

Tips for Installation, Calibration and Operation of SmartSwitch Tank Management Systems

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Calibration for Top Mounted Pressure-Type Level Sensors

This document describes the techniques used to calibrate top mounted pressure-type level sensors for *SmartSwitch* tank systems.

Overview of Tank Systems

The *SmartSwitch* models TC-8000, TM-4000, and the TD-4000 utilize a top mounted pressure-type level sensor as one of several options to provide fluid level indication for display at the Master Display Unit (MDU).

The maximum number of tanks which can be connected to each system are as follows: TC-8000 (eight tanks), TM-4000 (four tanks) and TD-4000 (four tanks).

The TC-8000 and the TM-4000 employ a network technology with Input/Output Units ("IOU's" or "tank controllers") distributed throughout the vessel and mounted near the tanks. Level sensors are wired directly to the IOU and the IOU transmits a level signal over a two-wire network to the Master for display as either a bar graph or % full/gallons/litres. IOU's can control macerator pumps as an option.

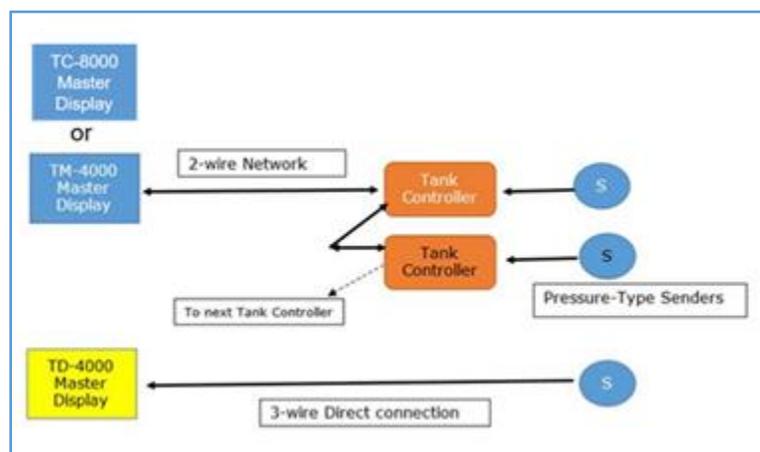
The TD-4000 is a hardwired system and as such does not use a two-wire network and IOU's to provide a level signal to the Master Station. Rather, the three wires from each level sensor are connected directly to the Master Station.

All the *SmartSwitch* systems use the model SEN-S/S pressure-type level sensors, however, there are several possible mounting locations. These include:

- Bottom side wall of the tank
- Discharge pipe
- Top mounted which utilizes a stainless steel mounting fixture with SAE 5-bolt pattern common to level senders and tube cut to the proper depth for the tank. The sensor measures the pressure at the bottom of the tank by sensing the air pressure in the tube which will be the same as the fluid pressure at the bottom of the tube.



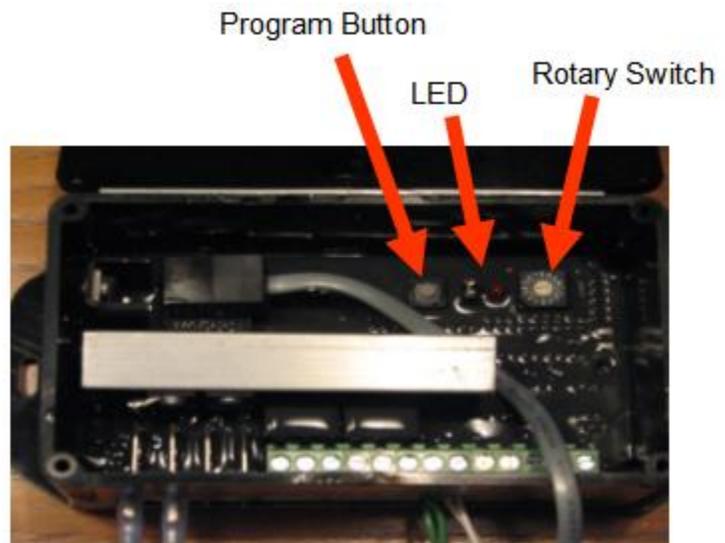
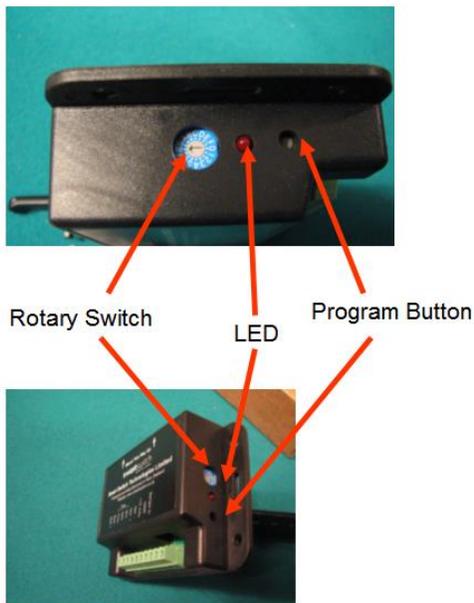
Comparison of TC-8000/TM-4000 Network and TD-4000 Hardwired Configurations



Top Mounted Pressure Sensor Calibration for TC-8000 and TM-4000 Systems

The TC-8000 and the TM-4000 both use the model HB-200 IOU (level sensing only) or model HB-200/P IOU (level sensing and pump control). These IOU's are a black control box mounted near the tank. Because the TC and TM are network systems, each IOU must have a unique address. This address is set on a rotary switch on the side of the IOU (HB-200) or under the cover of the IOU (HB-200/P).

Valid IOU addresses are "2" through "5" for the four tank systems (TM) and "2" through "9" for the eight tank system (TC).



HB-200 Input/Output Unit

HB-200/P Input/Output Unit

The calibration process is essentially a "pairing" operation between the IOU and the SEN-S/S sensor. The steps in this process are as follows:

1. Determine whether you have a regular or irregular shaped tank and if you will use the two or five-point calibration process. (Note that regularly shaped (rectangular vertical cross section) can use the "2-point calibration process, whereas irregularly shaped tanks must use the 5-point process.)
2. Decide which of calibration techniques you will use. SEE CALIBRATION TECHNIQUES PAGE 4. The various techniques use either the tank itself or a tube or other container for an "off-line" calibration.
3. If this is a retrofit of an existing system, find and record the position of the rotary switch which will indicate the address of that IOU. (You must return the switch to that address after calibration.)
4. Using a small screwdriver, turn the rotary switch to the "0" position, the calibration position.

5. Using programming button, set "EMPTY" with the probe in open air or at a level which you establish as the desired low point as follows:
 - a. Press and hold down the Program Button (on the IOU) until the LED comes on (approx. 3 seconds). The LED will begin flashing rapidly as it reads the value for the tank low point. Four slower flashes indicate it has set the tank low point.
 - b. Fill the tank or calibration tube to the required TANK FULL LEVEL. Wait approx. 30 seconds for the fluid to settle. Press and release the Program Button. The LED will begin flashing rapidly as it reads the value for the tank high point and once again, four slower flashes indicate it has set the tank high point. The unit will automatically leave program mode and the LED will go off. The device is now ready for use.
6. Return rotary switch to position you recorded in step 3.

