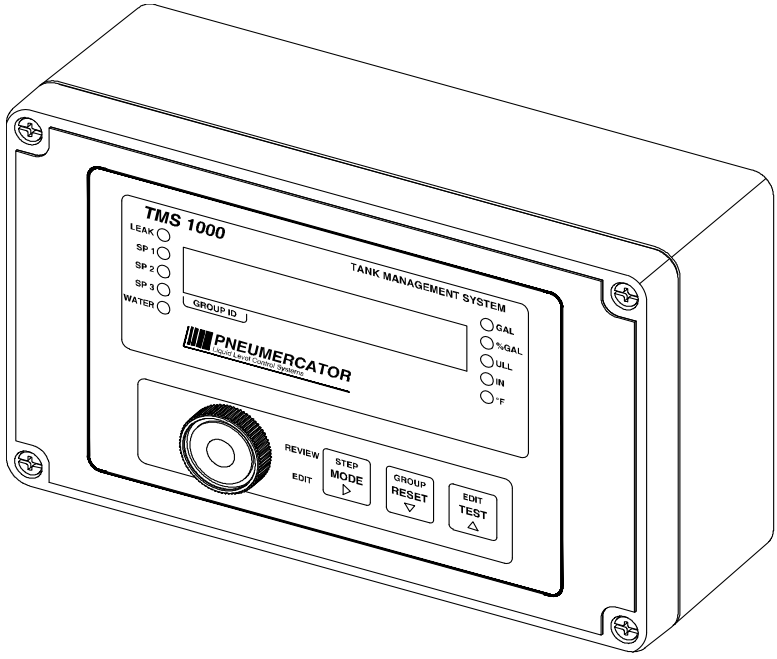
PNEUMERCATOR
Liquid Level Control Systems

SINGLE
NON-HAZARDOUS
TANK
MONITORING
SYSTEM

OPERATION & MAINTENANCE MANUAL



DRAWING NO. 20157 REV. N/C

MODEL TMS1000N

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Note: A separate INSTALLATION MANUAL is available, but NOT required for TMS1000N operation.

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SECTION 1 – FRONT PANEL DESCRIPTION

1.1 OVERVIEW

As illustrated in Figure 1-1 below, the TMS1000N front panel consists of an LED data display with visual alarm and mode annunciators, audible alarm annunciator, and user -friendly pushbutton controls.

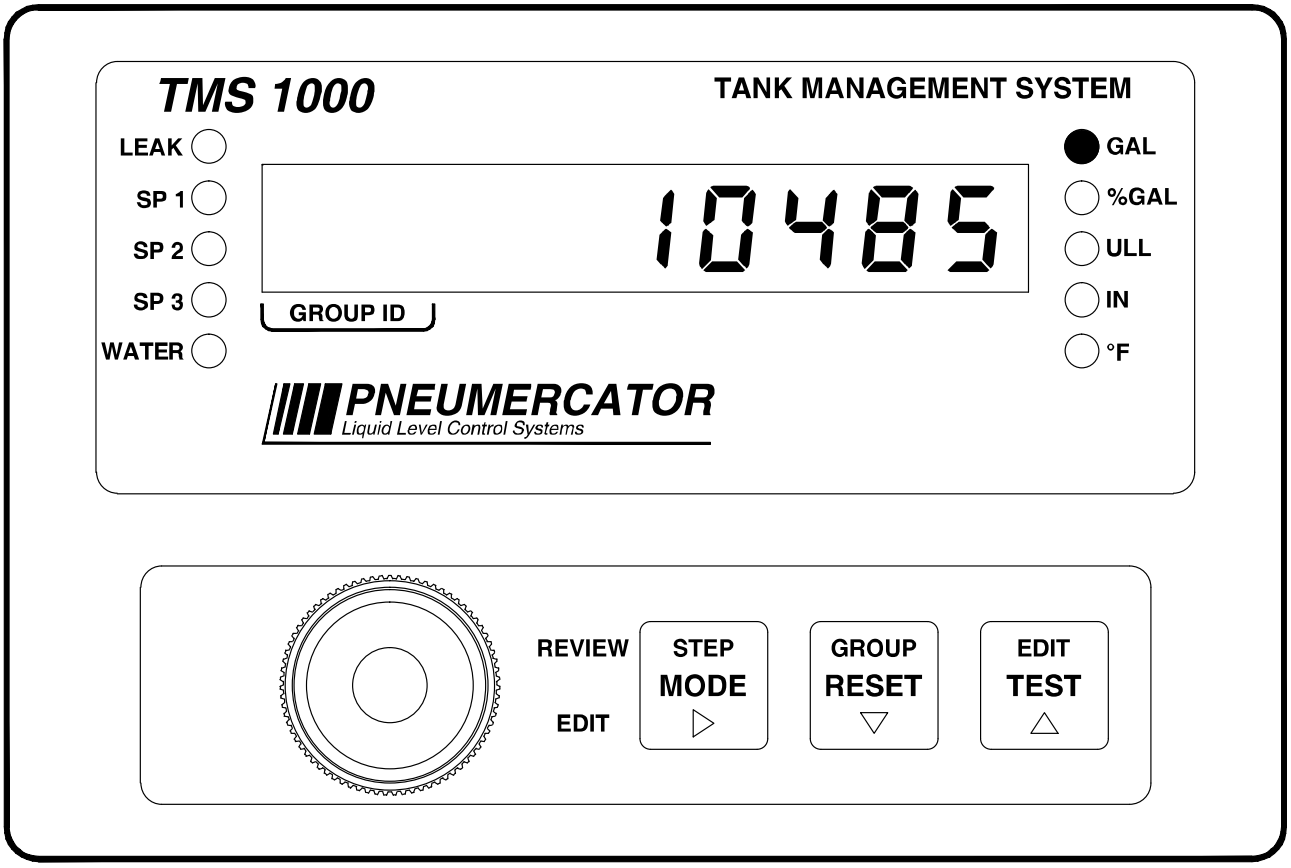

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Figure 1-1 – Front Panel Overview

1.2 DISPLAY

The front panel display consists of a nine-digit, seven segment, quasi-alphanumeric super bright LED display, providing on site viewing of current inventory data, alarms, errors, report logs, as well as, set-up and configuration data. Five high intensity point LEDs annunciate alarm conditions visible up to 75 feet away from console. Five additional LED annunciators provide indication of units of measure of the currently selected display data. See figure 1-2 below.

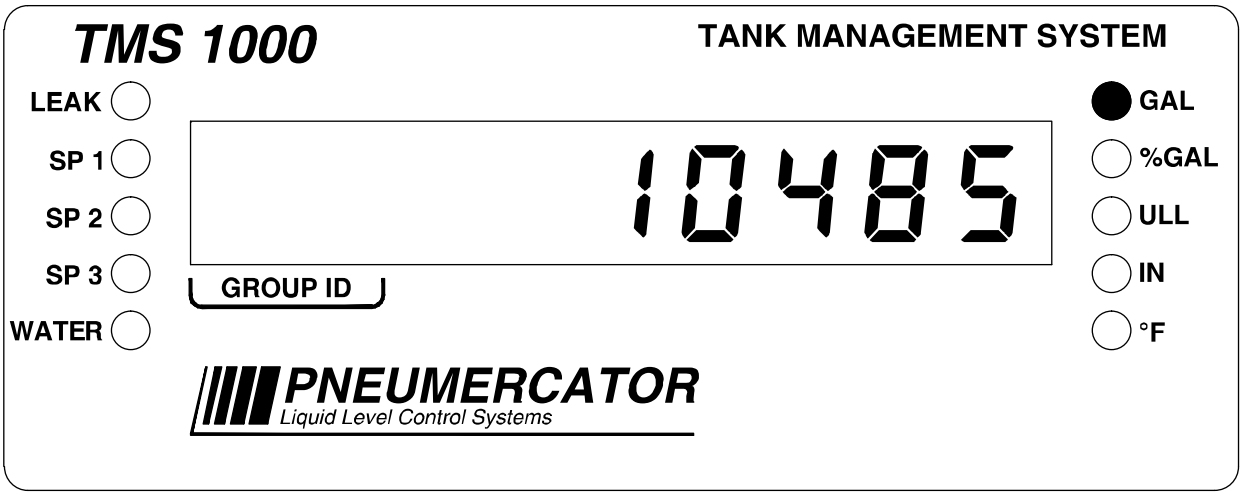

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Figure 1-2 – Front Panel Display

1.3 AUDIBLE ANNUNCIATOR

The audible annunciator integrated into the Front Panel activates for any programmed alarm condition alerting site personnel to this fact.

SECTION 2 – OPERATION

2.1 POWER-UP SEQUENCE

Upon application of AC power, the TMS performs a series of tasks prior to normal operation. These include in the following sequence;

1. A self-test to verify integrity of both system program and data memories, system I/O, and data acquisition interface electronics. Display is blank during this process.

2. Retrieval and verification of configuration and set-up data.
   Display shows "rEAd inG/ConF iG" (Reading/Configuration).

3. System initialization, including pre-start-up calculations.
   Display shows "SYStEn/ in it" (System/Initialization).

4. Firmware version identification. The TMS displays the current firmware versions installed in the system. This information may be requested by Pneumercator's Technical Support department for troubleshooting purposes.

5. Visual display and audible alarm check.
   Display shows "88888888" (88888888) with all LEDs on, audible alarm beeps **twice**.

6. Begin normal operation, display any error messages. For a description of system error, warning and info messages, refer to **appendix A**.

Note: In cases where the TMS power has been turned off for more than one to two minutes, a power-up sequence will generate the following warning message on the display, "WArn2 I/Pwr FAIL" Warning 21, Power Failure. This message is normal, and is just informing the user that the TMS has detected a power failure. Once acknowledged by the user by pressing any front panel pushbutton, this message will disappear from the display.

2.2 OVERVIEW

TMS front panel operation is defined by three user-selectable modes, View, Access, and Test, all selected using the MODE and TEST pushbuttons. See figure 2-1, System Function Tree below.

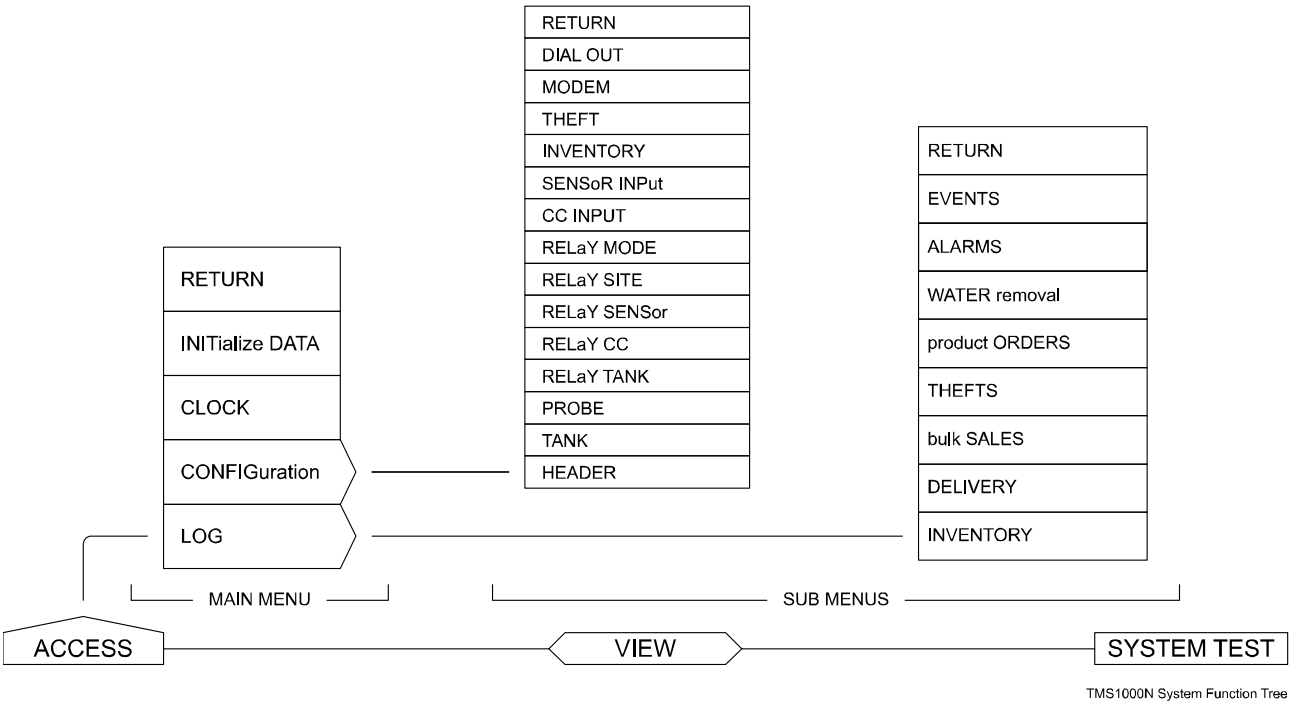

Figure 2-1 – System Function Tree

View: The View mode is the most frequently used and the default mode of operation for the console. The View mode displays current tank data, which includes product gross, net (temperature compensated) volumes, percent of capacity, 90% ullage, product and water levels, product temperature, and product type. In addition, alarm and error conditions are annunciated in the View mode.

