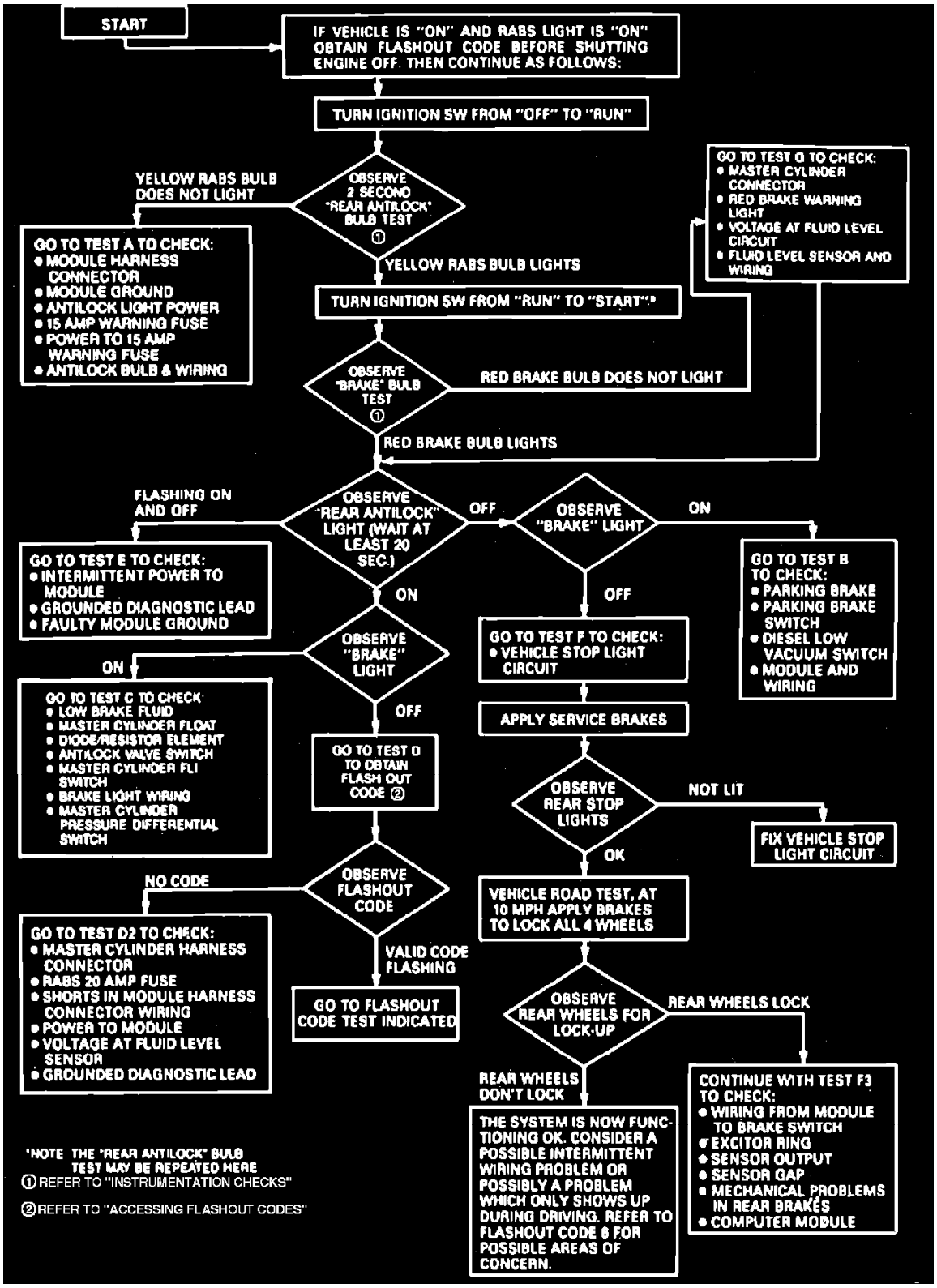
Antilock Brakes / Traction Control Systems: Testing and Inspection



Anti-Lock Brake System Troubleshooting Chart

Description of On-Board Diagnostics

Two warning lamps are located on the instrument panel to alert the driver to a system malfunction. The red brake warning lamp is used to indicate conventional brake system malfunctions such as low fluid level, parking brake applied and low vacuum conditions (diesel engines only). The yellow anti-lock system warning lamp is used to indicate proper warning lamp circuit operation (2 second illumination with ignition On or engine cranking). If yellow lamp comes on while vehicle is being driven, it is alerting the driver of an anti-lock system malfunction and yellow lamp can then be used to access flashout codes. This self-test feature contains 13 codes to indicate area of system malfunction. When a malfunction is detected within the system,

the computer module will shutdown the anti-lock system and illuminate the yellow warning lamp on the instrument panel. This will permit normal braking and at the same time will store a code in the system memory which can be retrieved by grounding the diagnostic connector of the computer module and counting the number of flashes of the yellow light. If the ignition is turned off before diagnosis is performed, the code stored will be lost. In this case, the vehicle must be started and driven to reproduce the condition. If more than one fault exists, only the first code recorded will be displayed. Additional codes will output only after the first fault has been corrected.

CONDITION	ACTION TO TAKE
No Flashout Code	See Flashout Code 0
Yellow REAR ANTILOCK Light Flashes 1 Time This Code Should Not Occur	See Flashout Code 1
Yellow REAR ANTILOCK Light Flashes 2 Times Open Isolate Circuit	See Flashout Code 2
Yellow REAR ANTILOCK Light Flashes 3 Times Open Dump Circuit	See Flashout Code 3
Yellow REAR ANTILOCK Light Flashes 4 Times Red Brake Warning Light Illuminated RABS Valve Switch Closed or Open Dump Valve	See Flashout Code 4
Yellow REAR ANTILOCK Light Flashes 5 Times System Dumps Too Many Times in 2WD (2WD and 4WD vehicles) Condition Occurs While Making Normal or Hard Stops. Rear Brake May Lock	See Flashout Code 5
Yellow REAR ANTILOCK Light Flashes 6 Times (Sensor Signal Rapidly Cuts In and Out) Condition Only Occurs While Driving	See Flashout Code 6
Yellow REAR ANTILOCK Light Flashes 7 Times No Isolate Valve Self Test	See Flashout Code 7
Yellow REAR ANTILOCK Light Flashes 8 Times No Dump Valve Self Test	See Flashout Code 8
Yellow REAR ANTILOCK Light Flashes 9 Times High Sensor Resistance	See Flashout Code 9
Yellow REAR ANTILOCK Light Flashes 10 Times Low Sensor Resistance	See Flashout Code 10
Yellow REAR ANTILOCK Light Flashes 11 Times Stop Lamp Switch Circuit Defective. Condition Indicated Only When Driving Above 35 mph	See Flashout Code 11
Yellow REAR ANTILOCK Light Flashes 12 Times Low Brake Fluid Level Detected During Antilock Stop	See Flashout Code 12
Yellow REAR ANTILOCK Light Flashes 13 Times Speed Processor Check	See Flashout Code 13
Yellow REAR ANTILOCK Light Flashes 14 Times Program Check	See Flashout Code 14
Yellow REAR ANTILOCK Light Flashes 15 Times Memory Failure	See Flashout Code 15
Yellow REAR ANTILOCK Light Flashes 16 Times or More 16 or More Flashes Should Not Occur	See Flashout Code 16

NOTE: Refer to Obtaining the Flashout Code in this Section for procedure to obtain flashout code.

