Volvo Chassis - P05E662 Park brake Sensor/Switch Circuit Range/Performance, Signal Compare failure

Currently Guided Diagnostics in Premium Tech Tool are leading to the incorrect fault tracing. This is being corrected. Until this is fixed, please see the information here for the GD instructions for this fault.

This fault is not new for the OBD 21 emissions but the way it is generated is new. For prior emissions levels, the park brake signal was monitored and if the sensor indicated that the park brake was engaged and the VECU saw road speed it would light the lamp and sound a warning in the dash.

New OBD standards require that the park brake function be made into a diagnostic routine. This led to the addition of a second switch to allow for diagnostics to be implemented.

The fault is generated by the VECU, but is broadcast by the engine ECU as an OBD requirement. This fault is checking that the state of the two park brake signals changes within a reasonable amount of time of the other. The two signals must agree. Fault tracing should be focused on making sure the correct signals are seen at the VECU when the park brake is released.

Diagnostics

Check continuity between VECU Pin C17 (park brake sensor input) and ground.

- **Note:** There is a diode in this circuit between the VECU and the first splice. Not having the meter lead polarity correct (positive and negative leads swapped) can cause a bad reading.

- There should be good continuity with the park brake set.
- There should be an open circuit with the park brake released.

Check the diode mentioned in the check above using the Diode Test function on the multimeter.

- More information on testing diodes can be found here.

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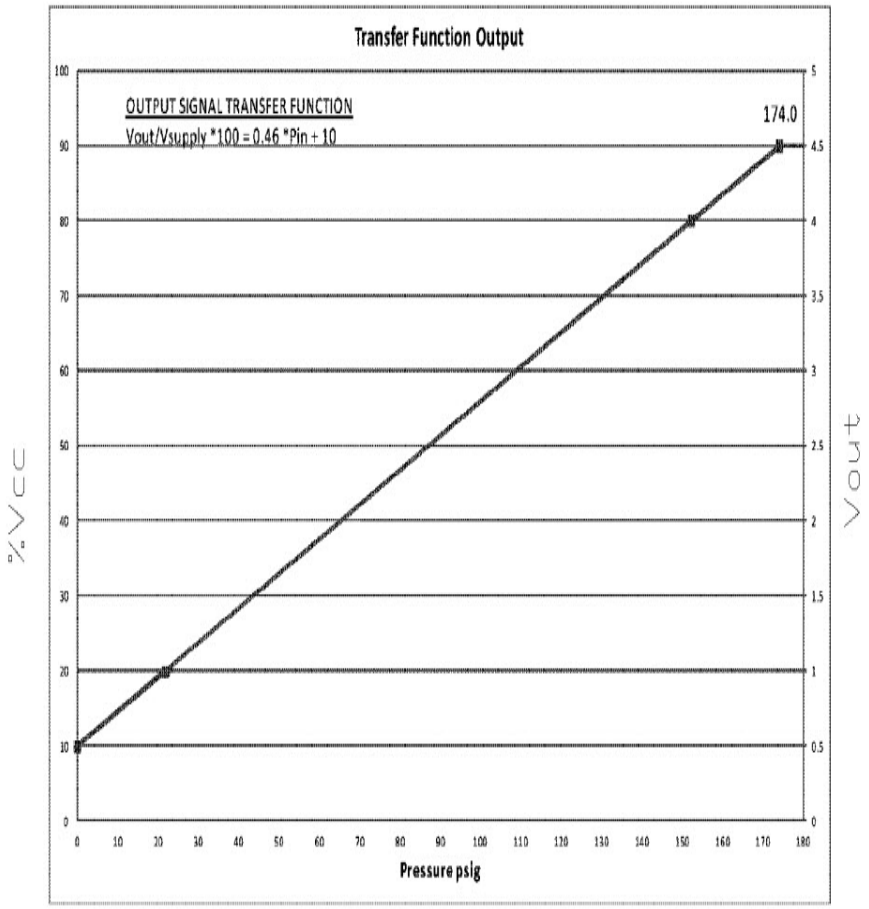
Check power supply voltage.

- The OBD three-wire park brake sensor should have 5 VDC to the sensor from the VECU pin C27 and sensor pin B. The sensor ground is B18 at the VECU and Pin A at the sensor.

