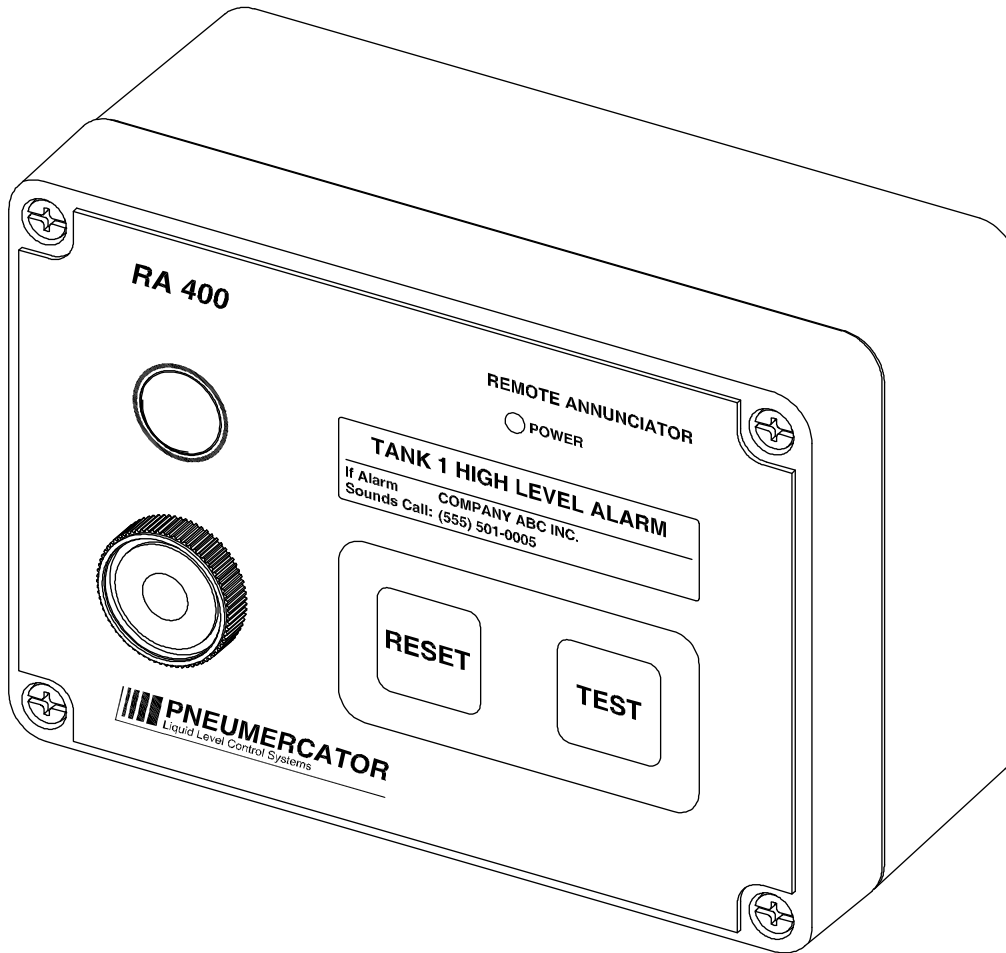# INSTRUCTION MANUAL

RA400 REMOTE ELECTRONIC ALARM ANNUNCIATOR

DWG NO. 20059 REV. N/C

This document describes the installation, programming and operation of the RA400 Remote Electronic Alarm Annunciator, which is designed for use with the LC2000 or most TMS Series models.
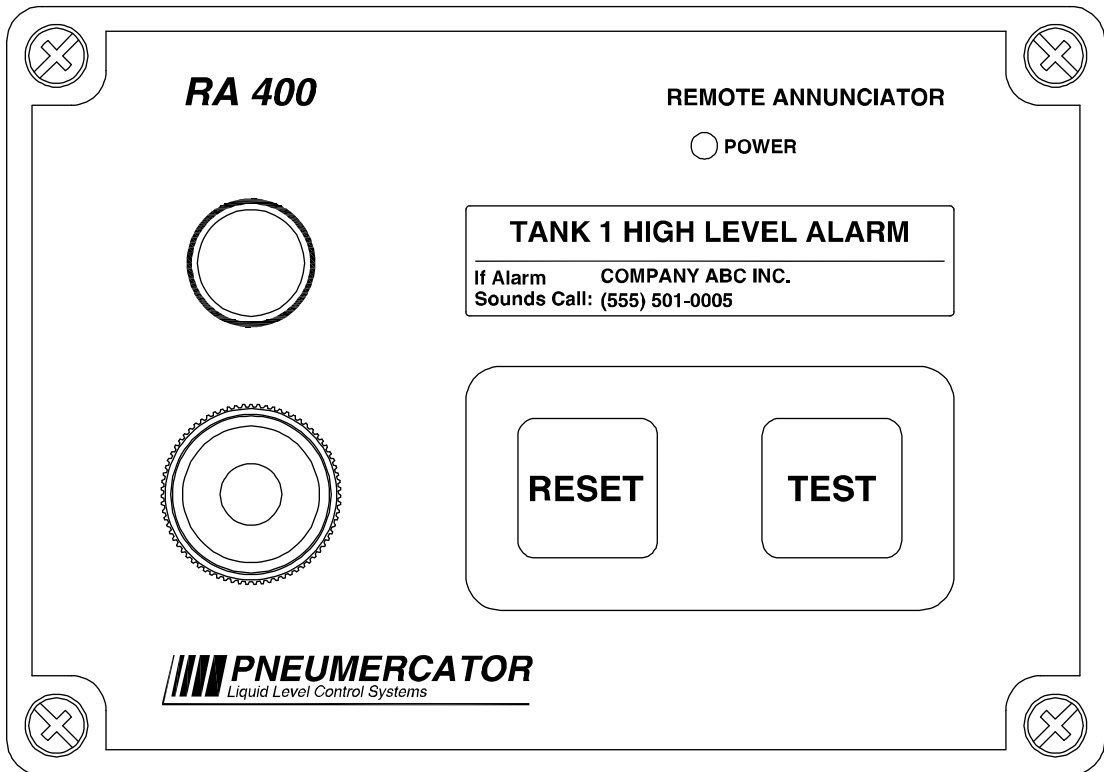
TABLE OF CONTENTS

1.0 Product Overview

The RA400 Remote Annunciator panel is used in applications where it is desired to receive TMS/LC2000 series alarms from various on-site locations at distances up to 4000 feet (1200M) away from the main console. Since the RA400 is a microprocessor-based, addressable device communicating over the RS-485 Peripheral Expansion Bus, up to 16 RA400 panels may be connected to a single TMS/LC2000. The RA400 is housed in a NEMA 4X enclosure for harsh industrial/ outdoor environments. The visual indicator employs an ultra-bright, LED strobe for maximum reliability in extreme temperatures. The membrane overlay pushbuttons are 1.75" on centers for easy operation with gloved hands.

