Instructions
and
Operating Manual

SERIES X76CTM

CONTINUOUS TANK MONITORING SYSTEM

RONAN

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1.0 INTRODUCTION

The X76CTM Continuous Electronic Tank Monitoring System is designed to tighten inventory control of fuels and other liquids stored in underground and aboveground tanks. The probe, controller and sensors form a system that measures fuel height, fuel temperature, water height, and leakage. It will also provide information on gross and net fuel volume, leak alarms, and time and date of the leak. Information acquired automatically provides faster shift changes by eliminating the need to manually stick the tanks and generate manual reports. This reduces human error and makes it possible to spot losses by theft, leaks, or meter miscalibration. The system provides a highly reliable tool for a sound inventory management practice.

2.0 GENERAL DESCRIPTION

The X76CTM features a 2 line by 24 character alphanumeric LCD that provides instant information for each tank including: product volume and level, product temperature, water level, and time and date. The X76CTM also provides reports, alarm warnings (utilizing the LCD display), an alarm LED, a printer, and output relays.

The X76CTM performs in-tank leak detection testing through a continuous statistical leak detection algorithm, which eliminates the need for unnecessary and costly station shutdown for in-tank tests.

Once the power-up and configuration of the X76CTM System are complete, the operation of the controller is automatic. Check to make sure that the paper is locked into the printer feeder. The system is ready for user login and monitoring.

IMPORTANT: Information provided by the X76CTM should be used as part of a conscientious inventory control program. If loss of product is identified by the Leak Detect Test, call for a precision tank test. Do not excavate tanks or take other remedial action based solely on X76CTM inventory or leak detection reports. While the X76CTM is capable of detecting leaks as small as 0.1 gallons per hour, the system is testing only that portion of the tank containing product at the time of the test. Call for a precision tank test to confirm a suspected leak.

NOTE: If an 'overfill tank tightness test' is to be performed to confirm a suspected tank leak, the 95040XB Gauge Probe must be removed from the tank. The system warranty will not cover damage to the probe resulting from an overfill condition.

3.0 SAFETY RULES

3.1 Intrinsic Safety

Hazardous atmospheric mixtures include all explosive or ignitable air mixtures involving gases or vapor at an atmospheric pressure and with ambient temperatures between zero and 120°F. The order of ignitable materials generally corresponds to the National Electrical Code groupings. The workable categories and test materials used typically for each are:

Group A: Acetylene (8.7% by volume)
Group B: Hydrogen (21.0% by volume)
Group C: Ethylene (7.8% by volume)
Group D: Methane (8.2% by volume)

The ignition capability of an electrical circuit is determined by the electrical energy available and the manner in which such energy is released. Energy may be released in the form of a spark, by resistive heating effects or a combination of the two. There are three basic mechanisms by which electrical energy may be released in the form of spark discharge: discharge of a capacitive circuit, interruption of current in an inductive circuit, and make-break of a resistive circuit. The minimum ignition energy for any flammable mixture is the smallest amount of energy released as a spark and sufficient to ignite the mixture at 0 psig.

The most easily ignited air mixture is that mixture of flammable material in air which requires the minimum amount of energy for ignition. The flammable material is usually designated in percentage by volume in air.

Normal operating conditions include maximum supply voltage and the extreme environmental conditions that fall within the ratings given for the specific equipment under investigation.

Abnormal operating conditions usually refer to any two mechanical or electrical faults occurring in combination. The faults are independent and include accidental damage to, and failure of, components or wiring.

Intrinsically safe electrical equipment and associated wiring are incapable of releasing sufficient electrical or thermal energy under normal or abnormal operating conditions to cause ignition of a specific hazardous mixture in its most easily ignited concentration in air. The flammable material may be a gas or vapor.

Underwriter's Laboratories, Inc. approvals are based on examination and test of samples of

production quality equipment and inspection of manufacturing and quality control facilities. Of particular consideration are the adequacy of design and workmanship, uniformity and dependability of production, effectiveness of quality control, functional suitability, assurance of availability of service, and replacement of parts.

Installation of intrinsically safe monitors makes it mandatory to maintain complete isolation between the field contact wiring and any other potential source of voltage.

To be completely assured of an intrinsically safe installation of the X76CTM, all equipment used must be installed by a Ronan Authorized Service Contractor. The installation, including the wiring, plus all the contact inputs, must meet requirements of isolation to avoid any failures that may occur in the system.

3.1.1 CAUTION

The X76CTM monitor enclosure must be mounted in a general-purpose area as defined by the National Electrical Code.

All wiring to sensors (i.e., Level Gauge Probes 95040XB, 95140XB; Level Sensors LS-1, LS-3, LS-3s, LS-3ss, LS-7, LS-7s, LS-30, LS-100, HVA; Pressure Switch JT-2P; and Vacuum Switch JT-2V), must be installed in a separate, dedicated conduit, to comply with intrinsically safe requirements.

All wiring to auxiliary relays must be kept separate from the probe and sensor input wiring.

The X76CTM chassis must be properly grounded including the intrinsically safe ground.

NOTE: Ronan Engineering Company does not accept the responsibility for the installation of the intrinsically safe equipment.

3.2 General Safety

*****Please read before beginning setup*****

This product has been installed and will operate in a highly combustible environment of a gasoline storage tank. It is essential that you carefully read and follow the warnings and instructions in this manual to protect yourself and others from serious injury, explosion, or electrical shock.

For safety reasons, we have taken particular care in the design of this product to limit power in the wiring to the fuel tanks and to keep that wiring physically separated from other wiring. It is your responsibility to maintain the effectiveness of these safety features by starting up and operating this product according to the instructions and warnings that follow. Failure to do so could create danger to life and property and result in voiding all warranties connected with this product.

WARNING:

1. Conduits or wiring troughs from probes and sensors to the controller must not contain other foreign wires. No other wiring is permitted with the probe wires and leak sensors in the intrinsically safe area of the system.
2. The conduit run from the probe to the controller must not exceed 2,500 feet. See Installation diagram X76D518.
3. All conduits must enter the controller through the threaded hubs provided.
4. Do not install the controller in a volatile, combustible, or explosive atmosphere.
5. The X76CTM System must be installed in an environment that is within the operating specifications of the system.

   NOTE: The controller must be located in a general purpose environment with a minimum temperature of 32°F. Check the system specifications for further information or call Ronan Engineering for assistance.
6. All external equipment used with the system must comply with the National Electrical Code for the area where the equipment is being installed. This is particularly important when selecting external horns, push buttons and relays to be used with the X76CTM System.

Failure to comply with these warnings could result in serious injury, property loss and equipment damage.

3.3 Intrinsic Safety Check for Warranty Registration & Checkout

Refer to the installation drawings in the back of this manual for details.

1. Check to be sure that probe wires are contained in a separate, dedicated rigid conduit. The conduit and wiring troughs from the probe or liquid sensors to the controller must not contain any other wires.
2. Make sure the probe to controller wiring does not exceed 2,500 feet. See the installation drawing for proper wiring requirements. All conduits must enter the controller through the threaded hubs provided.

3. Locate the intrinsic safety barrier cover inside the controller cabinet and remove the screws; open the cover.
   a) Locate the power supply terminals and verify that an earth ground has been provided, using a #12 AWG wire.
   b) Verify that the power supply terminals are wired correctly and are secure.
   c) Verify that the system power is properly wired to a separate, dedicated breaker and common phase with dispensers.
   d) Verify that all probe and liquid sensor connections have been made properly and are secure.
   e) If any discrepancies are found in the X76CTM wiring or installation, refer to the installation procedures and correct the discrepancies.
   f) Replace the intrinsic safety barrier cover and front cover of the controller.

Do not apply power to the system until all aspects of the installation have been checked and found to be in accordance with the instructions outlined in this instructions and operating manual. The installation of this system must comply with The National Electrical Code, federal, state, local codes, and other applicable safety codes.

To validate the warranty, the system start-up must be completed by a certified ASC (Authorized Service Contractor) trained on the X76CTM System. The warranty and checkout forms must be completed, including the certification number, and returned to:

Ronan Engineering Company
Warranty Department Manager
21200 Oxnard Street
Woodland Hills, California 91367

3.4 Tank Setup, Warranty and Checkout Forms

The Warranty and Checkout Forms are located at the back of this manual. A copy of these forms must be completed and returned to Ronan Engineering Company to validate the warranty. The Checkout Form, Part 1, includes the Tank Setup Information. Attach a copy of the tank statistics printout (F-64) to this form before returning it to Ronan. Before returning the forms, make sure that the following materials and information are included:

1. Warranty & Checkout Forms.
2. Tank specifications including tank material, volume, diameter, and Manufacturer Height to Volume Conversion Chart.
3. Tank tilt information (if the tank is tilted).
4. Fuel height readings at fill riser and probe riser, and their distances from the center of the tank. This reading would have been taken at the time of probe installation and recorded on the Warranty & Checkout Form, Part 1, Setup Information.

If the tank tilt indicated a difference in the fuel height readings, enter “YES” on the Setup Information Sheet. The X76CTM will calculate the tank tilt from this information.

3.5 Printer Paper Replacement

The X76CTM uses a special order paper roll. Check with your local Ronan distributor or call Ronan for assistance at 1-800-327-6626. See drawing on page 34.

1. Unscrew the nut and pull the printer door toward you.
2. Remove the empty paper roll and discard it. Save the roll shaft.
3. Insert the roll shaft into the new roll of paper.
4. Rest the new paper roll in slot on bracket.
5. Insert the paper between the green board and the black printer mechanism. Press the small push button located on the right side of the printer mechanism to advance the paper forward.
6. Select [PRINT] to check the printer operation. If there are no visible characters, then remove the paper by tearing the paper off at the back of the printer, and remove the excess paper through the front of the printer. Install new printer ribbon. Repeat steps 1 through 5.

3.5.1 CAUTION

1. To avoid paper jams, gently tear the printout in the clockwise direction.
2. Repair any printer jam right away before moving to the next operation. Repair printer jams by removing all foreign objects from the printer area. DO NOT pry or scratch the print head.
3. Always pull excess paper from front panel.
4. Never tear the paper while printer is running.

Figure 1: Keypad Push-button Layout.

4.0 KEYPAD EXTERNAL PUSH-BUTTON FUNCTIONS

A TEST push button and a green POWER indicator are provided in the external layer of the panel. Any incoming alarms can be silenced through the TEST push button. Under normal conditions, press this push button to test the system horn. If the test is successful, the external horn as well as the internal horn will be heard. Open the cover to access the X76CTM's alphanumeric LCD that will display tank and alarm information. The Display and Data Entry Keypad are used to program the system and will prompt you through the initial setup. The keypad is shown above as it appears on the unit. Keypad entries are divided into the following four types:

4.1 Alarm/Test and Sil/Test Keypad

The purpose of the SIL/TEST key is to acknowledge alarms (reset). To test the internal audible and visual alarms press the [SIL/TEST] push button.

When in the default display screen, it is possible to test the alarm light and horn by pressing the SIL/TEST or SILENCE keys. The horn and light will be active for 5 seconds.

4.2 Data Entry Keypad

The numeric [0] - [9] keys provide quick and easy numerical information input. Clear/Clear Entry Key [C/CE] will clear or correct data entry. It is also used for alphabetical information input. This key is used to scroll through the alphabetical characters from right to left. The Decimal Key [●] is used to enter a decimal point, colon, slash, or scroll through the alphabetical characters from the left to right. See Section 6.0 for editing parameters and advanced keyboard functions.

4.3 Commands Keypad

Enter Key [ENT]. Used for data entry.

Tank Number Key [TANK NO]. Prompts user to select tanks 1 through 8. It can also be used to advance the tank number by depressing the key twice.

High Level Key [HI]. Displays the set point of the High Level Alarm in gallons for the tank number displayed. It also scrolls through function codes available for configuration settings.

Low Level Key [LO]. Displays the set point of the Low Level Alarm in gallons for the tank number displayed. It also scrolls through function codes available for configuration settings.

Display Key [DISPLAY]. Changes the LCD format from inches and gallons to temperature and water level, time and date, and input annunciator windows.

Function Key [F]. Pressed prior to function codes.

Print Key [PRINT]. Prints a hard copy of the following report selections:

1. **Active Alarms Report.** Prints all alarms that are currently active (all active contact inputs and exceeded tank level set points).
2. **Inventory Report.** Prints the current level, volume, and temperatures for all active tanks.
3. **Shift Report.** Similar to the inventory report, but also includes the net change of the volumes and the temperature since the last time this report was printed. Normally it is printed every time the shift changes. The date and time of the last report are also printed.

4. **Daily Sales Report.** Prints the amount of product sold per tank for the last 24 hours (from midnight to midnight) and includes the number of days of available inventory at current usage rate.
5. **CSLD (Continuous Statistical Leak Detection) Report.** Prints the average leak rate, the error range, the 95% confidence leak rate, and the conclusion (passed, failed, inconclusive) for the current tank. The system allows selection of time intervals for which the report is to be generated.
6. **Tank Setup.** Prints the general tank information: shape, size, types of product, probe data, length, wire speed, repetition rate (for Magnetek 7030), as well as the alarm setting for the tank, level, and limit alarms. Use the [HI] and [LO] keys to toggle options.
7. **Tank Chart Report.** Prints the tank chart at one inch level increments.
8. **Annunciator Settings.** Prints the current setting for the annunciator: type of event, relay assigned, horn enable/disable, as well as scripts to be run at normal and alarm conditions.
9. **Contacts Settings.** Prints the contact settings: type (normally open/normally closed), current state (alarm/normal), and the relay to be activated depending on the contact state.This report prints the setting for all contacts, including the level gauge probe inputs.
10. **Relays Settings**. Prints the current settings for the X76CTM relays. For each relay (total of 4 relays) the current state, logic (normally open/normally closed), and the time-out is reported. If the time-out is 0, the relay will stay in this state until changed. The time-out option is for unattended stations to increase the external horn life, if attached, or in applications in which a pulse is required for remote alarm indication of multiple alarms (reflash).

5.0 USER LOGIN/LOGOUT

To operate and configure the X76CTM, the user must log in using a PIN preconfigured by the administrator. There are 10 predefined users: User 1-9 and User 0 (ADMIN). Only ADMIN is allowed to change the system settings, as well as the Personal Identification Number (PIN) for the other users. Any user can change their own PIN at any time. The procedure for changing the PIN is described in Section 10.

