHECK FOR BLOWN HEAD GASKET		
• Fill a bucket and suitable bottle with water. • Run engine until normal operating temperature is reached. Stop engine. • Place filled bottle in bucket with neck facing down. • Insert coolant overflow hose into neck of bottle. • Start engine and look for air bubbles in bottle.	No bubbles present ▶	GO to **P10**.
	Bubbles present ▶	REPLACE blown head gasket. REFER to Shop Manual, Section 22-12.
P10 CHECK COOLING SYSTEM FOR CONTAMINATION		
	No contamination present ▶	RETURN vehicle to customer.
	Contamination present ▶	CLEAN cooling system. REFER to Shop Manual, Section 22-12.

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Fuel Injection Pump Overheating

Pinpoint Test **Q**

TEST STEP	RESULT ▶	ACTION TO TAKE
Q0 OVERFLOW VALVE		
• Verify that fuel flows freely from overflow valve.	(OK) ▶	PERFORM Engine Performance Diagnosis Test Step EPC.8E.
	(OK) ▶	CLEAN orifice in overflow valve or REPLACE fitting. REFER to Shop Manual, Section 25-06.

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Engine Performance Diagnosis Procedure

The Engine Performance Diagnosis procedure begins with those items which are the high frequency, easy-to-diagnose problems, and progresses to the low frequency, hard-to-diagnose problems. Use of this procedure will promote rapid, as well as accurate diagnosis.

The Engine Performance Diagnosis procedure follows, step-by-step, the Engine Performance Chart. Each test step is labeled to coincide with the Engine Performance Chart steps.

NOTE: Under no circumstances should the fuel injection pump, fuel injectors or turbocharger be replaced until the Engine Performance Chart has been completely filled out. Warranty claims for the fuel injection pump, fuel injectors and turbocharger will not be accepted unless the Engine Performance Chart has been filled out as specified and all tamper-proof seals are intact.

Service each problem detected before going on the next step. If service corrects the original complaint, it will not be necessary to proceed to the next test step. However, if the complaint is not corrected, continue with the procedure until the complaint is corrected.

The following explanations refer to the basic test steps of the Engine Performance Diagnosis procedure and Chart. They give a brief description of the effect on performance these problems can create, giving an understanding of the importance of each test step.

1. **External Leakage:** Fuel leakage can be a reason for diesel fuel smell, poor fuel economy or poor performance. Oil leakage can be a reason for high oil consumption. An air intake system leak can shorten engine and turbocharger life, especially under dusty conditions. Coolant leakage can result in engine overheating. Exhaust gas or boost air leakage can cause poor engine performance and black smoke.

2. **Exhaust System Condition:** Kinks or dents in the exhaust system can cause high exhaust back pressure. This can result in loss of power and high smoke levels. If an aftermarket exhaust brake is installed ensure:

   - Maximum exhaust pressure does not exceed 310 kPa (45 psi) @ 2860 rpm.
   - Exhaust brake assembly is mounted a minimum of 1.7m (5.5 ft) downstream from turbocharger.

3. **Accelerator Linkage:** If the accelerator linkage is improperly adjusted, damaged or worn, low idle speed may be out of specification and the engine may not reach high idle and top speed, causing pulling power to be reduced.

4. **Fuel System Condition:** Kinks in the fuel lines or hoses can block or restrict fuel flow and loose connections can leak air into the fuel. This can result in loss of power, high smoke levels and failure to start.

5. **Fuel Quality:** Diesel engines need clean fuel, free of air, dirt, water and microbiological organisms. Any contamination may result in poor engine performance.

   NOTE: If the fuel is contaminated with water, microbiological organisms are able to grow in a diesel fuel tank, especially in warm, moist climates. Therefore, it is very important to keep water from getting into the fuel.

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Engine Performance Diagnosis Procedure

The diesel fuel recommended for use in the 6.6L and 7.8L Ford Diesel engines must be either grade 1-D or 2-D. Use No. 2-D fuel when ambient temperatures are above −7°C (20°F). Use No. 1-D when ambient temperatures are below −7°C (20°F). If No. 1-D is not available, use winterized 2-D. Use of regular No. 2-D during cold weather may cause starting and/or driveability problems due to reduced fuel flow caused by fuel waxing.

The use of high sulfur fuel should be avoided. When fuel sulfur content exceeds 0.5 percent by weight, oil change intervals should be shortened. Consult the maintenance schedule for the required intervals.

6. **Engine Idle Speed:** Low engine idle speed may cause stalling or rough running.
7. **Air Cleaner Restriction:** A dirty air filter or restriction in the air cleaner may result in low power, excessive smoke, poor fuel economy and oil leakage from the turbocharger.
8. **Fuel System Pressure and Capacity:** The fuel supply system must deliver the proper quantity of fuel with no pressure loss or air leaks in the chassis fuel system and then return unused fuel to the fuel tank. Restriction in the lines providing fuel to the fuel injection pump will result in low power, smoke problems and generally poor performance. Restrictions in the lines returning fuel to the fuel tank may cause problems of injection pump overheating, smoke problems and generally poor performance.
9. **Injection Timing:** Incorrect timing can be responsible for poor fuel economy, rough idling, hard starting and excessive smoke. Injection timing can be checked either statically or dynamically but can only be set statically.
10. The injector nozzles must be removed from the engine for testing. This is a functional test of injector nozzle performance which checks opening pressure, spray pattern and leakage.
11. **Compression and Crankcase Pressure:** These tests examine the condition of internal components of the engine. Low compression indicates leakage past the piston rings or valves. Crankcase pressure measures the amount of blow-by past the rings. Excessive blow-by past the rings creates high pressure in the crankcase. The crankcase pressure test will also indicate a clogged crankcase ventilation system. Compression testing, crankcase pressure readings and rate of oil consumption should be used to evaluate engine mechanical condition.
12. **Turbocharger:** These tests and checks examine the condition of the turbocharger to determine if it is affecting engine performance. Problems which can be caused by a turbocharger include low power, excessive exhaust smoke, excessive engine oil consumption, noise and oil leaks. Most turbocharger checks are performed with the engine off. Boost pressure, although not included in the Engine Performance Section, can be checked, but it requires a dynomometer since a full load condition must be simulated. Specifications for turbocharger boost are given in the Engine Performance Specifications Section and an adapter is available with the pressure test kit for checking boost pressure.

To perform the Engine Performance Diagnosis procedure, it is necessary to connect the Rotunda Pressure Test Kit 014-00762 or equivalent (Figure 20). Use the explanations outlined under Pressure Testing With the Gauge Bar to help in attaching the gauges and interpreting the readings.

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Engine Performance Diagnosis Procedure

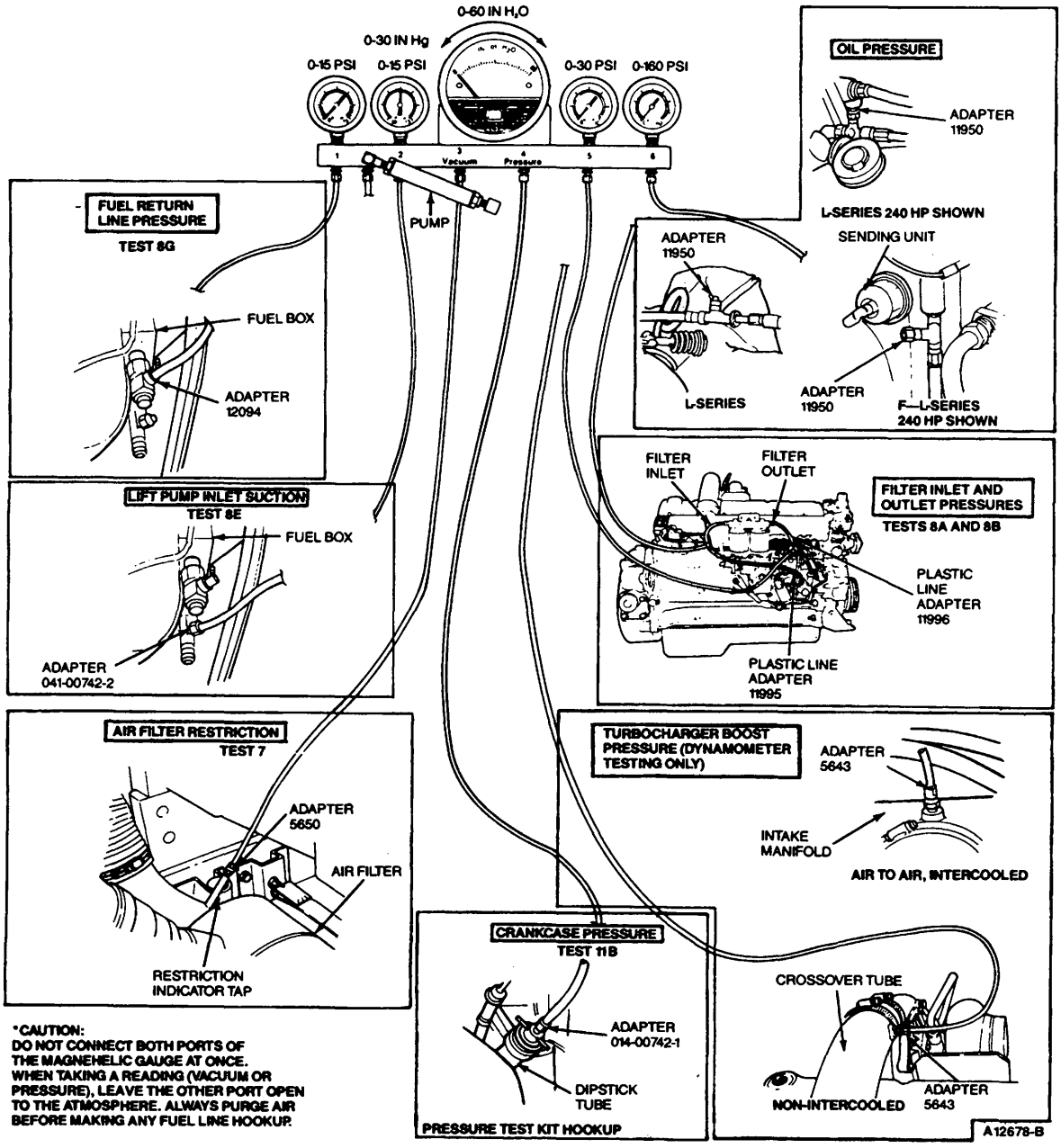


Figure 20 Connecting the Rotunda Pressure Test Kit

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Engine Performance Diagnosis Procedure

6.6L and 7.8L Diesel Engines Performance Diagnosis Procedure

Pressure Testing With the Gauge Bar

The gauge bar is used for several different pressure checks (Figure 21). Hookups are made using special adapters manufactured specifically for the 6.6L and 7.8L Ford Diesel engines.

NOTE: Use of the gauge bar is not mandatory. Individual gauges can be used, as long as they are accurate and applicable to a particular check. Technicians who own their own set of gauges may find that buying the Adapter Kit 014-00733 and 014-00742 will make it easier to hook their gauges into the 6.6L and 7.8L Ford Diesel engines and systems.

1986 6.6L (Phase I) 019-00034		Gage Bar Kit	1987 and Forward 6.6L and 7.8L 014-00762	
NU-12094		Lift Pump Inlet Adapter	014-00742-2	③
NU-11950		Fuel Return Adapter	NU-12094	
NU-5643		Turbo Boost Adapter	NU-5643	
NU-5650		Air Filter Adapter	NU-5650	
NU-11995	①	Fuel Line-Lift Pump-to-Filter Inlet Adapter	NU-11995	②
NU-11996		Fuel Line-Filter Outlet-to-Injection Pump Adapter	NU-11996	
NU-11706		Oil Pressure Adapter	NU-11950	
NU-11949		Crankcase Pressure Adapter	014-00742-1	③

① Adapter Kit 019-00033

② Adapter Kit 014-00733

③ Adapter Kit 014-00742

NOTE: Adapter Kits 014-00733 and 014-00742 may be used with any previously released pressure Test Kit (Gauge Bar).

Figure 21 Pressure Checks using Gauge Bar

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Engine Performance Diagnosis Procedure

Diagnostic tests that can be accomplished with the gauge bar along with hookup instructions are listed here:

Filter Inlet Pressure: Filter inlet pressure is measured by disconnecting the fuel line between the lift pump and the fuel filter inlet. In its place, a plastic line (11995) from the pressure test kit is installed. This line is equipped with a T-connection so that a pressure tap to the gauge bar can be made. Attach a line from the T-connection to the 0-1103 kPa (0-160 psi) gauge.

Filter Outlet Pressure: Filter outlet pressure is measured by disconnecting the fuel line between the fuel filter outlet and the inlet to the fuel injection pump. In its place, a plastic line (11996), from the pressure test kit is installed. This line is equipped with a T-connection so that a pressure tap to the gauge bar can be made. Attach a line from the T-connection to the 0-206 kPa (0-30 psi) gauge.

Connect both the Filter Inlet and Filter Outlet Pressure adapters at the same time to check the following:

- Filter Inlet Pressure
- Filter Outlet Pressure
- Pressure Drop Across the Fuel Filters
- Lift Pump Output Pressure
- Injection Pump Inlet Pressure (Fuel Galley Pressure)
- Air Leaks in the Fuel System (look for air bubbles in the plastic fuel lines)

Lift Pump Inlet Suction: To measure lift pump inlet suction, the coupling for the fuel line going into the fuel box from the fuel tank must be disconnected. At this point an adapter is screwed into the fuel box coupling and the fuel line coupling is screwed into the adapter. The adapter is equipped with a pressure tap which must be connected to 1-30 in Hg/0-15 psi gauge.

Fuel Return Line Pressure: To measure fuel return line pressure, the coupling for the fuel line going out of the box to the fuel tank must be disconnected. At this point, adapter 12094 is screwed into the fuel box. The adapter is equipped with a pressure tap which must be connected to the 0-1 bar (0-103 kPa or 0-15 psi) gauge.

Oil Pressure: Oil pressure is checked by tapping into a flexible line between the oil filter support and oil pressure sender switch. Use adapter 11950 to attach to either a coupling in the line or at the oil pressure sender switch at the dash panel.

Air Filter Restriction: Air filter restriction is checked at the same port where the restriction indicator is located. To check air filter restriction, remove the restriction indicator and install the adapter (5650) from the pressure test kit in its place. Connect the adapter to the vacuum side of the magnehelic gauge.

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Engine Performance Diagnosis Procedure

Crankcase Pressure: Crankcase pressure is measured from the dipstick tube. To make this check, remove the dipstick and install the adapter (014-00742) from the pressure side of the magnehelic gauge.

CAUTION

Do not connect both parts of the magnehelic gauge at once. When taking a reading (vacuum/pressure) leave the other port open to the atmosphere.

Turbo Boost Pressure: Turbo boost pressure is measured from a tap on the crossover tube or inlet manifold. Remove the tap and install the adapter (5643) from the pressure test kit. Connect the adapter to the 0-206 kPa (0-30 psi) gauge.

NOTE: Turbo boost pressure is checked only on a dynomometer or where full load conditions can be simulated.

Air Leak Testing

The gauge bar is equipped with a pressure pump. This pump can be used to pressurize fuel lines to help locate air leaks. Once an air leak is verified by seeing air bubbles in the fuel going to the injection pump, the exact location can be determined using the pressure pump and the following procedure:

1. Plug the end of the fuel line.
2. Install the pump into the system in front of the suspected air leak.
3. Pressurize the system to a maximum of 104 kPa (15 psi) and maintain pressure.
4. Wipe the fuel lines and connections with a soap and water solution.
5. An air leak will show up as bubbles.
6. Tighten the connection or replace components as needed to eliminate the leak.

Checking Fuel Cetane

Checking fuel is very important in diagnosis. Contaminants in the fuel, like water and microbiological organisms, are easy to see when a fuel sample is placed in a clear container. Diesel fuel should be clear, with an amber tint (actual color may vary). Water or particulates floating in the fuel are indicators of contaminated fuel. Diesel fuel must have a cetane rating of at least 40.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.1 CHECK FOR EXTERNAL LEAKAGE • With engine running, visually check for leakage of: 1. Fuel 2. Engine oil 3. Dirt past air cleaner 4. Coolant 5. Exhaust 6. Boost air	(OK) ▶ (OK) ▶	GO to **EPC.2**. SERVICE or REPLACE faulty component(s). If performance problem still exists, GO to **EPC.2**.
EPC.2 CHECK EXHAUST SYSTEM • Visually check exhaust system for dents or kinks which could cause restriction.	(OK) ▶ (OK) ▶	GO to **EPC.3**. SERVICE or REPLACE exhaust system components as required. REFER to Shop Manual, Section 26-01. GO to **EPC.3**.
EPC.3 ACCELERATOR LINKAGE ADJUSTMENT • With engine off, check that control lever contacts injection pump stops. Control lever must contact low idle stop when accelerator pedal is released, and must contact high idle stop when accelerator is fully depressed.	(OK) ▶ (OK) ▶	GO to **EPC.4**. ADJUST or SERVICE vehicle throttle linkage as necessary. REFER to Shop Manual, Section 25-60. GO to **EPC.4**.
EPC.4 FUEL SYSTEM CONDITION • Inspect fuel supply and return lines and hoses for kinks, and all connections for tightness. **NOTE: If problem is "not starting", perform EPC.5A and EPC.5B.**	(OK) ▶ (OK) ▶	GO to **EPC.5A**. SERVICE or REPLACE loose or damaged component(s). If performance problems still exist, GO to **EPC.5A**.

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Engine Performance Diagnosis | Pinpoint Test | EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.5A CHECK FUEL FOR CONTAMINATION • Obtain a fuel sample and visually examine fuel in a clear container (including bottom of container), for particles, clouding, or liquid contamination, such as water.	(OK) ▶ (OK) ▶	GO to **EPC.6**. REPLACE engine and chassis fuel filters. CLEAN and/or SERVICE fuel system. REFER to Shop Manual, Section 25-06. GO to **EPC.6**.
EPC.6 CHECK ENGINE IDLE SPEED • Check engine speed as outlined under Adjustments. • Bring engine up to normal operating temperature. • Idle speed is measured with manual transmission in NEUTRAL and automatic transmission in PARK. • Idle speed is shown on Vehicle Emission Control Information decal (VECI).	(OK) ▶ (OK) ▶	GO to **EPC.7**. ADJUST idle speed as outlined in this Section. GO to **EPC.7**.
EPC.7 CHECK AIR INTAKE RESTRICTION • Remove air cleaner restriction indicator and install adapter 5650 and Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm, no load. • Record restriction reading. • Restriction should not exceed 2.5 kPa (10 in of H_2O).	(OK) ▶ (OK) ▶	REMOVE adapter. INSTALL cap on air cleaner port. GO to **EPC.8A**. REPLACE filter element and CHECK intake system for blockage. REPEAT **EPC.7**. If restriction indicator is not functioning correctly, REPLACE it.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.8A FUEL FILTER OUTLET PRESSURE		
• Install adapter 11996 with Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record pressure reading. • Pressure should be 103-193 kPa (15-28 psi) at rated rpm.	(OK) ▶ Fuel pressure too low or fuel does not appear ▶ Fuel pressure too high ▶	GO to **EPC.8C**. GO to **EPC.8B**. GO to **EPC.8G**.
EPC.8B FUEL FILTER INLET PRESSURE		
• Install adapter 11995 with Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record pressure reading. • Pressure should be 103-207 kPa (15-30 psi) with a maximum allowable pressure drop across the filter of 48 kPa (7 psi).	(OK) ▶ Pressure drop is greater than 48 kPa (7 psi) ▶ Pressure is below 103 kPa (15 psi) ▶	GO to **EPC.8C**. REPLACE fuel filters. REPEAT **EPC.8B**. GO to **EPC.8C**.
EPC.8C CHECK FUEL SYSTEM FOR AIR LEAKS		
• Run engine with adapters 11995 and 11996 installed, and observe clear plastic lines for air bubbles.	No bubbles present ▶ Bubbles present ▶	GO to **EPC.8E**. GO to **EPC.8D**.
EPC.8D CHECK CHASSIS FUEL LINES		
• Disconnect fuel supply line at engine and fuel tank. • Plug one end of line and connect pressure pump from Rotunda Pressure Test Kit 014-00762 or equivalent to other end of line. Refer to Figure 20. • Apply a maximum of 103 kPa (15 psi) to line, and hold pressure. • Apply a soap and water solution to all connections and fittings, and look for air bubbles.	Bubbles present ▶ No bubbles present ▶	SERVICE or REPLACE any leaking connection or fittings. REFER to Shop Manual, Section 25-50. REPEAT **EPC.8C**. SERVICE ends of fuel supply lines. CHECK fuel tank pickup for leaks. SERVICE or REPLACE fuel tank pickup. REFER to Shop Manual, Section 25-50. REPEAT **EPC.8C**.