Top Mounted Pressure Sensor Calibration for TD-4000 Systems

Carefully read and understand the Sensor Programming Section from the TD-4000 Instruction Manual.

After setting up all input names and other characteristics from the "Programming Instructions" using the instructions from the Manual, you may now proceed to calibrate the inputs. (Note that "Sensor Programming" appears in a separate section from "Programming Instructions".)

The calibration steps are as follows:

1. Press and hold down the Backlight key. Now press and hold the Scroll key. Hold together for 3 seconds. This will bring you to the Set-Up Menu.
2. Use the Scroll or Backlight key on the Master Display to scroll to "Calibrate" and press the Pump Key. This will bring you to the Calibrate Menu.
3. Use the Scroll or Backlight key to scroll to the tank input requiring calibration.
4. Press the Pump key once to set the input to be calibrated.
5. Use the Scroll or Backlight key to scroll through the list of sensor options. Once you have found the "Pressure Sensor", press the Pump key.
6. Select 2 or 5-point calibration using the Backlight (for 2 point) or Scroll (for 5 point) key.
7. Follow the on-screen prompts to set the full and empty points carefully following the instructions in the manual.

SET-UP MENU	
PROGRAM INPUT	
CALIBRATE	◀
SET ALARM	
SET TANK VOL	
ERASE INPUT	
EXIT MENU	

CALIBRATE MENU	
PRESSURE	◀
ULTRA-SONIC	
10 – 180 OHM	
33 – 240 OHM	
OTHER SENDER	
TOP ONLY	
BOTTOM ONLY	
EXIT MENU	

If Pressure is selected the display will now show:

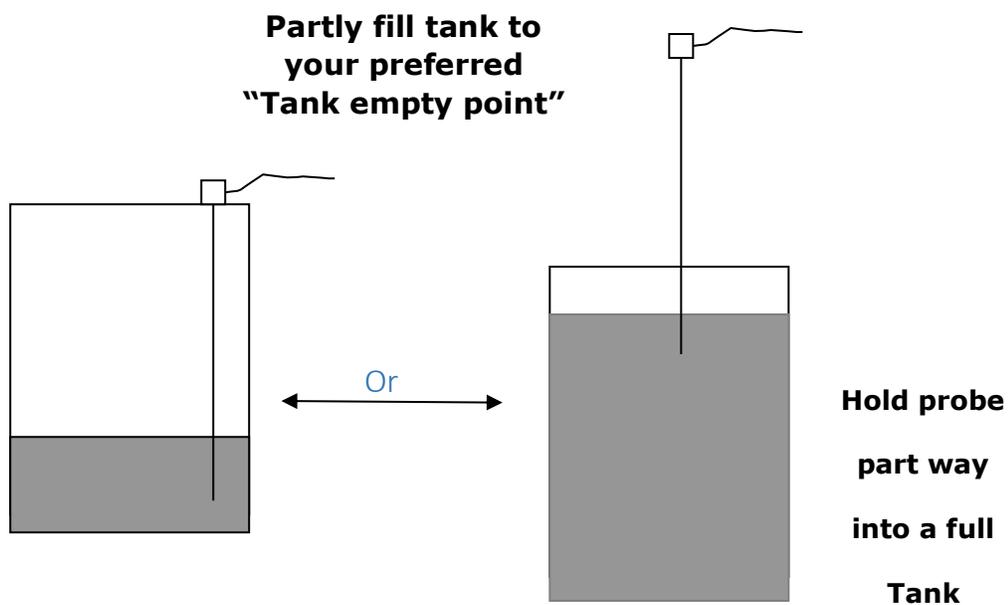
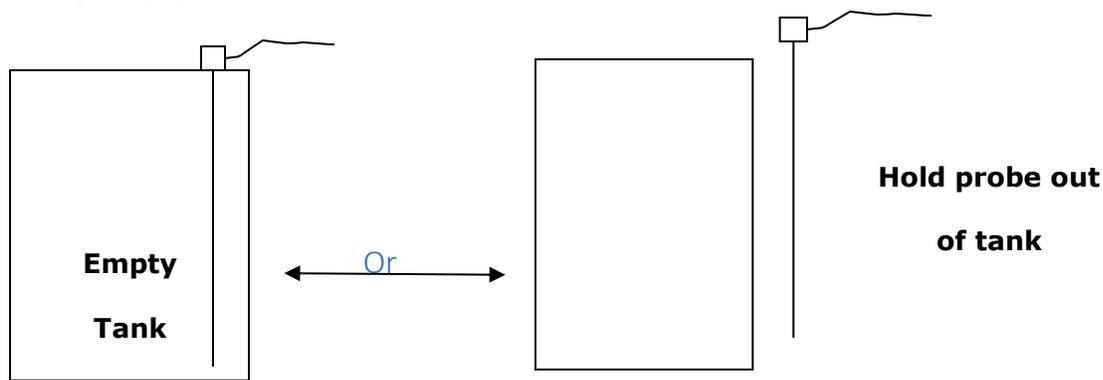
Calibration Mode	
< 2 Pt	5 Pt >

Calibration Techniques

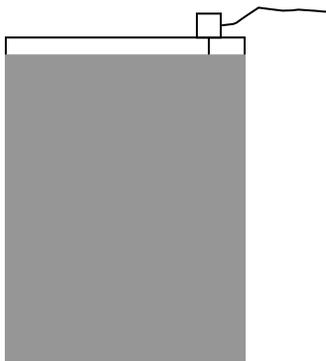
2 Point Calibration Using the Holding Tank

Setting Empty: (four different options)

Either start with an empty tank or remove the probe from a full tank or place a portion of the probe into a full tank to set empty point other than the tank actually being empty.



Setting Full:
Fully insert probe into tank



Diesel and water are different weights therefore either calculate the difference using the method below, or use the actual fluid the tank is being calibrated for. Diesel fuel weighs 83.3% per volume of water. Therefore, if calibrating for fuel but using water, a factor of 16.7% needs to be deducted from the water level height to provide proper calibration. For example, if "Full" equals 20 inches of fuel depth, mark a line on the sender probe at 16.66 inches ($20 \times 0.833 = 16.66$).

2-Point (1) Calibration using a Calibration Tube

Any container deep enough to accommodate the full length of the SEN-S/S probe can be used for calibration, including a section of tubing as small as ½ inch in diameter as shown in the photos below.



