

ANTI-LOCK BRAKE SYSTEM

1993 Mitsubishi Montero

1993 BRAKES
Mitsubishi Anti-Lock Brakes

Montero

DESCRIPTION

The Anti-Lock Brake System (ABS) is designed to prevent wheel lock-up during heavy braking. This allows operator to maintain steering control while stopping vehicle in shortest distance possible. Major components are hydraulic unit, wheel speed sensors, "G" sensor, Electronic Control Unit (ECU) and ANTI-LOCK warning light. ABS has a self-diagnostic system to indicate a system malfunction and for use in system trouble shooting.

NOTE: For more information on brake system, see BRAKE SYSTEM article in BRAKES section.

OPERATION

Each wheel sensor sends an AC electrical signal to the Electronic Control Unit (ECU). The ECU reads this information as wheel speed. When any decelerating wheel speed rate is determined to be excessive in comparison to other monitored wheels, the hydraulic unit cycles hydraulic brake pressure to each wheel to equalize speed of all wheels. ABS turns itself off when vehicle drops to 4 MPH. Minor lock-up may occur at this point.

With engine running and vehicle speed greater than 4 MPH, pump motor will operate for a short period of time and may be heard inside vehicle. During pump motor operation, ABS system is completing a self-check. During ABS system operation, a pulsing brake pedal and vibration in steering wheel and vehicle body may be experienced. These conditions are normal.

CAUTION: See ANTI-LOCK BRAKE SAFETY PRECAUTIONS below.

ANTI-LOCK BRAKE SAFETY PRECAUTIONS

- * NEVER open a bleeder valve or loosen a hydraulic line while ABS is pressurized
- * NEVER disconnect or reconnect any electrical connectors while ignition is on. Damage to ABS control unit may result.
- * DO NOT attempt to bleed hydraulic system without first referring to the appropriate article.
- * Only use specially designed brake hoses/lines on ABS-equipped vehicles.
- * DO NOT tap on speed sensor components (sensor, sensor rings). Speed rings must be pressed, NOT hammered into hubs. Striking these components can cause demagnetization or a loss of polarization, affecting the accuracy of the speed signal returning to the ABS control unit.
- * DO NOT mix tire sizes. Increasing the width, as long as tires remain close to the original diameter, is acceptable. Rolling diameter must be identical for all 4 tires. Some manufacturers recommend tires of the same brand, style and type. Failure to follow this precaution may cause inaccurate wheel speed readings.
- * DO NOT contaminate speed sensor components with grease. Only use recommended anti-corrosion coating.

- * When speed sensor components have been removed, ALWAYS check sensor-to-ring air gaps when applicable. These specifications can be found in each appropriate article.
- * ONLY use recommended brake fluids. DO NOT use silicone brake fluids in an ABS-equipped vehicle.
- * When installing transmitting devices (CB's, telephones, etc.) on ABS-equipped vehicles, DO NOT locate the antenna near the ABS control unit (or any control unit).
- * Disconnect all on-board computers, when using electric welding equipment.
- * DO NOT expose the ABS control unit to prolonged periods of high heat (185°F/85°C for 2 hours is generally considered a maximum limit).

BLEEDING BRAKE SYSTEM

BLEEDING PROCEDURES

When bleeding hydraulic system, follow normal manual or pressure bleeding procedures. Bleed brake system in following order: right rear, left rear, Load-Sensing Proportioning Valve (LSPV), right front and left front.

ADJUSTMENTS

NOTE: For adjustment information for brake pedal height, free play, parking brake and stoplight switch, see BRAKE SYSTEM article in BRAKES section.

WHEEL SPEED SENSOR

Sensor-To-Rotor Gap Adjustment

1) Raise and support vehicle. Remove wheel assembly. On rear axle, remove caliper assembly and support with wire. Remove rotor. Inspect sensor pole piece for damage. Repair if necessary. If sensor pole piece is okay, check wheel speed sensor-to-rotor gap.

2) Using a feeler gauge, check clearance between speed sensor pole and rotor tooth surface. See Fig. 1. Front sensor clearance should be .008-.390" (0.2-1.0 mm). Rear sensor clearance should be .012-.035" (0.3-0.9 mm). If clearance is not within specification, loosen sensor mounting bolt. Adjust sensor position until clearance is within specification. Tighten sensor mounting bolt to 84 INCH lbs. (120 N.m).

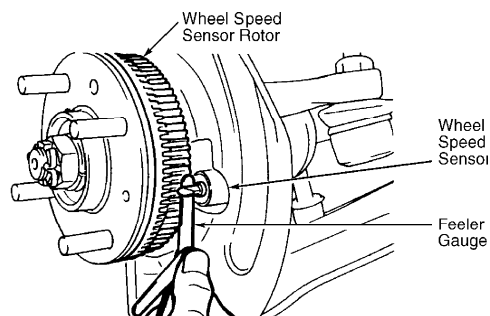


Fig. 1: Checking Wheel Speed Sensor-To-Rotor Gap (Typical)
Courtesy of Mitsubishi Motor Sales of America.

TROUBLE SHOOTING

ANTI-LOCK WARNING LIGHT

1) Turn ignition on. ANTI-LOCK warning light should illuminate for one second, and then go out. Turn ignition switch to START position. Warning light should come on and stay on.