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Engine Performance Diagnosis | Pinpoint Test | EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.8E CHECK LIFT PUMP • Connect adapter 12094 and Rotunda Pressure Test Kit 014-00762 or equivalent to fuel box. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record vacuum reading. • Vacuum must be a maximum of 34 kPa (10 in Hg).	(OK) ▶ (OK) ▶	GO to **EPC.8F**. SERVICE or REPLACE restricted fuel supply line. REFER to Shop Manual, Section 25-50. REPEAT **EPC.8E**.
EPC.8F CHECK LIFT PUMP VOLUME • Disconnect lift pump outlet and connect a clean sample hose. • Disconnect fuel shutoff solenoid. • Place end of sample hose in clean, graduated container and crank engine for 30 seconds. • Volume should be a minimum of 0.16L (1/3-pint) in 30 seconds or less.	(OK) ▶ (OK) ▶	GO to **EPC.8G**. REPLACE lift pump. REFER to Shop Manual, Section 25-06. REPEAT **EPC.8F**.
EPC.8G CHECK FUEL RETURN PRESSURE • Disconnect fuel return line at fuel box. Install adapter 11950 and Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record pressure reading. • Pressure should not exceed 41 kPa (6 psi) at rated rpm.	Fuel return pressure OK, EPC.8A OK ▶ Fuel return pressure OK, but fuel filter outlet pressure in EPC.8A high ▶ Fuel return pressure too high ▶	GO to **EPC.9**. SERVICE or REPLACE injection pump overflow valve. REFER to Shop Manual, Section 25-06. REPEAT **EPC.8A**. SERVICE or REPLACE fuel return line. REFER to Shop Manual, Section 25-50. REPEAT **EPC.8G**.
EPC.9 CHECK STATIC TIMING • Check injection pump static timing as outlined in this Section.	(OK) ▶ (OK) ▶	GO to **EPC.10**. ADJUST static timing as outlined.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.10 CHECK INJECTOR NOZZLES/LINES • Check injector nozzle lines for damage or restriction. • Remove injector nozzles. Refer to Shop Manual, Section 25-06. • Test injector nozzles as outlined.	(OK) ▶ (OK) ▶	GO to **EPC.11A**. REPLACE damaged lines. REFER to Shop Manual, Section 25-06. CLEAN or REPLACE injector nozzles as outlined. REFER to Shop Manual, Section 25-06 for Installation. If performance problem still exists, GO to **EPC.11A**.
EPC.11A CHECK COMPRESSION • Check engine compression as outlined.	(OK) ▶ (OK) ▶	GO to **EPC.11B**. SERVICE engine as necessary. REFER to Shop Manual, Section 22-12.
EPC.11B CHECK CRANKCASE PRESSURE • Remove engine oil dipstick and connect adapter 11949 and Rotunda Pressure Test Kit 014-00762 or equivalent. Refer to Figure 20. • Run engine at rated rpm with no load, transmission in PARK or NEUTRAL. • Record pressure reading. • Pressure should be a maximum of 0.7 kPa (3 in H_2O) at rated rpm.	(OK) ▶ (OK) ▶	GO to **EPC.12A**. GO to Pinpoint Test **E3** or **M6**. Problem is internal to engine. REFER to Shop Manual, Section 22-12.

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Engine Performance Diagnosis | Pinpoint Test | EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.12A CHECK TURBINE/COMPRESSOR WHEELS • Visually check turbocharger turbine and compressor wheels for evidence of contact with turbocharger housing (bent, broken, chipped or eroded blades) or foreign object ingestion damage or deposits.	(OK) ▶ (OK) ▶	GO to **EPC.12B**. DETERMINE source of foreign object ingestion. SERVICE or REPLACE turbocharger and/or other components as necessary. REFER to Shop Manual, Section 25-45.
EPC.12B OIL LEAKAGE-EXHAUST PIPE ELBOW/TURBINE HOUSING • Check for oil deposits at connection between exhaust pipe elbow and turbine outlet. **NOTE: Slight amount of oil seepage is normal after extended periods of idling.**	(OK) ▶ (OK) ▶	GO to **EPC.12C**. REPLACE turbocharger. REFER to Shop Manual, Section 25-45.
EPC.12C OIL LEAKAGE-EXHAUST MANIFOLD/TURBINE HOUSING • Check for excessive oil deposits between exhaust manifold and turbine inlet. **NOTE: A slight amount of oil seepage is normal after extended periods of idling.**	(OK) ▶ (OK) ▶	GO to **EPC.12D**. Problem is internal to engine. REFER to Shop Manual, Section 22-12.
EPC.12D OIL LEAKAGE-INTAKE MANIFOLD/ COMPRESSOR HOUSING • Check for oil deposits in intake manifold and compressor housing. **NOTE: Slight amount of seepage is normal after extended periods of idling.**	(OK) ▶ (OK) ▶	GO to **EPC.12E**. CHECK for intake restriction. GO to **EPC.7**. If intake restriction is OK, GO to **EPC.12G**.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC.12E OIL LEAKAGE-OIL SUPPLY/DRAIN PIPE FLANGES		
• Check for oil leaks at oil supply and drain pipe flanges. • Check oil drain pipe for clogging.	(OK) ▶ (OK) ▶	GO to **EPC.12F**. SERVICE or REPLACE oil drain pipe. TIGHTEN attaching bolts to specification. REPLACE gaskets as necessary. REFER to Shop Manual, Section 25-45.
EPC.12F CHECK FOR AIR LEAKS		
• Visually check for air intake and exhaust leaks at following: 1. Exhaust manifold to engine.[a] 2. Exhaust manifold to turbine inlet.[a b] 3. Turbine housing to center housing.[a b] 4. Turbine outlet to exhaust pipe elbow.[a b] 5. Compressor housing to center housing. 6. Compressor outlet to intake manifold.[c] 7. Compressor inlet to air cleaner duct. 8. Air cleaner housing and element.	(OK) ▶ (OK) ▶	GO to **EPC.12G**. SERVICE or REPLACE leaking component(s). REFER to Shop Manual, Sections 22-12, 25-40 and/or 25-45.
EPC.12G CHECK BEARING PLAY		
• Check turbocharger axial and radial bearing play. Refer to Shop Manual, Section 25-45.	(OK) ▶ (OK) ▶	REPLACE fuel injection pump. REFER to Shop Manual, Section 25-06. ADJUST static timing as outlined. REPLACE turbocharger. REFER to Shop Manual, Section 25-45.

[a] Possible whistle or scream noise varying with engine speed.

[b] May show signs of carbon buildup.

[c] May cause low boost.

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Injector Nozzle Testing

Where ideal conditions of good combustion, specified engine temperature control, and clean quality fuel prevail, nozzles require little attention. Nozzle trouble is usually indicated by one or more of the following symptoms:

- Exhaust smoke (black)
- Low power
- Missing under load
- Rough warm idle
- Excessive fuel consumption
- Engine will not rev up
- Combustion knock
- Overheating

On Vehicle Testing

When faulty nozzle operation is suspected on an engine that is misfiring or puffing black smoke, a simple test can be made to determine the problem nozzle(s).

1. Run the engine at the rpm which makes the problem most pronounced.
2. Momentarily loosen the high-pressure fuel inlet line connection on one nozzle assembly. Listen to see if it has an effect on the engine and look to see if the smoke level changes. Then tighten the connection to specification.

WARNING

BE EXTREMELY CAREFUL TO PREVENT BEING STRUCK BY DIESEL FUEL UNDER PRESSURE. DIESEL FUEL AT INJECTION PRESSURE CAN EASILY PIERCE THE SKIN, POSSIBLY CAUSING SEVERE INJURY FROM BLOOD POISONING. IF STRUCK BY PRESSURIZED DIESEL FUEL, SEEK MEDICAL HELP IMMEDIATELY.

3. Check each nozzle in the same manner.
4. If one nozzle is found where loosening makes no difference in performance or it causes the smoke level to change, that nozzle should be bench tested.

On Bench Testing

After removing the nozzle(s) from the engine, the injector nozzle pressure test should be performed. This test will provide valuable information regarding the condition of the nozzle(s). A clean workbench, clean washing fluid containers, clean tools and clean hands are essential to produce satisfactory results. Injector nozzles which are not functioning properly, have improper opening pressure, leak down, or spray patterns, should be replaced. Replacement injectors should be tested before assembly to engine.

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Injector Nozzle Testing

Figure 22 shows the Rotunda Injector Nozzle Tester 014-00300, used for pressure testing the injector nozzles. Use the following procedure for testing the injector nozzles.

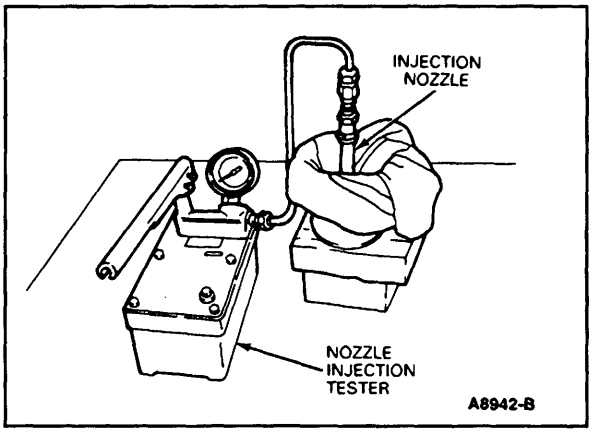


Figure 22 Injector Nozzle Tester

1. Prepare the stand for making tests. Place a container partly filled with shop cloths beneath the outlet pipe to catch the spray. Fill the stand reservoir with clean calibration fluid. Open the tester valve slightly and operate the tester handle to expel the air from the tester and outlet pipe. Operate the tester until solid fuel (no air bubbles) flows from the end of the outlet pipe. Close the tester valve.

   NOTE: Test injector nozzles using SAE approved calibration oil 208629, SAE J967D, or ISO 4113 fluid, rather than diesel fuel.

2. Install the proper adapter for testing the 6.6L and 7.8L Ford Diesel injectors on the injector nozzle test stand.

3. Connect the nozzle to the test stand. Take care to avoid cross-threading. Tighten connector nut securely with a wrench.

WARNING

ALWAYS WEAR APPROVED SAFETY GLASSES WHEN OPERATING THE TESTER. VOLATILE LIQUIDS CAN BE EXTREMELY FLAMMABLE WHEN VAPORIZED. AVOID ANY CONDITIONS (SPARKS, OPEN FLAMES, LIT CIGARETTES, ETC.) WHICH MIGHT IGNITE THE FLUID USED DURING THE TEST PROCEDURE. ENSURE THAT THE INJECTOR IS MOUNTED ON THE TESTER SO THAT THE SPRAY IS DIRECTED AWAY FROM THE OPERATOR AND ANY OTHER PERSONS. THE ONLY LIQUID APPROVED FOR USE IN THIS TESTER IS SAE CALIBRATION NO. 208629 OR EQUIVALENT CALIBRATION FLUID (SAE J967D OR ISO 4113).

WHEN A NOZZLE IS BEING TESTED OR IS IN OPERATION, KEEP HANDS AND OTHER PARTS OF THE BODY AWAY FROM THE SPRAYING NOZZLE. THE LIQUID SPRAY LEAVES THE NOZZLE TIP WITH SUFFICIENT FORCE TO PENETRATE THE SKIN AND CAUSE SERIOUS INJURY. THE NOZZLE TIP SHOULD BE ENCLOSED IN A TRANSPARENT RECEPTACLE IF AVAILABLE.

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Injector Nozzle Testing

4. Bleed air from the nozzle. Open the tester valve and operate tester handle for 8 to 10 quick strokes to expel (bleed) air from the injector nozzle. Test fluid should spray from the spray holes in the nozzle tip. If the nozzle is blocked or the needle jammed, replace the injector. Replacement injectors should be tested before assembly to the engine.

   NOTE: Conduct opening pressure, tip leakage and spray pattern tests separately. Do not attempt to evaluate more than one test step or result at a time.

5. **Check nozzle opening pressure** by pumping the injector nozzle tester and observing the pressure at which the needle valve lifts and fuel is ejected from the nozzle tip. Opening pressure must meet specifications or nozzle should be replaced.

6. **Check the nozzle for tip leakage.** Wipe the nozzle tip dry and operate the tester to maintain pressure at 2068 kPa (300 psi) below opening pressure of the nozzle. Hold the pressure for 10 seconds. If droplets form on the tip of the injector and fall off, the nozzle should be replaced. Wetness on the tip of the injector is acceptable.

   NOTE: Do not wipe the tip with fingers, because it tends to draw a small amount of fluid out of the injector giving a false impression of a leak. Use a clean cloth or blotting paper.

7. **Check the spray pattern of the nozzle** (Figure 23) by pumping the tester handle rapidly and observing the spray pattern coming from the orifices. Spray must come from each orifice and be similar in size and consistency. The spray should be well atomized and cone shaped as it comes from the injector nozzle. Injectors showing poor spray patterns should be replaced.

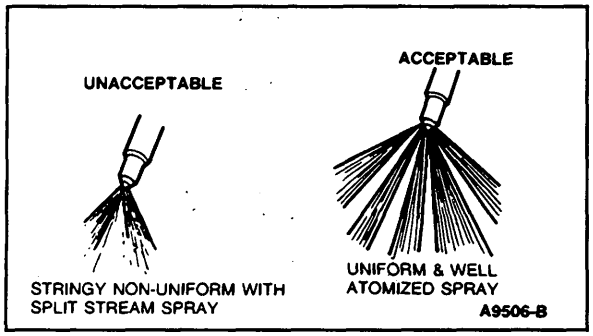


Figure 23 Spray Patterns

8. If the injector fails any of the tests, overhaul or replace the injector. Refer to Shop Manual, Section 25-06.

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Checking Compression

To check compression in the 6.6L and 7.8L Ford Diesel engines use the following procedure:

1. Be sure battery performance meets specifications.
2. Clean the engine, especially the area around the injectors.
3. Warm up the engine by operating for a minimum of 30 minutes at 1200 rpm.
4. Stop the engine and remove the high-pressure fuel lines and fuel leak-off line from the engine. Cap all the openings in the fuel injection system and fuel injection pump.
5. Remove the injector nozzle and seat washer from each cylinder. Cap the injector nozzle and line to prevent the entry of dirt into the system. Place the injectors in a rack to prevent damage while they are removed from the engine and to keep them in order.

   CAUTION

   If an injector is stuck in the cylinder head and will not pull straight out, turn the injector in a clockwise direction to break it loose. If it is turned in a counterclockwise direction there is a chance that the nozzle and holder could unscrew from each other, allowing the internal components to fall out.

   NOTE: The lines should not be capped until residual fuel has been removed from them. Otherwise, when the engine is cranked during the compression test, the fuel remaining in the lines will blow the caps off. To remove the residual fuel, crank the engine after the fuel shutoff solenoid has been disconnected, then cap the lines.
6. Disconnect the electrical connector at the bottom of the fuel shutoff solenoid (Figure 24) and cover with tape. This must be done to shut off the flow of fuel to the engine during cranking.

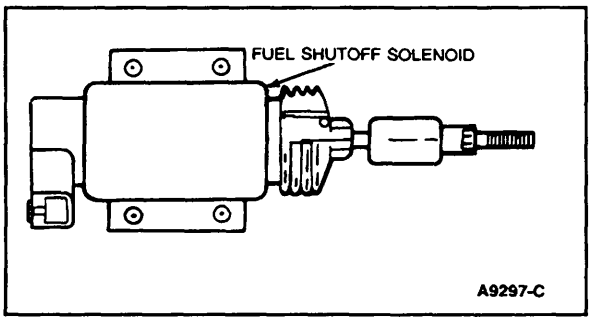


Figure 24 Fuel Shutoff Solenoid Terminals

7. Crank the engine to blow out any loose carbon particles from the injector bores.
8. Install the engine compression tester adapter 12210 into the injector bore of cylinder No. 1, using a new set washer and the injector mounting studs and nuts.
9. Connect Compression Gauge 014-00701 or equivalent and hose to the adapter.
10. Crank the engine (speed must be at least 200 rpm) and observe the gauge reading. Allow about 6-8 puffs per cylinder.
11. Repeat Steps 7 through 10 for each cylinder.
12. After completing the compression check, install the injector nozzles using new seat washers. Connect the injector lines back on the engine and attach the connector at the bottom of the fuel shutoff solenoid.

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Checking Compression

Test Conclusions

1. Minimum compression must be at least 1896 kPa (275 psi). Also, compression readings from the lowest cylinder must be at least 75 percent of the highest.
2. If any of the readings do not meet the above specifications, this indicates that there is leakage at the cylinder head gasket, piston rings or valves.

   NOTE: To determine if the rings or valves are at fault, squirt the equivalent of a tablespoon of heavy oil into the combustion chamber, then crank the engine to distribute the oil and repeat the compression test. The oil will temporarily seal leakage past the rings. During a compression test, if the pressure fails to climb steadily and remains the same during the first two succeeding strokes, or fails to climb during the entire test, suspect a sticking valve.
3. A low, even compression in two adjacent cylinders may indicate a cylinder head gasket leak. Check this before blaming the rings or valves.

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SECTION 20

Diesel Diagnosis — 7.3L Engine

Contents

Preliminary Checkout 20-1

Test Equipment 20-3

Idle Speed Setting Procedures 20-8

Setting Injection Timing — Static Timing 20-9

Setting Injection Timing — Dynamic Timing 20-10

System Description and Diagnosis 20-12

Glow Plug System Diagnostic Procedure 20-29

Engine Performance Diagnostic Procedure 20-47

Injection Nozzle Testing 20-57

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Preliminary Checkout

This Section covers adjustments, diagnostics, and test procedures for the 7.3L diesel engine Fast Start Glow Plug System and Fuel Injection System.

Before Starting

Efficient diagnosis must take place in an organized manner with a plan or procedure which starts with the obvious and goes on to the more difficult. Eliminate all the obvious and easy-to-do items first. Do not start by jumping to conclusions. The job worked on last week might have been caused by an entirely different problem than the one today.

Get All The Information Available

Check out all sources of information. Talk to the operator. Sometimes asking a question will cause the operator to remember something that is useful.

The following list is a set of basic questions. Get the answers to these in order to learn what the true complaint is, and what the basic problem is.

Operating Conditions:

1. Did the problem occur suddenly or over a long period of time?
2. Were there any abnormal noises before the failure?
3. Was the engine under heavy or light load? Decelerating or accelerating?
4. Did the water temperature or oil pressure vary?
5. Were weather conditions a factor?
6. What type of road grade was the vehicle on when the trouble was first noticed?
7. How was the trouble first noticed (felt, heard, etc.)?
8. What was the amount of oil consumption? Fuel? Coolant? Had there been a recent change?
9. What was the exhaust smoke like? Light or dense? Color?
10. Does the engine have good throttle response?
11. Is deceleration normal?
12. Does the engine shut off properly?
13. Does the engine start correctly when cold?
14. Does the engine ever miss?
15. What kind of fuel is being used? Grade and source?
16. Does the engine surge at idle or wide-open throttle?
17. Is the engine subjected to periods of extended idling?
18. Has the vehicle or equipment been in an accident or collision?

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Preliminary Checkout

Maintenance History:

1. Has the engine been serviced recently? What was done?
2. Has this complaint occurred before? If so, what was done then?
3. When was the last tune-up?
4. When were the oil and fuel filters last changed?
5. Who normally performs the maintenance and adjustments?
6. Is the maintenance schedule followed closely?
7. How is fuel obtained and stored?
8. What type service designation (SG/CE), and what grade oil is used?
9. How many miles or hours has the engine operated since the last service?

Observed Information:

1. Is the engine clean or dirty?
2. Are the belts in good condition? Loose?
3. Is there evidence of external oil, coolant or fuel leaks?
4. Does the engine appear to have overheated?
5. Are there any make-shift repairs on the engine (loose parts, wired-on parts, etc.)?
6. How does the engine sound at idle?
7. Are any pulleys wobbling?
8. Do any parts appear to have been altered or serviced recently?
9. Are there any aftermarket or unapproved parts on the engine?
10. Have any of the lines been altered or re-routed?
11. Are oil level, coolant level and fuel level satisfactory? (If the problem concerns bearings, notice the condition of the oil.)
12. During disassembly, does the engine have unusual odors, carbon accumulations, dirt or other conditions under the rocker cover?

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Test Equipment

The following test equipment (Figures 1 through 4) is required for adjusting idle speed and timing.

