

# PRODEMAND

YMMS: 1989 Ford Bronco II  
Engine: 2.9L Eng  
VIN:

Mar 7, 2021  
License:  
Odometer:

## ANTI-LOCK BRAKE SYSTEM

### 1989-92 BRAKES Ford Motor Corp. Anti-Lock Brake System

#### ANTI-LOCK BRAKE SAFETY PRECAUTIONS

- NEVER open a bleeder valve or loosen a hydraulic line while ABS is pressurized.
- NEVER disconnect or reconnect any electrical connectors while ignition is on. Damage to ABS control unit may result.
- DO NOT attempt to bleed hydraulic system without first referring to the appropriate article.
- Only use specially designed brake hoses/lines on ABS-equipped vehicles.
- DO NOT tap on speed sensor components (sensor, sensor rings). Speed rings must be pressed, NOT hammered into hubs. Striking these components can cause demagnetization or a loss of polarization, affecting the accuracy of the speed signal returning to the ABS control unit.
- DO NOT mix tire sizes. Increasing the width, as long as tires remain close to the original diameter, is acceptable. Rolling diameter must be identical for all 4 tires. Some manufacturers recommend tires of the same brand, style and type. Failure to follow this precaution may cause in-accurate wheel speed readings.
- DO NOT contaminate speed sensor components with grease. Only use recommended anti-corrosion coating.
- When speed sensor components have been removed, ALWAYS check sensor-to-ring air gaps when applicable. These specifications can be found in each appropriate article.
- ONLY use recommended brake fluids. DO NOT use silicone brake fluids in an ABS-equipped vehicle.
- When installing transmitting devices (CB's, telephones, etc.) on ABS-equipped vehicles, DO NOT locate the antenna near the ABS control unit (or any control unit).
- Disconnect all on-board computers, when using electric welding equipment.
- DO NOT expose the ABS control unit to prolonged periods of high heat (185°F/85°C for 2 hours is generally considered a maximum limit).

#### DESCRIPTION & OPERATION

The Rear Anti-Lock Brake System (RABS) is designed to prevent rear brake lock-up. This is done by controlling the amount of hydraulic fluid pressure to the rear wheel cylinders. The system consists of 2 warning lights (Red BRAKE and Yellow REAR ANTI-LOCK), a computer module, an electro-hydraulic valve, speed sensor and exciter ring. See Fig 1 -Fig 6 .

The control module continually monitors rear wheel speed. Wheel speed is sensed by speed sensor mounted on rear axle. As vehicle moves, teeth on exciter ring, located on ring gear inside the differential case, pass by the speed sensor probe. This induces an AC voltage signal in sensor circuit.

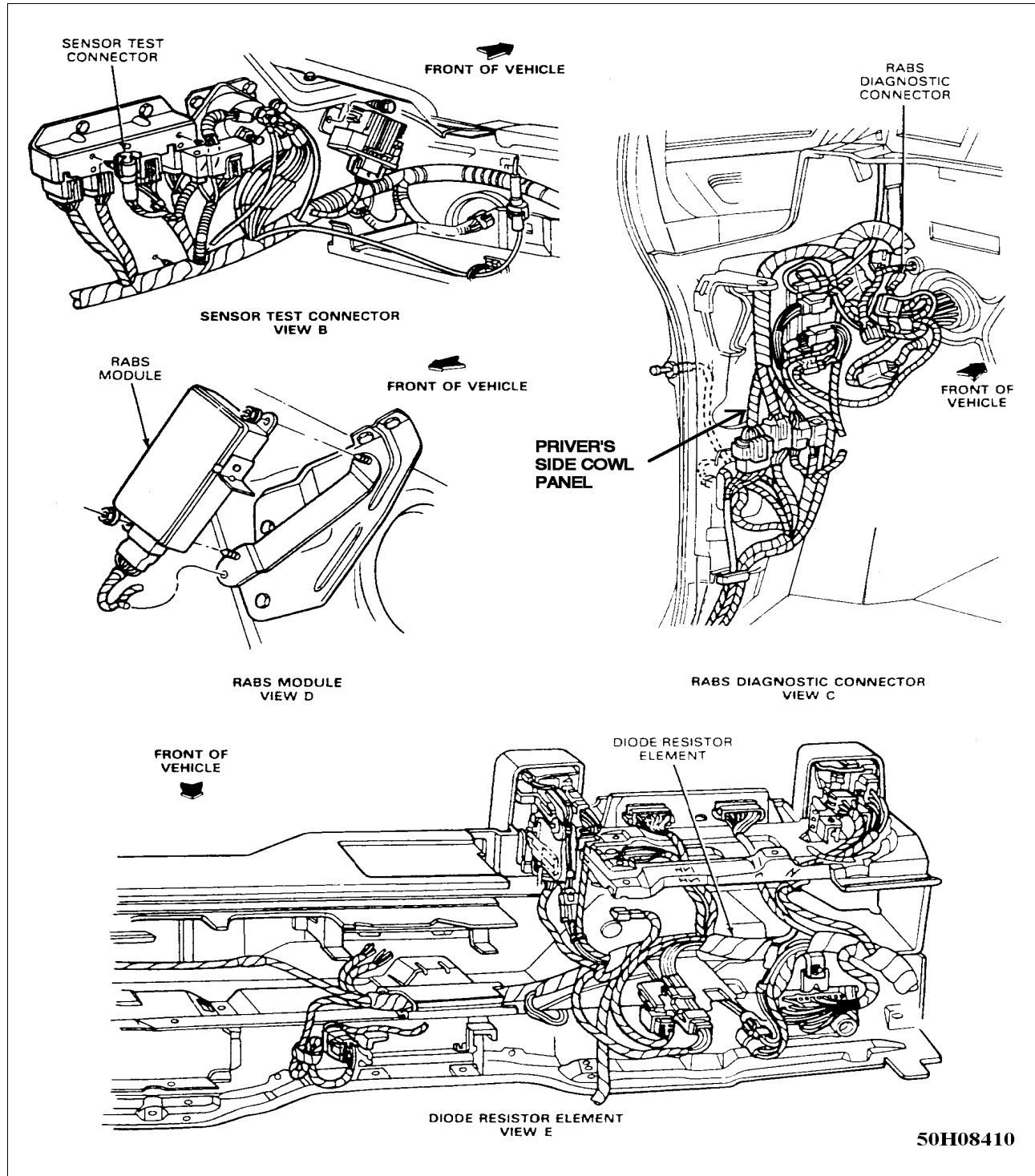
When brakes are applied, control module senses reduced wheel speed. If rate of deceleration is too great, indicating lock-up is occurring, the control module activates the electro-hydraulic valve. The valve, located on frame rail, then closes an internal isolation valve, isolating rear wheel cylinders from master cylinder. This stops rear brake pressure from increasing further.

If rate of deceleration is still too great, control module will activate dump solenoid with a series of rapid pulses, bleeding rear wheel cylinder fluid into the electro-hydraulic valve accumulator. This allows rear

wheels to spin back up to vehicle speed. Dump and isolation valves will continue to be pulsed in a way that allows rear wheels to rotate, while maintaining maximum deceleration during braking.

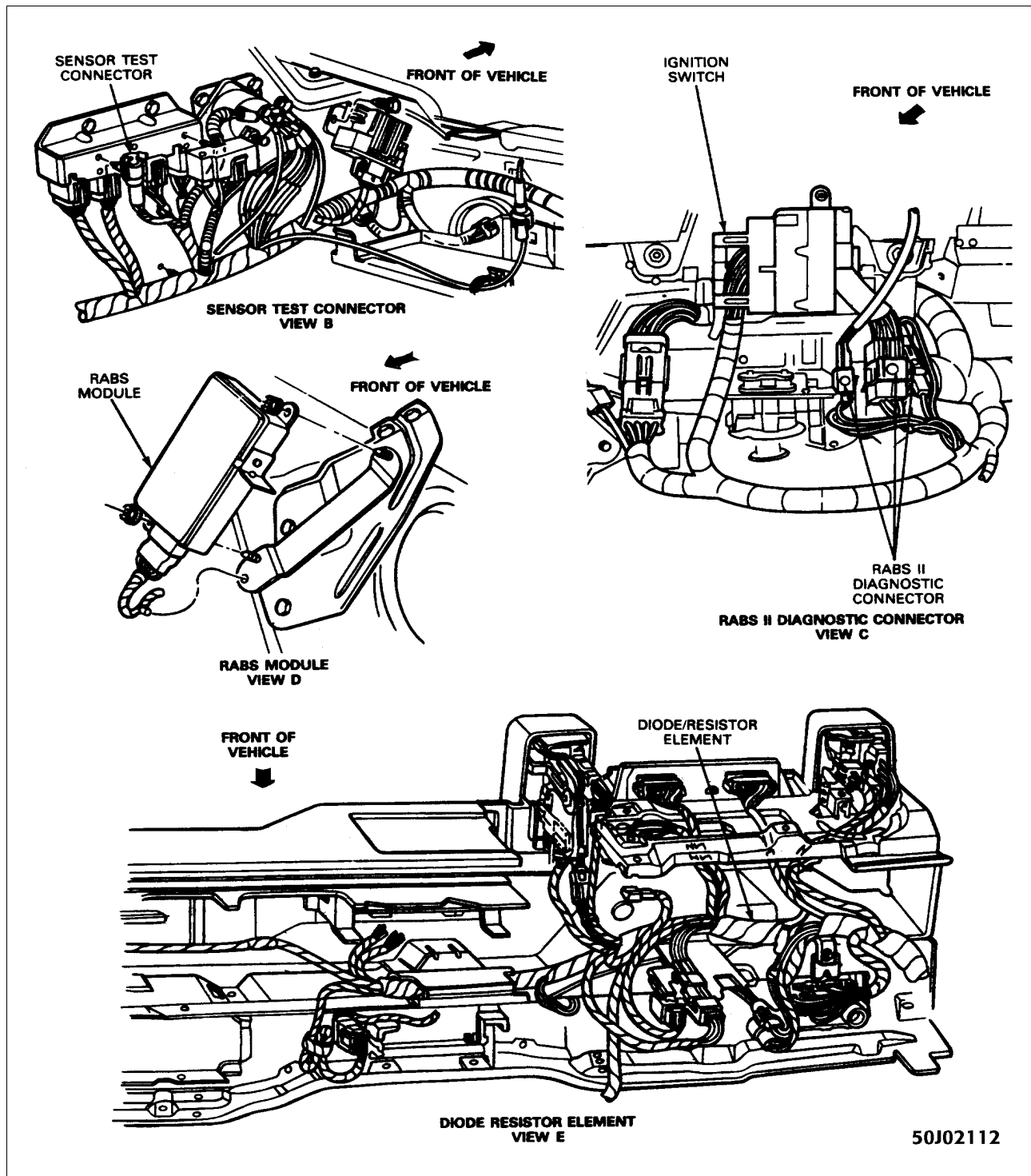
When vehicle comes to a complete stop and brake pedal has been released, control module de-energizes isolation valve. Any fluid in accumulator is returned to master cylinder and braking is returned to normal.

Fig 1: Aerostar (1990-91) - Ctrl Module, Diode/Resistor & Diagnostic Connector Location



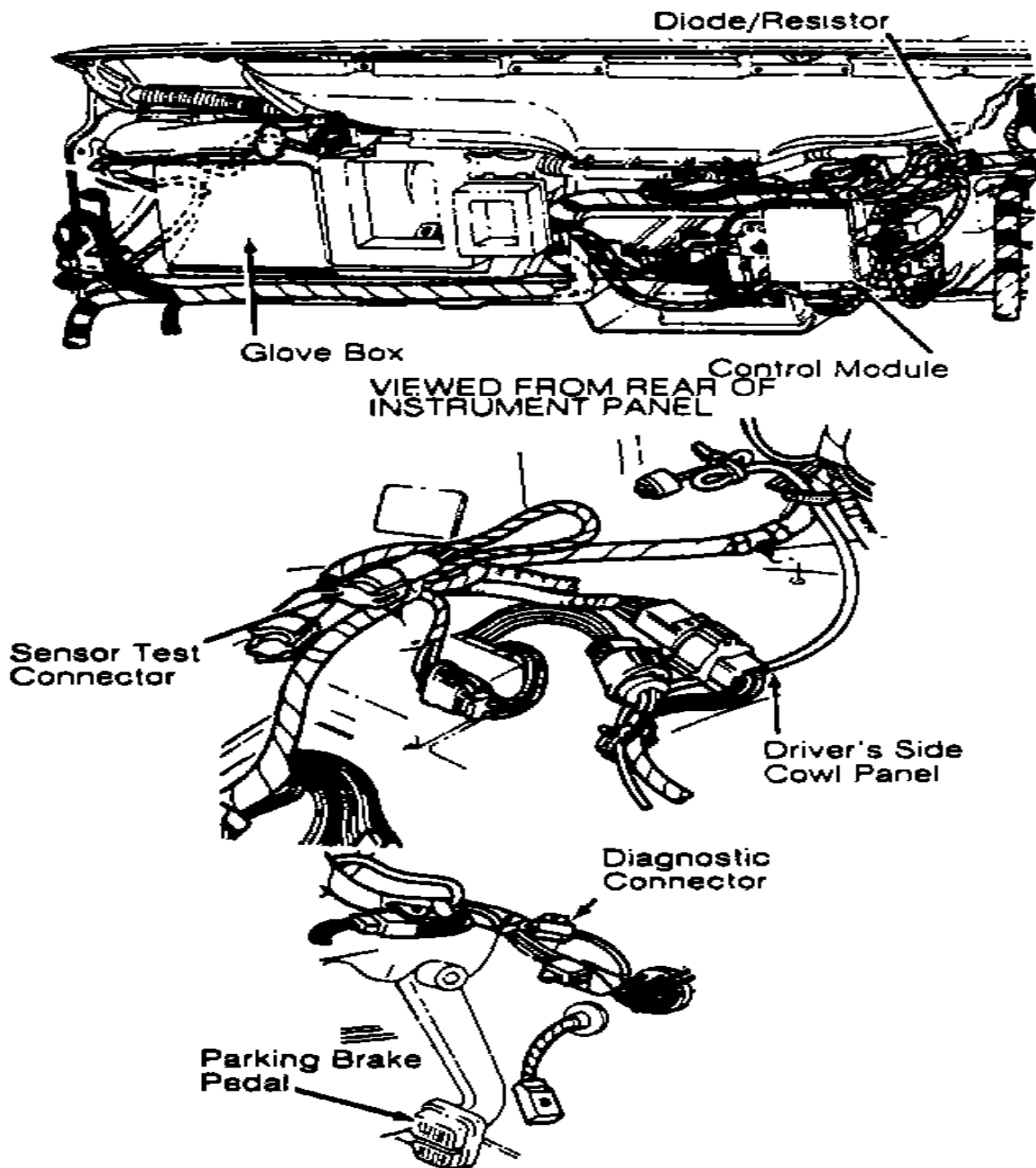
Courtesy of FORD MOTOR CO.

