



SiteSentinel[®]

Automated Monitoring System
Installation Manual

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Table Of Contents

1.0 Before You Begin	1
1.1 Installer Safety	1
1.2 Precision Leak Test	1
1.3 Initial Inspection	1
1.4 Manifolder Tanks	2
2.0 System Overview	3
2.1 Model II Controller	3
2.2 Model III Controller	5
2.3 Smart Module	6
2.4 I/O Module (Optional)	8
2.5 Model 613 Probe	9
3.0 Sensors	11
3.1 Vapor Sensor	11
3.2 Liquid Sensor	12
3.3 Universal Sump Sensor	13
3.4 Universal Reservoir Sensor	14
3.5 Liquid Phase Sensor	15
3.6 Interstitial Sensor	16
3.7 Freon Sensor	17
4.0 Tank Preparation	19
4.1 Probe Placement	19
4.2 Probe Installation in an Underground Tank	20
4.3 Calculating Product Offset	21

5.0 Conduit & Cabinet Installation	23
5.1 Controller Installation (Indoors Only)	23
5.2 I/O & Smart Module Installation	23
5.3 Circuit Breaker Conduit	24
5.4 RS-232 Communication Conduit	24
5.5 I/O Device Conduit	24
5.6 Probe & Sensor Conduit	26
5.7 Petro-Net Conduit	26
6.0 Probe & Sensor Installation	27
6.1 Probe Installation	27
6.1.1 ADAPTER COLLAR & RISER CAP	27
6.1.2 PROBE FLOATS	27
6.1.3 INSTALLATION PROCEDURE	27
6.2 Sensor Installation	28
6.2.1 INTRODUCTION	28
6.2.2 SINGLE-WALL TANK - DRY WELL MONITORING	29
6.2.3 SINGLE-WALL TANK - WET WELL MONITORING	32
6.2.4 DOUBLE-WALL TANK - NO WELL MONITORING	34
6.2.5 DOUBLE-WALL TANK - WITH WELL MONITORING	36
6.2.6 RESERVOIR SENSOR INSTALLATION	38
6.2.7 SUMP SENSOR INSTALLATION	40
6.2.8 INTERSTITIAL SENSOR INSTALLATION	42
6.2.9 FREON SENSOR INSTALLATION	44
7.0 Overall System Wiring	47
7.1 Probe Cable Seal-Offs	47
7.2 Smart Module Connections	48
7.3 I/O Module Inputs & Outputs	50
7.3.1 INPUTS	50
7.4 PETRO-NET Connections	51
7.5 Model III Peripherals	52
7.6 Connecting a Second System to the Model III	53

7.7 AC Power Connections 53

 7.7.1 MODEL II CONTROLLER AC WIRING 53

 7.7.2 Model III CONTROLLER AC WIRING 53

7.8 Model II Alarm Wiring 57

7.9 Model II External Printer Wiring 59

7.10 Model II External Terminal or PC Wiring 59

7.11 Model II Modem Wiring 60

 7.11.1 INTERNAL MODEL II MODEM 60

 7.11.2 EXTERNAL MODEL II MODEM 60

7.12 Model II Passthrough Port Wiring 61

 7.12.1 OVERVIEW 61

8.0 Other System Parameters 63

 8.1 Model II Comm Port Setup 63

 8.5 Module Assignment (Both Models) 65

Index 67

Notes:

1.0 Before You Begin

WARNING!

Improper installation may endanger installers and users of this equipment! Read these instructions CAREFULLY.

Model II? Model III?

This manual is for BOTH the Site Sentinel Model II and Model III. The functionality of both is nearly identical. The main differences are in the controller.

The Model II controller is a large, wall-mounted device equipped with a keypad, internal printer (option) and a display screen. Programming the Model II is typically done at the controller itself.

The Model III controller is a small tabletop box with two buttons and a STATUS display. Aside from the buttons there are no operator controls on the Model III controller, and all programming is done through the rear-panel port with a PC or terminal.

Any other differences between II and III are described where necessary.

1.1 Installer Safety

Installers must be experienced with the requirements of intrinsically safe devices, and must strictly obey the instructions in this manual to perform a safe installation.

Installation must be in accordance with the National Electrical Code (NFPA No. 70) and the Automotive and Marine Service Station Code (NFPA No. 30A).

A fuel tank is a **hazardous area** as defined in the NEC. Do *not* mount any part of the system, or any external devices (other than probes or sensors) within or above the hazardous area.

1.2 Precision Leak Test

A precision leak test should be performed on each tank - especially older ones - *before* installing the **SiteSentinel**. This test makes sure that leak data generated by the system is accurate and reliable. A *pressurized* precision leak test can be done on a tank after the probe has been installed, but DO NOT let the pressure exceed **20 psi**.

1.3 Initial Inspection

The Data Sheet lists specific details about your system. It is packed in the box with this manual. Store this sheet in a secure location.

Be sure to check the packaging carefully for any damage that might have occurred during shipping.

1.4 Manifolded Tanks

Tanks can be physically connected together, or manifolded, so that product flows freely between them.

To monitor manifolded tanks with the **SiteSentinel**, each tank in the group must have its own probe installed, and all probes for the group must be connected to the same Smart Module.

IMPORTANT

Many of the procedures described in the following pages must be followed for each tank that is to be included in the system. Please read the directions carefully before proceeding.

2.0 System Overview

2.1 Model II Controller

The Model II controller (Figure 1 next page) can monitor up to 128 probes, sensors, and external input and output devices. Because only AC power conduit connections are required for the controller, it can be placed almost anywhere.

You can operate the Model II controller either from its front-mounted 16-key keypad and graphic display, or from a terminal and/or personal computer ("PC"). No other hardware is required when you operate via the front panel controls.

When operated from a terminal or PC, the terminal can be connected locally (at the same site), or remotely using modems. The optional PV250 board (part #20-0227) provides RS-232 ports for the modems, terminals, PCs, and other external devices such as the K2500 Fuel Management System. Also included on the PV250 is an RS-232 serial port for an external printer, and inputs for two external contacts.

Any terminal that uses VT52, VT100, or WYSE 50 emulation are compatible with the SiteSentinel. If you are using a PC, it must be equipped with terminal emulation software.

Though all three methods of operation (display/keypad, local terminal/PC, and remote terminal/PC) can be connected to the Model II controller simultaneously, only one method may be used at a time. And, an operator cannot be interrupted by a second operator trying to "log in" by a different connection method.

Model II Controller Specifications	
Width:	19" (48.3 cm)
Height:	16.25" (41.3 cm)
Depth:	5.75" (14.6 cm)
Power	105-125 VAC, 60 Hz or 220-240 VAC, 50 Hz, 60 watts maximum
Temperature Range	32°F to 104°F (0°C to 40°C)
Module Capacity	8 Smart Modules and 8 I/O Modules
Display	
Backlight:	CCFT
Viewing Area:	5" x 3" (125 mm x 78 mm)
Format:	25 lines x 40 characters
Dot Matrix:	320 x 200 dots
Dot Color:	blue characters, white background
Keypad	16 keys: 10 alphanumeric; 6 function
Optional Internal Printer	40 column; plain paper
Optional Internal Modem (for remote operation)	model 224A; up to 2400 baud
Standard Alarms	one audible, one visible
External Alarm Inputs*	2 inputs for use with closed contact type inputs rated at 12 VDC, 40 mA
RS-232C Communication Ports (modem, PC/terminal, passthrough port)*†	up to 19,200 baud; VT100, VT52 or WYSE 50 emulation required; 7 data bits, even parity, 1 stop bit
RS-232C External Printer Serial Port*†	1200 baud; 7 data bits, even parity, 1 stop bit

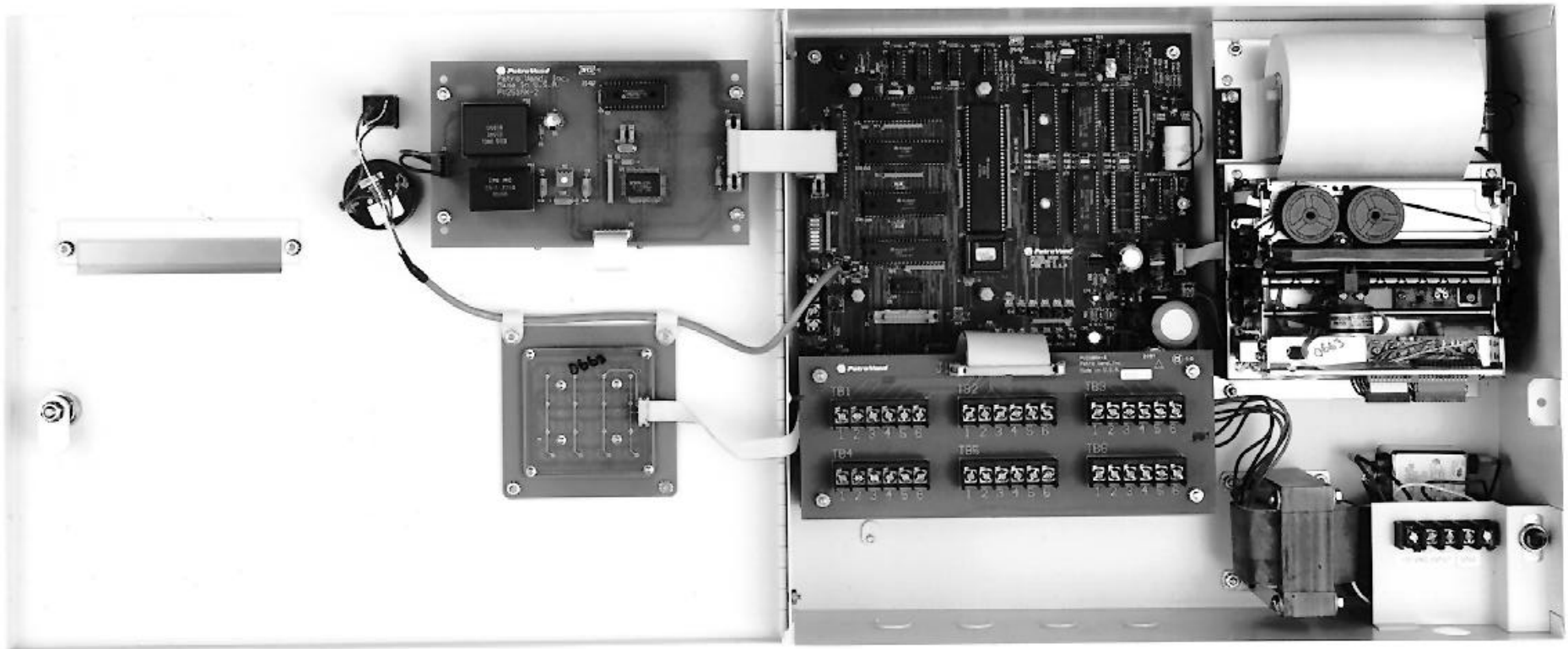


Figure 1 - Model II Controller Interior

2.2 Model III Controller

The Model III controller is a small microprocessor-based device which can monitor up to eight Smart Modules and eight I/O Modules. Because of its small size, it can be placed in many convenient locations. Its "power pack" plugs into any wall outlet.

The Model III controller can only be operated from a terminal and/or PC. The terminal or PC can be connected "locally", (at the same site), "remotely" (using modems and a telephone line), or both.

For local operation, the terminal or PC connects directly to one of the Model III RS-232 communication ports. For remote operation, attach a modem to the Model III controller MODEM port. A second modem is required at the terminal or PC.

Any terminal using VT52, VT100, or WYSE 50 protocol is compatible with the SiteSentinel. For a PC to communicate with the SiteSentinel, the PC must run a software program that emulates one of these terminal standards.

Note that although both methods of operation (local terminal/PC and remote terminal/PC) can be connected simultaneously, only one method may be used at a time. Once a person has begun using the system, he can *not* be interrupted by a second operator.

Model III Controller Specifications	
Cabinet Dimensions	2" H x 10" W x 11" D (5cm H x 25cm W x 28cm D)
Power Requirements Standard Optional	120 VAC, 50/60 Hz 220 to 240 VAC, 50/60 Hz
Module Capacity	8 Smart Modules and 8 I/O Modules
Serial Communication Ports	Petro-Net (RS-485) Printer (RS-232) Terminal (RS-232) Modem (RS-232) 3 Auxiliary Ports (RS-232)
Standard Alarm	one audible
Operating Temperature Range	32°F to 122°F (0°C to 50°C)
Operating Temperature Range for Peripheral Devices	40°F to 85°F (indoors only) (5°C to 29°C)

All equipment connected to the controller must be UL listed, equipped with a standard EIA RS-232C or RS-422A communication protocol, and not installed over a hazardous location.

2.3 Smart Module

The *Smart Module* (Figure 2 next page) gathers probe and sensor data. Up to four devices can be connected to the intrinsically safe (IS) barrier in the Smart Module. The barrier isolates the module from hazardous areas where probes and sensors are installed. Up to four barriers can be in each module, a total of 16 devices per module.

Up to eight modules can be connected to the controller via Petro-Net (twisted pair) wiring, for a total of 128 devices per system. Conduit is recommended for the Petro-Net wiring between the Smart Module and the controller, but it is *not* required.

The standard Smart Module includes one I.S. barrier. The part number for additional I.S. barriers is 20-4306.

