TS1
Ultra Sonic Tank Sender
Training

18 March 2008

Topics

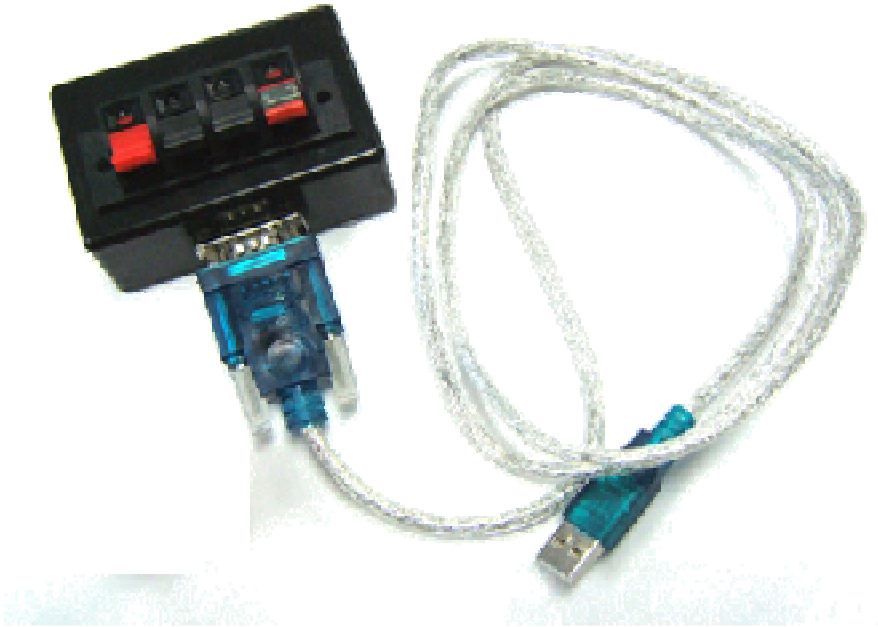
- TS1 Tank Sender
- TS1-PK Programming Kit
- TS1 Programming Software
- Programming TS1
- Troubleshooting

TS1

- TS1 is an advanced tank sender based on the ultra sonic measurement technology.
- Same tank sender can be configured via software to support:
  - 240-33ohm gauge, 10-180ohm gauge and 0-5volt DC meter
  - All size tanks with depth up to 2 meters
  - Accurate measurement for non-linear size tank
  - Standard SAE 5 mounting hole and easy fit

TS1 Tank Sender

TS1-PK Programming Kit



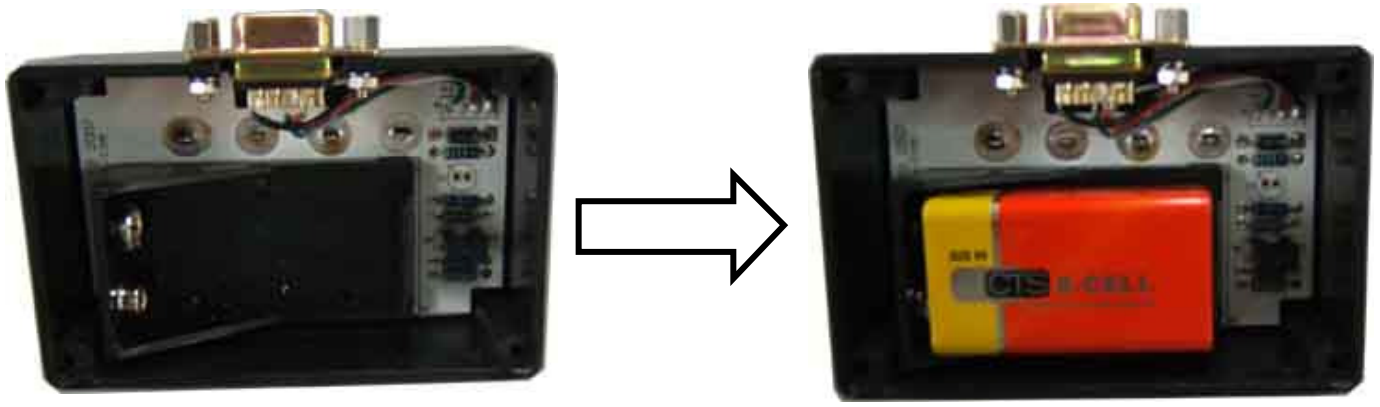
TS1-PK

- TS1-PK is the programming kit for the TS1 tank sender, which enables TS1 to be pre-programmed for target tank via a computer USB port.
- Consists of one interface box and one USB-to-Serial converter cable.
- One 9V battery must be installed into the interface box before use.

TS1-PK (battery not included)

Battery Installation

- Install the 9V battery into the TS1-PK interface box as shown below.
- Put the back cover on with four screws provided with the TS1-PK kit.

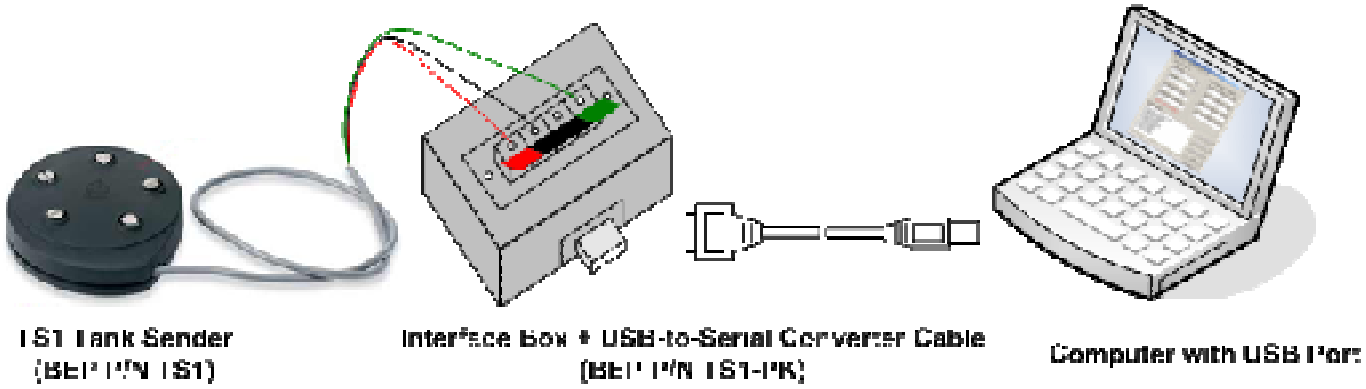


TS1-PK without 9V Battery

TS1-PK with 9V Battery installed

Connection

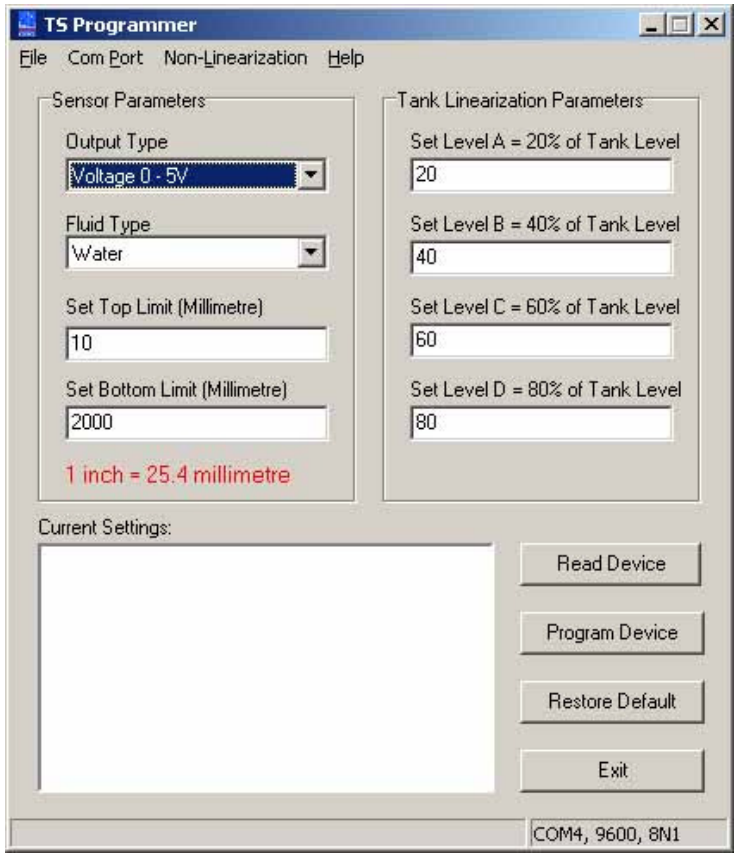
- The following diagram illustrates the connection between TS1 and TS1-PK, computer and TS1-PK.
- The computer will be running the TS1 Programming software, called “TS Programmer”.



