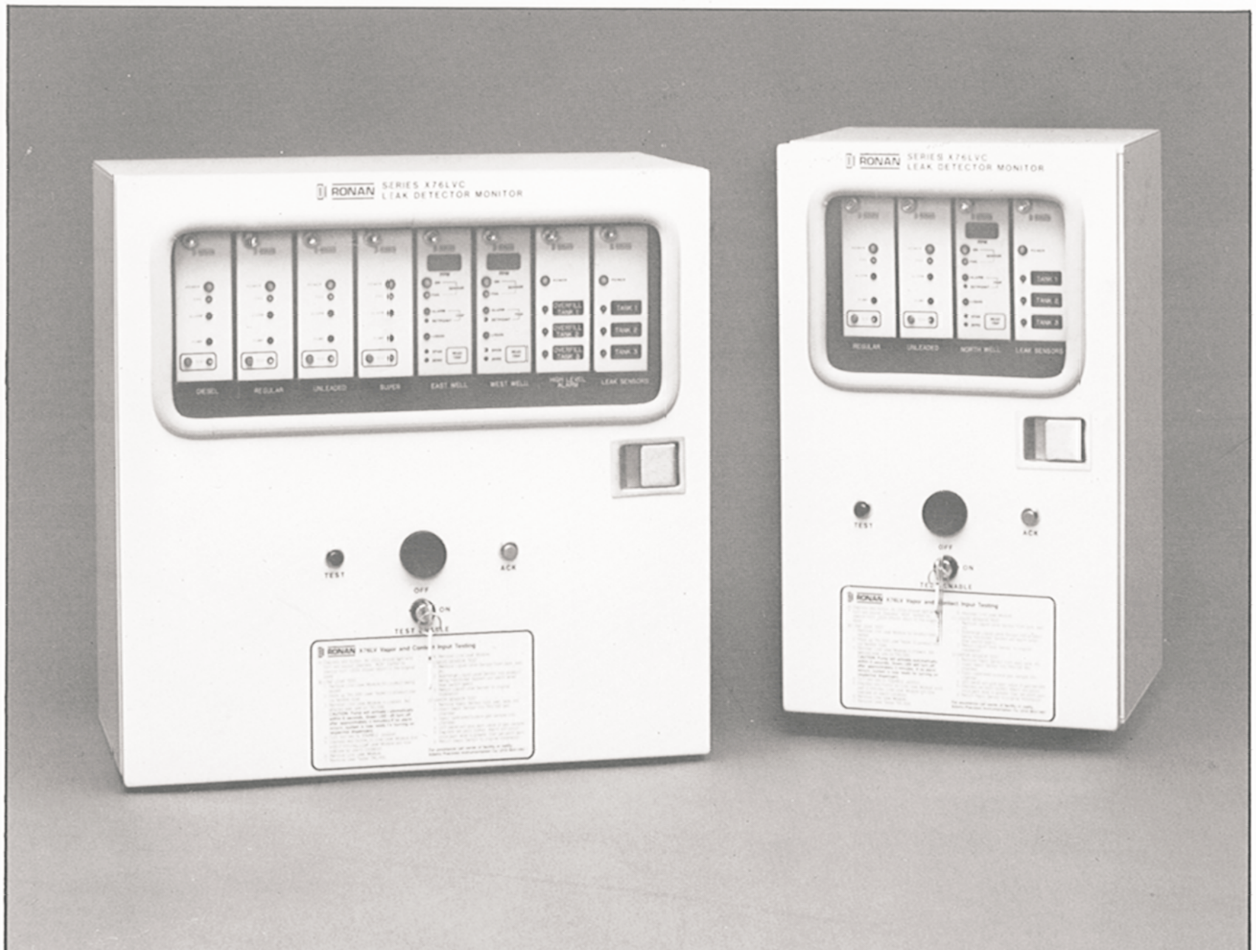
Instructions and Operating Manual

SERIES X76LVC

LEAK DETECTOR MONITOR SYSTEM



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Warranty: Ronan 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 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 Model X76LVC Series Leak Detectors provide the most technologically advanced monitoring system for today's underground tank and piping installations. Each system is capable of monitoring four different levels of measurements for leak detection.

1. Continuous monitoring of pressurized supply piping to alarm and shutdown systems if leak rates of 0.05 GPH occur.
2. Liquid level sensing to provide alarm and shutdown if liquid enters the annular space of double-wall tanks, secondary contained piping, leaks into manholes or caisson compartments and high liquid level to prevent overfilling of tanks.
3. Hydrostatic type and pressure sensing of the annular space of double-wall tanks with alarm if loss of pressure or liquid level is detected. This form of monitoring will indicate a leak in either the inner or outer wall of the tank.
4. Vapor sensing using digital readings in ppm on all sensors monitoring vadose and ground water type wells or may be applied to any secondary type of containment. The system is designed to have plug-in monitoring modules with individual sensors in the piping, well and tank annular spaces and secondary containment. This feature allows the simple addition of sensors and modules and maintains complete independence for each sensor for servicing, without affecting the rest of the system.

2.0 INTRINSIC SAFETY

Hazardous atmospheric mixtures include all explosive or ignitable air mixtures involving gases or vapors at an atmospheric pressure and with ambient temperatures between zero and 120°F. The order of ignitability of materials generally corresponds to the National Electrical 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 contact inputs, must meet requirements of isolation to avoid any failures that may occur in the system.

CAUTION: The X76LVC Monitor enclosure must be mounted in a general purpose area as defined by the National Electrical Code.

Power input 115 VAC ±10%, 60 Hz.

All wiring to sensors (i.e. Level Switches LS-3, LS-7, LS-10, LS-20 and Pressure Switch JT-2), must be installed in separate dedicated conduit to comply with the intrinsically safe requirements.

All wiring to JT-H1, JT-H2, HV and HVFS must be run in Class I, Division 1 conduit or be used with approved barriers, if general purpose wiring is required (i.e. buriable cables).

All wiring to auxiliary contacts must be kept separate from the input wiring.

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, pushbuttons and relays to be used with the X76LVC System.

The X76LVC chassis must be properly grounded including the intrinsically safe ground.

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

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 pushbuttons, horn relays, horns and bells, to assure that they are of an appropriate electrical classification.

3.1 Alarm Contact Inputs

Each sensor contact of the intrinsically safe system must be brought to the I.S. barrier inputs as a discrete pair of wires. The common practice of running one wire to many field 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 than 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 Vapor Sensor Inputs

The Vapor Sensors Model HV and HVFS are approved by Underwriters Laboratory for installation in Class I, Division 1, Group B, C and D hazardous areas. Wiring to these sensors must be done in accordance with the drawings detailed in this manual and must be kept in separate Class I, Division 1 conduit.

3.3 Optional External Pushbutton Wiring

Each pushbutton input terminal of the monitor should be wired to one side of the normally open contact of an external pushbutton, the other side being connected to V+. Ordinarily, this will preclude using the spare poles of the external pushbuttons for any auxiliary function.

The most frequently encountered wiring error in pushbutton wiring is the use of normally closed, rather than normally open, pushbutton contacts. This, of course, has the same effect as having the operator pressing the pushbutton continuously. The resulting confusion is often interpreted to be a major system malfunction.

3.4 Optional External Horn and Bell Wiring

If electronic horns are used as the system audibles, 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+ of the power source.

Systems using conventional vibrator-type horns and bells must use an interposing relay Model KV-700 or X53-1014.

3.5 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 barrier input terminals as indicated on the wiring diagram included in the manual.

3.6 Auxiliary Outputs

The wiring to the auxiliary transistor switch outputs is general purpose and must be kept separate from intrinsically safe wiring in the enclosures.

3.7 Power Supply Wiring

The 115 VAC source wiring must be connected to the terminals identified with "H," "N" and "G". This wiring must be kept separate from the I.S. wiring.

4.0 GENERAL INSTALLATION— SERIES X76LVC LEAK DETECTOR MONITOR SYSTEM

The Series X76LVC Leak Detector Monitor is available in a NEMA Type 1 enclosure equipped with plug-in modules for contact inputs, vapor sensor inputs and line leak monitors. All are accessible through the front door. Clearly indentified wire terminations located on the internal panel provide ease of wiring for sensors and power connections.

4.1 Field Wiring

The system's field wiring is shown in schematic X76D267 or X76D270 and **must be followed**

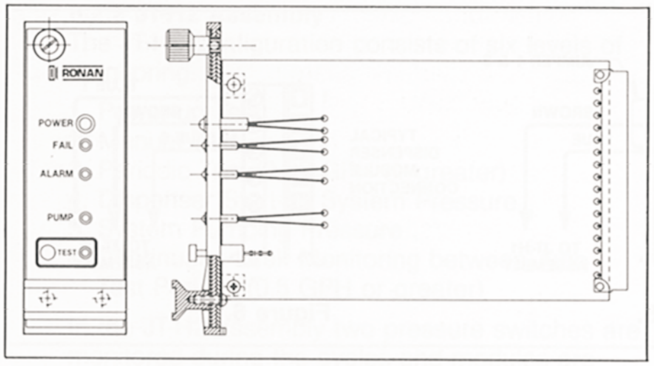


Figure 1. X76DM-4 Module Assembly

explicitly. The system requires 115 VAC, 60 Hz, supply voltage, terminated to the appropriate terminals. All field wires of the sensors to be monitored (e.g., tank levels) that are in a Class I, Division 1 area, are to be terminated to the input of the I.S. barrier chassis.

5.0 TROUBLESHOOTING/REPAIR

5.1 X76LVC Leak Detector Monitor System

CAUTION: The system's internal terminations are powered by 115 VAC. Touching these terminals can cause electrical shock.

The Series X76LVC Leak Detector Monitor System is designed for trouble-free operation and should not require troubleshooting in the field. Since the system consists of individual plug-in modules, the initial repair should be limited to the exchange of modules and verification of proper wiring of all incoming field connections.

6.0 X76DM-4 LINE-LEAK MONITORS

6.1 General Description

The Ronan X76DM-4 Line-Leak Monitor Module is designed around state of the art microprocessor technology, reducing the number of components while guaranteeing trouble-free operation. The module is standardized to two types of distinct operation (JT-H1 and JT-H2, explained later). Each module is powered by an on-board 115 VAC stepdown transformer and converted to DC regulated voltages for internal supply requirements.

All inputs and outputs are optically isolated for noise free operation and protection from damage caused by spurious high voltage surges to the internal circuitry.

An individual watchdog timer monitors the operational status of the microprocessor and will restart the microprocessor in case of malfunctions caused by spurious noise. The total design integration ensures reliable and trouble-free operation.

6.2 Operation

Generally there are two types of module configurations.

1. X76DM-4A (used with JT-H1 input assembly).
2. X76DM-4B (used with JT-H2 input assembly).

In selecting the manner of dispenser operation, the type of pressure switch assembly and the station pump should be considered.

If a JT-H1 pressure switch assembly is used, an X76DM-4A leak monitoring module must be

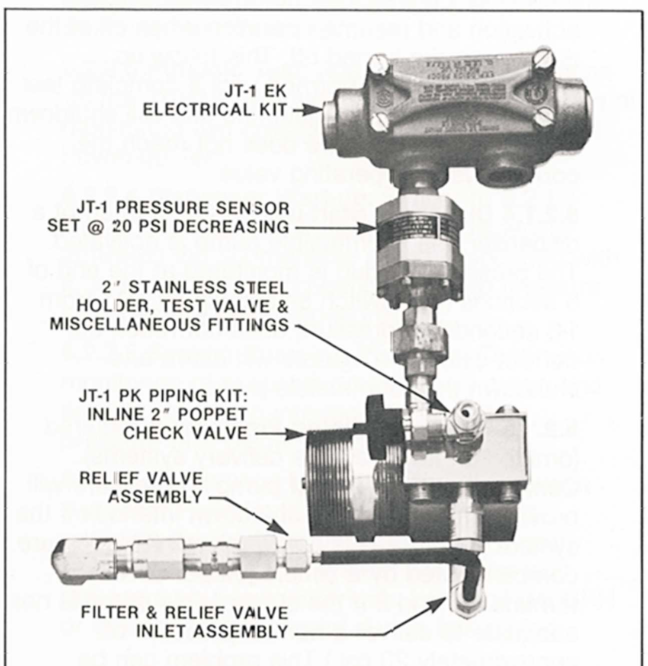


Figure 2. JT-H1 Pipeline Leak Sensor Assembly

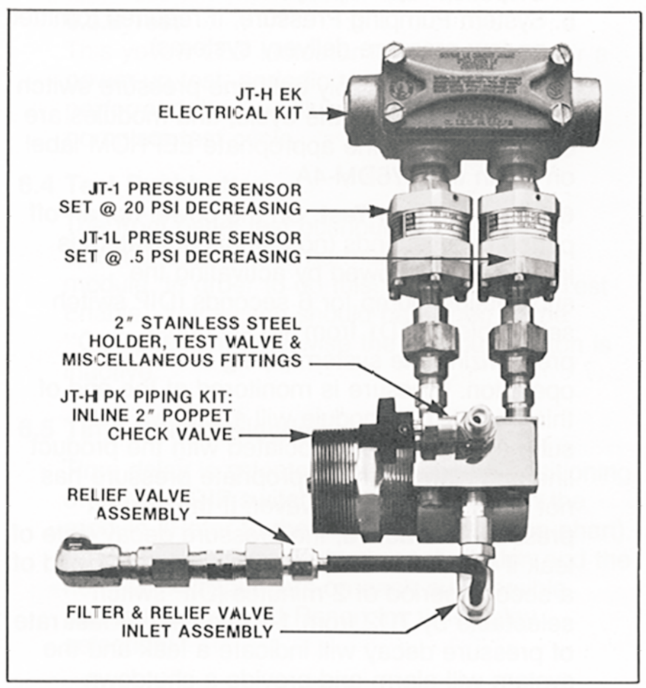


Figure 3. JT-H2 Pipeline Leak Sensor Assembly

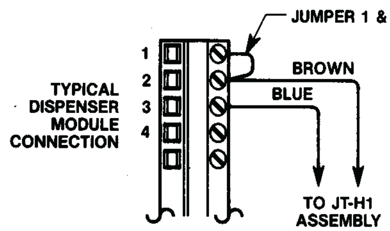


Figure 4.

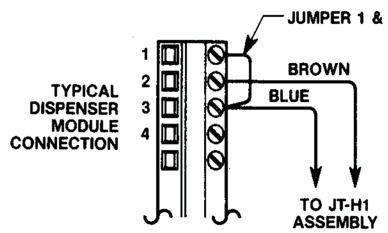


Figure 5.

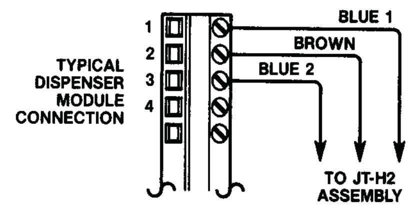


Figure 6.

used. To overcome the problem of low-power pump systems in some old stations where shutdown might occur on maximum dispenser loads, use the wiring configuration shown in Figure 4. On stations with high-power pump systems use the wiring configuration shown in Figure 5.

If a JT-H2 pressure switch assembly is used, an X76DM-4B leak monitoring module must be used. To overcome the problem of a low-power pump system in some old stations where shutdown might occur on maximum dispenser loads, use an X76DM-4B2 module with the wiring configuration shown in Figure 6. On stations with a high-power pump system, use an X76DM-4B1 module with the wiring configuration shown in Figure 6.

6.2.1 JT-H1 Input Assembly

The JT-H1 configuration consists of five levels of monitoring.

1. Power-up Test
2. Manual Test
3. Periodic Test (0.05 GPH or greater)
4. Dispenser Start-up System Pressure
5. System Pumping Pressure, if required (omitted on low pressure delivery systems).

In the JT-H1 assembly only one pressure switch is monitored during the cycle, and modules are distinguished by the appropriate EEPROM label on U2 in the X76DM-4A.