Access: The access mode provides access to all of the menus and submenus shown in Figure 2-1. In this mode the user can review report logs; review and edit system configuration data; perform initialization functions; and read or set the system clock.

Test: The Test mode allows visual verification of display operation, audible verification of the audible annunciator, and self-verification of critical system hardware.

2.3 VIEW MODE

Looking at the names assigned to the console front panel pushbuttons and display field, note that some appear in black lettering, others in orange. Only the **black**-lettered name assignments apply to the **VIEW** mode.

The seven-segment data display is formatted so that the currently selected data item appears on the right-hand side as indicated on the front panel. The LED annunciators on the left-hand side indicate alarm conditions. An alarm indicator is active when the particular LED is on.

Pushbutton Operation:
MODE: The MODE pushbutton functions both as a Display Mode Select (i.e. STEP) and a Product Name Recall. If the user depresses and holds MODE until an Audible beep is heard, the display will step to the next display item. Display items include, in order of appearance;

Display Item	Units LEDs	Display Resolution
Gross Volume (uncompensated)	Gallons	1 gallon
Net Volume (Temperature compensated)	Gallons, °F	1 gallon
Percent Volume	% Gallons	0.1%
Ullage	Gallons	1 gallon
Level	Inches	0.1 inches
Temperature	°F	0.1 °F

To recall the name of the product stored, depress and immediately release MODE. The product name will appear for two seconds, and then the display will revert back to displaying the currently selected data item.

RESET: The RESET pushbutton is used to provide an acknowledgement of the integrated audible annunciator. The RESET button will have no effect on the Alarm LEDs.

TEST: The Test mode allows visual verification of display operation, audible verification of the audible annunciator, and self-verification of critical system hardware.

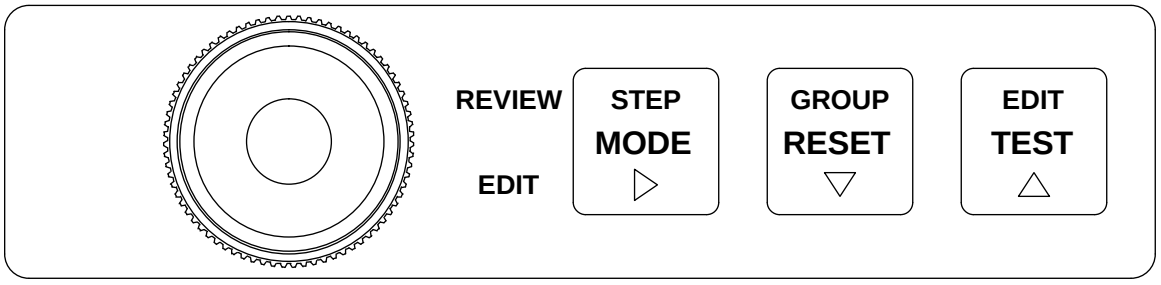

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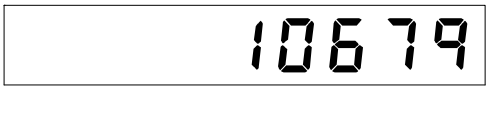
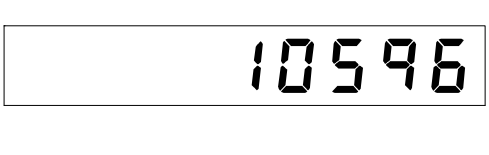
Figure 2-2 – Front Panel Buttons

Front Panel Alarm Acknowledgment:
Alarm, error or warning conditions, which occur during VIEW mode, will activate the front panel visual and audible annunciators. Depending upon user configuration programming, the user can silence the audible annunciator by momentarily pressing **any** front panel pushbutton. The visual annunciator will remain active until the alarm or error condition is eliminated. If subsequent alarm errors, or warnings occur, the audible annunciator will again be activated.

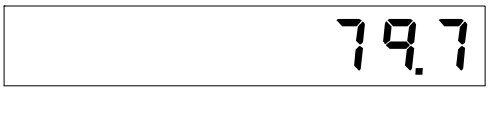
See below: Actual TMS Visual representation of Front Panel displayed items, in order of appearance:



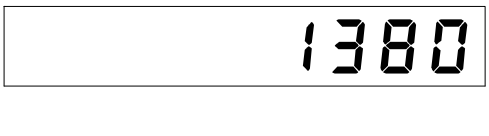
Gross Volume = 10679 Gallons



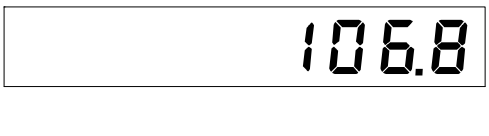
Net Volume = 10596 Gallons



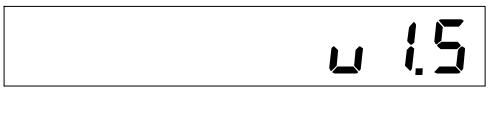
Percent Volume = 79.7% of Capacity



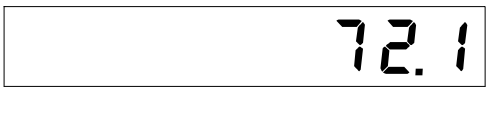
Ullage = 1380 Gallons



Product Level = 106.8 Inches



Water Level = 1.5 Inches



Temperature = 72.1°F

Product Name = Water

Pressing the MODE button until the BEEP, will select each item

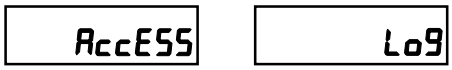
2.4 ACCESS MODE

Within the **ACCESS** mode there are several levels of menus and sub-menus, as illustrated in Figure 2-1. The main menus include **LOG** reports, **CONFIG**uration, **CLOCK** read/set, and Log/Configuration memory **INIT**ialization. Note: that the LOG and CONFIG main menus contain numerous sub-menus. These sub-menus will be described in detail later in this section. The main menus are as follows:

LoG	The LOG menu is used to review any of the various log reports generated by the TMS. The system does not allow the user to edit any of these reports.
ConF iG	The CONFIGuration menu is used to review or edit system configuration data.
C lock	The CLOCK menu is used to edit system date, time, and day of the week.
In it dAtA	The INITialization menu is used to initialize all or selected log report groups, or configuration memory.

How to enter the ACCESS mode:

The **ACCESS** mode is entered by first pressing and holding **TEST,** and then, while still holding **TEST**, simultaneously pressing and holding **MODE.** After approximately two seconds, the **TMS** will enter the **ACCESS** mode. The display will appear as follows:



where LOG is the first main menu

Note: The **TMS** front panel contains both black text, and orange text. Where present, the **orange** name assignments apply while in the ACCESS mode.

Pushbutton Operation:

Within the **ACCESS** mode there are two basic types of operations that the user can perform: REVIEW and EDIT. As seen on the TMS front panel, the three right-hand pushbuttons have different functions assigned to them for REVIEW and EDIT operations.

REVIEW MODE: REVIEW is the normal mode of operation within the **ACCESS** mode, and is used to examine or review log, configuration, or clock data within the system. REVIEW MODE is available in all menus and sub-menus.

STEP: The STEP pushbutton functions both as a STEP-to-the-next-item and a Data Name Recall. If the user depresses and holds STEP until an audible beep is heard, the display will step to the next menu data item. To recall the name of the menu data item the user momentarily depresses STEP. The menu data item name will appear for two seconds, and then the display will revert back to displaying the currently selected data item.

GROUP: The GROUP pushbutton selects from a list of numbered menu items. This selection is generic, and refers to the fact that, depending upon which menu the user has entered, GROUP will select the next relay, leak sensor, log record, etc.
EXAMPLE: If the user enters a relay setup menu, GROUP will select the next relay, and the GROUP ID display field will indicate the relay number rather than a tank ID. If the user enters the INVENTORY LOG menu, which stores up to 6 records, depressing GROUP will step to the next inventory record and the GROUP ID display field will represent the inventory record number 1 through 6.

EDIT: The EDIT pushbutton is used to edit or change the value of the currently displayed data item. If the displayed item is a menu or sub-menu name, EDIT allows the user to change the menu. If the displayed item is system data, for example, configuration or clock data, the EDIT function is inhibited unless enabled by opening the **EDIT ENABLE** DIP switch 1 located on the main board. An audible beep informs the user when editing in inhibited. Once **EDIT ENABLE** has been opened, editing is enabled for as long as the user remains in the ACCESS mode even if the switch is returned to the closed position. For additional security, if the **TMS** is in the ACCESS mode for more than four minutes and detects no user activity on the front panel pushbuttons, the system will time out and revert back to VIEW mode. Entry back into the ACCESS mode will again require opening **EDIT ENABLE** to re-enable editing.

EDIT MODE: EDIT is the mode of operation within the **ACCESS** mode used to modify configuration or clock data within the system. EDIT MODE is available in the CONFIG, CLOCK, and INIT DATA sub-menus.

The names associated with pushbutton functions during edit operations are labeled in **orange** on the front panel as ▶ (right arrow), ▼ (down arrow), and ▲ (up arrow), as shown in Figure 2-2.

▶: For numeric data, advances the blinking cursor to the right to the next digit to be changed. Pressing right arrow while at the right-most digit performs the function of ENTER, and causes the new or changed entry to be stored.

▼: Decrements the content of the blinking portion of the display. For numeric data this button is used to decrement the value of the selected digit. For alphanumeric names, ▼ decrements through a list of name selections.

▲: Increments the content of the blinking portion of the display. For numeric data this button is used to increment the value of the selected digit. For alphanumeric names, ▲ increments through a list of name selections.

2.5 TEST MODE

The TEST mode is initiated by depressing the TEST pushbutton. This action activates all of the front panel display LED segments and LED annunciators for visual verification, and will produce a double beep from the audible annunciator for audible verification.

SECTION 3 – ACCESS MODE MENUS

3.1 LOG

ACCESS

LoG	System reports
ConF iG	System configuration
C lock	Set system clock
In it dAtA	Resets select data to initialized values
rEturn	Exits access menu

The LOG menus listed below are a grouping of historical or on-demand records.

			Max records
InvEntorY	Inventory	- Scheduled inventory snapshots	6
dEL ivEr Y	Deliveries	- Delivery (Product added) transactions	4
SALES	Sales	- Bulk sales (Product removed) transactions	4
tHEFtS	Thefts	- Theft incidents	2
OrdErS	Product Order	- On-demand product reorder report	1
WAtEr	Water Removal	- Water removal transaction	1
ALArMS	Alarms	- Probe/sensor alarms	12
EvEntS	Errors	- System errors/events	4

In view mode depressing TEST button first, then MODE and holding both buttons momentarily will increment the TMS into the ACCESS MODE displaying the main menu beginning as follows with LOG**.** Pressing the EDIT (TEST) button again would cause LOG to blink. Once LOG is blinking, pressing the ▶ (MODE) button will enter the LOG menu revealing the INVENTORY submenu. **The LOG menu is used to review various reports generated by the TMS.**

In the LOG menu, the system does **not** allow the user to **edit** any of these reports.

Note: Three types of entries require the user to input programming data when configuring the TMS menus. It is mentioned here, to help the user interpret data displayed in the Log menus. This information below will be explained again in the CONFIG section of the manual.

Entry Type: Either a numeric value or a list of choices designated by the system.

Range Limits: Selects and enters a numeric value within a fixed boundary, set by the system.

Default/Initialized value: If not user programmed, this entry, value or term, will be set by the system.

To select and step through other records while in the LOG menu, pressing the ▲ (TEST) button at the flashing term such as INVENTORY will increment the system to the next menu. i.e. DELIVERY, then SALES, etc. The ▼ (RESET) button at the flashing term such as INVENTORY will decrement the system to the next menu. i.e. RETURN, then EVENTS, etc.