USB Driver

- USB Driver needs to be installed on the computer for the USB-to-Serial cable.
- Available for download from the BEP website www.bepmarine.com under *Technical Information and Downloads*.
- USB Driver Installation
  - DO NOT plug in the cable before installation.
  - Runs under Win98, 2K, XP and Vista.
  - Double-click the installation file and follow the on screen instructions.
  - Detailed instruction is also available from *Technical Information and Downloads*.

TS1 Programming Software



TS Programmer

- TS Programmer is a 32-bit Windows application that runs on a computer to pre-program the parameters of TS1 via TS1-PK.
- Parameters include:
  - Output Type: *0-5V*, *240-33R*, *10-180R*
  - Fluid Type: *water*, *petrol*, *diesel*, *waste*
  - Top Limit in Millimetres
  - Bottom Limit in Millimetres
  - Linearization Parameters

Obtaining TS Programmer

- Available for download from the BEP Marine website www.bepmarine.com under *Technical Information and Downloads*.
- TS Programmer Installation
  - REMOVE any old version before installation
  - Runs under Win98, 2K, XP and Vista.
  - Double-click the installation file and follow the on screen instructions.

Running TS Programmer

- After installation, a shortcut called “TS Programmer” will be created on the Windows desktop.
- The “TS Programmer” shortcut can also be accessed from the Windows Start menu under Programs BEP Marine.
- Double-click the shortcut to start the TS Programmer software.

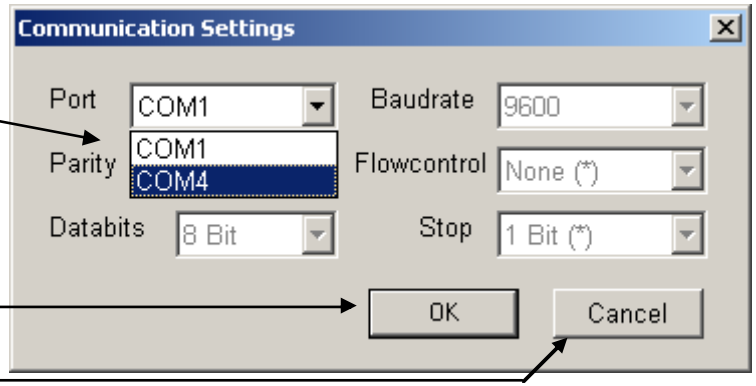
Selecting Com Port

- At start-up, you will be prompted to select a COM port for TS Programmer.
- If the USB-to-Serial cable has not been plugged into the computer's USB port, click the Cancel button. Otherwise, select the COM port with the highest number and click the OK button. *

Select the **COM port** from the pull-down list

Click the **OK** button to open the COM port

Click the **Cancel** button to NOT select a COM port



* You may need to select a different COM port if the one you selected does not work.

User Interface

Three Output Types:

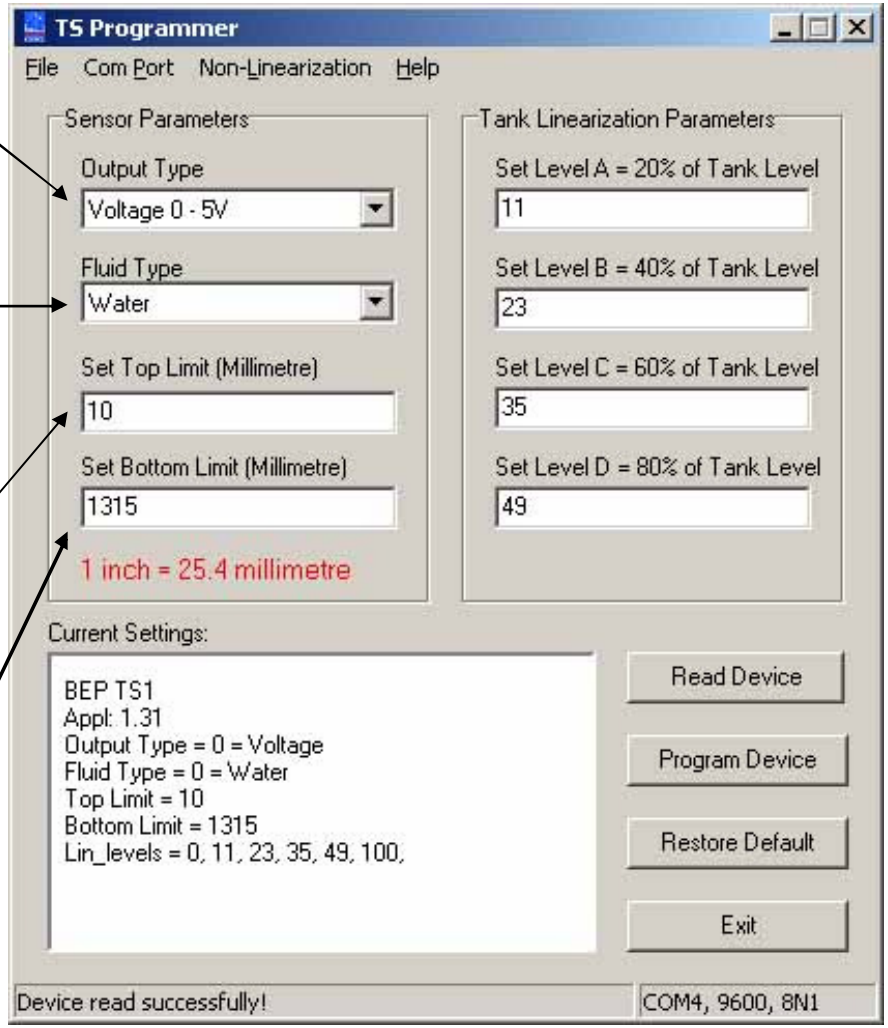
- Voltage 0-5V
- Resistive 240 – 33R
- Resistive 10-180R

Four Fluid Types:

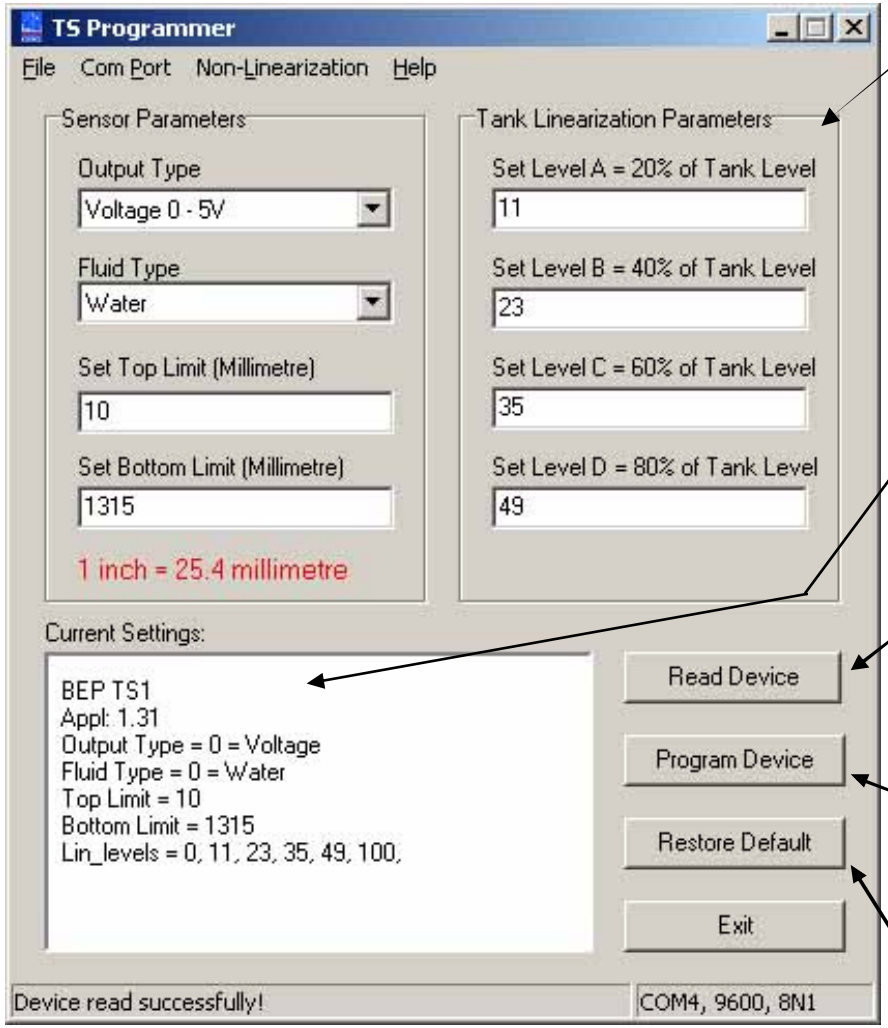
- Water
- Petrol
- Diesel
- Waste

Top Limit (TL) is the distance from the tank top to the fluid surface that will be considered as full tank.

Bottom Limit (BL) is the distance from the tank top to the fluid surface that will be considered as empty tank.



User Interface (cont)



* BL = Bottom Limit

Linearization Parameters:

- A = % Volume @ 20% of BL
- B = % Volume @ 40% of BL
- C = % Volume @ 60% of BL
- D = % Volume @ 80% of BL

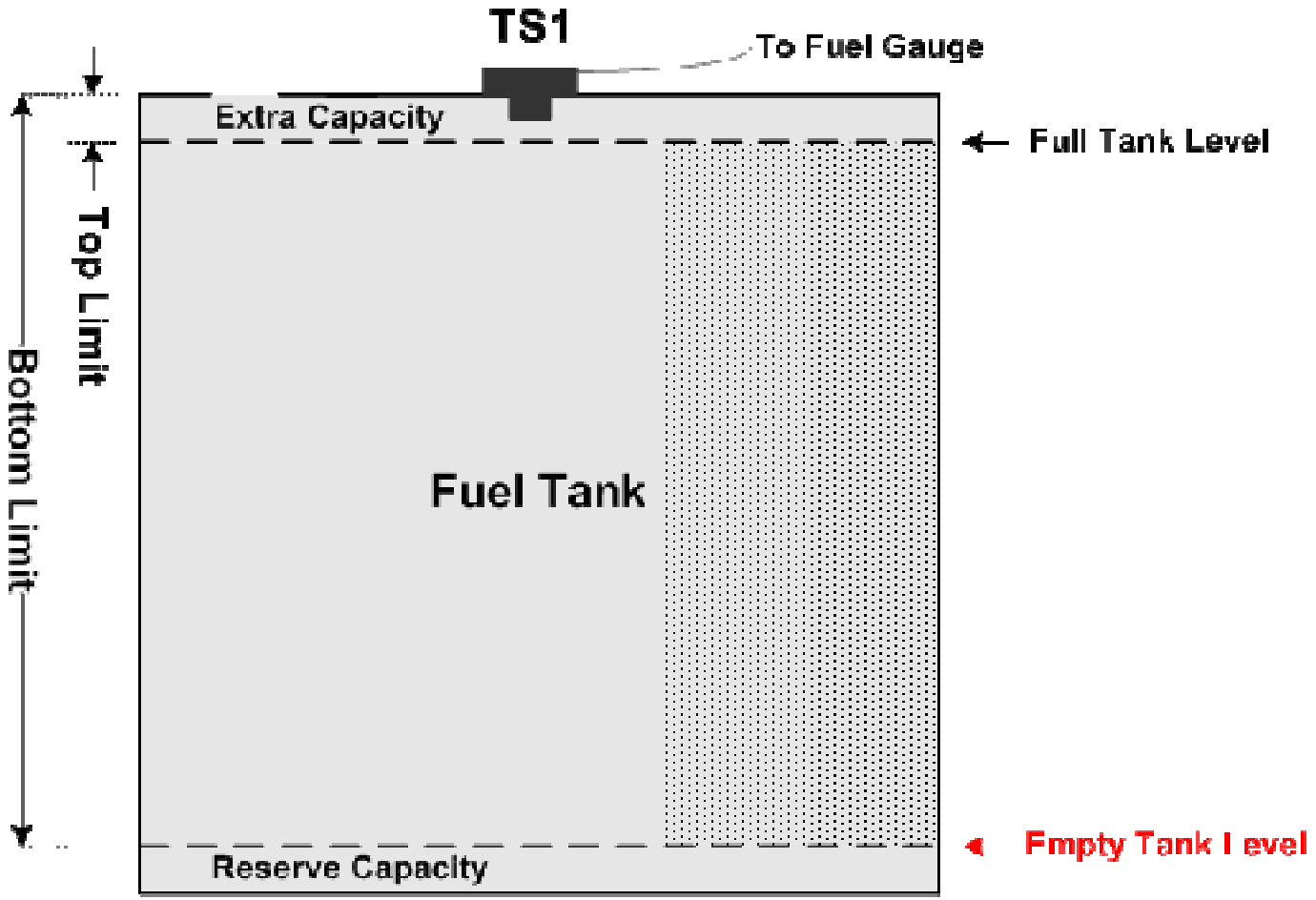
Current Settings box displays the communication status and readings from the target TS1 including firmware version.

Press the **Read Device** button to retrieve the firmware version and parameter values from the target TS1.

Press the **Program Device** button to configure the target TS1 with the defined parameter values.

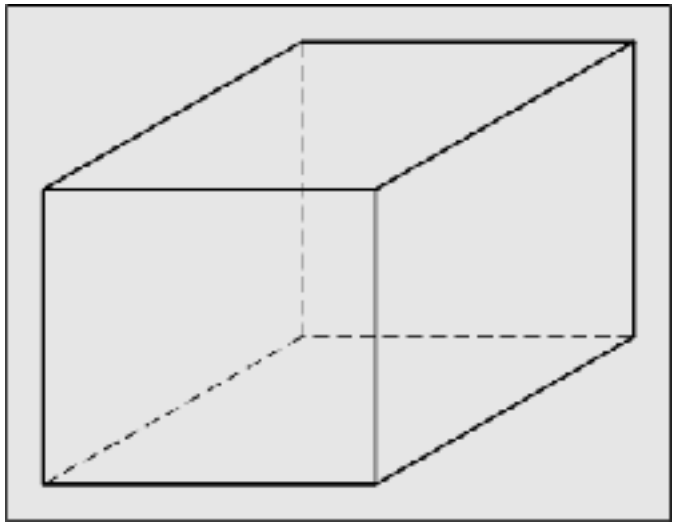
Press the **Restore Default** button to restore the target TS1 to its factory default values.

