

ANTI-LOCK BRAKE SYSTEM & TRACTION CONTROL

Article Text

1996 Volkswagen Golf
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ARTICLE BEGINNING

1995-96 BRAKES

Anti-Lock & Traction Control

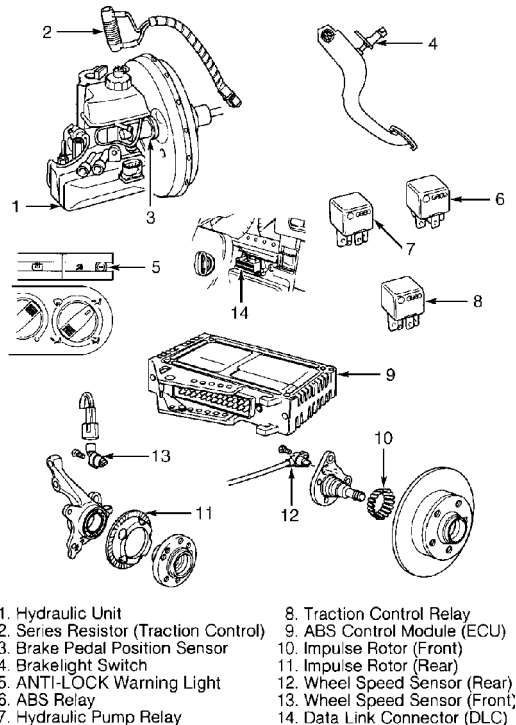
Golf III

DESCRIPTION

Vehicles may use Teves 04 or Teves 20 GI Anti-Lock Brake System (ABS). See Fig. 1 or 2. Both systems may include Electronic Differential Lock (traction control). Traction control operates at low speeds mainly during acceleration. This helps control excess wheel spin of the front wheels.

The anti-lock brake system reduces the chance of wheel lock-up during heavy braking. The anti-lock brake system consists of 4 wheel speed sensors, Electronic Control Unit (ECU), vacuum booster, master cylinder with split diagonal brakelines, brake pedal position sensor (mounted on brake booster), hydraulic pump and solenoid valves, ANTILOCK and BRAKE warning lights.

Teves 04, uses 3 relays (located at fuse/relay panel), to protect the hydraulic modulator, traction control solenoids and ECU. The ECU is located under right rear seat. On Teves 20 GI, the ECU is mounted on bottom of hydraulic unit.



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Fig. 1: Identifying ABS Components (Teves 04)
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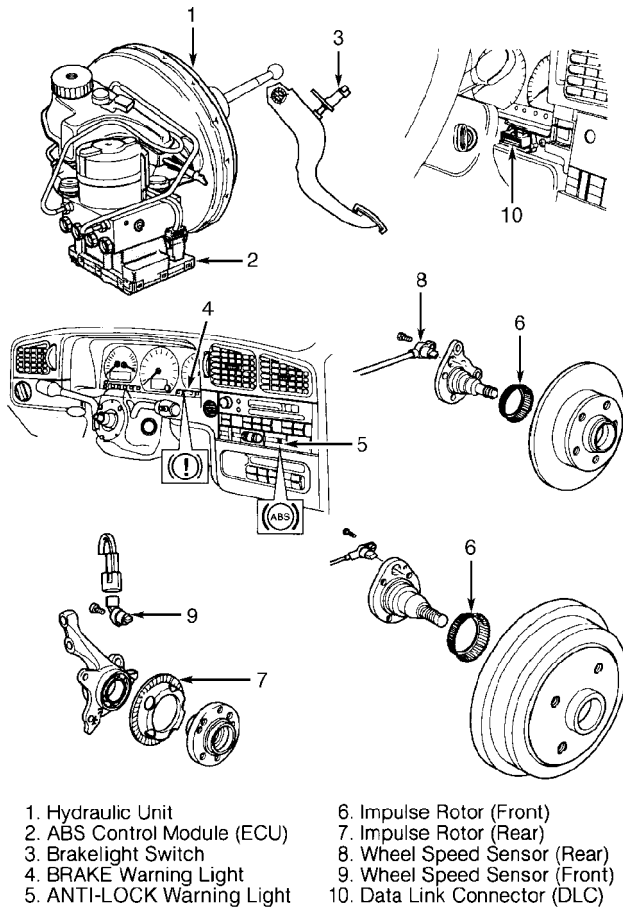
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LEGEND FOR FIGURE 1

| AA | |
|--|------------------------------------|
| Item No. | Description |
| 1. | Hydraulic Unit |
| 2. | Series Resistor (Traction Control) |
| 3. | Brake Pedal Position Sensor |
| 4. | Brakelight Switch |
| 5. | ANTILOCK Warning Light |
| 6. | ABS Relay |
| 7. | Hydraulic Pump Relay |
| 8. | Traction Control Relay |
| 9. | ABS Control Module (ECU) |
| 10. | Impulse Rotor (Front) |
| 11. | Impulse Rotor (Rear) |
| 12. | Wheel Speed Sensor (Rear) |
| 13. | Wheel Speed Sensor (Front) |
| 14. | Data Link Connector (DLC) |
| AA | |