CAUTION: WHEN CHECKING RESISTANCE IN THE RABS SYSTEM, ALWAYS DISCONNECT THE BATTERY. IMPROPER RESISTANCE READINGS MAY OCCUR WITH THE VEHICLE BATTERY CONNECTED.

Fig. 46 Flashout Code Chart

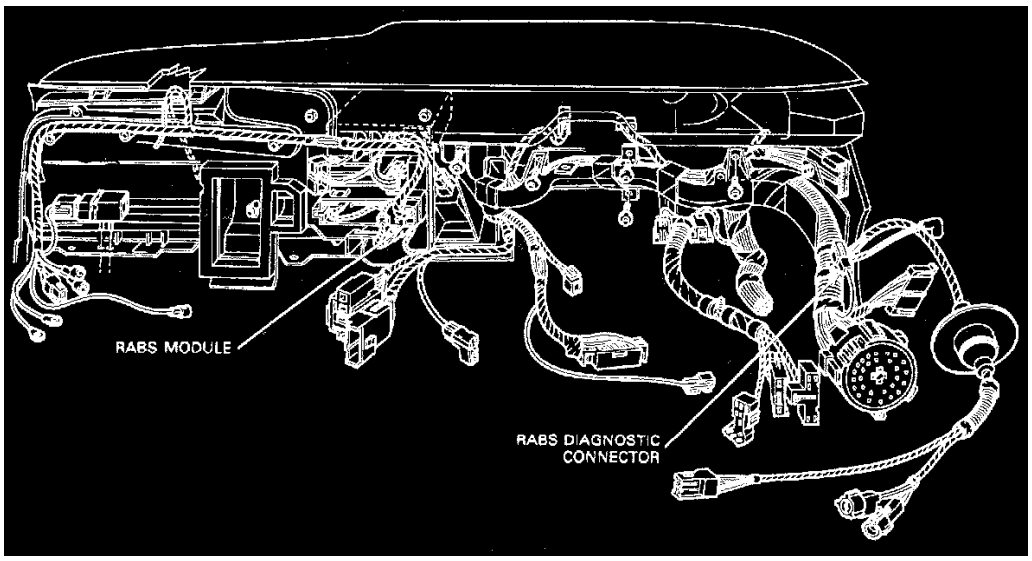
When only the yellow anti-lock brake system warning lamp is illuminated during vehicle operation (red brake system warning lamp is off), a service condition is present in the anti-lock brake system. At this point, a code will be stored in the computer module until the ignition switch is placed in the Off position. It is recommended that the fault code be obtained before the ignition is placed in the Off position. If ignition is placed in the Off position before obtaining the fault code, the vehicle may have to be driven in an effort to recreate the service condition.

If more than one service code is present, the first recognized flash out code can be obtained. If the yellow warning lamp is illuminated, but no fault codes are stored, a loss of power to the module, low brake fluid level or defective low brake fluid warning system may be present. In the case of low fluid level and defective brake fluid level warning system, the red brake system warning lamp may also be illuminated.

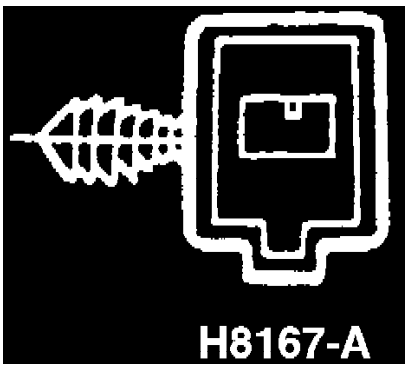
Displaying and Reading Trouble Codes

NOTE: Ford **DOES NOT** provide procedures other than those described to retrieve trouble codes.

1. If ignition switch has been placed in Off position, start engine and operate vehicle in an effort to recreate the service condition.



RABS Diagnostic Connector



Diagnostic Connector View

2. Connect suitable jumper wire to the diagnostic connector (black/orange wire) then momentarily ground jumper wire to chassis. As ground connection is made and broken, the yellow warning lamp will begin to flash the fault code.

3. Fault codes will be displayed as short flashes and a long flash. As an example, two short flashes and one long flash would indicated flashout code 3. Observe flashout code several times to avoid misreading. The code will continue to flash until the ignition is placed in the Off position.

4. Refer to flashout code charts, and diagnostic charts, for diagnostic and testing procedures.

5. After correcting service condition, the vehicle may be operated to obtain the next flashout code as necessary.

6. After all flashout codes have been obtained and service conditions corrected, remove jumper wire from diagnostic connector.

TEST STEP	RESULT ▶	ACTION TO TAKE
D1 NO FLASHOUT CODE BUT RABS LIGHT IS ILLUMINATED • There are some faults that illuminate the REAR ANTILOCK light but will not provide a Flashout Code. Refer to Obtaining the Flashout Code in this Section for procedure. Also, be sure to make a good, momentary ground from the diagnostic lead.	No Flashout Code ▶	GO to Test D2.

Fig. 64 Diagnostic Code

TEST STEP	RESULT	ACTION TO TAKE
1a NO TEST • This code should not occur. Refer to Obtaining the Flashout Code for procedures involved in getting the code.	Flashout Code is 1 ▶	If after repeated attempts to take the Flashout Code, Code 1 is still obtained GO to Test E.

Fig. 65 Diagnostic Codes

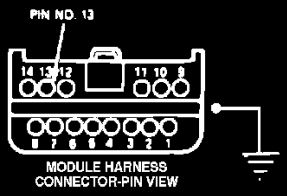
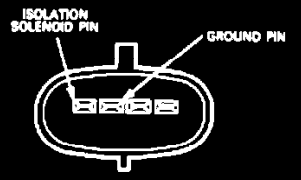
TEST STEP	RESULT	ACTION TO TAKE
2a CHECK FOR OPEN RABS VALVE ISOLATION SOLENOID WIRING OR MODULE 1. Turn ignition switch to the OFF position. 2. Disconnect battery. 3. Set the ohmmeter to the 200 ohm scale. 4. Disconnect module harness connector from module. 5. Check for resistance between harness connector Pin 13 and chassis ground.  MODULE HARNESS CONNECTOR-PIN VIEW	Resistance less than 6 ohms ▶ Resistance over 6 ohms ▶	REPLACE RABS module. GO to 2b.
2b CHECK FOR OPEN RABS VALVE ISOLATION SOLENOID OR WIRING 1. Disconnect battery. 2. Set ohmmeter to 200 ohm scale. 3. Check resistance between valve connector isolation solenoid pin and connector ground pin.  RABS VALVE CONNECTOR -- PIN VIEW	Resistance less than 6 ohms ▶ Resistance over 6 ohms ▶	REPAIR open in 599 circuit, isolation solenoid wire from valve to computer module. CHECK for dirty, loose or bent connector pins. REPLACE RABS valve.

