Troubleshooting & Operation of Fuel Gauge Circuit
Pre 1965 Chevrolets
With 30 ohm Sending Unit
By Rod Schein and Dave Folsom

Here are the diagrams for explaining the Operation and Troubleshooting of the Fuel Gauge Circuit.

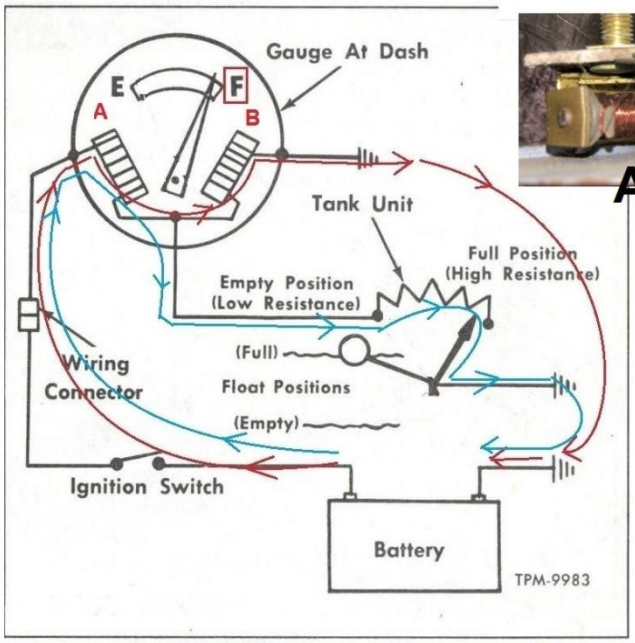
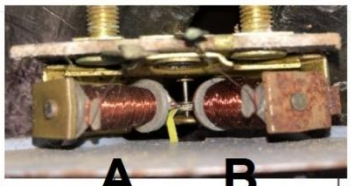
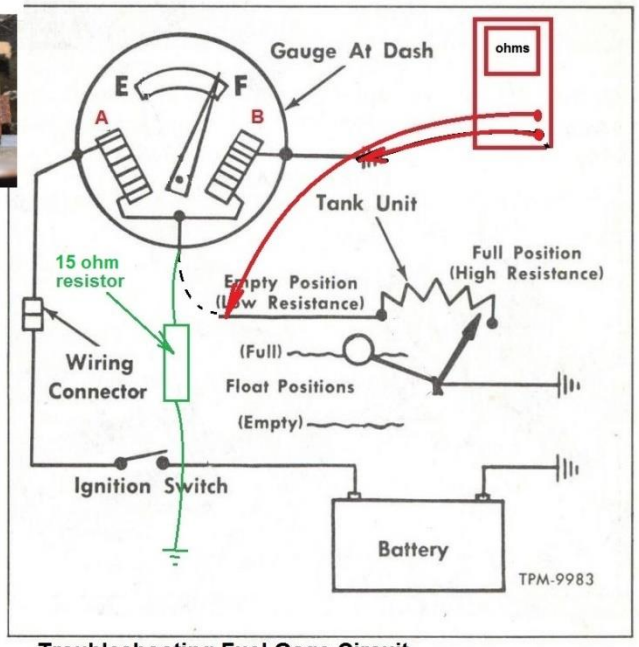


Figure 1—Fuel Gauge Schematic Wiring Diagram



Gauge

Photo by Dave Folsom



Troubleshooting Fuel Gage Circuit

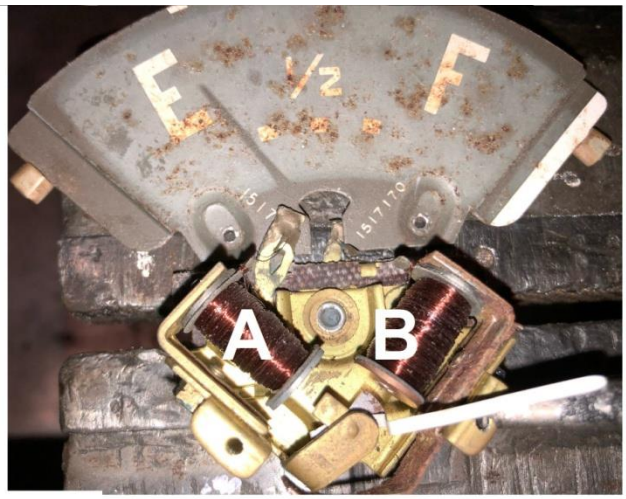
- The fuel gage has coil A that moves the needle toward Empty and coil B that moves the needle toward Full
- The sender unit is a variable resistor that is 30 ohms when the tank is full and zero ohms when the tank is empty. When the tank is half empty, the sender resistance is15 ohms
- When tank is full, the 30ohms sender keeps the blue current low compared to the red current. This cause the B coil to move the needle to the F position
- When the tank is empty, the zero ohms sender maximizes the blue current and grounds out the B coil. This causes the A coil to move the needle to the E position
- When the tank is between full and empty, the sender resistance between zero and 30 ohms allows both coils A and B to be energized causing the needle to move from F to E as the fuel level goes down

