

# Vehicle



# Test Guide

*The "hands on" Reference*

## Vehicle How To Test Guide for DMMs

Master your DMM!

### Application Notes

#### 1. Index to: Vehicle How To Test Guide

##### Meters

12. Tell how accurate your test meter is.
16. Set the digital meter for reading: open circuit, charging, or source voltage.
18. Place the meter probes to find open circuit, charging, or source voltage.
20. Set the meter for reading: the amount of source voltage available to any load on the vehicle.
22. Place the meter probes to find the amount of source voltage available to any load.
24. Set the meter for reading the voltage drop between the battery positive (+) terminal and the input pin to any load on the vehicle.
26. Place the probes to find the voltage drop between the battery positive (+) terminal and the input pin to any load on the vehicle.
28. Set the meter for reading the voltage drop between the battery negative (-) terminal and the output pin or case ground from any load.
30. Place the probes to find the voltage drop between the battery negative (-) terminal and the output pin or case ground from any load on the vehicle.
32. Calibrate an inductive pick up that plugs into a voltmeter.
34. Read a 100 millivolts-per-amp inductive pick up.
36. Make and use a 10x inductive multiplier.
38. Extend meter leads when testing a long distance from the battery.

##### Battery testing.

"How to": test for voltage drop:

40. Between the battery (+) post and clamp.
42. Between the battery (-) post and clamp.
44. Test the open circuit voltage of the battery.
46. Charge the battery.
48. Do a battery load test using a VAT 40 or 45.
50. Do a battery load test without a load tester.
52. & 97 Find the parasitic drain on any battery using an auxiliary battery.
54. Do a 3 - minute charge test on a battery
56. Between the battery (+) terminal and the starter motor armature lead.
58. Of a battery positive + pigtail wire.
60. Between the wire and the clamp material in a battery positive (+) pigtail wire.

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62. Between the battery negative (-) terminal and where the negative (-) cable attaches to the frame or the block.

64. Between the battery negative (-) cable conductor and its end connectors.

#### **Computer/module testing.**

66. Test for voltage drop of computer voltage feed wires that can be back-probed.

68. Test for voltage drop of computer ground wires that can be back-probed.

70. Load test computer voltage feed wires that cannot be back-probed.

72. Load test computer ground wires that cannot be back-probed.

#### **Continuity testing and ohmmeter usage.**

76. Test for continuity with an ohmmeter.

77. Be cautious when using an ohmmeter.

78. Tell if solid state components are affecting ohmmeter resistance readings.

74. How battery cable position, key on/off, and engine running affect ohmmeter readings.

#### **Current path, connections, and switch contact testing.**

79. Test for voltage drop of any length of wire.

80. Test for available voltage to a "hot at all times" connection.

82. Test for available voltage to a "hot in start or run" connection.

84. Load test a "hot at all times" connection.

86. Load test a "hot in start or run" connection.

88. Test any mechanical switch using an ohmmeter.

90. Test for voltage drop on any mechanical switch.

92. Test for voltage drop of a "suspect wire connector".

#### **Fuse, fusible link, and circuit breaker testing.**

94. Test for voltage drop between the battery positive (+) terminal and fuses.

96. Test for voltage drop across a fuse connection.

98. Use a blown fuse to direct your troubleshooting.

100. Find a short to ground, that resulted in a blown fuse, using a light bulb load.

83. Test fusible link wire.

102. Test a suspect circuit breaker.

#### **Generator (Alternator) testing.**

104. Test the generator charging voltage.

106. Test for voltage drop between the generator output and the battery positive (+) terminal.

108. Test connectors and connections of battery positive (+) pigtail wires.

110. Test for voltage drop between the battery negative (-) terminal and the generator housing.

112. Test for voltage drop between the generator housing and the block.

114. Test the generator for AC riding on DC.

116. Check for bad diodes in the generator using the meter's "diode test mode".

118. Test for shorted diodes in the generator using the "micro amp range" of the meter.

120. Verify a good generator.

121. Test the battery as a possible cause of multiple generator replacements.

#### **Relay testing.**

122. Troubleshoot a relay controlled circuit.

#### **Starter testing.**

128. Between the battery (+) terminal and the starter motor armature lead.

130. Of a starter mounted or remote mounted solenoid.

- 132. Between the battery negative (-) terminal and the starter motor housing.
- 134. Between the starter housing and the block.
- 136. Do a starter motor amperage draw test with a VAT 40 or 45.
- 138. Do a starter motor amperage draw test with a load tester that has a voltmeter and an amp meter, but no inductive pick up.
- 140. Do a starter motor amperage draw test with an inductive pick up plugged into a digital voltmeter.
- 126. Test the cranking voltage available to the starter motor.

#### **Shared current path testing.**

- 142. Between a truck bed and cab sheet metal.
- 144. Between the battery negative (-) terminal and the bulkhead ground strap.
- 146. Between the bulkhead ground strap and the block.
- 148. Between the battery negative (-) and a negative (-) pigtail attached to sheet or frame metal.
- 150. Of ground straps not directly connected to the battery negative (-) cable.
- 152. Across a suspect battery (-) pigtail cable or wire connector.

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- 154. Stop electrical switch pop "noise" in a radio.
- 158. Find the percent of alcohol in gasoline.
- 160. Check the acid content in coolant with a voltage drop test.
- 162. Test a rear window defogger using a test light.
- 162. Test a rear window defogger using a voltmeter.
- 163. Test thermistor temperature sensors.
- 167. Test permanent magnet generators.
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- 164. How DC motor in-rush current can affect voltage drop.
- 166. How DC "motor drag" can affect voltage drop.
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- 171. When the voltage drop is still excessive after repair, then what?

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- 174. Understanding what a voltmeter is reading.
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## **2. About the author**

**Joe Glassford, MA** taught at Triton College in River Grove, IL. Overall he has spent 29-years as a public school teacher and 15-years as an instructor for various companies including Allen Test Products, Delta Corporate Services and engineering personnel at the GM factory.

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