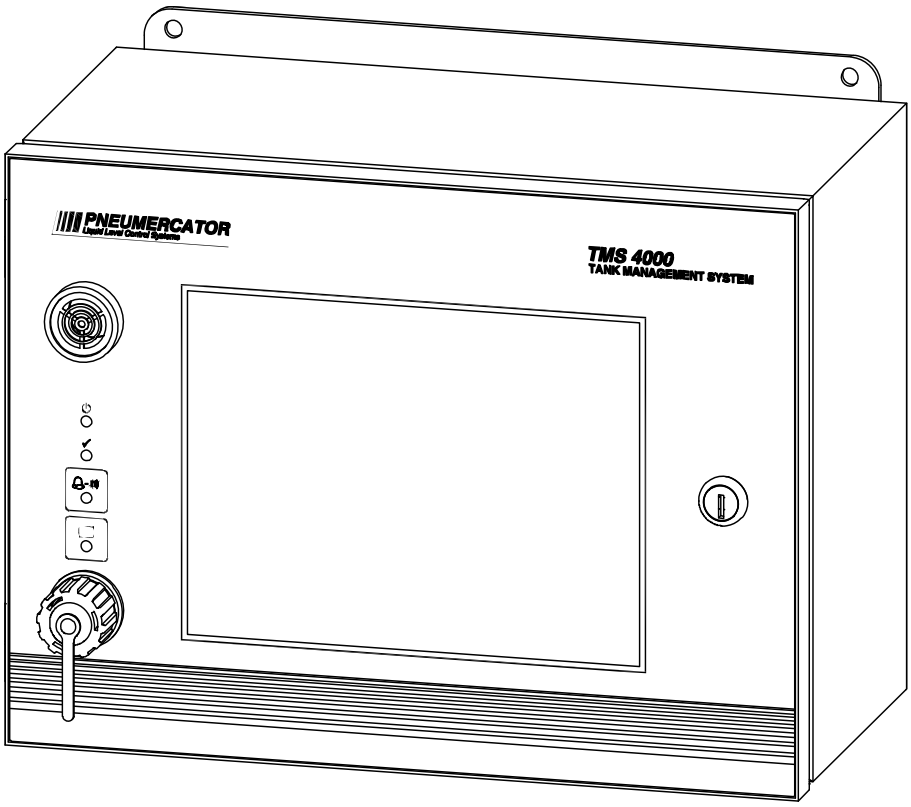
PNEUMERCATOR
Liquid Level Control Systems

MULTI TANK
MONITORING
SYSTEM

OPERATION MANUAL



DRAWING NO. 20208 REV. A

MODEL TMS4000

© COPYRIGHT 2018 PNEUMERCATOR CO., INC.

1785 EXPRESSWAY DRIVE NORTH
HAUPPAUGE, NY 11788

TEL: (631) 293-8450
FAX: (631) 293-8533
http://www.pneumercator.com

Note: A separate INSTALLATION MANUAL is available, but NOT required for TMS4000 operation.

TABLE OF CONTENTS

Page

Section 1 OVERVIEW
1.1 General System Overview 5
1.1.1 Processor Card Connections 6
1.2 Main Screen 7
1.3 Alarm Acknowledgment 8
1.4 Leak/Point Level Sensor Status 9
1.5 CC Input Status 11
1.6 Printing 13
1.7 Display Customization 14
1.8 Touch Screen Calibration (First Generation Resistive LCD Screen Only) 19

Section 2 SYSTEM CONFIGURATION
2.1 Setup Menu 20
2.2 System Configuration 21
2.3 Header 22
2.4 Tanks - General 23
2.5 Tanks - Dimensions 25
2.5.1 Tanks – Dimensions – Flat 26
2.5.2 Tanks – Dimensions – Vertical 27
2.5.3 Tanks – Dimensions – Custom 3 28
2.5.4 Tanks – Dimensions – Custom 8 29
2.5.5 Tanks – Dimensions – Vertical Conical 30
2.5.6 Tanks – Dimensions – Virtual 31
2.6 Tanks – Set Points 32
2.7 Tanks – Probe 33
2.8 Tanks – Leak Test 35
2.9 Leak Test Scheduling 37
2.9.1 Leak Test Scheduling – Manual 38
2.9.2 Leak Test Scheduling – Scheduled 39
2.9.3 Leak Test Scheduling – Auto 44
2.9.4 Leak Test Scheduling – Scheduled – Relay Control 45
2.10 CC Inputs 46
2.11 Sensor Inputs 48
2.12 Relays 50
2.12.1 Relays – Tank Triggers 50
2.12.2 Relays – CC Inputs 52
2.12.3 Relays – Sensors 53
2.12.4 Relays – Line Leak Triggers 55
2.12.5 Relays – Site 56
2.12.6 Relays – Relay Mode 57
2.13 Inventory 60
2.14 Theft 61
2.15 Dial Out 62
2.16 Comms (Communications) 64
2.17 Analog Outputs 67
2.18 Security 68
2.19 Firmware 70
2.20 Localization 71

TABLE OF CONTENTS

Page

Section 3 SYSTEM REPORTS
3.1 Overview 72
3.2 Inventory 73
3.3 Sales 75
3.4 Product Order 77
3.5 Delivery 79
3.6 Water Removal 81
3.7 Theft 83
3.8 Alarm 85
3.9 Event 87
3.10 Tank Leak/Leak Summary 89
3.11 System Events 91

SECTION 1 – PRODUCT DESCRIPTIONS

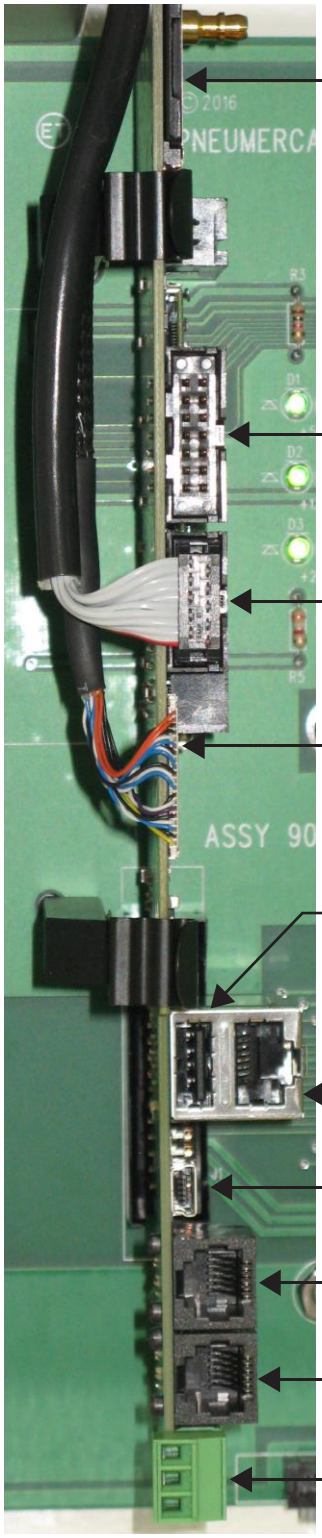
1.1 GENERAL SYSTEM OVERVIEW

This document covers the operation of the TMS4000 using the touch screen interface. A few additional details are visible on the face of the TMS4000 as shown below. Below the integrated horn in the top left corner are three LEDs. From top to bottom, these are the Green Power LED, Green Normal Status LED, and Red Alarm Status LED. The Alarm Status LED will blink for new alarms. Once the TMS alarm has been acknowledged using the Acknowledge button (Bell icon) in the top corner of the touch screen, the Alarm Status LED will not blink and will stay on until the alarm condition is satisfied. Once the alarm condition is satisfied, the Alarm Status LED will be off and the Normal Status LED will be on. Below the LEDs is the Day/Night sensor used to detect the ambient light and automatically adjust the screen brightness, when enabled.

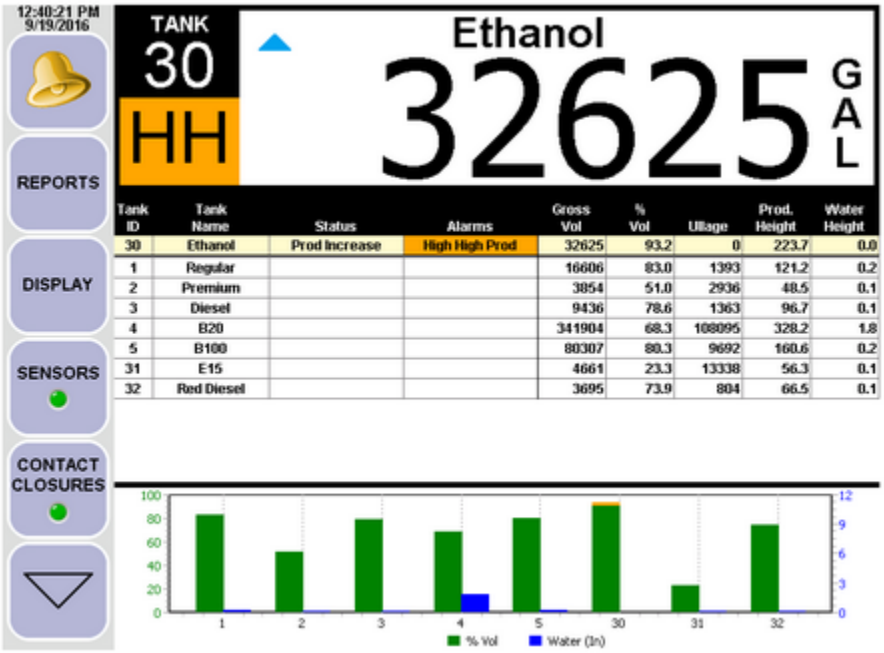
The touch screen is the primary interface for viewing real-time status of tank probes, sensors, and contact closure inputs. Additional access is provided for viewing system reports, changing the system Configuration, and upgrading the TMS firmware.

This manual was written referencing TMS4000 firmware version 10.044. Although some screen shots may vary between firmware versions, the principle of operation remains the same. Contact Pneumercator for any firmware version specific questions.

1.1.1 PROCESSOR CARD CONNECTIONS

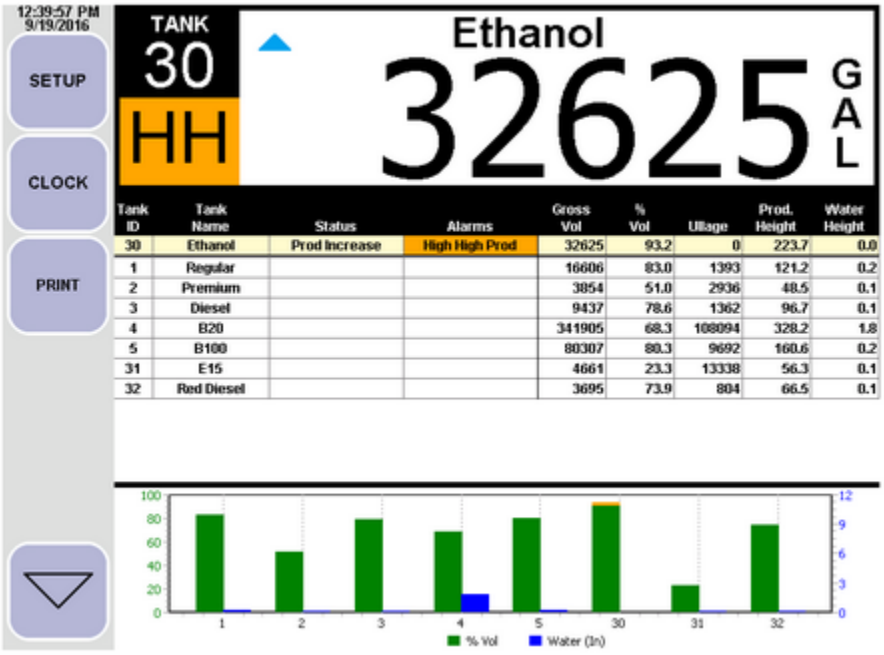


1.2 MAIN SCREEN



Tank ID	Tank Name	Status	Alarms	Gross Vol	% Vol	Ullage	Prod. Height	Water Height
30	Ethanol	Prod Increase	High High Prod	32625	93.2	0	223.7	0.0
1	Regular			16606	83.0	1393	121.2	0.2
2	Premium			3854	51.0	2936	48.5	0.1
3	Diesel			9436	78.6	1363	96.7	0.1
4	B20			341904	68.3	108095	328.2	1.8
5	B100			80307	80.3	9692	160.6	0.2
31	E15			4661	23.3	13338	56.3	0.1
32	Red Diesel			3695	73.9	804	66.5	0.1

Scroll to next set of buttons using down arrow in bottom left corner.



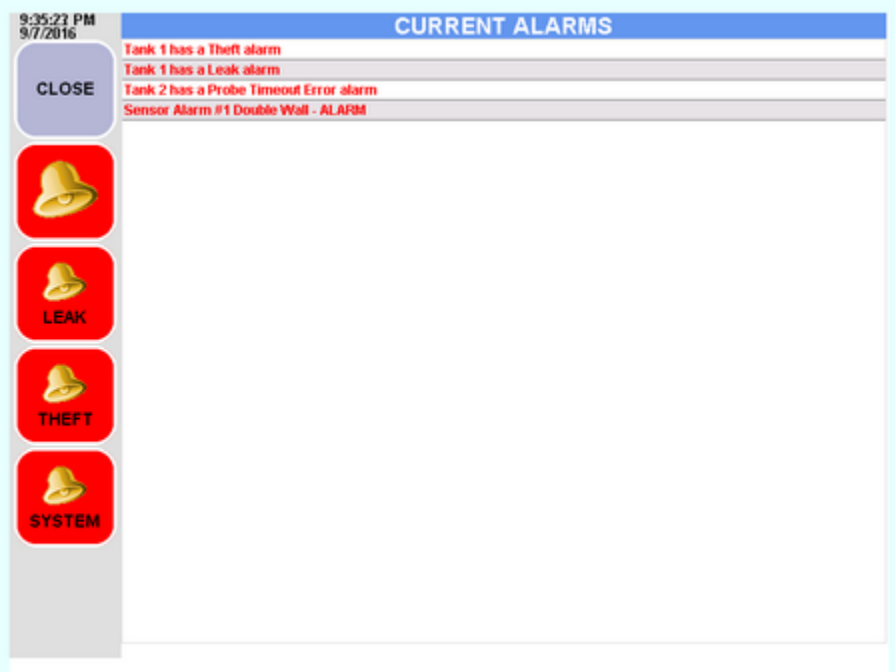
Tank ID	Tank Name	Status	Alarms	Gross Vol	% Vol	Ullage	Prod. Height	Water Height
30	Ethanol	Prod Increase	High High Prod	32625	93.2	0	223.7	0.0
1	Regular			16606	83.0	1393	121.2	0.2
2	Premium			3854	51.0	2936	48.5	0.1
3	Diesel			9437	78.6	1362	96.7	0.1
4	B20			341905	68.3	108094	328.2	1.8
5	B100			80307	80.3	9692	160.6	0.2
31	E15			4661	23.3	13338	56.3	0.1
32	Red Diesel			3695	73.9	804	66.5	0.1

Single Large Meter with Product and Water Bar Graphs shown

The above screens show the Main screen for the TMS4000. The buttons along the left edge provide access to different features that are described on the pages to follow. Above the buttons are shown the current date and time. The display to the right of the buttons show a large meter representing Tank 1, Gross Volume; a tabular display capable of displaying a minimum of 12 rows containing tank information without scrolling vertically; and a bar graph at the bottom showing bars for both percentage of tank volume and water level. The real-time display can be customized to suit your preferences as described in the following section.

1.3 ALARM ACKNOWLEDGMENT

Clicking on the Alarm Acknowledgment button (shown with a Bell icon) in the top left corner of the Main screen will silence the integrated horn and present the screen shown below. This provides the means of viewing the current Alarm/Event status and contains four different buttons on the left edge for acknowledging different categories of Alarm/Event conditions. The conditions that may be acknowledged in each button are listed below the screenshot.



General Acknowledgment: Represented by a bell icon without supporting text. The list of common conditions that may be acknowledged include:

- Tank Product Set Points
- Tank Water Set Points
- Tank Temperature Set Points
- Leak/Point Level Sensor Alarms
- CC Inputs

Leak Acknowledgment: The bell icon shown with LEAK below it is used to acknowledge a Failed In-Tank Leak Test. Once acknowledged, the failure will be removed from the list and will no longer cause the Alarm LED to be lit.

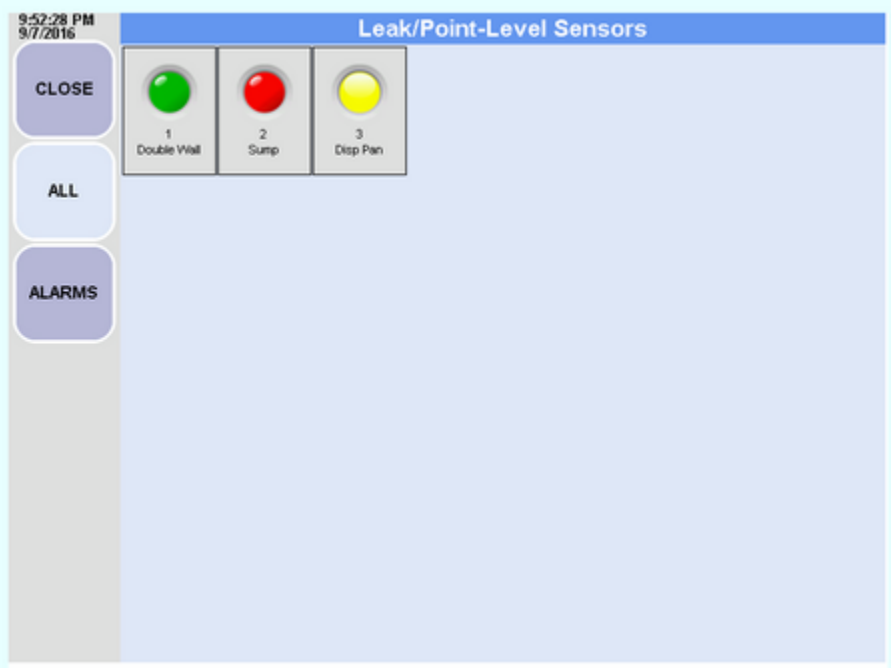
Theft Acknowledgment: The bell icon shown with THEFT below it is used to acknowledge a theft of product from a tank. Theft is an optional feature that must be enabled through the system configuration. Details are provided in a later section.

System Acknowledgment: The bell icon shown with SYSTEM below it is used to acknowledge system Events. These include Probe Timeout, Probe Sync, and Sensor Fault Errors.

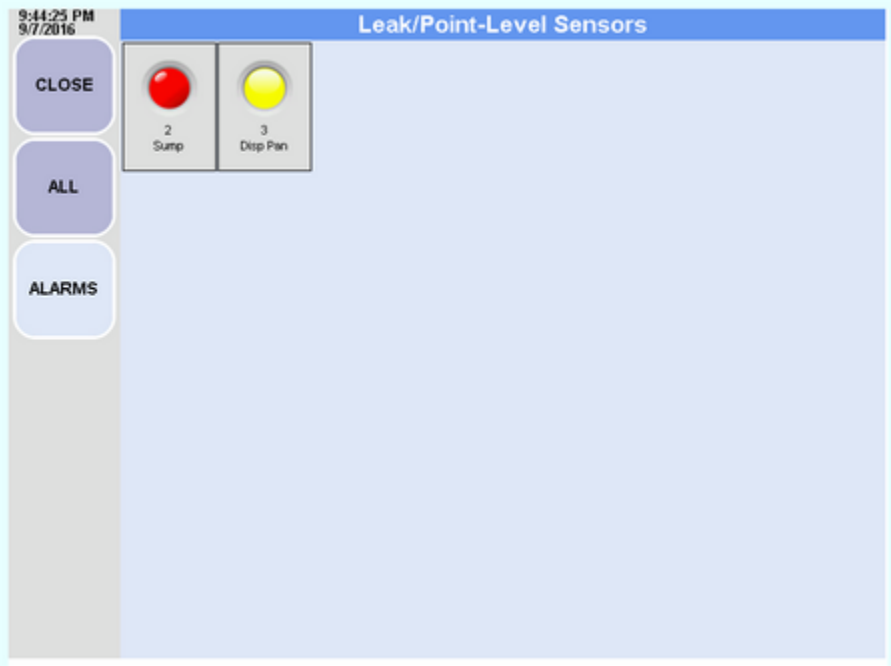
1.4 LEAK/POINT LEVEL SENSOR STATUS

The sensor's alarm or activity status is represented graphically as illustrated below. The colors represent the following:

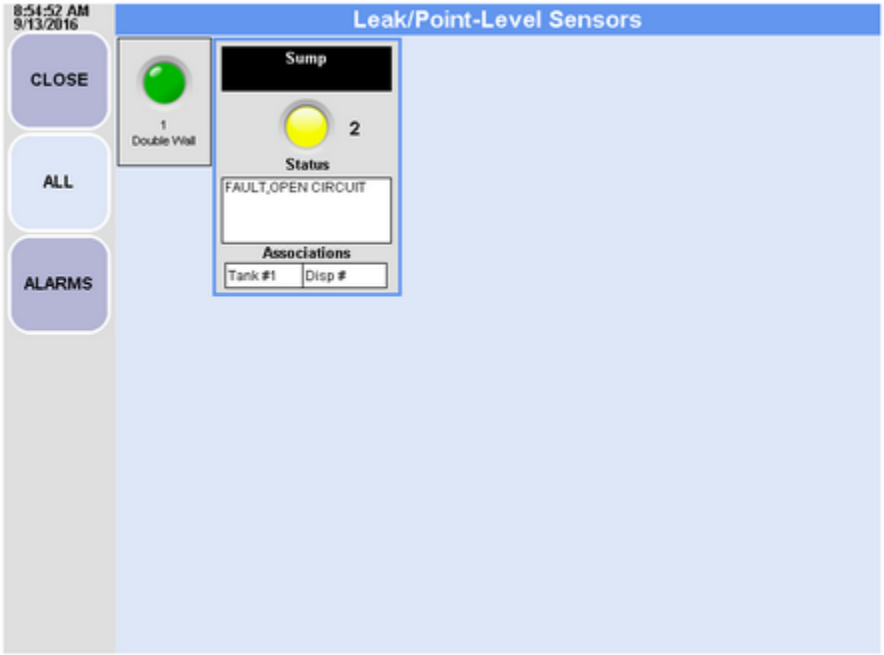
- Green: Normal or inactive sensor
- Red: Sensor alarm or activity. May be a general, product, or water alarm.
- Yellow: Sensor fault error. Either open or short-circuited wiring or a faulty sensor.



All view: shows the status for all enabled sensors



Alarms view: shows only the sensors in an alarm or error state.

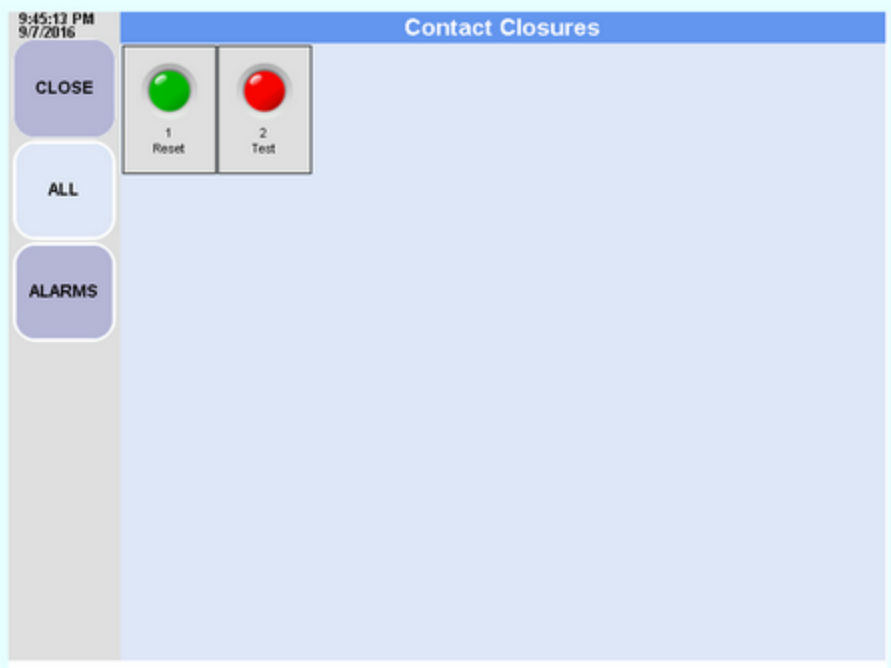


Additional details about the sensor can be obtained by touching the Sensor Status icon. The above screen shot shows a detailed description of the sensor condition in the Status section and additional information about the physical location of the sensor in the Associations section at the bottom.

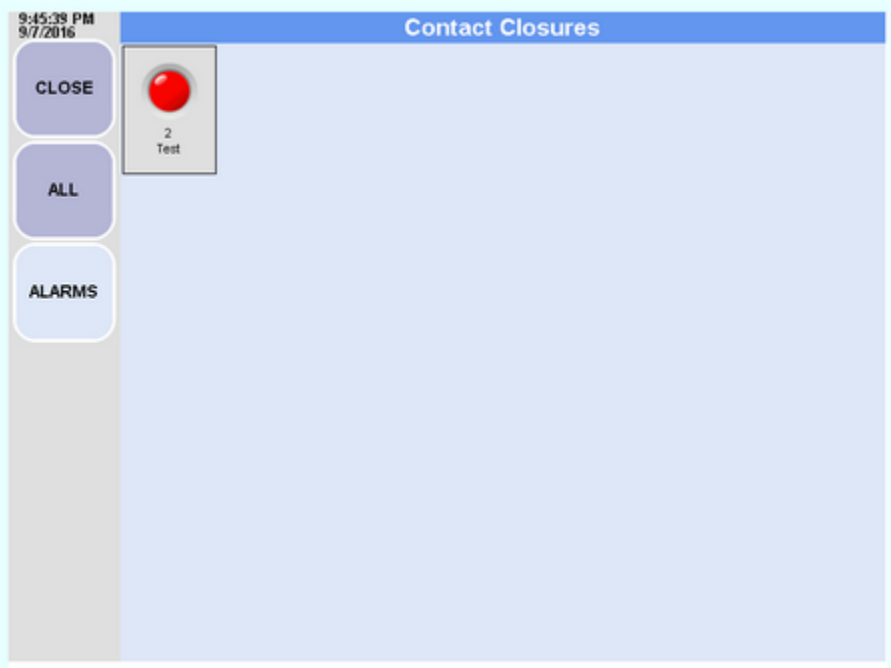
1.5 CC INPUT STATUS

The alarm or activity status of individual CC Inputs are represented graphically as illustrated below. The colors represent the following:

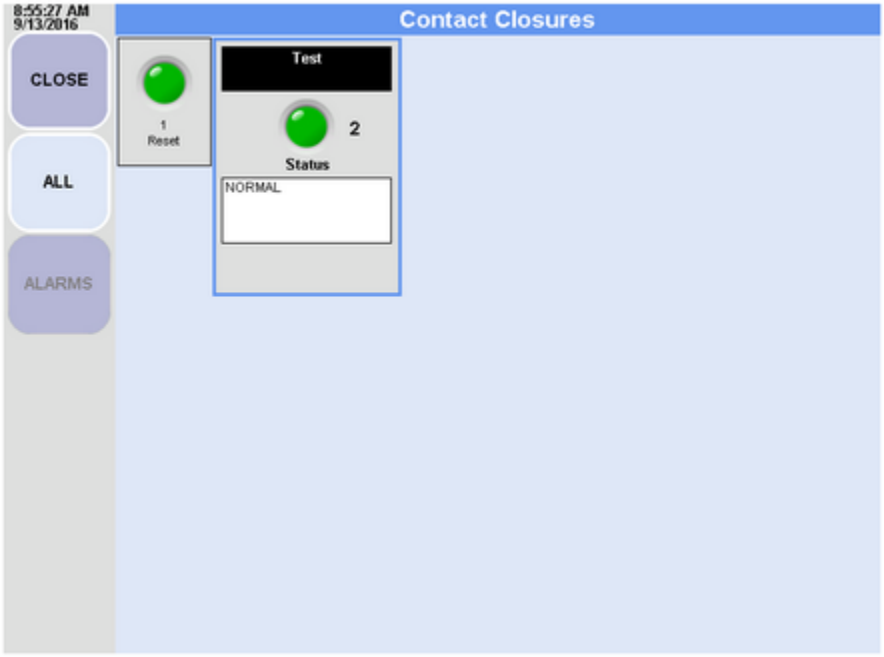
- Green: Normal or inactive sensor
- Red: CC Input in an alarm or active state.



All view: shows the status for all enabled CC Inputs



Alarms view: shows only the CC Inputs in an alarm or error state.

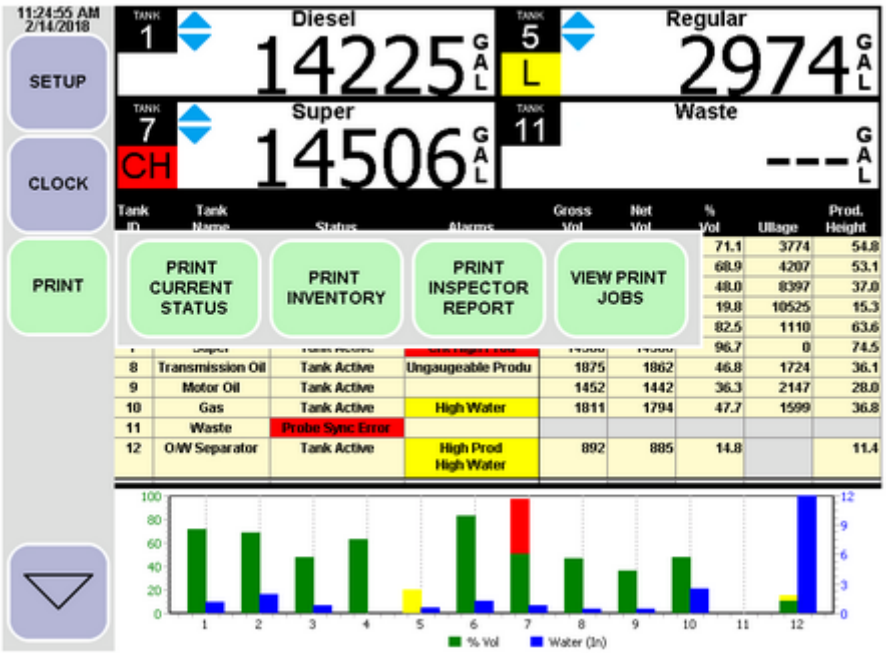


Additional details for the CC Input are show in the Status section after touching the CC Input Status icon.