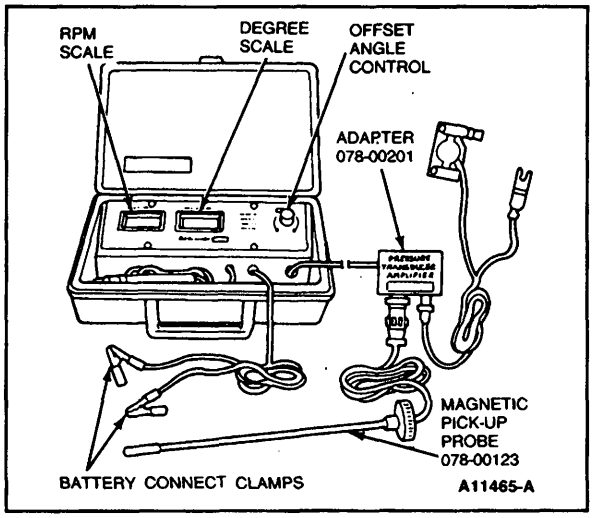


Figure 1 Rotunda 078-00200 Dynamic Timing Meter

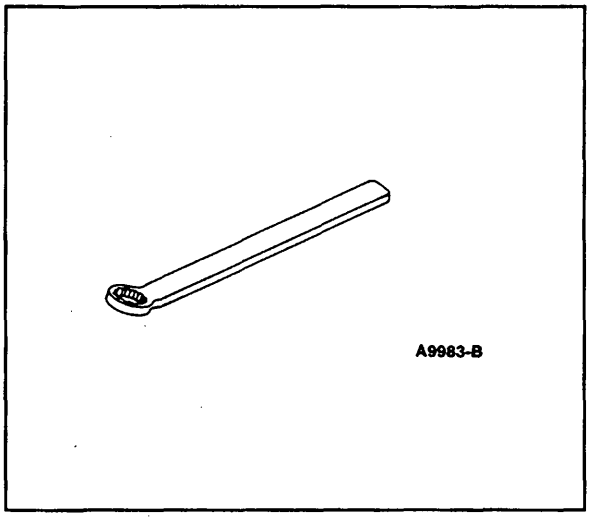


Figure 2 T86T-9000-C Injection Pump Mounting Wrench

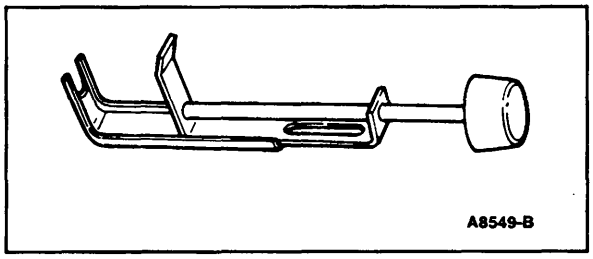


Figure 3 Throttle Control Tool D83T-9000-E

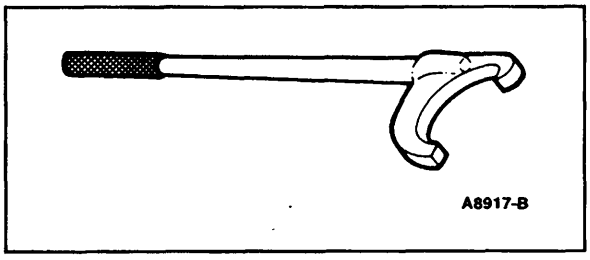


Figure 4 T83T-9000-C Injection Pump Rotating Tool

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Test Equipment

The following test equipment (Figures 5 and 6) is required for performing the Engine Performance Diagnostic Procedure.

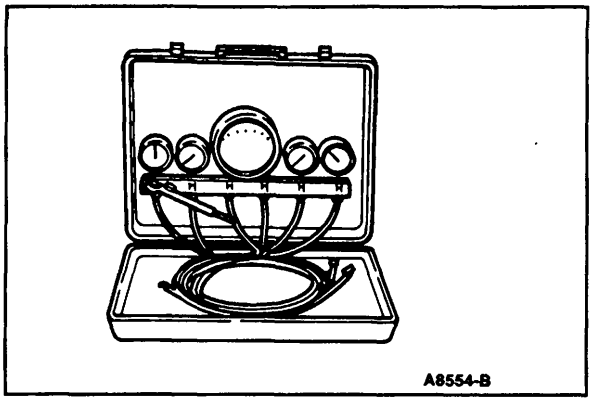


Figure 5 Rotunda 014-00761 Pressure Test Kit

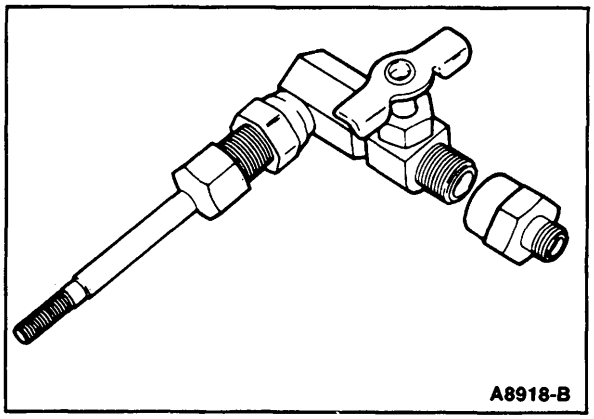


Figure 6 T83T-9000-A Fuel Transfer Pump Pressure Adapter

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Test Equipment

The following test equipment (Figures 7 and 8) is required for performing the "WAIT TO START" Lamp Diagnostic Procedure and the Fast Start Glow Plug System Diagnostic Procedure.

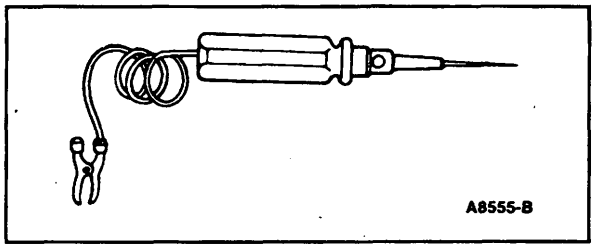


Figure 7 12-Volt Test Lamp

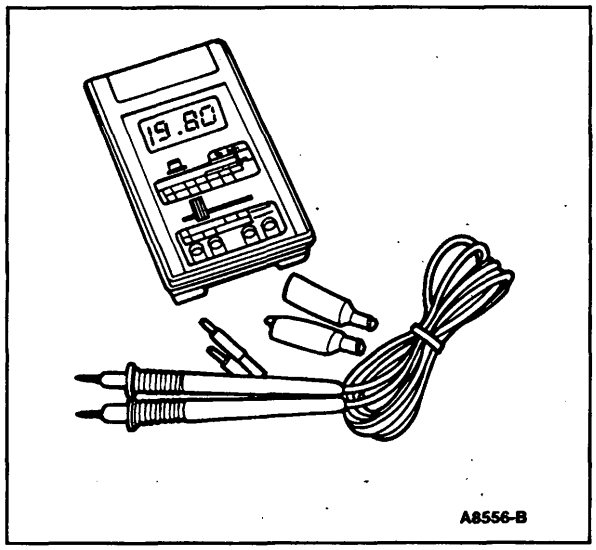


Figure 8 Rotunda 007-00001 Digital Volt Ohmmeter

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Test Equipment

The following test equipment (Figures 9 and 10) is required for Injection Nozzle testing and cleaning.

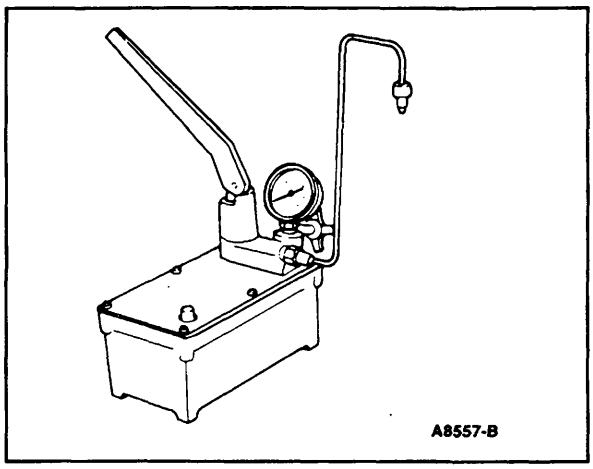


Figure 9 Rotunda 014-00300 Injector Nozzle or equivalent Tester Special Service Tool D83T-9000-F

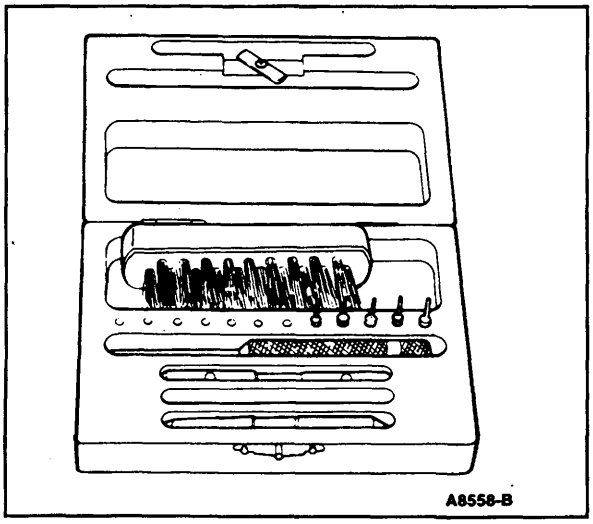


Figure 10 Rotunda 014-00301 Injector Nozzle or equivalent Cleaning Kit Special Service Tool D83T-9000-G

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Test Equipment

ENGINE PERFORMANCE SPECIFICATIONS

Engine Model	A-185, A-166
Number of Cylinders	8
Configuration	Vee
Bore	104.39 mm (4.11 in)
Stroke	106.20 mm (4.19 in)
Displacement	7.3 Liters (444 cu in)
Crankshaft Rotation (viewed from Flywheel End of Engine)	Counterclockwise
Compression Ratio	21.5:1
Firing Order	1-2-7-3-4-5-6-8
Idle Speed (No Load)*	650 rpm ± 50 rpm
Governor Speed (No Load)	3660 ± 50 rpm
Governor Speed (Full Load Rated)	3300 rpm
Timing (Dynamic)	8.5 ± 2 Degrees BTDC
Injection Pump	Stanadyne DB-2
Injection Nozzle	
Opening Pressure (New)	12,928 ± 517 kPa (1875 ± 75 psi)
Opening Pressure (Minimum)	9825 kPa (1425 psi)
Crankcase Pressure-No Load (Maximum)	20 kPa (6 in-H_2O) @ 3300 rpm
Fuel Pressure (Filter Inlet)	14 kPa (2 psi) @ idle
Fuel Pressure (Filter Outlet)	7 kPa (1 psi) @ 3300 rpm
Fuel Pump Suction	20 kPa (6 in. H_2O) @ 3300 rpm
Fuel Return Line Pressure	14 kPa (2 psi) @ 3300 rpm
Air Filter Restriction	107 kPa (25 in. H_2O) @ 3300 rpm
Valve Lifter	0 Valve Lash
Engine Lube Oil Pressure Low Idle, Minimum	69 kPa (10 psi)
(Engine at Operating Temperature)	276-482 kPa (40-70 psi)
Crankcase Capacity (Without Filter)	8.5 L (9 qt.)
Crankcase Capacity (With Filter)	9.5 L (10 qt.)
Thermostat Opening Temperature	89°C (192°F)

*** Manual transmission in Neutral position. Automatic transmission in Drive position.**

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Idle Speed Setting Procedures

Curb Idle Speed Adjustment

1. Place transmission in NEUTRAL or PARK.
2. Bring engine up to normal operating temperature.
3. Idle speed is measured with manual transmission in NEUTRAL and automatic transmission in DRIVE.
4. Ensure that curb idle adjusting screw is against the stop. If not, correct vehicle linkage.
5. Check curb idle speed, using Rotunda 055-00108 or equivalent. Curb idle speed is specified on the Vehicle Emissions Control Information (VECI) decal. Adjust to specification using idle speed adjusting screw (Fig. 11).
6. Place transmission in NEUTRAL or PARK. Rev engine momentarily. Place transmission in specified gear and check curb idle rpm. Adjust again if necessary.

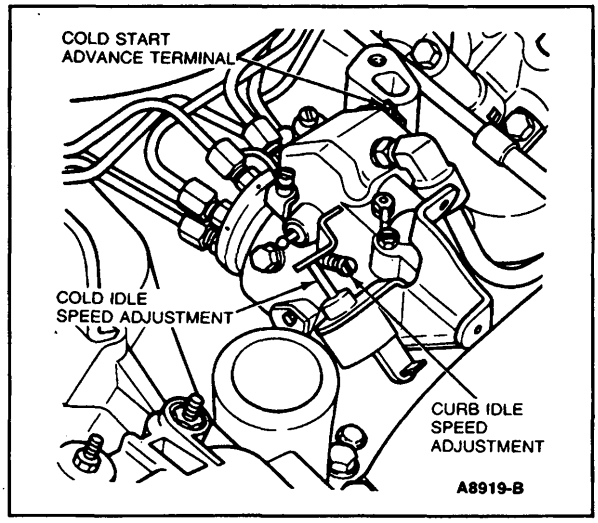


Figure 11 Idle Speed Adjusting Screw

Fast Idle Adjustment

At Cold Idle Solenoid:

1. Place transmission in NEUTRAL or PARK.
2. Start engine, and bring up to normal operating temperature.
3. Disconnect fast idle solenoid from wiring harness.
4. Apply battery voltage to solenoid to activate it.
5. Rev engine momentarily to set solenoid to activate it.
6. Check fast idle speed setting. Fast idle rpm should be 825 ± 25. Adjust to specification by turning solenoid plunger in or out (Fig. 11).
7. Rev engine momentarily and check fast idle rpm. Adjust as necessary.
8. Remove battery voltage from solenoid connector and connect to wiring harness.

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Setting Injection Timing — Static Timing

1. Remove fast idle bracket and solenoid from injection pump.
2. Break torque (keeping nuts snug) on three nuts attaching injection pump to pump mounting adapter using Tool T86T-9000-C or equivalent (Figure 2).
3. Install rotating Tool T83T-9000-C (Fig. 4) or equivalent on front of pump and rotate injection pump to align timing mark on injection pump mounting flange with timing mark on pump mounting adapter, to within ± 0.030 inch.
4. Remove rotating tool and tighten nuts to specification. Visually check timing to verify that timing marks are aligned (Fig. 12).
5. Install fast idle bracket and solenoid and tighten bolts to specification.

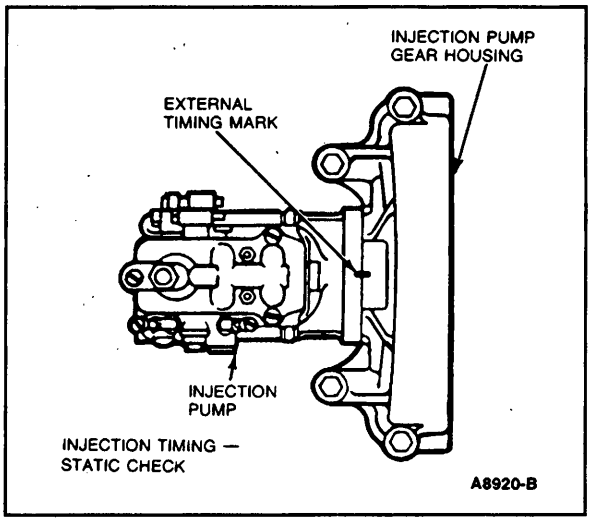


Figure 12 Injection Pump Timing Marks

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Setting Injection Timing — Dynamic Timing

1. Bring engine up to normal operating temperature.

   NOTE: When checking or setting dynamic injection timing on the 7.3L engine it is mandatory that the engine be stabilized at normal operating temperature of 89°C-100°C (192°F-212°F). This temperature is needed to ensure proper fuel ignition in the precombustion chambers.

2. Stop engine and install Dynamic Timing Meter, Rotunda 078-00200 or equivalent, by placing magnetic pickup in timing pointer probe hole (Fig. 13). Insert pickup until it almost touches vibration damper.

   NOTE: To prevent incorrect readings, ensure that vibration damper is clean and free of foreign debris and rust scale. If required, sand the area to remove rust and apply a light coat of paint to the area.

3. Attach clamp from Timing Meter Adapter Rotunda 078-00201 or equivalent, to the line pressure sensor on No. 1 injector nozzle (F-Series) or No. 4 injector nozzle (E-Series) and connect to timing meter (Fig. 14).

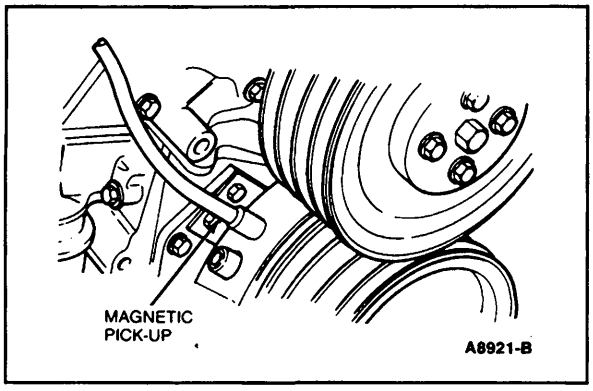


Figure 13 Magnetic Pickup — Dynamic Timing

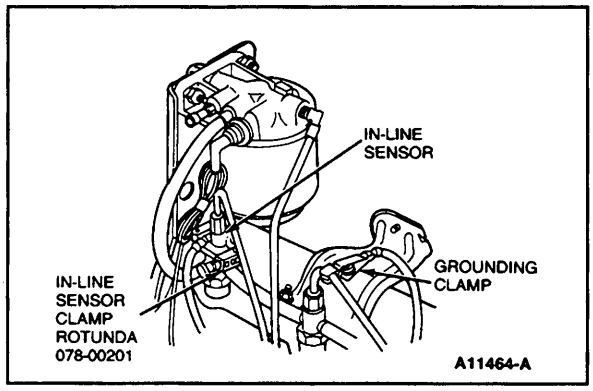


Figure 14 Luminosity Probe — Dynamic Timing

4. Connect dynamic timing meter to battery and dial in minus 20 degrees offset on meter. Disconnect cold start advance solenoid connector from solenoid terminal (Fig. 11).

   NOTE: Ensure that all wire leads are located away from the front accessory drive belts.

5. With transmission in NEUTRAL and rear wheels raised off the ground, start engine. Using Throttle Control Tool D83T-9000-E or equivalent, set engine speed to 2000 rpm with no accessory load. Observe injection timing on dynamic timing meter. Injection timing should be 8.5 degrees BTDC at 2000 rpm.

6. Apply battery voltage to cold start advance solenoid terminal to activate it.

   NOTE: Activating cold start advance solenoid can result in engine speed increase. Adjust throttle control to attain 2000 rpm, if required.

7. Check timing at 2000 rpm. The timing should be advanced at least 1 degree before the timing obtained in Step 5. If the advance is less than 1 degree, replace fuel injection pump top cover assembly.

8. If dynamic timing is not within ± 2 degrees of specification, adjustment of pump timing is necessary.

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Setting Injection Timing — Dynamic Timing

9. Turn engine off. Note timing mark alignment. Remove fast idle bracket and solenoid from injection pump. Break torque (keeping nuts snug) on nuts attaching injection pump to pump mounting adapter with Tool T86T-9000-C or equivalent (Figure 2).
10. Install rotating tool, T83T-9000-C or equivalent (Figure 4), on front of pump. Rotate clockwise (when viewed from front of engine) to retard, and counterclockwise to advance timing, by lightly tapping tool with a rubber mallet. Two degrees of dynamic timing is approximately 0.75mm (.030 inch) of timing mark movement.
11. Remove rotating tool and tighten nuts to specification. Start engine and recheck timing. Repeat Steps 9, 10 and 11 as necessary, to set timing to ± 1 degree of specification.
12. Turn engine off. Remove dynamic timing components. Install fast idle bracket and solenoid and tighten bolts to specification.

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System Description

This portion of this Section contains a brief description of the 7.3L diesel engine "WAIT TO START" Lamp System, Solid-State Glow Plug System and Fuel System. It also contains detailed diagnostic procedures for these systems.

The diagnostic procedures are broken into two parts. The first part is Symptom Analysis. This Section should be consulted first, as it will provide direction to perform a specific service or to a specific diagnostic procedure.

The second part contains the "WAIT TO START" Lamp, Solid-State Glow Plug System, Engine Performance diagnostic procedures, Fuel System Air Leak Diagnosis and Nozzle Testing. At the beginning of each of these procedures, there is an explanation of how to use that procedure. Read this explanation before performing the tests.

