A guide for the professional vehicle technician as well as the interested DIY. Over 800 photos and illustrations show "How To" test: batteries, computer/modules and sensors, continuity, current paths, connections, switch contacts, fuses, fusible links, circuit breakers, generators (alternators), relays, starters, shared current paths (the vehicle base system), engine compression, cylinder leak, fuel, fuel pumps, fuel injectors, as well as miscellaneous tests from "How To" use a mechanic’s stethoscope to six different ways to check for a blown head gasket. Detailed information about the DVOM - digital-volt-ohmmeter and where and "How To" place the meter probes to do effective troubleshooting is included as well as amp draw testing with a DVOM and "How To" correctly read and use the inductive pick up.

This book was designed as an illustrated “hands on ready reference”. Its purpose is to save you time by giving you illustrated clear examples of the tests, while informing and helping you understand each test as you do them; and above all, to help you improve your electrical, electronic, as well as some mechanical troubleshooting skills. Each test can be quickly located and used at the vehicle with the “Quick Index” that begins on page 4.

The book clearly explains voltage drop and how to find its root cause. Whether you work on gasoline or diesel engines, you will find this book helpful in honing and improving your troubleshooting skills.

If you have just picked this book up and are trying to determine if it can help you troubleshoot, I encourage you to look over the index - pages 4 though 15. I know you will be glad you added this ready reference to your tool box.

Index to: The “Hands On” Vehicle Testing Reference:

Page
16 How to Set 2 different Meters to Read All of the Following: Open Circuit Voltage, Charging Voltage, or Source Voltage.
18 How to Place the Meter Probes to Find Open Circuit, Charging, or Source Voltage.
20 How to Set the Meter to Read Source Voltage Available to Any Load on the Vehicle.
22 How to Place The Probes to Find The Amount of Source Voltage Available to Any Load on the Vehicle.
24 How to Set the Meter for Reading Voltage Drop Between the Battery Positive (+) Terminal and the Input Pin to Any Load.
26 How to Place Probes Voltage Dropping Between the Battery Positive (+) Terminal and the Input Pin to Any Load.
28 How to Extend Meter Leads When Testing a Long Distance From the Battery.
30 About Meter Selection.
31 Understanding a Meter’s MIN MAX Mode.
32 How to Get the Most Out of the MIN/MAX Setting on Your Meter.
33 How to Test The Resistance of Your Voltmeter Tests Leads.
34 How Accurate is Your Test Meter?
35 A Word About the .5% Accurate Meter.
36 How to Test the Accuracy of a Digital Voltmeter.
37 Does Your Meter Need to be “Calibrated”? Yes.
38 About Checking One Meter’s Reading Against Another.
39 When and Why You Should Change Your Meter’s Battery.
40 When To Push the “Hold” Button on a Digital Voltmeter.
41 What Can a Meter’s “Bar Graph” Tell You?
42 About Wire Insulation Porosity and Voltage Drop.
43 About Voltage & Voltage Drop
45 How Accurate Should Test Results Be?
46 About meter input impedance.
48 Understanding What a Voltmeter is Reading.
49 About Voltage & Voltage Drop
51 What Should You Check First Before Doing Voltage Drop Testing?
52 What Can Cause a Voltage Drop?
53 About Wire Insulation Porosity and Voltage Drop.
55 About the Blade to Female Terminal Connection “Drag Test”
56 About Terminal Connection “Fretting”.
57 About Terminal Connection “Fretting”.
58 How Connections Affect Voltage Drop.
59 About the Blade to Female Terminal Connection “Drag Test”
60 How Heat Can Cause a Voltage Drop.
61 How DC “Motor Drag” Can Affect Voltage Drop.
62 Understanding “In-Rush” Current.
64 About Wire Insulation Porosity and Voltage Drop.
66 How to Do Voltage Drop Testing With the EZ 3 Step.
Understanding the Difference: “Voltage Available to the Input Pin/s of Any Load”, and “Voltage Drop in the Current Path”.

