RARITAN SMART TANK MONITOR

OPERATION AND INSTALLATION INSTRUCTIONS

WARNING: *Raritan Engineering Company,Inc.recommends that a qualified person install this product. Equipment damage,injury to personnel or death could result from improper installation. Raritan Engineering Company,Inc. accepts no responsibility or liability for damage to equipment, or injury or death to personnel,that may result from improper installation or operation of this product.*

Introduction

Thank you for purchasing the TM-4000 Tank Monitor System. You have selected a capable system designed to provide years of reliable service under the most demanding conditions.The TM-4000 Tank Monitor System is a versatile, compact, modern, stylish, user-friendly intelligent network system. Our Research and Development Team have developed this system specifically for the marine environment using proven techniques and materials, which will ensure a long life at sea.

The TM-4000 allows builders and retrofitters to offer a system with maximum functionality thereby providing boat owners with excellent visibility of all tanks.

System Overview

The TM-4000 Tank Monitor System has been developed to allow monitoring of fluid levels and to provide intelligent intervention for controlling pumps in up to 4 tanks. It is a-network system, consisting of the TM-4000 Master Display Unit (MDU) and up to 4 Input/ Output Units (IOU). In addition, and as an option, any number of RM-400 Remote Display Units (RDU) may be added to provide tank status displays throughout the vessel.

A 2-wire network cable similar to that used for telephone installations interconnects all devices. The Master Display Unit (MDU) controls communication with all attached I/O Units (IOU) and provides monitoring of tank levels, interlock valve status and pumps status as well as pump control - all from a central location. System components may be located anywhere on the network cable and the cable may be up to 1000 meters in length.

These features, unique to the TM-4000, provide boat builders and retrofitters maximum flexibility in locating components onboard the vessel while minimizing wiring costs.

TM-4000 Master Display Unit (MDU)

Provides the following functions:

- full control from one central location on your boat
- visual indication of tank level (bar graph or lts / gals & percentage)
- visual indication of seacock position & pump status
- turn holding tank macerator pump on & off manually
- turn holding tank macerator pump on manually & off automatically
- turn water maker on manually & off manually or automatically
- all tanks are name programmable: e.g. (Aft-Grey) (Centre-Black) (Port Fuel) (Stb/Fuel)
- backlight
- audible alarm

RM-400 Remote Display Unit (RDU)

The RM-400 Repeater Display is an optional extra.
Any number of these may be connected anywhere on the vessel for convenient tank monitoring.

HT-100/P or HT-100 Input/Output Unit:

Is a controller which managers the tank pump, tank high output and provides an input for the fluid level sensor.

Features include:

- teach-in for level sensor with four point interpolation for irregular shaped tanks
- controls the pump and provides the input for the level sensor
- reversed output for tanks programmed as either fresh water or fuel, enabling for water maker or fuel transfer pumps to turn on when empty and off when full
- tank high level output which can be connected to the Aus/Sea toilet controller which disables the toilet when the holding tank is full
- an internal pump on/off override switch for tank servicing and cleaning
- supplied in two different models:
  HT-100/P features level sensor, tank high output, pump & electric seacock control
  HT-100 features level sensor and tank high output

OPERATION

1 Pushing the Backlight key will turn the backlight ON, push again to turn OFF.

2 Pushing the Pump key will turn the pump ON, push again to turn OFF. The Pump key will also act as the Mute key if an alarm is on. e.g. if the alarm is ON the first push will mute the alarm the second push the turn the pump ON.

3 Push and hold the Scroll for 4 seconds to change display modes (repeat to change back).

Pushing the Scroll key will change to the next tank on the system. If a pump is turned ON a "P" will be displayed in the top right section of the display. If the Scroll key is then pushed to display another tank the "P" will flash indicating there is a pump ON somewhere but it's not the tank you are looking at. If the Scroll key is pushed until the tank with the pump ON is reached the "P" will stay on solid. If the seacock interlock switch is fitted and the valve is closed the pump will not turn ON and a "V" will be displayed instead of the "P" and the audio alarm will sound (push the Pump button to mute). If the Scroll key is then pushed to display another tank the "V" will flash indicating there is a valve closed somewhere but it's not the tank you are looking at. Once the valve is opened the "V" will change to a "P" pushing the Pump button again will turn the pump ON. The Tank Select is non-volatile therefore the last tank displayed will be remembered and displayed on next system restart.