Check signal voltage.

- The signal wire is VECU Pin C23 and should be ~0.5 VDC with the parking brake applied (no pressure to the sensor) and ~3.5 VDC with the parking brakes released and the air pressure at 135 PSI. For other pressure and voltage combinations, see the graph below.



Schematics

Refer to the Online Schematics Viewer for the proper wire numbers. The online schematics viewer is correct for units running this switch configuration.

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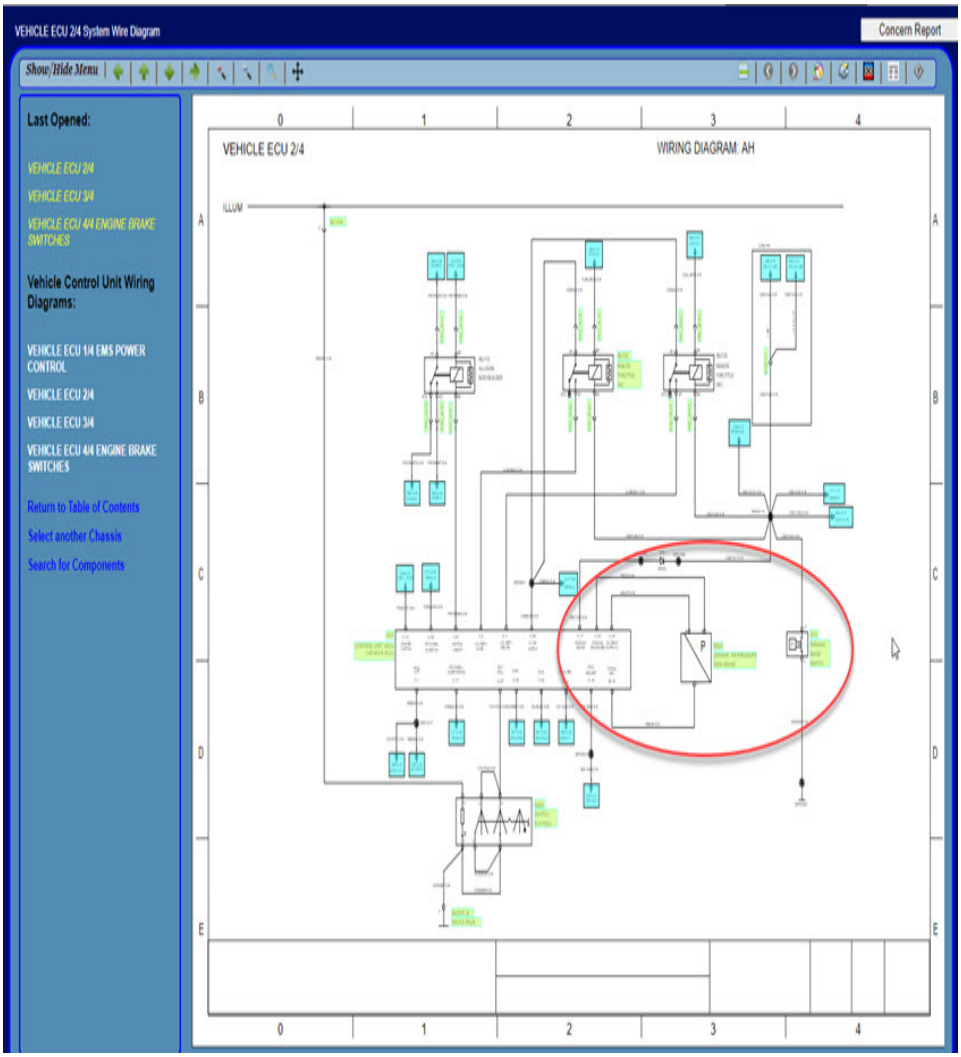

Component locations

Component designation for the new sensor is B322. The old switch is still in its original location.