Fig 2: Aerostar (1992) - Ctrl Module, Diode/Resistor &amp; Diagnostic Connector Location



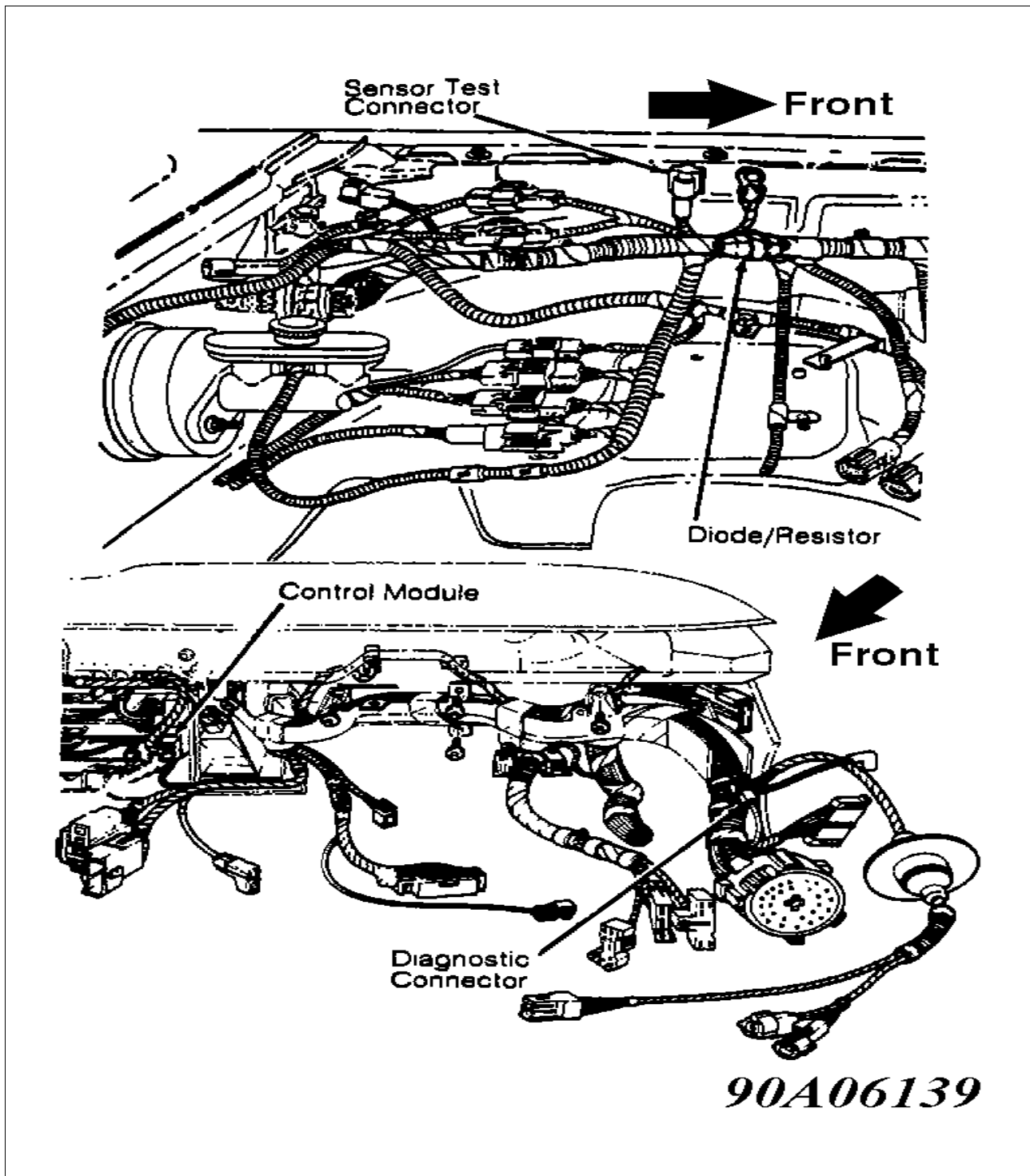
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Fig 3: Bronco & F Series - Ctrl Module, Diode/Resistor & Diagnostic Connector Location



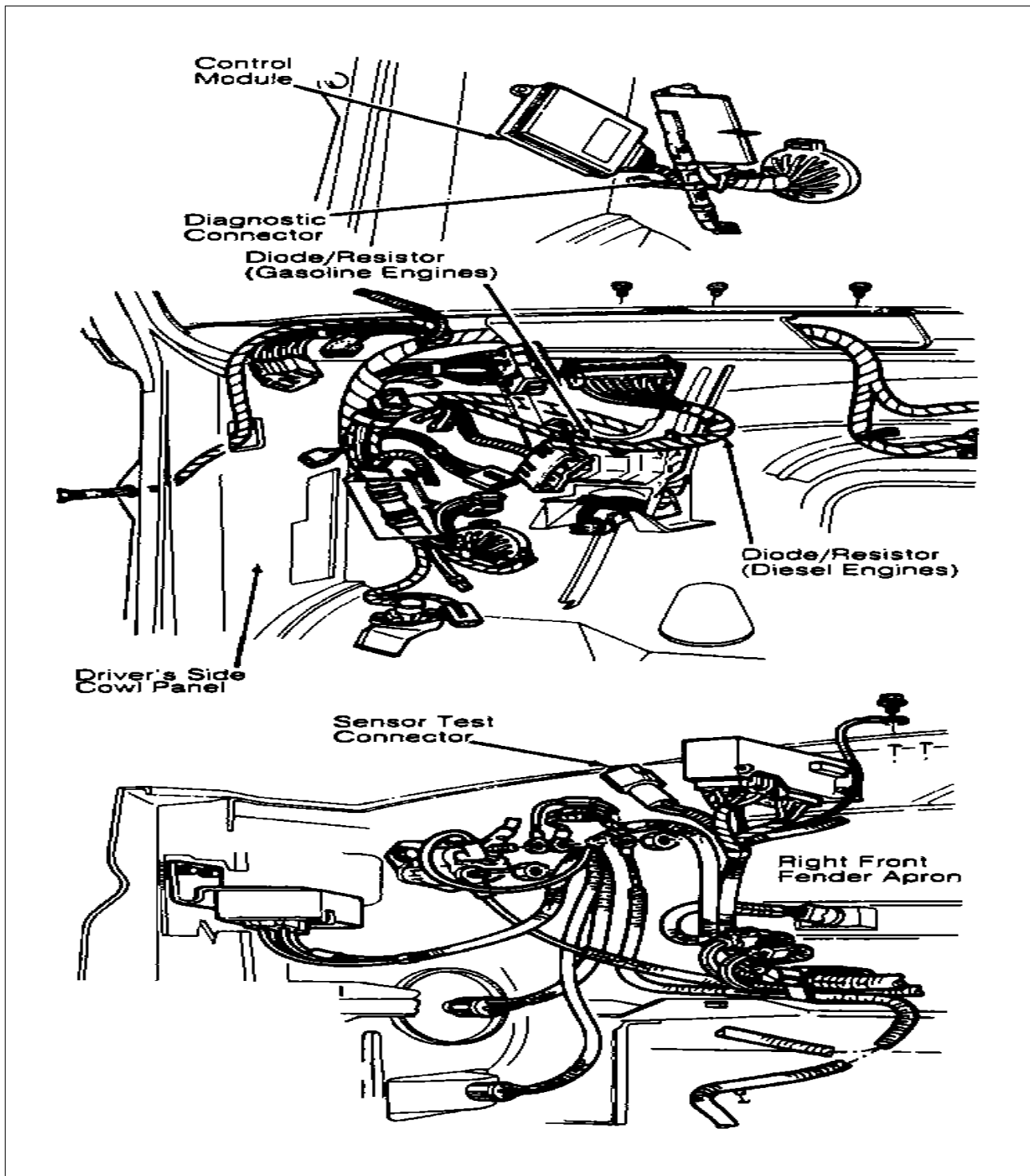
Courtesy of FORD MOTOR CO.

Fig 4: Explorer & Ranger - Ctrl Module, Diode/Resistor & Diagnostic Connector Location



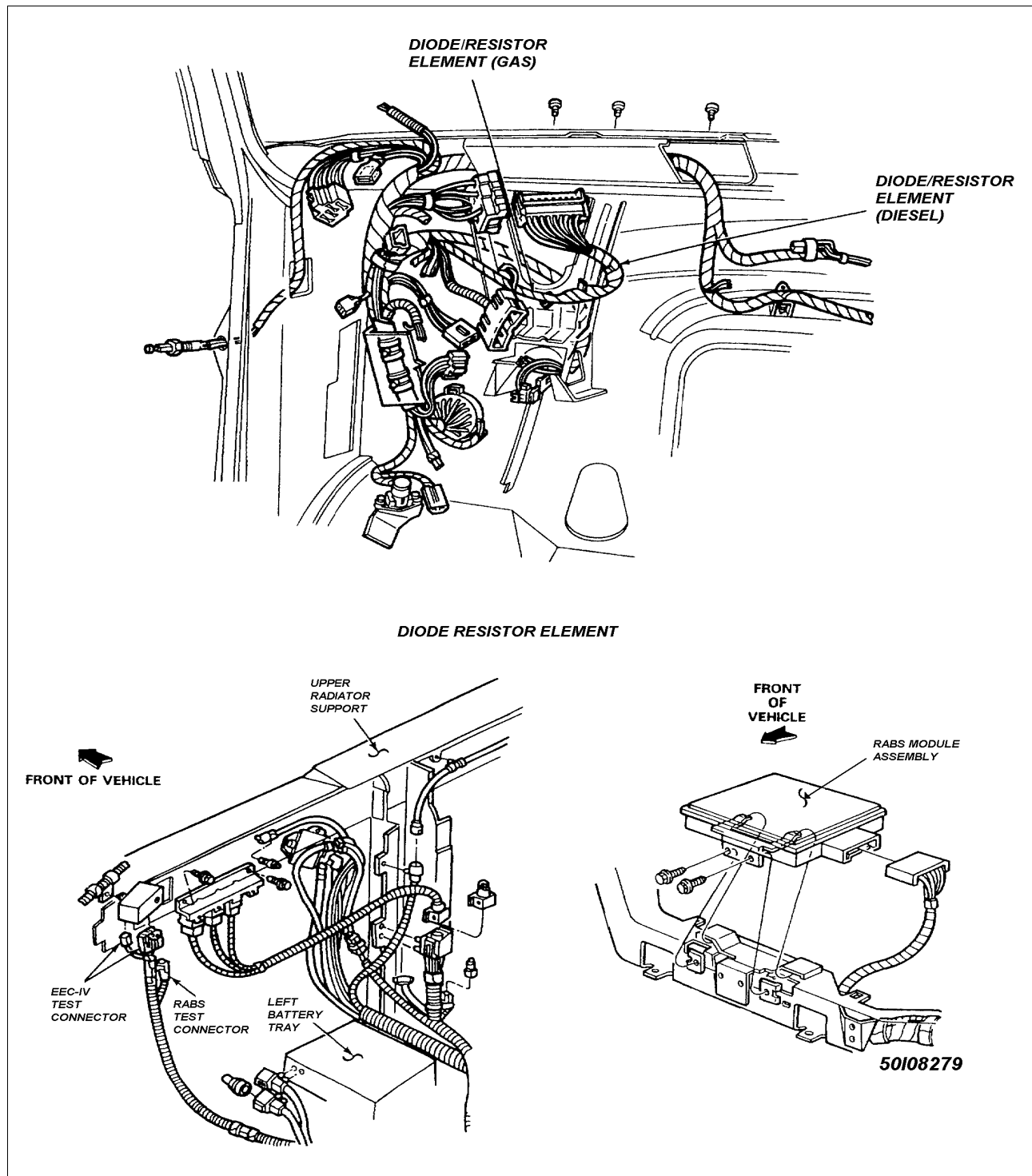
Courtesy of FORD MOTOR CO.

Fig 5: E Series (1990-91) - Ctrl Module, Diode/Resistor & Diagnostic Connector Location



Courtesy of FORD MOTOR CO.

Fig 6: E Series (1992) - Ctrl Module, Diode/Resistor &amp; Diagnostic Connector Location



Courtesy of FORD MOTOR CO.

Hydraulic system bleeding is necessary whenever air enters system. If master cylinder lines have been disconnected or master cylinder has run dry, bleed master cylinder and brakes at all 4 wheels. Bleed brakes with pressure bleeding equipment or by manually pumping brake pedal while using bleeder tubes. Always bleed brake lines in sequence. See BLEEDING SEQUENCE .