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Fig. 2: Identifying ABS Components (Teves 20 GI)

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LEGEND FOR FIGURE 2

| AA | |
|--|----------------------------|
| Item No. | Description |
| 1. | Hydraulic Unit |
| 2. | ABS Control Module (ECU) |
| 3. | Brakelight Switch |
| 4. | BRAKE Warning Light |
| 5. | ANTILOCK Warning Light |
| 6. | Impulse Rotor (Front) |
| 7. | Impulse Rotor (Rear) |
| 8. | Wheel Speed Sensor (Rear) |
| 9. | Wheel Speed Sensor (Front) |
| 10. | Data Link Connector (DLC) |
| AA | |

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

OPERATION

When pressure is applied to brake pedal, ECU monitors input signals from each wheel speed sensor. If ECU measures a rate of reduction greater than what is programmed in ECU, the ECU will output a signal to appropriate solenoid valve.

Hydraulic line pressure is controlled by one pair of solenoids for each disc brake. Each solenoid valve allows hydraulic pressure to increase or decrease to the appropriate wheel cylinder. If wheel lock-up is detected by ECU, inlet valve closes. This prevents further pressure increase. If wheel lock-up continues, ECU opens outlet valve and fluid pressure returns to brake fluid reservoir. Each front brake is controlled separately by ECU. Rear brakes are controlled together based on first wheel which starts to lock.

A vacuum booster provides pressure assist for normal braking. During ABS operation, some hydraulic fluid is returned to the reservoir. A hydraulic pump runs whenever the brakes are being applied and ABS is in operation. This maintains pressure to the control solenoids and prevents internal loss of brake fluid (brake pedal goes to floor).

On models with traction control, 2 differential locking solenoids are included. If ECU detects wheel spin while vehicle is accelerating less than about 25 MPH, traction control prevents excess wheel spin. Under these conditions, ECU applies brake (on faster spinning wheel) to slow wheel down to the speed of slower spinning wheel.

If a system failure occurs, ANTILOCK warning light, located on instrument panel, will come on. System will be deactivated, but conventional brake system will still operate. If brake fluid level drops too low, BRAKE warning light, located on instrument panel, will come on.

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BLEEDING BRAKE SYSTEM

CAUTION: Ensure fluid level in master cylinder is adequate at all times during bleeding procedure. Use only DOT 4 brake fluid. DO NOT use DOT 5 silicone brake fluid. DO NOT open bleed screws on hydraulic unit at any time.

BLEEDING PROCEDURES

NOTE: Manufacturer recommends bleeding brake system using Pressure Bleeder (US 1116). If a pressure bleeder is not available, use standard bleeding procedure.

1) Exhaust vacuum reserve from power unit by depressing brake pedal several times. Fill master cylinder with clean brake fluid. If master cylinder was replaced, bleed master cylinder before bleeding wheel calipers. Connect bleeder hose to appropriate caliper bleeder valve. See BRAKELINE BLEEDING SEQUENCE table.

BRAKELINE BLEEDING SEQUENCE

| Application | Sequence |
|-------------|----------|
|-------------|----------|

| | |
|------------------|-----------------|
| All Models | RR, LR, RF & LF |
|------------------|-----------------|

2) Submerge other end of hose in clean glass jar partially filled with clean brake fluid. Pump brake pedal several times, then hold down. Open bleeder valve. Holding pedal down, close bleeder valve. Release brake pedal.

3) Repeat procedure until brake fluid shows no signs of air bubbles. When bleeding rear brakes, push lever of pressure regulator (if equipped) in direction of rear axle. Ensure master cylinder reservoir is full.

ADJUSTMENTS

BRAKELIGHT SWITCH

1) Remove trim panel from under driver's side instrument panel. Disconnect brakelight switch harness connector. Rotate brakelight switch 90 degrees clockwise (right) and remove switch.

2) Pull brakelight switch plunger fully out. Depress brake pedal as far as possible by hand. Guide brakelight switch through locating hole and secure switch by rotating 90 degrees counterclockwise (left). Pull brake pedal back up by hand to stop. Brakelight switch plunger should be pushed back one notch.

3) Reconnect brakelight switch harness connector. Check brakelight switch function by depressing brake pedal and observing brakelights. Install instrument panel trim panel.

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PARKING BRAKE

Disc Brake

Raise vehicle and support securely. Release parking brake lever. Apply brake pedal once. Loosen lock nuts. Tighten each adjusting nut until lever on respective caliper lifts off stop. Measure gap between stop and lever. DO NOT move lever off stop more than .040" (1 mm). Tighten lock nuts. Ensure wheels lock at 3 notches.

Drum Brake

Raise vehicle and support securely. Release parking brake lever. Apply brake pedal once. Pull parking brake lever up 4 notches. Tighten parking brake lever adjusting nuts until wheels are difficult to turn by hand. Release parking brake lever. Ensure both wheels turn freely.