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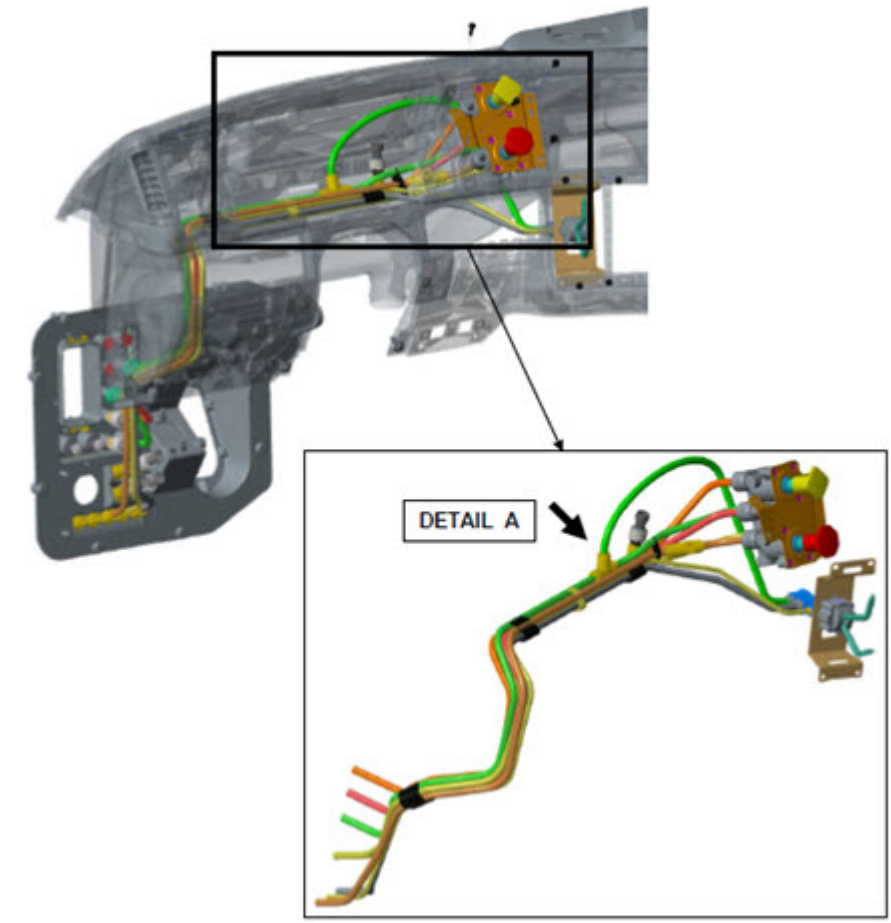