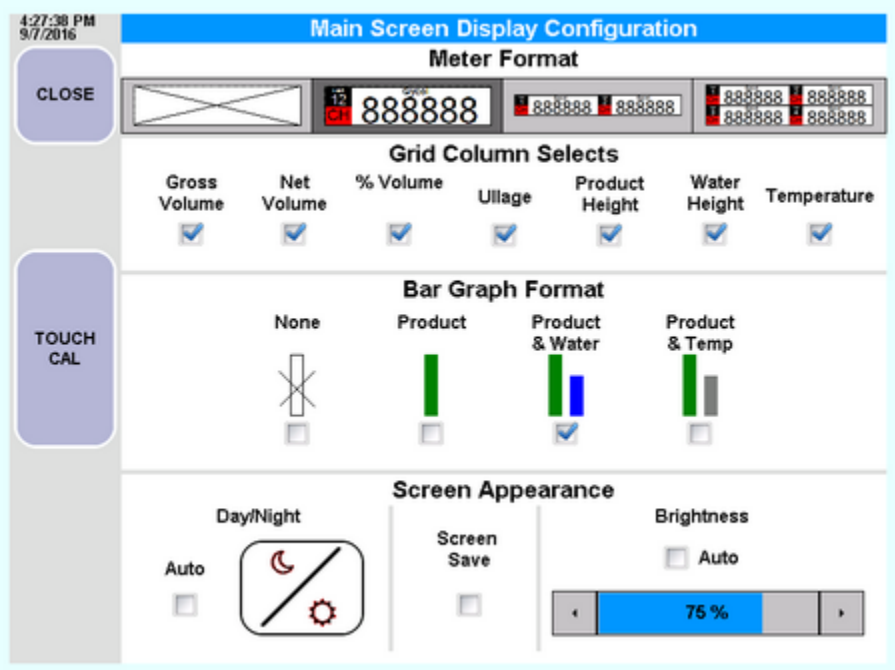
1.6 PRINTING

Many details may be printed from a TMS4000 equipped with a printer. A print button will be visible wherever printing is available. The information that can be printed includes the Reports and System Configuration. The below screen capture displays the options for the Print button accessible on the Main Screen. The reports accessible via this Print button are as follows:

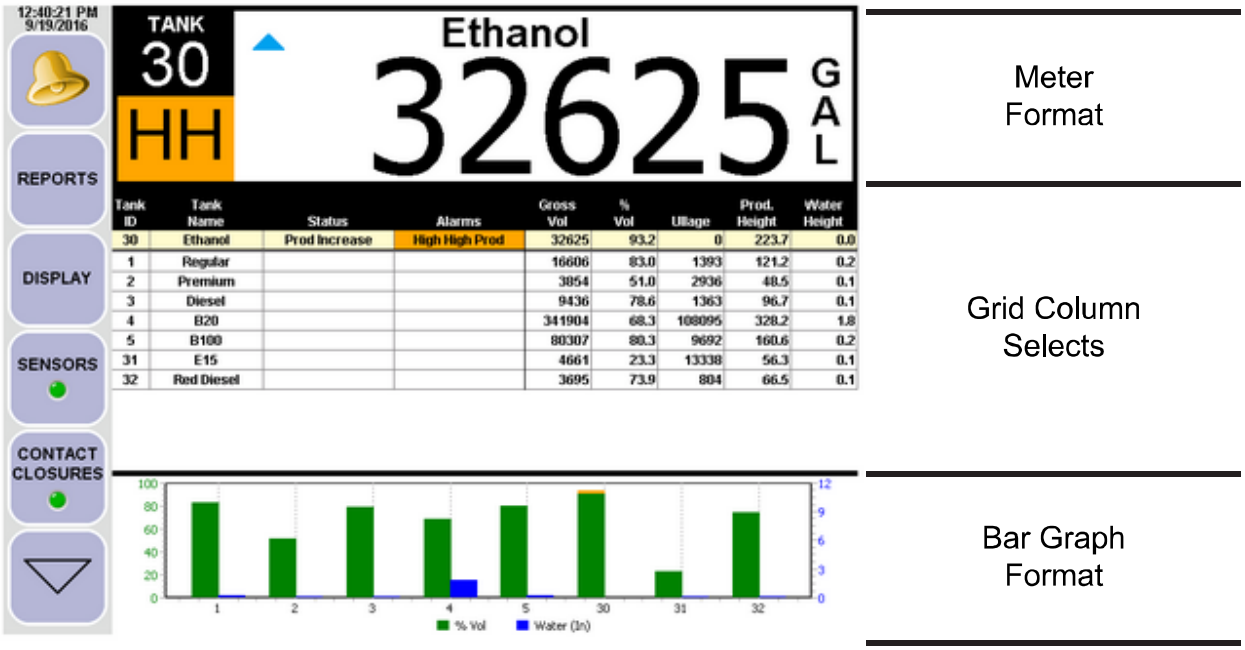
- Print Status: This prints the full system status reports including the states of all enabled tanks/probes and leak/point level sensors
- Print Inventory: The current Inventory displayed on the TMS4000 will be printed. This does not print the contents of the Inventory Report. To print the Inventory Report, simply go to the Reports button and click on the Print button. Other Reports may be printed in a similar fashion.
- Print Inspector Report: Combines the Status and Inventory Printouts into a single Report. This may either be printed or exported as a PDF.
- View Print Jobs: View the printer queue showing pending or active print jobs.



1.7 DISPLAY CUSTOMIZATION



Click on Display from the Main Screen to access the Display Customization screen, shown above. This screen offers settings to customize the real-time data presentation and screen brightness settings. The various settings are described below. Examples of screen configurations are found later in this section. The touch screen may also be recalibrated touching the Touch Cal button (First Generation Resistive LCD Screen Only). Details for recalibrating the screen are outlined in the following section.



Meter Format: The number of meters can be selected in single, dual or four-meter, or the meter window can be disabled altogether. The individual meters may be further customized from the real-time screen as described later in this section.

Grid Column Selects: The specific columns presented on the tabular display may be selected here. If more columns are selected than fit on the width of the display, the user may scroll by dragging their finger left-right across the tabular display. Note that the Tank ID, Tank Name, Status, and Alarms columns cannot be disabled.

- Gross Volume: Temperature Uncompensated volume
- Net Volume: Temperature-Compensated Volume.
- % Volume: Gross Volume/Tank Capacity x 100%.
- Ullage: Maximum delivery amount. See the Header section in Configuration for details on adjusting the maximum fill point.
- Product Height: Total height of liquid. For O/W Separator tanks, this is a measurement of the oil height.
- Water Height: Bottom water height or total water height for O/W Separator Tanks.
- Product Temperature: Volume-weighted average liquid temperature.

Bar Graph Format: Choices for configuring the bar graph are as follows:

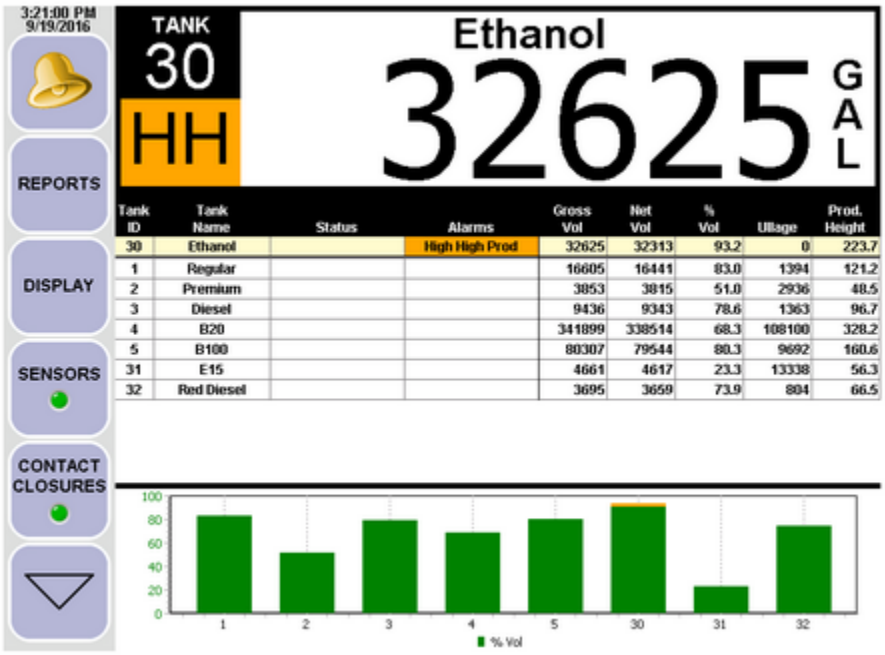
- Disabled
- Product Only
- Product and Water
- Product and Temperature

Screen Appearance: This section offers settings for configuring the Day/Night Mode, Screen Save, and Brightness features as described below:

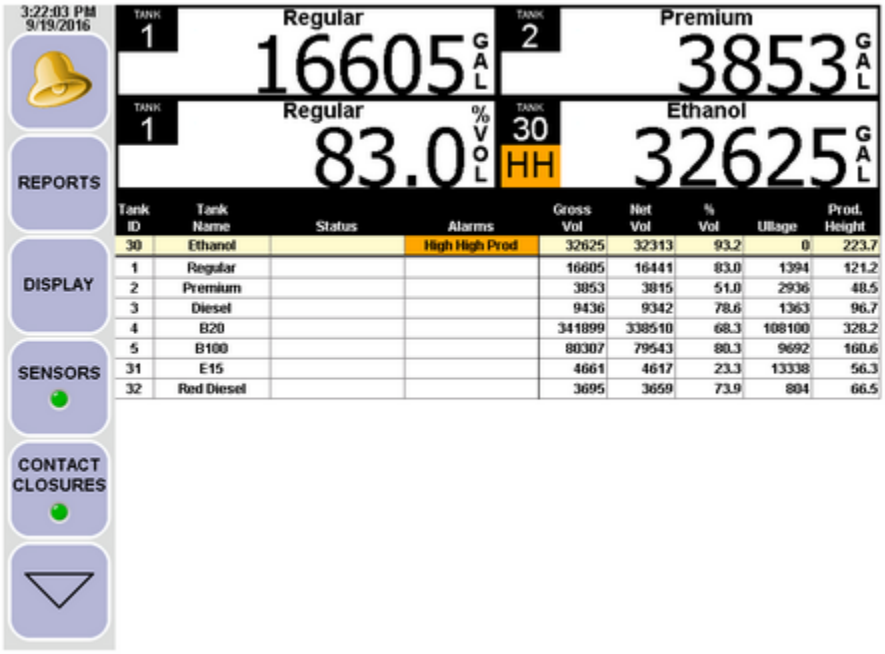
Day/Night: The LCD screen has two different color schemes to improve visibility for both Day and Night conditions. This feature can be set to automatically toggle between these two schemes using the information from the Day/Night sensor on the face of the TMS4000 or may be manually toggled by clicking on the Moon/Sun icon.

Screen Save: Dims the LCD to 3% brightness after a five-minute time delay. The screen is reactivated when the screen is touched or if an alarm or activity occur.

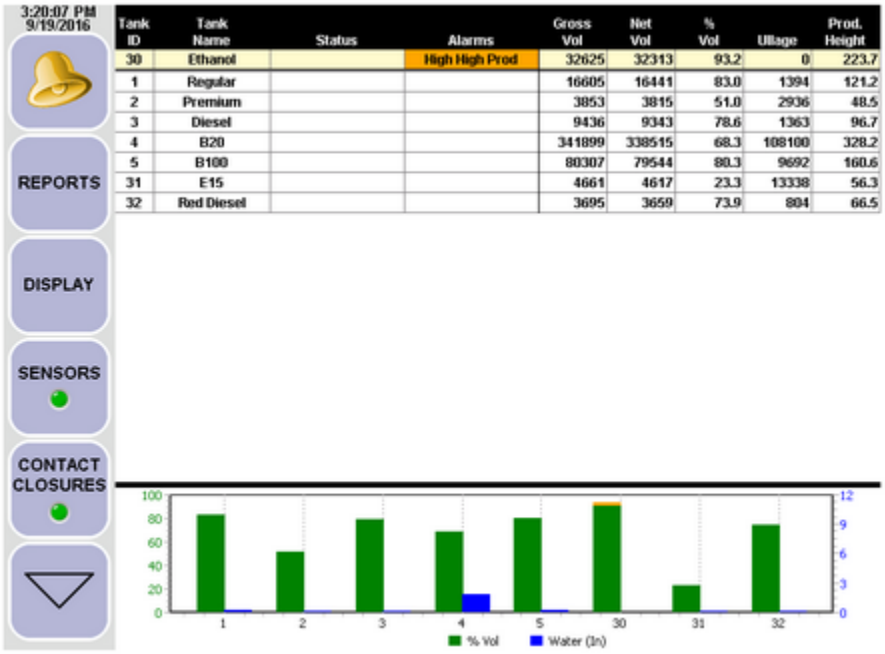
Brightness: The LCD screen brightness may be manually adjusted using the slider (default is 75%) or may be automatically adjusted using the information from the Day/Night sensor on the face of the TMS4000.



Example: One large meter with Product bar graph

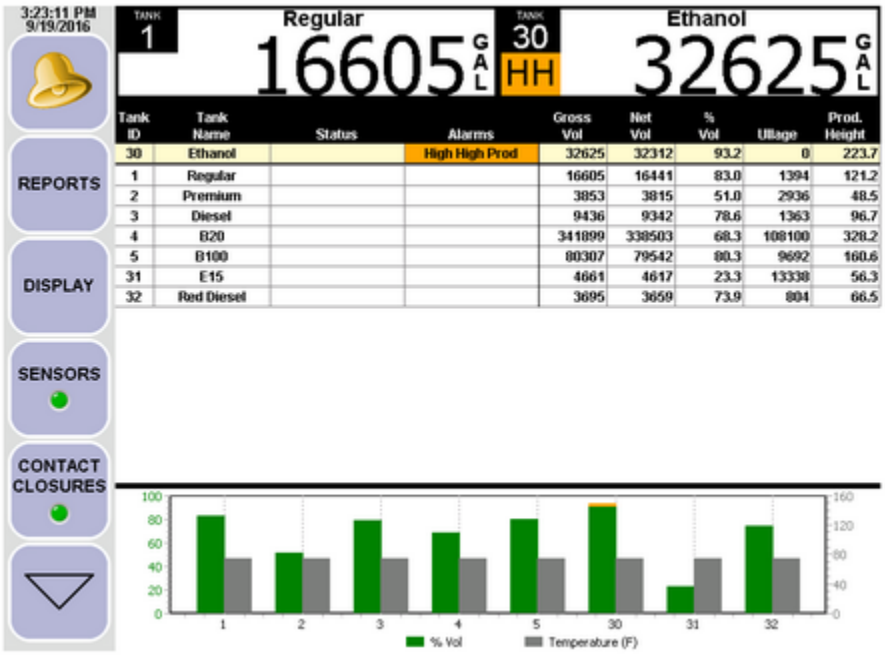


Example: Four small meters with bar graph disabled



Tank ID	Tank Name	Status	Alarms	Gross Vol	Net Vol	% Vol	Ullage	Prod. Height
30	Ethanol		High High Prod	32625	32313	93.2	0	223.7
1	Regular			16605	16441	83.0	1394	121.2
2	Premium			3853	3815	51.0	2936	48.5
3	Diesel			9436	9343	78.6	1363	96.7
4	B20			341899	338515	68.3	108100	328.2
5	B100			80307	79544	80.3	9692	160.6
31	E15			4661	4617	23.3	13338	56.3
32	Red Diesel			3695	3659	73.9	804	66.5

Example: Meters Disabled with Product and Water bar graph

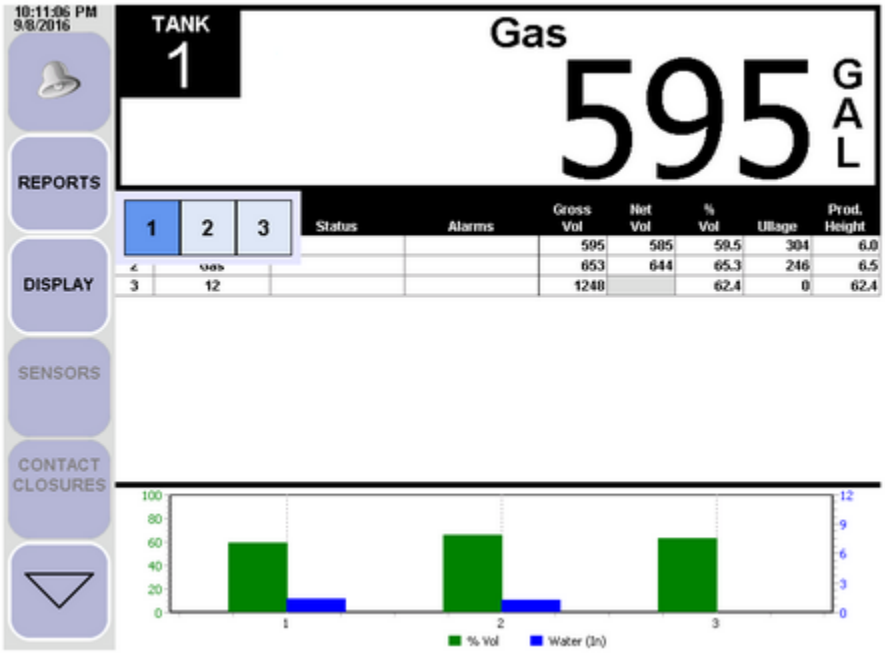


Tank ID	Tank Name	Status	Alarms	Gross Vol	Net Vol	% Vol	Ullage	Prod. Height
30	Ethanol		High High Prod	32625	32312	93.2	0	223.7
1	Regular			16605	16441	83.0	1394	121.2
2	Premium			3853	3815	51.0	2936	48.5
3	Diesel			9436	9342	78.6	1363	96.7
4	B20			341899	338503	68.3	108100	328.2
5	B100			80307	79542	80.3	9692	160.6
31	E15			4661	4617	23.3	13338	56.3
32	Red Diesel			3695	3659	73.9	804	66.5

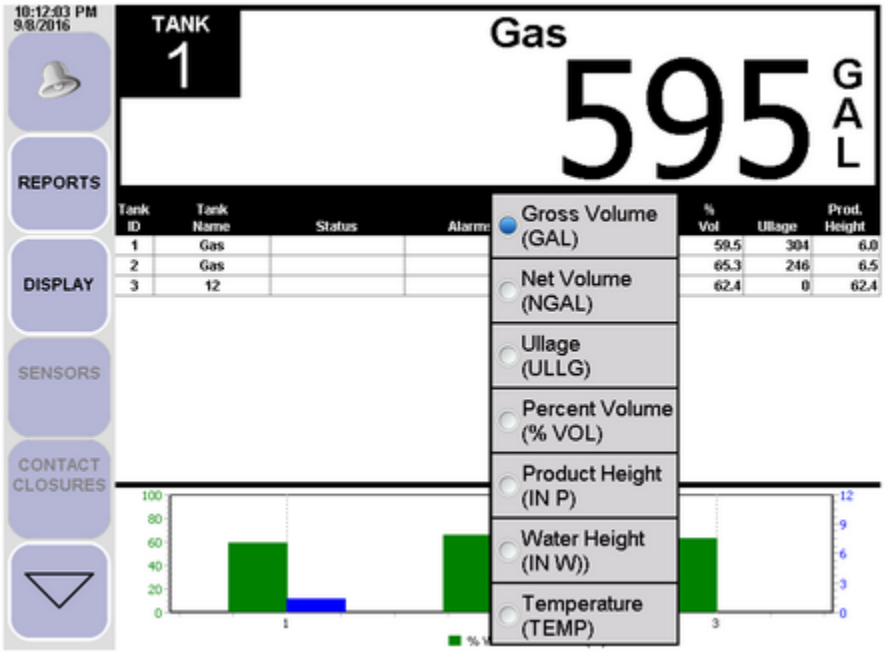
Example: 2 Small Meters with Product and Temperature bar graph

CUSTOMIZING INDIVIDUAL METERS

The below examples illustrate how each individual meter can be configured. The top example is for Tank Channel selection and the bottom example is for Unit selection.



Touch the Tank ID in the back box at the top left corner of the meter to bring up a selection of available Tank Channels that can be selected for the meter. Note that a Tank Channel represents where the probe is physically wired and may differ from the user assigned Tank ID

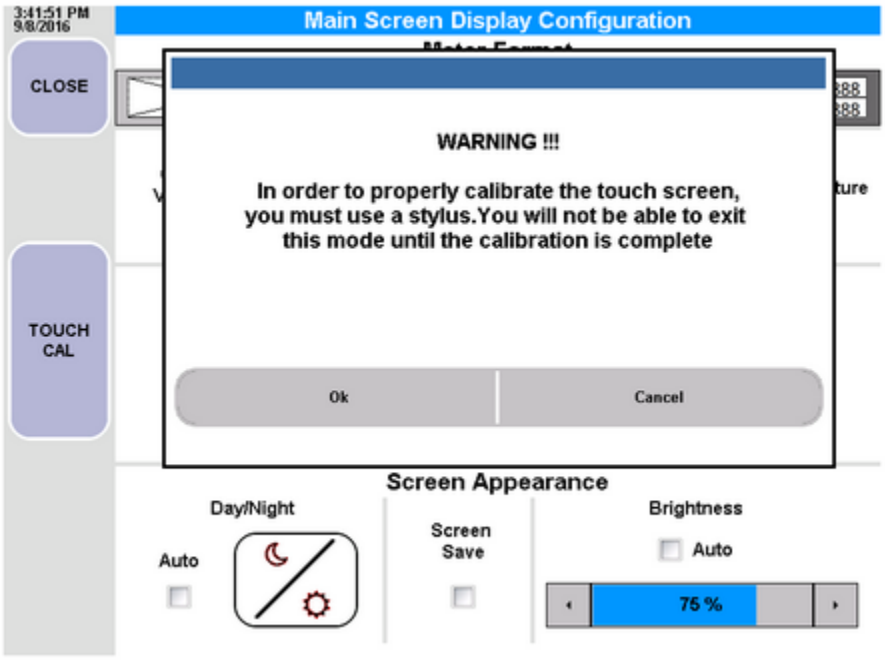


Touch the unit displayed on the far right of the meter (in this case, GAL) to display the drop down menu of choices. Touch the radio button for the desired selection to select that choice.

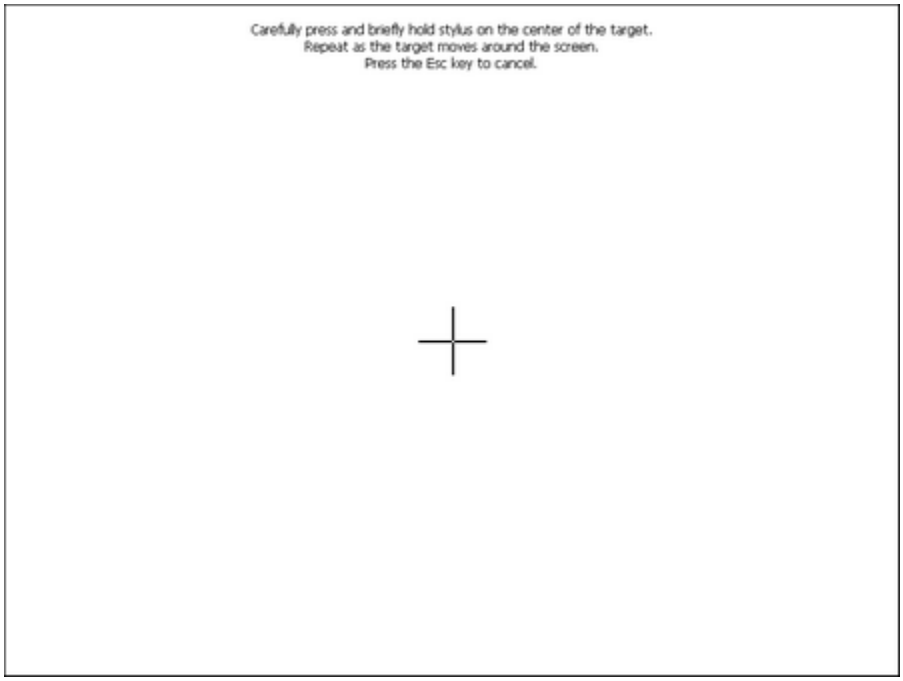
1.8 TOUCH SCREEN CALIBRATION

Note: Only applies to First Generation Resistive LCD Screens ONLY

The ability to recalibrate the touch screen is available in the event the user's touch does not match where the system responds to the touch. It is NOT recommended to perform this without contacting Pneumercator Technical Support. Note that you will need a stylus to properly recalibrate the screen. Failure to follow these instructions may result in the screen being unresponsive and require parts be returned to Pneumercator as directed by Pneumercator Technical Support.



Touching the Touch Cal button will show the above notification screen.



Follow the onscreen instructions above to complete the calibration. The calibration MUST BE COMPLETED to exit this screen.

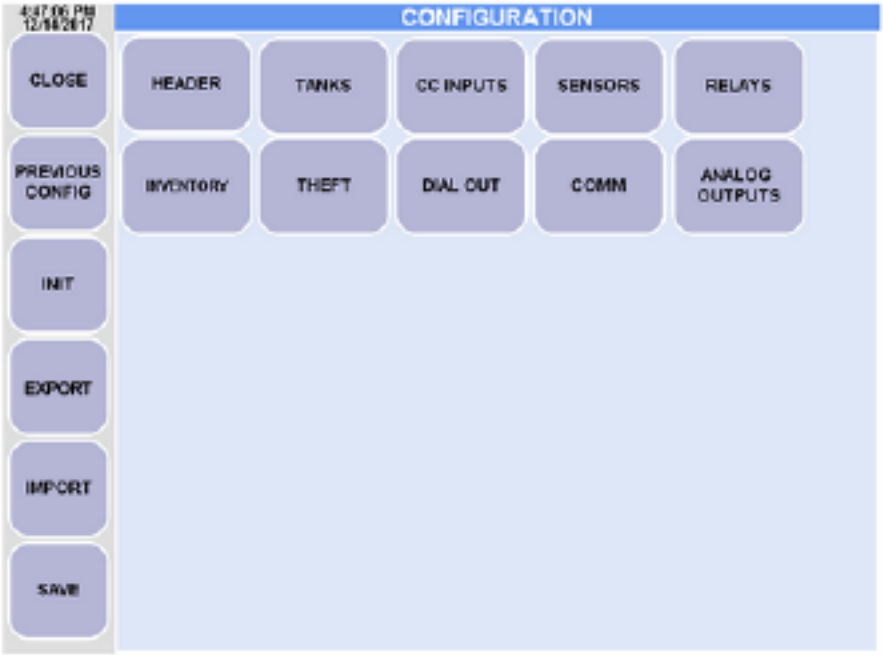
SECTION 2 – SYSTEM CONFIGURATION

2.1 SETUP MENU

The Setup Menu contains options for configuring the TMS and other select administrative functions. A brief description of each section is provided below.

- Config: The configuration of the TMS can be reviewed and/or modified in this section. This includes details for tank geometry, sensor configuration, and Communications and I/O Card configuration. Details are found in the next section.
- Leak Test: This section configures the details for the In-Tank Leak Test including the Test Length and scheduling of the test.
- The System Log contains a list of administrative events like a configuration change or firmware upgrade. Select system problems may also be documented here. This log will be described in Section 3.
- Security: sets the security for accessing select TMS features. Once enabled, a 4-digit PIN number will be needed to access select features.
- Firmware: provides the ability to upgrade the firmware or view what the current firmware level is.
- Localization: the system language and units of measure are configured here.

2.2 SYSTEM CONFIGURATION



The Config menu is divided into categories of configuration options. A brief description of each category is listed below. Additional details immediately follow this section.

- Header: global settings that affect system operation as a whole
- Tanks: all details for configuring a tank including the dimensions and probe details.
- CC Inputs: Contact Closure Inputs typically located on select Relay I/O Cards
- Sensors: Leak/Point Level Sensor
- Relays: Relay output triggers and behavior settings
- Inventory: schedule of inventory snapshot
- Theft: defines hours of operation for the facility
- Dial Out: conditions that can initiate a dial-out
- Comm: Serial, network, and modem settings
- Analog Outputs: tank data assignment to each channel

The buttons along the left edge perform the following functions:

- Close: Closes the Config Window. If changes were made, a prompt will appear questioning whether or not to save the configuration.
- Previous Config: The previously saved version of the configuration is stored in the TMS to allow recovery from accidental configuration changes.
- Init: Initializes the system configuration to the factory default settings.
- Export (Formerly labelled COPY): When a flash drive is inserted, a copy of the current configuration file will be copied to the flash drive. The User is prompted to enter a file name. The file extension used is .CFX. See Section 1.1.1 for location of USB Port.
- Import: When a flash drive is inserted with a valid file with the .CFX extension, the option to import is available. See Section 1.1.1 for location of USB Port.
- Save: The current configuration overwrites the previously saved Previous Configuration and the New Configuration changes become the current configuration.

2.3 HEADER

Site Name: Printed on system generated reports

Unit ID: Used to identify the TMS that generated a report. This is recorded in all Logs and is included on all printouts from the TMS. This is also used, in part, to identify a TMS that is making a phone call to a computer running Autopolling. See Unit ID.

Site ID: Used to identify the TMS that generated a report. This is recorded in all Logs and is included on all printouts from the TMS. This is also used, in part, to identify a TMS that is making a phone call to a computer running Autopolling. See Unit ID.

Horn Delay: Silences the integrated TMS horn after a delay set in minutes. Selecting None disables this feature.

Leak Print Mode: Choice between printing all In-Tank Leak Test Results (Pass-Fail) or only Failing results (Fail Only)

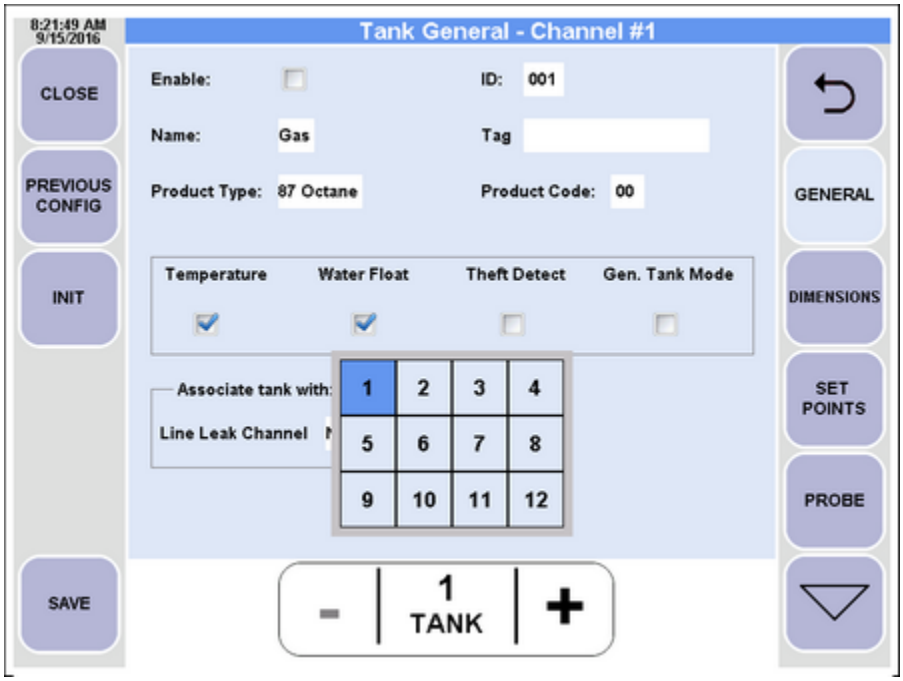
Ullage Limit: ullage is the free space in the tank. Factory default of 90% is used due to the fact that most applications do not permit the filling of a tank above the 90% volume mark. Other options include 85%, 95%, and 100%.

Sales Enable: Enables Bulk Sales Tracking and records data in the Sales Log. Not used for applications where simultaneous transactions can occur.

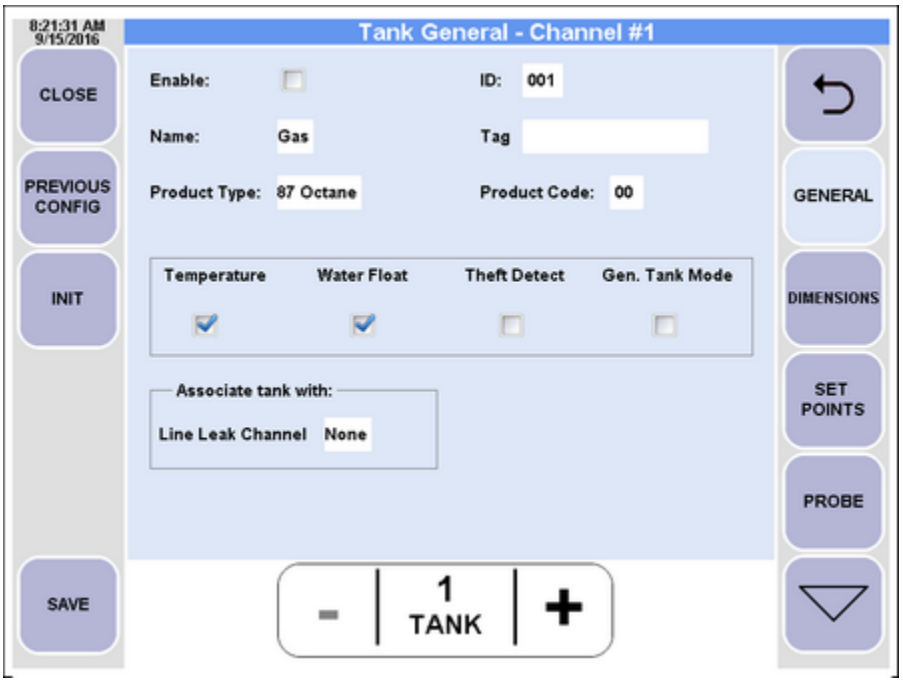
Line Leak Enable: Makes available the assignment of the Line Leak Channel number of the external LS300 Line Leak console to a specific Tank Channel

File Export Prefix: The Prefix is prepended to the file name of the exported report saved to a USB Flash Drive.