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Figure 1.0-1 Front Panel View

Figure 1.0-2 Interior View

1.1 TMS/LC2000 Compatibility

The RA400 can be used with most TMS/LC2000 models provided appropriate firmware is loaded. RA400 support is provided with the following TMS/LC2000 console firmware versions:

> LC2000: V6x.00.08 or later
> TMS2000: V2x.00.13 or later; V2x.01.xx
> TMS3000: V3x.00.13 or later; V3x.01.xx
> TMS2000W, TMS4000, TMS4000W: All firmware versions supported
>
> where "xx" denotes "don't care" values

Please contact Technical Support for an upgrade if you have firmware outside of the above range, or if you have questions about identifying the firmware version in your console.

> **IMPORTANT! Confirm that the installed TMS/LC2000 console firmware version supports RA400 communications.**

1.2 TEST Pushbutton

The TEST pushbutton is used to confirm operation of the front panel audible and visual alarms. For tank fill operations, TEST should always be used to confirm RA400 operation prior to filling the tank.

1.3 RESET Pushbutton

The RESET pushbutton is used to acknowledge alarm conditions. Note that acknowledging an alarm condition silences the audible annunciator for all existing alarms, but does not turn off the visual alarm, which remains active until the alarm condition is removed. The audible alarm will be re-activated for new alarms.

1.4 Visual Alarm Strobe

The visual alarm strobe is activated upon occurrence of any of the user-programmable tank, sensor, contact closure or system alarm conditions listed in the Alarm Programming Table in Section 3.1.3. The visual alarm strobe flashes two to three times every six seconds as a result of loss of communications between the RA400 and TMS/LC2000 console. Note that the visual alarm strobe remains active until the alarm condition is removed.

1.5 Audible Annunciator

A front panel horn is provided to annunciate both user-selectable alarms as well as communications failures. The horn can be silenced manually by pressing the RESET pushbutton, automatically by eliminating the alarm condition, or by programming an audible alarm shutoff. See Section 3.1.2 for audible alarm shutoff delay programming. Under alarm conditions, the beep rate of the annunciator varies with the alarm type as follows;

Alarm Group	Alarm Type	Beep Rate
Tank (TMS Only)	Leak	Fast (50ms)
	SP1	Medium Fast (100ms)
	SP2	Medium Slow (200ms)
	SP3	Slow (400ms)
	Water	Slow (400ms)
Sensor	All	Fast (50ms)
Contact Closure	All	Slow (400ms)
System	All	Slow (400ms)
Communications	All	One Fast Beep every 6 Seconds
		ms = milliseconds

1.6 Power Indicator LED

A front panel LED indicator is provided to confirm that the RA400 is being supplied with AC power, and that the RA400 DC power supply is operational.

> **DANGER! DO NOT assume that failure of the Power Indicator LED to operate is an indication that the AC connection is not LIVE. The LED will also not operate if the RA400 fuse has blown, or if the DC supply or LED has failed. TURN OFF POWER AT THE CIRCUIT BREAKER BEFORE SERVICING!**

1.7 User-Selectable Advisory Pocket Insert

The RA400 front panel includes a 0.8"H x 3.5"L clear pocket window that accepts a pocket insert displaying alarm description and emergency contact information. Blank inserts and pre-printed labels are provided for most alarm descriptions. These labels are applied to the blank pocket insert, which is then installed from the inside of the front cover. Optionally, the users may print their own labels, or write directly on the pocket insert. If writing directly on the pocket insert, an indelible marker or other permanent ink method should be used.
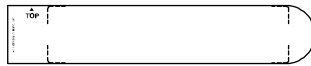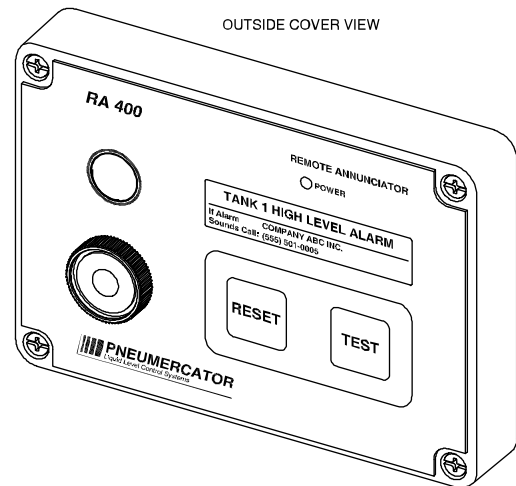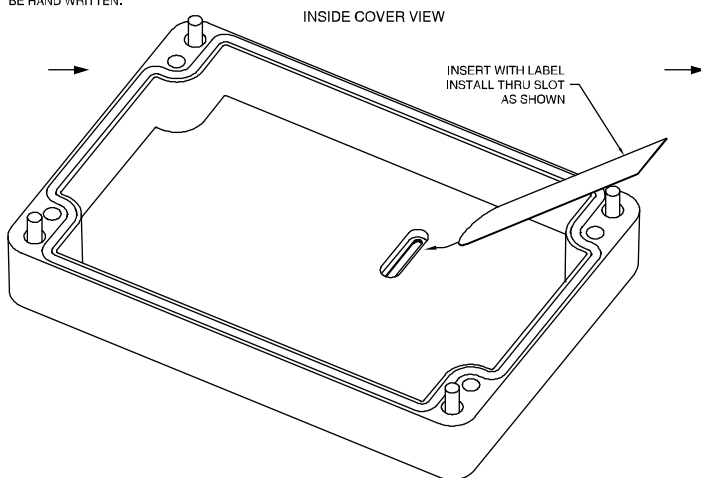
2.0 Installation

The RA400 is designed for both indoor and outdoor installation. If the unit is to be installed outdoors, the installer must pay attention to local code requirements for outdoor conduit runs containing AC line voltage.