6.2.1.1 Power-up Test: On the power-up, an off period of 8 seconds (no outputs activated) is immediately followed by activating the submersible pump for 6 seconds (DIP switch selectable by TD1 from 1-6 seconds), pressurizing the system piping to normal operation. Pressure is monitored at the end of this period. The module will shutdown the submersible pump associated with the product line and alarm if the appropriate pressure has not been reached. However, if the correct pressure is reached, the pressure decay (rate of leak if there is a leak) is monitored at the end of a second period of 2 minutes (DIP switch selectable by TD2 from 1-5 minutes). A fast rate of pressure decay will indicate a leak and the system will alarm and provide a shutdown interlock to prevent the starting of the submersible pump associated with the product line being monitored.

6.2.1.2 Manual Test: To activate a manual test, the front "Test Enable" key switch should be turned to the "On" position before pressing the front panel test pushbutton on the selected Line-leak Monitor.

This feature is normally used to test a product line for leaks, as well as initiating recovery from a prior shutdown or lockout condition.

This operation is similar to the power-up test except there is no initial 8 seconds off-time. Any dispenser operation would stop the manual test permanently until a second manual test is performed or activated when all of the dispensers are turned off.

6.2.1.3 Periodic Test: This is an automatic test performed by the system every 30 minutes. This feature is similar to manual test, monitoring pressure build-up in lines and pipes as well as the pressure decay measurement in the product line. The most distinct characteristics of a periodic test is that it will restart from the beginning if it was interrupted by a dispenser activation and resume operation when all of the dispensers are turned off. This follow-up characteristic is performed until a complete test operation is fulfilled. Again, the unit will shutdown or alarm if the pressure does not reach the correct system operating value.

6.2.1.4 Dispenser Start-up: On the start-up of a dispenser, the submersible pump is activated. The pressure buildup is monitored at the end of 6 seconds (DIP switch selectable by TD1 from 1-6 seconds). If pressure does not reach the correct value, the module will alarm and shutdown the submersible pump.

6.2.1.5 System Pumping Pressure: If required (omitted on low pressure delivery systems). Continuous monitoring of pumping pressure will provide an alarm and a shutdown interlock if the system pressure falls below 20 psi. (This feature can be deleted by a simple jumper between terminals 1 and 2 if the submersible pump is not adequate to deliver a normal pressure of approximately 20 psi.) This problem can be encountered on older stations with lower horse power pumps supplying several dispensers.

6.2.2 JT-H2 Assembly
The JT-H2 configuration consists of six levels of monitoring.

1. Power-up Test
2. Manual Test
3. Periodic Test (0.05 GPH or greater)
4. Dispenser Start-up System Pressure
5. System Pumping Pressure
6. Continuous Leak Monitoring between Auto-Test Periods (0.5 GPH or greater)

In the JT-H2 assembly two pressure switches are monitored during the cycles and modules are distinguished by the appropriate EEPROM label on U2 in the X76DM-4 (see paragraph 6.2).

6.2.2.1 Power-up Test: A power-up off period of 8 seconds (no outputs activated) is immediately followed by activating the submersible pump for 6 seconds (DIP switch selectable by TD1 from 1-6 seconds), pressurizing the system piping to normal operation. Pressure is monitored at the end of this period by the high pressure switch in the JT-H2 assembly. The module will shutdown the submersible pump associated with the product line and alarm if appropriate pressure has not been reached. However, if the correct pressure is reached, the submersible pump is shut-down normally and the pressure decay (rate of leak if there is a small leak) is monitored at the end of a second period of 2 minutes (DIP switch selectable by TD2 from 1-5 minutes) by the high pressure switch in the JT-H2 sensor assembly. A fast rate of decay would indicate a leak and the system will alarm and provide a shutdown interlock on the submersible pump associated with the product line being monitored.

6.2.2.2 Manual Test: A similar operation as the JT-H1 Power-up Test except that two pressure switches are monitored.

6.2.2.3 Periodic Test: Again, a similar operation as the JT-H1 Power-up Test with the exception of monitoring two pressure switches as in 6.2.2.1 Power-up Test.

6.2.2.4 Dispenser Start-up: Similar to 6.2.1.4 Dispenser Start-up operation. Any dispenser activates the submersible pump associated with it. In the JT-H2 configuration, the two pressure switches are being monitored.

6.2.2.5 System Pumping Pressure: Continuous monitoring of pumping pressure will alarm and provide shutdown interlock if the system pressure falls below 20 psi.

6.2.2.6 Continuous Leak Monitoring Between Auto-test Periods: In the pumping or non-pumping mode, if the pressure in the system falls below .5 psi, the system will alarm and provide a shutdown interlock. Leaks of 0.5 GPH or greater are monitored during this period.

6.3 Front Panel Status Indicators

There are five status indicators on the front panel of each X76DM-4 module. (Power, Fail, Alarm, Pump and Test).

6.3.1 Power
The green LED indicates when a module is plugged into the system and the 115 VAC power is turned on. This indication is taken from the output of the voltage regulator on the module. A failure of indication implies problems in several areas.

1. No power to the modules.
2. Faulty transformer.
3. Faulty voltage regulator.

In all cases, please contact the factory or an authorized service center.

6.3.2 Fail
This amber indicator turns on if the on-board microprocessor fails to operate. Unplug the module and plug it back into the system. If the probelm still exists, consult the factory or an authorized service center.

6.3.3 Alarm
This flashing red LED indicates shutdown of the submersible pump or low system pressure associated with that module. An audible buzzer is also turned on and may be silenced by the system's acknowledge pushbutton.

6.3.4 Pump
The small green LED indicates a running submersible pump. This is a true indication of a running pump. The signal output from the submersible pump must be connected to the module in order to obtain a proper indication of a running pump.

6.3.5 Test
This yellow LED indicator turns on whenever a power-up test, periodic test or manual test is performed. It stays illuminated during the complete test cycle.

6.4 Test Pushbutton

The front panel test pushbutton allows the operator to exercise normal tests on that module. In order to do this, the system's "Test Enable" key switch should be turned to the "On" position, otherwise the test pushbutton is inactive.

6.5 Time Delay Selection

Time delay is selected by appropriate positioning of the two DIP switches TD1 and TD2 on the module. (Refer to the time delay selection chart). Basically it is dependent on each station and the number of dispensers on each submersible pump. (Consult API Ronan for time delay selection).

Table I. Time Delay Selection

TD1	TD2	Switch		
		1	2	3
1.0 Sec.	1.0 Min.	Off	Off	Off
2.0 Sec.	1.5 Min.	On	Off	Off
2.5 Sec.	2.0 Min.	Off	On	Off
3.0 Sec.	2.5 Min.	On	On	Off
3.5 Sec.	3.0 Min.	Off	Off	On
4.0 Sec.	3.5 Min.	On	Off	On
5.0 Sec.	4.5 Min.	Off	On	On
6.0 Sec.	5.0 Min.	On	On	On

TD1 - Time setting for the submersible pump to run on Start-up, Power-up and Auto-test commands.

TD2 - Time period to test for leaks after piping pressurized by submersible pump.
Also time period to test for leaks after submersible pumps are normally turned off.

TD3 - Time period between TD1 ending and TD2 initiation (fixed in module's software).

TD4 - Time period between Auto-test for leaks. *(30 minutes fixed in module's software).

*Can be adjusted in factory, if required.

7.0 X76HVD DIGITAL HYDROCARBON VAPOR MODULE WITH HV OR HVFS SENSOR

The Ronan X76HVD-4-2.5 and X76HVD-4-20 Modules provide direct reading capability of hydrocarbon vapor concentrations in vadose or ground water monitoring wells. The X76HVD Module utilizes a passive or aspirated solid state diffusion sensor. The sensor provides an output proportional to actual vapor concentrations. The X76HVD-4-2.5 Module has a range of 0-2,500 ppm. This unit can be calibrated to detect hydrocarbon products with very high flash points, i.e. waste oil, diesel, JP-5, etc. The X76HVD-4-20 Module has a range of 0-20,000 ppm. This unit can be calibrated to detect hydrocarbon products with very low flash points, ie. all major gasoline types: methanol, benzene, toluene, etc. Each module has an adjustable setpoint to provide an audible and visual alarm should the ppm reading increase above the desired limit. The setpoint is read via the LED display panel.

The X76HVD Module contains an amber indicator to indicate failure of the vapor sensor HV or HVFS, plus a red alarm LED that flashes when the ppm exceeds the alarm trip setting, including the sounding of the audible device. A dual-color indicator is provided to illuminate green to indicate "Power-on", and red to show a wiring failure, such as a short or open wiring and an error in wiring involving incorrect polarity. These conditions will also activate the audible device. Depressing the acknowledge pushbutton turns off the horn and the LED remains flashing. On return to normal of the vapor ppm level, the flashing red alarm LED turns off. Potentiometers for the zero and span calibration of the vapor sensor are front accessible using the method of calibration as outlined in the instruction manual.

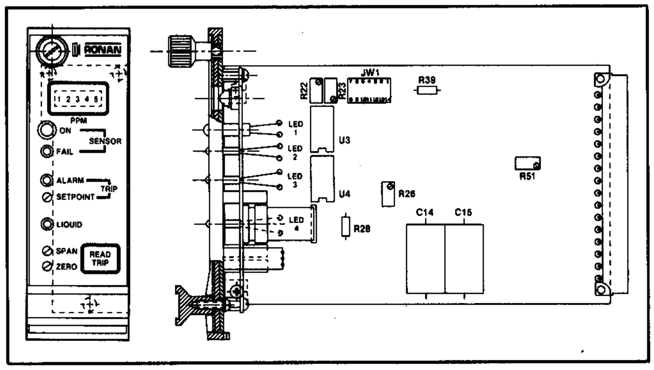


Figure 7. X76HVD-4 Module Assembly

8.0 X76HVD MODULE CALIBRATION

The Ronan X76HVD Vapor Sensor Module is factory calibrated. The module should be calibrated periodically due to sensor characteristic changes over time. The X76HVD Vapor Sensor Module consists of a main module and a digital display module. The following procedures should be followed carefully when calibration is needed.

8.1 Calibration Setup

Before calibrating the X76 Module, the unit should be plugged into the chassis using an optional Ronan extender card, in order to have access to internal adjustments. The unit must then have its vapor sensor connected properly (see Figure 8), in a normal atmosphere and powered for approximately ten minutes.

8.2 Output Current Calibration

The X76 Module provides an output current of 255 ±1 milliamperes to the vapor sensor. The three-wire connection, as shown in Figure 9, should be interrupted at the red lead with a milliammeter. The current to the sensor can be calibrated to 255 mA by adjusting potentiometer R51 on the module (see Figure 7).

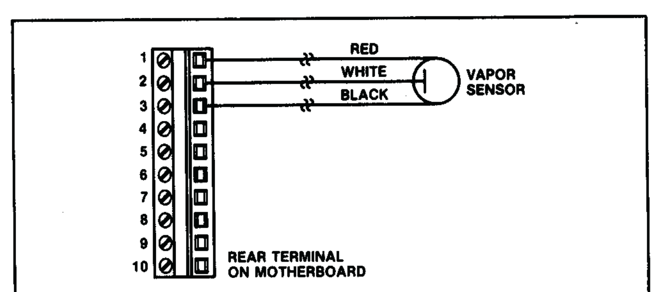


Figure 8. Vapor Sensor Connection

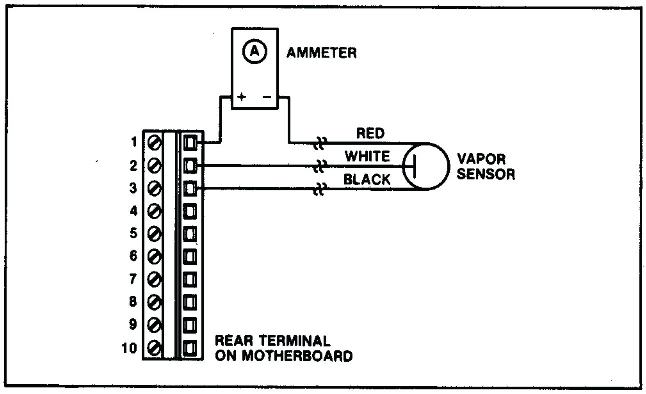


Figure 9. Vapor Sensor Connection with Ammeter

8.3 Liquid Sensor Voltage Calibration

NOTE: For voltage measurements, it is recommended that a small, retractable probe tip device be clipped to the components specified, with great care, to avoid damaging adjacent components. The negative [−] lead of a digital voltmeter (DVM) should be connected to the junction of C14 and C15 (toward the center of the module) where the silk screen C14 is positioned. The [+] lead is connected as required by the following steps.

The liquid sensor is calibrated to 2.50 ±.01 volts, measured at pin 3 of U4 on the main module. This voltage can be calibrated to 2.50 volts by adjusting potentiometer R26 on the main module.

8.4 Main Module Digital to Analog Converter Zero/Maximum Voltage

Before calibrating the vapor module using actual vapor, the digital to analog (D/A) circuit should be checked/adjusted to ensure proper response as follows:

On the main module, signal voltage at the output of the D/A converter is sent via a ribbon cable to the display module, which displays the hydrocarbon vapor concentration in parts per million (ppm).

8.4.1 Zero Adjustment

The main module is calibrated to have 0.00 ±.01 volt at R39. To simulate a real-time occurence of 0.00 volt at R39, potentiometer R11 (marked "SETPOINT" on front panel) should be adjusted (press the READ TRIP button to view), until R39 is 0.00 ±.01 volt. Measure with [+] probe at R39, at the lead which is next to the silk screen identifier for R39.

With the READ TRIP button pressed and R39 at 0.00 volt, the voltage at R28 should be adjusted to 0.00 volt by adjusting potentiometer R22. Measure with [+] probe at either end of 1 ohm resistor, R28, adjacent to Black Connector J1.

8.4.2 Maximum Adjustment

The main module is calibrated to have 2.00 ±.01 volt at R39. To simulate a real-time occurence of 2.00 volts at R39, SETPOINT should be adjusted (press the READ TRIP button to view), until R39 is 2.00 ±.01 volt. Measure at R39 as in paragraph 8.4.1.

With the READ TRIP button pressed and R39 at 2.00 volts, the voltage at R28 should be adjusted to 2.00 volts by adjusting potentiometer R23. Measure at R28 as above. The main module is now ready for calibration with a vapor sensor using actual vapor.

9.0 FRONT PANEL CALIBRATION ADJUSTMENTS

Before proceeding, verify that the ribbon cable from the X76 Module is connected to the calibrated display module and that the main module is directly plugged into the chassis without an extender card.

The front panel adjustments (ZERO, SPAN and SETPOINT) are designed for easy access. These potentiometers are factory calibrated, but may need periodic adjustments due to normal aging of the sensor element.

No two sensors are exactly alike. Each sensor may have a slightly different sensitivity, which the X76 Module compensates for through the ZERO and SPAN adjustments.

9.1 Front Panel ZERO Adjustment

The front panel ZERO adjustment is calibrated from the factory, but will need adjustment on a periodic basis. This is necessary because the vapor sensor will change slightly through normal use.

To verify the zero calibration, the display should read close to zero, without any introduced hydrocarbons present. Due to possible small impurities in the atmosphere, true zero may not be obtainable. To calibrate the display, adjust the panel ZERO adjustment until a reading close to zero is displayed. Any value with a decimal is not zero and may not be near zero (it is a negative voltage). Be certain that the display is free of a decimal.

9.2 Front Panel SPAN Adjustment

The front panel SPAN adjustment is pre-calibrated, but may also need adjustment on a periodic basis.

This adjustment is achieved by vapor testing. The vapor sensor must be installed in a Ronan test chamber and exposed to the full span concentration of butane gas. Once the sensor is exposed, the module display will be ready for calibration in approximately ten minutes.

The volume of the chamber is 1 liter (1,000cc). The injection of each cc of butane gas will simulate 1,000 ppm of butane vapor.

To calibrate, the front panel SPAN adjustment may be turned until the display reads slightly below the full span value (e.g. 20,000 ppm should be calibrated to 19,500 ppm).

9.3 Front Panel SETPOINT Adjustment

The front panel SETPOINT adjustment is factory calibrated to 25% of the full range concentration. The adjustment can easily be changed to any value within the full range concentration by turning the potentiometer until the appropriate ppm reading is obtained. To calibrate the setpoint, the READ TRIP button must be pressed.