Top & Bottom Limits

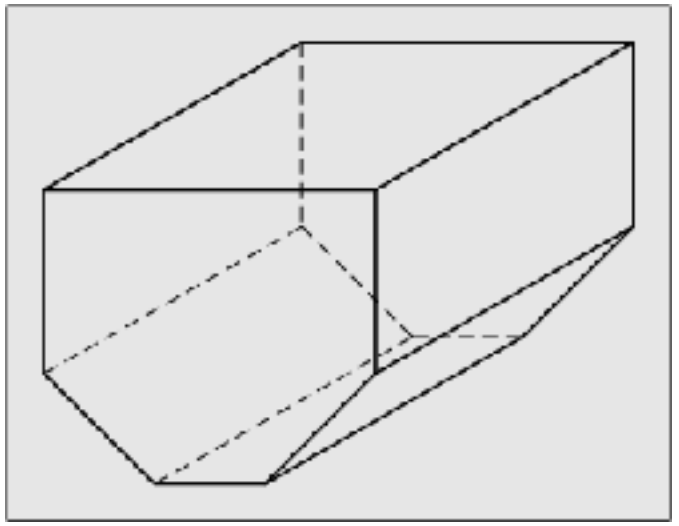


Linearization Parameters

- Linearization parameters are used to adjust the measurement accuracy for non-linear fuel tanks.
- A fuel tank is non-linear if the tank height is not proportional to its capacity.



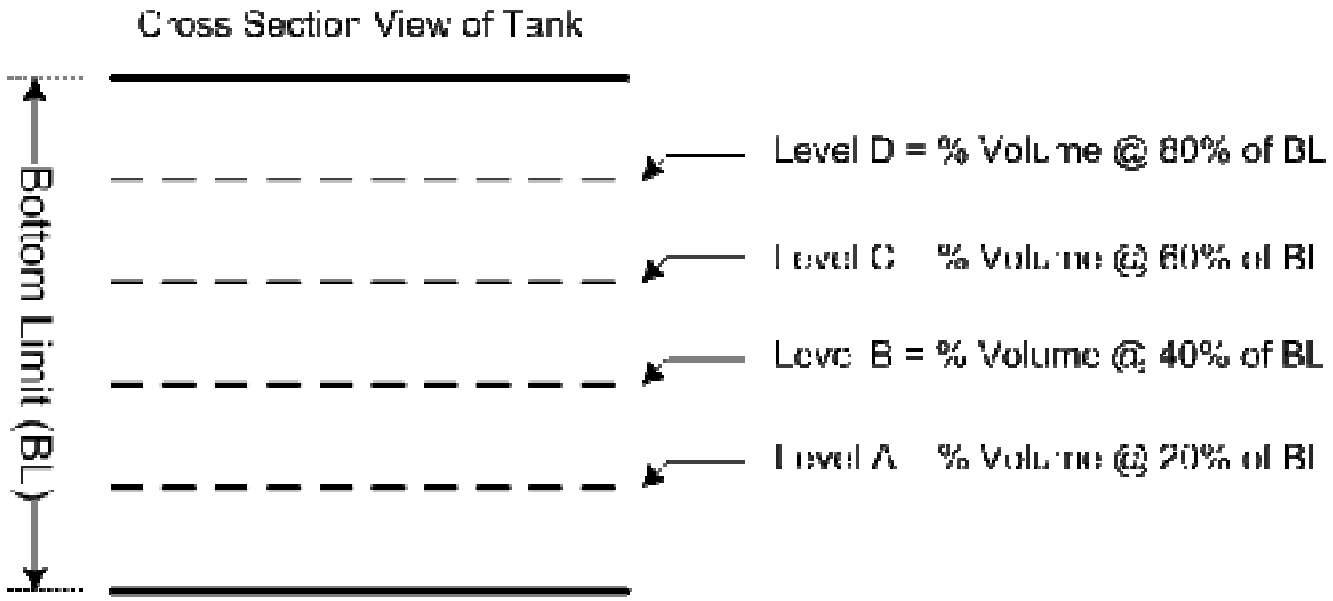
Linear Fuel Tank



Non-Linear Fuel Tank

Linearization Parameters (cont)

- Four level parameters, A, B, C, D, each represents the % fuel volume at 20%, 40%, 60% and 80% of the tank's bottom limit.
- For linear tank, A=20, B=40, C=60, D=80



* Tank's bottom limit is a user setting and can be different from tank's depth or height!

Linearization Parameters (cont)

- For non-linear tank, the linearization parameters are calculated as follows.

Example:

Assume full tank volume is 200 Litres and

Volume @ 20% BL is 30 Litres

$\Rightarrow$ % volume = 30/200 = 15% $\Rightarrow$ **Level A = 15**

Volume @ 40% BL is 50 Litres

$\Rightarrow$ % volume = 50/200 = 25% $\Rightarrow$ **Level B = 25**

Volume @ 60% BL is 110 Litres

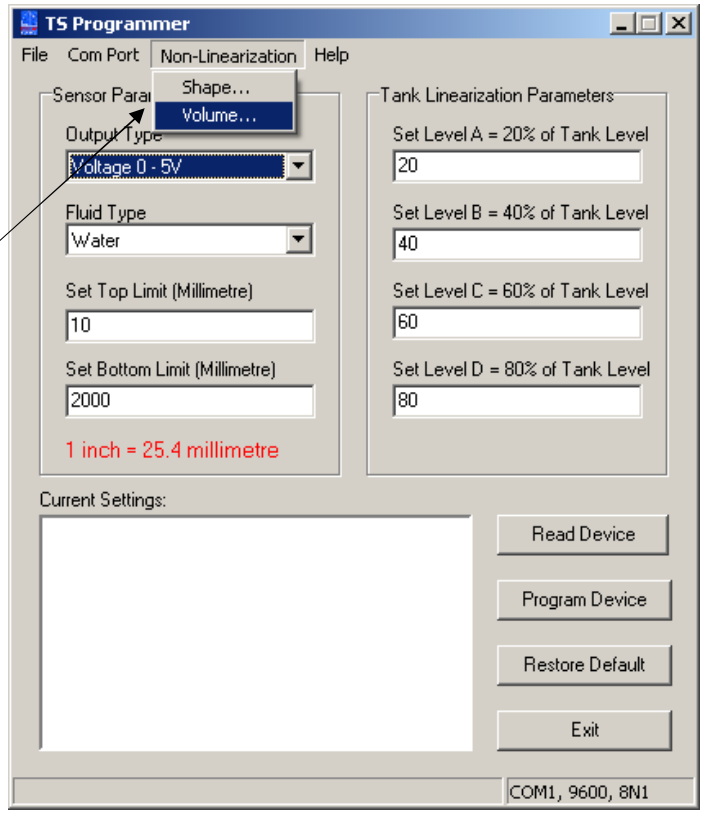
$\Rightarrow$ % volume = 110/200 = 55% $\Rightarrow$ **Level C = 55**

