A typical post-1975 emission laden, top-mounted, fuel sending unit used from 1975-'82 (bottom) next to a pre-1975 bottom-mounted fuel sending unit (top).

Restore Your C3 Fuel Tank Sending Unit

BY TOM RUSSO

If you've been plagued by a fuel gauge in your 1968-'82 Corvette that is inaccurate, but do not wish to part with a couple of hundred dollars for a fuel tank sending unit, then here's the fix you've been waiting for!

Of course, this assumes you've checked that all wiring and connections are in good shape, all wires connect with no frays, and the contacts have been cleaned and are making solid contact at all connection points. The

Let's face it, if your fuel gauge registers full after a fill, and remains at the "F" mark for hundreds of miles but then suddenly drops to "E" and the red "LOW FUEL" flashes (1978-'82), you've got a problem and it's fixable. In this article, we differentiate the

describes the problem, a repair, bench test and finally the field test.

THE ASSEMBLY: With the increasing complexity of emission controls and components to reduce fuel vapor emission, the fuel tank sending unit grew in component assemblies. Early C3 fuel sending units differ from late model sending units by both the method in which they mount

1 The tank attachment plate and filler neck for a top-mounted 1975-'82 assembly. It shows the fuel return tube, fuel delivery tube and the ECS tube from the liquid/vapor separator valve to the charcoal canister. Also, note the fuel gauge electrical connection above the filler neck.

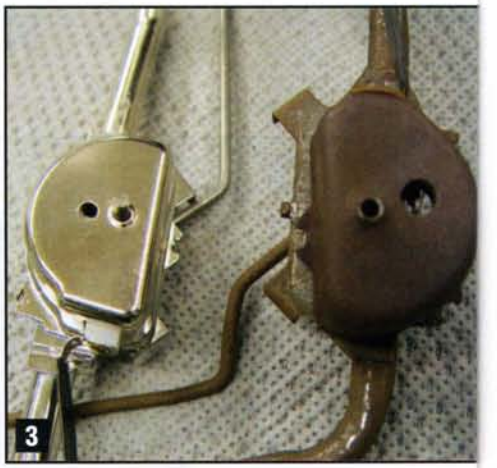
2 A component of the ECS to reduce vapor emissions: This valve has a ball that floats, allows fuel vapor to escape and prohibits liquid fuel from splashing through the tube that runs along the frame rail to the charcoal canister under the front driver's fender.

parts. Top-mounted fuel sending units were introduced in 1975 and include the fuel filler neck, unleaded fuel restrictor valve, fuel vapor separator valve, related connections to the charcoal canister, and the fuel lines to the fuel pump. Real early units, mounting from underneath, simply had a fuel tank sending unit. In today's Corvette aftermarket, when you check the box for fuel tank sending unit for

related assemblies.

Late model C3 AIMs refer to this collection of assemblies (Figure 1) as the "Fuel Meter Plate Assembly." If you search for a replacement part you'll find it listed as "fuel tank sending unit." However, as we describe how it works and the various components, you'll understand why GM referred to it as an assembly. The reference unit shown

In contrast, the basic design of the fuel tank sending unit did not change much from the early 1960's design. Each "assembly" consisted of the fuel delivery tube with a filter on the end (filter sock) combined with the fuel metering system. Each fuel metering system included the float, the metal box potentiometer and the lead that transferred the signal to outside the tank.



3 The potentiometer (pot) consists of a cover, resistor coil, wire wound around a band of plastic with a lead and a spring contact that sends a steady signal to the fuel gauge. The shiny pot is the pre-1975 pot while the weathered pot is the original late 1970's unit. Each cover also shows the "stops" for both "empty" and "full" along the straight portion of the cover.

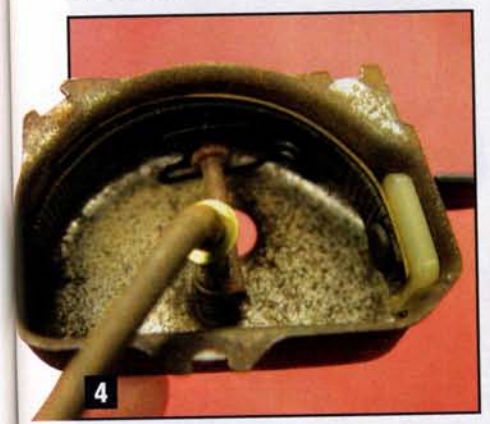
actual switch that sends the signal to the fuel gauge. This combination of systems is what makes replacement assemblies expensive. But unless a C3 is having a problem with fuel delivery, the only part that goes bad is the sending unit. Of course, there is also the filler neck tube the fuel cap screws into in order to create the sealed system. In the picture shown of a late model C3 unit, the return fuel tube rides next to the fuel line that delivers fuel to the fuel pump.