When the X76CTM is in one of the default displays, press any key (0-9) to identify the user to be logged in. The X76CTM prompts for the PIN entry of the user. The PIN is up to 6 digits long and during the process of entering the digits are substituted with asterisks (*) on the display. After entering all the digits, press [ENT]. If the PIN entered matches the number assigned to the user, the user will be logged in. If the number does not match, an error message will appear.

6.0 EDITING PARAMETERS

6.1 Editing Numeric Parameters

When editing a number, follow these rules:

a) If the first key pressed is a digit (0-9), the current value is erased and the digit is accepted.

b) Every digit entered (including the decimal point) is shifted from right to left.

c) Press the [C/CE] key to delete the last digit entered and shift the display to the right.

d) If the last digit is deleted, the display shows a reading of 0.

6.2 Editing Text Functions

When editing text, use the following functions:

[HI] [LO] Keys. Move the cursor left and right.

[C/CE] and [●] Keys. Scroll the letter under the cursor.

[TANK NO] Key. Changes the case of the letter under the cursor.

It is possible to enter a letter without scrolling through all letters. This is achieved by assigning the letters to the numbers, as it is done on a telephone keypad. Pressing once, the digit is put under the cursor. Pressing the same number up to 3 times will scroll through the assigned letters for this number. The letters are assigned as follows:

&-/	Assigned on 0
ABC	Assigned on 1
DEF	Assigned on 2
GHI	Assigned on 3
JKL	Assigned on 4

MNO Assigned on 5
PRS Assigned on 6
TUV Assigned on 7
YZ● Assigned on 8

Press the [TANK NO] key to toggle letter case.

7.0 DEFAULT DISPLAY

There are 4 real-time displays that can be used to show different parameters continuously:

1. Level and volume for the current tank.
2. Water level and product temperature of the current tank.
3. Date and time.
4. Tank and contact status.

The default display is selected by pressing the [DISPLAY] key. Each time the key is pressed it scrolls to the next of the four available displays.

When the Tank and Contact Status Display is selected, the following characters are used to show the status:

[.] Represents normal state of the contact. This is applicable also if the unused probe inputs are used for contacts. The normal state of the contact can be programmed to be either normally open or normally closed.

[■] Displays contact in alarm.

[Q] Tank is in quiet mode. In this mode, the tank is inactive. However, the conditions do not exist to enter a leak test.

[T] Tank is in leak test mode.

[D] Tank is in delivery mode (i.e., a delivery is taking place).

[S] Tank is in sale mode (i.e., a product is being withdrawn).

[C] Tank is closed, but the probe terminal is not used as a contact.

8.0 SETTING TANK DATA

The configuration of the X76CTM is designed to be performed in sequential steps. Because every step uses the data from the previous step (particularly for tank parameter settings), it is important to follow the steps below:

1. Configure tank geometry.
2. Configure the probes.
3. Configure the product.
4. Configure initial product levels.
5. Configure tank-based alarms: low, low-low, high, high-high and maximum water level alarm.

Configuration of the station's name and address, the contacts, relays, the annunciator, and the product information is order independent and can be done at any time.

9.0 BROWSING & PRINTING EVENT HISTORY

The X76CTM uses flash memory to store all of the events. The event storage capacity is approximately 3000 events. In the event of overflow, the oldest events are discarded. For typical station use, this is about 2 years usage. Each event is time-stamped and identified including users logged in at the time. The X76CTM stores the following types of events:

Power Up. Each time the X76CTM is powered up, it stores the date and time of power up.

User Login or Logout. User name and the date and time of the event is logged in.

Contact Event. Contact number and state (alarm or normal).

Tank Volume and Level Events. Low, low-low, high, high-high, and high water stored, as well as the state (alarm or normal).

Leak Test Results. When a leak test is completed, records the test duration, leak rate measured, and date and time of the test. Leak tests are started automatically during quiescent conditions.The X76CTM stores all of the results, and uses them for Continuous Statistical Leak Detection (CSLD).

To browse the event history, use Function 100. It always starts with the last event. Scroll through the events using [HI, LO] keys. Press the [PRINT] key and the X76CTM will print the event displayed on the screen. If [PRINT] is pressed again, the X76CTM prints the next 20 events. After printing the events, the X76CTM will wait for [PRINT] to be pressed again for the next 20 events, or [HI, LO] to continue scrolling.

Events can be filtered by type, date and time. This feature enables the user to make customized reports. To select the type of events to be seen, use Function 101. Select the type of event by using [HI, LO] keys. Press [ENT.]. Select the start and end times. The start time is by default the current time minus 24 hours, and the end time is the current time. Once changed to different values, the settings will remain in effect. If C/CE is pressed while editing

the times, the time is cleared and assumed not to be used for filtering. If the event is tank specific, a prompt for selecting the tank will be displayed (some events like contact, login, and logout are not tank related). After selecting the filter, the filtered events will be browsed the same as F100.

10.0 FUNCTION CODES

The functions available for the X76CTM are listed in Figure 2 by function number, description, and page location for detailed programming information. However, Section 10.0 has been outlined in the proper programming sequence.

To execute a function, press the F key. The following message appears:

```
Select function ____
Or scroll with (HI, LO) key
```

Enter the function code (if known) or use [HI] and [LO] keys to scroll through the available functions. The function appears with the description on the second line of the LCD. When the desired function is selected, press [ENT.].

Use the [DISPLAY] key at any time to cancel the action and return to the current default display.

F 7021, Beginning Initial Programming

Each X76CTM is factory tested prior to shipping. During the testing process many of the systems functions are programmed. If this information is not erased or reprogrammed, it may effect the performance of the system. It is suggested that the memory be cleared prior to programming the system for the first time or if making substantial changes to the system's programming.

F 94, Station Name

This function sets the station name. The station specific data is the station name, city, and address. The device is programmed at the factory with the manufacturer's name, address, and city.

```
Station Name
Ronan Engineering Company
```

F 95, Station Address

Sets the station address.

```
Station address
21200 Oxnard St.
```

F 96, Station City

Sets the stations city, state and zip code.

```
Station City
Woodland Hills CA 91367
```

Function	Description	Page No.
43	Delivery Threshold	12
44	Set Up Contact [HI, LO]	14
45	Select Probe Type	11
46	Date & Time Format [HI, LO]	10
47	Enter Tank Ullage %	12
48	Enter RTD-S Number	11
58	Software Version	
62	Enter Code For:	15
63	Set Up Communications	15
66	Display Tank and Contact Status	15
68	Manifolds to #12345678	13
72	Initial Product Level	11
73	Initial Water Level	11
74	Tank Model [HI, LO]	10
75	Leak Detect Threshold	12
76	High Water Level Alarm	13
78	Select Product [HI, LO]	12
79	Theft Detect Threshold	13
81	Set Up Relay [HI, LO]	14
82	Set Up Tank Alarm	13
84	High-High Volume Alarm	14
91	Enter Date & Time:	10
92	Enter Product Expansion	11
93	Select Units to Use	10
94	Station Name	9
95	Station Address	9
96	Station City	9
97	Enter Product Name	12
100	Browse Events	16
101	Event Query Filter	16
103	Print Report: [HI, LO]	16
184	Low-Low Volume Alarm	14
290	Disable Tank	11
291	Enable Tank	11
292	Enable Theft Monitor	19
7021	Beginning Initial Programming	9

Figure 2: Function Codes.

F 46, Date & Time Format [HI, LO] (Y2K Compliant)

Use this function to set up the time and date format. Use the [HI] and [LO] keys to scroll through the selections.

```
Date & time format (HI,LO): 1
mm/dd/yy  hh:mm:ss  AM/PM
```

The X76CTM can operate with date and time in different formats, to adapt for different countries. The formats supported are:

1.	mm/dd/yy hh:mm:ss	US style
2.	mm/dd/yyyy hh:mm:ss	Displays full year, US style
3.	mm/dd/yy hh:mm:ss	AM/PM, US style
4.	dd-mm-yy hh:mm:ss	European style
5.	dd-mm-yyyy hh:mm:ss	Displays full year, European style
6.	dd/mm/yy hh:mm:ss	European style
7.	dd/mm/yyyy hh:mm:ss	Displays full year, European style

F 91, Enter Date & Time

To set the time and date, use Function 91. With the X76CTM, both the date and time can be entered using this function. When entering the time, it must be entered in military format (24 hours). Use the [HI] and [LO] keys to advance the cursor to the corresponding digit.

```
Enter the date & time
03/02/98 15:18:49
```

F 93, Select Units to Use

The X76CTM defaults to US units. To change the unit type, use Function 93. Enter the digit corresponding to the following choices:

```
Select units to use
1-US  2-Imperial  3-Metric
```

F 74, Tank Model [HI, LO]

The X76CTM has a predefined table of most of the industry standard tanks strap charts (Owens-Corning and Xerxes models). Press Function 74, [ENT.] to generate the strap chart table.

```
Tank Model (HI,LO)_1
0/C2 (4) 1000 Owens-Corning
```

The X76CTM displays the following strap chart table.

```
User defined
0/C2 (4) 1000 Owens-Corning
0/C2 (6) 2500 Owens-Corning
0/C2 (6) 4000 Owens-Corning
0/C2 (6) 6000 Owens-Corning
0/C2 (8) 6000 Owens-Corning
0/C2 (8) 8000 Owens-Corning
0/C2 (8) 10000 Owens-Corning
0/C2 (8) 12000 Owens-Corning
0/C2 (10) 15000 Owens-Corning
0/C2 (10) 20000 Owens-Corning
0/C2 (10) 25000 Owens-Corning
0/C2 (10) 30000 Owens-Corning
X2 (4) 1000 Xerxes
X2 (6) 2500 Xerxes
X2 (6) 4000 Xerxes
X2 (6) 6000 Xerxes
X2 (8) 8000 Xerxes
X2 (8) 10000 Xerxes
X2 (8) 12000 Xerxes
X2 (10) 15000 Xerxes
X2 (10) 20000 Xerxes
X2 (10) 25000 Xerxes
X2 (10) 30000 Xerxes
```

For standard tanks where the strap table is known, select 6, User Types.

```
Select shape (HI,LO)_6
User types
```

For non-standard tanks select from the following shapes at the User Defined option:

```
1-Flat-end    (for steel tanks)
2-Round-end   (for fiberglass)
3-Vert. cyl
4-Spherical
5-Rectangular
```

Upon this selection, the strap table editing function automatically begins.

1. Enter the tank internal diameter.
2. Enter the actual capacity.
3. Select one of the 2 choices for the tank tilt using [C/CE].
4. If the tank is tilted, enter the probe location (1 for probe between the fill opening and the center, 2 for fill opening between the probe and the center).
5. Enter the distance between the probe and the fill openings.
6. Enter the distance between the probe opening and the center of the tank.

7. Enter the dipstick level at the probe opening.
8. Enter the dipstick level at the fill opening.

F 45, Select Probe Type

Use this function to select the type of the probe, and also to set up the probe parameters. Scroll through the list of supported probes with [HI] and [LO]. Select the desired model with [ENT.].

```
Select probe type:
Mt7100
```

Depending on the probe model, the X76CTM asks for different parameters: serial number, wire speed, and repetition rate (for Patriot's 7030 probe only). Entering the serial number is recommended, since it is written in the flash memory for maintenance purpose.

```
Enter probe serial #
2569273
```

Enter the probe's wire speed (shown on the upper end of probe), and press [ENT.] In the case of the 7030 probe, the X76CTM will prompt for the probe's repetition rate.

```
Enter speed of wire
9.250 ms/inch
```

NOTE: The speed of wire is located on the top of the probe and should be recorded on the setup sheet. The speed of wire must be entered before initial product and initial water levels, otherwise incorrect temperatures and levels will result.

Enter the probe length in inches. By default, the probe's length is calculated based on the tank diameter and probe type.

```
Probe length
————————— in
```

Enter the offset from the bottom of the tank, in case the probe is not touching the bottom.

```
Offset from bottom
————————— in
```

The option to disregard the water signal is used in applications where the water level is not monitored.

```
Disregard water: NO
Use C/CE to toggle
```

Inventory only is used in applications where fast polling of the probes is critical, and running leak tests is not needed. Once the inventory only option is confirmed, the X76CTM will not run leak tests for the selected tanks. The inventory only selection is recorded in the event log.

```
Inventory only: NO
Use C/CE to toggle
```

i**WARNING:** The tank parameters are changed using Function 74. For the tank diameter, the length of the probe will automatically recalculate to reflect the new diameter. If the probe length is not matched with the recalculated length, it must be changed again.

F 48, Enter RTD-S Number

Use Function 48 to change the number of RTD's in the probe from the default number for that probe.

F 290/291, Disable/Enable Tank

These functions are used to enable/disable the probe poling and tank calculations. It is recommended to close the tank before entering settings. Enable the tank after the new settings are entered. To open a tank for poling, use Function 291. To close (disable) a tank, use Function 290.

F 72, Initial Product Level

The configuration setting of the initial levels are required to calibrate the probe to the real level of the product (Function 72) and water (Function 73) in the tank. These settings are always overwritten when the probe data type is changed and must be re-entered.

Press Function 72 to set up the initial product (fuel). Enter the fuel level in inches, and press [ENT.].

```
Initial product level
22.86 in
```

NOTE: Use a gauge stick and Kolor Kut™ paste (or similar) to determine the initial level. If the tank is tilted, measure the level at the probe riser.

F 73, Initial Water Level

Use Function 73 for initial water level. Enter inches of water and press [ENT.].

```
Initial water level
0.00 in
```

NOTE: Before entering initial water level, take an accurate reading of the water level in the tank using Kolor Kut™ water finding paste or a similar product. Failure to do so will result in false or inaccurate water readings.

F 92, Enter Product Expansion

If Function 97 (Product Name) has been entered, a coefficient of thermal expansion will be needed for that product. Press Function 92, [ENT.] to enter a coefficient of thermal expansion.

```
Enter product expansion
0.00065
```

Enter coefficient of expansion and press [ENT.]. Function 92 is used when the product name cannot be found in product codes. The coefficient can be viewed or changed with this function. It is not necessary to enter the decimal point.