About Ignoring Polarity When Looking For Voltage Drop.

About Voltage Drop Testing Polarity.

About Probe Placement When Voltage Drop Testing on the Voltage Feed Side.

The Importance of Correct Probe Placement When Looking for Voltage Drop.

About Using a Grounding Source Other Than The Battery Negative (-) Terminal.

If You Think any Grounding Point Will Do, Read This.

“Ball Park” Voltage Drop Standards.

How to do “Base System Testing”.

When the Testing Voltage is Exactly the Same as the Source Voltage.

When the Voltage Drop is Still Excessive After Repair, Then What?

How to Set a Meter to Read Amps.

How to Set a Meter to Read mA (milliamps) and μA (micro amps).

About Measuring Battery Drop Testing Probe Polarity.

How and Where To Use an Inductive Pick-up.

How to Get an Accurate Reading with an Inductive Pick-Up.

How to Calibrate a “Rotating Knob” Inductive Pick-up Plugged Into a Voltmeter.

How to Calibrate a “Zero Button” Inductive Pick-Up Plugged into a Voltmeter.

About The Sensitivity of a Calibrated Meter.

How Accurate is the Current Clamp?

How to Read a 1 mV-per-amp Inductive Pick-up when a Voltmeter is Set to mV.

How to Read a 1 mV-per-amp Inductive Pick-up when a Voltmeter is set to Volts.

How to Read a 10mV/Amp Inductive Pick-up when a Voltmeter is set to mV.

How to Read a 10mV/Amp Inductive Pick-up When a Voltmeter is Set to Volts.

How to Read a 100mV/Amp Inductive Pick-up with a Voltmeter set to mV.

How to Read a 100mV/Amp Inductive Pick-up When a Voltmeter set to Volts.

About Inductive Pick-ups (Amp Clamps, Current Clamps, Current Probe).

About “Current Ramping”.

How to Adapt a Current Clamp (Amp Clamp, Current Probe) to an Oscilloscope.

How to Make and Use a 10X Inductive Multiplier.

How to Test the Open Circuit Voltage of the Battery.

How to Test the Voltage Drop Between the Battery (+) or (-) Post and the Clamp.

How To Find The Voltage Drop Between: The Battery (+) Terminal and a Positive (+) Pigtail Attached to a Fuse Box or BEC.

How to Test the Voltage Drop of a Battery (+) Pigtail Wire Between the Battery (+) Terminal and a BEC.

How to Test the Voltage Drop of a Battery Positive (+) Pigtail Wire Between the Battery Positive (+) Terminal and a Fuse Box.

How to Test the Voltage Drop Between the Wire and the Clamp Material in a Battery (+) Cable or (+) Pigtail Wire.

How to Test the Voltage Drop Between: The Battery Negative (-) Terminal and Where the Negative (-) Cable Connects.

How to Test the Voltage Drop Between The Battery Negative (-) Terminal and Where the Battery Negative (-) Cable Connects.

How to Test the Voltage Drop Between The Battery Negative (-) Terminal and the Bulkhead Ground Strap.

How to Test the Voltage Drop Between The Battery (-) Terminal and the Bulkhead Ground Strap and the Block.

How to Test the Voltage Drop Between the Battery (-) Terminal and Ground Straps not Directly Attached to the Negative Cable.

How to Test the Voltage Drop Between the Battery (-) Terminal and Where a Battery (-) Pigtail Attaches.

How to Test the Voltage Drop Between: The Battery (-) Terminal and the Output Pin or Case Ground.

How To Place The Probes To Find Voltage Drop Between: The Battery (-) Terminal and The Output Pin or Case Ground.

How to Test the Voltage Drop on the Ground Side of a Case Grounded Module or Component.

How to Do a Battery Load Test Using a VAT 40 or 45.

How to Do a Battery Load Test Without a Load Tester.

How to Do a 3-Minute Charge Test on a Battery.

How and Where To Hook Up An Auxiliary Battery to Avoid Losing Computer Memory.

How to Test For a Shorted Battery in a 2 Battery System.