> **WARNING! This device is designed for Ordinary Location, Non-Hazardous installation only, as defined by Underwriters Laboratories (UL) and the National Electrical Code (NEC). DO NOT install where flammable vapors may be present.**

2.1 Mounting

The RA400 is designed for wall mounting using the four mounting holes as shown in Figure 2.1-1. Mounting hole placement is made easy using supplied 1:1 scale mounting template in Figure 2.1-2. Note that these mounting holes are outside of the gasketed interior of the enclosure and therefore do not affect weatherproof performance.
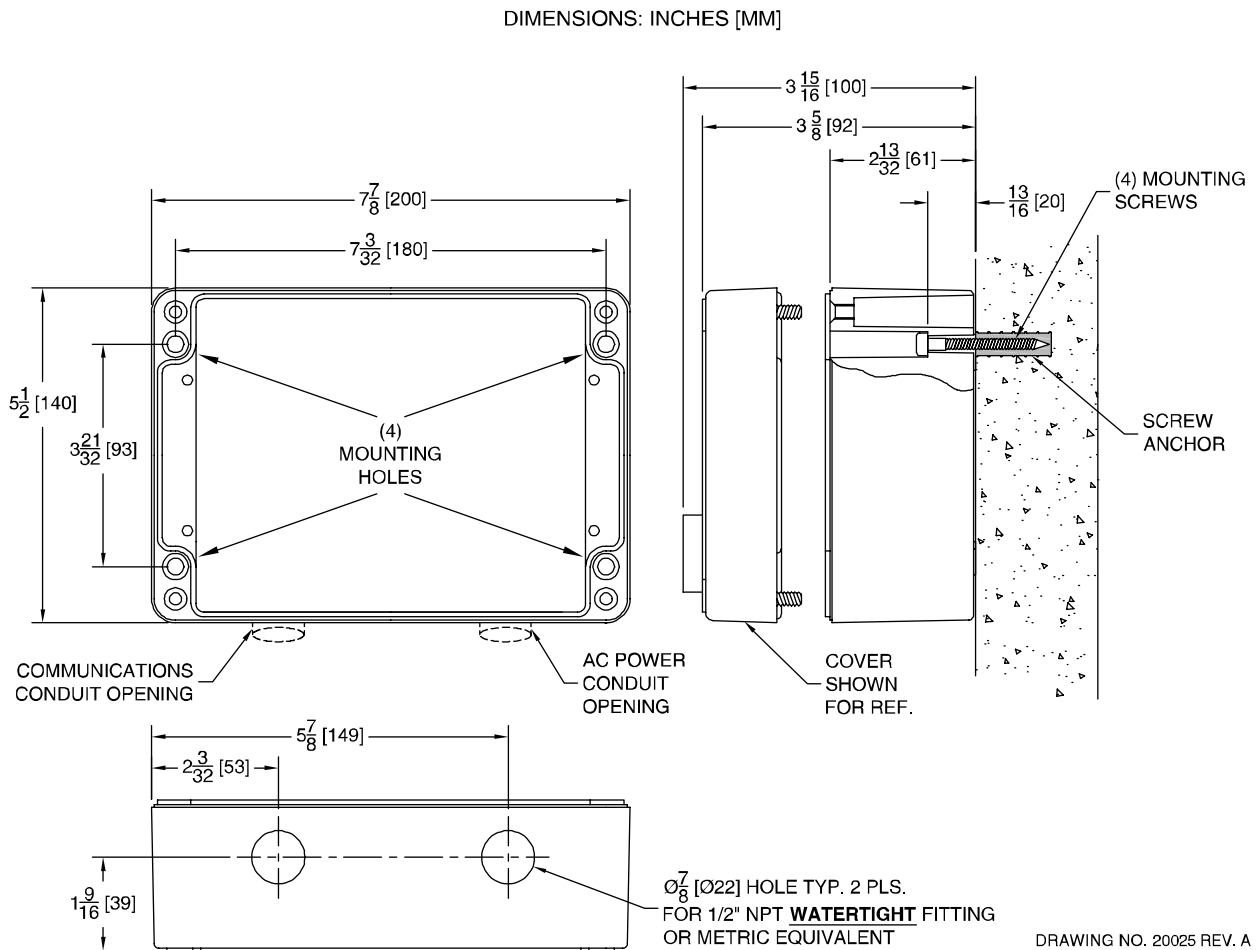
Figure 2.1-1

(This page intentionally left blank)
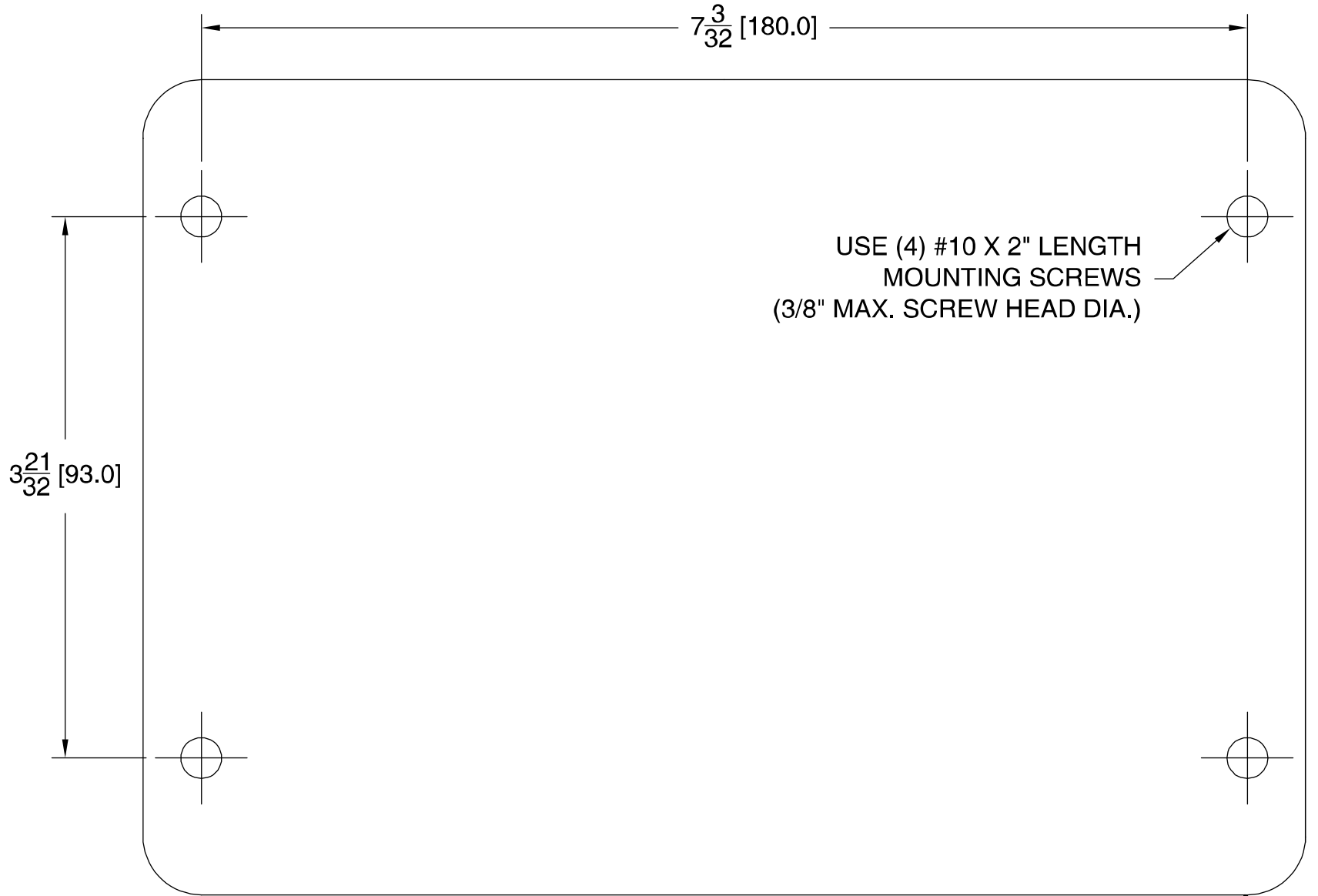
Figure 2.1-2 Mounting Template