2.4 TANKS - GENERAL



Touch the +/- buttons to increment Tank Channel by 1. Touch the Tank Channel number to bring up a list of possible Tank Channels. Touch the Tank Channel number on the table to make a selection.



Enable: Activates the selected Tank Channel. The Tank Channel number is represented by the tabs across the bottom. Use the small arrow buttons on the bottom right corner to access all available tank channels or click on a visible tank tab number.

ID: Used to assign a custom 3 digit numeric tank ID to a tank channel. Default setting has the Tank ID matching the Channel Number.

Tank Name: A name assigned to a tank to identify the stored product. Select from the list or type in a 16 character custom name.

Tank Tag: Printed on system generated reports

Product Type: Defines the coefficient of thermal expansion. Consult factory if product is not listed.

Product Code: Used to support V200 and V300 protocols. Not used in any calculations and is not present on any reports.

Temperature: Selects whether or not the temperature reading is viewed. Shown as a constant zero temperature if disabled. Temperature must be enabled for in-tank leak tests.

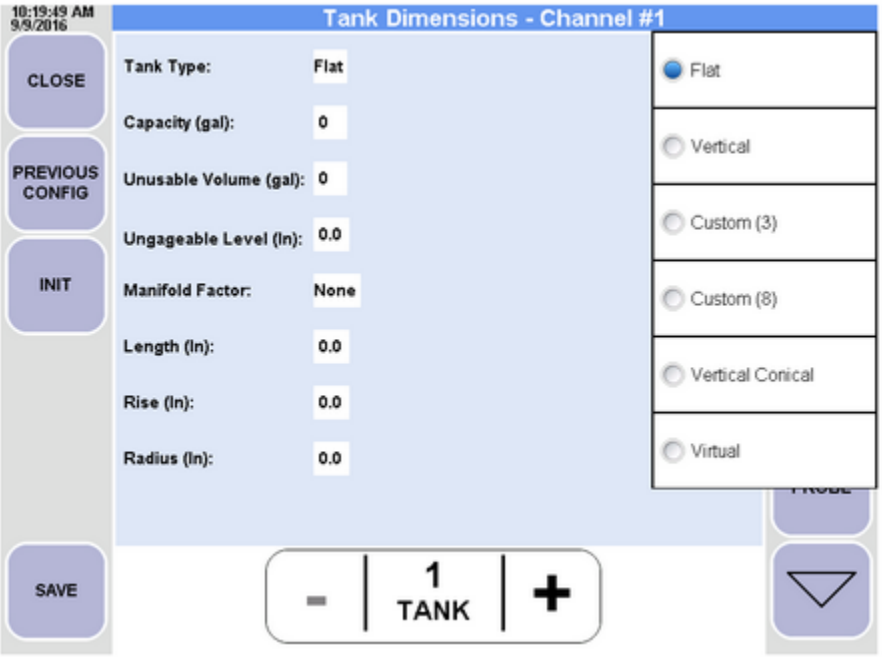
Water Float: Instructs the TMS to display the water level reported by the probe. This setting is intended for use in applications where the water reading is not desired. The TMS displays a blank in the water level field when disabled.

Theft Detect Enable: Enables a per tank setting for theft monitoring. See the Theft tab for more details.

Generator Tank: A special in-tank leak test mode intended for use on above ground generator tanks. Identical to Auto Leak Test Mode without the monthly limitation.

Associate with Line Leak Channel: Used in the Line Leak Report to identify the tank that the tested line supports. Only displayed if Line Leak Enable is checked in Header section.

2.5 TANKS - DIMENSIONS



The TMS support a wide range of tank shapes and sizes. These supported tanks can be configured by selecting the basic tank shape from the list as described below:

Flat: Flat-ended horizontal cylinder.

Vertical: includes vertical cylinders and rectangular tanks. Any tank with a constant volume per unit of level is supported with this type

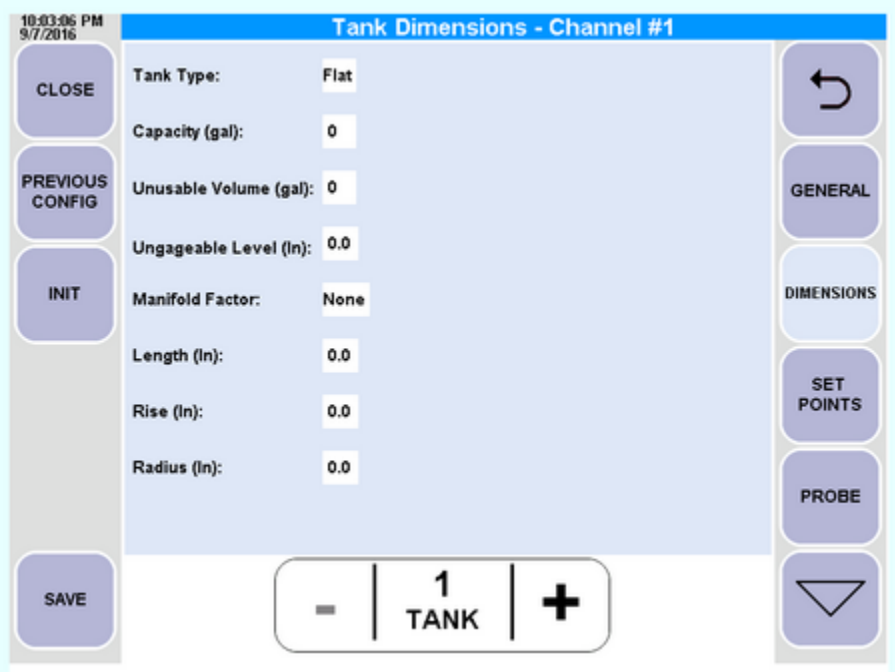
Custom (3): A horizontal cylinder with curved or dished ends.

Custom (8): An asymmetrical tank or other tank with unusual geometry. Contact Pneumercator for assistance.

Vertical Conical: A vertical cylinder with a cone bottom.

Virtual: Combines multiple tank to for a virtual tank for the purpose of defining Product Set Points for the collective volume.

2.5.1 TANKS – DIMENSIONS – FLAT



The following settings pertain to a flat-ended horizontal cylinder:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

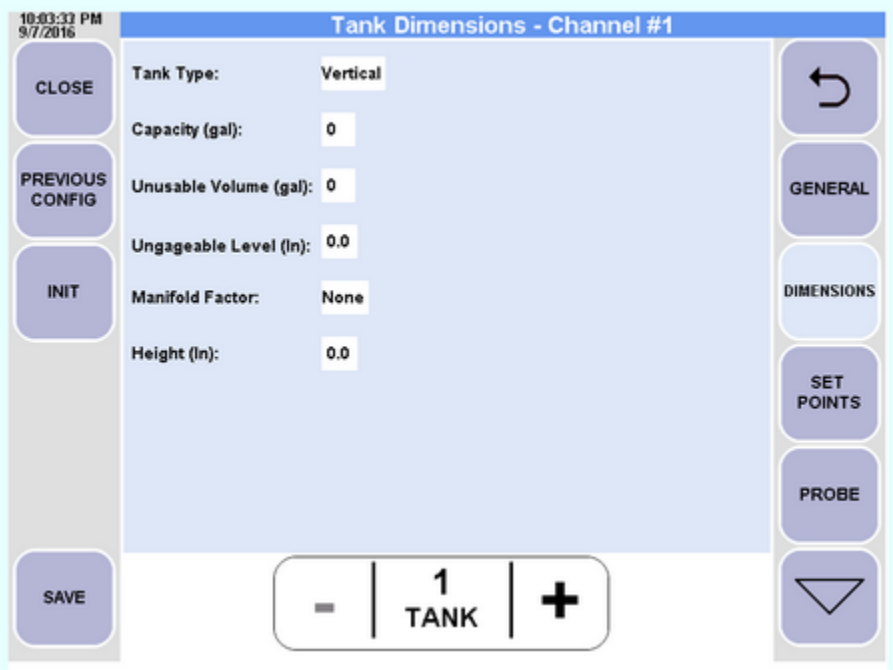
Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

Length: Only used if the tank is tilted. See Tank Rise.

Rise: Amount of tank tilt present on a horizontal tank. Measured in inches and is never negative. See Probe Location Offset.

Radius: 1/2 of the inside diameter. Refer to tank drawing or chart for details.

2.5.2 TANKS – DIMENSIONS – VERTICAL



The following settings pertain to a tank with a constant volume per unit level including vertical cylinders and rectangular tanks:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

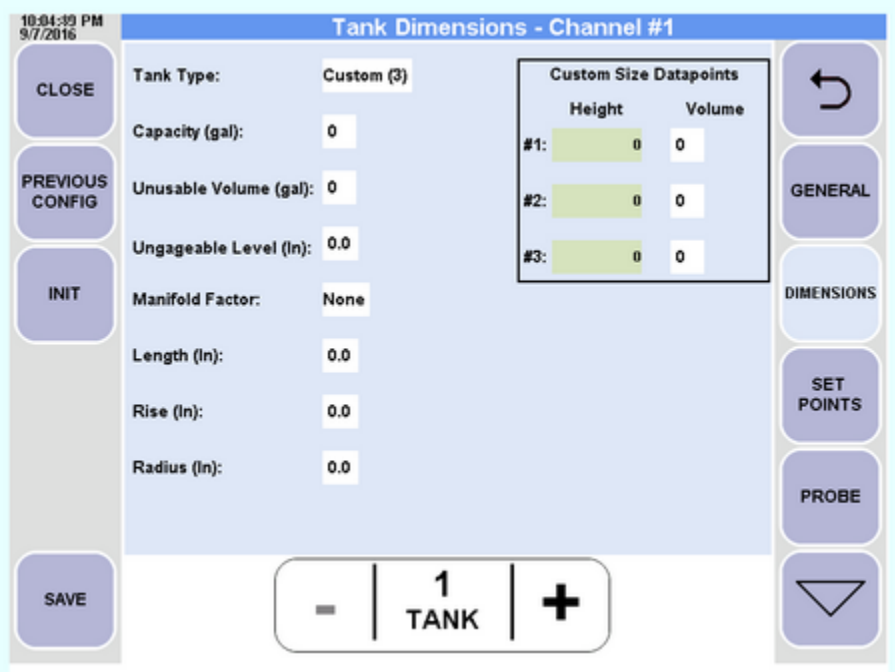
Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

Height: The inside height of the tank.

2.5.3 TANKS – DIMENSIONS – CUSTOM 3



The following settings pertain to a horizontal tank with curved or dished ends:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

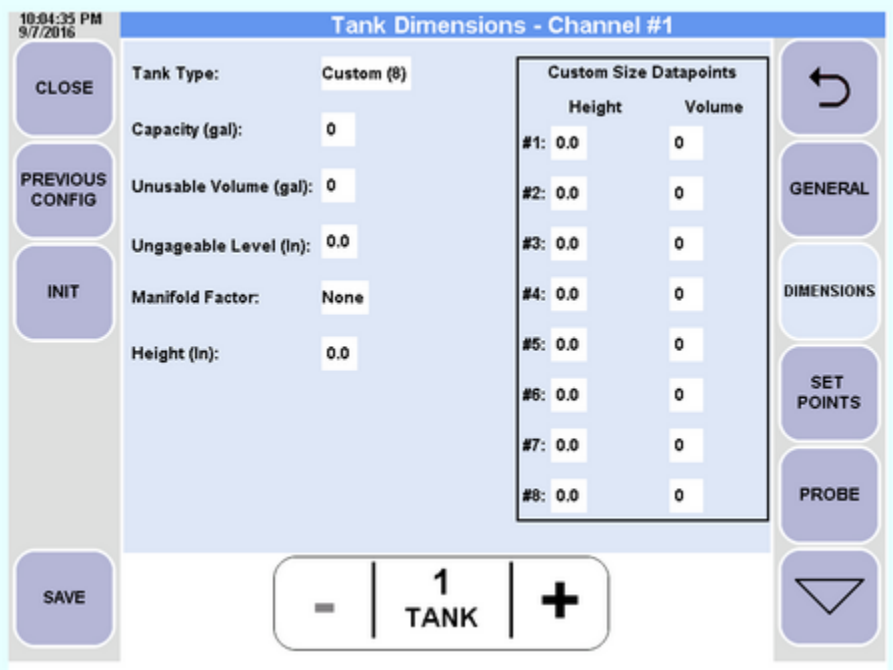
Length: Only used if the tank is tilted. See Tank Rise.

Rise: Amount of tank tilt present on a horizontal tank. Measured in level units and is never negative. See Probe Location Offset.

Radius: 1/2 of the tank diameter. Refer to tank drawing or chart for details.

Custom Size Datapoints: 3 levels are given based on the radius of the tank. Enter the volumes from the manufacturers tank chart for accurate volume calculations.

2.5.4 TANKS – DIMENSIONS – CUSTOM 8



The following settings pertain to tanks with an unusual or asymmetrical geometry:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

Height: The inside height of the tank.

Custom Size Datapoints: 8 levels and volumes are required. Refer to the manufacturers tank chart for accurate volume calculations. Contact Pneumercator for additional support in selecting specific data points best suited for the specific tank shape.

2.5.5 TANKS – DIMENSIONS – VERTICAL CONICAL

The following settings pertain to vertical tanks with a conical bottom:

Capacity: Use actual tank capacity so that an accurate volume calculation can be performed. (i.e. a tank may be referred to as a 10,000 gallon tank for conversation but the actual capacity may actually be 9844.)

Unusable Volume: Affects the calculations performed for the Product Order Report. This volume is excluded from the total volume when calculating the number of days of usable fuel remaining in the tank.

Ungageable Level: Represents the amount of liquid that cannot be measured by the probe. This may be due to the construction of the tank or the fact that the flex probe has a weight on the end of the shaft.

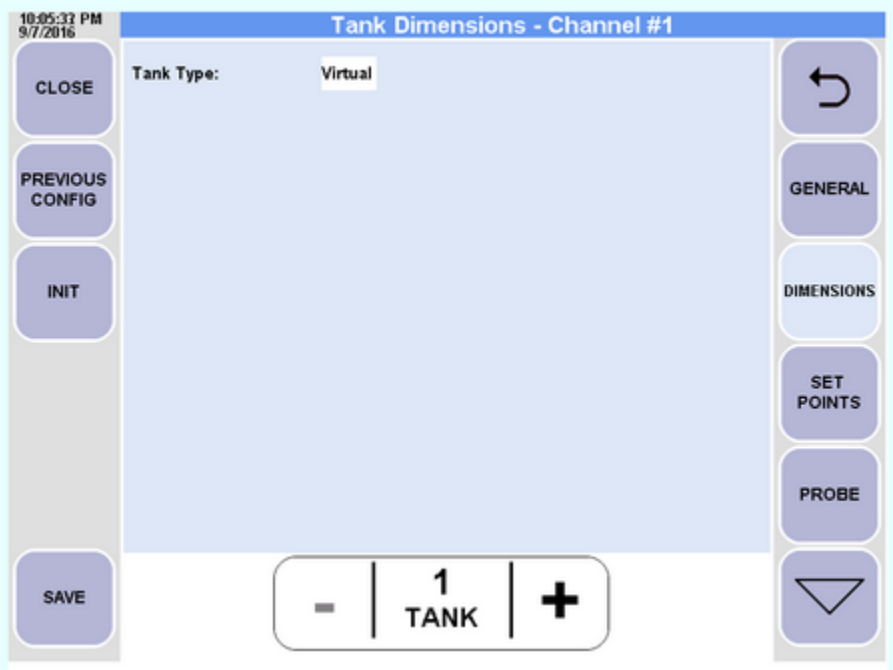
Manifold Factor: The number of Manifolds on a tank set with only one probe. Note that EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. Advanced settings here include the ability to auto select a pump based on the tank with the highest volume. Consult factory for details.

Height: The inside height of the tank.

Cone Height: Height of the cone and radius of the tank are used to determine the pitch of the cone.

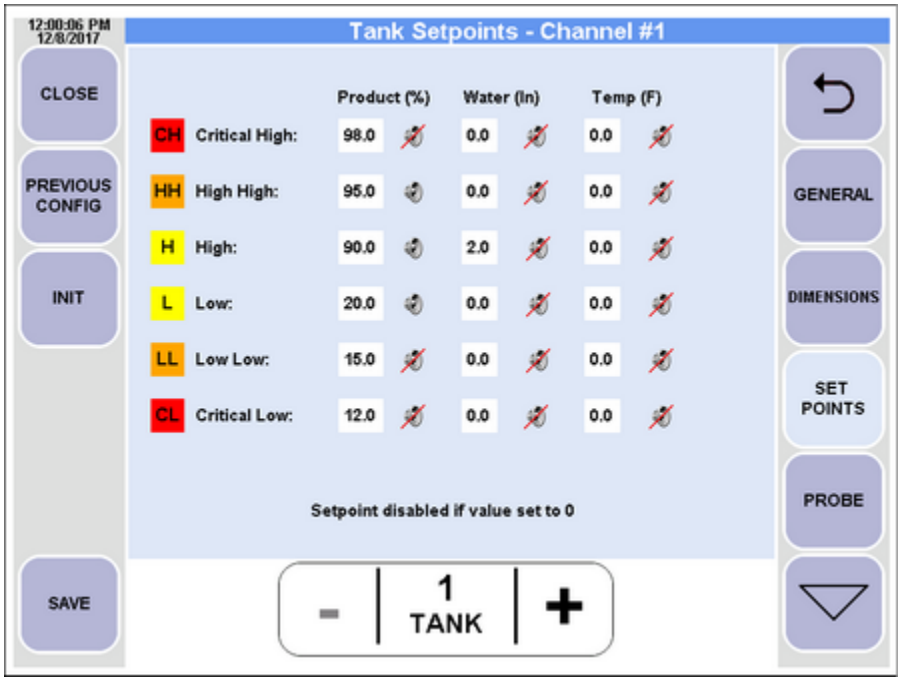
Radius: 1/2 of the diameter of the tank or cone. Refer to tank drawing or chart for details.

2.5.6 TANKS – DIMENSIONS – VIRTUAL



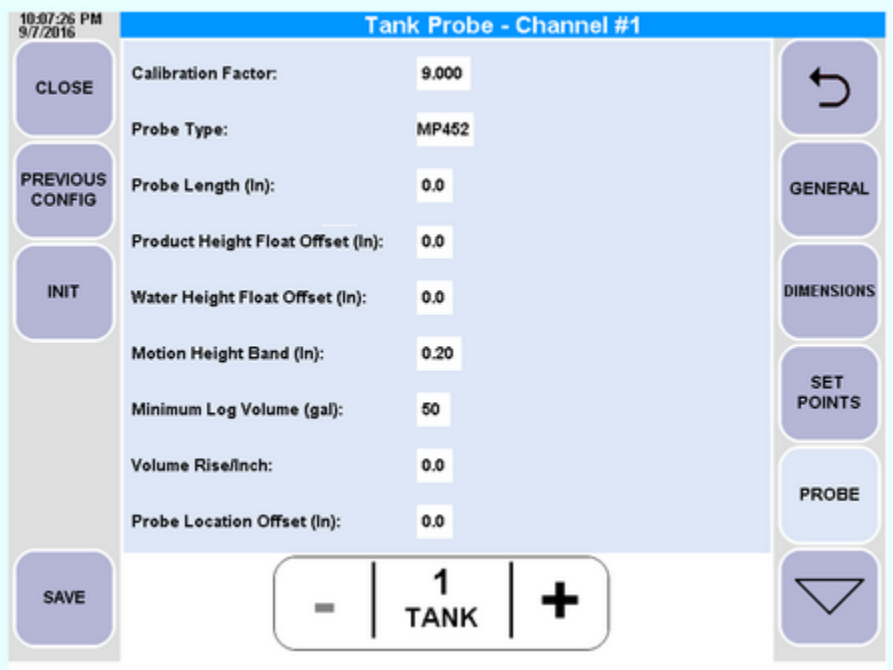
The virtual tank type is a specialized tank that allows the combining of multiple tanks into a single virtual tank for the purpose of defining Product Set Points. The tanks in the set are currently defined by assigning a custom tank name containing the Tank Channel numbers of the tanks to be included in the set.

2.6 TANKS – SET POINTS



The above screenshot shows the default values for the Tank Set Points. The units for the Set Points are displayed above each column. The horn symbol to the right of each value can be touched to toggle whether or not the internal horn activates when the alarm threshold is reached.

2.7 TANKS – PROBE



Calibration Factor: Also known as wire speed. This is a performance value that is measured for each probe and is necessary to generate an accurate level reading.

Probe Type: The model number of the probe. Only the first 5 characters are necessary. (i.e. MP461SC and MP461SA are both programmed as MP461.)

Probe Length: Used to determine the location of the temperature sensors within the probe shaft.

Product Height Float Offset: Compensates for the difference between a manual stick reading of product and the displayed product level. This setting should only be used if the product float is buoyant or floating.

Water Height Float Offset: Compensates for the difference between a manual stick reading of water and the displayed water level. If the manual stick reading shows no water, the water float offset should be set so that the final water reading on the TMS is 0.2 inches for both the MP45Xs and MP461SC. The recommended final reading for the MP46Xs is 1 inch.

Motion Height Band: Sensitivity adjustment used by the TMS to filter out surface action from actual transactions. Set in inches per minute. Defaults to 0.2 inches per minute. When the Motion Band is met or exceeded, the transaction begins. When the Motion Band is not met or exceeded for 3 consecutive minutes, the transaction is ended, categorized, and possibly recorded. See Minimum Log Volume.

Minimum Log Volume: After a transaction is completed, the volume of the transaction is compared to this setting to determine whether to record or discard the transaction. Used to further filter out false transactions.

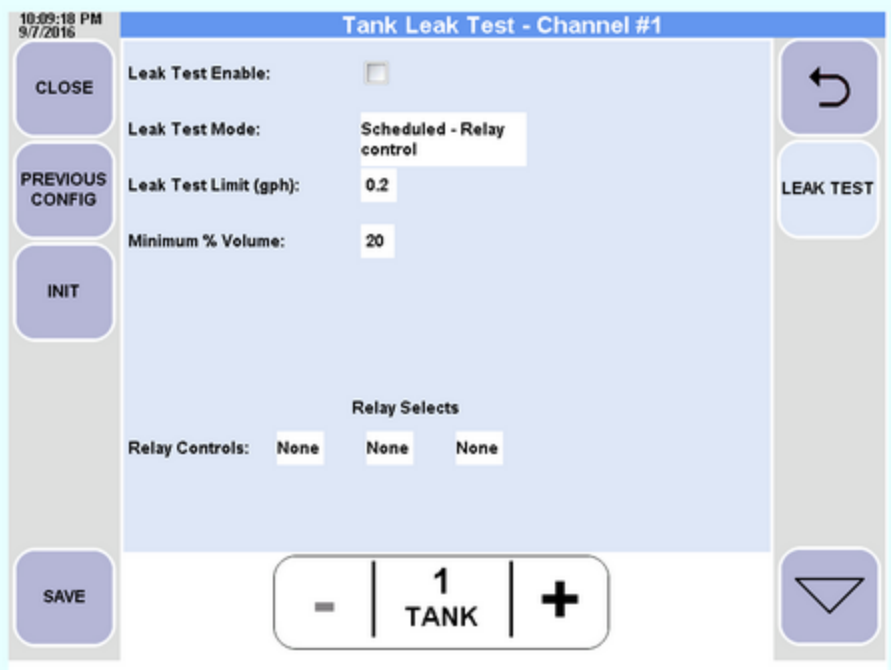
Riser Volume per Inch: MP452 only. Some designs of Oil/Water Separators allow the liquid level in the system to go above the top of the tank in one or more riser pipes. This setting allows the TMS to calculate the volume of product within the riser pipes.

Probe Location Offset: Used to pinpoint the location of the probe in a tilted tank. Represents how many inches away from the high end of the tank the probe is located.

2.8 TANKS – LEAK TEST

The below screenshots show all of the possible configuration settings for in-tank leak testing.

Auto Leak Test Mode settings



Scheduled – Relay Test Mode settings

Leak Test Enable: Test will not run if this box is not checked.

Leak Test Mode: Choose what type of test to run. Choices are as follows:

- Manual: On-demand leak test started when desired
- Timed: Runs on a programmed schedule
- Auto: Runs using information on a CC Input, likely from a current sensor (CS-10) that represents tank activity. Useful for locations where activity is possible 24 hours a day.
- Timed Relay Control: Also runs on a programmed schedule but up to 3 relays will activate at the scheduled time and the test starts 15 minutes later.

Leak Test Limit: Typically set for 0.2 GPH (Gallons Per Hour) for a monthly test. May be set to 0.1 GPH for an annual test.

Minimum % Volume: Defines minimum threshold of product in tank to allow a test to run. Must be used in conjunction with the % Volume Mode leak test schedule.

Auto Mode Pass/Fail: Auto mode completes one test per month. This setting determines what an acceptable completed test result is. A setting of Pass Only would cause the TMS to run the test again during that month if the last test failed.

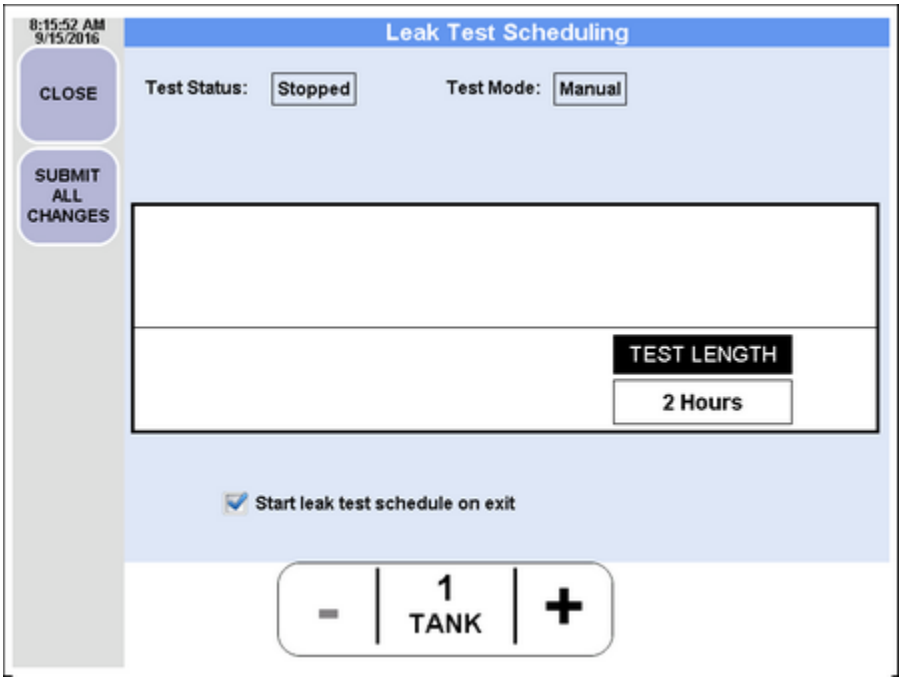
Pump/Generator Run Contact Closure Input (Auto Mode Only): Which input number is the activity signal being received on. Likely wired to a CS-10.

Relay Controls: (Timed Relay Control Mode Only): Select up to 3 relays to activate prior to running a leak test so that a tank in a manifolded set is physically isolated before beginning the leak test.

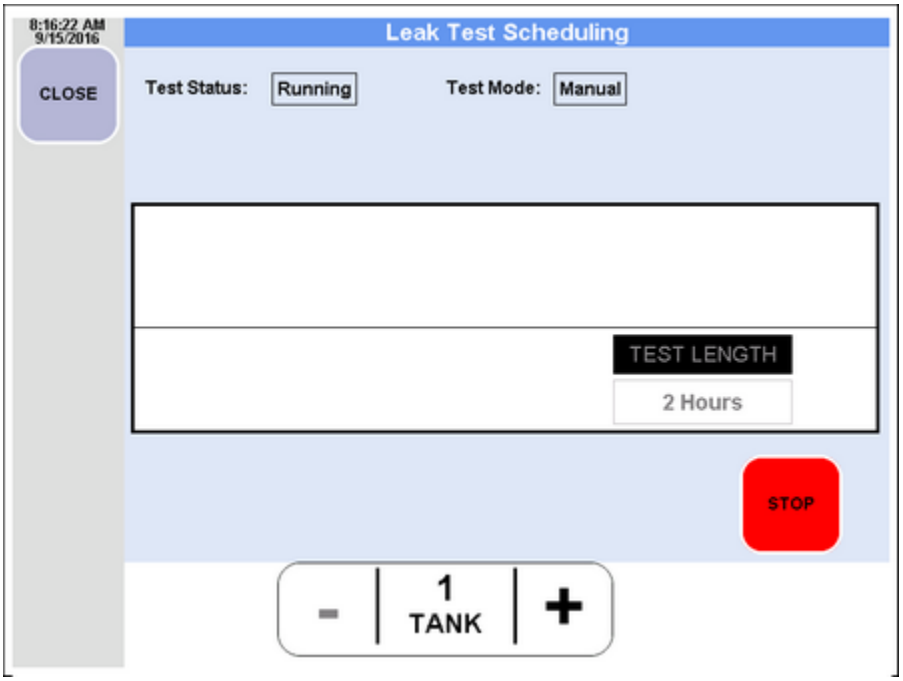
2.9 LEAK TEST SCHEDULING

The In-Tank Leak Test must be enabled as detailed in Section 2.8 above. Failure to do so will result in the below screenshot if any attempt to adjust the schedule is made.

2.9.1 LEAK TEST SCHEDULING - MANUAL

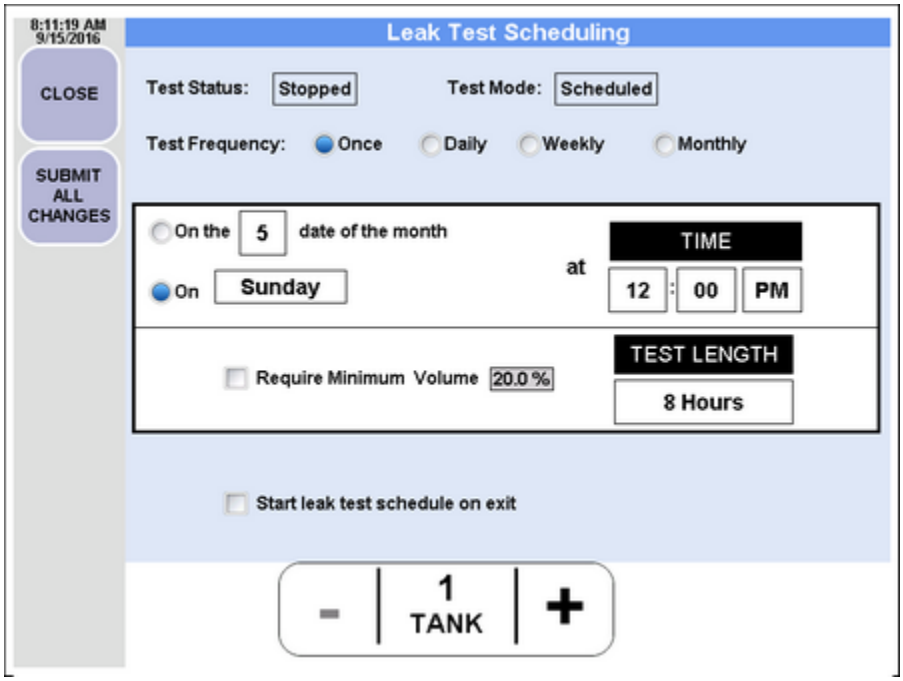


The Manual Leak Test Mode is ideal for applications where the user prefers to manually start the test, usually due to a site having a high throughput. The user would manually shutdown the tank before beginning the test. The test length must be set to comply with local regulations covering the size of tank being tested. Check the box marked “Start Leak Test Schedule On Exit” and touch the Close button to start the test immediately.



