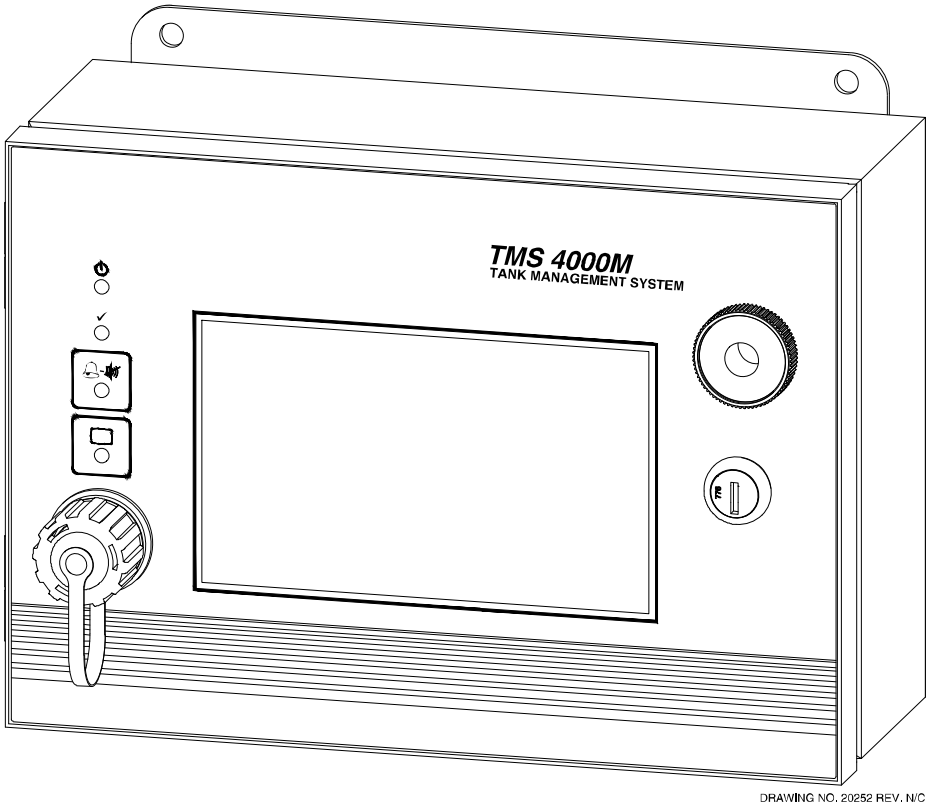
MULTI TANK
MONITORING
SYSTEM

OPERATION MANUAL



DRAWING NO. 20252 REV. N/C

MODEL TMS4000M

References V10.112 Firmware

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Note: A separate INSTALLATION MANUAL is available, but NOT required for TMS4000M operation.

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TABLE OF CONTENTS

SECTION 1 – PRODUCT DESCRIPTIONS

1.1 GENERAL SYSTEM OVERVIEW

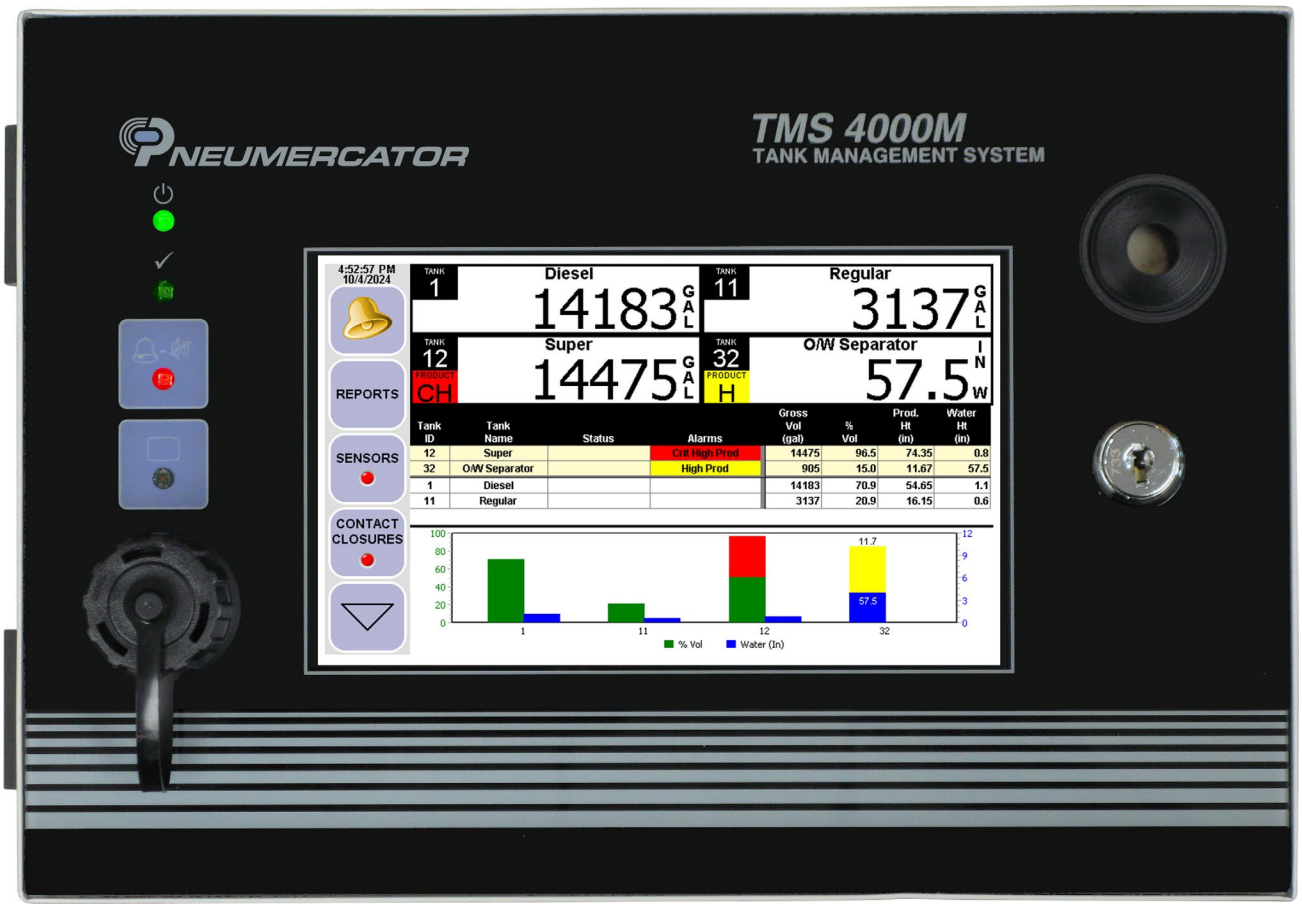
This document covers the operation, troubleshooting, and maintenance of the TMS4000M. The primary user interface is the color touch screen supplemented by a pair of status LEDs. The front panel also includes an integrated horn to the upper right of the LCD screen, and to the left of the LCD screen, from top to bottom, a Green Power LED, Green Normal Status LED, Red Alarm Status LED, and optional externally accessible USB Port. The Status LEDs behave as follows:

Red Alarm Status LED: blinks when a new alarm occurs. Once the TMS alarm has been acknowledged using the Acknowledge button (Bell icon) in the top left corner of the touch screen, the Alarm Status LED will stop blinking and will stay on until the alarm condition is satisfied.

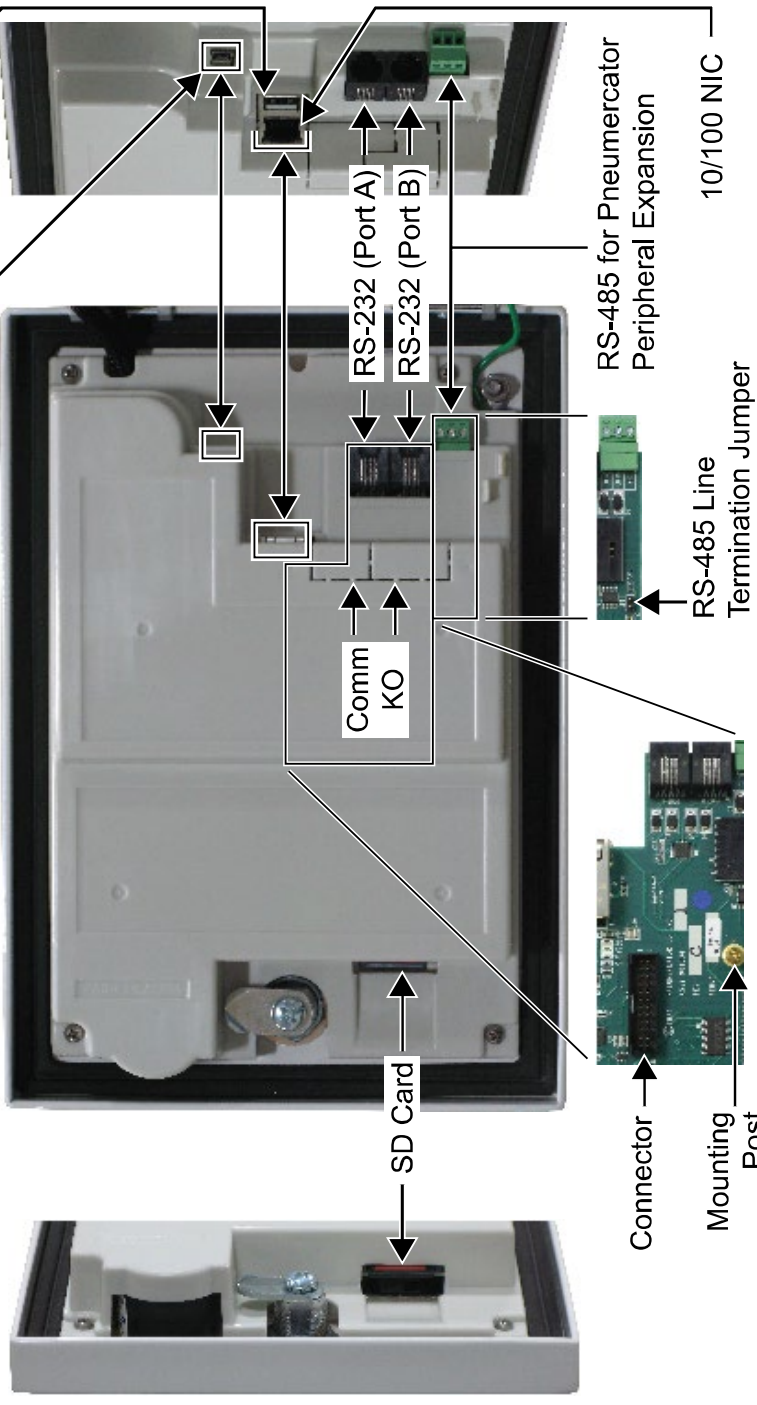
Green Alarm Status LED: active when the TMS has no active alarms.

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

This manual was written referencing TMS4000M firmware version 10.112. Although some screen shots may vary between firmware versions, the principle of operation remains the same. Contact Pneumercator Tech Support at (800) 209-7858 with any questions.



1.1.1 PROCESSOR BOARD CONNECTIONS



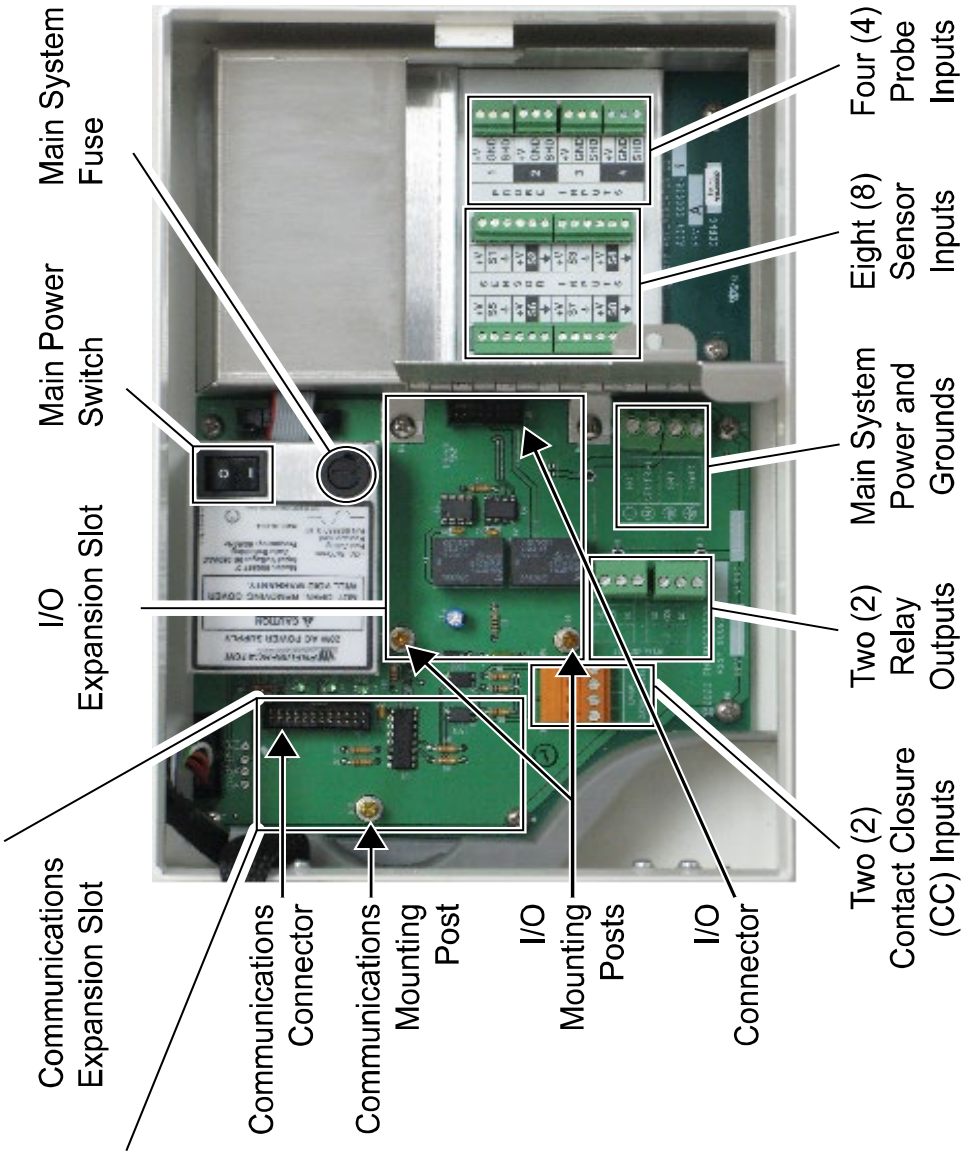
Note: The Flash Drive must include a Type A (rectangular) connector and be formatted as FAT32

Communications Expansion Slot: Supports select Communications options including:
Modbus RTU (900552-10), Isolated Modbus RTU (901050-10), Cellular Modem (901040-1)
RS-232 Serial C (900571-2), 14,400 Modem (900433-10), and Transceiver (900483-1)

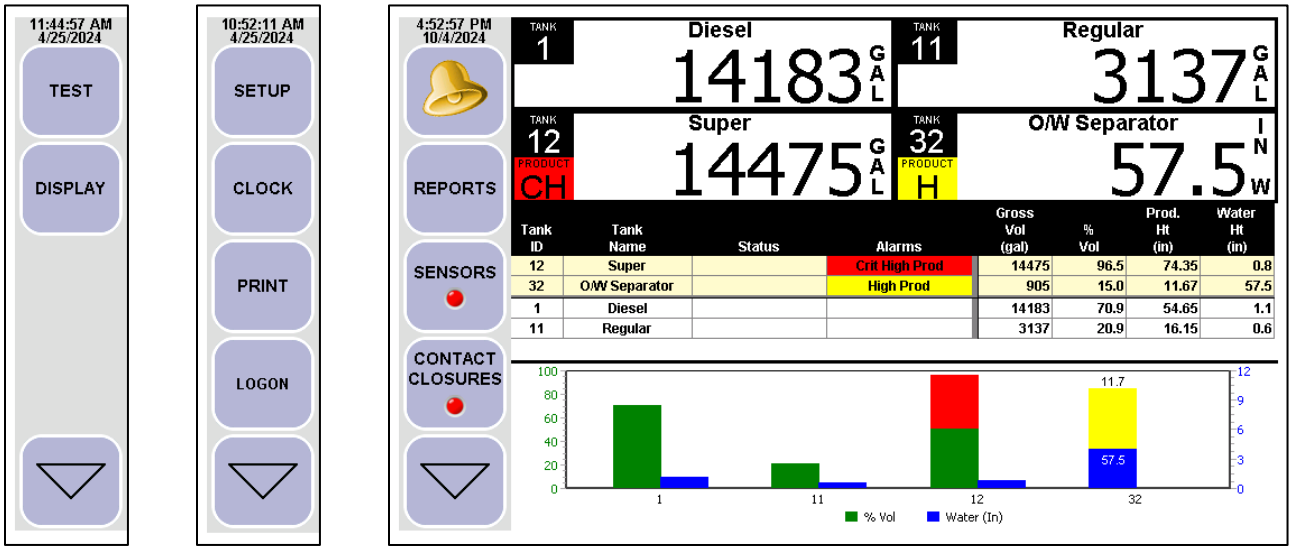
1.1.2 MAIN BOARD CONNECTIONS

Communications Expansion Slot: Supports select Communications options including: Modbus RTU (900552-10), Isolated Modbus RTU (901050-10), Transceiver (900483-1), Dual Modbus RTU (900665-5-5), and Dual Isolated Modbus RTU (900665-R-R)

I/O Expansion Slot: Supports select I/O options including: 4 Input/4 Relay Outputs (901042-1) and 4 Analog Outputs (901043-1)



1.2 MAIN SCREEN



The above image represents the Main screen for the TMS4000M. This screen may be divided into four quadrants representing display and control features as follows:

Meters (Top Right, Optional): Up to four Meters may be displayed, each representing a single Tank ID and Unit of Measure of the user's choice. Alarms for Product, Water, and Temperature are also represented as well as Tank Activity including Deliveries to and Withdrawals from the Tank.

Tabular (Center Right): resembling a spreadsheet, the Tabular section provides complete details about each tank including Volume, Level, and Temperature plus Tank Alarms and Statuses. Any tank with an active Alarm or Status are "floated" up to the top of the list and shown with an off-white background. Tanks with no active Alarm or Status are dropped to the bottom of the list and shown with a white background. Note: on power-up, all tanks are shown with an Active Status for three minutes while the TMS assesses which tanks have active transactions and which have a stable level.

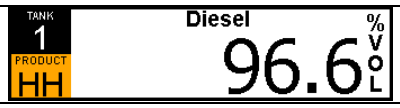
Bar Graphs (Bottom Right, Optional): the Bar Graphs, when enabled, include one bar for the Percent Volume of Product and optionally one additional bar representing either Water Level or Product Temperature. The non-alarm color for the bars (Green for Product, Blue for Water, Gray for Temperature) will change indicating any active alarms and the severity level (Yellow: least severe; Orange: moderately severe; Red most severe). For high alarms, only the portion of the bar that exceeds the high threshold will be shown in the appropriate color.

Toolbar (Left): The buttons along the left edge provide access to different features that are described on the pages to follow. Above the buttons, the current date and time is shown.

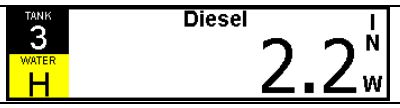
Additional details about the above features are provided on the pages that follow. Section 1.3 provides information about customizing the Meters, Tabular, and Bar Graph screen sections.

1.2.1 METERS EXAMPLES

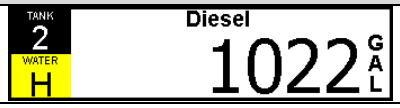
Below are some examples of Meters showing the various features including Tank ID (Top Left), Alarm (Bottom Left), Tank Name (Across the Top), Unit of Measure (Right edge), and numeric data.



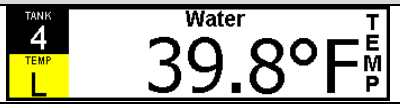
Tank ID: 1 **Tank Name:** Diesel
Alarm: High High Product **UOM:** % Volume
Value: 96.6% of actual Tank Capacity



Tank ID: 3 **Tank Name:** Diesel
Alarm: High Water **UOM:** Inches of Water
Value: 2.2 inches of bottom water

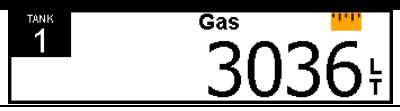


Tank ID: 2 **Tank Name:** Diesel
Alarm: High Water **UOM:** Gallons
Value: 1022 Gallons of Diesel

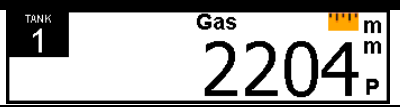


Tank ID: 4 **Tank Name:** Water
Alarm: Low Temperature **UOM:** °F
Value: 39.8°F average Temperature of Water

Note: Any Tank Alarm (Product, Water, Temperature) will be displayed independent of the selected UOM

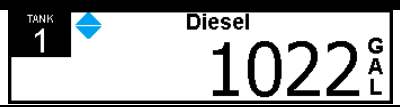


Tank ID: 1 **Tank Name:** Gas
Alarm: None **UOM:** Liters
Value: 3036 Liters of Gasoline

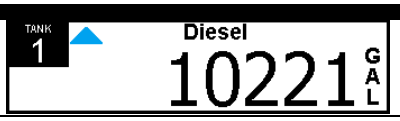


Tank ID: 1 **Tank Name:** Gas
Alarm: None **UOM:** millimeters
Value: 2204 millimeters of Gasoline

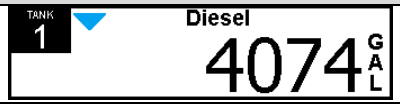
Note: Orange ruler at top right indicates secondary UOM selected for Meters.



Tank ID: 1 **Tank Name:** Diesel
Alarm: None **UOM:** Gallons
Value: 1022 Gallons of Diesel
Status: Active (double blue arrows)



Tank ID: 1 **Tank Name:** Diesel
Alarm: None **UOM:** Gallons
Value: 10221 Gallons of Diesel
Status: Product Increase/Delivery (blue up arrow)

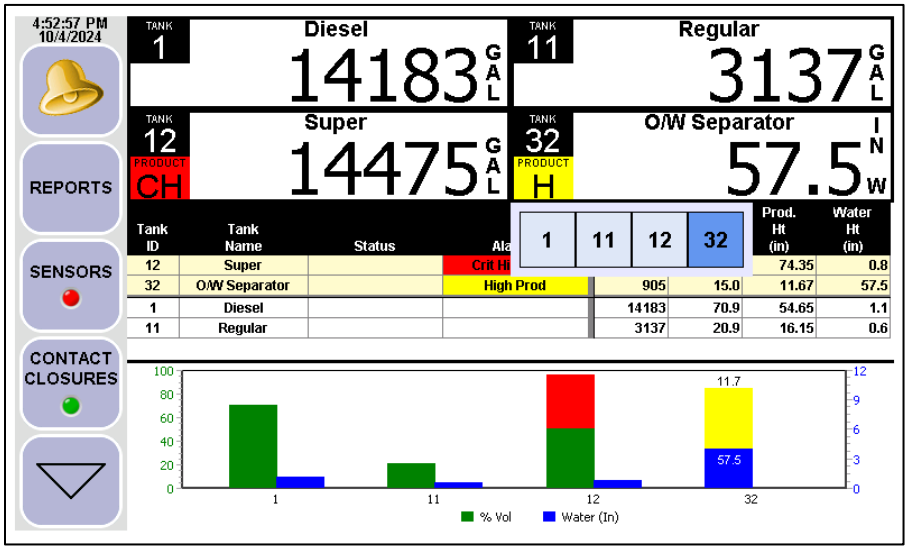


Tank ID: 1 **Tank Name:** Diesel
Alarm: None **UOM:** Gallons
Value: 4074 Gallons of Diesel
Status: Product Decrease (blue down arrow)
Note: May be Sale, Water Removal, or Theft

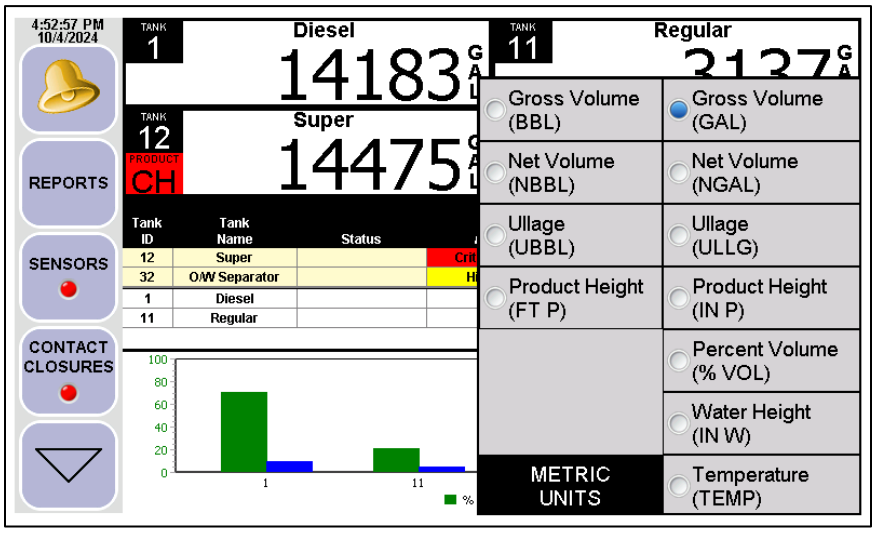
All tank activity, indicated by up and/or down arrows, is monitored for three minutes after the activity has stopped to ensure the transaction is accurately recorded. When both up and down arrows are displayed, the activity has not yet been determined to be an increase or decrease of product volume.
Note: Both up and down arrows will be displayed for at least three minutes upon powerup or configuration change to allow the TMS to confirm there is no activity on any tank channels. If activity is detected, the appropriate up or down arrow will be displayed for the duration of the transaction as described above.

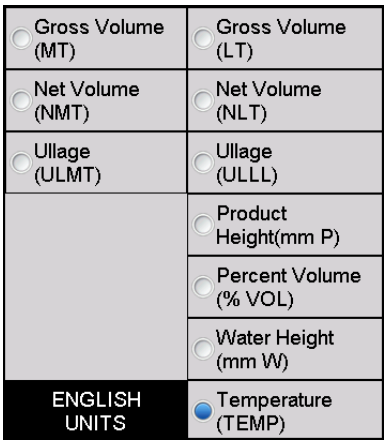
CUSTOMIZING INDIVIDUAL METERS

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 black box at the top left corner of the meter to bring up a selection of available Tank IDs that can be selected for the meter.





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 option to select that choice.

Note: Tap on Metric Units in the bottom left corner to change ALL Meters to Metric Units. The Primary Units of Measure will remain English as defined in Localization (See Section 1.14).

1.2.2 TABULAR
EXAMPLE

Tank ID	Tank Name	Status	Alarms	Gross Vol (gal)	% Vol	Prod. Ht (in)	Water Ht (in)
12	Super		Crit High Prod	14475	96.5	74.35	0.8
32	O/W Separator		High Prod	905	15.0	11.67	57.5
1	Diesel			14183	70.9	54.65	1.1
11	Regular			3137	20.9	16.15	0.6

Tank IDs 12 and 32 are “floated” to the top due to having an active Status and/or Alarm and are presented with an off-white background. The remaining Tank IDs are listed below with a white background.

Note: ALL Tanks are active for three minutes on powerup or after a configuration change to allow the TMS to identify any and all tanks with activity. The active status is cleared once the tanks are confirmed to have no activity.

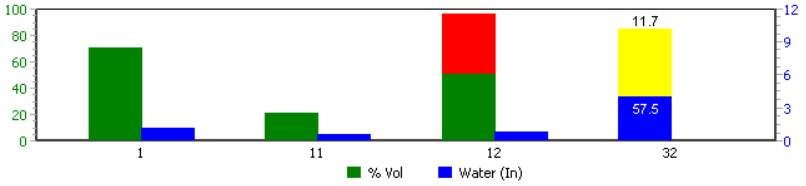
1.2.3 BAR GRAPH
HEIGHT

Product: corresponds to the Percent Volume scale on the left edge of bar graph chart
Water or Temperature: corresponds to the scale on the right edge of bar graph chart

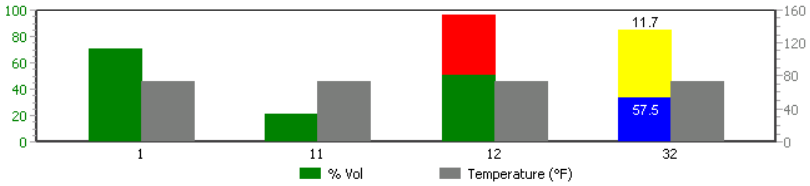
COLOR

Low Alarms: The entire bar will change color representing the most severe active alarm.
High Alarms: The portion of the bar at and above the High Alarm threshold will change color representing the most severe active alarm.

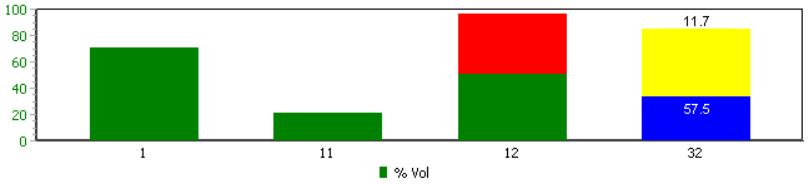
EXAMPLES



Product (% Volume) & Water (Inches)



Product (% Volume) & Temperature (°F)

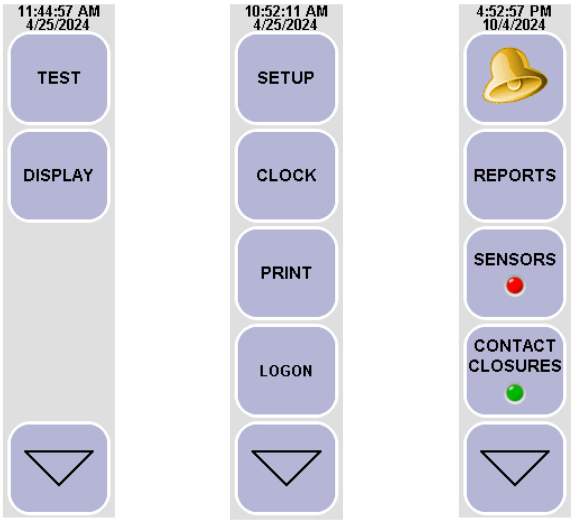


Product (% Volume) ONLY

The primary bar, shown in Green, represents the Product as a percentage of Tank Capacity. The height of the Product bar corresponds with the legend on the left side of the bar graph. The optional secondary bar represents either bottom Water (shown in Blue) or Product Temperature (shown in Gray). The height of the secondary bar corresponds with the legend on the right side of the bar graph.

Any Bar will be shown in its default color when there are no alarms but will change to Yellow, Orange, or Red for a Low Alarm, depending on the severity. For High alarms, only the portion that exceeds the High threshold will change to the corresponding color.

1.2.4 TOOLBARS

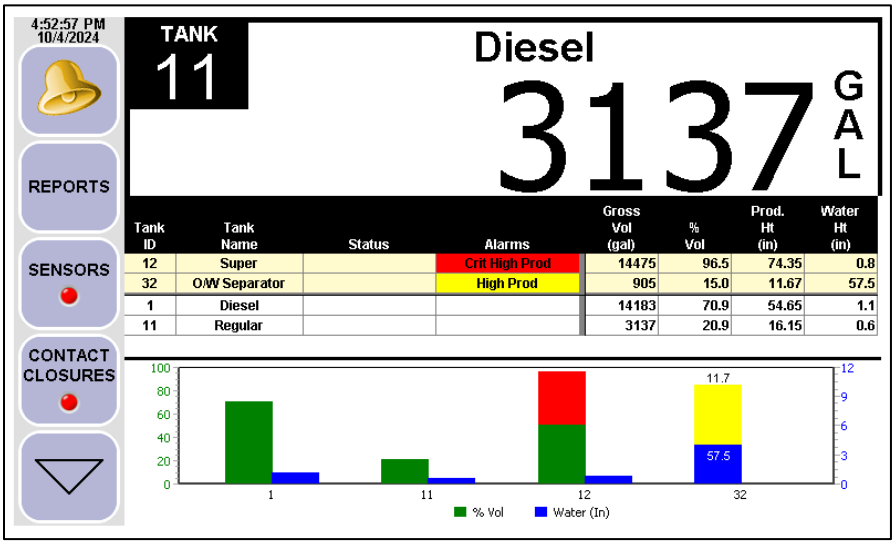


The Toolbar is located on the left-edge of the main screen. The Down Arrow button at the bottom provides access to multiple pages of buttons. Details for the Toolbar Buttons are as follows:

- Bell/Alarm Acknowledgment: See Section 1.5
- Clock: Set System Date/Time, See Section 1.10
- Contact Closures: Contact Closure (CC) Input Status, See Section 1.7
- Display: Display Customization, See Section 1.3 beginning on the next page
- Logon/Logoff: Security sign-in/out, See Section 1.11
- Print: See Section 1.9
- Reports: See Section 3
- Sensors: Leak/Point Level Sensor Status, See Section 1.6
- Setup: See Section 1.4
- Test: Confirms operation of integrated horn.

1.3 DISPLAY CUSTOMIZATION

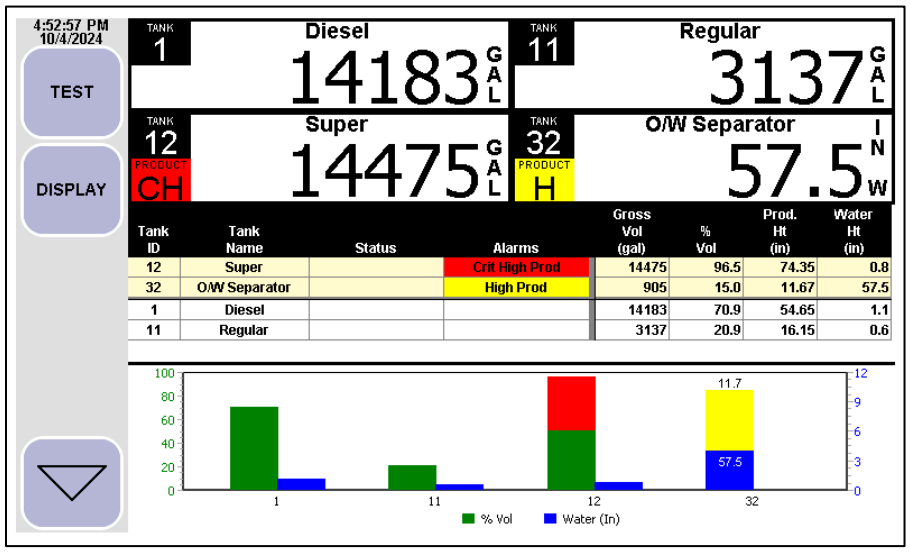
The TMS Display includes three sections that may be customized. These sections are presented from top to bottom as follows: Meters, Tabular Data, and Bar Graphs. The image below shows each individual section and the corresponding configuration header found on the DISPLAY Customization Screen. In addition, there are settings available in support of Screen Brightness.



Meter Format

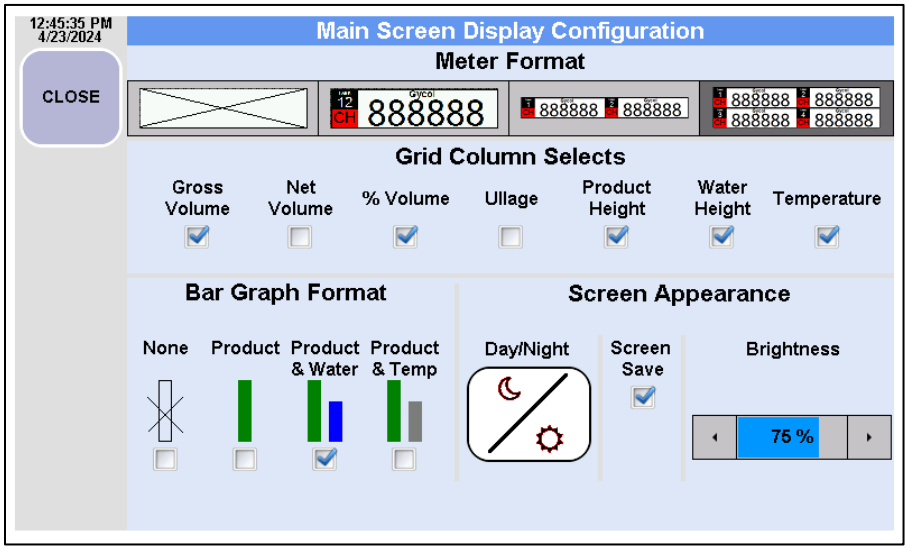
Grid Column Selects

Bar Graph Format



Tap on the DISPLAY button.

Note: Tap the DOWN ARROW button if the DISPLAY button is not visible.



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.

Meter Format: The Meter Section can be configured to include up to 4 Meters. Each Meter may be configured to represent one unit of measure (i.e. Gross Volume) for a single tank channel. See the Customizing Individual Meters topic later in this Section.

The options available for the Meter Section, from left to right, are as follows:

- Meter Section Disabled
- One Large Meter
- Two Small Meters
- Four Small Meters (selected)

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:** Actual Volume
- **Net Volume:** Temperature-Compensated Volume using industry standard 60°F/15.6°C.
- **% Volume:** Gross Volume/Tank Capacity x 100%.
- **Ullage:** Represents the free space in the tank, typically indicates maximum acceptable delivery volume. The default setting represents free space up to 90% capacity. See Section 2.2 for details on reviewing/configuring the Ullage value.
- **Product Height:** Total height of liquid.
  Note: For O/W Separator tanks, Product Height represents oil height.
- **Water Height:** Bottom water height.
- **Product Temperature:** Volume-weighted average liquid temperature.

Bar Graph Format: The bar graphs provide a visual representation for up to two values per tank including Product, Bottom Water, and Temperature. The options available for the Bar Graph Section, from left to right, are as follows:

- Bar Graph Section Disabled
- Product Only
- Product and Bottom Water
- Product and Temperature

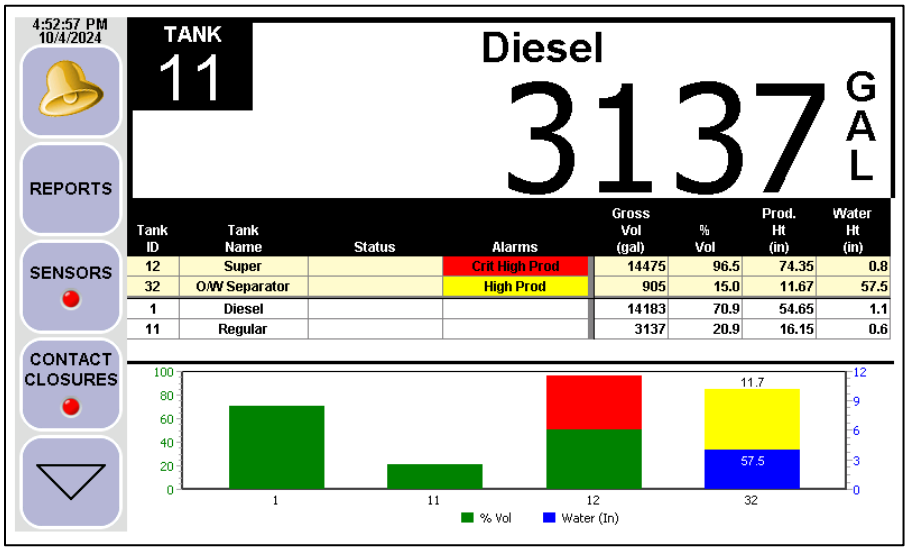
Screen Appearance: This section offers settings for configuring the Screen Save and Brightness features as described below:

Day/Night: FUTURE USE

Screen Save: Dims the LCD to 1% brightness after a five-minute time delay. The screen is restored to the default Brightness, as configured below, when the screen is touched or if an alarm, active tank status, or fluid transaction occurs. Once alarm is acknowledged, the screen will be eligible to dim after a five-minute time delay.

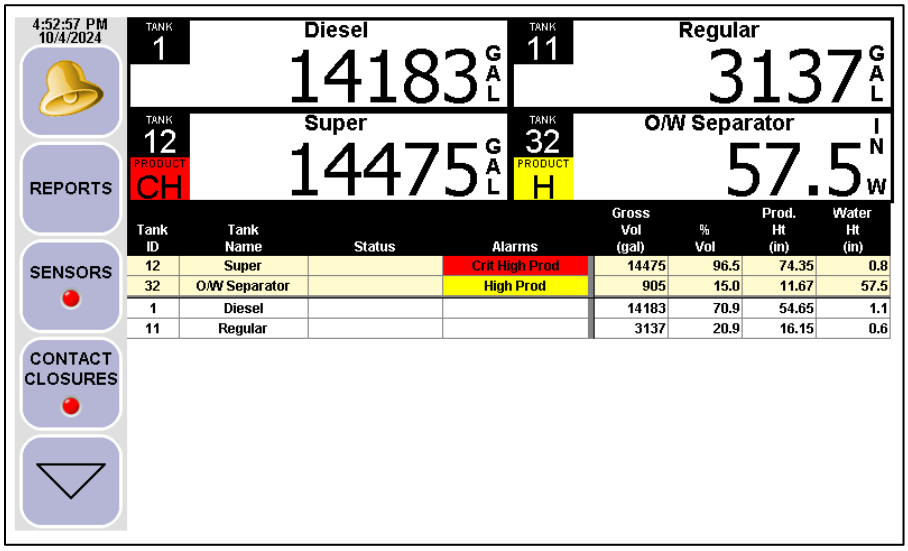
Brightness: The LCD screen brightness may be manually adjusted using the slider (default is 75%) or may be dimmed to 1% (See Screen Save feature above).

DISPLAY CUSTOMIZATION EXAMPLES



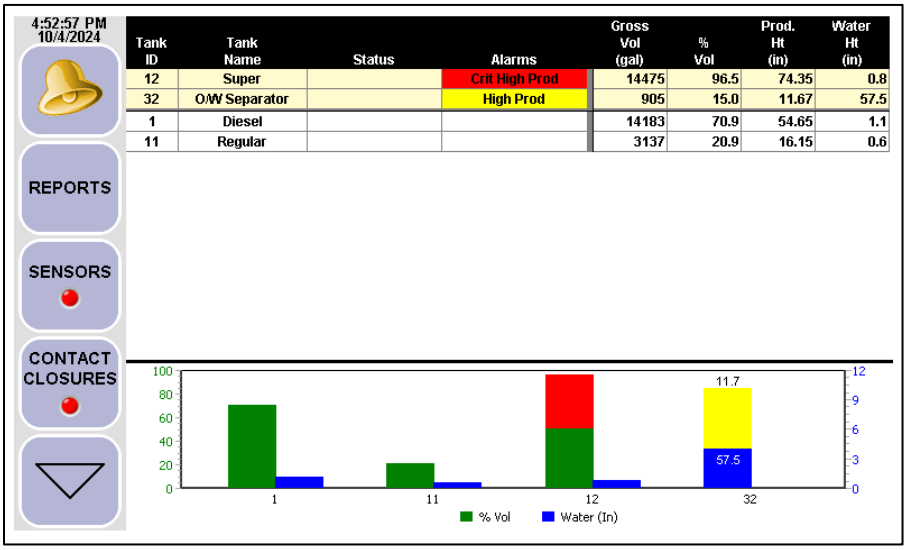
Tank ID	Tank Name	Status	Alarms	Gross Vol (gal)	% Vol	Prod. Ht (in)	Water Ht (in)
12	Super		Crit High Prod	14475	96.5	74.35	0.8
32	O/W Separator		High Prod	905	15.0	11.67	57.5
1	Diesel			14183	70.9	54.65	1.1
11	Regular			3137	20.9	16.15	0.6

Example: One Large Meter with Product Bar Graph

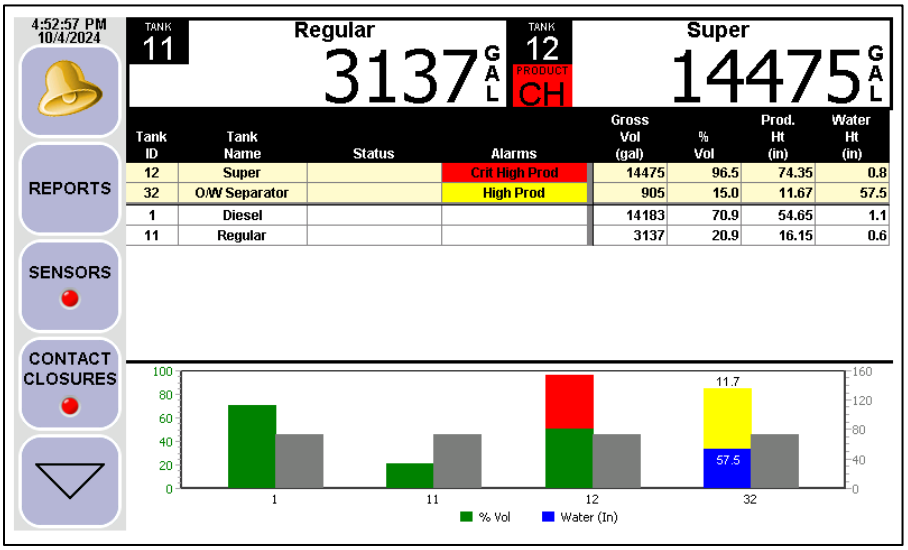


Tank ID	Tank Name	Status	Alarms	Gross Vol (gal)	% Vol	Prod. Ht (in)	Water Ht (in)
12	Super		Crit High Prod	14475	96.5	74.35	0.8
32	O/W Separator		High Prod	905	15.0	11.67	57.5
1	Diesel			14183	70.9	54.65	1.1
11	Regular			3137	20.9	16.15	0.6

Example: Four Small Meters with Bar Graph Section disabled

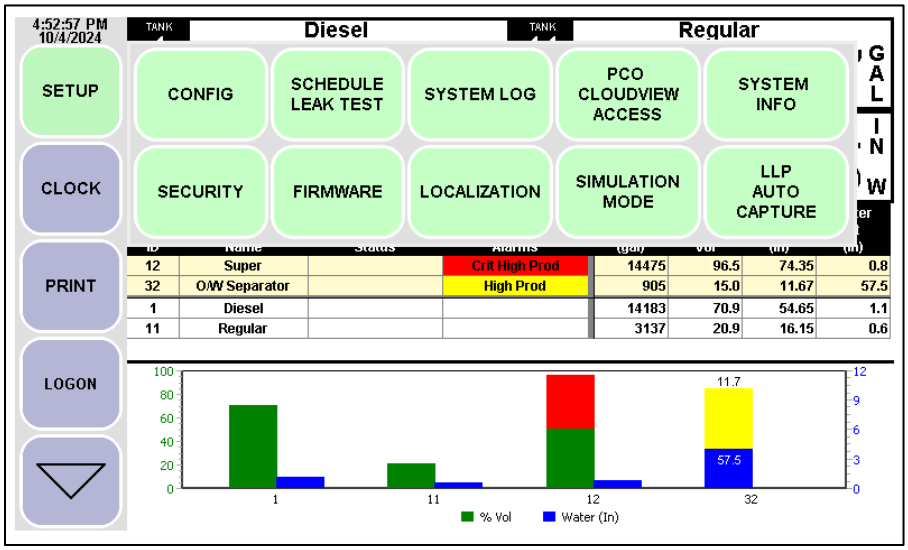


Example: Meter Section Disabled with Product and Bottom Water Bar Graphs



Example: 2 Small Meters with Product and Temperature Bar Graphs

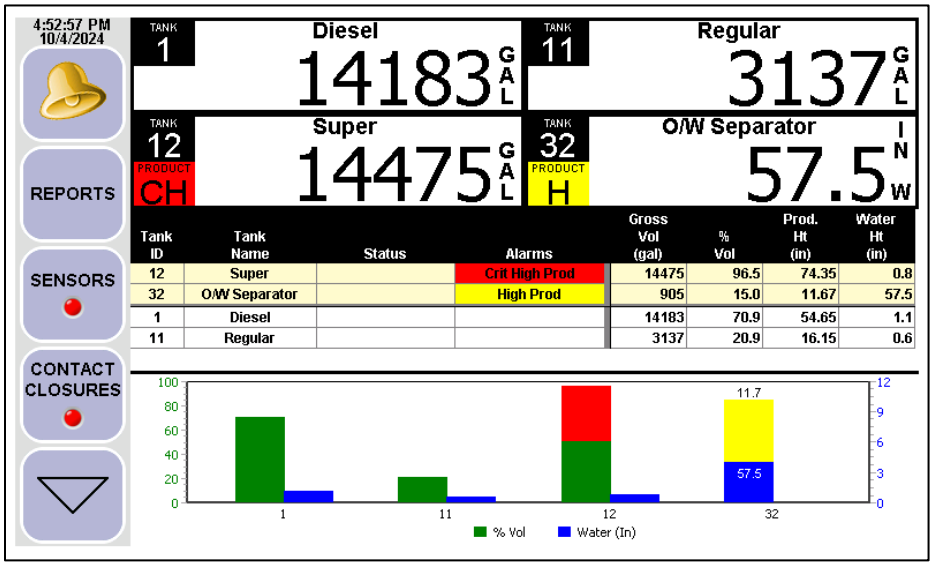
1.4 SETUP MENU



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. See Section 2
- **Firmware:** provides the ability to upgrade the Firmware (APP), OS (SYS), or Services Module (CHP) and view what the currently installed versions are. See Section 1.13
- **Schedule Leak Test:** This section configures the details for the In-Tank Leak Test including the Test Length and scheduling of the test. See Section 2.8
- **LLP Auto Capture:** See separate LLP203 Instruction Manual
- **Localization:** the system language and units of measure are configured here. See Section 1.14
- **PCO CloudView Access:** Register TMS to your PCO CloudView account and check registration status. See separate PCO CloudView Instruction Manual for details.
- **Security:** sets the security for accessing select TMS features. Once enabled, a 4-digit PIN number will be needed to access select features. See Section 1.11
- **Simulation Mode:** Simulate any SetPoint conditions including Product, Bottom Water, and Temperature SetPoints. See Section 1.8
- **System Info:** Shows the installed I/O and Intrinsically Safe Hardware. Also lists the installed version number of Firmware (APP), OS (SYS), and Services Module (CHP). See Section 1.12
- **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.