NOTE: No other information on adjustments is available from manufacturer.

TROUBLE SHOOTING

ANTILOCK WARNING LIGHT

Start engine. ANTILOCK warning light should come on, then turn off after a few seconds. If light does not come on when engine is started, check electrical system. If light comes on and stays on, fault has been detected by ECU and testing will be needed.

DIAGNOSIS & TESTING

NOTE: Diagnostic information for Teves 04 and 20 GI can only be accessed using V.A.G. 1551 scan tool and V.A.G. 1551/3 adapter. Teves 04 circuit testing requires V.A.G. 1598 test box with V.A.G. 1598/10 adapter. Teves 20 GI circuit testing requires V.A.G. 1598/21 test box.

CIRCUIT TESTS (TEVES 04)

NOTE: Socket number designations on V.A.G. 1598 test box are identical to terminal designations on ABS ECU harness connector.

NOTE: Check battery condition, brake fluid level, electrical connections and wiring for damage. If fluid level is incorrect or battery and/or electrical connections are faulty, correct problem before preceding. Perform each step, in sequence, to test entire system, except for ECU. If faulty ECU is suspected, replace with a known good unit and retest system. Unplug ECU connector for all test steps. If test box is unavailable, use fine wire attached to test lead probe to avoid damaging ECU harness connector terminals.

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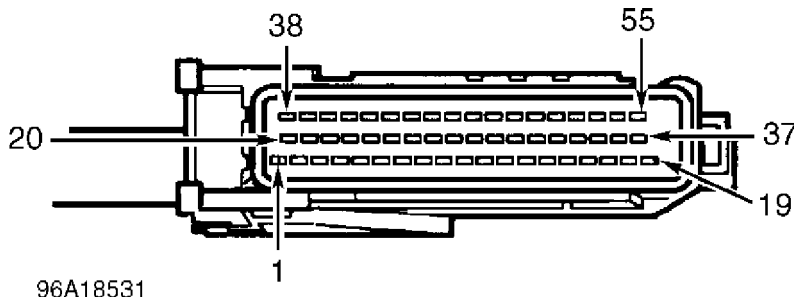


Fig. 3: Identifying ABS ECU Connector Terminals (Teves 04)
Courtesy of Volkswagen United States, Inc.

Voltage Supply Test (Traction Control)

Turn ignition off. Using voltmeter, check voltage between ECU harness connector terminals No. 1 and 35. See Fig. 3. Voltage should be 10.0-14.5 volts. If voltage is not as specified, check battery, ground, ABS fuse, relay and wiring. Repair as necessary. See WIRING DIAGRAMS.

Voltage Supply Test

Turn ignition off. Using voltmeter, check voltage between ECU harness connector terminals No. 1 and 53. See Fig. 3. Voltage should be 10.0-14.5 volts. If voltage is not as specified, check battery, ground, ABS fuse, relay and wiring. Repair as necessary. See WIRING DIAGRAMS.

ABS Relay Operation Test (ECU Voltage Supply)

Turn ignition off. Connect jumper wire between ECU harness connector terminals No. 19 and 34. Turn ignition on. Relay should operate (click) and ABS warning light should go out. Using voltmeter, check voltage between ECU harness connector terminals No. 1 and 33. See Fig. 3. Voltage should be 10.0-14.5 volts. If voltage is not as specified, check ground (terminal No. 1) and relay wiring (terminal No. 33). Repair as necessary. See WIRING DIAGRAMS. Remove jumper wire when test is complete.

ABS Relay Operation Test (Reference Voltage)

Turn ignition off. Connect jumper wire between ECU harness connector terminals No. 19 and 34. Turn ignition on. Relay should operate (click) and ABS warning light should go out. Using voltmeter, check voltage between ECU harness connector terminals No. 1 and 3. See Fig. 3. Voltage should be 10.0-14.5 volts. If voltage is not as specified, check wiring from ECU harness connector terminal No. 3 to battery positive. Repair as necessary. See WIRING DIAGRAMS. Remove jumper wire when test is complete.

Brakelight Switch Test

Turn ignition off. Depress and hold brake pedal. Using voltmeter, check voltage between ECU harness connector terminals No. 1 and 32. See Fig. 3. Voltage should be 10.0-14.5 volts. If voltage is not as specified, check wiring from ECU harness connector terminal No.

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1 to ground. Check wiring from ECU harness connector terminal No. 32 to relay panel. Also check brakelight switch and fuse. Repair as necessary. See WIRING DIAGRAMS.