F 78, Select Product [HI, LO]

The X76CTM has predefined the most common hydrocarbon fuel products. To select a product, use Function 78.

```
Select product (HI,LO)_1
```

Use the [HI] and [LO] keys to scroll through the predefined list and select the chosen product.

```
 0 = None
 1 = Regular
 2 = Premium
 3 = Super
 4 = Diesel
 5 = Kerosene
 6 = Toluene
 7 = Hydraulic Oil
 8 = #2 Heating Oil
 9 = Turbine Oil
10 = Xylene
11 = Jet Fuel
12 = AV Gas
13 = Water
```

If the product is not listed, enter the product name (to appear in reports) using Function 97, and its coefficient of expansion using Function 92.

F 97, Enter Product Name

If a product is not listed in the predefined list (Function 78), a new product name can be added by using Function 97 and its corresponding expansion coefficient, using Function 92.

F 47, Enter Tank Ullage %

Press Function 47, [ENT.] for programmable ullage. Message will display:

```
Enter tank ullage 95%
```

Enter the % and press [ENT.].

F 43, Delivery Threshold

When a product is delivered to a tank, the X76CTM senses it and writes the date, time, amount, and temperature of the delivered product. Sometimes, a small amount of product pouring back in the tank during transfer is not considered as delivery. To minimize confusion, the user can set up a value that will eliminate the small levels. The default threshold is 200 gallons. Use Function 43 to change the delivery threshold and press [ENT.] to save.

```
Delivery threshold
100.0 gl
```

F 75, Leak Detect Threshold

X76CTM has 4 leak-related alarms: Quick Test, Precise Test, High Leak, and CSLD (Continuous Statistical Leak Detection). The function for each of these alarms may be programmed independently using F82.

The Quick Test is started automatically after a predefined, probe-dependent interval following a delivery (1 hour for X76MP, 7100, MTS-UST and Veeder-Root MAG2). The result is compared to a probe-specific threshold and, if a failure has occurred, an alarm is generated. Testing immediately after a delivery is not precise, although still within the EPA requirements. Ronan recommends this result only as a leak indication, not as a basis for programming station shutdown.

The Precise Test is run after a longer waiting period following the delivery. It guarantees more accurate results and a lower number of false alarms. Two thresholds are possible for this test corresponding to the 0.1 and 0.2 gallons/hour EPA requirements. The thresholds are set automatically, and are probe dependent. Normally, a station shutdown procedure is specified for this alarm.

The High Leak alarm is activated whenever a gross leak is detected. The leak must be higher than 9 gph, and lower than the minimal pump throughput. High Leaks occur when a pipe is broken, or the tank is physically damaged. The High Leak detection alarm time is shorter than a leak test, typically less than 30 minutes.

The CSLD alarm is activated when long-term data shows possible tank leakage. It is useful for busy stations that do not have time to run a full test. Since the result of the CSLD test is based on the database compiled by short tests, it cannot be used to confirm a leak. If a CSLD alarm occurs, the tank must be shutdown and a full test, preferably a Precise Test, has to be run.

To set up the leak test parameters, select F75. Pressing [ENT.] at every parameter confirms the current value.

Leak scatter is a very important parameter, since it defines when the tank is quiescent, and a test can

be conducted. The higher it is, the easier it is to enter a leak test, but the data could be noisier and the results incorrect.

```
Leak scatter
0.2 gl
```

The activity threshold is used to distinguish tank leakage from real activity - delivery of sale. It can be increased to the minimal throughput of the dispenser pump. By default this is 9 gl/h.

```
Activity threshold
9.0 gl
```

Temperature scatter controls what temperature slope is acceptable to start a test.

```
Temp scatter
0.2 deg/h
```

Minimum test duration sets the minimum acceptable test time to be used by the CSLD database.

```
Min test duration
15 min
```

A maximum test duration of 120 minutes is sufficient for tanks up to 20,000 gallons. Increasing this duration usually will not improve the result and degrade the response time.

```
Max test duration
120 min
```

Precise wait after delivery can be entered to increase the test precision, although it is not needed in most cases.

```
Precise wait after delivery
360 min
```

This parameter allows the X76CTM to use a lower threshold for the Precise Test. Generally, this increases the probability of false alarms, but allows for early warning of possible tank leak.

```
0.1 gph test? No
```

The minimum CSLD duration sets a minimum combined test time for the CSLD algorithm to make its conclusions. Generally, the longer it is, the better.

```
Min CSLD duration
8 hours
```

The minimum history parameter sets the maximum number of days to be used by CSLD to acquire the minimal test duration. If there is not enough tests for this period, increasing the number of days is recommended. If it is not possible to acquire the data for one month, the tank should be shutdown and a normal test conducted.

```
Min CSLD history
14 days
```

F 68, Manifolds to t# 12345678

The X76CTM allows for the combining of two or more tanks to generate the combined product volume of physically manifolded tanks. If tank 2 is manifolded to tank 1, the reports for tank 1 will contain the manifolded volumes, while those for tank 2 will not. The same applies to the leak test. The leak test for tank 1 will use the combined product volume, while tank 2 will be independent.

Manifolding tanks is performed with Function 68. The display has 8 characters for every tank where the current tank is marked with a black block.

```
Manifolds to t# 12345678
1-8 to set/clr: ...*▮...
```

Press the key, corresponding to the tank number to be manifolded, to toggle the status of the tank (i.e., if tank is not manifolded, it will manifold and vice versa). Pressing the digit that corresponds to the current tank does not cause a change. To end manifolding, press [DISPLAY].

F 76, High-Water Level Alarm

The high water alarm is set using Function 76.

```
High water level alarm
3.5 in
```

The high water alarm warns when the water level has exceeded a preset level. When this set point is exceeded, an audible/visual alarm is generated followed by a printout of the alarm. The high water alarm can be programmed to an external output relay (Function 81). Information on the last water alarm warning for each tank is stored in memory.

F 79, Theft Detect Threshold

Use Function 79 to set up the theft detect threshold. A message will be displayed:

```
Theft detect threshold
10.0 gl
```

Enter the number of gallons loss that will make the theft gallon alarm active and press [ENT.].

NOTE: This function is only active when in THEFT DETECT MODE (Function 292).

F 82, Set Up Tank Alarm

The X76CTM can be configured to perform different actions when an alarm occurs. For each event, a relay can be assigned. The events supported are:

Leak Detected. This event is made active when a test with a maximal duration was ended, the probability of leak detection is higher than 95%, and the leak detected was higher than the threshold (typically 0.2 gph).

High Leak Detected. This event is activated when a maximal duration leak test is completed and the leak detected is higher than the High Leak threshold.

Low Volume Alarm. The volume of the product in the tank is below the threshold.

Low-Low Volume.

High Volume Alarm. The volume of the product in the tank is above the threshold.

High-High Volume.

High Water. The water level is above the threshold.

Probe Alarm. A probe failed or was restored.

To setup an event, select Function 82. Select the type of the event to be programmed. Select the relay to be assigned, or press [C/CE] to remove an assignment. Select the horn activation flag by toggling the current selection using [C/CE].

F 84, High-High Volume Alarm

Use Function 84 to enter the High-High Volume Alarm.

```
High-high volume alarm
9241.60 gl
```

Enter the number of gallons that will activate the alarm and press [ENT.].

F 184, Low-Low Volume Alarm

Use Function 184 to enter the Low-Low Volume Alarm.

```
Low-low volume alarm
924.16 gl
```

Enter the number of gallons that will activate the alarm, and press [ENT.].

F 81, Set Up Relay [HI, LO]

The X76CTM has 4 user programmable relays. The relays can be set up to respond to alarm conditions, or be controlled by commands in user scripts. The name, logic, and time-out can be set for every relay. To program a relay, use Function 81 and the [HI] and [LO] key.

```
Set up relay
Relay 1
```

Edit the relay name, and press [ENT.]. (By default, the relays are named RELAY1-4).

```
Enter relay name
Relay 1
```

Enter the relay time-out (0-255 s), and press [ENT.]. Entering 0 means that there is no time-out.

```
Enter relay time-out
25 s
```

Select the relay logic (1 for normally open, 2 for normally closed) using [C/CE].

```
Select relay logic
1-NormOpen   2-NormClose
```

F 44, Set Up Contact [HI, LO]

The X76CTM can have up to 16 contacts, depending on the number of active probes. Each contact is enabled and set up individually. If some or all probe terminals are not used with a probe, they can be used as a contact input.

Scroll through the contacts using [HI] and [LO]. When the desired contact number and name is displayed, press [ENT.].

```
Set up contact (HI,LO)-1
INPUT 01
```

The X76CTM asks whether you want to enable the contact. If the contact is not enabled, the function

ends without changes. If the contact is enabled, the display prompts for the contact name. Enter or confirm the contact name.

```
Enable contact YES
Use C/CE to toggle
```

The next prompt allows you to select the contact's logic, either N.O. (normally open) or N.C. (normally closed). Select the desired polarity using [C/CE].

```
Contact logic (use C/CE)
Norm. Open
```

Select the relay that will be energized when the contact is in active (alarm) state. Select 0 for NONE.

```
Select alarm relay (HI, LO) 0
NONE
```

After selecting the alarm relay, press [ENT.].

For the horn to sound while the contact is in alarm state, the option must be entered using [C/CE].

```
Horn on alarm
use C/CE to toggle
```

The system will prompt to set up contacts names. By default, all contacts have the name INPUT01 - INPUT16.

```
Setup contact (HI,LO)_1
Input01
```

Use [HI] and [LO] keys to scroll through the available contact listings. Press [ENT.] at the selected contact and start editing.

```
Enter contact name:
Contact01
```

F63, Set Up Communications

The X76CTM has two serial ports that can be assigned to support different protocols. They are not totally interchangeable. Com 1 (J1) is used primarily as a remote access setup port. The only exception to this use is when the port is being used as a Ronan X110 interface. The second port Com 2 (J3) is designed to support various protocols.

To set up ports, select Function 63. Select the port to be configured using the [HI] and [LO] keys.

```
Set up comport 0
Com 1
```

Select the port protocol. The X76CTM will assume the default values for the next parameters, but it is possible to change them.

Select the connection type:

```
Connection type 1
```

The three possible choices are:

1. **Computer**. This means connection will be made with null modem cable and no hardware handshake will be applied.

2. **Modem**. If chosen, the X76CTM will try to initialize the modem.

3. **RS485**. This assumes the Ronan supplied RS485 adapters are present, and a multidrop connection will be used.

Select the baud rate using the [HI], [LO] keys.

```
Speed 9600 bps
HI,LO
```

Select the bits per character. Only 7 and 8 are available.

```
Character bits 8
```

Select the parity using the [HI], [LO] keys. Choices are odd, even, or none.

```
Parity = None
HI, LO
```

If the protocol selected is for daisychaining multiple X76CTM's, like MODBUS™, or TM2000 emulation, enter the network address of the X76CTM.

F 62, Enter Current Code For:

To make a change to the PIN code, use Function 62. For security purposes, the X76CTM is designed so that only the administrator can change user codes. To change the code of another user, the administrator must first log in. At the default display, press the user number to be changed. A message will appear requesting the PIN code of the specific user. Ignore this message.

```
Enter PIN code for:
User 4 >_
```

To change, press Function 62 again, and a prompt for entering the new PIN code will appear. For security purposes, during the new entry, the real digits are substituted with asterisks (*) on the display. The requirement for the PIN code entry is numeric only. Up to six digits can be entered. Press [ENT.] to make the changes active.

```
New PIN code for:
User 4 >******_
```

F 58, Software Version

Use this function to display the current version of the software and the corresponding date and time.

```
X76CTM version 1.0
Built 02/16/98, 14:24:21
```

F 66, Display Tank and Contact Status

When the Tank and Contact Status Displays are selected, the following characters are used to show the status.

[.] Represents normal state of the contact. This is applicable also if the unused probe inputs are used for contacts. The normal state of the contact can be programmed to be either normally open or normally closed.

[■] Displays contact in alarm.

[Q] Tank is in quiet mode. In this mode, the tank is inactive. However, the conditions do not exist to enter a leak test.

[T] Tank is in leak test mode.

[D] Tank is in delivery mode (i.e., a delivery is taking place).

[S] Tank is in sale mode (i.e., a product is being withdrawn).

[C] Tank is closed, but the probe terminal is not used as a contact.

F 100, Browse Events

This function is used for unconditional and unfiltered display of the events from the event log, always beginning with the most recent event.

To browse the event history, use Function 100. This display defaults to the last event. To scroll through the list of events use the [HI] and [LO] keys. Pressing the [PRINT] key prompts the X76CTM to print the event that is on the screen. If [PRINT] is pressed again, the next 20 events will be printed. After printing those events, if [PRINT] is pressed again an additional 20 events will print, or [HI] and [LO] can be used to continue scrolling through the event history.

F 101, Event Filter Query

Use this function to selectively display events from the event log, filtered by type, start/end times, and tank. Browse the list of available event types. Select the event type with [HI] and [LO]. Use 255 for all event types.

```
Event query 255 filter
All
```

Enter start and end times to select a specific range of events. The end time (the most recent event) is displayed first. If an end time is not entered, the system defaults to 24 hours from the start time:

```
Query event: start
9/18/99      13:00:00
Query event: til
9/19/99      13:00:00
```

If a query by start/end time is not required, press the clear key [C/CE] to bypass this filter.

The system will prompt for tank filter if the event type is per tank based.

```
Filter by tank
All
```

The events can be browsed and printed the same as in Function 100.

F 103, Print Report [HI, LO]

Function 103 prints a hard copy of the following report selections:

1. **Active Alarms Report.** Prints all alarms that are currently active (all active contacts and tank level limit set points).
2. **Inventory Report.** Prints the current level, volume, and temperatures for all active tanks.
3. **Shift Report.** Similar to the inventory report, but also includes the net change of the volumes and the temperature since the last time this report was printed. Normally it is printed every time the shift changes. The date and time of the last report are also printed.
4. **Daily Sales Report.** Prints the average daily sales for each day of the week for the last month, as well as the number of days remaining until the tank reaches low level, based on the average sales.
5. **CSLD (Continuous Statistical Leak Detection) Report.** Prints the average leak rate, the error range, the 95% confi dence leak rate, and the conclusion (passed, failed, inconclu sive) for the current tank. The system allows selection of time intervals for which the report is to be generated.
6. **Tank Setup.** Prints the general tank information: shape, size, types of product, probe data, length wire speed, repetition rate (for Magnetek 7030), as well as the alarm setting for the tank, level, and volume alarms.
7. **Print Tank Chart.** Prints the tank chart at one-inch level increments.
8. **Annunciator Settings.** Prints the current setting for the annunciator: type of event, relay assigned, horn enable/disable, as well as scripts to be run at normal and alarm conditions.