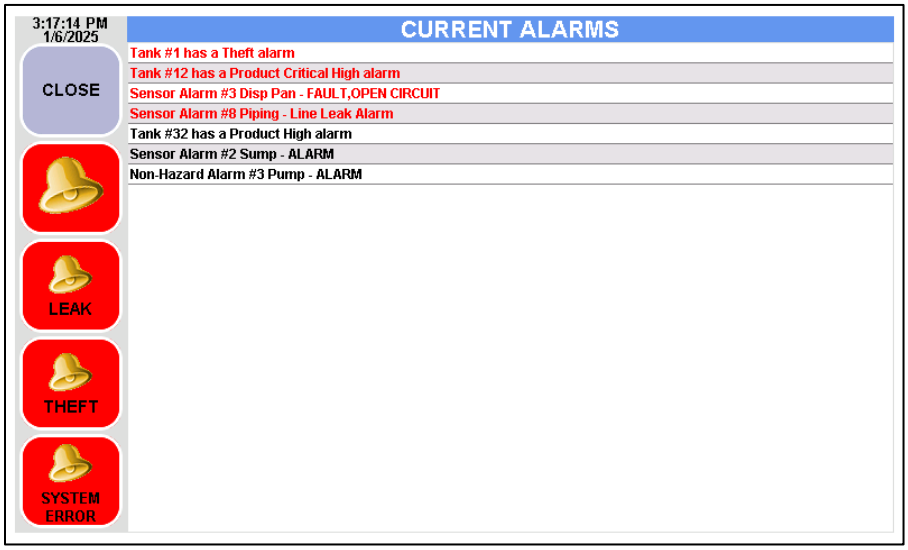
1.5 ALARM ACKNOWLEDGMENT



Tapping on the Acknowledgment button (shown with a Bell icon) will silence the integrated horn and present the screen shown on the next page. ALL active alarm and event conditions are listed, regardless of their acknowledgement status.

The Acknowledgment button behavior indicates the General Alarm Status as summarized on the below table:

	**Small, grayed out Bell with Gray button border:** No active alarms present
 	**Alternating buttons:** Represents at least one unacknowledged alarm. If integrated horn is active, tapping Bell button silences the horn. Tapping Bell button also switches to Alarm Acknowledgement window, shown on next page.
	**Large Bell button:** One or more alarms are active but all alarms have been acknowledged. Tap Bell button to view Alarm Acknowledgement window for a complete list of active alarms as shown on the next page.



The above represents the list of current Alarms and Events. Conditions that have not been acknowledged are listed on the top and shown in red text. Several Bell buttons, used for acknowledgement, are shown on the left edge representing the Security Categories for the Alarms/Events. The categories, from top to bottom, are as follows:

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

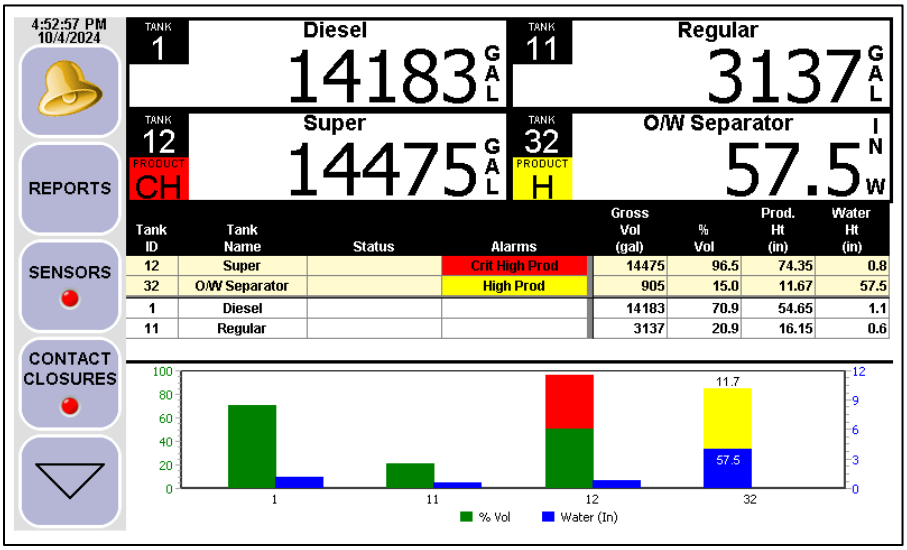
- Tank Product SetPoints
- Tank Water SetPoints
- Tank Temperature SetPoints
- Leak/Point Level Sensor Alarms
- CC Inputs

Leak Acknowledgment: The bell icon, labelled LEAK, acknowledges a Failed In-Tank Leak Test or Line Leak Test supported by the LLP203 Sensor. 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. labelled THEFT, acknowledges a theft of product from a tank. Theft is an optional feature that must be enabled through the system configuration. Details are provided in Section 2.13.

System Error Acknowledgment: The bell icon, labelled SYSTEM ERROR, acknowledges select system Events. These include Probe Timeout, Probe Sync, and Sensor Fault Errors.

1.6 LEAK/POINT LEVEL SENSOR STATUS



The common SENSORS button on the toolbar represents the collective status of ALL enabled Sensor Inputs. Note: if this button is not visible, tap the DOWN ARROW until the SENSORS button is displayed.

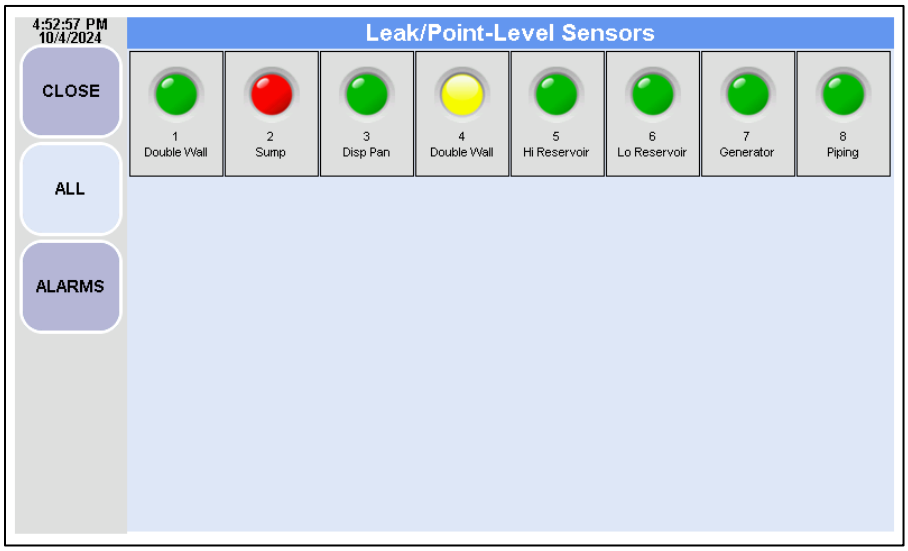
The colored indicator represents the summary status for all enabled sensors. Tap the SENSORS button to view individual Sensor Alarm Statuses. The table below represents the various summary statuses for the SENSORS button:

	Alarm/ Active	Fault/ Tamper	Normal/ Inactive	Bad/Missing Card Acquiring Data	All Sensors Disabled
SENSORS (red)	Y	?	?	?	N
SENSORS (yellow)	N	Y	?	?	N
SENSORS (green)	N	N	Y	?	N
SENSORS (gray)	N	N	N	Y	N
SENSORS	N	N	N	N	Y
? = Unknown					

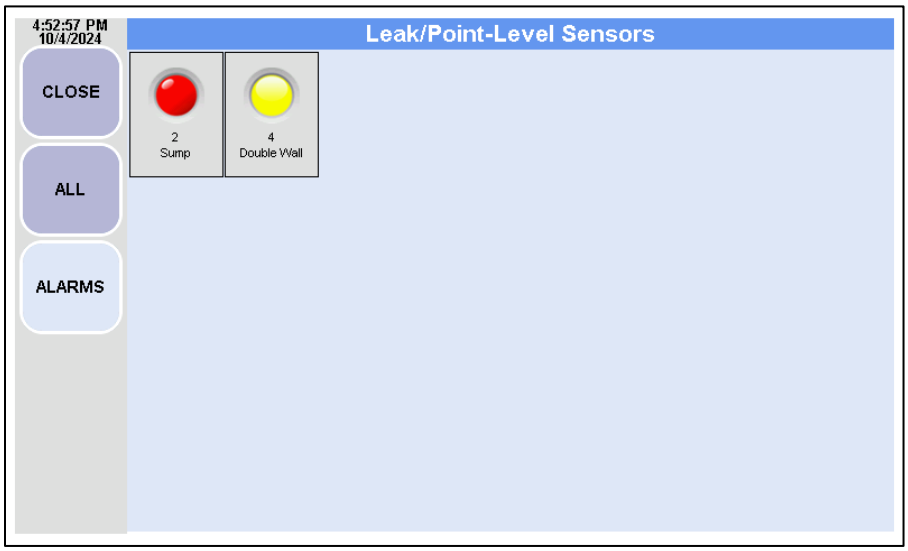
The sensor's alarm or activity status is represented graphically as illustrated below. The colors represent the following:

- Green: Normal or inactive sensor
- Red: Alarm or activity. May be a general, product, or bottom water alarm.
- Yellow: Sensor tampered with or wiring/sensor fault.
- Gray: Absent or Faulty Sensor Interface Card

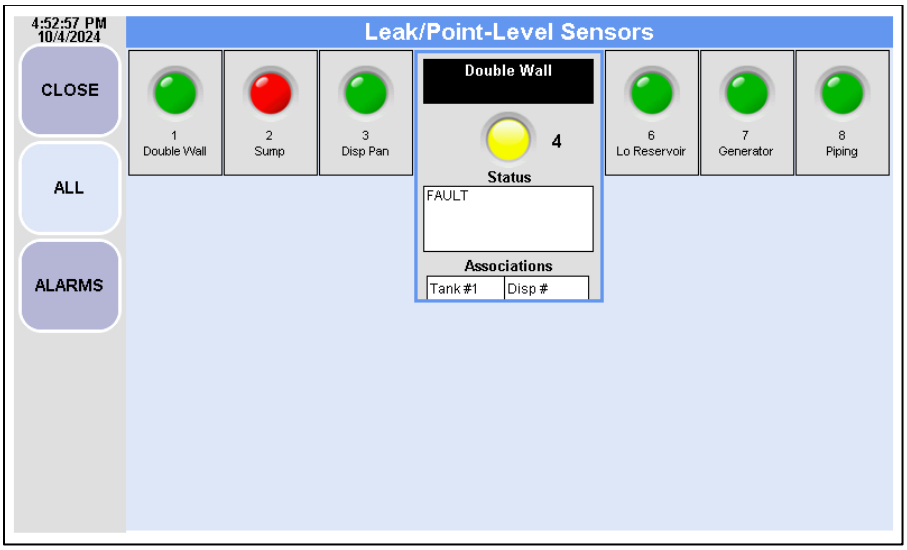
Note: Tap on individual Sensor Panel for more details.



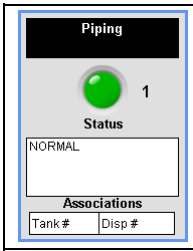
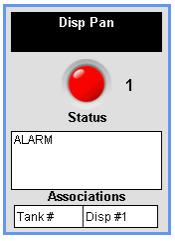
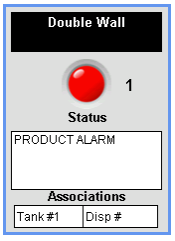
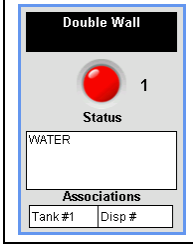
ALL button: shows the status for all enabled sensors

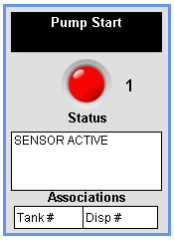
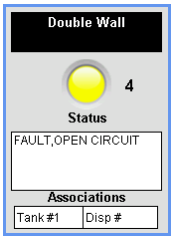
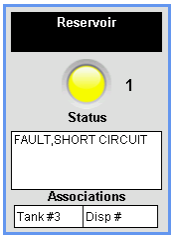
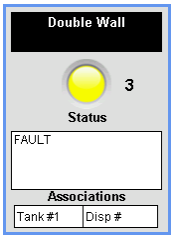
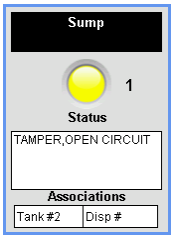
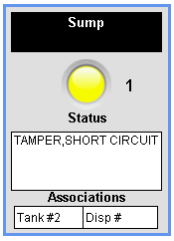
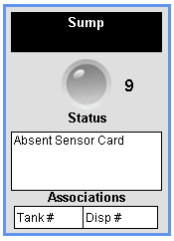


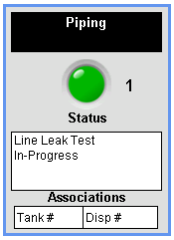
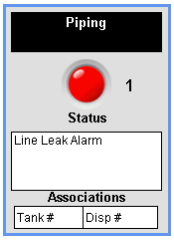
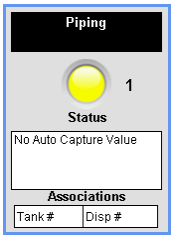
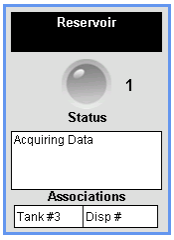
ALARMS button: shows only the sensors in an Alarm/Active, Fault, or Tamper state.



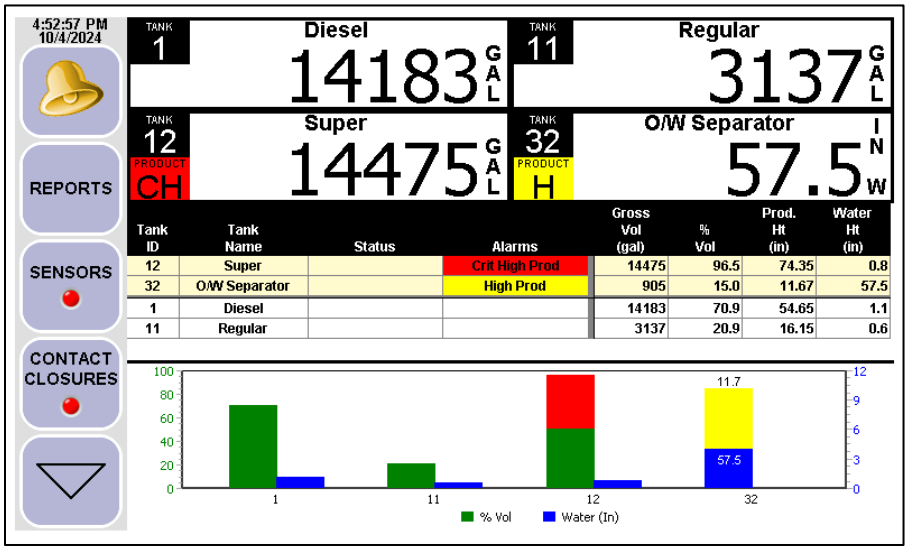
The above screen shows an example of the details available per sensor. These details include the Sensor Name, wiring position number, Status Description and color indicator, and Tank and Dispenser associations. A complete description for each individual Status is provided below.

	Normal/Inactive
	General Alarm. Generic alarm provided by all Point Level Sensors and most Leak Sensors EXCEPT the ES825-200F Discriminating Leak Sensor.
	Fuel Present Alarm. This alarm is only produced by the ES825-200F Discriminating Leak Sensor. **Note:** This **may** also be a Short Circuit Wiring Fault. See complete description on next page.
	Water Present Alarm. This alarm is only produced by the ES825-200F Discriminating Leak Sensor.

	Indicates Non-Alarm Sensor that is Active i.e. Pump Start
	Open Circuit Wiring Fault: The TMS is unable to communicate with a Sensor that includes the Fault Detection option due to a **break** in the wiring/splice and/or a faulty sensor.
	Short Circuit Wiring Fault: The TMS is unable to communicate with a Sensor that includes the Fault Detection option due to a **short-circuit** in the wiring/splice and/or a faulty sensor.
	Open Circuit Wiring Fault: The TMS is unable to communicate with a Sensor that includes the Fault Detection option due to a **break** in the wiring/splice and/or a faulty sensor. This alarm is only produced by the ES825-200F Discriminating Leak Sensor.
	Sensor Tampered with or Open Circuit Wiring Fault: The TMS is unable to communicate with a Sensor that includes the Fault Detection option due to a **break** in the wiring/splice and/or a faulty sensor.
	Sensor Tampered with or Short Circuit Wiring Fault: Confirm the Tamper-Resistant Sensor is resting at the bottom of the containment space. Otherwise, the TMS is unable to communicate with a Sensor that includes the Fault Detection option due to a **short-circuit** in the wiring/splice and/or a faulty sensor.
	The Sensor Interface Board is missing or damaged.

	A Line Leak Test utilizing the LLP203 Sensor is in progress. This is NOT an alarm.
	The Line Leak Test utilizing the LLP203 Sensor has failed. Refer to the LLP203 Instructions regarding the troubleshooting of a failed test.
	An LLP203 has been configured for a Discharge Time Capture Mode of Auto Capture. However, the Auto Capture procedure has not been completed. Refer to the LLP203 Instructions for guidance on performing the Auto Capture procedure. **Note:** This procedure MUST be performed by a factory-certified technician.
	This status would typically only appear on power up before the sensor status has been acquired. This will clear as soon as a Sensor Status is obtained.

1.7 CC INPUT STATUS



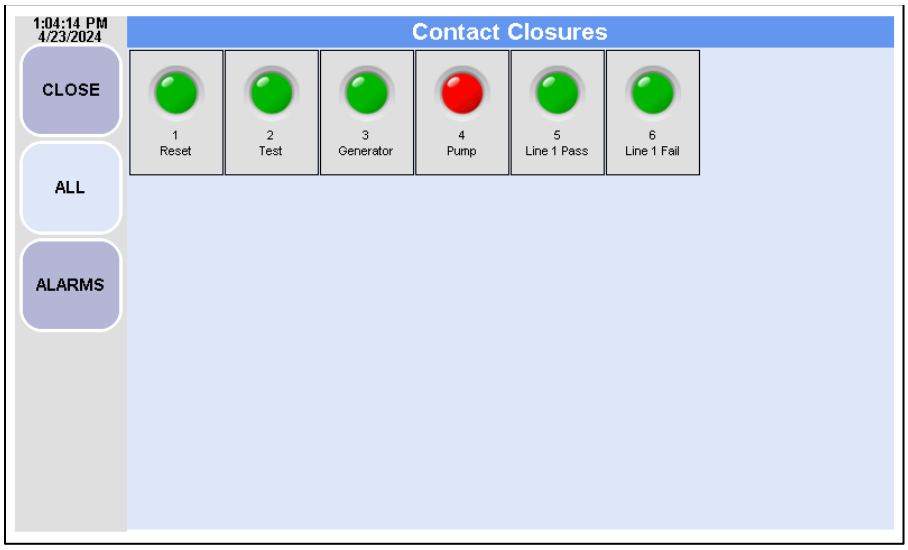
The common CONTACT CLOSURES button on the toolbar represents the collective status of ALL enabled CC Inputs. Note: if this button is not visible, tap the DOWN ARROW until the CONTACT CLOSURES button is displayed.

The colored indicator represents the summary status for all enabled CC Inputs. Tap the CONTACT CLOSURES button to view individual CC Input Statuses. The table below represents the various summary statuses for the CONTACT CLOSURES button:

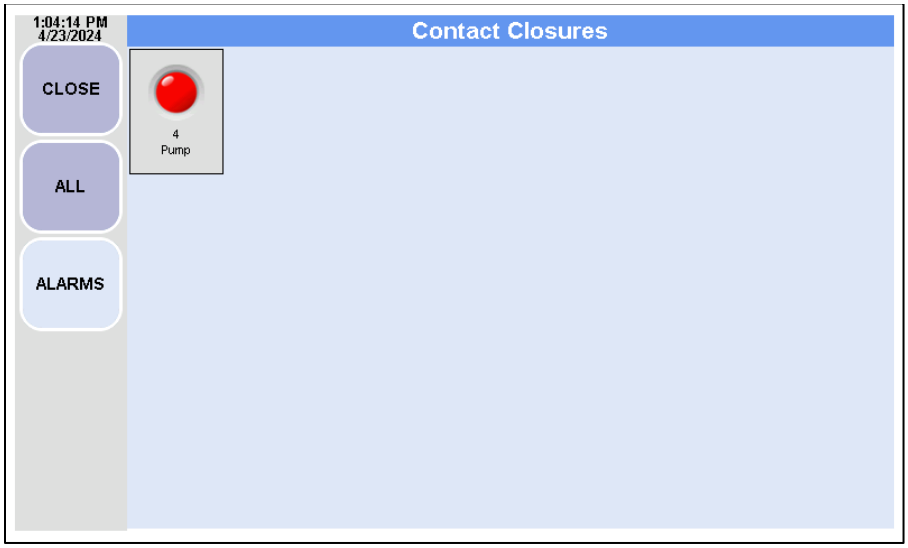
	Alarm/ Active	Normal/ Inactive	Bad/Missing Card	ALL CC Inputs Disabled
CONTACT CLOSURES	Y	?	?	N
CONTACT CLOSURES	N	Y	?	N
CONTACT CLOSURES	N	N	Y	N
CONTACT CLOSURES	N	N	N	Y

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

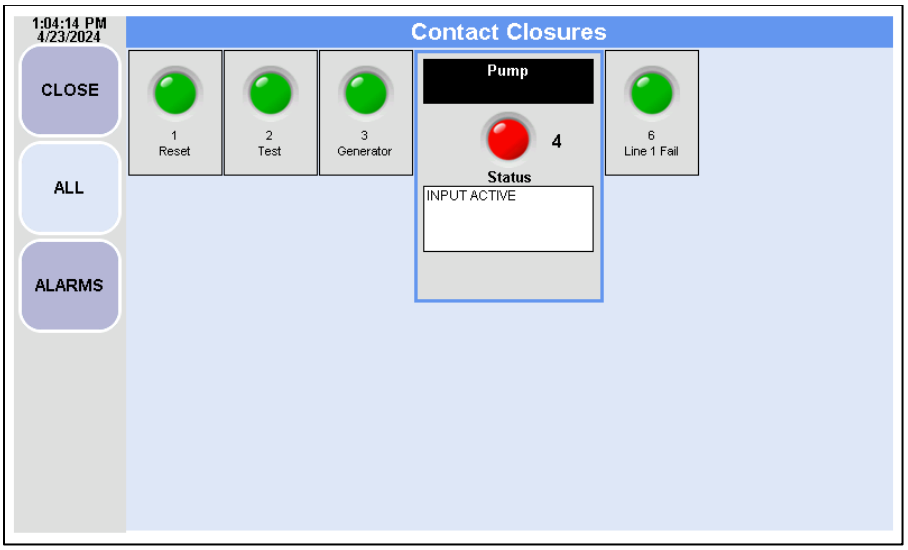
- Green: Normal or inactive sensor
- Red: CC Input in an alarm or active state.
- Gray: Absent or Faulty I/O Card



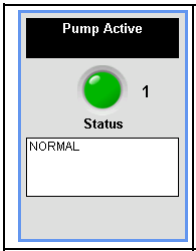
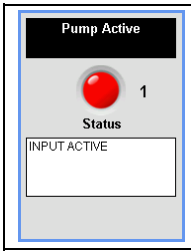
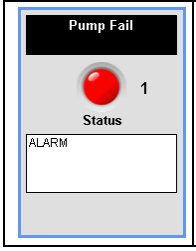
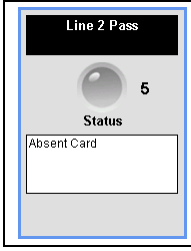
All view: shows the status for all enabled CC Inputs



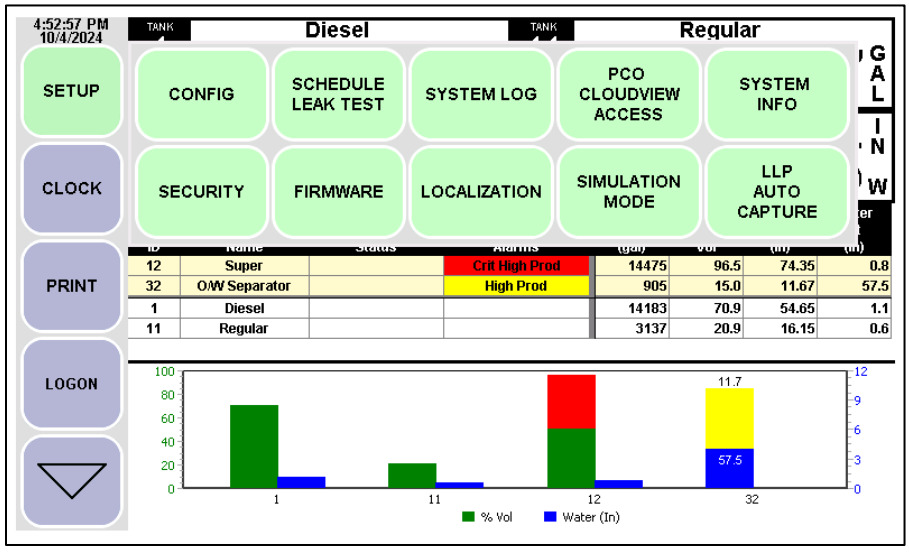
Alarms view: shows only the CC Inputs in an alarm or active state.



The above screen shows an example of the details available per CC Input. These details include the Input Name, wiring position number, Status Description and color indicator. A complete description for each individual Status is provided below.

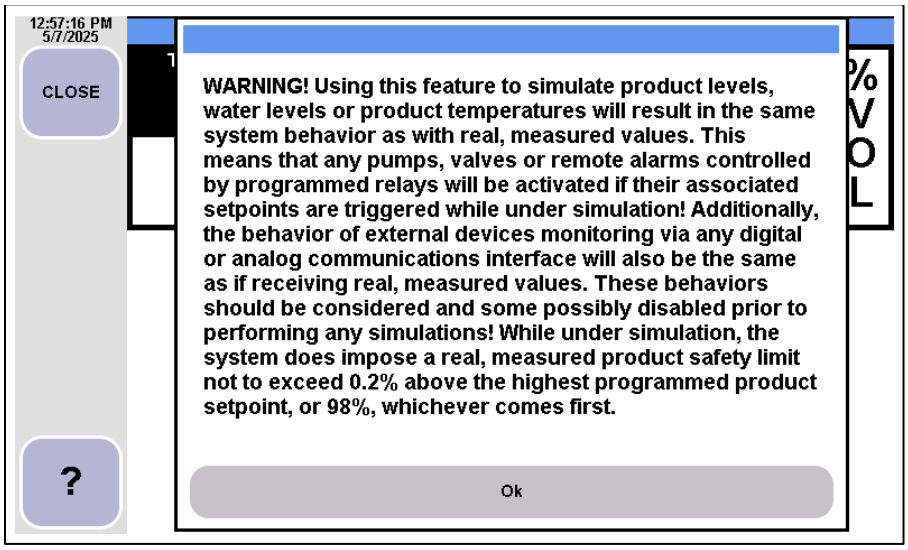
	Normal/Inactive		Indicates Non-Alarm Input that is Active i.e. Pump/Generator Active
	Alarm		The Relay Card is missing or damaged.

1.8 SIMULATION MODE

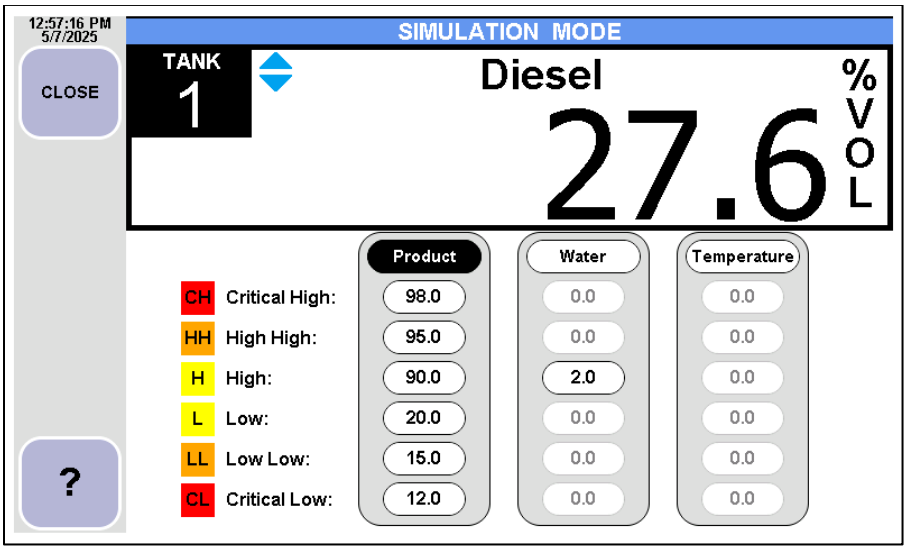


Tap SETUP then SIMULATION MODE.

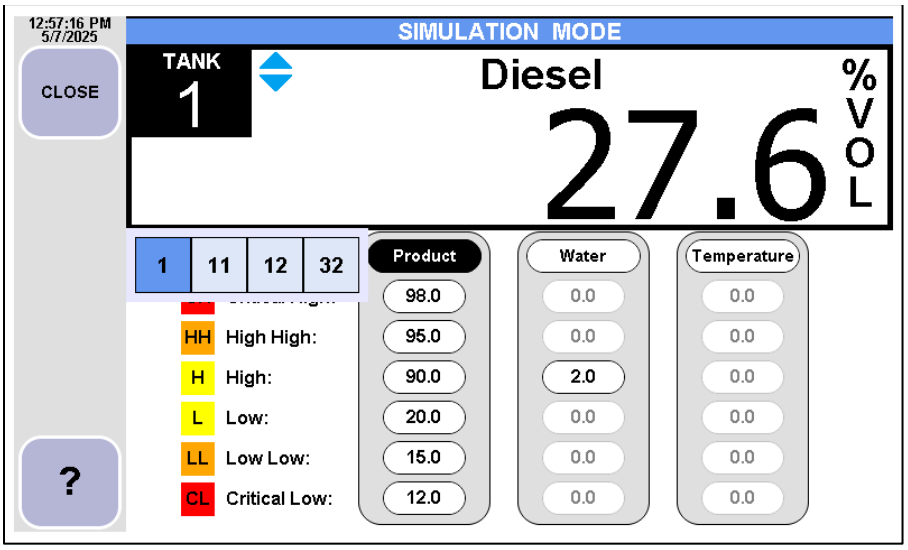
Note: Tap the DOWN ARROW button if the SETUP button is not visible.



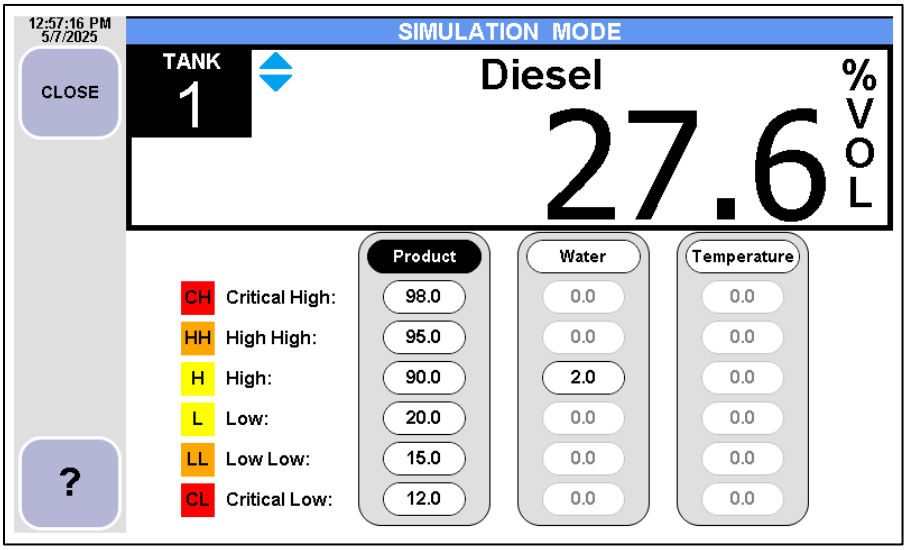
Acknowledge the above **WARNING** to proceed with testing SetPoint thresholds. As a safety feature, SetPoint Test Mode is DISABLED for any tank with a current Percent Volume over the highest configured Product SetPoint + 0.2% or 98%, whichever is lower.



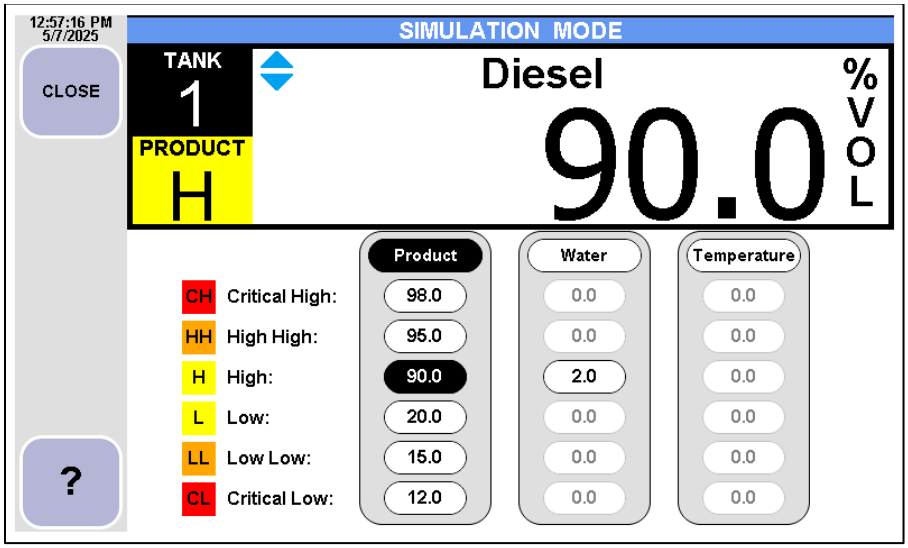
Tap on Tank ID Number to view Grid of available Tanks



Select the Tank from the grid representing the Tank to Simulate SetPoint conditions



Select the SetPoint category by tapping Product, Water, or Temperature
Note: By tapping on a SetPoint value, the category is automatically selected.

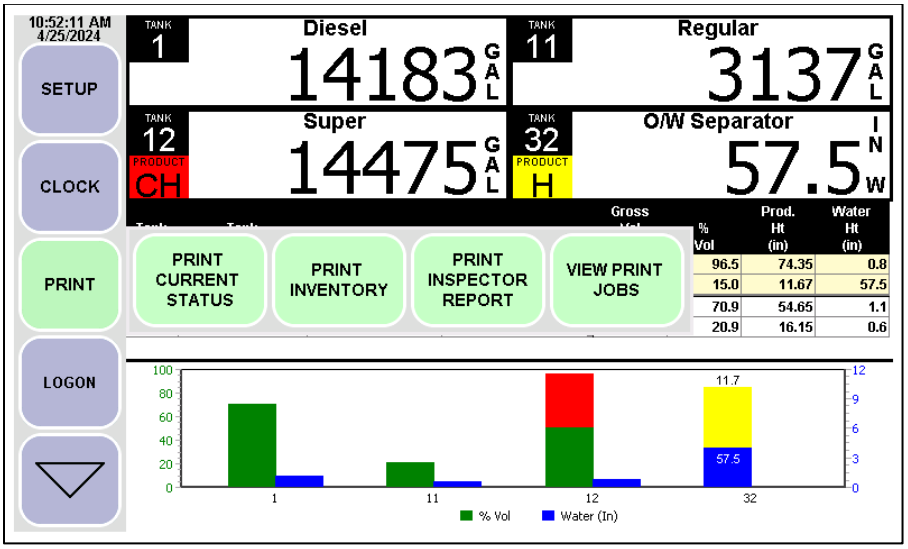


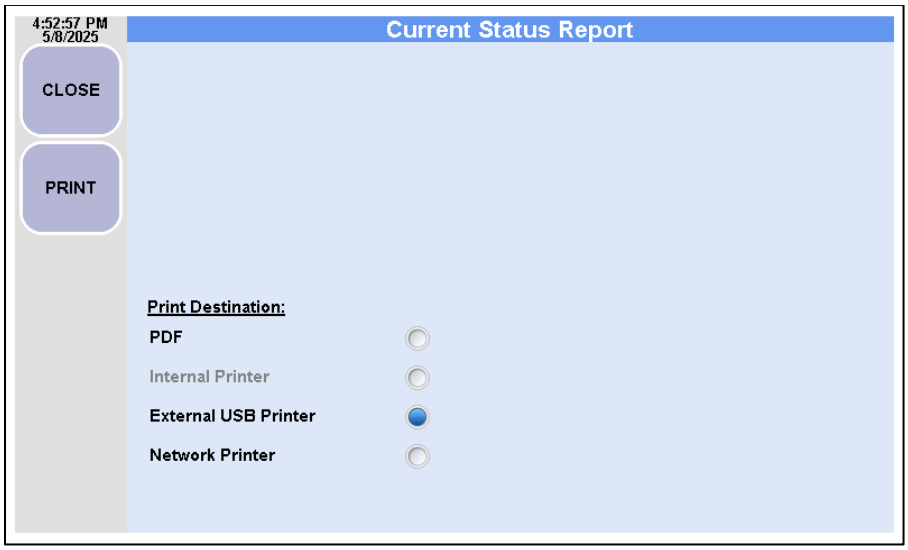
Tap on the SetPoint value to be simulated. Tap on value again to end simulation.
Note: The above screen shows that the High Product SetPoint has been selected

1.9 PRINTING

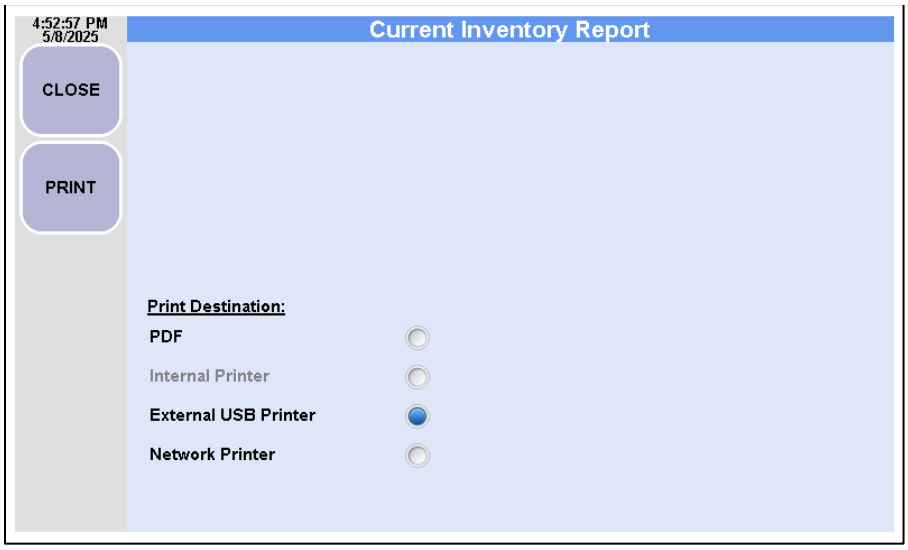
Select Reports containing current details are accessible via the PRINT button. Each report may be generated as a PDF on a USB Flash Drive or as a hardcopy on either the optional external USB printer or network accessible printer. The below screen capture displays the options for the Print button accessible on the Main Screen as follows:

- Print Current Status: Current Alarm Status report including tanks/probes and leak/point level sensors
- Print Inventory: Current Inventory report, including all Tank Alarms and Statuses, reflecting the information shown on the TMS4000M. For historical Inventory records, tap the Reports button, then Inventory, then Print button. See Section 3.2 for details.
- Print Inspector Report: A customizable report that includes the Current Status and optionally the Current Inventory and Leak Test Results.
- View Print Jobs: View the printer queue showing pending or active print jobs.

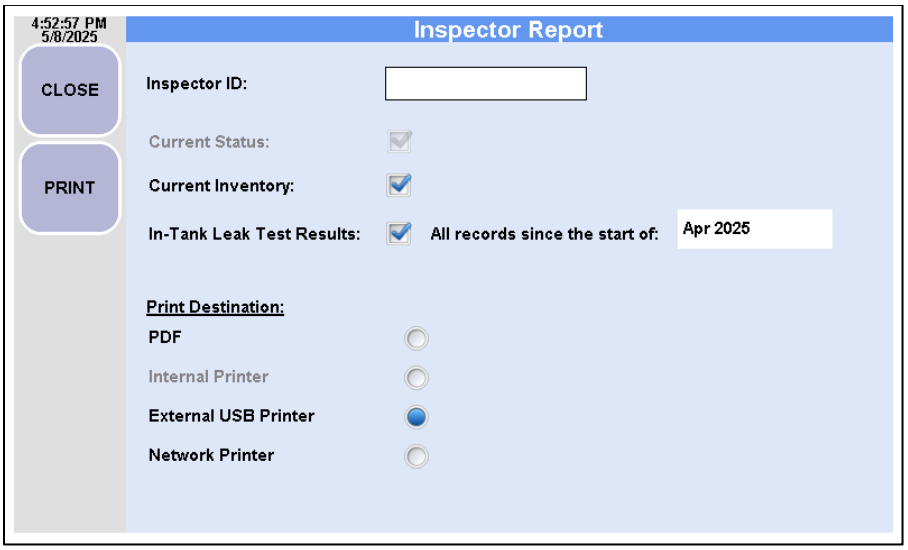




Current Status Report: Select PDF or specific Printer, then tap PRINT

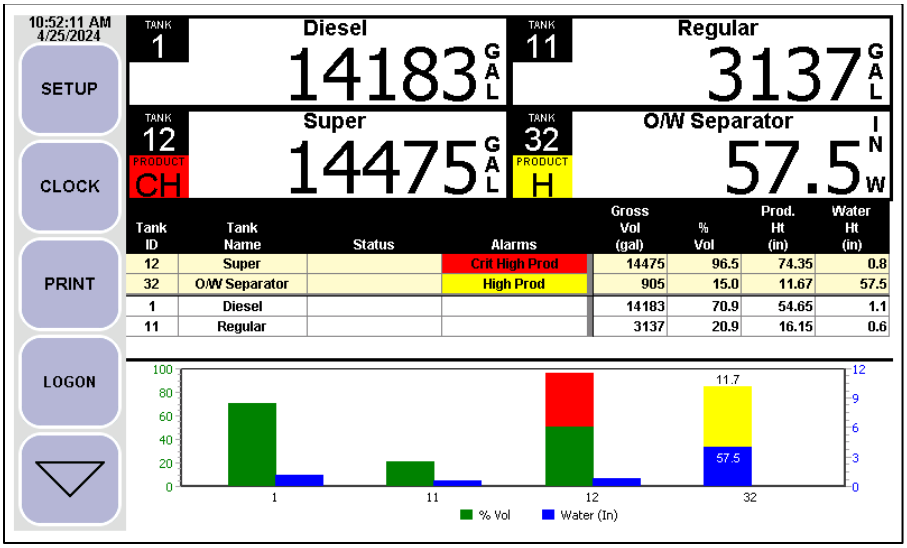


Current Inventory Report: Select PDF or specific Printer, then tap PRINT



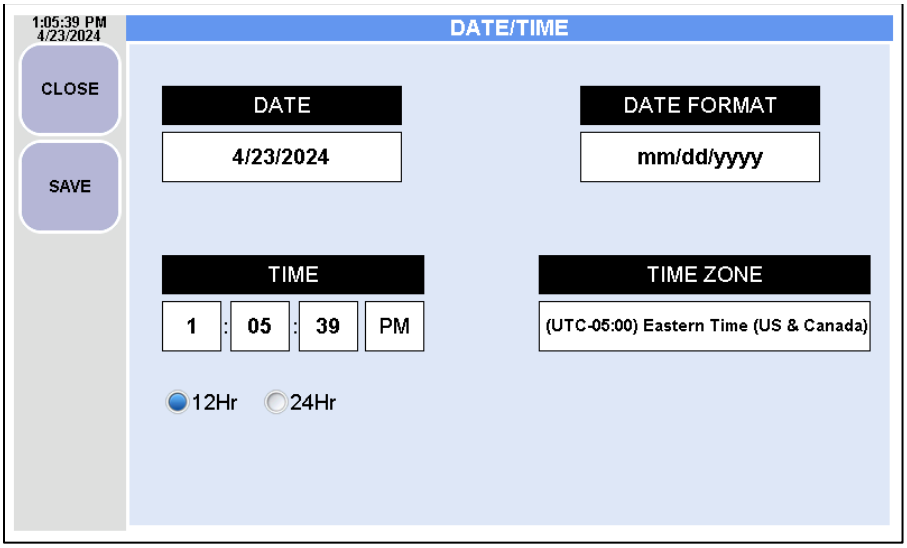
The Inspector Report may be customized by removing the Current Inventory and/or In-Tank Leak Test Results. The date range for the In-Tank Leak Test Results may also be customized with the default representing all results within the last month. Once the customizations have been completed, select PDF or specific Printer, then tap PRINT.

1.10 SYSTEM CLOCK



Tap CLOCK.

Note: Tap the DOWN ARROW button if the CLOCK button is not visible.

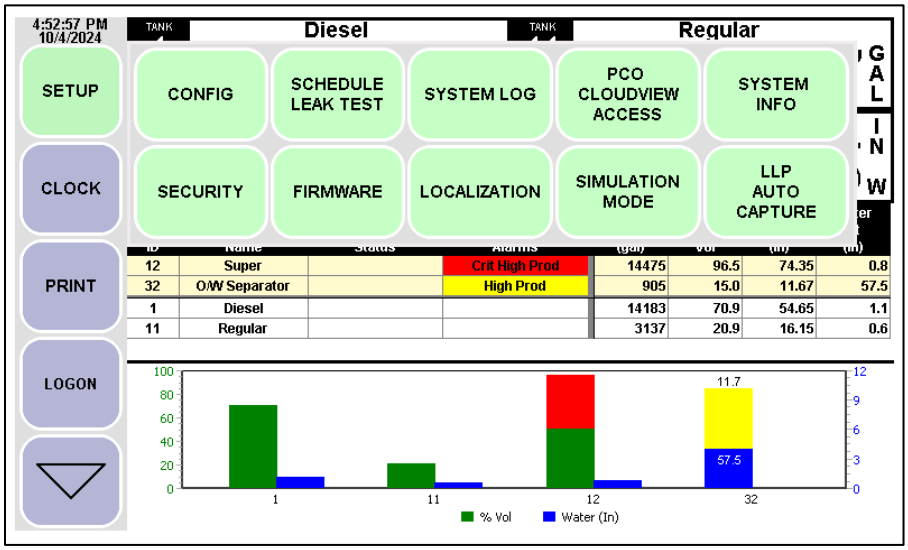


Once the changes have been completed, tap SAVE to save changes.

Note: Time Zone determines Daylight Savings Time rules.

1.11 SECURITY

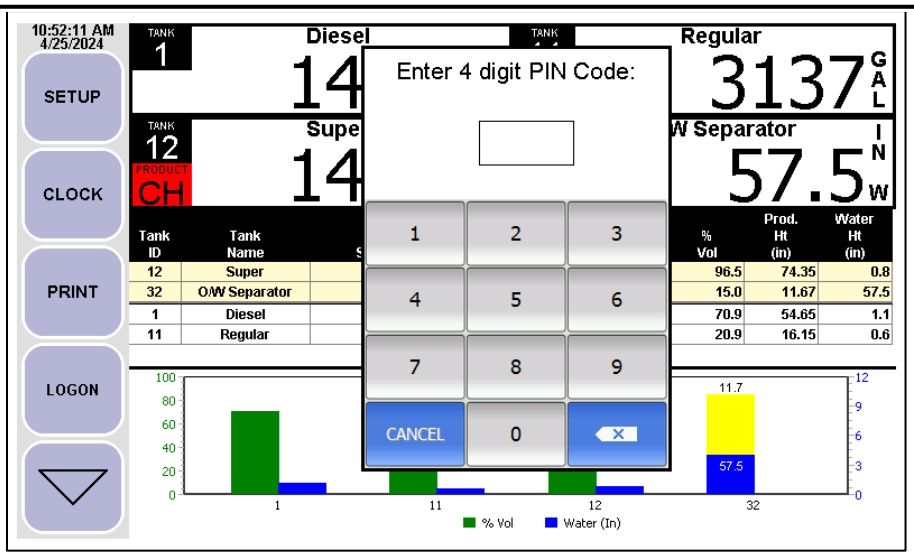
The TMS4000M can be configured to restrict access to specific information and/or functions. If this is desired, an Administrator account must first be created that has access to everything including the ability to create and modify additional user accounts with varying degrees of permission.



Tap SETUP then SECURITY.

Note: Tap the DOWN ARROW button if the SETUP button is not visible.