SMART MODULE SPECIFICATIONS	
Electrical Requirements Standard Voltage Supply: Optional Voltage Supply: Power Consumption:	105 to 125 VAC, 60 Hz 220 to 240 VAC, 50 Hz 60 watts maximum
Dimensions Width: Height: Depth:	17" (43.2 cm) 9.75" (24.8 cm). <i>Mounting tabs add 1" (2.54 cm) top and bottom.</i> 5.5" (13 cm). <i>Key adds 1.5" (3.8 cm)</i>
Mounting centers:	16.5" (41.9 cm) width by 11" (27.9 cm) height
Temperature Range	32°F to 104°F (0°C to 40°C)
Device Capacity per I.S. Barrier: per Smart Module: per System:	up to 4 devices up to 16 devices up to 128 devices
Probe Cable Requirement	Belden #88760 or Alpha #55371 cable (shielded two-wire twisted pair)
Sensor Wiring Requirement	14 to 18 AWG oil & gas resistant (TFFN, THHN, or THWN)
Petro-Net Communication Wiring Requirement	18 AWG, twisted pair, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Petro-Net Extension	5000 feet (1.5 km)

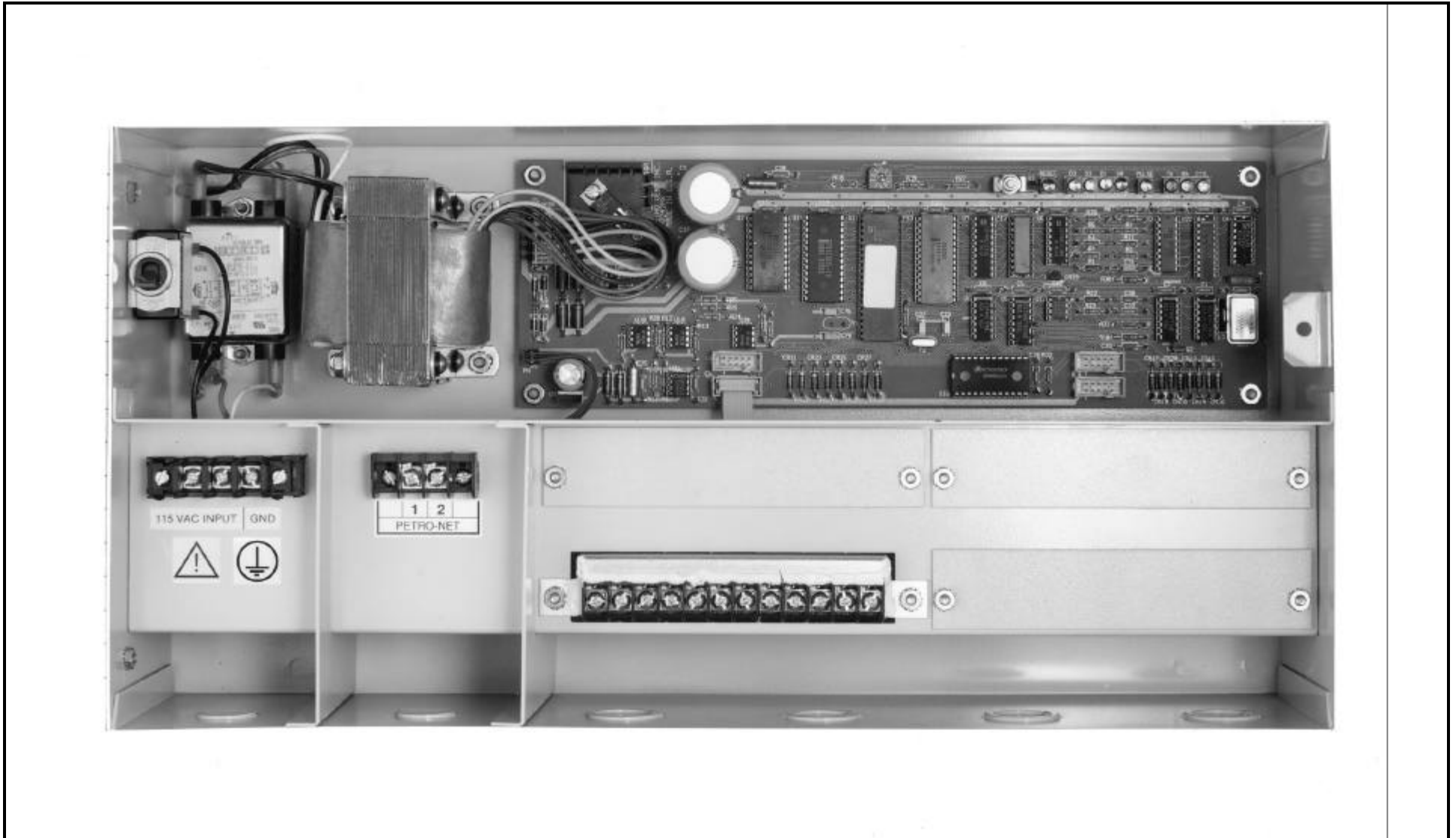


Figure 2 - Smart Module Interior

2.4 I/O Module (Optional)

The *optional* I/O Module expands either model’s capabilities by letting you connect as many as four input devices and 12 output devices to the controller. The I/O Module communicates with the controller via Petro-Net (twisted pair wiring). Up to eight I/O Modules can be connected for a total of 32 input and 96 output devices.

WARNING

The input terminals and output relays for the I/O Module are not intrinsically safe. Probe cables and sensor wiring must not share conduit with the wiring from devices connected to the I/O Module.

The I/O Module has not been evaluated by Underwriter’s Laboratories. Interconnection of the I/O Module and the system covered in this manual has not been evaluated by Underwriter’s Laboratories.

I/O MODULE SPECIFICATIONS	
Electrical Requirements Standard Voltage Supply: Optional Voltage Supply: Power Consumption:	105 to 125 VAC, 60 Hz 220 to 240 VAC, 50 Hz 60 watts maximum
Dimensions Width: Height: Depth:	8" (20 cm) 10" (25 cm) 4" (10 cm)
Temperature Range	32°F to 104°F (0°C to 40°C)
Module Capacity	up to 8 I/O Modules per Controller
Device Capacity	4 input devices 12 output devices
Output Relay Rating	20 amps at 240 VAC (normally open) 10 amps at 240 VAC (normally closed)
Output Relay Wiring Requirement	12 to 14 AWG
Input Rating	10 milliamps @ 5 VDC (sink)
Input Wiring Requirement	12 to 14 AWG
Petro-Net Communication Wiring Requirement	18 AWG, twisted pair, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Petro-Net Extension	5000 feet (1.5 km)

2.5 Model 613 Probe

The Petro Vend 613 probe (Figure 3) has a microcontroller and an EPROM data base. Setup data is stored in the probe, then downloaded to the controller during configuration. All 613 probes have built-in diagnostics for reliable operation.

The 613 can be installed either in aboveground or underground tanks. Use only *Belden #88760* or *Alpha #55371* cable to connect the probe to the Smart Module. If you order the cable from Petro Vend, ask for part number **12-1300**.

Each probe has five temperature sensors in the shaft for measuring product temperature. They are located at positions of approximately 20%, 40%, 50%, 60% and 80% of probe length. The probe head also contains a temperature sensor.

Specifications and available lengths for the Model 613 appear on the next page.

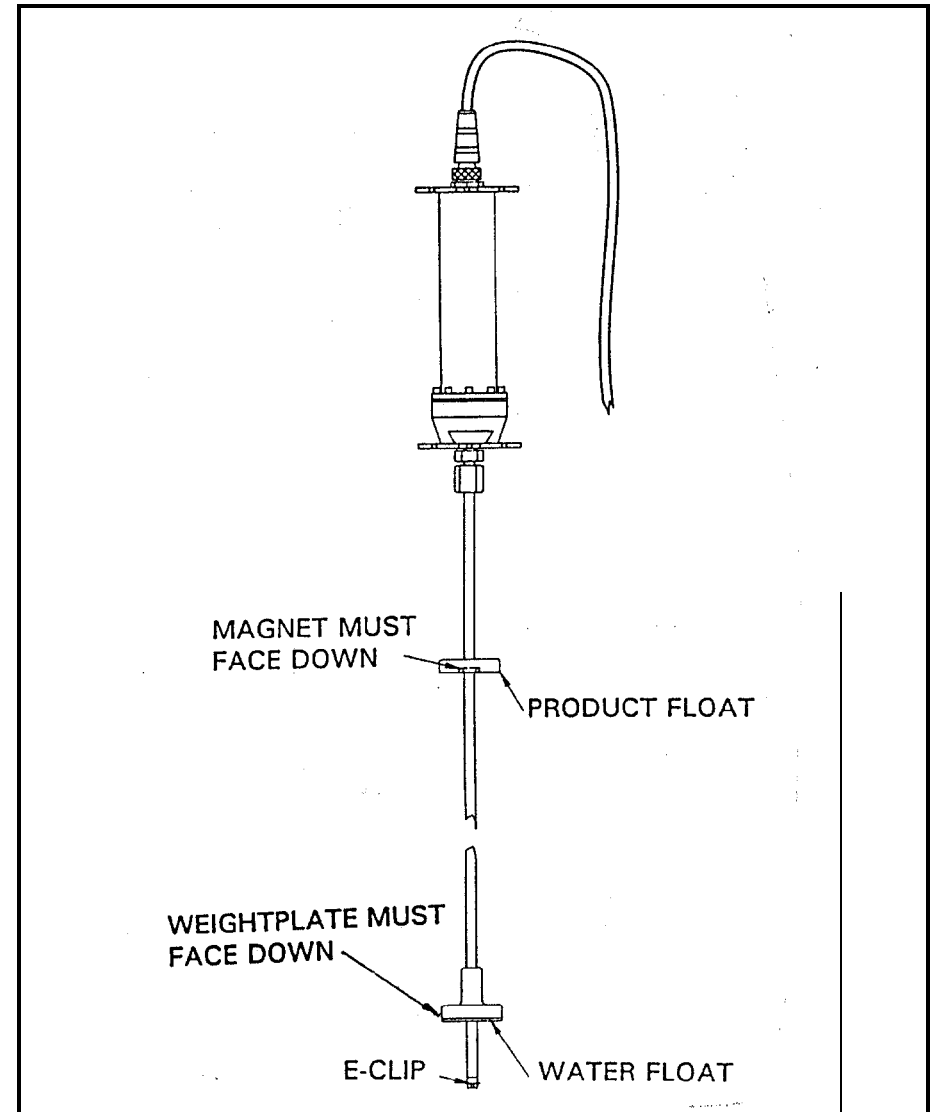


Figure 3 - Model 613 Probe

PV MODEL 613 PROBE SPECIFICATIONS	
Power Requirements	Powered through intrinsically safe barrier in Smart Module only
Operating Temperature	-13°F to 131°F (-25°C to 55°C)
Cable Requirement	Belden #88760 or Alpha #55371 cable (shielded two-wire twisted pair)
Maximum Cable Extension	1000 feet (305 m)
Level Measurement Product:	resolution of 0.0005 inch (0.013 mm)
Water:	resolution of 0.01 inch (0.3 mm); min. measurement: 0.37inch (0.9398 cm),
Temperature:	resolution of 0.001° F (.0005° C)
Classification	Class I, Division 1, Group D hazardous locations

PV MODEL 613 PROBE LENGTHS		
Probe Length	Tank Diameter (or Height)	Location of Temperature Sensors (Measured from Probe End). <i>The probe head also contains a sensor.</i>
53" (135 cm)	48" (122 cm)	7", 12", 20", 28", 36" (18, 30, 51, 71, 91 cm)
69" (175 cm)	64" (163 cm)	10", 16", 27", 37", 48" (25, 41, 69, 94, 122 cm)
77" (196 cm)	72" (183 cm)	11", 18", 30", 42", 54" (28, 46, 76, 107, 137 cm)
89" (226 cm)	84" (213 cm)	13", 22", 36", 49", 63" (33, 56, 91, 124, 160 cm)
101" (257 cm)	96" (244 cm)	15", 25", 41", 55", 71" (38, 64, 104, 140, 180 cm)
105" (267 cm)	100" (254 cm)	16", 26", 42", 58", 74" (41, 66, 106, 147, 188 cm)
113" (287 cm)	108" (274 cm)	17", 28", 46", 62", 80" (43, 71, 117, 157, 203 cm)
125" (317 cm)	120" (305 cm)	19", 31", 51", 69", 89" (48, 79, 130, 175, 226 cm)
149" (378 cm)	144" (366 cm)	24", 38", 61", 83", 106" (61, 97, 155, 211, 269 cm)

3.0 Sensors

3.1 Vapor Sensor

The vapor sensor (Figure 4) can be placed in dry monitoring wells around single-wall tanks, near pipelines, or in the interstitial space of double-wall tanks. The sensor also can be aboveground. Keep the following in mind when considering a vapor sensor:

- ❑ **Proper installation and sensor placement is CRITICAL.** Installation instructions are in Section 6.
- ❑ The sensor detects only certain hydrocarbon vapors. The sensor will NOT work in steam, or in inert or oxygen-deficient atmospheres.
- ❑ The sensor will NOT indicate the presence of explosive or combustible mists or sprays, lubrication oils, or explosive dusts such as those from grain or coal.