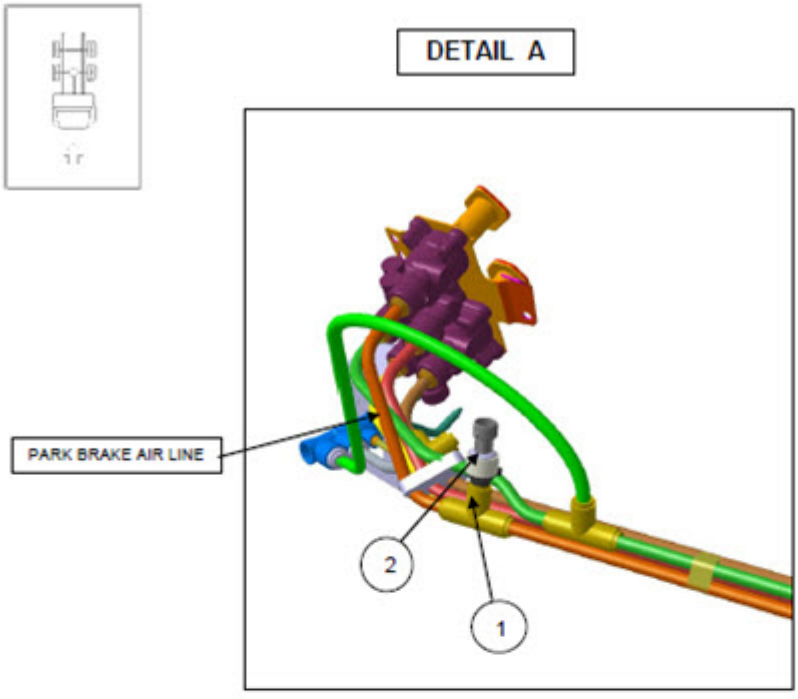
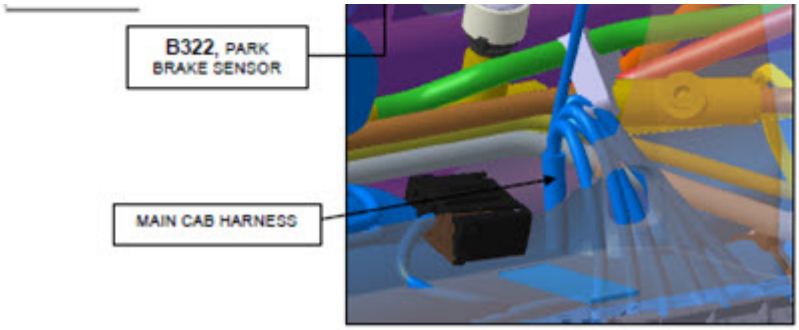
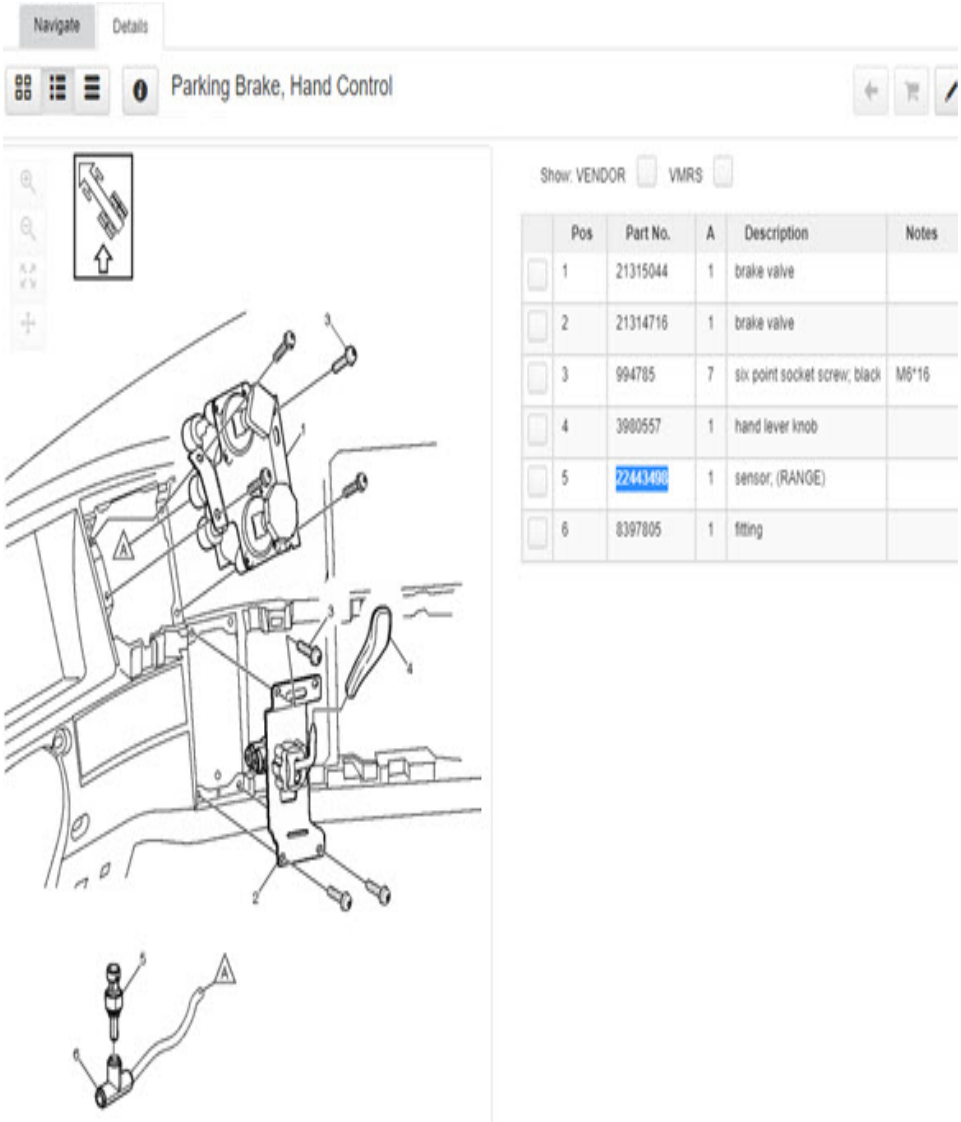