10.0 FUNCTIONAL TEST

The X76 Module can be tested by introduction of butane gas to an active X76 System.

10.1 Test Setup

The X76 Module must be powered for approximately ten minutes and the vapor sensor must be mounted in a Ronan test chamber (presently filled with normal atmosphere), prior to test (see Figure 10).

10.2 Vapor Test

The X76 Module can be tested by introducing the proper amount of butane gas inside the Ronan test chamber. The butane gas must be pure N-BUTANE (99.5% purity or better) and injected with a gas tight syringe. The amount of gas injected depends on the span of the module. 1 cc of butane gas corresponds to 1,000 ppm on the module display.

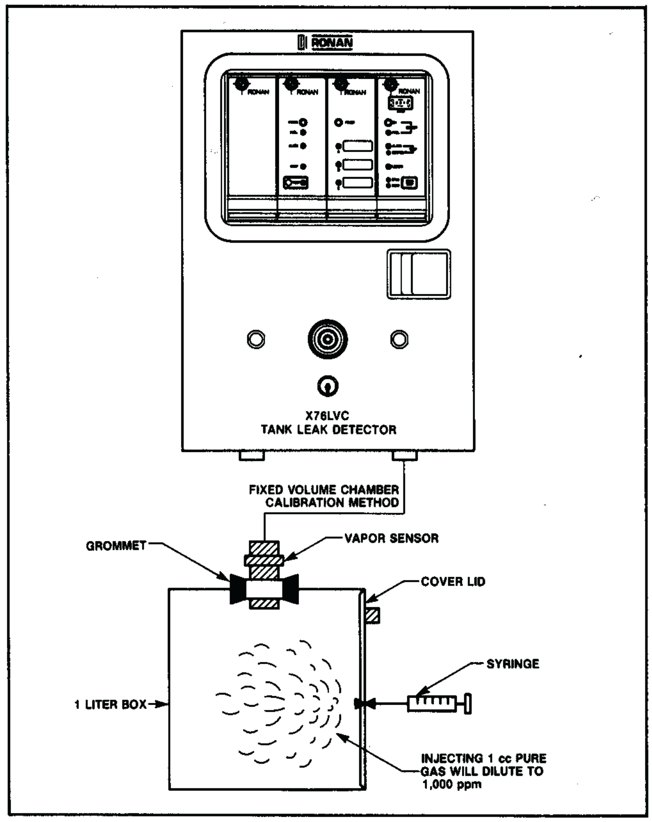


Figure 10. Vapor Sensor Calibration Method

10.3 Alarm Test

The X76 Moldule should trigger the blinking "Alarm" LED as well as the master module horn when the measured ppm level exceeds the desired setpoint value. The horn can be silenced by pressing the ACKnowledge pushbutton. The

Table II. Model X76LVC Gas ppm Calibration Factors

Calibration Source	Operating Gas	100% LEL in ppm	25% LEL in ppm	Conversion Factor	100% LEL X76HVD Display	25% LEL X76HVD Display
Butane Calibrate 0-20,000 ppm	Butane	19,000	4,750	1.0	19,000	4,750
	Propane	22,000	5,500	.74	16,280	4,070
	Gasoline	14,000	3,500	1.40	19,600	4,900
	Methanol	67,000	16,750	.23	15,410	3,853
	Hexane	11,000	2,750	1.27	13,970	3,493
	Acetone	26,000	6,500	1.05	27,300	6,825
	Alcohol	33,000	8,250	.60	19,800	4,950
	Diesel	N/A	N/A	.55	N/A	N/A
	Waste Oil	N/A	N/A	.20	N/A	N/A
Methane (Natural Gas Swamp Gas) Calibrate 0-20,000 ppm	Natural Gas	50,000	12,500	1.0	50,000	12,500

Note: To calibrate for operating gas ppm reading:

1. Inject 20 cc of butane into chamber and adjust SPAN for 19,500 ppm.
2. Expose sensor to operating gas sample.
3. Use conversion factor in Table II above to obtain sample gas equivalent ppm level.
4. For accurate diesel and waste oil conversion submit samples for evaluation.

LED will stop blinking only when the ppm value falls below the setpoint.

10.4 Sensor Integrity

The X76 Module sensor "Fail" LED (amber) can be tested by momentarily shorting together pins 1 and 3 of the vapor sensor.

If a sensor is not connected properly, the "On" LED (green) should become red.

10.5 Liquid Sensor Test

The X76 module "Liquid" LED (red) can be tested by momentarily shorting together pins 4 and 5 of the rear connector.

10.6 TKL-1000 Gas Sample Calibration Chamber

The following chart correlates the amount of pure butane gas to be injected in the TKL-1000 test chamber to provide the respective ppm of butane in the chamber. Note the chamber volume is one liter.

Table III. Concentration for One Liter Chamber

.1 cc = 100 ppm
.2 cc = 200 ppm
.5 cc = 500 ppm
1 cc = 1,000 ppm
2 cc = 2,000 ppm
10 cc = 10,000 ppm
20 cc = 20,000 ppm

11.0 X76AM ALARM MODULE

The X76AM-4 Alarm Module provides three red alarm LEDs and a green "Power-on" indicator that monitors the status of any contact type switch. Should an abnormal condition occur, the alarm LED will turn on, flashing red, and sound an audible alarm. Pressing the ACKnowledge pushbutton will turn the horn off and change the flashing red light to a steady red. The steady red light turns off when the contact returns to normal. The X76AM-4 module is typically used to monitor liquid level sensors LS-3, LS-7, LS-10 and LS-20, or the positive pressure sensor JT-2. These sensors monitor the level of liquids or loss of pressure caused by breached secondary containment or damaged primary containment vessels.

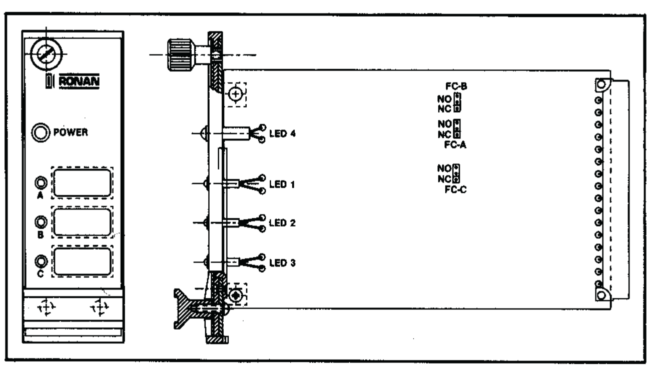


Figure 11. X76AM-4 Module Assembly

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 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.

12.0 X76/57 INTRINSIC SAFETY BARRIERS

The X76/57 I.S. Barriers are approved to provide an intrinsically safe signal from the LS-3, LS-7, LS-10, LS-20 and JT-2 sensors. Each sensor is wired via the intrinsically safe barrier per wiring schematics shown in the instruction manual. By utilizing the barrier, direct buriable type cable can be used. This can help reduce the installation costs, if desired.

12.1 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.

12.2 Mechanical Features

Input and output terminals are physically separated. The input terminal compartment has conduit knockouts, as do the output terminal compartments and power wiring.

12.3 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 Electrical 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.

Line leak monitor wiring to JT-H1 and JT-H2 must be run in conduit to meet Class I, Division 1 electrical classifications.

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

13.0 SPECIFICATIONS

13.1 System, Model X76LVC

Power: 115 VAC, 60 Hz

Power Consumption: 200 VA

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

Mounting: General purpose area; wall mount

13.2 Alarm Module X76AM-4

Field Sensor: Dry contact

Field Sensor Voltage: 12 VDC (supplied by X76LVC)

Number of Inputs: Three per module

13.3 Vapor Sensor, Model HV and HVFS

Detection Method: Solid-state diffusion type

Detectable Gases: Hydrocarbons, gasoline or diesel oil

Detectable Range: 0-20,000 ppm

Accuracy: ±5%

Response Time: Less than 15 sec to 90% full scale

Sensitivity: 5 ppm

Sensor Life: 3 years minimum

Zero Drift: Less than 5% per year

Operating Temperature: −40° to 165°F (−40° to 75°C)

Electrical Classification: Class I, Division 1, Groups B, C and D; hazardous atmosphere

Cable Length: 25 feet; 3-conductor, number 20 AWG shielded; max. length 1,000 feet

UL Listed 100826

13.4 Tank Leak Sensor, Model LS-3

Housing: 304 stainless steel

Mounting: ½" NPT male thread

Switch:
Type: Single pole, single throw N.C.
Rating: 10 VA
Float material: Buna-N
Pressure: 50 psi maximum
Leads: 20 AWG

UL Listed 48RO

13.5 Tank Leak Sensor, Model LS-7

For fiberglass tanks.

Housing Material: PVC (Geon 87241)

Liquid SpG: .70 minimum

Switch:
Type: Single pole, single throw N.C.
Rating: 10 VA
Leads: 20 AWG

UL Listed 48RO

13.6 Hydrostatic Leak Detector, Model LS-10 or LS-20

Reservoir:
Volume:
LS-10, two gallons (7.57 liters)
LS-20, four gallons (15.14 liters)
Material: Polyethylene plastic

Switch: Model LS-3
Type: Single pole, single throw N.O.
Rating: 10 VA
Float material: Buna-N
Pressure: 50 psi maximum
Leads: 20 AWG

UL Listed 48RO

13.7 Tank Leak Sensor, Model JT-2

Housing: Stainless steel, explosion proof, hermetically sealed, NEMA Types 7 and 9

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

Switch
Type: Single pole, double throw N.O. (shelf condition)
Rating: 10 VA

Electrical Connection: ½"−14 NPT with PVC-insulated 18 AWG leads

Pressure:
Connection: ¼"−18 NPT
Adjustment: ⅛" Allen wrench through port
Proof pressure: 299 psi

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

UL Listed 48RO

CSA Approved 34146

13.8 Line Leak Sensor Model JT-1 and JT-1L

Housing: Stainless steel, explosion proof, hermetically sealed, NEMA Types 7 and 9

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

Switch
Type: Single pole, double throw N.O. (shelf condition)
Rating: 10 VA

Electrical Connection: ½″ – 14 NPT with PVC-insulated 18 AWG leads

Pressure:

Connection: ¼″ – 18 NPT

Adjustment: ⅛″ Allen wrench through port

Proof pressure: 299 psi

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

UL Listed 48RO

CSA Approved 34146

14.0 ORDERING INFORMATION

X76LVC-( )-(__)-(____)-(____)

- **Range**
  A = 0-20,000 ppm plus X76HVD-4-20 Module
  B = 0-2,500 ppm plus X76HVD-4-2.5 Module
- **Type of Vapor Sensor HV or HVFS**
- **Quantity of Vapor Sensors**
- **Probe Type**
  LS-3(*) Vertical Liquid Level Sensor
  LS-7 Horizontal Liquid Level Sensor
  LS-10 or LS-20 Hydrostatic Leak Detector
  JT-2 Positive Pressure Leak Sensor
  *NO = Normally Open, NC = Normally Closed.
  NOTE: 1. All probes use Alarm Module X76AM-4 (3-Alarm/Module)
  2. Use additional listings for quantity and type of sensor, e.g. (2LS3)-(1LS10).
- **Quantity of Probes**
- **Type of Leak Sensor and Module**
  A = JT-H1 plus X76DM-4A Modules
  B = JT-H2 plus X76DM-4B(**) Modules
- **Quantity of Line Leak Sensors**
- **Chassis Size, 4 or 8 Modules**

14.1 Options

JT-1-PK	Piping Kit
JT-1-EK	Electrical Kit
JT-H-PK	Piping Kit
JT-H-EK	Electrical Kit

14.2 Spare Parts

LS-3(*)	Vertical Liquid Level Sensor
LS-7	Horizontal Liquid Level Sensor
LS-10	Hydrostatic Leak Detector
LS-20	Hydrostatic Leak Detector
JT-1	Line Leak Sensor (High)
JT-1L	Line Leak Sensor (Low)
JT-2	Tank Leak Sensor
JT-H1	Line Leak Sensor (Consisting of JT-1L with EK and PK)
JT-H2	Dual Leak Sensor (Consisting of JT-1 and JT-1L Sensors with EK and PK)
HV	Vapor Sensor (Passive)
HVFS	Vapor Sensor (Aspirating Type)
X76AM-4	Alarm Module (3-Alarm Inputs)
X76DM-4A	Dispenser Module (with JT-H1 Sensor)
X76DM-4B(**)	Dispenser Module (with JT-H2 Sensor)
X76HVD-4-20	Vapor Module (0-20,000 ppm)
X76HVD-4-2.5	Vapor Module (0-2,500 ppm)
X57SM-1	Intrinsically Safe Chassis (1 Module/3 Contact Inputs per Module
X57SM-4	Intrinsically Safe Chassis (4 Modules/3 Contact Inputs per Module)
X57-422P	I.S. Barrier (3 Inputs)
X76BP-4	Blank Plate

*NO = Normally Open, NC = Normally Closed.