VAPOR SENSOR SPECIFICATIONS	
Substance Detected	Hydrocarbon vapors
Wiring Requirement	14 to 18 AWG, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Wiring Length	500 feet (152 m) with 18 AWG wire 1000 feet (305 m) with 14 AWG wire
Storage Temp: Operating Temp:	-20°F to 160°F (-28°C to 71°C) -5°F to 122°F (-20°C to 50°C)
Power	12 VDC at 120 mA; case is isolated
Size Length: Width:	1.75" (45 mm) 0.63" (16 mm)
Classification	Class I, Division 1, Group D hazardous locations

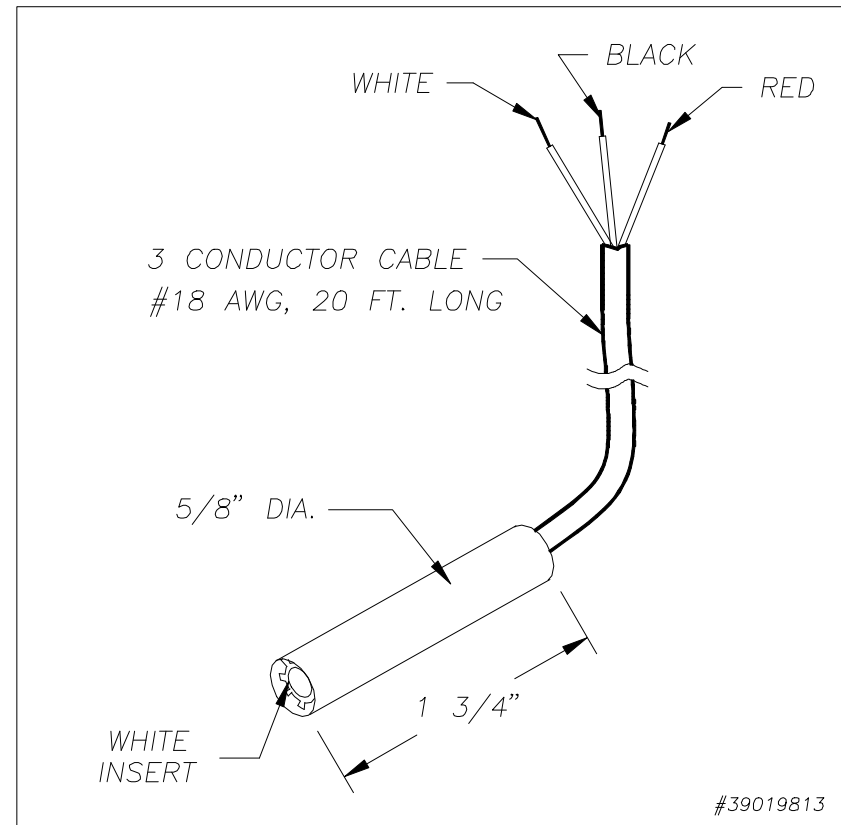


Figure 4 - Vapor Sensor

3.2 Liquid Sensor

The liquid sensor (Figure 5) is used to detect liquid covering a vapor sensor, or a liquid inside the interstitial space of a double-wall tank, a pipe, or a delivery system. The liquid sensor is *not* destroyed when activated. Installation instructions are in Section 6.

LIQUID SENSOR SPECIFICATIONS	
Substance Detected	Liquid
Wiring Requirement	14 to 18 AWG, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Wiring Length	500 feet (152 m) with 18 AWG wire 1000 feet (305 m) with 14 AWG wire
Temperature Limits	
Storage:	-20°F to 160°F (-28°C to 71°C)
Operating:	-5°F to 122°F (-20°C to 50°C)
Power	12 VDC at 20 mA
Maximum Fresh Water Submersion	15 feet (4.5 m)
Size	
Length:	1.5" (38 mm)
Width:	0.5" (13 mm)
Classification	Class I, Division 1, Group D hazardous locations

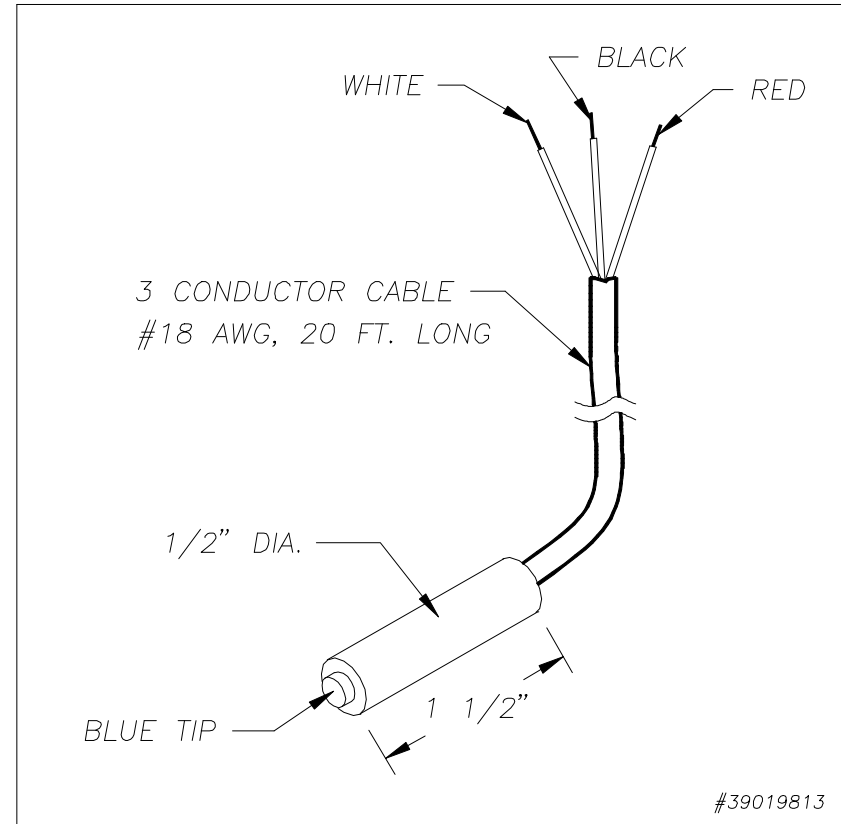


Figure 5 - Liquid Sensor

3.3 Universal Sump Sensor

The universal sump sensor (Figure 6) is used in an attached manway riser or collar riser. The sump sensor detects the presence of any liquid in a piping sump. When enough liquid enters the sump riser, it activates the sump sensor. Installation instructions are in Section 6.

UNIVERSAL SUMP SENSOR SPECIFICATIONS	
Substance Detected	Liquid
Fluid Suitability	Water; Ethylene glycol (up to 50% in water); Propylene glycol (up to 50% in water); Gasoline, kerosene or diesel fuel
Wiring Requirement	14 to 18 AWG, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Wiring Length	500 feet (152 m) with 18 AWG wire 1000 feet (305 m) with 14 AWG wire
Temperature Limits	
Storage:	-20°F to 160°F (-30°C to 70°C)
Operating:	-5°F to 120°F (-20°C to 50°C)
Power	12 VDC at 1 mA
Size	
Length:	2.5" (64 mm)
Width:	2.5" (64 mm)
Classification	CLASS 1 DIV. 1 GROUP D HAZARDOUS LOCATIONS

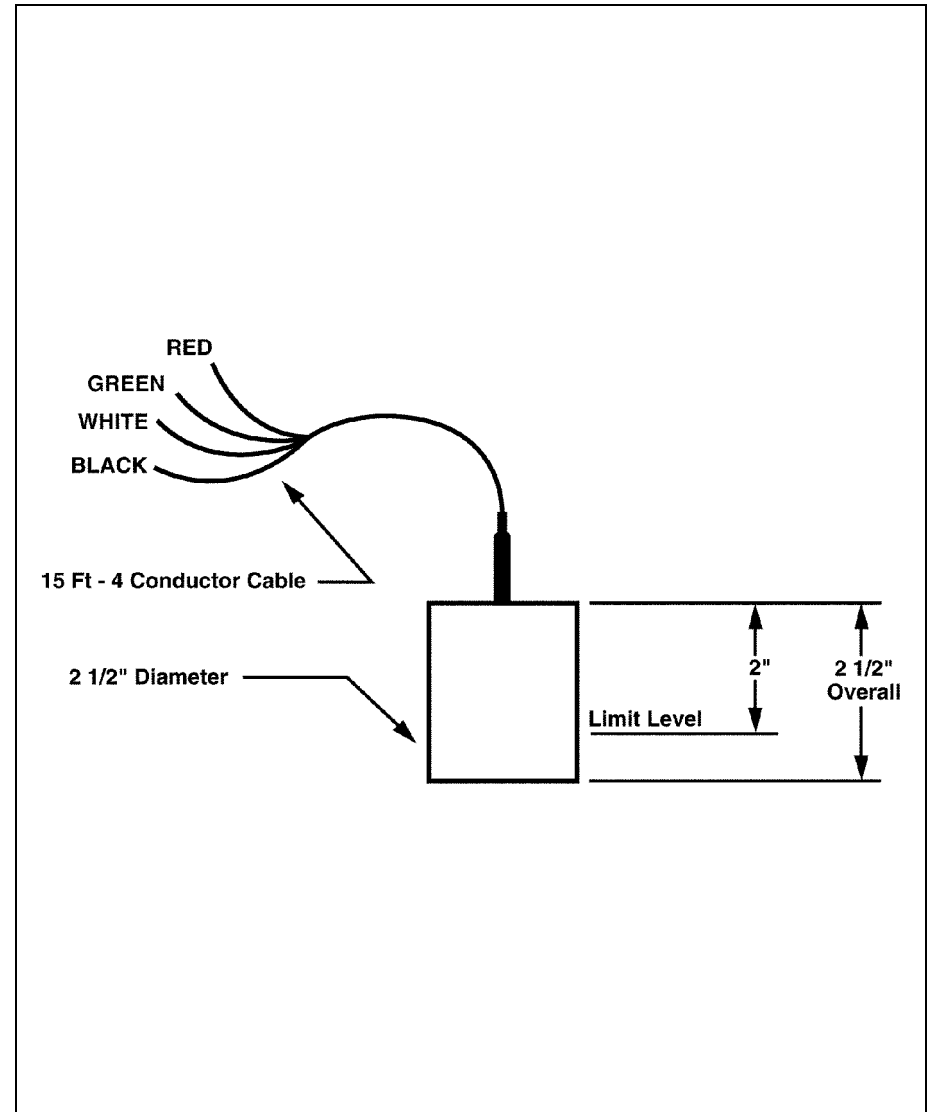


Figure 6 - Universal Sump Sensor

3.4 Universal Reservoir Sensor

The universal reservoir sensor (Figure 7) is used to hydrostatically monitor a double-wall tank. The sensor, placed in a tank reservoir, monitors the level of the liquid in the reservoir.

The sensor has a single float which senses a low or a high liquid level. If a leak occurs in the inner or outer wall of the tank, it causes the liquid in the reservoir to rise or fall. When liquid reaches the upper or lower sensor limit, the sensor is activated. Installation instructions are in Section 6.

UNIVERSAL RESERVOIR SENSOR SPECIFICATIONS	
Substance Detected	Change in Reservoir Fluid Level
Fluid Suitability	Potable water; Potable water with anti-fungal and/or anti-bacterial Agents; Salt brine (Up to 30% CaCl ₂ in water); Ethylene glycol (up to 50% in water); Propylene glycol (up to 50% in water); Gasoline, kerosine or diesel fuel
Wiring Requirement	14 to 18 AWG, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Wiring Length	500 feet (152 m) with 18 AWG wire 1000 feet (305 m) with 14 AWG wire
Temperature Limits	Storage: Operating:
	-20°F to 160°F (-30°C to 70°C) -4°F to 122°F (-20°C to 50°C)
Power	12 VDC at 1 mA
Size	
Length:	9.9" (250 mm)
Width:	2.5" (64 mm)
Classification	CLASS 1 DIV. 1 GROUP D HAZARDOUS LOCATIONS

