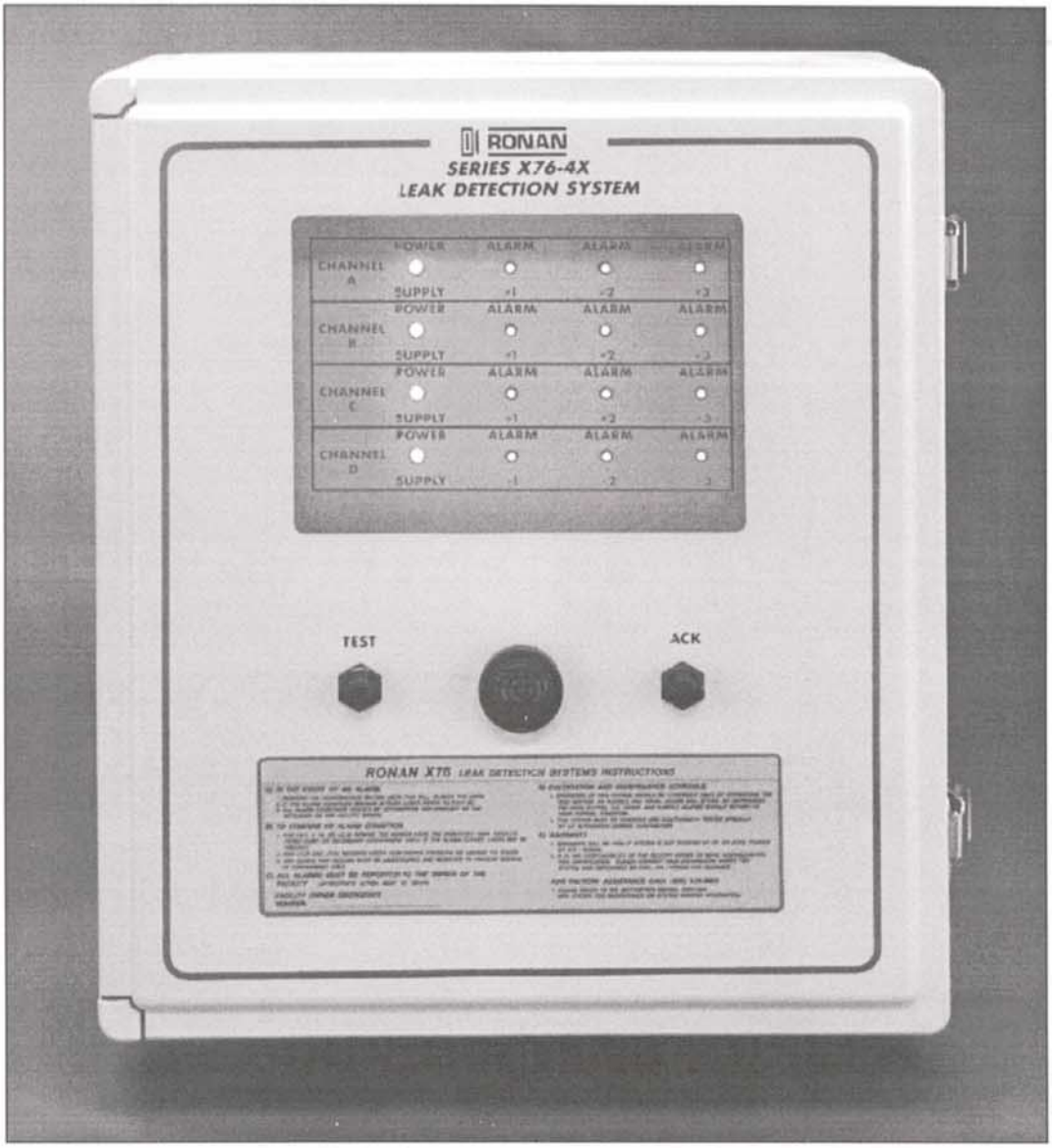
Instructions
and
Operating Manual

SERIES X76-4X & X76AST-4X

LEAK DETECTION SYSTEM



RONAN

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WARRANTY

Ronan Engineering warrants equipment of its own manufacture to be free from defects in material and workmanship under normal conditions of use and service, and will repair or replace, at their option, 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.

1.0 GENERAL DESCRIPTION

The Models X76-4X and X76AST-4X Leak Detection Systems combine the high reliability and low maintenance of solid state circuitry and a fail safe design in a weather tight corrosion resistant NEMA 4X enclosure suitable for industrial and harsh environments. The systems provide an intrinsically safe interface to all field sensors, on systems with optional X57 barriers. The X76-4X system is expandable from three to twelve inputs and will produce a high intensity audible warning and a visual alarm when a leak is detected. The X76AST-4X is equipped with three inputs and is available with or without an I.S. barrier. Each system is designed to monitor secondarily contained underground or aboveground tank and piping systems as well as high level, over-all protection within primary containment. Each system is capable of monitoring four different levels of measurements for leak detection.

1. Continuous liquid level sensing to provide alarm and shutdown if liquid enters the annular space of double-wall tanks, secondary contained piping, leaks into manifolds or casson compartments and high liquid level to prevent overfilling tanks.

2. Hydrostatic type sensing of "Wet" interstice double-wall tanks with an alarm if there is a loss or increase in liquid level. This form of monitoring will indicate a leak in either the primary or secondary tank walls.

3. Pressure sensing of interstitial spaces with an alarm if there is a loss of pressure in the tank interstice below a preset threshold. This form of monitoring will indicate a leak in either the primary or secondary tank walls.

4. Vacuum sensing of interstitial spaces with an alarm if there is a loss of vacuum in the tank interstice below a preset threshold. This form of monitoring will indicate a leak in either the primary or secondary tank walls.

2.0 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 ignitability of materials generally corresponds to the National Electric Code groupings. The workable categories and test materials used as typical 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 a flammable material in air, which requires the minimum amount of energy for ignition. The flammables are usually designated in percent by volume in air.

Normal operating conditions include maximum supply voltage and the extreme environmental conditions which 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. Underwriters Laboratory and Factory Mutual approvals are based on examination and tests 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, all equipment used must be approved by an agency, and the installation, including the wiring, plus all the sensor inputs, must meet requirements of isolation to avoid any failures that may occur in the system.

CAUTION: The X76-4X and X76AST-4X Monitor enclosures must be mounted in a general purpose area as defined by the National Electric Code.

Power input 115 VAC ±10%, 60 Hz.

All wiring to sensors (i.e. Level Sensors LS-3, LS-7, LS-30, HVA, Pressure Switch JT-2P and Vacuum Switch JT-2V), must be installed in separate dedicated conduit to comply with the intrinsically safe requirements.

All wiring to auxiliary relays must be kept separate from input wiring.

All external equipment used with the system must comply with the National Electric 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 X76-4X & X76AST-4X Systems.

The system chassis must be properly grounded including the intrinsically safe ground, if equipped with an intrinsic safety barrier.

NOTE: RONAN ENGINEERING COMPANY does not accept the responsibility for the installation of intrinsically safe equipment.

Systems without intrinsic safety barriers shall monitor sensors in non-classified areas only except for sensors which carry an explosion proof rating.

3.0 SPECIAL CAUTIONARY NOTES: INTRINSICALLY SAFE MONITORS

Before applying power and beginning the test procedure, it is important to review all the elements of the monitor system, including the cabinet itself, to verify that each component meets the requirements of the National Electrical Code for the area in which it is installed. Particular attention must be paid to reviewing the selection of any externally supplied push buttons, horns and bells, to assure that they are of an appropriate electrical classification. Model X76RA-4X and X76AST-RA-4X remote alarm annunciators are recommended.

3.1 Alarm Contact Inputs

Each sensor contact of the intrinsically safe system must be brought to the I.S. barrier inputs as discrete pairs of wires. The common practice of running one wire to many held contacts is not permitted if intrinsic safety is to be preserved. This is due to the nature of the barrier design, in which only a limited current, insufficient to actuate more then one input, is made available to the field wiring through each terminal. The jumpering of terminals must be avoided, as it also defeats the current-limiting properties of the barrier.

Each active input may be wired to a contact that either opens or closes with an alarm condition. Selection of the input contact type is accomplished on each module by the position of a jumper switch, identified as "NO" and "NC" for the normally open and normally closed positions, respectively. Using this terminology, a field contact that opens with an alarm condition is termed a "normally closed" alarm input and, conversely, the field contact that closes with an alarm condition is termed a "normally open" alarm input.

3.2 Optional External Horn and Bell Wiring

If electronic horns are used as the system audible, they may be directly driven by the horn driver outputs of the monitor. In this case, the Ronan Model X36 Electronic Horn should be installed with its V- terminal tied to the HORN terminal of the monitor and its V+ terminal tied to the V+ terminal of the power source. The Model X76AST-RA-4X Remote Alarm Annunciator may also be used and wired as shown in drawing number X76D533.

Systems using conventional vibrator-type horns and bells must use an interposing relay Model KV-700 or X53-1014 or utilize one or more of the onboard auxiliary relays.

3.3 Sensor and Contact Inputs

To maintain I.S. certification, all I.S. input wires must be routed through the special intrinsically safe compartment, in pairs (contacts), and wired to I.S. barrier input terminals as indicated on the wiring diagram number X76D533 referenced in this manual.

3.4 Auxiliary Relays

The wiring to the auxiliary relays is general purpose and must be kept separate from intrinsically safe wiring within the enclosures. Refer to section 9.0 for specifications.

3.5 Power Supply Wiring

The 115 Vac source wiring must be on a dedicated circuit in phase with all other pump control systems and be connected to the terminals identified with "H", "N", and "G". This wiring must be kept separate from I.S. wiring.

4.0 GENERAL INSTALLATION

The Series X76-4X Leak Detection System is available in a FPR NEMA 4 enclosure equipped with plug-in modules for liquid level inputs, pressure inputs and vacuum inputs. All are accessible through the system front door. Clearly identified wire termination's located on the internal panel provide ease of wiring for sensors, relays and power connections.

4.1 Field Wiring

The systems field wiring is shown on schematic X76D553 and must be followed explicitly. The system requires 115 Vac, 60 Hz, supply voltage or 220 Vac, 50 Hz on European versions, terminated to the appropriate terminals. All field wires, of the sensors to be monitored, that are in a Class I, Division 1 area, are to be terminated to the input terminals of the I .S. barrier chassis.

5.0 TROUBLESHOOTING & REPAIR

The series X76-4X & X76AST-4X, Leak Detection Systems are designed for trouble-free operation and should not require troubleshooting in the field. Since the system consists of plug-in modules, the initial troubleshooting or repair should be limited to the exchange of modules and verification of all incoming field wiring connections.

5.1 X76-4X & X76AST-4X Leak Detection System Cautionary Notes

CAUTION: Some of the systems internal termination's are powered by 115 Vac or 220 Vac. Touching these terminals can cause electrical shock. De-Energize the system before attempting any repair.