3.1.1 INVENTORY LOG

InvEntorY Inventory This menu displays a snapshot of the stored inventory data for each tank, which the user programs, at up to three scheduled capture times a day and selectable for each day of the week. An automatic hardcopy report can be generated if the TMS is linked to a PC utilizing the TMS Communicator software package. The user may also step through and view the record manually, utilizing the TMS front panel pushbuttons. The system has the capacity to store, beginning with the most recent, up to 6 inventory records. Inventory log reports will contain the following data: Date, Time, Tank Name, Product Type, Tank ID, Product Height, Gross Volume, Net Volume, Percent Volume, Ullage, and Temperature.

nn-dd	Month - Day	Month and Day of this inventory record. An empty record will have a 00-00.
HH' nn	Hour-Minute	Hour and Minute of the Inventory record. (time stored in 24 hr. format) Example 12'00 = 12 Noon; 23'59 = 11:59 PM; 00'00 = Midnight
tAnk NAmE	Tank Name	Tank Name assigned by user.
Prod tYPE	Product Type	Tank Product Type assigned by user.
tAnk id	Tank ID Number	2-digit numeric value assigned by user.
Prod Ht	Product Height	Product level (in/mm).
Gr Vol	Gross Volume	Gross Volume (gal/L).
NEt Vol	Net Volume	Net or Temperature Compensated Volume (gal/L).
P Vol	Percent Volume	Percentage of Total Volume.
ULLAGE	Ullage	The complement difference between the actual fuel volume and volume in which the tank can be filled to the Ullage limit (set in the HEADER menu) in Gross Volume (Gr Vol). Example: A 10,000 gallon tank is 8000 gallons full - System will store a 90% Ullage record of 1000 gallons.
tEmP	Temperature	Product Temperature (ºF/ºC).
rEturn	Return	*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the LOG submenu showing INVENTORY. *Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the INVENTORY menu showing **nn-dd**

3.1.2 DELIVERY LOG

dEL ıuEr Y Delivery This menu displays a snapshot of the stored delivery data for each tank, which the system will automatically log and record as a inventory increase when a delivery to a tank has occurred. An automatic hardcopy report can be generated if the TMS is linked to a PC utilizing the TMS Communicator software package. The user may also step through and view the record manually, utilizing the TMS front panel pushbuttons. The system has the capacity to store, beginning with the most recent, up to 4 delivery records. Delivery log reports will contain the following data: Date, Time, Tank Name, Product type, Tank ID, Start Product Height, End Product Height, Start Temperature, End Temperature, End Gross Volume, Start Gross Volume, Gross Volume Increase, End Net Volume, Start Net Volume, Net Volume Increase.

nn-dd	Month - Day	Month and Day of this delivery record. An empty record will have a 00-00.
HH' nn	Hour-Minute	Hour and Minute of the delivery record. (time stored in 24 hr. format) Example 12'00 = 12 Noon; 23'59 = 11:59 PM; 00'00 = Midnight
tAnk nAnE	Tank Name	Tank Name assigned by user.
Prod tYPE	Product Type	Tank Product Name assigned by user.
tAnk id	Tank ID Number	2-digit numeric value assigned by user.
bEG in Ht	Begin Height	Pre-delivery Product level (in/mm).
End Ht	End Height	Post-delivery Product level (in/mm).
bEG tEnP	Beginning Temperature	Pre-delivery Product Temperature in degrees in Fahrenheit (ºF/ºC).
End tEnP	End Temperature	Post-delivery Product Temperature in degrees in Fahrenheit (ºF/ºC).
Gr End	Gross End Volume	Post-delivery Gross Volume (gal/L).
Gr bEG in	Gross Begin Volume	Pre-delivery Gross Volume (gal/L).
Gr d iFF	Gross Difference	Difference between the beginning and ending Gross Volume (gal/L).
nEt End	Net End Volume	Post-delivery Net or Temperature Compensated Volume (gal/L).
nEt bEG in	Net Begin Volume	Pre-delivery Net or Temperature Compensated Volume (gal/L).
nEt d iFF	Net Difference	Difference between the beginning and ending Net volume (gal/L).
rEturn	Return	*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the LOG submenu showing DELIVERY. *Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the DELIVERY menu showing nn-dd

3.1.3 SALES LOG

SALES Sales This menu displays a snapshot of the stored bulk sales data for each tank, which the system will automatically log and record as a inventory decrease when a withdrawal from a tank has occurred. An automatic hardcopy report can be generated if the TMS is linked to a PC utilizing the TMS Communicator software package. The user may also step through and view the record manually, utilizing the TMS front panel pushbuttons. The system has the capacity to store, beginning with the most recent, up to 4 sales records. Sales log records will contain the following data: Date, Time, Tank Name, Product Type, Tank ID, Start Product Height, End Product Height, Start Temperature, End Temperature, Start Gross Volume, End Gross Volume, Gross Volume decrease, Start Net Volume, End Net Volume, Net Volume decrease.

nn-dd	Month - Day	Month and Day of this sales record. An empty record will have a 00-00.
HH'nn	Hour-Minute	Hour and Minute of the sales record. (time stored in 24 hr. format) Example 12 PM = 12'00; 23'59 = 11:59 PM; 00'00 = Midnight
tAnk nAnE	Tank Name	Tank Name assigned by user.
Prod tYPE	Product Type	Tank Product Name assigned by user.
tAnk id	Tank ID Number	2-digit numeric value assigned by user.
bEG in Ht	Begin Height	Pre-sales Product level (in/mm).
End Ht	End Height	Post-sales Product level (in/mm).
bEG tEnP	Beginning Temperature	Pre-sales Product Temperature (ºF/ºC).
End tEnP	End Temperature	Post-sales Product Temperature (ºF/ºC).
Gr bEG in	Gross Begin Volume	Pre-sales Gross Volume (gal/L).
Gr End	Gross End Volume	Post-sales Gross Volume (gal/L).
Gr diFF	Gross Difference	Difference between the beginning and ending Gross Volume (gal/L).
nEt bEG in	Net Begin Volume	Pre-sales Net or Temperature Compensated Volume (gal/L).
nEt End	Net End Volume	Post-sales Net or Temperature Compensated Volume (gal/L).
nEt diFF	Net Difference	Difference between the beginning and ending Net Volume (gal/L).
rEturn	Return	*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the LOG submenu showing SALES. *Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the SALES menu showing nn-dd

3.1.4 THEFTS LOG

tHEFtS Thefts This menu displays a snapshot of the stored theft data for each tank. Logged capture times, which the user programs are based on the facility scheduled closed hours. The system will automatically log and record an inventory decrease as a fuel theft while the station is closed. An automatic hardcopy report can be generated if the TMS is linked to a PC utilizing the TMS Communicator software package. The user may also step through and view the record manually, utilizing the TMS front panel pushbuttons. The system has the capacity to store, beginning with the most recent, up to 2 theft records. Theft log reports will contain the following data: Date, Time, Tank Name, Product Type, Tank ID, Start Product Height, End Product Height, Start Temperature, End Temperature, Start Gross Volume, End Gross Volume, Gross Volume decrease, Start Net Volume, End Net Volume, Net Volume decrease.

nn-dd	Month - Day	Month and Day of this theft record. An empty record will have a 00-00.
HH'nn	Hour-Minute	Hour and Minute of the theft record. (time stored in 24 hr. format) Example 12 PM = 12'00; 23'59 = 11:59 PM; 00'00 = Midnight
tAnk nAmE	Tank Name	Tank Name assigned by user.
Prod tYPE	Product Type	Tank Product Name assigned by user.
tAnk id	Tank ID Number	2-digit numeric value assigned by user.
bEG in Ht	Begin Height	Pre-theft Product level (in/mm).
End Ht	End Height	Post-theft Product level (in/mm).
bEG tEmP	Beginning Temperature	Pre-theft Product Temperature (ºF/ºC).
End tEmP	End Temperature	Post-theft Product Temperature (ºF/ºC).
Gr bEG in	Gross Begin Volume	Pre-theft Gross Volume (gal/L).
Gr End	Gross End Volume	Post-theft Gross Volume (gal/L).
Gr diFF	Gross Difference	Difference between the beginning and ending Gross Volume (gal/L).
nEt bEG in	Net Begin Volume	Pre-theft Net or Temperature compensated Volume (gal/L).
nEt End	Net End Volume	Post-theft Net or Temperature compensated Volume (gal/L).
nEt diFF	Net Difference	Difference between the beginning and ending Gross Volume (gal/L).
rEturn	Return	*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the LOG submenu showing THEFTS. *Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the THEFTS menu showing nn-dd

3.1.5 PRODUCT ORDER LOG

OrdErS Product Order A manually generated report for the tank at the moment the log record is accessed. The user will utilize this information to determine average daily fuel usage and date and the amount of fuel to order for the next delivery. In addition to the system capturing this data, an automatic hardcopy report can be generated if the TMS is linked to a PC utilizing the TMS Communicator software package. The user may also step through and view the record manually, utilizing the TMS front panel pushbuttons. Product Order log reports will contain the following data: Date, Time, Tank Name, Product Type, Tank ID, Delivery Date, Delivery Amount, Start Gross Volume, End Gross Volume, Gross Volume Usage, Days of Usable Fuel, Average Daily Usage, Usable Fuel remaining, Elapsed days since the last delivery, Ullage or Order amount.

nn-dd	Month - Day	Month and Day of this product order record. An empty record will have a 00-00.
HH' nn	Hour-Minute	Hour and Minute of the order record. (time stored in 24 hr. format) Example 12'00 = 12 Noon; 23'59 = 11:59 PM; 00"00 = Midnight
tAnk nAnE	Tank Name	Tank Name assigned by user.
Prod tYPE	Product Type	Tank Product Name assigned by user.
tAnk id	Tank ID Number	2-digit numeric value assigned by user.
dEL dAtE	Delivery Date	Date of Last Delivery.
dEL Ant	Delivery Amount	Amount of fuel delivered (gal/L).
Gr bEG in	Gross Begin Volume	Pre-delivery Gross Volume (gal/L).
Gr End	Gross End Volume	Post-delivery Gross Volume (gal/L).
tOtAL USE	Gross Difference	Gross amount of fuel used since last delivery (gal/L).
dAYS	Days	Elapsed days since the last delivery.
dA iLY USE	Daily Use	Average daily usage in Gross Volume (gal/L), based on the number of days since last delivery. For example, if 6000 gallons were used over 30 days, the average daily use would be 200 gallons.
USEAbLE	Usable	The current usable volume (gal/L) at 90% of total tank capacity.
dAYS LEFt	Days Left	This is how many days of fuel supply are remaining, based on the average daily usage and current usable volume.
ULLAGE	Ullage	Maximum product order amount in Gross Volume (gal/L) calculated based on current ullage percentage.
rEturn	Return	*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the LOG submenu showing ORDERS. *Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the ORDERS menu showing **nn-dd**

3.1.6 WATER REMOVAL LOG

UAtEr Water Removal The Water Removal menu displays an automatically generated report for each tank after the removal of water has taken place. In addition to the system capturing this data, an automatic hardcopy report can be generated if either, optional printer is installed, or if the TMS is linked to a PC utilizing the TMSCOMM communicator software package. The user may also step through and view the record manually, utilizing the TMS front panel pushbuttons. The system has the capacity to store, beginning with the most recent, up to 12 Water Removal records. Water Removal log reports will contain the following data: Date, Time, Tank Name, Product Type, Tank ID, Pre-report Product Volume, Pre-report H2o Volume, Pre-report Total (Product and H2o) Volume, Post-report Product Volume, Post-report H2o Volume, Post-report Total (Product and H2o) Volume, Post-report (Product and H2o) Percent Volume, Post-report Percent Volume, Post-report 90% Ullage or the (Order amount).

nn-dd	Month - Day	Month and Day of this product order record. An empty record will have a 00-00.
HH' nn	Hour-Minute	Hour and Minute of the order record. (time stored in 24 hr. format) Example 12'00 = 12 Noon; 23'59 = 11:59 PM; 00"00 = Midnight
tAnk nAnE	Tank Name	Tank Name assigned by user.
Prod tYPE	Product Type	Tank Product Name assigned by user.
tAnk id	Tank Ident	2-digit numeric value assigned by user.
Prod bEG.	Product Begin Volume	Initial Gross Volume (gal/L) for Product in the indicated tank excluding Water, before the water removal process starts.
h2o bEG in	Water Begin Volume	Initial Gross Volume (gal/L) for Water in the indicated tank excluding Product, before the water removal process starts.
bEG totAL	Gross Begin Volume	Initial Gross Volume (gal/L) for both Product and Water in the indicated tank, before the water removal process starts.
Prod End	Product End Volume	End Gross Volume (gal/L) for Product in the indicated tank excluding Water, before the water removal process starts.
h2o End	Water End Volume	End Gross Volume (gal/L) for Water in the indicated tank excluding Product, before the water removal process starts.
End totAL	Gross End Volume	End Gross Volume (gal/L) for both Product and Water in the indicated tank, before the water removal process starts.
P UoL	Percent End Volume	Total Product and Water Volume for the indicated tank in Percent, after the water removal process has been completed.
ULLAGE	Ullage	Maximum product order amount for the indicated tank in Gross Volume (gal/L) calculated at 90% of tank capacity, after the water removal process has been completed.
rEturn	Return	*Pressing the Test/Edit button at Return decrements the TMS back to the top of that submenu to repeat the **UAtEr** cycle again. **UAtEr** *Pressing the Mode/Step button at the Return decrements the TMS back out to the top of the **UAtEr** TMS main menu. **nn-dd**

3.1.7 ALARMS LOG

ALArMS Alarms This menu displays a snapshot of the stored alarm data, which the system will automatically log and record as a system, tank, or external leak alarm(s). An automatic hardcopy report can be generated if the TMS is linked to a PC utilizing the TMS Communicator software package. The user may also step through and view the record manually, utilizing the TMS front panel pushbuttons. The system has the capacity to store, beginning with the most recent, up to 12 alarm records. Alarm log reports will contain the following data: Date, Time, Alarm, Group Number, Alarm ID, and Detail. The TMS will report Sensors, 6 Product set points, 4 temperature set points, Non-IS Contact Closure Input, Theft, System Error, and Power Recovery.

nn-dd	Month - Day	Month and Day of this alarm record. An empty record will have a 00-00.
HH' nn	Hour-Minute	Hour and Minute of the alarm record. (time stored in 24 hr. format) Example 12'00 = 12 Noon; 23'59 = 11:59 PM; 00"00 = Midnight
ALArn	Alarm	Specific alarm condition assigned by TMS.
GrouP Nun	Group Number	A numeric alarm Identification code.
ALArn id	Alarm Ident	Designates specific alarm as system, tank, or external devices.
dEtAiL	Detail	Designates the condition as an Alarm, Warning, Information condition, or Error.
rEturn	Return	*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the LOG submenu showing ALARMS. *Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the ALARMS menu showing nn-dd

For description of Alarms, Warnings, or Errors, see Appendix A.

