

BRAKES

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BRAKES - ABS - ELECTRICAL DIAGNOSTICS

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BRAKES - ABS - ELECTRICAL DIAGNOSTICS

DIAGNOSIS AND TESTING

***ABS VERIFICATION TEST — VER 1**

Diagnostic Test

1. *ABS VERIFICATION TEST — VER 1

Turn the ignition off.

Connect all previously disconnected components and connectors.

Make sure all accessories are turned off and the battery is fully charged.

With the scan tool, clear DTCs in all modules.

Cycle the ignition off for 10 seconds, then on.

With the scan tool, select View DTCs in the ABS module.

If any DTCs have reset, perform the appropriate diagnostic procedure before continuing with this test.

If there are no DTCs present, road test the vehicle above 40 m.p.h. for at least two minutes.

CAUTION: Make sure braking capability is available before road testing the vehicle. During the test drive, perform several anti-lock braking stops.

With the DRBIII®, select View DTCs in the Anti-Lock Brake Module.

Are there any DTCs present?

Yes >> Perform the appropriate diagnostic procedure(s).

No >> Test Complete

APS VERIFICATION TEST — VER 1*Diagnostic Test****1. *APS VERIFICATION TEST — VER 1**

Turn the ignition off.

Connect all previously disconnected components and connectors.

Ensure all accessories are turned off and the battery is fully charged.

Ensure that the Ignition is on, and with the DRBIII®, erase all Diagnostic Trouble Codes from ALL modules. Start the engine and allow it to run for 2 minutes and fully operate the system that was malfunctioning.

Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII, read DTC's from ALL modules.

If any Diagnostic Trouble Codes are present, return to Symptom list and troubleshoot new or recurring symptom.

If there are no DTC's present after turning ignition on, road test the vehicle for at least 5 minutes. Perform several antilock braking stops.

CAUTION: Ensure braking capability is available before road testing.

Again, with the DRBIII® read DTC's. If any DTC's are present, return to Symptom list.

If there are no Diagnostic Trouble Codes (DTC's) present, and the customer's concern can no longer be duplicated, the repair is complete.

Are any DTC's present or is the original concern still present?

Yes >> Perform the appropriate diagnostic procedure(s).

No >> Test Complete

BODY STYLE MISMATCH — 85

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When both the traceability code number and body style can not be read from the NVRAM or they are invalid.

Possible Causes
WRONG CAB OR CAB NOT PROGRAMMED FROM THE FACTORY

Diagnostic Test

1. DTC VERIFICATION

NOTE: Diagnose and repair any Powertrain Control Module VIN or Communication DTCs before continuing with this test.

Turn the ignition on.

With the scan tool, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the scan tool, select View DTCs.

Does the DTC reset?

- Yes** >> Replace the Controller Antilock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Antilock Brake for additional information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Use the scan tool to read DTCs in all other modules. If any communication DTCs are present, perform the appropriate diagnostic procedure. Refer to any Technical Service Bulletins that apply. If no problems are found, test is complete.
-

BRAKE SWITCH CIRCUIT — 81 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

Continuous brake applied signal after ignition turn-on and remaining with sensed speed above 37.5 MPH (RWAL) or 15 MPH (ABS) for over 10 seconds and/or ABS active for at least a second with brake switch released and never sensed brake applied since power up.

Possible Causes
INTERMITTENT BRAKE SWITCH CIRCUIT DTC BRAKE SWITCH SIGNAL CIRCUIT SHORT TO VOLTAGE BRAKE SWITCH SIGNAL CIRCUIT OPEN GROUND CIRCUIT OPEN BRAKE LAMP SWITCH CAB

Diagnostic Test**1. VERIFY THE CONDITION**

NOTE: Driving with the brake applied may set this code.

Turn the ignition off.

Ensure all accessories are turned off and the battery is fully charged.

Turn the ignition on.

With the scan tool, monitor the status of the brake switch while pressing and releasing the brake pedal several times.

With the scan tool, erase DTCs.

CAUTION: Determine that braking capability is available before road testing the vehicle.

Road test the vehicle for at least 5 minutes over 40 MPH. Perform several anti-lock braking stops.

With the scan tool, read DTCs.

Does the original DTC reset and/or does intermittent brake switch operation occur?

Yes >> Go To 2

No >> The condition necessary to set this DTC is not present at this time. Using the wiring diagram/schematic as a guide, inspect the wiring and connectors relative to this circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

BRAKE SWITCH CIRCUIT — 81 (CONTINUED)**2. BRAKE LAMP SWITCH**

Turn ignition off.

Disconnect the Brake Lamp Switch harness connector.

Turn ignition on.

With the scan tool, monitor the brake switch status.

Connect and disconnect a jumper wire between the Ground circuit and the Brake Switch Signal circuit.

Does the scan tool display correctly with the jumper wire connected and disconnected?

Yes >> Replace the Brake Lamp Switch in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

3. BRAKE SWITCH SIGNAL CIRCUIT SHORT TO VOLTAGE

Turn the ignition off.

Disconnect the CAB Module harness connector.

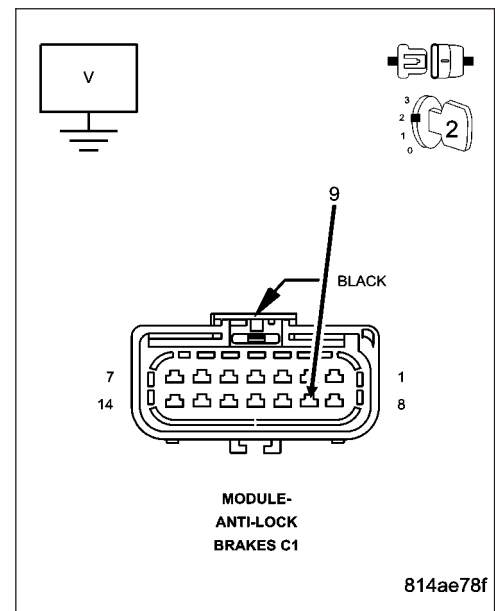
Turn the ignition on.

Measure the voltage of the Brake Switch Signal circuit.

Is there any voltage present?

Yes >> Repair the Brake Switch Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 4



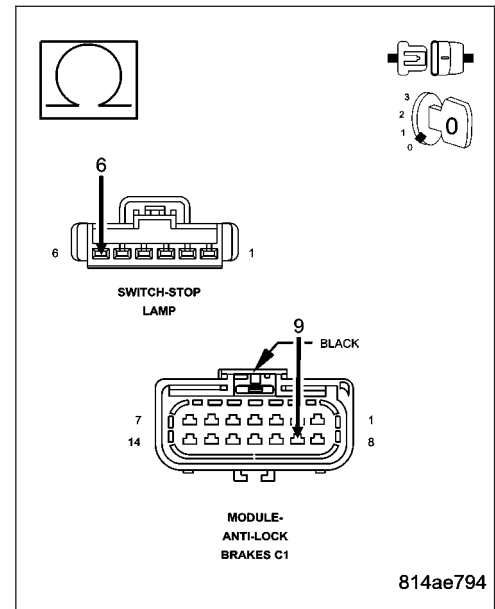
BRAKE SWITCH CIRCUIT — 81 (CONTINUED)**4. BRAKE SWITCH SIGNAL CIRCUIT OPEN**

Turn the ignition off.

Measure the resistance of the Brake Switch Signal circuit between the CAB harness connector and the brake switch harness connector.

Is the resistance above 5.0 ohms?

- Yes** >> Repair the open Brake Switch Signal circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

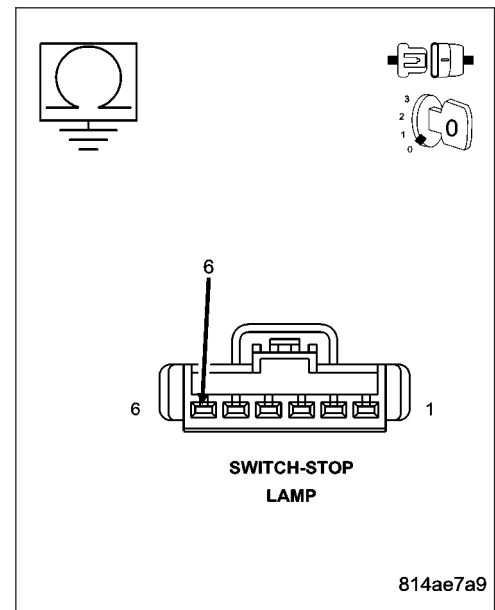
**5. GROUND CIRCUIT OPEN**

Using a 12-volt test light connected to 12 volts, check the Ground circuit at the brake switch harness connector.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

- Yes** >> Replace the Controller Anti-lock in accordance with the Service Information. Refer to the symptom *Replacing the Controller Anti-lock Brake for additional information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Repair the Ground circuit for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



ECU INTERNAL FAILURE -75

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When the CAB internal micro processor has an open/short in the status line which fails to transmit at the correct frequency.

Possible Causes
WHEEL SPEED SENSOR FAILURE
CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test

1. VERIFYING DTC

NOTE: Before continuing, check the Controller Anti-lock Brake harness connector terminals for corrosion, damage, or terminal push out. Repair as necessary.

Turn the ignition on.

With the DRBIII®, erase DTC's.

Turn the ignition off.

Turn the ignition on.

NOTE: Ensure that the Wheel Speed sensor are working properly.

With the DRBIII®, read DTC's.

Does the DRBIII® display ECU INTERNAL FAILURE and a WHEEL SPEED SENSOR DTC'S?

- Yes** >> Refer to the symptom list and diagnose the display Wheel Speed DTC.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Replace the Controller Anti-lock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Anti-Lock Brake for additional information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
-

EXCESSIVE DUMP TIME — 69

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

Antilock mode is active. Wheel speed is below 4 MPH (RWAL) and above 4 MPH (ABS). Vehicle is in two wheel drive mode. Wheel speed history ruling out any unusual events during the proceeding 15 second (RWAL) and 9 second (ABS). Need for more then maximum allowable dump cycles.

Possible Causes
INTERMITTENT EXCESSIVE DUMP TIME DTC
WHEEL SPEED WIRING HARNESS AND CONNECTORS
SUSPENSION
TONE WHEEL
WHEEL BEARING
BRAKE SYSTEM MECHANICAL CONDITION
ANTI-LOCK BRAKE HYDRAULIC CONTROL UNIT

Diagnostic Test**1. BRAKE SYSTEM MECHANICAL CONDITION**

Inspect the front and rear brakes for a mechanical condition that would cause any wheel(s) to lock-up during braking.

Inspect the Parking Brake to make sure it releases properly.

Were any problems found?

Yes >> Repair the braking system as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 2

2. TONE WHEEL

Inspect each Tone Wheel for damage, missing teeth or looseness in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

Yes >> Replace the Tone Wheel as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

EXCESSIVE DUMP TIME — 69 (CONTINUED)

3. WHEEL BEARING

Inspect each wheel bearing for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

Yes >> Repair or replace the wheel bearing(s) as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 4

4. WHEEL SPEED SENSOR WIRING HARNESS AND CONNECTORS

Start the engine.

With the scan tool, monitor the output of each Wheel Speed Sensor.

Raise and properly support the vehicle.

WARNING: BE SURE TO KEEP HANDS, FEET AND CLOTHING CLEAR OF ROTATING COMPONENTS.

Allow the drive wheels to rotate.

Rotate the non-driven wheels by hand.

Wiggle test the Wheel Speed wiring harnesses and connectors.

Look for any excessive variations in sensed wheel speed.

Were any problems found?

Yes >> Repair the wiring harness or connectors as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

5. LOADED WHEEL BEARING/SUSPENSION CONCERN

CAUTION: Make sure that the vehicle has braking capability before performing a road test.

NOTE: Have an assistant drive the vehicle while monitoring the scan tool.

With the scan tool, monitor the output of each Wheel Speed Sensor.

Road test vehicle so wheel bearings and suspension are loaded.

Look for any excessive variations in sensed wheel speed.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Hydraulic Control Unit in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

FOUNDATION BRAKE — 78 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on and no system under voltage DTC present.
- **Set Condition:**
Low feedback voltage from the Brake Fluid Level Switch Sense circuit.

Possible Causes
INTERMITTENT BRAKE FLUID LEVEL LOW DTC BRAKE FLUID LEVEL LOW BRAKE FLUID LEVEL SWITCH SENSE CIRCUIT SHORT TO GROUND GROUND CIRCUIT OPEN OR HIGH RESISTANCE BRAKE FLUID LEVEL SENSOR CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC CONDITION IS PRESENT**

Release the Parking Brake.

Turn the ignition off.

Turn the ignition on.

Monitor the Instrument Cluster.

Does the red Brake Warning Indicator stay on?

Yes >> Go To 2

No >> Go To 6

2. BRAKE FLUID LEVEL LOW

Turn the ignition off.

Inspect the Brake Fluid Level in accordance with the Service Information.

Is the Brake Fluid Level Low?

Yes >> Inspect the system and repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

FOUNDATION BRAKE — 78 (CONTINUED)**3. BRAKE FLUID LEVEL SWITCH SENSE CIRCUIT SHORT TO GROUND**

Turn the ignition off.

Disconnect the Brake Fluid Level Sensor harness connector.

Disconnect the CAB harness connector.

NOTE: Check connector - Clean/repair as necessary.

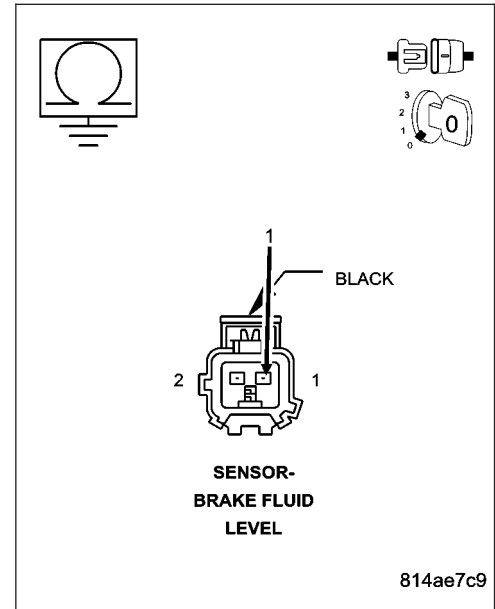
Measure the resistance between ground and the Brake Fluid Level Switch Sense circuit.

Is the resistance below 5.0 ohms?

Yes >> Repair the Brake Fluid Level Switch Sense circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 4

**4. BRAKE FLUID LEVEL SENSOR**

NOTE: Determine if the Brake Fluid Level Sensor is stuck in the down position. Repair as necessary.

Measure the resistance of the Brake Fluid Level Sensor at the sensor terminals.

NOTE: Resistance should be approximately 10,000 ohms with the reservoir full.

Is the resistance between 9,500 and 10,500 ohms?

Yes >> Go To 5

No >> Replace the Brake Fluid Level Switch in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

FOUNDATION BRAKE — 78 (CONTINUED)

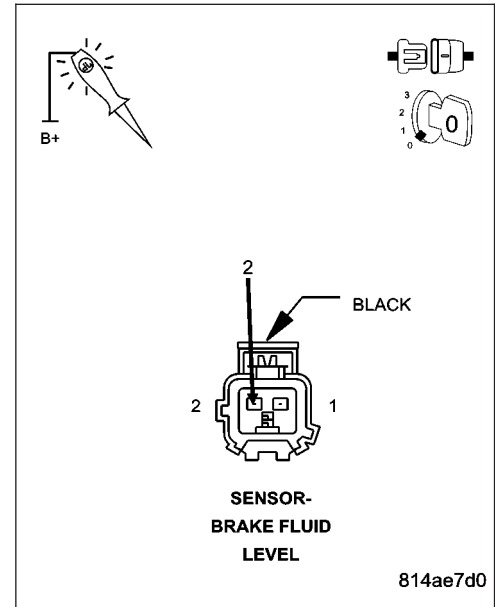
5. GROUND CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12-volt test light connected to 12 volts, check the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

- Yes** >> Replace the Controller Anti-lock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Controller Anti-lock Brake for additional information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Repair the Brake Fluid Level Switch ground circuit for an open circuit or high resistance. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**6. WIRING HARNESS INSPECTION**

Turn the ignition off.

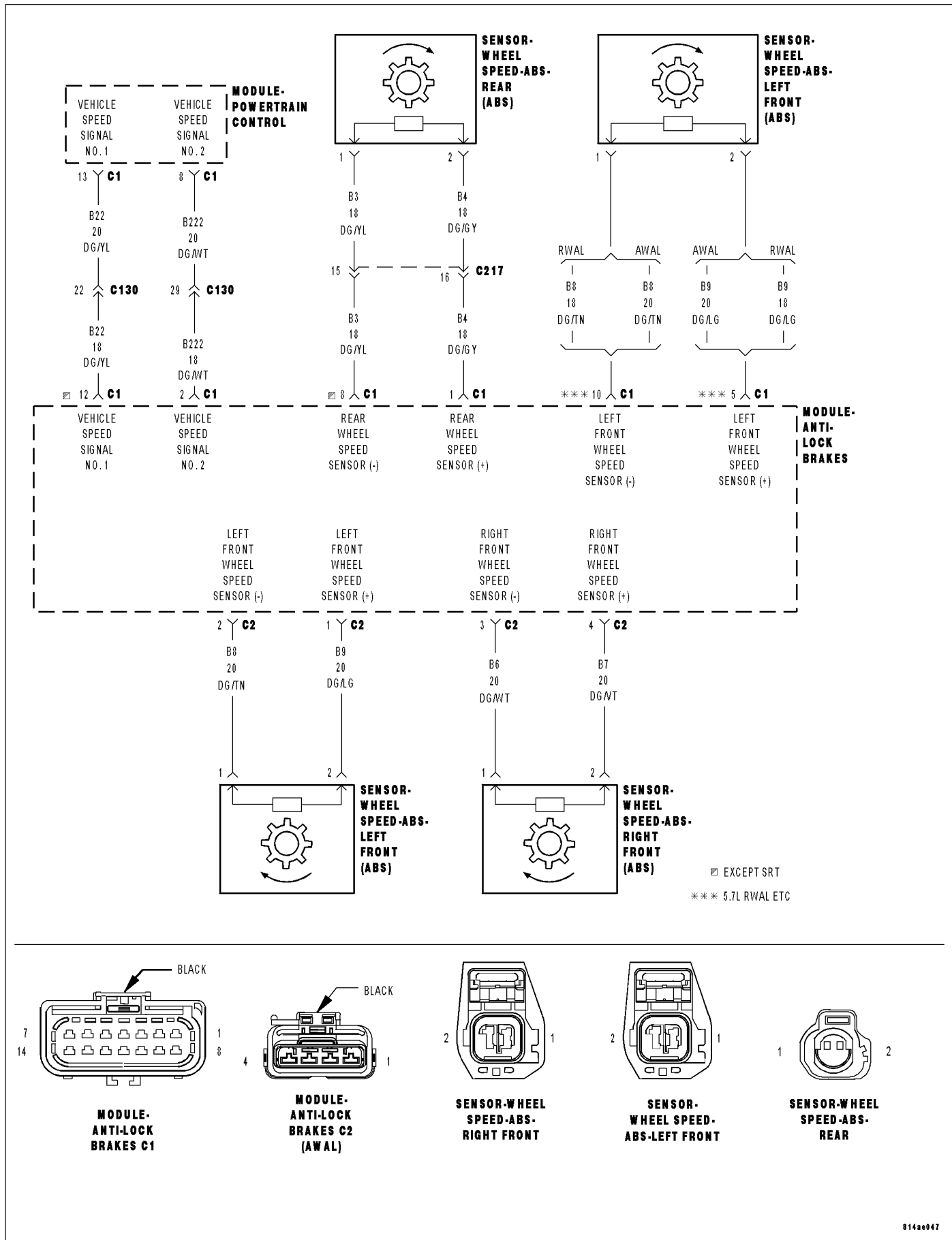
Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR — 27

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR — 27 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition turned on for at least 3.5 seconds. Average filtered speed for the two front wheels above 6km/h (4MPH). Speed for each suspect sensor above 32 km/h (20 MPH) (brake applied or ABS active) or 19 km/h (12 MPH) (brake released or ABS inactive).

- **Set Condition:**

When there is a sudden change of output signal from the sensor.

Possible Causes
INTERMITTENT LEFT FRONT WHEEL SPEED SENSOR DTC
LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORT TO GROUND
LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORT TO GROUND
LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN
LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN
LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO THE LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT
TONE WHEEL
EXCESSIVE LEFT FRONT WHEEL SPEED SENSOR AIR GAP
WHEEL BEARING
LEFT FRONT WHEEL SPEED SENSOR
CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display the DTC??

Yes >> Go To 2

No >> Go To 16

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR — 27 (CONTINUED)**2. CONTROLLER ANTI-LOCK BRAKE HARNESS CONNECTOR INSPECTION**

Turn the ignition off.

Inspect the CAB wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the CAB wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Were any problems found?

- Yes** >> Clean or Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 3
-

3. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4
-

4. TONE WHEEL DAMAGED/MISSING

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5
-

5. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6
-

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR — 27 (CONTINUED)

6. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 7

7. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Left Front Wheel Speed Sensor harness connector.

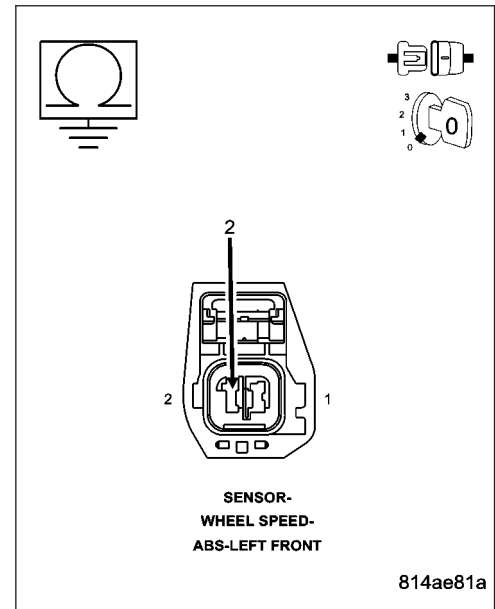
Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

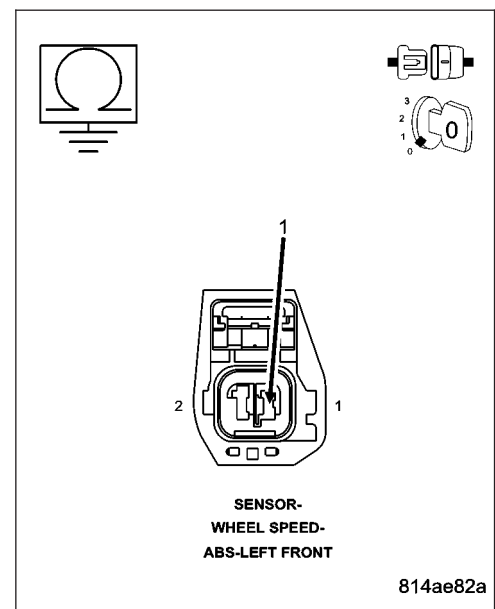
- Yes** >> Go To 8
- No** >> Repair the Left Front Wheel Speed Sensor (+) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**8. LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND**

Measure the resistance between the Left Front Wheel Speed Sensor (-) circuit and ground.

Is the resistance above 5.0 ohms?

- Yes** >> Go To 9
- No** >> Repair the Left Front Wheel Speed Sensor (-) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR — 27 (CONTINUED)**9. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN**

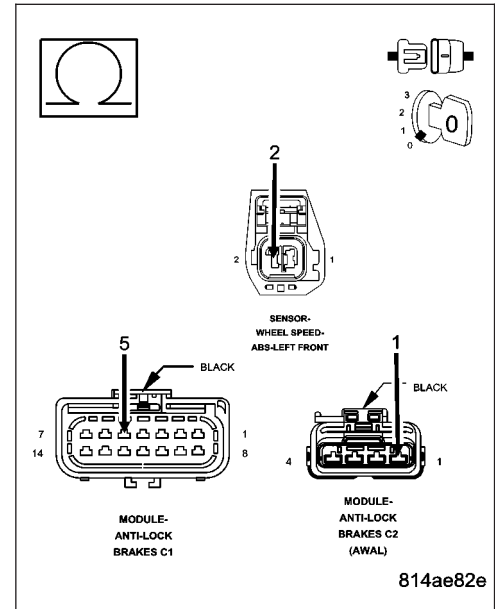
Measure the resistance of the Left Front Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open Left Front Wheel Speed Sensor (+) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**10. LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN**

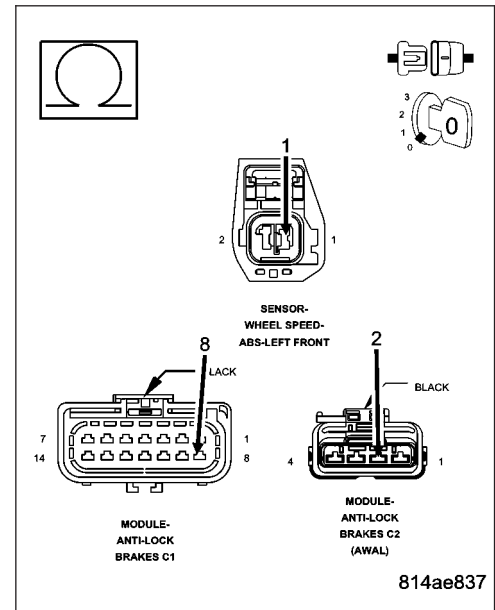
Measure the resistance of the Left Front Wheel Speed Sensor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 11

No >> Repair the open Left Front Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR — 27 (CONTINUED)

11. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

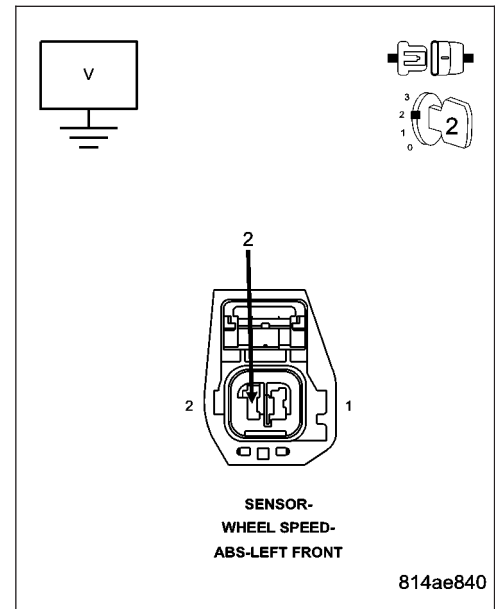
Measure the voltage of the Left Front Wheel Speed Sensor (+) circuit.

Is there any voltage present?

Yes >> Repair Left Front Wheel Speed Sensor (+) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 12

**12. LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE**

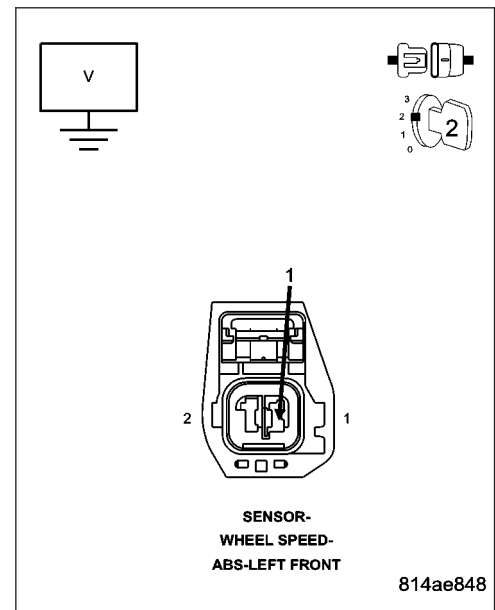
Measure the voltage of the Left Front Wheel Speed Sensor (-) circuit.

Is there any voltage present?

Yes >> Repair the Left Front Wheel Speed Sensor (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 13



INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR — 27 (CONTINUED)**13. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT**

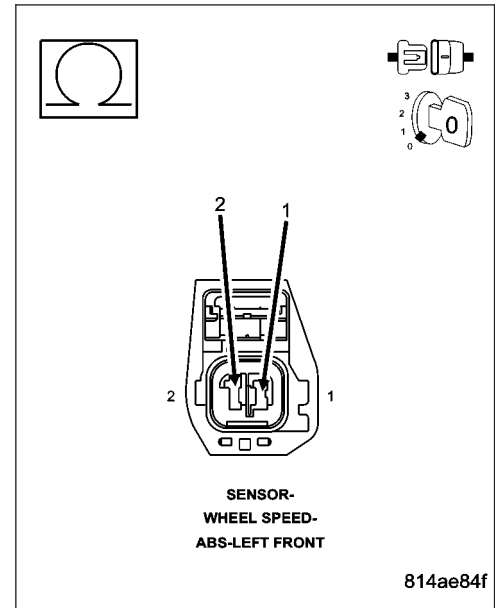
Turn the ignition off.

Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and the Left Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Left Front Wheel Speed Sensor (+) circuit for a short to the Left Front Wheel Speed Sensor (-) circuit. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 14

**14. LEFT FRONT WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Left Front Wheel Speed Sensor harness connector.

Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and Left Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1800–2200 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 15

No >> Replace the Left Front Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

15. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

INTERMITTENT SIGNAL FROM LEFT FRONT SENSOR — 27 (CONTINUED)

16. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

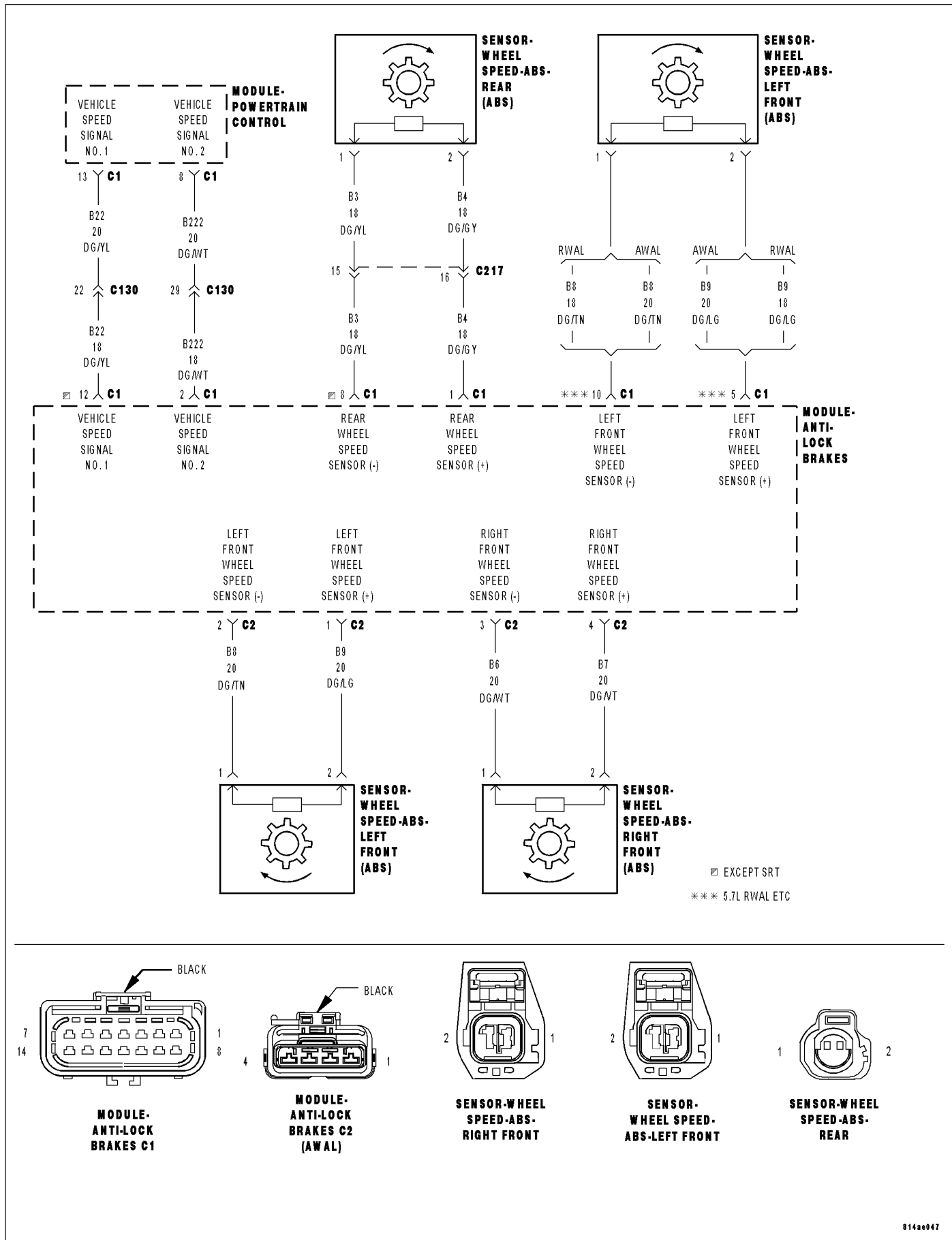
Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

INTERMITTENT SIGNAL FROM REAR SENSOR — 37

INTERMITTENT SIGNAL FROM REAR SENSOR — 37 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition turned on for at least 3.5 seconds. Average filtered speed for the wheels above 19 km/h (12 MPH) (brake released or ABS inactive) or 32 km/h (20 MPH) (brake applied or ABS active).

- **Set Condition:**

When there is a sudden change of output signal from the sensor.

Possible Causes
INTERMITTENT REAR WHEEL SPEED SENSOR DTC
REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORT TO GROUND
REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORT TO GROUND
REAR WHEEL SPEED SENSOR (+) CIRCUIT OPEN
REAR WHEEL SPEED SENSOR (-) CIRCUIT OPEN
REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE
REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE
REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE REAR WHEEL SPEED SENSOR (-) CIRCUIT
TONE WHEEL
EXCESSIVE REAR WHEEL SPEED SENSOR AIR GAP
WHEEL BEARING/REAR DIFFERENTIAL
REAR WHEEL SPEED SENSOR
CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display the DTC?

Yes >> Go To 2

No >> Go To 16

2. CONTROLLER ANTI-LOCK BRAKE HARNESS CONNECTOR INSPECTION

Turn the ignition off.

Inspect the CAB wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the CAB wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Were any problems found?

Yes >> Clean or Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

INTERMITTENT SIGNAL FROM REAR SENSOR — 37 (CONTINUED)

3. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 4

4. TONE WHEEL DAMAGED/MISSING

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

Yes >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

5. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 6

6. WHEEL BEARING/REAR DIFFERENTIAL

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Inspect the rear differential for proper operating. Refer to the Service information.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 7

INTERMITTENT SIGNAL FROM REAR SENSOR — 37 (CONTINUED)

7. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Rear Wheel Speed Sensor harness connector.

Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

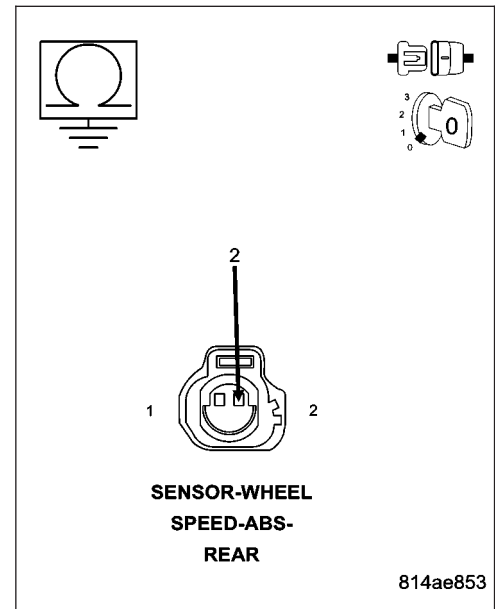
Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 8

No >> Repair the Rear Wheel Speed Sensor (+) circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**8. REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND**

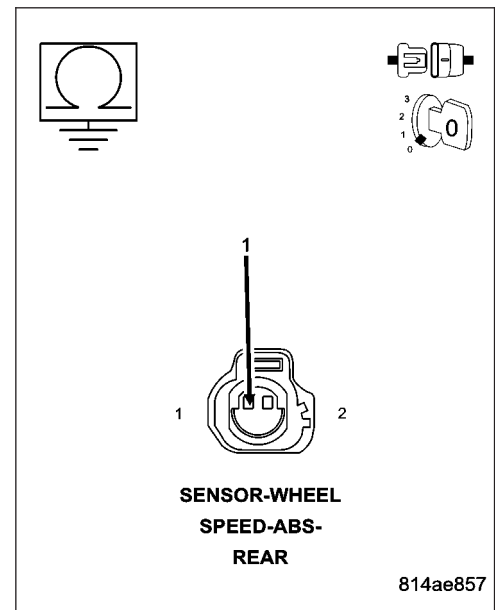
Measure the resistance between the Rear Wheel Speed Sensor (-) circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 9

No >> Repair the Rear Wheel Speed Sensor (-) circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



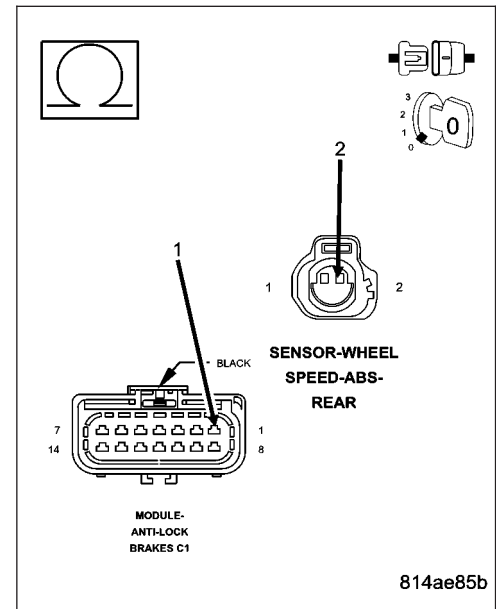
INTERMITTENT SIGNAL FROM REAR SENSOR — 37 (CONTINUED)**9. REAR WHEEL SPEED SENSOR (+) CIRCUIT OPEN**

Measure the resistance of the Rear Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open Rear Wheel Speed Sensor (+) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

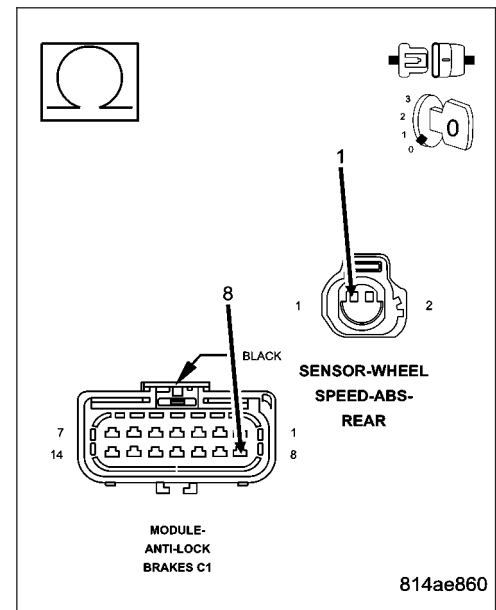
**10. REAR WHEEL SPEED SENSOR (-) CIRCUIT OPEN**

Measure the resistance of the Rear Wheel Speed Sensor (-) circuit.

Is the resistance below 5 ohms?

Yes >> Go To 11

No >> Repair the open Rear Wheel Speed Sensor (-) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



INTERMITTENT SIGNAL FROM REAR SENSOR — 37 (CONTINUED)

11. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

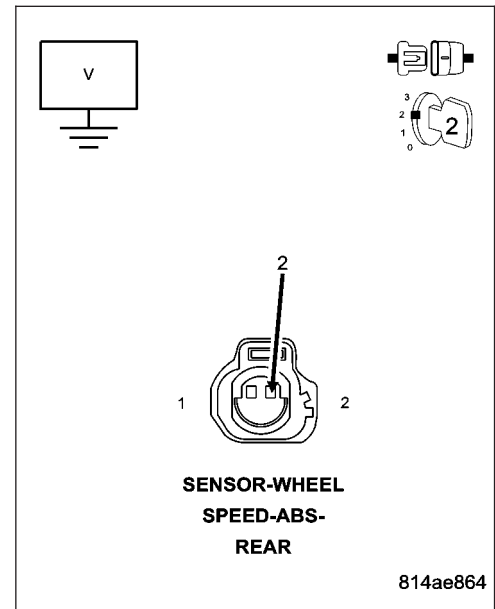
Measure the voltage of the Rear Wheel Speed Sensor (+) circuit.

Is there any voltage present?

Yes >> Repair Rear Wheel Speed Sensor (+) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 12

**12. REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE**

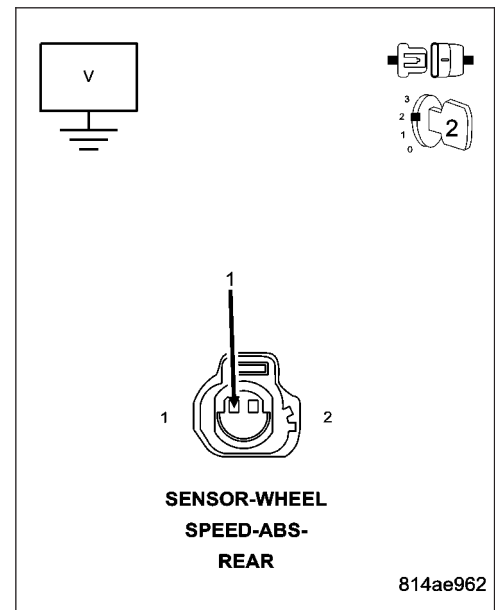
Measure the voltage of the Rear Wheel Speed Sensor (-) circuit.

Is there any voltage present?

Yes >> Repair the Rear Wheel Speed Sensor (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 13



INTERMITTENT SIGNAL FROM REAR SENSOR — 37 (CONTINUED)**13. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE REAR WHEEL SPEED SENSOR (-) CIRCUIT**

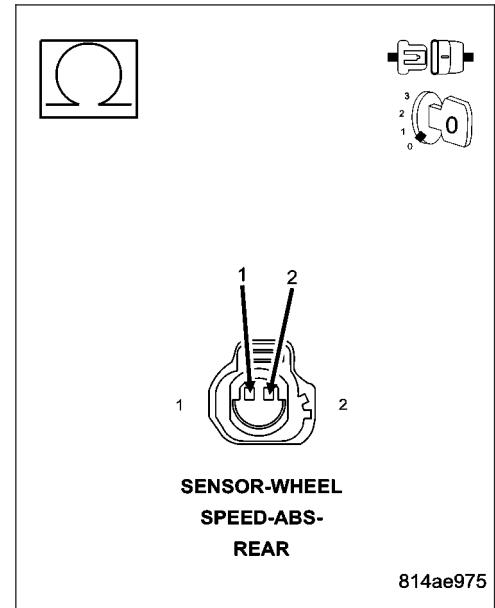
Turn the ignition off.

Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and the Rear Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Rear Wheel Speed Sensor (+) circuit for a short to the Rear Wheel Speed Sensor (-) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 14

**14. REAR WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Rear Wheel Speed Sensor harness connector.

Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and Rear Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1600–2300 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 15

No >> Replace the Rear Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

15. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

INTERMITTENT SIGNAL FROM REAR SENSOR — 37 (CONTINUED)

16. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

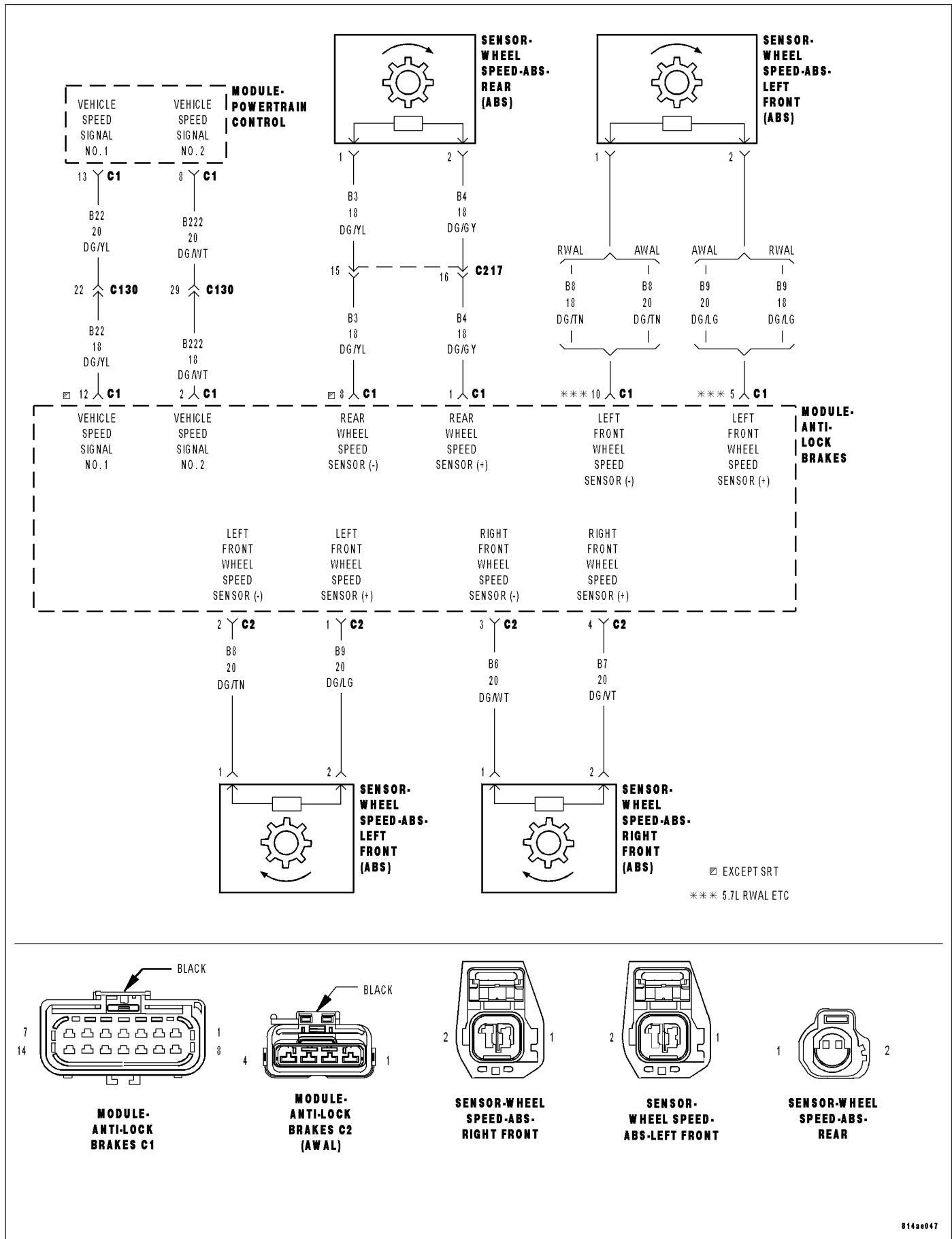
Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR — 27



INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR — 27 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition turned on for at least 3.5 seconds. Average filtered speed for the two front wheels above 6 km/h (4MPH). Speed for each suspect sensor above 32 km/h (20 MPH) (brake applied or ABS active) or 19 km/h (12 MPH) (brake released or ABS inactive).

- **Set Condition:**

When there is a sudden change of output signal from the sensor.

Possible Causes
INTERMITTENT LEFT FRONT WHEEL SPEED SENSOR DTC RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORT TO GROUND RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORT TO GROUND RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO THE RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT TONE WHEEL EXCESSIVE LEFT FRONT WHEEL SPEED SENSOR AIR GAP WHEEL BEARING RIGHT FRONT WHEEL SPEED SENSOR CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display the DTC??

Yes >> Go To 2

No >> Go To 16

INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR — 27 (CONTINUED)

2. CONTROLLER ANTI-LOCK BRAKE HARNESS CONNECTOR INSPECTION

Turn the ignition off.

Inspect the CAB wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the CAB wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Were any problems found?

Yes >> Clean or Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

3. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 4

4. TONE WHEEL DAMAGED/MISSING

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

Yes >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

5. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 6

INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR — 27 (CONTINUED)

6. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 7

7. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Right Front Wheel Speed Sensor harness connector.

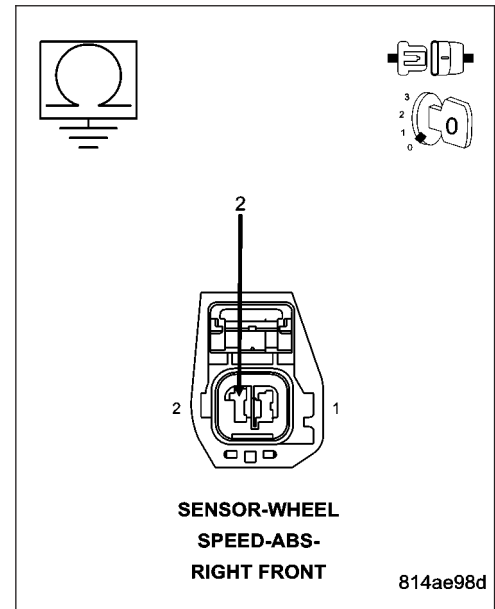
Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

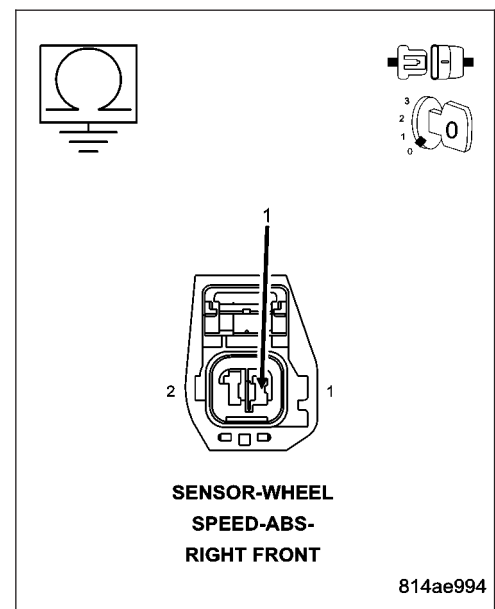
- Yes** >> Go To 8
- No** >> Repair the Right Front Wheel Speed Sensor (+) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**8. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND**

Measure the resistance between the Right Front Wheel Speed Sensor (-) circuit and ground.

Is the resistance above 5.0 ohms?

- Yes** >> Go To 9
- No** >> Repair the Right Front Wheel Speed Sensor (-) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR — 27 (CONTINUED)**9. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN**

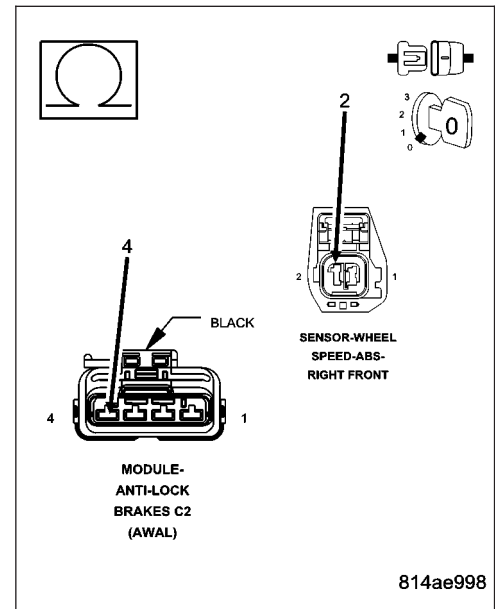
Measure the resistance of the Right Front Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open Right Front Wheel Speed Sensor (+) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**10. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN**

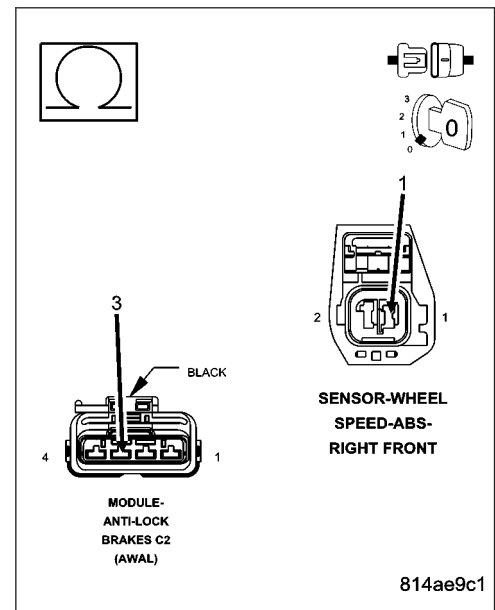
Measure the resistance of the Right Front Wheel Speed Sensor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 11

No >> Repair the open Right Front Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR — 27 (CONTINUED)

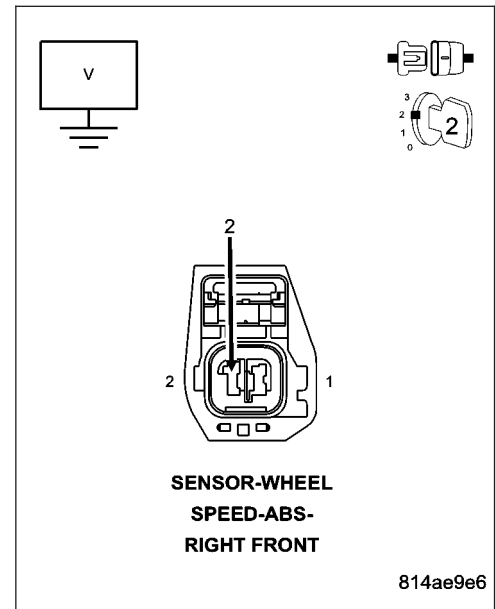
11. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the Right Front Wheel Speed Sensor (+) circuit.

Is there any voltage present?

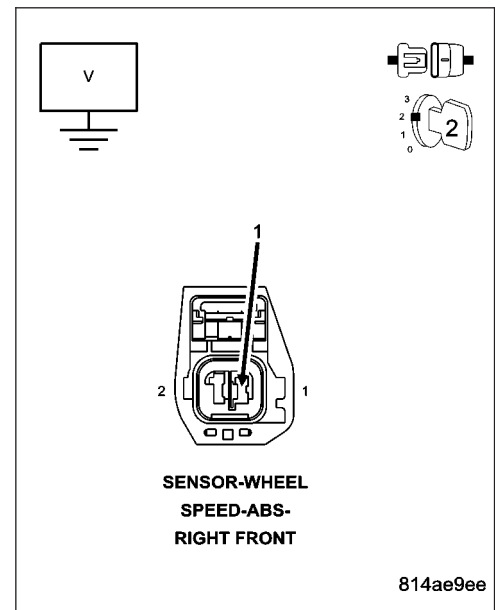
- Yes** >> Repair Right Front Wheel Speed Sensor (+) circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 12

**12. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE**

Measure the voltage of the Right Front Wheel Speed Sensor (-) circuit.

Is there any voltage present?

- Yes** >> Repair the Right Front Wheel Speed Sensor (-) circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 13



INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR — 27 (CONTINUED)**13. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT**

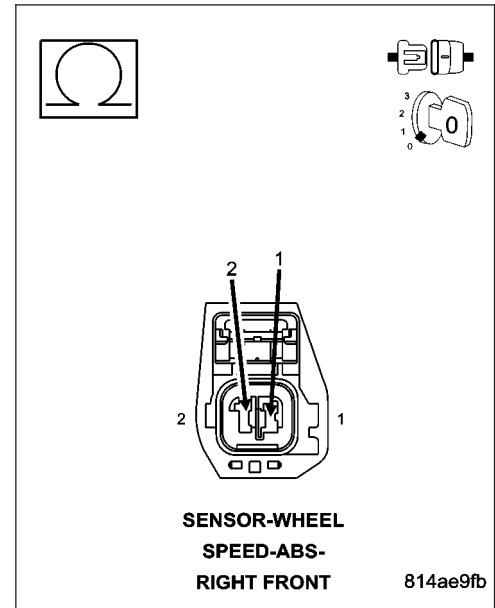
Turn the ignition off.

Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and the Right Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Right Front Wheel Speed Sensor (+) circuit for a short to the Right Front Wheel Speed Sensor (-) circuit. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 14

**14. RIGHT FRONT WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Right Front Wheel Speed Sensor harness connector.

Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and Right Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1800–2200 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 15

No >> Replace the Right Front Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

15. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

INTERMITTENT SIGNAL FROM RIGHT FRONT SENSOR — 27 (CONTINUED)

16. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

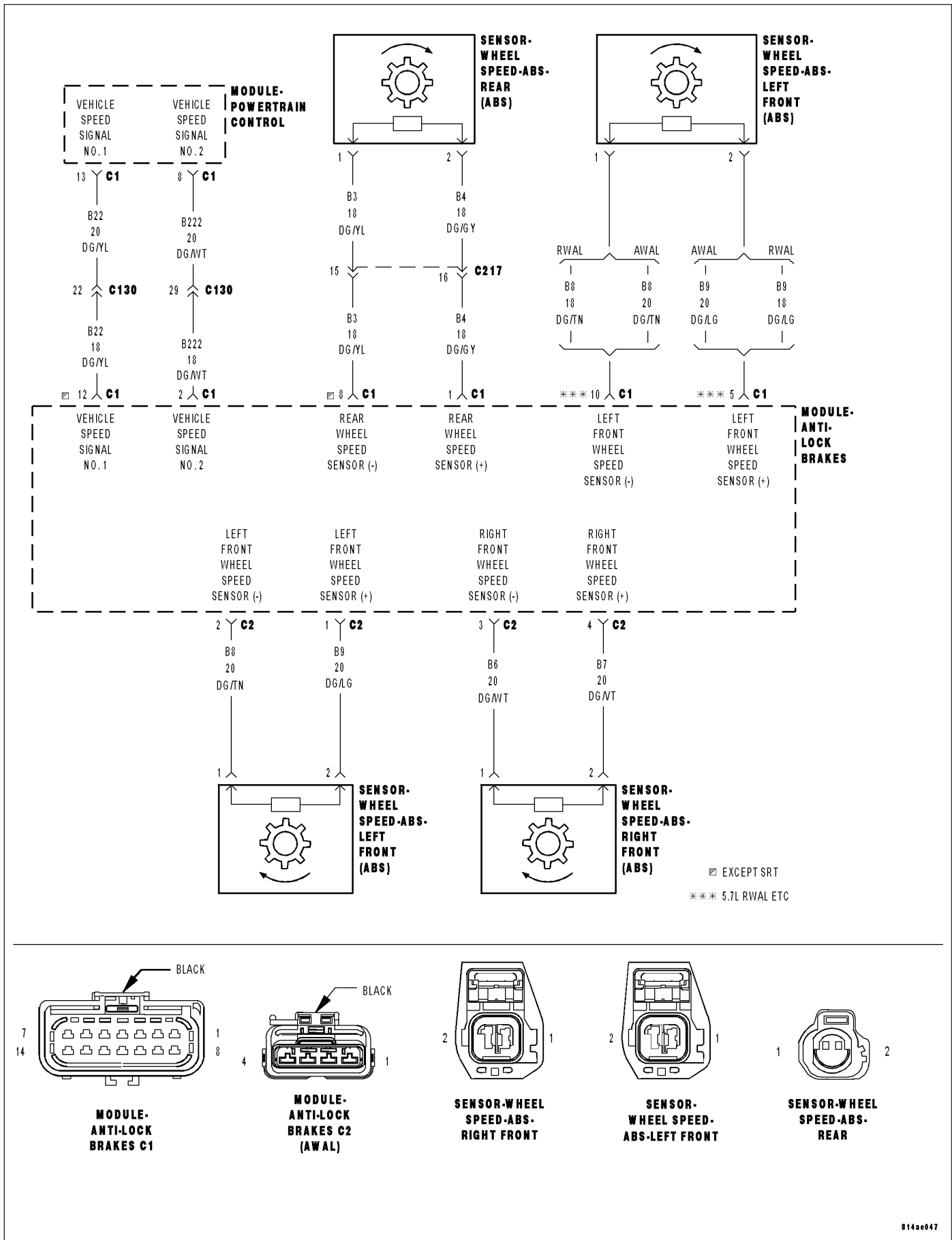
Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

LEFT FRONT SENSOR OPEN — 25



LEFT FRONT SENSOR OPEN — 25 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The CAB detects an open in the wheel speed sensor circuit

Possible Causes
INTERMITTENT LEFT FRONT WHEEL SPEED SENSOR DTC LEFT FRONT WHEEL SPEED SENSOR SUPPLY CIRCUIT SHORT TO GROUND LEFT FRONT WHEEL SPEED SENSOR SIGNAL CIRCUIT SHORT TO GROUND LEFT FRONT WHEEL SPEED SENSOR SUPPLY CIRCUIT OPEN LEFT FRONT WHEEL SPEED SENSOR SIGNAL CIRCUIT OPEN ONE WHEEL EXCESSIVE LEFT FRONT WHEEL SPEED SENSOR AIR GAP WHEEL BEARING LEFT FRONT WHEEL SPEED SENSOR CONTROL ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, select View DTCs.

Does the DRBIII® display the DTC?

Yes >> Go To 2

No >> Go To 12

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

LEFT FRONT SENSOR OPEN — 25 (CONTINUED)**3. TONE WHEEL DAMAGED/MISSING**

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

5. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6

6. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Left Front Wheel Speed Sensor harness connector.

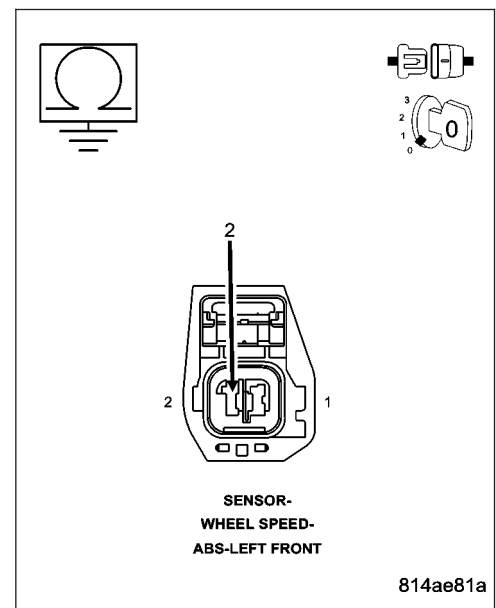
Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

- Yes** >> Go To 7
- No** >> Repair the Left Front Wheel Speed Sensor (+) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT SENSOR OPEN — 25 (CONTINUED)

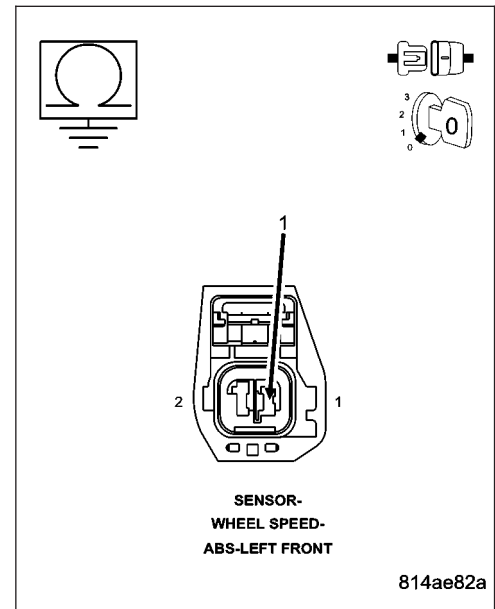
7. LEFT FRONT WHEEL SPEED SENSOR (-)CIRCUIT SHORTED TO GROUND

Measure the resistance between the Left Front Wheel Speed Sensor (-)circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 8

No >> Repair the Left Front Wheel Speed Sensor (-)circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

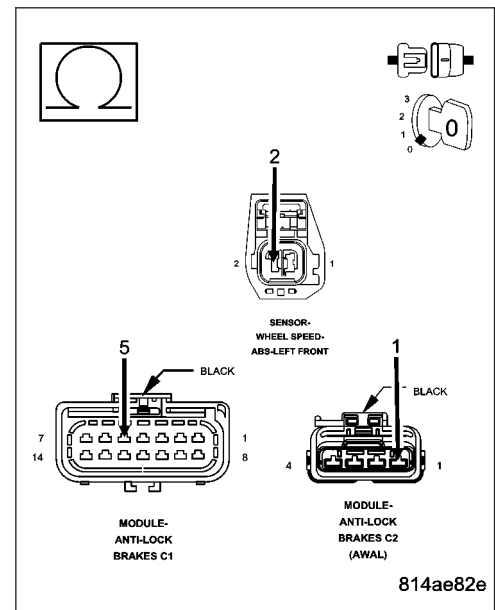
**8. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN**

Measure the resistance of the Left Front Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open Left Front Wheel Speed Sensor (+) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



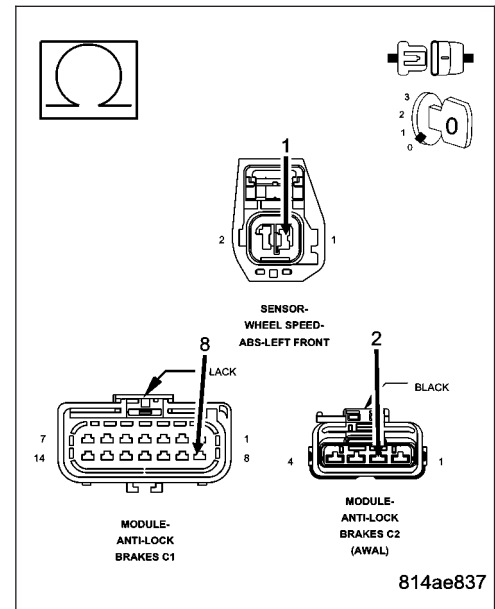
LEFT FRONT SENSOR OPEN — 25 (CONTINUED)**9. LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN**

Measure the resistance of the Left Front Wheel Speed Sensor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open Left Front Wheel Speed Sensor (-) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**10. LEFT FRONT WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Left Front Wheel Speed Sensor harness connector.

Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and Left Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1600–2300 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 11

No >> Replace the Left Front Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

11. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

LEFT FRONT SENSOR OPEN — 25 (CONTINUED)

12. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

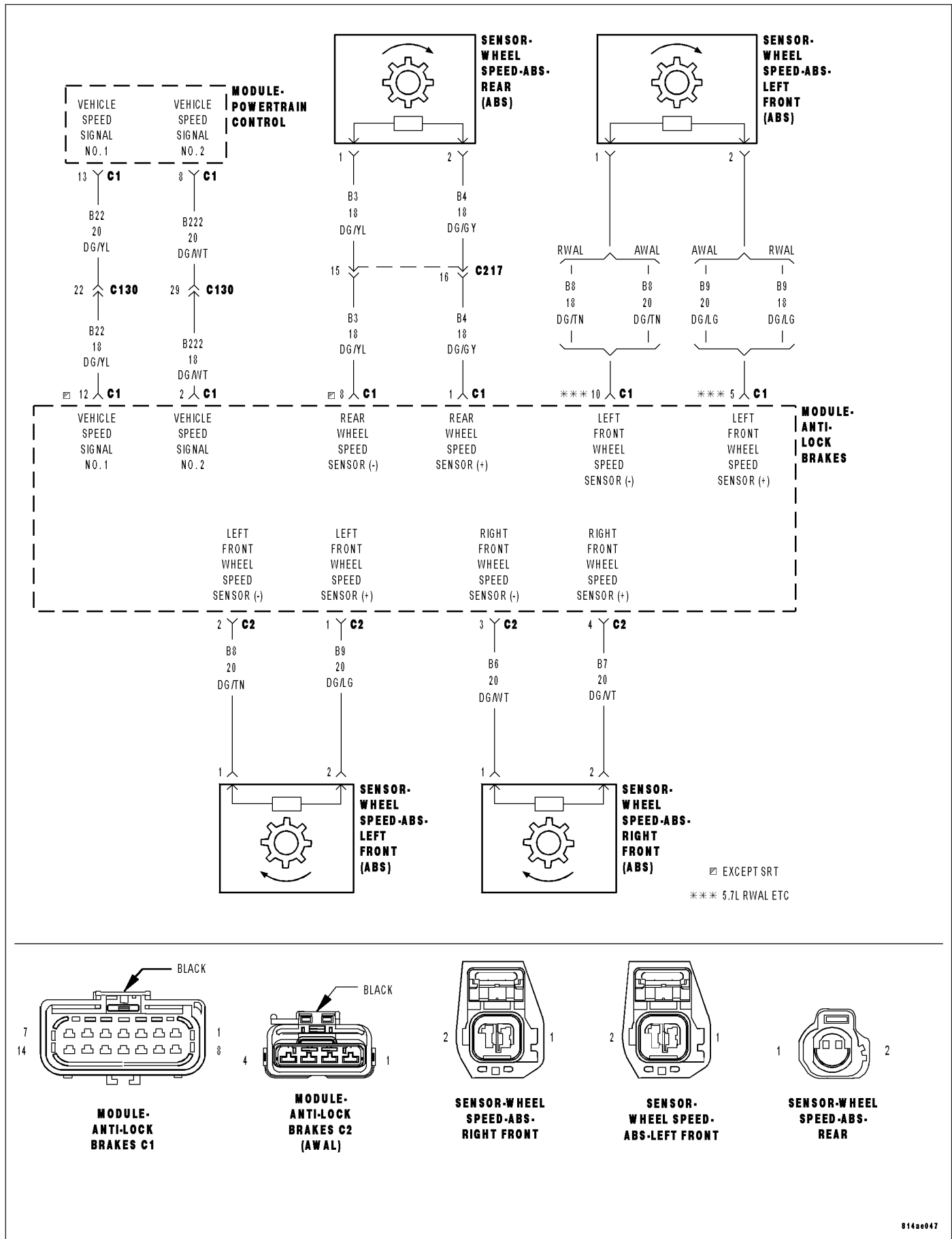
Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

LEFT FRONT SENSOR SHORTED — 90



LEFT FRONT SENSOR SHORTED — 90 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The CAB detect high voltage on the wheel speed sensor circuit.

Possible Causes
INTERMITTENT LEFT FRONT WHEEL SPEED SENSOR DTC LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE LEFT FRONT WHEEL SPEED SENSOR(-) CIRCUIT TONE WHEEL EXCESSIVE LEFT FRONT WHEEL SPEED SENSOR AIR GAP WHEEL BEARING LEFT FRONT WHEEL SPEED SENSOR CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.
 With the scan tool, clear DTCs.
 Turn the ignition off.
 Turn the ignition on.
 With the scan tool, read DTCs.

Does the DRBIII® display the DTC?

Yes >> Go To 2
No >> Go To 11

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.
 Inspect the Wheel Speed Sensor for proper mounting.
 Inspect the Wheel Speed Sensor harness and connector.
 Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
 Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
No >> Go To 3

LEFT FRONT SENSOR SHORTED — 90 (CONTINUED)**3. TONE WHEEL DAMAGED/MISSING**

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

5. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6

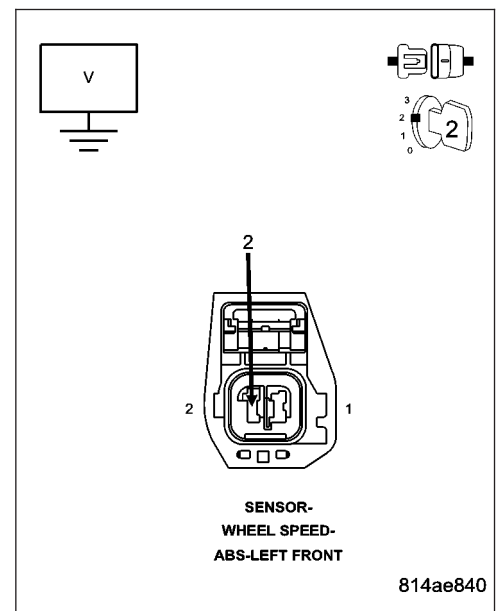
6. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the Left Front Wheel Speed Sensor (+) circuit.

Is there any voltage present?

- Yes** >> Repair Left Front Wheel Speed Sensor (+) circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 7



LEFT FRONT SENSOR SHORTED — 90 (CONTINUED)

7. LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE

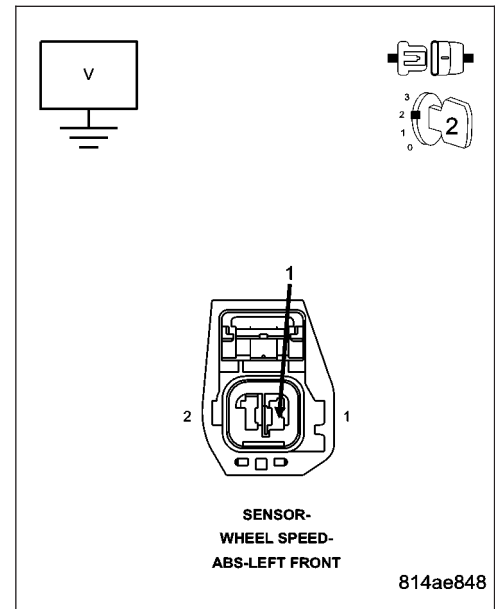
Measure the voltage of the Left Front Wheel Speed Sensor (-) circuit.

Is there any voltage present?