The procedure is as follows:

- Fill calibration tube with water to a level that, when the probe is inserted into the tube, water will overflow the top of the tube.
- Set "EMPTY" with the probe in open air or by partially inserting the probe into a full tube to set a preferred "Empty" point (as shown on page 4)
- To set "FULL", insert probe completely into tube,

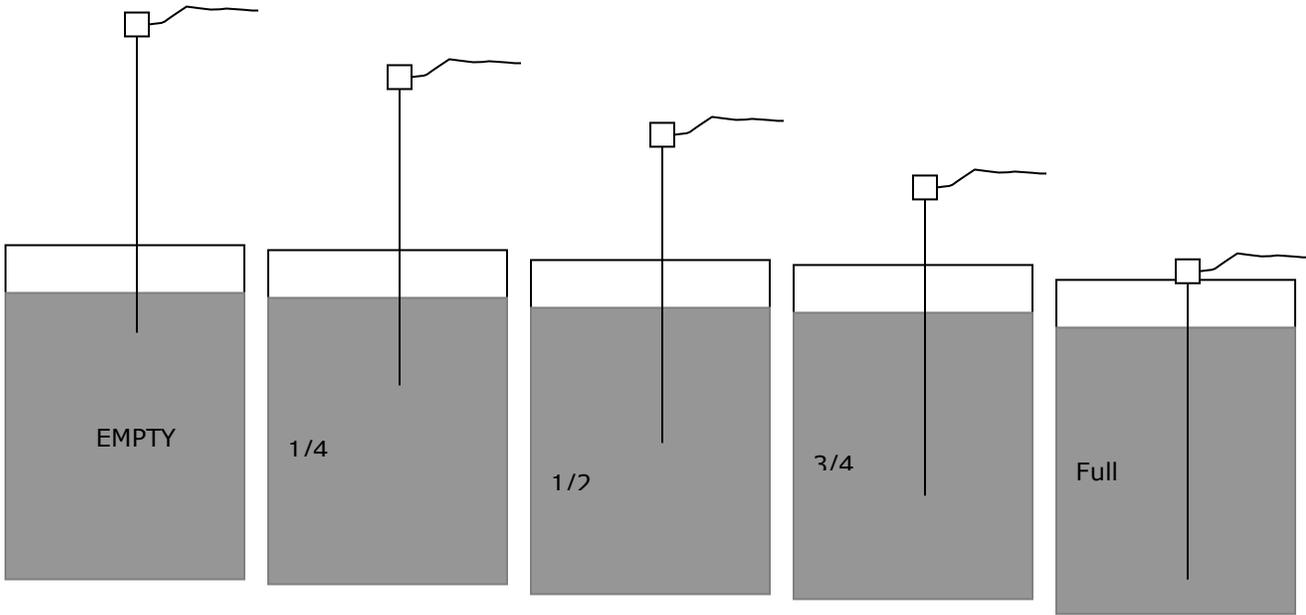
Note 1: The calibration tube technique can be used for 5-point calibration (described on the following page) if you know the point heights which correspond to the various volumes of fluid. In this process you mark the probe and insert into a full container or tube to the marked points setting each point as you insert the probe, being sure that the water spills over the top at each calibration point. In this way the top of the tube can be used as your reference point.

Note that water can be used to set the level for a diesel fuel tank using the formula shown in the box on page 5.

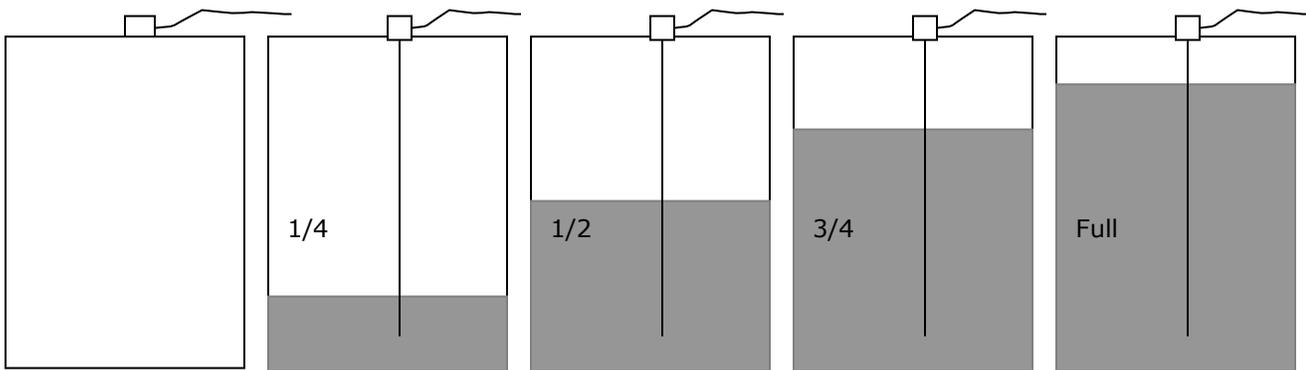
5 Point Calibration Using the Tank:

An irregularly shaped tank means that the volume of liquid in the tank is not directly proportional to the depth of the liquid. Therefore, the *SmartSwitch* 5-point calibration system allows the tank to be effectively divided into four separate tanks to closely approximate the actual volume in the tank.

As illustrated in the second example below, with the probe fully inserted into the tank, you would meter a known amount of liquid into the tank and record the actual level for each point in the calibration process. For example, if a tank holds 100 gallons, after setting the low or "empty" point, you would add 25 gallons and set the $\frac{1}{4}$ point, and so forth until the last (FULL) point has been set at which point the unit will leave the program mode. Or if you know the point heights which correspond to the various volumes of fluid, you can mark the probe and insert into a full tank to the marked points setting each point as you insert the probe. (First example below)



Or



Installation Considerations for Pressure-Type Level Senders

Installation cost depends on the location chosen to install the pressure sensor.

The model SEN-S/S 100 (left) can be mounted in the fuel/water delivery lines or, when combined with a stainless steel top-mount fixture (right), the sender assembly is mounted at the top of the tank.



Choosing the location for new senders

This is a key decision. Most owners will opt for a top-mounting solution because of the reduced cost of the installation. The question to consider is:

Is there sufficient access to the top of the tank to install a mounting fixture whose length equals the depth of the tank?

If the answer is "Yes", this is likely the most cost effective solution.

Top Mounting

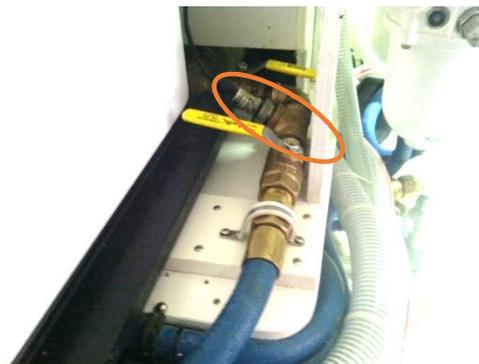
For boats without existing senders, a $\frac{3}{4}$ inch hole is drilled in the top of the tank to accept the fixture's "down tube" which extends to the bottom of the tank. The flange is mounted using 5 stainless steel screws.

For boats with an existing sender, drilling may not be required. Just remove the existing sender and mount the pressure sender assembly flange using the same mounting holes (if sender uses the industry standard SAE 5-hole pattern).

Delivery Line Mounting

Installation of the SEN-S/S100 senders in the delivery lines requires inserting a "T" fitting into each fuel/water delivery line as illustrated in these installation photos for port and starboard fuel tanks on an Eastbay 50.

The hardware required for this modification is a shutoff valve on each side of a $\frac{3}{4}$ inch pipe thread "T" fixture which accepts the SEN-S/S100 sender unit.



Installation of the SEN-S/S Top-Mounted Sender Assembly

Replacing a BEP Ultrasonic Sender

The mounting screw pattern is identical to the BEP sender – but note that the pattern of holes are NOT symmetrically placed around the rim of the flange. That is, the holes will match in only one orientation.



No drilling should be required to mount the sender assembly. The BEP sender has a $\frac{3}{4}$ to 1-inch hole in the center which is sufficient to accept the “down tube” of the SEN sender assembly. Mounting holes should match.