2.9.2 LEAK TEST SCHEDULING - SCHEDULED

A leak test may be scheduled to accommodate the needs of the sites and the requirements of the regulatory agencies. Several examples are shown below.



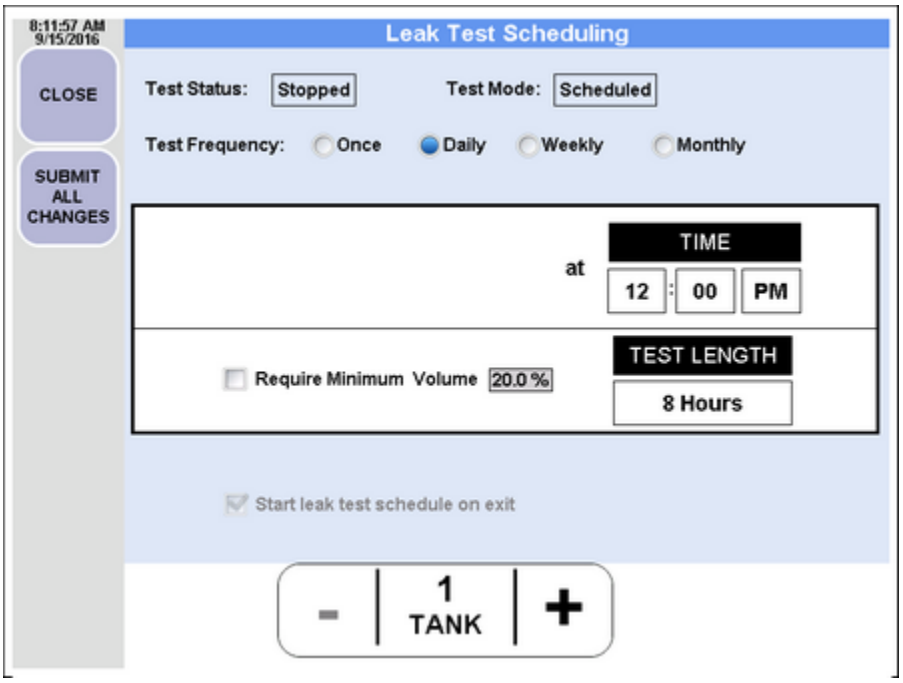
Selecting a Test Frequency of ONCE provides the means of starting a single test at the time and date configured above.

Selecting the radio button for On The nth Date Of The Month allows the user to run the test up to one month in the future. If, for example, today's date is September 15 and the value entered in the box is 14, the test will run on October 14th at the designated time. If the value entered is 15 but that time has already past, then the test will run on October 15th at the designated time.

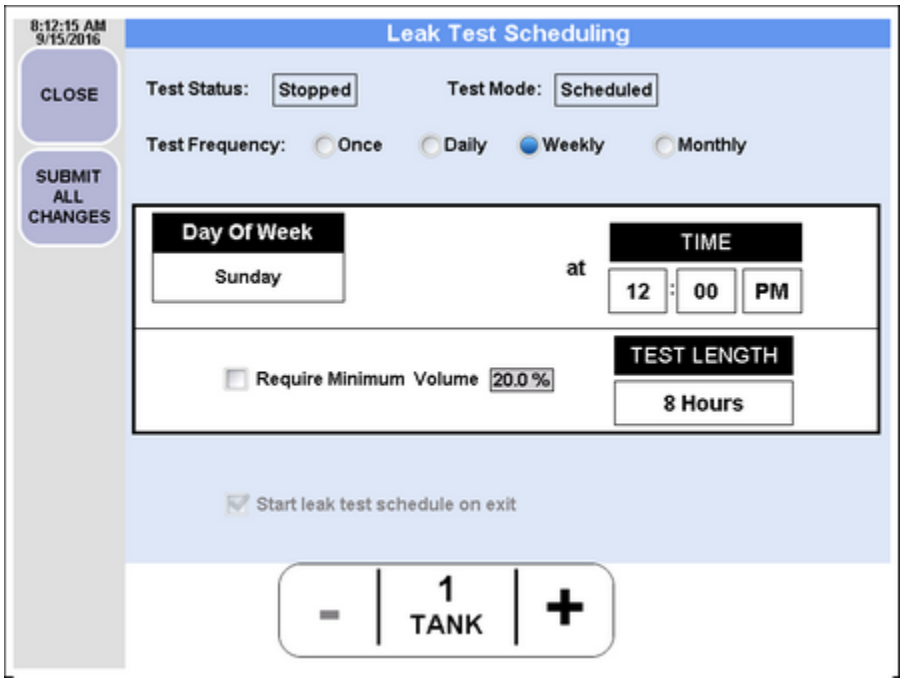
Selecting the radio button On Day of Week allows the test to be run up to one week ahead. The example above show the setting as On Sunday which would cause the TMS to begin the test on Sunday at the designated time.

If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).

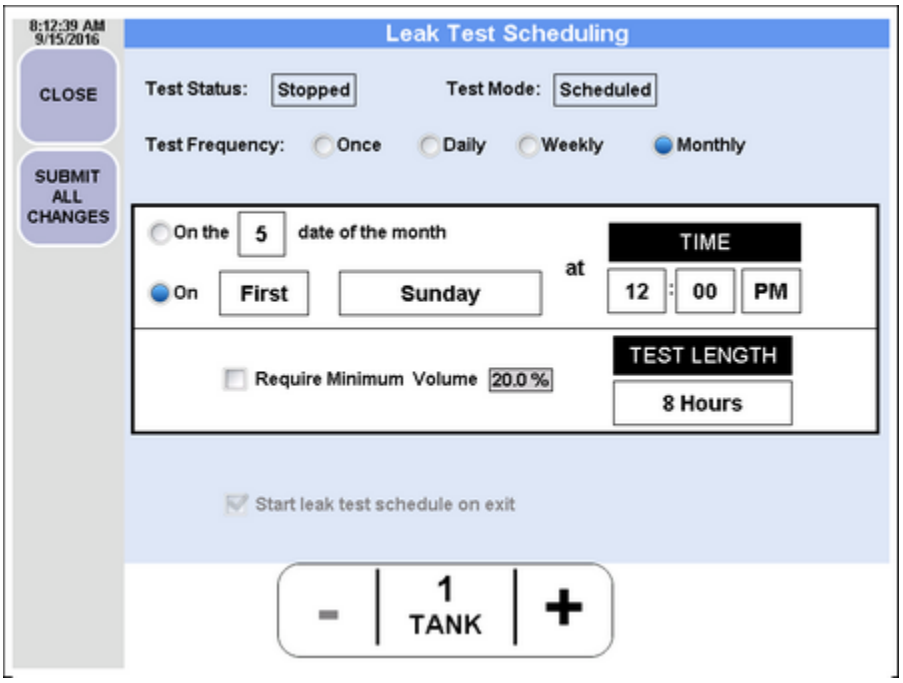
Upon completion, the schedule will be satisfied and no further tests will be run until the TMS schedule is reconfigured. This is generally used either to confirm a tank is not leaking on initial install or to manually run a test after a failure to confirm the results.



Selecting a Test Frequency of DAILY creates a repeating test that will run once a day at the configured start time displayed. Controls are provided for setting the Start Time and Test Length. If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).



Selecting a Test Frequency of WEEKLY creates a repeating test that will run once a week at the configured start time displayed. Controls are provided for selecting which Day of the Week, the Start Time, and Test Length. If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).

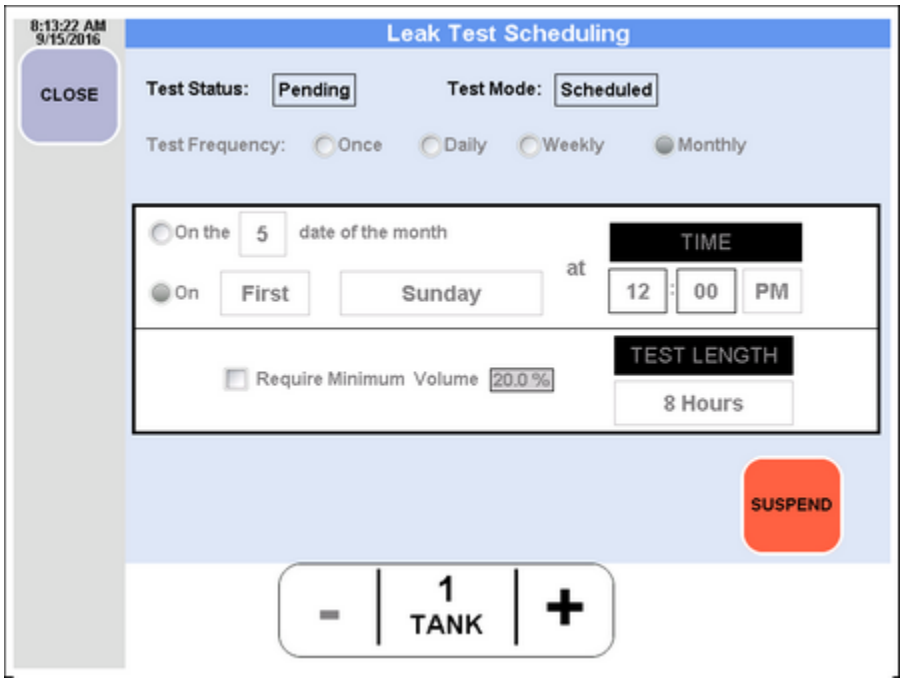


Selecting a Test Frequency of MONTHLY creates a repeating test that will run once a month at the configured start time and date displayed.

Selecting the radio button for On The nth Date Of The Month allows the user to run the test on that data every month. Do not select a date higher than 28 to avoid skipping a test in February.

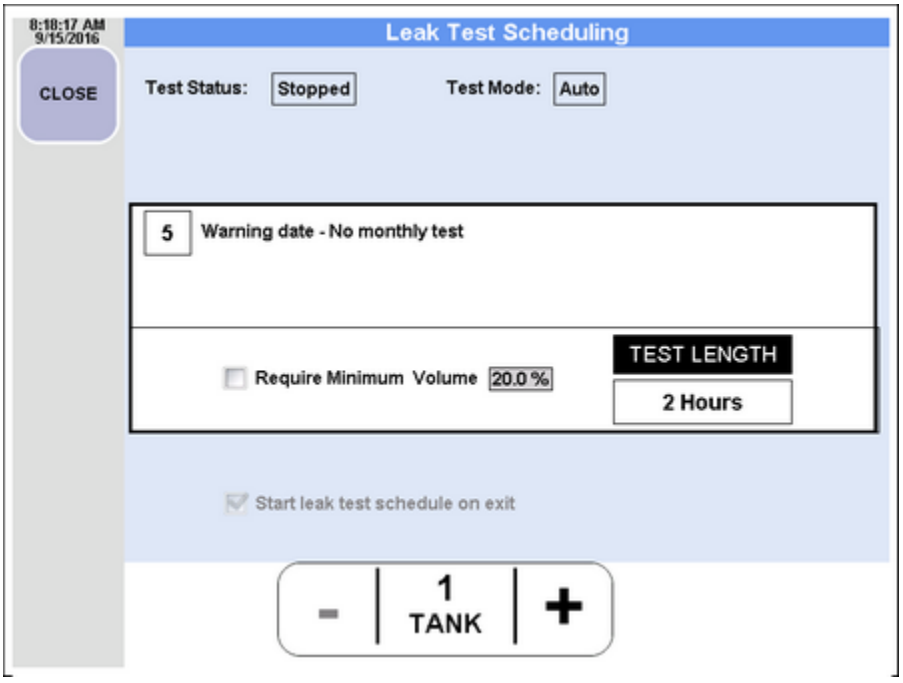
Selecting the radio button On nth Day of Week allows the test to be run once a month on a specific day of the week. The example above show the setting as On First Sunday which would cause the TMS to begin the test on First Sunday of the month at the designated time.

Controls are provided for selecting the Start Time and Test Length. If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).



To stop a test that is running or to stop the scheduler, touch the Suspend button show above.

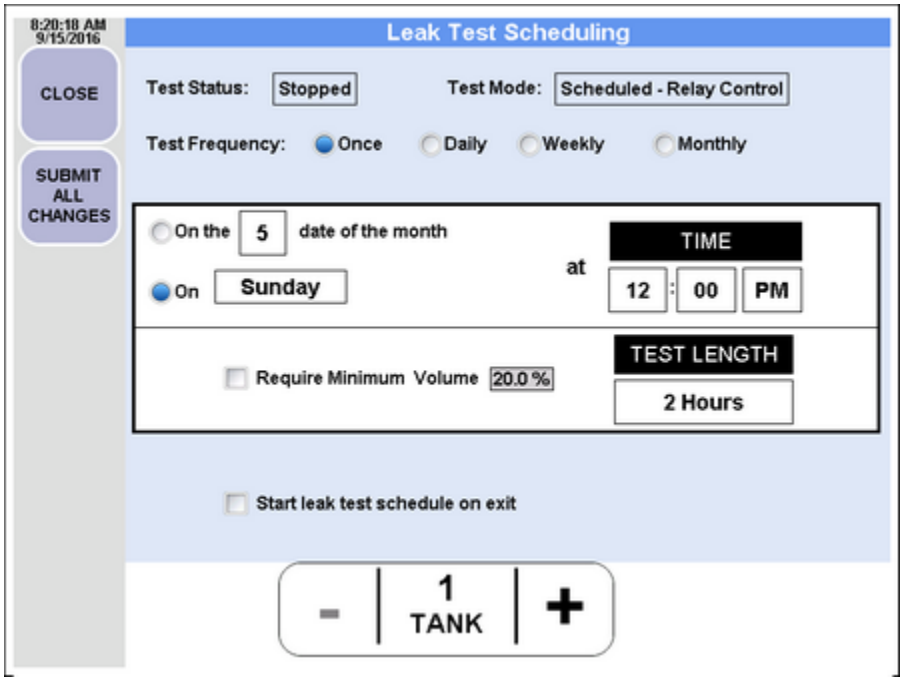
2.9.3 LEAK TEST SCHEDULING - AUTO



Auto Leak Test Mode has the leak test being started by the TMS based on the site activity monitored through a CC Input. The Scheduling window shown above shows a Warning Date – No Monthly Test feature. When configured, the TMS will provide a warning when the tank has not satisfied its monthly test requirements. It is recommended to set this value so there would be enough time to manually shut down the tank and perform a leak test.

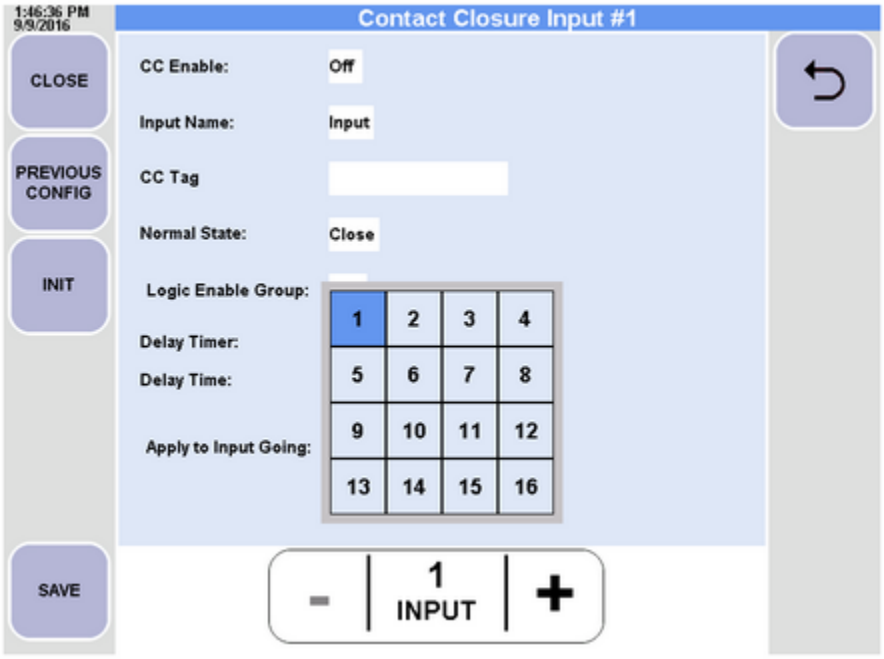
If the test requires a minimum % Volume, be sure to check the box to establish that requirement. The test will NOT run if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.8).

2.9.4 LEAK TEST SCHEDULING – SCHEDULED – RELAY CONTROL

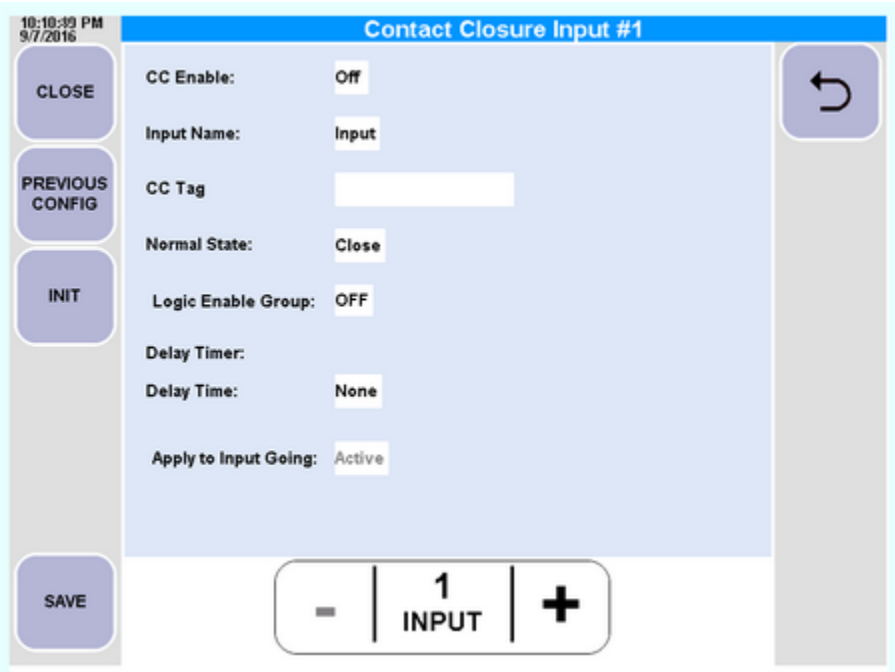


The scheduling options for the Test Mode of Scheduled – Relay Control are identical to those for the Test Mode of Scheduled. See Section 2.9.2 for complete details.

2.10 CC INPUTS



Touch the +/- buttons to increment CC Input by 1. Touch the CC Input number to bring up a list of possible CC Inputs. Touch the CC Input number on the table to make a selection.



CC Input Configuration settings. See next page for a description of each setting.

CC Enable: a CC Input can be enabled in one of several ways:

- Relay: Used to control something whether it is a relay or an auto leak test. (RS2 Test button) (CS-10)
- Gate: Advanced functionality incorporates a logic AND gate into this input. It is paired with other conditions that call out the same relay.
- Alarm: Used to represent an alarm condition from an external device.
- Acknowledge: Used to return a relay to its normal state (RS2 Reset button)
- Line Pass: Specific to specific LS300 Line Leak console configurations. Used to filter out the numerous passing tests and allow only one per month.
- FP Horn Ack: Front Panel Horn Acknowledgement allows an external automation system to send a dry contact signal to the TMS to silence the integrated TMS horn.
- Trigger Group: Part of an advanced auto pump select feature where the pump paired with the highest tank volume is selected. Consult factory for details.

Input Name: Select a name from the list or enter a 16 character custom name. Used to help to identify the input.

CC Tag: Printed on system generated reports

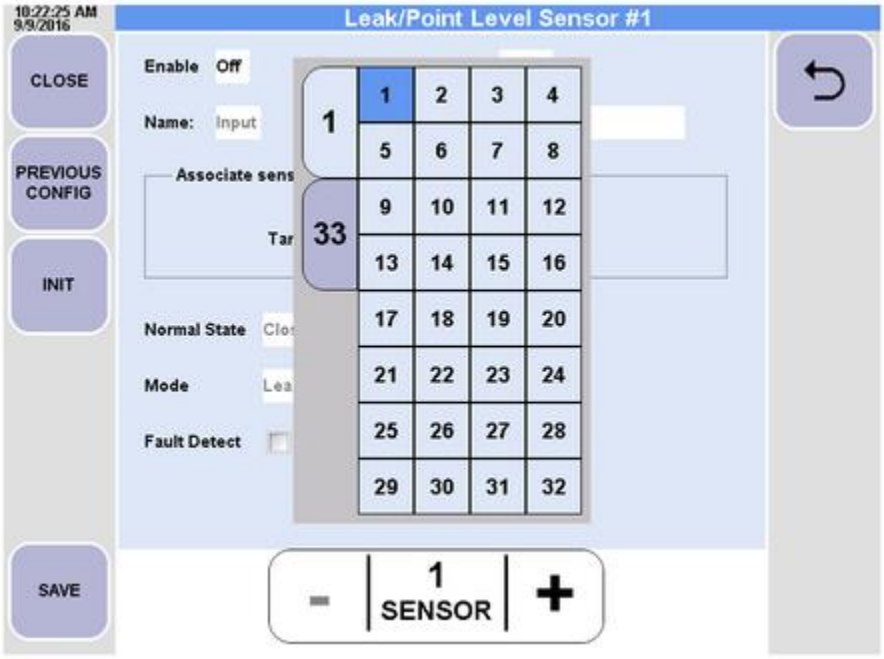
Normal State: Selects the normal contact state of the wired device.

Logic Enable Group: Another form of AND gate where all input in the same logic group are a member of the same gate.

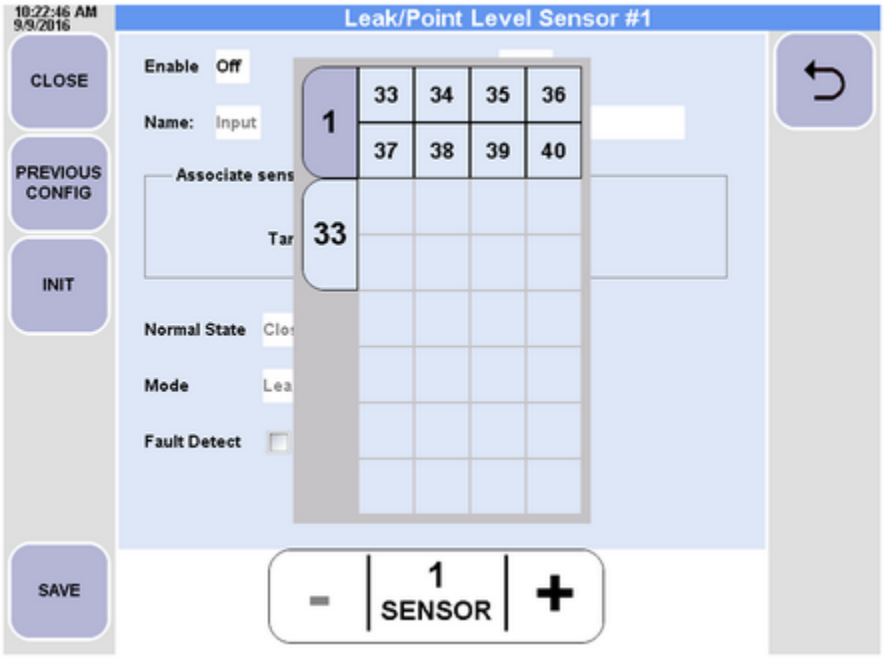
Delay Time: Delay the TMS reaction to the input.

Apply To Input Going: Selects whether the TMS response is delayed with the input going active or inactive.

2.11 SENSOR INPUTS



Touch the +/- buttons to increment Sensor Input by 1. Touch the Sensor Input number to bring up a list of possible Sensor Inputs. The tabs on the left edge show the starting Sensor Input number for the page of choices. Page 1 is shown above and Page 2 is shown below. Touch the Sensor Input number on the table to make a selection.



Sensor Input Configuration settings. See below for a description of each setting.

Enable: Enables the sensor as either Alarm to generate an alarm on the TMS or as Relay to control a relay in the TMS without an alarm. Choosing alarm does not prevent you from also activating a relay on this condition.

Type: Enter the model number of the sensor connected to the TMS.

Name: Choose from the list of predefined names or type in a 16 character name.

Tag: Printed on system generated reports.

Associate Sensor With: Helps to locate a sensor by associating it with a tank or dispenser.

Normal State: Selects the normal contact state of the sensor, open or closed.

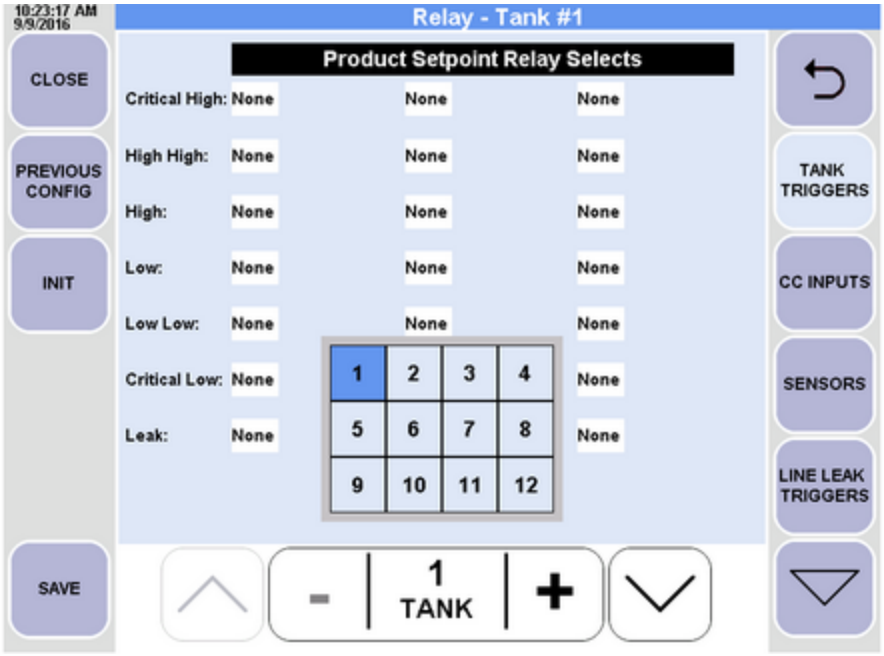
Mode: Select Leak for sensor detecting leaks. Select Other for sensor used for purposes other than leak detection. The integrated horn beeping pattern will differ for sensors defined as Leak sensors versus Other sensors.

Fault Detect: Must be selected for sensors with integrated fault detection circuitry.

2.12 RELAYS

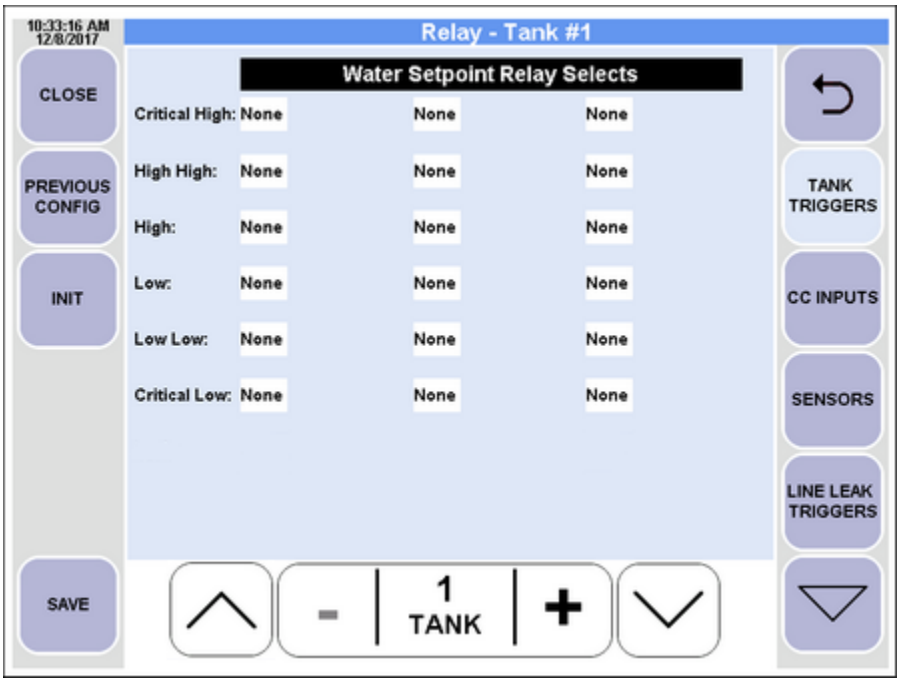
Relay outputs may be configured to trigger from any system alarm or event. The conditions are divided into several categories for easy selection. Any one condition may be assigned to up to three relays. The last category, Relay Mode, contains settings that affect the behavior of the relay.

2.12.1 RELAYS – TANK TRIGGERS

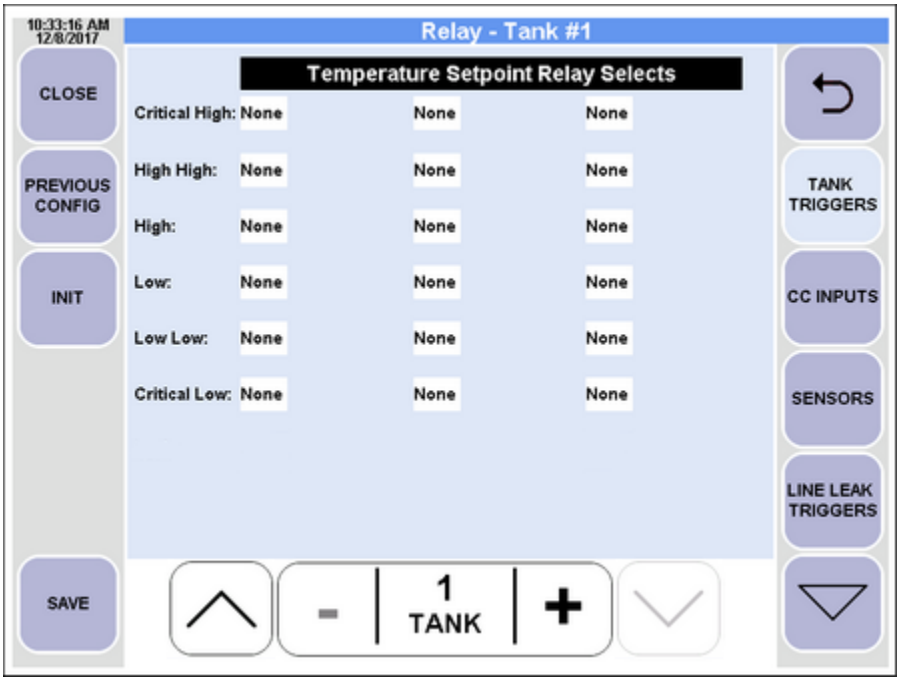


Touch the +/- buttons to increment Tank Channel by 1. Touch the Tank Channel number to bring up a list of possible Tank Channels. Touch the Tank Channel number on the table to make a selection.

Relay assignments for both the Product Set Points and the failure of an In-Tank Leak Test (Leak).