## BLEEDING BRAKE SYSTEM

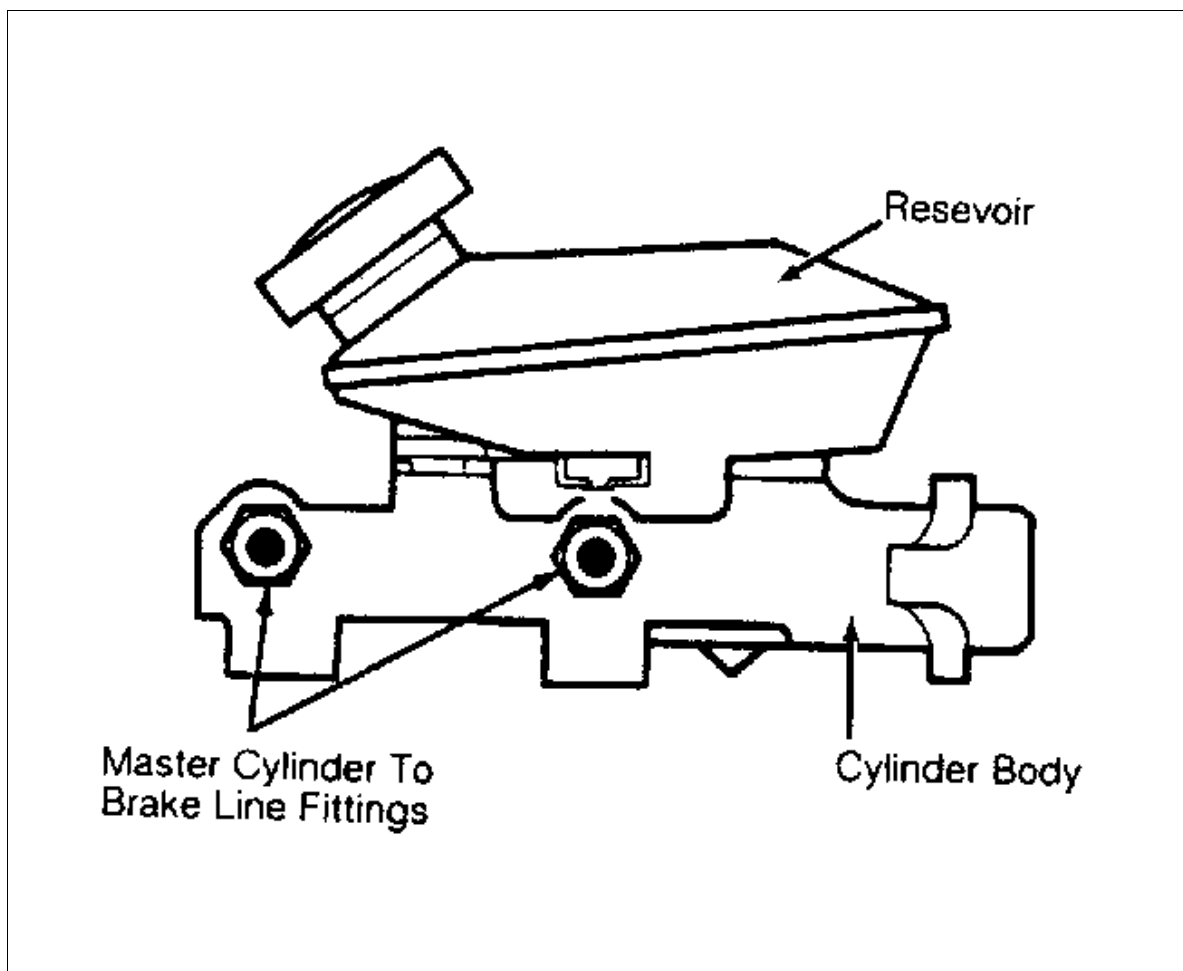
## MANUAL BLEEDING

**CAUTION:** DO NOT allow reservoir to run dry during bleeding operation. If brake fluid is spilled on vehicle paint, immediately rinse off with water.

**NOTE:** Manual bleeding procedure for Bronco and "E" and "F" Series vehicles is not available from manufacturer. Procedure is similar to other models.

1. Clean master cylinder cap and surrounding area. Remove cap. Explorer and Ranger models are equipped with dual type master cylinder. Aerostar has a cartridge type master cylinder. On Explorer and Ranger, bleed primary and secondary systems separately. Loosen primary or secondary master cylinder hydraulic line fitting. See Fig 7 .

Fig 7: Bleeding Master Cylinder (Typical)



Courtesy of FORD MOTOR CO.

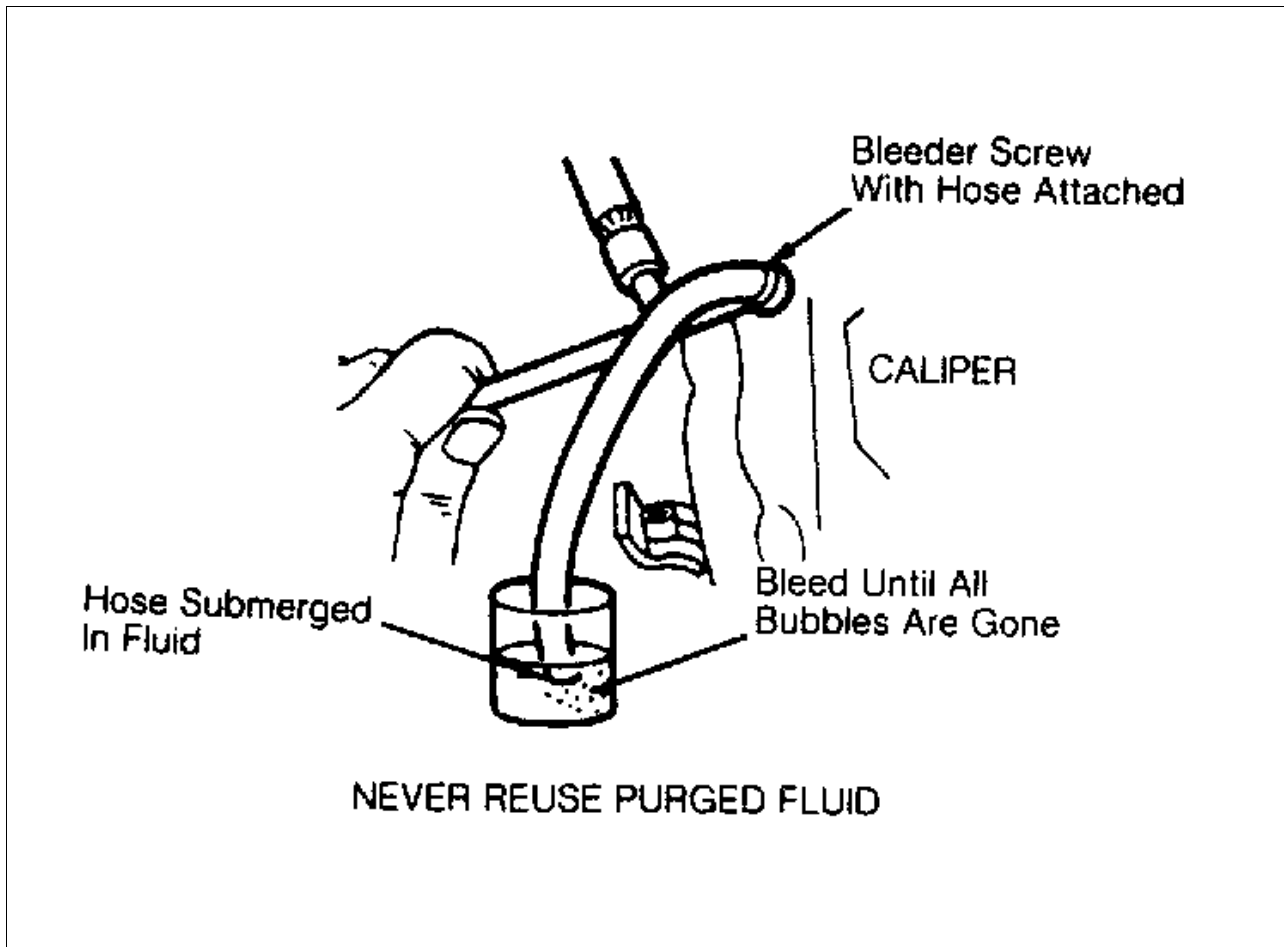
2. On Aerostar, loosen either master cylinder hydraulic line. On all models, wrap a cloth around



brake lines (on Aerostar, bleed longest line first) to absorb escaping brake fluid. Push brake pedal down slowly, forcing air out. With pedal fully depressed, tighten fittings to prevent air from being sucked into master cylinder when pedal is released. Release pedal.

3. Loosen fitting, and repeat procedure until air is completely purged from master cylinder. When all air has escaped, tighten fittings with pedal down. Release pedal and depress again. Pedal should be firm. If not, repeat bleeding procedure.
4. On Aerostar, attach a rubber drain hose to bleeder fitting on front of master cylinder. Submerge hose in small container half filled with clean brake fluid. Open bleeder fitting. Loosen bleeder fitting about 3/4 turn. Slowly push brake pedal completely down.
5. Close bleeder fitting, and return pedal to full released position. Repeat procedure until all air is purged from master cylinder. On all models, repeat procedure at bleeder fitting on rear anti-lock brake electro-hydraulic valve and each wheel cylinder. See BLEEDING SEQUENCE . See Fig 8 . When bleeding is complete, fill master cylinder to proper level.

Fig 8: Bleeding Wheel Cylinders



Courtesy of FORD MOTOR CO.

## PRESSURE BLEEDING

1. Clean master cylinder cap and surrounding area. Remove cap. See Fig 7 . With pressure tank at least 1/2 full of specified fluid and charged between 10-30 psi ( $.7-2.0 \text{ kg/cm}^2$ ), connect tank to master cylinder using adapters. Follow equipment manufacturer's pressure instructions.

**CAUTION:** NEVER exceed 50 psi (3.5 kg/cm<sup>2</sup>) during bleeding.

2. Open pressure bleeder valve. On Aerostar, attach one end of rubber drain tube to master cylinder bleeder fitting. Open bleed fitting. On all others, bleed master cylinder primary and secondary hydraulic lines one at a time. Put shop towels in place to catch brake fluid.
3. Open lines. On all models, allow brake fluid to flow out until all air is purged. Close bleed fitting and hydraulic line. Close pressure bleeder valve. Attach rubber drain hose to first wheel cylinder bleeder valve to be serviced. See Fig 8 . See BLEEDING SEQUENCE .
4. Place other end of hose in clean glass jar partially filled with clean brake fluid so end of hose is submerged in fluid. Open pressure bleeder valve. Open bleeder fitting. Close bleeder fitting when fluid flow is free of bubbles. Repeat procedure on remaining wheel cylinders in sequence. See BLEEDING SEQUENCE .
5. When bleeding operation is complete, close pressure bleeder valve and remove tank hose from adapter fitting. Check brake pedal operation. Ensure that master cylinder is full of fluid.

## BLEEDING SEQUENCE

Before bleeding system, exhaust all vacuum from power unit by depressing brake pedal several times. Bleed master cylinder first, followed in sequence by RABS electro-hydraulic valve, rear wheel cylinders and front calipers.

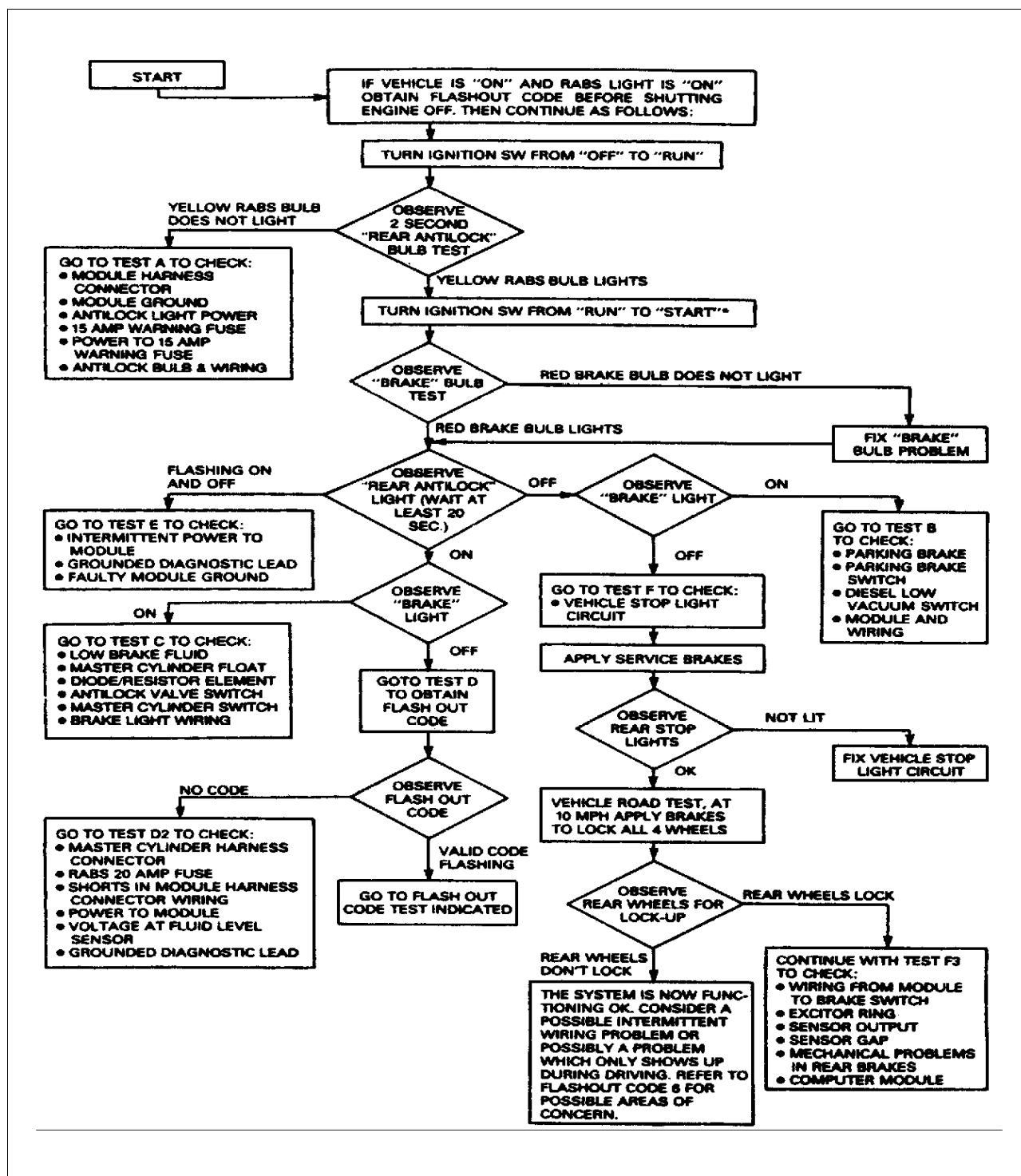
### BLEEDING SEQUENCE

Application	Sequence
All Models	Master Cylinder, RABS Electro-Hydraulic Valve Wheel Cylinders: RR, LR, RF, LF