Stainless steel screws should be used to mount the flange and a silicone caulk or other gasket material should be placed under the flange prior to tightening.

For installation in a new tank or an existing tank with a different sender arrangement

Select an appropriate location with sufficient access above the tank to insert the “down tube”, remembering that the tube is approximately equal to the depth of the tank. There is no restriction on the location relative to the side wall of the tank.

Six holes must be drilled in the top of the tank.(*). These include a center hole approximately $\frac{3}{4}$ inch in diameter for the “down tube” and five holes sized for the mounting screws.

Stainless steel screws should be used to mount the flange and a silicone caulk or other gasket material should be placed under the flange prior to tightening.

(*). Note that many senders use the same SAE 5-hole pattern as the SmartSwitch SEN-S/S sender assembly, in which case you may not need to drill new holes.

Top Only and Bottom Only Calibration for SmartSwitch TM-4000, TC-8000 and TD-4000 Tank Monitor and Control Systems

After calibrating the bottom and top settings of a tank you may wish to go back and change either of these settings individually.

If Top Only is selected: the system will read the current level of the tank and calibrate this as the top level for that particular tank.

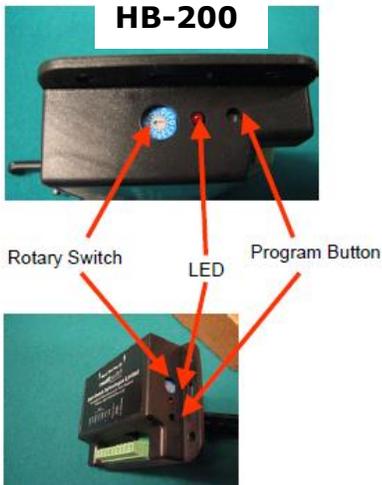
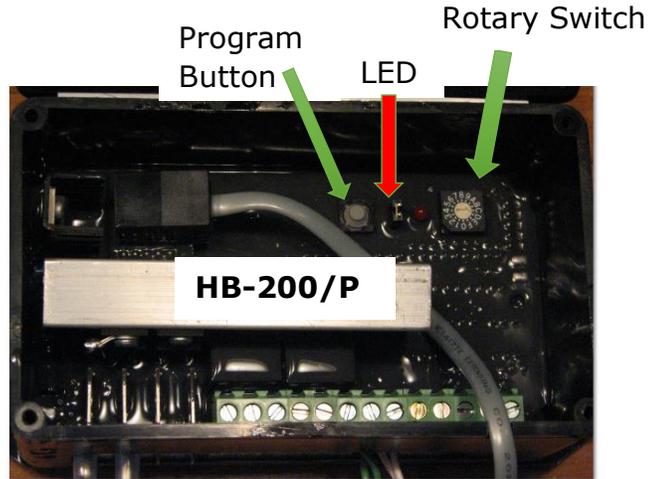
If Bottom Only is selected: the system will read the current level of the tank and calibrate this as the bottom level for that particular tank.

To set top only or bottom only calibration points for:

TM-4000 and TC-8000

Find the Rotary Switch in the Input/Output Unit (The Rotary Switch is accessed under the cover in the HB-200/P Unit and on the side of the case of the HB-200)

Important: Prior to moving switch to the calibration position, note the switch position as this is the tank's address. The switch must be returned to this position after calibration and before returning the tank to operation.



The Bottom Only setting can be changed by turning the Rotary Switch to position A.

Press and hold down the Program Button (on the IOU) until the LED comes on (approx. 3 seconds), this will set the current tank level as the tank low point. Press and release the program button, the LED will give 3 quick flashes. The tank low point has now been saved and the unit will automatically leave program mode. Important: Return the rotary switch to the tank's original address. The device is now ready for use.

The Top Only setting can be changed by turning the Rotary Switch to position B

Press and hold down the Program Button (on the IOU) until the LED comes on (approx. 3 seconds), this will set the tank high point. Press and release the Program Button, the LED will give 3 quick flashes. The tank high point has now been saved and the unit will automatically leave

program mode. Important: Return the rotary switch to the tank's original address. The device is now ready for use.

SET-UP MENU
PROGRAM INPUT ◀
CALIBRATE
SET ALARM
SET TANK VOL
SET OUTPUT
SPECIAL PUMP
PUMP START/STOP
DISABLE TOILET
COPY CALIBRATE
ERASE INPUT
EXIT MENU

TD-4000

The "program mode" brings up the "Set-Up Menu". (See manual to enter the program mode) Select "Calibrate".

From the Calibrate Menu, select either Top Only or Bottom Only. The top or bottom level will be set when you make this selection and the display will return the Set-Up Menu.

CALIBRATE MENU
PRESSURE ◀
ULTRA-SONIC
10 - 180 OHM
33 - 240 OHM
OTHER SENDER
TOP ONLY
BOTTOM ONLY
EXIT MENU

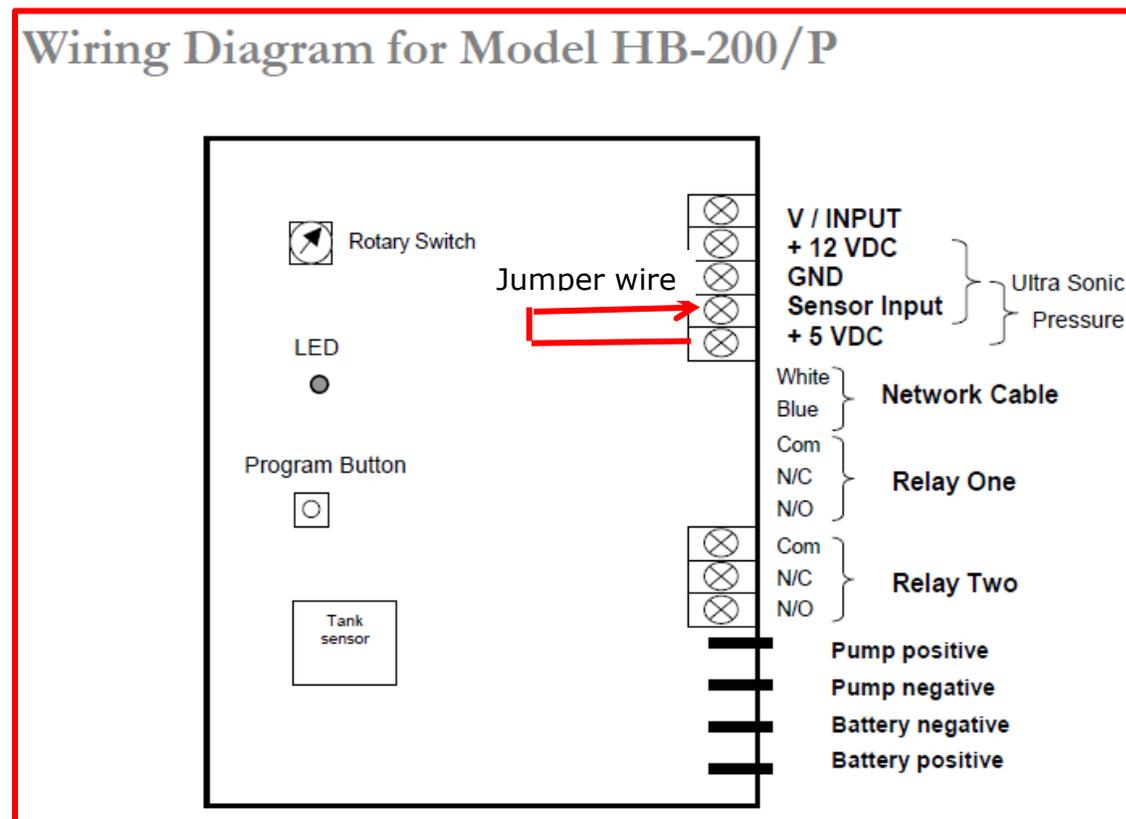
Pumping out a tank in the event of a level sensor failure

Method One

Open the cover on the IOU (Tank Controller) by removing the 4 screws. Find the "Program Button". Looking at the IOU with the terminals facing down, the programming button lies to the left of both the rotary switch and the LED programming light. Push this button. This will turn the pump on. Push again to turn the pump off.

