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ABS II Diagnosis

INTRODUCTION

The first ABS System was introduced in 1988 on the K100 model motorcycles. An improved system, ABS II was introduced on 1994 models on the K1100 and R1100 models. The two systems operate primarily the same but the fault codes differ. This section covers the ABS II System. Refer to the previous section for first ABS System.

CHECK THE BASICS

Before any electrical diagnosis takes place always **consider** the basics. The following list will assist you in **considering** other areas of the motorcycles operating systems that may prevent operation or effect performance.

Determine if any of the listed items below might be a contributing factor to the malfunction of the motorcycle. Check them.

1. **Battery Fully charged:** >12.6VDC

2. **Check brake fluid level:** If necessary, top off brake fluid reservoir.

3. **Check brake system for leaks:** If necessary, correct any leakage.

4. **Check brake system for air in lines, spongy brake that pumps up.**

ABS Test Steps

The ABS System is diagnosed using the BMW Multi-Tester in conjunction with ABS / Motronic Diagnosis KTE-201 to access the fault codes and the BMW Multi-Tester in conjunction with the Volt / Ohm Leads and Adapters for various test steps.

All of the equipment connections are made with the special harness adapters as outlined in the test equipment section of this manual.

Prior to doing any testing or disconnecting of components, access the fault code and record it on the Repair Order. Perform the test procedures for each fault code as provided in this section. If no fault codes are stored, test drive the motorcycle and check for fault codes.

The ABS Control Unit will shut the system down when a fault is detected. Therefore only one fault code will be stored. Since it is possible to have more than one fault, after completing the corrective action for a fault, clear the fault and test drive the motorcycle.

If the fault indicators are not working properly, troubleshoot them as directed in Test 10 of this section.

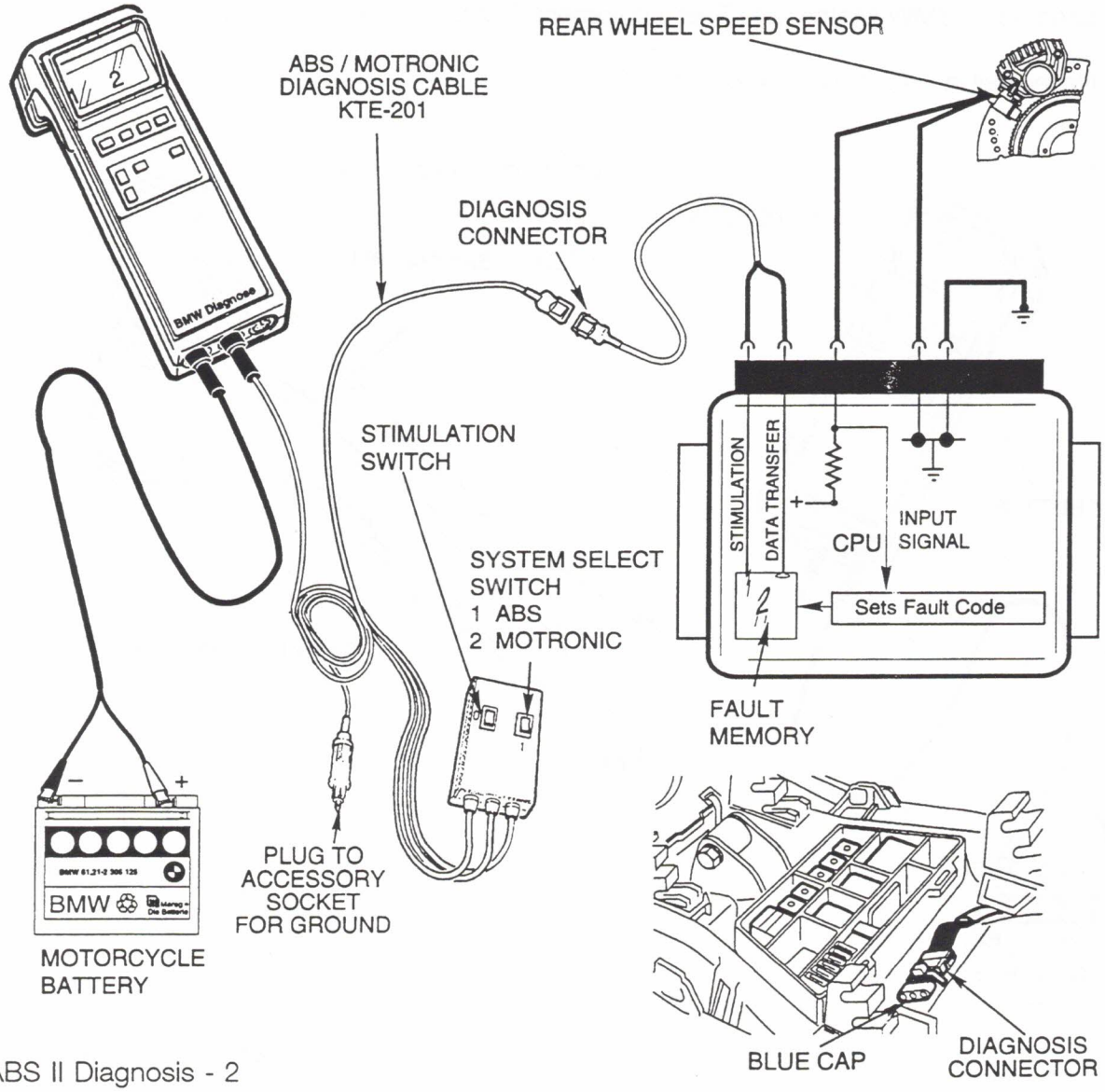
TEST LEAD HOOK UP

Test Lead Hook Up For Accessing Fault Codes

1. Turn ignition switch to OFF position.

2. Connect the Battery Power Cable to the left connector on the bottom of the BMW Multi-Tester. Connect the red clip to the lead to the positive terminal of the battery and the black clip to the negative terminal.

3. Connect the round plug of the ABS / Motronic Diagnosis KTE-201 to the center plug on the bottom of the BMW Multi-Tester. Connect the rectangular plug on the cable to the diagnosis plug (with blue cap) on the motorcycle. Plug the round plug with the spring loaded contact into the motorcycles auxiliary power socket for a ground connection.



Test Lead Hook Up For Volt / Ohm Reading

1. Set ignition switch to OFF position.

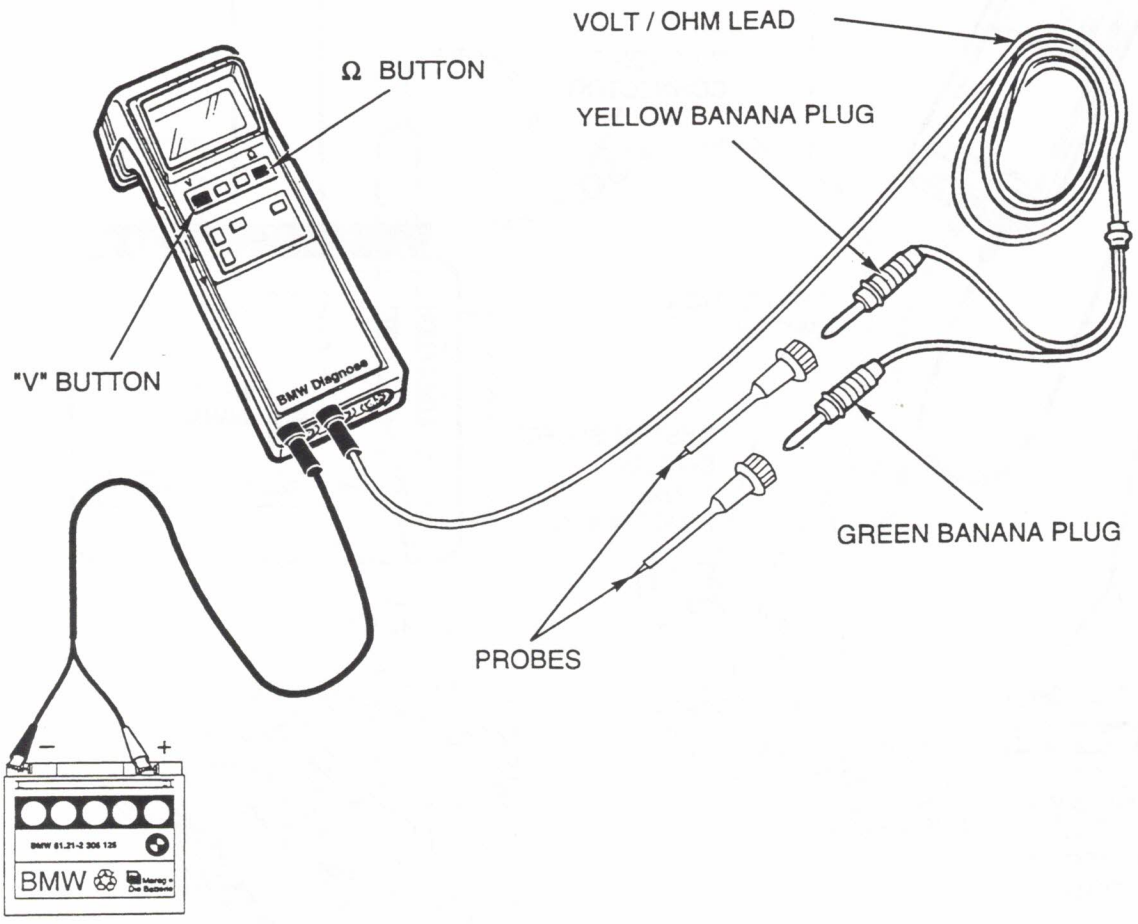
2. Connect the round 4 pin plug on the Volt / Ohm lead to the center plug on the bottom of the BMW Multi-Tester.

