

Voltmeters:

Key on - engine off — 12 volts

Engine running without accessories or lights on — 13.5 - 14.5 volts

Engine running with accessories and lights on — 13.0 - 14.0 volts

} Approximately, depending on regulator system and engine speed.

Lower readings mean a weak battery or malfunction in the voltage regulator.

Wiring:

We recommend 16-gauge wire except for the final ground wire which should be 14-gauge.

Wire the gauges in series from a (+) accessory source which is not already overloaded with other accessories such as electric fans and air conditioning. The ground is also run in series including the light socket ground. The final 14-gauge wire needs to be connected to a good ground such as the engine block ground strap or the battery ground itself.

All wiring should be of high quality stranded wire with good insulation. Take care to avoid hot engine components when running engine compartment wire. Use grommets when running wire through the fire wall. If your gauge's pointer moves noticeably when the lights, fans, or air conditioner comes on, you are wired into an overloaded circuit either on the hot or ground side.

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Installation and Troubleshooting Guide

General Information:

These tips are intended to help you with the installation of the instruments listed in this manual. Again, please check the instructions provided within the packaged instrument for more details. The troubleshooting guide highlights solutions to some commonly asked questions.

To Begin, go to #**1**, below

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Temperature/Pressure Senders:

Do not use Teflon tape on the threads. It will interfere with the sender ground. Sender threads are tapered pipe threads and are self-sealing.

Temperature senders are most accurate when installed in the intake manifold. It is also acceptable to use the OEM engine manufacturing specified location.

Do not use tee adapters, reducing, or angle adapters for temperature senders since the sender tip or bulb will not be immersed in the water flow.

Fuel Senders:

Gauge manufacturers use different ohm ranges when building their fuel senders. The following are typical:

	<u>EMPTY</u>	<u>FULL</u>
VDO Lever Arm	10 ohm	180 ohm (included in instrument kit)
Stewart Warner	240 ohm	33 ohm
G.M. from '65	0 ohm	90 ohm
G.M. pre '65	0 ohm	30 ohm
Ford pre '90	73 ohm	10 ohm
VDO Tube Type	60-90 ohm	0 ohm

VDO makes compatible fuel gauges in some styles. Check the catalog for the style and part number which matches your sender. Remember the sender and gauge ohm range must match.

[text continues at #**2**] ➔

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Gauge Testing:

If a gauge is suspected to be faulty, the following tests can be performed on the VDO gauge and sender:

- 1) Turn the key on:
 - Pressure Gauge - pointer to "0"
 - Fuel Gauge - pointer to amount of fuel in tank
 - Temperature Gauge - pointer to temperature of engine water
- 2) With the key on, pull sender wire off the sender:
 - Fuel & Pressure Gauge - pointer will go to maximum right hand position
 - Temperature Gauge - pointer will go to maximum left hand position
- 3) With the key on, ground the sender wire to the engine chassis:
 - Fuel & Pressure Gauge - pointer will go to maximum left hand position
 - Temperature Gauge - pointer will go to maximum right hand position
- 4) All VDO electric gauge pointers peg full left hand position with the power off.

Sender Testing:

Senders can be tested with an ohm meter that measures from 10 to 2,000 ohms. Connect the positive lead from the tester to the sender terminal and the negative lead to a good ground. The following readings will occur if the sender is operating properly:

Temperature Sender:	Cold	- 700 ohms
	Hot (250 degrees)	- 22 ohms
Pressure Sender:	Engine off	- 10 ohms
	Engine running	40 psi = 105 ohms; 60 psi = 152 ohms.
Fuel Sender*:	Tank empty	- 10 ohms; full - 180 ohms

*If the fuel gauge reads backwards, but accurate, the float arm has been installed from left to right into the pivot. Reinstall from right to left. Using a VDO 10-180 ohm gauge with a 240-33 ohm sender will also give a backward reading.

Fuel Sender Testing:

As explained before, there are many different ohm ranges in sending units. Therefore, with an ohm meter you can check to ascertain if unit is working properly.

VDO No. 226 001: E = 10 ohms; F = 180 ohms

An empty tank will read 10 ohms. As you add gas, the ohm reading will go up until tank is full and reads 180 ohms.

G.M.: Both 0-30 and 0-90. Empty tank will read "0" ohms. As you fill tank, reading will go up.

Stewart Warner & Ford: Empty tank will read high ohm range (S.W.-240; Ford-73) and go **DOWN** as you fill the tank.

Wiring of Sender to Speedo:

Red on sender to term #2 on speedo
Black on sender to term #3 and ground
Off-white on sender to term #6 and #8
Switched 12v to term #4

Testing Hall Effect Sender:

Turn ignition key "ON". Put red lead of voltmeter to term #2 and black lead to term #3. You should have between 5-12volts dc.
With the key "ON", leave the black lead on term #3 and put the red lead on term #8. Remove the sender from the transmission. Rotate the square drive shaft in the sender very slowly with your fingers. You should see the voltmeter pulse from 0-4 volts dc. (0-4-0-4-0)
If it pulses, the sender is working properly. If the voltmeter stays a constant 5 volts dc, the sender is defective.

Programming the Speedo:

Mark a measured mile with another car by spraying a paint line on the side of the road, drive 1 mile and spray another paint line on the side of the road.
Hold button "in" on front of speedo. Start the vehicle. Using the button, scroll to "AUtOCl". Wait a few seconds and the word "bUtton" will appear on the display. Drive to your first mile marker at this point. Your speedo will not work in the calibration mode. At your first mile marker, press the button on the front of the speedo. The word "StArT" will appear. You start driving. At your next mile marker, press the button. You are finished.