Yes >> Repair the Left Front Wheel Speed Sensor (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 8

**8. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT**

Turn the ignition off.

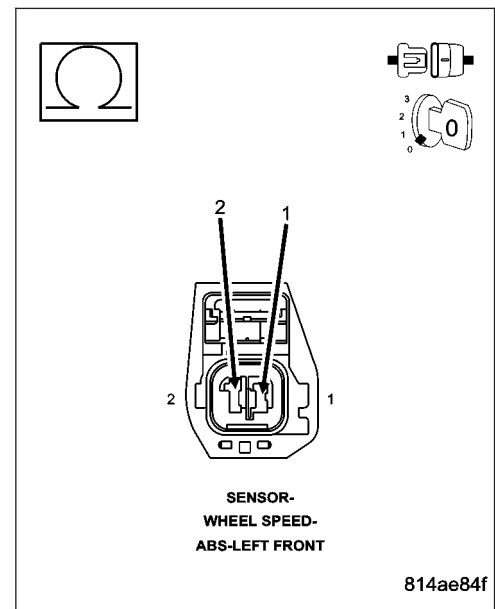
Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and the Left Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Left Front Wheel Speed Sensor (+) circuit for a short to the Left Front Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 9



LEFT FRONT SENSOR SHORTED — 90 (CONTINUED)**9. LEFT FRONT WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Left Front Wheel Speed Sensor harness connector.

Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and Left Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1600–2300 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 10

No >> Replace the Left Front Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

10. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

11. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

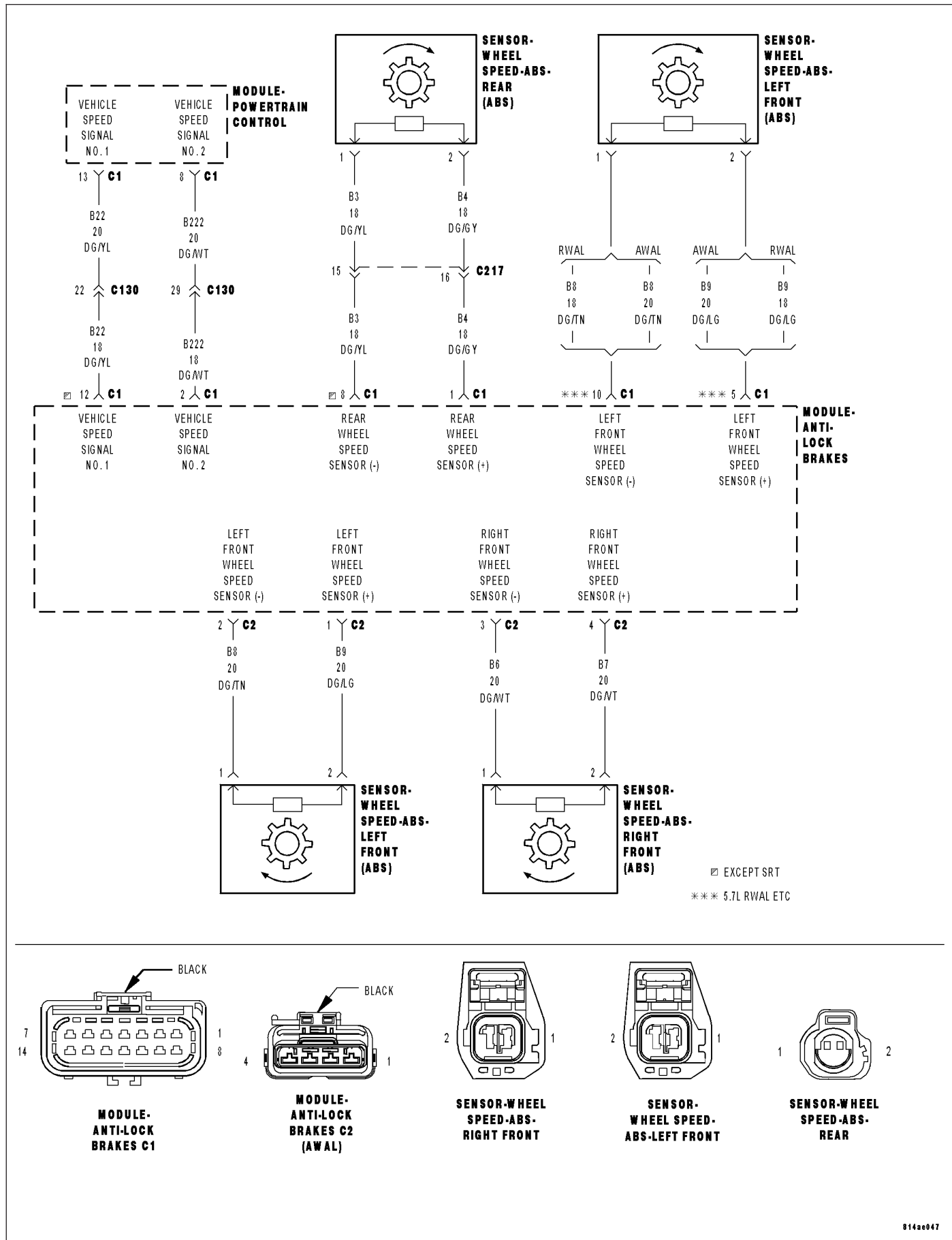
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

NO SIGNAL FROM LEFT FRONT SENSOR - 26



NO SIGNAL FROM LEFT FRONT SENSOR - 26 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition turned on for at least 3.5 seconds. Average filtered speed for the two front wheels above 6km/h (4MPH). Speed for each suspect sensor above 32 km/h (20 MPH) (brake applied or ABS active) or 19 km/h (12 MPH) (brake released or ABS inactive).

- **Set Condition:**

One sensor is unable to reach 4 MPH while the remaining sensors are indicating above 8 MPH.

Possible Causes
INTERMITTENT LEFT FRONT WHEEL SPEED SENSOR DTC
LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORT TO GROUND
LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORT TO GROUND
LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN
LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN
LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE
LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT
TONE WHEEL
EXCESSIVE LEFT FRONT WHEEL SPEED SENSOR AIR GAP
WHEEL BEARING
LEFT FRONT WHEEL SPEED SENSOR
CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display the DTC??

Yes >> Go To 2

No >> Go To 15

NO SIGNAL FROM LEFT FRONT SENSOR - 26 (CONTINUED)

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

3. TONE WHEEL DAMAGED/MISSING

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

Yes >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

5. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 6

NO SIGNAL FROM LEFT FRONT SENSOR - 26 (CONTINUED)**6. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND**

Turn the ignition off.

Disconnect the Left Front Wheel Speed Sensor harness connector.

Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

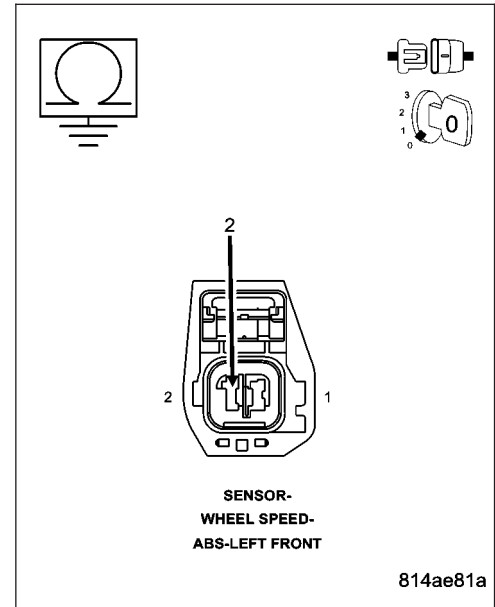
Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 7

No >> Repair the Left Front Wheel Speed Sensor (+) circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**7. LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND**

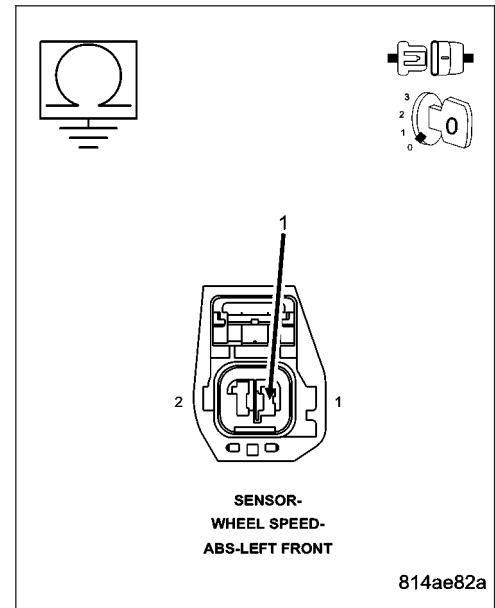
Measure the resistance between the Left Front Wheel Speed Sensor (-) circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 8

No >> Repair the Left Front Wheel Speed Sensor (-) circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



NO SIGNAL FROM LEFT FRONT SENSOR - 26 (CONTINUED)

8. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN

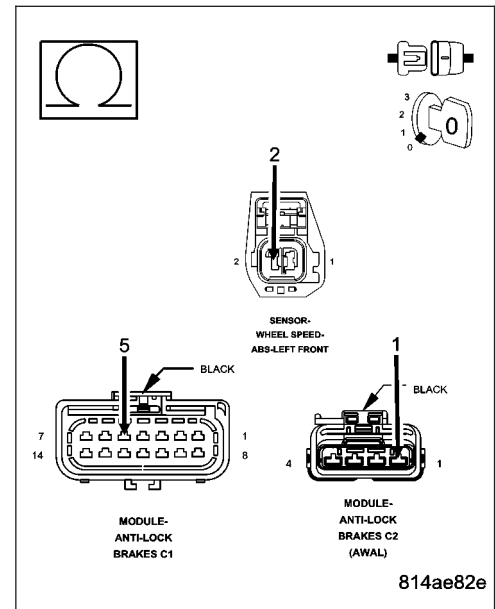
Measure the resistance of the Left Front Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open Left Front Wheel Speed Sensor (+) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**9. LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN**

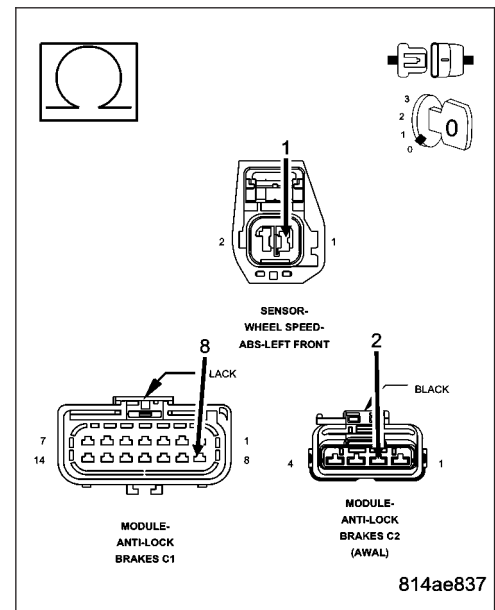
Measure the resistance of the Left Front Wheel Speed Sensor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open Left Front Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



NO SIGNAL FROM LEFT FRONT SENSOR - 26 (CONTINUED)**10. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition on.

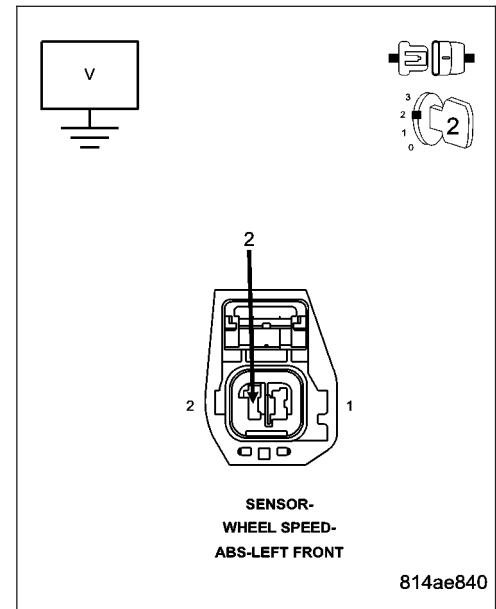
Measure the voltage of the Left Front Wheel Speed Sensor (+) circuit.

Is there any voltage present?

Yes >> Repair Left Front Wheel Speed Sensor (+) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 11

**11. LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE**

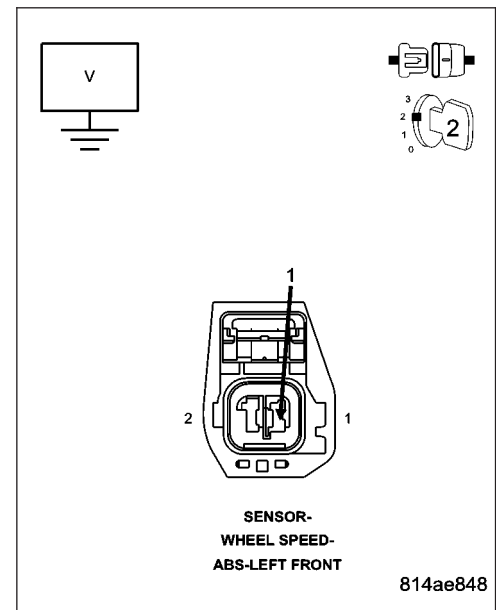
Measure the voltage of the Left Front Wheel Speed Sensor (-) circuit.

Is there any voltage present?

Yes >> Repair the Left Front Wheel Speed Sensor (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 12



NO SIGNAL FROM LEFT FRONT SENSOR - 26 (CONTINUED)**12. LEFT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE LEFT FRONT WHEEL SPEED SENSOR (-) CIRCUIT**

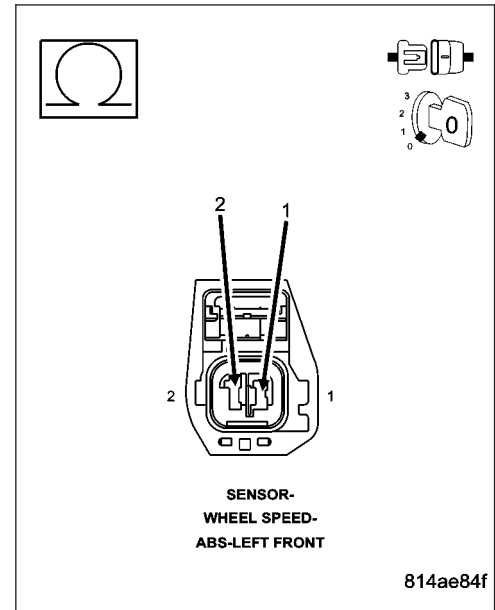
Turn the ignition off.

Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and the Left Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Left Front Wheel Speed Sensor (+) circuit for a short to the Left Front Wheel Speed Sensor (-) circuit. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 13

**13. LEFT FRONT WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Left Front Wheel Speed Sensor harness connector.

Measure the resistance between the Left Front Wheel Speed Sensor (+) circuit and Left Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1800–2200 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 14

No >> Replace the Left Front Wheel Speed Sensor in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

14. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information. Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

NO SIGNAL FROM LEFT FRONT SENSOR - 26 (CONTINUED)

15. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

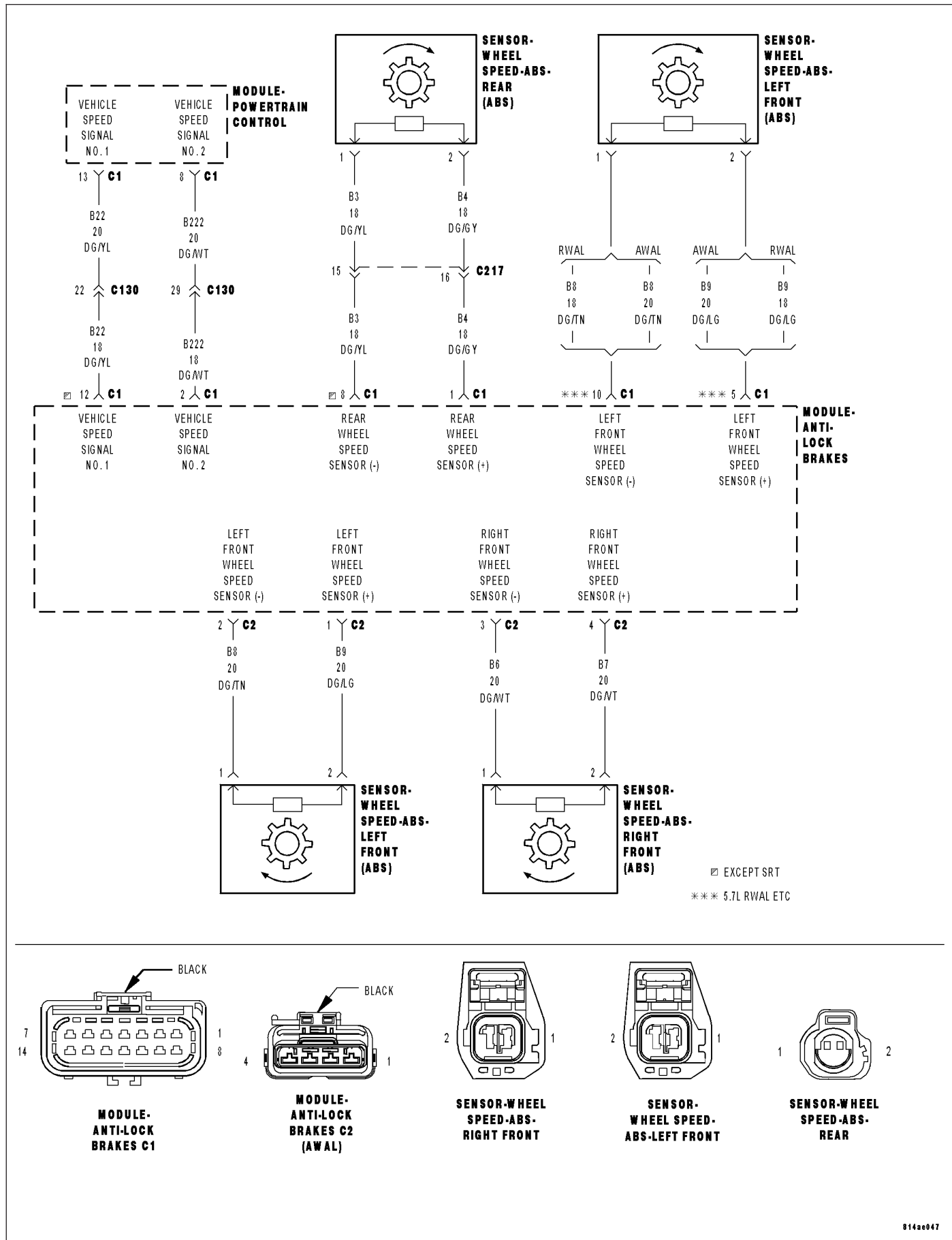
Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

NO SIGNAL FROM REAR SENSOR - 36



NO SIGNAL FROM REAR SENSOR - 36 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
One sensor is unable to reach 4 MPH while the remaining sensors are indicating above 8 MPH.

Possible Causes
INTERMITTENT REAR WHEEL SPEED SENSOR DTC REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORT TO GROUND REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORT TO GROUND REAR WHEEL SPEED SENSOR (+) CIRCUIT OPEN REAR WHEEL SPEED SENSOR (-) CIRCUIT OPEN REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE REAR WHEEL SPEED SENSOR (-) CIRCUIT TONE WHEEL EXCESSIVE REAR WHEEL SPEED SENSOR AIR GAP WHEEL BEARING/REAR DIFFERENTIAL REAR WHEEL SPEED SENSOR CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.
 With the DRBIII®, clear DTCs.
 Turn the ignition off.
 Turn the ignition on.
 With the DRBIII®, read DTCs.

Does the DRBIII® display the DTC?

Yes >> Go To 2

No >> Go To 15

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.
 Inspect the Wheel Speed Sensor for proper mounting.
 Inspect the Wheel Speed Sensor harness and connector.
 Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
 Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

NO SIGNAL FROM REAR SENSOR - 36 (CONTINUED)**3. TONE WHEEL DAMAGED/MISSING**

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

5. WHEEL BEARING/REAR DIFFERENTIAL

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.
Inspect the rear differential for proper operating. Refer to the Service information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6

6. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Rear Wheel Speed Sensor harness connector.

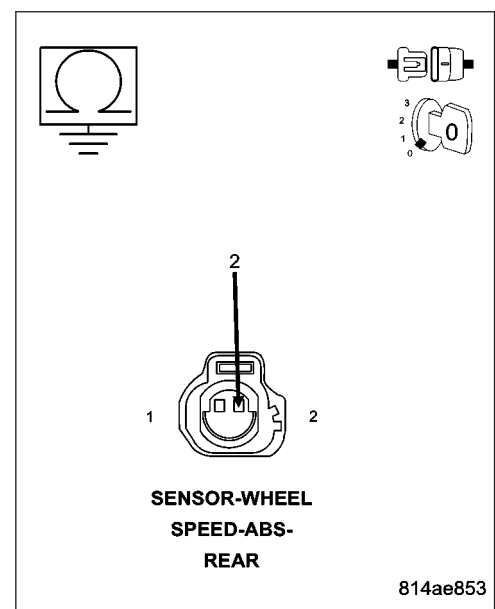
Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

- Yes** >> Go To 7
- No** >> Repair the Rear Wheel Speed Sensor (+) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



NO SIGNAL FROM REAR SENSOR - 36 (CONTINUED)**7. REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND**

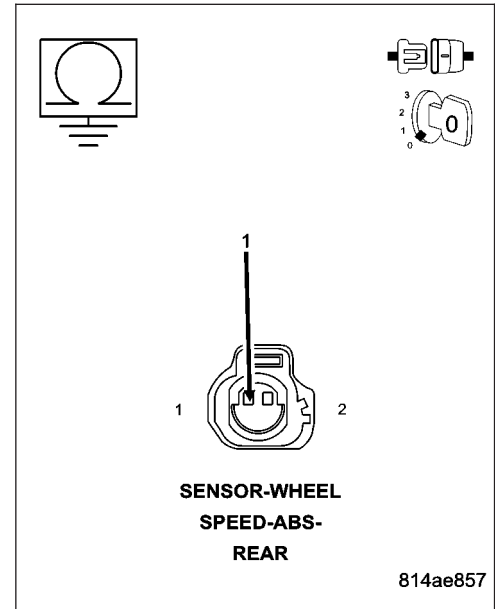
Measure the resistance between the Rear Wheel Speed Sensor (-) circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 8

No >> Repair the Rear Wheel Speed Sensor (-) circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

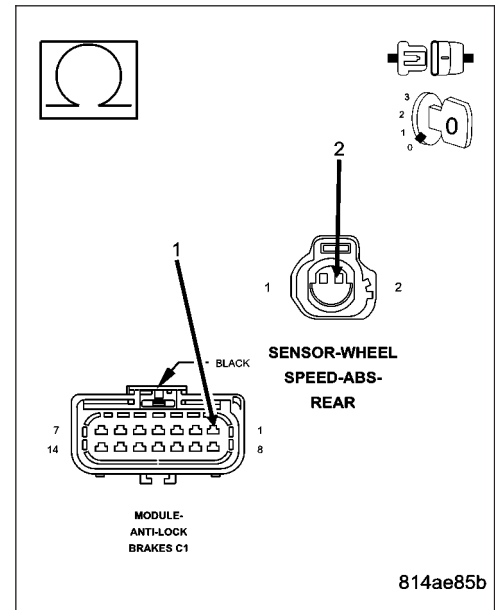
**8. REAR WHEEL SPEED SENSOR (+) CIRCUIT OPEN**

Measure the resistance of the Rear Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open Rear Wheel Speed Sensor (+) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



NO SIGNAL FROM REAR SENSOR - 36 (CONTINUED)

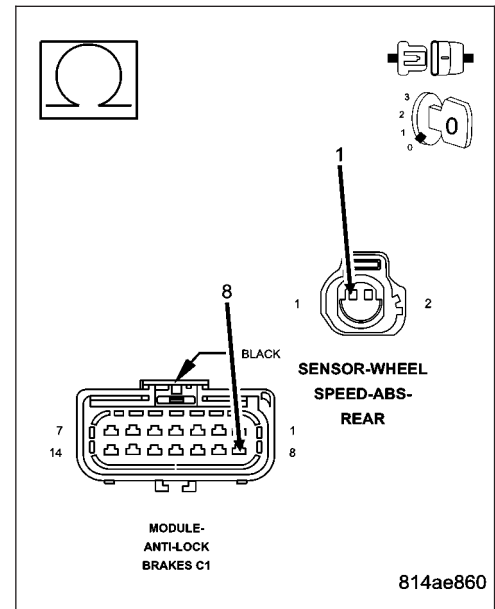
9. REAR WHEEL SPEED SENSOR (-) CIRCUIT OPEN

Measure the resistance of the Rear Wheel Speed Sensor (-) circuit.

Is the resistance below 5 ohms?

Yes >> Go To 10

No >> Repair the open Rear Wheel Speed Sensor (-) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**10. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition on.

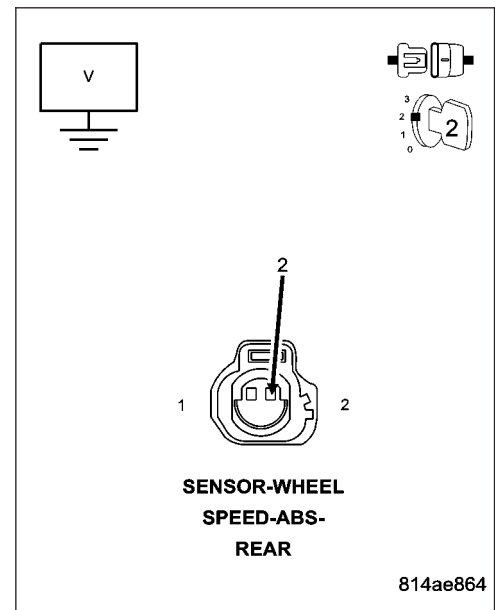
Measure the voltage of the Rear Wheel Speed Sensor (+) circuit.

Is there any voltage present?

Yes >> Repair Rear Wheel Speed Sensor (+) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 11



NO SIGNAL FROM REAR SENSOR - 36 (CONTINUED)**11. REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE**

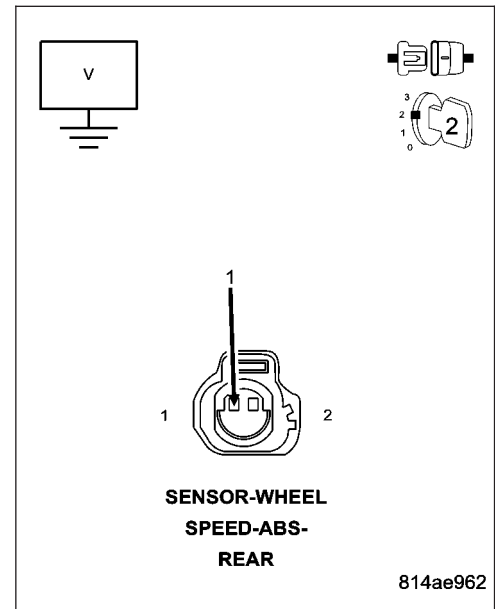
Measure the voltage of the Rear Wheel Speed Sensor (-) circuit.

Is there any voltage present?

Yes >> Repair the Rear Wheel Speed Sensor (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 12

**12. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE REAR WHEEL SPEED SENSOR (-) CIRCUIT**

Turn the ignition off.

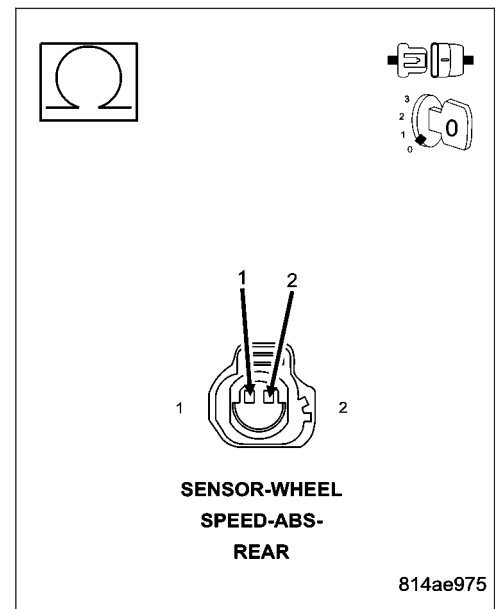
Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and the Rear Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Rear Wheel Speed Sensor (+) circuit for a short to the Rear Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 13



NO SIGNAL FROM REAR SENSOR - 36 (CONTINUED)

13. REAR WHEEL SPEED SENSOR

Turn the ignition off.

Connect the Rear Wheel Speed Sensor harness connector.

Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and Rear Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1600–2300 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 14

No >> Replace the Rear Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

14. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

15. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

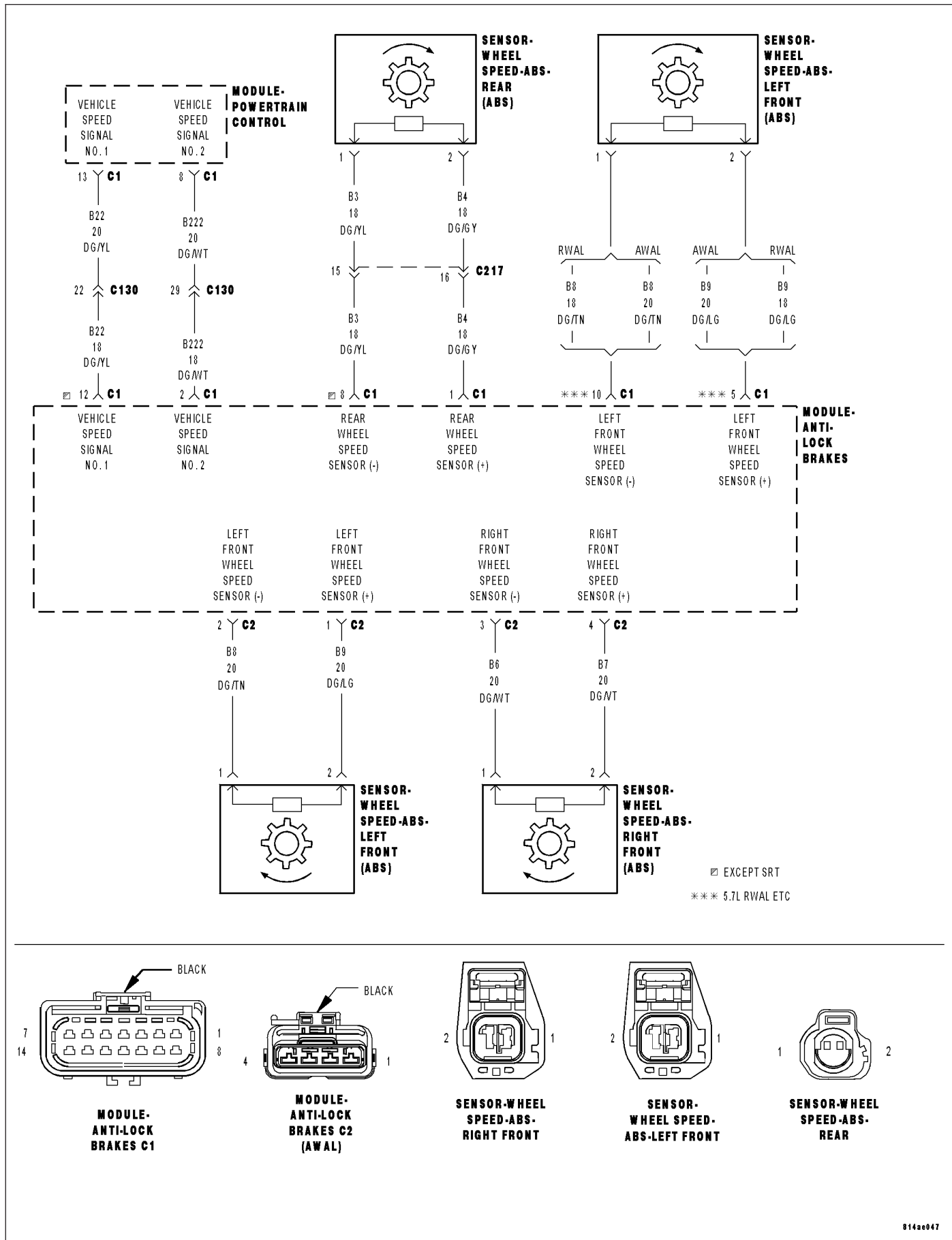
Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

NO SIGNAL FROM RIGHT FRONT SENSOR — 22

NO SIGNAL FROM RIGHT FRONT SENSOR — 22 (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**
Ignition on.
- **Set Condition:**
One sensor is unable to reach 4 MPH while the remaining sensors are indicating above 8 MPH.

Possible Causes
INTERMITTENT LEFT FRONT WHEEL SPEED SENSOR DTC RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORT TO GROUND RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORT TO GROUND RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT TONE WHEEL EXCESSIVE LEFT FRONT WHEEL SPEED SENSOR AIR GAP WHEEL BEARING RIGHT FRONT WHEEL SPEED SENSOR CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DRBIII® display the DTC??

Yes >> Go To 2

No >> Go To 15

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

NO SIGNAL FROM RIGHT FRONT SENSOR — 22 (CONTINUED)**3. TONE WHEEL DAMAGED/MISSING**

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

5. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6

6. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Right Front Wheel Speed Sensor harness connector.

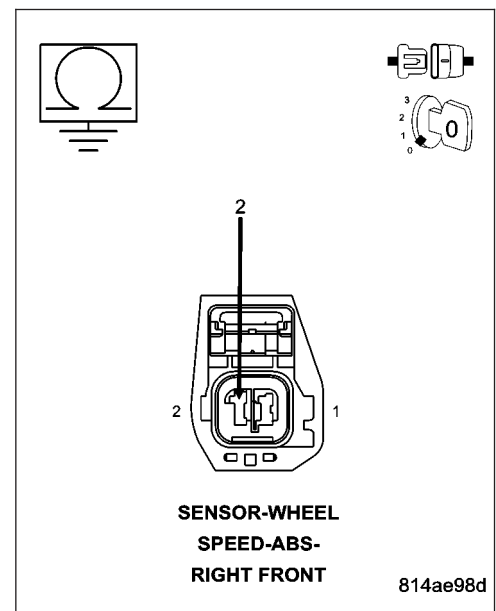
Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

- Yes** >> Go To 7
- No** >> Repair the Right Front Wheel Speed Sensor (+) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



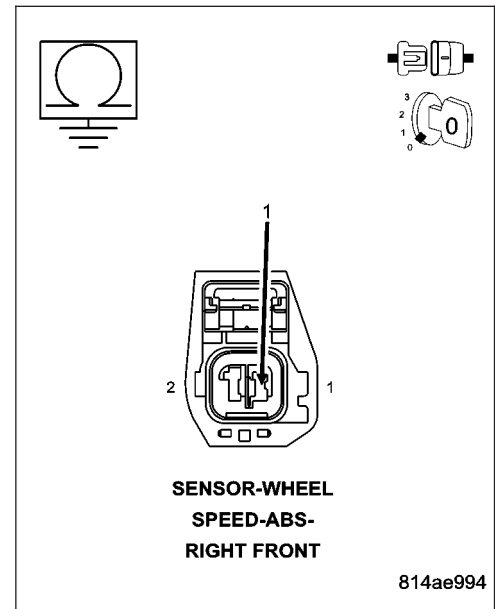
NO SIGNAL FROM RIGHT FRONT SENSOR — 22 (CONTINUED)**7. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND**

Measure the resistance between the Right Front Wheel Speed Sensor (-) circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 8

No >> Repair the Right Front Wheel Speed Sensor (-) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

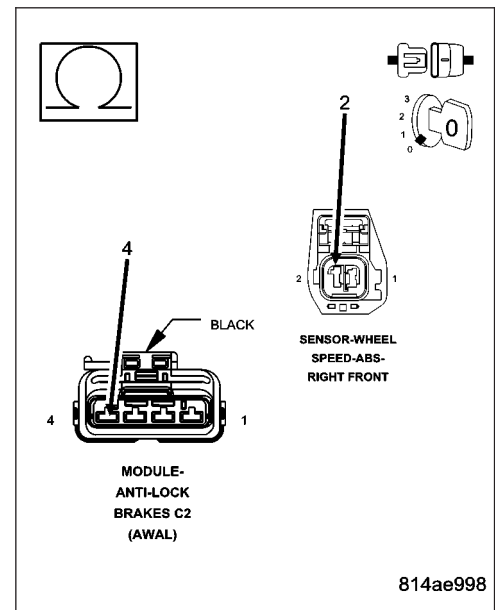
**8. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN**

Measure the resistance of the Right Front Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open Right Front Wheel Speed Sensor (+) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



NO SIGNAL FROM RIGHT FRONT SENSOR — 22 (CONTINUED)**9. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN**

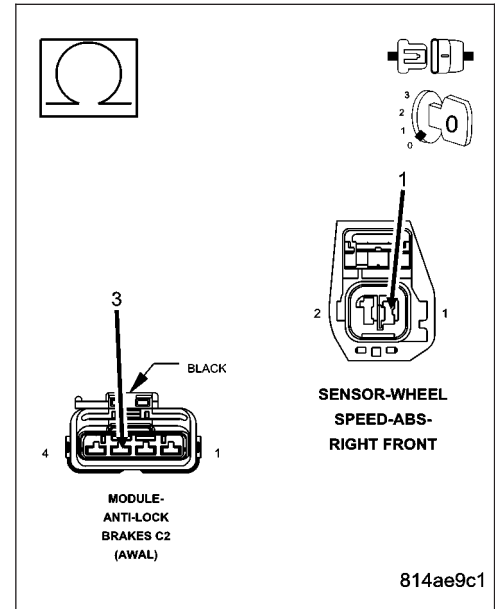
Measure the resistance of the Right Front Wheel Speed Sensor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open Right Front Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**10. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE**

Turn the ignition on.

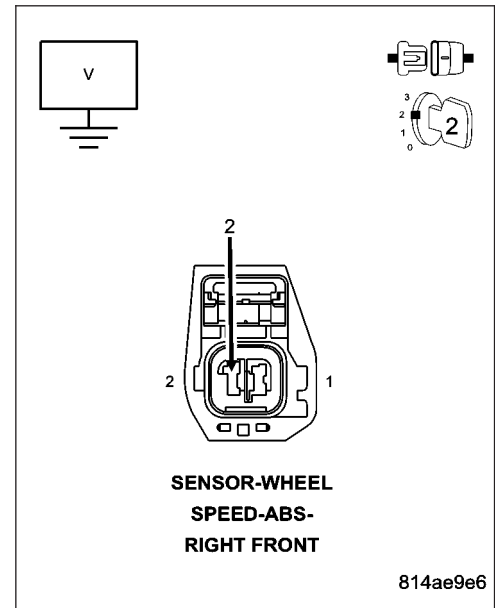
Measure the voltage of the Right Front Wheel Speed Sensor (+) circuit.

Is there any voltage present?

Yes >> Repair Right Front Wheel Speed Sensor (+) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 11



NO SIGNAL FROM RIGHT FRONT SENSOR — 22 (CONTINUED)

11. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE

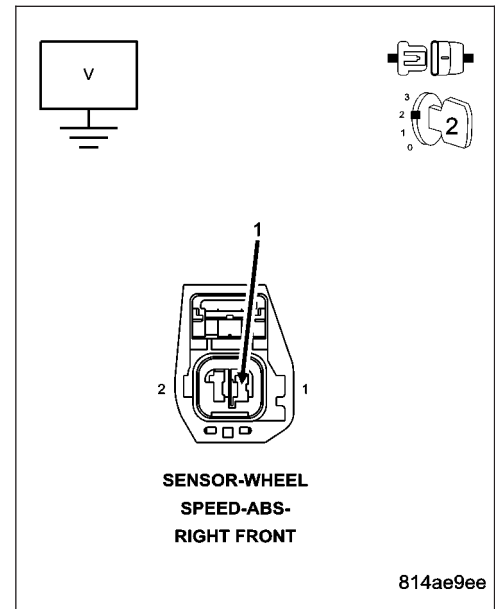
Measure the voltage of the Right Front Wheel Speed Sensor (-) circuit.

Is there any voltage present?

Yes >> Repair the Right Front Wheel Speed Sensor (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 12

**12. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT**

Turn the ignition off.

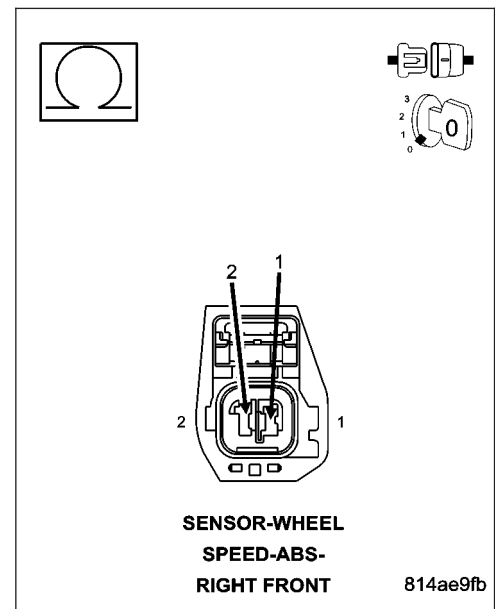
Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and the Right Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Right Front Wheel Speed Sensor (+) circuit for a short to the Right Front Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 13



NO SIGNAL FROM RIGHT FRONT SENSOR — 22 (CONTINUED)**13. RIGHT FRONT WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Right Front Wheel Speed Sensor harness connector.

Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and Right Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1800–2200 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 14

No >> Replace the Right Front Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

14. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

15. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

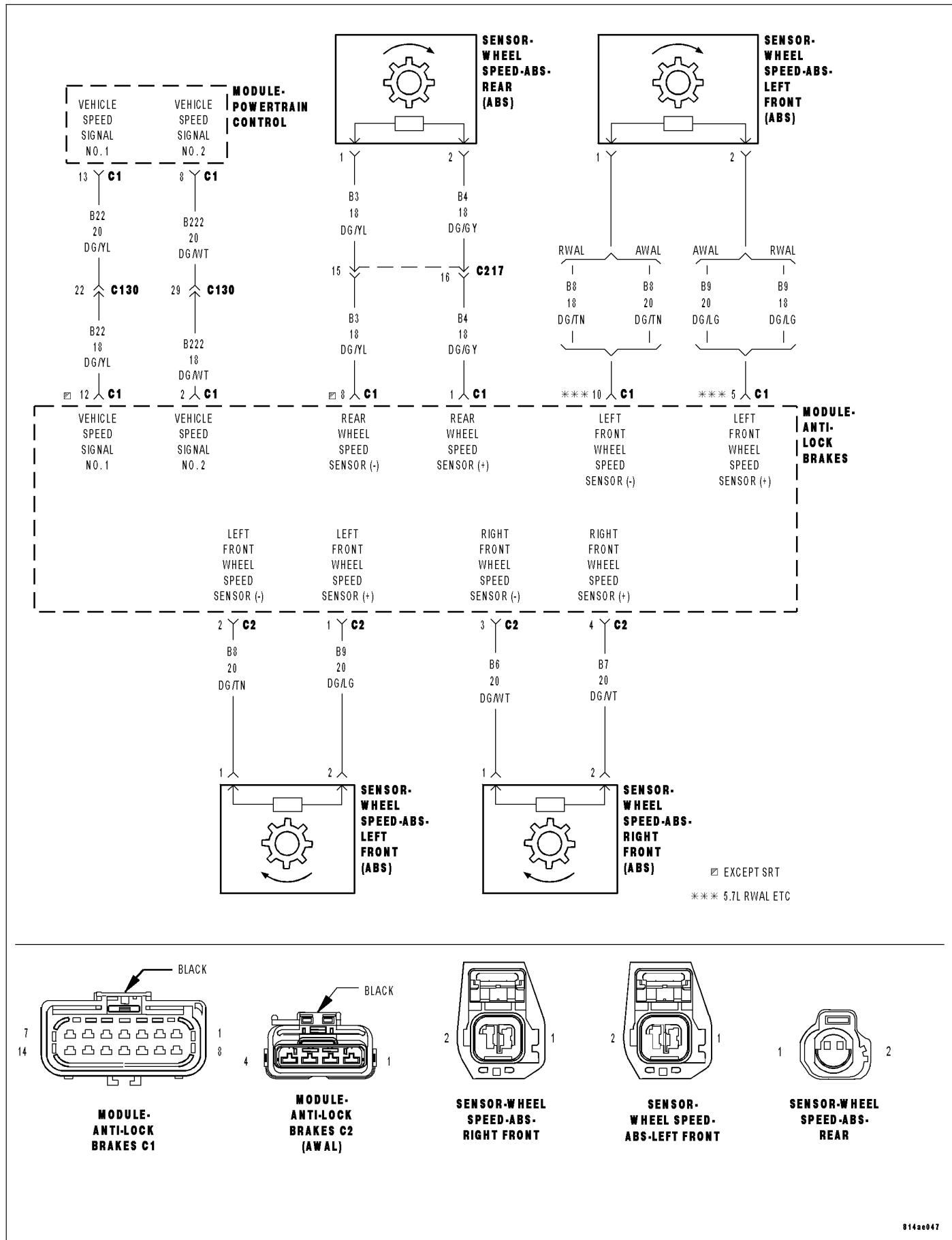
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

REAR SENSOR OPEN — 35



REAR SENSOR OPEN — 35 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The CAB detects an open in the wheel speed sensor circuit

Possible Causes
INTERMITTENT LEFT FRONT WHEEL SPEED SENSOR DTC REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORT TO GROUND REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORT TO GROUND REAR WHEEL SPEED SENSOR (+) CIRCUIT OPEN REAR FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN TONE WHEEL EXCESSIVE REAR FRONT WHEEL SPEED SENSOR AIR GAP WHEEL BEARING/REAR DIFFERENTIAL REAR WHEEL SPEED SENSOR CONTROL ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, select View DTCs.

Does the DRBIII® display the DTC?

Yes >> Go To 2

No >> Go To 12

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

REAR SENSOR OPEN — 35 (CONTINUED)**3. TONE WHEEL DAMAGED/MISSING**

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

5. WHEEL BEARING/REAR DIFFERENTIAL

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information. Ensure the Rear Differential is operating properly. Refer to the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6

6. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Rear Wheel Speed Sensor harness connector.

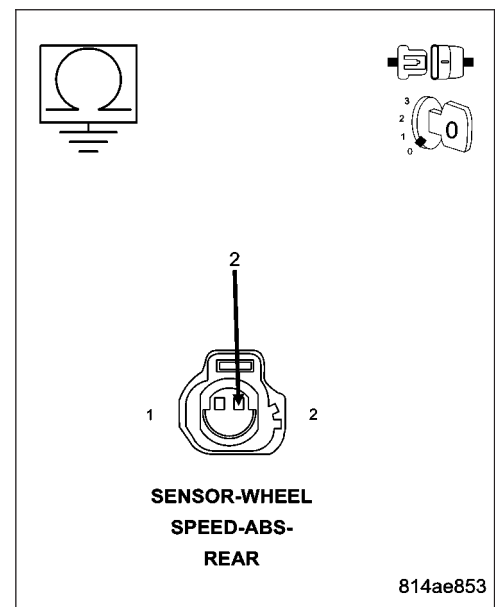
Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

- Yes** >> Go To 7
- No** >> Repair the Rear Wheel Speed Sensor (+) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



REAR SENSOR OPEN — 35 (CONTINUED)**7. REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND**

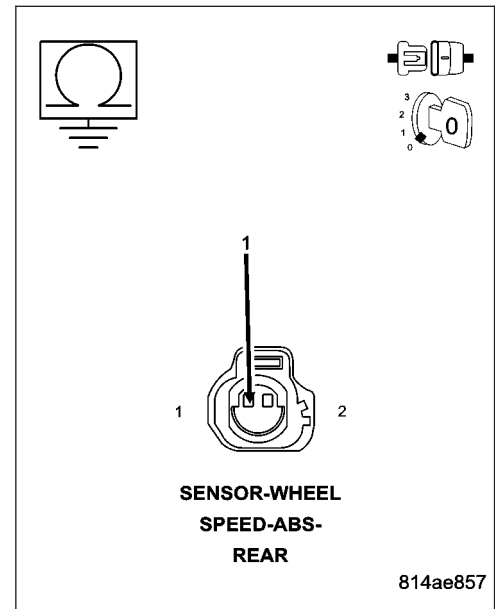
Measure the resistance between the Rear Wheel Speed Sensor (-) circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 8

No >> Repair the Rear Wheel Speed Sensor (-) circuit for a short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

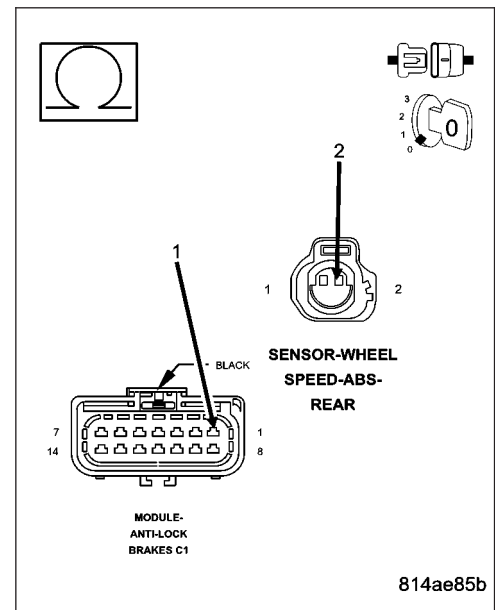
**8. REAR WHEEL SPEED SENSOR (+) CIRCUIT OPEN**

Measure the resistance of the Rear Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open Rear Wheel Speed Sensor (+) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



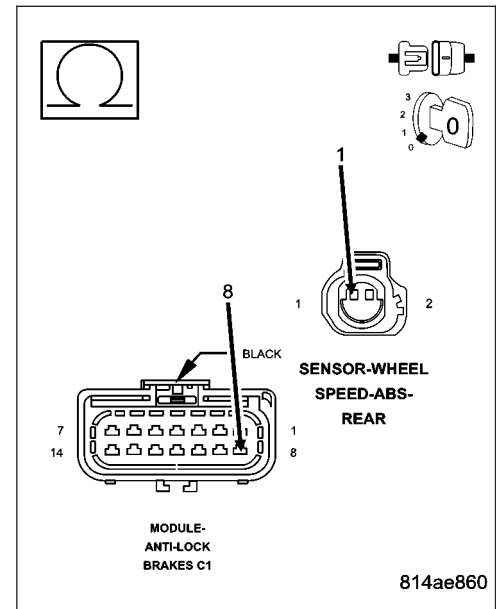
REAR SENSOR OPEN — 35 (CONTINUED)**9. REAR WHEEL SPEED SENSOR (-) CIRCUIT OPEN**

Measure the resistance of the Rear Wheel Speed Sensor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open Rear Wheel Speed Sensor (-) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**10. REAR WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Rear Wheel Speed Sensor harness connector.

Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and Rear Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1600–2300 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 11

No >> Replace the Rear Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

11. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

REAR SENSOR OPEN — 35 (CONTINUED)

12. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

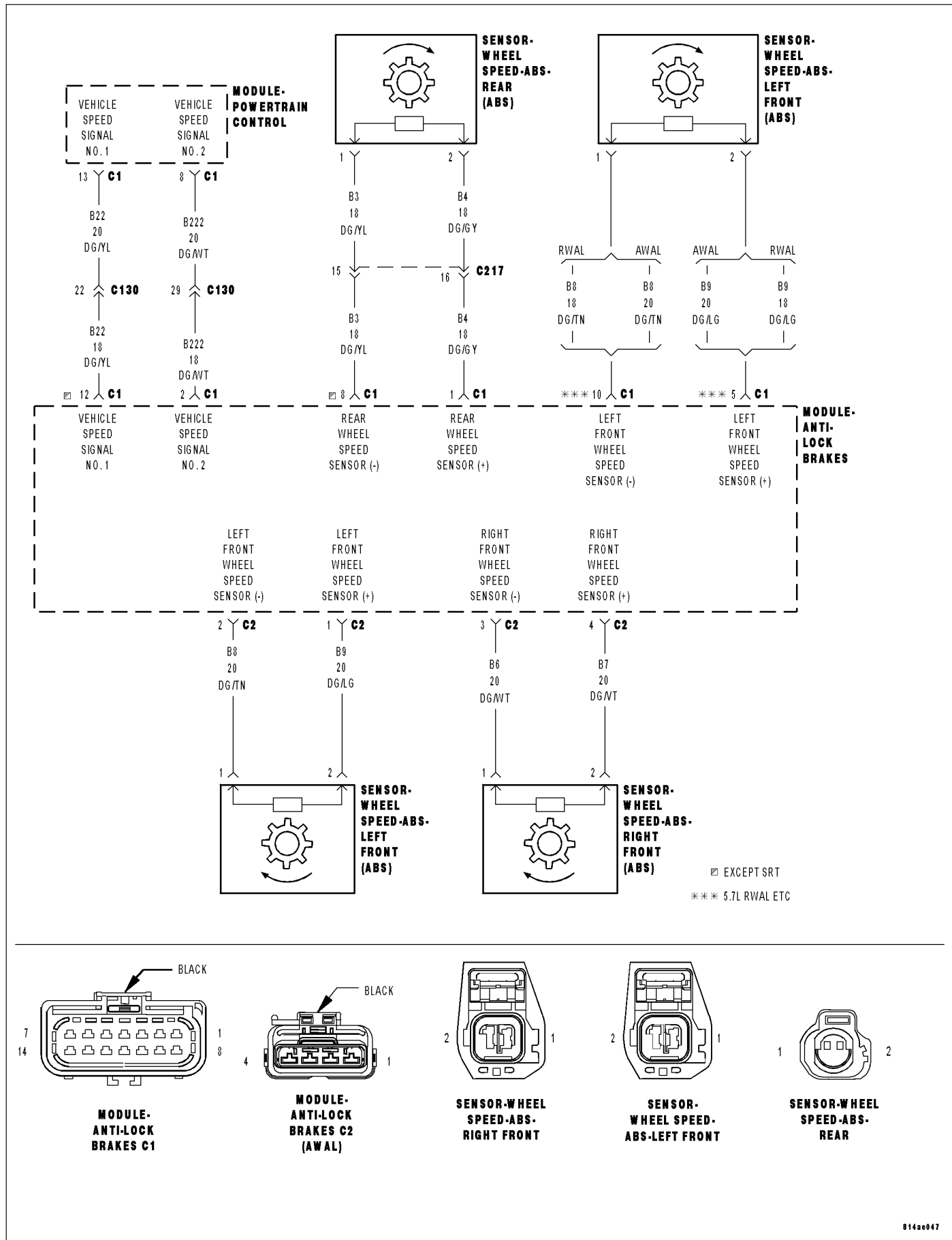
Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

REAR SENSOR SHORTED — 93



REAR SENSOR SHORTED — 93 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The CAB detect high voltage on the wheel speed sensor circuit.

Possible Causes
INTERMITTENT REAR FRONT WHEEL SPEED SENSOR DTC REAR FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE REAR FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE REAR FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE REAR FRONT WHEEL SPEED SENSOR (-) CIRCUIT TONE WHEEL EXCESSIVE REAR FRONT WHEEL SPEED SENSOR AIR GAP WHEEL BEARING REAR FRONT WHEEL SPEED SENSOR CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.
 With the scan tool, clear DTCs.
 Turn the ignition off.
 Turn the ignition on.
 With the scan tool, read DTCs.

Does the DRBIII® display the DTC?

Yes >> Go To 2
No >> Go To 11

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.
 Inspect the Wheel Speed Sensor for proper mounting.
 Inspect the Wheel Speed Sensor harness and connector.
 Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
 Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
No >> Go To 3

REAR SENSOR SHORTED — 93 (CONTINUED)**3. TONE WHEEL DAMAGED/MISSING**

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

5. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6

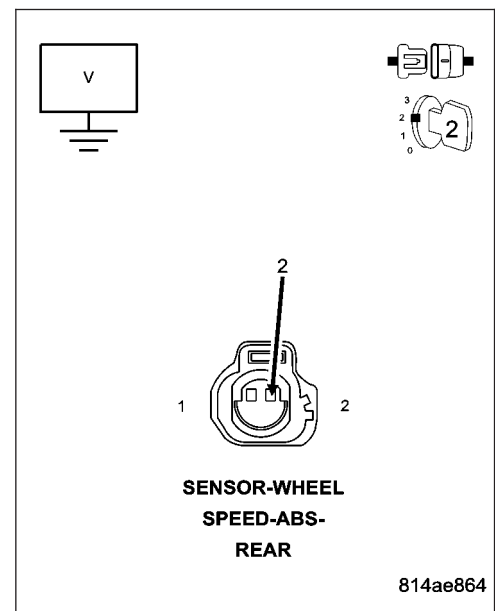
6. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the Rear Wheel Speed Sensor (+) circuit.

Is there any voltage present?

- Yes** >> Repair Rear Wheel Speed Sensor (+) circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 7



REAR SENSOR SHORTED — 93 (CONTINUED)**7. REAR WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE**

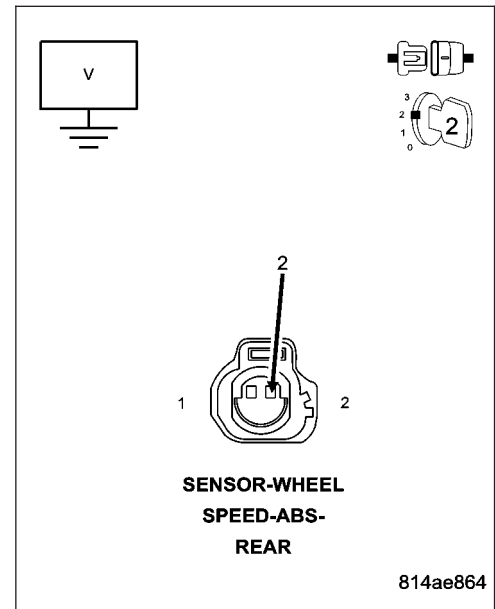
Measure the voltage of the Rear Wheel Speed Sensor (-) circuit.

Is there any voltage present?

Yes >> Repair the Rear Wheel Speed Sensor (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 8

**8. REAR WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE Rear WHEEL SPEED SENSOR (-) CIRCUIT**

Turn the ignition off.

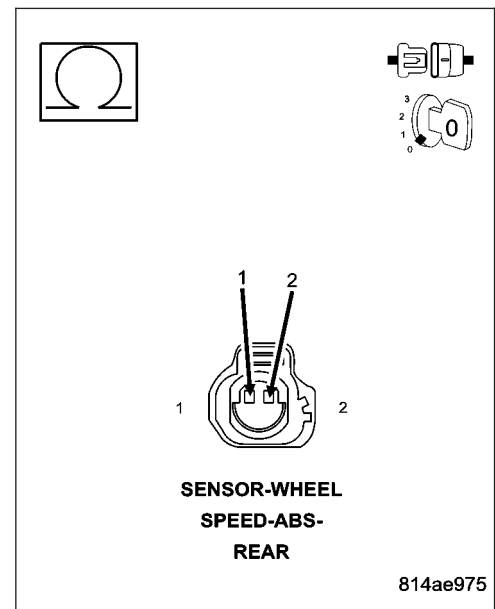
Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and the Rear Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Rear Wheel Speed Sensor (+) circuit for a short to the Rear Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 9



REAR SENSOR SHORTED — 93 (CONTINUED)

9. REAR WHEEL SPEED SENSOR

Turn the ignition off.

Connect the Rear Wheel Speed Sensor harness connector.

Measure the resistance between the Rear Wheel Speed Sensor (+) circuit and Rear Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1600–2300 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 10

No >> Replace the Rear Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

10. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

11. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

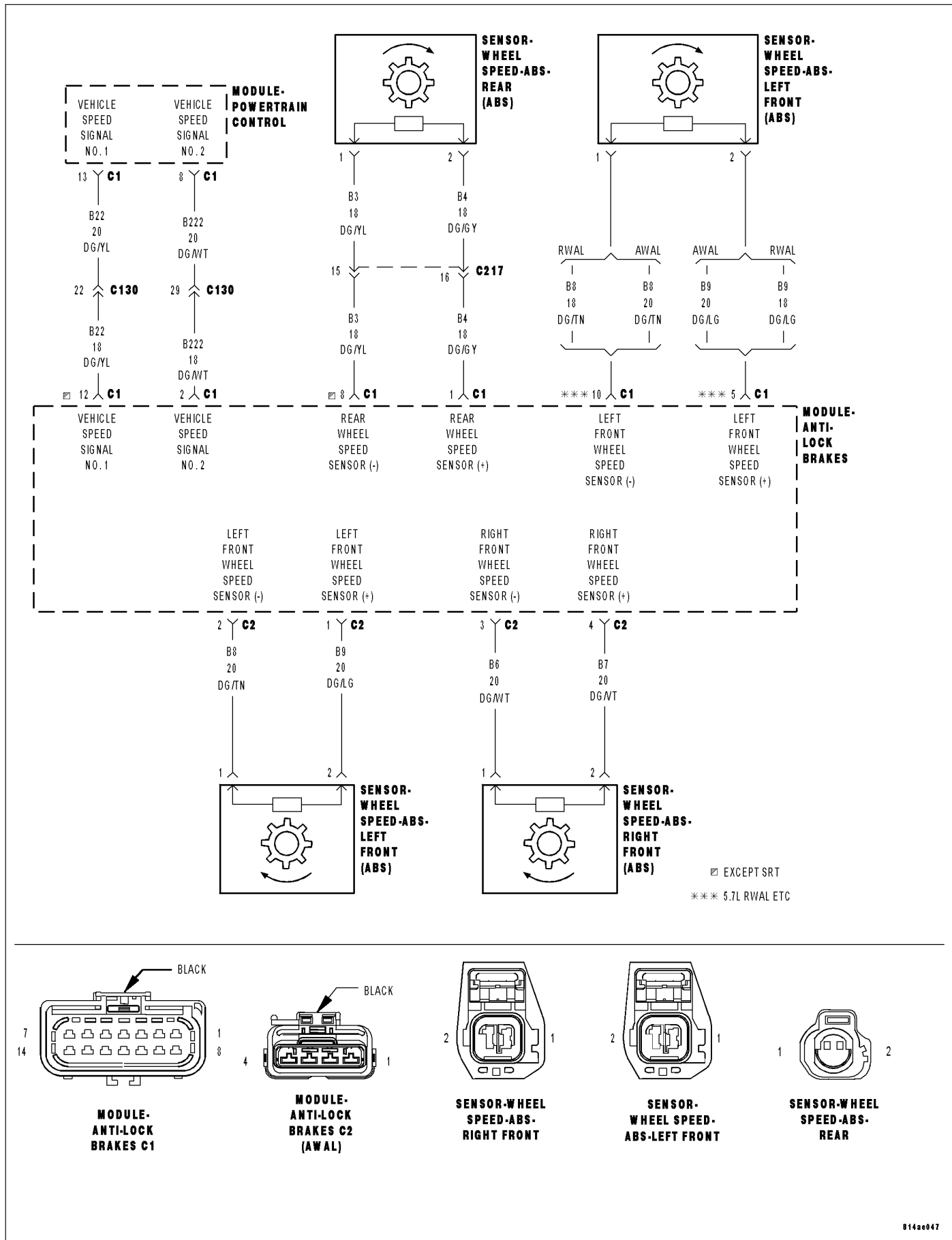
Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

RIGHT FRONT SENSOR OPEN — 21

RIGHT FRONT SENSOR OPEN — 21 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The CAB detects an open in the wheel speed sensor circuit

Possible Causes
INTERMITTENT RIGHT FRONT WHEEL SPEED SENSOR DTC RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORT TO GROUND RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORT TO GROUND RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN TONE WHEEL EXCESSIVE RIGHT FRONT WHEEL SPEED SENSOR AIR GAP WHEEL BEARING RIGHT FRONT WHEEL SPEED SENSOR CONTROL ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, select View DTCs.

Does the DRBIII® display the DTC?

Yes >> Go To 2

No >> Go To 12

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

RIGHT FRONT SENSOR OPEN — 21 (CONTINUED)**3. TONE WHEEL DAMAGED/MISSING**

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

5. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6

6. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Disconnect the Right Front Wheel Speed Sensor harness connector.

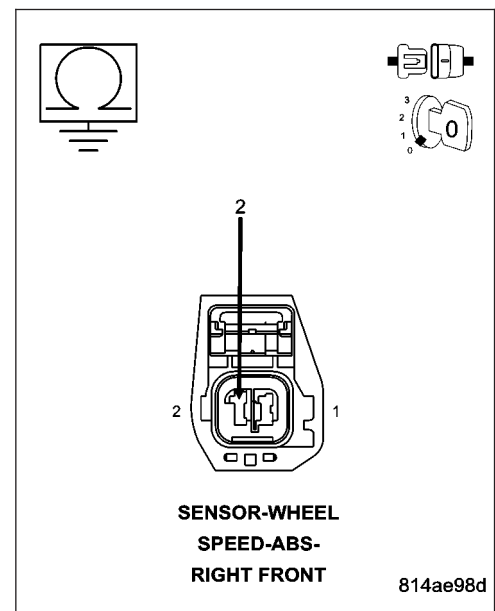
Disconnect the Controller Anti-lock Brake harness connector.

NOTE: Check connector - Clean/repair as necessary.

Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and ground.

Is the resistance above 5.0 ohms?

- Yes** >> Go To 7
- No** >> Repair the Right Front Wheel Speed Sensor (+) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



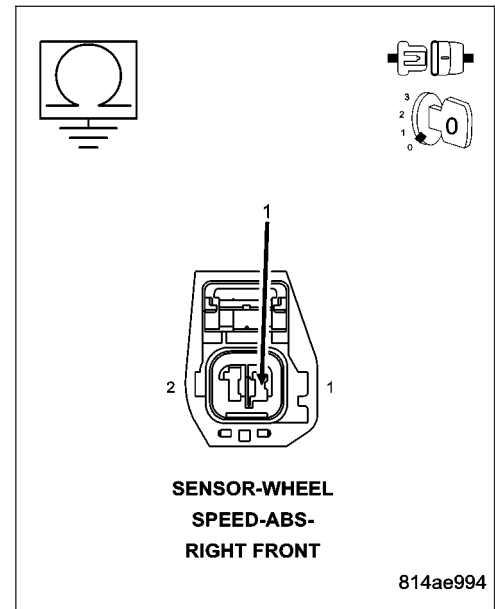
RIGHT FRONT SENSOR OPEN — 21 (CONTINUED)**7. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO GROUND**

Measure the resistance between the Right Front Wheel Speed Sensor (-) circuit and ground.

Is the resistance above 5.0 ohms?

Yes >> Go To 8

No >> Repair the Right Front Wheel Speed Sensor (-) circuit for a short to ground.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

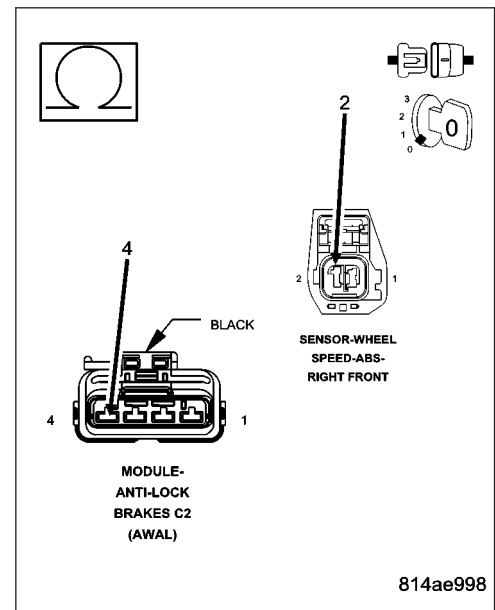
**8. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT OPEN**

Measure the resistance of the Right Front Wheel Speed Sensor (+) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open Right Front Wheel Speed Sensor (+) circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT SENSOR OPEN — 21 (CONTINUED)**9. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT OPEN**

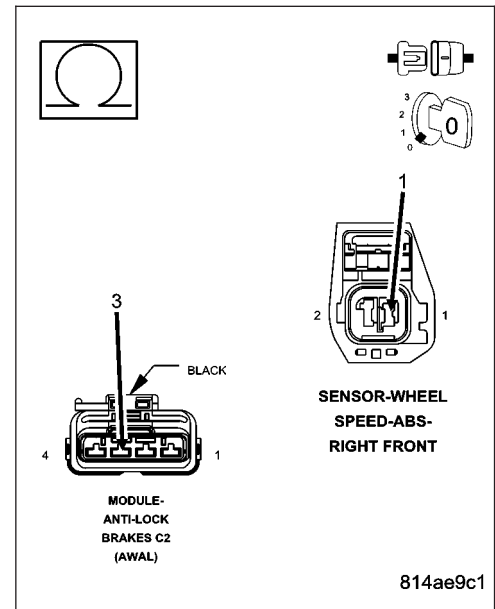
Measure the resistance of the Right Front Wheel Speed Sensor (-) circuit.

Is the resistance below 5.0 ohms?

Yes >> Go To 10

No >> Repair the open Right Front Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**10. RIGHT FRONT WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Right Front Wheel Speed Sensor harness connector.

Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and Right Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1600–2300 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 11

No >> Replace the Right Front Wheel Speed Sensor in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

11. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

RIGHT FRONT SENSOR OPEN — 21 (CONTINUED)

12. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

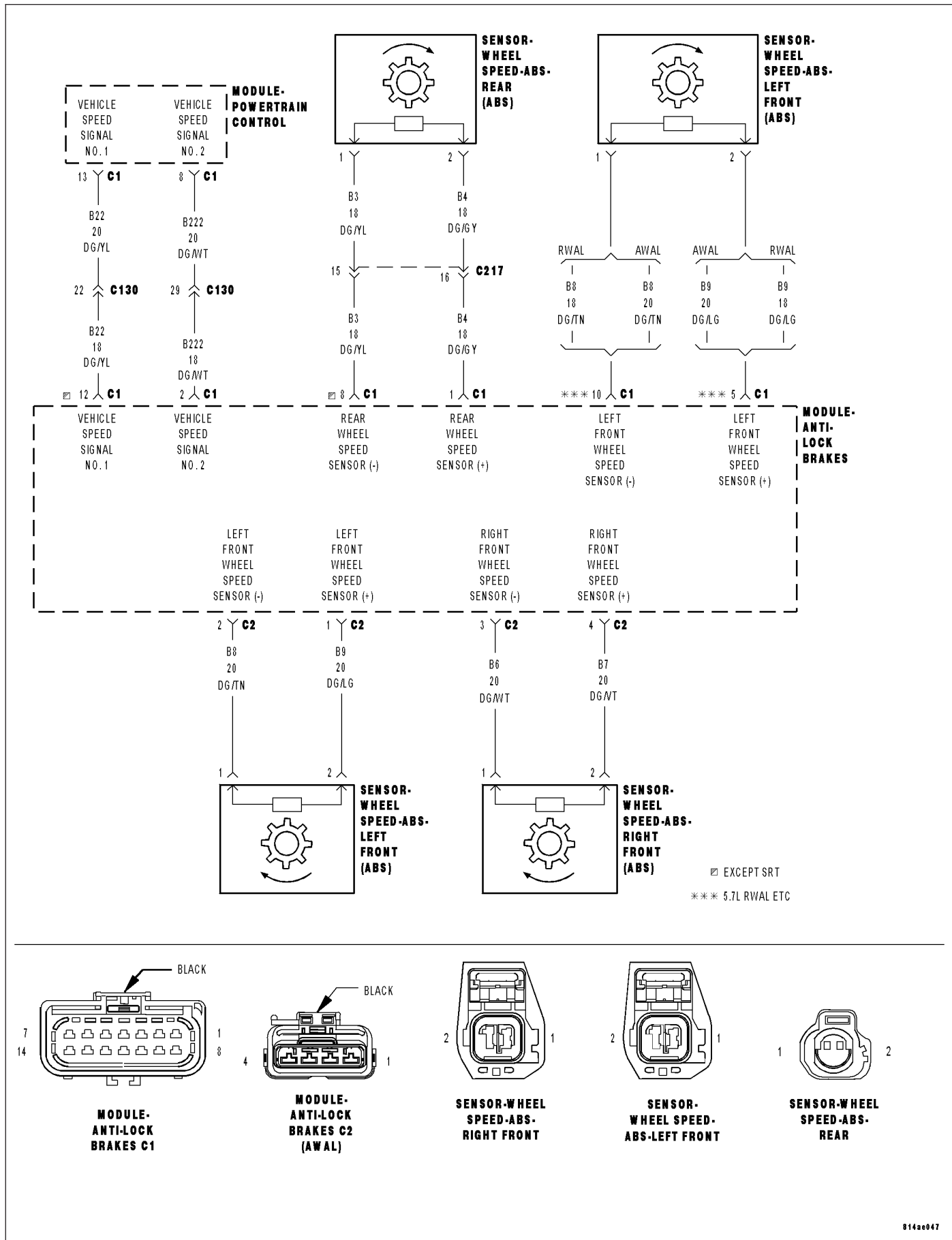
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

RIGHT FRONT SENSOR SHORTED — 91

RIGHT FRONT SENSOR SHORTED — 91 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The CAB detect high voltage on the wheel speed sensor circuit.