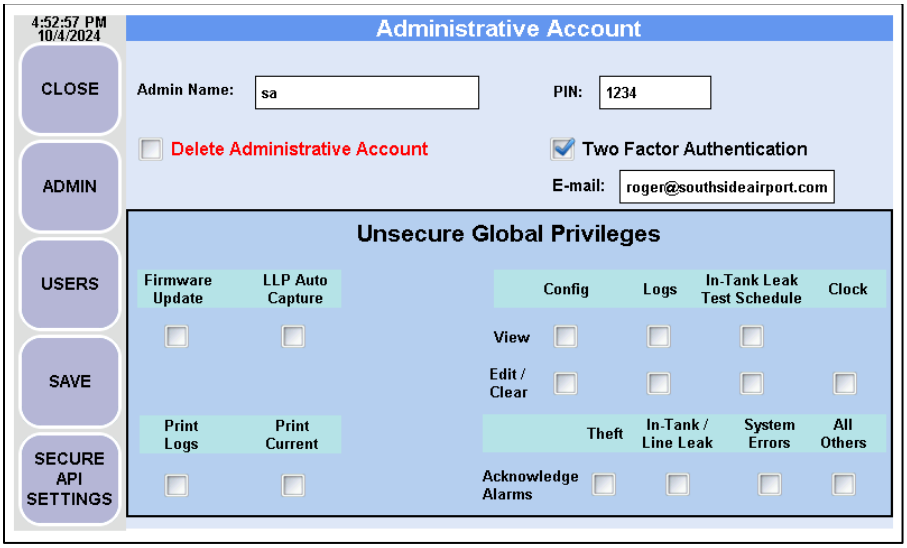
Note: Logon button is only visible when Security has been enabled.



If Security is enabled, tap LOGON, then enter PIN to manually sign in.

Note: When attempting to access a secured feature, the PIN Prompt automatically appears.

ADMIN



To Enable Security, enter the Admin Name and 4-digit numeric PIN for the Administrative Account. The Admin Name is commonly set as “sa”, for System Administrator, but may be any name of your choosing. The Admin may define Global Privileges for which security is not required.

To Remove Security, tap on the checkbox for “Delete Administrative Account”, then tap SAVE to save the changes. The ADMIN and ALL USER ACCOUNTS will be deleted.

Two Factor Authentication (2FA) may be enabled if the TMS is internet accessible and the optional Remote GUI software is being used to connect to the TMS over a network. Primary access is granted by entering the User Name and 4-digit PIN Number. With 2FA enabled, an email will be sent to the provided address containing a code that must be entered in the Remote GUI before TMS access is granted.

If User Accounts are desired, tap the USERS button and proceed to the instructions on the next page. Otherwise, tap SAVE to save the changes to the TMS.

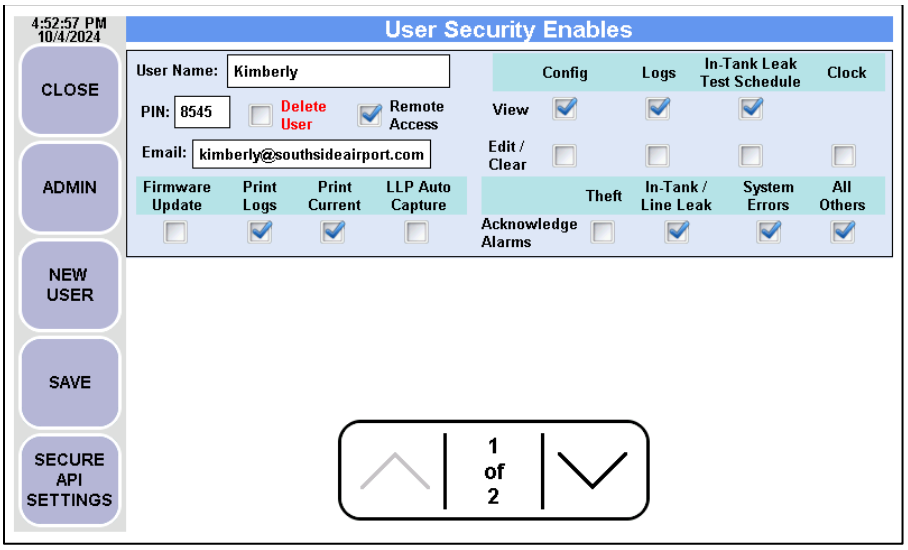
Secure API Settings provides access to configuring the Rest API Protocol.

Note: The User Name is not used to sign into the TMS via the touchscreen but is recorded in the System Log to document the user responsible for taking certain actions such as changing configuration or upgrading firmware.

Administrator Access Note: Only the Administrator may access select settings including:

- Security: includes Viewing/Modifying/Deleting Security Accounts
- Localization: changing system language or units of measure
- PCO CloudView: Registering the TMS with PCO CloudView account

USERS



Each user must have a unique User Name and unique 4-digit numeric PIN number assigned. Individual users may be deleted by checking the Delete User checkbox and saving the changes. An email address is only required if using 2FA with the Remote GUI software over a network.

Note: The User Name is not used to sign into the TMS via the touchscreen but is recorded in the System Log to document the user responsible for taking certain actions such as changing configuration or upgrading firmware.

TMS access may be granted to the following functions:

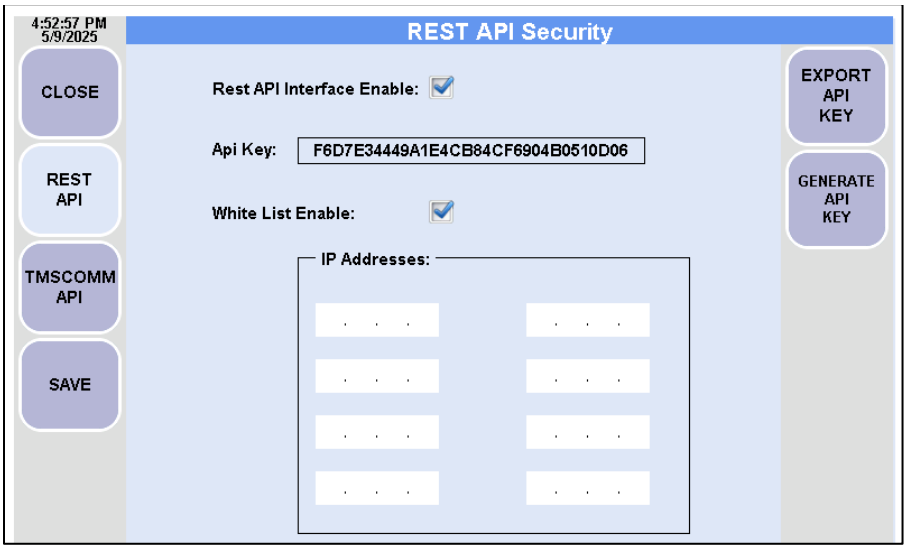
- Acknowledge Alarms:
  - All Others: Includes Tank SetPoints for Product, Water, and Temperature, CC Input and Sensor Alarms.
  - In-Tank Leak: Failed In-Tank Leak Test
  - System Errors: Include Probe Timeout, Probe Sync, and Sensor Fault
  - Theft: Any detected theft
- Clock (Edit Only): Changing the Date and Time
- Config: Individual restrictions are as follows:
  - View: on TMS display
  - Edit/Clear: making changes to or erasing the system configuration
- Firmware Update: Firmware Updates may be performed using a USB flash drive. Restrictions may be placed on performing any change to the system firmware
- In-Tank Leak Test Schedule: Individual restrictions are as follows:
  - View: on TMS display
  - Edit: making changes to the Leak Test Schedule
- LLP Auto Capture
- Logs (Reports): Individual restrictions are as follows:
  - Print: using printer connected to TMS
  - View: on TMS display
  - Clear: Erasing Logs/Reports
- Print Current: Generate all printouts accessed from Print button on Main Screen.
- Print Logs (Reports): Generate a printout from within any Report window.

SECURE API SETTINGS

The TMS4000M supports Rest API protocol over a Network Interface. Communications security is provided by a Key that must be present on both the TMS and any device communicating with the TMS.

To implement Rest API protocol, the TMS must first have Security enabled. Tap on the Secure API Settings button to access the screens needed to configure these options.

REST API



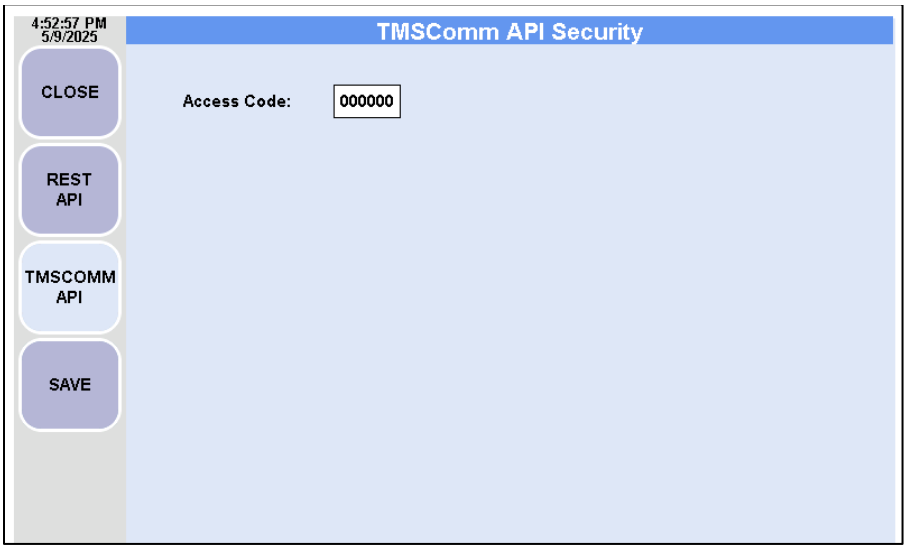
Rest API is an industry standard network protocol, secured by an API Key generated by the TMS4000M, and subsequently exported to a Rest API Server. First, check the Rest API Interface Enable checkbox. An API Key is automatically generated. If a new key is desired, tap the Generate API Key button. Changing the Key on a regular basis helps to maintain the overall security of the link. Any time a new key is generated, be sure to Export the new Key onto a USB Flash Drive by tapping the Export API Key button. This key will be needed on any device that will be communicating with the TMS.

The optional White List provides limits to which IP addresses the TMS will respond to, thereby providing additional security. Check the White List Enable checkbox and enter up to eight IP Addresses. Any requests coming from a device not on the White List will be ignored.

Refer to the separate Rest API documentation for complete details.

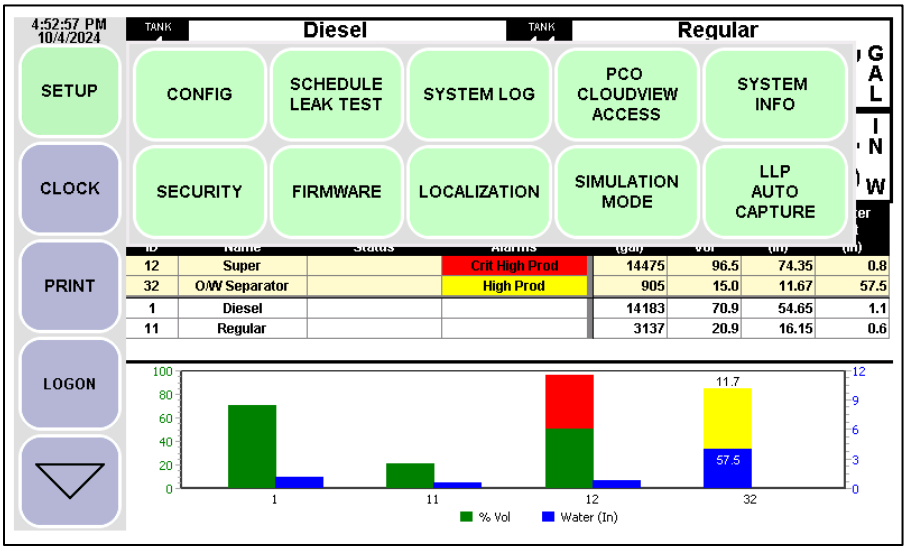
TCP Port Number Used: 443

TMSCOMM API



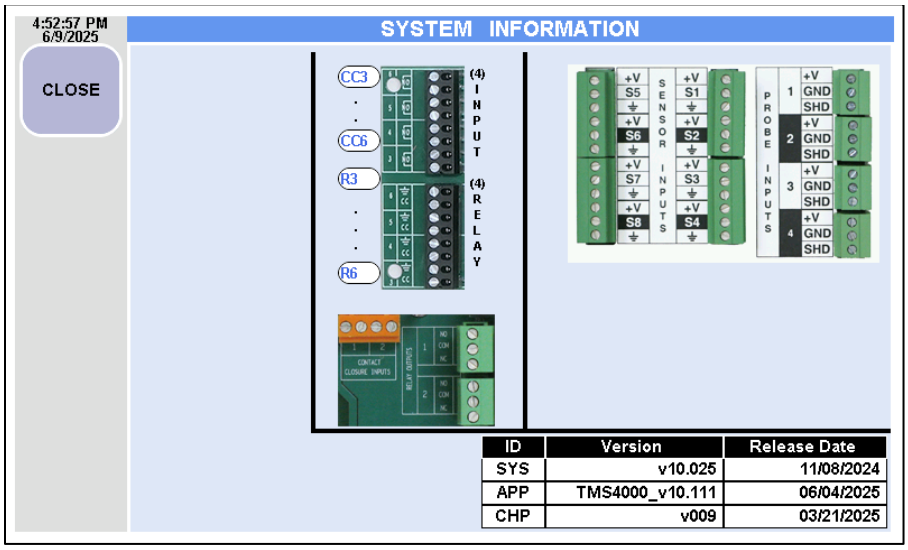
Access Code: The Access Code is used as a command prefix when Security is enabled for select Communications interfaces including: Serial (RS-232 or RS-485), Network, and Modem. Security may be enabled for individual interfaces and is not a global setting. See Section 2.15 regarding enabling Security for select communications interfaces.

1.12 SYSTEM INFO



Tap SETUP then SYSTEM INFO.

Note: Tap the DOWN ARROW button if the SETUP button is not visible.

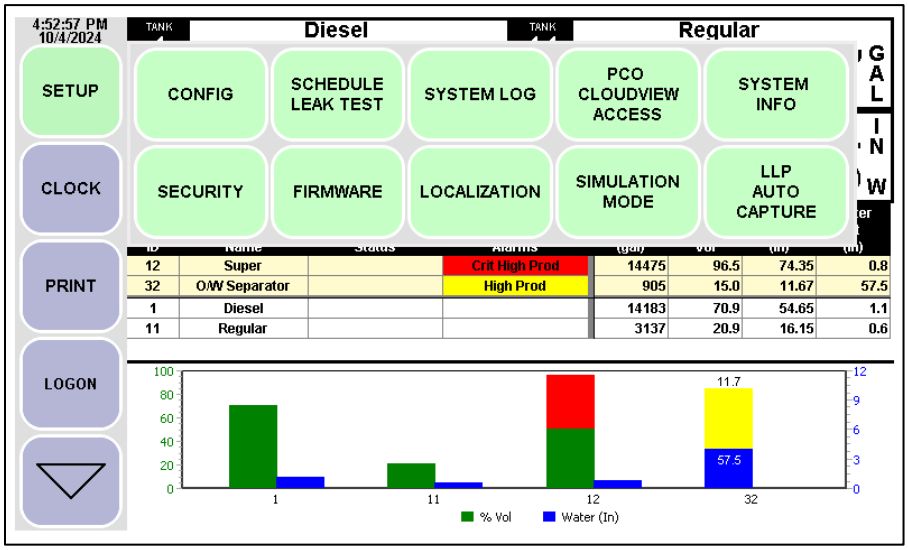


Represents the Intrinsically Safe Inputs, integrated I/O, and Optional I/O installed. Also lists the Versions of various aspects of the TMS.

Note: APP represents the firmware version of the TMS and may be upgraded as explained beginning on the next page. SYS and CHP may be updated with a file from Pneumercator on a USB Flash Drive. Select features may require a minimum SYS and/or CHP version.

1.13 FIRMWARE

The Firmware screen provides access to upgrading the Firmware (APP), OS (SYS), and Services Module (CHP) in the TMS4000M. These files are typically provided by Pneumercator and must be copied to a USB Flash Drive that is inserted into the USB Port of the TMS4000M. These files may also be downloaded from CloudView.



Tap SETUP then FIRMWARE.

Note: Tap the DOWN ARROW button if the SETUP button is not visible.

It is recommended to update TMS Firmware (APP) first, then OS (SYS), and lastly Services Module (CHP). See the next page for instructions on updating the OS (SYS) and Services Module (CHP) after completing the upgrade of TMS Firmware.

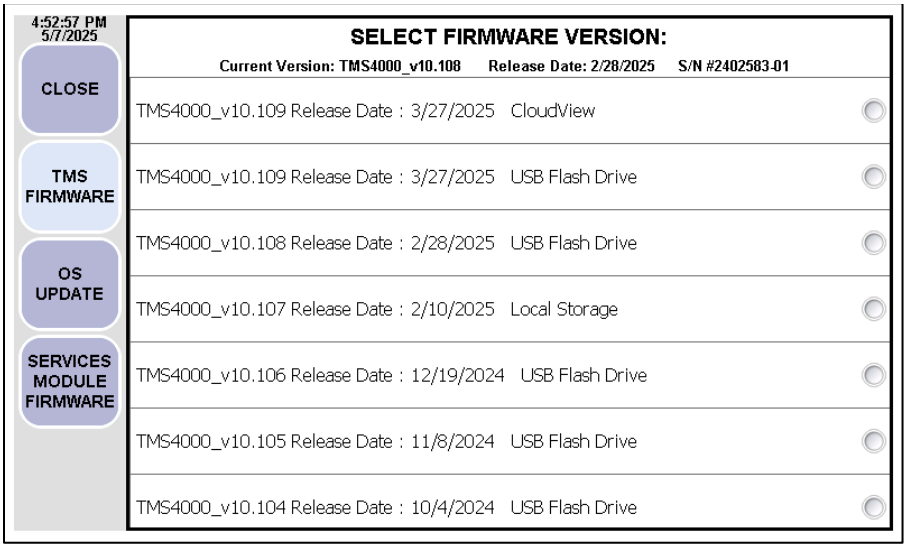
USB Note: See Section 1.1.1 for location of USB Port.

Note: Unless otherwise instructed by Pneumercator, it is advised to install the latest update at the top of the list.

The below TMS Firmware screen and OS and Services Module screens on the next page show the currently installed version and Release Date across the top. The TMS Serial Number is shown to the right of the release date. This Serial Number typically matches the Serial Number found on the outside of the TMS on the left-hand side, handwritten on the silver UL Label.

A list of available versions is displayed below the Header with the most recent shown at the top. The Version Number, Release Date, and file source of the update are provided on each line. The file sources may include:

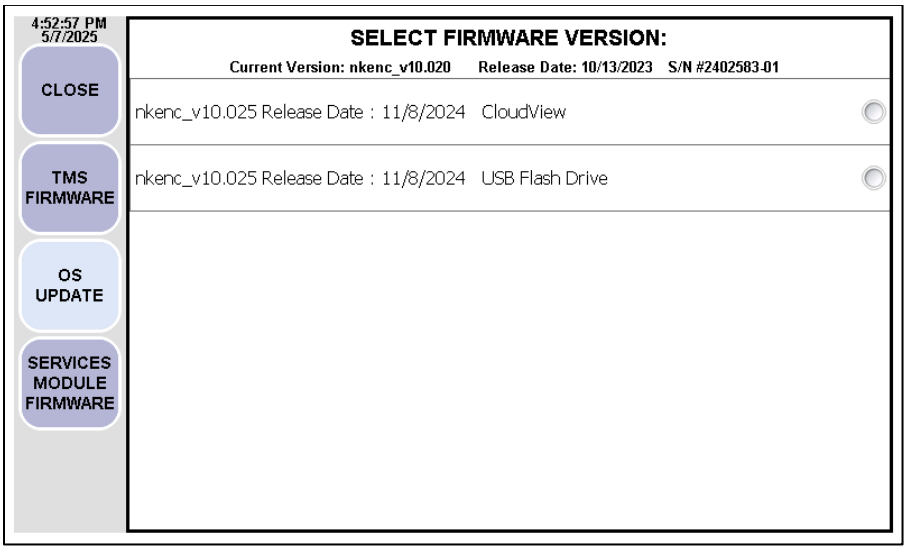
- CloudView: Only shown on TMS systems that are registered to PCO CloudView.
- Local Storage: The previous version of firmware installed in the TMS.
- USB Flash Drive: A file copied to a USB Flash Drive installed in the TMS.



TMS Firmware (APP)

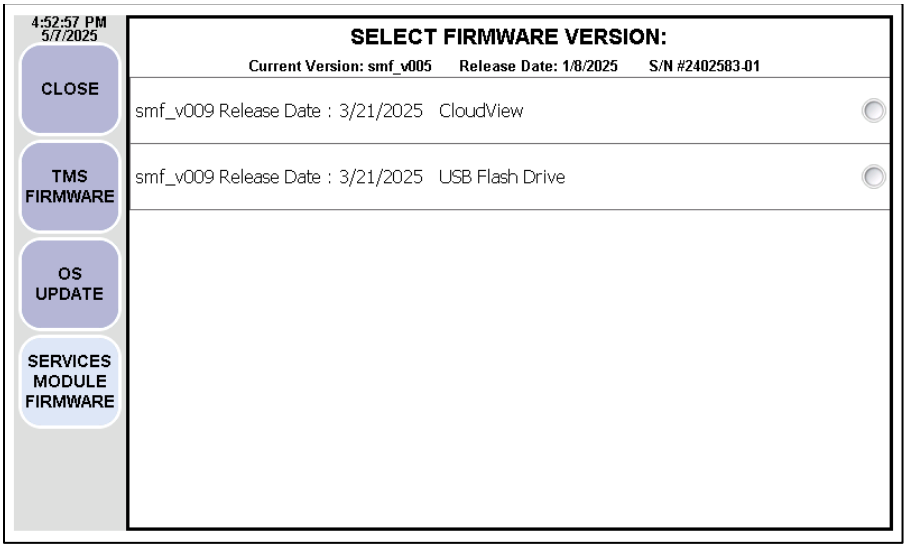
Note: An Install/Upgrade button may be displayed once a selection has been made. If so, tap on the Install/Upgrade button to begin the installation of the upgrade. This button has been eliminated in newer firmware releases.

Restart Note: Note that the TMS will automatically restart one time after upgrading the TMS Firmware.



OS (SYS)

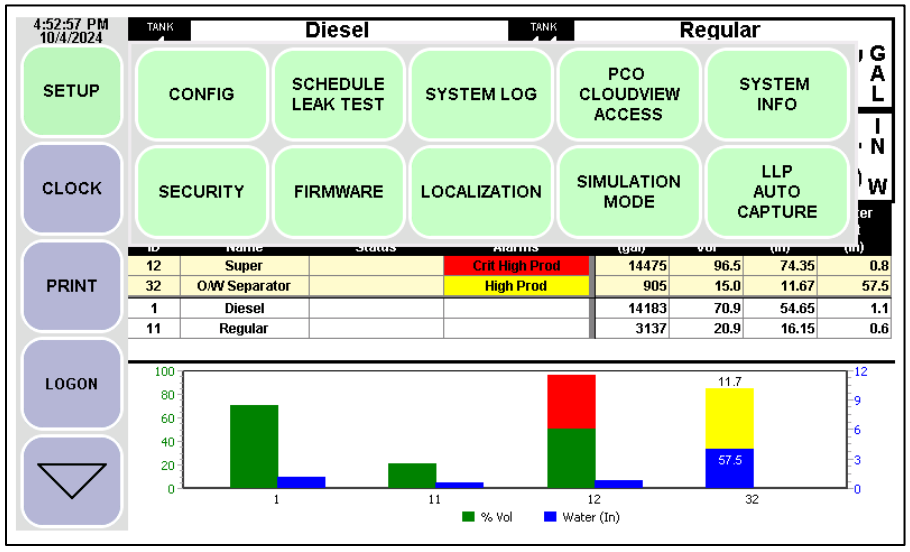
Restart Note: Note that the TMS will automatically restart TWICE after upgrading the TMS Firmware.



Services Module (CHP)

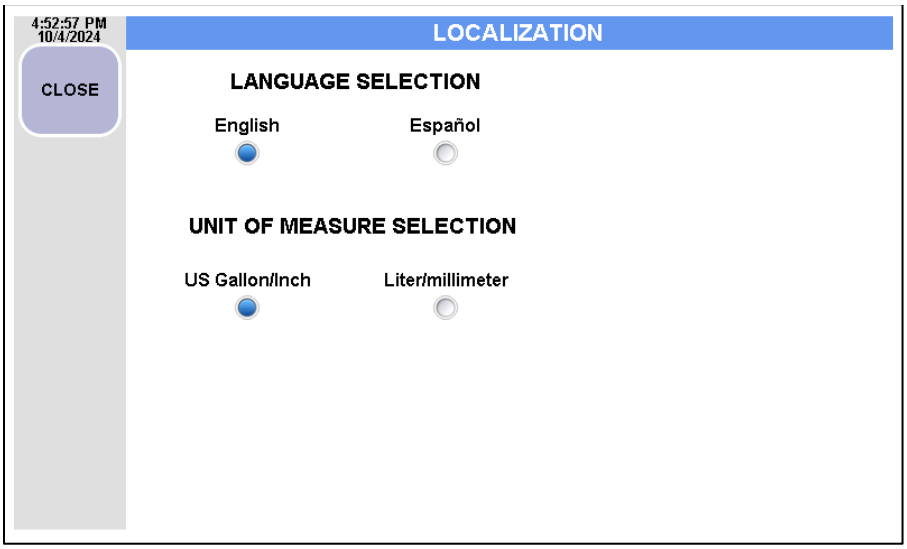
Restart Note: The TMS will NOT automatically restart. It is recommended to either recycle the TMS power or to resave the TMS configuration so the TMS will restart and implement the new Services Module Firmware.

1.14 LOCALIZATION



Tap SETUP then LOCALIZATION.

Note: Tap the DOWN ARROW button if the SETUP button is not visible.

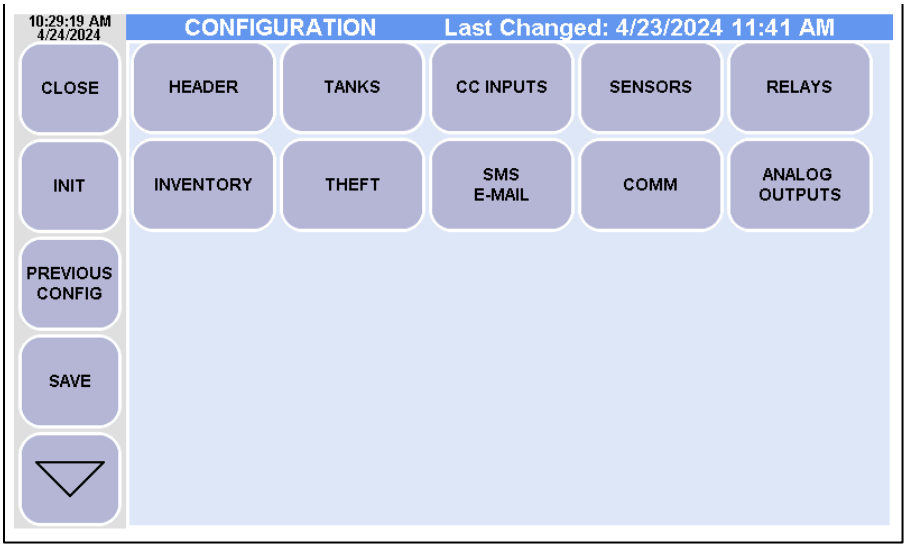


Choose between English and Spanish languages and US versus Metric units of measure

Note: The above selection for Units of Measure represents the Primary Units of Measure for the TMS and are represented on all configuration screens, reports, and tabular data on the main screen. The Meters on the main screen may be configured to convert from the primary Units of Measure, selected above, to the secondary Units of Measure, not selected above, for applications where the site personnel require access to both US and Metric Units of Measurement.

SECTION 2 – SYSTEM CONFIGURATION

2.1 OVERVIEW



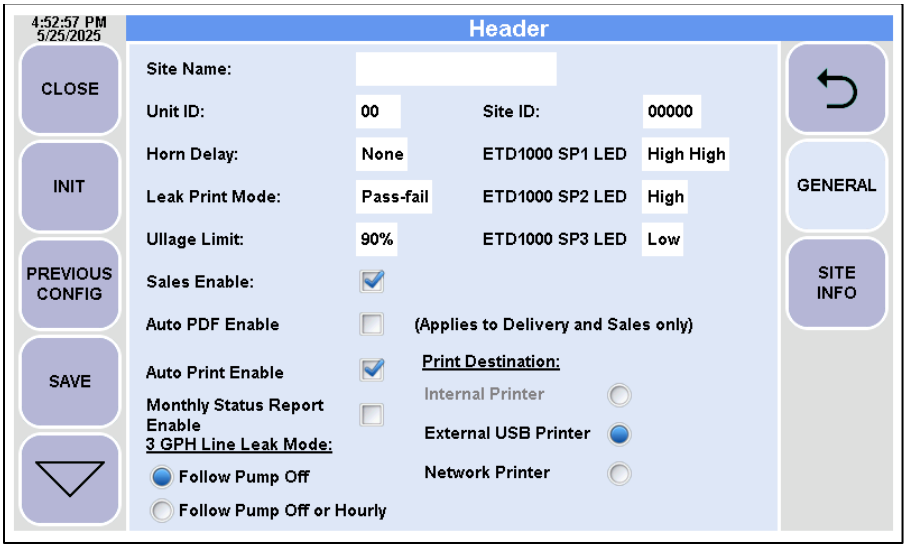
The Config menu is divided into categories of configuration settings. A brief description of each category is listed below. Additional details immediately follow this section.

- **Analog Outputs:** Option card representing numeric tank data, typically using 4-20mA.
- **CC Inputs:** Optional Contact Closure Inputs located on select Relay I/O Cards
- **Comm:** Communications settings including Serial, Network, and Modem
- **Header:** Global settings affecting system operation as a whole
- **Inventory:** Schedule of inventory snapshots, disabled by default
- **Relays:** Optional Relay outputs. Settings include condition triggers and behavior
- **Sensors:** Leak/Point Level Sensors
- **SMS/E-mail:** Define recipients and conditions generating SMS/E-mail
- **Tanks:** Tank/Probe settings including geometry, SetPoints, and In-Tank Leak Test
- **Theft:** Hours of operation for the facility, disabled by default

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. If the TMS is registered to PCO CloudView, the last three versions of the configuration file will be available.
- **Init:** Initializes the system configuration to the factory default settings.
- **Export (Formerly labelled COPY):** When a flash drive is inserted, 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.

2.2 HEADER



Tap on the GENERAL button on the right toolbar to access the above settings.
Note: GENERAL is selected by default when HEADER is tapped.

3 GPH Line Leak Mode: Select the mode of operation for ALL LLP203 Line Leak Sensors connected to this TMS. Choices are as follows:

- **Follow Pump Off:** Performs a Line Leak Test every time the pump powers off after running for at least 30 seconds. Requires a CC Input, enabled as RELAY, to monitor pump activity. See Section 2.10 for details on configuring the LLP203.
- **Follow Pump Off or Hourly:** In addition to the FOLLOW PUMP OFF setting described above, the TMS will perform a Line Leak Test Hourly. To accomplish this, the TMS needs to be able to control the pump. The TMS requires a Relay Output connected to the pump controller to provide the required hook signal.

Auto PDF Enable: When enabled, the TMS will export a PDF Receipt for a Delivery or Bulk Sale when a USB Flash Drive is installed.

Auto Print Enable: When enabled, the TMS will automatically generate a printout on the selected printer for transactions (deliveries, sales, etc.), leak test results, alarms, events, and scheduled inventory snapshots.

ETD1000 LED Settings: A set of global settings that specify which of the 6 Product SetPoints from the TMS correspond to which of the 3 Product SetPoint LEDs (SP1, SP2, SP3) on the ETD1000

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)

Monthly Status Report: When enabled, the TMS will generate a Monthly Status Report that is saved as a PDF. If Auto Printing is enabled, an immediate printout is also generated.

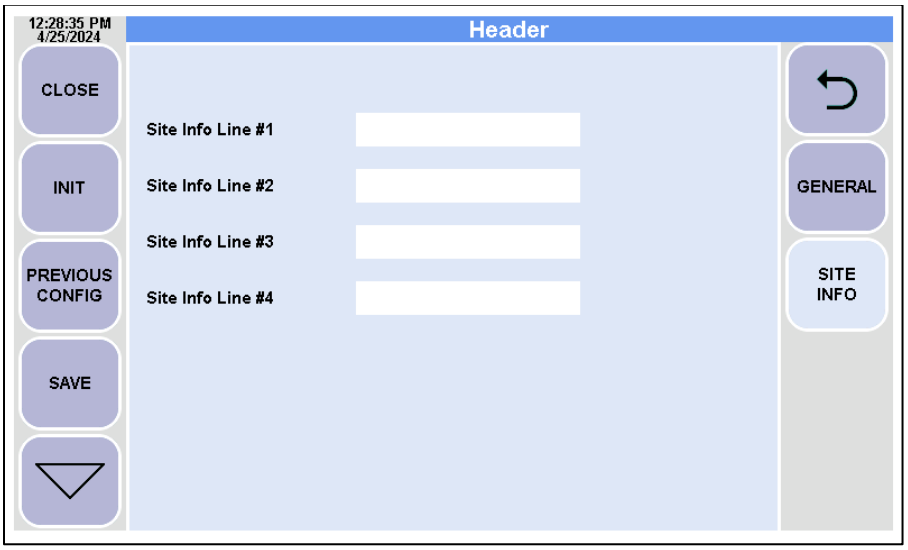
Sales Enable: Enables Bulk Sales Tracking and records data in the Sales Log. Not used for applications where simultaneous transactions can occur. Also used to provide Usage data for Generators when Generator Tank Mode is enabled in Tanks > General. See Section 2.3 for details.

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.

Site Name: Printed on system generated reports and is used as a prefix for all files exported to a USB Flash Drive from the TMS.

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

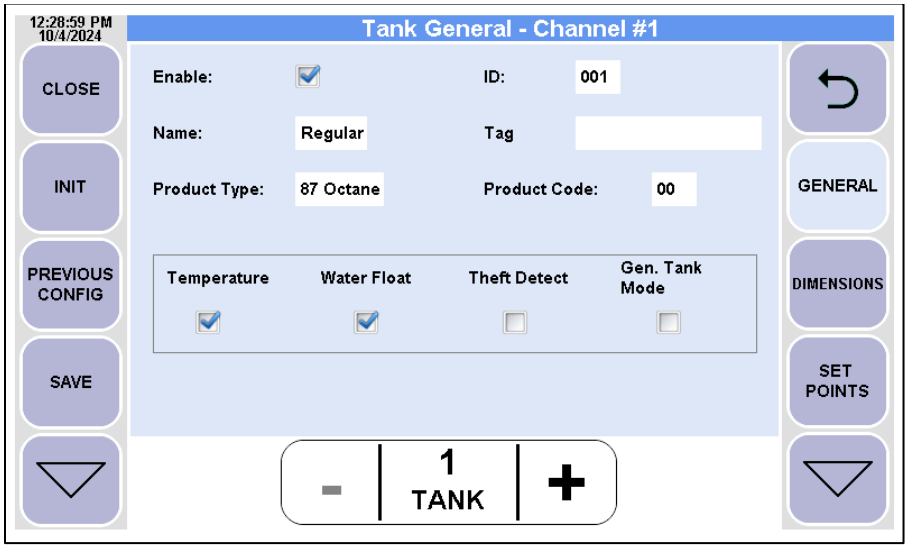
Unit ID: Used to identify the TMS that generated a report. This is recorded in all Logs and is included on all printouts from the TMS.



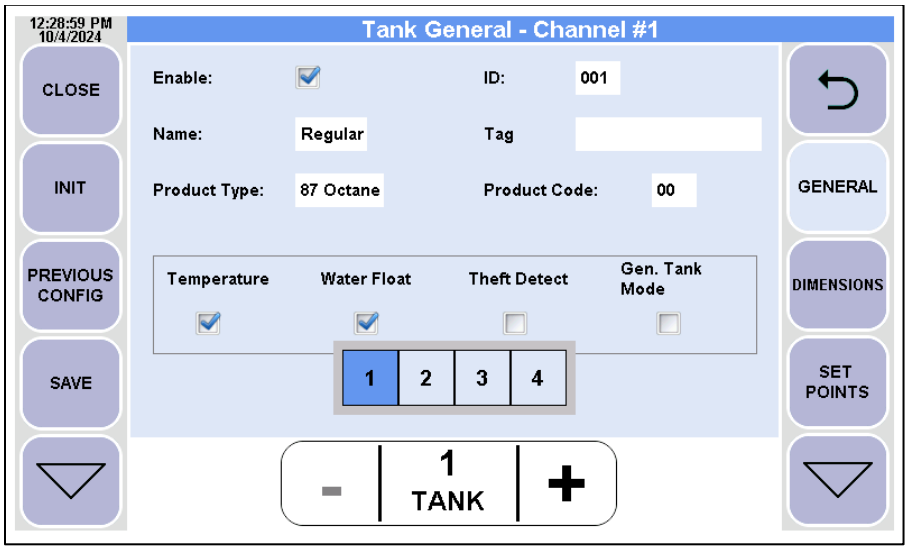
Tap on the SITE INFO button on the right toolbar to access the above settings.

Site Info: Used as a Printer Header for the External USB Printer, Network Printer, and PDF Reports.

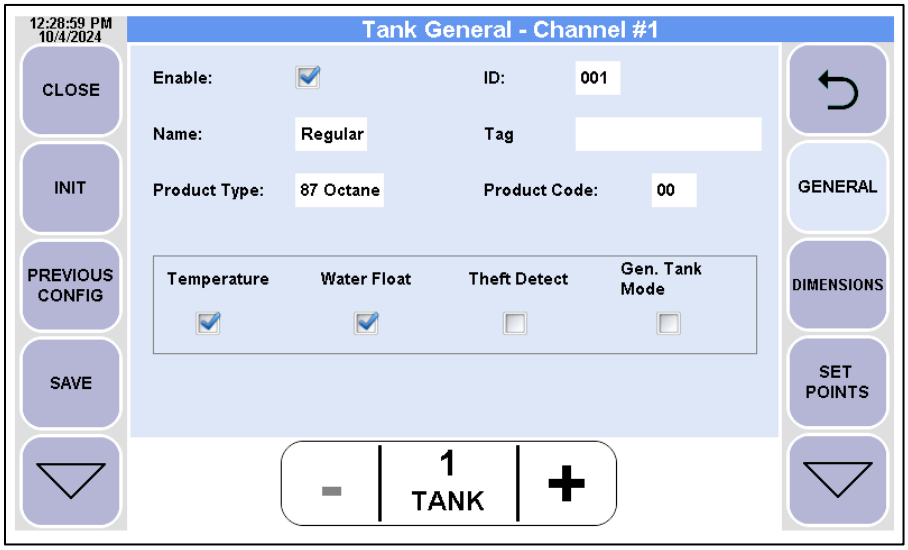
2.3 TANKS – GENERAL



Tap on the GENERAL button on the right toolbar to access the above settings.
Note: GENERAL is selected by default when TANKS is tapped.



Touch the +/- buttons to increment Tank Channel by 1. Touch the Tank Channel number to bring up a grid of possible Tank Channels. Touch the Tank Channel number on the grid to access the configuration settings for the selected Tank Channel.



Enable: Activates the selected Tank Channel.

Gen. Tank Mode: Activates two separate features, Sudden Loss Monitoring and Usage Reporting, typically used in support of Generator Tanks.

- Minimum required settings include:
  - **CC Inputs > CC Enable:** Enable CC Input as RELAY to monitor the Generator Active Signal. The generator active signal may be provided by a CS-10 Current Sensor or supplied by the Generator Panel. See Section 2.9 for setting details.
  - **CC Inputs > Normal State:** Represents the Normal Contact State for the generator active signal. The CS-10 is Normally Open. Consult documentation for generator manufacturer for signal details. See Section 2.9 for setting details.
- Sudden Loss Monitoring: The TMS can perform Sudden Loss Monitoring.
  - **Tanks > Leak Test > Leak Test Enable:** Enable Leak Testing to perform Sudden Loss Monitoring. See Section 2.7 for setting details.
    Note: Sudden Loss Monitoring is subject to the Leak Test configuration values shown in Section 2.7 including Leak Test Limit and Minimum % Volume.
  - **Tanks > Leak Test > Pump/Gen run Contact Closure:** Specify the CC Input Number enabled to recognize the Generator Active Signal.
- Usage Reporting: The tank usage can be monitored by associating a CC Input with a Tank Channel. Usage will be monitored when the CC Input is active and is NOT subject to the Motion Height Band setting. The usage would be recorded in the Sales Log. Required supporting settings include:
  - **Tanks > Probe > Minimum Log Volume:** Usage equal to or greater than the Minimum Log Volume are recorded in the Sales Log. See Section 2.6.

ID: A unique 3-digit numeric Tank ID used to identify the tank on the Real-Time Display and on Reports. The default setting for the Tank ID matches the Channel Number. i.e., Tank Channel 1 is Tank ID 001, Tank Channel 10 is Tank ID 010, etc.

Note: The leading zeroes are dropped when the Tank ID is displayed. i.e., Tank ID 001 is displayed as 1, Tank ID 010 is displayed as 10.

Name: A name assigned to a tank typically used to identify the stored product. Select from the predefined list or enter a 16-character custom name.

Virtual Tank Note: The Name is also used to establish the Tank Channel Numbers within a Virtual Tank set. Up to 6 Tank Channels may be added by defining a User-Defined Name containing the Tank Channel Numbers to be added to the set. Non-numeric values are ignored.
Example: To add Tanks Channels 1, 2, and 3, the Name may be: 123 OR 1+2+3 OR 1-2-3

Product Code: Used to support V300 protocol. Not used in any calculations and is not present in any reports. Intended to identify the fluid in the tank.

Product Type: Defines the coefficient of thermal expansion used to calculate Net Volume and perform accurate In-Tank Leak Tests. Consult factory if product is not listed.

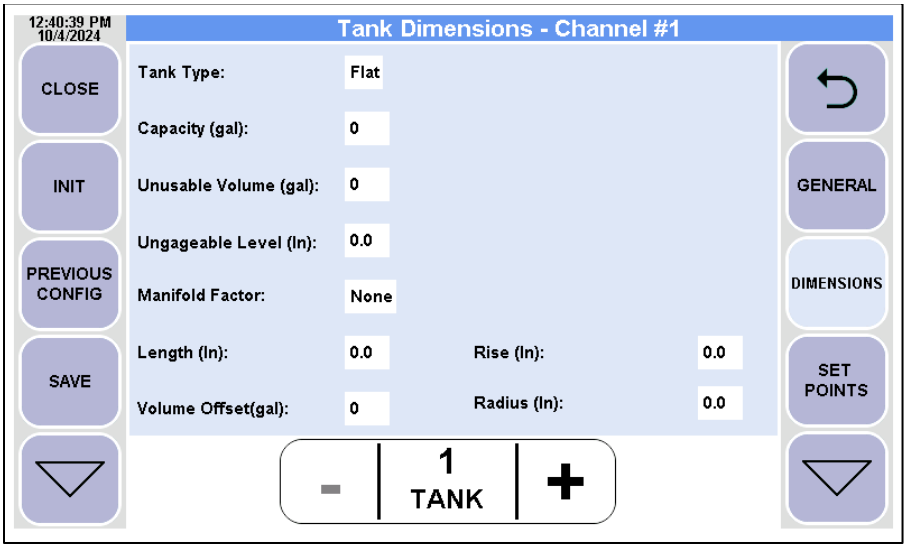
Tag: Supplemental information visible in the configuration that can be used to provide additional details about the Tank Channel.

Temperature: When unchecked, both the temperature reading and net volume are disabled. These fields are grayed out for the selected tank. This is enabled by default.
Note: Temperature must be enabled to perform in-tank leak tests.

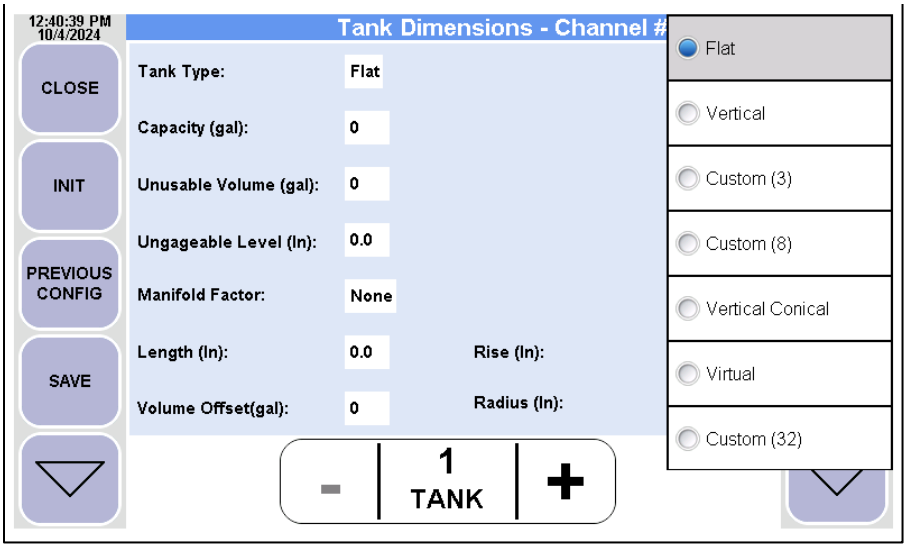
Theft Detect: Enables theft monitoring. A theft is defined as a loss of product during hours when the facility is closed. See Section 2.13 to define the hours of operation for the facility.

Water Float: When unchecked, the bottom water float data is ignored and not displayed.

2.4 TANKS – DIMENSIONS

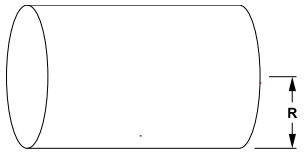
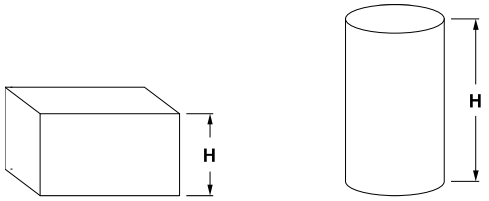
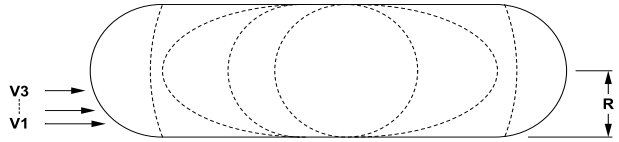
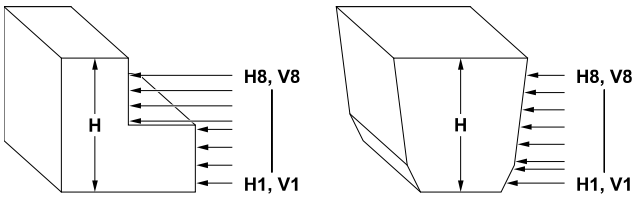
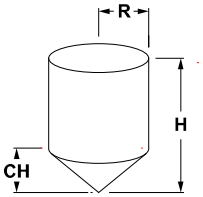
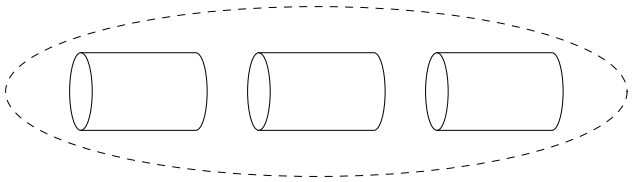
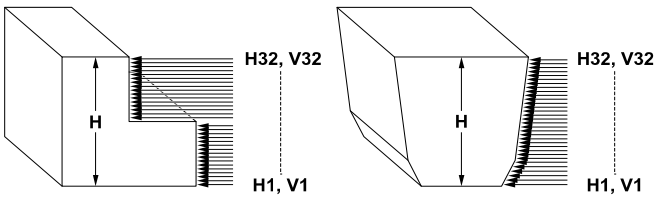


Tap on the DIMENSIONS button on the right toolbar to access the above settings.



Tap on TANK TYPE to bring up the list of choices. See next page for a definition of each choice.

The TMS supports 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:

Tank Type		Description
	**FLAT**	Flat-ended horizontal cylinder. See Section 2.4.1
	**VERTICAL**	Includes vertical cylinders and rectangular tanks. Any tank with a constant volume per unit of level is supported See Section 2.4.2
	**CUSTOM (3)**	A horizontal cylinder with curved or dished ends. See Section 2.4.3
	**CUSTOM (8)**	An asymmetrical tank or other tank with unusual geometry. Contact Pneumercator for assistance. See Section 2.4.4
	**VERTICAL CONICAL**	A vertical cylinder with a cone bottom. See Section 2.4.5
	**VIRTUAL**	Combines multiple tank volumes into a single virtual tank for the purpose of defining Product SetPoints based on the collective volume. See Section 2.4.6
	**CUSTOM (32)**	An asymmetrical tank or other tank with unusual geometry. Contact Pneumercator for assistance. See Section 2.4.7

WARNING

Enter the tank data from the Calibration Chart and/or Tank Drawing as provided by the Tank Manufacturer. Failure to enter the most accurate data available will result in inaccurate volume calculations which can affect the overfill alarm provided by the TMS, potentially resulting in a fluid spill.

Volume Notes

- Use the volume on the Chart and not the Tank Chart Header.
- Use the highest volume reading at the lowest level.
- The data plate on the tank typically refers to either the usable or marketing capacity. Enter the actual capacity from the tank manufacturer's calibration chart.

Level Notes

- Use inside dimensions from tank drawing.
- Radius equals one-half of diameter.
- Use the lowest level with the highest volume.