## TROUBLE SHOOTING

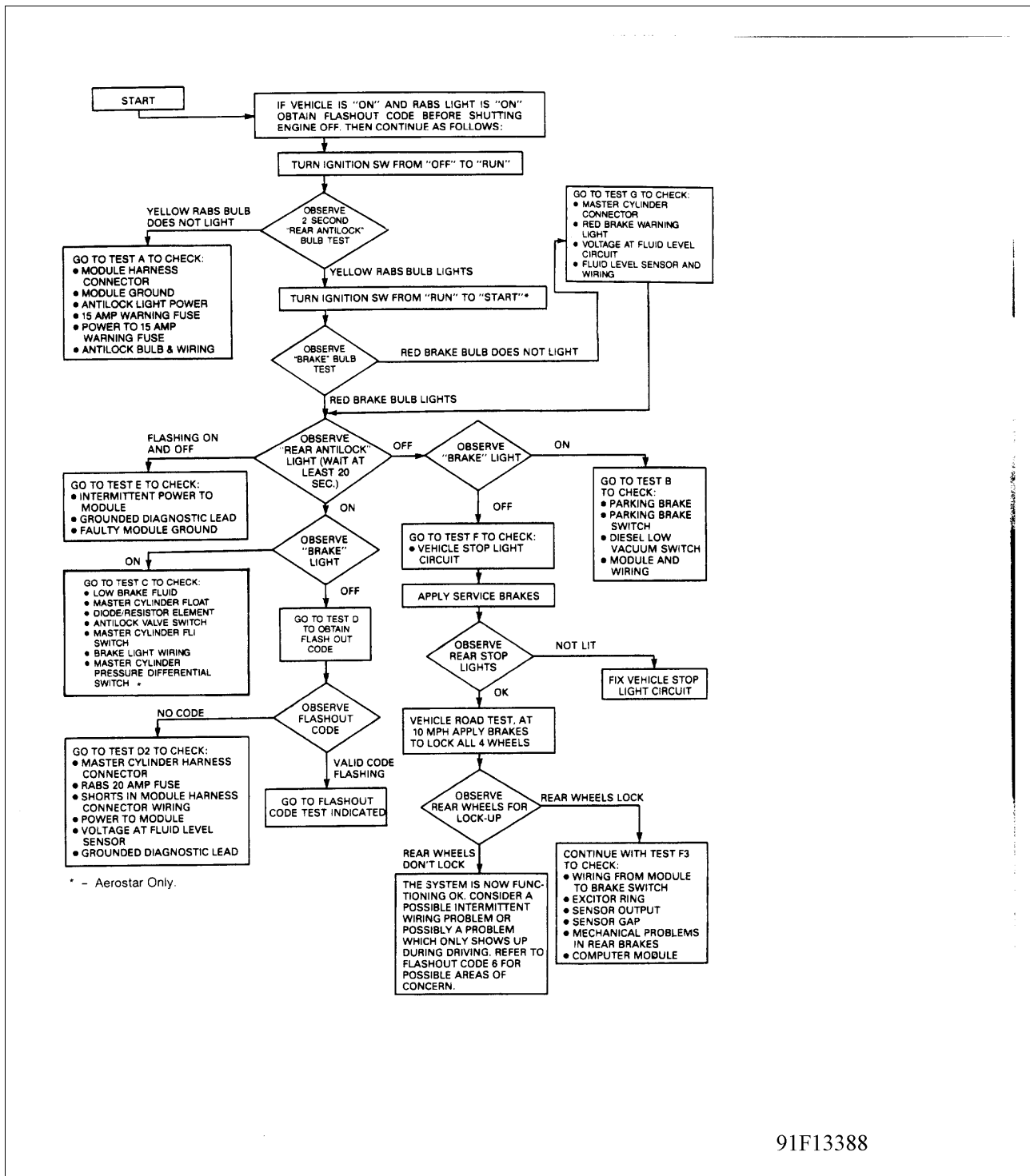
**NOTE:** ALWAYS disconnect positive battery cable before measuring resistance on RABS system or incorrect resistance readings may be obtained. Before condemning circuit, always check connectors for dirty or corroded terminals.

Fig 9: 1989 RABS Trouble Shooting Chart



Courtesy of FORD MOTOR CO.

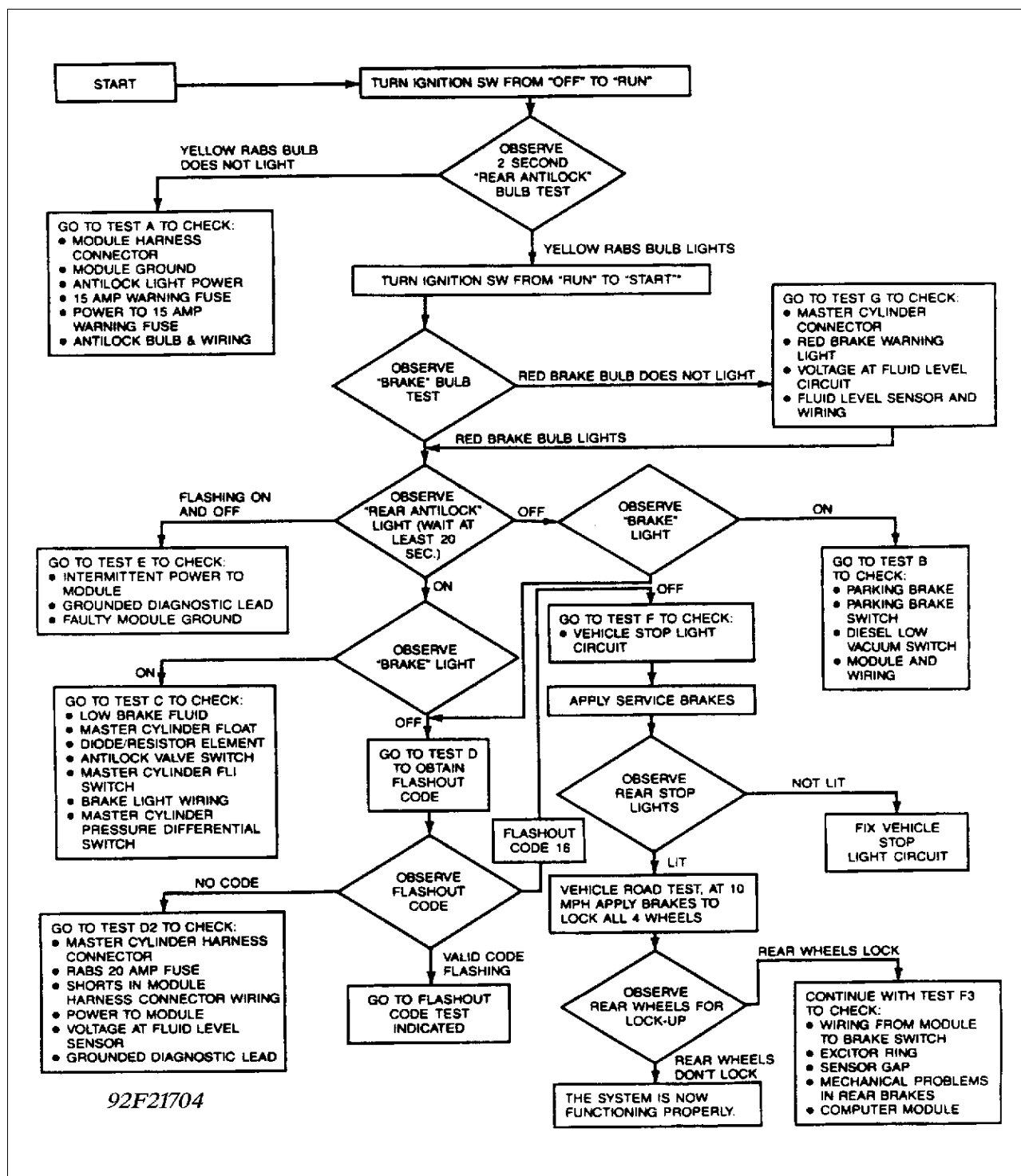
Fig 10: 1990-92 RABS Trouble Shooting Chart (Except 1992 Aerostar)



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Courtesy of FORD MOTOR CO.

Fig 11: 1992 RABS Trouble Shooting Chart (Aerostar)



Courtesy of FORD MOTOR CO.

## DIAGNOSIS

### RETRIEVING TROUBLE CODES

#### Except Aerostar

Rear Anti-Lock Brake System (RABS) has a self-test capability. There are 2 warning lights, located on instrument panel, to inform driver of malfunction. Red BRAKE warning light indicates low fluid level,

parking brake on or low vacuum (diesel models). Yellow REAR ANTI-LOCK warning light comes on when control module detects a malfunction and/or anti-lock brake system is inoperative. Both lights should come on for approximately 2 seconds when ignition is turned on or when cranking engine. See Fig 12 .

When Yellow REAR ANTI-LOCK warning light comes on during normal operation, a trouble code can be received from control module. Code will be lost if vehicle is shut off before code is retrieved. In some cases, code may reappear when vehicle is restarted. In other cases, vehicle may have to be driven to reproduce problem.

**WARNING:** *Block front and rear wheels to prevent vehicle from moving while trouble codes are being retrieved.*

**NOTE:** *If multiple system faults exist, only first detected fault code can be received.*

If Red BRAKE warning light is on because of low brake fluid level, together with Yellow REAR ANTI-LOCK warning light, Yellow warning light will not flash trouble code but will glow steadily. System faults concerning brake fluid level switch and power loss to control module, will cause anti-lock brake system to deactivate. Yellow warning light will come on but control module will not generate a trouble code.

Before retrieving trouble code, ensure vehicle is on a level area. Transmission should be in Park or Neutral. Note if Red BRAKE warning light is on. Apply parking brake. Keep ignition on so code will not be lost. Locate rear anti-lock brake diagnostic connector and attach jumper wire. See Fig 1 -Fig 6 . Momentarily ground other end of jumper wire. When ground is contacted then broken, Yellow REAR ANTI-LOCK warning light will flash trouble code. A code consists of a number of short flashes and one long flash. Count each flash, short and long to obtain code number.

### Aerostar

A flashout code of 16 will be obtained when module detects normal system operation. Thus, flashout code of 16 indicates "system OK".

Before obtaining flashout code, drive vehicle to a level area, and place shift lever in PARK for A/T and NEUTRAL for M/T. Notice whether red BRAKE light is on or not (for future reference), and then apply parking brake. Keep ignition key in ON position so that code will not be lost.

**WARNING:** *Block front and rear wheels to prevent vehicle from moving while trouble codes are being retrieved.*

To obtain flashout code, locate RABS diagnostic connector (with orange/black wire) on main wire bundle inside driver's side cab under dash slightly rearward of pin 53 connector. See Fig 1 or Fig 2 . Note that Aerostar will have a mating connector plugged into diagnostic connector. Disconnect this mating connector prior to following next step.

Attach jumper wire to black/orange wire. Momentarily ground it to chassis. When ground is made and then broken, Rear ABS light should begin to flash.

**CAUTION:** *Care must be taken to connect only*

*black/orange wire to ground. Connection of mating connector side wire (light green w/yellow stripe) to ground will result in a blown fuse.*

**NOTE:** *If red Brake light was on (as noticed before parking*

*brake was applied), problem may be w/low fluid level circuit and, in this case, no flashout code will be flashed and yellow REAR ABS light will remain on steadily.*

The code consists of a number of short flashes and ends with a long flash. Count short flashes and include the following long flash in count to obtain code number. For example, three short flashes followed by one long flash indicates Flashout Code 4. The code will continue to repeat itself until key is turned off. It is recommended that code be verified by reading it several times. In addition, the first code flashed may be too short because it may have been started in middle. It should be ignored.

**TROUBLE CODES****No Codes**

Some system faults light REAR ANTI-LOCK warning light, but do not set a trouble code. See RETRIEVING TROUBLE CODES . If trouble code should be set but cannot be retrieved, refer to RABS TROUBLE SHOOTING CHART. See Fig 12 . Ensure a good momentary ground is made at diagnostic connector.

