

ENGINE MANAGEMENT AND EMISSION SYSTEM 29T
(RS Cosworth 4x4
15:04 and 83 US Emission Levels)

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TECHNICAL DATA

RS COSWORTH 4x4

Fuel SystemInjectors

Manufacturer	Weber
Type	Electronically operated
Lubrication for injector seals	Clean engine oil

Fuel Pump

Manufacturer	Bosch
Type	Electric roller cell
Output pressure	Greater than 5 bar at 12 volts

Pressure Regulator

Manufacturer	Weber
System pressure	3,2 to 3,8 bar (with ignition 'on' - engine <u>not</u> running)
System pressure	2,7 to 3,3 bar (at idle with engine running).
Lubricant for Regulator seals	clean engine oil

Idle Speed

15:04 vehicles	850 + 50 rpm
83 US vehicles	900 ± 50 rpm

Idle CO% (15:04 variants only)	1,0 to 2,0
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Turbocharger

Boost pressure (ECU controlled)	0,8 bar (maximum 0,9 bar)
Solenoid control valve:	
Control begins at	1,000 rpm (approximately)
Boost reduces at	6,000 rpm (approximately)
Charge air control temperature	70°C

Tightening Torques

	<u>Nm</u>	<u>lbf ft</u>
Wastegate actuator rod locknut	5,6 to 7,9	4,0 to 6,0
Actuator to retainer	5,6 to 7,9	4,0 to 6,0
Intermediate housing to turbine housing	18,5 to 21,9	14,0 to 16,0
Intermediate housing to compressor housing	16,4 to 19,8	12,0 to 14,0
Exhaust downpipe to turbocharger	19,0 to 23,0 (M8) 35 - 47 (M10)	14,0 to 17,0
Exhaust manifold to Turbocharger assembly	32,0 to 36,0	24,0 to 27,0
Oil feed adaptor to turbocharger	25,0 to 35,0	18,0 to 26,0
Oil feed to adaptor	25,0 to 27,0	18,0 to 20,0
Turbo drain pipe to turbocharger.. .. .	18,5 to 21,5	14,0 to 16,0
Water pipe banjo bolts to turbocharger.. .. .	19,0 to 23,0	14,0 to 17,0
Throttle cable bracket to plenum chamber	18,5 to 21,5 + Loctite 518	14,0 to 16,0
Fuel regulator to fuel rail	8,0 to 10,0	6,0 to 8,0
Fuel rail to plenum chamber	8,0 to 10,0	6,0 to 8,0
Breather valve intake to plenum chamber.	15,0 to 20,0 + Loctite 242	11,0 to 15,0
Air charge temperature sensor to plenum chamber	23,0 to 25,0 + Loctite 518	17,0 to 18,0
HEGO sensor to turbocharger	28,0 to 30,0	20,0 to 22,0
TDC sensor bracket to sump	8,0 to 10,0	6,0 to 8,0
TDC sensor to bracket	4,0 to 6,0 + Loctite 270	3,0 to 5,0
Distributor clamp to cylinder block	8,5 to 21,5	13,0 to 16,0



TECHNICAL DATA (cont'd)

RS COSWORTH 4x4

Ignition System

Coil

Primary resistance 0,72 to 0,88 ohms

Secondary resistance 4500 to 8600 ohms

Spark Plugs

Type AGPR 902P

Electrode gap - all territories 1,00 mm (0,040 in)

Firing order 1 - 3 - 4 - 2

Distributor

Dwell angle Totally controlled by ECU module
and cannot be adjusted

Initial advance .. . 16° BTDC

HT Leads

Resistance 30,000 ohms maximum per lead

Ignition Amplifier Module

Ignition Amplifier Module heat sink compound
(specification number) 815F-12103-AA

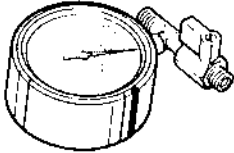
Clearance Settings

TDC sensor to pulley teeth 0,6 to 1,0 mm

Distributor cam to phase sensor 0,2 to 0,3 mm



SPECIAL SERVICE TOOLS

Tool	Tool Name
 23-021	Pressure gauge
 23-027	Fuel line separator
 21-152	Distributor installation alignment tool

GENERAL EQUIPMENT

- RPM Meter
- CO Meter
- Tamperproof Plug Remover (150 mm long)
- Cooling System Pressure Tester
- L.E.D. tester (V. Lowener No. 0132060, V.L. Churchill No. 0472060)

22 214 0 DISTRIBUTOR - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED:

Distributor installation
alignment tool 21-152

To Remove

1. Disconnect battery earth cable.
2. Remove induction hose from intercooler to throttle body.
3. Remove timing belt cover to enable access to distributor assembly.
4. Unclip distributor cap and position clear of distributor. Remove rotor arm and dust cover (refit rotor arm).
5. Using a spanner on the crankshaft pulley bolt, rotate engine clockwise until No.1 cylinder is at T.D.C.
6. Disconnect distributor multiplug.
7. Remove distributor retaining bolt and plate, then "lift out" distributor assembly from engine.

To Install

8. Check that 'O' ring on distributor body is in good condition, if not, fit a new 'O' ring.
9. Insert alignment tool 21-152, into distributor (rotor arm must be removed), thereby locking distributor shaft into the correct position relative to the phase sensor, refer to Fig.3. Insert distributor into engine.

Should distributor not engage into engine, it may be helpful to slightly rock the crankshaft drive pulley (see Part 'B' of Fig.1) backwards and forwards with the use of a suitable spanner or socket with bar. This will enable the distributor drive to engage and allow the distributor to slide fully into the engine. Recheck to ensure timing marks are correctly positioned before securing distributor into position.

10. Refit dust cover, rotor and distributor cap.
11. Reconnect distributor multiplug and induction hose from intercooler to throttle body.
12. Refit timing belt cover to engine and secure.
13. Reconnect battery earth cable.

NOTE: Ignition timing is totally controlled by the Engine Management control module and does NOT require checking with a timing light.

14. Start engine to ensure correct operation.

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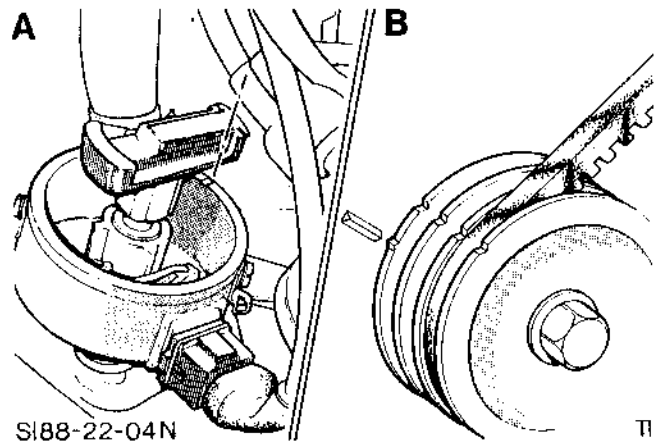


Fig.1. No.1. cylinder at T.D.C.
A - Distributor mark
B - Crank pulley lug inline with pointer

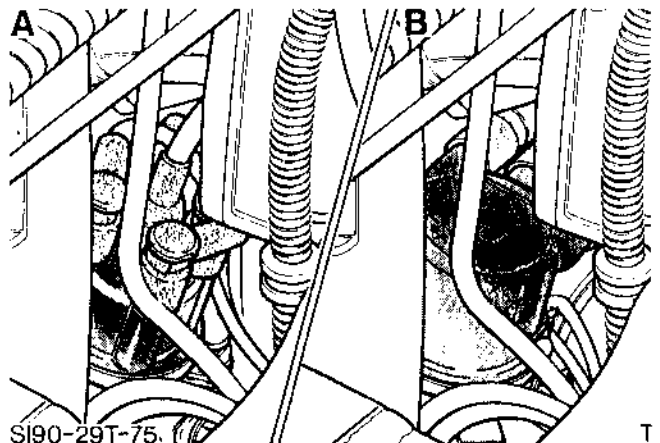


Fig.2. A - 83 US distributor cap
B - 15:04 distributor cap

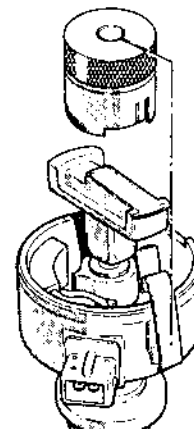


Fig.3. Align rotor arm with Special Tool.
(Distributor rotor arm to be removed)

22 215 5 PHASE SENSOR - DISTRIBUTOR - REMOVE AND
INSTALL
(Distributor removed from vehicle)

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Dismantle

1. Disconnect "phase" sensor plug and remove from base plate of distributor.
2. Remove base plate and "phase" sensor from distributor housing (2 bolts), refer to Fig.2.

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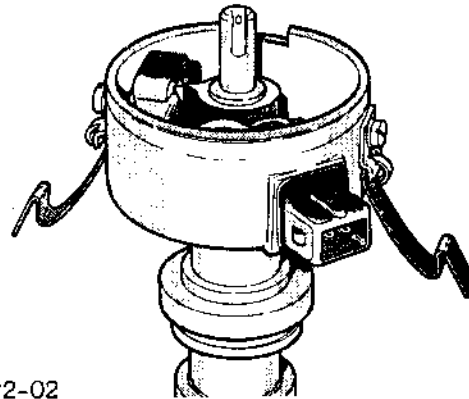


Fig.1. Distributor assembly removed from vehicle.

To Reassemble

3. Refit base plate and "phase" sensor to distributor housing (2 bolts).
4. Refit "phase" sensor plug to base plate.

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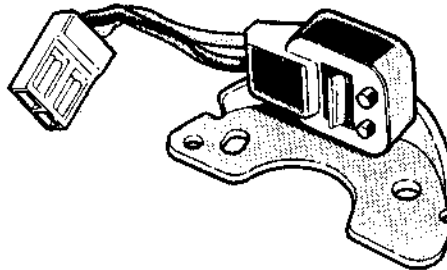


Fig.2. "Phase" sensor removed from distributor.

5. Adjust phase sensor

Slacken base plate and adjust "phase" sensor to a clearance of 0,2 to 0,3 mm from distributor shaft cam lobes, refer to Fig.3. Tighten base plate, ensuring correct clearance is maintained.

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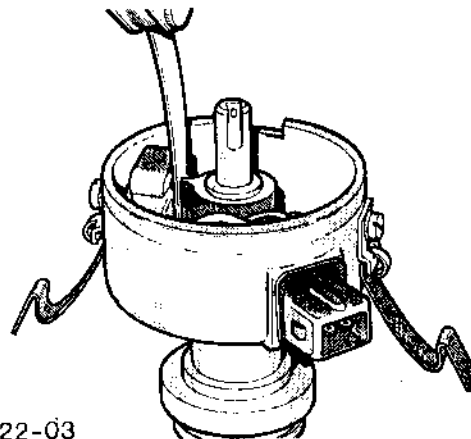


Fig.3. Adjust "phase" sensor to specification.

22 292 0 IGNITION AMPLIFIER MODULE -
REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Disconnect multiplug from ignition amplifier module, refer to Fig.1.
3. Remove both screws along with their washers and "lift out" module from vehicle.

To Install

4. Coat rear face of ignition amplifier module with heat sink compound, refer Technical Data on page 3.
5. Reposition ignition amplifier module and secure with both screws and washers.
6. Reconnect ignition amplifier module multiplug.
7. Reconnect battery earth cable.
8. Start engine to ensure correct operation.

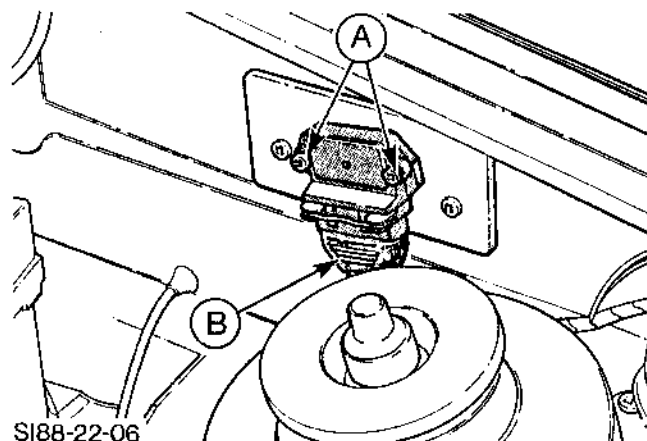


Fig.1. Ignition amplifier module.
A - Securing screws
B - Multiplug

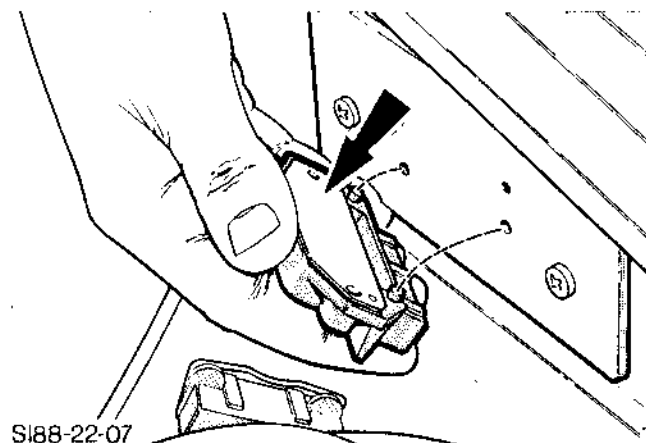


Fig.2. Apply heat sink compound to module.

22 414 0 IGNITION COIL - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Disconnect HT and LT connections at coil.
3. Remove both screws, "lift out" coil with strap assembly and suppression capacitor.