2) When ignition switch is turned from START to ON position, warning light should illuminate for one second, and then go out. If warning light functions as specified, go to step 3). If warning light does not function as specified, see appropriate trouble shooting test:

- * ANTI-LOCK WARNING LIGHT INOPERATIVE.
- * IGNITION SWITCH IN ON POSITION, WARNING LIGHT REMAINS ON.
- * IGNITION SWITCH IN START POSITION, WARNING LIGHT INOPERATIVE.
- * IGNITION SWITCH IN ON POSITION, WARNING LIGHT BLINKS TWICE. IN START POSITION, WARNING LIGHT STAYS ON. WHEN IGNITION SWITCH IS CYCLED FROM START TO ON POSITION, WARNING LIGHT BLINKS ONCE.

3) Test drive vehicle. If ABS light does not come on at low speed, go to next step. If ABS light comes on at low speed, motor relay, solenoid valve or wheel speed sensor malfunction is indicated. Go to step 6). If insufficient braking force or ABS malfunction exists, go to next step. If none of above symptoms exist, go to step 6).

4) Check conventional brake system components for proper operation. Check for mechanical lock of hydraulic unit solenoid valve. Check for plugged hydraulic line in hydraulic unit. Repair or replace as necessary. If hydraulic unit is okay, go to next step.

5) Ensure wheel speed sensor rotor gap is correct. See WHEEL SPEED SENSOR under ADJUSTMENTS. Check for faulty wheel speed sensor. See WHEEL SPEED SENSOR under COMPONENT TESTING. Replace sensor as necessary. See WHEEL SPEED SENSOR under REMOVAL & INSTALLATION. Inspect ECU wiring. If testing indicates no mechanical or electrical failures, substitute ECU with known good unit and retest.

6) Enter ABS self-diagnostics, and retrieve codes. See RETRIEVING CODES under DIAGNOSIS & TESTING. If no codes are displayed, fault may be intermittent. Attempt to make malfunction reoccur. If no diagnostic output exists, check for faulty wiring harness between ECU and self-diagnostic connector. Repair or replace as necessary.

NOTE: Trouble shoot warning light in following sequence:

- * Instrument Cluster Circuit
- * ECU and Valve Relay.

ANTI-LOCK Warning Light Inoperative

1) If all other warning lights illuminate with ignition on, go to step 3). If other warning lights do not illuminate, check fuse No. 11 in main fuse panel. If fuse is blown, correct cause of blown fuse, and replace fuse. If fuse is okay, go to next step.

2) Remove instrument cluster. Turn ignition on. Using DVOM, measure voltage between vehicle ground and instrument cluster ABS warning light terminal No. 107. See Fig. 2. If battery voltage is present, repair or replace instrument cluster. If battery voltage is not present, repair wire harness between junction block and instrument cluster.

3) Turn ignition off. Check for faulty warning light bulb. Replace bulb as necessary. If bulb is okay, using an ohmmeter, check for continuity between instrument cluster connector terminals No. 107 and 158. See Fig. 2. If continuity exists, clean and/or repair connector terminals. If connector terminals are okay, check for open circuit to ECU and valve relay. Go to steps 4) and 5). If continuity does not exist, replace instrument cluster.

4) To check ECU, turn ignition off. Remove ECU connector. ECU is located on right rear wheelwell. See Fig. 17. Turn ignition on. Measure voltage between terminal No. 13 and vehicle ground. See Fig. 3. If battery voltage is not present, repair circuit between warning light and ECU. If battery voltage is present, substitute ECU with known good unit and retest.

5) To check valve relay, see HYDRAULIC UNIT RELAYS under COMPONENT TESTING. If relay is okay, remove hydraulic unit connector. Turn ignition on. Measure voltage between terminal No. 8 and vehicle ground. See Fig. 4. If battery voltage is present, go to next step. If battery voltage is not present, repair circuit between ABS warning light and hydraulic unit.

6) Turn ignition off. Check for continuity between terminal No. 9 and vehicle ground. If continuity does not exist, repair circuit between hydraulic unit and vehicle ground. If continuity exists, check for continuity between terminals No. 8 and 9. If continuity exists, check for defective connector. If continuity does not exist, replace hydraulic unit.

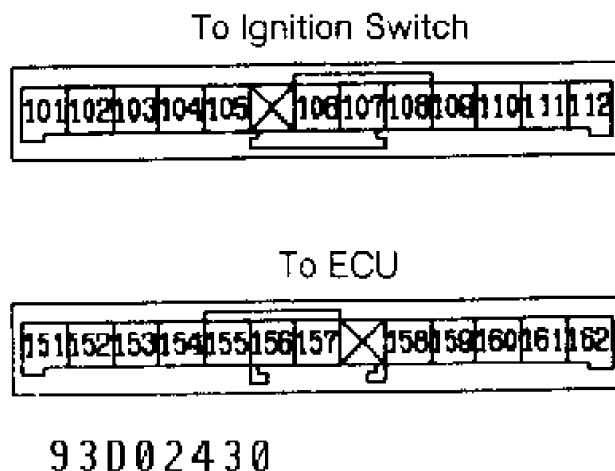


Fig. 2: Identifying Instrument Cluster Connector Terminals
 Courtesy of Mitsubishi Motor Sales of America.

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