Troubleshooting

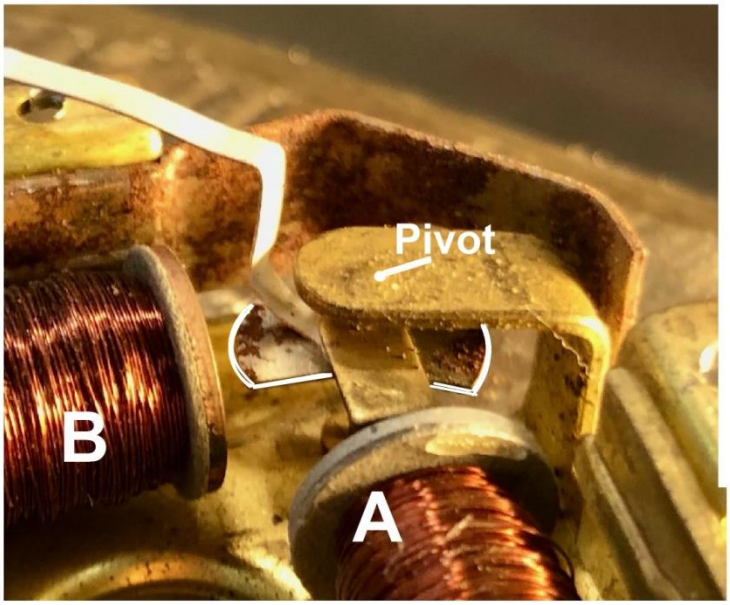
- To test the sender unit, disconnect the sender wire from back of the fuel gauge and connect an ohmmeter, one lead to sender wire and the other lead to ground (see diagram) If you have the sender out of the tank, you can move the float up and down and the ohmmeter should read between 0 to 30 ohms, following the float motion, evenly. If the sender resistor is shorted to ground, you will get 0 ohms or less than 30 ohms. If the sender resistor is open (broken in half, no current path), you will get infinite resistance (a “1” on the digital ohmmeter display)
- To test the fuel gauge with the sender wire disconnected, Dave uses a quick test. Turn on the ignition switch. Short the sender terminal to ground. This should cause the gauge to read Empty. Not connecting the sender terminal to anything (open circuit) should cause the gauge to read Full. If you want to test for half full tank, use a jumper wire to connect one end of a 15 ohm resistor to the sender input and the other end of the resistor to ground. (See diagram) Turn on the ignition switch. This should result in a gauge reading of half Full.

How the Gauge Works

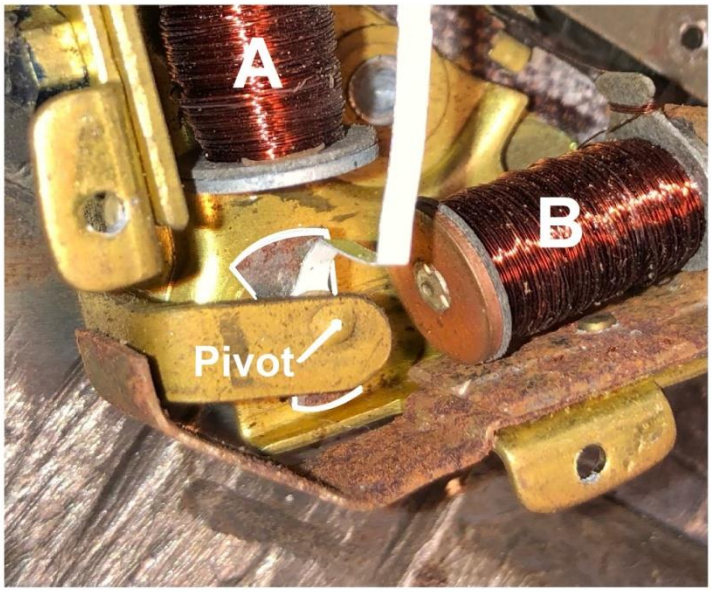
Assembled Gas Gauge



Gauge Face Removed from Magnet Coils



Needle in Full Position
Iron "Butterfly" attracted by Coil B



Needle in Empty Possition
Iron "Butterfly attracted by Coil A

Photos & Gauge disassembly furnished by Dave Folsom
The gas gauge pictured is from a 1949 to 1953 Chevrolet Truck.