To Install

4. Reposition coil with strap assembly and suppression capacitor in place. Secure with both retaining screws.

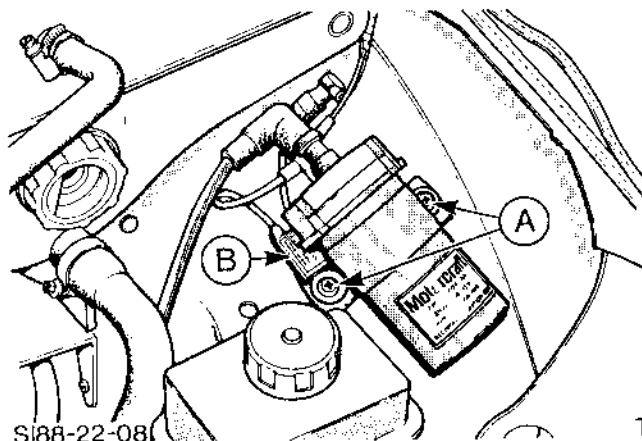


Fig.1. Ignition coil location.

- A - Mounting screws
B - Suppression capacitor

5. Reconnect HT and LT connections.
6. Reconnect battery earth cable.

7. Start engine to ensure correct operation.

22 619 0 SPEED SENSOR - ENGINE - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Raise vehicle on ramp.
3. Remove both bolts securing engine speed/TDC sensor to sump bracket.
4. Disconnect speed sensor multiplug from wiring harness. Remove cable and securing clip from sump (1 bolt).

To Install

5. Reposition and secure engine speed/TDC sensor cable bracket (1 bolt) and reconnect multiplug.
6. Reposition engine speed/TDC sensor to mounting bracket. Align crankshaft pulley teeth with sensor and adjust sensor to a clearance of 0,6 to 1,0 mm, refer to Fig.3.
7. Lower vehicle to ground.
8. Reconnect battery earth cable.
9. Start engine to ensure correct operation.

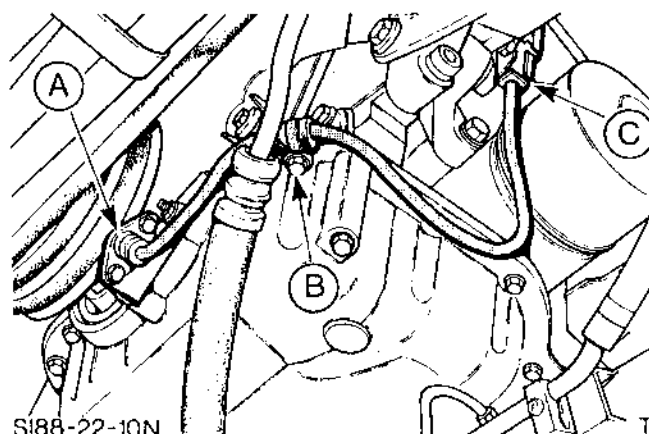
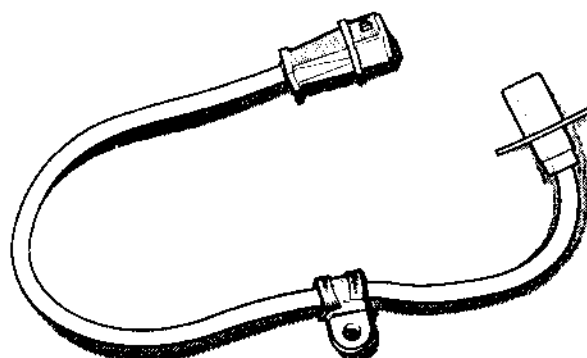
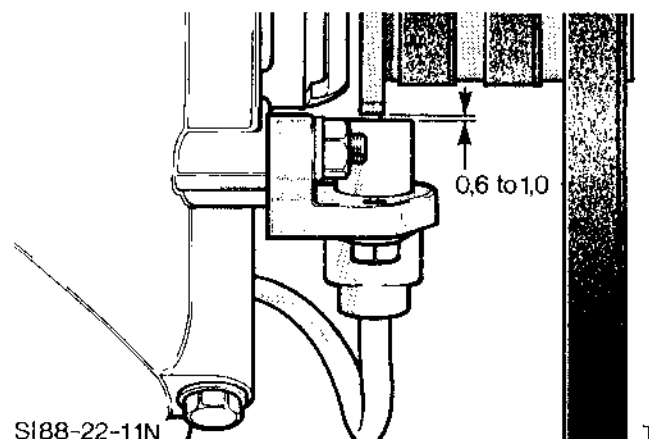


Fig.1. A - Engine speed/TDC sensor
B - Engine speed/TDC sensor cable bracket
C - Engine speed/TDC sensor cable multiplug



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Fig.2. Engine speed/TDC sensor assembly.



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Fig.3. Engine speed/TDC sensor clearance.

23 174 0 AIR CLEANER ASSEMBLY - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Remove engine breather hose, solenoid control valve hose and air cleaner to turbocharger intake hose, refer to Fig.1.
3. Release air cleaner cover, detach and remove air cleaner element, refer to Fig.2.
4. Remove right hand inner fender wheelarch protector. Remove air cleaner box retaining nuts and washers from beneath inner fender, refer to Fig.3.
5. "Lift out" air cleaner box assembly from engine compartment.

To Install

6. Transfer metal reinforcements to new air cleaner box assembly, should new air cleaner box be required to be fitted.
7. Reposition air cleaner box assembly, refit retaining nuts, along with washers from beneath inner fender.
8. Refit air cleaner element and cover, then secure with all five retaining clips.
9. Reconnect hoses to air cleaner box cover.
10. Refit inner fender protective shield.
11. Reconnect battery earth cable.
12. Start engine to ensure correct operation.

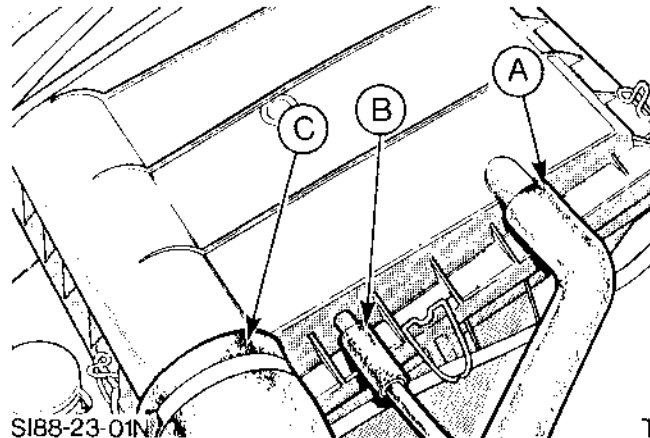


Fig.1. A - Engine breather hose
B - Solenoid control valve hose
C - Turbocharger intake hose

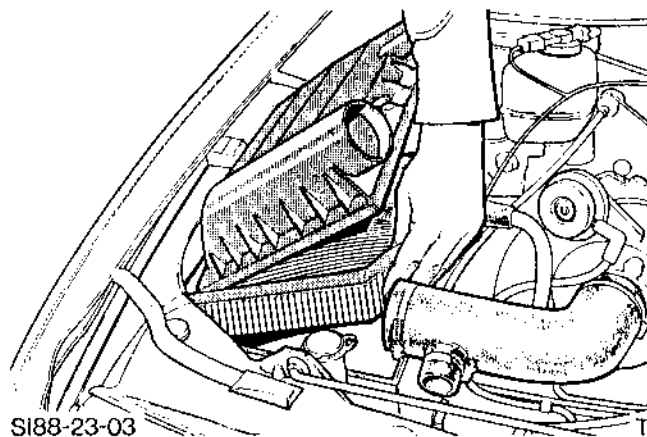


Fig.2. Air cleaner element removal.

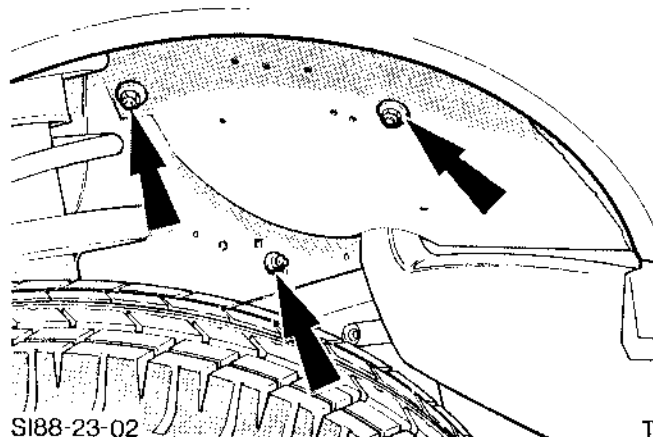


Fig.3. Air cleaner nuts to inner wheelarch.

23 215 0 FUEL MIXTURE/CO% - ADJUST

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED:

CO Meter
RPM Meter
Tamperproof Plug Remover (150 mm long)

NOTE: The procedure below is for 15:04 emission level vehicles only. For '83 US emission level vehicles, refer to control module remove and install (29 200 0), commencing page 28.

IMPORTANT NOTE: If CO% reading is exceptionally high (above 2,5%) or below 0,3%, carryout checks in the Vehicle System Test Manual.

To Adjust

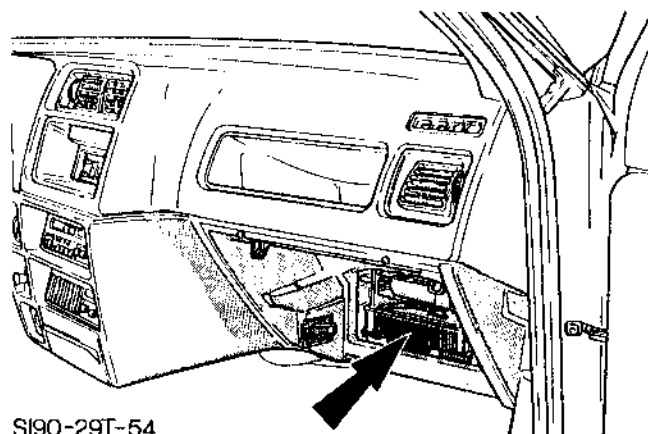
1. Warm engine to normal operating temperature.
2. Open glove box on passenger's side of vehicle.
3. Remove glove box assembly, enabling access to ECU module, refer to Fig.1.
4. Unclip ECU module from retaining bracket, refer to Fig.2.
5. Connect a CO meter to engine as per manufacturer's instructions.
6. Stabilise engine by running at 3000 rpm for approximately 15 seconds and allow to idle.
7. Wait for meter to stabilise and record CO% and idle speed.
8. Adjust CO% screw to achieve correct specification, refer to Fig.3.

IMPORTANT NOTE: When performing this operation, note that the depth of the tamperproof plug remover should not exceed 4 mm, otherwise damage to the CO% adjustment potentiometer can occur.

IMPORTANT NOTE: Adjustment must be completed within 10 to 30 seconds from time meters stabilise. If time taken is longer than 30 seconds, run engine again at 3000 rpm for a further 15 seconds and re-check.

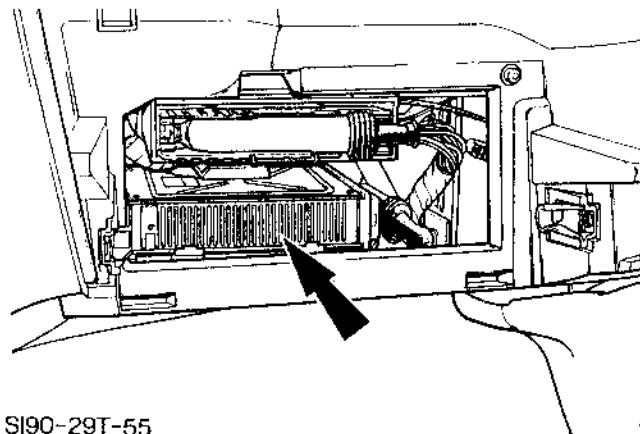
9. Remove idle speed control valve multiplug. Engine idle should stabilise at approximately 850 rpm. If idle is incorrect, refer to the Vehicle System Test manual and carryout checks for incorrect idle speed.
10. Switch 'off' engine and remove test equipment.
11. Fit new tamperproof plug to ECU module.
12. Position module into retaining bracket, ensuring bracket clips module into position.
13. Refit glove box assembly.

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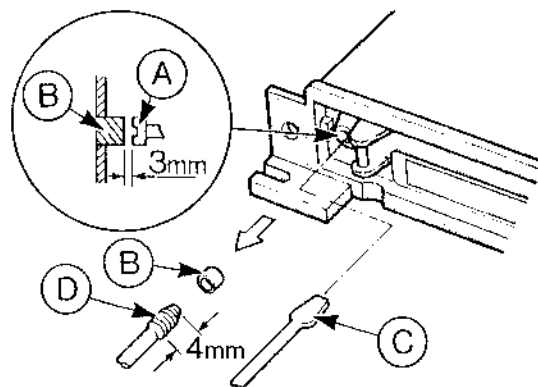
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Fig.1. ECU module location.



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Fig.2. Module positioned in retaining bracket.



SI88-22-14

Fig.3. A - CO% adjustment screw
B - Tamperproof plug
C - Screwdriver
D - Tamperproof plug remover

23 266 0 FUEL PRESSURE REGULATOR - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED:

Fuel Line Separator 23-027

IMPORTANT NOTE: WHEN REMOVING FUEL LINES, IT MUST BE REMEMBERED THAT THE FUEL SYSTEM REMAINS PRESSURISED. TAKE ADEQUATE SAFETY PRECAUTIONS TO PREVENT FUEL SPILLAGE.

To Remove

1. Disconnect battery earth cable.
2. Disconnect vacuum hose.
3. Disconnect fuel return pipe at chassis fuel line with Special Service Tool 23-027, refer to Fig.2.
4. Remove both securing bolts and lift off regulator assembly, refer to Fig.1.

To Install

5. Reposition regulator after having lubricated seal with clean engine oil and secure to fuel rail with both bolts.
6. Reconnect fuel return line connection.
7. Reconnect vacuum hose.
8. Reconnect battery earth cable.
9. Start engine to ensure correct operation.