6.0 X76AM-4B ALARM MODULE INPUTS

The X76AM-4B Alarm Module is connected via factory wiring to three red "Alarm" LED's and a green "Power On" LED. The module continuously monitors the status of any contact type input through the I.S. barrier. Should an abnormal condition occur, the alarm LED will illuminate and flash and the audible alarm will sound. Pressing the **ACK**nowledge button will silence the horn and change the flashing alarm LED to a steady on condition. The alarm LED will go off when the contact status returns to normal. If the alarm modules is tied to an auxiliary relay, (maximum of six), the auxiliary relay will be energized.

6.1 Operation

Each active input may be wired to a contact that either opens or closes with an alarm condition. Selection of the input contact type logic is accomplished on each module by the position of a jumper switch, identified as "NO" and "NC" for the normally open and normally closed position, respectively. Using this terminology, a field contact that opens with an alarm condition is termed a "normally closed" alarm input and, conversely, the field contact that closes with an alarm condition is termed a "normally open" alarm input.

The X76AM-4B Alarm Module is designed for use with contact type sensor inputs such as the models: LS-3, LS-3s, LS-3ss, LS-7, LS-7s, LS-30, HVA, JT-2P and JT-2V. These sensors will monitor and detect changes in liquid level, pressure or vacuum caused by breached secondary containment vessels or damaged primary containment vessels.

7.0 X57-422P INTRINSIC SAFETY BARRIERS

The X57-422P Intrinsic Safety Barrier is approved to provide an intrinsically safe input signal from the LS-3, LS-3s, LS-3ss, LS-7, LS-7s, LS-30, HVA, JT-2P and JT-2V sensors. Each sensor is wired via the intrinsically safe barriers per wiring schematics shown in this instruction manual. By utilizing the barrier, direct buriable type cable can be used. This can help reduce the installation costs, if desired.

7.1 Applications

The Intrinsically Safe Interface System accepts intrinsically safe input signals from the hazardous area via an approved barrier to provide output signals that can be used for operating general purpose external computers, logic systems or shutdown circuits.

7.2 Mechanical Features

Input and output terminals are physically separated. The input terminal compartment has a water-tite threaded hub for terminating conduits as do the output terminal compartments and power wiring. All field wiring, including system power shall enter the system through the threaded hubs provided. Failure to comply could result in impaired system performance and damage or failure of the systems safety features.

7.3 Special Installation Instructions

Equipment and associated wiring approved as intrinsically safe may be installed in any hazardous location for which it is approved. The provisions of Articles 500-517 of the National Electric Code need not apply to such installations.

As the intrinsically safe portion of the system is made up of the contact inputs and associated wiring, all input contact wiring is to be run in conduit reserved for the exclusive use of this intrinsically safe field wiring.

The field input wiring for any particular field contact is to be of such size that the total loop resistance is less than 1,000 ohms.

The system is to be grounded at the input voltage terminals. The ground connection shall be such that the resistance to ground is less than 1.0 ohm.

8.0 START-UP & TESTING

When the X76-4X or X76AST-4X Leak Detection System is first installed, the system and the installation should be thoroughly inspected prior to applying initial system power. This inspection should include, but not be limited to; testing for ground faults, verifying sensor input wiring, verifying that all the requirements for intrinsic safety have been met and verifying that any external devices connected to the monitor are approved for use in that area.

8.1 Start-Up (Commissioning)

Start-Up and Testing, (Commissioning), of the X76-4X and X76AST-4X systems should be conducted by a factory trained representative or ASC (Authorized Service Contractor) and then by following the Ronan Start-Up and Certification Procedures.

8.2 Re-Certification

Re-Certification of the system should be conducted at least once each year for compliance with U.S.E.P.A. 40 CFR 280. Re-Certification should be conducted by an ASC (Authorized Service Contractor) and then by following the Ronan Start-Up and Certification Procedures.

NOTE: Validation of the system warranty is contingent upon submittal of start-up paper work to the factory.

9.0 SPECIFICATIONS

9.1 System, Model X76-4X and X76AST-4X

Power: 115 Vac, 60 Hz (or 220 Vac, 50 Hz on European versions).

Power Consumption: Less then 200 VA.

Operating Temperature: 32 to 165°F (0 to 75°C).

Mounting: General purpose, Indoor or Outdoor area; wall mount.

Auxiliary Relays: DPDT, 12 Vdc coil, 10 A contacts.

9.2 Alarm Module, X76AM-4B

Field Sensor: Dry contact.

Field Sensor Voltage: 12 Vdc (Supplied by the Module).

Number of Inputs: Three per module, (maximum of 12 on Model X76-4X and maximum of 3 on Model X76AST-4X).

Power Indicator: LED, Green.

Alarm Indicator: LED, Red, three per module.

9.3 I.S. Barrier, X57-422P

Type: Zener Diode.

End-to-End Resistance: 240 ohms.

Maximum Voltage: 19.5 Vdc.

Fuse Rating: 50 mA.

Groups: A-G.

9.4 Leak Sensor, Model LS-3, LS-3s, LS-3ss

Housing: 304 stainless steel.

Mounting: 1/2" NPT male thread.

Switch:

Type: SPST, N.C.

Rating: 10 VA.
Float Material: Buna-N (LS-3, LS-3s), 316 Stainless steel (LS-3ss).
Pressure: 50 psig maximum.
Leads: 20 AWG.

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

Application: Vertical position liquid detection.

Listing: UL 48RO.

9.5 Tank Leak Sensor, Model LS-7, LS-7s

Housing: PVC (Geon 87241).

Liquid Specific Gravity: 0.70 minimum.

Switch:
Type: SPST, N.C.
Rating: 10 VA.
Float Material: PVC, (LS-7, LS-7s).
Pressure: 50 psig maximum.
Leads: 20 AWG.

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

Application: Horizontal position liquid detection.

Listing: UL 48RO.

9.6 Hydrostatic Leak Sensor, Model LS-30

Housing: 304 stainless steel.

Mounting: 1/2" NPT male thread.

Switch:
Type: DPDT, N.C. top, N.O. bottom.
Rating: 1 0 VA.
Float Material: Polysulfone.
Pressure: 50 psig maximum.
Leads: 20 AWG.

Application: Vertical position High/Low level detection, 4" separation.

Listing: UL 48RO.

9.7 Tank Leak Sensor, Model JT-2P, JT-2V

Housing: Aluminum body with stainless steel inlet, explosion proof, hermetically sealed, NEMA Types 7 and 9.

Manifold: Brass, 1" NPT male thread.

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: 1/2" NPT with PVC insulated 18 AWG color coded leads.

Pressure:
Connection: 1/4" NPT.
Adjustment: Allen wrench through port.
Proof Pressure: 299 psig.

Gauge: 0-30 psig (JT-2P), 0-20" Hg (JT-2V).

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

Listing: UL 48RO.

10.0 ORDERING INFORMATION

The Ronan Model X76-4X Leak Detection System can be configured to meet the different local, State and Federal codes for above and below ground storage by proper selection of sensors and monitor modules. For example; a particular local code and/or facility may require leak detection of the tank interstice and piping containment sump. The monitor system would be: Model X76-4X-6-2(LS-3)-2(LS-30).

Model X76-4X - (__) - __ (__)

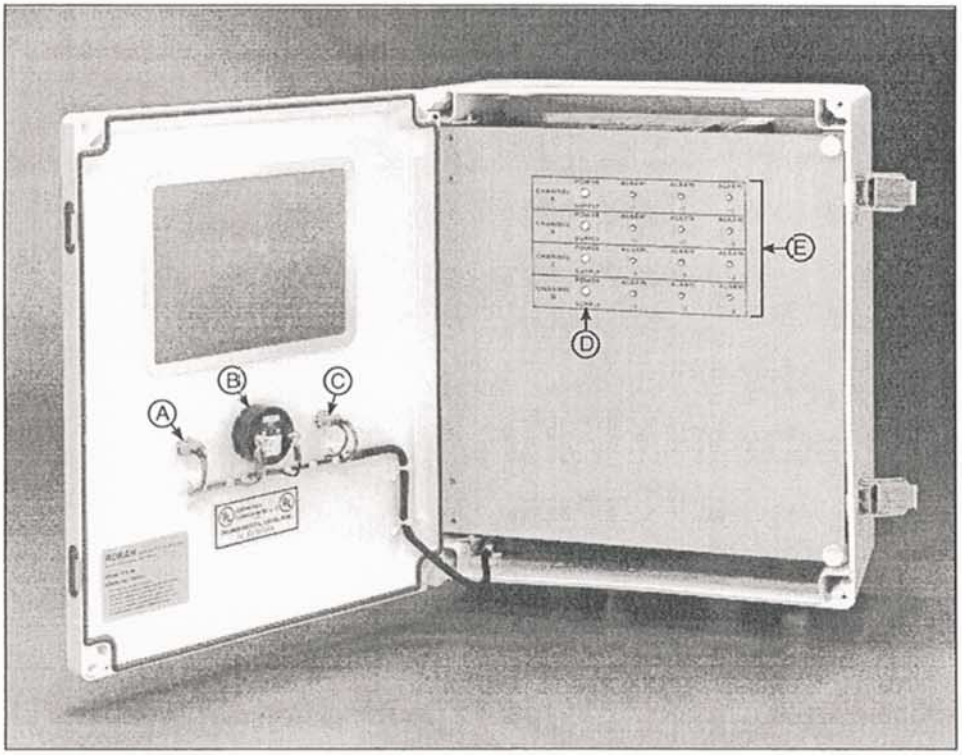
- **Probe Sensor Type:**
  - LS-3 Vertical Liquid
  - LS-7 Horizontal Liquid
  - LS-30 Dual Level Reservoir
  - JT-2P Positive Pressure
  - JT-2V Vacuum Leak
  - HVA Mini Vertical Liquid
  - Note: Use additional listing if more than one type of sensor is used. e.g. 2(LS-3)-2(LS-7).
- **Probe Quantity**
- **Number of Alarm Inputs:** 3, 6, 9 or 12 (12 Maximum).

The Ronan Model X76-AST-4X Leak Detection System was designed with above ground tank installations in mind and can be configured to meet the different local, State and Federal codes for above as well as below ground storage by proper selection of sensors and monitor modules. For example; a particular local code and/or facility may require leak detection of the tank interstice, delivery spill box and overfill prevention. The monitor system would be: Model X76AST-4X-1-3(LS-2).