Parts

The part number for the new sensor is 22443498, and is the same for all products running this switch.



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How to Test Diodes with a Digital Multimeter

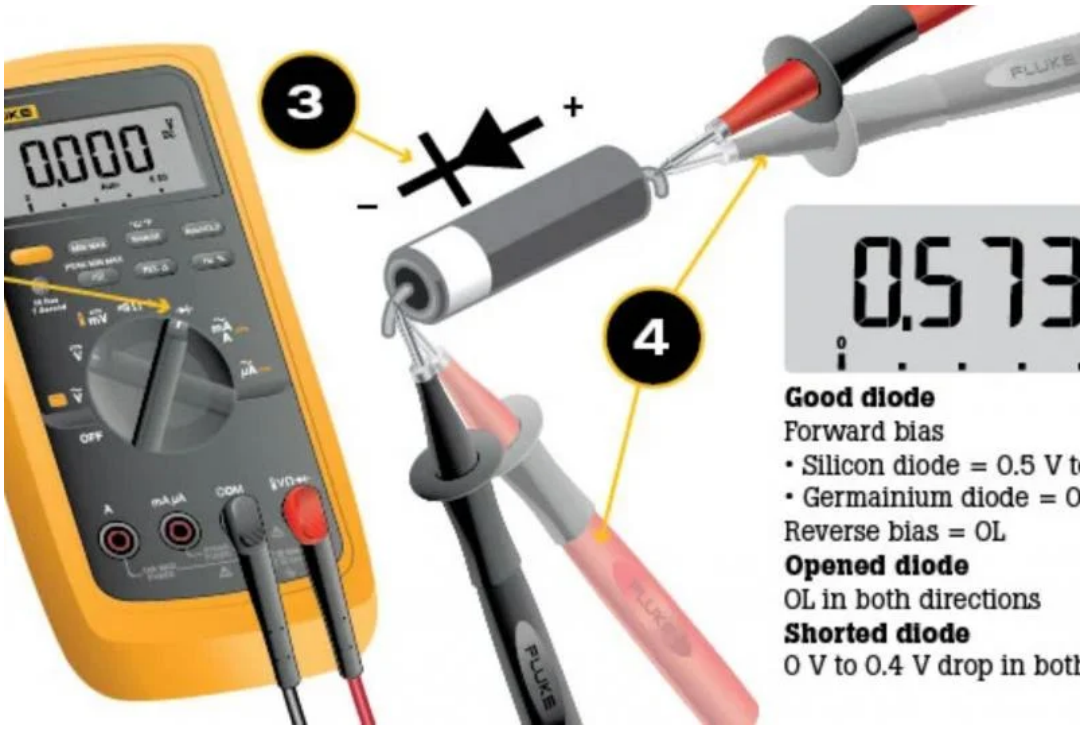
Multimeters (/en-us/learn/blog/digital-multimeters), 101 Learning (/en-us/learn/blog/fundamentals)
Digital multimeters (https://www.fluke.com/en-us/products/electrical-testing/digital-multimeters) can test diodes (https://www.fluke.com/en-us/learn/blog/electrical/what-is-a-diode) using one of two methods:

1. Diode Test mode: almost always the best approach.
2. Resistance mode: typically used only if a multimeter is not equipped with a Diode Test mode.

Note: In some cases it may be necessary to remove one end of the diode from the circuit in order to test the diode.
Things to know about the Resistance mode when testing diodes:

- Does not always indicate whether a diode is good or bad.
- Should not be taken when a diode is connected in a circuit since it can produce a false reading.
- CAN be used to verify a diode is bad in a specific application after a Diode Test indicates a diode is bad.

A diode is best tested by measuring the voltage drop across the diode when it is forward-biased. A forward-biased diode acts as a closed switch, permitting current to flow.