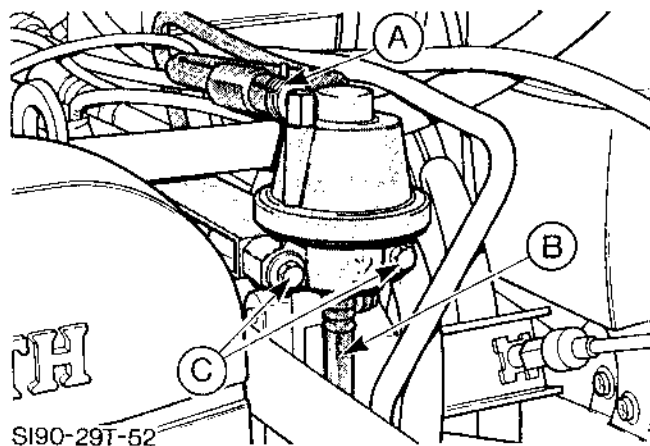


Fig.1. Fuel pressure regulator.

- A - Vacuum hose
- B - Fuel return pipe
- C - Retaining bolts

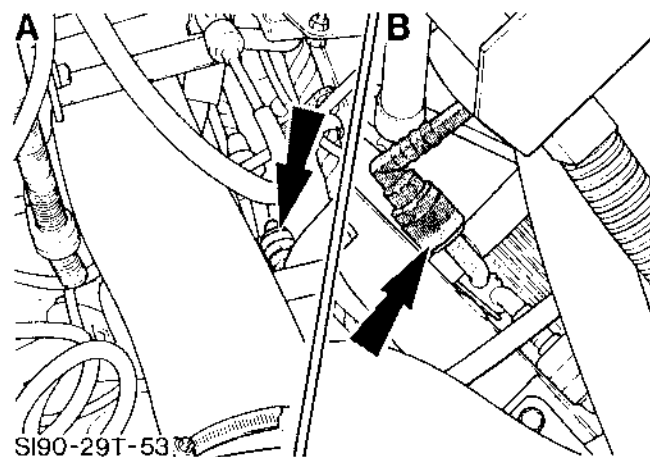


Fig.2. Fuel return pipe connector.

23 323 0 IDLE SPEED CONTROL VALVE - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Disconnect multiplug from idle speed control valve.
3. Remove both retaining bolts and 'lift-out' idle speed control valve.

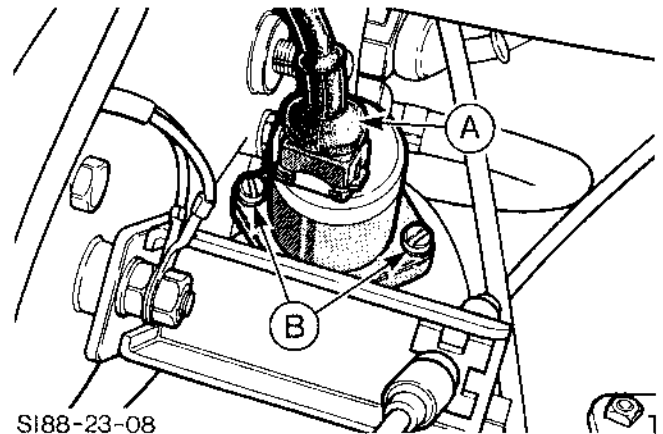


Fig.1. Idle speed control valve location.

A - Multiplug
B - Retaining bolts

To Install

4. Fit new "O" rings to idle speed control valve.
5. Position idle speed control valve into detent pin and secure with both bolts.
6. Refit multiplug connector to valve.
7. Reconnect battery earth cable.
8. Start engine to ensure correct operation.

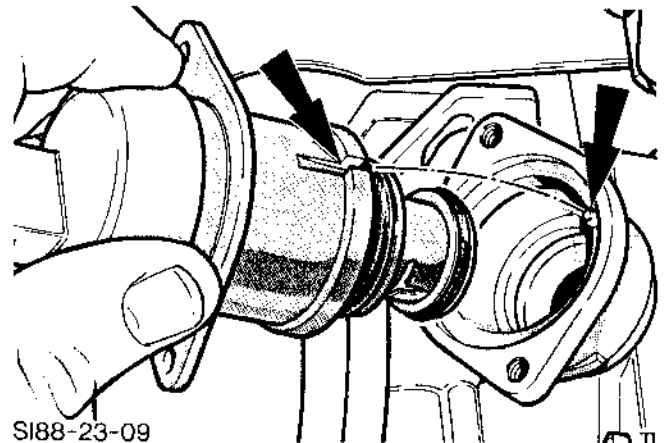


Fig.2. Locate valve on detent pin.

23 325 0 THROTTLE POSITION SENSOR -
REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

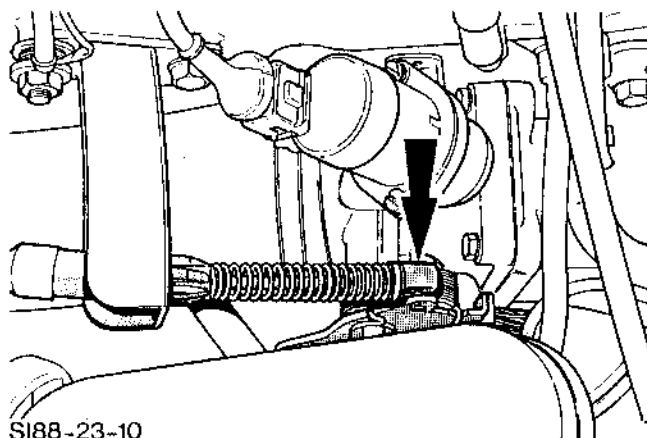
1. Disconnect battery earth cable.
2. Remove throttle cable to throttle butterfly clip.

NOTE: Do not remove throttle cable bracket from air chamber as Loctite used at initial build may fall inside air chamber.

3. Remove induction hose from throttle body intake connection.
4. Disconnect throttle position sensor multiplug and idle speed control valve multiplug.
5. Remove throttle butterfly housing from induction chamber connection (4 bolts), refer to Fig.2.
6. Remove both bolts securing sensor to throttle butterfly housing, refer to Fig.3.

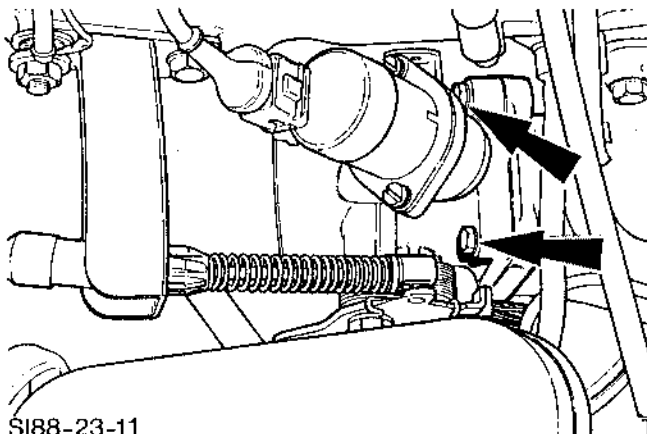
To Install

7. Position sensor on throttle butterfly shaft and turn anti-clockwise until spring pressure is felt. Tighten retaining bolts, ensuring spring pressure is not being applied.
8. Clean gasket faces and using a new gasket, fit throttle butterfly housing to air chamber connection.
9. Reconnect throttle position sensor and idle speed control valve multiplugs.
10. Fit induction hose to throttle plate intake connection.
11. Fit throttle cable to throttle butterfly and adjust throttle cable as necessary.
12. Reconnect battery earth cable.
13. Start engine to ensure correct operation.



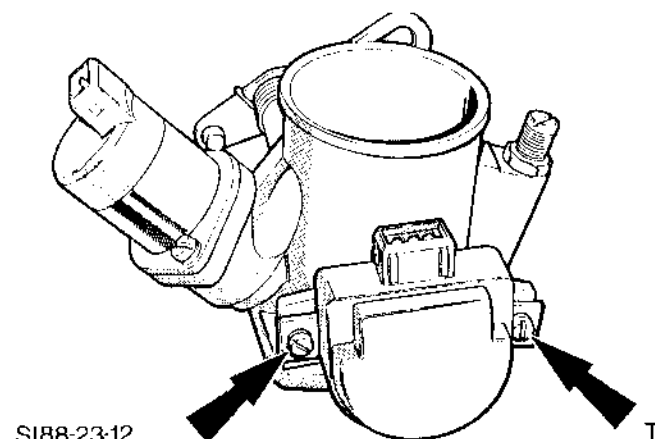
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Fig.1. Throttle cable to throttle butterfly.



SI88-23-11

Fig.2. Throttle housing bolts (2 shown).



SI88-23-12

Fig.3. Throttle position sensor securing screws.

23 455 0 FUEL INJECTORS - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED:

Fuel line separator 23-027

IMPORTANT NOTE: WHEN REMOVING FUEL LINES, IT MUST BE REMEMBERED THAT THE FUEL SYSTEM REMAINS PRESSURISED. TAKE ADEQUATE SAFETY PRECAUTIONS TO PREVENT FUEL SPILLAGE.

To Remove

1. Disconnect battery earth cable.
2. Disconnect and remove vacuum hose from fuel pressure regulator.
3. Disconnect and remove degas hose and crankcase vent pipe.
4. Disconnect multiplugs from injectors, idle speed control valve and air charge temperature sensor.
5. Disconnect fuel supply and return pipe connections with Special Service Tool 23-027 refer to Fig.2.
6. Remove fuel rail retaining bolts and "lift out" fuel rail complete with injectors from intake manifold, refer to Fig.3.
7. Remove individual injector securing clips, allowing injectors to become detached from fuel rail.

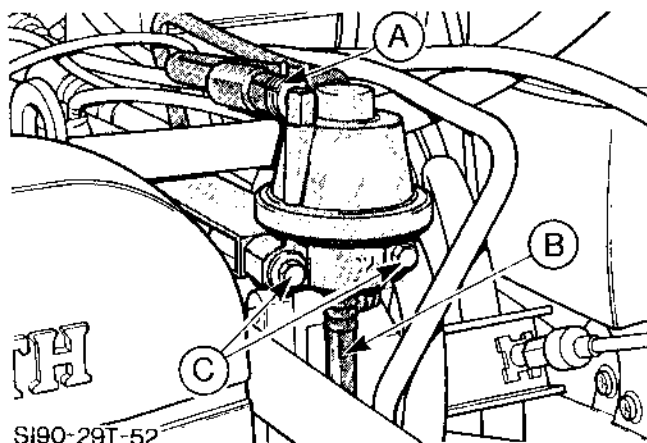


Fig.1. A - Vacuum hose
B - Fuel return pipe
C - Retaining bolts

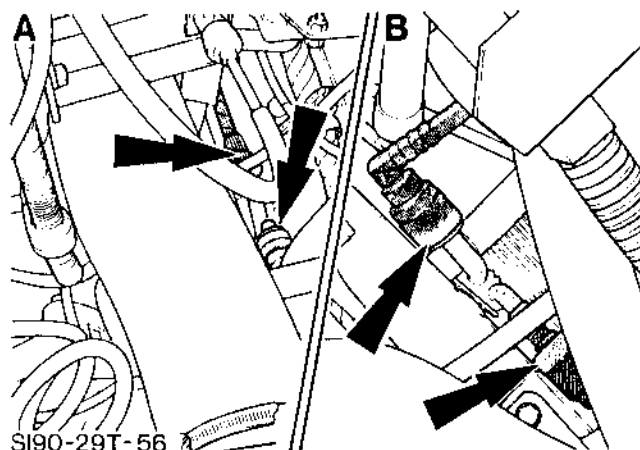


Fig.2. Both A and B show fuel pipe connectors viewed from different angles.

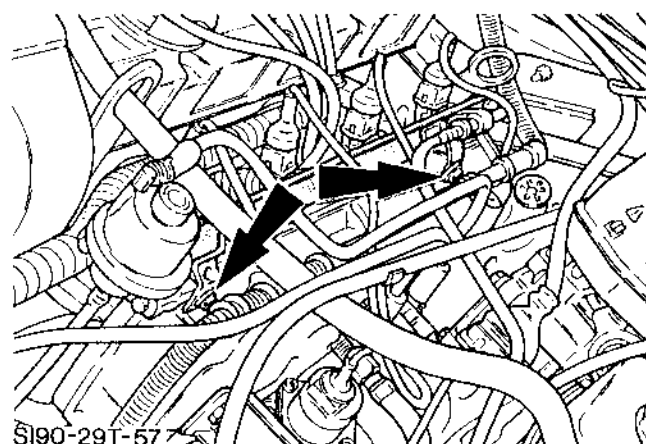


Fig.3. Fuel rail retaining bolts.

23 455 0

RS COSWORTH 4x4

To Install

8. Fit injectors to fuel rail assembly and secure with clips (one per injector).

NOTE: Always use new 'O' rings and clips on all injectors when refitting, refer to Fig.4.

9. Lubricate injector 'O' rings with clean engine oil and reposition complete with fuel rail assembly into intake manifold. Secure with both bolts, refer to Fig.5.

10. Reconnect fuel supply and return pipe connectors.

11. Reconnect vacuum line to fuel pressure regulator.

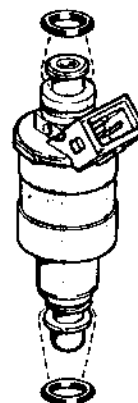
12. Reconnect multiplugs to injectors, idle speed control valve and air charge temperature sensor (route cables and secure as appropriate).