3.1.8 EVENTS LOG

EuEnt5 Events This menu displays a snapshot of the stored event data for each tank, which the system will automatically log and record as a system Error, Warning, or TMS Information Condition. An automatic hardcopy report can be generated if the TMS is linked to a PC utilizing the TMS Communicator software package. The user may also step through and view the record manually, utilizing the TMS front panel pushbuttons. The system has the capacity to store, beginning with the most recent, up to 4 event records. Event log reports may contain any combination of the following data: Date, Time, Error Number, Event ID, and Detail.

nn-dd	Month - Day	Month and Day of this alarm record. An empty record will have a 00-00.
HH' nn	Hour-Minute	Hour and Minute of the alarm record. (time stored in 24 hr. format) Example 12'00 = 12 Noon; 23'59 = 11:59 PM; 00'00 = Midnight
Error Nun	Error Number	A numeric 2-digit error Identification code.
EuEnt id	Event Ident	Designates specific condition of event.
dEtA iL	Detail	Designates specific event as a Error, Warning, or TMS Information Condition.
rEturn	Return	*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the LOG submenu showing EVENTS. *Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the EVENTS menu showing **nn-dd**

For description of Alarms, Warnings, or Errors, see Appendix A.

3.2 CONFIGURATION

ACCESS LoG

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In view mode depressing TEST button first, then MODE and holding both buttons momentarily will increment the TMS into the ACCESS MODE displaying the main menu beginning as follows with LOG**.** Pressing the EDIT (TEST) button again would cause LOG to blink. Once LOG is blinking, press the ▲ (TEST) button to go to the CONFIG menu. Once CONFIG is blinking, pressing the ▶ (MODE) button will enter the CONFIG menu revealing the HEADER submenu.

The CONFIG menu is used to review or edit system configuration data.

Note: Three types of entries require the user to input programming data when configuring the TMS menus. It is mentioned here, to help the user interpret data displayed in the CONFIG menus. This information below will be explained again in the CLOCK section of the manual.

Entry Type: Either a numeric value or a list of choices designated by the system.

Range Limits: Selects and enters a numeric value within a fixed boundary, set by the system.

Default/Initialized value: If not user programmed, this entry, value or term, will be set by the system.

To select and step through other records while in the CONFIG menu, pressing the ▲ (TEST) button at the flashing term such as HEADER will increment the system to the next menu. i.e. TANK, then PROBE, etc. The ▼ (RESET) button at the flashing term such as HEADER will decrement the system to the next menu. i.e. RETURN, then DIAL OUT, etc.

3.2.1 HEADER

CONFIG

HEADER	**Header - Global System Settings**
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

HEADER Header This menu provides access to global TMS settings. It is essential that these parameters are qualified prior to further TMS programming.

ACC CODE Access Code: When security is enabled via DIP switch 4 (see Appendix B), this code is required to communicate with the TMS. This code is also used when attempting to upload firmware into the TMS.
Entry Type: 6-digit numeric
Range Limits: 000000-999999
Default/Initialized value 000000

SECURITY Security: When security is enabled via DIP switch 4 (see Appendix B), this setting selects which communications interfaces implement the security feature.
Entry Type: select list
Range Limits: N/A
Default/Initialized value SER IAL
Item List: SER IAL = RS-232 Serial Port MODEM = Modem
both = Both RS-232 and Modem

UNIT ID Unit ID: Useful for differentiating between multiple TMS systems at the same site. User may assign up to 100 unique numbers per site.
Entry Type: 2-digit numeric
Range Limits: 00-99
Default/Initialized value: 00

SITE ID Site ID: Useful as a means for identifying more than one site.
User can assign up to 100000 unique site ID numbers.
Entry Type: 3-digit numeric
Range Limits: 00000-99999
Default/Initialized value: 00000

DSP MODE Default Display Mode: This entry selects the default mode in which the TMS will display data while in the normal viewing mode. The TMS will automatically revert back to the default mode (GR VOL) gross volume display after a four minute time out is recognized for non-utilization of the front panel pushbuttons..
Entry Type: select list
Range Limits: N/A
Default/Initialized value: GR VOL
Item List: GR VOL = Gross Volume LEVEL = Units of measure
PCTVOL = Percent Gross Volume NETVOL = Net Volume

bAud rAtE Baud Rate: This entry allows the user to select the baud rate for the TMS RS-232 serial communications port.
Entry Type: select list
Range Limits: 1.2K-38.4K (1,200 - 38,400)
Default/Initialized value: 9.6
Item List: 9.6 9600 Baud | 38.4 38,400 Baud | 1.2 1200 Baud | 2.4 2400 Baud | 4.8 4800 Baud

SEr iALFmt Serial Format: This entry allows the user to select the parity, data bits, and stop bit for the RS-232 serial communications port.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: n-8-1
Item List: n-8-1 No Parity, 8 Data Bits, 1 Stop Bit
E-7-1 Even Parity, 7 Data Bits, 1 Stop Bit
o-7-1 Odd Parity, 7 Data Bits, 1 Stop Bit

SP1 LEd SP1 LED: This entry allows the user to assign one of the six set points to one of the three set point LEDs. This would result in this set point being defined as an alarm set point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: HiHi
Item List: HiHi High High | Hi High | Lo Low | LoLo Low Low | Cr tLo Critical Low | Cr tHi Critical High

SP2 LEd SP2 LED: This entry allows the user to assign one of the six set points to one of the three set point LEDs. This would result in this set point being defined as an alarm set point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: Hi
Item List: Hi High | Lo Low | LoLo Low Low | Cr tLo Critical Low | Cr tHi Critical High | HiHi High High

SP3 LEd SP3 LED: This entry allows the user to assign one of the six set points to one of the three set point LEDs. This would result in this set point being defined as an alarm set point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: Lo
Item List: Lo Low | LoLo Low Low | Cr tLo Critical Low | Cr tHi Critical High | HiHi High High | Hi High

SALE En Sale Enable: When enabled, Allows system to detect and log bulk sales when the following conditions are valid:
1. Station is open for business, according to hours of operation programmed in THEFT DETECT submenu.
2. Withdrawal exceeds MINIMUM LOG VOLUME programmed in TANK.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: no

HorndELAY Horn Delay: The ability to have the TMS automatically acknowledge the integrated horn after a delay of 1-9 minutes. Although the horn is silenced, the LED for that condition will continue to be visually illuminated until alarm condition is satisfied. This feature can be disabled by selecting NONE.
Entry Type: select list
Range Limits: (None, 1-9)
Default/Initialized value: nonE

ULL Limit Ullage Limit: Defines the maximum percentage of Gross Volume that is intended to occupy the tank. The Ullage value reported by the TMS represents the Gross Gallons that can be added to the tank to reach that percentage of Gross Volume.
Entry Type: select list
Range Limits: (85%, 90%, 95%, 100%)
Default/Initialized value: **90**

dSt EnAbL Daylight Savings Time Enable: Enables automatic clock adjustment based on the current U.S. Daylight Savings Time rules.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

rEturn Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing HEADER.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the HEADER menu showing ACCESS CODE.

3.2.2 TANK

CONFIG

HEADER	Header - Global System Settings
TANK	**Tank - Programming setup**
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

TANK The TANK menu in CONFIG lets the user configure tank-specific details including: Tank ID, Product and Temperature Alarm Setpoints, and Tank Geometry.

TANK EN Tank Enable: This entry identifies whether the tank is active and has a probe in service.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: NO

TANK NAME Tank Name This entry allows the user to select a generic name for fuel contents. User selects the Tank Name for each enabled tank. See table below.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: GAS

GAS = Gas	DIESEL=Diesel	FUEL = Fuel
2 OIL = #2 Fuel Oil	3 OIL = #3 Fuel Oil	4 OIL = #4 Fuel Oil
5 OIL = #5 Fuel Oil	6 OIL = #6 Fuel Oil	OIL = Oil
WASTE = Waste Oil	KERO = Kerosene	AV GAS = Aviation Gas
AV 100 = Aviation 100	100 LL = 100 Low Lead	JET = Jet Fuel
JET A = Jet A Fuel	JP4 = JP4	JP5 = JP5
JP8 = JP8	LOSULF = Low Sulfur Diesel	HISULF = Hi Sulfur Diesel
RD DSL = Red Diesel	CL DSL = Clear Diesel	NOLEAD = No Lead
PREM = Premium	PLUS = Plus	MIDGRD = MidGrade
REGULR = Regular	REG 1 = Regular 1	REG 2 = Regular 2
REG 3 = Regular 3	REG 4 = Regular 4	SUPER = Super
SUPER 1 = Super 1	SUPER2 = Super 2	SUPER3 = Super 3
SUPER4 = Super 4	SPRUNL = Super Unleaded	TOLUEN = Toluene
HYDO IL = Hydraulic Oil	TRBO IL = Turbine Oil	WSTH2O = Waste Water
LUBE = Lube Oil	TRANS = Transmission Oil	MOTOR = Motor Oil
OW SEP = Oil/Water Separator	GLYCOL = Glycol	MEK = MEK/Methyl Ethyl Ketone
XYLENE = Xylene	NAPTHA = Naptha	AR 100 = Aromatic 100
ISOBUT = Isobutyraldehyde	WATER = Water	OIL-PL = Oil-Plasticizer
METHNL = Methanol	RECYCD = Recycled Oil	VIRG IN = Virgin Oil
NOGAS = Mogas	ETHANL = Ethanol	ETH 10 = 10% Ethanol
ETH 15 = 15% Ethanol	ETH 20 = 20% Ethanol	ETH 85 = 85% Ethanol
USER = User-defined Tank Name		

tAnk id — Tank ID Number: This entry selects a unique tank identification number to any 2-digit numerical value up to 99.
Entry Type: 2-digit numeric
Range Limits: 01-99
Default/Initialized value: 01

UOL ModE — Volume Mode: This entry allows the user to select one of two modes which is dependent on tank capacity. The BY 1 mode is selected for tank capacities of less than 1 million gallons. The BY 10 mode is selected for Tank capacities 1 million gallons and higher. All other settings programmed in gallons would be multiplied by 10. Example: A 2,000,000 gallon capacity would be entered as 200,000 in the CONFIG, TANK CAPACITY menu.
Entry Type: select list
Range Limits: (by 1, by 10)
Default/Initialized value: bY 1

Prod tYPE — Product Type This entry allows the user to select tank contents.
User selects the Product Type for each enabled tank. See table below.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: 87 OctAnE
Note: For products not listed - Consult Factory

87 oct = 87 Octane	89 oct = 89 Octane	91 oct = 91 Octane
92 oct = 92 Octane	93 oct = 93 Octane	94 oct = 94 Octane
95 oct = 95 Octane	d iESEL = Diesel	HEro = Kerosene
No 2 = #2 Fuel Oil	No 4 = #4 Fuel Oil	No 6 = #6 Fuel Oil
UAStE = Waste Oil	Au 9A5 = Aviation Gas	Au 100 = Aviation 100
100 LL = 100 Low Lead	JEt A = Jet A Fuel	JP4 = JP4
JP5 = JP5	JP8 = JP8	ToLuEn = Toluene
LubE = Lube Oil	trAn5 = Transmission Oil	Motor = Motor Oil
9LYcoL = Glycol	MEH = MEK/Methyl Ethyl Ketone	xYLEnE = Xylene
NAPtHA = Naptha	Ar 100 = Aromatic 100	iSobut = Isobutyraldehyde
UAtEr = Water	O iL-PL = Oil-Plasticizer	MEthnL = Methanol
ChEn = Chemical	EtHANL = Ethanol	EtH 10 = 10% Ethanol
EtH 15 = 15% Ethanol	EtH 20 = 20% Ethanol	EtH 85 = 85% Ethanol

SP Cr iH i — Set Point – Critical High Volume: This is one of the three programmable overage alarms for detecting a percentage of gross volume at or above the programmed threshold. This will only generate an alarm when associated with one of the numbered set point LEDs. It can always be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: 98.0

SP H iH i — Set Point – High High Volume: This is one of the three programmable overage alarms for detecting a percentage of gross volume at or above the programmed threshold. This will only generate an alarm when associated with one of the numbered set point LEDs. It can always be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: 95.0

SP H iGh — Set Point – High Volume: This is one of the three programmable overage alarms for detecting a percentage of gross volume at or above the programmed threshold. This will only generate an alarm when associated with one of the numbered set point LEDs. It can always be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: 90.0

