SECTION 5E1

ANTILOCK BRAKE SYSTEM

CAUTION: To help avoid personal injury due to poor braking, DO NOT tap into the vehicle's brake system to operate a trailer brake system.

NOTICE: When fasteners are removed, always install them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reusable, and those requiring thread-locking compound will be called out. The correct fastener tightening specification must be used when installing fasteners. If the above conditions are not followed, system damage could result.

NOTICE: The use of rubber hoses or parts other than those specified for the Antilock Brake System (ABS) may lead to functional problems requiring replacement of the hydraulic parts. Replace all components included in repair kits used to service this system. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any hydraulic component is removed or brake line disconnected, it is necessary to bleed the entire brake system. The fastener tightening specifications specified are for dry, unlubricated fasteners.

NOTICE: Use only Supreme 11 (GM 1052542) or equivalent DOT 3 brake fluid. The use of DOT 5 (silicone) brake fluid is not recommended. Reduced braking performance or durability may result.

NOTICE: Avoid spilling brake fluid on any of the vehicle's painted surfaces, wiring, cables or electrical connectors. Brake fluid will damage paint and electrical connections. If any fluid is spilled on the vehicle, flush the area with water to lessen the damage.

DELCO CHASSIS ABS VI TECHNICAL ASSISTANCE

For 1994 model year, Delco Chassis Division has an ABS VI field service plan in place. This plan has been developed to improve customer satisfaction. The plan is set up to help Delco Chassis understand each field malfunction and to allow us to obtain all of the failed components back for detailed analysis. With this direct field contact, we are able to continuously improve our ABS system components.

The plan consists of a Technical Assistance Hotline, staffed by Delco Chassis personnel, that you must phone to create a technical assistance case or to order parts for some ABS VI malfunctions. Please be prepared to provide specific diagnostic trouble code information, VIN and dealer code when phoning for a part or for assistance. **The phone number is 1-800-523-0203.**

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GENERAL DESCRIPTION

ABBREVIATIONS/DEFINITIONS

Several abbreviations are commonly used throughout this section. They are presented here for reference.

ABS	Antilock Brake System
B +	Battery Voltage
CKT	Circuit
CPA	Connector Position Assurance
DLC	Data Link Connector
DTC	Diagnostic Trouble Codes
DVM	Digital Multimeter
EBCM	Electronic Brake Control Module
ESB	Expansion Spring Brake
Infinite	Open Circuit/Unmeasurably High Resistance
MSC	Mass Storage Cartridge

BASIC KNOWLEDGE REQUIRED

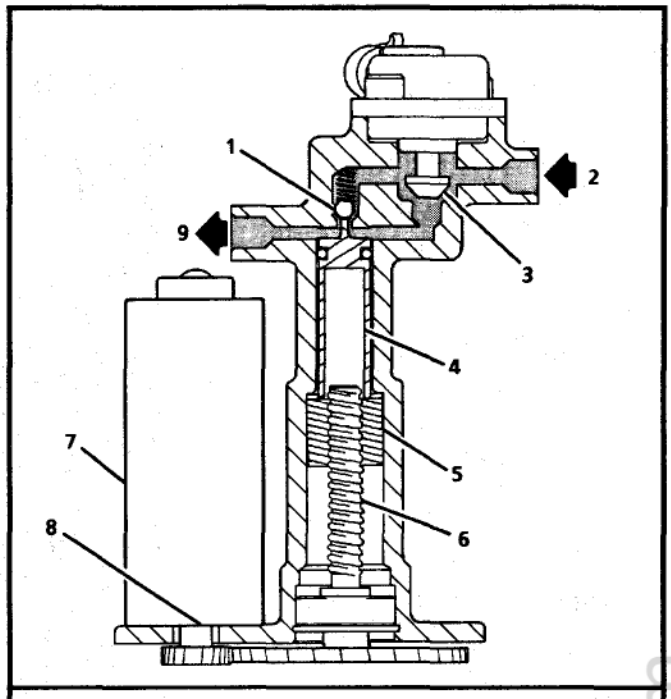
Before using this section, it is important that you have a basic knowledge of the following items. Without this basic knowledge, it will be difficult to use the diagnostic procedures contained in this section.

If you need a review of basic electrical troubleshooting knowledge, SECTION 8A contains helpful information in the introduction. Basic use of circuit testing tools is also covered in SECTION 8A. Additionally, electrical/electronic courses are offered through General Motors Service Training.

- Basic Electrical Circuits - You should understand the basic theory of electricity and know the meaning of voltage, current (amps) and resistance (ohms). You should understand what happens in a circuit with an open or shorted wire. You should be able to read and understand a wiring diagram.
- Use of Circuit Testing Tools - You should know how to use a test light and how to use jumper wires to bypass components to test circuits. You should be familiar with the High Impedance Multimeter (DVM) J 39200. You should be able to measure voltage, resistance and current and be familiar with the meter controls and how to use them correctly.

Important

- When measuring the resistance to ground of a circuit or component, make sure to use a solid, unpainted chassis ground or the negative battery terminal.



1 CHECK VALVE OPEN
2 BRAKE PRESSURE FROM COMBINATION VALVE
3 OPEN SOLENOID
4 PISTON
5 BALL SCREW NUT
6 BALL SCREW SPINDLE
7 ABS MOTOR PACK
8 EXPANSION SPRING BRAKE (ESB)
9 BRAKE PRESSURE TO FRONT BRAKE

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Figure 1 - Front Base Braking Mode

SYSTEM OPERATION

Base Braking Mode

Under normal operating conditions, the brake systems will operate using conventional braking by means of brake pedal force, the vacuum booster, and the compact master cylinder. Each front channel consists of a motor, solenoid, ESB, ball screw, piston, and check valve. As illustrated in Figure 1, under normal operating conditions (base brakes), the piston is held in the upmost (or "home") position and the solenoid is open (not energized). This is accomplished by turning the ball screw via the motor to drive the nut upwards. Once at the upmost position, the piston is held by an Expansion Spring Brake (ESB). Two paths are available to transfer braking pressure to the wheel: (1) through the modulator, around the check valve, and out to the wheel, (2) through the modulator, past the normally open solenoid, and out to the wheel.

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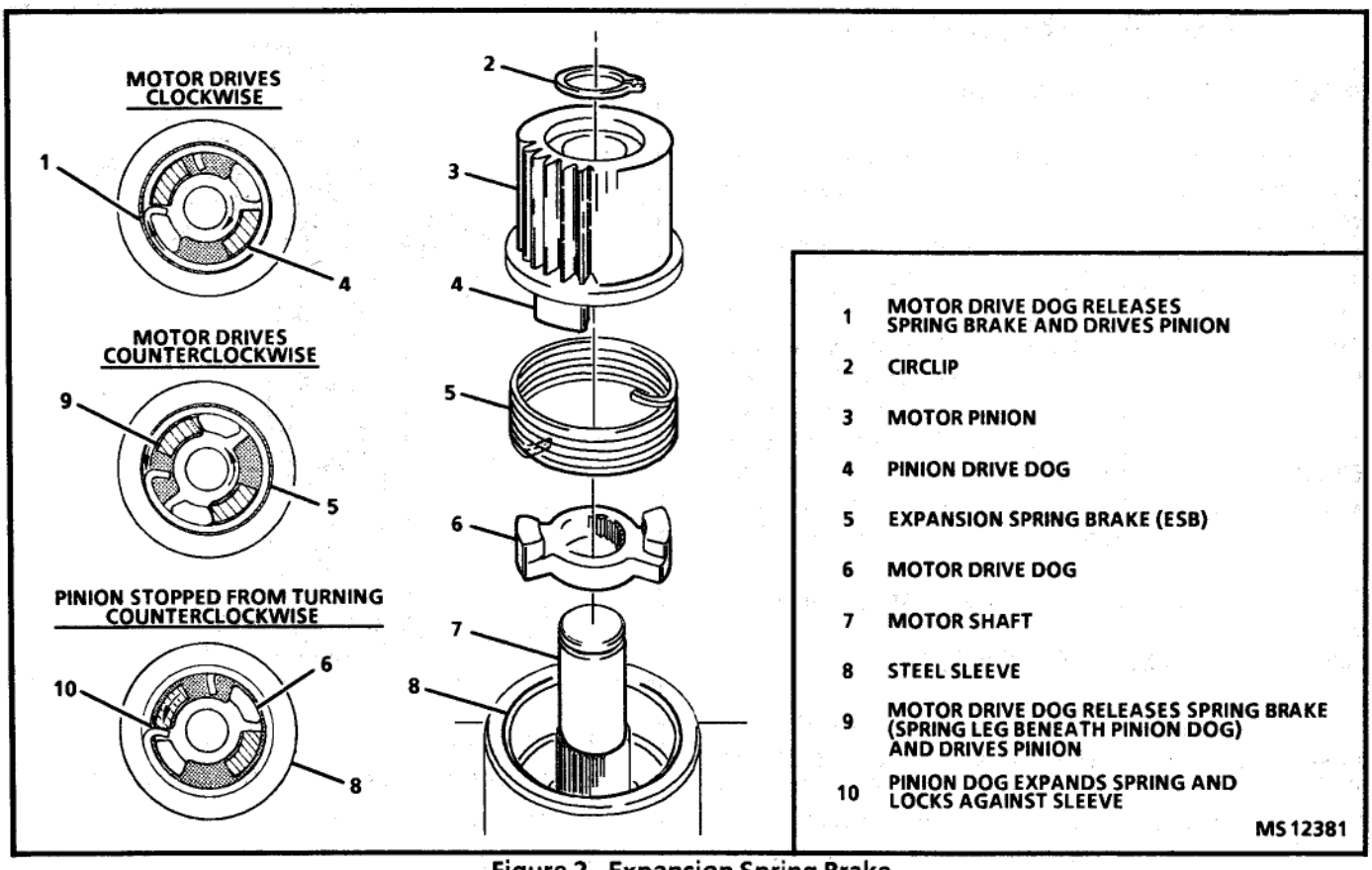


Figure 2 - Expansion Spring Brake

The solenoid in the front circuits provides an alternate brake pressure path to the wheel. With this arrangement, if the ABS were to lose power or malfunction with the piston not in its home position, a redundant brake fluid path is available. Refer to Figure 1.

The rear channels operate in a similar manner except no solenoid exists.

Antilock Braking Mode

ABS VI has been designed to improve the controllability and steerability of a vehicle during braking. ABS VI accomplishes this objective by controlling the hydraulic pressure applied to each wheel brake. Antilock braking occurs only when the brake switch is closed and a microprocessor, located in the EBCM, determines one or more wheels is about to lose traction during braking. The EBCM will then allow the hydraulic modulator to change the brake pressures several times each second to keep the wheel(s) from locking and provide the driver with maximum vehicle controllability. ABS VI CANNOT INCREASE THE BRAKE PRESSURE ABOVE THE MASTER CYLINDER PRESSURE APPLIED BY THE DRIVER, AND CANNOT APPLY THE BRAKES BY ITSELF.

The result is greatly improved braking, enabling the driver to more easily maintain steerability and to bring the vehicle to a controlled stop. ABS VI provides effective braking and directional control over a wide range of road surfaces and driving conditions.

If any wheel(s) begins to approach lock-up, the EBCM will control the three (3) motors and two (2) solenoids, appropriately, to control brake pressure to the affected wheel(s). During front wheel ABS operation, the solenoids are turned "ON" to isolate that brake pressure path to the wheel (see Figure 3). The EBCM then provides controlled current to the motors to regulate the speed and amount of movement. As the motors move backwards, the piston follows the nut downward, allowing the check valve to seat. The brake pressure to the wheel is now a function of the controlled volume within the piston chamber. To reduce brake pressure, the motor drives the nut further downward. To reapply or increase brake pressure, the motor drives the nut and piston upward. If ABS was entered during low brake pressure, such as on ice, and dry pavement is then encountered during reapply, the piston is driven all the way to the top. This results in the unseating of the check valve, and a return to base brakes until sufficient brake pressure exists to cause the wheel to approach lock-up again. At this point, the ABS cycle would start again. This process can occur in less than one second if the driver is pressing firmly on the brake pedal.

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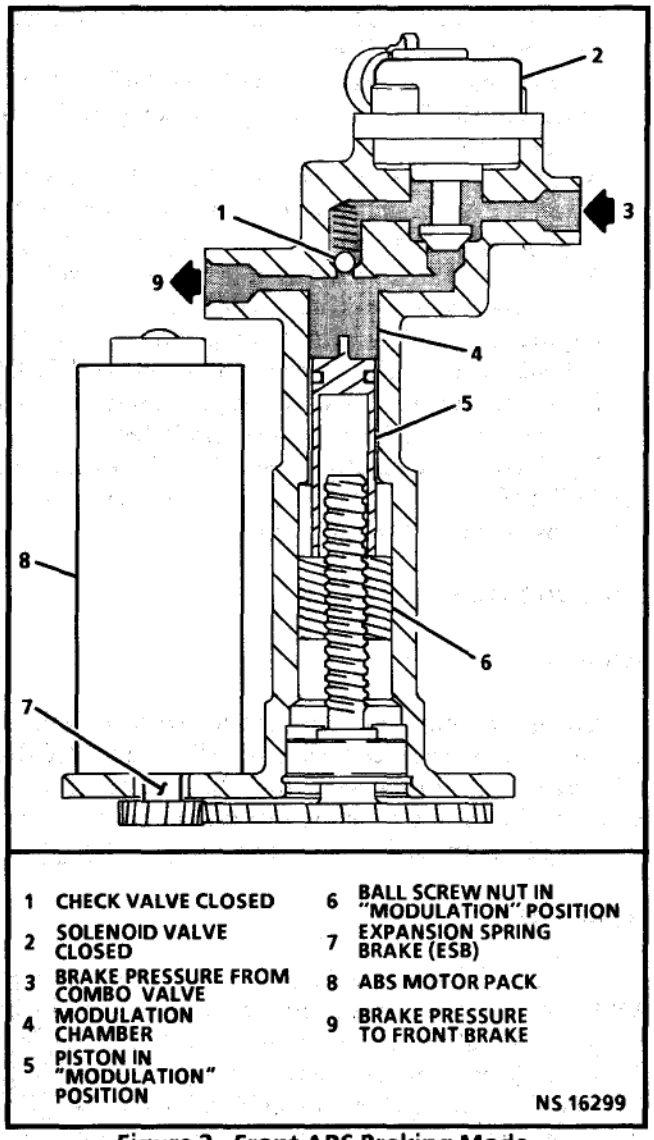


Figure 3 - Front ABS Braking Mode

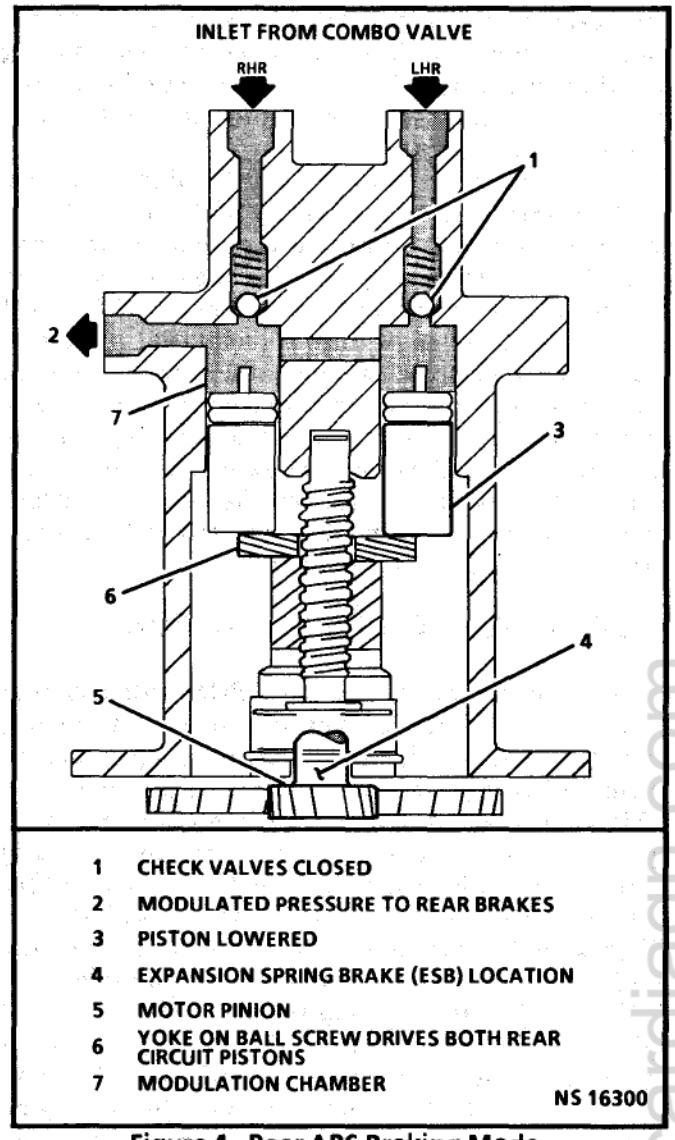


Figure 4 - Rear ABS Braking Mode

Total brake pressure during ABS is limited to the brake pressure present when ABS was entered. Also, anytime wheel brake pressure exceeds the brake pressure at the master cylinder (caused by reduced force on the brake pedal), the check valve unseats and a small volume of brake fluid is returned to the master cylinder. In this manner, ABS VI CANNOT INCREASE BRAKE PRESSURE ABOVE MASTER CYLINDER PRESSURE APPLIED BY THE DRIVER AND CANNOT APPLY THE BRAKES BY ITSELF. When ABS is no longer required, the pistons are returned to their upmost (or "home") position and are held by the ESBs (refer to "ESB Operation," found in this section). The solenoids on the front channels are simultaneously opened to again provide a redundant base braking path.

The rear channel operates in a similar manner except no solenoid is used (refer to Figure 4). Both rear brake pressures are controlled by the same motor and both rear brake pressures are controlled together. If either rear wheel begins to lock, brake pressure to both rear wheels is reduced to maximize vehicle stability.

There is no rear solenoid due to the nature of the braking system. The vast majority of braking is accomplished with the front brakes. If an ABS failure were to occur that affected the operation of the rear base brakes, a diagnostic trouble code would be stored and the EBCM would turn "ON" both the "ABS INOP" lamp and the "BRAKE" warning lamp.

ESB OPERATION

The Expansion Spring Brake (ESB) is used to hold the piston in the upmost (or "home") position. An ESB is a spring that is retained in a housing at a close tolerance. One end of the spring is in contact with the motor drive dog and the other end is in contact with the pinion drive dog (refer to Figure 2). In normal braking, brake pressure is present on the top of the piston, applying a downward force.

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The force applies a counterclockwise torque to the motor pinion which tries to rotate the spring counterclockwise. The counterclockwise torque expands the spring outward within the housing and prevents gear rotation.

When the motor is turned "ON" and tries to drive the ball screw nut, the end of the ESB in contact with the motor drive dog rotates inward causing the spring to contract in its housing allowing the motor to rotate the modulator gear (refer to Figure 2). The most common application of this principle is in window crank mechanisms, where a small amount of force on the crank handle allows the window to be lowered or raised, but the weight of the window or force on the window will not allow the window to move downward. For the ESB, brake pressure on the top of the pistons corresponds to the weight of the window and the motor corresponds to the window crank handle.

SYSTEM - SELF TEST (INITIALIZATION)

During initialization, the EBCM will not only perform self-diagnostics, but will also verify motor, modulator, solenoid, relay, and lamp operation to ensure all components are functioning properly. The EBCM also checks the wheel speed sensor circuitry for open circuits and shorts to ground or voltage at this time. If the EBCM detects a malfunction in either itself or other ABS VI components, it will store a Diagnostic Trouble Code (DTC) and turn "ON" the ABS warning lamp ("ABS INOP") if applicable. The "ABS INOP" warning lamp will be "ON" for about 3 seconds with the key in the "RUN" position. During cranking the ABS warning lamp will be "ON" and then remain "ON" for about 3 seconds after the engine starts. A slight mechanical noise may be heard during the system initialization, which is normal. The entire initialization is run about 2-3 seconds after the engine starts. If your foot is on the brake pedal when the engine is started, the system will not initialize until your foot is removed or 5 km/h (3 mph) is reached. If foot pressure on the pedal interrupts the system initialization, a slight movement in the pedal may be felt.

Warning Lamp Operation

Normal Lamp Operation

The standard brake system uses a single red "BRAKE" warning lamp located in the instrument panel cluster.

The antilock brake system uses the same red "BRAKE" warning lamp, an amber ABS warning lamp ("ABS INOP"), and an amber ABS active lamp ("LOW TRAC").

1. When the ignition is turned to the "RUN" position, the "ABS INOP", "LOW TRAC", and "BRAKE" lamps all turn "ON" for approximately three seconds, then turn "OFF."
2. As the engine is cranked, both the "ABS INOP" lamp and the "BRAKE" lamp will turn "ON" and remain "ON."
3. After the engine is started, the "ABS INOP", "LOW TRAC", and "BRAKE" lamps will be "ON" for approximately three seconds then turn "OFF."
4. Anytime the EBCM determines that the vehicle has entered a braking event where ABS is required, the "LOW TRAC" lamp will turn "ON" to indicate that ABS is active. The "LOW TRAC" lamp will remain "ON" for approximately 3 to 4 seconds after the ABS event is completed.

For further information regarding "ABS INOP", "LOW TRAC", and "BRAKE" lamp operation, refer to "Warning Lamps" in this section.

Tires and ABS

Spare Tire

Using the compact spare supplied with the vehicle will not affect the operation of ABS. The EBCM software can compensate for this smaller tire. However, increased stopping distances may occur due to reduced tire tread depth on compact spare tires.

Replacement Tires

Tire size is important for proper performance of the ABS. Replacement tires should be the same size load range and construction as the original tires. Replace tires in axle sets and only with tires of the same TPC (Tire Performance Criteria) specification number. Use of any other tire size or type may seriously affect the ABS operation. For more information on original equipment and replacement tires, refer to SECTION 3E.

SYSTEM COMPONENTS

The ABS VI Antilock Braking System (ABS) consists of a conventional hydraulic brake system plus antilock components. The conventional brake system includes a vacuum power booster, master cylinder, front disc brakes, rear disc or drum brakes, interconnecting hydraulic brake lines, low fluid sensor, and a red "BRAKE" warning lamp.

The ABS components include a hydraulic modulator/motor pack assembly, an Electronic Brake Control Module (EBCM), a system enable relay, three wheel speed sensors, interconnecting wiring, an amber ABS warning lamp, and an amber ABS active lamp (refer to Figure 5).

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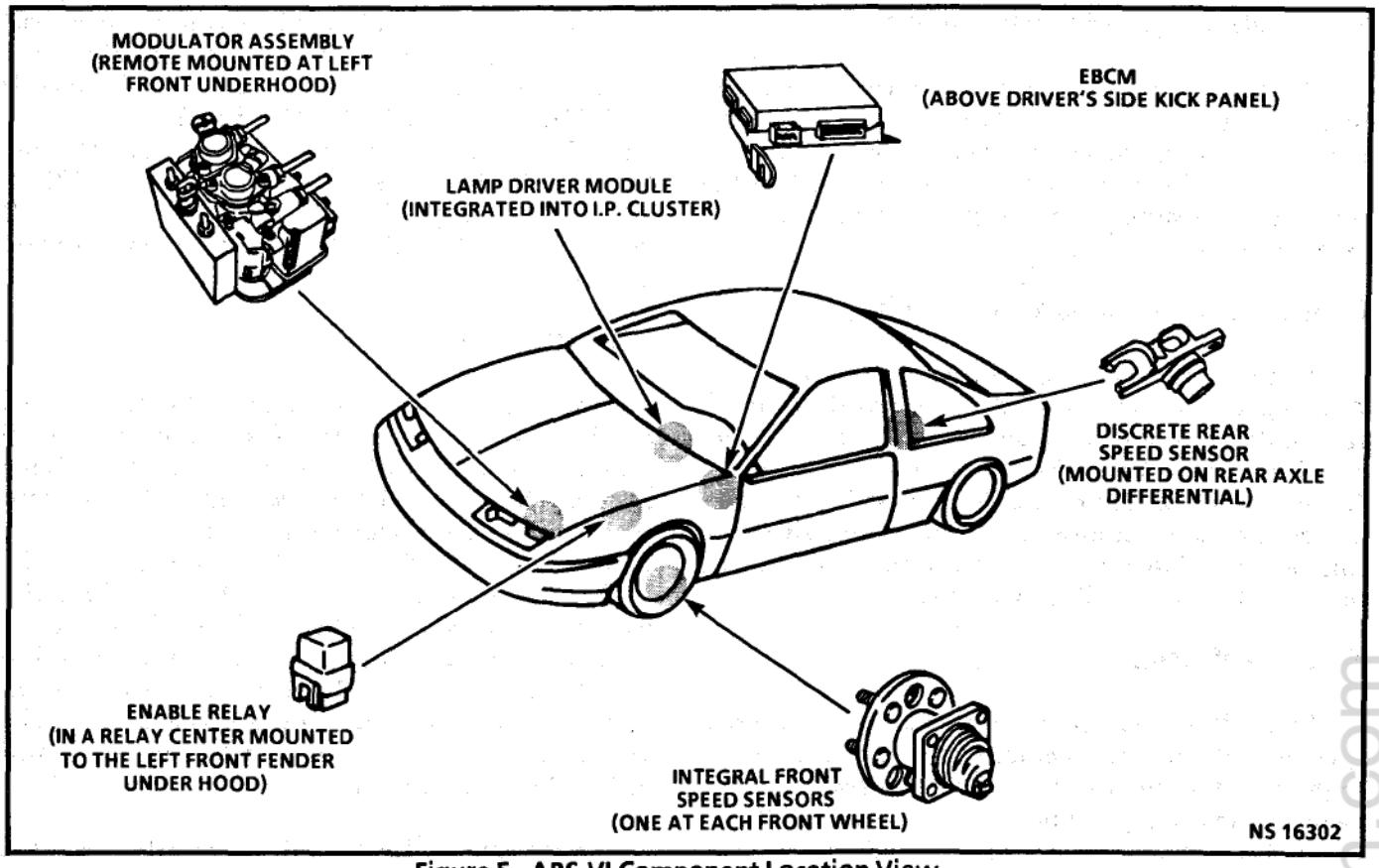


Figure 5 - ABS-VI Component Location View

Hydraulic Modulator/Motor Pack Assembly

The hydraulic modulator/motor pack assembly controls hydraulic pressure to the front calipers and rear wheel cylinders or calipers by modulating hydraulic pressure to prevent wheel lock-up. The basic hydraulic modulator configuration consists of gear subassemblies, ball screws, nuts, pistons, and hydraulic check valves. The motor pack consists of three motors, three drive gears, and three ESBs. For more information, refer to "Base Braking Mode" and "Antilock Braking Mode" in this section.

Electronic Brake Control Module (EBCM)

The controlling element of ABS VI is a microprocessor based Electronic Brake Control Module, or EBCM. Inputs to the system include three wheel speed sensors, the brake switch, ignition switch, and unswitched battery voltage. Outputs include three bidirectional motor controls, three lamp controls, two solenoid controls, and the system enable relay. A bidirectional serial data line, located in pin "M" of the Data Link Connector (DLC), is provided for service diagnostic tools and assembly plant testing.

The EBCM monitors the speed of each wheel. If any wheel begins to approach lock-up and the brake switch is "ON," the EBCM controls the motors and solenoids to reduce brake pressure to the wheel approaching lock-up. Once the wheel regains traction, brake pressure is increased until the wheel again begins to approach lock-up. This cycle repeats until either the vehicle comes to a stop, the brake is released, or no wheels approach lock-up. Additionally, the EBCM monitors itself, each input (except the serial data link) and each output for proper operation. If any system malfunction is detected, the EBCM will store a DTC in nonvolatile memory (DTCs will not disappear if the battery is disconnected). Refer to "Self-Diagnostics" in this section for more detailed information.

NOTICE: There is no serviceable or removable PROM. The EBCM must be replaced as an assembly.

Front Wheel Speed Sensors

The front wheel speed sensors consist of a variable reluctance sensor. The sensor and toothed ring are part of the hub and bearing assembly. As teeth pass by the sensor, an AC voltage with a frequency proportional to the speed of the wheel is generated. The magnitude of the voltage increases with increasing speed. The sensor is not repairable, nor is the air gap adjustable. The entire front bearing assembly must be replaced.

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Front Wheel Speed Sensor Rings

The front wheel speed sensor toothed rings are an integral part of the hub and bearing assembly. Like the front wheel speed sensors themselves, they are not serviceable. If a malfunction is detected in either the sensor or the toothed ring, the entire hub and bearing assembly must be replaced.

Rear Wheel Speed Sensor and Ring

A single rear wheel speed sensor is used for this ABS application and is located on the rear differential. It operates in the same manner as the front wheel speed sensors, refer to "Front Wheel Speed Sensors." However, the toothed ring is located within the rear differential and contains 106 equally spaced teeth. The sensor and toothed ring are not repairable and no provision for air gap adjustment exists.

ABS Enable Relay

The ABS enable relay is a normally-open contact type, and has special contact material to handle the high currents required for ABS VI operation. The relay allows battery voltage and current to be supplied to the EBCM, which supplies power to the motors and solenoids.

Brake Combination Valve

Refer to "Brake Combination Valve" in SECTION 5A.

Wiring Harness

The wiring harness is the mechanism by which the EBCM is electrically connected to power and ground, wheel speed sensors, motors, solenoids, fuses, switches, lamps, the enable relay and the serial communications port. The components, considered part of the wiring harness, are the wires that provide electrical interconnection and connectors/terminals that provide an electrical/mechanical interface from the wire to a system component.

Wheel Speed Sensor Jumper Harness

Between each wheel speed sensor and the main wiring harness is a jumper harness made up of highly flexible twisted pair wiring. This wiring exists because the main harness must connect to the suspension of the vehicle, thus the wiring in this area is subjected to the same motion as a spring or shock absorber. Consequently, any repair to this section of wiring will result in stiffening and therefore, eventual failure due to wire fatigue. For this reason, THE WHEEL SPEED SENSOR JUMPER HARNESSES ARE NOT REPAIRABLE AND MUST BE REPLACED. DO NOT ATTEMPT TO SOLDER, SPLICE, OR CRIMP THESE HARNESSES AS EVENTUAL FAILURE WILL LIKELY RESULT. Refer to "On-Vehicle Service" in this section.

Warning Lamps

The Electronic Brake Control Module (EBCM) continuously monitors itself and the other ABS components. If the EBCM detects a problem with the system, the "ABS INOP" lamp will either flash or light continuously (solid lamp) to alert the driver of the problem. The "ABS INOP" lamp will flash if the EBCM attempts to turn "ON" the red "BRAKE" warning lamp in conjunction with the "ABS INOP" lamp and is unable to do so. The lamp is flashed to warn the driver that an ABS malfunction exists which may have degraded base brake performance. The vehicle must be serviced immediately to regain full base and ABS braking ability.

CAUTION: The braking system may not be working properly if the "ABS INOP" lamp is flashing. Driving with a flashing "ABS INOP" lamp can lead to an accident. If the "ABS INOP" lamp is flashing, pull safely off the road and have the vehicle towed for service.

A solid "ABS INOP" lamp indicates that a problem has been detected that affects the operation of ABS. No antilock braking will be available. Normal, non-antilock brake performance will remain. In order to regain ABS braking ability, the ABS must be serviced.

The red "BRAKE" warning lamp will be illuminated when a low brake fluid level in the master cylinder is sensed, the parking brake switch is closed, the bulb test switch section of the ignition switch is closed, or under control of the EBCM when certain ABS DTCs are set. This lamp indicates to the driver a base brake problem may exist.

The "LOW TRAC" indicator lamp is used to alert the driver when ABS is active. Anytime the EBCM determines that the vehicle has entered a braking event where ABS is required, the "LOW TRAC" lamp will turn "ON" to indicate that ABS is active. The "LOW TRAC" lamp will remain "ON" for approximately 3 to 4 seconds after the ABS event is completed.

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Fuses and Fusible Links

The vehicle's power distribution system consists of fuses, fusible links, circuit breakers, and the ignition switch. Fusible links are short pieces of wire several sizes smaller than the circuit wire to which they supply power. They are covered with special high temperature insulation. When conducting an improperly high current flow, they will melt and stop current flow. They are designed to protect the vehicle's electrical system from electrical shorts in circuits that are not protected by circuit breakers or fuses. For fuse and fusible link locations, refer to SECTIONS 8A-10 and 8A-11.

DIAGNOSIS-ELECTRICAL

DIAGNOSTIC PROCESS

When servicing the ABS, the following steps should be followed in order. Failure to follow these steps may result in the loss of important diagnostic data and may lead to difficult and time-consuming diagnosis procedures:

1. Perform a vehicle preliminary diagnosis inspection. This should include:
   - Inspection of the master cylinder fluid reservoir for proper brake fluid level and signs of contamination.
   - Inspection of the hydraulic modulator for any leaks or wiring damage.
   - Inspection of brake components at all four wheels. Verify no drag exists. Also, verify proper brake apply operation.
   - Inspection for worn or damaged wheel bearings that may allow a wheel to "wobble."
   - Inspection of the wheel speed sensors and their wiring. Verify proper solid sensor attachment, undamaged sensor toothed ring, and undamaged wiring, especially at vehicle attachment points.
   - Verify proper outer CV joint alignment and operation.
   - Verify tires meet legal tread depth requirements.
2. Perform "Diagnostic System Check" found in this section. If any DTCs are displayed, select "F1: DTC History" to note the last malfunction that occurred. Diagnose and repair this malfunction first.
3. If no DTCs are present, or mechanical component malfunctions are present, or if the failure is intermittent and not reproduceable, test drive the vehicle while using the automatic snapshot feature of the Tech 1. Perform normal acceleration, stopping, and turning maneuvers. If this does not reproduce the malfunction, perform an ABS stop, on a low coefficient surface such as gravel, from approximately 48-80 km/h (30-50 mph) while triggering the snapshot mode on any ABS DTC. If the failure is still not reproduceable, use the enhanced diagnostic information found in DTC HISTORY to determine whether or not this malfunction should be diagnosed further based on frequency of failure. Refer to "Enhanced Diagnostics" found in this section.
4. Once all system malfunctions have been corrected, clear the ABS DTCs.

SELF-DIAGNOSTICS

The EBCM contains sophisticated on-board diagnostics that, when accessed with a Tech 1 or T-100 (this service manual is written for the use of Tech 1), are designed to identify the source of any system malfunction as specifically as possible, including whether or not the malfunction is intermittent. There are 53 diagnostic trouble codes to assist with diagnosis.

When using the Tech 1 with ABS VI, the last diagnostic trouble code is specifically identified, and specific ABS data is stored at the time of this malfunction. Also, in addition to the last DTC set, there is information about the first five DTCs set. Using the Tech 1, each input and output can be monitored, thus enabling malfunction confirmation and repair verification. Manual control of components and automated functional tests are also available when using the Tech 1. Details of many of these functions are contained in the following sections.

DISPLAYING DIAGNOSTIC TROUBLE CODES (DTCs)

Diagnostic trouble codes can be read through the use of the Tech 1 scan tool. There are no provisions for "Flash Code" diagnostics.

CLEARING DIAGNOSTIC TROUBLE CODES (DTCs)

The DTCs in EBCM memory are erased in one of two ways:

1. Tech 1.
2. Ignition cycle default.

These two methods are detailed below. Be sure to verify proper system operation and absence of DTCs when the clearing procedure is completed.

The EBCM will not permit DTC clearing until all DTCs have been displayed. Also, DTCs cannot be cleared by unplugging the EBCM, disconnecting the battery cables, or turning the ignition "OFF" (except on an ignition cycle default).

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Tech 1 Method

Select "F2: DTC(s)" for diagnostic trouble codes. After DTCs have been viewed completely, Tech 1 will ask, "CLEAR DTCs"?; answer "YES." Tech 1 will then read, "HISTORY DATA WILL BE LOST. CLEAR DTCs"? Answer "YES" and DTCs will be cleared.

Ignition Cycle Default

If no diagnostic trouble codes occur for 100 drive cycles [a drive cycle occurs when the ignition is turned "ON" and the vehicle is driven faster than 16 km/h (10 mph)], any existing DTCs are automatically cleared from the EBCM memory.

INTERMITTENTS AND POOR CONNECTIONS

As with most electronic systems, intermittent malfunctions may be difficult to accurately diagnose. The following is a method to try to isolate an intermittent malfunction, especially wheel speed circuitry.

If an ABS malfunction occurs, the ABS warning lamp will be "ON" during the ignition cycle in which the malfunction was detected. If it is an intermittent problem which seems to have corrected itself (ABS warning lamp "OFF"), a diagnostic trouble code will be stored. Also stored will be the history data of the DTC at the time the malfunction occurred. The Tech 1 must be used to read DTC history data.

Most intermittents are caused by faulty electrical connections or wiring. Refer to "Intermittents and Poor Connections" in SECTION 8A-4 for a very detailed explanation of how to locate and repair intermittent conditions.

TECH 1 DIAGNOSTICS

The Tech 1, when plugged into the DLC, becomes part of the vehicle's electronic system. The Tech 1 can perform the following functions:

- Display ABS data.
- Display and clear ABS diagnostic trouble codes.
- Control ABS components.
- Perform extensive ABS diagnosis.
- Provide diagnostic testing for intermittent ABS conditions.

Each test mode has specific diagnosis capabilities which depend upon various keystrokes. In general, five keys control sequencing: "YES," "NO," "EXIT," up arrow and down arrow. The F0 through F9 keys select operating modes, perform functions within an operating mode, or enter DTC or model year designations.

In general, the Tech 1 has six test modes for diagnosing the ABS. The six test modes are as follows:

- **MODE F0: DATA LIST** - In this test mode, the Tech 1 continuously monitors wheel speed data, brake switch status and other inputs and outputs.
- **MODE F1: DTC HISTORY** - In this mode, DTC history data is displayed. This data includes how many ignition cycles since the DTC occurred, along with other information for the last DTC set. The first five and last DTC set are included in the DTC history data.
- **MODE F2: DIAGNOSTIC TROUBLE CODES** - In this test mode, diagnostic trouble codes stored by the EBCM, both current ignition cycle and history, may be displayed or cleared.
- **MODE F3: SNAPSHOT** - In this test mode, the Tech 1 captures data before and after a system malfunction (auto trigger) from a forced manual key press, or from a DTC setting.
- **MODE F4: MISC. TESTS** - In this test mode, the Tech 1 performs various ABS functional tests to assist in problem isolation during troubleshooting.
- **MODE F5: MOTOR REHOME** - In this mode, the Tech 1 commands the EBCM to rehome the motors on the hydraulic modulator/master cylinder assembly. This mode should **ALWAYS** be used prior to bleeding the brake system.

Enhanced Diagnostics

Enhanced diagnostic information, found in the DTC HISTORY function of the Tech 1, is designed to provide the service technician with specific malfunction occurrence information. For each of the first five and the very last diagnostic trouble code stored, data is stored to identify the specific DTC, the number of occurrences, and the number of drive cycles since the malfunction first and last occurred [a drive cycle occurs when the ignition is turned "ON" and the vehicle is driven faster than 16 km/h (10 mph)]. However, if a malfunction is present, the drive cycle counter will increment by turning the ignition "ON" and "OFF." These first five diagnostic trouble codes are also stored in the order of occurrence. The order in which the first five DTCs occurred can be useful in determining if a previous malfunction is linked to the most recent malfunction, such as an intermittent wheel speed sensor which later becomes completely open.

During difficult diagnosis situations, this information can be used to identify malfunction occurrence trends. Did the malfunction only occur once over a large number of drive cycles, indicating an unusual condition present when it occurred?

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Does the malfunction occur infrequently over a large number of drive cycles, indicating that special diagnosis techniques may be required to identify the source of the malfunction?

If, for example, a malfunction occurred 1 out of 50 drive cycles, the malfunction is intermittent and has not recurred for 49 drive cycles. This malfunction may be difficult or impossible to duplicate and may have been caused by a severe vehicle impact (large pot hole, speed bump at high speed, etc.) that momentarily opened an electrical connector or caused unusual vehicle suspension movement. Problem resolution is unlikely, and the problem may never recur (check diagnostic aids provided for that DTC). If, for example, the malfunction occurred 3 out of 15 drive cycles, the odds of finding the cause are still not good, but you know how often it occurs.

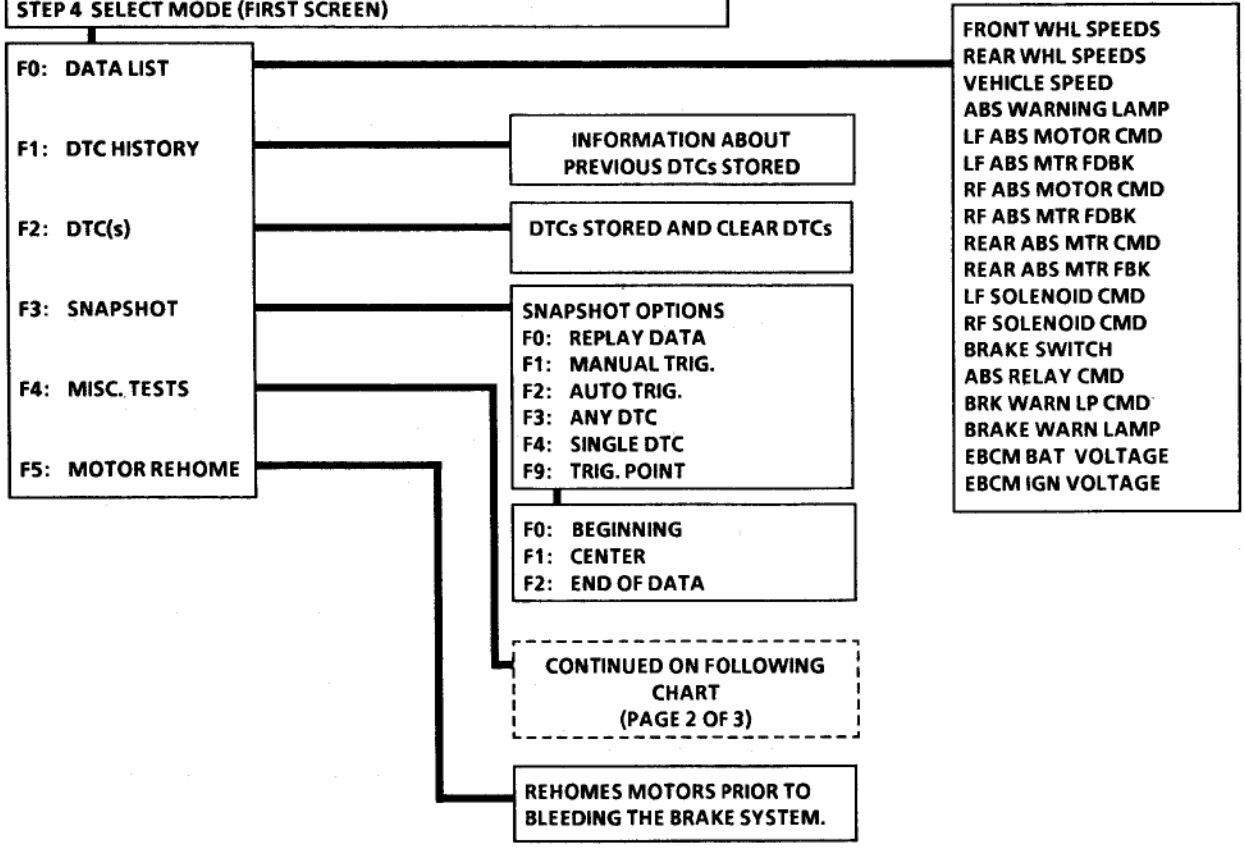
If the malfunction occurred 10 out of 20 drive cycles, the odds of finding the cause are very good, as the malfunction may be easily reproduced.

By using the additional malfunction data, you can also determine if a malfunction is randomly intermittent or if it has not recurred for long periods of time due to weather changes or a repair prior to this visit. Say a DTC occurred 10 of 20 drive cycles but has not recurred for 10 drive cycles. This means the malfunction occurred 10 of 10 drive cycles but has not reoccurred since. A significant environmental change or a repair may have occurred 10 drive cycles ago. A repair may not be necessary if customer information can confirm a recent repair. If no repair was made, the service technician can focus on diagnosis techniques used to locate difficult-to-recreate problems, such as those suggested in "Diagnostic Aids" for the DTC in question.

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DIAGNOSTIC PROCESS
(Page 1 of 3)

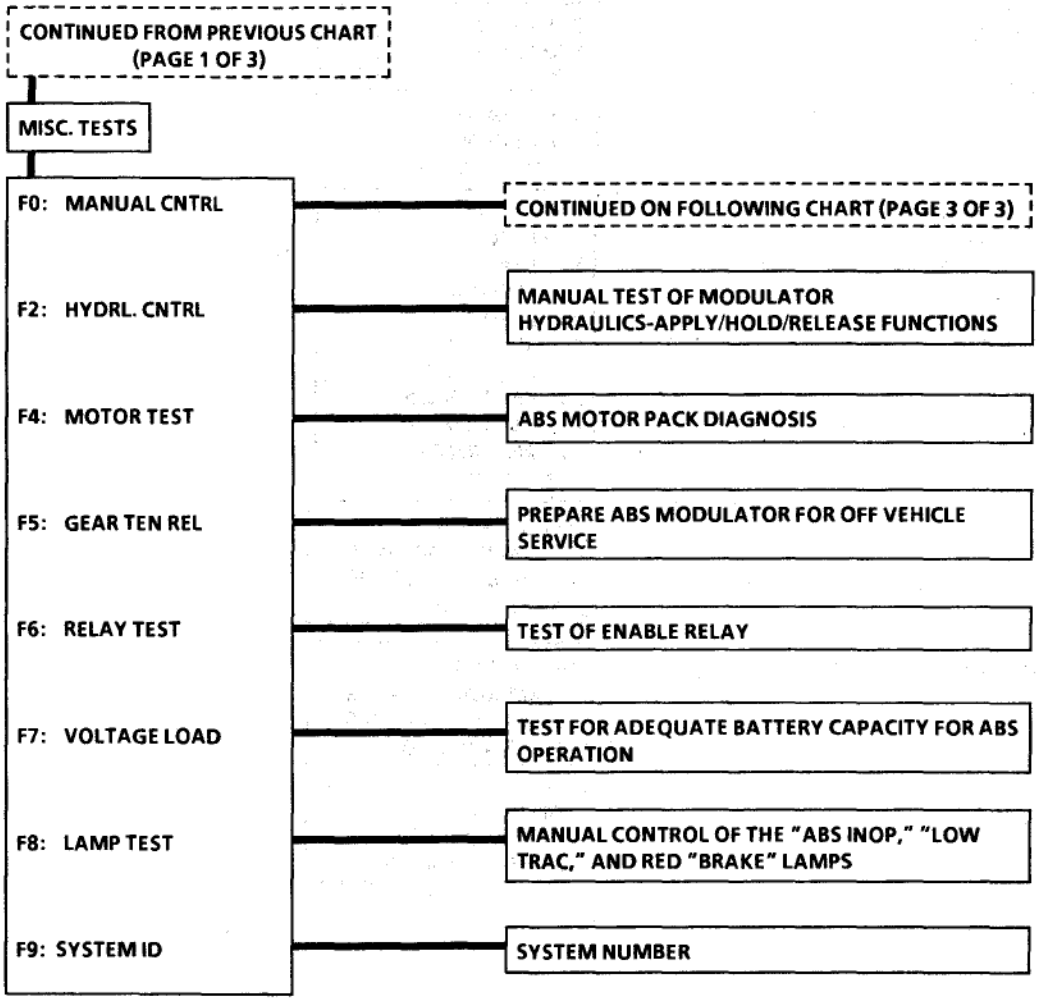
MSC CHASSIS APPLICATION SELECTION	TECH 1 SCREEN DISPLAY
STEP 1 SELECT VEHICLE MODEL YEAR	MODEL YEAR: 19??
STEP 2 SELECT VEHICLE TYPE	"F0: PASSENGER CAR"
STEP 3 SELECT BODY TYPE	
STEP 4 SELECT MODE (FIRST SCREEN)	



6-11-93
MS 12563

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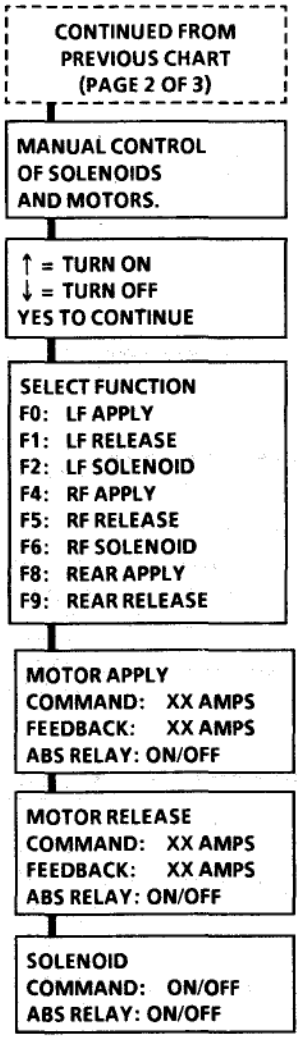
DIAGNOSTIC PROCESS
(Page 2 of 3)



7-6-93
NS 15761

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DIAGNOSTIC PROCESS
(Page 3 of 3)

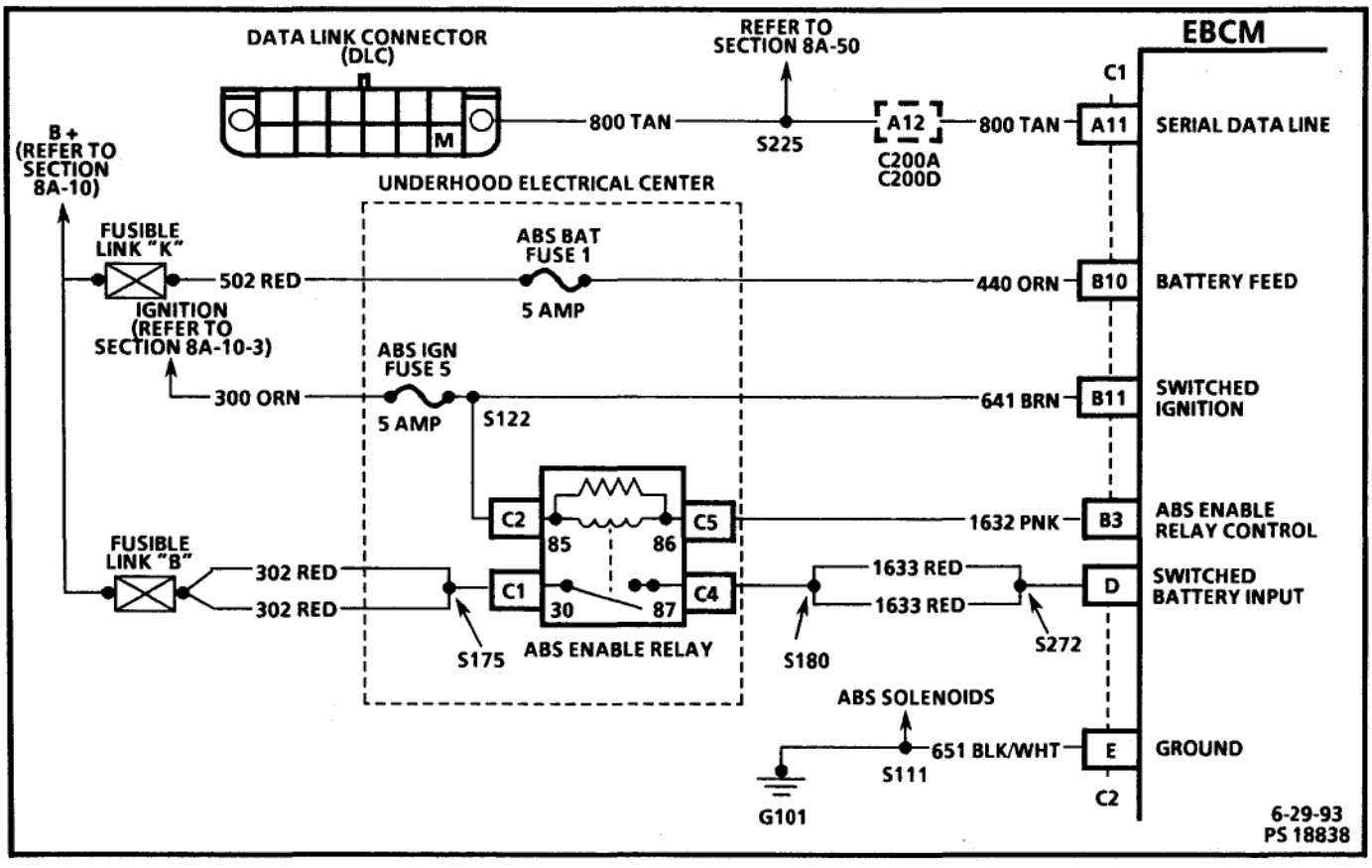


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MS 12565

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DIAGNOSTIC SYSTEM CHECK

(Page 1 of 4)

System Description:

The diagnostic system check is an organized approach to identifying a problem created by an Antilock Brake System (ABS) malfunction. It must be the starting point for any ABS complaint diagnosis because it directs the service technician to the next logical step in diagnosing the complaint.

Serial data is transmitted by the EBCM through terminal "A11". The EBCM is supplied switched ignition voltage through terminal "B11", battery voltage through terminal "B10" and switched battery voltage through terminal "D". The EBCM ground is provided through terminal "E".

Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Indicates if EBCM is transmitting data.
2. Checks for a serial data line malfunction.
3. Checks for proper Tech 1 connection to DLC.
4. Checks for open ABS BAT 5 amp Fuse 1.
5. Checks for open ABS IGN 5 amp Fuse 5.
6. Checks for high resistance in the EBCM ground circuit.
7. Checks for current DTCs.
8. Checks for proper ABS warning lamp operation.
9. Checks for history DTCs.

Diagnostic Aids: Excessive resistance in the ground or power supply circuits will not allow communication with the EBCM. If communication with the EBCM is not possible, ensure the ABS ground connection is good and that there is no excessive resistance in any of the power supply circuits.

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DIAGNOSTIC SYSTEM CHECK

(Page 1 of 4)

NOTICE: ENSURE MASS STORAGE CARTRIDGE IS UPDATED TO INCLUDE THE LATEST AVAILABLE VERSION OF THE CHASSIS APPLICATION.

1
- VERIFY ALL EBCM CONNECTORS ARE CONNECTED PROPERLY.
- INSTALL TECH 1.
- IGNITION "ON."
- WITHIN ABS PORTION OF MASS STORAGE CARTRIDGE CHASSIS APPLICATION, SELECT "F0: DATA LIST."
  IS DATA BEING RECEIVED FROM THE EBCM?

NO

2 DOES TECH 1 DISPLAY "NO COMMUNICATIO N WITH VEHICLE. CHECK DLC CONNECTOR"?

YES

7
- SELECT "F2: DTC(s)."
  ARE ANY CURRENT DTCs DISPLAYED?

YES

REFER TO APPLICABLE DTC CHART.

NO

8
- IGNITION "OFF" FOR 10 SECONDS.
- TURN IGNITION "ON" AND OBSERVE "ABS INOP" LAMP.
  DID LAMP ILLUMINATE FOR 3 SECONDS AND THEN GO "OFF"?

YES

9
- SELECT "F1: DTC HISTORY."
  ARE ANY HISTORY DTCs PRESENT?

NO

TO FURTHER DIAGNOSE CUSTOMER COMPLAINT, REFER TO "DIAGNOSTIC PROCESS," STEP 3, IN THIS SECTION.

YES

REVIEW "ENHANCED DIAGNOSTICS" INFORMATION IN THIS SECTION.

NO

DOES "ABS INOP" LAMP ILLUMINATE INTERMITTENTLY?

NO

GO TO CHART A FOR "ABS INOP" LAMP "ON" OR "OFF" CONSTANTLY, NO DTCs STORED.

YES

GO TO CHART B FOR "ABS INOP" LAMP "ON" INTERMITTENTLY , NO DTCs STORED.

NO

3
- ENSURE TECH 1 DLC CONNECTOR IS CONNECTED PROPERLY TO DLC.
  IS CONNECTION GOOD?

YES

REFER TO SECTION 8A-50.

YES

4
- IGNITION "OFF."
- REMOVE AND INSPECT ABS/BAT FUSE 1, 5 AMP.
  IS FUSE BLOWN?

NO

RECONNECT TECH 1 DLC CONNECTOR. RETURN TO FIRST STEP IN THIS CHART.

NO

5
- INSTALL ABS/BAT FUSE 1, 5 AMP.
- REMOVE AND INSPECT ABS/IGN FUSE 5, 5 AMP.
  IS FUSE BLOWN?

YES

GO TO PAGE 2 OF 4 OF THIS DIAGNOSTIC SYSTEM CHECK.

NO

6
- DISCONNECT NEGATIVE BATTERY CABLE.
- INSTALL ABS/IGN FUSE 5, 5 AMP.
- DISCONNECT 8-WAY EBCM CONNECTOR.
- USING J 39200, MEASURE RESISTANCE BETWEEN THE NEGATIVE BATTERY TERMINAL AND 8-WAY EBCM HARNESS CONNECTOR TERMINAL "E".
  IS RESISTANCE 2Ω OR LESS?

YES

GO TO PAGE 3 OF 4 OF THIS DIAGNOSTIC SYSTEM CHECK.

YES

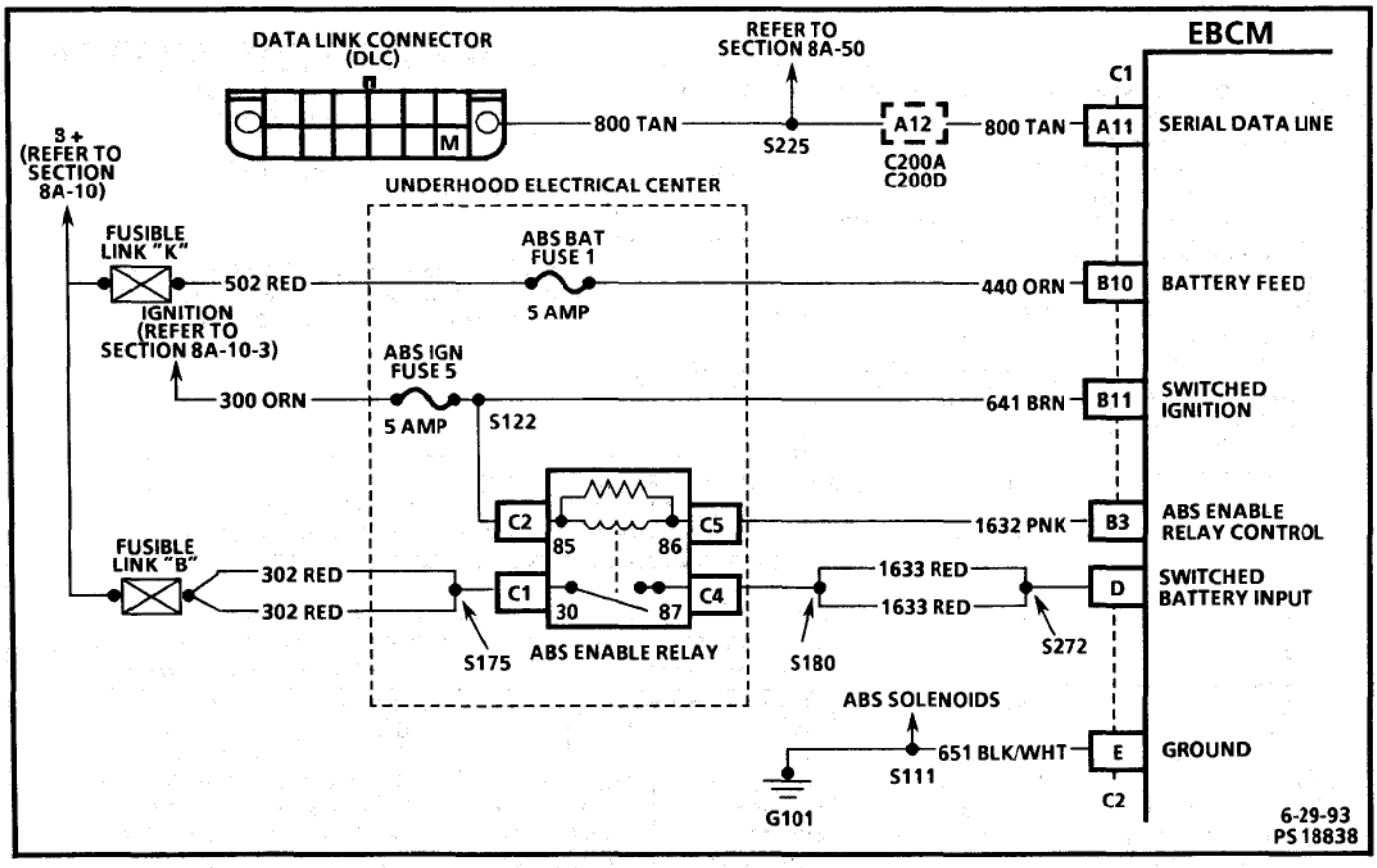
GO TO PAGE 4 OF 4 OF THIS DIAGNOSTIC SYSTEM CHECK.

NO

REPAIR OPEN OR HIGH RESISTANCE IN CKT 651. RETURN TO FIRST STEP IN THIS CHART.

7-14-93
NS 15700

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DIAGNOSTIC SYSTEM CHECK

(Page 2 of 4)

System Description:

The diagnostic system check is an organized approach to identifying a problem created by an Antilock Brake System (ABS) malfunction. It must be the starting point for any ABS complaint diagnosis because it directs the service technician to the next logical step in diagnosing the complaint.

Serial data is transmitted by the EBCM through terminal "A11". The EBCM is supplied switched ignition voltage through terminal "B11", battery voltage through terminal "B10" and switched battery voltage through terminal "D". The EBCM ground is provided through terminal "E".

Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

10. Checks for possible short to ground in the battery feed circuitry.
11. Checks for possible short to ground in the EBCM.
12. Ensures short to ground is not due to physical damage of the circuitry.

Diagnostic Aids: Excessive resistance in the ground or power supply circuits will not allow communication with the EBCM. If communication with the EBCM is not possible, ensure the ABS ground connection is good and that there is no excessive resistance in any of the power supply circuits.

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DIAGNOSTIC SYSTEM CHECK

(Page 2 of 4)

CONTINUED FROM DIAGNOSTIC SYSTEM CHECK (PAGE 1 OF 4)

YES

10
- REPLACE ABS BAT 5 AMP FUSE 1.
- WAIT 10 SECONDS.
- REMOVE AND INSPECT ABS BAT 5 AMP FUSE 1. IS FUSE BLOWN?

YES

11
- DISCONNECT 32-WAY EBCM CONNECTOR.
- REPLACE ABS BAT 5 AMP FUSE 1.
- WAIT 10 SECONDS.
- REMOVE AND INSPECT ABS BAT 5 AMP FUSE 1. IS FUSE BLOWN?

YES

REFER TO SECTION 8A TO DIAGNOSE FOR A SHORT TO GROUND IN THE BATTERY FEED CIRCUITRY.

NO

- INSTALL FUSE.
- REFER TO SECTION 8A TO DIAGNOSE FOR A POSSIBLE SHORT TO GROUND IN BATTERY FEED CIRCUITRY. RETURN TO FIRST STEP IN THIS CHART.

NO

12
- INSPECT CKT 440 AND 32-WAY EBCM HARNESS CONNECTOR FOR PHYSICAL DAMAGE WHICH MAY RESULT IN A SHORT TO GROUND WITH THE 32-WAY EBCM HARNESS CONNECTOR CONNECTED TO THE EBCM. CORRECT DAMAGE IF EVIDENT.
- RECONNECT ALL CONNECTORS
- WAIT 10 SECONDS.
- REMOVE AND INSPECT ABS BAT 5 AMP FUSE 1. IS FUSE BLOWN?

YES

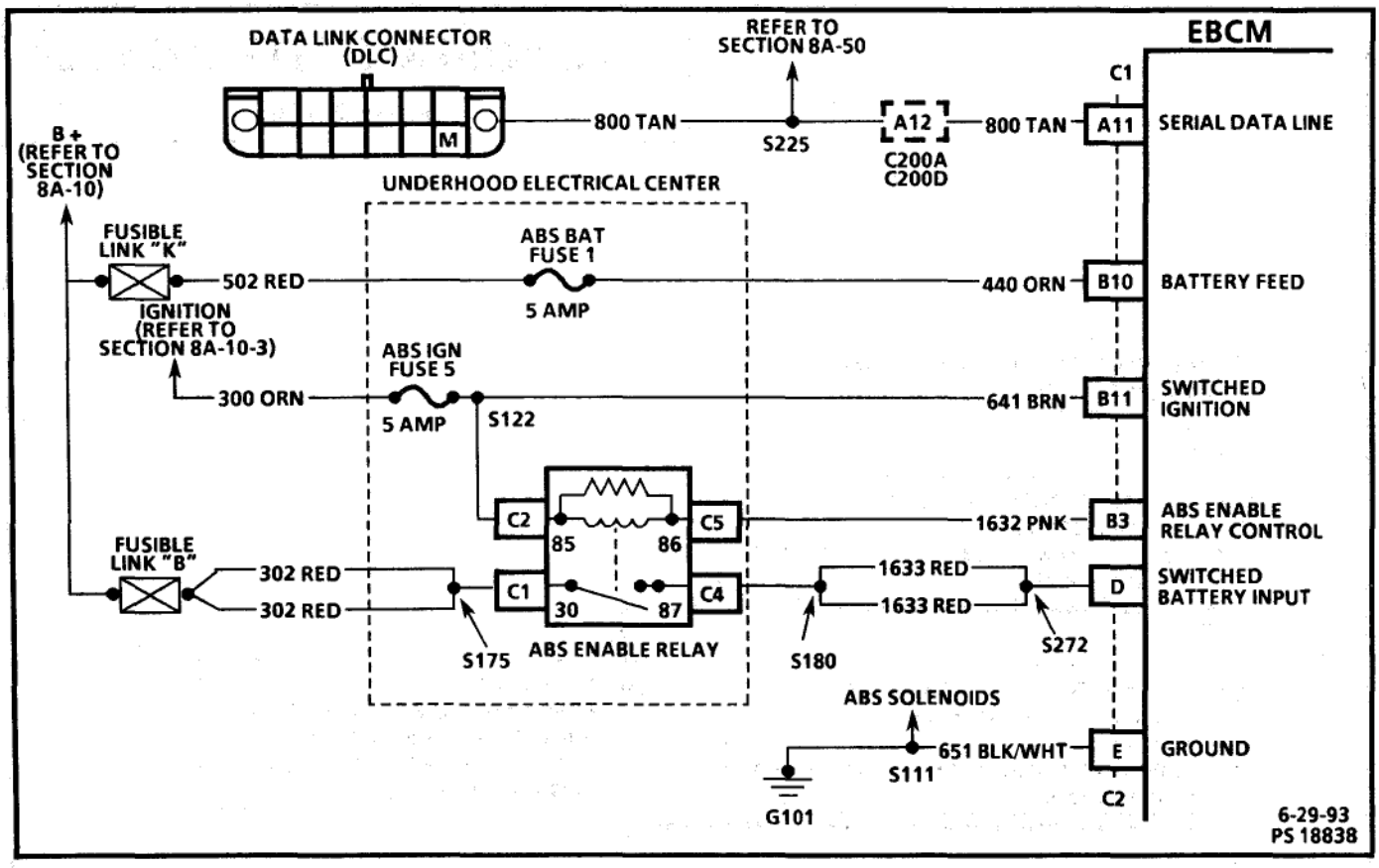
- REPLACE EBCM.
- REPLACE ABS BAT 5 AMP FUSE 1. RETURN TO FIRST STEP IN THIS CHART.

NO

MALFUNCTION IS INTERMITTENT.

7-3-93
PS 18924

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DIAGNOSTIC SYSTEM CHECK

(Page 3 of 4)

System Description:

The diagnostic system check is an organized approach to identifying a problem created by an Antilock Brake System (ABS) malfunction. It must be the starting point for any ABS complaint diagnosis because it directs the service technician to the next logical step in diagnosing the complaint.

Serial data is transmitted by the EBCM through terminal "A11". The EBCM is supplied switched ignition voltage through terminal "B11", battery voltage through terminal "B10" and switched battery voltage through terminal "D". The EBCM ground is provided through terminal "E".

Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

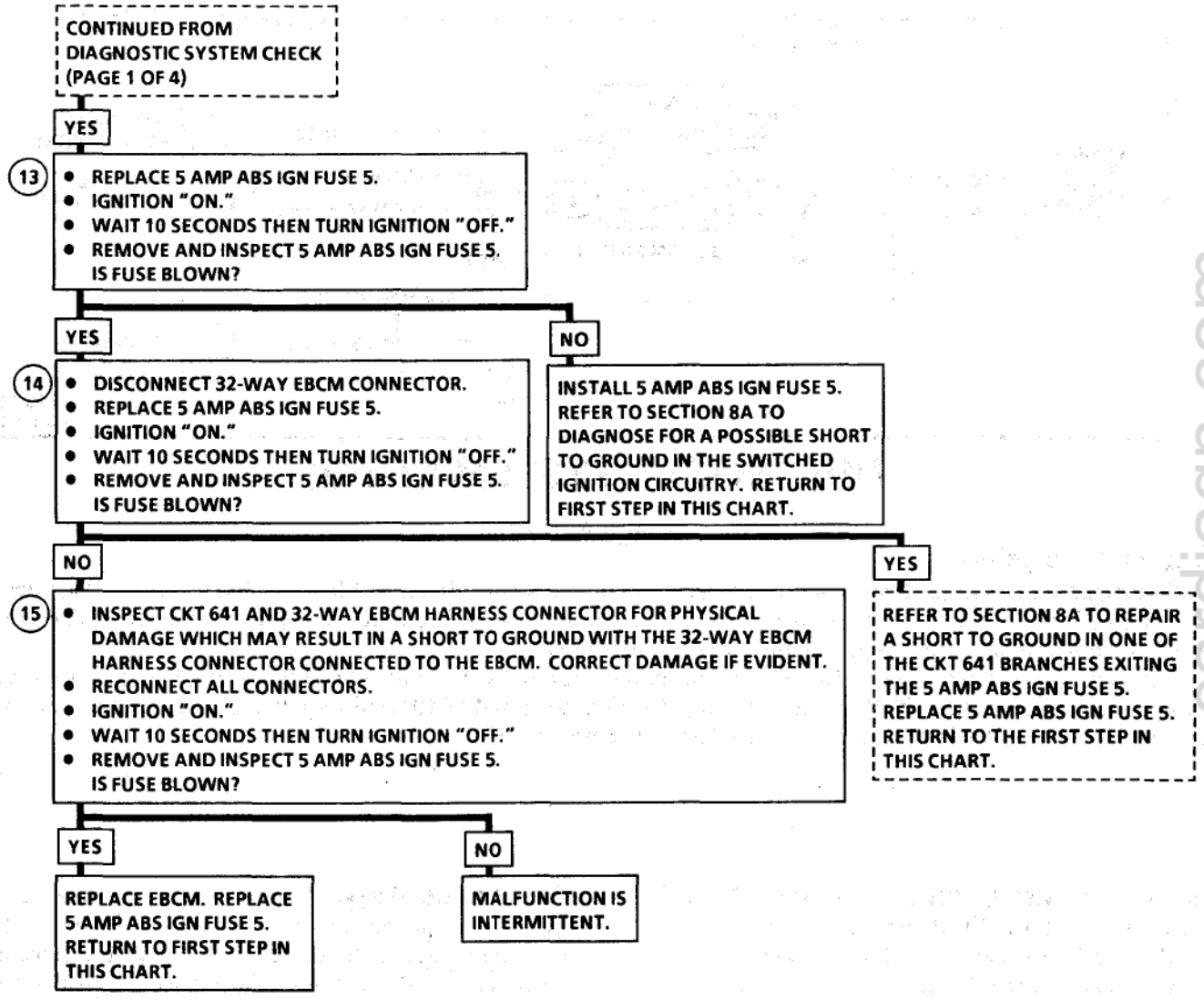
13. Checks for possible short to ground in the switched ignition circuitry.
14. Isolates the short to ground to either the circuitry or the EBCM.
15. Ensures short to ground is not due to physical damage of the circuitry.