13. Refit degas tank hose and crankcase vent pipe.

14. Reconnect battery earth cable.

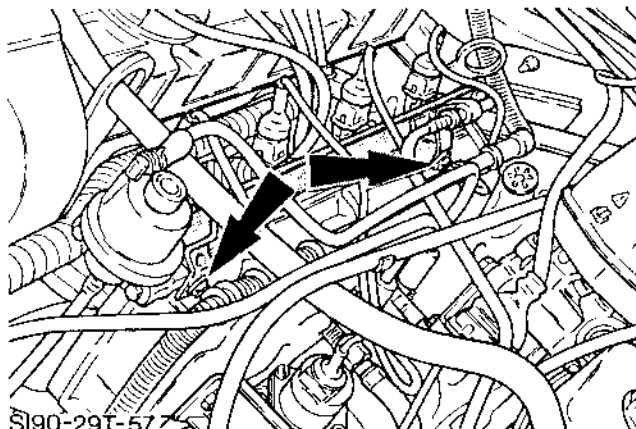
15. Switch ignition 'on' and check for fuel leaks.

16. Start engine to ensure correct operation.



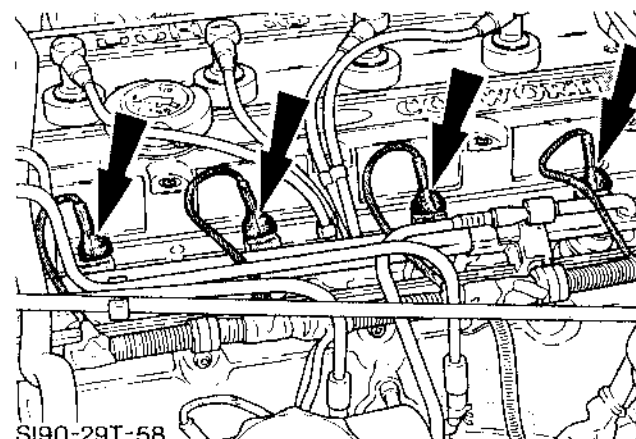
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Fig.4. New injector 'O' rings fitted.



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Fig.5. Refit fuel rail retaining bolts.



SI90-29T-58

Fig.6. Reconnect plugs to injectors.

23 534 0 FUEL PUMP - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

IMPORTANT NOTE: WHEN REMOVING FUEL LINES, IT MUST BE REMEMBERED THAT THE FUEL SYSTEM REMAINS PRESSURISED. TAKE ADEQUATE SAFETY PRECAUTIONS TO PREVENT FUEL SPILLAGE

To Remove

1. Disconnect battery earth cable.
2. Raise vehicle on a ramp.
3. Clamp fuel pump inlet hose with a suitable clamp to prevent fuel draining from tank when hose is disconnected (take care not to damage hose), refer to Fig.1.
4. Hold a suitable container beneath fuel pump inlet connection, loosen clamp and remove hose. Plug end of hose to prevent fuel seepage.
5. Loosen fuel outlet hose gently as fuel system will still be pressurised, refer to Fig.2. Remove hose and collect any fuel in a suitable container.
6. Disconnect electrical wiring loom connectors. Loosen pump securing bolt and slide pump out from bracket. Remove damper from outlet port.

To Install

7. Clean fuel pipe and wiring connectors.
8. Slide fuel pump into bracket and secure.
9. Reconnect fuel lines and wiring connectors.
10. Remove clamp from hose.
11. Reconnect battery earth cable.
12. Lower vehicle to the ground.
13. Switch ignition 'on' and 'off' five times and check for fuel leakage.

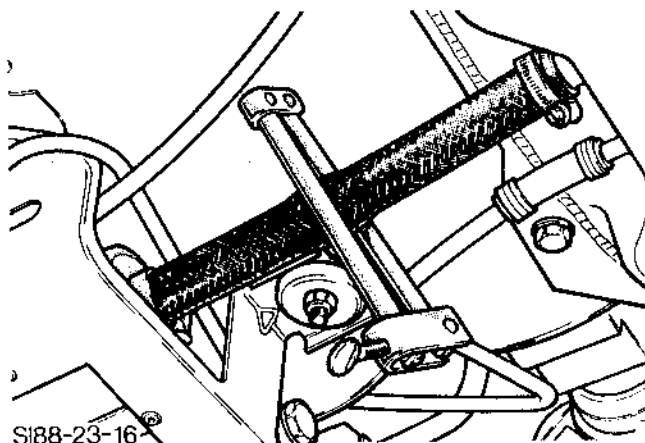


Fig.1. Pump inlet hose suitably clamped.

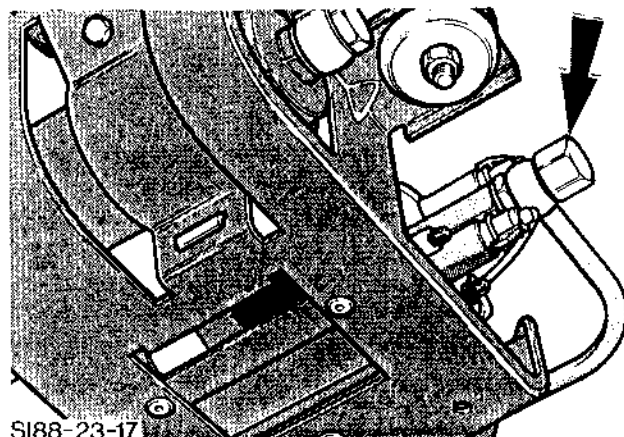


Fig.2. Slacken outlet hose, taking appropriate precautions to collect fuel residue.

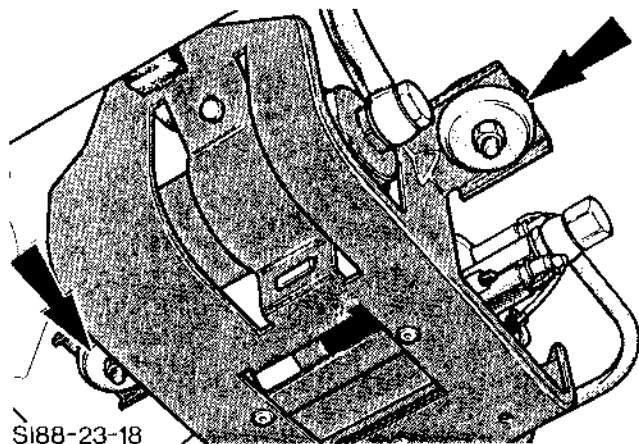


Fig.3. Fuel pump retaining nuts.

23 545 0 FUEL FILTER - REMOVE AND INSTALL

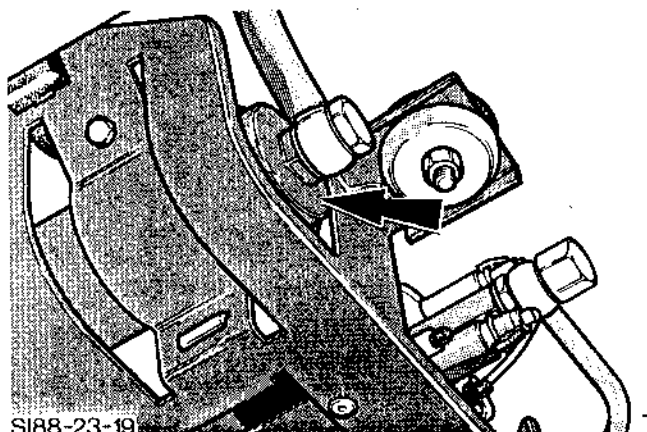
SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

IMPORTANT NOTE: WHEN REMOVING FUEL LINES, IT MUST BE REMEMBERED THAT THE FUEL SYSTEM REMAINS PRESSURISED. TAKE ADEQUATE SAFETY PRECAUTIONS TO PREVENT FUEL SPILLAGE.

To Remove

1. Disconnect battery earth cable.
2. Raise vehicle on a ramp.
3. Clamp fuel feed hose at tank.
4. Position a suitable container beneath fuel filter. Slacken fuel inlet pipe, allow pressure to reduce. Remove fuel inlet and outlet pipe, refer to Fig.1.
5. Loosen filter retaining bolts and slide out filter assembly, refer to Fig.2.

NOTE: Take care when removing filter, as it will still contain fuel.

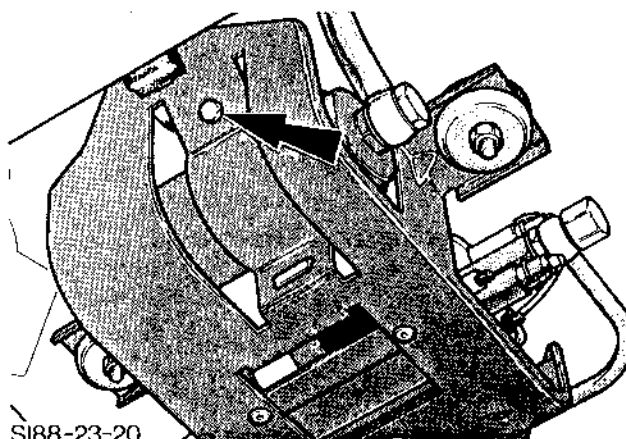


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Fig.1. Fuel filter location.

To Install

6. Fit new filter assembly and secure, ensuring that filter is round the correct way (note direction of flow arrows).
7. Refit fuel filter inlet and outlet pipes.
8. Remove clamp from fuel feed hose.
9. Reconnect battery earth cable.
10. Lower vehicle to ground.
11. Switch ignition 'on' and 'off' five times and check for fuel leakage.



SI88-23-20

Fig.2. Fuel filter assembly retaining bolt.

23 601 0 BOOST PRESSURE - ADJUST

SPECIAL TOOLS AND EQUIPMENT REQUIRED:

Pressure Gauge and Hose 23-021

Cooling System Pressure Tester

NOTE: Following fitment of a new turbocharger or refitting of the original unit to the engine, boost pressure must be checked and adjusted as necessary.

This operation is divided into three sections:

- Initial 'static' adjustment.
- Preparing the vehicle for road testing.
- Carrying out the road test - final operating adjustment.

IMPORTANT NOTE: Roller testing is not recommended as the temperatures generated by the engine, brakes and road tyres become extremely high and maximum cooling of these components will only be satisfactorily achieved by actually driving the vehicle on the road.

NOTE: Once the tamperproof lead seal positioned on the turbo charger waste gate actuator rod has been removed, enabling the following procedure to be carried out, there is no "in Service" requirement for a new lead seal or for the original broken and removed lead seal to be repaired and refitted, following completion of this procedure.

Initial Static Adjustment

1. With actuator rod disconnected from waste gate operating lever, connect cooling system pressure tester to waste gate actuator and apply a pressure of 0,6 bar (max. 0,63 bar), refer to Fig.2.
2. With 0,6 bar (max. 0,63 bar) pressure applied to the actuator, adjust actuator rod length so that it just slips onto the waste gate lever, refer to Fig.3.
3. Fit a new circlip to retain actuator rod to waste gate lever. Tighten actuator rod locknut, ensuring that the rod eye does not twist on tightening.

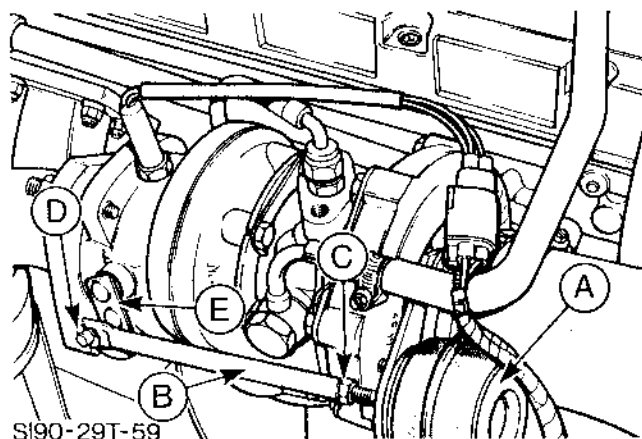


Fig.1. A - Waste gate actuator D - Circlip
B - Actuator rod E - Waste gate lever
C - Actuator rod locknut

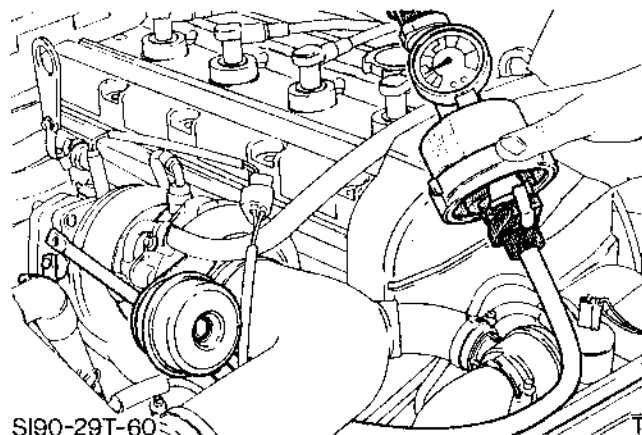


Fig.2. Waste gate actuator rod disconnected and cooling system pressure tester fitted.

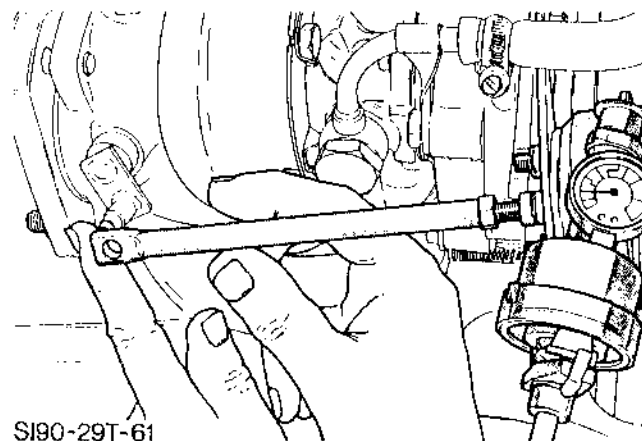


Fig.3. Adjust rod length so that it just slips onto waste gate lever.

Preparing the Vehicle for Road Testing

Boost pressure is measured with a pressure gauge which reads "bar". Connect gauge to vehicle as detailed below:

4. Connect the pressure gauge into a 'T' piece as indicated in Fig.4. Use approximately a 2 metre length of 6 mm diameter neoprene tubing, enabling gauge to be routed into vehicle for the purpose of viewing.