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills CA 91367

**** Active alarms ****
** 07/29/99 09:10:06 **

    Contact alarms
No Name     Time
-- -------- -----------
12 RegAnnul 07/29 09:08

     Tank alarms
# Name/prod Type/time
- --------- ---------
1 Regular   Normal
2 Premium   Closed
3 Super     Closed
4 Regular   Closed
5 Regular   Closed
6 Regular   Closed
7 Regular   Closed
8 Regular   Closed

   New alarms:

-- 07/29/99 09:08:26
   C12 RegAnnular alarm
```

Report 1: Active Alarms.

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills CA 91367

** Inventory report ***
** 07/29/99 09:10:31 **

 Tank #1, Regular
----------------------
Product          Regular
Level          33.92 in
Water,lvl       0.17 in
Net          3168.06 gl
Gross        3182.30 gl
Water,grs       2.85 gl
Total        3185.15 gl
Ullage 95%,  6056.45 gl
Temp           66.91  F
```

Report 2: Inventory Report.

9. **Contacts Settings.** Prints the contact settings: type (normally open/normally closed), current state alarm/ normal), and the relay to be activated depending on the

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills CA 91367

**** Shift report *****
** 07/29/99 09:10:41 **

Last report printed:
07/28/99 17:20:03

 Tank #1, Regular
-----------------------
Product          Regular
Level          33.92 in
Water,lvl       0.17 in
Net          3168.06 gl
Gross        3182.30 gl
Water,grs       2.85 gl
Total        3185.15 gl
Ullage 95%,  6056.45 gl
Temp           66.92  F
Prod.change  3168.06 gl
Temp.change     2.70  F
```

Report 3: Shift Report.

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills,CA 91367

* Daily sales report **
** 08/01/99 12:01:29 **

 Tank #4, Regular
-----------------------
Last 30 days used.
Avg daily:     889.0 gl
Monthly:     26670.0 gl

Day of week  Aver.sales
-----------  -----------
Sunday        1020.0 gl
Monday         801.0 gl
Tuesday        670.1 gl
Wednesday      890.1 gl
Thursday       940.0 gl
Friday         820.0 gl
Saturday      1140.0 gl

5.1 days until low
```

Report 4: Daily Sales Report.

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills,CA 91367

***** CSLD report *****
** 08/01/99 01:54:39 **

 Tank #4, Regular
-----------------------
T4 08/01/99 01:53:50
   Leak test,precise
   Duration:       2:00
   Rate:     -0.02 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       60%

T4 07/31/99 14:56:50
   Leak test,precise
   Duration:       2:00
   Rate:     -0.01 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       60%

T4 07/31/99 06:59:50
   Leak test,precise
   Duration:       1:12
   Rate:     -0.03 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       60%

T4 07/31/99 04:47:51
   Leak test,precise
   Duration:       0:24
   Rate:      0.03 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       37%

T4 07/30/99 21:58:50
   Leak test,precise
   Duration:       1:47
   Rate:     -0.00 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       37%

T4 07/30/99 18:17:50
   Leak test,precise
   Duration:       2:00
   Rate:     -0.02 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       54%

T4 07/30/99 14:14:50
   Leak test,precise
   Duration:       1:37
   Rate:     -0.09 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       56%

T4 07/30/99 05:46:50
   Leak test,precise
   Duration:       0:32
   Rate:     -0.02 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       56%

T4 07/29/99 22:47:50
   Leak test,precise
   Duration:       1:48
   Rate:      0.02 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       26%

T4 07/29/99 17:53:50
   Leak test,quick
   Duration:       1:41
   Rate:     -0.01 gl/h
   Threshold  0.11 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       26%

T4 07/29/99 14:34:50
   Leak test,quick
   Duration:       0:18
   Rate:     -0.02 gl/h
   Threshold  0.10 gl/h
   Water:     0.00 gl/h
   Result:         pass
   Tank full:       28%

T4 07/29/99 13:22:50
   Leak test,quick
   Duration:       1:12
   Rate:     -0.02 gl/h
   Threshold  0.10 gl/h
   Water:    -0.00 gl/h
   Result:         pass
   Tank full:       50%

Total tests          12
From     07/02/99 01:54
Till     08/01/99 01:54
Total time       16:31
Avg.fill           50%
Avg.rate   -0.0128 gl/h
Avg.range   0.0258 gl/h
Avg.err         0.0518
95% rate    0.0647 gl/h
Result          passed
```

Report 5: CSLD Report.

prints the settings for all contacts, including the level gauge probe inputs.

10. **Relays Settings.** Prints the current settings for the 76CTM relays. For each relay (total of 4 relays) the current state, logic (normally open/

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills CA 91367

***** Tank Setup ******
** 07/29/99 09:10:20 **

 Tank #1, Regular
----------------------
Model       OC2(8)10000
Manufact  Owens-Corning
Shape         round-end
Diameter       92.00 in
Length        362.00 in
Dish length    27.00 in
Tilt            0.00 in
Capacity     9728.00 gl
Product          Regular
Exp.Coeff        0.00065
Manifolded No

Probe             mt7100
Serial#         BW655658
Length         92.00 in
Offset          0.00 in
RTD#1 at       15.33 in
RTD#2 at       30.67 in
RTD#3 at       46.00 in
RTD#4 at       61.33 in
RTD#5 at       76.67 in
Wire speed  9.250 us/in
Poll mode precise

*** Alarm settings ***

Low alarm    1945.60 gl
LoLo alarm    972.80 gl
High alarm   8755.20 gl
HiHi alarm   9241.60 gl
High water      3.50 in

* Leak test settings *

Threshold     0.20 gl/h
HiLeak        0.20 gl/h
Temp.scat.   0.20 deg/h
Min.test         15 min
Max.test        120 min
Activity wait    60 min
Prec.test wait  360 min
```

Report 6: Tank Setup.

```
Tank #1, Regular
----------------------
Model       OC2(8)10000
Manufact  Owens-Corning
Shape         round-end
Diameter       92.00 in
Length        362.00 in
Dish length    27.00 in
Tilt            0.00 in
Capacity     9728.00 gl
Product          Regular
Exp.Coeff        0.00065
Manifolded No

Level       +0       +1
  0.0       0.0      17.0
  2.0      48.0      89.0
  4.0     136.0     197.0
  6.0     249.0     313.0
  8.0     382.0     454.0
 10.0     531.0     611.0
 12.0     695.0     782.0
 14.0     873.0     968.0
 16.0    1066.0    1166.0
 18.0    1269.0    1374.0
 20.0    1482.0    1592.0
 22.0    1704.0    1818.0
 24.0    1935.0    2053.0
 26.0    2174.0    2296.0
 28.0    2420.0    2545.0
 30.0    2673.0    2801.0
 32.0    2931.0    3063.0
 34.0    3196.0    3330.0
 36.0    3465.0    3601.0
 38.0    3739.0    3877.0
 40.0    4016.0    4156.0
 42.0    4296.0    4437.0
 44.0    4579.0    4721.0
 46.0    4864.0    5007.0
 48.0    5149.0    5291.0
 50.0    5432.0    5572.0
 52.0    5712.0    5851.0
 54.0    5989.0    6127.0
 56.0    6263.0    6398.0
 58.0    6532.0    6665.0
 60.0    6797.0    6927.0
 62.0    7055.0    7183.0
 64.0    7308.0    7432.0
 66.0    7554.0    7675.0
 68.0    7793.0    7910.0
 70.0    8024.0    8136.0
 72.0    8246.0    8354.0
 74.0    8459.0    8562.0
 76.0    8662.0    8760.0
 78.0    8855.0    8946.0
 80.0    9033.0    9117.0
 82.0    9197.0    9274.0
 84.0    9346.0    9415.0
 86.0    9479.0    9538.0
 88.0    9592.0    9639.0
 90.0    9680.0    9711.0
 92.0    9728.0
```

Report 7: Tank Chart Report.

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills CA 91367

 Annunciator settings
** 08/06/99 10:29:08 **

on Contact
   Relay:  none
   Horn:   Yes
   Scripts:
   Normal: none
   Alarm:  none
   X110: 0

* Settings for tank 3 *
----------------------
on Probe
   Relay:  RemoteCTA
   Horn:   No
   Scripts:
   Normal: none
   Alarm:  none
   X110: 1
on Low
   Relay:  RemoteCTA
   Horn:   No
   Scripts:
   Normal: none
   Alarm:  none
   X110: 2
on LowLow
   Relay:  RemoteCTA
   Horn:   No
   Scripts:
   Normal: none
   Alarm:  none
   X110: 3
on High
   Relay:  RemoteCTA
   Horn:   No
   Scripts:
   Normal: none
   Alarm:  none
   X110: 4
on HighHigh
   Relay:  RemoteCTA
   Horn:   No
   Scripts:
   Normal: none
   Alarm:  none
   X110: 5
on HiWater
   Relay:  RemoteCTA
   Horn:   No
   Scripts:
   Normal: none
   Alarm:  none
   X110: 6
on Theft
   Relay:  RemoteCTA
(Continued)
```

Report 8: Annunciator Settings.

normally closed), current state (alarm/normal), and the relay to be activated depending on the contact state. This report prints the settings for all contacts, including the level gauge probe inputs.

10. **Relays Settings.** Prints the current settings for the 76CTM relays. For each relay (total of 4 relays) the current state, logic (normally open/normally closed) and the time-out is reported. If the time-out is 0, the relay will stay in this state until changed.The time-out option is for unattended stations, to increase the external horn life, if attached or in applications where a plulse is required for remote alarm indication of multiple alarms (reflash).

```
   Horn:   No
   Scripts:
   Normal: none
   Alarm:  none
   X110: 7
on QuickTest
   Relay:  none
   Horn:   Yes
   Scripts:
   Normal: none
   Alarm:  none
   X110: 8
on PreciseTest
   Relay:  none
   Horn:   Yes
   Scripts:
   Normal: none
   Alarm:  none
   X110: 8
on HiLeak
   Relay:  none
   Horn:   Yes
   Scripts:
   Normal: none
   Alarm:  none
   X110: 8
on Csld
   Relay:  none
   Horn:   Yes
   Scripts:
   Normal: none
   Alarm:  none
   X110: 8
```

Report 8 (Cont.)

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills CA 91367

** Contacts settings **
** 08/06/99 10:29:20 **

 1 SupPipeSump
   State: Normal
   Logic: Norm.Open
   Relay: SuperPSD
 2 SupFullSump
   State: Normal
   Logic: Norm.Open
   Relay: SuperPSD
 3 SupAnnular
   State: Normal
   Logic: Norm.Open
   Relay: SuperPSD
 4 RegPipeSump
   State: Normal
   Logic: Norm.Open
   Relay: UnleadedPSD
 5 RegFullSump
   State: Normal
   Logic: Norm.Open
   Relay: UnleadedPSD
 6 RegAnnular
   State: Normal
   Logic: Norm.Open
   Relay: UnleadedPSD
7 RegPipeSump
   State: Normal
   Logic: Norm.Open
   Relay: RegularPSD
 8 RegFullSump
   State: Normal
   Logic: Norm.Open
   Relay: RegularPSD
 9 Probe input
10 Probe input
11 Probe input
12 RegAnnular
   State: Normal
   Logic: Norm.Open
   Relay: RegularPSD
13 Disp#1
   State: Normal
   Logic: Norm.Open
   Relay: none
14 Disp#2
   State: Normal
   Logic: Norm.Open
   Relay: none
15 Disp#3
   State: Normal
   Logic: Norm.Open
   Relay: none
16 Spare
   State: Normal
   Logic: Norm.Open
   Relay: none
```

Report 9: Contacts Settings.

F 292, Enable Theft Monitor

The theft alarm is defined as the activity of the tank (sale or withdrawal) when the tank is declared as inactive. To start theft monitoring, use Function 292. The current net volume is recorded and the system monitors the net volume for changes. If the net volume decreases more than the threshold value (default 10 gal), a theft alarm is generated. The net volume change will be recorded. For every occurrence, the amount is recorded, until the function is disabled. The theft monitoring can be disabled using Function 291.

10.1 Setting the User Pin

For security purposes, the X76CTM is designed so that only the adminis-

```
Ronan Engineering LDM
21200 Oxnard Street
Woodland Hills CA 91367

*** Relays settings ***
** 08/06/99 10:29:27 **

1 SuperPSD
  State: Open
  Logic: Norm.Open
  Timeout: 0 s
2 UnleadedPSD
  State: Open
  Logic: Norm.Open
  Timeout: 0 s
3 RegularPSD
  State: Open
  Logic: Norm.Open
  Timeout: 0 s
4 RemoteCTA
  State: Closed
  Logic: Norm.Closed
  Timeout: 30 s
```

Report 10: Relays Settings.

trator can access and alter the user codes. Function 62 is used to change the PIN codes. During new code entry, the numbers are substituted with asterisks (*) on the display for additional security. The administrator should first log in, then enter the new user number. This starts the login procedure for the new user. When Function 62 is pressed, a prompt for entering the user's PIN will appear.

For example: To change the PIN for user 4, log in as administrator, pressing 0. Enter the PIN code for administrator. The default display will appear. Press 4. The X76CTM will prompt to enter the user 4 PIN number. Disregard prompt and press Function 62. The system will prompt again for the new user 4 PIN number. Enter the new code.

10.2 Modbus™ Support

The X76CTM supports Modbus™ protocol in both ASCII and RTU modes. The mode is selectable via the front panel or the text terminal interface. For constant reading of the tank information, the RTU mode is recommended because of the small data overhead.