August 12, 2020

DIMENSIONS: INCHES (MM)

$7\frac{3}{32}$ [180.0]

$3\frac{21}{32}$ [93.0]

USE (4) #10 X 2" LENGTH
MOUNTING SCREWS
(3/8" MAX. SCREW HEAD DIA.)

DRAWING NO. 20024 REV. N/C

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2.2 Wiring

2.2.1 AC Power

DANGER! AC power must be turned off at the circuit breaker before attempting to connect AC wiring to this device.

WARNING! Do not connect or disconnect front panel display cable while AC power is applied. Damage to display or main board may occur!

Wire AC power in accordance with Figure 2.2.1-1 below. Be sure to set 115/230VAC selector switch to the proper voltage. Note that the AC terminal block can be wired in-place or unplugged.
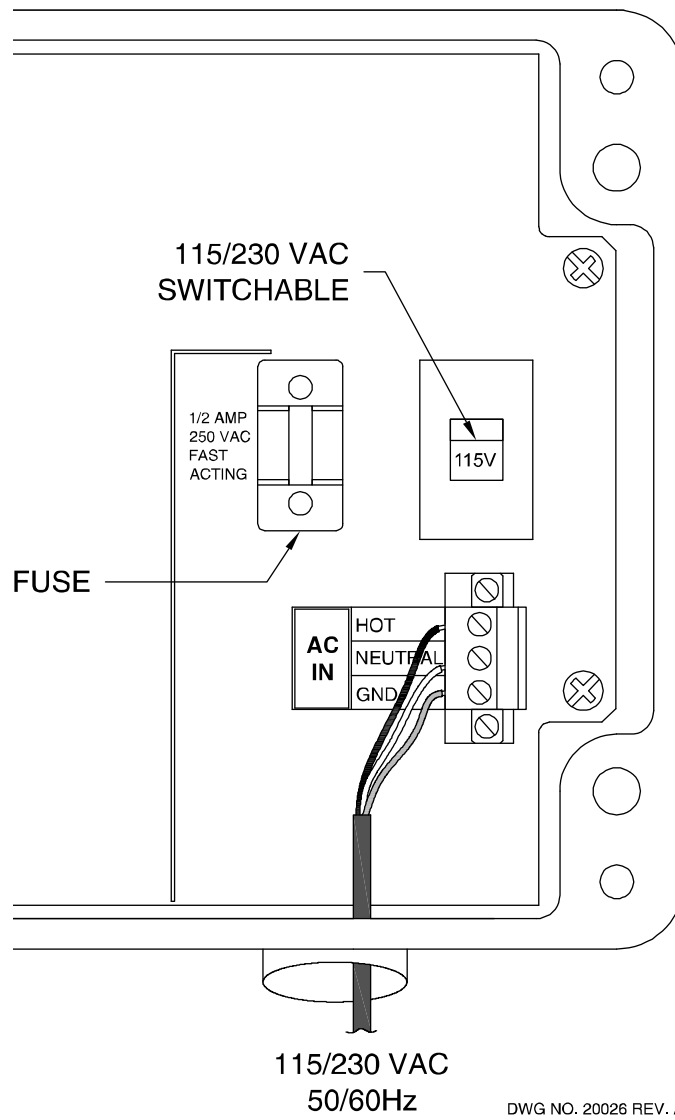
Figure 2.2.1-1