Possible Causes
INTERMITTENT RIGHT FRONT WHEEL SPEED SENSOR DTC RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT ONE WHEEL EXCESSIVE RIGHT FRONT WHEEL SPEED SENSOR AIR GAP WHEEL BEARING RIGHT FRONT WHEEL SPEED SENSOR CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the scan tool, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the scan tool, read DTCs.

Does the DRBIII® display the DTC?

Yes >> Go To 2

No >> Go To 11

2. WHEEL SPEED SENSOR INSPECTION

Turn the ignition off.

Inspect the Wheel Speed Sensor for proper mounting.

Inspect the Wheel Speed Sensor harness and connector.

Inspect the Wheel Speed Sensor for excessive debris on the sensor.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3

RIGHT FRONT SENSOR SHORTED — 91 (CONTINUED)**3. TONE WHEEL DAMAGED/MISSING**

Inspect the Tone Wheel in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 4

4. EXCESSIVE WHEEL SPEED SENSOR AIR GAP

Measure the Wheel Speed Sensor Air Gap in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 5

5. WHEEL BEARING LOOSE/BINDING

Inspect the wheel bearings for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

- Yes** >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 6

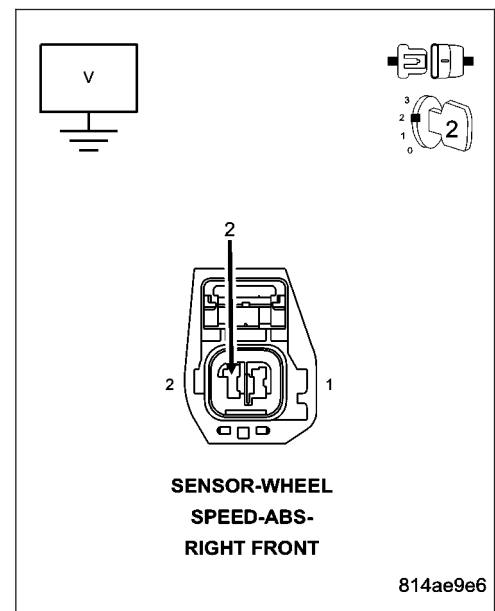
6. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO VOLTAGE

Turn the ignition on.

Measure the voltage of the Right Front Wheel Speed Sensor (+) circuit.

Is there any voltage present?

- Yes** >> Repair Right Front Wheel Speed Sensor (+) circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 7



RIGHT FRONT SENSOR SHORTED — 91 (CONTINUED)**7. RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT SHORTED TO VOLTAGE**

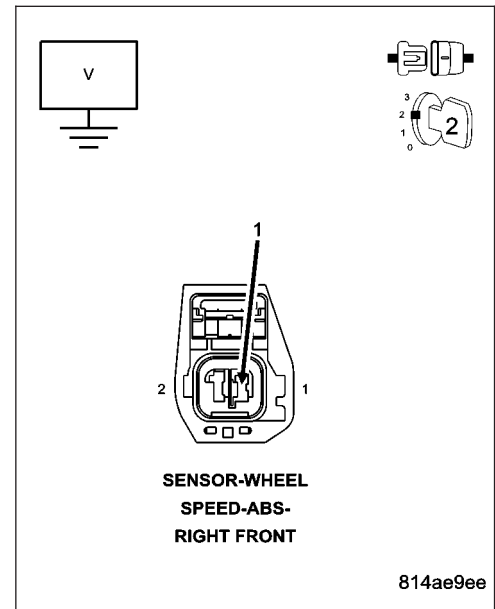
Measure the voltage of the Right Front Wheel Speed Sensor (-) circuit.

Is there any voltage present?

Yes >> Repair the Right Front Wheel Speed Sensor (-) circuit for a short to voltage.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 8

**8. RIGHT FRONT WHEEL SPEED SENSOR (+) CIRCUIT SHORTED TO THE RIGHT FRONT WHEEL SPEED SENSOR (-) CIRCUIT**

Turn the ignition off.

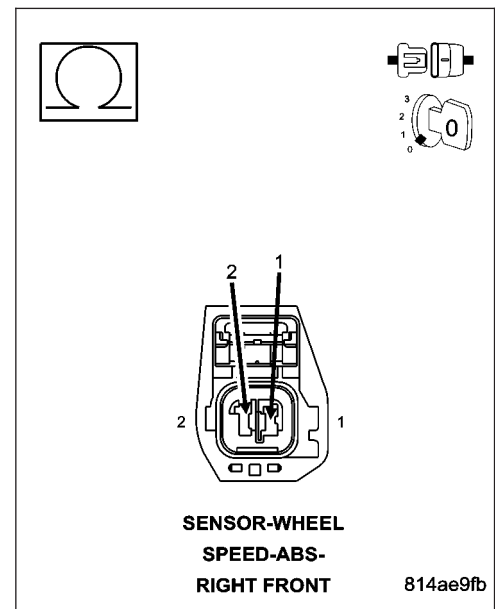
Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and the Right Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

Is the resistance below 5.0 ohms?

Yes >> Repair Right Front Wheel Speed Sensor (+) circuit for a short to the Right Front Wheel Speed Sensor (-) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 9



RIGHT FRONT SENSOR SHORTED — 91 (CONTINUED)**9. RIGHT FRONT WHEEL SPEED SENSOR**

Turn the ignition off.

Connect the Right Front Wheel Speed Sensor harness connector.

Measure the resistance between the Right Front Wheel Speed Sensor (+) circuit and Right Front Wheel Speed Sensor (-) circuit at the Controller Anti-lock Brake harness connector.

NOTE: The resistance should be approximately 1600–2300 ohms at 76 degrees F.

Is the resistance within the noted range?

Yes >> Go to 10

No >> Replace the Right Front Wheel Speed Sensor in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

10. CONTROLLER ANTI-LOCK BRAKE

Turn the ignition off.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Controller Anti-lock Brake in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

11. WIRING HARNESS INSPECTION

Turn the ignition off.

NOTE: Towing the vehicle with ignition ON may set this DTC.

Inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

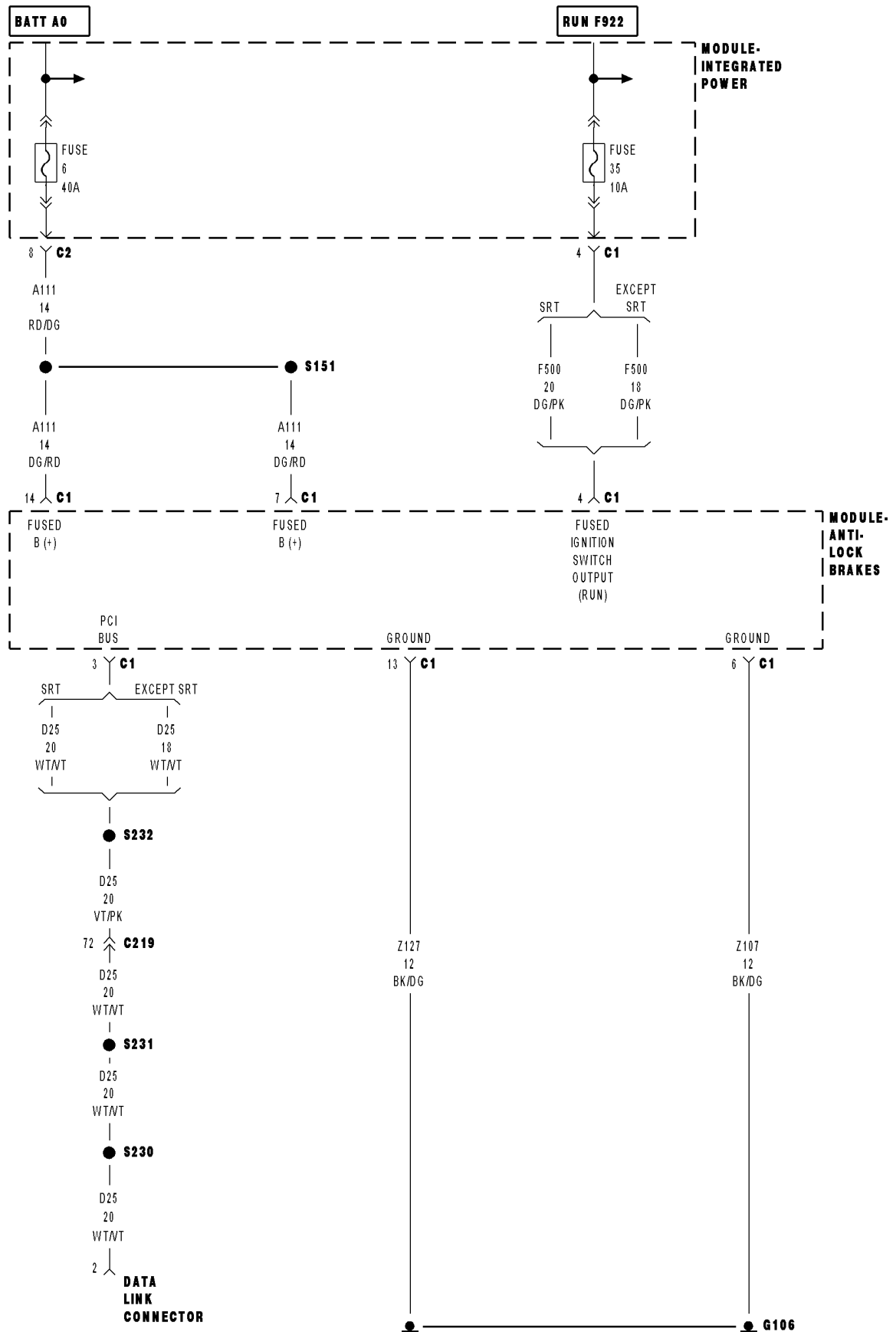
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

INTERNAL MAIN RELAY OPEN — 65



INTERNAL MAIN RELAY OPEN — 65 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
Solenoid feedback voltage is below the calibrated value. (solenoids do not energize)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

NOTE: Diagnose and repair any powertrain Charging system DTCs before continuing with this procedure.

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 5

INTERNAL MAIN RELAY OPEN — 65 (CONTINUED)

2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

NOTE: Before continuing, inspect the fuses that are related to the ABS system.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

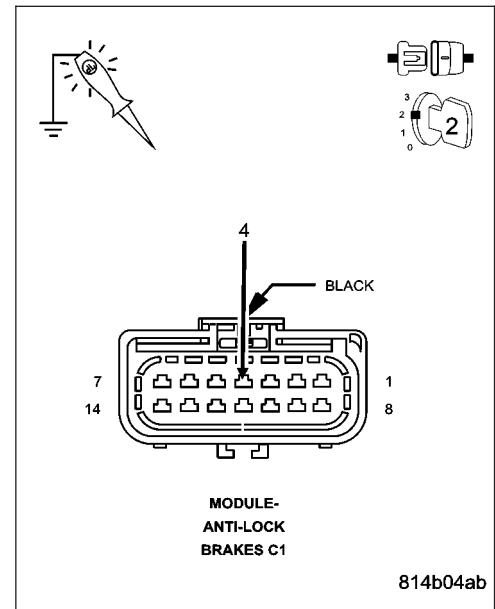
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12-volt test light connected to ground, probe the Fused B+circuit.

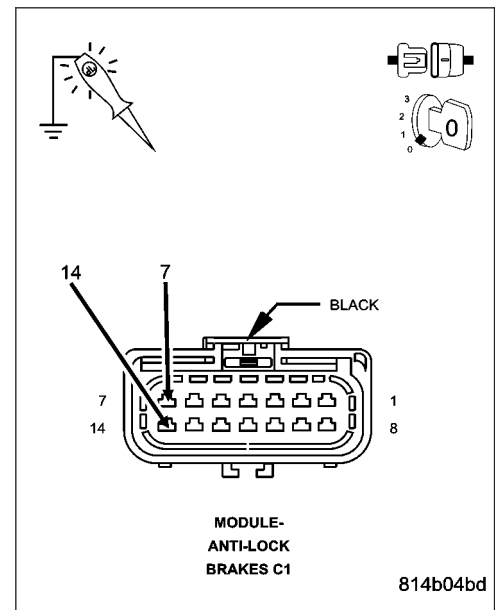
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



INTERNAL MAIN RELAY OPEN — 65 (CONTINUED)**4. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

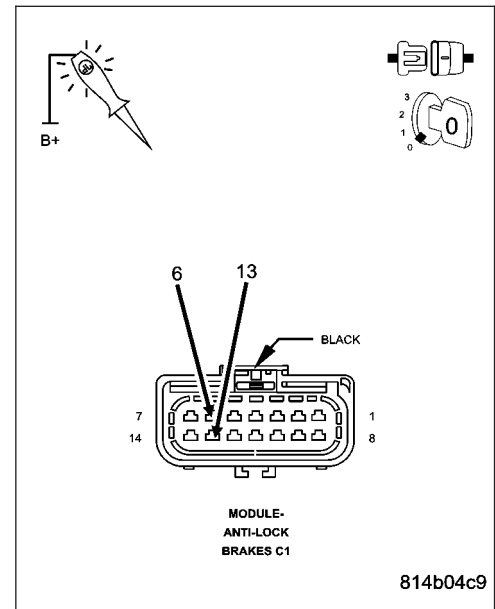
Turn the ignition off.

Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

Is the test light illuminated and bright?

- Yes** >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Repair the Ground circuit(s) for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**5. INTERMITTENT DTC**

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

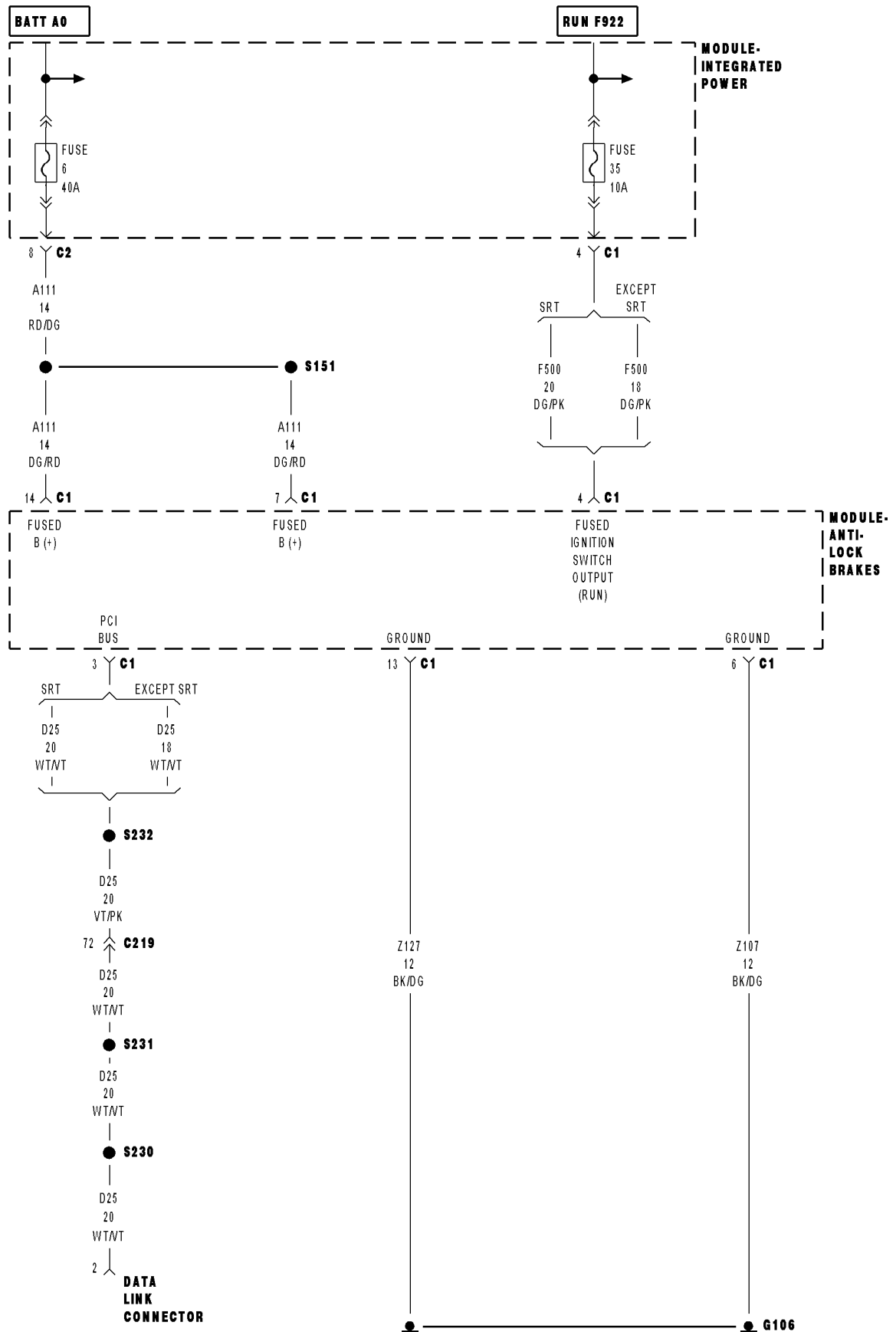
Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.

INTERNAL MAIN RELAY SHORTED — 66



INTERNAL MAIN RELAY SHORTED — 66 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The Relay feedback is above the calibrated value.

Possible Causes
INTERMITTENT BATTERY VOLTAGE HIGH DTC POWERTRAIN CHARGING SYSTEM DTCS PRESENT FUSED B+ CIRCUIT GROUND CIRCUIT CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

NOTE: Diagnose and repair any powertrain Charging system DTCs before continuing with this procedure.

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 4

INTERNAL MAIN RELAY SHORTED — 66 (CONTINUED)

2. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT

Turn the ignition off.

Disconnect the Controller Anti-Lock Brake harness connector.

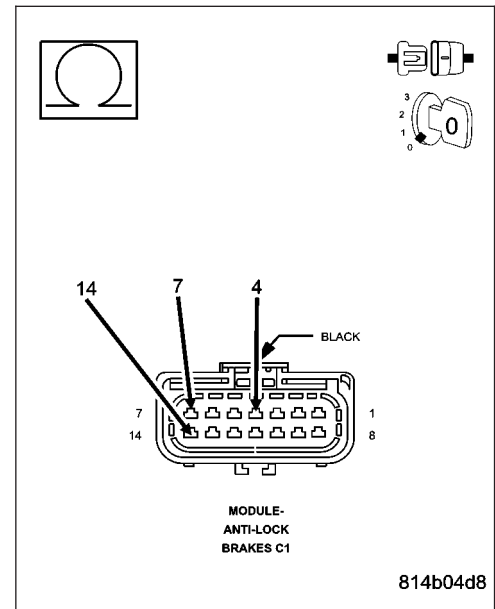
Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 3



3. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE

Turn the ignition off.

Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

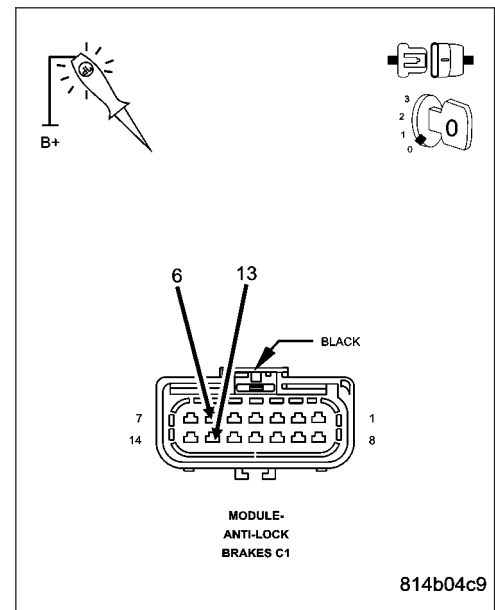
Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



INTERNAL MAIN RELAY SHORTED — 66 (CONTINUED)

4. INTERMITTENT DTC

NOTE: Check the PowertrainControl Module for any charging system DTCs and repair as necessary.

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Ensure the charging system is operating properly.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

LEFT FRONT DUMP SOLENOID OPEN - 46 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is low logic feedback voltage from the solenoid when it is expect to be high. (solenoid not energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

LEFT FRONT DUMP SOLENOID OPEN - 46 (CONTINUED)

2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

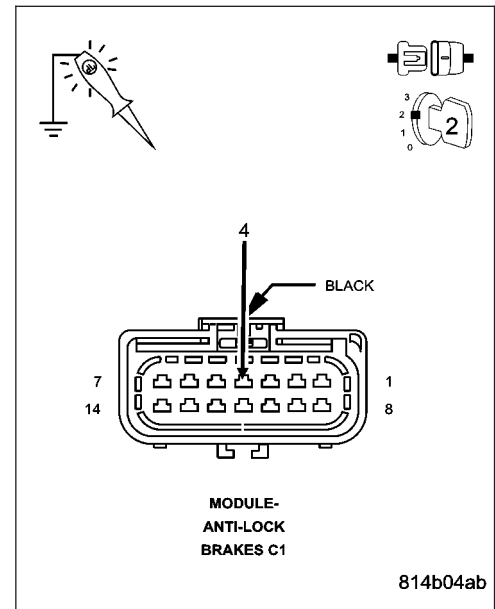
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

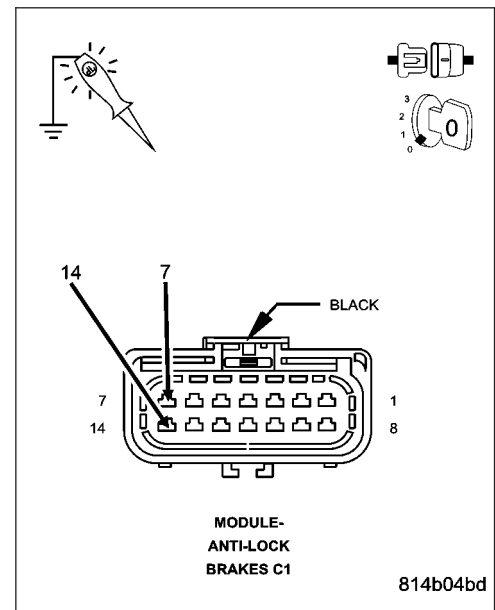
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT DUMP SOLENOID OPEN - 46 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

Disconnect the Controller Anti-Lock Brake harness connector.

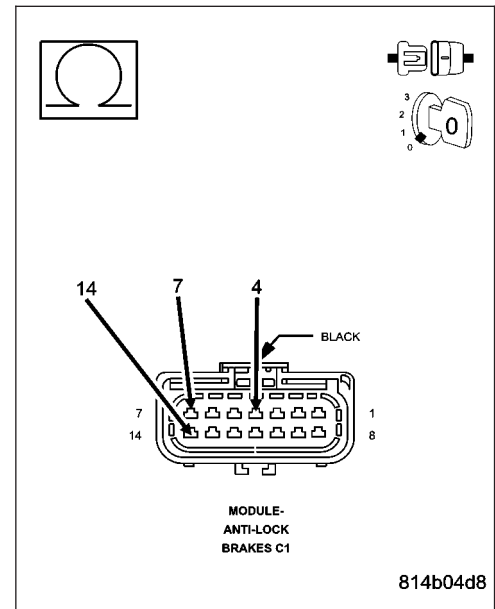
Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

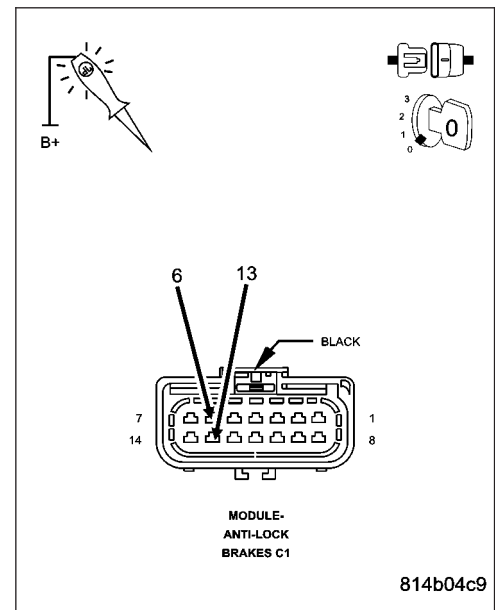
Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT DUMP SOLENOID OPEN - 46 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

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LEFT FRONT DUMP SOLENOID SHORTED - 48 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is high logic feedback voltage from the solenoid when it is supposed to be low. (solenoid energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

LEFT FRONT DUMP SOLENOID SHORTED - 48 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

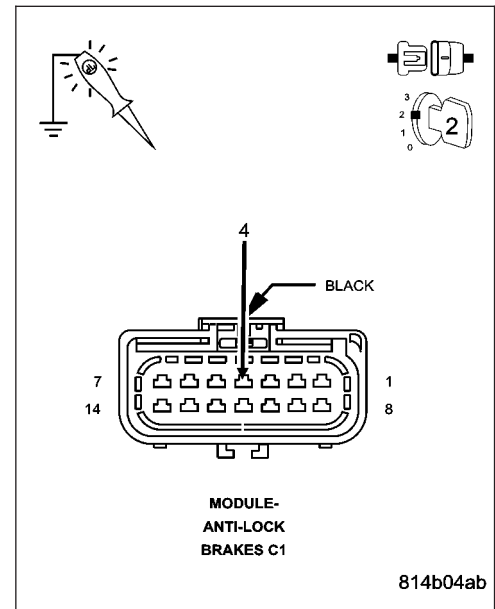
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

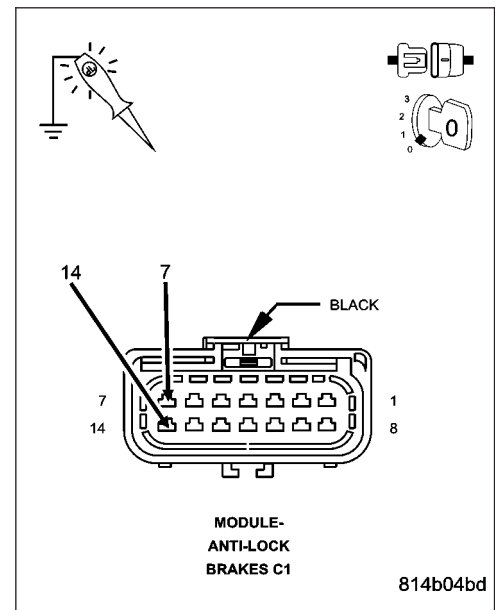
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT DUMP SOLENOID SHORTED - 48 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

Disconnect the Controller Anti-Lock Brake harness connector.

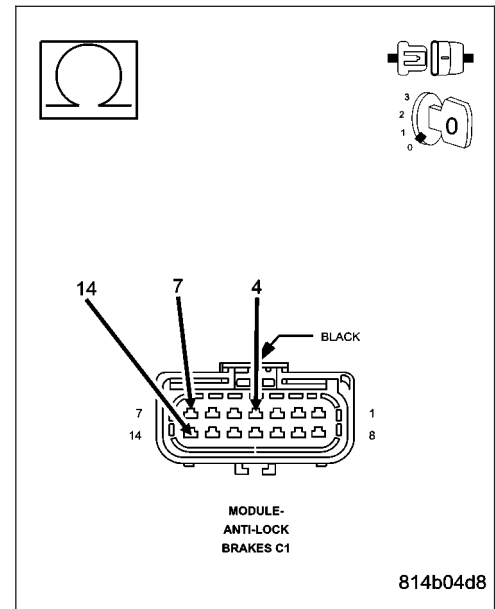
Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

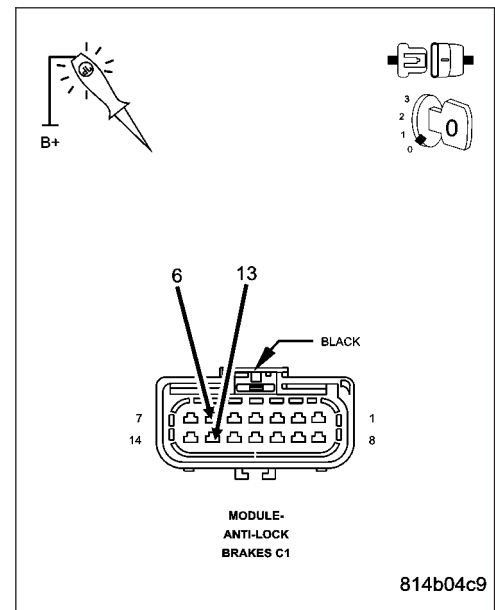
Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT DUMP SOLENOID SHORTED - 48 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

LEFT FRONT ISOLATION SOLENOID OPEN - 45 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is low logic feedback voltage from the solenoid when it is expect to be high. (solenoid not energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

LEFT FRONT ISOLATION SOLENOID OPEN - 45 (CONTINUED)

2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

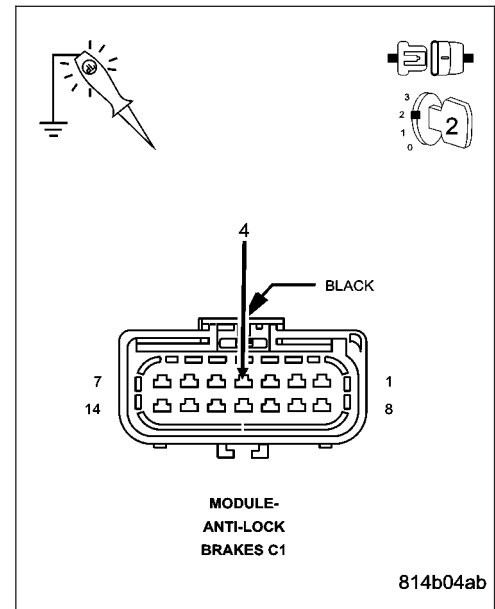
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

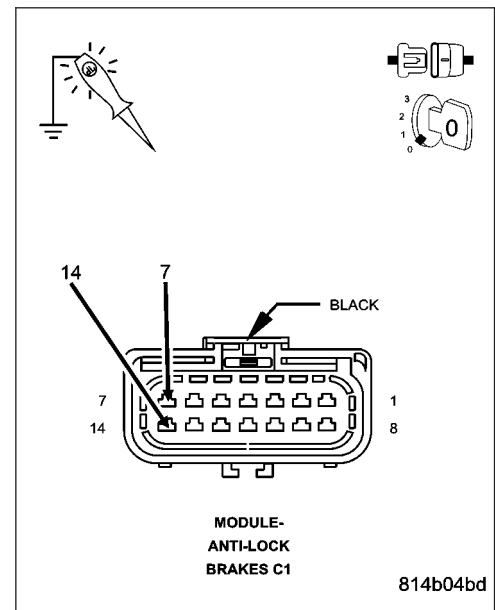
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT ISOLATION SOLENOID OPEN - 45 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

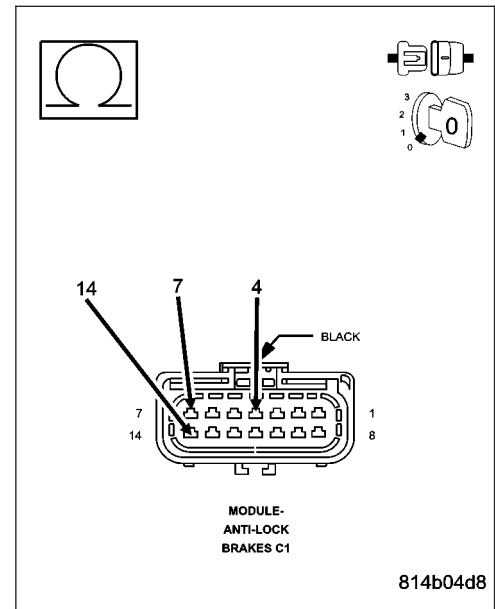
Disconnect the Controller Anti-Lock Brake harness connector.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

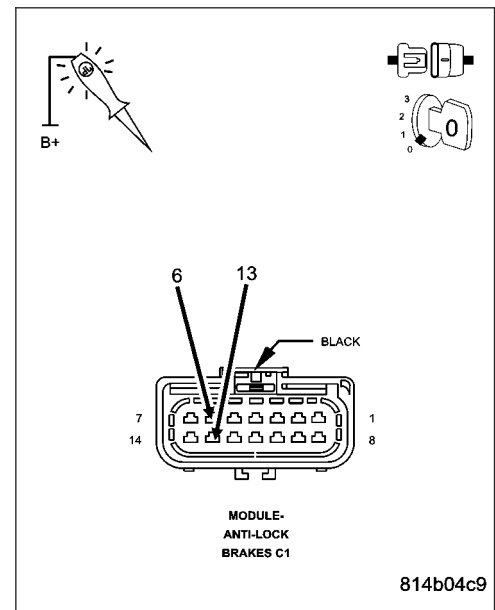
Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT ISOLATION SOLENOID OPEN - 45 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

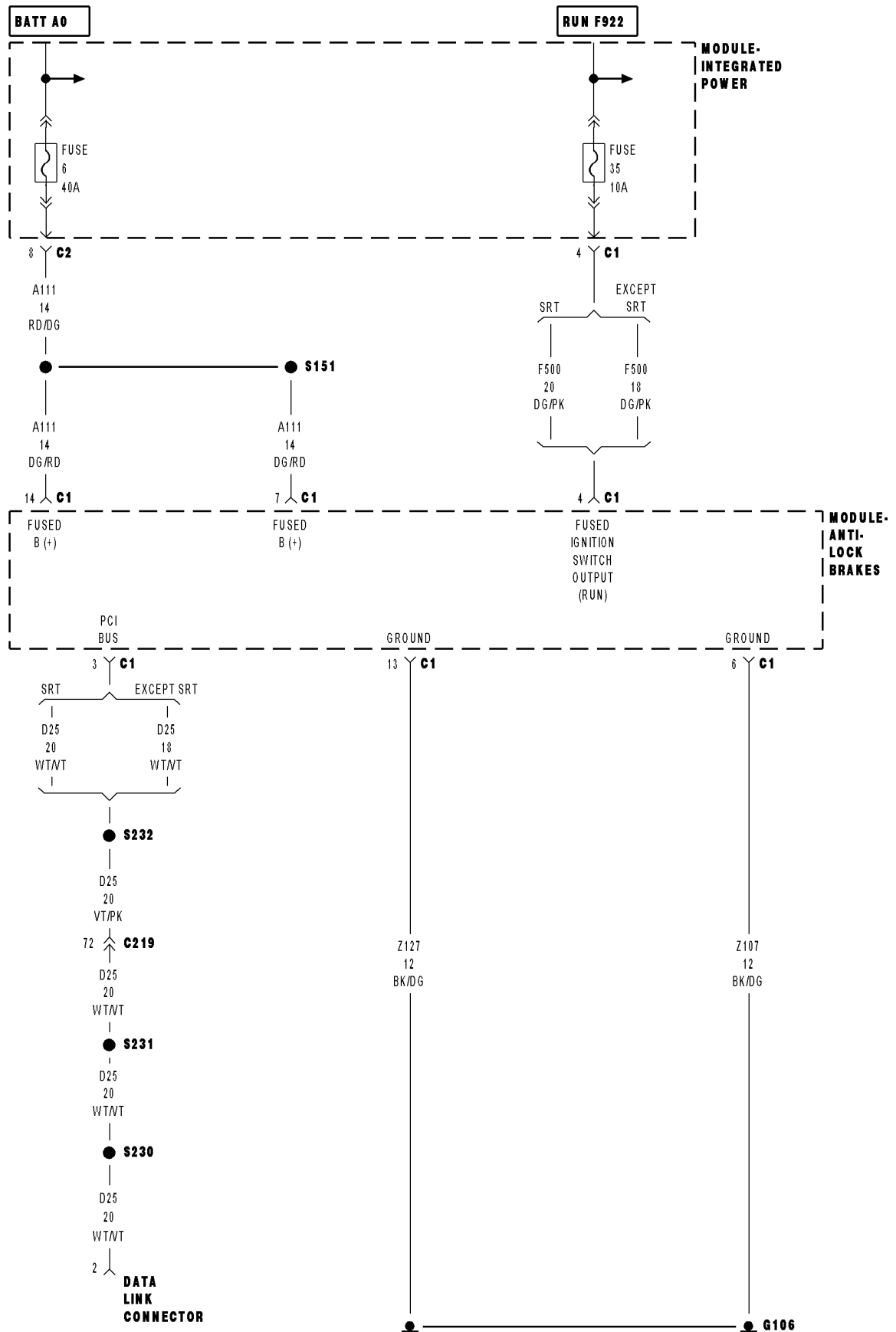
Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

LEFT FRONT ISOLATION SOLENOID SHORTED - 47


LEFT FRONT ISOLATION SOLENOID SHORTED - 47 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is high logic feedback voltage from the solenoid when it is supposed to be low. (solenoid energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

LEFT FRONT ISOLATION SOLENOID SHORTED - 47 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

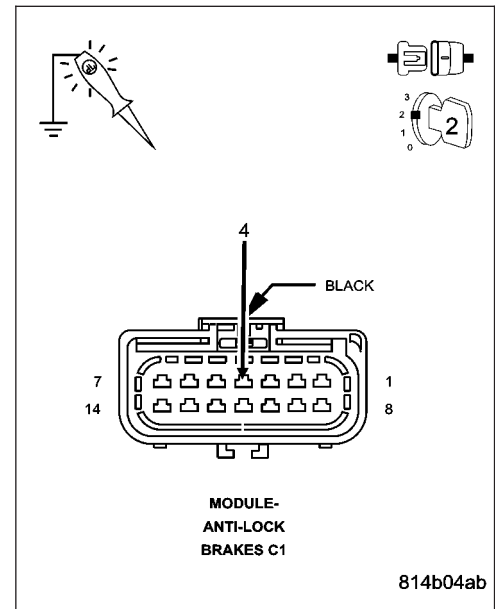
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

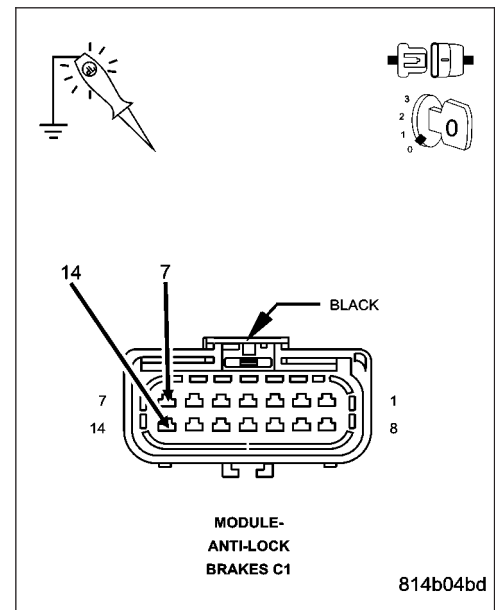
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT ISOLATION SOLENOID SHORTED - 47 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

Disconnect the Controller Anti-Lock Brake harness connector.

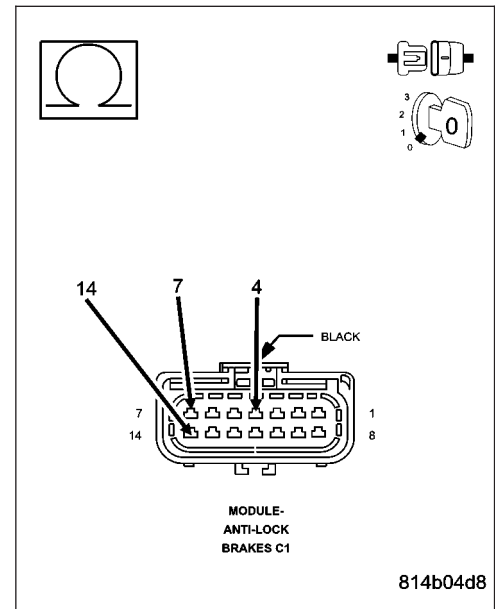
Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

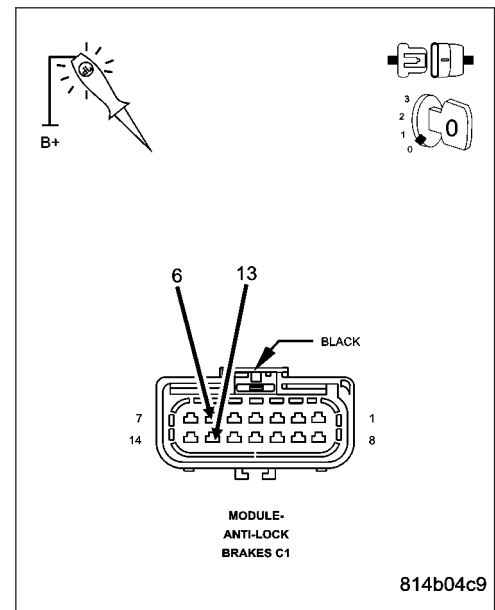
Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



LEFT FRONT ISOLATION SOLENOID SHORTED - 47 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

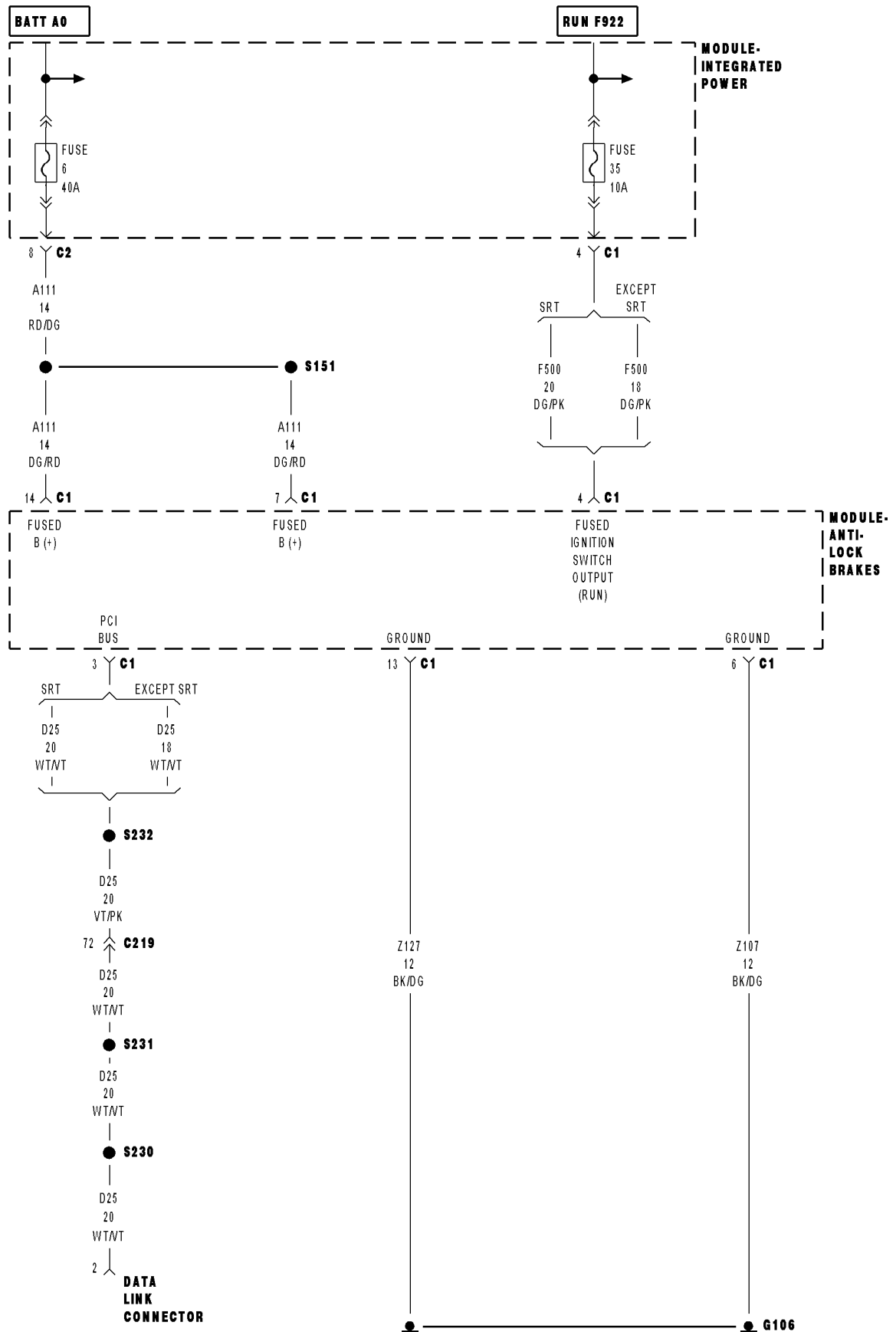
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

RIGHT FRONT DUMP SOLENOID OPEN - 42



RIGHT FRONT DUMP SOLENOID OPEN - 42 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is low logic feedback voltage from the solenoid when it is expect to be high. (solenoid not energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

RIGHT FRONT DUMP SOLENOID OPEN - 42 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

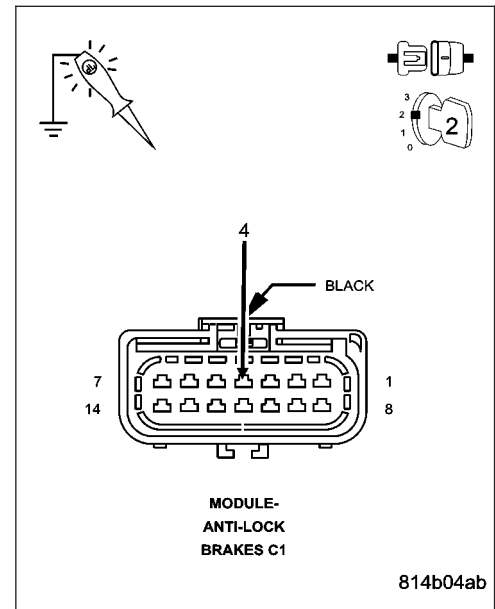
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

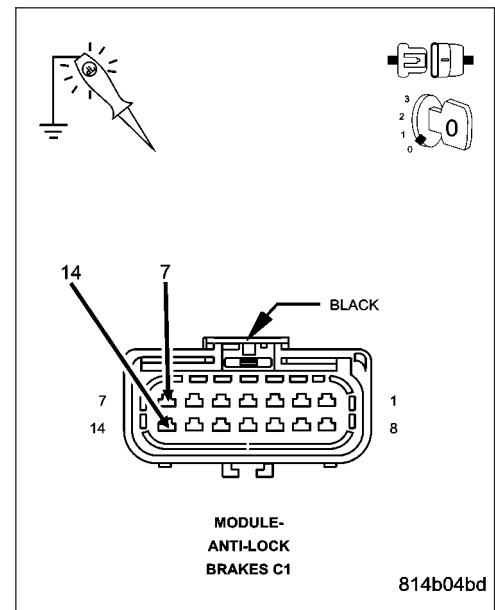
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT DUMP SOLENOID OPEN - 42 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

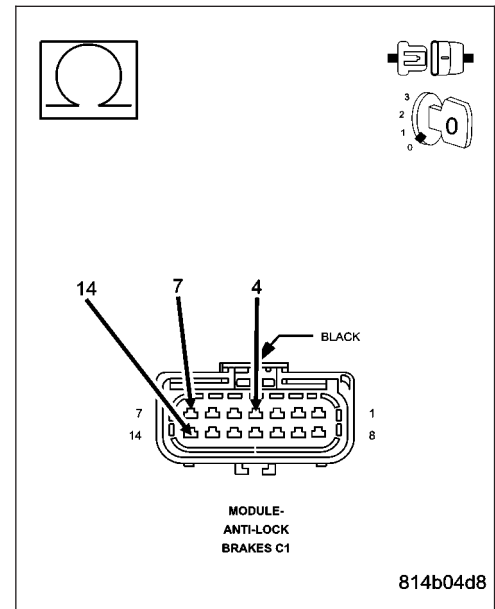
Disconnect the Controller Anti-Lock Brake harness connector.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

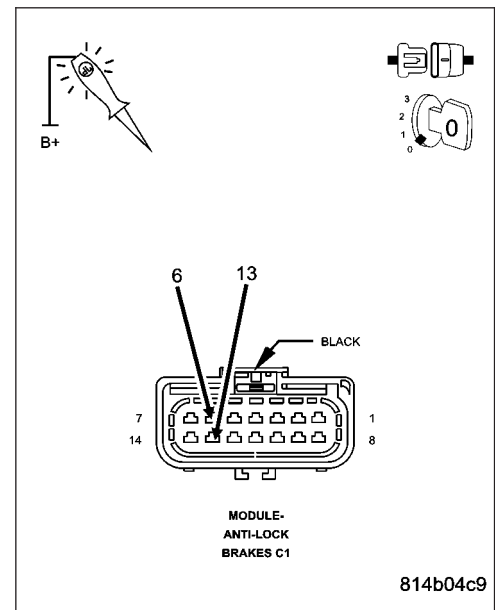
Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT DUMP SOLENOID OPEN - 42 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

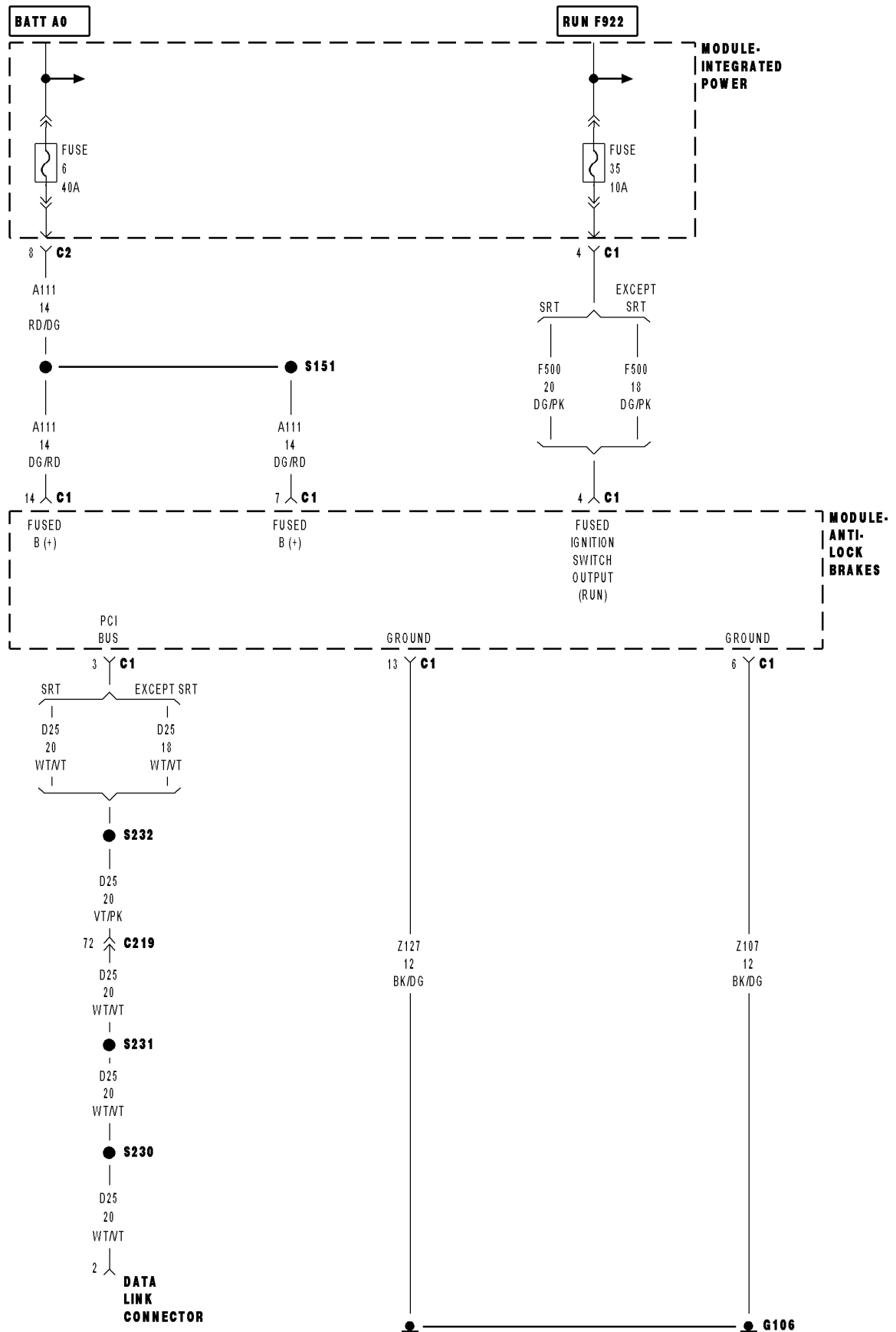
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

REAR DUMP SOLENOID SHORTED - 53



REAR DUMP SOLENOID SHORTED - 53 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is high logic feedback voltage from the solenoid when it is supposed to be low. (solenoid energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

REAR DUMP SOLENOID SHORTED - 53 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

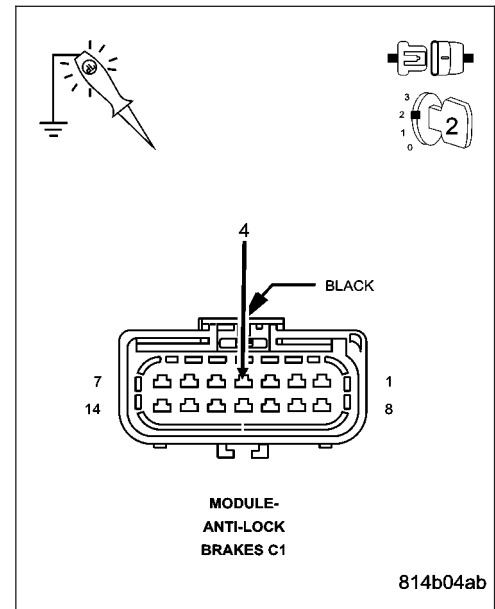
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

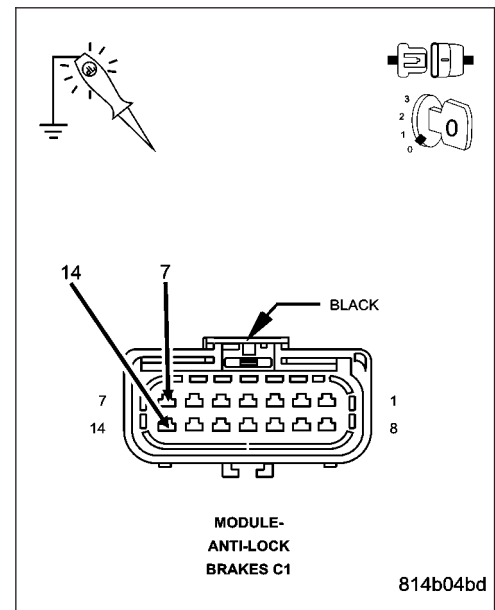
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



REAR DUMP SOLENOID SHORTED - 53 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

Disconnect the Controller Anti-Lock Brake harness connector.

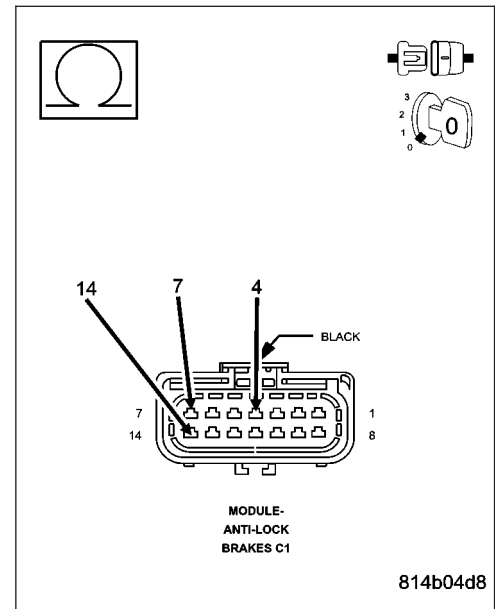
Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

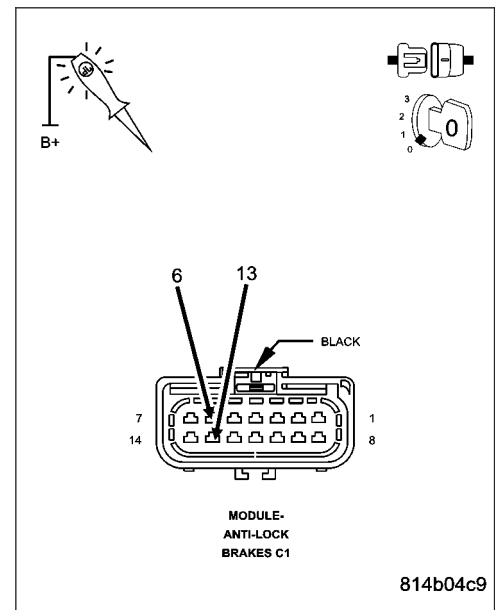
Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



REAR DUMP SOLENOID SHORTED - 53 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

REAR ISOLATION SOLENOID OPEN - 51 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is low logic feedback voltage from the solenoid when it is expect to be high. (solenoid not energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

REAR ISOLATION SOLENOID OPEN - 51 (CONTINUED)

2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

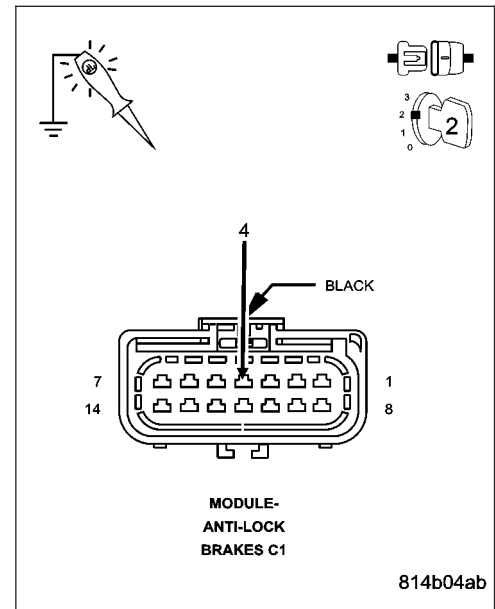
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

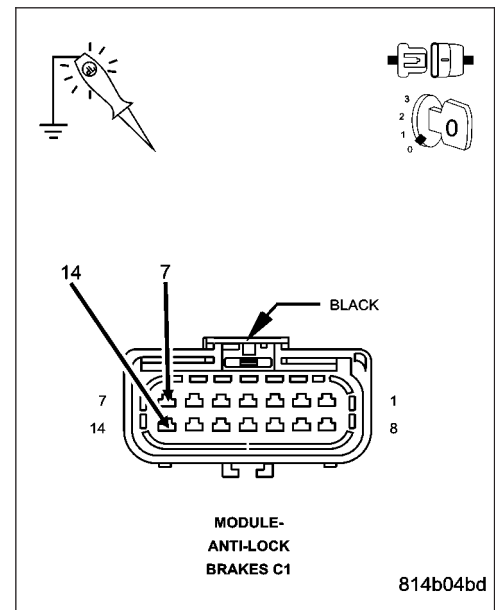
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



REAR ISOLATION SOLENOID OPEN - 51 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

Disconnect the Controller Anti-Lock Brake harness connector.

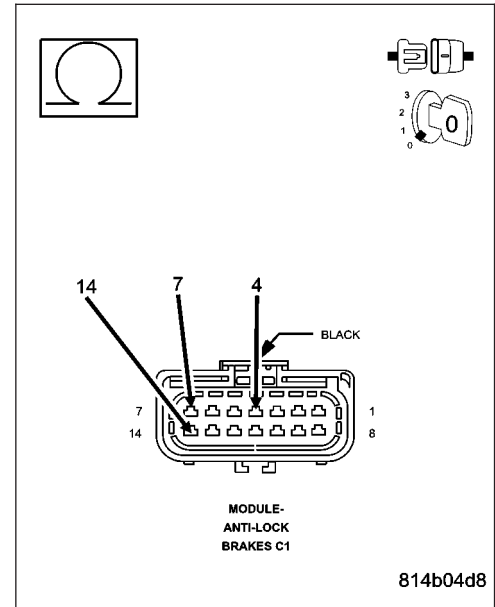
Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

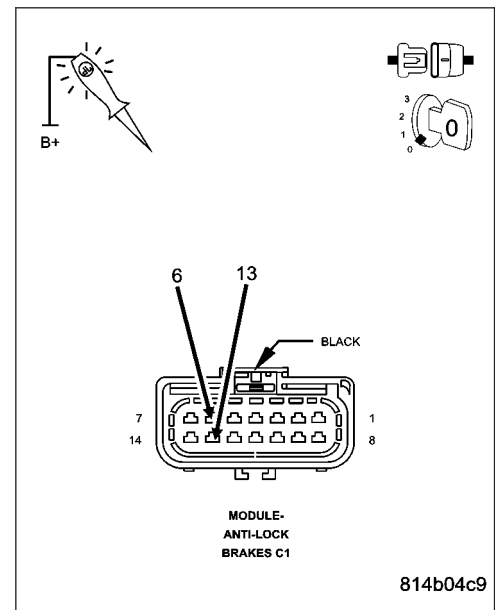
Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



REAR ISOLATION SOLENOID OPEN - 51 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

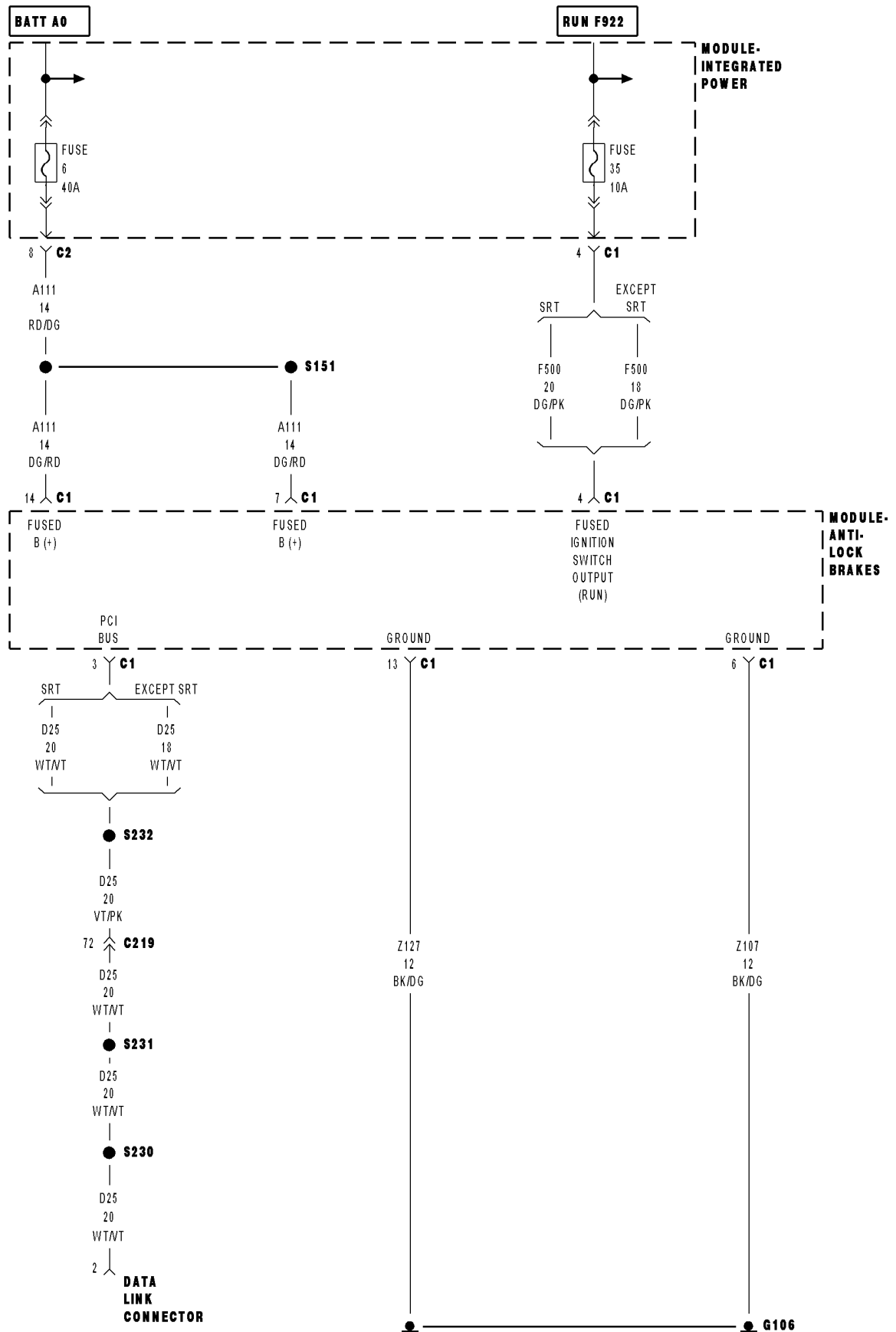
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

REAR ISOLATION SOLENOID SHORTED - 53



REAR ISOLATION SOLENOID SHORTED - 53 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is high logic feedback voltage from the solenoid when it is supposed to be low. (solenoid energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

REAR ISOLATION SOLENOID SHORTED - 53 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

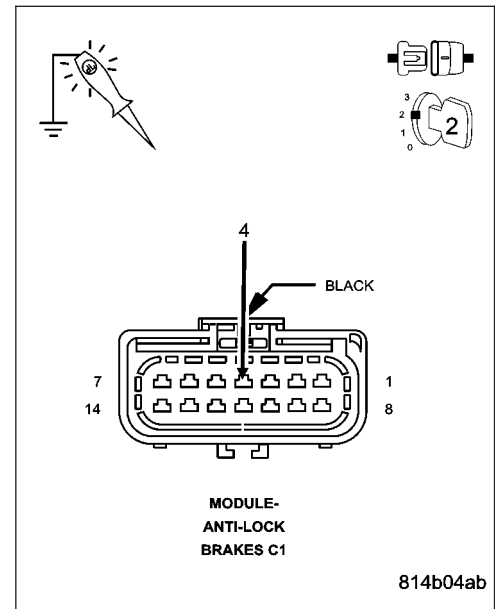
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

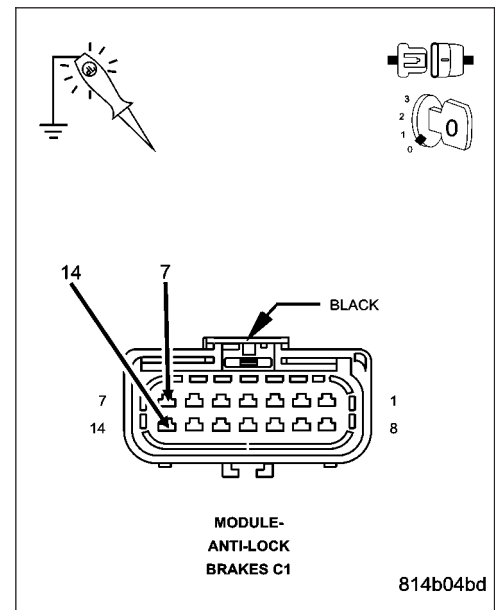
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



REAR ISOLATION SOLENOID SHORTED - 53 (CONTINUED)

4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT

Turn the ignition off.

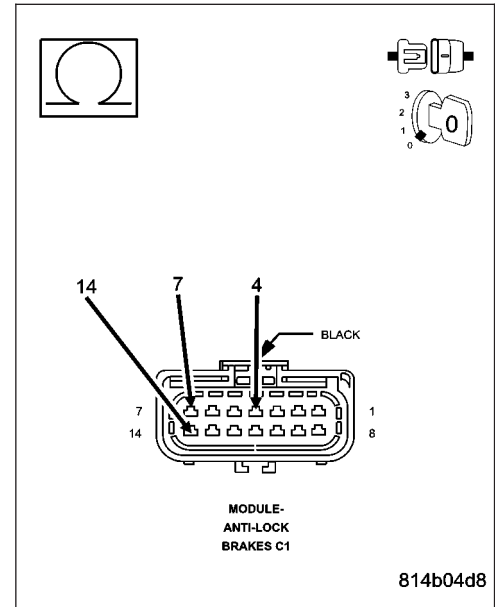
Disconnect the Controller Anti-Lock Brake harness connector.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5



5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE

Turn the ignition off.

