Sensor Voltage Probe
User Manual

1. Introduction

The Sensor Voltage Probe can perform four functions namely:
- Simulation of 0.5V ~ 7.0V (3A output).
- Simulation of 0.2V ~ 7.0V (150mA or 0.15A output).
- Volt measurement up to 70V DC with polarity check.
- Resistance (Ω) measurement up to 5KΩ.

The simulated voltages output is mainly used to emulate the signals generated by different types of sensors in the vehicle.

It can be used in all automobiles (12V/24V systems) with ECM/ECU either independently, or very often it is used together with a diagnostic scanner to distinguish faults whether that lies in the sensor itself or related to the connection (connector or wires) during troubleshooting phase.

From the reading of Error codes on the diagnostic scanner, faults are recognized, as the sensors data which is imitated at the same time by this probe were observed.

Through the simulation of the sensor output signals, the ECM / ECU response as well as its efficiency can be estimated.

2. Typical Applications

1. Simulates vehicle sensors output signals of Crankshaft Position (CKP) sensor, Camshaft Position (CMP) sensor, ABS sensor, Wheel Speed (WSS) sensor, Coolant Temperature sensor, Lambda (O2) sensor, MAF, MAP, etc.
2. Imitates sensor's signals at different working modes of the engine. This is done by simulating the signals with this VR1 Probe without removing the sensor unit. During simulation process, the ECU's activities are monitored on the Live Data screen displayed by the Diagnostic Scanner.

In this way, we can determine the real cause of the fault whether it lies in the cables connected to the ECU or at the sensor itself before any replacement of parts take place.

3. Safety Protection

The Sensor Voltage Probe has a variety of internal safe guards which are used to protect itself as well as any other electrical components within the vehicle's computer structure.

When using the probe there is no risk of damage to the components in the vehicle or any other equipment that may be used as well. The entire product is tested to ensure that it is secured against any excess voltage.

It is protected from large voltage transients which is normally met in modern automotive and truck vehicles, as well as reverse polarity.

The Sensor Voltage Probe has an internal circuit which will limit the possibility to damage any components which are in the engine's computer system.

The Sensor Voltage Probe can be used for the following:
1. Adjust the input from practically all engine sensors, which includes variable voltages and voltage generating. This creates a faster way to find the sensors which are faulty or at risk of being damaged.
2. Adjust various sensor inputs to help specify a variety of engine operating modes, checking the computer's output reaction. As a result, this will recognise any problems within the computer as well as the output actuators,

solenoids and other control devices.

The Sensor Voltage Probe is able to be used on any aged or imported vehicle with a computerised engine control system. Scan tools which are plugged into the vehicle's internal computer are used to recognise the fault codes and read data stream where needed, however, they will only read out the data and not put any information into the system.

The Sensor Voltage Probe is more beneficial than standard scan tools as it will adjust various sensor inputs, allowing you to verify if the sensor's signal is getting through to the computer or not. As a result, the computer should be reading the correct data and making the appropriate responses.

4. Basic Sensory Theory

Computerised Engine Controls Sensors are designed to monitor various conditions which could affect a vehicles performance. These signals which come from the various sensors are used by a computer to allow the control of the fuel mixture, ignition timing, idle speed, operation of the EGR valve, canister purge control valve and other emission functions, the lockup of the torque converter in the automatic transmission and the shifting of the gears in late model automatic vehicles.

A problem in any of the system's important sensors can result in a range of drive ability issues. These issues can include; hard starting, poor idle, intermittent fault, stalling, excessive idle speed, excessive tailpipe emissions, improper shifting or torque converter build-up.

The Sensor Voltage Probe allows you to input voltage to both the sensor and directly to the computer. This should allow you to determine whether the sensor is working properly or if the computer is receiving the sensor signal.

Types of Sensor:
There are a variety of different sensors within an engine which are categorised into the following categories;

1. Variable Resistance Sensors
These types of sensors are often called '2-WIRE' sensors. This is because the sensors are usually connected by two wires to the computer; a voltage supply wire and a signal return wire.