**1 = High Power Pumping System
2 = Low Power Pumping System

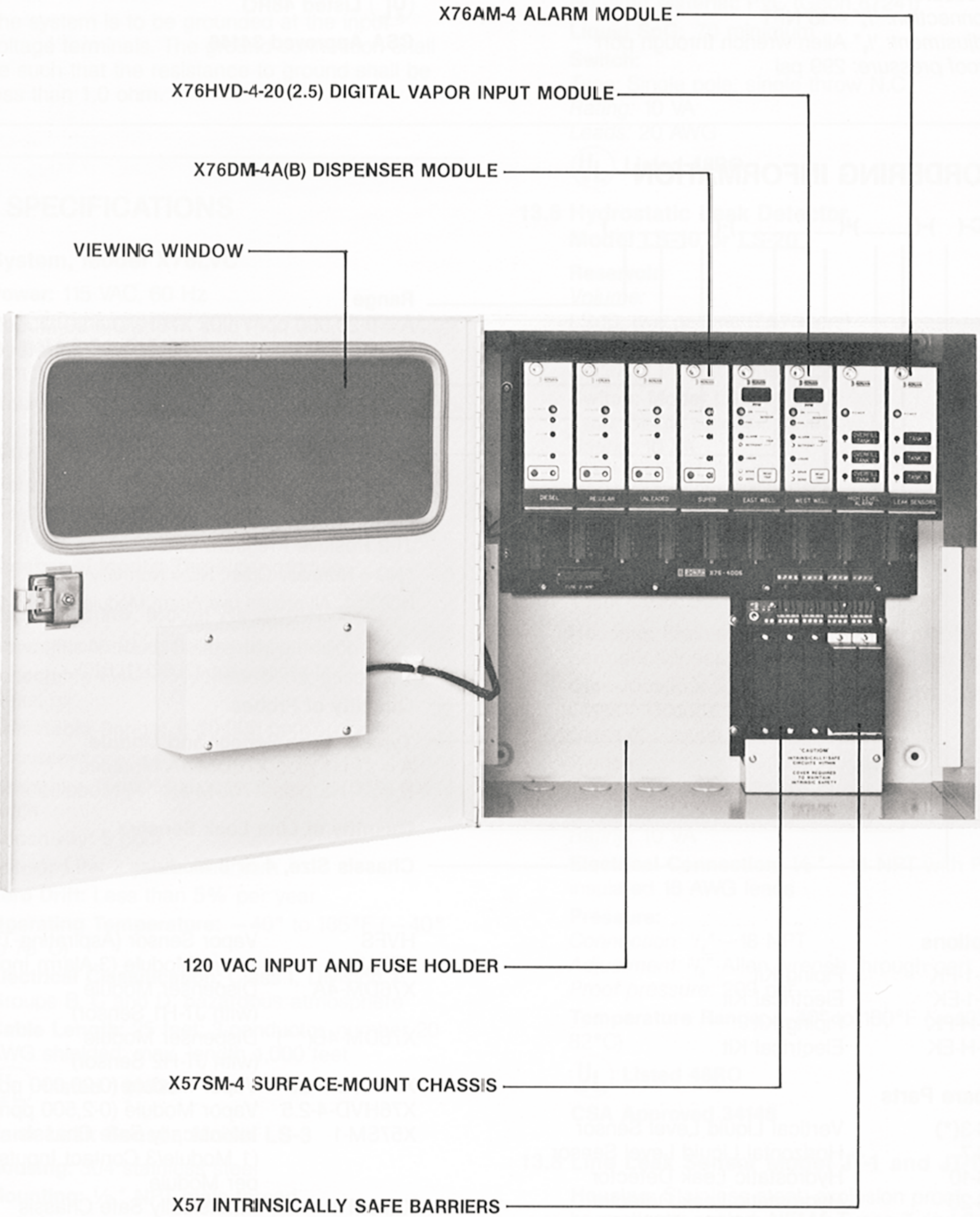
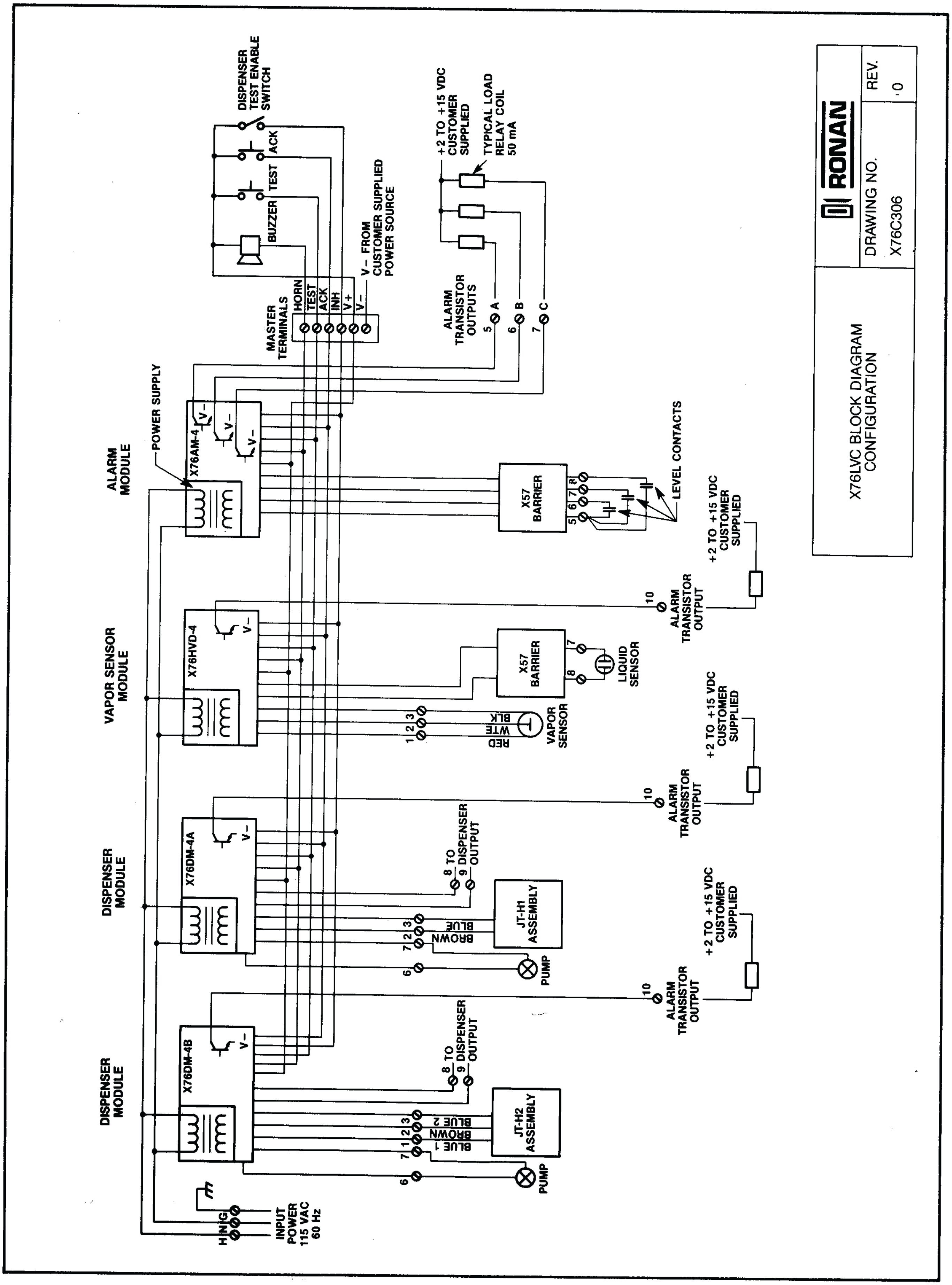
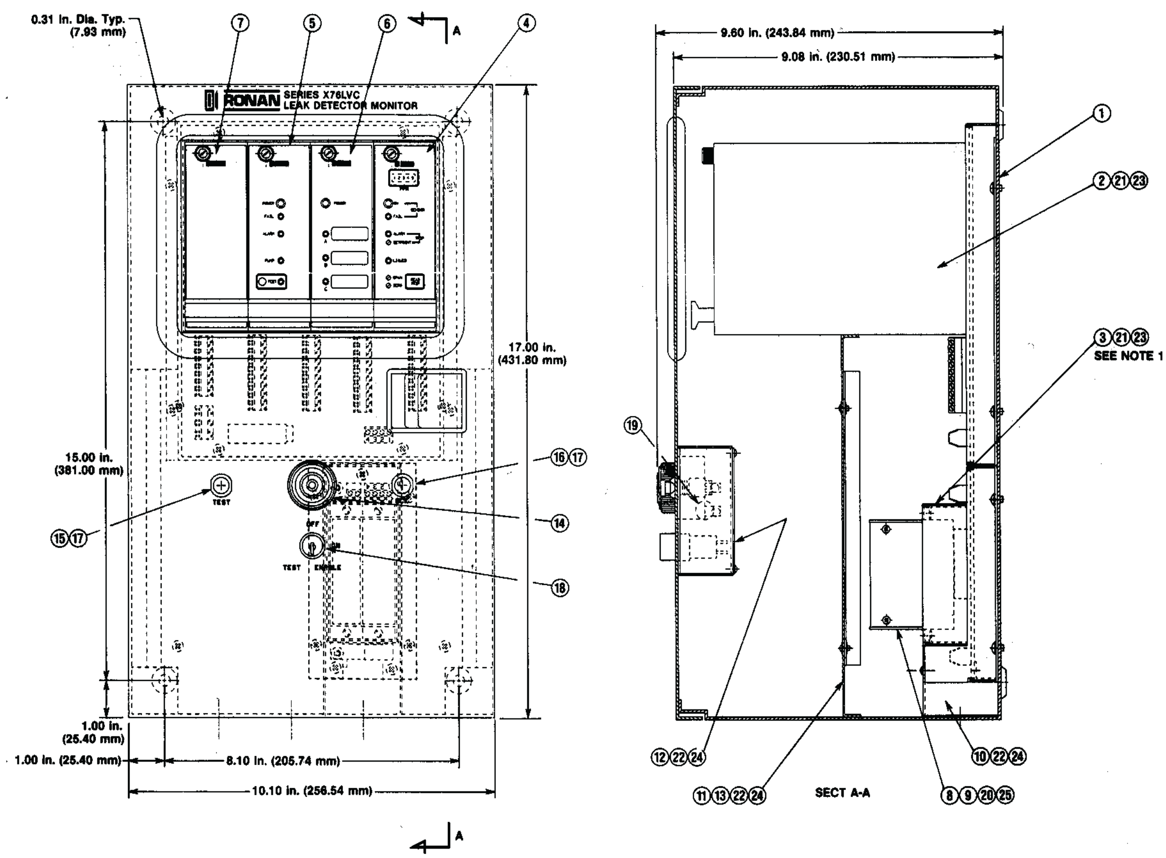


Figure 12. X76LVC-8-4B-6LS-3-2HVA Internal View


X76LVC BLOCK DIAGRAM
CONFIGURATION
RONAN
DRAWING NO.
X76C306
REV.
0
ALARM MODULE
X76AM-4
POWER SUPPLY
VAPOR SENSOR MODULE
X76HVD-4
DISPENSER MODULE
X76DM-4A
DISPENSER MODULE
X76DM-4B
MASTER TERMINALS
HORN
TEST
ACK
INH
V+
V−
V− FROM CUSTOMER SUPPLIED POWER SOURCE
BUZZER
TEST
ACK
DISPENSER TEST ENABLE SWITCH
ALARM TRANSISTOR OUTPUTS
+2 TO +15 VDC CUSTOMER SUPPLIED
TYPICAL LOAD RELAY COIL 50 mA
X57 BARRIER
LEVEL CONTACTS
LIQUID SENSOR
VAPOR SENSOR
RED
WTE
BLK
ALARM TRANSISTOR OUTPUT
TO DISPENSER OUTPUT
JT-H1 ASSEMBLY
JT-H2 ASSEMBLY
BLUE
BROWN
BLUE 1
BLUE 2
PUMP
INPUT POWER 115 VAC 60 Hz
H
N
G

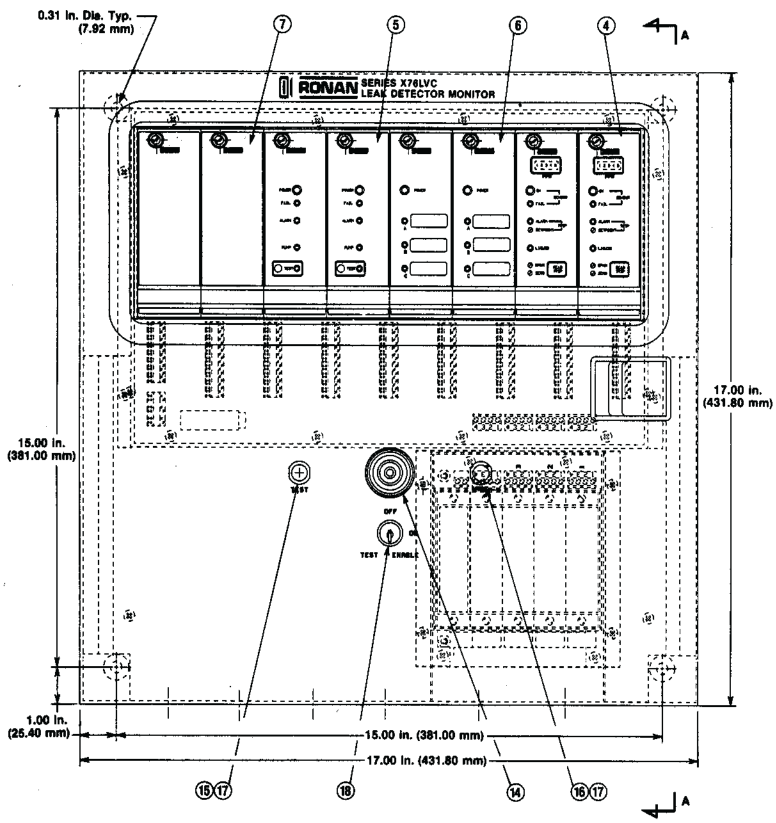


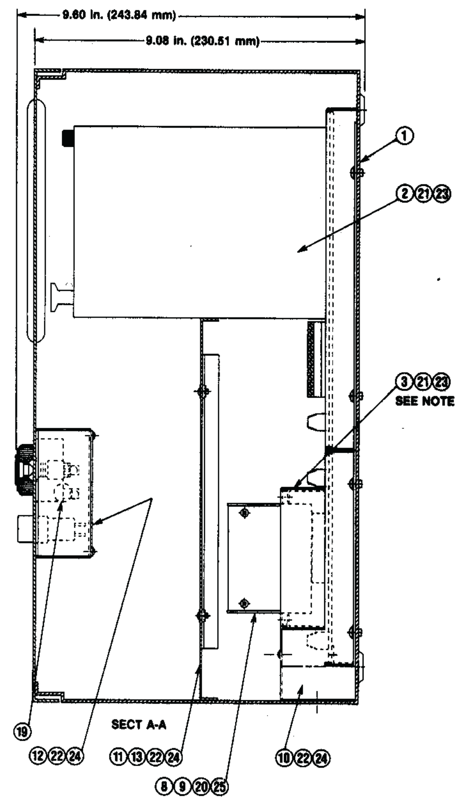
List of Materials				
Item	**Qty.**	**Part No.**	**Description**	**Spec**
1	1	X76D271-1	Enclosure Assy.	Ronan
2	1	X76D276-1	Chassis Assy.	Ronan
3	As Req'd	X57C26-1	X57SM-1 Assy.	Ronan
4	As Req'd	X76C196	X76HVD-4 Module Assy.	Ronan
5	As Req'd	X76C197	X76DM-4 Module Assy.	Ronan
6	As Req'd	X76D280	X76AM-4 Module Assy.	Ronan
7	As Req'd	X76D224	X76BP-4 Cover Assy.	Ronan
8	As Req'd	X57D4	X57-422P Module Assy.	Ronan
9	As Req'd	X53C106	Blank Panel	Ronan
10	As Req'd	X76C292-1	Cover, X57	Ronan
11	1	X76C289-1	Cover	Ronan
12	1	X76B291	Cover	Ronan
13	4	X3A100	Cover Fastener	Ronan

List of Materials				
Item	**Qty.**	**Part No.**	**Description**	**Spec**
14	1	FMB-628	Horn	Piezo
15	1	MPG106F-0	Micro Switch w/Black Cap	Alco Switch
16	1	MPG106F-2	Micro Switch w/Red Cap	Alco Switch
17	2	N45	Nut	Alco Switch
18	1	31-414D	Key Lock Smith	EAD
19	1	SB-500-6	Snap Bushing	Heyco
20	As Req'd	63730	Captive Screw, 4-40 × ¼	
21	As Req'd		10-32 × ¼ PH RD HD MS	
22	As Req'd		6-32 × ¼ PH RD HD MS	
23	As Req'd		#10 Inter Tooth Lkwr.	
24	As Req'd		#6 Inter Tooth Lkwr.	
25	As Req'd		#4 Inter Tooth Lkwr.	

NOTE: 1. Use X57SM-4 (Drawing No. X57C26-1) without Module X57D4, Cover X57C19-1, and Blank Panel X53C106.
2. For wiring see Drawing No. X76C213.