Method Two

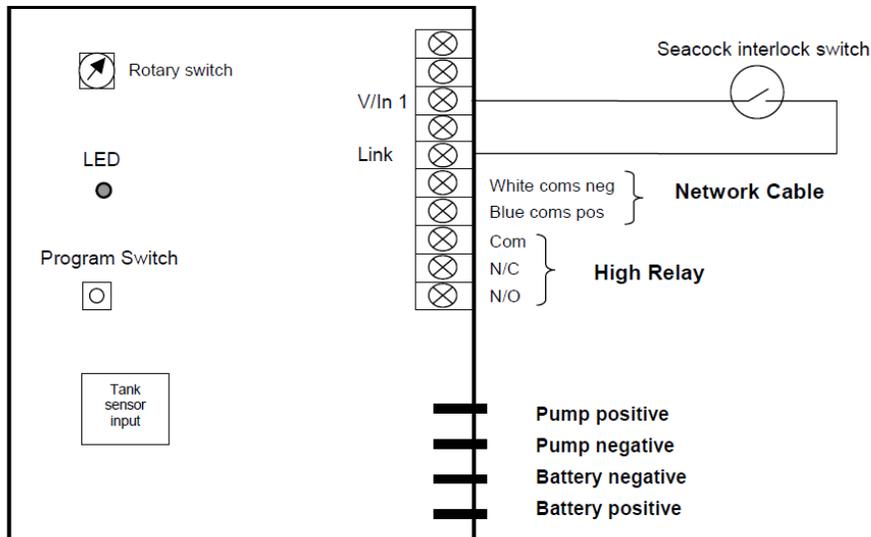
The TM-4000 and TC-8000 systems will only allow the pump to start if the sensed level is above EMPTY. This feature is employed to prevent the pump from running dry and damaging the impeller. You can defeat this feature by causing the system to sense a full tank. Here's how: The sensor input terminal is looking for 5v which equals "FULL" to the system. To satisfy this, put a temporary jumper wire from the "5 volt" terminal to the "Sensor" input terminal, the system will read "full" and you can run the pump to empty the tank. (The terminals are accessed by removing the IOU cover as in Method One.)



Replacing an HT-100/P Input/Output Unit with HB-200/P

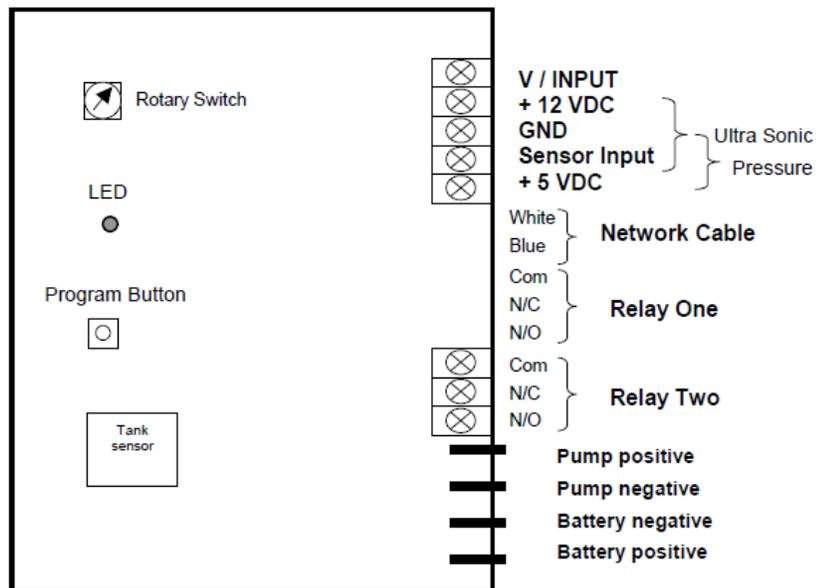
Existing TM-4000 Input/Output Unit (Tank Controller) Wiring

Wiring Diagram for Model HT-100/P

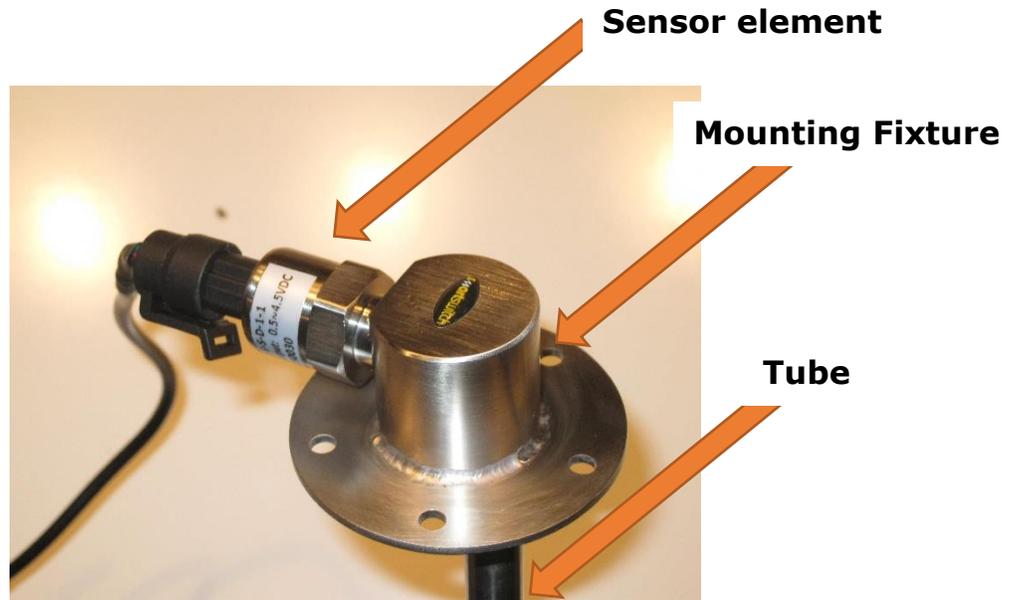


NEW TM-4000 Input/Output Unit (Tank Controller) Wiring

Wiring Diagram for Model HB-200/P



Installing SEN-S/S 100 Level Sensor Element in an existing SmartSwitch Top Tank Mounting Fixture



In the SEN-S/S100/600 sender assembly, the mounting fixture's tube extends to near the bottom of the tank. The proper operation of the top mounted pressure sensor depends on an air column inside tube such that virtually no liquid is inside the tube. Thus the pressure felt by the sensor element through this air column is the same as that at the bottom of the tank and that pressure is translated to a fluid level.