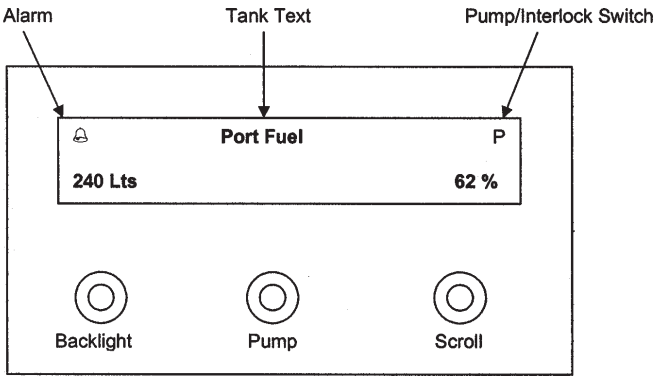
Audio Alarm:
The audio alarm can be turned ON or OFF by holding down the Backlight button for three seconds, you will hear a bleep after every second. After three bleeps you may release the button, if the alarm is ON a small bell icon will appear on the top left

This system has two display modes see #3 at the left to change

DISPLAY MODE 1

DISPLAY MODE 2

DISPLAY FUNCTIONS



Installation Steps

Step 1:
Install and connect the Master Display unit (MDU).

Step 2:
Install and connect the tank sensors.

Step 3:
Install and connect the I/O units (IOU).

Step 4:
Set-up Rotary Switches

Electrical Specifications TM-4000

Supply Voltage	12 to 32 Volts DC (Auto-sensing)
Quiescent Current	0.03 Amps
Data Retention	50 years (without power)

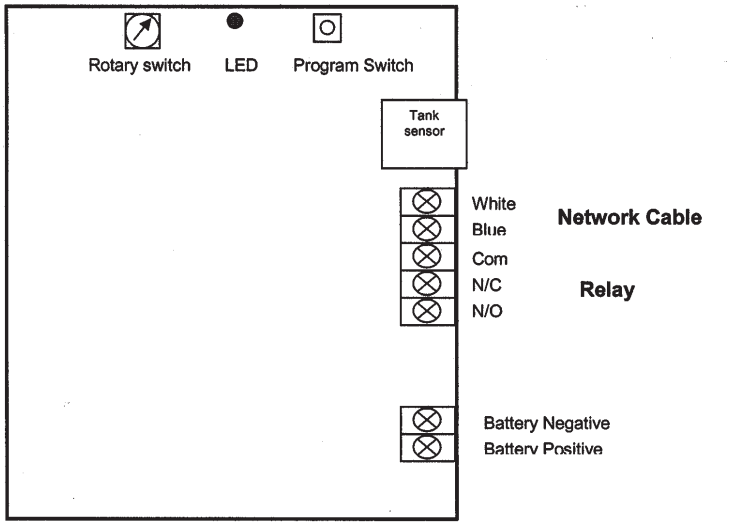
Electrical Specifications HT-100

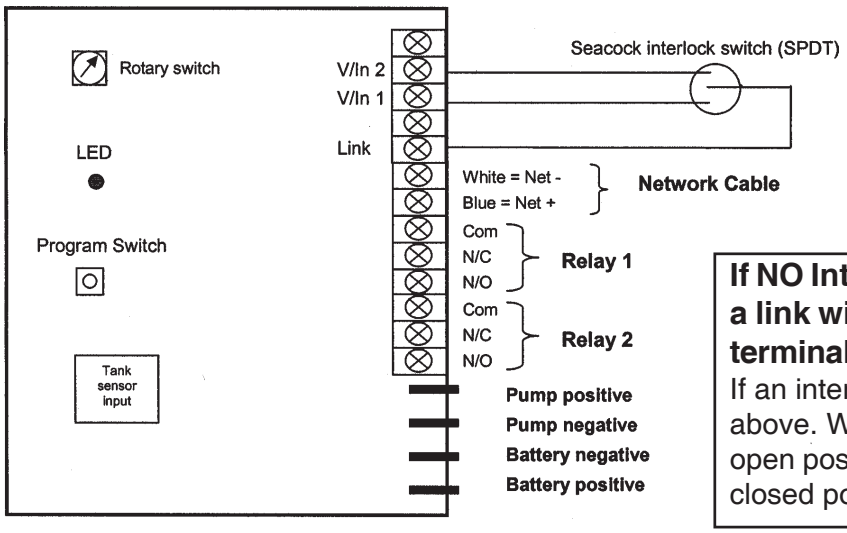
Supply Voltage	12 to 32 Volts DC (Auto-sensing)
Quiescent Current	0.024 Amps
High Relay Load	3 amps Inductive