Model X76AST-4X- __ - __ (__)

- **Probe Sensor Type:**
  - LS-3 Vertical Liquid
  - LS-7 Horizontal Liquid
  - LS-30 Dual Level Reservoir
  - JT-2P Positive Pressure
  - JT-2V Vacuum Leak
  - HVA Mini Vertical Liquid
  - Note: Use additional listing if more than one type of sensor is used. e.g. 2(LS-3)-2(LS-7).
- **Probe Quantity**
- **Configuration Type:**
  - 1 = I.S. Barrier & 3 Aux. Relays
  - 2 = I.S. Barrier & 1 Aux. Relay
  - 3 = Without I.S. Barrier, includes 3 Aux. Relays
  - 4 = Without I.S. Barrier, includes 1 Aux. Relay

11.0 TECHNICAL DRAWINGS



11.1 X76-4X Interior View (Dead Front)

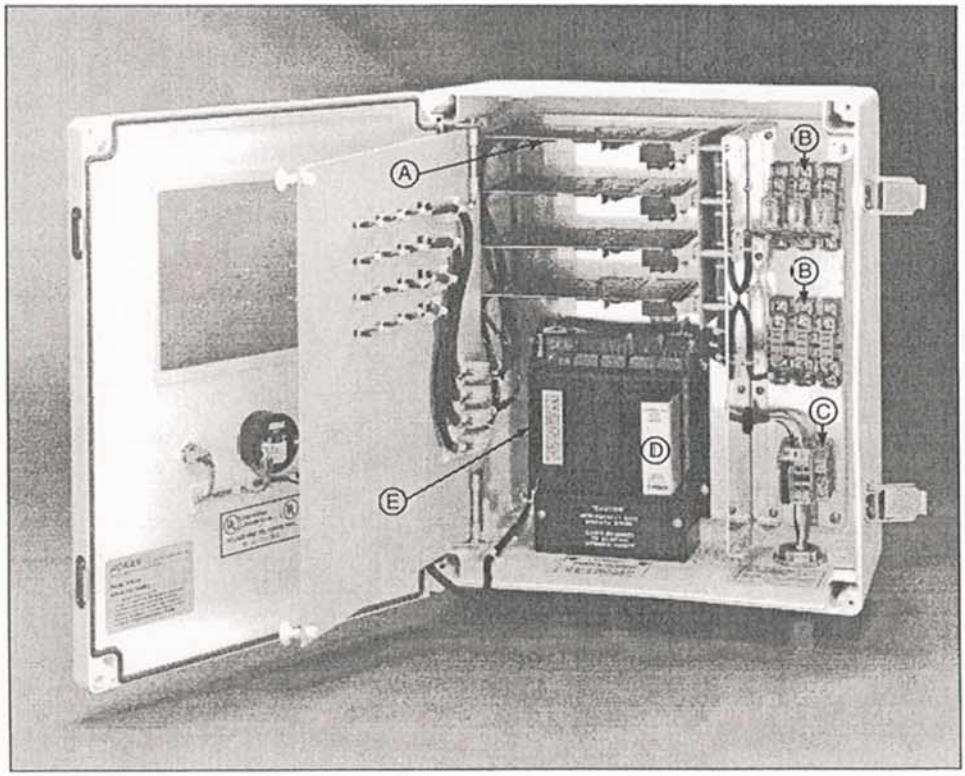
A. Test Push Button

B. Silence (Ack) Switch

C. Alarm Horn Push Button

D. Power Indicators

E. Alarm Indicators



11.2 X76-4X Interior View (Component Section)

A. X76AM-4B Alarm Module (4 Maximum)

B. Auxiliary Relays

C. Input Power Terminals

D. Intrinsically Safe Barrier X57-422P

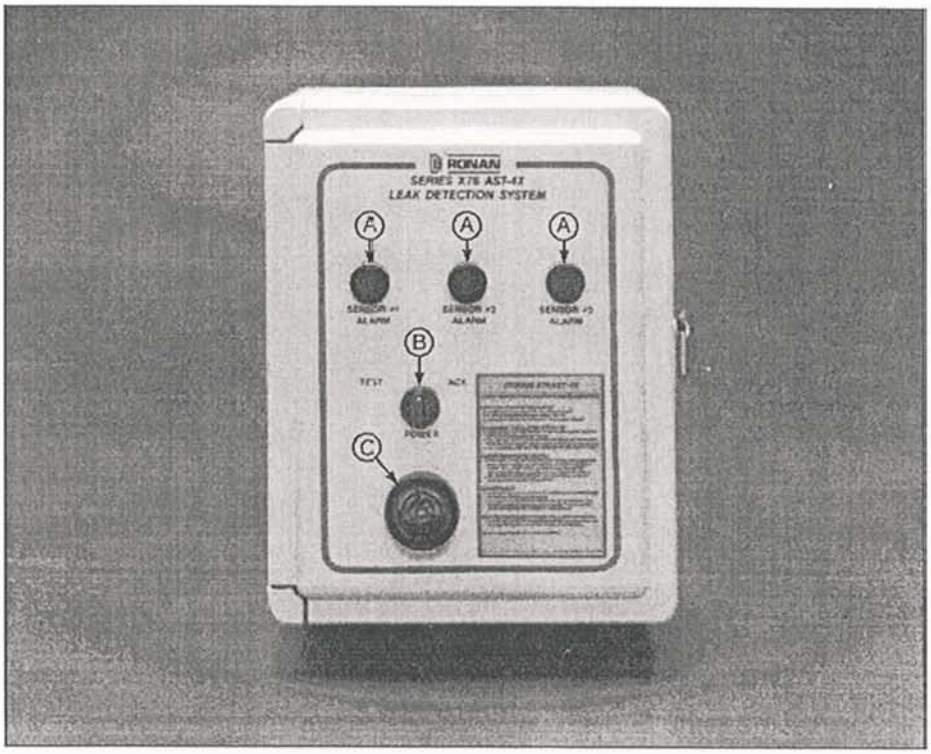
E. Intrinsic Safety Chassis

11.3 X76AST-4X Exterior View

A. Alarm Indicators

B. Test/Ack Switch

C. Alarm Horn



11.4 X76AST-4X Interior View

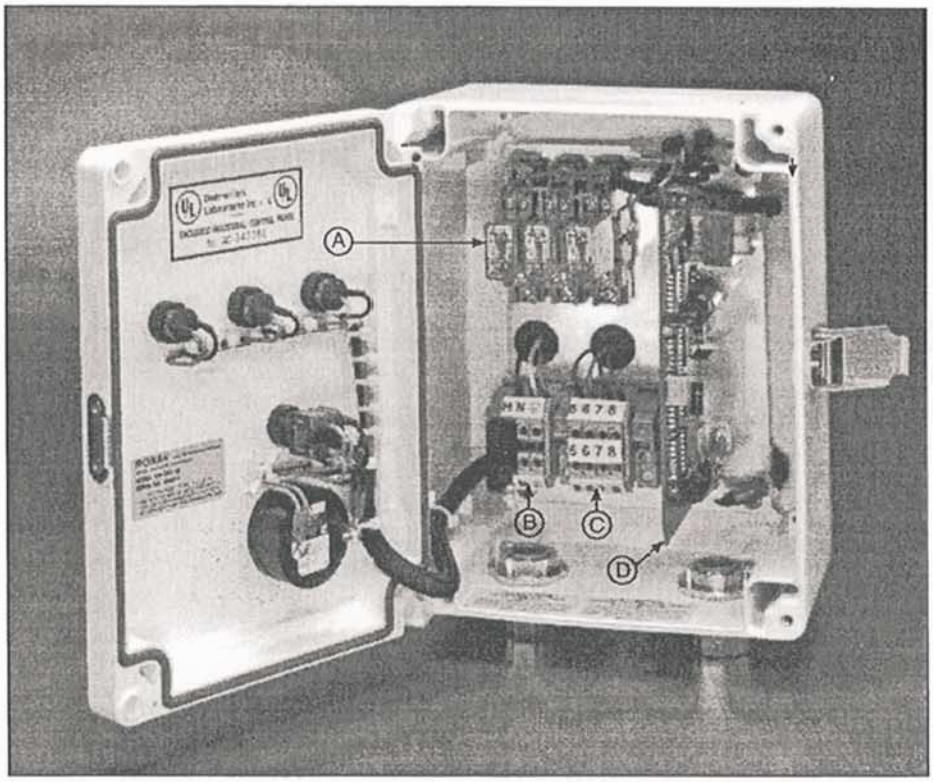
A. Auxiliary Relays

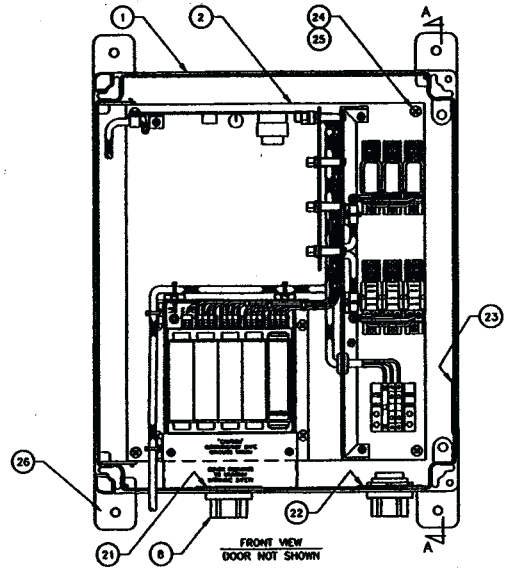
B. Input Power Terminals

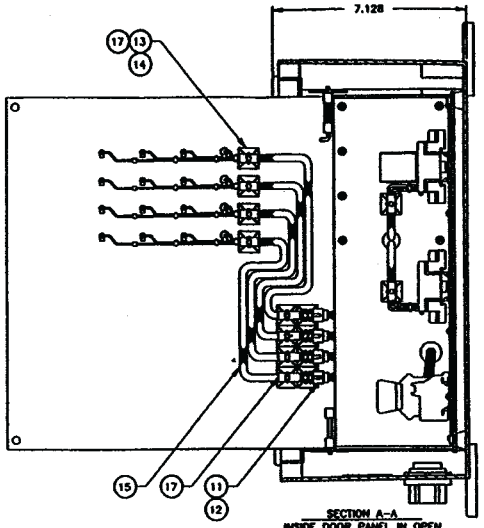
C. Optional Remote Annunciator Terminals