Right Front Wheel Speed Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 29 and 47. See Fig. 3. Resistance should be 1.0-1.3 k/ohms. If resistance is not as specified, check related wiring from ECU harness connector to wheel speed sensor for opens, shorts or loose connections. Also disconnect wheel speed sensor connector and check sensor. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Front Wheel Speed Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 30 and 48. See Fig. 3. Resistance should be 1.0-1.3 k/ohms. If resistance is not as specified, check related wiring from ECU harness connector to wheel speed sensor for opens, shorts or loose connections. Also disconnect wheel speed sensor connector and check sensor. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Rear Wheel Speed Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 27 and 45. See Fig. 3. Resistance should be 1.0-1.3 k/ohms. If resistance is not as specified, check related wiring from ECU harness connector to wheel speed sensor for opens, shorts or loose connections. Also disconnect wheel speed sensor connector and check sensor. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Rear Wheel Speed Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 28 and 46. See Fig. 3. Resistance should be 1.0-1.3 k/ohms. If resistance is not as specified, check related wiring from ECU harness connector to wheel speed sensor for opens, shorts or loose connections. Also disconnect wheel speed sensor connector and check sensor. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Front Wheel Speed Sensor Shielding Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 1 and 29. See Fig. 3. Resistance should be at least 2 megohms. If resistance is not as specified, check related wiring from ECU harness connector to wheel speed sensor for chafing, loose connections or other damage. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Front Wheel Speed Sensor Shielding Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 1 and 30. See Fig. 3. Resistance should be at least 2 megohms. If resistance is not as specified, check

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related wiring from ECU harness connector to wheel speed sensor for chafing, loose connections or other damage. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Rear Wheel Speed Sensor Shielding Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 1 and 27. See Fig. 3. Resistance should be at least 2 megohms. If resistance is not as specified, check related wiring from ECU harness connector to wheel speed sensor for chafing, loose connections or other damage. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Rear Wheel Speed Sensor Shielding Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 1 and 28. See Fig. 3. Resistance should be at least 2 megohms. If resistance is not as specified, check related wiring from ECU harness connector to wheel speed sensor for chafing, loose connections or other damage. Repair/replace as necessary. See WIRING DIAGRAMS.

ABS Relay Winding Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 34 and 53. See Fig. 3. Resistance should be 50-100 ohms. If resistance is not as specified, check related wiring from ECU harness connector to ABS relay. Also check relay. Repair/replace as necessary. See WIRING DIAGRAMS.

Hydraulic Pump Relay Winding Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 15 and 33. See Fig. 3. Resistance should be 50-100 ohms. If resistance is not as specified, check related wiring from ECU harness connector to hydraulic pump relay. Also check relay. Repair/replace as necessary. See WIRING DIAGRAMS.

Traction Control Relay Winding Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 7 and 33. See Fig. 3. Resistance should be 50-100 ohms. If resistance is not as specified, check related wiring from ECU harness connector to traction control relay. Also check relay. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Front Inlet Valve Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 20. See Fig. 3. Resistance should be 6.5-10.0 ohms. If resistance is not as specified, check related wiring from ECU harness connector to left front inlet valve. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Front Inlet Valve Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 38. See Fig. 3. Resistance

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should be 6.5-10.0 ohms. If resistance is not as specified, check related wiring from ECU harness connector to right front inlet valve. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Rear Inlet Valve Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 54. See Fig. 3. Resistance should be 6.5-10.0 ohms. If resistance is not as specified, check related wiring from ECU harness connector to left rear inlet valve. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Rear Inlet Valve Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 55. See Fig. 3. Resistance should be 6.5-10.0 ohms. If resistance is not as specified, check related wiring from ECU harness connector to right rear inlet valve. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Front Outlet Valve Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 2 and 3. See Fig. 3. Resistance should be 3-7 ohms. If resistance is not as specified, check related wiring from ECU harness connector to left front outlet valve. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Front Outlet Valve Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 21. See Fig. 3. Resistance should be 3-7 ohms. If resistance is not as specified, check related wiring from ECU harness connector to right front outlet valve. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Rear Outlet Valve Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 36. See Fig. 3. Resistance should be 3-7 ohms. If resistance is not as specified, check related wiring from ECU harness connector to left rear outlet valve. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Rear Outlet Valve Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 18. See Fig. 3. Resistance should be 3-7 ohms. If resistance is not as specified, check related wiring from ECU harness connector to right rear outlet valve. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

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Differential Lock Valve No. 1 Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 37. See Fig. 3. Resistance should be 6-10 ohms. If resistance is not as specified, check related wiring from ECU harness connector to differential lock valve No. 1. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Differential Lock Valve No. 2 Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 40. See Fig. 3. Resistance should be 6-10 ohms. If resistance is not as specified, check related wiring from ECU harness connector to differential lock valve No. 2. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Hydraulic Pump Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 31 and 49. See Fig. 3. Resistance should be 29-40 ohms. If resistance is not as specified, check related wiring from ECU harness connector to hydraulic pump sensor. Also check valve resistance at hydraulic unit. Repair/replace as necessary. See WIRING DIAGRAMS.

Pressure Control Switch Resistance Test (Traction Control)

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 13 and 26. See Fig. 3. Resistance should be 1.5 ohms minimum with brake pedal not depressed. Resistance should be 2 megohms minimum with brake pedal depressed. If resistance is not as specified, check related wiring from ECU harness connector to hydraulic unit connector. If wiring is okay, replace hydraulic unit. See WIRING DIAGRAMS.