Fig. 67 Diagnostic Codes

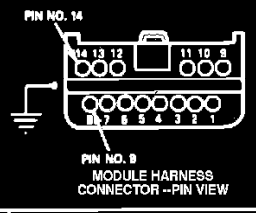
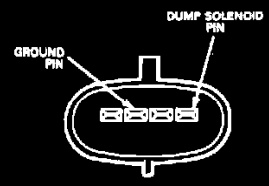
TEST STEP	RESULT	ACTION TO TAKE
3a CHECK FOR OPEN RABS VALVE DUMP SOLENOID WIRING OR COMPUTER MODULE		
1. Turn ignition switch to the off position. 2. Disconnect the battery. 3. Disconnect module harness connector from module. 4. Place the ohmmeter on the 200 ohm scale. 5. Check resistance between pin 8 (or pin 14) and chassis ground.  MODULE HARNESS CONNECTOR --PIN VIEW	Resistance less than 3 ohms ▶ Resistance greater than 3 ohms ▶	REPLACE computer module. GO to Test 3b.
3b CHECK FOR OPEN RABS VALVE DUMP SOLENOID OR WIRING		
1. Turn the ignition switch to the off position. 2. Disconnect the battery. 3. Disconnect RABS valve harness connector from valve connector. 4. Check resistance between valve connector dump solenoid pin and ground pin.  RABS VALVE CONNECTOR -- PIN VIEW	Resistance less than 3 ohms ▶ Resistance greater than 3 ohms ▶	REPAIR open in 664 circuit, dump solenoid wire, from valve to module. CHECK for loose, dirty or bent connector pins. REPLACE RABS valve.

Fig. 69 Diagnostic Codes

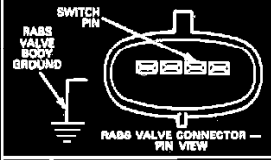
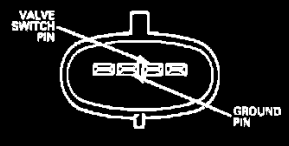
TEST STEP	RESULT	ACTION TO TAKE
4a CHECK FOR CLOSED RABS VALVE SWITCH		
1. Disconnect RABS valve harness connector from valve connector. 2. Place ohmmeter on the 20K scale. 3. Check resistance between valve connector switch pin and valve body.  	Resistance greater than 10K ohms ▶ Resistance less than 10K ohms ▶	GO to Test 4B. REPLACE RABS valve.
4b CHECK RESISTANCE BETWEEN VALVE SWITCH AND VALVE GROUND		
1. Set the ohmmeter on the 20K ohm scale. 2. Check resistance between valve connector switch pin and valve solenoid ground pin.  RABS VALVE CONNECTOR -- PIN VIEW	Resistance 18-26K ohms ▶ Resistance higher than 26K or lower than 18K ▶	GO to Test 4C. REPLACE RABS valve.

Fig. 71 iagnostic Codes

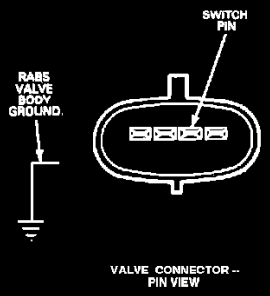
TEST STEP	RESULT ▶	ACTION TO TAKE
4c CHECK FOR HYDRAULIC LEAK IN DUMP SECTION OF VALVE		
1. Set the ohmmeter on the 200K scale. 2. Check resistance between valve connector switch pin and valve body with hydraulic pressure applied for at least 30 seconds.  VALVE CONNECTOR -- PIN VIEW	Resistance greater than 10K ohms ▶ Resistance lower than 10K ohms ▶	GO to Test 4d. REPLACE RABS valve.

Fig. 71 Diagnostic Codes

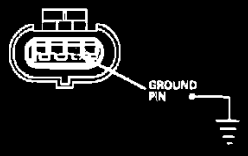
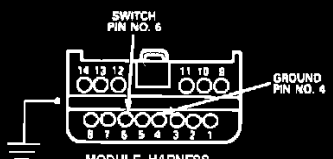
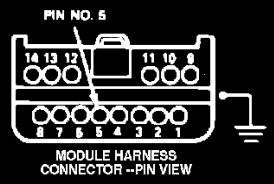
TEST STEP	RESULT ▶	ACTION TO TAKE
4d CHECK FOR OPEN RABS VALVE GROUND WIRE		
1. Set ohmmeter on 200 ohm scale. 2. Check for resistance between ground pin of harness connector and chassis ground.  RABS VALVE HARNESS CONNECTOR -- PIN VIEW	Resistance less than 1 ohm ▶ Resistance 1 ohm or more ▶	GO to Test 4e. REPAIR open in 397 circuit, isolation solenoid wire. CHECK for dirty or loose connector pins.
4e CHECK RESISTANCE IN RABS VALVE WIRING FROM THE MODULE CONNECTOR TO VALVE (OR MODULE)		
1. Install RABS valve connector into valve. 2. Disconnect battery 3. Disconnect the module harness connector from the module. 4. Set the ohmmeter on 200K scale. 5. Check resistance between pin 4 and pin 6 of module harness connector.  MODULE HARNESS CONNECTOR -- PIN VIEW	Resistance 18-26K ohms ▶ Resistance higher than 26K or lower than 18K ▶	REPLACE computer module. REPAIR open or short in 535 circuit, valve switch wire from valve to computer module.

Fig. 71 Diagnostic Codes

TEST STEP	RESULT ▶	ACTION TO TAKE
5a		
For 4x2 vehicles or 4x4 vehicles for which the problem was initiated in 4x2 mode		GO to Step 5b.
For 4x4 vehicles for which the problem was initiated in 4x4 mode only		GO to Step 5c.
5b CHECK FOR MECHANICAL PROBLEMS IN REAR BRAKE SYSTEM		
1. Disconnect the RABS module harness connector from the module to deactivate the RABS. 2. Drive the vehicle (in 4x2 mode). 3. Make normal stops in a safe area to determine the condition of the rear brake system.	Rear brakes are grabby or tend to lock up easily ▶	REPAIR rear brake system and RETEST.
	Rear brakes are satisfactory for normal braking ▶	REPLACE RABS valve.
5c CHECK FOR MISSING SIGNAL FROM 4 WD SWITCH TO COMPUTER MODULE		
1. Disconnect the RABS module harness from the module. 2. Turn ignition switch on. 3. Shift into 4x4 mode. 4. Set voltmeter to 20 VDC scale. 5. Measure voltage between pin 5 and chassis ground.	Voltage is less than 1 volt ▶	REPLACE RABS valve.
	Voltage is greater than 1 volt ▶	REPAIR 4x4 indicator switch.



MODULE HARNESS CONNECTOR --PIN VIEW

Fig. 72 Diagnostic Codes

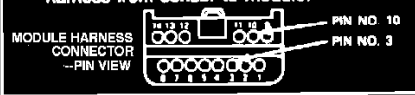
TEST STEP	RESULT ▶	ACTION TO TAKE
6a CHECK FOR ERRATIC SENSOR SIGNAL AND LOOSE WIRE CONNECTIONS 1. Turn ignition off. 2. Disconnect battery. 3. Set ohmmeter on the 2000 ohm scale. 4. Check resistance between Pin 10 and Pin 3 of the harness connector while shaking the harness from sensor to module. 	Constant reading of 1000 to 2000 ohms ▶ Reading is erratic ▶	GO to Step 6b. REPAIR loose connection in the 519 or 523 circuits (sensor leads). CHECK for dirty or loose pins, frayed or shorted connectors.
6b CHECK FOR METAL CHIPS ON SENSOR MAGNET POLE PIECE • Remove the sensor from the differential and inspect for a build-up of metal chips on sensor magnetic pole.	No metal chips are present ▶ Metal chips are present ▶	GO to Step 6c. DRAIN and CLEAN differential. CHECK the excitor ring for broken or chipped teeth.
6c CHECK FOR EXCITOR RING DAMAGE 1. Remove sensor from carrier. 2. Rotate excitor ring and check for damage to teeth.	Teeth are intact and no visible lateral runout is observed ▶ Teeth are damaged or lateral runout of excitor ring is visible ▶	REINSTALL sensor and GO to Test 6d. REPAIR axle.
6d CHECK FOR ERRATIC OR LOW SENSOR OUTPUT ON COMPUTER MODULE 1. Locate the sensor test connector. 2. Position vehicle on a hoist and raise the rear wheels to clear the floor. 3. Start the engine and turn the wheels at 5 mph. 4. Place voltmeter on the 2000 mv AC scale. 5. Measure voltage at the two pins of the sensor test connector. 	Voltage greater than 650 mV RMS and steady ▶ Voltage less than 650 mV RMS or erratic ▶	REPLACE module. REPLACE sensor and recheck output and replace the sensor test connector cap.

