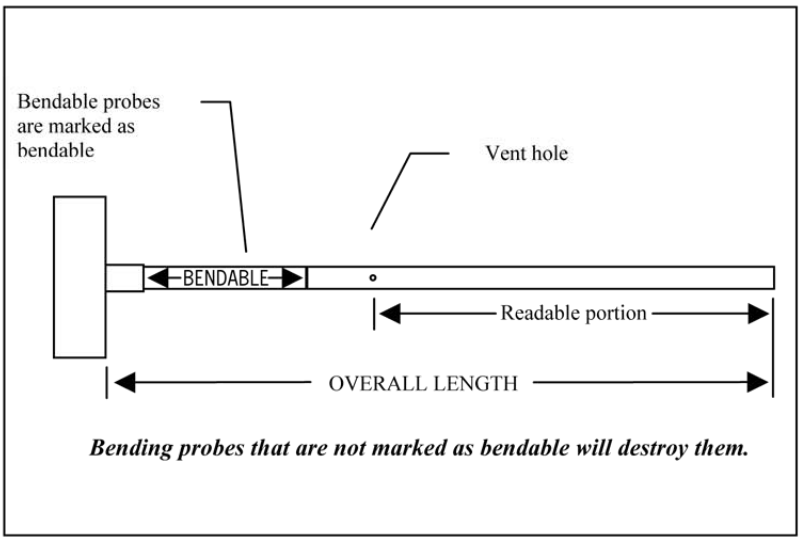
PRINCETON CAPACITIVE FUEL LEVEL PROBES

3133 MADISON AVE, WYOMING, MI 49548 (616) 243-8800 email support@princeton-electronics.com

Instructions

These instructions are for the bendable and non-bendable probes. The probes are mounted by a SAE 5 bolthole pattern or press fit with supplied rubber grommet (for plastic tanks only). An optional backing plate kit can be used to adapt tanks without this bolthole pattern. The rubber grommet is not used when mounting with the SAE 5 bolt pattern



Bending probes that are not marked as bendable will destroy them.

Theory of operation

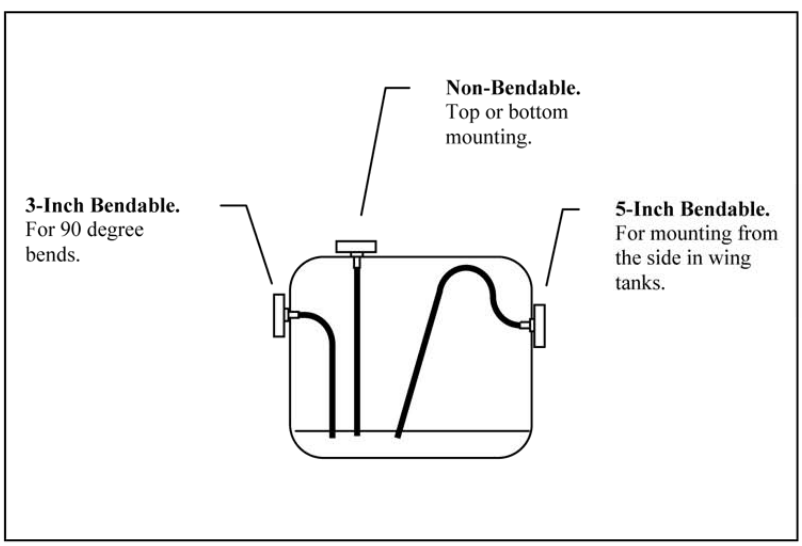
The probe senses a change in fuel level using a capacitive sensor formed by two metal conductors. No current passes through the fuel. The aluminum outer tube is at ground potential through an isolation capacitor. The inner brass rod has a signal on it through a 1 Meg ohm resister. There is a digital microprocessor that filters and conditions the signal providing a very stable fuel level reading.

The leads from the probe are protected from miss wiring of the probe. The supply voltage can be from 10 to 28 volts continues.

Probe operation

The probe has two modes of operation, calibration and run. The probe comes from the factory in the calibration mode. To calibrate the probe see the calibration instructions.