ABS Relay Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 1 and 3, 1 and 33, and 1 and 19. See Fig. 3. Resistance in each test should be 1.5 ohms or less. If resistance is not as specified, check wire from terminals No. 3 and 33 (without relay) to ground. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Rear Wheel Speed Sensor Voltage Test

Turn ignition off. Raise and support vehicle. Using voltmeter, check voltage between ECU harness connector terminals No. 27 and 45. See Fig. 3. Rotate right rear wheel at one revolution per minute. Voltage should be at least 65 millivolts AC. If voltage is not as specified, check related wiring and connectors from ECU harness connector to wheel speed sensor. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Rear Wheel Speed Sensor Voltage Test

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Turn ignition off. Raise and support vehicle. Using voltmeter, check voltage between ECU harness connector terminals No. 28 and 46. See Fig. 3. Rotate left rear wheel at one revolution per minute. Voltage should be at least 65 millivolts AC. If voltage is not as specified, check related wiring and connectors from ECU harness connector to wheel speed sensor. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Front Wheel Speed Sensor Voltage Test

Turn ignition off. Raise and support vehicle. Using voltmeter, check voltage between ECU harness connector terminals No. 29 and 47. See Fig. 3. Rotate right front wheel at one revolution per minute. Voltage should be at least 65 millivolts AC. If voltage is not as specified, check related wiring and connectors from ECU harness connector to wheel speed sensor. Repair/replace as necessary. See WIRING DIAGRAMS.

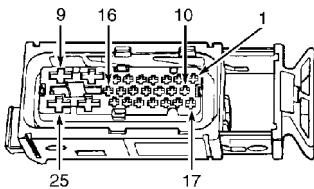
Left Front Wheel Speed Sensor Voltage Test

Turn ignition off. Raise and support vehicle. Using voltmeter, check voltage between ECU harness connector terminals No. 30 and 48. See Fig. 3. Rotate left front wheel at one revolution per minute. Voltage should be at least 65 millivolts AC. If voltage is not as specified, check related wiring and connectors from ECU harness connector to wheel speed sensor. Repair/replace as necessary. See WIRING DIAGRAMS.

CIRCUIT TESTS (TEVES 20 GI)

NOTE: Socket number designations on V.A.G. 1598/21 test box are identical to terminal designations on ABS ECU harness connector.

NOTE: Check battery condition, brake fluid level, electrical connections and wiring for damage. If fluid level is incorrect or battery and/or electrical connections are faulty, correct problem before preceding. Perform each step, in sequence, to test entire system, except for ECU. If faulty ECU is suspected, replace with a known good unit and retest system. Unplug ECU connector for all test steps. If test box is unavailable and to avoid damaging ECU harness connector terminals, use fine wire attached to test lead probe.



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Fig. 4: Identifying ABS ECU Connector Terminals (Teves 20 GI)
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Hydraulic Pump Supply Voltage Test

Turn ignition off. Using voltmeter, check voltage between ECU harness connector terminals No. 8 and 25. See Fig. 4. Voltage should be 10.0-14.5 volts. If voltage is not as specified, check related wiring and connectors from ECU harness connector terminal No. 8 and ground. Check related wiring and connectors from ECU harness connector terminal No. 25 and ABS fuse No. 1 and battery positive. Repair/replace as necessary. See WIRING DIAGRAMS.

Solenoid Valves Supply Voltage Test

Turn ignition off. Using voltmeter, check voltage between ECU harness connector terminals No. 9 and 24. See Fig. 4. Voltage should be 10.0-14.5 volts. If voltage is not as specified, check related wiring and connectors from ECU harness connector terminal No. 24 and ground. Check related wiring and connectors from ECU harness connector terminal No. 9 and ABS fuse No. 2 and battery positive. Repair/replace as necessary. See WIRING DIAGRAMS.

Electronic Control Unit Supply Voltage Test

Turn ignition off. Using voltmeter, check voltage between ECU harness connector terminals No. 8 and 23. See Fig. 4. Voltage should be 10.0-14.5 volts. If voltage is not as specified, check related wiring and connectors from ECU harness connector terminal No. 8 and ground. Check related wiring and connectors from ECU harness connector terminal No. 23 and ABS relay. Repair/replace as necessary. See WIRING DIAGRAMS.