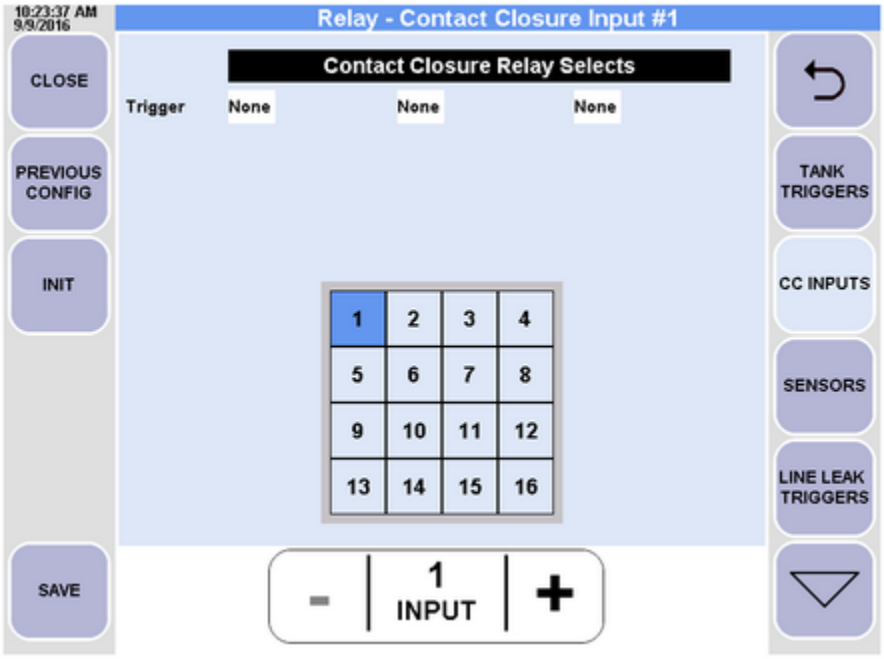


Relay assignments for bottom Water Set Points.

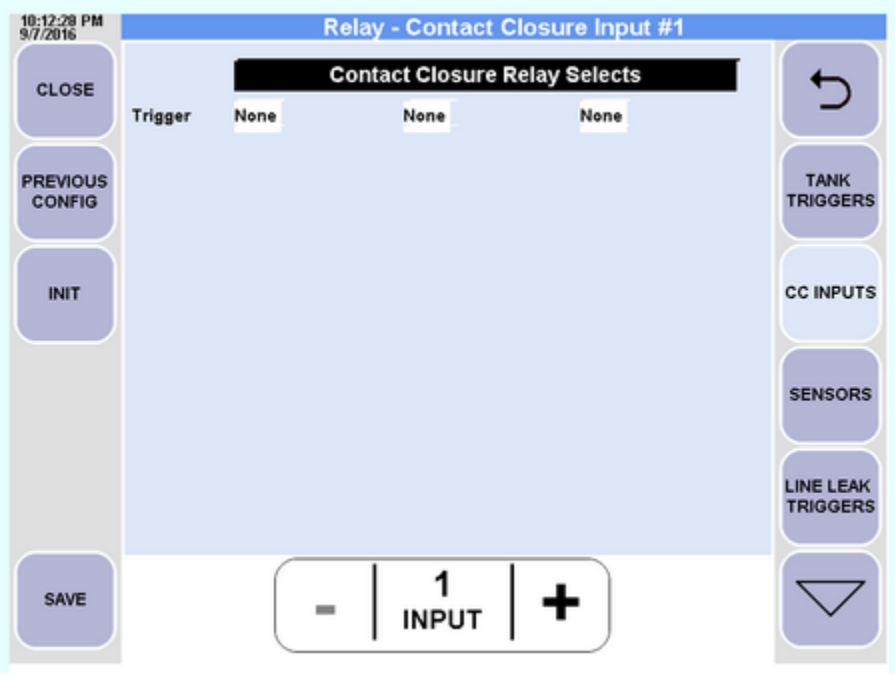


Relay assignments for Temperature Set Points.

2.12.2 RELAYS – CC INPUTS

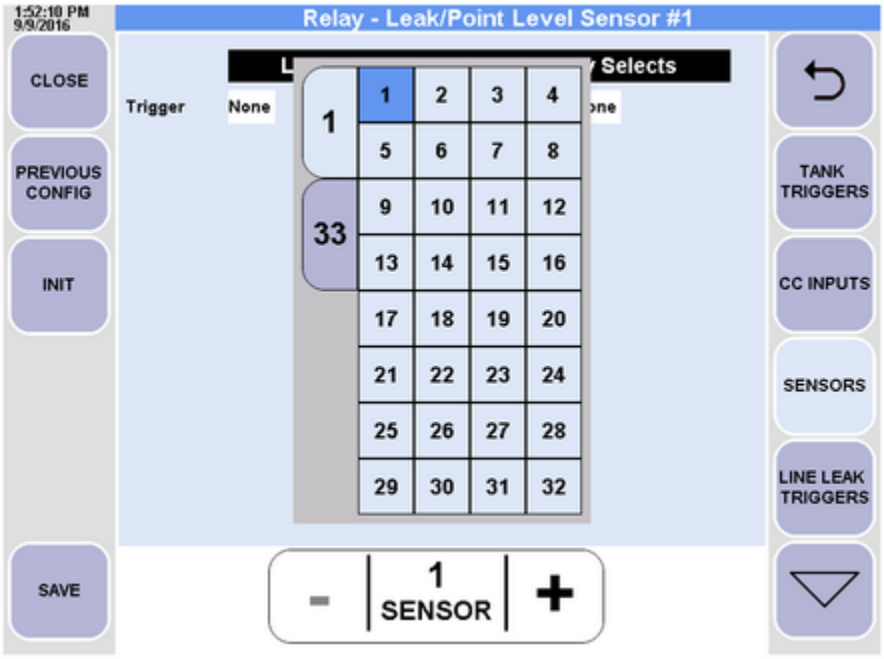


Touch the +/- buttons to increment CC Input by 1. Touch the CC Input number to bring up a list of possible CC Inputs. Touch the CC Input number on the table to make a selection.

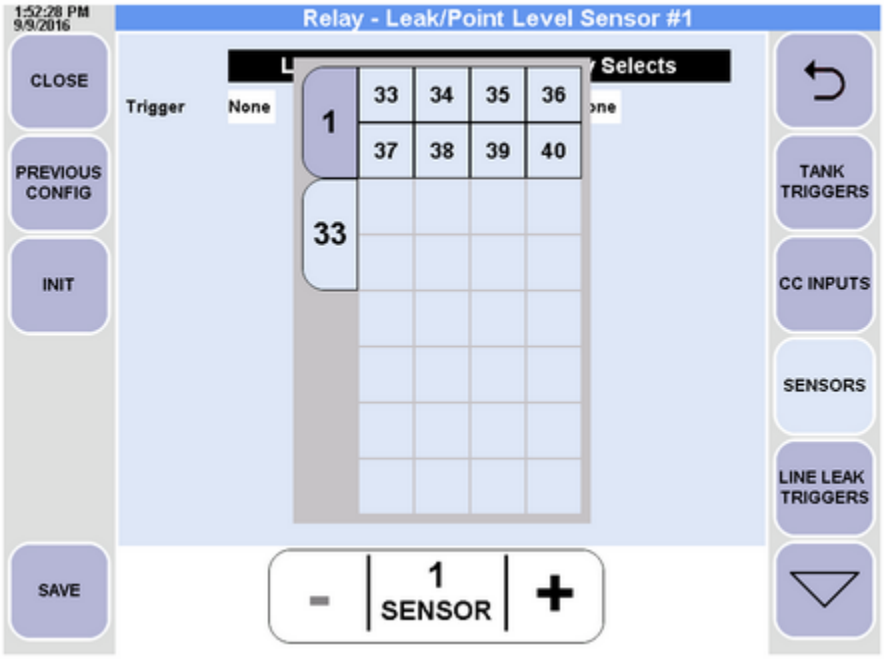


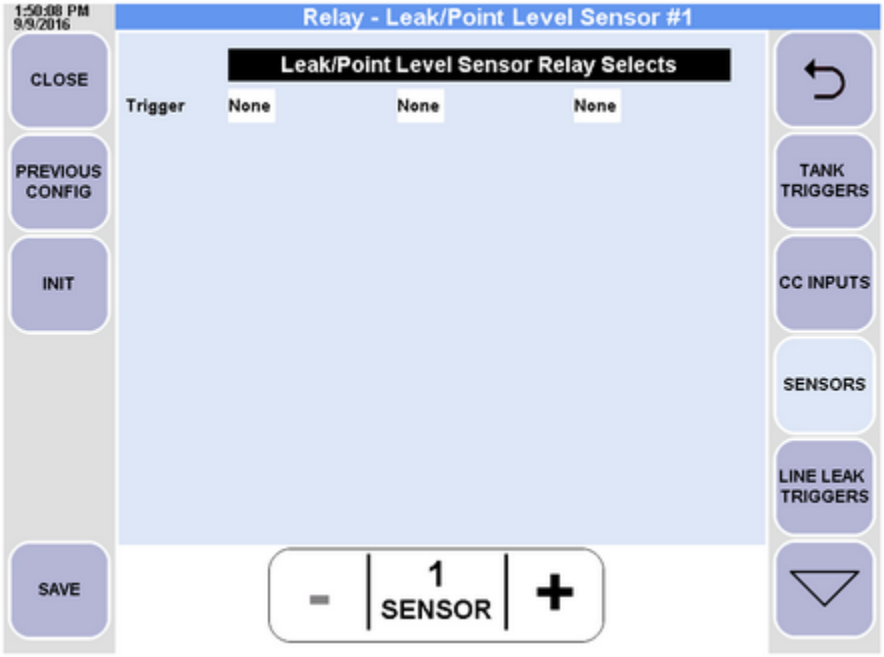
Relay assignments for the CC Inputs.

2.12.3 RELAYS - SENSORS



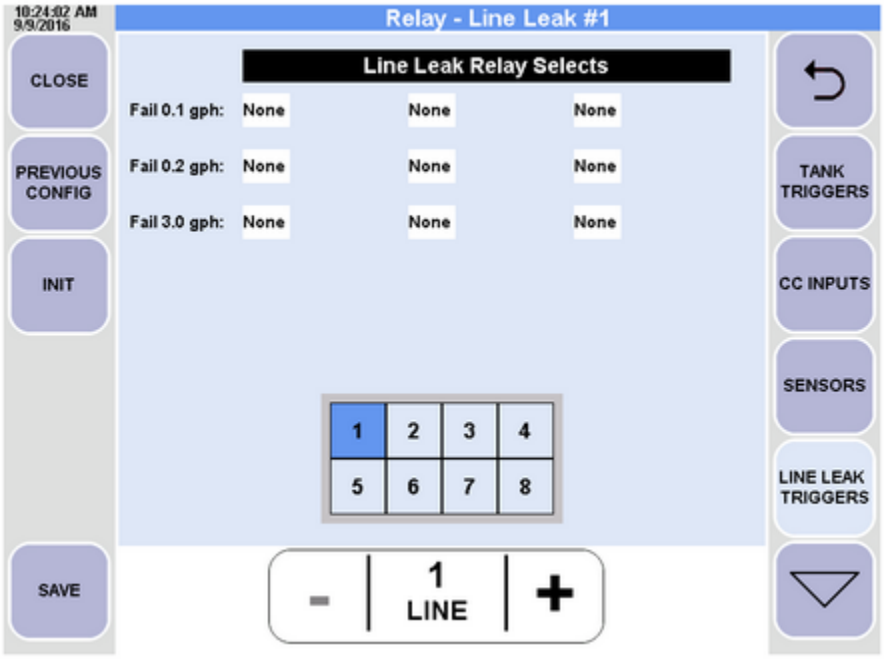
Touch the +/- buttons to increment Sensor Input by 1. Touch the Sensor Input number to bring up a list of possible Sensor Inputs. The tabs on the left edge show the starting Sensor Input number for the page of choices. Page 1 is shown above and Page 2 is shown below. Touch the Sensor Input number on the table to make a selection.



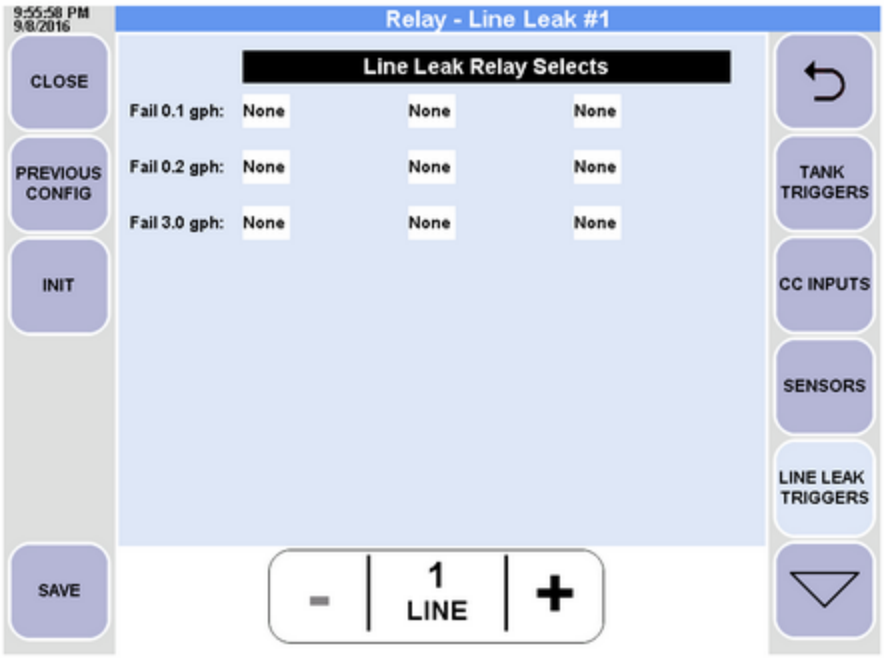


Relay assignments for the Sensor Inputs.

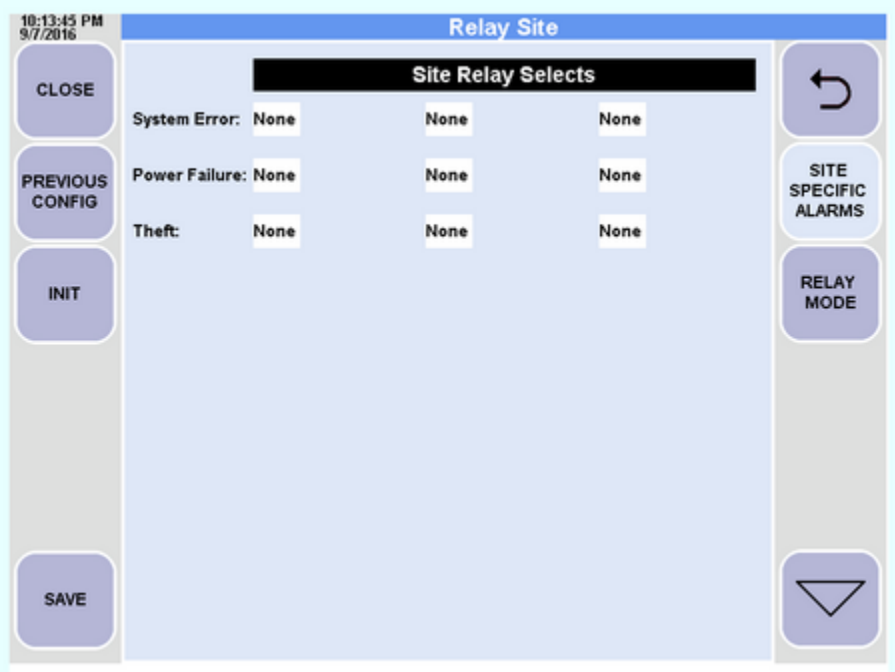
2.12.4 RELAYS – LINE LEAK TRIGGERS



Touch the +/- buttons to increment Line Leak Channel by 1. Touch the Line Leak Channel number to bring up a list of possible Line Leak Channels. Touch the Line Leak Channel number on the table to make a selection.



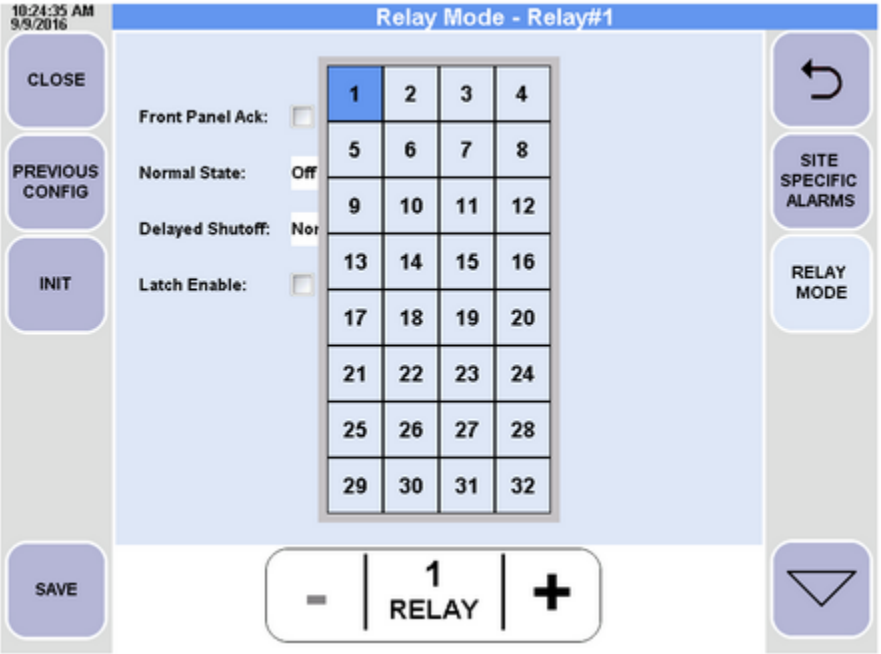
2.12.5 RELAYS – RELAY SITE



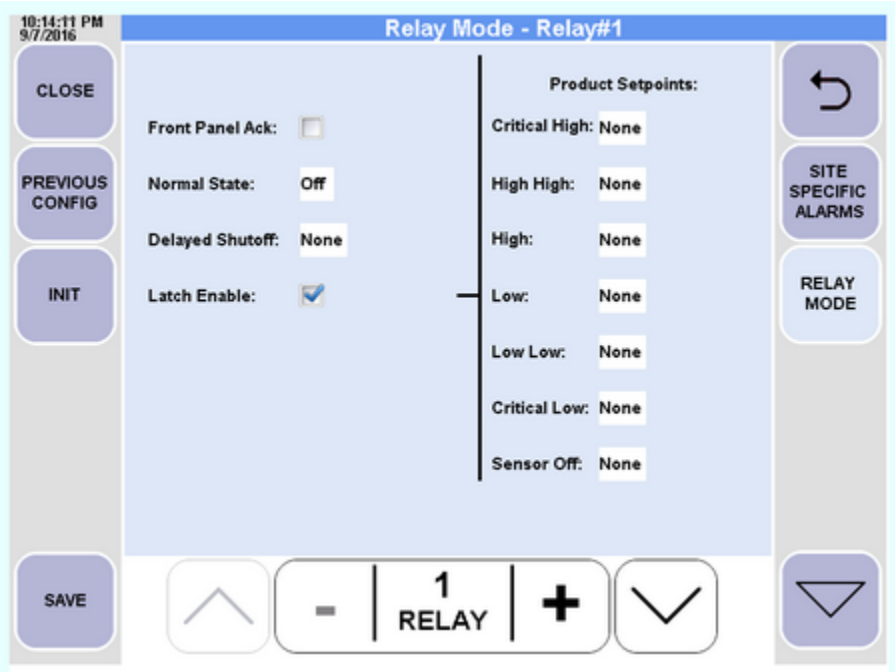
Represents site specific conditions that include System Errors, Power Failure, and Theft. The details are as follows:

- System Error: Includes Probe Timeout, Probe Sync, and Sensor Fault Error conditions.
- Power Failure: A relay will activate once power has been restored to the TMS.
- Theft: A theft condition detected for ANY tank will activate a relay output.

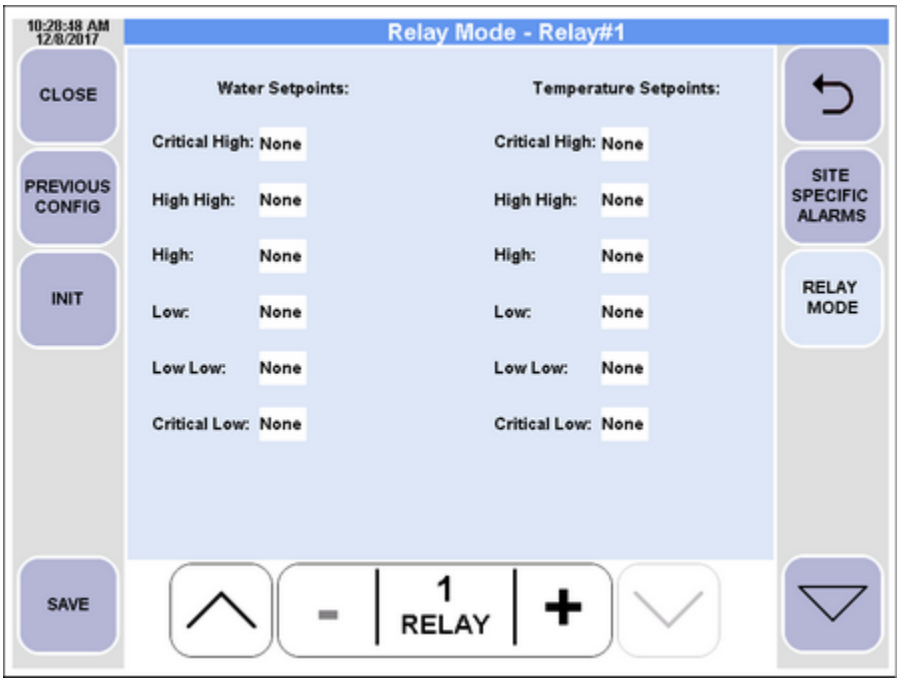
2.12.6 RELAYS – RELAY MODE



Touch the +/- buttons to increment Relay Output Number by 1. Touch the Relay Output Number to bring up a list of possible Relay Output Numbers. Touch the Relay Output Number on the table to make a selection.



The left side of the above screen shows several settings that affect the behavior of the relay. The right side of the screen is visible when enabling the Latch feature and represent the Latch Off conditions. Additional Latch Off conditions are configurable on the second page, accessible by touching the down arrow to the right of the plus sign. Complete details can be found on the following page.



Front Panel Ack: Acknowledges a relay by returning it to the defined normal state after pressing any key on the front panel of the TMS

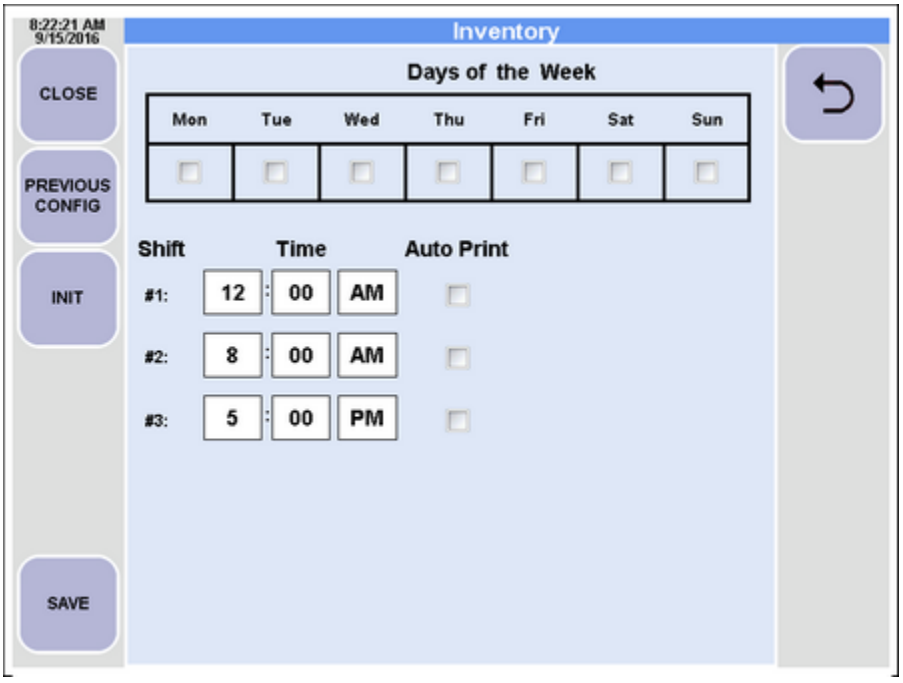
Normal State: A relay is de-energized by default when there is no condition present to activate it. This can be reversed by defining the normal state of the relay as on (energized). A de-energized relay, in that case, would represent the alarm or action state.

Delayed Shutoff: Returns the relay to normal after a delay set in minutes. Selecting None disables this feature.

Latch Enable: Enables a latching feature which separates the conditions that activate a relay from the condition that returns the relay to normal. Ideal for pump/valve control applications. By enabling this feature for a particular relay, all conditions previously assigned to that relay will be the Latch On condition for the relay. Separate conditions would be defined as the latch off conditions as follows:

- Product Set Points: Select the hardware channel of the tank next to the desired Set Point to select the Latch Off condition for the selected relay.
- Sensor Off: Located immediately below the Product Set Points. Select the Sensor number to be used as the Latch Off condition for the selected relay.
- Water Set Points: Select the hardware channel of the tank next to the desired Set Point to select the Latch Off condition for the selected relay.
- Temperature Set Points: Select the hardware channel of the tank next to the desired Set Point to select the Latch Off condition for the selected relay.

2.13 INVENTORY



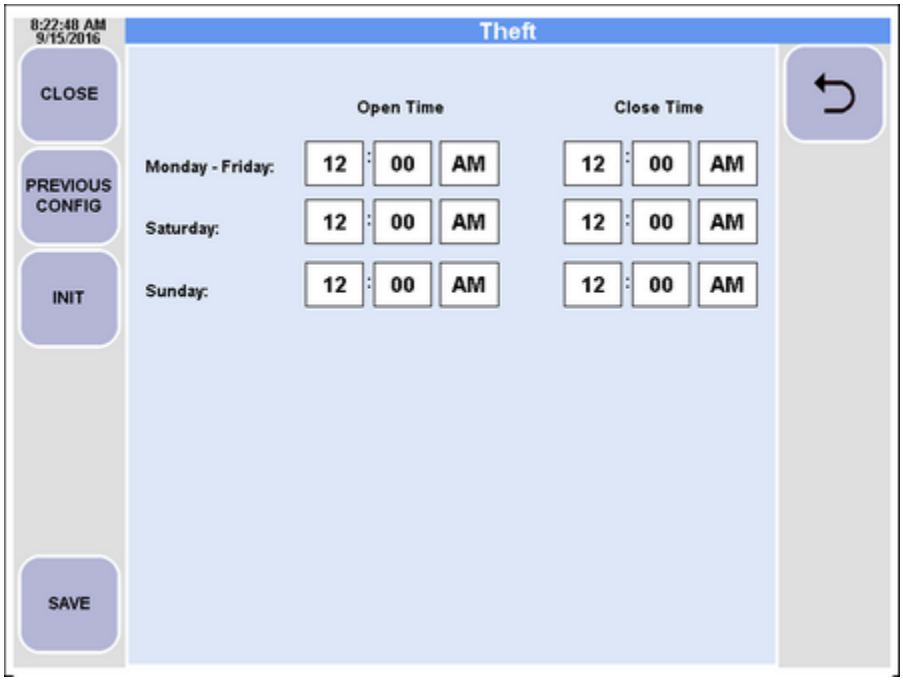
When enabled, the TMS will record inventory snapshots/shift reports to the Inventory Log, as scheduled.

The snapshot can be enabled for any or all of the seven days of the week be checking the appropriate checkboxes. The snapshot is disabled by unchecking all days of the week.

Inventory Log Times: Up to three snapshots can be made daily by setting three different times above. If only one or two snapshots daily are required, make sure that there are only that many different times listed above. For example, if all three Log Times were configured for midnight, one snapshot at midnight would occur if there were any days of the week checked. By changing one of the three times to 12:00PM, you would record two snapshots daily: one at midnight and one at noon. This assumes that at least one day of the week is checked.

Each snapshot can generate a printout on the TMS if desired by checking the appropriate box.

2.14 THEFT



A theft is defined in the TMS as a loss of product during a period when the location is scheduled to be closed. Set the hours of operation above to properly monitor for theft. See Section 2.4 for enabling theft monitoring per tank.

2.15 DIAL OUT

Touch the +/- buttons to increment Dial Out Configuration Number by 1. Touch the Dial Out Configuration Number to bring up a list of possible Dial Out Configuration Numbers. Touch the Dial Out Configuration Number on the table to make a selection.

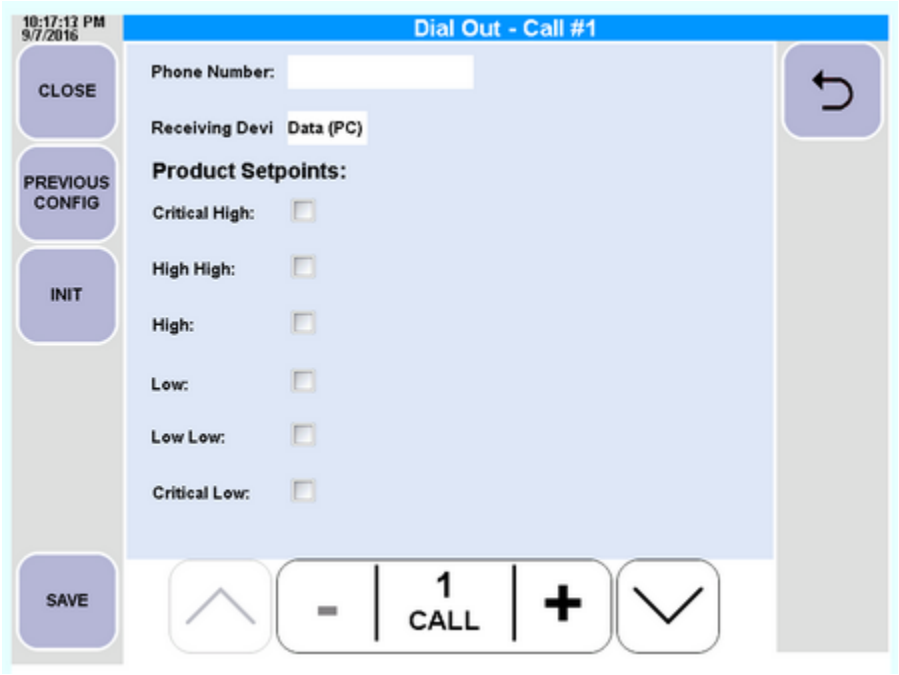
Phone Number: supports a total of 21 digits to make a phone call. A comma represents a pause. See Pause Length in Section 2.16, Modem section for details on setting the length from 1-9 seconds.

Receiving Devi: choice of the following Receiving Devices:

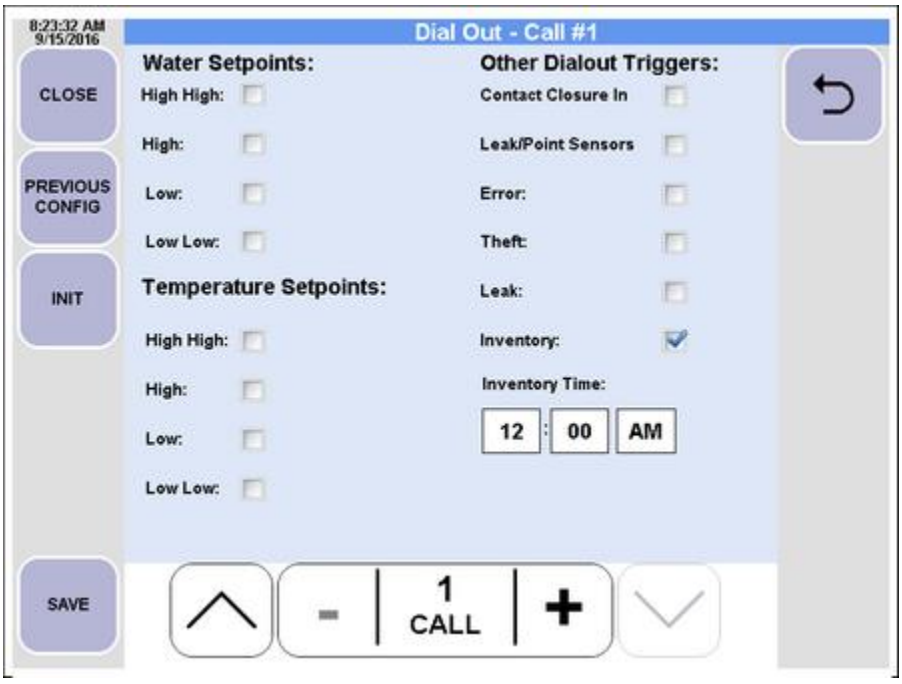
- Data (PC): a computer with TMS Communicator installed and Autopolling running and set to answer the phone upon ringing. The Autopolling configuration controls what data is requested.
- Fax: Any device capable of receiving a fax via phone. Transmits a generic fax report showing inventory with probe and sensor alarm statuses.
- TTY: A text only transmission that can be received by any TTY capable device. HyperTerminal or other terminal emulation program is capable of handling this signal. Transmits a printout comparable to the printout generated by the TMS on its integrated printer.
- Numeric pager: Any numeric pager. Alphanumeric pagers are not supported. Message is limited to what can be incorporated into the 21 digit dial out string

Conditions that will initiate an outbound phone call are as follows:

- Product Set Point: Any Product Set Point for any tank channel
- Water Set Point: Any Water Set Point for any tank channel
- Temperature Set Point: Any Temperature Set Point for any tank channel
- Contact Closure In: Any active CC Input. CC Inputs are found on select relay I/O cards.
- Leak/Point Sensors: Any Sensor alarm.
- Error: Any system error recorded in the Events log
- Theft: Any documented theft recorded in the Thefts Log
- Leak: Any Failed In-Tank Leak Test. Not to be confused with Leak Sensors.
- Inventory: A daily dialout at the time listed below the checkbox if new Inventory Report exists.