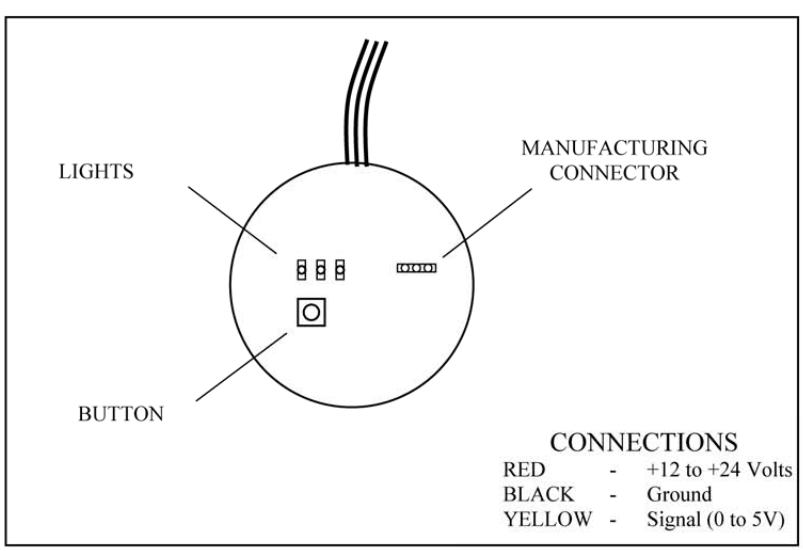
When power is applied and the probe has been calibrated the probe will perform a self-test sequence. The middle light flashes quickly while this process takes place. The output of the probe will go to full for 1 second and then empty for 1 second. This allows a visual test of both the gauge and the probe for proper operation. The output is filtered with a RC network and therefore does not change rapidly. The gauge will read full very briefly. After the self-test a heartbeat will flash every 2 seconds on the middle light. The current level is updated without averaging to get a reading quickly at power-up.



The output of the probe is digitally filtered by two methods. The first is an averaging function. Readings are averaged for 60 seconds before being passed to the second digital filter. This type of filtering works well with fuel because of low frequency sloshing. With float type probes this is seen in the indicator rocking back and fourth. The averaging method eliminates this.

The second digital filter is a low pass filter that behaves like a RC filter with a long time constant. The output will change slowly. The main benefit from this filter is the elimination of high frequency oscillations.

Because of the filtering used the fuel level reading will be very stable. It can take up to 120 seconds to update an actual change in fuel quantity. Even while filling the tank this is not a problem.



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1) Determine location

- Non-bendable probes mount on the top or bottom of the tank. Bendable probes mount from the sides.
- Must be clear of any interference of probe head and aluminum sensing tube. The probe will move a small amount from vibration. There must be clearance for this.
- Be sure you can get the probe in a ½ hole with the length of probe above the tank. You must have sufficient room above the tank.
- Drill a ½ inch hole for the probe.

2) Determine length of probe

- Place the probe in the ½ inch hole without the rubber grommet. Allow the aluminum sensing tube to rest on the bottom of the tank.
- Measure from the bottom of the probe head to the top of the tank. Add ½ inch to the measurement. This is the amount to shorten the probe.