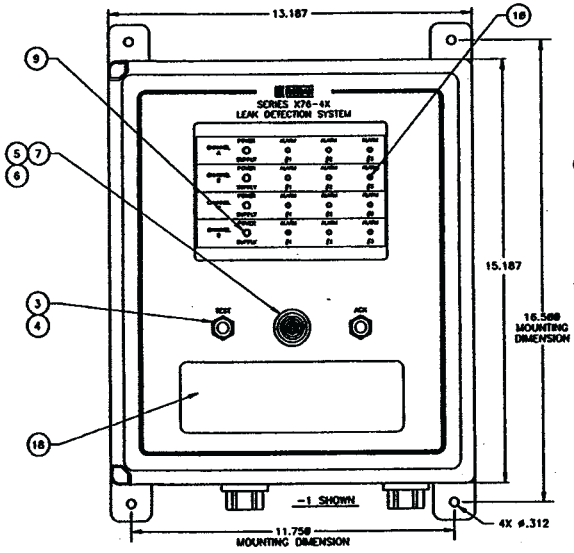
D. X76AM-4B Alarm Module

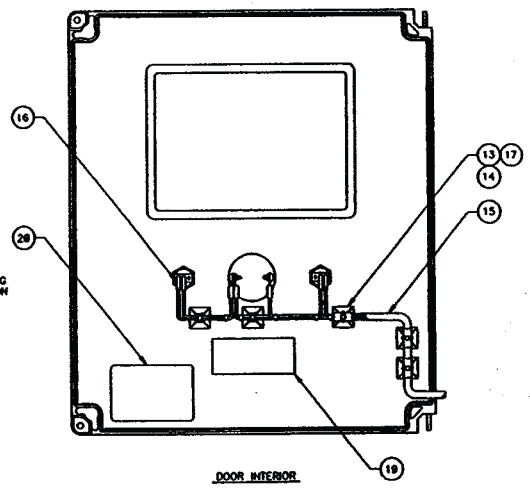
E. Optional X57-422P Intrinsic Safety Barrier (Not Shown)









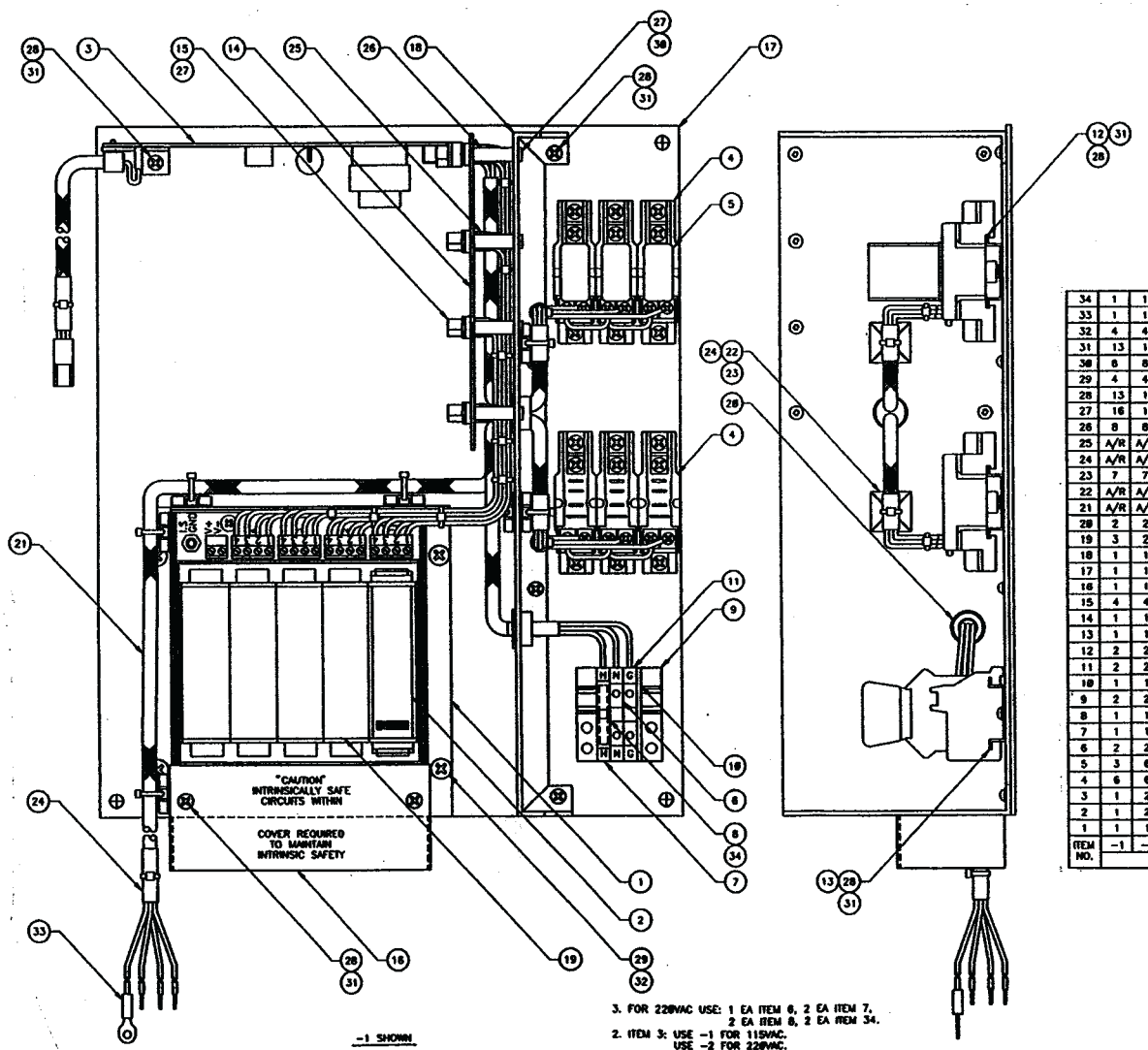


NOTES: UNLESS OTHERWISE SPECIFIED.

1. FOR WIRING OF ITEMS 3, 5, 9, AND 18 SEE DRAWING NUMBER X76D481.

ITEM NO.	-1	-2	-3	-4	PART NO.	DESCRIPTION	SPEC
	QTY						
26	4	4	4	4	24325130	MOUNTING FEET	ROBROY
25	4	4	4	4		#10 EXT TOOTH LOCKWASHER	CON'L
24	4	4	4	4		10-32 X 5/16 PH PAN HD SCREW	CON'L
23	1	1	1	1	X76C498-5	INFORMATION LABELS	RONAN
22	1	1	1	1	X76C498-4	INFORMATION LABELS	RONAN
21	1	1	1	1	X76C498-3	INFORMATION LABELS	RONAN
20	1	1	1	1	X76C498-2	INFORMATION LABELS	RONAN
19	1	1	1	1	X76C498-1	INFORMATION LABELS	RONAN
18	1	1	1	1	X76C489	INSTRUCTION LABEL	RONAN
17	A/R	A/R	A/R	A/R	HSTM25-Q	HEATSHRINK TUBING	PANDUIT
16	A/R	A/R	A/R	A/R	HSTM89-Q	HEATSHRINK TUBING	PANDUIT
15	A/R	A/R	A/R	A/R	SE25P-TRO	BRAIDED SLEEVING	PANDUIT
14	A/R	A/R	A/R	A/R	ABM4-AC	CABLE TIE MOUNT	PANDUIT
13	A/R	A/R	A/R	A/R	PLT1M-C	TIE STRAP	PANDUIT
12	24	24	24	24	02-06-2103	MALE CRIMP TERMINALS	MOLEX
11	4	4	4	4	03-06-2061	PLUG 6 PIN	MOLEX
10	12	12	12	12	PP156PR4-2VF-W18	L.E.D. (RED)	ITAL
9	4	4	4	4	PPS251TWRG4-2VF-W18	L.E.D. (GREEN)	ITAL
8	2	2	2	2	ST2-CP	HUB .75	MYER
7	1	1	1	1	X76B469	HORN WASHER	RONAN
6	1	1	1	1	BMR-1	HORN RING	MALLORY
5	1	1	1	1	SC628	SONALERT HORN	MALLORY
4	2	2	2	2	BP598	MICRO SWITCH BOOT	AUGAT
3	2	2	2	2	MPG1B6F	MICRO SWITCH	AUGAT
2	-	-	-	1	X76D482-4	ASSEMBLY SUB PANEL X76-4X-12	RONAN
	-	-	1	-	X76D482-3	ASSEMBLY SUB PANEL X76-4X-9	RONAN
	-	1	-	-	X76D482-2	ASSEMBLY SUB PANEL X76-4X-6	RONAN
	1	-	-	-	X76D482-1	ASSEMBLY SUB PANEL X76-4X-3	RONAN
1	1	1	1	1	X76D483	ENCLOSURE MODIFICATION	RONAN

X76-4X
ASSEMBLY/DIMENSIONAL



ITEM NO.	QTY -1	QTY -2	QTY -3	QTY -4	PART NO.	DESCRIPTION	SPEC.
34	1	1	1	1	GMA-2	2. AMP FUSE 5 X 20MM	BUSSMAN
33	1	1	1	1		#6 RING LUG	COM'L
32	4	4	4	4		#10 INT TOOTH LOCKWASHER	COM'L
31	13	14	15	16		#6 INT TOOTH LOCKWASHER	COM'L
30	8	8	8	8		#4 INT TOOTH LOCKWASHER	COM'L
29	4	4	4	4		10-32 X 5/16 PH PAN HD SCREW	COM'L
28	13	14	15	16		6-32 X 5/16 PH PAN HD SCREW	COM'L
27	16	16	16	16		4-40 X 5/16 PH PAN HD SCREW	COM'L
26	8	8	8	8	9156	STANDOFF (3/4 LG)	J.R. IND.
25	A/R	A/R	A/R	A/R	HSTTM09-Q	HEAT SHRINK TUBING	PANDUIT
24	A/R	A/R	A/R	A/R	HSTTM25-Q	HEAT SHRINK TUBING	PANDUIT
23	7	7	7	7	ABMM-AC	CABLE TIE MOUNT	PANDUIT
22	A/R	A/R	A/R	A/R	PLT1M-C	TIE STRAP	PANDUIT
21	A/R	A/R	A/R	A/R	SE25P-TRO	BRAIDED SLEEVING	PANDUIT
20	2	2	2	2	625-8	BUSHING	HEYCO
19	3	2	1	–	X57C42	BLANK PANEL	PHILLIPS ENG.
18	1	1	1	1	X76D485	BRACKET, REAR PANEL	RONAN
17	1	1	1	1	X76D484	SUB PANEL	RONAN
16	1	1	1	1	X76C292	X57-SM COVER	RONAN
15	4	4	4	4	180-032-455	CONNECTOR	PANDUIT
14	1	1	1	1	X76B547	BOARD, CONNECTOR	RONAN
13	1	1	1	1	X76B484-1	DIN RAIL	RONAN
12	2	2	2	2	X76B491	DIN RAIL	RONAN
11	2	2	2	2	10 51 00 3	TERMINAL MARKING STRIP (H, N, GND)	PHOENIX
10	1	1	1	1	30 03 02 8	END CAP	PHOENIX
9	2	2	2	2	12 01 44 2	END CLAMP	PHOENIX
8	1	1	1	1	00 21 05 3	FUSE PLUG	PHOENIX
7	1	1	1	1	28 12 01 8	FUSE BLOCK	PHOENIX
6	2	2	2	2	30 03 01 7	TERMINAL BLOCK	PHOENIX
5	3	6	6	6	RH1B-U-DC12V	12VDC RELAY	IDEC
4	6	6	6	6	SH1B-05	RELAY SOCKET	IDEC
3	1	2	3	4	X76C492	ALARM MODULE	RONAN
2	1	2	3	4	X57-422P	I.S. BARRIER	RONAN
1	1	1	1	1	X57D48-1	X57SM-4-8 ASSEMBLY	RONAN