The Iron “Butterfly” (outlined in white) is connected to the Gas Gauge Indicator Needle. The two coils have cores, most likely iron, which become magnetized when current flows through the coils. The greater the current, the stronger the magnet. The B magnet pulls the needle toward Full and the A magnet pulls the needle toward Empty. As the gas tank empties, the B magnet weakens and the A magnet becomes stronger. This is caused by the current in B becoming less and current in A becoming stronger.

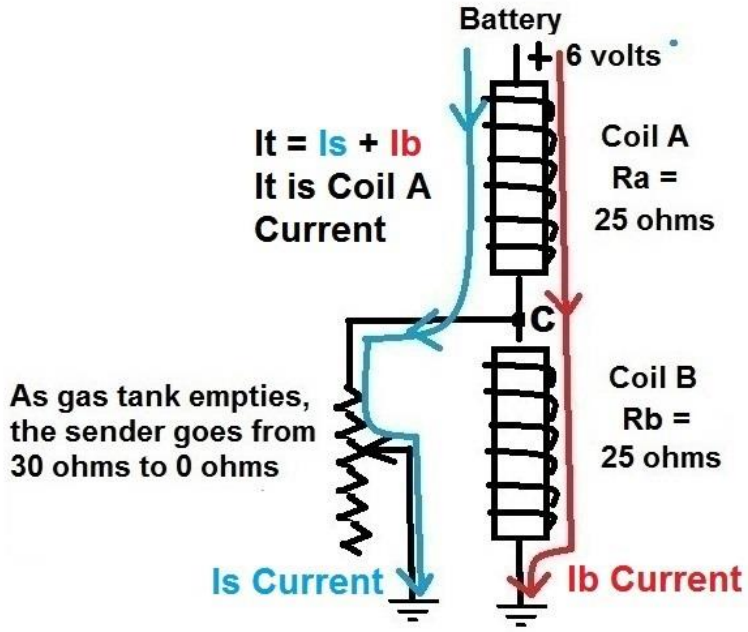
The calculations showing this change in currents can be found on the next pages. The variable that changes as the gas tank empties is the sender resistance, going from 30 ohms to 0 ohms.

The Ohms War

Coil A Ohms Coil B Ohms

Measurements by Dave Folsom

Both coils are about 25 ohms. That means that the 30 ohms sender plays a major role in determining the strength of the magnetism of Coil A & Coil B. If we focus on voltages, as the tank empties and the sender ohms decreases, coil A has more voltage & a stronger magnetic pull on the needle toward empty. As this is happening, the voltage across coil B is decreasing resulting in less magnetic pull by coil B. To see why, here are calculations that show the 6v battery voltage being divided between Coil A & Coil B and what happens when the sender resistance decreases. These calculations also show that as the gas tank empties causing the sender resistance to decrease, the current through Coil A increases and the current through Coil B decreases.



Gas Gauge Schematic

This circuit divides up the battery voltage, 6 volts, between the circuit above point C and the circuit below point C. The calculations below show that as the gas tank empties (sender resistance decreasing), the voltage at point C drops gradually which causes the remainder of the 6v to increase across Coil A. With more voltage, Coil A moves the needle closer to Empty. Also, note that with Vc decreasing, Coil B has less voltage and less pull on the needle toward Full.

Rs=Sender Resistance

Rsb=Parallel Resistance of Sender & Coil B

Rt=Total Resistance of Circuit

Calculation of Vc with Rspect to Ground and all Currents

A	B	C	D	E	F	G	H	I
			Resistances in Ohms, Voltages in Volts, Current in Amps					
	Ra=25	Rb=25						Ck Work
Rs	Rsb	Rt=Ra+Rsb	(Rsb/Rt)	Vc=Rsb/Rt)6v	It=6/Rt	Is=Vc/Rs	Ib=Vc/Rb	It=Is+Ib
30	13.6	38.6	0.352	2.112	0.155	0.0704	0.0845	0.1549
20	11.11	36.11	0.307	1.842	0.166	0.0921	0.0737	0.1658
15	9.38	34.38	0.273	1.638	0.175	0.1092	0.0655	0.1747
10	7.14	32.14	0.222	1.332	0.187	0.1332	0.0533	0.1865
0	0	25	0	0	0.24	Coil A Current = It = 0.24		

As resistance of sender decreases (gas tank going empty), sender current (Is) and total current through Coil A increases. At the same time Coil B current (Ib) decreases. Therefore Coil A has a stronger magnetic pull toward Empty than Coil B toward Full.