



VET 100 Circuit Analysis Tool

Operating Instructions

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1 Introduction

The VET 100 Circuit Analysis Tool is used in conjunction with an on-board diagnostic (OBD) scan tool, such as the Bosch ADS 625, to identify faulty engine sensors, wiring harnesses, and/or issues with the engine control module (ECM).

2 Safety Warnings

Explanation of Safety Signal Words

The safety signal word designates the degree or level of hazard seriousness.



DANGER: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in equipment damage.



DANGER: To prevent serious personal injury or death,



- ▶ When an engine is operating, keep the service area well ventilated or attach a building exhaust removal system to the engine exhaust system. This will prevent the buildup and inhalation of carbon monoxide, an odorless, poisonous gas that can lead to serious personal injury or death.



WARNING: To prevent personal injury and/or equipment damage,



- ▶ Study, understand, and follow all safety precautions and operating instructions before using the VET 100 Circuit Analysis Tool. If the operator cannot read the instructions, safety precautions and operating instructions must be read and discussed in the operator's native language.

- ▶ Do not make any ground or jumper connections between the sensor wires and any other electrical circuits on the vehicle unless directed by the vehicle's service manual.



- ▶ Before servicing, ensure that (1) the vehicle is in park (automatic transmission) or neutral (manual transmission), (2) the emergency brake is engaged, and (3) the wheels are chocked.

- ▶ After servicing the vehicle, reset the code memory using the OBD scan tool.



- ▶ Keep all body parts clear of the drive belts, high voltage plug wires, and hot surfaces located underneath the hood of the vehicle.



- ▶ Wear eye protection that meets ANSI Z87.1, CE EN166, AS/NZS 1337, and OSHA standards.
 - ▶ Wear personal protective equipment that meets ANSI/ISEA and OSHA standards.
 - ▶ Use the VET 100 Circuit Analysis Tool only on vehicles with a computerized engine control system.
 - ▶ Do not use the VET 100 Circuit Analysis Tool for anything other than its intended purpose.
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- ▶ No alteration shall be made to this tool.
 - ▶ Inspect the condition of the VET 100 Circuit Analysis Tool before each use; do not use if damaged, altered, or in poor condition.
 - ▶ Replace a damaged VET 100 Circuit Analysis Tool using only the replacement components listed in Section 3 of the operating instructions.
 - ▶ Refer to the service manual for the vehicle being serviced. Adhere to all diagnostic procedures and precautions. Failure to do so could result in personal injury or otherwise unneeded repairs.
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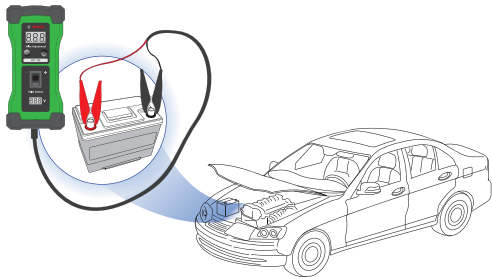
3 Tool Components



Item No.	Description	Part No. / Kit No.
1	VET 100	3920
2	1.83m/6ft Battery Cable	3920-01
3	1m/3.3ft Cable for Probe Tip	3920-02
4	2mm Flat Terminal	3920-02
5	2mm Probe Tip	3920-02
6	Pin Tip Probe	3920-02

4 Testing Faulty Sensors

1. Turn off the vehicle's ignition before disconnecting any of the sensors from the engine.
 2. Connect the VET 100 Circuit Analysis Tool to the vehicle's battery using the positive and negative clamps. See Figure 1. NOTE: The voltage of the battery is displayed at the bottom of the VET 100 Circuit Analysis Tool.
 3. Refer to the vehicle's electrical wiring diagrams to determine which sensor signal wire to probe with voltage. See vehicle's service manual for the correct operating voltage of the sensor being tested.
 4. Set the voltage on the VET 100 Circuit Analysis Tool to the correct voltage for the sensor being tested using the ▼ and ▲ arrows. NOTE: The voltage range for the VET 100 Circuit Analysis Tool is 0.5 V to 7 V, and can be adjusted in 0.5 V increments.
 5. Apply voltage to the correct sensor signal wire by touching the positive (red) test probe and pushing the power switch on the VET 100 Circuit Analysis Tool.
 6. Read the OBD scan tool (not included with VET 100 Circuit Analysis Tool) to see if the reading displays the same voltage that was applied by the VET 100 Circuit Analysis Tool. If the voltage reading is lower than what was applied, the wiring harness or ECM has a potential voltage loss and may need repair or replacement. If the voltage is the same as what was applied, the sensor is faulty and will need to be replaced. NOTE: The voltage signal may translate to a pressure or temperature reading.
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**Figure 1**