Therefore, the sensor element must be replaced on an installed top fixture either with a completely empty tank – or - with the stainless steel top mounting fixture completely withdrawn from the tank. This is to ensure that the fixture's probe has no liquid inside the tube.

The sensor element must be mounted into the threaded section of the mounting fixture using a liquid pipe thread compound suitable for gas. If this joint is not 100% airtight fluid will migrate into the tube and the sensor will not operate correctly.

Supplemental Installation Instructions for replacement of the TM-4000 or TC-8000 tank monitor and control system

For general installation instructions refer to the TM-4000 or TC-8000 Installation Manual. This supplement will aid in the replacement of the level sensor on TM-4000 or TC-8000 systems using the SEN-S/S pressure-type level sensor where an earlier version pressure level sensor or an ultrasonic level sensor was applied.

SPECIAL PUMP FEATURE for holding tanks with a filter on breather vent and using pressure-type level sensors:

Explanation: When the pump is turned on liquid is removed from the tank faster than air can replace it due to the constrictive nature of the air filter causing a partial vacuum which is felt by the pressure sensor.

The Special Pump feature allows the pump to run for a pre-set time without looking at the tank level. (Which will be incorrect as described above). During this period the display will flash: "PUMPING" The pump will then turn off for one minute allowing the tank to equalize its pressure. The Master Display will show "EQUALIZING" during this period. The control system will then look at the tank level and turn the pump back on for a time period. This time will be based on the actual tank level (e.g. if the tank level is low the time period will be short). This procedure will continue until the tank is empty.

IMPORTANT: Special Pump Feature: **This feature can only be implemented on later model systems. Check the menu on the programming screen at the master display to see if this feature is listed**

Calibration (or pairing) of the Sensor with its Tank Controller -

Applicable for Regularly Shaped Tanks ONLY *(see note below)

Calibration of the sensor (pairing of the sensor and Tank Controller/Input-Output Unit) can be carried out either prior to or after the sensor has been installed in the tank. For the top-mounted SEN-S/S with probe extending to the bottom of the tank, most installers find it preferable to this pairing/calibration process prior to the sensor being inserted into the tank. An "off-line" calibration eliminates the need to fill and empty the tank which can be particularly time consuming for large holding tanks.

To do an off-line (that is, out of the tank) a calibration on the level sensor to "pair" it with its tank controller, do the following:

Make a calibration tube using a length of ½ inch PVC water pipe (available at a local home improvement store) which has been capped on one end and is longer than the sensor probe being calibrated:

1. Fill PVC pipe at least half full with water
2. Follow the calibration procedure from the installation manual setting the rotary switch to position "0" and do the following:
 - a. Set EMPTY with the probe in open air (out of the calibration tube) using programming button.
 - b. Insert probe completely into tube, being sure that the water spills over the top which insure the probe is measuring the full depth.
 - c. Set FULL or 100% point using programming button.
 - d. Return rotary switch to #2 position (Failure to do so will show as a "Comm Fault" message at the Master Display.)

- e. Observing the Master Display reading, test the Empty and Full position at least once to be sure the calibration has been successful.

* IMPORTANT: This calibration process is only applicable for tanks with a regular shape, that is, those with a flat bottom and vertical sides. Irregularly shaped tanks must be calibrated using the 5-point calibration process described in the Installation Manual with the sensor mounted in the tank.

CAUTION: For calibration of a PRESSURE SENSOR (SEN-S/S) using either the 2-POINT or 5-POINT method with the sensor mounted in the tank:

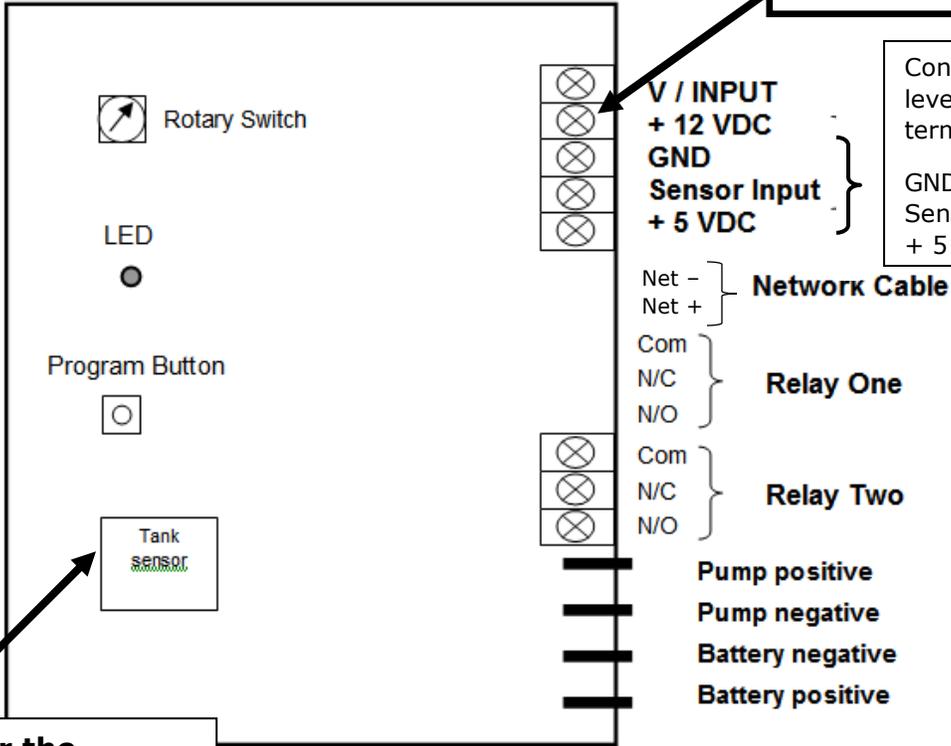
When setting the FULL level, be certain that NO FLUID REMAINS IN THE BREATHER TUBE. Setting the FULL level with a breather pipe which is either partially or completely full, will give a false setting. Any fluid sitting above the top of the tank in the breather tube will cause the system to record that level as the top of the tank rather than the true tank top. Therefore, if you are filling the tank to set the FULL point, DO NOT fill until the fluid spurts out of the breather as a sign of FULL. Be sure you stop the filling at the true tank top, or if you do believe that the breather contains fluid, drain enough fluid (or run the engine long enough) to insure the tank breather is empty.

SEE NEXT PAGE FOR THE WIRING OF THE SEN-S/S TO THE TANK CONTROLLER (BLACK BOX).

CAREFULLY FOLLOW THE WIRING SCHEME TO AVOID DAMAGE TO THE SENSOR UNIT.