Diagnostic Aids: Excessive resistance in the ground or power supply circuits will not allow communication with the EBCM. If communication with the EBCM is not possible, ensure the ABS ground connection is good and that there is no excessive resistance in any of the power supply circuits.

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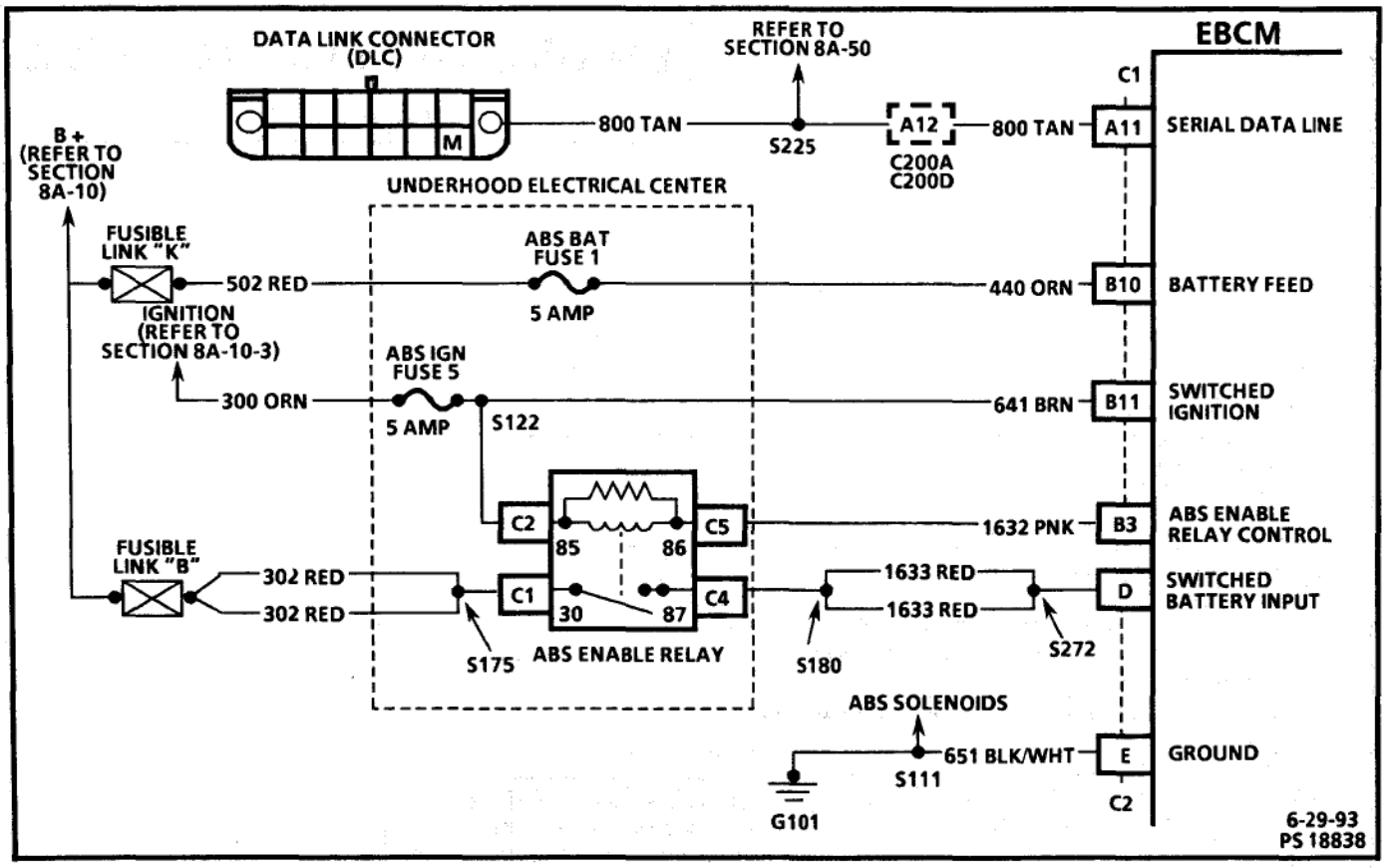
DIAGNOSTIC SYSTEM CHECK

(Page 3 of 4)



7-7-93
PS 18932

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DIAGNOSTIC SYSTEM CHECK

(Page 4 of 4)

System Description:

The diagnostic system check is an organized approach to identifying a problem created by an Antilock Brake System (ABS) malfunction. It must be the starting point for any ABS complaint diagnosis because it directs the service technician to the next logical step in diagnosing the complaint.

Serial data is transmitted by the EBCM through terminal "A11". The EBCM is supplied switched ignition voltage through terminal "B11", battery voltage through terminal "B10" and switched battery voltage through terminal "D". The EBCM ground is provided through terminal "E".

Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

16. Checks for an open in CKT 440 or 502.
17. Checks for proper battery voltage at the EBCM.
18. Checks for high resistance in the battery feed circuitry.
19. Ensures malfunction is not due to poor terminal contact.
20. Checks for high resistance in the switched ignition circuit between the fuse block and the EBCM.

Diagnostic Aids: Excessive resistance in the ground or power supply circuits will not allow communication with the EBCM. If communication with the EBCM is not possible, ensure the ABS ground connection is good and that there is no excessive resistance in any of the power supply circuits.

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DIAGNOSTIC SYSTEM CHECK

(Page 4 of 4)

CONTINUED FROM DIAGNOSTIC SYSTEM CHECK (PAGE 1 OF 4)

16
- DISCONNECT 32-WAY EBCM CONNECTOR.
- USING J 39200, MEASURE VOLTAGE BETWEEN GROUND AND 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B10".

IS VOLTAGE GREATER THAN 10 VOLTS?

YES

17
- DISCONNECT POSITIVE BATTERY CABLE.
- USING J 39200, MEASURE RESISTANCE BETWEEN POSITIVE BATTERY CABLE TERMINAL AND 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B10".

IS RESISTANCE 2Ω OR LESS?

YES

18
- IGNITION "ON." (THIS IS DONE TO PROVIDE CIRCUIT CONTINUITY.)
- USING J 39200, MEASURE RESISTANCE BETWEEN POSITIVE BATTERY CABLE TERMINAL AND 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B11".

IS RESISTANCE 2Ω OR LESS?

YES

19
- INSPECT EBCM AND EBCM CONNECTOR TERMINALS FOR POOR TERMINAL CONTACT.
- INSPECT BATTERY TERMINALS AND BATTERY CABLE TERMINALS FOR A POOR CONNECTION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT."

IS POOR TERMINAL CONTACT OR A POOR CONNECTION EVIDENT?

NO

- RECONNECT EBCM CONNECTORS AND BATTERY CABLES. PROCEED TO SECTION 8A-50.

YES

REPLACE TERMINALS OR REPAIR POOR CONNECTION INTEGRITY. RETURN TO FIRST STEP IN THIS CHART.

NO

20
- IGNITION "OFF."
- REMOVE ABS IGN 5 AMP FUSE 5.
- USING J 39200, MEASURE RESISTANCE BETWEEN EACH ABS IGN 5 AMP FUSE 5 BLOCK TERMINAL AND 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B11".

IS RESISTANCE 2Ω OR LESS FOR EITHER MEASUREMENT?

YES

REFER TO SECTION 8A TO REPAIR OPEN OR HIGH RESISTANCE BETWEEN POSITIVE BATTERY CABLE TERMINAL AND ABS IGN 5 AMP FUSE 5 BLOCK TERMINAL. RETURN TO THE FIRST STEP IN THIS CHART.

NO

REPAIR OPEN OR HIGH RESISTANCE IN CKT 641. INSTALL ABS IGN 5 AMP FUSE 5. RETURN TO FIRST STEP IN THIS CHART.

NO

REPAIR OPEN IN CKT 440. RETURN TO FIRST STEP IN THIS CHART.

NO

REPAIR HIGH RESISTANCE IN CKT 440. RETURN TO FIRST STEP IN THIS CHART.

7-9-93
PS 18933

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DIAGNOSTIC TROUBLE CODE AND SYMPTOM TABLE		PAGE #
CHART	**SYMPTOM**	
A	"ABS INOP" Lamp "ON" or "OFF" Constantly, No DTCs Stored	5E1-24
B	"ABS INOP" Lamp "ON" Intermittently, No DTCs Stored	5E1-25
C	"Low TRAC" Indicator Lamp "ON" With Ignition "OFF," No DTCs Stored	5E1-26
D	Tech 1 Displays Undefined DTCs	5E1-27
DIAGNOSTIC TROUBLE CODE	**DESCRIPTION**	
11	ABS Warning or Low Trac Lamp Ckt Malfunction (1 of 2)	5E1-28
14	ABS Enable Relay Contact Circuit Open (1 of 3)	5E1-32
15	ABS Rly Contact Ckt Short to Batt or Always Closed	5E1-38
16	ABS Enable Relay Coil Circuit Open	5E1-40
17	ABS Enable Relay Coil Circuit Shorted to Gnd	5E1-42
18	ABS Enable Relay Coil Circuit Shorted to Batt	5E1-44
21	Left Front Wheel Speed = 0	5E1-46
22	Right Front Wheel Speed = 0	5E1-50
24	Rear Wheel Speed = 0	5E1-54
25	Left Front Excessive Wheel Speed Variation	5E1-58
26	Right Front Excessive Wheel Speed Variation	5E1-62
28	Rear Excessive Wheel Speed Variation	5E1-66
32	LF Wheel Speed Snr Ckt Open or Short to Gnd/Batt (1 fo 3)	5E1-70
33	RF Wheel Speed Snr Ckt Open or Short to Gnd/Batt (1 of 3)	5E1-72
35	RR Wheel Speed Snr Ckt Open or Short to Gnd/Batt (1 of 3)	5E1-74
36	Low System Voltage (1 of 2)	5E1-76
37	High System Voltage	5E1-78
38	Left Front ESB Will Not Hold Motor	5E1-80
41	Right Front ESB Will Not Hold Motor	5E1-82
42	Rear ESB Will Not Hold Motor	5E1-84
44	Left Front ABS Channel Will Not Move	5E1-86
45	Right Front ABS Channel Will Not Move	5E1-98
46	Rear ABS Channel Will Not Move	5E1-90
47	Left Front ABS Motor Free Spins (1 of 2)	5E1-92
48	Right Front ABS Motor Free Spins (1 of 2)	5E1-96
51	Rear ABS Motor Free Spins (1 of 2)	5E1-100
52	Left Front ABS Channel in Release Too Long	5E1-104
53	Right Front ABS Channel In Release Too Long	5E1-106
54	Rear ABS Channel in Release Too Long	5E1-108
55	EBCM Malfunction	5E1-110
56	Left Front ABS Motor Circuit Open	5E1-112
57	Left Front ABS Motor Circuit Shorted to Gnd	5E1-114
58	Left Front ABS Motor Circuit Shorted to Batt	5E1-116

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DIAGNOSTIC TROUBLE CODE AND SYMPTOM TABLE		PAGE #
DIAGNOSTIC TROUBLE CODE	DESCRIPTION	
61	Right Front ABS Motor Circuit Open	5E1-118
62	Right Front ABS Motor Circuit Shorted to Gnd	5E1-120
63	Right Front ABS Motor Circuit Shorted to Batt	5E1-122
64	Rear ABS Motor Circuit Open	5E1-124
65	Rear ABS Motor Circuit Shorted to Ground	5E1-126
66	Rear ABS Motor Circuit Shorted to Battery	5E1-128
76	Left Front Sol Circuit Open or Shorted to Batt	5E1-130
77	Left Front Solenoid Circuit Shorted to Gnd	5E1-132
78	Right Front Sol Circuit Open or Shorted to Batt	5E1-134
81	Right Front Solenoid Circuit Shorted to Gnd	5E1-136
82	Calibration Malfunction	5E1-138
86	EBCM Turned "ON" the Red "BRAKE" Warning Lamp	5E1-140
87	Red "BRAKE" Warning Lamp Circuit Open	5E1-142
88	Red "BRAKE" Warning Lamp Ckt Shorted to Batt	5E1-144
91	Open Brake Switch During Deceleration	5E1-146
92	Open Brake Switch When ABS Was Required	5E1-148
93	DTC 91 or 92 Set in Current or Prev. Ign. Cycle	5E1-150
94	Brake Switch Contacts Always Closed	5E1-152
95	Brake Switch Circuit Open	5E1-154
96	Rear Brake Lamp Circuit Open	5E1-156

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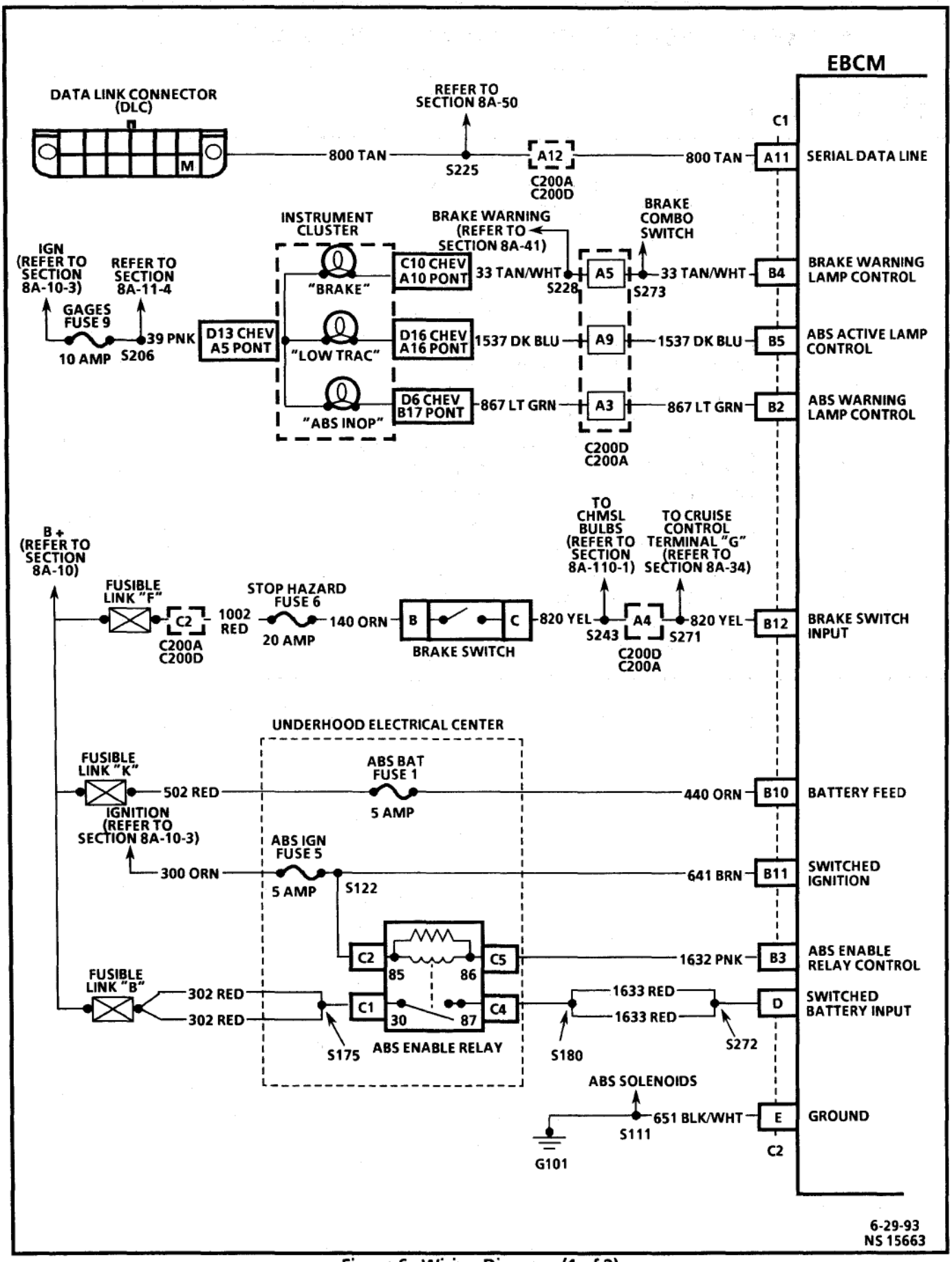


Figure 6 - Wiring Diagram (1 of 2)

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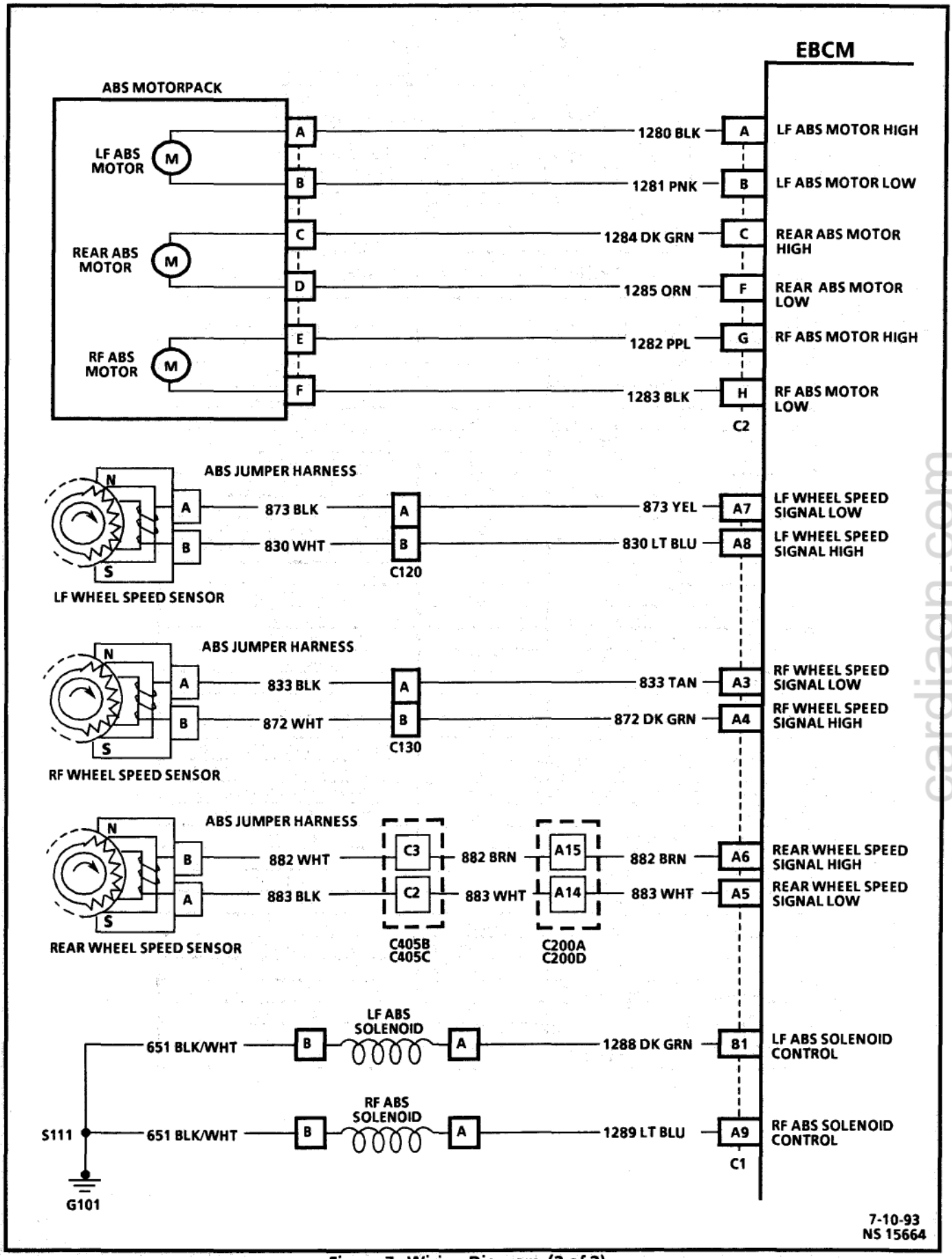
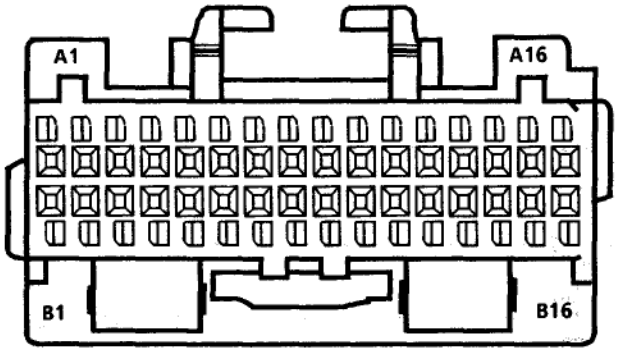


Figure 7 - Wiring Diagram (2 of 2)

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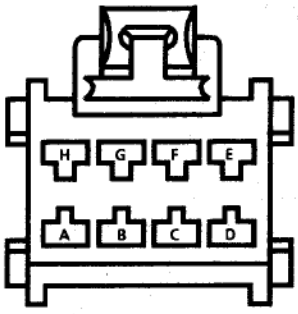
EBCM 32-WAY CONNECTOR

CONNECTOR TERMINAL	CIRCUIT NO.	COLOR	CIRCUIT DESCRIPTION
A1	PLUGGED		NOT USED
A2	PLUGGED		NOT USED
A3	833	TAN	RF WHEEL SPEED SIGNAL LOW
A4	872	DK GRN	RF WHEEL SPEED SIGNAL HIGH
A5	883	WHT	REAR WHEEL SPEED SIGNAL LOW
A6	882	BRN	REAR WHEEL SPEED SIGNAL HIGH
A7	873	YEL	LF WHEEL SPEED SIGNAL LOW
A8	830	LT BLU	LF WHEEL SPEED SIGNAL HIGH
A9	1289	LT BLU	RF ABS SOLENOID CONTROL
A10	PLUGGED		NOT USED
A11	800	TAN	SERIAL DATA LINE
A12	PLUGGED		NOT USED
A13	PLUGGED		NOT USED
A14	PLUGGED		NOT USED
A15	PLUGGED		NOT USED
A16	PLUGGED		NOT USED
B1	1288	DK GRN	LF ABS SOLENOID CONTROL
B2	867	LT GRN	ABS WARNING LAMP CONTROL
B3	1632	PNK	ABS ENABLE RELAY CONTROL
B4	33	TAN/WHT	BRAKE WARNING LAMP CONTROL
B5	1537	DK BLU	ABS ACTIVE LAMP CONTROL
B6	PLUGGED		NOT USED
B7	PLUGGED		NOT USED
B8	PLUGGED		NOT USED
B9	PLUGGED		NOT USED
B10	440	ORN	BATTERY FEED
B11	641	BRN	SWITCHED IGNITION
B12	820	YEL	BRAKE SWITCH INPUT
B13	PLUGGED		NOT USED
B14	PLUGGED		NOT USED
B15	PLUGGED		NOT USED
B16	PLUGGED		NOT USED

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NS 15735

Figure 8 - EBCM Connector Face View (1 of 2)

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EBCM 8-WAY CONNECTOR

PIN	CIRCUIT NO.	COLOR	CIRCUIT
A	1280	BLK	LF ABS MOTOR HIGH
B	1281	PNK	LF ABS MOTOR LOW
C	1284	DK GRN	REAR ABS MOTOR HIGH
D	1633	RED	SWITCHED BATTERY
E	651	BLK/WHT	GROUND
F	1285	ORN	REAR ABS MOTOR LOW
G	1282	PPL	RF ABS MOTOR HIGH
H	1283	BLK	RF ABS MOTOR LOW

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NS 15736

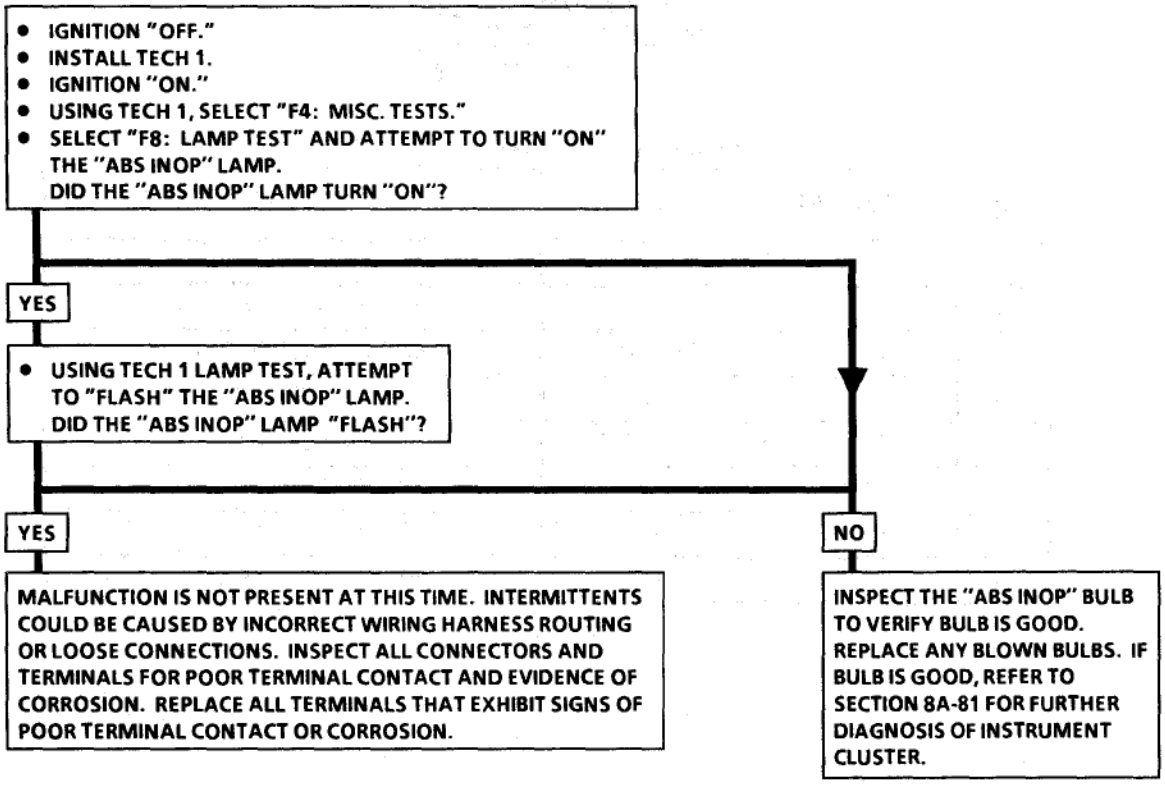
Figure 9 - EBCM Connector Face View (2 of 2)

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CHART A

"ABS INOP" LAMP "ON" OR "OFF" CONSTANTLY, NO DTCs STORED

NOTICE: DIAGNOSTIC SYSTEM CHECK MUST BE COMPLETED BEFORE USING THIS CHART.



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CHART B

"ABS INOP" LAMP "ON" INTERMITTENTLY, NO DTCs STORED

NOTICE: DIAGNOSTIC SYSTEM CHECK MUST BE COMPLETED BEFORE USING THIS CHART.

1
- IGNITION "OFF."
- DISCONNECT 8-WAY EBCM CONNECTOR.
- DISCONNECT NEGATIVE BATTERY TERMINAL.
- DISCONNECT POSITIVE BATTERY TERMINAL.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN THE NEGATIVE BATTERY CABLE TERMINAL AND TERMINAL "E" OF THE 8-WAY EBCM HARNESS CONNECTOR.
- OBSERVE MEASURED RESISTANCE WHILE "WIGGLING" WIRE HARNESS AND CONNECTORS.

IS RESISTANCE ALWAYS 2Ω OR LESS?

YES

2
- DISCONNECT 32-WAY EBCM CONNECTOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN POSITIVE BATTERY CABLE TERMINAL AND TERMINAL "B10" OF THE 32-WAY EBCM HARNESS CONNECTOR.
- OBSERVE MEASURED RESISTANCE WHILE "WIGGLING" WIRE HARNESS AND CONNECTORS.

IS RESISTANCE ALWAYS 2Ω OR LESS?

YES

3
- TURN IGNITION SWITCH "ON" (THIS IS DONE TO COMPLETE THE IGNITION CIRCUIT).
- USING J 39200, MEASURE THE RESISTANCE BETWEEN POSITIVE BATTERY CABLE TERMINAL AND TERMINAL "B11" OF THE 32-WAY EBCM HARNESS CONNECTOR.
- OBSERVE MEASURED RESISTANCE WHILE "WIGGLING" WIRE HARNESS AND CONNECTORS.

IS RESISTANCE ALWAYS 2Ω OR LESS?

YES

4
- CHECK POSITIVE BATTERY TERMINAL AND POSITIVE BATTERY CABLE TERMINAL FOR A POOR CONNECTION.
- INSPECT TERMINALS "B11" AND "B10" OF THE 32-WAY EBCM CONNECTOR AND TERMINAL "E" OF THE 8-WAY EBCM CONNECTOR FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT."

IS THERE EVIDENCE OF POOR TERMINAL CONTACT OR CORROSION?

NO

5
- IGNITION "OFF."
- RECONNECT ALL CONNECTORS.
- IGNITION "ON."

IS "ABS INOP" LAMP "ON" INTERMITTENTLY WITH NO DTCs SET?

NO

MALFUNCTION IS NOT PRESENT AT THIS TIME. INTERMITTENTS MAY BE CAUSED BY INCORRECT WIRING HARNESS ROUTING OR LOOSE GROUND CONNECTIONS. REFER TO SECTION 8A-4, "INTERMITTENTS AND POOR CONNECTIONS."

YES

REPLACE EBCM.

NO

REPAIR INTERMITTENT OPEN OR HIGH RESISTANCE IN CKT 651. REFER TO SECTION 8A-4, "INTERMITTENTS AND POOR CONNECTIONS."

NO

REPAIR INTERMITTENT OPEN OR HIGH RESISTANCE IN CKTs 440 OR 502. REFER TO SECTION 8A-4, "INTERMITTENTS AND POOR CONNECTIONS."

NO

REPAIR INTERMITTENT OPEN OR HIGH RESISTANCE IN CKTs 641 OR 300. REFER TO SECTION 8A-4, "INTERMITTENTS AND POOR CONNECTIONS."

YES

REPLACE TERMINALS THAT EXHIBIT POOR TERMINAL CONTACT OR SIGNS OF CORROSION. REPAIR CONNECTION INTEGRITY IF POOR CONTACT EXISTS AT BATTERY.

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CHART C

"LOW TRAC" INDICATOR LAMP "ON" WITH IGNITION "OFF," NO DTCs STORED

NOTICE: DIAGNOSTIC SYSTEM CHECK MUST BE COMPLETED BEFORE USING THIS CHART.

- IGNITION "OFF."
- OBSERVE THE "LOW TRAC" INDICATOR LAMP. IS THE "LOW TRAC" INDICATOR LAMP "ON"?

NO

MALFUNCTION IS NOT PRESENT AT THIS TIME. INTERMITTENTS COULD BE CAUSED BY INCORRECT WIRING HARNESS ROUTING OR LOOSE CONNECTIONS. INSPECT ALL CONNECTORS AND TERMINALS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.

YES

REPAIR SHORT TO VOLTAGE ON CKT 1537.

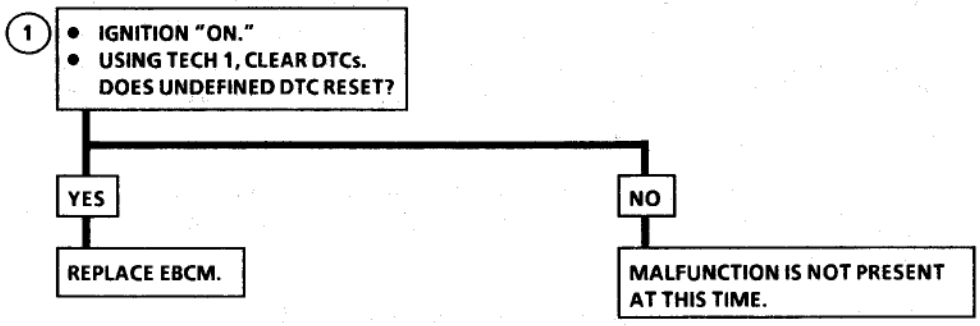
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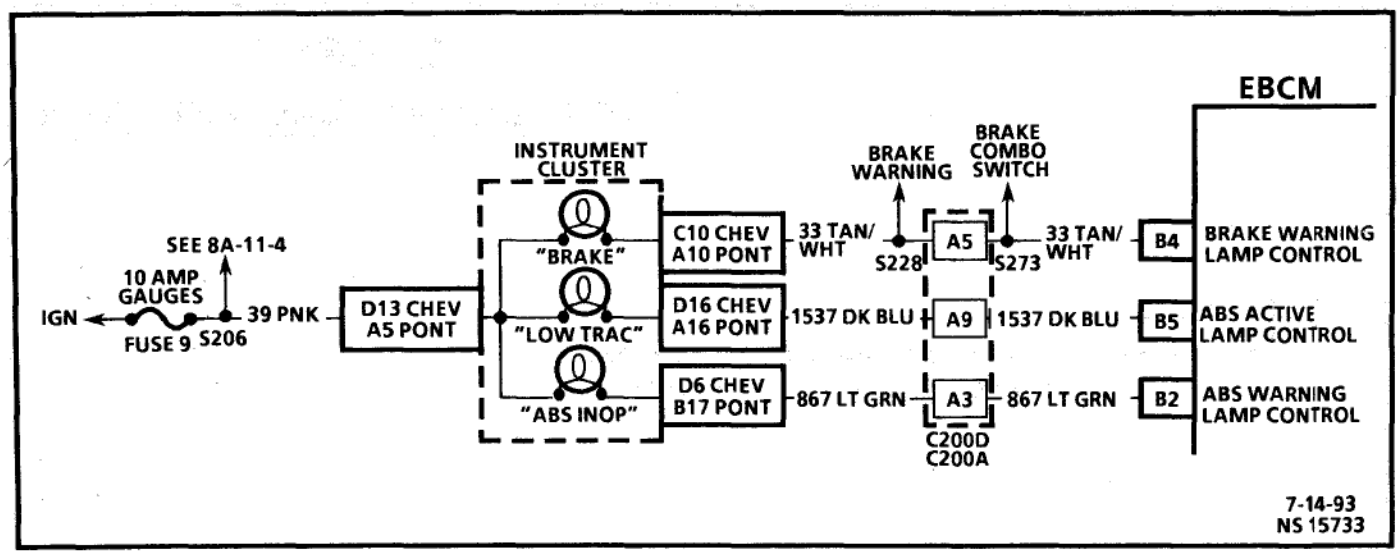
CHART D
TECH 1 DISPLAYS UNDEFINED DTCs

Important

- USE THIS CHART IF ANY OF THE FOLLOWING UNDEFINED DTCs ARE SET - 12, 13, 23, 27, 31, 34, 43, 67, 68, 71, 72, 73, 75, 83, 84, 85, 97, OR 98.



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DTC 11

(Page 1 of 2)
ABS WARNING OR LOW TRAC LAMP CKT MALFUNCTION

Circuit Description:

This DTC checks the state of both the "ABS INOP" lamp and the "LOW TRAC" lamp to identify a situation in which the driver could not be alerted to a system malfunction or of possible slippery driving conditions. Due to an integral lamp driver module within the instrument panel cluster, the EBCM must provide a ground to turn the "ABS INOP" lamp "OFF." The "LOW TRAC" lamp circuit is such that the EBCM provides a ground to turn "ON" the "LOW TRAC" lamp.

DTC Will Set When: DTC 11 can only be set during the three second bulb check or when either of the lamps are commanded "ON." If the EBCM cannot control either the "ABS INOP" lamp or the "LOW TRAC" lamp for two seconds, a malfunction exists.

Action Taken: A malfunction DTC is stored; however, ABS is not disabled.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Determines if the "ABS INOP" lamp can be properly controlled.
2. Determines if the lamp is "ON" constantly.
3. Checks for other DTCs which could turn "ON" the "ABS INOP" lamp.
4. Determines if the "ABS INOP" lamp can be turned "OFF" manually.
5. Checks the integrity of the "ABS INOP" lamp circuitry.
6. Checks for a short to voltage on the "ABS INOP" lamp circuitry.
7. Determines if a malfunctioning EBCM is the cause of DTC 11.
8. Verifies that the other I/P indicator lamps function properly.
9. Determines if the "ABS INOP" lamp can be turned "ON" manually.
10. Checks for a short to ground in the "ABS INOP" lamp circuitry.
11. Verifies condition of the 10 amp "GAGES" Fuse 9.
12. Determines if DTC 11 was set due to an EBCM malfunction.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The lamp test function of the Tech 1 may be used to command the lamp "ON" while looking for an intermittent malfunction in the "ABS INOP" lamp circuitry.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

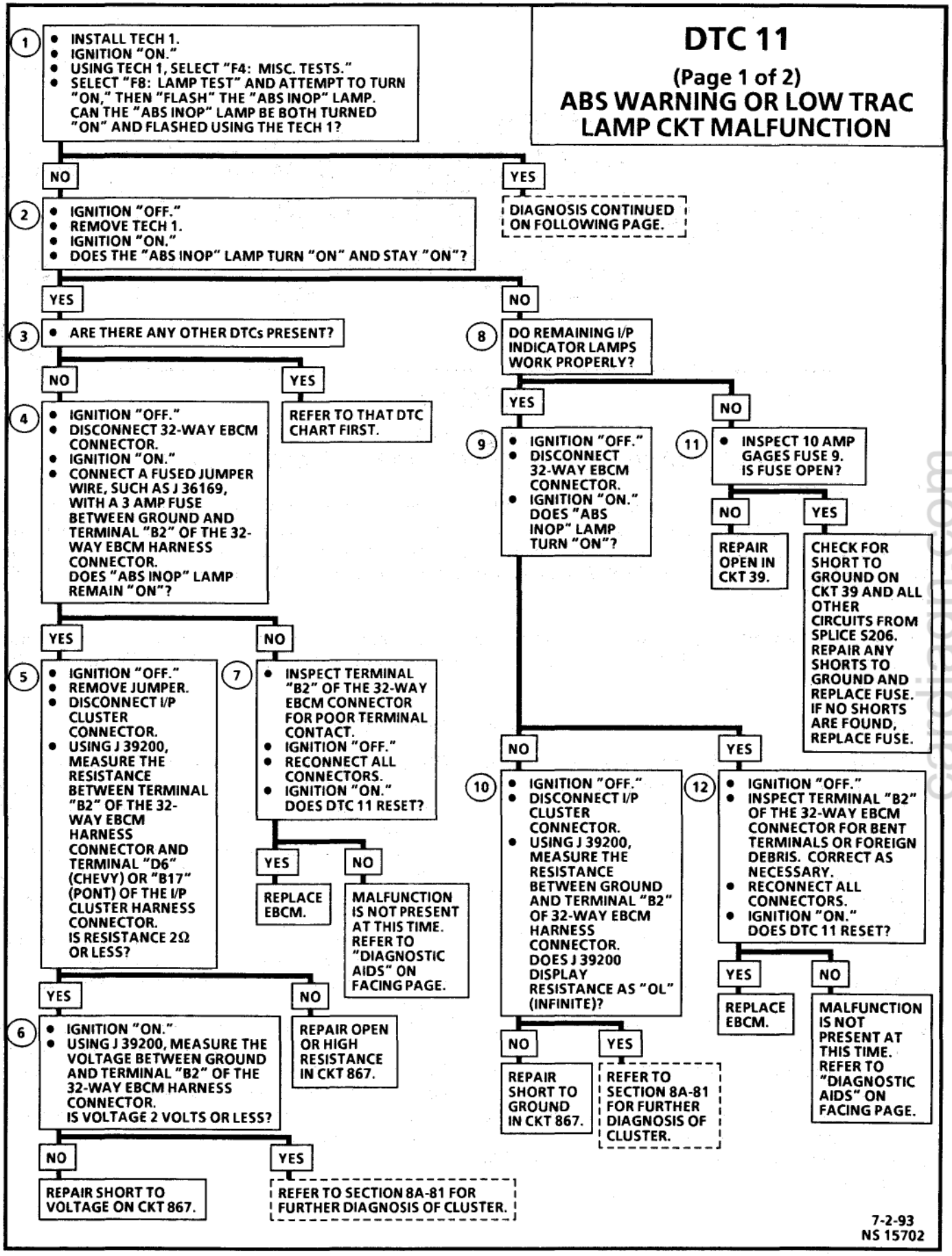
Any circuitry that is suspected as causing the intermittent complaint should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

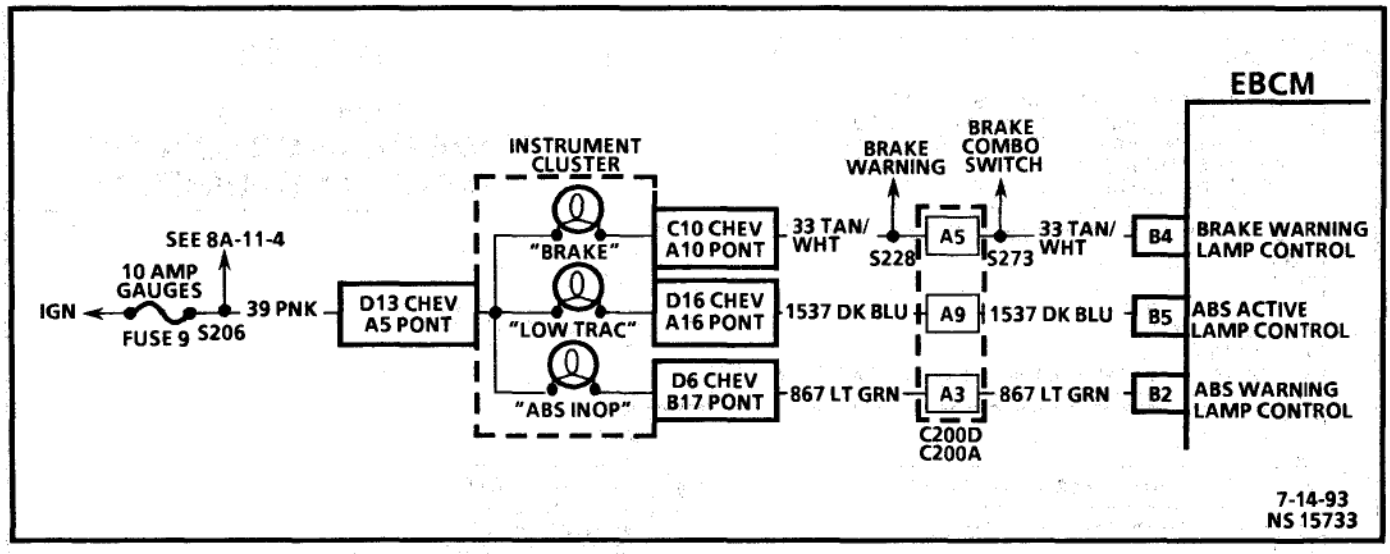
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DTC 11

(Page 1 of 2)

ABS WARNING OR LOW TRAC LAMP CKT MALFUNCTION





DTC 11

(Page 2 of 2)

ABS WARNING OR LOW TRAC LAMP CKT MALFUNCTION

Circuit Description:

This DTC checks the state of both the "ABS INOP" lamp and the "LOW TRAC" lamp to identify a situation in which the driver could not be alerted to a system malfunction or of possible slippery driving conditions. Due to an integral lamp driver module within the instrument panel cluster, the EBCM must provide a ground to turn the "ABS INOP" lamp "OFF." The "LOW TRAC" lamp circuit is such that the EBCM provides a ground to turn "ON" the "LOW TRAC" lamp.

DTC Will Set When: DTC 11 can only be set during the three second bulb check or when either of the lamps are commanded "ON." If the EBCM cannot control either the "ABS INOP" lamp or the "LOW TRAC" lamp for two seconds, a malfunction exists.

Action Taken: A malfunction DTC is stored; however, ABS is not disabled.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

13. Determines if the "LOW TRAC" lamp can be properly controlled.
14. Determines if the "LOW TRAC" lamp is "ON" constantly.
15. Checks for a short to ground in the "LOW TRAC" lamp circuitry.
16. Determines if DTC 11 was set due to a EBCM malfunction.
17. Determines if DTC 11 was set due to a EBCM malfunction.
18. Determines if the "LOW TRAC" lamp can be controlled manually.
19. Verifies the integrity of the "LOW TRAC" lamp circuitry.
20. Determines if there is a short to voltage in the "LOW TRAC" lamp circuitry.
21. Determines if DTC 11 was set due to an EBCM malfunction.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The lamp test function of the Tech 1 may be used to command the lamp "ON" while looking for an intermittent malfunction in the "LOW TRAC" lamp circuitry.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry that is suspected as causing the intermittent complaint should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 11

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ABS WARNING OR LOW TRAC CKT MALFUNCTION

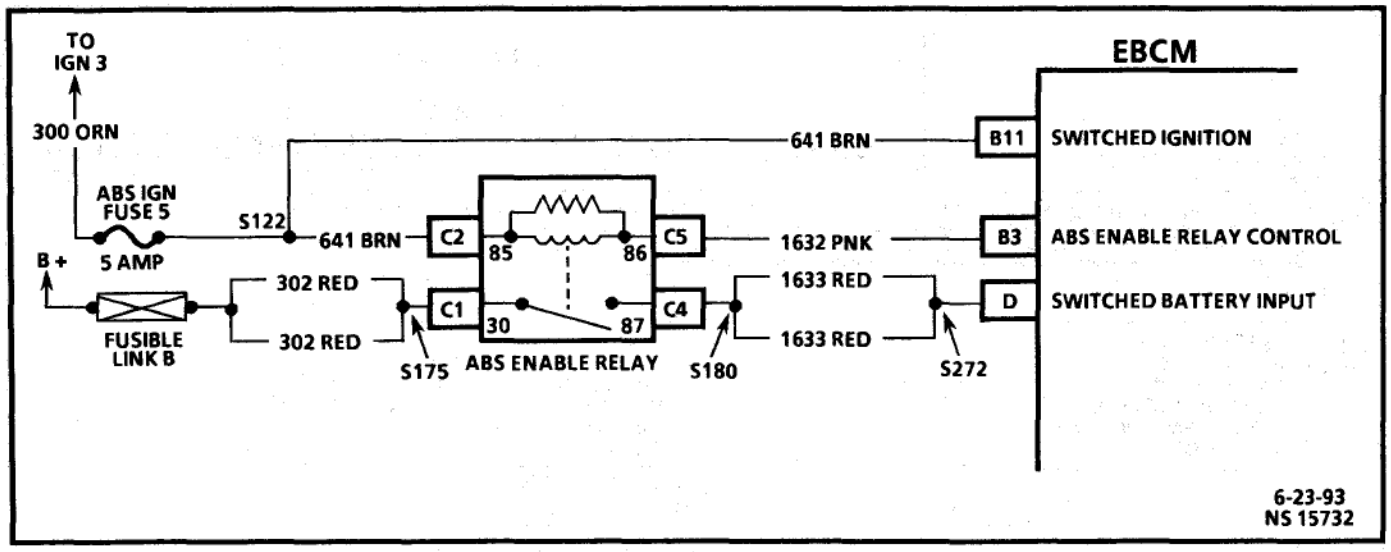
DIAGNOSIS CONTINUED FROM PREVIOUS PAGE

13 • STILL USING TECH 1 LAMP TEST, ATTEMPT TO TURN "ON," THEN "OFF" THE "LOW TRAC" LAMP. CAN THE "LOW TRAC" LAMP BE TURNED BOTH "ON" AND "OFF" USING THE TECH 1?

- NO
  - **14** • IGNITION "OFF." • REMOVE TECH 1. • IGNITION "ON." DOES THE "LOW TRAC" LAMP TURN "ON" AND STAY "ON"?
    - YES
      - **15** • IGNITION "OFF." • DISCONNECT 32-WAY EBCM CONNECTOR. • IGNITION "ON." DOES THE "LOW TRAC" LAMP TURN "ON"?
        - NO
          - **16** • IGNITION "OFF." • INSPECT TERMINAL "B5" OF THE 32-WAY EBCM CONNECTOR FOR BENT TERMINALS OR FOREIGN DEBRIS. CORRECT AS NECESSARY. • RECONNECT ALL CONNECTORS. • IGNITION "ON." DOES DTC 11 RESET?
            - YES → REPLACE EBCM.
            - NO → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
        - YES → REPAIR SHORT TO GROUND ON CKT 1537.
    - NO
      - **18** • IGNITION "OFF." • DISCONNECT 32-WAY EBCM CONNECTOR. • IGNITION "ON." • CONNECT A FUSED JUMPER WIRE, SUCH AS J 36169, WITH A 3 AMP FUSE BETWEEN GROUND AND TERMINAL "B5" OF THE 32-WAY EBCM HARNESS CONNECTOR. DOES THE "LOW TRAC" LAMP TURN "ON"?
        - NO
          - **19** • IGNITION "OFF." • DISCONNECT I/P CLUSTER CONNECTOR. • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "B5" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "D16" (CHEVY) OR "A16" (PONT) OF THE I/P CLUSTER HARNESS CONNECTOR. IS RESISTANCE 2Ω OR LESS?
            - YES
              - **20** • IGNITION "ON." • USING J 39200, MEASURE THE VOLTAGE FROM GROUND TO TERMINAL "B5" OF THE 32-WAY EBCM HARNESS CONNECTOR. IS VOLTAGE 2 VOLTS OR LESS?
                - YES → REFER TO SECTION 8A-81 FOR FURTHER DIAGNOSIS OF CLUSTER.
                - NO → REPAIR SHORT TO VOLTAGE IN CKT 1537.
            - NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 1537.
        - YES
          - **21** • IGNITION "OFF." • INSPECT TERMINAL "B5" OF THE 32-WAY EBCM CONNECTOR FOR POOR TERMINAL CONTACT. • RECONNECT ALL CONNECTORS. • IGNITION "ON." DOES DTC 11 RESET?
            - YES → REPLACE EBCM.
            - NO → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- YES
  - **17** • IGNITION "OFF." • INSPECT ALL CONNECTORS FOR POOR TERMINAL CONTACT. • RECONNECT ALL CONNECTORS. • IGNITION "ON." DOES DTC 11 RESET?
    - YES → REPLACE EBCM.
    - NO → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

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DTC 14

(Page 1 of 3)
ABS ENABLE RELAY CONTACT CIRCUIT OPEN

Circuit Description:

Ignition voltage is supplied through terminal "C2" of the ABS enable relay. The EBCM then is able to energize the pull-in coil by completing the ground circuit at terminal "B3" of the EBCM. The magnetic field created closes the ABS enable relay contacts and allows battery voltage and current to be supplied to the EBCM, which supplies power to the motors and solenoids.

DTC Will Set When: DTC 14 can be set anytime after the EBCM commands the ABS enable relay "ON" (the relay is first commanded "ON" during the three second bulb check). This test monitors the availability of current/voltage to the motors and solenoids. This malfunction indicates voltage is not available and would therefore not allow ABS operation if required.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see if DTC 16 is also set as current or history. If DTC 16 is also set, proceed to that chart first.
2. Verifies that the malfunction is currently present.
3. Verifies that the relay can be turned "ON" and provide voltage to the EBCM.
4. Checks for high resistance in the switched battery circuit from the relay to the EBCM.
5. Checks for high resistance in the switched battery circuit from the battery to the relay.
6. Checks for high resistance in the relay contacts.
7. Checks for poor terminal contact or corrosion at the connectors.
8. Determines if the EBCM is the cause of the malfunction.

Diagnostic Aids: An "Intermittent" problem may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the problem can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry that is suspected as causing the "Intermittent" complaint should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

VIBRATION, TEMPERATURE EFFECTS:

Check for vibration effects by performing the relay test function of the Tech 1. With the relay test commanded "ON," lightly tap the top and sides of the relay while monitoring relay voltage. If the relay voltage changes significantly, replace the relay.

If DTC 14 only sets when the vehicle is initially started in cold ambient conditions (temperature less than 32°F-0°C), replace the relay.

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DTC 14

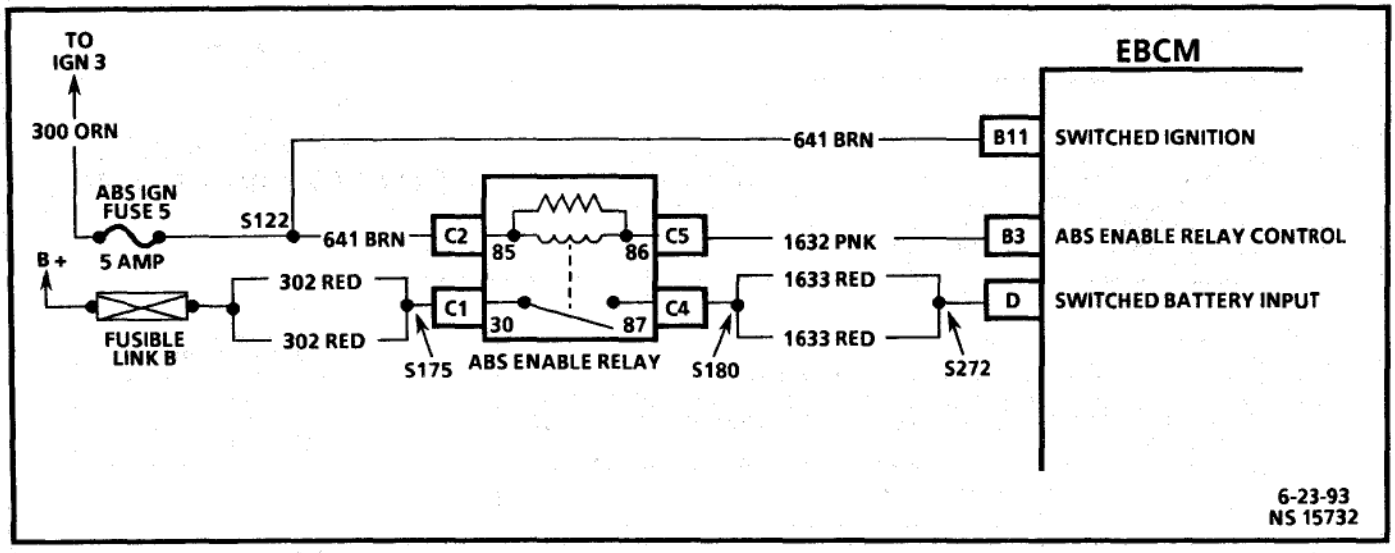
(Page 1 of 3)

ABS ENABLE RELAY CONTACT CIRCUIT OPEN

1. IS DTC 16 ALSO PRESENT OR IN HISTORY?
   - YES → PROCEED TO DTC 16 CHART FIRST.
   - NO →
2. • IGNITION "ON," ENGINE "OFF."
   • USING TECH 1, SELECT DATA LIST AND OBSERVE EBCM BATTERY VOLTAGE.
   DOES TECH 1 INDICATE THAT EBCM BATTERY VOLTAGE IS GREATER THAN 10 VOLTS?
   - YES → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - NO →
3. • IGNITION "OFF."
   • DISCONNECT 32-WAY AND 8-WAY EBCM CONNECTORS.
   • CONNECT A FUSED JUMPER, SUCH AS J 36169 WITH A 3 AMP FUSE BETWEEN GROUND AND TERMINAL "B3" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   • IGNITION "ON."
   • USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "D" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS VOLTAGE 10 VOLTS OR GREATER?
   - NO → DIAGNOSIS CONTINUED ON NEXT PAGE.
   - YES →
4. • IGNITION "OFF."
   • DISCONNECT JUMPER USED IN STEP 3.
   • DISCONNECT ABS ENABLE RELAY.
   • USING J 39200, MEASURE RESISTANCE BETWEEN TERMINAL "C4" OF THE ABS ENABLE RELAY HARNESS CONNECTOR AND TERMINAL "D" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 2Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1633.
   - YES →
5. • DISCONNECT NEGATIVE BATTERY CABLE.
   • DISCONNECT POSITIVE BATTERY CABLE.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN POSITIVE BATTERY CABLE TERMINAL AND TERMINAL "C1" OF THE ABS ENABLE RELAY HARNESS CONNECTOR.
   IS RESISTANCE 2Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 302. REFER TO SECTION 8A.
   - YES →
6. • USING A JUMPER WIRE, CONNECT TERMINAL "86" ON THE ABS ENABLE RELAY TO GROUND.
   • USING A FUSED JUMPER WIRE, SUCH AS J 36169, WITH A 3 AMP FUSE, CONNECT TERMINAL "85" ON THE ABS ENABLE RELAY TO B+.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINALS "30" AND "87" ON THE ABS ENABLE RELAY.
   IS RESISTANCE 2Ω OR LESS?
   - NO → REPLACE ABS ENABLE RELAY.
   - YES →
7. • INSPECT ABS ENABLE RELAY AND ABS ENABLE RELAY HARNESS CONNECTOR FOR A POOR CONNECTION OR POOR TERMINAL CONTACT.
   • INSPECT EBCM AND EBCM CONNECTOR TERMINALS "B3" AND "D" FOR POOR TERMINAL CONTACT.
   • INSPECT POSITIVE BATTERY TERMINAL AND POSITIVE BATTERY CABLE TERMINAL FOR A POOR CONNECTION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT."
   IS POOR TERMINAL CONTACT OR A POOR CONNECTION EVIDENT?
   - YES → REPLACE TERMINALS THAT EXHIBIT POOR TERMINAL CONTACT OR EVIDENCE OF CORROSION.
   - NO →
8. • RECONNECT ALL CONNECTORS.
   • IGNITION "ON."
   DOES DTC 14 RESET?
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

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DTC 14

(Page 2 of 3)
ABS ENABLE RELAY CONTACT CIRCUIT OPEN

Circuit Description:

Ignition voltage is supplied through terminal "C2" of the ABS enable relay. The EBCM then is able to energize the pull-in coil by completing the ground circuit at terminal "B3" of the EBCM. The magnetic field created closes the ABS enable relay contacts and allows battery voltage and current to be supplied to the EBCM, which supplies power to the motors and solenoids.

DTC Will Set When: DTC 14 can be set anytime after the EBCM commands the ABS enable relay "ON" (the relay is first commanded "ON" during the three second bulb check). This test monitors the availability of current/voltage to the motors and solenoids. This malfunction indicates voltage is not available and would therefore not allow ABS operation if required.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

9. Checks for high resistance in the entire relay coil circuit.
10. Verifies proper battery condition.
11. Verifies proper voltage is available at the ABS enable relay.
12. Checks for an open in the switched battery circuit from the relay to the EBCM.
13. Verifies the condition of the ABS enable relay.

Diagnostic Aids: An "Intermittent" problem may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the problem can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry that is suspected as causing the "Intermittent" complaint should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

VIBRATION, TEMPERATURE EFFECTS:

Check for vibration effects by performing the relay test function of the Tech 1. With the relay test commanded "ON," lightly tap the top and sides of the relay while monitoring relay voltage. If the relay voltage changes significantly, replace the relay.

If DTC 14 only sets when the vehicle is initially started in cold ambient conditions (temperature less than 32°F-0°C), replace the relay.

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DTC 14

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ABS ENABLE RELAY CONTACT CIRCUIT OPEN

DIAGNOSIS CONTINUED FROM PREVIOUS PAGE.

9
- IGNITION "OFF."
- REMOVE JUMPER WIRE INSTALLED IN STEP 3, IF NOT ALREADY REMOVED.
- DISCONNECT NEGATIVE BATTERY CABLE.
- DISCONNECT POSITIVE BATTERY CABLE.
- WITH BATTERY STILL DISCONNECTED, TURN IGNITION SWITCH TO "RUN." THIS COMPLETES THE IGNITION CIRCUIT TO THE ABS ENABLE RELAY.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "B3" OF THE 32-WAY EBCM HARNESS CONNECTOR AND THE POSITIVE BATTERY CABLE TERMINAL. IS RESISTANCE 95Ω OR LESS WHEN MEASURED AT APPROXIMATELY 20 °C (68°F)?

YES

NO → DIAGNOSIS CONTINUED ON NEXT PAGE.

10
- USING J 39200, MEASURE THE VOLTAGE BETWEEN THE NEGATIVE AND POSITIVE BATTERY TERMINALS. IS VOLTAGE 10 VOLTS OR GREATER?

YES

NO → REFER TO SECTION 6D3 TO CORRECT LOW VOLTAGE CONDITION.

11
- IGNITION "OFF."
- RECONNECT POSITIVE BATTERY CABLE.
- RECONNECT NEGATIVE BATTERY CABLE.
- DISCONNECT ABS ENABLE RELAY.
- MEASURE THE VOLTAGE BETWEEN TERMINAL "C1" OF THE ABS ENABLE RELAY HARNESS CONNECTOR AND GROUND. IS VOLTAGE 10 VOLTS OR GREATER?

YES

NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 302.

12
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "C4" OF THE ABS ENABLE RELAY HARNESS CONNECTOR AND TERMINAL "D" OF THE 8-WAY EBCM HARNESS CONNECTOR. IS RESISTANCE 2Ω OR LESS?

YES

NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 1633.

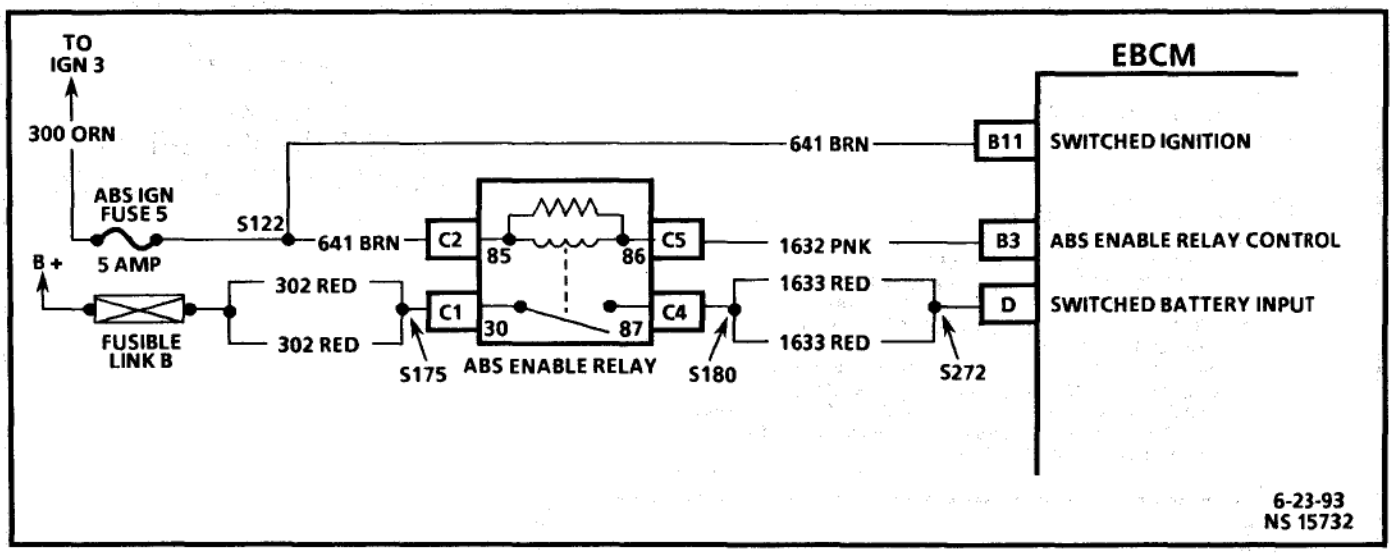
13
- USING A JUMPER WIRE, CONNECT TERMINAL "86" ON THE ABS ENABLE RELAY TO GROUND.
- USING A FUSED JUMPER WIRE, SUCH AS J 36169, WITH A 3 AMP FUSE, CONNECT TERMINAL "85" ON THE ABS ENABLE RELAY TO VOLTAGE.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINALS "30" AND "87" ON THE ABS ENABLE RELAY. IS RESISTANCE 2Ω OR LESS?

YES → MALFUNCTION WAS MOST LIKELY DUE TO A POOR CONNECTION. INSPECT ALL CONNECTORS AND TERMINALS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT EVIDENCE OF POOR TERMINAL CONTACT OR CORROSION.

NO → REPLACE ABS ENABLE RELAY.

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DTC 14

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ABS ENABLE RELAY CONTACT CIRCUIT OPEN

Circuit Description:

Ignition voltage is supplied through terminal "C2" of the ABS enable relay. The EBCM then is able to energize the pull-in coil by completing the ground circuit at terminal "B3" of the EBCM. The magnetic field created closes the ABS enable relay contacts and allows battery voltage and current to be supplied to the EBCM, which supplies power to the motors and solenoids.

DTC Will Set When: DTC 14 can be set anytime after the EBCM commands the ABS enable relay "ON" (the relay is first commanded "ON" during the three second bulb check). This test monitors the availability of current/voltage to the motors and solenoids. This malfunction indicates voltage is not available and would therefore not allow ABS operation if required.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

14. Checks for proper resistance of the relay coil.
15. Checks for high resistance in the ABS enable relay control circuit between the relay and the EBCM.
16. Checks for high resistance in the ABS enable relay control circuit between the battery and the relay.

Diagnostic Aids: An "Intermittent" problem may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the problem can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry that is suspected as causing the "Intermittent" complaint should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

VIBRATION, TEMPERATURE EFFECTS:

Check for vibration effects by performing the relay test function of the Tech 1. With the relay test commanded "ON," lightly tap the top and sides of the relay while monitoring relay voltage. If the relay voltage changes significantly, replace the relay.

If DTC 14 only sets when the vehicle is initially started in cold ambient conditions (temperature less than 32°F-0°C), replace the relay.

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DTC 14

(Page 3 of 3)

ABS ENABLE RELAY CONTACT CIRCUIT OPEN

DIAGNOSIS CONTINUED FROM PREVIOUS PAGE.

14
- DISCONNECT ABS ENABLE RELAY.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINALS "85" AND "86" ON THE ABS ENABLE RELAY. IS RESISTANCE 95Ω OR LESS WHEN MEASURED AT APPROXIMATELY 24°C (75°F)?

YES

15
- MEASURE THE RESISTANCE BETWEEN TERMINAL "C5" OF THE ABS ENABLE RELAY HARNESS CONNECTOR AND TERMINAL "B3" OF THE 32-WAY EBCM HARNESS CONNECTOR. IS RESISTANCE 2Ω OR LESS?

YES

16
- MEASURE THE RESISTANCE BETWEEN TERMINAL "C2" OF THE ABS ENABLE RELAY HARNESS CONNECTOR AND THE POSITIVE BATTERY CABLE TERMINAL. IS RESISTANCE 2Ω OR LESS?

YES

MALFUNCTION WAS MOST LIKELY DUE TO A POOR CONNECTION. INSPECT ALL CONNECTORS AND TERMINALS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT EVIDENCE OF POOR TERMINAL CONTACT OR CORROSION.

NO

REPAIR OPEN OR HIGH RESISTANCE IN CKT 641, CKT 300, IGNITION SWITCH, OR BATTERY FEED CIRCUIT TO IGNITION SWITCH. REFER TO SECTION 8A FOR FURTHER INFORMATION.

NO

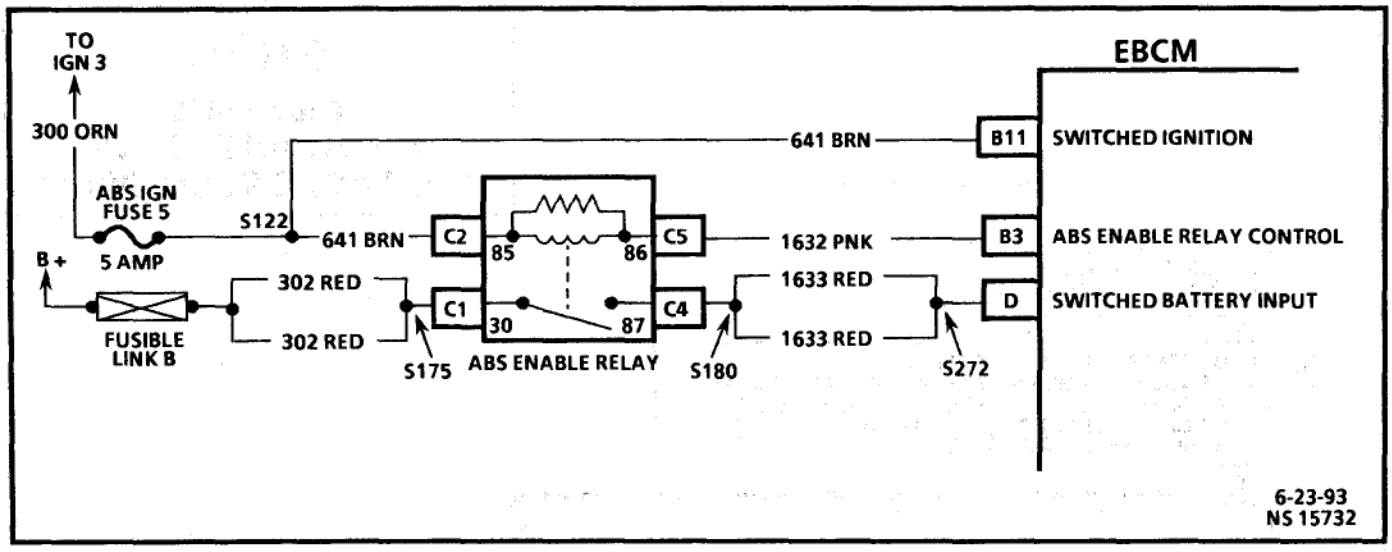
REPAIR OPEN OR HIGH RESISTANCE IN CKT 1632.

NO

REPLACE ABS ENABLE RELAY.

7-9-93
NS 16314

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DTC 15

ABS RLY CONTACT CKT SHORT TO BATT OR ALWAYS CLOSED

Circuit Description:

Ignition voltage is supplied through terminal "C2" of the ABS enable relay. The EBCM then is able to energize the pull-in coil by completing the ground circuit at terminal "B3" of the EBCM. The magnetic field created closes the ABS enable relay contacts and allows battery voltage and current to be supplied to the EBCM, which supplies power to the motors and solenoids.

DTC Will Set When: DTC 15 can be set only before the EBCM commands the relay "ON." This test determines if the ABS enable relay is energized when it should not be. This malfunction would not allow the ABS enable relay to remove power to the ABS system. If a second malfunction were to occur that requires the ABS enable relay to be turned "OFF," that malfunction cannot be removed if the relay cannot be controlled. The malfunction must be present for three consecutive drive cycles before the DTC is set.