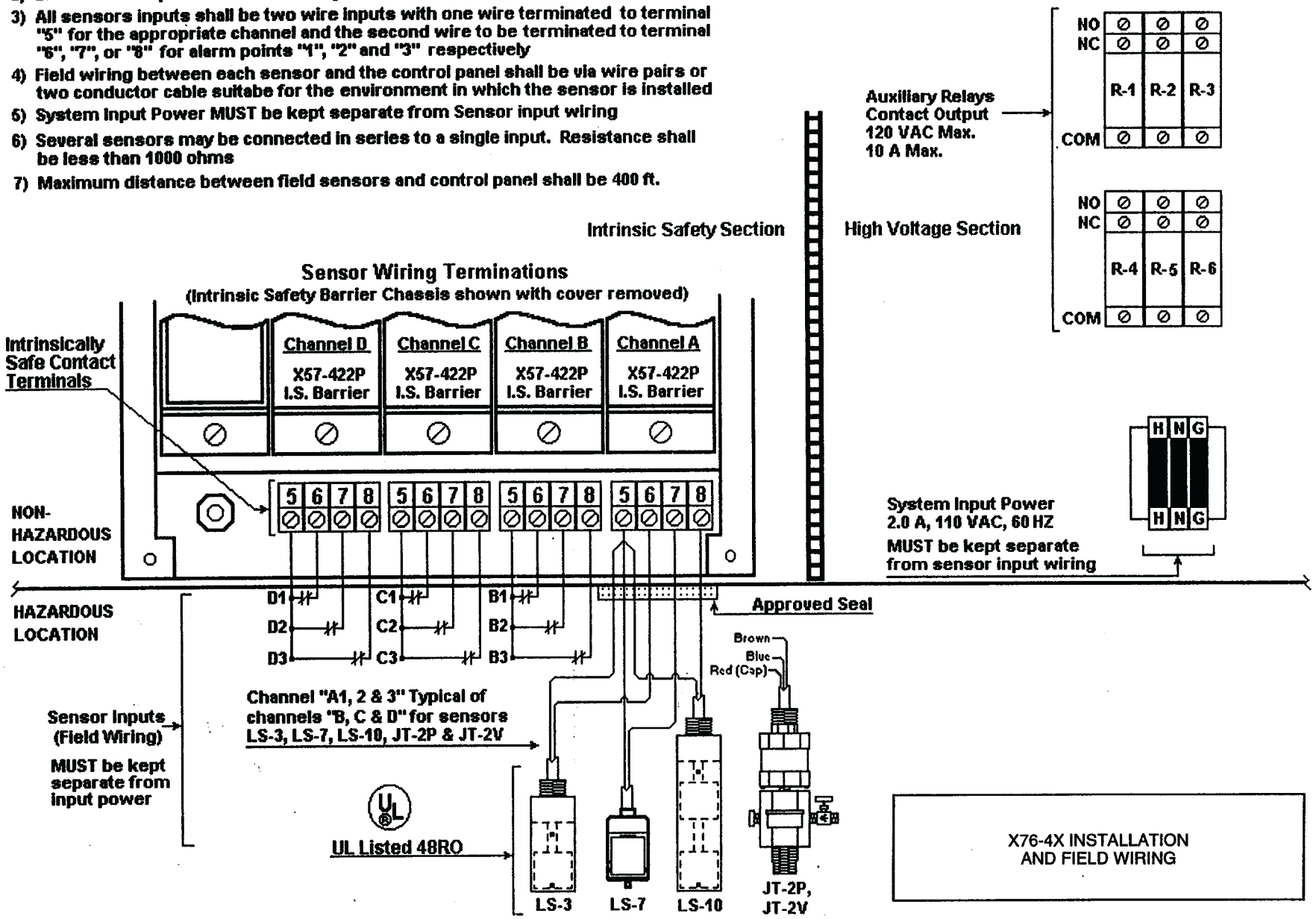
3. FOR 220VAC USE: 1 EA ITEM 6, 2 EA ITEM 7, 2 EA ITEM 8, 2 EA ITEM 34.
2. ITEM 3: USE -1 FOR 115VAC. USE -2 FOR 220VAC.
1. FOR WIRING DIAGRAM SEE DRAWING NUMBER X76D481.

NOTES: UNLESS OTHERWISE SPECIFIED.

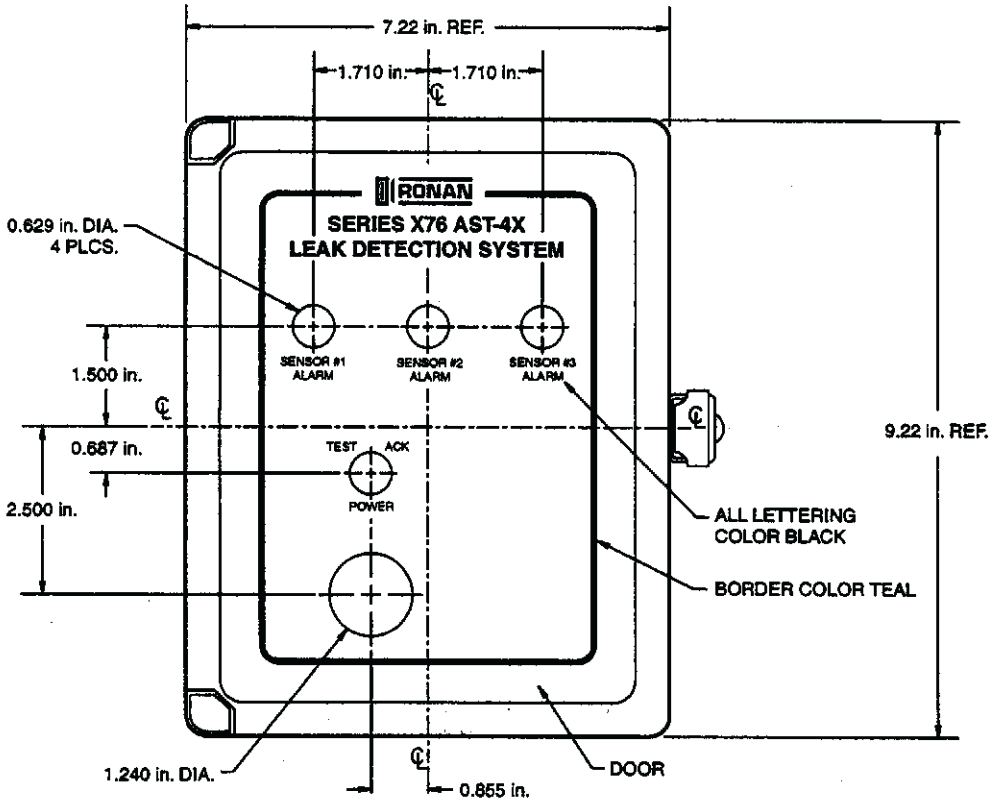
X76-4x
SUB PANEL ASSEMBLY

WIRING NOTES

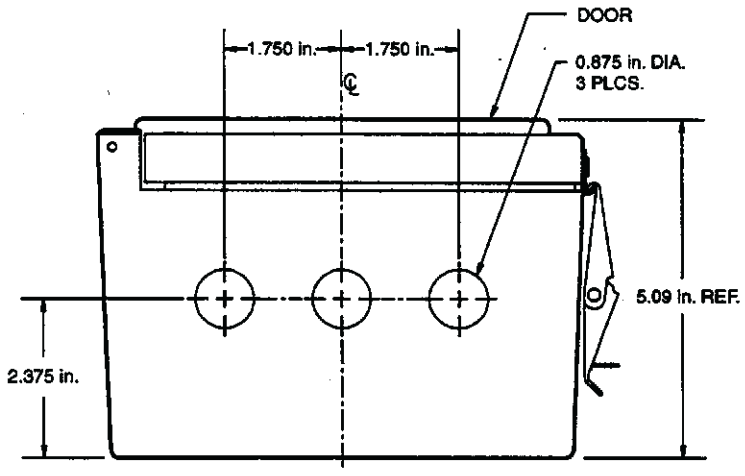
1) Sensor inputs MUST be run in a dedicated Intrinsically Safe conduit
2) Each sensor input MUST enter the system beneath the Intrinsic Safety Chassis
3) All sensors inputs shall be two wire inputs with one wire terminated to terminal "5" for the appropriate channel and the second wire to be terminated to terminal "6", "7", or "8" for alarm points "1", "2" and "3" respectively
4) Field wiring between each sensor and the control panel shall be via wire pairs or two conductor cable suitabe for the environment in which the sensor is installed
5) System Input Power MUST be kept separate from Sensor input wiring
6) Several sensors may be connected in series to a single input. Resistance shall be less than 1000 ohms
7) Maximum distance between field sensors and control panel shall be 400 ft.