10.2.1 Register Allocation. The system data accessible through Modbus™, is on a per tank basis.The variables are sent in IEEE 4 bit floating point format or as 4 bit scaled integer long numbers, for devices that do not

Modbus™ Register Allocations

Register	Parameter Name	Dimension	Data Style
1 2	Product Level.	Inches	Floating Point
3 4	Water Level.	Inches	Floating Point
5 6	Product Gross Volume.	Gallons	Floating Point
7 8	Total Gross Volume.	Gallons	Floating Point
9 10	Product Average Temperature. The average of the submerged thermistor temperature.	°F	Floating Point
11 12	Product Net Volume. The volume calculated when the product temperature is 60°F.	Gallons	Floating Point
13 14	Current CSLD (Continuous Statistical Leak Detection) Leak Rate. Rate is based on at least one month test history.	Gallons per Hour	Floating Point
15 16	Last Completed Leak Test Rate. A test that has not been canceled before the scheduled test duration has expired.	Gallons Per Hour	Floating Point
17 18	Time of Last Completed Test. Time is in UNIX format (32 bit integer, number of seconds since January 1, 1970).	Seconds	Unsigned Long Number
19 20	Tank Status. A field with different flags that correspond to tank alarms.		Unsigned Long Number
21 22	Scaled Product Level.	0.001 Inches	Unsigned Long Number
23 24	Scaled Water Level.	0.001 Inches	Unsigned Long Number
25 26	Scaled Product Gross Volume.	0.001 Gallons	Unsigned Long Number
27 28	Scaled Total Gross Volume.	0.001	Unsigned Long Number
29 30	Scaled Product Average Temperature. The average of the submerged thermistor temperatures.	0.001°F	Unsigned Long Number
31 32	Scaled Product Net Volume. The calculated volume when the product temperature is 60°F.	0.001 Gallons	Unsigned Long Number
33 34	Scaled Current CSLD (Continuous Statistical Leak Detection) Leak Rate. Based on a least one month test history.	0.001 Gallons per Hour	Unsigned Long Number
35 36	Scaled Last Completed Leak Test Rate. A test that has not been canceled before the scheduled test duration expired.	0.001 Gallons per Hour	Unsigned Long Number
37-50	Reserved.		

support the floating point format. Although the Modbus™ register in the Read Multiple Registers Command (03) is 16 bit wide, each floating point or unsigned long number will occupy 2 registers. The register allocations for the tanks are shown in the table on page 20.

The last registers are reserved for future use. The data for the next tanks occupy the next 350 registers at 50 registers per tank, with the same register allocations

11.0 SPECIFICATIONS

11.1 Model X76CTM System

Power Requirements: 115/230 Vac, 50/60 Hz ±10%.

Power Consumption: 50 VA.

Operating Temp.: 32 to 125°F (0 to 52°C).

Mounting: NEMA 4, indoor or outdoor area, wall mount.

Display: Alphanumeric LCD, 2 lines x 24 characters per line.

Probe Inputs: One (1) to eight (8).

Sensor Inputs: Up to 16 passive inputs 24 Vdc, 12 mA.

Remote Communication Ports: Two (2) RS232C Serial Interface Ports.

Auxiliary Relay Outputs: Four (4) SPDT, 120 Vac max., 7.5 A max.

Data Entry Keypad: Three section membrane.

Printer: Alphanumeric paper, impact, 2¼ in. wide x 75 ft. (24 characters wide).

Dimensions: 12 in. W x 15½ in. H x 6-3/32 in. D.

Alarms: LED & Sonalert; 80db @ 10 ft. (115 Vac power only).

Approvals: UL 48RO.

11.2 Gauging Probe, Model 95040XB and Model 95140XB

Power Requirements: 24 Vdc intrinsically safe, pulsed, supplied by control chassis.

Operating Temperature: -40 to 130°F (-40 to 54°C) (consult factory for other temperature ranges).

Probe Material: 316 stainless steel (consult factory for other material types).

Float Material: Ceon-D, X95040XB; 316SS, 95140XB.

Repeatability: .02% or full range.

Accuracy: .05% of full range.

Resolution: ± .001 in.

Site Characteristics: 4 in. schedule 40 riser.

Wiring: Two (2) conductor shielded cables, max. length 2500 ft.

Approvals: UL Listed 48RO, intrinsically safe for use in hazardous locations, Class I, Div. 1, Groups C & D; Class II, Div. 1, Groups E, F, & G; Class III, Div. 1.

11.3 Leak Sensor, Models LS-3, LS-3s, and LS-3ss

Housing: 304 stainless steel.

Mounting: ½ in. NPT male thread.

Switch:
- ***Type:*** SPST, N.O. or N.C.
- ***Rating:*** 10 VA.
- ***Float Material:*** Buna-N (LS-3, LS-3s). 316 stainless steel (LS-3ss).

Pressure: 50 psi maximum.

Leads: 20 AWG.

Test Mechanism: Stainless steel cable (LS-3s).

Application: Vertical position liquid detection.

Approvals: UL Listed 48RO.

11.4 Tank Leak Sensor, Model LS-7, and LS-7s

Housing: PVC.

Liquid Specific Gravity: 70 minimum.

Switch:
- ***Type:*** SPST, N.C.
- ***Rating:*** 10 VA.
- ***Float Material:*** PVC.
- ***Pressure:*** 50 psi maximum.
- ***Leads:*** 20 AWG.

Test Mechanism: Stainless steel cable (LS-7s).

Application: Horizontal position liquid detection.

Approvals: UL Listed 48RO.

11.5 Hydrostatic Leak Sensor, Model LS-30

Housing: 304 stainless steel.

Mounting: ½ in. NPT male thread.

Switch:

Type: DPDT, N.C. top, N.O. bottom.
Rating: 10 VA.
Float Material: Polysulfone.
Pressure: 50 psi maximum.
Leads: 20 AWG.

Application: Vertical position high/low level. detection, 4 in. separation.

Approvals: UL Listed 48RO.

11.6 Tank Leak Sensor Models JT-2P & 2V

Sensor Housing: Aluminum body with ¼in. stainless steel inlet, explosion proof, hermetically sealed, NEMA types 7 and 9.

Manifold: Brass, 1 in. NPT male thread (JT-2P, JT-2V).

Classification: Class I, Groups A, B, C, and D; Class II, Groups E, F, and G.

Switch:

Type: SPDT, N.O. (shelf condition).
Rating: 10 VA.

Electrical Connection: ½ in. NPT with PVC insulated 18 AWG color coded leads.

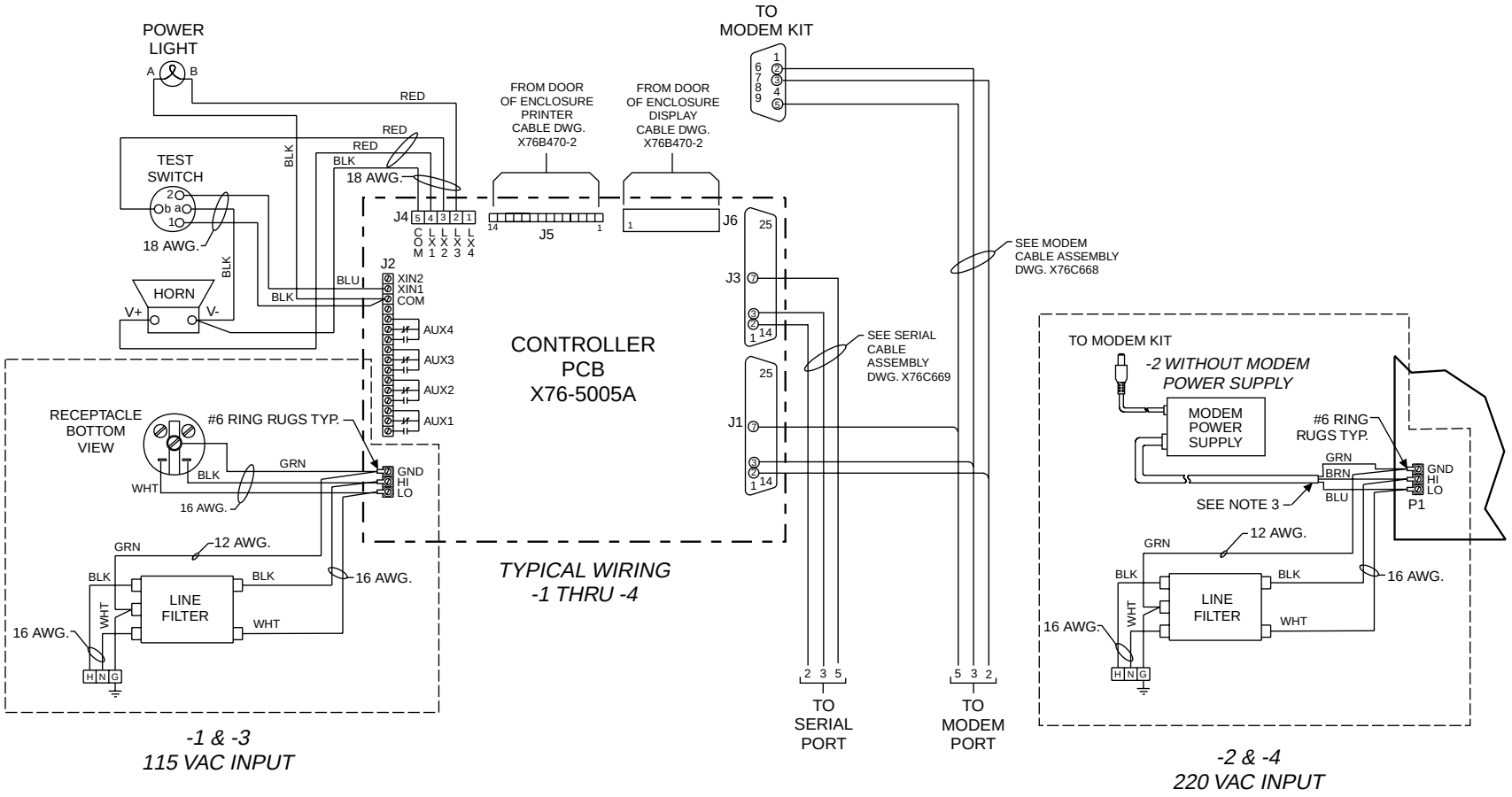
Pressure:

Connection: ¼ in. NPT.
Adjustment: Allen wrench through port.
Proof Pressure: 299 psi.

Gauge: 0-30 psi (JT-2P), 0-20 in. Hg (JT-2V).

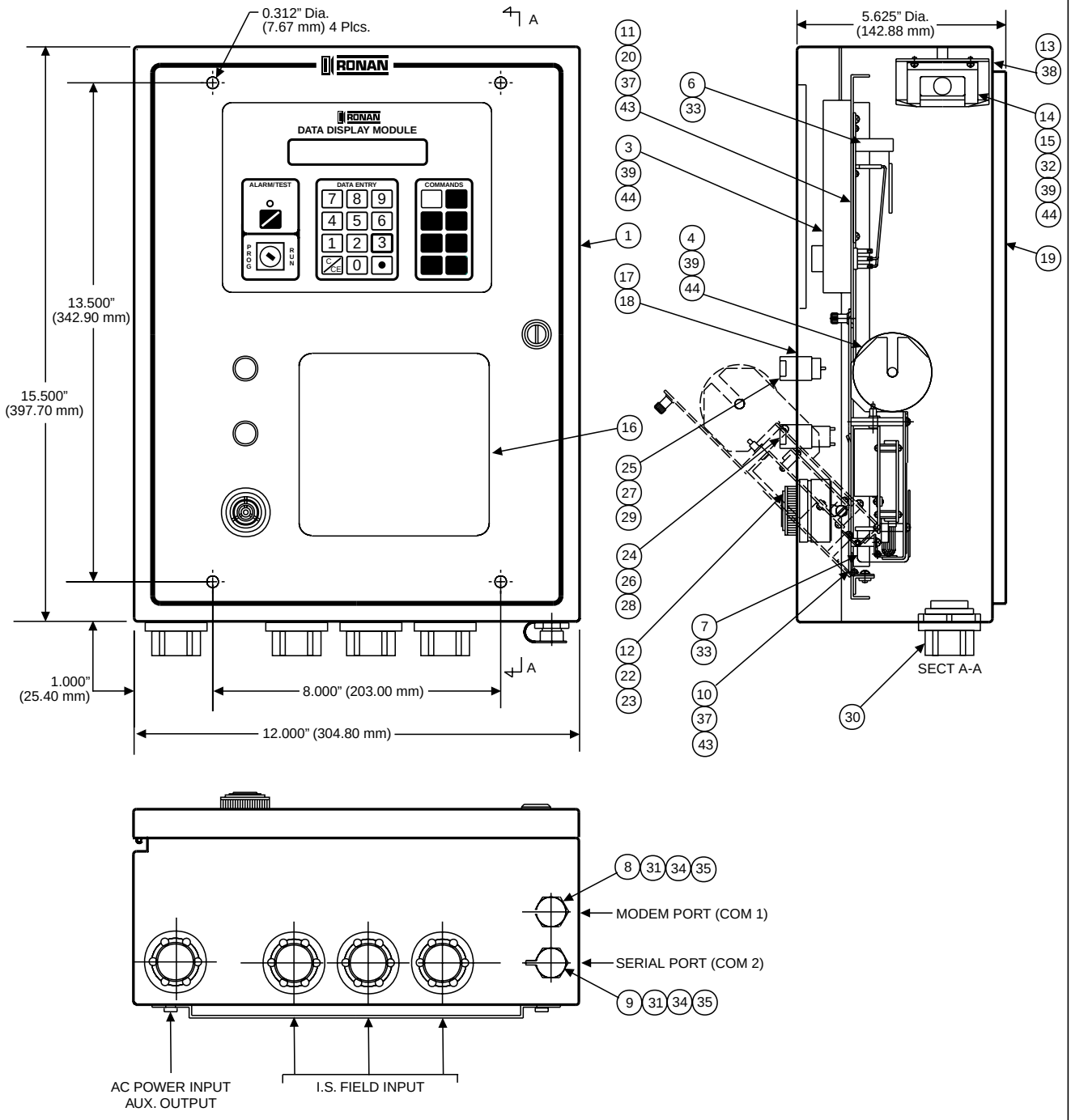
Temp. Range: -40 to 180°F (-40 to 82°C).

Approvals: UL Listed 48RO.



NOTES:
1. All wiring to be UL1430, 300 V, 105°C.
2. J4 (2 thru 5) & J2 (XIN2, XIN1 & COM) wires are 30 inches long.
3. Cut 64 inches from the end.
4. Reference Ronan Engineering Drawing Number X76D655.