3. Place the probe on the yellow banana plug for positive (+) connection and the probe on the green banana plug for negative (-) connection.

4. Connect the Battery Power Cable to the left connector on the bottom of the BMW Multi-Tester. Connect the red clip to the positive terminal of the battery and the black clip to the negative terminal.

5. When testing for resistance, continuity or open circuit, zero the BMW Multi-Tester as directed in BMW Motorcycle Test Equipment Section, page Test Equipment - 8.

6. Never test a control unit for ohms.



DIAGNOSIS FAULT CODES

GENERAL

The ABS II system has the capability of monitoring its operation. When a malfunction occurs, the control unit detects it and stores the information about the malfunction in a portion of the control unit known as the fault memory. The information in the fault memory is in the form of a numeric code. These codes correspond to an actual circuit or component that is found to be defective on the system.

The existence of a fault is indicated by the ABS indicators in the instrument cluster. These indicators operate during the self-test function up to a speed of 2.5 mph. If the indicators continue to flash above this speed or if they flash alternately during operation of the ABS II System, a fault in the system has been detected.

Located on the motorcycle is a connector known as the diagnosis lead. Using the KTE-201 connected to the diagnosis lead, the codes are accessed and displayed. Refer to the Fault Code chart (next page) for an explanation of what the fault is.

ACCESSING FAULT CODES

- Connect the BMW Multi-Tester and KTE-201 to the motorcycle as directed in "Test Lead Hook Up" above.

- On the KTE-201 switch box, set the ABS / Motronic Selection Switch to "1". Set the Fault Memory Stimulation Switch to "0.

- On the BMW Multi-Tester, press the "V" button. Press the ▲ & ▼ buttons simultaneously. In the display, a large "0" will light up on the left with a small "0" on either side.

- Turn the ignition on. If a fault is stored in the ABS Control Unit, the fault code will show up in the display on the right with a "1" to the left. If only a "0" shows up to the left, no faults have been stored.

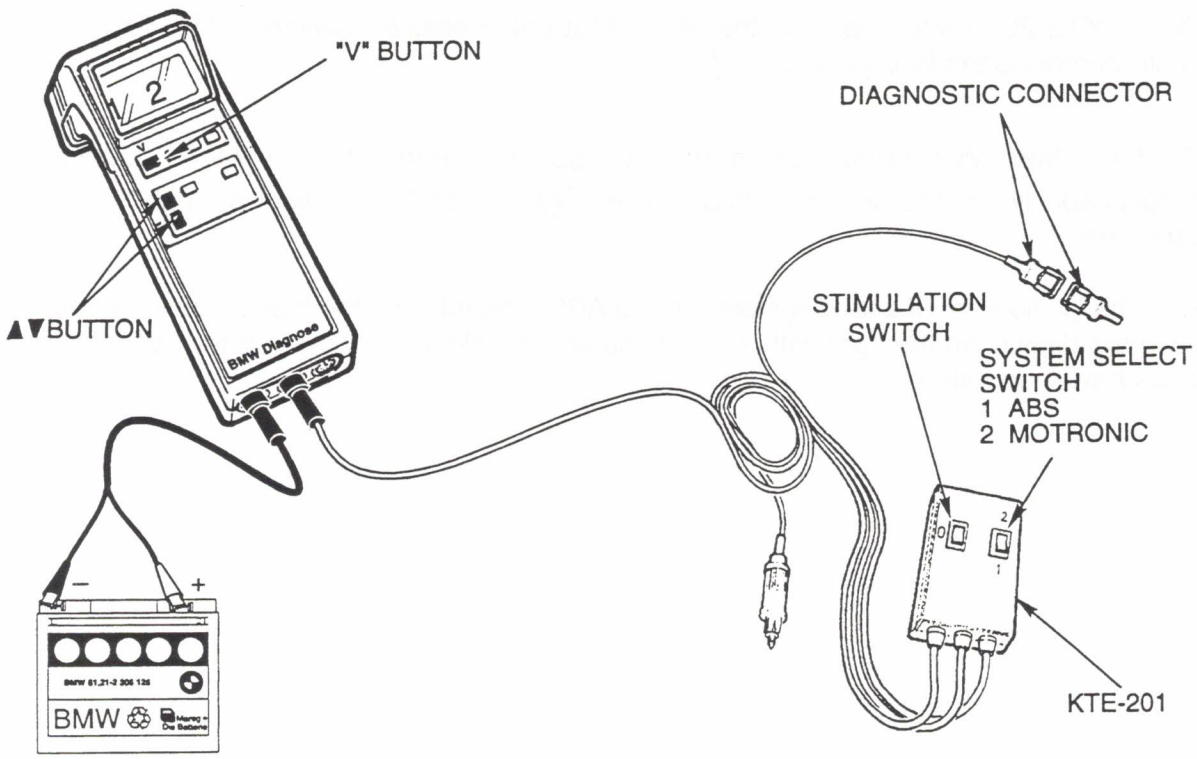
ABS SYSTEM FAULT CODES

CODES	FAULT DESCRIPTION
3	Front wheel sensor
4	Rear wheel sensor
5 (See Note 1)	Battery voltage too low
6	ABS relay
7	ABS Hydraulic/Electrical Unit
8 (See Note 1)	Outside influence
9 (See Note 2)	Indicator lights

NOTES

1. Faults with codes 5 and 8 are self erasing, they will be erased when ignition is shut off, use the kill switch.

2. Fault 9 is for the indicator lights and warning light relay. It has no bearing on the ABS System.



ERASING FAULT CODE

Prior to erasing the fault, record the code on the Repair Order. Erase the fault code as follows:

1. Hook up test equipment as directed in "Test Lead Hook Up - Accessing Fault Codes", page ABS II Diagnosis - 2.

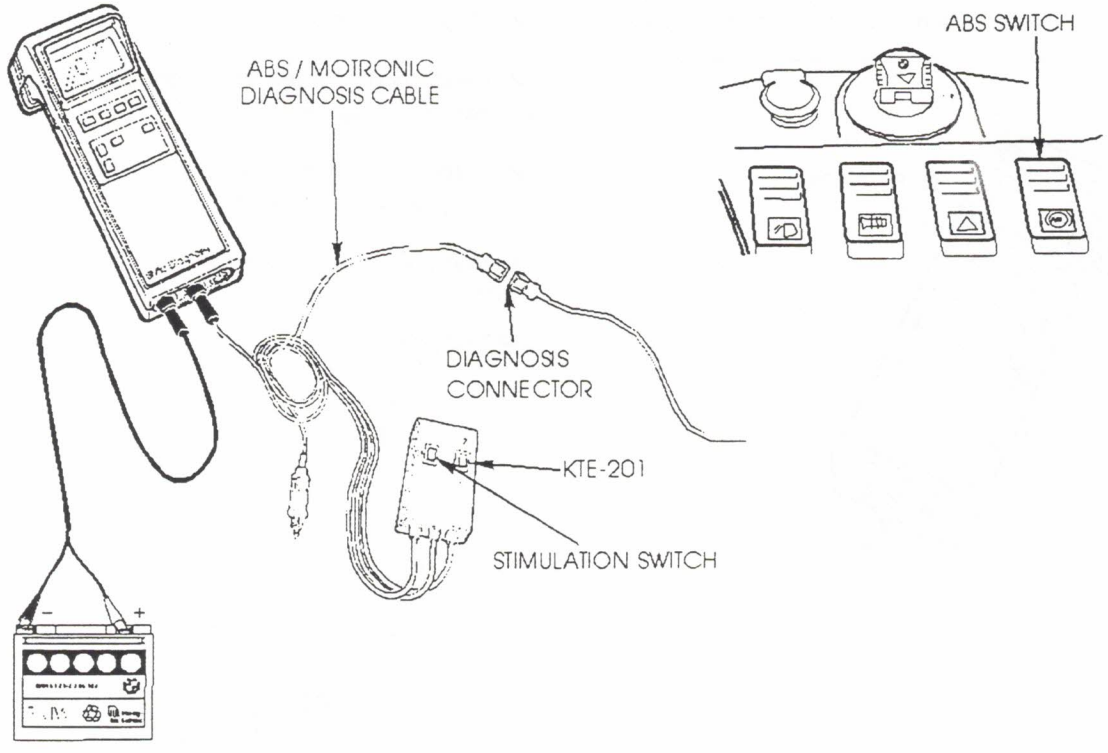
2. Turn ignition switch to ON position and read out fault code.

3. Press and hold down Stimulation Switch on the KTE-201. Press and hold ABS Switch on motorcycle. Hold both switches depressed for at least 10 seconds. One ABS Warning Indicators should come on constant.

4. Release the ABS Switch first and then the Stimulation Switch on the KTE-201.

5. Turn ignition switch to OFF position for at least 5 seconds. Fault storage is now erased.

6. Repeat "Accessing Fault Codes", page ABS II Diagnosis - 5. If the fault code is not erased, repeat steps 1 through 5 and increase the time in steps 3 and 5.



ABS II SYSTEM TEST

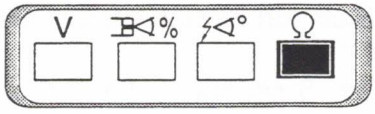
1. Fault Code 3 - Front Wheel Speed Sensor (Continued on next page)

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pins 13 and 25 of ABS CU plug = resistance between pins.

Test Condition:

1. Ignition switch to OFF position.
2. ABS CU plug disconnected.
3. BMW Multi-Tester Ω button pressed.

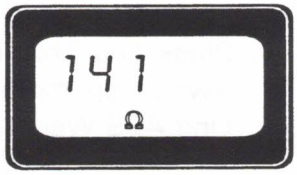


4. Perform zero calibration procedure on the tester.
5. Volt/Ohm leads from BMW Multi-Tester connected between pins 13 and 25 of ABS CU plug.

BMW Multi-Tester Display:

Resistance =

135 ± 20Ω



If resistance reading is correct, check front sensor gap. If gap is correct, replace ABS CU.

If an open circuit is indicated, go to page 8.

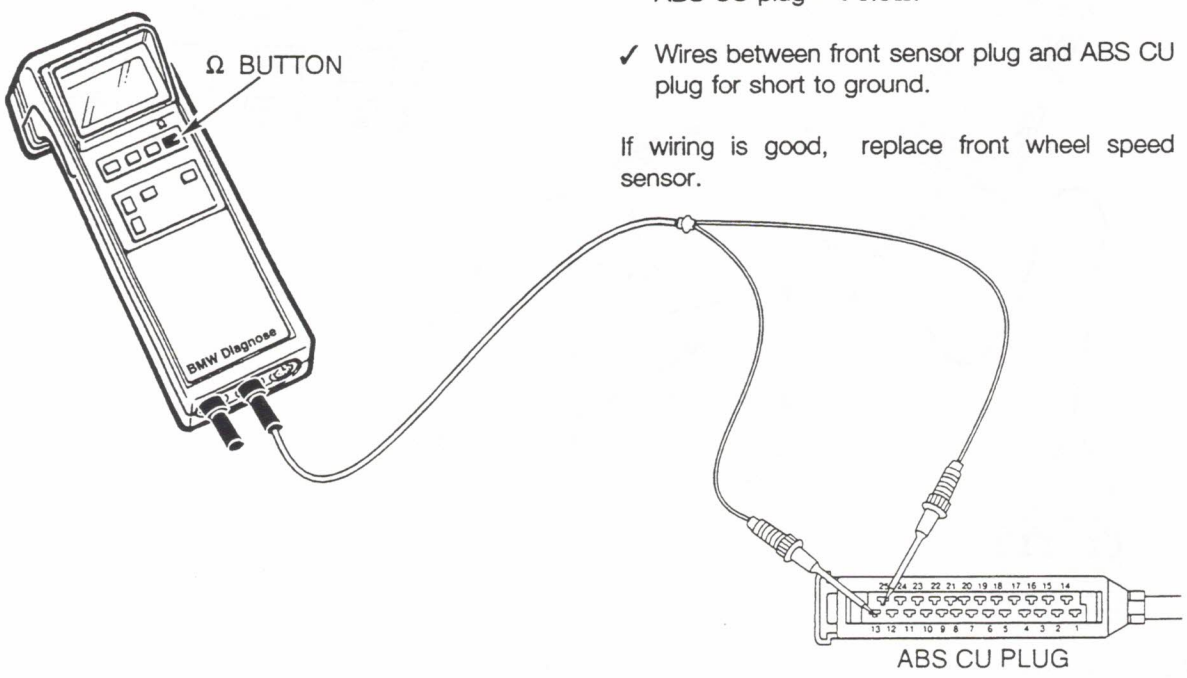
If resistance reading is not correct, check the following:

✓ Plug connectors and harness for corrosion.

✓ Resistance of wires from front sensor plug to ABS CU plug - < 0.3Ω.

✓ Wires between front sensor plug and ABS CU plug for short to ground.

If wiring is good, replace front wheel speed sensor.



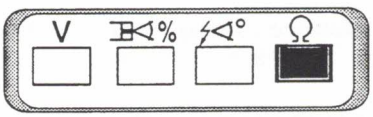
1. Fault Code 3 - Front Wheel Speed Sensor (Continued from previous page)

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pins 13 and 25 of ABS CU plug = open circuit to ground.

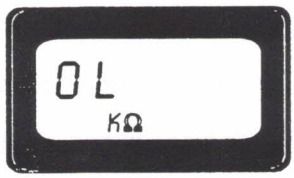
Test Condition:

1. Ignition switch to OFF position.
2. ABS CU plug disconnected.
3. BMW Multi-Tester Ω button pressed.



4. Perform zero calibration procedure on the tester.
5. Volt/Ohm leads from BMW Multi-Tester connected between pin 13 of ABS CU plug and frame ground and between pin 25 and frame ground.