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Warning Lamps

"Wait To Start" Lamp

The "WAIT TO START" lamp comes on when the ignition switch is turned to the RUN position, and the engine is below normal operating temperature. It will remain lit for 4 to 10 seconds, depending on engine temperature. If engine is at or above normal operating temperature the lamp will not turn on.

NOTE: If the ignition switch is left in the ON position for an extended period of time or the engine is not started within the two minute cycling time, the glow plug system must be reset by turning the ignition switch to OFF position.

Fuel Filter Restriction Warning Lamp

The 7.3L diesel is equipped with a fuel filter restriction sensor. A restriction indicator lamp is located in the instrument cluster to alert the operator.

If the lamp comes on during normal engine operation, replace the filter as soon as possible.

"Water In Fuel" Warning Lamp

The "WATER IN FUEL" warning lamp should turn on when the ignition switch is in the START position to indicate proper lamp and sensor function. The lamp will come on if the fuel filter/water separator has a significant amount of water in it. If the lamp comes on during normal engine operation, drain the fuel bowl in the filter as soon as possible. Water in the fuel could cause extensive damage to the fuel injection system.

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Solid-State Glow Plug System

The Solid-State Glow Plug system consists of the glow plug controller, the glow plug harness assembly and glow plugs (Fig. 15).

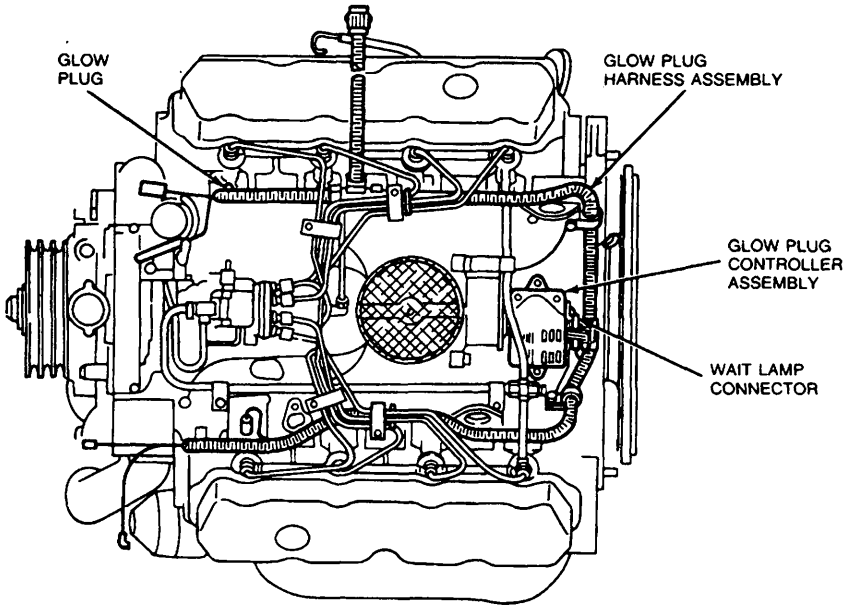


Figure 15 Solid State Glow Plug Control System

The system determines the glow plug temperature by electronically measuring the resistance of the glow plugs. It then maintains this temperature regardless of ambient temperatures.

The system is actuated when the ignition switch is turned to the RUN position. The "WAIT TO START" lamp lights until the glow plugs reach the proper temperature. The lamp goes out and the engine can be started.

The afterglow operation of the glow plugs continues after the "WAIT TO START" lamp turns off. The glow plugs cycle on and off for a period of time. This helps to reduce white smoke after engine start-up.

The glow plug system can be recycled by turning the ignition off and on. This immediately restarts the glow plug cycle. The engine can be started as soon as the "WAIT TO START" lamp goes off.

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Solid-State Glow Plug System

Glow Plug Controller

The power relay is mounted on top of the solid-state controller circuit board. The complete assembly is mounted on the rear of the intake manifold (Fig. 16).

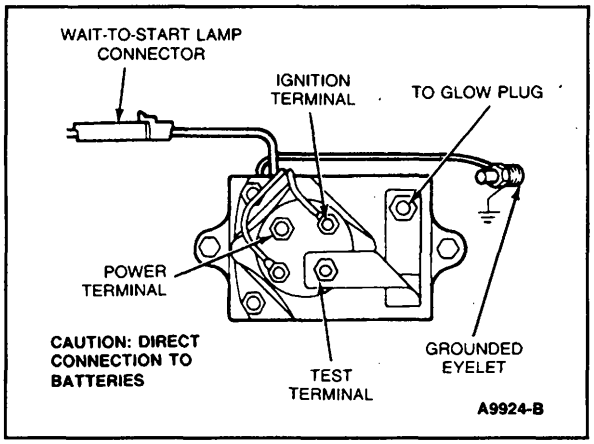


Figure 16 Solid-State Glow Plug Controller

Glow Plugs

The system uses positive temperature coefficient (PTC) glow plugs. The resistance of the glow plugs changes as the temperature rises. The glow plugs use bullet-type terminals (Fig. 17).

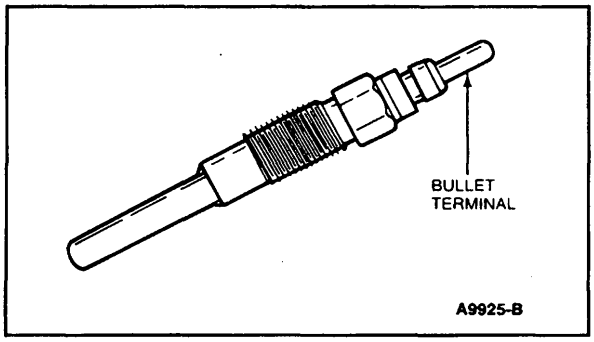


Figure 17 Glow Plugs

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Solid-State Glow Plug System

Wiring Schematic

Use the electrical schematic (Fig. 18) when diagnosing the glow plug system.

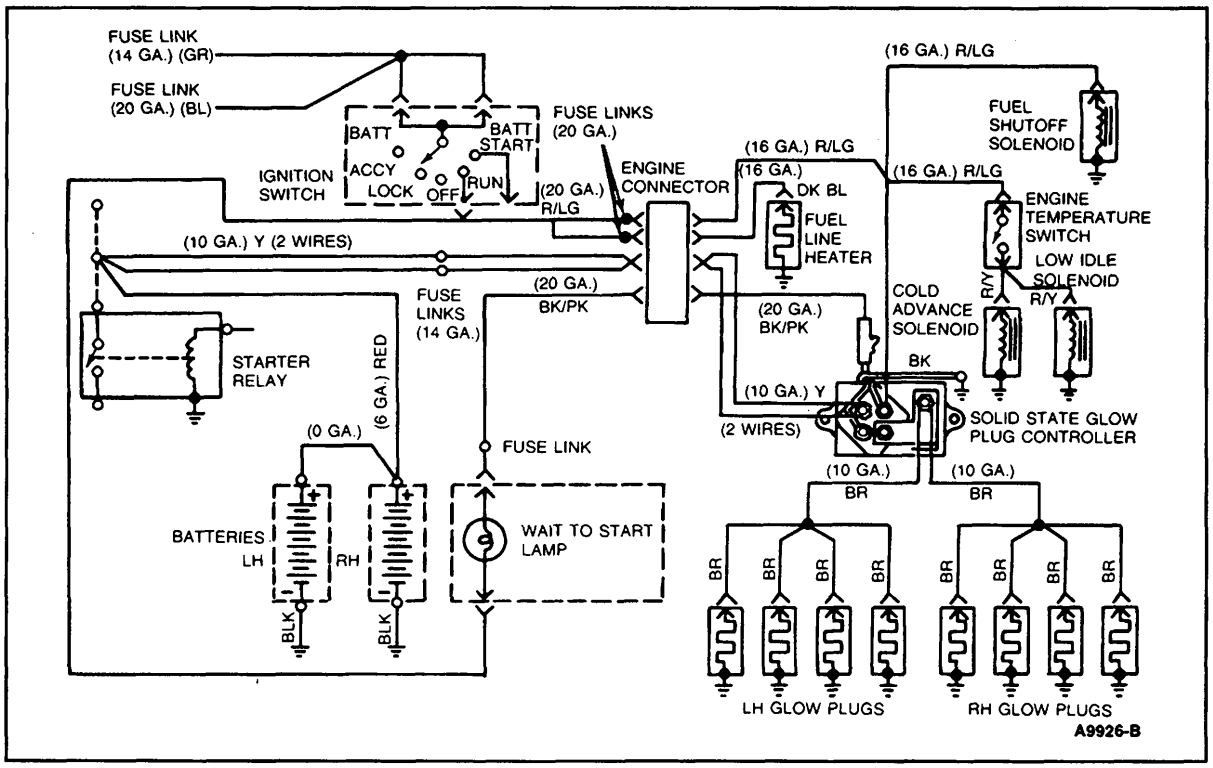


Figure 18 Wiring Schematic

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Fuel System Description

Figure 19 shows a schematic of the fuel supply and return lines. Fuel from the tank is routed to the fuel supply pump which pumps fuel through a combination fuel filter, heater and water separator. The filter header contains a continuous vent (orifice bleed-off system) which aids starting by eliminating the need to manually prime the fuel filter. A vacuum switch is incorporated into the fuel filter header which will activate a light on the instrument panel indicating the need for filter replacement. The water separator portion of the filter assembly has a probe which will activate an instrument panel light when the filter requires draining at the water and sediment drain located on the bottom of the assembly.

Fuel enters the inlet of the injection pump and is delivered under high pressure through injection nozzles into the engine cylinders for combustion. On each nozzle is a fuel return fitting that returns excess fuel to the fuel tank. Excess fuel from the injection pump and each injection nozzle are collected in bleed-off lines and returned to the fuel tank.

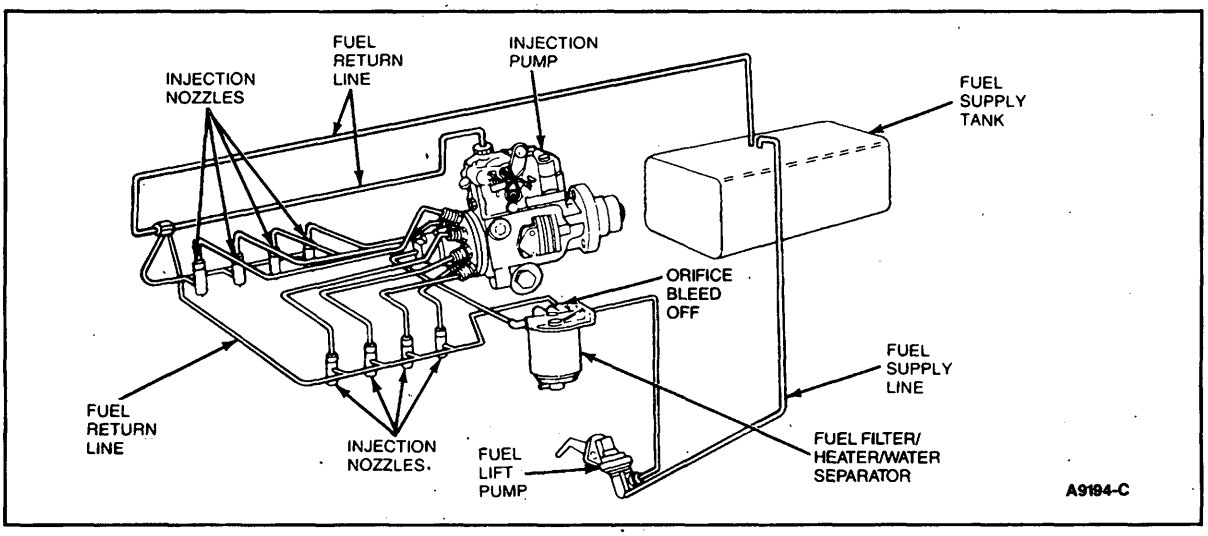


Figure 19 Fuel System Schematic

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Symptom Analysis

Consult the Symptom Analysis Diagnostic Procedures first. These will indicate a service to be performed or provide direction to either the Fast Start Glow Plug System Diagnostic Procedure or the Engine Performance Diagnostic Procedure.

If the GLOW PLUG lamp is suspected of being faulty, go directly to the GLOW PLUG diagnostic procedure before performing the Glow Plug System Diagnostic Procedure.

If the problem is Loss of Power and/or Increased Fuel Consumption, go directly to the Engine Performance Diagnostic Procedure.

Evaluating "Normal" Diesel Engine Exhaust Smoke

The following is a description of what is "normal" and expected exhaust smoke for a vehicle with a diesel engine. Diesel exhaust smoke can be classified into two categories according to the color of the smoke.

The first category is blue-white smoke.

- Blue-white smoke may be observed at engine start-up whether the engine is up to operating temperatures or not. This start-up smoke will be observed at all ambient temperatures and should last no longer than a minute after the vehicle is driven.
- When ambient temperature is below 10°C (50°F), blue-white smoke can return after the engine warm-up due to extended idling. This is due to the combustion chambers cooling down during periods of extended idling time.

Heavy blue-white smoke will also occur when the engine is operated at wide-open throttle (accelerator pedal to the floor) with the transmission in NEUTRAL or with a lightly loaded vehicle in any transmission gear setting. The smoke is a normal characteristic for a diesel engine with a light min.-max. governor spring in the fuel injection pump. This results in the following characteristics due to the engine operating above its rated speed (3300 rpm) in a no-load or lightly loaded condition:

- Heavy blue-white smoke.
- Fuel injection pump governor hunting resulting in high speed engine rpm surging.
- Engine sputtering or misfiring.

The conditions can be eliminated by not operating the engine above its maximum full load rated speed of 3300 rpm.

NOTE: Chassis fuel system air leaks may also cause continuous heavy blue-white smoke.

The second category of diesel exhaust smoke is black smoke. Black smoke occurs whenever the engine is working hard. The engine works hard when it is going up a steep grade, pulling a trailer, carrying a heavy load, or during acceleration. More black smoke will be observed when operating the vehicle at higher altitudes. If black smoke is observed while the engine is idling (at low altitude) or under normal driving conditions, the problem should be diagnosed as soon as possible.

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Symptom Analysis

Engine Cranks But Will Not Start (Cold)	Pinpoint Test A
Engine Cranks But Will Not Start (Normal Operating Temperature)	Pinpoint Test B
Engine Quits, Stalls or Stumbles	Pinpoint Test C
Engine Misses	Pinpoint Test D
Engine Knocks	Pinpoint Test E
Low Oil Pressure with Proper Oil Level	Pinpoint Test F
Blue/White Smoke (Engine at Normal Operating Temperature)	Pinpoint Test G
Excessive Black Smoke	Pinpoint Test H
"Wait-To-Start" Lamp Testing	Pinpoint Test J
Glow Plug Testing	Pinpoint Test K
Fuel System Air Leak Diagnosis	Pinpoint Test L
Low Power	Go to Engine Performance Diagnostic Procedure.
Increased Fuel Consumption	Go to Engine Performance Diagnostic Procedure.

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Engine Cranks But Will Not Start	Pinpoint Test	A

TEST STEP	RESULT ▶	ACTION TO TAKE
A0 STARTING PROCEDURE		
NOTE: If the ignition key is left in the ON position for an extended period of time or the engine is not started within the two minute cycling time, the glow plug system must be reset by turning the ignition key to OFF position. • Check and follow correct starting procedure on vehicle visor.	(OK) ▶ (OK) ▶	RETURN vehicle to customer. GO to A1.
A1 GLOW PLUG MODULE RELAY		
• Open hood. • Listen for glow plug module relay click when ignition switch is turned to ON position.	(OK) ▶ (OK) ▶	GO to A2. GO to Glow Plug System Diagnostic Procedure.
A2 FUEL FLOW CHECK		
• Loosen one injection nozzle line nut (1/2 to one turn) while cranking engine.	Fuel discharges ▶ Fuel does not discharge ▶	GO to Glow Plug System Diagnostic Procedure. GO to A3.
A3 ENERGIZE TO RUN SOLENOID (ETR)		
• Check voltage at ETR solenoid (terminal located at front of injection pump) while cranking engine. Voltage must be at least 9 volts. • Check solenoid terminal for dirt/corrosion and loose/broken electrical connection.	(OK) ▶ (OK) ▶	GO to A4. REFER to Shop Manual, Section 31-01. REPEAT Test Step A3.
A4 CHECK COLD IDLE SPEED/ADVANCE		
• Check voltage at cold advance solenoid (terminal located at left rear of injection pump) while cranking engine. Voltage must be at least 9 volts. • If no voltage is present, verify switching function of temperature sensing switch located behind thermostat housing.	(OK) ▶ (OK) ▶	GO to Engine Performance Diagnostic Procedure. REFER to Shop Manual, Section 31-01. REPEAT Test Step A4.

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Engine Cranks But Will Not Start (Normal Operating Temperature)	Pinpoint Test	B

TEST STEP	RESULT ▶	ACTION TO TAKE
B0 STARTING PROCEDURE • Check and follow correct starting procedure on vehicle visor.	(OK) ▶	RETURN vehicle to customer.
	(OK) ▶	GO to **B1**.
B1 FUEL FLOW CHECK • Loosen one injection nozzle line nut (1/2 to one turn) while cranking engine.	Fuel discharges ▶	GO to Engine Performance Diagnostic Procedure.
	Fuel does not discharge ▶	GO to **B2**.
B2 ENERGIZE-TO-RUN SOLENOID (ETR) • With ignition switch in the ON position, check voltage at ETR solenoid (terminal at front of injection pump). Voltage must be at least 9 volts. • Check solenoid terminal for dirt/corrosion and loose/broken electrical connection.	(OK) ▶	GO to Engine Performance Diagnostic Procedure.
	(OK) ▶	REFER to Shop Manual, Section 31-01. REPEAT Test Step **B2**.

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Engine Quits, Stalls or Stumbles	Pinpoint Test	C

TEST STEP	RESULT ▶	ACTION TO TAKE
C0 IDLE SPEED		
• Perform Test Step [EPC.10] in the Engine Performance Diagnostic Procedure.	(OK) ▶	GO to [C1].
	(OK) ▶	ADJUST idle speed as described in this Section, under Adjustments.
C1 ENERGIZE-TO-RUN SOLENOID (ETR)		
• Check ETR solenoid (terminal located at left front of injection pump) for dirt/corrosion and loose/ broken electrical connection. While cranking, voltage must be at least 9 volts.	(OK) ▶	GO to [C2] or [C3] as required.
	(OK) ▶	CLEAN, SERVICE or REPLACE terminal connection. REFER to Shop Manual, Section 31-01. REPEAT Test Step [C1].
C2 COLD ADVANCE SYSTEM (COLD ENGINE)		
• Check voltage at cold advance solenoid (terminal located at left rear of injection pump) while cranking engine. Voltage must be at least 9 volts. • If no voltage is present, verify switching function of temperature sensing switch located behind thermostat housing.	(OK) ▶	GO to Engine Performance Diagnostic Procedure.
	(OK) ▶	REFER to Shop Manual, Section 31-01. REPEAT Test Step [C2].
C3 COLD ADVANCE SYSTEM (HOT ENGINE)		
• Check for voltage at cold advance solenoid (terminal located at left rear of injection pump) while cranking engine. No voltage should be present.	(OK) ▶	GO to Engine Performance Diagnostic Procedure.
	(OK) ▶	REPLACE temperature sensing switch. REPEAT Test Step [C3].

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Engine Misses	Pinpoint Test	D

TEST STEP	RESULT ▶	ACTION TO TAKE
D0 DETERMINE WHEN MISS OCCURS		
• Engine will miss when cold if one or more glow plugs are not heating.	Engine misses only when cold ▶	REFER to Glow Plug System Diagnostic Procedure.
	Engine misses at normal operating temperature ▶	GO to **D1**.
D1 ISOLATE MISS		
• Loosen each injection nozzle line nut (one at a time) while running engine. Refer to Injection Nozzle Testing in this Section.	Miss not isolated to specific cylinder ▶	GO to Engine Performance Diagnostic Procedure.
	Miss isolated to specific cylinder(s) ▶	GO to **D2**.
D2 CHECK NOZZLE FUEL DELIVERY		
• Check injection nozzle fuel line(s) for kinks or restrictions as described in Shop Manual, Section 22-08. • Perform injection nozzle test as described under Injection Nozzle Testing in this Section.	Nozzle(s) and lines OK ▶	GO to **D3**.
	Nozzle(s) and/ or lines Not OK ▶	REPLACE damaged line(s) as described in Shop Manual, Section 22-08. REPLACE nozzle(s) as described under Injection Nozzle Testing in this Section.
D3 CYLINDER COMPRESSION CHECK		
• Perform cylinder compression test as described in Shop Manual, Section 22-08.	(OK) ▶	GO to Engine Performance Diagnostic Procedure.
	(OK) ▶	GO to **D4**.
D4 CHECK CRANKCASE PRESSURE		
• Perform Engine Performance Diagnostic Procedure Test Step **EPC12.**	(OK) ▶	SERVICE or REPLACE valve train as described in Shop Manual, Section 22-08.
	(OK) ▶	OVERHAUL power cylinder as described in Shop Manual, Section 22-08.