Volume @ 80% BL is 150 Litres

$\Rightarrow$ % volume = 150/200 = 75% $\Rightarrow$ **Level D = 75**

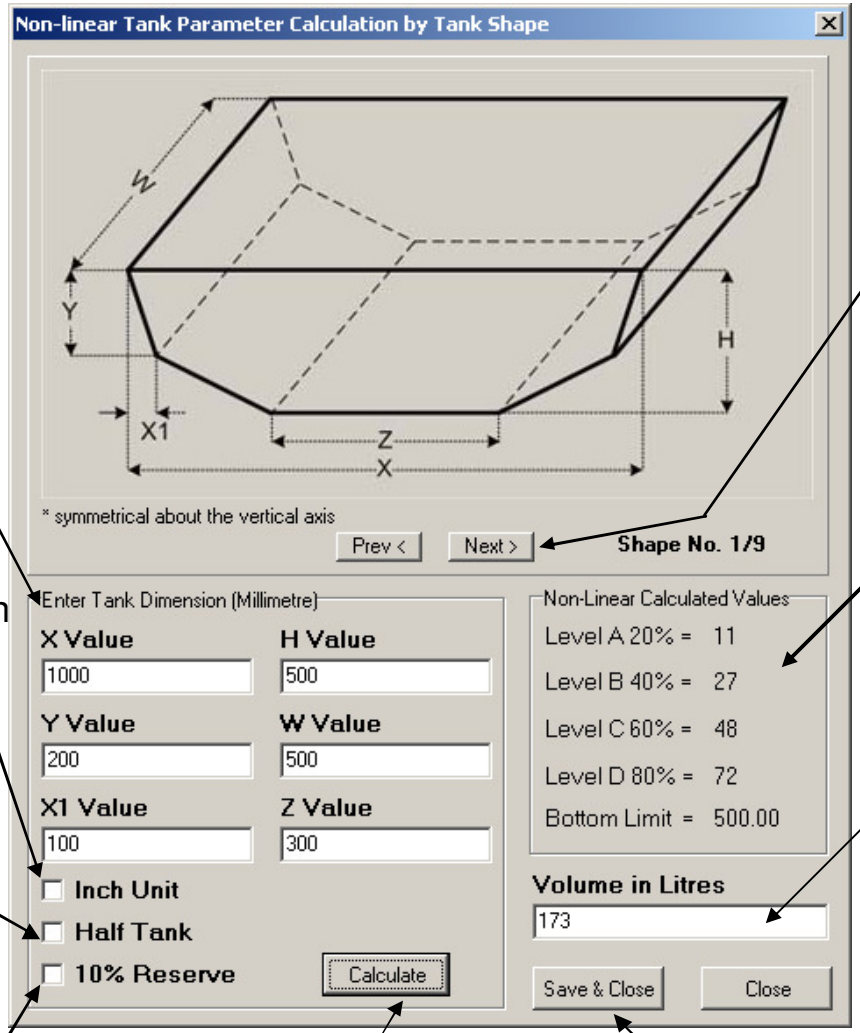
Linearization Calculation Tools

- TS Programmer provides two calculators to help the user calculate the linearization parameters
  - using tank shape
  - using tank volume



Select the calculator from the **Non-Linearization** menu

Calculation by Shape



Enter your tank dimension.

If tank dimension unit is US inch, tick this box.

Tick this box if your tank is half size of the selected one.

Tick this box to enable 10% reserve. New BL will be calculated.

Click this button to perform calculation

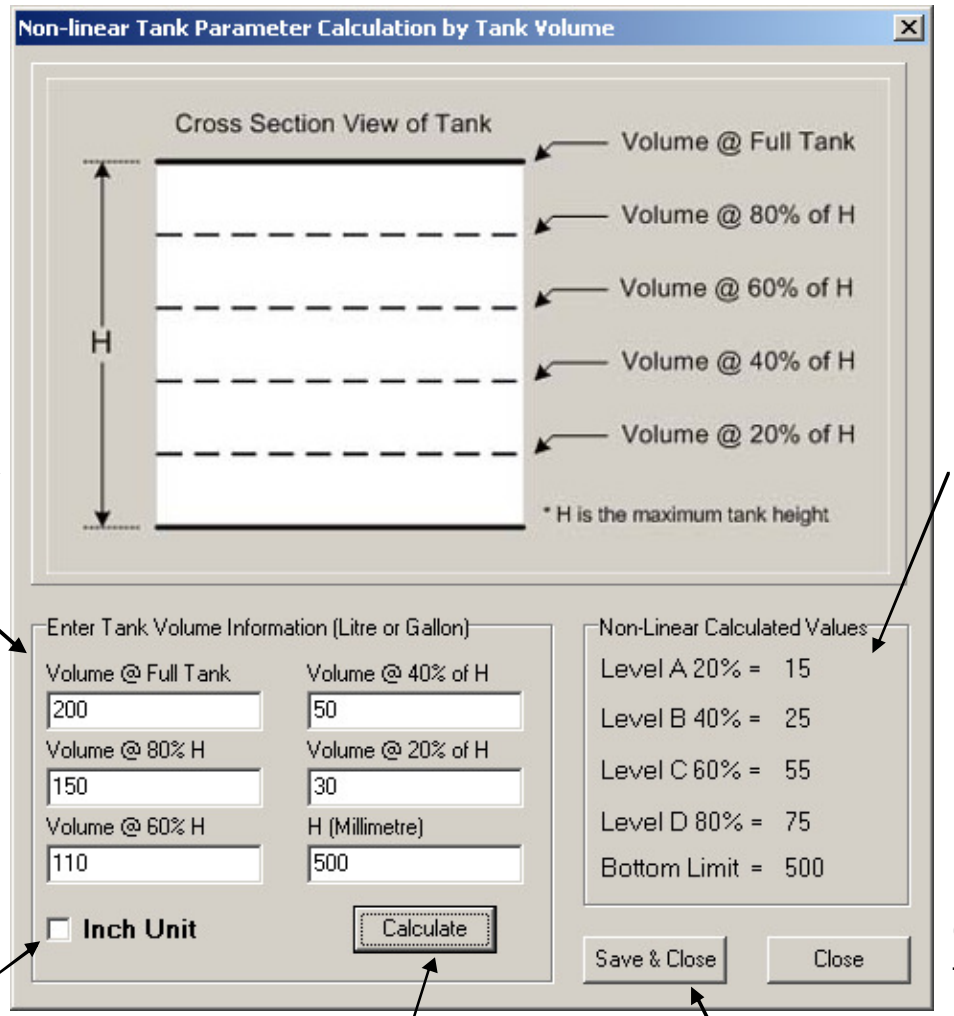
Select your tank shape. Tick the **Half Tank** box if your tank is half size.

Calculated linearization parameter values and bottom limit (if 10% reserve is selected).

Calculated tank volume.

Click this button to save the calculated values to the main form.

Calculation by Volume



Enter your tank volume data.

Calculated linearization parameter values and bottom limit.

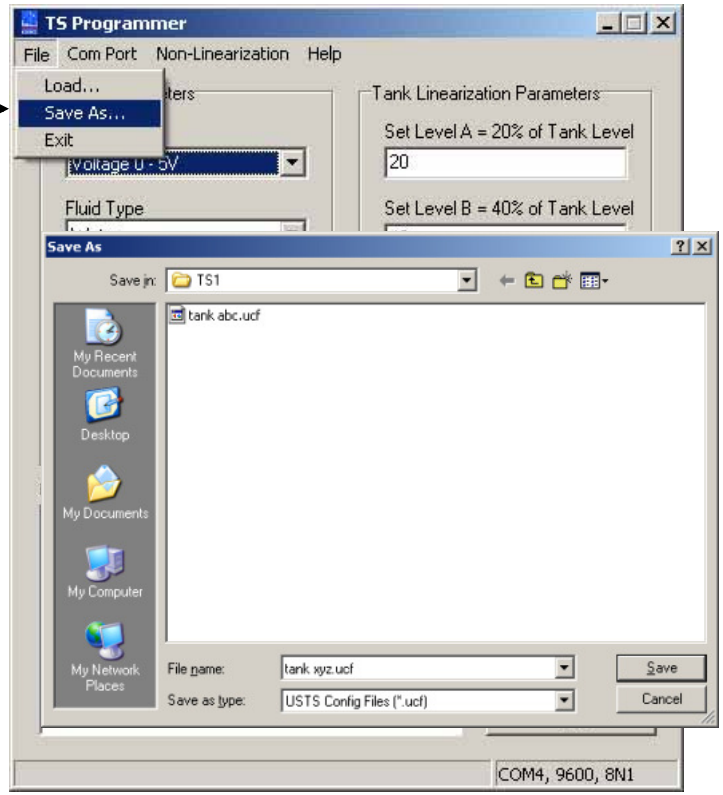
If tank dimension unit is US inch, tick this box.