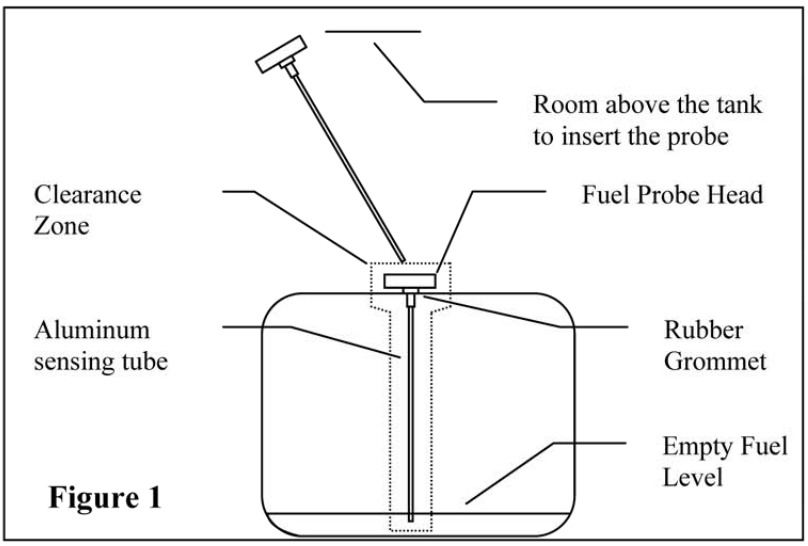

Figure 1

3) Cutting to length

- Measure from the tip of the probe the amount determined in step 2, and mark with a felt tip marker. ***Double-check your measurements. Cut probes cannot be exchanged or returned for credit.***
- Probes can be shortened to 3 inches of length measured from the vent hole to the end of the probe. This is for probes of 24 inches or less. Probes over 24 inches can shortened in ½.
- Use a pipe cutter to cut the outer aluminum tube. ***Do not hold the probe head while cutting. Hold the aluminum tube.*** This will keep you from cutting too aggressively. The probe head is not designed to take a twisting force.
- Slide the separated part from the center brass rod. ***Do not cut the brass rod at this time***. You may need to deburr both ends of the cut aluminum tube with a sharp x-acto knife. Do not forcefully remove the separated part. It should slide off easily when de-burred.
- There will be one or more exposed plastic spacers. Slide the closest one into the remaining aluminum tube about 1/8 of an inch.
- Use side cutters to cut the brass rod even with the end of the aluminum tube. Leave the brass rod just as it is after using the side cutters. This will keep the spacer from falling out. The brass rod must not be in contact with the aluminum tube.

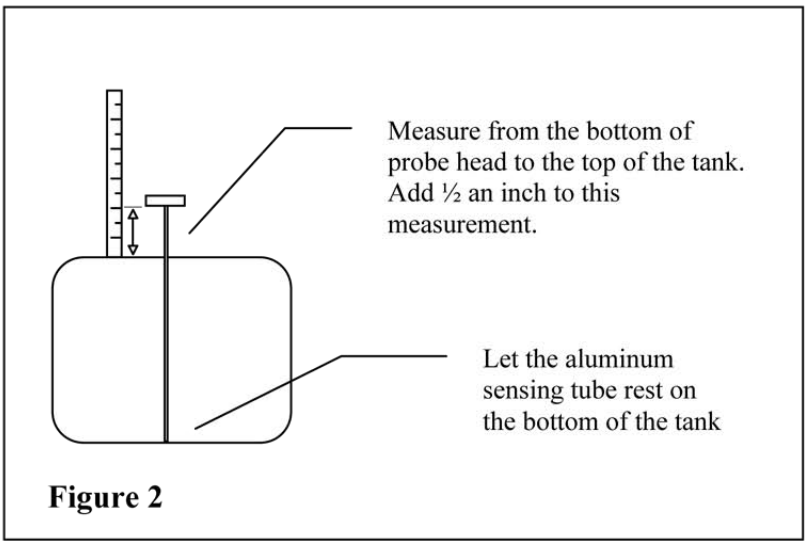

Figure 2

3) Installing with rubber grommet

- Place the rubber grommet in the ½ inch hole. Slide the probe through the grommet. Be careful not to bend the probe.
- If there is not enough room above the tank to put the probe straight in, remove the grommet from the hole, leaving the aluminum tube still through. This will allow you to put the probe in at an angle. After the probe is mostly in the tank, put the grommet back in the ½ inch hole and press the probe through the grommet until the head of the probe rests upon the face of the grommet.