Example:

Partial Tank Chart
8' Diameter 10,000 Gallon

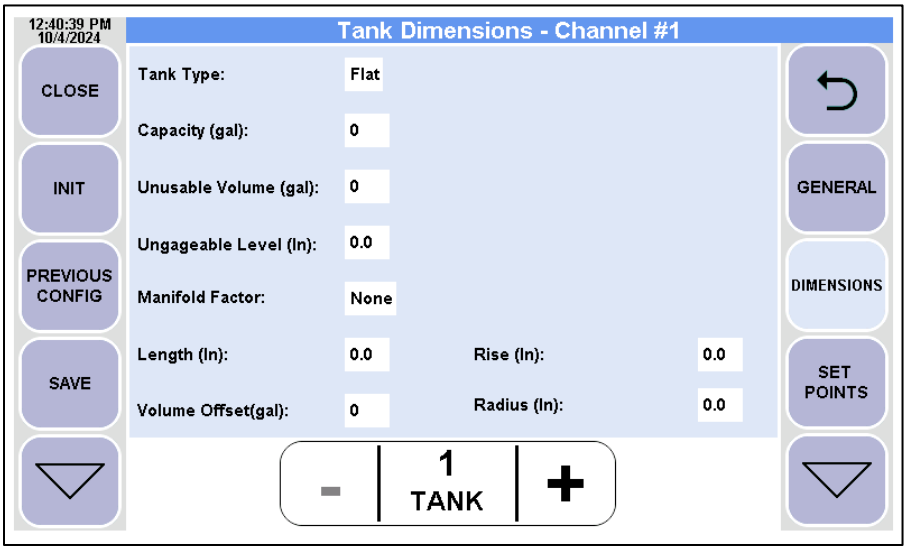
Inches	Gallons	Comments
92	9874	
92-1/8	9876	
92-1/4	9879	
92-3/8	9881	
92-1/2	9882	
92-5/8	**9884**	**Select Highest Volume at Lowest Level**
92-3/4	9884	
92-7/8	9884	
93	9884	

Actual Capacity: 9884 Gallons

Actual Inside Diameter: 92-5/8 Inches ≈ 92.6 Inches

Radius = Diameter ÷ 2
Actual Inside Radius: 46.3 Inches = 92.6 ÷ 2

2.4.1 TANKS – DIMENSIONS – FLAT



Tank Type = FLAT

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

Capacity: Enter actual tank capacity, preferably from the tank manufacturer's calibration chart.

Length: Enter inside length. Required only if the tank is tilted (Rise > 0). See Rise.

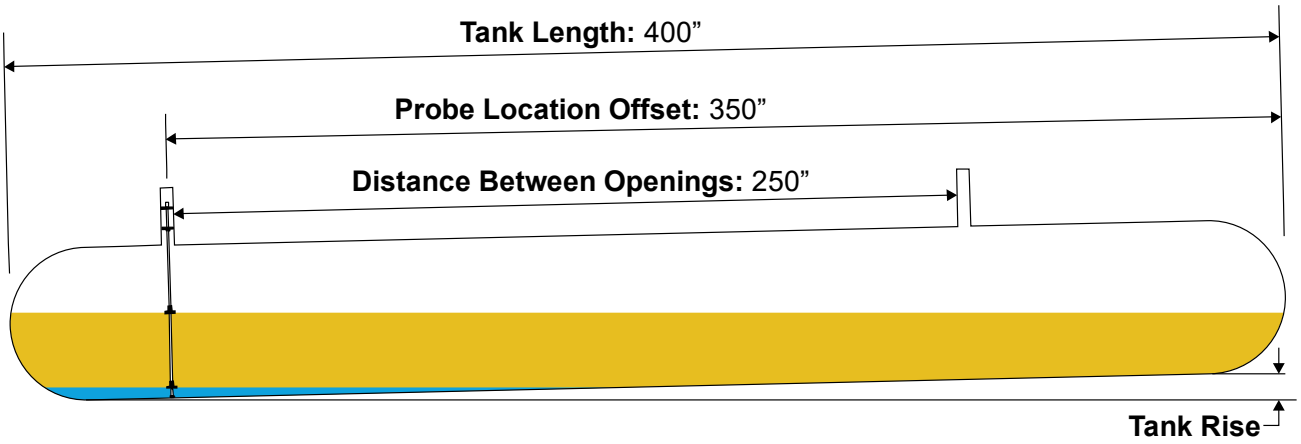
Manifold Factor: The number of Manifolds on a tank set with only one probe. Tanks are assumed to be of equal size and level with each other.

Leak Testing Note: EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. See Section 2.7 for Timed-Relay Leak Test Mode.

Tank Auto Select Note: Compare Group settings are available to assign a Tank Channel to a Compare Group letter. This feature allows the TMS to select the pump for the tank with the greatest volume within a set of two tanks. Refer to separate Tank Auto Select instructions for details.

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

Rise: Amount of Tank Tilt. Represents how much higher the high end of the tank is compared to the low end in units of level (inches/millimeters). Requires Tank Length and Probe Location Offset (See Section 2.6).



Tank Rise Calculation Example – Refer to image above:

Manual Stick Readings:
Left opening: 49.5 inches
Right opening: 47 inches
Difference between stick readings: 2.5 inches

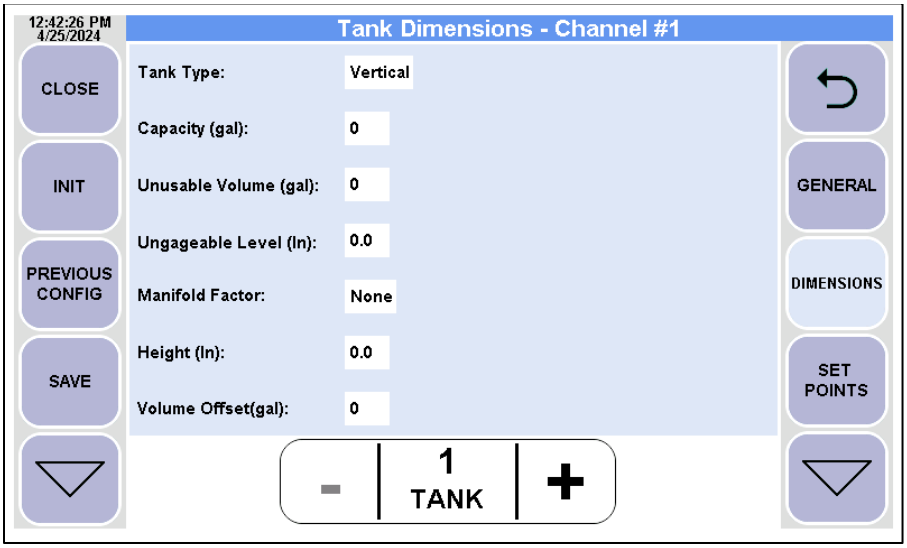
Tank Rise: formula is as follows:
(**Difference between stick readings**) × (**Tank Length**) ÷ (**Distance between openings**)
Example calculation: 2.5 × 400 ÷ 250 = 4 inches.
Tank Rise: 4 inches

Ungageable Level: Represents the level of fluid in the bottom of the tank that cannot be measured by the probe. This may be due to the construction of the tank or mounting height of the probe. The TMS would provide a Low Product Alarm. The TMS would calculate the volume in the entire tank.

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

Volume Offset: Represents a linear volume offset for select applications where there may be unreachable areas, such as a sump in the tank floor, or unusable areas such as a sloped floor or cone bottom that the customer would prefer to NOT have represented in the tank volume reading.

2.4.2 TANKS – DIMENSIONS – VERTICAL



Tank Type = VERTICAL

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

Capacity: Enter actual tank capacity, preferably from the tank manufacturer's calibration chart.

Height: Enter inside height.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Tanks are assumed to be of equal size and level with each other.

Leak Testing Note: EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. See Section 2.7 for Timed-Relay Leak Test Mode.

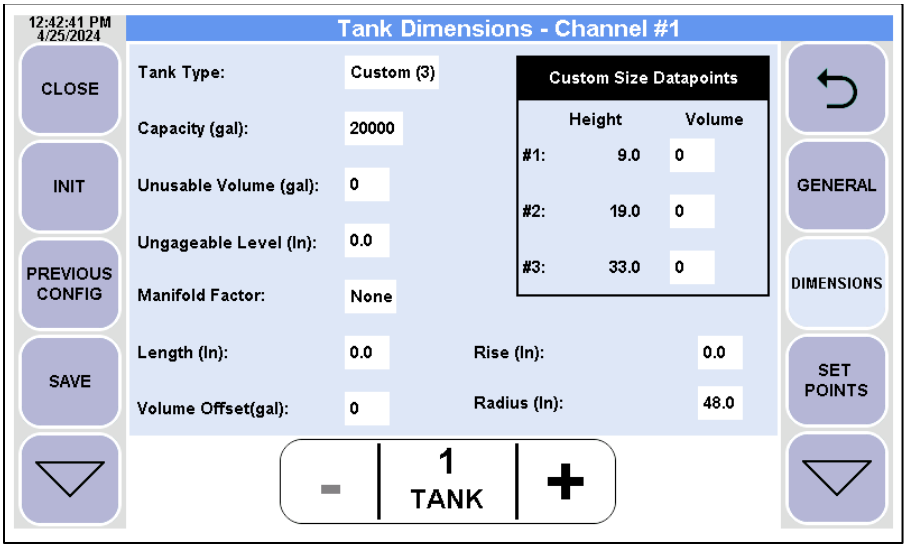
Tank Auto Select Note: Compare Group settings are available to assign a Tank Channel to a Compare Group letter. This feature allows the TMS to select the pump for the tank with the greatest volume within a set of two tanks. Refer to separate Tank Auto Select instructions for details.

Ungageable Level: Represents the level of fluid in the bottom of the tank that cannot be measured by the probe. This may be due to the construction of the tank or mounting height of the probe. The TMS would provide a Low Product Alarm. The TMS would calculate the volume in the entire tank.

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

Volume Offset: Represents a linear volume offset for select applications where there may be unreachable areas, such as a sump in the tank floor, or unusable areas such as a sloped floor or cone bottom that the customer would prefer to NOT have represented in the tank volume reading.

2.4.3 TANKS – DIMENSIONS – CUSTOM (3)



Tank Type = CUSTOM (3)

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

Capacity: Enter actual tank capacity, preferably from the tank manufacturer's calibration chart.

Custom Size Datapoints: Enter the corresponding volumes for the heights using the tank manufacturer's calibration chart.

Note: Enter the Datapoints AFTER entering the Tank Radius.

Length: Enter inside length. Required only if the tank is tilted (Rise > 0). See Rise.

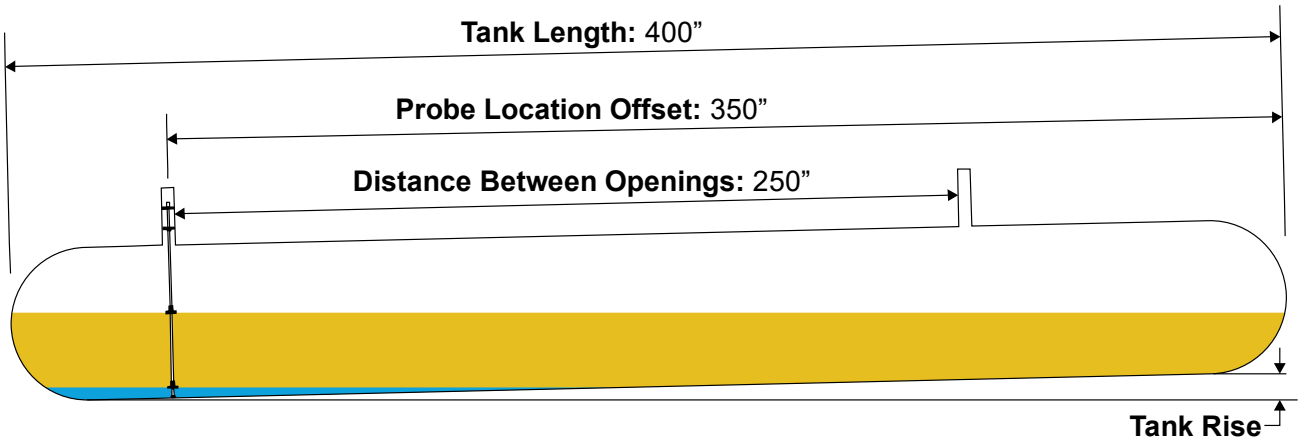
Manifold Factor: The number of Manifolds on a tank set with only one probe. Tanks are assumed to be of equal size and level with each other.

Leak Testing Note: EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. See Section 2.7 for Timed-Relay Leak Test Mode.

Tank Auto Select Note: Compare Group settings are available to assign a Tank Channel to a Compare Group letter. This feature allows the TMS to select the pump for the tank with the greatest volume within a set of two tanks. Refer to separate Tank Auto Select instructions for details.

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

Rise: Amount of Tank Tilt. Represents how much higher the high end of the tank is compared to the low end in units of level (inches/millimeters). Requires Tank Length and Probe Location Offset (See Section 2.6).



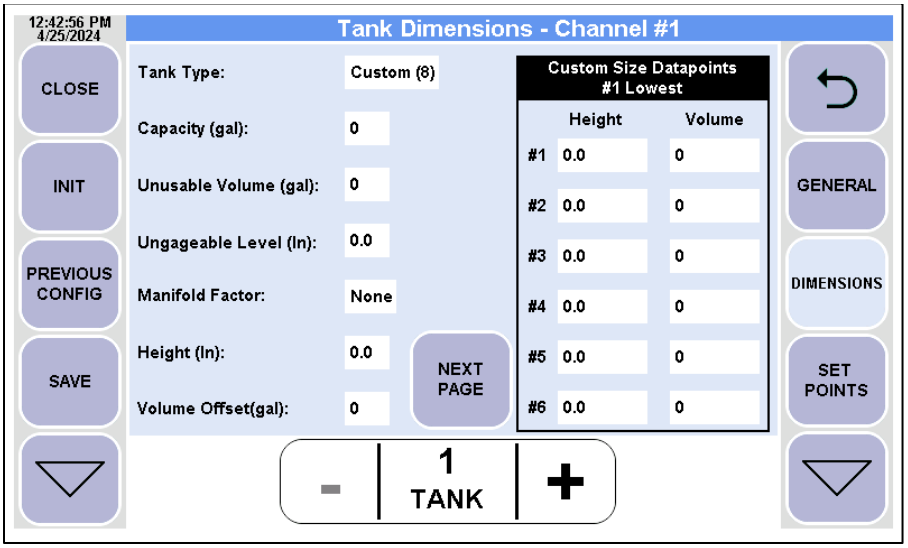
Tank Rise Calculation Example – Refer to image above:
Manual Stick Readings: Left opening: 49.5 inches Right opening: 47 inches **Difference between stick readings:** 2.5 inches **Tank Rise:** formula is as follows: (**Difference between stick readings**) × (**Tank Length**) ÷ (**Distance between openings**) Example calculation: 2.5 × 400 ÷ 250 = 4 inches. **Tank Rise:** 4 inches

Ungageable Level: Represents the level of fluid in the bottom of the tank that cannot be measured by the probe. This may be due to the construction of the tank or mounting height of the probe. The TMS would provide a Low Product Alarm. The TMS would calculate the volume in the entire tank.

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

Volume Offset: Represents a linear volume offset for select applications where there may be unreachable areas, such as a sump in the tank floor, or unusable areas such as a sloped floor or cone bottom that the customer would prefer to NOT have represented in the tank volume reading.

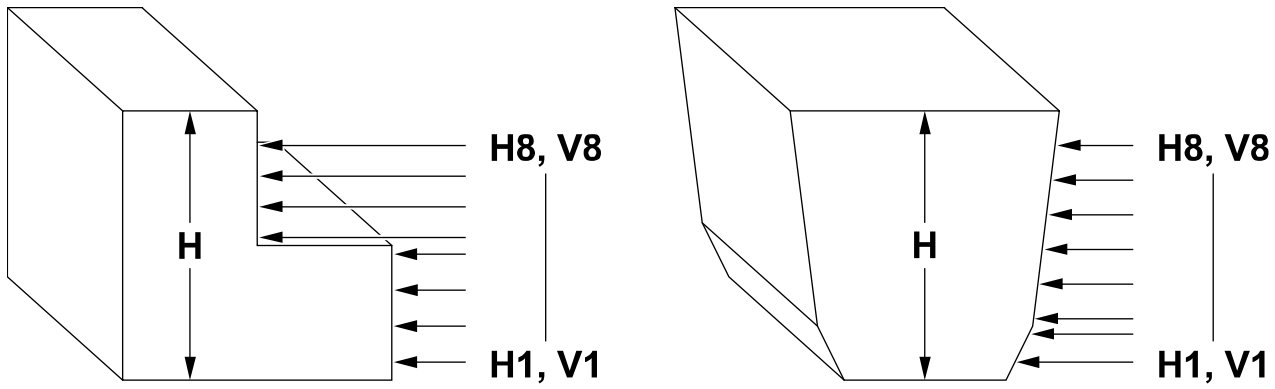
2.4.4 TANKS – DIMENSIONS – CUSTOM (8)



Tank Type = CUSTOM (8)

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

Capacity: Enter actual tank capacity, preferably from the tank manufacturer's calibration chart.



Custom Size Datapoints: Up to 8 heights and volumes may be used, from bottom to top. See diagram above for reference. Enter the data from the tank manufacturer's calibration chart. Contact Pneumercator for additional support in selecting specific data points best suited for the specific tank shape.

Note: Tap the Next Page button to access heights and volumes 7 and 8.

Height: Enter inside height.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Tanks are assumed to be of equal size and level with each other.

Leak Testing Note: EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. See Section 2.7 for Timed-Relay Leak Test Mode.

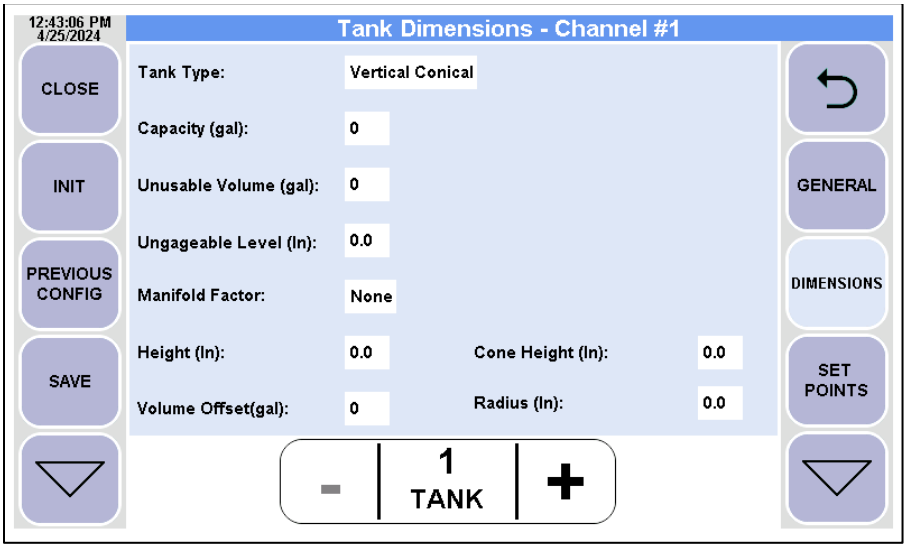
Tank Auto Select Note: Compare Group settings are available to assign a Tank Channel to a Compare Group letter. This feature allows the TMS to select the pump for the tank with the greatest volume within a set of two tanks. Refer to separate Tank Auto Select instructions for details.

Ungageable Level: Represents the level of fluid in the bottom of the tank that cannot be measured by the probe. This may be due to the construction of the tank or mounting height of the probe. The TMS would provide a Low Product Alarm. The TMS would calculate the volume in the entire tank.

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

Volume Offset: Represents a linear volume offset for select applications where there may be unreachable areas, such as a sump in the tank floor, or unusable areas such as a sloped floor or cone bottom that the customer would prefer to NOT have represented in the tank volume reading.

2.4.5 TANKS – DIMENSIONS – VERTICAL CONICAL



Tank Type = VERTICAL CONICAL

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

Capacity: Enter actual tank capacity, preferably from the tank manufacturer's calibration chart.

Cone Height: Enter inside Cone Height.

Height: Enter inside height including the cone bottom.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Tanks are assumed to be of equal size and level with each other.

Leak Testing Note: EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. See Section 2.7 for Timed-Relay Leak Test Mode.

Tank Auto Select Note: Compare Group settings are available to assign a Tank Channel to a Compare Group letter. This feature allows the TMS to select the pump for the tank with the greatest volume within a set of two tanks. Refer to separate Tank Auto Select instructions for details.

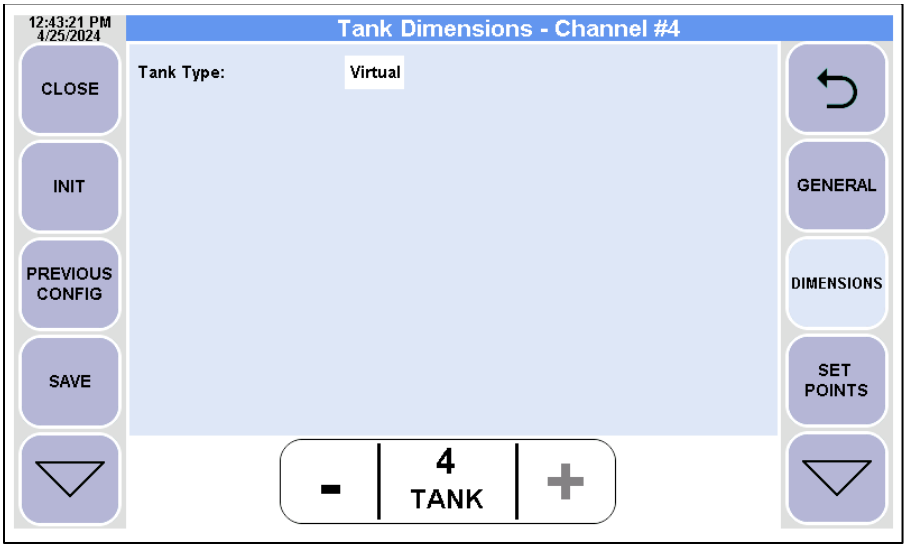
Radius: 1/2 of the inside diameter. Refer to tank drawing or chart for details.

Ungageable Level: Represents the level of fluid in the bottom of the tank that cannot be measured by the probe. This may be due to the construction of the tank or mounting height of the probe. The TMS would provide a Low Product Alarm. The TMS would calculate the volume in the entire tank.

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

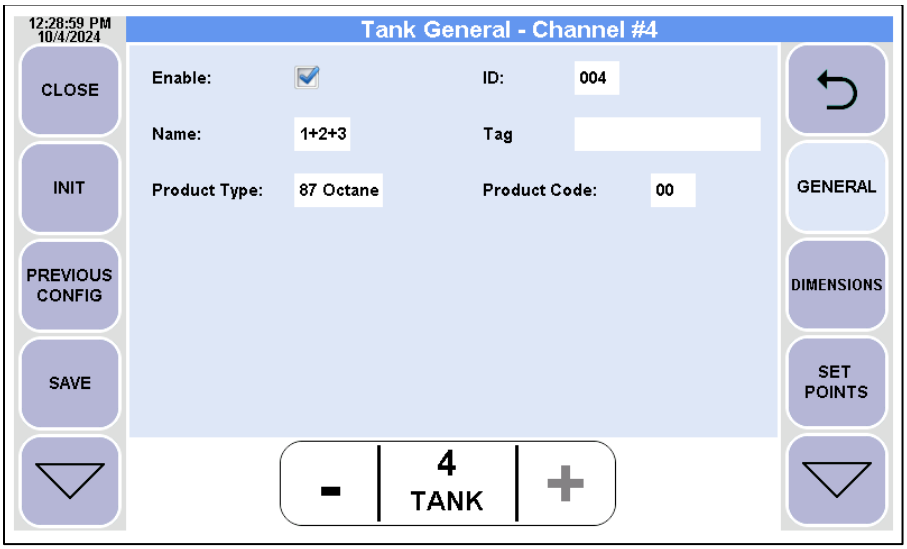
Volume Offset: Represents a linear volume offset for select applications where there may be unreachable areas, such as a sump in the tank floor, or unusable areas such as a sloped floor or cone bottom that the customer would prefer to NOT have represented in the tank volume reading.

2.4.6 TANKS – DIMENSIONS – VIRTUAL



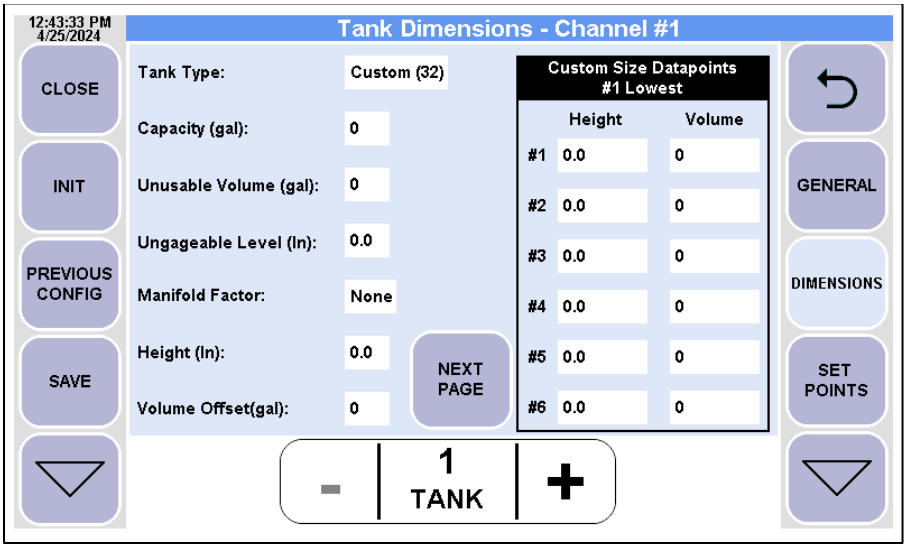
Tank Type = VIRTUAL

The virtual tank type is a specialized tank that allows the volumes of up to 3 tank channels to be combined into a single virtual tank for the purpose of defining Product SetPoints based on the collective volume of the virtual tank set. 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.



Virtual Tank Example: Shows Tank Channels 1, 2, and 3 have been joined as Tank Channel 4. See Section 2.3 for Tank Name details.

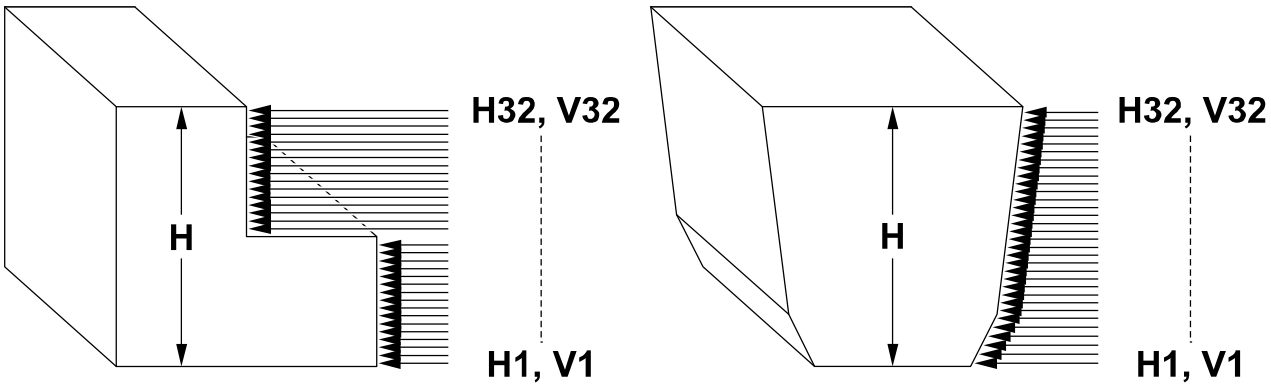
2.4.7 TANKS – DIMENSIONS – CUSTOM (32)



Tank Type = CUSTOM (32)

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

Capacity: Enter actual tank capacity, preferably from the tank manufacturer's calibration chart.



Custom Size Datapoints: Up to 32 heights and volumes may be used, from bottom to top. See diagram above for reference. Enter the data from the tank manufacturer's calibration chart. Contact Pneumercator for additional support in selecting specific data points best suited for the specific tank shape.

Note: Tap the Next Page button to access heights and volumes 7 through 32.

Height: Enter inside height.

Manifold Factor: The number of Manifolds on a tank set with only one probe. Tanks are assumed to be of equal size and level with each other.

Leak Testing Note: EPA requirements for manifolded tanks are to isolate the tank from the set before performing a leak test. See Section 2.7 for Timed-Relay Leak Test Mode.

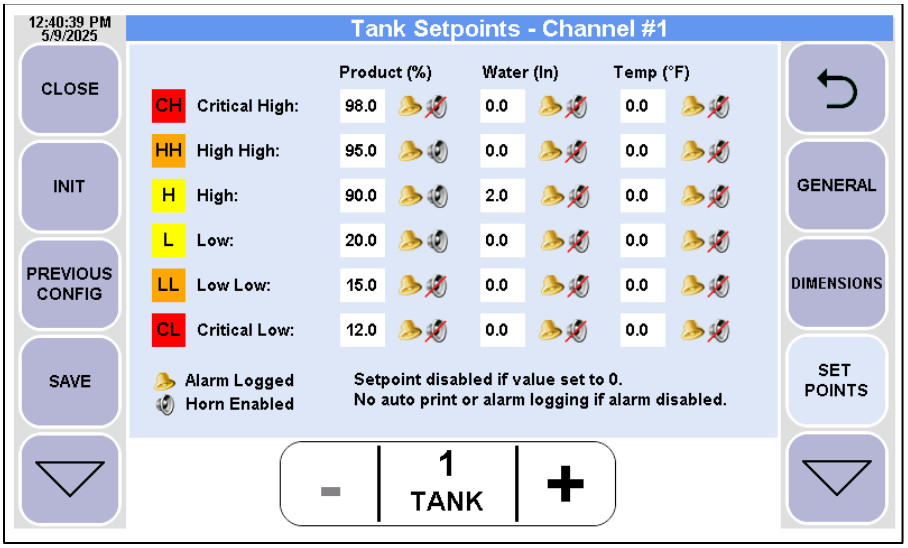
Tank Auto Select Note: Compare Group settings are available to assign a Tank Channel to a Compare Group letter. This feature allows the TMS to select the pump for the tank with the greatest volume within a set of two tanks. Refer to separate Tank Auto Select instructions for details.

Ungageable Level: Represents the level of fluid in the bottom of the tank that cannot be measured by the probe. This may be due to the construction of the tank or mounting height of the probe. The TMS would provide a Low Product Alarm. The TMS would calculate the volume in the entire tank.

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

Volume Offset: Represents a linear volume offset for select applications where there may be unreachable areas, such as a sump in the tank floor, or unusable areas such as a sloped floor or cone bottom that the customer would prefer to NOT have represented in the tank volume reading.

2.5 TANKS – SETPOINTS

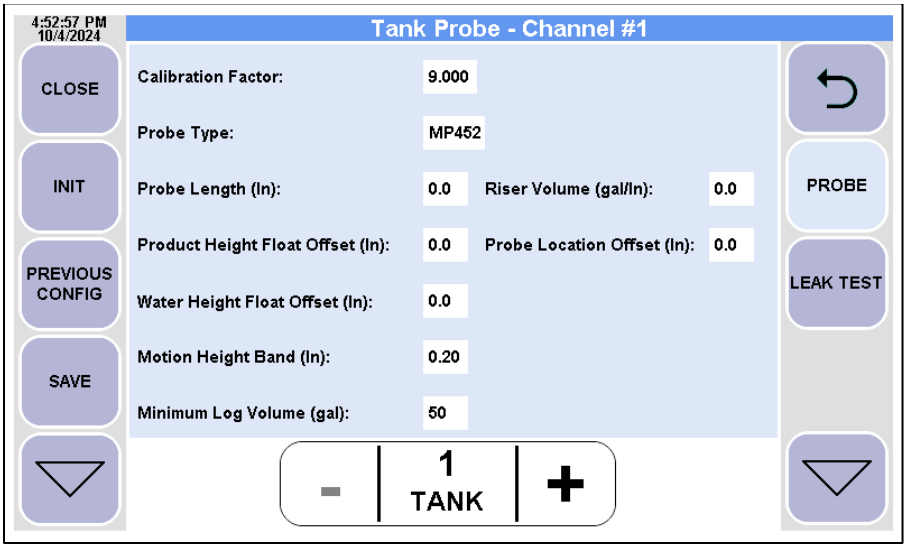


The above screenshot shows the default values for the Tank SetPoints. Each SetPoint represents a key threshold that needs to be identified, typically for the purpose of alarming and/or controlling external hardware such as remote alarms or valves. The units for the SetPoints are displayed above each column. The pair of symbols, bell and horn, represents the three choices for how the TMS represents the alarm. Tap on the pair of icons to toggle between the three SetPoint Modes. These modes are summarized below and detailed on the table that follows.

- Alarm with Internal Horn activating
- Alarm without Internal Horn activating
- Non-Alarm

Response			
Built-In Horn Activates	X		
Visible on LCD	X	X	
Recorded in Alarm Log	X	X	
Alarm Receipt printed	X	X	
E-Mail/SMS Alert sent	X	X	
Visible via Comm Interface	X	X	X
Visible on Status Printout	X	X	X
Relays Triggered	X	X	X

2.6 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.

Float Offsets: See next page.

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.

Motion Height Band: Sensitivity adjustment used by the TMS to filter out surface action from actual transactions. Defaults to 0.2 inch/5mm per minute. When the Motion Height Band is met or exceeded, the transaction begins. When the Motion Height Band is not met or exceeded for 3 consecutive minutes, the transaction is ended, categorized, and possibly recorded. See Minimum Log Volume.

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

Probe Location Offset (Tank Rise > 0 Only): Used to pinpoint the location of the probe in a tilted tank. Represents how far away, in inches/millimeters, from the high end of the tank the probe is located.

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.)

Riser Volume per Inch/mm (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 collective volume of product within the riser pipes.

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.

Probe Model	2" S/S Floats		4" Buna-N Floats	
	Inches	mm	Inches	mm
MP45xS: Riser Mounted	1.3 ± 0.3	33 ± 8	-1.5 ± 0.3	-38 ± 8
MP45xS: Direct Mounted	2.3 ± 0.3	58 ± 8	-0.5 ± 0.3	-13 ± 8
MP461SC	2.8 ± 0.3	71 ± 8	0.0 ± 0.3	0 ± 8
MP461SA/MP462SA	9.3 ± 1.0	236 ± 25	6.5 ± 1.0	165 ± 25
MP463SA (289-432 OAL)	14.3 ± 1.0	363 ± 25	11.5 ± 1.0	292 ± 25
MP463SA (433-600 OAL)	18.3 ± 1.0	465 ± 25	15.5 ± 1.0	394 ± 25
MP464SA (601-720 OAL)	21.3 ± 1.0	541 ± 25	18.5 ± 1.0	470 ± 25
MP464SA (721-840 OAL)	24.3 ± 1.0	617 ± 25	21.5 ± 1.0	546 ± 25

Formula:
[Stick Reading] – [TMS Display] = Product Height Float Offset

Calculation examples:
Scenario 1:
TMS4000M equipped with MP450S Riser Mounted Probe and 4" Buna-N Floats
TMS Display: 49.5 inches of Product
Stick Reading: 48.0 inches of Product
48.0 – 49.5 = -1.5 inch Product Height Float Offset.
Note: The Offset calculation is confirmed within the expected range of -1.5" ± 0.3". Value may be entered into the TMS.

Scenario 2:
TMS4000M equipped with MP450S Riser Mounted Probe and 4" Buna-N Floats
TMS Display: 98.0 inches of Product
Stick Reading: 48.0 inches of Product
48.0 – 98.0 = -50.0 inch Product Height Float Offset.
Note: The Offset calculation is **outside of** the expected range of -1.5" ± 0.3". Troubleshooting is required. Problem may be as simple as the float being stuck in the riser above the tank.

Scenario 3:
TMS4000M equipped with MP463SA Probe and 4" Buna-N Floats
TMS Display: 360.0 inches of Product
Stick Reading: 375.0 inches of Product
375.0 – 360.0 = 15.0 inch Product Height Float Offset.
Note: The Offset calculation is confirmed within the expected range of 15.5" ± 1.0". Value may be entered into the TMS.

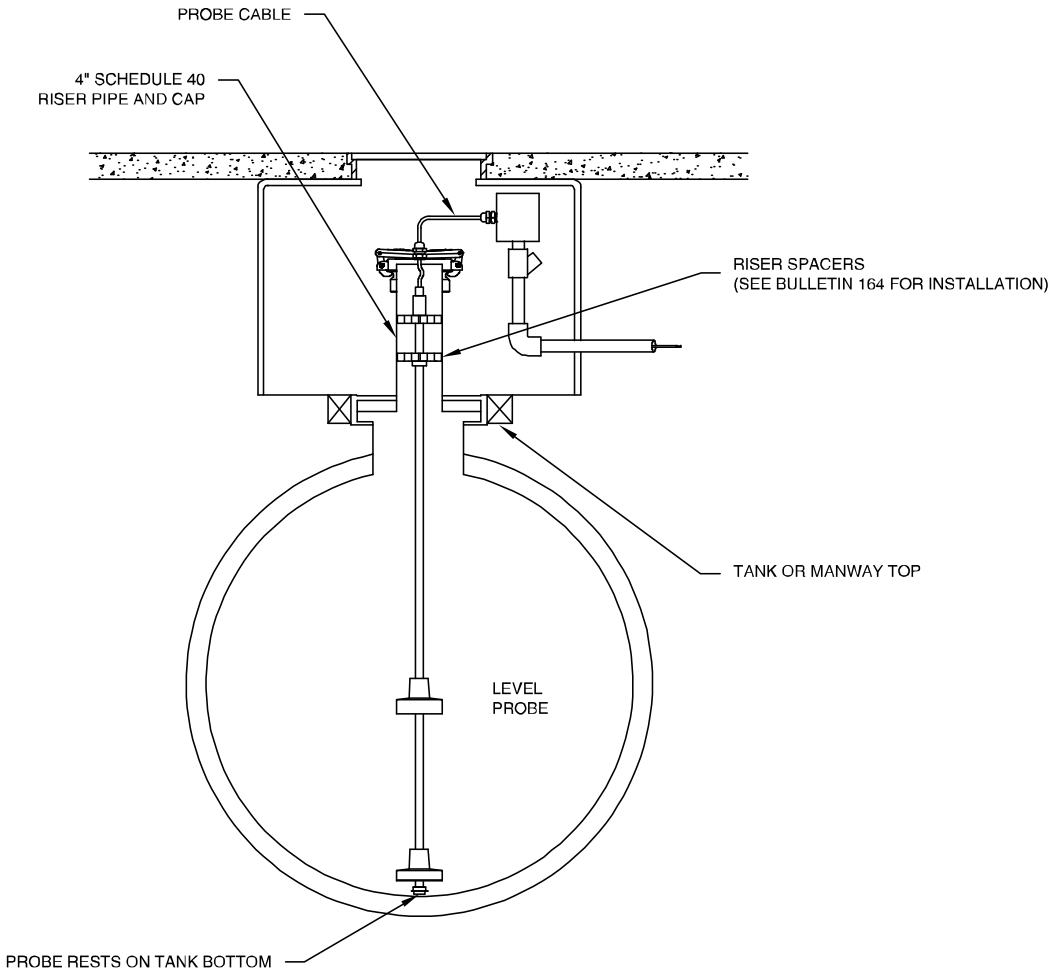
Water Height Float Offset: Compensates for the difference between a manual stick reading of bottom water and the displayed bottom water level. Calculated using the same method as the Product Height Float Offset above. If the manual stick reading shows no water, the Water Height Float Offset should be set so that the final water reading on the TMS is as follows:

Probe Type	Minimum Recommended Bottom Water Reading
MP45xS	0.2 inch/5mm
MP461SC	0.5 inch/13mm
MP46xS	1 inch/25mm

2.7 TANKS – LEAK TEST

The TMS4000M is capable of performing Volumetric In-Tank Leak Tests. The Leak Test must only be enabled when ALL of the following criteria is met: (Refer to the National Workgroup website, www.neiwpcc.org/nwglde/, or contact Pneumercator for up-to-date information):

- Tank requirements
  - Single-Wall Underground Storage Tank
  - Isolated (Not Manifolded)
  - Not Heated or Pressurized
  - Up to 30,000 Gallon [113,600 Liter] capacity
    - 0.2 GPH [0.8 LPH] in 2 hours for tanks up to 20,000 Gallons [75,700 Liters]
    - 0.1 GPH [0.4 LPH] in 8 hours for tanks up to 20,000 Gallons [75,700 Liters]
    - 0.2 GPH [0.8 LPH] in 8 hours for tanks up to 30,000 Gallons [113,600 Liters]
- Qualifying Petroleum Product as defined by the Federal EPA.
- MP450S, Dual Float with 5 Temperature Sensors (MP450S-xxx-25)
  - Riser Mounted (See below example)
  - 4-inch Urethane or Buna-N floats



MP45xS installed using Riser Mount Method

The TMS supports three basic **Leak Test Modes**:

- **Manual**: An On-Demand Leak Test initiated by the User
- **Scheduled**: The TMS is configured to follow a fixed schedule
- **Auto**: The TMS monitor the Pump/Generator activity via CC Input to identify a window of opportunity to perform the Leak Test.

Settings Common to All Leak Test Modes include:

Leak Test Enable: Check this box to enable In-Tank Leak Testing for the selected Tank Channel.

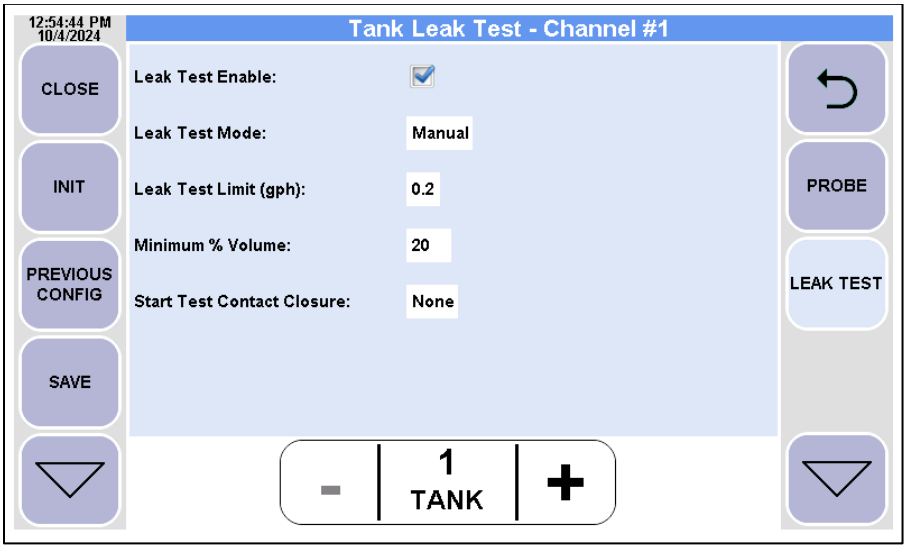
Leak Test Limit: Represents the maximum acceptable Leak Limit for the Tank. Typically set as follows:

- Monthly: 0.2 GPH / 0.8 LPH
- Annual: 0.1 GPH / 0.4 LPH

Leak Test Mode: Choose between four Leak Test Modes as follows:

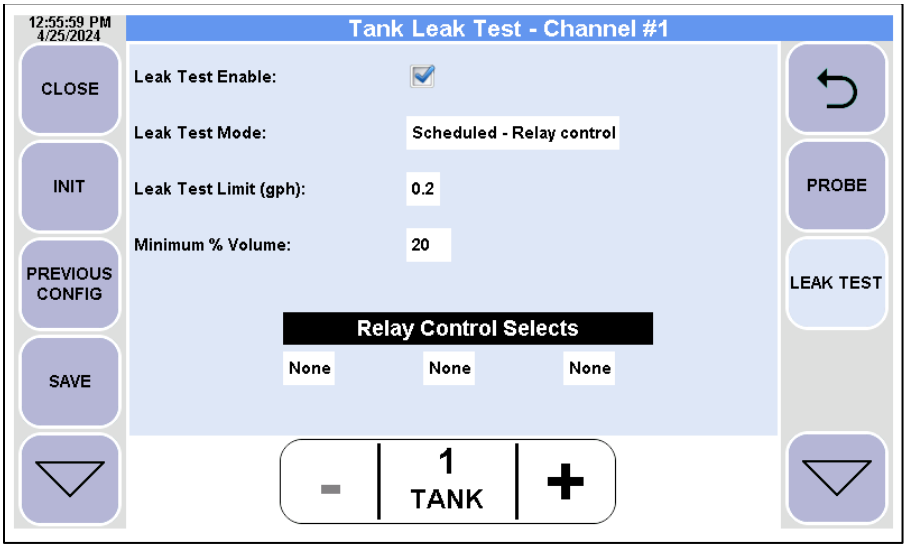
Minimum % Volume: Defines the minimum volume, as a percent of tank capacity, required to perform an in-tank leak test. Enforcement of this requirement is optional as selected on the Leak Test Scheduling window. Note: In addition to the Third-Party Certification for the TMS (listed on the National Workgroup website: www.neiwpcc.org/nwglde/), your local jurisdiction may have a different requirement. Be sure to enter the higher of the TMS Requirements versus the local regulations to be incompliance with all requirements.

LEAK TEST MODE: MANUAL



Start Test Contact Closure: This optional setting allows the Leak Test to be started by a dry contact signal connected to the specified CC Input. The CC Input must be enabled as Relay to support this feature.

LEAK TEST MODE: SCHEDULED



Shown with **Relay Control** option

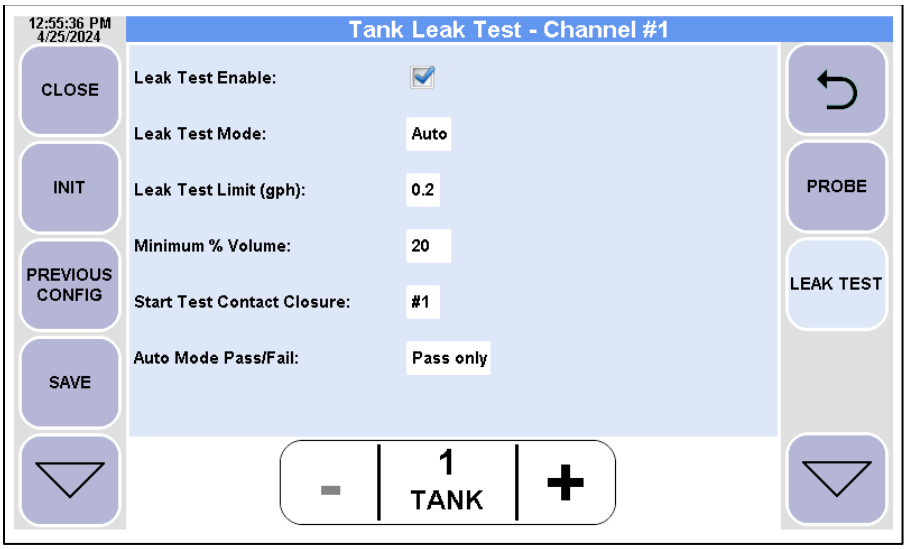
Scheduled Leak Test Mode should be chosen when following a predefined schedule is desired. Section 2.8 provides complete details on selecting a Leak Test frequency. A Basic Summary of the frequency options is as follows:

- **Once:** Intended to run a single isolated test either as the initial test to demonstrate tank tightness or if a Leak Test has recently failed and a second Leak Test is desired to confirm the failure.
- **Daily:** Not commonly chosen. If a tank has failed one or more Leak Tests, a Daily Leak Test may be selected to collect more Leak Test data to make a proper decision on the next course of action to address the failure.
- **Weekly:** The most commonly selected frequency satisfies the monthly requirements of the local environmental agency but frequent enough to provide several opportunities during the month to show a passing Leak Test result.
- **Monthly:** Supports the minimum testing frequency required by the local environmental agency.

Scheduled – Relay Control: In addition to running a test as described above, the TMS will activate up to three relays at the scheduled test start time. The test will begin to run 15 minutes later. This Leak Test Mode was intended for use with manifolded tanks so that a single tank could be isolated from the tank set to perform an EPA-compliant Leak Test.

Relay Control Selects (Scheduled – Relay Control Leak Test Mode Only): Specify up to 3 TMS Relay Outputs used to isolate a single tank from a manifolded tank set. The Relay Outputs are likely connected to the appropriate siphon break valves.

LEAK TEST MODE: AUTO



Auto Leak Test Mode is intended for use at facilities where the tank activity is unpredictable or is open 24 hours a day. The TMS seeks out an inactive period allowing the leak test to begin. If pump/generator activity is detected while a leak test is in progress, the test is aborted and a new inactive period is sought out. Once a test has been satisfactorily completed, no further tests are performed for the remainder of the month.
Note: The TMS monitors Pump/Generator activity using a CC Input. This activity signal may be provided by a current sensor (CS-10) or by a dry contact signal provided by the pump/generator manufacturer.

The basic rules for Auto Leak Test Mode are as follows:

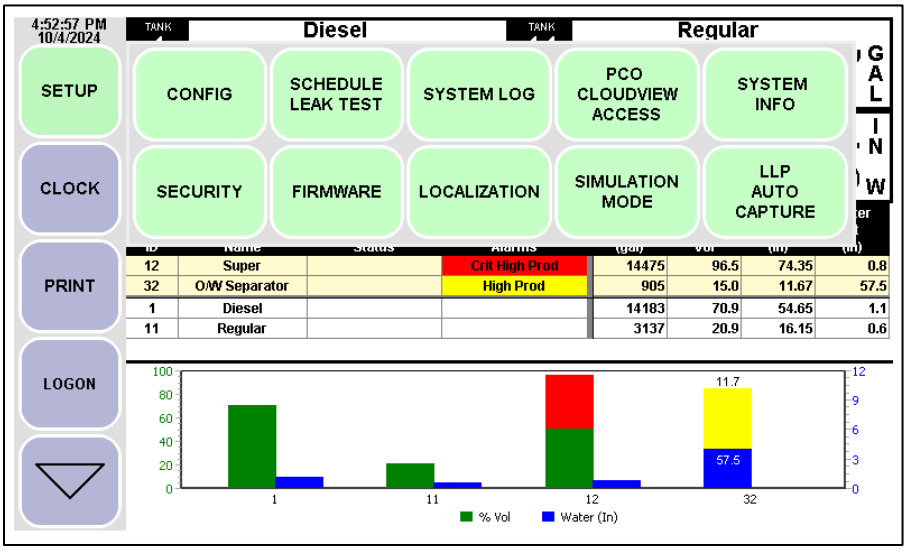
- The beginning of the month starts a new Auto Leak Test Mode cycle.
- Activity will prevent a leak test from starting and will abort a leak test in progress.
- The leak test will not begin after a delivery until at least 8 hours has passed
- No further leak tests are performed for the month once a completed test meets the criteria defined in the Auto Mode Pass/Fail setting.