BMW Multi-Tester Display:

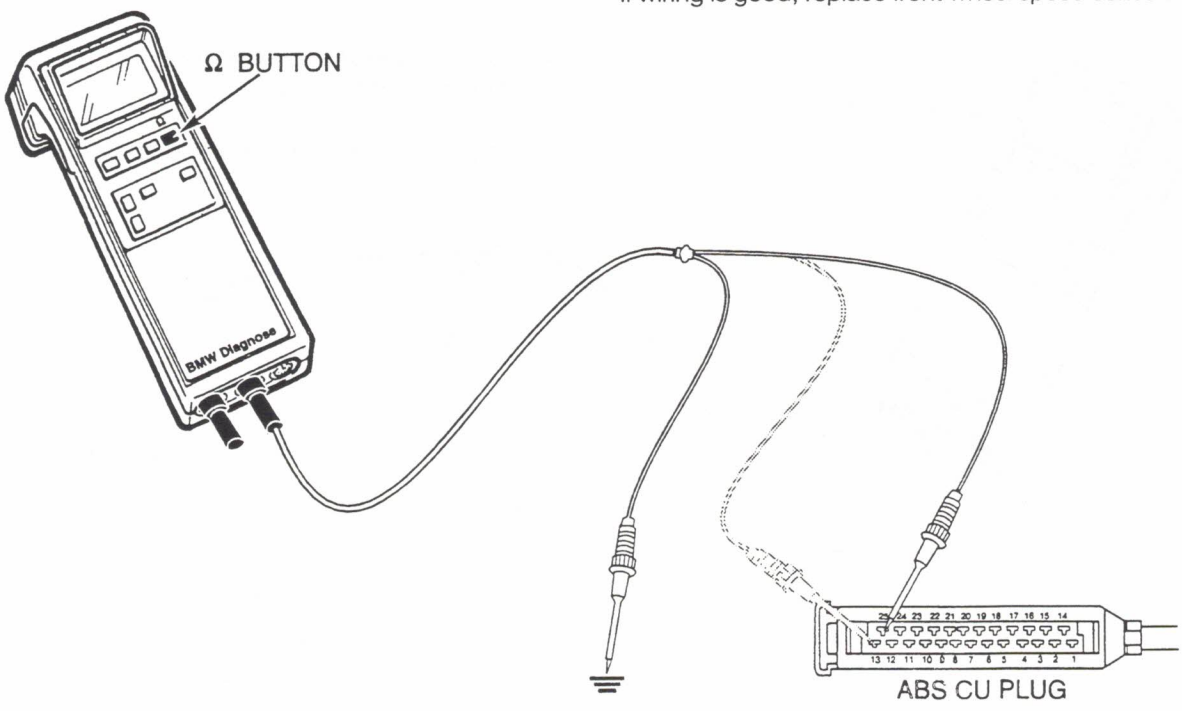


An open circuit should be indicated.

If a circuit to ground is indicated, check the following for short to ground.

- ✓ Pin 13 of ABS CU plug to front wheel speed sensor plug.
- ✓ Pin 25 of ABS CU plug to front wheel speed sensor plug.

If wiring is good, replace front wheel speed sensor.



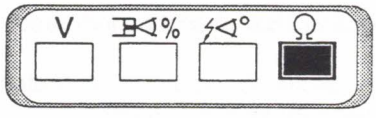
2. Fault Code 4 - Rear Wheel Speed Sensor (Continued on next page)

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pins 12 and 24 of ABS CU plug = resistance between pins.

Test Condition:

1. Ignition switch to OFF position.
2. ABS CU plug disconnected.
3. BMW Multi-Tester Ω button pressed.

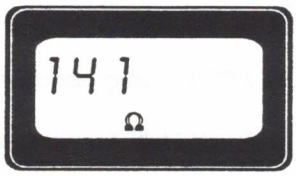


4. Perform zero calibration procedure on the tester.
5. Volt/Ohm leads from BMW Multi-Tester connected between pins 12 and 24 of ABS CU plug.

BMW Multi-Tester Display:

Resistance =

135 ± 20Ω



If resistance reading is correct, check rear sensor gap. If gap is correct, replace ABS CU.

If an open circuit is indicated, go to page 10.

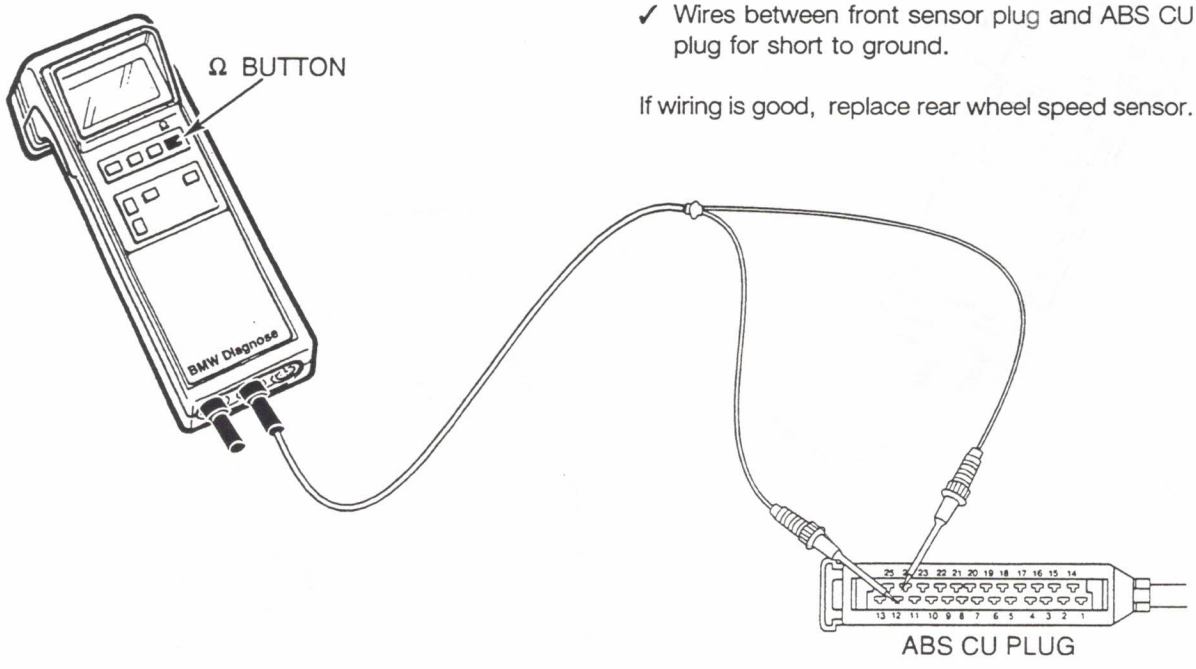
If resistance reading is not correct, check the following:

✓ Plug connectors and harness for corrosion.

✓ Resistance of wires from front sensor plug to ABS CU plug - < 0.3Ω.

✓ Wires between front sensor plug and ABS CU plug for short to ground.

If wiring is good, replace rear wheel speed sensor.



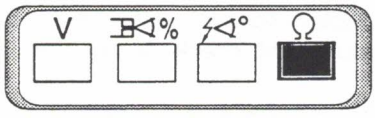
2. Fault Code 4 - Rear Wheel Speed Sensor (Continued from previous page)

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pins 12 and 24 of ABS CU plug = open circuit to ground.

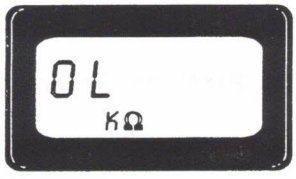
Test Condition:

1. Ignition switch to OFF position.
2. ABS CU plug disconnected.
3. BMW Multi-Tester Ω button pressed.



4. Perform zero calibration procedure on the tester.
5. Volt/Ohm leads from BMW Multi-Tester connected between pin 12 of ABS CU plug and frame ground and between pin 24 and frame ground.