Electrical Specifications HT-100/P

Supply Voltage	12 to 32 Volts DC (Auto-sensing)
Quiescent Current	0.024 Amps
High Relay Load	3 amps Inductive
Pump Output	88 amps

Network (RS-485)
The cable connecting the Master Display Unit to the Input/ Output Unit is referred to as the network cable and may run up to 1000 meters in total length.





If NO Interlock switch is fitted: Place a link wire between the Link & V/In 1 terminals.
If an interlock switch is fitted then wire as above. When the seacock valve is in the open position the switch needs to be in the closed position.

SENSOR INSTALLATION

! WARNING !

PLEASE NOTE:

For sensor Model SEN-100 The Maximum Tank Height is 3.28 feet

For sensor Model SEN-250 The Maximum Tank Height is 9.8 feet

The maximum surge and safe pressure is 28psi.

For more information see

“Calibration Tips & Tricks”

Mounting Adaptors Available:

A range of mounting adaptors are available which includes flat sidewall, top mount, 1.5" pipe, 2" pipe, 3" pipe and drain valve. Ask your dealer for details

Should a 4 to 20-milliamp loop sensor supplied by another manufacturer be used, then the adaptor (part number SM-420) will need to be installed.

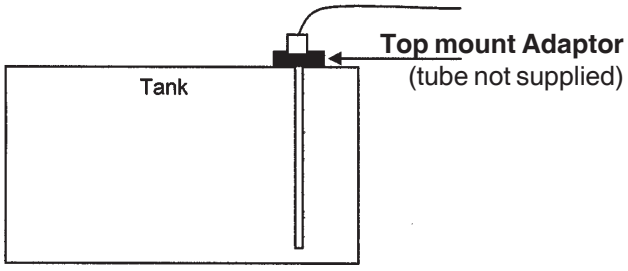
Sensor Installation:

The sensor should be mounted as low in the sidewall as possible using a ¾” spin-in or the flat sensor adapter. If the sensor adapter is used it will require drilling a 5/8" hole in the sidewall. Apply silicon glue liberally to the bottom of the adapter. Using #10 x ½” stainless steel self-tapping screws attach the adapter to the sidewall. Once the adapter is attached make sure that the hole in the adapter is clear of any excess glue. Allow drying as per the instructions for the glue. Wrap the threads of the sensor using PTFE plumbers tape and install the sensor. Tighten by hand. It is not recommended to install the sensor in the bottom of the tank. Although the sensor will operate correctly it will provide an area for debris to collect which would be difficult to flush out.

The top-mounting adaptor requires 3/4" ABS or PVC pipe cut to the proper length so that the pipe is about 1/2" from the bottom of the tank. This pipe glues into the adaptor and the sensor screws into the top of the adaptor. It is held on with 2 self-tapping screws. Care must be taken that the sensor threads are sealed with PTFE tape and screwed in tight to ensure no air leaks, as the tube must remain pressurized.

The sensor will be damaged if subject to over pressure during installation, caused by
compressing the small air gap between the sensor and the ball valve.

DO NOT PRESSURIZE TANK WITH SENSOR FITTED



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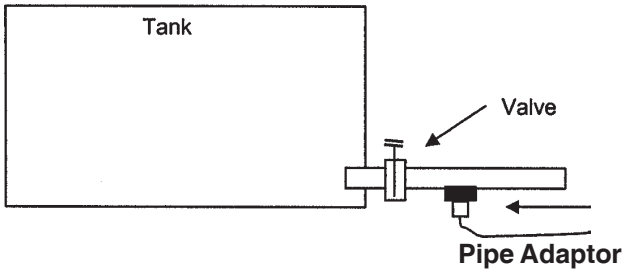
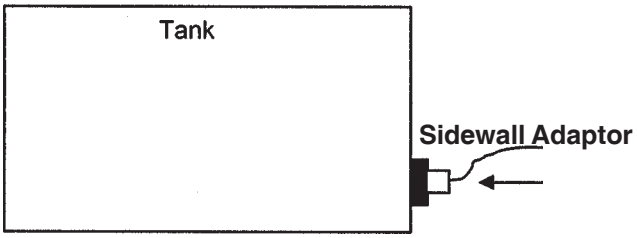


The sensor will be damaged if subject to over pressure during installation, caused by compressing the small air gap between the sensor and the ball valve.