Auto Mode Pass/Fail (Excludes Generator Tank Mode): Defines the criteria for satisfying Auto Leak Test Mode as follows:

- Pass Only (Default): Only a PASSING leak test result will satisfy Auto Leak Test Mode preventing any further Leak Test from being performed for the month.
- Pass/Fail: Any COMPLETED test, regardless of the result, will satisfy Auto Leak Test Mode preventing any further Leak Test from being performed for the month.

Start Test Contact Closure (Auto Leak Test Mode Only): Specify the CC input number used to monitor the pump/generator activity in support of Auto Leak Test Mode/Generator Tank Mode.

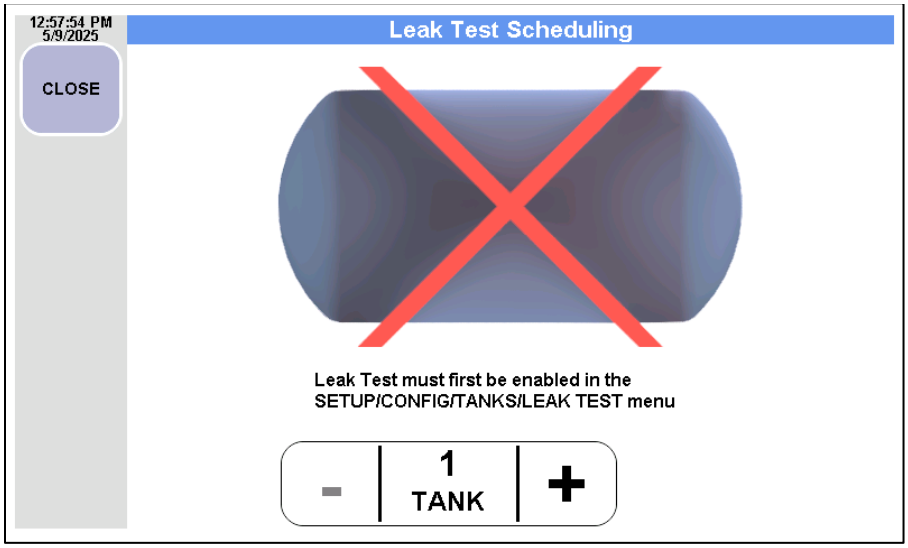
2.8 LEAK TEST SCHEDULING



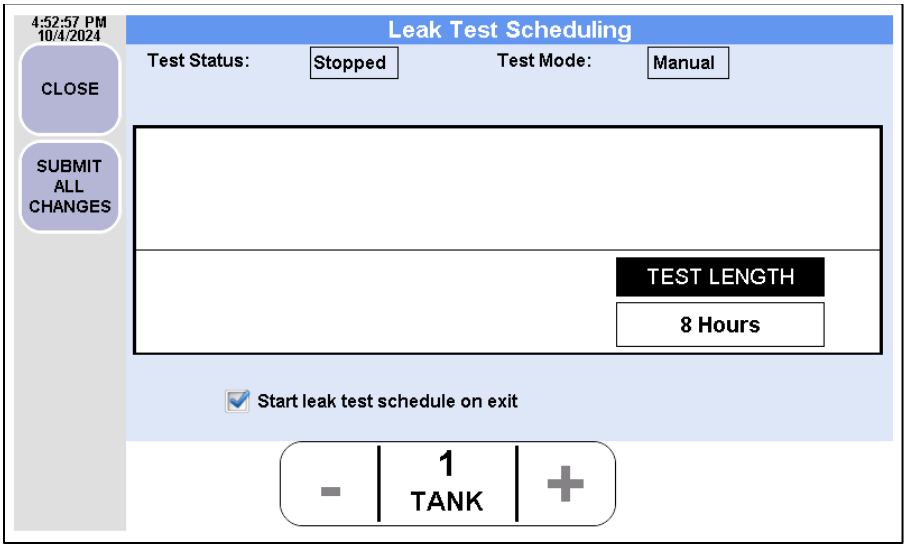
Tap SETUP then LEAK TEST.

Note: Tap the DOWN ARROW button if the SETUP button is not visible.

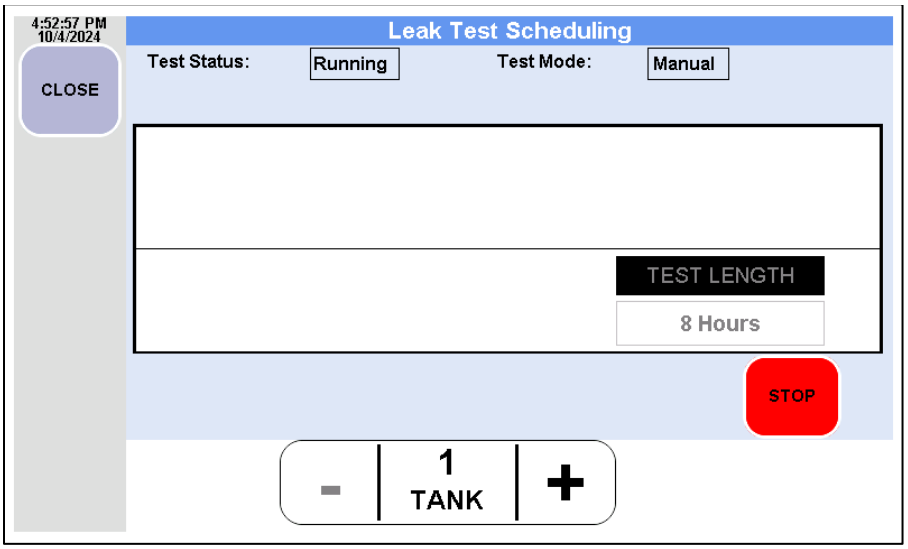
Any tank requiring In-Tank Leak Testing must first address the settings in Section 2.7. Any tank where In-Tank Leak Testing has not been enabled will be represented by a tank with a red X through it as shown below.



2.8.1 LEAK TEST SCHEDULING - MANUAL

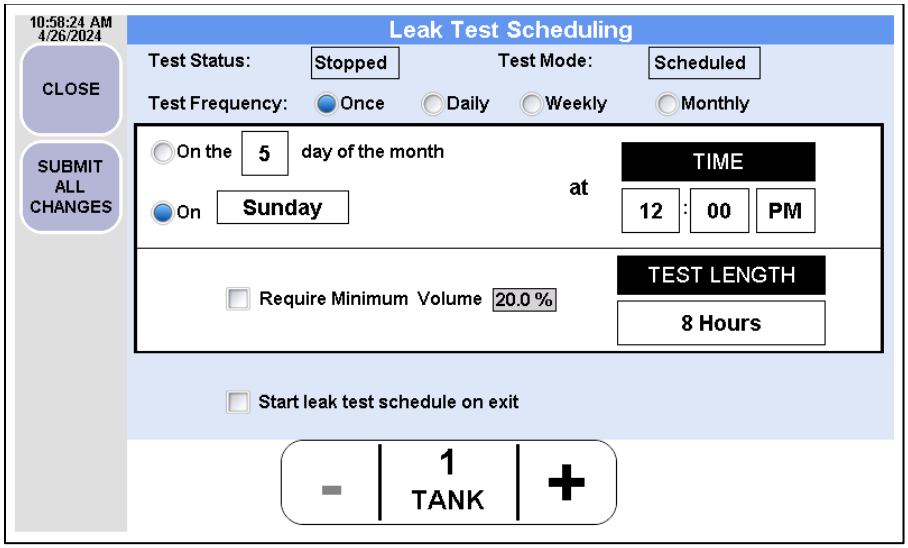


The Manual Leak Test Mode is ideal for applications where the user prefers to manually start the test, usually due to a site having a high throughput. The user would manually shutdown the tank before beginning the test. The test length must be set to comply with local regulations covering the size of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



2.8.2 LEAK TEST SCHEDULING – SCHEDULED

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



Test Frequency = ONCE

The TMS will perform a single in-tank leak test based on the criteria defined above. No further tests will be performed until a new Test Schedule has been defined. This is typically used to confirm the tank is not leaking prior to defining a repeating permanent schedule.

On The <BLANK> Day Of The Month: Allows the user to run the test up to one month in the future. If, for example, today's date is December 22 and the value entered in the box is 14, the test will run on January 14th at the designated time. If the value entered is 22 but the specified time has already past, then the test will run on January 22nd at the designated time. Supported range is 1-28.

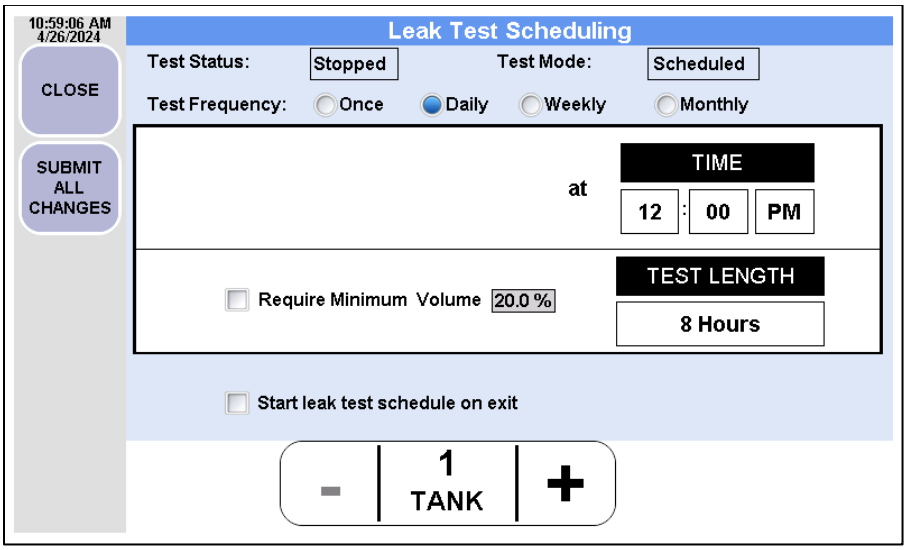
On <BLANK>: Allows the test to be run up to one week ahead. The example above shows the setting as On Sunday which would cause the TMS to begin the test on the next occurrence of Sunday at the specified time.

Time: Specify the time for the test to begin.

Require Minimum Volume: If a Minimum % Volume is required by the regulations, check the Require Minimum Volume box to enforce that requirement. The In-Tank Leak Test will NOT be performed if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.7).

Test Length: Specify the test length as required by the tank capacity, TMS certification, and local regulations.

Start Leak Test Schedule On Exit: Check this box, then tap Submit All Changes button on the left edge for the scheduling changes to take effect.



Test Frequency = DAILY

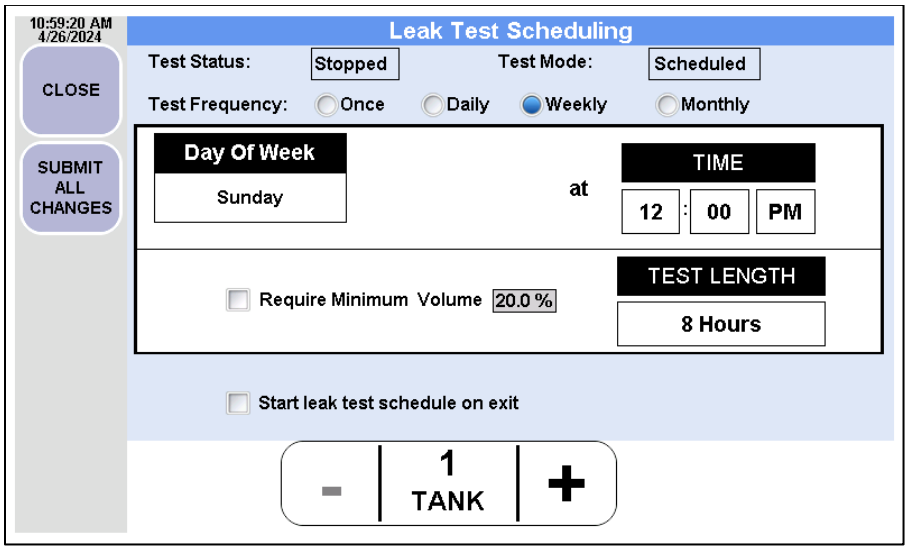
Selecting DAILY presents the options that apply for a daily in-tank leak test. This is typically used on tanks where there is concern that an actual leak or other unidentified loss may be present in order to quickly confirm the findings.

Time: Specify the time for the test to begin.

Require Minimum Volume: If a Minimum % Volume is required by the regulations, check the Require Minimum Volume box to enforce that requirement. The In-Tank Leak Test will NOT be performed if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.7).

Test Length: Specify the test length as required by the tank capacity, TMS certification, and local regulations.

Start Leak Test Schedule On Exit: Check this box, then tap Submit All Changes button on the left edge for the scheduling changes to take effect.



Test Frequency = WEEKLY

Selecting WEEKLY presents the options that apply for a weekly in-tank leak test. This is the most commonly chosen selection for monthly testing requirements. A Weekly Test Frequency ensures that there will be at least four testing opportunities during any calendar month to eliminate the need to reconfigure the TMS for an additional test due to a single test failure.

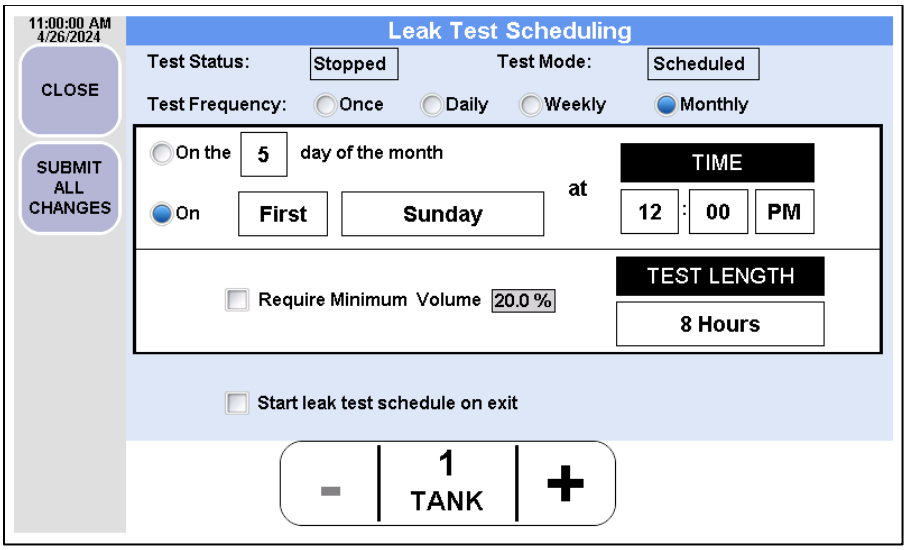
Day Of Week: Specify the day of the week that the test will be performed on.

Time: Specify the time for the test to begin.

Require Minimum Volume: If a Minimum % Volume is required by the regulations, check the Require Minimum Volume box to enforce that requirement. The In-Tank Leak Test will NOT be performed if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.7).

Test Length: Specify the test length as required by the tank capacity, TMS certification, and local regulations.

Start Leak Test Schedule On Exit: Check this box, then tap Submit All Changes button on the left edge for the scheduling changes to take effect.



Test Frequency = MONTHLY

Selecting MONTHLY presents the options that apply for a monthly in-tank leak test. This represents the minimum Test Frequency to satisfy monthly testing requirements. A Monthly Test Frequency is typically used with tanks that have consistently passed tests without a single false positive result.

On The <BLANK> Day Of The Month: Specify the date for each calendar month on which the test should be performed. Supported range is 1-28.

On <NTH> <BLANK>: An alternate way to define a monthly test. Specify the week and day of the week to perform the test. For example:

On First Sunday: Test is performed on the first Sunday of each month,

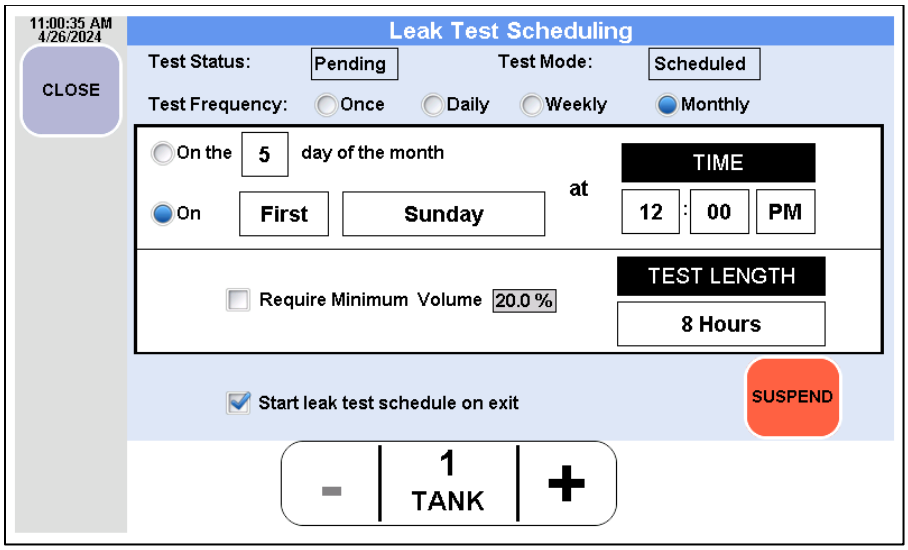
On Second Saturday: Test is performed on the second Saturday of each month,

Time: Specify the time for the test to begin.

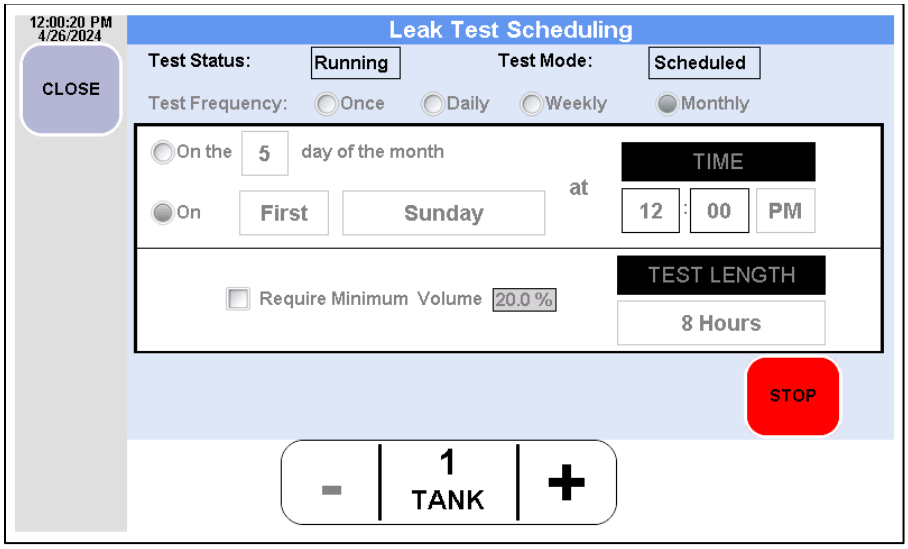
Require Minimum Volume: If a Minimum % Volume is required by the regulations, check the Require Minimum Volume box to enforce that requirement. The In-Tank Leak Test will NOT be performed if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.7).

Test Length: Specify the test length as required by the tank capacity, TMS certification, and local regulations.

Start Leak Test Schedule On Exit: Check this box, then tap Submit All Changes button on the left edge for the scheduling changes to take effect.

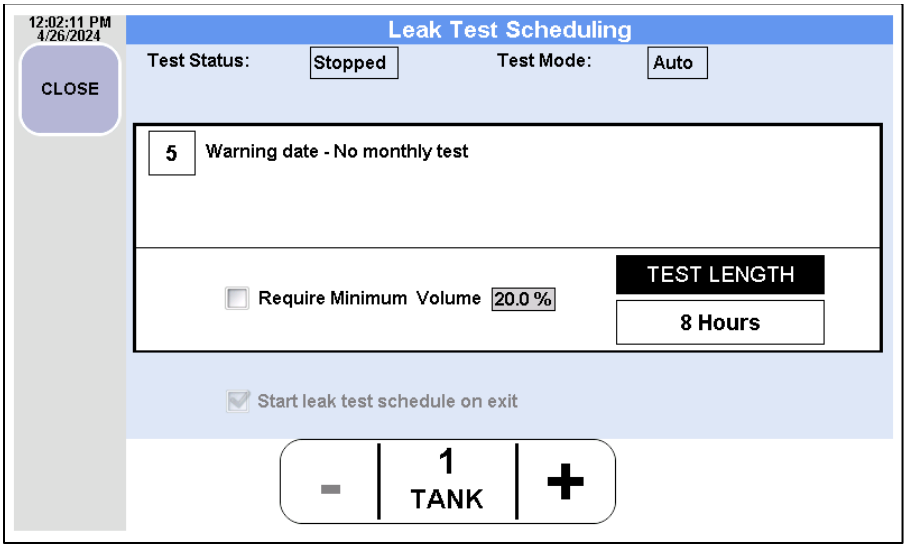


Tap **Suspend** button to prevent any future leak tests from being performed on the selected tank channel. The Test Status will change to **Stopped.**



Tap the **Stop** button to stop the current leak test and prevent any future leak tests from being performed on the selected tank channel. The Test Status will change to **Stopped.**

2.8.3 LEAK TEST SCHEDULING – AUTO

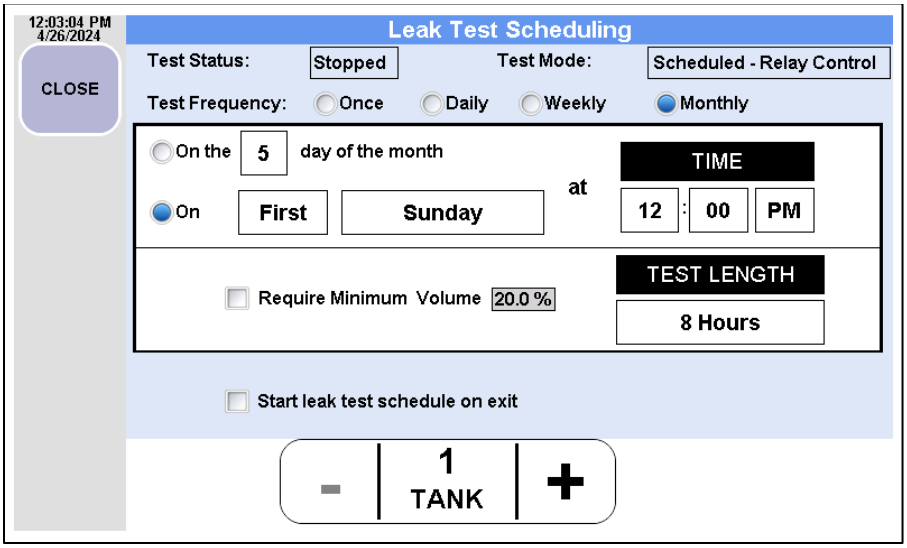


Auto Leak Test Mode accommodates applications where the tank is available to have fuel withdrawn 24 hours a day, 7 days a week. Due to the tank availability, it would be difficult to predict when to schedule an In-Tank Leak Test. The TMS will instead monitor the pump/generator activity through a CC Input, typically wired to the CS-10 Current Sensor or other dry contact signal provided by the pump/generator manufacturer. The TMS will attempt to complete an In-Tank Leak Test, once per month, that satisfies the criteria defined in the Auto Mode Pass/Fail setting (See Section 2.7). Once this criterion is met, no further attempts will be made for the remainder of the calendar month.

Require Minimum Volume: If a Minimum % Volume is required by the regulations, check the Require Minimum Volume box to enforce that requirement. The In-Tank Leak Test will NOT be performed if the percent volume is below this threshold. The percentage value is configured in the Setup/Config/Tanks/Leak Test menu (See Section 2.7).

Warning Date – No Monthly Test: Represents the date during the month (21 = 21st of every month) when a Warning will be issued if an In-Tank Leak Test has not yet been satisfactorily completed. It is recommended to set this value so as to have ample time for the remainder of the month to manually shut down the tank and perform an In-Tank Leak Test.

2.8.4 LEAK TEST SCHEDULING – SCHEDULED – RELAY CONTROL

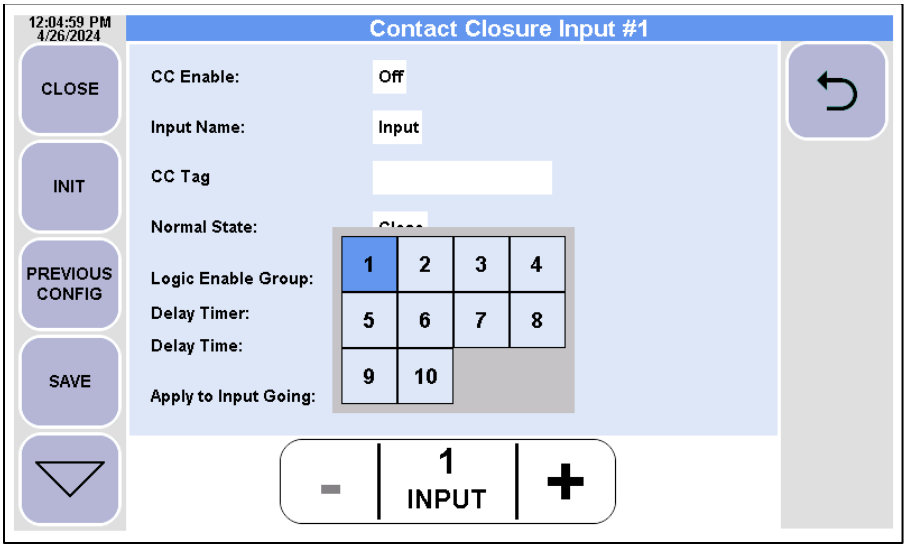


Scheduled – Relay Control is used in applications where a tank containing a magnetostrictive probe needs to be isolated from a manifolded tank set prior to beginning the In-Tank Leak Test. Isolating a tank from the manifolded set is required to perform an In-Tank Leak Test that is recognized by the EPA.

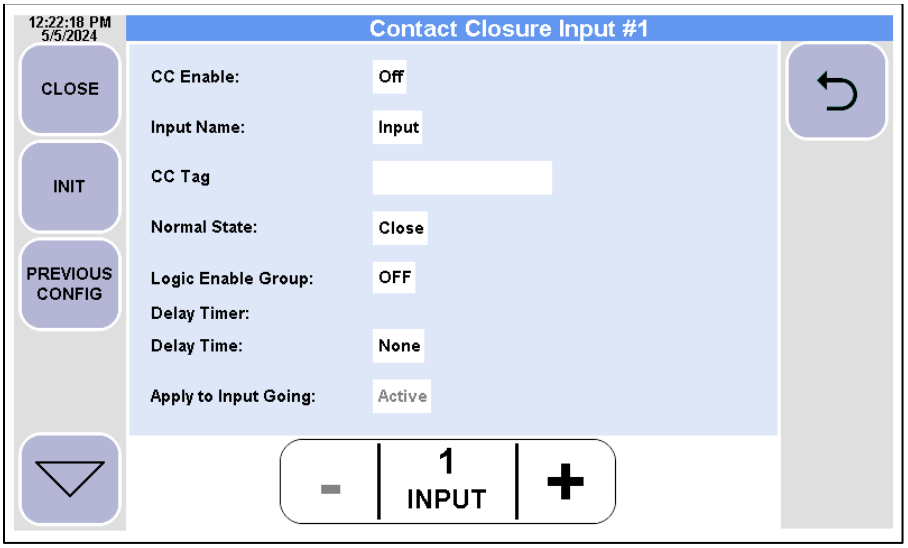
Up to three relays may be activated at the scheduled start time to isolate the tank. See Section 2.7 for details on configuring the relay outputs. Each relay would typically be connected to a siphon break valve. The In-Tank Leak Test would begin 15 minutes AFTER the Relay Outputs have activated thereby adding 15 minutes to the complete sequence required to perform the In-Tank Leak Test.

The scheduling options are identical to those for the Test Mode of Scheduled. See Section 2.8.2 for complete details.

2.9 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:

- Acknowledge: Returns all assigned Relay Outputs to their normal state. The most common application is in support of the Reset button for the RS2 (Normally Open).
- Alarm: Represents an alarm condition from an external device. This may be a separate Pneumercator system connected via Relay Output or third-party device via dry contact output.
- FP Horn Ack: Front Panel Horn Acknowledgement allows an external automation system to provide a dry contact signal for the purpose of silencing the integrated TMS horn.
- Gate: Creates a 2-condition logic AND gate between the CC Input and another TMS condition having a common relay assigned.
- Line Pass: Accepts a dry contact signal representing a passing Line Leak Test from select LS300 Line Leak console configurations. The first passing test per month is reported. All subsequent passing tests are ignored for the remainder of the month.
- Relay: Used as a control input in support of one of the following:
    - Activate relays: May support the RS2 Test button (Normally Open)
    - Auto Leak Test Mode: Accepts a signal that represents the pump/generator activity so the TMS can perform an In-Tank Leak Test during periods of inactivity. This may come from a CS-10 Current Sensor (Normally Open) or via dry contact signal provided by the pump or generator manufacturer.
    - LLP203 Catastrophic Line Leak: Accepts a signal that represents the pump/generator activity so the TMS can monitor the LLP beginning at the moment the activity stops. This may come from a CS-10 Current Sensor (Normally Open) or via dry contact signal provided by the pump or generator manufacturer.
- Trigger Group: This selection assigns a CC Input to a Trigger Group letter. This feature allows the TMS to select the pump for the tank with the greatest volume within a set of two tanks. Refer to separate Tank Auto Select instructions for details.

CC Tag: Supplemental information visible in the configuration that can be used to provide additional details about the purpose of the CC Input.

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

Normal State: Specify the Non-Alarm or Inactive State for the device connected to the CC Input. Note that both the RS2 and CS10 are Normally Open devices.

Advanced Settings:

Logic Enable Group: A logical AND gate where the inputs to the AND gate are all CC Inputs assigned to the same Logic Enable Group letter.

Advanced Settings – Delay Timer: The following settings are used to create a delay in the TMS response to a change in the CC Input State. This delay may be applied to the status either going active or inactive.

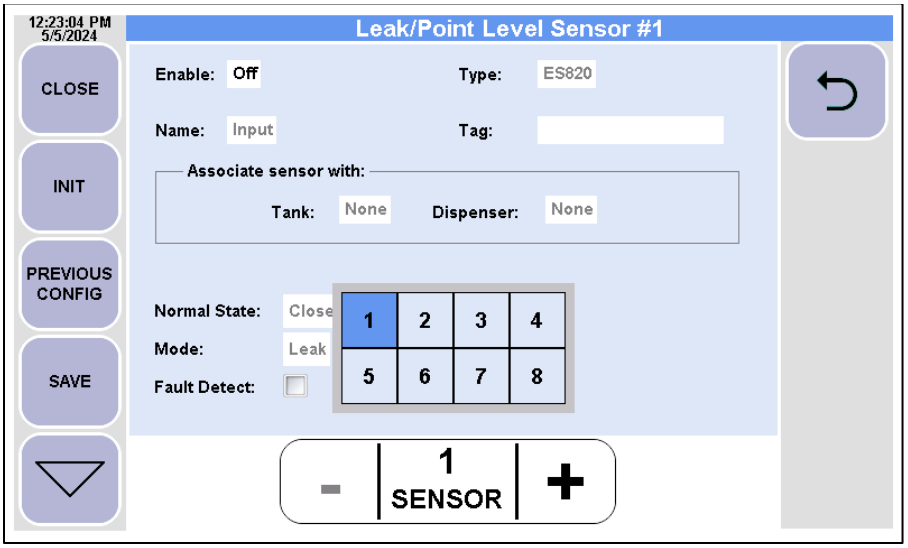
Delay Time: The length of the delay may be 2, 5, 10, or 20 seconds.

Apply To Input Going: The delay may be applied to the CC Input activating or deactivating.

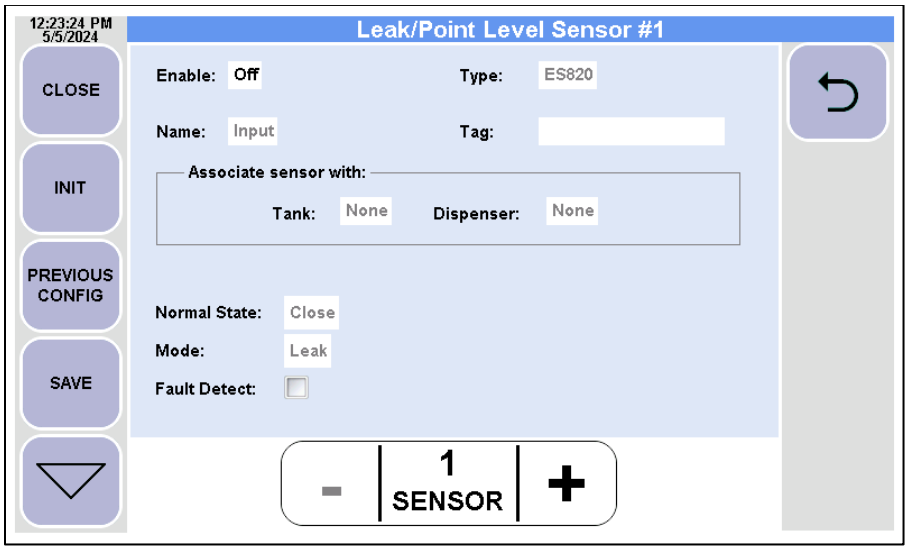
Delay Timer Example:

Delay Time: 10 seconds
Apply To Input Going: Active
When the signal connected to the CC Input activates, the TMS will NOT consider the CC Input active until 10 seconds later.

2.10 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. Touch the Sensor Input number on the table to make a selection.



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

Associate Sensor With: Helps to locate a sensor by associating it with a tank or dispenser. When combined with a descriptive Name and/or Tag, can pinpoint the sensor location.

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 a relay from also activating on this condition.

Fault Detect: Must be selected for sensors with integrated fault detection circuitry as indicated by the F suffix.

Mode: Specify whether the Sensor is used for secondary containment (Leak) or Point Level Monitoring (Other). The integrated horn will beep faster for Leak Sensors. Any alarm will indicate the difference between Leak and Point Level (High/Low) conditions.

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

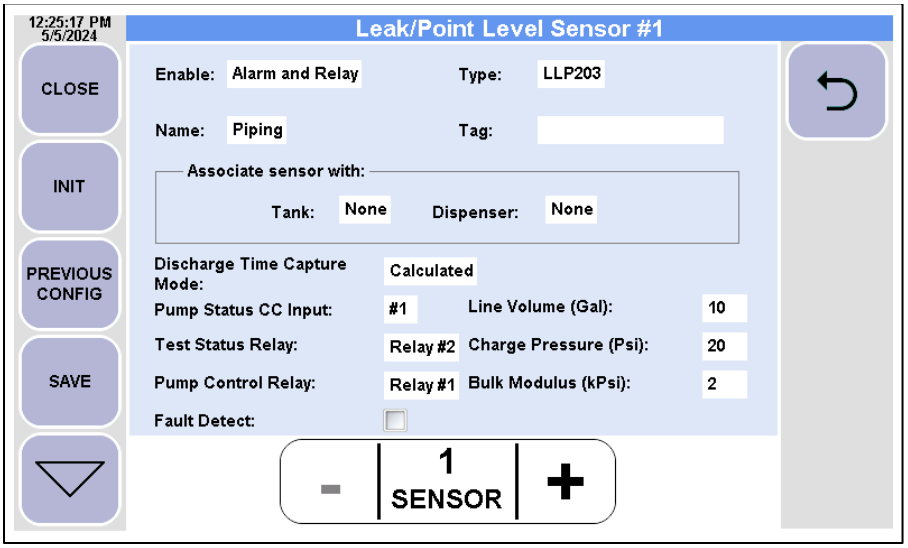
Normal State: Specify the normal contact state of select sensor models, open or closed. Many models are predefined due to their design.

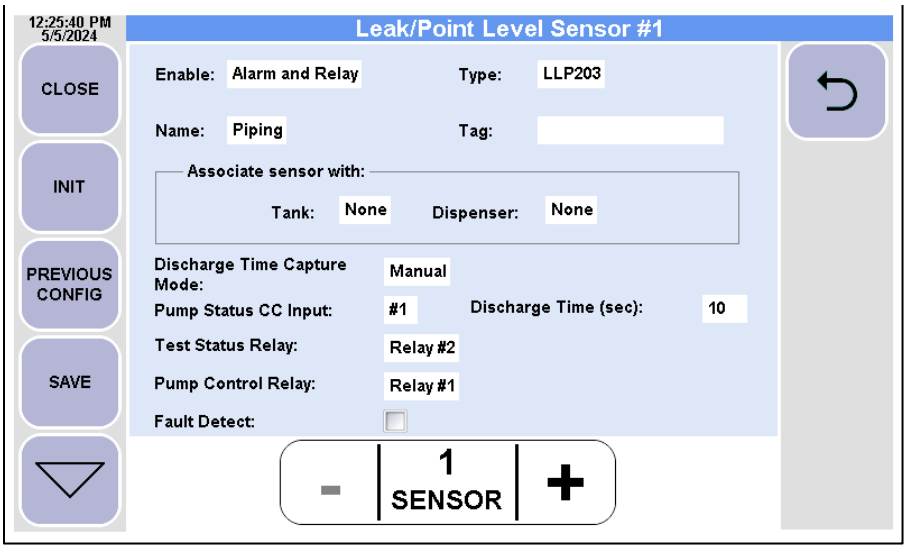
Tag: Supplemental information visible in the configuration that can be used to provide additional details about the purpose and/or location of the Sensor.

Type: Enter the model number of the sensor connected to the TMS. Refer to the separate Instruction documentation for Sensor-specific instructions as listed below:

ES825-100: Bulletin 142
ES825-200: Bulletin 143
HS100D2 (Well): Drawings 50360, 50411
HS100ND (Leak): Drawing 50390
LLP203: LLP203 Instruction Manual
LS600 (Point Level): Bulletin 193
LS600LD (Leak Detection): Drawing 10452
LS600LD-T (Tamper-Resistant, Leak): Dwg 10452
LS610: Drawing 10455
RSU800: Bulletin 153
RSU801: Bulletin 156

2.10.1 SENSOR INPUTS – LLP203 SETTINGS





REFER TO LLP203 INSTRUCTION MANUAL REGARDING INSTALLATION, WIRING, LLP203 SPECIFIC SETTINGS, AND AUTO CAPTURE PROCEDURE

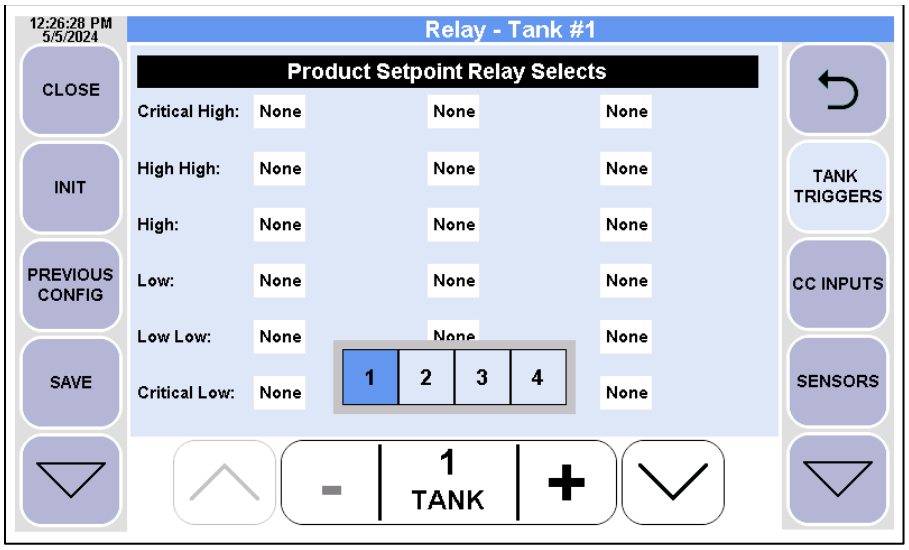
The LLP203 settings shown are affected by the Discharge Time Capture Mode and 3GPH Line Leak Mode

	Discharge Time Capture Mode			3GPH Line Leak Mode	
Setting	**Auto**	**Calculated**	**Manual**	**Hourly**	**Pump Off**
Bulk Modulus		X		X	X
Charge Pressure		X		X	X
Discharge Time			X	X	X
Line Volume		X		X	X
Test Status Relay	X	X	X	X	X
Pump Control Relay	X	X	X	X	
Pump Status Contact Closure Input	X	X	X	X	X

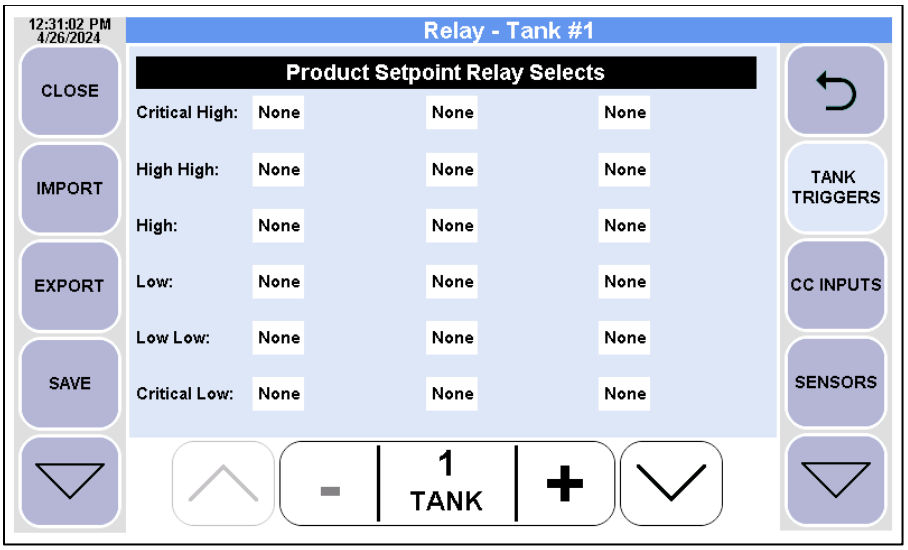
2.11 RELAYS

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

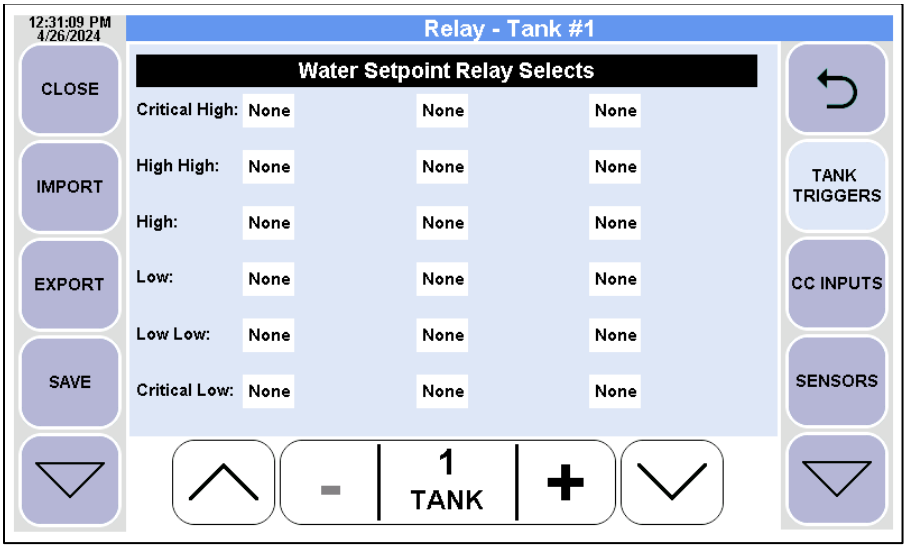
2.11.1 RELAYS – TANK TRIGGERS



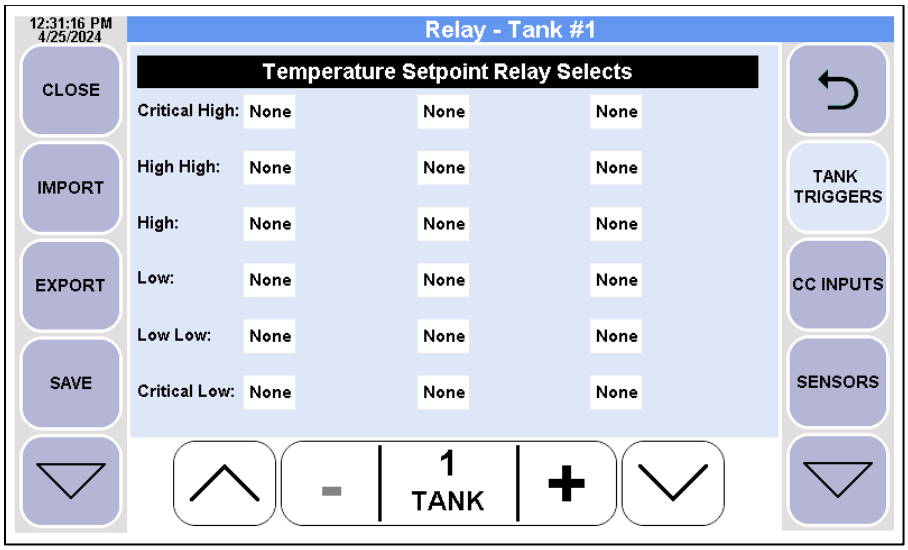
Touch the +/- buttons to increment Tank Channel by 1. Touch the Tank Channel number to bring up a list of possible Tank Channels. Touch the Tank Channel number on the table to make a selection.



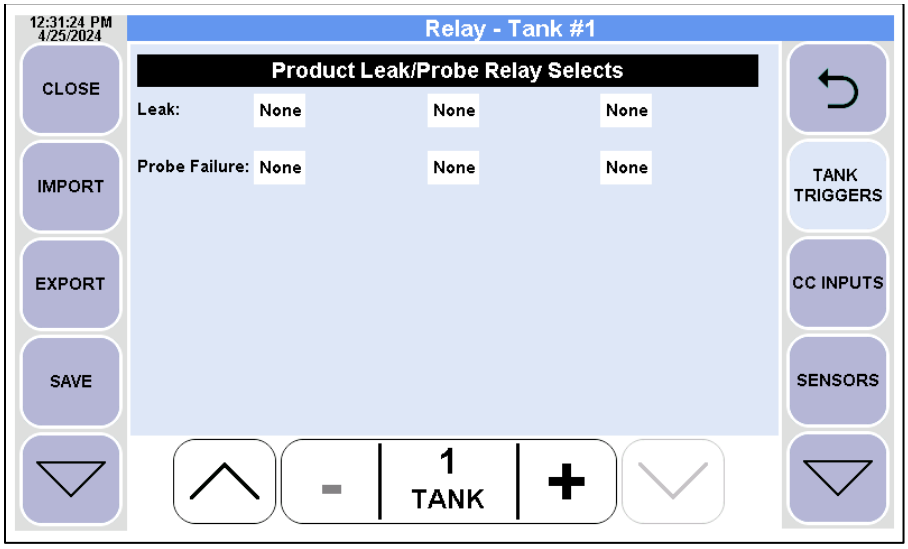
Relay assignments for Product SetPoints.
Use Down Arrow (to the right of Plus button) to access Bottom Water SetPoints, Temperature SetPoints, failure of an In-Tank Leak Test (Leak), or Probe Failure Relay Selects



Relay assignments for bottom Water SetPoints.
Use Up Arrow (to the left of Minus button) to access Product SetPoint Relay Selects
Use Down Arrow (to the right of Plus button) to access Temperature SetPoint, failure of an In-Tank Leak Test (Leak), or Probe Failure Relay Selects

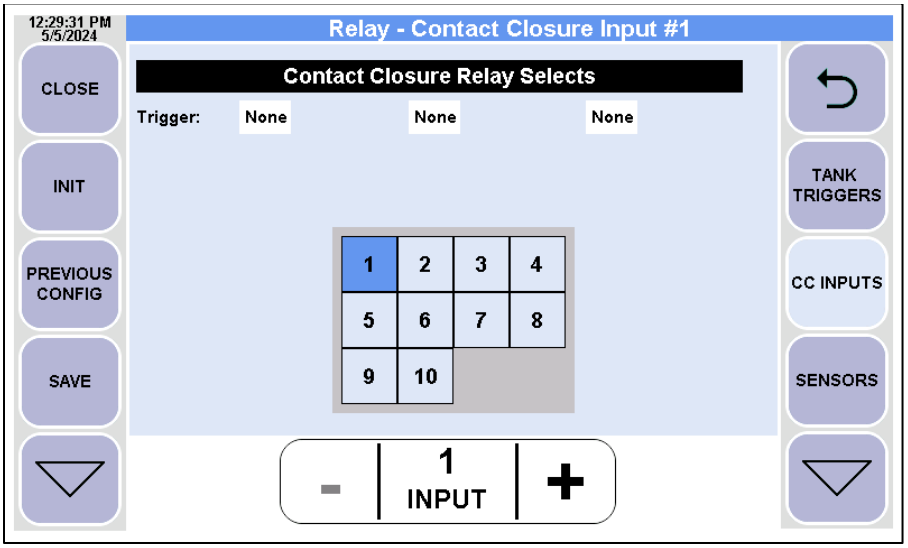


Relay assignments for Temperature SetPoints.
Use Up Arrow (to the left of Minus button) to access Product and Bottom Water Relay Selects
Use Down Arrow (to the right of Plus button) to access failure of an In-Tank Leak Test (Leak), or Probe Failure Relay Selects

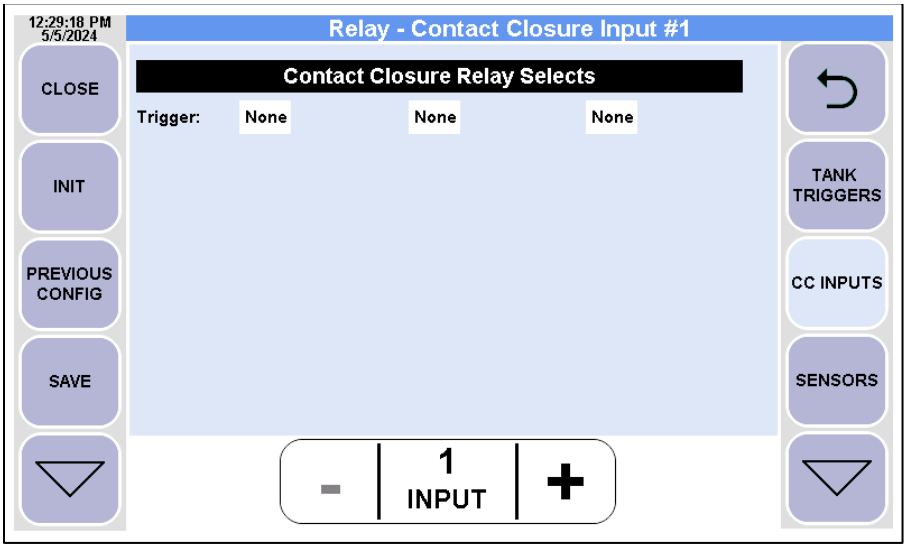


Relay assignments for failure of an In-Tank Leak Test (Leak), or Probe Failure.
Use Up Arrow (to the left of Plus button) to access Product SetPoint, Bottom Water SetPoint, and Temperature SetPoint Relay Selects

2.11.2 RELAYS – CC INPUTS

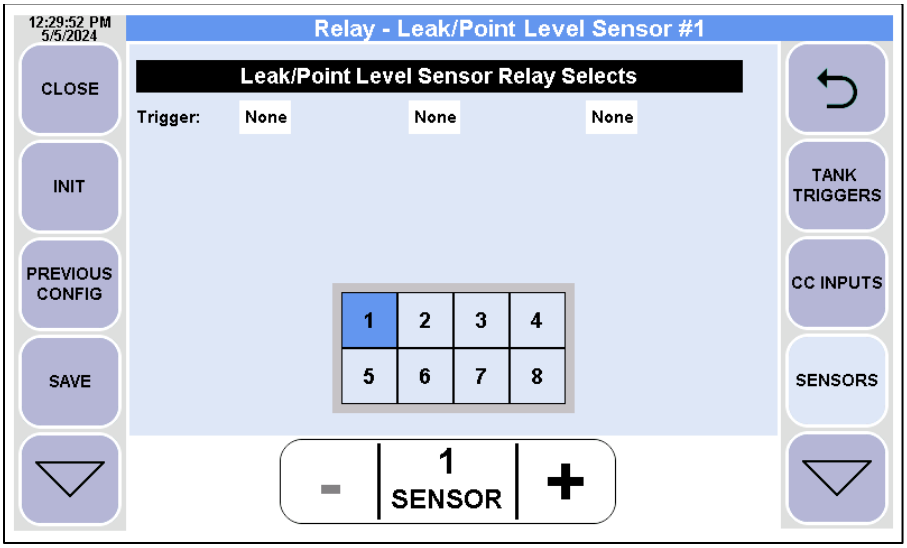


Touch the +/- buttons to increment CC Input by 1. Touch the CC Input number to bring up a list of possible CC Inputs. Touch the CC Input number on the table to make a selection.