Fig. 73 Diagnostic Codes

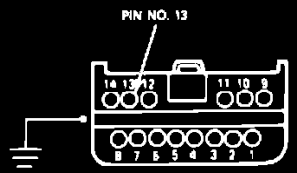
TEST STEP	RESULT	ACTION TO TAKE
7a CHECK FOR RABS VALVE ISOLATION SOLENOID OR WIRING SHORTED TO GROUND 1. Turn ignition off. 2. Disconnect the valve harness connector from the valve connector. 3. Set the ohmmeter on the 200 ohm scale. 4. Measure the resistance between the valve isolation solenoid pin and the valve ground pin in the valve connector.  RABS VALVE CONNECTOR -- PIN VIEW	Resistance is greater than 3 ohms ▶ Resistance is less than 3 ohms ▶	GO to Test 7b. REPLACE RABS valve.
7b CHECK FOR BLOWN INTERNAL FUSE IN THE MODULE 1. Turn ignition off. 2. Disconnect the battery. 3. Disconnect the valve harness connector from the valve. 4. Disconnect the module harness connector from the module. 5. Place the ohmmeter on the 20K ohm scale. 6. Measure the resistance between module harness connector pin 13 and chassis ground.  MODULE HARNESS CONNECTOR --PIN VIEW	Resistance greater than 20K ohms ▶ Resistance less than 20K ohms ▶	REPLACE module. REPAIR short in 49.5 circuit between RABS valve and module. RECONNECT module and valve.

Fig. 75 Diagnostic Codes

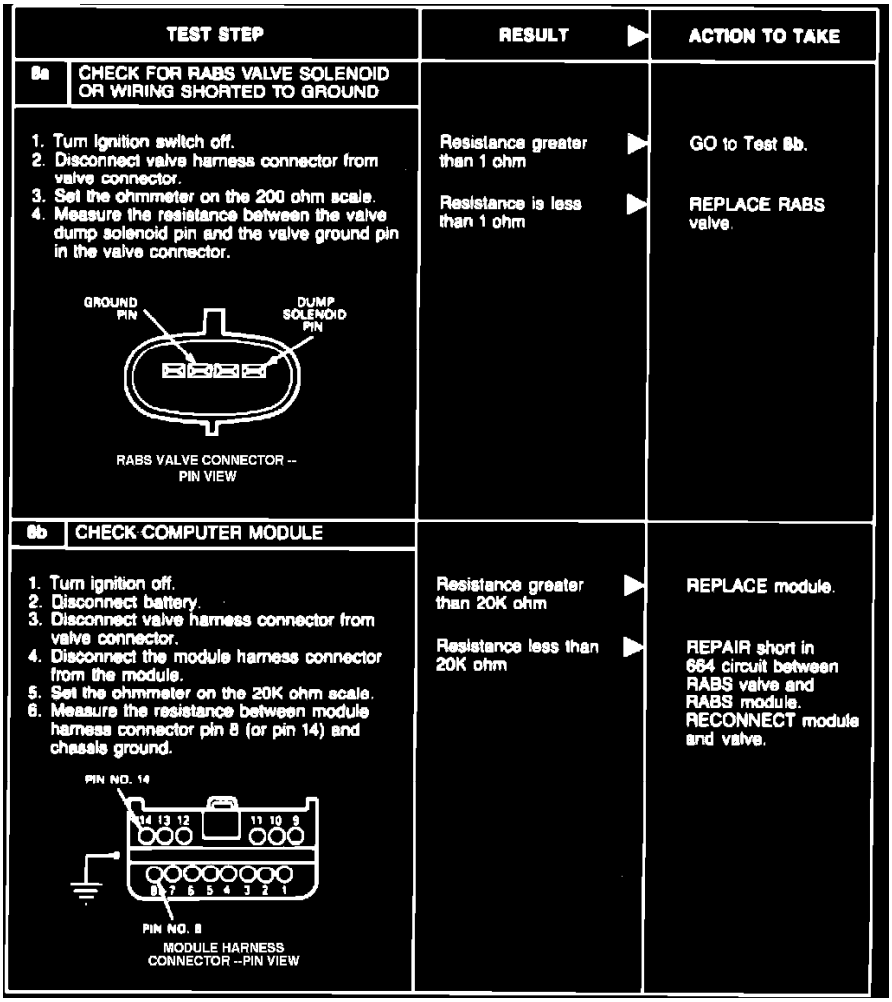
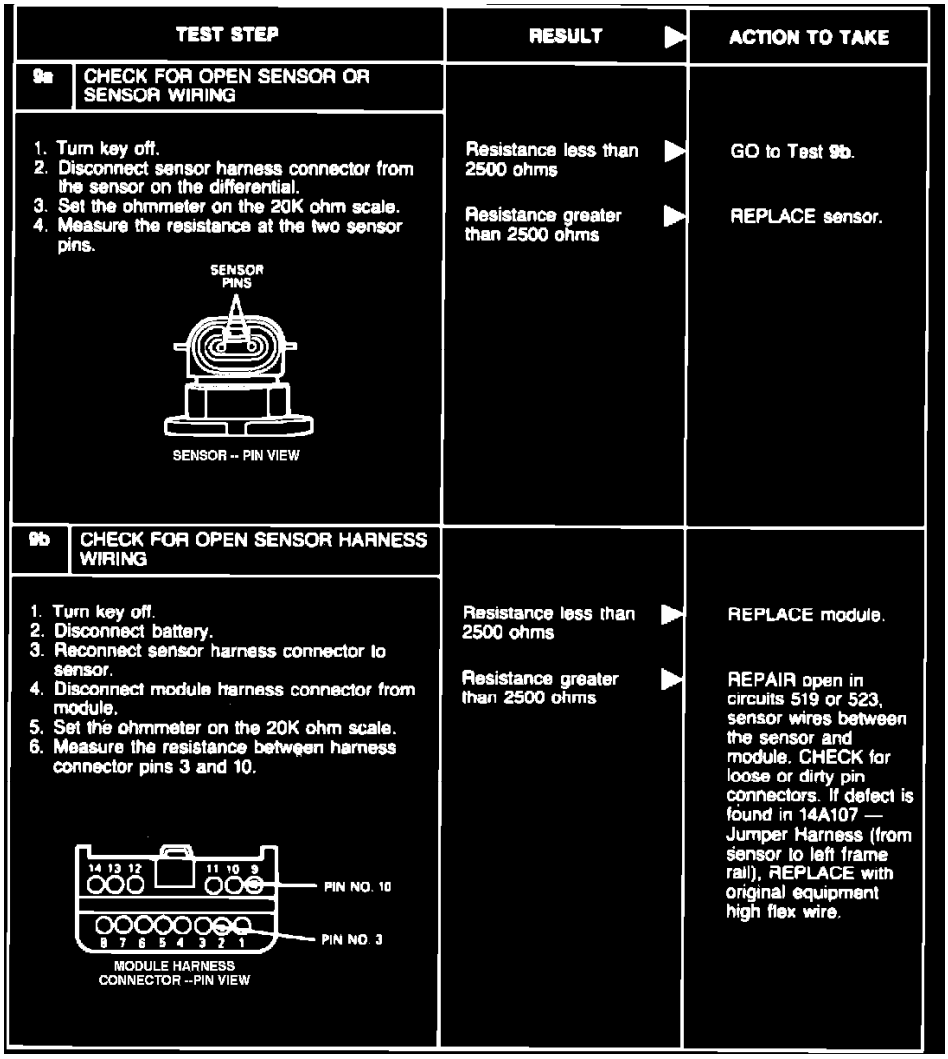