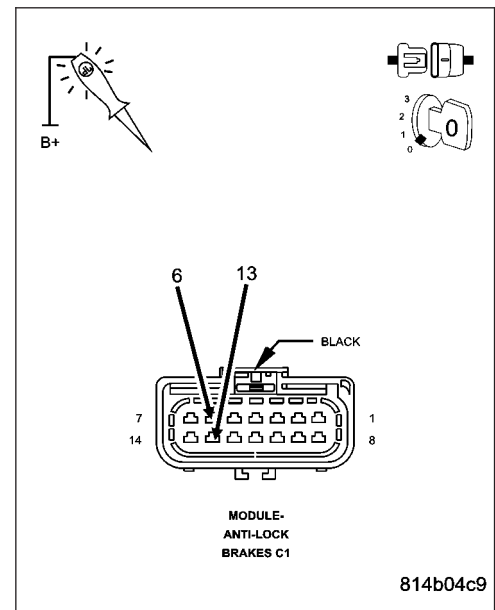
Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



REAR ISOLATION SOLENOID SHORTED - 53 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

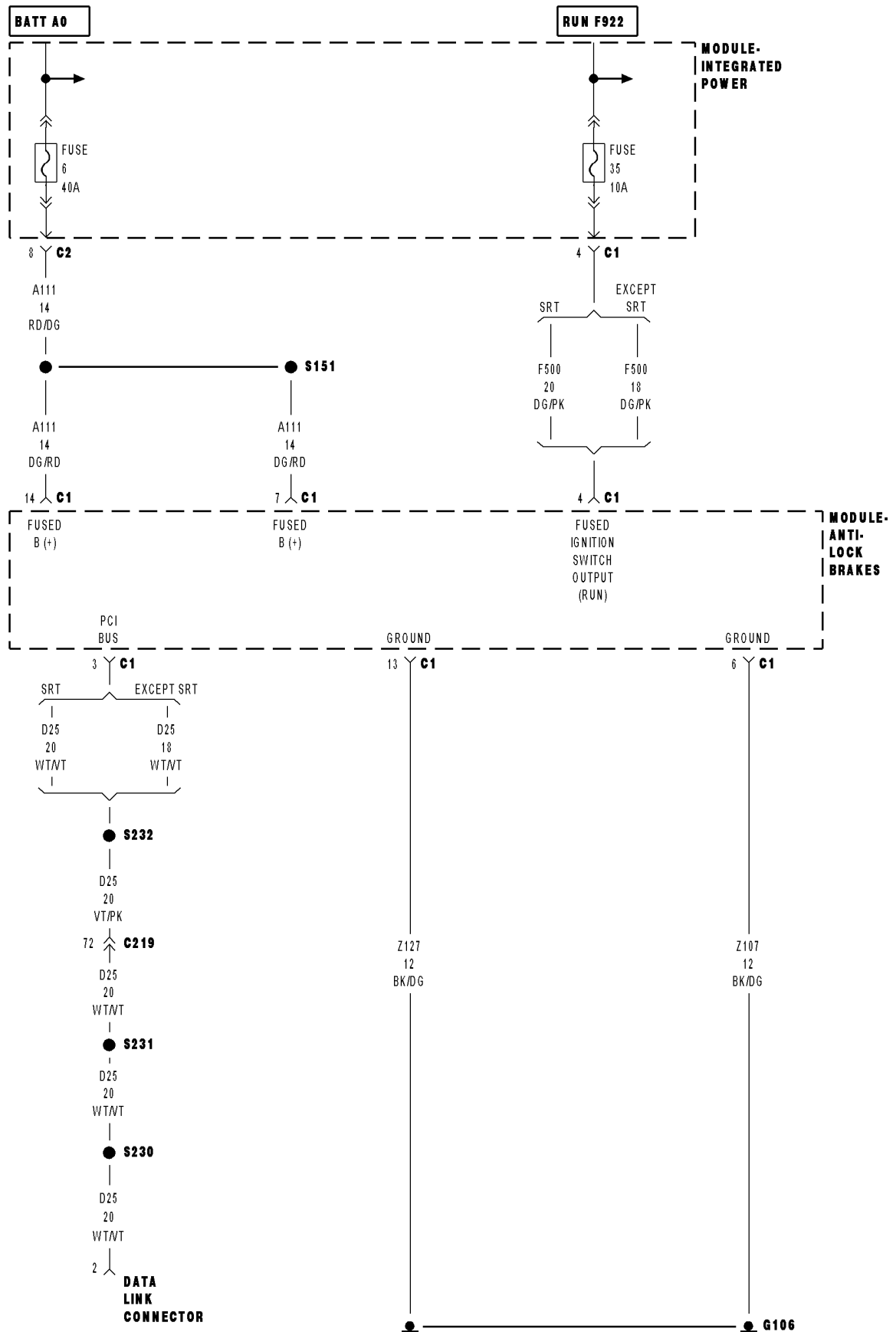
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

RIGHT FRONT DUMP SOLENOID OPEN - 42



RIGHT FRONT DUMP SOLENOID OPEN - 42 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is low logic feedback voltage from the solenoid when it is expect to be high. (solenoid not energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

RIGHT FRONT DUMP SOLENOID OPEN - 42 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

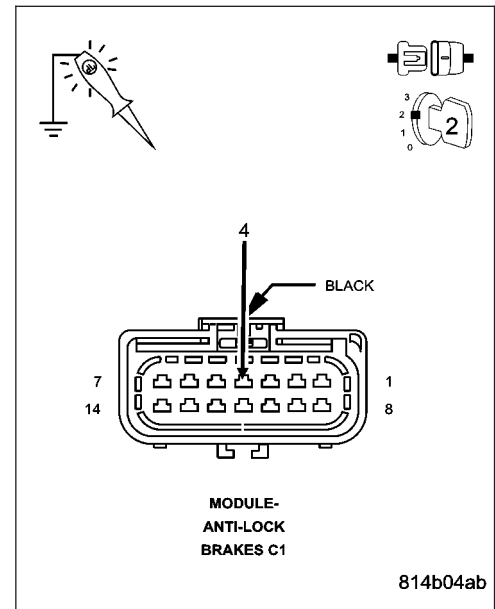
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

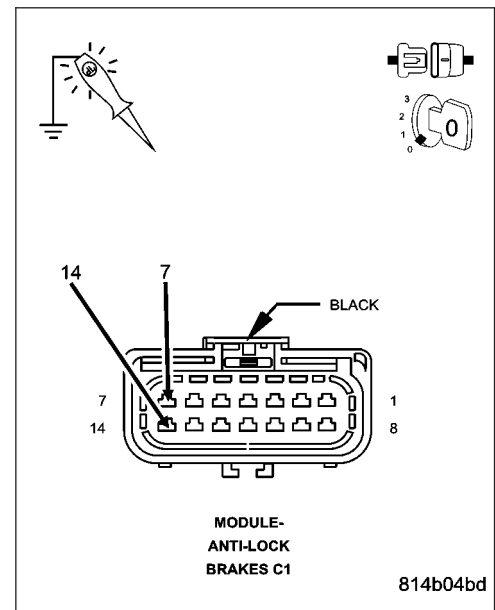
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT DUMP SOLENOID OPEN - 42 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

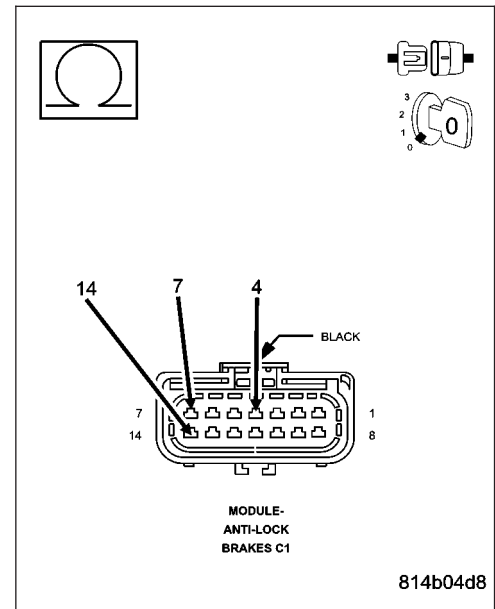
Disconnect the Controller Anti-Lock Brake harness connector.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

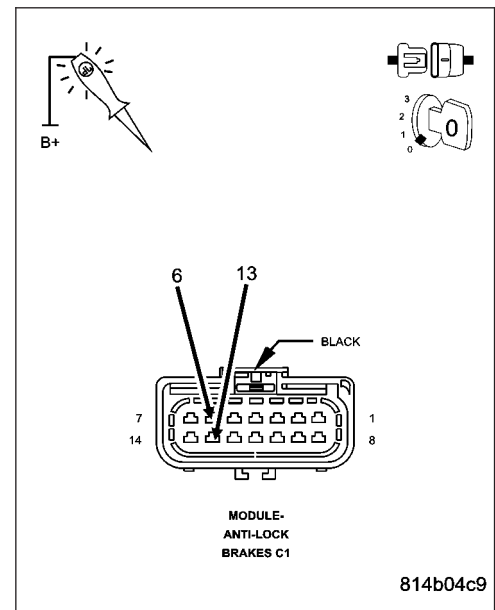
Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT DUMP SOLENOID OPEN - 42 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

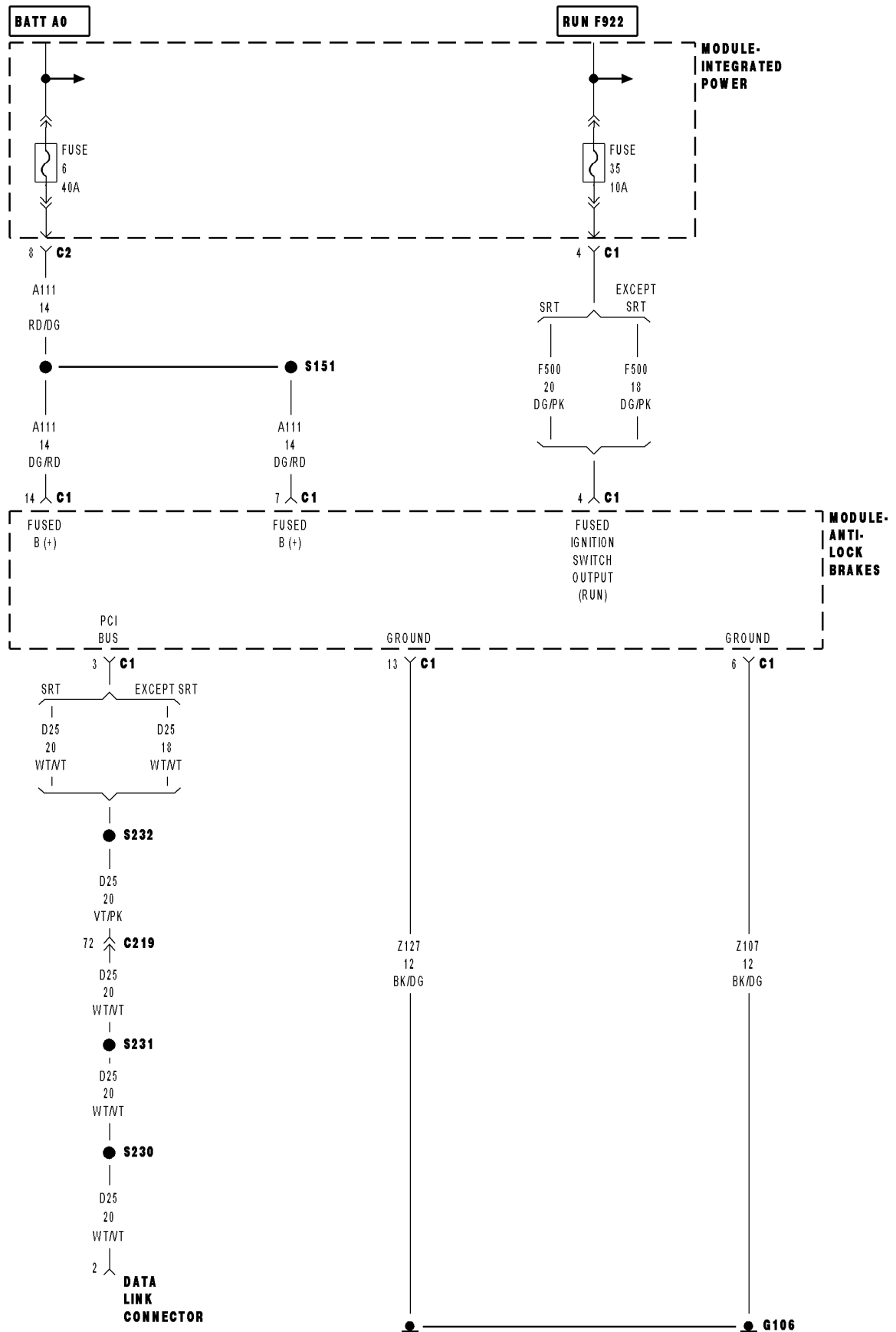
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

RIGHT FRONT DUMP SOLENOID SHORTED - 44



RIGHT FRONT DUMP SOLENOID SHORTED - 44 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is high logic feedback voltage from the solenoid when it is supposed to be low. (solenoid energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

RIGHT FRONT DUMP SOLENOID SHORTED - 44 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

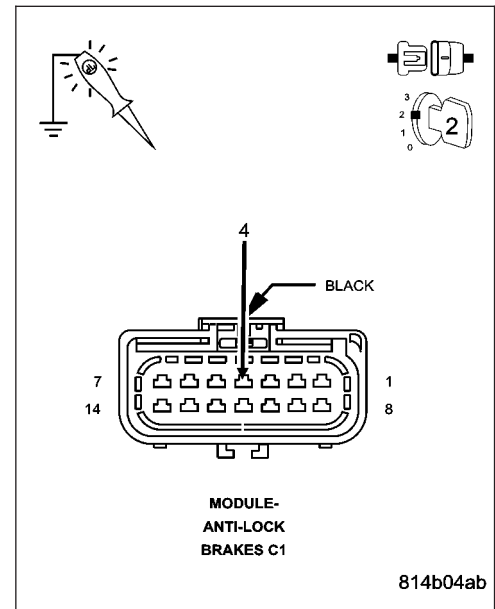
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

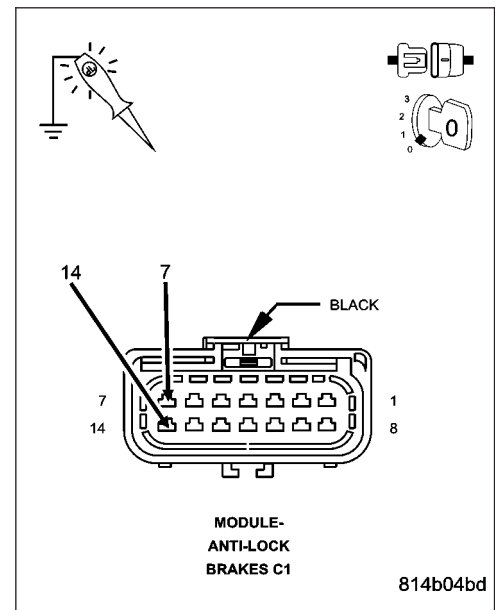
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT DUMP SOLENOID SHORTED - 44 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

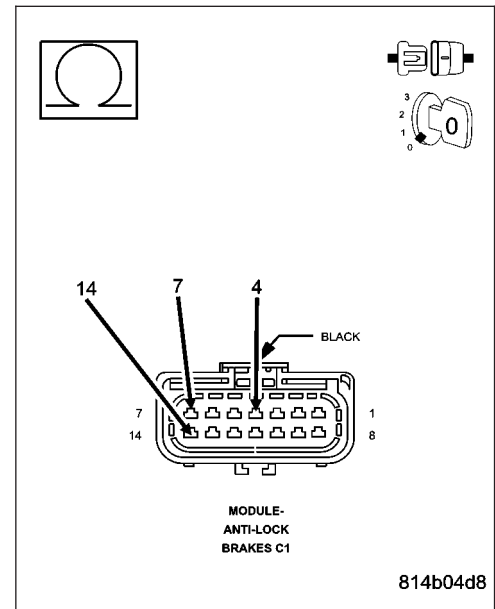
Disconnect the Controller Anti-Lock Brake harness connector.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

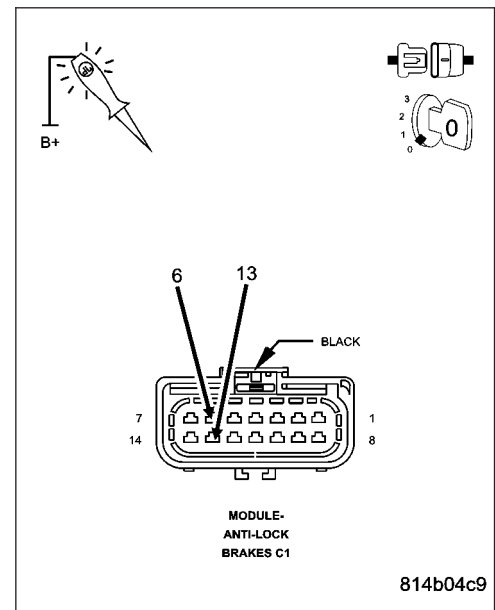
Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT DUMP SOLENOID SHORTED - 44 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

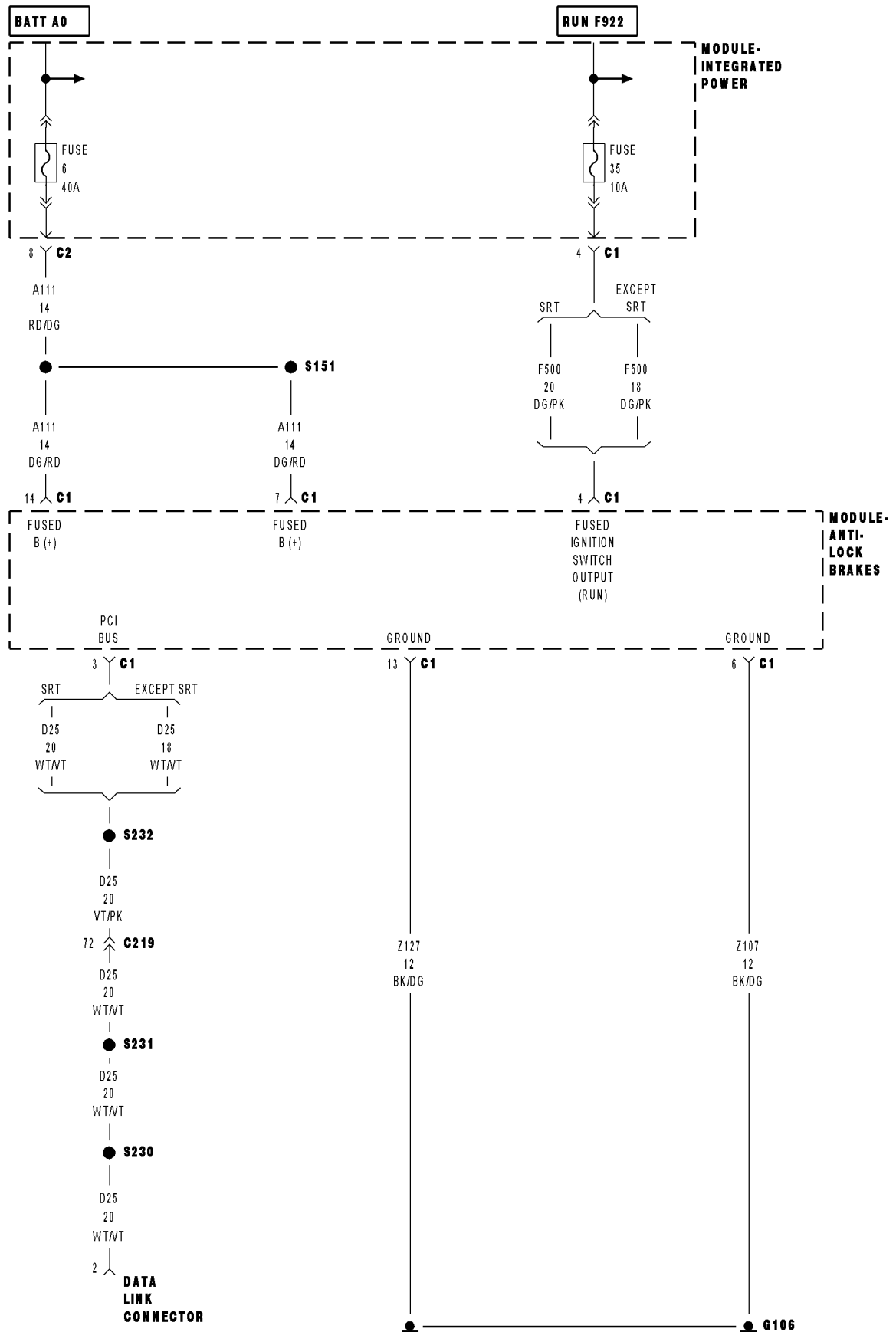
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

RIGHT FRONT ISOLATION SOLENOID OPEN - 41



RIGHT FRONT ISOLATION SOLENOID OPEN - 41 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is low logic feedback voltage from the solenoid when it is expect to be high. (solenoid not energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

RIGHT FRONT ISOLATION SOLENOID OPEN - 41 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

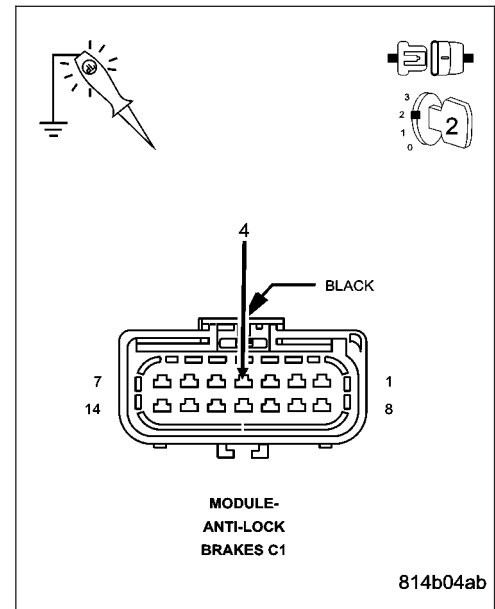
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

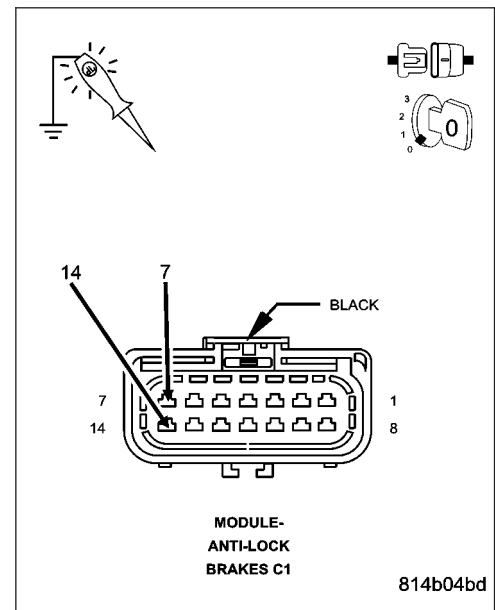
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT ISOLATION SOLENOID OPEN - 41 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

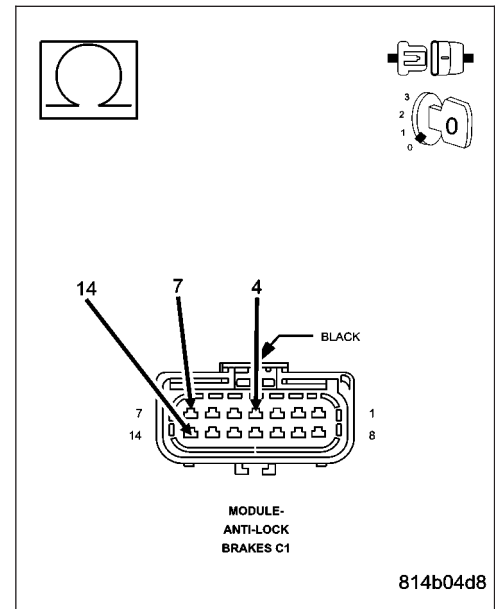
Disconnect the Controller Anti-Lock Brake harness connector.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

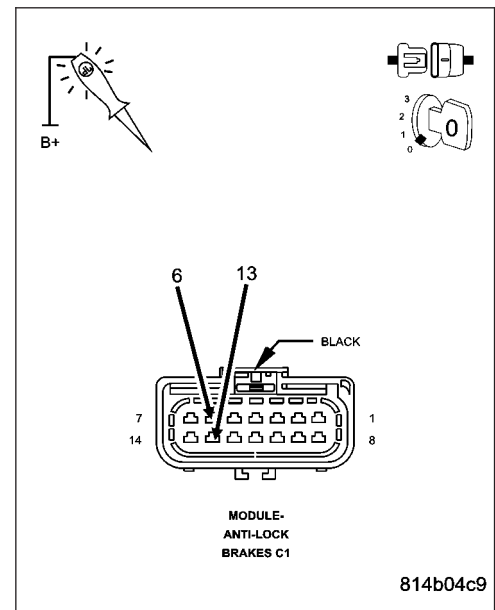
Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT ISOLATION SOLENOID OPEN - 41 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

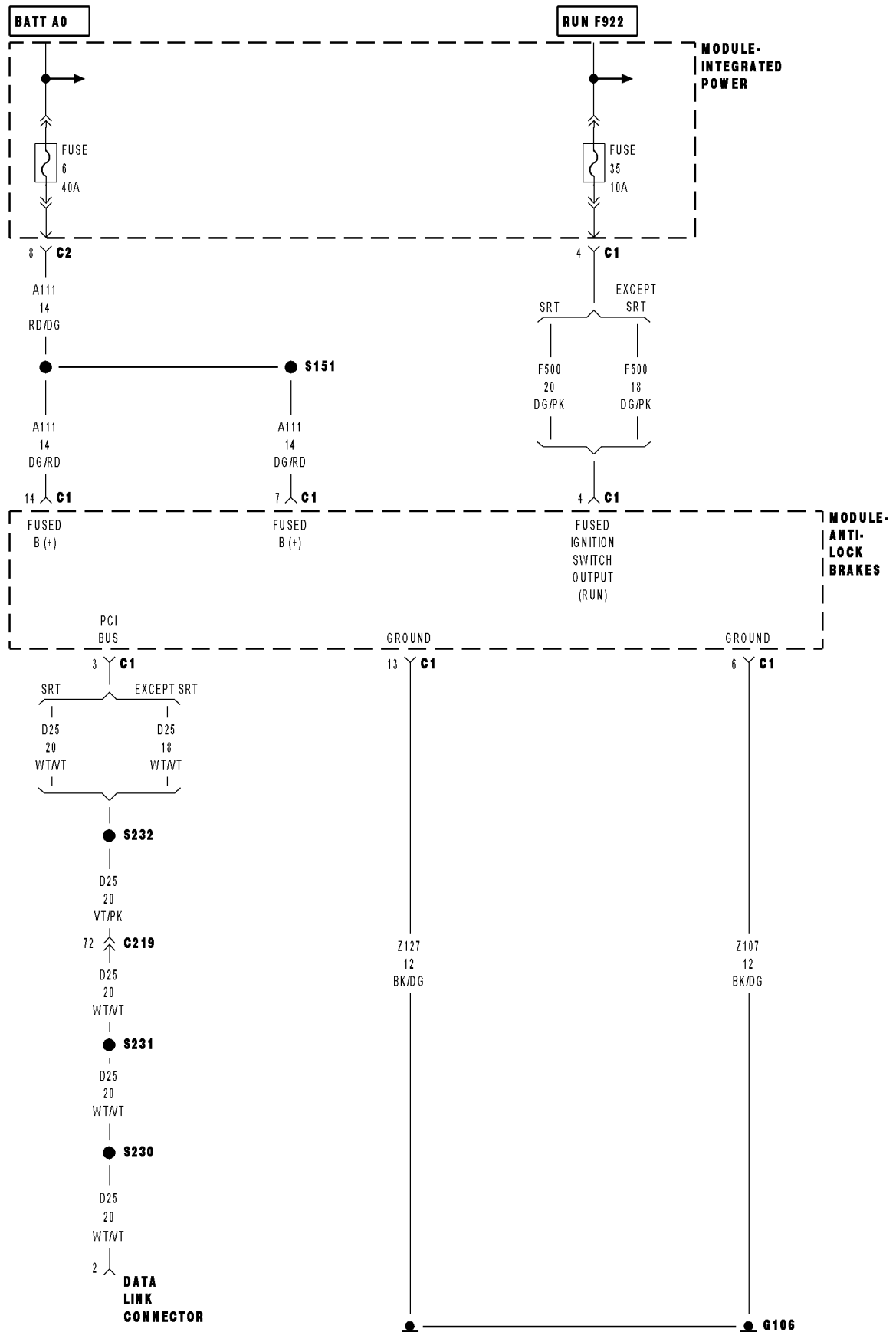
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

RIGHT FRONT ISOLATION SOLENOID SHORTED - 43



RIGHT FRONT ISOLATION SOLENOID SHORTED - 43 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is high logic feedback voltage from the solenoid when it is supposed to be low. (solenoid energized)

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 6

RIGHT FRONT ISOLATION SOLENOID SHORTED - 43 (CONTINUED)**2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE**

NOTE: Before continuing, inspect the fuses that are related to the ABS system. If one or more is found to be opened, use the schematic and repair the short to ground.

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

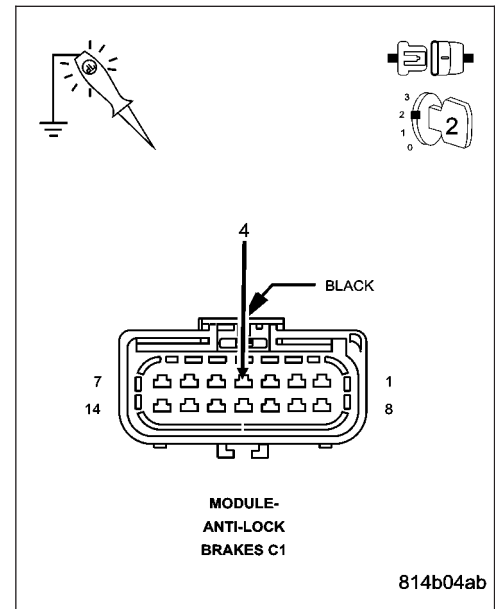
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE**

Using a 12-volt test light connected to ground, probe the Fused B+ circuit.

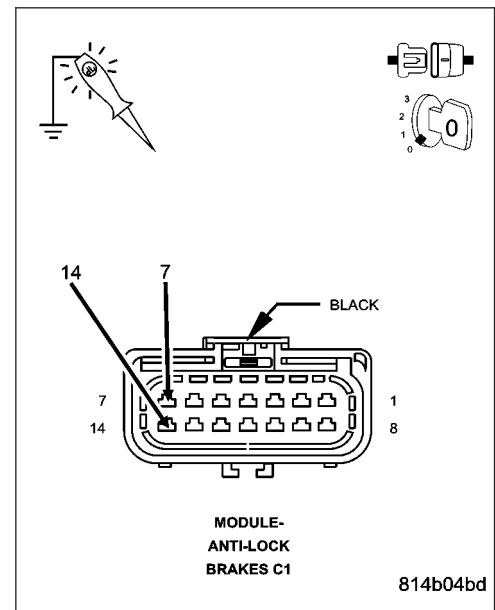
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+ circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT ISOLATION SOLENOID SHORTED - 43 (CONTINUED)**4. FUSED B+ CIRCUIT SHORTED TO FUSED IGNITION SWITCH OUTPUT CIRCUIT**

Turn the ignition off.

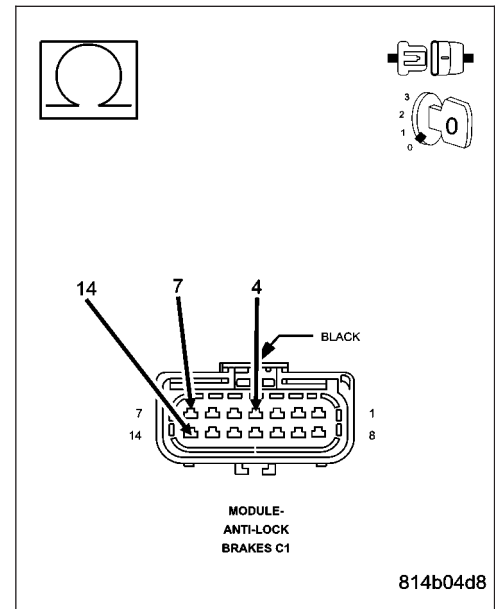
Disconnect the Controller Anti-Lock Brake harness connector.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

Does the test light illuminate?

Yes >> Repair the Fused B+ circuit shorted to the Fused Ignition Switch Output circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

**5. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

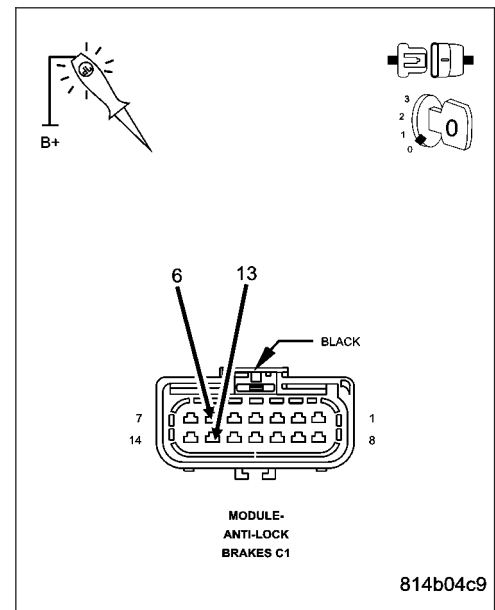
Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



RIGHT FRONT ISOLATION SOLENOID SHORTED - 43 (CONTINUED)

6. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

MISMATCHED VIN — 84

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
This DTC will set if the current VIN does not match the broadcast VIN from the PCM within 10 seconds.

Possible Causes
ICOMMUNICATIONS DTC(S) PRESENT POWERTRAIN CONTROL MODULE ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. DTC IS ACTIVE

Turn the ignition on.
With the DRBIII®, erase DTCs.
Turn the ignition off.
Turn the ignition on.
Wait ten seconds.
With the DRBIII®, read DTCs.

Does the DTC reset?

Yes >> Go To 2
No >> Go To 3

2. WRONG VIN PROGRAMMED IN PCM

Turn the ignition on.
With the DRBIII®, read the VIN in the PCM.
Compare VIN in the PCM to the vehicle VIN.

Is the correct VIN programmed in the PCM?

Yes >> Replace the Antilock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Replace the Powertrain Control Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

MISMATCHED VIN — 84 (CONTINUED)

3. COMMUNICATION DTCS PRESENT

Turn the ignition off.

With the DRBIII®, read DTCs in all other modules. If any communications DTCs are present, refer to the appropriate diagnostic procedure.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

NUMBER OF TONE RING TEETH OUT OF RANGE - 82

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The DTC will set if the stored tone wheel tooth count is out of range.

Possible Causes
TONE RING/AXLE SIZE MISMATCH
ANTI-LOCK BRAKE MODULE

Diagnostic Test**1. TONE RING/AXLE SIZE MISMATCH**

Turn the ignition on.

With the DRBIII®, determine the axle size that is programmed into the Controller Anti-lock Brake.

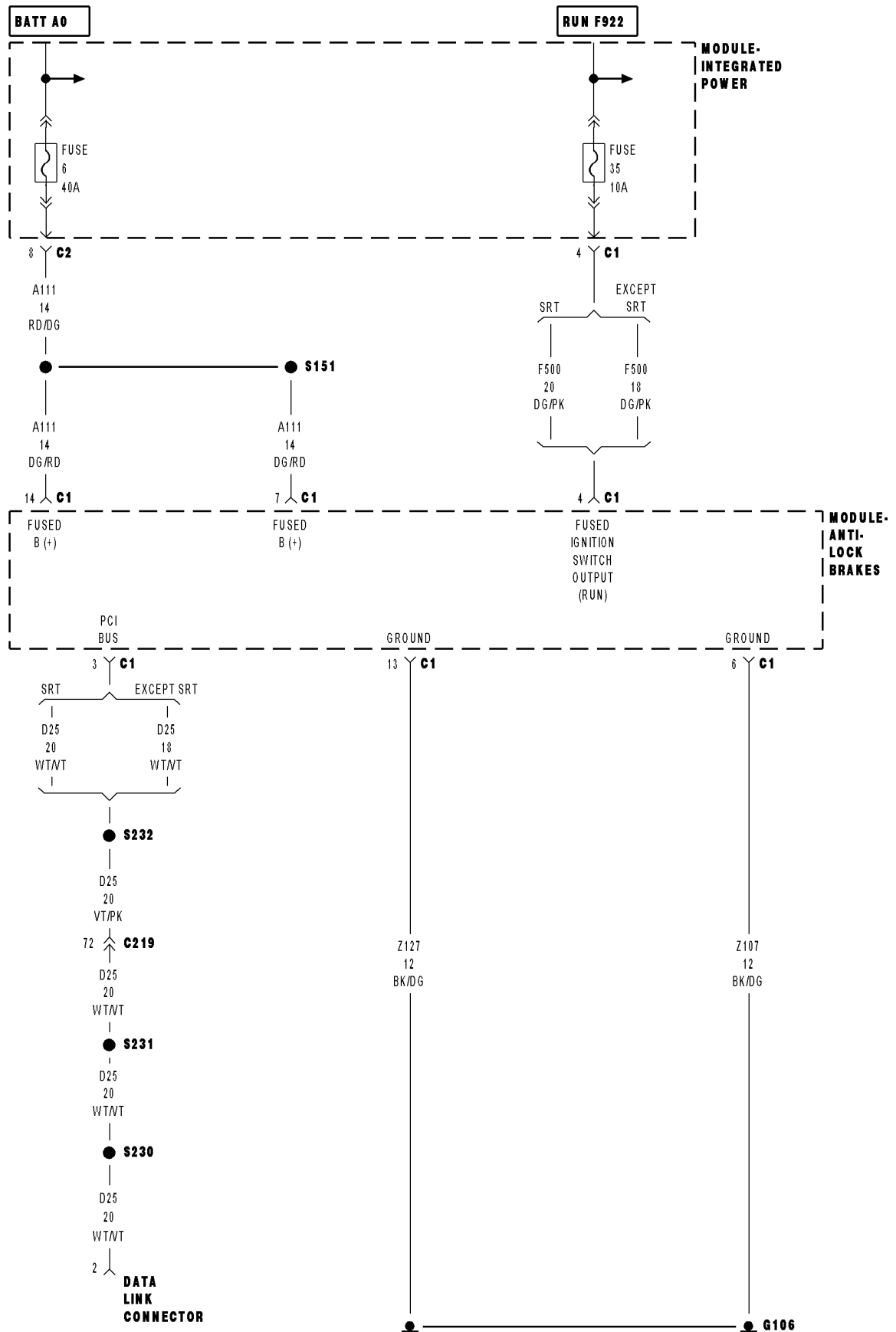
Inspect and identify the vehicle axle size.

Compare the axle size programmed into the Anti-lock Brake Module, and the actual axle size installed into the vehicle.

Does the programmed axle size match the installed axle?

- Yes** >> Replace the Controller Anti-lock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Anti-lock Brake Module for additional information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Reprogram the Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
-

PUMP MOTOR CIRCUIT OPEN — 67



PUMP MOTOR CIRCUIT OPEN — 67 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
Ignition on for at least 3.5 seconds. ABS pump motor command never given during the current ABS command.
Low feedback voltage from the low side of the motor.

Possible Causes
ABS PUMP MOTOR INTERMITTENT DTC FUSED B(+) CIRCUIT INTERMITTENTLY SHORTED TO GROUND FUSED B(+) CIRCUIT SHORTED TO GROUND FUSE OPEN - PUMP MOTOR CIRCUIT NO B+ SUPPLY TO FUSE ABS PUMP MOTOR INOPERATIVE FUSED B(+) CIRCUIT OPEN GROUND CIRCUIT OPEN GROUND CIRCUIT HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, read DTC's.

With the DRBIII®, erase DTC's.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, actuate the ABS pump motor.

Did the Pump Motor operate when actuated?

Yes >> Go To 10

No >> Go To 2

2. FUSE OPEN - PUMP MOTOR CIRCUIT

Turn the ignition off.

Remove and inspect the ABS Pump Motor fuse.

Is the Fuse open?

Yes >> Go To 3

No >> Go To 5

PUMP MOTOR CIRCUIT OPEN — 67 (CONTINUED)**3. FUSED B(+) CIRCUIT INTERMITTENTLY SHORT**

Ensure the Pump Motor connector is secure.

Visually inspect the Fused B(+) circuit in the wiring harness from the ABS PUMP fuse to the CAB harness connector. Look for any signs of an intermittent short to ground.

Is the wiring harness OK?

Yes >> Go To 4

No >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

4. FUSED B(+) CIRCUIT SHORTED TO GROUND

Disconnect the CAB harness connector.

Ensure the ABS Pump Motor connector is secure.

Measure the resistance of the Fused B(+) circuit to ground.

Is the resistance above 5.0 ohms?

Yes >> Replace the Controller Anti-Brake in accordance with the service manual. Refer to the symptom *Replacing the Controller Anti-Lock Brake for additional information

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Fused B(+) circuit short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

5. FUSED B(+) CIRCUIT OPEN

Remove the ABS PUMP Fuse.

Disconnect the CAB harness connector.

Measure the resistance of the Fused B (+) circuit between the ABS PUMP Fuse Terminal and the CAB harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the Fused B(+) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

6. NO B+ SUPPLY TO FUSE

Turn the ignition on.

Measure the voltage of the B(+) supply at the ABS PUMP Fuse terminal.

Is the voltage above 11 volts?

Yes >> Go To 7

No >> Repair the B(+) Supply circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

PUMP MOTOR CIRCUIT OPEN — 67 (CONTINUED)

7. ABS PUMP MOTOR INOPERATIVE

Turn the ignition off.

Disconnect the ABS Pump Motor connector.

Connect a 10 gauge jumper wire between ABS Pump Motor Fused B(+) circuit and a 40 Amp Fused B(+) circuit.

Connect a 10 gauge jumper wire between ABS Pump Motor ground circuit and ground.

Monitor ABS Pump Motor operation.

Is the ABS Pump Motor operating?

Yes >> Go To 8

No >> Replace the ABS Pump Motor/Hydraulic Control Unit assembly.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

8. GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the CAB harness connector.

Measure the resistance of the CAB Ground circuits.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open in the Ground circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

9. GROUND CIRCUIT HIGH RESISTANCE

Make sure the ABS Pump Motor connector is secure.

Turn the ignition on.

With the DRBIII®, enable ABS Pump Motor actuation.

NOTE: NOTE: ABS Pump Motor will not operate, but voltage will be applied.

Measure the voltage drop across the ABS Ground circuit connection, with ABS Pump Motor actuation enabled.

Is the voltage below 0.1 volt?

Yes >> Replace the Controller Anti-Lock Brake in accordance with the service manual.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the high resistance in the Ground circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

PUMP MOTOR CIRCUIT OPEN — 67 (CONTINUED)

10. WIRING HARNESS INSPECTION

Turn the ignition off.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Make sure the Pump Motor connector is secure.

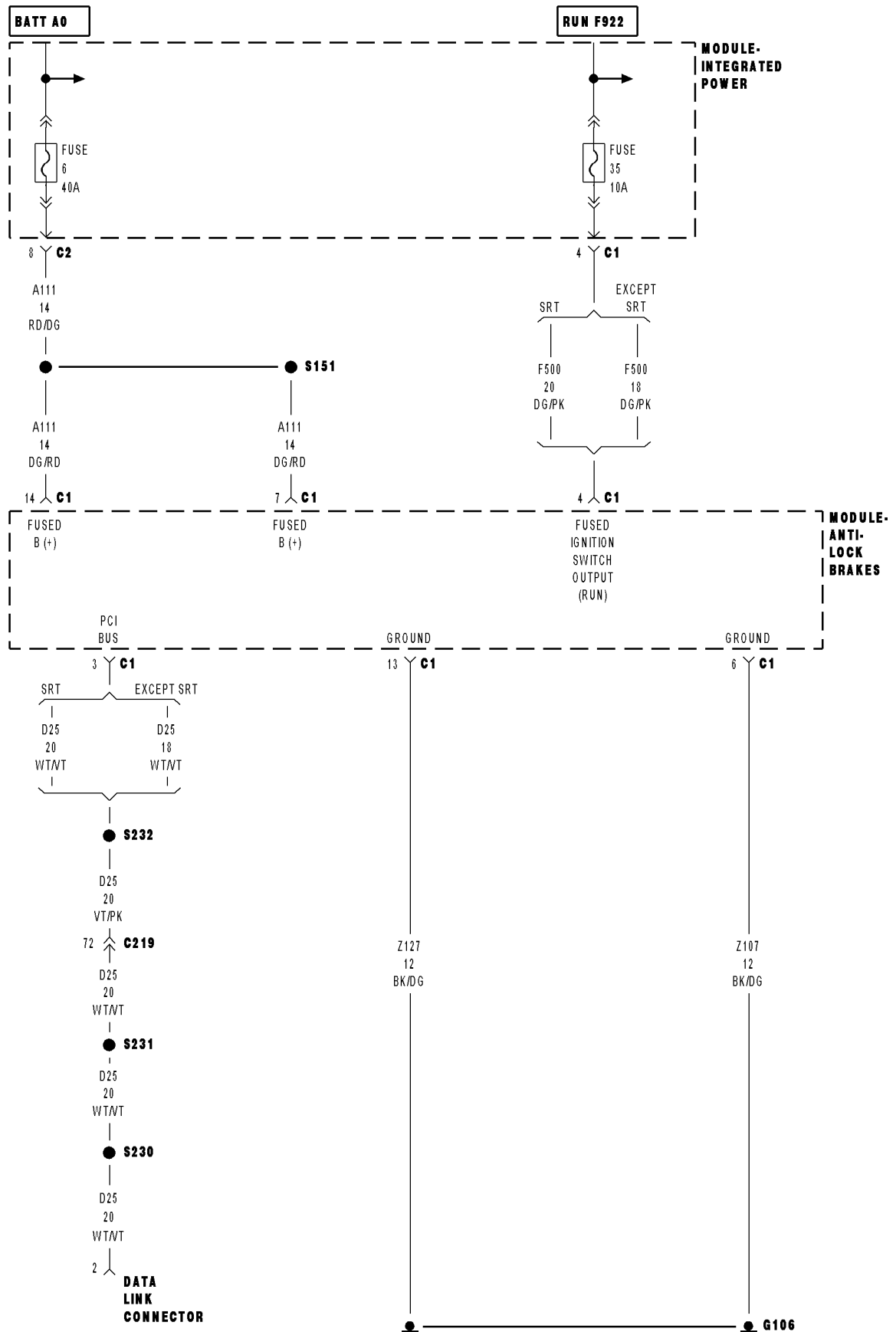
Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair the Left Front Wheel Speed Sensor Signal circuit for a short to voltage.
 Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

PUMP MOTOR STALLED — 68



PUMP MOTOR STALLED — 68 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**

Ignition on.

- **Set Condition:**

When vehicle speed is above 15 MPH without ABS active. Vehicle speed above 4 MPH with a fault from the previous ignition cycle. ABS pump motor command given and then turned off. High feedback voltage from the low side of the motor continuously.

Possible Causes
ABS PUMP MOTOR INTERMITTENT DTC FUSED B(+) CIRCUIT INTERMITTENTLY SHORTED TO GROUND FUSED B(+) CIRCUIT SHORTED TO GROUND FUSE OPEN - PUMP MOTOR CIRCUIT NO B+ SUPPLY TO FUSE ABS PUMP MOTOR INOPERATIVE FUSED B(+) CIRCUIT OPEN GROUND CIRCUIT OPEN GROUND CIRCUIT HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, read DTC's.

With the DRBIII®, erase DTC's.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, actuate the ABS pump motor.

Did the Pump Motor operate when actuated?

Yes >> Go To 10

No >> Go To 2

2. FUSE OPEN - PUMP MOTOR CIRCUIT

Turn the ignition off.

Remove and inspect the ABS Pump Motor fuse.

Is the Fuse open?

Yes >> Go To 3

No >> Go To 5

PUMP MOTOR STALLED — 68 (CONTINUED)**3. FUSED B(+) CIRCUIT INTERMITTENTLY SHORT**

Ensure the Pump Motor connector is secure.

Visually inspect the Fused B(+) circuit in the wiring harness from the ABS PUMP fuse to the CAB harness connector. Look for any signs of an intermittent short to ground.

Is the wiring harness OK?

Yes >> Go To 4

No >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

4. FUSED B(+) CIRCUIT SHORTED TO GROUND

Disconnect the CAB harness connector.

Ensure the ABS Pump Motor connector is secure.

Measure the resistance of the Fused B(+) circuit to ground.

Is the resistance above 5.0 ohms?

Yes >> Replace the Controller Anti-Brake in accordance with the service manual. Refer to the symptom *Replacing the Controller Anti-Lock Brake for additional information

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Fused B(+) circuit short to ground.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

5. FUSED B(+) CIRCUIT OPEN

Remove the ABS PUMP Fuse.

Disconnect the CAB harness connector.

Measure the resistance of the Fused B (+) circuit between the ABS PUMP Fuse Terminal and the CAB harness connector.

Is the resistance below 5.0 ohms?

Yes >> Go To 6

No >> Repair the open in the Fused B(+) circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

6. NO B+ SUPPLY TO FUSE

Turn the ignition on.

Measure the voltage of the B(+) supply at the ABS PUMP Fuse terminal.

Is the voltage above 11 volts?

Yes >> Go To 7

No >> Repair the B(+) Supply circuit.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

PUMP MOTOR STALLED — 68 (CONTINUED)**7. ABS PUMP MOTOR INOPERATIVE**

Turn the ignition off.

Disconnect the ABS Pump Motor connector.

Connect a 10 gauge jumper wire between ABS Pump Motor Fused B(+) circuit and a 40 Amp Fused B(+) circuit.

Connect a 10 gauge jumper wire between ABS Pump Motor ground circuit and ground.

Monitor ABS Pump Motor operation.

Is the ABS Pump Motor operating?

Yes >> Go To 8

No >> Replace the ABS Pump Motor/Hydraulic Control Unit assembly.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

8. GROUND CIRCUIT OPEN

Turn the ignition off.

Disconnect the CAB harness connector.

Measure the resistance of the CAB Ground circuits.

Is the resistance below 5.0 ohms?

Yes >> Go To 9

No >> Repair the open in the Ground circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

9. GROUND CIRCUIT HIGH RESISTANCE

Make sure the ABS Pump Motor connector is secure.

Turn the ignition on.

With the DRBIII®, enable ABS Pump Motor actuation.

NOTE: NOTE: ABS Pump Motor will not operate, but voltage will be applied.

Measure the voltage drop across the ABS Ground circuit connection, with ABS Pump Motor actuation enabled.

Is the voltage below 0.1 volt?

Yes >> Replace the Controller Anti-Lock Brake in accordance with the service manual.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the high resistance in the Ground circuit.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

PUMP MOTOR STALLED — 68 (CONTINUED)

10. WIRING HARNESS INSPECTION

Turn the ignition off.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Make sure the Pump Motor connector is secure.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair the Left Front Wheel Speed Sensor Signal circuit for a short to voltage.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

RAM READ/WRITE — 71

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The CAB is unable to change, recognize or clear a value (bit) in RAM.

Possible Causes
ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. ANTI-LOCK BRAKE MODULE

NOTE: Diagnose and repair any Powertrain Control Module VIN or Communication DTCs before continuing with this test.

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DTC reset?

- Yes** >> Replace the Controller Antilock Brake in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Inspect the wiring harness and connector on the CAB. Check for chafed, pierced, pinched, or partially broken wires. Check the connector for broken hold down tab, bent or pushed out terminals. repair as necessary.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
-

REAR RESET SWITCH CLOSED — 63

- **When Monitored:**
Ignition on.
- **Set Condition:**
When not in Antilock control mode and the reset switch voltage is low.

Possible Causes
HYDRAULIC CONTROL UNIT

Diagnostic Test**1. VERIFYING DTC**

Turn the ignition on.

With the DBR111®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DBR111®, read DTCs.

Does the DTC reset?

- Yes** >> Replace the Hydraulic Control Unit in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

ROM CHECKSUM – 71

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
The SUM of all the storage bytes in the CAB's ROM not equal to the original sum stored in ROM..

Possible Causes
ANTI-LOCK BRAKE MODULE

Diagnostic Test**1. ANTI-LOCK BRAKE MODULE**

NOTE: Diagnose and repair any Powertrain Control Module VIN or Communication DTCs before continuing with this test.

Turn the ignition on.

With the DRBIII®, clear DTCs.

Turn the ignition off.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DTC reset?

- Yes** >> Replace the Controller Antilock Brake in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Inspect the wiring harness and connector on the CAB. Check for chafed, pierced, pinched, or partially broken wires. Check the connector for broken hold down tab, bent or pushed out terminals. repair as necessary.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

TIRE REVS EPR MILE OUT OF RANGE

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
With the ignition on.
- **Set Condition:**
The DTC will set if the stored tire size is out of range.

Possible Causes
INTERMITTENT TIRE REVOLUTIONS RANGE PERFORMANCE DTC INCORRECT TIRE SIZE PROGRAMMED INTO ANTI-LOCK BRAKE MODULE ANTI-LOCK BRAKE MODULE

Diagnostic Test

1. DTC CONDITION IS PRESENT

Turn the ignition on.

Observe the ABS Warning Indicator.

Is the ABS Warning Indicator Flashing?

Yes >> Go To 2

No >> Go To 3

2. INCORRECT TIRES PROGRAMMED INTO ANTI-LOCK BRAKE MODULE

Inspect all four tires on the vehicle and note the size of each tire.

NOTE: A non-production size tire cannot be programmed into the CAB. The production Powertrain, with the production size tires, is the only emissions certified configuration that is available for reprogramming.

Turn the ignition on.

With the scan tool, read the tire size that is programmed into the CAB.

Does the displayed tire size match the actual tire size on the vehicle?

Yes >> Replace the Controller Anti-lock Brake in accordance with the Service Information. Refer to the symptom *Replacing the Anti-lock Brake Module for additional information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Reprogram the tire size in accordance with the Service Information. Make sure that the ignition is on throughout the reprogramming procedure.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

TIRE REVS EPR MILE OUT OF RANGE (CONTINUED)

3. WIRING HARNESS INSPECTION

Turn the ignition off.

Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires.

Visually inspect the related wire harness connectors. Look for broken, bent, pushed out, or corroded terminals.

Refer to any Hotline letters or Technical Service Bulletins that may apply.

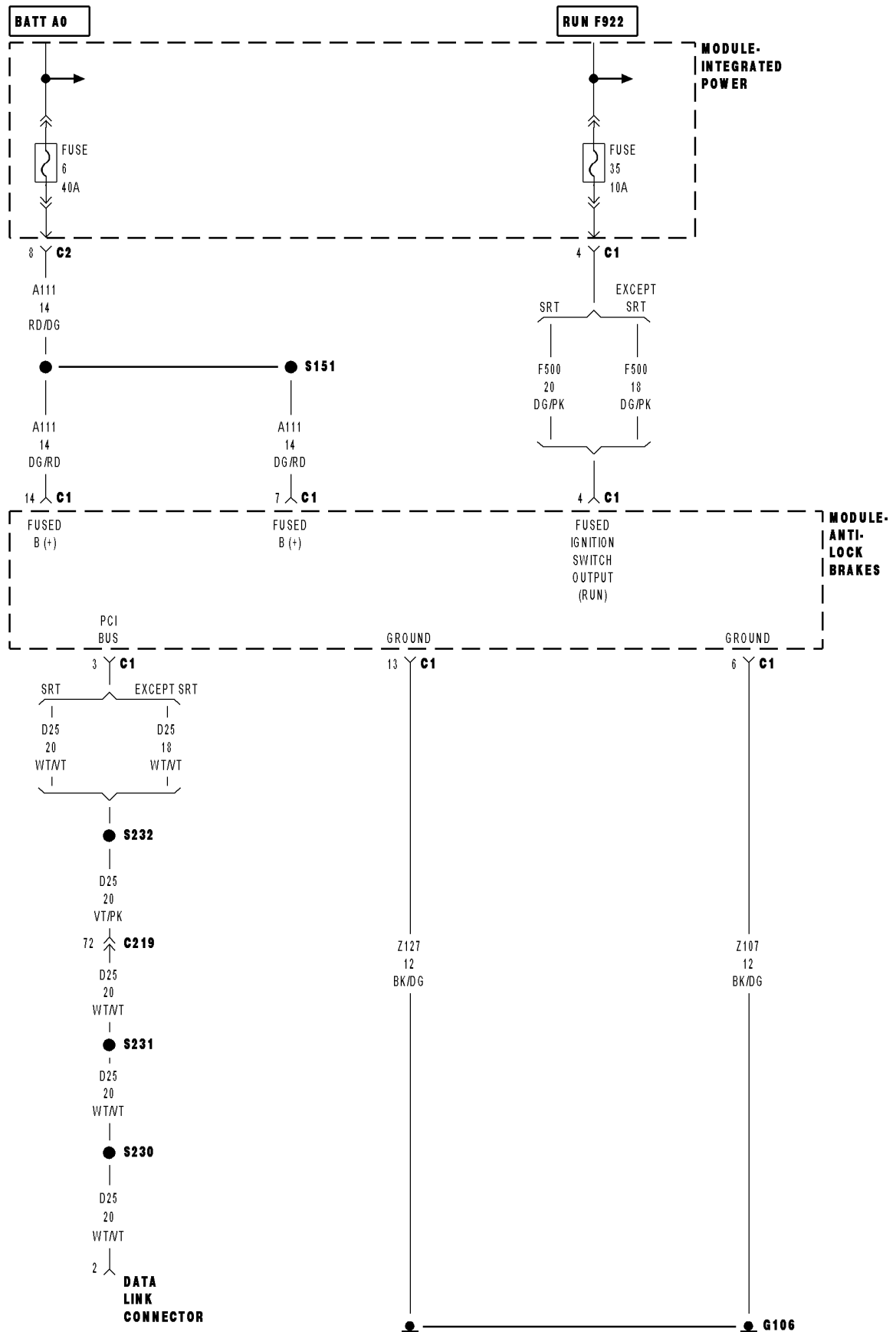
Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

WATCHDOG — 73



WATCHDOG — 73 (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When there is a deviation from the expected result of a CAB internal self check.

Possible Causes
INTERMITTENT BATTERY VOLTAGE LOW DTC FUSED RUN RELAY OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE GROUND CIRCUIT OPEN OR HIGH RESISTANCE CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

Turn the ignition on.

With the DRBIII®, erase DTCs.

Turn the ignition off.

Start the engine.

With the DRBIII® read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 5

2. FUSED IGNITION SWITCH OUTPUT CIRCUIT OPEN OR HIGH RESISTANCE

NOTE: Before continuing, inspect the fuses that are related to the **ABS system.**

Turn the ignition off.

Disconnect the Controller Anti-lock Brake harness connector.

Check connectors - Clean/repair as necessary.

Turn the ignition on.

Using a 12-volt test light connected to ground, probe the Fused Ignition Switch Output circuit.

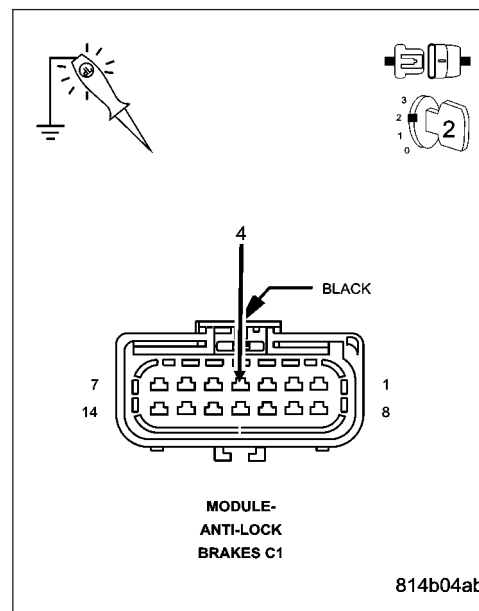
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 3

No >> Repair the Fused Ignition Switch Output circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



WATCHDOG — 73 (CONTINUED)

3. FUSED B+ CIRCUIT OPEN OR HIGH RESISTANCE

Using a 12-volt test light connected to ground, probe the Fused B+circuit.

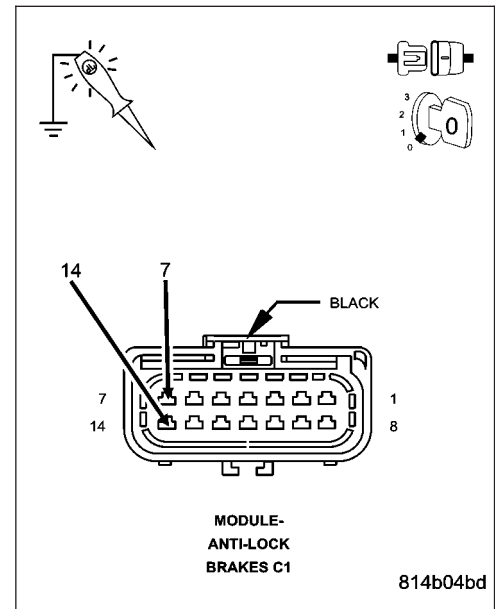
NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery.

Is the test light illuminated and bright?

Yes >> Go To 4

No >> Repair the Fused B+circuit for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

**4. GROUND CIRCUIT(S) OPEN OR HIGH RESISTANCE**

Turn the ignition off.

Using a 12-volt test light connected to B+, probe both the Ground circuit.

NOTE: The test light should be illuminated and bright. Compare the brightness to that of a direct connection to the battery at each circuit.

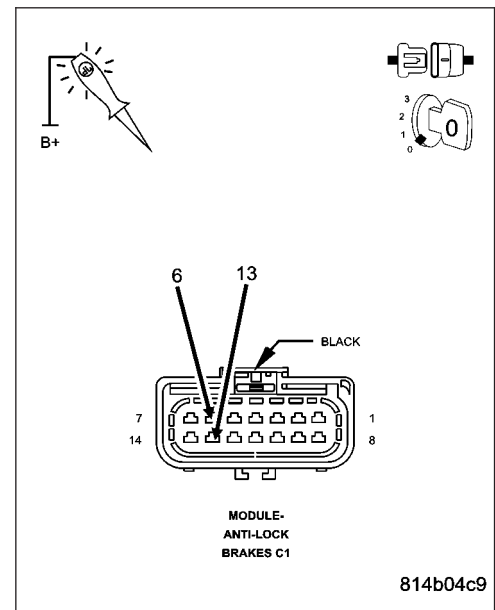
Is the test light illuminated and bright?

Yes >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Repair the Ground circuit(s) for an open circuit or high resistance.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)



WATCHDOG — 73 (CONTINUED)

5. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

Yes >> Repair as necessary.

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Test Complete.

SYSTEM CONTROL MODE TMEOUT — 74

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When the vehicle is in antilock control mode. Vehicle speed is above 4 MPH for 2 seconds. ABS mode is on continuous pressure control mode for an excessive period of time (two minutes).

Possible Causes
INTERMITTENT EXCESSIVE DUMP TIME DTC
WHEEL SPEED WIRING HARNESS AND CONNECTORS
SUSPENSION
TONE WHEEL
WHEEL BEARING
BRAKE SYSTEM MECHANICAL CONDITION
BRAKE SWITCH SENSE CIRCUIT
BRAKE SWITCH
CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. BRAKE SYSTEM MECHANICAL CONDITION**

NOTE: This DTC must be active before continuing, clear all DTC(s) and attempt to reset. Riding the brake for an extended period of time while driving can cause this DTC to set. If the DTC does not reset review with the customer driving habits.

Inspect the front and rear brakes for a mechanical condition that would cause any wheel(s) to lock-up during braking.

Inspect the Parking Brake to make sure it releases properly.

Were any problems found?

- Yes** >> Repair the braking system as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 2

2. TONE WHEEL

Inspect each Tone Wheel for damage, missing teeth or looseness in accordance with the Service Information.

NOTE: The Tone Wheel Teeth should be perfectly square, not bent or nicked.

Were any problems found?

- Yes** >> Replace the Tone Wheel as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 3

SYSTEM CONTROL MODE TMEOUT — 74 (CONTINUED)

3. WHEEL BEARING

Inspect each wheel bearing for excessive run out or improper clearance in accordance with the Service Information.

Were any problems found?

Yes >> Repair or replace the wheel bearing(s) as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 4

4. WHEEL SPEED SENSOR WIRING HARNESS AND CONNECTORS

Start the engine.

With the scan tool, monitor the output of each Wheel Speed Sensor.

Raise and properly support the vehicle.

WARNING: BE SURE TO KEEP HANDS, FEET AND CLOTHING CLEAR OF ROTATING COMPONENTS.

Allow the drive wheels to rotate.

Rotate the non-driven wheels by hand.

Wiggle test the Wheel Speed wiring harnesses and connectors.

Look for any excessive variations in sensed wheel speed.

Were any problems found?

Yes >> Repair the wiring harness or connectors as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 5

5. LOADED WHEEL BEARING/SUSPENSION CONCERN

CAUTION: Make sure that the vehicle has braking capability before performing a road test.

NOTE: Have an assistant drive the vehicle while monitoring the scan tool.

With the scan tool, monitor the output of each Wheel Speed Sensor.

Road test vehicle so wheel bearings and suspension are loaded.

Look for any excessive variations in sensed wheel speed.

Were any problems found?

Yes >> Repair as necessary in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

No >> Go To 6

SYSTEM CONTROL MODE TMEOUT — 74 (CONTINUED)

6. BRAKE SWITCH SENSE CIRCUIT

NOTE: The brake lamps must be operating properly before contining.

NOTE: Riding the brake can cause this fault, a review of the customers driving habits may help in the diagnosing of this DTC.

With the DRBIII®, in the Inputs/Outputs, monitor the Brake Switch state.

Apply and release the brake pedal.

Does the Brake Switch state on the DRBIII® match the actual pedal state?

- Yes** >> Replace the Controller Antilock Brake in accordance with the Service Information. refer to the symptom
 *Replacing the Controller Antilock Brake for additional information.
 Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Repair the Brake Switch Sense circuit. If OK, replace the Brake Switch.
 Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
-

SYSTEM OVER/UNDER VOLTAGE - 96

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When CAB voltage drops below 9.5 volts or if the voltage rises above 17 volts. ABS will be disabled for the duration of the out of voltage.

Possible Causes
INTERMITTENT BATTERY VOLTAGE HIGH DTC POWERTRAIN CHARGING SYSTEM DTCS PRESENT CONTROLLER ANTI-LOCK BRAKE

Diagnostic Test**1. DTC IS ACTIVE**

NOTE: Diagnose and repair any powertrain Charging system DTCs before continuing with this procedure.

NOTE: Ensure the battery is fully charged.

Turn the ignition on.

With the DRBIII®, record and erase DTCs.

Start the engine.

Measure the voltage at both the Fused B+ circuit and Fused Ignition Switch Output circuit at the by back probing the CAB harness connector.

Is the voltage between 10 and 16.5 volts and the DTC is present?

- Yes** >> Replace the Controller Anti-lock Brake Module in accordance with the Service Information.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Go To 2

2. INTERMITTENT DTC

NOTE: Check the Powertrain Control Module for any charging system DTCs and repair as necessary.

Turn the ignition off.

NOTE: Inspect the CAB fuses, harness connector, and wiring, look for open fuses, corrosion, and/or damage.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Ensure the charging system is operating properly.

Inspect the vehicle for aftermarket accessories that may exceed the Charging System output.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary.
Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.

***REPLACING THE ANTILOCK BRAKE MODULE**

Possible Causes
REPLACING THE ANTI-LOCK BRAKE MODULE

Diagnostic Test**1. REPLACING THE ANTILOCK BRAKE MODULE**

NOTE: Note: It may be necessary to call STAR to order a new ABS module.

NOTE: Note: Failure to properly program the ABS module will result in an illuminated or blinking ABS indicator.

Turn the ignition off.

Replace the Anti-lock Brake Module in accordance with the Service Information.

With the scan tool, perform the module configuration procedures as necessary in accordance with the Service Information.

Road test the vehicle above 40 m.p.h. for at least two minutes.

With the scan tool, select View DTCs in the Anti-Lock Brake Module.

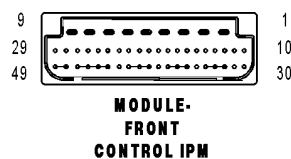
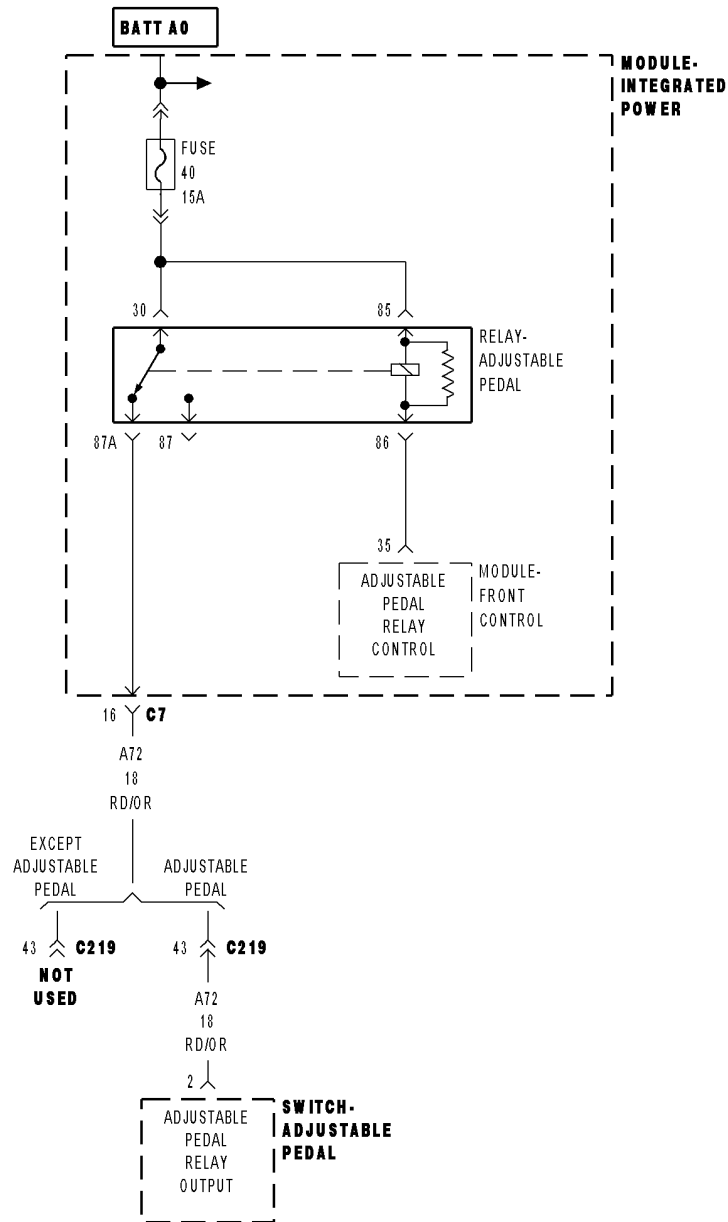
Are there any DTCs present?

Yes >> Perform the appropriate diagnostic procedure(s).

No >> Test Complete

Perform ABS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

APS RELAY CONTROL CIRCUIT HIGH



APS RELAY CONTROL CIRCUIT HIGH (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**
Ignition on.
- **Set Condition:**
When the FCM detects a short to voltage on the Adjustable Pedals Relay Control circuit.

Possible Causes
INTERMITTENT DTC ADJUSTABLE PEDAL RELAY ADJUSTABLE PEDAL CONTROL CIRCUIT SHORTED TO VOLTAGE ANTI-LOCK BRAKE MODULE

Diagnostic Test**1. VERIFY DTC**

With the DRBIII®, record and erase DTCs.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 4

2. ADJUSTABLE PEDALS RELAY OPERATION

Turn the ignition off.

Substitute the Adjustable Pedals Relay with a known good one.

Turn the ignition on.

Attempt to operate the Adjustable Pedals.

With the DRBIII®, read DTC.

Does the DTC reset?

Yes >> Go To 3

No >> Replace the Adjustable Pedals Relay.

Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

APS RELAY CONTROL CIRCUIT HIGH (CONTINUED)

3. ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE

Turn the ignition off.

Remove the FCM from the IPM.

Remove the Adjustable Pedals Relay.

Turn the ignition on.

Measure the voltage on the Adjustable Pedals Relay Control circuit in the Adjustable Pedals Relay Control circuit terminal.

Does the voltmeter indicate voltage present?

- Yes** >> Repair the short to voltage in the Adjustable Pedals Relay Control circuit.
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Replace the FCM in accordance with the Service Information
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
-

4. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

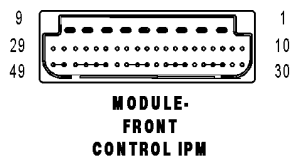
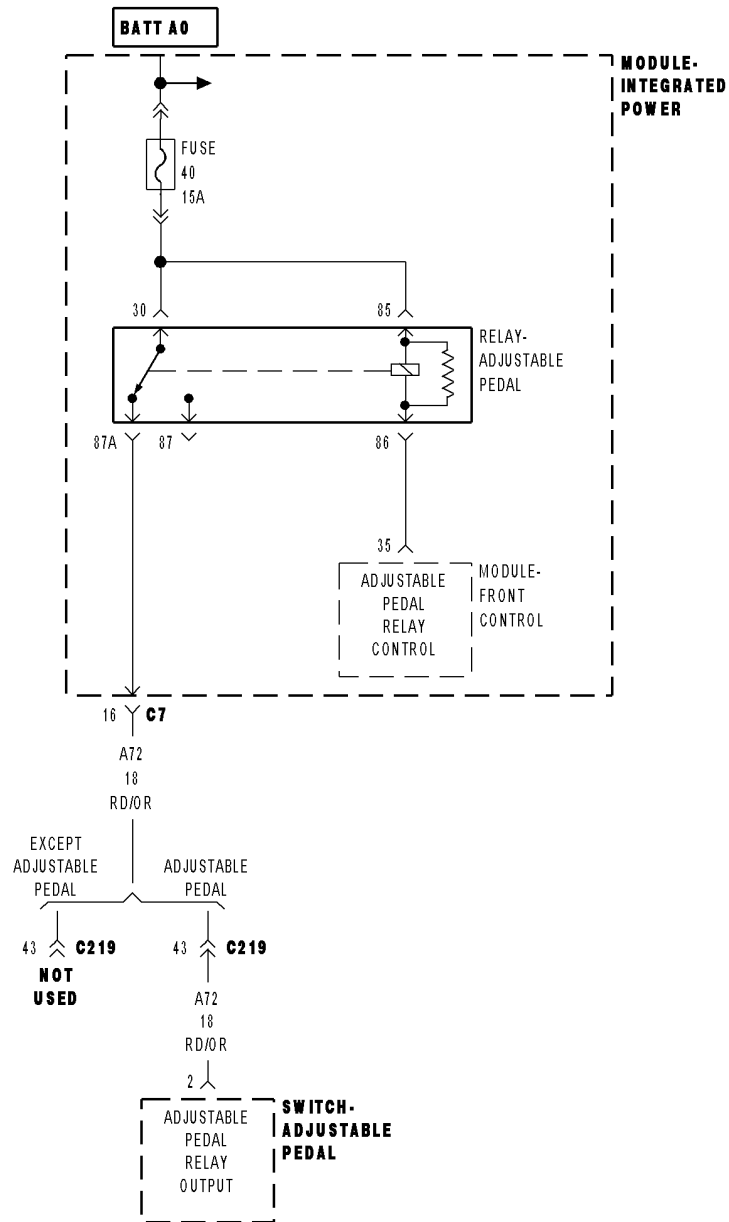
Check connectors - Clean/repair as necessary.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

APS RELAY CONTROL CIRCUIT LOW



APS RELAY CONTROL CIRCUIT LOW (CONTINUED)

For a complete wiring diagram **Refer to Section 8W.**

- **When Monitored:**
Ignition on.
- **Set Condition:**
When the FCM detects a short to ground on the Adjustable Pedals Relay Control circuit.

Possible Causes
INTERMITTENT DTC ADJUSTABLE PEDAL RELAY ADJUSTABLE PEDAL CONTROL CIRCUIT SHORTED TO GROUND ANTI-LOCK BRAKE MODULE

Diagnostic Test**1. VERIFY DTC**

With the DRBIII®, record and erase DTCs.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 4

2. ADJUSTABLE PEDALS RELAY OPERATION

Turn the ignition off.

Substitute the Adjustable Pedals Relay with a known good one.

Turn the ignition on.

Attempt to operate the Adjustable Pedals.

With the DRBIII®, read DTC.

Does the DTC reset?

Yes >> Go To 3

No >> Replace the Adjustable Pedals Relay.

Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

APS RELAY CONTROL CIRCUIT LOW (CONTINUED)

3. ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT SHORTED TO GROUND

Turn the ignition off.

Remove the FCM from the IPM.

Remove the Adjustable Pedals Relay.

Turn the ignition on.

Measure the resistance between ground and the Adjustable Pedals Relay Control circuit in the Adjustable Pedals Relay Control circuit terminal.

Is the resistance below 100 ohms?