X76-4X INSTALLATION AND FIELD WIRING



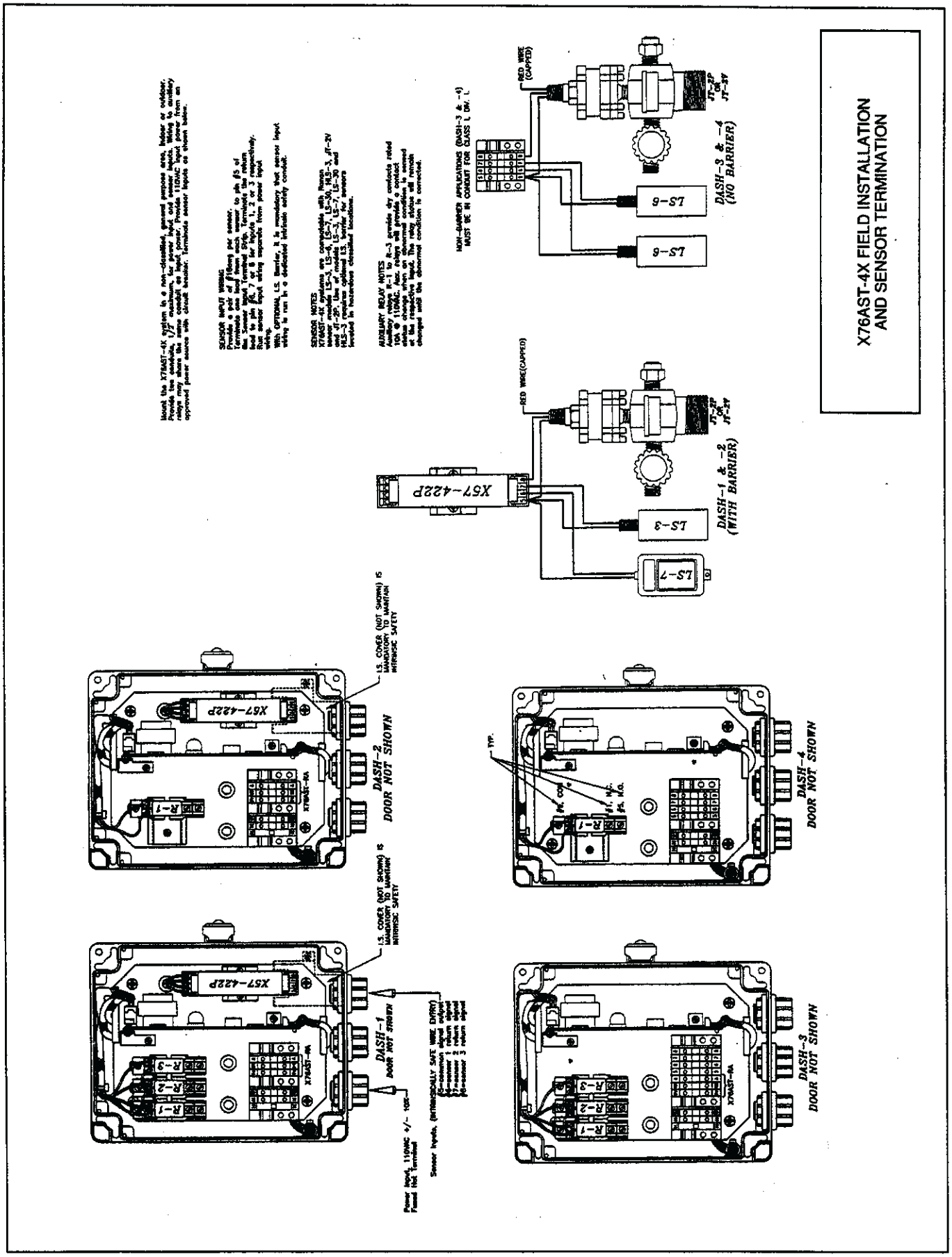
FRONT VIEW

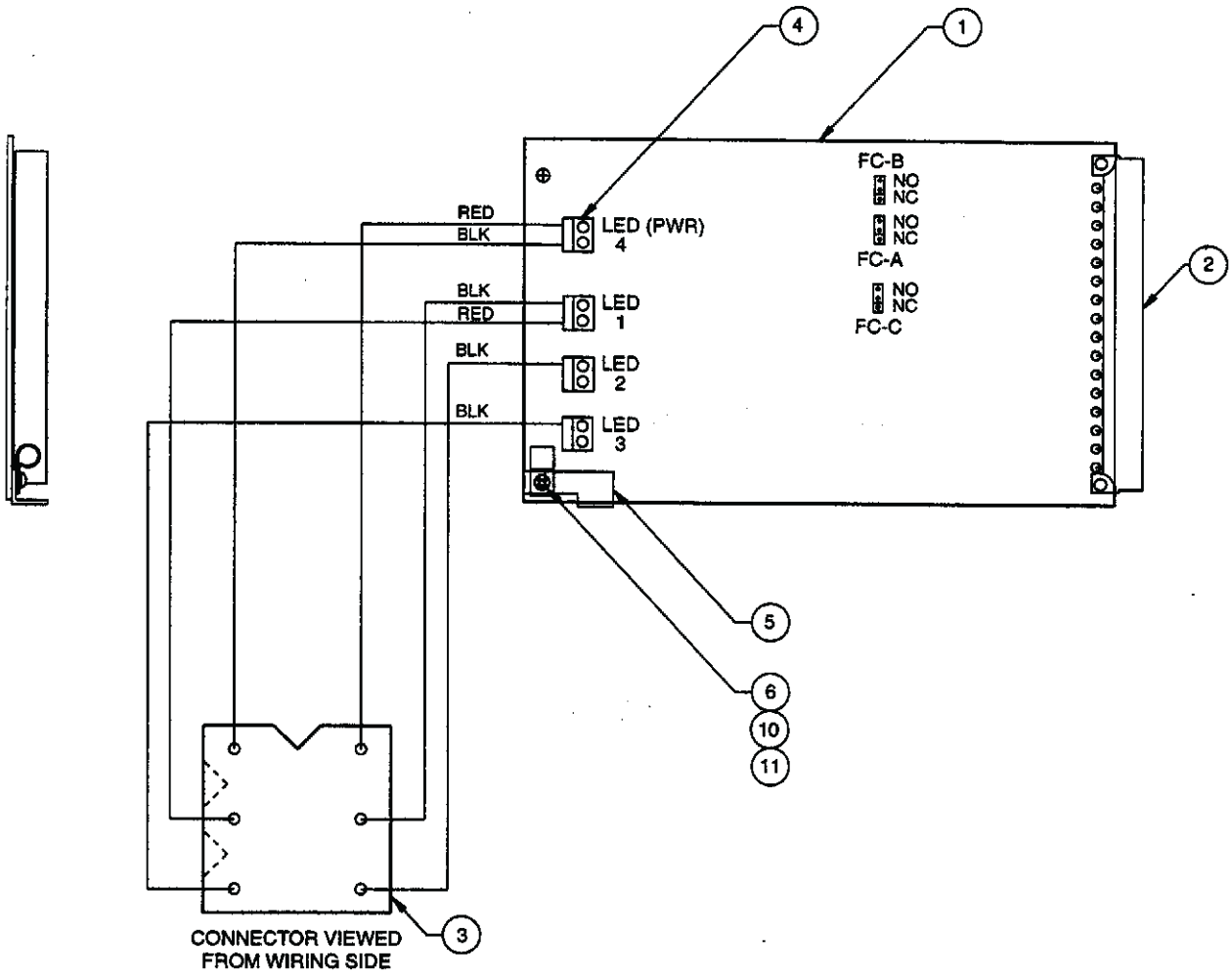


BOTTOM VIEW

NOTE: Reference Ronan Engineering Drawing Number X76D522.

X76AST-4X
ENCLOSURE MODIFICATION
DIMENSIONAL


X76AST-4X FIELD INSTALLATION
AND SENSOR TERMINATION
DASH-1 & -2
(WITH BARRIER)
DASH-3 & -4
(NO BARRIER)
DASH-1
DOOR NOT SHOWN
DASH-2
DOOR NOT SHOWN
DASH-3
DOOR NOT SHOWN
DASH-4
DOOR NOT SHOWN
X57-422P
LS-3
LS-7
LS-6
LS-6
RED WIRE(CAPPED)
RED WIRE (CAPPED)
LS. COVER (NOT SHOWN) IS MANDATORY TO MAINTAIN INTRINSIC SAFETY
LS. COVER (NOT SHOWN) IS MANDATORY TO MAINTAIN INTRINSIC SAFETY
Power Input, 110VAC +/- 10%
Fused Hot Terminal
Sensor Inputs, (INTRINSICALLY SAFE WIRE ENTRY)
NON-BARRIER APPLICATIONS (DASH-3 & -4)
MUST BE IN CONDUIT FOR CLASS I, DIV. I.
SENSOR INPUT WIRING
SENSOR NOTES
AUXILIARY RELAY NOTES
Mount the X76AST-4X system in a non-classified, general purpose area, indoor or outdoor.
Provide two conduits, 1/2" maximum, for power input and sensor inputs. Wiring to auxiliary
relays may share the same conduit as input power. Provide 110VAC input power from an
approved power source with circuit breaker. Terminate sensor inputs as shown below.

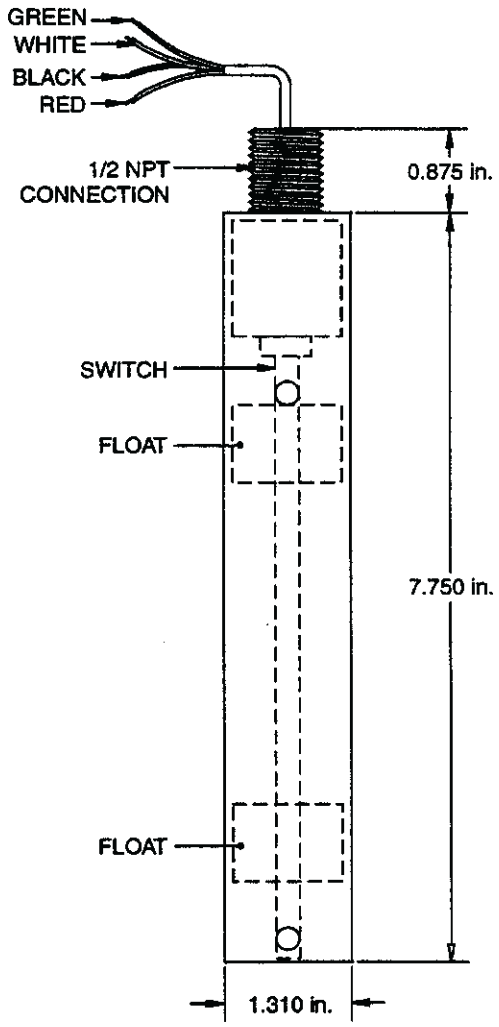


NOTES:

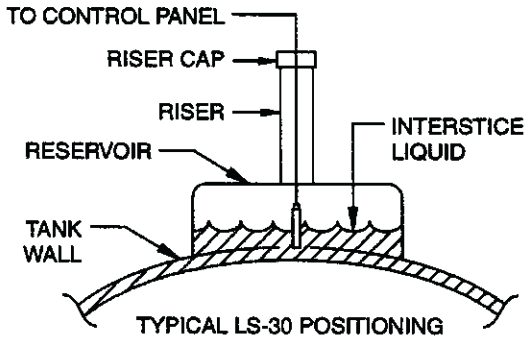
1. Wire to extend 10 inches beyond circuit board and includes items 3, 6, 7, and 8.
2. For schematic see X76-4004.
3. -1 used for 115 Vac.
   -2 used for 220 Vac.
4. Reference Ronan Engineering Drawing Number X76C492.

ITEM NO.	QUANTITY		PART NO.	DESCRIPTION
	-1	-2		
1	-1	-	X76-4004	PCB
	-	1	X76-4010	PCB
2	1	1	100-032-053	PCB Connector
3	1	1	03-06-1062	Receptacle, 6 Pin
4	4	4	SMB 3S02S	Terminal Block
5	1	1	X76B486	Bracket, Alarm Module
6	1	1	CCS31-56-C	Cable Clamp
7	A/R	A/R	SE25P-TRO	Braided Sleeve
8	A/R	A/R	HSTTO-25Q	Heatshrink Tubing
9	A/R	A/R	PLT1M-C	Tie Strap
10	1	1		6-32 x 5/16 Ph Pan Hd Screw
11	1	1		#6 Int. Tooth Lockwasher

X76AM-4
ALARM MODULE ASSEMBLY



LISTED 48RO



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.