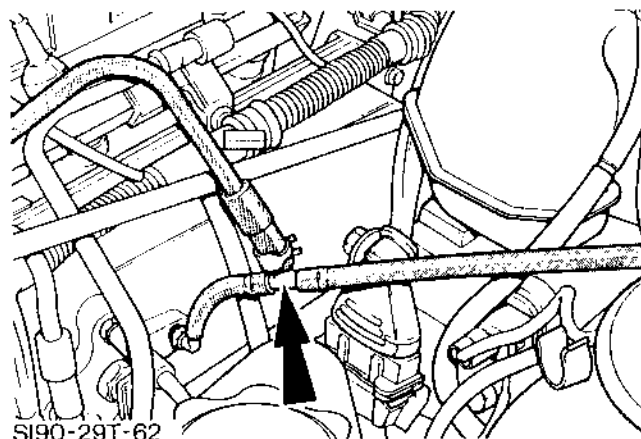


Fig.4. Connect pressure gauge to engine.

5. If only one person will be carrying out the test, it is essential that the pressure gauge is secured to the driver's side vent nozzle and in an upright position, refer to Fig.5.

6. Warm engine to normal operating temperature and conduct road testing as described below and on the following page.

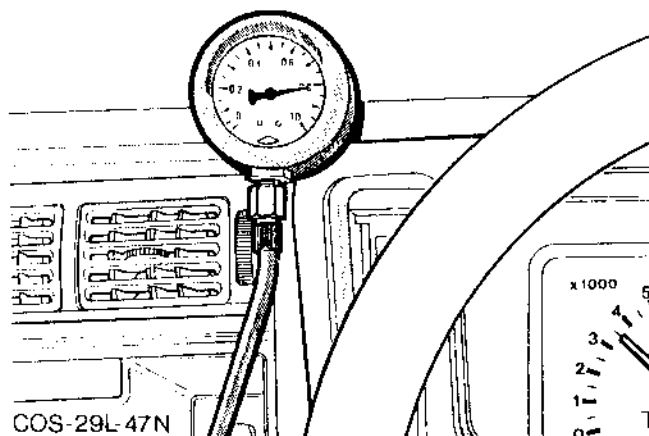


Fig.5. Gauge installation hose routing.

Carrying out the Road Test - final operating adjustment

IMPORTANT NOTE:

We strongly recommend that the test is carried out by two individuals, one to drive the car to the requirements mentioned on the following page and to ensure that the road conditions are acceptable for this to occur. The other person to read the gauge accurately to ensure that the correct reading is taken and logged.

Test Commences

- a) With a clear, straight road ahead and behind (without junctions), select 3rd gear and drive along at an engine speed of approximately 1500 rpm.
- b) Fully depress the throttle pedal.
- c) Keeping the throttle pedal fully depressed, allow engine speed to rise to 3500 rpm, at which time fully apply the footbrake (still ensuring that full throttle is maintained). With both throttle and footbrake fully applied, read boost pressure seen on gauge and log. DO NOT EXCEED 5 SECONDS FOR TOTAL TEST DURATION WITH FULL THROTTLE AND FULL BRAKES APPLIED.

Specification: 0,8 bar (maximum 0,9)

NOTE: After taking reading, drive the car for at least 1 mile to allow the brakes to cool.

7. If reading obtained is within specification, (see figure identified above), apply a small amount of paint to turbocharger actuator rod threads and locknut, refer to Fig.8.
8. If reading obtained was outside specification, actuator rod should be adjusted as follows:

NOTE: Once the tamperproof lead seal positioned on the turbo charger waste gate actuator rod has been removed, enabling adjustment to be carried out, there is no "in Service" requirement for a new lead seal or for the old original broken and removed lead seal to be repaired and refitted, following completion of this procedure.

- Loosen locknut on waste gate actuator rod, remove circlip and detach rod from the waste gate operating lever.

• If Boost Pressure Low

Shorten rod one half turn for every 0,02 bar of pressure below that specified.

• If Boost Pressure High

Lengthen rod one half turn for every 0,02 bar of pressure above that specified.

9. After adjustment, refit rod and circlip and tighten locknut, ensuring that rod eye does not bind on waste gate lever.
10. Repeat road test procedure mentioned above to ensure correct specification is now met.
11. If boost pressure is now within specification, apply paint mark to actuator rod threads and locknut, refer to Fig.8.
12. Remove test equipment from vehicle.

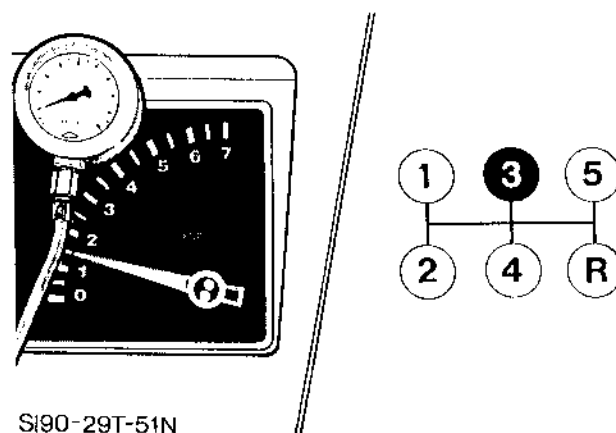


Fig.6. 3rd gear engaged (engine speed at 1500 rpm).

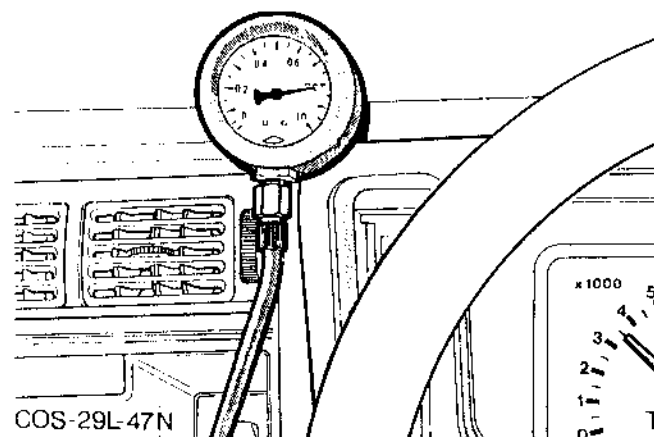


Fig.7. Readings taken with throttle and brakes fully depressed.

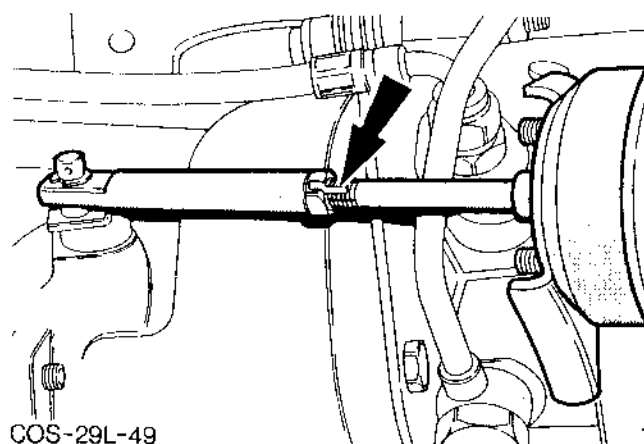


Fig.8. Paint mark introduced over thread and locknut of waste gate actuator rod.

23 612 0 TURBOCHARGER - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Remove induction hose from air cleaner, bypass valve and turbocharger assembly.
3. Remove turbocharger heat shield.
4. Remove both solenoid control valve hoses from turbocharger and actuator.
5. Disconnect bottom induction hose from turbocharger to intercooler.
6. Disconnect HEGO sensor ('83 US vehicles only).
7. Remove oil pressure hose from turbocharger, refer to Fig.1.
8. Drain engine coolant. Remove coolant feed and return pipes from turbocharger.
9. Remove 3 exhaust securing nuts to turbocharger, refer to Fig.2.
10. Disconnect top heater hose enabling access to top row of exhaust manifold nuts. Remove top row of exhaust manifold nuts.
11. Disconnect turbocharger oil return pipe at sump connection, refer to Fig.2.
12. Disconnect bolts securing exhaust downpipe to catalytic portion of exhaust system.
13. Remove alternator and bracket, enabling access to bottom exhaust manifold nuts.
14. Remove bottom exhaust manifold nuts and lift turbocharger along with exhaust manifold out of vehicle.
15. Remove turbocharger from exhaust manifold.
16. With Turbocharger removed, strip down to required level.

Strip turbocharger assembly down to required level and transfer items such as oil pressure connection, boost pressure connection onto new unit (should one be required to be fitted), prior to installation.

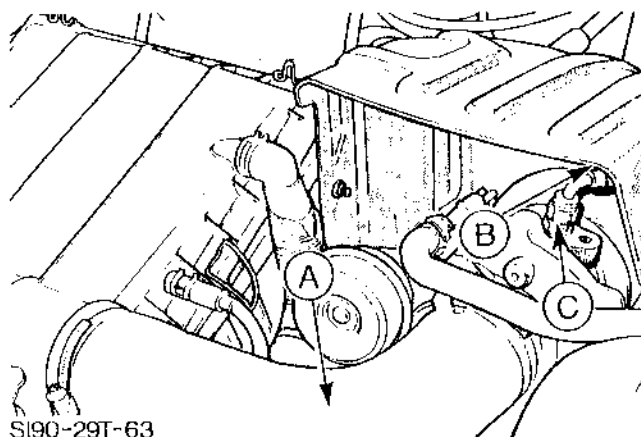


Fig.1. A - Induction hose
B - Heat shield
C - Oil pressure hose connection

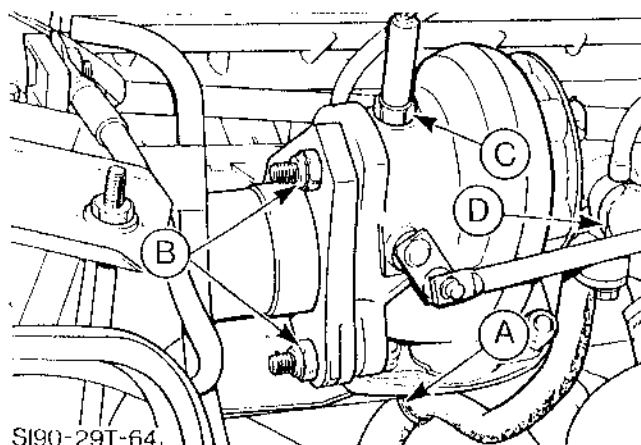


Fig.2. A - Turbocharger sump connection
B - Turbocharger to exhaust system nuts
C - HEGO sensor ('83 US vehicle only)
D - Coolant outlet pipe

23 612 0

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To Install

17. Reposition turbocharger assembly onto exhaust manifold and tighten nuts to specification.
18. Reposition exhaust manifold with Turbocharger connected into vehicle, ensuring new manifold gaskets are used and oil return pipe at sump connection is made (refer to Fig.3).
19. Reconnect turbocharger engine coolant feed pipe from thermostat housing.
20. Reconnect engine coolant return pipe from turbocharger.
21. Reconnect HEGO sensor ('83 US vehicles only).
22. Reconnect and torque oil pressure hose to turbocharger to specification (see page 2), refer to Fig.4.
23. Reconnect bottom induction hose from intercooler to turbocharger.
24. Reconnect both solenoid control valve hoses from turbocharger and actuator.
25. Reconnect top heater hose from thermostat housing to heater assembly.
26. Reconnect induction hose from air cleaner, bypass valve and turbocharger assembly.
27. Refit alternator and bracket assembly to engine. Reconnect electrical connections and both alternator drive belts.
28. Reposition exhaust down pipe loosely into exhaust system.
29. Reconnect exhaust system to turbocharger assembly (3 nuts) and torque to specification, refer to Fig.2.
30. Realign exhaust system and tighten into position.
31. Fill cooling system to 'max' mark.
32. Reconnect battery earth cable.
33. Check waste gate valve setting and adjust rod as necessary (see Repair Operation 23 601 0 on page 19).
34. Following completion of Repair Operation No. 23 601 1, refit turbocharger heat shield.

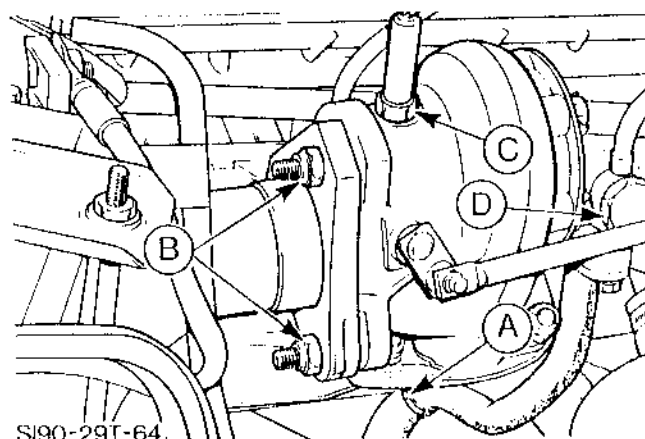


Fig.3. A - Turbocharger sump connection
B - Turbocharger to exhaust system nuts
C - HEGO sensor ('83 US vehicle only)
D - Coolant outlet pipe

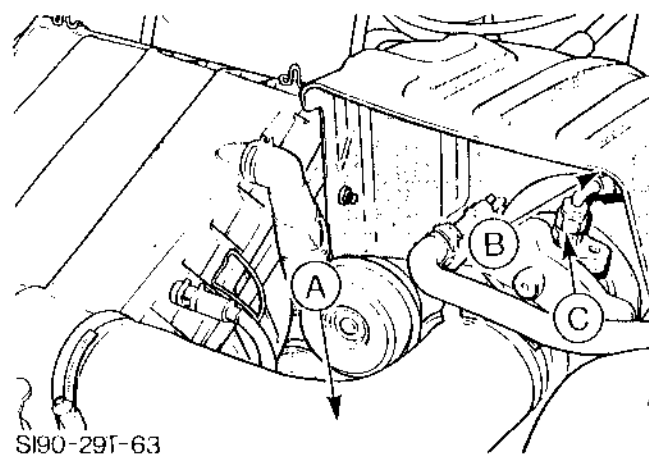


Fig.4. A - Induction hose
B - Heatshield
C - Oil pressure hose connection

23 616 0 SOLENOID CONTROL VALVE - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Disconnect solenoid control valve multiplug, refer to Fig.1.
3. Disconnect three hoses from solenoid control valve assembly, refer to Fig.2.