Wiring Diagram for Model HB-200/P

CAUTION:
DO NOT use this 12v terminal for the SEN-S/S100 sensor



Connect SEN-S/S100 level sensor to these terminals

GND = Black
 Sensor Input = Green
 + 5 VDC = Red

Not Used for the SEN-S/S100 Level Sensor

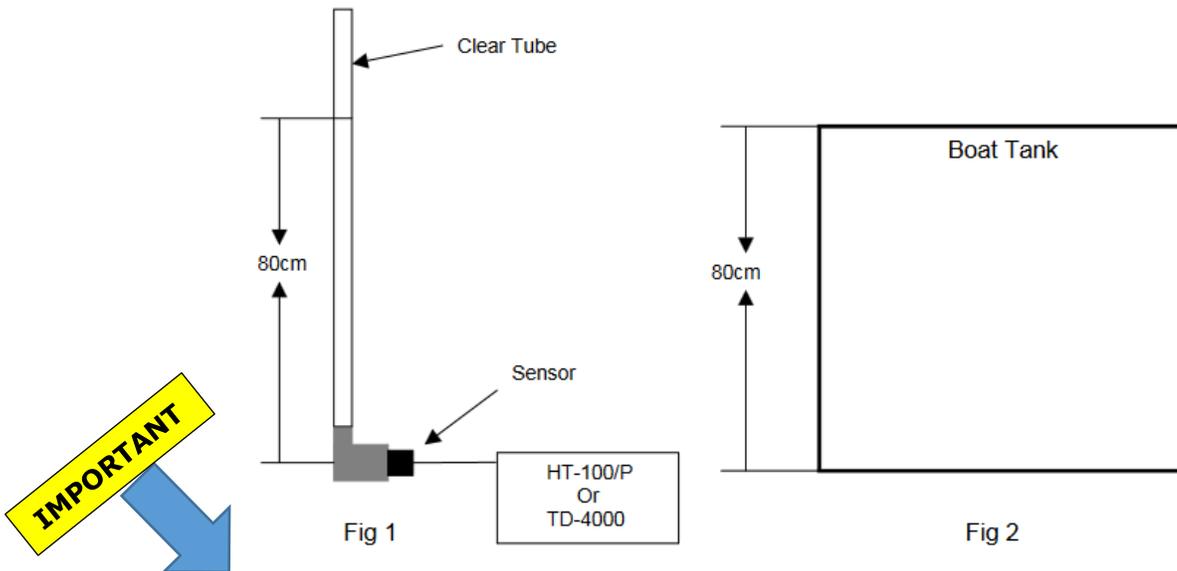
Calibration of Line Mounted Pressure Sensors

This jig allows the off-line calibration of a delivery line mounted sensor. The use of a valve is not necessary but makes it convenient to change sensors if you are calibrating multiple sensors.

A length of clear plastic tubing makes it convenient to measure the depth, but, once again, is not necessary. Any pipe of the proper depth is acceptable.

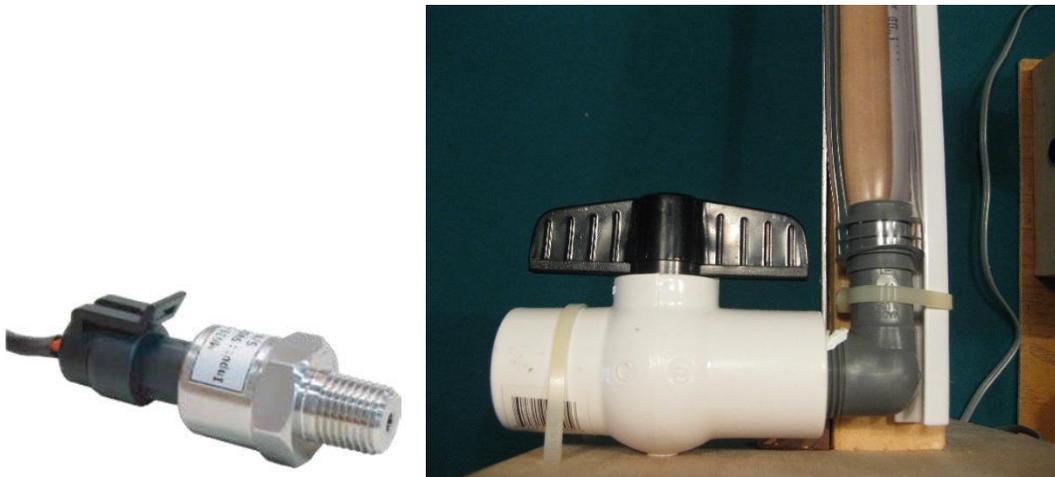
At the bottom of the tubing mount a standard elbow as used for plumbing with an adaptor to go from $\frac{3}{4}$ inch to $\frac{1}{4}$ inch NPT for the sensor element – with the valve being optional.

Calibration of the sensor can be accomplished "off line" (as per Fig 1), if the tank depth is known. A fully calibrated sensor can then be installed, as the boat is available.



NOTE: Diesel and water are different weights therefore either calculate the difference using the method below, or use the actual fluid the tank is being calibrated for.

Diesel fuel weighs 83.3% per volume of water. Therefore, if calibrating for fuel but using water, a factor of 16.7% needs to be deducted from the water level height to provide proper calibration. Using the above example, an 80cm fuel tank would be calibrated as "full" using 66.6cm of water in the tube (80cm X 0.833 = 66.6cm)



Setup and operation of the Day Tank function and the Fuel Transfer function for the TD-4000



There are three choices for transfer of fuel from tank to tank. They are:

- **Manual transfer with auto pump shutdown of sending tank**
- **Day Fuel**
- **Fuel Transfer**

Manual transfer of fuel from tank A to Tank B with auto pump shutdown when Tank A is empty

- In this option, tanks A is designated as "**Transfer**" and B is designated as "**Fuel Tank**" (step 4 of the programming).
- Next, from the Main Menu scroll to "Set Output" to designate which of the two outputs will be associated with the Tank A and **controlling Pump 1**. (Output 1 – blue wire / Output 2 – white wire) You will be returned to the Main Menu.
- Next, on the Main Menu scroll to the "Pump Start/Stop" option. Identify the tank number associated with Tank A and program its high and low levels. You will be returned to the Main Menu.
- Scroll to "Exit Menu" to save data.

Transfer Operation: To transfer, pump the PUMP key from the **Tank A screen**. Pumping will commence and the PUMP symbol will appear either flashing or steady on all screens. The pump will be shut down when the preset low level has been reached in Tank A.

Manual transfer of fuel from tank A to Tank B with auto pump shutdown when Tank B is full

- In this option, tank A is designated as "**Fuel Tank**" and B is designated as "**Transfer**" (step 4 of the programming).
- Next, from the Main Menu scroll to "Set Output" to designate which of the two outputs will be associated with the Tank B and **controlling Pump 1**. (Output 1 – blue wire / Output 2 – white wire) You will be returned to the Main Menu.
- Next, on the Main Menu scroll to the "Pump Start/Stop" option. Identify the tank number associated with Tank B and program its high and low levels. You will be returned to the Main Menu.
- Scroll to "Exit Menu" to save data.

Transfer Operation: To transfer, pump the PUMP key from the **Tank B screen**. Pumping will commence and the PUMP symbol will appear either flashing or steady on all screens. The pump will be shut down when the preset high level has been reached in Tank B.

Automatic Transfer of Fuel from Tank A to Tank B (Day Fuel)

If you select **Day Fuel** as the "Input Type" (step 4 of the "Program Tank" operation), the TD-4000 will automatically turn on the transfer pump when the day tank reaches a programmed low level and begin to move fuel to the day tank. At the programmed high level, the transfer pump will automatically shut down.