BMW Multi-Tester Display:



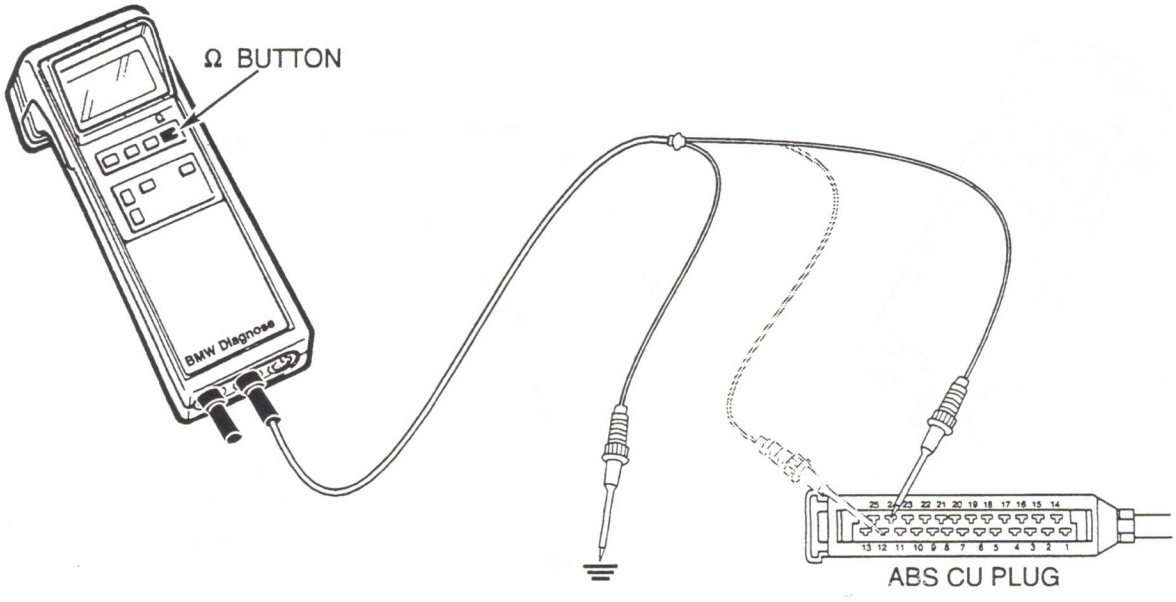
An open circuit should be indicated.

If a circuit to ground is indicated, check the following for short to ground.

✓ Pin 12 of ABS CU plug to rear wheel speed sensor plug.

✓ Pin 24 of ABS CU plug to rear wheel speed sensor plug.

If wiring is good, replace rear wheel speed sensor.



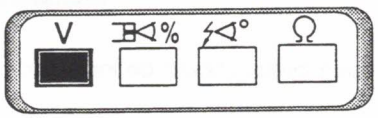
3. Fault Code 5 - Battery Voltage Too Low (Continued on next page)

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pin 14 of ABS CU plug = 12.6VDC Power

Test Condition:

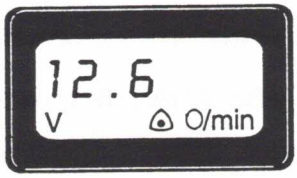
1. ABS CU plug disconnected.
2. BMW Multi-Tester V button pressed.



3. Volt/Ohm leads from BMW Multi-Tester connected yellow to pin 14 of ABS CU plug and green to frame ground.
4. Turn ignition switch to ON position.

BMW Multi-Tester Display:

Voltage reading should be same as battery voltage.



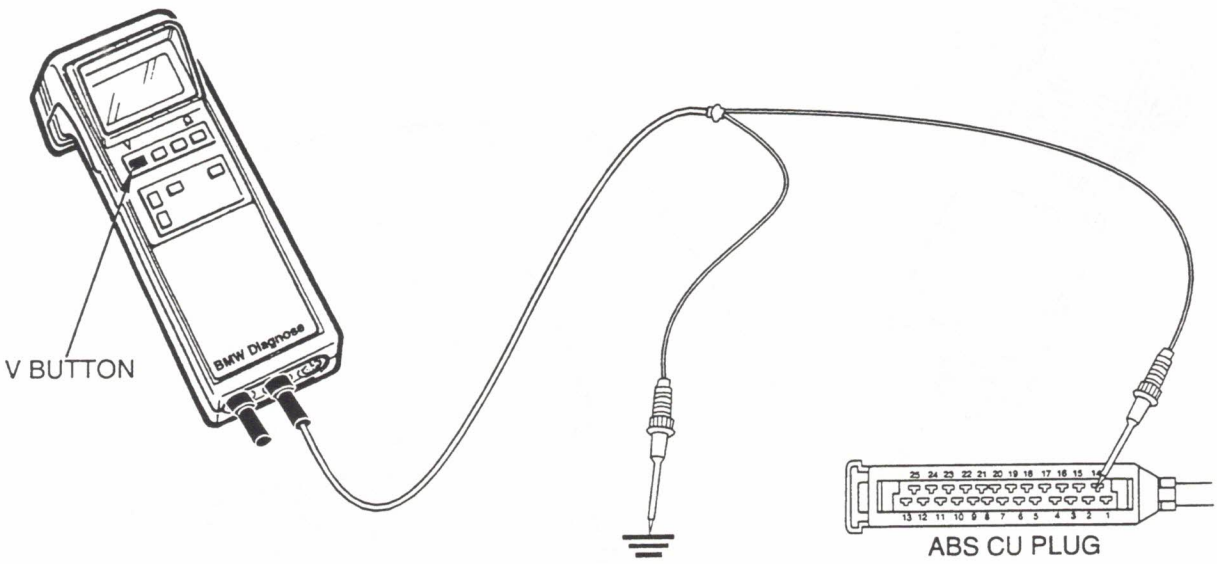
If display voltage differs from direct battery measurement, check the following:

✓ Battery charge and condition.

✓ Ground connection at battery, frame, engine.

✓ Pin 14 (red wire) of ABS CU plug to battery +.

If display voltage is battery voltage, replace ABS CU.



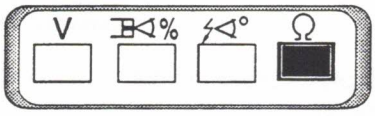
3. Fault Code 5 - Battery Voltage Too Low (Continued from previous page)

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pin 1 and 2 of ABS CU plug to ground = < 0.3Ω

Test Condition:

1. ABS CU plug disconnected.
2. Ignition switch to OFF position.
3. BMW Multi-Tester Ω button pressed.

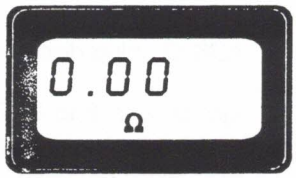


4. Perform zero calibration procedure on the tester.
5. Volt/Ohm leads from BMW Multi-Tester connected to pin 1 of ABS CU plug and to frame ground and pin 2 and frame ground.

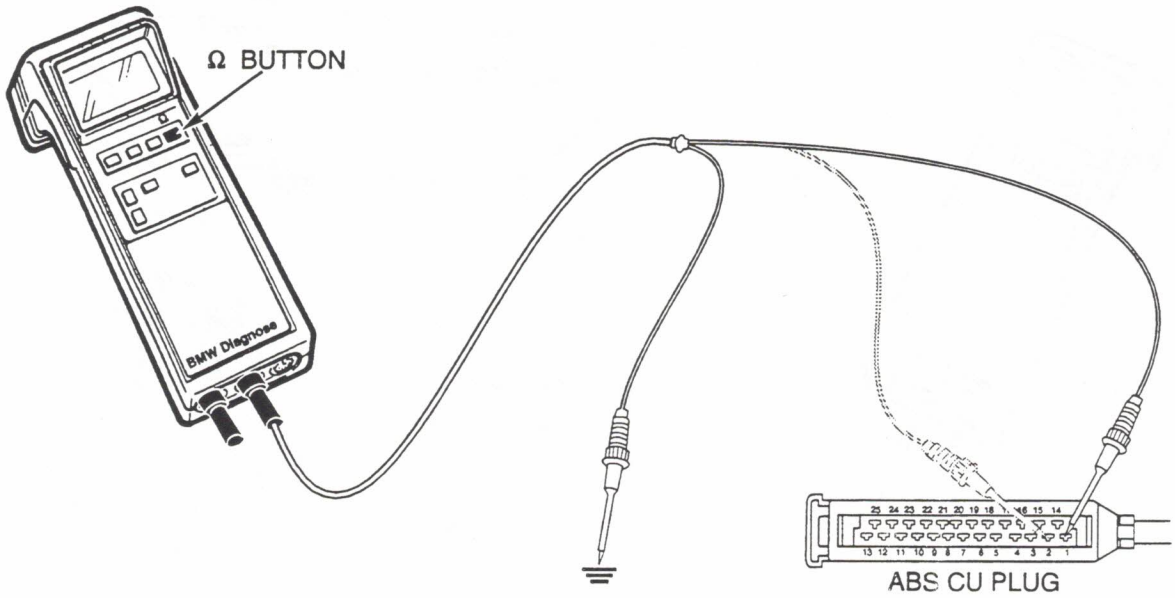
BMW Multi-Tester Display:

Resistance =

< 0.3Ω



If resistance reading is > 0.3Ω, check wires from pins 1 and pin 2 of ABS CU plug to ground connection.