X76LVC-4 ASSEMBLY	RONAN	
	DRAWING NO.	REV.
	X76D186	2





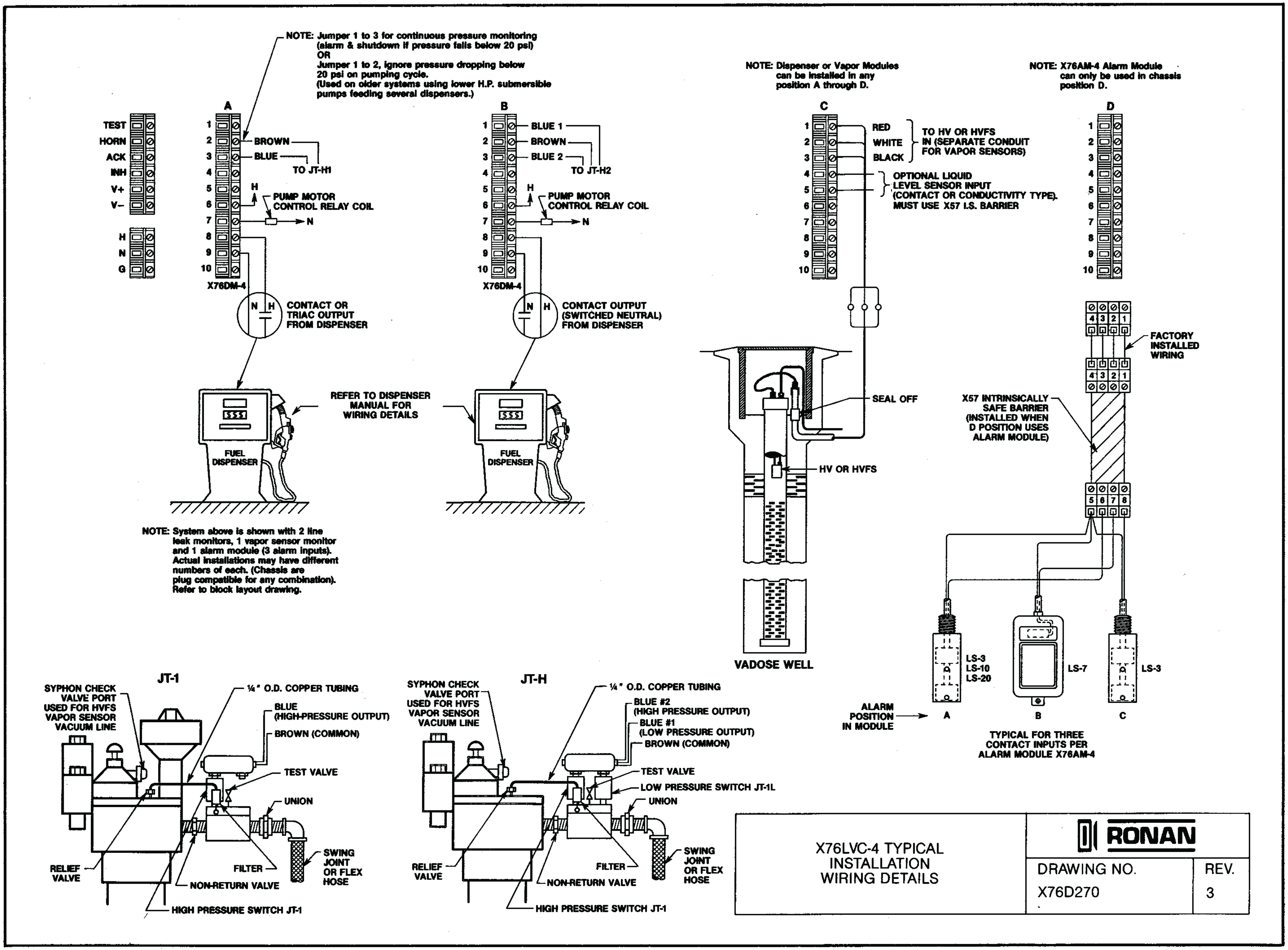
Item	Qty.	Part No.	Description	Spec
1	1	X76D271-2	Enclosure Assy.	Ronan
2	1	X76D276-2	Chassis Assy.	Ronan
3	As Req'd	X76D3-1	X57SM-4 Assy.	Ronan
4	As Req'd	X76C196	X76HVD-4 Module Assy.	Ronan
5	As Req'd	X76C197	X76DM-4 Module Assy.	Ronan
6	As Req'd	X76D280	X76AM-4 Module Assy.	Ronan
7	As Req'd	X76D224	X76BP-4 Cover Assy.	Ronan
8	As Req'd	X57D4	X57-422P Module Assy.	Ronan
9	As Req'd	X53C106	Blank Panel	Ronan
10	As Req'd	X76C292-2	Cover, X57	Ronan
11	1	X76C289-2	Cover	Ronan
12	1	X76B291	Cover	Ronan
13	4	X3A100	Cover Fastener	Ronan

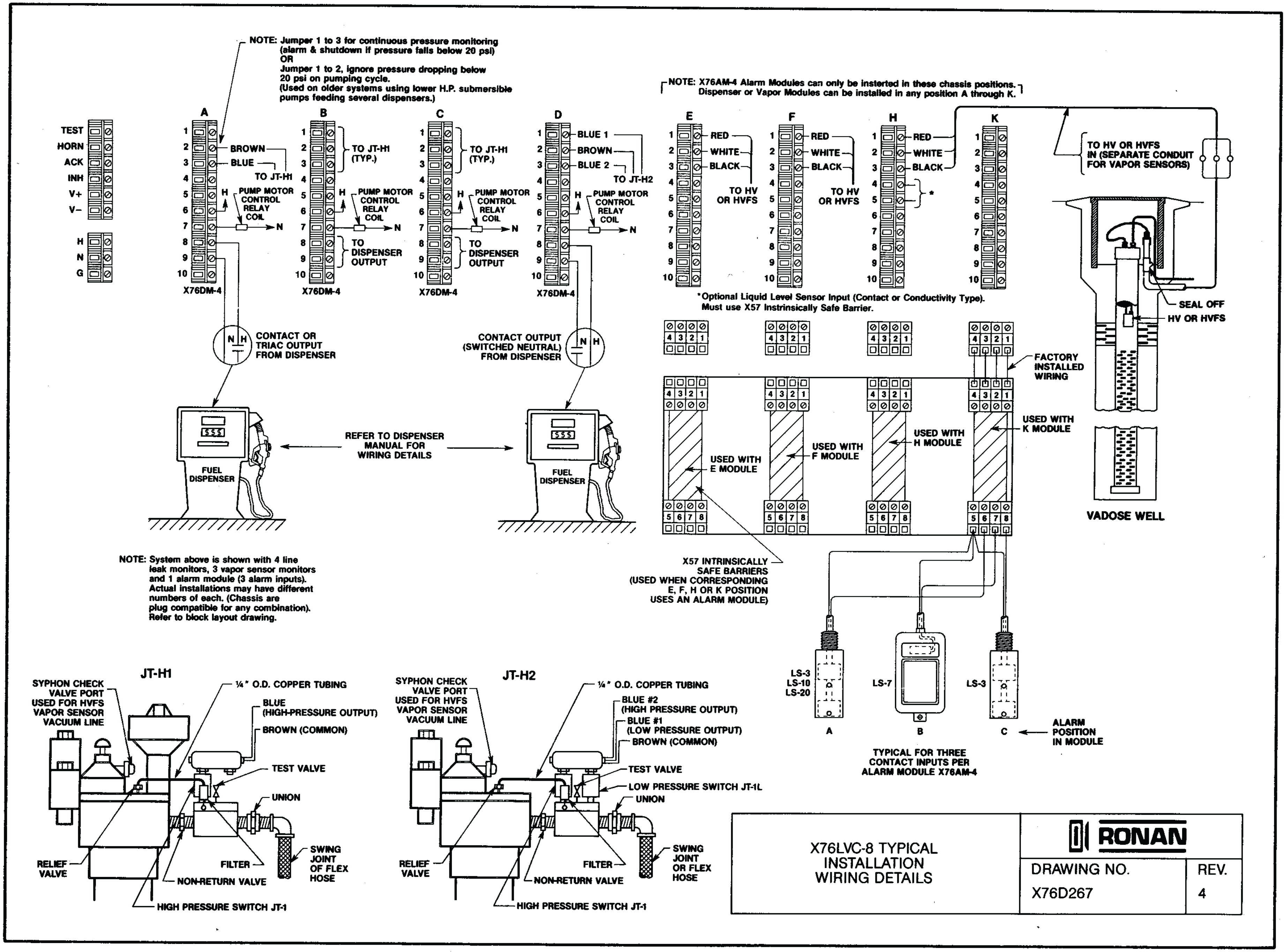
List of Materials

Item	Qty.	Part No.	Description	Spec
14	1	FMB-628	Horn	Piezo
15	1	MPG106F-0	Micro Switch w/Black Cap	Alco Switch
16	1	MPG106F-2	Micro Switch w/Red Cap	Alco Switch
17	2	N45	Nut	Alco Switch
18	1	31-414D	Key Lock Smith	EAD
19	1	SB-500-6	Snap Bushing	Heyco
20	As Req'd	63730	Captive Screw, 4-40 x ¼	
21	As Req'd		10-32 x ¼ PH RD HD MS	
22	As Req'd		6-32 x ¼ PH RD HD MS	
23	As Req'd		#10 Inter Tooth Lkwr.	
24	As Req'd		#6 Inter Tooth Lkwr.	
25	As Req'd		#4 Inter Tooth Lkwr.	

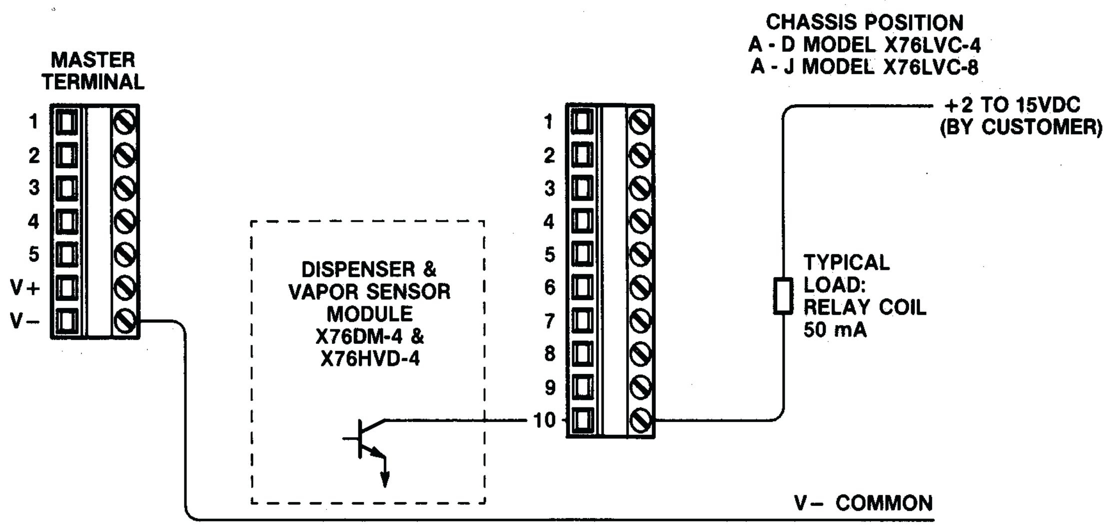
NOTE: 1. Use X57SM-4 (Drawing No. X57D3-1) without Module X57D4, Cover X57C19-1, and Blank Panel X53C106.
2. For wiring see Drawing No. X76C213.

X76LVC-8 ASSEMBLY	RONAN	
	DRAWING NO.	REV.
	X76D211	2


NOTE: Jumper 1 to 3 for continuous pressure monitoring (alarm & shutdown if pressure falls below 20 psi) OR Jumper 1 to 2, ignore pressure dropping below 20 psi on pumping cycle. (Used on older systems using lower H.P. submersible pumps feeding several dispensers.)
NOTE: Dispenser or Vapor Modules can be installed in any position A through D.
NOTE: X76AM-4 Alarm Module can only be used in chassis position D.
TEST
HORN
ACK
INH
V+
V–
H
N
G
A
B
C
D
BROWN
BLUE
TO JT-H1
BLUE 1
BROWN
BLUE 2
TO JT-H2
PUMP MOTOR CONTROL RELAY COIL
X76DM-4
CONTACT OR TRIAC OUTPUT FROM DISPENSER
CONTACT OUTPUT (SWITCHED NEUTRAL) FROM DISPENSER
RED
WHITE
BLACK
TO HV OR HVFS IN (SEPARATE CONDUIT FOR VAPOR SENSORS)
OPTIONAL LIQUID LEVEL SENSOR INPUT (CONTACT OR CONDUCTIVITY TYPE). MUST USE X57 I.S. BARRIER
FACTORY INSTALLED WIRING
REFER TO DISPENSER MANUAL FOR WIRING DETAILS
FUEL DISPENSER
SEAL OFF
X57 INTRINSICALLY SAFE BARRIER (INSTALLED WHEN D POSITION USES ALARM MODULE)
HV OR HVFS
NOTE: System above is shown with 2 line leak monitors, 1 vapor sensor monitor and 1 alarm module (3 alarm inputs). Actual installations may have different numbers of each. (Chassis are plug compatible for any combination). Refer to block layout drawing.
VADOSE WELL
LS-3
LS-10
LS-20
LS-7
LS-3
ALARM POSITION IN MODULE
TYPICAL FOR THREE CONTACT INPUTS PER ALARM MODULE X76AM-4
JT-1
SYPHON CHECK VALVE PORT USED FOR HVFS VAPOR SENSOR VACUUM LINE
¼" O.D. COPPER TUBING
BLUE (HIGH-PRESSURE OUTPUT)
BROWN (COMMON)
TEST VALVE
UNION
SWING JOINT OR FLEX HOSE
FILTER
RELIEF VALVE
NON-RETURN VALVE
HIGH PRESSURE SWITCH JT-1
JT-H
BLUE #2 (HIGH PRESSURE OUTPUT)
BLUE #1 (LOW PRESSURE OUTPUT)
LOW PRESSURE SWITCH JT-1L
X76LVC-4 TYPICAL INSTALLATION WIRING DETAILS
RONAN
DRAWING NO.
X76D270
REV.
3

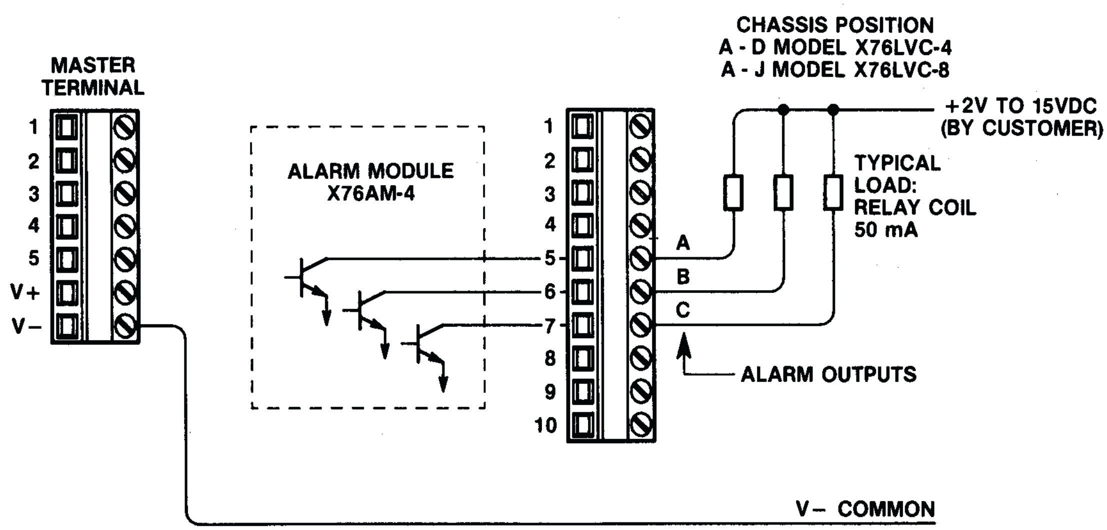

NOTE: Jumper 1 to 3 for continuous pressure monitoring (alarm & shutdown if pressure falls below 20 psi)
OR
Jumper 1 to 2, ignore pressure dropping below 20 psi on pumping cycle.
(Used on older systems using lower H.P. submersible pumps feeding several dispensers.)
NOTE: X76AM-4 Alarm Modules can only be insterted in these chassis positions. Dispenser or Vapor Modules can be installed in any position A through K.
TEST
HORN
ACK
INH
V+
V−
H
N
G
A
B
C
D
E
F
H
K
BROWN
BLUE
TO JT-H1
PUMP MOTOR CONTROL RELAY COIL
TO JT-H1 (TYP.)
TO DISPENSER OUTPUT
BLUE 1
BROWN
BLUE 2
TO JT-H2
X76DM-4
RED
WHITE
BLACK
TO HV OR HVFS
*Optional Liquid Level Sensor Input (Contact or Conductivity Type). Must use X57 Instrinsically Safe Barrier.
TO HV OR HVFS IN (SEPARATE CONDUIT FOR VAPOR SENSORS)
SEAL OFF
HV OR HVFS
VADOSE WELL
CONTACT OR TRIAC OUTPUT FROM DISPENSER
CONTACT OUTPUT (SWITCHED NEUTRAL) FROM DISPENSER
REFER TO DISPENSER MANUAL FOR WIRING DETAILS
FUEL DISPENSER
FACTORY INSTALLED WIRING
USED WITH E MODULE
USED WITH F MODULE
USED WITH H MODULE
USED WITH K MODULE
X57 INTRINSICALLY SAFE BARRIERS (USED WHEN CORRESPONDING E, F, H OR K POSITION USES AN ALARM MODULE)
NOTE: System above is shown with 4 line leak monitors, 3 vapor sensor monitors and 1 alarm module (3 alarm inputs). Actual installations may have different numbers of each. (Chassis are plug compatible for any combination). Refer to block layout drawing.
LS-3
LS-10
LS-20
LS-7
LS-3
A
B
C
ALARM POSITION IN MODULE
TYPICAL FOR THREE CONTACT INPUTS PER ALARM MODULE X76AM-4
JT-H1
SYPHON CHECK VALVE PORT USED FOR HVFS VAPOR SENSOR VACUUM LINE
¼" O.D. COPPER TUBING
BLUE (HIGH-PRESSURE OUTPUT)
BROWN (COMMON)
TEST VALVE
UNION
RELIEF VALVE
FILTER
NON-RETURN VALVE
SWING JOINT OF FLEX HOSE
HIGH PRESSURE SWITCH JT-1
JT-H2
BLUE #2 (HIGH PRESSURE OUTPUT)
BLUE #1 (LOW PRESSURE OUTPUT)
LOW PRESSURE SWITCH JT-1L
SWING JOINT OR FLEX HOSE
X76LVC-8 TYPICAL INSTALLATION WIRING DETAILS
RONAN
DRAWING NO.
X76D267
REV.
4