For your assistance, below are listed the hose connections associated with the solenoid control valve assembly, refer to Fig.2.

W (W - waste gate) Air hose to turbocharger waste gate actuator from solenoid.

C (C - compressor) Air hose from turbocharger compressor housing to solenoid.

R (R - return) Air hose to air cleaner from solenoid.

4. Remove securing screws and lift off solenoid control valve from vehicle.

To Install

5. Reposition solenoid control valve and secure with both screws, refer to Fig.1.
6. Reconnect all three air hoses to solenoid control valve assembly.
7. Reconnect solenoid control valve multiplug.
8. Reconnect battery earth cable.
9. Start engine to ensure correct operation.

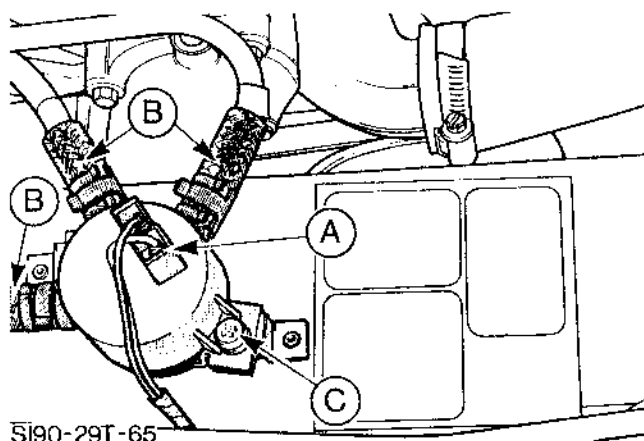
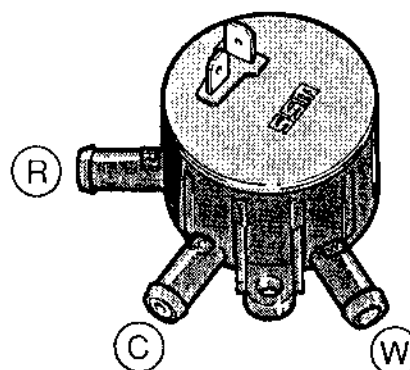


Fig.1. Solenoid control valve assembly.
A - Multiplug connection
B - 3 hose connections
C - Solenoid securing screw



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Fig.2. Solenoid control valve removed.

23 620 0 INTERCOOLER - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Disconnect solenoid control valve multiplug, 3 air hose connections and both assembly securing screws, refer to Fig.1.
3. Disconnect "by-pass" hose from top of intercooler and position to one side, refer to Fig.2.
4. Disconnect air hoses from left and right hand sides of intercooler.

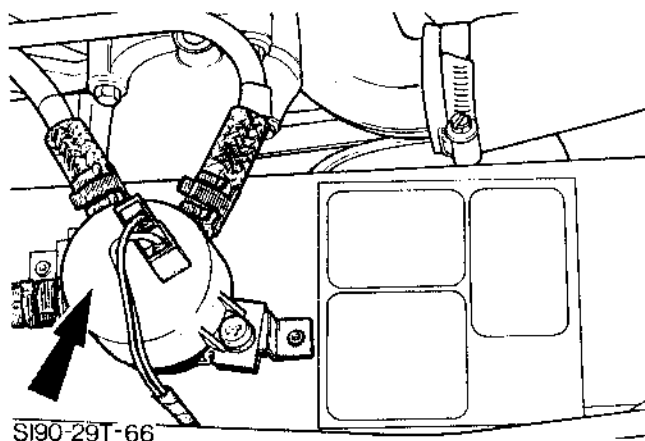
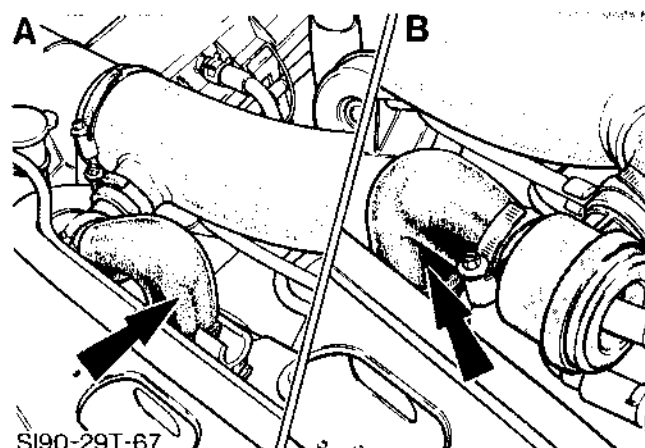
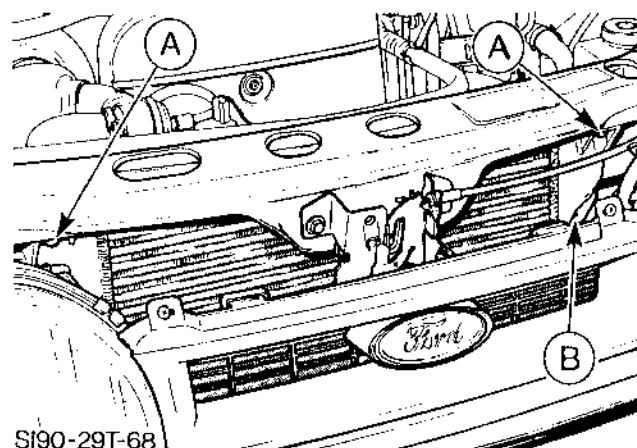


Fig.1. Solenoid control valve assembly.


Fig.2. A - 15:04 vehicle variant
B - 83 US vehicle variant

5. Remove air cleaner intake from intercooler body (1 plastic expansion rivet).
6. Remove 4 intercooler securing bolts and 2 nuts, refer to Fig.3 and Fig.4. This will allow intercooler assembly to be removed from vehicle.


Fig.3. Intercooler retaining nuts and bolts.
A - Outside top retaining bolts
B - Inside bottom nuts (one shown)

To Install

7. Position intercooler into vehicle and fasten with 4 bolts and 2 nuts, refer to Fig.4.

8. Reconnect air cleaner intake pipe to intercooler body (1 new plastic expansion rivet).

9. Reconnect air hoses to left and right hand side of intercooler.

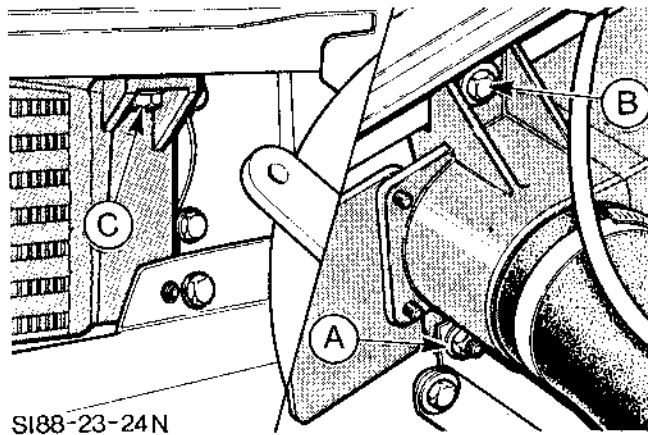
10. Reconnect "by-pass" hose into top of intercooler, refer to Fig.2.

11. Refit solenoid control valve with both securing screws.

12. Reconnect all 3 air hoses and multiplug connections.

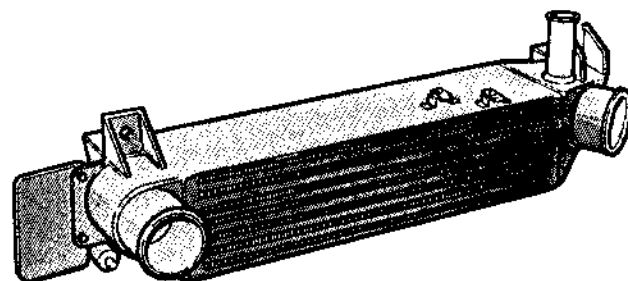
12. Reconnect battery earth cable.

14. Start engine to ensure correct operation.



SI88-23-24N

Fig.4. A - Bottom intercooler securing nuts
B - Top inside intercooler securing bolts
C - Top outside intercooler securing bolts



SI88-23-25N

T

Fig.5. Intercooler assembly.

25 250 0 CATALYST - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

NOTE: 83 US emission level vehicles only.

To Remove

1. Disconnect battery earth cable.
2. Raise vehicle on hoist.
3. Remove both nuts securing front flange of catalyst to exhaust system "downpipe", refer to Fig.2.
4. Remove both sets of nuts securing rear catalyst flanges to remainder of exhaust system.
5. Separate catalysts from exhaust system.

To Install

6. Clean all mating joints.
7. Loosely reposition catalysts back into exhaust system.
8. Align complete exhaust system and secure.
9. Lower hoist to ground.
10. Reconnect battery earth cable.
11. Start engine and check exhaust joints for leakage.

PRELIMINARY CATALYTIC CONVERTER

To Remove

1. Disconnect battery earth cable.
2. Remove 3 nuts from the Preliminary catalyst flange to turbocharger, refer to Fig.3.
3. Raise vehicle on hoist.
4. Remove both nuts securing catalysts to Preliminary catalyst, and lift away from vehicle, refer to Fig.3.

To Install

5. Refit Preliminary catalyst loosely to exhaust system.
6. Align exhaust system and tighten bolts to torques on page 2.
7. Lower vehicle to ground and reconnect battery.
8. Start engine and check joints for leakage.

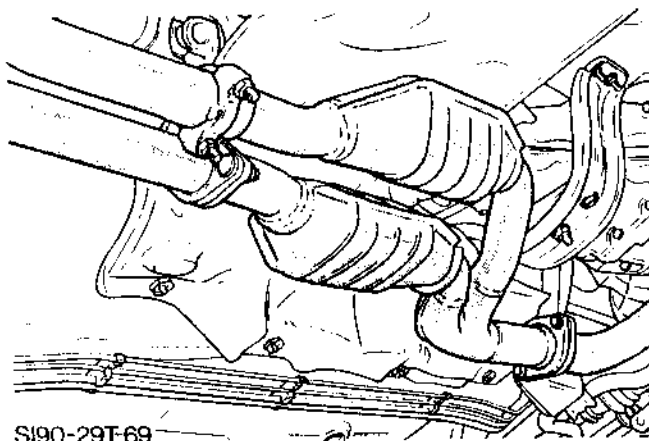


Fig.1. Catalyst section of exhaust system.

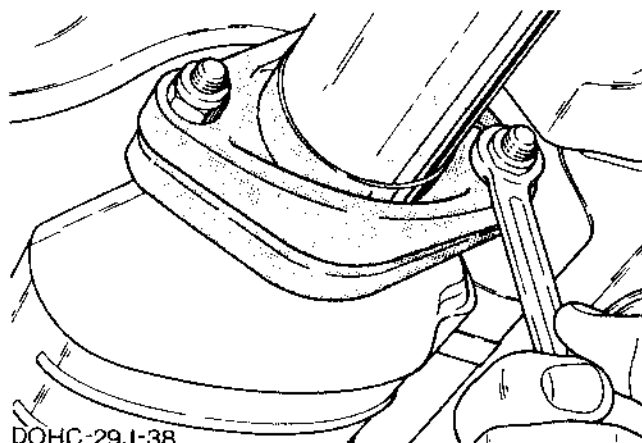


Fig.2. Remove bolts securing front and rear flanges of catalyst to exhaust system.

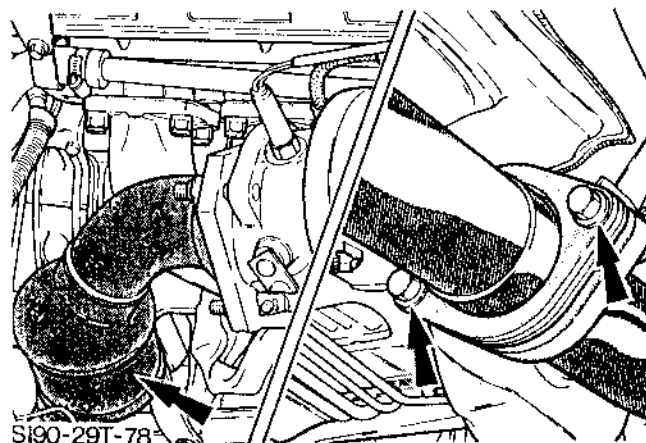


Fig.3. Preliminary catalytic converter.

29 200 0 CONTROL MODULE - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED:

- CO meter (15:04 vehicles)
- RPM meter (15:04 vehicles)
- L.E.D. tester (83 US vehicles)

NOTE: On Removal and Installation of Control Module, CO% must be checked on both 15:04 and '83 US vehicles. The procedures for '83 US emission level vehicles follows the control module removal and installation instruction below. For 15:04 emission level vehicles, CO% check and adjust is featured in 23 215 0 (page 11).

To Remove

1. Disconnect battery earth cable.
2. Open glove box on passenger side of vehicle.
3. Remove glove box assembly to allow access to the ECU module, refer to Fig.1.
4. Unclip ECU module from retaining bracket, refer to Fig.2.
5. Disconnect ECU multiplug by unclipping.