4. Fault Code 6 - ABS Relay (In ABS Hydraulic/Electric Unit) (Continued on next page)

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

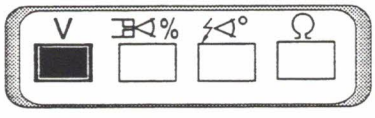
Tested Pins: Terminals 30 and 31 of ABS Relay Socket = battery voltage

Test Condition:

1. ABS CU plug disconnected.
2. Ignition switch to OFF position.
3. ABS Relay removed.

NOTE: To remove relay, loosen #20 torque screws.

4. BMW Multi-Tester V button pressed.



5. Volt/Ohm leads from BMW Multi-Tester connected yellow to terminal 30 and green to terminal 31 of ABS Relay socket.

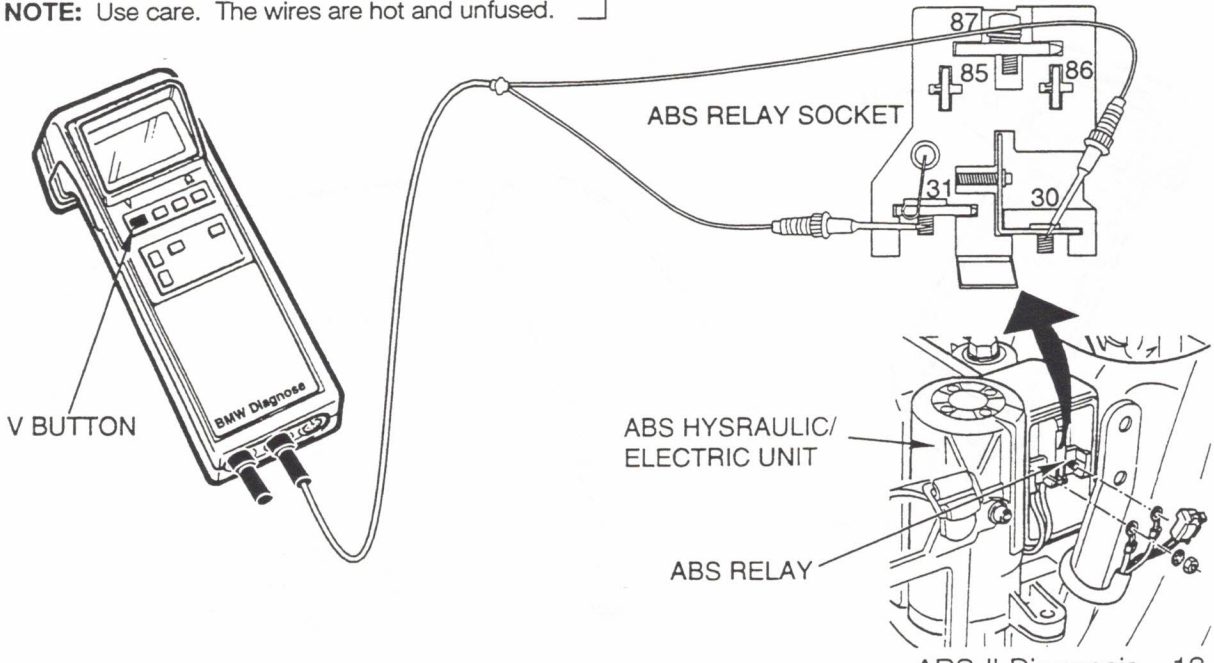
NOTE: Use care. The wires are hot and unfused.

BMW Multi-Tester Display:

Voltage reading should be same as battery voltage.

If display voltage is not <12.6VDC, check the following:

- ✓ Battery charge and condition.
- ✓ Terminal 31 of ABS Relay socket to frame ground.
- ✓ Ground connection at battery, frame, engine.
- ✓ Terminal 30 (red wire) of ABS Relay socket to battery +.



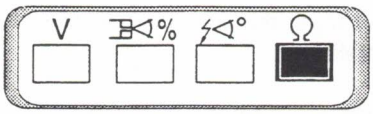
4. Fault Code 6 - ABS Relay (In ABS Hydraulic/Electric Unit) (Continued from previous page)

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pin 8 of ABS CU plug to pin 85 of ABS Relay socket; pin 19 of ABS CU plug to pin 86 of ABS Relay socket.

Test Condition:

1. ABS CU plug disconnected.
2. Ignition switch to OFF position.
3. ABS Relay removed.
4. BMW Multi-Tester Ω button pressed.

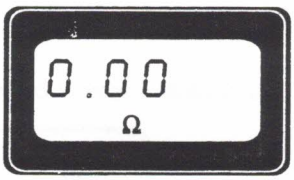


5. Perform zero calibration procedure on the tester.
6. Volt/Ohm leads from BMW Multi-Tester connected between pin 8 of ABS CU plug and pin 85 of ABS Relay socket and pin 19 of ABS CU plug and pin 86 of ABS Relay socket.

BMW Multi-Tester Display:

Resistance =

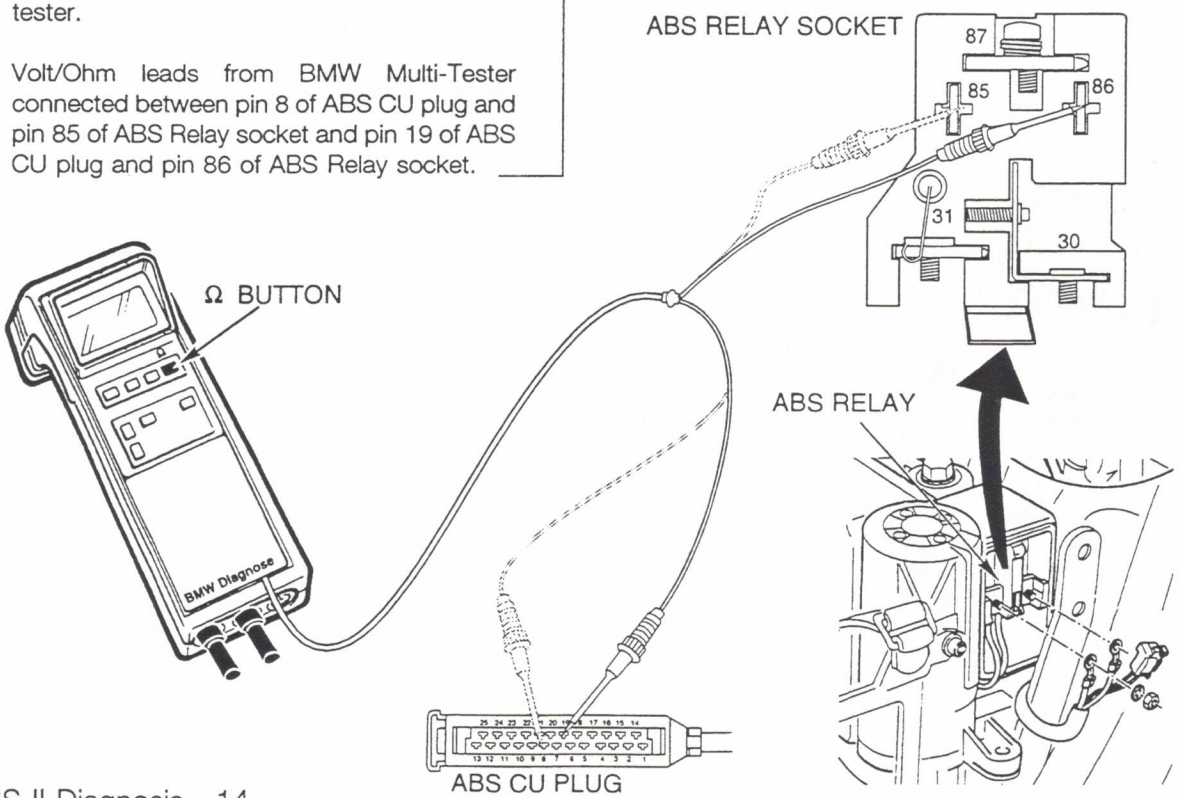
< 0.3Ω



If resistance is not < 0.3Ω, check wiring and connections.