2. Adjust various sensor inputs to help specify a
These sensors include; coolant temperature (CTS) sensors, manifold air temperature (MAT) sensors and outside air temperature (OAT) sensors.
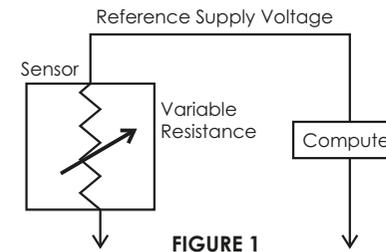

FIGURE 1

2. Variable Voltage Sensors
These types of sensors are often called '3-WIRE' sensors. This is because the sensors use 3 wires to connect to a computer; a voltage supply wire (normally 3 volts), a signal return wire and a ground wire.

These sensors include; throttle position (TPS) sensors, manifold absolute pressure (MAP) sensors, barometric pressure (BARO) sensors and some mass airflow (MAF) sensors.
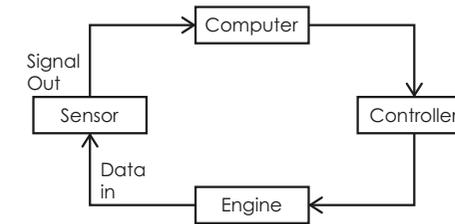

FIGURE 2

3. An oxygen sensor will also produce a variable voltage signal, however; this is different from other sensors in this category because an oxygen sensor will generate its own voltage (similar to a battery).

The voltage which is created by the sensor will depend on the amount of oxygen within the exhaust. This means that the lower the oxygen level within the exhaust, the higher the output voltage will be.

The sensor's output voltage will range from around 0.1V (lean) to 1.0V (rich). The sensor might have between one to three wires connecting it to the computer depending on whether it is heated or not.
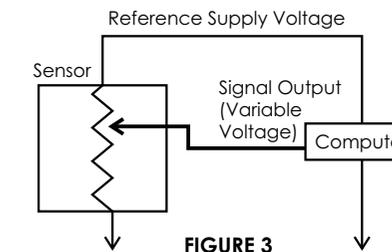

FIGURE 3

How to operate Sensor Voltage Probe:

Voltage Output Simulation: 0.5V ~ 7.0V (3A)

1. Firstly, make sure that the vehicle's ignition is turned off and all the sensors are disconnected from the wiring connection. Make sure you refer to the Vehicle Service Manual's electrical wiring diagram to ensure that you have the correct sensor voltages.
2. To operate the Sensor Voltage Probe, connect the positive and negative clamps to the terminals on either 12V or 24V vehicle battery. The LCD display will light up. If they were accidentally inversely connected, Sensor Voltage probe will not power up. When this happens, re-clamp them again with the correct polarity.
3. As soon as it is powered up, the wake-up screen will appear as below (Fig. 4).

FIG. 4

4. A few seconds later after it had done its self-test, the display screen will change to as shown in Fig.5 below, it will always start with 0.5V ~ 7.0V simulation (Power feed up to 3A max. output).

FIG. 5

When this test mode is selected, pressing key will increase the initial starting voltage of 0.5V by a step of 0.1V until to the desired tip output voltage that need to simulate.
(For example: 5.8V as shown in Fig. 6 below)

FIG. 6

Then press OK key will continue with the display as shown below (Fig. 7).

FIG. 7

Here, in the Power Switch mode display it allows the selection of voltage power feed out in Normal (Press and hold OK key, the output power will keep ON and once let go, it turns OFF) or Lock (Press OK key once, the output power turns ON. Press OK key again, it turns OFF).