About “Parasitic Drain”.

Drain Times Until Battery Goes Dead.

How to Find The Battery’s Parasitic Drain on a Battery Using a Meter Set to Read mA.

How To Find The Battery’s Parasitic Drain Using a 1Ω /10watt Resistor In Series With Battery Post and Cable.

How to use the Kent-Moore J-38758 Parasitic Draw Test Switch.

How to Find the Battery’s Parasitic Drain by Reading the Voltage Drop Across a Fuse.

Can You Use an Inductive Pick Up to Find Parasitic Load?

How to See if The Battery Has Low Resistance That Could Cause Generator/Alternator Diodes to Burn Out.

How To Hook Up Battery “Jumper Cables”.

How to Neutralize Battery Acid.

How to Charge the Battery.

How to Probed to Terminal Connection Can Cause a Voltage Drop That Can Cause Ring Gear Damage.

About the “Side Mount” Battery Cable Connections.

About Touching Removed Battery Cables Together to Clear Computer Memory.

About Scan Tool and Battery Charger Hooked Up at the Same Time.

About Scan Tools.

How to Test the Voltage Drop of Computer Voltage Feed Wires That Can Be Back-probed.

How to Test the Voltage Drop of Computer Ground Wires That Can Be Back-probed.

Computer Module & Sensor Testing

How to Load Test Computer Voltage Feed Wires That Cannot Be Back-probed.


Understanding the “Diode Test Mode” of a Digital Volt/Ohm/Amp Meter.

How to Test a Diode Removed From a Fuse Box or BEC (bussed electrical connector).

How to Test a Diode.

How to Test an LED (Light Emitting Diode) Using a Test Light.

How to Test an LED (Light Emitting Diode) with the Diode Test Mode of a Meter.