If resistance is < 0.3Ω, replace ABS Relay.

After completing testing, install ABS Relay.



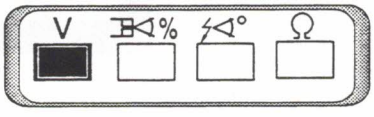
5. Fault Code 7 ABS Hydraulic/Electric Unit

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pins 1 to 14 of ABS CU plug = battery voltage

Test Condition:

1. ABS CU plug disconnected.
2. Ignition switch to OFF position.
3. BMW Multi-Tester V button pressed.



4. Volt/Ohm leads from BMW Multi-Tester connected yellow to pin 14 and green to pin 1 of ABS CU plug.

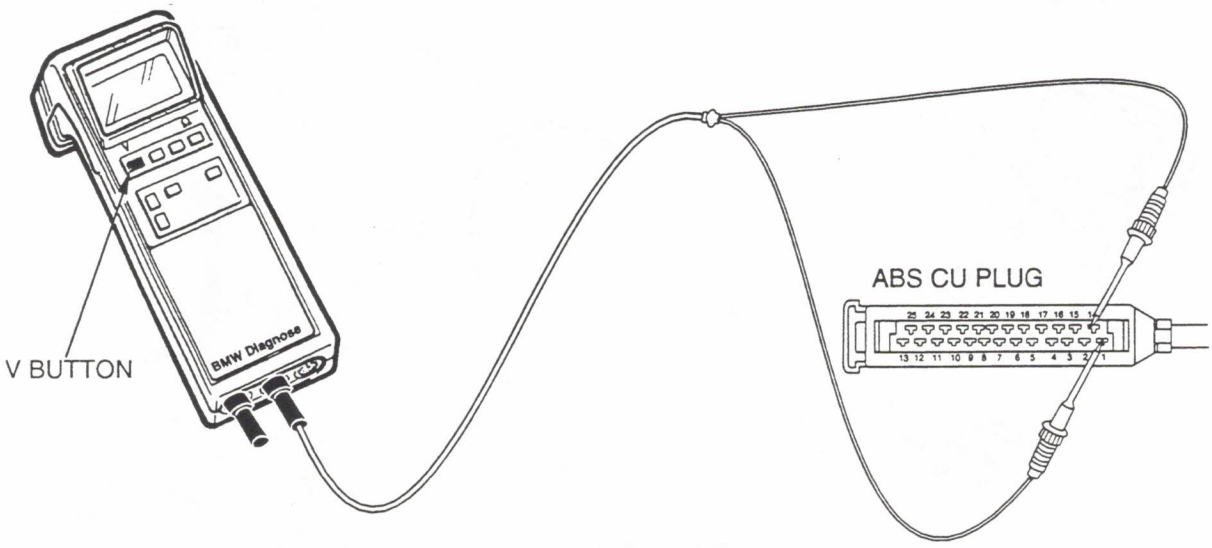
BMW Multi-Tester Display:

Voltage reading should be same as battery voltage.

If voltage reading is correct, perform operation test and check coding of ABS CU.

If voltage reading is not correct, check the following:

- ✓ Battery charge and condition.
- ✓ Ground connection at battery, frame, engine.
- ✓ Pin 1 of ABS CU plug to frame ground.
- ✓ Pin 14 of ABS CU plug to battery +.



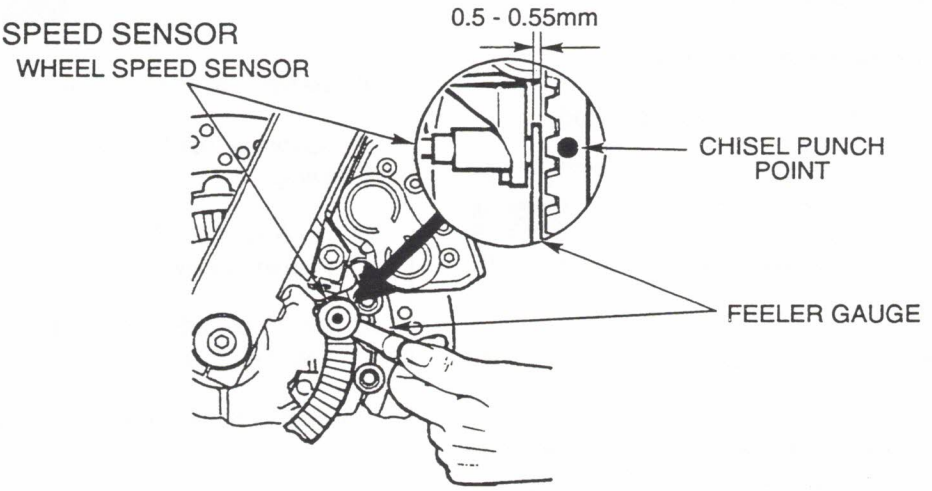
6. Fault Code 8 - Outside Influence

This Fault Code is a result of outside influence on the ABS CU. To eliminate the Fault Code, perform the following:

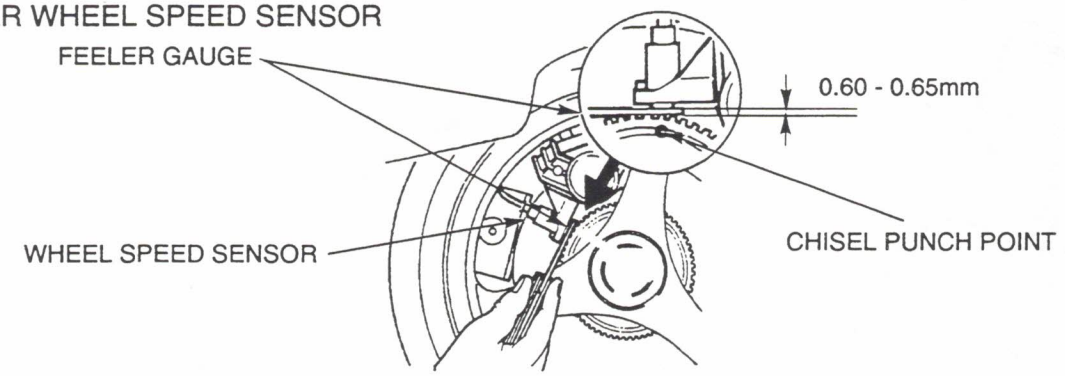
- Check motorcycle coding, page ABS II Diagnosis - 19.
- Check plug connections on sensors for loose connections.
- Check that sensor clearance is as shown below.

Erase Fault Code, page ABS II Diagnosis - 6. Test drive motorcycle, page ABS II Diagnosis - 21. Check for Fault Codes.

FRONT WHEEL SPEED SENSOR



REAR WHEEL SPEED SENSOR



7. Fault Code 9 - Indicator Lights

This Fault Code relates to the operation of the Warning Indicators. Perform Tests 8 through 11 as required by the operation of the Warning Indicators.

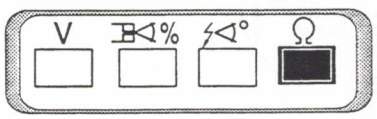
8. One Or Both Warning Indicators Do Not Come On When Starting Motorcycle

Test Equipment: BMW Multi-Tester and Volt / Ohm Leads and Adapters

Tested Pins: Pin 5 to pin 15 of ABS CU plug = resistance

Test Condition:

1. Read out fault code. Eliminate fault. Erase fault code. Test drive motorcycle. If both lights do not come on, proceed with test.
2. ABS CU plug disconnected.
3. Ignition switch to OFF position.
4. BMW Multi-Tester Ω button pressed.