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Engine Knocks	Pinpoint Test	E

TEST STEP	RESULT ▶	ACTION TO TAKE
E0 BELT DRIVEN ACCESSORIES • Check engine front drive components for proper operation.	(OK) ▶ (OK) ▶	GO to E1. SERVICE or REPLACE as necessary. REFER to specific accessory Shop Manual Section.
E1 ENGINE COOLANT TEMPERATURE • Verify engine is not overheating.	(OK) ▶ (OK) ▶	GO to E2. REFER to Shop Manual, Section 27-02.
E2 ISOLATE ENGINE KNOCK • Loosen each injection nozzle line nut (one at a time) while running engine. Refer to Injection Nozzle Testing.	Engine knock not isolated to specific cylinder ▶ Engine knock isolated to specific cylinder(s) ▶	GO to Engine Performance Diagnostic Procedure. GO to E3.
E3 CHECK NOZZLE FUEL DELIVERY • Check injection nozzle fuel line(s) for kinks or restrictions as described in Shop Manual Section 22-08. • Perform injection nozzle test as described under Injection Nozzle Testing.	Nozzle(s) and lines OK ▶ Nozzle(s) and/or lines not OK ▶	GO to Engine Performance Diagnostic Procedure. REPLACE damaged line(s) as described in Shop Manual, Section 22-08. REPLACE nozzle(s) as described under Injection Nozzle Testing.

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Low Oil Pressure With Proper Oil	Pinpoint Test	F

TEST STEP	RESULT ▶	ACTION TO TAKE
F0 OIL PRESSURE TRANSDUCER • Verify accuracy of oil pressure transducer. Use Adapter 5633 with Pressure Test Kit 014-00761 or equivalent. Refer to Pressure Test Kit hookup illustration in this Section.	(OK) ▶ (OK) ▶	GO to F1. REPLACE transducer. REPEAT Test Step F0.
F1 CHANGE ENGINE OIL AND FILTER • Change engine oil and filter and run engine until normal operating temperature is reached. Check oil pressure reading.	(OK) ▶ (OK) ▶	RETURN vehicle to customer. SERVICE or REPLACE lubrication system components as necessary. (REFER to Shop Manual, Section 22-08.)

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Blue/White Smoke (Engine At Normal Operating Temperature)	Pinpoint Test	G

TEST STEP	RESULT ▶	ACTION TO TAKE
G0 ENGINE TEMPERATURE **NOTE: Refer to Symptom Analysis.** • Verify that engine stabilizes in normal operating range.	(OK) ▶ (OK) ▶	GO to G2 . GO to G1 .
G1 THERMOSTAT OPERATION • Remove thermostat. (Refer to Shop Manual, Section 22-08.) • Test thermostat for proper operation. (Refer to Shop Manual, Section 22-08.)	(OK) ▶ (OK) ▶	REPLACE thermostat housing with integral air bleed check valve. REPEAT Test Step G0 . REPLACE thermostat. (REFER to Shop Manual, Section 22-08). REPEAT Test Step G0 .
G2 EXCESSIVE OIL LEVEL • Check engine oil level indicator for excessive oil fill.	(OK) ▶ (OK) ▶	GO to G3 . DRAIN excess oil from oil pan. If problem still exists, GO to G3 .
G3 FUEL RETURN • Perform fuel return pressure test as described in Test Step **EPC5** of the Engine Performance Diagnostic Procedure.	(OK) ▶ (OK) ▶	PERFORM entire Engine Performance Diagnostic Procedure. SERVICE or REPLACE fuel return line(s) as necessary. (Refer to Shop Manual, Section 24-50.) REPEAT Step G3 .

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Excessive Black Smoke	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H0 VERIFY SMOKE LEVEL		
NOTE: Refer to Symptom Analysis • Verify under what conditions black smoke occurs.	Light load and/or low altitude ▶	GO to H1. **NOTE: For warranty claim approval, Engine Performance Chart must be filled out for the following steps: EPC.2; EPC.6; EPC.11; EPC.13.**
	Under heavy load ▶	Normal when going up steep grades, pulling a trailer, maximum load, maximum acceleration or at high altitudes.
H1 EXHAUST SYSTEM CONDITION		
• Complete Test Step **EPC2** of Engine Performance Diagnostic Procedure, and record problem description and results on Engine Performance Chart.	(OK) ▶	GO to H2.
	(OK) ▶	SERVICE or REPLACE exhaust system as necessary. (REFER to Shop Manual, Section 26-01.) If problem still exists, GO to H2.
H2 CHECK AIR CLEANER RESTRICTION		
• Complete Test Step **EPC6** of Engine Performance Diagnostic Procedure and record results on Engine Performance Chart.	(OK) ▶	GO to H3.
	(OK) ▶	REPLACE air filter element and/or SERVICE system. REPEAT Test Step H2.

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Excessive Black Smoke	Pinpoint Test	H

TEST STEP	RESULT ▶	ACTION TO TAKE
H3 INJECTION PUMP TIMING • Complete Test Step **EPC10** of Engine Performance Diagnostic Procedure and record results on Engine Performance Chart.	(OK) ▶ (OK) ▶	GO to [H4]. ADJUST timing. (REFER to Adjustments in this Section.) If problem still exists, GO to [H4].
H4 INJECTION NOZZLES • Complete Test Step **EPC11** of Engine Performance Diagnostic Procedure and record results on Engine Performance Chart.	(OK) ▶ (OK) ▶	REPLACE injection pump as described in Shop Manual, Section 22-08. REPLACE damaged injection nozzle fuel inlet lines (REFER to Shop Manual, Section 22-08). REPLACE nozzles as described in this Section, and Shop Manual, Section 22-08. If problem still exists, REPLACE injection pump as described in Shop Manual, Section 22-08.

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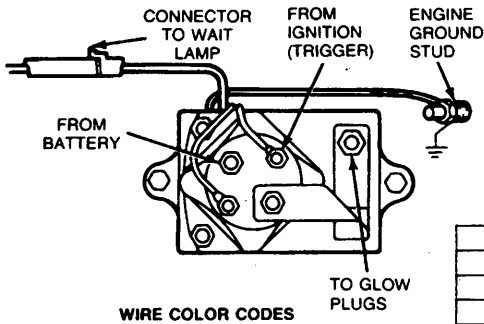
Solid-State Glow Plug System Diagnostic Procedure

Perform the Glow Plug System Basic Diagnostic Test (hereafter referred to as Basic Test) first. If the vehicle passes the Basic Test without running any Pinpoint Tests, the Glow Plug system is OK and the vehicle's problem exists somewhere else other than the Glow Plug System. However, if a step of the Basic Test fails, run only the Pinpoint Test specified by the failed step.

Refer to Figure 20 for test lamp connections and Glow Plug System wiring harness test points referred to in the Basic Test and the Pinpoint Tests. Perform only those services specified by the Pinpoint Tests.

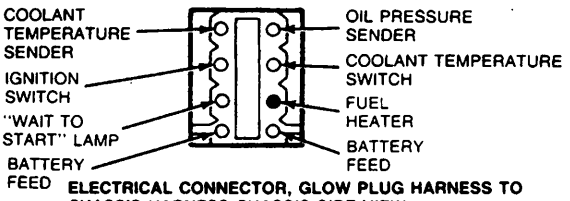
Operation of the Glow Plug System is completely automatic. If, after completing a specific Pinpoint Test it is determined that a component must be replaced, the glow plugs should be disconnected until system has been re-checked by repeating the Basic Test to make sure the Glow Plug System works properly.

A Fast Start Glow Plug System Troubleshooting Chart is available for use by technicians. The technician can use it as a check list while performing tests and diagnostic procedures.



WIRE COLOR CODES

TERMINAL	COLOR
TRIGGER	DK. BLUE
GROUND	RED/WHITE
BATTERY	YELLOW
GLOW PLUGS	(LH) ORANGE/WHITE (RH) BROWN
WAIT LAMP	BLACK/PINK



ELECTRICAL CONNECTOR, GLOW PLUG HARNESS TO CHASSIS HARNESS CHASSIS SIDE VIEW

TERMINAL	WIRE COLOR CODES
IGNITION SWITCH	RED W/LIGHT GREEN STRIPE
"WAIT TO START" LAMP	BLACK W/PINK STRIPE
BATTERY FEED	YELLOW
BATTERY FEED	YELLOW
OIL PRESSURE SENDER	WHITE W/RED STRIPE
COOLANT TEMPERATURE SENDER	RED W/WHITE STRIPE
COOLANT TEMPERATURE SWITCH	RED W/BLACK STRIPE
IGNITION LEAD TO FUEL HEATER	DARK BLUE

A9882-C

Figure 20 Glow Plug System Diagnostic Test Points

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Glow Plug Pinpoint Testing

The following is a series of Pinpoint Tests that can be used to diagnose the glow plug system.

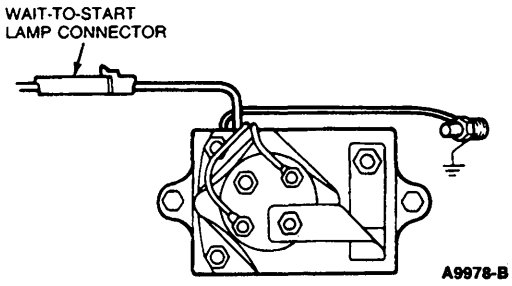
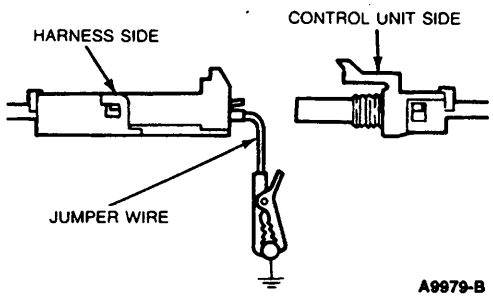
CAUTION

Never bypass the timed pulse function of the glow plug system. A constant 12 volt current to the glow plugs will cause them to overheat and fail within seconds, possibly resulting in severe engine damage.

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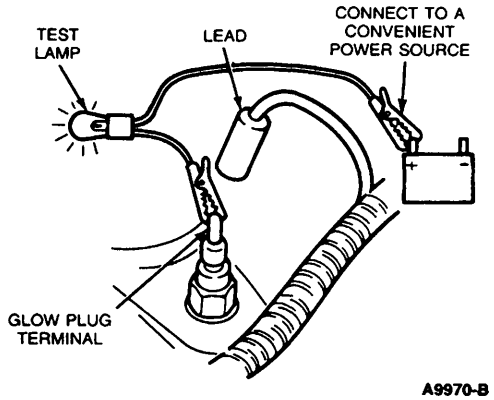
"Wait-To-Start" Lamp Testing

Pinpoint **J**

TEST STEP	RESULT ▶	ACTION TO TAKE
J1 "WAIT-TO-START" LAMP STAYS ON		
• Disconnect the "wait-to-start" lamp connector at control unit. • Turn ignition switch to ON position. 	Lamp On ▶ Lamp Off ▶	SERVICE wiring to lamp. DISCONNECT power at both batteries. REPLACE control unit.
J2 "WAIT-TO-START" LAMP DOES NOT GO ON		
• Disconnect the "wait-to-start" lamp connector at control unit. • Connect jumper wire from harness side to ground. • Turn ignition switch to ON position. 	Lamp On ▶ Lamp Off ▶	GO to Hard Starting Checks. REPLACE bulb or SERVICE wiring.

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Glow Plug Testing	Pinpoint Test	K

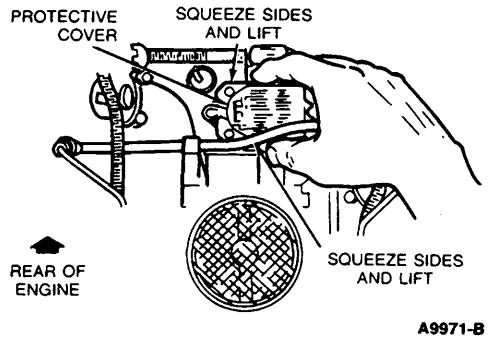
TEST STEP	RESULT ▶	ACTION TO TAKE
K1 CHECK GLOW PLUGS		
• Ignition switch in OFF position and leads removed from glow plugs. • Check continuity between glow plug terminal and a power source with glow plugs installed in engine.  	(OK) ▶ (OK) ▶	GO to K2. REPLACE plug(s). GO to K2.

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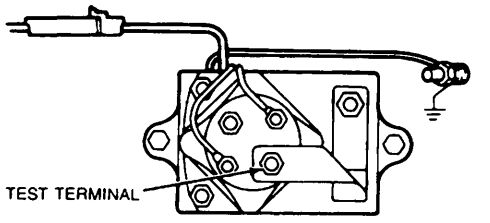
Glow Plug Testing

Pinpoint Test **K**

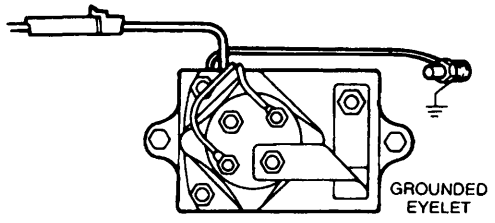
TEST STEP	RESULT ▶	ACTION TO TAKE
K2 CHECK HARNESS		
• Ignition switch in OFF position and leads removed from glow plugs. • Squeeze sides of protective cover and remove. • Check continuity between each glow plug lead and test terminal of control unit.	OK at all leads ▶	GO to K3.
	Not OK at any or all leads ▶	SERVICE or REPLACE harness. GO to K3.
K3 CHECK CONTROL UNIT		
• Ignition switch in OFF position. • Contact ohmmeter to ground wire terminal eyelet and to ground post on each battery.	Less than 1 ohm ▶	GO to K4.
	More than 1 ohm ▶	CLEAN or SERVICE ground connection. REPEAT check. GO to K4.



A9971-B



A9972-B

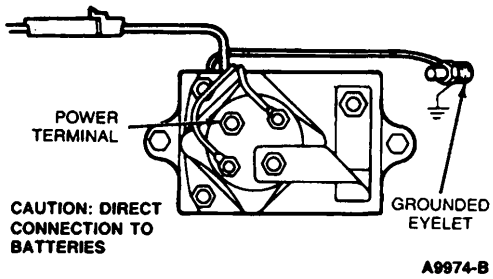
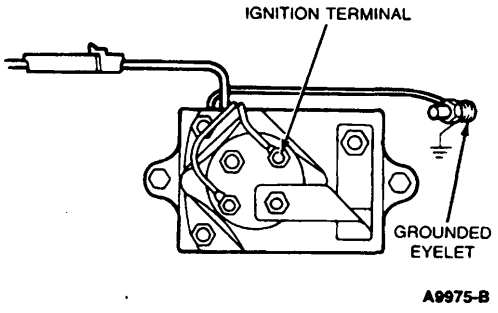


A9973-B

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Glow Plug Testing

Pinpoint Test **K**

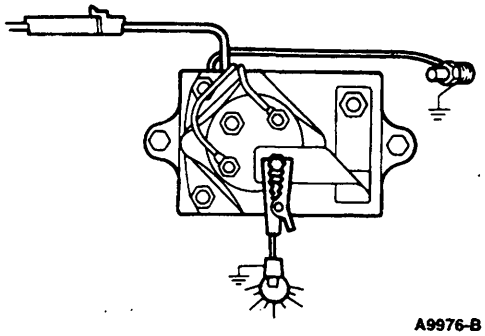
TEST STEP	RESULT ▶	ACTION TO TAKE
K4 CHECK SUPPLY VOLTAGE		
• Ignition switch in OFF position. • Connect voltmeter to control unit power terminal and ground.  	More than 10 volts ▶	GO to K5.
	Less than 10 volts ▶	SERVICE wiring or RECHARGE battery. GO to K5.
K5 CHECK VOLTAGE FROM IGNITION SWITCH		
• Check voltmeter to Ignition Terminal on control unit and ground. • Turn ignition switch to ON position and all accessories off.  	More than 8 volts ▶	GO to K6.
	Less than 8 volts ▶	CHECK fusible link, SERVICE wiring or RECHARGE battery. GO to K6.

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Glow Plug Testing

Pinpoint Test **K**

TEST STEP	RESULT ▶	ACTION TO TAKE
K6 FUNCTIONAL TEST		
• With ignition switch in OFF position connect 12 volt test light to test terminal on control unit. • Position test light so it can be viewed from driver's position. • Turn ignition switch to ON position and monitor system operation. • Compare test light times to Test Light Chart.	Test light times within specifications ▶	System function is correct.
	Test light times out of specifications ▶	DISCONNECT power at both batteries. REPLACE control unit. REPEAT test.



A9976-B

TEST LIGHT CHART

NOTE: Total Test Light "ON" Time includes time from the beginning of the initial "ON" cycle" to the end of the last "ON-OFF cycle" measured in seconds.

Control* Unit Temp. °F	"Wait-to-Start" Lamp "ON" Time (Sec.)	Test Light Total Time (Sec.)
– 20°C	7-15	35-70
0°F	7-12	25-60
35°F	5-12	15-35
70°F	3-5	7-15
105°F	1-3	3-5
140°F	1 or Less	1-3

* Temperature of Control Unit, NOT ambient temperature

NOTE: The "Wait-to-Start" Lamp and/or Test Light may not illuminate if engine temperature is at or near normal operating temperature.

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Glow Plug Failure Analysis

The following are examples of Glow Plug Failure. Each example gives a different clue to glow plug failure analysis.

- There is no visible damage, but glow plug is electrically open (Fig. 21). This indicates an internal heating element failure.
- Glow plug tip that is missing can be caused by incorrect timing or poor fuel quality (Fig. 22).
- Multiple, distorted glow plugs are usually caused by electrical overheating (Fig. 23). A complete evaluation of the glow plug control system should be made.

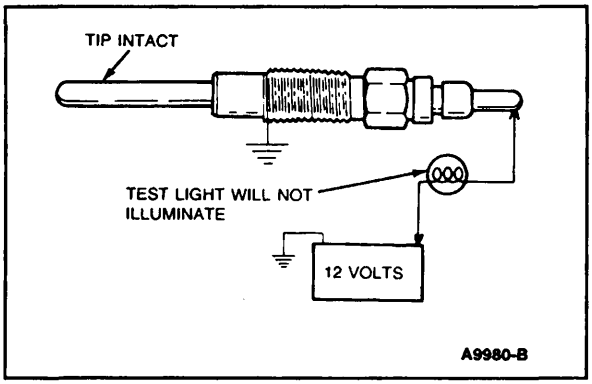


Figure 21 Electrically Open

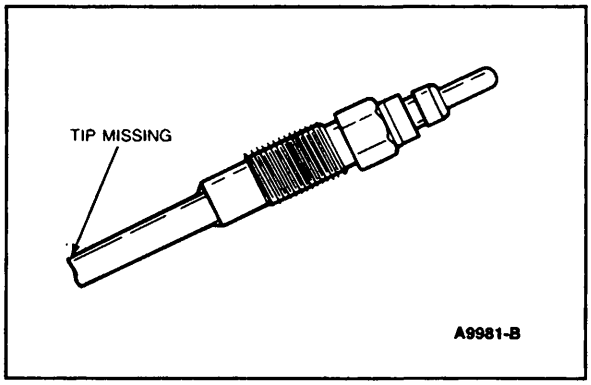


Figure 22 Missing Tips

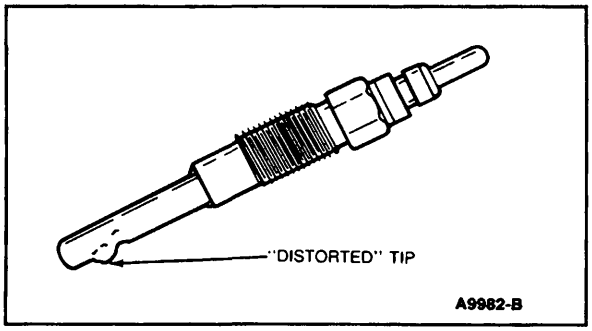


Figure 23 Distorted Tips

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Fuel System Air Leak Diagnosis

Hard starting, white smoke in the normal engine operating range, poor idle quality, or lack of power under load can be caused by several conditions. One of these conditions is air leaks in the fuel supply system. This procedure is provided to assist in the diagnosis of 7.3L diesel engine fuel system air leaks.