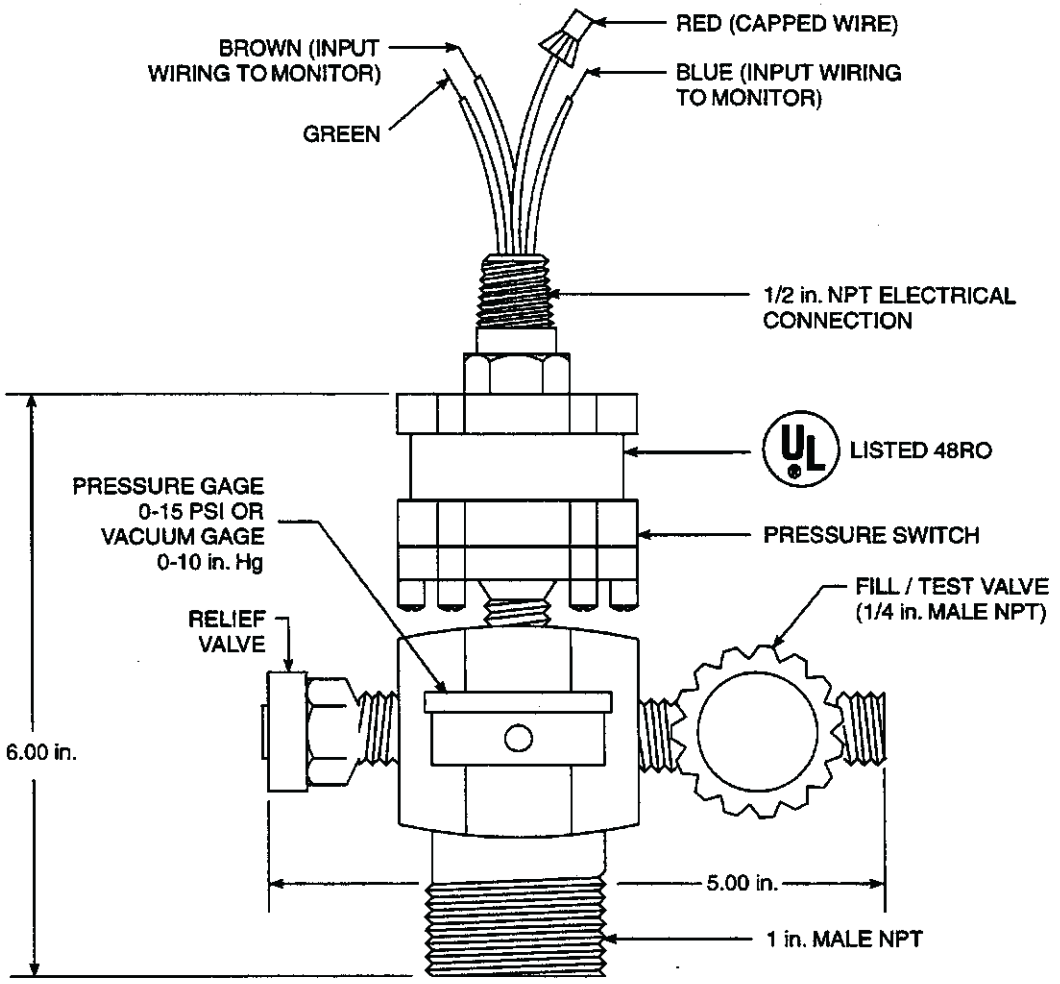
OTHER APPLICATIONS

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.

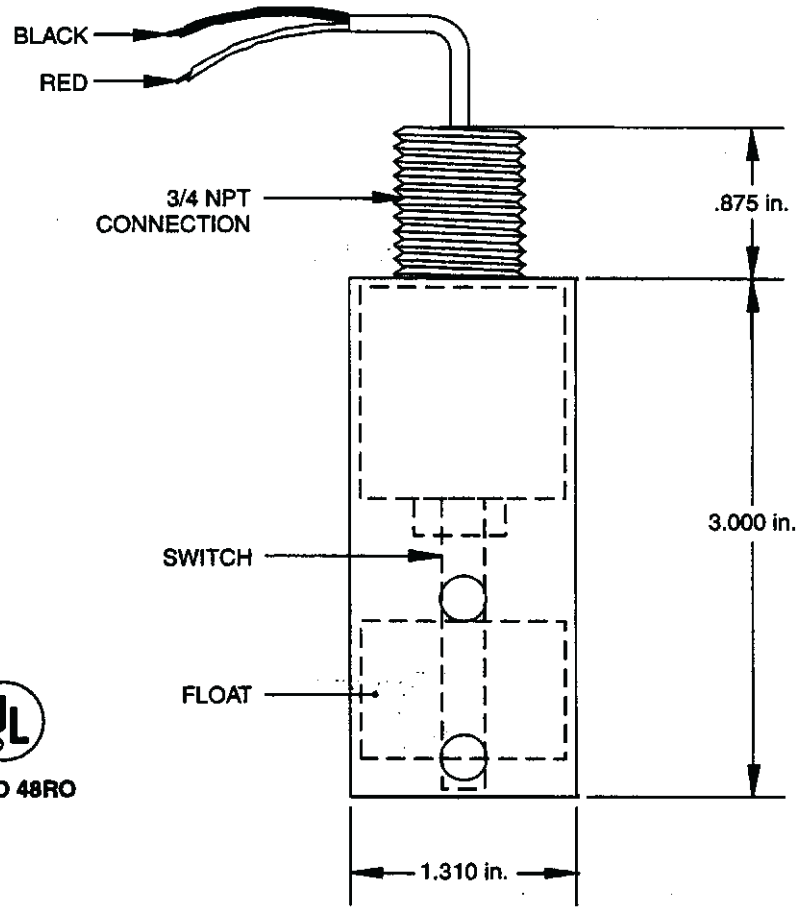
Provide electrical conduit, two each #18 AWG wires to sensor input terminals of the Models X76-4X, X76ETM-4X, X76S, X76VS, X76LVC, X76LVCS or X76ETM Tank Monitor. Contact the brown and blue sensor wires (NO position). Intrinsically safe wiring must be in a dedicated conduit only. No 115 Vac or other 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 voided.

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.

POSITIVE PRESSURE/VACUUM TANK LEAK SENSOR ASSEMBLY MODEL JT-2P & JT-2V



LISTED 48RO

INSTALLATION INSTRUCTIONS FOR STEEL DOUBLE-WALL TANKS

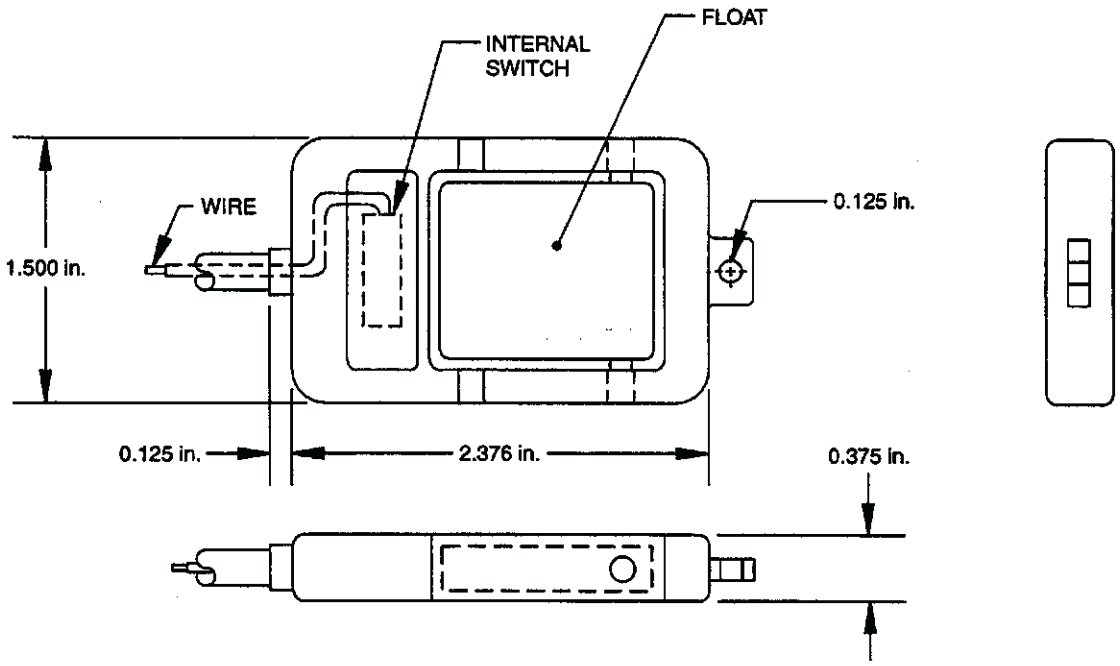
Lower sensor on cable until it rests on bottom of the tank annulus in a vertical position. Pull the remaining cable into the junction box and cut off the excess length. Secure cable to prevent slipping into the tank annulus. Connect leads to wire from the tank monitor input terminal strip.

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.

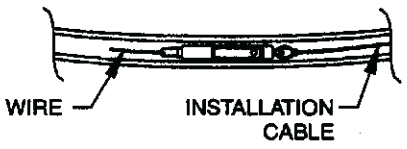
TANK LEAK SENSOR
MODEL LS-3



INSTALLATION INSTRUCTIONS FOR FIBERGLASS TANKS

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

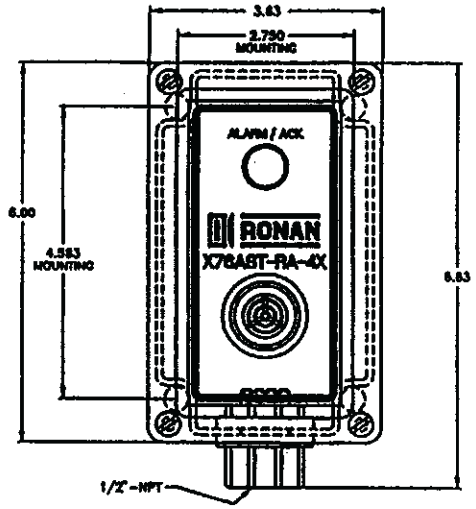
LISTED 48RO

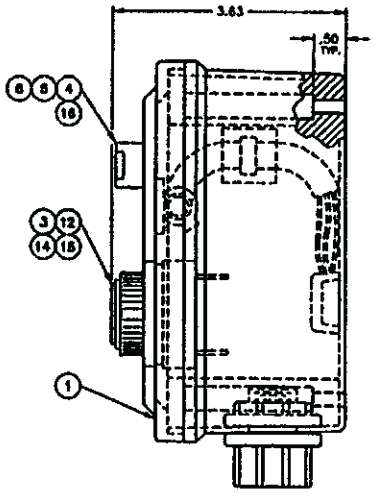


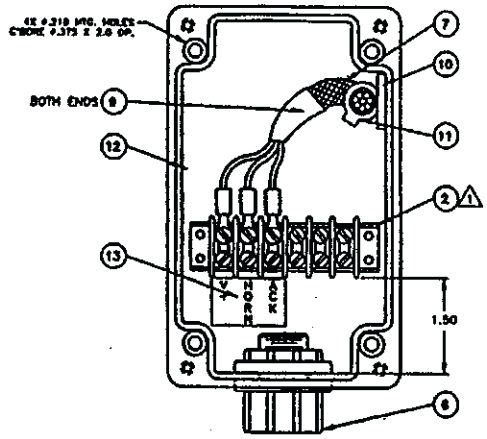
TYPICAL INSTALLATION IN DOUBLE-WALL TANK

NOTE: Reference Ronan Engineering Drawing Number X76B546.