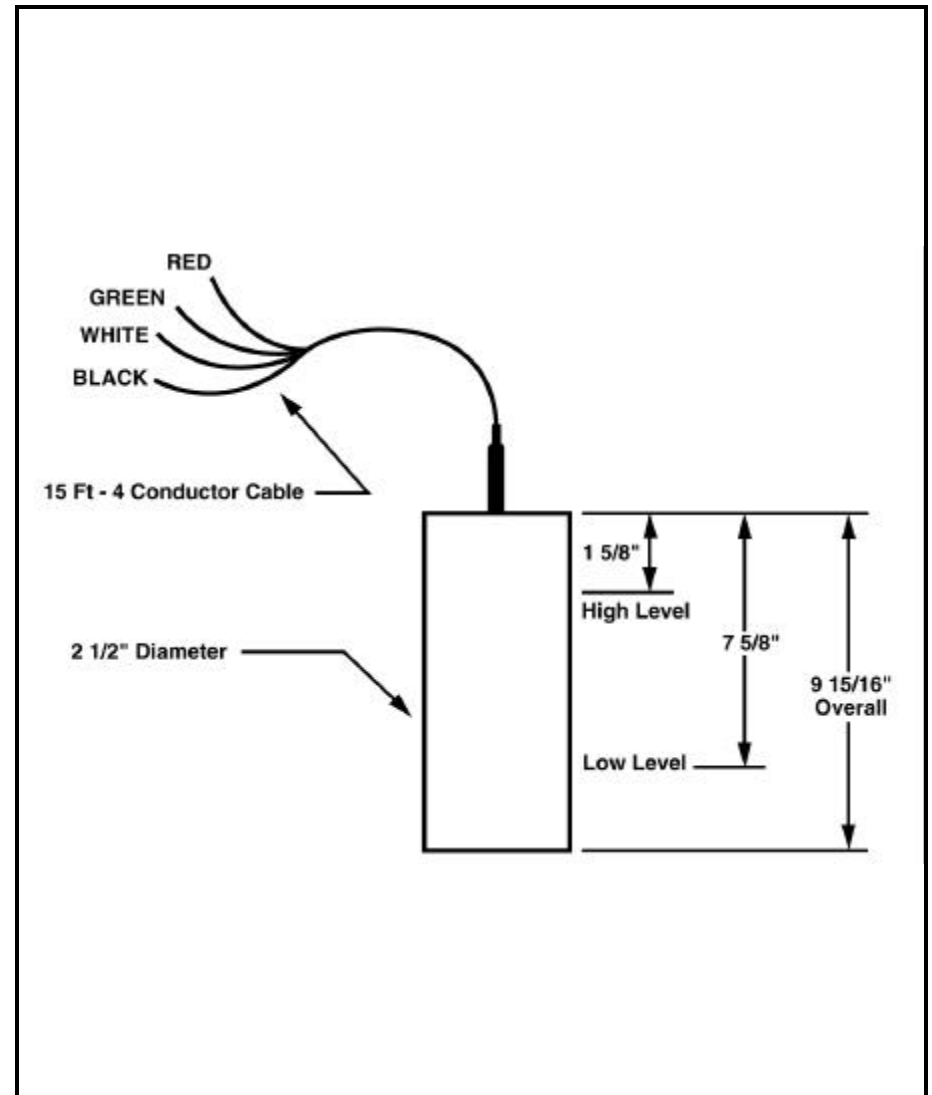


Figure 7 - Universal Reservoir Sensor

3.5 Liquid Phase Sensor

The liquid phase sensor (Figure 8) detects liquid hydrocarbons in wet monitoring wells, in piping (with or without secondary containment), and in above/below grade vaulted tanks.

Liquid phase sensors are available with and without a water-sensing element. When equipped with both hydrocarbon- and water-sensing elements, they go to separate terminals in the Smart Module, allowing the system to show hydrocarbons and water independently. Installation instructions are in Section 6.

LIQUID PHASE SENSOR SPECIFICATIONS	
Substances Detected	Hydrocarbons (other than LPG, heavy crudes, mineral oils and heavier fuel oils), chlorinated hydrocarbons, ethers, organic acids, esters, and higher alcohols
Wiring Requirement	14 to 18 AWG, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Wiring Length	500 feet (152 m) with 18 AWG wire 1000 feet (305 m) with 14 AWG wire
Operating Temperature Limits (without water present)	-20°F to 130°F (-30°C to 55°C)
Lengths: <i>Without</i> water element <i>With</i> water element	6, 10 and 15 feet 15 or 20 feet
Power	12 VDC
Classification	CLASS 1 DIV. 1 GROUP D HAZARDOUS LOCATIONS

IMPORTANT

If the sensor comes in contact with a hydrocarbon, see Appendix D in the Ops Guide for instructions on drying the sensor. This is especially important if the contact is with a hydrocarbon product other than gasoline (such as diesel fuel).

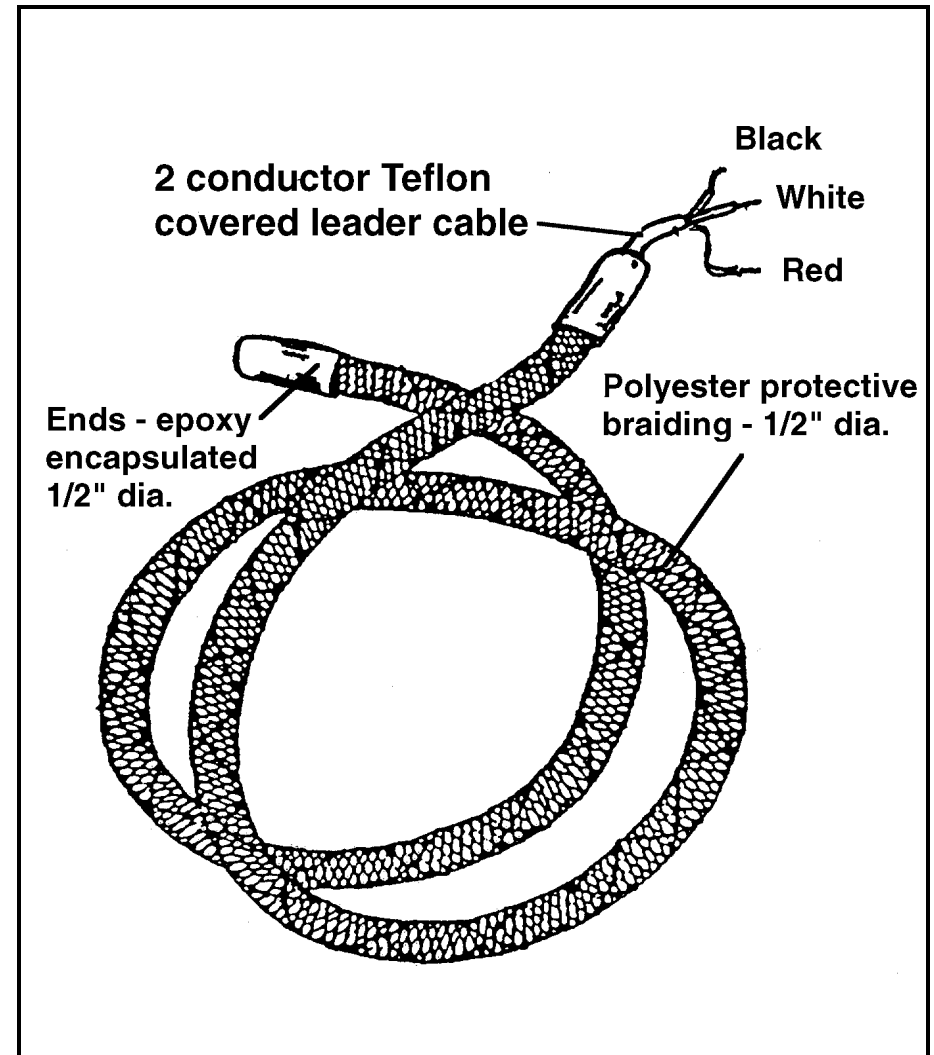


Figure 8 - Liquid Phase Sensor

3.6 Interstitial Sensor

The interstitial sensor (Figure 9) detects liquid hydrocarbons and/or water within any interstitial space of 1/2-inch (13 mm) or more. The two sensing elements are wired to separate terminals in the SiteSentinel Smart Module, enabling the system to indicate the presence of hydrocarbon and water independently. Installation instructions are in Section 6.

INTERSTITIAL SENSOR SPECIFICATIONS	
Substances Detected (Hydrocarbon Sensor)	Hydrocarbons (other than LPG, heavy crudes, mineral oils and heavier fuel oils), chlorinated hydrocarbons, ethers, organic acids, esters, and higher alcohols
Wiring Requirement	14 to 18 AWG, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Wiring Length	500 feet (152 m) with 18 AWG wire 1000 feet (305 m) with 14 AWG wire
Operating Temperature Limits (without water present)	-20°F to 130°F (-30°C to 55°C)
Power	12 VDC
Size	
Width:	0.5" (13 mm)
Length:	20 feet (6.1 m)
Classification	CLASS 1, DIV. 1 GROUP D HAZARDOUS LOCATIONS

IMPORTANT

If the interstitial sensor comes in contact with a hydrocarbon product, refer to Appendix D in the Operator's Guide for instructions on drying the sensor. This is especially important if the contact is with a hydrocarbon product other than gasoline (such as diesel fuel).

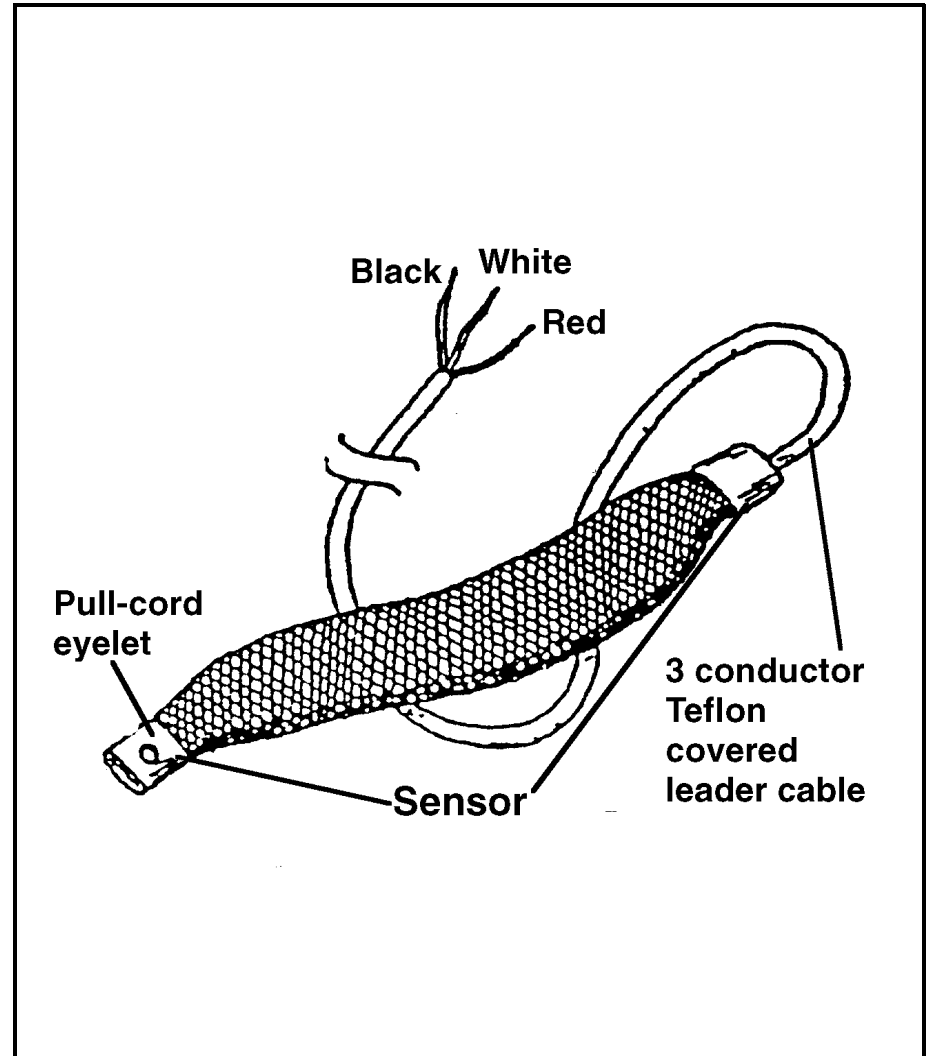


Figure 9 - Interstitial Sensor

3.7 Freon Sensor

The freon sensor (Figure 10) detects refrigerant leaks, possibly preventing asphyxiation due to freon or ammonia displacement of oxygen. The sensor detects freon or ammonia fumes caused by leaks.

Place freon sensors around pipes and vessels containing refrigerants. *Proper installation and sensor placement is CRITICAL!* For areas prone to flooding, a liquid sensor is recommended to prevent the freon sensor from being submerged in liquid. The sealed liquid sensor is protected from particles such as dirt and requires no special orientation or modification. *Installation instructions are in Section 6. There are two models of freon sensors available, one for #12 freon (part # 30-3208) and one for #22 or 134A freon (part # 30-3209).*

FREON SENSOR SPECIFICATIONS	
Substance Detected	Ammonia or Freon
Maximum Sensitivity Ammonia: Freon:	50 to 150 ppm 100 to 300 ppm
Wiring Requirement	14 to 18 AWG, oil & gas resistant (TFFN, THHN, or THWN)
Maximum Wiring Length	500 feet (152 m) with 18 AWG wire 1000 feet (305 m) with 14 AWG wire
Temperature Limits Storage Operating Temperature Change Effects % Highest Maximum Sensitivity	-40°F to 160°F (-40°C to 70°C) -20°F to 140°F (-30°C to 60°C) ±5% from 15°F to 50°F (-10°C to 10°C) ±30% all other ranges
Power	12 VDC at 120 mA
Size Length: Width:	3" (76 mm) 1" (25 mm)
Classification	CLASS 1 DIV. 1 GROUP D HAZARDOUS LOCATIONS

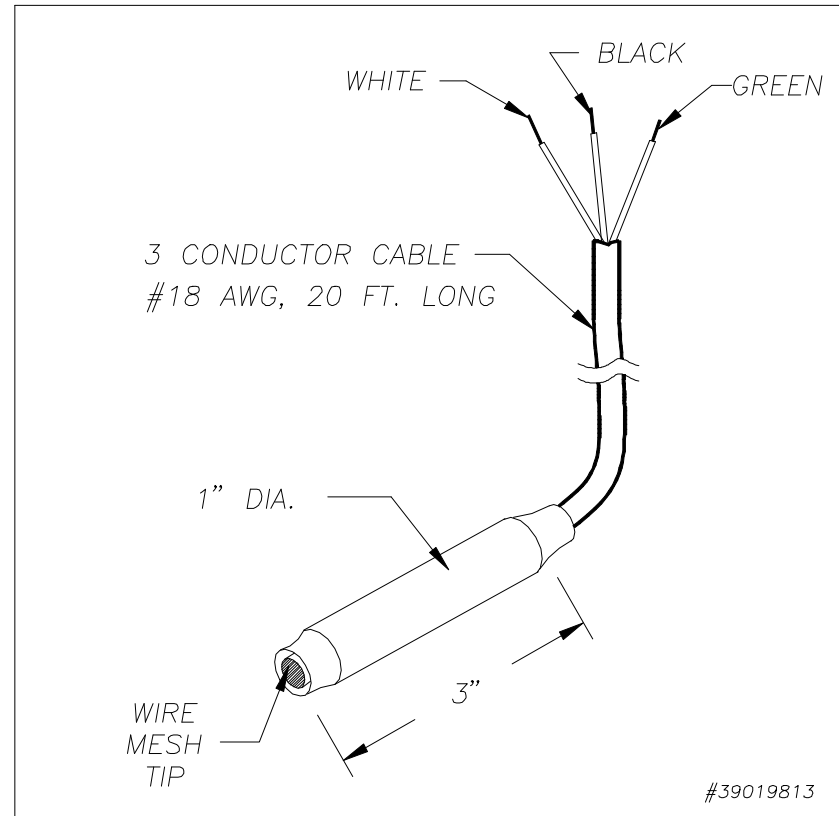


Figure 10 - Freon Sensor

Notes:

4.0 Tank Preparation

WARNINGS

SiteSentinel probes are safe for Class 1, Div 1, Group D hazardous locations. This includes tanks containing regular, super, diesel and unleaded gasoline; antifreeze; kerosene; mineral spirits; oxinol, methanol and methanol blends; motor, torque and transmission oil; and alcohol.