DISPENSER MODULE X76DM-4
OR
VAPOR MODULE X76HVD-4



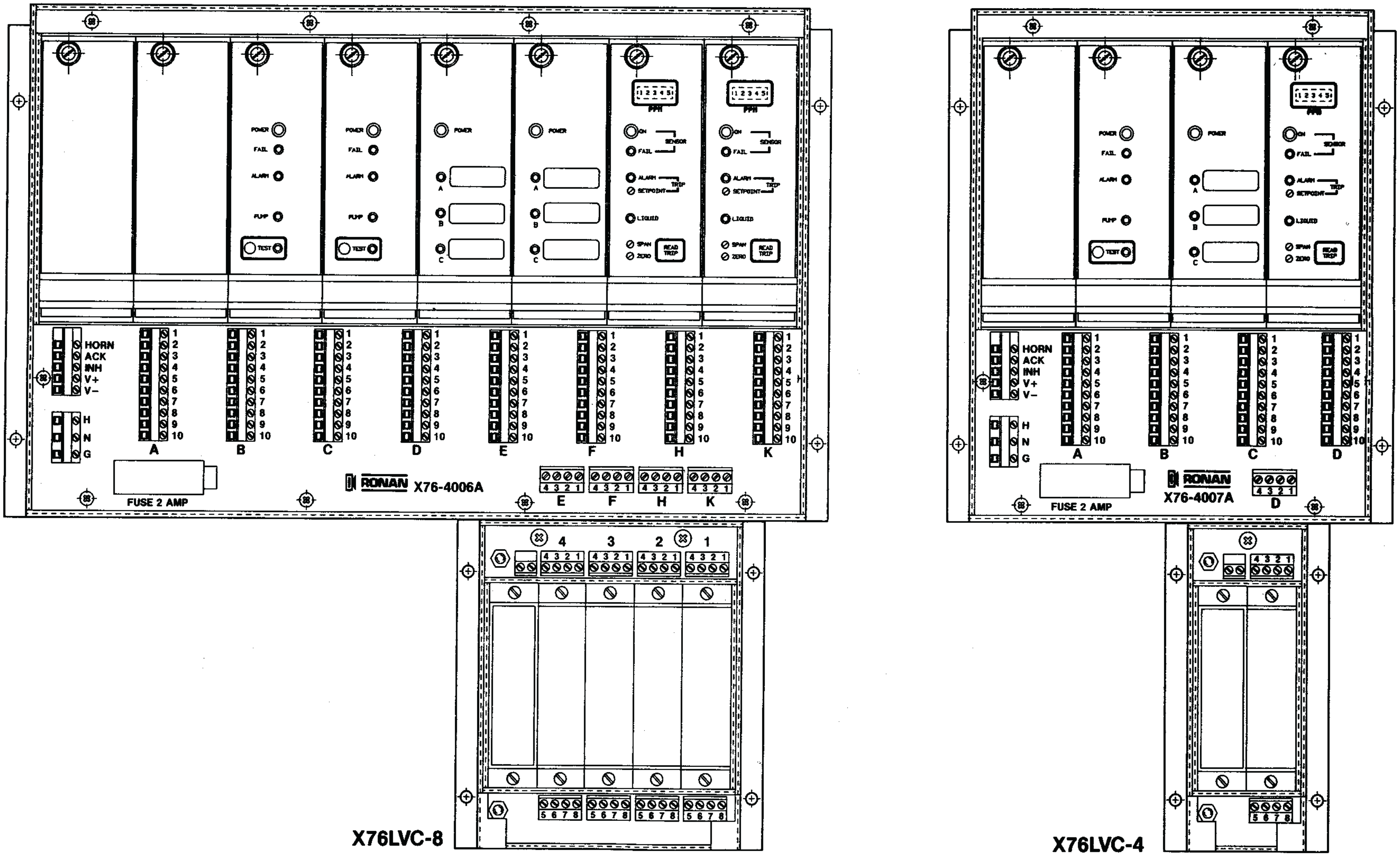
NOTE: These modules provide a transistor switch output at terminal 10. An external load such as a relay coil can be connected between a positive voltage source in the range of 2 to 15 VDC and terminal 10. The return of the voltage source must be connected to the V- terminal of the X76LVC System.

ALARM MODULE X76AM-4

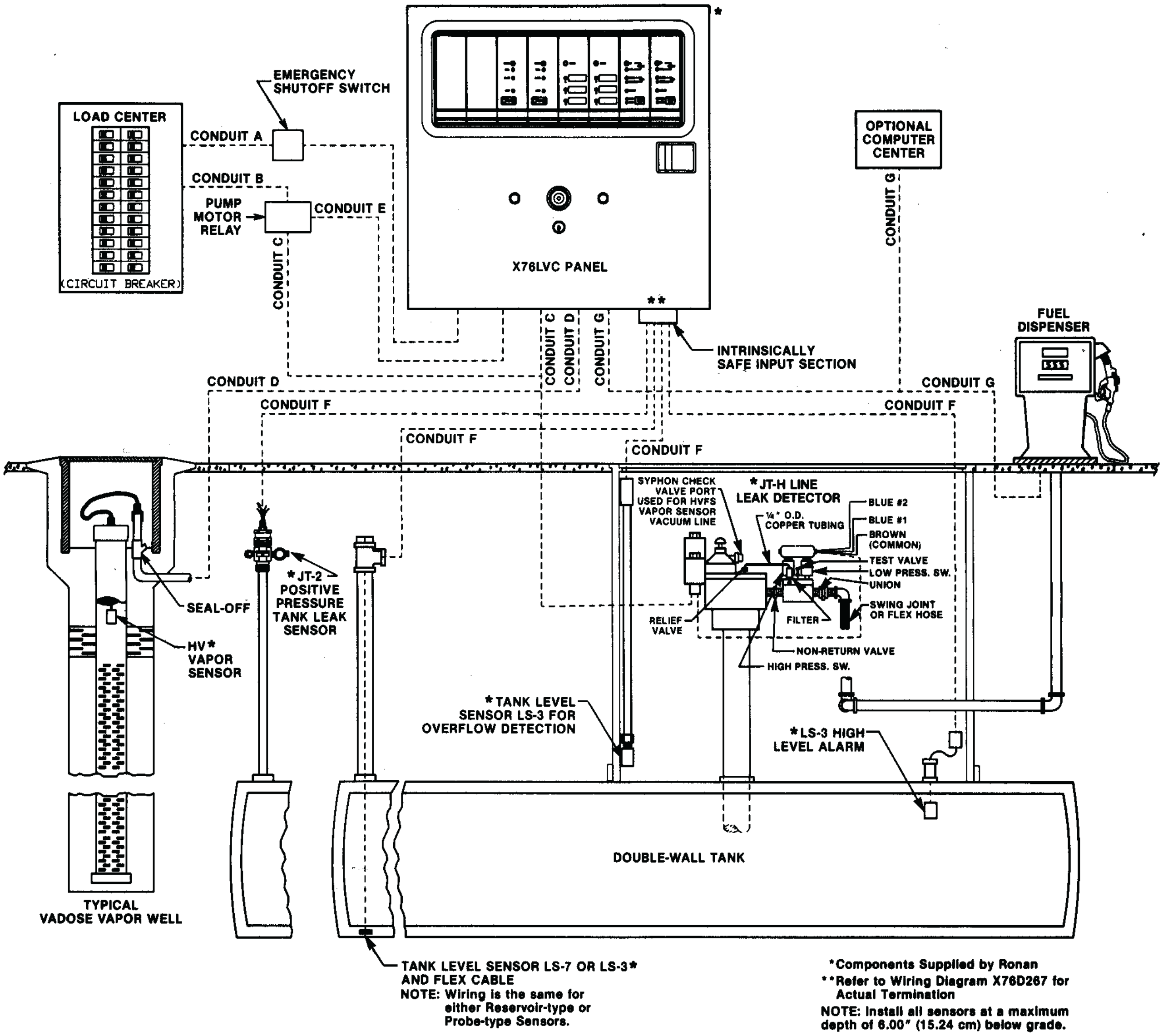


NOTE: Three independent transistor switch outputs are provided at terminals 5, 6 and 7. External loads are to be connected as shown and must be wired as described for the dispenser and vapor sensor modules above.

AUXILIARY OUTPUTS WIRING DIAGRAM	RONAN	
	DRAWING NO.	REV.
	X76C305	0

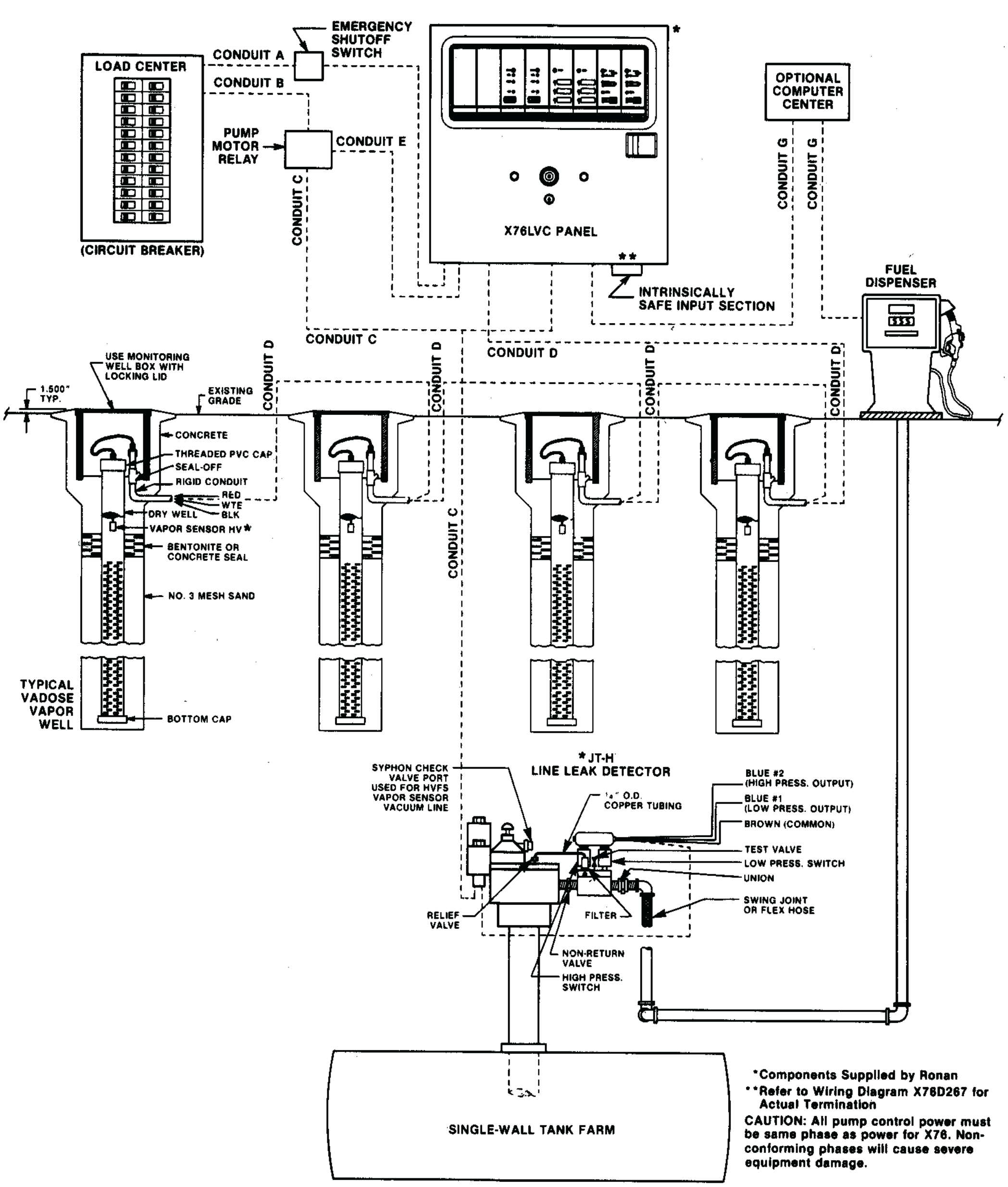


CHASSIS ASSEMBLY	RONAN	
	DRAWING NO.	REV.
	X76D276	0



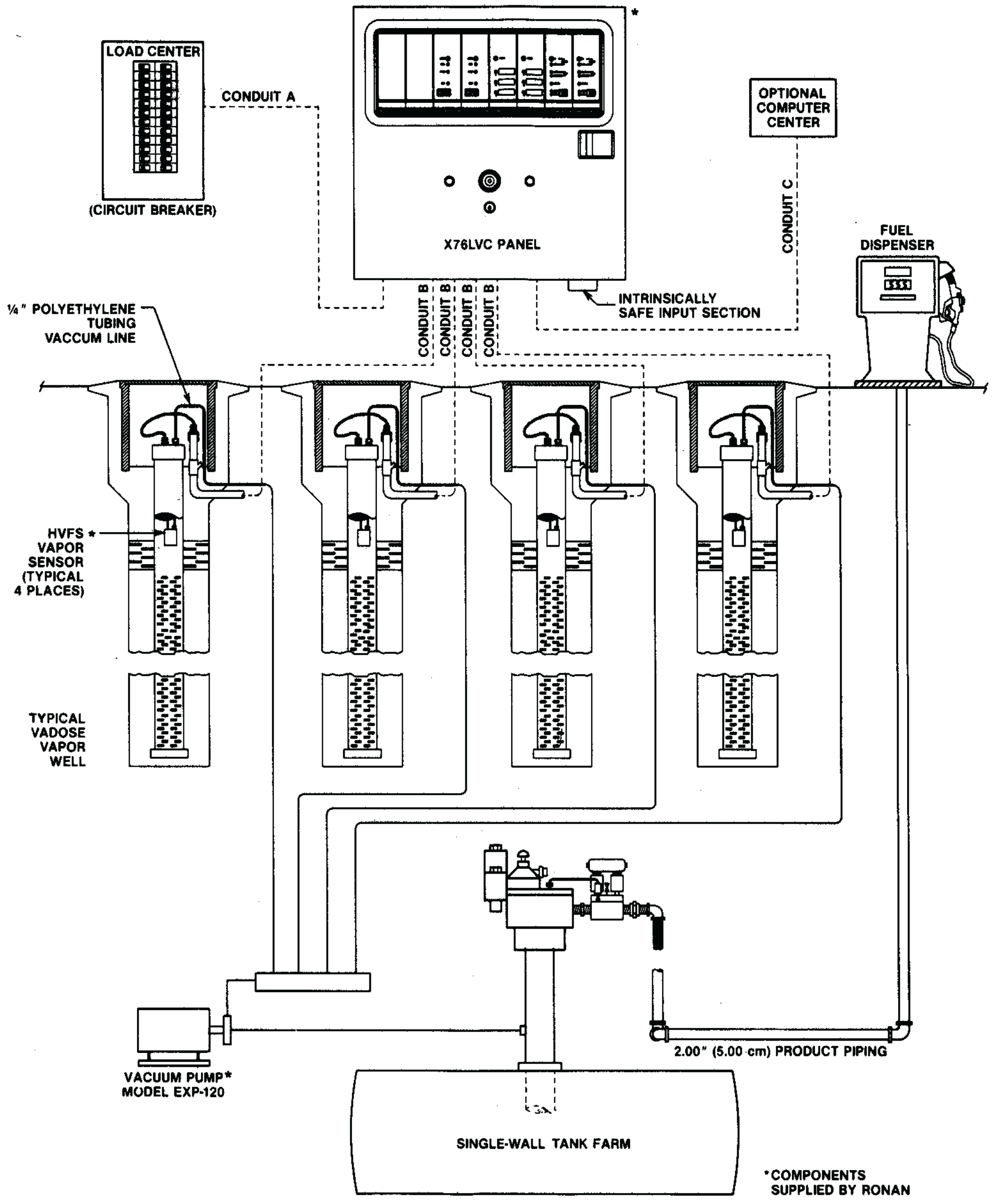
Conduit	Number of Wires	Purpose
A	3	X76 Power (Hot, Neutral, Ground, 120 VAC)
B	2	240 VAC Power to Relay Starter
C	5	240 VAC Submersible Pump Power (2 Wires), JT-H Line Leak Sensor (3 Wires)
D	3	Vapor Sensor HV: 3 Wire Twisted or Shielded Cable
E	1	120 VAC Hot to Relay Starter Coil (1 Wire)
F	2	Tank Sensor Intrinsically Safe Circuit (Must be Separate Conduit)
G	1	120 VAC Return Hot from Dispenser Switch or Computer Load Center