HOW IT WORKS: Now that we have segregated the *real* fuel gauge sending unit from the fuel meter plate assembly, we can describe how it works. The actual switch is a resistor coil or potentiometer, and is designed to send a steady signal to the fuel gauge. The spring contact maintains tension against a coil inside the cover. This measures the amount of resistance and emits this information to the fuel gauge on your console. The spring contact moves in concert with the float and assesses resistance as it moves across the stationary contact housed in the shield. Stops are located on the float side and prevent the float from moving beyond "E" and "F" points. So, the float rides the top of the fuel level in the tank and this information is transmitted, via the spring contact, to the wound coil and onto the fuel gauge.

it will take to repair/rebuild the unit. The most frequent occurrence is a buildup on the contacts that prevent the signal from reaching the fuel gauge. Over time, gas imparts a varnish-like residue that clings to the two contacts that make up the potentiometer. As well, the spring loses contact with the wound coil inside the cover and also may have a buildup of this varnish-like substance. Another possibility you must confirm is whether the wound coil has detached at some point or whether the spring is broken. The latter is the most unlikely.

THE REPAIR: The fix is simple if the coil has not broken its continuity. With the sending unit assembly extracted from the tank, remove the cover from the potentiometer. With either a screwdriver or needle nose pliers, gently pry the ears upward that hold the cover to the base. Locate inside the cover, the coiled wire around the band or flat wire lead. Check to confirm the wound wire is still connected at both ends. If still connected, your unit is in good shape. Also, this is where the varnish-like substance has built up for over 25 years. Use either thinner or something like STP gas treatment to remove the residue from both coil and spring.

Also, with the cover off, increase the tension of the spring against the inside cover coil by stretching it, gently though. You'll find it's quite limber. Once you put the cover back on, you can determine if the stretch was sufficient by peering through the hole on the backside while moving the float mechanism. You should hear the spring rub across the coil and see the spring contact in touch with the cover coil by peering through the opening.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BENCH TEST: Finally, bench test your handiwork with an ohmmeter. Connect one lead from the ohmmeter to the lead from the signal wire and then ground the other lead. Move the float mechanism through the entire range and determine if you're getting a reading throughout the range. You should hear the spring make contact with the coil as it moves through the range. The high end is "F" and the low end is "E" – you should see zero ohms at the low end and 90 ohms at the high end. You may find the high end stumbles a bit but this is common. If you have it right, the "F" end will move quite slowly in comparison to the middle portion and then onto the "E" end. Suddenly, you'll see the OHM needle increase its speed as you move the float toward "E." This is to be expected.

TECHNICAL SHARK FUEL GAUGE FIX

5 An inside view of a reproduction, new potentiometer not unlike an original unit installed in the 1970's. Note the opaque white plastic insert with the wire wound around plastic to make the resistor coil. Note the spring in contact with the resistor coil.

6 This is a 1978 spring worn by hundreds of tank fillings compared to a new pot brass spring. The spring contact maintains tension against the potentiometer coil inside the "pot" cover. The original spring contact is discolored, but its contact surface with the resistor coil shines from rubbing across the coil over several decades.

7 The final step is to test the unit before installing in the tank. An ohmmeter is used with one lead connected to the resistor coil while the other is grounded. A second pair of hands or cleverly moving the float armature arm with one hand (and the other grounding the unit) will move the needle through the gauge range.

If this test shows a steady reading throughout the OHM scale, then you've successfully restored your sending unit at a fraction of the cost for either a reproduction or NOS fuel tank sending unit.

FIELD TEST: Reassemble in the reverse order the unit was removed. Use a new gasket and replace rubber hoses. New hoses will be much more flexible and easier to reconnect than the original hoses. Use only fuel-line rated hoses. If you're working with a bottom-mounted unit, check to ensure there are no leaks as you add fuel. My field test for this unit was a 1978 model equipped with a 24-gallon tank and a five-gallon reserve.

If equipped with the "LOW FUEL" lamp, it's helpful to use it in your field test. The Low Fuel Warning Lamp was introduced in 1968, but disappeared in 1969 until the 1978 model, and remained through 1982. The lamp flashes "LOW FUEL" in red when fuel reaches the reserve. With the 24-gallon tank in 1978, it flashes at about four to five gallons in reserve so you must add enough fuel to turn the lamp off. On all other model years, you'll need to monitor the fuel gauge.

Add enough fuel to move the needle past the point at which it got stuck before you did the repair. Then, drive the Corvette. ■

EMISSION CONTROLS IN THE 1970S

In 1968, emission controls were introduced on all Corvettes to control exhaust, crankcase and fuel vapors. Sealed fuel caps were introduced to control fuel vapors in 1970 to meet early evaporative emission requirements of 6 grams per mile. RPO NA9 "California Emissions" (later to become known as ECS or evaporative control system) was available in 1970 for those new Corvette purchasers who shared clean air ethics. For California buyers, it was required. In 1972, fuel vapor emissions regulations were reduced to 2 grams per mile.

In 1971, evaporative emission controls were required for the first time on all Corvettes and the Evaporative Control System (ECS) was introduced, whose basic elements carry through to this day. ECS consists of a charcoal canister with a mechanism to purge the fuel vapors at the appropriate time and mix with air and fuel, routing it to the carb. There is also a liquid/vapor separator that allows vapors to separate from the liquid fuel and move under pressure to the canister. Until 1975, components of ECS were mounted on the tanks surface but toward the cabin. In 1975, ECS was assembled along with the fuel metering system into a single assembly. If you compare an early 1970's ECS system with a 2003 system, with the exception of electronic controls, the units are quite similar.

Why is this important to know? Well, because when you purchase your genuine GM restoration part you purchase some portion of several systems; all you really need when your fuel gauge is not working and you've assessed it's the sending unit, is the sending unit itself.