# UNDERSTANDING YOUR BONANZA FUEL QUANTITY INDICATOR SYSTEM

Fuel indicator problems in Bonanzas need not be a source of mystery and frustration. An understanding of the system will allow common glitches to be isolated and cured. Most importantly, it will make the owner far more knowledgeable when he needs to consult a mechanic. The general concept of the system design is explained below. This is followed by a step-by-step trouble shooting and repair procedure which your mechanic might use. The described procedure assumes that eighty gallon tanks (optional) have been installed. However, the forty gallon system (standard) is the same, except for a minor variation. This system was installed in models D-9060 through D-9568, excluding D-9222 through 9390. Although models D-9569 through 9817 have the same system, the circuit board (herin referred to as PC) is not physically attached to the fuel gauge. Straight tad! models had this system installed in CD-1235 through 1304, CE-290 through 470 and CJ-26 through 51. Models CE-471 through 612 and CJ-52 through 104 have the displaced PCs. Excluded straight tails are CE-350 through 408.

The fuel quantity indication system is based upon a method of reading the direct relationship between the actual amount of fuel in the tank and the resistance registered by the fuel quantity transmitter (herein referred to as transmitter). Contained within a single eighty gallon fuel tank are two transmitter assemblies. At the heart of these is a variable resistor. With the fuel tank full, both transmitters register maximum resistance. The registered resistance is varied as the float, attached to a lever arm and riding atop the fuel, causes a contact to move across a resistor winding within the heart of the transmitter. Two transmitters, wired in series, are necessary because of the wing dihedral. As fuel burns, first the outboard float drops, followed by the inboard. When approximately one-third of the fuel burns, the outboard float rests on the bottom of the tank, thereby registering no resistance. The only remaining resistance is from the inboard transmitter. Continuing fuel burn results in a progressive reduction of the registered resistance as the inboard float falls. When the inboard float reaches its lowest travel, the tank is empty of usable fuel and the cabin gauge displays "empty". The PC is the intermediary between the transmitters and the fuel gauge. The PC drives the fuel gauge and allows calibration of the system. The wire going to Pin #1 on the PC is the point of connection from the inboard transmitter. The other pins on the PC supply current and ground to the PC.

The left and right fuel tanks have identical but separate indicator systems. A properly working fuel gauge and PC on one side can be used to troubleshoot the opposite or non-working side. While this is true for the fuel gauge and PC, it is not true for the transmitters in the tanks. These transmitters, with their attached lever arms and floats, are constructed as mirror images of the contra-lateral side.

The steps described below begin in the cabin at the fuel gauge and end at the outboard transmitter. The example given with each component (fuel gauge, PC, etc.) is expressed as though the discussed component is faulty. When a mechanic is unable to return the system to operation with the isolation, repair or replacement of a faulty component, additional faults can be uncovered by continuing the search outwards toward the outboard transmitter.

A mechanic who installs good quality solderless connectors to the PCs while carefully labeling each wire will make the job considerably easier for himself, because it allows the switching of PCs back and forth to each fuel gauge. It also allows the switching of the PCs to the opposite tank leads and facilitates the replacement of PC components and their subsequent testing.

**STEP #1 FUEL GAUGE**

**Test:** With the PCs still connected to the leads from their original tanks, switch the right PC to the left gauge and vice versa.

**Indication:** The non-working side continues not to work while the initially working gauge continues to read correctly (it reads the quantity in the opposite tank).

**Note:** If the original problem switches to the opposite side, both gauges are operating properly.

**STEP #2 PRINTED CIRCUIT BOARDS**

The following assumes that the fuel gauge was OK when Step #1 was performed and that the problem switched to the opposite side.

**Test:** With the right PC still attached to the left fuel gauge, disconnect the leads attached to the right PC, replacing these leads with those leads coming from the left tank and vice versa. (This isolates the PCs.)

**Indication:** The problem which was initially on the right side has now switched to the left side.

**Conclusion:** The right PC is bad. (This is the most common problem.)

**Fix:** Replace PC (approximately $700) Repair PC: Your mechanic will check for the following:

A. Proper power supply to Pin #4

B. Proper ground to Pin #3

C. Replacement of any defective working part(s) if PC is in good shape. (These parts consist of three resistors, one diode, one transistor, and a variable resistor.)

D. Reinstall the PC on its original side, test and calibrate. (Since the mechanic carefully marked which lead came from which tank, he will have no problem reestablishing the proper connections).

**STEP #3 WIRES AND CONNECTORS FROM INBOARD FUEL TRANSMITTER TO PIN #1.**

**Test:** Connect one lead of ohmmeter/continuity tester to Pin #1, the other to the lead on fuel transmitter which goes to Pin #1.

**Indication:** High resistance or discontinuity. Determine if the problem is corrected by running a shunt wire between these same terminals (the fuel transmitter and Pin #1 on the PC).

**Conclusion:** Connector(s) corroded if resistance is high. Broken wire or connector if discontinuous. (Connectors are in wheel well.)

**Fix:** Replace defective part(s).

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**STEP #4 INBOARD FUEL TRANSMITTER**

**Test and Indication:** With fuel transmitter removed and an ohmmeter connected between the two terminals and while moving the float arm very slowly, the resistance changes in a

non-linear pattern from 76 ohms to zero. Any increase in resistance during this process reveals corrosion on the resistor winding at that position. It is this corrosion that will cause the fuel gauge to flicker toward "full" position whenever that point is reached on the winding.

**Fix:** Spray the inside of the rheostat assembly with electrical contact cleaner, work vigorously back and forth and retest. If not absolutely linear and regular, replace the transmitter.

**STEP #5 CONTINUITY OF WIRE FROM INBOARD TO OUTBOARD FUEL TRANSMITTER**

Procedure: Same as in Step #3 above.

**STEP #6 OUTBOARD FUEL TRANSMITTER**

**Procedure:** Same as in Step #4 above, but maximum resistance is 43 ohms.

**Note:** With standard (40 gallon) tanks, a single transmitter is used. This transmitter has a resistance of 160 ohms at maximum.

**STEP #7 CHECK GROUND FROM OUTBOARD FUEL TRANSMITTER**

**Procedure:** Clean connectors and surface. Replace if necessary.

The above described procedure will allow your mechanic to localize any problem and, at the same time, identify more than one problem (if more exist) in the fuel indication system. While there is some physical and financial hazard to looking over the mechanic's shoulder, the reassurance that your system is tested thoroughly and that any replaced component will definitely cure the problem will give the owner much peace of mind.

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