X76LVC LEAK DETECTION SYSTEM BLOCK DIAGRAM	RONAN	
	DRAWING NO.	REV.
	X76D301	0



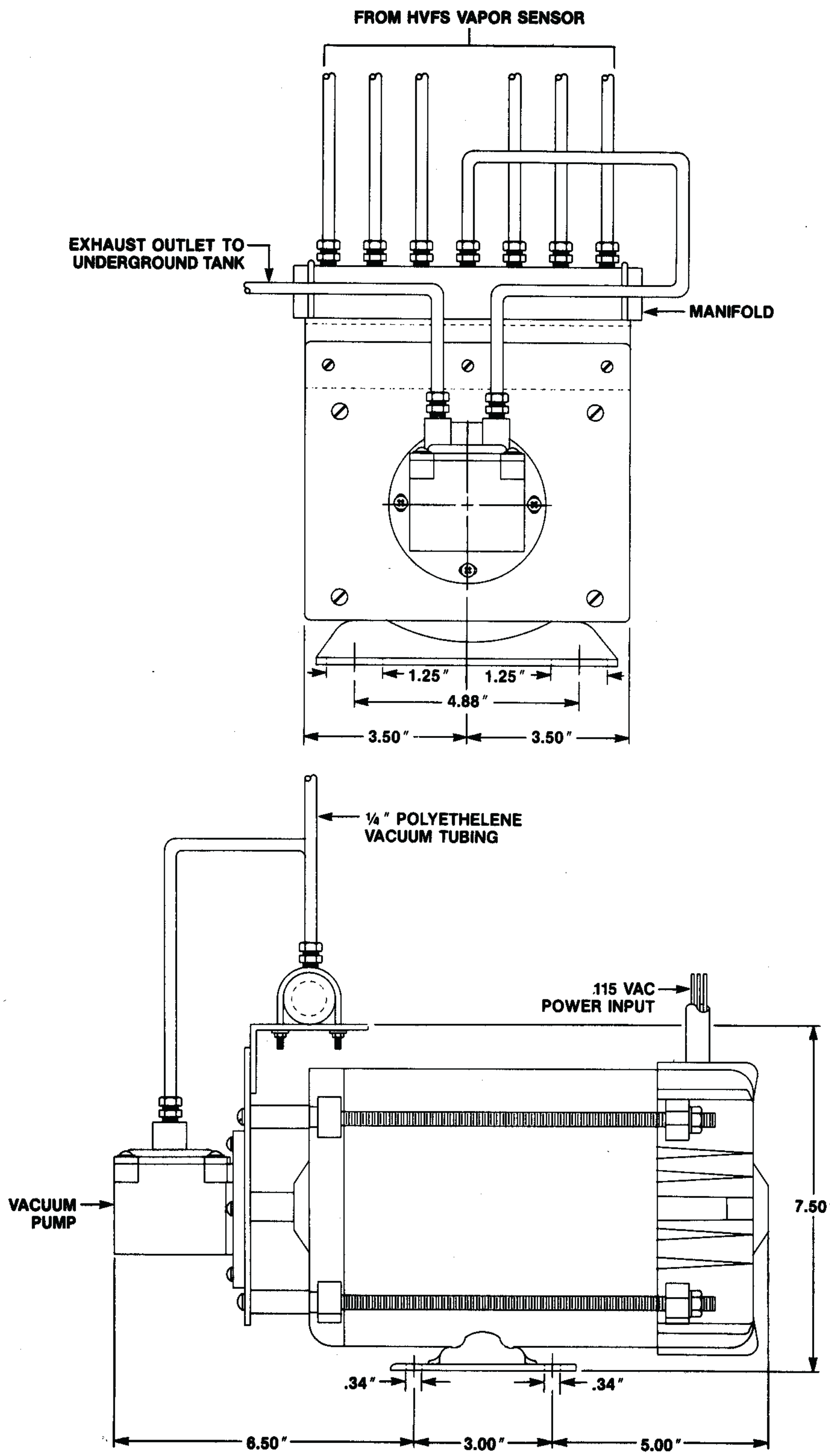
Conduit	Number of Wires	Purpose
A	3	X76 Power (Hot, Neutral, Ground, 120 VAC)
B	2	240 VAC Power to Relay Starter
C	4	240 VAC Submersible Pump Power (2 Wires), JT-1 Line Leak Sensor: Hot and Signal Return (2 Wires) (Cap Spare Red Wire)
D	3	Vapor Sensor HV: 3 Wire Twisted or Shielded Cable NOTE: Loop Single Conduit Run from Well to Well
E	2	120 VAC Hot to Relay Starter Coil (1 Wire)
G	1	120 VAC Return Hot from Dispenser Switch or Computer Load Center

TYPICAL WIRING & CONDUIT FOR X76LVC-8 LINE LEAK & HV VAPOR MONITOR	RONAN	
	DRAWING NO.	REV.
	X76D233	1

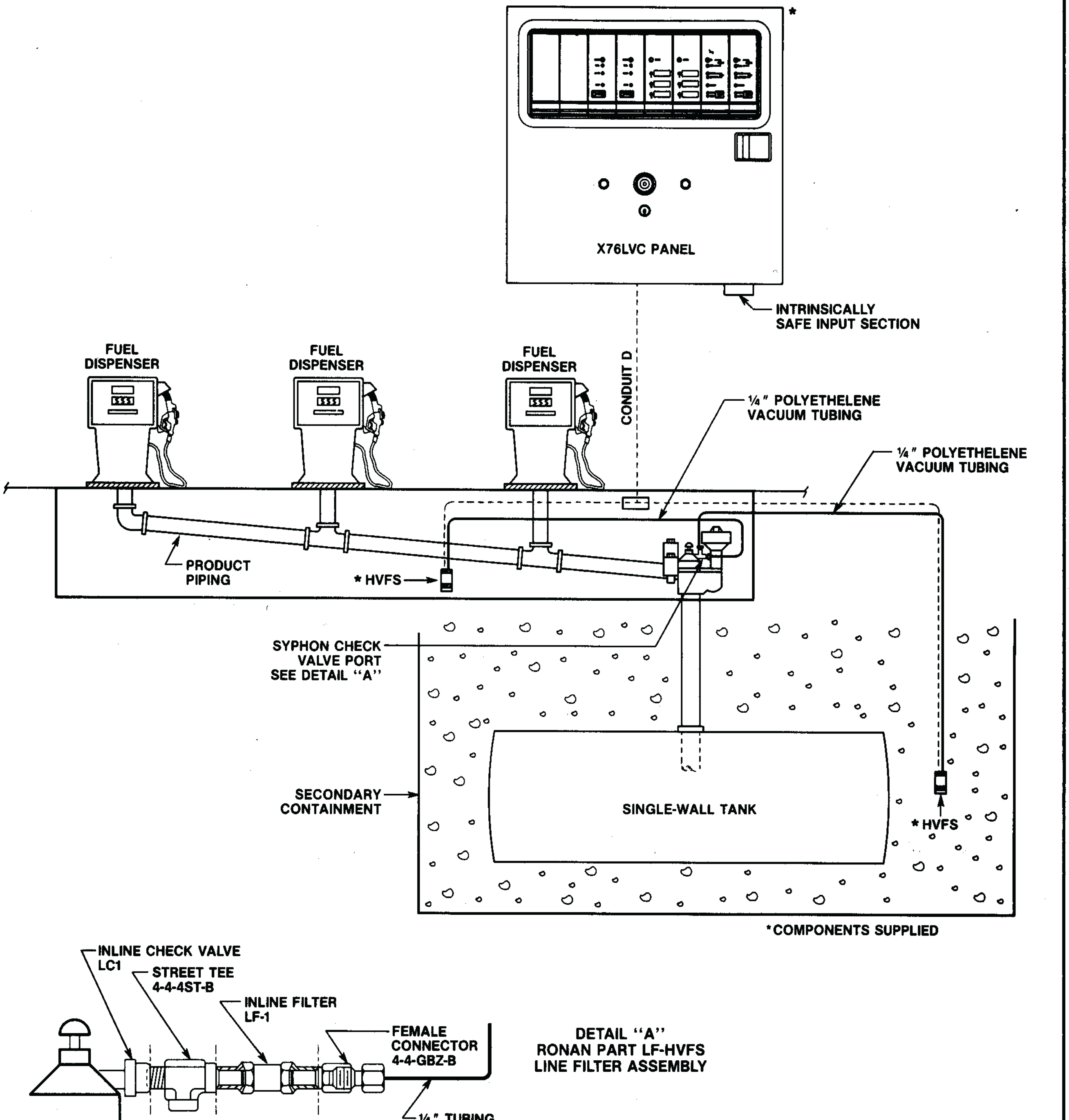


Conduit	Number of Wires	Purpose
A	3	X76LVC Power (Hot, Neutral, Ground, 120 VAC)
B	3	Vapor Sensor HVFS: 3 Wire Twisted or Shielded Cable
C	2	Isolated Contact Available for Computer or Interlock Shutdown Purposes
¼ " Polyflo Tubing		Tubing from Sensor to Manifold Valve Port. Each Sensor Requires Individual Tube.

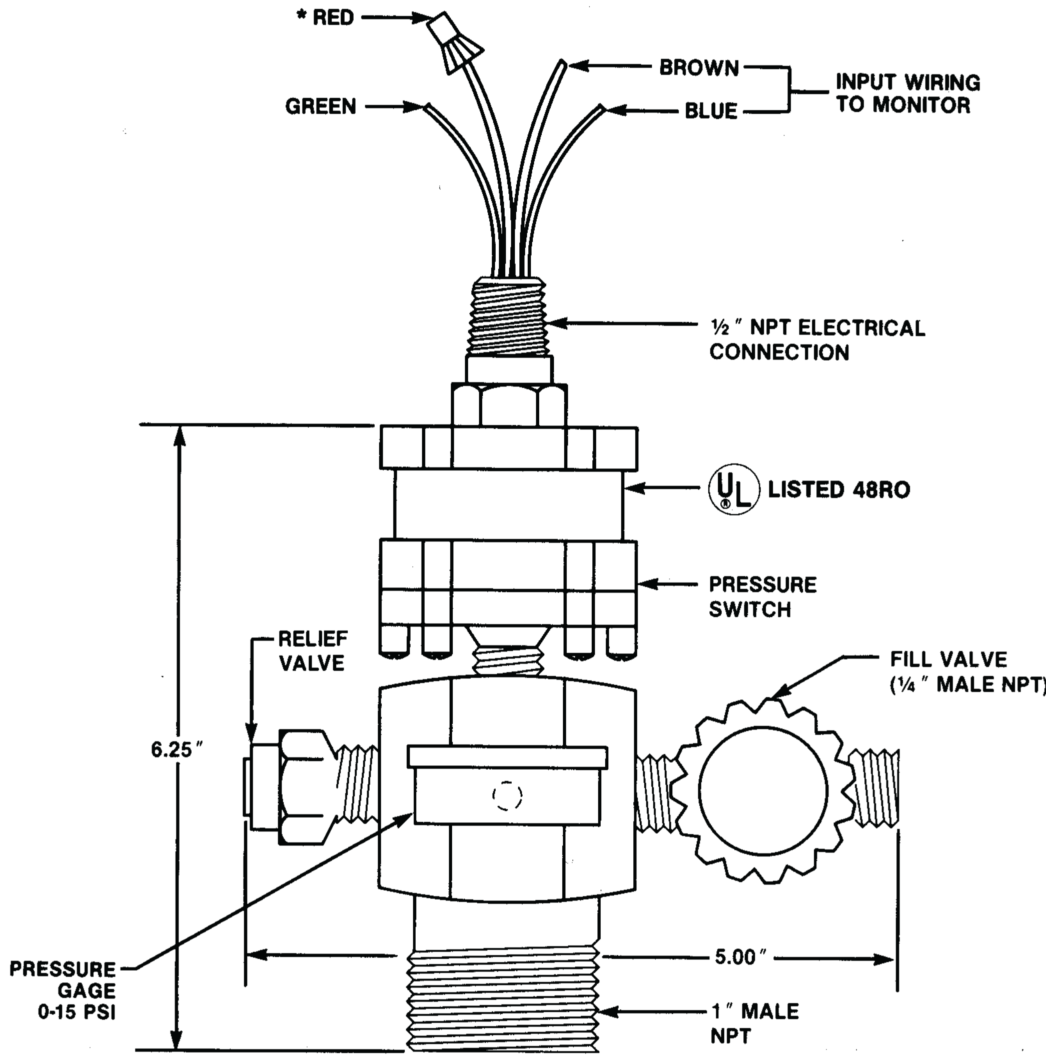
X76LVC LEAK DETECTION SYSTEM WITH ASPIRATING VAPOR SENSOR USING A COMMON VACUUM PUMP	RONAN	
	DRAWING NO.	REV.
	X76D303	0



MODEL EXP-120 VACUUM PUMP ASSEMBLY	RONAN	
	DRAWING NO. X76D129	REV. 0



X76LVC LEAK DETECTION SINGLE-WALL INSTALLATION USING ASPIRATING VAPOR SENSORS	RONAN	
	DRAWING NO.	REV.
	X76D302	0



INSTALLATION INSTRUCTIONS

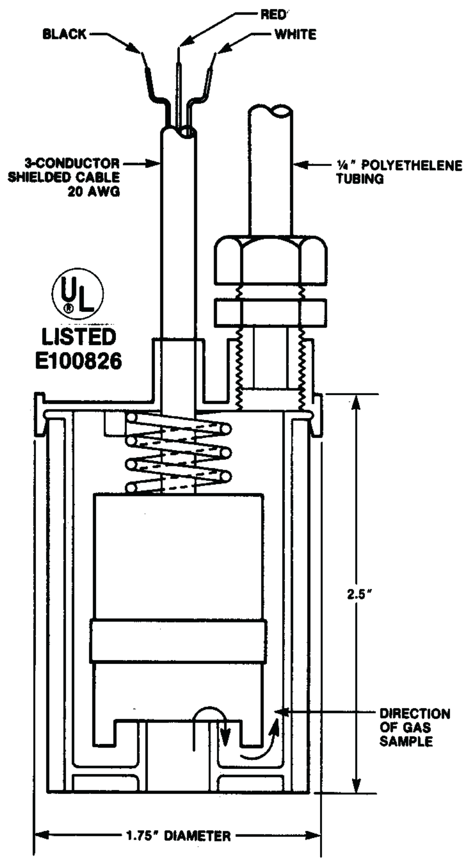
Install JT-2 Positive Pressure Leak Sensor on riser from four inch or six inch tank port. All other tank ports must be sealed with #150 class pipe fittings. Teflon paste type sealer is suggested for all threaded joints.

Provide electrical conduit, two each eighteen AWG type wire to input terminals of X76S, X76VS, X76LV or X76LVC. Hook up to brown and blue wires (normally open position). Intrinsically safe wiring must be in dedicated conduit only. No 115 VAC or other wiring allowed in the same conduit. LED(s) or alarm points should be in alarm condition. Pressurize the tank via air compressed through JT-2 fill and relief valve manifold (provided with sensor) to 2.9 psig. At this time the alarm condition should clear and the system is now in service.