X76CTM INTERNAL WIRING DIAGRAM

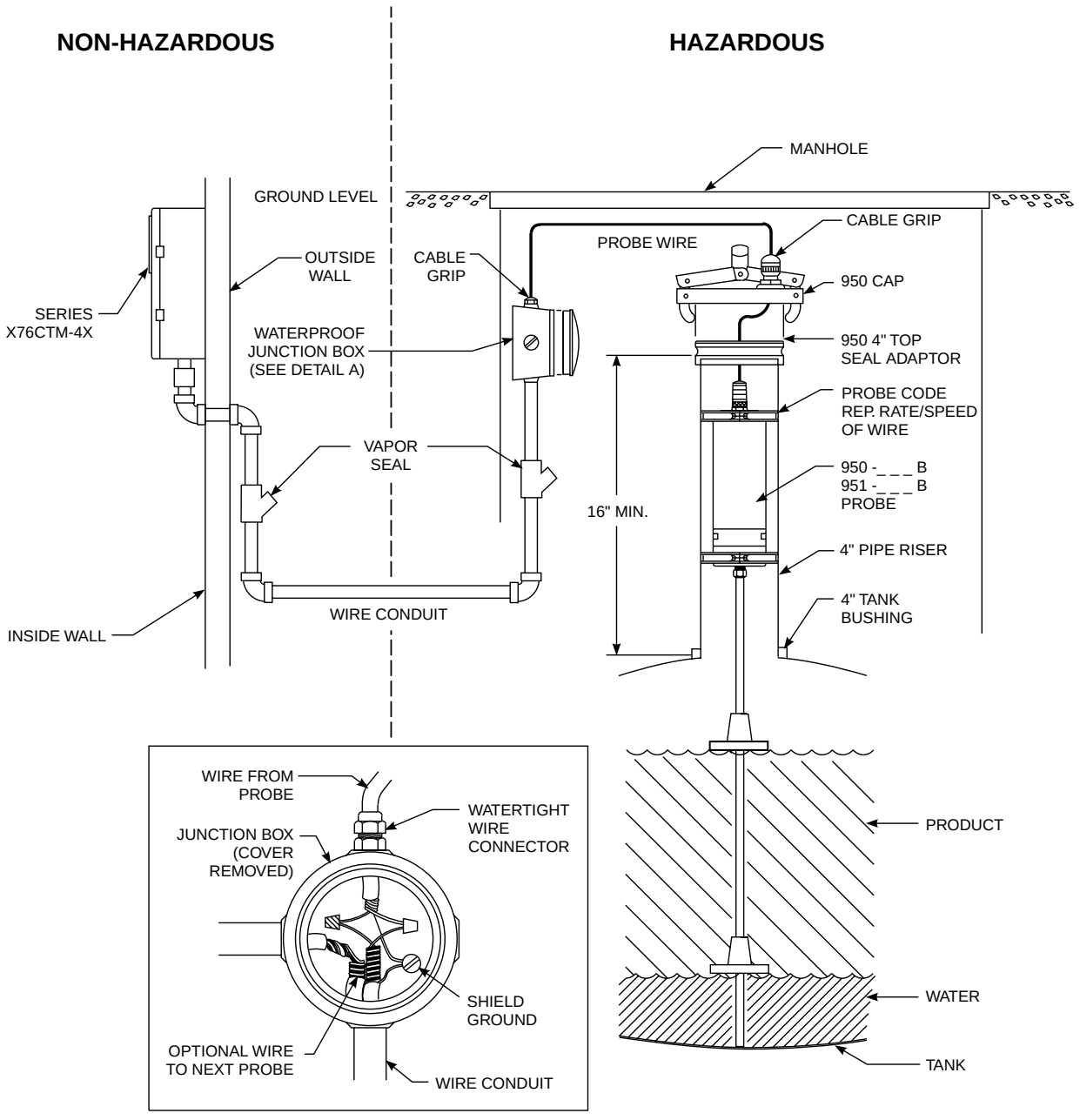

0.312" Dia.
(7.67 mm) 4 Plcs.
A
RONAN
DATA DISPLAY MODULE
ALARM/TEST
DATA ENTRY
COMMANDS
PROG
RCN
CLR
13.500"
(342.90 mm)
15.500"
(397.70 mm)
1.000"
(25.40 mm)
8.000" (203.00 mm)
12.000" (304.80 mm)
5.625" Dia.
(142.88 mm)
SECT A-A
MODEM PORT (COM 1)
SERIAL PORT (COM 2)
AC POWER INPUT
AUX. OUTPUT
I.S. FIELD INPUT

Item	Model No.	Description
	X76D640-1	X76CTM-1 Assembly (115 Vac)
	X76D640-2	X76CTM-2 Assembly (220 Vac)
	X76D640-3	X76CTM-3 Assembly (115 Vac with Modem)
	X76D640-4	X76CTM-4 Assembly (220 Vac with Modem)
1	X76D641-1	Enclosure Assembly
2	X76D648-1	Controller PCB Assembly
	X76D648-2	Controller PCB Assembly
3	X76C334	Data Display Module Assembly
4	X76C331	Printer Assembly
5	X76C650-1	Mounting Panel Assembly
	X76C650-2	Mounting Panel Assembly
	X76C670-1	Mounting Panel Assembly
	X76C670-2	Mounting Panel Assembly
6	X76C470-1	Display Cable Assembly
7	X76C470-2	Printer Cable Assembly
8	X76C668	Modem Cable Assembly
9	X76C669	Serial Cable Assembly
10	X76C332	Mounting Plate
11	X76C338	Enclosure Cover
12	X76B469	Washer, Horn
13	X76B653	Modem Mounting Plate
14	X76B663	Clamp, Right
15	X76B664	Clamp, Left
16	X76C654-1	Instruction Label
17	X76C654-2	Instruction Label
18	X76C654-3	Instruction Label
19	X76C647	Mounting Plate
20	X76B705	Flush Latch Modification
21		
22	SC628	Horn
23	BNR-1	Ring, Horn
24	51-435.036	Push Button, Lighted
25	51-030.005	Indicator, Power
26	51-931.2	Lens, Red
27	51-931.5	Lens, Green

Item	Model No.	Description
28	31-968.2.2	LED, Red
29	31-968.2.5	LED, Green
30	ST-2	Hub
31	94F720	Weathertight Connector Cap
32	PKT-14.4/EXT	Modem (External)
33	FCC-A-CB	Flat Cable Mounts
34	ABMM-A-C	Tie-Wrap Mount
35	FCC-D8	Tie-Wrap
36		
37	0632 x 0086 PHPHMS	6 - 32 x 1/4 PH RD HD MS
38	0632 x 0086 PHFHMS	6 - 32 x 1/4 PH Flat HD MS
39	0440 X 0086 PHPHMS	4 - 40 x 1/4 PH RD HD MS
40		
41		8 - 32 Hex Nut
42		#8 Intertooth Lockwasher
43		#6 Intertooth Lockwasher
44		#4 Intertooth Lockwasher

NOTES:
1. For wiring diagram reference Ronan Engineering Drawing Number X76D655.
2. For sub assembly drawings reference Ronan Engineering Drawing Numbers X76D48 and X76C650.

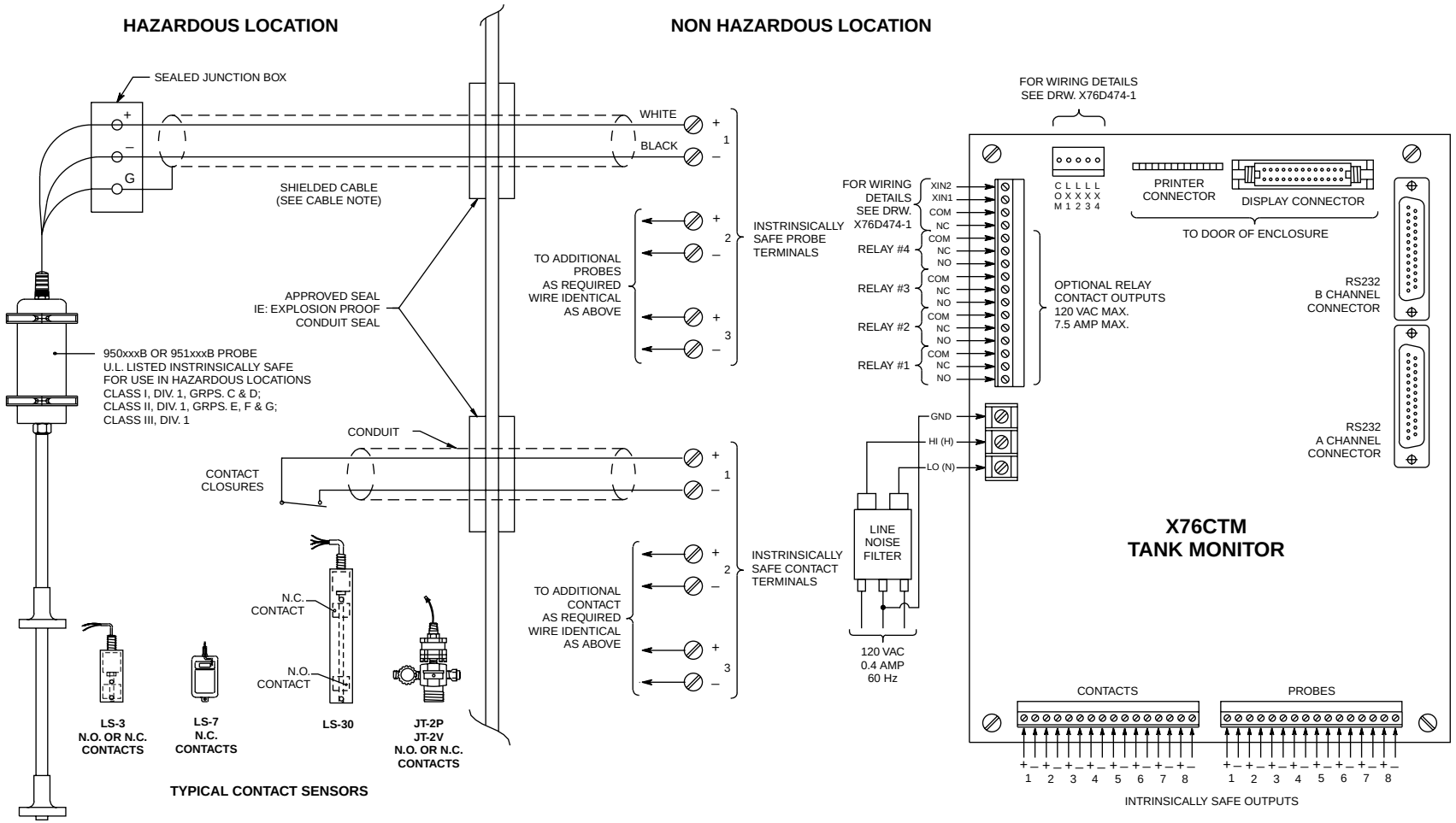
X76CTM
ASSEMBLY DRAWING



"WATERPROOF JUNCTION" DETAIL A

NOTE: Reference Ronan Engineering Drawing Number X76D510.

X76CTM TYPICAL INSTALLATION DRAWING



GROUNDING NOTES

1. The resistance between the ground screw and the system earth ground must be < 1 Ohm.
2. The transducer ground wire shall be connected to drain wire or shield wire of cabling. Do not terminate drain wire at panel.

CABLE NOTES

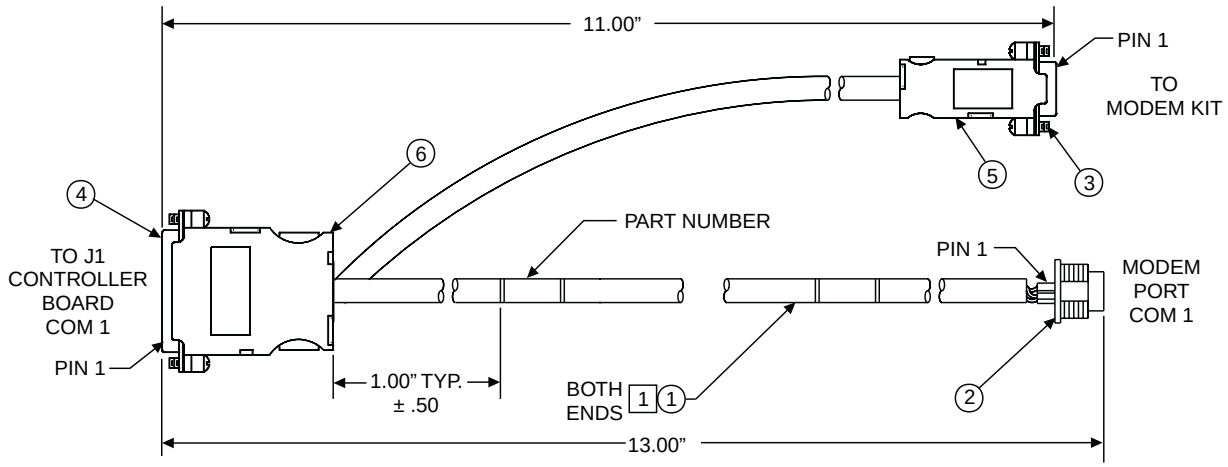
1. Cable sets that run together must be installed per ISA Standard #RP126.
2. For transducer cable lengths up to 1000 ft., shielded cable (#8441 Belden or equivalent) or heavier gauge can be used, cable capacitance shall be < 60 pF per foot. Cable inductance shall be < 0.2 H per foot.
3. For contact cable lengths up to 1000 ft., unshielded twisted pair cables are recommended. Cable capacitance shall be < 60 pF per foot. Cable inductance shall be < 0.2 H per foot.
4. For transducer and/or contact cable lengths exceeding 1000 ft. and up to 2500 ft., twin axial Belden cable #9182 (U.L. 2606) must be used.

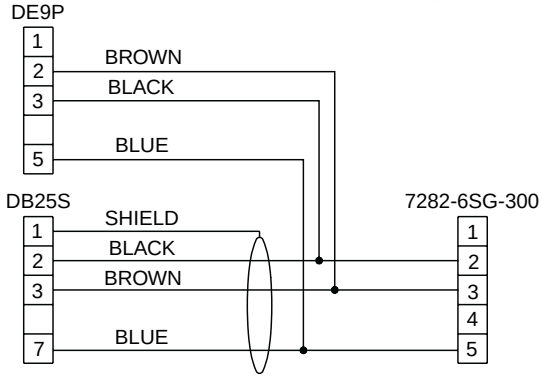
INTRINSICALLY SAFE TERMINAL NOTES

1. Probe terminals may only be connected to U.L. listed 950xxxB model probes (xxx = probe length).
2. Contact terminals may only be connected to passive contacts.
3. Wiring shield cover must be installed securely in place prior to applying operating power.