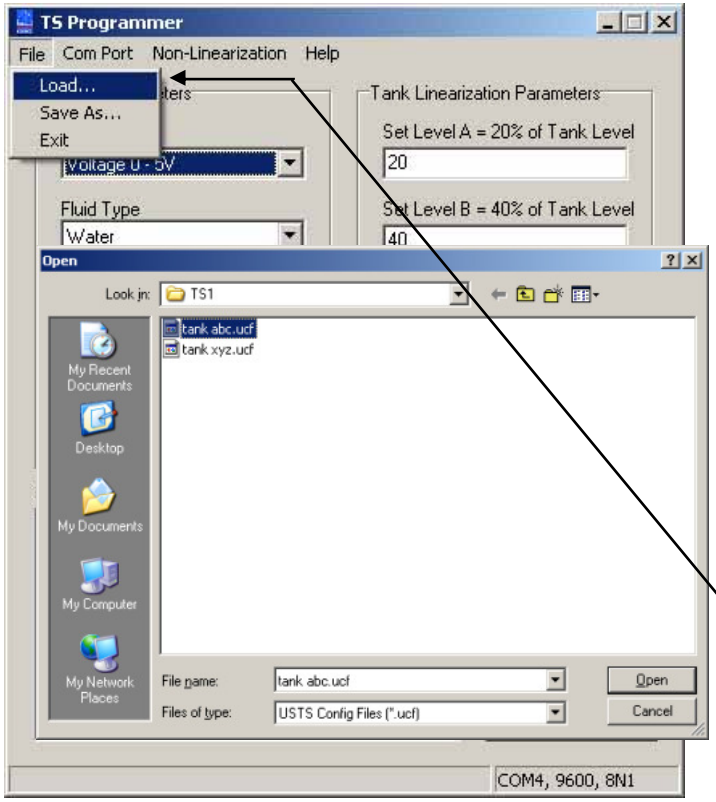
Click this button to perform calculation

Click this button to save the calculated values to the main form.

Save & Load Configuration

Click **File Save As…** to save the target tank parameter settings to a configuration file (.ucf), which can be loaded later.

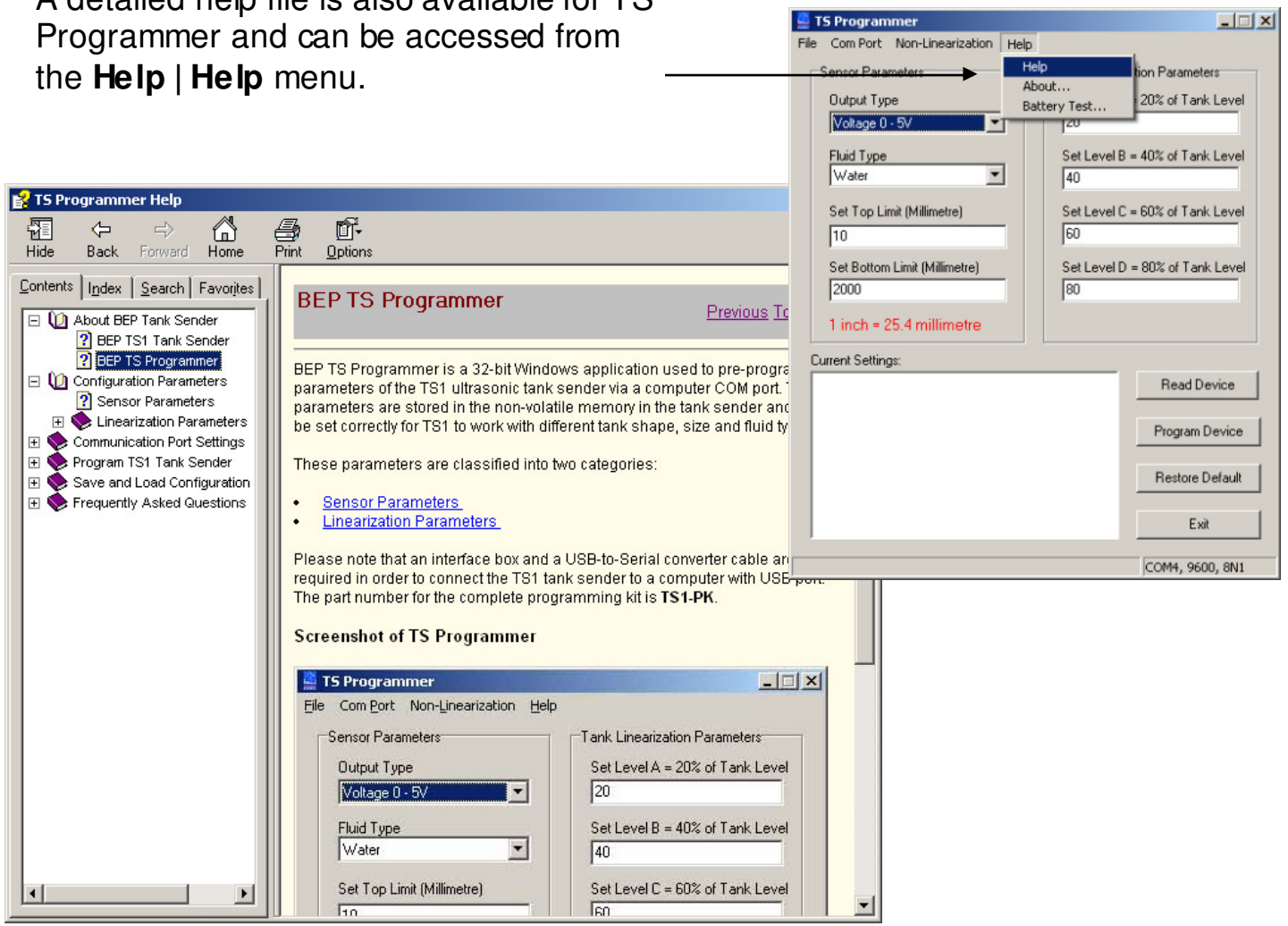




Click **File Load…** to load the saved target tank parameter settings from a configuration file (.ucf).

TS Programmer Help

A detailed help file is also available for TS Programmer and can be accessed from the **Help** | **Help** menu.



Programming TS1

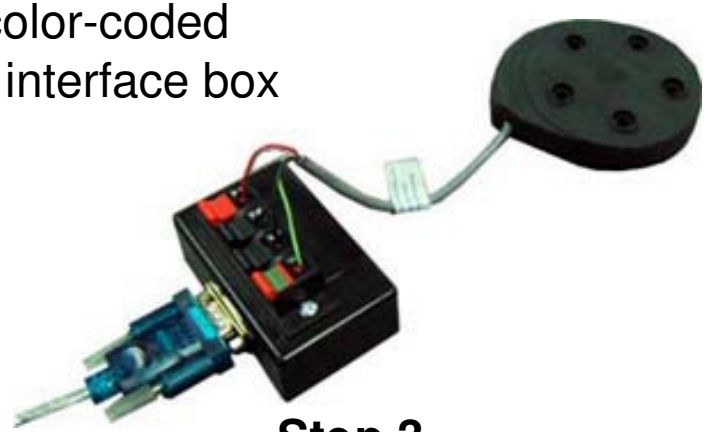
Step-by-Step Connection

(9V Battery Installed)

Step 1
Connect three TS1 wires to their corresponding color-coded connectors on the interface box

(USB Driver Installed)