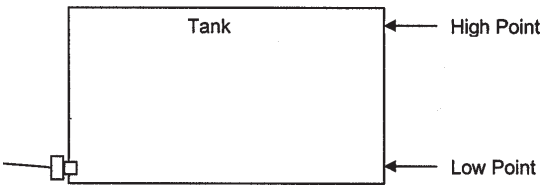
DO NOT PRESSURIZE TANK WITH SENSOR FITTED



Two different methods of tank programming are available:

Method 1 sets tank low and tank high points which can only be used if the tank is a regular size and shape.

Method 2 sets tank low, tank quarter, tank half, tank three quarters and tank full points, offering more accuracy if the tank is an irregular size and shape.



Method 1:

Turn Rotary switch to position 0

Fill the tank to the required TANK LOW LEVEL; minimum suggested is liquid just covering the sensor. Wait for approx. 30 seconds for the fluid to settle. Press and hold down the program 30 seconds for the fluid to settle. Press and hold down the program button until the LED comes on (approx. 3 seconds) this will set the tank low point. Fill the tank to the required TANK FULL LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give three quick flashes, the tank high point will be set and the unit will automatically leave program mode. The device is now ready for use.

Turn Rotary switch to correct position (see Setting Rotary Switch)

The Bottom only setting can be done by turning the rotary switch to position A

Fill the tank to the required TANK LOW LEVEL minimum suggested is liquid just covering the sensor, wait approx. 30 seconds for the fluid to settle. Press and hold down the program button until the LED comes on (approx. 3 seconds) this will set the tank low point. Push and release the program button, the LED will give three quick flashes, the tank low point will be set and the unit will automatically leave program mode. The device is now ready for use.

Turn Rotary switch to correct position (see Setting Rotary Switch)

The Top only setting can be done by turning the rotary switch to position B

Fill the tank to the required TANK FULL LEVEL and wait approx. 30 seconds for the fluid to settle. Press and hold down the program button until the LED comes on (approx. 3 seconds) this will set the tank high point. Push and release the program button, the LED will give three quick flashes, the tank high point will be set and the unit will automatically leave program mode. The device is now ready for use.

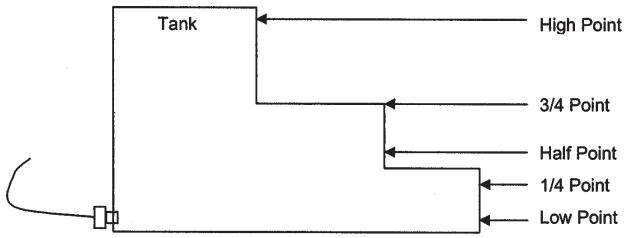
Turn Rotary switch to correct position (see Setting Rotary Switch)

Method 2:

Turn Rotary switch to position F

Fill the tank to the required TANK LOW LEVEL, minimum suggested is liquid just covering the sensor. Wait for approx. 30 seconds for the fluid to settle. Press and hold down the program button (approx. 3 seconds) the LED will give four quick flashes and stay on, tank low point as now been set. Fill the tank to the required QUARTER LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give one quick flash, tank 1/4 point as now been set. Fill the tank to the required HALF LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give two quick flashes, tank 1/2 point as now been set. Fill the tank to the required THREE QUARTERS LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give three quick flashes, tank 3/4 point as now been set. Fill the tank to the required FULL LEVEL and wait approx. 30 seconds for the fluid to settle. Push and release the program button, the LED will give four quick flashes and turn off, tank full point as now been set. All tank points will be set and the unit will automatically leave program mode. The device is now ready for use.

Turn Rotary switch to correct position (see Setting Rotary Switch)



Setting One System From Another

Once one HT-100 or HT-100/P has been calibrated you can transmit the calibration settings from that unit to as many more as required (tanks would need to be the same).

The HT-100 can transmit or receive from or to HT-100/P and vice versa.