To perform the Fuel System Air Leak Diagnosis, the following adapters (Fig. 24 and 25) need to be assembled as shown from locally available materials.

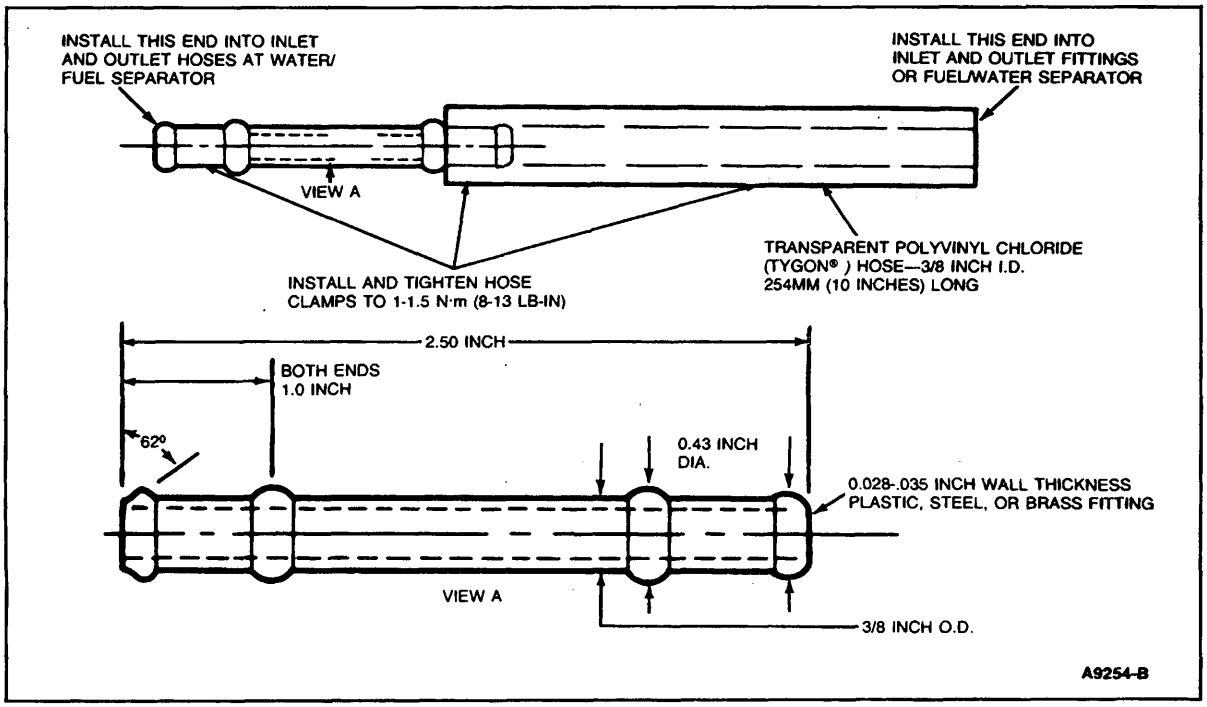


Figure 24 Water/Fuel Separator Adapter, Two Required

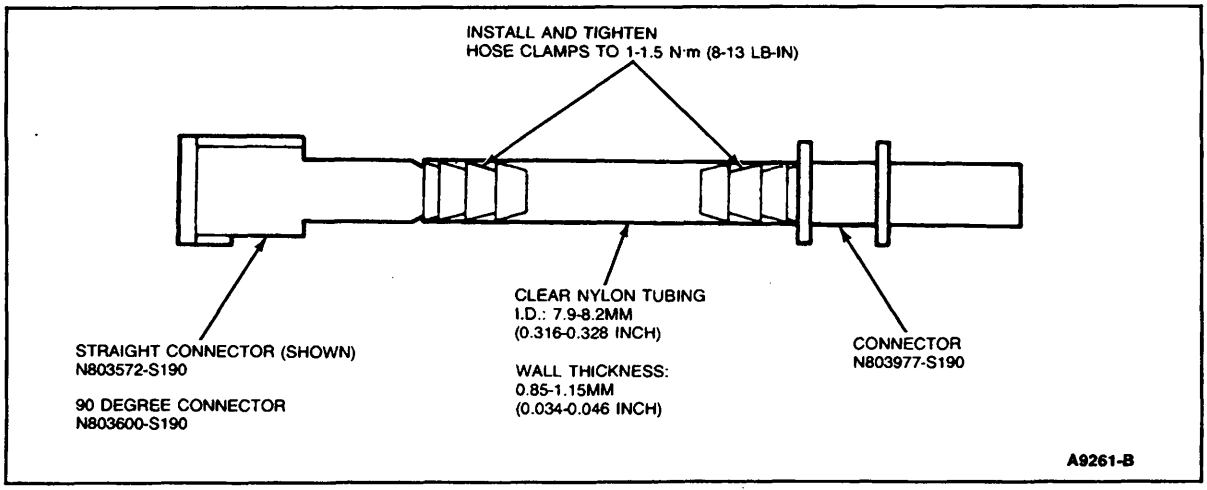
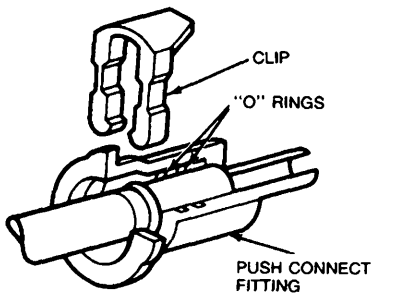


Figure 25 Selector Valve/Fuel Tank Push Connect Adapter — F-Series (Two Required)

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Fuel System Air Leak Diagnosis	Pinpoint Test	L

TEST STEP	RESULT ▶	ACTION TO TAKE
L1 CHECK HOSE CONNECTIONS		
NOTE: Prior to starting the diagnostic procedure, verify that the fuel tank(s) contain at least a half tank of fuel — the fuel level compensates for the range of vehicle attitudes that may uncover the fuel sender pickup hose or sender by-pass in the fuel tank when the fuel level is low. Visually inspect the fuel system for obvious problems such as kinked hoses, damaged lines or push-connect fittings. • Verify that the push-connect fitting clip is in place. • Verify that the push-connect fittings are properly installed on the tube end by pulling the fitting away from the tube (axially along the tube). The fitting should not pull off from the tube end. If the fitting does pull away, push the fitting axially back on to the tube until a definite click is heard. • Pull and push the fitting one more time to verify proper installation.  A11546-A	(OK) ▶ (OK) ▶	GO to L2 . SERVICE or REPLACE fuel lines, clamps or push-connect fittings. REFER to Light Truck Shop Manual, Volume B, Section 25-50, for push-connect fitting service.

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Fuel System Air Leak Diagnosis

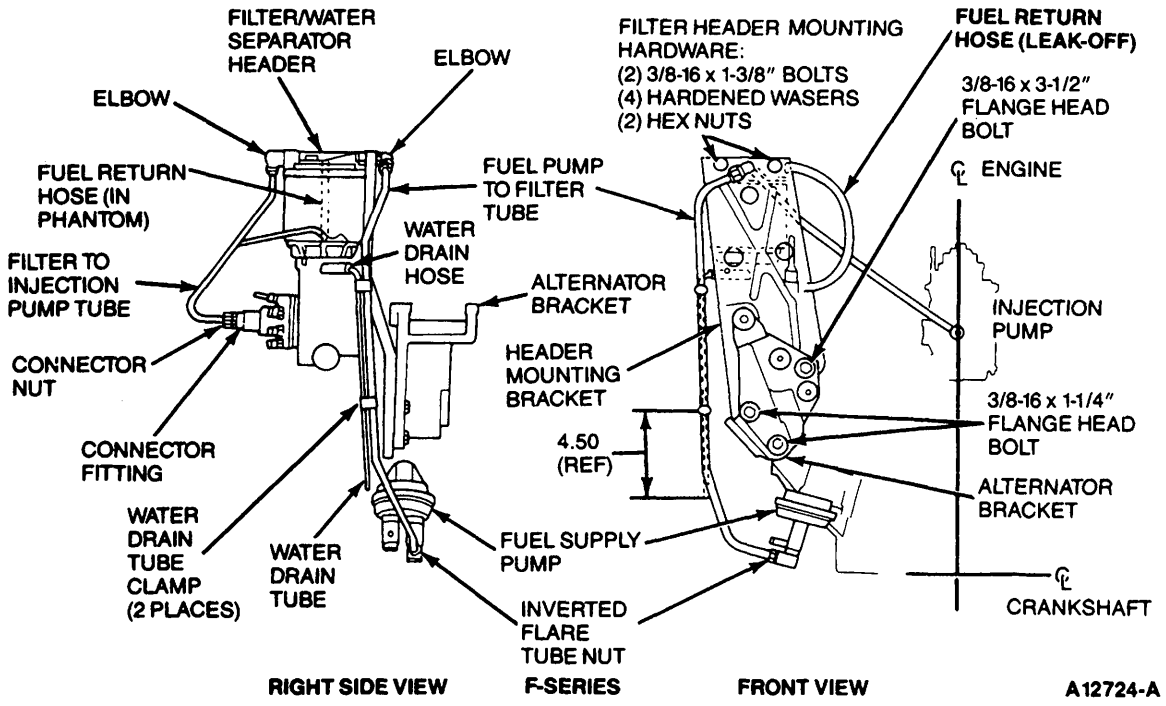
Pinpoint Test **L**

TEST STEP	RESULT ▶	ACTION TO TAKE
L2 CHECK SYSTEM FOR BUBBLES OR FOAM		
• Remove the rubber fuel return bypass hose which connects the fuel filter outlet fitting bypass orifice to the return lines at the fuel injection nozzles. CAUTION **Care should be taken when removing or installing hose to the plastic fitting at the fuel injection nozzle return lines. Lubricate hose with diesel fuel to ease installation.** • Install a 305mm (12-inch) length of 3/16″ I.D. clear polyvinyl chloride, TYGON ® hose (to view fuel flow) in place of the above rubber fuel hose, then tighten hose clamps to 1-1.5 N•m (8-13 lb-in). • Run engine at approximately 3,000 rpm for two to three minutes to clear air from the system, which was induced by the previous operation. • Observe fuel hose for air bubbles at 3,000 engine rpm. • Any continuous stream of bubbles larger than 1.58mm (1/16 inch) indicates air ingestion. A moving concentration of bubbles of any size, or foam, is unacceptable. **NOTE: TYGON ® is a registered trademark of Norton Industries Plastics.**	(OK) ▶ (OK) ▶	Problem elsewhere in system. REMOVE TYGON ® hose and INSTALL original hose. REFER to Symptom Analysis in this Section. GO to L3.

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Fuel System Air Leak Diagnosis	Pinpoint Test	L

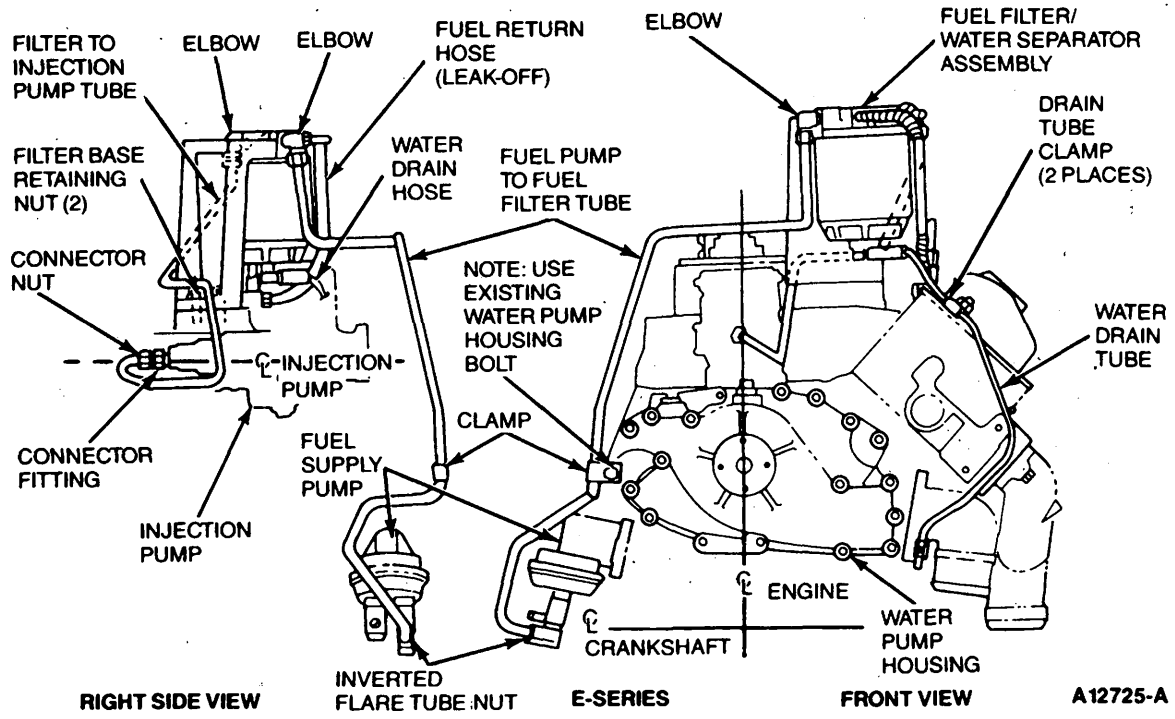
	TEST STEP	RESULT ▶	ACTION TO TAKE
L2	CHECK SYSTEM FOR BUBBLES OR FOAM (Continued)		



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Fuel System Air Leak Diagnosis	Pinpoint Test	L

	TEST STEP	RESULT ▶	ACTION TO TAKE
L2	CHECK SYSTEM FOR BUBBLES OR FOAM (Continued)		



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Fuel System Air Leak Diagnosis	Pinpoint Test	L

TEST STEP	RESULT ▶	ACTION TO TAKE
L3 CHECK DIRECTION OF FLOW • Observe direction of flow of bubbles. Bubbles should flow from fuel filter outlet fitting to the fuel injection nozzle return system.	(OK) ▶	GO to [L4] for single tank system. GO to [L5] for dual tank system.
	(OK) ▶	Fuel System is restricted. GO to Engine Performance Diagnosis in this Section. PERFORM Steps [EPC4A] through [EPC4D].
L4 CHECK HOSE CONNECTIONS • Check tor damage to hose connections at rubber fuel hose from chassis fuel line to mechanical lift pump and at inlet and outlet hoses at water separator. • Tighten hose clamps to 1-1.5 N•m (8-13 lb-in). • After tightening hose clamps, run engine for five minutes at 3,000 rpm and check for air bubbles in TYGON ® hose.	(OK) ▶	REPLACE TYGON ® hose with original hose. Problem resolved.
	(OK) ▶	GO to [L5].

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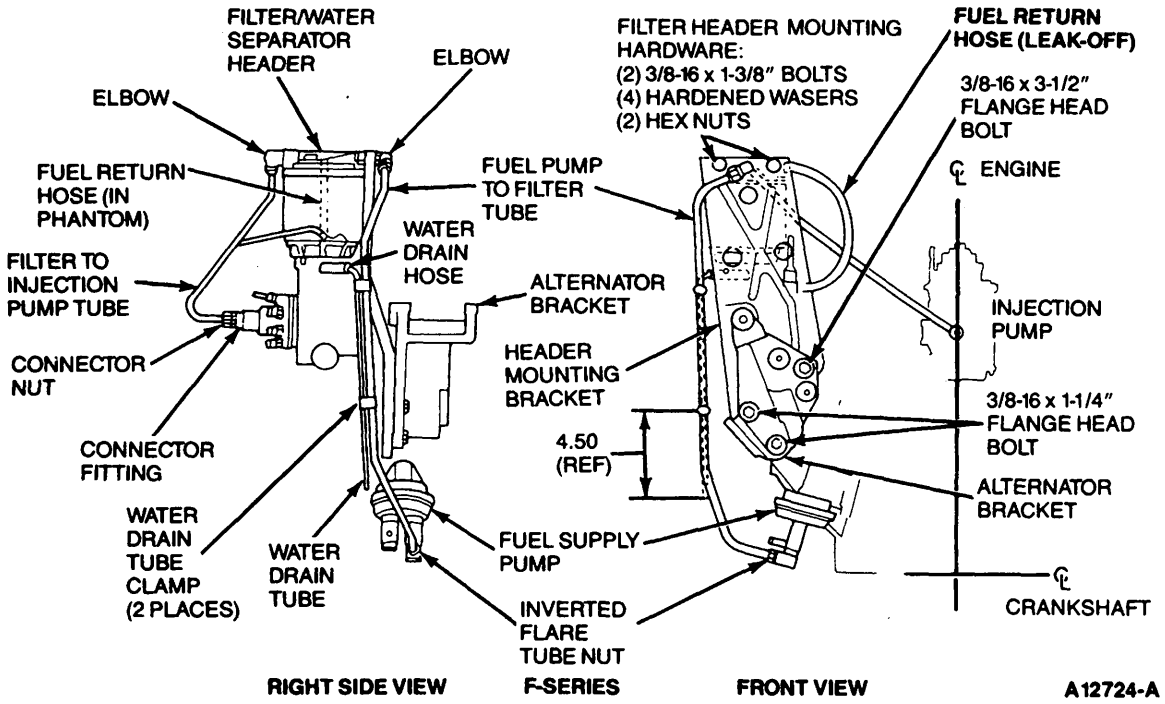
Fuel System Air Leak Diagnosis	Pinpoint Test	L

TEST STEP		RESULT ▶	ACTION TO TAKE
L5	CHECK FUEL FILTER/WATER SEPARATOR FOR BUBBLES		
• Disconnect fuel filter/water separator inlet hose. Install hose adapter and tighten clamps to 1-1.5 N•m (8-13 lb-in). **NOTE: Refer to Air Leak Diagnosis — Hose Adapter procedures in this Section.** • Disconnect fuel/water separator outlet hose. Install hose adapter and tighten clamps to 1-1.5 N•m (8-13 lb-in). CAUTION **Disconnect hoses and install adapters one at a time to prevent hose mix-up.** • Operate engine at 1,500 rpm for five minutes to develop steady fuel flow. Then, operate engine at 3,000 rpm for an additional two minutes and check for bubbles in hose adapters.		Air bubbles present in inlet hose, single tank system. ▶ Air bubbles present in inlet hose, dual tank system ▶ Air bubbles present in outlet hose only ▶	SERVICE hoses and connections between fuel/water separator as necessary. REPEAT Test Step L5. GO to L6. CHECK hose adapter at fuel/water separator inlet for air leaks. Operate water/fuel separator drain **with engine off.** REPEAT Test Step L5. If bubbles persist, REPLACE water/fuel separator. REPEAT Test Step L2.

