Programmable and Non-Programmable Fuel Sender Installation and Calibration

HOW THE SENDERS MEASURE LIQUID LEVEL

The senders work by measuring capacitance, which means no moving parts are required. This makes them ideal for road, off-road, and boat racing. Electronics in the head convert this measured capacitance to the programmed output of ohms or volts. Capacitance is measured between the inner sensing tube and the grounded outer tube, and requires the fluid to be non-conductive.

SHORTENING AND BENDING SENDERS (if required)

Fuel senders are calibrated by the manufacturer or by **HARMON *Racing Cells*** prior to shipment. However, to shorten the sender after receiving it please follow these instructions (Note: 12" senders can be shortened to 3" max; 24" senders can be shortened to 13" max):

1. Cut the outer tube to desired length using a tube cuter or saw (Note: We recommend leaving approx. ¼" between the bottom of sender and bottom of bladder to prevent damage).
2. Cut or snip the inner tube to desired length as well.
3. Re-calibrate the sender.

For bending, most senders provided by **HARMON *Racing Cells*** are bendable at or above the 3" mark on the outer tube. Senders that are not bendable will not have this mark. To bend senders:

1. Identify the mark that is 3" on the upper end of the outer tube, near the head.
2. Bend the sending unit within the 3" range up to 90° (Note: Bending the sender anywhere other than within the 3" range risks shorting the inner to outer tube, causing a false "Empty" reading).

Once bending is complete there is no need to re-calibrate the sender.

CONNECTIONS

All senders must be wired PRIOR to calibration. Failure to correctly wire the sender to the gauge may result in false readings or even damage to the sending unit or gauge.

NEG: connect this to DC ground (Note: Our senders work with *negative-ground* systems only).

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 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 240/33 ohm gauge (not all), we can offer 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 when the sender is in a factory-programmed alarm state, meaning a low or high level. A DC load which requires 0.3A or less can be connected to this output, with the far side of the load connected to battery voltage. Typically the load is an alarm light. During an alarm, if the ALARM output is momentarily shorted to NEG by a pushbutton switch, the alarm will turn off until a new alarm condition occurs. This is convenient for audible alarms.

PROGRAMMABLE FUEL SENDERS

Programmable fuel senders can be distinguished from older analog style ones by a "P" in the part number (e.g. CBF**P**). Senders with aluminum tubing are for oil, diesel, or gasoline of up to 10% ethanol. THESE

SENDERS ARE NOT INTENDED FOR USE IN WATER. Do not attempt to calibrate senders in water as this may damage the sender and void any warranty.

CALIBRATION FOR PROGRAMMABLE FUEL SENDERS

The output range (e.g. E240/F33 ohms) and alarm levels (if ordered) are set at the factory and not by **HARMON *Racing Cells.*** They cannot be changed by either **HARMON *Racing Cells*** or by the end user but can be changed back at the factory if needed.

The senders are calibrated at the factory but must be recalibrated if shortened. In order to do so, first determine if you have an AUTOCAL sender (which have an AutoCal stamp or sticker on the head) or a non-AutoCal sender (will not have a stamp or will have a "MAG" in the label). Make sure all connections are correct, then follow the steps below:

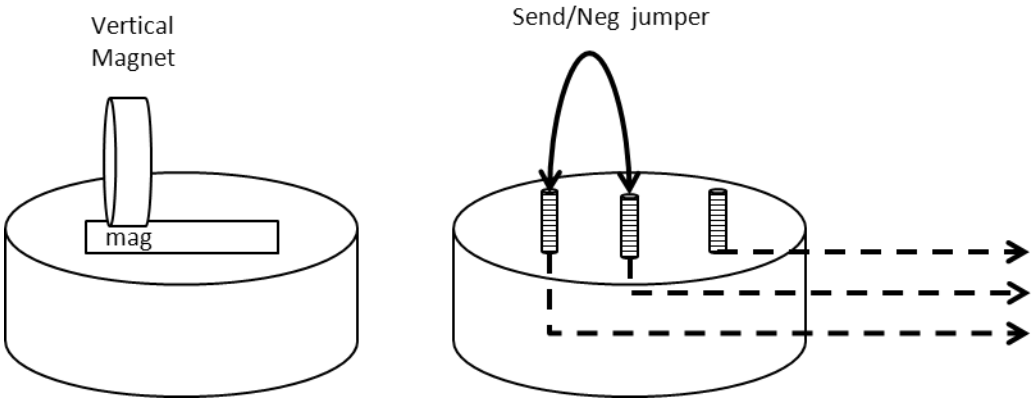
AUTOCAL Senders

SETTING EMPTY: After shortening and with the sender removed from the tank (or in an empty tank), connect the 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. Once the needle settles on Empty, turn OFF the power.

SETTING FULL: With the power turned OFF install the sender into a full tank of gas (or in a PVC tube or fuel line to simulate a full tank). ONLY HYDROCARBON FUELS CAN BE USED. Once installed, 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.

MANUAL CAL for non-AutoCal Senders

For senders where the label shows "MAG", a magnet can be applied on the word as shown in this picture. Otherwise, a jumper such as a clip lead should be applied between Send and Negative. Timing is **important**, and therefore it is a two-person job; one person to switch the power and count, and one person to handle the jumper/magnet. If it doesn't work right away, please email for advice rather than torturing yourself.

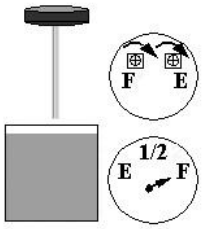


SETTING EMPTY: 1) Have the sender out of the tank and wired normally to the gauge, with the power turned **OFF**; 2) have the jumper or magnet **applied**; 3) have someone turn the power **ON** and count "1000-1, 1000-2" (ie 2 sec), at which point you **remove** the jumper or magnet; 4) the needle should bounce several times between Empty and Full over about 5 seconds before finishing on Empty. If you don't see these multiple bounces, the sender did not see your attempted calibration.

SETTING FULL: The Full is set automatically by the Full Detection sensor at power up each time the tank has been filled, so there is no need to calibrate Full.

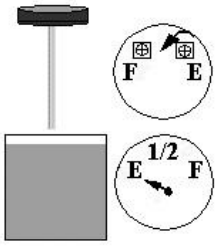
CALIBRATION FOR NON-PROGRAMMABLE FUEL SENDERS

The EMPTY adjustment is set at the factory. A minor adjustment of the FULL screw (SEE "SETTING THE FULL") is all that should be required to complete the calibration. Complete calibration procedure will be necessary if you have to shorten the probe.

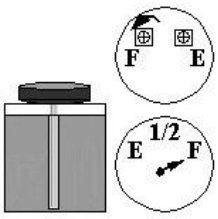


Make the wiring connections as shown on the wiring diagram. Turn on the ignition switch. Turn the FULL and EMPTY adjustment screws located on top of unit to the full CW (clockwise) position.

SETTING EMPTY: Must be done with probe out of tank or when tank is empty. Slowly turn the EMPTY screw CCW (counter clockwise) until the needle on the meter just stops moving downward. The needle should be on or just below the Empty mark. Now turn the screw CW (clockwise) to make sure the needle starts moving upscale immediately, then turn CCW until the needle just stops moving downward again. This is the EMPTY reference mark. Repeat this step until you are sure the EMPTY reference is obtained.



SETTING FULL: Put the probe into your tank. Turn the FULL screw CCW until the needle indicates the liquid level in your tank. For best results, the probe should be fully immersed in a full tank. If you accidently adjust below your tank level, turn the FULL screw full CW and repeat this setting.



Remove the unit from the tank. Shake the unit a few times to remove the residual liquid. The needle should now rest on or below the EMPTY mark. This completes the calibration. Do not make any more adjustments.

HELP

For general questions about sender shortening, bending, or calibrating feel free to contact **HARMON** ***Racing Cells*** directly.
1-949-583-7191
jim@harmonracingcells.com

For technical or specific questions about sender performance, including issues with calibration, please contact the manufacturer directly by email or fax only.
Centroid Products
1-386-423-3709 Fax
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