Action Taken: A malfunction DTC is stored. ABS is not disabled.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Determines if any other DTCs are present.
2. Indicates that the EBCM is capable of controlling the enable relay as commanded.
3. Checks for a possible short to battery voltage in CKT 1633.
4. Determines whether the short to voltage is in CKT 1633 or as a result of a malfunctioning relay.
5. Checks for a possible intermittent in wiring or connectors.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 15

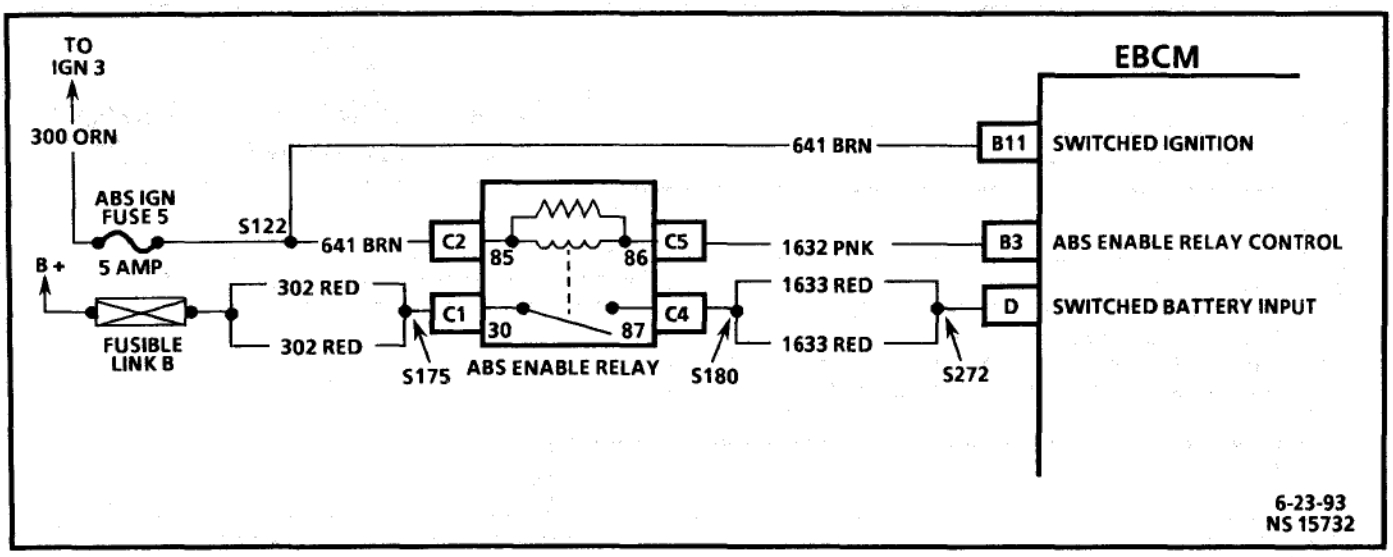
ABS RLY CONTACT CKT SHORT TO BATT OR ALWAYS CLOSED

1. ARE ANY OTHER DTCs SET?
   - YES → PROCEED TO THAT DTC CHART FIRST.
   - NO →
2. • IGNITION "ON," ENGINE "OFF."
   • USING THE RELAY TEST FUNCTION OF THE TECH 1, COMMAND ABS ENABLE RELAY "OFF."
   DOES TECH 1 INDICATE THAT ABS ENABLE RELAY IS "OFF" AND BATTERY VOLTAGE IS LESS THAN 5 VOLTS?
   - YES → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - NO →
3. • IGNITION "OFF."
   • DISCONNECT 32-WAY AND 8-WAY EBCM HARNESS CONNECTORS.
   • IGNITION "ON."
   • USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "D" OF THE 8-WAY EBCM CONNECTOR.
   IS VOLTAGE 2 VOLTS OR LESS?
   - YES →
5. • IGNITION "OFF."
   • INSPECT CKT 1633 AND THE 8-WAY EBCM HARNESS CONNECTOR FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WHEN ALL CONNECTORS ARE CONNECTED. REPAIR DAMAGE IF EVIDENT.
   • RECONNECT 8-WAY AND 32-WAY EBCM CONNECTORS.
   • IGNITION "ON."
   • USING RELAY TEST FUNCTION OF TECH 1, COMMAND ABS ENABLE RELAY "OFF."
   DOES TECH 1 INDICATE THAT ABS ENABLE RELAY IS "OFF" AND BATTERY VOLTAGE IS LESS THAN 5 VOLTS?
   - NO → REPLACE EBCM.
   - YES → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - NO →
4. • IGNITION "OFF."
   • DISCONNECT ABS ENABLE RELAY.
   • IGNITION "ON."
   • MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "D" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS VOLTAGE 2 VOLTS OR LESS?
   - YES → REPLACE ABS ENABLE RELAY.
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 1633.

AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs, AND TEST DRIVE VEHICLE FOR 3 DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING ABOVE 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-10-93
NS 15704

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DTC 16

ABS ENABLE RELAY COIL CIRCUIT OPEN

Circuit Description:

Ignition voltage is supplied through terminal "C2" of the ABS enable relay. The EBCM then is able to energize the pull-in coil by completing the ground circuit at terminal "B3" of the EBCM. The magnetic field created closes the ABS enable relay contacts and allows battery voltage and current to be supplied to the EBCM, which supplies power to the motors and solenoids.

DTC Will Set When: DTC 16 can be set only after DTC 14 has been set. This test detects an open in the ABS enable relay coil circuit. An open in this circuit will not allow the ABS enable relay to be energized thus preventing voltage/current to the motors and solenoids. If this malfunction is present and the ignition is turned "OFF" before 5 km/h (3 mph) is reached, DTC 14 is set alone.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Indicates the EBCM is capable of controlling the ABS enable relay as commanded.
2. Checks to ensure that voltage is available to the pull-in coil of the ABS enable relay.
3. Ensures that there is continuity through the pull-in coil of the ABS enable relay.
4. Verifies the integrity of the relay control circuit.
5. Ensures malfunction was not due to poor terminal contact.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the frequency of the malfunction is high, but is currently intermittent, check for high coil resistance by measuring between relay terminals "C4" and "C5" using a J 39200. If resistance shows greater than 100Ω, replace the relay.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 16

ABS ENABLE RELAY COIL CIRCUIT OPEN

1
- IGNITION "ON," ENGINE "OFF."
- USING THE RELAY TEST FUNCTION OF THE TECH 1, COMMAND THE ABS ENABLE RELAY "ON."

DOES TECH 1 INDICATE ABS ENABLE RELAY "ON" AND BATTERY VOLTAGE ABOVE 10 VOLTS?

NO

2
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "C2" OF THE ABS ENABLE RELAY CONNECTOR.

IS VOLTAGE 10 VOLTS OR GREATER?

YES

3
- USING THE RELAY TEST FUNCTION OF THE TECH 1, COMMAND THE ABS ENABLE RELAY "OFF."
- MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "C5" OF THE ABS ENABLE RELAY CONNECTOR.

IS VOLTAGE 10 VOLTS OR GREATER?

YES

4
- IGNITION "OFF."
- DISCONNECT 32-WAY EBCM CONNECTOR.
- IGNITION "ON."
- MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B3" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS VOLTAGE 10 VOLTS OR GREATER?

YES

5
- IGNITION "OFF."
- INSPECT 32-WAY EBCM CONNECTOR TERMINAL "B3" FOR POOR TERMINAL CONTACT OR EVIDENCE OF CORROSION. REFER TO SECTION 8A-4 "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.
- RECONNECT ALL CONNECTORS.
- IGNITION "ON."

DOES DTC 16 SET AS A CURRENT DTC?

YES

REPLACE EBCM.

NO

MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

REPAIR OPEN OR HIGH RESISTANCE IN CKT 1632.

NO

CHECK FOR INTERMITTENT CONNECTIONS AT ABS ENABLE RELAY. IF OK, REPLACE ABS RELAY.

NO

REPAIR OPEN OR HIGH RESISTANCE IN CKT 641 OR ABS IGN FUSE 5.

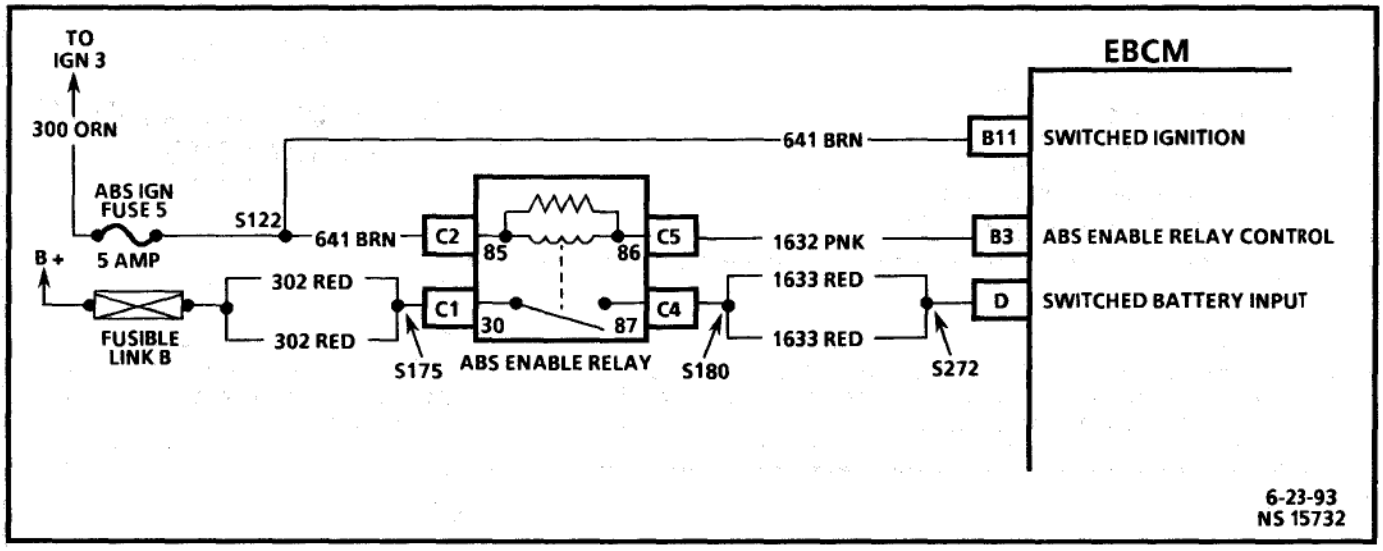
YES

MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-28-93
NS 15705

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DTC 17

ABS ENABLE RELAY COIL CIRCUIT SHORTED TO GND

Circuit Description:

Ignition voltage is supplied through terminal "C2" of the ABS enable relay. The EBCM then is able to energize the pull-in coil by completing the ground circuit at terminal "B3" of the EBCM. The magnetic field created closes the ABS enable relay contacts and allows battery voltage and current to be supplied to the EBCM, which supplies voltage to the motors and solenoids.

DTC Will Set When: DTC 17 can be set before the EBCM commands the ABS enable relay "ON." This test determines if the ABS enable relay is energized when it should not be. This malfunction would not allow the ABS enable relay to remove power to the ABS system. If a second malfunction were to occur that requires the ABS enable relay to be turned "OFF," that malfunction cannot be removed if the relay cannot be controlled.

Action Taken: A malfunction DTC is stored. ABS is not disabled.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Indicates that the EBCM is capable of controlling the ABS enable relay as commanded.
2. Checks to ensure that the ABS enable relay or control CKT 1632 are not shorted to ground.
3. Checks to see if the EBCM is internally shorted to ground. A grounded terminal "B3" would cause the ABS enable relay to be energized any time the ignition was in the "ON" position.
4. Checks for a short to ground in control CKT 1632 or a defective relay.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

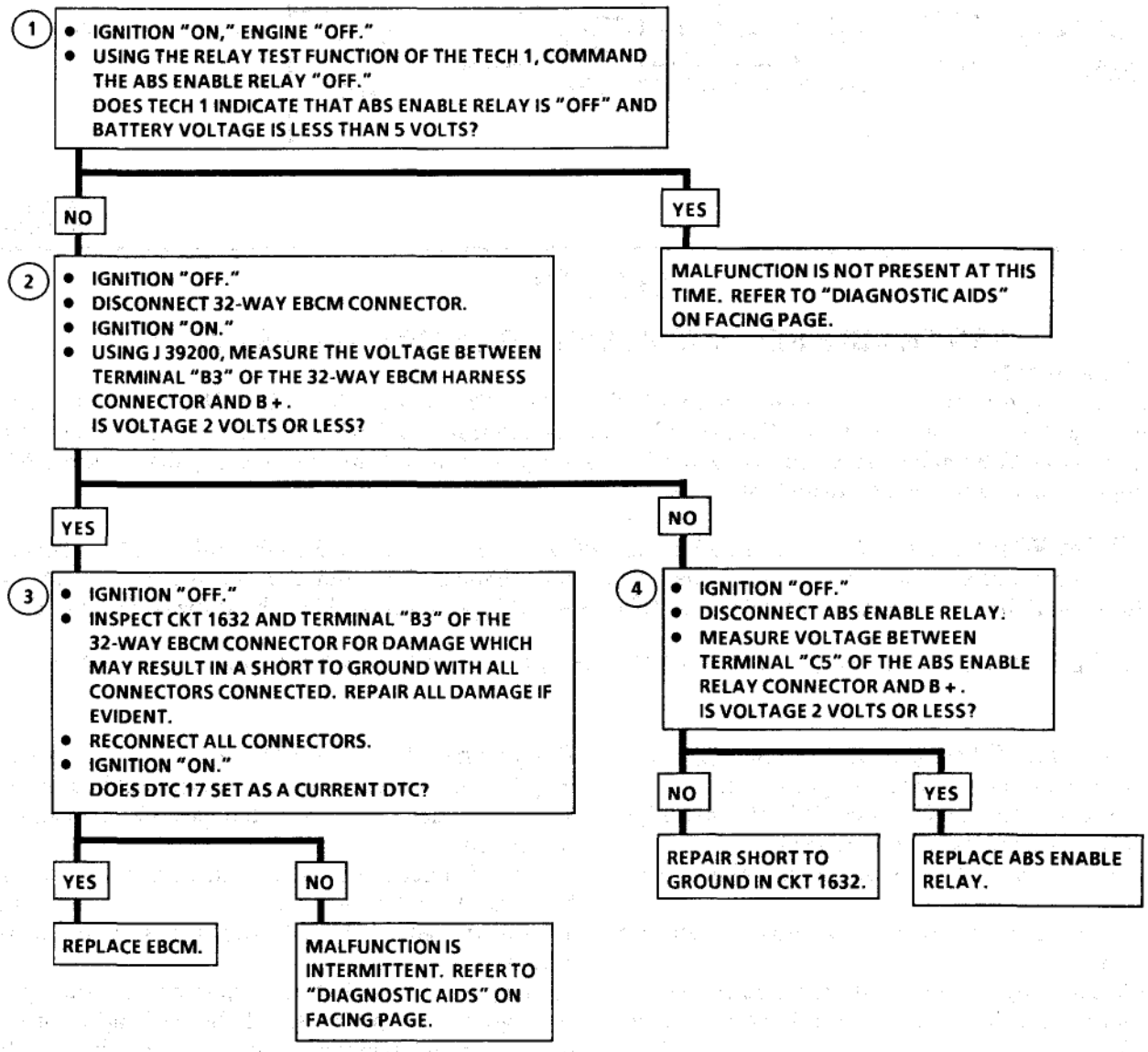
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 17

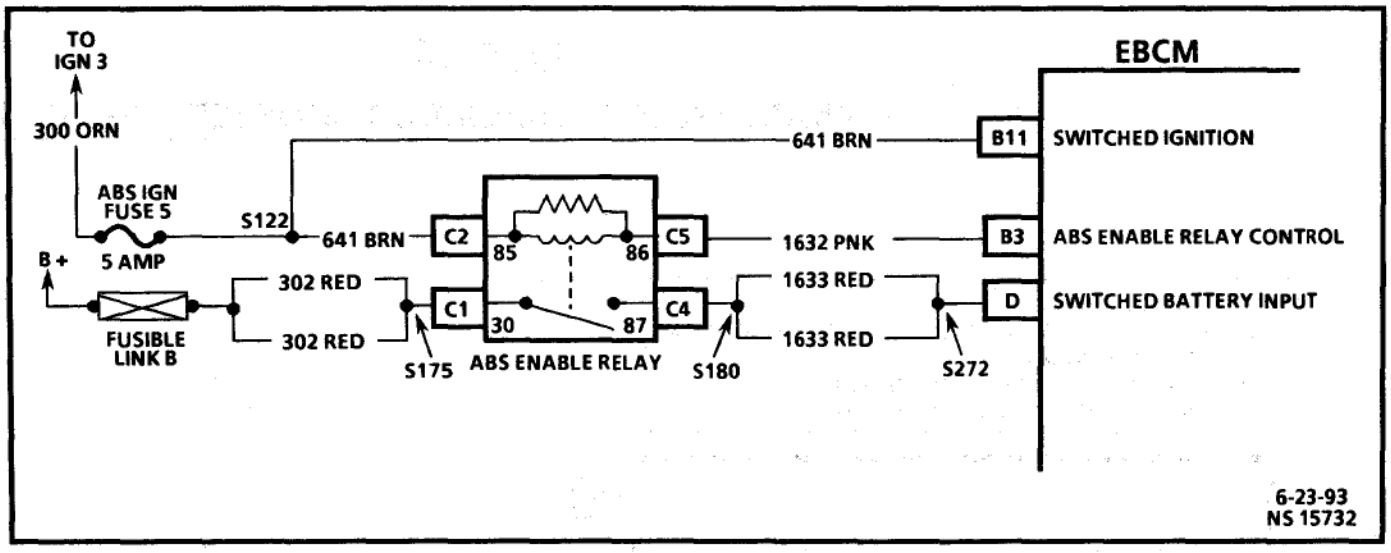
ABS ENABLE RELAY COIL CIRCUIT SHORTED TO GND



AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

7-7-93
NS 15706

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DTC 18

ABS ENABLE RELAY COIL CIRCUIT SHORTED TO BATT

Circuit Description:

Ignition voltage is supplied through terminal "C2" of the ABS enable relay. The EBCM then is able to energize the pull-in coil by completing the ground circuit at terminal "B3" of the EBCM. The magnetic field created closes the ABS enable relay contacts and allows battery voltage and current to be supplied to the EBCM, which supplies voltage to the motors and solenoids.

DTC Will Set When: DTC 18 can be set after the EBCM commands the ABS enable relay "ON." This test monitors the availability of current/voltage to the motors and solenoids. A malfunction of this type will not allow voltage to be available to the motors and solenoids; therefore, ABS operation would not be allowed if required.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Indicates that the EBCM is capable of controlling the ABS enable relay as commanded.
2. Checks for a short to voltage on the relay control circuit.
3. Verifies that the relay coil has the appropriate resistance.
4. Checks for relay contacts that are failed closed.
5. Checks for possible poor terminal contact at the EBCM.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 18

ABS ENABLE RELAY COIL CIRCUIT SHORTED TO BATT

1
- IGNITION "ON," ENGINE "OFF."
- USING RELAY TEST FUNCTION OF TECH 1, COMMAND ABS ENABLE RELAY "ON." DOES TECH 1 INDICATE ABS ENABLE RELAY "ON" AND BATTERY VOLTAGE ABOVE 10 VOLTS?

NO

2
- IGNITION "OFF."
- DISCONNECT ABS ENABLE RELAY.
- DISCONNECT 32-WAY EBCM CONNECTOR.
- IGNITION "ON."
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B3" OF THE 32-WAY EBCM HARNESS CONNECTOR. IS VOLTAGE 2 VOLTS OR LESS?

YES

3
- IGNITION "OFF."
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "C2" AND TERMINAL "C5" OF THE ABS ENABLE RELAY. IS RESISTANCE 40Ω OR GREATER?

YES

4
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINALS "30" AND "87" OF THE ABS ENABLE RELAY. DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

5
- INSPECT CKT 1632 AND TERMINAL "B3" OF THE 32-WAY EBCM CONNECTOR FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
- RECONNECT ALL CONNECTORS.
- IGNITION "ON." DOES DTC 18 SET AS A CURRENT DTC?

YES

REPLACE EBCM.

NO

MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

REPLACE ABS ENABLE RELAY.

NO

REPLACE ABS ENABLE RELAY.

NO

REPAIR SHORT TO VOLTAGE IN CKT 1632.

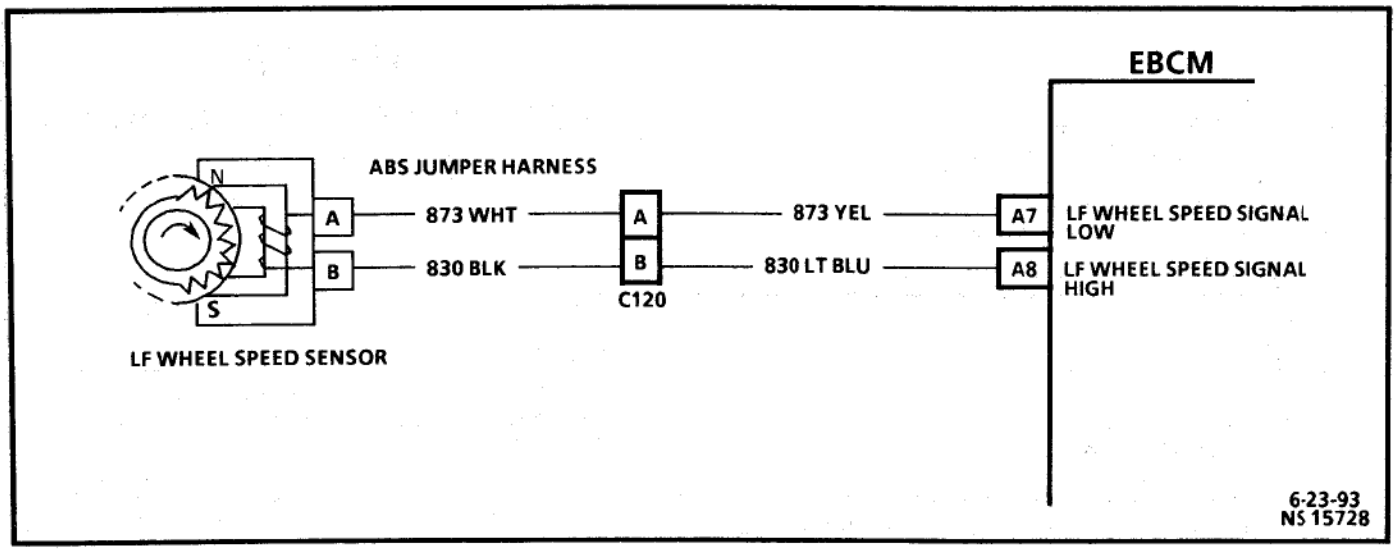
YES

MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

7-7-93
NS 15707

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DTC 21

LEFT FRONT WHEEL SPEED = 0

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 21 can be set when the vehicle is not in an ABS stop. If the left front wheel speed = 0 and the vehicle's reference speed is greater than 8 km/h (5 mph), a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step identifies a wheel speed sensor or circuitry that is damaged and visibly apparent.
2. Checks to see that the wheel speed sensor coil is within proper resistance values.
3. Verifies that the wheel speed sensor can generate an appropriate output signal.
4. This ensures that the wheel speed circuitry is not shorted together.
5. Ensures that the malfunction was not due to physical damage.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 21
LEFT FRONT WHEEL SPEED = 0

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1. • IGNITION "OFF."
   • PHYSICALLY INSPECT THE LEFT FRONT WHEEL SPEED SENSOR, LEFT FRONT WHEEL SPEED SENSOR JUMPER HARNESS, AND CONNECTORS FOR DAMAGE.
   IS PHYSICAL DAMAGE INDICATED?
   - YES → REPLACE WHEEL SPEED SENSOR AND/OR JUMPER HARNESS IF DAMAGED. DRIVE VEHICLE ABOVE 24 km/h (15 MPH) TO ENSURE DTC 21 DOES NOT SET.
   - NO →
2. • DISCONNECT LEFT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN SENSOR TERMINALS "A" AND "B."
   IS RESISTANCE BETWEEN 1020 AND 1137Ω WHEN SENSOR IS 20°C (68°F)?
   (IF TEMPERATURE OF THE SENSOR IS SUSPECTED TO BE OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
3. • WITH J 39200 STILL CONNECTED, SELECT A/C VOLTAGE SCALE.
   • SPIN WHEEL BY HAND WHILE OBSERVING VOLTAGE.
   IS VOLTAGE AT LEAST 100 mV (VOLTAGE WILL INCREASE AS WHEEL SPEED INCREASES)?
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
4. • IGNITION "OFF."
   • DISCONNECT 32-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A7" AND "A8" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - NO → REPAIR SHORT BETWEEN CKTs 830 AND 873.
   - YES →
5. • INSPECT CKTs 830 AND 873 AND 32-WAY EBCM CONNECTOR FOR DAMAGE WHICH MAY RESULT IN A SHORT BETWEEN CKTs 830 AND 873 WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • TEST DRIVE VEHICLE ABOVE 24 km/h (15 MPH) FOR AT LEAST 30 SECONDS.
   DOES DTC 21 SET AS A CURRENT DTC?
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

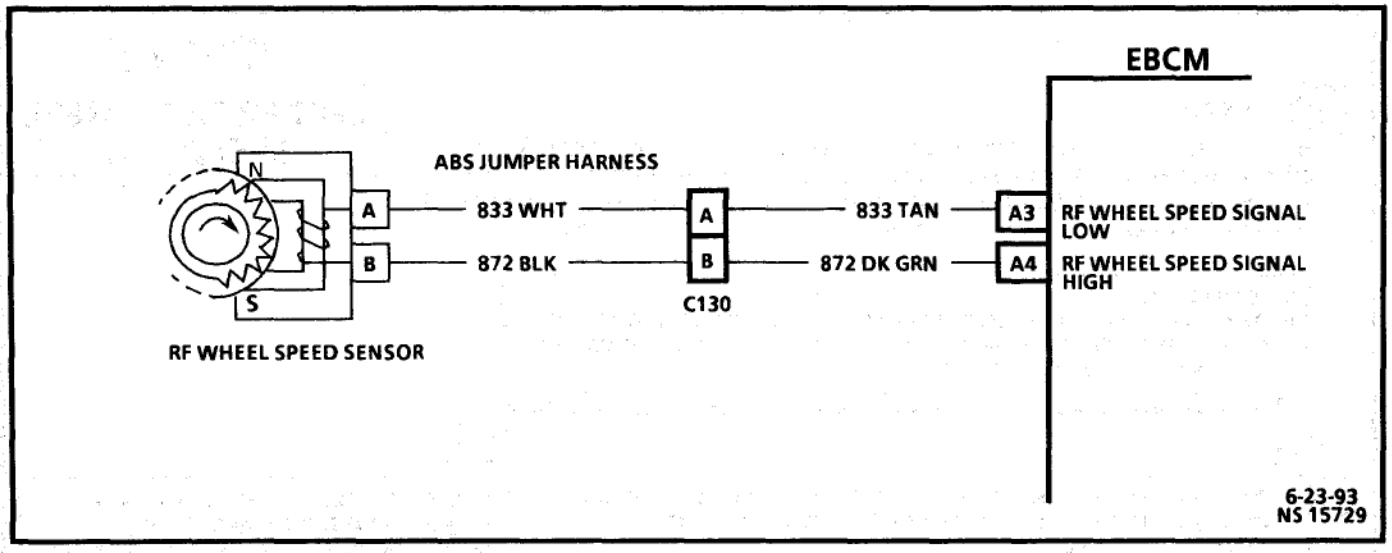
FRONT WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	804 TO 1066
5 TO 43	41 TO 110	956 TO 1240
44 TO 93	111 TO 200	1112 TO 1463

7-9-93
NS 16188

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DTC 22

RIGHT FRONT WHEEL SPEED = 0

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 22 can be set when the vehicle is not in an ABS stop. If the right front wheel speed = 0 and the vehicle's reference speed is greater than 8 km/h (5 mph), a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step identifies a wheel speed sensor or circuitry that is damaged and visibly apparent.
2. Checks to see that the wheel speed sensor coil is within proper resistance values.
3. Verifies that the wheel speed sensor can generate an appropriate output signal.
4. This ensures that the wheel speed circuitry is not shorted together.
5. Ensures that the malfunction was not due to physical damage.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 22
RIGHT FRONT WHEEL SPEED = 0

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1
- IGNITION "OFF."
- PHYSICALLY INSPECT THE RIGHT FRONT WHEEL SPEED SENSOR, RIGHT FRONT WHEEL SPEED SENSOR JUMPER HARNESS, AND CONNECTORS FOR DAMAGE.

IS PHYSICAL DAMAGE INDICATED?

- YES → REPLACE WHEEL SPEED SENSOR AND/OR JUMPER HARNESS IF DAMAGED. DRIVE VEHICLE ABOVE 24 km/h (15 MPH) TO ENSURE DTC 22 DOES NOT SET.
- NO →

2
- DISCONNECT RIGHT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN SENSOR TERMINALS "A" AND "B."

IS RESISTANCE BETWEEN 1020 AND 1137Ω WHEN SENSOR IS 20°C (68°F)?
(IF TEMPERATURE OF THE SENSOR IS SUSPECTED TO BE OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)

- NO → REPLACE WHEEL SPEED SENSOR.
- YES →

3
- WITH J 39200 STILL CONNECTED, SELECT A/C VOLTAGE SCALE.
- SPIN WHEEL BY HAND WHILE OBSERVING VOLTAGE.

IS VOLTAGE AT LEAST 100 mV (VOLTAGE WILL INCREASE AS WHEEL SPEED INCREASES)?

- NO → REPLACE WHEEL SPEED SENSOR.
- YES →

4
- IGNITION "OFF."
- DISCONNECT 32-WAY EBCM CONNECTOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A3" AND "A4" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

- NO → REPAIR SHORT BETWEEN CKTs 833 AND 872.
- YES →

5
- INSPECT CKTs 833 AND 872 AND 32-WAY EBCM CONNECTOR FOR DAMAGE WHICH MAY RESULT IN A SHORT BETWEEN CKTs 833 AND 872 WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
- RECONNECT ALL CONNECTORS.
- TEST DRIVE VEHICLE ABOVE 24 km/h (15 MPH) FOR AT LEAST 30 SECONDS.

DOES DTC 22 SET AS A CURRENT DTC?

- NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- YES → REPLACE EBCM.

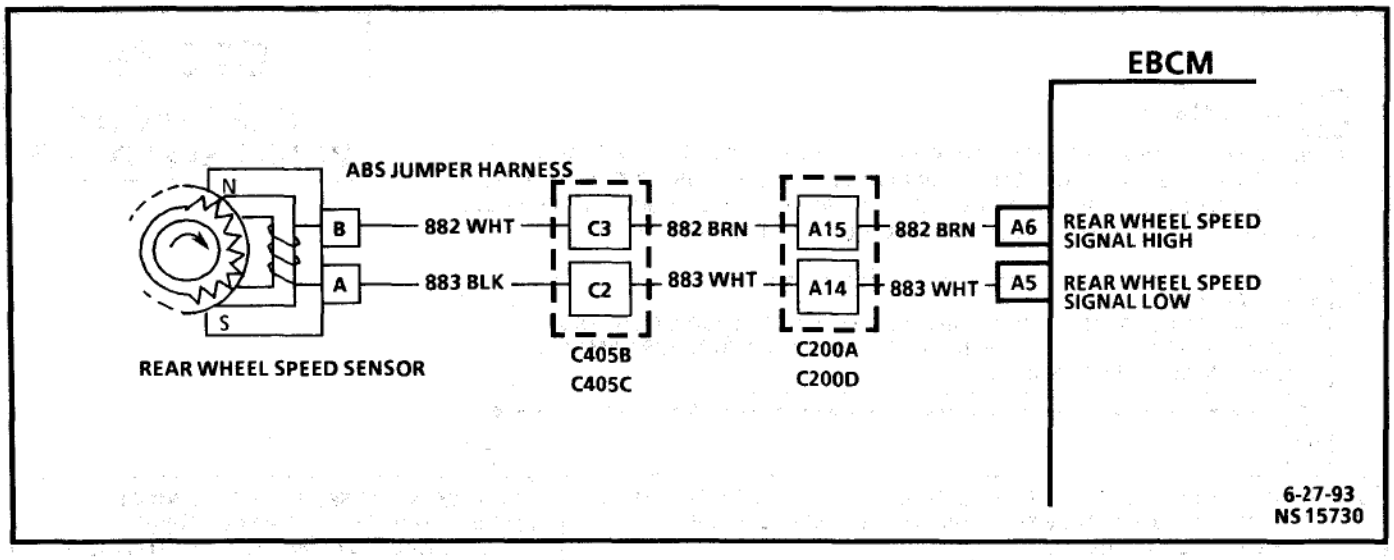
FRONT WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	804 TO 1066
5 TO 43	41 TO 110	956 TO 1240
44 TO 93	111 TO 200	1112 TO 1463

7-9-93
NS 16189

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DTC 24

REAR WHEEL SPEED = 0

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 24 can be set when the vehicle is not in an ABS stop. If the rear wheel speed = 0 and the vehicle's reference speed is greater than 8 km/h (5 mph), a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step identifies a wheel speed sensor or circuitry that is damaged and visibly apparent.
2. Checks to see that the wheel speed sensor coil is within proper resistance values.
3. Verifies that the wheel speed sensor can generate an appropriate output signal.
4. Verifies that the wheel speed circuitry is not shorted together.
5. Ensures that the malfunction was not due to physical damage.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 24
REAR WHEEL SPEED = 0

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1. • IGNITION "OFF."
   • PHYSICALLY INSPECT THE REAR WHEEL SPEED SENSOR, WHEEL SPEED SENSOR JUMPER HARNESS, AND CONNECTORS FOR DAMAGE.
   IS PHYSICAL DAMAGE INDICATED?
   - YES → REPLACE WHEEL SPEED SENSOR AND/OR WHEEL SPEED SENSOR JUMPER HARNESS IF DAMAGED. DRIVE VEHICLE ABOVE 24 km/h (15 MPH) TO ENSURE DTC 24 DOES NOT SET.
   - NO →
2. • DISCONNECT REAR WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN SENSOR TERMINALS "A" AND "B."
   IS RESISTANCE BETWEEN 969 AND 1185Ω WHEN SENSOR IS 20°C (68°F)?
   (IF TEMPERATURE OF THE SENSOR IS SUSPECTED TO BE OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
3. • WITH J 39200 STILL CONNECTED, SELECT A/C VOLTAGE SCALE.
   • VEHICLE TRANSMISSION IN NEUTRAL.
   • SPIN WHEEL BY HAND WHILE OBSERVING VOLTAGE.
   IS VOLTAGE AT LEAST 100 mV (VOLTAGE WILL INCREASE AS WHEEL SPEED INCREASES)?
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
4. • IGNITION "OFF."
   • DISCONNECT 32-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A5" AND "A6" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - NO → REPAIR SHORT BETWEEN CKTs 882 AND 883.
   - YES →
5. • INSPECT CKTs 882 AND 883 AND 32-WAY EBCM CONNECTOR FOR DAMAGE WHICH MAY RESULT IN A SHORT BETWEEN CKTs 882 AND 883 WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • TEST DRIVE VEHICLE ABOVE 24 km/h (15 MPH) FOR AT LEAST 30 SECONDS.
   DOES DTC 24 SET AS A CURRENT DTC?
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

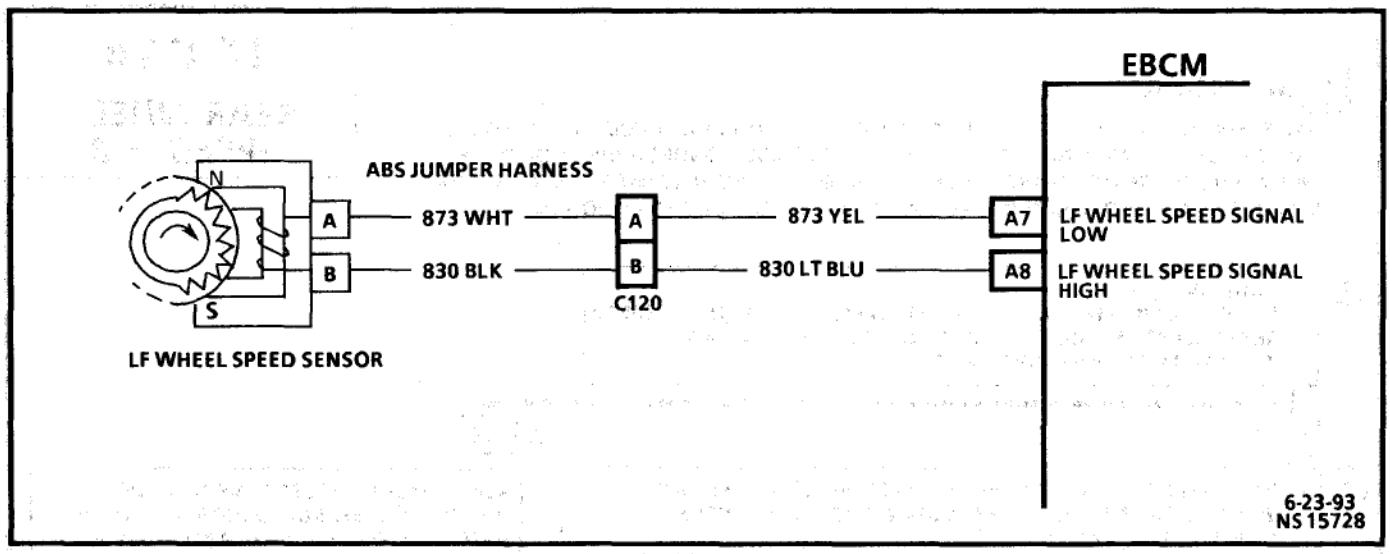
REAR WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	763 TO 1110
5 TO 43	41 TO 110	908 TO 1292
44 TO 93	111 TO 200	1057 TO 1525

7-12-93
PS 18177

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DTC 25

LEFT FRONT EXCESSIVE WHEEL SPEED VARIATION

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 25 can be set when the brake is "OFF." The purpose of this test is to detect a situation in which the left front wheel acceleration or deceleration is beyond specified limits.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step identifies a wheel speed sensor or circuitry that is damaged and visibly apparent.
2. Checks to see that the wheel speed sensor coil is within proper resistance values.
3. Verifies that the wheel speed sensor can generate an appropriate output signal.
4. This ensures that the wheel speed circuitry is not shorted together.
5. Ensures that the malfunction was not due to physical damage.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 25
LEFT FRONT EXCESSIVE WHEEL SPEED VARIATION

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1. • IGNITION "OFF."
   • PHYSICALLY INSPECT THE LEFT FRONT WHEEL SPEED SENSOR, LEFT FRONT WHEEL SPEED SENSOR JUMPER HARNESS, AND CONNECTORS FOR DAMAGE.
   IS PHYSICAL DAMAGE INDICATED?
   - YES → REPLACE WHEEL SPEED SENSOR AND/OR JUMPER HARNESS IF DAMAGED. DRIVE VEHICLE ABOVE 24 km/h (15 MPH) TO ENSURE DTC 25 DOES NOT SET.
   - NO →
2. • DISCONNECT LEFT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN SENSOR TERMINALS "A" AND "B."
   IS RESISTANCE BETWEEN 1020 AND 1137Ω WHEN SENSOR IS 20°C (68°F)?
   (IF TEMPERATURE OF THE SENSOR IS SUSPECTED TO BE OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
3. • WITH J 39200 STILL CONNECTED, SELECT A/C VOLTAGE SCALE.
   • SPIN WHEEL BY HAND WHILE OBSERVING VOLTAGE.
   IS VOLTAGE AT LEAST 100 mV (VOLTAGE WILL INCREASE AS WHEEL SPEED INCREASES)?
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
4. • IGNITION "OFF."
   • DISCONNECT 32-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A7" AND "A8" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - NO → REPAIR SHORT BETWEEN CKTs 830 AND 873.
   - YES →
5. • INSPECT CKTs 830 AND 873 AND 32-WAY EBCM CONNECTOR FOR DAMAGE WHICH MAY RESULT IN A SHORT BETWEEN CKTs 830 AND 873 WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • TEST DRIVE VEHICLE ABOVE 24 km/h (15 MPH) FOR AT LEAST 30 SECONDS.
   DOES DTC 25 SET AS A CURRENT DTC?
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

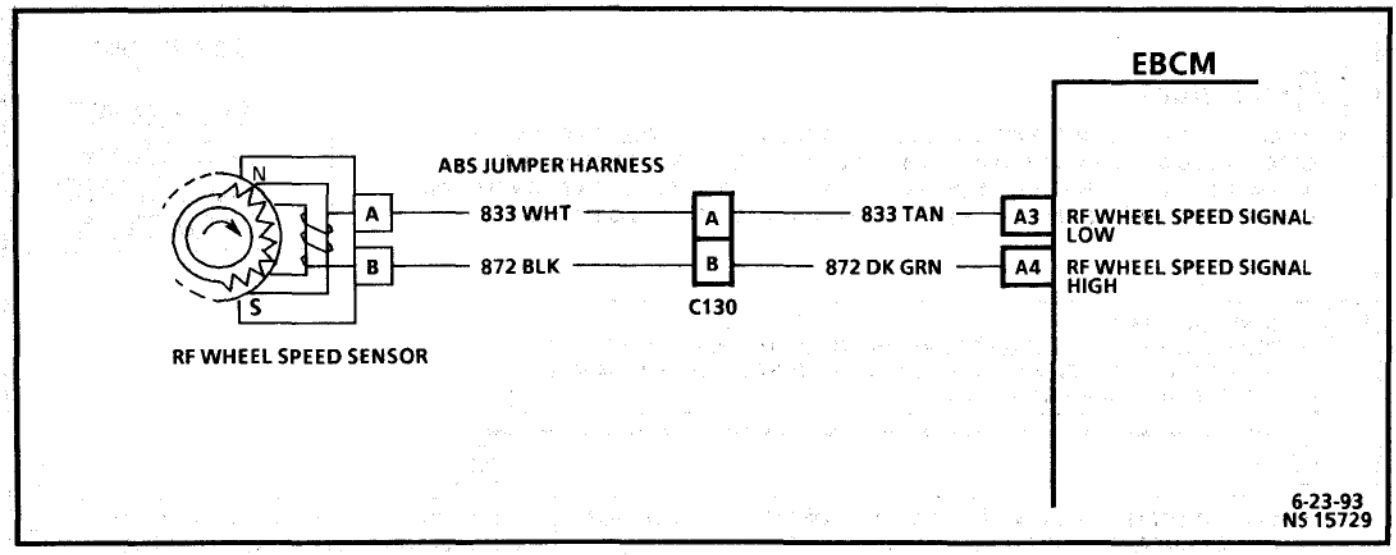
FRONT WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	804 TO 1066
5 TO 43	41 TO 110	956 TO 1240
44 TO 93	111 TO 200	1112 TO 1463

7-9-93
PS 18185

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DTC 26

RIGHT FRONT EXCESSIVE WHEEL SPEED VARIATION

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 26 can be set when the brake is "OFF." The purpose of this test is to detect a situation in which the right front wheel acceleration or deceleration is beyond specified limits.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step identifies a wheel speed sensor or circuitry that is damaged and visibly apparent.
2. Checks to see that the wheel speed sensor coil is within proper resistance values.
3. Verifies that the wheel speed sensor can generate an appropriate output signal.
4. This ensures that the wheel speed circuitry is not shorted together.
5. Ensures that the malfunction was not due to physical damage.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 26
RIGHT FRONT EXCESSIVE WHEEL SPEED VARIATION

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1. • IGNITION "OFF."
   • PHYSICALLY INSPECT THE RIGHT FRONT WHEEL SPEED SENSOR, RIGHT FRONT WHEEL SPEED SENSOR JUMPER HARNESS, AND CONNECTORS FOR DAMAGE.
   IS PHYSICAL DAMAGE INDICATED?
   - YES → REPLACE WHEEL SPEED SENSOR AND/OR JUMPER HARNESS IF DAMAGED. DRIVE VEHICLE ABOVE 24 km/h (15 MPH) TO ENSURE DTC 26 DOES NOT SET.
   - NO →
2. • DISCONNECT RIGHT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN SENSOR TERMINALS "A" AND "B."
   IS RESISTANCE BETWEEN 1020 AND 1137Ω WHEN SENSOR IS 20°C (68°F)?
   (IF TEMPERATURE OF THE SENSOR IS SUSPECTED TO BE OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
3. • WITH J 39200 STILL CONNECTED, SELECT A/C VOLTAGE SCALE.
   • SPIN WHEEL BY HAND WHILE OBSERVING VOLTAGE.
   IS VOLTAGE AT LEAST 100 mV (VOLTAGE WILL INCREASE AS WHEEL SPEED INCREASES)?
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
4. • IGNITION "OFF."
   • DISCONNECT 32-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A3" AND "A4" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - NO → REPAIR SHORT BETWEEN CKTs 833 AND 872.
   - YES →
5. • INSPECT CKTs 833 AND 872 AND 32-WAY EBCM CONNECTOR FOR DAMAGE WHICH MAY RESULT IN A SHORT BETWEEN CKTs 833 AND 872 WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • TEST DRIVE VEHICLE ABOVE 24 km/h (15 MPH) FOR AT LEAST 30 SECONDS.
   DOES DTC 26 SET AS A CURRENT DTC?
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

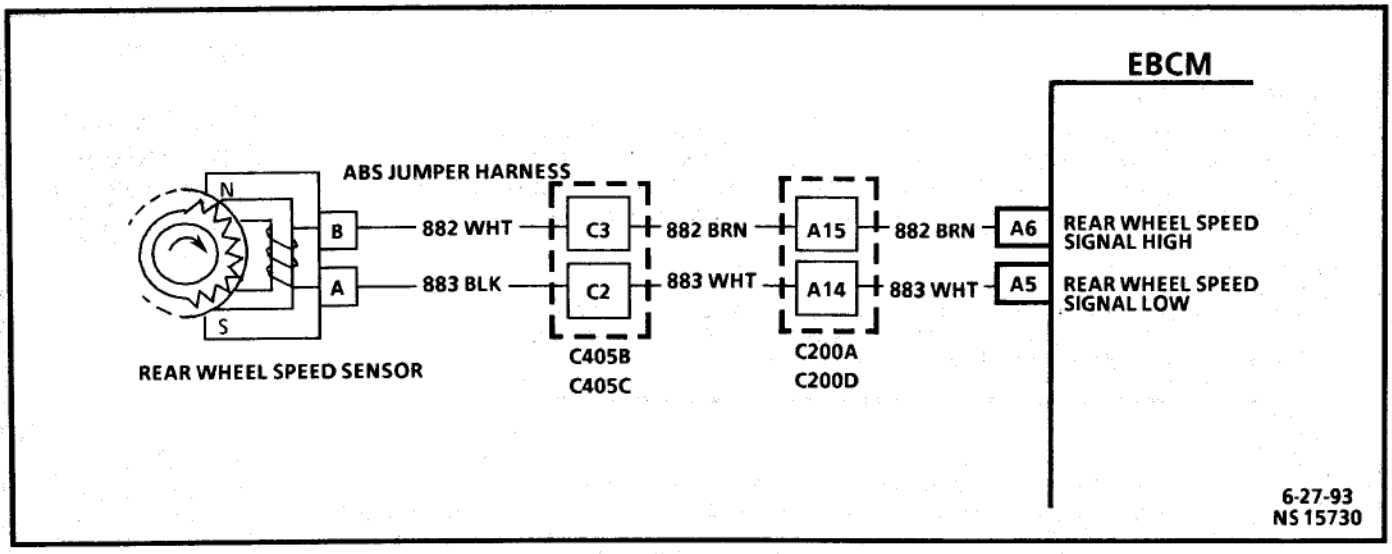
FRONT WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	804 TO 1066
5 TO 43	41 TO 110	956 TO 1240
44 TO 93	111 TO 200	1112 TO 1463

7-9-93
PS 18173

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DTC 28

REAR EXCESSIVE WHEEL SPEED VARIATION

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 28 can be set when the brake is "OFF." The purpose of this test is to detect a situation in which the right rear wheel acceleration or deceleration is beyond specified limits.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This step identifies a wheel speed sensor or circuitry that is damaged and visibly apparent.
2. Checks to see that the wheel speed sensor coil is within proper resistance values.
3. Verifies that the wheel speed sensor can generate an appropriate output signal.
4. This ensures that the wheel speed circuitry is not shorted together.
5. Ensures that the malfunction was not due to physical damage.
6. Checks rear sensor toothed ring for physical damage.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 28
REAR EXCESSIVE WHEEL SPEED VARIATION

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1. • IGNITION "OFF."
   • PHYSICALLY INSPECT THE REAR WHEEL SPEED SENSOR, WHEEL SPEED SENSOR JUMPER HARNESS, AND CONNECTORS FOR DAMAGE.
   IS PHYSICAL DAMAGE INDICATED?
   - YES → REPLACE WHEEL SPEED SENSOR AND/OR WHEEL SPEED SENSOR JUMPER HARNESS IF DAMAGED. DRIVE VEHICLE ABOVE 24 km/h (15 MPH) TO ENSURE DTC 28 DOES NOT SET.
   - NO →
2. • DISCONNECT REAR WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN SENSOR TERMINALS "A" AND "B."
   IS RESISTANCE BETWEEN 969 AND 1185Ω WHEN SENSOR IS 20°C (68°F)?
   (IF TEMPERATURE OF THE SENSOR IS SUSPECTED TO BE OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
3. • WITH J 39200 STILL CONNECTED, SELECT A/C VOLTAGE SCALE.
   • VEHICLE TRANSMISSION IN NEUTRAL.
   • SPIN WHEEL BY HAND WHILE OBSERVING VOLTAGE.
   IS VOLTAGE AT LEAST 100 mV (VOLTAGE WILL INCREASE AS WHEEL SPEED INCREASES)?
   - NO → REPLACE WHEEL SPEED SENSOR.
   - YES →
4. • IGNITION "OFF."
   • DISCONNECT 32-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A5" AND "A6" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - NO → REPAIR SHORT BETWEEN CKTs 882 AND 883.
   - YES →
5. • INSPECT CKTs 882 AND 883 AND 32-WAY EBCM CONNECTOR FOR DAMAGE WHICH MAY RESULT IN A SHORT BETWEEN CKTs 882 AND 883 WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • TEST DRIVE VEHICLE ABOVE 24 km/h (15 MPH) FOR AT LEAST 30 SECONDS.
   DOES DTC 28 SET AS A CURRENT DTC?
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES →
6. • INSPECT REAR SENSOR TOOTHED RING IN REAR AXLE DIFFERENTIAL FOR MISSING TEETH OR OTHER PHYSICAL DAMAGE. REFER TO SECTION 4B.
   IS ANY PHYSICAL DAMAGE INDICATED?
   - YES → REPLACE TOOTHED RING. REFER TO SECTION 4B.
   - NO → REPLACE EBCM.

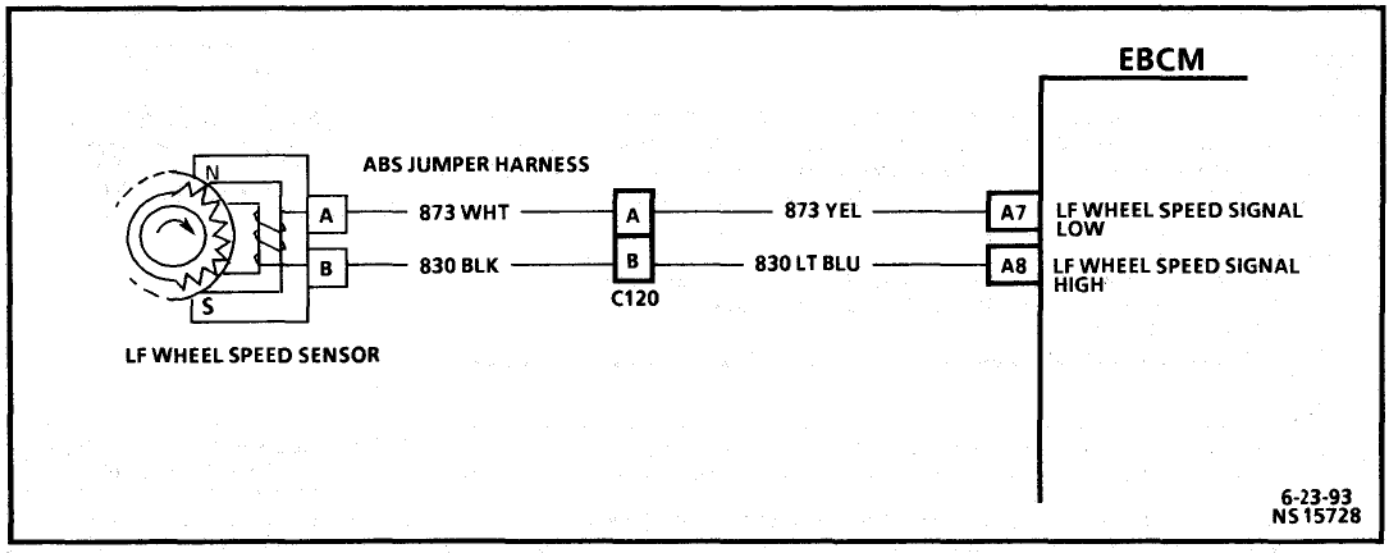
REAR WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	763 TO 1110
5 TO 43	41 TO 110	908 TO 1292
44 TO 93	111 TO 200	1057 TO 1525

7-16-93
PS 18177

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DTC 32

(Page 1 of 3)

LF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring often referred to as the air gap.

DTC Will Set When: DTC 32 can be set anytime after initialization. If either of the left front wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for proper resistance of the wheel speed sensor coil.
2. Checks for a short to ground in the wheel speed sensor wiring.
3. Checks for a short to voltage in the wheel speed sensor wiring.
4. Checks for a short to voltage in CKT 873.
5. Checks for a short to voltage in CKT 830.
6. Ensures that the malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 32

(Page 1 of 3)
LF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1
- IGNITION "OFF."
- USING A 5% SALT WATER SOLUTION (TWO TEASPOONS OF SALT TO 12 OZ. WATER), THOROUGHLY SPRAY THE LEFT FRONT WHEEL SPEED SENSOR JUMPER HARNESS.
- DISCONNECT 32-WAY EBCM HARNESS CONNECTOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINALS "A7" AND "A8" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS RESISTANCE BETWEEN 1020 AND 1137Ω WHEN SENSOR IS 20°C (68°F)? (*IF TEMPERATURE OF SENSOR IS SUSPECTED TO OTHER THAN 20°C (68°F), REFER TO THE TABLE ON PAGE 2 OF 2 OF THIS DTC CHART FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.*)

YES

2
- MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A7" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

3
- IGNITION "ON."
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A7" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS VOLTAGE 1 VOLT OR LESS?

NO

4
- IGNITION "OFF."
- DISCONNECT LEFT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
- IGNITION "ON."
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A7" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS VOLTAGE 1 VOLT OR LESS?

YES

5
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A8" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS VOLTAGE 1 VOLT OR LESS?

YES

MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WHEN ALL COMPONENTS ARE CONNECTED. REPAIR ALL DAMAGE IF FOUND. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION.

NO

REPAIR SHORT TO VOLTAGE IN CKT 830.

NO

REPAIR SHORT TO VOLTAGE IN CKT 873.

NO

DIAGNOSIS CONTINUED ON PAGE 2 OF 3 OF THIS DTC CHART.

NO

DIAGNOSIS CONTINUED ON PAGE 3 OF 3 OF THIS DTC CHART.

YES

6
- IGNITION "OFF."
- INSPECT TERMINALS "A7" AND "A8" OF THE 32-WAY EBCM HARNESS CONNECTOR FOR POOR TERMINAL CONTACT AND CONTAMINATION. ALSO INSPECT CKTs 830 AND 873 FOR DAMAGE WHICH MAY RESULT IN AN OPEN CIRCUIT, SHORT TO GROUND, OR SHORT TO VOLTAGE. REPAIR ALL DAMAGE IF EVIDENT.
- RECONNECT ALL CONNECTORS.
- IGNITION "ON."

DOES DTC 32 SET AS A CURRENT DTC?

YES

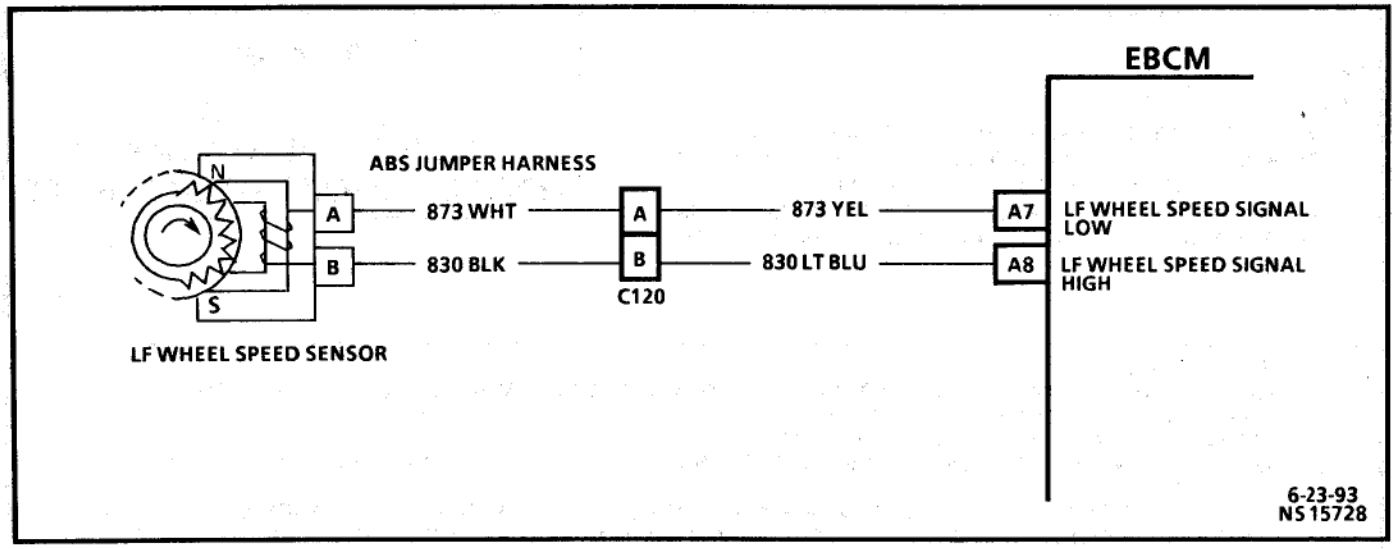
REPLACE EBCM.

NO

MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

7-9-93
NS 15712

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DTC 32

(Page 2 of 3)

LF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring often referred to as the air gap.

DTC Will Set When: DTC 32 can be set anytime after initialization. If either of the left front wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

7. Checks for high resistance in CKT 873.
8. Checks for high resistance in CKT 830.
9. Verifies proper resistance of the wheel speed sensor coil

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 32

(Page 2 of 3)

LF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

DIAGNOSIS CONTINUED FROM PAGE 1 OF 3 OF THIS DTC CHART.

7 • DISCONNECT LEFT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
• USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A7" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "B" OF THE LEFT FRONT WHEEL SPEED SENSOR HARNESS CONNECTOR.
IS RESISTANCE 2Ω OR LESS?

YES

8 • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A8" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "A" OF THE LEFT FRONT WHEEL SPEED SENSOR HARNESS CONNECTOR.
IS RESISTANCE 2Ω OR LESS?

YES

9 • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE LEFT FRONT WHEEL SPEED SENSOR CONNECTOR.
IS RESISTANCE BETWEEN 1020 AND 1137Ω WHEN SENSOR IS 20°C (68°F)? (*IF TEMPERATURE OF SENSOR IS SUSPECTED TO OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.*)

YES

MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN HIGH RESISTANCE WHEN ALL COMPONENTS ARE CONNECTED. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION. REPAIR ALL DAMAGE IF FOUND.

NO

REPLACE WHEEL SPEED SENSOR.

NO

REPAIR HIGH RESISTANCE IN CKT 830 (WHEEL SPEED SENSOR JUMPER MUST BE REPLACED IF DAMAGED).

NO

REPAIR HIGH RESISTANCE IN CKT 873 (WHEEL SPEED SENSOR JUMPER MUST BE REPLACED IF DAMAGED).

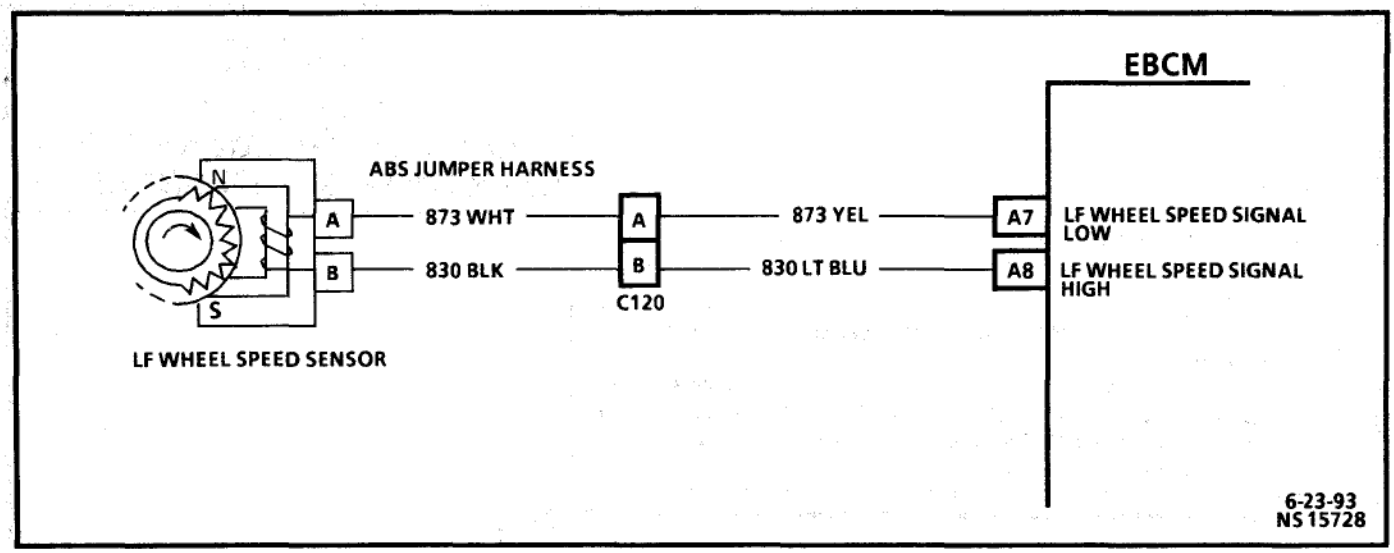
FRONT WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	804 TO 1066
5 TO 43	41 TO 110	956 TO 1240
44 TO 93	111 TO 200	1112 TO 1463

7-9-93
PS 18996

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DTC 32

(Page 3 of 3)

LF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring often referred to as the air gap.

DTC Will Set When: DTC 32 can be set anytime after initialization. If either of the left front wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

10. Checks for a short to ground in CKT 873.
11. Checks for a short to ground in CKT 830.
12. Checks for a short to ground in the wheel speed sensor jumper harness.
13. Verifies that the wheel speed sensor is not internally shorted to ground.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 32

(Page 3 of 3)
LF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

DIAGNOSIS CONTINUED FROM PAGE 1 OF 3 OF THIS DTC CHART.

(10)
- DISCONNECT CONNECTOR C120 (LOCATED LH INNER FRAME RAIL).
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A7" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

(11)
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A8" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

(12)
- THOROUGHLY RESPRAY THE LEFT FRONT WHEEL SPEED SENSOR JUMPER HARNESS WITH THE SALT WATER SOLUTION.

IMPORTANT: DO NOT ALLOW WATER TO ENTER ANY WHEEL SPEED SENSOR CONNECTOR.

- DISCONNECT LEFT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A," THEN "B" OF THE LEFT FRONT WHEEL SPEED SENSOR HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE) FOR BOTH MEASUREMENTS?

YES

(13)
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A" OF THE LEFT FRONT WHEEL SPEED SENSOR CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN A SHORT TO GROUND WHEN ALL COMPONENTS ARE CONNECTED. PAY PARTICULAR ATTENTION TO THE JUMPER HARNESS, SMALL NICKS OR CUTS CAN CAUSE A MALFUNCTION. REPAIR ANY DAMAGE IF FOUND. JUMPER HARNESS MUST BE REPLACED IF DAMAGED. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION.

NO

REPLACE WHEEL SPEED SENSOR.

NO

REPLACE LEFT FRONT WHEEL SPEED SENSOR JUMPER HARNESS.

NO

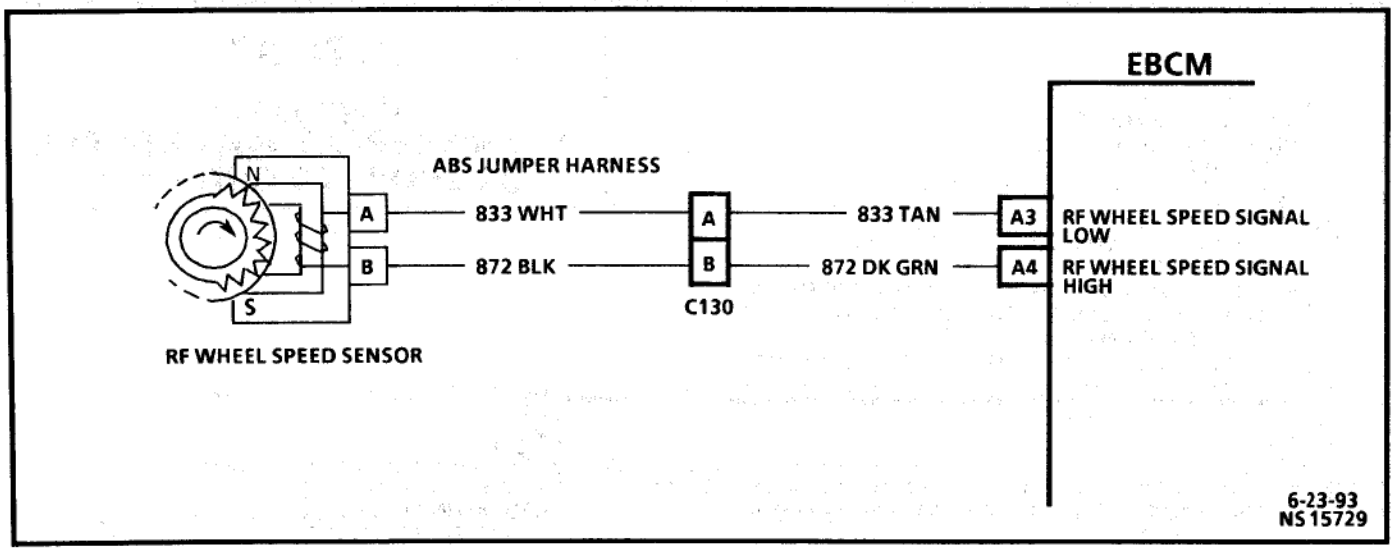
REPAIR SHORT TO GROUND IN CKT 830.

NO

REPAIR SHORT TO GROUND IN CKT 873.

7-10-93
PS 18997

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DTC 33

(Page 1 of 3)

RF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 33 can be set anytime after initialization. If either of the right front wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for proper resistance of the wheel speed sensor coil.
2. Checks for a short to ground in the wheel speed sensor wiring.
3. Checks for a short to voltage in the wheel speed sensor wiring.
4. Checks for a short to voltage in CKT 833.
5. Checks for a short to voltage in CKT 872.
6. Ensures that the malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 33

(Page 1 of 3)
RF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1. IGNITION "OFF."
   - USING A 5% SALT WATER SOLUTION (TWO TEASPOONS OF SALT TO 12 OZ. WATER), THOROUGHLY SPRAY THE RIGHT FRONT WHEEL SPEED SENSOR JUMPER HARNESS.
   - DISCONNECT 32-WAY EBCM HARNESS CONNECTOR.
   - USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINALS "A3" AND "A4" OF THE 32-WAY EBCM HARNESS CONNECTOR.

   IS RESISTANCE BETWEEN 1020 AND 1137Ω WHEN SENSOR IS 20°C (68°F)? *(IF TEMPERATURE OF SENSOR IS SUSPECTED TO OTHER THAN 20°C (68°F), REFER TO THE TABLE ON PAGE 2 OF 2 OF THIS DTC CHART FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)*

   - YES → 2
   - NO → DIAGNOSIS CONTINUED ON PAGE 2 OF 3 OF THIS DTC CHART.

2. MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A3" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - YES → 3
   - NO → DIAGNOSIS CONTINUED ON PAGE 3 OF 3 OF THIS DTC CHART.

3. IGNITION "ON."
   - USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A3" OF THE 32-WAY EBCM HARNESS CONNECTOR.

   IS VOLTAGE 1 VOLT OR LESS?
   - NO → 4
   - YES → 6

4. IGNITION "OFF."
   - DISCONNECT RIGHT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
   - IGNITION "ON."
   - USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A3" OF THE 32-WAY EBCM HARNESS CONNECTOR.

   IS VOLTAGE 1 VOLT OR LESS?
   - YES → 5
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 833.

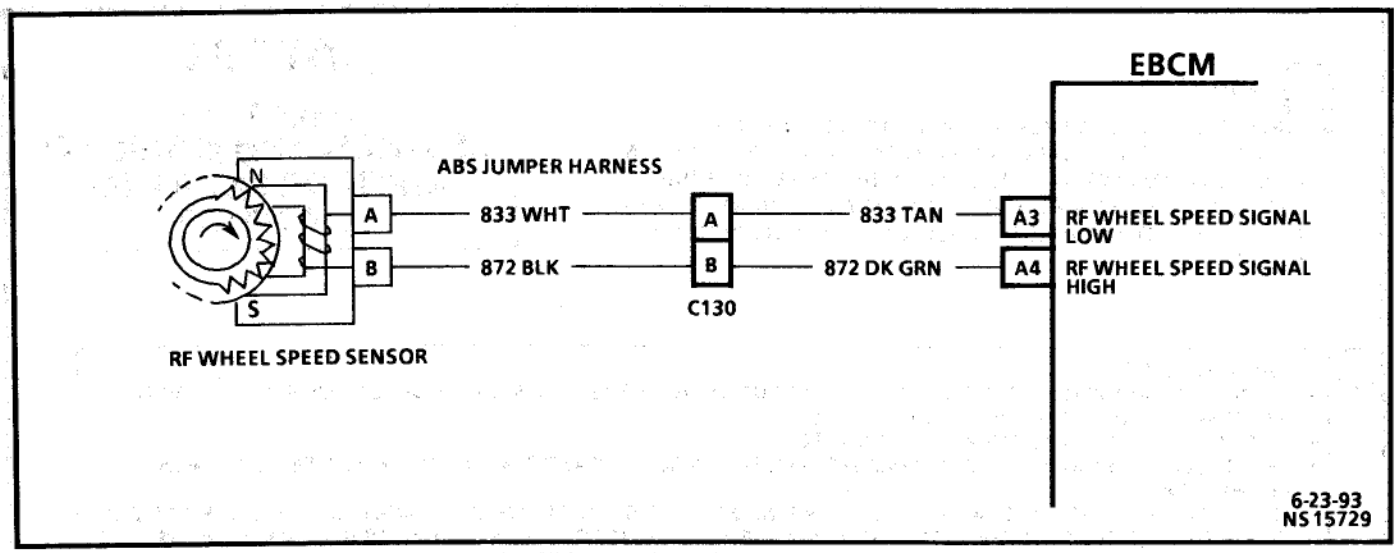
5. USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A4" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   IS VOLTAGE 1 VOLT OR LESS?
   - YES → MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WHEN ALL COMPONENTS ARE CONNECTED. REPAIR ALL DAMAGE IF FOUND. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION.
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 872.