Brakelight Switch Voltage Test

Turn ignition off. Using voltmeter, check voltage between ECU harness connector terminals No. 8 and 12. See Fig. 4. Voltage should be 0.0-0.5 volt with brake pedal not depressed. Voltage should be 10.0-14.5 volts with brake pedal depressed. If voltage is not as specified, check related wiring and connectors from ECU harness connector terminal No. 8 and ground. Check related wiring and connectors from ECU harness connector terminal No. 12 and relay panel. Check brakelight fuse. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Front Wheel Speed Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 3 and 18. See Fig. 4. Resistance should be 1.0-1.3 k/ohms. If resistance is not as specified, check related wiring and connectors from ECU harness connector and wheel speed sensor for loose connectors or damaged wires. Disconnect wheel speed sensor connector and check sensor resistance. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Front Wheel Speed Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 4 and 11. See Fig. 4. Resistance should be 1.0-1.3 k/ohms. If resistance is not as specified, check related wiring and connectors from ECU harness connector and wheel

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speed sensor for loose connectors or damaged wires. Disconnect wheel speed sensor connector and check sensor resistance. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Rear Wheel Speed Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 1 and 17. See Fig. 4. Resistance should be 1.0-1.3 k/ohms. If resistance is not as specified, check related wiring and connectors from ECU harness connector and wheel speed sensor for loose connectors or damaged wires. Disconnect wheel speed sensor connector and check sensor resistance. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Rear Wheel Speed Sensor Resistance Test

Turn ignition off. Using ohmmeter, check resistance between ECU harness connector terminals No. 2 and 10. See Fig. 4. Resistance should be 1.0-1.3 k/ohms. If resistance is not as specified, check related wiring and connectors from ECU harness connector and wheel speed sensor for loose connectors or damaged wires. Disconnect wheel speed sensor connector and check sensor resistance. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Front Wheel Speed Sensor Voltage Test

Turn ignition off. Raise and support vehicle. Using voltmeter, check voltage between ECU harness connector terminals No. 3 and 18. See Fig. 4. Rotate right front wheel at one revolution per minute. Voltage should be at least 65 millivolts AC. If voltage is not as specified, check related wiring and connectors from ECU harness connector to wheel speed sensor. Ensure sensor has not been interchanged. Use V.A.G. 1551/3 scan tool to read measuring value block. Repair/replace as necessary. See WIRING DIAGRAMS.

Left Front Wheel Speed Sensor Voltage Test

Turn ignition off. Raise and support vehicle. Using voltmeter, check voltage between ECU harness connector terminals No. 4 and 11. See Fig. 4. Rotate left front wheel at one revolution per minute. Voltage should be at least 65 millivolts AC. If voltage is not as specified, check related wiring and connectors from ECU harness connector to wheel speed sensor. Ensure sensor has not been interchanged. Use V.A.G. 1551/3 scan tool to read measuring value block. Repair/replace as necessary. See WIRING DIAGRAMS.

Right Rear Wheel Speed Sensor Voltage Test

Turn ignition off. Raise and support vehicle. Using voltmeter, check voltage between ECU harness connector terminals No. 1 and 17. See Fig. 4. Rotate right rear wheel at one revolution per minute. Voltage should be 190-1140 millivolts AC. If voltage is not as specified, check related wiring and connectors from ECU harness connector to wheel speed sensor. Ensure sensor has not been interchanged. Use V.A.G. 1551/3 scan tool to read measuring value block. Repair/replace as necessary. See WIRING DIAGRAMS.

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Left Rear Wheel Speed Sensor Voltage Test

Turn ignition off. Raise and support vehicle. Using voltmeter, check voltage between ECU harness connector terminals No. 2 and 10. See Fig. 4. Rotate left rear wheel at one revolution per minute. Voltage should be 1190-1140 millivolts AC. If voltage is not as specified, check related wiring and connectors from ECU harness connector to wheel speed sensor. Ensure sensor has not been interchanged. Use V.A.G. 1551/3 scan tool to read measuring value block. Repair/replace as necessary. See WIRING DIAGRAMS.

REMOVAL & INSTALLATION

ABS ELECTRONIC CONTROL UNIT (ECU)

Removal & Installation (Teves 04)

ABS ECU is located under right rear seat. Ensure ignition is off. Press ECU securing clip together and pull out. Fold down retaining clip releasing connector latch and remove connector. Remove ECU mounting bolts and remove ECU. To install, reverse removal procedure.

Removal & Installation (Teves 20 GI)

ABS ECU is attached to bottom of ABS hydraulic unit, See HYDRAULIC UNIT.

HYDRAULIC UNIT

Removal & Installation (Teves 04)

1) Hydraulic unit and booster is removed as an assembly. Disconnect negative battery cable. Disconnect electrical connectors from hydraulic unit. Remove brake fluid reservoir. Disconnect brakelines from hydraulic unit and seal brakelines and threaded holes.

2) From inside vehicle, remove shelf below left side of instrument panel. Disconnect brake pedal from brake booster. Remove brake booster-to-firewall nuts. Remove hydraulic unit, master cylinder and brake booster as an assembly.

3) To install, reverse removal procedure. Tighten fittings to specifications. See TORQUE SPECIFICATIONS. Bleed brake system. See BLEEDING BRAKE SYSTEM

Removal & Installation (Teves 20 GI)

1) ABS ECU is bolted to bottom of ABS hydraulic unit, left side of engine compartment. Disconnect negative battery cable. Remove engine coolant expansion tank and swing to one side. Connect bleeder bottle with bleeder hose to left front caliper bleeder screw and open bleeder screw. Depress brake pedal 2 3/8" (60 mm). Install Pedal Loading Device (V.A.G. 1238 B) to hold pedal in place. Close bleeder screw.