2.2.2 Communications

The RA400 supports an RS-485 multi-drop cabling topology as illustrated in Figure 2.2.2-1 below. Maximum cable distance from the TMS/LC2000 console to the furthest RA400 is 4000 feet (1200M).
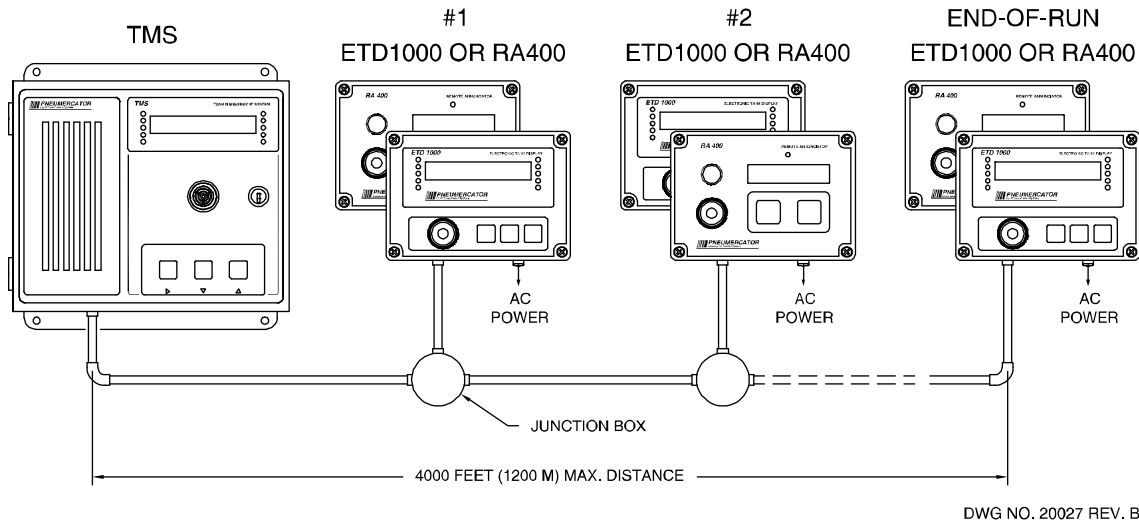
Figure 2.2.2-1 TMS Communications Topology
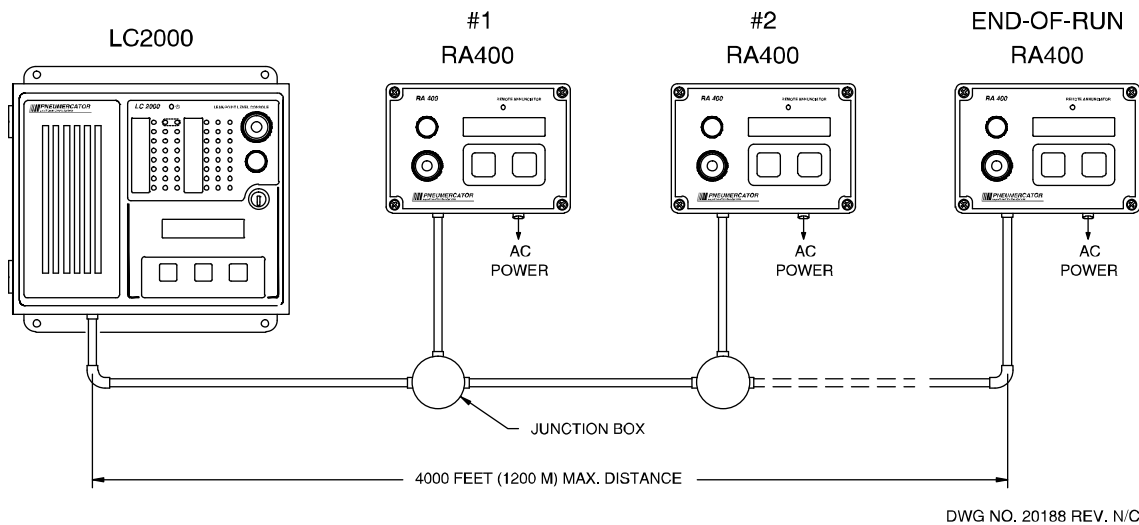
Figure 2.2.2-2 LC2000 Communications Topology

2.2.2.1 Cable Requirements

Cable type should be 24AWG, single twisted pair, shielded, designated for RS-485 communications having a nominal impedance of 120 ohms.

Recommended Cables:
   -4 °F to 176 °F (-20 °C to 80 °C) Operation* - Belden 9841 or equivalent
 -94 °F to 392 °F (-70 °C to 200 °C) Operation* - Belden 89841 or equivalent

*See Section 4.0 Product Specifications for Operating Temperature range limits of the RA400.

> IMPORTANT! Use only recommended RS-485 communications cable or manufacturer's DOCUMENTED equivalent.

2.2.2.2 RA400 Terminal Connections

Plug-in terminal blocks TB2 and TB3 are provided for connection to the RS-485 Expansion Bus. Both input and output terminals are provided to support multi-drop wiring to additional RA400s or other RS-485 expansion bus peripherals.

TB2 **RS-485 COMMS.** TB3

	IN		OUT	
⊘		CH. A (+)	O	⊘
⊘	I N	CH. B (-)	U	⊘
⊘		SHIELD	T	⊘

DRAWING NO. 20033 REV. N/C

2.2.2.3 RA400 Communications Wiring Detail

See Figure 2.2.2.3-1 below.

END-OF-RUN
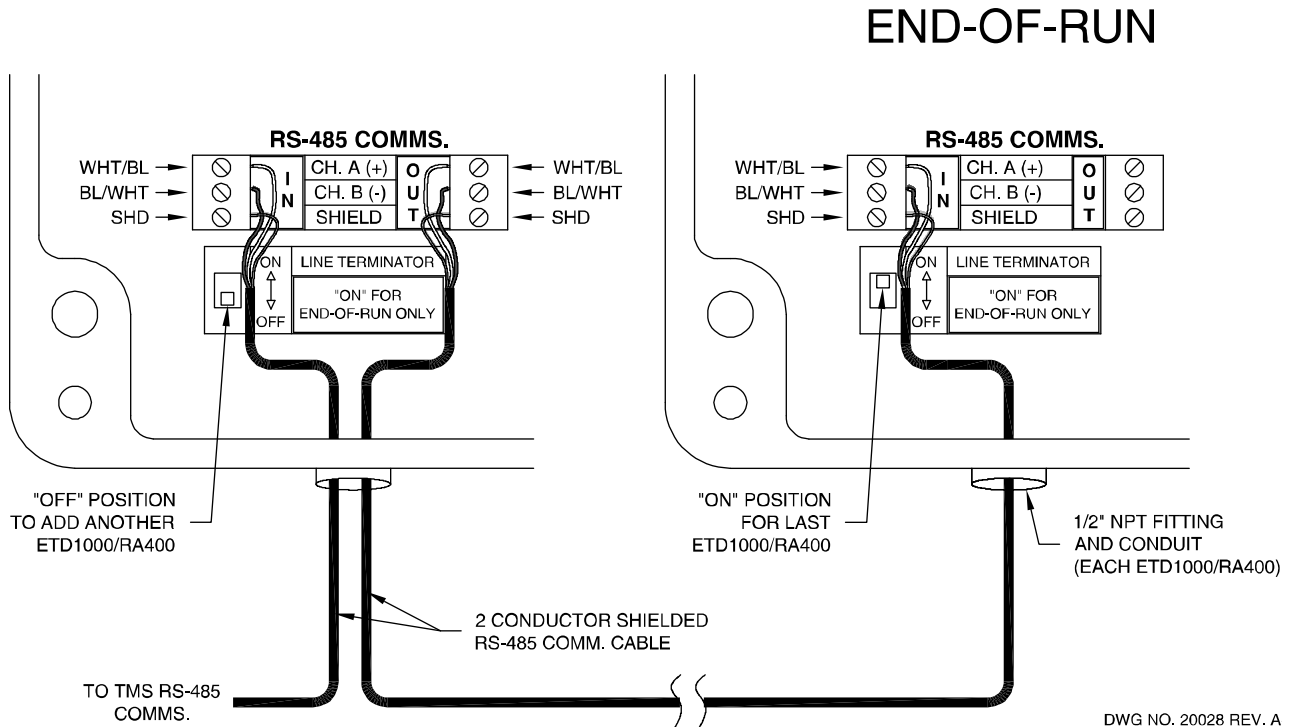
Figure 2.2.2.3-1 RA400 Communications Wiring

