

JOHN HINCKLEY

Got a question for John? E-mail him at [ceeditor@amosautomotive.com](mailto:ceeditor@amosautomotive.com).



**READER'S QUESTION:** I've been dealing with some wiring issues on my '61, correcting some "Bubba" work by previous owners, and I'm down to my last problem, the fuel gauge. The gauge needle fluctuates wildly when I step on the brakes or use the turn signals, and it doesn't accurately reflect the amount of fuel in the tank. Can you share some possible diagnostic techniques and cures for these two problems?

**RESPONSE:** These are classic (and chronic) C1 symptoms that have been experienced and dealt with by many owners of straight-axle Corvettes. The basic flaw in the circuit design on C1s is that the ground for the fuel tank sending unit is shared with all the rear lamps, at the single harness ground at the left rear of the trunk. If this ground isn't perfectly clean and making good contact, every time the rear lamps are in use (especially the bright filaments for the brake lights/turn signals), it back-feeds the fuel sending unit ground wire and causes the fuel gauge needle to fluctuate in sync with the bright filaments. This can be cured by removing the fuel tank compartment cover and adding a dedicated ground wire from the sending unit to the frame; run the wire across the tank and down through the hole where the fuel feed pipe exits, crimp a ring terminal on the end, and secure it to a hole drilled in the frame with a zinc-plated, self-tapping screw and star washer. This will permanently cure the "dancing needle" syndrome. Leave the tank compartment cover off for the next step so you have access to the sending unit terminals.

To solve the gauge accuracy issue, check the gauge first, before digging into the sending unit (which must be removed from the tank to check it). The gauge circuit is fairly simple. The gauge is fed 12 volts to its "I" (ignition) terminal, and a brown or tan wire runs from the gauge "S" (sending unit) terminal to the sending unit in the tank. The sending unit is simply a variable resistor between the wire from the gauge and ground. With the tank full, the sender resistor produces about 30 ohms resistance and a "Full" gauge reading. An empty tank produces zero ohms resistance, and an "Empty" gauge reading. (Note: C3 sender circuits work the same way, except their range is 0-90 ohms. C2s use a unique three-wire system we'll examine in a future column).

For a gross check of gauge function, disconnect the brown wire from the "S" terminal at the gauge. With the key on, the gauge should read "Full." Then connect a jumper wire from the "S" terminal on the gauge to ground; with the key on, the gauge should fall to "Empty." To check gauge accuracy, we'll make a five-dollar calibration tool that simulates the tank sending unit from a linear 0-100 ohm variable potentiometer (volume control), available at Radio Shack. Solder a jumper from the center tap to either end tap, solder an insulated wire with an alligator clip to each end tap, and you're in business.

Connect the leads from a multimeter (set on ohms) to each alligator clip, turn the shaft, and mark the case at the positions where the multimeter reads zero, 15 ohms, and 30 ohms. Now connect the tool's clips to the gauge "S" terminal and to a known good ground; with the key on, the gauge should read "Empty"

with the pot set at zero ohms, 1/2-full with the pot set at 15 ohms, and "Full" with the pot set at 30 ohms. If this checks out, we'll move to the sending unit end of the circuit. If the gauge doesn't respond as noted, it needs work.

Reconnect the brown wire to the gauge "S" terminal. At the tank's sending unit, disconnect the brown wire from its terminal; with the key on, the gauge should read "Full." Ground the end of the brown wire; with the key on, the gauge should read "Empty." This verifies the body wiring between the gauge and the sending unit. Connect our tool between the end of the brown wire and ground and repeat the test we did on the gauge. If the needle indication results are different, it indicates a high-resistance connection in the brown wire between the sending unit and the gauge.

If these tests check out correctly, the gauge indication problem is in the tank sending unit, which needs to be replaced. Use a new gasket on the flange, and a new fuel strainer "sock" on the pickup tube, and check the 0-30 ohm resistance range of the new sending unit with your multimeter by moving the float arm up and down before you install it. ■



Here's the five-dollar diagnostic tool made from a Radio Shack 0-100 ohm volume control. It simulates the fuel sending unit to check the gauge and wiring.