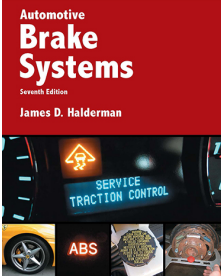


Automotive Brake Systems



CHAPTER 18

ABS Diagnosis and Service

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OBJECTIVES

- Explain the ABS diagnostic procedure and the brake warning lamp operation.
- Explain how to retrieve ABS diagnostic trouble codes.
- Explain how to diagnosis wheel speed sensors.
- Explain how to diagnose the OBD-II ABS system.

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ABS DIAGNOSTIC PROCEDURE

- To diagnose an ABS problem use the following steps:
 - STEP 1: Verify the customer concern.
 - STEP 2: Perform a visual inspection.
 - STEP 3: Check for stored diagnostic trouble codes.
 - STEP 4: Complete the repair.
 - STEP 5: Verify the repair.

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BRAKE WARNING LAMP OPERATION

- When visually diagnosing an antilock braking system problem first check the status of the brake warning lamps
- Red Brake Warning Lamp
 - A red brake warning lamp (RBWL) warns of a possible dangerous failure in the base brakes
 - This lamp will also light if the parking brake is applied and may light due to an ABS failure

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BRAKE WARNING LAMP OPERATION

- Amber ABS Warning Lamp
 - The amber ABS warning lamp usually comes on after an engine start during the initialization or start-up self-test sequence
 - The amount of time the lamp remains on after the ignition is turned on varies with design

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RETRIEVING DIAGNOSTIC TROUBLE CODES

- The exact procedure depends on the type of ABS and vehicle
- Consult factory service information for the vehicle being diagnosed
- Some systems can only display flash codes.
- Some systems can perform self-diagnosis and display all information on a scan tool

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KELSEY-HAYES ANTILOCK (NONINTEGRAL)

- The Kelsey-Hayes rear-wheel antilock uses two solenoids and valves to control the rear-wheel brakes
- Kelsey-Hayes four-wheel antilock uses the computer to pulse the valves
- This pulsing is called pulse-width modulated (PWM) and the valve is called a PWM valve

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KELSEY-HAYES ANTILOCK (NONINTEGRAL)

- GM trucks' (RWAL) DTCs are retrieved by flash codes or scan data through the use of a scan tool or connect H to A at the data link connector (DLC)
- Ford RABS DTCs are retrieved by jumper lead flash codes only
- Dodge light truck DTCs are retrieved by ground diagnostic connections

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BOSCH 2 ABS (NONINTEGRAL)

- Retrieving Diagnostic Trouble Codes
 - On General Motors vehicles connect A to H at the data link connector (DLC)
 - For most systems, a scan tool should be used, if available

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TEVES MARK IV

- The Teves Mark IV is a nonintegral (remote) ABS system
 - Retrieving diagnostic trouble codes
 - Clearing diagnostic trouble codes
 - On some vehicles, a scan tool is required
 - Driving over 20 mph (32km/h) will clear codes on some vehicles
 - Disconnecting the battery will clear the codes, but will cause loss of other "keep alive" functions

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DELPHI (DELCO) ABS-VI (NONINTEGRAL)

- The Delphi (Delco) ABS-VI is unique from all other ABS systems because it uses a motor-driven ball screws and pistons for brake pressure to reduce, hold, and apply

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DELPHI (DELCO) ABS-VI (NONINTEGRAL)

- Retrieving Diagnostic Codes
 - This system has extensive self-diagnostic capability
 - A scan tool designed to work with the Delphi VI system is required to access this information

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WHEEL SPEED SENSOR DIAGNOSIS

- Wheel speed sensor (WSS) circuits are often the cause of many ABS problems
- These components may suffer from physical damage, buildup of metallic debris on the sensor tip, corrosion, poor electrical connections, and damaged wiring
- Test a WSS by measuring its output voltage and circuit continuity

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WHEEL SPEED SENSOR DIAGNOSIS

- A breakout box (BOB) cable connects to the ABS harness near the ABS module
- All WSS resistance checks, including the wiring to the sensors, can be measured at one location
- Resistance Measurement
 - The resistors of most WSS range from 800 Ω to 1,400 Ω

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WHEEL SPEED SENSOR DIAGNOSIS

- A reading of about 1,000 ohms or 1 K Ω indicates proper sensor coil resistance
- Checking For Short-To-Ground
 - Connect either lead of an ohmmeter to one of the WSS wires and the other to a good, clean chassis ground
 - The resistance should be infinity (OL)
 - If resistance reading is low the sensor or sensor wiring must be replaced

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WHEEL SPEED SENSOR DIAGNOSIS

- AC Voltage Check
 - Connect a digital meter to the WSS terminals or input to the controller in the breakout box and set the meter to read AC volts
 - A good WSS should produce voltage of at least 0.1 volt (100 mV)
 - A sensor voltage of lower than 0.1 volt (100 mV) may be caused by three things:

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WHEEL SPEED SENSOR DIAGNOSIS

- Excessive clearance between the sensor and tone ring.
- Buildup of debris on the end of the sensor.
- Excessive resistance in the sensor or sensor wiring.
- DC Bias Voltage
 - Some ABS systems apply a 2.5 volt DC voltage to the wheel speed sensors, called a bias voltage

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WHEEL SPEED SENSOR DIAGNOSIS

- Bias voltage is used by the ABS controller to detect fault in the sensor or sensor wiring
- Scope Testing
 - Attach the scope leads to the sensor terminals or to the input connector on the breakout box
 - Rotate the wheel by hand or by using engine power with all four wheels off the ground

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WHEEL SPEED SENSOR DIAGNOSIS

- A good WSS should produce an alternating current (AC) sine wave signal that increases in frequency and amplitude with increasing wheel speed
- A bent axle or hub will produce a wavelike pattern that fluctuates as the strength of the sensor signal changes with each revolution

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WHEEL SPEED SENSOR DIAGNOSIS

- Damaged or missing teeth on the tone ring will cause flat spots or gaps in the sine wave pattern
- Scan Tool Testing
 - As an assistant drives the vehicle, connect the scan tool and monitor the speed of all of the sensors
 - All sensors should indicate the same speed. If not, carefully check the tone ring for damage

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OBD-II ABS DIAGNOSIS

- Vehicles 1996 and Newer
 - The OBD-II diagnostic connector is used to transmit ABS diagnostic trouble code information to a scan tool
 - A factory scan tool or an enhanced factory level scan tool will be needed to retrieve ABS diagnostic trouble codes (DTCs) and scan tool data

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OBD-II ABS DIAGNOSIS

- Scan Tools Needed For ABS Diagnosis
 - Scan tools can be divided into two basic groups:
 - Factory scan tools are required by all dealers that sell and service the brand of vehicle.
 - Aftermarket scan tools are designed to function on more than one brand of vehicle.

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OBD-II ABS DIAGNOSIS

- Diagnostic Procedure
 - Diagnosis steps usually include the following:
 - STEP 1: Verify the fault, making sure that it is in the antilock system and not caused by a fault in the base brakes.
 - STEP 2: Retrieve any stored diagnostic trouble codes.

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OBD-II ABS DIAGNOSIS

- STEP 3: Perform detailed tests to find the root cause.
- STEP 4: Verify the repair of the fault and clear any stored diagnostic trouble codes.

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SUMMARY

- When visually diagnosing an antilock braking system problem first check the status of the brake warning lamps
- Kelsey-Hayes four-wheel antilock uses the computer to pulse the valves
- Wheel speed sensor (WSS) circuits are often the cause of many ABS problems