NOTE: Reference Ronan Engineering Drawing Number X76D515.

X76CTM SYSTEM
WIRING INFORMATION



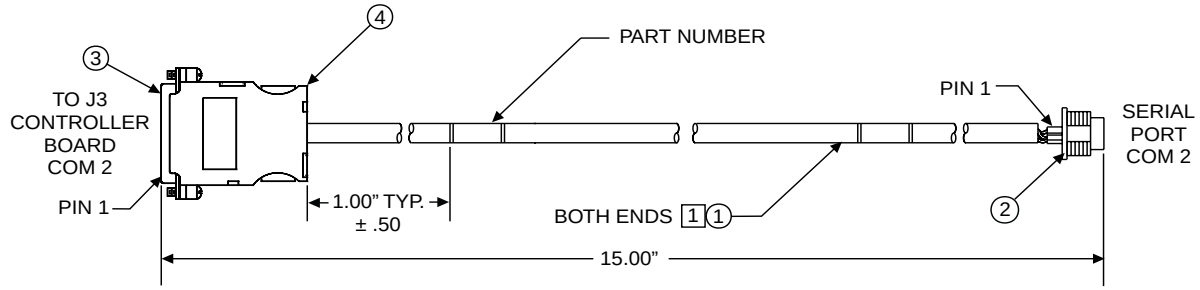


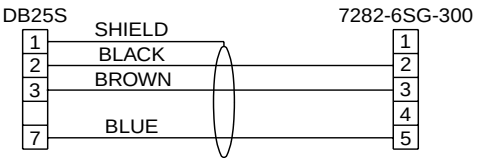
CABLE WIRING

Modem Cable Assembly

Item	Model No.	Description
1	9536	Cable
2	7282-6SG-300	Connector
3	DE9P	Connector, 9 Pin, D-Type (Female)
4	DB25S	Connector, 25 Pin, D-Type (Female)
5	DDM090003BSK1	Back Shell with Hardware
6	DDM250003SK1	Back Shell with Hardware

NOTES: Unless otherwise specified.
[1] Jacket strip Length is 1.000 inch.
Reference Ronan Engineering Drawing Number X76C668.





CABLE WIRING

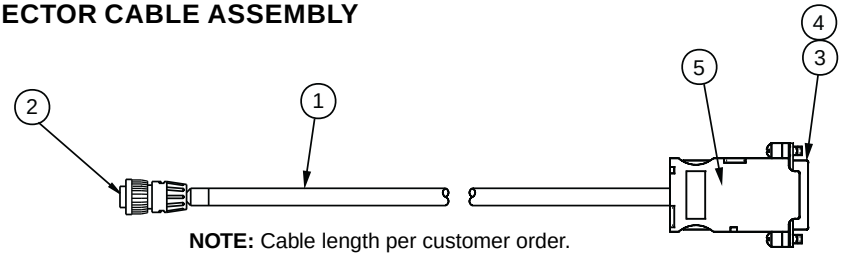
Serial Cable Assembly

Item	Model No.	Description
1	9536	Cable
2	7282-6SG-300	Connector
3	DB25S	Connector, 25 Pin, D-Type (Female)
4	DDM250003SK1	Back Shell with Hardware

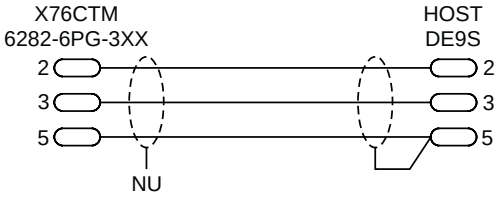
NOTES: Unless otherwise specified.
[1] Jacket strip Length is 1.000 inch.
Reference Ronan Engineering Drawing Number X76C669.

X76CTM MODEM & SERIAL
CABLE ASSEMBLIES

9 PIN CONNECTOR CABLE ASSEMBLY



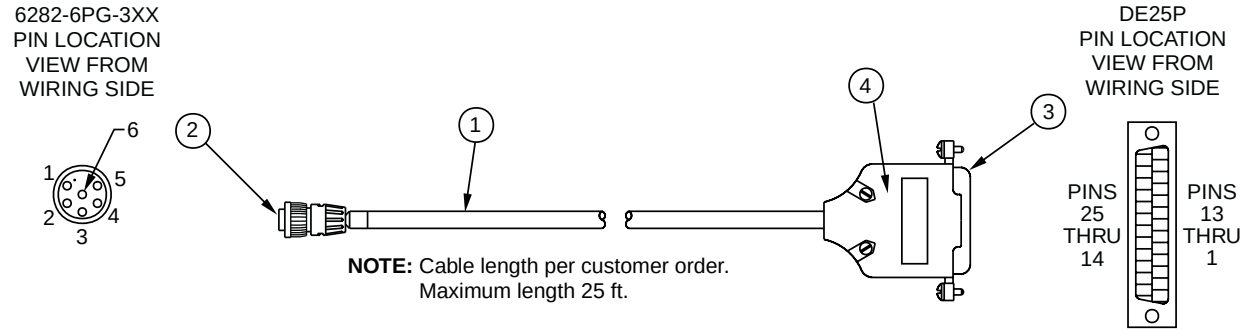
NOTE: Cable length per customer order.
Maximum length 25 ft.



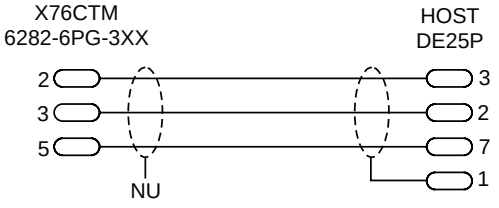
9 Pin Cable Assembly

Item	Model No.	Description
1	9536	Cable
2	6282-6PG-3XX	Connector
3	DE9S	Connector, 9 Pin (Female)
4	DDM090003BSKI	Back Shell
5	DB110963-1	Cover

25 PIN CONNECTOR CABLE ASSEMBLY



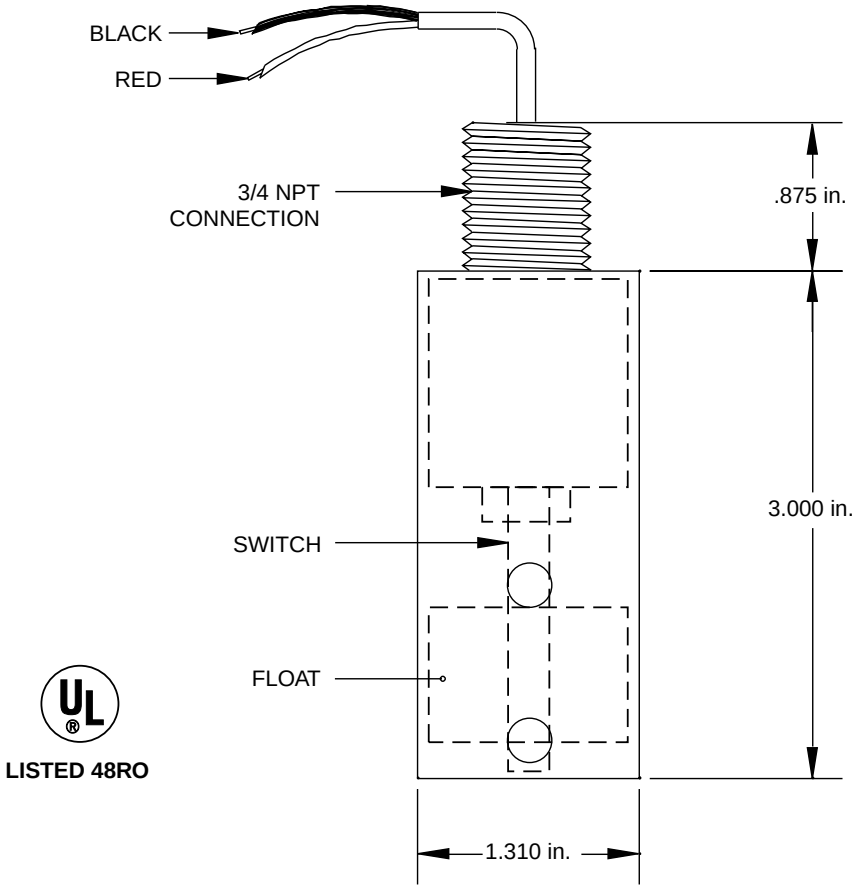
NOTE: Cable length per customer order.
Maximum length 25 ft.



25 Pin Cable Assembly

Item	Model No.	Description
1	9536	Cable
2	6282-6PG-3XX	Connector
3	745496-2	Connector, 25 Pin IDE (Male)
4	745173-3I	Shell with Hardware

X76CTM 9 PIN AND 25 PIN
CABLE ASSEMBLIES
TO HOST RS232 CABLE



LISTED 48RO

INSTALLATION INSTRUCTIONS
FOR STEEL DOUBLE WALL TANKS

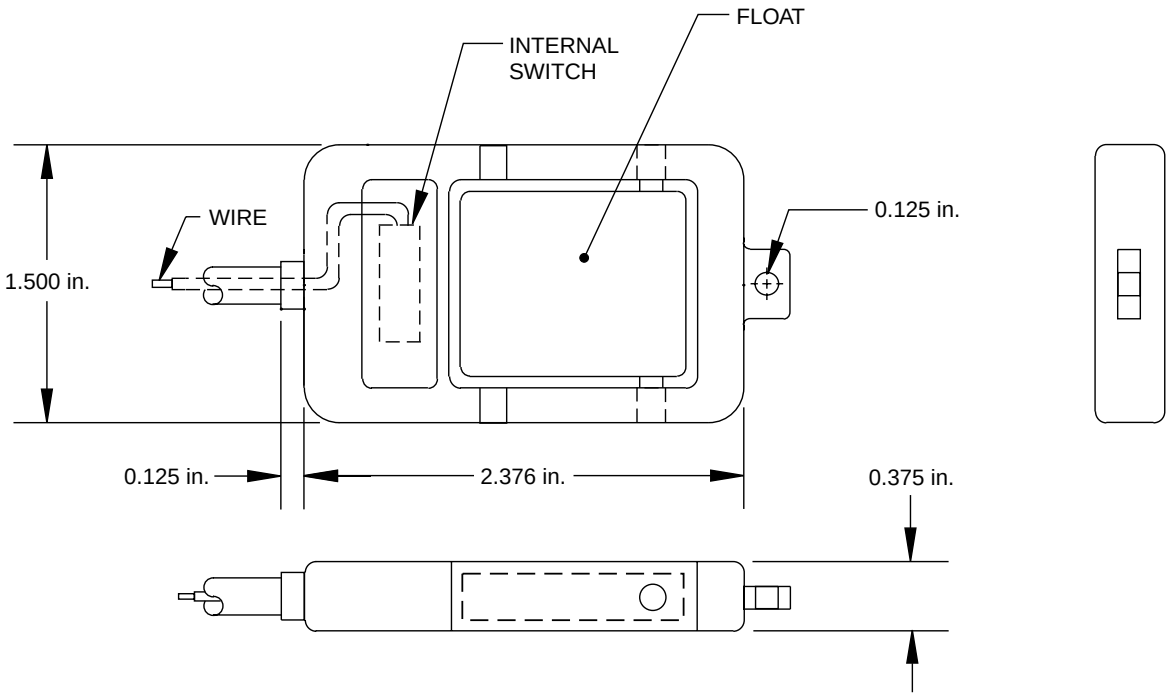
Lower sensor on cable until it rests on bottom of tank annulus in a vertical position. Pull the remaining cable into the junction box and cut off the excess length. Secure cable to prevent slipping into the tank annulus. Connect leads to wire from the tank monitor input terminal strip.

OTHER APPLICATIONS

High level alarm for overfill prevention in the tank sump leak sensor. Piping sump leak sensor. Secondary containment liquid level monitor. Pump start/pump stop level sensor.

NOTE: Reference Ronan Engineering Drawing Number X76B545

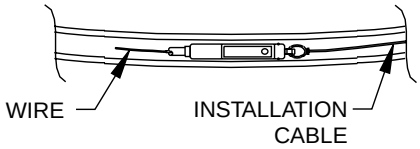
TANK LEAK SENSORS
MODEL LS-3, LS-3S, AND LS-3SS



LISTED 48RO

INSTALLATION INSTRUCTIONS FOR FIBERGLASS TANKS

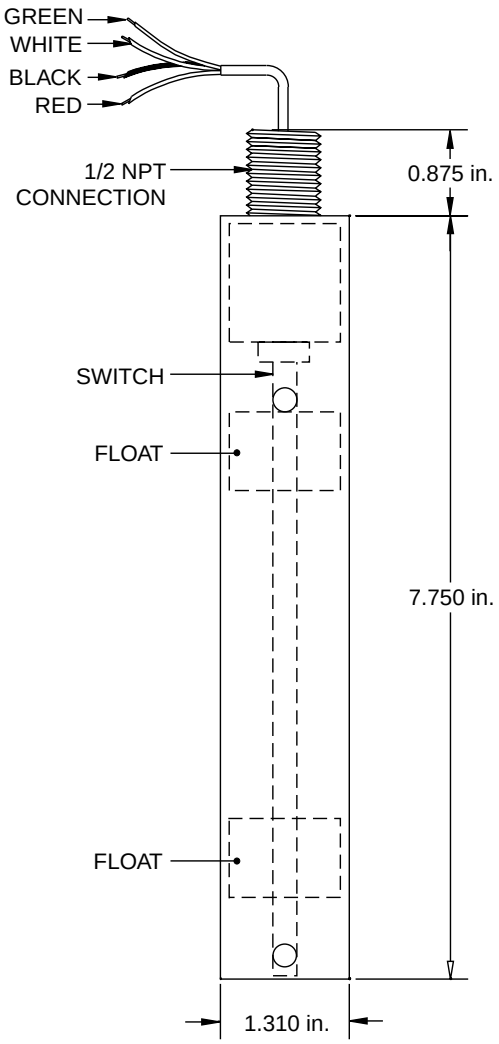
1. Insert fish tape through annulus space.
2. Attach pull-string to LS-7 (LS-7s).
3. Tag signal cable and pull string each 18 feet from LS-7 (LS-7s). Typical for 8 foot diameter tank.
4. Attach fish tape to pull string.
5. Pull LS-7 (LS-7s) through tank annulus.
6. Match tag mark on signal cable and pull string.
7. LS-7 (LS-7s) is now positioned at the tank bottom, centerline.