Note: This must be done independently from the complete system setup (only the two units connected)

Connect the power and network cable to both units:

Step 1:

Turn the rotary switch to position C for the master transmitter (the unit that is calibrated).

Step 2:

Turn the rotary switch to position D for the slave receiver (the unit that needs calibrating).

You will see both LED'S flashing, please wait (approx 20 seconds) for the LED'S to stop flashing, the slave receiver now has the same calibration setting as the master transmitter.

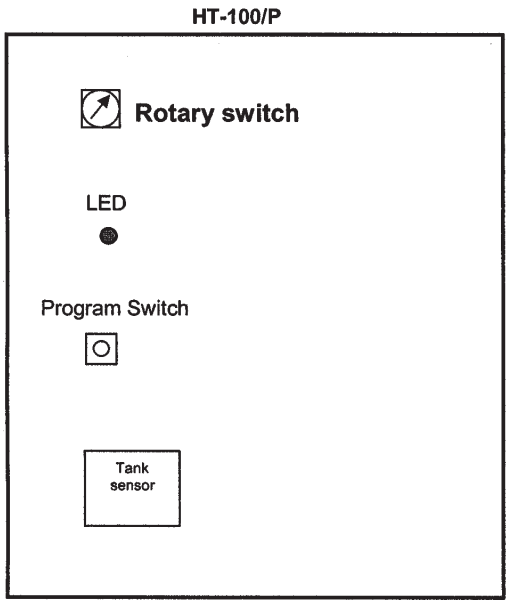
SETTING ROTARY SWITCH

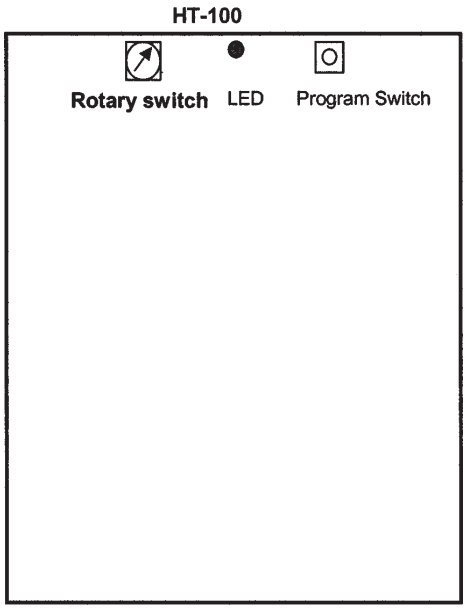
Each Input/Output Unit: HT-100 or HT-100/P on the network must have the Rotary Switch set to a unique number (from 2 to 5). NO two devices may share the same Rotary Switch number.

This Rotary Switch is situated inside the Box of the Input/Output Unit (see below for position).

For ease of reference please use the chart provided as this will enable quick reference when programming the Display Unit. See example below.

	Switch #	Tank Position	Tank Type
Example	*2*	*AFTPORT*	*GREY*
	2		
	3		
	4		
	5		





PROGRAMMING

Step 1: Placing the unit in Program Mode

Press and hold down the Backlight & Scroll keys together for three seconds. This will place the unit in program mode.

Step 2: Selecting the tank to program

Once the unit is in program mode the display will show " Select Switch # " use the Scroll or Backlight keys to change the switch number which corresponds to the I/O unit being programmed (refer to table 1 on page 11) for switch number. Once the switch number has been selected push the Pump key.

Step 3: Program or Erase

The display will now show " < Erase Prog > " use the Scroll key to program or the Backlight key to erase. If the Scroll key is pushed go to step 4 if the Backlight key is pushed go to step 8.

Step 4: Selecting /Creating Tank Name

The display will now show : → **AFT Select Position**

Use the Scroll or Backlight key to scroll through the pre-named tank positions. Once you have found the text required or the text you would like to change, push the Pump key. If you want to choose the name on the display push the Pump key again this will take you to step 5. If you would like to change/create your own text name then use the Scroll key to scroll through the alphabet and the Backlight key to change to the next character. When finished push the Pump key this will take you to Step 5.

Step 5: Selecting Tank Type

Note: Tank Type is a NAME ONLY and sets the way the Alarm, Relay 1, Pump and Relay 2 behave and DOES NOT have to be set as the fluid in the tank.

Select the tank type that best suits the options you require.