How to Test a NPN Transistor.
How to Test a PNP Transistor.
How to Test for a PCM (Power Train Control Module) Reset.
Things to Consider Before Re-flashing a Module.
Quick Test to See if the MAF (Mass Air Flow) Sensor is Your Problem.
How to Test for a Bad MAF (Mass Air Flow) Sensor with a Scan Tool.
How to Narrow Down Which Computer is Drawing an Excessive Amount of Current.
How to Use a “NOID” (Neon Organic Iodine Diode) Light.
How to Test the Resistance of a PM (Permanent Magnet) Generator.
How to Test a Knock Sensor.
Quick Test to See if a Hall Effect Switch is Working.
About Hall Effect Switches.
How to Test a Thermistor Temperature Sensor.
About Thermistor Temperature Sensors.
How to Test the Computer Sensor Reference Voltage.
How to Test for an Open Throttle Position Sensor With a Voltmeter.
How to Test a TPS (Throttle Position Sensor) with the Bar Graph on a Voltmeter.
How to Test a Throttle Position Sensor With an Oscilloscope.
How to Test a MAP (Manifold Absolute Pressure) Sensor With a Voltmeter and Vacuum Pump.
How to Measure Frequency of a MAP or Mass Air Flow Sensor.
How To Test a Carburetor MC (Mixture Control) Solenoid.
Understanding Frequency and Duty Cycle Measurements to Pulse Width.
How to Find a Dead Oxygen Sensor With a Voltmeter.
How to Test the Voltage Drop on the Ground side of an Oxygen Sensor Signal.
How to Check for a Shorted Computer Controlled Solenoid or Relay.
Quick Test for Oxygen Sensor Response Time to Lean and Rich Air/Fuel Ratio.
How to Bench Test an Oxygen Sensor with a Propane Torch
No Meter Test for an Oxygen Sensor Heater Problem.
How to Test the Oxygen Sensor With an Analog Lab Scope.
The Case for Load Testing All Wires.
Before You Jump Into Any Type of Diagnosis on a Computer Controlled Vehicle, Revisit The Fundamentals.
What to Do Before You Replace a Computer or an Electronic Control Module.
About Welding on a Computer Controlled Vehicle.
About Diodes.
About Light Emitting Diodes (LED).
About Transistors.
About Basic Logic Gates.
About Computer/Module Logic Control.
How to do a Basic IC Chip Test on a Discrete Component Board.
About Resistors.
About (PM) Permanent Magnet Generators.
About the TPS (Throttle Position Sensor).
About “Pulse-Width Modulation”.
Understanding a “Signature Waveform”.
About Hall Effect Switches.
How to Test a Thermistor Temperature Sensor.
About Thermistor Temperature Sensors.
How to Test the Computer Sensor Reference Voltage.
How to Test for an Open Throttle Position Sensor With a Voltmeter.
How to Test a TPS (Throttle Position Sensor) with the Bar Graph on a Voltmeter.
How to Test a Throttle Position Sensor With an Oscilloscope.
How to Test a MAP (Manifold Absolute Pressure) Sensor With a Voltmeter and Vacuum Pump.
How to Measure Frequency of a MAP or Mass Air Flow Sensor.
How To Test a Carburetor MC (Mixture Control) Solenoid.
Understanding Frequency and Duty Cycle Measurements to Pulse Width.
How to Find a Dead Oxygen Sensor With a Voltmeter.
How to Test the Voltage Drop on the Ground side of an Oxygen Sensor Signal.
How to Check for a Shorted Computer Controlled Solenoid or Relay.
Quick Test for Oxygen Sensor Response Time to Lean and Rich Air/Fuel Ratio.
How to Bench Test an Oxygen Sensor with a Propane Torch
No Meter Test for an Oxygen Sensor Heater Problem.
How to Test the Oxygen Sensor With an Analog Lab Scope.
The Case for Load Testing All Wires.
Before You Jump Into Any Type of Diagnosis on a Computer Controlled Vehicle, Revisit The Fundamentals.
What to Do Before You Replace a Computer or an Electronic Control Module.
About Welding on a Computer Controlled Vehicle.
About Diodes.
About Light Emitting Diodes (LED).
About Transistors.
About Basic Logic Gates.
About Computer/Module Logic Control.
How to do a Basic IC Chip Test on a Discrete Component Board.
About Resistors.
About (PM) Permanent Magnet Generators.
About the TPS (Throttle Position Sensor).
About “Pulse-Width Modulation”.
Understanding a “Signature Waveform”.
About “Sensors”.
About Oxygen Sensors.
How to Troubleshoot a “Short to Voltage” / “Short to Power”.  
How to Locate a Bad Fuel Injector Without Disassembly.  