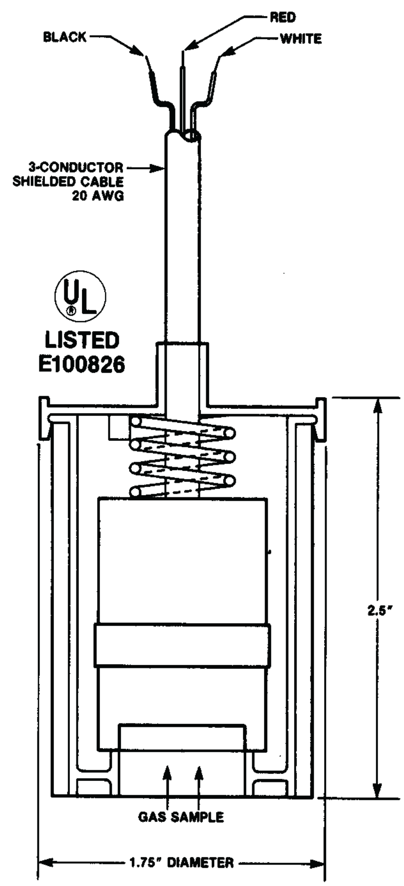
Note: When filling tank annulus with compressed air, one must utilize the relief and fill manifold. Never exceed 3 psig or warranty of tank may be void.

*Red wire N.C. signal must be capped off to prevent short circuit to ground.

POSITIVE PRESSURE TANK LEAK SENSOR ASSEMBLY MODEL JT-2	RONAN	
	DRAWING NO.	REV.
	X76C34	3



A. MODEL HVFS



B. MODEL HV

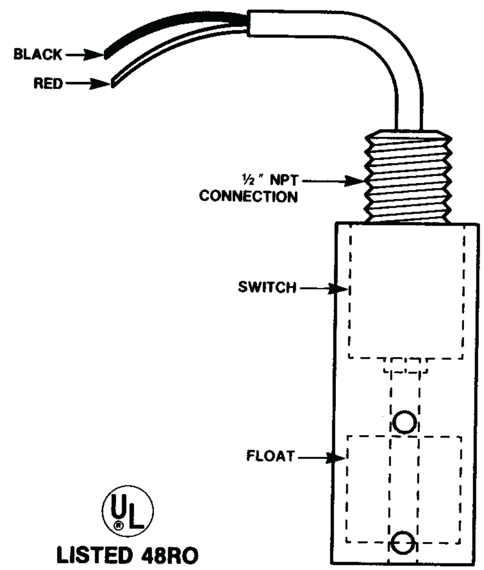
A. RONAN MODEL HVFS ASPIRATING HYDROGEN VAPOR SENSOR

1. The Ronan Model HVFS Vapor Sensor consists of a passive type semiconductor sensor with the addition of an external vacuum source to create a continuous vapor sample flow across the vapor sensor. This provides an added zone of influence for early gas detection on vadose and/or ground water wells.
2. The vacuum source is available by either of the following two methods.
   - The sumbersible product pump using the existing siphon port.
   - Ronan Model EXP-120 Vacuum Pump (Refer to Drawing X76D129) rated Class I, Division 1, Groups C & D.
3. The Model HVFS is UL listed for Class I, Division 1, Groups C & D areas.
   Note: The continuous vapor sample is exhausted back into this underground tank, avoiding any hazardous gases being transmitted to the general occupancy area.
   - Each well is being monitored continuously for maximum reliability.
   - Continuous monitoring permits the capability of both reading the ppm of each well simultaneously, plus the alarm ppm setpoint of each well.
   - With any interruption of the vacuum source, the HVFS Sensor continues to provide passive sensing capability.
   - The Model HVFS Sensor can be used with the X76VS and X76LVC Leak Detection Systems.

B. RONAN MODEL HV PASSIVE HYDROCARBON VAPOR SENSOR

1. The Ronan Model HV Vapor Sensor consists of a passive type semiconductor.
2. The Model HV is UL listed for Class I, Division 1, Groups C & D areas.
   - Continuous monitoring permits the capability of both reading the ppm of each well simultaneously, plus the alarm ppm setpoint of each well.
   - The Model HV Sensor can be used with the X76VS and X76LVC Leak Detection Systems.

MODEL HVFS ASPIRATING & MODEL HV PASSIVE HYDROCARBON VAPOR SENSORS	RONAN	
	DRAWING NO.	REV.
	X76C119, X76C120	I



LISTED 48RO

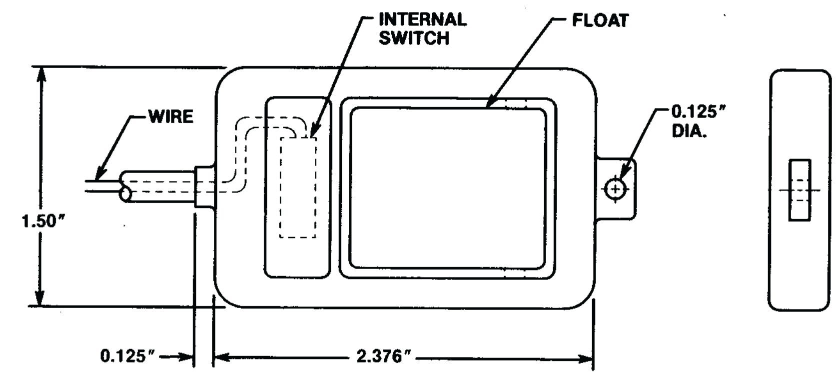
INSTALLATION INSTRUCTIONS
(For Steel Double-wall Tanks)

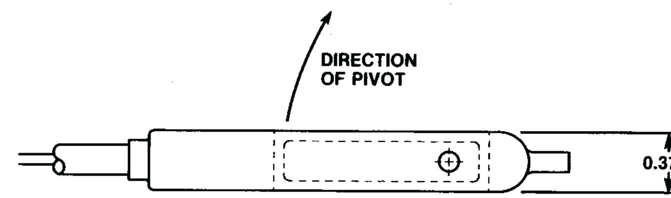
Lower sensor on cable until it rests on bottom of tank annulus in vertical position. Pull remaining cable into junction box and cut off excess length. Secure cable to prevent slipping into tank annulus. Connect leads to wire from tank monitor terminal strip.

OTHER APPLICATIONS

High level alarm for overflow in the tank and manhole's liner or secondary containment liquid level monitor.

TANK LEAK SENSOR MODEL LS-3	RONAN	
	DRAWING NO.	REV.
	X76C240	1

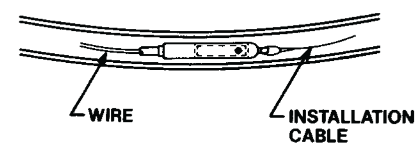




(SCALE ½)

INSTALLATION INSTRUCTIONS
(For Fiberglass Tank)

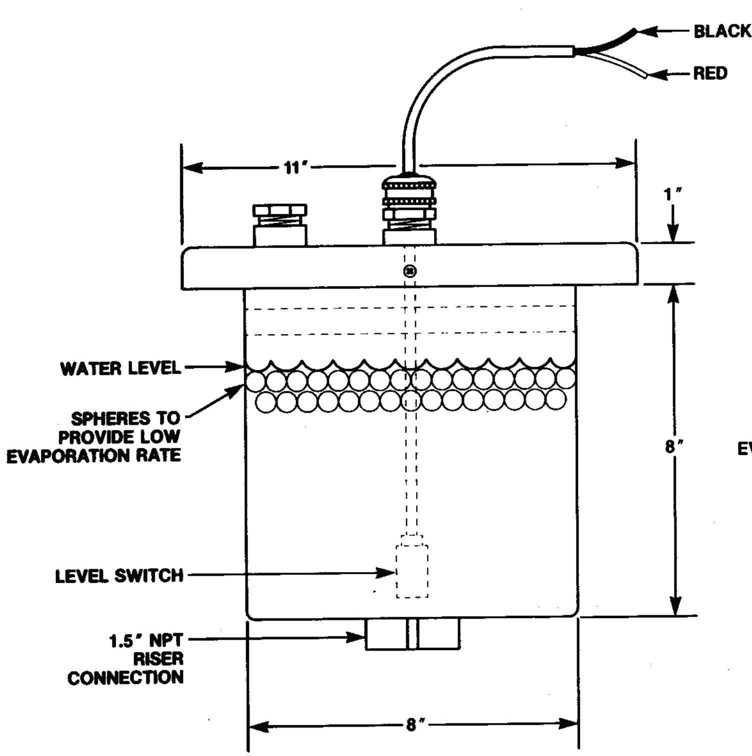
1. Insert fish tape through annular space.
2. Attach pull-string to LS-7.
3. Tag signal cable and pull-string each 18 feet from LS-7 (typical for 8 foot tank).
4. Attach fish tape to pull-string.
5. Pull LS-7 through annulus.
6. Match tag mark on signal cable and pull-string.
7. LS-7 now positioned bottom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



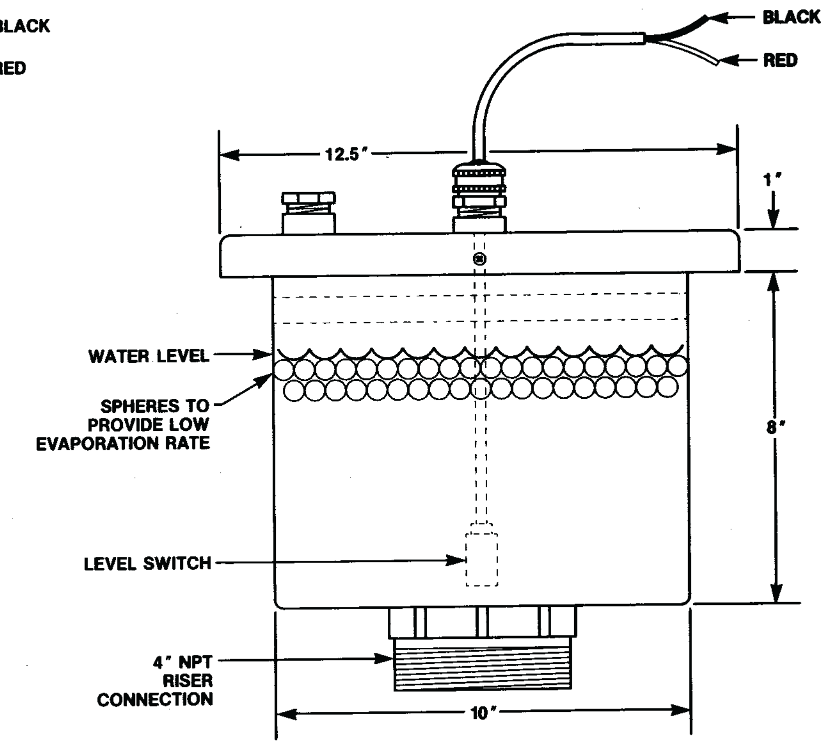
TYPICAL INSTALLATION IN DOUBLE-WALL TANK (SCALE ¼)

LISTED 48RO

TANK LEAK SENSOR MODEL LS-7	RONAN	
	DRAWING NO.	REV.
	X76C241	0



LS-10



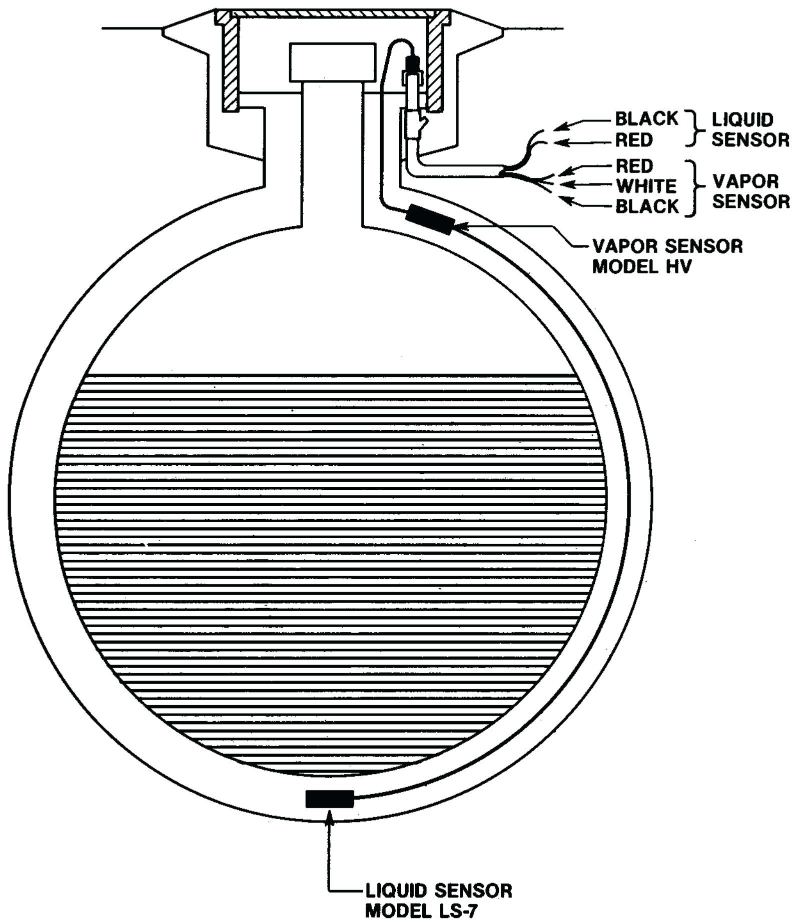
LS-20

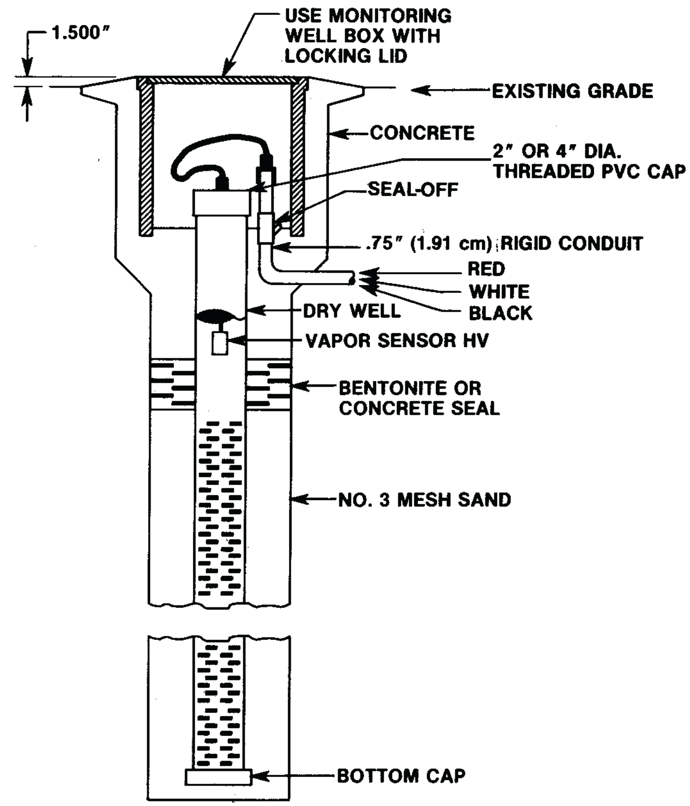
INSTALLATION INSTRUCTIONS

Mount reservoir on tank annulus riser, at least one foot above tank with maximum height not to exceed two feet. Install conduit to electrical connection. Connect leads to tank monitor wiring. Fill tank annulus and reservoir completely with water (refer to tank manufacturer's filling procedure).

UL LISTED 48RO

HYDROSTATIC LEAK SENSORS MODEL LS-10 (2 GALLON) OR MODEL LS-20 (4 GALLON)	RONAN	
	DRAWING NO. X76C227	REV. 2





HYDROCARBON VAPOR SENSOR VADOSE OR GROUND WATER-WELL & DOUBLE-WALL TANK MONITORING	RONAN	
	DRAWING NO. X76C263	REV. 3

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