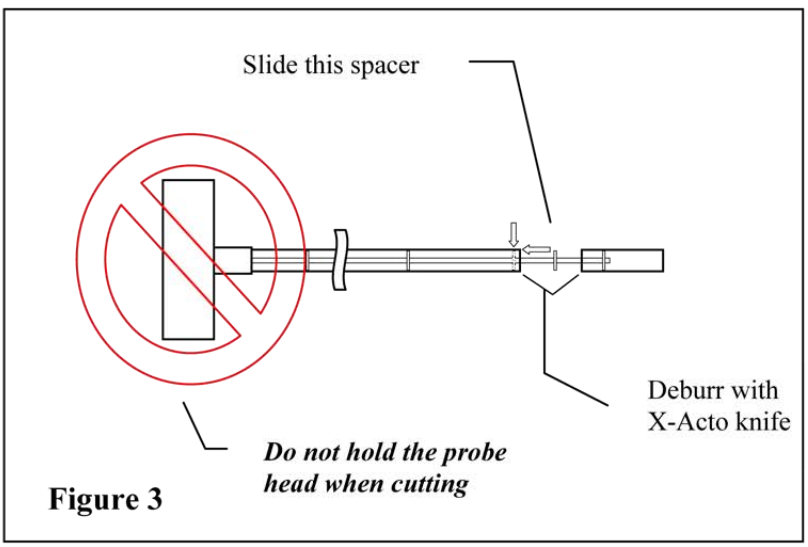

Figure 3

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General Calibration Information 1,2 and 5 Set-point models

The probe reads fuel level linearly from 0 to 100%. Meaning if the fuel level is covering 25% of the probe the output will be 25% of the 5 volt output. If the tank is square then the level in the tank will match the output of the probe and a 2 set-point probe will read linearly. When the tank is not square, 25% on the probe may not match the actual fuel level. This is where a 5 set-point model will linearize the reading. The output is still continous from empty to full, meaning the out does not just read at the calibration points. When using a more advanced guage that has its own linearization a 1 set-point model can be used.

- The probe can be recalibrated an unlimited number of times.
- The calibration sequence is **empty first** for all models.
- **5 set point** models will continue with ¼, ½, ¾ and **full**.
- **2 set point** models will continue with **full**.
- **1 set point** models only the **empty** is calibrated.
- Calibration can be entered or restarted at any time.
- Probes are shipped with calibration activated. When power is applied the left light will be flashing.
- To enter calibration mode, hold the button down while turning on the power.
- Power can be removed during the calibration process after any set point (lights flashing). When power is returned the probe will continue.
- The empty set point can take as long as 16 seconds. All other set points are less than 2 seconds.
- Water affects the probe giving a reading of full. Water will not hurt the probe. The surface tension of water will make it hard to be removed from the probe. Gently tapping the probe will help.
- The likelihood of ever getting water in the probe other than deliberately exposing the probe to water is remote. There would have to be significant amount of water in the fuel tank (the unusable portion) to reach the bottom of the probe. The probe should be at least a ¼ of an inch above the bottom of the tank.

Flashing	Off	
◉○○	EMPTY	SET POINT
◉◉○	¼	SET POINT
○◉○	½	SET POINT
○◉◉	¾	SET POINT
○○◉	FULL	SET POINT

Table 1 Set point modes

● ON	○ OFF
●○● / ○●○	DATA ERROR
●●● / ○○○	CAL ERROR
●●○ / ○○●	UNSTABLE

Table 2 Error codes

Calibration

- Hold down the button while turning the power on. (If the left light is not already flashing.)
- Release the button. The left light will be flashing. Indicating **Empty** set point.
- Place the amount of fuel you want to read **Empty** in the tank.
- Press the button. The left light will stay on (stop flashing) while the initial calibration is performed. This can take as long as 16 seconds. The rest of the set points will take less than 2 seconds.
- Place the amount of fuel that you want to read for the next set point. Refer to table 1. Press the button. Continue until done.
- After the **last** set point has been entered the middle light will flash about every five seconds. This indicates the probe is functioning and outputting fuel level information.

Description of error codes

Data Error – The calibration is stored in non-volatile memory. The data has become corrupted or the memory is bad. Try recalibrating one time. If you still get this error then the probe is defective and return it for warranty repair.

CAL Error – The probe failed to calibrate. Possible causes. Water in the tank, inner brass rod is shorted to the outside aluminum tube. Alcohol in the fuel, trying to calibrate full first instead of empty, or the probe electronics have failed.

Unstable – The fuel level was not stable during calibration or the probe electronics have failed.

Limited Lifetime Warranty

Princeton Electronics, Inc. will repair or replace any probe found to have a manufacture defect. Probes that have been shortened, or the leads cut cannot be exchanged or returned for credit unless they are found to have a manufacturer defect.

Disclaimer

This fuel probe is for reference only, the operator is responsible to visually inspect fuel quantities prior to use. Relying solely on a fuel gage could result in unexpected engine stoppage.

Because Princeton Electronics, Inc. does not install the fuel monitoring system we rely solely on the installer to insure proper installation.

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