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Fuel System Air Leak Diagnosis	Pinpoint Test	L

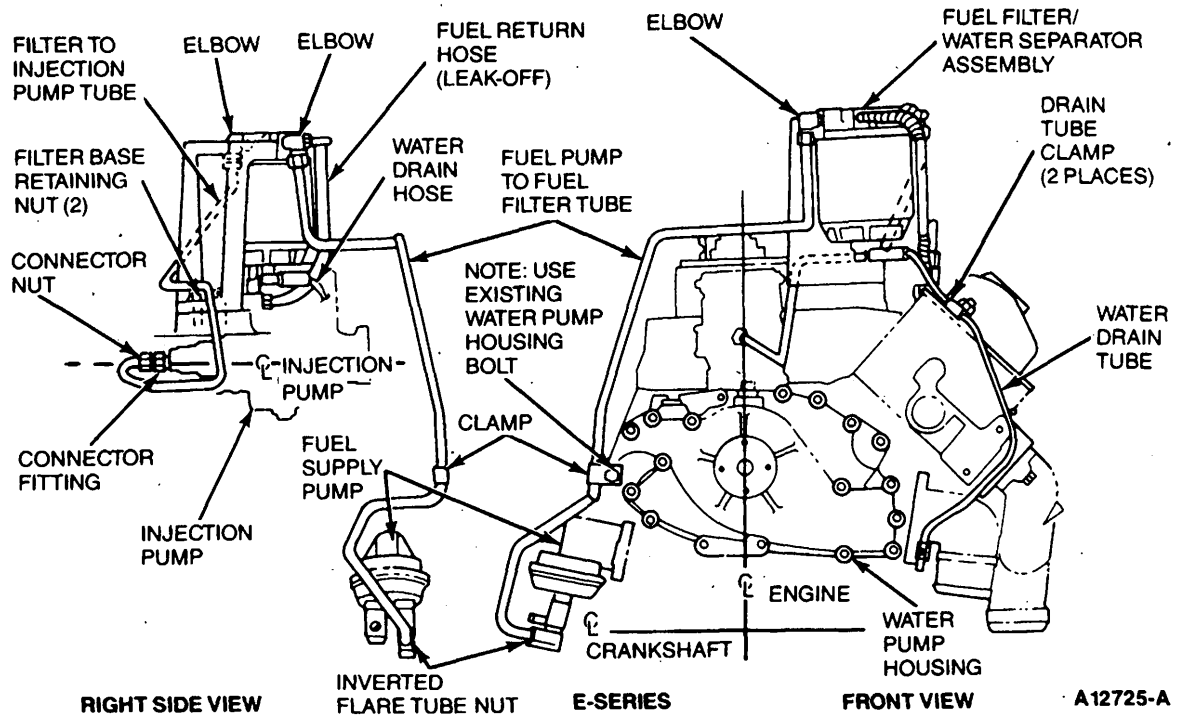
	TEST STEP	RESULT ▶	ACTION TO TAKE
L5	CHECK FUEL FILTER/WATER SEPARATOR FOR BUBBLES (Continued)		



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Fuel System Air Leak Diagnosis	Pinpoint Test	L

	TEST STEP	RESULT ▶	ACTION TO TAKE
L5	CHECK FUEL FILTER/WATER SEPARATOR FOR BUBBLES (Continued)		

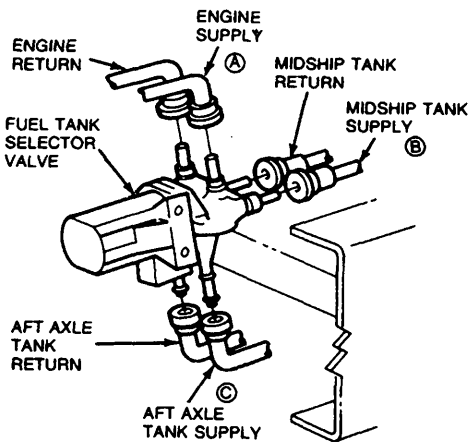


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Fuel System Air Leak Diagnosis

Pinpoint Test **L**

TEST STEP	RESULT ▶	ACTION TO TAKE
L6 OPERATE SELECTOR VALVE — DUAL TANKS		
• Start and run engine. • Observe TYGON® hose while switching selector valve between tanks.	Bubbles present in both tank positions ▶	GO to L4.
	Bubbles present in only one tank position ▶	GO to L7.
L7 CHECK SELECTOR VALVE CONNECTIONS		
• Check push-connect fittings for tightness as outlined in Test Step L1. • Fittings should be tight.	(OK) ▶	GO to L8.
	(OK) ▶	SERVICE push-connect fittings, as necessary. REFER to Shop Manual, Section 25-50 for push-connect fitting service.
L8 BY-PASS SELECTOR VALVE		
• Disconnect push-connect fittings from fuel tank selector valve for affected tank. • Install push-connect fitting adapters between fuel lines and selector valve. • Run engine at 3,000 rpm for two to three minutes to clear any air ingested during adapter installation. Run engine an additional one to two minutes and observe transparent fuel lines in adapters.	Bubbles not present in either adapter ▶	Air leak is between fuel tank selector valve and water/fuel separator. SERVICE fuel lines and connections as necessary. REPEAT Test Step L2.
	Bubbles present in both adapters ▶	Air leak is between fuel tank and selector valve. SERVICE fuel lines and connections as necessary. REPEAT Test Step L2.
	Bubbles present in selector valve outlet adapter only. ▶	REPLACE fuel tank selector valve. REPEAT Test Step L2.



1. INSTALL ONE ADAPTER AT POINT A
2. INSTALL OTHER ADAPTER AT:
   POINT B FOR MIDSHIP TANK
   POINT C FOR AFT AXLE TANK

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Engine Performance Diagnostic Procedure

The Engine Performance Diagnostic Procedure begins with those items which are the high frequency, easy-to-diagnose problems, and progresses to the low frequency, hard to diagnose problems. Use of this procedure will promote rapid as well as accurate diagnosis.

The Engine Performance Diagnostic Procedure follows, step by step, the Engine Performance Chart. Each test step is labeled to coincide with the Engine Performance Chart steps.

NOTE: Under no circumstances should the fuel injection pump be replaced until the Engine Performance Chart has been completely filled out. The only exceptions to this is in the case of Excessive Black Smoke (Symptom Analysis Diagnostic Procedure H) and external leaks. In these cases, only those steps specified need to be filled out. Warranty claims for the fuel injection pump or injectors will not be accepted unless the Engine Performance Chart is filled out as specified and all tamperproof seals are intact.

NOTE: Service each problem detected before going on to the next step. If service corrects the original complaint, it will not be necessary to proceed to the next test step. However, if the complaint is not corrected, continue with the test until the complaint is corrected.

The following explanations refer to the basic test steps of the Engine Performance Diagnostic Procedure and Chart. They give a brief description of how these problems can affect performance, and an understanding of the importance of each test step.

1. External Leakage: Fuel leakage can be a reason for diesel fuel smell or low economy. Oil leakage can be a reason for high oil consumption. An air intake system leak can shorten engine life, especially under dusty conditions. Coolant leakage can result in engine overheating.
2. Exhaust System Condition: Kinks or dents in the exhaust system can cause high exhaust back pressure. This can result in loss of power and high smoke levels.
3. Fuel Quality: Diesel engines need clean fuel, free of air, dirt and water. Any contamination may result in poor engine performance.
4. Fuel System Condition: Kinks in the fuel lines or hoses can block or restrict fuel flow and loose connections can leak air into the fuel. This can result in loss of power and high smoke levels.

   NOTE: The fuel supply system must deliver the proper quantity of fuel with no pressure loss or air leaks in chassis fuel system.

5. Fuel System Return Line Restriction: A restriction in the fuel return line will raise the pressure in the injection pump causing an adverse effect on injection pump timing, resulting in excessive smoke levels or loss of power.
6. Air Cleaner Restriction: A dirty air cleaner may result in low power, excessive smoke and poor fuel economy.
7. Transfer Pump Pressure: This is the pressure which is available to charge the injection plunger. Low pressure will result in low power, and excessive smoke levels.
8. Accelerator Linkage: If the accelerator linkage is improperly adjusted, the engine cannot reach full rated rpm and top speed and pulling power will be reduced, or curb idle speed will be excessive.

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Engine Performance Diagnostic Procedure

9. Engine Idle Speed: Low engine idle speed may cause stalling or rough running.
10. Injection Timing: Incorrect timing can be responsible for poor fuel economy, rough idling or hard starting and excessive smoke.
11. Injection Nozzle Test: The injection nozzles must be removed from the engine for this test. This is a functional test of injection nozzle performance. Incorrect nozzle performance will cause misses, poor fuel economy, loss of power and excessive smoke.
12. Crankcase Pressure: This test measures the amount of crankcase blow-by. More blow-by will create high pressures. Crankcase pressure readings, plus rate of oil consumption, should be used to evaluate engine mechanical condition.

To perform the Engine Performance Diagnostic Procedure it will be necessary to connect the Pressure Test Kit, Rotunda 014-00761 or equivalent, to the various components as shown in Figure 26.

NOTE: If the problem is hard starting, follow the procedures for troubleshooting the glow plug system prior to troubleshooting the fuel system.

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Engine Performance Diagnostic Procedure

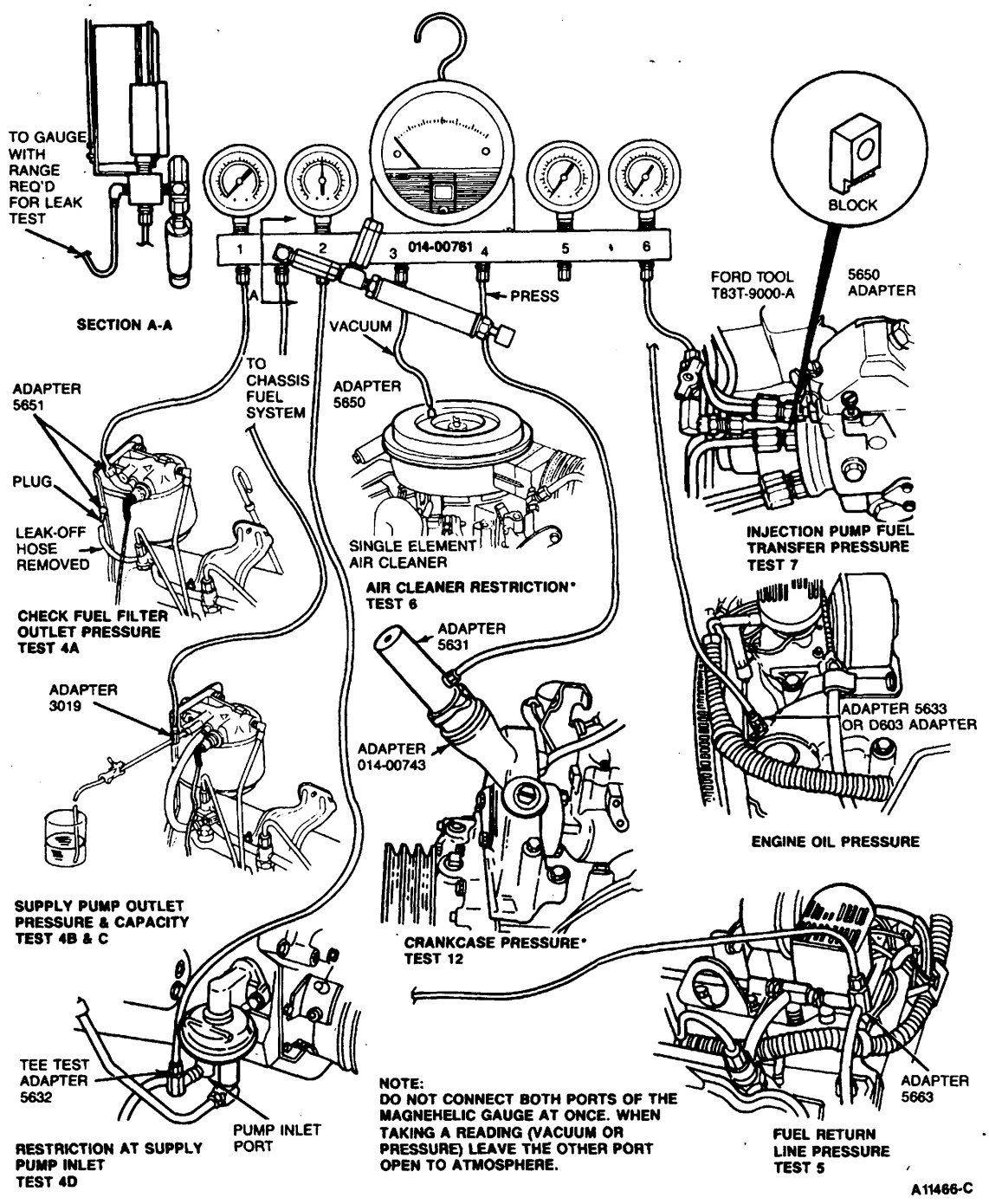


Figure 26 Pressure Test Kit Hookup — Rotunda Model 014-00761

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC1 CHECK FOR EXTERNAL LEAKAGE		
• With engine running, visually check for leakage of: 1. Fuel 2. Engine oil 3. Proper installation and dirt past air cleaner 4. Coolant	No leakage ▶ Leakage detected ▶	GO to **EPC2**. SERVICE or REPLACE faulty component(s). If problem still exists, GO to **EPC2**.
EPC2 CHECK EXHAUST SYSTEM		
• Visually check exhaust system for dents or kinks which could cause restriction.	(OK) ▶ (OK) ▶	GO to **EPC3A**. SERVICE or REPLACE exhaust system as required. (Refer to Shop Manual, Section 26-01.) GO to **EPC3A**.
EPC3A CHECK FOR AIR IN FUEL		
• Install a length of clear PVC hose in place of rubber hose between fuel filter outlet and injection nozzle return system. • Run engine for two minutes. Then, run engine at 3,000 rpm and check for bubbles in clear hose. **NOTE: Correct direction of fuel flow is from fuel filter toward fuel return system. Fuel flow in opposite direction is indication of restriction in fuel supply system.** **NOTE: On vehicles with dual fuel tanks, check with tank selector switch in each position for a minimum of two minutes.**	Fuel flow direction OK, bubbles less than 1.58mm (1/16 inch) diameter. ▶ Fuel flow direction OK, bubbles 1.58mm (1/16 inch) diameter or larger ▶ Fuel flow direction not OK ▶	GO to **EPC3B**. GO to Fuel System Air Leak Diagnosis in this Section. REPEAT Test Step **EPC3A** when air leaks are eliminated. GO to **EPC5A**. REPEAT **EPC3A**, when fuel flow direction is corrected.
EPC3B CHECK FUEL FOR CONTAMINATION		
• Obtain a fuel sample and visually examine fuel in a clear container (including bottom of container), for particles, clouding, or liquid contamination, such as water.	(OK) ▶ (OK) ▶	Go to **EPC3C**. REPLACE fuel filter. CLEAN and/or SERVICE fuel system as required. Refer to Shop Manual, Section 24-50. GO to **EPC3C**.

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Engine Performance Diagnosis | Pinpoint Test | EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC3C CHECK FUEL FOR CETANE VALUE		
• Check cetane value of fuel sample taken in Test Step **EPC3B** using cetane tester included with Dynamic Timing Meter, 078-00200 or equivalent. • Cetane value should be minimum of 40.	More than 40 ▶	GO to EPC4A.
	Less than 40 ▶	Complete Tests EPC4, 5, 6 and 8. INFORM owner* to change fuel source. GO to **EPC4A**. ***NOTE: Do not replace fuel injection pump because of low cetane problem.**
EPC4A FUEL FILTER OUTLET PRESSURE		
• Remove air bleed orifice hose from fuel filter fitting. • Install adapter 5651 with Pressure Test Kit 014-00761 or equivalent. (Refer to Pressure Test Kit Hook-Up Illustration.) • Run engine at 3,300 rpm, with no load. • Record pressure reading. On dual tank vehicles, check both tanks. • Pressure should be minimum of 1 psi at 3,300 rpm.	(OK) ▶	GO to **EPC4C**.
	(OK) ▶	GO to **EPC4B**.
EPC4B FUEL SUPPLY PUMP OUTLET PRESSURE		
• Remove vacuum purge valve from fuel filter adapter. • Install adapter 3019 and Pressure Test Kit 014-00761 or equivalent. (Refer to Pressure Test Kit Hook-Up Illustration.) **NOTE: Make sure clamp is closed on sampling hose.** • Leave adapter from Test Step **EPC4A** installed and cap end. • Run engine at idle, no load. • Record pressure reading. On dual tank vehicles, check both tanks. • Pressure should be minimum of 2 psi at idle.	(OK) ▶	REPLACE fuel filter and REPEAT Test Step **EPC4A**.
	(OK) ▶	GO to **EPC4C**.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC4C FUEL PUMP CAPACITY		
• Position end of sample hose on adapter 3019 in a clear, one quart, graduated fuel container. • Follow procedures for Test Step **EPC4B** and open clamp on sample hose, allowing fuel to flow into fuel container, for 30 seconds. • Record volume. On dual tank vehicles, check both tanks. • Volume should be a minimum of one pint in 30 seconds at idle, no load.	Pressure and volume OK ▶	GO to **EPC5**.
	Pressure OK Volume Not OK ▶	GO to **EPC4D**.
	Volume OK Pressure Not OK ▶	REPLACE fuel supply pump and REPEAT Test Step **EPC4A**.
	Pressure and Volume Not OK ▶	GO to **EPC4D**.
EPC4D CHECK RESTRICTION AT FUEL SUPPLY PUMP		
• Connect fuel return line removed in Test Step **EPC4A**. • Install adapter 5632 and Pressure Test Kit to fuel supply pump inlet. • With rear wheels off the ground and transmission in NEUTRAL or PARK, run engine at 3,300 rpm. • Record vacuum reading. On dual tank vehicles, check both tanks. • Vacuum should be less than 6 in-Hg.	(OK) ▶	GO to **EPC4A**.
	(OK) ▶	SERVICE or REPLACE restricted chassis fuel line(s). Refer to Shop Manual, Section 24-50. REPEAT Test Step **EPC4A**.
EPC5 CHECK FUEL RETURN PRESSURE		
• Remove fuel return line at junction fitting at left rear of engine. • Install adapter 5663 and Pressure Test Kit 014-00761, or equivalent. • Run engine at 3,300 rpm, no load, transmission in NEUTRAL or PARK. • Record pressure reading. On dual tank vehicles, check both tanks. • Maximum pressure should not exceed 2 psi at 3,300 rpm. **NOTE: Fuel return hose removed in EPC4A must be connected for this test.**	(OK) ▶	GO to **EPC6**.
	(OK) ▶	SERVICE or REPLACE fuel return line(s) as necessary. REFER to Shop Manual, Section 24-50. REPEAT Test Step **EPC5**.

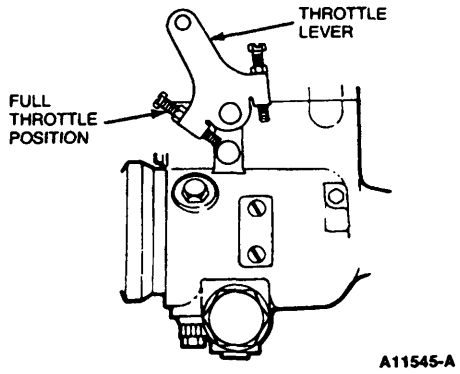
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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC6 CHECK AIR INTAKE RESTRICTION		
• Remove cap on air cleaner test port and install adapter 5650 and Pressure Test Kit 014-00761, or equivalent. • Run engine at 3,300 rpm, no load. • Record restriction reading. • Restriction should not exceed 25 inches of H_2O.	More than 2 inches H_2O but less than 25 inches H_2O ▶	REMOVE adapter. INSTALL cap on air cleaner port. GO to **EPC7**.
	25 inches H_2O or more ▶	REPLACE filter element and CHECK intake system for blockage. REPEAT Test Step **EPC6**.
	Less than 2 inches H_2O ▶	CORRECT restriction in fitting on air cleaner test port. REPEAT Test Step **EPC6**.
EPC7 CHECK INJECTION PUMP TRANSFER PRESSURE		
• Remove screw from transfer pump pressure port cover. • Install Tool T83T-9000-A or equivalent through cover and O-ring and into port. Install adapter 5650 and Pressure Test Kit 014-00761 or equivalent. • Fittings must be tight and not leaking. • Run engine at 3,300 rpm, no load, with transmission in NEUTRAL. • Record pressure reading. • Pressure should be 90 to 110 PSI.	(OK) ▶	GO to **EPC8**.
	(OK) ▶	REPLACE injection pump. (REFER to Shop Manual, Section 22-08.) If performance problem still exists after installing new pump, CHECK and ADJUST injection pump dynamic timing. (REFER to adjustments in this Section.) If performance problem still exists after adjusting timing, GO to **EPC8**.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC8 ACCELERATOR LINKAGE ADJUSTMENT • With engine off, check that throttle lever contacts injection pump stop at full accelerator pedal depression. Full throttle screw is not adjustable. Tampering may cause injection pump damage.  	(OK) ▶ (OK) ▶	GO to **EPC9**. ADJUST or SERVICE vehicle throttle linkage as necessary. (Refer to Shop Manual, Section 24-60.) GO to **EPC9**.
EPC9 CHECK ENGINE IDLE SPEED • Check engine idle speed as described under Adjustments in this Section. • Bring engine up to normal operating temperature. • Idle speed is measured with manual transmission in NEUTRAL and automatic transmission in DRIVE. • Idle speed is shown on Vehicle Emission Control Information (VECI) decal.	(OK) ▶ (OK) ▶	GO to **EPC10**. ADJUST as necessary. GO to **EPC10**.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC10 DYNAMIC INJECTION PUMP TIMING**		
• Install Dynamic Timing Meter and check injection pump timing. (Refer to Dynamic Injection Pump Timing.) Measure at 2,000 rpm, no load. **Engine must be at normal operating temperature. • Record dynamic timing in Box A, Step 10 of the 7.3L Engine Performance Chart. • Apply +12 volt battery power to the injection pump timing advance solenoid and record dynamic timing in Box B, Step 10 of the 7.3L Engine Performance Chart.	B is more than 1° advanced from A, and A is within ± 2°. ▶	GO to **EPC11**.
	B is more than 1° advanced from A, and A is not within ± 2°. ▶	ADJUST timing. (REFER to Shop Manual, Section 22-08 and adjustments.) If performance problem still exists after adjusting timing, GO to **EPC11**.
	B is less than 1° advanced from A. ▶	REPLACE fuel injection pump and REPEAT **EPC10**.
EPC11 CHECK INJECTION NOZZLES AND INLET LINES		
NOTE: Perform this check only if engine has an obvious combustion knock or miss. • Check injection nozzle inlet lines for kinks or restriction. (Refer to Shop Manual, Section 22-08.) • Test injection nozzles as described in this Section. **NOTE: Warranty claims for injection nozzles will not be accepted unless the completed Engine Performance chart is submitted with the returned parts.**	Lines and nozzles OK ▶	GO To **EPC12**.
	Lines and/or nozzles not OK ▶	REPLACE damaged injection nozzle fuel inlet lines. (REFER to Shop Manual, Section 22-08.) REPLACE injection nozzles as described in this Section and Shop Manual, Section 22-08. If performance problem still exists, GO to **EPC12**.