Fig. 77 Diagnostic Codes



TEST STEP	RESULT ▶	ACTION TO TAKE
9a CHECK FOR OPEN SENSOR OR SENSOR WIRING		
1. Turn key off. 2. Disconnect sensor harness connector from the sensor on the differential. 3. Set the ohmmeter on the 20K ohm scale. 4. Measure the resistance at the two sensor pins. SENSOR PINS SENSOR -- PIN VIEW	Resistance less than 2500 ohms ▶ Resistance greater than 2500 ohms ▶	GO to Test 9b. REPLACE sensor.
9b CHECK FOR OPEN SENSOR HARNESS WIRING		
1. Turn key off. 2. Disconnect battery. 3. Reconnect sensor harness connector to sensor. 4. Disconnect module harness connector from module. 5. Set the ohmmeter on the 20K ohm scale. 6. Measure the resistance between harness connector pins 3 and 10. 14 13 12 11 10 9 — PIN NO. 10 8 7 6 5 4 3 2 1 — PIN NO. 3 MODULE HARNESS CONNECTOR --PIN VIEW	Resistance less than 2500 ohms ▶ Resistance greater than 2500 ohms ▶	REPLACE module. REPAIR open in circuits 519 or 523, sensor wires between the sensor and module. CHECK for loose or dirty pin connectors. If defect is found in 14A107 — Jumper Harness (from sensor to left frame rail), REPLACE with original equipment high flex wire.

Fig. 78 Diagnostic Codes

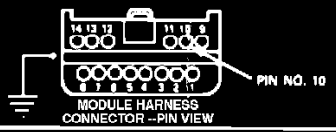
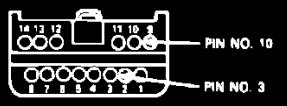
TEST STEP	RESULT	ACTION TO TAKE
10a CHECK FOR SHORTED SENSOR 1. Turn ignition off. 2. Disconnect the sensor harness from the sensor. 3. Place the ohmmeter on the 20K ohms scale. 4. Measure the resistance at the two sensor pins.  	Resistance less than 1000 ohms Resistance is greater than 1000 ohms	REPLACE sensor. GO to Test 10b.
10b CHECKING FOR GROUNDED SENSOR WIRING 1. Turn ignition off. 2. Disconnect the battery. 3. Disconnect the sensor harness connector from the sensor. 4. Disconnect the module harness connector from the module. 5. Set the ohmmeter on the 20K ohm scale. 6. Measure the resistance from pin 10 of the harness connector to chassis ground.  	Resistance less than 20K ohms Resistance is greater than 20K ohms	REPAIR short to ground in 523 circuit, sensor HI lead to module. CHECK for frayed wires or shorted connectors. If defect is found in the 14A107 Jumper Harness (from sensor to left frame rail), REPLACE with original equipment high flex wire. GO to Test 10c.
10c CHECK FOR SHORTED SENSOR WIRING 1. Turn ignition off. 2. Disconnect sensor harness connector from the sensor. 3. Disconnect the module harness connector from the module. 4. Place the ohmmeter on the 20K ohms scale. 5. Measure the resistance from pin 3 to pin 10 of the harness connector.  	Resistance less than 20K ohms Resistance greater than 20K ohms	REPAIR short between the 523 and 519 sensor circuits. CHECK for frayed wires or shorted connectors. If defect is found in the 14A107 Jumper Harness (from sensor to left frame rail), REPLACE with original equipment high flex wire. REPLACE the RABS module.

Fig. 79 Diagnostic Codes

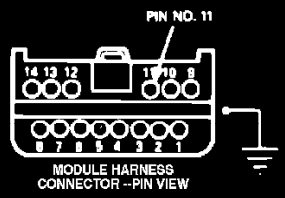
TEST STEP	RESULT ▶	ACTION TO TAKE
11a CHECK VEHICLE STOP LIGHTS		
• Apply the service brakes and observe the rear brake lamps.	Lamps illuminate ▶	GO to Test 11b.
	Lamps do not illuminate ▶	REPAIR or REPLACE vehicle stop light switch. CHECK for blown stop light switch fuse. Investigate reason for blown fuse. CHECK for open stop light switch wiring or blown stop lamps. REPAIR as needed.
11b WIRING FROM MODULE TO BRAKE SWITCH		
• Check for an open between the brake switch and the module: 1. Turn the ignition off. 2. Set the voltmeter on the 20 VDC scale. 3. Remove the module harness connector. 4. Measure the voltage between pin 11 and chassis ground while stepping on the brake pedal.  MODULE HARNESS CONNECTOR --PIN VIEW	Voltage is less than 9V ▶	REPAIR the open in the 511 circuit.
	Voltage is 9V or more ▶	CHECK 4 way flasher and directional wiring. This condition could create feedback through the stop light circuit. Also, cruise controls may not operate correctly.

Fig. 80 Diagnostic Codes

TEST STEP	RESULT ▶	ACTION TO TAKE
12a		
• Check the brake fluid level at the master cylinder reservoir.	Brake fluid level low ▶	Check for luid leaks in vehicle brake system and repair as required. Fill master cylinder to required level.
	Brake fluid level OK ▶	REPLACE module.

Fig. 83 Diagnostic Codes

TEST STEP	RESULT ▶	ACTION TO TAKE
13a NO TEST		
• RABS module speed circuit phase lock loop failure detected during module self test.	13 flashes are present ▶	REPLACE RABS module.

Fig. 85 Diagnostic Codes

TEST STEP	RESULT	ACTION TO TAKE
14a NO TEST • RABS module program check sum failure detected during self test.	If 14 flashes are present	REPLACE RABS module.

Fig. 87 Diagnostic Codes

TEST STEP	RESULT	ACTION TO TAKE
15a NO TEST • RABS module RAM failure detected during self test.	If 15 flashes are present	REPLACE RABS module.

Fig. 89 Diagnostic Codes

TEST STEP	RESULT	ACTION TO TAKE
16a NO TEST • This code should not occur. Refer to obtaining the Flashout Code for procedures involved in getting the code.	Flashout Code is 16	If after repeated attempts to take the Flashout Code, Code 16 is still obtained, REPLACE RABS module.