**Code 1**

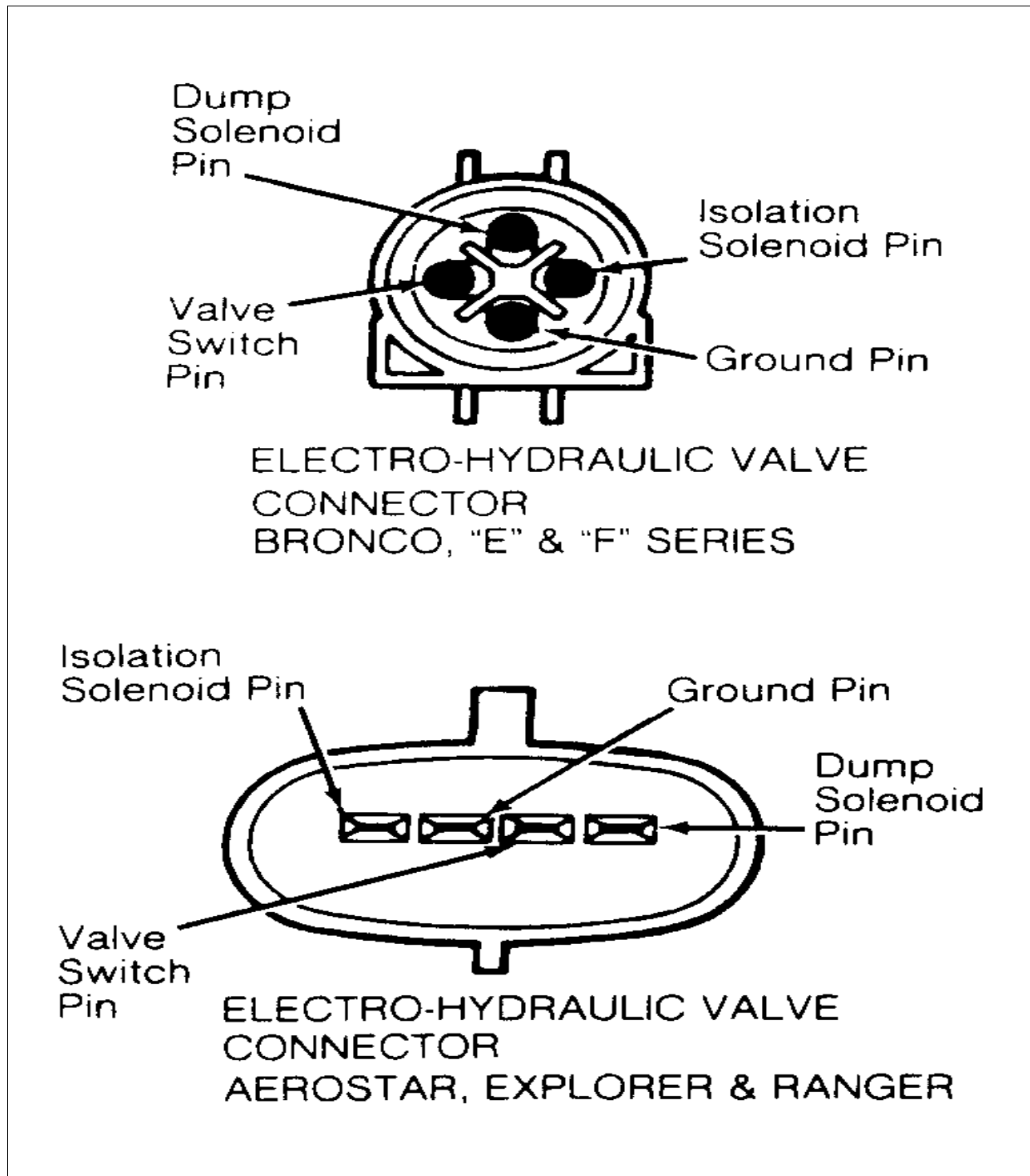
Code 1 is not a valid code. Perform RETRIEVING TROUBLE CODES again. If Code 1 appears again, go to TEST E - YELLOW LIGHT FLASHING & RED LIGHT OFF under TESTING.

**Code 2 (Open Isolate Circuit)**

1. Turn ignition off. Disconnect battery. Unplug control module harness connector. Measure resistance between module connector pin No. 13 and ground. If resistance is 6 ohms or less, replace control module, and retest system.
2. If resistance is greater than 6 ohms, reconnect module connector. On Bronco, "E" and "F" Series, disconnect electro-hydraulic valve connector. On all others, go to step 4). On Bronco, "E" and "F" Series, measure resistance between ground pin (harness side) and ground. See Fig 12 .
3. If resistance is one ohm or more, repair open in ground circuit wire. If resistance is less than one ohm, measure resistance between isolation solenoid pin and ground pin on valve side. See Fig 12 . If resistance is 6 ohms or less, repair open between isolation solenoid valve and control module.
4. On all others, disconnect electro-hydraulic valve connector. See Fig 12 . Measure resistance between isolation solenoid pin and ground pin on valve side. If resistance is greater than 6 ohms, replace electro-hydraulic valve and retest. If resistance is 6 ohms or less, repair open

between isolation solenoid valve and control module.

Fig 12: Identifying Electro-Hydraulic Valve Connector Pins



Courtesy of FORD MOTOR CO.

### Code 3 (Open Dump Circuit)

1. Turn ignition off. Disconnect battery. Unplug control module connector. Measure resistance between pin No. 8 or 14 and ground on valve side. See Fig 12 . If resistance is less than 3 ohms, replace control module. If resistance is 3 ohms or more, reconnect module connector.



2. Unplug electro-hydraulic valve connector. Measure resistance between dump solenoid pin and ground pin on valve side. If resistance is less than 3 ohms, repair open between dump valve connector and control module. If resistance is 3 ohms or more, replace electro-hydraulic valve.

#### **Code 4 (Closed Valve Switch Or Open Dump Valve) Bronco, "E" & "F" Series**

1. When this occurs, Red BRAKE warning light will be on. Unplug electro-hydraulic valve connector. Measure resistance between valve switch pin (on valve side) and valve body. See Fig 12 . If resistance is less than 10,000 ohms, replace electro-hydraulic valve.
2. If resistance is 10,000 ohms or more, measure resistance between valve switch pin and ground pin on valve side. See Fig 12 . If resistance is 10,000 ohms or less, replace electro-hydraulic valve. If resistance is more than 10,000 ohms, disconnect battery.
3. Unplug control module connector. Measure resistance between module connector pin No. 6 (on harness side) and ground. See Fig 13 . If resistance is 100,000 ohms or more, replace control module. If resistance is less than 100,000 ohms, repair short between valve and control module.

#### **Aerostar, Explorer, Ranger & Navajo**

1. When this occurs, Red BRAKE warning light will be on. Unplug electro-hydraulic valve connector. Measure resistance between valve switch pin (on valve side) and valve body. See Fig 12 . If resistance is less than 10,000 ohms, replace electro-hydraulic valve. If resistance is 10,000 ohms or more, check resistance between valve switch pin (on valve side) and solenoid ground pin. See Fig 12 .
2. If resistance is more than 26,000 ohms or less than 18,000 ohms, replace electro-hydraulic valve. If resistance is 18,000-26,000 ohms, check resistance between valve switch pin (on valve side) and valve body, with hydraulic pressure applied for a minimum of 30 seconds.
3. If resistance is less than 10,000 ohms, replace electro-hydraulic valve. If resistance is 10,000 ohms or more, check resistance between ground pin (on harness side) and chassis ground. See Fig 12 . If resistance is one ohm or more, repair open in isolation solenoid wire. If resistance is less than one ohm, reconnect valve connector.
4. Disconnect battery. Unplug control module connector. Measure resistance between pin No. 4 and pin No. 6 at module connector, on harness side. See Fig 13 . If resistance is more than 26,000 ohms or lower than 18,000 ohms, repair open or short between electro-hydraulic valve and control module. If resistance is 18,000-26,000 ohms, replace control module.

#### **Code 5 (System Dumps Too Many Times)**

1. This condition occurs in 2WD, on either 2WD or 4WD vehicles. Problem happens when making normal or hard stops, and rear brakes may lock-up. If problem occurred with 2WD or 4WD vehicle (while in 2WD), go to step 2). If problem occurred with 4WD vehicle (while in 4WD), go to step 3).
2. Disconnect control module connector to disable system. Drive vehicle in 2WD mode and make several normal stops to check rear brake operation. If rear brake operates properly, replace electro-hydraulic valve, and retest system. If rear brakes grab or lock-up easily, repair rear brake system (mechanical), and retest system.
3. Unplug control module connector. Turn ignition on. Shift transfer case into 4WD mode. Measure voltage between pin No. 5 and chassis ground. See Fig 13 . If voltage is less than one volt, replace electro-hydraulic valve. If voltage is one volt or more, repair or replace 4WD

indicator switch, located on transfer case.

### **Code 6 (Speed Sensor Signal Rapidly Cuts In And Out)**

1. This condition only happens while driving. Turn ignition off. Disconnect battery. Measure resistance between module connector pins No. 3 and 10, while shaking wiring harness between speed sensor and module connector. See Fig 13 . If reading is erratic, repair loose connection in sensor leads.
2. If resistance is 1000-2000 ohms and steady, remove speed sensor. Check for build up of metal chips on sensor pole. If metal chips are present, drain and clean differential. Check exciter ring for broken or chipped teeth. If no metal chips are present, remove sensor from carrier.
3. Inspect exciter ring for damaged teeth. If teeth are okay and no visible lateral runout is seen, reinstall speed sensor. If teeth are damaged and lateral runout is visible, repair differential.
4. To check for low or erratic sensor output, raise vehicle to allow rear wheels to spin freely. Start engine. With rear wheels rotating at 5 MPH, measure voltage between test connector pins. If voltage is 650 mV or more and steady, replace control module. If voltage is less than 650 mV and/or is erratic, replace speed sensor and test connector cap. Retest system.

### **Code 7 (No Isolate Valve Self-Test)**

1. Turn ignition off. Unplug electro-hydraulic valve connector. Measure resistance between isolation solenoid pin and ground pin at valve. See Fig 12 . If resistance is less than 3 ohms, replace valve. If resistance is 3 ohms or more, turn ignition off, and disconnect battery.
2. With electro-hydraulic valve connector still apart, unplug control module connector. Measure resistance between module pin No. 13 and chassis ground. See Fig 13 . If resistance is 20,000 ohms or more, replace control module. If resistance is less than 20,000 ohms, repair short between electro-hydraulic valve and control module.

### **Code 8 (No Dump Valve Self-Test)**

1. Turn ignition off. Unplug electro-hydraulic valve connector. Measure resistance between dump solenoid pin and ground pin at valve. See Fig 12 . If resistance is less than one ohm, replace electro-hydraulic valve. If resistance is one ohm or more, turn ignition off, and disconnect battery.
2. With electro-hydraulic valve connector still apart, unplug control module connector. Measure resistance between module connector pins No. 8 or 14 and ground. See Fig 13 . If resistance is 20,000 ohms or more, replace control module. If resistance is less than 20,000 ohms, repair short between electro-hydraulic valve and control module.

### **Code 9 (High Sensor Resistance)**

1. Turn ignition off. Unplug RABS sensor connector at sensor. Measure resistance between sensor pins. If resistance is 2500 ohms or more, replace sensor. If resistance is less than 2500 ohms, disconnect battery. Reconnect RABS sensor connector. Unplug control module connector.
2. Measure resistance between module connector pins No. 3 and 10. See Fig 13 . If resistance is less than 2500 ohms, replace control module. If resistance is 2500 ohms or more, repair open between RABS sensor and control module. If jumper harness between RABS sensor and frame rail is defective, replace ONLY with original equipment High Flex Wire. Splice Connector (E6EB-14488-AA) MUST be used.

### **Code 10 (Low Sensor Resistance)**

1. Turn ignition off. Unplug RABS sensor connector at sensor. Measure resistance between sensor pins. If resistance is 1000 ohms or less, replace sensor. If resistance is more than 1000 ohms, disconnect battery. With RABS sensor connector apart from sensor, unplug control module connector.
2. Measure resistance between module pin No. 10 and chassis ground. See Fig 13 . If resistance is less than 20,000 ohms, repair short to ground between RABS sensor and control module. If jumper harness between RABS sensor and frame rail is defective, replace ONLY with original equipment High Flex Wire. Splice Connector (E6EB-14488-AA) MUST be used.
3. If resistance is 20,000 ohms or more, measure resistance between module connector pins No. 3 and 10. If resistance is 20,000 ohms or more, replace control module. If resistance is less than 20,000 ohms, repair short between RABS sensor wires. If jumper harness between RABS sensor and frame rail is defective, replace ONLY with original equipment High Flex Wire. Splice Connector (E6EB-14488-AA) MUST be used.

### **Code 11 (Stoplight Switch Circuit)**

1. This condition occurs only when driving above 35 MPH. Depress brake pedal and check stoplight operation. If stoplights do not operate, repair stoplight circuit, and retest system. If stoplights operate properly, turn ignition off. Unplug control module connector. Measure voltage at module connector pin No. 11 while depressing brake pedal. See Fig 13 .
2. If voltage is less than 9 volts, repair open between stoplight switch and control module. If voltage is 9 volts or more, check 4-way flasher and wiring. A problem with 4-way flasher or wiring could cause feedback through stoplight circuit.

### **Code 12 (Fluid Level Switch Closed During A Stop) Bronco, "E" & "F" Series**

When this occurs, Red BRAKE warning light will be on. For test procedure, see under TESTING C . Skip step 3).

### **Code 12 (Loss Of Brake Fluid For One Second During Stop) Aerostar, Explorer, Navajo & Ranger**

1. When this occurs, Red BRAKE warning light will be on. Check brake fluid level. If low, check complete system for leaks, and repair as necessary. Refill master cylinder. If fluid level is okay, go to next step.
2. Check master cylinder fluid level switch. Remove connector from master cylinder. Connect a jumper wire between the Purple/Yellow wire and Purple/White wire. If Rear ABS and Brake warning lights stay ON, go to step 3). If warning lights stay OFF, replace master cylinder reservoir.
3. Check for shorts in brake light wiring. Disconnect brake module harness connector from module. Turn ignition switch ON. If Rear ABS light goes OFF and Brake light stays ON, check for short to ground in circuits 977 and 128. See WIRING DIAGRAMS . If both warning lamps go OFF, replace control module.

### **Code 13 (Speed Sensor Check)**

This code indicates control module speed circuit phase lock loop failure, detected during module self-test. Replace control module.

### **Code 14 (Program Check)**

This code indicates control module program check sum failure detected during self-test. Replace control module.

#### **Code 15 (Memory Failure)**

This code indicates control module RAM failure detected during self-test. Replace control module.