How to Do a Bench Load Test on a Fuel Injector.  
How to Find a Dead Fuel Injector in a Port Fuel Injected System.  
How To Find a Dead Fuel Injector With a Mechanic’s Stethoscope.  
About the Digital Logic Pulser.  
How to do an Injector Flow Test with a Logic Pulser.  
How To Check the Resistance of Any Fuel Injector.  
How to Test for a “Shorted” Fuel Injector.  
How to Test for a Fuel Injector’s Waveform.  
About the “Signature Waveform”.  
About Fuel Injectors.  
How to Test the Fuel Pump on an EFI Vehicle with a Fuel Return System.  
How to Test Fuel Pump Pressure Through All Ranges of Engine Operation With a Scan Tool.  
How to Test the Amperage Draw of an Electric Fuel Pump.  
How to Tell the Difference Between a Fuel Pump Pressure or Volume Problem.  
Quick Test For Good Fuel Volume With a Scan Tool or Digital Volt Meter.  
How To Find the Percent of Alcohol in Gasoline.  
How to Find Out if There is Gasoline in a Diesel Fuel Tank.  
About fuses.  
How to Assume any Fuse is “Good” by Just Looking At it.  
How to Use a Blown Fuse to Direct Your Troubleshooting.  
How To Test Fusible Link Wire.  
How To Test a “In The Fuse Box” With a Voltmeter.  
How To Test a Fuse “In The Fuse Box” With a 12Volt Test Light.  
How to Test a Fuse “Removed From the Fuse Box” Using an Ohmmeter.  
How to Test a Fuse “Removed from the Fuse Box” Using a Self Powered Test Light.  
How to Test the Voltage Drop Across a AC/DC® or OES® Fuse Connection.  
How to Test the Voltage Drop Across an ATC®, ATO®, Maxi®, or Mini® Fuse Connection.  
How to Test a Suspect Circuit Breaker.  
About the Type 1 Auto Reset Circuit Breaker.  
About the Type 2 Modified Reset Circuit Breaker.  
About the Type 3 Manual Reset Thermal Non-cycling Circuit Breakers.  
About the Positive Temperature Coefficient (PTC) Circuit Breaker.  
How to Quickly Find Out If the Alternator is Charging.  
How to Test the Voltage Drop Between: the Generator Output and the Battery Positive (+) Pigtail Wire.  
How To Test The Voltage Drop of The Generator Ground.  
How to Test the Voltage Drop Between the Generator Housing and the Block.  
How to Test the Generator/Alternator Charging Voltage.  
How to Test an Alternator/Generator for Undercharge and Overcharge.  
How to Test a 3 Phase Generator (Alternator) for AC Riding on DC.  
How to Check for Bad Diodes in a Non-Computer-Controlled Generator (Alternator) Using the “Diode Test Mode”.  
How to Test for Shorted Diodes in the Generator (Alternator) Using The “Micro amp (µA) Range” of the Meter.  
How to Use a Compass to Help You Troubleshoot Generator Charging Problems.  
How to Use a Lab Scope to Measure Ripple Voltage.  
About Generator/Alternator Testing.  
How to Test the Generator Rotor for Current Draw.  
How to Polarize a Generator.  
How to Find a “False Air” Leak Using Propane.  
How to Verify That the Crankcase Can Hold a Vacuum on a Carbureted or Throttle Body Fuel Injected Vehicle.  
How to Verify That a Rough Idle on a Carbureted or Throttle Body Vehicle is Not Caused by “Blow By”.  
How To Deal With Engine “Knock”, “Ping”, “Detona457 How to Test for a Bad Power Brake Booster.  
Quick Test for Checking Excessive Timing Chain Slack on a Distributor Equipped Engine.  
About the Manometer (Slack Tube).  
About Troubleshooting Trailer Wiring.  
Help Backing a Trailer onto a Hitch.  
Open Circuit Voltage Testing Caution!  
About the Teslite® - Open Circuit Voltage Tester.  
Open Circuit Voltage Feed Side Testing with a Teslite®.  
Open Circuit Voltage Ground Side Testing with a Teslite®.  
Consider a Pyrometer-Thermometer.  
About the Infrared Thermometer.  
How to Use a Timing Light.  
How to Use a Timing Light to Find a Misfire.  
How To Test for a Bad Throw-Out Bearing.  
How to Check the Engine’s Intake Manifold Vacuum Looking for a Vacuum Leak.  
How to Do a “Dry and Wet” Compression Test.  
How to Do a “Running Compression” Test.  
About the “Relative Compression Test”.  
How to do a Cylinder Power Balance Test.  
How to Do a “Cylinder Leak Down” Test.  
Quick Test to See if a Water Pump is Working as Designed on Fluid in the Combustion Chamber.  
How to Check For a “Blown Head Gasket” with a Radiator Pressure Tester.  