To Install

6. Refit multiplug to ECU module.
7. Position module into retaining bracket, ensuring bracket clips into position.
8. Refit glove box assembly.
9. Reconnect battery earth cable.

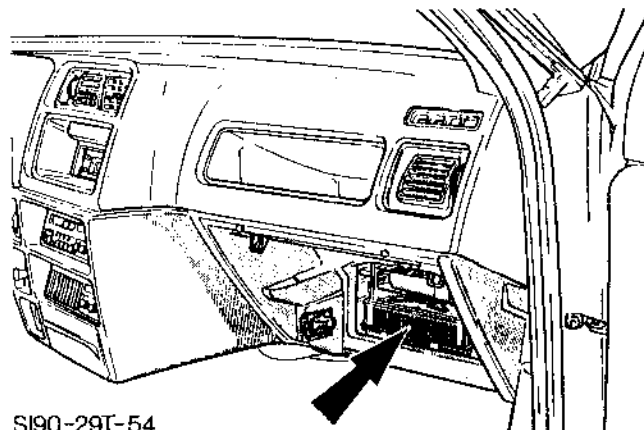
15:04 Emission Level Vehicles Only

The current CO% mixture check and adjust procedure featured in 23 215 0 (page 11), should be followed.

83 US Emission Level Vehicles Only

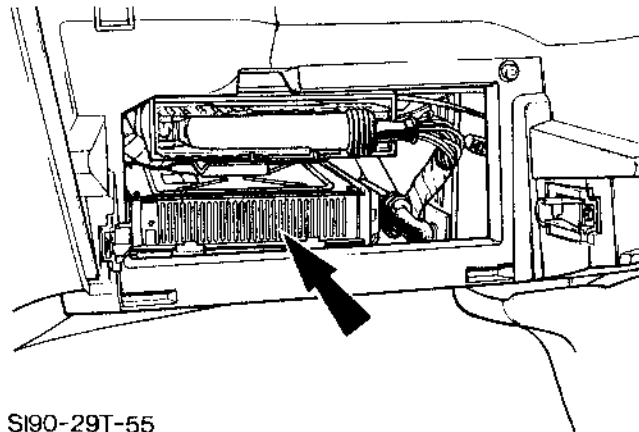
(applies to Sierra only, because there is no adjustment on Escort)

An L.E.D. tester (V. Lowener No. 0132060 or V.L. Churchill No. 0472060) must be used to achieve correct CO% check and adjustment. The procedure of which, is featured on page 29.



SI90-29T-54

Fig.1. ECU module location.



SI90-29T-55

Fig.2. Module positioned in retaining bracket.

CO₂ Check and Adjust Procedure (83 US only)

RS COSWORTH 4x4

1. Warm engine to normal operating temperature then switch 'off' engine.
2. Join L.E.D. tester to vehicle self-test connector (located next to ECU module, refer to Fig.1) with red lead of tester to battery positive terminal. Ensure on/off switch is in '0' position.

NOTE: The L.E.D. tester provides three functions:

- Fault diagnosis
- CO₂ check
- HEGO sensor operation

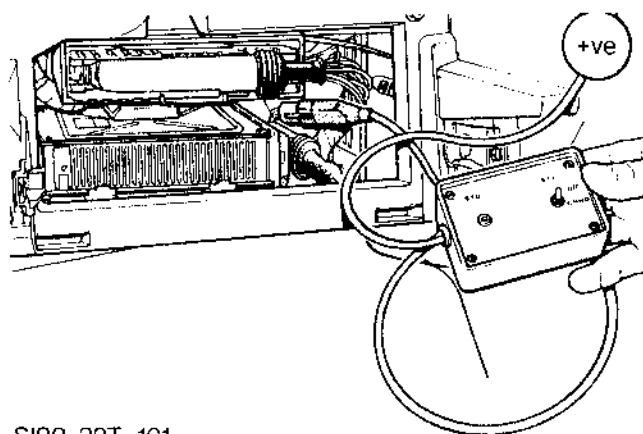
3. Start engine and allow to idle.

NOTE: Ensure that electric cooling fans are not running whilst watching and waiting for information to be forthcoming from L.E.D. tester, nor whilst moving CO₂ adjustment screw in or out of ECU module, during the course of this procedure. If they do activate, switch 'off' engine, wait for approximately 30 seconds (until fans have stopped running), then restart engine and commence procedure from the beginning again.

4. The indicator light on the L.E.D. tester should flash rapidly, which indicates that all is O.K. If the L.E.D. remains illuminated then a vehicle fault condition is evident, refer to page 32 of the Cosworth 4x4 Vehicle System test manual.
5. Move the switch on the L.E.D. tester to position '1' and observe the light (should be 'off' indicating that all is O.K. If not, refer to page 32 of the Cosworth 4x4 Vehicle System Test manual).
6. Return switch to position '0' on L.E.D. tester.
7. Return switch to position '1' on L.E.D. tester, then wait for approximately 10 seconds so that CO₂ can be checked and displayed by L.E.D.

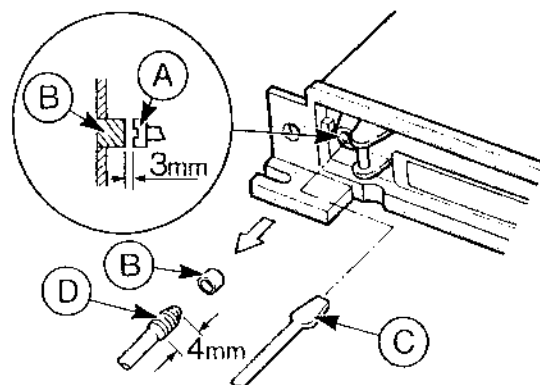
- If the light on the L.E.D. tester flashes rapidly, CO₂ is correct and no adjustment is required.
- If the light on the L.E.D. tester remains 'on', the CO₂ is rich and must be adjusted by turning the control module adjustment screw anti-clockwise (refer to Fig.2.), then 'blip' throttle and await L.E.D. response.
- If the light on the L.E.D. is not illuminated the CO₂ is lean and must be adjusted by turning the control module adjustment screw clockwise, (refer to Fig.2), then 'blip' throttle and await L.E.D. response.

NOTE: If the light flashes slowly at a constant rate this indicates that certain vehicle conditions are not correct, i.e. coolant not to normal operating temperature or engine idle speed not to specification. If CO₂ setting is completely lost and you are unable to adjust in line with correct specification, please refer to next page.



SI90-29T-101

Fig.1. L.E.D. tester connected to vehicle.



SI88-22-14

Fig.2. A - CO₂ adjustment screw
B - Tamperproof plug
C - Screwdriver
D - Tamperproof plug remover

If a 3-1 error code (HEGO sensor) is given by the L.E.D. tester, this does not necessarily mean that the HEGO sensor is faulty, but possibly "out of range" of adjustment. Should this occur or the CO% setting appears to be completely lost, carry out the action specified below:-

- With LED tester in position '0' and connected to engine (engine switched 'off'), turn ECU CO% adjustment screw 6 full turns Lean (anti-clockwise) then 2 turns Rich (clockwise) to mid point of range.
- Start engine. L.E.D. tester will now 'flash' rapidly, whilst in position '0'.
- Then switch 0-1 (to error code position), no codes should show (no flashing of L.E.D. should occur).
- Return switch to position '0' on L.E.D. tester.
- Return switch to position '1' on L.E.D. tester, then wait for approximately 10 seconds for an L.E.D. response. This will determine the engine operating CO% specification at the time, from which you can establish whether an adjustment is necessary.

NOTE: Ensure that electric cooling fans are not running whilst watching and waiting for information to be forthcoming from L.E.D. tester, nor whilst moving CO% adjustment screw in or out of ECU module, during the course of this procedure. If they do activate, switch 'off' engine, wait for approximately 30 seconds (until fans have stopped running), then restart engine and commence procedure from the beginning again.

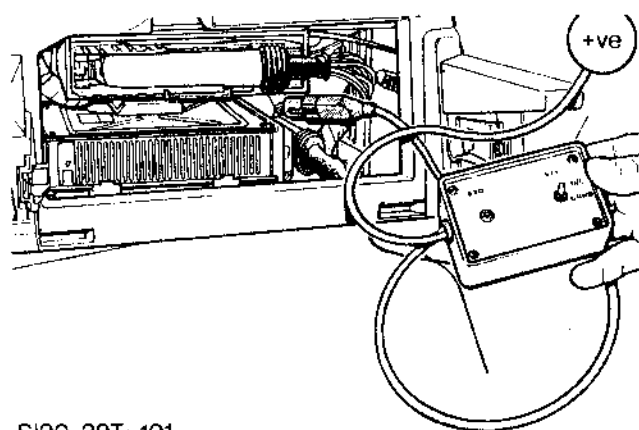
- Move CO% screw in $\frac{1}{2}$ a turn at a time to find either full Rich (light 'on'), full Lean (light 'off') or rapid flashing, confirming CO% is to correct specification.

Correct CO% specification is normally found to be about $\frac{1}{2}$ turn from mid point of range. 1 full turn away from mid point of tolerance band either way, will cause an "out of range" situation to occur (light flashing slowly).

- If the L.E.D. is then switched 0-1 for a further 10 seconds, HEGO operation will then be seen (light flashes 'on' and 'off' as HEGO operates - normally a slowish rate).

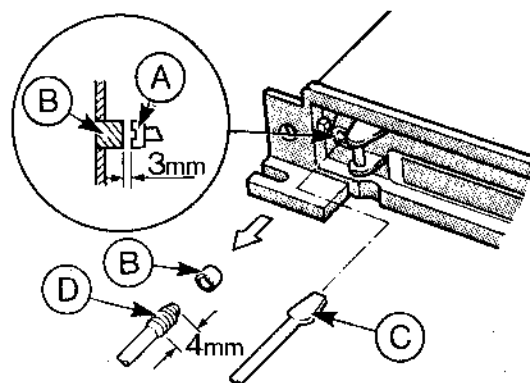
If L.E.D. is permanently 'on' or 'off', HEGO sensor or ECU module is not working properly.

NOTE: Following each "in Service" adjustment of the ECU module adjustment screw, the throttle must be depressed, allowing the engine speed to rise to 3,000 rpm momentarily. When returning to idle the true CO% can be registered and displayed by the LED tester.



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Fig.3. LED tester connected to vehicle.



SI88-22-14

Fig.4. A - CO% adjustment screw
B - Tamperproof plug
C - Screwdriver
D - Tamperproof plug remover

29 220 0 HEGO SENSOR - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

NOTE: 83 US emission level vehicles only

To Remove

1. Disconnect battery earth cable.
2. Remove both turbocharger heat shield securing bolts, refer to Fig.1.
3. Disconnect HEGO sensor multiplug, do not pull on wiring, refer to Fig.2.
4. Unscrew HEGO sensor from turbocharger assembly and remove, ensuring sealing ring is attached, refer to Fig.2.

To Install

5. Do not touch tip of HEGO sensor. Ensure HEGO sensor and turbocharger threads are clean.
6. Refit HEGO with new sealing ring. Tighten to specified torque, refer to Technical Data on page 2.
7. Refit multiplug, ensuring lock tabs "snap" into position.
8. Reconnect battery earth cable.
9. Start engine and check HEGO sensor joint for leaks.
10. Refit turbocharger heat shield and secure with both bolts.

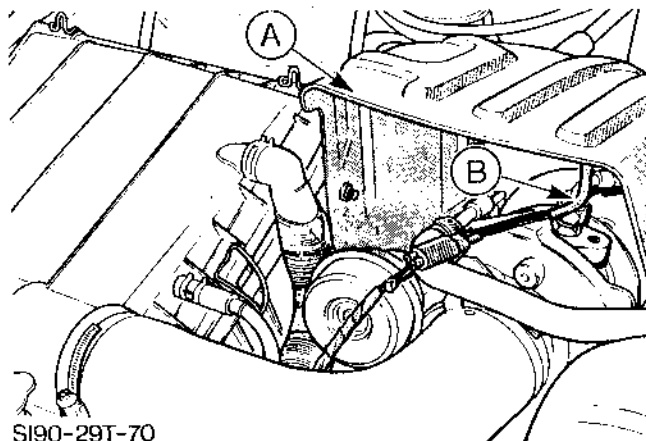


Fig.1. A - Turbocharger heat shield
B - HEGO sensor location

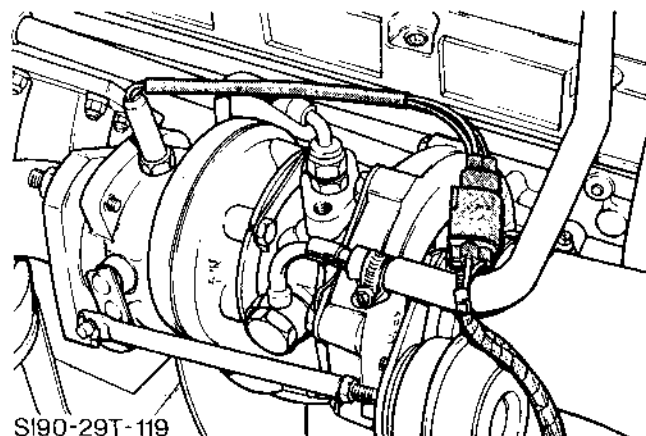
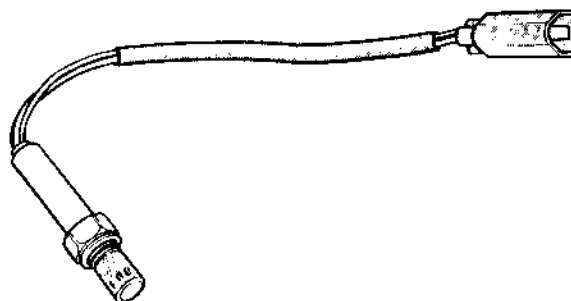


Fig.2. HEGO sensor location in turbocharger.



SI90-29T-120

Fig.3. HEGO sensor assembly.