Fig. 91 Diagnostic Codes

Brake System (Red) Warning Lamp

To check brake system warning lamp, turn ignition key to the Start position. The red warning lamp should glow momentarily. The warning lamp will also illuminate if the parking brake mechanism is not fully released. If warning lamp fails to glow, service of the electrical system is indicated. If warning lamp illuminates with ignition key in the Run position, check and repair conventional brake system as required. If conventional brake system is found to be operating properly, check anti-lock brake system for stored codes as outlined under **ACCESSING FLASHOUT CODES AND CODE DESCRIPTION** In certain instances both red and yellow warning lamps will glow simultaneously. If this occurs, check and repair conventional brake system as required. If red warning lamp continues to glow, refer to **WARNING LAMP CONDITION CHART** for proper diagnostic and testing procedures, then refer to **Brakes and Traction Control/Brakes/Antilock Brake System/Testing and Inspection/Procedures/Pinpoint Test Charts** Tests A through G, as required.

Antilock Brake System (Yellow) Warning Lamp

To check anti-lock brake system warning lamp, turn ignition key to the On position. The yellow warning lamp should glow for approximately two seconds and then shut off. If warning lamp fails to glow, or glows continuously, refer to **WARNING LAMP CONDITION CHART** for proper diagnostic and testing procedures, then refer to **Brakes and Traction Control/Brakes/Antilock Brake System/Testing and Inspection/Procedures/Pinpoint Test Charts** Tests A through G, as required. In addition, if warning lamp continues to glow during vehicle operation, check anti-lock brake system for stored codes as outlined under **ACCESSING FLASHOUT CODES AND CODE DESCRIPTION.**

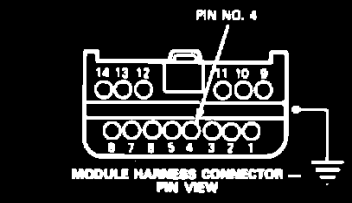
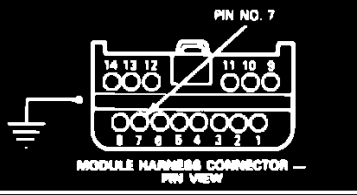
TEST STEP	RESULT	ACTION TO TAKE
A1 MODULE HARNESS CONNECTOR		
• Check to make sure module harness is fully plugged into computer module.	Harness is fully plugged in	GO to Test A2.
	Harness is not fully plugged in	CONNECT harness to module.
A2 COMPUTER MODULE GROUND		
• Check for good computer module ground: 1. Disconnect Battery 2. Remove harness connector from module. 3. Set ohmmeter on the 200 ohm scale. 4. Check for resistance between harness connector pin 4 and chassis ground  **CAUTION: WHEN CHECKING RESISTANCE IN THE ANTILOCK SYSTEM, ALWAYS DISCONNECT THE BATTERY. IMPROPER RESISTANCE MAY OCCUR WITH THE VEHICLE BATTERY CONNECTED.**	Resistance less than 1 ohm	GO to Test A3.
	Resistance 1 ohm or greater	CHECK for open in module ground wire. CHECK for loose, dirty or broken connector pins.
A3 ANTILOCK LIGHT POWER		
• Check for voltage to ANTILOCK light: 1. Reconnect the battery. 2. Set voltmeter on 20 VDC scale position. 3. Turn ignition to the on position. 4. Check voltage between harness connector pin 7 and a known good chassis ground. 	Voltage greater than 9V	REPLACE Module.
	Voltage less than 9V	GO to Test A4

Fig. 34 Test Chart A

TEST STEP	RESULT	ACTION TO TAKE
A4 RABS 15 AMP LIGHT FUSE		
• Remove and inspect RABS 15 amp light fuse.	Fuse is OK	REPLACE fuse and GO to Test A5.
	Fuse is blown	CHECK for short to ground between fuse panel and warning lamps. REPAIR short and replace 15 amp fuse.
A5 POWER TO RABS LIGHT FUSE		
• Check for voltage to fuse. 1. Set voltmeter to 20 VDC scale. 2. Turn ignition to the on position. 3. Check voltage between panel fuse connector and known good chassis ground.	Voltage greater than 9V	GO to Test A6.
	Voltage less than 9V	REPAIR fuse panel or vehicle electrical system.
A6 RABS LIGHT BULB		
• Check RABS light bulb.	Bulb is OK	REPAIR open between RABS light fuse and pin 7 of the module wiring harness connector.
	Bulb is not OK	REPLACE bulb.

Fig. 34 Test Chart A

TEST STEP	RESULT ▶	ACTION TO TAKE
B1 PARKING BRAKE		
• Check parking brake application: 1. Turn ignition key to the on position. 2. Check the parking brake pedal and release if applied.	BRAKE light goes off ▶	PERFORM road test. If lockup occurs GO to Test B2.
	BRAKE light stays on ▶	GO to Test B2.
B2 PARKING BRAKE SWITCH		
• Check parking brake switch: 1. Disconnect the parking brake switch connector.	BRAKE light goes off ▶	ADJUST parking brake or REPLACE parking brake switch.
	BRAKE light remains on ▶	GO to Test B3.
B3 MODULE AND WIRING		
• Remove module harness connector from module.	BRAKE light goes off ▶	REPLACE the computer module.
	If BRAKE light remains on ▶	CHECK for short to ground in wiring from BRAKE light to the RABS diode resistor

Fig. 36 Test Chart B

TEST STEP	RESULT ▶	ACTION TO TAKE
C1 LOW BRAKE FLUID		
• Check the brake fluid level at the master cylinder reservoir.	Brake fluid level OK ▶	GO to Test C2.
	Brake fluid level low ▶	CHECK for fluid leaks in vehicle brake system and repair as required. Fill master cylinder to required level.
C2 MASTER CYLINDER FLOAT		
• Check master cylinder float for buoyancy: 1. Remove cap from master cylinder reservoir. 2. Using a clean steel implement, push down on float in reservoir.	Float moves down ▶	GO to Test C3.
	Float does not move down (sits at the bottom of the reservoir) ▶	REPLACE master cylinder reservoir.
C3 DIODE/RESISTOR ELEMENT		
• Check for proper functioning of the diode/resistor element. 1. Turn ignition key to the on position. 2. Check parking brake and release if applied.	Both the ANTILOCK and BRAKE warning lamps go off ▶	REPLACE RABS diode/resistor element.
	Both the ANTILOCK and BRAKE warning lamps stay on ▶	GO to Test C4.
C4 DIODE/RESISTOR ELEMENT CONTINUED		
• Continue to check for proper functioning of the diode/resistor element. 1. Remove the parking brake switch and the diesel low vacuum switch, if so equipped.	Both the ANTILOCK and BRAKE warning lamps go off ▶	REPLACE RABS diode/resistor element.
	Both the ANTILOCK and BRAKE warning lamps stay on ▶	GO to Test C5.

Fig. 37 Test Chart C

TEST STEP	RESULT ▶	ACTION TO TAKE
C5 ANTILOCK VALVE SWITCH		
• Obtain the flashout code as described in Diagnosis and Testing	Flashout code is obtained ▶	REFER to Flashout Codes Charts
	ANTILOCK and BRAKE warning lamps stay on steady ▶	GO to Test C6.
C6 MASTER CYLINDER SWITCH		
• Check for proper functioning of the master cylinder fluid level indicator switch: 1. Remove the connector from the master cylinder. 2. Connect a jumper wire between the two purple/white wires in the connector. 3. Turn the ignition key to the on position.	ANTILOCK and BRAKE warning lamps stay on ▶	GO to Test C7.
	ANTILOCK and BRAKE warning lamps go off ▶	REPLACE the master cylinder reservoir.
C7 BRAKE LIGHT WIRING		
• Check for shorts in brake light wiring. 1. Disconnect module harness connector from module. 2. Turn ignition key to the on position.	ANTILOCK light goes off and BRAKE light stays on ▶	CHECK for short to ground in the 977 circuit. REFER to wiring diagram
	Both ANTILOCK and BRAKE warning lamps go off ▶	REPLACE module.