If you have any questions about whether a product is included in this classification, please contact your product distributor or **Petro Vend** distributor.

SiteSentinel probes must be installed as described in this section. If the minimum or maximum dimensions specified cannot be met, do not proceed with the installation.

4.1 Probe Placement

The ideal location for a probe is in the **center** of the tank (Figure 11). The probe should be located at least three feet (91 cm) from the tank fill pipe. If this distance is less than three feet, the force of the product entering the tank can cause the water float to rise up the shaft of the probe. This may cause the **SiteSentinel** to generate a false high water alarm. Adjust the drop tube of the fill pipe so that the product flow is diverted *away* from the probe.

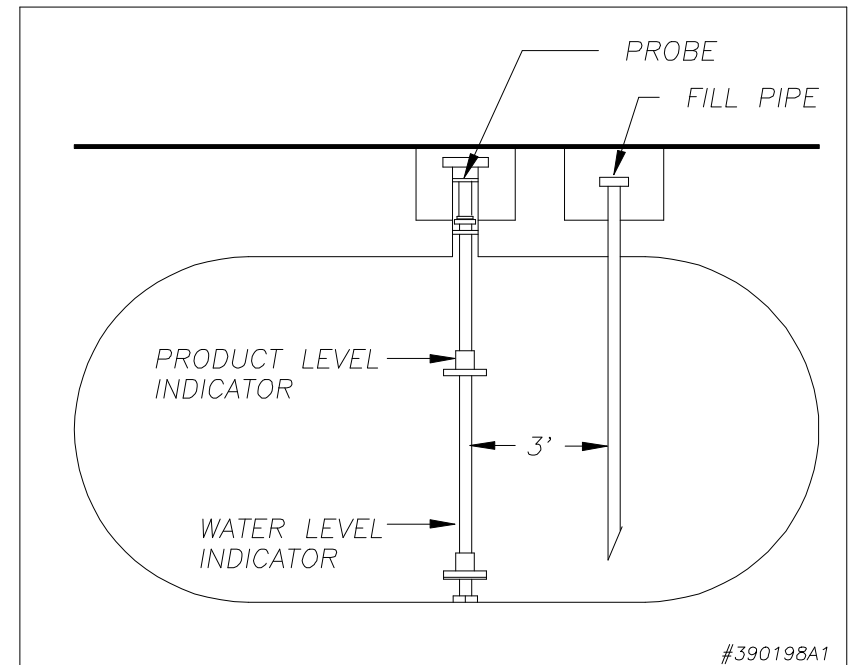


Figure 11 - Probe Placement

4.2 Probe Installation in an Underground Tank

1. Refer to Figure 12. Install a manhole of at least 18" (46 cm) diameter around an unused fitting in the top of the tank. This manhole must be large enough to accommodate a weatherproof junction box.

If this fitting is not in the center of the tank, you must take some additional measurements for probe compensation. Refer to the next page for details.

2. Install a 4" (10 cm) diameter riser pipe in the fitting. This pipe must be 19"- 60" (38 - 152 cm) long, enough to allow the cable from the probe to reach a weatherproof junction box.
3. Install a weatherproof junction box near the riser pipe. The box must be large enough to accommodate ½-inch (13 mm) conduit.
4. Install the ½-inch NPT bushing (supplied with each probe) in the weatherproof junction box.

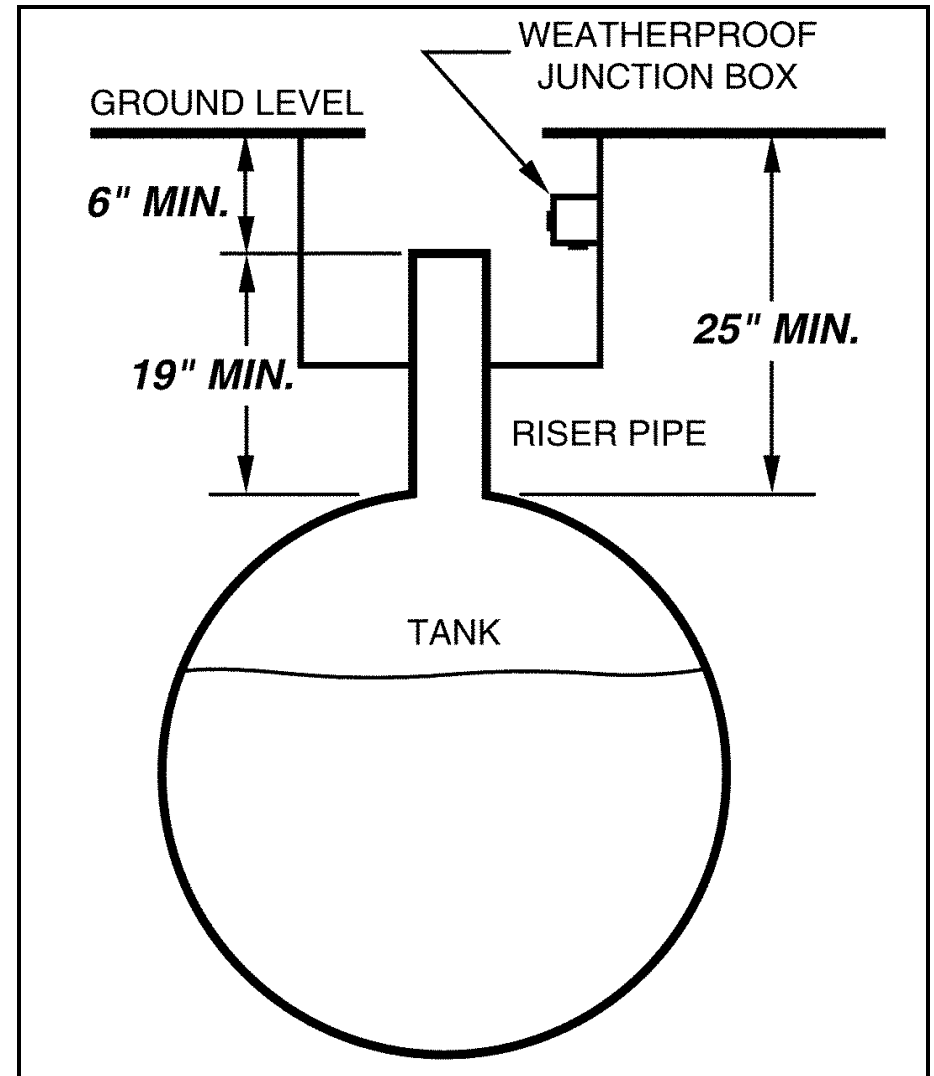


Figure 12 - Underground Tank Preparation

4.3 Calculating Product Offset

You can calculate a product offset for a probe that is *not* installed in the center of a "pitched" tank. Pitch is the tilt of a tank along its horizontal axis. Some tanks are intentionally installed with one end lower than the other. This allows water and sediment to collect at the low end, while clear product is drawn from the high end. Pitch can also be caused by tank settling.

The rate of pitch can be measured by using a dipstick to measure the level of product at two points (preferably opposite ends) of the tank.

See Figure 13. The product depth at the deep (lower) end of the tank is value "A". The product depth at the shallow (higher) end is value "B". The distance between the two measuring points is "C".

The formula for pitch is:

$$\frac{A - B}{C}$$

For example:

$$\frac{46'' - 40''}{120''} = \frac{6''}{120''} = 0.05$$

To calculate the product offset, measure value "D", the distance of the probe from the center of the tank. The formula for product offset is "D" x pitch. For the example above, 36" x 0.05 = 1.8"

If the probe is located closer to the shallow end of the tank, the product offset is positive; for the example, 1.8. If the probe is located closer to the deep end of the tank, the product offset is negative; for the example, -1.8.

Refer to the *Site Sentinel Operator's Guide* for details about entering the product offset.

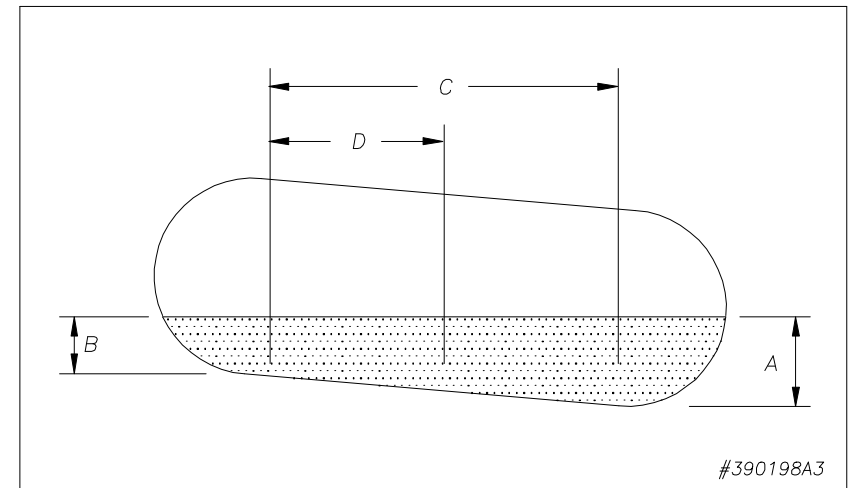


Figure 13 - Calculating Offset in a Tank

Notes:

5.0 Conduit & Cabinet Installation

WARNINGS

Do not mount any system component or external device (other than probes or sensors) within or above the hazardous area. Do not drill holes in ANY SiteSentinel cabinets. Do not connect the controller to equipment that uses or generates more than 250 volts. Probe cables and sensor wiring must not share conduit with any other wiring. *Only* power wiring may share conduit with Petro-Net.

5.1 Controller Installation (Indoors Only)

MODEL II: Mount the Model II controller on a wall in a secure indoor location using the mounting tabs provided. If possible, align the cabinet so that the display is at eye level (approx. 5-6 feet above the floor). Knockout locations are shown in Figure 14.

MODEL III: Place the Model III controller near an electrical outlet, and close to where your system wiring enters the facility. Plug the power pack into the outlet; connect the cable from the power pack to the jack on the back of the controller.