SP Lo — Set Point – Low Volume: This is one of the three programmable underage alarms for detecting a percentage of gross volume at or below the programmed threshold. This will only generate an alarm when associated with one of the numbered set point LEDs. It can always be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: **20.0**

SP LoLo — Set Point – Low Low Volume: This is one of the three programmable underage alarms for detecting a percentage of gross volume at or below the programmed threshold. This will only generate an alarm when associated with one of the numbered set point LEDs. It can always be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: **15.0**

SP CrtLo — Set Point – Critical Low Volume: This is one of the three programmable underage alarms for detecting a percentage of gross volume at or below the programmed threshold. This will only generate an alarm when associated with one of the numbered set point LEDs. It can always be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: **12.0**

CrtHHorn — Horn – Critical High Volume Set Point: Enables the audible annunciator for the Critical High Set Point if associated with one of the numbered set point LEDs.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

HiHi Horn — Horn – High High Volume Set Point: Enables the audible annunciator for the High High Set Point if associated with one of the numbered set point LEDs.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **YES**

High Horn — Horn – High Volume Set Point: Enables the audible annunciator for the High Set Point if associated with one of the numbered set point LEDs.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **YES**

Lo Horn — Horn – Low Volume Set Point: Enables the audible annunciator for the Low Set Point if associated with one of the numbered set point LEDs.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **YES**

LoLo Horn — Horn – Low Low Volume Set Point: Enables the audible annunciator for the Low Low Set Point if associated with one of the numbered set point LEDs.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

CrtLHorn — Horn – Critical Low Volume Set Point: Enables the audible annunciator for the Critical Low Set Point if associated with one of the numbered set point LEDs.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

tEmP HiHi Set Point – High High Temperature: This is one of the two programmable overage alarms for detecting a product temperature at or above the programmed threshold. It can also be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: **90.0**

tEmP High Set Point – High Temperature: This is one of the two programmable overage alarms for detecting a product temperature at or above the programmed threshold. It can also be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: **43.0**

tEmP Lo Set Point – Low Temperature: This is one of the two programmable underage alarms for detecting a product temperature at or below the programmed threshold. It can also be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: **40.0**

tEmP LoLo Set Point – Low Temperature: This is one of the two programmable underage alarms for detecting a product temperature at or below the programmed threshold. It can also be used to control an integrated relay.
Entry Type: 3 digit numeric, %
Range Limits: 0-99.9%
Default/Initialized value: **25.0**

HHtP Horn Horn – High High Temperature Set Point: Enables the audible annunciator for the High High Temperature Set Point.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **YES**

HitP Horn Horn – High Temperature Set Point: Enables the audible annunciator for the High Temperature Set Point.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

LotP Horn Horn – Low Temperature Set Point: Enables the audible annunciator for the Low Temperature Set Point.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

LLtP Horn Horn – Low Low Temperature Set Point: Enables the audible annunciator for the Low Low Temperature Set Point.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **YES**

tAnk tYPE Tank Type: There are five different tank types as outlined below. This entry allows the user to selects one of those tank types.
Entry Type: Select List
Range Limits: N/A
Default/Initialized value: **FLAt**
Item List: **FLAt** Flat-ended horizontal cylinder.
UErt Vertical. Any tank with a constant volume/height.
CUSt 3 Custom 3. Typically used on fiberglass UST.
CUSt 8 Custom 8. Primarily used on asymmetrical tanks.
ConE Cone. Vertical cylinders with a conical bottom.

tAnk CAP Tank Capacity: **Actual** tank capacity in gallons.
Entry Type: 6-digit numeric
Range Limits: 0 - 999,999
Default/Initialized value: **0**

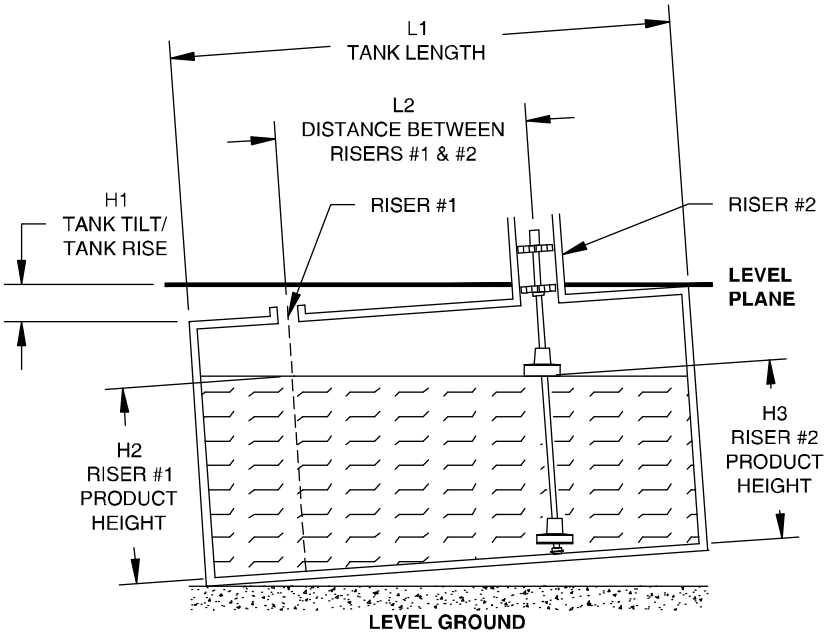
MAn FoLd Manifold Factor: This entry is selected when multiple tanks of the same geometry are manifolded together and monitored with one probe located in the primary tank. The manifold factor reflects the number of tanks connected to the primary tank. If no tanks are manifolded together, the system should be set to (**nonE**).
Entry Type: select list
Range Limits: None, 1-6
Default/Initialized value: **nonE**

tAnk rAd Tank Radius: This entry requires the user to enter the **tank radius**. The radius is half of the diameter. Needed for tank types of FLAT, CUSTOM 3, and CONE.
Entry Type: 4 digit numeric
Range Limits: 0- 999.9
Default/Initialized value: **0.0**

tAnk r iSE

Tank Rise: This menu determines Tank Tilt. This entry requires the user to **manually Dip and record a field measured fuel height**. Applies to tank types of FLAT and CUSTOM 3.
Note: Tank tilt is calculated over the entire tank length.
Entry Type: 2-digit numeric
Range Limits: 0-9.9
Default/Initialized value: 0.0

Calculating Tank Rise
The user sticks and records fuel level in two of the riser openings that are the greatest distance apart. The fuel height difference is multiplied by the ratio set by dividing the total tank length (L1) by the distance between the two risers (L2).
See the following illustration and Example:



DRAWING NO. 20163 REV. N/C

User Measured Values:
Fuel Level in Riser #1 (H2) =30”
Fuel Level in Riser #2 (H3) =25”
Distance between the (2) risers (L2) = 200”
Total Tank Length (L1) = 300”

User Calculations:
Difference in fuel level between risers= 30” (H2) – 25” (H3) =5"
Calculated ratio between the Total Tank Length over the distance between the risers= 1.5

$$\frac{\text{Total Tank Length (L1)}}{\text{Distance between the risers (L2)}} = \frac{300”}{200”} = 1.5 \text{ Ratio}$$

The above value 1.5 is then multiplied by the difference in fuel level calculated between the risers. 1.5 x 5” = 7.5” Tank rise or tilt (H1) over the entire tank.

tAnk Ht

Tank Height: This entry requires the user to enter **inside tank height**. Needed for tank type of VERTICAL, CUSTOM 8, and CONE.
Entry Type: 5-digit numeric
Range Limits: 0 - 1999.9
Default/Initialized value: 0.0

tAnk LEn Tank Length: This entry requires the user to enter **inside tank length** dimension. Needed for tank type of CUSTOM 3 if TANK RISE is not zero.
Entry Type: 5-digit numeric
Range Limits: 0.0 - 1999.9
Default/Initialized value: **0.0**

ConE Ht Cone Height: Defines the height of the cone bottom.
Entry Type: 3-digit numeric
Range Limits: 0.0 - 99.9
Default/Initialized value: **0.0**

HE iGht Height #: This entry identifies the **inside liquid height** for which a matching volume is needed. This value will be based on the TANK RADIUS entered for a CUSTOM 3 tank type OR will be required to be manually entered for a CUSTOM 8 tank type.
Entry Type: 5-digit numeric
Range Limits: 0.0 - 9999.9
Default/Initialized value: **0.0**

UOLUnE Volume #: This entry identifies the **inside liquid volume** for the HEIGHT defined immediately preceding this setting. This value should be based on either the tank manufacturer's calibration chart or on calculated values.
Entry Type: 6-digit numeric
Range Limits: 0 - 999999
Default/Initialized value: **0**

thEFt En Theft Enable: Activates theft monitoring when the following conditions are valid:
1. Station is closed for business, according to hours of operation programmed in THEFT submenu.
2. Withdrawal exceeds MINIMUM LOG VOLUME programmed in PROBE submenu.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

UnUSEAbLE Unusable Volume: Represents the product volume below a submersible or suction pump that cannot be utilized.
Entry Type: 6-digit numeric
Range Limits: 0 – 999999
Default/Initialized value: **0**

UnGAGEAbL Ungaugeable Level: Represents the minimum gaugeable level in the tank. This applies to probes which are mounted in a fixed position to a flange and or suspended from the top of a tank. One example where this setting would be used is in chemical mixing tanks where the internal construction would prevent the probe from being located near the bottom. At this level, the TMS will report and display a message showing a product level equal to the float as low as it can travel. The actual product level in the tank may be below the reported TMS value or empty. When the level drops to this point, the TMS will display a Low Product (**Lou Prod**) message.
Entry Type: 5-digit numeric
Range Limits: 0.0 - 9999.9
Default/Initialized value: **0.0**

rEturn Return:
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing TANK.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the TANK menu showing TANK ENABLE.

3.2.3 PROBE

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	**Probe - Programming setup**
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

PROBE Probe A collection of settings that are all probe-specific.

PROBE TYP Probe Type: This value is located on the label at the head of the probe and is identified as the Model.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: MP550
Item List:

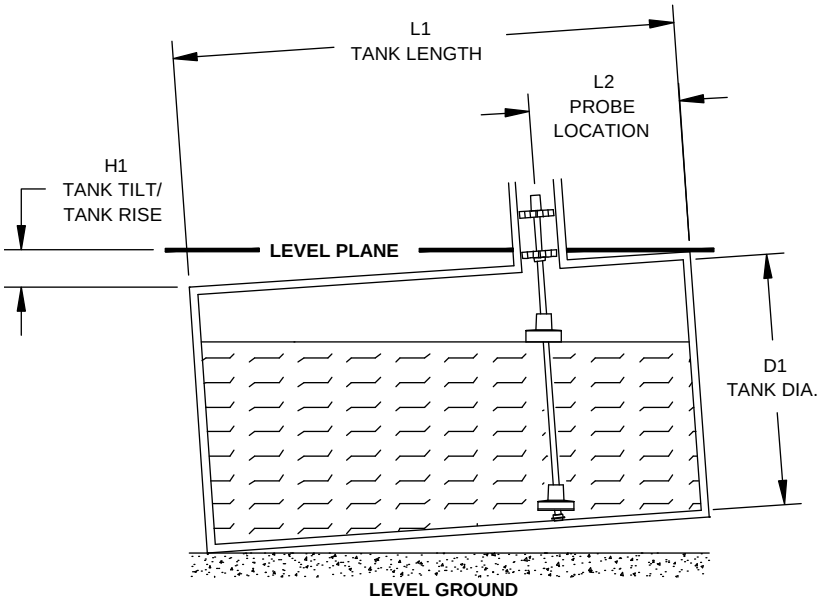
MP550 MP550	MP--- Obsolete	MP--- Obsolete
MP552 MP552	MP--- Obsolete	MP551 MP551
MP561 MP561	MP562 MP562	MP563 MP563

PROBE LEN Probe Length: This value is located on the label at the head of the probe.
Entry Type: 5-digit numeric
Range Limits: 0.0 - 1999.9
Default/Initialized value: 0.0

PROD HO Product Float Height Offset: This is a level offset provided to compensate for other variables like float depth in the liquid and mounting height of the probe. This can only be performed if the float is buoyant in the product.
Entry Type: 4-digit numeric
Range Limits: +/- 0.0 - 299.9
Default/Initialized value: -000.0

ProbE Loc Probe Location Offset: Represents the horizontal distance to the probe (L2) from the high end of the tank. This setting is used in conjunction with TANK RISE in the TANK sub menu.
Entry Type: 4-digit numeric
Range Limits: 0.0 - 599.9
Default/Initialized value: **000.0**

Probe Location Offset Illustration



DRAWING NO. 20164 REV. N/C

Mot bAnd Motion Height Band: This entry allows the user to enter minimum fuel trip value for probe float travel. This entry will negate the possibility of wave action in the tank, which can trigger false transactions. The value represents the distance the float must travel within one minute to initiate transaction monitoring. The transaction is considered complete when the motion height band is NOT exceeded for three consecutive minutes.
Entry Type: 2-digit numeric
Range Limits: 0.00 - 0.99"
Default/Initialized value: **0.20**

Log Min Minimum Logged Volume: Represents the minimum volume change of a transaction that will be recorded in the appropriate log. Any transactions that do NOT meet this minimum are discarded.
Entry Type: 3-digit numeric
Range Limits: 0 - 999/g
Default/Initialized value: **50**

rEturn Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing PROBE.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the PROBE menu showing PROBE TYPE.