2) Remove brake master cylinder heat shield. Disconnect brakelines from brake master cylinder and hydraulic unit. Using plugs from Repair Kit (1H0 698 311 A), seal brakelines and threaded holes. Remove hydraulic unit-to-bracket bolts and remove hydraulic unit.

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Disconnect hydraulic pump motor harness from ECU.

3) Remove ECU-to-hydraulic unit screws and remove ECU. DO NOT tilt ECU when removing. Cover ECU solenoids with lint-free cloth. After separating ECU from hydraulic unit, protect valve dome. To install, reverse removal procedure. Tighten fittings to specifications. See TORQUE SPECIFICATIONS. Bleed brake system. See BLEEDING BRAKE SYSTEM

WHEEL SPEED SENSORS

NOTE: To protect magnetic part of sensor, always leave new wheel speed sensor in special packaging until ready for installation.

Removal & Installation

Remove bolt retaining wheel speed sensor. Unplug connector. Remove wheel speed sensor. To install, apply Lubricant (G-000-650) to sensor. Install sensor and tighten retaining bolt to 89 INCH lbs. (10 N.m).

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

AA

Applications Ft. Lbs. (N.m)

Brake Booster-To-Firewall Nut 18 (25)

Brakeline Fitting 11 (15)

Master Cylinder-To-Booster Nut 18 (25)

INCH Lbs. (N.m)

ECU-To-Hydraulic Unit Screw 35 (4)

Hydraulic Unit-To-Bracket 71 (8)

Wheel Speed Sensor Bolt 89 (10)

AA

WIRING DIAGRAMS

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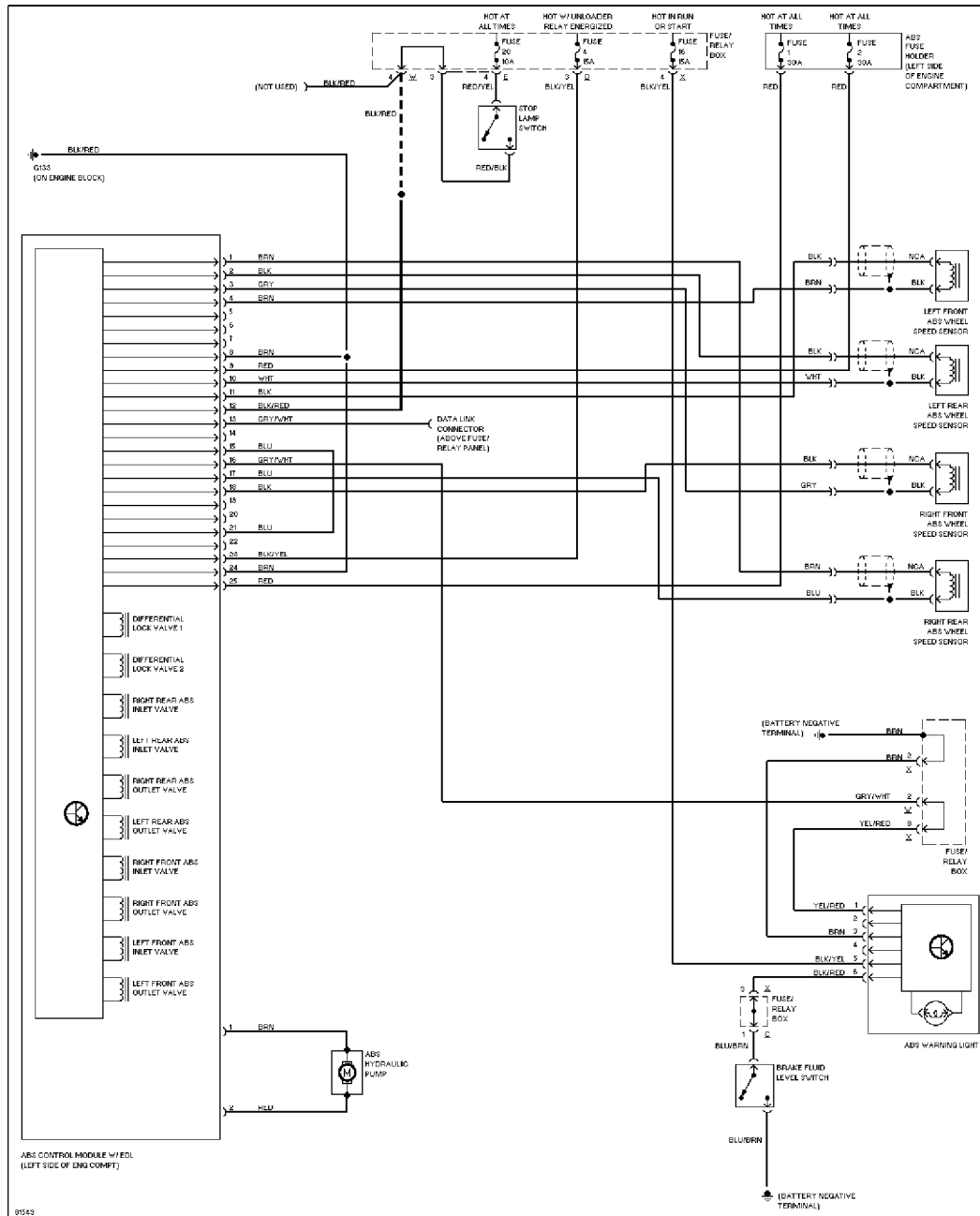
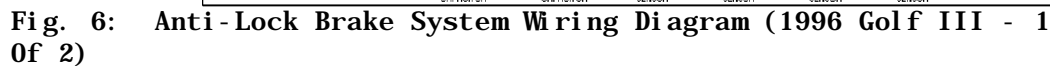