2.2.2.4 RS-485 Communications Wiring Detail

Current version TMS/LC2000 consoles have the same type of plug-in terminal connector and wiring designations as the RA400, as illustrated in Figure 2.2.2.4-1 below. Previous versions have a 6-position modular jack. If the board type is a previous version, you will need to replace it with a current revision board. Please contact the factory for more details.

LC2000/TMS2000 − − OR − − TMS3000/TMS4000

RS-485 COMMS.
3 POSITION
TERMINAL BLOCK

CH. A (WHT/BL)
CH. B (BL/WHT)
SHD (SHIELD)

HOT NEUT GND ISGND ISGND

1/2" NPT
FITTING AND
CONDUIT

RS-485
COMMUNICATIONS I/O

CH. A (WHT/BL)
CH. B (BL/WHT)
SHD (SHIELD)

HOT NEUT GND ISGND ISGND

3/4" NPT
FITTING AND
CONDUIT

RS-485 COMMS.
3 POSITION
TERMINAL BLOCK

RS-485
COMMUNICATIONS I/O
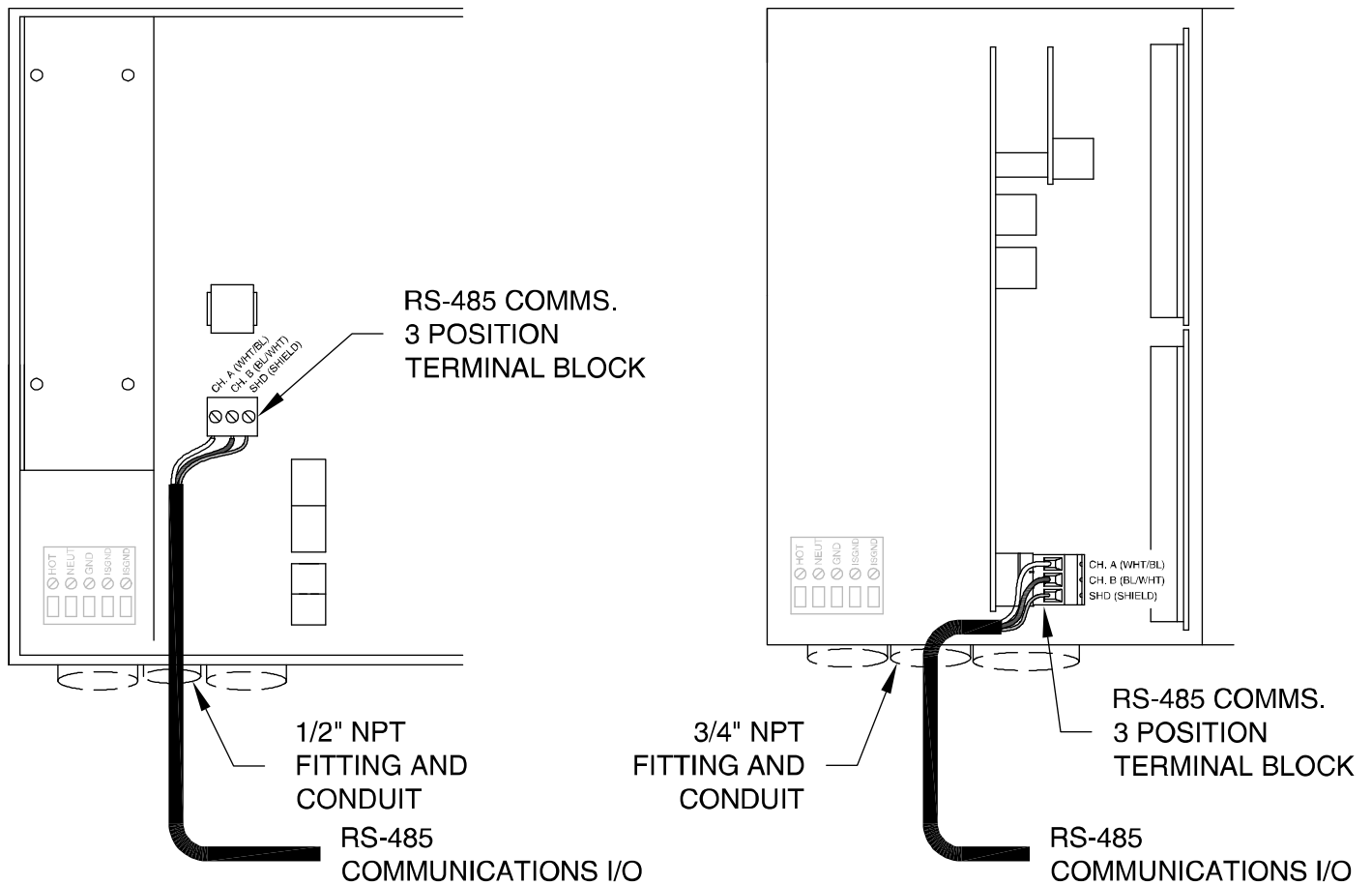
Figure 2.2.2.4-1 RS-485 Communications Connection, Current Version Boards

2.2.2.5 Line Termination Resistor

The RS-485 bus requires that the end-of-run device be terminated with a 120-ohm resistor. This is accomplished by setting the LINE TERMINATION switch to "ON" if the selected RA400 is the last device on the bus. Otherwise this switch should be set to "OFF".
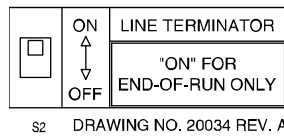
2.2.3 RS-2 Remote TEST/RESET Wiring