Also See Relay's on next page and Alarm under operating instructions

The display will now show : → **Grey Tank Select Tank Type**

Use the Scroll or Backlight key to scroll through the tank types. Once you have found the one required push the Pump key.

If the tank type Grey or Black is selected the display will now show " Set Hi Point 8 " use the Scroll or Backlight key to scroll through the tank levels 8 to 16. (8 = Half 16 = Full). Once you have selected the level push the Pump key. This sets the alarm and relay 1 trigger point.

If the tank type Fresh or Fuel is selected the display will now show " Set Low Point 0 " use the Scroll or Backlight key to scroll through the levels 0 to 8. (0 = Empty 8 = Half) (1 = one bar from empty, 2 = two bars from empty etc.) Once you have selected the level push the Pump key. This sets the alarm and relay 1 trigger point.

If the tank type **Water Maker (Man or Auto)** is selected the display will now show " Set Low Point 0 " use the Scroll or Backlight key to scroll through the levels 0 to 8. (0 = Empty 8 = Half) (1 = one bar from empty, 2 = two bars from empty etc.) Once you have selected the level push the Pump key. This sets the alarm trigger point ONLY. Relay1 will turn ON at tank full and OFF at 3 bars less than full.

If the tank type **Motor-Home Water** is selected the display will now show " Set Low Point 0 " use the Scroll or Backlight key to scroll through the levels 0 to 8. (0 = Empty 8 = Half) (1 = one bar from empty, 2 = two bars from empty etc.) Once you have selected the level push the Pump key. This sets the alarm trigger point. (If a HT-100/P is connected Relay1 will turn ON at this trigger point and OFF at 1 bar greater than this trigger point. Also see details under HT-100 and HT-100/P sections.

Step 6: Tank Volume

The screen will now display "Do you want to set Tank Volume". This allows for displaying the tank volume in either Liters or Gallons. If this feature is required push Scroll. Push the Backlight key for Liters or the Scroll key for Gallons.
The display will now show " Set Vol 00000". Use the Scroll and Backlight keys to scroll up and down numbers and the Pump key to enter and move to the next digit. . When the last digit is reached and the Pump key is push you will go to step 7.

Step 7: Next or End

The display will now show " < End Next > " push the Scroll key to program the next I/O unit which will return you back to Step 3 or push the Backlight key to exit from program mode.

Step 8: Erase Tanks

The display will now show " Are U Sure < Y N > " push the Scroll key for NO or the Backlight key for YES. If NO is selected the unit will return back to Step 2 if YES is selected the Tank Position and Type will be erased for that switch position and the unit will return you back to Step 7.

Relay's:

The output relay 1 & relay 2 are a 3-amp inductive load relay with common, normally open and normally closed contacts available.

HT-100 (relay 1 & alarm)

Tank type set as Grey or Black

When the tank reaches the programmed high-level point (see Step 5 above) the alarm and relay 1 will turn ON, and OFF two display bars below full. This output could be used to disable the toilet controller or activate a tank full warning light/alarm. Pushing the Mute key will mute the alarm.

Tank type set as Fresh or Fuel

When the tank reaches the programmed low-level point (see Step 5 above) the alarm and relay 1 will turn ON, and will turn OFF when the tank has been filled by two bars above the programmed low-level.
Pushing the Mute key will mute the alarm.

Tank type set as Water-Maker (Man or Auto)

When the tank reaches the programmed low-level point (see Step 5 above) the alarm will turn ON.
Relay 1 will turn ON when the tank is full and OFF two display bars below full. Pushing the Mute key will mute the alarm.

Tank type set as Motor-Home Water

Pushing the Pump On/Off button at any time will activate relay 1, which will turn OFF automatically when the programmed low-level point is reached or it can be turned OFF at any time by pushing the Pump On/Off button again. Pushing the Mute key will mute the alarm.

HT-100/P (pump output, relay 2, relay 1 & alarm)

Grey or Black Tank

If the tank is programmed as either Grey or Black and the tank reaches the programmed high-level point (see Step 5 above) the audio alarm and relay 1 will turn ON indicating a full tank, and OFF two display bars below full. Pushing the Pump On/Off button will activate the pump and relay 2, which will turn OFF automatically when the tank reaches empty or it can be turned OFF at any time by pushing the Pump On/Off button again. Pushing the Mute key will mute the alarm.