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Engine Performance Diagnosis	Pinpoint Test	EPC

TEST STEP	RESULT ▶	ACTION TO TAKE
EPC12 CRANKCASE PRESSURE TEST • Remove crankcase depression regulator valve and securely plug opening to prevent blow-by. (Refer to Shop Manual, Section 22-08.) • Remove oil filler cap and install adapter 5631, and Pressure Test Kit 014-00761, or equivalent. (Refer to Pressure Test Kit Hook-Up illustration.) • Ensure dipstick is seated in dipstick tube. • Run engine at 3,300 rpm no load, with transmission in NEUTRAL. • Record pressure reading. • Pressure should not exceed 6 inches H_2O at 3,300 rpm. **NOTE: Warranty claims for injection pumps will not be accepted unless all tamper-resistant seals are intact and the completed Engine Performance Chart is submitted with the returned parts.**	(OK) ▶ (OK) ▶	REPLACE injection pump, and CHECK and ADJUST timing. (REFER to Shop Manual, Section 22-08 and Adjustments in this Section.) Problem is internal to the engine. (REFER to Shop Manual, Section 22-08.)

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Injection Nozzle Testing

Where ideal conditions of good combustion, specified engine temperature control, and absolutely clean fuel prevail, nozzles require little attention. Nozzle trouble is usually indicated by one or more of the following symptoms:

- Smoky exhaust (black)
- Loss of power
- Misfiring
- Increased fuel consumption
- Combustion Knock
- Engine Overheating

When faulty nozzle operation is suspected on an engine that is misfiring or puffing black smoke, a simple test can be made to determine which cylinder(s) is causing the problem.

- Run the engine at the rpm which makes the problem most pronounced.
- Momentarily loosen the high-pressure fuel inlet line connection on one nozzle assembly one-half to one turn. Then, tighten connection to specification.
- Check each cylinder in the same manner.
- If one nozzle is found where loosening makes no difference in the misfiring, or the puffing black smoke stops, that nozzle should be tested. Test only the suspect nozzle(s).

Remove suspect nozzles as outlined in Shop Manual, Section 22-08. After removing nozzle(s) from the engine, the Injection Nozzle Test should be performed. This test will provide valuable information regarding the condition of the nozzle(s). A clean workbench, clean washing fluid containers, clean tools, and clean hands are all essential to produce satisfactory results.

NOTE: It is advisable to test the nozzles before cleaning them.

Figure 27 shows the Rotunda Injection Nozzle Tester, 014-00300 or equivalent, used for this test.

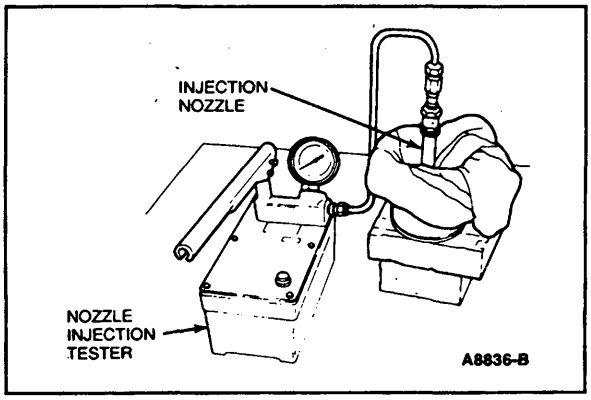


Figure 27 Injection Nozzle Tester 014-00300

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Injection Nozzle Testing

NOTE: Perform this check only if engine has an obvious combustion knock or miss.

1. Prepare stand for making tests. Fill stand reservoir with clean Calibration Fluid. Open tester valve slightly and operate tester handle to expel air from tester and outlet pipe. Operate tester until solid fluid (without air bubbles) flows from end of outlet pipe. Close tester valve.
2. Connect injection nozzle to test stand. Care should be taken to avoid cross-threading. Tighten connector nut securely with end wrench. Nozzle Adapter which is supplied with tester 014-00300 has RH thread to nozzle assembly and LH thread to tester piping.
3. Bleed air from nozzle. Open stand valve and operate tester handle for 8 to 10 quick strokes to expel (bleed) air from injection nozzle. Fluid should discharge from the spray hole in nozzle tip.

WARNING

ALWAYS WEAR APPROVED SAFETY GLASSES WHEN OPERATING THE TESTER. VOLATILE LIQUIDS CAN BE EXTREMELY FLAMMABLE WHEN VAPORIZED. AVOID ANY CONDITIONS (SPARKS, OPEN FLAMES, LIT CIGARETTES, ETC.) WHICH MIGHT IGNITE THE FLUID USED DURING THE TEST PROCEDURE. THE ONLY LIQUID APPROVED FOR USE IN THIS TESTER IS SAE CALIBRATION NO. 208629, OR EQUIVALENT CALIBRATION FLUID (SAE J968D OR ISO 4113).

WHEN A NOZZLE IS BEING TESTED OR IS IN OPERATION, KEEP HANDS AND OTHER PARTS OF THE BODY AWAY FROM THE NOZZLE. THE LIQUID DISCHARGE LEAVES THE NOZZLE TIP WITH SUFFICIENT FORCE TO PENETRATE THE SKIN AND CAUSE SERIOUS INJURY. THE NOZZLE TIP SHOULD BE ENCLOSED IN A TRANSPARENT RECEPTACLE IF AVAILABLE.

4. Check nozzle opening pressure. Close pump valve, and operate pump handle in slow even strokes to bring system up to pressure. Record highest pressure reached before nozzle opens. Repeat operation, increasing handle speed if necessary to establish consistant readings. Refer to Fig. 28 for nozzle opening pressures.

NOTE: Disregard tip leakage during this test.

NOTE: Spray pattern testing is not required.

NEW		USED (MINIMUM)	
kPa	PSI	kPa	PSI
12,928 ± 517	1,875 ± 75	9,825	1,425

① CALIBRATION CODE: 468J-R00 AND 468X-ROD.

② BE SURE TO USE INJECTORS WITH STAMPED CODE "B" OR "BB"

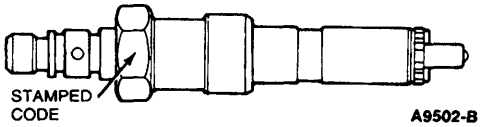


Figure 28 Nozzle Opening Pressure

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Injection Nozzle Testing

5. Check for tip leakage. Blow nozzle tip dry using filtered compressed air. Operate test pump to maintain pressure at about 1378 kPa (200 psi) below the opening pressure obtained in Test 1. Wetting of the nozzle tip is acceptable as long as a drop does not fall, within five seconds (Fig. 29).

NOTE: Make sure that any accumulation at the nozzle tip is not due to test fluid leaking down the outside of the nozzle body from the return openings. If questionable, wrap a shop cloth around the nozzle body to prevent fluid leaking down the outside of the nozzle body from reaching the tip.

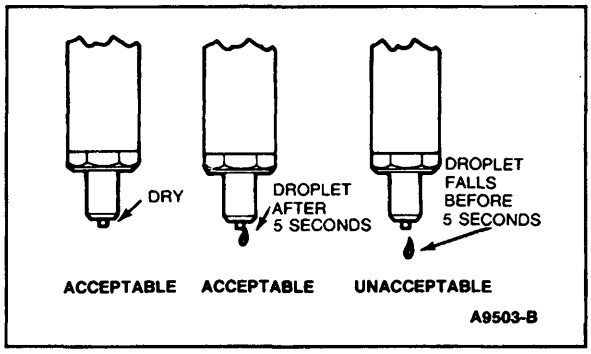


Figure 29 Nozzle Leakage Patterns

6. After testing is completed, make sure to open the pump valve to release the built up pressure prior to removing the nozzle from the tester. When nozzle is removed, cap the nozzle tip and inlet until installed back in engine.

NOTE: If nozzle passes the nozzle opening pressure and tip leakage tests, it is suitable for further service in the engine.

NOTE: Nozzles showing leakage at nozzle tip spray hole or opening pressure below the minimum permissible limit, are damaged or worn and must be replaced, if within warranty coverage. Servicing the nozzle(s) (disassemble, clean and rebuild) instead of replacement to correct nozzle tip leakage or low opening pressure is only permissible beyond the warranty period if so desired.

NOTE: Warranty claims for replacement of the nozzle(s) will not be accepted unless the completed Engine Performance (Diagnostic) Chart is submitted with the returned part(s).

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METRICS

INTRODUCTION

Most threaded fasteners are covered by specifications that define required mechanical properties, such as tensile strength, yield strength, proof load and hardness. These specifications are carefully considered in initial selection of fasteners for a given application. To assure continued satisfactory vehicle performance, replacement fasteners used should be of the correct strength, as well as the correct nominal diameter, thread pitch, length, and finish.

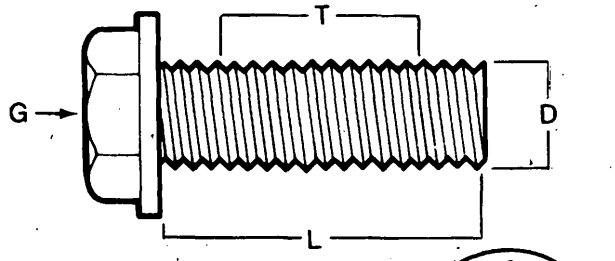
Most original equipment fasteners (English system or Metric) are identified with markings or numbers indicating the strength of the fastener. These markings are described in the pages that follow. Attention to these markings is important in assuring that the proper replacement fasteners are used.

Further, some metric fasteners, especially nuts, are colored blue. This metric blue identification is in most cases a temporary aid for production start-up, and color will generally revert to normal black or bright after start-up.

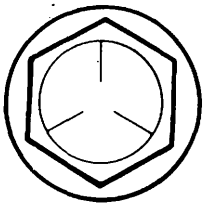
English system and metric system fasteners are available through your Ford Parts and Service operation.

NOMENCLATURE FOR BOLTS

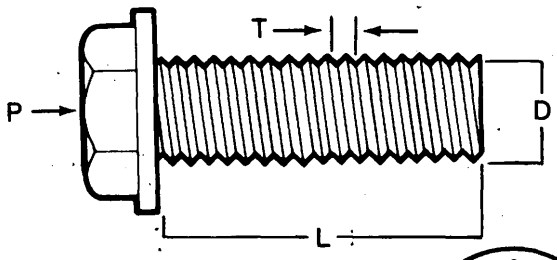
(ENGLISH) INCH SYSTEM
Bolt, 1/2-13x1



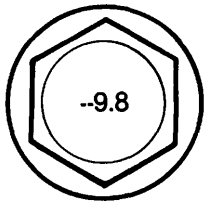
G—Grade Marking (bolt strength)
L—Length, (inches)**
T—Thread Pitch (thread/inch)
D—Nominal Diameter (inches)



METRIC SYSTEM
Bolt M12-1.75x25



P—Property Class* (bolt strength)
L—Length (millimeters)**
T—Thread Pitch (thread width crest to crest mm)
D—Nominal Diameter (millimeters)



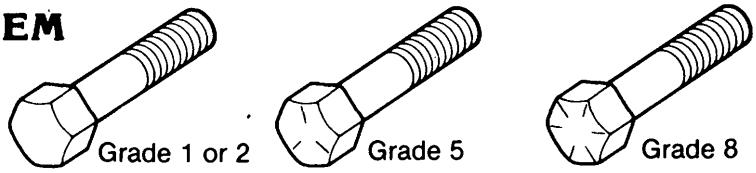
*The property class is an Arabic numeral distinguishable from the slash SAE English grade system.

**The length of all bolts is measured from the underside of the head to the end.

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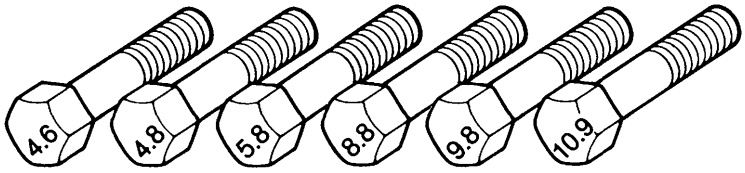
BOLT STRENGTH IDENTIFICATION

(ENGLISH) INCH SYSTEM



English (Inch) bolts—Identification marks correspond to bolt strength—increasing number of slashes represent increasing strength.

METRIC SYSTEM



Metric bolts—Identification class numbers correspond to bolt strength—increasing numbers represent increasing strength. Common metric fastener bolt strength property are 9.8 and 10.9 with the class identification embossed on the bolt head.

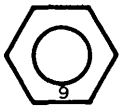
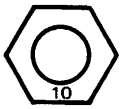
HEX NUT STRENGTH IDENTIFICATION

(ENGLISH) INCH SYSTEM

Grade	Hex Nut Grade 5	Hex Nut Grade 8
Identification		
	3 Dots	6 Dots

Increasing dots represent increasing strength.

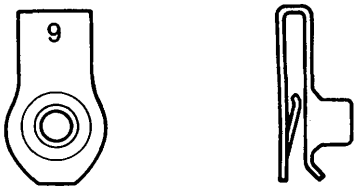
METRIC SYSTEM

Class	Hex Nut Property Class 9	Hex Nut Property Class 10
Identification		
	9 Arabic 9	10 Arabic 10

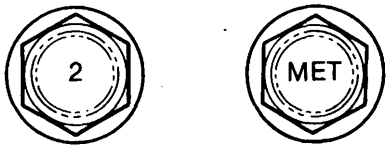
May also have blue finish or paint daub on hex flat. Increasing numbers represent increasing strength.

OTHER TYPES OF PARTS

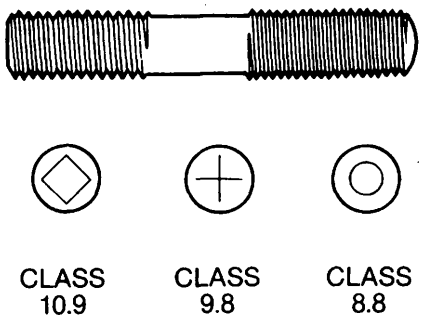
Metric identification schemes vary by type of part, most often a variation of that used of bolts and nuts. Note that many types of English and metric fasteners carry no special identification if they are otherwise unique.



—Stamped U-Nuts



—Tapping, thread forming and certain other case hardened screws



—Studs, Large studs may carry the property class number. Smaller studs use a geometric code on the end.

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ENGLISH METRIC CONVERSION

Description	Multiply	By	For Metric Equivalent
ACCELERATION	Foot/sec^2	0.304 8	metre/sec^2 (m/s^2)
	Inch/sec^2	0.025 4	metre/sec^2
TORQUE	Pound-inch	0.112 98	newton-metres (N·m)
	Pound-foot	1.355 8	newton-metres
POWER	horsepower	0.746	kilowatts (kw)
PRESSURE or STRESS	inches of water	0.2488	kilopascals (kPa)
	pounds/sq. in.	6.895	kilopascals (kPa)
	pounds/sq. in.	14.5	bar
ENERGY or WORK	BTU	1 055.	joules (J)
	foot-pound	1.355 8	joules (J)
	kilowatt-hour	3 600 000. or 3.6×10^6	joules (J = one W's)
LIGHT	foot candle	10.76	lumens/metre^2 (lm/m^2)
FUEL PERFORMANCE	miles/gal	0.425 1	kilometres/litre (km/l)
	gal/mile	2.352 7	litres/kilometre (l/km)
VELOCITY	miles/hour	1.609 3	kilometres/hr. (km/h)
LENGTH	inch	25.4	millimetres (mm)
	foot	0.304 8	metres (m)
	yard	0.914 4	metres (m)
	mile	1.609	kilometres (km)
AREA	inch^2	645.2	millimetres^2 (mm^2)
		6.45	centimetres^2 (cm^2)
	foot^2	0.092 9	metres^2 (m^2)
	yard^2	0.836 1	metres^2
VOLUME	inch^3	16 387.	mm^3
	inch^3	16.387	cm^3
	quart	0.016 4	litres (l)
	quart	0.946 4	litres
	gallon	3.785 4	litres
	yard^3	0.764 6	metres^3 (m^3)
MASS	pound	0.453 6	kilograms (kg)
	ton	907.18	kilograms (kg)
	ton	0.90718	tonne
FORCE	kilogram	9.807	newtons (N)
	ounce	0.278 0	newtons
	pound	4.448	newtons
TEMPERATURE	degree farenheit	0.556 (°F -32)	degree Celsius (°C)

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DECIMAL AND METRIC EQUIVALENTS

Fractions	Decimal Inch	Metric mm
1/64	.015625	.397
1/32	.03125	.794
3/64	.046875	1.191
1/16	.0625	1.588
5/64	.078125	1.984
3/32	.09375	2.381
7/64	.109375	2.778
1/8	.125	3.175
9/64	.140625	3.572
5/32	.15625	3.969
11/64	.171875	4.366
3/16	.1875	4.763
13/64	.203125	5.159
7/32	.21875	5.556
15/64	.234375	5.953
1/4	.250	6.35
17/64	.265625	6.747
9/32	.28125	7.144
19/64	.296875	7.54
5/16	.3125	7.938
21/64	.328125	8.334
11/32	.34375	8.731
23/64	.359375	9.128
3/8	.375	9.525
25/64	.390625	9.922
13/32	.40625	10.319
27/64	.421875	10.716
7/16	.4375	11.113
29/64	.453125	11.509
15/32	.46875	11.906
31/64	.484375	12.303
1/2	.500	12.7

Fractions	Decimal Inch	Metric mm
33/64	.515625	13.097
17/32	.53125	13.494
35/64	.546875	13.891
9/16	.5625	14.288
37/64	.578125	14.684
19/32	.59375	15.081
39/64	.609375	15.478
5/8	.625	15.875
41/64	.640625	16.272
21/32	.65625	16.669
43/64	.671875	17.066
11/16	.6875	17.463
45/64	.703125	17.859
23/32	.71875	18.256
47/64	.734375	18.653
3/4	.750	19.05
49/64	.765625	19.447
25/32	.78125	19.844
51/64	.796875	20.241
13/16	.8125	20.638
53/64	.828125	21.034
27/32	.84375	21.431
55/64	.859375	21.828
7/8	.875	22.225
57/64	.890625	22.622
29/32	.90625	23.019
59/64	.921875	23.416
15/16	.9375	23.813
61/64	.953125	24.209
31/32	.96875	24.606
63/64	.984375	25.003
1	1.00	25.4

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TORQUE CONVERSION

NEWTON METRES (N·m)	POUND-FEET (LB-FT)
1	0.7376
2	1.5
3	2.2
4	3.0
5	3.7
6	4.4
7	5.2
8	5.9
9	6.6
10	7.4
15	11.1
20	14.8
25	18.4
30	22.1
35	25.8
40	29.5
50	36.9
60	44.3
70	51.6
80	59.0
90	66.4
100	73.8
110	81.1
120	88.5
130	95.9
140	103.3
150	110.6
160	118.0
170	125.4
180	132.8
190	140.1
200	147.5
225	166.0
250	184.4

POUND-FEET (LB-FT)	NEWTON METRES (N·m)
1	1.356
2	2.7
3	4.0
4	5.4
5	6.8
6	8.1
7	9.5
8	10.8
9	12.2
10	13.6
15	20.3
20	27.1
25	33.9
30	40.7
35	47.5
40	54.2
45	61.0
50	67.8
55	74.6
60	81.4
65	88.1
70	94.9
75	101.7
80	108.5
90	122.0
100	135.6
110	149.1
120	162.7
130	176.3
140	189.8
150	203.4
160	216.9
170	230.5
180	244.0

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FOR EXAMPLE...

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  If yes; Manual _____ **Volume** _____ **Page** _____

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