Step 2
Connect the USB-to-Serial cable to the computer's USB port

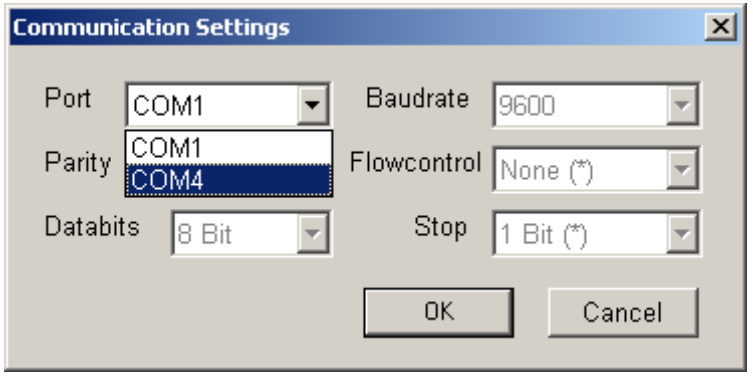


Step 3
Connect the USB-to-Serial cable to the interface box's DB9 port

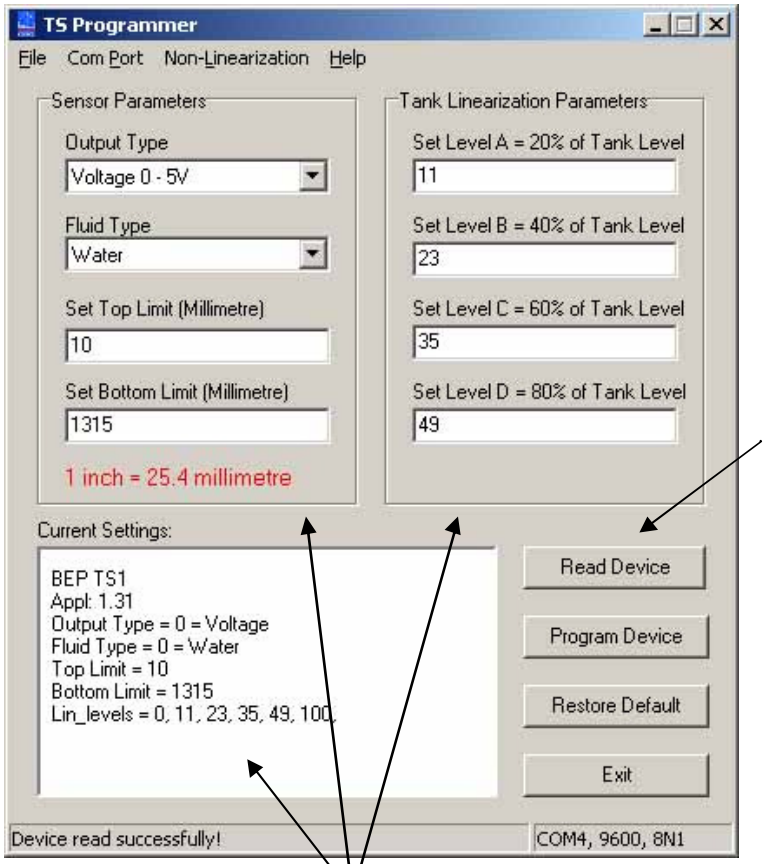
Step 4
Start TS Programmer on the computer now!

Select COM Port

- When TS Programmer starts, it will prompt the user to select a COM port.
- If there are more than one COM ports, select the one with highest number as the USB-to-Serial cable normally has the highest number.
- If it does not work, please try the COM ports in the drop-down list from high to low.



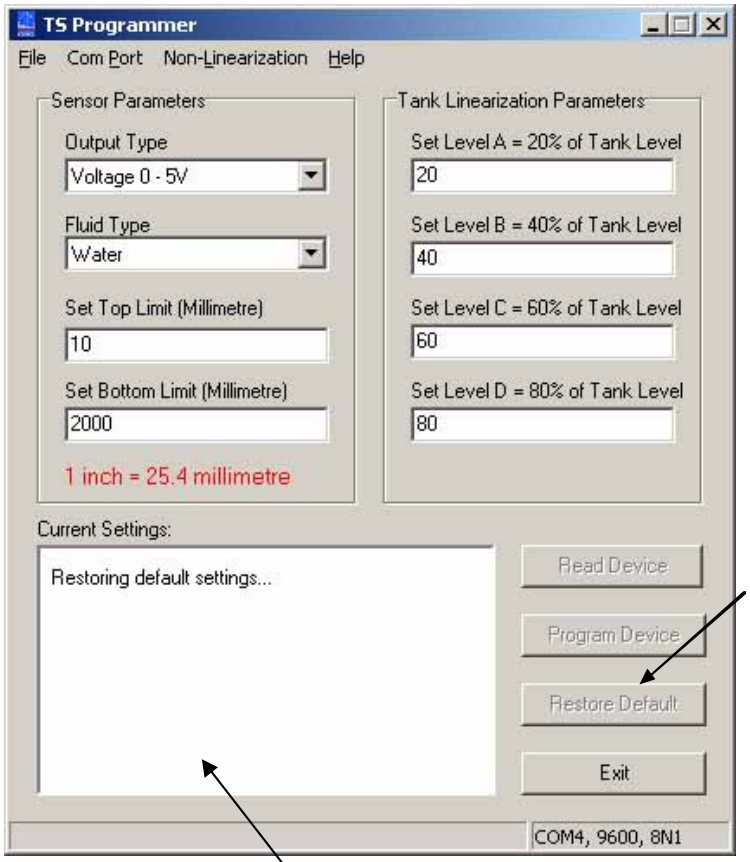
Read TS1



Press the **Read Device** button to retrieve the firmware version and parameter values from the TS1.

Results will be displayed in the **Current Settings** box and updated in the parameter edit boxes.

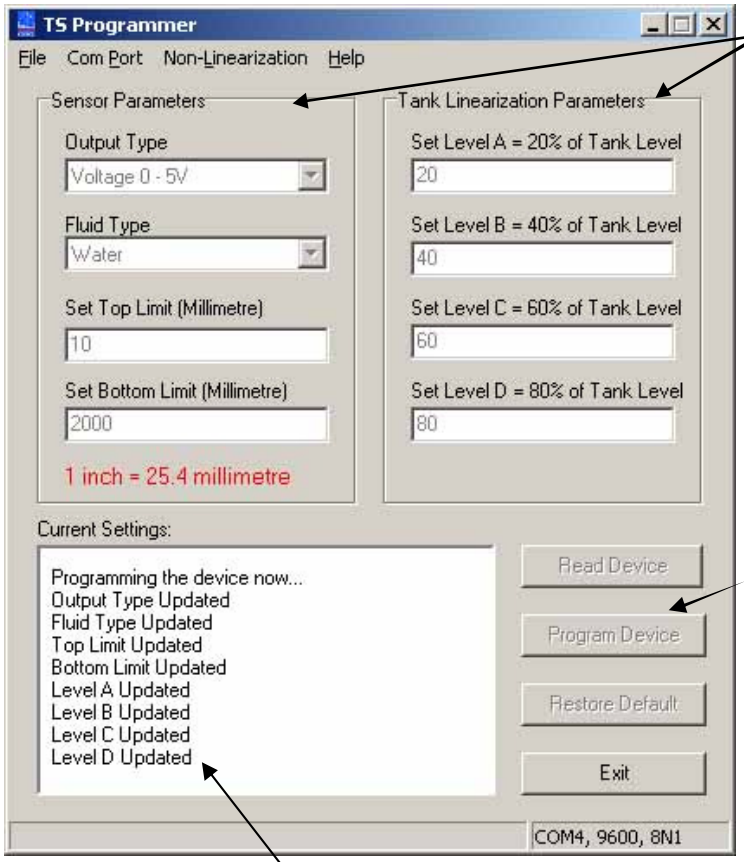
Restore Factory Default



Press the **Restore Default** button to restore the target TS1 to its factory default values.

Restoring progress will be displayed in the **Current Settings** box.

Program TS1

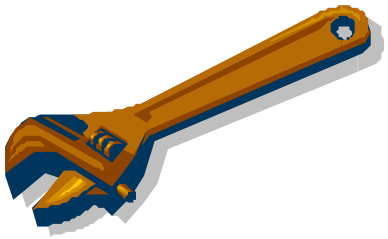


Enter the parameter values for the target TS1. You may use the **linearization calculator** to calculate the linearization parameters and bottom limit, or load the parameter values from a saved configuration file.

Press the **Program Device** button to configure the target TS1 with the above parameter values.

Programming progress will be displayed in the **Current Settings** box.

Troubleshooting



TS1 Issues

- My tank is one meter deep and when it is empty, the gauge still shows half full.

Ans: The bottom limit may have been set to two meters for the TS1. Read the setting from the TS1 and re-program it with the right values.

TS1 Issues (cont)

- When connecting the TS1 to my gauge, the gauge shows full when the tank is empty and vice versa.

Ans: The gauge may be a 240-33ohm gauge but the TS1 output is set to 10-180ohm or vice verse. Read the settings from the TS1 and make sure that the output type has been set to the correct gauge type.