6. IGNITION "OFF."
   - INSPECT TERMINALS "A3" AND "A4" OF THE 32-WAY EBCM HARNESS CONNECTOR FOR POOR TERMINAL CONTACT AND CONTAMINATION. ALSO INSPECT CKTs 833 AND 872 FOR DAMAGE WHICH MAY RESULT IN AN OPEN CIRCUIT, SHORT TO GROUND, OR SHORT TO VOLTAGE. REPAIR ALL DAMAGE IF EVIDENT.
   - RECONNECT ALL CONNECTORS.
   - IGNITION "ON."

   DOES DTC 33 SET AS A CURRENT DTC?
   - YES → REPLACE EBCM.
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

7-8-93
NS 15713

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DTC 33

(Page 2 of 3)

RF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 33 can be set anytime after initialization. If either of the right front wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

7. Checks for high resistance in CKT 833.
8. Checks for high resistance in CKT 872.
9. Verifies proper resistance of the wheel speed sensor coil.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 33

(Page 2 of 3)

RF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

DIAGNOSIS CONTINUED FROM PAGE 1 OF 3 OF THIS DTC CHART.

7 • DISCONNECT RIGHT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
• USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A3" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "A" OF THE RIGHT FRONT WHEEL SPEED SENSOR HARNESS CONNECTOR.
IS RESISTANCE 2Ω OR LESS?

YES

8 • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A4" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "B" OF THE RIGHT FRONT WHEEL SPEED SENSOR HARNESS CONNECTOR.
IS RESISTANCE 2Ω OR LESS?

YES

9 • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE RIGHT FRONT WHEEL SPEED SENSOR CONNECTOR.
IS RESISTANCE BETWEEN 1020 AND 1137Ω WHEN SENSOR IS 20°C (68°F)? *(IF TEMPERATURE OF SENSOR IS SUSPECTED TO OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)*

YES

MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN HIGH RESISTANCE WHEN ALL COMPONENTS ARE CONNECTED. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION. REPAIR ALL DAMAGE IF FOUND.

NO

REPLACE WHEEL SPEED SENSOR.

NO

REPAIR HIGH RESISTANCE IN CKT 872 (WHEEL SPEED SENSOR JUMPER MUST BE REPLACED IF DAMAGED).

NO

REPAIR HIGH RESISTANCE IN CKT 833 (WHEEL SPEED SENSOR JUMPER MUST BE REPLACED IF DAMAGED).

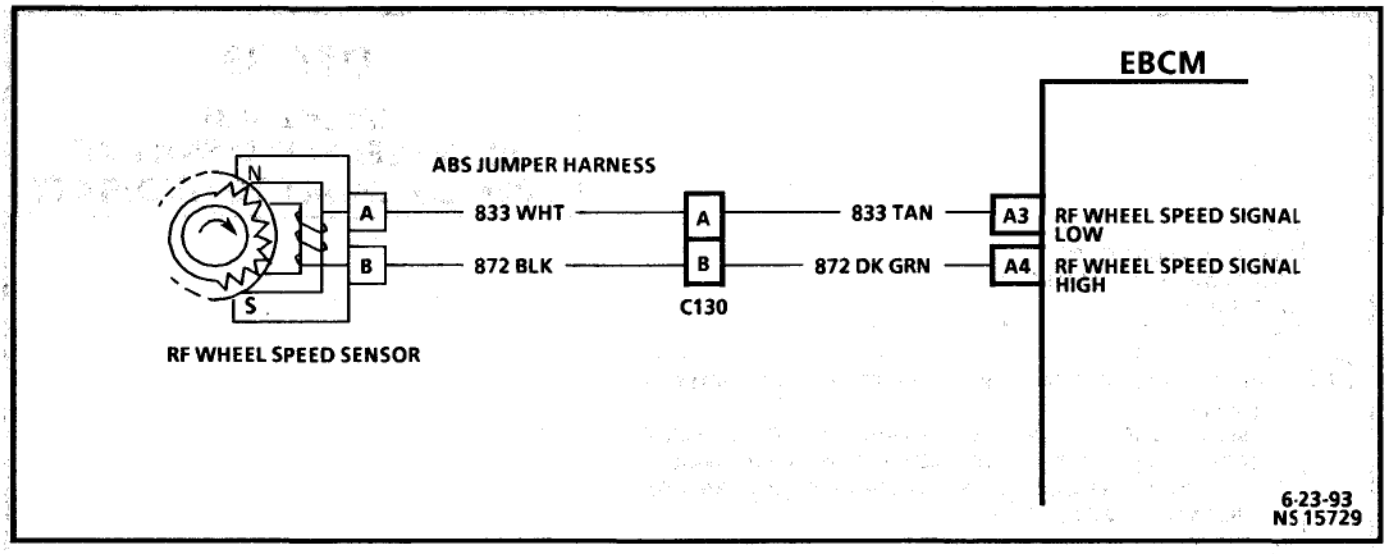
FRONT WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	804 TO 1066
5 TO 43	41 TO 110	956 TO 1240
44 TO 93	111 TO 200	1112 TO 1463

7-9-93
PS 18994

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DTC 33

(Page 3 of 3)

RF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 33 can be set anytime after initialization. If either of the right front wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

10. Checks for a short to ground in CKT 833.
11. Checks for a short to ground in CKT 872.
12. Checks for a short to ground in the wheel speed sensor jumper harness.
13. Verifies that the wheel speed sensor is not internally shorted to ground.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 33

(Page 3 of 3)

RF WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

DIAGNOSIS CONTINUED FROM PAGE 1 OF 3 OF THIS DTC CHART.

(10)
- DISCONNECT CONNECTOR C130 (LOCATED RH INNER FRAME RAIL).
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A3" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

(11)
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A4" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

(12)
- THOROUGHLY RESPRAY THE RIGHT FRONT WHEEL SPEED SENSOR JUMPER HARNESS WITH THE SALT WATER SOLUTION.

IMPORTANT: DO NOT ALLOW WATER TO ENTER ANY WHEEL SPEED SENSOR CONNECTOR.

- DISCONNECT RIGHT FRONT WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A," THEN "B" OF THE RIGHT FRONT WHEEL SPEED SENSOR HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE) FOR BOTH MEASUREMENTS?

YES

(13)
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A" OF THE RIGHT FRONT WHEEL SPEED SENSOR CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN A SHORT TO GROUND WHEN ALL COMPONENTS ARE CONNECTED. PAY PARTICULAR ATTENTION TO THE JUMPER HARNESS, SMALL NICKS OR CUTS CAN CAUSE A MALFUNCTION. REPAIR ANY DAMAGE IF FOUND. JUMPER HARNESS MUST BE REPLACED IF DAMAGED. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION.

NO

REPLACE WHEEL SPEED SENSOR.

NO

REPLACE RIGHT FRONT WHEEL SPEED SENSOR.

NO

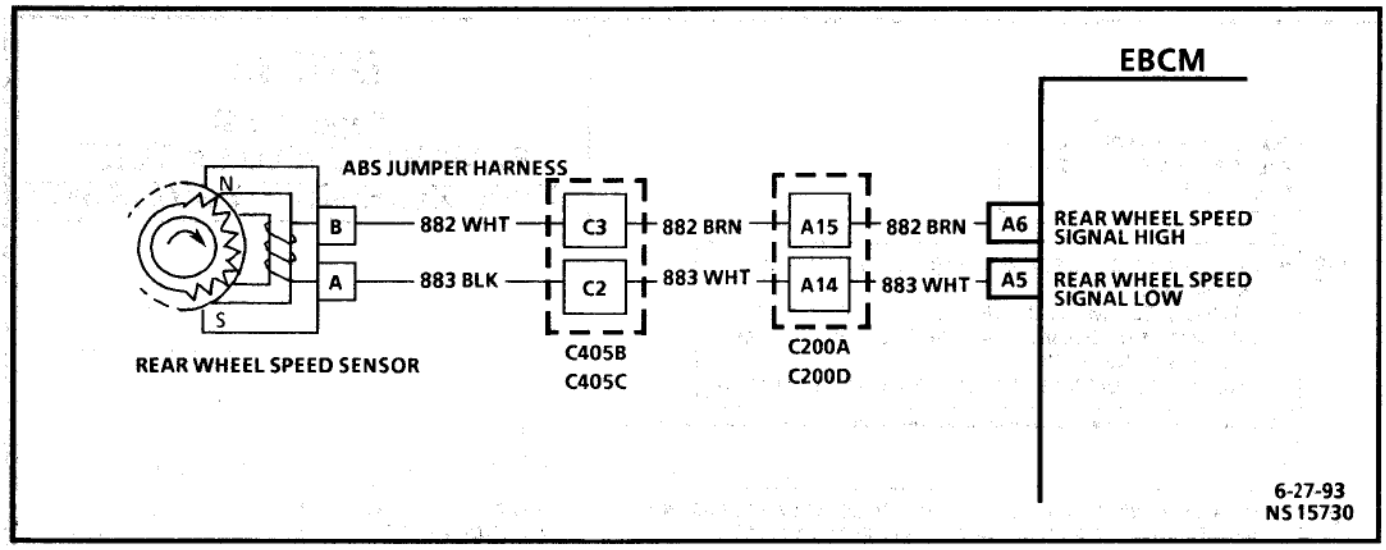
REPAIR SHORT TO GROUND IN CKT 872.

NO

REPAIR SHORT TO GROUND IN CKT 833.

7-9-93
PS 18995

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DTC 35

(Page 1 of 3)

RR WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 35 can be set anytime after initialization. If either of the right rear wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for proper resistance of the wheel speed sensor coil.
2. Checks for a short to ground in the wheel speed sensor wiring.
3. Checks for a short to voltage in the wheel speed sensor wiring.
4. Checks for a short to voltage in CKT 883.
5. Checks for a short to voltage in CKT 882.
6. Ensures that the malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 35

(Page 1 of 3)
RR WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Important

- WHEEL SPEED SENSOR INTERMITTENT MALFUNCTIONS MAY BE DIFFICULT TO LOCATE. CARE SHOULD BE TAKEN NOT TO DISTURB ANY ELECTRICAL CONNECTIONS PRIOR TO AN INDICATED STEP OF THIS CHART. THIS WILL ENSURE THAT AN INTERMITTENT CONNECTION WILL NOT BE CORRECTED BEFORE THE SOURCE OF THE MALFUNCTION IS FOUND.

1
- IGNITION "OFF."
- USING A 5% SALT WATER SOLUTION (TWO TEASPOONS OF SALT TO 12 OZ. WATER), THOROUGHLY SPRAY THE REAR WHEEL SPEED SENSOR JUMPER HARNESS.
- DISCONNECT 32-WAY EBCM HARNESS CONNECTOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINALS "A5" AND "A6" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS RESISTANCE BETWEEN 969 AND 1185Ω WHEN SENSOR IS 20°C (68°F)? *(IF TEMPERATURE OF SENSOR IS SUSPECTED TO OTHER THAN 20°C (68°F), REFER TO THE TABLE ON PAGE 2 OF 2 OF THIS DTC CHART FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.)*

YES

2
- MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A5" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

3
- IGNITION "ON."
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A5" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS VOLTAGE 1 VOLT OR LESS?

NO

4
- IGNITION "OFF."
- DISCONNECT REAR WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
- IGNITION "ON."
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A5" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS VOLTAGE 1 VOLT OR LESS?

YES

5
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A6" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS VOLTAGE 1 VOLT OR LESS?

YES

MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WHEN ALL COMPONENTS ARE CONNECTED. REPAIR ALL DAMAGE IF FOUND. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION.

NO

REPAIR SHORT TO VOLTAGE IN CKT 882.

NO

REPAIR SHORT TO VOLTAGE IN CKT 883.

NO

DIAGNOSIS CONTINUED ON PAGE 2 OF 3 OF THIS DTC CHART.

NO

DIAGNOSIS CONTINUED ON PAGE 3 OF 3 OF THIS DTC CHART.

YES

6
- IGNITION "OFF."
- INSPECT TERMINALS "A5" AND "A6" OF THE 32-WAY EBCM HARNESS CONNECTOR FOR POOR TERMINAL CONTACT AND CONTAMINATION. ALSO INSPECT CKTs 882 AND 883 FOR DAMAGE WHICH MAY RESULT IN AN OPEN CIRCUIT, SHORT TO GROUND, OR SHORT TO VOLTAGE. REPAIR ALL DAMAGE IF EVIDENT.
- RECONNECT ALL CONNECTORS.
- IGNITION "ON."

DOES DTC 35 SET AS A CURRENT DTC?

YES

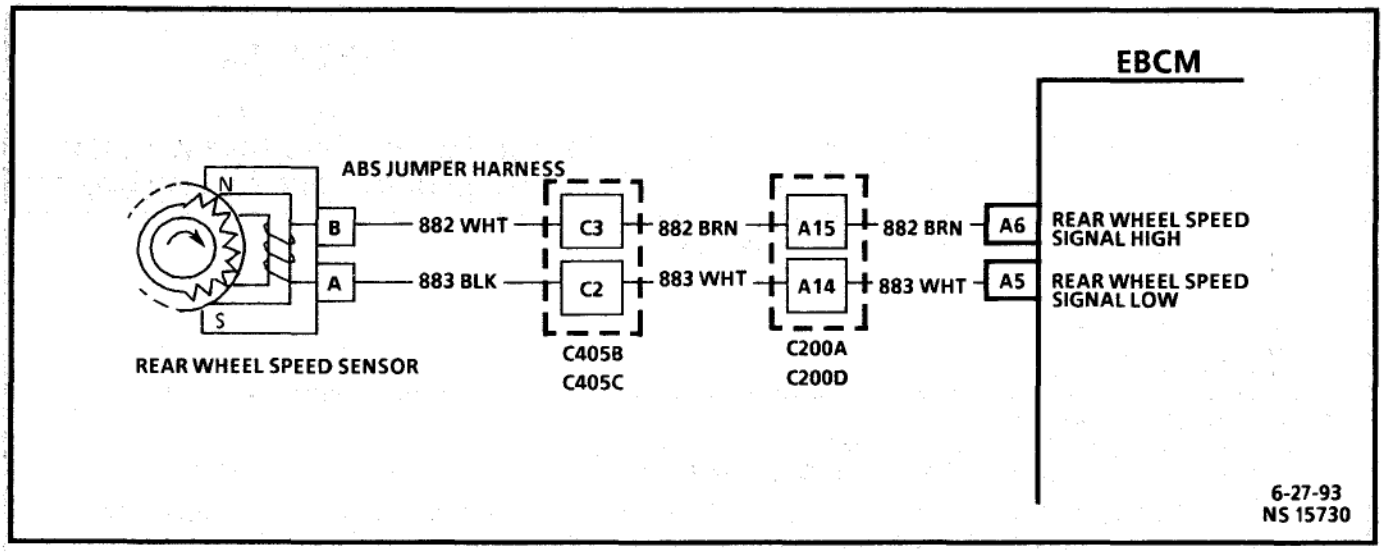
REPLACE EBCM.

NO

MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

7-8-93
NS 15714

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DTC 35

(Page 2 of 3)

RR WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 35 can be set anytime after initialization. If either of the right rear wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

7. Checks for high resistance in CKT 833.
8. Checks for high resistance in CKT 882.
9. Verifies proper resistance of the wheel speed sensor coil.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 35

(Page 2 of 3)

RR WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

DIAGNOSIS CONTINUED FROM PAGE 1 OF 3 OF THIS DTC CHART.

7
- DISCONNECT REAR WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A5" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "A" OF THE REAR WHEEL SPEED SENSOR HARNESS CONNECTOR.

IS RESISTANCE 2Ω OR LESS?

YES

8
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A6" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "B" OF THE REAR WHEEL SPEED SENSOR HARNESS CONNECTOR.

IS RESISTANCE 2Ω OR LESS?

YES

9
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE REAR WHEEL SPEED SENSOR CONNECTOR.

IS RESISTANCE BETWEEN 969 AND 1185Ω WHEN SENSOR IS 20°C (68°F)? (*IF TEMPERATURE OF SENSOR IS SUSPECTED TO OTHER THAN 20°C (68°F), REFER TO THE TABLE BELOW FOR APPLICABLE SENSOR RESISTANCE VALUES; THE VALUES IN THE TABLE ARE FOR TEMPERATURE OF THE SENSOR, NOT AIR TEMPERATURE.*)

YES

MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN HIGH RESISTANCE WHEN ALL COMPONENTS ARE CONNECTED. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION. REPAIR ALL DAMAGE IF FOUND.

NO

REPLACE WHEEL SPEED SENSOR.

NO

REPAIR HIGH RESISTANCE IN CKT 882 (WHEEL SPEED SENSOR JUMPER MUST BE REPLACED IF DAMAGED).

NO

REPAIR HIGH RESISTANCE IN CKT 883 (WHEEL SPEED SENSOR JUMPER MUST BE REPLACED IF DAMAGED).

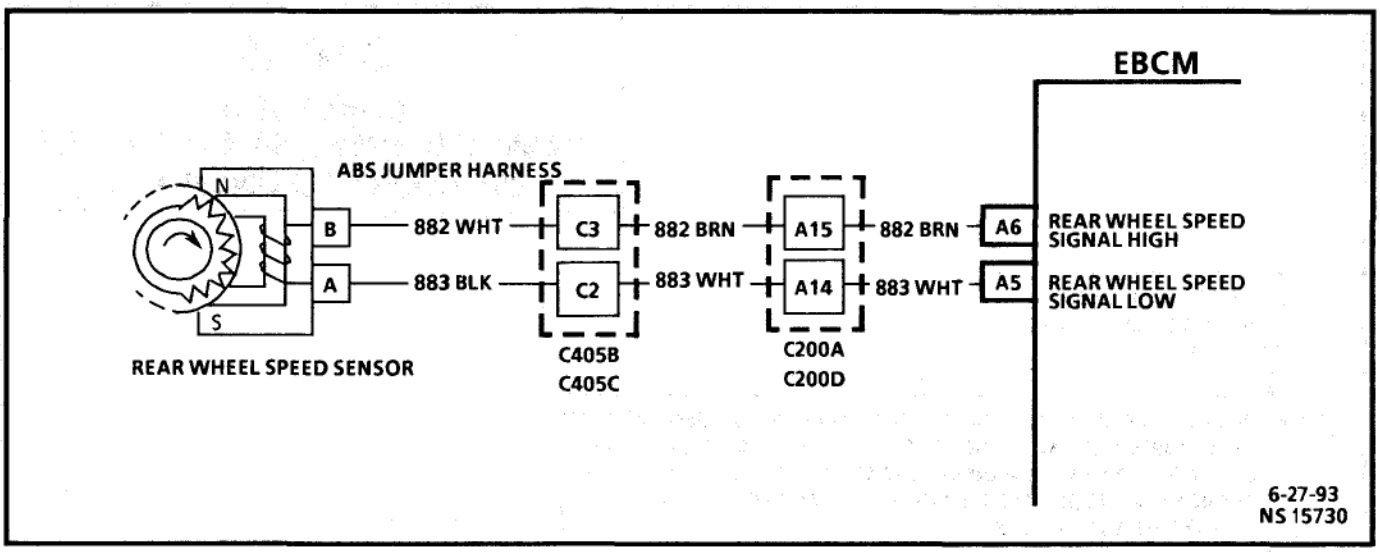
REAR WHEEL SPEED SENSOR

TEMPERATURE OF SENSOR VS. SENSOR RESISTANCE (APPROXIMATE)

TEMP. (°C)	TEMP. (°F)	RESISTANCE (OHMS)
-34 TO 4	-30 TO 40	763 TO 1110
5 TO 43	41 TO 110	908 TO 1292
44 TO 93	111 TO 200	1057 TO 1525

7-9-93
PS 18993

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DTC 35

(Page 3 of 3)
RR WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

Circuit Description:

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring, often referred to as the air gap.

DTC Will Set When: DTC 35 can be set anytime after initialization. If either of the right rear wheel speed circuits are open or shorted to voltage or ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the ABS warning lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

10. Checks for a short to ground in CKT 883.
11. Checks for a short to ground in CKT 882.
12. Checks for a short to ground in the wheel speed sensor jumper harness.
13. Verifies that the wheel speed sensor is not internally shorted to ground.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

If the customer's comments reflect that the ABS warning lamp is "ON" only during moist environmental changes (rain, snow, vehicle wash), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. If DTC is not current, clear DTCs and simulate the effects of water intrusion. Use the following procedure. Spray down the suspected area with a 5% salt water solution (two teaspoons of salt to 12 oz. of water). Test drive vehicle over various road surfaces (bumps, turns, etc.) above 24 km/h (15 mph) for at least 30 seconds. If DTC returns, replace suspected harness.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Resistance of the wheel speed sensor will increase with an increase in sensor temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace wheel speed sensor jumper harness. Likewise, if replacing a wheel speed sensor jumper harness, inspect sensor terminals. If evidence of corrosion or water intrusion exists, replace wheel speed sensor. Refer to "On-Vehicle Service" in this section.

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DTC 35

(Page 3 of 3)

RR WHEEL SPEED SNR CKT OPEN OR SHORT TO GND/BATT

DIAGNOSIS CONTINUED FROM PAGE 1 OF 3 OF THIS DTC CHART.

(10)
- DISCONNECT CONNECTOR C405B, C405C (LOCATED ON THE LH SIDE REAR UNDER BODY, BEHIND REAR SEAT).
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A5" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

(11)
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A6" OF THE 32-WAY EBCM HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

(12)
- THOROUGHLY RESPRAY THE REAR WHEEL SPEED SENSOR JUMPER HARNESS WITH THE SALT WATER SOLUTION.

IMPORTANT: DO NOT ALLOW WATER TO ENTER ANY WHEEL SPEED SENSOR CONNECTOR.

- DISCONNECT REAR WHEEL SPEED SENSOR DIRECTLY AT SENSOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A," THEN "B" OF THE REAR WHEEL SPEED SENSOR HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE) FOR BOTH MEASUREMENTS?

YES

(13)
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A" OF THE REAR WHEEL SPEED SENSOR CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

YES

MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS AND HARNESSES FOR DAMAGE WHICH MAY RESULT IN A SHORT TO GROUND WHEN ALL COMPONENTS ARE CONNECTED. PAY PARTICULAR ATTENTION TO THE JUMPER HARNESS, SMALL NICKS OR CUTS CAN CAUSE A MALFUNCTION. REPAIR ANY DAMAGE IF FOUND. JUMPER HARNESS MUST BE REPLACED IF DAMAGED. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE FOR MORE INFORMATION.

NO

REPLACE WHEEL SPEED SENSOR.

NO

REPLACE REAR WHEEL SPEED SENSOR JUMPER HARNESS.

NO

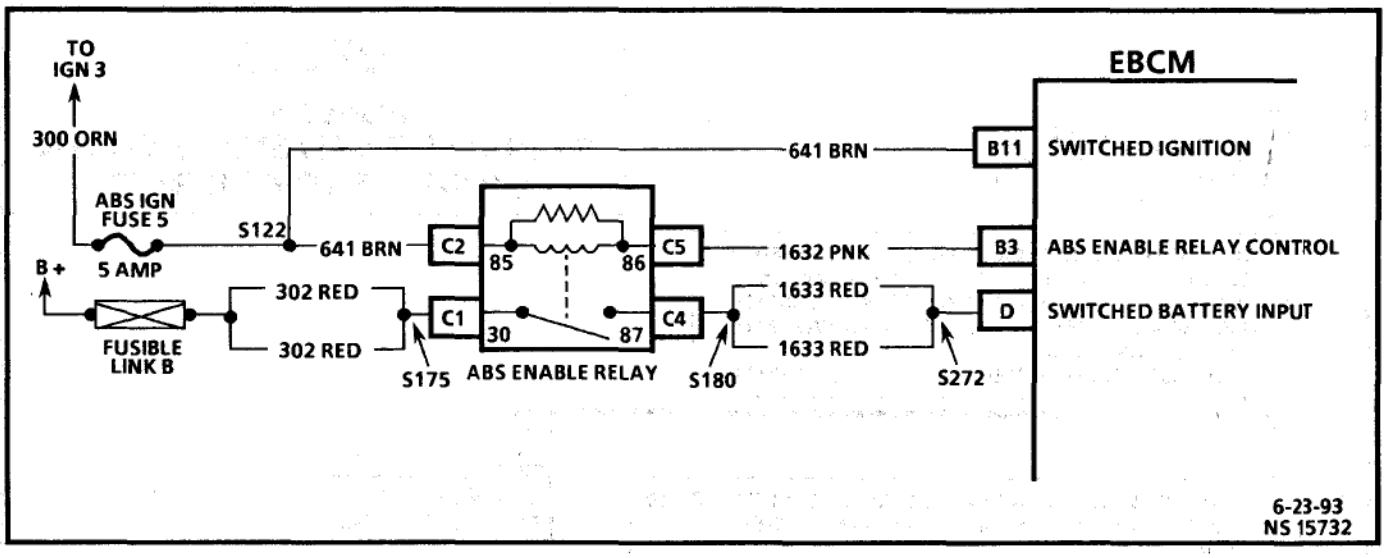
REPAIR SHORT TO GROUND IN CKT 882.

NO

REPAIR SHORT TO GROUND IN CKT 883.

7-10-93
PS 18992

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DTC 36

(Page 1 of 2)
LOW SYSTEM VOLTAGE

Circuit Description:

This DTC is used to monitor the voltage level available to the EBCM controller. If the voltage drops below 11.5 volts, full performance of the ABS system cannot be guaranteed. During ABS operation, there are several current requirements that will cause battery voltage to drop. Because of this, voltage is monitored prior to ABS to indicate good charging system condition and also during ABS when voltage may drop significantly.

DTC Will Set When: DTC 36 can only be set if the vehicle's speed is greater than 5 km/h (3 mph). If the switched battery voltage is less than 11.5 volts non-ABS or less than 9.0 volts ABS, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see what voltage is readily available at terminal "D" of the EBCM. If voltage is representative of good charging system condition, a malfunction is not present.
2. Isolates the condition to high circuit resistance, or improper charging system operation.
3. Isolates which circuit is the source of the low voltage condition.
4. Checks for high resistance in CKT 302.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

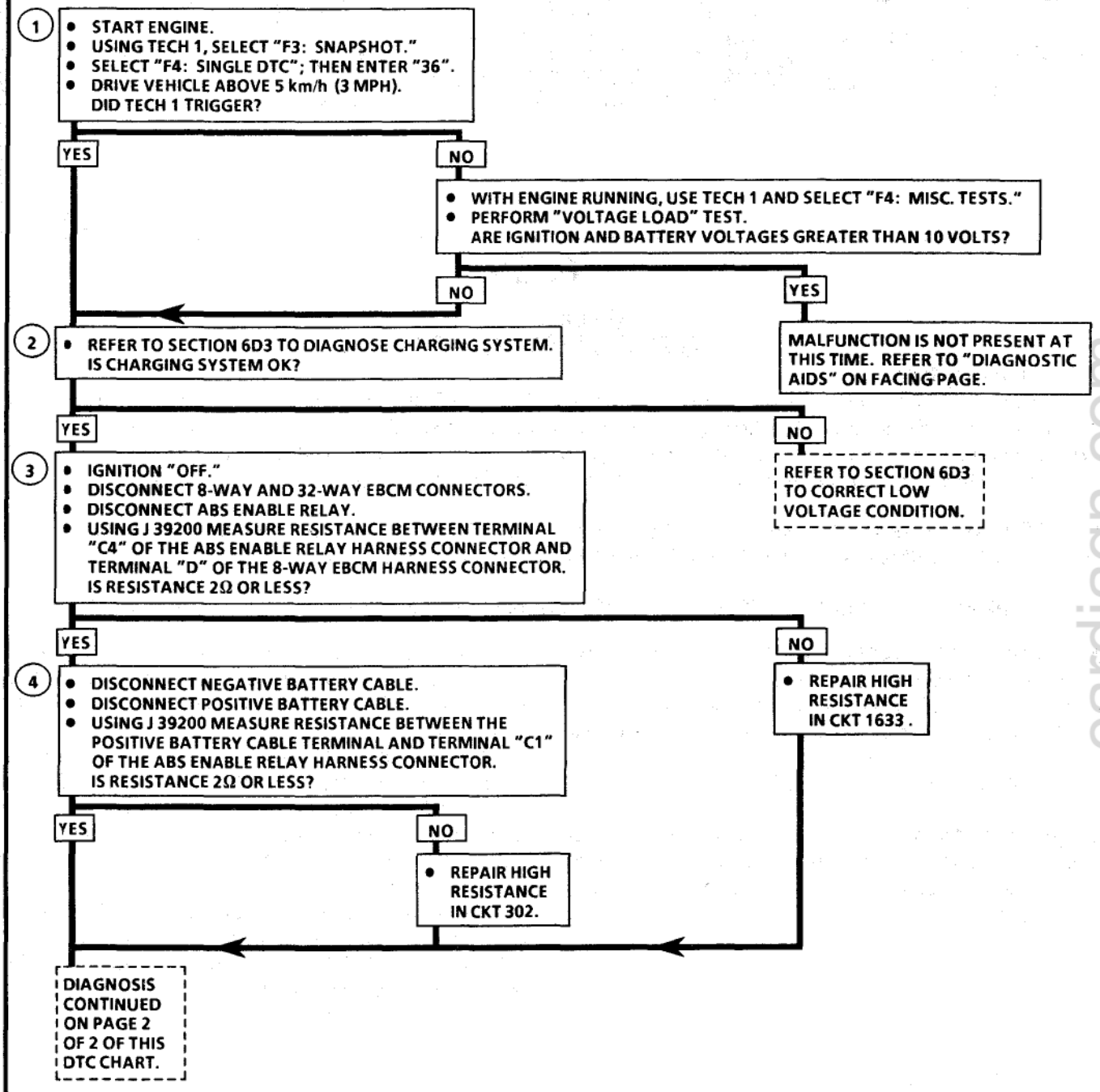
While performing a voltage load test, if it is noted that only ignition voltage drops below acceptable voltage levels, CKT 641 should be checked for high resistance or an open condition.

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DTC 36

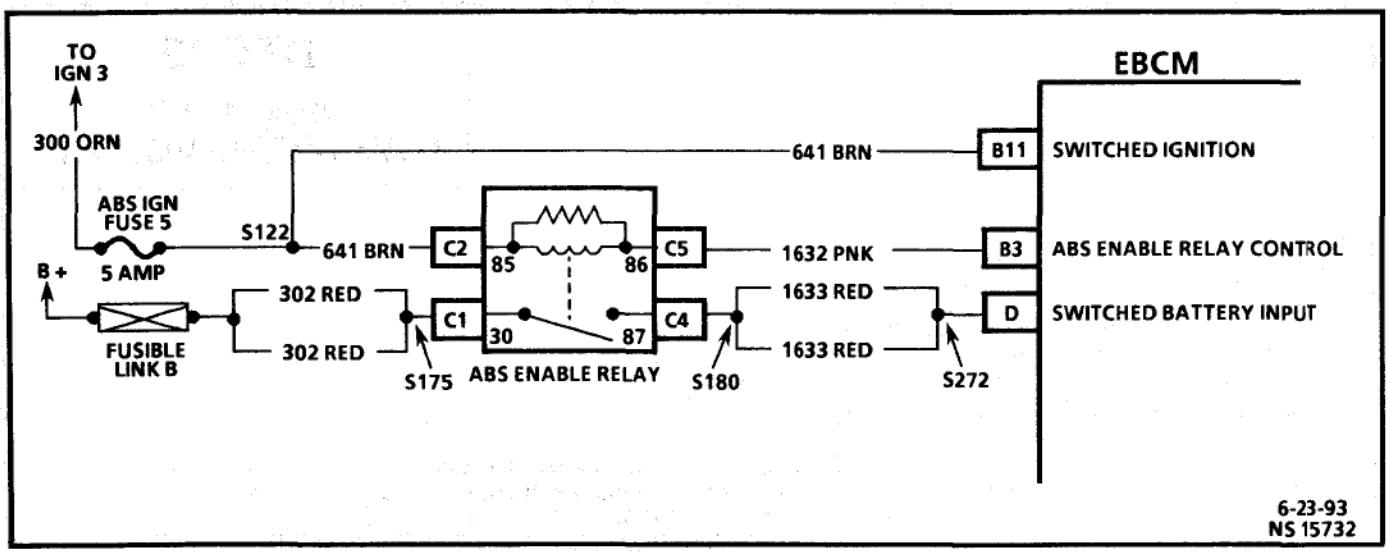
(Page 1 of 2)

LOW SYSTEM VOLTAGE



7-7-93
NS 15715

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DTC 36

(Page 2 of 2)
LOW SYSTEM VOLTAGE

Circuit Description:

This DTC is used to monitor the voltage level available to the EBCM controller. If the voltage drops below 11.5 volts, full performance of the ABS system cannot be guaranteed. During ABS operation, there are several current requirements that will cause battery voltage to drop. Because of this, voltage is monitored prior to ABS to indicate good charging system condition and also during ABS when voltage may drop significantly.

DTC Will Set When: DTC 36 can only be set if the vehicle's speed is greater than 5 km/h (3 mph). If the switched battery voltage is less than 11.5 volts non-ABS or less than 9.0 volts ABS, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

5. Checks for high resistance in CKT 641.
6. Checks for high resistance in the ignition fuse feed circuit.
7. Checks for malfunctioning EBCM.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

While performing a voltage load test, if it is noted that only ignition voltage drops below acceptable voltage levels, CKT 641 should be checked for high resistance or an open condition.

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DTC 36

(Page 2 of 2)
LOW SYSTEM VOLTAGE

DIAGNOSIS CONTINUED FROM PAGE 1 OF 2 OF THIS DTC CHART.

5
- REMOVE ABS IGN 5 AMP FUSE 5.
- USING J 39200 MEASURE RESISTANCE BETWEEN EACH ABS IGN 5 AMP FUSE 5 BLOCK TERMINAL AND TERMINAL "B11" OF THE 32-WAY EBCM HARNESS CONNECTOR. IS EITHER MEASUREMENT 2Ω OR LESS?

YES

6
- WITH BATTERY CABLES DISCONNECTED, TURN IGNITION "ON" (THIS PROVIDES IGNITION CIRCUIT CONTINUITY).
- USING J 39200, MEASURE RESISTANCE BETWEEN POSITIVE BATTERY CABLE TERMINAL AND EACH ABS IGN 5 AMP FUSE 5 BLOCK TERMINAL. IS EITHER MEASUREMENT 2Ω OR LESS ?

YES

7
- IGNITION "OFF."
- INSPECT ABS ENABLE RELAY AND ABS ENABLE RELAY HARNESS CONNECTOR FOR POOR TERMINAL CONTACT. INSPECT 8-WAY AND 32-WAY EBCM HARNESS CONNECTORS FOR A POOR CONNECTION TO THE EBCM. INSPECT POSITIVE BATTERY CABLE TERMINAL FOR POOR CONTACT TO THE BATTERY. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE TERMINALS IF POOR CONTACT IS EVIDENT.
- RECONNECT ALL CONNECTORS.
- DRIVE VEHICLE ABOVE 5 km/h (3 MPH). DOES DTC 36 SET AS A CURRENT DTC?

YES

REPLACE EBCM.

NO

MALFUNCTION IS MOST LIKELY DUE TO A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

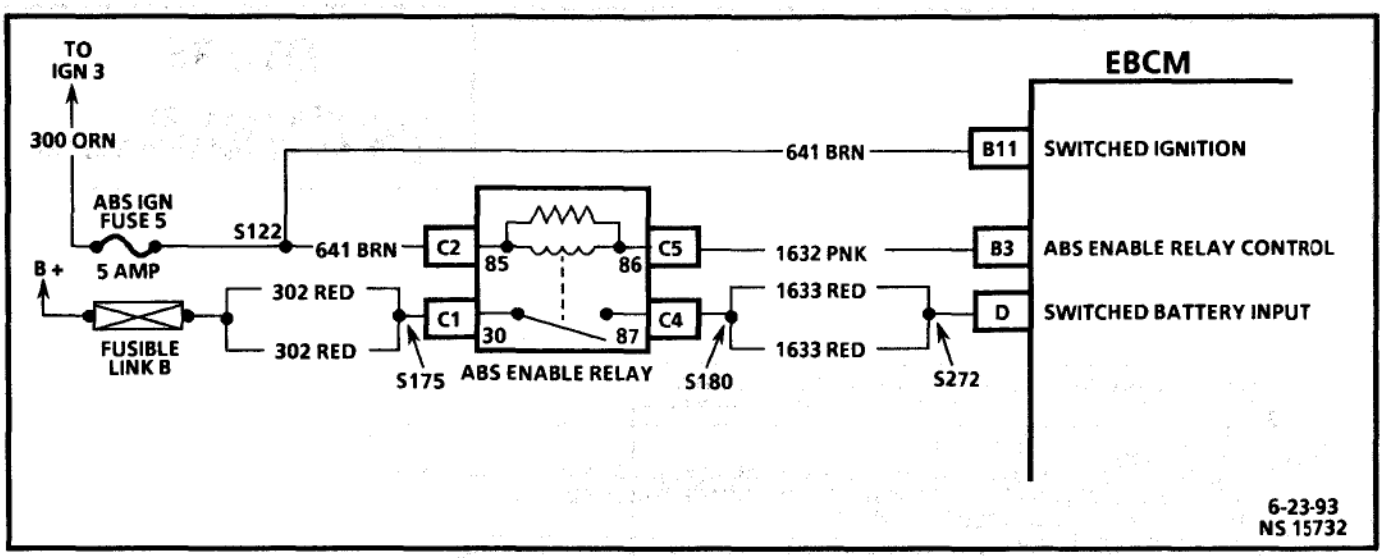
REPAIR HIGH RESISTANCE IN CKT 641.

NO

REFER TO SECTION 8A TO REPAIR HIGH RESISTANCE IN THE "IGNITION SWITCH 'RUN' FUSE FEED" CIRCUIT.

7-2-93
PS 18940

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DTC 37

HIGH SYSTEM VOLTAGE

Circuit Description:

This DTC is designed to detect high vehicle voltage levels prior to any required motor movement (initialization or ABS). If excessive voltage exists, demagnetization of the motor magnets may occur, which would eventually affect or eliminate ABS performance.

DTC Will Set When: DTC 37 can only be set if the vehicle's speed is greater than 5 km/h (3 mph). If the switched battery voltage is greater than 17 volts, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks the voltage level being received by the EBCM.
2. Checks to see if high voltage condition is due to charging system malfunction.
3. Checks for poor terminal contact which may cause an intermittent malfunctioning, or a malfunctioning EBCM.

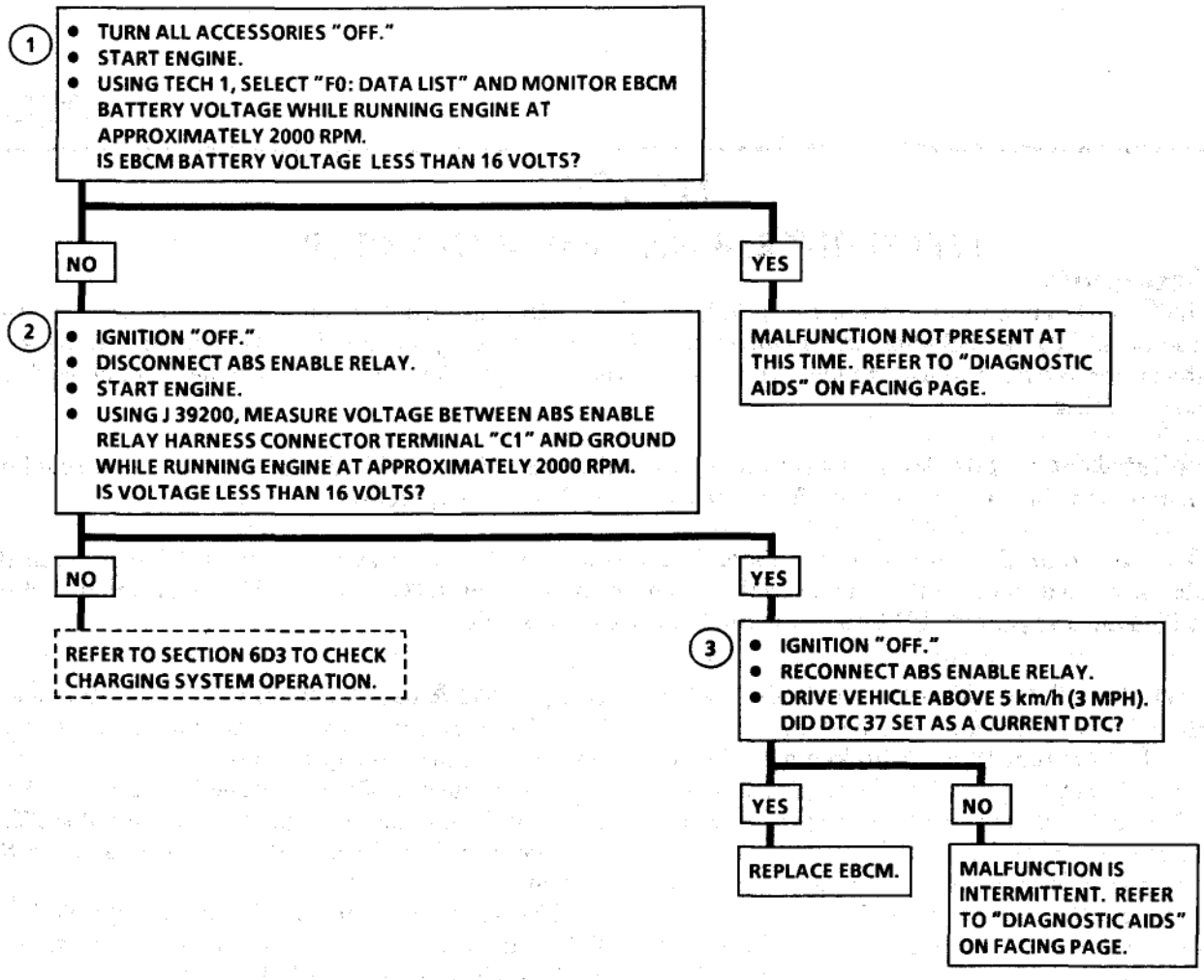
Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

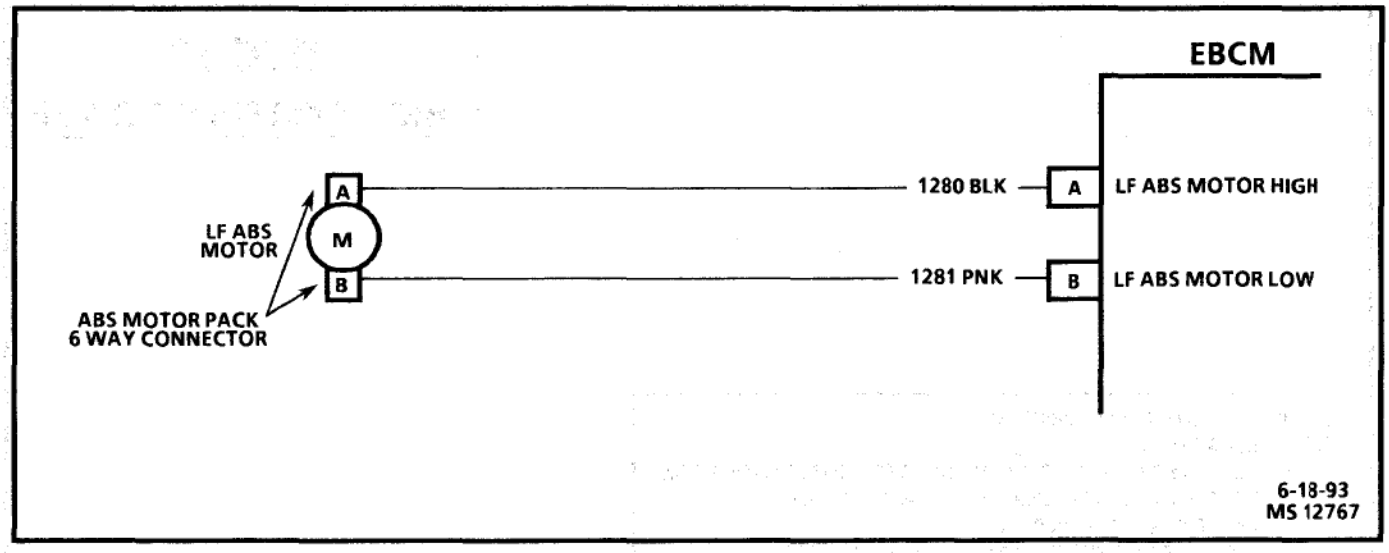
Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 37
HIGH SYSTEM VOLTAGE



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DTC 38

LEFT FRONT ESB WILL NOT HOLD MOTOR

Circuit Description:

This DTC is designed to detect a slipping left front ESB. During initialization and braking, the left front motor is re-homed. If the ESB slips, the motor/piston will move. During the next key "ON" initialization, a re-home of the motor verifies the motor/piston remained at the home position. If motor movement is detected, the ESB must be slipping.

DTC Will Set When: DTC 38 can be set during initialization. If the EBCM detects that the ESB could not hold the piston in the home position, a malfunction exists. DTC 86 is always set with DTC 38.

Action Taken: If an ESB cannot hold a piston in the home position, the piston may be backdriven when the brake pedal is applied, causing the brake pedal to drop. A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp and the red "BRAKE" warning lamp are turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks the left front ESB. A broken or defective ESB would result in the left front piston being backdriven by hydraulic pressure and pedal movement would result.
2. This step ensures that the proper motor circuits are located in the proper connector cavities.
3. Checks for high resistance in the ABS motor "HIGH" circuitry.
4. This step checks for high resistance in the ABS motor "LOW" circuitry.
5. Checks for proper resistance of the ABS motor windings.
6. Checks for poor terminal contact or corrosion in the connectors.
7. Checks for a malfunctioning EBCM.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

The static modulator test function of the Tech 1 or T-100 may be used to locate an intermittent malfunction associated with the ESB.

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DTC 38

LEFT FRONT ESB WILL NOT HOLD MOTOR

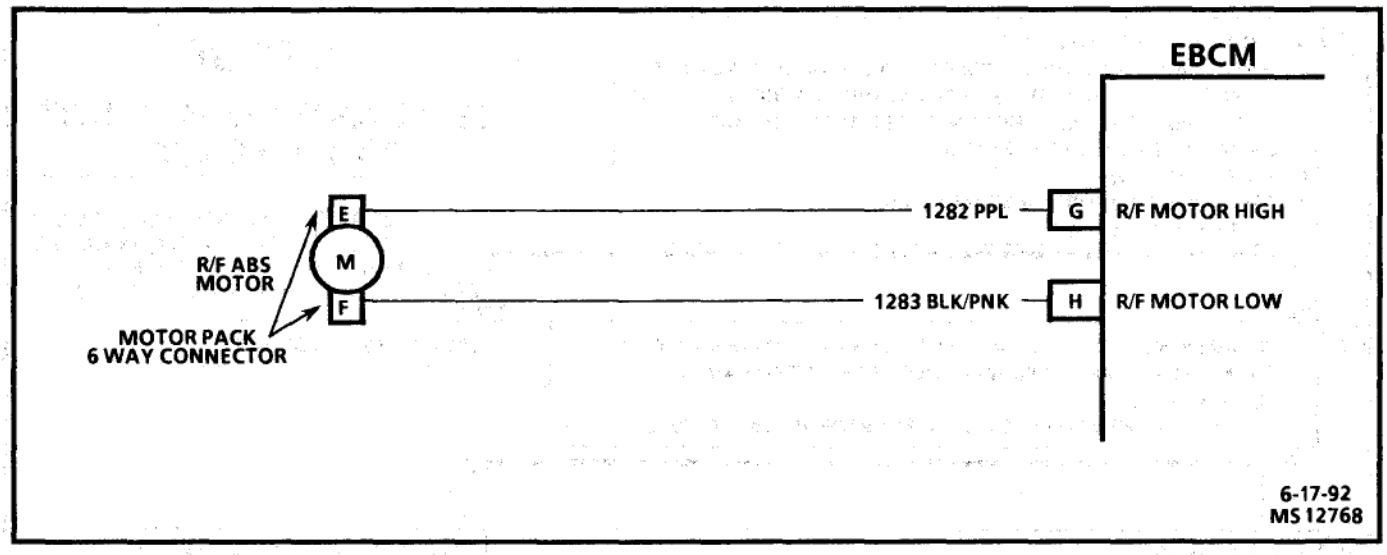
NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

1. • IGNITION "ON," ENGINE "OFF."
   • PUMP BRAKE PEDAL UNTIL FIRM TO DEPLETE VACUUM RESERVE.
   • USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
   • SELECT MOTOR APPLY FUNCTION OF THE LEFT FRONT ABS CHANNEL AND APPLY THE MOTOR.
   • WAIT 5 SECONDS.
   • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   DID BRAKE PEDAL FALL?
   - YES → REPLACE ABS MOTOR PACK.
   - NO →
2. • VISUALLY INSPECT THE 6-WAY ABS MOTOR PACK AND 8-WAY EBCM CONNECTORS FOR PROPER WIRE COLOR/CONNECTOR CAVITY COMBINATION.
   ARE THE PROPER WIRES LOCATED IN THE PROPER CONNECTOR CAVITIES?
   - NO → USING THE CIRCUIT DIAGRAMS LOCATED IN THE FRONT OF THIS SECTION, PLACE THE PROPER WIRES INTO THE PROPER CONNECTOR CAVITIES. CLEAR DTCs AND RECHECK SYSTEM.
   - YES →
3. • IGNITION "OFF."
   • DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "A" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1280.
   - YES →
4. • MEASURE THE RESISTANCE BETWEEN TERMINAL "B" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "B" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1281.
   - YES →
5. • MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE ABS MOTOR PACK CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPLACE ABS MOTOR PACK.
   - YES →
6. • INSPECT THE 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR FOR POOR TERMINAL CONTACT OR CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT."
   DO ANY TERMINALS EXHIBIT POOR CONTACT OR EVIDENCE OF CORROSION?
   - YES → REPLACE TERMINALS THAT EXHIBIT POOR TERMINAL CONTACT OR EVIDENCE OF CORROSION.
   - NO →
7. • IGNITION "OFF."
   • RECONNECT ALL CONNECTORS.
   • START ENGINE WITH FOOT OFF BRAKE.
   • ALLOW ENGINE TO RUN FOR AT LEAST 10 SECONDS.
   • REPEAT ABOVE IGNITION CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 38 SET IN THE LAST THREE IGNITION CYCLES?
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH) AND THEN KEYING DOWN.

6-24-93
NS 16171

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DTC 41

RIGHT FRONT ESB WILL NOT HOLD MOTOR

Circuit Description:

This DTC is designed to detect a slipping right front ESB. During initialization and braking, the right front motor is re-homed. If the ESB slips, the motor/piston will move. During the next key "ON" initialization, a re-home of the motor verifies the motor/piston remained at the home position. If motor movement is detected, the ESB must be slipping.

DTC Will Set When: DTC 41 can be set during initialization. If the EBCM detects that the ESB could not hold the piston in the home position, a malfunction exists. DTC 86 is always set with DTC 41.

Action Taken: If an ESB cannot hold a piston in the home position, the piston may be backdriven when the brake pedal is applied, causing the brake pedal to drop. A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp and the red "BRAKE" warning lamp are turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks the right front ESB. A broken or defective ESB would result in the right front piston being backdriven by hydraulic pressure, and pedal movement would result.
2. Ensures that the proper motor circuits are located in the proper connector cavities.
3. Checks for high resistance in the ABS motor "HIGH" circuitry.
4. This step checks for high resistance in the ABS motor "LOW" circuitry.
5. Checks for proper resistance of the ABS motor windings.
6. Checks for poor terminal contact or corrosion in the connectors.
7. Checks for a malfunctioning EBCM.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

The static modulator test function of the Tech 1 or T-100 may be used to locate an intermittent malfunction associated with the ESB.

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DTC 41

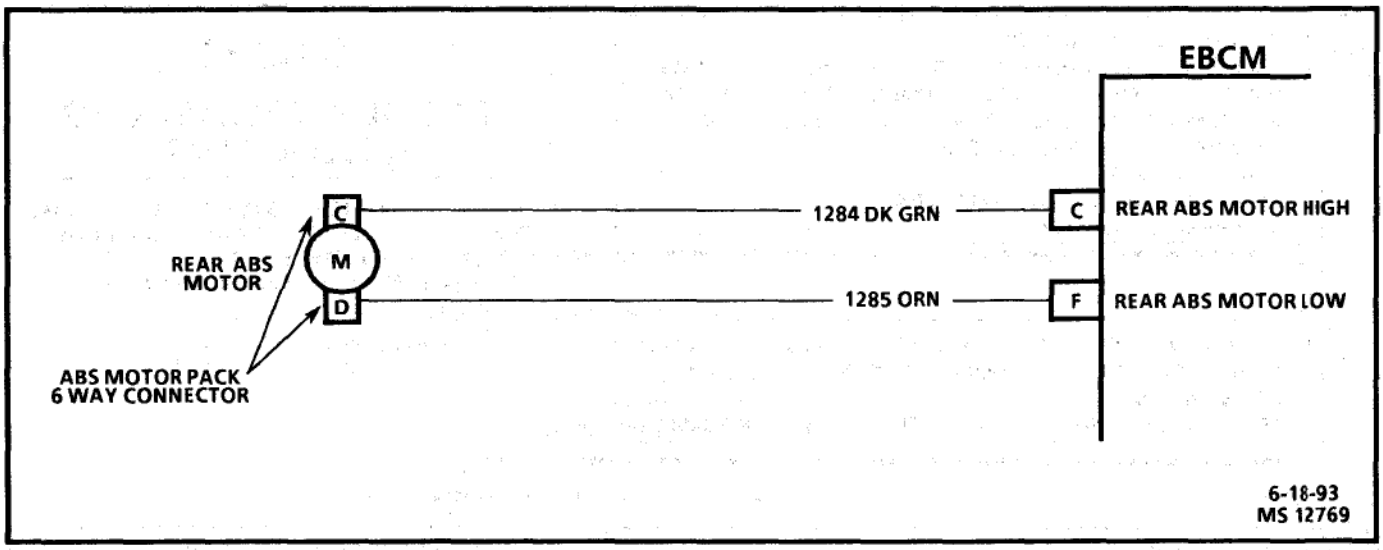
RIGHT FRONT ESB WILL NOT HOLD MOTOR

NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

1. • IGNITION "ON," ENGINE "OFF."
   • PUMP BRAKE PEDAL UNTIL FIRM TO DEPLETE VACUUM RESERVE.
   • USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
   • SELECT MOTOR APPLY FUNCTION OF THE RIGHT FRONT ABS CHANNEL AND APPLY THE MOTOR.
   • WAIT 5 SECONDS.
   • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   DID BRAKE PEDAL FALL?
   - YES → REPLACE ABS MOTOR PACK.
   - NO →
2. • VISUALLY INSPECT THE 6-WAY ABS MOTOR PACK AND 8-WAY EBCM CONNECTORS FOR PROPER WIRE COLOR/CONNECTOR CAVITY COMBINATION.
   ARE THE PROPER WIRES LOCATED IN THE PROPER CONNECTOR CAVITIES?
   - NO → USING THE CIRCUIT DIAGRAMS LOCATED IN THE FRONT OF THIS SECTION, PLACE THE PROPER WIRES INTO THE PROPER CONNECTOR CAVITIES. CLEAR DTCs AND RECHECK SYSTEM.
   - YES →
3. • IGNITION "OFF."
   • DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "E" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "G" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1282.
   - YES →
4. • MEASURE THE RESISTANCE BETWEEN TERMINAL "F" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "H" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1283.
   - YES →
5. • MEASURE THE RESISTANCE BETWEEN TERMINAL "E" AND TERMINAL "F" OF THE ABS MOTOR PACK CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPLACE ABS MOTOR PACK.
   - YES →
6. • INSPECT THE 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR FOR POOR TERMINAL CONTACT OR CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT."
   DO ANY TERMINALS EXHIBIT POOR CONTACT OR EVIDENCE OF CORROSION?
   - YES → REPLACE TERMINALS THAT EXHIBIT POOR TERMINAL CONTACT OR EVIDENCE OF CORROSION.
   - NO →
7. • IGNITION "OFF."
   • RECONNECT ALL CONNECTORS.
   • START ENGINE WITH FOOT OFF BRAKE.
   • ALLOW ENGINE TO RUN FOR AT LEAST 10 SECONDS.
   • REPEAT ABOVE IGNITION CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 41 SET IN THE LAST THREE IGNITION CYCLES?
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH) AND THEN KEYING DOWN. 6-24-93 NS 16172

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DTC 42

REAR ESB WILL NOT HOLD MOTOR

Circuit Description:

This DTC is designed to detect a slipping rear axle ESB. During initialization and braking, the rear motor is re-homed. If the ESB slips, the motor/piston will move. During the next key "ON" initialization, a re-home of the motor verifies the motor/piston remained at the home position. If motor movement is detected, the ESB must be slipping.

DTC Will Set When: DTC 42 can be set during initialization. If the EBCM detects that the ESB could not hold the piston in the home position, a malfunction exists. DTC 86 is always set with DTC 42.

Action Taken: If an ESB can hold a piston in the home position, the piston may be backdriven when the brake pedal is applied, causing the brake pedal to drop. A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp and the red "BRAKE" warning lamp are turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks the rear axle ESB. A broken or defective ESB would result in the rear axle pistons being backdriven by hydraulic pressure and wheel movement would result.
2. Ensures that the proper motor circuits are located in the proper connector cavities.
3. Checks for high resistance in the ABS motor "HIGH" circuitry.
4. Checks for high resistance in the ABS motor "LOW" circuitry.
5. Checks for proper resistance of the ABS motor windings.
6. Checks for poor terminal contact or corrosion in the connectors.
7. Checks for a malfunctioning EBCM.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

The static modulator test function of the Tech 1 or T-100 may be used to locate an intermittent malfunction associated with the ESB.

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DTC 42
REAR ESB WILL NOT HOLD MOTOR

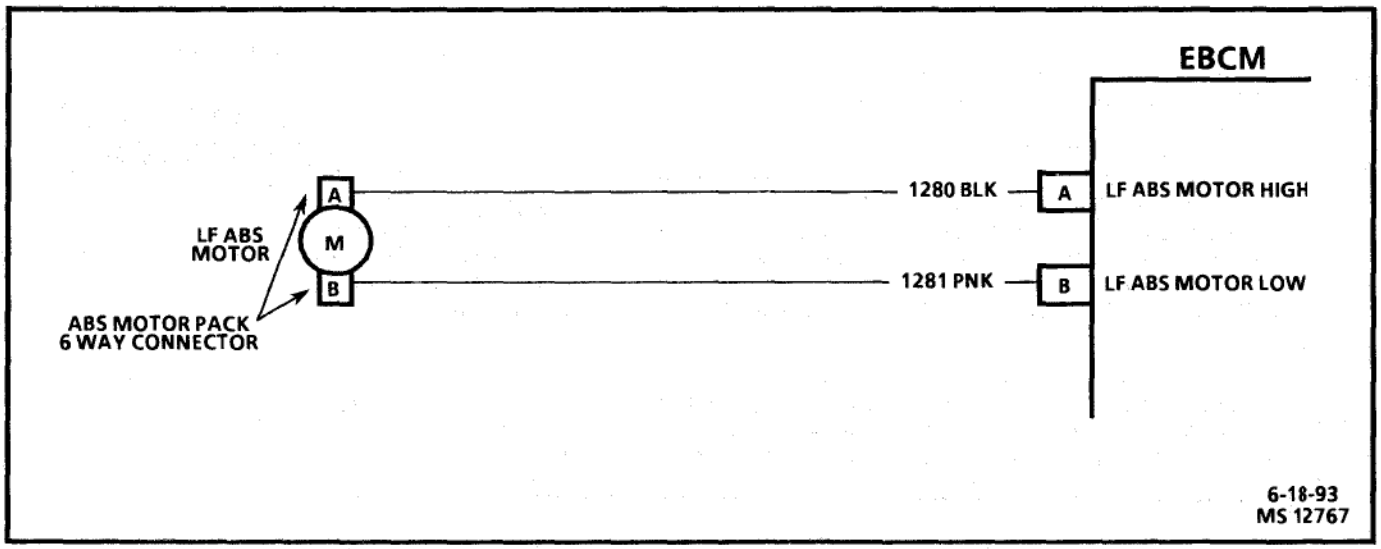
NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

1. • RAISE THE VEHICLE SUCH THAT THE REAR WHEELS ARE APPROXIMATELY SIX INCHES OFF THE FLOOR.
   • IGNITION "ON," ENGINE "OFF."
   • PUMP BRAKE PEDAL UNTIL FIRM TO DEPLETE VACUUM RESERVE.
   • APPLY FIRM PRESSURE ON BRAKE PEDAL AND RELEASE.
   • REAPPLY VERY FIRM PRESSURE ON BRAKE PEDAL AND HAVE AN ASSISTANT TRY TO SPIN THE REAR WHEELS BY HAND.
   COULD ASSISTANT SPIN THE REAR WHEELS?
   - YES → REPLACE ABS MOTOR PACK.
   - NO →
2. • VISUALLY INSPECT THE 6-WAY ABS MOTOR PACK AND 8-WAY EBCM CONNECTORS FOR PROPER WIRE COLOR/CONNECTOR CAVITY COMBINATION.
   ARE THE PROPER WIRES LOCATED IN THE PROPER CONNECTOR CAVITIES?
   - NO → USING THE CIRCUIT DIAGRAMS LOCATED IN THE FRONT OF THIS SECTION, PLACE THE PROPER WIRES INTO THE PROPER CONNECTOR CAVITIES. CLEAR DTCs AND RECHECK SYSTEM.
   - YES →
3. • IGNITION "OFF."
   • DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "C" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "C" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1284.
   - YES →
4. • MEASURE THE RESISTANCE BETWEEN TERMINAL "D" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "F" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1285.
   - YES →
5. • MEASURE THE RESISTANCE BETWEEN TERMINAL "C" AND TERMINAL "D" OF THE ABS MOTOR PACK CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPLACE ABS MOTOR PACK.
   - YES →
6. • INSPECT THE 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR FOR POOR TERMINAL CONTACT OR CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT."
   DO ANY TERMINALS EXHIBIT POOR CONTACT OR EVIDENCE OF CORROSION?
   - YES → REPLACE TERMINALS THAT EXHIBIT POOR TERMINAL CONTACT OR EVIDENCE OF CORROSION.
   - NO →
7. • IGNITION "OFF."
   • RECONNECT ALL CONNECTORS.
   • START ENGINE WITH FOOT OFF BRAKE.
   • ALLOW ENGINE TO RUN FOR AT LEAST 10 SECONDS.
   • REPEAT ABOVE IGNITION CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 42 SET IN THE LAST THREE IGNITION CYCLES?
   - YES → REPLACE EBCM.
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH) AND THEN KEYING DOWN.

6-24-93
NS 16173

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DTC 44

LEFT FRONT ABS CHANNEL WILL NOT MOVE

Circuit Description:

This DTC is designed to detect bound-up ESB, a stuck ABS motor, or a seized hydraulic modulator. When the release is commanded during initialization, the ESB should release the ABS motor, resulting in sensed current being less than commanded current (motor is spinning freely). If the ABS motor is not moving, sensed current will be equal to stall current.

DTC Will Set When: DTC 44 can be set during normal operation. If the EBCM detects a condition in which it cannot move the motor in either direction, a malfunction exists.

Action Taken: This malfunction indicates the channel cannot be moved properly. A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Ensures that proper motor circuits are located in the proper connector cavities.
2. Checks for proper ABS motor movement during apply and release commands from the Tech 1.
3. Compares EBCM command current to motor feedback current.
4. Checks for a short circuit between the ABS motor "HIGH" and ABS motor "LOW" circuits.
5. Checks for an ABS motor that is internally shorted.
6. Determines if the malfunction is caused by a defective EBCM or poor terminal contact.
7. Verifies that the ABS motor can actually apply when commanded.
8. Checks for proper hydraulic modulator gear and piston movement.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. DTC 44 may set after modulator disassembly if the modulator pistons are positioned at the bottom of their bore.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 44

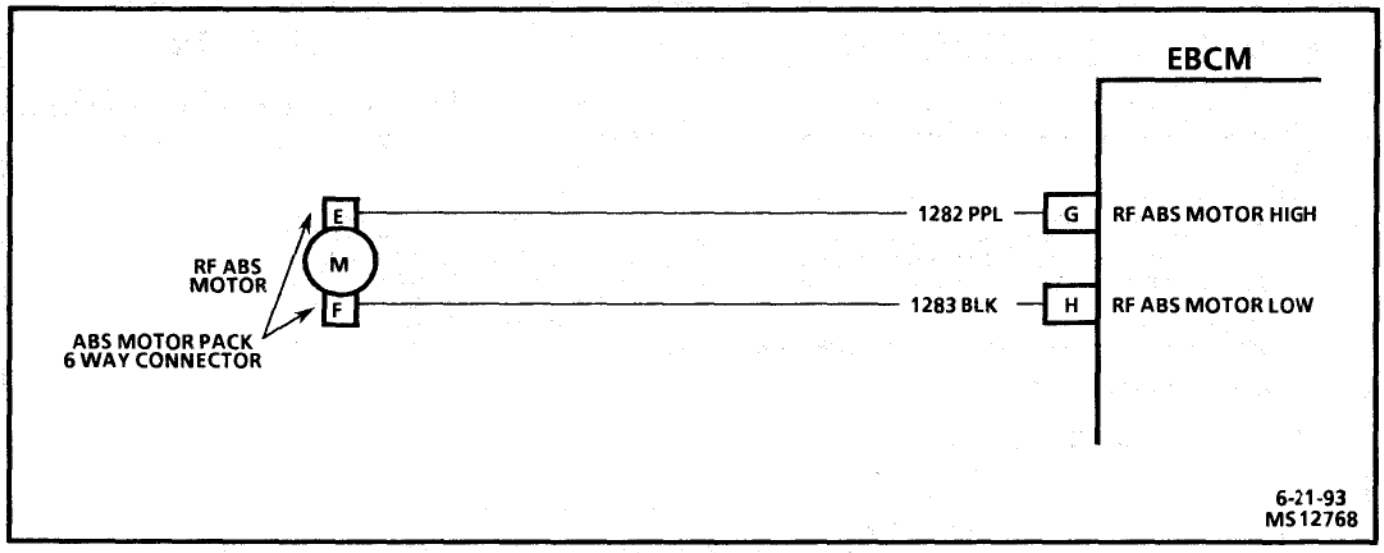
LEFT FRONT ABS CHANNEL WILL NOT MOVE

1. • VISUALLY INSPECT THE 6-WAY ABS MOTOR PACK AND THE 8-WAY EBCM CONNECTORS FOR PROPER WIRE COLOR/CONNECTOR CAVITY COMBINATION.
   ARE THE PROPER WIRES LOCATED IN THE PROPER CONNECTOR CAVITIES?
   - NO → USING THE CIRCUIT DIAGRAMS LOCATED IN THE FRONT OF THIS SECTION, PLACE THE PROPER WIRES IN THE PROPER CONNECTOR CAVITIES. CLEAR DTCs AND RECHECK SYSTEM.
   - YES →
2. • IGNITION "ON," ENGINE "OFF."
   • PUMP BRAKE PEDAL UNTIL FIRM TO DEPLETE VACUUM RESERVE.
   • USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
   • SELECT LEFT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR.
   • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   • SELECT LEFT FRONT ABS MOTOR RELEASE FUNCTION AND RELEASE MOTOR.
   DID BRAKE PEDAL FALL?
   - NO →
   - YES →
7. • FIRM PRESSURE STILL "ON" BRAKE PEDAL.
   • SELECT LEFT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR.
   DID BRAKE PEDAL RISE?
   - NO →
   - YES → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
3. • REMOVE FOOT FROM BRAKE PEDAL.
   • SELECT LEFT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR WHILE CAREFULLY OBSERVING THE COMMANDED CURRENT AND THE FEEDBACK CURRENT ON THE TECH 1.
   WAS THE FEEDBACK CURRENT HIGHER THAN THE COMMANDED CURRENT?
   - YES →
4. • EXIT TECH 1 MANUAL CONTROL FUNCTION.
   • IGNITION "OFF."
   • DISCONNECT THE 8-WAY EBCM CONNECTOR AND THE 6-WAY ABS MOTOR PACK CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - YES →
5. • MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE ABS MOTOR PACK CONNECTOR.
   IS RESISTANCE 0.4Ω OR GREATER?
   - YES →
6. • RECONNECT ALL CONNECTORS.
   • IGNITION "OFF."
   • START ENGINE WITH FOOT OFF BRAKE.
   • ALLOW ENGINE TO RUN FOR AT LEAST 10 SECONDS.
   • REPEAT ABOVE IGNITION CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 44 SET IN THE LAST THREE IGNITION CYCLES?
   - YES → REPLACE EBCM.
   - NO → MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS FOR CONTAMINATION AND POOR TERMINAL CONTACT. REPLACE ANY TERMINALS THAT EXHIBIT POOR TERMINAL CONTACT OR EVIDENCE OF CORROSION.
   - NO → REPLACE ABS MOTOR PACK.
   - NO → REPLACE HYDRAULIC MODULATOR.
   - NO → REPAIR SHORT BETWEEN CKT 1280 AND CKT 1281.
   - NO →
8. • USING TECH 1 MISC. TESTS, PERFORM GEAR TENSION RELIEF FUNCTION.
   • IGNITION "OFF."
   • REMOVE HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY FROM VEHICLE. REFER TO "ON VEHICLE SERVICE" IN THIS SECTION.
   • SEPARATE ABS MOTOR PACK FROM HYDRAULIC MODULATOR.
   • GRASP THE GEAR ON THE HYDRAULIC MODULATOR (THE HYDRAULIC MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS) FURTHEST FORWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE AND ATTEMPT TO MOVE THE GEAR.
   CAN THE GEAR BE ROTATED AT LEAST 10 FULL TURNS LOCK TO LOCK?
   - YES → REPLACE ABS MOTOR PACK.
   - NO →
   - NO →

* AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN. AND THEN KEYING DOWN.

7-3-93
NS 16174

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DTC 45

RIGHT FRONT ABS CHANNEL WILL NOT MOVE

Circuit Description:

This DTC is designed to detect bound-up ESB, a stuck ABS motor, or a seized hydraulic modulator. When the release is commanded during initialization, the ESB should release the ABS motor, resulting in sensed current being less than commanded current (motor is spinning freely). If the ABS motor is not moving, sensed current will be equal to stall current.

DTC Will Set When: DTC 45 can be set during normal operation. If the EBCM detects a condition in which it cannot move the ABS motor in either direction, a malfunction exists.