- Yes** >> Repair the short to ground in the Adjustable Pedals Relay Control circuit.
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Replace the FCM in accordance with the Service Information
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
-

4. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

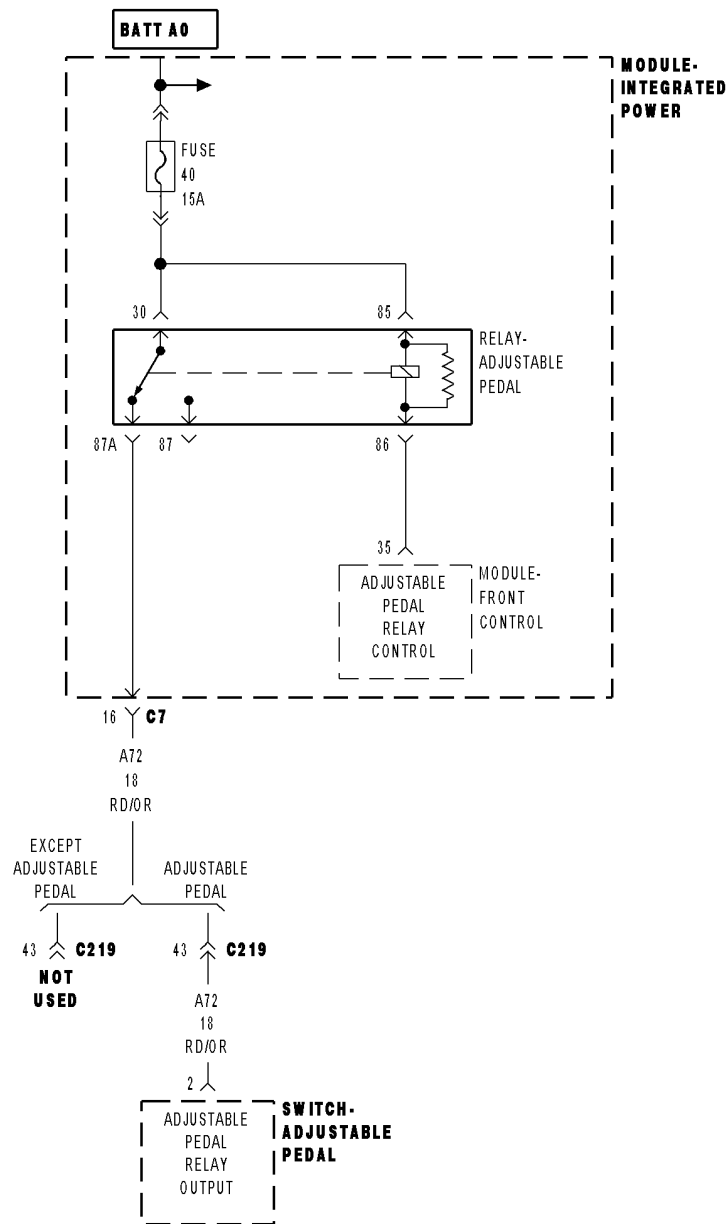
Check connectors - Clean/repair as necessary.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

APS RELAY CONTROL CIRCUIT OPEN



APS RELAY CONTROL CIRCUIT OPEN (CONTINUED)

For a complete wiring diagram Refer to Section 8W.

- **When Monitored:**
Ignition on.
- **Set Condition:**
When the FCM detects an open on the Adjustable Pedals Relay Control circuit.

Possible Causes
INTERMITTENT DTC ADJUSTABLE PEDAL RELAY ADJUSTABLE PEDAL CONTROL CIRCUIT OPEN ANTI-LOCK BRAKE MODULE

Diagnostic Test**1. VERIFY DTC**

With the DRBIII®, record and erase DTCs.

Turn the ignition on.

With the DRBIII®, read DTCs.

Does the DTC reset?

Yes >> Go To 2

No >> Go To 4

2. ADJUSTABLE PEDALS RELAY OPERATION

Turn the ignition off.

Substitute the Adjustable Pedals Relay with a known good one.

Turn the ignition on.

Attempt to operate the Adjustable Pedals.

With the DRBIII®, read DTC.

Does the DTC reset?

Yes >> Go To 3

No >> Replace the Adjustable Pedals Relay.

Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)

APS RELAY CONTROL CIRCUIT OPEN (CONTINUED)

3. ADJUSTABLE PEDALS RELAY CONTROL CIRCUIT OPEN

Turn the ignition off.

Remove the FCM from the IPM.

Remove the Adjustable Pedals Relay.

Turn the ignition on.

Measure the resistance of the Adjustable Pedals Relay Control circuit between the Adjustable Pedals Relay Control circuit terminal and the FCM connector.

Is the resistance below 100 ohms?

- Yes** >> Repair the short to ground in the Adjustable Pedals Relay Control circuit.
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Replace the FCM in accordance with the Service Information
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
-

4. INTERMITTENT DTC

Turn the ignition off.

Using the wiring diagram/schematic as a guide, inspect the wiring and connectors.

Check connectors - Clean/repair as necessary.

Refer to any Technical Service Bulletins that may apply.

Were any problems found?

- Yes** >> Repair as necessary.
Perform APS VERIFICATION TEST - VER 1. (Refer to 5 - BRAKES/ELECTRICAL - DIAGNOSIS AND TESTING)
- No** >> Test Complete.
-

BRAKES - BASE - SERVICE INFORMATION

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BRAKES - BASE - SERVICE INFORMATION**DIAGNOSIS AND TESTING****BASE BRAKE SYSTEM**

Base brake components consist of the brake pads, calipers, brake drum in hat rotor in the rear, rotors, brake lines, master cylinder, booster, and parking brake components.

Brake diagnosis involves determining if the problem is related to a mechanical, hydraulic, or vacuum operated component.

The first diagnosis step is the preliminary check.

PRELIMINARY BRAKE CHECK

1. Check condition of tires and wheels. Damaged wheels and worn, damaged, or underinflated tires can cause pull, shudder, vibration, and a condition similar to grab.
2. If complaint was based on noise when braking, check suspension components. Jounce front and rear of vehicle and listen for noise that might be caused by loose, worn or damaged suspension or steering components.
3. Inspect brake fluid level and condition. Note that the brake reservoir fluid level will decrease in proportion to normal lining wear. **Also note that brake fluid tends to darken over time. This is normal and should not be mistaken for contamination.**
 - a. If fluid level is abnormally low, look for evidence of leaks at calipers, wheel cylinders, brake lines, and master cylinder.

- b. If fluid appears contaminated, drain out a sample to examine. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals and cups will also have to be replaced after flushing. Use clean brake fluid to flush the system.
4. Check parking brake operation. Verify free movement and full release of cables and pedal. Also note if vehicle was being operated with parking brake partially applied.
5. Check brake pedal operation. Verify that pedal does not bind and has adequate free play. If pedal lacks free play, check pedal and power booster for being loose or for bind condition. Do not road test until condition is corrected.
6. Check booster vacuum check valve and hose.
7. If components checked appear OK, road test the vehicle.

ROAD TESTING

1. If complaint involved low brake pedal, pump pedal and note if it comes back up to normal height.
2. Check brake pedal response with transmission in Neutral and engine running. Pedal should remain firm under constant foot pressure.
3. During road test, make normal and firm brake stops in 25-40 mph range. Note faulty brake operation such as low pedal, hard pedal, fade, pedal pulsation, pull, grab, drag, noise, etc.
4. Attempt to stop the vehicle with the parking brake only and note grab, drag, noise, etc.

PEDAL FALLS AWAY

A brake pedal that falls away under steady foot pressure is generally the result of a system leak or fluid contamination. The leak point could be at a brake line, fitting, hose, or caliper/wheel cylinder. If leakage is severe, fluid will be evident at or around the leaking component.

Internal leakage (seal by-pass) in the master cylinder caused by worn or damaged piston cups, may also be the problem cause.

An internal leak in the ABS or RWAL system may also be the problem with no physical evidence.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up worn linings, rotors, drums, or rear brakes out of adjustment are the most likely causes. The proper course of action is to inspect and replace all worn component and make the proper adjustments.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However, thin brake drums or substandard brake lines and hoses can also cause a spongy pedal. The proper course of action is to bleed the system, and replace thin drums and substandard quality brake hoses if suspected.

HARD PEDAL OR HIGH PEDAL EFFORT

A hard pedal or high pedal effort may be due to lining that is water soaked, contaminated, glazed, or badly worn. The power booster or check valve or a vacuum hose could also be faulty.

PEDAL PULSATION

Pedal pulsation is caused by components that are loose, or beyond tolerance limits.

The primary cause of pulsation are disc brake rotors with excessive lateral runout or thickness variation, or out of round brake drums. Other causes are loose wheel bearings or calipers and worn, damaged tires.

NOTE: Some pedal pulsation may be felt during ABS activation.

BRAKE DRAG

Brake drag occurs when the lining is in constant contact with the rotor or drum. Drag can occur at one wheel, all wheels, fronts only, or rears only.

Drag is a product of incomplete brake shoe release. Drag can be minor or severe enough to overheat the linings, rotors and drums.

Minor drag will usually cause slight surface charring of the lining. It can also generate hard spots in rotors and drums from the overheat-cool down process. In most cases, the rotors, drums, wheels and tires are quite warm to the touch after the vehicle is stopped.

Severe drag can char the brake lining all the way through. It can also distort and score rotors and drums to the point of replacement. The wheels, tires and brake components will be extremely hot. In severe cases, the lining may generate smoke as it chars from overheating.

Common causes of brake drag are:

- Seized or improperly adjusted parking brake cables.
- Loose/worn wheel bearing.
- Seized caliper or wheel cylinder piston.
- Caliper binding on corroded bushings or rusted slide surfaces.
- Loose caliper mounting.
- Drum brake shoes binding on worn/damaged support plates.
- Mis-assembled components.
- Long booster output rod.

If brake drag occurs at all wheels, the problem may be related to a blocked master cylinder return port, or faulty power booster (binds-does not release).

BRAKE FADE

Brake fade is usually a product of overheating caused by brake drag. However, brake overheating and resulting fade can also be caused by riding the brake pedal, making repeated high deceleration stops in a short time span, or constant braking on steep mountain roads. Refer to the Brake Drag information in this section for causes.

BRAKE PULL

Front brake pull condition could result from:

- Contaminated lining in one caliper
- Seized caliper piston
- Binding caliper
- Loose caliper
- Rusty caliper slide surfaces
- Improper brake pads
- Damaged rotor

A worn, damaged wheel bearing or suspension component are further causes of pull. A damaged front tire (bruised, ply separation) can also cause pull.

A common and frequently misdiagnosed pull condition is where direction of pull changes after a few stops. The cause is a combination of brake drag followed by fade at one of the brake units.

As the dragging brake overheats, efficiency is so reduced that fade occurs. Since the opposite brake unit is still functioning normally, its braking effect is magnified. This causes pull to switch direction in favor of the normally functioning brake unit.

An additional point when diagnosing a change in pull condition concerns brake cool down. Remember that pull will return to the original direction, if the dragging brake unit is allowed to cool down (and is not seriously damaged).

REAR BRAKE GRAB OR PULL

Rear grab or pull is usually caused by improperly adjusted or seized parking brake cables, contaminated lining, bent or binding shoes and support plates, or improperly assembled components. This is particularly true when only one rear wheel is involved. However, when both rear wheels are affected, the master cylinder or proportioning valve could be at fault.

BRAKES DO NOT HOLD AFTER DRIVING THROUGH DEEP WATER PUDDLES

This condition is generally caused by water soaked lining. If the lining is only wet, it can be dried by driving with the brakes very lightly applied for a mile or two. However, if the lining is both soaked and dirt contaminated, cleaning and/or replacement will be necessary.

BRAKE LINING CONTAMINATION

Brake lining contamination is mostly a product of leaking calipers or worn seals, driving through deep water puddles, or lining that has become covered with grease and grit during repair. Contaminated lining should be replaced to avoid further brake problems.

WHEEL AND TIRE PROBLEMS

Some conditions attributed to brake components may actually be caused by a wheel or tire problem.

A damaged wheel can cause shudder, vibration and pull. A worn or damaged tire can also cause pull.

Severely worn tires with very little tread left can produce a grab-like condition as the tire loses and recovers traction. Flat-spotted tires can cause vibration and generate shudder during brake operation. A tire with internal damage such as a severe bruise, cut, or ply separation can cause pull and vibration.

BRAKE NOISES

Some brake noise is common with rear drum brakes and on some disc brakes during the first few stops after a vehicle has been parked overnight or stored. This is primarily due to the formation of trace corrosion (light rust) on metal surfaces. This light corrosion is typically cleared from the metal surfaces after a few brake applications causing the noise to subside.

BRAKE SQUEAK/SQUEAL

Brake squeak or squeal may be due to linings that are wet or contaminated with brake fluid, grease, or oil. Glazed linings and rotors with hard spots can also contribute to squeak. Dirt and foreign material embedded in the brake lining will also cause squeak/squeal.

A very loud squeak or squeal is frequently a sign of severely worn brake lining. If the lining has worn through to the brake pads in spots, metal-to-metal contact occurs. If the condition is allowed to continue, rotors can become so scored that replacement is necessary.

BRAKE CHATTER

Brake chatter is usually caused by loose or worn components, or glazed/burnt lining. Rotors with hard spots can also contribute to chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.

THUMP/CLUNK NOISE

Thumping or clunk noises during braking are frequently **not** caused by brake components. In many cases, such noises are caused by loose or damaged steering, suspension, or engine components. However, calipers that bind on the slide surfaces can generate a thump or clunk noise.

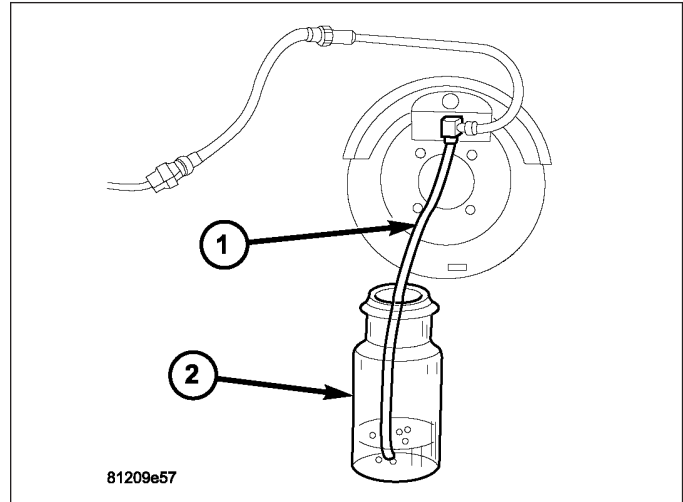
STANDARD PROCEDURE

MANUAL BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

1. Remove reservoir filler caps and fill reservoir.
2. If calipers were overhauled, open all caliper bleed screws. Then close each bleed screw as fluid starts to drip from it. Top off master cylinder reservoir once more before proceeding.
3. Attach one end of bleed hose (1) to bleed screw and insert opposite end in glass container (2) partially filled with brake fluid. Be sure end of bleed hose is immersed in fluid.

NOTE: Bleed procedure should be in this order (1) Right rear (2) Left rear (3) Right front (4) Left front.



4. Open up bleeder, then have a helper press down the brake pedal. Once the pedal is down close the bleeder. Repeat bleeding until fluid stream is clear and free of bubbles. Then move to the next wheel.
5. Before moving the vehicle verify the pedal is firm and not mushy.
6. Top off the brake fluid and install the reservoir cap.

PRESSURE BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

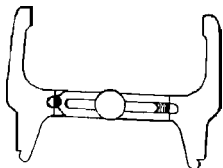
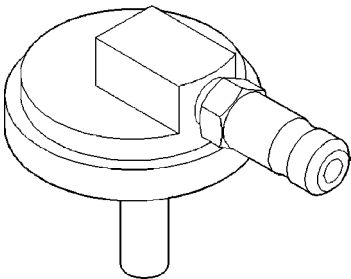
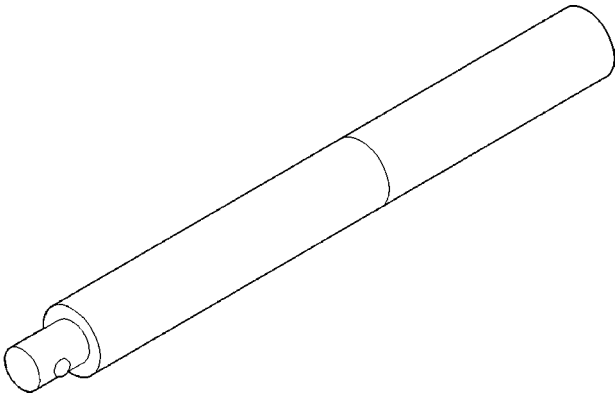
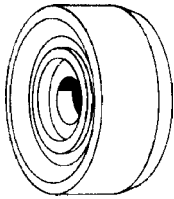
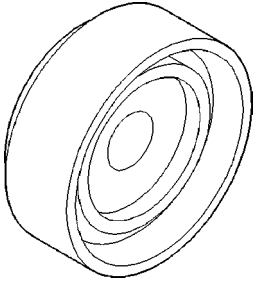
Follow the manufacturers instructions carefully when using pressure equipment. Do not exceed the tank manufacturers pressure recommendations. Generally, a tank pressure of 15-20 psi is sufficient for bleeding.

Fill the bleeder tank with recommended fluid and purge air from the tank lines before bleeding.

Do not pressure bleed without a proper master cylinder adapter. The wrong adapter can lead to leakage, or drawing air back into the system.

SPECIAL TOOLS

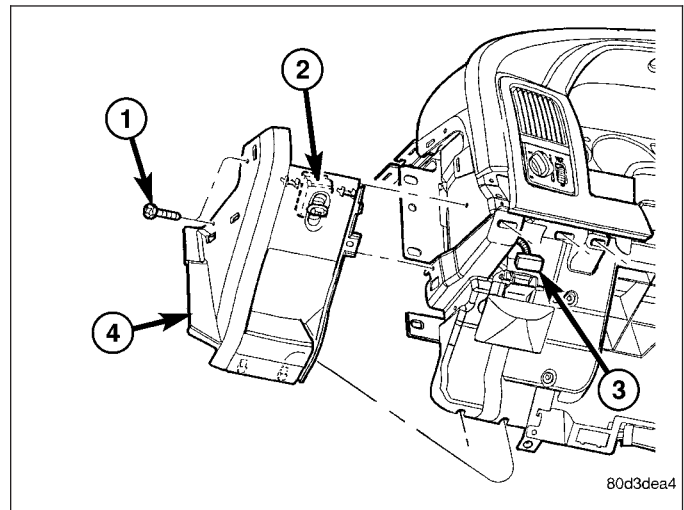
BASE BRAKES



SWITCH-ADJUSTABLE PEDALS

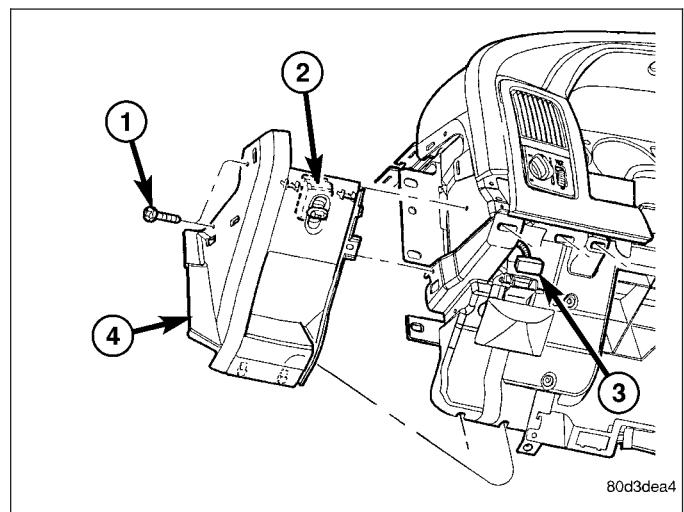
REMOVAL

1. Remove the lower drivers side bezel (4) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL DR SIDE BEZEL - REMOVAL).
2. Disconnect the electrical connector (3) from the adjustable pedal switch (2).
3. Remove the switch (2) from the lower drivers side bezel (4) by squeezing the retaining clips together and pushing the switch outwards.



INSTALLATION

1. Install the switch (2) to the lower drivers side bezel (4) by pushing the switch inwards seating the retaining clips to the lower drivers side bezel (4).
2. Reconnect the electrical connector (3) to the adjustable pedal switch (2).
3. Install the lower drivers side bezel (4) (Refer to 23 - BODY/INSTRUMENT PANEL/INSTRUMENT PANEL DR SIDE BEZEL - INSTALLATION).



MOTOR-ADJUSTABLE PEDALS

DESCRIPTION

The Adjustable Pedals System (APS) is designed to enable the fore and aft repositioning of the brake and accelerator pedals. This results in improved ergonomics in relation to the steering wheel for taller and shorter drivers. Being able to adjust the pedal positions also allows the driver to set steering wheel tilt and seat position to the most comfortable position. The position of the brake and accelerator pedals can be adjusted without compromising safety or comfort in actuating the pedals.

Change of pedal position is accomplished by means of a motor driven screw. Operating the adjustable pedal switch activates the pedal drive motor (1). The pedal drive motor turns a screw that changes the position of the brake and accelerator pedals. The pedal can be moved rearward (closer to the driver) or forward (away from driver). The brake pedal is moved on its drive screw to a position where the driver feels most comfortable.

The accelerator pedal is moved at the same time and the same distance as the brake pedal.

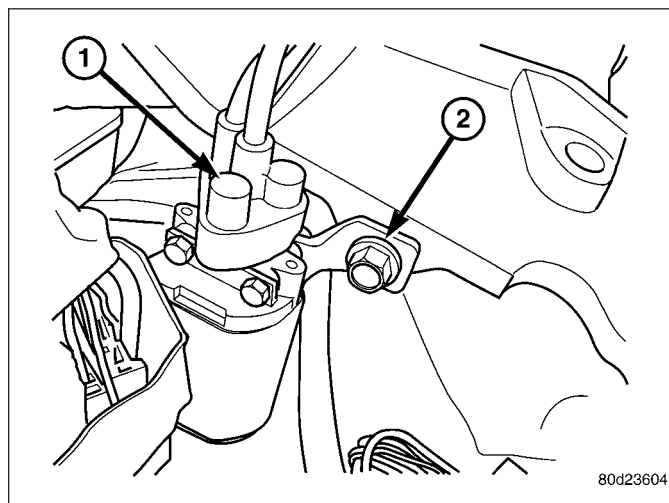
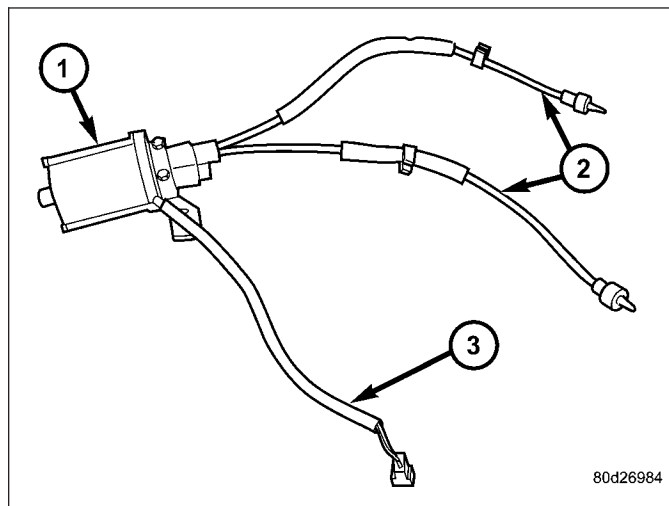
Neither the pedal drive motor (1) nor drive mechanism are subject to the mechanical stress of brake or accelerator application.

- SYSTEM FEATURES:

- Range of Adjustment: The pedals may be adjusted up to 3 in. (75 mm)
- Pedal Adjustment Speed: 0.5 in./sec (12.5 mm/sec)
- Pedal Adjustment Inhibitors: Pedal adjustment is inhibited when the vehicle is in reverse or when cruise control is activated.

REMOVAL

1. Disconnect the negative battery cable.
2. Remove the kneeblocker (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
3. Remove the brake light switch and discard (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL).
4. Disconnect the adjustable pedal cables from the brake and accelerator pedals **Also clutch pedal if equipped with a manual transmission.**
5. Disconnect the electrical connector.
6. Unclip the cable fasteners to the support.
7. Remove the one mounting bolt (2) for the adjustable pedal motor (1).
8. Remove the adjustable pedal motor (1) with the cables.

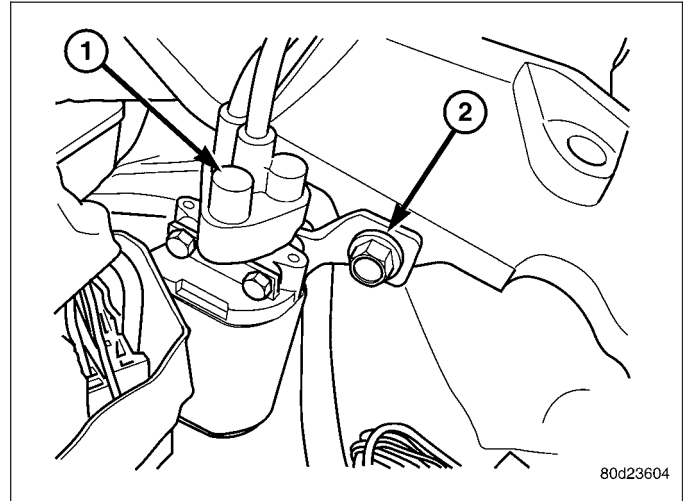


NOTE: Adjustable pedal cables are not serviceable. If they need service the adjustable pedal motor with the cables must be installed.

INSTALLATION

NOTE: Adjustable pedal cables are not serviceable. If they need service the adjustable pedal motor with the cables must be installed.

1. Install the adjustable pedal motor (1) with the cables.
2. Install the one mounting bolt (2) for the adjustable pedal motor (1).



3. Clip the cable fasteners to the support.
4. Reconnect the electrical connector.
5. Reconnect the adjustable pedal cables to the brake and accelerator pedals **Also clutch pedal if equipped with a manual transmission.**
6. Install the new brake light switch (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL).
7. Install the kneeblocker (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).
8. Reconnect the negative battery cable.
9. Check for proper operation of the pedals.

HYDRAULIC/MECHANICAL**SPECIFICATIONS****SPECIFICATIONS - TORQUE CHART****TORQUE SPECIFICATIONS**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake Booster Mounting Nuts	28	21	250
Master Cylinder Mounting Nuts	18	—	160
Caliper Bleed Screws	19	14	168
Caliper Mounting Pins Front	32	24	—
Caliper Mounting Pins Rear	30	22	—
Caliper Adapter Mounting Bolts Front LD	176	130	—
Caliper Adapter Mounting Bolts Front HD & SRT-10	339	250	—
Caliper Adapter Mounting Bolts Rear LD	135	100	—
Caliper Adapter Mounting Bolts Rear HD & SRT-10	197	145	—
Junction Block Bolts To Frame	10	7.5	—
Brake Pedal Assembly Bracket Nuts	28	21	—
Support Plate Mounting Bolts/Nuts LD	64	47	—
Support Plate Mounting Bolts/Nuts SRT-10 & HD	203	150	—
Brake Line Fittings Master Cylinder	19	14	170

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Brake Line Fittings Junction Block	19	14	170
Caliper Brake Line Banjo Bolt Front	27	20	245
Caliper Brake Line Banjo Bolt Rear	27	20	245
Brake Hose Front Bolts To Frame	10	7.5	—
Brake Hose Front Fitting	19	14	250
Brake Hose Rear Fitting	19	14	250
Parking Brake Pedal Assembly	19	14	250
Rotor to Hub Bolt Rear HD DRW	128	95	—
Extension to Rotor Nut HD DRW Front	130	96	—
Hub/Bearing Bolts LD & SRT-10	163	120	—
Hub/Bearing Bolts Front 4X2 HD	176	130	—

BASE BRAKE**SPECIFICATIONS**

DESCRIPTION	SPECIFICATION
Front Disc Brake Caliper Type	Dual Piston Sliding
Rear Disc Brake Caliper Type LD	Single Piston Sliding
Rear Disc Brake Caliper Type SRT-10	Dual Piston Sliding
Rear Disc Brake Caliper Type HD	Dual Piston Sliding
Front Disc Brake Caliper LD	2X54 mm (2.12 in.)
Front Disc Brake Caliper SRT-10	4X57 mm (2.24 in.)
Front Disc Brake Caliper HD	2X56 mm (2.20 in.)
Front Disc Brake Rotor LD	336×28 mm (13.2×1.1 in.)
Front Disc Brake Rotor SRT-10	380×35.5 mm (14.96×1.397 in.)
Front Disc Brake Rotor HD	353×35.5 mm (13.89×1.397 in.)
Front/Rear Disc Brake Rotor Max. Runout LD	0.050 mm (0.002 in.)
Front Disc Brake Rotor Max. Runout SRT-10	0.050 mm (0.002 in.)
Rear Disc Brake Rotor Max. Runout SRT-10	0.050 mm (0.002 in.)
Front/Rear Disc Brake Rotor Max. Runout HD SRW	0.131 mm (0.005 in.)
Rear Disc Brake Rotor Max. Runout HD DRW	0.328 mm (0.012 in.)
Front/Rear Disc Brake Rotor Max. Thickness Variation LD	0.012 mm (0.0005 in.)
Front Disc Brake Rotor Max. Thickness Variation SRT-10	0.012 mm (0.0005 in.)

DESCRIPTION	SPECIFICATION
Rear Disc Brake Rotor Max. Thickness Variation SRT-10	0.012 mm (0.0005 in.)
Front/Rear Disc Brake Rotor Max. Thickness Variation HD	0.013 mm (0.0005 in.) Loose Rotor
Minimum Front Rotor Thickness LD	26.4 mm (1.039 in.)
Minimum Front Rotor Thickness SRT-10	33.9 mm (1.344 in.)
Minimum Front Rotor Thickness HD	34 mm (1.33 in.)
Minimum Rear Rotor Thickness LD	20.4 mm (.803 in)
Minimum Rear Rotor Thickness HD	28.39 mm (1.117 in)
Minimum Rear Rotor Thickness SRT-10	28.4 mm (1.118 in.)
Rear Disc Brake Caliper LD	1x54 mm (2.12 in)
Rear Disc Brake Caliper SRT-10	2x36 mm (1.42 in)
Rear Disc Brake Caliper HD SRW	2x45 mm (1.77 in)
Rear Disc Brake Caliper HD DRW	2x51 mm (2.00 in)
Rear Disc Brake Rotor LD	350x22 mm (13.77 X .86 in)
Rear Disc Brake Rotor SRT-10	350x22 mm (13.77 X .86 in)
Rear Disc Brake Rotor HD	353x30 mm (13.89 X 1.18 in)
Rear Disc Brake Rotor Max Drum Diameter SRT-10 & HD	207.2 mm (8.157 in.)
Brake Booster Type Gasoline Engines LD	Vacuum Dual Diaphragm
Brake Booster Type Gasoline Engines HD SRW	Vacuum Dual Diaphragm
Brake Booster Type Diesel Engines HD DRW	Hydroboost

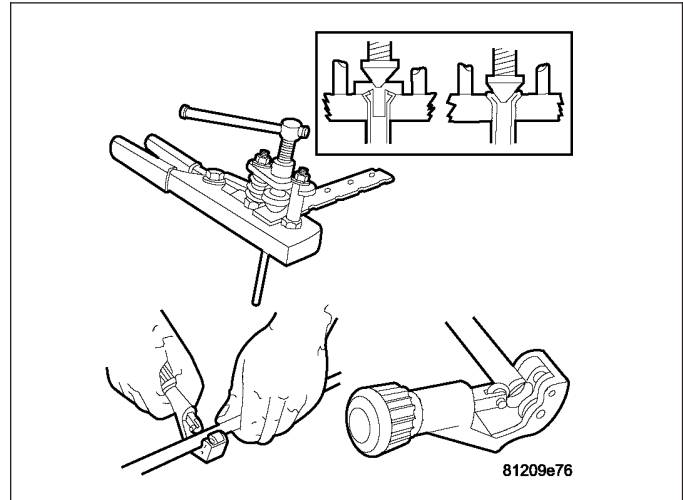
LINES-BRAKE

STANDARD PROCEDURE

DOUBLE INVERTED FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

1. Cut off damaged tube with Tubing Cutter.
2. Ream cut edges of tubing to ensure proper flare.
3. Install replacement tube nut on the tube.
4. Insert tube in flaring tool.
5. Place gauge form over the end of the tube.
6. Push tubing through flaring tool jaws until tube contacts recessed notch in gauge that matches tube diameter.
7. Tighten the tool bar on the tube
8. Insert plug on gauge in the tube. Then swing compression disc over gauge and center tapered flaring screw in recess of compression disc.
9. Tighten tool handle until plug gauge is squarely seated on jaws of flaring tool. This will start the inverted flare.
10. Remove the plug gauge and complete the inverted flare.

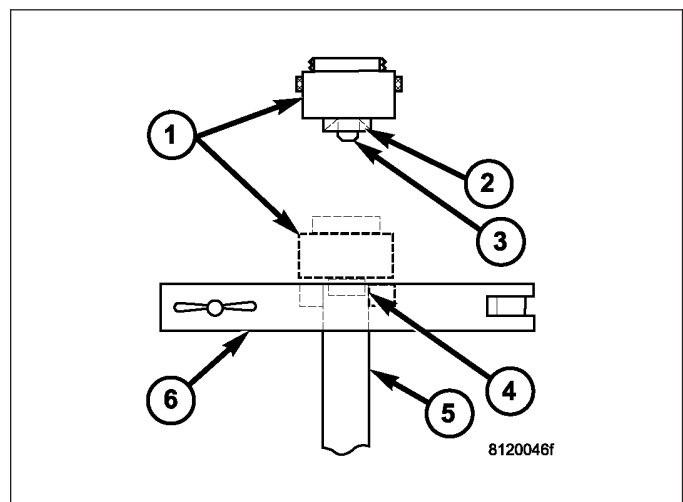


ISO FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

To make a ISO flare use an ISO flaring tool kit.

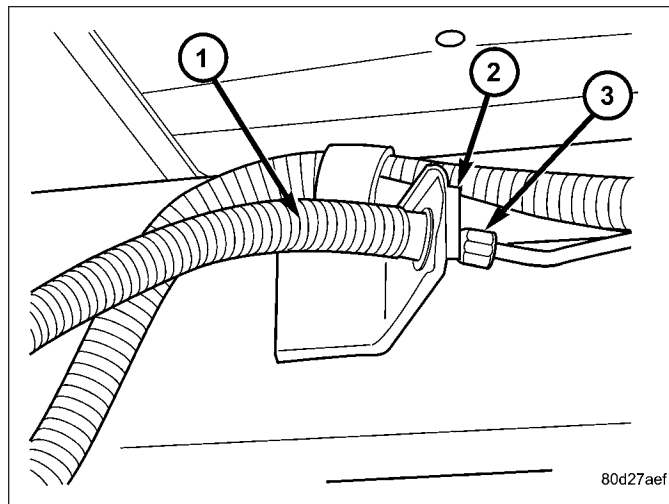
1. Cut off damaged tube with Tubing Cutter.
2. Remove any burrs from the inside of the tube.
3. Install tube nut on the tube.
4. Position the tube in the flaring tool flush with the top of the tool bar (6). Then tighten the tool bar on the tube.
5. Install the correct size adaptor (1) on the flaring tool yoke screw.
6. Lubricate the adaptor (2).
7. Align the adaptor and yoke screw over the tube.
8. Turn the yoke screw in until the adaptor is squarely seated on the tool bar.



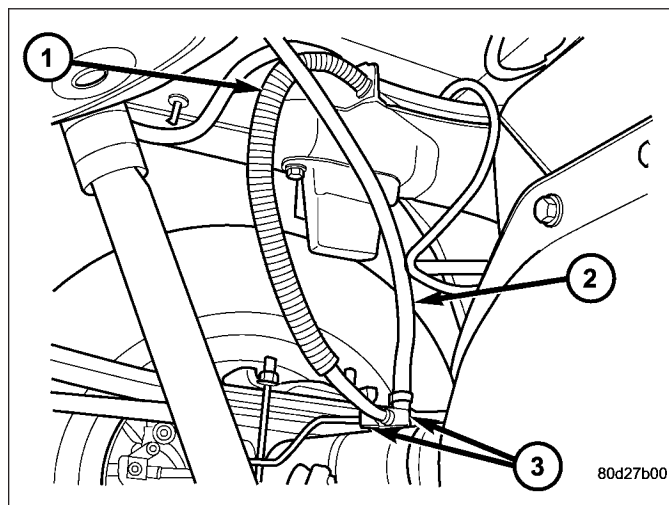
REMOVAL

REAR BRAKE HOSE

1. Raise and support the vehicle.
2. Remove the brake line (3) from the hose (1) at the frame.
3. Remove the brake hose clip (2) at the top of the hose located at the frame.

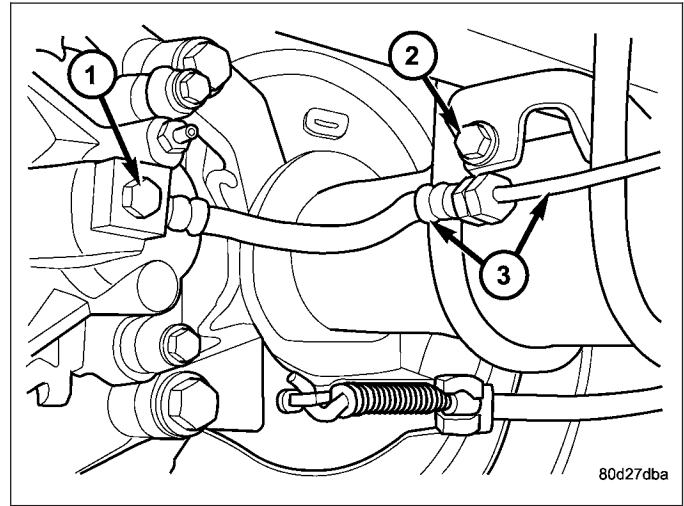


4. Remove the vent hose (2).
5. Remove the two brake lines (3) at the bottom of the hose (1) located at the axle.
6. Remove the mounting bolt for the brake hose at the axle.
7. Remove the hose.



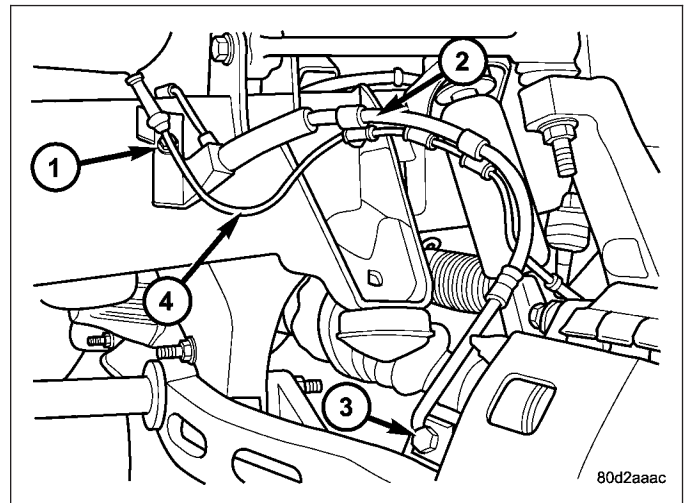
REAR TUBE / HOSE ASSEMBLY

1. Raise and support the vehicle.
2. Remove the brake line located at the axle.
3. Remove the mounting bolt (2) for the brake hose (3) at the axle.
4. Remove the banjo bolt (1) at the caliper.
5. Remove the hose.



FRONT HOSE

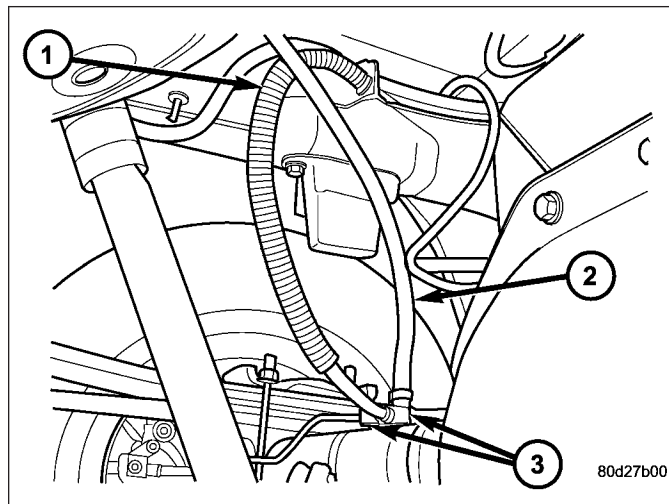
1. Raise and support vehicle.
2. Remove the tire and wheel assembly.
3. Remove the brake hose (2) from the brake line located at the frame.
4. Remove the brake hose banjo bolt (3) at the caliper.
5. Remove the mounting bolt securing the brake hose (2) to the frame and remove the wheel speed sensor wire (4) from the brake hose (2).
6. Remove the hose.



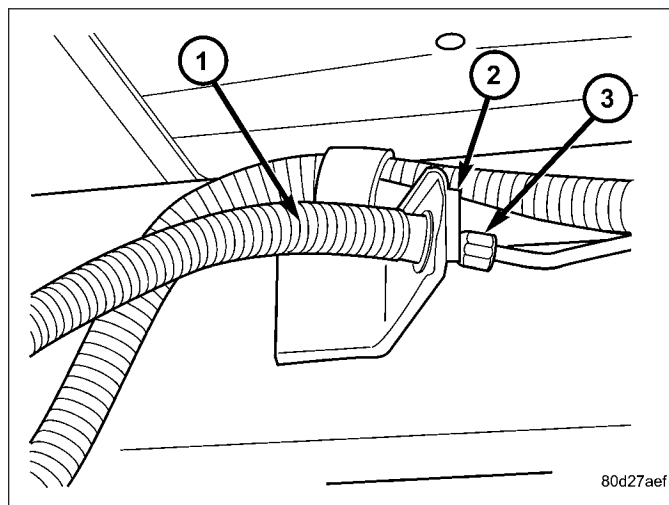
INSTALLATION

REAR BRAKE HOSE

1. Install the hose (1).
2. Install the mounting bolt for the brake hose (1) at the axle.
3. Install the two brake lines (3) at the bottom of the hose located at the axle.
4. Install the vent hose (2).

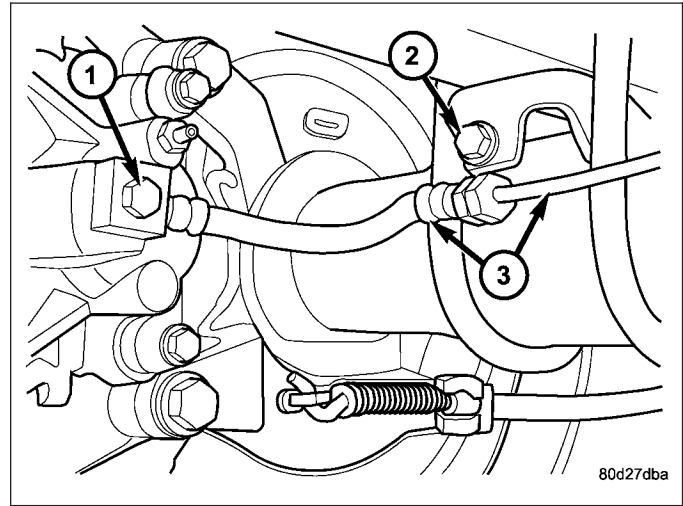


5. Install the brake hose clip (2) at the top of the hose (1) located at the frame.
6. Install the brake line (3) to the hose at the frame.
7. Lower the vehicle and remove the support.
8. Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).



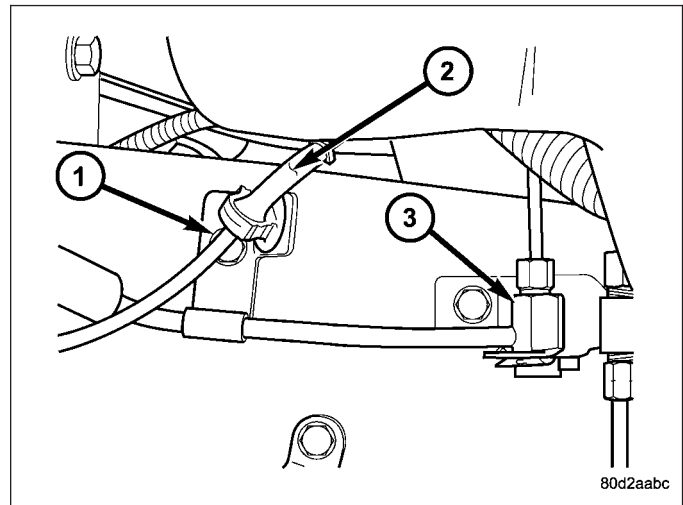
REAR TUBE / HOSE ASSEMBLY

1. Install the hose (3).
2. Install the banjo bolt (1) at the caliper and tighten fitting bolt to 27 N·m (245 in. lbs.).
3. Install the mounting bolt (2) for the brake hose (3) at the axle.
4. Install the brake line located at the axle.
5. Lower the vehicle and remove the support.
6. Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).



FRONT BRAKE HOSE

1. Install the hose (3).
2. Install the mounting bolt (1) for the brake hose (3) at the frame.
3. Install the brake hose banjo bolt at the caliper.
4. Reinstall the wheel speed sensor wire (2) to the brake hose.
5. Remove the support and lower the vehicle.
6. Bleed the brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

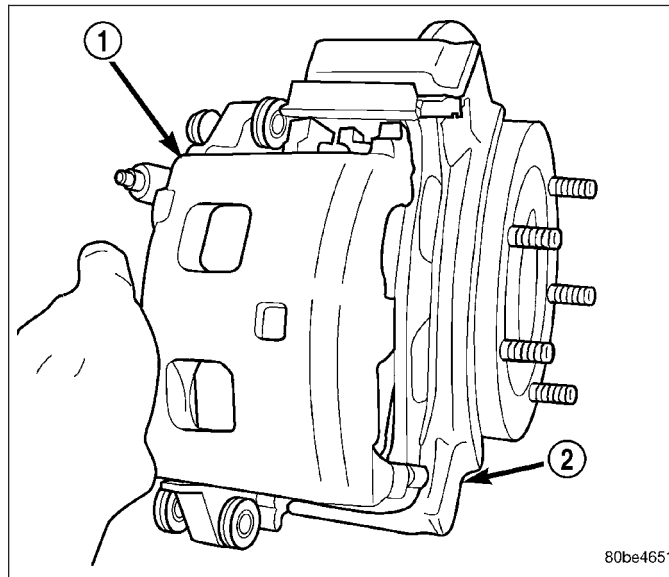


PADS - BRAKE

REMOVAL

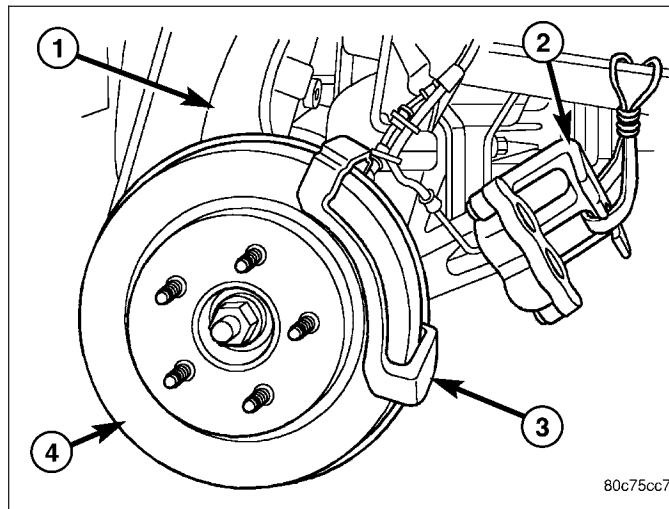
FRONT

1. Raise and support vehicle.
2. Remove the wheel and tire assemblies.
3. Compress the caliper.
4. Remove the caliper (1), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
5. Remove the caliper (1) by tilting the top up and off the caliper adapter (2).

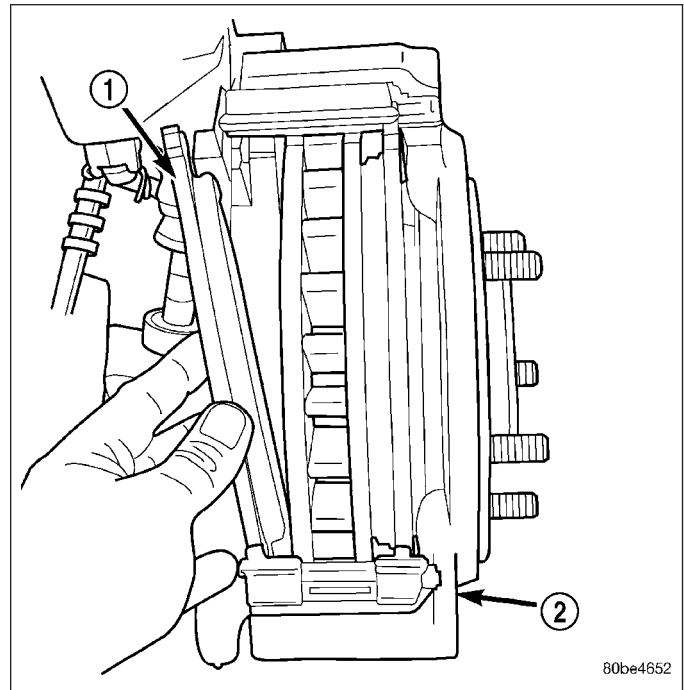


NOTE: Do not allow brake hose to support caliper assembly.

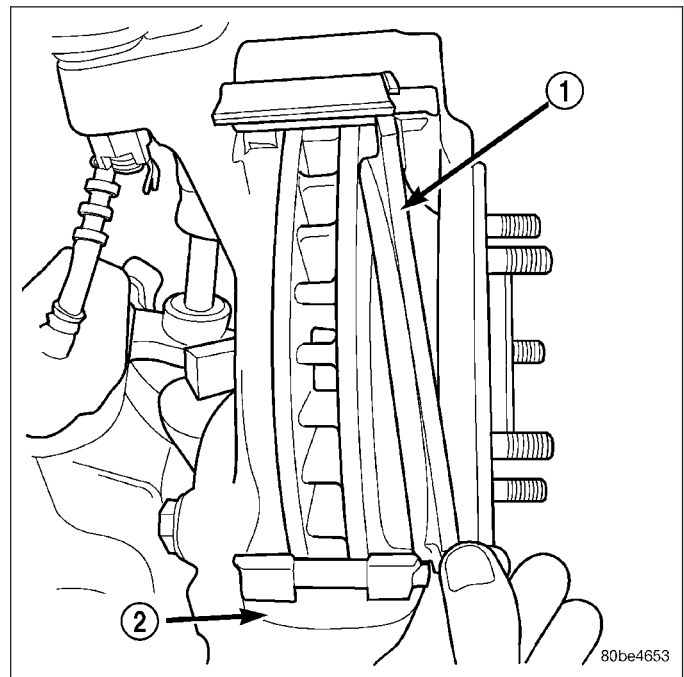
6. Support and hang the caliper (2).



7. Remove the inboard brake shoe (1) from the caliper adapter (2).

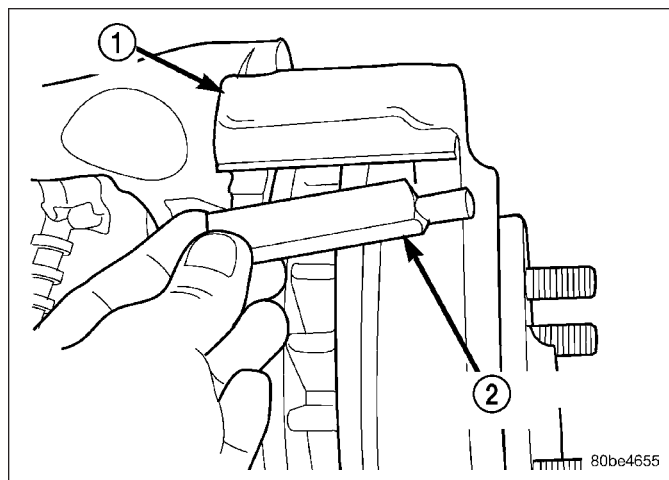


8. Remove the outboard brake shoe (1) from the caliper adapter (2).

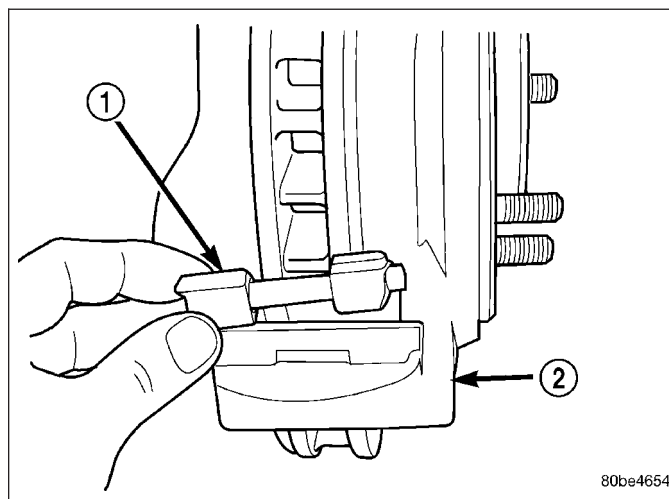


NOTE: Anti-rattle springs are not interchangeable.

9. Remove the top anti-rattle springs (2) from the caliper adapter (1).

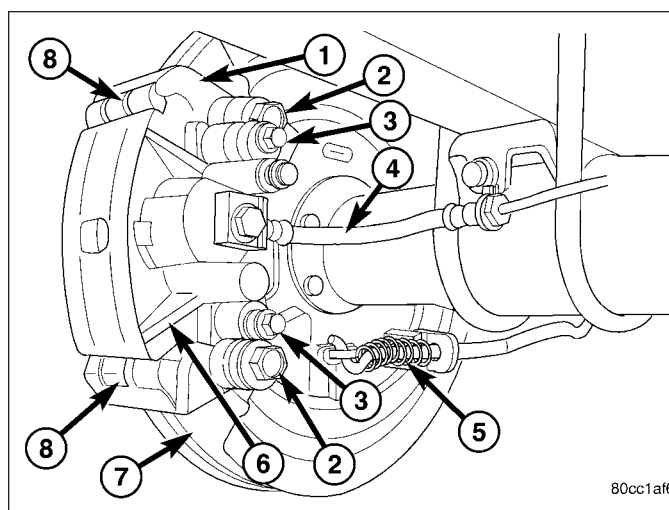


10. Remove the bottom anti-rattle springs (2) from the caliper adapter (1).



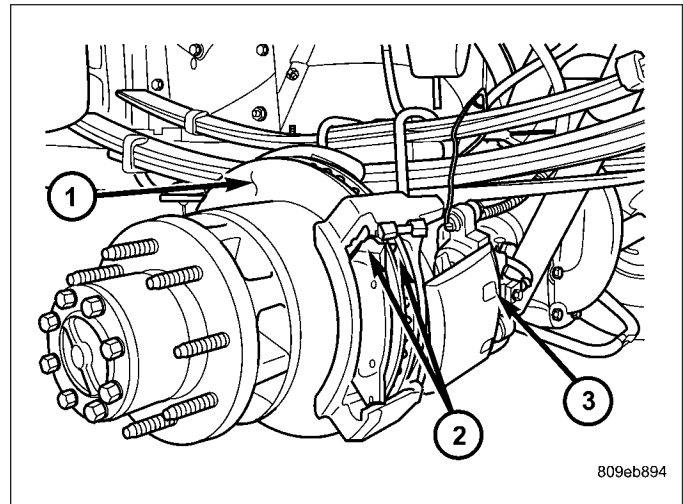
REAR

1. Raise and support the vehicle.
2. Remove the rear wheel and tire assemblies.
3. Compress the caliper.
4. Remove caliper slide bolts (3).

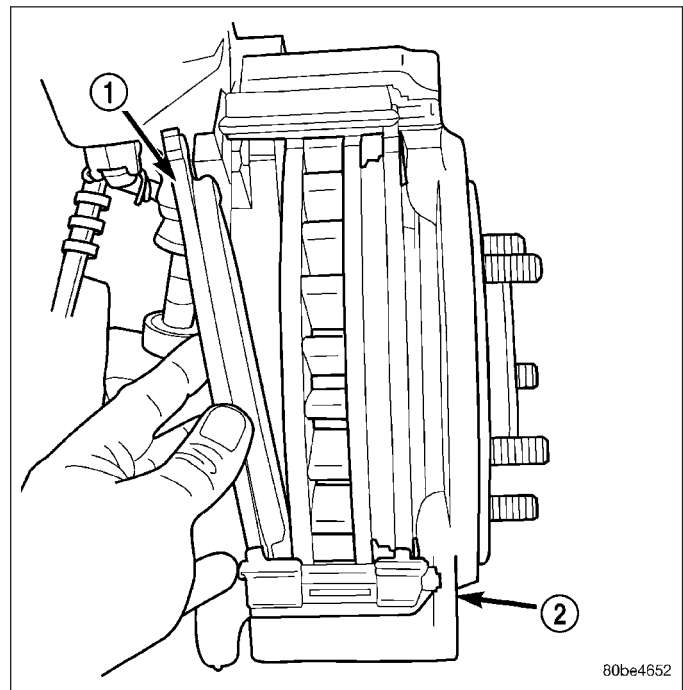


NOTE: Do not allow brake hose to support caliper assembly.

5. Remove the caliper (3), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL) and then tilt the top up and off the caliper adapter.



6. Remove inboard brake shoe (1) from the caliper adapter (2).

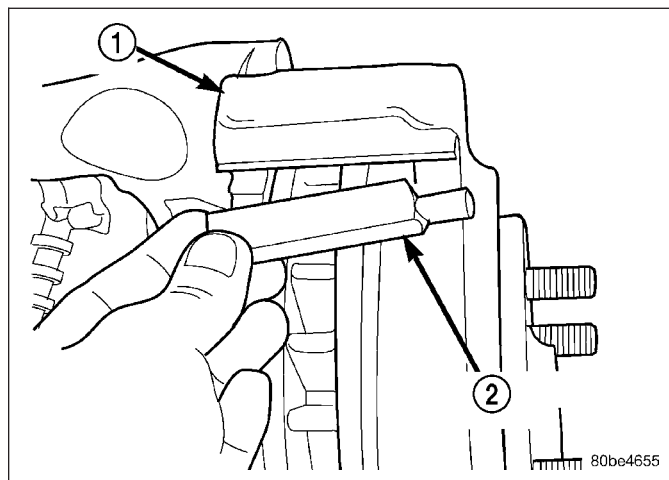


7. Remove outboard brake shoe (1) from caliper adapter (2).

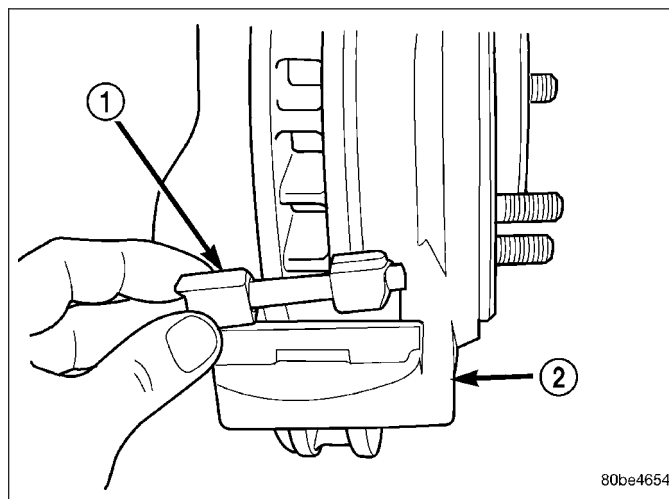


NOTE: Anti-rattle springs are not interchangeable.

8. Remove the top anti-rattle spring (2) from the caliper adapter (1).



9. Remove the top anti-rattle spring (2) from the caliper adapter (1).



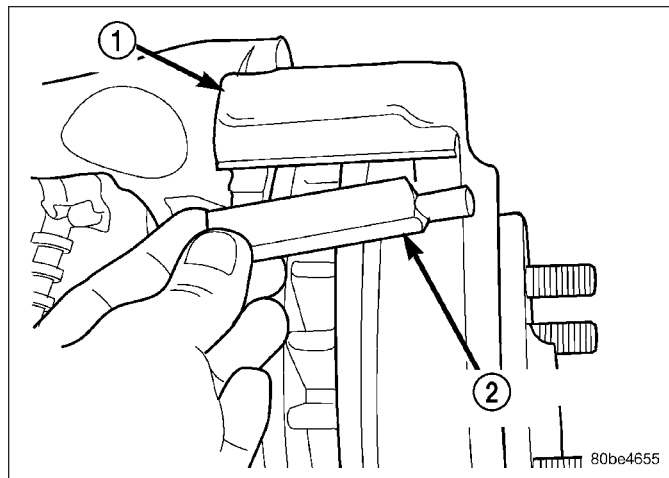
INSTALLATION

FRONT

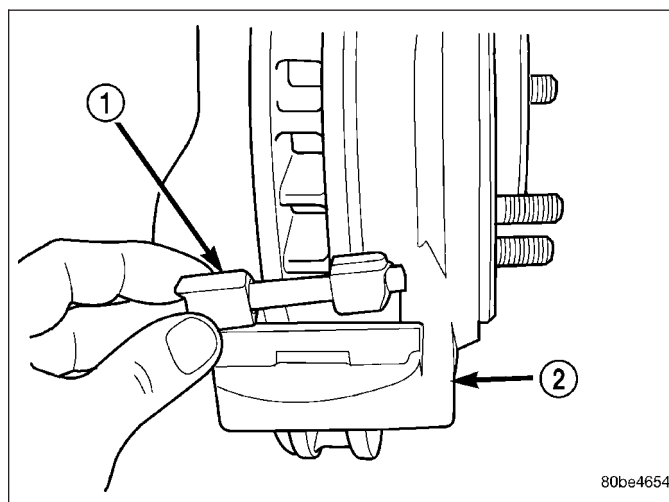
1. Bottom pistons in caliper bore with C-clamp. Place an old brake shoe between a C-clamp and caliper piston.
2. Clean caliper mounting adapter (1) and anti-rattle springs (2).
3. Lubricate anti-rattle springs with Mopar brake grease.

NOTE: Anti-rattle springs are not interchangeable.

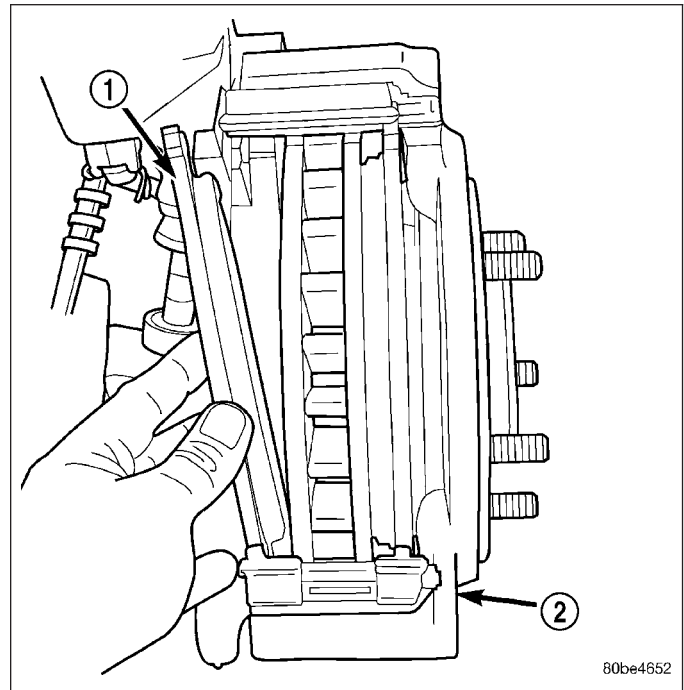
4. Install **new** top anti-rattle springs (2).



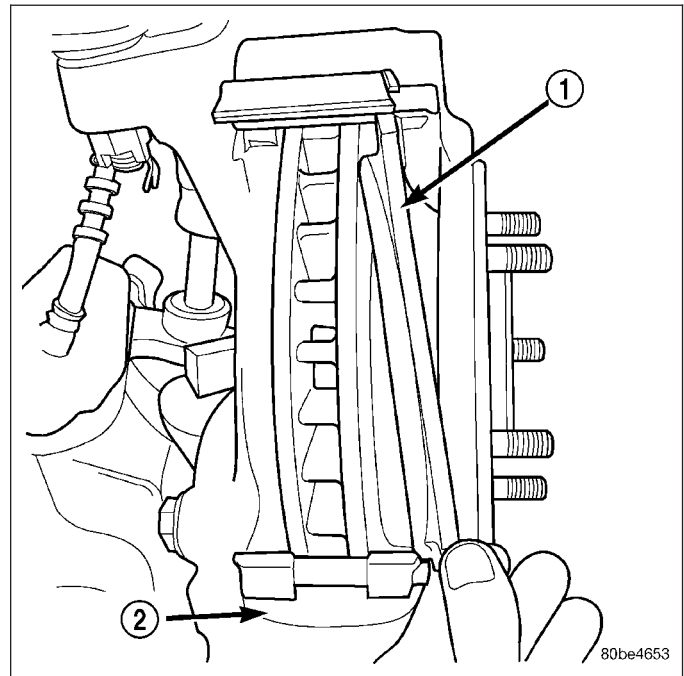
5. Install **new** bottom anti-rattle springs (1).



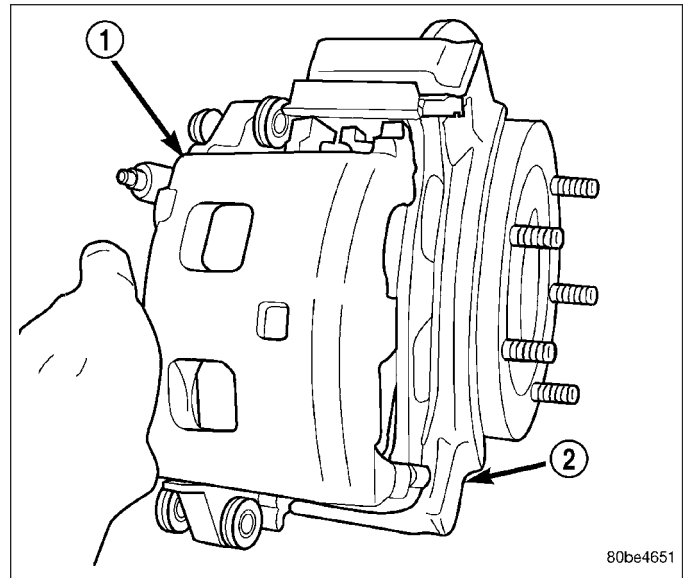
6. Install inboard brake shoe (1) in adapter (2).



7. Install outboard brake shoe (1) in adapter (2).



8. Tilt the top of the caliper (1) over rotor and under adapter (2). Then push the bottom of the caliper down onto the adapter.
9. Install caliper (1), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
10. Install wheel and tire assemblies and lower vehicle, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
11. Apply brakes several times to seat caliper pistons and brake shoes and obtain firm pedal.
12. Top off master cylinder fluid level.

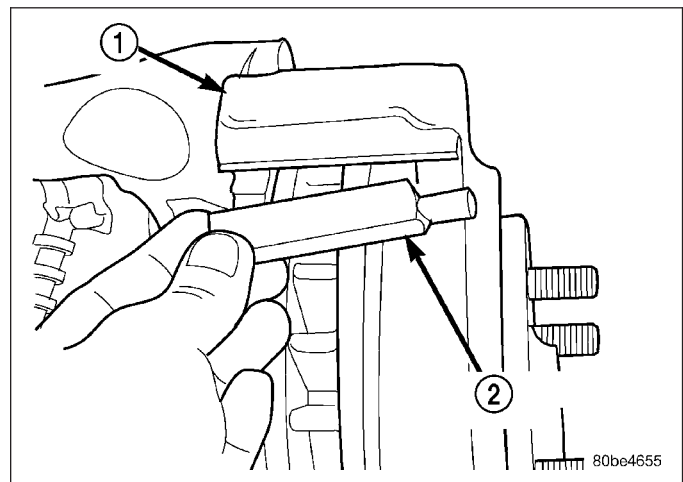


REAR

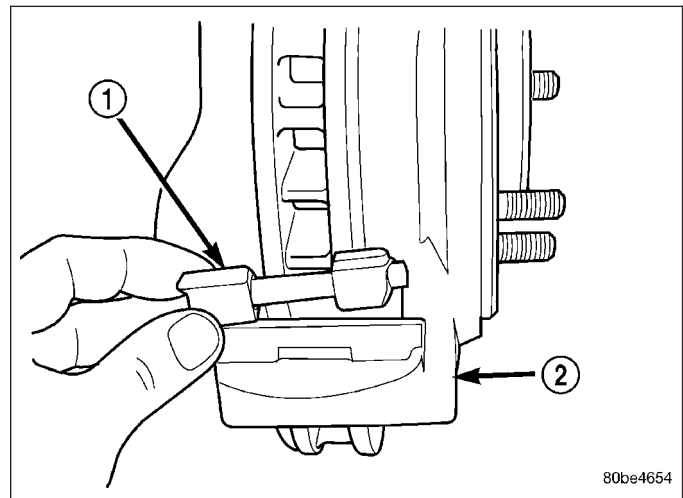
1. Clean caliper mounting adapter (1) and anti-rattle springs (2).
2. Lubricate anti-rattle springs with Mopar brake grease.

NOTE: Anti-rattle springs are not interchangeable.

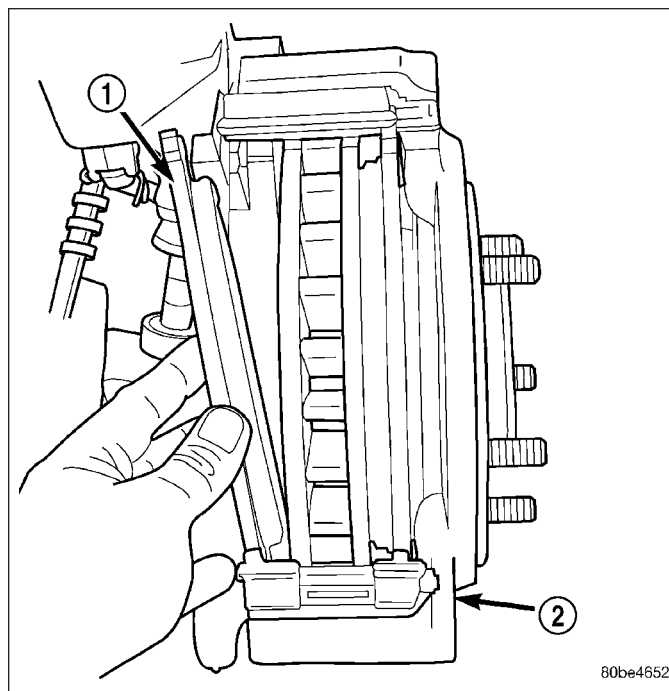
3. Install **new** top anti-rattle spring (2).



4. Install **new** bottom anti-rattle spring (1).



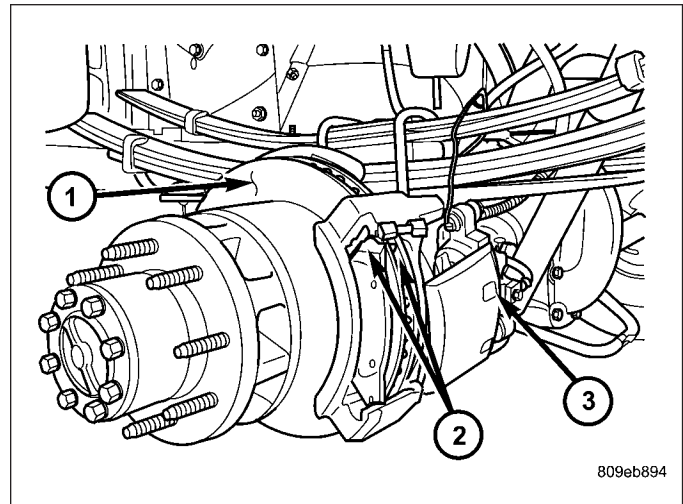
5. Install inboard brake shoe (1) in adapter (2).



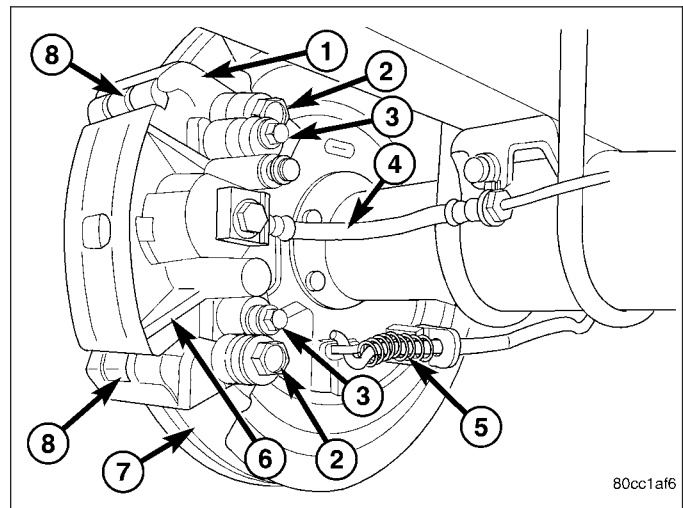
6. Install outboard brake shoe (1) in adapter (2).



7. Tilt the bottom of the caliper (3) over rotor (1) and under adapter. Then push the top of the caliper down onto the adapter.



8. Install caliper (6), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
9. Install wheel and tire assemblies and lower vehicle, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
10. Apply brakes several times to seat caliper pistons and brake shoes and obtain firm pedal.
11. Top off master cylinder fluid level.