#### **Code 16 (Aerostar)**

This code should not occur. Recheck flashing sequence. If codes continue to occur, replace control module.

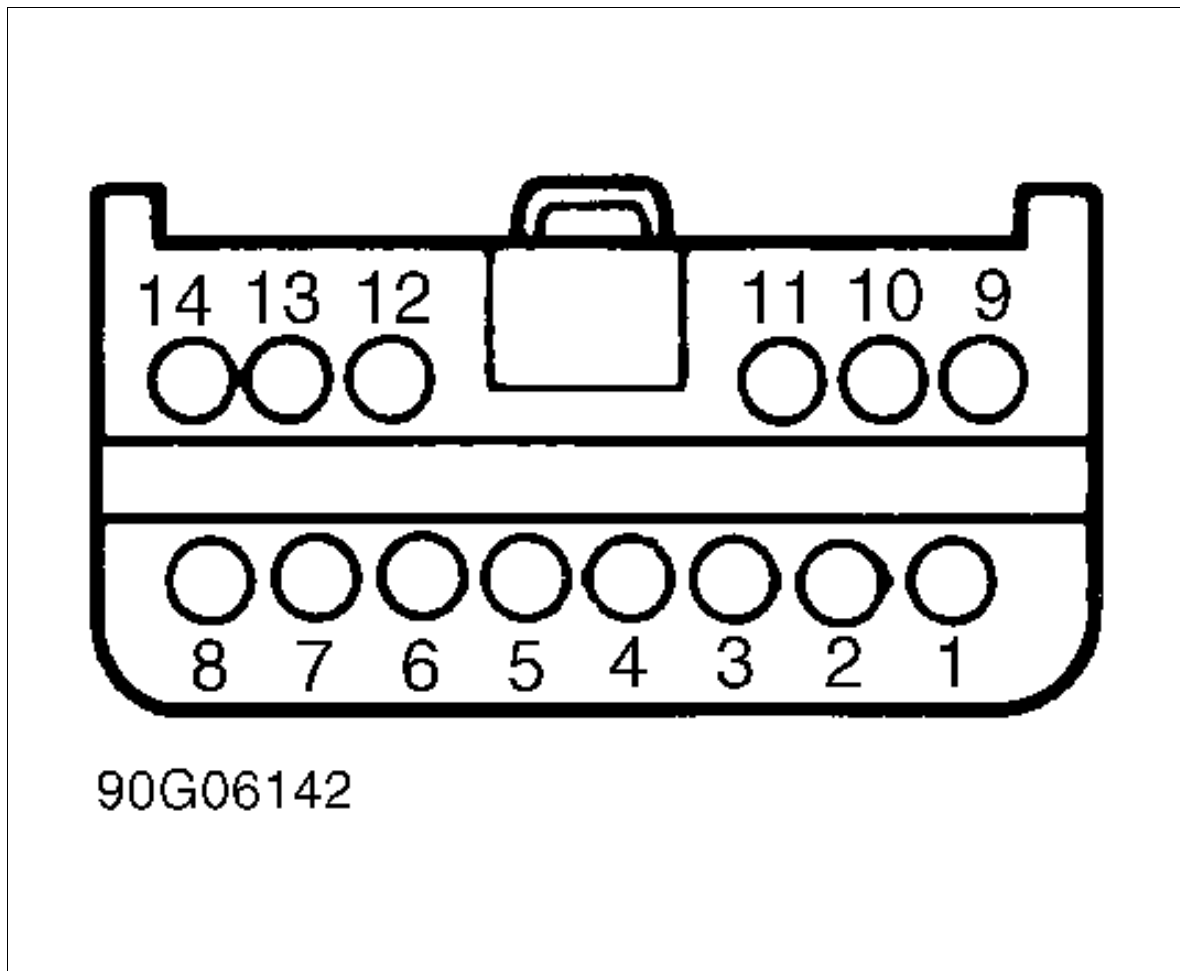
### **TESTING**

**NOTE:** *References to Red light and Yellow light, refer to Red BRAKE warning light and Yellow REAR ANTI-LOCK Brake warning light.*

#### **TEST A - YELLOW LIGHT OFF & DOES NOT SELF-CHECK**

1. Ensure control module connector is fully engaged. If not, engage connector, and retest system. If connector is engaged, disconnect battery. Unplug control module connector. Measure resistance between connector pin No. 4 and ground. See Fig 13 .

Fig 13: Identifying Control Module Pins



Courtesy of FORD MOTOR CO.

2. If resistance is one ohm or more, check for open circuit between pin No. 4 and ground. If resistance is less than one ohm, reconnect battery. Turn ignition on. Check voltage at connector pin No. 7. If voltage is 9 volts or more, replace control module.
3. If voltage is less than 9 volts, check Yellow ABS light 15-amp fuse. If fuse is bad, check for short between fuse and warning lights. Replace fuse and retest system. If fuse is okay, check voltage at fuse. If voltage is less than 9 volts, check fuse panel or vehicle electrical system.
4. If voltage is 9 volts or more, check warning light bulb. If bulb is bad, replace bulb and retest system. If bulb is okay, repair open in wiring between warning light fuse and control module connector pin No. 7.

**TEST B - RED LIGHT ON, YELLOW LIGHT OFF & DOES SELF-CHECK**

1. Turn ignition on. Release parking brake pedal, if applied. If Red light goes off, road test vehicle. If brakes lock-up, go to step 2). If Red light stays on, go to step 2).
2. Unplug parking brake switch connector. If Red light goes out, adjust or replace parking brake switch. If Red light remains on, disconnect module harness connector from module (gas engines). On diesel engines, go to step 4).
3. On gasoline engines, if Red light goes out after disconnecting module connector, replace

control module. If Red light stays on, check for short to ground in wiring between Red light and diode/resistor.

4. On diesel engines, disconnect vacuum warning switch connector. If Red light goes off, repair vacuum pump. If Red light stays on, unplug control module connector.
5. If Red light goes off, replace control module. If Red light remains on, check for shorted wiring between Red light and diode/resistor. See Fig 1 -Fig 6 for diode/resistor locations.

### **TEST C - YELLOW & RED LIGHTS ON STEADY**

1. Check master cylinder fluid level. If fluid level is low, check for leaks, refill reservoir and retest system. If fluid level is okay, remove cap from master cylinder. Carefully push down on float in reservoir. If float does not move downward, replace master cylinder reservoir. Retest system. If float moves downward, reinstall master cylinder cap.
2. Turn ignition on. Check parking brake and release if applied. If both lights go off, replace diode/resistor. See Fig 1 -Fig 6 . If both lights stay on, remove parking brake switch and diesel low vacuum switch (if equipped) connectors.
3. If both lights go off, replace diode/resistor. If both lights stay on, attempt to retrieve trouble code. See RETRIEVING TROUBLE CODES . If trouble code is retrieved, go to appropriate code. See RETRIEVING TROUBLE CODES . If both lights are still on steady, turn ignition off.
4. Unplug fluid level sensor connector, at master cylinder. Connect a jumper wire between the 2 Purple/Yellow and Purple/White wires. Turn ignition on. If both lights go off, replace master cylinder reservoir. If both lights stay on, turn ignition off.
5. Unplug control module connector. Turn ignition on. If both lights go off, replace control module. If both lights stay on, check for short in fluid level and parking brake switch wiring. Repair short in wiring and retest system.

### **TEST D - YELLOW LIGHT ON, RED LIGHT OFF**

1. Attempt to retrieve trouble code. See RETRIEVING TROUBLE CODES . If trouble code was retrieved, see appropriate CODE 1 -16 heading. If trouble code cannot be retrieved, ensure master cylinder connector is plugged in fully. If connector is fully plugged in, check RABS 20-amp fuse.
2. If fuse is bad, check for short in wiring between fuse panel and control module connector. If fuse is okay, turn ignition off. Unplug control module. Turn ignition on. If Yellow light remains on, repair short in wiring between Yellow light and control module connector.
3. If light goes off, measure voltage at control module connector pin No. 1 and at pin No. 9. If voltage is less than 9 volts at either pin, repair open circuit between fuse panel and appropriate pin at connector or power source to fuse panel. If voltage is 9 volts or more, go to next step.
4. Measure voltage at control module connector pin No. 2. If voltage is 8 volts or more, go to step 6). If voltage is less than 8 volts, measure voltage at each of 2 Purple/White wires at fluid level switch on Bronco and "E" and "F" Series (Purple/White wire and Purple/Yellow wire on all other models). DO NOT unplug switch connector to check voltage. If voltage is 8 volts or more at one wire but less than 8 volts at other, replace master cylinder reservoir.
5. If voltage is less than 8 volts at both wires, replace diode/resistor or repair open in indicator light power supply wire between fuse panel and instrument panel. See Fig 1 -Fig 6 . If voltage is 8 volts or more at both wires, check for open in Purple/Yellow wire or Purple/White wires.

6. Turn ignition off. Reconnect control module connector to module. Turn ignition on. Measure voltage at diagnostic connector. If voltage is less than one volt, check for open in Black/Orange wire between diagnostic connector and control module. If voltage is one volt or more, replace control module and retest system.

#### TEST E - YELLOW LIGHT FLASHING & RED LIGHT OFF

1. Turn ignition off. Unplug control module connector. Turn ignition on. Shake instrument panel harness while measuring voltage. Measure voltage at control module connector pin No. 1 and at pin No. 9. If voltage is intermittent or is less than 9 volts, check for open in wiring between fuse panel and connector pin No. 1 and pin No. 9.
2. If voltage is steady and 9 volts or more, turn ignition off. Disconnect battery. Measure resistance between control module connector pin No. 12 and ground. Shake module harness while measuring resistance. If resistance is less than 100,000 ohms or resistance varies, repair short in Black/Orange wire between diagnostic connector and module connector.
3. If resistance was 100,000 ohms or more and steady, measure resistance between module connector pin No. 4 and ground. Shake module harness while measuring resistance. If resistance is one ohm or more, repair open in Black/White wire between module connector pin No. 4 and body ground. If resistance is less than one ohm and is steady, replace control module.

#### TEST F - LIGHTS OKAY & REAR WHEELS LOCK-UP

1. Ensure stoplights are working properly. If not, repair stoplights and retest. If stoplights are working properly, operate vehicle at approximately 10 MPH. Apply brakes to attempt lock-up of all brakes, and observe left rear wheel operation in mirror. If rear wheels do not lock-up, system is operating properly.
2. Intermittent wiring problem may be occurring during normal driving conditions. Go to CODE 6 for testing. If rear wheels lock up, turn ignition off. Unplug control module connector. Measure voltage at module connector pin No. 11 while depressing brake pedal. If voltage is less than 9 volts, repair open in Red/Light Green wire on Aerostar or Light Green wire on all others, between stoplight switch and module connector pin No. 11.
3. If voltage is 9 volts or more, turn ignition off. Remove speed sensor. Check for presence of exciter ring and condition of teeth. If damage to component is found, replace damaged component and retest. If components are okay, reinstall speed sensor. Raise rear of vehicle and support. Block front wheels. On 4WD models, place transfer case in 2WD mode.

**WARNING:** Use care when working around rotating wheels.

4. Remove cap from sensor test connector. See Fig 1 -Fig 6 . Start engine and place transmission in gear. With wheels rotating at 5 MPH, measure voltage between test connector pins.
5. If voltage is 650 mV or more, reinstall sensor test connector. Go to step 7). If voltage is less than 650 mV, replace speed sensor and retest system. If voltage is still low after replacing speed sensor, turn engine off. Remove speed sensor from differential. Measure speed sensor pole height from mounting face to end of pole piece. Measurement should be 1.07-1.08" (27.2-27.4 mm).

6. Measure between top of exciter ring teeth to sensor mounting face of carrier. Difference between 2 measurements is sensor gap. If difference is more than .050" (1.27 mm), check for defective sensor or carrier housing. If difference is less than .050" (1.27 mm), go to step 7).
7. Check rear brakes for mechanical problems such as grabbing, locking and pulling. Repair brakes as necessary. If rear brakes are okay, replace control module and retest.

## **TEST G - YELLOW LIGHT SELF-CHECKS, RED LIGHT DOES NOT SELF-CHECK**

Ensure connector on brake fluid level switch, at the master cylinder, is plugged in fully. If not, reconnect and retest. If connector is okay, apply parking brake and check Red warning light. If Red warning light does not come on, check bulb or an open in light circuit. If light comes on, go to TEST D - YELLOW LIGHT ON, RED LIGHT OFF , step 4).

## **REMOVAL & INSTALLATION**

### **ELECTRO-HYDRAULIC VALVE**

Disconnect and plug brake lines connected to electro-hydraulic valve. Unplug electrical connector. Remove mounting bolts retaining valve to frame. Remove valve. To install, reverse removal procedure.

### **SPEED SENSOR**

Unplug speed sensor connector. Remove hold-down bolt and sensor. To install, ensure "O" ring is positioned on sensor and sensor tip is clean of all metal particles. Lightly lubricate "O" ring with engine oil. Install sensor. DO NOT use force to install sensor. Install hold-down bolt.

### **CONTROL MODULE**

On 1989-91 "E" Series, remove parking brake actuator assembly. Remove screws attaching control module behind kick panel. Remove control module. On all other models, remove screws attaching control module to dash panel bracket. Remove control module. To install, reverse removal procedure.

### **EXCITER RING**

Remove differential case from axle housing. See DIFFERENTIAL article in DRIVE AXLES. Exciter ring must be pressed off differential case, and discarded. To install, reverse removal procedure.

## **TORQUE SPECIFICATIONS**

### **TORQUE SPECIFICATIONS**

Application	Ft. Lbs. (N.m)
Brake Lines	
1/2"-20	10-17 (14-23)
7/16"-24	10-15 (14-20)
3/8"-24	10-15 (14-20)
Electro-Hydraulic Valve Mounting Bolts	
Bronco & "F" Series	12-17 (16-23)
Explorer & Ranger	11-14 (15-19)



"E" Series	19-24 (26-32)
Speed Sensor Hold-Down Bolt	25-30 (34-41)
<b>INCH Lbs. (N.m)</b>	
Electro-Hydraulic Valve Mounting Bolts	
Aerostar	30-40 (3.4-4.5)

## WIRING DIAGRAMS

For anti-lock brake system wiring diagrams, see Fig 14 -21 . Also refer to appropriate chassis wiring diagram in WIRING DIAGRAMS .