Action Taken: This malfunction indicates the channel cannot be moved properly. A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Ensures that proper ABS motor circuits are located in the proper connector cavities.
2. Checks for proper ABS motor movement during apply and release commands from the Tech 1.
3. Compares EBCM command current to motor feedback current.
4. Checks for short between CKT 1282 and CKT 1283.
5. Checks for an ABS motor that is internally shorted.
6. Checks to see if malfunction is due to poor terminal contact or the EBCM.
7. Verifies that the motor can actually apply when commanded.
8. Checks for proper hydraulic modulator gear and piston movement.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. DTC 45 may set after modulator disassembly if the modulator pistons are positioned at the bottom of their bore.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 45

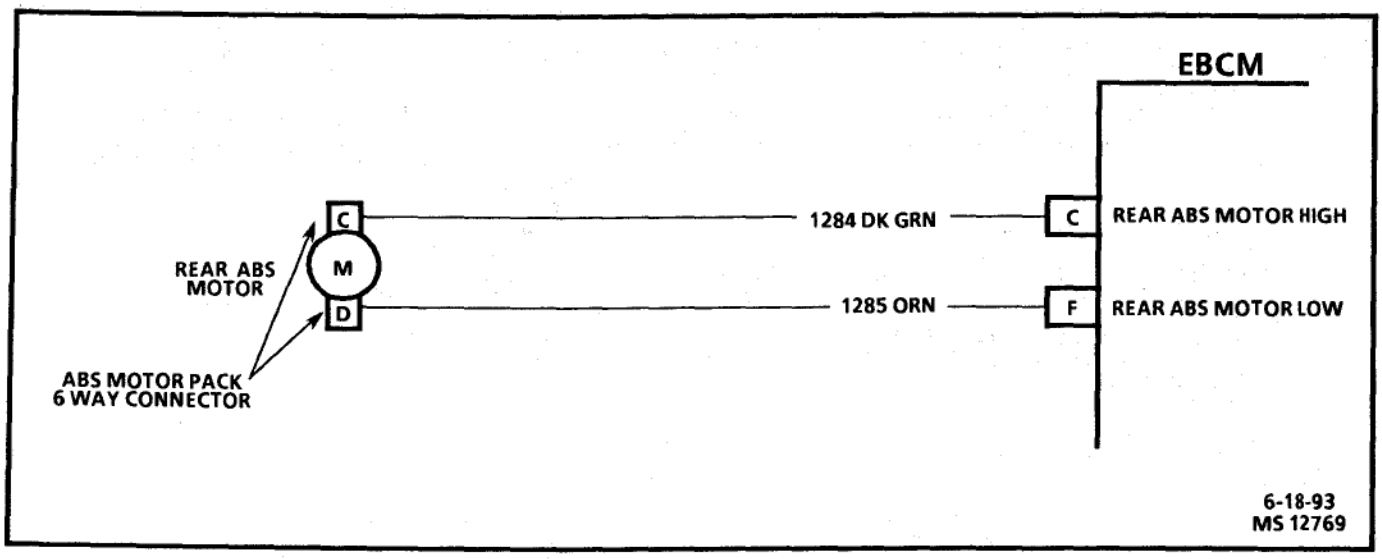
RIGHT FRONT ABS CHANNEL WILL NOT MOVE

1. • VISUALLY INSPECT THE 6-WAY ABS MOTOR PACK AND THE 8-WAY EBCM CONNECTORS FOR PROPER WIRE COLOR/CONNECTOR CAVITY COMBINATION.
   ARE THE PROPER WIRES LOCATED IN THE PROPER CONNECTOR CAVITIES?
   - NO → USING THE CIRCUIT DIAGRAMS LOCATED IN THE FRONT OF THIS SECTION, PLACE THE PROPER WIRES IN THE PROPER CONNECTOR CAVITIES. CLEAR DTCs AND RECHECK SYSTEM.
   - YES →
2. • IGNITION "ON," ENGINE "OFF."
   • PUMP BRAKE PEDAL UNTIL FIRM TO DEPLETE VACUUM RESERVE.
   • USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
   • SELECT RIGHT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR.
   • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   • SELECT RIGHT FRONT ABS MOTOR RELEASE FUNCTION AND RELEASE MOTOR.
   DID BRAKE PEDAL FALL?
   - NO →
   - YES →
7. • FIRM PRESSURE STILL "ON" BRAKE PEDAL.
   • SELECT RIGHT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR.
   DID BRAKE PEDAL RISE?
   - NO →
   - YES → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
3. • REMOVE FOOT FROM BRAKE PEDAL.
   • SELECT RIGHT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR WHILE CAREFULLY OBSERVING THE COMMANDED CURRENT AND THE FEEDBACK CURRENT ON THE TECH 1.
   WAS THE FEEDBACK CURRENT HIGHER THAN THE COMMANDED CURRENT?
   - YES →
4. • IGNITION "OFF."
   • DISCONNECT THE 8-WAY EBCM CONNECTOR AND THE 6-WAY ABS MOTOR PACK CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "G" AND TERMINAL "H" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - NO → REPAIR SHORT BETWEEN CKT 1282 AND CKT 1283.
   - YES →
5. • MEASURE THE RESISTANCE BETWEEN TERMINAL "E" AND TERMINAL "F" OF THE ABS MOTOR PACK CONNECTOR.
   IS RESISTANCE 0.4 Ω OR GREATER?
   - NO → REPLACE ABS MOTOR PACK.
   - YES →
6. • RECONNECT ALL CONNECTORS.
   • EXIT TECH 1 MANUAL CONTROL FUNCTION.
   • IGNITION "OFF."
   • START ENGINE WITH FOOT OFF BRAKE.
   • ALLOW ENGINE TO RUN FOR AT LEAST 10 SECONDS.
   • REPEAT ABOVE IGNITION CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 45 SET IN THE LAST THREE IGNITION CYCLES?
   - YES → REPLACE EBCM.
   - NO → MALFUNCTION IS INTERMITTENT. INSPECT ALL CONNECTORS FOR CONTAMINATION AND POOR TERMINAL CONTACT. REPLACE ANY TERMINALS THAT EXHIBIT POOR TERMINAL CONTACT OR EVIDENCE OF CORROSION.
   - NO → REPLACE HYDRAULIC MODULATOR.
8. • USING TECH 1 MISC. TESTS, PERFORM GEAR TENSION RELIEF FUNCTION.
   • IGNITION "OFF."
   • REMOVE HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY FROM VEHICLE. REFER TO "ON VEHICLE SERVICE" IN THIS SECTION.
   • SEPARATE ABS MOTOR PACK FROM HYDRAULIC MODULATOR.
   • GRASP THE GEAR ON THE HYDRAULIC MODULATOR (THE HYDRAULIC MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS) FURTHEST REARWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE AND ATTEMPT TO MOVE THE GEAR.
   CAN THE GEAR BE ROTATED AT LEAST 10 FULL TURNS LOCK TO LOCK?
   - YES → REPLACE ABS MOTOR PACK.

* AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN.

7-3-93
NS 16175

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DTC 46

REAR ABS CHANNEL WILL NOT MOVE

Circuit Description:

This DTC is designed to detect bound-up ESB, a stuck ABS motor, or a seized hydraulic modulator. When the release is commanded during initialization, the ESB should release the ABS motor, resulting in sensed current being less than commanded current (motor is spinning freely). If the ABS motor is not moving, sensed current will be equal to stall current.

DTC Will Set When: DTC 46 can be set during normal operation. If the EBCM detects a condition in which it cannot move the motor in either direction, a malfunction exists.

Action Taken: This malfunction indicates the channel cannot be moved properly. A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Ensures that proper ABS motor circuits are located in the proper connector cavities.
2. Checks for proper ABS motor movement during apply and release commands from the Tech 1.
3. Compares EBCM command current to ABS motor feedback current.
4. Checks for a short circuit between the ABS motor "HIGH" and ABS motor "LOW" circuits.
5. Checks to see if malfunction is due to poor terminal contact or the EBCM.
6. Verifies that the motor can actually release when commanded.
7. Checks for proper hydraulic modulator gear and piston movement.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks or binds.

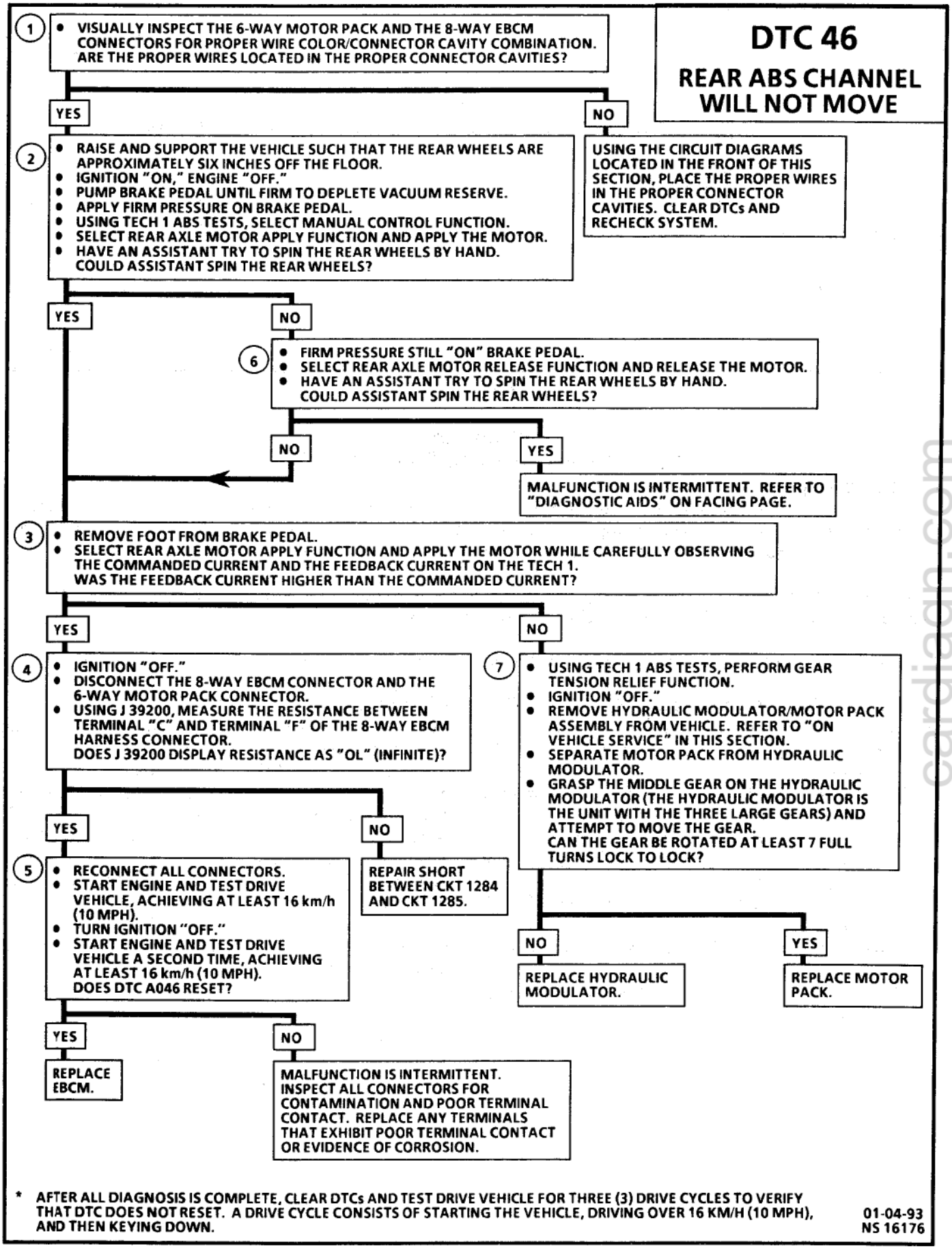
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. DTC 46 may set after modulator disassembly if the modulator pistons are positioned at the bottom of their bore.

Depending on the frequency of the malfunction, a physical inspection of the mechanical parts suspected may be necessary.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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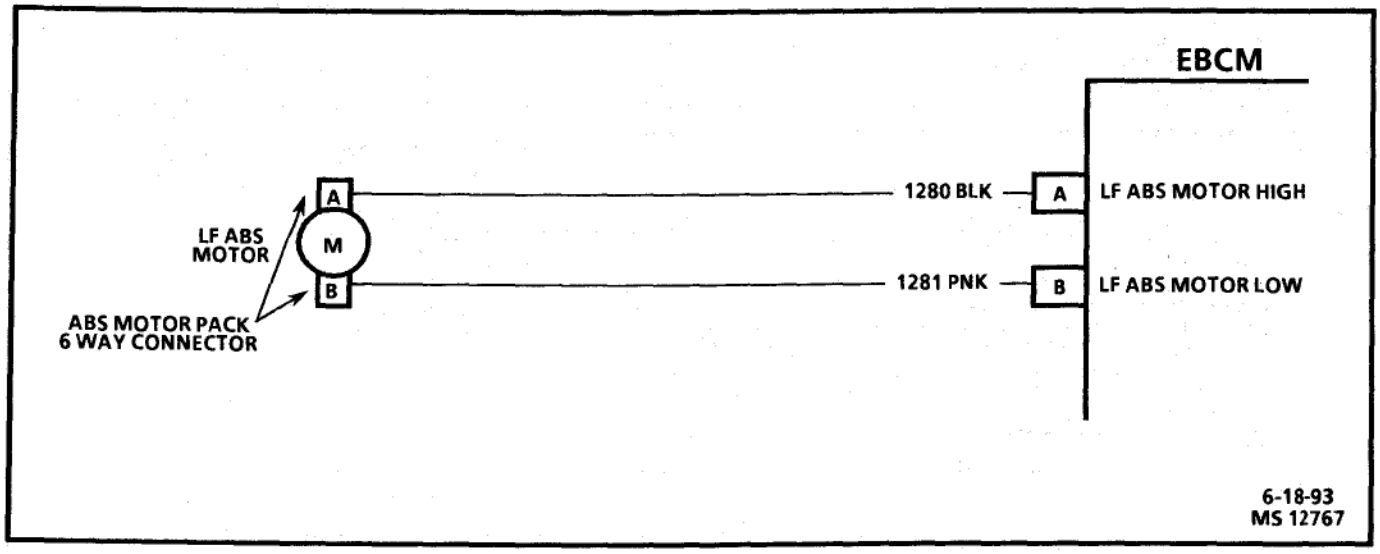
DTC 46
REAR ABS CHANNEL WILL NOT MOVE



* AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN.

01-04-93
NS 16176

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DTC 47

(Page 1 of 2)
LEFT FRONT ABS MOTOR FREE SPINS

Circuit Description:

This DTC is designed to detect a stripped nut or gear assembly during initialization. During the homing sequence, the piston should reach the top of the bore resulting in a stalled ABS motor. If this does not occur, the ABS motor must be spinning with little or no resistance, indicating a nut/screw or gear malfunction.

DTC Will Set When: DTC 47 can only be set during initialization. If the feedback current is less than the command current for a specified period of time, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see if the corresponding open motor DTC is also set.
2. Verifies that the ABS motor was actually applied as command by observing feedback current.
3. Verifies that the ABS motor can release.
4. Verifies that the ABS motor can be applied by observing pedal movement.
5. Checks for an open in the ABS motor "HIGH" circuitry.
6. Checks for an open in the ABS motor "LOW" circuitry.
7. Checks for an ABS motor that is internally shorted.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. If the DTC only occurs once and DTC 56 also occurs, refer to DTC 56. If intermittent and enhanced diagnostics shows this DTC occurs during ABS, refer to DTC 56.

Depending on the frequency of the malfunction, a physical inspection of the mechanical parts suspected may be necessary.

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DTC 47

(Page 1 of 2)
LEFT FRONT ABS MOTOR FREE SPINS

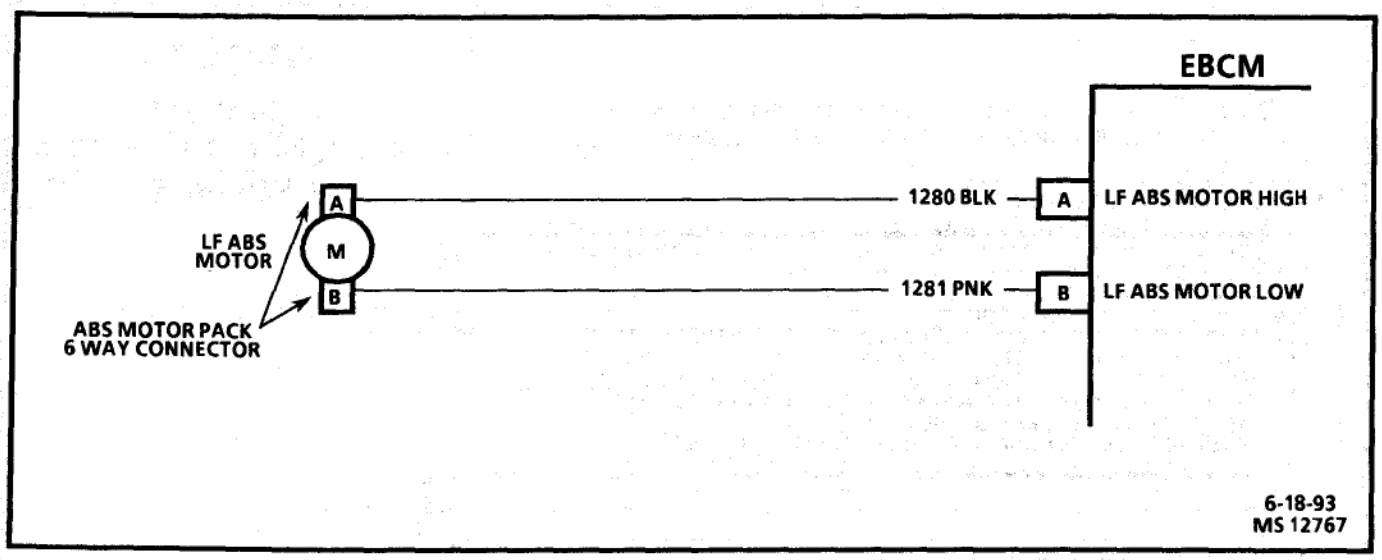
NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

1. IS DTC 56 ALSO CURRENTLY SET?
   - YES → PROCEED TO DTC 56 CHART FIRST.
   - NO →
2. • IGNITION "ON," ENGINE "OFF."
   • PUMP BRAKE PEDAL UNTIL FIRM TO DEPLETE VACUUM RESERVE.
   • USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
   • SELECT LEFT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR WHILE CAREFULLY OBSERVING THE COMMAND CURRENT AND FEEDBACK CURRENT ON THE TECH 1.
   WERE BOTH COMMAND AND FEEDBACK CURRENT 10 AMPS?
   - YES →
3. • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   • SELECT LEFT FRONT ABS MOTOR RELEASE FUNCTION AND RELEASE THE MOTOR.
   DID THE BRAKE PEDAL FALL AND WERE BOTH COMMAND AND FEEDBACK CURRENT 6 AMPS?
   - NO → GO TO STEP 5.
   - YES →
4. • FIRM PRESSURE STILL ON BRAKE PEDAL.
   • SELECT LEFT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR (THIS MOVES THE PISTON TO THE TOP OF ITS BORE.)
   DID BRAKE PEDAL RISE?
   - YES → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - NO →
5. • USING TECH 1 MISC. TESTS, PERFORM GEAR TENSION RELIEF FUNCTION.
   • IGNITION "OFF."
   • DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "A" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1280.
   - YES →
6. • MEASURE THE RESISTANCE BETWEEN TERMINAL "B" OF THE 6-WAY ABS MOTOR PARK HARNESS CONNECTOR AND TERMINAL "B" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1281.
   - YES →
7. • MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE ABS MOTOR PACK CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPLACE ABS MOTOR PACK.
   - YES → DIAGNOSIS CONTINUED ON NEXT PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-25-93
NS 16177

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DTC 47

(Page 2 of 2)
LEFT FRONT ABS MOTOR FREE SPINS

Circuit Description:

This DTC is designed to detect a stripped nut or gear assembly during initialization. During the homing sequence, the piston should reach the top of the bore resulting in a stalled motor. If this does not occur, the motor must be spinning with little or no resistance, indicating a nut/screw or gear malfunction.

DTC Will Set When: DTC 47 can only be set during initialization. If the feedback current is less than the command current for a specified period of time, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

8. Checks for a stripped gear on the ABS motor pack (unit with three small gears).
9. Checks for a stripped gear on the hydraulic modulator (unit with three large gears).
10. Checks to see if the ABS motor pack has an internal malfunction.
11. Checks for a malfunctioning hydraulic modulator.
12. Ensures malfunction was not due to poor terminal contact.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. If the DTC only occurs once and DTC 56 also occurs, refer to DTC 56. If intermittent and enhanced diagnostics shows this DTC occurs during ABS, refer to DTC 56.

Depending on the frequency of the malfunction, a physical inspection of the mechanical parts suspected may be necessary.

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DTC 47

(Page 2 of 2)
LEFT FRONT ABS MOTOR FREE SPINS

DIAGNOSIS CONTINUED FROM PREVIOUS PAGE.

8

- REMOVE HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY FROM VEHICLE (REFER TO "ON-VEHICLE SERVICE" IN THIS SECTION).
- REMOVE GEAR COVER.
- CHECK FOR STRIPPED GEAR ON ABS MOTOR PACK; ABS MOTOR PACK IS THE UNIT WITH THE THREE SMALL GEARS. THE LEFT FRONT GEAR IS THE GEAR FURTHEST FORWARD WHEN THE ASSEMBLY IS INSTALLED IN THE VEHICLE. IS THE ABS MOTOR PACK GEAR STRIPPED?

YES → REPLACE ABS MOTOR PACK.

NO

9

- CHECK FOR A STRIPPED GEAR ON HYDRAULIC MODULATOR; MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS. THE LEFT FRONT GEAR IS THE GEAR FURTHEST FORWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE. IS THE MODULATOR GEAR STRIPPED?

YES → REPLACE HYDRAULIC MODULATOR GEAR.

NO

10

- RECONNECT ELECTRICAL CONNECTORS
- SECURELY POSITION HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY IN VEHICLE WITH GEAR COVER REMOVED SUCH THAT THE GEAR SET CAN BE OBSERVED. BE CAREFUL NOT TO DAMAGE GEAR SET OR ALLOW THE HYDRAULIC MODULATOR TO MOVE WHILE TESTING.
- IGNITION "ON."
- USING TECH 1 MISC. TESTS SELECT MANUAL CONTROL FUNCTION.
- SELECT LEFT FRONT ABS MOTOR APPLY AND APPLY THE MOTOR WHILE OBSERVING THE GEAR SET FURTHEST FORWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE.
- SELECT LEFT FRONT ABS MOTOR RELEASE FUNCTION AND RELEASE THE MOTOR WHILE STILL OBSERVING THE GEAR SET.
- SELECT LEFT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR. DID GEAR SET MOVE IN BOTH DIRECTIONS FOR AT LEAST ONE REVOLUTION?

NO → REPLACE ABS MOTOR PACK.

YES

11

- USING TECH 1 MISC. TESTS, PERFORM GEAR TENSION RELIEF FUNCTION.
- IGNITION "OFF."
- SEPARATE THE ABS MOTOR PACK FROM THE HYDRAULIC MODULATOR.
- GRASP THE GEAR ON THE HYDRAULIC MODULATOR (THE HYDRAULIC MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS) FURTHEST FORWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE AND ATTEMPT TO MOVE THE GEAR. CAN THE GEAR BE ROTATED MORE THAN 13 FULL TURNS LOCK TO LOCK?

YES → REPLACE THE HYDRAULIC MODULATOR.

NO

12

- INSPECT ALL CONNECTORS AND TERMINALS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4 "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.
- REINSTALL HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY IN VEHICLE.
- RECONNECT ALL CONNECTORS.
- IGNITION "OFF."
- START ENGINE WITH FOOT OFF BRAKE.
- ALLOW ENGINE TO RUN FOR AT LEAST 10 SECONDS.
- REPEAT ABOVE IGNITION CYCLE SEQUENCE TWO MORE TIMES. DID DTC 47 SET IN THE LAST THREE IGNITION CYCLES?

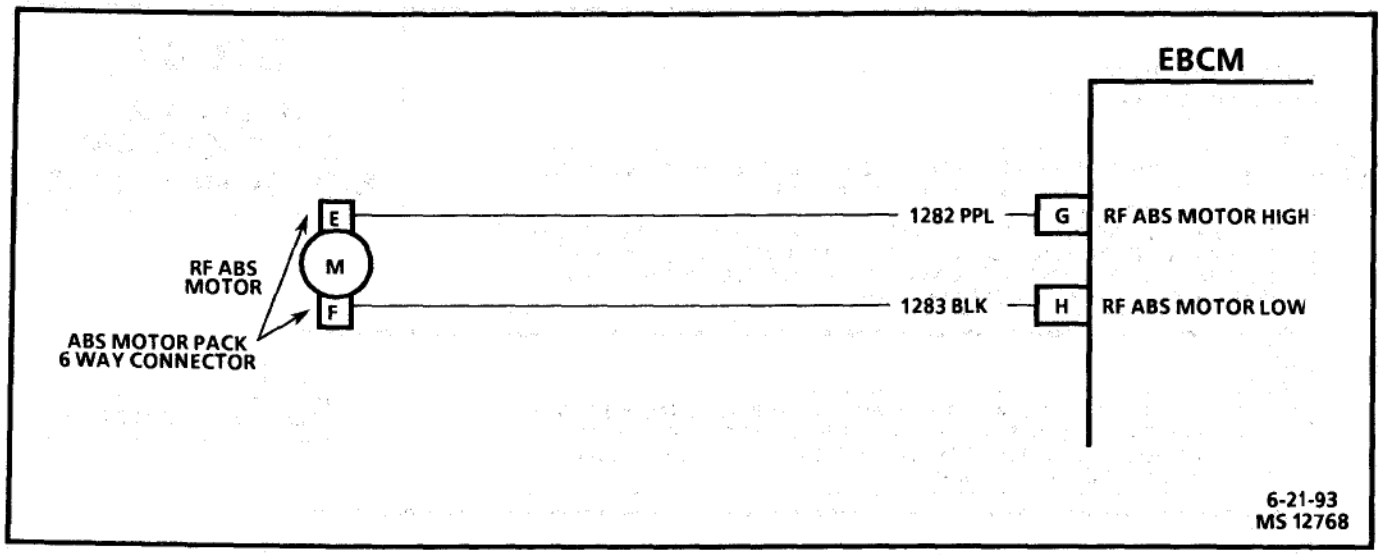
YES → REPLACE EBCM.

NO → MALFUNCTION IS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

7-2-93
NS 16044

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DTC 48

(Page 1 of 2)
RIGHT FRONT ABS MOTOR FREE SPINS

Circuit Description:

This DTC is designed to detect a stripped nut or gear assembly during initialization. During the homing sequence, the piston should reach the top of the bore resulting in a stalled ABS motor. If this does not occur, the ABS motor must be spinning with little or no resistance, indicating a nut/screw or gear malfunction.

DTC Will Set When: DTC 48 can only be set during initialization. If the feedback current is less than the command current for a specified period of time, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see if the corresponding open motor DTC is also set.
2. Verifies that the ABS motor was actually applied as command by observing feedback current.
3. Verifies that the ABS motor can release.
4. Verifies that the ABS motor can be applied by observing pedal movement.
5. Checks for high resistance in the ABS motor "HIGH" circuitry.
6. Checks for high resistance in the ABS motor "LOW" circuitry.
7. Checks for proper resistance of the ABS motor windings.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. If the DTC only occurs once and DTC 61 also occurs, refer to DTC 61. If intermittent and enhanced diagnostics shows this DTC occurs during ABS, refer to DTC 61.

Depending on the frequency of the malfunction, a physical inspection of the mechanical parts suspected may be necessary.

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DTC 48

(Page 1 of 2)

RIGHT FRONT ABS MOTOR FREE SPINS

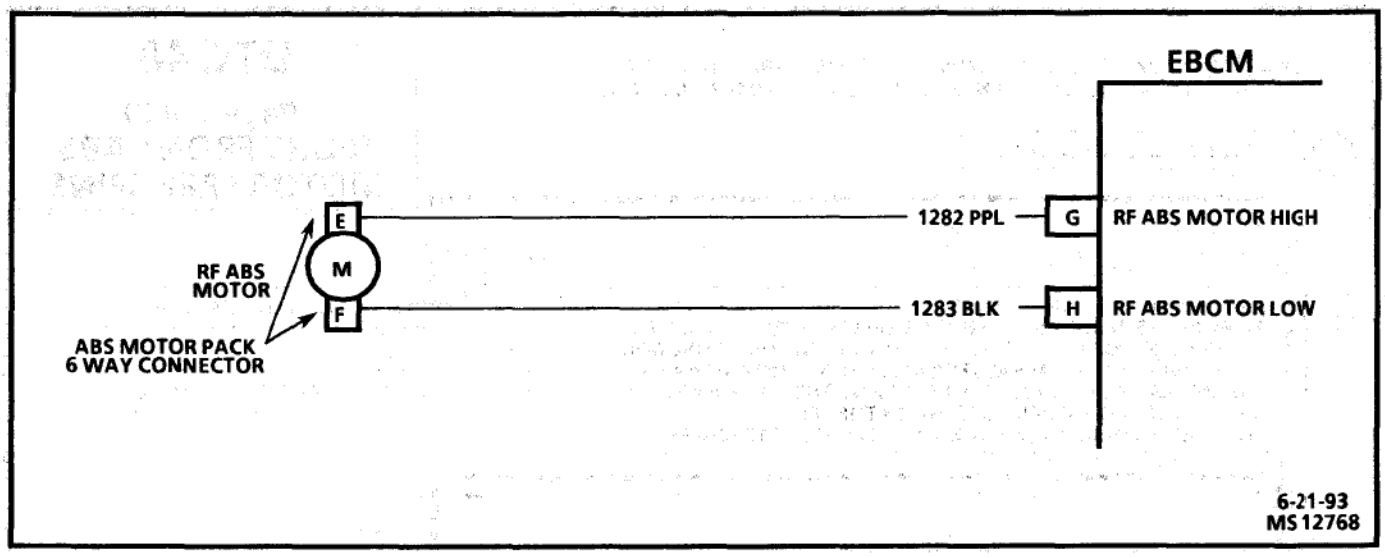
NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

1. IS DTC 61 ALSO CURRENTLY SET?
   - YES → PROCEED TO DTC 61 CHART FIRST.
   - NO →
2. • IGNITION "ON," ENGINE "OFF."
   • PUMP BRAKE PEDAL UNTIL FIRM TO DEPLETE VACUUM RESERVE.
   • USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
   • SELECT RIGHT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR WHILE CAREFULLY OBSERVING THE COMMAND CURRENT AND FEEDBACK CURRENT ON THE TECH 1.
   WERE BOTH COMMAND AND FEEDBACK CURRENT 10 AMPS?
   - YES →
3. • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   • SELECT RIGHT FRONT ABS MOTOR RELEASE FUNCTION AND RELEASE THE MOTOR.
   DID THE BRAKE PEDAL FALL AND WERE BOTH COMMAND AND FEEDBACK CURRENT 6 AMPS?
   - NO → GO TO STEP 5.
   - YES →
4. • FIRM PRESSURE STILL ON BRAKE PEDAL.
   • SELECT RIGHT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR (THIS MOVES THE PISTON TO THE TOP OF ITS BORE.)
   DID BRAKE PEDAL RISE?
   - YES → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - NO →
5. • USING TECH 1 MISC. TESTS, PERFORM GEAR TENSION RELIEF FUNCTION.
   • IGNITION "OFF."
   • DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "E" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "G" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1282.
   - YES →
6. • MEASURE THE RESISTANCE BETWEEN TERMINAL "F" OF THE 6-WAY ABS MOTOR PARK HARNESS CONNECTOR AND TERMINAL "H" OF THE 8-WAY EBCM HARNESS CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1283.
   - YES →
7. • MEASURE THE RESISTANCE BETWEEN TERMINAL "E" AND TERMINAL "F" OF THE ABS MOTOR PACK CONNECTOR.
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPLACE ABS MOTOR PACK.
   - YES → DIAGNOSIS CONTINUED ON NEXT PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

7-8-93
NS 16178

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DTC 48

(Page 2 of 2)
RIGHT FRONT ABS MOTOR FREE SPINS

Circuit Description:

This DTC is designed to detect a stripped nut or gear assembly during initialization. During the homing sequence, the piston should reach the top of the bore resulting in a stalled ABS motor. If this does not occur, the ABS motor must be spinning with little or no resistance, indicating a nut/screw or gear malfunction.

DTC Will Set When: DTC 48 can only be set during initialization. If the feedback current is less than the command current for a specified period of time, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

8. Checks for a stripped gear on the ABS motor pack (unit with three small gears).
9. Checks for a stripped gear on the hydraulic modulator (unit with three large gears).
10. Verifies that the ABS motor can be applied under a load situation.
11. Verifies that the hydraulic modulator is functioning properly.
12. Ensures malfunction was not due to poor terminal contact.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. If the DTC only occurs once and DTC 61 also occurs, refer to DTC 61. If intermittent and enhanced diagnostics shows this DTC occurs during ABS, refer to DTC 61.

Depending on the frequency of the malfunction, a physical inspection of the mechanical parts suspected may be necessary.

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DTC 48
(Page 2 of 2)
RIGHT FRONT ABS MOTOR FREE SPINS

DIAGNOSIS CONTINUED FROM PREVIOUS PAGE.

8
- REMOVE HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY FROM VEHICLE. (REFER TO "ON-VEHICLE SERVICE" IN THIS SECTION.)
- REMOVE GEAR COVER.
- CHECK FOR STRIPPED GEAR ON ABS MOTOR PACK; ABS MOTOR PACK IS THE UNIT WITH THE THREE SMALL GEARS. THE RIGHT FRONT GEAR IS THE GEAR FURTHEST REARWARD WHEN THE ASSEMBLY IS INSTALLED IN THE VEHICLE. IS THE ABS MOTOR PACK GEAR STRIPPED?

YES → REPLACE ABS MOTOR PACK.

NO

9
- CHECK FOR A STRIPPED GEAR ON HYDRAULIC MODULATOR; MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS. THE RIGHT FRONT GEAR IS THE GEAR FURTHEST REARWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE. IS THE MODULATOR GEAR STRIPPED?

YES → REPLACE HYDRAULIC MODULATOR GEAR.

NO

10
- RECONNECT ELECTRICAL CONNECTORS.
- SECURELY POSITION HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY IN VEHICLE WITH GEAR COVER REMOVED SUCH THAT THE GEAR SET CAN BE OBSERVED. BE CAREFUL NOT TO DAMAGE GEAR SET OR ALLOW THE HYDRAULIC MODULATOR TO MOVE WHILE TESTING.
- IGNITION "ON."
- USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
- SELECT RIGHT FRONT ABS MOTOR APPLY AND APPLY THE MOTOR WHILE OBSERVING THE GEAR SET FURTHEST REARWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE.
- SELECT RIGHT FRONT ABS MOTOR RELEASE FUNCTION AND RELEASE THE MOTOR WHILE STILL OBSERVING THE GEAR SET.
- SELECT RIGHT FRONT ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR. DID GEAR SET MOVE IN BOTH DIRECTIONS FOR AT LEAST ONE REVOLUTION?

NO → REPLACE ABS MOTOR PACK.

YES

11
- USING TECH 1 MISC. TESTS, PERFORM GEAR TENSION RELIEF FUNCTION.
- IGNITION "OFF."
- SEPARATE THE ABS MOTOR PACK FROM THE HYDRAULIC MODULATOR.
- GRASP THE GEAR ON THE HYDRAULIC MODULATOR (THE HYDRAULIC MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS) FURTHEST REARWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE AND ATTEMPT TO MOVE THE GEAR. CAN THE GEAR BE ROTATED MORE THAN 13 FULL TURNS LOCK TO LOCK?

YES → REPLACE THE HYDRAULIC MODULATOR.

NO

12
- INSPECT ALL CONNECTORS AND TERMINALS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4 "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.
- REINSTALL HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY IN VEHICLE.
- RECONNECT ALL CONNECTORS.
- IGNITION "OFF."
- START ENGINE WITH FOOT OFF BRAKE.
- ALLOW ENGINE TO RUN FOR AT LEAST 10 SECONDS.
- REPEAT ABOVE IGNITION CYCLE SEQUENCE TWO MORE TIMES. DID DTC 48 SET IN THE LAST THREE IGNITION CYCLES?

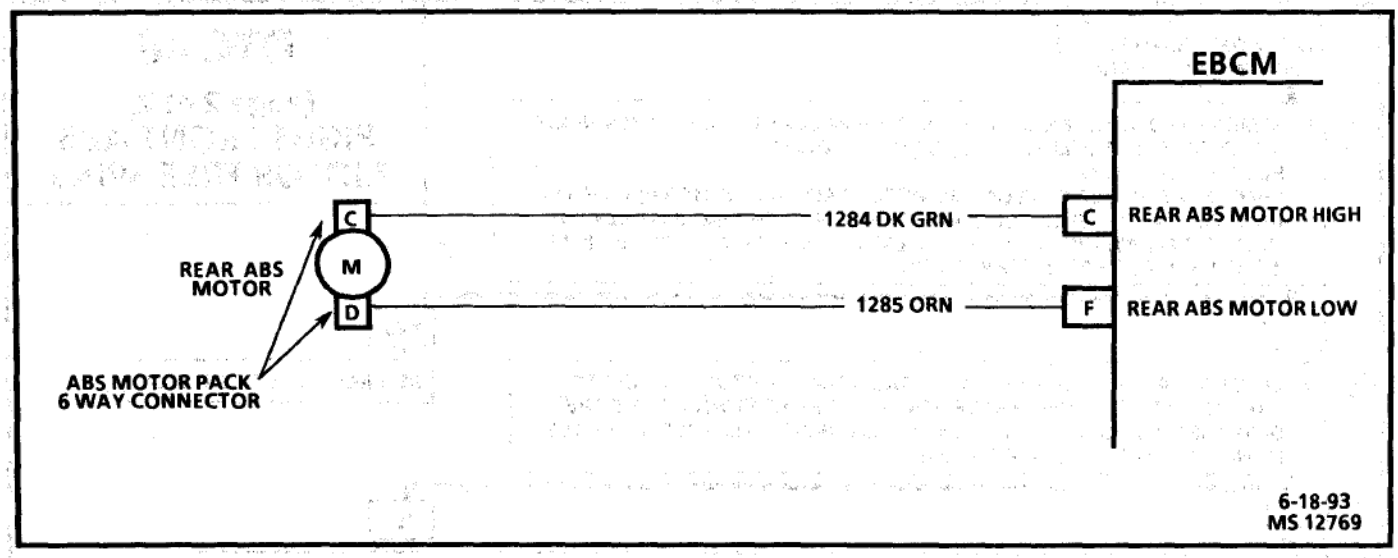
YES → REPLACE EBCM.

NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

7-2-93
NS 16045

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DTC 51

(Page 1 of 2)
REAR ABS MOTOR FREE SPINS

Circuit Description:

This DTC is designed to detect a stripped nut or gear assembly during initialization. During the homing sequence, the piston should reach the top of the bore resulting in a stalled ABS motor. If this does not occur, the ABS motor must be spinning with little or no resistance, indicating a nut/screw or gear malfunction.

DTC Will Set When: DTC 51 can be set during initialization. If the feedback current is less than the command current for a specified period of time, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see if the corresponding open ABS motor DTC is also set.
2. Verifies that the ABS motor was actually applied as command by observing feedback current.
3. Verifies that the ABS motor can release.
4. Verifies that the ABS motor can be applied by observing pedal movement.
5. Checks for high resistance in the ABS motor "HIGH" circuitry.
6. Checks for high resistance in the ABS motor "LOW" circuitry.
7. Checks for proper resistance of the ABS motor windings.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. If the DTC only occurs once and DTC 64 also occurs, refer to DTC 64. If intermittent and enhanced diagnostics show this DTC occurs during ABS, refer to DTC 64.

Depending on the frequency of the malfunction, a physical inspection of the mechanical parts suspected may be necessary.

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DTC 51

(Page 1 of 2) REAR ABS MOTOR FREE SPINS

NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

1. IS DTC 64 ALSO CURRENTLY SET?
   - YES → PROCEED TO DTC 64 CHART FIRST.
   - NO →
2. - IGNITION "ON," ENGINE "OFF."
   - PUMP BRAKE PEDAL UNTIL FIRM TO DEPLETE VACUUM RESERVE.
   - USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
   - SELECT REAR AXLE ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR WHILE CAREFULLY OBSERVING THE COMMAND CURRENT AND FEEDBACK CURRENT ON THE TECH 1.

   WERE BOTH COMMAND AND FEEDBACK CURRENT 10 AMPS?
   - YES →
3. - APPLY FIRM PRESSURE ON BRAKE PEDAL.
   - SELECT REAR AXLE ABS MOTOR RELEASE FUNCTION AND RELEASE THE MOTOR.

   DID THE BRAKE PEDAL FALL AND WERE BOTH COMMAND AND FEEDBACK CURRENT 6 AMPS?
   - YES →
4. - FIRM PRESSURE STILL ON BRAKE PEDAL.
   - SELECT REAR AXLE ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR (THIS MOVES THE PISTON TO THE TOP OF ITS BORE.)

   DID BRAKE PEDAL RISE?
   - YES → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - NO →
5. - USING TECH 1 MISC. TESTS, PERFORM GEAR TENSION RELIEF FUNCTION.
   - IGNITION "OFF."
   - DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR AND 8-WAY EBCM CONNECTOR.
   - USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "C" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR AND TERMINAL "C" OF THE 8-WAY EBCM HARNESS CONNECTOR.

   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1284.
   - YES →
6. - MEASURE THE RESISTANCE BETWEEN TERMINAL "D" OF THE 6-WAY ABS MOTOR PARK HARNESS CONNECTOR AND TERMINAL "F" OF THE 8-WAY EBCM HARNESS CONNECTOR.

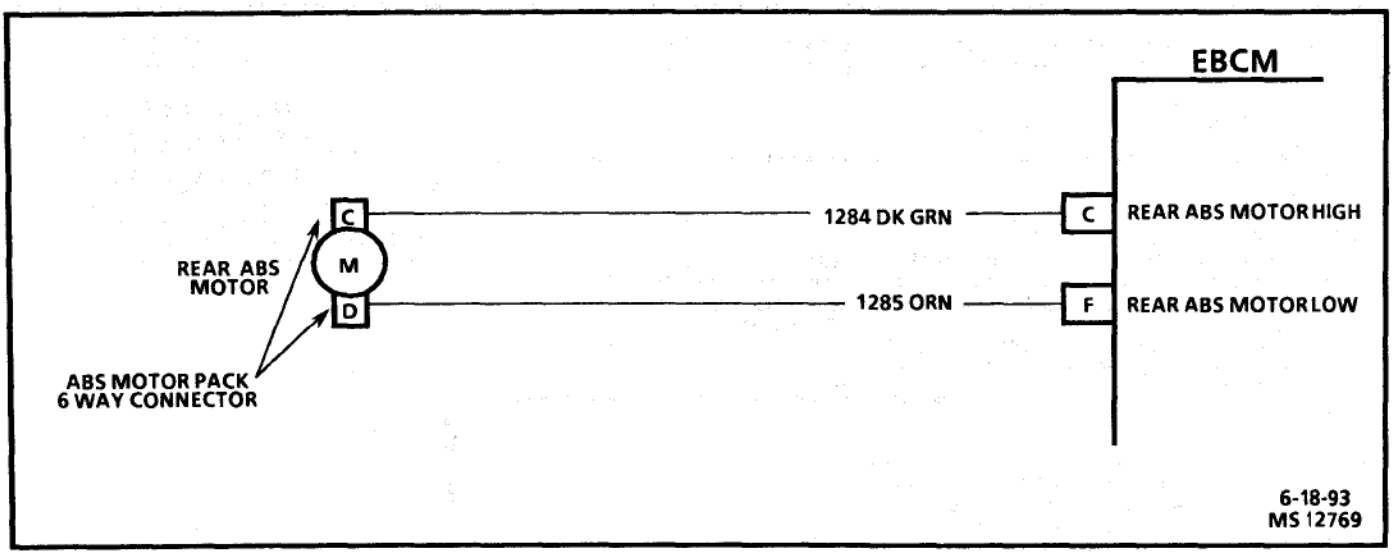
   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPAIR HIGH RESISTANCE IN CKT 1285.
   - YES →
7. - MEASURE THE RESISTANCE BETWEEN TERMINAL "C" AND TERMINAL "D" OF THE ABS MOTOR PACK CONNECTOR.

   IS RESISTANCE 1.5Ω OR LESS?
   - NO → REPLACE ABS MOTOR PACK.
   - YES → DIAGNOSIS CONTINUED ON NEXT PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-25-93
NS 16179

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DTC 51

(Page 2 of 2)
REAR ABS MOTOR FREE SPINS

Circuit Description:

This DTC is designed to detect a stripped nut or gear assembly during initialization. During the homing sequence, the piston should reach the top of the bore resulting in a stalled motor. If this does not occur, the ABS motor must be spinning with little or no resistance, indicating a nut/screw or gear malfunction.

DTC Will Set When: DTC 51 can be set during initialization. If the feedback current is less than the command current for a specified period of time, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled, and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

8. Checks for a stripped gear on the ABS motor pack (unit with three small gears).
9. Checks for a stripped gear on the hydraulic modulator (unit with three large gears).
10. Verifies that the motor can be applied under a load situation.
11. Verifies that the hydraulic modulator is functioning properly.
12. Ensures malfunction was not due to poor terminal contact.

Diagnostic Aids: An "Intermittent" malfunction in this DTC may result from a mechanical part of the system that sticks, binds, or slips.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. If the DTC only occurs once and DTC 64 also occurs, refer to DTC 64. If intermittent and enhanced diagnostics show this DTC occurs during ABS, refer to DTC 64.

Depending on the frequency of the malfunction, a physical inspection of the mechanical parts suspected may be necessary.

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DTC 51
(Page 2 of 2)
REAR ABS MOTOR FREE SPINS

DIAGNOSIS CONTINUED FROM PREVIOUS PAGE.

8
- REMOVE HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY FROM VEHICLE (REFER TO "ON-VEHICLE SERVICE" IN THIS SECTION).
- REMOVE GEAR COVER.
- CHECK FOR STRIPPED GEAR ON ABS MOTOR PACK; ABS MOTOR PACK IS THE UNIT WITH THE THREE SMALL GEARS. THE REAR AXLE GEAR IS THE MIDDLE GEAR OF THE THREE.

IS THE ABS MOTOR PACK GEAR STRIPPED?

YES → REPLACE ABS MOTOR PACK.

NO

9
- CHECK FOR A STRIPPED GEAR ON HYDRAULIC MODULATOR; MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS. THE REAR AXLE GEAR IS THE MIDDLE GEAR OF THE THREE.

IS THE MODULATOR GEAR STRIPPED?

YES → REPLACE HYDRAULIC MODULATOR GEAR.

NO

10
- RECONNECT ELECTRICAL CONNECTORS
- SECURELY POSITION HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY IN VEHICLE WITH GEAR COVER REMOVED SUCH THAT THE GEAR SET CAN BE OBSERVED. BE CAREFUL NOT TO DAMAGE GEAR SET OR ALLOW THE HYDRAULIC MODULATOR TO MOVE WHILE TESTING.
- IGNITION "ON."
- USING TECH 1 MISC. TESTS, SELECT MANUAL CONTROL FUNCTION.
- SELECT REAR AXLE ABS MOTOR APPLY AND APPLY THE MOTOR WHILE OBSERVING THE MIDDLE GEAR SET .
- SELECT REAR AXLE ABS MOTOR RELEASE FUNCTION AND RELEASE THE MOTOR WHILE STILL OBSERVING THE GEAR SET.
- SELECT REAR AXLE ABS MOTOR APPLY FUNCTION AND APPLY THE MOTOR.

DID GEAR SET MOVE IN BOTH DIRECTIONS FOR AT LEAST ONE REVOLUTION?

NO → REPLACE ABS MOTOR PACK.

YES

11
- USING TECH 1 MISC. TESTS, PERFORM GEAR TENSION RELIEF FUNCTION.
- IGNITION "OFF."
- SEPARATE THE ABS MOTOR PACK FROM THE HYDRAULIC MODULATOR.
- GRASP THE MIDDLE GEAR ON THE HYDRAULIC MODULATOR (THE HYDRAULIC MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS) AND ATTEMPT TO MOVE THE GEAR.

CAN THE GEAR BE ROTATED MORE THAN 8 FULL TURNS LOCK TO LOCK?

YES → REPLACE THE HYDRAULIC MODULATOR.

NO

12
- INSPECT ALL CONNECTORS AND TERMINALS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4 "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.
- REINSTALL HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY IN VEHICLE.
- RECONNECT ALL CONNECTORS.
- IGNITION "OFF."
- START ENGINE WITH FOOT OFF BRAKE.
- ALLOW ENGINE TO RUN FOR AT LEAST 10 SECONDS.
- REPEAT ABOVE IGNITION CYCLE SEQUENCE TWO MORE TIMES.

DID DTC 51 SET IN THE LAST THREE IGNITION CYCLES?

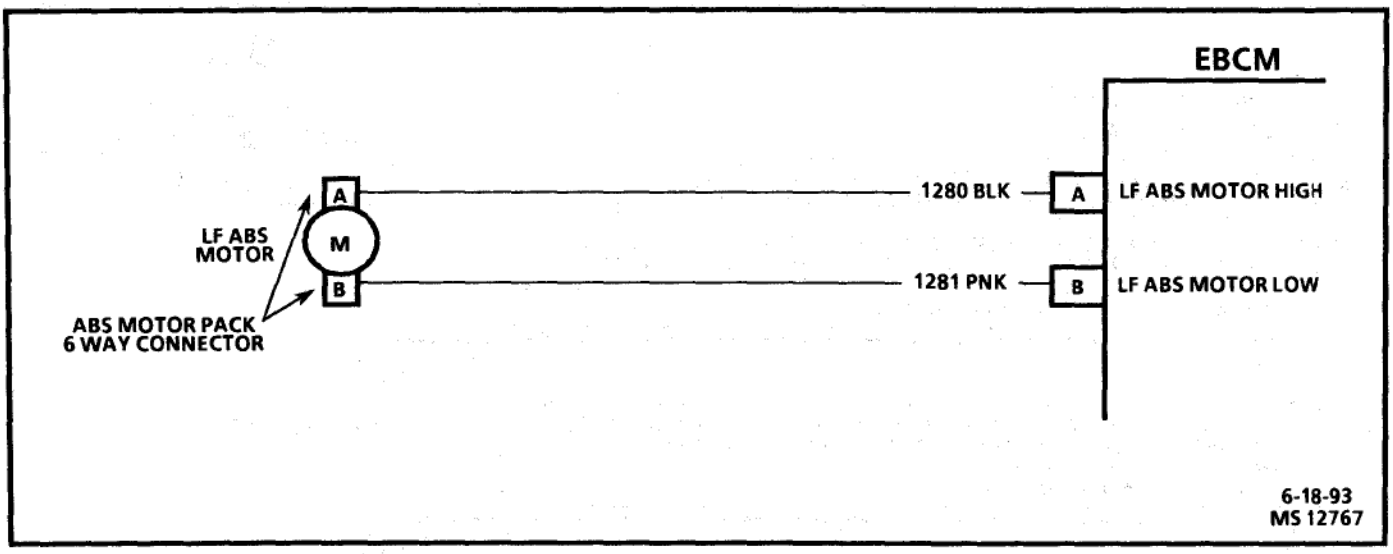
YES → REPLACE EBCM.

NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS " ON FACING PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

7-2-93
NS 16046

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DTC 52

LEFT FRONT ABS CHANNEL IN RELEASE TOO LONG

Circuit Description:

This DTC will diagnose an ABS motor that is energized longer than expected. This could occur if a wheel speed sensor is malfunctioning, the ABS motor does not turn, the left front solenoid mechanically fails open, or the ABS motor wires are crossed.

DTC Will Set When: DTC 52 can be set only during an ABS stop. If the EBCM commands the left front ABS channel in release for three seconds, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Identifies a problem in a wheel speed sensor that may cause the system to be in release too long.
2. Identifies an ABS motor as being failed or wired incorrectly.
3. Checks for a solenoid that may have mechanically failed open.
4. Verifies proper solenoid operation.
5. If Step 3 has failed, this serves to isolate the cause of the hydraulic problem, to either the solenoid or the ABS hydraulic modulator assembly.
6. Determines whether a malfunctioning motor pack or hydraulic modulator is the reason for DTC 52 being set.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a mechanical part of the system that sticks or binds.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. DTC 52 may occur if on ice and steering wheel is turned to lock during braking. Using the Tech 1, perform hydraulic test to ensure total brake system is functional.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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Important

EXCESSIVE DRAG OR HIGH RESISTANCE IN THE BASE BRAKE OR SUSPENSION SYSTEM MUST BE INSPECTED AND CORRECTED BEFORE PROCEEDING WITH DTC DIAGNOSIS.

DTC 52

LEFT FRONT ABS CHANNEL IN RELEASE TOO LONG

ARE ANY WHEEL SPEED DTCs CURRENTLY SET?

- YES → PROCEED TO THAT DTC CHART FIRST.
- NO →

1. • USING TECH 1, SELECT "F0: DATA LIST" AND TEST VEHICLE DURING A STEADY DECEL CONDITION FROM 35 MPH TO 0 MPH WHILE MONITORING ALL WHEEL SPEEDS.
   DO ANY OF THE WHEEL SPEEDS INDICATE ERRATIC OR INTERMITTENT OPERATION?

- YES → PROCEED TO WHEEL SPEED = 0 DTC FOR AFFECTED WHEEL.
- NO →

2. • IGNITION "ON."
   • USING TECH 1 MANUAL CONTROL FUNCTION , SELECT LEFT FRONT ABS MOTOR APPLY AND APPLY MOTOR.
   • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   • SELECT LEFT FRONT ABS MOTOR RELEASE AND COMMAND RELEASE OF MOTOR.
   DID BRAKE PEDAL FALL?

- NO →
  - BRAKE PEDAL DID NOT MOVE →

6. • USING TECH 1 PERFORM GEAR TENSION RELIEF FUNCTION.
   • IGNITION "OFF."
   • REMOVE HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY FROM VEHICLE.
   • SEPARATE ABS MOTOR PACK FROM HYDRAULIC MODULATOR.
   • GRASP THE GEAR ON THE HYDRAULIC MODULATOR (HYDRAULIC MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS) FURTHEST FORWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE AND ATTEMPT TO ROTATE THE GEAR IN EITHER DIRECTION.
   CAN THE GEAR BE MOVED BY HAND?

     - YES → REPLACE ABS MOTOR PACK.
     - NO → REPLACE ABS HYDRAULIC MODULATOR.

  - BRAKE PEDAL ROSE → REPAIR CROSSED WIRES (CKTs 1280 and 1281) TO LEFT FRONT ABS MOTOR.

- YES →

3. • REMOVE FOOT FROM BRAKE PEDAL.
   • USING TECH 1 MANUAL CONTROL FUNCTION, SELECT LEFT FRONT SOLENOID AND COMMAND THE SOLENOID "ON."
   • APPLY FIRM PRESSURE TO BRAKE PEDAL.
   DID BRAKE PEDAL FALL?

- YES → PROCEED TO STEP 5 OF THIS CHART.
- NO →

4. • FIRM PRESSURE STILL APPLIED TO BRAKE PEDAL.
   • USING TECH 1, COMMAND LEFT FRONT SOLENOID "OFF."
   DID BRAKE PEDAL FALL?

- YES → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- NO →

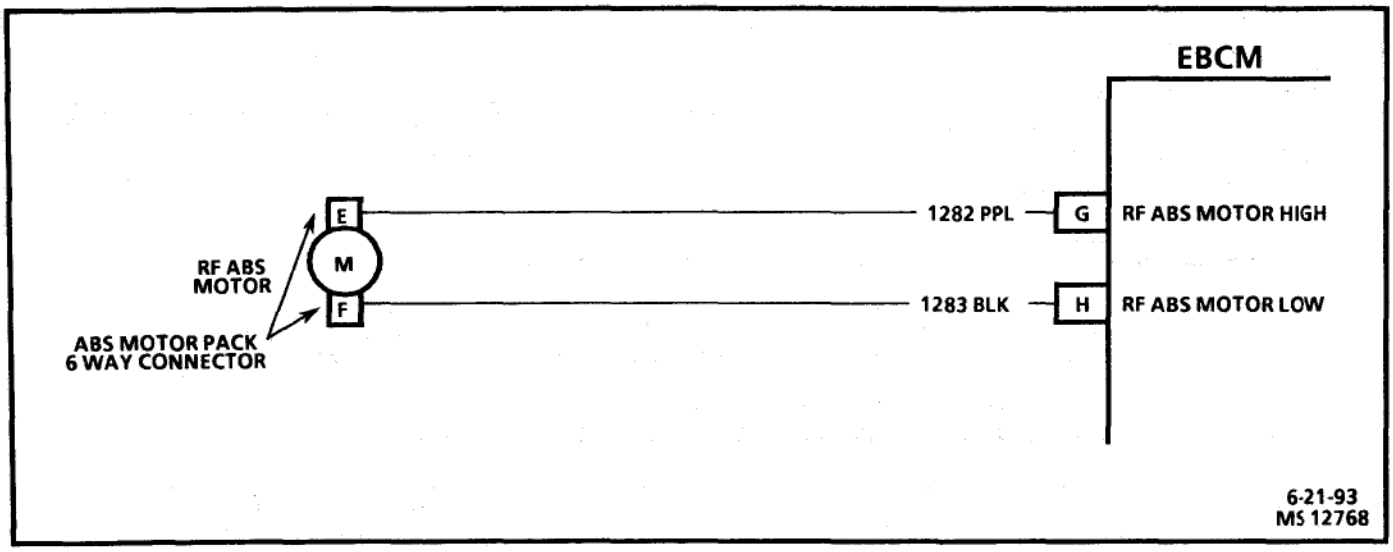
5. • REMOVE FOOT FROM BRAKE PEDAL.
   • IGNITION "OFF."
   • PHYSICALLY SWITCH THE LEFT FRONT SOLENOID WITH RIGHT FRONT SOLENOID.
   • IGNITION "ON."
   • USING TECH 1 MANUAL CONTROL FUNCTION, SELECT LEFT FRONT SOLENOID AND COMMAND THE SOLENOID "ON."
   • APPLY FIRM PRESSURE TO BRAKE PEDAL.
   DID BRAKE PEDAL FALL?

- YES → REPLACE ABS HYDRAULIC MODULATOR.
- NO → REPLACE THE SOLENOID WHICH WAS ORIGINALLY IN THE LEFT FRONT CHANNEL.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16km/h (10 MPH) AND THEN KEYING DOWN.

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NS 16180

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DTC 53

RIGHT FRONT ABS CHANNEL IN RELEASE TOO LONG

Circuit Description:

This DTC will diagnose a motor that is energized longer than expected. This could occur if a wheel speed sensor is malfunctioning, the motor does not turn, the right front solenoid mechanically fails open, or the ABS motor wires are crossed.

DTC Will Set When: DTC 53 can be set only during an ABS stop. If the EBCM commands the right front channel in release for three seconds, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Identifies a problem in a wheel speed sensor that may cause the system to be in release too long.
2. Identifies a motor as being failed or wired incorrectly.
3. Checks for a solenoid that may have mechanically failed open.
4. If Step 3 has failed, this serves to isolate the cause of the hydraulic problem, to either the solenoid or the ABS hydraulic modulator assembly.
5. Checks for a solenoid that may have mechanically failed closed.
6. Determines whether a malfunction motor pack or hydraulic modulator is the reason for DTC 53 being set.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a mechanical part of the system that sticks or binds.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. DTC 53 may occur on ice if steering wheel is turned to lock during braking. Using the Tech 1 perform hydraulic test to ensure total brake system is functional.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 53

RIGHT FRONT ABS CHANNEL IN RELEASE TOO LONG

Important

EXCESSIVE DRAG OR HIGH RESISTANCE IN THE BASE BRAKE OR SUSPENSION SYSTEM MUST BE INSPECTED AND CORRECTED BEFORE PROCEEDING WITH DTC DIAGNOSIS.

ARE ANY WHEEL SPEED DTCs CURRENTLY SET?

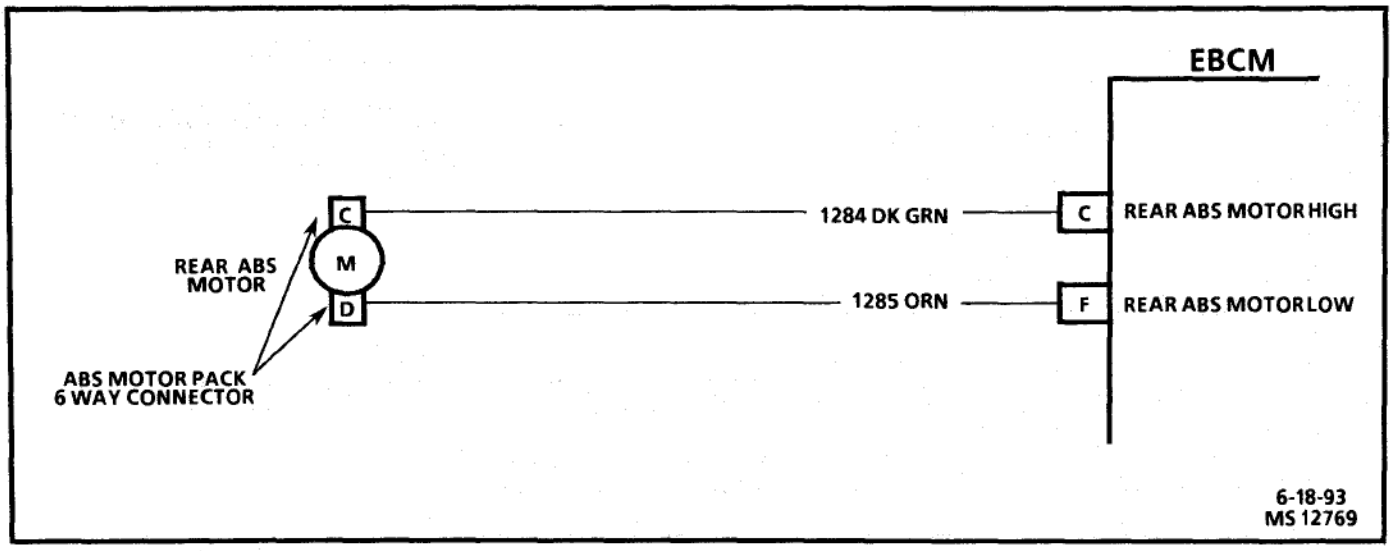
- YES → PROCEED TO THAT DTC CHART FIRST.
- NO →

1. • USING TECH 1, SELECT "F0: DATA LIST " AND TEST VEHICLE DURING A STEADY DECEL CONDITION FROM 35 MPH TO 0 MPH WHILE MONITORING ALL WHEEL SPEEDS.
   DO ANY OF THE WHEEL SPEEDS INDICATE ERRATIC OR INTERMITTENT OPERATION?
   - YES → PROCEED TO WHEEL SPEED = 0 DTC FOR AFFECTED WHEEL.
   - NO →
2. • IGNITION "ON."
   • USING TECH 1 MANUAL CONTROL FUNCTION, SELECT RIGHT FRONT ABS MOTOR APPLY AND APPLY MOTOR.
   • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   • SELECT RIGHT FRONT ABS MOTOR RELEASE AND COMMAND RELEASE OF MOTOR.
   DID BRAKE PEDAL FALL?
   - NO →
     - BRAKE PEDAL DID NOT MOVE →
6. • USING TECH 1 PERFORM GEAR TENSION RELIEF FUNCTION.
   • IGNITION "OFF."
   • REMOVE HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY FROM VEHICLE.
   • SEPARATE ABS MOTOR PACK FROM HYDRAULIC MODULATOR.
   • GRASP THE GEAR ON THE HYDRAULIC MODULATOR (HYDRAULIC MODULATOR IS THE UNIT WITH THE THREE LARGE GEARS) FURTHEST REARWARD WHEN THE UNIT IS INSTALLED IN THE VEHICLE AND ATTEMPT TO ROTATE THE GEAR IN EITHER DIRECTION.
   CAN THE GEAR BE MOVED BY HAND?
   - YES → REPLACE ABS MOTOR PACK.
   - NO → REPLACE ABS HYDRAULIC MODULATOR.
     - BRAKE PEDAL ROSE → REPAIR CROSSED WIRES (CKTs 1282 AND 1283) TO RIGHT FRONT ABS MOTOR.
   - YES →
3. • REMOVE FOOT FROM BRAKE PEDAL.
   • USING TECH 1 MANUAL CONTROL FUNCTION, SELECT RIGHT FRONT SOLENOID AND COMMAND THE SOLENOID "ON."
   • APPLY FIRM PRESSURE TO BRAKE PEDAL.
   DID BRAKE PEDAL FALL?
   - YES → PROCEED TO STEP 5 OF THIS CHART.
   - NO →
4. • FIRM PRESSURE STILL APPLIED TO BRAKE PEDAL.
   • USING TECH 1, COMMAND RIGHT FRONT SOLENOID "OFF."
   DID BRAKE PEDAL FALL?
   - NO →
5. • REMOVE FOOT FROM BRAKE PEDAL.
   • IGNITION "OFF."
   • PHYSICALLY SWITCH THE RIGHT FRONT SOLENOID WITH THE LEFT FRONT SOLENOID.
   • IGNITION "ON."
   • USING TECH 1 MANUAL CONTROL FUNCTION, SELECT RIGHT FRONT SOLENOID AND COMMAND THE SOLENOID "ON."
   • APPLY FIRM PRESSURE TO BRAKE PEDAL.
   DID BRAKE PEDAL FALL?
   - YES → REPLACE ABS HYDRAULIC MODULATOR.
   - NO → REPLACE THE SOLENOID WHICH WAS ORIGINALLY IN THE RIGHT FRONT CHANNEL.
   - YES → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16km/h (10 MPH) AND THEN KEYING DOWN.

7-2-93
NS 16182

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DTC 54

REAR ABS CHANNEL IN RELEASE TOO LONG

Circuit Description:

This DTC will diagnose an ABS motor that is energized longer than expected. This could occur if a wheel speed sensor is malfunctioning, the ABS motor does not turn, or the ABS motor wires are crossed.

DTC Will Set When: DTC 54 can be set only during an ABS stop. If the EBCM commands the rear axle channel in release for three seconds, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Identifies a problem in a wheel speed sensor that may cause the system to be in release too long.
2. Checks for a wheel that may stick or bind because of a mechanical fault.
3. Checks to see if the ABS motor is capable of moving and applying the hydraulic piston for the rear wheels.
4. Ensures that the ABS motor wiring is not crossed.
5. Isolates the fault of a "no-apply" situation to either the ABS motor pack or ABS hydraulic modulator assembly.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a mechanical part of the system that sticks or binds.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. Using the Tech 1, perform hydraulic test to ensure total brake system is functional.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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IMPORTANT: EXCESSIVE DRAG OR HIGH RESISTANCE IN THE BASE BRAKE OR SUSPENSION SYSTEM MUST BE INSPECTED AND CORRECTED BEFORE PROCEEDING WITH DTC DIAGNOSIS.

DTC 54
REAR ABS CHANNEL IN RELEASE TOO LONG

ARE ANY WHEEL SPEED DTCs CURRENTLY SET?

- **YES** → PROCEED TO THAT DTC CHART FIRST.
- **NO**

1. • USING TECH 1, SELECT "F0: DATA LIST" AND TEST VEHICLE DURING A STEADY DECEL CONDITION FROM 35 MPH TO 0 MPH WHILE MONITORING ALL WHEEL SPEEDS ON TECH 1 DATA LIST.
   DO ANY OF THE WHEEL SPEEDS INDICATE ERRATIC OR INTERMITTENT OPERATION?
   - **YES** → PROCEED TO WHEEL SPEED = 0 DTC FOR AFFECTED WHEEL.
   - **NO**

2. • RAISE REAR OF VEHICLE AND SUPPORT AS INDICATED IN SECTION 0A.
   • SPIN BOTH REAR WHEELS AND CONFIRM PHYSICAL CONDITION OF BASE BRAKE SYSTEM.
   COULD BOTH REAR WHEELS BE SPUN FREELY BY HAND?
   - **NO** → REPAIR SOURCE OF RESISTANCE IN BASE BRAKE SYSTEM.
   - **YES**

3. • IGNITION "ON," ENGINE "OFF."
   • USING MANUAL CONTROL FUNCTION OF TECH 1, SELECT REAR AXLE ABS MOTOR APPLY.
   • APPLY FIRM PRESSURE ON BRAKE PEDAL.
   • COMMAND APPLY OF REAR ABS MOTOR AND TRY TO SPIN REAR WHEELS BY HAND.
   COULD REAR WHEELS BE SPUN BY HAND?
   - **NO** → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - **YES**

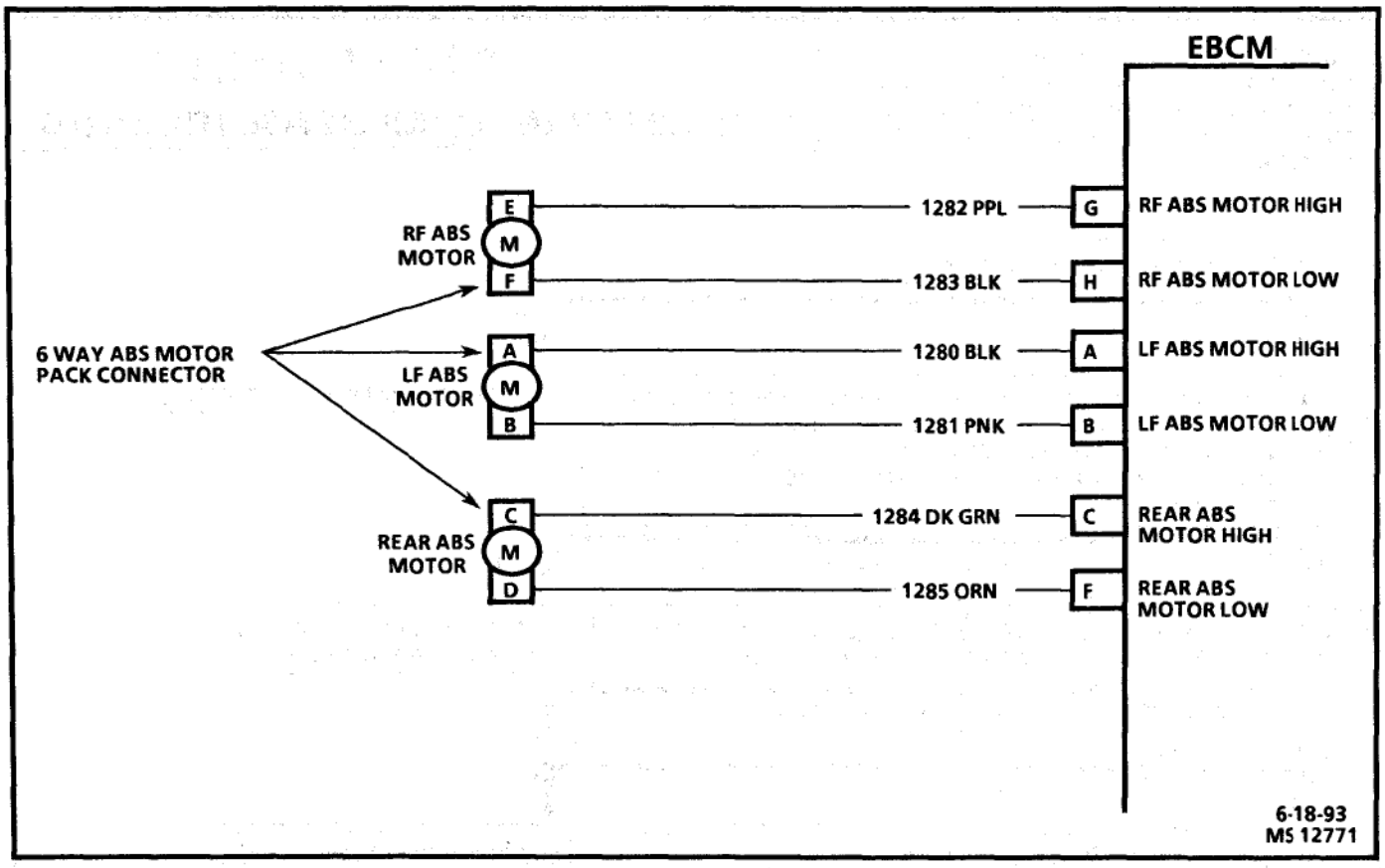
4. • WITH FIRM PRESSURE ON BRAKE PEDAL STILL APPLIED, COMMAND A RELEASE OF THE REAR AXLE ABS MOTOR.
   CAN WHEELS BE MOVED?
   - **NO** → REPAIR CROSSED WIRES AT REAR ABS MOTOR CIRCUIT.
   - **YES**

5. • USING TECH 1, PERFORM GEAR TENSION RELIEF FUNCTION.
   • IGNITION "OFF."
   • REMOVE HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY FROM VEHICLE.
   • SEPARATE ABS MOTOR PACK FROM HYDRAULIC MODULATOR.
   • CONNECT ABS MOTOR PACK WIRING.
   • IGNITION "ON."
   • USING TECH 1, PERFORM MOTOR TEST.
   DO ALL THREE ABS MOTOR PACK GEARS (SMALL GEARS) SPIN FREELY?
   - **YES** → REPLACE ABS HYDRAULIC MODULATOR.
   - **NO** → REPLACE ABS MOTOR PACK.

AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN.

7-7-93
NS 16183

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DTC 55

EBCM MALFUNCTION

Circuit Description:

This DTC identifies a malfunction detected by the MDI custom IC. It also ensures the cause of the malfunction is not a result of a problem with the ABS enable relay under a DTC 55 malfunction.

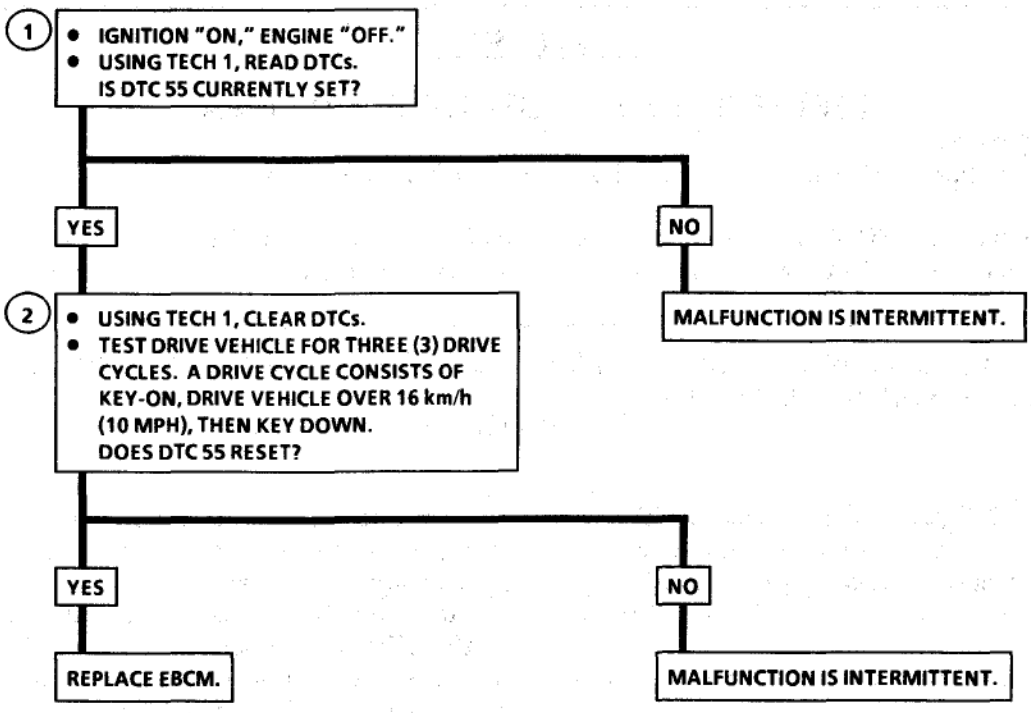
Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see if the malfunction is still present.
2. Checks to see if the malfunction is intermittent.

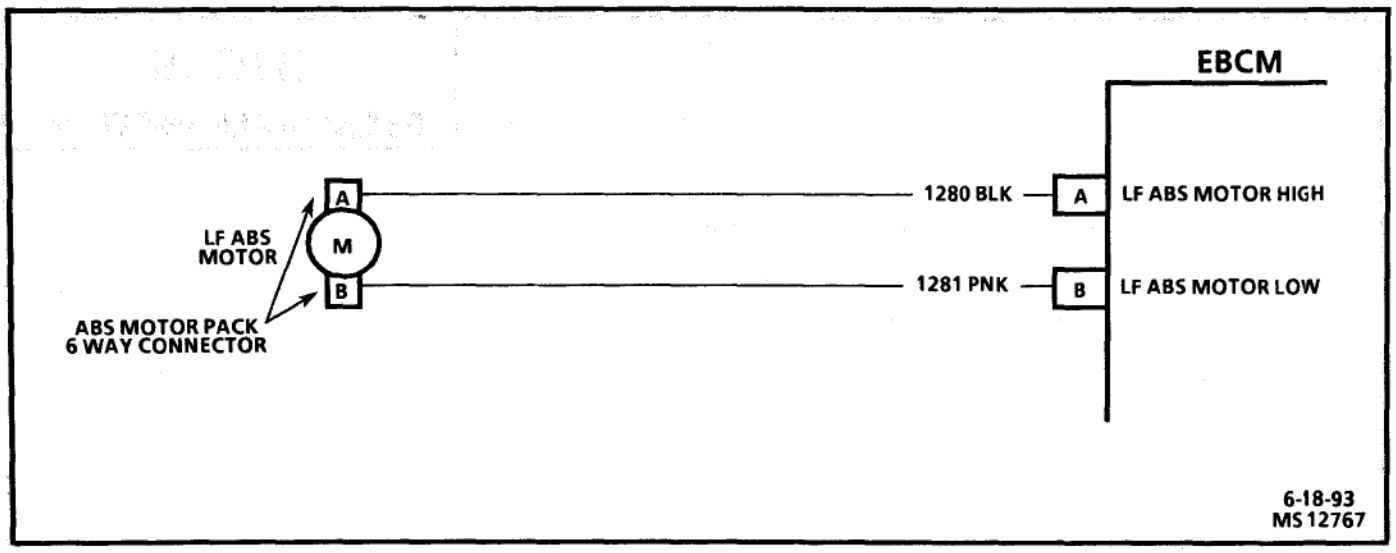
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DTC 55
EBCM MALFUNCTION



cardiagn.com

7-3-93
NS 15427



DTC 56

LEFT FRONT ABS MOTOR CIRCUIT OPEN

Circuit Description:
This DTC identifies an ABS motor that cannot be energized due to an open in its circuitry.

DTC Will Set When: DTC 56 can be set only when the ABS motor is commanded "OFF." If the EBCM detects an out of range voltage on either of the left front ABS motor circuits indicating an open circuit, a malfunction exists.

Action Taken: An open ABS motor will not activate when requested. A malfunction DTC is stored, "ABS is disabled and the ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for proper resistance of the ABS motor.
2. Checks for an open in the ABS motor "HIGH" circuitry.
3. Checks for an open in the ABS motor "LOW" circuitry.
4. Ensures malfunction was not due to poor terminal contact.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 56
LEFT FRONT ABS MOTOR CIRCUIT OPEN

DOES DTC 56 OCCUR INTERMITTENTLY?

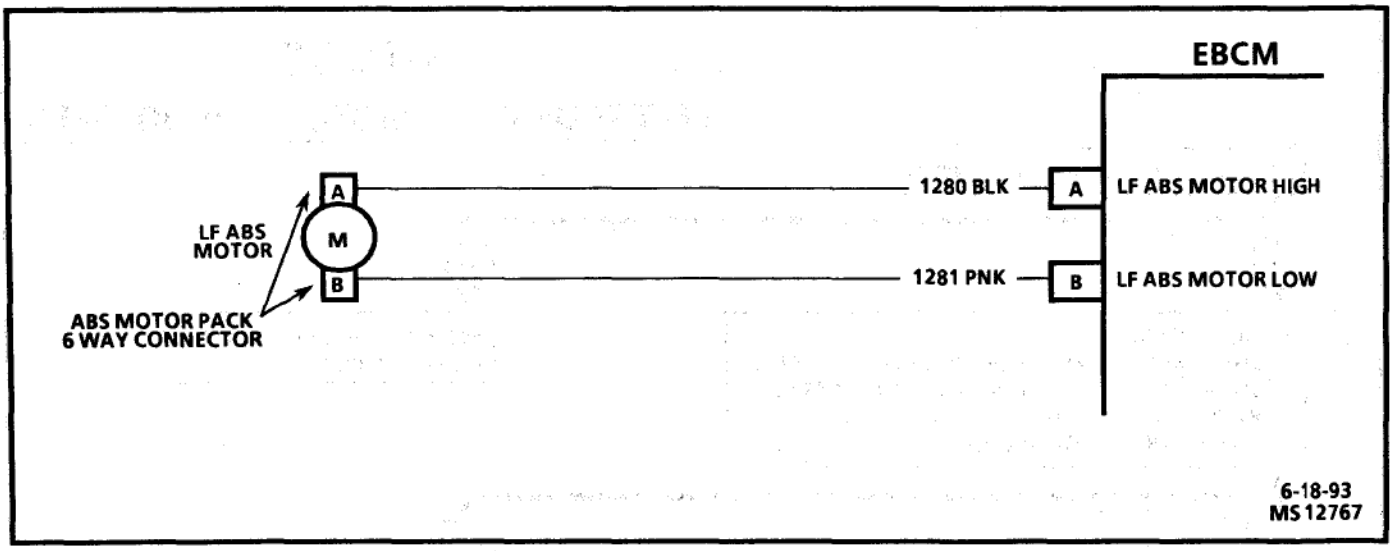
- YES → REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- NO

1. • IGNITION "OFF."
   • DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR.
   • USING J 39200, MEASURE RESISTANCE ACROSS ABS MOTOR PACK TERMINALS "A" AND "B".
   IS RESISTANCE BELOW 2000Ω?
   - NO → REPLACE ABS MOTOR PACK.
   - YES
2. • DISCONNECT 8-WAY CONNECTOR AT EBCM.
   • USING J 39200, MEASURE RESISTANCE BETWEEN TERMINAL "A" OF THE 8-WAY EBCM HARNESS CONNECTOR AND TERMINAL "A" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   IS RESISTANCE 2Ω OR LESS?
   - NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 1280.
   - YES
3. • USING J 39200, MEASURE RESISTANCE BETWEEN TERMINAL "B" OF THE 8-WAY EBCM HARNESS CONNECTOR AND TERMINAL "B" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   IS RESISTANCE 2Ω OR LESS?
   - NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 1281.
   - YES
4. • INSPECT THE 6-WAY ABS MOTOR PACK AND 8-WAY EBCM CONNECTORS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.
   • RECONNECT ALL CONNECTORS.
   • IGNITION "OFF."
   • START ENGINE AND TEST DRIVE VEHICLE, ACHIEVING AT LEAST 16 km/h (10 MPH).
   • REPEAT ABOVE DRIVE CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 56 SET IN THE LAST THREE DRIVE CYCLES?
   - NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN.

6-21-93
MS 12772

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DTC 57

LEFT FRONT ABS MOTOR CIRCUIT SHORTED TO GND

Circuit Description:

This DTC identifies an ABS motor circuit that is shorted to ground. This malfunction will not allow the ABS motor to be controlled at the commanded current rate or will cause the driver circuit to allow current directly to ground.

DTC Will Set When: DTC 57 can be set anytime. If the EBCM detects an out of range voltage on either of the left front ABS motor circuits indicating a circuit shorted to ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a short to ground in the ABS motor "HIGH" circuitry.
2. Checks for a short to ground in the ABS motor "LOW" circuitry.
3. Checks for an ABS motor that is internally shorted to ground.
4. Ensures malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 57

LEFT FRONT ABS MOTOR CIRCUIT SHORTED TO GND

DOES DTC 57 OCCUR INTERMITTENTLY?

- YES → REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- NO →

(1)
- IGNITION "OFF."
- DISCONNECT THE 6-WAY ABS MOTOR PACK CONNECTOR AND THE 8-WAY EBCM CONNECTOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

- NO → REPAIR SHORT TO GROUND IN CKT 1280.
- YES →

(2)
- MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "B" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

- NO → REPAIR SHORT TO GROUND IN CKT 1281.
- YES →

(3)
- MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "A" OF THE ABS MOTOR PACK.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

- NO → REPLACE ABS MOTOR PACK.
- YES →

(4)
- INSPECT CKTs 1280 AND 1281 AND RELATED CONNECTORS FOR DAMAGE WHICH MAY RESULT IN A SHORT TO GROUND WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
- RECONNECT ALL CONNECTORS.
- IGNITION "OFF."
- START ENGINE AND TEST DRIVE VEHICLE, ACHIEVING AT LEAST 16 km/h (10 MPH).
- REPEAT ABOVE DRIVE CYCLE SEQUENCE TWO MORE TIMES.

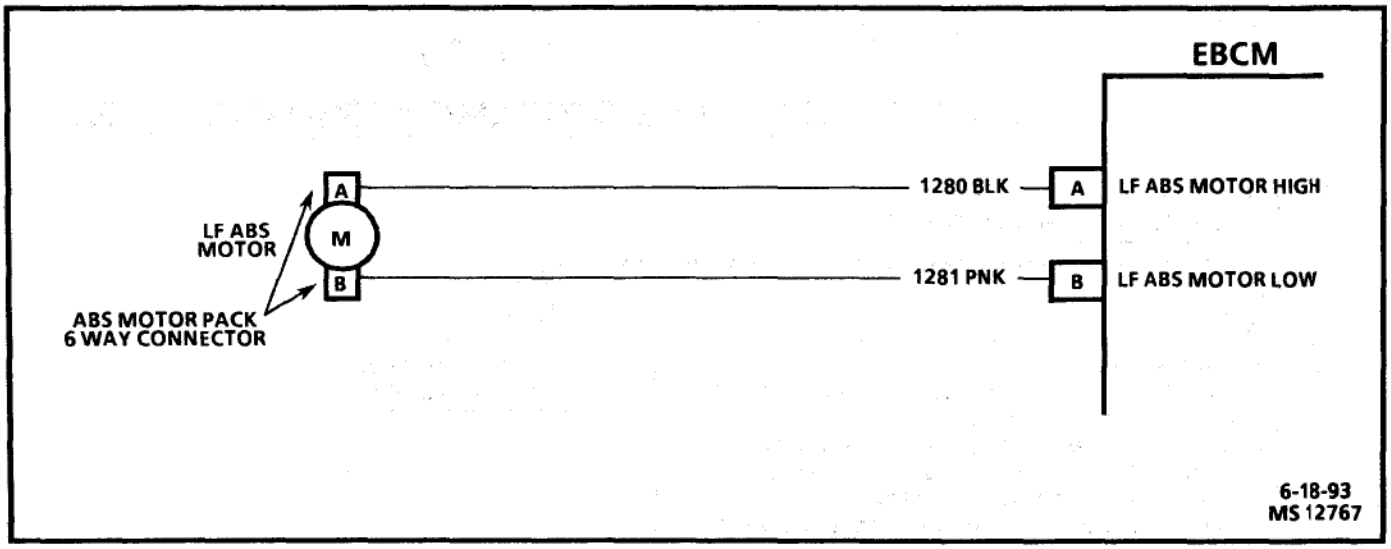
DID DTC 57 SET IN THE LAST THREE DRIVE CYCLES?

- NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- YES → REPLACE EBCM.

AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-17-93
MS 12773

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DTC 58

LEFT FRONT ABS MOTOR CIRCUIT SHORTED TO BATT

Circuit Description:

This DTC identifies an ABS motor circuit that is shorted to battery or an ABS motor that has low or no resistance. This malfunction will not allow the ABS motor to be controlled at the commanded current rate or will cause the ABS motor to turn in the opposite direction, or not at all.

DTC Will Set When: DTC 58 can be set only when the ABS motor is commanded "OFF." If the EBCM detects an out of range voltage on either of the left front ABS motor circuits indicating a circuit shorted to battery or an ABS motor shorted, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a short to voltage in the ABS motor "HIGH" circuitry.
2. Checks for a short to voltage in the ABS motor "LOW" circuitry.
3. Checks for a short between the "HIGH" and "LOW" motor circuits.
4. Checks for an ABS motor that is internally shorted.
5. Ensures malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise ABS motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the ABS motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 58
LEFT FRONT ABS MOTOR CIRCUIT SHORTED TO BATT

NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

DOES DTC 58 OCCUR INTERMITTENTLY?

- NO
- YES → REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

1. • IGNITION "OFF."
   • DISCONNECT THE 6-WAY ABS MOTOR PACK CONNECTOR AND THE 8-WAY EBCM CONNECTOR.
   • IGNITION "ON."
   • USING J 39200 , MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   IS VOLTAGE 1 VOLT OR LESS?
   - YES
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 1280.

2. • MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   IS VOLTAGE 1 VOLT OR LESS?
   - YES
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 1281.

3. • IGNITION "OFF."
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - YES
   - NO → REPAIR SHORT BETWEEN CKTs 1280 AND 1281.

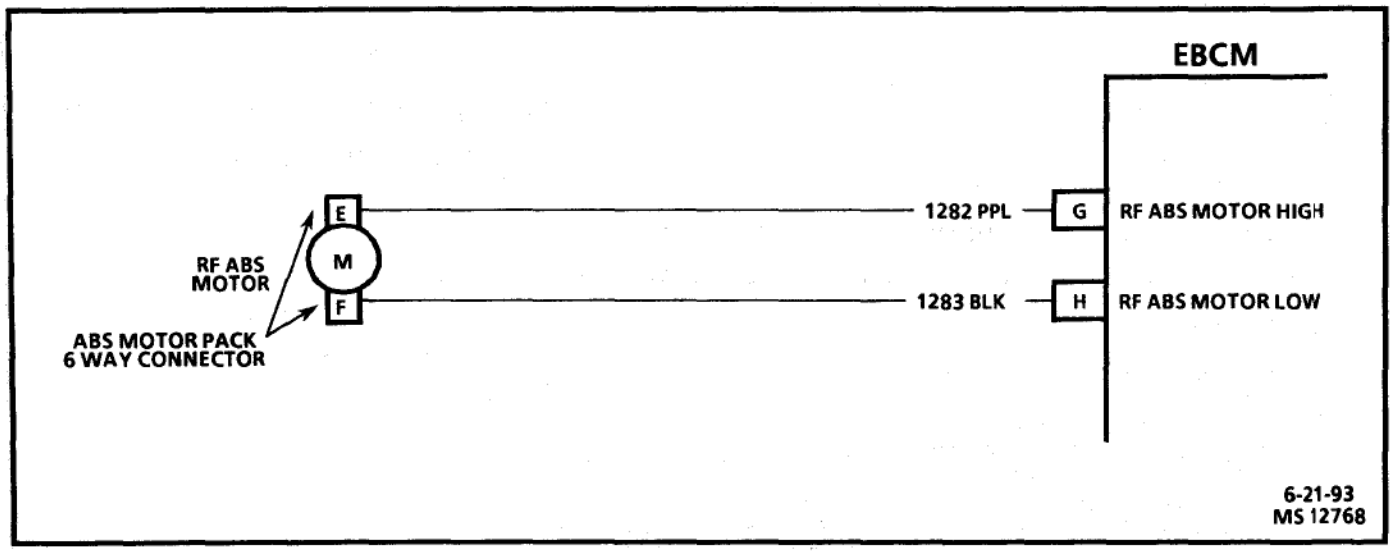
4. • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE ABS MOTOR PACK.
   IS RESISTANCE GREATER THAN 0.4Ω?
   - YES
   - NO → REPLACE ABS MOTOR PACK.

5. • INSPECT CKTs 1280 AND 1281 AND RELATED CONNECTORS FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • IGNITION "OFF."
   • START ENGINE AND TEST DRIVE VEHICLE, ACHIEVING AT LEAST 16 km/h (10 MPH).
   • REPEAT ABOVE DRIVE CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 58 SET IN THE LAST THREE DRIVE CYCLES?
   - YES → REPLACE EBCM.
   - NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN.

6-17-93
MS 12774

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DTC 61

RIGHT FRONT ABS MOTOR CIRCUIT OPEN

Circuit Description:

This DTC identifies an ABS motor that cannot be energized due to an open in its circuitry. This malfunction will not allow proper front ABS operation.

DTC Will Set When: DTC 61 can be set only when the ABS motor is commanded "OFF." If the EBCM detects an out of range voltage on either of the right front ABS motor circuits indicating an open circuit, a malfunction exists.

Action Taken: An open motor will not activate when requested. A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for proper resistance of the ABS motor.
2. Checks for an open in the ABS motor "HIGH" circuitry.
3. Checks for an open in the ABS motor "LOW" circuitry.
4. Ensures malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise ABS motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the ABS motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

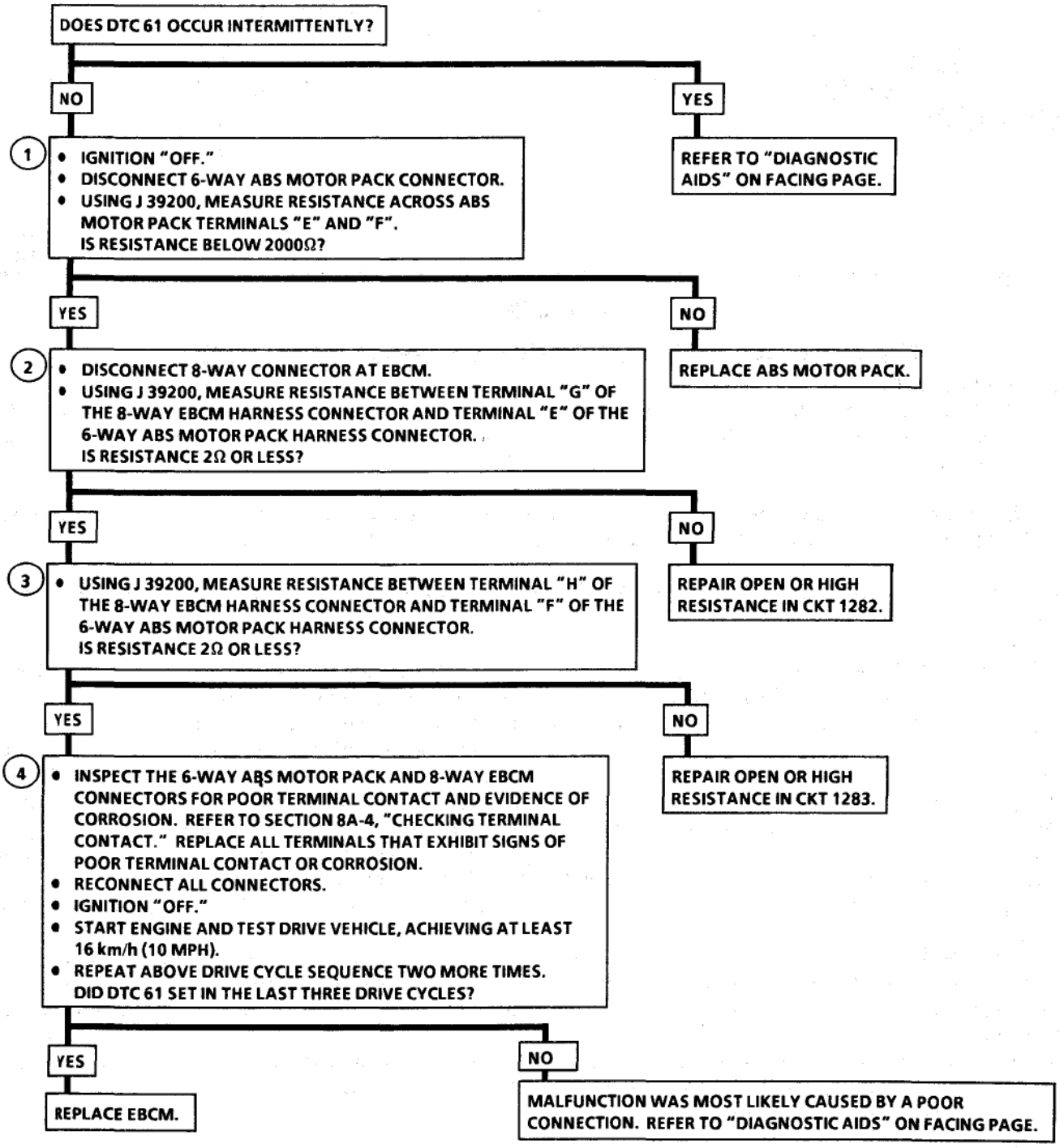
If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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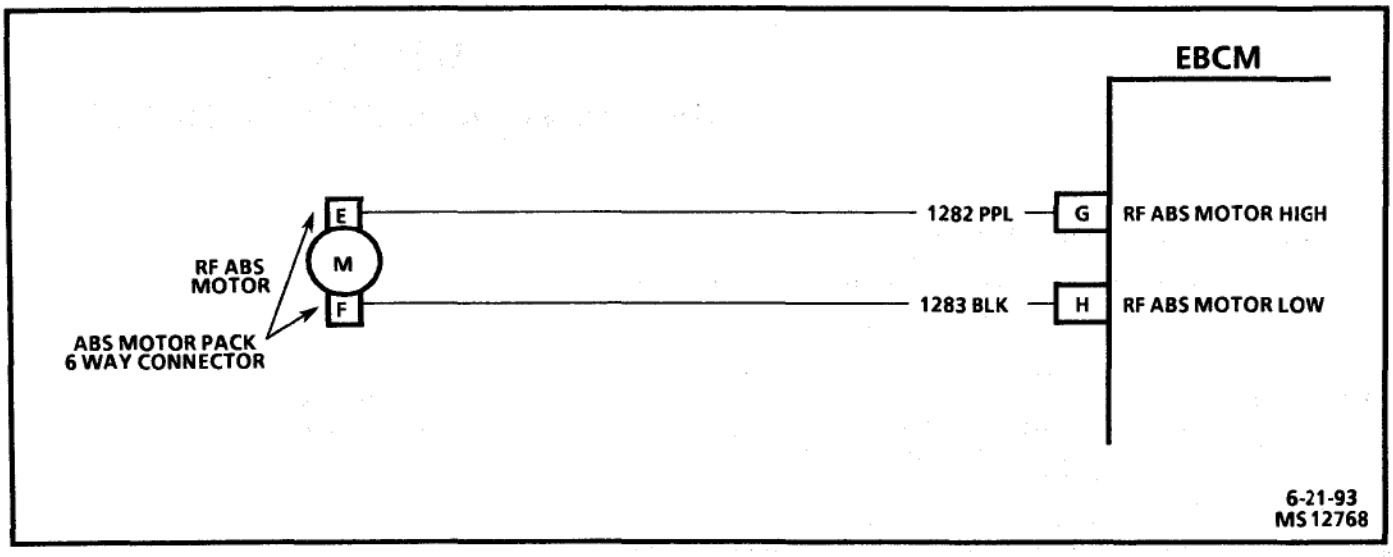
DTC 61
RIGHT FRONT ABS MOTOR CIRCUIT OPEN



AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-27-93
MS 12775

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DTC 62

RIGHT FRONT ABS MOTOR CIRCUIT SHORTED TO GND

Circuit Description:

This DTC identifies an ABS motor circuit that is shorted to ground. This malfunction will not allow the ABS motor to be controlled at the commanded current rate or will cause the ABS motor driver circuit to allow current directly to ground.

DTC Will Set When: DTC 62 can be set anytime. If the EBCM detects an out of range voltage on either of the right front ABS motor circuits indicating a circuit shorted to ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a short to ground in the ABS motor "HIGH" circuitry.
2. Checks for a short to ground in the ABS motor "LOW" circuitry.
3. Checks for an ABS motor that is internally shorted to ground.
4. Ensures malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise ABS motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the ABS motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 62

RIGHT FRONT ABS MOTOR CIRCUIT SHORTED TO GND

DOES DTC 62 OCCUR INTERMITTENTLY?

- YES → REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- NO →

(1)
- IGNITION "OFF."
- DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR AND THE 8-WAY EBCM CONNECTOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "E" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

- NO → REPAIR SHORT TO GROUND IN CKT 1282.
- YES →

(2)
- MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "F" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

- NO → REPAIR SHORT TO GROUND IN CKT 1283.
- YES →

(3)
- MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "E" OF THE ABS MOTOR PACK.

DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?

- NO → REPLACE ABS MOTOR PACK.
- YES →

(4)
- INSPECT CKTs 1282 AND 1283 AND RELATED CONNECTORS FOR DAMAGE WHICH MAY RESULT IN A SHORT TO GROUND WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
- RECONNECT ALL CONNECTORS.
- IGNITION "OFF."
- START ENGINE AND TEST DRIVE VEHICLE, ACHIEVING AT LEAST 16 km/h (10 MPH).
- REPEAT ABOVE DRIVE CYCLE SEQUENCE TWO MORE TIMES.

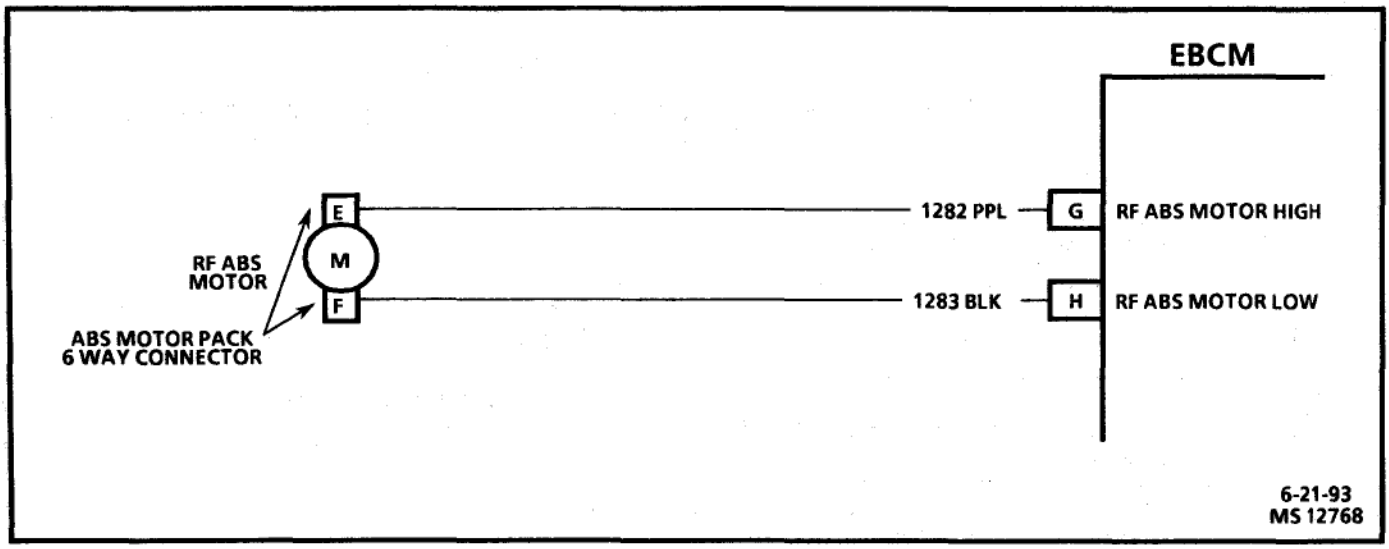
DID DTC 62 SET IN THE LAST THREE DRIVE CYCLES?

- NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- YES → REPLACE EBCM.

AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-17-93
MS 12776

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DTC 63

RIGHT FRONT ABS MOTOR CIRCUIT SHORTED TO BATT

Circuit Description:

This DTC identifies an ABS motor circuit that is shorted to battery or an ABS motor that has low or no resistance. This malfunction will not allow the ABS motor to be controlled at the commanded current rate or will cause the ABS motor to turn in the opposite direction or not at all.

DTC Will Set When: DTC 63 can be set only when the ABS motor is commanded "OFF." If the EBCM detects an out of range voltage on either of the right front ABS motor circuits indicating a circuit shorted to battery or an ABS motor shorted, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a short to voltage in the ABS motor "HIGH" circuitry.
2. Checks for a short to voltage in the ABS motor "LOW" circuitry.
3. Checks for short circuit between ABS motor "HIGH" and motor "LOW".
4. Checks for proper resistance of the ABS motor.
5. Ensures malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

DTC 63

RIGHT FRONT MOTOR CIRCUIT SHORTED TO BATT

DOES DTC 63 OCCUR INTERMITTENTLY?

- NO
- YES → REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

1. • IGNITION "OFF."
   • DISCONNECT THE 6-WAY ABS MOTOR PACK CONNECTOR AND THE 8-WAY EBCM CONNECTOR.
   • IGNITION "ON."
   • USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "E" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   IS VOLTAGE 1 VOLT OR LESS?
   - YES
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 1282.

2. • MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "F" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   IS VOLTAGE 1 VOLT OR LESS?
   - YES
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 1283.

3. • IGNITION "OFF."
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "E" AND TERMINAL "F" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - YES
   - NO → REPAIR SHORT BETWEEN CKTs 1282 AND 1283.

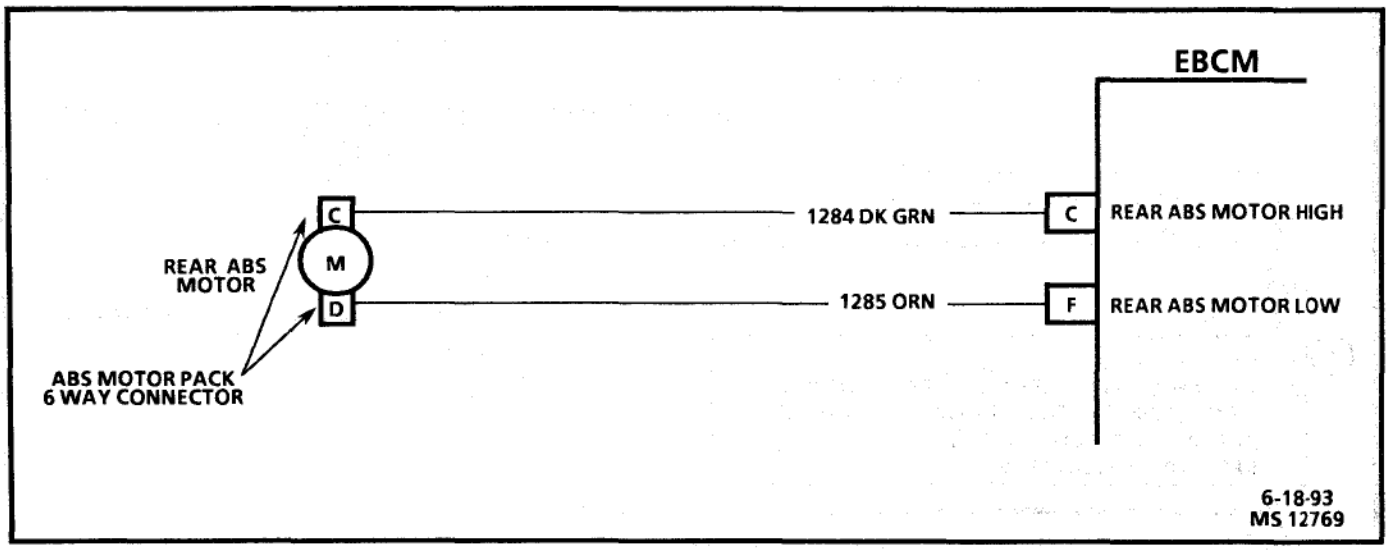
4. • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "E" AND TERMINAL "F" OF THE ABS MOTOR PACK.
   IS RESISTANCE GREATER THAN 0.4Ω?
   - YES
   - NO → REPLACE ABS MOTOR PACK.

5. • INSPECT CKTs 1282 AND 1283 AND RELATED CONNECTORS FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • IGNITION "OFF."
   • START ENGINE AND TEST DRIVE VEHICLE, ACHIEVING AT LEAST 16 km/h (10 MPH).
   • REPEAT ABOVE DRIVE CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 63 SET IN THE LAST THREE DRIVE CYCLES?
   - YES → REPLACE EBCM.
   - NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN. MS 12777

6-24-93

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DTC 64

REAR ABS MOTOR CIRCUIT OPEN

Circuit Description:

This DTC identifies an ABS motor that cannot be energized due to an open in its circuitry. This malfunction will not allow proper rear ABS operation.

DTC Will Set When: DTC 64 can be set only when the ABS motor is commanded "OFF." If the EBCM detects an out of range voltage on either of the rear axle ABS motor circuits indicating an open circuit, a malfunction exists.

Action Taken: An open motor will not activate when requested. A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. This checks for proper resistance of the ABS motor.
2. Checks for an open in the ABS motor "HIGH" circuitry.
3. Checks for an open in the ABS motor "LOW" circuitry.
4. Ensures malfunction was not due to poor terminal contact.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 64
REAR ABS MOTOR CIRCUIT OPEN

DOES DTC 64 OCCUR INTERMITTENTLY?

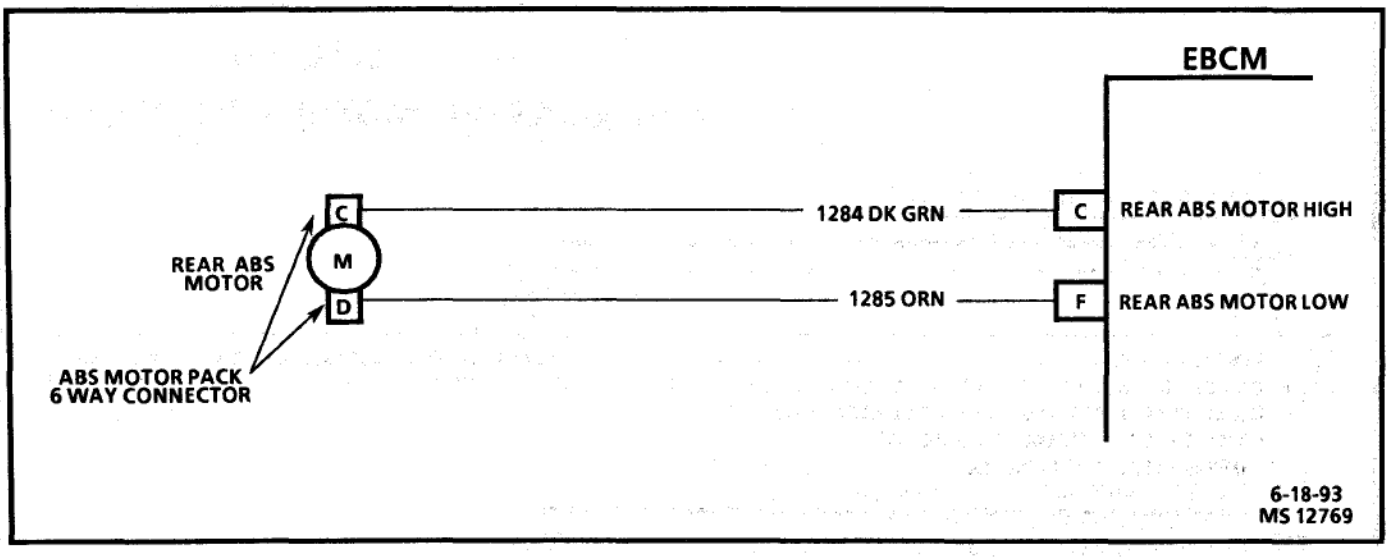
- YES → REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- NO →

1. • IGNITION "OFF."
   • DISCONNECT 6-WAY ABS MOTOR PACK CONNECTOR.
   • USING J 39200, MEASURE RESISTANCE ACROSS ABS MOTOR PACK TERMINALS "C" AND "D".
   IS RESISTANCE BELOW 2000Ω?
   - NO → REPLACE ABS MOTOR PACK.
   - YES →
2. • DISCONNECT 8-WAY CONNECTOR AT EBCM.
   • USING J 39200, MEASURE RESISTANCE BETWEEN TERMINAL "C" OF THE 8-WAY EBCM HARNESS CONNECTOR AND TERMINAL "C" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   IS RESISTANCE 2Ω OR LESS?
   - NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 1284.
   - YES →
3. • USING J 39200, MEASURE RESISTANCE BETWEEN TERMINAL "F" OF THE 8-WAY EBCM HARNESS CONNECTOR AND TERMINAL "D" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR.
   IS RESISTANCE 2Ω OR LESS?
   - NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 1285.
   - YES →
4. • INSPECT THE 6-WAY ABS MOTOR PACK AND 8-WAY EBCM CONNECTORS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.
   • RECONNECT ALL CONNECTORS.
   • IGNITION "OFF."
   • START ENGINE AND TEST DRIVE VEHICLE, ACHIEVING AT LEAST 16 km/h (10 MPH).
   • REPEAT ABOVE DRIVE CYCLE SEQUENCE TWO MORE TIMES.
   DID DTC 64 SET IN THE LAST THREE DRIVE CYCLES?
   - NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-24-93
MS 12778

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DTC 65

REAR ABS MOTOR CIRCUIT SHORTED TO GROUND

Circuit Description:

This DTC identifies an ABS motor circuit that is shorted to ground. This malfunction will not allow the ABS motor to be controlled at the commanded current rate or will cause the driver circuit to allow current directly to ground.

DTC Will Set When: DTC 65 can be set anytime. If the EBCM detects an out of range voltage on either of the rear axle ABS motor circuits indicating a circuit shorted to ground, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a short to ground in the ABS motor "HIGH" circuitry.
2. Checks for a short to ground in the ABS motor "LOW" circuitry.
3. Checks for an ABS motor that is internally shorted to ground.
4. Ensures malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise ABS motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the ABS motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

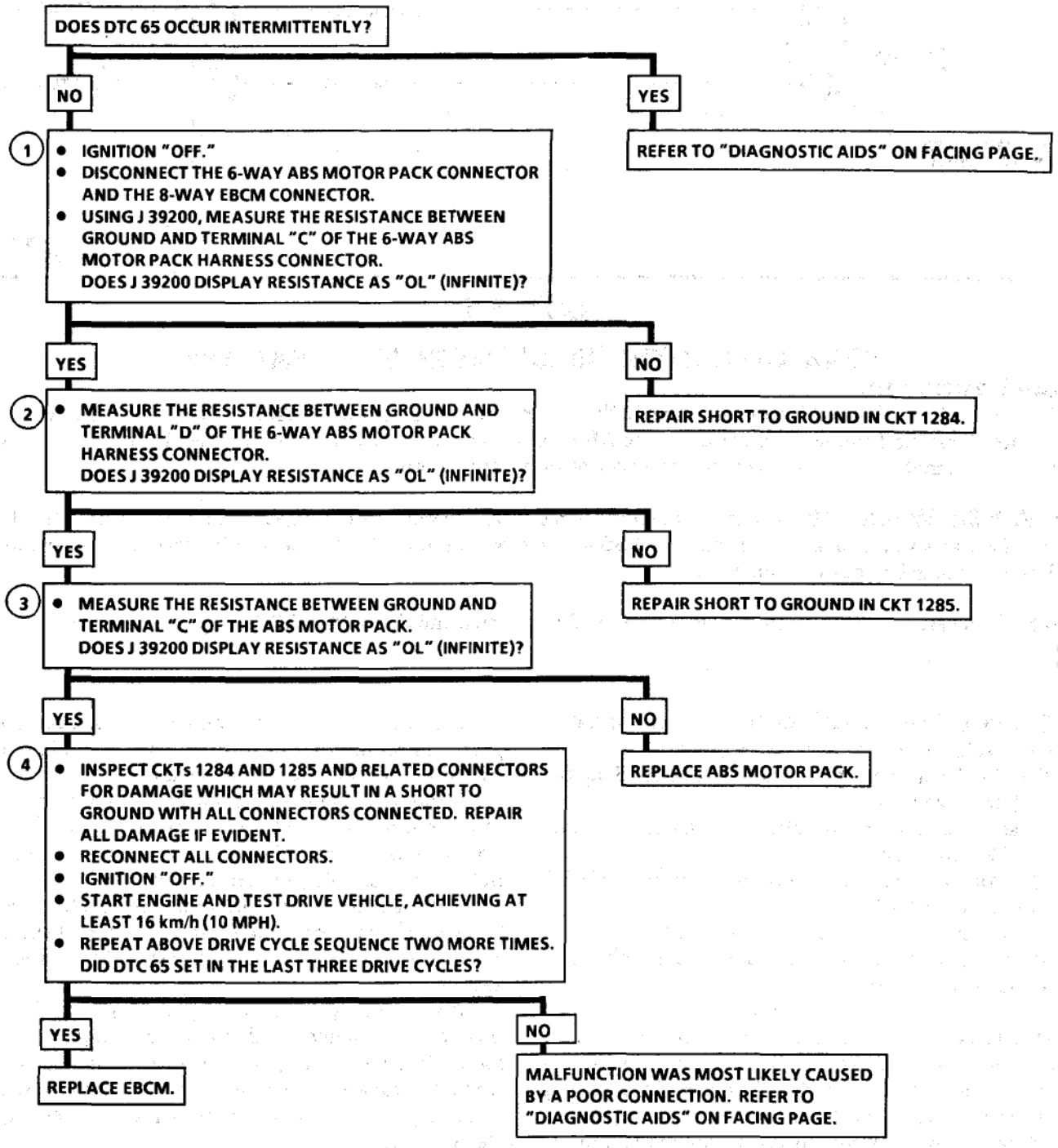
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 65

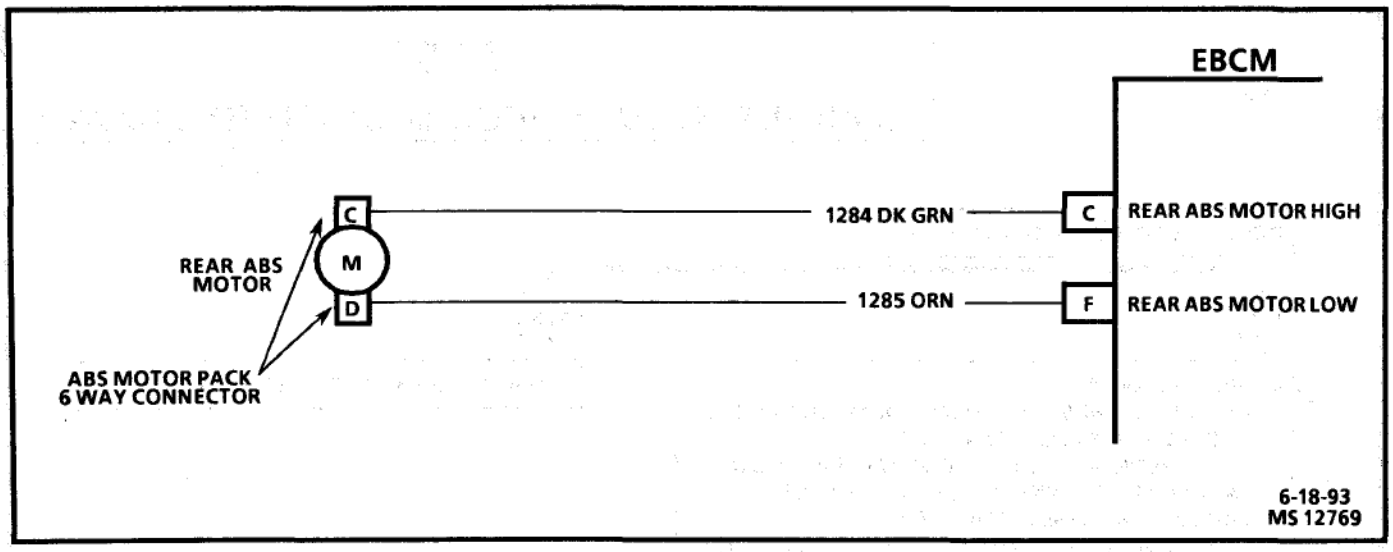
REAR ABS MOTOR CIRCUIT SHORTED TO GROUND



AFTER ALL DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 km/h (10 MPH), AND THEN KEYING DOWN.

6-17-93
MS 12779

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DTC 66

REAR ABS MOTOR CIRCUIT SHORTED TO BATTERY

Circuit Description:

This DTC identifies an ABS motor circuit that is shorted to battery or an ABS motor that has low or zero resistance. This malfunction will not allow the ABS motor to be controlled at the commanded current rate or will cause the ABS motor to turn in the opposite direction or not turn at all.

DTC Will Set When: DTC 66 can be set only when the ABS motor is commanded "OFF." If the EBCM detects an out of range voltage on either of the rear ABS axle motor circuits indicating a circuit shorted to battery or an ABS motor shorted, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a short to voltage in the ABS motor "HIGH" circuitry.
2. Checks for a short to voltage in the ABS motor "LOW" circuitry.
3. Checks for a short circuit between motor "HIGH" and motor "LOW".
4. Checks for proper resistance of the ABS motor.
5. Ensures malfunction was not due to physical damage of the circuitry.

Diagnostic Aids: Using Tech 1, select manual control function, and exercise ABS motor movement of affected channel in both directions while applying light pressure on the brake pedal.

If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the ABS motor, an intermittent malfunction may be indicated.

An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 65
REAR ABS MOTOR CIRCUIT SHORTED TO BATTERY

NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.

DOES DTC 66 OCCUR INTERMITTENTLY?

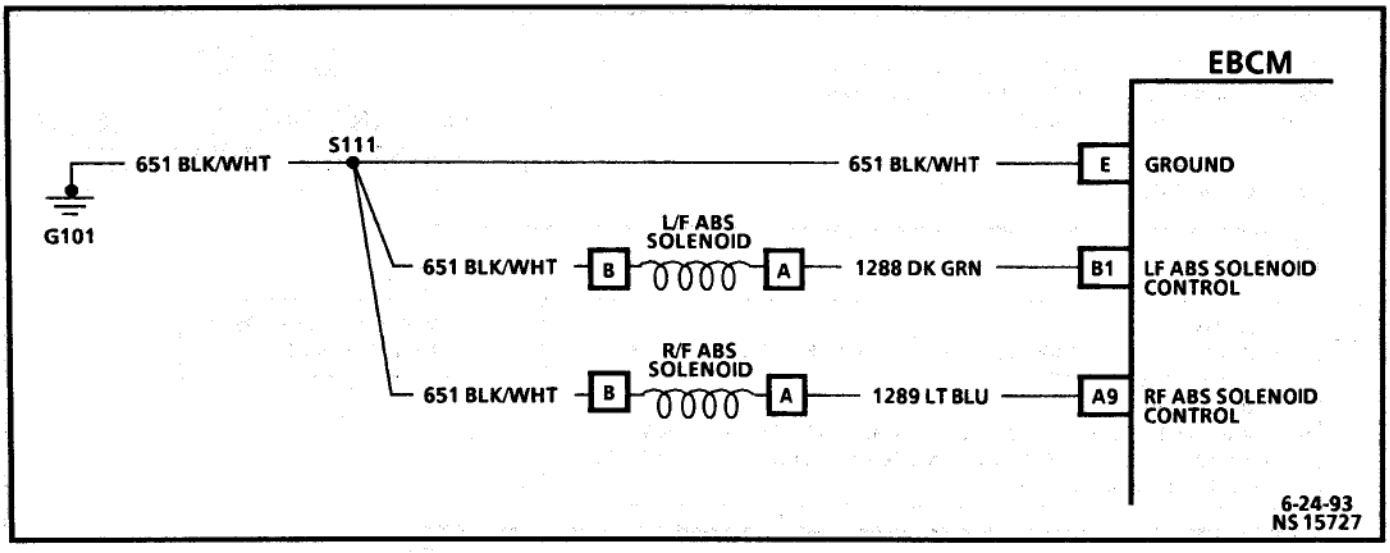
- YES → REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- NO →

1. • IGNITION "OFF."
   • DISCONNECT THE 6-WAY ABS MOTOR PACK CONNECTOR AND THE 8-WAY EBCM CONNECTOR.
   • IGNITION "ON."
   • USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "C" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR. IS VOLTAGE 1 VOLT OR LESS?
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 1284.
   - YES →
2. • MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "D" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR. IS VOLTAGE 1 VOLT OR LESS?
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 1285.
   - YES →
3. • IGNITION "OFF."
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "C" AND TERMINAL "D" OF THE 6-WAY ABS MOTOR PACK HARNESS CONNECTOR. DOES J 39200 DISPLAY RESISTANCE AS "OL" (INFINITE)?
   - NO → REPAIR SHORT BETWEEN CKTs 1284 AND 1285.
   - YES →
4. • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "C" AND TERMINAL "D" OF THE ABS MOTOR PACK. IS RESISTANCE GREATER THAN 0.4Ω?
   - NO → REPLACE ABS MOTOR PACK
   - YES →
5. • INSPECT CKTs 1284 AND 1285 AND RELATED CONNECTORS FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WITH ALL CONNECTORS CONNECTED. REPAIR ALL DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • IGNITION "OFF."
   • START ENGINE AND TEST DRIVE VEHICLE, ACHIEVING AT LEAST 16 km/h (10 MPH).
   • REPEAT ABOVE DRIVE CYCLE SEQUENCE TWO MORE TIMES. DID DTC 66 SET IN THE LAST THREE DRIVE CYCLES?
   - NO → MALFUNCTION WAS MOST LIKELY CAUSED BY A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
   - YES → REPLACE EBCM.

AFTER DIAGNOSIS IS COMPLETE, CLEAR DTCs AND TEST DRIVE VEHICLE FOR THREE (3) DRIVE CYCLES TO VERIFY THAT DTC DOES NOT RESET. A DRIVE CYCLE CONSISTS OF STARTING THE VEHICLE, DRIVING OVER 16 KM/H (10 MPH), AND THEN KEYING DOWN.

6-17-93
MS 12780

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DTC 76

LEFT FRONT SOL CIRCUIT OPEN OR SHORTED TO BATT

Circuit Description:

This DTC identifies a solenoid that cannot be energized due to an open in its circuitry, or a solenoid that is always energized due to a short to battery in its circuitry between the driver and the solenoid. An open will not allow proper ABS operation, but the short to battery simply turns "ON" the solenoid. A path for base brakes is still allowed once the motor re-homes and the check ball is lifted off its seat during key "ON" initialization.

DTC Will Set When: DTC 76 can be set only when the solenoid is commanded "OFF." If the EBCM detects an excessive voltage in the left front solenoid control circuit, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a short to voltage in the control circuitry of the solenoid.
2. Checks for an open in the control circuit of the solenoid.
3. Checks the solenoid coil for proper resistance.
4. Checks for an open in the solenoid ground circuit.
5. Checks for a possible intermittent malfunction in the solenoid circuitry due to poor terminal contact.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 76

LEFT FRONT SOL CIRCUIT OPEN OR SHORTED TO BATT

1. • IGNITION "OFF."
   • DISCONNECT 32-WAY EBCM CONNECTOR.
   • IGNITION "ON," ENGINE "OFF."
   • USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B1" OF THE 32-WAY EBCM HARNESS CONNECTOR.
   IS VOLTAGE 1 VOLT OR LESS?
   - YES
   - NO → REPAIR SHORT TO VOLTAGE IN CKT 1288.

2. • IGNITION "OFF."
   • DISCONNECT LEFT FRONT SOLENOID CONNECTOR.
   • USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "B1" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "A" OF THE LEFT FRONT SOLENOID HARNESS CONNECTOR.
   IS RESISTANCE 2Ω OR LESS?
   - YES
   - NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 1288.

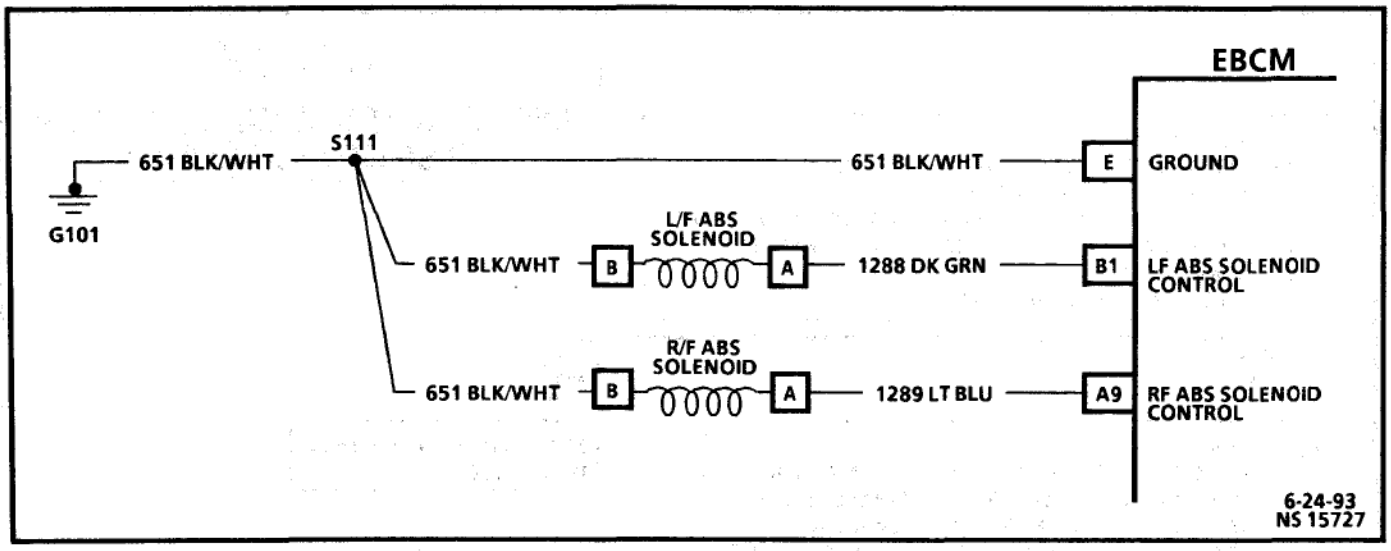
3. • MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE LEFT FRONT SOLENOID.
   IS RESISTANCE BETWEEN 2.5 AND 5Ω?
   - YES
   - NO → REPLACE LEFT FRONT SOLENOID.

4. • MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "B" OF THE LEFT FRONT SOLENOID HARNESS CONNECTOR.
   IS RESISTANCE 2Ω OR LESS?
   - YES
   - NO → REPAIR OPEN OR HIGH RESISTANCE IN CKT 651.

5. • INSPECT LEFT FRONT SOLENOID AND 32-WAY EBCM HARNESS CONNECTORS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.
   • INSPECT CKT 1288 FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WITH ALL CONNECTORS CONNECTED. REPAIR DAMAGE IF EVIDENT.
   • RECONNECT ALL CONNECTORS.
   • IGNITION "ON."
   DOES DTC 76 SET AS A CURRENT DTC?
   - YES → REPLACE EBCM.
   - NO → MALFUNCTION IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

7-7-93
NS 15717

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DTC 77

LEFT FRONT SOLENOID CIRCUIT SHORTED TO GND

Circuit Description:

This DTC identifies a solenoid that cannot be energized due to an open in its driver circuitry, or a short to ground between the solenoid driver and the solenoid. These malfunctions can affect ABS operation since the flow of brake fluid to the wheel cylinder cannot be stopped, making ABS operation for that channel impossible.

DTC Will Set When: DTC 77 can be set only when the solenoid is commanded "ON." If the EBCM detects the left front solenoid control circuit voltage is out of specification, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a solenoid that is internally shorted to ground.
2. Checks for a solenoid that is not within proper resistance values.
3. Indicates if a short to ground exists in the solenoid circuitry.
4. Checks for a possible intermittent malfunction in the solenoid circuitry due to poor terminal contact.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

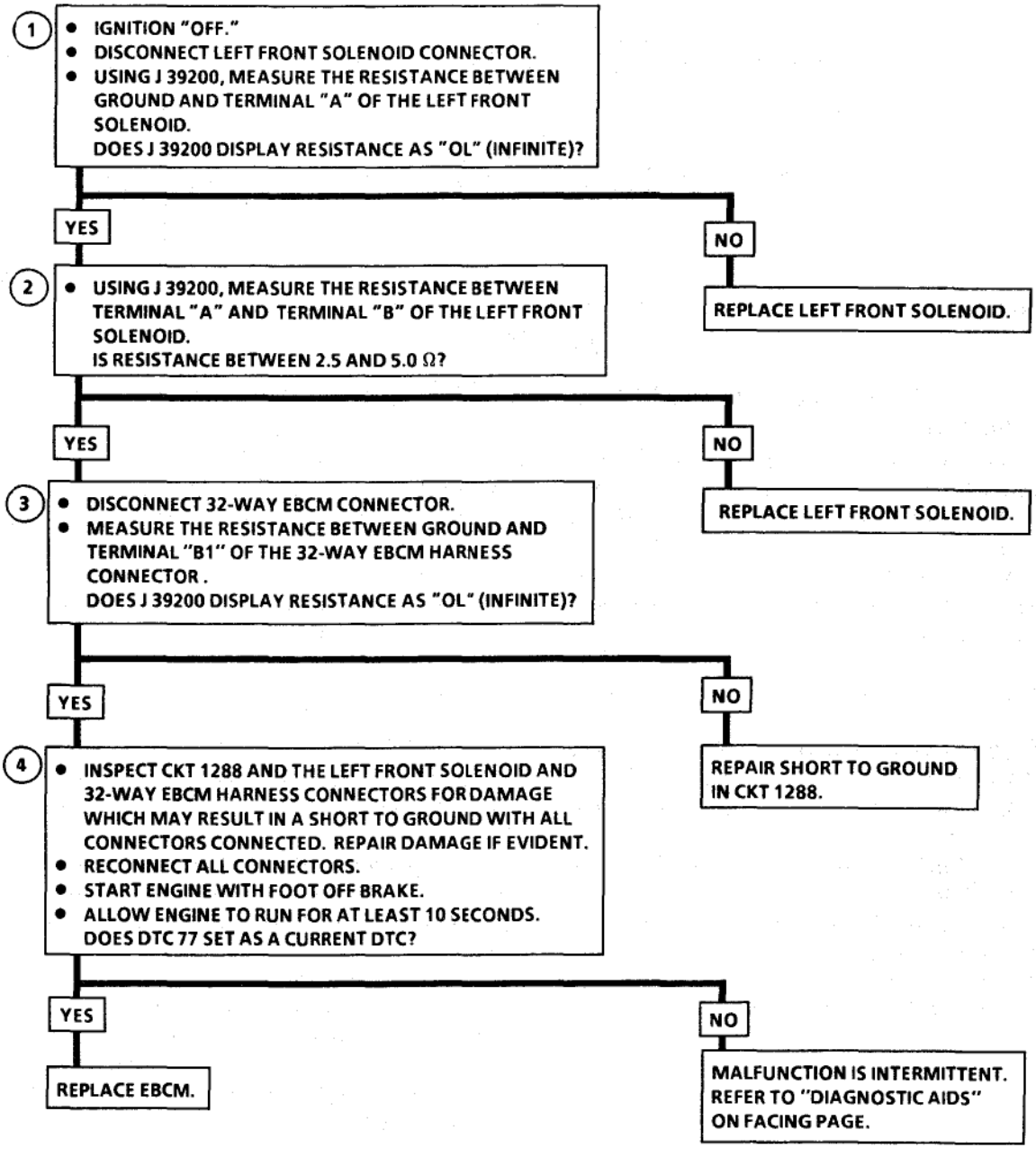
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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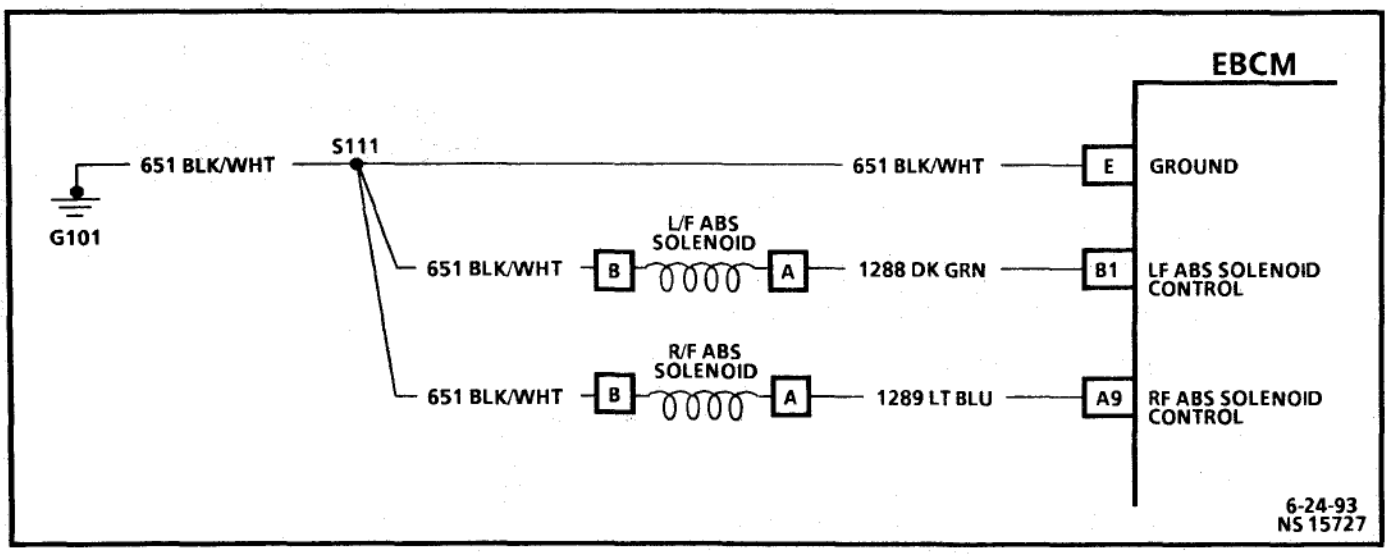
DTC 77

LEFT FRONT SOLENOID CIRCUIT SHORTED TO GND



7-9-93
NS 15718

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DTC 78

RIGHT FRONT SOL CIRCUIT OPEN OR SHORTED TO BATT

Circuit Description:

This DTC identifies a solenoid that cannot be energized due to an open in its circuitry, or a solenoid that is always energized due to a short to battery in its circuitry between the driver and the solenoid. An open will not allow proper ABS operation, but the short to battery simply turns "ON" the solenoid. A path for base brakes is still allowed once the motor re-homes and the check ball is lifted off its seat during key "ON" initialization.

DTC Will Set When: DTC 78 can be set only when the solenoid is commanded "OFF." If the EBCM detects an excessive voltage in the right front solenoid control circuit, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a short to voltage in the control circuitry of the solenoid.
2. Checks for an open in the control circuit of the solenoid.
3. Checks the solenoid coil for proper resistance.
4. Checks for an open in the solenoid ground circuit.
5. Checks for a possible intermittent malfunction in the solenoid circuitry due to poor terminal contact.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 78

RIGHT FRONT SOL CIRCUIT OPEN OR SHORTED TO BATT

1
- IGNITION "OFF."
- DISCONNECT 32-WAY EBCM CONNECTOR.
- IGNITION "ON," ENGINE "OFF."
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "A9" OF THE 32-WAY EBCM HARNESS CONNECTOR.

IS VOLTAGE 1 VOLT OR LESS?

YES

2
- IGNITION "OFF."
- DISCONNECT RIGHT FRONT SOLENOID CONNECTOR.
- USING J 39200, MEASURE THE RESISTANCE BETWEEN TERMINAL "A9" OF THE 32-WAY EBCM HARNESS CONNECTOR AND TERMINAL "A" OF THE RIGHT FRONT SOLENOID HARNESS CONNECTOR.

IS RESISTANCE 2Ω OR LESS?

YES

3
- MEASURE THE RESISTANCE BETWEEN TERMINAL "A" AND TERMINAL "B" OF THE RIGHT FRONT SOLENOID.

IS RESISTANCE BETWEEN 2.5 AND 5Ω?

YES

4
- MEASURE THE RESISTANCE BETWEEN GROUND AND TERMINAL "B" OF THE RIGHT FRONT SOLENOID HARNESS CONNECTOR.

IS RESISTANCE 2Ω OR LESS?

YES

5
- INSPECT RIGHT FRONT SOLENOID AND 32-WAY EBCM HARNESS CONNECTORS FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF POOR TERMINAL CONTACT OR CORROSION.
- INSPECT CKT 1289 FOR DAMAGE WHICH MAY RESULT IN A SHORT TO VOLTAGE WITH ALL CONNECTORS CONNECTED. REPAIR DAMAGE IF EVIDENT.
- RECONNECT ALL CONNECTORS.
- IGNITION "ON."

DOES DTC 78 SET AS A CURRENT DTC?

YES

REPLACE EBCM.

NO

MALFUNCTION IS MOST LIKELY DUE TO POOR TERMINAL CONTACT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

REPAIR SHORT TO VOLTAGE IN CKT 1289.

NO

REPAIR OPEN OR HIGH RESISTANCE IN CKT 1289.

NO

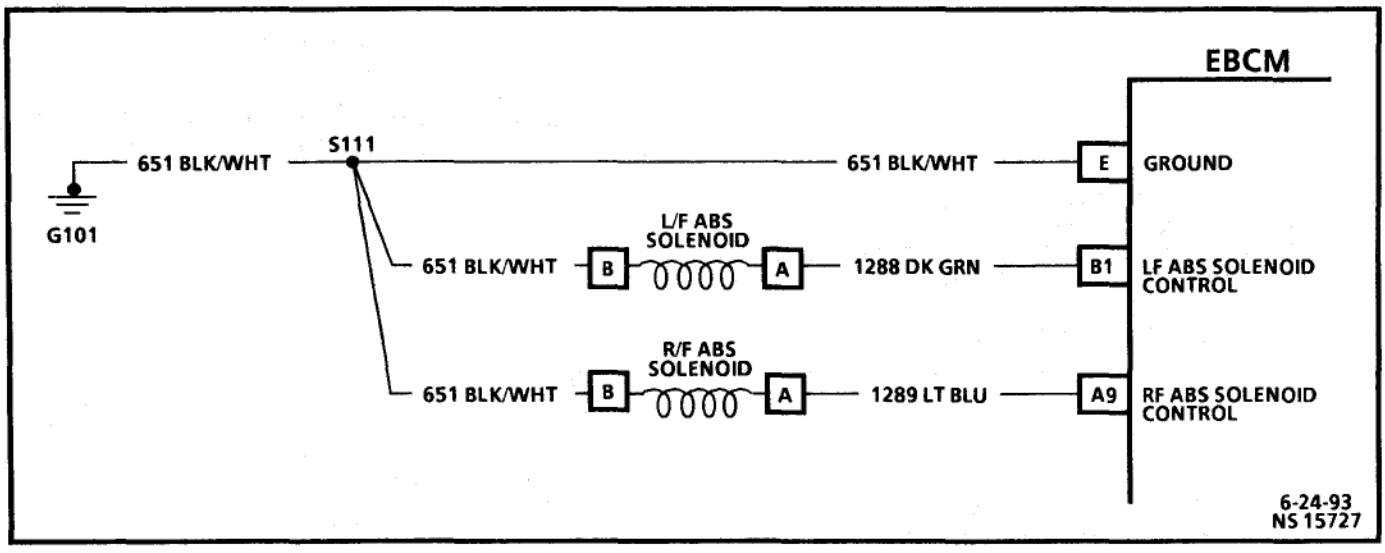
REPLACE RIGHT FRONT SOLENOID.