CALIPERS-DISC BRAKE

DESCRIPTION

LIGHT DUTY (LD) CALIPERS

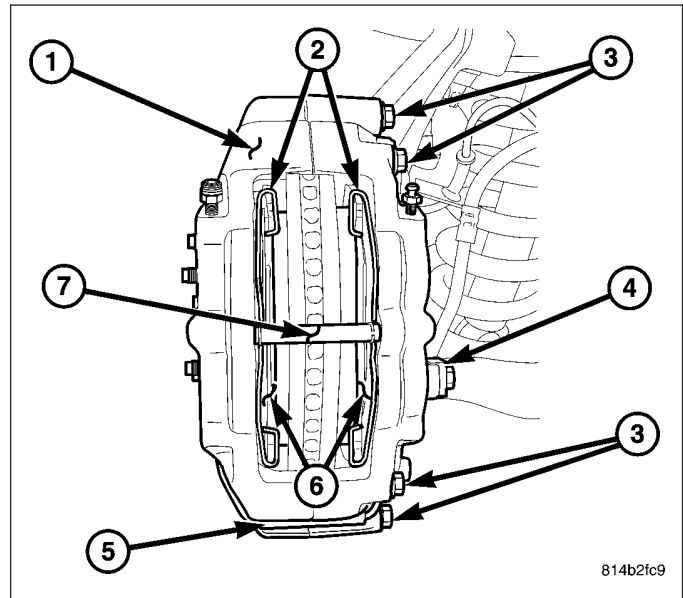
The calipers are a single piston type in the rear and dual piston type in the front. The calipers are free to slide laterally, this allows continuous compensation for lining wear.

HEAVY DUTY (HD) CALIPERS

The calipers are a dual piston type in the front & rear. The calipers are free to slide laterally, this allows continuous compensation for lining wear.

FRONT CALIPERS – SRT-10

The front calipers (1) are a four piston type and the rear calipers are a dual piston type. The calipers are free to slide laterally, this allows continuous compensation for lining wear.



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OPERATION

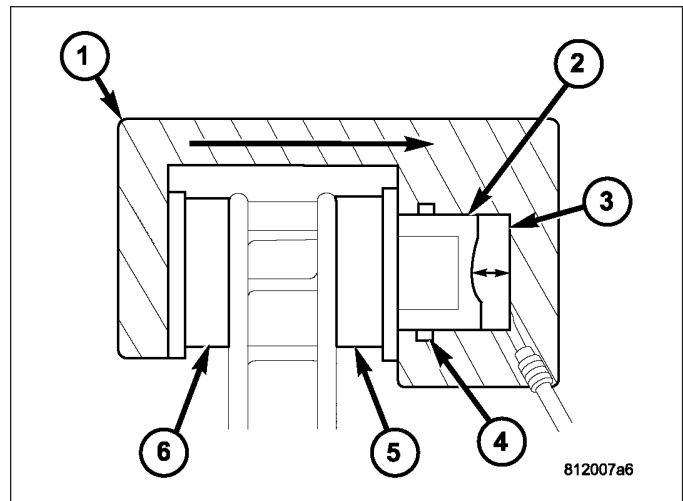
When the brakes are applied fluid pressure is exerted against the caliper piston (2). The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal.

Fluid pressure applied to the piston is transmitted directly to the inboard brake pad (5). This forces the pad lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on the mounting bolts. This action brings the outboard brake pad lining (6) into contact with the outer surface of the disc brake rotor.

In summary, fluid pressure acting simultaneously on both piston and caliper, produces a strong clamping action. When sufficient force is applied, friction will attempt to stop the rotors from turning and bring the vehicle to a stop.

Application and release of the brake pedal generates only a very slight movement of the caliper and piston. Upon release of the pedal, the caliper and piston return to a rest position. The brake pads do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

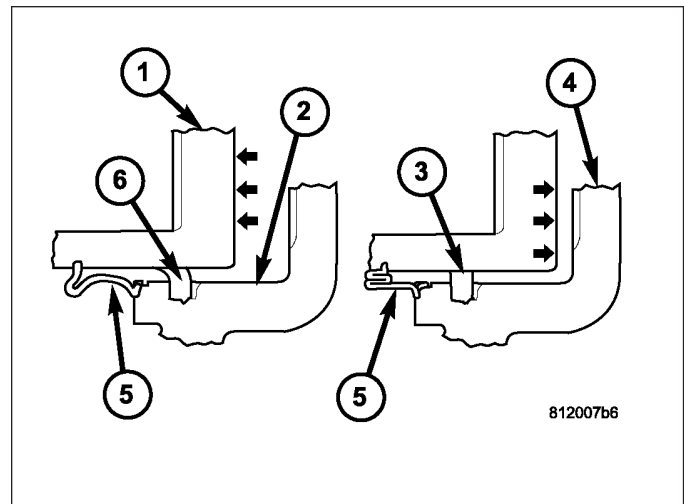
The caliper piston seal (4) controls the amount of piston (2) extension needed to compensate for normal lining wear.



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During brake application, the seal is deflected outward by fluid pressure and piston movement(6). When the brakes (and fluid pressure) are released, the seal relaxes and retracts the piston (3).

The amount of piston retraction is determined by the amount of seal deflection. Generally the amount is just enough to maintain contact between the piston and inboard brake pad.

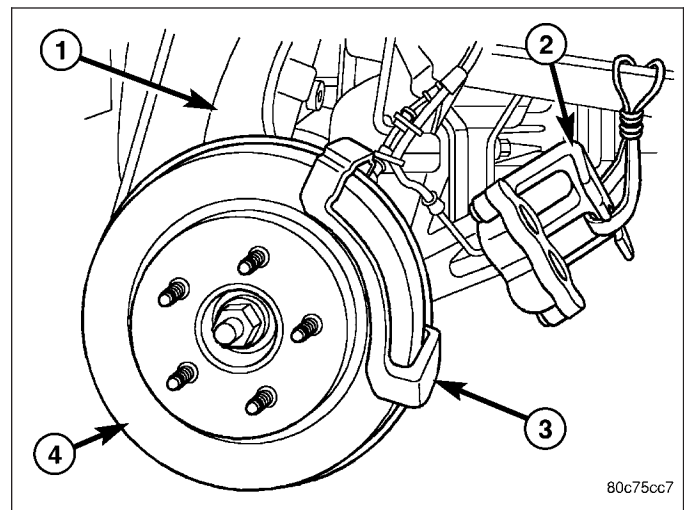


REMOVAL

FRONT

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

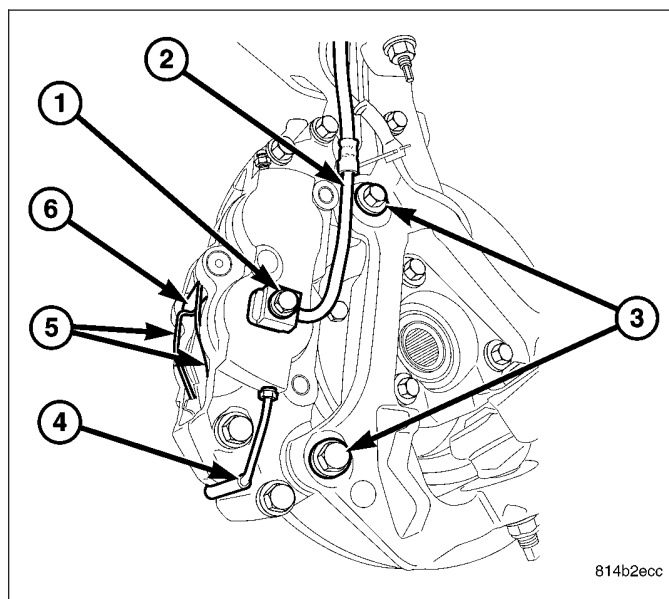
1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Compress the disc brake caliper.
4. Remove the banjo bolt and discard the copper washer.
5. Remove the caliper slide bolts.
6. Remove the disc brake caliper (2).



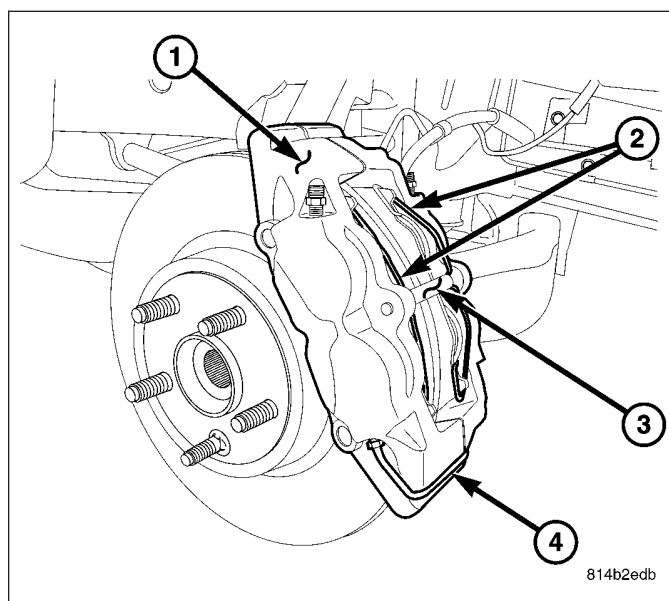
FRONT - SRT-10

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Compress the disc brake caliper.
4. Remove the banjo bolt (1) and discard the copper washer.
5. Remove the caliper mounting bolts (3).



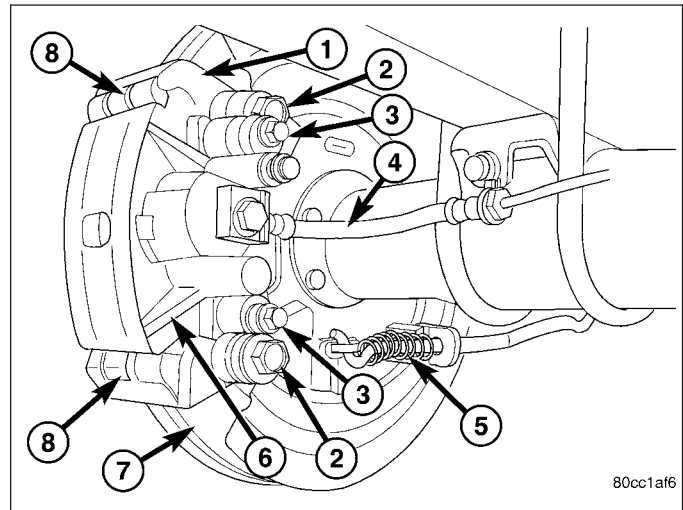
6. Remove the disc brake caliper (1).



REAR

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

1. Raise and support vehicle.
2. Remove the wheel and tire assembly.
3. Drain small amount of fluid from master cylinder brake reservoir with suction gun.
4. Remove the brake hose banjo bolt and discard the copper washers if replacing caliper.
5. Remove the caliper slide bolts (3).
6. Remove the caliper (6) from vehicle.

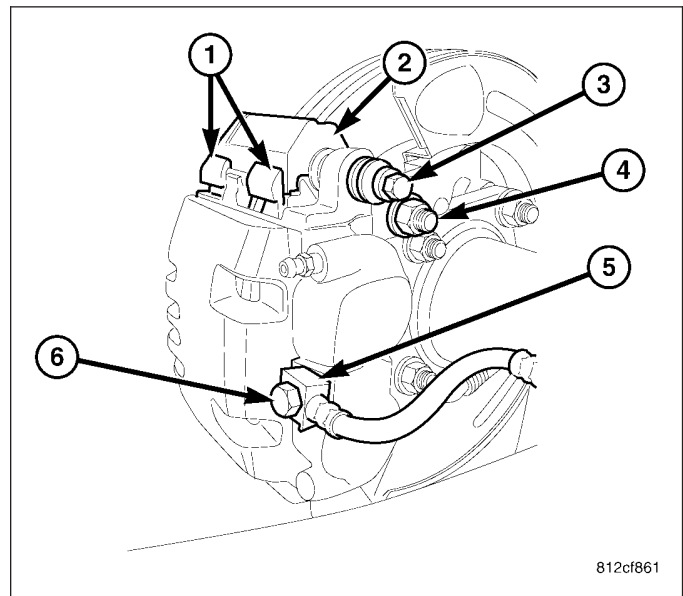


REAR - SRT-10

1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Compress the disc brake caliper using tool #C4212F.
4. Remove the caliper pin bolts (3).
5. Remove the banjo bolt (6) and discard the copper washer.

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose with result. Provide a suitable support to hang the caliper securely.

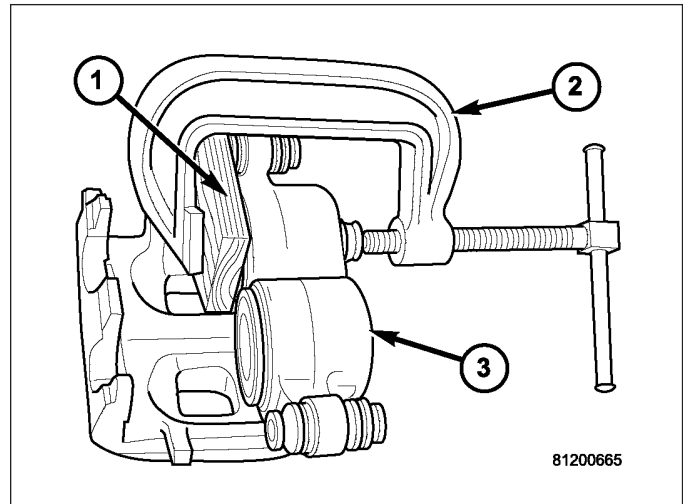
6. Remove the rear disc brake caliper.



DISASSEMBLY

DISC BRAKE CALIPER

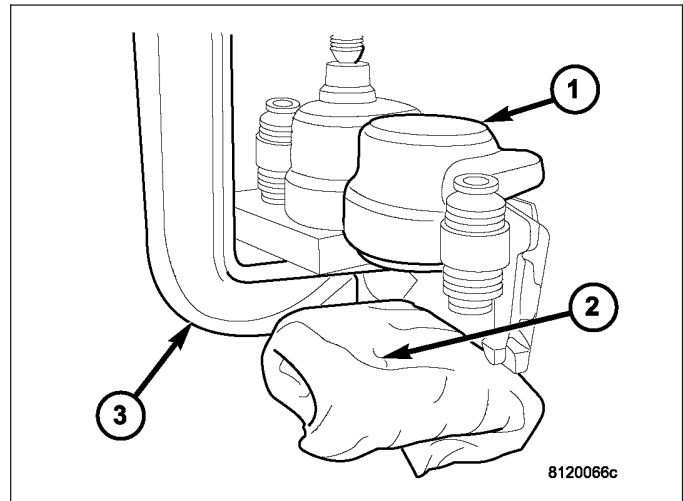
1. Drain the brake fluid from caliper.
2. C-clamp (2) a block of wood (1) over one piston.



3. Take another piece of wood and pad it with one-inch thickness of shop towels (2). Place this piece in the outboard shoe side of the caliper in front of the other piston. This will cushion and protect caliper piston during removal.
4. To remove the caliper piston direct **short bursts of low pressure air** with a blow gun through the caliper brake hose port. Use only enough air pressure to ease the piston out.

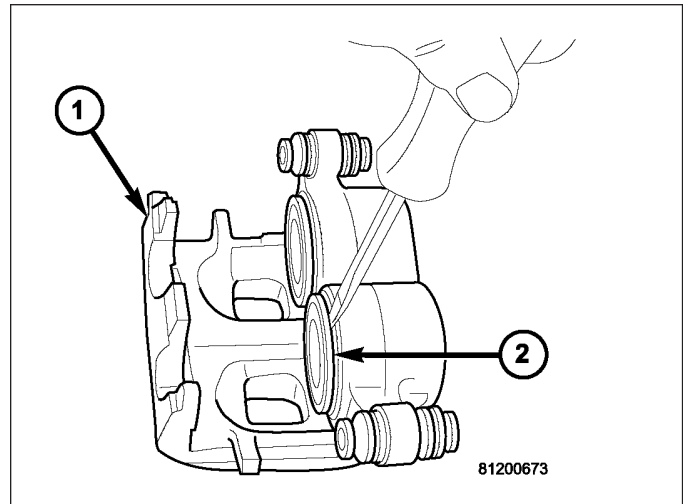
CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston.

WARNING: NEVER ATTEMPT TO CATCH THE PISTON AS IT LEAVES THE BORE. THIS COULD RESULT IN PERSONAL INJURY.



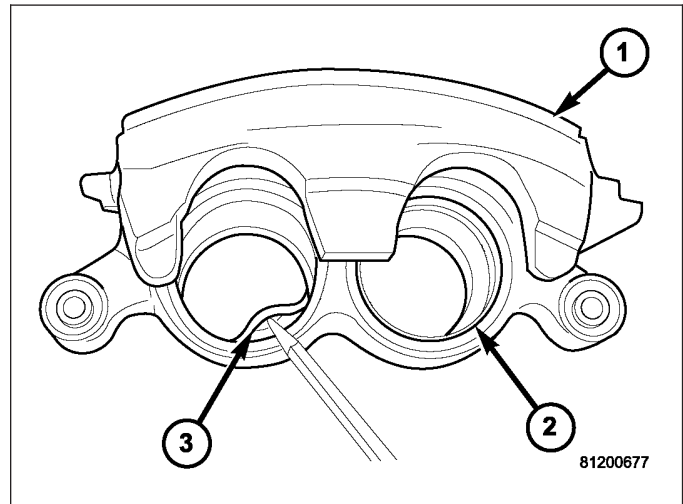
5. Remove the C-clamp and block of wood from the caliper and clamp it over the dust boot of the first piston removed. This will seal the empty piston bore.
6. Move the padded piece of wood in front of the other piston.
7. Remove the second piston using the same procedure with **short bursts of low pressure air**.

8. Remove piston dust boots (2) with a suitable pry tool.



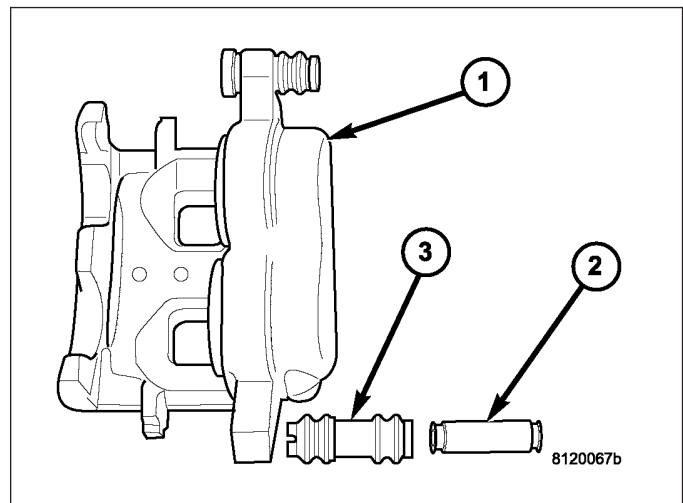
CAUTION: Do not scratch piston bore while removing the seals.

9. Remove piston seals (3) from caliper (1).



10. Push caliper mounting bolt bushings (3) out of the boot seals (2) and remove the boot seals from the caliper (1).

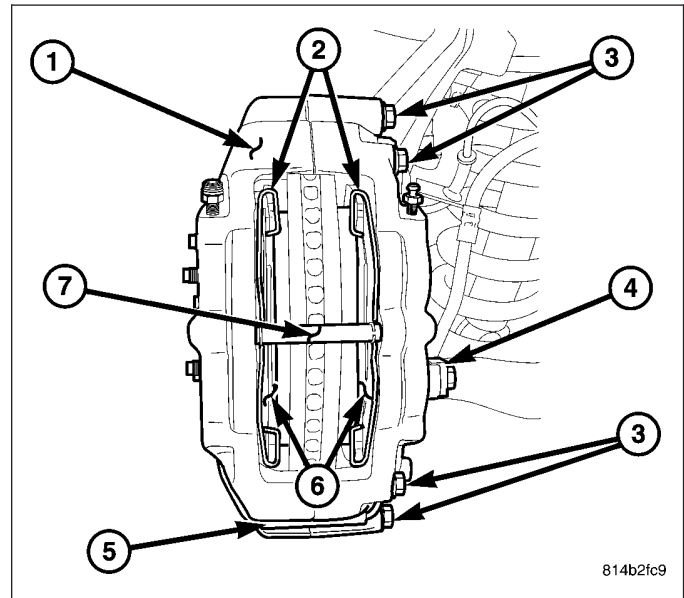
11. Remove caliper bleed screw.



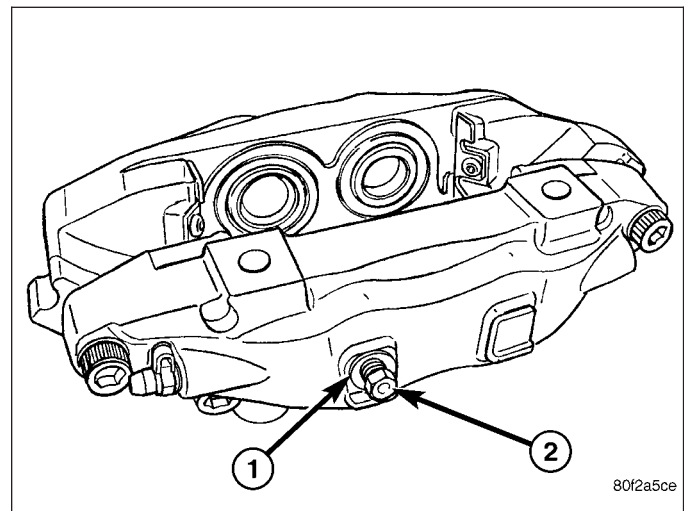
DISC BRAKE CALIPER - FRONT - SRT-10

NOTE: Before disassembling caliper, clean and inspect it. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - CLEANING) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSPECTION)

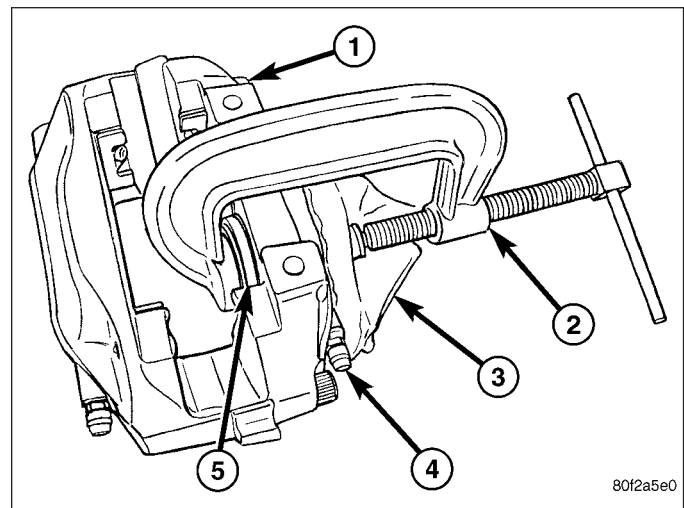
1. Remove front disc brake caliper (1) from vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - REMOVAL).
2. If brake pads were not removed from caliper prior to removing caliper from vehicle, remove brake pads (6). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/pads - REMOVAL)
3. Remove transfer brake tube (5) between inboard and outboard caliper halves.



4. Install M10 X 1.0 threaded plug(2) in flex hose banjo bolt hole (1). This hole needs to be plugged to remove caliper inboard pistons using compressed air.



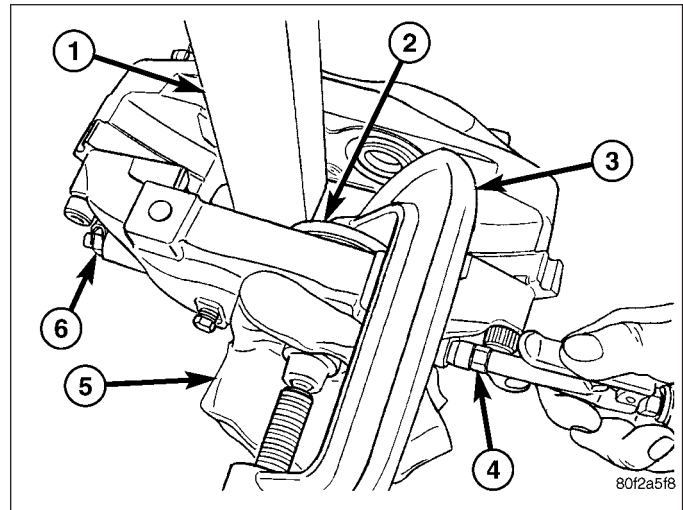
5. Install C-clamp (2) over inboard caliper piston nearest to bleeder screw as follows:
 - a. Lay shop towel (3) over outside of inboard caliper half to protect finish.
 - b. Place Installer, Special Tool 6454 (5), over piston and boot nearest to bleeder screw and hold in place. Either side of Installer will work.
 - c. Place C-clamp (2) over tool and towel as shown and tighten C-clamp. DO NOT USE EXCESSIVE FORCE; excessive force could damage caliper or piston.



6. Place an appropriate size block (1) of wood inside center area of caliper, in front of first piston to be removed. Block of wood should be large enough to allow piston to exit piston bore just far enough for piston to be pulled out remaining distance by hand, but not exit the bore completely.

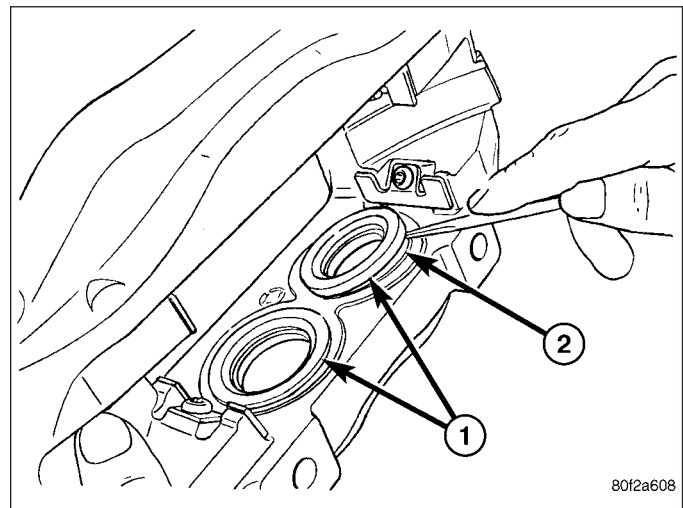
WARNING: DO NOT PLACE FACE OR HANDS NEAR PISTONS OR INTO CENTER AREA OF CALIPER WHEN USING COMPRESSED AIR TO REMOVE PISTONS FROM BORE OF CALIPER. PERSONAL INJURY CAN RESULT FROM SUCH ACTION.

WARNING: UNDER NO CONDITIONS SHOULD HIGH PRESSURE AIR BE USED TO REMOVE PISTON FROM CALIPER BORE. PERSONAL INJURY CAN RESULT FROM SUCH ACTION.

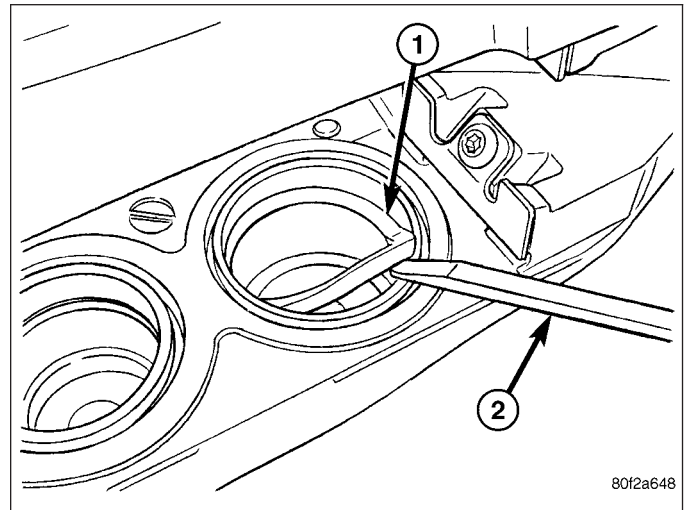


7. Using a rubber tipped air nozzle (4), apply short bursts of low pressure compressed air to caliper transfer port to force piston from bore.
8. Remove block of wood (1) from center area of caliper.
9. Remove piston from caliper bore, but leave piston dust boot in place.
10. Transfer C-clamp (3) and Installer to cover piston boot and bore where piston was just removed. It may be necessary to place a small piece of rubber over hole in center of Installer to seal off installer.
11. Place block of wood (1) inside center area of caliper, in front of second piston to be removed.
12. Using a rubber tipped air nozzle (4), apply short bursts of low pressure compressed air to caliper transfer port to force piston from bore.
13. Remove block of wood (1) from center area of caliper.
14. Remove piston from caliper bore.
15. Remove C-clamp (3) and Installer.

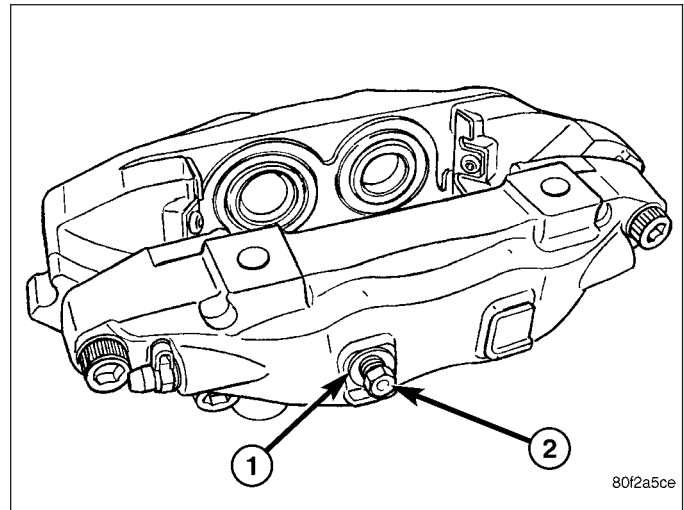
16. Remove piston dust boots (1) from empty piston bores of caliper. To do so, carefully pry each boot from its retaining groove using a small screwdriver. The screwdriver must be inserted between outer edge of dust boot and caliper. **Do not insert screwdriver into bore of caliper to remove boot; scoring of bore may occur.**



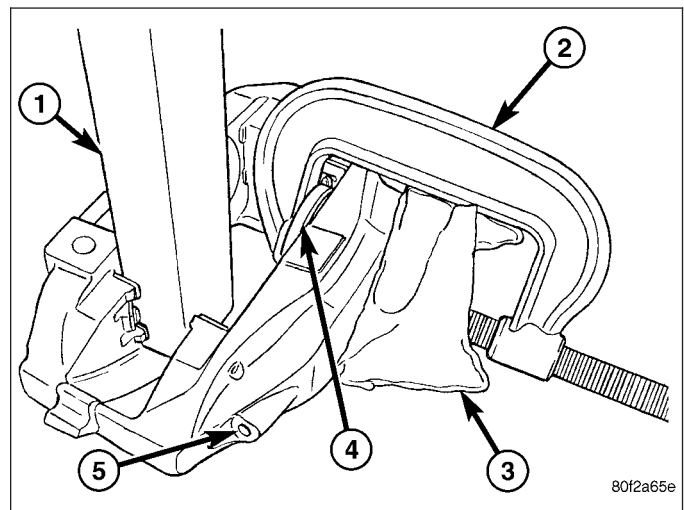
17. Remove piston seal (1) from each empty piston bores using a trim stick (2) or other suitable tool. **Do not use a screwdriver or other metal tool; scoring of bore or burring of seal groove may occur.**



18. Remove bleeder screw from inboard half of caliper.
19. Remove threaded plug (2) from banjo bolt hole (1) in inboard half of caliper.



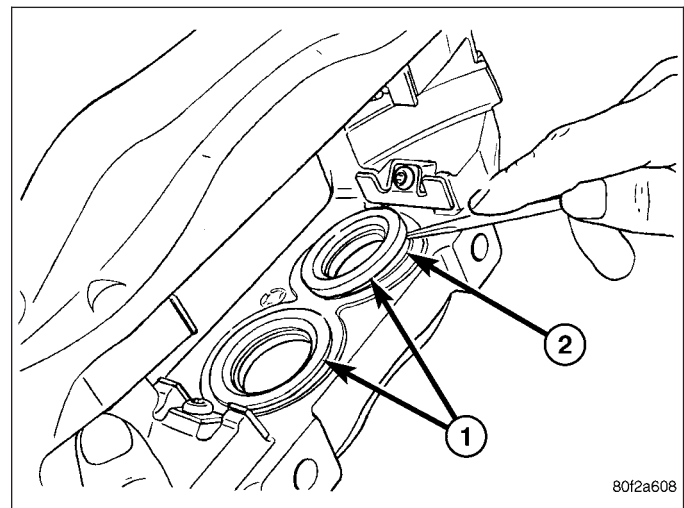
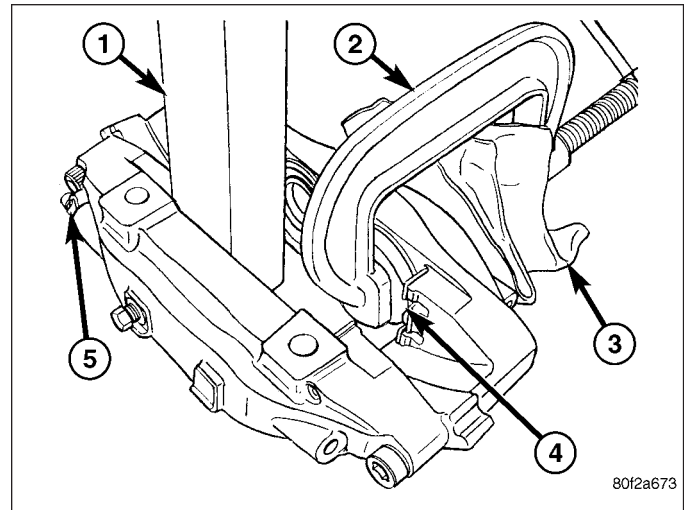
20. Install C-clamp (2) over outboard caliper piston nearest to bleeder screw as follows:
- Lay shop towel (3) over outside of outboard caliper half to protect finish.
 - Place Installer, Special Tool 6454 (4), over piston and boot nearest to bleeder screw and hold in place. Either side of Installer will work.
 - Place C-clamp (2) over tool and cloth as shown and tighten C-clamp. **DO NOT USE EXCESSIVE FORCE;** excessive force could damage caliper or piston.
21. Place an appropriate size block of wood (1) inside center area of caliper, in front of piston nearest transfer tube port. Block of wood should be large enough to allow piston to exit piston bore just far enough for piston to be pulled out remaining distance by hand, but not exit the bore completely.



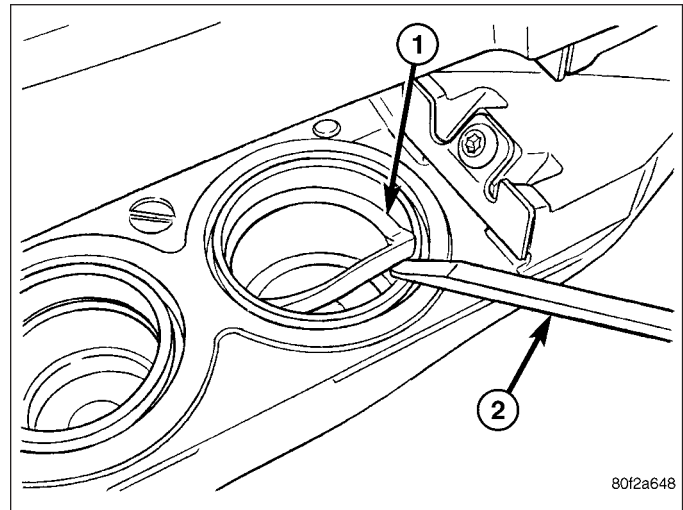
WARNING: DO NOT PLACE FACE OR HANDS NEAR PISTONS OR INTO CENTER AREA OF CALIPER WHEN USING COMPRESSED AIR TO REMOVE PISTONS FROM BORE OF CALIPER. PERSONAL INJURY CAN RESULT FROM SUCH ACTION.

WARNING: UNDER NO CONDITIONS SHOULD HIGH PRESSURE AIR BE USED TO REMOVE PISTON FROM CALIPER BORE. PERSONAL INJURY CAN RESULT FROM SUCH ACTION.

22. Using a rubber tipped air nozzle, apply short bursts of low pressure compressed air to caliper transfer port to force piston from bore.
23. Remove block of wood (1) from center area of caliper.
24. Remove piston from caliper bore, but leave piston dust boot in place.
25. Transfer C-clamp (2) and Installer to cover piston boot and bore where piston was just removed. It may be necessary to place a small piece of rubber over hole in center of Installer to seal off installer.
26. Place the piece of wood (1) inside center area of caliper, in front of piston to be removed.
27. Using a rubber tipped air nozzle, apply short bursts of low pressure compressed air to caliper transfer port to force piston from bore.
28. Remove piece of wood from center area of caliper.
29. Remove piston from caliper bore.
30. Remove C-clamp and Installer.
31. Remove piston dust boots (1) from empty piston bores of outboard half of caliper. To do so, carefully pry each boot from its retaining groove (2) using a small screwdriver. The screwdriver must be inserted between outer edge of dust boot and caliper. **Do not insert screwdriver into bore of caliper to remove boot; scoring of bore may occur.**



32. Remove piston seal (1) from each empty piston bore of outboard half of caliper using a trim stick (2) or other suitable tool. **Do not use a screwdriver or other metal tool; scoring of bore or burring of seal groove may occur.**
33. Remove bleeder screw on outboard half of caliper.



34. Thoroughly clean each of the four pistons using Mopar® Non-Chlorinated Brake Parts Cleaner, alcohol or other suitable solvent and wipe dry using a lint free towel. Inspect all surfaces of each piston for any signs of corrosion or scoring. If any corrosion on piston cannot be removed using these products, or if piston is scored, replace piston. **Do not sand piston to remove corrosion or scoring.**

CAUTION: Do not attempt to hone piston bores of this caliper. If bores cannot be cleaned using appropriate solvents, caliper must be replaced.

35. Clean piston bores of caliper using Mopar® Non-Chlorinated Brake Parts Cleaner, alcohol or another suitable solvent saturated into a lint free towel. Once thoroughly cleaned, wipe each bore dry using a clean lint free towel. Inspect all surfaces inside caliper bores for any signs of corrosion or scoring. If any corrosion inside piston bores cannot be removed using these products, or if any bore is scored, the caliper assembly must be replaced.
36. Using compressed air, blow out piston bores of caliper to remove any particles that may be left from cleaning procedure and to ensure bore is dry.
37. Proceed to Assembly to assemble caliper. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - ASSEMBLY)

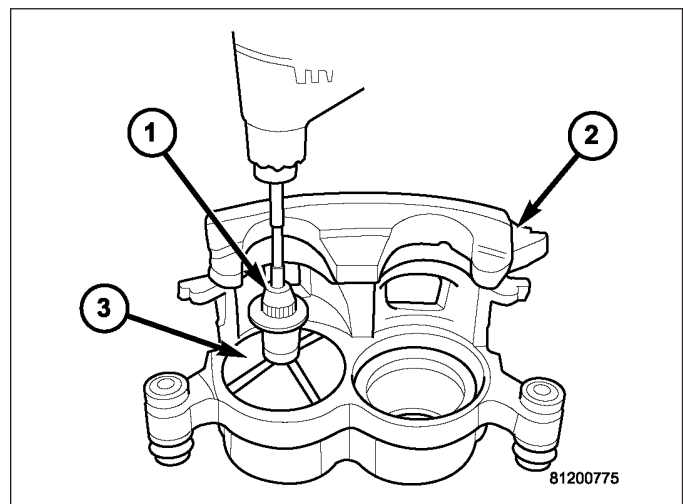
INSPECTION

The piston is made from a phenolic resin (plastic material) and should be smooth and clean.

The piston must be replaced if cracked or scored. Do not attempt to restore a scored piston surface by sanding or polishing.

CAUTION: If the caliper piston is replaced, install the same type of piston in the caliper. Never interchange phenolic resin and steel caliper pistons. The pistons, seals, seal grooves, caliper bore and piston tolerances are different.

The bore can be **lightly** polished with a brake hone (3) to remove very minor surface imperfections. The caliper should be replaced if the bore is severely corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).



ASSEMBLY

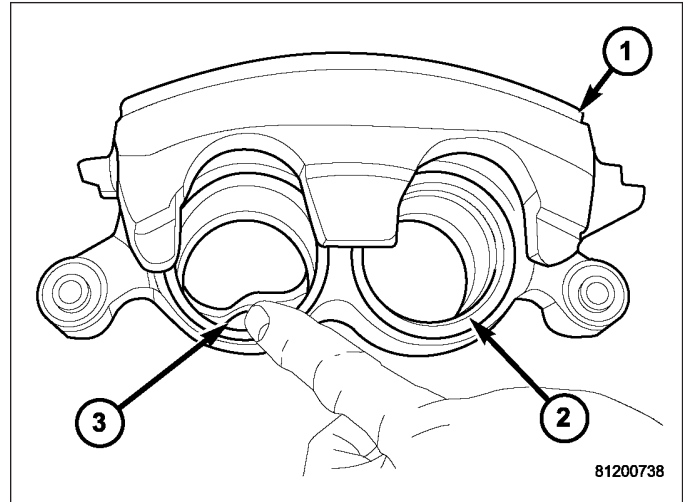
DISC BRAKE CALIPER

CAUTION: Dirt, oil, and solvents can damage caliper seals. Insure assembly area is clean and dry.

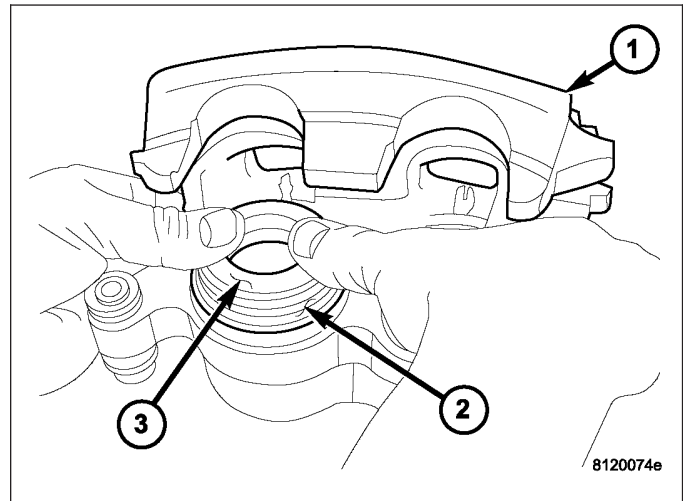
1. Lubricate caliper pistons, piston seals and piston bores with clean, fresh brake fluid.

NOTE: Verify seal is fully seated and not twisted.

2. Install new piston seals (3) into caliper bores (2).



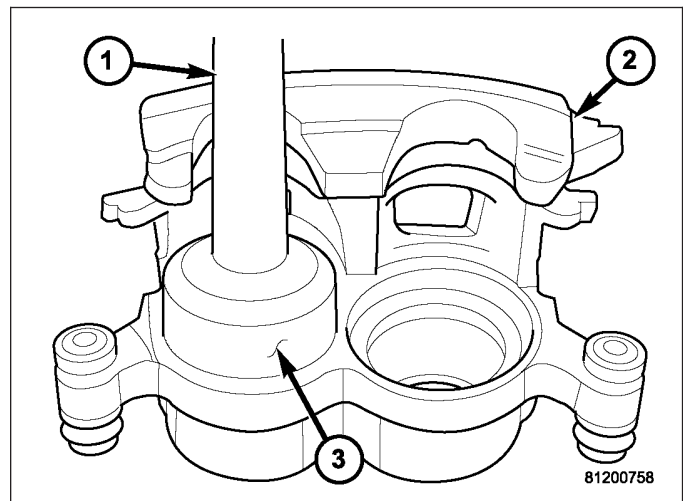
3. Lightly lubricate lip of new boot with silicone grease. Install boot on piston and work boot lip into the groove at the top of piston (3).
4. Stretch boot (2) rearward to straighten boot folds, then move boot forward until folds snap into place.
5. Install piston (3) into caliper bore and press piston down to the bottom of the caliper bore by hand or with hammer handle.



6. Seat dust boot in caliper (2) with Handle C-4171 (1) and Installer (3):
 - 54 mm caliper: Installer C-3716-A
7. Install the second piston and dust boot.
8. Lubricate caliper mounting bolt bushings, boot seals and bores with Mopar brake grease or Dow Corning® 807 grease only.

CAUTION: Use of alternative grease may cause damage to the boots seals.

9. Install the boot seals into the caliper seal bores and center the seals in the bores.
10. Install mounting bolt bushings into the boot seals and insure seal lip is engaged into the bushing grooves at either end of the bushing.

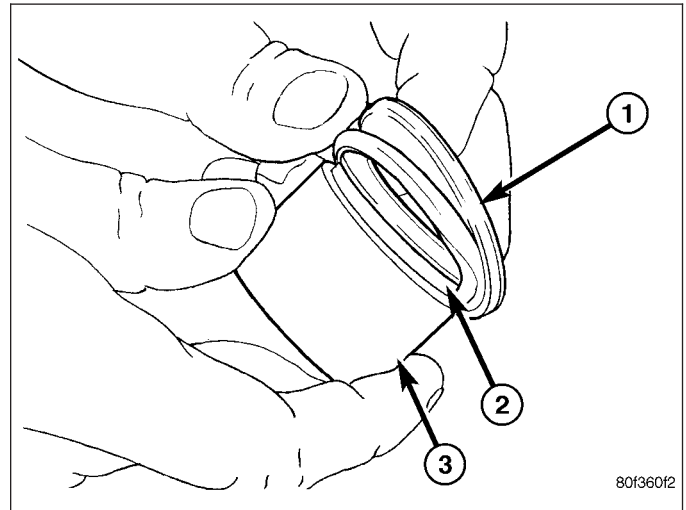


11. Install caliper bleed screw.

DISC BRAKE CALIPER - FRONT - SRT-10

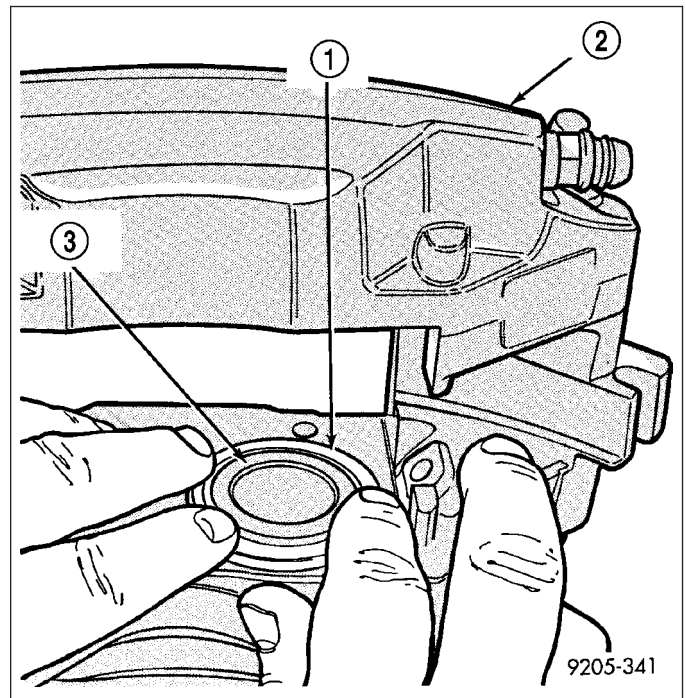
NOTE: Perform Step 1 through Step 4 for each piston and bore of caliper. Keep in mind there are two different size pistons, bores, seals and boots used on each caliper.

1. Dip NEW piston seal in fresh clean Mopar® brake fluid conforming to DOT 4 specifications. By hand, gently work seal into seal groove in caliper piston bore until the seal is properly seated.
2. Lightly coat inside of NEW dust boot (1) with fresh clean Mopar® brake fluid conforming to DOT 4 specifications. Install dust boot on caliper piston (3). Be sure dust boot is completely seated in retaining groove (2) of caliper piston.

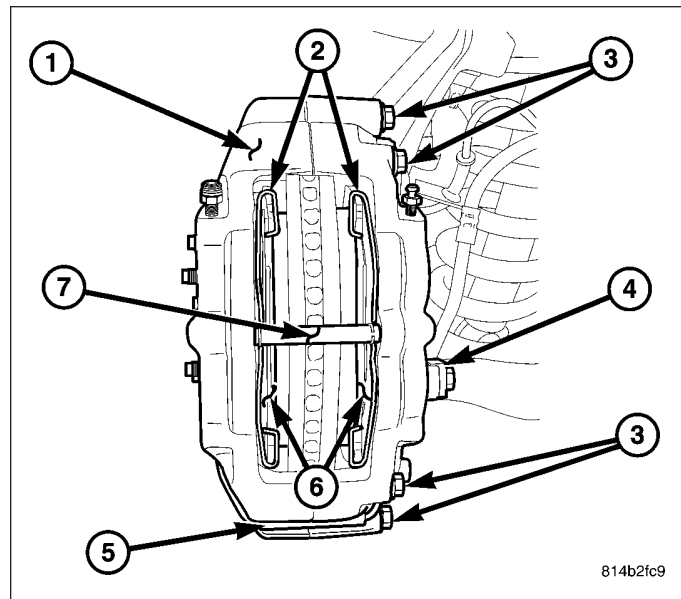


CAUTION: When installing piston (3), force must be applied to the piston uniformly to avoid cocking and binding the piston in the bore.

3. Squarely position piston (3) into top portion of piston bore. Using finger pressure, evenly apply pressure to top of piston, pressing it into bore until it is past piston seal, bottomed in bore.
4. Using finger pressure, press outer ring of dust boot into retaining groove surrounding caliper bore until flush with caliper machined surface.



5. Repeat above procedure for remaining pistons and bores.
6. Install bleeder screws in top of caliper.
7. Install transfer brake fluid tube (5) between inboard and outboard caliper halves. Tighten tube nuts to 17 N·m (145 in. lbs.) torque.
8. Install brake pads (6) in caliper (1). (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/BRAKE PADS/SHOES - INSTALLATION)
9. Install caliper (1) on vehicle. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER - INSTALLATION)



INSTALLATION

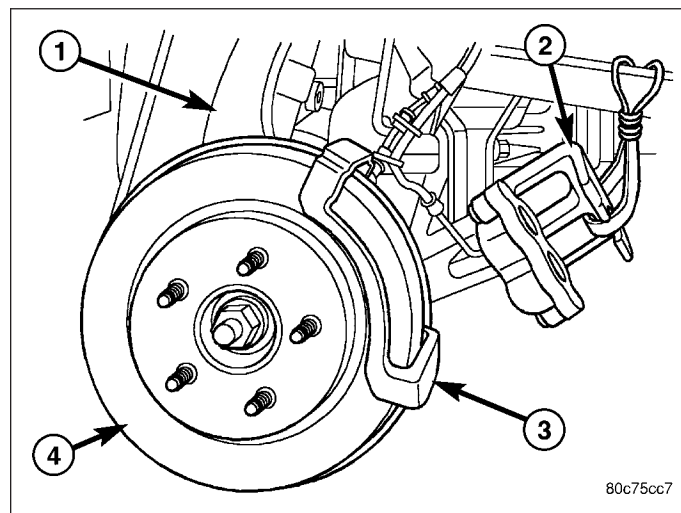
FRONT

NOTE: Install a new copper washers on the banjo bolt when installing

1. Install the disc brake caliper (2).

CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.

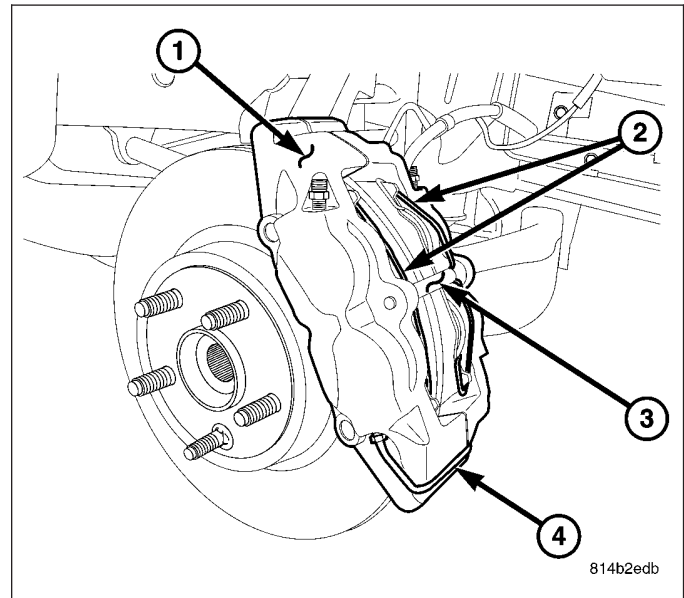
2. Install the banjo bolt with new copper washers to the caliper. Tighten to 27 N·m (20 ft. lbs.)
3. Install the caliper slide pin bolts. tighten to 32 N·m (24 ft. lbs.)
4. Bleed the base brake system, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - STANDARD PROCEDURE).
5. Install the tire and wheel assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
6. Lower the vehicle.



FRONT - SRT-10

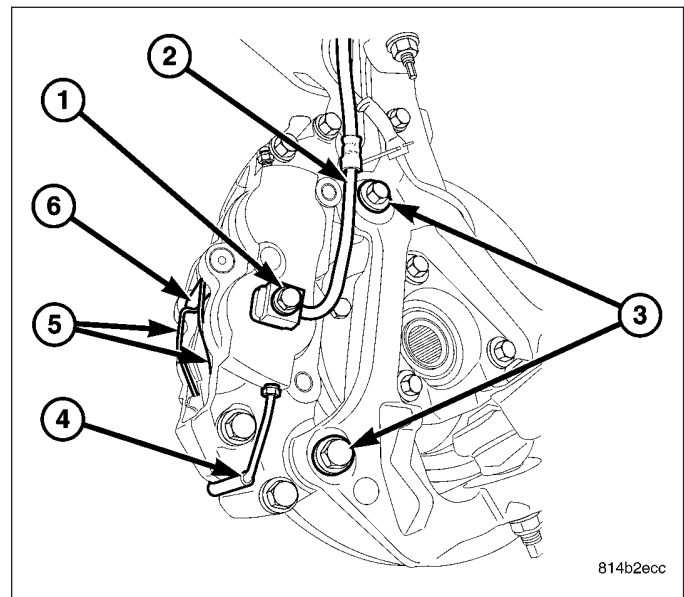
NOTE: Install a new copper washers on the banjo bolt when installing

1. Install the disc brake pads, anti-rattle springs (2) and pad retaining pin (3).
2. Install the disc brake caliper (1).



CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.

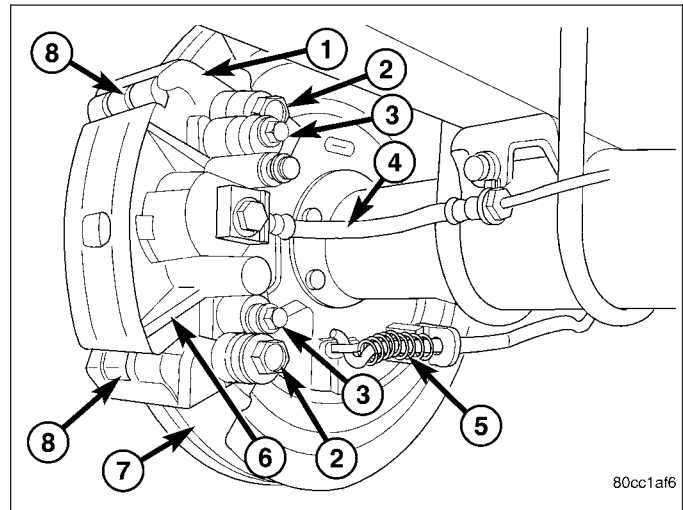
3. Install the brake hose (2) banjo bolt (1) with new copper washers to the caliper. Tighten to 27 N·m (20 ft. lbs.)
4. Install the caliper mounting bolts (3). tighten to 32 N·m (24 ft. lbs.).
5. Bleed the base brake system, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - STANDARD PROCEDURE).
6. Install the tire and wheel assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
7. Lower the vehicle.



REAR

1. Install caliper (6) to the caliper adapter (1).
2. Coat the caliper mounting slide pin bolts (3) with silicone grease. Then install and tighten the bolts to 30 N·m (22 ft. lbs.).
3. Install the brake hose banjo bolt if removed.
4. Install the brake hose (4) to the caliper (6) with **new seal washers** and tighten fitting bolt to 27 N·m (245 in. lbs.).

CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.



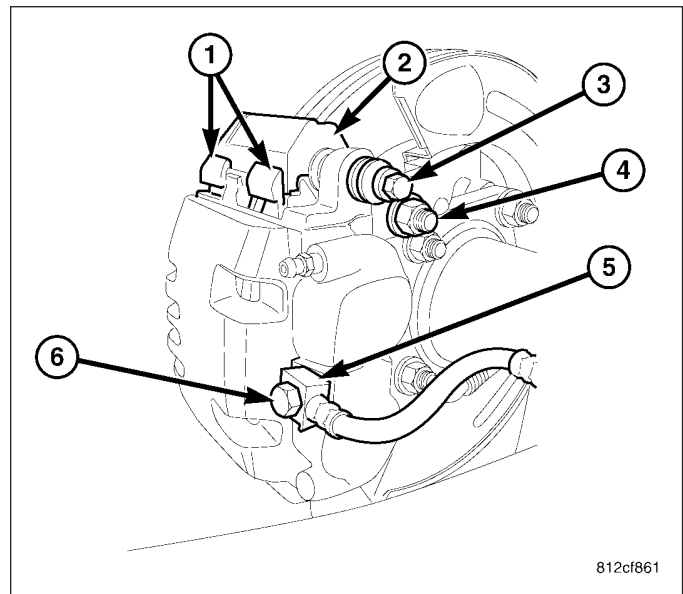
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5. Bleed the base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).
6. Install the wheel and tire assemblies (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
7. Remove the supports and lower the vehicle.
8. Verify a firm pedal before moving the vehicle.

REAR - SRT-10

NOTE: Install a new copper washers on the banjo bolt when installing

1. Install the rear disc brake caliper.
2. Install the banjo bolt (6) with new copper washers to the caliper. tighten to 27 N·m (20 ft. lbs.)
3. Install the caliper pin bolts (3). tighten to 30 N·m (22 ft. lbs.)
4. Bleed the base brake system, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - STANDARD PROCEDURE).
5. Install the tire and wheel assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
6. Lower the vehicle.



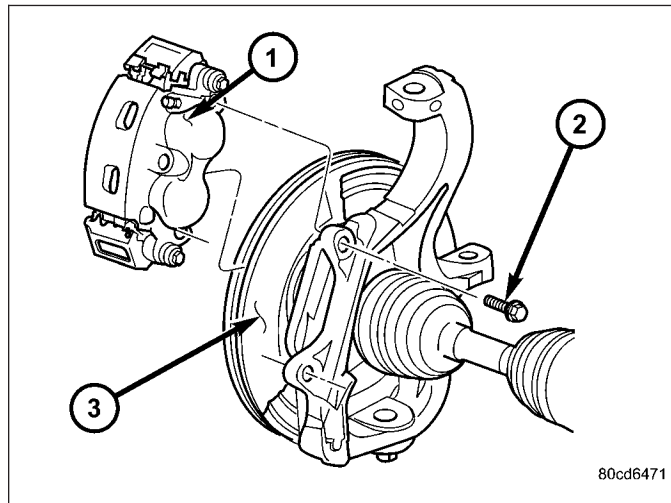
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ADAPTER-DISC BRAKE CALIPER

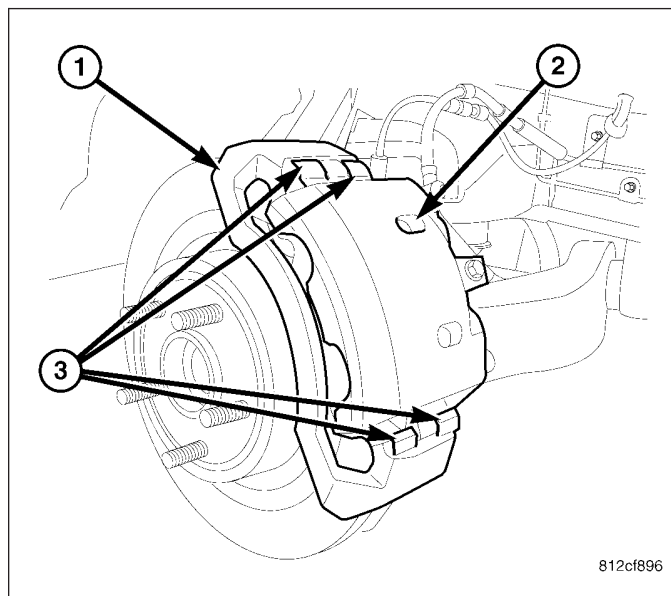
REMOVAL

FRONT

1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Remove the disc brake caliper (1) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
4. Remove the bolts (2) securing the caliper adapter to the steering knuckle.



5. Remove the caliper adapter (1).

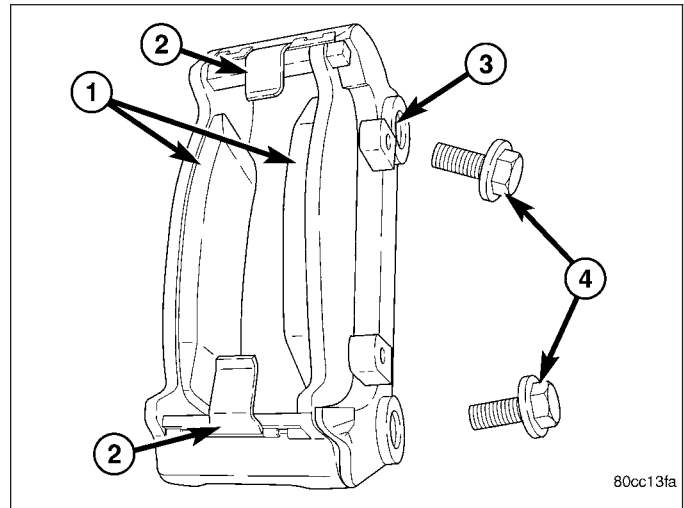


REAR

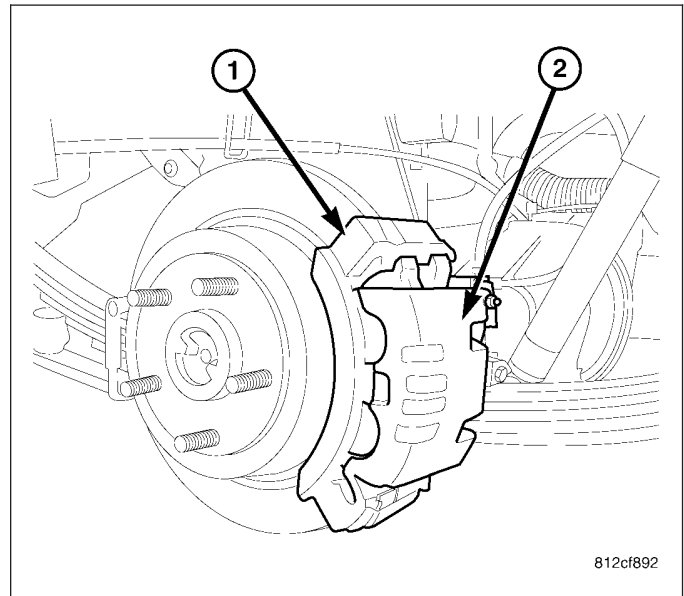
1. Raise and support the vehicle.
2. Remove the wheel and tire assembly.
3. Drain a small amount of fluid from master cylinder brake reservoir with a **clean** suction gun.
4. Bottom the caliper pistons into the caliper by prying the caliper over.
5. Remove the caliper slide bolts.
6. Remove the disc brake caliper from the mount.

CAUTION: Never allow the disc brake caliper to hang from the brake hose. Damage to the brake hose will result. Provide a suitable support to hang the caliper securely.

7. Remove the inboard and outboard brake pads (1).
8. Remove the anti-rattle clips (2).
9. Remove the caliper adapter mounting bolts (4).



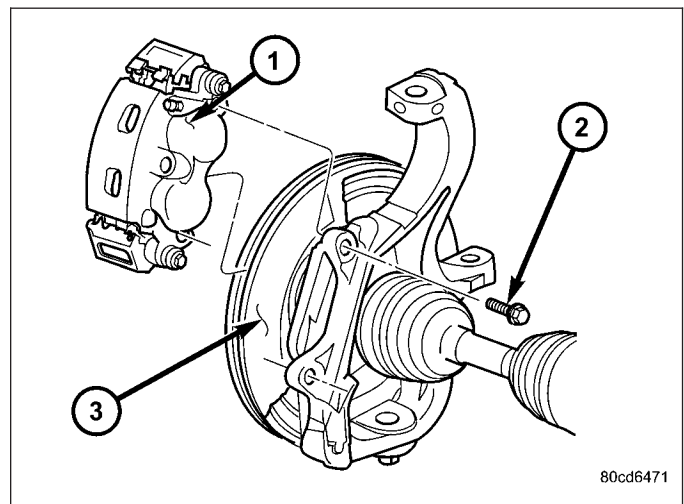
10. Remove the caliper adapter (1).



INSTALLATION

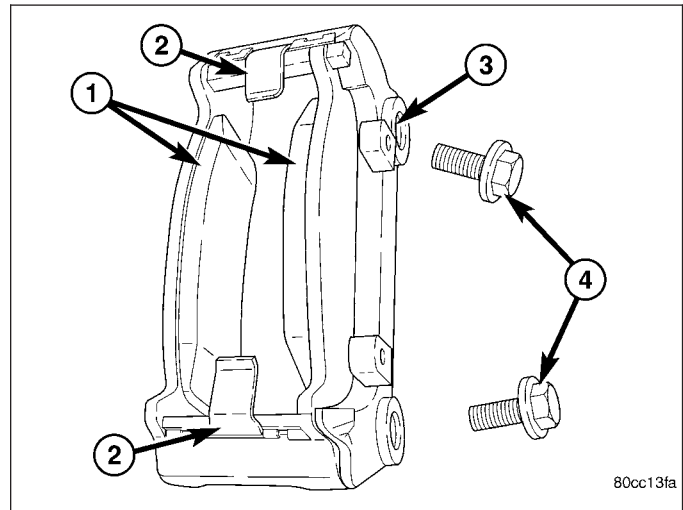
FRONT

1. Install the caliper adapter to the steering knuckle.
2. Install the caliper adapter mounting bolts (2) and tighten to 176 N·m (130 ft.lbs.) **LD** or tighten to 339 N·m (250 ft.lbs.) **HD**.
3. Install the disc brake caliper (1) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
4. Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
5. Remove the support and lower the vehicle.



REAR

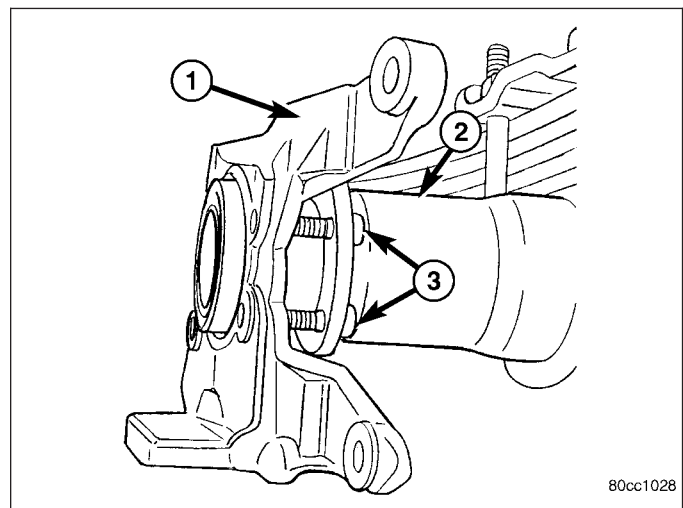
1. Install the caliper adapter mounting bolts (4). Tighten the mounting bolts to 135 N·m (100 ft.lbs) **LD** or tighten to 197 N·m (145 ft.lbs.) **HD**.
2. Install the anti-rattle clips (2).
3. Install the inboard and outboard pads (1).
4. Install the caliper mounting bolts.
5. Install the tire and wheel assembly.



MOUNT-DISC BRAKE CALIPER ADAPTER

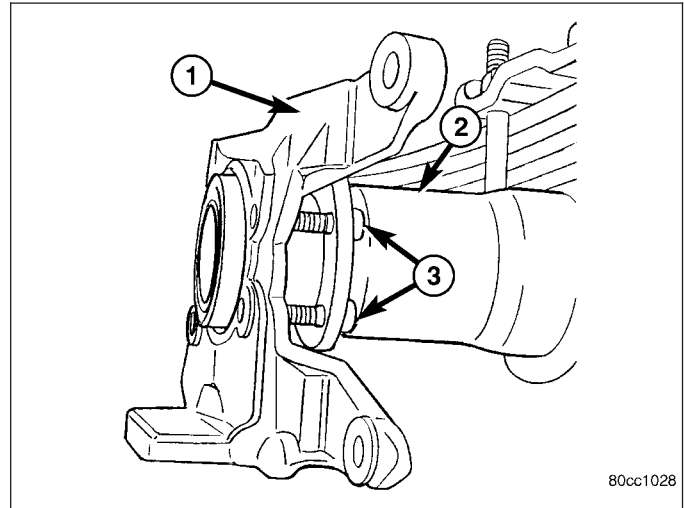
REMOVAL - REAR

1. Remove wheel and tire assembly.
2. Remove the disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
3. Remove the caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL).
4. Remove the rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
5. Remove the axle shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - REMOVAL).
6. Remove the park brake shoes (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - REMOVAL).
7. Remove the parking brake cable from the brake lever.
8. Remove the bolts (3) attaching the support plate to the axle and remove the support plate.
9. Remove the caliper adapter mount (1) from the axle housing (2).



INSTALLATION

1. Install the caliper adapter mount (1) on the axle housing (2).
2. Install support plate on axle flange. Tighten attaching bolts (3) to 68 N·m (50 ft. lbs.) **LD** or tighten to 203 N·m (150 ft.lbs.) **HD**.



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3. Install parking brake cable in the brake lever.
4. Install the park brake shoes (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - INSTALLATION)..
5. Install axle shaft, (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - INSTALLATION).
6. Adjust brake shoes to drum with brake gauge (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).
7. Install the rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
8. Install the caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).
9. Install the caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
10. Install wheel and tire assembly.

FLUID

DIAGNOSIS AND TESTING

BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals, Antilock Brakes hydraulic unit and all hydraulic fluid hoses.

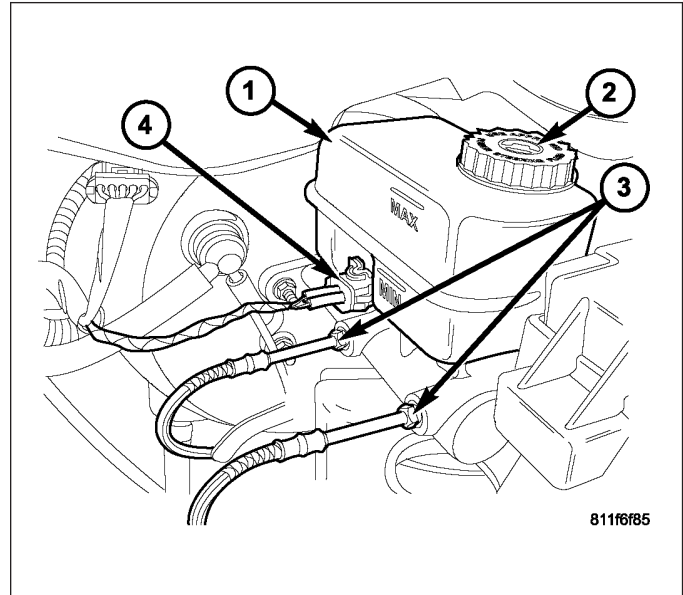
STANDARD PROCEDURE

BRAKE FLUID LEVEL

Always clean the master cylinder reservoir (1) and cap (2) before checking fluid level. If not cleaned, dirt could enter the fluid.

The fluid fill level is indicated on the side of the master cylinder reservoir (1).

The correct fluid level is to the MAX indicator on the side of the reservoir. If necessary, add fluid to the proper level.



SPECIFICATIONS

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar brake fluid or an equivalent from a tightly sealed container.

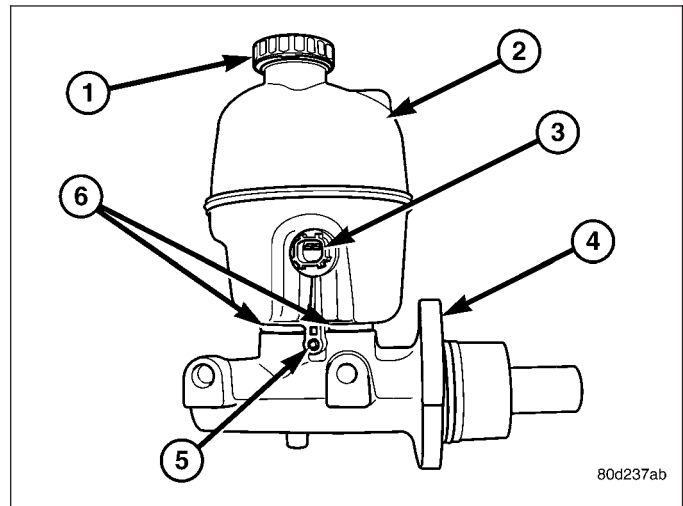
CAUTION: Never use reclaimed brake fluid or fluid from an container which has been left open. An open container of brake fluid will absorb moisture from the air and contaminate the fluid.

CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid, etc.

RESERVOIR-FLUID

REMOVAL

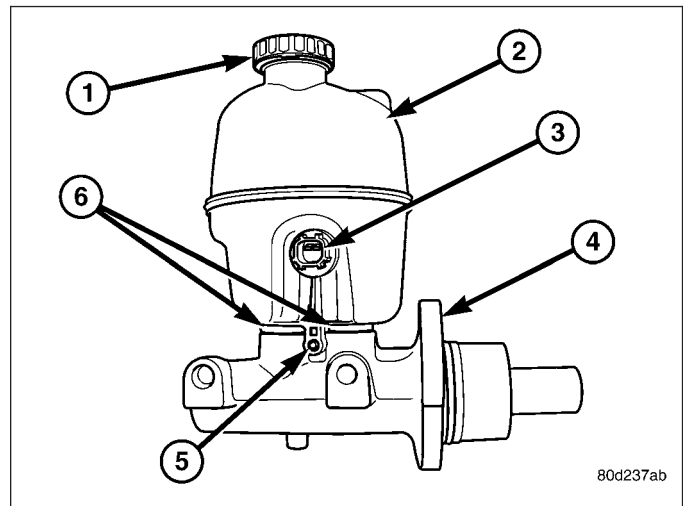
1. Install the prop rod on the brake pedal to keep pressure on the brake system.
2. Remove the reservoir cap (1) and siphon fluid into a drain container.
3. Remove the electrical connector from the fluid level switch (3) in the reservoir (2).
4. Remove the reservoir mounting bolt (5).
5. Remove the reservoir (2) from the master cylinder (4) by pulling upwards.
6. Remove old grommets from cylinder body.



INSTALLATION

CAUTION: Do not use any type of tool to install the grommets. Tools may cut, or tear the grommets creating a leak problem after installation. Install the grommets using finger pressure only.

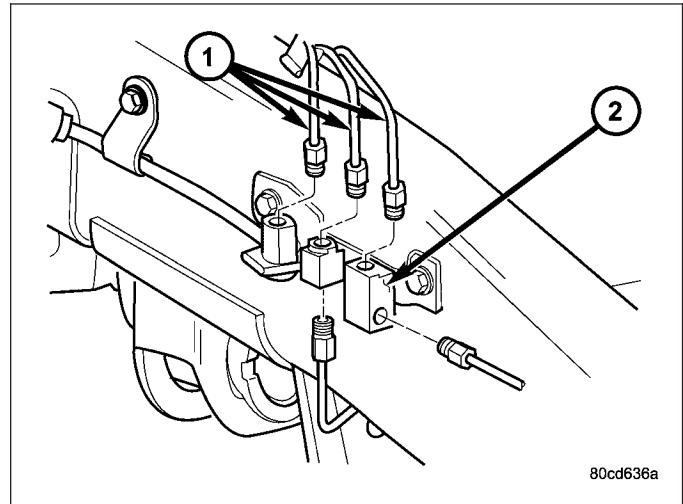
1. Lubricate the new grommets (6) with clean brake fluid and Install new grommets in cylinder body. Use finger pressure to install and seat grommets (6).
2. Start the reservoir (2) in grommets (6). Then rock the reservoir back and forth while pressing downward to seat it into the grommets.
3. Install the mounting bolt (5) for the reservoir (2) to the master cylinder (4).
4. Reconnect the electrical connector to the fluid reservoir level switch (3).
5. Remove the prop rod from the vehicle.
6. Fill and bleed base brake system, (Refer to 5 - BRAKES - STANDARD PROCEDURE).



BRAKE JUNCTION BLOCK

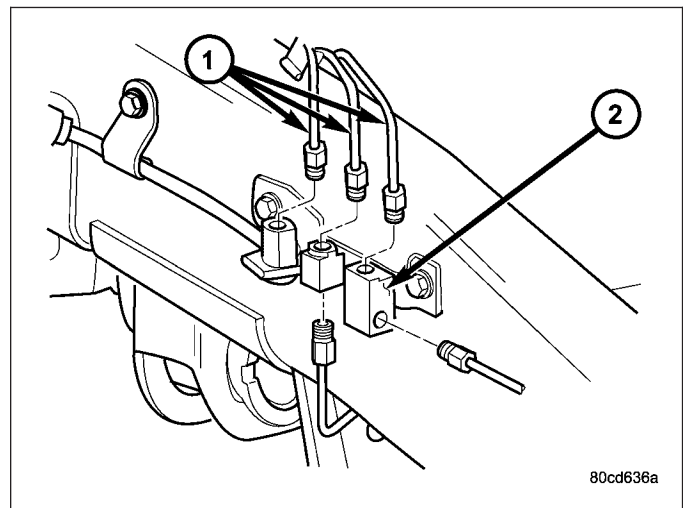
REMOVAL

1. Remove the brake lines (1) from the junction block (2).
2. Remove the junction block (2) mounting bolt and remove the junction block from the bracket.



INSTALLATION

1. Position the junction block (2) on the bracket and install the mounting bolt. Tighten the mounting bolt to 23 N·m (210 in. lbs.).
2. Install the brake lines (1) into the junction block (2) and tighten to 19-23 N·m (170-200 in. lbs.).
3. Bleed the base brake system, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - STANDARD PROCEDURE).



MASTER CYLINDER

DESCRIPTION

A two-piece master cylinder is used on all models. The cylinder body containing the primary and secondary pistons is made of aluminum. The removable fluid reservoir is made of nylon reinforced with glass fiber. The reservoir stores reserve brake fluid for the hydraulic brake circuits and has a switch for indicating low fluid levels. The reservoir is the only serviceable component.

The fluid compartments of the nylon reservoir are interconnected to permit fluid level equalization. However, the equalization feature does not affect circuit separation in the event of a front or rear brake malfunction. The reservoir compartments will retain enough fluid to operate the functioning hydraulic circuit.

Care must be exercised when removing/installing the master cylinder connecting lines. The threads in the cylinder fluid ports can be damaged if care is not exercised. Start all brake line fittings by hand to avoid cross threading.

The cylinder reservoir can be replaced when necessary. However, the aluminum body section of the master cylinder is not a repairable component.

NOTE: If diagnosis indicates that an internal malfunction has occurred, the aluminum body section must be replaced as an assembly.

OPERATION

The master cylinder bore contains a primary and secondary piston. The primary piston supplies hydraulic pressure to the front brakes. The secondary piston supplies hydraulic pressure to the rear brakes.

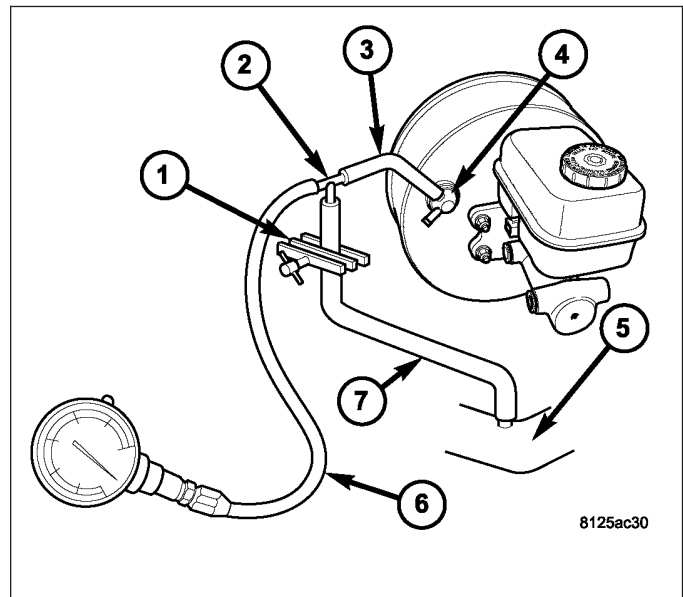
DIAGNOSIS AND TESTING

MASTER CYLINDER/POWER BOOSTER

1. Start engine and check booster vacuum hose connections. A hissing noise indicates vacuum leak. Correct any vacuum leak before proceeding.
2. Stop engine and shift transmission into Neutral.
3. Pump brake pedal until all vacuum reserve in booster is depleted.
4. Press and hold brake pedal under light foot pressure. The pedal should hold firm, if the pedal falls away master cylinder is faulty (internal leakage).
5. Start engine and note pedal action. It should fall away slightly under light foot pressure then hold firm. If no pedal action is discernible, power booster, vacuum supply, or vacuum check valve is faulty. Proceed to the POWER BOOSTER VACUUM TEST.
6. If the POWER BOOSTER VACUUM TEST passes, rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and immediately turn off ignition to stop engine.
7. Wait a minimum of 90 seconds and try brake action again. Booster should provide two or more vacuum assisted pedal applications. If vacuum assist is not provided, booster is faulty.

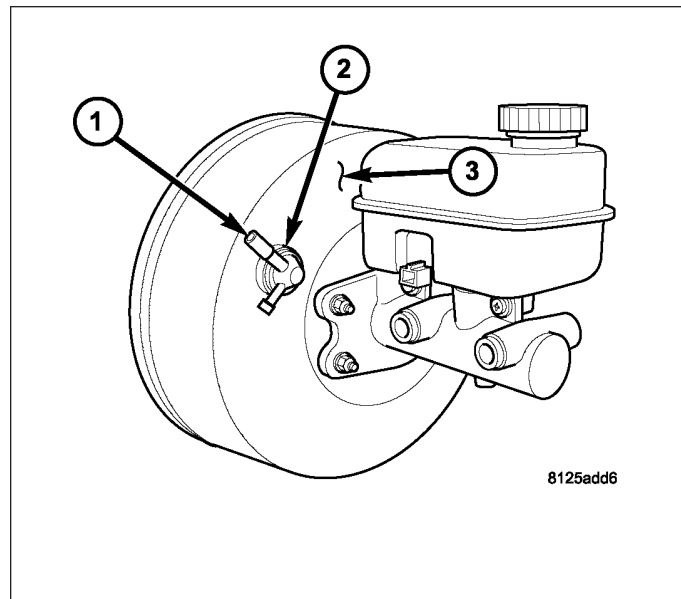
POWER BOOSTER VACUUM TEST

1. Connect vacuum gauge (6) to booster check valve (4) with short length of hose (3) and T-fitting (2).
2. Start and run engine at curb idle speed for one minute.
3. Observe the vacuum supply. If vacuum supply is not adequate, repair vacuum supply.
4. Clamp (1) hose (7) shut between intake vacuum source (5) and check valve (4).
5. Stop engine and observe vacuum gauge (6).
6. If vacuum drops more than one inch HG (33 millibars) within 15 seconds, booster diaphragm or check valve is faulty.



POWER BOOSTER CHECK VALVE TEST

1. Disconnect vacuum hose from check valve (1).
2. Remove check valve (1) and valve seal (2) from booster (3).
3. Use a hand operated vacuum pump for test.
4. Apply 15-20 inches vacuum at large end of check valve.
5. Plug off the small end to prevent vacuum leakage.
6. Vacuum should hold steady. If gauge on pump indicates vacuum loss, check valve is faulty and should be replaced.

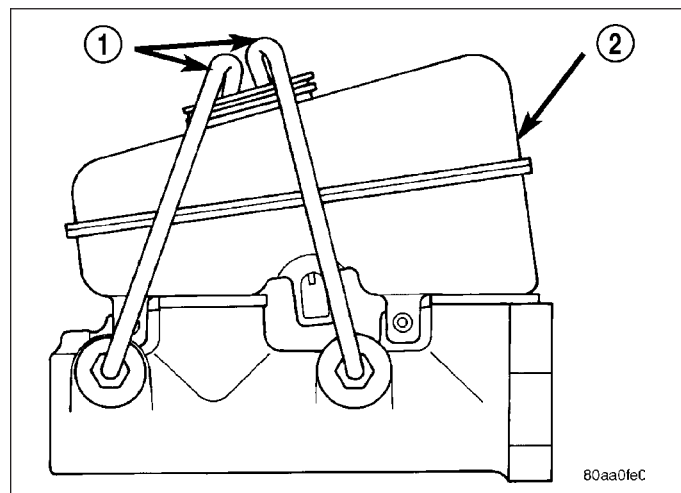


STANDARD PROCEDURE

MASTER CYLINDER BLEEDING

A new master cylinder should be bled before installation on the vehicle. Required bleeding tools include bleed tubes and a wood dowel to stroke the pistons. Bleed tubes can be fabricated from brake line.

1. Mount master cylinder in vise.
2. Attach bleed tubes to cylinder outlet ports (1). Then position each tube end into reservoir (2).
3. Fill reservoir with fresh brake fluid.
4. Press cylinder pistons inward with wood dowel. Then release pistons and allow them to return under spring pressure. Continue bleeding operations until air bubbles are no longer visible in fluid.

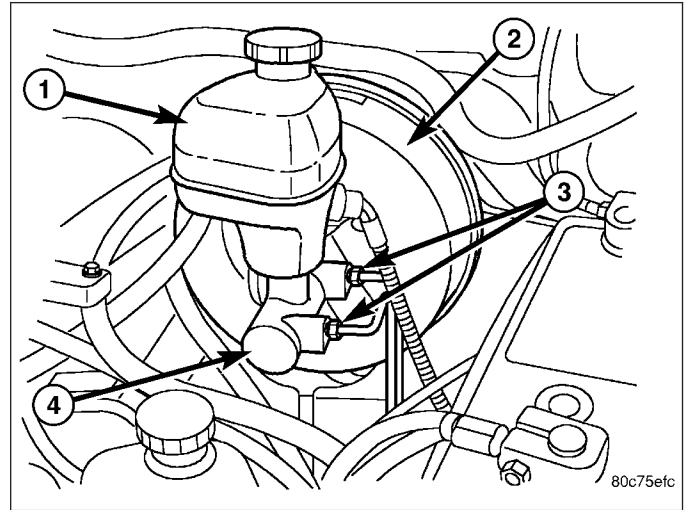


REMOVAL

ALL EXCEPT HYDROBOOST

1. Depress the brake pedal five times to deplete any vacuum that may remain in the booster unit.
2. Siphon and drain the fluid from the reservoir.
3. Disconnect the electrical connector for the low fluid level.
4. Place a towel or rag under the master cylinder outlet port area to protect the vehicle from brake fluid damage.
5. Remove the brake lines (3) from the master cylinder (4).
6. Remove the mounting nuts from the master cylinder (4).
7. Remove the master cylinder (4).

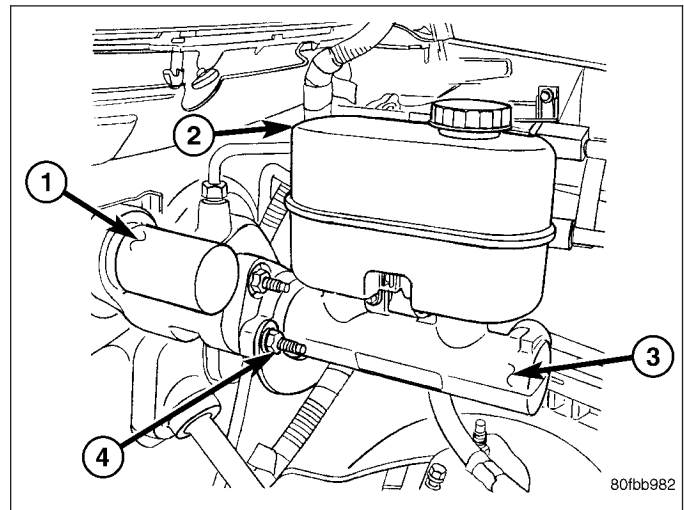
NOTE: Gently ease the master cylinder & reservoir assembly away from the booster, During removal the master cylinder should be kept as perpendicular to the front of the booster as possible to avoid excess interference with the booster output rod and in order not to dislodge the output rod from its seat inside the booster.



HYDROBOOST

1. Remove the brake lines from the master cylinder.
2. Disconnect the electrical connector for the low fluid level.
3. Remove the mounting nuts (4) from the master cylinder (3).
4. Remove the master cylinder (3).

NOTE: Using care remove the master cylinder directly forward in order not to dislodge the output rod from its seat inside the booster.



INSTALLATION

ALL EXCEPT HYDROBOOST

NOTE: If master cylinder is replaced bleed cylinder before installation.

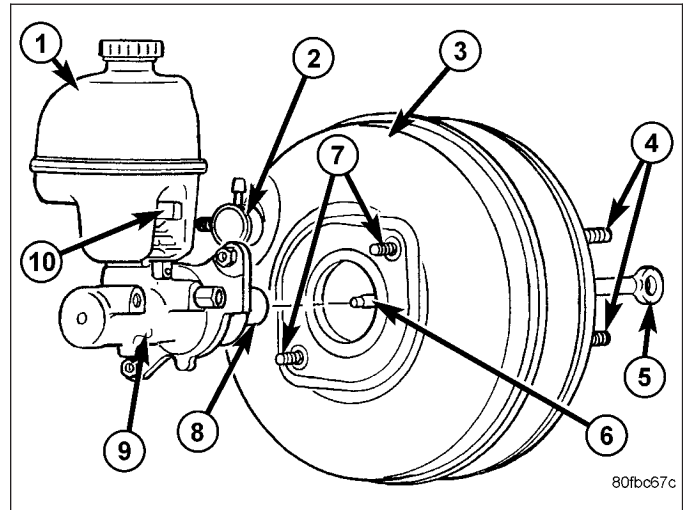
NOTE: Make sure the output rod of the brake booster is in position and retained by a output rod retaining ring, by looking into the boosters master cylinder mounting hole. This position will enable the output rod to enter inside of the master cylinder plunger sleeve during installation. Proper position is obtained when the output rod is centered perpendicular to the master cylinder mounting hole.

NOTE: Prior to installing the master cylinder assembly check that there is a vacuum seal present at the shoulder of the master cylinder flange and it's neck. A square seal must be present to ensure vacuum integrity with the booster.

1. Gently install the master cylinder (9) on the booster mounting studs (4).

NOTE: Take precautions to locate the master cylinder plunger over the booster output rod, before installing the master cylinder. If correctly fitted the master cylinder should slide easily onto the booster output rod before the mounting studs are engaged in the flange holes of the master cylinder.

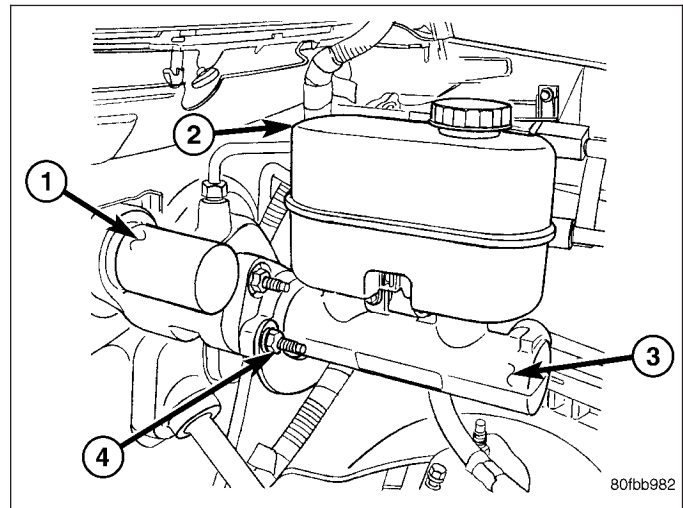
2. Install new mounting nuts and tighten to 25 N·m (221 in. lbs.)
3. Install the brake lines and tighten to 19 N·m (170 in. lbs.)
4. Reconnect the electrical connector for the low fluid level switch.
5. Fill and bleed the base brake system. (Refer to 5 - BRAKES - STANDARD PROCEDURE).



HYDROBOOST

NOTE: If master cylinder is replaced bleed cylinder before installation.

1. Install the master cylinder (3) on the booster mounting studs.
2. Install new mounting nuts (4) and tighten to 25 N·m (221 in. lbs.)
3. Install the brake lines and tighten to 19 N·m (170 in. lbs.)
4. Reconnect the electrical connector for the low fluid level switch.
5. Fill and bleed the base brake system. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

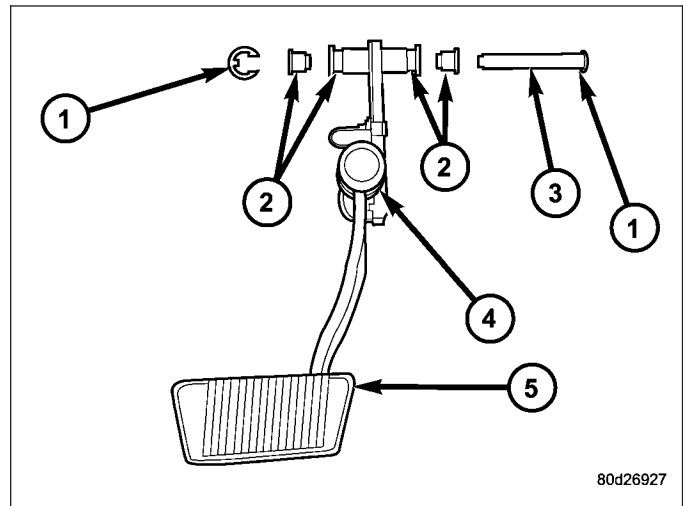


PEDAL

DESCRIPTION

NOTE: The brake pedal is serviced as a complete assembly including accelerator pedal and the bracket.

A suspended-type brake pedal is used. The pedal is attached to the pedal support bracket with a pivot shaft pin (3) and bushings (2). If the bushings (2) become dry a spray lubricant can be used to eliminate noises. The booster push rod is attached to the pedal with a clip (1). The pedal (4), bushings (2), pivot pin (3) and support bracket are not serviceable components.



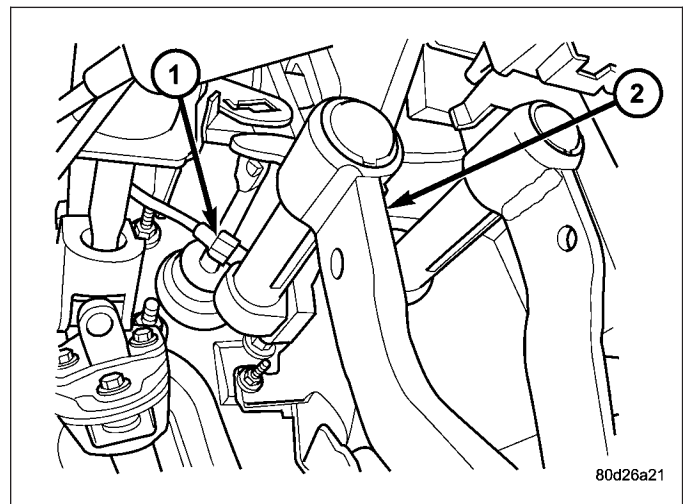
OPERATION

The brake pedal is attached to the booster push rod. When the pedal is depressed, the primary booster push rod is depressed which moves the booster secondary rod. The booster secondary rod depress the master cylinder piston.

REMOVAL

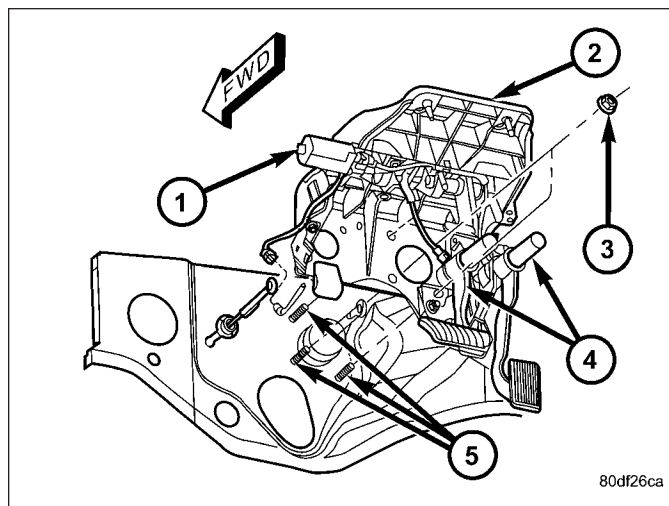
NOTE: The brake pedal is serviced as a complete assembly including accelerator pedal and the bracket.

1. Disconnect the negative battery cable.
2. Remove the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).
3. Remove the brake lamp switch and discard (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL).
4. **On vehicles equipped with adjustable pedals.**
Disconnect the adjuster cable (1) to the pedal (2).



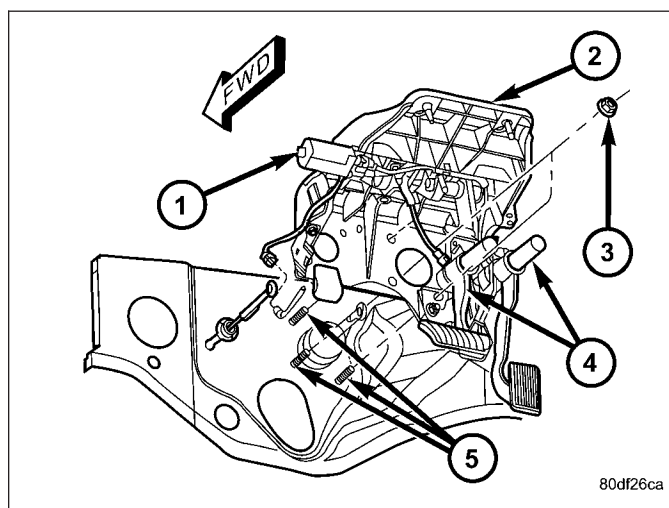
5. Remove the steering column (Refer to 19 - STEERING/COLUMN - REMOVAL).

6. Remove the brake booster (5) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/POWER BRAKE BOOSTER - REMOVAL).
7. Disconnect the electrical connectors.
8. Remove the module mounting bolts.
9. Disconnect the accelerator pedal cable.
10. Remove the pedal assembly mounting nuts/fasteners (4).

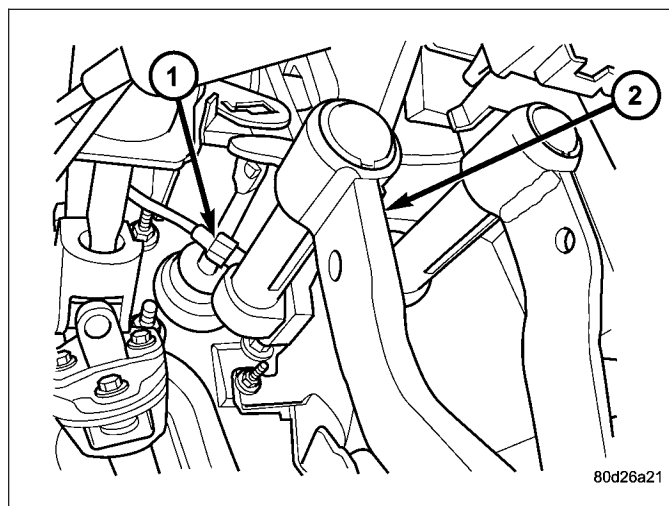


INSTALLATION

1. Install the pedal assembly (4) to the vehicle.
2. Install the mounting bolts (3) and tighten to 28 N·m (21 ft. lbs.).



3. Reconnect the accelerator cable (1) to the pedal (2).



4. Install the module mounting bolts and tighten to 38 N·m (28 ft. lbs.).
5. Reconnect the electrical connectors.

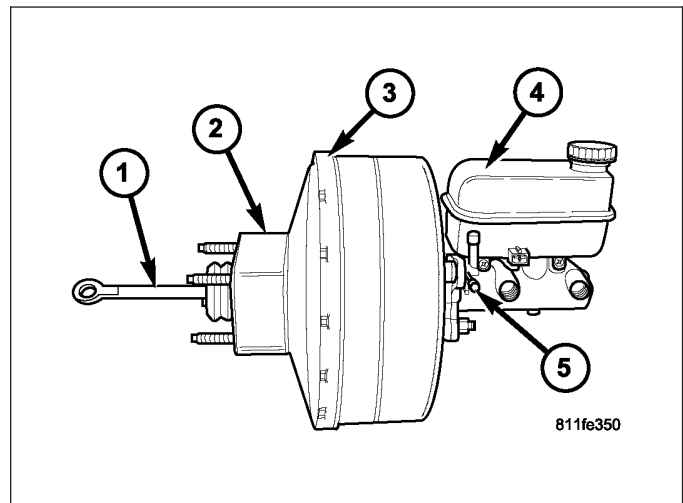
6. Install the brake booster (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/POWER BRAKE BOOSTER - INSTALLATION).
7. Install the steering column (Refer to 19 - STEERING/COLUMN - INSTALLATION).
8. Install a new brake lamp switch. (Refer to 8 - ELECTRICAL/LAMPS/LIGHTING - EXTERIOR/BRAKE LAMP SWITCH - REMOVAL).
9. **On vehicles equipped with adjustable brake pedal.**Reconnect the electrical connector to the motor and the adjuster cable at the pedal.
10. Install the steering column opening cover (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).
11. Reconnect the negative battery cable.

BOOSTER-POWER BRAKE

DESCRIPTION

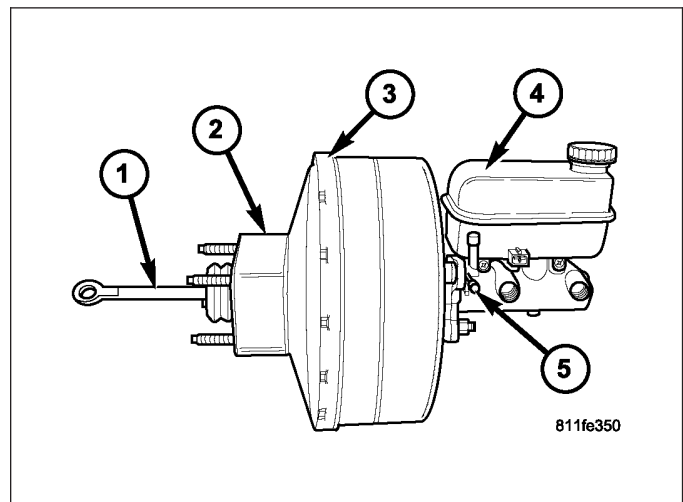
All models use a tandem diaphragm, power brake booster (3).

NOTE: The power brake booster is not a repairable component. The booster must be replaced as an assembly if diagnosis indicates a malfunction has occurred.



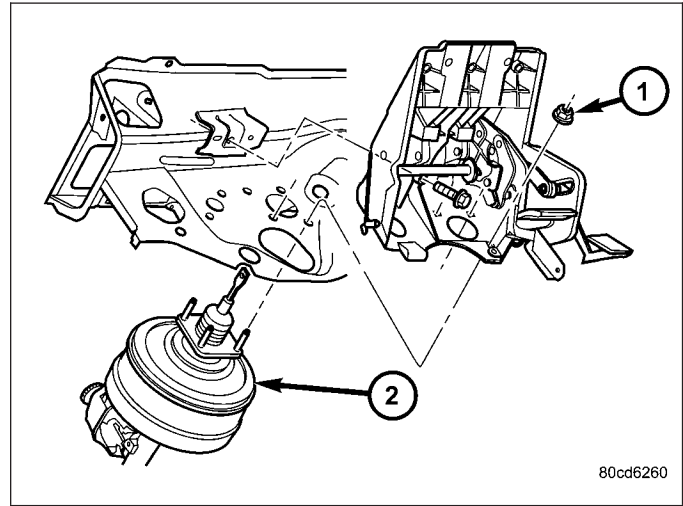
OPERATION

The booster unit consists of a single housing divided into two by a tandem diaphragm (3). The outer edge of the diaphragm is secured to the housing. A spacer block (2) is located in between the cowl and the booster housing. The booster push rod (1), connects the booster to the brake pedal and master cylinder (4), is attached to the center of the diaphragm. A check valve (5) is used in the booster outlet connected to the engine intake manifold. Power assist is generated by utilizing a combination of vacuum and atmospheric pressure to boost brake assist.



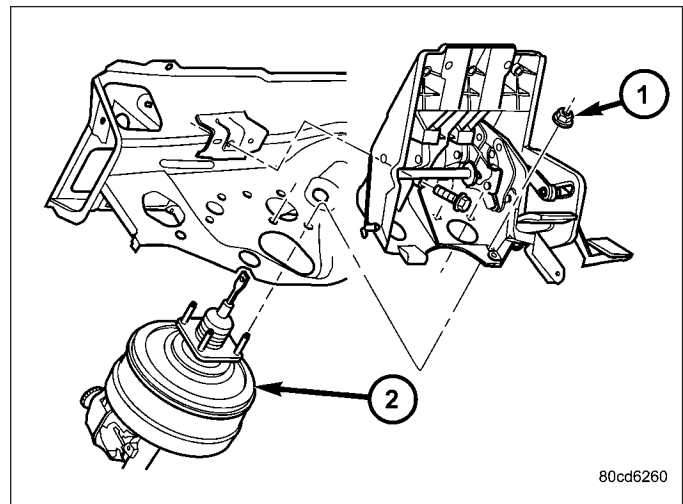
REMOVAL

1. Remove master cylinder. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - REMOVAL).
2. Disconnect vacuum line at booster.
3. Remove clip securing booster push rod to brake pedal (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/PEDAL - REMOVAL)..
4. Remove the nuts (1) from the booster mounting studs.
5. Remove the booster (2) and gasket from front cowl panel.



INSTALLATION

1. Guide the booster (2) studs into the cowl panel holes and seat the booster on the panel.
2. Install and tighten new booster attaching nuts (1) to 28 N·m (250 in. lbs.).



3. Install the booster push rod on brake pedal and install clip.
4. Install the booster check valve if removed and connect the vacuum hose to the check valve.
5. Install the master cylinder. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/MASTER CYLINDER - INSTALLATION).
6. Fill and bleed the brake system. (Refer to 5 - BRAKES - STANDARD PROCEDURE).

BOOSTER-HYDRO-BOOST BRAKE

DIAGNOSIS AND TESTING

HYDRAULIC BOOSTER

The hydraulic booster uses hydraulic pressure from the power steering pump. Before diagnosing a booster problem, first verify the power steering pump is operating properly. Perform the following checks.

- Check the power steering fluid level.
- Check the brake fluid level.
- Check all power steering hoses and lines for leaks and restrictions.

- Check power steering pump pressure.

NOISES

The hydraulic booster unit will produce certain characteristic booster noises. The noises may occur when the brake pedal is used in a manner not associated with normal braking or driving habits.

HISSING

A hissing noise may be noticed when above normal brake pedal pressure is applied, 40 lbs. or above. The noise will be more noticeable if the vehicle is not moving. The noise will increase with the brake pedal pressure and an increase of system operating temperature.

CLUNK-CHATTER-CLICKING

A clunk-chatter-clicking may be noticed when the brake pedal is released quickly, after above normal brake pedal pressure is applied 50-100 lbs..

BOOSTER FUNCTION TEST

With the engine off depress the brake pedal several times to discharge the accumulator. Then depress the brake pedal using 40 lbs. of force and start the engine. The brake pedal should fall and then push back against your foot. This indicates the booster is operating properly.

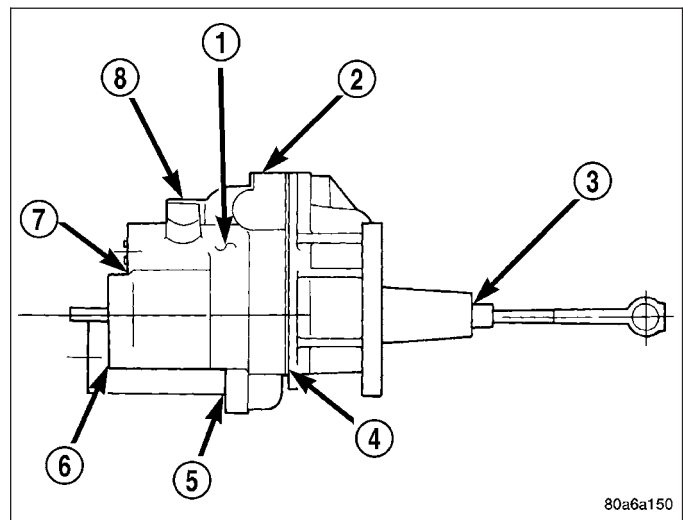
ACCUMULATOR LEAKDOWN

1. Start the engine, apply the brakes and turn the steering wheel from lock to lock. This will ensure the accumulator is charged. Turn off the engine and let the vehicle sit for one hour. After one hour there should be at least two power assisted brake application with the engine off. If the system does not retain a charge the booster must be replaced.
2. With the engine off depress the brake pedal several times to discharge the accumulator. Grasp the accumulator and see if it wobbles or turns. If it does the accumulator has lost a gas charge and the booster must be replaced.

SEAL LEAKAGE

If the booster leaks from any of the seals the booster assembly must be replaced.

- **INPUT ROD SEAL (3):** Fluid leakage from rear end of the booster.
- **PISTON SEAL (6):** Fluid leakage from vent at front of booster.
- **HOUSING SEAL (4):** Fluid leakage between housing and housing cover.
- **SPOOL VALVE SEAL (7):** Fluid leakage near spool plug.
- **RETURN PORT FITTING SEAL (8):** Fluid leakage from port fitting.



HYDRAULIC BOOSTER DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
Slow Brake Pedal Return	1. Excessive seal friction in booster. 2. Faulty spool valve action. 3. Restriction in booster return hose. 4. Damaged input rod.	1. Replace booster. 2. Replace booster. 3. Replace hose. 4. Replace booster.
Excessive Brake Pedal Effort.	1. Internal or external seal leakage. 2. Faulty steering pump.	1. Replace booster. 2. Replace pump.
Brakes Self Apply	1. Dump valve faulty. 2. Contamination in hydraulic system. 3. Restriction in booster return hose.	1. Replace booster. 2. Flush hydraulic system and replace booster. 3. Replace hose.
Booster Chatter, Pedal Vibration	1. Slipping pump belt. 2. Low pump fluid level.	1. Replace power steering belt. 2. Fill pump and check for leaks.
Grabbing Brakes	1. Low pump flow. 2. Faulty spool valve action.	1. Test and repair/replace pump. 2. Replace booster.

STANDARD PROCEDURE**BLEEDING**

The hydraulic booster is generally self-bleeding, this procedure will normally bleed the air from the booster. Normal driving and operation of the unit will remove any remaining trapped air.

1. Fill power steering pump reservoir.
2. Disconnect fuel shutdown relay and crank the engine for several seconds, Refer to Fuel System for relay location and WARNING.
3. Check fluid level and add if necessary.
4. Connect fuel shutdown relay and start the engine.
5. Turn the steering wheel slowly from lock to lock twice.
6. Stop the engine and discharge the accumulator by depressing the brake pedal 5 times.
7. Start the engine and turn the steering wheel slowly from lock to lock twice.
8. Turn off the engine and check fluid level and add if necessary.

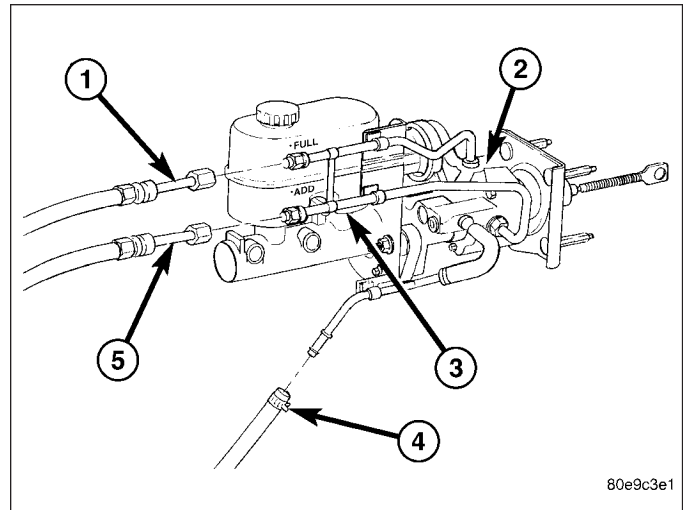
NOTE: If fluid foaming occurs, wait for foam to dissipate and repeat steps 7 and 8.

REMOVAL

NOTE: If the booster is being replaced because the power steering fluid is contaminated, flush the power steering system before replacing the booster.

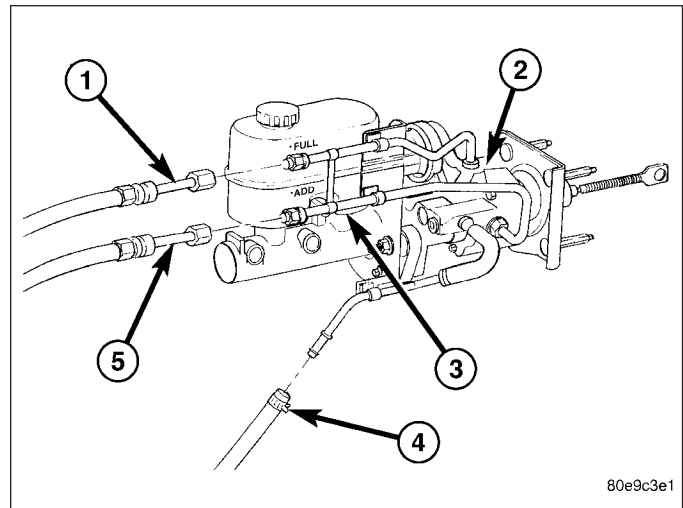
1. With engine off depress the brake pedal 5 times to discharge the accumulator.
2. Remove brake lines from master cylinder.
3. Remove mounting nuts from the master cylinder.
4. Remove the bracket from the hydraulic booster lines and master cylinder mounting studs.

5. Remove the master cylinder (3).
6. Remove the return hose (4) and the two pressure lines (1&5) from the hydraulic booster (2).
7. Remove the booster push rod clip, washer and rod remove from the brake pedal.
8. Remove the mounting nuts from the hydraulic booster and remove the booster.



INSTALLATION

1. Install the hydraulic booster (2) and tighten the mounting nuts to 28 N·m (21 ft. lbs.).
2. Install the booster push rod, washer and clip onto the brake pedal.
3. Install the master cylinder (3) on the mounting studs. and tighten the mounting nuts to 23 N·m (17 ft. lbs.).
4. Install the brake lines to the master cylinder and tighten to 19 N·m (170 in. lbs.).
5. Install the hydraulic booster line bracket onto the master cylinder mounting studs.
6. Install the master cylinder mounting nuts and tighten to 23 N·m (17 ft. lbs.).
7. Install the hydraulic booster pressure lines (1&5) to the bracket and booster.
8. Tighten the pressure lines to 41 N·m (30 ft. lbs.).



NOTE: Inspect o-rings on the pressure line fittings to insure they are in good condition before installation. Replace o-rings if necessary.

9. Install the return hose (4) to the booster.
10. Bleed base brake system, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL - STANDARD PROCEDURE).
11. Fill the power steering pump with fluid, (Refer to 19 - STEERING/PUMP - STANDARD PROCEDURE).

CAUTION: MOPAR (MS-9602) ATF+4 is to be used in the power steering system. No other power steering or automatic transmission fluid is to be used in the system. Damage may result to the power steering pump and system if any other fluid is used, and do not overfill.

12. Bleed the hydraulic booster (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/POWER BRAKE BOOSTER - STANDARD PROCEDURE).

ROTORS

DIAGNOSIS AND TESTING

DISC BRAKE ROTOR

The rotor braking surfaces should not be refinished unless necessary.

Light surface rust and scale can be removed with a lathe equipped with dual sanding discs. The rotor surfaces can be restored by machining with a disc brake lathe if surface scoring and wear are light.

Replace the rotor for the following conditions:

- Severely Scored
- Tapered
- Hard Spots
- Cracked
- Below Minimum Thickness

ROTOR MINIMUM THICKNESS

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if below minimum thickness, or if machining would reduce thickness below the allowable minimum.

Rotor minimum thickness is usually specified on the rotor hub. The specification is either stamped or cast into the hub surface.

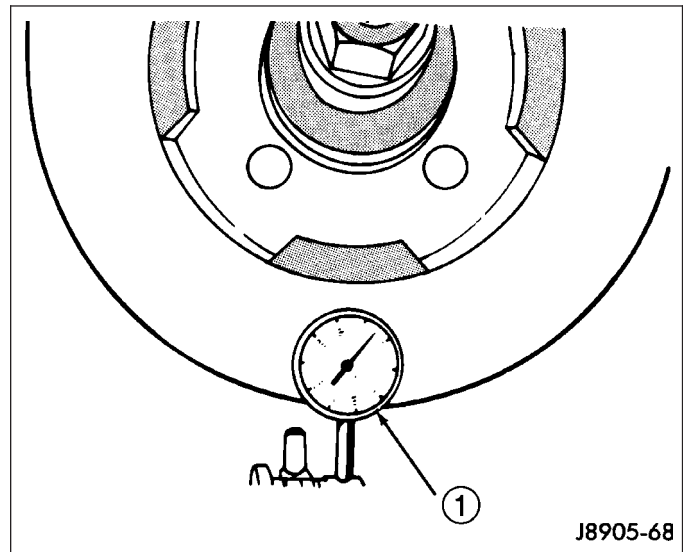
ROTOR RUNOUT

Check rotor lateral runout with dial indicator C-3339 (1). Excessive lateral runout will cause brake pedal pulsation and rapid, uneven wear of the brake shoes. Position the dial indicator plunger approximately 25.4 mm (1 in.) inward from the rotor edge.

NOTE: Be sure wheel bearing has zero end play before checking rotor runout.

Maximum allowable rotor runout is 0.131 mm (0.005 in.) **HD**.

Maximum allowable rotor runout is 0.050 mm (0.002 in.) **LD**.



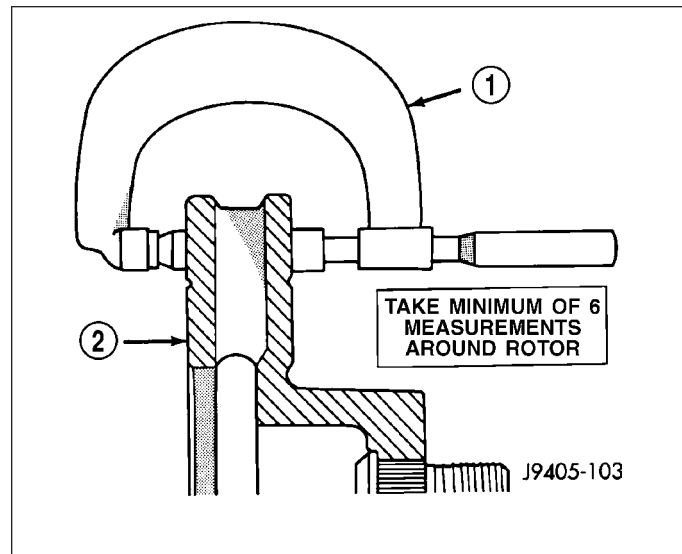
ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

Measure rotor thickness at 6 to 12 points around the rotor face.

Position the micrometer (1) approximately 25.4 mm (1 in.) from the rotor (2) outer circumference for each measurement.

Thickness should not **vary** by more than 0.015 mm (0.0059 in.) from point-to-point on the rotor. Machine or replace the rotor if necessary.



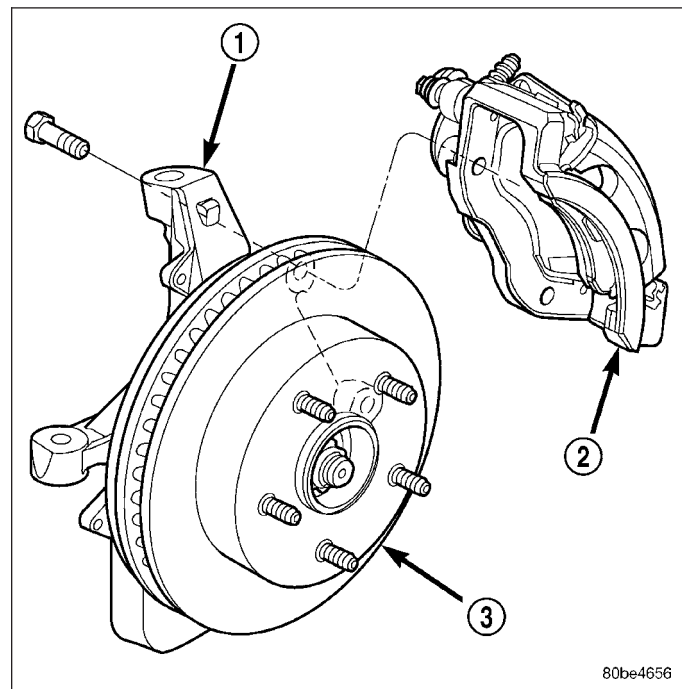
REMOVAL

FRONT

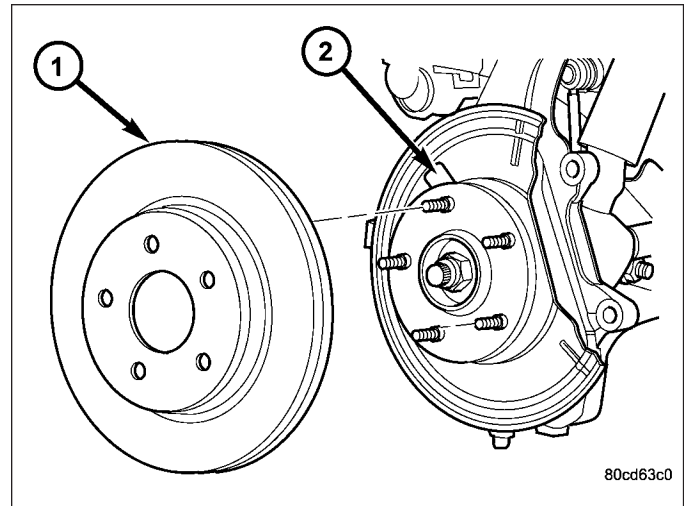
1. Raise and support the vehicle.
2. Remove the wheel and tire assembly.

NOTE: Do not allow brake hose to support caliper adapter assembly.

3. Remove the caliper (2) from the steering knuckle (1), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL) and remove caliper adapter assembly.

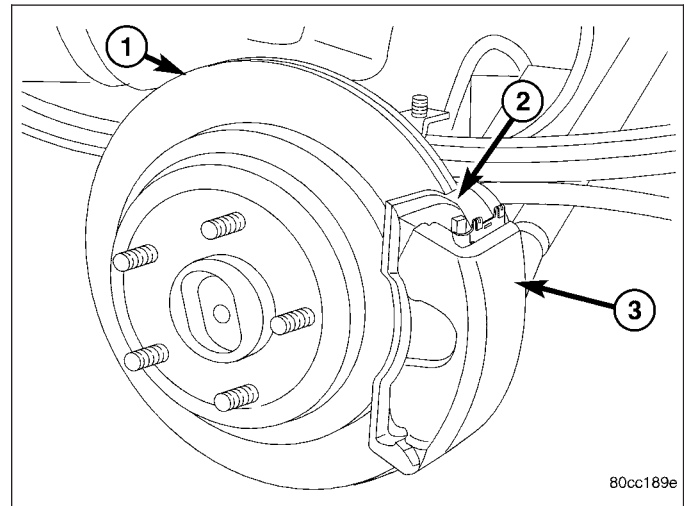


4. Remove the extension to the rotor nuts **HD DRW ONLY**.
5. Remove the rotor (1) from the hub/bearing (2) wheel studs.



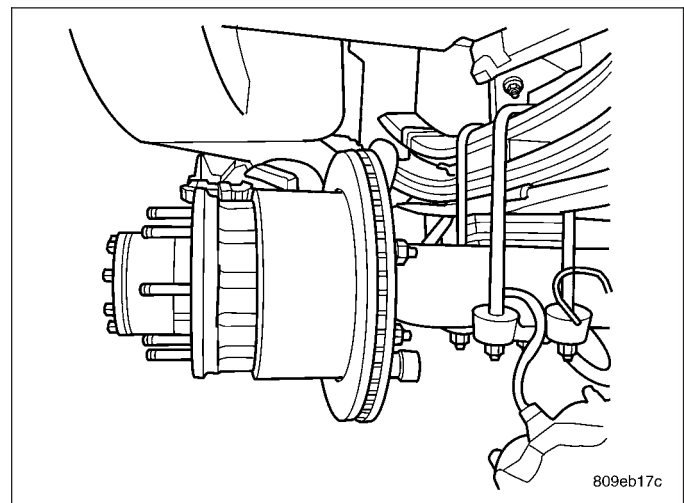
REAR

1. Raise and support the vehicle
2. Remove the tire and wheel assembly.
3. Remove the disc brake caliper (3), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
4. Remove the caliper adapter (2) bolts. (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL)
5. Remove the retaining clips and rotor assembly (1).



REAR DUAL WHEELS

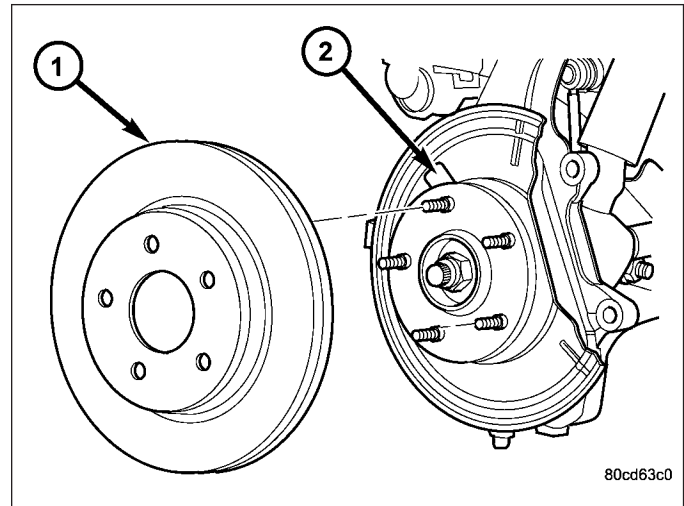
1. Raise and support the vehicle
2. Remove the tire and wheel assembly.
3. Remove the disc brake caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
4. Remove the caliper adapter bolts.
5. Remove the rear axle shaft from the housing on dual rear wheels, (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 286RBI/AXLE SHAFTS - REMOVAL).
6. Remove the hub and rotor assembly (C3500 only).



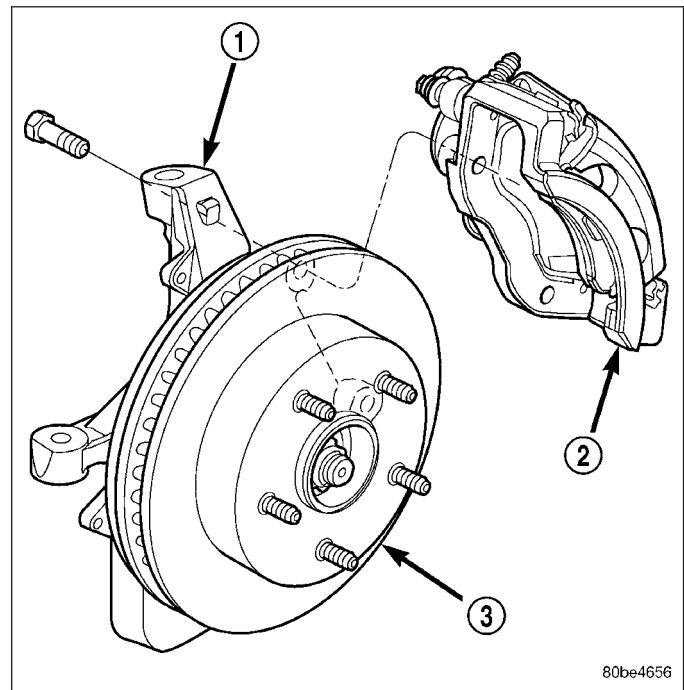
INSTALLATION

FRONT

1. On models with all-wheel antilock system (ABS), check condition of tone wheel on hub/bearing (2). If teeth on wheel are damaged, hub/bearing assembly will have to be replaced (tone wheel is not serviced separately).
2. Install the hub extension and nuts to the front rotor. Tighten nuts to 130 N·m (96 ft.lbs). **HD DRW ONLY.**
3. Install the rotor (1) onto the hub/bearing (2) wheel studs.

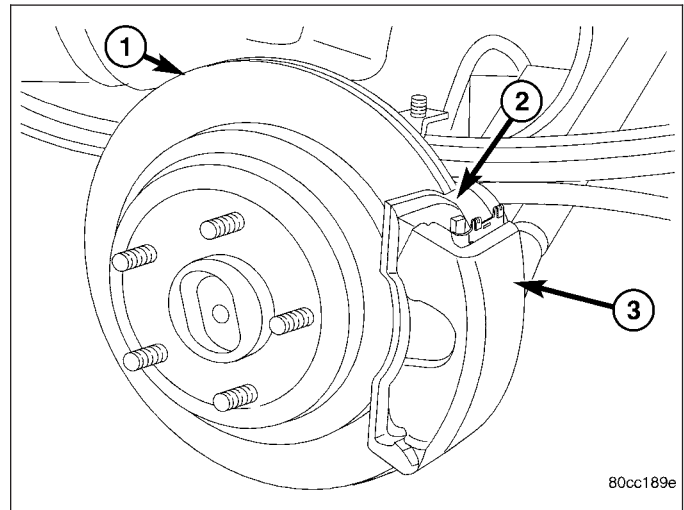


4. Install the caliper adapter assembly (2), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION) and tighten adapter bolts to:
5. Install the wheel and tire assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE) and lower the vehicle.
6. Apply the brakes several times to seat brake pads. Be sure to obtain firm pedal before moving vehicle.



REAR

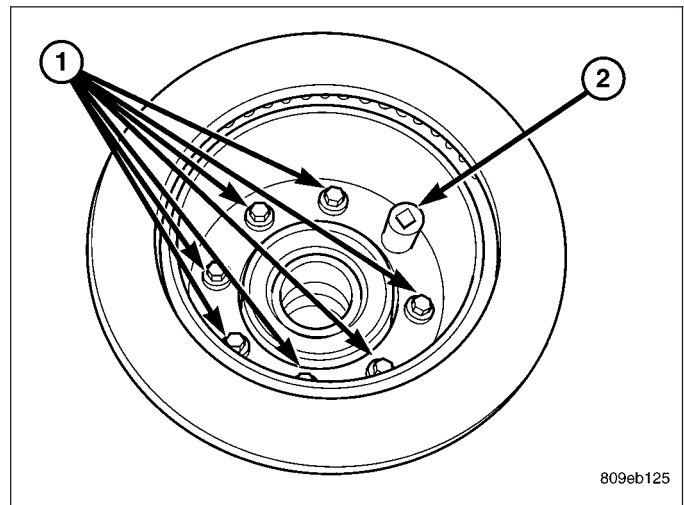
1. Install the rotor (1) to the axleshaft.
2. Install the caliper adapter (2) (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).
3. Install the caliper adapter bolts and tighten the mounting bolts to 135 N·m (100 ft.lbs) **LD** or 197 N·m (145 ft.lbs) **HD**.
4. Install the disc brake caliper (3), (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
5. Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
6. Lower the vehicle.



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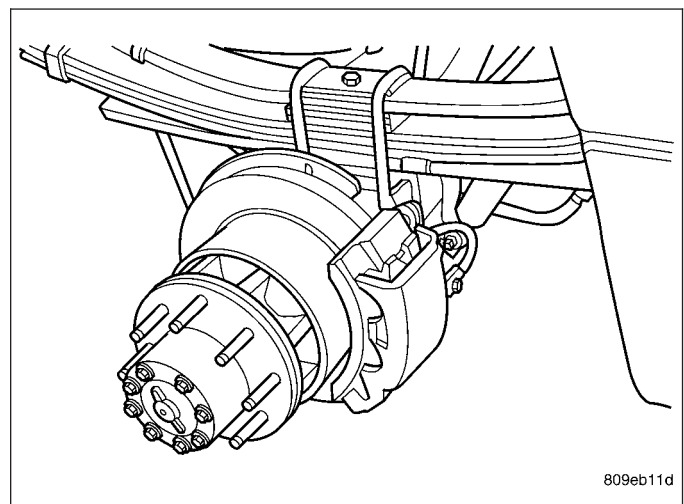
REAR DUAL WHEELS

1. Install the hub to the rotor. Tighten the bolts (1) to 128 N·m (95 ft. lbs.).



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2. Install the hub and rotor assembly.
3. Install the rear axle shaft to the housing with dual wheels, (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 286RBI/AXLE SHAFTS - INSTALLATION).
4. Install the caliper adapter bolts 197 N·m (145 ft.lbs) **LD**.
5. Install the disc brake caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION)..
6. Install the tire and wheel assembly, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
7. Lower the vehicle.

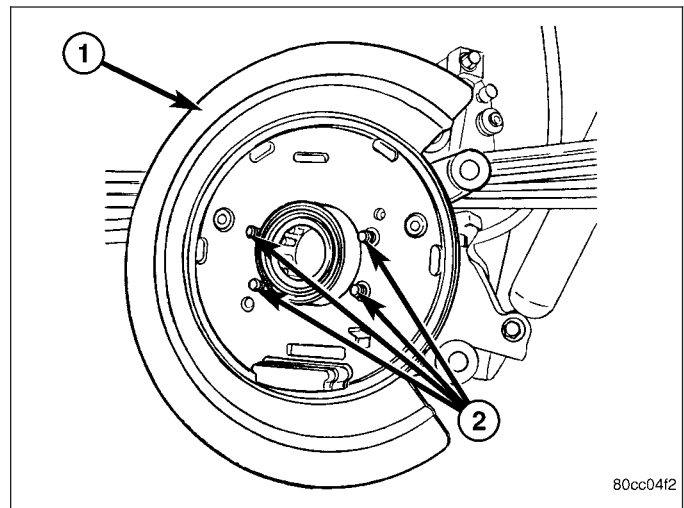


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PLATE-SUPPORT

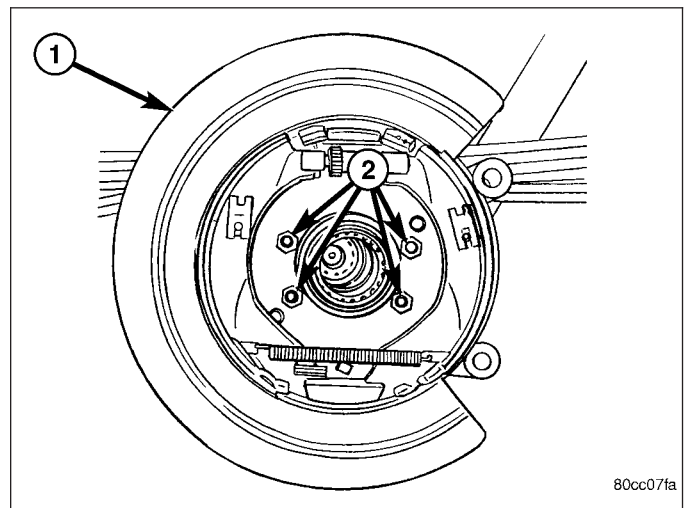
REMOVAL

1. Remove wheel and tire assembly.
2. Remove the disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
3. Remove the caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - REMOVAL).
4. Remove the rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
5. Remove the axle shaft (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - REMOVAL).
6. Remove the park brake shoes (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - REMOVAL).
7. Remove the parking brake cable from the brake lever.
8. Remove the bolts (2) attaching the support plate (1) to the axle and remove the support plate.



INSTALLATION

1. Install support plate (1) on axle flange. Tighten attaching bolts (2) to 68 N·m (50 ft. lbs.) **LD** or 203 N·m (150 ft.lbs) **HD**.
2. Install parking brake cable in the brake lever.
3. Install the park brake shoes (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - INSTALLATION)..



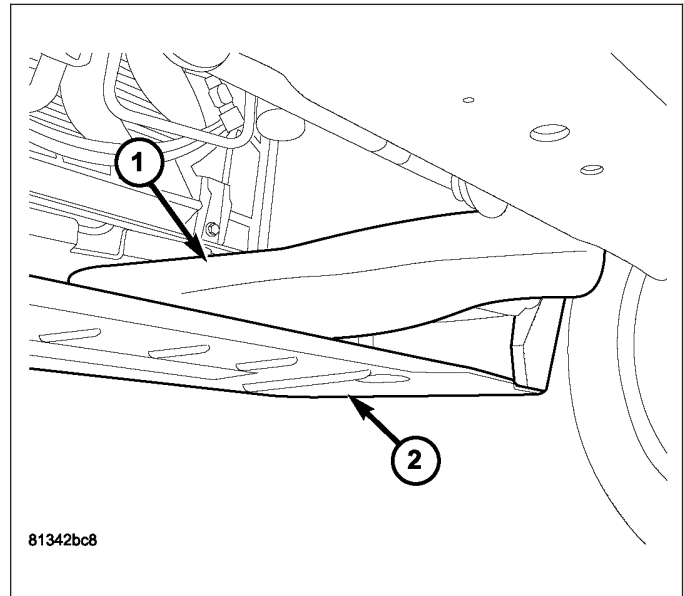
4. Install axle shaft, (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - INSTALLATION).
5. Adjust brake shoes to drum with brake gauge (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).

6. Install the rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
7. Install the caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPER ADAPTER - INSTALLATION).
8. Install the caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
9. Install the wheel and tire assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).

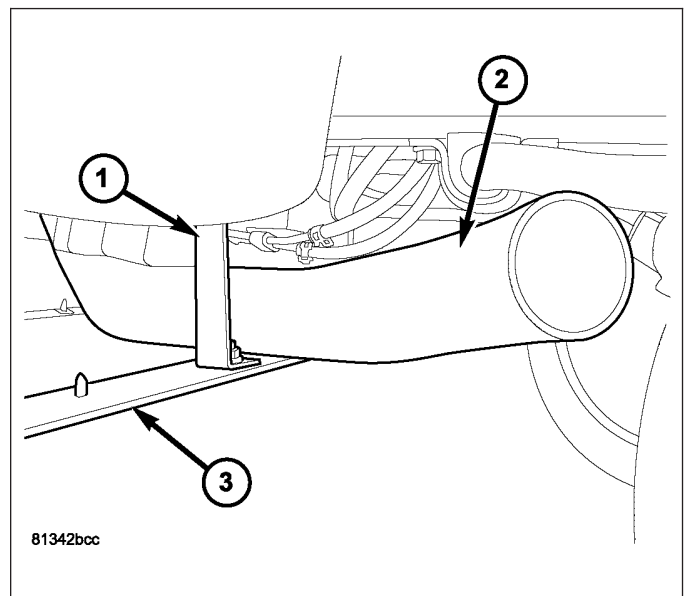
DUCTS-BRAKE COOLING - SRT-10

REMOVAL

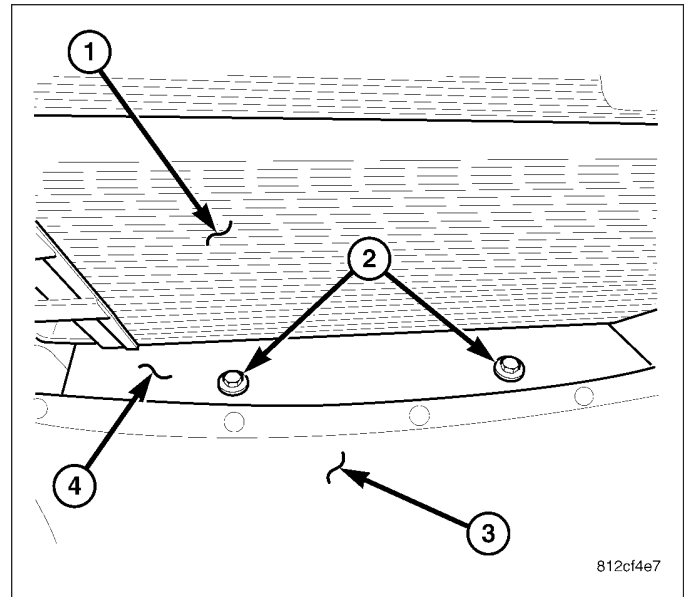
1. Raise and support the vehicle.
2. Remove the lower air deflector (2) (Refer to 23 - BODY/EXTERIOR/BELLY PAN - DESCRIPTION).



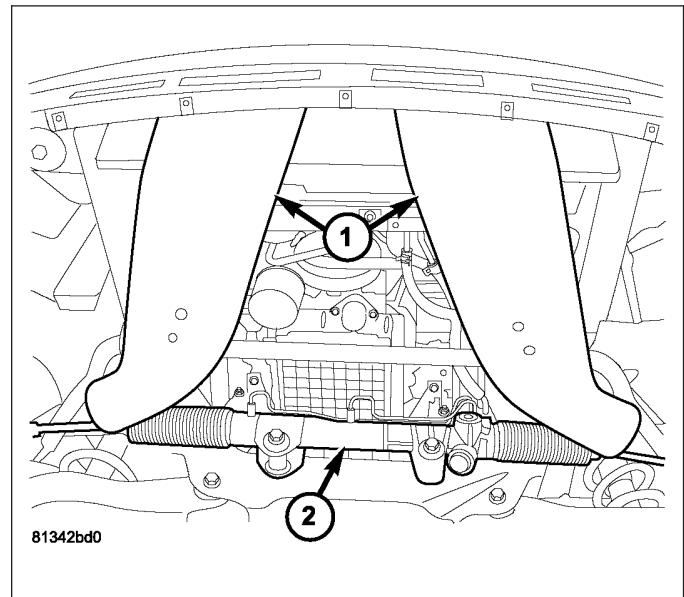
3. Disconnect the brake cooling duct support bracket (1) from the cooling duct (2).



4. Remove the front fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/Front Fascia - Removal).
5. Remove the air deflector (4) between the a/c condenser and the bumper (3).

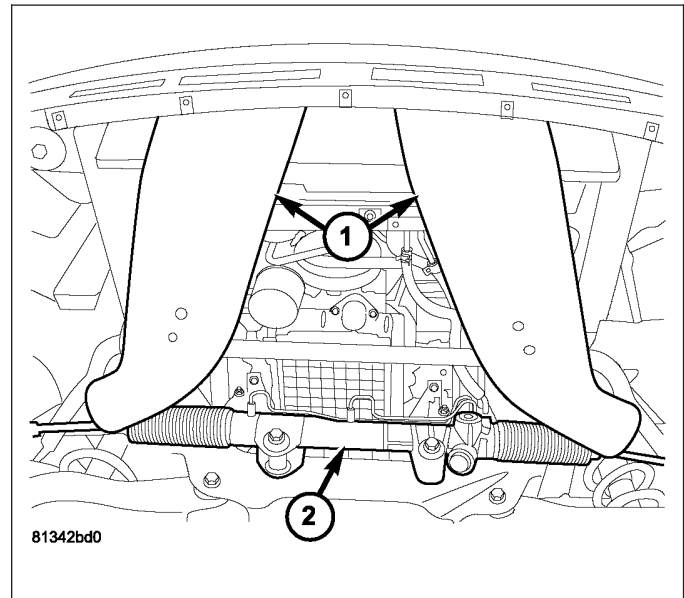


6. Remove the brake duct (1) upper retaining mounts.
7. Remove the brake cooling duct (1).

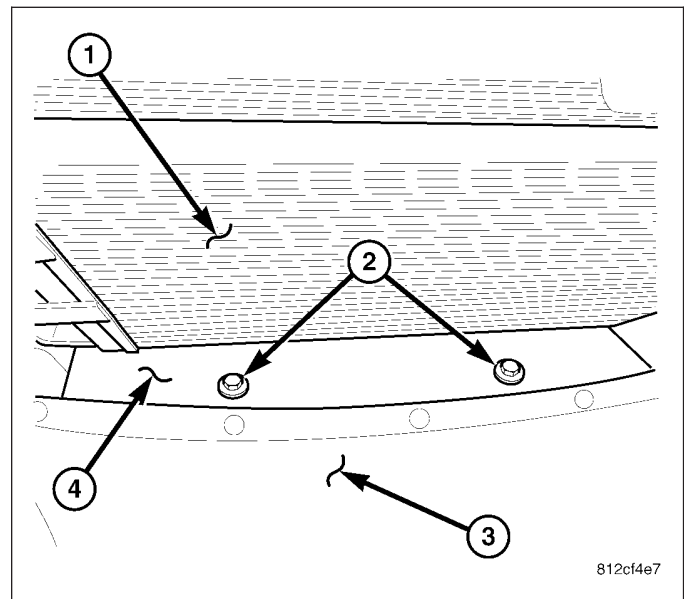


INSTALLATION

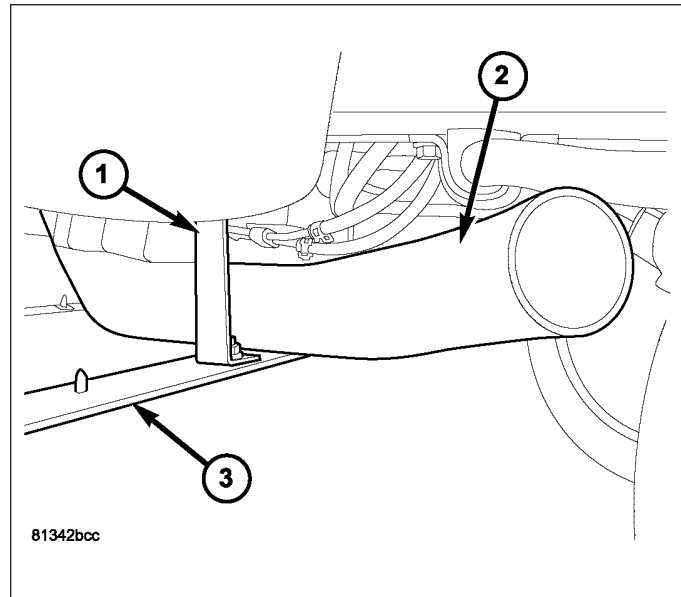
1. Install the brake cooling duct (1) to the vehicle.
2. Install the brake duct upper retaining screws by the bumper.