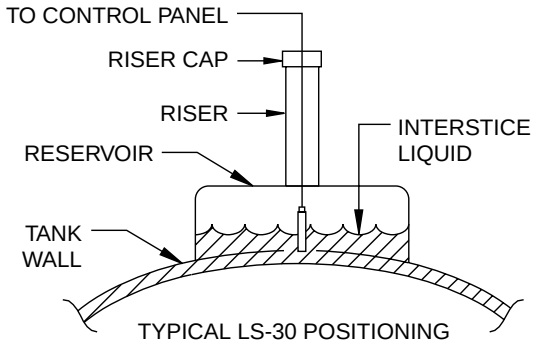
TYPICAL INSTALLATION IN DOUBLE WALL TANK

NOTE: Reference Ronan Engineering Drawing Number X76B546

TANK LEAK SENSOR
MODEL LS-7 AND LS-7S



LISTED 48RO



TYPICAL LS-30 POSITIONING

INSTALLATION INSTRUCTIONS LS-30
FOR DOUBLE WALL FIBERGLASS TANKS WITH INTEGRAL RESERVOIR

Lower sensor on cable until half* of sensor is submerged in liquid. Pull remaining cable into junction box and cut off excess cable length. Secure cable to prevent slipping into tank annulus. Connect leads to wire from tank monitor terminal strip.

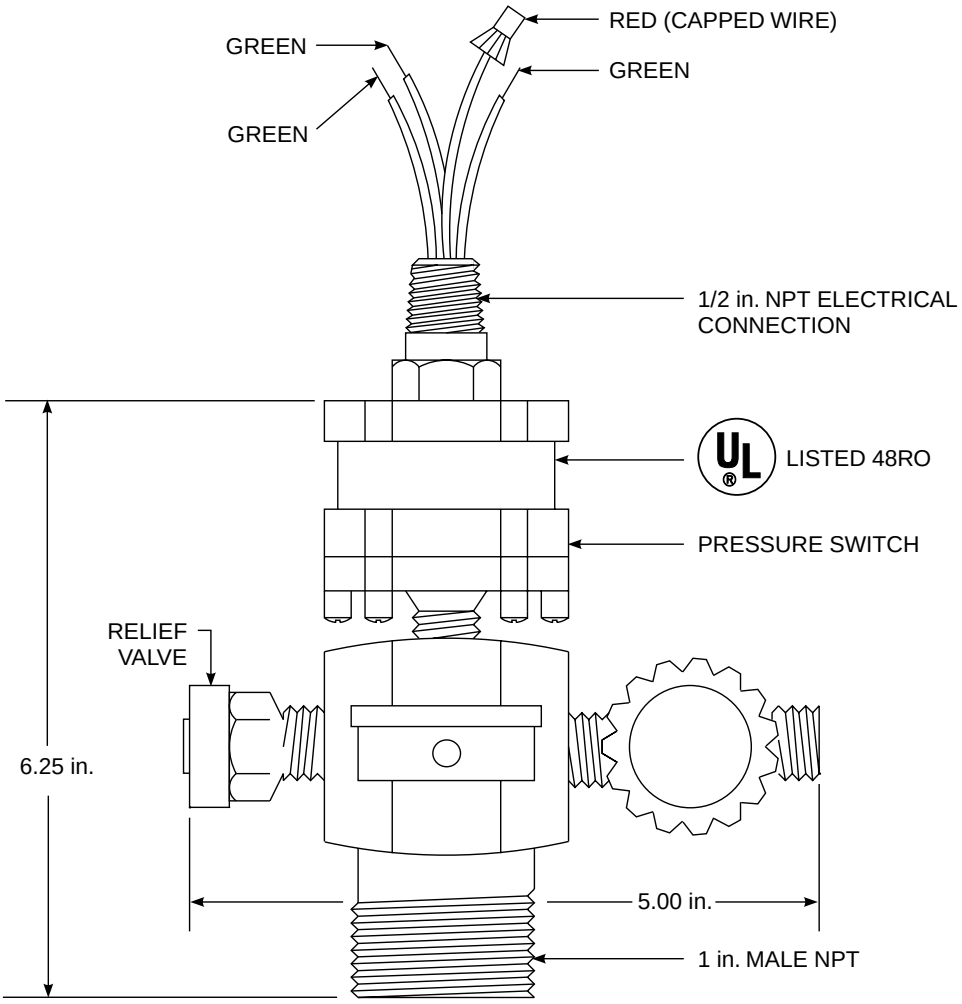
OTHER APPLICATIONS

High/High, Low/Low, or High/Low level sensor.

NOTE: Bottom float, Red and Black wires. Top float, White and Green wires. For single alarm return White and Black wires to panel, jump Green and Red. For dual alarm return all four wires to panel. Reference Ronan Drawing Number X76B542.

* The sensor position is dependent upon the product level. If the tank is 3/4 full the sensor should be submerged 3/4 of its range. If the tank is 1/4 full the sensor should be submerged 1/4 of its range. The interstice liquid should always be below the reservoir riser.

TANK LEAK SENSOR
MODEL LS-30



INSTALLATION INSTRUCTIONS

Install the JT-2P Positive Pressure Leak Sensor or JT-2V Positive Vacuum Leak Sensor on the tank interstice riser. All other tank ports must be sealed with #150 class pipe fittings. Teflon paste type sealer is suggested for all threaded joints.

Provide electrical conduit, two each #18 AWG wires to sensor input terminals of the Models X76S, X76VS, X76LVC, X76LVCS, X76ETM, or X76CTM tank monitors. Contact the brown and blue sensor wires (N.O. position). Intrinsically safe wiring must be in a dedicated conduit only. No 115 Vac or other wiring is allowed in the same conduit. Pressurize the tank interstice with compressed air or nitrogen, (DO NOT USE OXYGEN), or evacuate the tank interstice through the JT-2P or V fill and relief valve manifold (provided with the sensor) to 2.9 psig or 10 inches Hg. When the pressure or vacuum has been applied, the system alarm will return to normal.

NOTE: When filling the tank annulus with compressed air or nitrogen, the sensor fill and relief manifold MUST be used. Never exceed 3 psig or the tank warranty may be void.

WARNING: The red wire, (N.C. position) MUST be capped off to prevent a short circuit to ground.

NOTE: Reference Ronan Engineering Drawing Number X76B556

TANK LEAK SENSORS
MODELS JT-2P & JT-2V

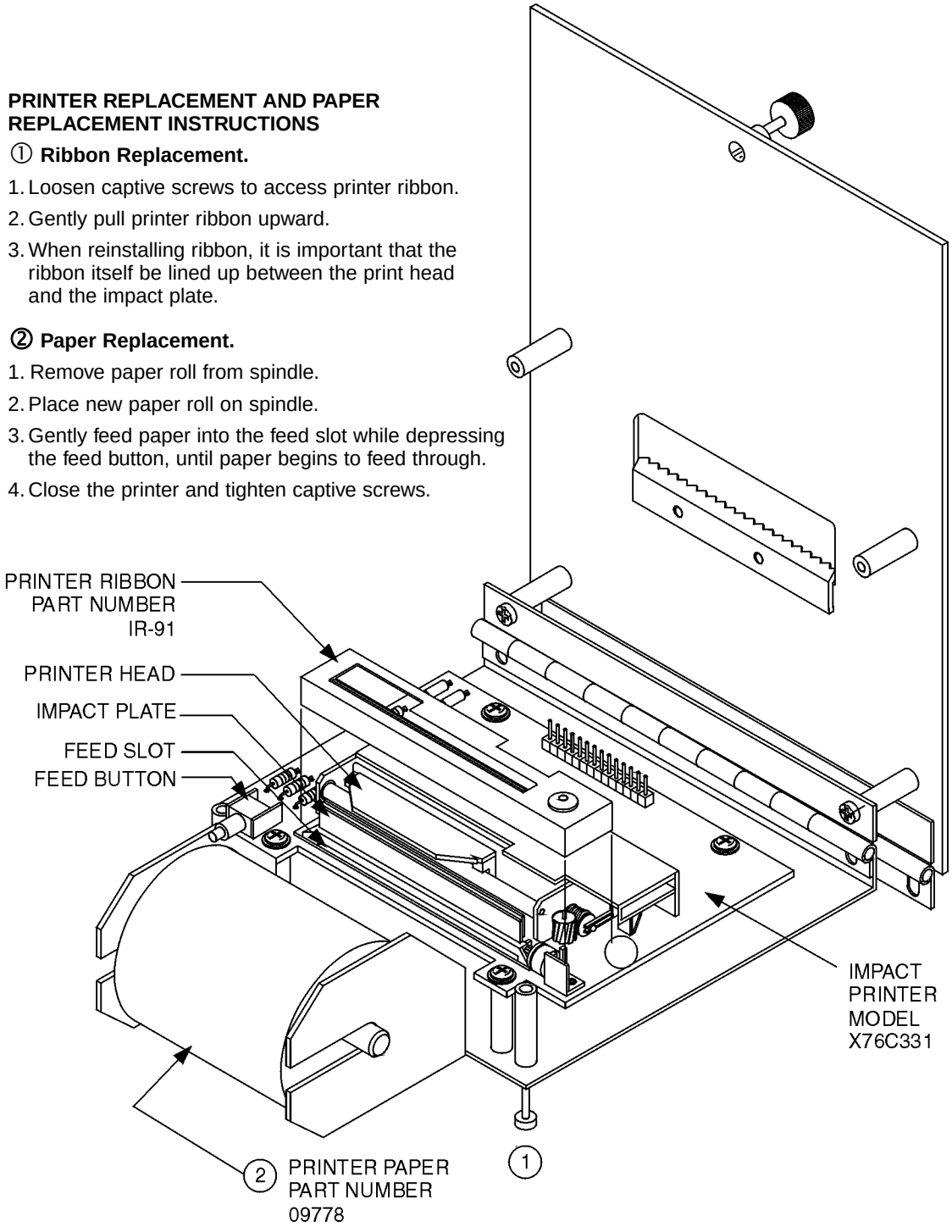
PRINTER REPLACEMENT AND PAPER REPLACEMENT INSTRUCTIONS

① Ribbon Replacement.

1. Loosen captive screws to access printer ribbon.
2. Gently pull printer ribbon upward.
3. When reinstalling ribbon, it is important that the ribbon itself be lined up between the print head and the impact plate.

② Paper Replacement.

1. Remove paper roll from spindle.
2. Place new paper roll on spindle.
3. Gently feed paper into the feed slot while depressing the feed button, until paper begins to feed through.
4. Close the printer and tighten captive screws.



NOTE: Reference Ronan Engineering Drawing Number X76C712

X76CTM PRINTER RIBBON
AND PAPER REPLACEMENT

CHECKOUT FORM, PART 1

Serial Number _____

Installation Location	Installed By	Distributor
Date _____	Date _____	Date _____
Facility Name _____	Facility Name _____	Facility Name _____
Street _____	Street _____	Street _____
City _____ State _____ Zip _____	City _____ State _____ Zip _____	City _____ State _____ Zip _____
Phone Number _____	Phone Number _____	Phone Number _____
Owner/Manager _____	Installation Supervisor _____	

Tank/System Setup Information

State	1	2	3	4	5	6	7	8
Product Label								
Probe Serial Number								
Speed of Wire								
Tank Manufacture and Model								
Tank Wall - Steel or Fiberglass								
If Steel, Diameter in Inches								
Tank Capacity - Gallons Full								
If Fiberglass, 1/4 Height Gallons								
Tank Tilt								
Distance of Probe Riser to Center of Tank								
Distance Between Fill Riser and Probe Riser								
Product Height at Fill Riser								
Product Height at Probe Riser								
Manifolded Tanks								
Initial Water Level								
Initial Product Level								
High Level Alarm Limit (Gallons)								
Hi Hi Level Alarm Limit (Gallons)								
Low Level Alarm Limit (Gallons)								
High Water Alarm (Inches)								
Theft Gallon Limit								
Leak Detect Threshold (Tanks)								
Leak Detect Start Time (Tanks)								
Leak Detect Stop Time (Tanks)								
Leak Detect Theshold (Lines)								
Leak Detect Start Time (Lines)								
Leak Detect Stop Time (Lines)								
Relay #1								
Relay #2								
Relay #3								
Relay #4								
Contact Inputs								

To validate warranty, return one copy of Part 1 and one copy of WARRANTY REGISTRATION (Part 2) to: **RONAN ENGINEERING COMPANY,** 21200 Oxnard Street, Woodland Hills, CA 91367

WARRANTY REGISTRATION FORM, PART 2

WARNING! Failure to return the Warranty Registration Form will void any and all WARRANTY CLAIMS.

Installing (Company) _____

Company Address _____

Company Phone _____

Facility Name _____

Site Address or I.D. _____

Site Phone _____

Controller Serial No. _____ Date of Service _____

PLEASE FILL OUT PROBE INFORMATION:

Number of Tank Level Probes _____

PROBE SERIAL OR MODEL NUMBERS:

Probe #1 _____ Channel #1 _____

Probe #2 _____ Channel #2 _____

Probe #3 _____ Channel #3 _____

Probe #4 _____ Channel #4 _____

Probe #5 _____ Channel #5 _____

Probe #6 _____ Channel #6 _____

Probe #7 _____ Channel #7 _____

Probe #8 _____ Channel #8 _____

INSTALLER:
I hereby certify that the system has been installed and set up in accordance with the procedures that are specified in Ronan's X76CTM Instruction and Operations Manual. I have also read all the warnings and certify that there are no Instrinsic Safety violations due to improper installation of this system. I have provided the facility owner with an Operations Manual and demonstrated the operation of this equipment to facility personnel on-site.

Company _____ Date _____

Signature _____

Comments _____

_____

_____

_____

WARRANTY: Ronan Engineering warrants equipment of its own manufacturing to be free from defects in material and workmanship under normal conditions of use and service, and will repair any component found to be defective, on its return, transportation charges prepaid, within one year of its original purchase. This warranty carries no liability, either expressed or implied, beyond our obligation to replace the unit which carries the warranty.

TO VALIDATE WARRANTY YOU MUST RETURN ORIGINAL COPY TO RONAN ENGINEERING COMPANY:
21200 Oxnard Street, Woodland Hills, CA 91367. Phone (800) 327-6626 (818) 883-5211 FAX (818) 992-6435

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