(pic-cal-7-1-2020.doc) extra highlighting of things folks miss

1. CENTROID'S PROGRAMMABLE FUEL AND WATER SENDERS
Centroid's microcontroller-based senders can be distinguished from our older analog style by a "P" in the part number : ie CGF**P** or CGW**P**. Senders with aluminum tubing are for oil, diesel, or gasoline of up to 10% ethanol; and senders with PVC tubing are for potable water. We don't make units for non-potable water, because that leaves deposits on the sense wire.

2. HOW THE SENDERS MEASURE LIQUID LEVEL
Centroid's senders work by measuring capacitance without moving parts. Electronics in the head convert this measured capacitance to the programmed output of ohms or volts. In fuel senders, capacitance is measured between the inner sensing tube and the grounded outer tube, and **the fluid must be non-conductive**. In water senders, capacitance is measured between the inner insulated sense wire and the water, with the water being grounded by a wire wrapped around the outer tube.

3. SHORTENING AND BENDING SENDERS (if required)
A fuel sender's outer tube can be shortened using a tubing cutter, and the inner tube snipped. Only senders ordered as bendable, with a black bend circle on the tubing, can be bent. Bend only between the head and the bend circle.

Shortening a water sender requires the following steps: 1) unwind the outer ground wire; 2) pull the PVC tube from its friction fit on the head, to expose the white sense wire; 3) use a heat gun to soften and pull the black sealing piece from the white wire; 4) shorten both wires and the tube; 5) put the black sealing piece back on the shortened white wire and heat it to get a good seal again (important!); 6) put the outer tube back on and rewrap the outer ground wire.

4. CONNECTIONS
NEG: connect this to DC ground. NOTE: our senders only work with *negative-ground* systems.
SEND: connect this to the Send input of your gauge or display. NOTE: this is an electronic output which will confuse your ohmmeter if you try to take a resistance reading. Instead we troubleshoot by voltages, while connected to the gauge.
POS (most senders): Most Centroid senders have an ignition-voltage POS terminal to run their electronics. A fused voltage between 11-28vdc should be wired to the POS connection. The voltage should turn off when the system is turned off, both for safety and to avoid running down the battery. For a number of brands of E240/F33 ohm gauge (not all), we can make a special sender that doesn't have this POS connection. These senders run their electronics from voltage on the Send connection.
ALARM (if ordered): The ALARM output switches to ground. A DC load which requires 0.3A or less can be connected to this output, with the far side of the load connected to ignition voltage.

5. CALIBRATION
The output range (eg E240/F33 ohms) and alarm levels (if ordered) are set at the factory per the customer's order. They cannot be changed by the end user. They can be changed for you back at the factory if needed, however.

If you did not shorten the sender, the factory Empty and Full settings will be correct! **ONLY if you shorten**, cal per the steps below. **Dont cal fuel senders in water**. **Email for advice promptly if you have trouble--** dont spend more than 5 minutes on it.

A. AUTOCAL for sender you shorten having an AutoCal stamp on the head
EMPTY: after shortening the sender, connect the empty sender to the system wiring, and turn on the power. The gauge needle should bounce between Empty and Full a couple of times and return to Empty as the sender discovers its shorter length.
FULL: Turn OFF the power and install the sender into a full tank of the appropriate liquid. Turn ON the power. The reading should go above Full and then finish on Full. This Autocal Full will use Full Detection at each fillup.

B. OR MANUAL CAL for senders you shorten not stamped AutoCal
Normally, manual cal is done via **jumpering** or bridging **Send to Neg** and turning on power. **ONLY** for our 240/33 ohm sender with **no Pos connection**, this is done with a *33 ohm resistor* (eg mouser.com 271-33-RC, $0.22)
TIMING: for label dates   **4/13 and later: E=10sec, F=20sec**.   only **3/13 and earlier: E=2sec, F=6sec**.

Jumpering

B1: MANUAL EMPTY   1) Have the sender out of the tank and wired normally to the gauge, with the ignition switch **OFF**; 2) have the jumper **applied**; 3) have someone turn the ignition switch **ON** and count the **Empty** seconds listed above, at which point you **remove** the jumper 4) the reading should bounce several times between Empty and Full over about 5 seconds before finishing on Empty. If you dont see these multiple bounces or dont finish on Empty, please email for advice.

B2: MANUAL FULL   For fuel senders with 1/2" tubing, Full is set **automatically** by the Full Detection sensor at powerup each time the tank has been filled. This is useful because it corrects for "dielectric constant" differences between tank-fulls of fuel.

But for water senders or fuel senders with 1/4" tubing, or if for some reason you find you need a non-automatic Full:

1) Have the sender in a full tank or container of the appropriate liquid and wired normally to the gauge, with the ignition switch **OFF**; 2) have the jumper **applied**; 3) have someone turn the ignition switch **ON** and count the **Full** seconds listed above, at which point you **remove** the jumper; 4) the reading should bounce several times between Empty and Full over about 5 seconds before finishing on Full. If you dont see these multiple bounces or dont finish on Full, please email for advice. Don't experiment.

6. HELP
We provide free tech support, but by email or fax only (we're a very small company). You'll be answered the same working day by an engineer. And check www.centroidproducts.com for documents such as a troubleshooting form.