To implement this function, you must **first designate the "Tank Type" for Tank B (diagram above) as a Day Tank**. After setting the alarm point and designating audible alarm (Y/N), setting the volume in gallons or liters, you will be returned to the main menu. Scroll to the menu item "Pump Start/Stop". Identify the Input # of the day tank. Then set the "pump start" tank level by moving the

bar graph up or down (scroll and backlight keys), and set the "pump stop" level. You will be returned to the Main Menu.

Next, on the Main Menu scroll to the "Pump Start/Stop" option. Identify the tank number associated with Day Tank (B) and program its high and low levels. You will be returned to the Main Menu.

Next, from the Main Menu scroll to "Set Output" to designate which of the two outputs will be associated with the Day Tank (B). (Output 1 – blue wire / Output 2 – white wire) You will be returned to the Main Menu.

Next program **Tank A's** Input Type as a "**Fuel Tank**" (step 4) and set name, volume, and low level alarm point. You will be returned to the Main Menu.

Scroll to "Exit Menu" to save data.

Now, the Day Tank will automatically be maintained at a level between the low and high levels set during tank programming. Whenever fuel is being pumped into the Day Tank, the PUMP symbol will begin flashing on the Day Tank (tank B) display and a steady PUMP symbol on Tank A's display. No manual intervention is required, however, the pump can be shut down at any time by pressing the Pump key. It will be necessary to verify Tank A has sufficient fuel at all times since the pump will operate irrespective of Tank A's level. A visual indicator and optional audible alarm will be generated if the fuel level drops below the preset alarm point.

Fuel Transfer between Tanks A and B in either direction

Generally, the Fuel Transfer option is used when fuel is to be transferred back and forth between Tanks A and B.

- i. In this option, both tanks A and B are designated as "**Transfer Tank's**" (step 4 of the programming).
- ii. Next, from the Main Menu scroll to "Set Output" to associate each tank with the pump that fills that tank. In the diagram above, **Tank A will be associated with Pump 2** since Pump 2 fills Tank A from Tank B. Similarly **Pump 1 will be associated with Tank B** since it fills Tank B from Tank A.
- iii. After programming the outputs for each tank, you will be returned to the Main Menu.
- iv. Next, on the Main Menu scroll to the "Pump Start/Stop" option. Identify the tank number associated with Tank A and program its high and low levels. You will be returned to the Main Menu. Identify the tank number associated with Tank B and program its high and low levels. You will be returned to the Main Menu.
- v. Scroll to "Exit Menu" to save data.

In operation you MUST start the transfer operation by pushing the PUMP key FROM THE SCREEN of the TANK TO BE FILLED. For example, if you want to transfer fuel from Tank A to Tank B, go to Tank B's screen display and push the PUMP key. The pump will start, the PUMP symbol will flash, and pumping will continue until either Tank B's high limit is reached or the pump is shut off by pressing the pump button while on screen B.

The operation is similar for transfer from tank B to tank A. Go to Tank A's screen display and push the PUMP key. The pump will start, the PUMP symbol will flash, and pumping will continue until either Tank A's high limit is reached or the pump is shut off by pressing the pump button while on screen A.

If it is desirable to stop the transfer automatically if the sending tank is empty, or at its low limit, rather than the receiving tank being full, the pump associated with each tank must be reversed. That is, Tank A must be associated with output #1 (pump #1) and tank B with output #2 (pump #2) and pumping must be initiated from the sending tank

Calibration of the tank depth using a potentiometer for large tanks with delivery line mounted pressure sensors

An alternative to doing a direct calibration of the tank controller using methods described on page 18, is the setting of levels using a potentiometer. Refer to the table below for the voltage settings at the "sensor" terminal on the tank controller for water/waste water and fuel for both the SEN-S/S 100 (max depth of water 1.0 meters) and SEN-S/S 250 sensors (max depth of water 2.5 meters). Note: Max depth of fuel is greater (See NOTE on page 17) **Fine tune the settings using the techniques described on page 10.**

SmartSwitch Model SEN-S/S 100 and SEN-S/S 250 Stainless Steel Pressure Sensor												
Calibration Voltage Settings for Water/Waste Water and Fuel Tanks												
SEN-S/S 100 Voltage Settings						SEN-S/S 250 Voltage Settings						
0.203						0.075						
Tank Depth inches	Voltage setting for Water	Voltage setting for Fuel	Tank Depth cm	Tank Depth inches	Voltage setting for Water	Voltage setting for Fuel	Tank Depth cm	Tank Depth inches	Voltage setting for Water	Voltage setting for Fuel	Tank Depth cm	
47		4.6	120	118		4.5	300	55	2.9	2.4	140	
45		4.4	115	116		4.4	295	53	2.8	2.3	135	
43		4.2	110	114		4.3	290	51	2.7	2.2	130	
41		4.0	105	112		4.3	285	49	2.6	2.2	125	
39	4.6	3.8	100	110		4.2	280	47	2.6	2.1	120	
37	4.4	3.6	95	108		4.1	275	45	2.5	2.1	115	
35	4.2	3.5	90	106		4.0	270	43	2.4	2.0	110	
33	4.0	3.3	85	104		4.0	265	41	2.3	1.9	105	
31	3.8	3.1	80	102		3.9	260	39	2.2	1.9	100	
30	3.6	3.0	75	100		3.8	255	37	2.2	1.8	95	
28	3.4	2.8	70	98	4.5	3.7	250	35	2.1	1.7	90	
26	3.2	2.7	65	96	4.4	3.7	245	33	2.0	1.7	85	
24	3.0	2.5	60	94	4.4	3.6	240	31	1.9	1.6	80	
22	2.8	2.3	55	93	4.3	3.5	235	30	1.9	1.6	75	
20	2.6	2.1	50	91	4.2	3.5	230	28	1.8	1.5	70	
18	2.4	2.0	45	89	4.1	3.4	225	26	1.7	1.4	65	
16	2.2	1.8	40	87	4.1	3.4	220	24	1.6	1.4	60	
14	2.0	1.6	35	85	4.0	3.3	215	22	1.6	1.3	55	
12	1.8	1.5	30	83	3.9	3.2	210	20	1.5	1.2	50	
10	1.6	1.3	25	81	3.8	3.2	205	18	1.4	1.2	45	
8	1.4	1.1	20	79	3.8	3.1	200	16	1.3	1.1	40	
6	1.2	1.0	15	77	3.7	3.1	195	14	1.3	1.1	35	
4	1.0	0.8	10	75	3.6	3.0	190	12	1.2	1.0	30	
2	0.8	0.6	5	73	3.5	2.9	185	10	1.1	0.9	25	
0	0.5	0.4	0	71	3.5	2.9	180	8	1.0	0.9	20	
				69	3.4	2.8	175	6	1.0	0.8	15	
				67	3.3	2.7	170	4	0.9	0.7	10	
				65	3.2	2.7	165	2	0.8	0.7	5	
				63	3.2	2.6	160	0	0.7	0.6	0	
				61	3.1	2.6	155					
				59	3.0	2.5	150					
				57	2.9	2.4	145					