NO

REPAIR OPEN OR HIGH RESISTANCE IN CKT 651.

7-8-93
NS 15719

mitchell1 cardiagn.com



DTC 81

RIGHT FRONT SOLENOID CIRCUIT SHORTED TO GND

Circuit Description:

This DTC identifies a solenoid that cannot be energized due to an open in its driver circuitry, or a short to ground between the solenoid driver and the solenoid. These malfunctions can affect ABS operation since the flow of brake fluid to the wheel cylinder cannot be stopped, making ABS operation for that channel impossible.

DTC Will Set When: DTC 81 can be set only when the solenoid is commanded "ON." If the EBCM detects the right front solenoid control circuit voltage is out of specification, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for a solenoid that is internally shorted to ground.
2. Checks for a solenoid that is not within proper resistance values.
3. Indicates if a short to ground exists in the solenoid circuitry.
4. Checks for a possible intermittent malfunction in the solenoid circuitry due to poor terminal contact.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

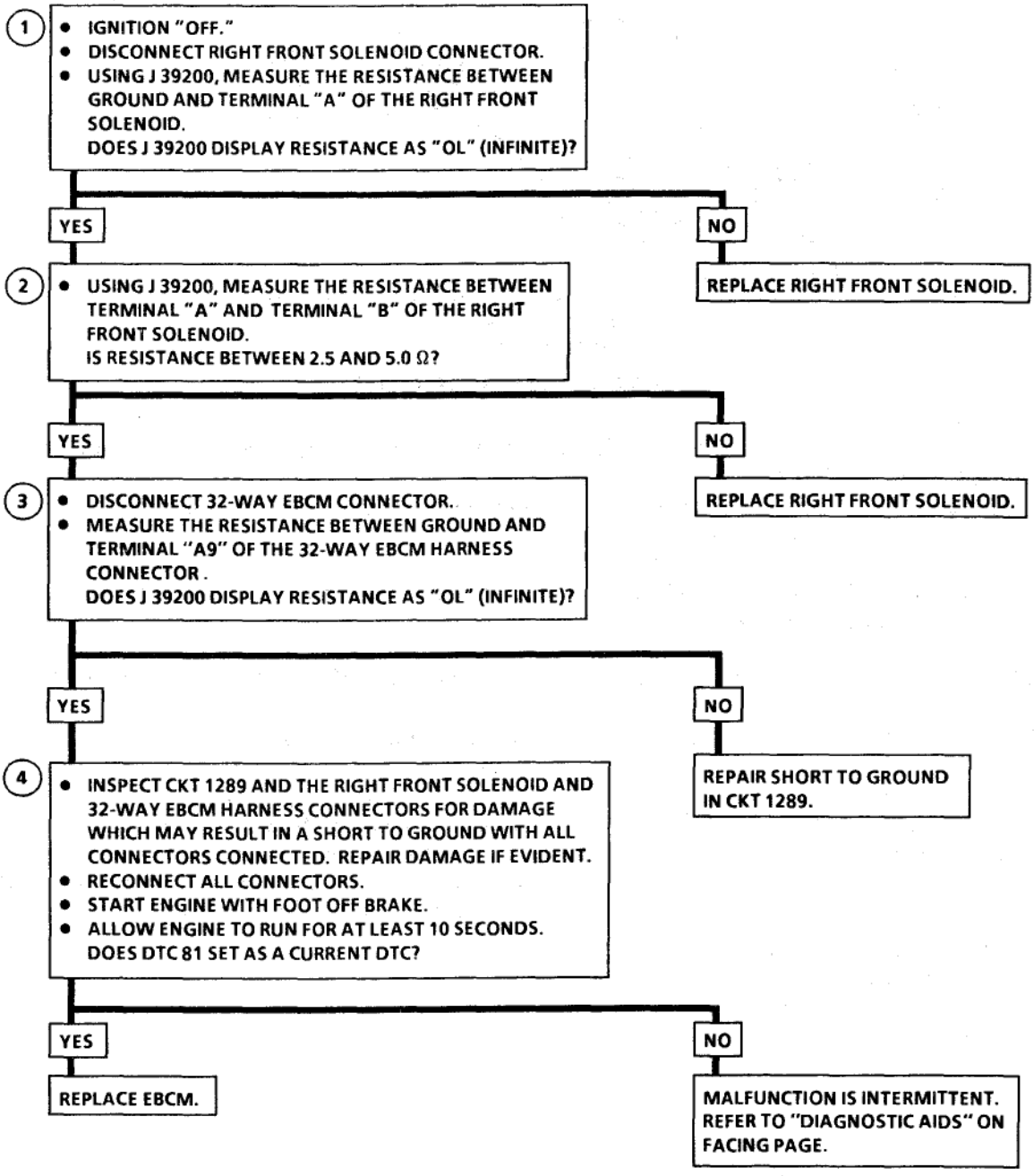
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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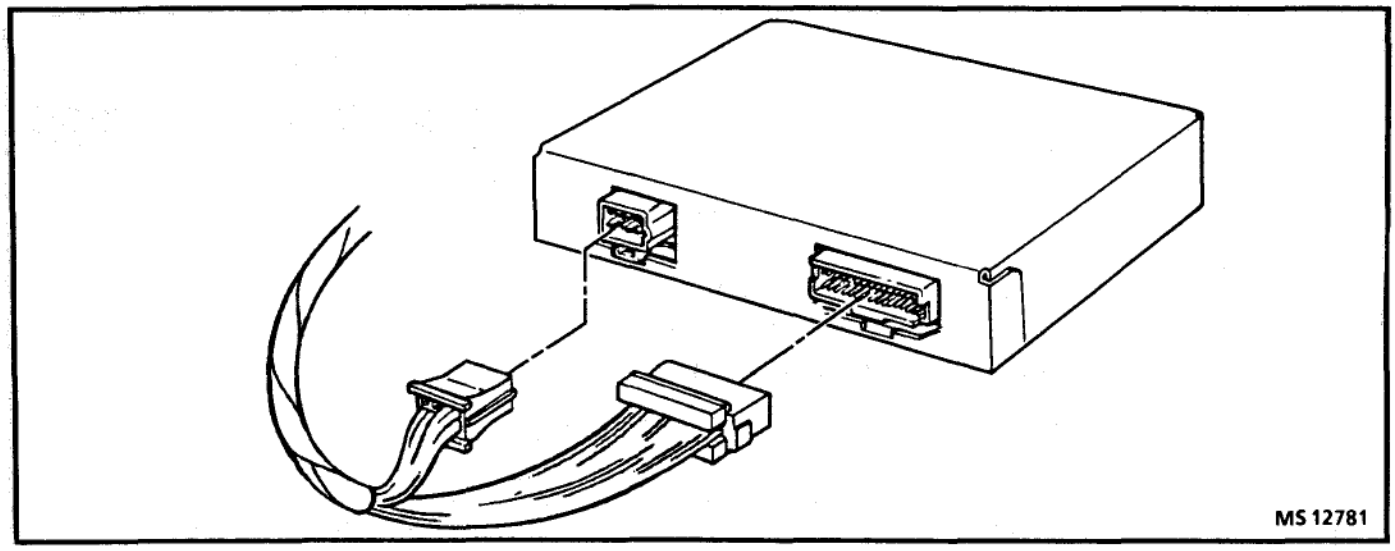
DTC 81

RIGHT FRONT SOLENOID CIRCUIT SHORTED TO GND



7-14-93
NS 15720

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DTC 82

CALIBRATION MALFUNCTION

Circuit Description:

This DTC allows the EBCM to check for a calibration malfunction by comparing the calibration value to a known value stored in the EEPROM.

This DTC is also used as a security measure to prevent improper use of calibrations or changes to these calibrations that may alter the designed function of ABS.

DTC Will Set When: DTC 82 can be set at key-up. If the program identifier is incorrect or the memory checksum is incorrect, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks to see if the malfunction is present during diagnosis. If present, the EBCM is not functioning correctly and must be replaced.

Important

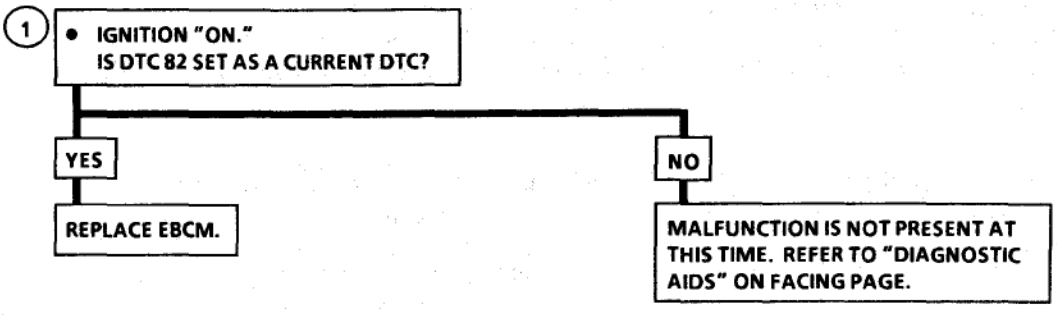
- At the time of printing, 1994 vehicles with ABS-VI were not being field reprogrammed to correct this failure. A service bulletin will be issued when EEPROM reprogramming is authorized.

Diagnostic Aids: An intermittent DTC 82 may be caused by a bad cell in the EEPROM that is sensitive to temperature changes. If DTC 82 failed more than once, but is intermittent, replace EBCM.

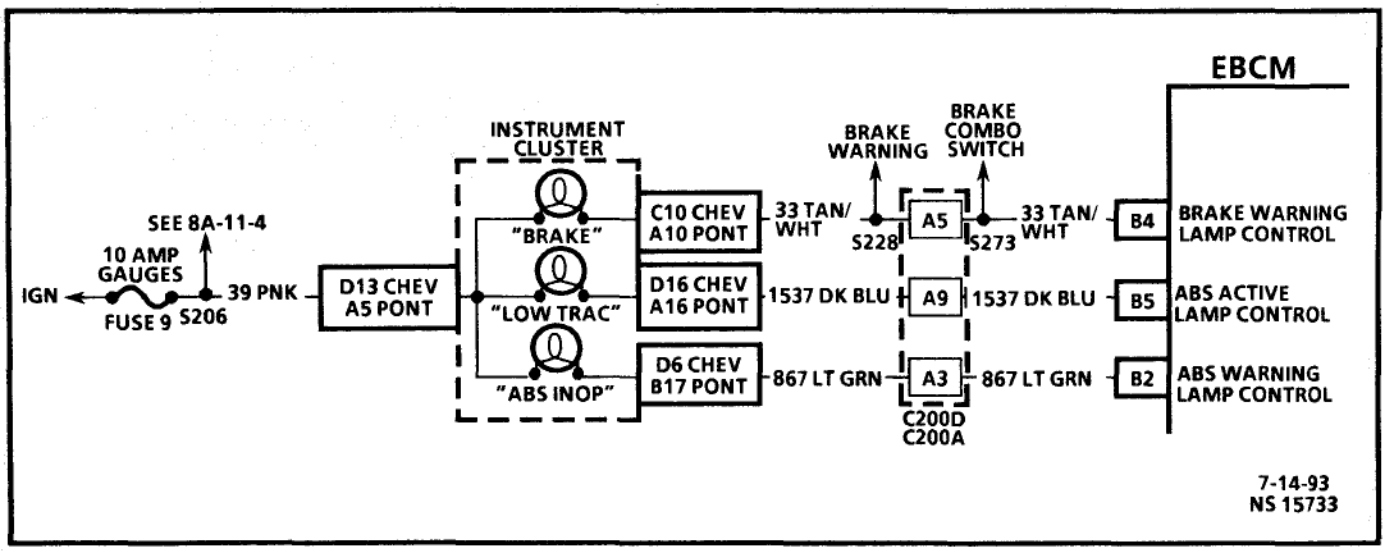
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

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DTC 82
CALIBRATION MALFUNCTION



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DTC 86

EBCM TURNED "ON" THE RED "BRAKE" WARNING LAMP

Circuit Description:

This DTC is provided as an information only DTC, and reflects the status of the command issued by the ABS EBCM to illuminate the red brake warning lamp. If another DTC issues a command to illuminate the red brake warning lamp, DTC 86 will be stored in EEPROM as a history DTC at the conclusion of the ignition cycle.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Serves to identify if a DTC other than DTC 86 commanded the red brake warning lamp "ON."

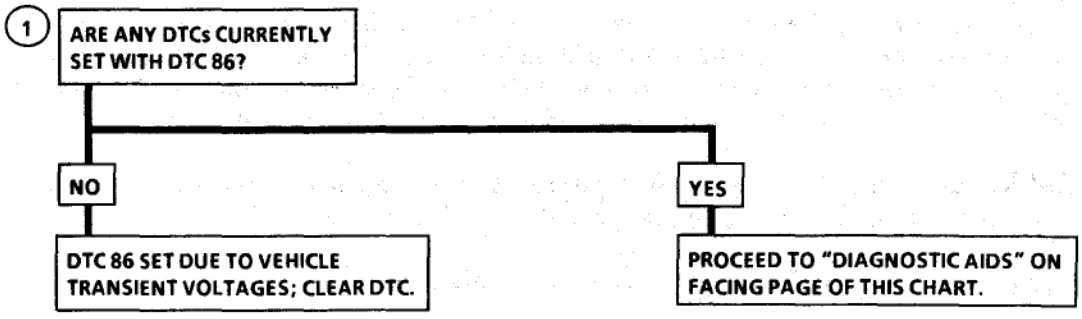
Diagnostic Aids: Any ABS mechanical DTC that issues a command to illuminate the red "BRAKE" telltale will also result in DTC 86 being stored in EEPROM during shut down. These DTCs are: 38, 41, 42, 46, and 51. If the motors are not in their home position, certain electrical DTCs will also command the red "BRAKE" telltale "ON." These DTCs are: 14, 16, 18, 55, 56, 57, 58, 61, 62, 63, 64, 65, and 66.

If any of these DTCs are indicated along with DTC 86, they must be corrected prior to addressing a DTC 86 malfunction.

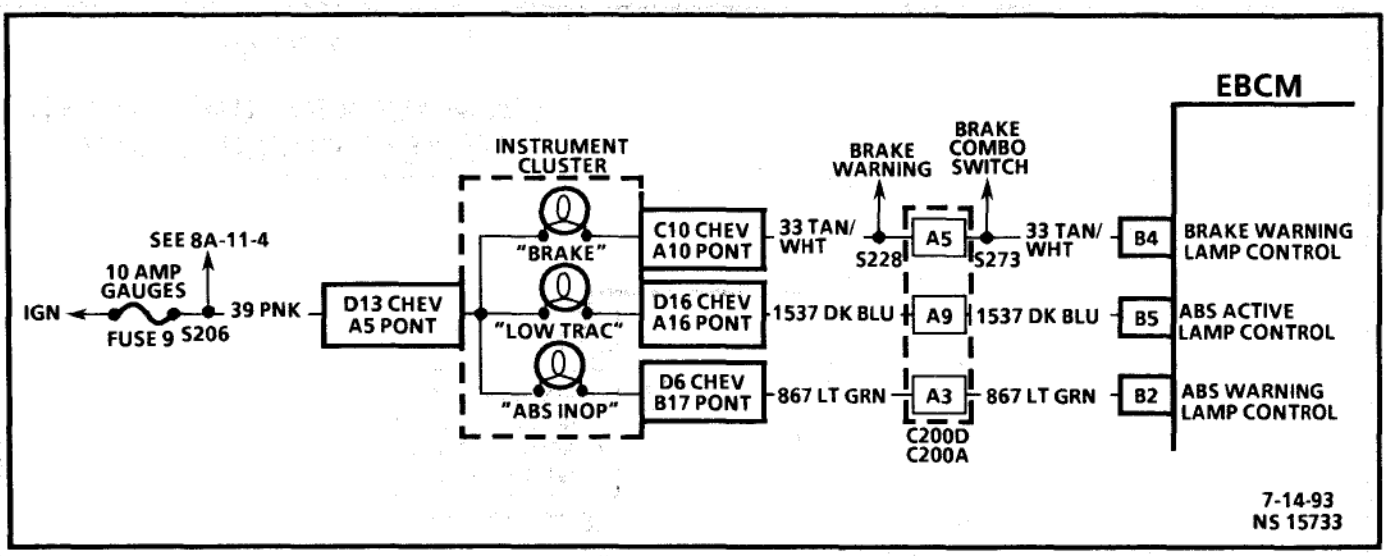
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DTC 86

EBCM TURNED "ON" THE RED "BRAKE" WARNING LAMP



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DTC 87

RED "BRAKE" WARNING LAMP CIRCUIT OPEN

Circuit Description:

This DTC is used to verify the EBCM has continuity to the red brake warning lamp in case the EBCM must turn it "ON." This will only occur if an ABS malfunction is detected that may degrade base brake operation.

Because ABS is not the only device controlling the red brake warning lamp (parking brake and low fluid sensor may also turn "ON" the lamp) a short to ground in this circuit cannot be detected.

DTC Will Set When: DTC 87 can be set after initialization is completed. If the red brake warning lamp circuit voltage is out of specification indicating an open circuit, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is not disabled.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Identifies if the ground circuit to the red brake warning lamp is completed by a source other than the EBCM.
2. Checks for high resistance in park brake circuitry.
3. Checks for malfunctioning EBCM.
4. Checks for high resistance in fluid level switch circuitry.
5. Checks for malfunctioning warning lamp bulb.
6. Checks for open or high resistance in CKT 33.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section. If a Tech 1 or T-100 are not available, the parking brake handle may be lifted to verify proper lamp operation and continuity of CKTs 3 and 39.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 87
RED "BRAKE" WARNING LAMP CIRCUIT OPEN

1
- IGNITION "OFF."
- DISCONNECT 32-WAY EBCM CONNECTOR.
- USING A FUSED JUMPER SUCH AS J 36169 WITH A 3 AMP FUSE, CONNECT 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B4" TO GROUND.
- IGNITION "ON."

IS RED BRAKE WARNING LAMP "ON"?

YES

2
- ENSURE BRAKE FLUID IS AT THE PROPER LEVEL.
- IGNITION "OFF."
- REMOVE JUMPER USED IN STEP 1.
- APPLY PARK BRAKE.
- IGNITION "ON."
- USING J 39200, MEASURE VOLTAGE BETWEEN GROUND AND 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B4."

IS VOLTAGE LESS THAN 2 VOLTS?

YES

3
- RELEASE PARK BRAKE.
- IGNITION "OFF."
- DISCONNECT BRAKE COMBO VALVE SWITCH.
- INSPECT 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B4" FOR POOR TERMINAL CONTACT OR CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE TERMINALS THAT EXHIBIT POOR CONTACT OR CORROSION.
- RECONNECT 32-WAY EBCM CONNECTOR.
- START ENGINE.
- WAIT 10 SECONDS.

DOES DTC 87 SET AS A CURRENT DTC?

NO

4
- IGNITION "OFF."
- INSPECT BRAKE COMBO VALVE SWITCH HARNESS CONNECTOR FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF TERMINAL CONTACT OR CORROSION.
- RECONNECT BRAKE COMBO VALVE SWITCH CONNECTOR.
- START ENGINE.
- WAIT 10 SECONDS.

DOES DTC 87 SET AS A CURRENT DTC?

YES

CHECK BRAKE FLUID LEVEL AND REFER TO SECTION 8A TO REPAIR HIGH RESISTANCE IN BRAKE PRESSURE DIFFERENTIAL SWITCH CIRCUITRY.

NO

MALFUNCTION IS MOST LIKELY DUE TO A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

YES

REPLACE EBCM.

NO

REFER TO SECTION 8A TO REPAIR HIGH RESISTANCE IN PARK BRAKE SWITCH CIRCUITRY.

NO

5
- IGNITION "OFF."
- REMOVE I/P CLUSTER.
- REMOVE AND INSPECT RED BRAKE WARNING LAMP.

IS BULB OPEN?

YES

REPLACE BULB.

NO

6
- USING J 39200, MEASURE RESISTANCE BETWEEN I/P CLUSTER HARNESS CONNECTOR TERMINAL "C10" (CHEV) OR "A10" (PONT) AND 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B4."

IS RESISTANCE LESS THAN 2Ω?

YES

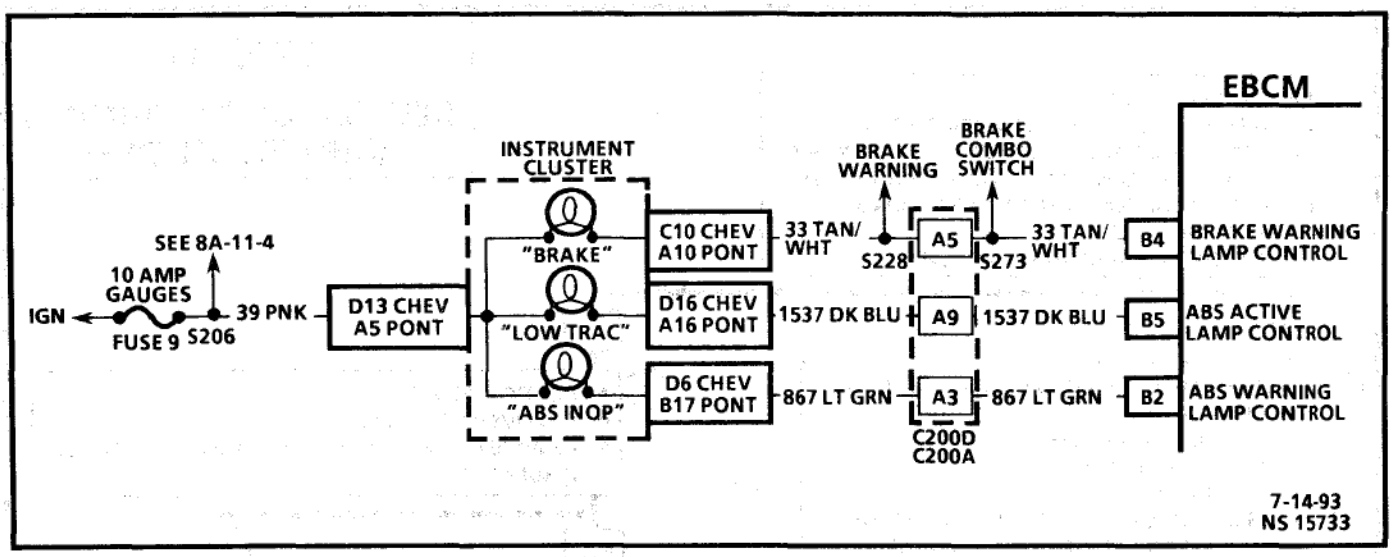
REFER TO SECTION 8A TO DIAGNOSE CLUSTER AND/OR CIRCUITRY TO CLUSTER.

NO

REPAIR OPEN OR HIGH RESISTANCE IN CKT 33.

7-9-93
NS 15721

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DTC 88

RED "BRAKE" WARNING LAMP CKT SHORTED TO BATT

Circuit Description:

This DTC identifies a short to battery between the EBCM and the red brake warning lamp, or an open driver that does not allow the red brake warning lamp to be illuminated by the EBCM. This will only occur if an ABS fault is detected that may degrade base brake operation.

DTC Will Set When: DTC 88 can be set only at the beginning of the three second bulb check. If the EBCM detects battery voltage on the red brake warning lamp control circuit, a malfunction exists.

Action Taken: A malfunction DTC is stored. ABS is not disabled; however, the "ABS INOP" lamp will flash to indicate a malfunction exists.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Identifies if the ground circuit to the red brake warning lamp is being completed by a source other than the EBCM.
2. Identifies if the malfunction is currently present.
3. By removing the 10 amp "GAGES" Fuse 9, the voltage source is eliminated. This test indicates if voltage is being supplied from a source other than the gauge fuse.
4. Ensures malfunction was not due to physical damage of the circuitry.
5. Checks for DTC 86 also being set.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

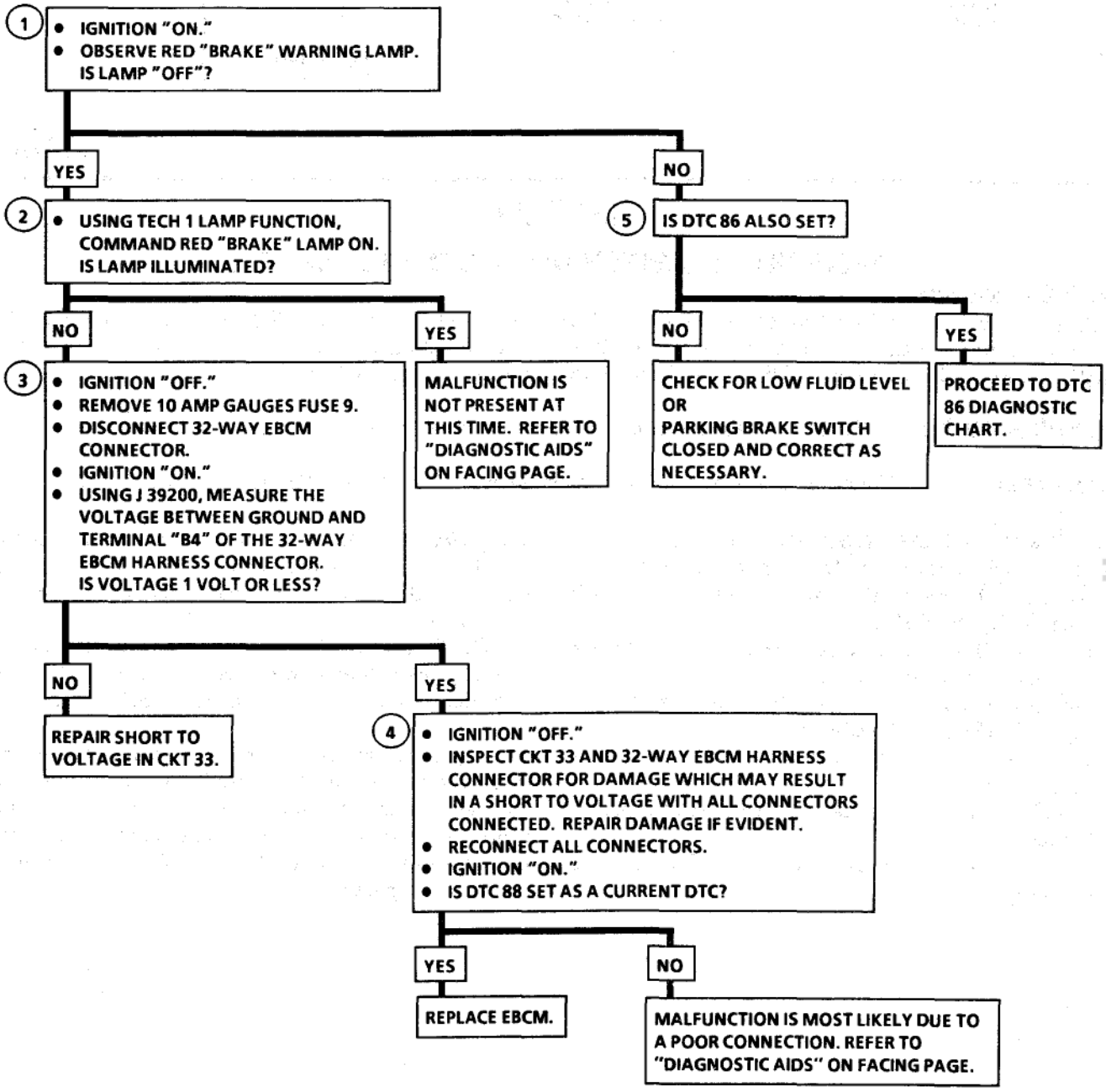
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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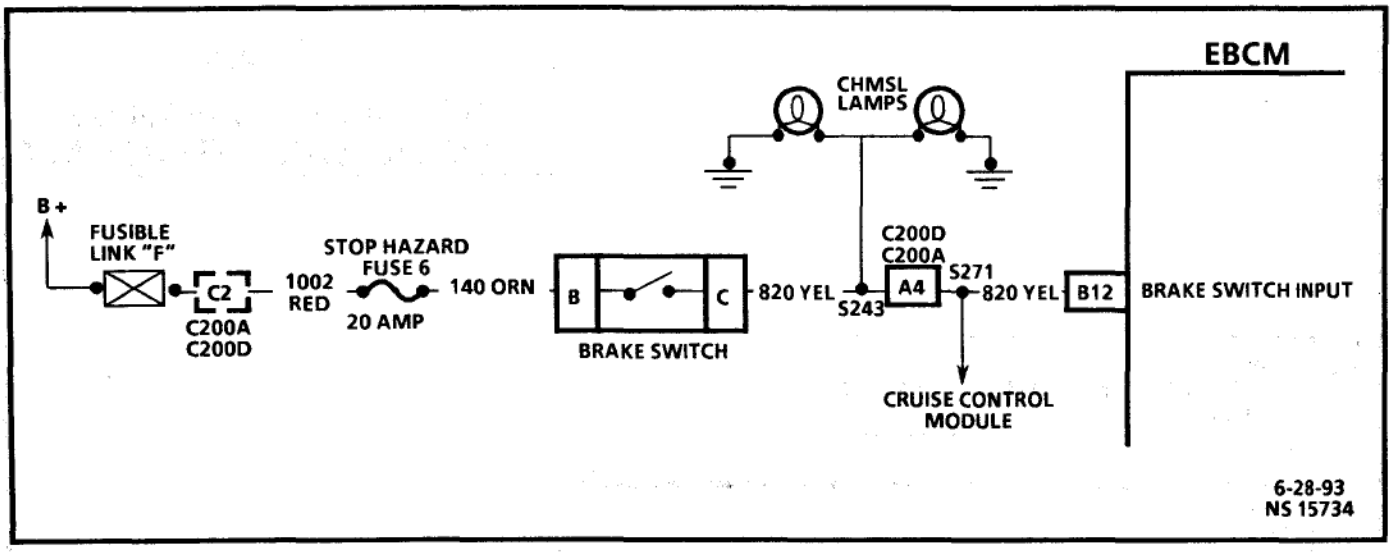
DTC 88

RED "BRAKE" WARNING LAMP CKT SHORTED TO BATT



7-16-93
NS 15722

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DTC 91

OPEN BRAKE SWITCH DURING DECELERATION

Circuit Description:

This DTC is used to detect an open brake switch in the non-ABS mode. The EBCM looks for deceleration rates that would indicate braking action and verifies this assumption by requiring several repeats of this detection method. In each case, ABS will not be available since no brake switch is seen.

DTC Will Set When: DTC 91 can be set if three deceleration cycles occur with the brake switch "OFF."

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Indicates if the brake switch signal is being received by the EBCM.
2. Indicates if an open circuit exists in the brake switch or brake lamp circuitry.
3. Isolates the open circuit to either the brake switch input circuitry, or the EBCM.
4. Ensures malfunction was not due to poor terminal contact.
5. Verifies that voltage is available at the brake switch.
6. Verifies that the brake switch is functioning properly.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 91
OPEN BRAKE SWITCH DURING DECELERATION

IS DTC 95 CURRENTLY SET?

NO

1. • IGNITION "ON."
   • USING TECH 1, SELECT "FØ: DATA LIST."
   • APPLY LIGHT PRESSURE ON BRAKE PEDAL, WHILE MONITORING BRAKE SWITCH STATUS ON TECH 1.
   DOES TECH 1 INDICATE BRAKE SWITCH "ON" WITHIN 1 INCH OF TRAVEL?

NO

2. • WITH PRESSURE STILL APPLIED TO BRAKE PEDAL, OBSERVE REAR BRAKE LAMPS.
   ARE BRAKE LAMPS "ON"?

YES

3. • IGNITION "OFF."
   • DISCONNECT 32-WAY EBCM CONNECTOR.
   • IGNITION "ON."
   • USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B12" OF THE 32-WAY EBCM HARNESS CONNECTOR WHILE APPLYING FIRM PRESSURE ON BRAKE PEDAL.
   IS VOLTAGE 10 VOLTS OR GREATER?

YES

4. • INSPECT 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B12" FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF TERMINAL CONTACT OR CORROSION.
   • RECONNECT ALL CONNECTORS.
   • DRIVE VEHICLE AND PERFORM A MODERATELY HARD ABS STOP.
   DOES DTC 91 OR 92 SET AS A CURRENT DTC?

YES

REPLACE EBCM.

NO

MALFUNCTION IS MOST LIKELY DUE TO A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

REPAIR SHORTED OR OPEN CKT 820.

YES

PROCEED TO DTC 95 DIAGNOSTIC CHART.

YES

MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

5. • USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B" OF THE BRAKE SWITCH.
   IS VOLTAGE 10 VOLTS OR GREATER?

YES

6. • MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "C" OF THE BRAKE SWITCH WHILE APPLYING FIRM PRESSURE ON BRAKE PEDAL.
   IS VOLTAGE 10 VOLTS OR GREATER?

NO

MISADJUSTED OR FAULTY BRAKE SWITCH. ADJUST OR REPLACE SWITCH AS NECESSARY.

YES

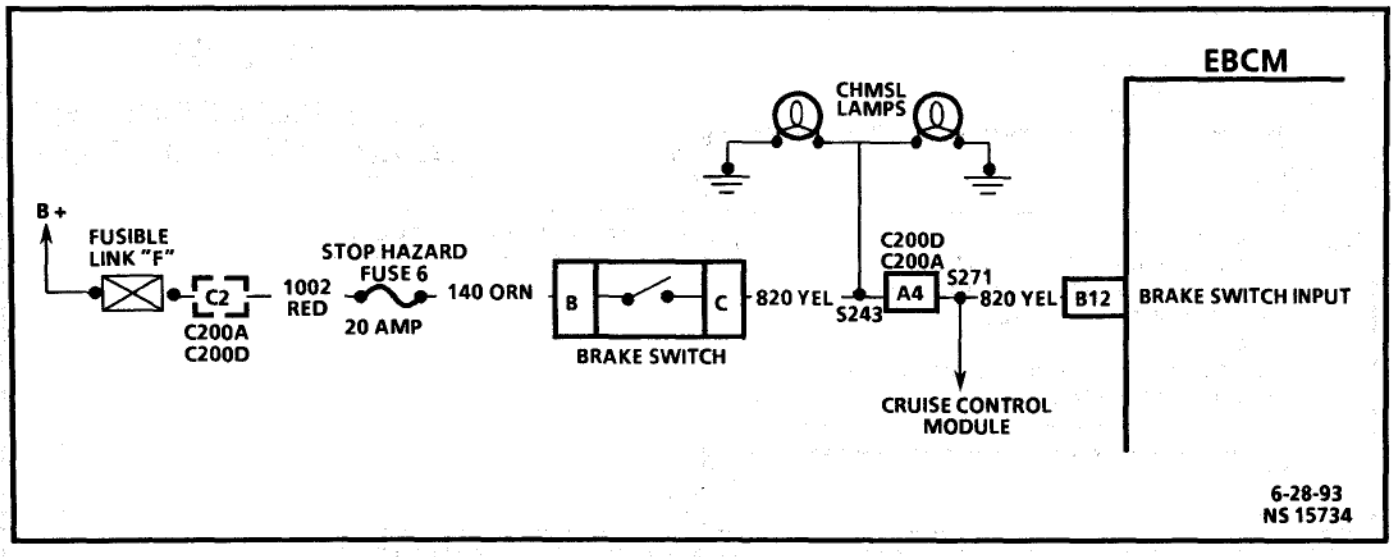
REPAIR OPEN CKT 820.

NO

REPAIR OPEN OR SHORTED CKT 140 AND REPLACE 20 AMP STOP HAZARD FUSE 6.

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NS 15723

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DTC 92

OPEN BRAKE SWITCH WHEN ABS WAS REQUIRED

Circuit Description:

This DTC is run to determine the proper operation of the brake switch. This is important because ABS is activated when the brake switch is "ON." If the brake switch is "OFF," ABS will never be activated. Since this malfunction is difficult to detect under normal braking conditions, this malfunction is only detected when ABS is required.

DTC Will Set When: DTC 92 can be set if the vehicle's speed is greater than 8 km/h (5 mph). If the brake was not "ON" and a release was required on two channels for 0.5 seconds, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Indicates if the brake switch signal is being received by the EBCM.
2. Indicates if an open circuit exists in the brake switch or brake lamp circuitry.
3. Isolates the open circuit to either the brake switch input circuitry, or the EBCM.
4. Ensures malfunction was not due to poor terminal contact.
5. Verifies the voltage is available at the brake switch.
6. Verifies that the brake switch is functioning properly.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 92

OPEN BRAKE SWITCH WHEN ABS WAS REQUIRED

IS DTC 95 CURRENTLY SET?

- YES → PROCEED TO DTC 95 DIAGNOSTIC CHART.
- NO →

1
- IGNITION "ON."
- USING TECH 1, SELECT "FØ: DATA LIST."
- APPLY LIGHT PRESSURE ON BRAKE PEDAL, WHILE MONITORING BRAKE SWITCH STATUS ON TECH 1.

DOES TECH 1 INDICATE BRAKE SWITCH "ON" WITHIN 1 INCH OF TRAVEL?

- YES → MALFUNCTION IS NOT PRESENT AT THIS TIME. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- NO →

2
- WITH PRESSURE STILL APPLIED TO BRAKE PEDAL, OBSERVE REAR BRAKE LAMPS.

ARE BRAKE LAMPS "ON"?

- NO → **5**
  - USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B" OF THE BRAKE SWITCH.

  IS VOLTAGE 10 VOLTS OR GREATER?
  - NO → REPAIR OPEN OR SHORTED CKT 140 AND REPLACE 20 AMP STOP HAZARD FUSE 6.
  - YES → **6**
    - MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "C" OF THE BRAKE SWITCH WHILE APPLYING FIRM PRESSURE ON BRAKE PEDAL.

    IS VOLTAGE 10 VOLTS OR GREATER?
    - YES → REPAIR OPEN CKT 820.
    - NO → MISADJUSTED OR FAULTY BRAKE SWITCH. ADJUST OR REPLACE SWITCH AS NECESSARY.
- YES →

3
- IGNITION "OFF."
- DISCONNECT 32-WAY EBCM CONNECTOR.
- IGNITION "ON."
- USING J 39200, MEASURE THE VOLTAGE BETWEEN GROUND AND TERMINAL "B12" OF THE 32-WAY EBCM HARNESS CONNECTOR WHILE APPLYING FIRM PRESSURE ON BRAKE PEDAL.

IS VOLTAGE 10 VOLTS OR GREATER?

- NO → REPAIR SHORTED OR OPEN CKT 820.
- YES →

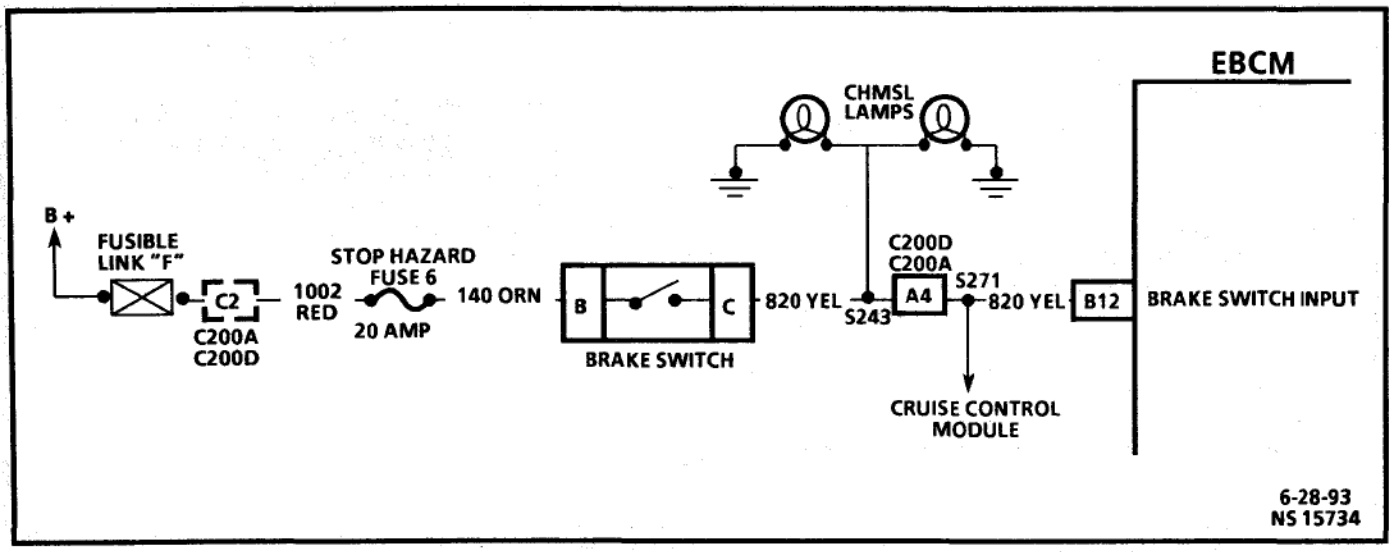
4
- INSPECT 32-WAY EBCM HARNESS CONNECTOR TERMINAL "B12" FOR POOR TERMINAL CONTACT AND EVIDENCE OF CORROSION. REFER TO SECTION 8A-4, "CHECKING TERMINAL CONTACT." REPLACE ALL TERMINALS THAT EXHIBIT SIGNS OF TERMINAL CONTACT OR CORROSION.
- RECONNECT ALL CONNECTORS.
- DRIVE VEHICLE AND PERFORM A MODERATELY HARD ABS STOP.

DOES DTC 91 OR 92 SET AS A CURRENT DTC?

- NO → MALFUNCTION IS MOST LIKELY DUE TO A POOR CONNECTION. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
- YES → REPLACE EBCM.

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NS 15723

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DTC 93

DTC 91 OR 92 SET IN CURRENT OR PREV. IGN CYCLE

Circuit Description:

This DTC is the second portion of DTCs 91 and 92. If DTCs 91 or 92 failed during the last ignition cycle, DTC 93 becomes a current failure during the next ignition cycle, keeping ABS disabled until a brake switch "ON" state is seen. When a change is seen during an ignition cycle in which DTC 93 is a current malfunction, DTC 91 or 92 will clear itself at the end of the current ignition cycle, and ABS will enable itself at the start of the next ignition cycle. DTC 93 alone indicates 91 or 92 failed previously, but is intermittent, or has been corrected.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Indicates which DTC (either 91 or 92) caused DTC 93 to set.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

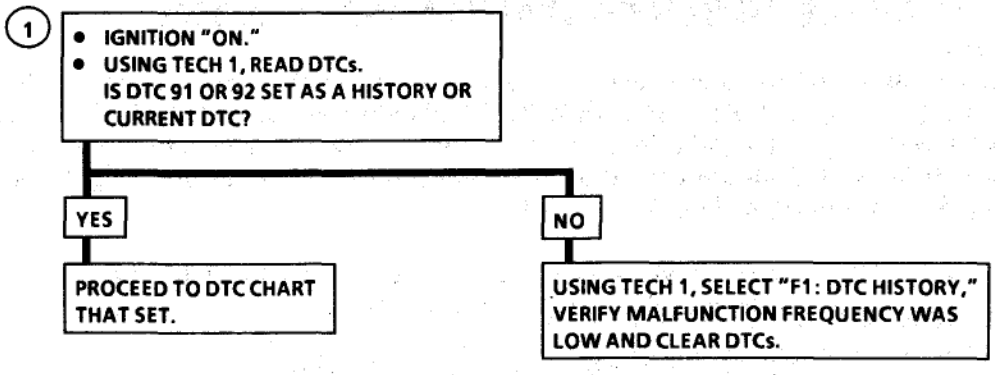
Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

Also, verify proper brake switch operation using the data list of the Tech 1. As the brake is applied, the data list should display the brake switch "ON" within 1 inch of travel.

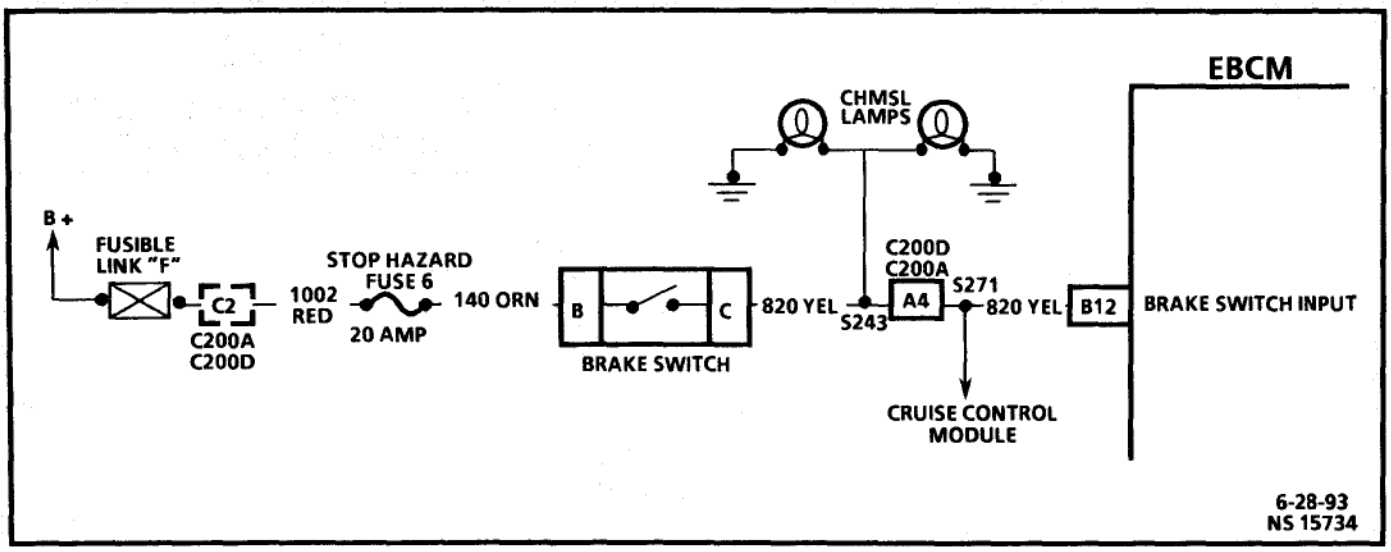
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DTC 93

DTC 91 OR 92 SET IN CURRENT OR PREV. IGN CYCLE



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DTC 94

BRAKE SWITCH CONTACTS ALWAYS CLOSED

Circuit Description:

This DTC is run to determine the proper operation of the brake switch. This is important because ABS is activated when the brake switch is "ON" and turned "OFF" when the brake is "OFF." If the brake switch is always "ON," ABS operation will always be requested resulting in potential modulator cycling on rough roads. Additionally, this malfunction will most likely result in a dead battery (due to the brake lights staying "ON") if the driver is not informed of this malfunction.

DTC Will Set When: DTC 94 can be set when the vehicle reaches at least 40 km/h (25 mph). If the brake was never "OFF" during two consecutive drive cycles, a malfunction exists.

Action Taken: A malfunction DTC is stored. ABS is not disabled; however.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks if the malfunction is currently present.
2. Isolates the cause of the malfunction to either a malfunctioning or misadjusted brake switch, or a short to voltage in the brake switch circuitry.
3. Checks for unwanted voltage on the brake switch input circuit.
4. Checks for a possible intermittent malfunction.

Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

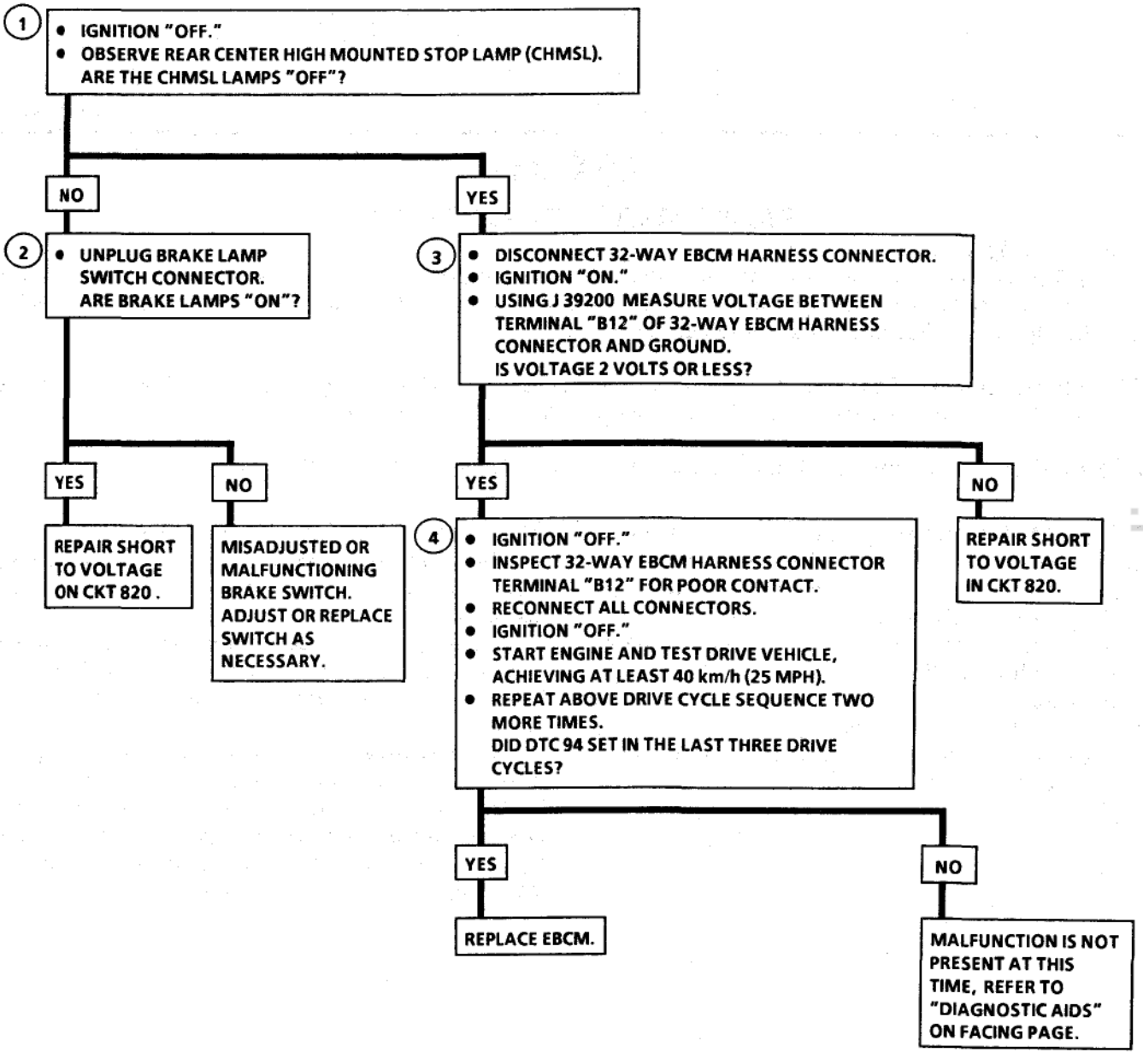
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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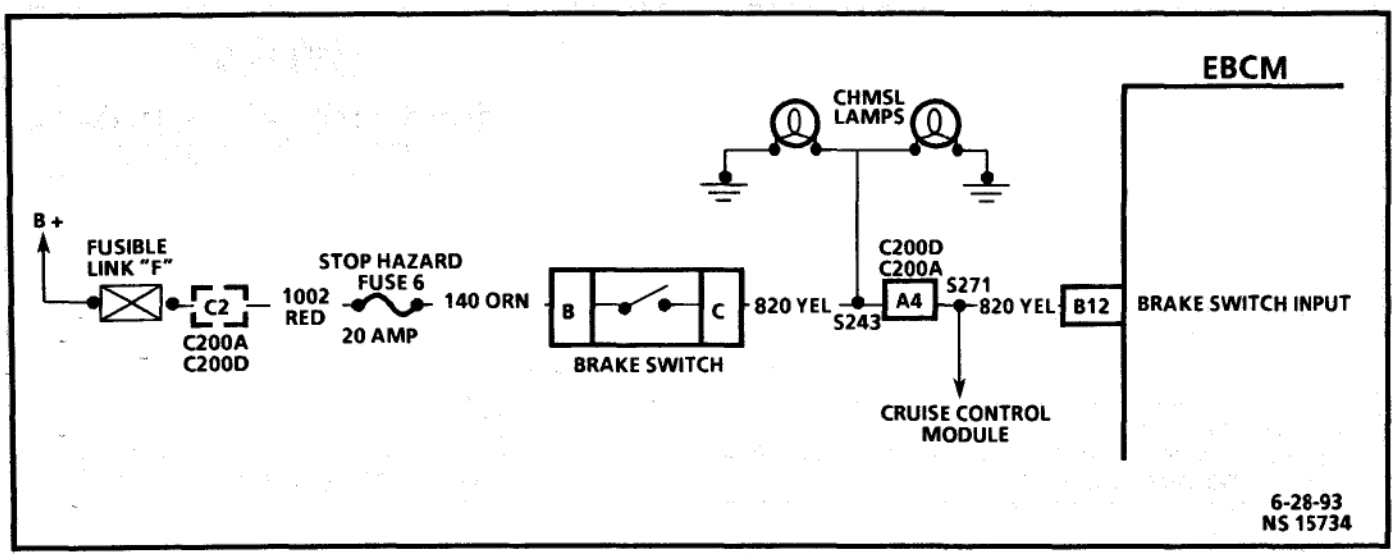
DTC 94

BRAKE SWITCH CONTACTS ALWAYS CLOSED



7-6-93
NS 15724

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DTC 95

BRAKE SWITCH CIRCUIT OPEN

Circuit Description:

This DTC is used to identify open brake switch circuitry that prevents the brake switch input to the EBCM from changing states when the brake is applied. This DTC is used in conjunction with DTCs 91 and 92 to determine the cause of an open brake switch malfunction.

DTC Will Set When: DTC 95 can be set after initialization is completed. If the brake switch input voltage is out of specification for one second indicating an open circuit, a malfunction exists.

Action Taken: A malfunction DTC is stored, ABS is disabled and the "ABS INOP" lamp is turned "ON."

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Is used to confirm that an open in the brake switch circuitry currently exists.
2. Indicates if the brake switch signal is being received by the EBCM.
3. Indicates if an open circuit exists in the brake switch or brake lamp circuitry.
4. Isolates the open circuit to either the brake switch input circuitry, or the EBCM.

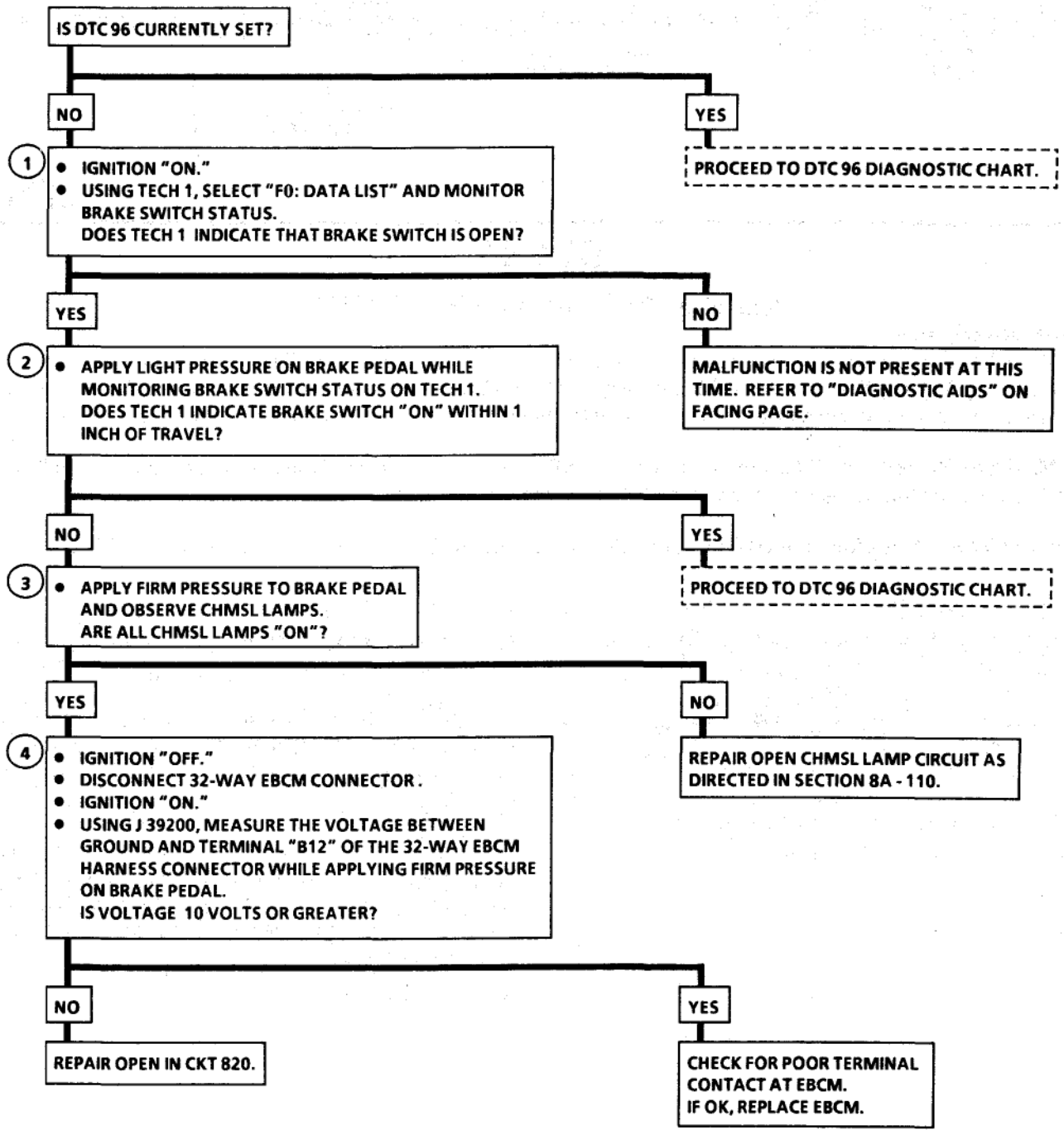
Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

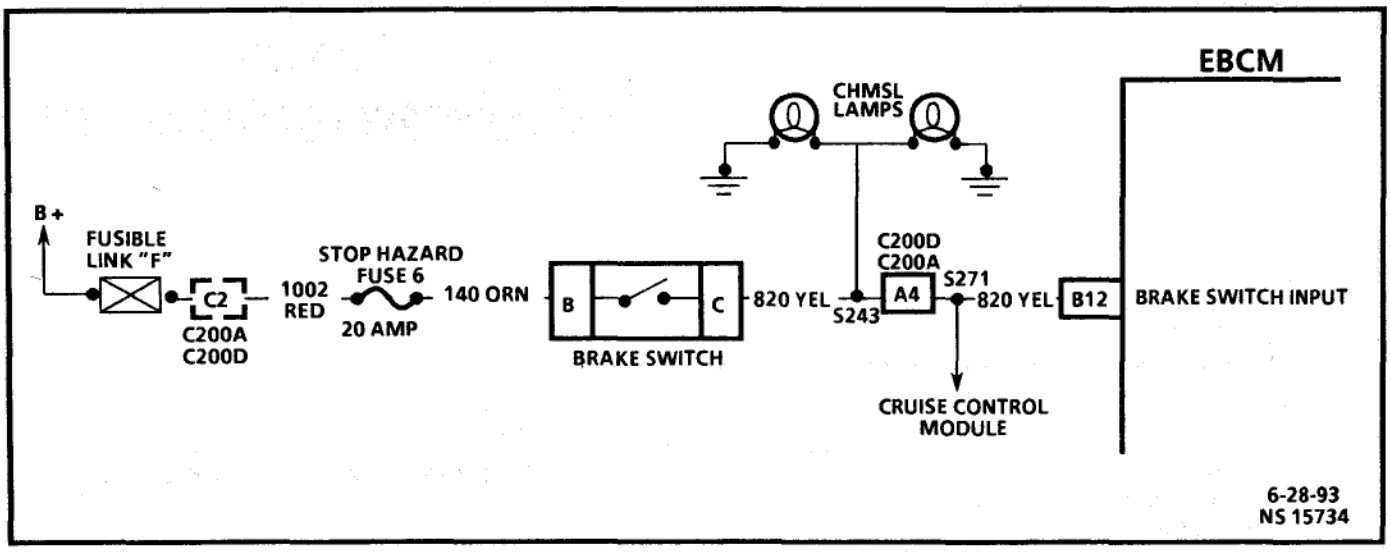
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DTC 95
BRAKE SWITCH CIRCUIT OPEN



7-8-93
NS 15725

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DTC 96

REAR BRAKE LAMP CIRCUIT OPEN

Circuit Description:

This DTC is designed to isolate the cause of a DTC 95 malfunction and indicate to the driver ABS is still available. If DTC 95 fails with DTC 96, the Center High Mounted Stop Lamp (CHMSL) circuit is open. The presence of battery voltage at the brake switch input indicates a valid brake switch input is still available.

DTC Will Set When: DTC 96 can be set only after DTC 95 has been set. If the EBCM detects battery voltage on the brake switch input circuit for 0.5 seconds, a malfunction exists.

Action Taken: A malfunction DTC is stored. ABS is not disabled; however.

DTC Chart Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. As a result of a malfunction of an additional brake switch circuit DTC, this DTC may be set. To insure proper diagnosis, any additional brake switch DTCs must be repaired first.
2. Identifies if the malfunction is currently present in the brake circuit.

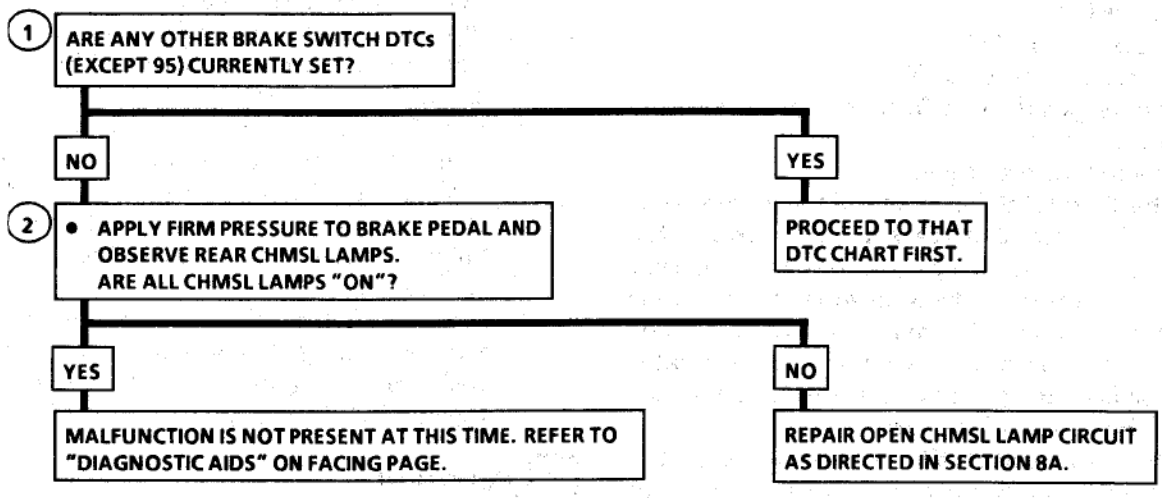
Diagnostic Aids: An "Intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the Tech 1, as described in "Tech 1 Diagnostics" found in this section.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wiring connections or physical damage to the wiring harness.

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DTC 96
REAR BRAKE LAMP CIRCUIT OPEN



6-24-93
NS 15726

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DIAGNOSIS/MISC. TEST (F4)

MANUAL CONTROL (F0)

This function can be used to manually control the ABS VI motors and solenoids.

Motor Test (Apply/Release)

Each motor can be manually turned "ON" for up to 5 seconds, at a current of 10 amps applied (forward) or 6 amps released (reverse). After running the motors, the command and feedback currents will be stored in a snapshot buffer. This information can be reviewed, when instructed to do so by the trouble tree, to determine if the motors are operating properly.

The test below describes how the front motors will normally operate, the rear motor can be tested in a similar manner, except there will be only a slight pedal drop (bump) and rise during the test.

1. Ignition "OFF."
2. Install Tech 1 with MSC.
3. Ignition "ON," engine "OFF."
4. Pump brake pedal until firm to deplete vacuum from power booster.
5. Depress and hold brake pedal.
6. Using the Tech 1, "Release" one of the motors. The brake pedal should move smoothly toward the floor. As the pedal drops, the feedback current should momentarily drop to only a few amps (indicating motor movement) and then become equal to command current (6 amps). This indicates the motor is no longer moving since the piston has reached the bottom of the bore.
7. With the brake pedal still depressed and at the floor, "Apply" the same motor. The brake pedal should now smoothly rise back to the top of its travel. The feedback current should momentarily drop to a few amps, then quickly increase to the command current (10 amps). This indicates the motor is no longer moving since the piston has reached the top of the bore ("home" position).

Solenoid Test ("ON/OFF")

Only use this test when no DTCs are stored and you suspect a leaky solenoid or check valve.

1. Ignition "OFF."
2. Install Tech 1 with MSC.
3. Ignition "ON," engine "OFF."
4. Pump brake pedal and deplete vacuum from power booster.
5. Select manual control (F0).
6. Select left front or right front motor release.
7. "Release" the motor for the channel being tested. Review the motor command and feedback currents to be sure the motor released properly. Refer to "Motor (Apply/Release)" in this section.
8. Select the solenoid for the same channel as that being tested.
9. With no brake pedal pressure applied, turn the solenoid "ON."
10. Depress the brake pedal. It should be very high and firm.
    - If the pedal goes nearly to the floor, the solenoid is leaking or not closing and/or the check valve is leaking, proceed to Step 12.
11. With brake pressure still applied, turn the solenoid "OFF." The brake pedal should move toward the floor. This verifies normal solenoid operation. END OF TEST.
    - If the pedal does not, the solenoid is stuck "ON," proceed to Step 12.
12. Verify that the solenoid connectors are connected to the proper solenoids, (the right front solenoid is the one on the rear of the modulator, closest to the brake booster). If the wiring is incorrect, move the connectors to the proper solenoid and repeat this entire test starting with Step 1.
    A. Physically switch the two solenoids.
    B. Repeat the entire test starting at Step 1 for the channel in question.
    - If the test now works properly, test the other channel. If the test fails for this channel, replace the solenoid currently installed in this channel. Refer to "Hydraulic Modulator Solenoid" under "On-Vehicle Service" in this section.
    - If the test fails for the same channel, the check valve is leaking. Replace hydraulic modulator. Refer to "Hydraulic Modulator" under "Unit Repair" in this section.

Important

- After performing Step 12, it is necessary to bleed the brake system. Refer to "Bleeding Procedure" in this section.

HYDRAULIC CONTROL TEST (F2)

This test is used to verify base brake apply and ABS release, hold, and apply function.

1. Ignition "OFF."
2. Raise the vehicle such that all wheels to be tested are off the ground.
3. Install Tech 1 with MSC.
4. Ignition "ON," vehicle transmission in neutral.
5. Select a channel to test; left front, right front, or rear. When testing the rear brakes, both rear wheels should rotate and not rotate together at various points in the test; this is true because both rear brake pressures are controlled together.
6. Firmly depress brake pedal. Pedal should remain high and firm.

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7. Have an assistant attempt to rotate the wheel being tested. If the wheel does not rotate, base brake apply is working properly.
8. With the brake pedal still depressed, press the ↑ key on the Tech 1 to start the test. The Tech 1 will display "Release" on the screen. Your assistant should be able to rotate the wheel being tested during the release portion of the test (approximately 2 seconds long). This verifies ABS pressure release. The brake pedal should remain high and firm. (If the brake pedal moves toward the floor, verify the solenoid electrical connectors are connected to the correct solenoids.)
9. The Tech 1 will switch to the "Hold" mode and display the word "Hold" on the screen along with an 18 second decrement counter. With the brake pedal still depressed, have your assistant attempt to rotate the wheel. The wheel should rotate for the full 18 seconds of the test. This verifies ABS pressure hold.
10. When the hold portion of the test is complete, brake pressure will be applied and a slight bump may be felt in the pedal. This is normal. The assistant should not be able to rotate the wheel at the point. This verifies ABS apply.

MOTOR TEST (F4)

Once the motor pack has been separated from the hydraulic modulator, this test will help determine if the motor pack is operating properly.

The Tech 1 will rotate the motors in one direction, than the other.

- If any motor does not turn in both directions, the motor pack is malfunctioning and must be replaced. The motor pack is not serviceable and must be replaced as an assembly. Refer to "Motor Pack" under "Unit Repair" in this section.
- If all three motors rotate, try to rotate each gear on the hydraulic modulator, refer to "No Gear Movement" in this section.

NO GEAR MOVEMENT

After the motor pack has been removed, rotate each gear by hand on the hydraulic modulator (unit with large gears). The front gears (non-center gears) should be able to be rotated approximately 12.25 full turns lock to lock. If the gear does not turn freely or at least 12 turns are not possible, replace the hydraulic modulator.

The rear gear (center gear) should rotate approximately 7.25 turns. If the gear does not turn freely or at least 7 turns are not possible, replace the hydraulic modulator.

Refer to "Hydraulic Modulator" under "Unit Repair" in this section if replacement of the modulator is indicated above.

GEAR TENSION RELIEF (F5)

When the displacement cylinder pistons are in the "home" position, each motor has prevailing torque. This torque results in "gear tension," or force on each gear that makes motor pack separation difficult. To avoid injury, or damage to the gears, the "Gear Tension Relief Function" briefly reverses each motor to eliminate the prevailing torque.

Always perform the "Gear Tension Relief Function" prior to removing the hydraulic modulator/motor pack assembly from the vehicle.

RELAY TEST (F6)

This test allows the user to turn the relay "ON" and "OFF" using the ↑ and ↓ arrow keys on the Tech 1. The battery voltage supplied to the EBCM through the relay contacts is displayed on the screen during the test.

When the relay is commanded "ON," the voltage should be equal to the battery voltage. When the relay is "OFF," the voltage should drop below 2 volts.

NOTICE: Voltage will not drop to zero when the relay contacts are open due to capacitors in the EBCM. If voltage drops below 2 volts, the relay is operating properly.

VOLTAGE LOAD TEST (F7)

The ABS VI system can draw significant amounts of current when operating. This test turns "ON" many of the system components to load-test the vehicle's electrical system.

If low voltage malfunctions or intermittent ABS operations are occurring, this test will allow you to monitor the ignition and switched battery inputs to the EBCM. If only one of these two inputs drops below 10 volts during testing, a high resistance may be present in that power feed circuit. If both inputs drop below 10 volts the vehicle's electrical system needs to be diagnosed. In either case, the Tech 1 will display that the "Voltage Load Test" failed.