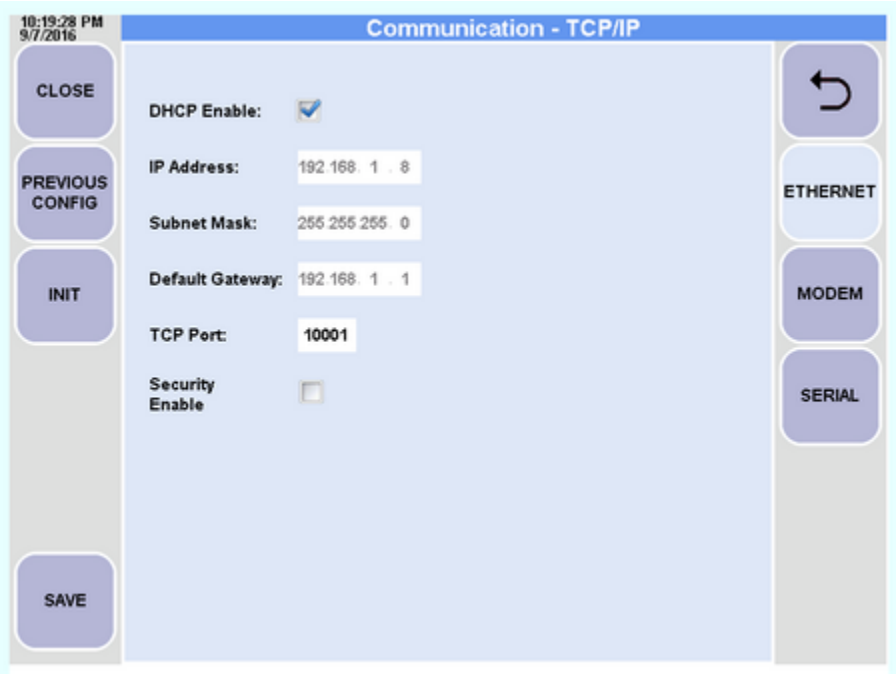


These represent the configuration settings for each set of dial out rules.



2.16 COMMS

The communications section is divided into three categories as illustrated below.



DHCP Enable: Stands for Dynamic Host Control Protocol. Used for automatically assigning an IP Address to a Network Card.

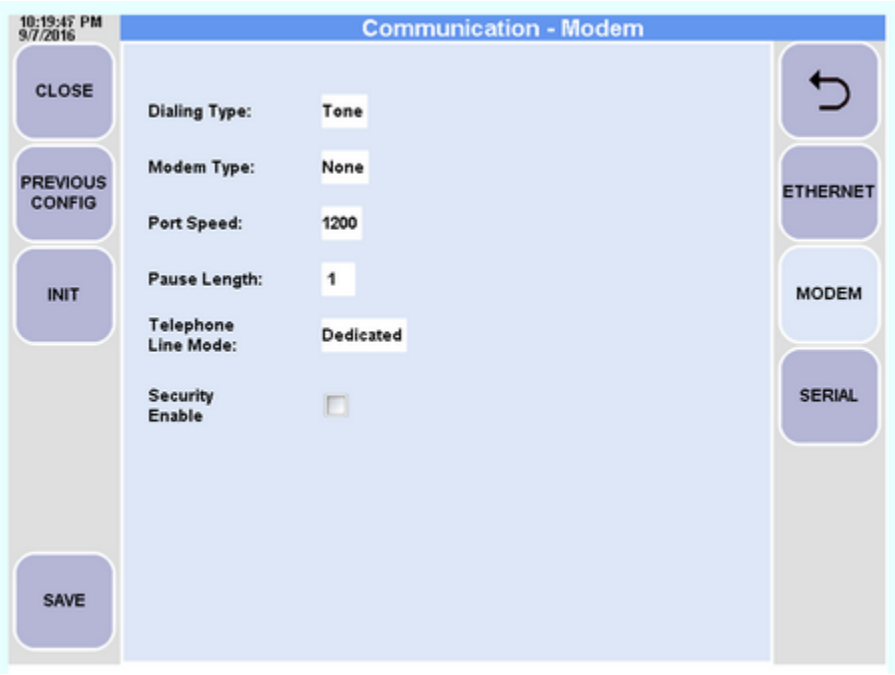
IP Address: A unique address that identifies the TMS on the network. The IP address consists of four octets separated by decimal points that can each range from 0-255. If DHCP is enabled, the currently assigned value is displayed.

Subnet Mask: A mask that defines the subnet of the network supporting the TMS. The Subnet Mask consists of four octets separated by decimal points that can each range from 0-255. If DHCP is enabled, the currently assigned value is displayed.

Default Gateway: A unique address that identifies where responses are sent to when a request is sent from outside of the network. The Default Gateway consists of four octets separated by decimal points that can each range from 0-255. If DHCP is enabled, the currently assigned value is displayed.

TCP Port: The default value of 10001 is recommended unless there are incompatibilities with the current network infrastructure.

Security Enable: Requires a 6-digit numeric Access Code that is prepended to any command issued to the TMS.



Dialing Type: Choice between tone (pushbutton) and pulse (rotary) dialing.

Modem Type: Choices are as follows:

- None: No Modem or Serial C expansion card installed
- Internal: Supports 900433-x Internal Data Modem
- Fax Modem: Supports 900503-1 Internal Fax Modem
- Port Modem: Intended for external modem connected to the RS-232 port. Contact Pneumercator for specific devices supported.
- Serial C: Supports the 900571-x Communications Expansion Cards
- Cell Modem: Intended for a cellular modem. Contact Pneumercator for specific devices supported.

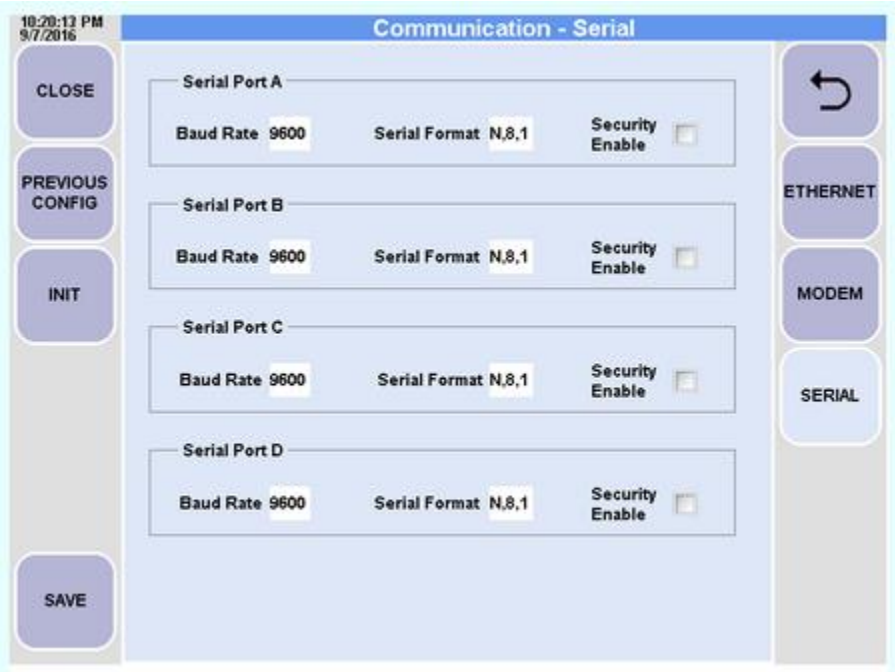
Port Speed: determines the maximum speed the modem is permitted to communicate at.

Pause length: defines the duration of the pause represented by a comma in the dial out string. See Section 2.15 for entering phone number and comma in configuration.

Telephone Line Mode:

- Dedicated: allows the TMS try placing a call without detecting a dial tone. After 5 unsuccessful attempts, the TMS will no longer attempt to place a call for this particular event.
- Shared: the TMS must detect a dial tone before attempting to place a call. After 5 unsuccessful attempts, the TMS will no longer attempt to place a call for this particular event. Failure to detect a dial tone does NOT qualify as a failed attempt.

Security Enable: Requires a 6-digit numeric Access Code that is prepended to any command issued to the TMS.

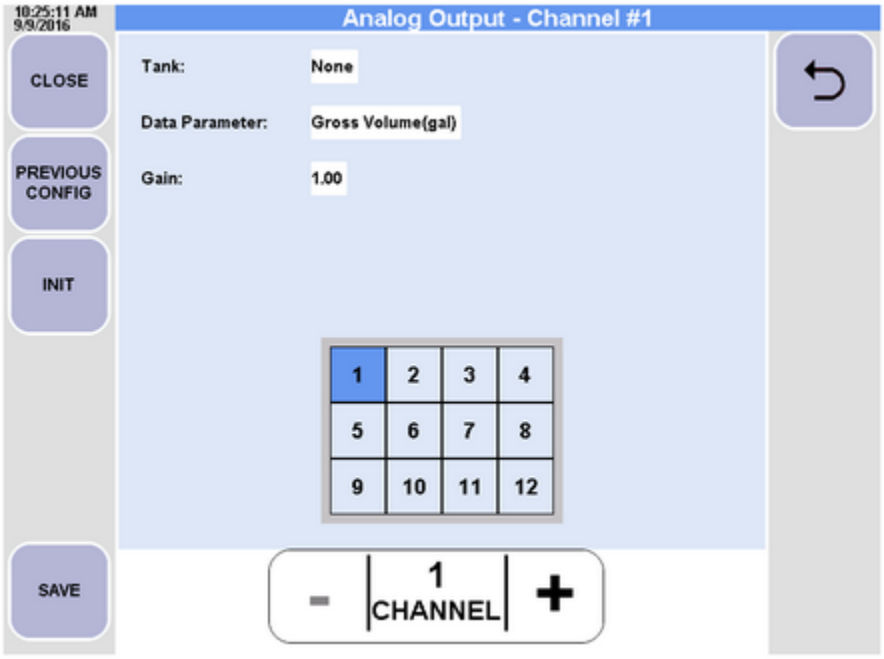


Each individual Serial Port can be configured for the following settings with the defaults shown above:

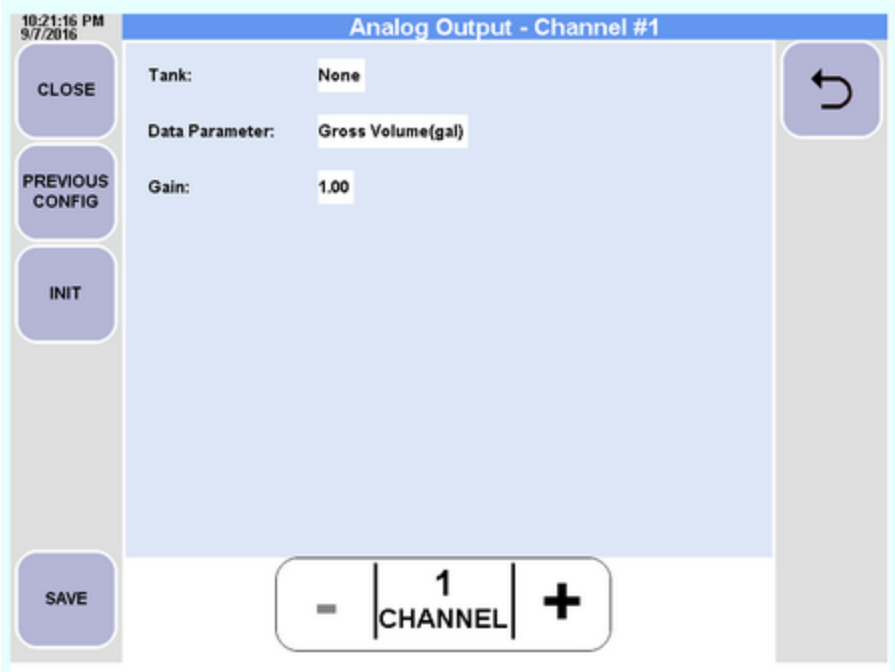
- Baud Rate: the connection speed required to communicate to the attached device
- Serial Format: Presented in the form of Parity, Data Bits, and Stop Bits. Special formats are available to support the external LS300 Line Leak console in both 4 and 8 channel configurations.
- Security Enable: Requires a 6-digit numeric Access Code that is prepended to any command issued to the TMS.

Serial Port A & B are integrated onto the Processor Card of the TMS4000. Serial C & D are optional ports found on select 900571-x communications expansion cards.

2.17 ANALOG OUTPUTS



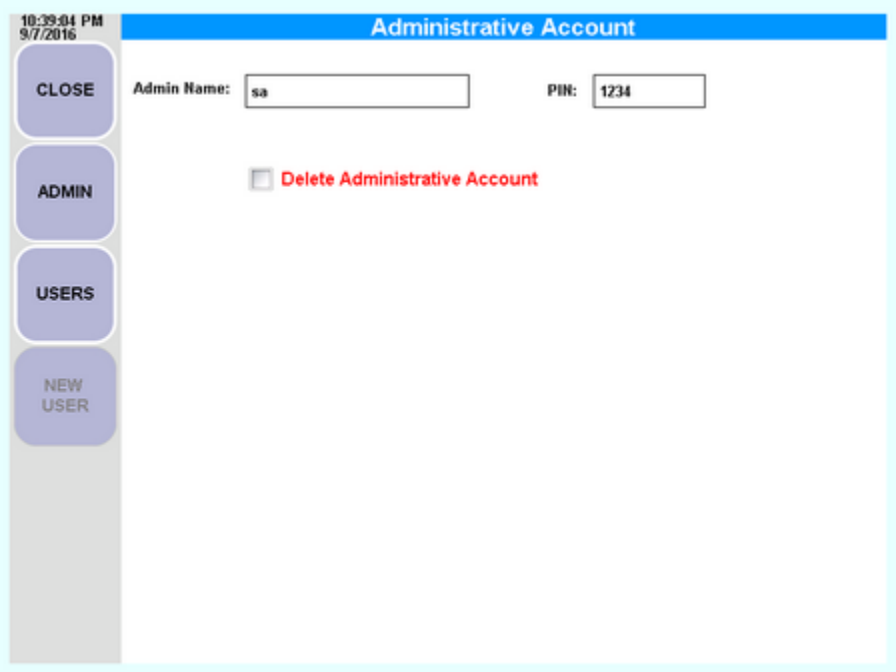
Touch the +/- buttons to increment Analog Output Channel by 1. Touch the Analog Output Channel to bring up a list of possible Analog Output Channels. Touch the Analog Output Channel on the table to make a selection.



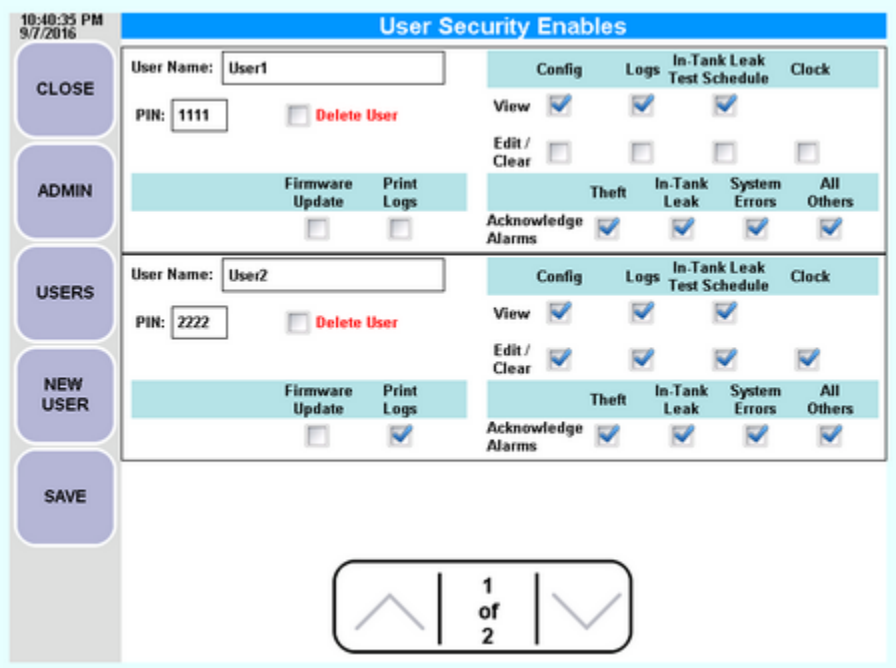
Each desired output must be assigned to a Tank Channel to enable the output. The Data Parameter specifies the information represented by the Analog Output Channel. The Gain should be left configured as 1.00 unless 0-1 mA mode is required. In that case, the Analog Output Card should be configured for 0-20 mA. Consult Bulletin 139 for complete details.

2.18 SECURITY

The TMS4000 can be configured to restrict access to specific information and/or functions. If this is desired, an Administrator account must first be created that has access to everything including the ability to create and modify additional user accounts with varying degrees of permissions.



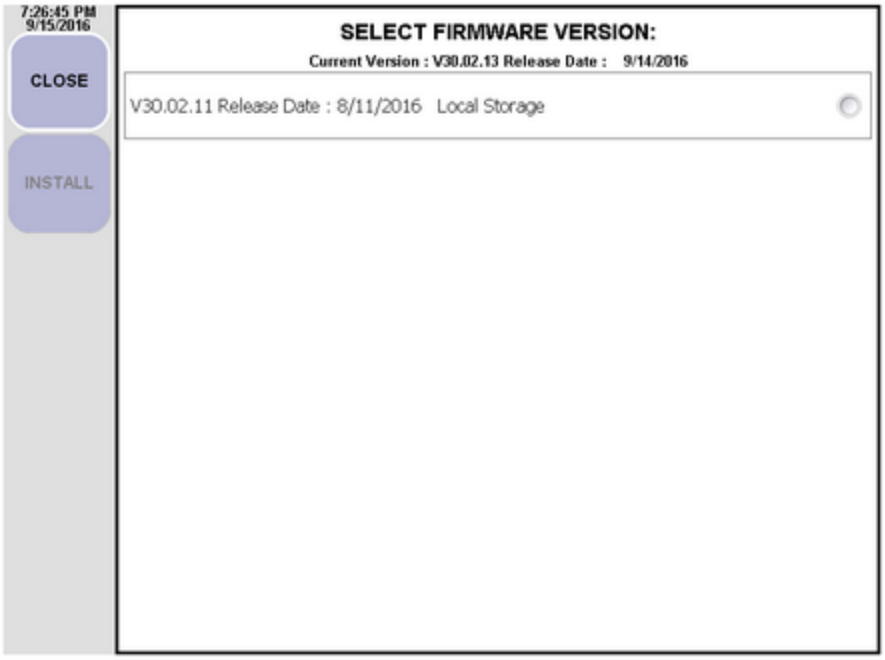
Enter a name for the Administrator and 4-digit numeric PIN. The name is only used in the System Reports to document the user responsible for taking certain actions. Delete the Administrative account to remove all restrictions from accessing TMS4000 functions. See the following page for details on the settings available in the below screenshot showing user accounts.



Each user must have a User Name and 4-digit numeric PIN number assigned. Like the Administrator account, the user name is only used in the System Reports to document the user responsible for taking certain actions. Individual users may be deleted by checking the Delete User checkbox and saving the changes. Access restrictions may currently be placed on the following functions:

- Firmware Update: Firmware Updates may be performed using a USB flash drive. Restrictions may be placed on performing any change to the system firmware
- Logs/Reports: Individual restrictions are as follows:
    - Print: using printer connected to TMS
    - View: on TMS display
    - Clear: Erasing Logs/Reports
- Config: Individual restrictions are as follows:
    - View: on TMS display
    - Edit/Clear: making changes to or erasing the system configuration
- In-Tank Leak Test Schedule: Individual restrictions are as follows:
    - View: on TMS display
    - Edit: making changes to the Leak Test Schedule
- Edit Clock: Changing the Date and Time
- Acknowledge Alarms:
    - Theft: Any detected theft
    - In-Tank Leak: Failed In-Tank Leak Test
    - System Errors: Include Probe Timeout, Probe Sync, and Sensor Fault
    - All Others: Includes Tank Set Points for Product, Water, and Temperature, CC Input and Sensor Alarms.

2.19 FIRMWARE



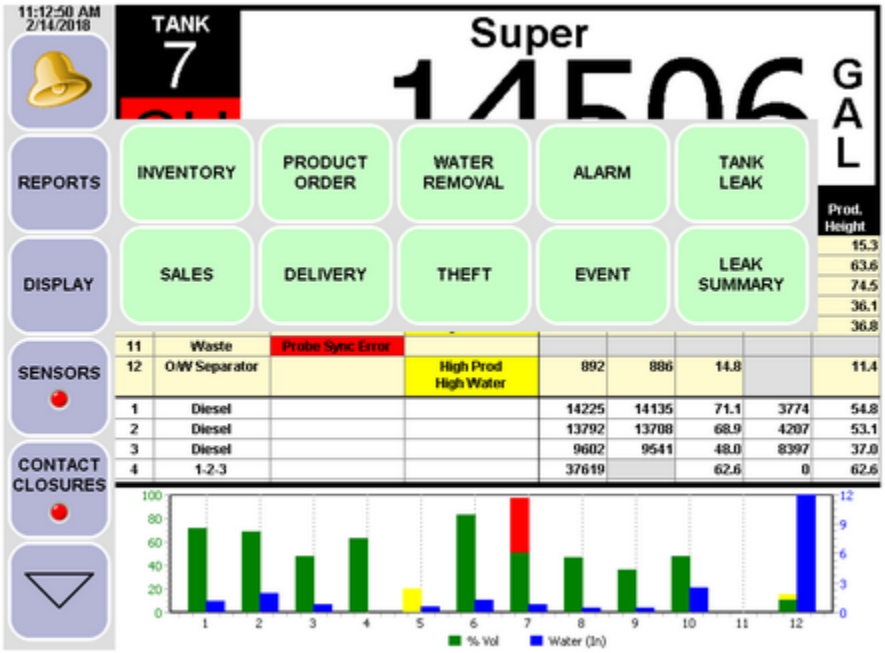
The current version of firmware is displayed across the top. The previous version is available in the event there is technical difficulties with the existing firmware. The Install button will be available once a flash drive is inserted into the internal USB Port with a valid firmware file supplied by Pneumercator. See Section 1.1.1 for location of USB Port.

2.20 LOCALIZATION

The localization screen provides a choice between English and Spanish languages and American versus Metric units of measure.

SECTION 3 SYSTEM REPORTS

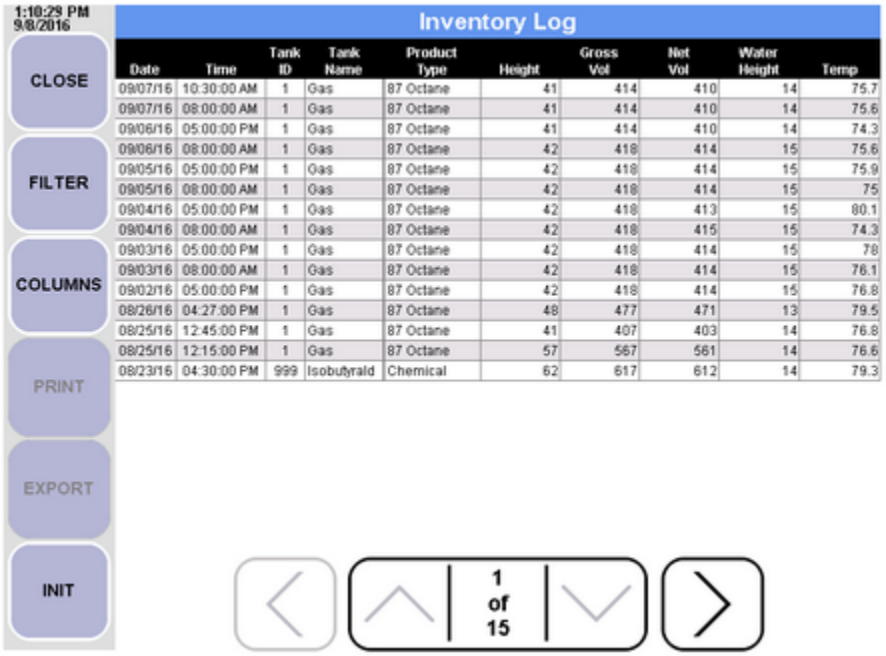
3.1 OVERVIEW



The Reports available in the TMS4000 include the 9 reports displayed above and a System Events Log found in the Setup menu. Any report may be exported to a USB Flash Drive in CSV format by touching the Export button. The CSV (Comma Separated Values) file may be opened using Microsoft Excel or any other comparable software program. See Section 1.1.1 for location of USB Port. The description for each log is as follows:

- Inventory: Contains scheduled Inventory snapshots as defined in the Configuration. Refer to Section 2.13 for additional details
- Sales: Bulk sales representing the sale or withdrawal of fuel from a tank.
- Product Order: An on-demand report indicating the number of days of usable fuel remaining based on the average daily usage since the last delivery
- Delivery: The delivery or addition of fuel to the tank.
- Water Removal: Indicates the water removed from below the fuel surface in the tank.
- Theft: Contains the unauthorized removal of fuel from the tank. Refer to Section 2.14 for additional details.
- Alarm: Alarms for Tank Set Points for Product, Water, and Temperature. Also includes CC Input and Sensor alarms.
- Event: Probe and Sensors errors, Power Fail, and problems regarding Leak Tests, excluding completed failed tests
- Tank Leak: Completed In-Tank Leak Test Results
- Leak Summary: The latest passing test per tank for all previous months. If no test passes for any one month per tank, the latest failure will be listed.
- System Events: Include select Security Events and hardware or software failures of the TMS4000.

3.2 INVENTORY



Date	Time	Tank ID	Tank Name	Product Type	Height	Gross Vol	Net Vol	Water Height	Temp
09/07/16	10:30:00 AM	1	Gas	87 Octane	41	414	410	14	75.7
09/07/16	08:00:00 AM	1	Gas	87 Octane	41	414	410	14	75.6
09/06/16	05:00:00 PM	1	Gas	87 Octane	41	414	410	14	74.3
09/06/16	08:00:00 AM	1	Gas	87 Octane	42	418	414	15	75.6
09/05/16	05:00:00 PM	1	Gas	87 Octane	42	418	414	15	75.9
09/05/16	08:00:00 AM	1	Gas	87 Octane	42	418	414	15	75
09/04/16	05:00:00 PM	1	Gas	87 Octane	42	418	413	15	80.1
09/04/16	08:00:00 AM	1	Gas	87 Octane	42	418	415	15	74.3
09/03/16	05:00:00 PM	1	Gas	87 Octane	42	418	414	15	78
09/03/16	08:00:00 AM	1	Gas	87 Octane	42	418	414	15	76.1
09/02/16	05:00:00 PM	1	Gas	87 Octane	42	418	414	15	76.8
08/26/16	04:27:00 PM	1	Gas	87 Octane	48	477	471	13	79.5
08/25/16	12:45:00 PM	1	Gas	87 Octane	41	407	403	14	76.8
08/25/16	12:15:00 PM	1	Gas	87 Octane	57	567	561	14	76.6
08/23/16	04:30:00 PM	999	Isobutyrald	Chemical	62	617	612	14	79.3

Date: Date the snapshot was taken

Time: Time the snapshot was taken

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Tank Name: The name assigned to the tank. See Section 2.4

Product Type: The Product Type assigned to the tank. See Section 2.4

Height: The total level of liquid in the tank as measured in inches/millimeters

Gross Vol: The total volume of liquid in the tank as measured in gallons/liters

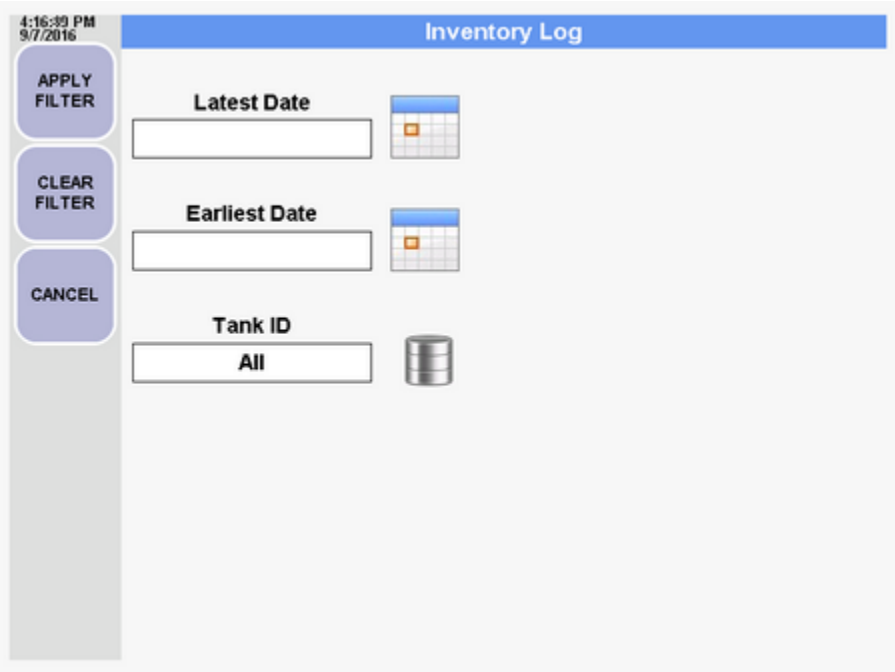
Net Vol: The total temperature-compensated volume of liquid in the tank as measured in gallons/liters. Industry standard compensation for liquid represented as if it was 68°F/20°C.

Water Height: The total level of water below the fuel in the tank as measured in inches/millimeters

Temp: The average liquid temperature in the tank

Ullage: The amount of free space in the tank up to the defined ullage threshold as measured in gallons/liters. See Section 2.3

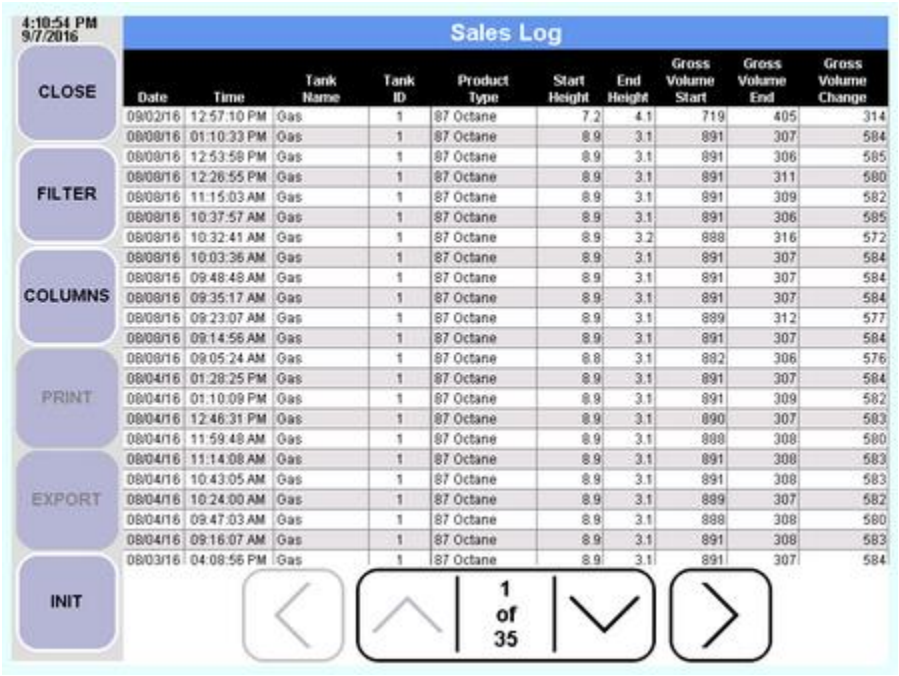
% Vol: The percentage of total tank volume at the time of the snapshot.