Fig. 37 Test Chart C

TEST STEP	RESULT ▶	ACTION TO TAKE
D1 OBTAIN THE FLASHOUT CODE		
• Obtain the flashout code as described in Diagnosis and Testing  RABS DIAGNOSTIC CONNECTOR -- PIN VIEW	Flashout code cannot be obtained ▶ Flashout code is obtained ▶	GO to Test D2. Refer to the Flashout Code Charts
D2 MASTER CYLINDER CONNECTOR		
• Make sure master cylinder connector is fully plugged in.	Master cylinder connector is not fully plugged in ▶ Master cylinder connector is plugged in ▶	PLUG in the master cylinder connector. GO to Test D2A.
D2A M/C PRESS. DIFFERENTIAL CONNECTOR		
• Make sure master cylinder pressure differential connector is fully plugged in (Aerostar only).	Pressure differential switch connector is not fully plugged in ▶ Pressure differential switch connector is plugged in ▶	PLUG in the master cylinder pressure differential switch connector. GO to Test D3.
D3 RABS 20 AMP FUSE		
• Remove and inspect the RABS 20 amp fuse.	Fuse is OK ▶ Fuse is blown ▶	REPLACE Fuse. GO to Test D4. Short to ground between the fuse panel and the module wiring harness connector. REPAIR short in the 601 or 601A circuit and REPLACE the 20 amp. fuse. REFER to the Wiring Diagrams

Fig. 39 Test Chart D

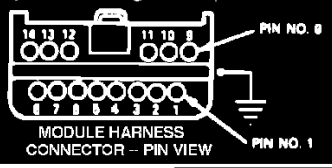
TEST STEP	RESULT	ACTION TO TAKE
D4 SHORTS IN MODULE HARNESS CONNECTOR WIRING		
• Check wiring for short to ground: 1. Turn ignition switch to the on position. 2. Remove the module harness connector from the module. 3. Observe the REAR ANTILOCK light.	Light goes off ▶ Light remains on ▶	GO to Test D5. CHECK for a short to ground in the 603 Circuit. REFER to Wiring Diagram
D5 POWER TO THE MODULE		
• Check for an open in the circuit supplying power to the module: 1. Set the voltmeter on the 20 VDC scale. 2. Turn the ignition switch to the on position. 3. Measure the voltage between pin 1 (or pin 9) and chassis ground. 	Voltage less than 9V. ▶ Voltage greater than 9V. ▶	REPAIR the open in the 601 or 601A circuit or power to the fuse panel. See Wiring Diagram. GO to Test D6.
D6 VOLTAGE AT THE FLUID LEVEL CIRCUIT		
• Check the voltage from the fluid level switch circuit: 1. Set the voltmeter on the 20 VDC Scale. 2. Turn the ignition switch to the on position. 3. Measure the voltage between pin 2 and chassis ground. 	Voltage less than 8V. ▶ Voltage greater than 8V. ▶	GO to Test D7. GO to Test D8.

Fig. 39 Test Chart D

TEST STEP	RESULT	ACTION TO TAKE
D7 FLUID LEVEL SENSOR AND WIRING		
• Check for voltage at the fluid level sensor: 1. Set voltmeter on the 20 VDC scale. 2. Turn the ignition switch to the on position. 3. Measure the voltage at the purple/white wire (No. 977), and at the purple/yellow wire (No. 128) at the back of the master cylinder fluid level switch connector without disconnecting the connector.  	Voltage greater than 8V at both wires. Voltage less than 8V at both wires. Voltage greater than 8V at one wire and less than 8V at the other wire.	CHECK for open in 128 (Ranger) or 977A (Aerostar) and 977 circuits. REPLACE diode resistor element or open in 640 circuit. CHANGE the master cylinder reservoir.
D8 GROUNDED DIAGNOSTIC LEAD		
• Check the voltage at the diagnostic lead. 1. Reconnect the module harness connector. 2. Set the voltmeter on the 20 VDC scale. 3. Turn the ignition to the on position. 4. Measure the voltage between the diagnostic lead and chassis ground.  	Voltage is less than 1V Voltage is greater than 1V	CHECK for a short in the 571 diagnostic circuit. If no short is found, GO to Test D9. GO to Test D9.
D9 COMPUTER MODULE		
• Replace computer module and retest.		