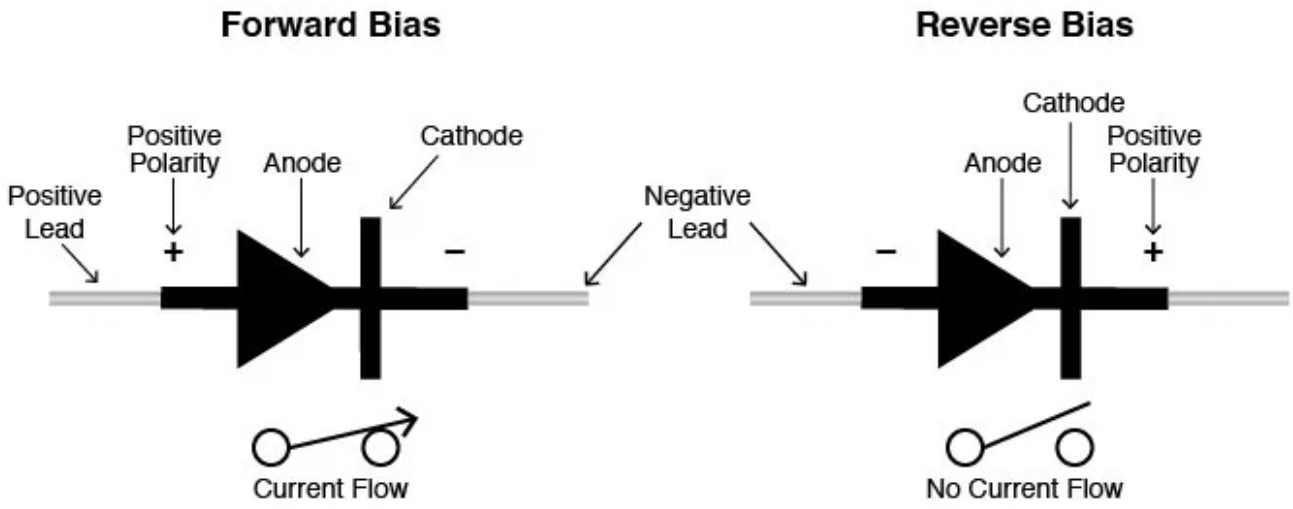
A multimeter's Diode Test mode produces a small voltage between test leads. The multimeter then displays the voltage drop when the test leads are connected across a diode when forward-biased. The Diode Test procedure is conducted as follows:

1. Make certain a) all power to the circuit is OFF and b) no voltage exists at the diode. Voltage may be present in the circuit due to charged capacitors. If so, the capacitors need to be discharged. Set the multimeter to measure ac or dc voltage as required.
2. Turn the dial (rotary switch) to Diode Test mode. It may share a space on the dial with another function.
3. Connect the test leads to the diode. Record the measurement displayed.
4. Reverse the test leads. Record the measurement displayed.

Diode test analysis

- A good forward-based diode displays a voltage drop ranging from 0.5 to 0.8 volts for the most commonly used silicon diodes. Some germanium diodes have a voltage drop ranging from 0.2 to 0.3 V.
- The multimeter displays OL when a good diode is reverse-biased. The OL reading indicates the diode is functioning as an open switch.
- A bad (opened) diode does not allow current to flow in either direction. A multimeter will display OL in both directions when the diode is opened.
- A shorted diode has the same voltage drop reading (approximately 0.4 V) in both directions.

A multimeter set to the Resistance mode (Ω) can be used as an additional diode test or, as mentioned previously, if a multimeter does not include the Diode Test mode.