Fuel Tank

If the tank is programmed as Fuel the pump output and relay 2 will automatically turn ON when the tank reaches the programmed low-level point (see Step 5 above) and OFF when full, alternatively pushing the Pump On/Off button any time will activate the pump, which will turn OFF automatically when the tank reaches full or it can be turned OFF at any time by pushing the Pump On/Off button again. The alarm and relay 1 will turn ON when the tank goes below the programmed low-level value and will turn OFF when the tank is two bars above the programmed low-level. Pushing the Mute key will mute the alarm.

Fresh Tank

If the tank is programmed as Fresh the audio alarm and relay 1 will turn ON when the tank reaches the programmed low-level point (see Step 5 above) to indicate the tank is low and will turn OFF when the tank is two bars above the programmed low-level. Pushing the Pump On/Off button any time will activate the pump and relay 2, which will both turn OFF automatically when the tank reaches full or the pump and relay 2 can be turned OFF at any time by pushing the Pump On/Off button again. Pushing the Mute key will mute the alarm.

Water-Maker Man

If the tank is programmed as Water-Maker Man the audio alarm will turn ON when the tank reaches the programmed low-level point (see Step 5 above) to indicate the tank is low and OFF two display bars above the programmed low-level point. If connected to a water maker pushing the Pump On/Off button any time will activate the pump and relay 2, which will both turn OFF automatically when the tank reaches full. The pump and relay 2 can be turned off at any time by pushing the Pump On/Off button again. Relay 1 will turn ON when the tank is full and OFF two display bars below full. Pushing the Mute key will mute the alarm.

Water-Maker Auto

If the tank is programmed as Water-Maker Auto the pump output and relay 2 will automatically turn ON when the tank reaches the programmed low-level point (see Step 5 above) and OFF when full, alternatively pushing the Pump On/Off button any time will activate the pump output and relay 2, which will turn OFF automatically when the tank reaches full or it can be turned OFF at any time by pushing the Pump On/Off button again. Relay 1 will turn ON when the tank is full and OFF two display bars below full. Pushing the Mute key will mute the alarm. This setting could be used for land based systems.