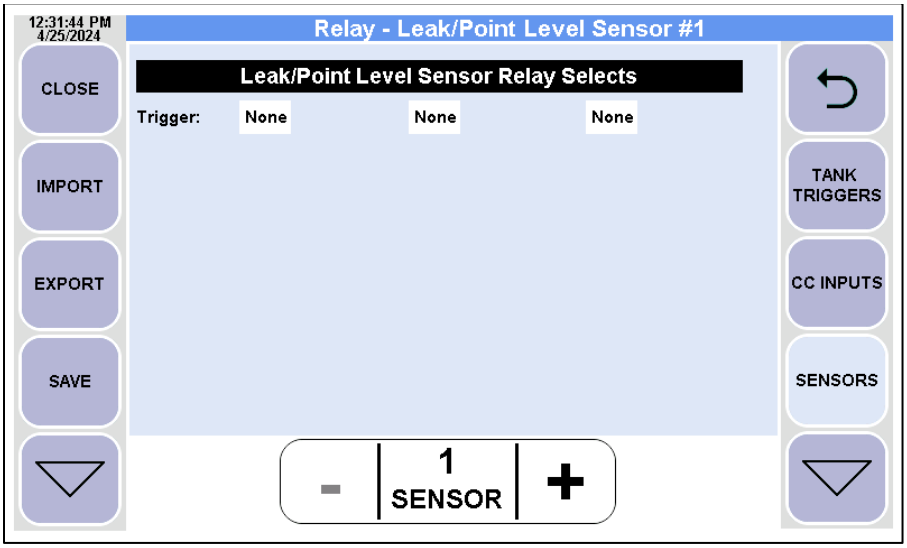


Relay assignments for the Non-Hazardous Contact Closure (CC) Inputs.

2.11.3 RELAYS - SENSORS

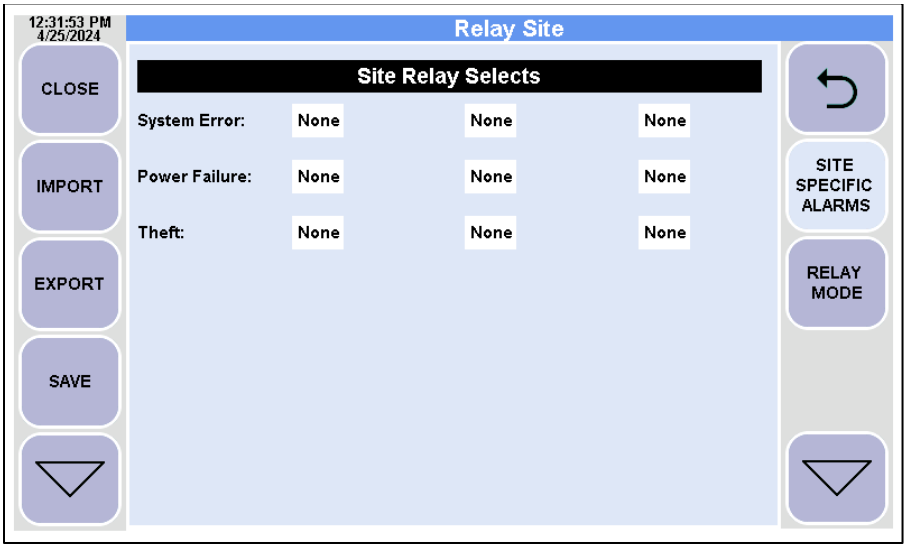


Touch the +/- buttons to increment Sensor Input by 1. Touch the Sensor Input number to bring up a list of possible Sensor Inputs. Touch the Sensor Input number on the table to make a selection.



Relay assignments for the Leak/Point Level Sensor Inputs.

2.11.4 RELAYS – RELAY SITE



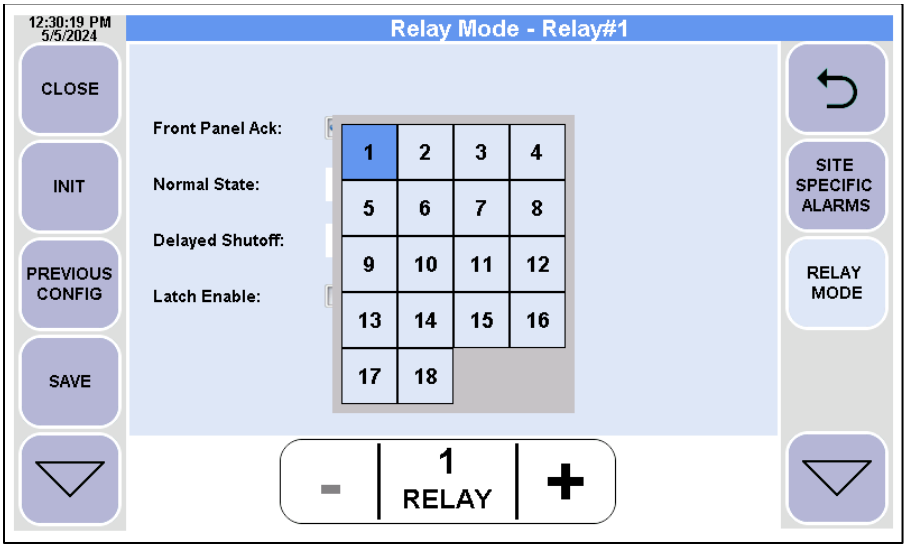
Represents site specific conditions that include System Errors, Power Failure, and Theft. The details are as follows:

- **System Error:** Includes Probe Timeout, Probe Sync, and Sensor Fault Error conditions.

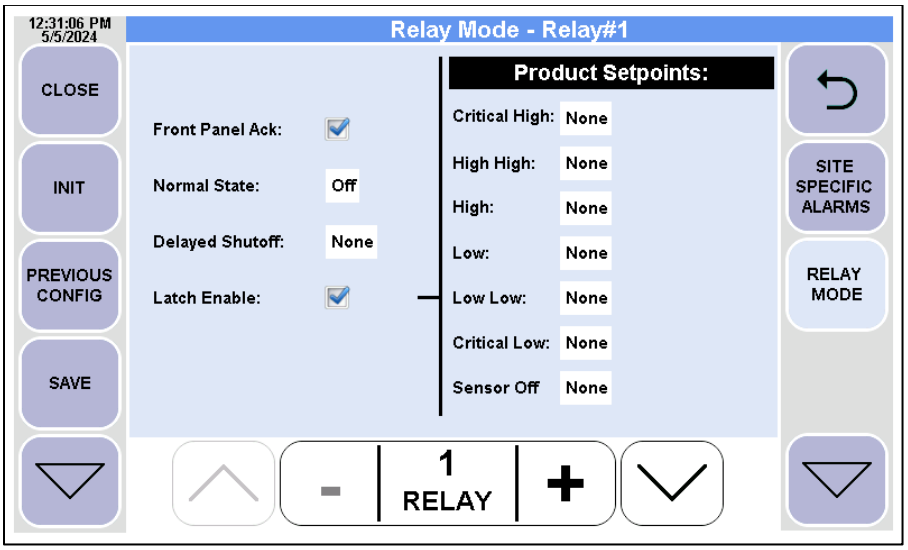
- **Power Failure:** A relay will activate once power has been restored to the TMS.
  Note: For applications requiring notification the moment the Power Failure occurs, set the Normal State in the Relay Mode screen to ON for any otherwise unassigned relay.

- **Theft:** A theft condition detected for ANY tank will activate a relay output.

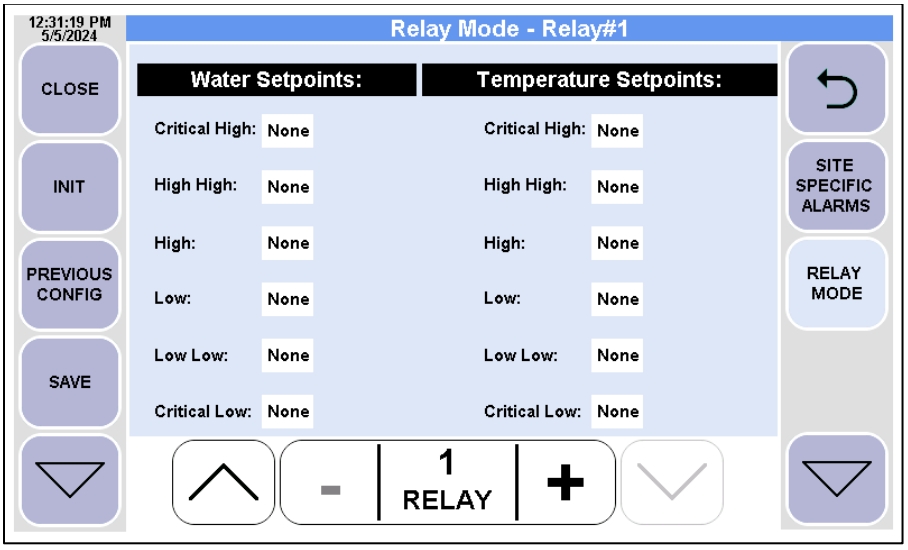
2.11.5 RELAYS – RELAY MODE



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.



Delayed Shutoff: Returns the relay to its normal state after the specified number of minutes. Selecting None disables this feature.

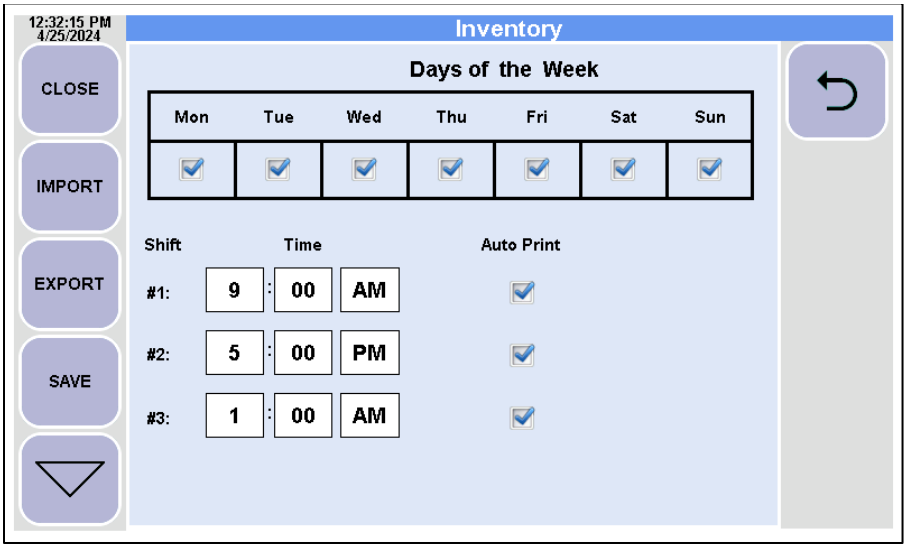
Front Panel Ack: Acknowledges a relay by returning it to its normal state, as defined in the Normal State setting below, after tapping the corresponding Alarm Acknowledgment button on the Current Alarms screen.

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.

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 assigned conditions represent the Latch On condition for the relay. Separate conditions would be defined as the latch off conditions as follows:

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

2.12 INVENTORY



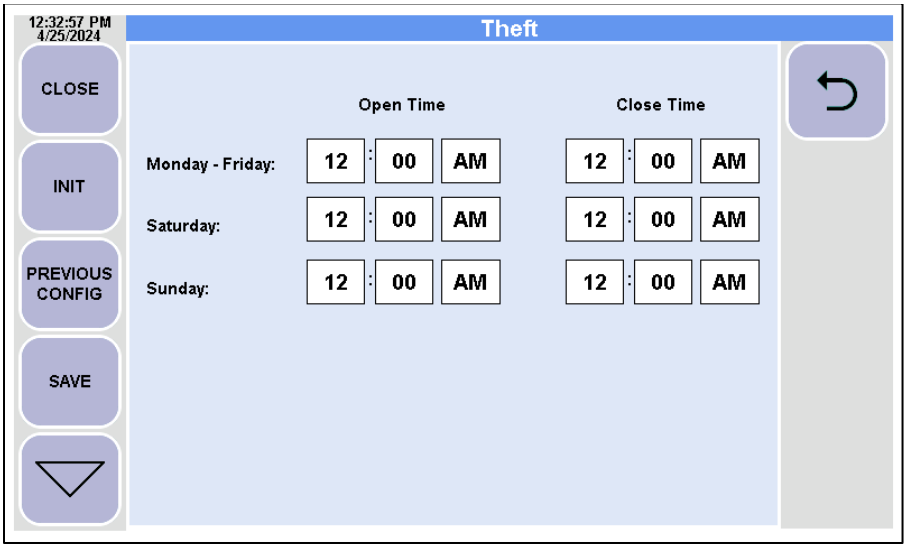
When enabled, the TMS will document inventory snapshots to the Inventory Report, for each unique time listed for the specified days of the week. These snapshots are typically used as Shift Reports.

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

Inventory Log Times: The TMS will create a snapshot for every unique time shown above. If only one or two snapshots daily are required, confirm that only one or two unique times are listed above. For example, if all three Log Times were configured for midnight (12:00 AM), a daily snapshot would occur at midnight for every day of the week checked. By changing one of the three times to 12:00PM, two snapshots would be recorded per day of the week checked: one at midnight and one at noon.

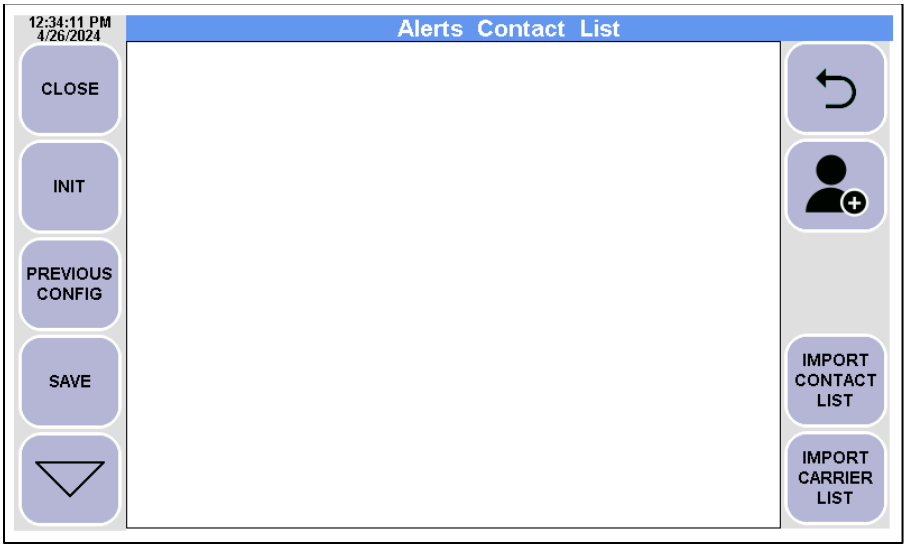
Each snapshot can generate a printout on the TMS by checking the appropriate box.

2.13 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 allow theft monitoring when the facility is closed. See Section 2.3 for enabling theft monitoring per tank.

2.14 SMS E-MAIL

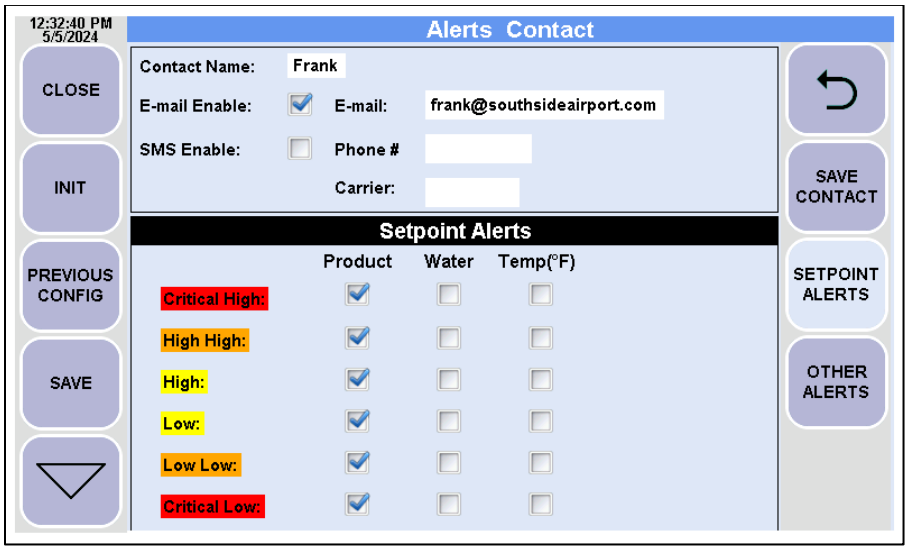


The SMS E-Mail feature will notify users, based on individually defined criteria, via e-mail or text message (SMS). The notifications may include Alarms, Events, or other select information.

Tap on the Add Contact button on the right toolbar to create a new Contact.

Import Contact List: A previously exported contact list may be imported from a USB Flash Drive. This list includes all contacts and criteria to generate an e-mail or SMS message at the time of the export.

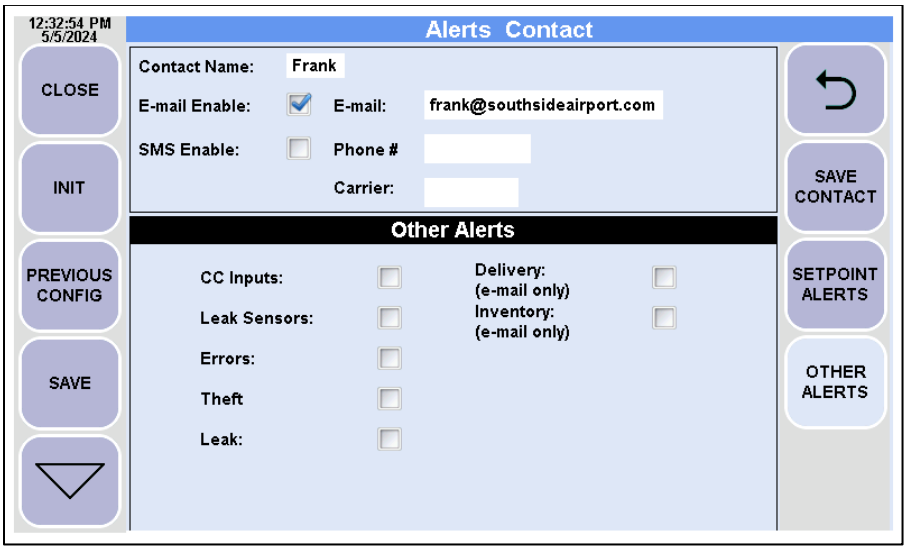
Import Carrier List: The carrier list is updated by Pneumercator as new carriers, or cellular service providers, are added or removed or their messaging settings change. Please contact Pneumercator Technical Support at (800) 209-7858 if you cannot find your carrier on the list or are not receiving messages from your carrier.



The above screen shows an E-mail contact created for Frank. An E-Mail Alert will be sent when any Product SetPoint or Leak/Point Level Sensor activates. To enable Text Messaging (SMS) Alerts, check the SMS Enable checkbox, enter the mobile phone number, and select the Cellular Service Provider (Carrier) for the Cell Phone being contacted. Tap **Save Contact** to save a new contact. Tap **Save** to save all changes including Contacts and other Configuration changes.

The Alerts that may be sent via SMS/E-Mail include:

SetPoint Alerts: Includes Product, Bottom Water, and Temperature SetPoints. The rows represent Critical High, High High, High, Low, Low Low, and Critical Low thresholds.



Other Alerts:
CC Inputs: Contact Closure Input Alarms. Note that CC Inputs are present on most Relay Card options.

Leak Sensors: Includes all Point Level and Leak Sensor Alarms.

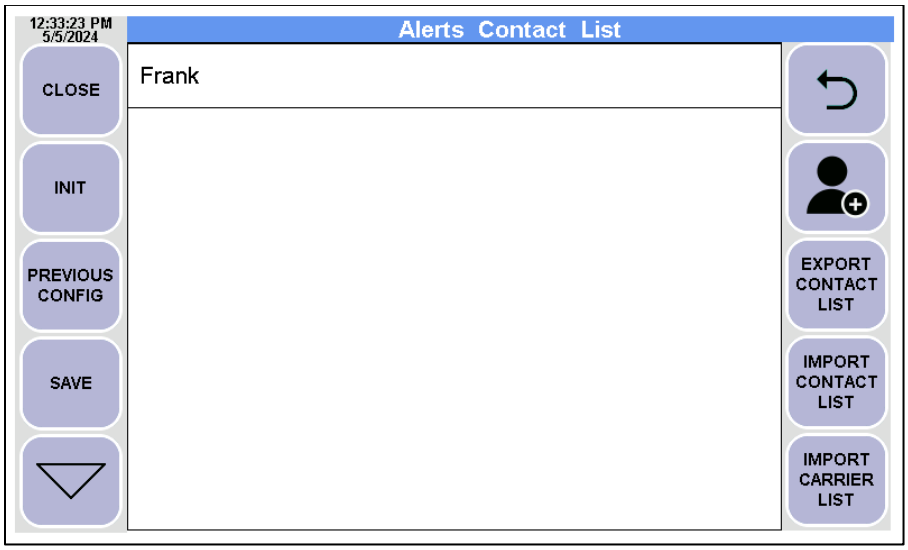
Errors: Represents all System Errors including Probe and Sensor Errors.

Theft: Theft of Product from a Tank.

Leak: Failed In-Tank Leak Test

Delivery (E-Mail Only): E-Mails a Delivery Receipt upon completion of any Product Delivery.

Inventory (E-Mail Only): E-Mails an Inventory Report for every scheduled Inventory Snapshot.

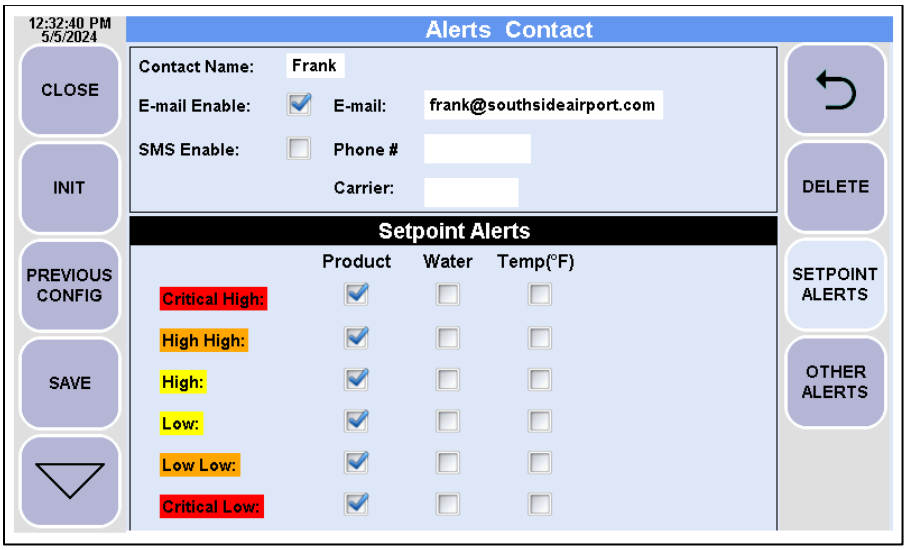


The above screen shows a New Contact created for Frank. Tap on an existing contact name to make modifications to the contact settings or to Delete the contact. Tap on the Add Contact button on the right toolbar to create additional new Contacts. Tap the **Save** button to complete all changes.

Export Contact List: Export the complete Contact List, including all recipients and messaging criteria, to a USB Flash Drive.

Import Contact List: A previously exported contact list may be imported from a USB Flash Drive. This list includes all contacts and criteria to generate an e-mail or SMS message at the time of the export.

Import Carrier List: The carrier list is updated by Pneumercator as new carriers, or cellular service providers, are added or removed or their messaging settings change. Please contact Pneumercator Technical Support at (800) 209-7858 if you cannot find your carrier on the list or are not receiving messages from your carrier.

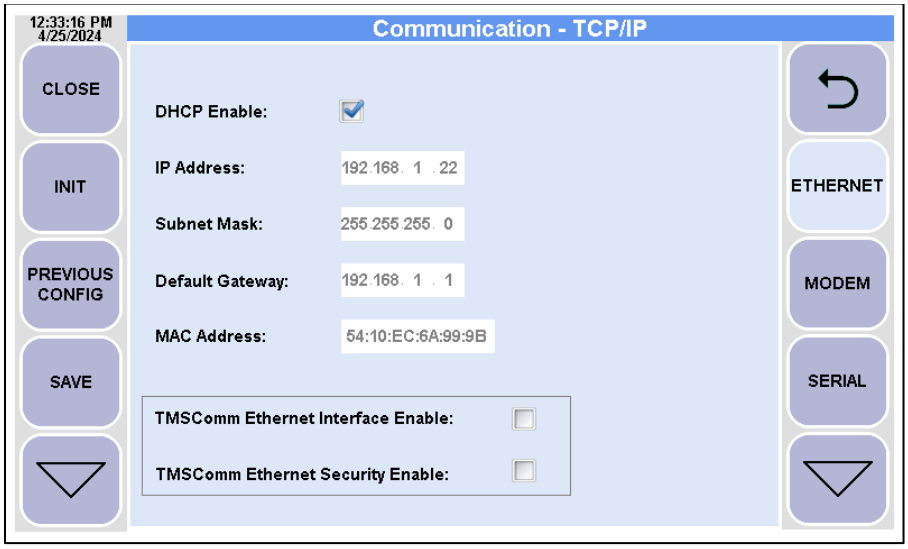


Modify the contact, as needed. Tap the Back Arrow button in the Top Right corner to return to the list of contacts. Tap Delete to delete the displayed contact.

2.15 COMMS

The communications section is divided into five categories as represented by the tool bar on the right edge of the below screen.

2.15.1 ETHERNET



Note: Consult with site IT staff to determine the values for the next four settings.

DHCP Enable: Stands for Dynamic Host Control Protocol. DHCP is a feature managed by a DHCP Server Used for automatically assigning IP Addresses to any Network Card. The TMS is considered a DHCP Client. Note that the IP Address, Subnet Mask, and Default Gateway will be visible, but grayed out. These values, which cannot be changed, represent the information the TMS received from the DHCP Server.

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.
Note: The TCP Port Number is fixed at 10001

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.

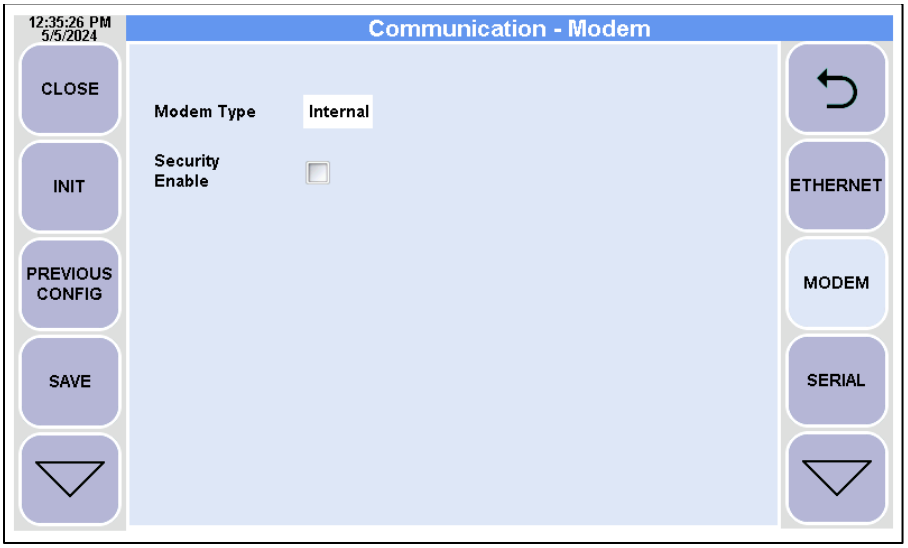
Default Gateway: A unique address that identifies where responses are sent through when a request is sent from outside of the network. The Default Gateway consists of four octets separated by decimal points that can each range from 0-255.

MAC Address: A unique hardware identifier used to identify the TMS on the network.

TMSComm Ethernet Interface Enable: When checked, enables TMSComm access over Network. This does NOT disable the Network Interface for PCO CloudView or messaging.

TMSComm Ethernet Security Enable: Requires a 6-digit numeric Access Code, default of all zeroes (000000), that is prepended to any command issued to the TMS.

2.15.2 MODEM



Internal Modem Selected

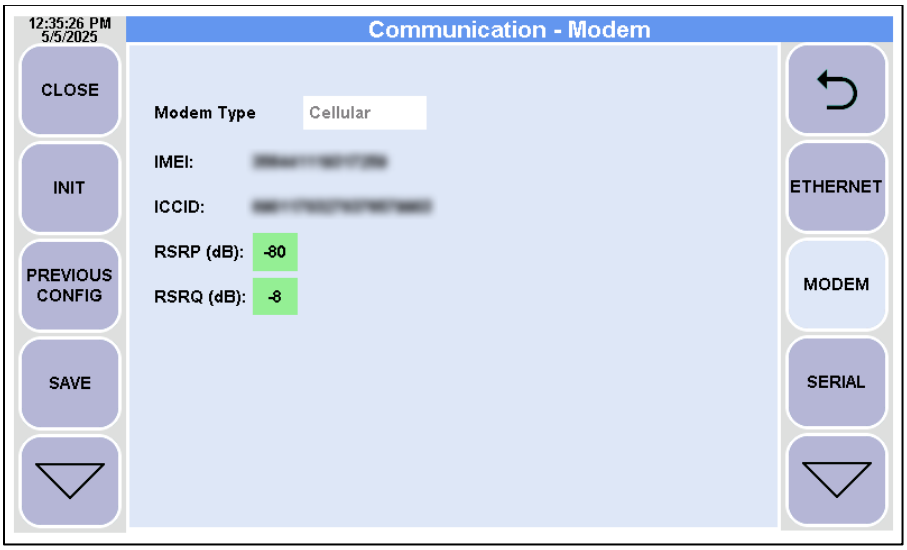
Modem Type: Choices are as follows:

- None: No Modem or Serial C expansion card installed
- Internal: Supports 900433-x Internal Data Modem
- Serial C: Supports the 900571-2 RS-232 Communications Expansion Card

Note: Cellular is displayed automatically when the optional Cellular Modem is installed. See next page for cellular-specific details.

Security Enable: Requires a 6-digit numeric Access Code, default of all zeroes (000000), that is prepended to any command issued to the TMS.

Note: Only visible if Modem Type set to Internal



Cellular Modem detected

IMEI: Unique identifier for the cellular modem

ICCID: Unique identifier for the SIM Card.

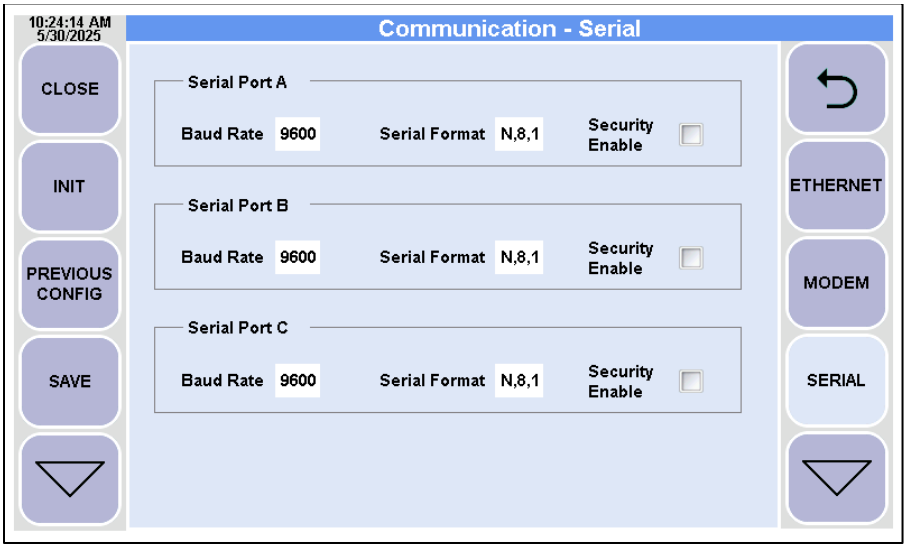
RSRP: A measurement of Signal Power. Both a numeric value, in decibels, and color are provided. The colors represent the following:

- Green: Excellent
- Yellow: Good
- Orange: Fair
- Red: Weak

RSRQ: A measurement of Signal Quality. Both a numeric value, in decibels, and color are provided. The colors represent the following:

- Green: Ideal
- Yellow: Satisfactory
- Red: Poor

2.15.3 SERIAL

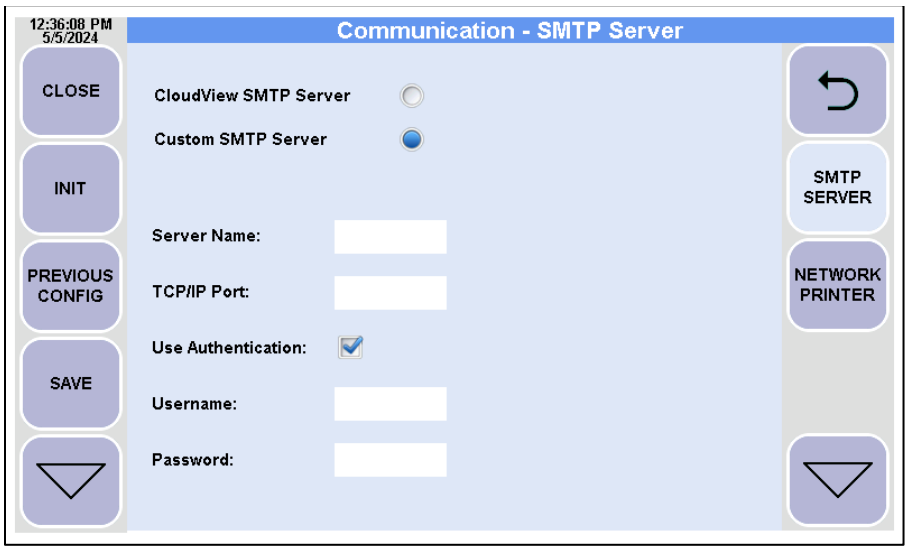


Each individual Serial Port can be configured for the following settings with the defaults shown above:

- **Baud Rate:** Connection speed required to communicate with the attached device
- **Serial Format:** Presented in the industry-standard 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, default of all zeroes (000000), that is prepended to any command issued to the TMS.

Note: Serial Port A & B are integrated onto the Processor Card of the TMS4000M. Serial C is an optional port used by the 900571-2 RS-232 communications expansion card. The 900571-2 must be enabled as a Modem Type of Serial C as detailed on the previous page.

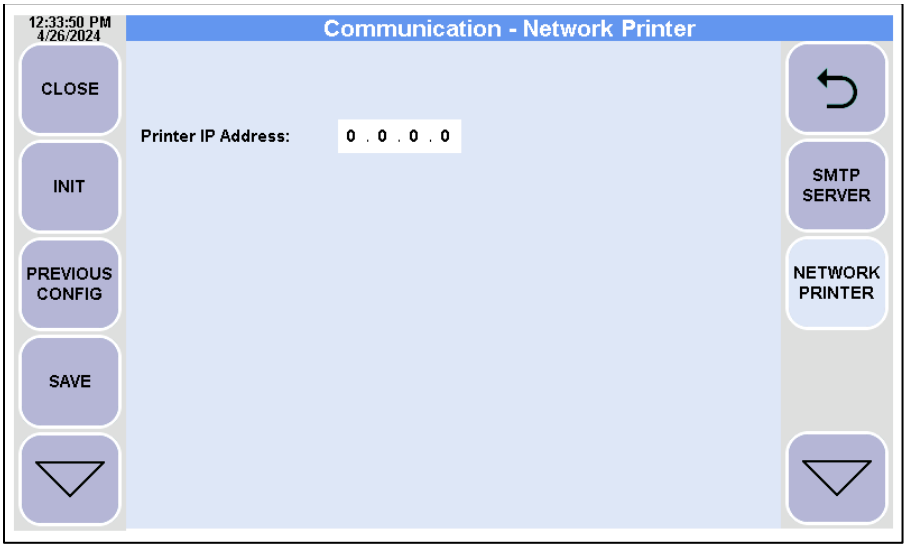
2.15.4 SMTP SERVER



The SMTP Server is responsible for accepting E-Mail and SMS messages from the TMS4000M so that it can be delivered to the appropriate address. If the TMS4000M has been registered with the PCO CloudView service, then the PCO CloudView SMTP Server must be selected. Otherwise, contact your E-Mail Administrator for the Server Name and TCP/IP Port required to send E-Mail.

Note: Many SMTP Servers require Authentication in order to prevent unauthorized use and help reduce the amount of E-Mail spam sent over the internet. If your E-Mail provider requires Authentication, check the Use Authentication checkbox and enter your credentials in both the Username and Password boxes.

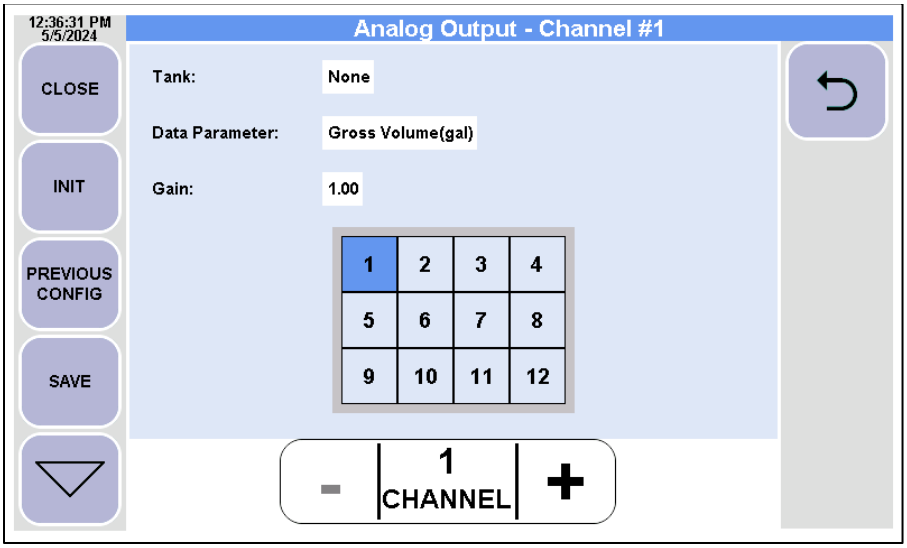
2.15.5 NETWORK PRINTER



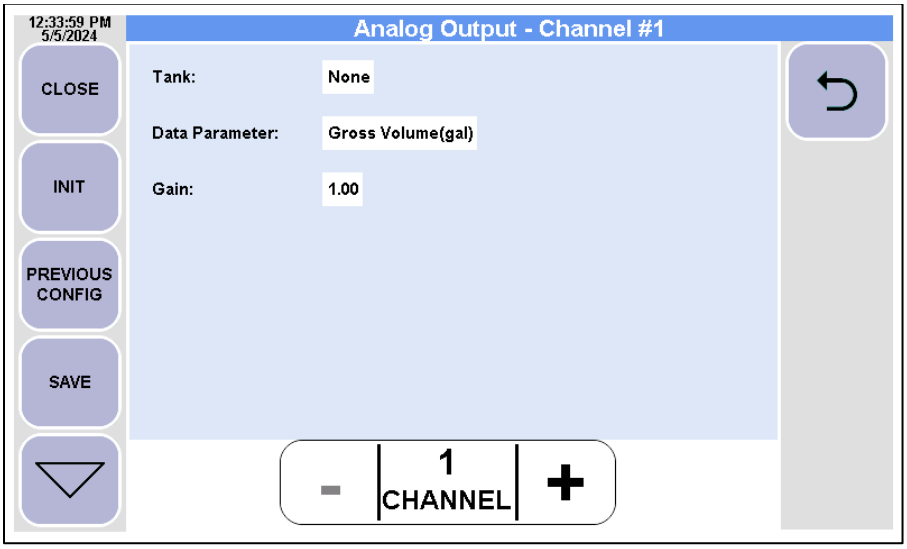
A TMS4000M connected to a TCP/IP Network may use a Network accessible Printer to output any of its Reports. Enter the IP Address for the Network Printer as shown on the above screen.

The Network Printer may be selected as the default printer used for all TMS-Generated Reports (see Section 2.2) and may also be manually selected for any User-Generated Reports.

2.16 ANALOG OUTPUTS



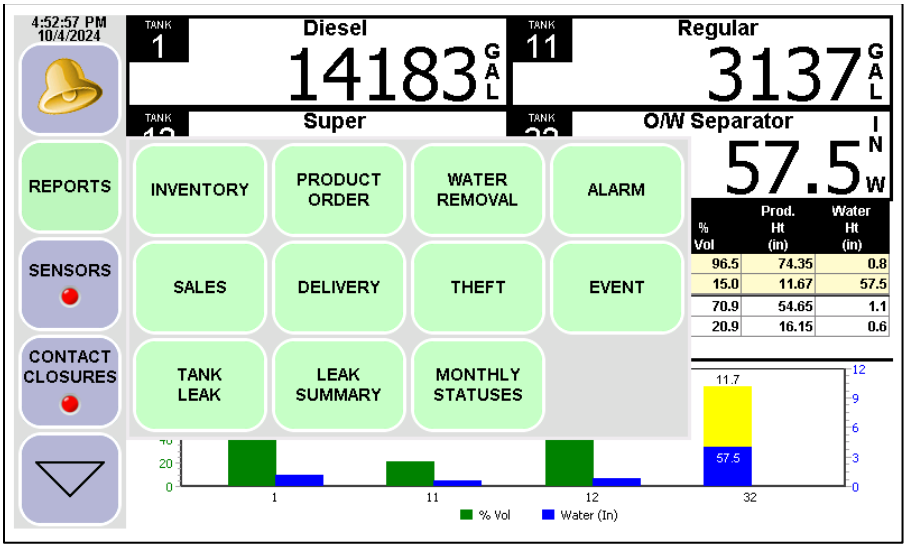
Touch the +/- buttons to increment Analog Output Channel by 1. Touch the Analog Output Channel to bring up a list of possible Analog Output Channels. Touch the Analog Output Channel on the grid to make a selection.



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 corresponding Bulletin for complete details.

SECTION 3 SYSTEM REPORTS

3.1 OVERVIEW

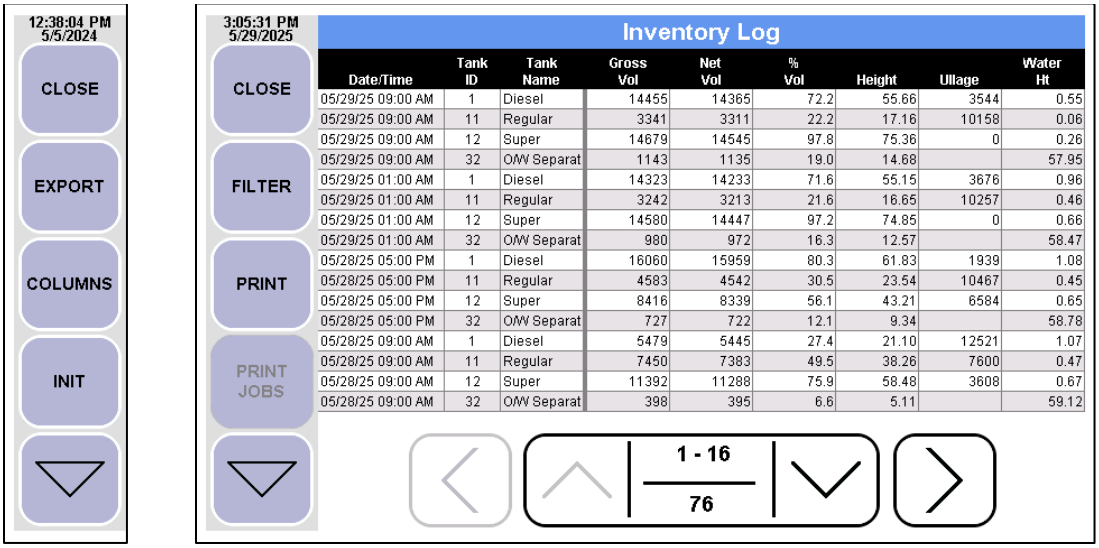


The Reports available in the TMS4000M include the 11 reports displayed above and a System Events Log found in the Setup menu. Unless otherwise specified, any report may be printed to an external USB printer, network printer, or a PDF File on a USB Flash Drive or exported to a USB Flash Drive in CSV format by touching the Export button. The CSV (Comma Separated Values) file may be opened using most spreadsheet or word processing programs. See Section 1.1.1 for location of USB Port. The description for each log is as follows:

- **Alarm:** Alarms for Tank SetPoints for Product, Water, and Temperature. Also includes CC Input and Sensor alarms.
- **Delivery:** The delivery or addition of fuel to the tank.
- **Event:** Probe and Sensor errors, Power Fail, and problems regarding Leak Tests, excluding completed failed tests
- **Inventory:** Scheduled Inventory snapshots as defined in the Configuration. Refer to Section 2.12 for additional details
- **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.
- **Monthly Statuses:** Generated on the first of every month, indicating current inventory and alarm statuses.
- **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
- **Sales:** Bulk sales representing the sale or withdrawal of fuel from a tank. See Section 2.2 to enable.
- **Tank Leak:** Completed In-Tank Leak Test Results
- **Theft:** Unauthorized removal of fuel from the tank. Refer to Section 2.13 for additional details.
- **Water Removal:** Indicates the water removed from below the fuel surface in the tank.

- **System Events (Export to CSV Only)** (Located in SETUP menu)**:** Include select Security Events and hardware or software failures of the TMS4000M.

3.2 INVENTORY



The Inventory Report represents Shift Reports or other scheduled Inventory Snapshots. The TMS may be configured so that these snapshots occur up to three times per day. See Section 2.12 for complete details.

The panel at the bottom center shows the record numbers being viewed (**1-16** shown above represents records numbers **one through sixteen**), total number of records (**76**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the Inventory data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Inventory Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display. If more columns are selected than fit on the display, use the left and right arrows at the bottom of the screen to navigate between pages of columns.