Fig. 39 Test Chart D

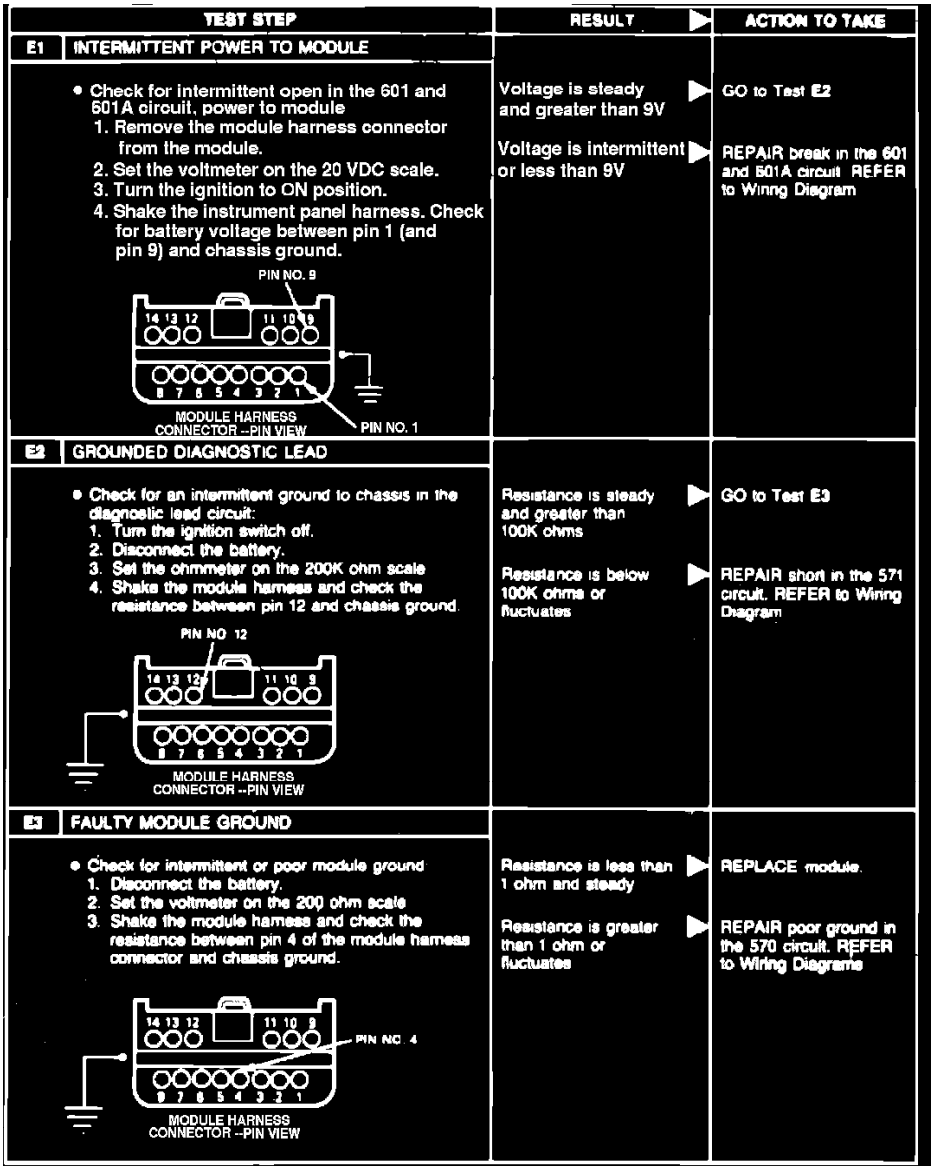


Fig. 41 Test Chart E

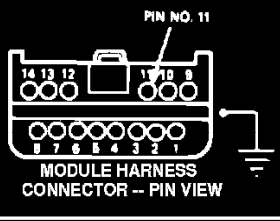
TEST STEP	RESULT ▶	ACTION TO TAKE
F1 STOPLAMPS		
• Check for stoplamp operation: 1. Apply the service brakes and observe the rear brakelamps.	Rear stoplamps not illuminated ▶ Rear stoplamps OK ▶	REPAIR the stoplamp circuit. GO to Test F2.
F2 VEHICLE ROAD TEST		
• Perform a low speed vehicle road test: 1. At approximately 10 mph apply the service brakes in an attempt to lock all four wheels while observing the left rear wheel in the side mirror.	Rear wheels lock ▶ Rear wheels do not lock ▶	GO to Test F3. The system is now functioning OK. Consider a possible intermittent wiring problem or possibly a problem which only shows up during driving. REFER to Flashout Code 6
F3 WIRING FROM MODULE TO BRAKE SWITCH		
• Check for an open between the brake switch and the module: 1. Turn the ignition off. 2. Set the voltmeter on the 20 VDC scale. 3. Remove the module harness connector. 4. Measure the voltage between pin 11 and chassis ground while stepping on the brake pedal.  MODULE HARNESS CONNECTOR -- PIN VIEW	Voltage is less than 9V ▶ Voltage is 9V or more ▶	REPAIR the open in the 511 circuit. GO to Test F4.
F4 EXCITOR RING INSPECTION		
• Remove sensor from carrier and check for: 1. Presence of the excitor ring 2. Condition of the teeth.	Ring is present with the teeth intact ▶ Ring is not present or the teeth are damaged ▶	REINSTALL the sensor and GO to Test F5. REPAIR axle.

Fig. 42 Test Chart F

TEST STEP	RESULT	ACTION TO TAKE
F5 SENSOR OUTPUT		
• Check for low sensor signal output: 1. Set the voltmeter on the 2000 mV AC scale. 2. Position the vehicle on the hoist and raise the rear wheels off the ground. 3. Remove the cap from the sensor test connector and connect the voltmeter across the connector leads. 4. Start the engine and turn the rear wheels at 5 mph. 5. Measure the voltage output of the sensor.  CONNECTOR PINS SENSOR TEST CONNECTOR – PIN VIEW	Voltage is 650 mV (RMS) or greater ▶ Voltage is less than 650 mV (RMS) ▶	REINSTALL the sensor test connector cap and GO to Test F7. REPLACE the sensor, RETEST, and REINSTALL the sensor test connector cap. If the voltage is still low, GO to Test F6.
F6 SENSOR GAP		
• Determine the sensor gap: 1. Remove the sensor from the carrier. 2. Measure the height of the sensor pole piece from the mounting face of the sensor flange. Pole should be 1.07-1.08 inch. 3. Measure the depth to the top of the excitor ring teeth from the sensor mounting face on the carrier. 4. Subtract the two measurments. This is the sensor gap.	Gap is less than 0.050 inches ▶ Gap is greater than 0.050 inches ▶	GO to Test F7. The gap is too large. CHECK for defective sensor or carrier housing.
F7 MECHANICAL PROBLEMS IN REAR BRAKES		
• Check the rear brakes for mechanical problems such as grabbing, locking or pulling.	Rear Brakes OK ▶ Rear brakes lock, grab or pull ▶	GO to Test F8. REPAIR and RETEST.
F8 COMPUTER MODULE		
• Replace computer module and retest.		

Fig. 42 Test Chart F

TEST STEP	RESULT	ACTION TO TAKE
G1 MASTER CYLINDER CONNECTORS		
• Check connectors on master cylinder, brake fluid level switch and delta pressure switch if equipped.	Connectors are fully plugged in ▶ Connector is not fully plugged in ▶	GO to Test G2. CONNECT connector to master cylinder.
G2 RED BRAKE WARNING LIGHT		
• Apply parking brake to see if red brake warning light lights.	Red warning light lights ▶ Red warning light does not light ▶	GO to Test D6. REPAIR warning lamp circuit. CHECK for open bulb.

Fig. 43 Test Chart G

Chart Description

Test Step Description

A1 - Module Harness Connector
A2 - Computer Module Ground
A3 - Antilock Light Power
A4 - RABS 15 Amp Light Fuse
A5 - Power to RABS Light Fuse

A6 - RABS Light Bulb

B1 - Parking Brake
B2 - Parking Brake Switch
B3 - Module and Wiring

C1 - Low Brake Fluid
C2 - Master Cylinder Float
C3 - Diode/Resistor Element
C4 - Diode/Resistor Element (Continued)
C5 - Antilock Valve Switch
C6 - Master Cylinder Switch
C7 - Brake Light Wiring

D1 - Obtain the Flashout Code
D2 - Master Cylinder Connector
D2A - M/C Press. Differential Connector
D3 - RABS 20 Amp Fuse
D4 - Shorts in Module Harness Connector Wiring
D5 - Power to the Module
D6 - Voltage at the Fluid Level Circuit
D7 - Fluid Level Sensor and Wiring
D8 - Grounded Diagnostic Lead
D9 - Computer Module

E1 - Intermittent Power to Module
E2 - Grounded Diagnostic Lead
E3 - Faulty Module Ground

F1 - Stoplamps
F2 - Vehicle Road Test
F3 - Wiring from Module to Brake Switch
F4 - Excitor Ring Inspection
F5 - Sensor Output
F6 - Sensor Gap
F7 - Mechanical Problems in Rear Brakes
F8 - Computer Module

G1 - Master Cylinder Connectors
G2 - Red Brake Warning Light

Condition	Action to Take
Yellow ANTILOCK Light Off and Does Not Self-Check	See Test A
Yellow ANTILOCK Light Off, and ANTILOCK Light Does Self-Check, Red BRAKE Light On	See Test B
Yellow ANTILOCK Light On and Red BRAKE Light On	See Test C
Yellow ANTILOCK Light On, Red BRAKE Light Off	See Test D
Yellow ANTILOCK Light Flashing, Red BRAKE Light Off	See Test E
Rear Wheels Lock with Hard Stops -- Both Lamps Functioning Properly (Light Self-Checks are OK and Lights are OFF)	See Test F
Yellow ANTILOCK Light Self-Checks, Red Brake Light Does Not Self Check	See Test G
Flashout Code is Known	See Flashout Codes Chart

CAUTION: WHEN CHECKING RESISTANCE IN THE ANTILOCK BRAKE SYSTEM, ALWAYS DISCONNECT THE BATTERY. IMPROPER RESISTANCE READINGS WILL OCCUR WITH THE VEHICLE BATTERY CONNECTED.

Fig. 27 Warning Lamp Condition Chart