5 Testing Faulty Sensor Wiring or ECM

1. If continuing from Section 4, “Testing Faulty Sensors,” reconnect all sensors to the engine before turning on the vehicle’s ignition.
 2. Connect the VET 100 Circuit Analysis Tool to the vehicle’s battery using the positive and negative clamps. See Figure 1. NOTE: The voltage of the battery is displayed at the bottom of the VET 100 Circuit Analysis Tool.
 3. Refer to the vehicle’s electrical wiring diagrams to determine which sensor signal wire to probe with voltage. See vehicle’s service manual for the correct operating voltage of the sensor signal wire being tested.
 4. Set the voltage on the VET 100 Circuit Analysis Tool to the correct voltage for the sensor signal wire being tested using the ▼ and ▲ arrows. NOTE: The voltage range for the VET 100 Circuit Analysis Tool is 0.5 V to 7 V, and can be adjusted in 0.5 V increments.
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5. Apply voltage to the ECM pin of the correct sensor signal wire by touching the positive (red) test probe directly to the pin and pushing the power switch on the VET 100 Circuit Analysis Tool.
6. Read the OBD scan tool (not included with VET 100 Circuit Analysis Tool) to see if the reading displays the same voltage that was applied by the VET 100 Circuit Analysis Tool. If the voltage reading matches to what was applied, the wiring harness is faulty; however, if the voltage reading is lower than what was applied, the ECM is not processing the voltage signal properly and may need to be replaced. **NOTE:** The voltage signal may translate to a pressure or temperature reading.

6 Circuit Analysis Sensor Theory

Computer Controlled Sensors:

Sensors are designed to monitor various conditions that could affect a vehicle's performance. These signals are used by the ECM to control the fuel mixture, ignition timing, idle speed, exhaust gas recirculation (EGR) valve, purge valve, and other emission functions. A problem with any of the ECM's sensors can result in a range of drivability issues including, but not limited to: hard starting, poor idle, intermittent fault, stalling, excessive idle speed, excessive tailpipe emissions, or improper shifting. The VET 100 Circuit Analysis Tool can input voltage to both the sensors and the ECM, allowing the user to determine whether the sensors are working properly and/or if the ECM is properly receiving the sensor signal.

Computer controlled sensors fall into one of two categories. See next page.

1. Variable Resistance Sensors

These types of sensors are also referred to as “**2-Wire**” sensors. They usually contain two wires—a voltage supply wire and a signal return wire—that connect to the ECM. These sensors include: coolant temperature sensors, manifold air temperature sensors, and outside air temperature sensors. See Figure 2.

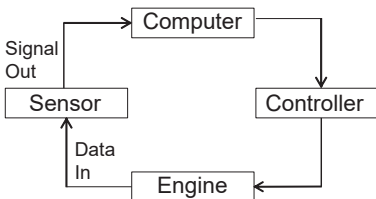


Figure 2

2. Variable Voltage Sensors

These types of sensors are also referred to as “**3-Wire**” sensors. They usually contain three wires—a voltage supply wire, a signal return wire, and a ground wire—that connect to the ECM. These sensors include: throttle position sensors, manifold absolute pressure (MAP) sensor, barometric pressure sensor, and some mass airflow sensors. See Figure 3.

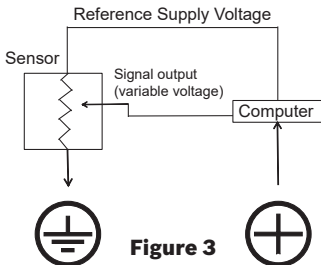


Figure 3

7 Technical Tips

- ▶ The Circuit Analysis Tool's maximum voltage of 7 V is designed to safely accommodate the operating range of most ECMs.
- ▶ Use Ohm's Law ($R = V/I$), where the resistance (R) in ohms is equal to the voltage (V) in volts divided by the current (I) in amps, to calculate the voltage resistance. If the back-end voltage received by the ECM is lower than the front-end voltage emitted from the Circuit Analysis Tool, there is a voltage drop. This voltage drop indicates corrosion of either the sensor or wiring harness, causing less voltage to reach the ECM than normal.
- ▶ Consult a wiring diagram to confirm correct voltage at sensors.
- ▶ Connect the Circuit Analysis Tool to 12 or 24 V battery systems only. A flashing red light will appear on the user interface if battery voltage is low.
- ▶ Use this tool along with an OBD scan tool to identify the cause of a fault code and to fix issues that generate fault codes on vehicle components including, but not limited to: accelerator pedal voltage up to 5 V, EGR signal voltage up to 5 V, diesel regulator valve, throttle bodies, camshaft sensors, crankshaft sensors, mass air flow (MAF) sensors, MAP sensors, parking sensors, temperature sensors, oil pressure sensors, and transducer-based components.