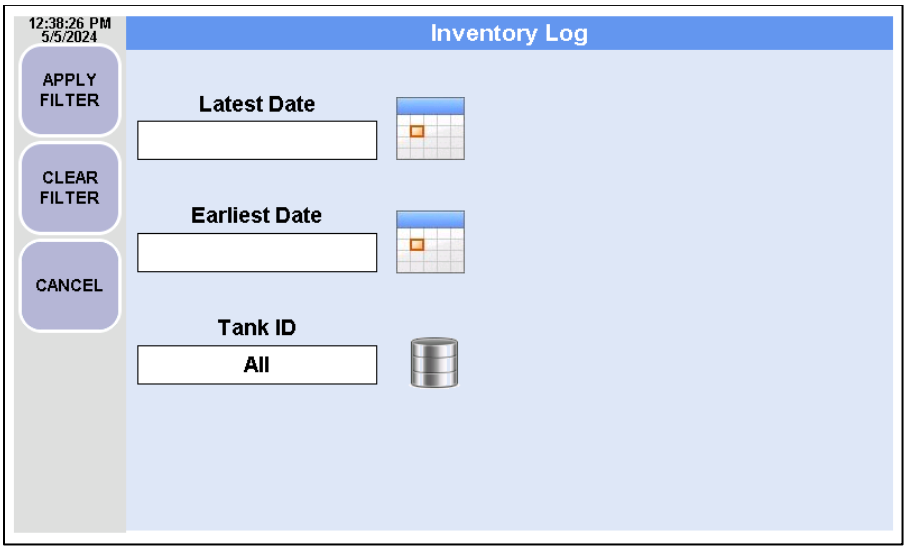
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

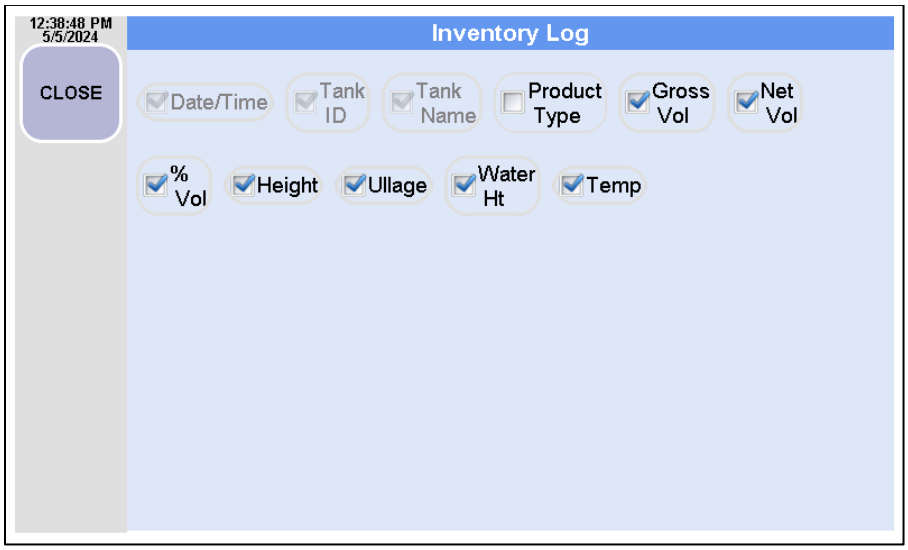
Filter: Provides the ability to filter the data based on a range of dates and/or Tank ID.

Init: Initialize or erase the Inventory Report.

Print: The Print function provides the ability to filter by Date and/or Tank ID as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter options include defining a date range and/or specific Tank ID. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
Date/Time: Date and Time the snapshot was taken

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.3.

Tank Name: The name assigned to the tank. See Section 2.3

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Gross Vol: The Gross Volume or total fluid volume in the tank as measured in gallons/liters.
O/W Separator Note: Gross Volume will represent volume of petroleum, excluding the bottom water.

Height: The total fluid level in the tank as measured in inches/millimeters
O/W Separator Note: Height will represent height of petroleum, excluding the bottom water.

Net Vol: The Net Volume or total temperature-compensated volume of liquid in the tank as measured in gallons/liters. Industry standard compensation for liquid represented as if it was 60°F/15.6°C.

% Vol: The percentage of total tank volume at the time of the snapshot.
Calculated as: (Gross Volume/Tank Capacity) × 100

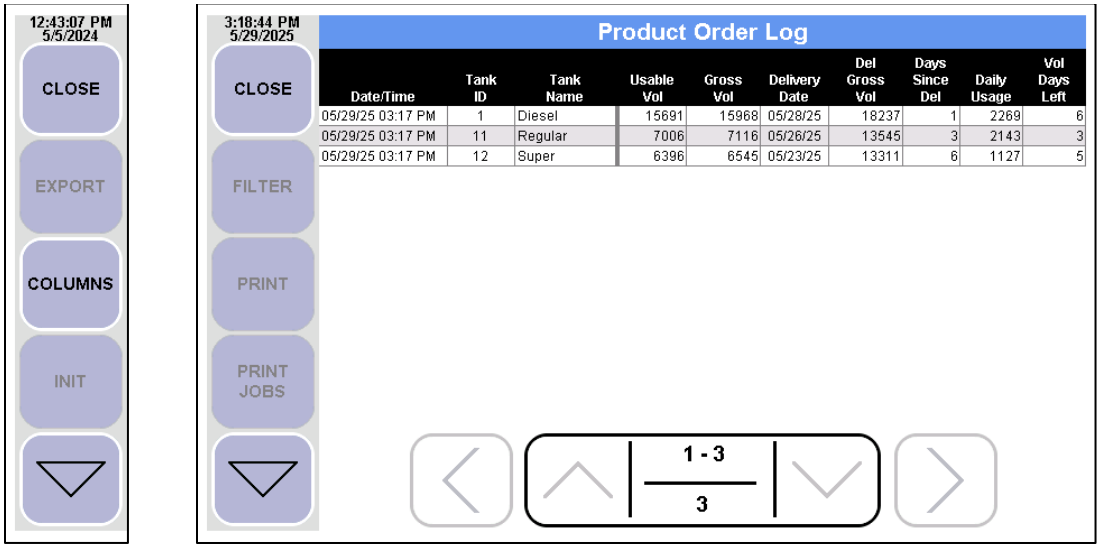
Product Type: The Product Type assigned to the tank. See Section 2.3

Ullage: The amount of free space in the tank up to the defined ullage threshold as measured in gallons/liters. The default ullage threshold is 90%. See Section 2.2
Calculated as: (Tank Capacity × (Ullage Threshold ÷ 100)) – Gross Volume
Note: Negative result shown as zero.

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

Temp: Temperature represented as the average fluid temperature in the tank

3.3 PRODUCT ORDER



The Product Order Report provides an estimate for the number of days of fuel remaining based on the average daily usage since the last delivery. The estimate is calculated as follows:

Usable Vol ÷ Daily Usage = Vol Days Left (Fractions are dropped)

Note: Usable Volume represents Gross Vol minus both the Water Volume and Unusable Volume as defined in Section 2.4.

The panel at the bottom center shows the record numbers being viewed (**1-3** shown above represents records numbers **one through three**), total number of records (**3**), and up and down arrows to navigate up or down the list of records, one page at a time.

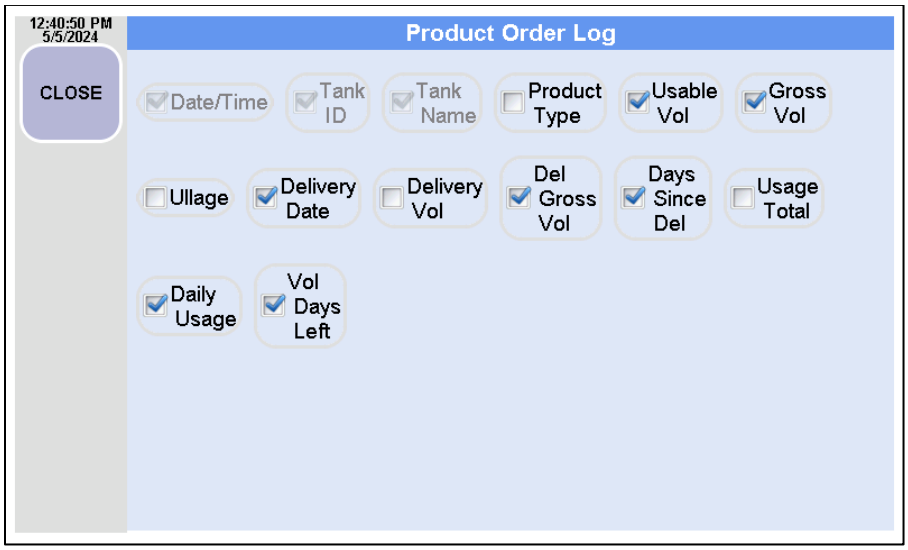
The tool bar on the left edge represents options for handling the Product Order Report data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Product Order Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display. If more columns are selected than fit on the display, use the left and right arrows at the bottom of the screen to navigate between pages of columns.

Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

Print: The Print function provides the ability to filter by Date and/or Tank ID as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
Date/Time: Date and Time the snapshot was taken

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.3.

Tank Name: The name assigned to the tank. See Section 2.3

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Daily Usage: The average daily usage since the last delivery

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

Del Gross Vol: The total volume of fluid in the tank after the latest delivery

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

Delivery Vol: The volume of Product delivered to the tank at the most recent delivery

Gross Vol: The Gross Volume or total fluid volume currently in the tank as measured in gallons/liters.

Product Type: The Product Type assigned to the tank. See Section 2.3

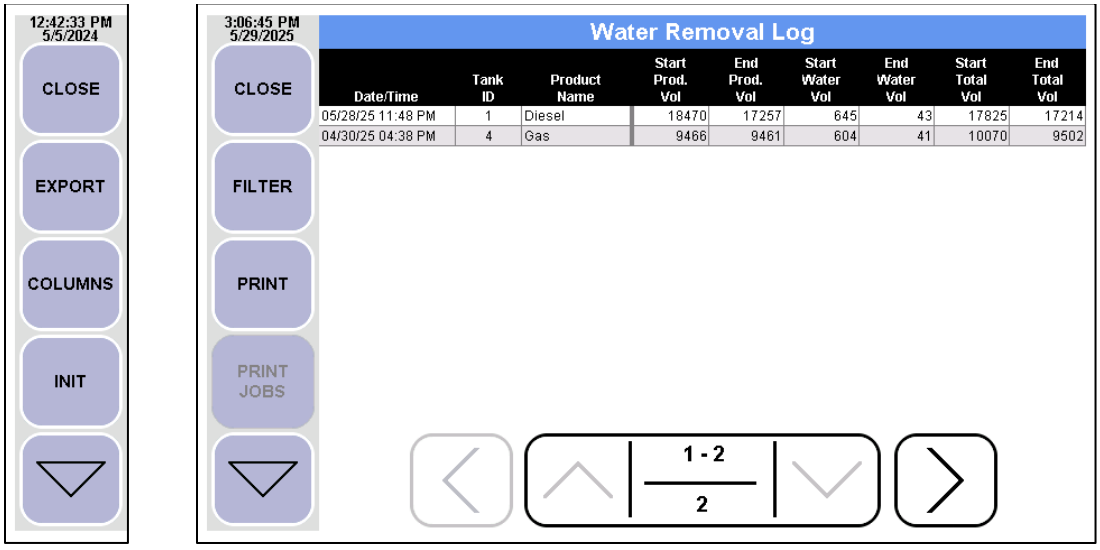
Ullage: The amount of free space in the tank up to the defined ullage threshold as measured in gallons/liters. The default ullage threshold is 90%. See Section 2.2
Calculated as: (Tank Capacity × (Ullage Threshold ÷ 100)) – Gross Volume
Note: Negative result shown as zero.

Usable Vol: Represents the usable Product Volume in the tank.
Calculated as Gross Vol – (Water Volume + Unusable Volume). See Section 2.4 for defining Unusable Volume.

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

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

3.4 WATER REMOVAL



The Water Removal Report contains a record of all instances where the bottom water of a fuel tank was removed.

The panel at the bottom center shows the record numbers being viewed (**1-2** shown above represents records numbers **one through two**), total number of records (**2**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the Water Removal data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Water Removal Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display. If more columns are selected than fit on the display, use the left and right arrows at the bottom of the screen to navigate between pages of columns.

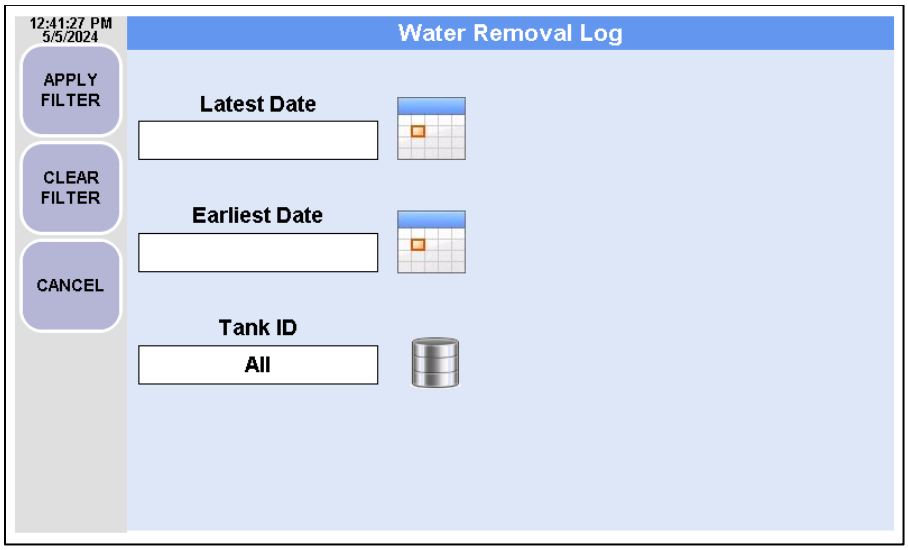
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

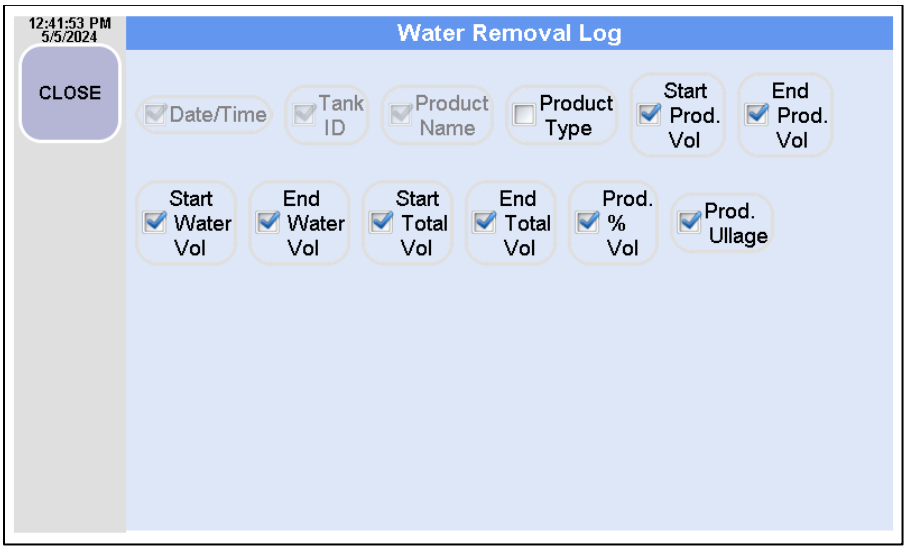
Filter: Provides the ability to filter the data based on a range of dates and/or Tank ID.

Init: Initialize or erase the Water Removal Report.

Print: The Print function provides the ability to filter by Date and/or Tank ID as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter options include defining a date range and/or specific Tank ID. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
Date/Time: Date and Time the bottom Water Removal was completed.

Product Name: The name assigned to the tank. See Section 2.3

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.3.

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Prod. % Vol: Product Percent Volume represents the percentage of total tank capacity occupied by all liquid, fuel and water combined, after water removal has been completed.
Calculated as: (Gross Volume/Tank Capacity) × 100

Prod. Ullage: Product Ullage represents the amount of free space in the tank, after water removal has been completed, up to the defined ullage threshold as measured in gallons/liters. The default ullage threshold is 90%. See Section 2.2
Calculated as: (Tank Capacity × (Ullage Threshold ÷ 100)) – Gross Volume
Note: Negative result shown as zero.

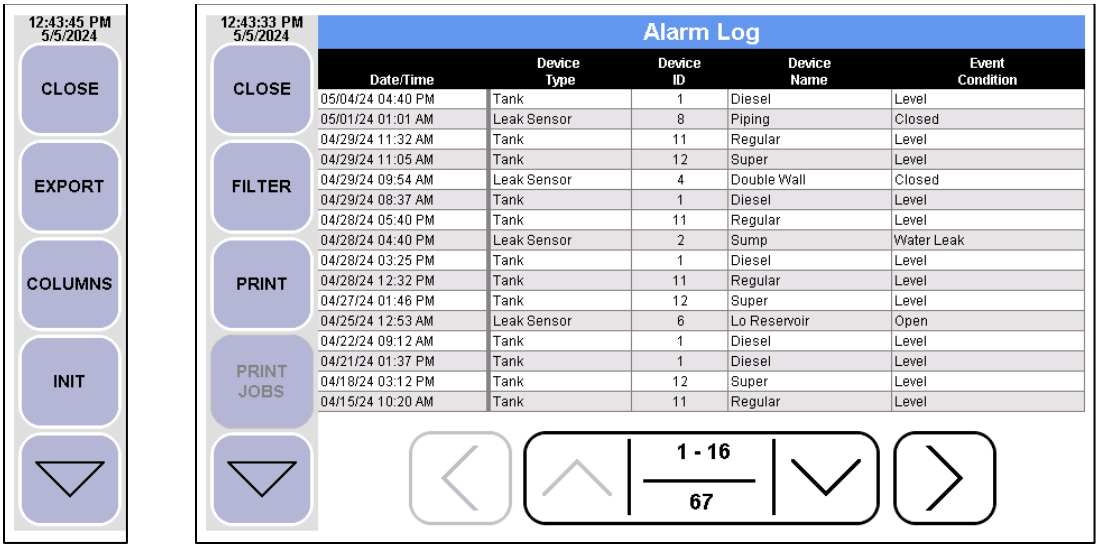
Prod. Vol: The Product Volume of fuel is provided both at the **Start** and **End** of the water removal process.

Product Type: The Product Type assigned to the tank. See Section 2.3

Total Vol: The Total Volume of all liquid, fuel and water combined, is provided both at the **Start** and **End** of the water removal process.

Water Vol: The Volume of bottom Water is provided both at the **Start** and **End** of the water removal process

3.5 ALARM



The Alarm Report contains a record of all alarms including High, Low, Leak, and CC Input alarms.

The panel at the bottom center shows the record numbers being viewed (**1-16** shown above represents records numbers **one through sixteen**), total number of records (**67**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the Alarm data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Alarm Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display.

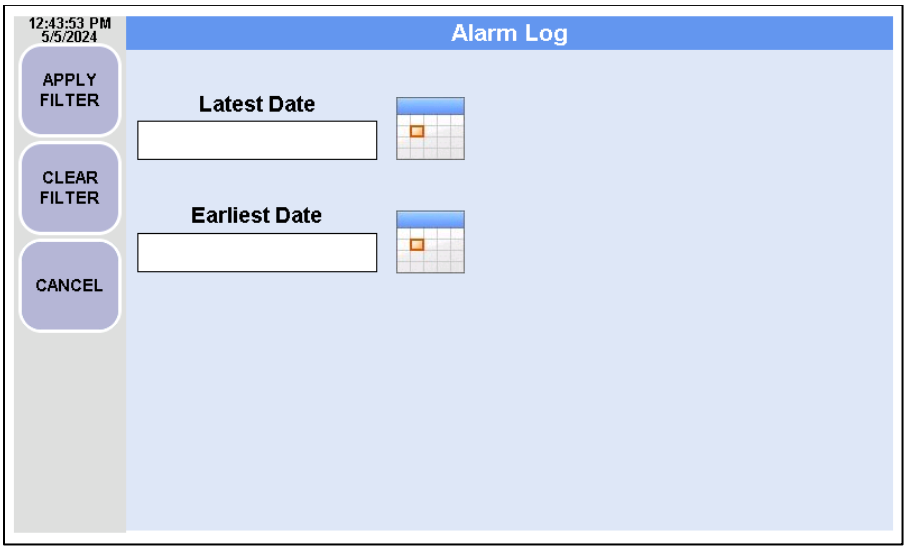
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

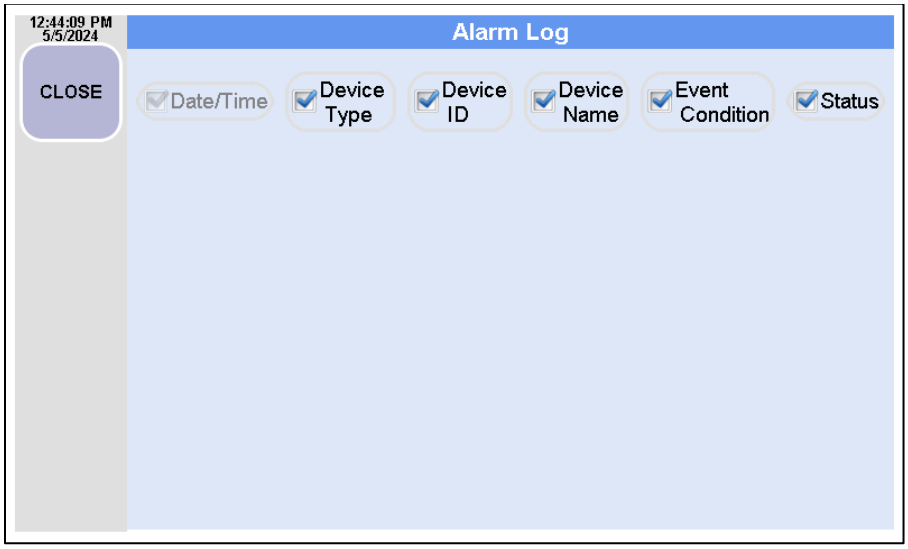
Filter: Provides the ability to filter the data based on a range of dates.

Init: Initialize or erase the Alarm Report.

Print: The Print function provides the ability to filter by Date as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter controls allow for the defining of a date range. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
Date/Time: Date and Time the Alarm occurred

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Device ID: The ID number of the Tank or Input Number for the Sensor or CC Input in alarm

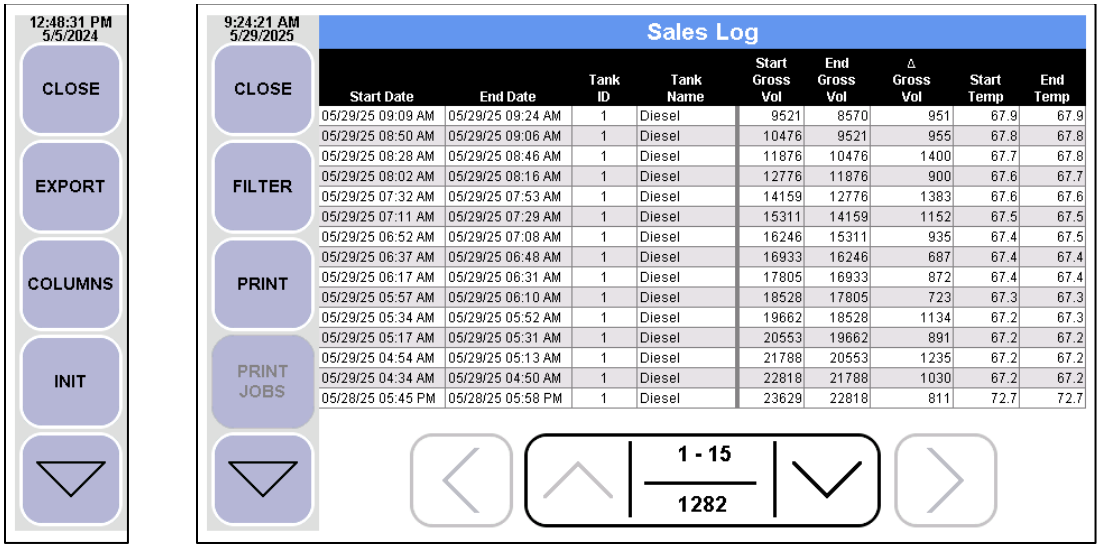
Device Name: The name assigned to the Device Type in alarm

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

Event Condition: The category of alarm: Level, Oil Leak, Water Leak, etc.

Status: Detailed description of the alarm: High Product, Low Product, High Water, Sensor Alarm, etc.

3.6 SALES



The bulk Sales Report contains a record of all instances where Product was sold/removed from the tank. This feature is disabled by default. It is intended for use at Bulk Storage facilities or other applications where only one withdrawal/sale can occur at a time. See Section 2.2 for complete details.

The panel at the bottom center shows the record numbers being viewed (**1-15** shown above represents records numbers **one through fifteen**), total number of records (**1,282**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the bulk Sales data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the bulk Sales Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display. If more columns are selected than fit on the display, use the left and right arrows at the bottom of the screen to navigate between pages of columns.

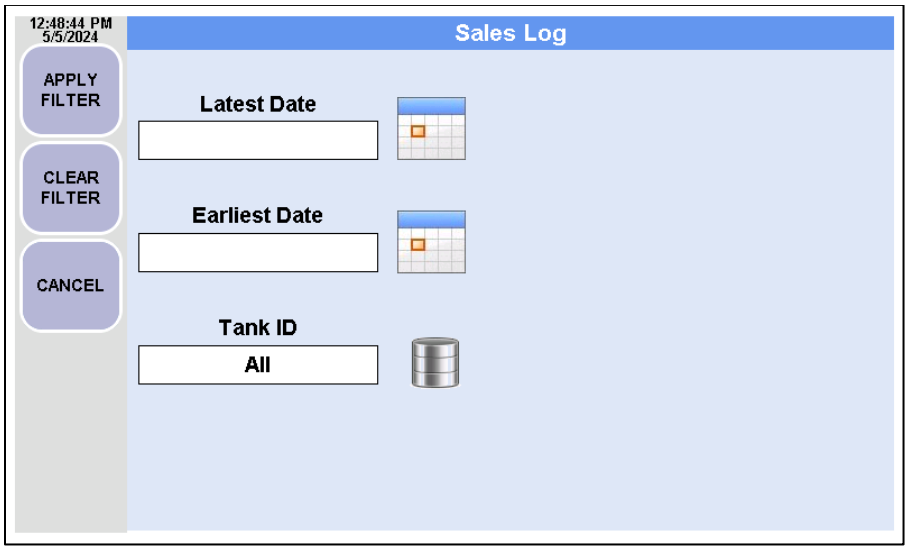
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

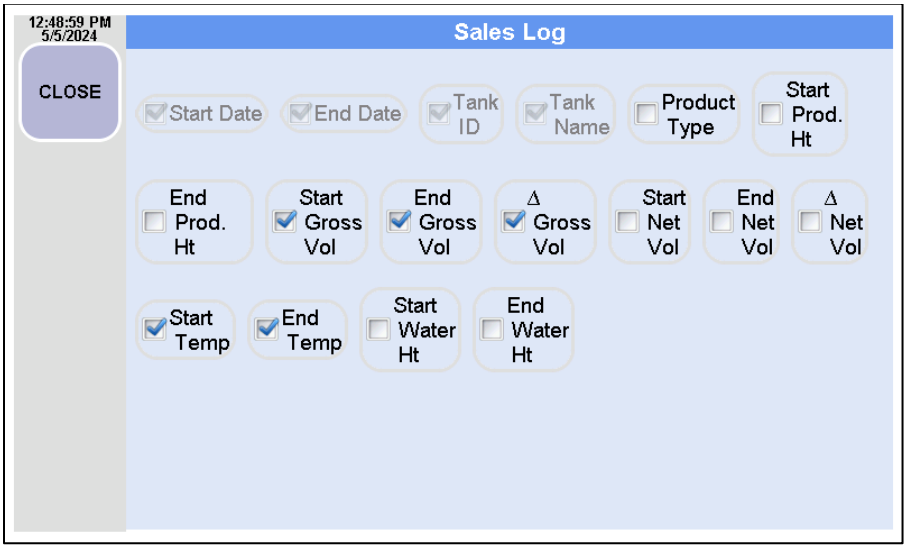
Filter: Provides the ability to filter the data based on a range of dates and/or Tank ID.

Init: Initialize or erase the bulk Sales Report.

Print: The Print function provides the ability to filter by Date and/or Tank ID as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter options include defining a date range and/or specific Tank ID. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
End Date: Date and Time the bulk Sale was completed

Start Date: Date and Time the bulk Sale began

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.3.

Tank Name: The name assigned to the tank. See Section 2.3

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Gross Vol: The total volume of liquid in the tank is provided at the **Start** and **End** of the bulk Sale with the change in Gross Volume represented as the Delta (**Δ**).

Net Vol: The Net Volume represents the temperature-compensated liquid volume in the tank, adjusted to the industry standard of 60°F (15.6°C). Net Volume is provided at the **Start** and **End** of the bulk Sale with the change in Net Volume represented as the Delta (**Δ**).

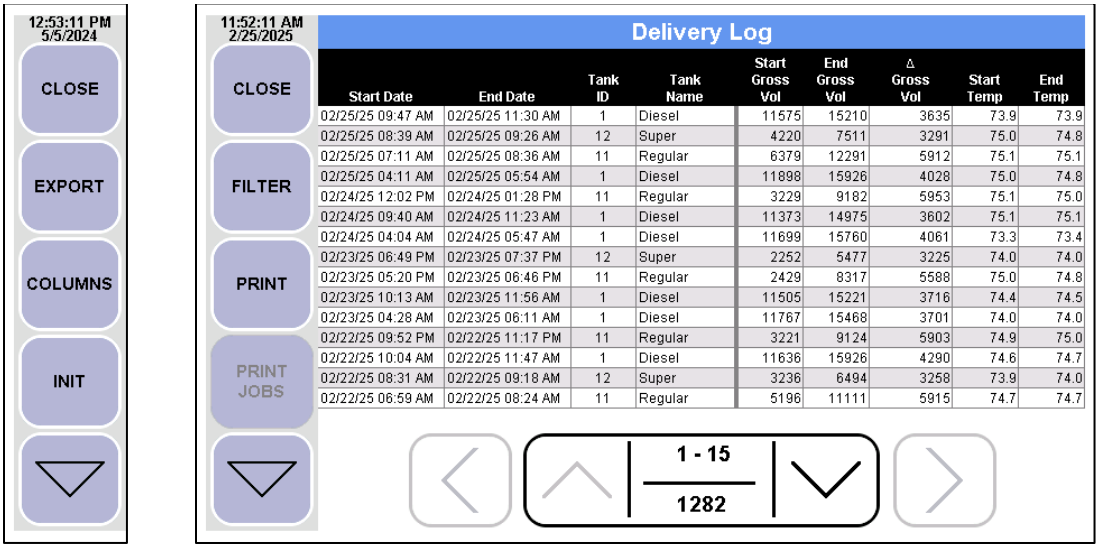
Prod. Ht: The total liquid Height in the tank is provided both at the **Start** and **End** of the bulk Sale.

Product Type: The Product Type assigned to the tank. See Section 2.3

Temp: The average liquid temperature is provided both at the **Start** and **End** of the bulk Sale.

Water Ht: The Height of bottom water is provided both at the **Start** and **End** of the bulk Sale.

3.7 DELIVERY



The Delivery Report contains a record of all instances where Product was delivered/added to the tank.

The panel at the bottom center shows the record numbers being viewed (**1-15** shown above represents records numbers **one through fifteen**), total number of records (**1,282**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the Delivery data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Delivery Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display. If more columns are selected than fit on the display, use the left and right arrows at the bottom of the screen to navigate between pages of columns.

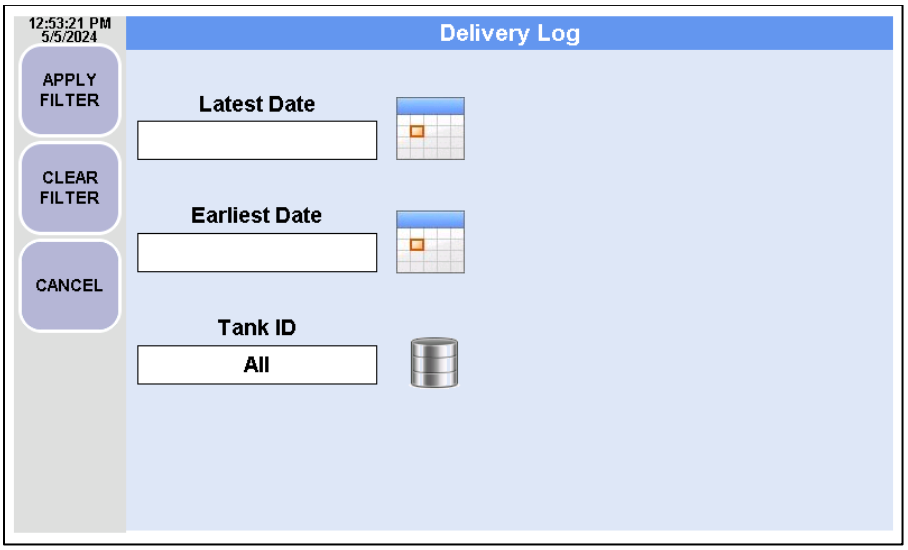
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

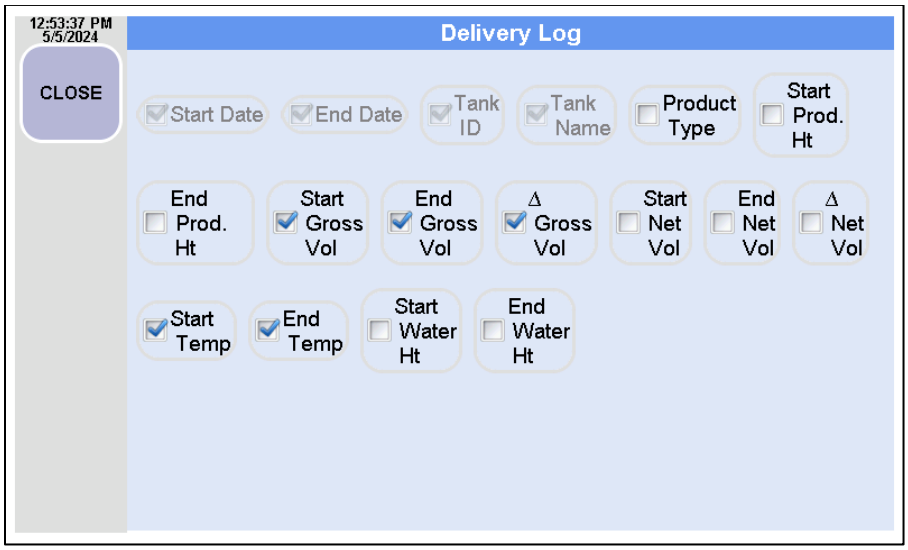
Filter: Provides the ability to filter the data based on a range of dates and/or Tank ID.

Init: Initialize or erase the Delivery Report.

Print: The Print function provides the ability to filter by Date and/or Tank ID as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter options include defining a date range and/or specific Tank ID. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
End Date: Date and Time the Delivery was completed

Start Date: Date and Time the Delivery began

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.3.

Tank Name: The name assigned to the tank. See Section 2.3

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Gross Vol: The total volume of liquid in the tank is provided at the **Start** and **End** of the Delivery with the change in Gross Volume represented as the Delta (**Δ**).

Net Vol: The Net Volume represents the temperature-compensated liquid volume in the tank, adjusted to the industry standard of 60°F (15.6°C). Net Volume is provided at the **Start** and **End** of the Delivery with the change in Net Volume represented as the Delta (**Δ**).

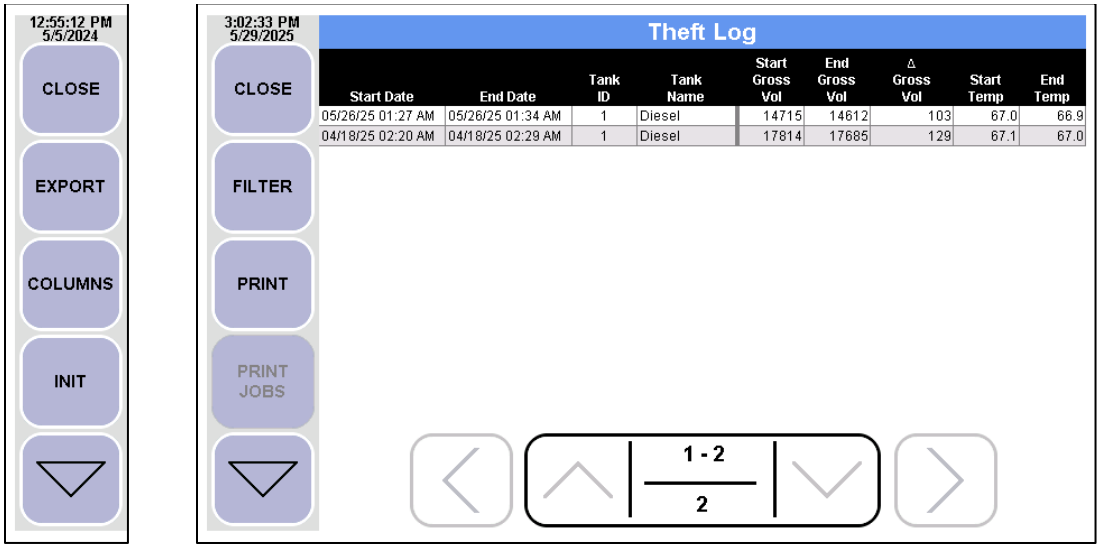
Prod. Ht: The total liquid Height in the tank is provided both at the **Start** and **End** of the Delivery.

Product Type: The Product Type assigned to the tank. See Section 2.3

Temp: The average liquid temperature is provided both at the **Start** and **End** of the Delivery.

Water Ht: The Height of bottom water is provided both at the **Start** and **End** of the Delivery.

3.8 THEFT



The Theft Report contains a record of all instances where Product was stolen from the tank. This feature is disabled by default. See Section 2.3 to enable Theft monitoring for specific tanks. See Section 2.13 to define the hours of operation for the facility.

The panel at the bottom center shows the record numbers being viewed (**1-2** shown above represents records numbers **one through two**), total number of records (**2**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the Theft data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Theft Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display. If more columns are selected than fit on the display, use the left and right arrows at the bottom of the screen to navigate between pages of columns.

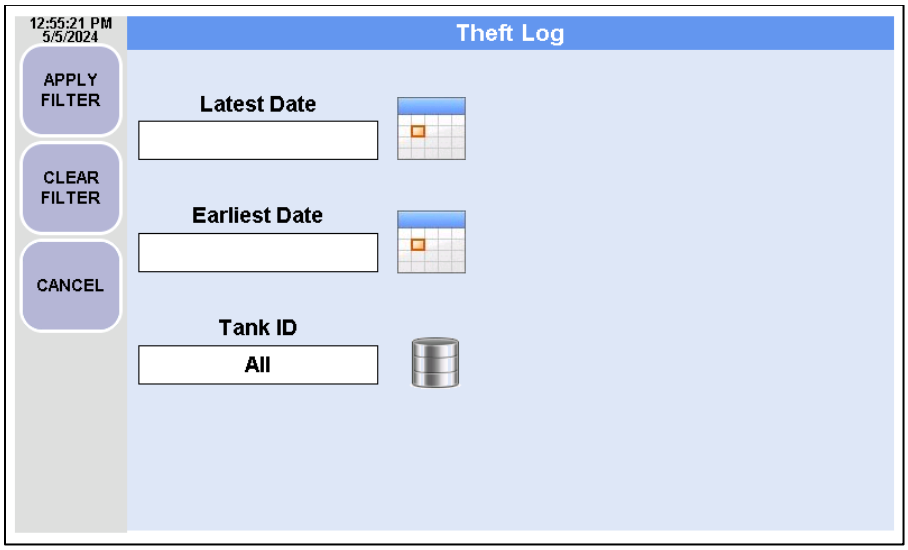
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

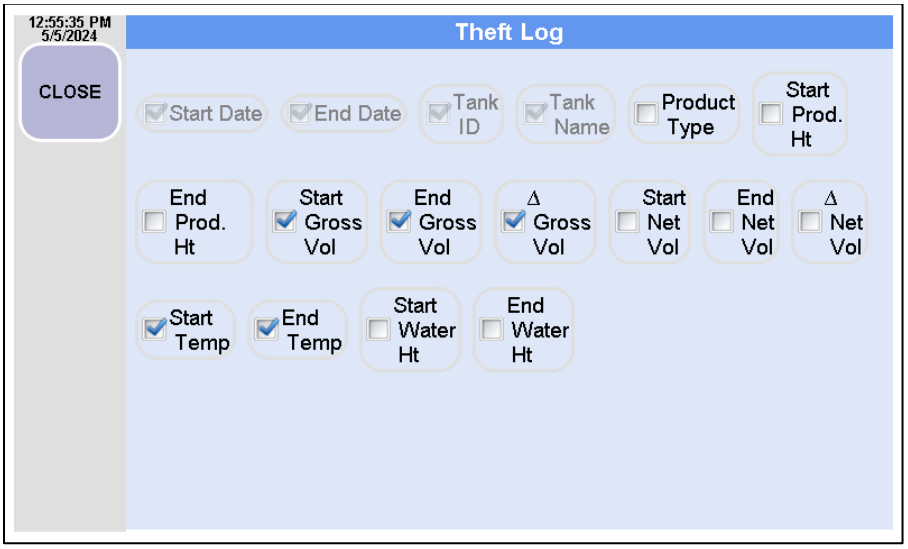
Filter: Provides the ability to filter the data based on a range of dates and/or Tank ID.

Init: Initialize or erase the Theft Report.

Print: The Print function provides the ability to filter by Date and/or Tank ID as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter options include defining a date range and/or specific Tank ID. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
End Date: Date and Time the Theft ended.

Start Date: Date and Time the Theft began.

Tank ID: The Tank ID number, not Tank Hardware Channel number, assigned to the documented tank. See Section 2.3.

Tank Name: The name assigned to the tank. See Section 2.3

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Gross Vol: The total volume of liquid in the tank is provided at the **Start** and **End** of the Theft with the change in Gross Volume represented as the Delta (**Δ**).

Net Vol: The Net Volume represents the temperature-compensated liquid volume in the tank, adjusted to the industry standard of 60°F (15.6°C). Net Volume is provided at the **Start** and **End** of the Theft with the change in Net Volume represented as the Delta (**Δ**).

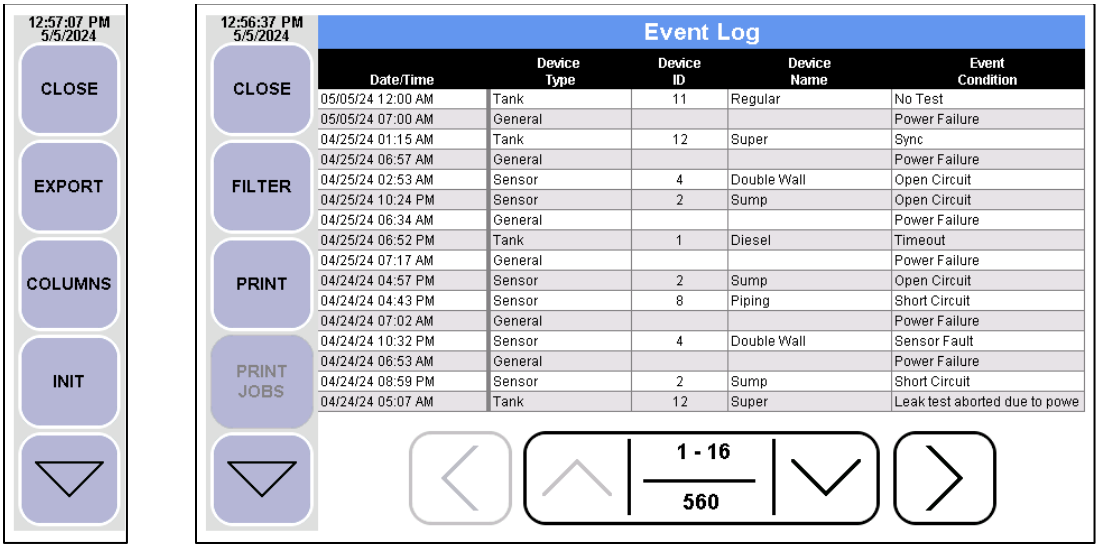
Prod. Ht: The total liquid Height in the tank is provided both at the **Start** and **End** of the Theft.

Product Type: The Product Type assigned to the tank. See Section 2.3

Temp: The average liquid temperature is provided both at the **Start** and **End** of the Theft.

Water Ht: The Height of bottom water is provided both at the **Start** and **End** of the Theft.

3.9 EVENT



The Event Report contains a record of all events including Probe Errors, Sensor Wiring Faults, and Power Fail notifications.

The panel at the bottom center shows the record numbers being viewed (**1-16** shown above represents records numbers **one through sixteen**), total number of records (**560**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the Event data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Event Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display.

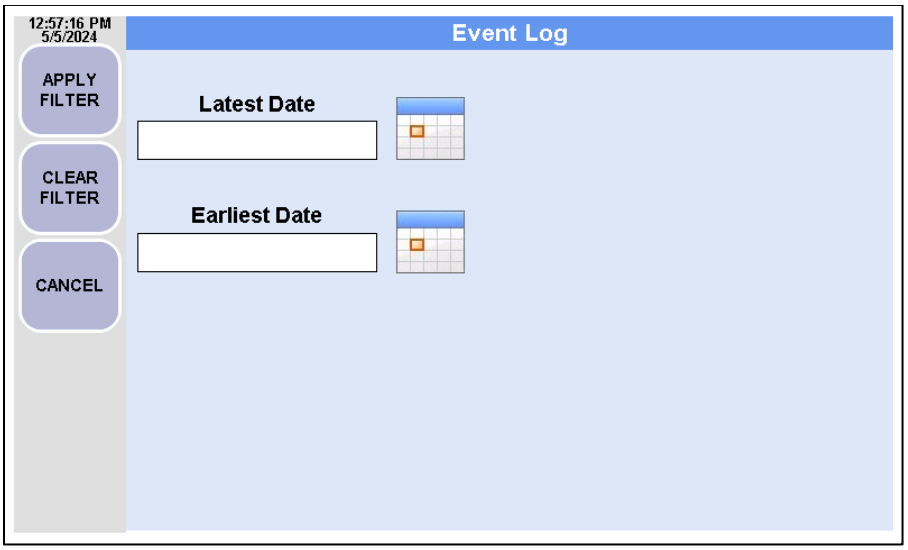
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

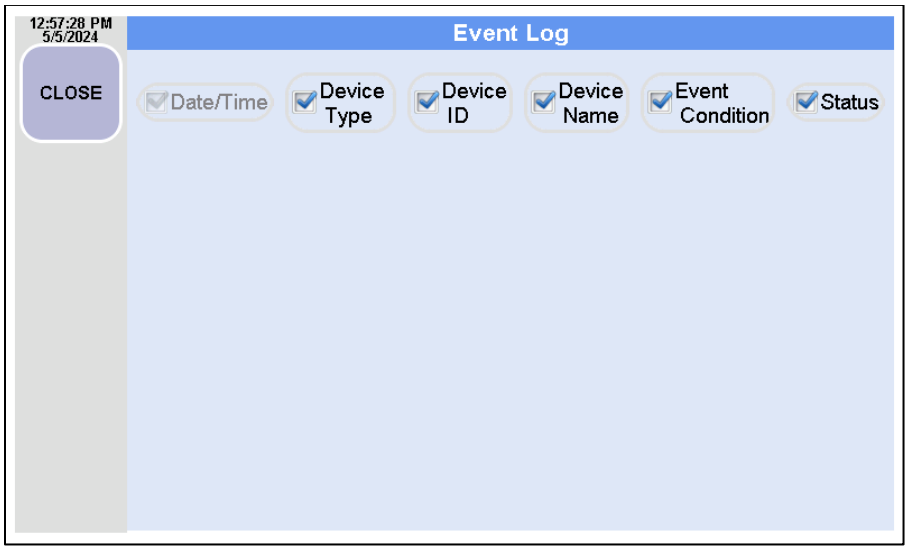
Filter: Provides the ability to filter the data based on a range of dates.

Init: Initialize or erase the Event Report.

Print: The Print function provides the ability to filter by Date as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter controls allow for the defining of a date range. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
Date/Time: Date and Time the Event occurred

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Device ID: The ID number of the Tank or Input Number for the Sensor or CC Input causing the Event

Device Name: The name assigned to the Device Type causing the Event

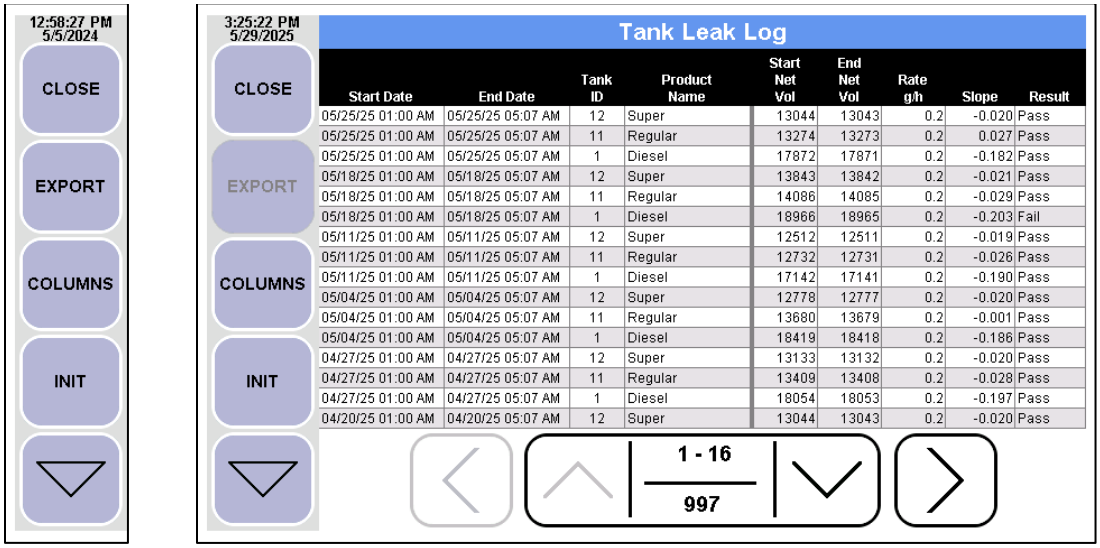
Device Type: Includes, Tank, Sensor, and CC Input

Event Condition: The category of event: Probe Error, Sensor Error, Power Failure Error, etc.