3.2.4 RELAY TANK

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	**Relay Tank - Programming tank related alarms to control relays**
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

RELY TANK Relay Tank: A list of conditions monitored by the level probe that can each affect up to three relays. The Default/Initialized value for all settings is NO.NO.NO. Each NO represents a potential relay position that is disabled. It is enabled by changing NO to the number of the relay to be activated.

This setting can be edited if editing has been enabled via DIP switch 1. Once enabled, pressing the EDIT (TEST) button will cause the display to flash. Even though the entire display is flashing, only the first position is currently selected. Using the ▲ and ▼ buttons will cycle through the choices at the first position. Pressing ▶ will advance to the next position but the display will NOT change. Repeating this process will allow all three positions to be edited.

CRTH TR.G Relay Trigger – Critical High Product: List of relays to be triggered by the Critical High Product Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO.NO.NO

H.H TR.G Relay Trigger – High High Product: List of relays to be triggered by the High High Product Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO.NO.NO

HIGH TR.G Relay Trigger – High Product: List of relays to be triggered by the High Product Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO.NO.NO

LO TR.G Relay Trigger – Low Product: List of relays to be triggered by the Low Product Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO.NO.NO

LOLO TR.G Relay Trigger – Low Low Product: List of relays to be triggered by the Low Low Product Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO.NO.NO

CrtL tr.9 Relay Trigger – Critical Low Product: List of relays to be triggered by the Critical Low Product Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: no.no.no

HHtP tr.9 Relay Trigger – High High Product Temperature: List of relays to be triggered by the High High Product Temperature Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: no.no.no

HitP tr.9 Relay Trigger – High Product Temperature: List of relays to be triggered by the High Product Temperature Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: no.no.no

LotP tr.9 Relay Trigger – Low Product Temperature: List of relays to be triggered by the Low Product Temperature Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: no.no.no

LLtP tr.9 Relay Trigger – Low Low Product: List of relays to be triggered by the Low Low Product Temperature Set Point
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: no.no.no

rEturn Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing RELAY TANK.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the RELAY TANK menu showing CRITICAL HIGH TRIGGER.

3.2.5 RELAY CONTACT CLOSURE

`ConF ig`

`HEAdEr`	Header - Global System Settings
`tAnk`	Tank - Programming setup
`ProbE`	Probe - Programming setup
`rELY tAnk`	Relay Tank - Programming tank related alarms to control relays
`rELY cc`	**Relay CC - Programming contact closure inputs to control relays**
`rELY SEnS`	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
`rELY S itE`	Relay Site - Programming site related alarms/errors to control relays
`rELY ModE`	Relay Mode - Status of relay operation
`cc inPut`	Contact Closure Input
`SEnSr inP`	Sensor Input
`InvEntorY`	Tank Inventory Log Data setup
`tHEFt`	Theft - Detection (Hours of operation)
`ModEn`	Modem Communications - Setup
`d iAL out`	Auto-Dial out - Setup for selected Alarms or Tank information
`rEturn`	Return - Exits CONFIG menu

`rELY cc` Relay – Contact Closure: A non-hazardous contact closure (CC) input can affect up to three relays. The Default/Initialized value for all settings is `no.no.no`. Each NO represents a potential relay position that is disabled. It is enabled by changing NO to the number of the relay to be activated. The number at the left of the display represents the CC input number.

This setting can be edited if editing has been enabled via DIP switch 1. Once enabled, pressing the EDIT (TEST) button will cause the display to flash. Even though the entire display is flashing, only the first position is currently selected. Using the ▲ and ▼ buttons will cycle through the choices at the first position. Pressing ▶ will advance to the next position but the display will NOT change. Repeating this process will allow all three positions to be edited.

`cc tr ig` Contact Closure Trigger: List of relays to be triggered by a non-hazardous Contact Closure (CC) Input. The number at the left of the display represents the CC input number.
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: `no.no.no`

`rEturn` Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing RELAY CC.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the RELAY CC menu showing CONTACT CLOSURE TRIGGER.

3.2.6 RELAY SENSOR

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	**Relay Sensor - Using Intrinsically Safe sensor inputs to control relays**
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

RELY SENS Relay – Sensor: A Sensor input can affect up to three relays. The Default/Initialized value for all settings is NO.NO.NO. Each NO represents a potential relay position that is disabled. It is enabled by changing NO to the number of the relay to be activated. The number at the left of the display represents the Sensor input number.

This setting can be edited if editing has been enabled via DIP switch 1. Once enabled, pressing the EDIT (TEST) button will cause the display to flash. Even though the entire display is flashing, only the first position is currently selected. Using the ▲ and ▼ buttons will cycle through the choices at the first position. Pressing ▶ will advance to the next position but the display will NOT change. Repeating this process will allow all three positions to be edited.

SENS TRIG Sensor Trigger: List of relays to be triggered by a Sensor Input. The number at the left of the display represents the Sensor input number.
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO.NO.NO

RETURN Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing RELAY SENSOR.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the RELAY SENSOR menu showing SENSOR TRIGGER.

3.2.7 RELAY SITE

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	**Relay Site - Programming site related alarms/errors to control relays**
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

RELY SITE Relay – Site Specific: A Site Specific condition can affect up to three relays. The Default/Initialized value for all settings is NO,NO,NO. Each NO represents a potential relay position that is disabled. It is enabled by changing NO to the number of the relay to be activated. The number at the left of the display represents the Sensor input number.

This setting can be edited if editing has been enabled via DIP switch 1. Once enabled, pressing the EDIT (TEST) button will cause the display to flash. Even though the entire display is flashing, only the first position is currently selected. Using the ▲ and ▼ buttons will cycle through the choices at the first position. Pressing ▶ will advance to the next position but the display will NOT change. Repeating this process will allow all three positions to be edited.

THEFT Theft Trigger: List of relays to be triggered by a Theft of Product.
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO,NO,NO

POWERFAIL Power Fail Trigger: List of relays to be triggered by the Power Fail, Warning 21 message
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO,NO,NO

SYS ERROR System Error Trigger: List of relays to be triggered by any System Error/Event.
Entry Type: numeric list
Range Limits: (01-04).(01-04).(01-04)
Default/Initialized value: NO,NO,NO

RETURN Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing RELAY SITE.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the RELAY SITE menu showing THEFT.

3.2.8 RELAY MODE

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	**Relay Mode - Status of relay operation**
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

RELY MODE — Relay Mode/Behavior: This menu contains various settings to control the behavior of a relay. The number at the left of the display represents the relay output number.

NORMALLY — Normal Contact State (Normally): Defines the default power state of a relay output as either Powered Off or Powered On. The Powered On selection provides a Failsafe relay output since all relays are Powered Off when the TMS loses power.
Entry Type: select list
Range Limits: (On, Off)
Default/Initialized value: OFF

FP ACK — Front Panel Acknowledgment (FP Ack): When enabled, returns the state of the programmed relay to its normal state as defined in NORMALLY.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: no

DELAY — Delay: Provides a time delay to automatically return a relay to its normal state. This feature is disabled by selecting NONE.
Entry Type: select list in minutes
Range Limits: (None, 1-9)
Default/Initialized value: NONE

LATCH EN — Latch Enable: Offers the ability for a relay to be manipulated by a secondary condition to return the relay to the normal state. When activated, all references to this particular relay in other menus would represent the Latch On condition(s). Any of the settings below define the Latch Off condition for this relay.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: no
Example: A common pump control scenario would have a relay activate on a Low Set Point and deactivate on a High Set Point. This would allow the tank to be filled before deactivating the pump. Note: Pumps are NOT controlled directly by the TMS. The TMS would simply provide a signal to represent when the pump should run.

Cr tH OFF Latch Off – Critical High Product: When selected, returns the relay to normal when tank reaches the Critical High Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: **tnk no**
Item List: **tnk no** = Feature disabled (no tank selected)
tnk 1 = Feature enabled

H iH i OFF Latch Off – High High Product: When selected, returns the relay to normal when tank reaches the High High Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: **tnk no**
Item List: **tnk no** = Feature disabled (no tank selected)
tnk 1 = Feature enabled

H iGh OFF Latch Off – High Product: When selected, returns the relay to normal when tank reaches the High Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: **tnk no**
Item List: **tnk no** = Feature disabled (no tank selected)
tnk 1 = Feature enabled

Lo OFF Latch Off – Low Product: When selected, returns the relay to normal when tank reaches the Low Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: **tnk no**
Item List: **tnk no** = Feature disabled (no tank selected)
tnk 1 = Feature enabled

LoLo OFF Latch Off – Low Low Product: When selected, returns the relay to normal when tank reaches the Low Low Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: **tnk no**
Item List: **tnk no** = Feature disabled (no tank selected)
tnk 1 = Feature enabled

Cr tL OFF Latch Off – Critical Low Product: When selected, returns the relay to normal when tank reaches the Critical Low Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: **tnk no**
Item List: **tnk no** = Feature disabled (no tank selected)
tnk 1 = Feature enabled

SEnSr OFF Latch Off – Sensor: When selected, returns the relay to normal when tank reaches the selected Sensor.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: **inP no**
Item List: **inP no** = Feature disabled (no tank selected)
inP 1 = Latch Off for sensor 1 activity
inP 2 = Latch Off for sensor 2 activity

HHtP OFF Latch Off – High High Product Temperature: When selected, returns the relay to normal when tank reaches the High High Temperature Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: tnk no
Item List: tnk no = Feature disabled (no tank selected)
tnk 1 = Feature enabled

HitP OFF Latch Off – High Product Temperature: When selected, returns the relay to normal when tank reaches the High Temperature Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: tnk no
Item List: tnk no = Feature disabled (no tank selected)
tnk 1 = Feature enabled

LotP OFF Latch Off – Low Product Temperature: When selected, returns the relay to normal when tank reaches the Low Temperature Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: tnk no
Item List: tnk no = Feature disabled (no tank selected)
tnk 1 = Feature enabled

LLtP OFF Latch Off – Low Low Product Temperature: When selected, returns the relay to normal when tank reaches the Low Low Temperature Set Point.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: tnk no
Item List: tnk no = Feature disabled (no tank selected)
tnk 1 = Feature enabled

rEturn Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing RELAY MODE.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the RELAY MODE menu showing NORMALLY.

3.2.9 CONTACT CLOSURE INPUT

CONF.9

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	**Contact Closure Input**
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

CC INP — Contact Closure Input This entry allows the user to configure and enable each external contact closure input for Relay, Alarm, Acknowledgment, and Gate function control. The number at the left of the display represents the CC input number.

Example: Any contact closure input can be programmed as a **Gate** function to add an extra condition to any relay output, such as disabling a pump override control application. Similarly, the user may select to **Acknowledge** any contact closure input, such as a remote mounted Horn or Beacon, disabling the optional relay contact(s) that have been programmed to trigger the remotely located annunciating alarm device.

CC ENABLE — Contact Closure (CC) Enable: User enters choice of dry contact closure input. Options include Off, Relay, Gate Control function, Alarm or Acknowledge. The contact closure selection entered will enable and operate in one of the above modes. User will select from menu for specific contact closure operational modes.
Entry Type: Select list
Range Limits: N/A
Default/Initialized value: OFF
Item List: OFF Off: Input is disabled
RELAY Relay: Input intended to control one or more relay outputs
GATE Gate: Input becomes part of an AND logic gate defined by other conditions that reference the same relay output
ALARM Alarm: Input intended to receive an alarm signal.
ACK Acknowledge: Input will acknowledge or return to the normal state all defined relays.
FPACK Front Panel Acknowledge: Input will acknowledge the front panel horn. This is intended for use with PLC/BMS systems.

INP NAME — Input Name: Selects a name for the input. Visible only through TMS Communicator or in the Alarm Log.
Entry Type: select list
Range Limits: None
Default/Initialized value: USER
Item List:

USER User-defined	GENRTR Generator	RES 1 Reserve 1
RES 2 Reserve 2	RES 3 Reserve 3	RES 4 Reserve 4
L1PASS Line 1 Pass	L1FAIL Line 1 Fail	L2PASS Line 2 Pass
L2FAIL Line 2 Fail	L3PASS Line 3 Pass	L3FAIL Line 3 Fail
L4PASS Line 4 Pass	L4FAIL Line 4 Fail	PUMP Pump

USEr nAnE — User Name: A six character custom name assigned using TMS Communicator.
Entry Type: 6 character, alphanumeric
Range Limits: None
Default/Initialized value: InPut

nornALLY — Normal Contact State (Normally): Defines the input's normal or non-action state as either open or closed.
Entry Type: select list
Range Limits: (Open, Close)
Default/Initialized value: CLOSE

Log ic En — Logic Enable Group: Selects the input to become a member of an AND logic group identified by its letter. All inputs within the lettered logic group must be active before any assigned relays will activate.
Entry Type: select list
Range Limits: AND (A-H)
Default/Initialized value: OFF

t inEdELAY — Time Delay: When an input is part of a lettered logic group, this feature can apply a time delay, either going active or inactive, before considering the input to be truly active/inactive. After the time delay passes, the logic rules are applied.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: 00 SEC
Item List:
00 SEC Disabled. CC Input reported realtime
↑02 SEC 2 second delay before CC Input is reported active
↑05 SEC 5 second delay before CC Input is reported active
↑ 10 SEC 10 second delay before CC Input is reported active
↑20 SEC 20 second delay before CC Input is reported active
↓02 SEC 2 second delay before CC Input is reported inactive
↓05 SEC 5 second delay before CC Input is reported inactive
↓ 10 SEC 10 second delay before CC Input is reported inactive
↓20 SEC 20 second delay before CC Input is reported inactive

rEturn — Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing CC INPUT.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the CC INPUT menu showing CC ENABLE.