A connection is provided to externally TEST and RESET the RA400 using a Pneumercator model RS-2 Remote TEST/RESET Switch Assembly or similar device having NORMALLY OPEN contacts. Note that the front panel TEST and RESET pushbuttons remain active when wired for external operation.
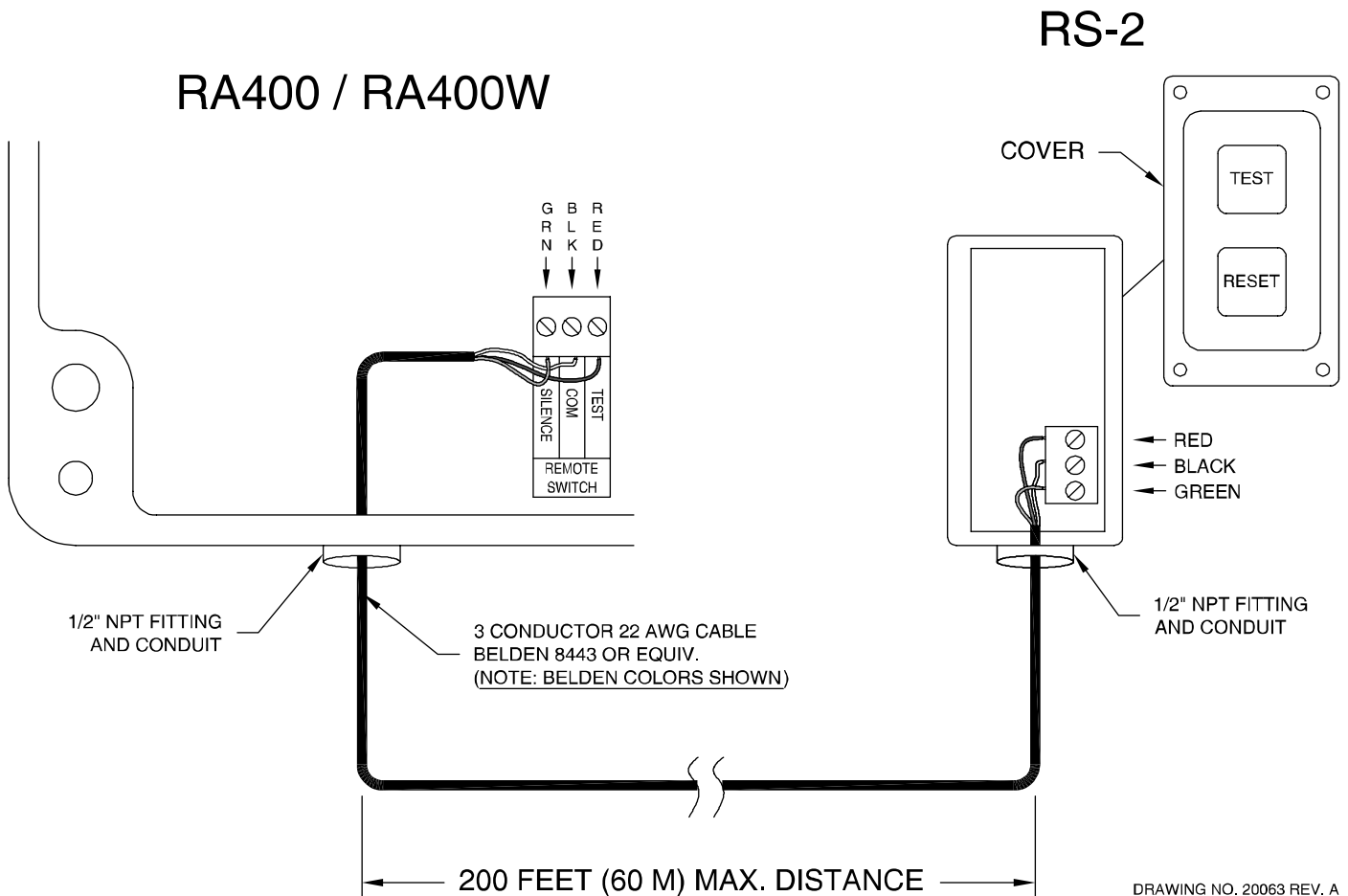
Figure 2.2.3-1 RS-2 Remote TEST/RESET Wiring

3.0 Configuration

The RA400 provides user-programmable features that allow the operator to alter audible/visual alarm operation as well as control interaction with the TMS/LC2000 for remote alarm acknowledgement. These programmable features are selectable using on-board dipswitches. No programming is required at the TMS/LC2000 console.

3.1 On-Board Programming

3.1.1 Setting Logical Address – S3

The TMS/LC2000 has the ability to individually address up to sixteen (16) RA400 remote displays. Rotary dipswitch S3 is used to select unique addresses for each RA400 connected to the same TMS/LC2000. Note that address order is not important, and that RA400 device addresses are independent of other TMS/LC2000 smart peripheral types. For example, an RA400 set to device address "4" will not conflict with an ETD1000 also set to device address "4".

Table 3.1.1-1 S3 Assignments
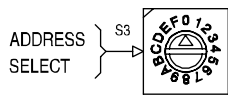
ADDRESS SELECT S3

DRAWING NO. 20064 REV. A

S3 Address Select	RA400 Device Address
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10
A	11
B	12
C	13
D	14
E	15
F	16

3.1.2 Setting Shutoff Delay – S4

The RA400 provides the user with selectable automatic shutoff delays for the audible alarm. Once initiated, the audible alarm will turn off after the selected time delay has elapsed, or immediately if acknowledged at the front panel. This feature is useful in applications where continued operation of an unacknowledged audible alarm poses a nuisance or noise abatement problem.