5. Once Normal mode is selected as an example given below (Fig. 8), press and hold OK key will proceed to voltage output with display as shown in Fig. 9 below. Once the key is let go, the voltage output power will turn OFF as shown in Fig. 10 below:
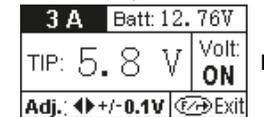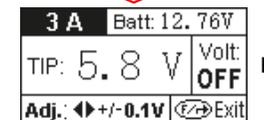

FIG. 8

FIG. 9

FIG. 10

6. If needed to increase or decrease the output voltage, pressing or key will increase or decrease the voltage by a step of 0.1V until to the desired set tip voltage output that need to simulate while it is still in this switch mode.
7. In event that there is a scanner scope connected you should be able to see the reading on your scope, which should display the same voltage that has been activated. If the voltage is lower than selected then you have a potential voltage loss.

TAKE NOTE:
Once you have set the required voltage, (before connecting to the circuit please ensure you check the voltage of that circuit by using the

vehicles wiring diagram) press or hold the [OK] *key to activate the voltage output to the tip. The output will be positive (+) voltage only.* **CAUTION:** *You are responsible for the voltage that you have set.*

Voltage Measurement and Polarity Check

1. To access into other Functions, pressing F/➜ key while the screen is in 0.5V ~ 7.0V simulation display (Fig. 11 below) it will get into the Other Function menus as seen in Fig. 12 below

FIG. 11   **FIG. 12**

2. Since the [VOLT METER] is highlighted (Fig. 12), pressing OK key will enter into Volts Test mode (Fig. 13 below) which tests up to 70V DC maximum.
3. It checks the polarity of the circuit at the same time when conducting the test. **Red** LED will light up and the beeper will sound for power (+) positive supply detected. For negative (-) or ground supply, the **Green** LED will light up and the beeper will also sound when detected (see examples below).
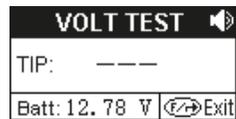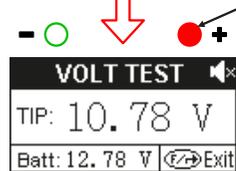
Green LED on standby   Red LED on standby

FIG. 13

Red LED lights up on positive (+) polarity

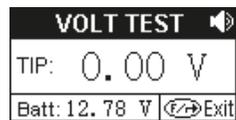**FIG. 14**

Green LED lights up on positive (+) polarity

FIG. 15

By default, the beeper is always ON. If you need to switch it OFF, just press OK key and key together at once and you will notice that

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the speaker icon will change to which stops the sound.

To switch ON the beeper back again, repeat the same procedure.

Note: The beeper will switch ON again every time VR1 probe is powered OFF and then ON again.

4. Performing Volts measurement on the car. Since Sensor Voltage probe is getting power source from the same battery in the car during Volt tests, you can just perform the test using its Red probe (+) only without having to connect the Black probe (-) to its axillary ground (Fig. 16) for volts readout as it is sharing the same common ground with other electrical components.

Red probe (+)

To battery positive (+) terminal

To battery positive (+) terminal

Axillary Ground (-)

FIG. 16

5. Results Display
While in Volt Test mode, you will notice that the Battery voltage (power source) is shown in the display (example: Fig. 17 below). This is very helpful because if tests perform on circuits sharing the same common ground, it can tell whether resistance is present in the circuits when compared with its Tip volts readout (example: Fig. 18 below.)
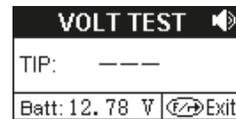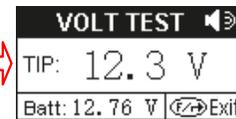
FIG. 17   **FIG. 18**

If the difference in volts were great when compared then it warrants a check on that particular circuit to confirm the problem.

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6. For Volts measurement on circuits that do not shared the common ground (-) i.e. from different power source then the Black probe (-) needs to be attached to the probe's axillary ground (see Fig. 16 above) to work with the Red probe (+) in order to get the volts readout.

7. To exit, just press F/➜ key once will go back to Function Menu (Fig. 12). Pressing this key twice (2x) will exit back to the initial screen: (see Fig. 5 above).