Provided filter can select a date range and/or specific Tank IDs.

Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.3 SALES



Date	Time	Tank Name	Tank ID	Product Type	Start Height	End Height	Gross Volume Start	Gross Volume End	Gross Volume Change
09/02/16	12:57:10 PM	Gas	1	87 Octane	7.2	4.1	719	405	314
08/08/16	01:10:33 PM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	12:53:58 PM	Gas	1	87 Octane	8.9	3.1	891	306	585
08/08/16	12:26:55 PM	Gas	1	87 Octane	8.9	3.1	891	311	580
08/08/16	11:15:03 AM	Gas	1	87 Octane	8.9	3.1	891	309	582
08/08/16	10:37:57 AM	Gas	1	87 Octane	8.9	3.1	891	306	585
08/08/16	10:32:41 AM	Gas	1	87 Octane	8.9	3.2	888	316	572
08/08/16	10:03:36 AM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	09:48:48 AM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	09:35:17 AM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	09:23:07 AM	Gas	1	87 Octane	8.9	3.1	889	312	577
08/08/16	09:14:56 AM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/08/16	09:05:24 AM	Gas	1	87 Octane	8.8	3.1	882	306	576
08/04/16	01:28:25 PM	Gas	1	87 Octane	8.9	3.1	891	307	584
08/04/16	01:10:09 PM	Gas	1	87 Octane	8.9	3.1	891	309	582
08/04/16	12:46:31 PM	Gas	1	87 Octane	8.9	3.1	890	307	583
08/04/16	11:59:48 AM	Gas	1	87 Octane	8.9	3.1	888	308	580
08/04/16	11:14:08 AM	Gas	1	87 Octane	8.9	3.1	891	308	583
08/04/16	10:43:05 AM	Gas	1	87 Octane	8.9	3.1	891	308	583
08/04/16	10:24:00 AM	Gas	1	87 Octane	8.9	3.1	889	307	582
08/04/16	09:47:03 AM	Gas	1	87 Octane	8.9	3.1	888	308	580
08/04/16	09:16:07 AM	Gas	1	87 Octane	8.9	3.1	891	308	583
08/03/16	04:08:56 PM	Gas	1	87 Octane	8.9	3.1	891	307	584

Date: Date the sale was completed

Time: Time the sale was completed

Tank Name: The name assigned to the tank. See Section 2.4

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Start Height: The total liquid level in the tank at the beginning of the sale

End Height: The total liquid level in the tank at the end of the sale

Gross Volume Start: The total volume of liquid in the tank at the beginning of the sale

Gross Volume End: The total volume of liquid in the tank at the end of the sale

Gross Volume Change: The total change in volume liquid as a result of the sale

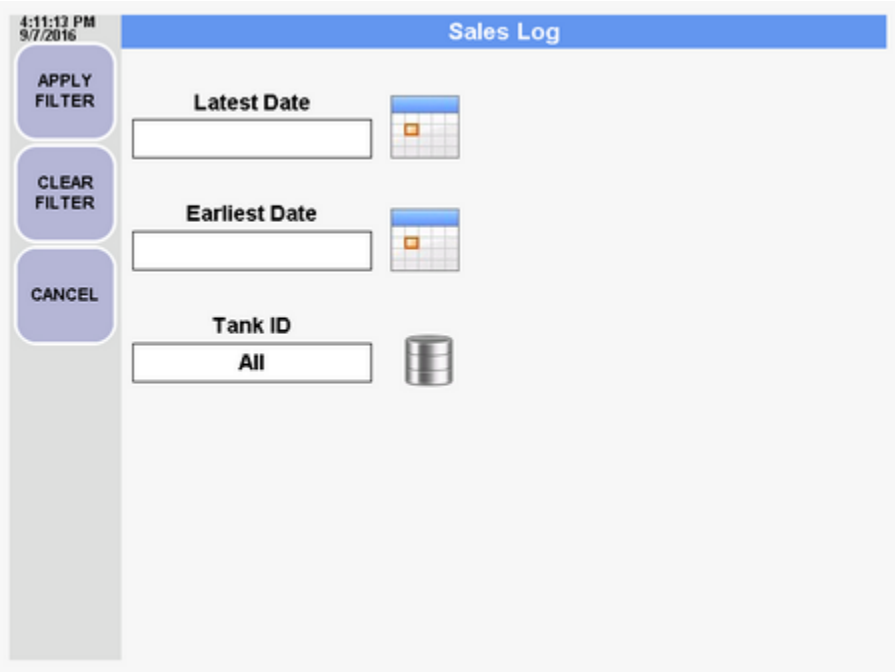
Net Volume Start: The total temperature-compensated of volume of liquid in the tank at the beginning of the sale

Net Volume End: The total temperature-compensated volume of liquid in the tank at the end of the sale

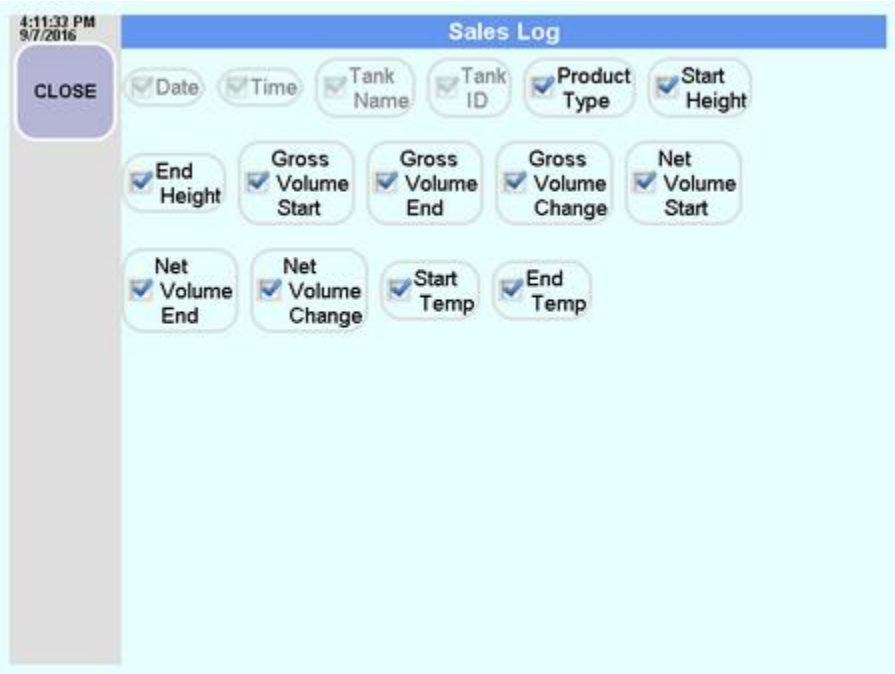
Net Volume Change: The total change in temperature-compensated volume of liquid in the tank at the beginning of the sale

Start Temp: The average liquid temperature at the beginning of the sale

End Temp: The average liquid temperature at the end of the sale



Provided filter can select a date range and/or specific Tank IDs.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.4 PRODUCT ORDER

Date: Date the report was generated

Time: Time the report was generated

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Tank Name: The name assigned to the tank. See Section 2.4

Product Type: The Product Type assigned to the tank. See Section 2.4

Usable Volume: The Total Gross Tank Volume minus the Unusable Volume. See Section 2.5

Gross Vol: The Total Gross Tank Volume

Ullage: The amount of free space in the tank up to the defined ullage threshold as measured in gallons/liters. See Section 2.3

Delivery Date: The date of the most recent delivery for this tank

Delivery Volume: The volume of fuel delivered to the tank at the most recent delivery

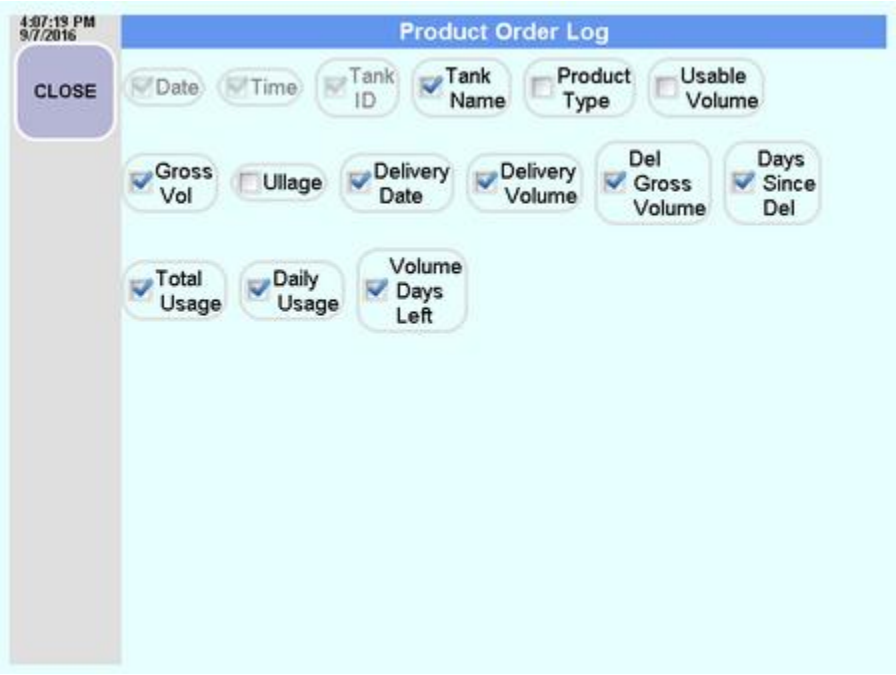
Del Gross Volume: The total volume of fuel in the tank after the latest delivery

Days Since Del: The number of days that passed since the last delivery

Total Usage: The total amount of fuel used since the last delivery

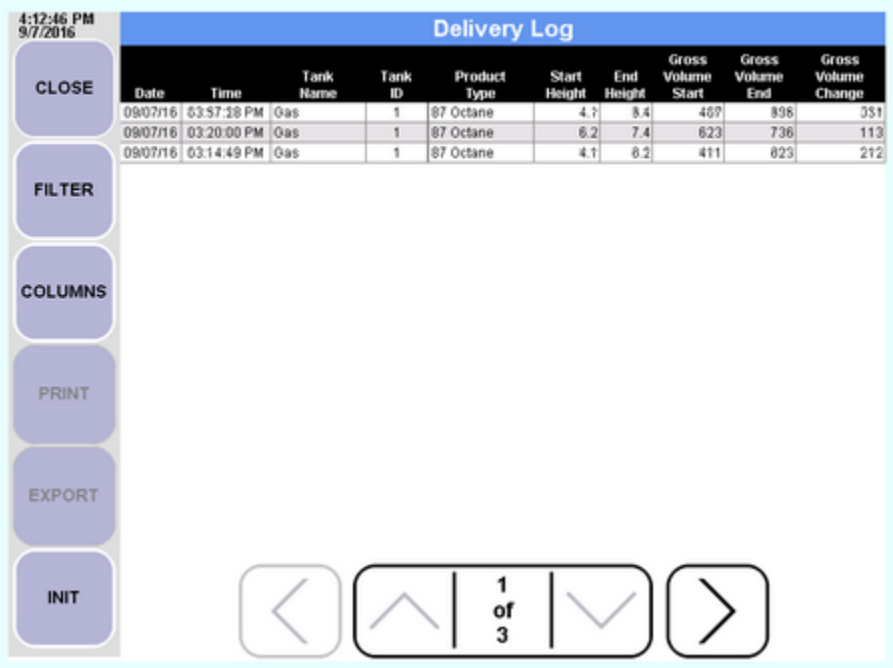
Daily Usage: The average daily usage

Volume Days Left: The estimated number of days of usable fuel remaining based on the Daily Usage.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.5 DELIVERY



Date: Date the delivery was completed

Time: Time the delivery was completed

Tank Name: The name assigned to the tank. See Section 2.4

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Start Height: The total liquid level in the tank at the beginning of the delivery

End Height: The total liquid level in the tank at the end of the delivery

Gross Volume Start: The total volume of liquid in the tank at the beginning of the delivery

Gross Volume End: The total volume of liquid in the tank at the end of the delivery

Gross Volume Change: The total change in volume liquid as a result of the delivery

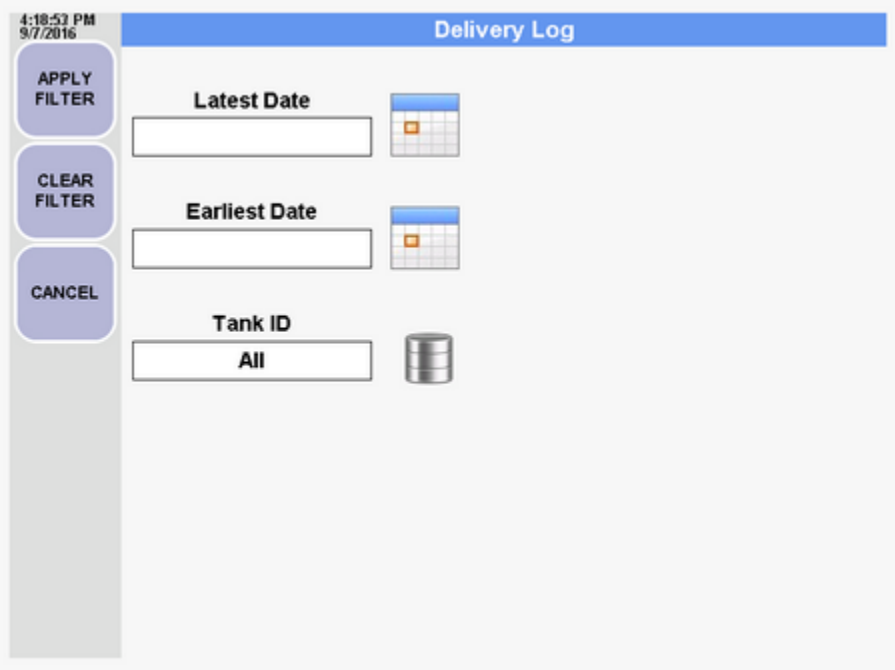
Net Volume Start: The total temperature-compensated of volume of liquid in the tank at the beginning of the delivery

Net Volume End: The total temperature-compensated volume of liquid in the tank at the end of the delivery

Net Volume Change: The total change in temperature-compensated volume of liquid in the tank at the beginning of the delivery

Start Temp: The average liquid temperature at the beginning of the delivery

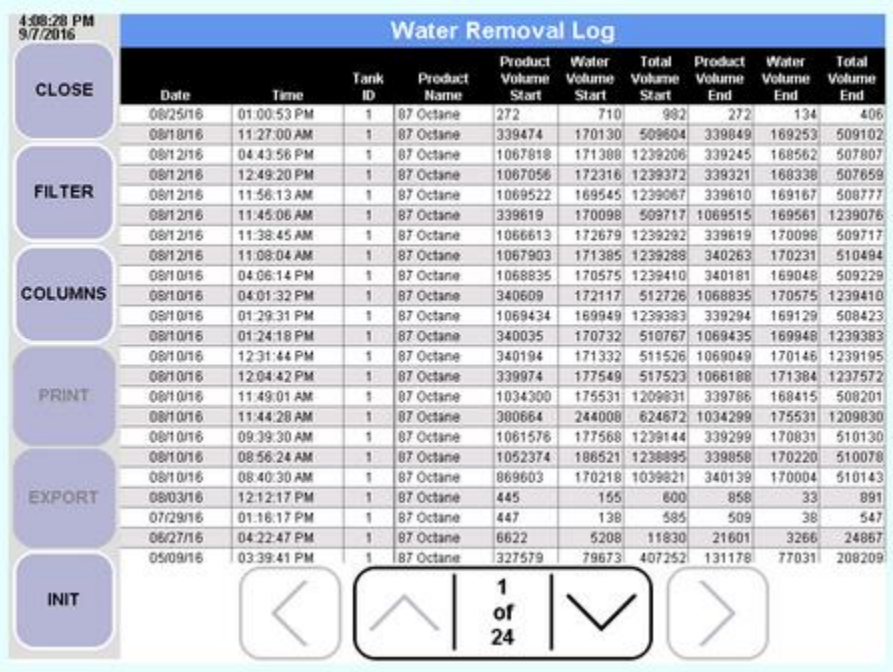
End Temp: The average liquid temperature at the end of the delivery



Provided filter can select a date range and/or specific Tank IDs.

Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.6 WATER REMOVAL



Date	Time	Tank ID	Product Name	Product Volume Start	Water Volume Start	Total Volume Start	Product Volume End	Water Volume End	Total Volume End
08/25/16	01:00:53 PM	1	87 Octane	272	710	982	272	134	406
08/18/16	11:27:00 AM	1	87 Octane	339474	170130	509604	339849	169253	509102
08/12/16	04:43:56 PM	1	87 Octane	1067818	171388	1239206	339245	168562	507807
08/12/16	12:49:20 PM	1	87 Octane	1067056	172316	1239372	339321	168338	507659
08/12/16	11:56:13 AM	1	87 Octane	1069522	169545	1239067	339610	169167	508777
08/12/16	11:45:06 AM	1	87 Octane	339619	170098	509717	1069515	169561	1239076
08/12/16	11:38:45 AM	1	87 Octane	1066613	172679	1239292	339619	170098	509717
08/12/16	11:08:04 AM	1	87 Octane	1067903	171385	1239288	340263	170231	510494
08/10/16	04:06:14 PM	1	87 Octane	1068835	170575	1239410	340181	169048	509229
08/10/16	04:01:32 PM	1	87 Octane	340609	172117	512726	1068835	170575	1239410
08/10/16	01:29:31 PM	1	87 Octane	1069434	169949	1239383	339294	169129	508423
08/10/16	01:24:18 PM	1	87 Octane	340035	170732	510767	1069435	169948	1239383
08/10/16	12:31:44 PM	1	87 Octane	340194	171332	511526	1069049	170146	1239195
08/10/16	12:04:42 PM	1	87 Octane	339974	177549	517523	1068188	171384	1237572
08/10/16	11:49:01 AM	1	87 Octane	1034300	175531	1209831	339786	168415	508201
08/10/16	11:44:28 AM	1	87 Octane	380664	244008	624672	1034299	175531	1209830
08/10/16	09:39:30 AM	1	87 Octane	1061576	177568	1239144	339299	170831	510130
08/10/16	08:56:24 AM	1	87 Octane	1052374	186521	1238895	339858	170220	510078
08/10/16	08:40:30 AM	1	87 Octane	869603	170218	1039821	340139	170004	510143
08/03/16	12:12:17 PM	1	87 Octane	445	155	600	858	33	891
07/29/16	01:16:17 PM	1	87 Octane	447	138	585	509	38	547
06/27/16	04:22:47 PM	1	87 Octane	6622	5208	11830	21601	3266	24867
05/09/16	03:39:41 PM	1	87 Octane	327579	79673	407252	131178	77031	208209

Date: Date the water removal was completed

Time: Time the water removal was completed

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Tank Name: The name assigned to the tank. See Section 2.4

Product Volume Start: The volume of fuel before water was removed

Water Volume Start: The volume of water before water was removed

Total Volume Start: The volume of all liquid, fuel and water combined, before water was removed

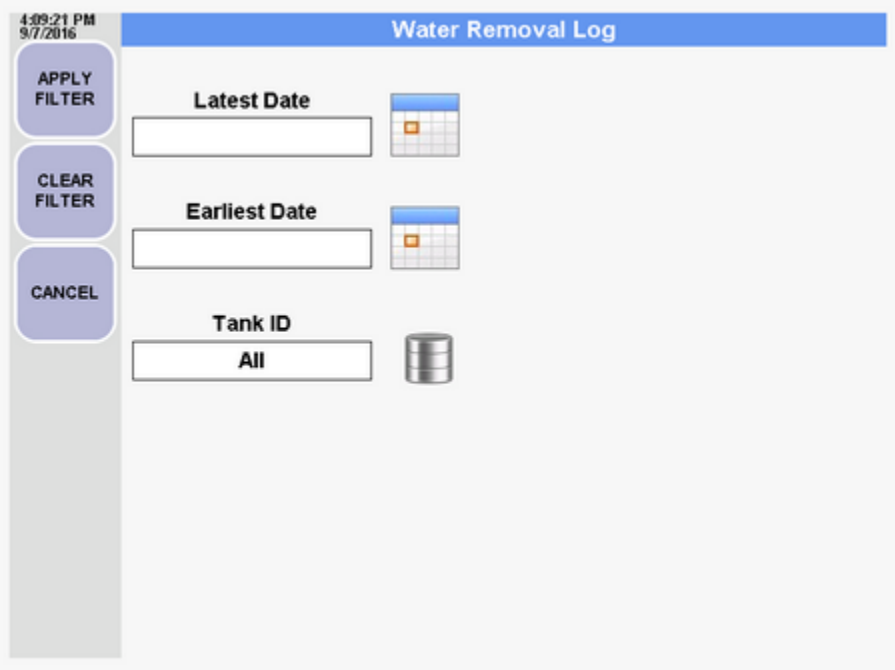
Product Volume End: The volume of fuel after water was removed

Water Volume End: The volume of water after water was removed

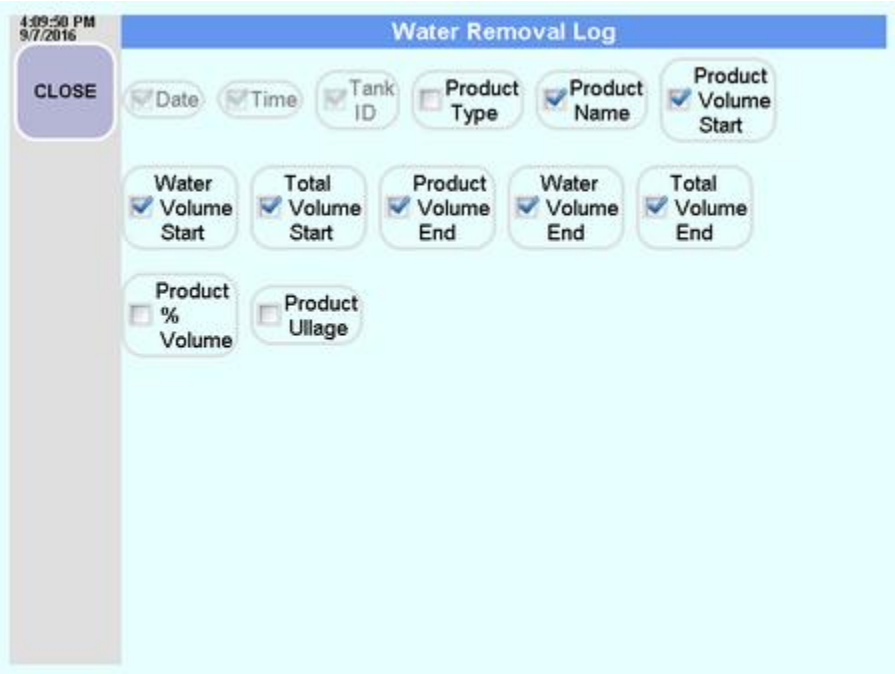
Total Volume End: The volume of all liquid, fuel and water combined, after water was removed

Product % Volume: The percent of total tank volume of all liquid, fuel and water combined, after water was removed

Product Ullage: The amount of free space after water was removed in the tank up to the defined ullage threshold as measured in gallons/liters. See Section 2.3

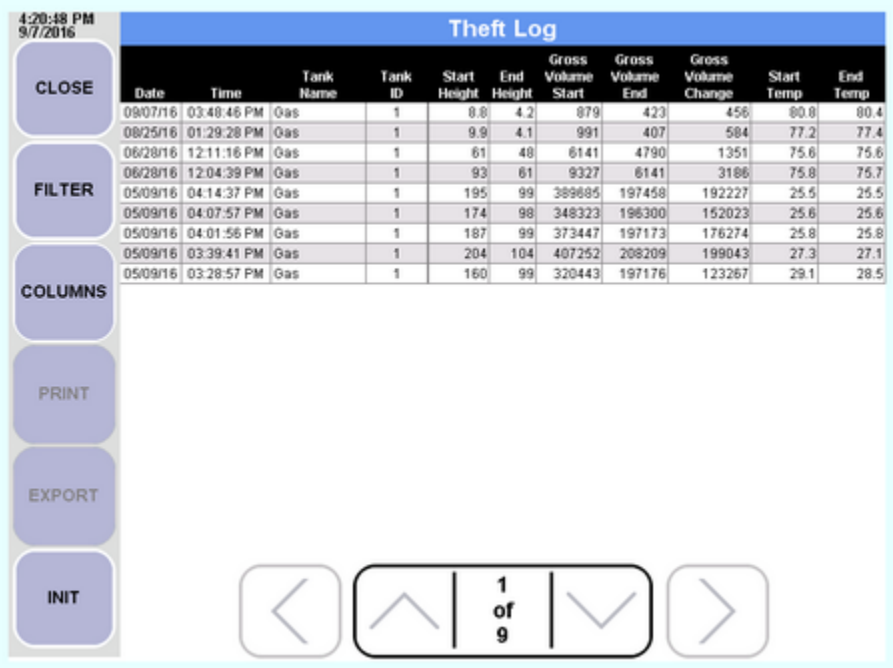


Provided filter can select a date range and/or specific Tank IDs.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.7 THEFT



Date	Time	Tank Name	Tank ID	Start Height	End Height	Gross Volume Start	Gross Volume End	Gross Volume Change	Start Temp	End Temp
09/07/16	03:48:46 PM	Gas	1	8.8	4.2	879	423	456	80.8	80.4
08/25/16	01:29:28 PM	Gas	1	9.9	4.1	991	407	584	77.2	77.4
06/28/16	12:11:16 PM	Gas	1	61	48	6141	4790	1351	75.6	75.6
06/28/16	12:04:39 PM	Gas	1	93	61	9327	6141	3186	75.8	75.7
05/09/16	04:14:37 PM	Gas	1	195	99	389685	197458	192227	25.5	25.5
05/09/16	04:07:57 PM	Gas	1	174	98	348323	196300	152023	25.6	25.6
05/09/16	04:01:56 PM	Gas	1	187	99	373447	197173	176274	25.8	25.8
05/09/16	03:39:41 PM	Gas	1	204	104	407252	208209	199043	27.3	27.1
05/09/16	03:28:57 PM	Gas	1	160	99	320443	197176	123267	29.1	28.5

Date: Date the theft ended

Time: Time the theft ended

Tank Name: The name assigned to the tank. See Section 2.4

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Start Height: The total liquid level in the tank at the beginning of the theft

End Height: The total liquid level in the tank at the end of the theft

Gross Volume Start: The total volume of liquid in the tank at the beginning of the theft

Gross Volume End: The total volume of liquid in the tank at the end of the theft

Gross Volume Change: The total change in volume liquid as a result of the theft

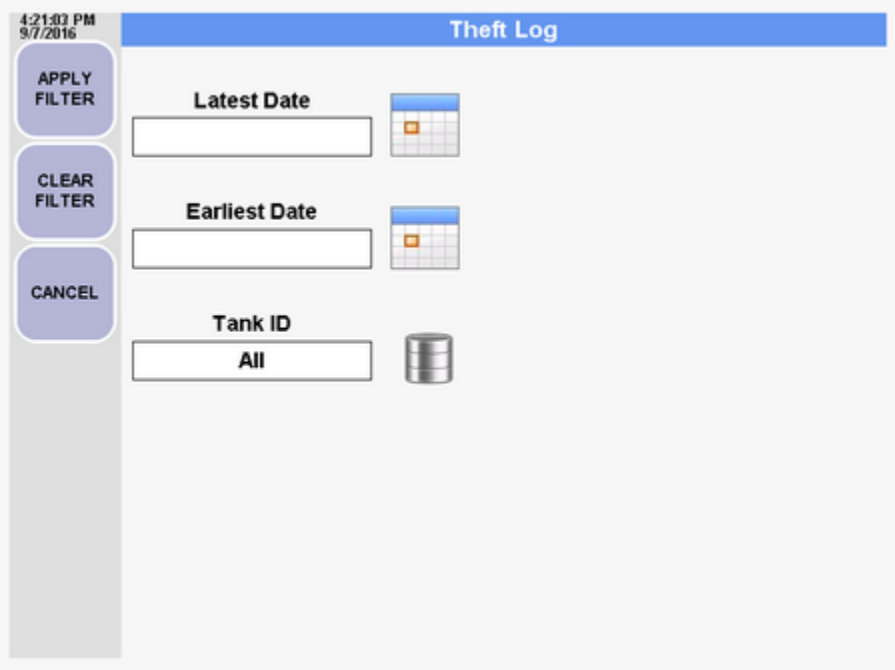
Net Volume Start: The total temperature-compensated of volume of liquid in the tank at the beginning of the theft

Net Volume End: The total temperature-compensated volume of liquid in the tank at the end of the theft

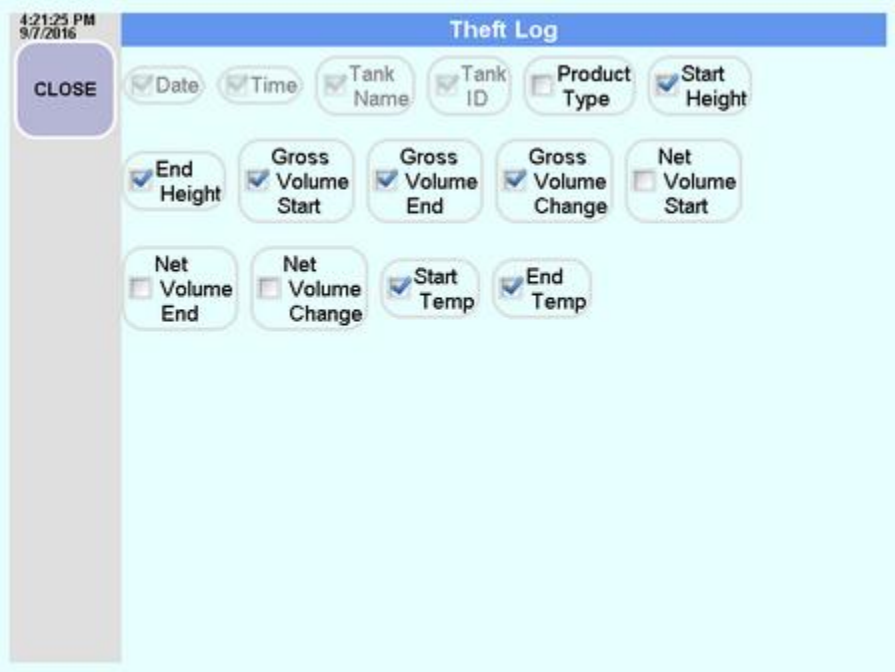
Net Volume Change: The total change in temperature-compensated volume of liquid in the tank at the beginning of the theft