3.2.10 SENSOR INPUT

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	**Sensor Input**
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

SENSR INP — Sensor Input: Provides the means to configure each sensor input. The number at the left of the display represents the sensor input number.

SENSR EN — Contact Closure Enable: Provides the ability to either select how to enable a sensor or to disable the input.
Entry Type: Select list
Range Limits: N/A
Default/Initialized value: OFF
Item List:
OFF Off/Disabled.
ALARM Alarm: provides visual and audible annunciation at the TMS when the sensor activates. This sensor may also be used to control a relay output.
RELAY Relay: being used to control a relay output. This will not be recorded in the Alarm Log and will not generate any front panel alarms.

TYPE — Type: Enter the model number of the sensor to properly recognize the sensor signal.
Entry Type: select list
Range Limits: None
Default/Initialized value: ES820
Item List:

ES820 ES820	ES8254 ES825-400FL	
HS100 HS100	LS600 LS600	LS610 LS610
RSU800 RSU800	RSU801 RSU801	RSU802 RSU802
OTHER Other	ES8253 ES825-300FL	

INP NAME — Input Name: Assigns a name to a sensor to help with identification.
Entry Type: select list
Range Limits: None
Default/Initialized value: USER
Item List:

USER User-defined	SUMP Sump	PIPING Piping
CONTN Containment	DBWALL Double-Wall	DIKE Dike
LEAK Leak	RESVOR Reservoir	WELL Well
GENRTR Generator	WATER Water	OIL Oil
VAULT Vault	H RES High Reservoir	LO RES Low Reservoir
HIGH High	HI HIGH High-High	LO Low
LOLO Low-Low	TRBINE Turbine	DISPAN Dispenser Pan

USEr nAnE — User Name: A six character custom name assigned using TMS Communicator.
Entry Type: 6 character, alphanumeric
Range Limits: None
Default/Initialized value: InPut

FAuLt En — Fault Enable: In supervised mode the system will detect and report short-circuited and open-circuited sensor field wiring when used in conjunction with fault reporting sensors. Fault-reporting leak sensors will require the Pneumercator type "FL" series or compatible. Select YES to enable the fault detection.
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: no

nornALLY — Normal Contact State (Normally): Defines the input's normal or non-action state as either open or closed.
Entry Type: select list
Range Limits: (Open, Close)
Default/Initialized value: CLOSE

rEturn — Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing SENSOR INPUT.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the SENSOR INPUT menu showing SENSOR ENABLE.

3.2.11 INVENTORY

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	**Tank Inventory Log Data setup**
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

INVENTORY — Inventory Log Setup: This menu allows the user to enable and program the **inventory** data reporting times for each tank, at up to three user-programmable times per day, selectable for each day of the week. The TMS will record an inventory snapshot at each **different** time programmed for each selected day of the week. The system will have the capacity to store up to the 6 most recent inventory records.

HOUR 1 — Hour 1: User enters which hour of the day in 24-hour format for the TMS to record inventory data snapshot in the Inventory Log.
Entry Type: 4-digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

HOUR 2 — Hour 2: User enters which hour of the day in 24-hour format for the TMS to record inventory data snapshot in the Inventory Log.
Entry Type: 4-digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

HOUR 3 — Hour 3: User enters which hour of the day in 24-hour format for the TMS to record inventory data snapshot in the Inventory Log.
Entry Type: 4-digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

SUN ENABL — Sunday: The TMS will record an inventory snapshot in the Inventory Log on Sunday at each different time programmed above..
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: no

MON ENABL — Monday: The TMS will record an inventory snapshot in the Inventory Log on Monday at each different time programmed above..
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: no

TUE ENABL — Tuesday: The TMS will record an inventory snapshot in the Inventory Log on Tuesday at each different time programmed above..
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: no

UEd EnAbL Wednesday: The TMS will record an inventory snapshot in the Inventory Log on Wednesday at each different time programmed above..
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

thu EnAbL Thursday: The TMS will record an inventory snapshot in the Inventory Log on Thursday at each different time programmed above..
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

Fr i EnAbL Friday: The TMS will record an inventory snapshot in the Inventory Log on Friday at each different time programmed above..
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

SAt EnAbL Saturday: The TMS will record an inventory snapshot in the Inventory Log on Saturday at each different time programmed above..
Entry Type: select list
Range Limits: (Yes, No)
Default/Initialized value: **no**

rEturn Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing INVENTORY.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the INVENTORY menu showing HOUR 1.

3.2.12 THEFT

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	**Theft - Detection (Hours of operation)**
MODEM	Modem Communications - Setup
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

THEFT — Theft: This menu allows the user to enable the system to detect and log and inventory decrease as a theft when the following conditions are valid:

1. Station is closed for business, according to hours of operation programmed in THEFT DETECT submenu.
2. Withdrawal exceeds MINIMUM LOG VOLUME programmed in TANK submenu for that tank.

The system will have the capacity to store up to the (2) most recent theft records.

M-F OPEN — Monday-Friday Open: User enters the hour of the day in 24-hour format for Monday-Friday that the facility **OPENS** for business and the tanks are available.
Entry Type: 4-digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

M-F CLOSE — Monday-Friday Close: User enters the hour of the day in 24-hour format for Monday-Friday that the facility **CLOSES** for business and the tanks are not available.
Entry Type: 4-digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

SAT OPEN — Saturday Open: User enters the hour of the day in 24-hour format for Saturday that the facility **OPENS** for business and the tanks are available.
Entry Type: 4 digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

SAT CLOSE — Saturday Close: User enters the hour of the day in 24-hour format for Saturday that the facility **CLOSES** for business and the tanks are not available.
Entry Type: 4-digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

Sun OPEN — Sunday Open: User enters the hour of the day in 24-hour format for Sunday that the facility **OPENS** for business and the tanks are available.
Entry Type: 4 digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

Sun CLOSE — Sunday Close: User enters the hour of the day in 24-hour format for Sunday that the facility **CLOSES** for business and the tanks are not available.
Entry Type: 4 digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: 00' 00

rEturn — Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing THEFT.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the THEFT menu showing M-F OPEN.

3.2.13 MODEM

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	**Modem Communications - Setup**
DIAL OUT	Auto-Dial out - Setup for selected Alarms or Tank information
RETURN	Return - Exits CONFIG menu

MODEM — Modem: Allows the user to enable and configure the secure internal modem system within the TMS locking enclosure to assure a positive telephone link; free of tampering.

MODEM — Modem Selection: Select which type of modem is installed in the TMS.
Entry Type: select list
Range Limits: N/A
Default/Initialized value: NONE
Item List: NONE = No modem installed; INTERNAL = Internal modem; -------- = Not available; PORT MDM = External serial port modem

BAUD RATE — Baud Rate: Defines the maximum baud rate allowed for the installed TMS modem.
Entry Type: Select list
Range Limits: 1.2K-14.4K (1,200 - 14,400)
Default/Initialized value: 2.4K
Item List: 2.4K 2400 Baud; 1.2K 1200 Baud; 4.8K 4800 Baud; 9.6K 9600 Baud; 14.4K 14,400 Baud

DIAL TYPE — Dial Type: Selects the capabilities of the telephone service as touch-tone or rotary pulse.
Entry Type: Select list
Range Limits: (Tone, Pulse)
Default/Initialized value: TONE

PAUSE — Pause: Defines the pause length of a comma within the dial-out phone number.
Entry Type: 1-digit numeric, seconds
Range Limits: 1-9
Default/Initialized value: 1 SEC

TEL LINE — Telephone Line: Defines the availability of the telephone line as dedicated for the TMS or shared with other equipment.
Entry Type: Select list
Range Limits: (Dedicated, Shared)
Default/Initialized value: DEDICATED

RETURN — Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing MODEM.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the MODEM menu showing MODEM.

3.2.14 DIAL-OUT

CONFIG

HEADER	Header - Global System Settings
TANK	Tank - Programming setup
PROBE	Probe - Programming setup
RELY TANK	Relay Tank - Programming tank related alarms to control relays
RELY CC	Relay Contact Closure - Programming contact closure inputs to control relays
RELY SENS	Relay Sensor - Using Intrinsically Safe sensor inputs to control relays
RELY SITE	Relay Site - Programming site related alarms/errors to control relays
RELY MODE	Relay Mode - Status of relay operation
CC INPUT	Contact Closure Input
SENSR INP	Sensor Input
INVENTORY	Tank Inventory Log Data setup
THEFT	Theft - Detection (Hours of operation)
MODEM	Modem Communications - Setup
DIAL OUT	**Auto-Dial out - Setup for selected Alarms or Tank information**
RETURN	Return - Exits CONFIG menu

DIAL OUT — Dial-out: Configures the phone number and conditions that initiate the TMS dial-out to a computer or other data device. The number at the left of the display represents the one of the five available dial-out configuration slots.

TEL LOCAL — Telephone Number – Local: The TMS can support up to 21 digits in the dial-out phone number. This setting represents the rightmost seven digits of the 21 digits. This would be used for a local U.S. telephone number.
Entry Type: up to 7 digits
Range Limits: Per character: 0-9, P for Pause or comma, _ for unneeded digit
Default/Initialized value: -------

TEL AREA — Telephone Number – Area Code: The TMS can support up to 21 digits in the dial-out phone number. This setting represents the centermost seven digits of the 21 digits. This could be used for the area code of a U.S. telephone number or for any digits needed beyond or to the left of the base or local seven digits.
Entry Type: up to 7 digits
Range Limits: Per character: 0-9, P for Pause or comma, _ for unneeded digit
Default/Initialized value: -------

TEL AREA2 — Telephone Number – Area Code 2: The TMS can support up to 21 digits in the dial-out phone number. This setting represents the leftmost seven digits of the 21 digits. This could be used for any digits needed beyond or to the left of the rightmost 14 digits.
Entry Type: up to 7 digits
Range Limits: Per character: 0-9, P for Pause or comma, _ for unneeded digit
Default/Initialized value: -------

LINE TYPE — Receiving Device Type (Line Type): User can select the type of device that is being called by the TMS.
Entry Type: Select list
Range Limits: N/A
Default/Initialized value: DATA
Item List:
DATA Data: A computer running TMSComm or any other data device that uses a communications protocol provided by Pneumercator to communicate to the TMS.
--- Not available
TTY TTY: A Teletype style data dump to any device capable of receiving this text only broadcast.
NPAGER Numeric Pager: Used to send a page to a numeric pager. The telephone number and the page would all be entered in the 21 digit dial-out string.

Cr tH dAl — Critical High Product – Dial-Out: Defines if the TMS initiates a dial-out for a Critical High Product Set Point.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

HiHi dAL — High High Product – Dial-Out: Defines if the TMS initiates a dial-out for a High High Product Set Point.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

High dAL — High Product – Dial-Out: Defines if the TMS initiates a dial-out for a High Product Set Point.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

Lo dAL — Low Product – Dial-Out: Defines if the TMS initiates a dial-out for a Low Product Set Point.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

LoLo dAl — Low Low Product – Dial-Out: Defines if the TMS initiates a dial-out for a Low Low Product Set Point.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

Cr tLd Al — Critical Low Product – Dial-Out: Defines if the TMS initiates a dial-out for a Critical Low Product Set Point.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

thFt dAL — Theft – Dial-Out: Defines if the TMS initiates a dial-out for Theft of Product.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

cc dAL — Contact Closure – Dial-Out: Defines if the TMS initiates a dial-out for an active Contact Closure Input.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

SEnS dAL — Sensor – Dial-Out: Defines if the TMS initiates a dial-out for an active Sensor Input.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: no

Err dAL — System Error – Dial-Out: Defines if the TMS initiates a dial-out for any System Error/Event.
Entry Type: Select List above
Range Limits: (Yes, No)
Default/Initialized value: no

`Inv dIAL` Inventory – Dial-Out: Defines if the TMS initiates a dial-out at the scheduled time for any new entries in the Inventory Log.
Entry Type: Select List
Range Limits: (Yes, No)
Default/Initialized value: `no`

`Inv Hour` Inventory – Dial-Out: Defines if the time at which the TMS checks for any new entries in the Inventory Log and initiates a dial-out, if enabled above.
Entry Type: 4 digit numeric hours, minutes
Range Limits: 00'00 – 23'59
Default/Initialized value: `00' 00`

`rEturn` Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the CONFIG submenu showing DIAL OUT.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the DIAL OUT menu showing TEL LOCAL.