Status: Detailed description of the event: Timeout, Sync, Open Circuit, Short Circuit, Sensor Fault, etc.

3.10 TANK LEAK

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 failure is recorded. Otherwise, both Tank Leak and Leak Summary are functionally equal.



Start Date	End Date	Tank ID	Product Name	Start Net Vol	End Net Vol	Rate g/h	Slope	Result
05/25/25 01:00 AM	05/25/25 05:07 AM	12	Super	13044	13043	0.2	-0.020	Pass
05/25/25 01:00 AM	05/25/25 05:07 AM	11	Regular	13274	13273	0.2	0.027	Pass
05/25/25 01:00 AM	05/25/25 05:07 AM	1	Diesel	17872	17871	0.2	-0.182	Pass
05/18/25 01:00 AM	05/18/25 05:07 AM	12	Super	13843	13842	0.2	-0.021	Pass
05/18/25 01:00 AM	05/18/25 05:07 AM	11	Regular	14086	14085	0.2	-0.029	Pass
05/18/25 01:00 AM	05/18/25 05:07 AM	1	Diesel	18966	18965	0.2	-0.203	Fail
05/11/25 01:00 AM	05/11/25 05:07 AM	12	Super	12512	12511	0.2	-0.019	Pass
05/11/25 01:00 AM	05/11/25 05:07 AM	11	Regular	12732	12731	0.2	-0.026	Pass
05/11/25 01:00 AM	05/11/25 05:07 AM	1	Diesel	17142	17141	0.2	-0.190	Pass
05/04/25 01:00 AM	05/04/25 05:07 AM	12	Super	12778	12777	0.2	-0.020	Pass
05/04/25 01:00 AM	05/04/25 05:07 AM	11	Regular	13680	13679	0.2	-0.001	Pass
05/04/25 01:00 AM	05/04/25 05:07 AM	1	Diesel	18419	18418	0.2	-0.186	Pass
04/27/25 01:00 AM	04/27/25 05:07 AM	12	Super	13133	13132	0.2	-0.020	Pass
04/27/25 01:00 AM	04/27/25 05:07 AM	11	Regular	13409	13408	0.2	-0.028	Pass
04/27/25 01:00 AM	04/27/25 05:07 AM	1	Diesel	18054	18053	0.2	-0.197	Pass
04/20/25 01:00 AM	04/20/25 05:07 AM	12	Super	13044	13043	0.2	-0.020	Pass

The Tank Leak Report contains detailed test results for all tanks.

The panel at the bottom center shows the record numbers being viewed (**1-16** shown above represents records numbers **one through sixteen**), total number of records (**997**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the Tank Leak data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Tank Leak Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display.

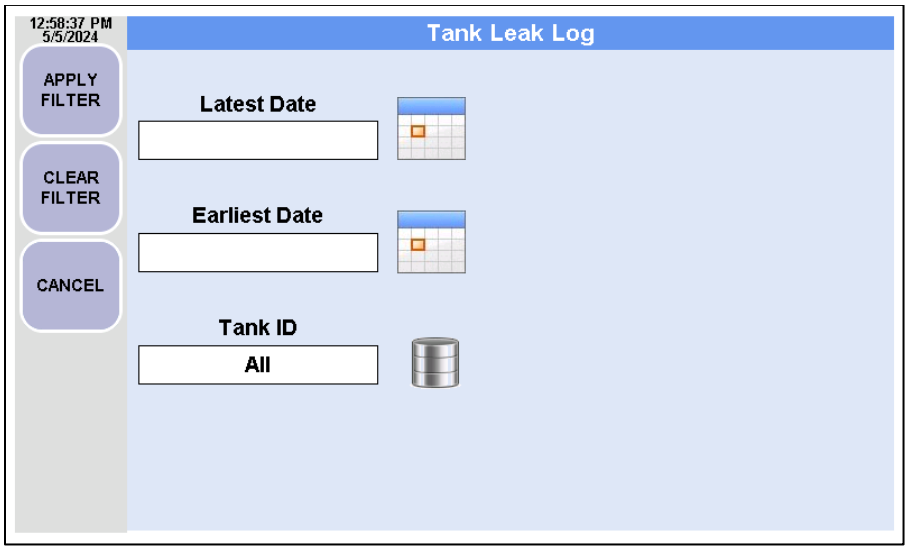
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

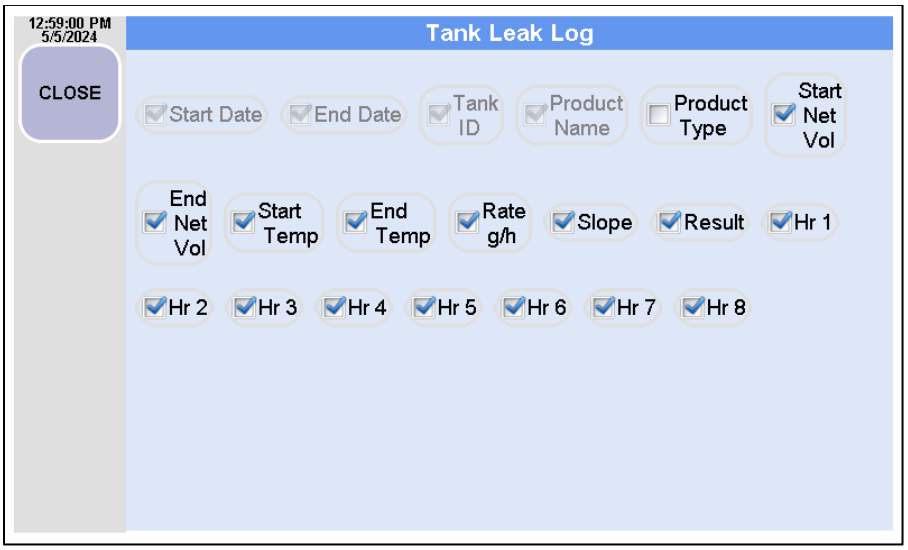
Filter: Provides the ability to filter the data based on a range of dates or Tank ID.

Init: Initialize or erase the Tank Leak Report.

Print: The Print function provides the ability to filter by Date as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter options include defining a date range and/or specific Tank ID. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
End Date: The date and time the test was completed

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

Start Date: The date and time the test was started

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

OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Hr 1-8: The average cumulative change in volume at the end of each hour.

Net Vol: The Net Volume represents the temperature-compensated liquid volume in the tank, adjusted to the industry standard of 60°F (15.6°C). Net Volume is provided at the **Start** and **End** of the In-Tank Leak Test.

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

Rate g/h: The minimum detected loss, represented as Gallons per Hour, that qualifies as a leak. See section 2.8

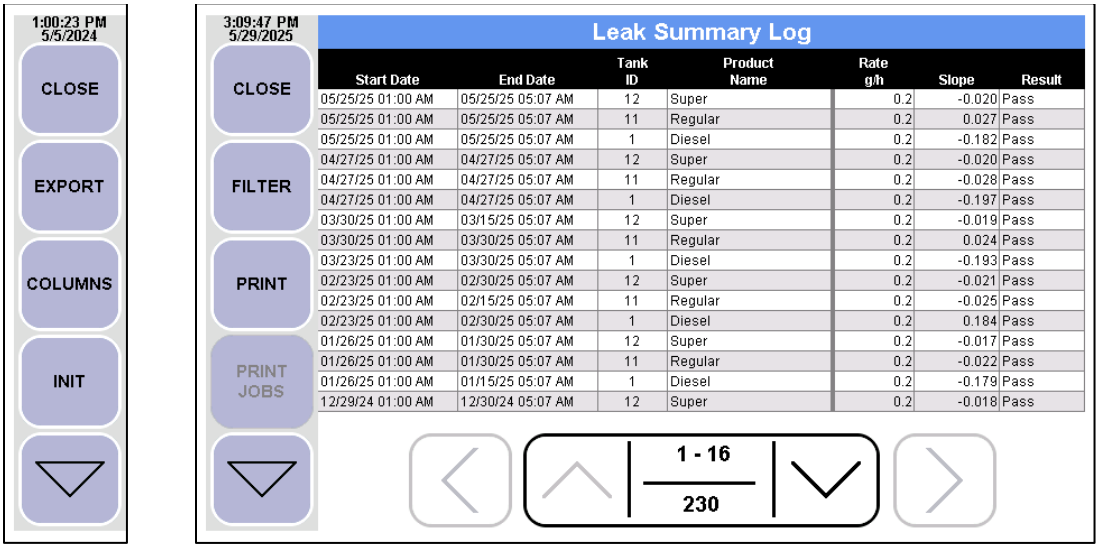
Result: Pass or Fail

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

Temp: The average liquid temperature is provided both at the **Start** and **End** of the In-Tank Leak Test.

3.11 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 failure is recorded.



The Leak Summary Report contains summary test results, one per month, for all tanks.

The panel at the bottom center shows the record numbers being viewed (**1-16** shown above represents records numbers **one through sixteen**), total number of records (**230**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the Leak Summary data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the Leak Summary Report window and returns to the Main TMS Display. The available tools include the following:

Columns: Provides the ability to select which columns are visible on the display.

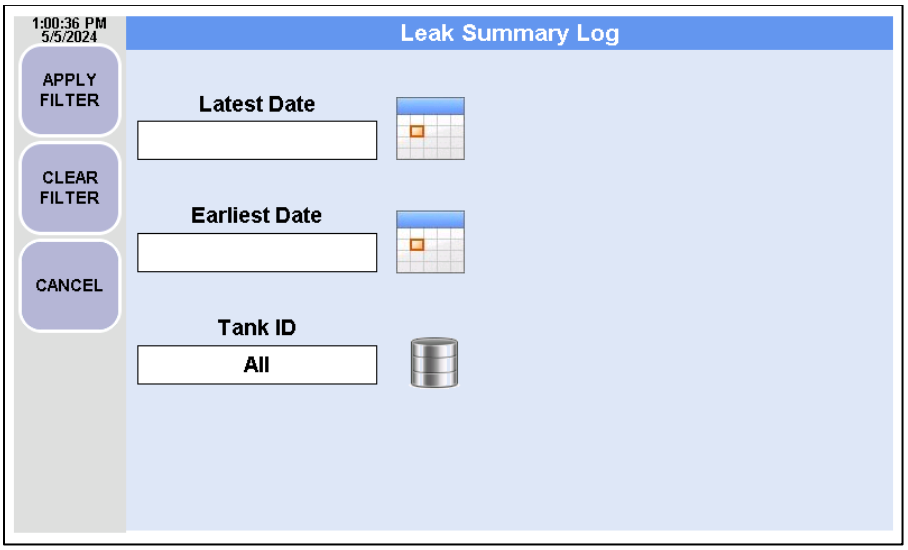
Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Note: Refer to Print command below to generate a PDF File.

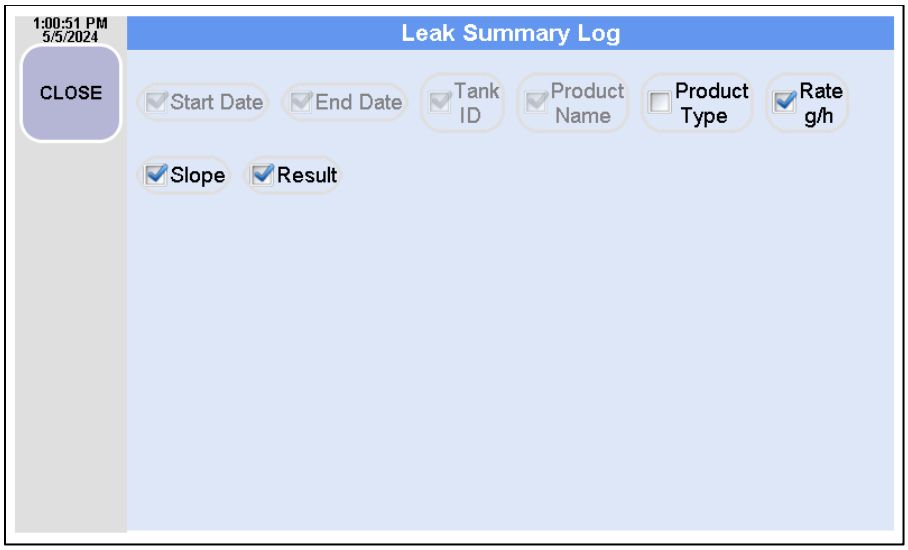
Filter: Provides the ability to filter the data based on a range of dates or Tank ID.

Init: Initialize or erase the Leak Summary Report.

Print: The Print function provides the ability to filter by Date as well as selecting the printer to use including the External USB or Network-Accessible Printer or as a PDF Report sent to a Flash Drive.



Filter options include defining a date range and/or specific Tank ID. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.



REQUIRED COLUMNS: Grayed out indicating these columns cannot be disabled.
End Date: The date and time the test was completed.

Start Date: The date and time the test was started.

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

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

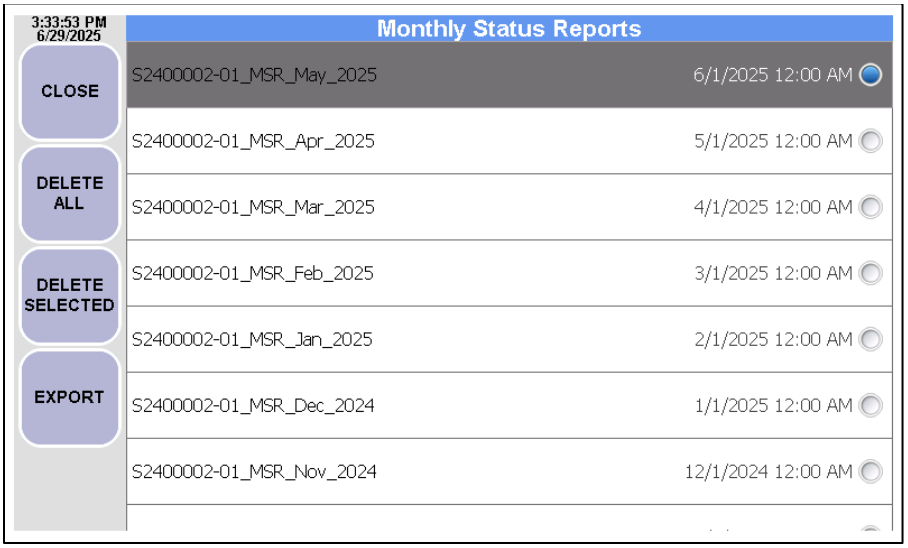
OPTIONAL COLUMNS: Columns may be selected individually. Checkmark indicates visible column.
Product Type: The Product Type assigned to the tank. See Section 2.4.

Rate g/h: The minimum detected loss, represented as Gallons per Hour, that qualifies as a leak. See Section 2.8.

Result: Pass or Fail.

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

3.12 MONTHLY STATUS REPORT



The Monthly Status Report represents the Inventory for all tanks and Status of all probes and sensors as a PDF report that can be exported for viewing. The report is generated at midnight on the first of every month. See Section 2.2 for instructions on enabling this feature.

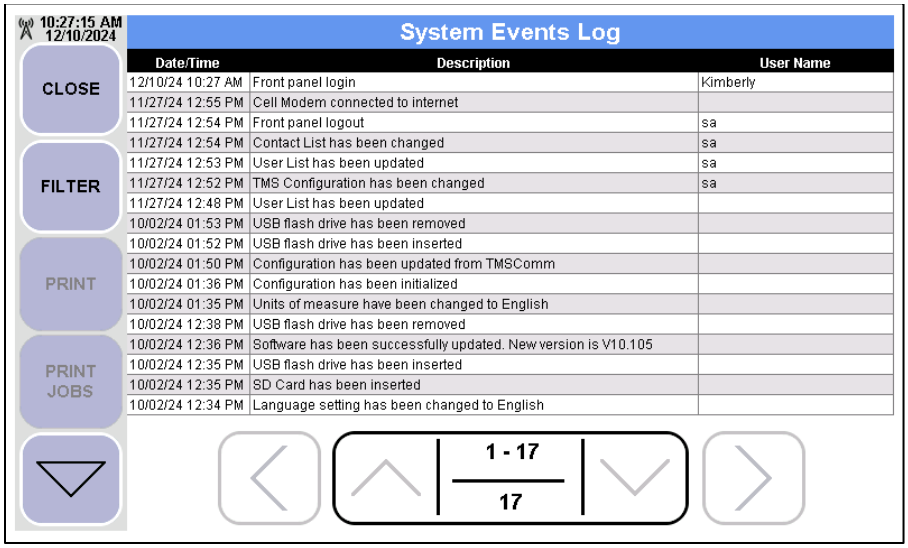
The tool bar on the left edge represents options for handling the Monthly Status Report data. The Close button closes the Monthly Status Report window and returns to the Main TMS Display. The available tools include the following:

Delete All: Deletes All Monthly Status Reports from the TMS.

Delete Selected: Select the Report to be deleted and tap Delete Selected to remove from the TMS.

Export: Export the data to a USB Flash Drive as a PDF file. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

3.13 SYSTEM EVENTS



The System Event Log contains System Events such as change of Configuration notification, Firmware Updates, and Security Login/Logout.

The panel at the bottom center shows the record numbers being viewed (**1-17** shown above represents records numbers **one through seventeen**), total number of records (**17**), and up and down arrows to navigate up or down the list of records, one page at a time.

The tool bar on the left edge represents options for handling the System Event data. The down arrow at the bottom of the tool bar advances to the next tool bar as shown above. The Close button closes the System Event Report window and returns to the Main TMS Display. The available tools include the following:

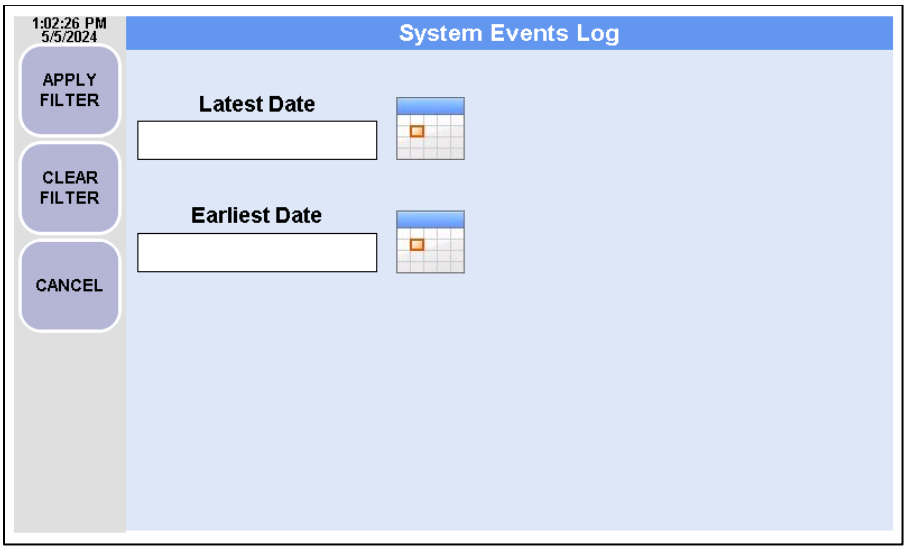
Columns: Lists which columns are visible on the display. The columns viewed cannot be customized.

Export: Export the data to a USB Flash Drive as a CSV (Comma Separated Values) file. A CSV file may be viewed in most spreadsheet or word processing programs. The Export Button will be grayed out if the Flash Drive is not installed or recognized.

Filter: Provides the ability to filter the data based on a range of dates.

Init: The System Event Log may not be initialized in the field.

Print: The System Event Log may not be printed from the TMS. Export as CSV and print on computer printer, if a hard-copy is needed.

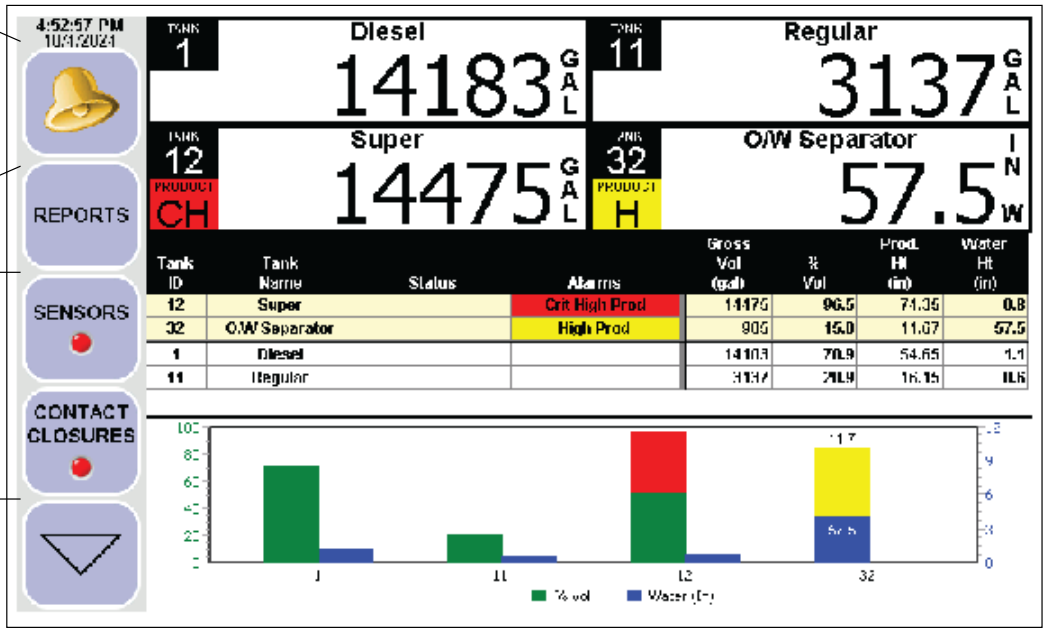


Filter controls allow for the defining of a date range. Tap on Apply Filter to view the records that meet the filter criteria. Tap on Clear Filter to view all records.

APPENDIX A – TROUBLESHOOTING: ALARMS, EVENTS, AND WARNINGS

Alarm Acknowledgement
Tap to silence TMS horn and open detailed Alarm window where visual alarms may be acknowledged.

Sensor and CC Input Statuses
Summary LED graphic represents status. Tap to view individual input statuses.



Tank Alarm & Event Conditions:

Tank Alarm & Event conditions are represented on the TMS Display in either the Status or Alarms columns. Tank Channels with an active Status or Alarm are “floated” to the top of the list and represented with an off-white background. A thicker horizontal separator is used to divide the Tank Channels with an active Status or Alarm (above separator) from those that have no active Status or Alarm (below separator).

The status column represents select Errors and other non-Alarm Statuses such as Product Increase (Delivery) or Leak Test In-Progress. The Alarms column represents all Alarm conditions for a Tank Channel.

Non-alarm Statuses: Visual notification only, no attention typically required.

Description	Status Column	Details
Absent Probe Card	Absent Probe Card	A Tank Channel is enabled without the corresponding Probe Card present.
Leak Test In Progress	Leak Test IP	The In-Tank Leak Test is running
Product Decrease	Prod Decrease	The Product Volume is decreasing. This may be due to a Sale, Theft, or Bottom Water Removal.
Product Increase (Delivery)	Prod Increase	The Product Volume is increasing due to a Delivery.
Pump/Generator Running	Pump/Generator Running	The Pump or Generator is running as detected by the associated CC Input.
Tank Active	Tank Active	Tank Activity has been detected. This may be a volume increase or decrease. The Tank Activity Status will also be active for 3 minutes after a Configuration change or powering on of the TMS.
Ungaugeable Level	Ungaugeable Level	The Product Level has dropped to or below the lowest point the Product Float can travel to.

Tank Alarm Conditions:
Alarm conditions are recorded in the Alarm Log and are printed automatically on either the external USB or network-accessible printer if the Auto Print feature is enabled. Alarm conditions are also user programmable to send an SMS or E-Mail out upon alarm.

SetPoint alarms:
SetPoint alarms represent High and Low conditions for Product Volume, Bottom Water, and Temperature in the Tank. Both audible and visual annunciators are activated. The audible and blinking visual indicators are acknowledged via Front panel Alarm Bell button. Remaining visual conditions will continue until the specific SetPoint conditions are corrected.

SetPoint Name	Displayed in the Alarm Column		
	Product	Water	Temperature
Critical High	Crit High Prod	Crit High Water	Crit High Temp
High High	High High Prod	High High Water	High High Temp
High	High Prod	High Water	High Temp
Low	Low Prod	Low Water	Low Temp
Low Low	Low Low Prod	Low Low Water	Low Low Temp
Critical Low	Crit Low Prod	Crit Low Water	Crit Low Temp

Printout Sample

```
********************************
            Alarms


     07/29/22
     15:12

ABC Fuel Depot
Site id       02450
Unit id          01
--------------------------------
Date       07/29/22
Time          15:12

High          Alarm
Tank Id           1

Alarm Id       High
Detail        Level
--------------------------------
********************************
```

High Product Volume
Default: 90% of Capacity or Higher

SetPoint Name	Factory Defaults		
	Product	Water	Temperature
Critical High	98% and higher	Disabled	Disabled
High High	95% and higher	Disabled	Disabled
High	90% and higher	2”/51 mm and higher	Disabled
Low	20% and lower	Disabled	Disabled
Low Low	15% and lower	Disabled	Disabled
Critical Low	12% and lower	Disabled	Disabled

See Section 2.5 for details on configuring SetPoints.

Leak alarm:
The Leak alarm represents the failure of an In-Tank Leak Test. This MAY represent an actual failure of the tank wall but does require additional investigation to confirm. Both audible and visual annunciators are activated. The audible and blinking visual indicators are acknowledged via Front panel Alarm Bell button. The visual indicators may then be acknowledged using the Leak Alarm Acknowledge button in the Alarm Status window. The following recommendations are to be followed in the event of an In-Tank Leak Test failure:

- Repeat the Test, as soon as possible, to confirm the results.
- Confirm the Product Level Reading has been calibrated.
- Confirm the Tank Geometry configuration in the TMS matches the design of the tank.
- Check functionality of tank-related hardware including all vents, check valves, and any valves controlling the flow into and out of the tank.
- Confirm that the tank qualifies for in-tank leak testing. Requirements include: Underground Petroleum Storage Tank with a capacity up to 30,000 Gallons [113,600 Liters]. The TMS must be equipped with a MP450S-xxx-25 and 4” Floats. Contact Pneumercator for details.

Displayed in the Alarm Column

Leak

Alarm Printout Sample*

```
********************************
            Alarms


     08/26/22
     11:55

ABC Fuel Depot
Site id       54321
Unit id          99
--------------------------------
Date       08/26/22
Time          11:55

       Level  Alarm
Tank Id         202

Alarm Id       Leak
Detail        Level
--------------------------------
********************************
```

In-Tank Leak Test Failure

*** Note:** A failed test will print both an Alarm (shown) and Test Results Printout and is recorded in both the Alarms and Tank Leak Reports.

Theft alarm:
A Theft is defined as a loss of Product during the hours defined in the TMS where the facility is closed. See Section 2.13 for defining the hours of operation. See Section 2.3 for enabling Theft detection for individual tanks. Both audible and visual annunciators are activated. The audible and blinking visual indicators are acknowledged via Front panel Alarm Bell button. The visual indicators may then be acknowledged using the Theft Alarm Acknowledge button in the Alarm Status window.

Displayed in the Alarm Column

Theft

Printout Sample

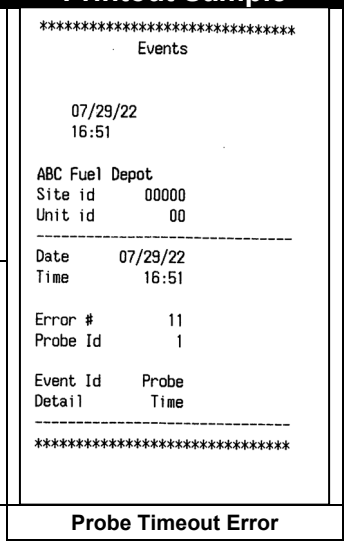
```
********************************
            Thefts


     08/05/22
     15:53

ABC Fuel Depot
Site id       02450
Unit id          01
--------------------------------
Date       08/05/22
Time          15:53

Name             Diesel
Prod Type        Diesel
Tank id          001

Begin Ht       8.5 Inch
End Ht         4.6 Inch

Beg Temp       74.0  °F
End Temp       73.9  °F

Gr Begin       1521 Gal
Gr End         1211 Gal
Gr Theft        310 Gal

Net Begin      1517 Gal
Net End        1209 Gal
Net Theft       308 Gal
--------------------------------
********************************
```

Theft of Product from Tank

Tank Event Conditions:
Tank Event conditions are recorded in the Event Log and are printed automatically on either the external USB or network-accessible printer if the Auto Print feature is enabled. Event conditions are also user programmable to send an SMS or E-Mail out upon alarm.

Probe Errors:
A Probe Error will result in the Tank Channel being permanently taken offline until the TMS Configuration is changed or until the TMS is repowered. The TMS will represent the tank at 100% capacity on all external interfaces including all communications interfaces, Relay Outputs, and Analog Outputs. Each Error is described in the below table with Error-specific troubleshooting advise provided. Generic Probe Error Troubleshooting advice can be found immediately below the table and can resolve the majority of Probe Errors.

Status	Description	Printout Sample
Probe Sync Error	**Probe Synchronization Error (Error 10):** The TMS is receiving a signal from the probe that can't be interpretted.	
Probe Timeout Error	**Probe Timeout Error (Error 11):** The TMS does not detect any signal from the probe.	



Probe Timeout Error

Troubleshooting:
Check the following for any above listed Probe Error unless otherwise noted.

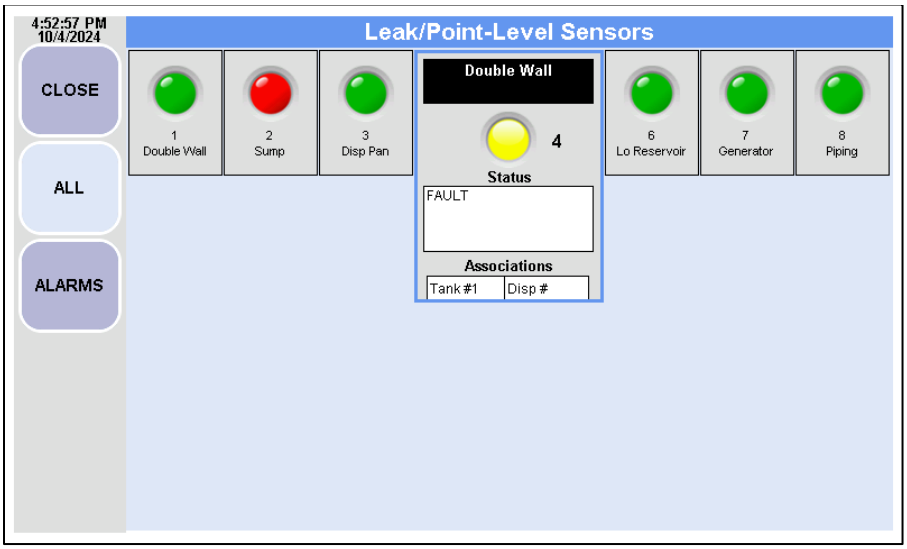
- **Cabling:**
  - Correct Field Cabling Part Number. Use correct part number cable, Belden 8441 or approved equivalent
  - In TMS, check for properly secured wires with all strands twisted together and not shorting to an adjacent position.
  - Check all junction boxes for the presence of water or corrosion.
  - Check cabling at head is properly secured and spliced.
- **Probe Assembly:** Check for improper assembly as follows:
  - Floats: Includes proper orientation and number of floats as indicated by "F" variable in Probe Model Number: MP4xx-xxx-Fx
  - Spacers: Used to keep float magnets from entering dead band or getting to close to each other. Refer to probe documentation for details.
- **Bottom Clearance:** Direct-mount probes require minimum bottom clearance per below table.

Model #	Size Range (Effective)	B/C
MP45x	Up to 36 [910]	0.25 [6]
MP45x	37-179 [911-4550]	0.5 [13]
MP45x	180-288 [4551-7315]	1 [25]
MP461SC	ALL	0.5 [13]
MP461	ALL	2 [51]

Model #	Size Range (OAL)	B/C
MP462	ALL	2 [51]
MP463	289-432 [7316-10975]	3 [76]
MP463	433-600 [10976-15240]	4 [102]
MP464	601-720 [15241-18290]	5 [127]
MP464	721-840 [18291-21335]	6 [152]

Dimensions provided in inches [millimeters] B/C: Bottom Clearance

Leak/Point Level Sensor Status:
Produces an audible annunciator and are visually represented on the Sensor Status window. All alarms are also listed in the Alarm Status window. The audible annunciator can be acknowledged via Front panel. The visual annunciator for the Sensor will remain active until the condition is corrected.



Sensor Status – Access by tapping Sensors button on Main Screen

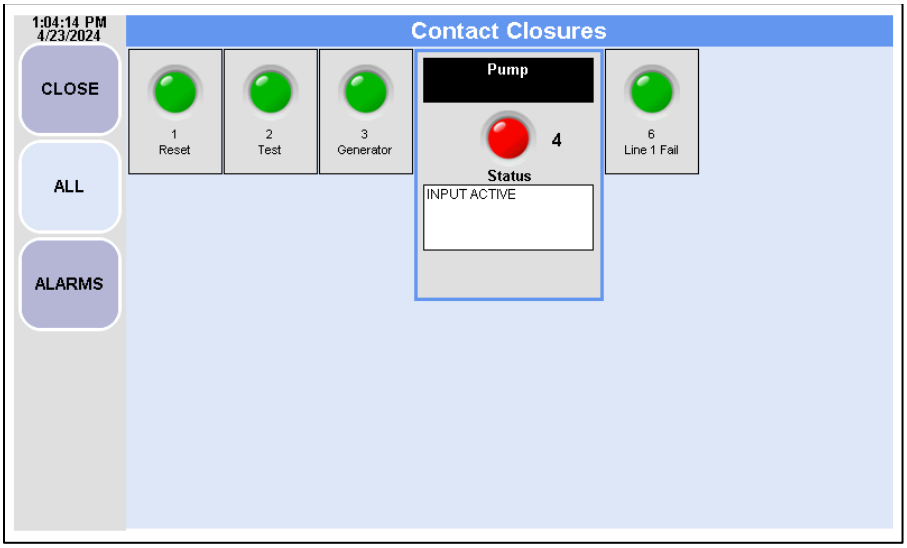
The sensor's alarm or activity status is represented graphically as illustrated above. The colors generally represent the following:

- Green: Normal or inactive sensor.
- Red: Alarm or activity. May be a general, product, or bottom water alarm.
- Yellow: Tamper or wiring fault error. Sensor tampered with, wiring fault, or sensor fault.
  Troubleshooting Note: Check all connections, including splices, between the TMS and sensor. Confirm TMS Configuration represents connected sensors.
- Gray: Absent or Faulty Sensor Interface Card.

Note: See Section 1.6 for complete details on Sensor Statuses.

Note: Tap on individual Sensor Panel for more details.

Contact Closure (CC) Input Alarm/Status:
Produces an audible annunciator and are visually represented on the Contact Closure Status window. All alarms are also listed in the Alarm Status window. The audible annunciator can be acknowledged via Front panel. The visual annunciator for the CC Input will remain active until the condition is corrected.



Contact Closure (CC) Input Status – Access by tapping Contact Closures button on Main Screen

The Contact Closure (CC) Input's alarm or activity status is represented graphically as illustrated above. The colors generally represent the following:

- Green: Normal or inactive sensor.
- Red: Alarm or activity.

Note: See Section 1.7 for complete details on CC Input Statuses.

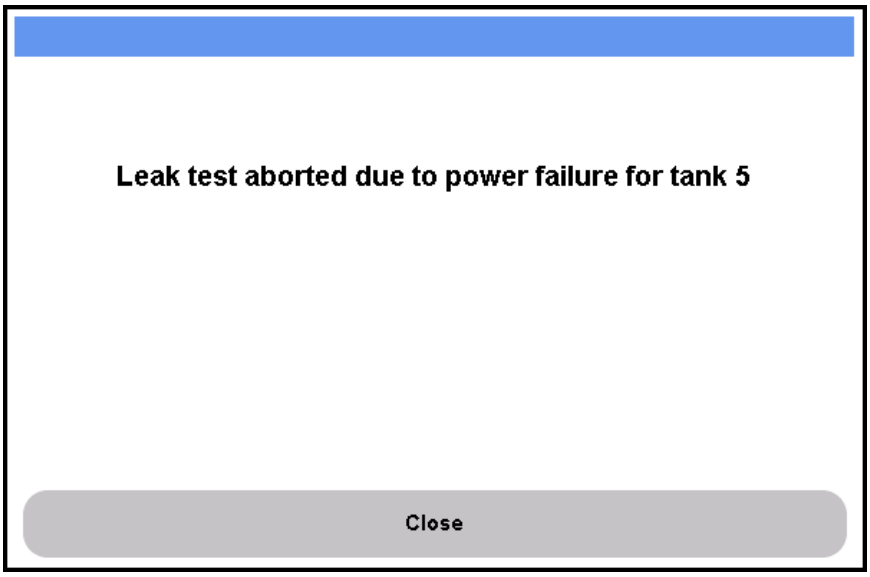
Note: Tap on individual CC Input Panel for more details.

Warnings:
Warnings are typically less critical than Alarms and Events but still may require some attention. Warnings are recorded in the Event Log and are printed automatically on either the external USB or network-accessible printer if the Auto Print feature is enabled. Warning conditions are also user programmable to send an SMS or E-Mail out upon activation.

In-Tank Leak Test Warnings

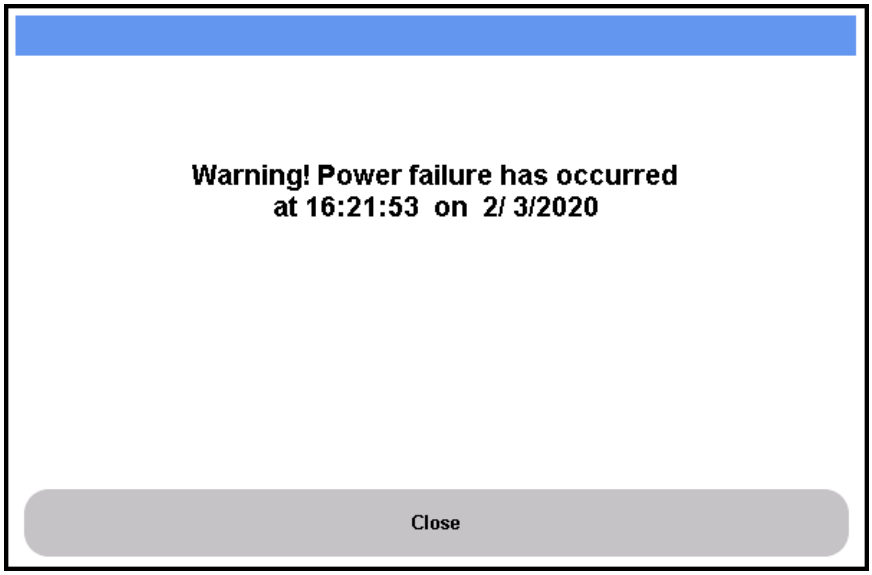
Delivery During Test	**Delivery During In-Tank Leak Test** A delivery occurred while the In-Tank Leak Test was running. This resulted in the Leak Test being aborted. The TMS will run the Leak Test at the next scheduled opportunity.
No Monthly Leak Test	**No Monthly Leak Test Performed** A notification provided by the TMS when configured for an Auto In-Tank Leak Test. The exact date that the notification is provided is defined in SETUP > LEAK TEST. Intended to notify site personnel that the In-Tank Leak Test has not yet been satisfactorily completed as the end of the month is approaching.

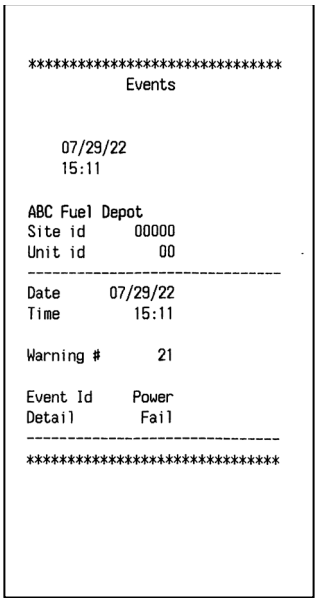
In-Tank Leak Test aborted due to a power failure



The In-Tank Leak Test had started but was unable to complete due to the TMS losing main system power. The In-Tank Leak Test will run at the next scheduled opportunity.

Power Fail, Warning 21

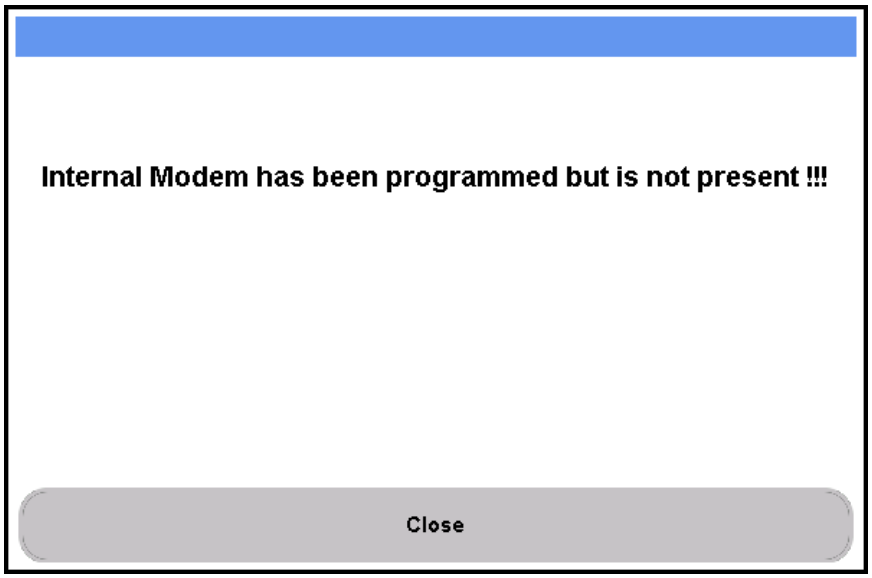




The power has been restored after a loss of power. This was intended to notify site personnel of the power loss, knowing that any scheduled in-tank leak tests would not have been performed while the power was out. Transactions, alarms, events, etc., that occurred while the power was out would not have been documented.

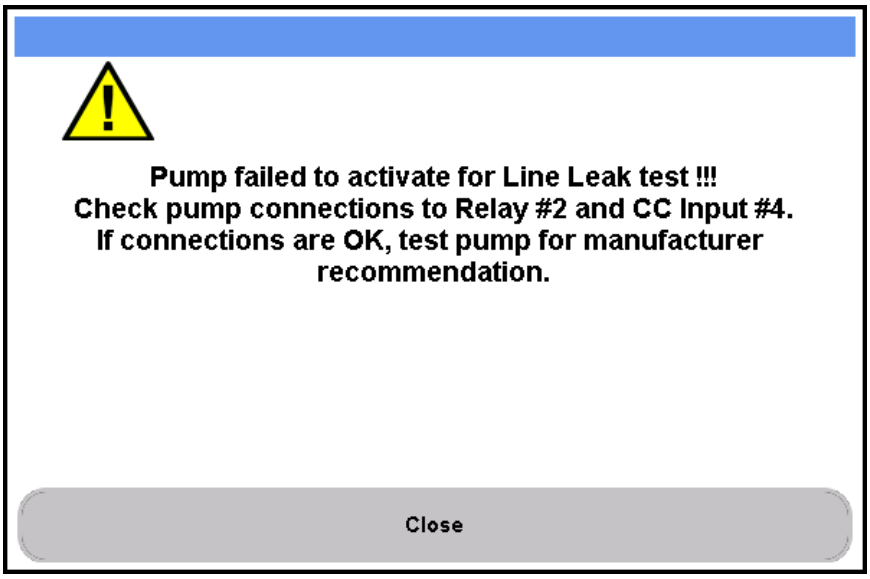
Power Failures are documented in the Events Log. An example of the printout generated by the optional external USB receipt printer is shown above.

Modem Warning:



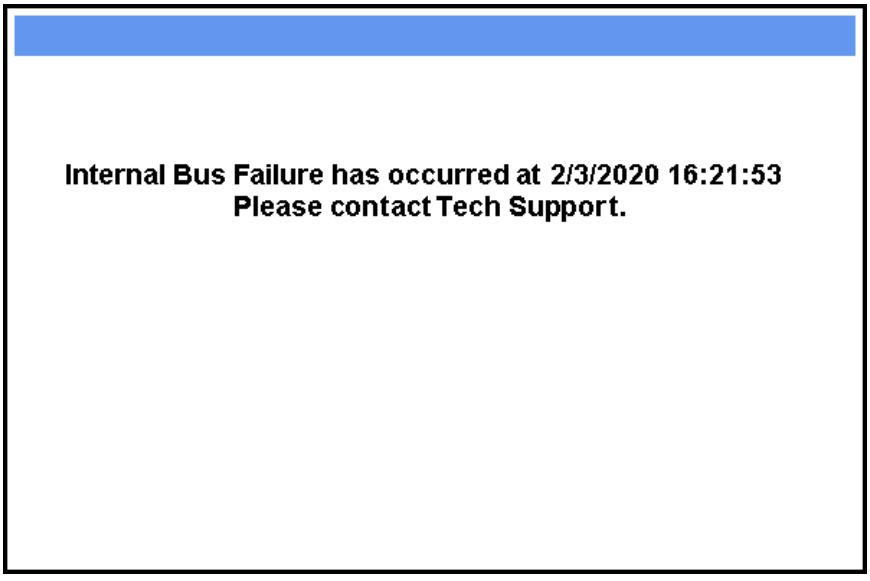
The TMS has been configured to support the optional internal modem, 900433-x, but the modem could not be detected. Confirm that the modem has been installed. If the modem is already installed, return the modem to Pneumercator for evaluation or install a replacement modem.

Pump failed to activate for the Hourly Line Leak Test



The TMS did not detect that the pump was activated in support of the Line Leak Test when the TMS is configured to run the Line Leak Test hourly. The message indicates the Relay number being used to control the pump and the CC Input number being used to monitor that the pump has activated. Check all connections to the TMS and verify that the pump is operating correctly as per the pump manufacturer's instructions.

Internal Bus Failure



A critical hardware failure has occurred. Power off the TMS and remove ALL electronic assemblies EXCEPT the Power Supply Board (900860-x), Processor Card (900907-1), and Color LCD Touchscreen. Power on the TMS. If the problem persists, contact Pneumercator Tech Support at (800) 209-7858. If the TMS starts normally, power off the TMS, add one electronic assembly previously removed, and power on the TMS. Repeat this step, one assembly at a time, until all failed assemblies have been identified.

APPENDIX B – MAINTENANCE

This maintenance documentation presumes that the system to be tested has been installed in accordance with all current documentation for the system and has been started up by a factory certified technician. If you feel that this service has not been performed, adequately or otherwise, please contact your local authorized Pneumercator service provider to make the necessary arrangements.

The TMS Series will be able to detect many conditions, including probe communication issues and sensor wiring faults (when equipped with a Pneumercator fault detecting sensor). Reviewing and addressing any Alarm or Event conditions displayed on the TMS would be the best place to start for determining the proper functioning of the system. Inspection of all cabling for cracking or swelling and evaluating the condition of the splices will help to maintain a properly working system.

Before connecting or disconnecting ANY cables, power off the system. Once the cabling changes are complete, the system can be powered on.

While annual inspection is considered to be good general practice, it may be required by regulation or application to perform inspections more frequently.

The following table includes a model specific list of additional points of inspection.

Model(s)	Check points
TMS System	1. If equipped with a printer, verify there is adequate paper. Press PRINT, then PRINT CURRENT STATUS, and select external USB printer to verify the operation of the printer. Note: the printout generated will include a Full Inventory and Alarm Status report which can be used for further identification of problems. 2. Press the TEST button to verify all integrated LEDs and horn are functioning 3. Take a stick reading of each tank for both Product and Water and confirm that the TMS Level Reading matches the stick reading. If there is a discrepancy, perform the float height offset procedure as outlined in the Quick Startup Guide. 4. If In-Tank Leak Testing is required, confirm the results show passing tests and verify the schedule.
Rigid Probes	Remove the probe to verify there is no damage or residue buildup on the floats or probe shaft. Clean as necessary. No annual calibration required. Recalibration required only if probe or floats are replaced.

ES825-100F (non-discriminating)	Remove and inspect the sensor for physical damage. Test the sensor by placing in a nonreflective water-filled container shielded from ambient light. Verify the alarm received on the system display is as expected. Clean sensor to remove any contaminants.
ES825-200F (discriminating)	Remove and inspect the sensor for physical damage. Test the sensor by placing in a nonreflective water-filled container shielded from ambient light. Verify the alarm received on the system display is as expected. Repeat using a container filled with product. Clean sensor to remove any contaminants.
Float switch sensors: Includes: LS600, LS600LD, LS610, RSU800	Remove and inspect the sensor for physical damage or debris that may obstruct the movement of the float. Test the sensor by manipulating the float. Verify the alarm received on the system display is as expected. Clean sensor to remove any contaminants, as necessary.
HS100, HS100D, HS100D2	1. Flip the bottom cap upside-down to confirm the operation of the float switch 2. Refer to the documentation supplied with the sensor for proper testing procedures for the hydrocarbon sensing polymer strip. Contact Pneumercator for additional information.
HS100ND	Refer to the documentation supplied with the sensor for proper testing procedures. Contact Pneumercator for additional information.
LLP203-x-x	Refer to the documentation supplied with the sensor for proper testing procedures. Contact Pneumercator for additional information.
Remote Alarms: Includes all RA and select LC1000 systems	Press the Test button associated with the remote alarm. It is also recommended to simulate an alarm on the controlling system to verify the operation of the remote alarm.
Remote Displays: Includes ETD1000	Confirm the display of the TMS matches what is displayed on the Remote Display. Press the Test button to confirm proper operation of the display and integrated horn.

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.

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