5.2 I/O & Smart Module Installation

Like the controller, the Smart Modules and the I/O Modules must be mounted on a wall in a secure indoor location using the mounting tabs provided. Knockout locations are shown in Figures 15 and 16. *Smart Modules require AC power.*

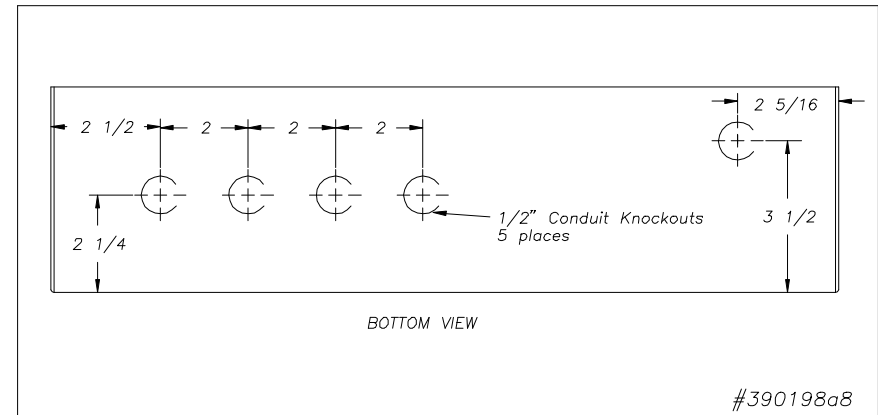


Figure 14 - Model II Controller Knockouts

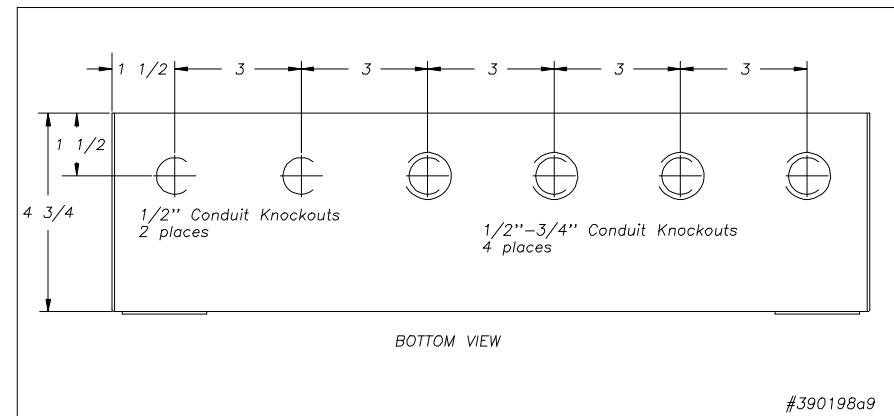


Figure 15 - Model II Smart Module Knockouts

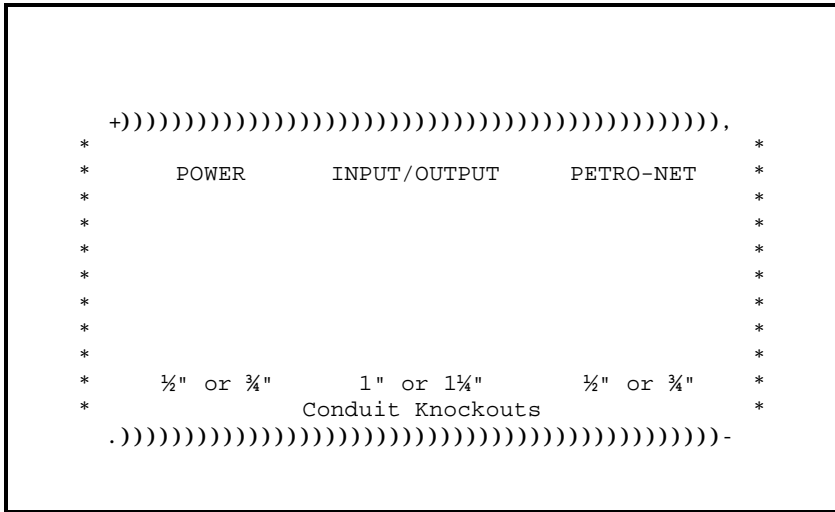


Figure 16 - I/o Module Knockouts

5.3 Circuit Breaker Conduit

Conduit installation is shown in Figure 17.

Install a 1/2-inch (13 mm) conduit from the power knockout in the controller to the circuit breaker box.

Install a 1/2-inch (13 mm) conduit from the power knockout in each module to the circuit breaker box. *This conduit can also be used for Petro-Net wiring.*

5.4 RS-232 Communication Conduit

Conduit installation is shown in Figure 17. If a terminal or PC located over 6 feet from the controller is to be connected, you must install conduit for the RS-232 cable.

Install a 1/2-inch (13 mm) conduit from a knockout in the controller to a 4"x4" (10 cm x 10 cm) peripheral junction box.

5.5 I/O Device Conduit

Conduit installation is shown in Figure 17. You should use rigid steel conduit for wiring runs to all I/O devices, especially for runs of over 50 feet (15 m).

Each I/O Module has a single 1" - 1.25" (2.5 to 3.3 cm) knockout for the conduit for I/O device wiring. Additional knockouts are provided for power and Petro-Net communication wiring conduits, refer to Figure 16.

WARNING

To prevent interference, all wiring to and from a Smart Module must be protected by rigid steel conduit. *Probe and sensor wires must be alone in their conduits. DO NOT run with wiring from other manufacturer's probes, sensors or alarms.*

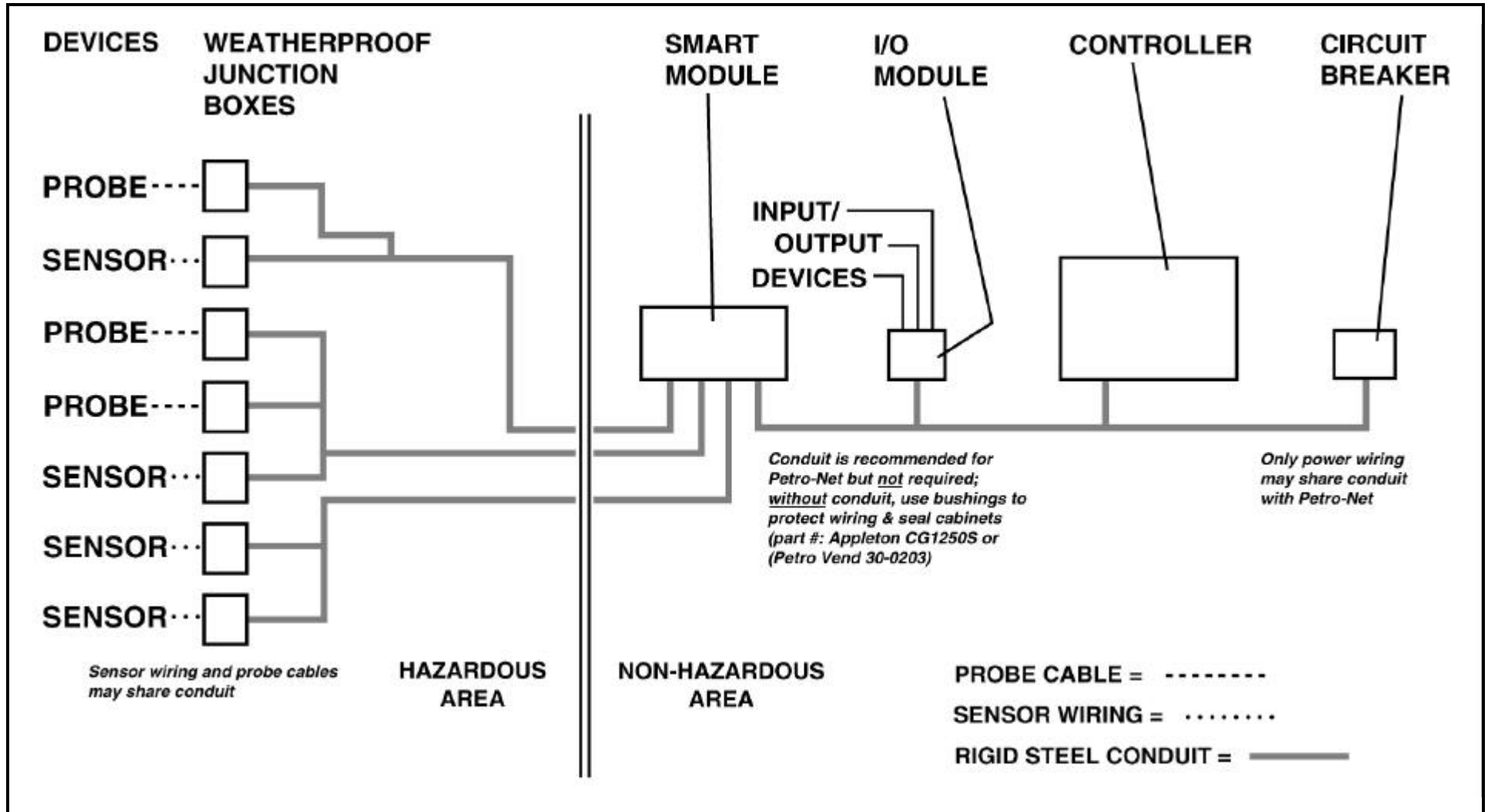


Figure 17 - Conduit Installation

5.6 Probe & Sensor Conduit

Conduit installation is shown in Figure 17. *All probe cables and sensor wiring must be protected by rigid steel conduit.* Each Smart Module has four 1/2-3/4-inch (13-19 mm) knockouts to accommodate the conduit for probe cables and sensor wiring. Additional knockouts are also provided for power and communication wiring conduits.

Use the table below to determine the number and size of the conduits run between each Smart Module and its corresponding probes and sensors.

Group probe and sensor wires into single dedicated conduits for each barrier.

PROBES/SENSORS	NUMBER & SIZE OF CONDUIT
1 to 2	one 1/2-inch
3 to 4	one 3/4-inch
5 to 6	one 1/2- & one 3/4-inch
7 to 8	two 3/4-inch
9 to 12	three 3/4-inch
13 to 16	four 3/4-inch

IMPORTANT

All probes for a manifold tank group must be connected to the *same* Smart Module.

Petro-Net communication wiring may share conduit with the AC power supply wiring for the Controller and the modules. Power supply wiring for other devices or equipment (such as pumps and lighting) must *not* share conduit with either Petro-Net or the power supply wiring for any **SiteSentinel** components.

5.7 Petro-Net Conduit

Conduit installation is shown in Figure 17. The communication link between the Smart Module(s), the I/O Module(s), and the controller is *Petro-Net*. Petro-Net uses 18 AWG, twisted pair wiring and is immune to most background electrical noise.

Conduit is highly recommended as added protection for the wiring. If conduit is *not* used, you must install a bushing at each cabinet knockout; the bushings seal the cabinets and provide strain relief for the wiring. Order the bushing from **Petro Vend** (part # 30-0203) or from Appleton Corp. (their part # CG1250S).

Petro-Net wiring for the modules can be “daisy-chained” - numerous modules can be tied together, as long as one module in the "chain" is connected to the controller. See Page 51 for a typical arrangement.

6.0 Probe & Sensor Installation

6.1 Probe Installation

6.1.1 ADAPTER COLLAR & RISER CAP

A modified adapter collar and riser cap are required for each probe. These collar and riser cap kits are available from **Petro Vend**; order kit number **030-2000**.

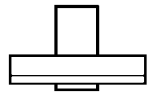
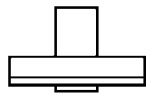

First, install the modified adapter collar onto the riser pipe. Next, screw in the bushing supplied with the probe into the $\frac{3}{8}$ -inch (10 mm) NPT hole in the riser cap. After the probe is lowered into the tank, snap the cap into place.

6.1.2 PROBE FLOATS

There are three types of floats used with the probes: *Product*, *Water for Diesel* and *Water for Gasoline*.

Keep in mind that the two types of water floats are NOT interchangeable.

Because diesel is more dense than gasoline, the water/diesel floats are heavier than the water/gasoline floats. If the wrong water float is installed in a diesel tank, it does not sink through the product to the water below. As a result, the tank will have unusually high water measurements and possibly erratic product measurements as the water float interferes with the product float.

FLOAT TYPE	APPEARANCE	DESCRIPTION
water/diesel		weight plate with 3 holes
water/gasoline		weight plate with 6 holes
product		no weight plate

6.1.3 INSTALLATION PROCEDURE

A stainless steel plug is welded in the end of the probe. An E-ring is attached to the plug to keep the floats from slipping off the probe shaft.

1. Remove the E-ring.
2. With its magnet oriented toward the *end* of the probe, carefully slide the *product* float onto the shaft.
3. With its magnet oriented toward the *head* of the probe, carefully slide the *water* float onto the probe shaft.

If your station has tanks with products of different density (such as diesel and regular fuel), be sure that the water floats are properly matched to the products.

4. Replace the E-ring and slide both floats to the bottom of the probe.
5. A blue cable is provided with each probe. This cable has a 3-prong connector that attaches to the probe head and three leads to wire at the weatherproof junction box. Feed the blue cable through the riser cap. Attach the cable connector to the socket in the probe head.
6. Using the cable, carefully lower the probe into the riser pipe until it rests on the bottom of the tank. Be careful not to damage the floats.
7. Tighten the bushing and leave a few inches of slack in the cable.
8. Snap the riser cap in place and secure with a lock.
9. Install the cable bushing with the ½-inch (13 mm) NPT into the weatherproof junction box. Pass the cable through this bushing and tighten.

IMPORTANT

The end of the probe must rest on the bottom of the tank.

6.2 Sensor Installation

6.2.1 INTRODUCTION

The **SiteSentinel** sensors (described in Section 3, beginning on Page 11) must be installed, located and operated according to all applicable codes. These codes include, but are not limited to, the **National Fire Prevention Code** and the **National Electrical Code**.

Due to the variety of surface and soil conditions, placement of monitoring wells should be determined by someone familiar with local conditions and codes. Do a ground water survey for best results.

All sensors are intrinsically safe for use in hazardous locations Class 1, Group D, Division 1 and 2, as defined by the National Electrical Code. Connect to Smart Modules using 14 to 18 AWG twisted pair wiring and rigid steel conduit. *Never "common wire" sensors together.*

The maximum distance between a sensor and the Smart Module is 500 feet (152 m) with 18 AWG wire and 1000 feet (305 m) with 14 AWG wire. *Seal off all wiring for vapor protection!*

Four common scenarios are illustrated and described next:

Single-Wall Tank/Dry Well Monitoring
Single-Wall Tank/Wet Well Monitoring
Double-Wall Tank/NO Well Monitoring
Double-Wall Tank/WITH Well Monitoring

Additional sections explain containment sump monitoring, aboveground tank monitoring, trench/manway monitoring and freon sensor installation. Follow the appropriate sections for your site.