3.3 CLOCK

ACCESS LoG

CONFIG

CLOCK

INIT DATA

RETURN

In view mode depressing TEST button first, then MODE and holding both buttons momentarily will increment the TMS into the ACCESS MODE displaying the main menu beginning as follows with LOG**.** Pressing the EDIT (TEST) button again would cause LOG to blink. Once LOG is blinking, press the ▲ (TEST) button twice to go to the CLOCK menu. Once CLOCK is blinking, pressing the ▶ (MODE) button will enter the CLOCK menu revealing the DATE.

The CLOCK menu is used to review or edit system clock data.

Note: Two types of entries require the user to input programming data when configuring the TMS menus. It is mentioned here, to help the user interpret data displayed in the CONFIG menus. This information below will be explained again in the CLOCK section of the manual.

Entry Type: Either a numeric value or a list of choices designated by the system.

Range Limits: Selects and enters a numeric value within a fixed boundary, set by the system.

CLOCK — Clock: The CLOCK menu provides access to the system date, time, and day of the week. All scheduled tasks depend on the system clock to function.

MM-DD-YY — Date (MM/DD/YY): Represents the current local date.
Entry Type: 6 digit numeric, months, days, years
Range Limits: Any valid date. Year is entered as a two digit value.
Sample value: 06-22-11 (Represents June 22, 2011)

HH'MM'SS — Time (HH'MM'SS): Represents the current local time in 24-hour format.
Entry Type: 6 digit numeric hours, minutes, seconds
Range Limits: Any valid time in 24-hour format.
Sample value: 00' 00' 00 (Represents 12:00:00AM or midnight)

DAY — Day Of The Week: Represents the current day of the week.
Entry Type: select list
Range Limits: N/A
TMS listed options include:

Item List:			
	Sun Sunday	Mon Monday	tuE Tuesday
UEd Wednesday	thu Thursday	Fri Friday	SAt Saturday

RETURN — Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the ACCESS submenu showing CLOCK.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the CLOCK menu showing MM-DD-YY.

3.4 INIT DATA

ACCESS
LoG
ConFIG
CLock
InIt dAtA
rEturn

In view mode depressing TEST button first, then MODE and holding both buttons momentarily will increment the TMS into the ACCESS MODE displaying the main menu beginning as follows with LOG**.** Pressing the EDIT (TEST) button again would cause LOG to blink. Once LOG is blinking, press the ▲ (TEST) button three times to go to the INIT DATA menu. Once INIT DATA is blinking, pressing the ▶ (MODE) button will enter the INIT DATA menu revealing INIT DATA.

The INIT DATA menu is a command menu used to initialize the selected data.

InIt dAtA A command that provides the ability to initialize the selected data to the factory default settings. This can be useful if there any suspicion of corrupted data or simply to provide a clean starting point for the system. Once the data to be initialized is selected, pressing the ▶ (MODE) button will initialize that area in memory and return the display to showing NONE.
Item list:
nonE None: No data selected to initialize. The starting point for the command menu.
InvEntorY Inventory Log
dEL IvErY Delivery Log
SALES Sales Log
tHEFtS Thefts Log
OrdErS Product Order Log
AlArmS Alarms Log
EvEntS Events Log
All LoGS All Logs: Initializes all of the system Logs
ConFIG Configuration: Initializes all Configuration data. DO NOT use this unless the Configuration data is no longer needed.
ALL All: Initializes all system Logs and Configuration data. DO NOT use this unless the all of this data is no longer needed.
rEturn Return: Command to return to the INIT DATA sub menu.

rEturn Return
*Pressing the EDIT (TEST) button at RETURN decrements the TMS back to the ACCESS submenu showing INIT DATA.

*Holding the STEP (MODE) button until one TMS beep at RETURN advances the TMS to the top of the INIT DATA menu showing INIT DATA.

APPENDIX A

TMS CONSOLE ALARM & EVENT CONDITIONS TABLES

Alarm Conditions:
The following alarm conditions are recorded in the **Alarm Log**. Alarm conditions are also user programmable to auto-dial out upon alarm.
Leak and Setpoint alarms will produce both audible and visual LED annunciators until acknowledged via Front panel or Edit enable buttons. Visual LED conditions will continue until the specific leak or setpoint conditions are corrected.
Theft alarms will produce an audible annunciator and appear on the TMS display showing a theft message condition across the display. Theft alarms can only be acknowledged via the **Edit enable** button. The displayed message will continue until the condition is corrected.
CC and SENSOR alarms will produce an audible annunciator and appear on the TMS display showing a CC or SENSOR alarm message across the display. The audible annunciator can be acknowledged via Front panel or Edit enable buttons. The CC or SENSOR displayed message will continue until the condition is corrected.

Alarm Description					
Display Only		Display and Computer Format			
Status	**Detail**	**Description**	**Item ID**	**Name**	**Notes**
SP1	n/a	PRODUCT SETPOINT #1 ALARM	tank #	SetPoint assigned to LED in HEADER menu	Meets or exceeds the programmed product SetPoint. Factory default value is for a HIGH HIGH alarm at or above 95% of Gross Volume.
SP2	n/a	PRODUCT SETPOINT #2 ALARM	tank #	SetPoint assigned to LED in HEADER menu	Meets or exceeds the programmed product SetPoint. Factory default value is for a HIGH alarm at or above 90% of Gross Volume.
SP3	n/a	PRODUCT SETPOINT #3 ALARM	tank #	SetPoint assigned to LED in HEADER menu	Meets or exceeds the programmed product SetPoint. Factory default value is for a LOW alarm at or below 20% of Gross Volume.
Theft	n/a	THEFT ALARM	tank #	n/a	Theft of product from the tank
CC	Open	CONTACT CLOSURE ALARM - OPEN	cc #	Contact Closure Name	Device wired to CC Input is in alarm
CC	Closed	CONTACT CLOSURE ALARM - CLOSED	cc #	Contact Closure Name	
Sensor	Open	POINT SENSOR ALARM - OPEN	sensor #	Sensor Name	Point level (High, Low, etc.) sensor is in alarm
Sensor	Closed	POINT SENSOR ALARM - CLOSED	sensor #	Sensor Name	
Sensor	Open	LEAK SENSOR ALARM - OPEN	sensor #	Sensor Name	Non-discriminating leak sensor is in alarm
Sensor	Closed	LEAK SENSOR ALARM - CLOSED	sensor #	Sensor Name	
Sensor	Product	LEAK SENSOR ALARM - PRODUCT	sensor #	Sensor Name	Discriminating leak sensor is in alarm
Sensor	Water	LEAK SENSOR ALARM - WATER	sensor #	Sensor Name	

Note: ISCC or Intrinsically Safe Contact Closure is synonymous with Leak/Pt. Level Sensor

Error Conditions:
All Error conditions are recorded in the Event Log. Error conditions are also user programmable to auto-dial out upon alarm. Errors will produce an audible alarm and appear on the TMS display showing the specific error condition and code number. Errors conditions can only be silenced by acknowledging the Front panel buttons. The displayed error message will continue until the condition is corrected.

Event Description for Errors				
Error #	**Description**	**Item ID**	**Name**	**Notes**
10	PROBE LEVEL	probe #	n/a	Unintelligible signal received from probe
11	PROBE TIMEOUT	probe #	n/a	No signal being detected from probe
13	PROBE TEMPERATURE	probe #	n/a	Unintelligible signal received from probe
20	SENSOR FAULT - SHORT CIRCUIT	sensor #	sensor name	Wiring fault with all sensors but ES825-200F
21	SENSOR FAULT - OPEN CIRCUIT	sensor #	sensor name	
22	SENSOR FAULT	sensor #	sensor name	Wiring fault with ES825-200F

Note: ISCC or Intrinsically Safe Contact Closure is synonymous with Leak/Pt. Level Sensor

Warning Conditions:
With the exception for a Power Failure, Warning 21 (Pur FAiL WArn2 1), warning conditions are not logged in the **Event Log**. Warnings will produce an audible alarm and appear on the TMS display showing the specific warning condition and code number. Warning conditions may be user acknowledged via Front panel buttons.

Event Description for Warnings				
Warning #	**Description**	**Item ID**	**Name**	**Notes**
1	MODEM - INITIALIZATION ERROR	n/a	n/a	Check the phone line and then the modem for trouble
2	MODEM - COMMAND ERROR	n/a	n/a	
3	MODEM - RESPONSE TIMEOUT ERROR	n/a	n/a	
4	MODEM - NO CARRIER	n/a	n/a	
5	MODEM - COMMUNICATIONS ERROR	n/a	n/a	
6	MODEM - NO DIALTONE	n/a	n/a	
7	CONFIG - TANK	tank #	n/a	Checksum error in the referenced section of memory. Review the configuration and resave the configuration to the TMS. If the warning persists there may be a memory failure in the TMS
8	CONFIG - PROBE	probe #	n/a	
9	CONFIG - HEADER	n/a	n/a	
10	CONFIG - RELAY/TANK	tank #	n/a	
11	CONFIG - RELAY/CC	cc #	n/a	
12	CONFIG - RELAY/SENSOR	sensor #	n/a	
13	CONFIG - RELAY/SITE	n/a	n/a	
14	CONFIG - RELAY/MODE	relay #	n/a	
15	CONFIG - CC	cc #	n/a	
16	CONFIG - SENSOR	sensor #	n/a	
17	CONFIG - INVENTORY	n/a	n/a	
18	CONFIG - THEFT	n/a	n/a	
19	CONFIG - MODEM	n/a	n/a	
20	CONFIG - DIALOUT	dialout ch. #	n/a	
21	POWER FAIL DETECTED	n/a	n/a	Reported after a 1-2 minute loss of power when the power has been restored.
23	TANK ID LENGTH	tank #	n/a	A double digit tank ID has been assigned to a tank with a capacity of one million gallons or greater. The TMS requires these ID's be 1 digit to accommodate the length of the volume reading.
28	FRONT END COMMUNICATION	n/a	n/a	Indicates a communications failure on the Main Board. Power off the TMS1000N, wait at least two seconds, and power on the TMS1000N. If the Warning persists, the Main Board, P/N 900699-1, will need to be repaired or replaced.

Note: ISCC or Intrinsically Safe Contact Closure is synonymous with Leak/Pt. Level Sensor

Information Messages:
Information messages convey statuses generally considered to be advisory. These types of messages appear only on the TMS display until acknowledged via Front panel buttons. They do not generate audible/visual alarms, and are not captured in any of the system logs.

Event Description for Information Messages				
Info #	**Description**	**Item ID**	**Name**	**Notes**
2	UNGAUGEABLE LEVEL	tank #	n/a	TMS informs user that the product float for the indicated tank has reached a float collar stop or its minimum gaugeable level. Because the stop is some distance above the actual tank bottom, an alternating minimum gaugeable level and the message "Low Product" will be displayed. This condition is usually associated with probes requiring "Special Tank TOP mounting". These minimum gauging points are programmed for all enabled tanks in the changed in the **Config Tank Menu.**

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 TMS1000N will be able to detect many conditions, including memory failure within the system, 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 a 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	1. Press the TEST button to verify all integrated lights and horn are functioning 2. Take a stick reading of the tank 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.
Rigid Probes (MP55xS)	Remove the probe to verify there is no damage to the floats and no residue buildup on the floats or probe shaft. Clean as necessary.
ES825-300FL (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.
ES825-400FL (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.

HS100ND	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.

APPENDIX C

TMS Main Board Dip Switch Settings

The TMS1000N is equipped with a Main System Board that is supplied with DIP switches that have been factory set. Switches are housed in a small rectangular Red enclosure and are numbered 1-4.

Note: As always, any mechanical or electrical modifications to TMS system (including switch settings), probe, sensor, or other accessories requires the console to be powered-down.

Dip Switch Function/Condition:

SW1: Edit Enable – With the rocker arm in the OPEN position, this switch activates the **Edit Enable** feature. This allows the user to make any necessary programming changes via the front panel buttons.

SW2: Unused – Factory set at Closed.

SW3: Motion Band Symbol – With the rocker arm in the OPEN position, this switch activates the System **Motion Band Symbol**, producing a lower case horizontal line to the right of the Tank ID #. This visual display represents movement of product in the tank for either Deliveries, Sales, or Thefts. Any of these conditions will be logged as a function of the Motion Band sensitivity setting, which is user programmed in the CONFIG PROBE menu. This symbol will disappear from the display within 3 minutes after the tank contents has settled and stopped moving. The motion band symbol will also be present on system power up. The audible annunciator will not be activated during this condition.

SW4: Communication Security – With the rocker arm in the OPEN position, this switch activates the TMS **Communication Security** feature. This feature is used when a pass code is desired to prevent unauthorized access when communicating with the TMS. This switch works in conjunction with the Security setting found in the Header menu.

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 installation 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 Installation 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, instructions, 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 instruction manual, and followed all precautions, PCO will fulfill the terms stated in our warranty obligation.

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

Distributed by:

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