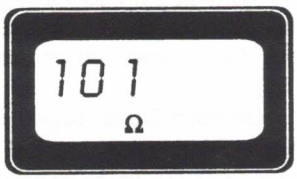


5. Perform zero calibration procedure on the tester.
6. Volt/Ohm leads from BMW Multi-Tester connected between pins 5 and 15 of ABS CU plug.

BMW Multi-Tester Display:

Resistance =

110 ± 20Ω



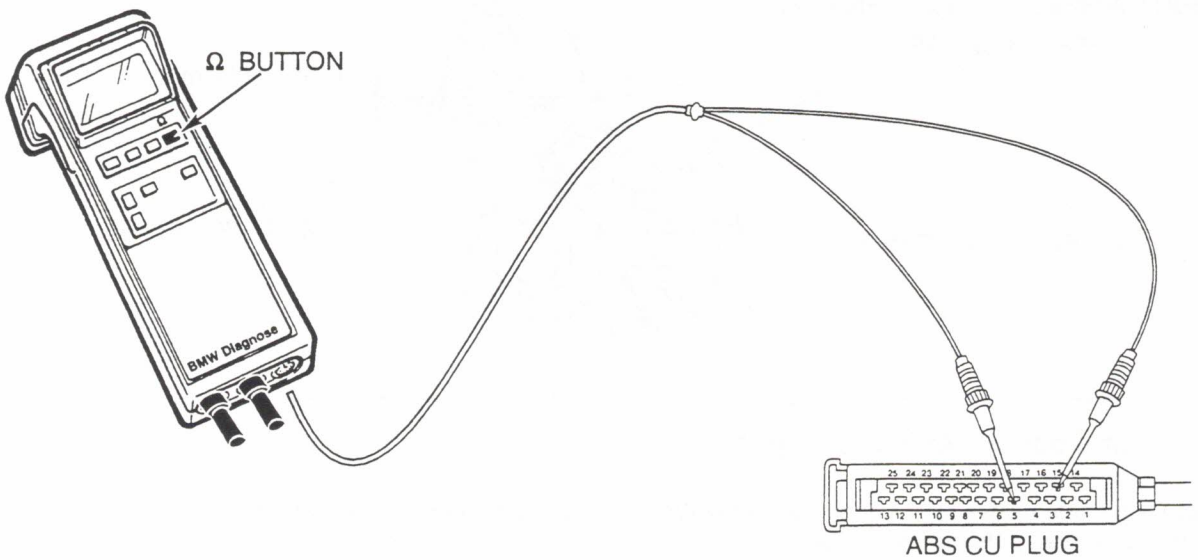
If resistance reading is correct, replace ABS CU.

If resistance reading is not correct, check the following:

✓ Pin 5 of ABS CU plug to terminal 86 of ABS Warning Relay.

✓ Pin 15 of ABS CU plug to terminal 85 of ABS Warning Relay.

If wiring is good, replace ABS Warning Relay.



ABS II SYSTEM

CONTROL UNIT CODING

Each ABS II Control Unit is coded to the specific motorcycle model when first installed. This is accomplished by the pin assignments of the Control Unit plug. This coding can be read using the BMW Multi-Tester and the KTE-201. The motorcycle wiring can also be checked for proper coding by checking the ABS CU plug pin wires (listed in table) to ground.

ABS CONTROL UNIT CODING

MODEL	CU CODE	CU PIN 9	CU PIN 10	CU PIN 22	CU PIN 23
R1100RS	2	OPEN	GROUND	OPEN	OPEN
K1100RS	7	OPEN	GROUND	GROUND	GROUND
R1100RT	8	GROUND	OPEN	OPEN	OPEN
R1100GS	4	OPEN	OPEN	GROUND	OPEN
R1100R/ R850R	12	GROUND	OPEN	GROUND	OPEN
K1100LT	11	GROUND	GROUND	OPEN	GROUND

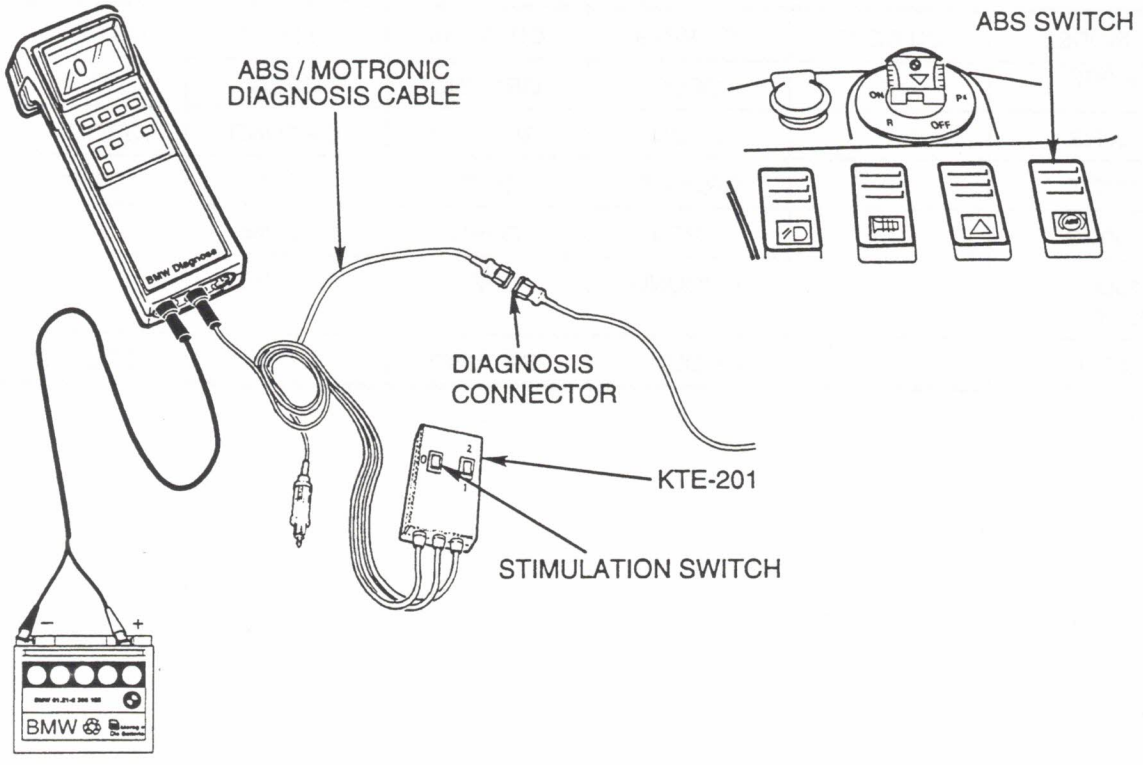
Checking Control Unit Coding

1. Hook up test equipment for accessing fault codes as directed on page ABS II Diagnosis - 2.

2. Erase all faults as directed on page ABS II Diagnosis - 6.

3. Turn ignition switch ON. Press and hold ABS switch on the motorcycle. The number in the BMW Multi-Tester display is the code of the Control Unit.

4. Check that the code is correct to model as listed in the table above.



ABS II SYSTEM

TEST DRIVE

1. Turn ignition switch OFF and then ON. Check ABS Warning Indicators. Indicators should be flashing together. If indicators are not flashing together, troubleshoot system.

2. Drive motorcycle above 2.5 MPH. Check that Warning Indicators go off. If indicators do not go off, access fault code, record code on Repair Order, correct fault and erase code. Repeat Test Drive.

3. Apply both front and rear brakes and check Warning Indicators. If Indicators come on, access fault code, correct fault and erase code. Repeat Test Drive.

4. Disconnect front or rear wheel speed sensor. Drive Motorcycle and check that Warning Indicators come on. Depress ABS Cancel Switch and check that Warning Indicators remain on constant. If Indicators do not remain on constant, troubleshoot system. Repeat Test Drive.

5. Reconnect front or rear wheel speed sensor. Erase fault code.