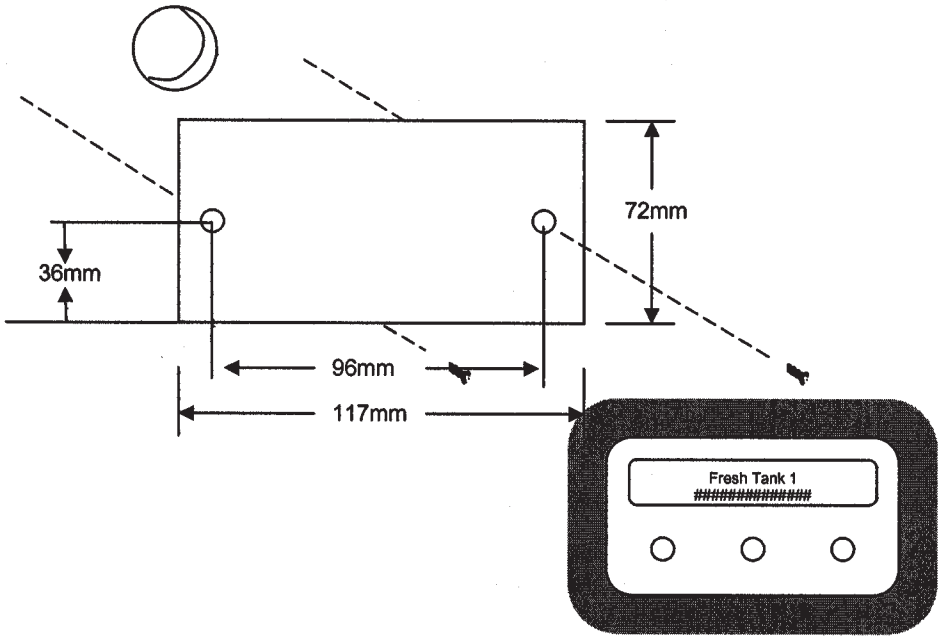
Motor-Home Water

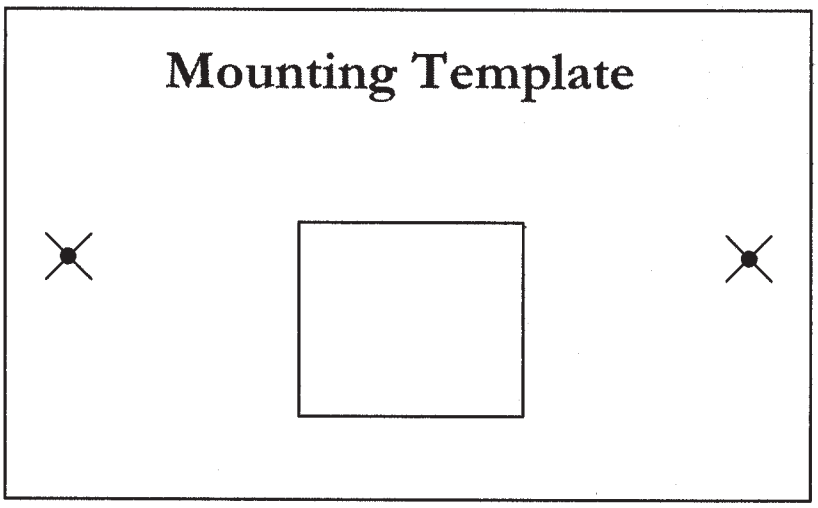
If the tank is programmed as Motor-Home Water pushing the Pump On/Off button at any time will activate the pump output and relay 2, which will turn OFF automatically when the programmed low-level point is reached or it can be turned OFF at any time by pushing the Pump On/Off button again. Relay 1 will turn ON when the programmed low-level point is reached and OFF one display bar above the programmed low-level point. Pushing the Mute key will mute the alarm.

TM-4000 Mounting

Warning:

If the display unit is being installed in an area where it may experience moisture or wetting, please ensure a bead of silicone is placed behind the unit to prevent water entering via the connection cable.





LIMITED WARRANTY

Raritan Engineering Company warrants to the original purchaser that this product is free of defects in materials or workmanship for a period of one year from the product's date of purchase. Should this product prove defective by reason of improper workmanship and/or materials within the warranty period , Raritan shall, at its sole option, repair or replace the product.

1. TO OBTAIN WARRANTY SERVICE, Consumer must deliver the product prepaid, together with a detailed description of the problem, to Raritan at 530 Orange St., Millville, N.J. 08332, or 3101 SW 2nd Ave. Ft. Lauderdale, FL 33315. When requesting warranty service, purchaser must present a sales slip or other document which establishes proof of purchase. THE RETURN OF THE OWNER REGISTRATION CARD IS NOT A CONDITION PRECEDENT OF WARRANTY COVERAGE. However, please complete and return the owner Registration Card so that Raritan can contact you should a question of safety arise which could affect you.
2. THIS WARRANTY DOES NOT COVER defects caused by modifications, alterations, repairs or service of this product by anyone other than Raritan; defects in materials or workmanship supplied by others in the process of installation of this product; defects caused by installation of this product other than in accordance with the manufacturer's recommended installation instructions or standard industry procedures; physical abuse to, or misuse of, this product. This warranty also does not cover damages to equipment caused by fire, flood, external water, excessive corrosion or Act of God.
3. ANY EXPRESS WARRANTY NOT PROVIDED HEREIN, AND ANY REMEDY FOR BREACH OF CONTRACT WHICH BUT FOR THIS PROVISION MIGHT ARISE BY IMPLICATION OR OPERATION OF LAW, IS HEREBY EXCLUDED AND DISCLAIMED. ALL IMPLIED WARRANTIES SUCH AS THOSE OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE, IF APPLICABLE, AS WELL AS ANY IMPLIED WARRANTIES WHICH MIGHT ARISE BY IMPLICATION OF LAW, ARE EXPRESSLY LIMITED TO A TERM OF ONE YEAR. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG A LIMITED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.
4. UNDER NO CIRCUMSTANCES SHALL RARITAN BE LIABLE TO PURCHASER OR ANY OTHER PERSONS FOR ANY SPECIAL OR CONSEQUENTIAL DAMAGES, WHETHER ARISING OUT OF BREACH OF WARRANTY, BREACH OF CONTRACT, OR OTHERWISE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.
5. No other person or entity is authorized to make any express warranty, promise or affirmation of fact or to assume any other liability on behalf of Raritan in connection with its products except as specifically set forth in this warranty.
6. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

RARITAN
The Most Dependable Name on the Water

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