Fig. 5: Anti-Lock Brake System Wiring Diagram (1995 Golf III)

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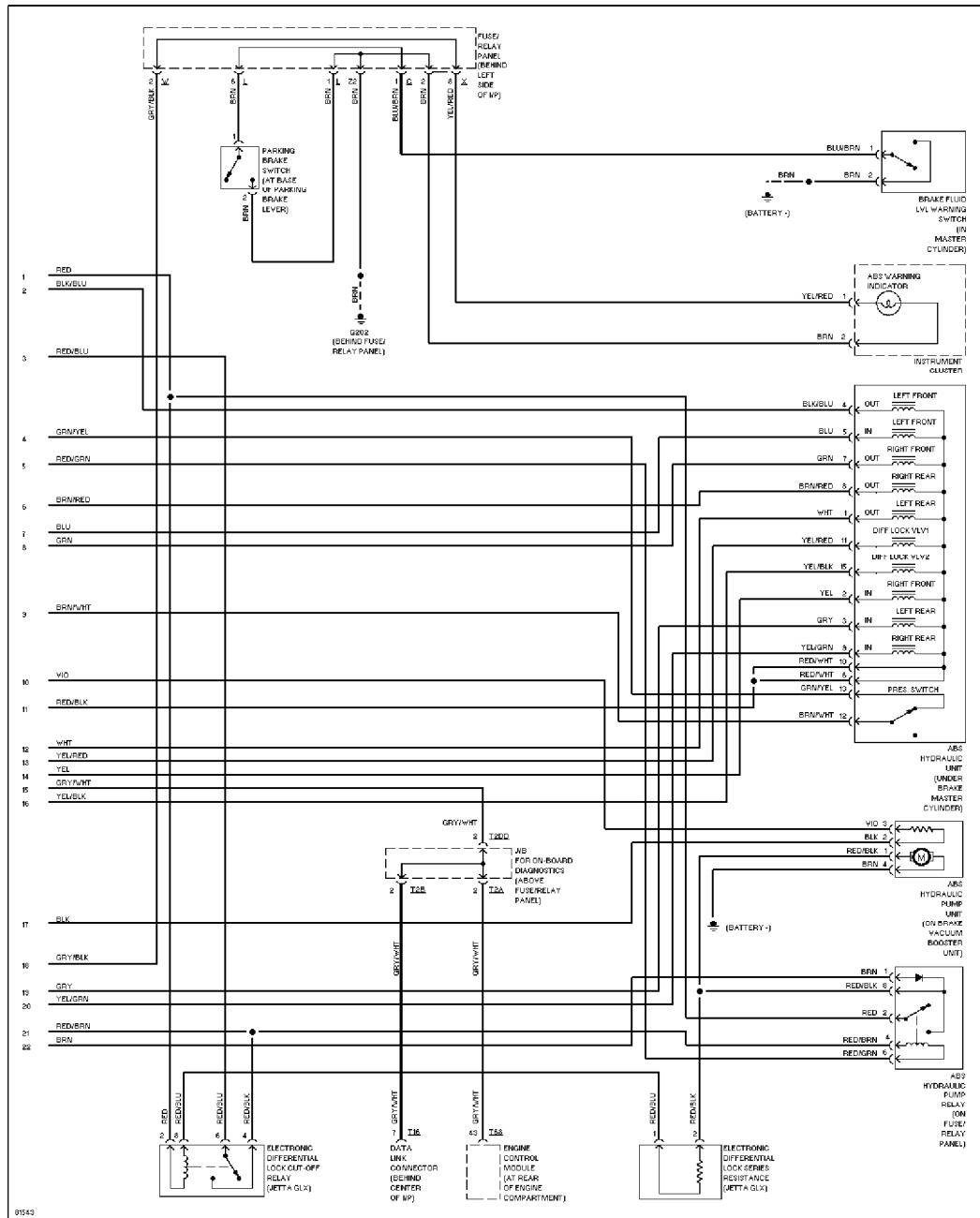


Fig. 7: Anti-Lock Brake System Wiring Diagram (1996 Golf III - 2 of 2)

END OF ARTICLE