29 222 0 KNOCK SENSOR - REMOVE AND INSTALL

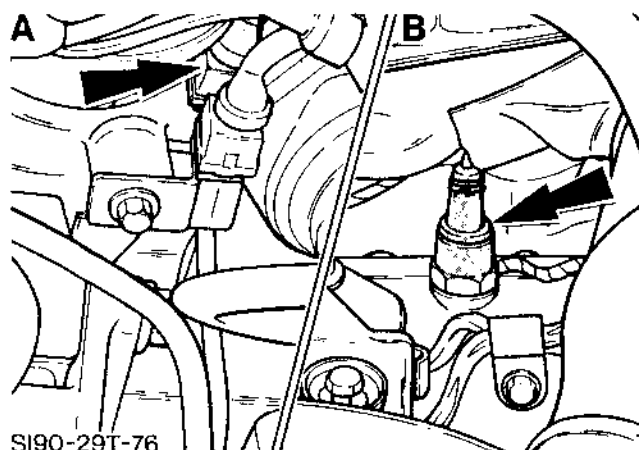
SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Disconnect knock sensor multiplug, which is located next to distributor (transmission side of distributor), refer to Fig.1.
3. Carefully guide wiring loom from its routing as it runs to opposite side of engine to knock sensor location.
4. Unscrew knock sensor from engine.

To Install

5. Reposition, screw and tighten knock sensor into engine block, ensuring that wiring loom does not become twisted and sustain internal damage.
6. Route wiring loom from knock sensor around the engine to its multiplug connection point with the main engine loom by the distributor and reconnect, refer to Fig.1.
7. Reconnect battery earth cable.
8. Start engine to ensure correct operation.



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Fig.1. A - Knock sensor multiplug
(distributor side of engine)
B - Knock sensor
(turbocharger side of engine)

29 224 0 SENSOR - MANIFOLD ABSOLUTE PRESSURE -
REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Remove three retaining bolts securing sensor to bracket (sensor positioned on underside of bracket), refer to Fig.1.
3. Disconnect manifold absolute pressure sensor multiplug.
4. Cut "off" existing hose clip and remove vacuum pipe from sensor, refer to Fig.2.

To Install

5. Refit vacuum pipe, using a new hose clip.
6. Reconnect manifold absolute pressure sensor multiplug.
7. Reposition sensor to underside of bracket and secure with three bolts.
8. Reconnect battery earth cable.
9. Start engine to ensure correct operation.

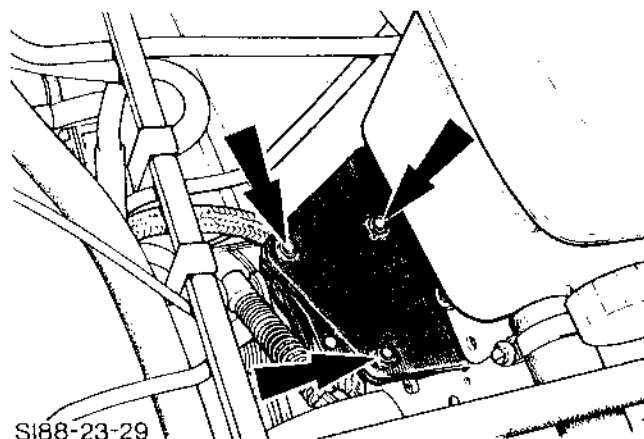


Fig.1. Sensor securing bolts.
(Remove from underside of bracket).

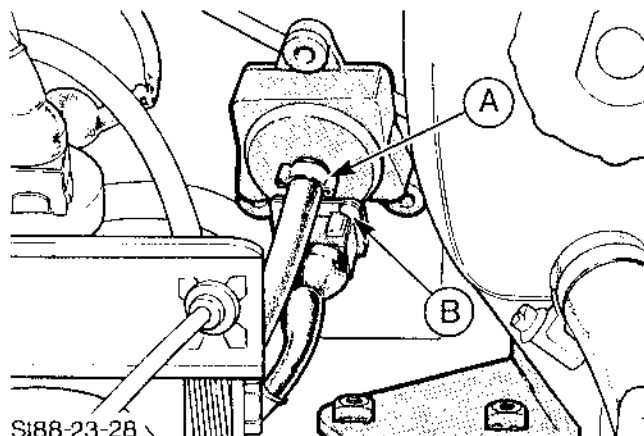


Fig.2. A - Vacuum pipe connection
B - Sensor multiplug

29 250 0 CARBON CANISTER - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

NOTE: 83 US emission level vehicles only.

To Remove

1. Disconnect battery earth cable.
2. Remove both turbocharger heat shield bolts to allow access to the Carbon Canister assembly.
3. Detach canister plastic pipe connector (push fit into canister assembly), refer to Fig.2.
4. Remove retaining bolt and "lift out" canister assembly, refer to Fig.2.

To Install

5. Refit canister assembly into its location and secure with retaining bolt.
6. Refit canister plastic pipe connector (push in), refer to Fig.2.
7. Refit turbocharger heat shield and secure with both bolts.
8. Reconnect battery earth cable.

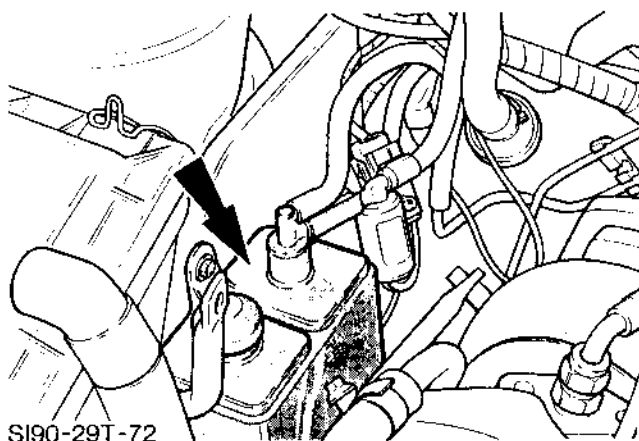


Fig.1. Carbon canister assembly and location.

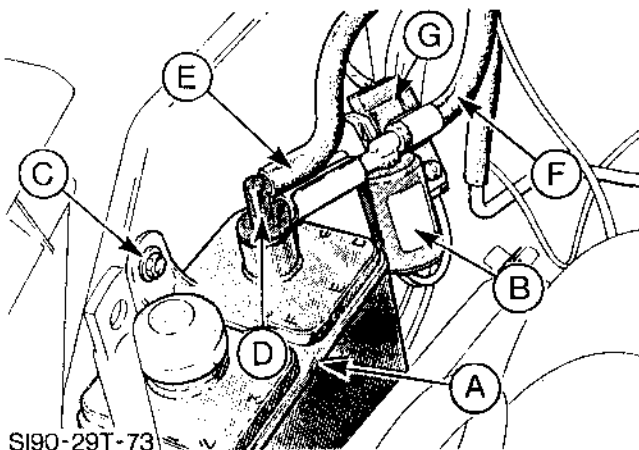


Fig.2. A - Carbon canister
B - Solenoid assembly
C - Canister retaining bolt
D - Canister pipe connector
E - Canister purge line from tank
F - Canister purge line to engine
G - Solenoid multiplug connector

29 622 0 AIR CHARGE TEMPERATURE SENSOR -
REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Disconnect multiplug from air charge temperature sensor, refer to Fig.1.
3. Remove sensor from plenum chamber of engine, refer to Fig.1.

To Install

4. Refit sensor into plenum chamber of engine, refer to Fig.1.
5. Tighten sensor to specified torque, see Technical Data on page 2.
6. Reconnect sensor multiplug.
7. Reconnect battery earth cable.
8. Start engine to ensure correct operation.

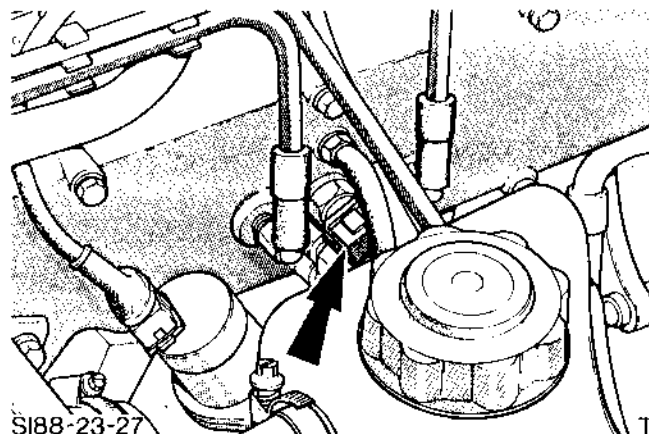


Fig.1. Air charge temperature sensor multiplug.

33 577 0 SWITCH - FUEL SHUT OFF -
REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

To Remove

1. Disconnect battery earth cable.
2. Remove spare wheel and cover from vehicle.
3. Locate inertia switch mounted in spare wheel well, refer to Fig.1.
4. Remove both screws securing inertia switch to bracket located in spare wheel body recess, refer to Fig.2.
5. Disconnect multiplug from switch, do not pull on wiring.

To Install

6. Reconnect multiplug to switch, ensuring that locking tabs "snap" into position.
7. Refit switch into its location and secure with both screws.
8. Ensure inertia switch is reset by pushing button down on top of switch assembly, refer to Fig.2.
9. Reposition spare wheel and cover into vehicle.
10. Reconnect battery earth cable.
11. Start engine to ensure switch is operating correctly.

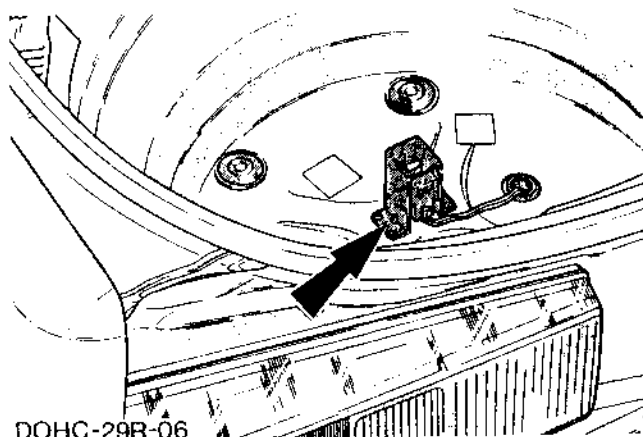
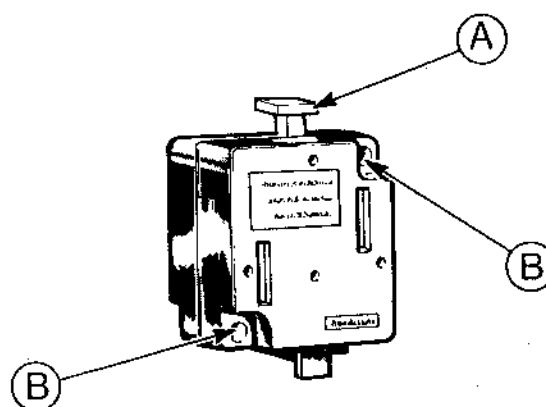


Fig.1. Inertia switch location.



VE6-29B-01

Fig.2. A - Inertia switch reset button
B - inertia switch securing points

33 772 0 SOLENOID CANISTER PURGE - REMOVE AND INSTALL

SPECIAL SERVICE TOOLS AND EQUIPMENT REQUIRED: NONE

NOTE: 83 US emission level vehicles only.

To Remove

1. Disconnect battery earth cable.
2. Disconnect solenoid multiplug, do not pull on wiring, refer to Fig.1.
3. Disconnect both pipes from canister purge solenoid. Remove solenoid assembly from its location, refer to Fig.2.

To Install

4. Refit both pipes to canister purge solenoid.
5. Reconnect multiplug, ensuring locking tab "snaps" into position.
6. Reconnect battery earth cable.
7. Start engine to ensure correct operation.

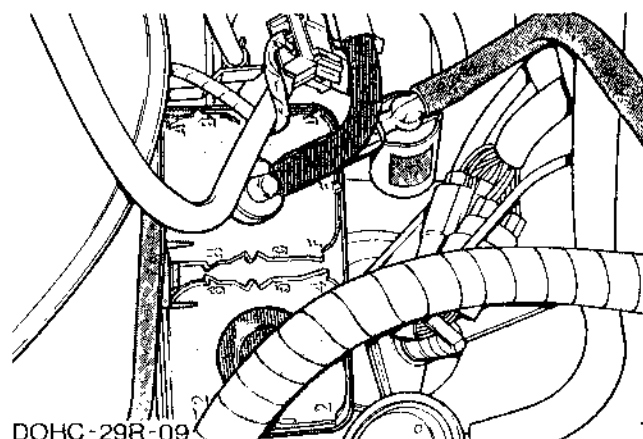


Fig.1. Canister purge solenoid and location.

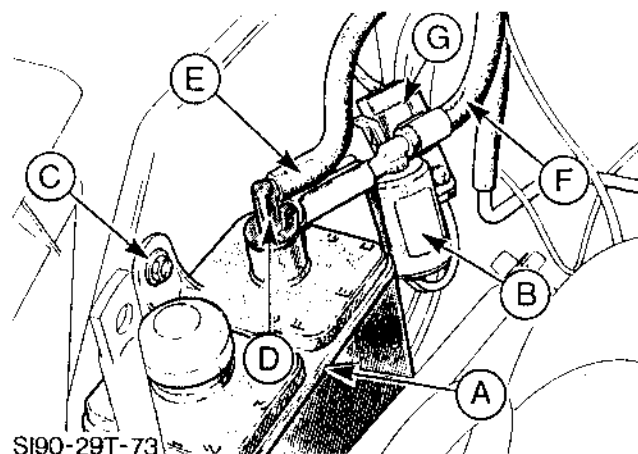


Fig.2. A - Carbon canister
B - Solenoid assembly
C - Canister retaining bolt
D - Canister pipe connector
E - Canister purge line from tank
F - Canister purge line to engine
G - Solenoid multiplug connector