LAMP TEST (F8)

This test allows the user to control the warning/indicator lamps associated with ABS. It can be used to check the lamp circuit including the lamp driver module. The amber "ABS INOP" lamp can be turned "ON" or flashed. The red "BRAKE" warning lamp and the "LOW TRAC" lamp can be turned "ON" and "OFF."

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SYSTEM ID (F9)

This feature is used to determine the ABS VI version and whether the system includes Traction Control (TCS).

MOTOR REHOME (F5)

The motor rehome function is initiated by pressing the F5 key from the Tech 1 "Select Mode" menu. The motor rehome function must ALWAYS be used prior to bleeding the brake system. This function will return all of the hydraulic modulator pistons to their upmost or "home" position. This allows all fluid paths within the modulator to be open so that the modulator can be properly bled.

Important

- The motor rehome function cannot be performed if any current DTCs are present. If current DTCs are present, the vehicle must be repaired and DTCs cleared before performing the motor rehome function.

ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

CAUTION: Brake fluid may irritate eyes and skin. In case of contact, take the following actions:
- **Eye contact - rinse thoroughly with water.**
- **Skin contact - wash with soap and water.**
- **If ingested - consult a physician immediately.**

CAUTION: To help avoid personal injury due to poor braking, DO NOT tap into the vehicle's brake system to operate a trailer brake system.

NOTICE: When fasteners are removed, always install them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread-locking compound, will be called out. The correct fastener tightening specification must be used when installing fasteners that require it. If the above conditions are not followed, parts or system could be damaged.

NOTICE: The use of rubber hoses or parts other than those specified for the Antilock Brake System (ABS) may lead to functional problems requiring replacement of the hydraulic parts. Replace all components included in repair kits used to service this system. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any hydraulic component is removed or brake line disconnected, it is necessary to bleed all or part of the brake system. The fastener tightening specifications listed are for dry, unlubricated fasteners.

NOTICE: Use only Supreme 11 (GM 1052542) or equivalent DOT 3 brake fluid. The use of DOT 5 (silicone) brake fluid is not recommended. Reduced braking performance or durability may result.

NOTICE: Avoid spilling brake fluid on any of the vehicle's painted surfaces, wiring, cables or electrical connectors. Brake fluid will damage paint and electrical connections. If any fluid is spilled on the vehicle, flush the area with water to lessen the damage.

CHECKING AND ADDING FLUID

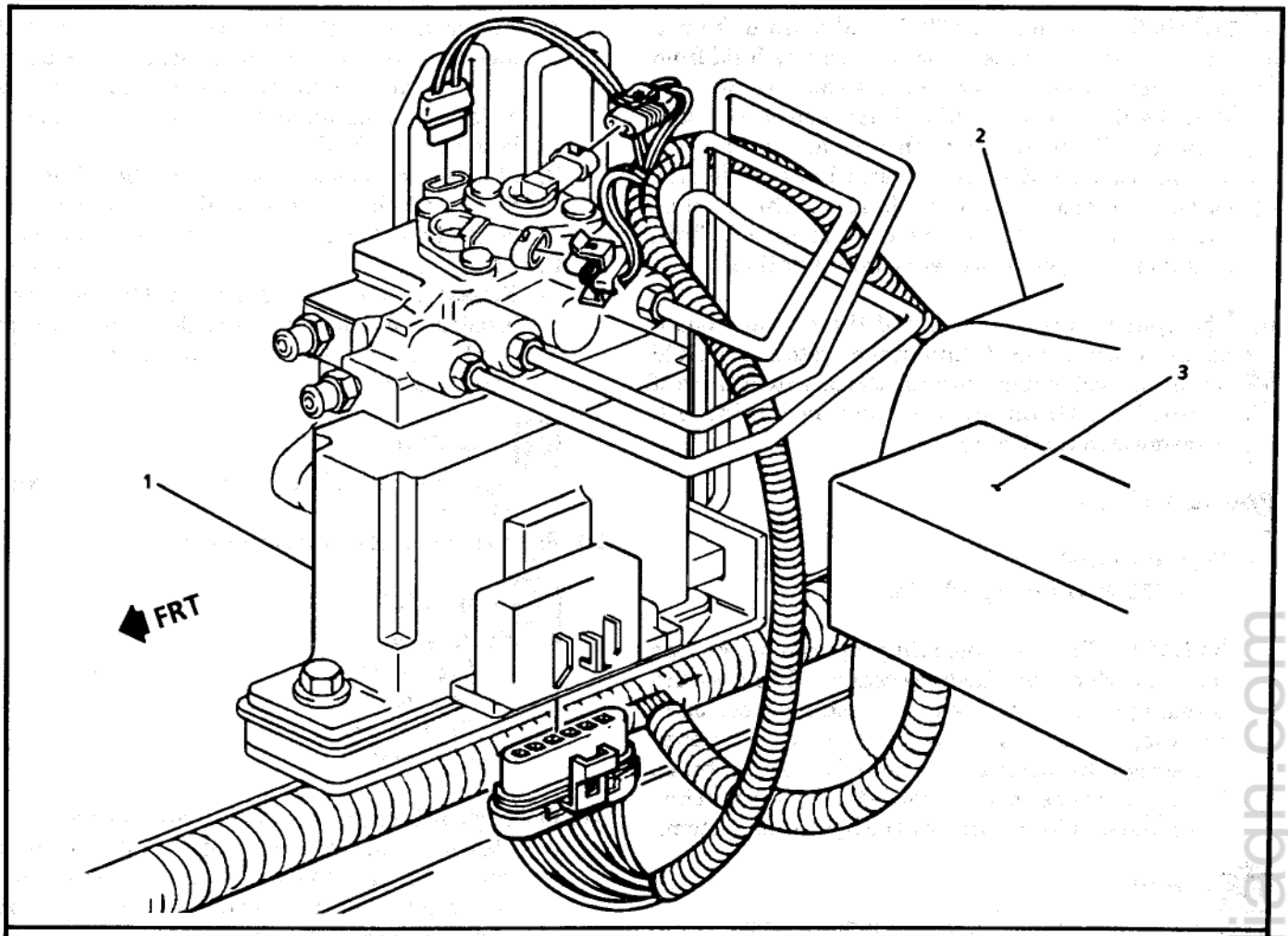
Refer to SECTION 5A.

FLUSHING PROCEDURE

Important

- If evidence of contamination is present in the vehicle's brake fluid, the entire brake system must be flushed following one of the procedures outlined below.
- After flushing the entire brake system, all rubber components must be replaced. Components which must be replaced include: brake hose assemblies, master cylinder rubber parts, brake caliper and wheel cylinder boots and seals, combination valve assembly, hydraulic modulator, and ABS solenoids. Refer to the proper "On-Vehicle Service" for replacement procedures.
- After all rubber components have been replaced, the entire brake system must be re-flushed following one of the procedures outlined below.
- Once the second flushing procedure has been performed, a complete system bleed must be performed, refer to "Bleeding Procedure" in this section.

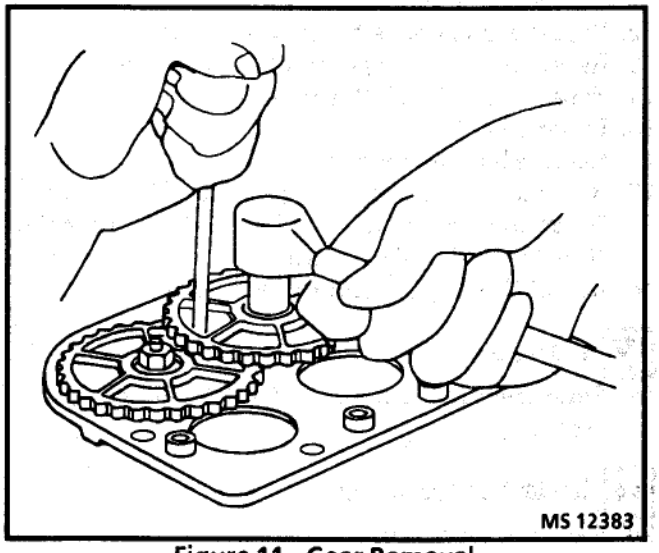
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1 HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY
2 LEFT HAND WHEELHOUSE
3 UNDERHOOD ELECTRICAL CENTER

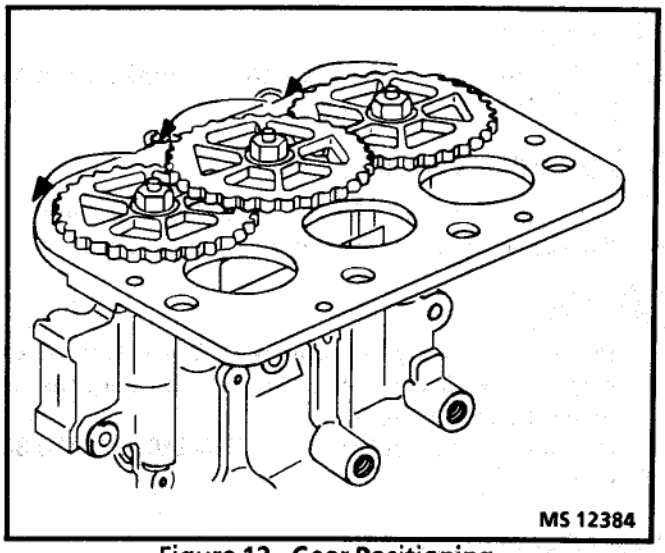
NS 16308

Figure 10 - ABS Hydraulic Modulator/Motor Pack Assembly



MS 12383

Figure 11 - Gear Removal



MS 12384

Figure 12 - Gear Positioning

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NOTICE: Use only DOT 3 brake fluid from a clean, sealed container. Do not use any fluid from a container which is wet with water. Do not use DOT 5 silicone brake fluid. Improper brake fluid, mineral oil (from such things as engine oil, transmission fluid, etc.), or water in the fluid may cause the brake fluid to boil or the rubber components to deteriorate. Keep all fluid containers capped to prevent contamination.

- The system must be flushed if there is any doubt about the condition of fluid in the system or if fluid has been used which contains the slightest trace of mineral oil (from such things as engine oil, transmission fluid, etc.).

Pressure Flush

Tools Required:
J 35589, Bleeding Adapter

NOTICE: Pressure bleeding equipment can be used to perform the flush procedure. The pressure bleeding equipment used for flushing must be of the diaphragm type. It must have a rubber diaphragm between the air supply and the brake fluid to prevent air, moisture, and other contaminants from entering the hydraulic system.

Clean

1. Fluid reservoir cover and surrounding area.

Remove or Disconnect

2. Fluid reservoir cover.
3. Any remaining brake fluid in reservoir.

Inspect

4. Refill reservoir with clean DOT 3 brake fluid to proper level.

Install or Connect

5. Bleeder adaptor J 35589 to brake fluid reservoir.
6. Bleeder adaptor to pressure bleeding equipment.

Adjust

7. Pressure bleeding equipment to 35-70 kPa (5-10 psi) and wait for approximately 30 seconds to insure there is no leakage.
8. Pressure bleed equipment to 205-240 kPa (30-35 psi).

Hydraulic Modulator

9. Proceed as follows with pressure bleeding equipment connected and pressurized:
   A. Attach a clear plastic hose to the rearward bleeder valve on the hydraulic modulator. Place the other end of the hose in a container to collect draining brake fluid. Do not submerge hose end into fluid.
   B. Slowly open bleeder valve and allow fluid to flow until clean brake fluid flows or until at least 118 ml (4 ounces) of fluid is accumulated.
   C. Close valve.
   D. Repeat above procedure for the forward bleeder valve until clean brake fluid flows or until at least 118 ml (4 ounces) of fluid is accumulated.

Tighten

- Hydraulic modulator bleeder valve to 9 N·m (80 lb. in.).

10. Raise vehicle and suitably support.

Important

- Flush sequence:
  - Right rear.
  - Left rear.
  - Right front.
  - Left front.

11. Flush wheel brakes in sequence shown above.
    A. Attach bleeder hose to bleeder valve at each wheel and place the other end into a container to collect draining brake fluid. Do not submerge hose end in fluid.
    B. Slowly open bleeder valve and allow fluid to flow.
    C. Close valve when clean brake fluid begins to flow or at least 235 ml (8 ounces) of fluid is accumulated.
12. Repeat Step 11 on left rear wheel brake.
13. Repeat Step 11 on right front wheel brake.
14. Repeat Step 11 on left front wheel brake.
15. Lower vehicle.
16. Remove bleeder adapter.
17. Replace all rubber components listed under "Flushing Procedure," refer to the appropriate "On-Vehicle Service" section.
18. Repeat flushing procedure one more time.

Inspect

19. Fluid level in reservoir and fill to correct level if necessary.

Install or Connect

20. Fluid reservoir cap.
21. Bleed the entire brake hydraulic system; refer to "Bleeding Procedure" in this section.

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Manual Flush

Important

- In the following steps, use a suitable container and/or shop rags to catch fluid and prevent it from contacting any painted surfaces.

Clean

1. Fluid reservoir cover and surrounding area.

Remove or Disconnect

2. Fluid reservoir cover.
3. Any remaining brake fluid in reservoir.

Inspect

4. Refill reservoir with clean DOT 3 brake fluid to proper level.

Install or Connect

5. Fluid reservoir cover.

Hydraulic Modulator

6. Flush hydraulic modulator as follows:
   A. Attach a clear plastic bleeder hose to rearward bleeder valve on the hydraulic modulator and place the other end of hose in a container to collect draining brake fluid. Do not submerge hose end into fluid.
   B. Slowly open rearward bleeder valve 1/2 to 3/4 turns.
   C. Depress brake pedal until fluid begins to flow.
   D. Close valve and release brake pedal. Repeat above steps until clean brake fluid flows or at least 118 ml (4 ounces) of fluid is accumulated.
   E. Repeat above procedure for the forward bleeder valve until clean brake fluid flows or at least 118 ml (4 ounces) of brake fluid is accumulated.

Tighten

- Hydraulic modulator bleeder valves to 9 N·m (80 lb. in.).

Remove or Disconnect

7. Fluid reservoir cover.

Inspect

8. Fluid level in reservoir and fill to correct level if necessary.

Install or Connect

9. Fluid reservoir cover.
10. Raise vehicle and suitably support.

Important

- Flush sequence:
  - Right rear.
  - Left rear.
  - Right front.
  - Left front.

11. Flush wheel brakes in sequence shown above.
    A. Attach bleeder hose to bleeder valve at each wheel and place the other end into a container to collect draining brake fluid. Do not submerge hose end in fluid.
    B. Open bleeder valve.
    C. Slowly depress brake pedal.
    D. Close valve and slowly release brake pedal.
    E. Repeat above procedure until clean brake fluid flows or at least 235 ml (8 ounces) of fluid is accumulated.
12. Repeat Step 11 on left rear brake.
13. Repeat Step 11 on right front brake.
14. Repeat Step 11 on left front brake.
15. Lower vehicle.
16. Replace all rubber components listed under "Flushing Procedure," refer to the appropriate "On-Vehicle Service" section.
17. Repeat flushing procedure one more time.

Inspect

18. Fluid level in reservoir and fill to correct level if necessary.

Install or Connect

19. Fluid reservoir cap.
20. Bleed the entire brake hydraulic system; refer to "Bleeding Procedure" in this section.

BLEEDING PROCEDURE

NOTICE: If any brake component is repaired or replaced such that air is allowed to enter the brake system, the entire bleeding procedure MUST be followed.

NOTICE: Use only SUPREME 11 (GM 1052542) or equivalent DOT 3 brake fluid from a clean, sealed container. Do not use fluid from an open container that may be contaminated with water. The use of DOT 5 (silicone) brake fluid is not recommended. Reduced braking performance or durability may result.

NOTICE: Avoid spilling brake fluid on any of the vehicle's painted surfaces, wiring, cables or electrical connectors. Brake fluid will damage paint and electrical connections.

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If any fluid is spilled on the vehicle, flush the area with water to lessen the damage.

NOTICE: Prior to bleeding the brakes, the front and rear displacement cylinder pistons must be returned to the topmost position. The preferred method uses a Tech 1 to perform the rehoming procedure. If a Tech 1 is not available, the second procedure may be used, but it is extremely important that the procedure be followed exactly as outlined.

With Tech 1 (Preferred Method)

1. Using a Tech 1 or T-100 (CAMS), select "F5: Motor Rehome." The motor rehome function cannot be performed if current DTCs are present. If DTCs are present, the vehicle must be repaired and DTCs cleared before performing the motor rehome function.
2. The entire brake system should now be bled following either "Pressure Bleeding" or "Manual Bleeding" outlined below.

Without Tech 1

NOTICE: This method can only be used if the "ABS INOP" lamp is not illuminated and no DTCs are present.

Important

- Do not place your foot on the brake pedal through this entire procedure unless specifically directed to do so.

1. Remove foot from brake pedal.
2. Start engine and allow it to run for at least 10 seconds while observing the "ABS INOP" lamp.
3. If the "ABS INOP" lamp turned "ON" and stayed "ON" after about 10 seconds, the bleeding procedure must be stopped and a Tech 1 must be used to diagnose the ABS malfunction.
4. If the "ABS INOP" lamp turned "ON" for approximately 3 seconds, then turned "OFF" and stayed "OFF," turn the ignition "OFF."
5. Repeat Steps 1 through 4 one more time.
6. The entire brake system should now be bled following either "Pressure Bleeding" or "Manual Bleeding" outlined below.

REHOME PROCEDURE

1. Using a Tech 1 or T-100 (CAMS), select F5: Motor Rehome. The motor rehome function cannot be performed if current DTCs are present. If DTCs are present, the vehicle must be repaired and DTCs cleared before performing the motor rehome function.
2. The entire brake system should now be bled following either "Pressure Bleeding" or "Manual Bleeding" outlined below.

Pressure Bleeding

Tools Required:
J 35589, Bleeding Adaptor

NOTICE: Use only DOT 3 brake fluid from a clean, sealed container. Do not use fluid from an open container that may be contaminated with water. Do not use DOT 5 brake fluid.

NOTICE: Pressure bleeding equipment must be of the diaphragm type. It must have a rubber diaphragm between the air supply and the brake fluid to prevent air, moisture and other contaminants from entering the hydraulic system.

Clean

1. Fluid reservoir cover and surrounding area.

Remove or Disconnect

2. Fluid reservoir cover.

Inspect

3. Fluid to be at proper level. Refer to SECTION 5A. Add clean brake fluid as required.

Install or Connect

4. Bleeder adaptor J 35589 to brake fluid reservoir.
5. Bleeder adaptor to pressure bleeding equipment.

Adjust

6. Pressure bleed equipment to 35-70 kPa (5-10 psi) and wait for approximately 30 seconds to insure there is no leakage.
7. Pressure bleed equipment to 205-240 kPa (30-35 psi).

Hydraulic Modulator

8. Proceed as follows with pressure bleeding equipment connected and pressurized:
   A. Attach a clear plastic bleeder hose to the rearward bleeder valve on the hydraulic modulator. Submerge opposite hose end in a clean container partially filled with clean brake fluid.
   B. Slowly open bleeder valve and allow fluid to flow until no air is seen in fluid.
   C. Close valve when fluid flows without any air bubbles.

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D. Repeat Steps 8B and 8C until no air bubbles are present.
E. Relocate the bleeder hose on the forward hydraulic modulator bleeder valve and repeat Steps 8A through 8D.

Tighten

- Hydraulic modulator bleeder valves to 9 N·m (80 lb. in.).

Brake Pipe Connections

Important

- Use a shop cloth to catch escaping brake fluid. Take care to prevent fluid from running down motor pack and entering the motor pack base or into the electrical connector. Also, do not allow brake fluid to contact any painted surfaces as surface damage will occur. If brake fluid does contact any surface, flush surface with water to lessen damage.

9. Proceed to bleed the master cylinder brake connections as follows with pressure bleeding equipment connected and pressurized:
   A. Crack (slightly open) the forward brake pipe tube nut on the master cylinder and check for air in escaping fluid.
   B. When air flow ceases, immediately tighten tube nut.

   Tighten

   - Master cylinder tube nut to 32 N·m (24 lb. ft.).

   C. Repeat Steps 9A and 9B for the rearward master cylinder brake pipe connection.
10. Proceed to bleed the brake combination valve connections as follows with pressure bleeding equipment connected and pressurized:
    A. Crack (slightly open) the forward brake pipe tube nut on the brake combination valve and check for air in escaping fluid.
    B. When air flow ceases, immediately tighten tube nut.

    Tighten

    - Brake combination valve tube nut to 18 N·m (13 lb. ft.).

    C. Repeat Steps 10A and 10B for the rearward brake combination valve pipe connection.
11. Proceed to bleed the hydraulic modulator brake connections as follows with pressure bleeding equipment connected and pressurized:
    A. Crack (slightly open) the forward brake pipe tube nut on the hydraulic modulator and check for air in escaping fluid.
    B. When air flow ceases, immediately tighten tube nut.

    Tighten

    - Hydraulic modulator tube nut to 32 N·m (24 lb. ft.).

    C. Repeat Steps 11A and 11B for the remaining hydraulic modulator brake pipe connections, moving from front to rear.

Wheel Brakes

12. Raise vehicle and suitably support.
13. Proceed as follows to bleed the rear wheel brakes:
    A. Attach a clear plastic bleeder hose to the right rear wheel bleeder valve and submerge opposite hose end in a clean container partially filled with clean brake fluid.
    B. Slowly open bleeder valve and allow fluid to flow.
    C. Close valve when fluid begins to flow without any air bubbles. Tap lightly on the caliper or backing plate to dislodge any trapped air bubbles.
    D. Relocate bleeder hose to the left rear wheel bleeder valve and repeat Steps 13A through 13C.
14. Remove pressure to the pressure bleeding equipment.
15. Attach a clear plastic bleeder hose to the right front wheel bleeder valve and submerge opposite hose end in a clean container partially filled with clean brake fluid.
16. Turn the ignition "ON."
17. Open the bleeder valve and apply the brake until the red "BRAKE" warning lamp turns "ON." This shuttles the brake pressure differential warning valve.
18. Close bleeder valve.
19. Reapply pressure to pressure bleeding equipment.
20. Turn the ignition "OFF."

Important

- Do not reapply the brakes after closing the bleeder valve.

21. Lower vehicle.
22. Repeat the entire Step 8.
23. Raise vehicle and suitably support.
24. Repeat the entire Step 13.
25. Proceed as follows to bleed the front wheel brakes:
    A. Attach a clear plastic bleeder hose to the right front wheel bleeder valve and submerge opposite hose end in a clean container partially filled with clean brake fluid.
    B. Slowly open bleeder valve and allow fluid to flow.

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C. Close valve when fluid begins to flow without any air bubbles. Tap lightly on the caliper to dislodge any trapped air bubbles.
D. Relocate bleeder hose to the left front wheel bleeder valve and repeat Steps 25A through 25C.

26. Lower vehicle.
27. Remove pressure bleeding equipment, including bleeder adapter J 35589.

Inspect

28. Fluid level in reservoir and fill to proper level if necessary.

Install or Connect

29. Fluid reservoir cap.

Inspect

30. With ignition "ON," apply brake pedal with moderate force and hold. Note pedal travel and feel.
    - If pedal feels firm and constant and pedal travel is not excessive, start the engine. With the engine running, recheck the pedal travel. If it's still firm and constant and pedal travel is not excessive, go to Step 31.
    - If pedal feels soft or has excessive travel either initially or after engine start, the following procedure may be used. With the Tech 1, "Release" then "Apply" each motor 2 to 3 times and cycle each solenoid 5 to 10 times. When finished, be sure to "Apply" the front and rear motors to ensure the pistons are in the upmost position. DO NOT DRIVE THE VEHICLE. If a Tech 1 is not available, remove foot from brake pedal, start the engine and allow it to run for at least 10 seconds to initialize the ABS. DO NOT DRIVE THE VEHICLE. After 10 seconds, turn the ignition "OFF." This initialization procedure MUST be repeated 5 times to ensure any trapped air has been dislodged. Now repeat bleeding procedure starting at Step 1.
31. Road test the vehicle.
    - Make several normal (non ABS) stops from a moderate speed to ensure proper brake system function. Allow adequate cooling time between stops.

Manual Bleeding

NOTICE: Use only DOT 3 brake fluid from a clean, sealed container. Do not use brake fluid from an open container that may be contaminated with water. Do not use DOT 5 brake fluid.

Important

- In the following steps, use a suitable container and/or shop cloths to catch fluid and prevent it from contacting any painted surfaces.

Clean

1. Fluid reservoir cover and surrounding area.

Remove or Disconnect

2. Fluid reservoir cover.

Inspect

3. Fluid level in reservoir and fill to the correct level if necessary.

Install or Connect

4. Fluid reservoir cover.

Hydraulic Modulator

5. Prime hydraulic modulator as follows:
   A. Attach clear plastic bleeder hose to the rearward bleeder valve on the hydraulic modulator. Submerge opposite hose end in a clean container partially filled with clean brake fluid.
   B. Slowly open rearward bleeder valve 1/2 to 3/4 turns.
   C. Depress brake pedal and hold until fluid begins to flow.
   D. Close valve and release brake pedal.
   E. Repeat Steps 5B and 5D until no air bubbles are present.
   F. Relocate the bleeder hose on the forward hydraulic modulator bleeder valve and repeat Steps 5A through 5E.

Important

- Once fluid is seen to flow from both modulator bleeder valves, the hydraulic modulator is sufficiently full of fluid. However, it may not be completely purged of air. At this point move to the wheel brakes and bleed them. This ensures that the lowest points in the system are completely free of air and then the hydraulic modulator can be purged of any remaining air.

Remove or Disconnect

6. Fluid reservoir cover.

Inspect

7. Fluid level in reservoir and fill to the correct level if necessary.

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Install or Connect

8. Fluid reservoir cover.

Wheel Brakes

9. Raise vehicle and suitable support.

Important

- Bleed sequence:
  - Right rear.
  - Left rear.
  - Right front.
  - Left front.

10. Bleed wheel brakes in sequence shown above.
    A. Attach a clear plastic bleeder hose to the bleeder valve at each wheel and submerge opposite hose end in a clean container partially filled with clean brake fluid.
    B. Open bleeder valve.
    C. Slowly depress brake pedal.
    D. Close valve and slowly release brake pedal.
    E. Wait 5 seconds.
    F. Repeat Steps 10B through 10E until the brake pedal feels firm and no air bubbles are observed in the bleeder hose.
       - To assist in freeing entrapped air, tap lightly on caliper or backing plate with a rubber mallet.
11. Repeat Step 10 on left rear wheel brake.
12. Repeat Step 10 on right front wheel brake.
13. Repeat Step 10 on left front wheel brake.
14. Lower vehicle.

Remove or Disconnect

15. Fluid reservoir cover.

Inspect

16. Fluid level in reservoir and fill to the correct level if necessary.

Install or Connect

17. Fluid reservoir cover.
18. Bleed the hydraulic modulator.
    A. Attach a clear plastic bleeder hose to the rearward bleeder valve on the hydraulic modulator. Submerge opposite hose end in a clean container partially filled with clean brake fluid.
    B. Depress brake pedal with moderate force.
    C. Slowly open rearward bleeder valve 1/2 to 3/4 turns and allow fluid to flow.
    D. Close valve and slowly release brake pedal.
    E. Wait 5 seconds.
    F. Repeat Steps 18B through 18E until the no air bubbles are observed in the bleeder hose.
    G. Relocate the bleeder hose on the forward hydraulic modulator bleeder valve and repeat Steps 18A through 18F.

Tighten

- Hydraulic modulator bleeder valves to 9 N·m (80 lb. in.).

Remove or Disconnect

19. Fluid reservoir cover.

Inspect

20. Fluid level in reservoir and fill to the correct level if necessary.

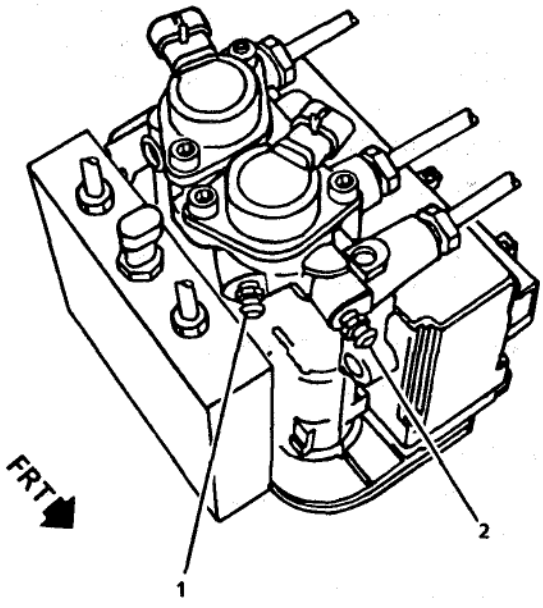
Install or Connect

21. Fluid reservoir cover.

Inspect

22. With ignition "ON" apply brake pedal with moderate force and hold. Note pedal travel and feel.
    - If pedal feels firm and constant and pedal travel is not excessive, start the engine. With the engine running, recheck the pedal travel. If it's still firm and constant and pedal travel is not excessive, go to Step 23.
    - If pedal feels soft or has excessive travel either initially or after engine start, the following procedure may be used. With the Tech 1, "Release" then "Apply" each motor 2 to 3 times and cycle each solenoid 5 to 10 times. When finished, be sure to "Apply" the front and rear motors to ensure the pistons are in the upmost position. DO NOT DRIVE THE VEHICLE. If a Tech 1 is not available, remove foot from brake pedal, start the engine and allow it to run for at least 10 seconds to initialize the ABS. DO NOT DRIVE THE VEHICLE. After 10 seconds, turn the ignition "OFF." This initialization procedure MUST be repeated 5 times to ensure any trapped air has been dislodged. Now repeat bleeding procedure starting at Step 1.
23. Road test the vehicle.
    - Make several normal (non-ABS) stops from a moderate speed to ensure proper brake system function. Allow adequate cooling time between stops.

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1 REARWARD BLEEDER VALVE

2 FORWARD BLEEDER VALVE

NS 16304

Figure 13 - ABS Hydraulic Modulator Bleeder Locations

HYDRAULIC MODULATOR BLEEDER VALVES
Figure 13

Remove or Disconnect
- Damaged bleeder valve or valves.

Install or Connect
- New bleeder valve or valves.

Tighten
- Bleeder valve to 9 N·m (80 lb. in.).

HYDRAULIC MODULATOR SOLENOID
Figure 14

Remove or Disconnect
1. Solenoid electrical connector.
2. Torx® head bolts.
3. Solenoid.

Important
- Be sure the seal is still attached to the solenoid when it is removed. If not, check solenoid bore in modulator.
- Do not attempt to disassemble solenoid, it is serviceable only as an assembly.
- Lubricate seal on new solenoid with clean brake fluid.

Install or Connect
1. New solenoid.
   - Verify that the solenoid lip seal is properly positioned before solenoid is installed in hydraulic modulator (refer to Figure 14).
   - Position solenoid so that its electrical connector will face the same direction as the solenoid that was removed.
   - By hand, press down firmly on solenoid until its flange seats on ABS hydraulic modulator.
2. Torx® head bolts.

Tighten
- Bolts to 4.5 N·m (40 lb. in.).

3. Solenoid electrical connector to solenoid.

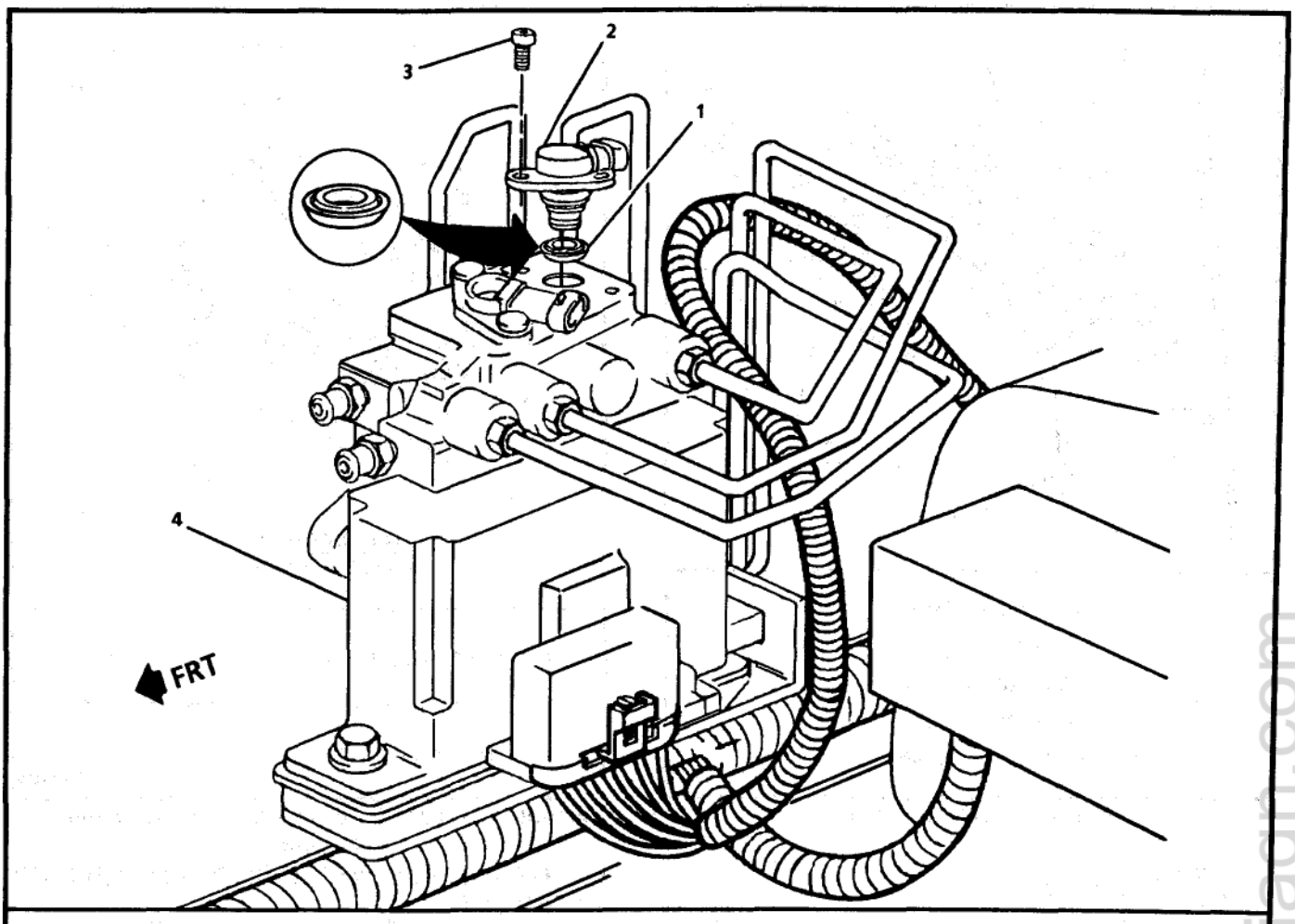
Important
- Make sure the solenoid connectors are installed on correct solenoids.
- It is necessary to bleed the entire system. Refer to "Bleeding System" in this section.

HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY
Figure 10

CAUTION: To help avoid personal injury, due to a retained load on the hydraulic modulator, the gear tension relief function of the Tech 1 must be performed prior to the removal of the ABS hydraulic modulator.

Remove or Disconnect
1. Using Tech 1, perform "Gear Tension Relief Sequence," as outlined in this section.
2. Air cleaner duct assembly.
3. Two solenoid electrical connectors.
4. Brake pressure differential warning switch electrical connector.
5. 6-pin motor pack electrical connector.
6. Five brake pipes (two to master cylinder, three to wheel brakes).
   - Place shop cloth on top of motor pack to catch any dripping fluid. Take care not to allow any brake fluid to enter the bottom of the motor pack or the electrical connectors. Plug open brake pipes to prevent fluid loss and contamination.
7. Bolt attaching front of hydraulic modulator/motor pack assembly to frame rail.
8. Hydraulic modulator/motor pack assembly from vehicle.

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1	SOLENOID LIP SEAL	3	TORX® HEAD BOLT
2	SOLENOID	4	HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY

NS 16309

Figure 14 - Hydraulic Modulator Solenoid Removal

Install or Connect

1. Hydraulic modulator/motor pack assembly in vehicle.
2. Bolt attaching hydraulic modulator/motor pack assembly to frame rail.

Tighten

- Bolt to 9.0 N·m (80 lb. in.).

3. Five brake pipes to hydraulic modulator/motor pack assembly.
4. 6 pin motor pack electrical connector.
5. Brake pressure differential warning switch electrical connector.
6. Two solenoid electrical connectors.

Important

- Bleed entire brake system as outlines in "Bleeding System" in this section.

Tighten

- Two brake combination valve tube nuts to 18 N·m (13 lb. ft.).
- Three hydraulic modulator tube nuts to 32 N·m (24 lb. ft.).

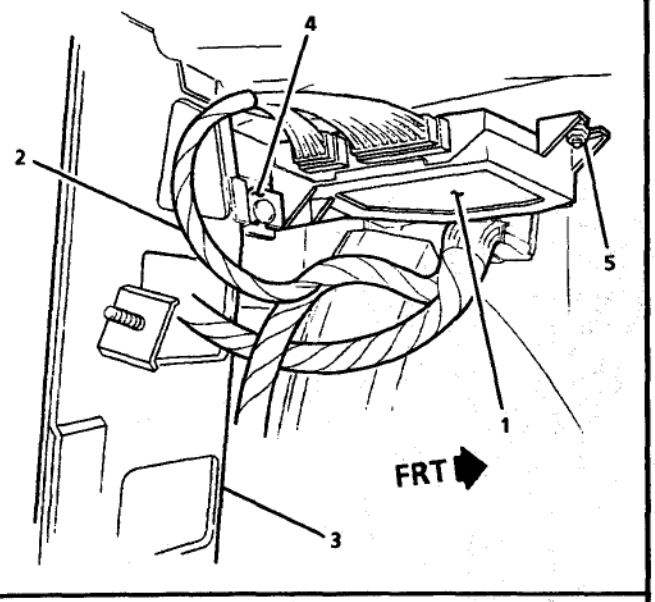
ELECTRONIC BRAKE CONTROL MODULE (EBCM)

Figure 15

Remove or Disconnect

1. Fasteners on lower sound insulator panel under steering column.
2. Lower sound insulator panel from vehicle.
3. Manual transmission only: left side kick panel.
4. Nut attaching EBCM bracket to upper I/P.
5. Push in retainer ("Christmas Tree") attaching EBCM bracket to sidewall.

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1 EBCM AND BRACKET
2 EBCM HARNESS
3 LEFT HAND KICK PANEL
4 PUSH-IN RETAINER
5 MOUNTING STUD AND NUT

NS 16187

Figure 15 - EBCM Location

Important

- It will be necessary to cut the push in retainer head off to remove EBCM bracket. Do not attempt to pry fastener out as damage to the EBCM bracket may result.

6. EBCM and EBCM bracket from mounting place.
7. EBCM electrical connectors.
8. EBCM from vehicle.
9. Remaining portion of push in retainer.

Important

- It is necessary to remove the destroyed retainer to insure proper retaining force when installing the new push in retainer.

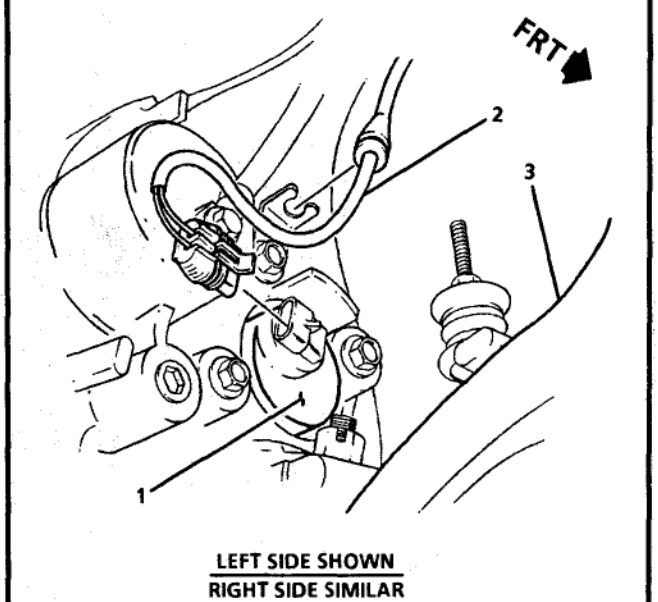
Install or Connect

1. EBCM electrical connectors.
2. EBCM and EBCM bracket into mounting location.
3. New push in retainer ("Christmas Tree") attaching EBCM bracket to sidewall.
4. Nut attaching EBCM bracket to upper I/P.

Tighten

- Nut to 25.0 N·m (18.5 lb. ft.).

5. Manual transmission only: left side kick panel.
6. Lower sound insulator panel and fasteners.



LEFT SIDE SHOWN
RIGHT SIDE SIMILAR

1 FRONT WHEEL SPEED SENSOR
2 FRONT WHEEL SPEED SENSOR JUMPER HARNESS
3 LOWER CONTROL ARM

NS 16186

Figure 16 - Front Wheel Bearing and Speed Sensor Assembly

FRONT WHEEL BEARING AND SPEED SENSOR ASSEMBLY

Figure 16

Important

- The front wheel speed sensors and rings are integral with the hub and bearing assemblies. Should a speed sensor or ring require replacement, the entire hub and bearing assembly must be replaced. Refer to SECTION 3C.

FRONT WHEEL SPEED SENSOR JUMPER HARNESS

Figure 17

Raise and support vehicle on a suitable hoist as indicated in SECTION 0A.

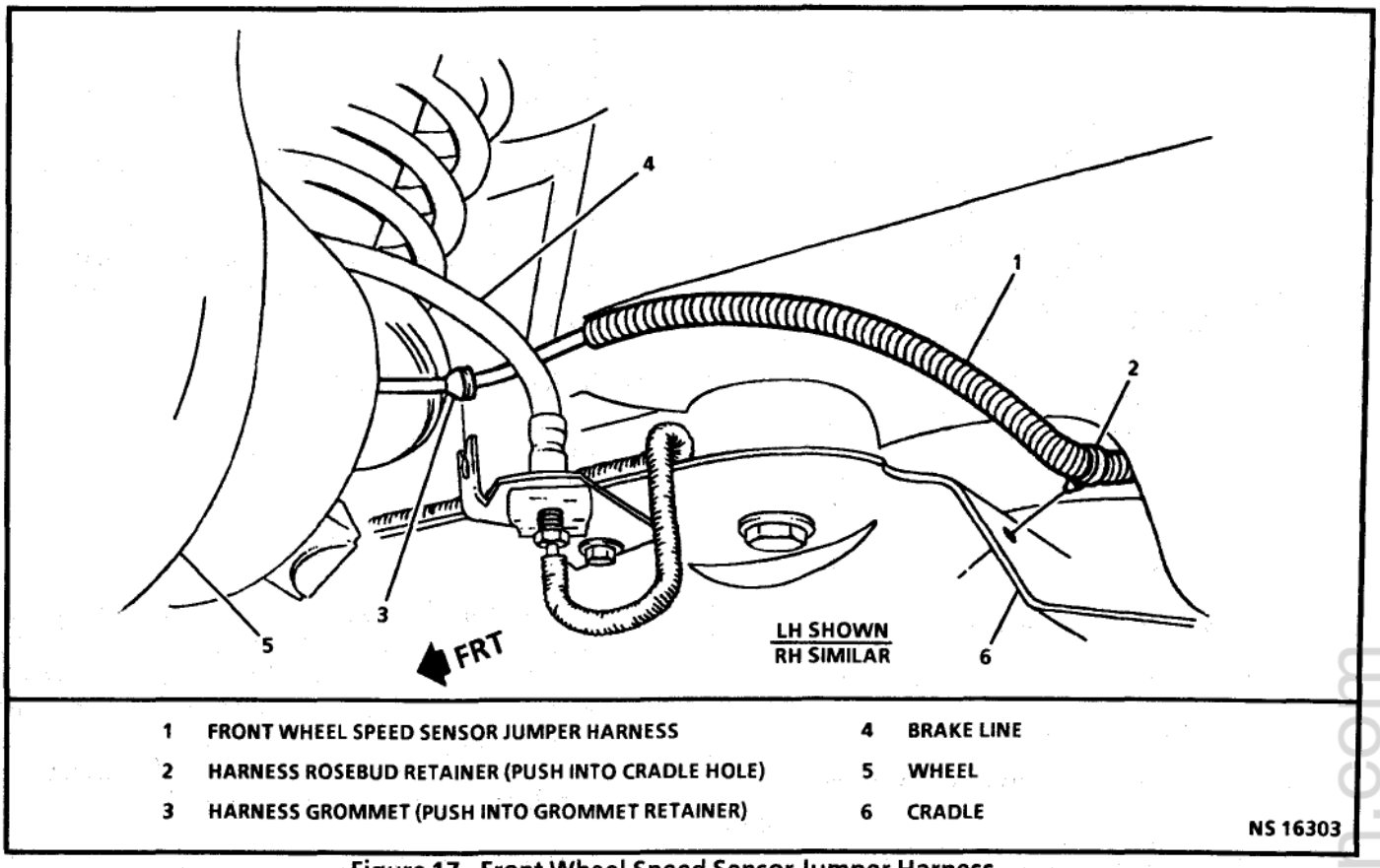
Remove or Disconnect

1. Connector from wheel speed sensor.
2. Harness from retaining clips.
3. Harness grommets from retainers.
4. Upper jumper harness connector attached to inside of frame rail.

Install or Connect

1. Upper jumper harness connector attached to inside of frame rail.

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1	FRONT WHEEL SPEED SENSOR JUMPER HARNESS	4	BRAKE LINE
2	HARNESS ROSEBUD RETAINER (PUSH INTO CRADLE HOLE)	5	WHEEL
3	HARNESS GROMMET (PUSH INTO GROMMET RETAINER)	6	CRADLE

NS 16303

Figure 17 - Front Wheel Speed Sensor Jumper Harness

2. Harness to retaining clips.
3. Harness rubber grommets into retainers.
4. Connector to wheel speed sensor.

REAR WHEEL SPEED SENSOR
Figure 18

Raise and support vehicle on a suitable hoist as indicated in SECTION 0A.

Remove or Disconnect

1. Connector from wheel speed sensor.
2. Jumper harness grommet from retainer.
3. Bolt attaching sensor to differential housing.
4. Sensor from differential housing.

Install or Connect

1. Sensor into differential housing.

Important

- Be sure to lubricate sensor O-ring with differential oil before installing sensor into differential housing.

2. Bolt attaching sensor to differential housing.

Tighten

- Bolt to 10 N·m (89 lb. in.).

3. Connector to wheel speed sensor.
4. Jumper harness grommet into retainer.

REAR WHEEL SPEED SENSOR TOOTHED RING

Important

- The rear wheel speed sensor toothed ring is an integral part of the rear differential case. If it has been determined that the toothed ring must be replaced, refer to SECTION 4B for removal and installation procedures.

REAR WHEEL SPEED SENSOR JUMPER HARNESS

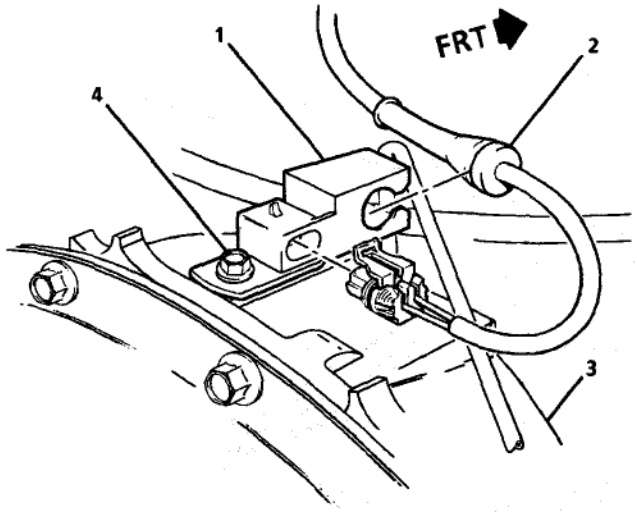
Remove or Disconnect

1. Connector from wheel speed sensor.
2. Jumper harness grommet from retainer.
3. Upper jumper harness connector from rear body pass-thru connector.

Install or Connect

1. Upper jumper harness connector to rear body pass-thru connector.
2. Connector to wheel speed sensor.
3. Jumper harness grommet into retainer.

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1 REAR WHEEL SPEED SENSOR
2 REAR WHEEL SPEED SENSOR JUMPER HARNESS
3 REAR AXLE HOUSING
4 REAR WHEEL SPEED SENSOR MOUNTING BOLT
NS 16185

Figure 18 - Rear Wheel Speed Sensor

ENABLE RELAY
Figure 19

Remove or Disconnect
1. Enable relay cover.
2. Relay from connector.

Install or Connect
1. Relay to connector.
2. Enable relay cover.

BRAKE COMBINATION VALVE

Refer to SECTION 5A.

WARNING/INDICATOR LAMPS

Refer to SECTION 8C for replacement procedures and detailed information.

ELECTRICAL CONNECTORS
Figure 20

Some ABS VI components are equipped with electrical connectors using a Connector Position Assurance (CPA) lock. This feature insures that when the connectors are installed they are aligned properly and connected securely.

Important
- Remove the lock before separating the electrical connectors.
- Take care not to damage the locking pin during removal.
- Make sure that the rubber connector seal is in place on the connector before and after connection.
- Always install the lock after the connection is made.

FUSE AND FUSIBLE LINKS

Refer to SECTION 8A-11 for repair or replacement information.

UNIT REPAIR

CAUTION: To help avoid personal injury, due to a retained load on the ABS hydraulic modulator/motor pack assembly, the gear tension relief function of the Tech 1 must be performed prior to removal of the ABS hydraulic modulator/motor pack assembly.

NOTICE: The following service procedures shall be performed only after the hydraulic modulator/motor pack assembly has been removed from the vehicle. Do not perform these procedures with the unit installed on the vehicle. Complete overhaul of the hydraulic modulator/motor pack assembly is not authorized - only the following steps. These steps will break the unit down into major components for replacement purposes.

GEAR COVER
Figure 21

Disassemble
1. Torx® head screws attaching gear cover.
2. Remove gear cover.

Assemble
1. Gear cover to hydraulic modulator/motor pack assembly.
2. Torx® head screws.

Tighten
- Torx® bolts to 4 N·m (35 lb. in.).

MOTOR PACK
Figure 21

Disassemble
1. Remove gear cover.

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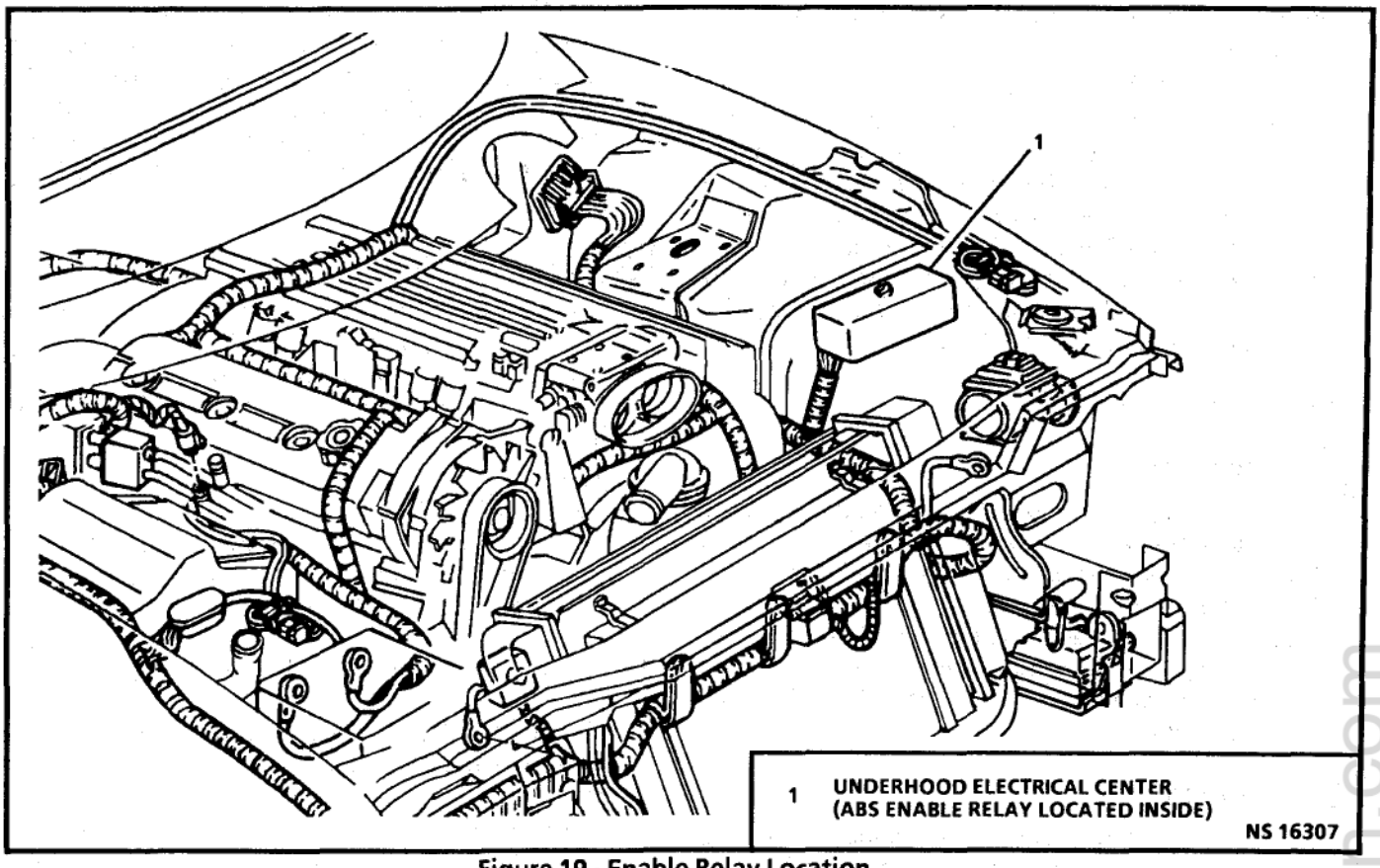


Figure 19 - Enable Relay Location

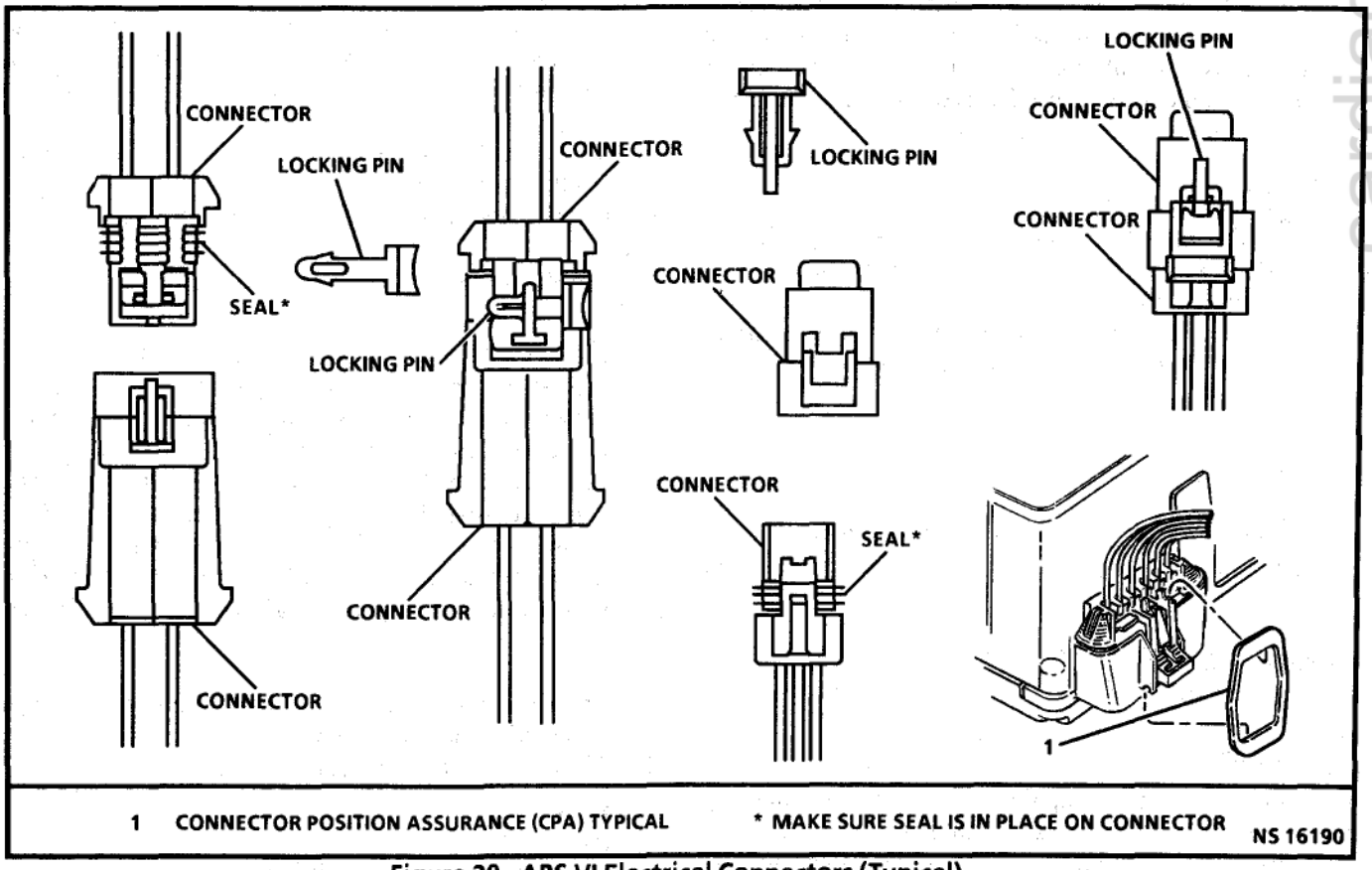


Figure 20 - ABS VI Electrical Connectors (Typical)

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2. Four Torx® head screws attaching motor pack.

Important

- Use care when handling motor pack to ensure motor pack connector is not damaged, or accidental intrusion of brake fluid into the motor pack does not occur. This may result in a premature failure of the motor pack.
- Take care in handling the motor pack. If dropped or damaged during handling, the motor pack must be replaced.

3. Remove motor pack.

Important

- If disassembly of the hydraulic modulator/motor pack assembly was due to a ABS hydraulic functional test that did not pass, the "Automated Motor Pack Diagnosis Test" described in this section should be performed at this time to isolate the motor pack or hydraulic modulator.
- No repair of the motor pack is authorized. Replace as an assembly.

Assemble

1. With the hydraulic modulator upside down, and the gears facing you, rotate each hydraulic modulator gear counterclockwise until movement stops. This procedure will position the pistons very close to the top of the modulator bore, simplifying the brake bleeding procedure (refer to Figure 12).
2. Motor pack to hydraulic modulator.

Important

- Take care in handling the motor pack. If dropped or damaged during handling the motor pack must be replaced.
- Align each of the three motor pack pinions with the hydraulic modulator gears.

3. Four Torx® head screws.

Tighten

- Torx® head screws to 4.5 N·m (40 lb. in.).

4. Gear cover to hydraulic modulator/motor pack assembly.

GEAR REPLACEMENT
Figures 11 and 12

Important

- Do not attempt to repair damaged motor packs or hydraulic modulators. Other than modulator drive gear replacement, repair of these assemblies is not authorized. Do not lubricate or oil gears on motor pack.

CAUTION: The modulator drive gears are under spring load and will turn during disassembly. After removing hydraulic modulator drive gear cover, exercise extreme care not to place fingers into the gear set, since fingers can be pinched by rotating gears.

Disassemble

1. Hydraulic modulator. Refer to "Hydraulic Modulator" in this section.
2. Torx® head screws attaching gear cover.
3. Four motor pack to hydraulic modulator Torx® head screws.

Important

- Take care in handling the motor pack. If dropped or damaged in the handling, the motor pack must be replaced.

4. Separate motor pack from hydraulic modulator.

NOTICE: Do not allow gear to turn while removing the retaining nut, since the modulator piston can hit the top of the modulator bore, damaging the piston. Turn the modulator gear to position the piston in the center of its travel. Place a screwdriver through the holes in the gears (not between the gears) into the recessed hole in the modulator base. This will prevent the gear from turning, aiding in gear removal.

5. Three modulator drive gear to modulator drive shaft retaining nuts.
6. Gears from modulator (refer to Figure 11).

Assemble

NOTICE: Do not allow gear to turn while tightening the retaining nut, since the modulator piston can bottom out in the modulator bore damaging the piston. Turn the modulator gear to position the piston in the center of its travel. Place a screwdriver through the holes in the gears (not between the gears) into the recessed hole in the modulator base. This will prevent the gear from turning, aiding in gear installation (refer to Figure 11).

1. Position hydraulic modulator drive gears onto hydraulic modulator drive shaft.
2. Three gear retaining nuts.

Tighten

- Nuts to 8.5 N·m (76 lb. in.).

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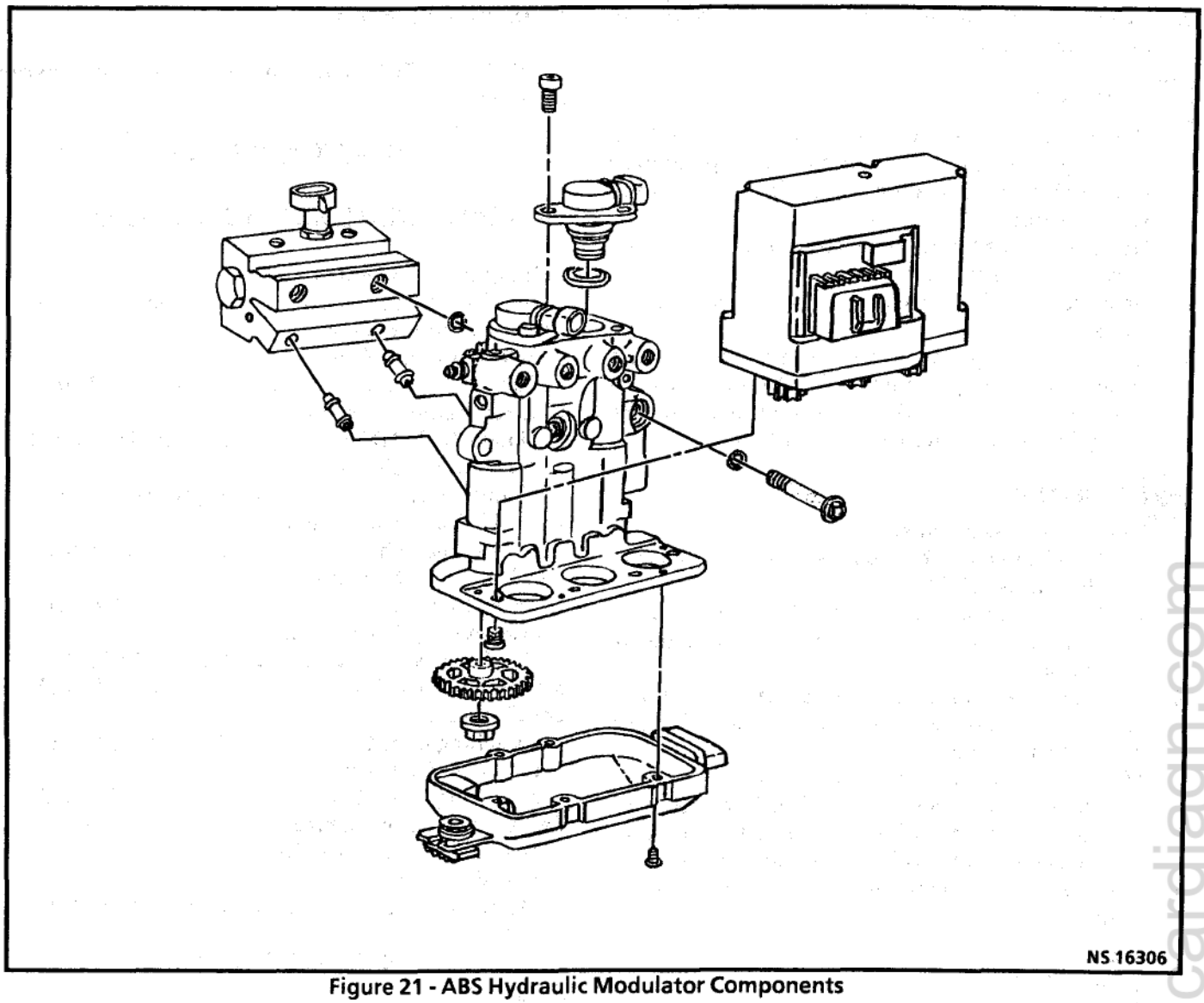


Figure 21 - ABS Hydraulic Modulator Components

3. With the hydraulic modulator upside down, and the gears facing you, rotate each hydraulic modulator gear counterclockwise until movement stops. This procedure will position the pistons very close to the top of the hydraulic modulator bore, simplifying the brake bleeding procedure (refer to Figure 12).
4. Position motor pack onto hydraulic modulator, aligning the three motor pack gears with the modulator gears.

Important

- Take care in handling the motor pack. If dropped or damaged during handling, the motor pack must be replaced.

5. Four motor pack to hydraulic modulator Torx® head screws.

Tighten

- Torx® head screws 4.5 N·m (40 lb. in.).

6. Gear cover onto hydraulic modulator with Torx® head screws.

Tighten

- Torx® head screws to 4 N·m (35 lb. in.).

7. Hydraulic modulator. Refer to "Hydraulic Modulator" in this section.

HYDRAULIC MODULATOR
Figure 21

Disassemble

1. Remove gear cover. Refer to "Gear Cover" in this section.
2. Remove motor pack. Refer to "Motor Pack" in this section.
3. Two hydraulic modulator to brake combo valve banjo bolts; separate hydraulic modulator from brake combo valve.
4. Two transfer tubes with O-rings from brake combo valve or hydraulic modulator.

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5. Banjo bolt O-rings from brake combo valve and hydraulic modulator.

Important

- If hydraulic modulator is to be replaced, install the three gears in the same location on replacement hydraulic modulator. Refer to "Gear Replacement" in this section.
- No repair of the hydraulic modulator is authorized. Replace as an assembly.
- Refer to SECTION 5A for repair of brake combo valve.
- Use new transfer tube assemblies when assembling the hydraulic modulator/brake combo valve assembly. Make sure two O-rings are properly installed on each transfer tube.

Assemble

1. Two transfer assemblies.
   - Lubricate transfer tube assembly O-rings with clean brake fluid.
   - Install transfer tube assemblies in ports in hydraulic modulator and push in by hand to bottom.
2. Lubricate new banjo bolt O-ring with clean brake fluid and install into the brake combo valve and hydraulic modulator.
3. Hydraulic modulator to brake combo valve.
   - Hold brake combo value and rock into position on hydraulic modulator inserting transfer tube assemblies into brake combo valve ports.
4. Two hydraulic modulator to brake combo valve banjo bolts.

Tighten

- Banjo bolts to 16 N·m (12 lb. ft.).

5. With the hydraulic modulator upside down, and the gears facing you, rotate each hydraulic modulator gear counterclockwise until movement stops. This procedure will position the pistons very close to the top of the modulator bore simplifying the brake bleeding procedure (refer to Figure 12).
6. Motor pack to hydraulic modulator.
7. Gear cover to hydraulic modulator/motor pack assembly.

MASTER CYLINDER

Refer to SECTION 5A for repair of master cylinder.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

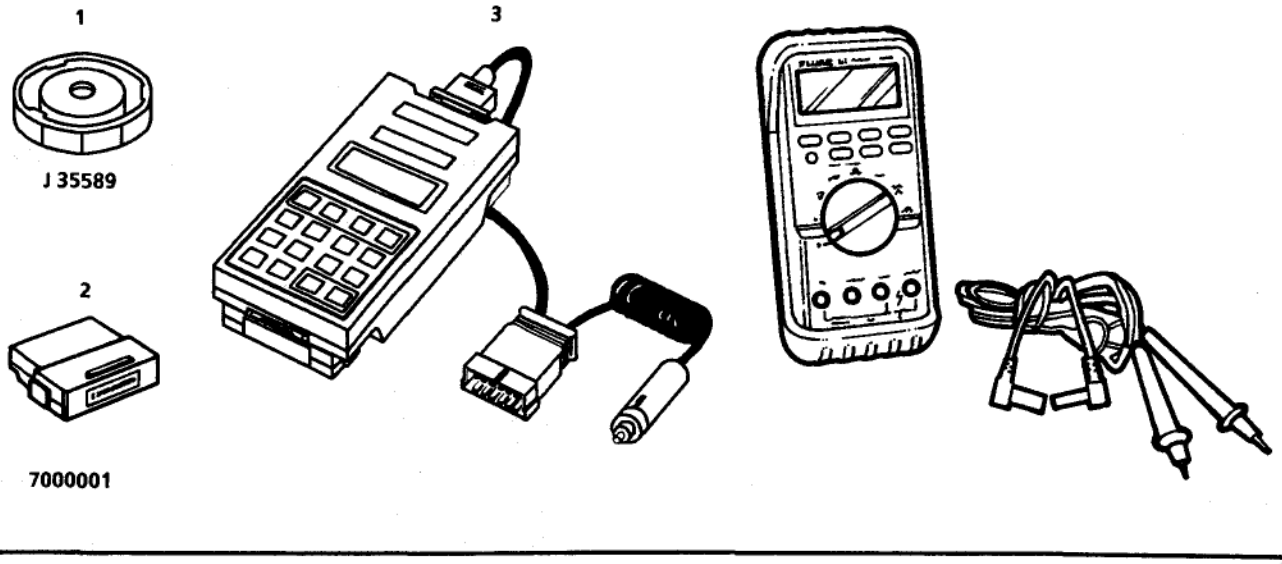
ABS Hydraulic Modulator Bleeder Valves	9.0 N·m (80 lb. in.)
ABS Hydraulic Modulator Solenoid Torx® Head Bolt	4.5 N·m (40 lb. in.)
Electronic Brake Control Module (EBCM) Nut	25 N·m (18.5 lb. ft.)
ABS Hydraulic Modulator Mounting Bolt	9.0 N·m (80 lb. in.)
Three Hydraulic Modulator Brake Pipe Tube Nuts	32 N·m (24 lb. ft.)
Two Brake Combination Valve Brake Pipe Tube Nuts	18 N·m (13 lb. ft.)
Two Master Cylinder Brake Pipe Tube Nuts	32 N·m (24 lb. ft.)
Modulator Drive Gear Nuts	8.5 N·m (75 lb. in.)
Torx® Head Screws Attaching Gear Cover	4.0 N·m (35 lb. in.)
Four Torx® Head Screws Attaching Motor Pack	4.5 N·m (40 lb. in.)
Two Banjo Bolts Attaching Brake Combination Valve to ABS Hydraulic Modulator	16 N·m (12 lb. ft.)

SPECIAL TOOLS

Figure 22

The J 39200 High Impedance Multimeter is the only DVM authorized for use in diagnosing and servicing the ABS VI system.

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1	BRAKE BLEEDING ADAPTER	3	TECH 1 SCAN TOOL
2	MASS STORAGE CARTRIDGE	4	J 39200 - DIGITAL MULTIMETER

NS 16305

Figure 22 - ABS VI Special Tools

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