> **WARNING! Use this feature only if an unacknowledged alarm will not pose a potential safety or environmental hazard.**

Table 3.1.2-1 S4 Assignments
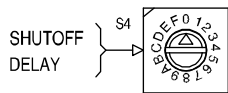
SHUTOFF DELAY — S4

DRAWING NO. 20065 REV. A

S4 Shutoff Select	RA400 Shutoff Delay (Minutes)
0	NONE
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15

3.1.3 Alarm Programming - S5(1-5), S6, S7

The RA400 alarm programming provides the user with considerable flexibility in the selection of which alarms it is to annunciate. Referring to Table 3.1.3-1 below, the Alarm TYPE dipswitches allow the user to select between four types of alarms; TANK, SENSOR, CONTACT CLOSURE and SYSTEM. For each alarm type, the Alarm GROUP dipswitches allow the user to select a tank, sensor or contact closure group, for example, tanks 1 thru 4, 5 thru 8, 9 thru 12, etc., or all tanks. The user can further select individual devices within the selected Alarm GROUP. The TANK and SYSTEM alarm types also provide specific alarm selections as indicated in Table 3.1.3-1 below.

Table 3.1.3-1 Alarm Programming

ALARM PROGRAMMING

SWITCH S5					SWITCH S6								SWITCH S7							
1	2	3	4	5	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8

Tank Selects / Tank Alarm Selects

Type		Group			Tank Selects								Tank Alarm Selects							
C	C	C	C	C	T1	T2	T3	T4	LEAK	SP1	SP2	SP3	*	*	*	W	*	*	*	-
C	C	C	C	O	T5	T6	T7	T8	LEAK	SP1	SP2	SP3	*	*	*	W	*	*	*	-
C	C	C	O	C	T9	T10	T11	T12	LEAK	SP1	SP2	SP3	*	*	*	W	*	*	*	-
C	C	C	O	O	T13	T14	T15	T16	LEAK	SP1	SP2	SP3	*	*	*	W	*	*	*	-
C	C	O	C	C	T17	T18	T19	T20	LEAK	SP1	SP2	SP3	*	*	*	W	*	*	*	-
C	C	O	C	O	T21	T22	T23	T24	LEAK	SP1	SP2	SP3	*	*	*	W	*	*	*	-
C	C	O	O	C	Select All Tanks				LEAK	SP1	SP2	SP3	*	*	*	W	*	*	*	-
C	C	O	O	O	Select All Tanks				LEAK	SP1	SP2	SP3	*	*	*	W	*	*	*	-

Leak/Point Level Sensor Selects

Type		Group			Leak/Point Level Sensor Selects															
C	O	C	C	C	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16
C	O	C	C	O	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32
C	O	C	O	C	S33	S34	S35	S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48
C	O	C	O	O	S49	S50	S51	S52	S53	S54	S55	S56	S57	S58	S59	S60	S61	S62	S63	S64
C	O	O	C	C	S65	S66	S67	S68	S69	S70	S71	S72	S73	S74	S75	S76	S77	S78	S79	S80
C	O	O	C	O	S81	S82	S83	S84	S85	S86	S87	S88	S89	S90	S91	S92	S93	S94	S95	S96
C	O	O	O	C	Select All Leak/Point Level Sensors (S6, S7 settings do not apply)															
C	O	O	O	O	Select All Leak/Point Level Sensors (S6, S7 settings do not apply)															

Contact Closure Input Selects

Type		Group			Contact Closure Input Selects															
O	C	C	C	C	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
O	C	C	C	O	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32
O	C	C	O	C	C33	C34	C35	C36	C37	C38	C39	C40	C41	C42	C43	C44	C45	C46	C47	C48
O	C	C	O	O	C49	C50	C51	C52	C53	C54	C55	C56	C57	C58	C59	C60	C61	C62	C63	C64
O	C	O	C	C	Select All Contact Closure Inputs (S6, S7 settings do not apply)															
O	C	O	C	O	Select All Contact Closure Inputs (S6, S7 settings do not apply)															
O	C	O	O	C	Select All Contact Closure Inputs (S6, S7 settings do not apply)															
O	C	O	O	O	Select All Contact Closure Inputs (S6, S7 settings do not apply)															

System Alarm Selects

Type		Group			System Alarm Selects															
O	O	C	C	C	TD	PF	SF	-	-	-	-	-	-	-	-	-	-	TK	SR	CC

"TD" = Theft Detect, "PF" = Probe Failure, "SF" = Sensor Fault
"TK" = Any Tank Alarm, "SR" = Any Sensor Alarm, "CC" = Any Contact Closure Alarm

Notes

"O" = OPEN	An alarm select is ACTIVE when the corresponding switch is OPEN.
"C" = CLOSE	"*" = Future Use, "-" = Not Applicable or Don't Care

Factory Default Switch Settings by Family

Type		Group			LC2000															
C	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Type		Group			TMS Series															
C	C	O	O	O	O	O	O	O	C	O	O	C	C	C	C	C	C	C	C	C

3.1.4 Miscellaneous Programming - S5(6-8)

	S5	
Function	**Position(s)**	**Mode**
Alarm Type	1,2	See Section 3.1.3
Alarm Group	3,4,5	See Section 3.1.3
Not used	6	MUST be set to "Open"
Front Panel Ack.	7	*Closed = LOCAL Open = LOCAL and TMS/LC2000
Factory only	8	MUST be set to "Closed"
		*Factory Default

Front Panel (FP) Acknowledge Settings: If set to LOCAL, front panel acknowledgement will only silence local RA400 audible alarm. If set to LOCAL and TMS/LC2000, both RA400 and TMS/LC2000 audible alarms will be silenced.

4.0 Product Specifications

Dimensions: 7.9" W x 5.5" H x 3.5" D

Weight: 8 lbs

Operating Temperature: -40 ⁰F to 160 ⁰F (-40 ⁰C to 70 ⁰C)

Humidity: 95% Non-condensing

Enclosure Construction: Cast Aluminum, Epoxy Powder Coat Paint Finish, Gasketed Cover w/Captive SS Screws

Enclosure Rating: NEMA 4X, Watertight and Corrosion-proof

Power Requirements: 115 / 230 VAC Switchable, 50-60Hz, 5W Max.

Audible Alarm: 100db

Visual Alarm: Ultra-bright LED Strobe

Communications: TMS/LC2000 Peripheral Expansion Bus

Communications Format: RS-485, Half-Duplex

Connection Type: Plug-In Terminal Block with Wire Entries

    Input: Ch. A (+), Ch. B (-), Shield
    Output: Ch. A (+), Ch. B (-), Shield

Recommended RS-485 Cable: Belden 9841 (PVC Jacket), 89841 (FEP Teflon Jacket) or similar

Maximum Cable Length: 4000 Feet/1200 Meters total to end of run

Slave Address Select: 1 thru 16, Rotary Dip Switch Selectable