6.2.2 SINGLE-WALL TANK - DRY WELL MONITORING

Figure 18 on page 31 represents a typical dry monitoring well layout for a single-wall tank. The sensors are placed around the perimeter of the tanks. Monitoring wells are dug as close as possible to the tanks or product lines for optimum sensor response.

Figure 18 also shows a typical monitoring well cross-section. The manhole should be watertight, and the monitoring well should be at least two feet deeper than the bottom of the tanks to be monitored. Use either two-inch or four-inch well casing.

To obtain an adequate sample area, the *perforated* section should be a large part of the well casing's length. Place a cap on the bottom of the well casing to prevent dirt entry. Backfill dirt around the casing.

The vapor sensor monitors hydrocarbon vapors. A *liquid* sensor should also be installed, and placed lower than the vapor sensor to detect any liquid buildup.

Though vapor sensors are *not* damaged by submersion in liquid, it will not function properly until removed from the liquid and given sufficient time to dry. The sealed liquid sensor is protected from particles such as dirt. It requires no special placement. Any combination of vapor and liquid sensors may be used.

WARNING

Do not "common" wire any of the sensors as damage to the Smart Module will result.

Failure to cover monitoring wells may result in personal injury and/or monitoring well contamination.

PROCEDURE

1. Drill the bore hole *away* from any surface spill area to prevent spilled products from flowing into the hole.
 2. Line the bore holes with perforated casing to prevent collapse.
 3. Fill the area between the bore hole walls and the casing with the proper backfill material to permit gas and water diffusion.
 4. Connect the sensor directly to the Smart Module by splicing the sensor wires to TFFN, THHN or THWN (oil and gas resistant) cabling which, after running thru vapor sealoffs, goes into the Smart Module.
 - If the total distance (from sensor to controller) is 500 feet (152 m) or less, use **18 AWG** wire for the wiring.
 - If the total distance is 500 to 1000 feet (152 m to 305 m), you use 14 AWG wire.
- Follow all applicable codes! Use appropriate splicing materials and tools when splicing and wiring the sensor.
5. Determine the depth of each sensor installation and mark that length on the sensor wiring.
 6. Check the sensor ID tag (on the metal portion of the sensor) for the sensor type (see Page 11). Mark the end of the wiring to identify the sensor type.

7. Lower the sensors into the well, to the mark on the wiring. *The liquid sensor should not touch the bottom of the well.* The vapor sensor should be about halfway down the well.
8. Thread a cap on the top of the well casing to prevent water and other contaminants from entering the monitoring well.
9. Run separate wiring from each sensor to the Smart Module. Note that probe cables and sensor wiring can share the same conduit.

Keep track of sensor wiring to ensure proper wiring at the Smart Module.

NOTE: *The site diagram shows a Model II controller. Layout is identical for a Model III controller.*

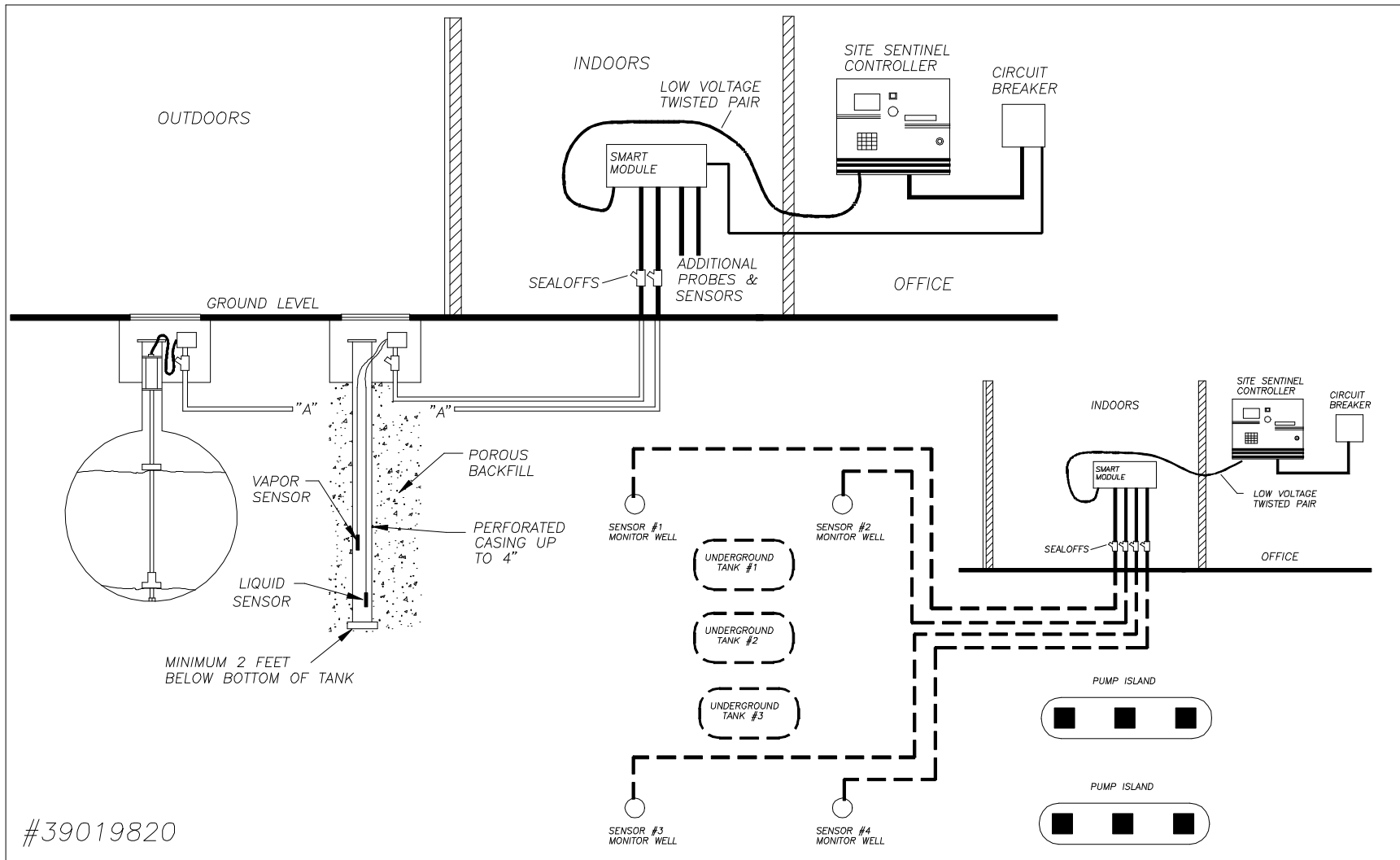


Figure 18 - Single Wall Tank/ Dry Well Monitoring (Model II Controller shown, same overall layout with Model III Controller)

6.2.3 SINGLE-WALL TANK - WET WELL MONITORING

Figure 19 shows a typical wet monitoring well layout for a single-wall tank. The sensors are placed around the perimeter of the tanks. The monitoring wells are dug as close as possible to the tanks or product lines for best sensor response.

Figure 19 also shows a typical monitoring well cross-section. Instructions are the same as that for the dry well monitoring - see Page 29.

WARNINGS

Do not "common" wire any of the sensors as damage to the Smart Module will result.

Failure to cover monitoring wells may result in personal injury and/or monitoring well contamination.

PROCEDURE

1. Drill the bore hole away from any surface spill area to prevent spilled products from flowing into the hole.
2. Line the bore holes with a perforated casing to prevent collapse.
3. Fill the area between the borehole walls and the casing with backfill material to permit gas and water diffusion.
4. Connect the sensor directly to the Smart Module by splicing the sensor wires to TFFN, THHN or THWN (oil and gas resistant) cabling which, after running thru vapor sealoffs, goes into the Smart Module.

- If the total distance (from sensor to controller) is 500 feet (152 m) or less, use **18 AWG** wire for the wiring.
- If the total distance is 500 to 1000 feet (152 m to 305 m), you use 14 AWG wire.

Follow all applicable codes! Use appropriate splicing materials and tools when splicing and wiring the sensor.

5. Determine the depth of each sensor and mark that length on the sensor wiring. To make sure the sensor will rest on the bottom of the well, measure the well from the bottom to the top and add six inches. Then, use the combined measurement to determine the total length, within the well, of the sensor and wiring to be used.
6. Lower the sensors in the well to the mark on the wiring.
7. A liquid-tight straight-fitting is supplied with each sensor. This fitting lets you pass the leader wiring through most caps and still maintain a liquid-tight passage. The clearance hole for non-threaded mounting is $\frac{5}{8}$ -inch (16 mm) diameter. Insert the leader wiring through the well cap, using the supplied fitting.
8. Run separate wiring from each sensor to the Smart Module. Note that probe cables and sensor wiring *can* share the same conduit.

Keep track of sensor wiring identity to ensure proper wiring at the Smart Module.

NOTE: *The site diagram shows a Model II controller. Layout is identical for a Model III controller.*

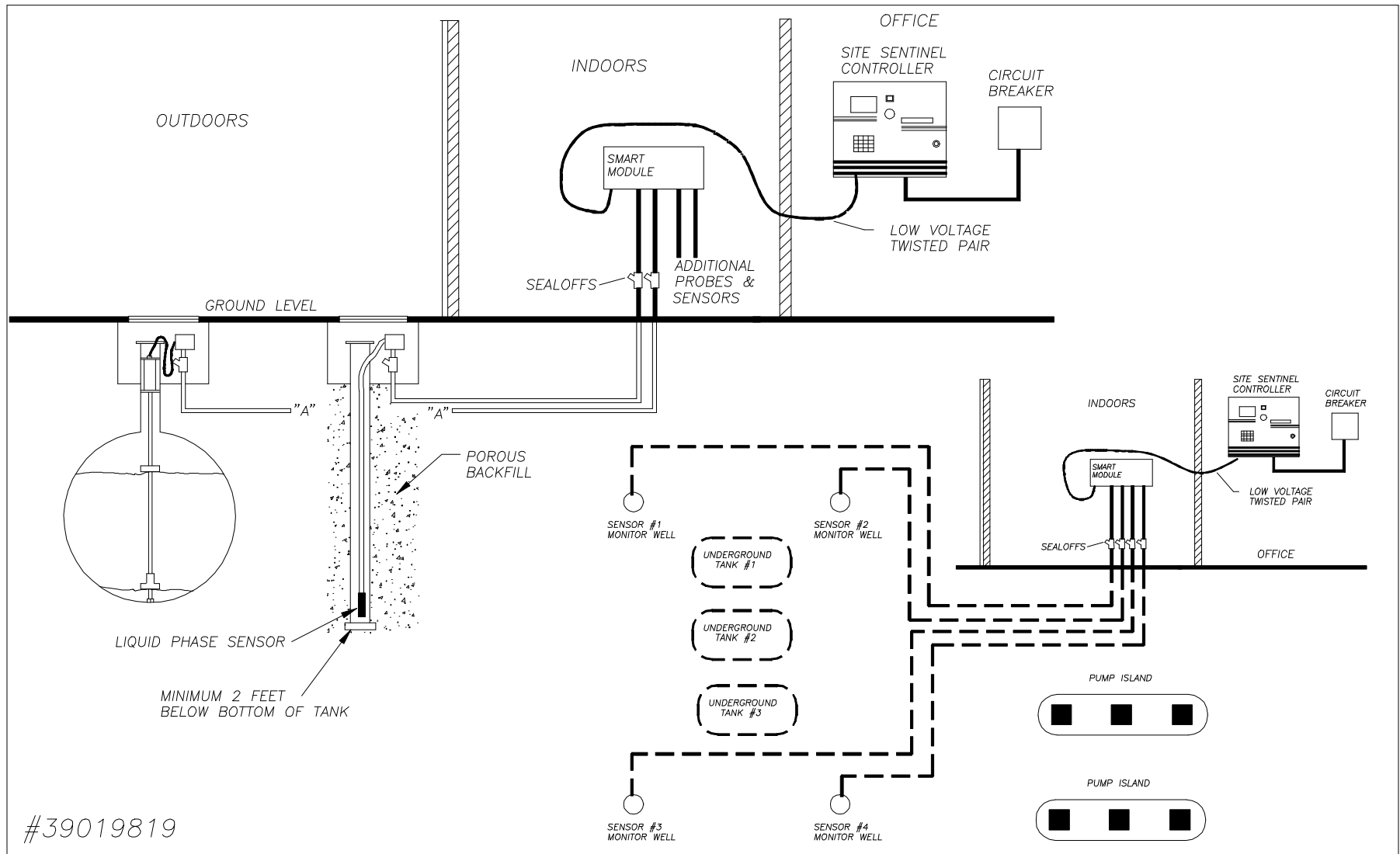


Figure 19 - Single-Wall Tank/Wet Well Monitoring (Model II Controller shown. Layout is identical with a Model III Controller)

6.2.4 DOUBLE-WALL TANK - NO WELL MONITORING

The space between the walls of a double-wall tank is the *interstitial* space, and it is an ideal location for vapor and liquid sensors.

If the *outside* tank wall develops a leak, water enters the interstitial space, and the liquid sensor indicates an alarm. If the *inside* wall develops a leak, the tank contents enter the interstitial space and both sensors indicate an alarm condition.

Figure 20 on the following page shows a typical sensor layout for a double-wall tank.

WARNING

Do not "common" wire any of the sensors as damage to the Smart Module will result.