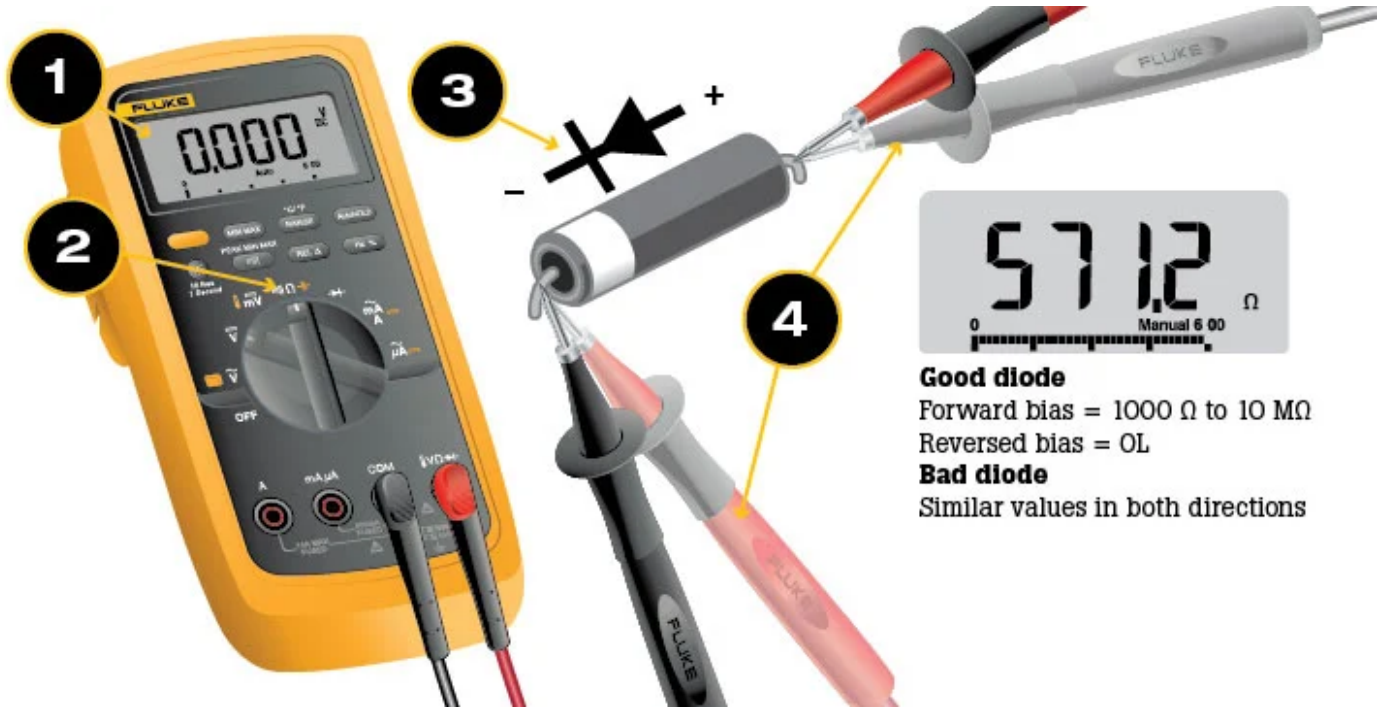


A diode is forward-biased when the positive (red) test lead is on the anode and the negative (black) test lead is on the cathode.

- The forward-biased resistance of a good diode should range from 1000 Ω to 10 MΩ.
- The resistance measurement is high when the diode is forward-biased because current from the multimeter flows through the diode, causing the high-resistance measurement required for testing.

A diode is reverse-biased when the positive (red) test lead is on the cathode and the negative (black) test lead is on the anode.

- The reverse-biased resistance of a good diode displays OL on a multimeter. The diode is bad if readings are the same in both directions.



The resistance mode procedure is conducted as follows:

1. Make certain a) all power to the circuit is OFF and b) no voltage exists at the diode. Voltage may be present in the circuit due to charged capacitors. If so, the capacitors need to be discharged. Set the multimeter to measure ac or dc voltage as required.
2. Turn the dial to Resistance mode (Ω). It may share a space on the dial with another function.
3. Connect the test leads to the diode after it has been removed from the circuit. Record the measurement displayed.
4. Reverse the test leads. Record the measurement displayed.
5. For best results when using the Resistance mode to test diodes, compare the readings taken with a known good diode.

Reference: Digital Multimeter Principles by Glen A. Mazur, American Technical Publishers.

Related resources

- How to measure current with a clamp accessory (https://www.fluke.com/en-us/learn/blog/digital-multimeters/how-to-measure-current-with-clamp-accessory)

- How to measure duty cycle with a digital multimeter (https://www.fluke.com/en-us/learn/blog/digital-multimeters/how-to-measure-duty-cycle)

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