Resistance (OHM) Measurement

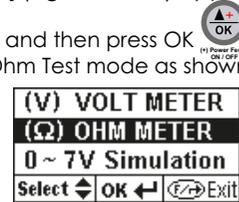1. From the Functions Menu display, select [OHM METER] (Fig. 19 below) by pressing key once and then press OK key to enter into the Ohm Test mode as shown in Fig. 20 below.

FIG. 19

FIG. 20

FIG. 21

2. Connect the Black (-) probe to Sensor Voltage Probe axillary ground wire (see Fig. 16 above) for use together with the Red Probe during the test.
3. Proceed to test resistance (Ohm) on components with the Red (+) probe and Black (-) probe (see example: Fig. 21 above). It can test up to 5,000 Ohms (5K) maximum.

To exit, just press F/➜ key once will go back to Function Menu (Fig. 19). Pressing this key twice (2x) will exit back to the initial screen: (see Fig. 5 above).

0 ~ 7.0V (150 mA Output) Simulation

1. This function can be accessed from the Function menu (Fig. 22) by pressing key to highlight [0V ~7.0V Simulation] and then

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press OK key.

FIG. 22

2. The initial simulating volt output will start from 0.2V and with every pressing of key which will increase it by a step of 0.1V until the desired simulation volts output as seen in example: Fig. 24 below.
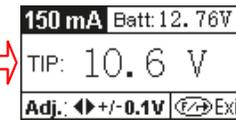
FIG. 23   **FIG. 24**

3. When the set simulating voltage is confirmed, pressing OK key will change the LCD screen will display the selection of Power Switch mode (Fig. 25 as below):

FIG. 25

4. Same as previously described on page 7, select the Switch mode preferred and press key to proceed the voltage simulation output as examples shown below:
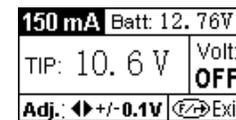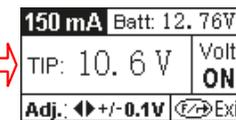
FIG. 26   **FIG. 27**

5. If needed to increase or decrease the output voltage, pressing or key will increase or decrease the voltage by a step of 0.1V until to the desired set tip voltage output that need to simulate while it is still in this switch mode.

TAKE NOTE:
Once you have set the required voltage, (before connecting to the circuit please ensure you check the voltage of that circuit by using the vehicles wiring diagram) pressing or hold key will activate the voltage output to the tip. The output will be positive (+) voltage only.

CAUTION: *You are responsible for the voltage that you have set.*

6. If you have your scanner scope connected you should be able to see the reading on your scope, which should display the same voltage that has been activated. If the voltage is lower than selected then you have a potential voltage loss.

7. To exit, just press F/➜ key once will go back to Function Menu (Fig. 22). Pressing this key twice (2x) will exit back to the initial screen: (see Fig. 5 above).

Technical Specifications:

Operating Voltage.........................9V to 30V max
Display…………………LCD Screen (128 x 64 pixels)
Voltage measurement …….………Up to 70V DC
Accuracy…………………….............…+/- 2% + 1 digit
Polarity indication…….(+) **Red** LED, (-) **Green** LED
Ohm measurement……….Up to 5,000 Ohms (5K)
Accuracy……………………………............+/- 5%

Simulated Voltages:

0.5Volt ~ 7.0 Volt Output Range:
Max. Output Current……………………...3.0 Amps
Adjustment Resolution…………………………..0.1V
Accuracy…….............……………+/- 5% reading + 1

0.2 Volt ~ 7.0 Volt Output Range:

Max. Output Current………...150mA (0.15 Amps)
Adjustment Resolution………………………....... 0.1V
Accuracy……..……………………. +/- 5% reading +1

Built-in Safety features:

Short circuit Protection…………………………….....
……………….....Self-Recovery - 3.0 Amps PTC fuse
Inverse Polarity Protection………………………….....
.................................No power on reverse polarity
Working Temperature…...0ºC (32F) ~ 50ºC (122F)
Working Humidity…………………….......10% ~ 80 %
Approvals……………………………….......CE, ROHS