Start Temp: The average liquid temperature at the beginning of the theft

End Temp: The average liquid temperature at the end of the theft

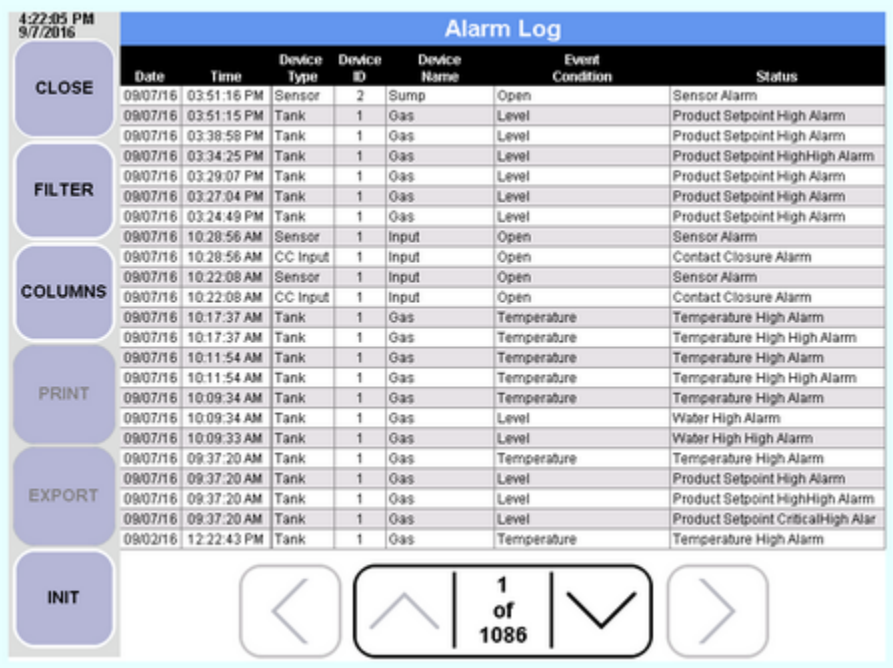


Provided filter can select a date range and/or specific Tank IDs.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.8 ALARM



Date	Time	Device Type	Device ID	Device Name	Event Condition	Status
09/07/16	03:51:16 PM	Sensor	2	Sump	Open	Sensor Alarm
09/07/16	03:51:15 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	03:38:58 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	03:34:25 PM	Tank	1	Gas	Level	Product Setpoint HighHigh Alarm
09/07/16	03:29:07 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	03:27:04 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	03:24:49 PM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	10:28:56 AM	Sensor	1	Input	Open	Sensor Alarm
09/07/16	10:28:56 AM	CC Input	1	Input	Open	Contact Closure Alarm
09/07/16	10:22:08 AM	Sensor	1	Input	Open	Sensor Alarm
09/07/16	10:22:08 AM	CC Input	1	Input	Open	Contact Closure Alarm
09/07/16	10:17:37 AM	Tank	1	Gas	Temperature	Temperature High Alarm
09/07/16	10:17:37 AM	Tank	1	Gas	Temperature	Temperature High High Alarm
09/07/16	10:11:54 AM	Tank	1	Gas	Temperature	Temperature High Alarm
09/07/16	10:11:54 AM	Tank	1	Gas	Temperature	Temperature High High Alarm
09/07/16	10:09:34 AM	Tank	1	Gas	Temperature	Temperature High Alarm
09/07/16	10:09:34 AM	Tank	1	Gas	Level	Water High Alarm
09/07/16	10:09:33 AM	Tank	1	Gas	Level	Water High High Alarm
09/07/16	09:37:20 AM	Tank	1	Gas	Temperature	Temperature High Alarm
09/07/16	09:37:20 AM	Tank	1	Gas	Level	Product Setpoint High Alarm
09/07/16	09:37:20 AM	Tank	1	Gas	Level	Product Setpoint HighHigh Alarm
09/07/16	09:37:20 AM	Tank	1	Gas	Level	Product Setpoint CriticalHigh Alar
09/02/16	12:22:43 PM	Tank	1	Gas	Temperature	Temperature High Alarm

Date: Date the alarm occurred

Time: Time the alarm occurred

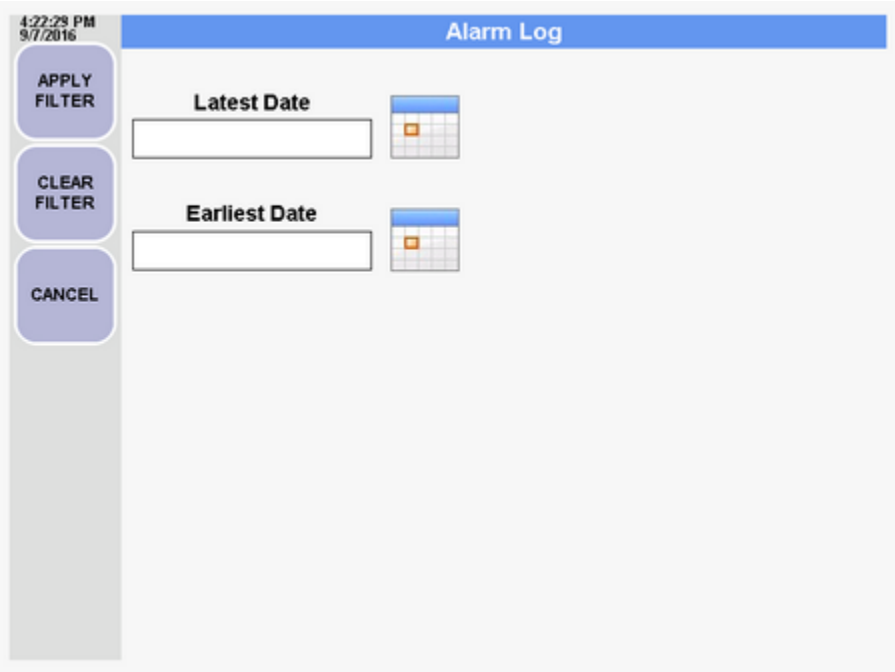
Device Type: Includes, Tank, Sensor, and CC Input

Device ID: The ID number of the Device Type in alarm

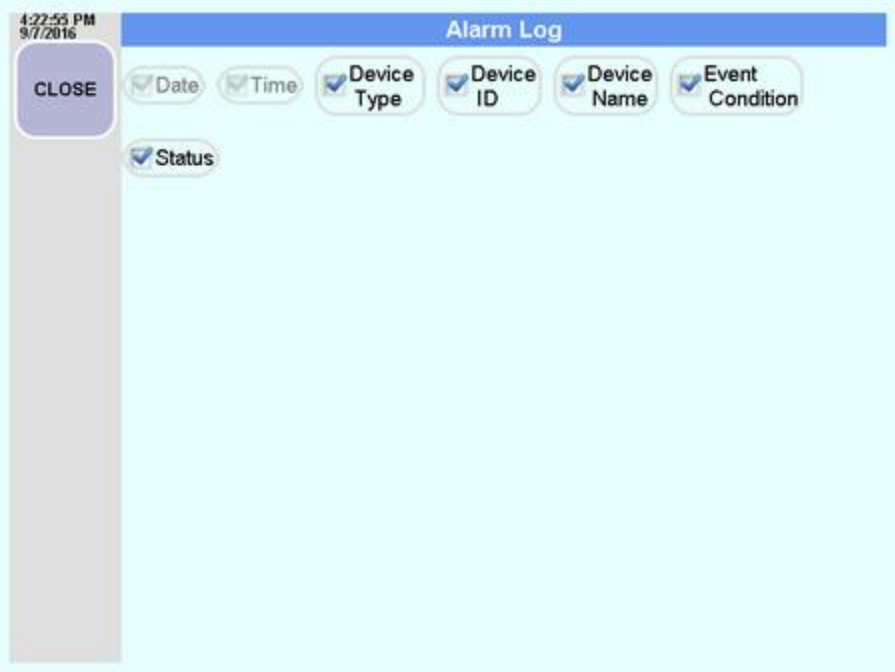
Device Name: The name assigned to the Device Type in alarm

Event Condition: The category of alarm

Status: Detailed description of the alarm



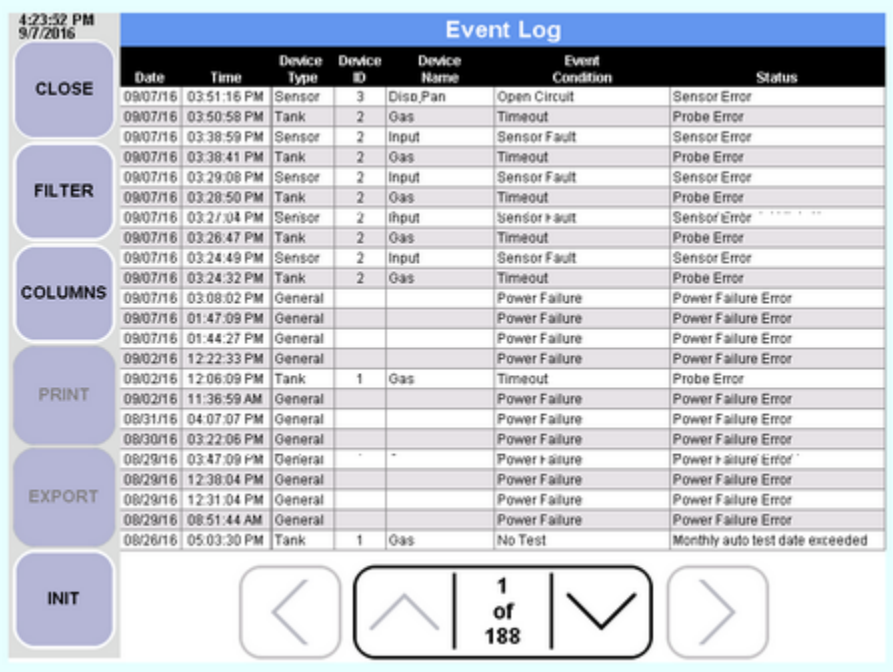
Provided filter can select a date range.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.9 EVENT

The probe map/system setup below should be completed by the electrical installer as each probe,



Date	Time	Device Type	Device ID	Device Name	Event Condition	Status
09/07/16	03:51:16 PM	Sensor	3	Disp,Pan	Open Circuit	Sensor Error
09/07/16	03:50:58 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:38:59 PM	Sensor	2	Input	Sensor Fault	Sensor Error
09/07/16	03:38:41 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:29:08 PM	Sensor	2	Input	Sensor Fault	Sensor Error
09/07/16	03:28:50 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:27:04 PM	Sensor	2	Input	Sensor Fault	Sensor Error
09/07/16	03:26:47 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:24:49 PM	Sensor	2	Input	Sensor Fault	Sensor Error
09/07/16	03:24:32 PM	Tank	2	Gas	Timeout	Probe Error
09/07/16	03:08:02 PM	General			Power Failure	Power Failure Error
09/07/16	01:47:09 PM	General			Power Failure	Power Failure Error
09/07/16	01:44:27 PM	General			Power Failure	Power Failure Error
09/02/16	12:22:33 PM	General			Power Failure	Power Failure Error
09/02/16	12:06:09 PM	Tank	1	Gas	Timeout	Probe Error
09/02/16	11:36:59 AM	General			Power Failure	Power Failure Error
08/31/16	04:07:07 PM	General			Power Failure	Power Failure Error
08/30/16	03:22:06 PM	General			Power Failure	Power Failure Error
08/29/16	03:47:09 PM	General			Power Failure	Power Failure Error
08/29/16	12:38:04 PM	General			Power Failure	Power Failure Error
08/29/16	12:31:04 PM	General			Power Failure	Power Failure Error
08/29/16	08:51:44 AM	General			Power Failure	Power Failure Error
08/26/16	05:03:30 PM	Tank	1	Gas	No Test	Monthly auto test date exceeded

Date: Date the event occurred

Time: Time the event occurred

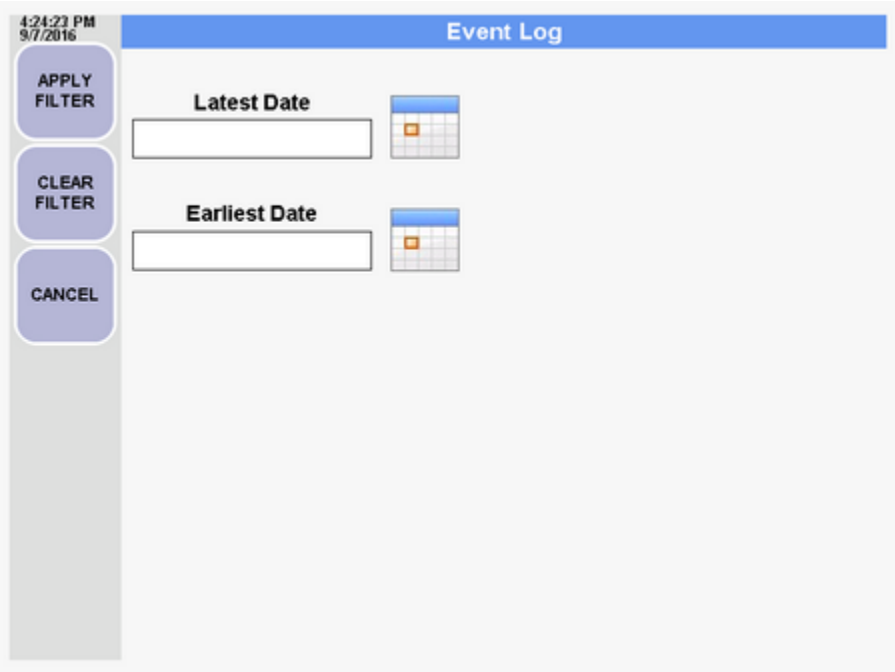
Device Type: Includes, Tank, Sensor, and CC Input

Device ID: The ID number of the Device Type causing the event, if applicable

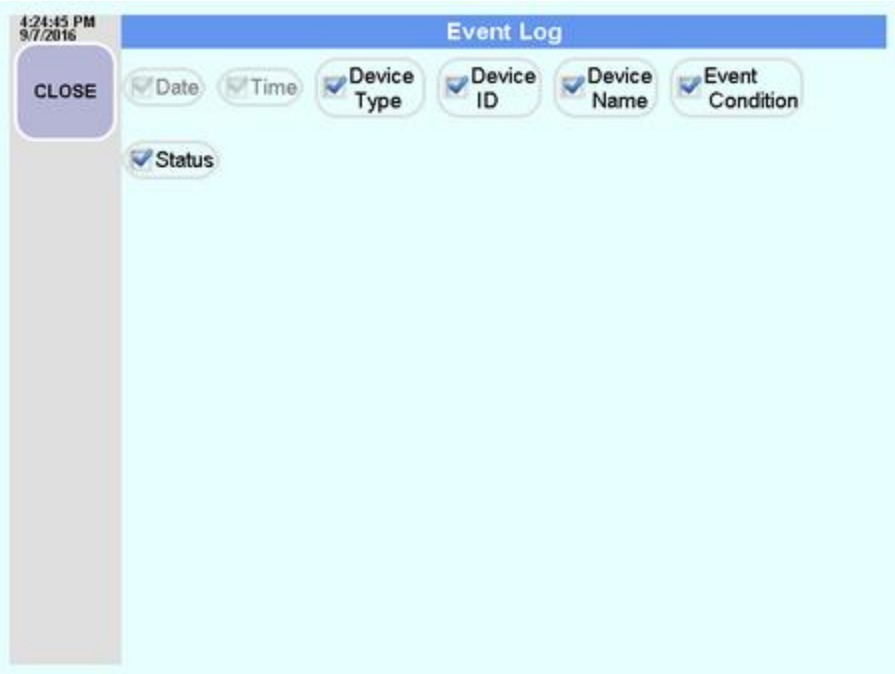
Device Name: The name assigned to the Device Type causing the event, if applicable

Event Condition: The category of event

Status: Detailed description of the event



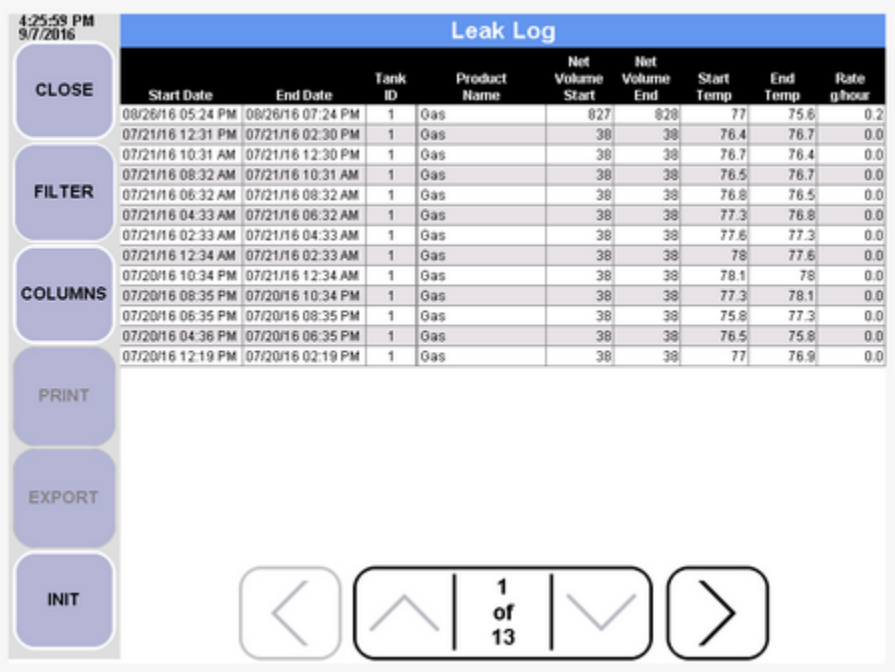
Provided filter can select a date range.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.10 TANK LEAK/LEAK SUMMARY

Note: The Leak Summary Log contains a subset of the Tank Leak Log data including Start and End Date, Tank ID, Product Type, Product Name, Slope, and Result. The latest passing test per tank for all previous months are represented. If no passing test exists for a specific month, the latest fail is recorded. Otherwise both Tank Leak and Leak Summary are functionally equal.



Start Date	End Date	Tank ID	Product Name	Net Volume Start	Net Volume End	Start Temp	End Temp	Rate g/hour
08/26/16 05:24 PM	08/26/16 07:24 PM	1	Gas	827	828	77	75.6	0.2
07/21/16 12:31 PM	07/21/16 02:30 PM	1	Gas	38	38	76.4	76.7	0.0
07/21/16 10:31 AM	07/21/16 12:30 PM	1	Gas	38	38	76.7	76.4	0.0
07/21/16 08:32 AM	07/21/16 10:31 AM	1	Gas	38	38	76.5	76.7	0.0
07/21/16 06:32 AM	07/21/16 08:32 AM	1	Gas	38	38	76.8	76.5	0.0
07/21/16 04:33 AM	07/21/16 06:32 AM	1	Gas	38	38	77.3	76.8	0.0
07/21/16 02:33 AM	07/21/16 04:33 AM	1	Gas	38	38	77.6	77.3	0.0
07/21/16 12:34 AM	07/21/16 02:33 AM	1	Gas	38	38	78	77.6	0.0
07/20/16 10:34 PM	07/21/16 12:34 AM	1	Gas	38	38	78.1	78	0.0
07/20/16 08:35 PM	07/20/16 10:34 PM	1	Gas	38	38	77.3	78.1	0.0
07/20/16 06:35 PM	07/20/16 08:35 PM	1	Gas	38	38	75.8	77.3	0.0
07/20/16 04:36 PM	07/20/16 06:35 PM	1	Gas	38	38	76.5	75.8	0.0
07/20/16 12:19 PM	07/20/16 02:19 PM	1	Gas	38	38	77	76.9	0.0

Start Date: The date and time the test was started

End Date: The date and time the test was completed

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.4.

Product Type: The Product Type assigned to the tank. See Section 2.4

Product Name: The name assigned to the tank. See Section 2.4

Net Volume Start: The total temperature-compensated of volume of liquid in the tank at the beginning of the test

Net Volume End: The total temperature-compensated volume of liquid in the tank at the end of the test

Start Temp: The average liquid temperature at the beginning of the test

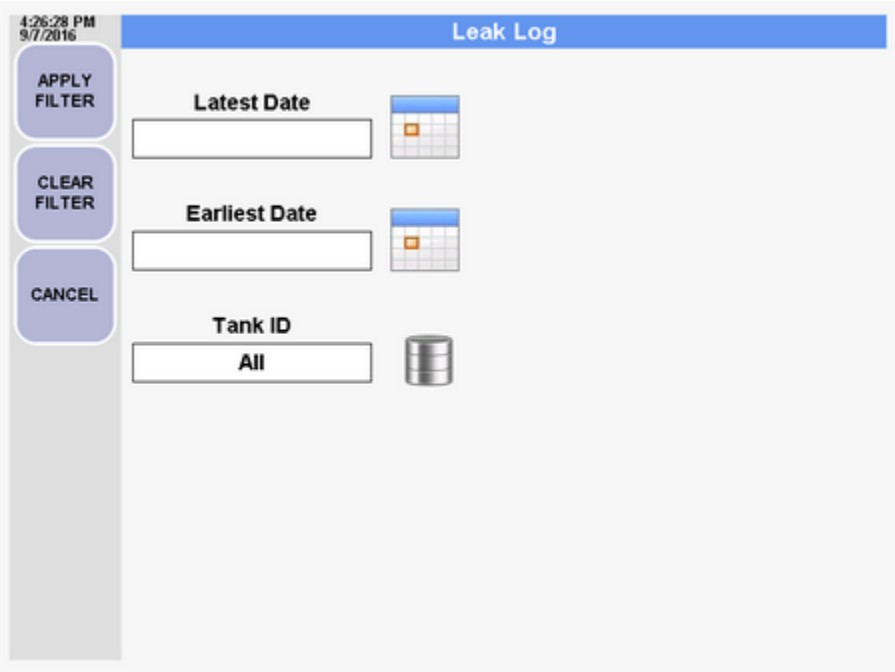
End Temp: The average liquid temperature at the end of the test

Rate g/hour: The minimum detected loss that qualifies as a leak. See section 2.8

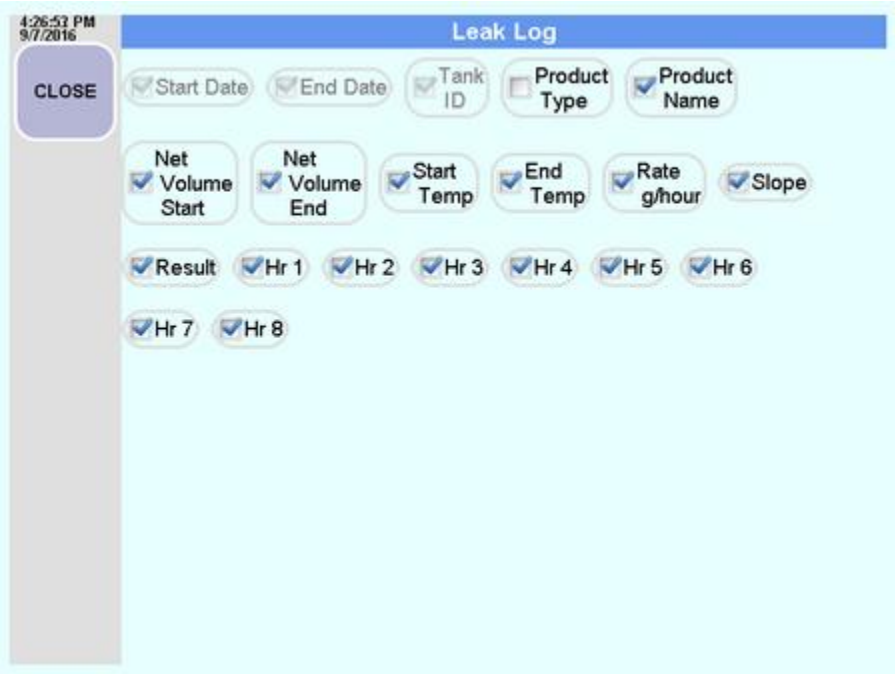
Slope: The actual average change in volume observed at the completion of the test

Result: Pass or Fail

Hr: The average cumulative change in volume at the end of each hour.

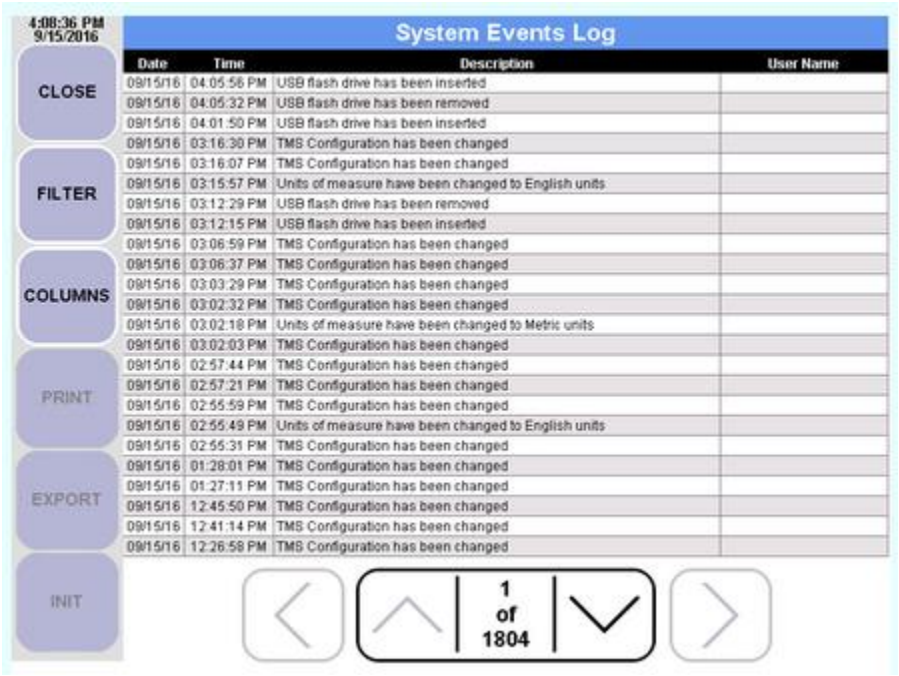


Provided filter can select a date range and/or specific Tank IDs.



Individual columns may be disabled by unchecking box. Grayed out values cannot be disabled.

3.11 SYSTEM EVENTS

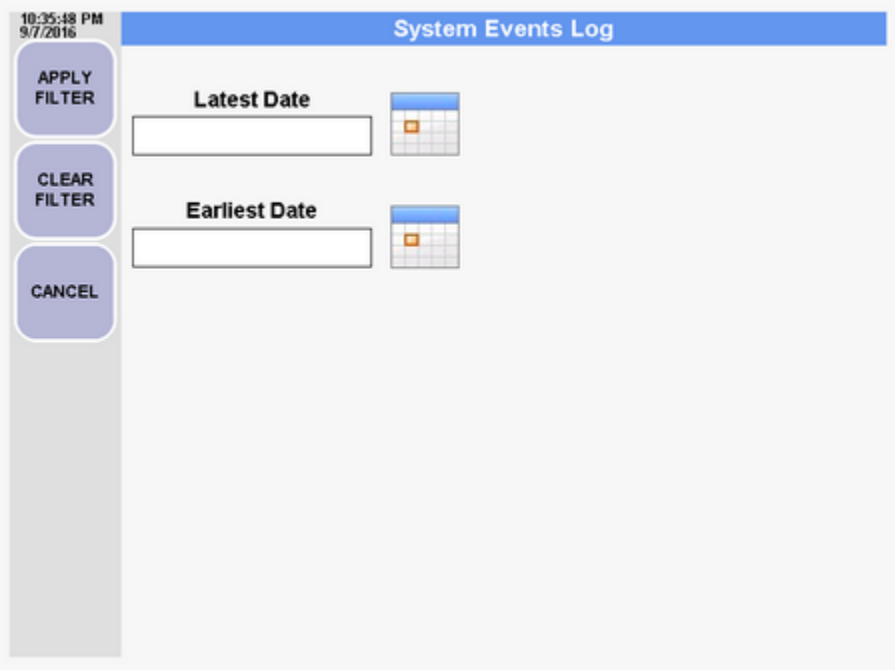


Date: Date the incident occurred

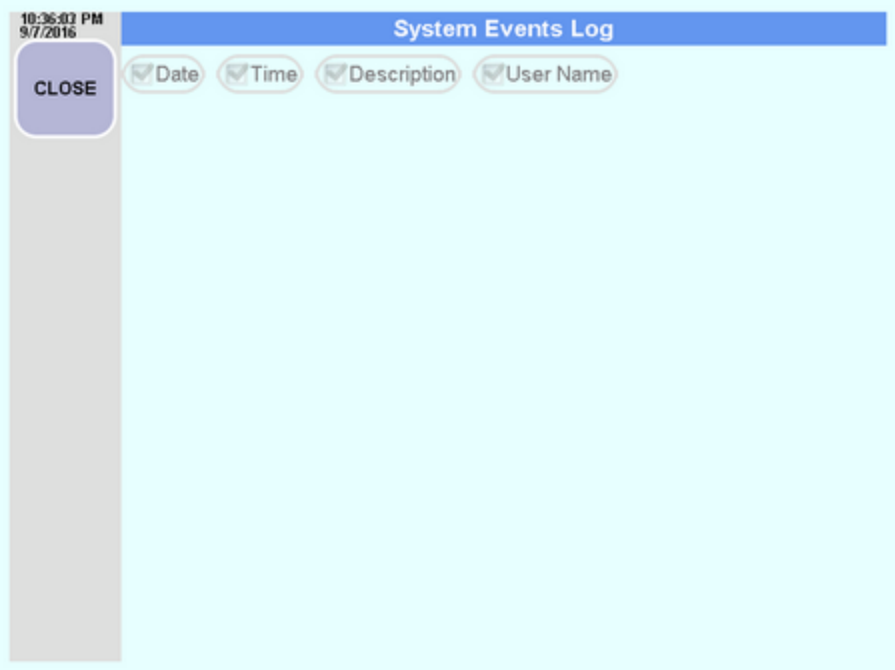
Time: Time the incident occurred

Description: A description of the incident

User Name: The name of the user responsible for the security event.



Provided filter can select a date range.



Displays a list of individual columns. This Report does not currently support disabling columns.

PNEUMERCATOR TMS SERIES

LIMITED WARRANTY

TMS Series

Pneumercator, here and after referred to as **PCO**, warrants its **TMS Series** family of products to be free of defects in material and workmanship for a period of **Twelve (12) months** from date of Operation or **Fifteen (15) months** from date of invoice, whichever comes first.

During the warranty period on the **TMS Series**, **PCO,** or factory third party independent representatives will repair or replace the product at the location where it is installed at no additional cost to the customer.

Packages must be inspected upon receipt for damage, missing parts, and/or manuals. **PCO** must be contacted by telephone immediately with a description of damaged or missing parts so replacements can be sent. Written details must be sent within **thirty (30) days.**

Pneumercator will not be responsible for shipping charges incurred by the customer.

Warranty repair coverage invoices will be paid if **all** the following conditions are met:

- PCO has acknowledged and authorized warranty work to be done by issuing a *Warranty Repair Number*.
- Start-up Service technician has been trained by PCO
- Warranty start-up form has been submitted to PCO
- Technician fills out and submits a PCO "Service Report"
- Parts (if any) used are returned to PCO with a proper WRGA (*Warranty Return Goods Authorization)*
- Returned parts are found to be defective.

Repair time will be paid according to PCO document "Standard Warranty Labor Charge Schedule"

If the Warranty Registration/Start up Check List has been completed and returned on file with the factory and the product is installed in accordance with the specific PCO Operation Product Manual, PCO will activate and meet warranty criteria as described above. Warranty criteria shall be voided if any product has been subjected to misuse, negligence, damage from acts of nature (lightning, wind, rain, etc.) or is in violation of the products design intent, disregard to warnings, installations, modified or repaired by unauthorized personnel or improperly installed. Given that the third party independent contractor has installed the equipment in accordance with the specific product installation manual, and followed all precautions, PCO will fulfill the terms stated in our warranty obligation.

Under no circumstances does the warranty provide a remedy in excess of the equipment. No other expressed or implied warranty is given by PCO. PCO shall not be liable for consequential damages or any expenses incurred by the user.

Distributed by:

PNEUMERCATOR
Liquid Level Control Systems
1785 Expressway Drive North, Hauppauge NY 11788
(631) 293-8450 Fax (631) 293-8533