TS1 Issues (cont)

- My gauge starts to swing between full and empty after certain time.

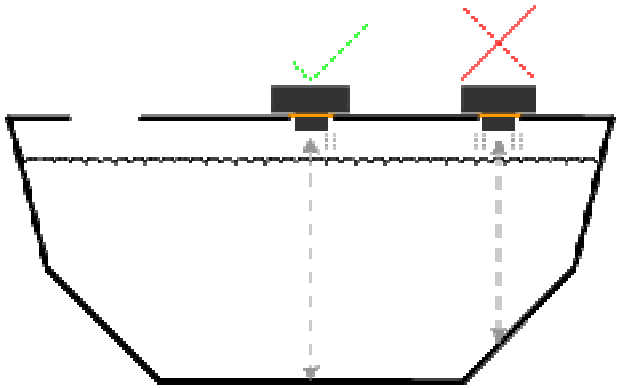
Ans: When TS1 cannot detect a valid fuel level from the tank, it will behave this way after 10 minutes. As soon as it detects a valid fuel level, the swing should stop. Fill up your tank and if the behavior persists, then you might have a faulty TS1.

TS1 Issues (cont)

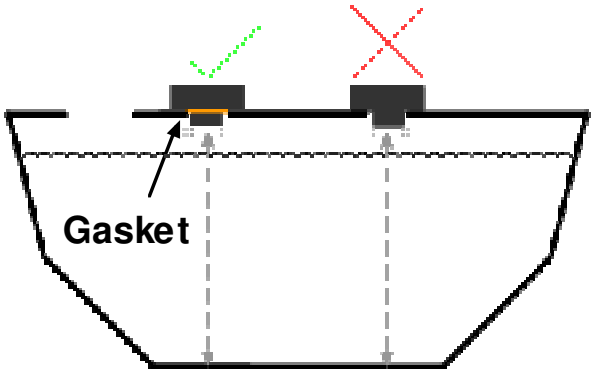
- I can hear the ‘click’ sound from the TS1. My gauge shows empty though there are still fuel in the tank. Also, I cannot read or program the TS1.

Ans: The output driver of the TS1 may have been damaged. It could be caused by incorrect wiring, for example, connecting the green wire to negative and the black wire to the gauge input.

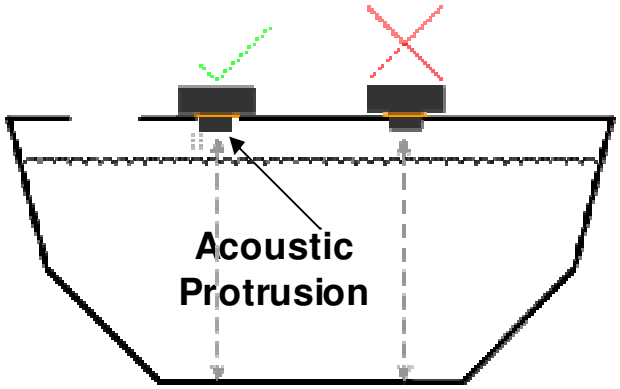
TS1 Installation Issues



Case 1
TS1 must be mounted at the deepest tank point!



Case 2
Gasket must be used!

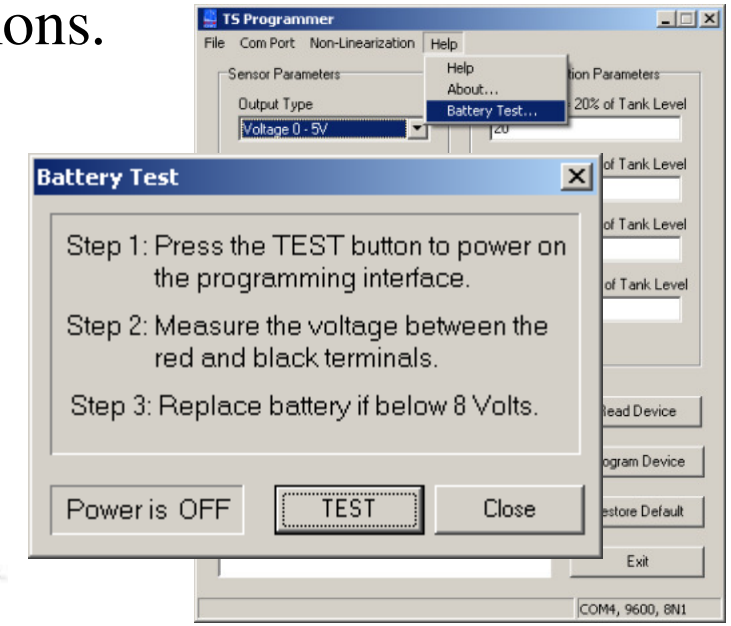


Case 3
Acoustic protrusion must not touch the tank frame.

TS1-PK Issues

- How do I check the condition of 9V battery in the interface box?

  Ans: Connect a voltmeter to the red and black connectors on the interface box as shown below. Open the **Battery Test** dialog from the **Help | Battery Test…** menu of TS Programmer. Follow the on screen instructions.



TS1-PK Issues (cont)

- I was asked to install the driver for the USB-to-Serial cable every time I plugged the cable into my computer and the COM port number keeps changing!

  Ans: For WinXP, if you plug the USB-to-Serial cable into a USB port for the first time, you will be asked to install the driver for this particular USB port (although you may have already installed the driver for the other USB port previously) and the COM port number will be different from different USB ports. This issue does not occur under Win98 or Win2K.

TS Programmer Issues

- When TS Programmer starts, no COM port is shown in the Port drop-down list.

  Ans: Please make sure that the USB-to-Serial cable is plugged into your computer and the driver has been installed correctly.

- When the correct COM port is selected, a warning dialog pops up, saying “Cannot Open COM port!”

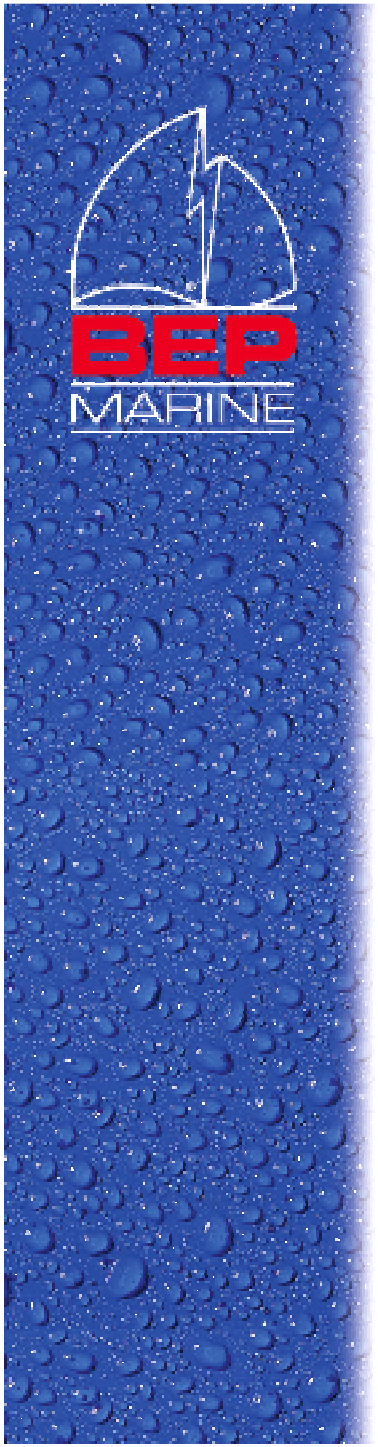
  Ans: Please make sure that no other software is using the COM port. Reboot your computer if necessary.

TS Programmer Issues (cont)

- Cannot read or program TS1. An error dialog pops up, saying “Failed to connect with the device! Check battery or connection”

Ans: Please make sure that

1. All the physical connections are correct.
2. The correct COM port is selected.
3. The battery in the interface box is not depleted.
4. TS1 is not faulty due to incorrect wiring.



The End!