Fig 14: Rear ABS Wiring Diagram (Aerostar) 1990-91

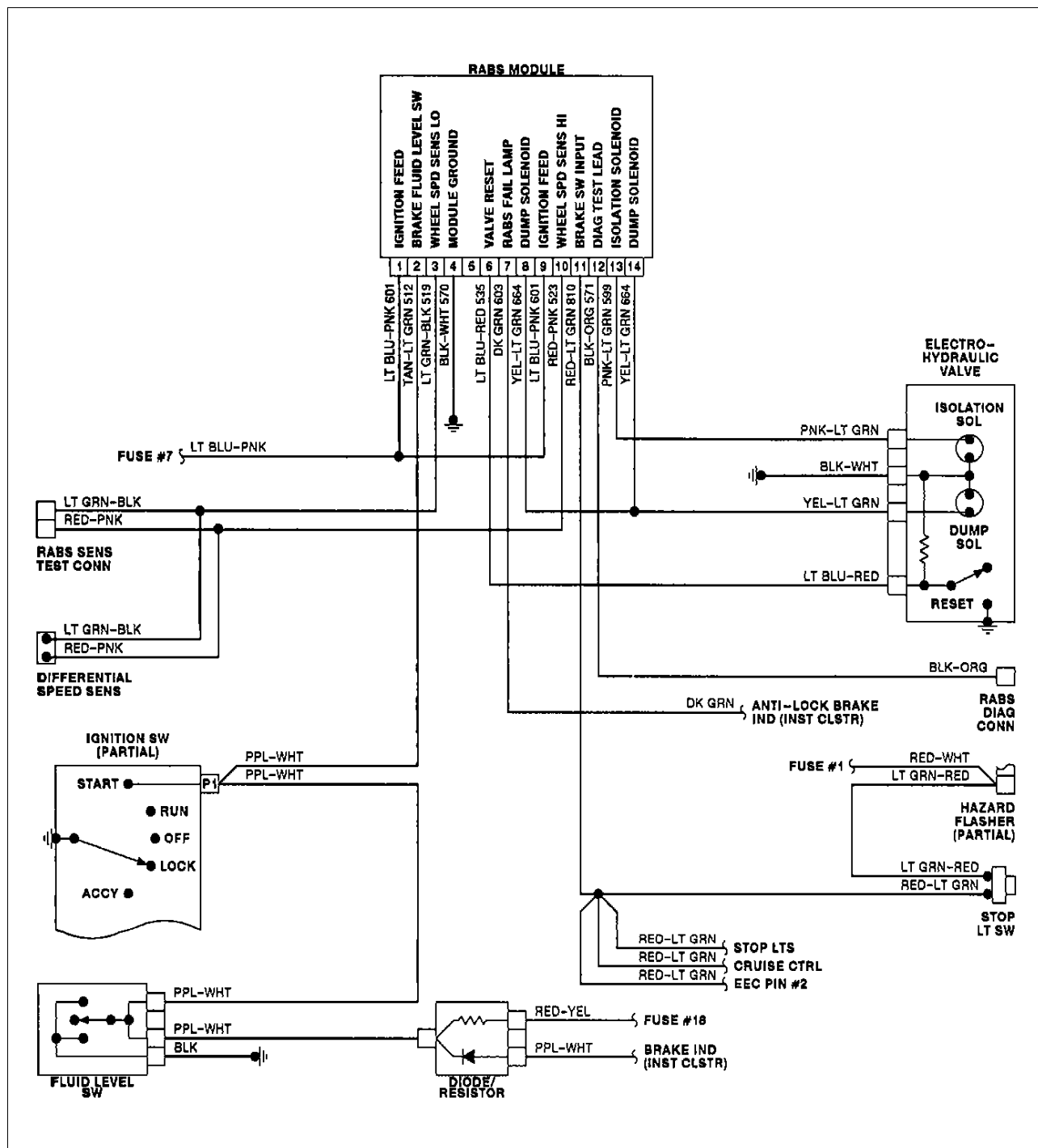


Fig 15: Rear ABS Wiring Diagram (Van)