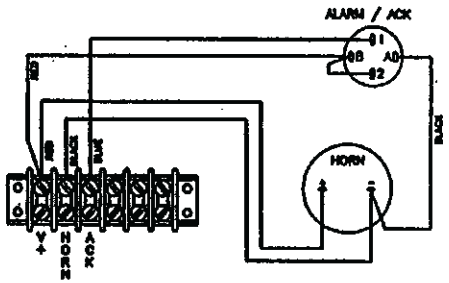
TANK LEAK SENSOR
MODEL LS-7







COVER NOT SHOWN



SCHEMATIC

NOTES:

⚠1 TERMINAL BLOCK TO BE SECURED WITH ADHESIVE.

⚠2 ITEMS 4, 5, & 16 MAY BE REPLACED WITH IDEC P/N: ALCW-M14P-R

3. ALL WIRE 18 AWG, UL1430.

ITEM NO	QTY	WIRE / PART NUMBER	DESCRIPTION	MFR
16	1	X760535	LED, RED	RONAN
15	1	6NR-1	RING, HORN	MALLORY
14	1	X760464	WASHER, HORN	RONAN
13	1	X760534	LAMACOID	RONAN
12	A/R	PNF18-6R-M	RING LUG	PANDUIT
11	A/R	FCG-6M	TIE WRAP	PANDUIT
10	A/R	ABM4-A-C	TIE-WRAP MOUNT	PANDUIT
9	A/R	HSTT.250-48Q	SHRINK SLEEVING	PANDUIT
8	A/R	HSTT.125-48Q	SHRINK SLEEVING	PANDUIT
7	A/R	SC23FR-TRO	BRAIDED SLEEVING	PANDUIT
6	1	ST-1	HUB (1/2"-NPT)	MYERS
5	1	51-931.2	LENSE, RED	EAO
⚠1 4	1	51-436.030	PUSHBUTTON, LIGHTED	EAO
3	1	SC926	HORN	SONALERT
2	1	600-6	TERMINAL BLOCK	KULKA
1	1	X760531	BOX MODIFICATION	RONAN

X76AST-RA-4X REMOTE
ALARM ANNUNCIATOR

12.0 THIRD PARTY PERFORMANCE DATA

Evaluation of the Ronan liquid sensor Models LS-3N.C., LS-3N.O., LS-7, LS-30 and HVA was conducted using procedures described in the EPA protocol "Standard Methods for Evaluating Leak Detection Methods: Liquid-Phase Out-of-Tank Product Detectors". All of the sensors evaluated meet the federal EPA requirements for detecting leaks in underground storage tanks. The work was conducted at the KWA Test Center by Ken Wilcox Associates, Inc. Modifications to the procedures were made to accommodate the specialized requirements of interstitial monitors.

The Ronan Models X76-4X and X76AST-4X systems were not tested as part of the evaluation as the leak detection performance in subject to field performance of the sensors. The system control panel continuously monitors all field sensors for changes in status. A change in status at one of the sensors is communicated to the control panel and responded to according to system programming or setup. Any loss of communication between the sensor and control panel will be alarmed.

12.1 Description

Ronan Liquid Sensors, Models; LS-3N.C., LS-3N.O., LS-7, LS-30 and HVA.

12.1.1 Detector Output Type: Qualitative.

12.1.2 Operating Principle: Float Switch.

12.2 Evaluation Results

The detectors listed were tested for their ability to detect a layer of liquid (hydrocarbon or water) in the interstitial space of a double wall tank and secondary containment around associated piping. The following parameters were determined:

Lower Detection Limit: The smallest product thickness the detector can reliably detect.

Specificity: Whether or not the sensor responds to various products.

Detection Time: Amount of time the detector must be exposed to product before it responds.

Fall Time: Amount of time that passes before the detector returns to its baseline reading after product is removed.

12.2.1 Compiled Test Results:

Accuracy (%)100	100
Bias*	N/A
Precision* (%)	N/A
Detection Time (hh:mm:ss)	<00:00:01
Fall Time (hh:mm:ss)	<00:00:01
Lower Detection Limit (in)	**

**See attached chart

12.2.2 Specificity Results (%):*

*These sensors will respond to any liquid which has sufficient depth and gravity to raise the float.

Test	LS-3N.C.		LS-3N.O.	
	Gasoline	Water	Gasoline	Water
Accuracy (%)	100	100	100	100
Bias*	N/A	N/A	N/A	N/A
Precision*	N/A	N/A	N/A	N/A
Detection Time (hh:mm:ss)	< 1 sec	< 1 sec	< 1 sec	< 1 sec
Fall Time (hh:mm:ss)	< 1 sec	< 1 sec	< 1 sec	< 1 sec
Lower Detection Limit (in)	1.09	0.85	0.92	0.67

Test	LS-7		HVA (Mini)	
	Gasoline	Water	Gasoline	Water
Accuracy (%)	100	100	100	100
Bias*	N/A	N/A	N/A	N/A
Precision*	N/A	N/A	N/A	N/A
Detection Time (hh:mm:ss)	< 1 sec	< 1 sec	< 1 sec	< 1 sec
Fall Time (hh:mm:ss)	< 1 sec	< 1 sec	< 1 sec	< 1 sec
Lower Detection Limit (in)	0.42	0.32	0.33	0.28

Test	LS-30 (Low)		LS-30 (High)	
	Gasoline	Water	Gasoline	Water
Accuracy (%)	100	100	100	100
Bias*	N/A	N/A	N/A	N/A
Precision*	N/A	N/A	N/A	N/A
Detection Time (hh:mm:ss)	< 1 sec	< 1 sec	< 1 sec	< 1 sec
Fall Time (hh:mm:ss)	< 1 sec	< 1 sec	< 1 sec	< 1 sec
Lower Detection Limit (in)	N/A	1.86	N/A	6.0

Table 12.1: Test Results.

LS-3N.C.			LS-3N.O.			LS-7			HVA		
Run #	Volume	Calculated Level	Run #	Volume	Calculated Level	Run #	Volume	Calculated Level	Run #	Volume	Calculated Level
1	128.0	0.9	1	100	0.67	1	40	0.34	1	44	0.29
2	127.0	0.8	2	101	0.68	2	38	0.32	2	44	0.29
3	127.0	0.8	3	101	0.68	3	38	0.32	3	42	0.27
4	127.0	0.8	4	100	0.67	4	38	0.32	4	46	0.30
5	128.0	0.9	5	100	0.67	5	38	0.32	5	43	0.28
6	127.0	0.8	6	100	0.67	6	38	0.32	6	43	0.28
Ave. =	0.9	in	Ave. =	0.67	in	Ave. =	0.32	in	Ave. =	0.28	in

LS-30 (High Level)*			LS-30 (Low Level)**		
Run #	Volume	Calculated Level	Run #	Volume	Calculated Level
1	N/A*	6.0	1	278	1.88
2	N/A	6.0	2	278	1.88
3	N/A	6.0	3	272	1.84
4	N/A	6.0	4	274	1.85
5	N/A	6.0	5	276	1.87
6	N/A	6.0	6	275	1.86
Ave. =	6.0	in	Ave. =	1.86	in

Sensor No.	Description
LS-3N.C.	Vertical Liquid Sensor
LS-3N.O.	Reservoir Sensor (Liquid Loss)
LS-7	Horizontal Liquid Sensor
LS-30	Dual Reservoir Sensor Liquid Loss/Gain
HVA	Mini Vertical Liquid Sensor

* Alarm occurs when liquid level exceeds 6 in from bottom of probe.
** Alarm occurs when liquid level is below 1.86 in.

Table 12.2: Water Tests.

LS-3N.C.			LS-3N.O.			LS-7			HVA		
Run #	Volume	Calculated Level	Run #	Volume	Calculated Level	Run #	Volume	Calculated Level	Run #	Volume	Calculated Level
1	162	1.08	1	136	0.91	1	51	0.43	1	50	0.32
2	163	1.09	2	137	0.92	2	51	0.43	2	52	0.34
3	162	1.08	3	136	0.91	3	50	0.42	3	52	0.34
4	162	1.08	4	137	0.92	4	50	0.42	4	51	0.33
5	162	1.08	5	137	0.92	5	50	0.42	5	51	0.33
6	163	1.09	6	137	0.92	6	50	0.42	6	52	0.34
Ave. =	1.09	in	Ave. =	0.91	in	Ave. =	0.43	in	Ave. =	0.33	in

LS-30 (High Level)**			LS-30 (Low Level)**		
Run #	Volume	Calculated Level	Run #	Volume	Calculated Level
1	**	**	1	**	**
2	**	**	2	**	**
3	**	**	3	**	**
4	**	**	4	**	**
5	**	**	5	**	**
6	**	**	6	**	**
Ave. =	6.0	in	Ave. =	1.86	in

Sensor No.	Description
LS-3N.C.	Vertical Liquid Sensor
LS-3N.O.	Reservoir Sensor (Liquid Loss)
LS-7	Horizontal Liquid Sensor
LS-30	Dual Reservoir Sensor Liquid Loss/Gain
HVA	Mini Vertical Liquid Sensor

** Tests conducted on LS-30 with gasoline.

Table 12.3: Gasoline Tests.

RONAN ENGINEERING COMPANY
21200 Oxnard Street
Woodland Hills
California 91367 U.S.A.
(818) 883-5211
(800) 327-6626
FAX (818) 992-6435

RONAN ENGINEERING LIMITED U.K.
1 Tilley Road
Crowther Industrial Estate
Washington, Tyne and Wear
United Kingdom, NE38-OEA
(191) 416-1689
FAX (191) 416-5856

RONAN ENGINEERING LIMITED
32 Bermondsey Road
Toronto, Ontario
Canada M4B1Z5
(416) 752-0310
FAX (416) 752-8072

RONAN ENGINEERING PTY. LTD.
Unit 10, 8 Leighton Place
Hornsby, N.S.W. 2077
Australia
(02) 477-7344
FAX (02) 477-6151