3. Install the air deflector (4) between the A/C condenser and bumper (3).
4. Install the front fascia (Refer to 13 - FRAME & BUMPERS/BUMPERS/FRONT FASCIA - INSTALLATION).



5. Install the cooling duct (2) to the bracket (1).
6. Install the lower air deflector (3) (Refer to 23 - BODY/EXTERIOR/BELLY PAN - DESCRIPTION).

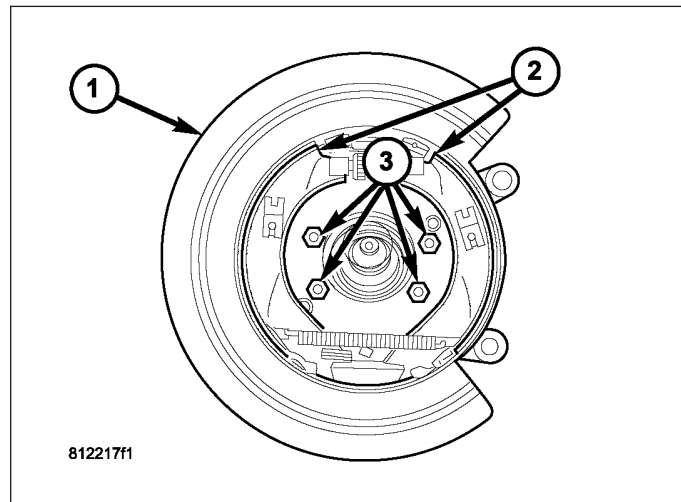


PARKING BRAKE

DESCRIPTION

The parking brakes are secured to a support plate (1) and operated by a system of cables and levers attached to a primary and secondary shoe (2) positioned within the drum section of the rotor.

The drum-in-hat design utilizes an independent set of shoes (2) to park the vehicle.



OPERATION

To apply the parking brake the pedal is depressed. This creates tension in the cable which pulls forward on the park brake lever. The lever pushes the park brake shoes outward and into contact with the drum section of the rotor. The contact of shoe to rotor parks the vehicle.

A torsion locking mechanism is used to hold the pedal in an applied position. Parking brake release is accomplished by the hand release.

A parking brake switch is mounted on the parking brake lever and is actuated by movement of the lever. The switch, which is in circuit with the red warning light in the dash, will illuminate the warning light whenever the parking brake is applied.

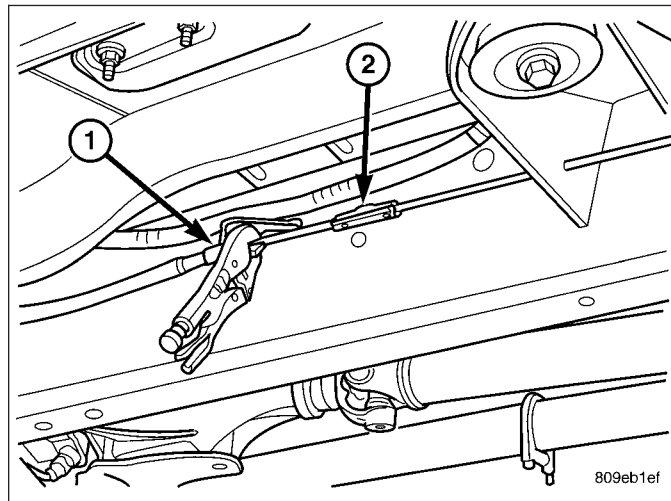
Parking brake adjustment is controlled by a cable tensioner mechanism. The cable tensioner, once adjusted at the factory, should not need further adjustment under normal circumstances. Adjustment may be required if a new tensioner, or cables are installed, or disconnected.

CABLES

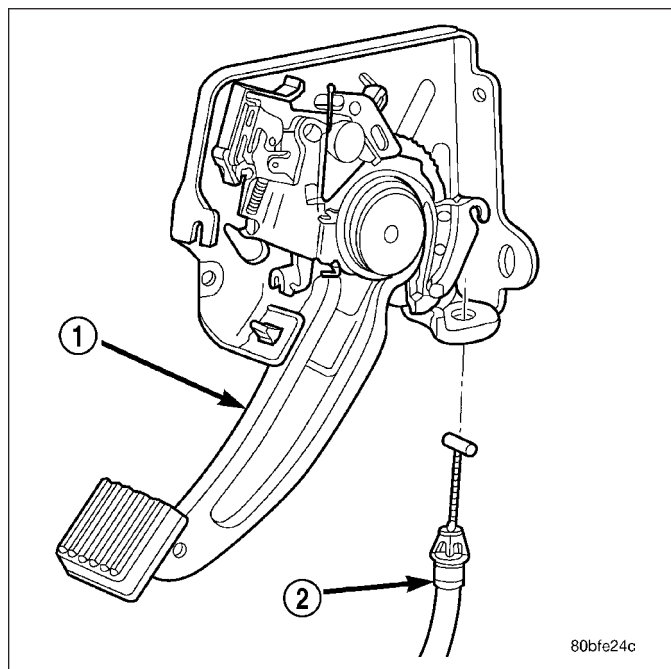
REMOVAL

FRONT PARKING BRAKE CABLE

1. Raise and support vehicle.
2. Lockout the parking brake cable (2).

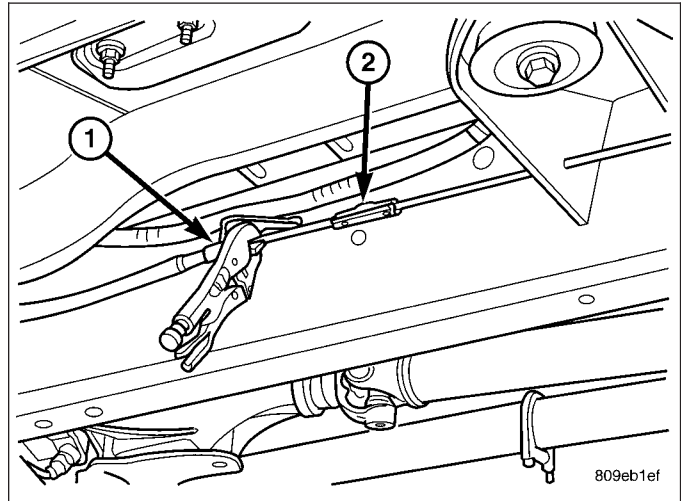


3. Loosen adjusting nut to create slack in front cable.
4. Remove the front cable from the cable connector.
5. Compress cable end fitting at underbody bracket and remove the cable from the bracket.
6. Lower vehicle.
7. Push ball end of cable out of pedal clevis with small screwdriver.
8. Compress cable end fitting at the pedal bracket (1) and remove the cable (2).
9. Remove the left cowl trim and sill plate.
10. Pull up the carpet and remove the cable from the body clip.
11. Pull up on the cable and remove the cable with the body grommet.

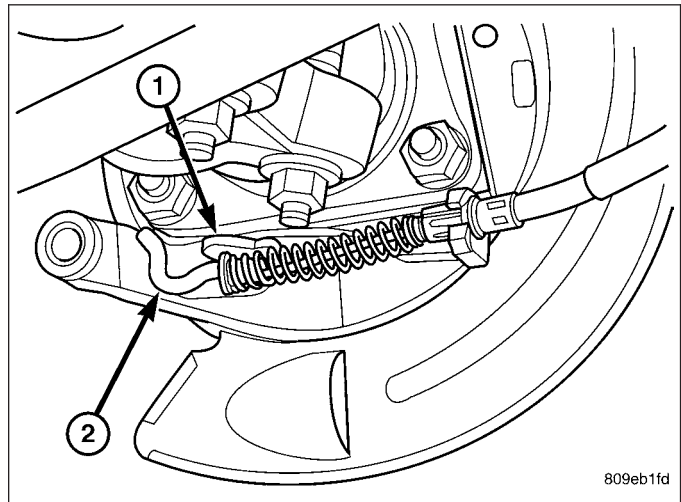


REAR PARK BRAKE CABLE

1. Raise and support the vehicle.
2. Lockout the parking brake cable (2).

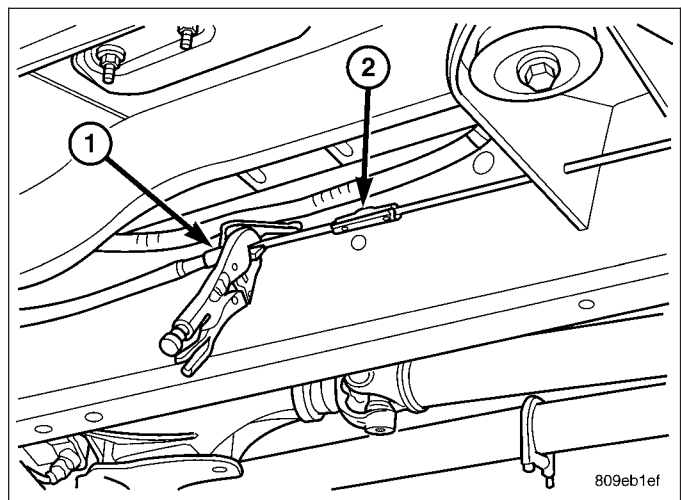


3. Loosen cable adjuster nut.
4. Remove the rear park brake cable from the intermediate park brake cable.
5. Compress tabs on cable end fitting on the rear park brake cable to the frame mount bracket. Then pull the cable through the bracket.
6. Disengage the park brake cable (2) from behind the rotor assembly..
7. Compress cable tabs on each cable end fitting at the brake cable support plate.
8. Remove the cables from the brake cable support plates.



RIGHT REAR CABLE

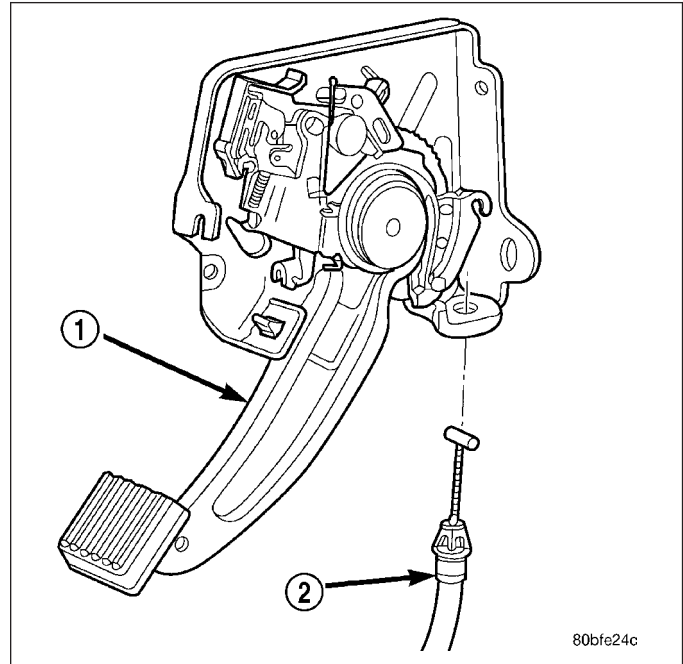
1. Raise and support the vehicle.
2. Lockout the parking brake cable (2).



INSTALLATION

FRONT PARKING BRAKE CABLE

1. From inside the vehicle, insert the cable end fitting (2) into the hole in the pedal assembly (1).
2. Seat the cable retainer in the pedal assembly (1).
3. Engage the cable ball end in clevis on the pedal assembly.



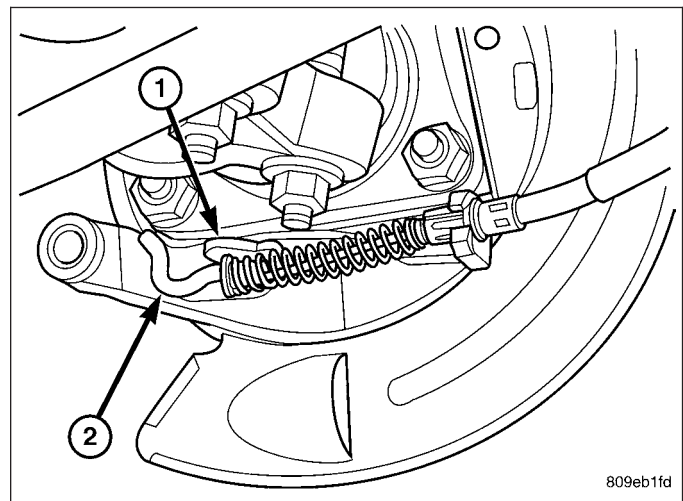
4. Route the cable through the floorpan and install the body grommet.
5. Place the carpet down and install the left cowl trim and sill plate.
6. Raise and support the vehicle.
7. Route the cable through the underbody bracket and seat the cable end fitting in the bracket.
8. Connect the cable to the cable connector.
9. Perform the park brake adjustment procedure, (Refer to 5 - BRAKES/PARKING BRAKE/CABLE TENSIONER - ADJUSTMENTS).
10. Lower the vehicle.

REAR PARK BRAKE CABLE

1. Push each cable end (2) through the brake cable support plate hole until the cable end fitting tabs lock into place.

NOTE: Pull on the cable to ensure it is locked into place.

2. Push the cable through the frame bracket.
3. Lock the left cable end fitting tabs into the frame bracket hole.
4. Install the rear cables into the tensioner rod behind the rear of the brake assembly.

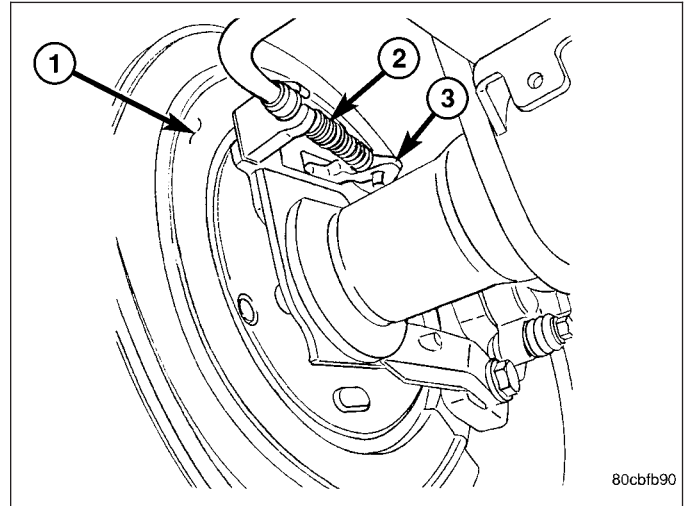


5. Install the cable to the intermediate cable connector.

6. Release and remove the lock out device.
7. Perform the park brake adjustment procedure, (Refer to 5 - BRAKES/PARKING BRAKE/CABLE TENSIONER - ADJUSTMENTS).
8. Remove the supports and lower the vehicle.

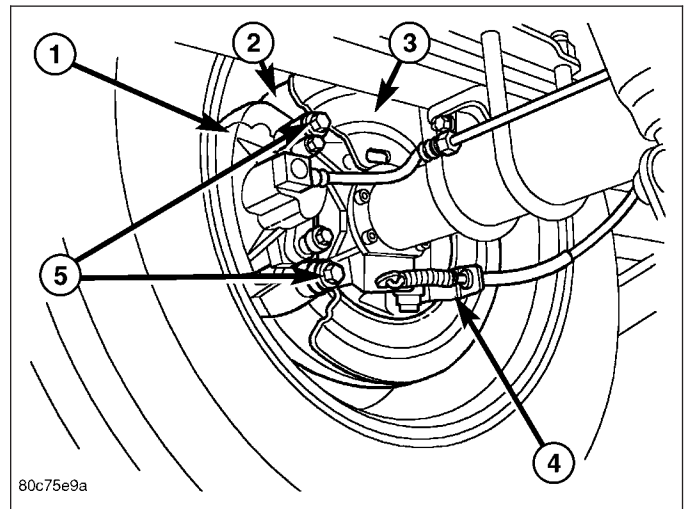
RIGHT REAR CABLE

1. Install the brake cable (2) to the brake lever (3).
2. Install the cable bracket to the shock bracket.
3. Install the cable to the axle bracket.
4. Install the cable to the frame bracket.
5. Install the right cable to the equalizer.
6. Install the right cable to the front cable.
7. Adjust the brake cable at the equalizer and using the adjuster nut.



LEFT REAR CABLE

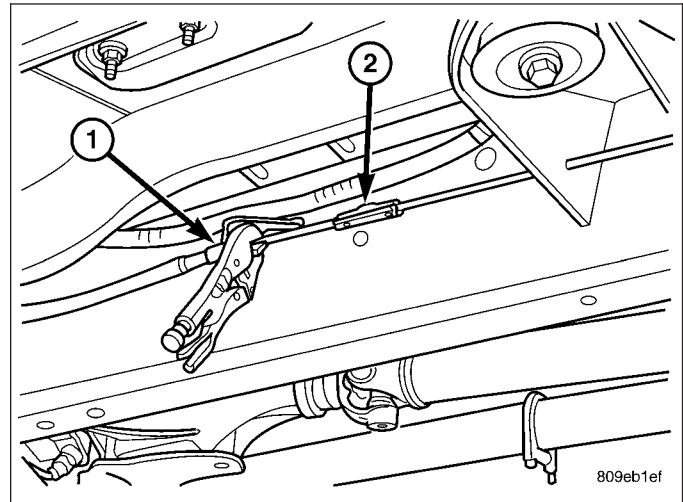
1. Install the brake cable (4) to the brake lever.
2. Install the brake cable to the frame bracket.
3. Install the left brake cable to the equalizer.
4. Adjust the brake cable at the equalizer and adjuster nut.



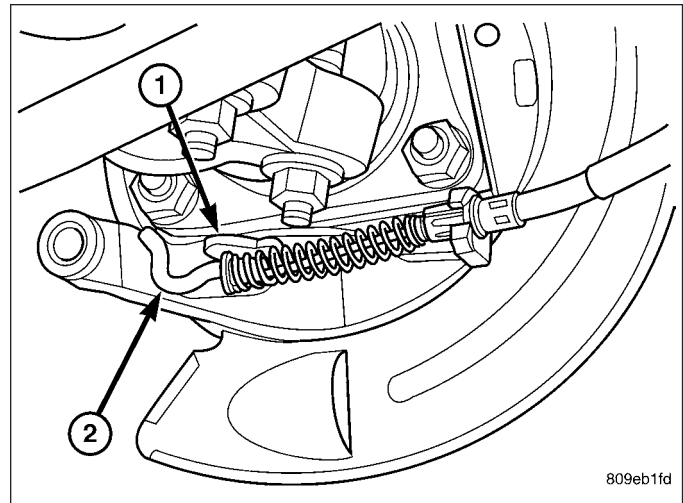
SHOES

REMOVAL

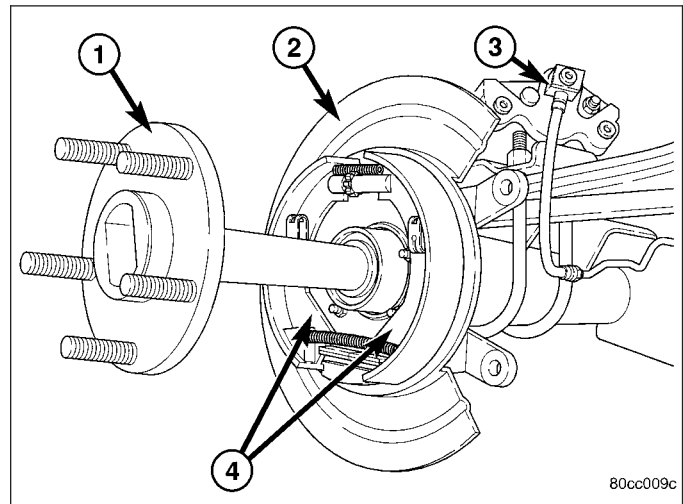
1. Raise and support the vehicle.
2. Remove the tire and wheel assembly.
3. Remove the disc brake caliper, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
4. Remove the disc brake rotor, (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
5. Lockout the parking brake cable (2).



6. Disengage the park brake cable (2) from behind the rotor assembly to allow easier disassembly of the park brake shoes.



7. Remove the axleshaft (1) (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 11 1/2 AA/AXLE SHAFTS - REMOVAL).
8. Disassemble the rear park brake shoes (4).



CLEANING - REAR DRUM IN HAT BRAKE

Clean the individual brake components, including the support plate exterior, with a water dampened cloth or with brake cleaner. Do not use any other cleaning agents. Remove light rust and scale from the brake shoe contact pads on the support plate with fine sandpaper.

INSPECTION - REAR DRUM IN HAT BRAKE

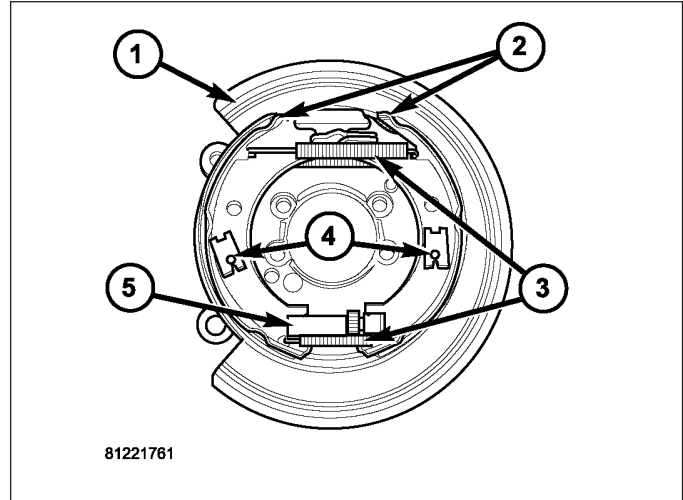
As a general rule, riveted brake shoes (2) should be replaced when worn to within 0.78 mm (1/32 in.) of the rivet heads. Bonded lining should be replaced when worn to a thickness of 1.6 mm (1/16 in.).

Examine the lining contact pattern to determine if the shoes are bent or the drum is tapered. The lining should exhibit contact across its entire width. Shoes (2) exhibiting contact only on one side should be replaced and the drum checked for runout or taper.

Inspect the adjuster screw assembly (5). Replace the assembly if the star wheel or threads are damaged, or the components are severely rusted or corroded.

Discard the brake springs (3) and retainer components (4) if worn, distorted or collapsed. Also replace the springs if a brake drag condition had occurred. Overheating will distort and weaken the springs.

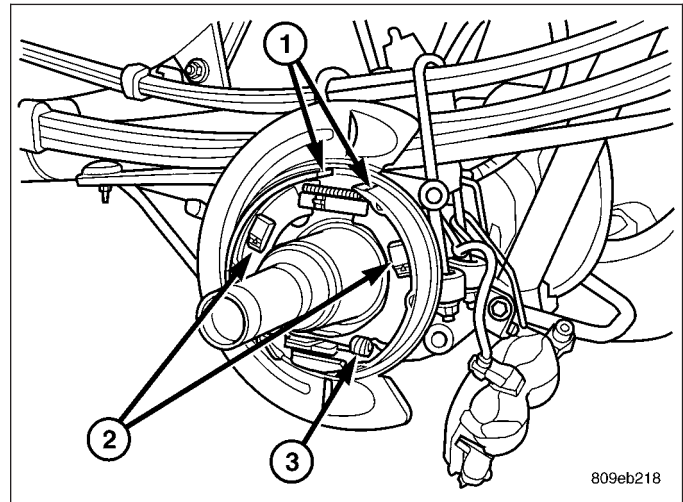
Inspect the brake shoe contact pads on the support plate (1), replace the support plate if any of the pads are worn or rusted through. Also replace the plate (1) if it is bent or distorted.



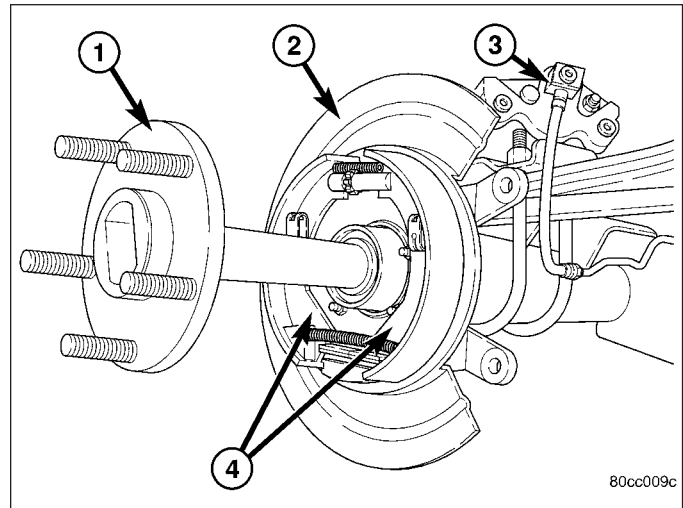
INSTALLATION

NOTE: On a new vehicle or after parking brake lining replacement, it is recommended that the parking brake system be conditioned prior to use. This is done by making one stop from 25 mph on dry pavement or concrete using light to moderate force on the parking brake foot pedal.

1. Reassemble the rear park brake shoes (1) or.



2. Install the axleshaft (1) (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 9 1/4/AXLE SHAFTS - INSTALLATION) or (Refer to 3 - DIFFERENTIAL & DRIVELINE/REAR AXLE - 11 1/2 AA/10 1/2 AA/AXLE SHAFTS - INSTALLATION).



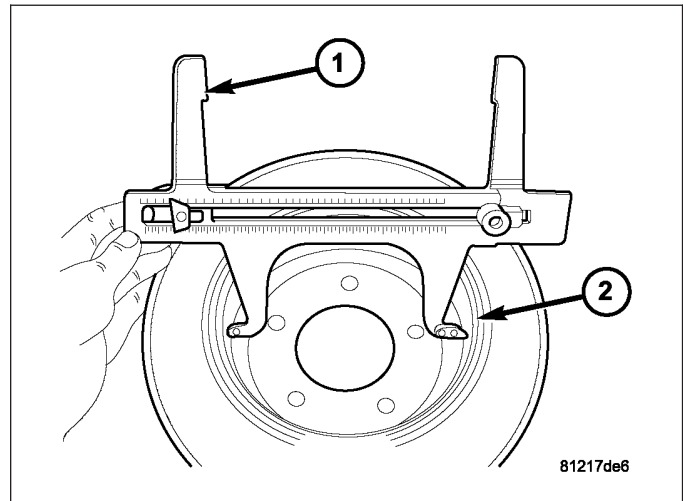
3. Install the park brake cable to the lever behind the support plate.
4. Unlock the park brake cable.
5. Install the disc brake rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
6. Install the disc brake caliper (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
7. Adjust the rear brake shoes (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).
8. Install the tire and wheel assembly (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
9. Lower the vehicle.

ADJUSTMENTS

PARKING BRAKE SHOES

CAUTION: Before adjusting the park brake shoes be sure that the park brake pedal is in the fully released position. If park brake pedal is not in the fully released position, the park brake shoes can not be accurately adjusted.

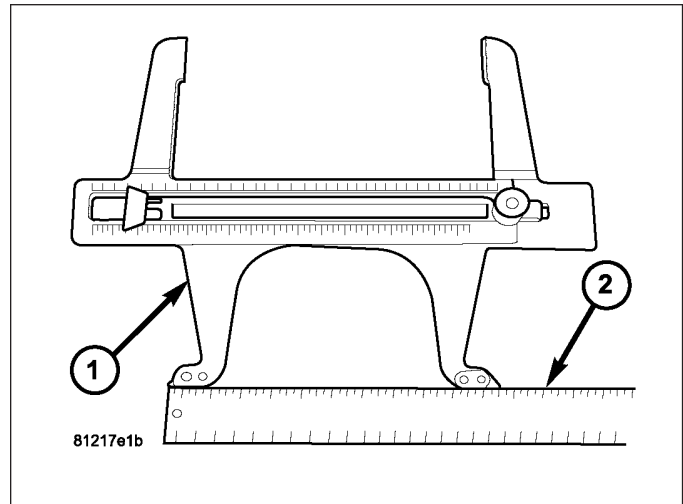
1. Raise vehicle.
2. Remove tire and wheel.
3. Remove disc brake caliper from caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - REMOVAL).
4. Remove rotor from the axleshaft (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).



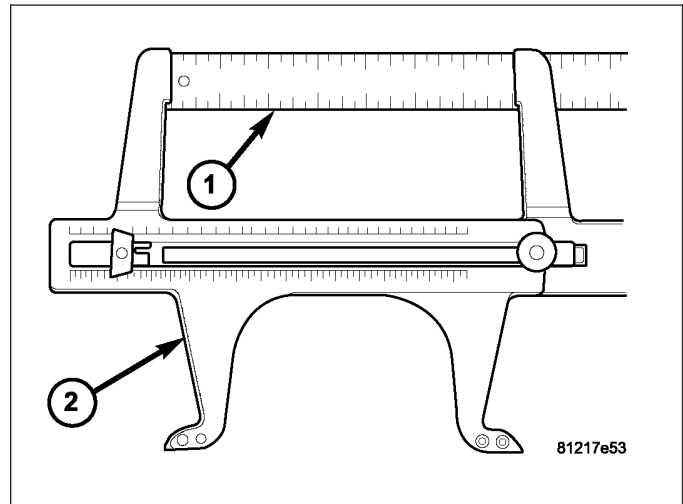
NOTE: When measuring the brake drum diameter, the diameter should be measured in the center of the area in which the park brake shoes contact the surface of the brake drum.

5. Using Brake Shoe Gauge, Special Tool C-3919 (1), or equivalent, **accurately** measure the inside diameter of the park brake drum portion (2) of the rotor.

6. Using a ruler (2) that reads in 64th of an inch, accurately read the measurement of the inside diameter of the park brake drum from the special tool (1).



7. Reduce the inside diameter measurement of the brake drum that was taken using Special Tool C-3919 (2) by 1/64 of an inch. Reset Gauge, Brake Shoe, Special Tool C-3919 (2) or the equivalent used, so that the outside measurement jaws are set to the reduced measurement.



8. Place Gauge, Brake Shoe, Special Tool C-3919, or equivalent over the park brake shoes. The special tool must be located diagonally across at the top of one shoe and bottom of opposite shoe (widest point) of the park brake shoes.
9. Using the star wheel adjuster, adjust the park brake shoes until the lining on the park brake shoes just touches the jaws on the special tool.
10. Repeat step 8 above and measure shoes in both directions.
11. Install brake rotor on the axleshaft (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).
12. Rotate rotor to verify that the park brake shoes are not dragging on the brake drum. If park brake shoes are dragging, remove rotor and back off star wheel adjuster one notch and recheck for brake shoe drag against drum. Continue with the previous step until brake shoes are not dragging on brake drum.
13. Install disc brake caliper on caliper adapter (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/DISC BRAKE CALIPERS - INSTALLATION).
14. Install wheel and tire.
15. Tighten the wheel mounting nuts in the proper sequence until all nuts are torqued to half the specified torque. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.) **LD**, 197 N·m (145 ft. lbs.) **HD SRW**, 210 N·m (155 ft. lbs.) **HD DRW**.
16. Lower vehicle.
17. Apply and release the park brake pedal one time. This will seat and correctly adjust the park brake cables.

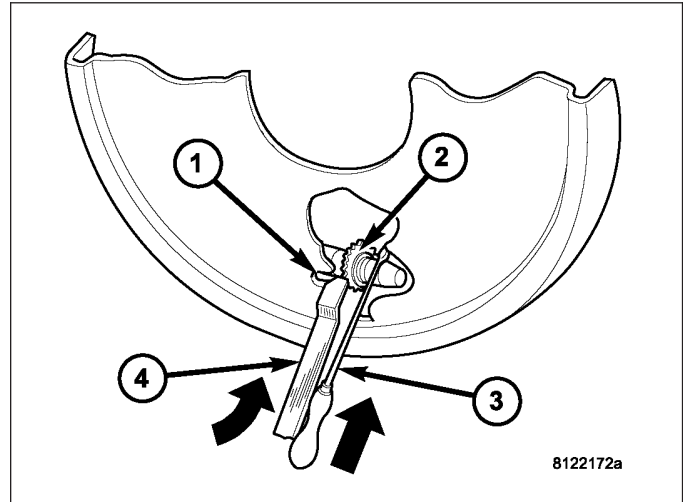
CAUTION: Before moving vehicle, pump brake pedal several times to ensure the vehicle has a firm enough pedal to stop the vehicle.

18. Road test the vehicle to ensure proper function of the vehicle's brake system.

WITH ADJUSTING TOOL

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

1. Be sure parking brake lever is fully released.
2. Raise vehicle so rear wheels can be rotated freely.
3. Remove plug from each access hole in brake support plates.
4. Loosen parking brake cable adjustment nut until there is slack in front cable.
5. Insert adjusting tool (4) through support plate access hole (1) and engage tool in teeth of adjusting screw star wheel (2).
6. Rotate adjuster screw star wheel (move tool handle upward) until slight drag can be felt when wheel is rotated.
7. Push and hold adjuster lever away from star wheel with thin screwdriver (3).
8. Back off adjuster screw star wheel until brake drag is eliminated.
9. Repeat adjustment at opposite wheel. Be sure adjustment is equal at both wheels.
10. Install support plate access hole plugs.
11. Adjust parking brake cable and lower vehicle.
12. Depress park brake pedal and make sure park brakes hold the vehicle stationary.
13. Release park brake pedal.

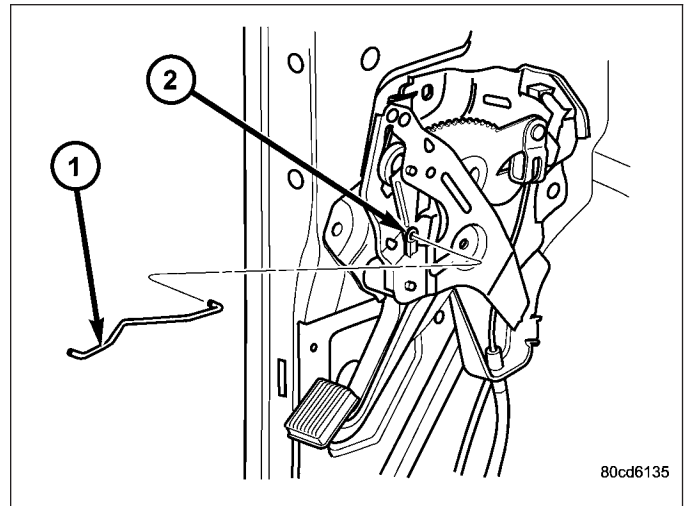


PEDAL

REMOVAL

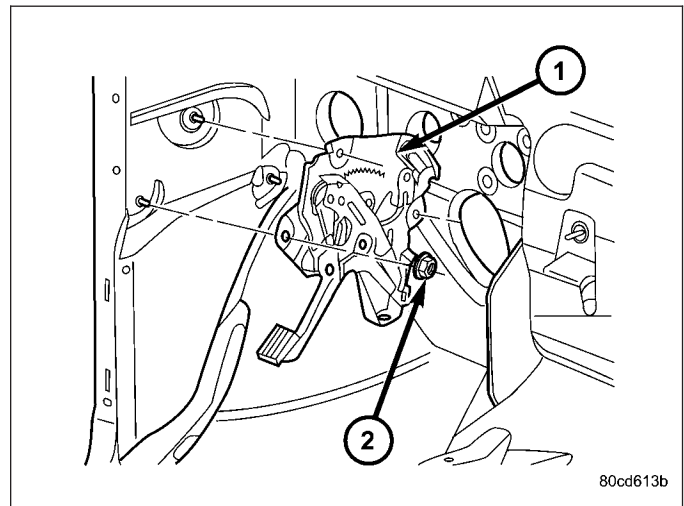
1. Release the parking brake.
2. Raise the vehicle.
3. Loosen the cable tensioner nut at the equalizer to create slack in the front cable.
4. Lower the vehicle.
5. Remove the knee bolster, (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - REMOVAL).

6. Disconnect the brake lamp wire from the switch on the pedal assembly (2).
7. Roll the carpet back, loosen the front cable grommet from the floorpan and the cable retainer.
8. Disengage the release rod (1) from the arm on the pedal assembly (2).
9. Remove the bolts/nuts from the pedal assembly (2) and remove the assembly.



INSTALLATION

1. Position the replacement pedal assembly (1) on the dash and cowl.
2. Install the bolts/nuts (2) and tighten to 28 N·m (21 ft. lbs.).
3. Install the park brake release rod.
4. Connect the front cable to the arm on the pedal assembly (1).
5. Install the front cable grommet into the floorpan and the cable retainer, roll the carpet back.
6. Connect the wires to the brake lamp switch.
7. Install the knee bolster, (Refer to 23 - BODY/INSTRUMENT PANEL/STEERING COLUMN OPENING COVER - INSTALLATION).
8. Raise the vehicle.



9. Adjust the parking brake cable tensioner (Refer to 5 - BRAKES/PARKING BRAKE/CABLE TENSIONER - ADJUSTMENTS).

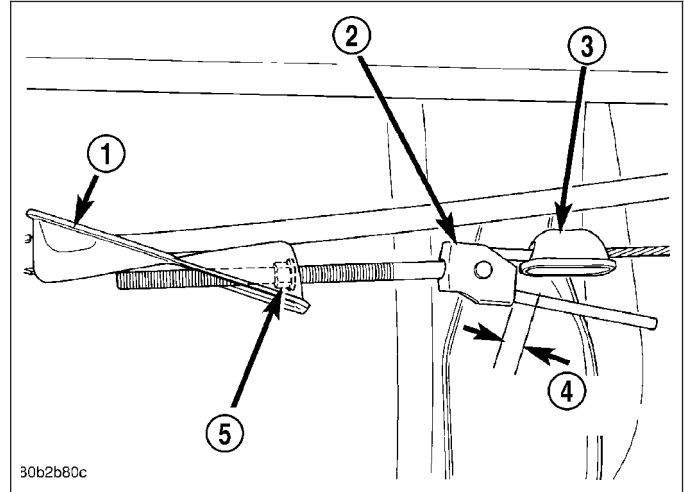
TENSIONER-CABLE

ADJUSTMENTS

CABLE TENSIONER

NOTE: Tensioner adjustment is only necessary when the tensioner, or a cable has been replaced or disconnected for service. When adjustment is necessary, perform adjustment only as described in the following procedure. This is necessary to avoid faulty park brake operation.

1. Raise the vehicle.
2. Back off the cable tensioner adjusting nut (5) to create slack in the cables.



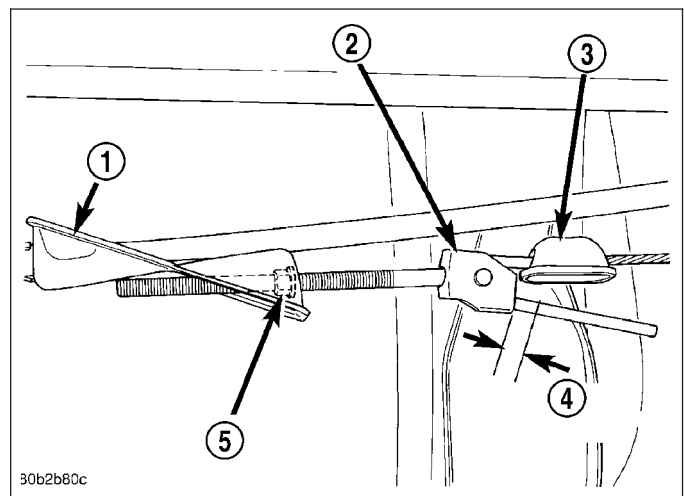
3. Remove the rear wheel/tire assemblies. Then remove the brake rotors (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
4. Verify the brakes are in good condition and operating properly.
5. Verify the park brake cables operate freely and are not binding, or seized.
6. Check the rear brake shoe adjustment with standard brake gauge (Refer to 5 - BRAKES/PARKING BRAKE/SHOES - ADJUSTMENTS).
7. Install the rotors (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION) and verify that the rotors rotate freely without drag.
8. Install the wheel/tire assemblies, (Refer to 22 - TIRES/WHEELS/WHEELS - STANDARD PROCEDURE).
9. Lower the vehicle enough for access to the park brake foot pedal. Then fully apply the park brakes.

NOTE: Leave park brakes applied until adjustment is complete.

10. Raise the vehicle again.
11. Mark the tensioner rod 6.35 mm (1/4 in.) from edge of the tensioner (2).
12. Tighten the adjusting nut (5) on the tensioner rod until the mark is no longer visible.

CAUTION: Do not loosen, or tighten the tensioner adjusting nut for any reason after completing adjustment.

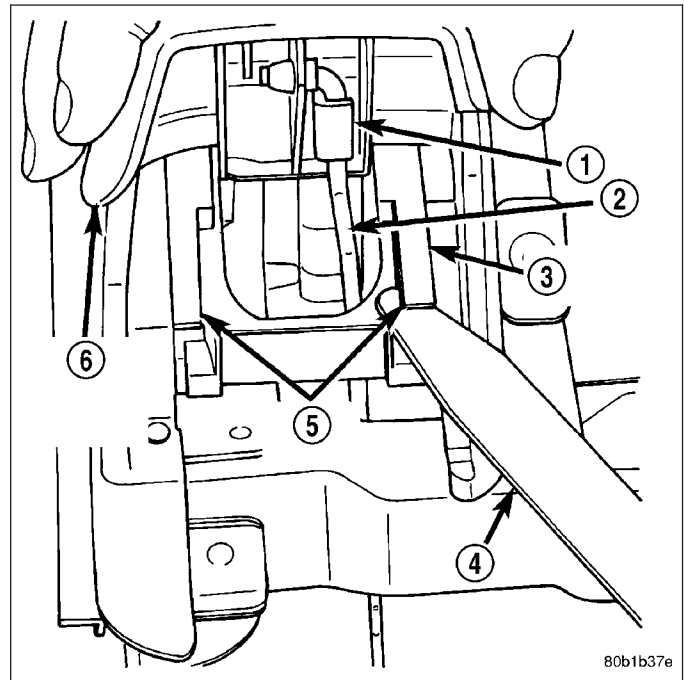
13. Lower the vehicle until the rear wheels are 15-20 cm (6-8 in.) off the shop floor.
14. Release the park brake foot pedal and verify that rear wheels rotate freely without drag. Then lower the vehicle.



HANDLE-RELEASE

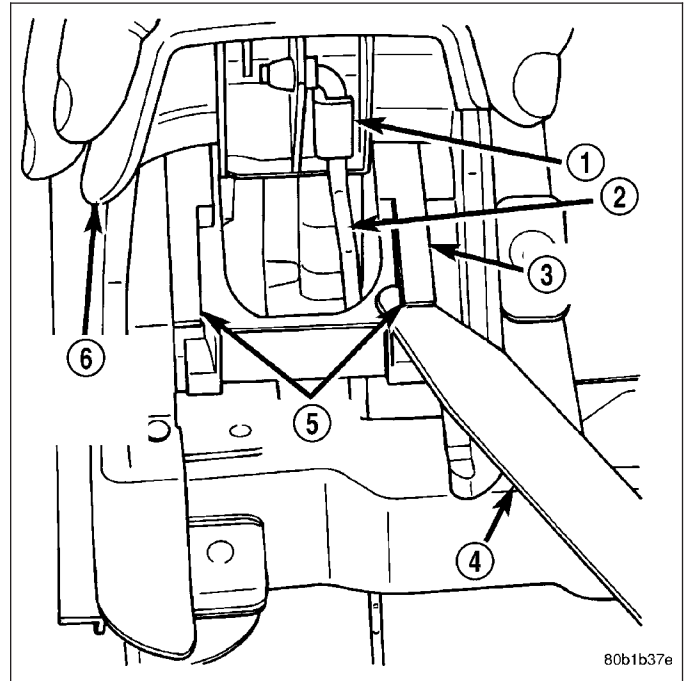
REMOVAL

1. Disconnect and isolate the battery negative cable.
2. Reach under the driver side outboard end of the instrument panel to access and unsnap the plastic retainer clip that secures the park brake release linkage rod to the park brake mechanism on the left cowl side inner panel.
3. Disengage the park brake release linkage rod end from the park brake mechanism.
4. Lift the park brake release handle to access and unsnap the plastic retainer clip that secures the park brake release linkage rod to the lever on the back of the park brake release handle.
5. Lower the park brake release handle and reach under the driver side outboard end of the instrument panel to disengage the park brake release linkage rod end from the lever on the back of the park brake release handle.
6. Lift the park brake release handle to access the handle mounting bracket.
7. Using a trim stick (4) or another suitable wide flat-bladed tool, gently pry each of the park brake release handle (6) mounting bracket latch tabs (5) away from the retaining notches in the instrument panel receptacle.
8. With both of the park brake release handle mounting bracket latches released, slide the handle and bracket assembly down and out of the instrument panel receptacle.



INSTALLATION

1. Position the park brake release handle to the instrument panel.
2. Slide the handle and bracket assembly up into the instrument panel receptacle until both of the park brake release handle (6) mounting bracket latches are engaged with the notches in the instrument panel receptacle.
3. Lower the park brake release handle and reach under the driver side outboard end of the instrument panel to engage the park brake release linkage rod end with the lever on the back of the park brake release handle (6).
4. Lift the park brake release handle to access and snap the plastic retainer clip that secures the park brake release linkage rod to the lever on the back of the park brake release handle over the linkage rod.
5. Reach under the driver side outboard end of the instrument panel to access and engage the park brake release linkage rod end to the park brake mechanism.
6. Snap the plastic retainer clip that secures the park brake release linkage rod to the park brake mechanism on the left cowl side inner panel over the linkage rod.
7. Reconnect the battery negative cable.



BRAKES - ABS - SERVICE INFORMATION

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BRAKES - ABS - SERVICE INFORMATION

DESCRIPTION

The antilock brake system (ABS) is an electronically operated, three channel brake control system. The vehicle has Electronic Variable Brake Proportioning (EVBP) designed into the system which eliminates the combination/proportioning valve.

The system is designed to prevent wheel lockup and maintain steering control during braking. Preventing lockup is accomplished by modulating fluid pressure to the wheel brake units.

The hydraulic system is a three channel design. The front wheel brakes are controlled individually and the rear wheel brakes in tandem. The ABS electrical system is separate from other electrical circuits in the vehicle. A specially programmed controller antilock brake unit operates the system components.

ABS system major components include:

- Controller Antilock Brakes (CAB)
- Hydraulic Control Unit (HCU)
- Wheel Speed Sensors (WSS)
- ABS Warning Light

OPERATION

Battery voltage is supplied to the CAB. The CAB performs a system initialization procedure at start up. A check of the ABS motor is performed at 15 miles per hour. Initialization consists of a static and dynamic self check of system electrical components.

The static and dynamic checks occurs at ignition start up. During the dynamic check, the CAB briefly cycles solenoids to verify operation. An audible noise may be heard during this self check. This noise should be considered normal. The ABS motor and pump are then checked at a speed of 15 mile per hour.

If an ABS component exhibits a fault during initialization, the CAB illuminates the amber warning light and registers a fault code in the microprocessor memory.

The CAB monitors wheel speed sensor inputs continuously while the vehicle is in motion. However, the CAB will not activate any ABS components as long as sensor inputs indicate normal braking.

During normal braking, the master cylinder, power booster and wheel brake units all function as they would in a vehicle without ABS. The HCU components are not activated.

The purpose of the antilock system is to prevent wheel lockup. Preventing lockup helps maintain vehicle braking action and steering control.

The antilock CAB activates the system whenever sensor signals indicate periods of wheel slip.

The antilock system prevents lockup during a wheel slip condition by modulating fluid apply pressure to the wheel brake units.

Brake fluid apply pressure is modulated according to wheel speed, degree of slip and rate of deceleration. Sensors at each front wheel convert wheel speed into electrical signals. These signals are transmitted to the CAB for processing and determination of wheel slip and deceleration rate.

The ABS system has three fluid pressure control channels. The front brakes are controlled separately and the rear brakes in tandem. A speed sensor input signal indicating a wheel slip condition activates the CAB antilock program.

There are Two solenoid valves (Isolation and Dump valve) which are used in each antilock control channel. The valves are all located within the HCU valve body and work in pairs to either increase, hold, or decrease apply pressure as needed in the individual control channels.

During an ABS stop the ISO valve is energized which acts to prevent further pressure build-up to the calipers. Then the Dump valve dumps off pressure until the wheel unlocks. This will continue until the wheels quit slipping altogether.

STANDARD PROCEDURE

ABS BRAKE BLEEDING

ABS system bleeding requires conventional bleeding methods plus use of the DRB scan tool. The procedure involves performing a base brake bleeding, followed by use of the scan tool to cycle and bleed the HCU pump and solenoids. A second base brake bleeding procedure is then required to remove any air remaining in the system.

1. Perform base brake bleeding, (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).
2. Connect scan tool to the Data Link Connector.
3. Select ANTILOCK BRAKES, followed by MISCELLANEOUS, then ABS BRAKES. Follow the instructions displayed. When scan tool displays TEST COMPLETE, disconnect scan tool and proceed.
4. Perform base brake bleeding a second time, (Refer to 5 - BRAKES - STANDARD PROCEDURE) OR (Refer to 5 - BRAKES - STANDARD PROCEDURE).
5. Top off master cylinder fluid level and verify proper brake operation before moving vehicle.

SPECIFICATIONS**TORQUE CHART****TORQUE SPECIFICATIONS**

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
ABS Assembly Mounting Bolts	15	11	—
ABS Assembly CAB Screws	3.5	—	31
ABS Assembly Brake Line Fittings	19	—	170
Wheel Speed Sensors Front Sensor Bolt	21	—	190
Wheel Speed Sensors Bracket To Knuckle	6.7	—	60
Wheel Speed Sensors Rear Sensor Stud	22.5	—	200
Controller Mounting Screws	6	—	53
RWAL Module Mounting Bolts	15	11	—
RWAL Valve Brake Line Fittings	19	—	170
Rear Wheel Speed Sensor Mounting Bolt	24	—	200

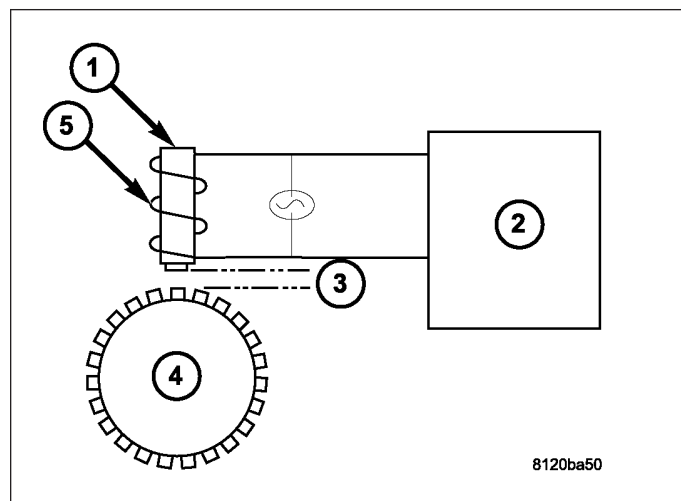
SENSOR- WHEEL SPEED-ABS-FRONT**DESCRIPTION**

The ABS brake system uses 3 wheel speed sensors. A sensor is mounted to each front hub/bearings. The third sensor is mounted on top of the rear axle differential housing.

OPERATION

The Wheel Speed Sensor consists of a magnet (1) surrounded by windings from a single strand of wire (5). The sensor sends a small AC signal to the ABM. This signal is generated by magnetic induction. The magnetic induction is created when a toothed sensor ring (exciter ring or tone wheel) (4) passes the stationary magnetic WSS.

When the ring gear is rotated, the exciter ring (4) passes the tip of the WSS. As the exciter ring tooth approaches the tip of the WSS, the magnetic lines of force expand, causing the magnetic field to cut across the sensor's windings (5). This, in turn causes current to flow through the WSS circuit in one direction. When the exciter ring tooth moves away from the sensor tip, the magnetic lines of force collapse cutting the winding in the opposite direction. This causes the current to flow in the opposite direction. Every time a tooth of



the exciter ring passes the tip of the WSS, an AC signal is generated current. Each AC signal (positive to negative signal or squarewave) is interpreted by the ABM. It then compares the frequency of the sinewave to a time value to calculate vehicle speed. The ABM continues to monitor the frequency to determine a deceleration rate that would indicate a possible wheel-locking tendency.

The signal strength of any magnetic induction sensor is directly affected by:

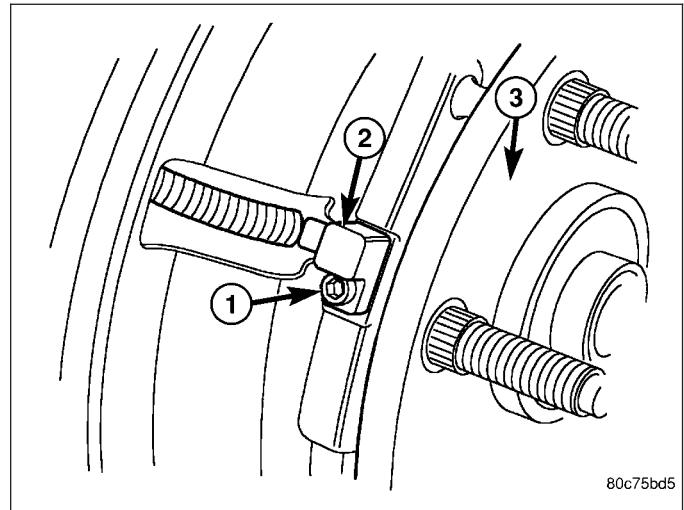
- Magnetic field strength; the stronger the magnetic field, the stronger the signal
- Number of windings in the sensor; more windings provide a stronger signal
- Exciter ring speed; the faster the exciter ring/tone wheel rotates, the stronger the signal will be
- Distance (3) "air gap" between the exciter ring teeth and WSS; the closer the WSS is to the exciter ring/tone wheel, the stronger the signal will be.

The WSS is not adjustable. A clearance specification has been established for manufacturing tolerances. If the clearance is not within these specifications, then either the WSS or other components may be damaged. The clearance between the WSS and the exciter ring is 0.005 – 0.050 in.

The assembly plant performs a "Rolls Test" on every vehicle that leaves the assembly plant. One of the test performed is a test of the WSS. To properly test the sensor, the assembly plant connects test equipment to the Data Link Connector (DLC). This connector is located to the right of the steering column and attached to the lower portion of the instrument panel. The rolls test terminal is spliced to the WSS circuit. The vehicle is then driven on a set of rollers and the WSS output is monitored for proper operation.

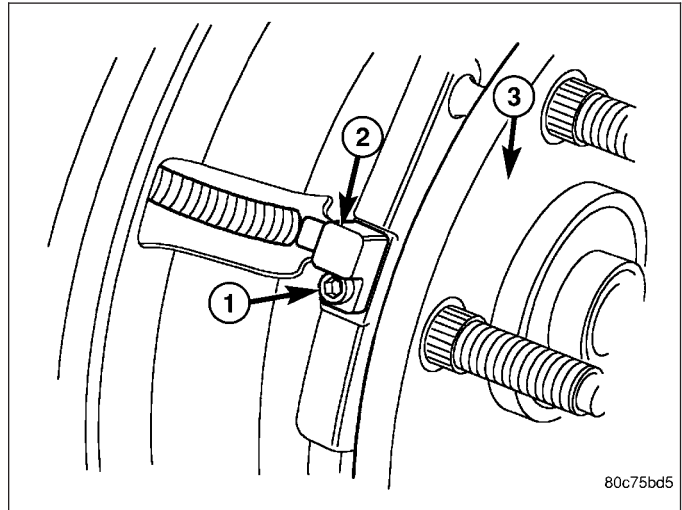
REMOVAL

1. Remove the front rotor (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - REMOVAL).
2. Remove the wheel speed sensor mounting bolt (1) from the hub (3).
3. Remove the wheel speed sensor (2) from the hub (3).
4. Remove the wiring from the clips and disconnect the electrical connector.



INSTALLATION

1. Install the wiring to the clips and Reconnect the electrical connector.
2. Install the wheel speed sensor (2) to the hub (3).
3. Install the wheel speed sensor mounting bolt (1) to the hub (3). Tighten the bolt to 21 N·m (190 in. lbs.).
4. Install the front rotor and brake caliper assembly (Refer to 5 - BRAKES/HYDRAULIC/MECHANICAL/ROTORS - INSTALLATION).



SENSOR-WHEEL SPEED-ABS-REAR

DIAGNOSIS AND TESTING

REAR WHEEL ANTILOCK

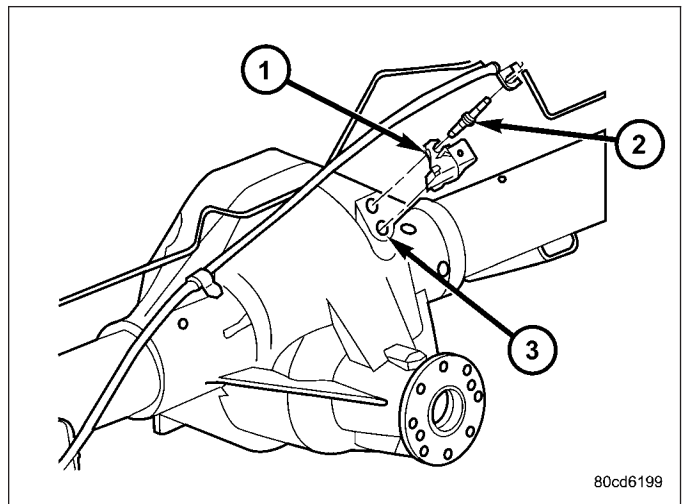
Diagnosis of base brake conditions which are mechanical in nature should be performed first. This includes brake noise, lack of power assist, parking brake, or vehicle vibration during normal braking.

The RWAL brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The CAB monitors the system inputs and outputs circuits to verify the system is operating properly. If the CAB senses a malfunction in the system it will set a DTC into memory and trigger the warning lamp.

NOTE: The MDS or DRB III scan tool is used to diagnose the RWAL system. For test procedures refer to the Chassis Diagnostic Manual.

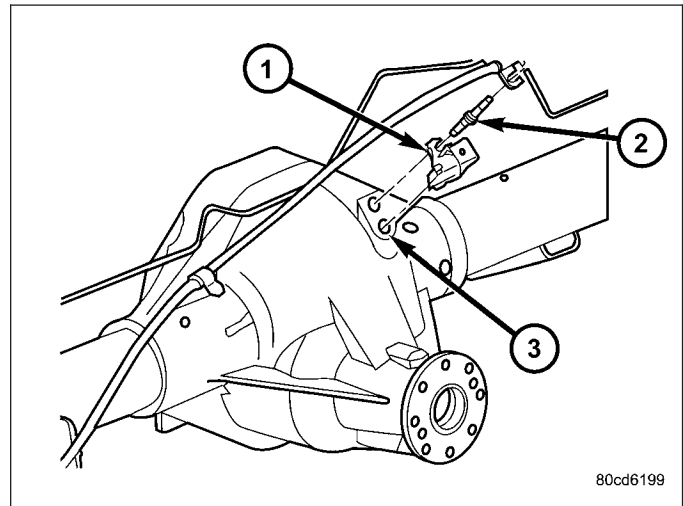
REMOVAL

1. Raise the vehicle on a hoist.
2. Remove the brake line mounting nut and remove the brake line from the sensor stud.
3. Remove the mounting stud (2) from the sensor and shield.
4. Remove the sensor (1) and shield from the differential housing (3).
5. Disconnect the sensor wire harness and remove the sensor (1).



INSTALLATION

1. Connect the harness to the sensor. **Be sure the seal is securely in place between the sensor and the wiring connector.**
2. Install the O-ring on the sensor (if removed).
3. Insert the sensor (1) in the differential housing (3).
4. Install the sensor shield.
5. Install the sensor mounting stud (2) and tighten to 24 N·m (200 in. lbs.).
6. Install the brake line on the sensor stud (2) and install the nut.
7. Lower the vehicle.



WHEEL-TONE

DIAGNOSIS AND TESTING

REAR WHEEL SPEED SENSOR

Diagnosis of base brake conditions which are mechanical in nature should be performed first. This includes brake noise, lack of power assist, parking brake, or vehicle vibration during normal braking.

The Antilock brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The CAB monitors the system inputs and outputs circuits to verify the system is operating properly. If the CAB senses a malfunction in the system it will set a DTC into memory and trigger the warning lamp.

NOTE: The MDS or DRB III scan tool is used to diagnose the Antilock Brake system. For test procedures refer to the Chassis Diagnostic Manual.

HYDRAULIC/MECHANICAL

DESCRIPTION - ELECTRONIC VARIABLE BRAKE PROPORTIONING

Vehicles equipped with ABS use electronic variable brake proportioning (EVBP) to balance front-to-rear braking. The EVBP is used in place of a rear proportioning valve. The EVBP system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the integrated control unit (ICU).

OPERATION - ELECTRONIC VARIABLE BRAKE PROPORTIONING

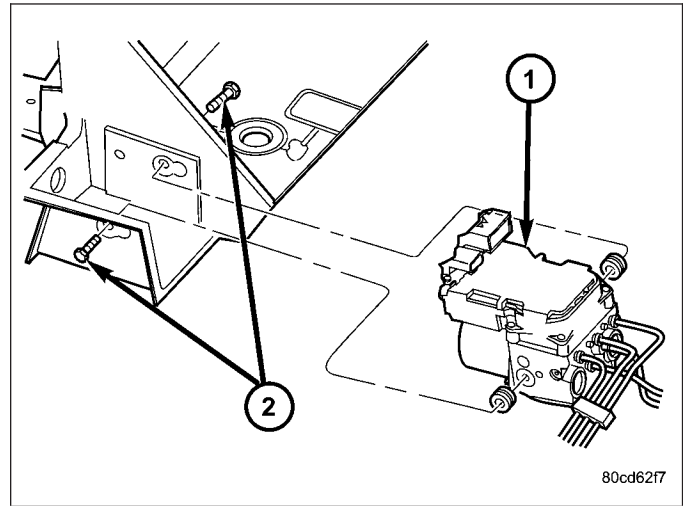
EVBP is able to decrease, hold and increase rear brake pressure without activating full ABS control. Upon entry into EVBP the inlet valve for the rear brake circuit is switched on so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure, the outlet valve for the rear brake circuit is pulsed. This allows fluid to enter the low pressure accumulator (LPA) in the hydraulic control unit (HCU) resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure, the outlet valve is switched off and the inlet valve is pulsed. This increases the pressure to the rear brakes.

The EVBP will remain functional during many ABS fault modes. If both the red BRAKE and amber ABS warning indicators are illuminated, the EVBP may not be functioning.

HCU (HYDRAULIC CONTROL UNIT)

DESCRIPTION

The HCU (1) consists of a valve body, pump motor, low pressure accumulators, inlet valves, outlet valves and noise attenuators.



OPERATION

Accumulators in the valve body store extra fluid released to the system for ABS mode operation. The pump provides the fluid volume needed and is operated by a DC type motor. The motor is controlled by the CAB.

The valves modulate brake pressure during antilock braking and are controlled by the CAB.

The HCU provides three channel pressure control to the front and rear brakes. One channel controls the rear wheel brakes in tandem. The two remaining channels control the front wheel brakes individually.

During antilock braking, the solenoid valves are opened and closed as needed.

During normal braking, the HCU solenoid valves and pump are not activated. The master cylinder and power booster operate the same as a vehicle without an ABS brake system.

NOTE: The three modes mentioned below do occur but not necessarily in the order listed everytime.

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure increase, pressure hold, and pressure decrease. The valves are all contained in the valve body portion of the HCU.

PRESSURE DECREASE

The outlet valve is opened and the inlet valve is closed during the pressure decrease cycle.

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the CAB closes the inlet then opens the outlet valve, which also opens the return circuit to the accumulators. Fluid pressure is allowed to bleed off (decrease) as needed to prevent wheel lock.

Once the period of high wheel slip has ended, the CAB closes the outlet valve and begins a pressure increase or hold cycle as needed.

PRESSURE HOLD

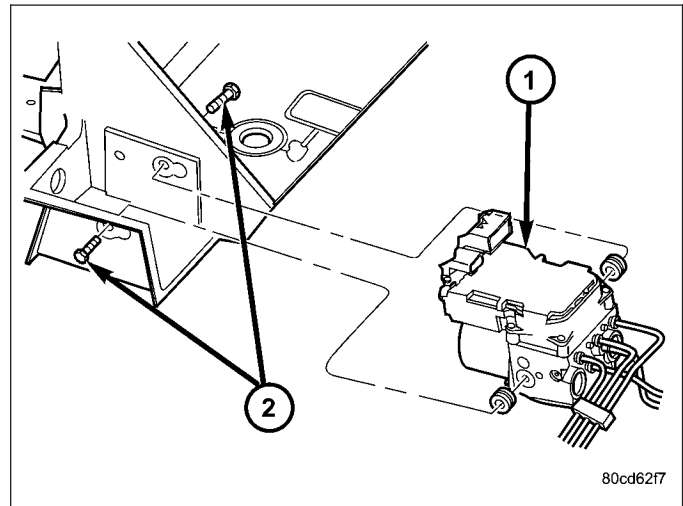
Both solenoid valves are closed in the pressure hold cycle but only the inlet valve is energized. Fluid apply pressure in the control channel is maintained at a constant rate. The CAB maintains the hold cycle until sensor inputs indicate a pressure change is necessary.

PRESSURE INCREASE

The inlet valve is open and the outlet valve is closed during the pressure increase cycle. The pressure increase cycle is used to reapply the brakes. This cycle controls re-application of fluid apply pressure.

REMOVAL

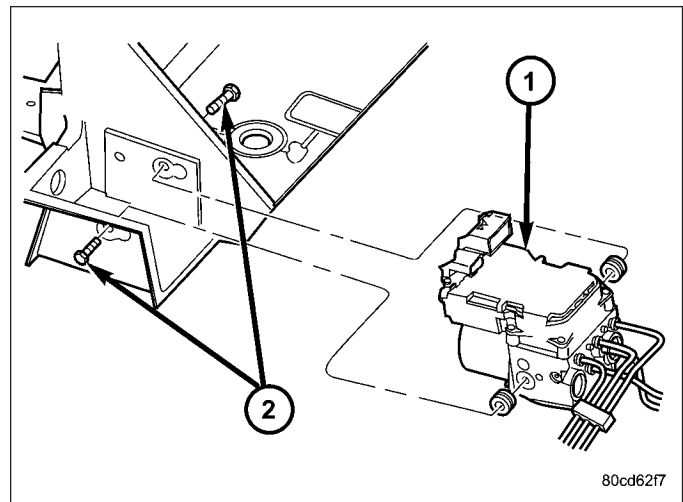
1. Disconnect the battery cables from the battery.
2. Remove the battery.
3. Disconnect the two electrical harness connectors.
4. Remove the five brake lines from the HCU (1).
5. Remove HCU/CAB mounting bolts (1) and remove the HCU/CAB (1).



INSTALLATION

NOTE: If the CAB is being replaced with a new CAB is must be reprogrammed with the use of a DRB III.

1. Install HCU/CAB (1) on the mounts (2) and Tighten the bolts to 15N·m (11 ft. lbs.).
2. Install the five brake lines to the HCU (1) and tighten to 19 N·m (170 in. lbs.).
3. Install the two electrical harness connectors to the HCU/CAB (1) and push down on the release to secure the connectors.



4. Install the battery.
5. Install the battery cables to the battery.
6. Bleed ABS brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

VALVE-RWAL

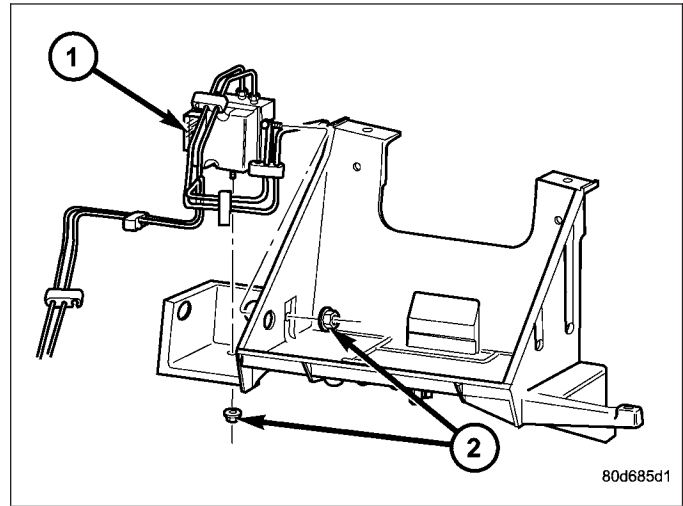
DESCRIPTION

Rear Wheel Antilock (RWAL) brake system is standard equipment on 1500 series vehicles. The RWAL brake system is designed to prevent rear wheel lock-up on virtually all types of road surfaces. RWAL braking is desirable because a vehicle which is stopped without locking the rear wheels will retain directional stability. This allows the driver to retain greater control of the vehicle during braking.

The valve is located on the drivers side inner fender under the hood. The valve modulates hydraulic pressure to the rear brakes.

The RWAL components include:

- RWAL Valve(1)
- Controller Antilock brake (CAB)
- Rear Wheel Speed Sensor (WSS)



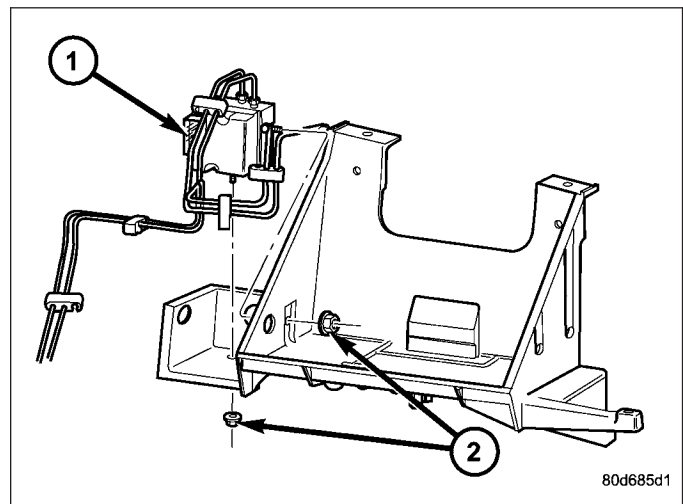
OPERATION

When the brakes are applied, hydraulic fluid is routed from the master cylinder's secondary circuit to the RWAL valve. From there hydraulic fluid is routed to the rear brakes. The Controller Antilock Brake (CAB) contains an Electronic Variable Brake Proportioning (EVBP) control algorithm, which proportions the applied braking force to the rear wheels during braking. The EVBP function of the RWAL system takes the place of a conventional hydraulic proportioning valve. The CAB monitors the rear wheel speed through the rear wheel speed sensor and calculates an estimated vehicle deceleration. When an established deceleration threshold is exceeded, an isolation valve is closed to hold the applied brake pressure to the rear brakes constant. Upon further increases in the estimated vehicle deceleration, the isolation valve is selectively opened to increase rear brake pressure in proportion to the front brake pressure. If impending rear wheel lock-up is sensed, the CAB signals the RWAL valve to modulate hydraulic brake pressure to the rear wheels to prevent lock-up.

NORMAL BRAKING Since the RWAL valve also performs the EVBP or proportioning function, vehicle deceleration under normal braking may be sufficient to trigger the EVBP function of the RWAL system without full RWAL activity as would normally occur during an impending rear wheel lock-up. As previously mentioned, the isolation valve is selectively closed and opened to increase rear brake pressure in proportion to the front brake pressure under EVBP control. Slight brake pedal pulsations may be noticed as the isolation valve is opened.

REMOVAL

1. Disconnect the battery cables from the battery.
2. Remove the battery.
3. Disconnect the electrical harness connector.
4. Remove the brake lines from the rwal valve (1).
5. Remove rwal valve mounting nuts (2) and remove the rwal valve (1).



INSTALLATION

1. Install rwal valve (1) and Tighten the nuts (2) to 15 N·m (11 ft. lbs.).
2. Install the brake lines to the rwal valve and tighten to 19 N·m (170 in. lbs.).
3. Install the electrical harness connector to the rwal valve and secure the connector.
4. Install the battery.
5. Install the battery cables to the battery.
6. Bleed ABS brake system (Refer to 5 - BRAKES - STANDARD PROCEDURE).