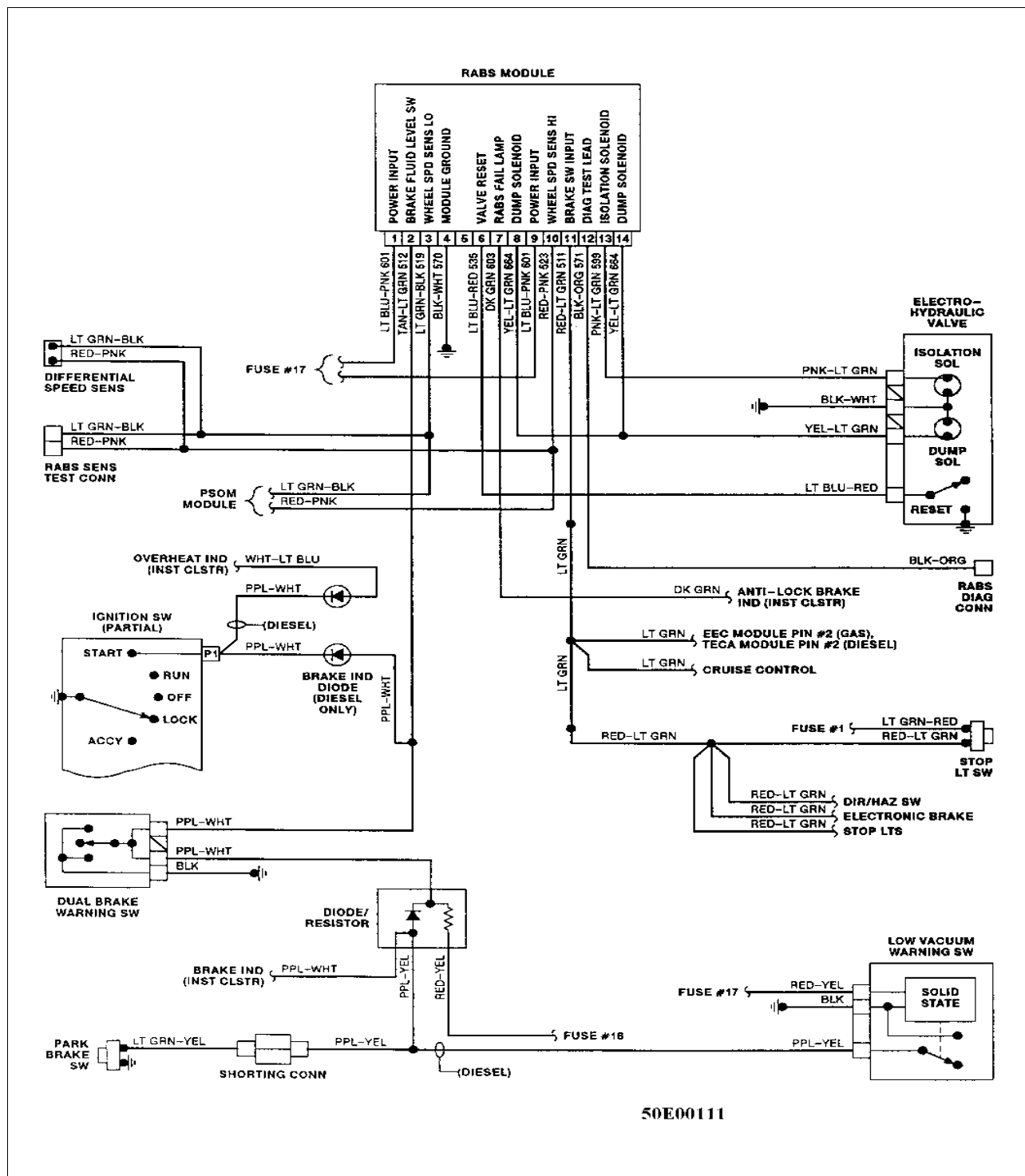


Fig 16: Rear ABS Wiring Diagram (Bronco &amp; F Series) - 1989

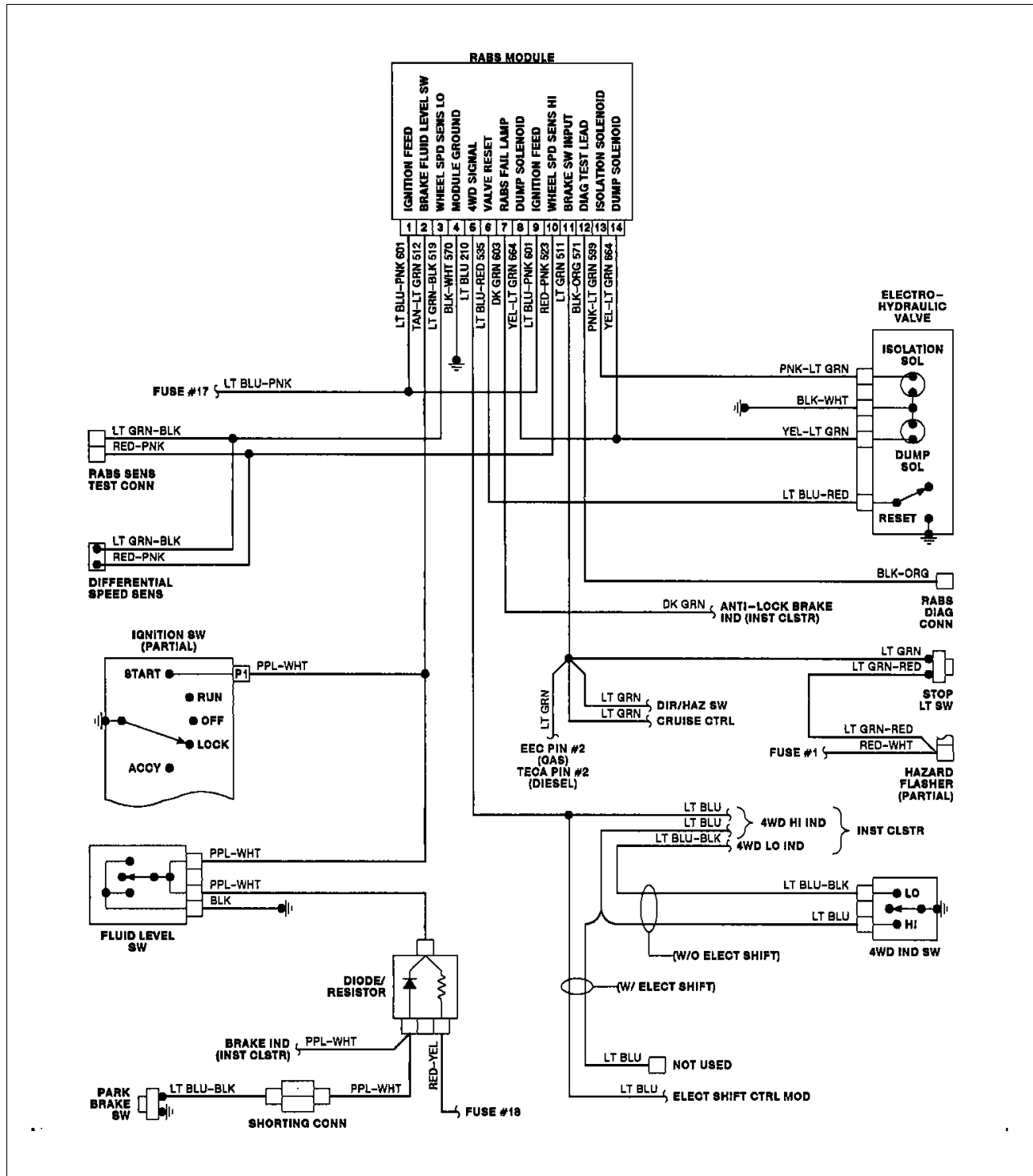


Fig 17: Rear ABS Wiring Diagram (Explorer &amp; Ranger) - 1990-91

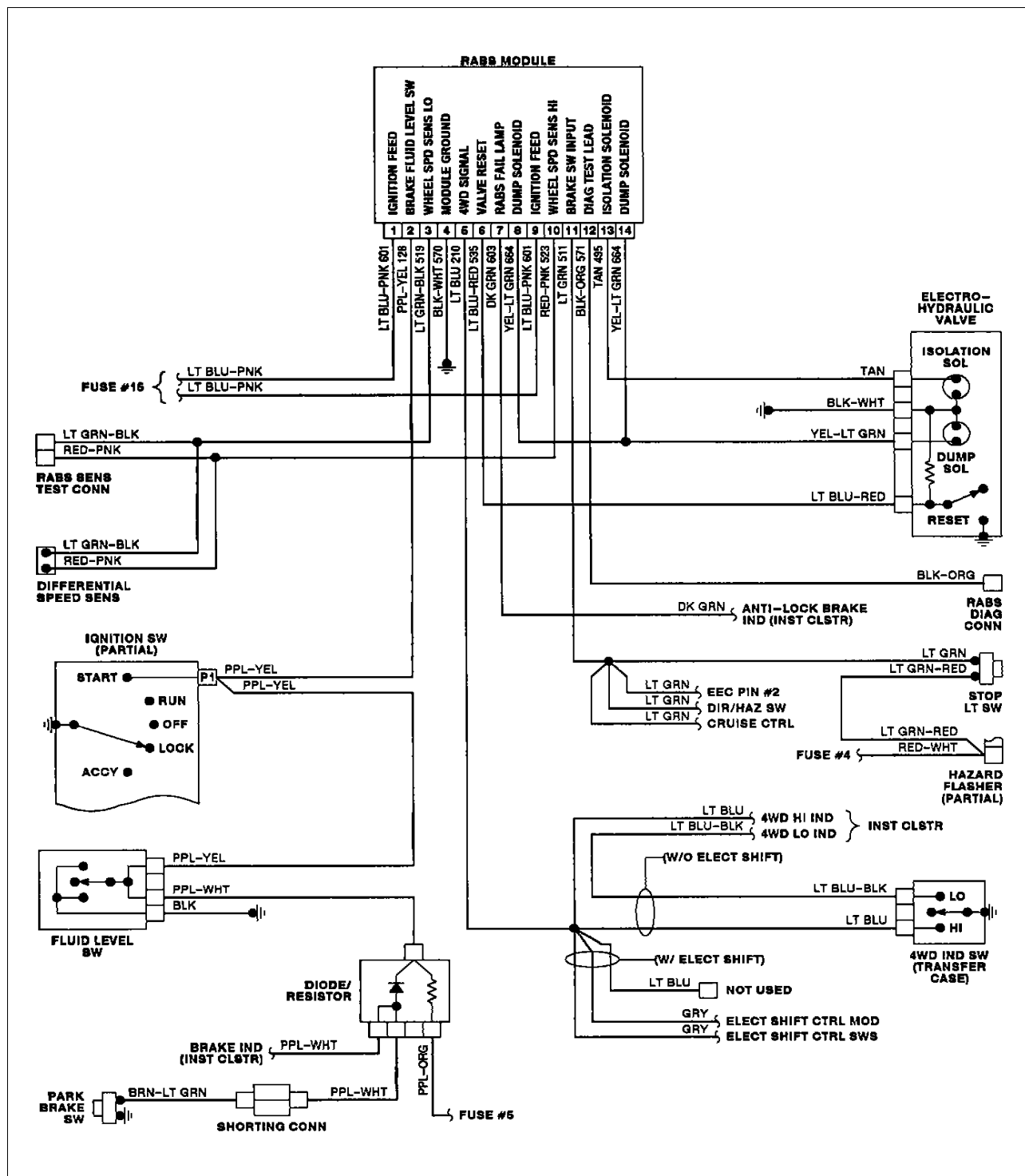


Fig 18: Rear ABS Wiring Diagram (E Series) - 1990-91

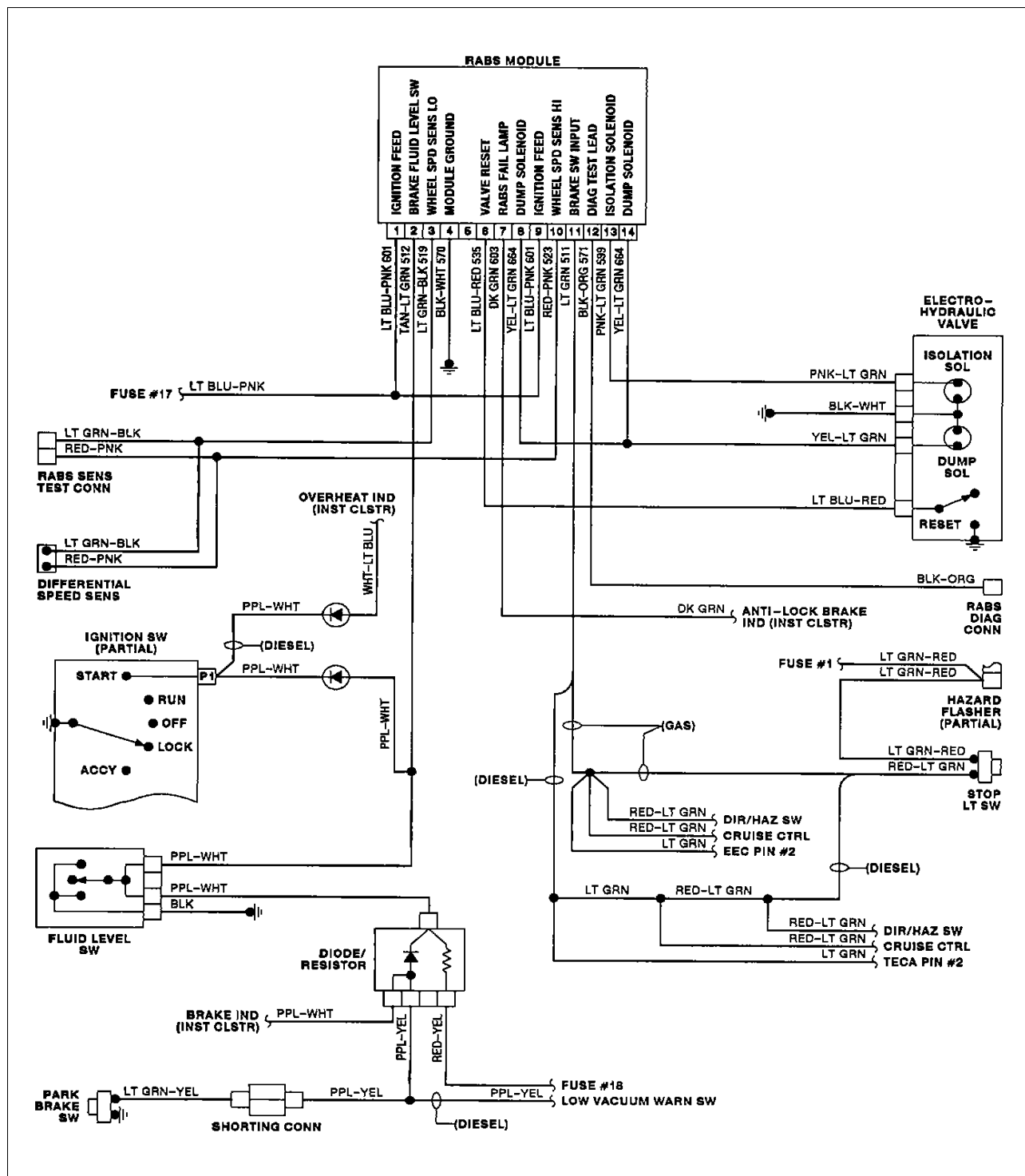
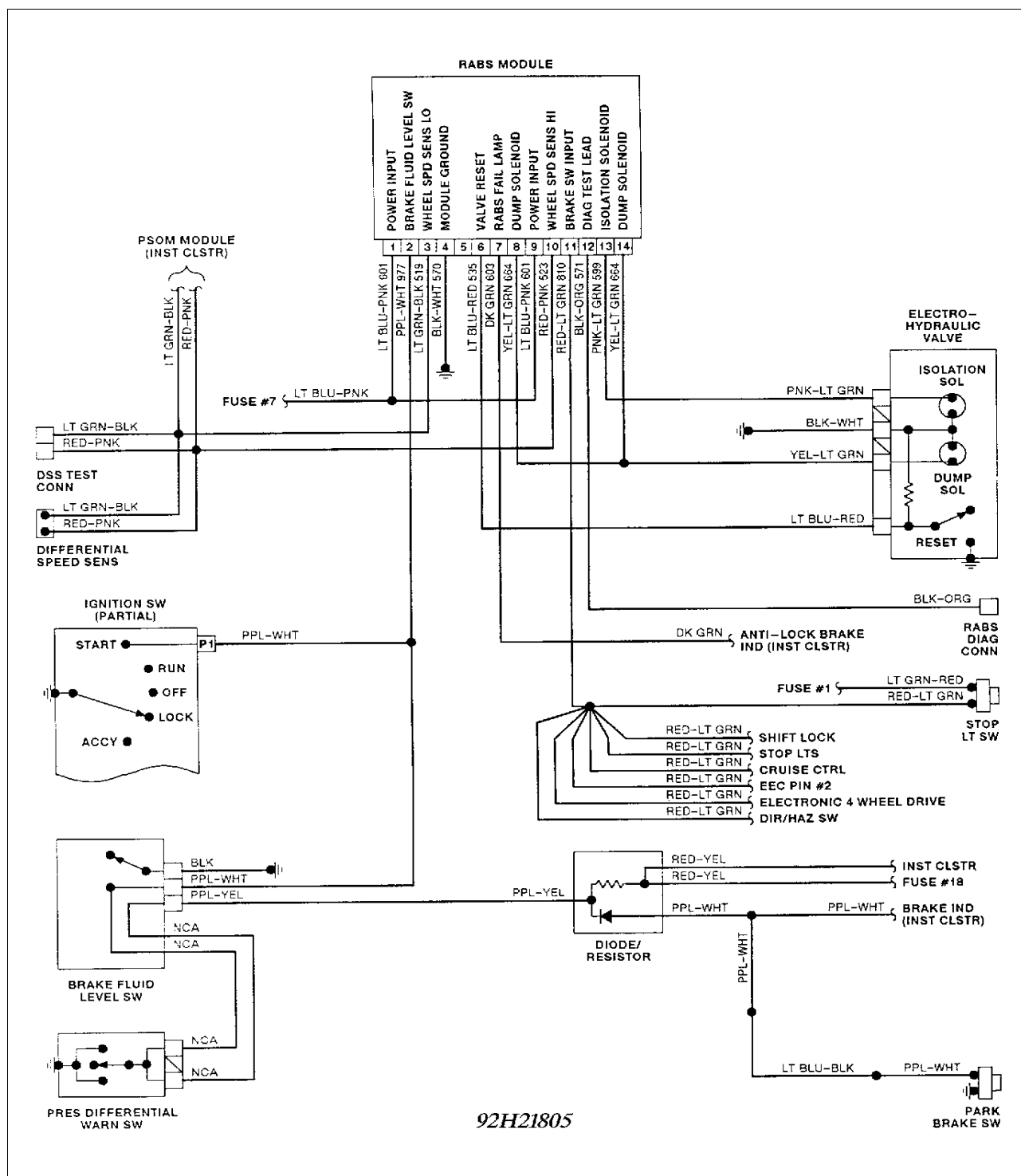


Fig 19: Rear ABS Wiring Diagram (Aerostar) - 1992



92H21805

Fig 20: Rear ABS Wiring Diagram (Bronco &amp; Pickup) - 1992

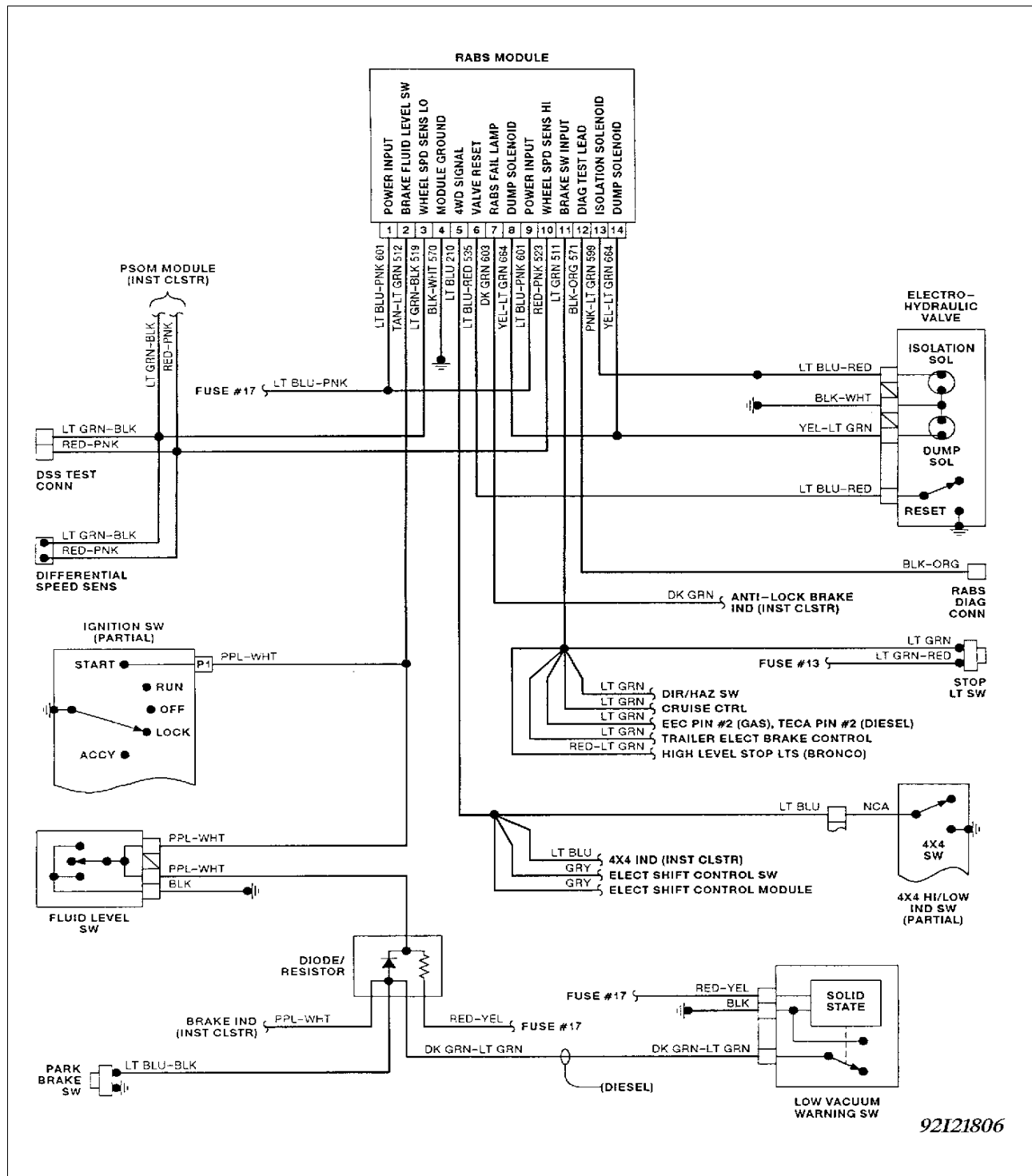




Fig 21: Rear ABS Wiring Diagram (Explorer &amp; Ranger) - 1992