How to Check For a “Blown Head Gasket” Using a Battery Powered CO Tester.  
How to Check For a “Blown Head Gasket” With an Air Compressor.  
How to Check For a “Blown Head Gasket” Looking for False Boiling.
How to Check For a “Blown Head Gasket” With a Gas Analyzer.
How to Check For a “Blown Head Gasket” With a Combustion Leak Tester.
How to Test for Coolant (water & antifreeze) in a Vehicle’s Oil.
How to Find a Leak in an Exhaust System Using Transmission.
How to Find a Leak in an Exhaust System Using a Shop Vacuum Blower.
How to Check for a Plugged Exhaust System Using a Removed O2 Sensor Hole.
How to Test Back Pressure to See if the Catalytic Converter is Plugged.
How to Tell if an Engine Hesitation is Loss of Spark or Loss of Fuel.
How to use the ST125 Spark Tester.
How to do a Cranking Coil Stress Test Without a ST-125 Spark Tester.
How to Test for Spark Plug Wire Carbon Tracking and a Leaking Spark Plug Boot.
How to Test For a Shorted Secondary Coil Winding.
How to Find a Leak in an Exhaust System Using a Shop Vacuum Blower.
How to Test the Primary Resistance Values of DIS Coils.
How to Test the Primary & Secondary Resistance Values of Oil Filled Coils.
How To Find a Misfiring Coil on a Coil-On-Plug “COP” System.
How to do a Comparative Resistance Test on a Distributor-less Ignition System.
How To Check For Radiator Overheat.
How and Where to Use a Mechanic’s Stethoscope.
How to Use a Compass to Help You Troubleshoot.
How to Diagnose Bad Ball Joints.
How to Diagnose a Bad Wheel Bearing.
How to Check for Acid Content In Coolant With a Voltage Drop Test.
How to Find Volts, Amps, Ohms, and Watts.
Understanding the term “Bar”.
How to Deal With that “Chirping Belt”.
How to Inspect an Engine Belt Using a Timing Light.
Observed Wire Sizes Used In Vehicles.
Temperature Conversion Chart – Centigrade to Fahrenheit / Fahrenheit to Centigrade.
Where to Start When Dealing with a No Start due to a “No Crank”.
Where to Start When Dealing with a No Start but Engine does Crank.
Understanding the Relay Coil Winding “Control” Circuit and the “Load” Circuit.
How to Test the Voltage Drop of a Relay Contact.
How to Troubleshoot a Relay Controlled Circuit.
How To Test a Relay Coil Winding For Engineered Resistance Value.
How to Bench Test for a Relay’s Contact Resistance.
How to “Hot Wire” a Relay Coil For the “Click”.
How to Test a Relay With a Diode Across The Coil Winding.
About Relays with a Surge Suppression Diode.
How to Test a Relay With a Resistor Across The Coil Winding.
How to Troubleshoot a Non-Computer Controlled Relay Circuit.
How to Load Test a Relay Coil Winding.
More About Relays.
About “Starter Solenoids” and “Continuous Duty Solenoids”.
How to Test the Cranking Voltage Available to the Starter Motor.
How to Find the Actual Voltage Drop Between: the Battery (+) Terminal and the Starter Motor Armature Lead.
How to Test the Voltage Drop of the Starter Motor Ground.
How to Test the Voltage Drop Between the Starter Housing and the Block.
How to Test the Voltage Drop of a Starter Mounted or Remote Mounted Solenoid.
Quick Test for Cranking, Charging Voltage Looking for Excessive Starter Amp Draw With No Inductive Pick-Up Using MIN/MAX.
How to do a Starter Motor Amperage Draw Test With an Inductive Pick Up Plugged Into a Digital Voltmeter.
How to do a Starter Motor Amp Draw Test with a VAT 40 or 45.
How to do a Starter Motor Amp Draw Test With a Load Tester That has a Voltmeter and Amp Meter, but No Inductive Pick Up.
Understanding “Starter Motor Heat Soak” Starts Cold, Once Hot - No Start.
A Suggestion for the Color Blind Using Wiring Diagrams.
Smokes Bad Only When First Started Cold, Once Running, No More Smoke?
How to Deal with a Rusted or Seized, Brake Bleeder, Tapered Plug, Nut, etc.
How to Remove a Rusted Disc Brake Drum or Rotor.
In The Event Your Cell Phone Goes in The Hot Tub, or Your Scan Tool or Voltmeter Get Soaked
About Parts Removal and Replacement.
To Use a Torque Stick or Not.
Sources for Useful Information on Vehicle Understanding and Testing.
The author, Joe Glassford’s, experience.

Available at: www.Vestest.com The Vehicle Voltage Drop Website