PROCEDURE

1. Splice the sensor wires to TFFN, THHN or THWN (oil and gas resistant) wires. These wires pass thru vapor seal-offs, and enter the Smart Module.
 - If the total distance from sensor to controller is 500 feet (152 m) or less, use 18 AWG wire for the wiring.
 - If the total distance is 500 to 1000 feet (152 m to 305 m), use 14 AWG wire.

Follow all applicable codes and use appropriate splicing materials and tools when splicing and wiring the sensor.

2. Mark the end of the wiring to identify the sensor type.
3. Lower the liquid sensor into the interstitial space of the tank until it is near the bottom of the tank.
4. Lower the vapor sensor into the interstitial space of the tank, and place it mid-way around the circumference of the tank.
5. Ensure that no water or other contaminants enter the space between the walls of the tank, since this may cause one of the sensors to trigger an alarm.
6. Run separate wires from each sensor to the Smart Module. Note that probe cables and sensor wiring can share the same conduit. Keep track of sensor wiring identity to ensure proper wiring at the Smart Module.

NOTE: *The site diagram shows a Model II controller. Layout is identical for a Model III controller.*

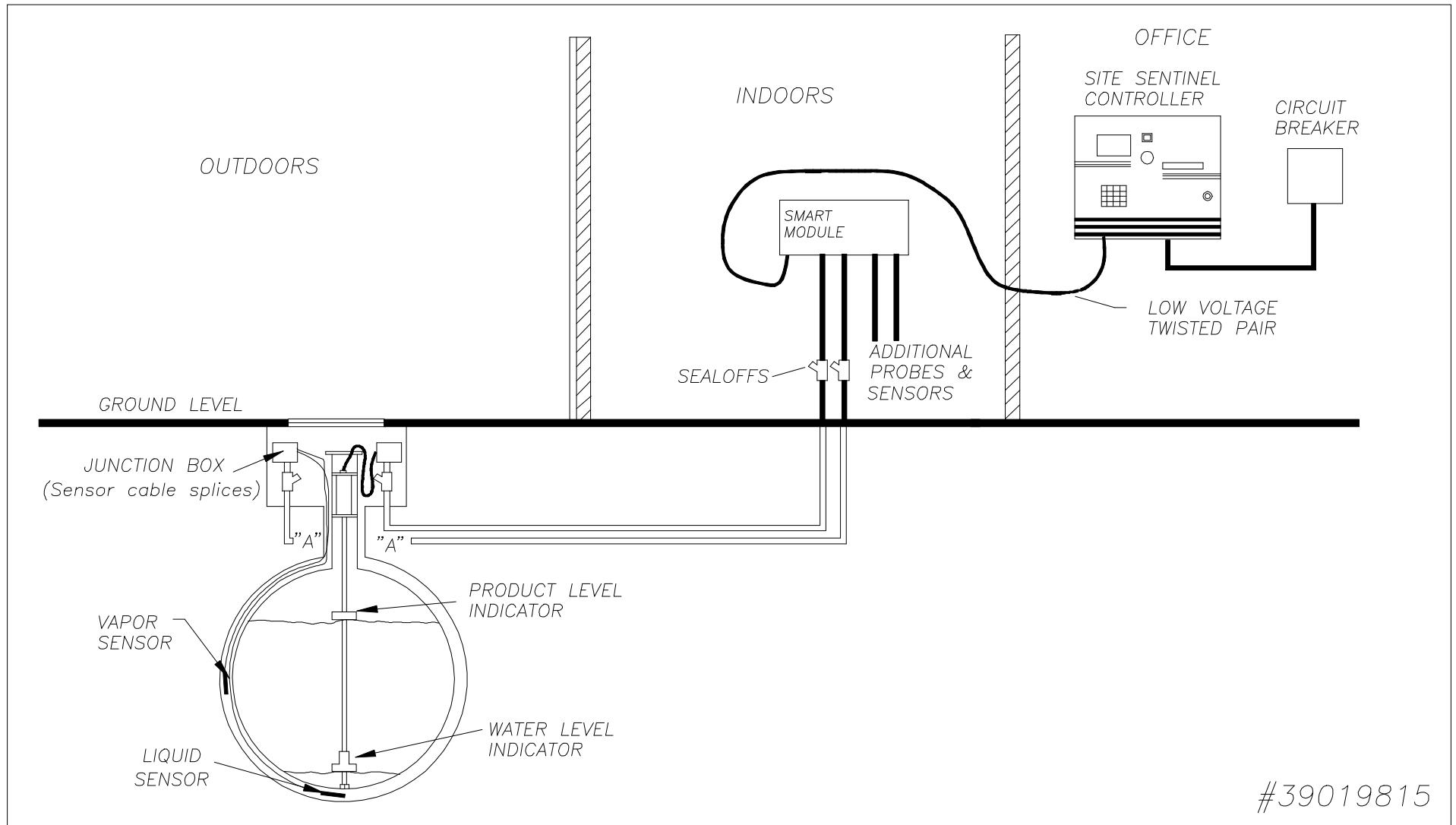


Figure 20 - Double-Wall Tank with NO Well Monitoring (Model II Controller shown. Layout is identical with a Model III Controller)

6.2.5 DOUBLE-WALL TANK - WITH WELL MONITORING

A monitoring well is used with a double-wall tank only if the local water table reaches tank level. Because of the danger of water table contamination, install the well with a liquid phase sensor (Page 15).

Figure 21 is a typical wet monitor well layout for a double-wall tank. Place sensors around the tank's perimeter. Locate wells as close as possible to the tanks or product lines for best sensor response. A monitoring well cross-section is also shown. Manholes are water-tight.

The monitoring well should be at least two feet deeper than the bottom of the monitored tanks. Use two- or four-inch well casing; the perforated section should be a large portion of the casing length. The bottom of the casing should have a cap to prevent dirt from entering it, and porous material should be back-filled around the casing.

WARNING

Do not "common" wire any of the sensors as damage to the Smart Module will result.

PROCEDURE

1. Drill the bore hole away from any surface spill area to prevent spilled products from flowing into the hole.
2. Line the bore holes with perforated casing to prevent collapse. Fill area between the bore hole walls and casing with the proper backfill material to permit gas and water diffusion.
4. Connect the sensor to the Smart Module by splicing the sensor wires to TFFN, THHN or THWN wires. These wires, in turn, pass thru

vapor seal-offs, and enter the Smart Module.

- If the total distance from sensor to controller is 500 feet (152 m) or less, use 18 AWG wire for the wiring.
- If the total distance is 500 to 1000 feet (152 m to 305 m), use 14 AWG wire.

Follow all applicable codes and use appropriate splicing materials and tools when splicing and wiring the sensor.

5. Measure the depth of each sensor installation. Mark that length on the sensor wiring. The sensor should rest on the well bottom, so measure the well from the bottom to the top and add six inches. Use the combined measurement to determine the total length, within the well, of the sensor and wiring to be used.
6. Lower the sensors in the well to the mark on the wiring.
7. A liquid-tight straight-fitting is supplied with each sensor. This fitting enables you to pass the leader wiring through most caps and still maintain a liquid-tight passage. The clearance hole for non-threaded mounting is $\frac{5}{8}$ -inch (16 mm) diameter. Insert the leader wiring through the well cap, using the supplied fitting. **COVER THE WELLS!** *Failure to cover monitoring wells may result in personal injury and/or monitoring well contamination.*
8. Run a separate wiring from each sensor to the Smart Module (or the Smart Module junction box). Note that probe cables and sensor wiring can share the same conduit. Keep track of sensor wiring identity to ensure proper wiring at the Smart Module.

NOTE: *The site diagram shows a Model II controller. Layout is identical for a Model III controller.*

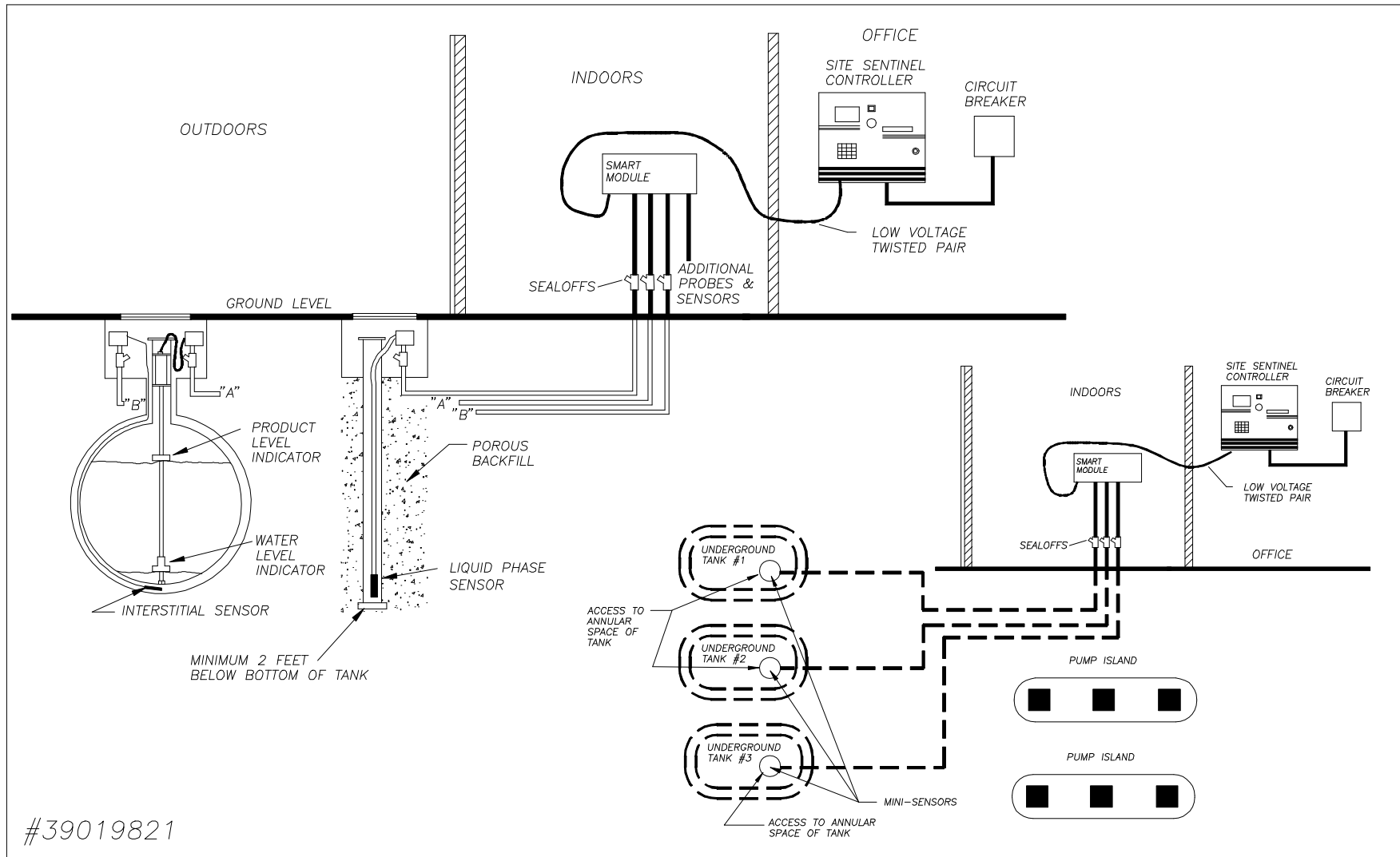


Figure 21 - Double-Wall Tank WITH Well Monitoring (Model II Controller shown. Layout is identical with a Model III Controller)

6.2.6 RESERVOIR SENSOR INSTALLATION

Use a universal reservoir sensor (described on Page 14) with hydrostatically monitored tanks. The reservoir sensor monitors the level of the liquid in the reservoir of a double-wall tank. An installation example appears in Figure 22.

The sensor has a single float which senses a low or a high liquid level within the reservoir. If a leak occurs in either wall of a tank, it causes the liquid in the reservoir to rise or fall. When liquid reaches the upper or lower limit on the sensor, the sensor activates.

PROCEDURE

1. The depth of liquid in the reservoir should be between 4½ inches (114 mm) and 5½ inches (140 mm).
 2. Drill a hole in the standpipe large enough for the PVC bushing. Using an appropriate adhesive, insert the bushing into the hole. Allow to dry.
 3. Wrap the end of the strain relief bushing with thread sealing tape, and thread into the PVC bushing.
 4. Feed the sensor lead wiring through the clamp bushing from the inside of the pipe. *Do not tighten the clamp onto the wiring.*
 5. Lower the sensor into the reservoir until the sensor rests on the bottom of the reservoir. Take up the slack in the lead wiring by pulling the wiring out through the clamp bushing until all of the slack is removed.
 6. Tighten the clamp bushing onto the wiring. Route the lead wiring into the junction box and secure the wiring.
7. Connect the sensor to the Smart Module by splicing the sensor wires to TFFN, THHN or THWN wires. These wires, in turn, pass thru vapor seal-offs, and enter the Smart Module.
 - If the total distance from sensor to controller is 500 feet (152 m) or less, use 18 AWG wire for the wiring.
 - If the total distance is 500 to 1000 feet (152 m to 305 m), use 14 AWG wire.

Follow all applicable codes and use appropriate splicing materials and tools when splicing and wiring the sensor. Identify sensor wires to ensure proper wiring at the Smart Module. Follow all applicable codes.

8. Run a separate wiring from each sensor to the Smart Module. Note that probe cables and sensor wiring can share the same conduit.

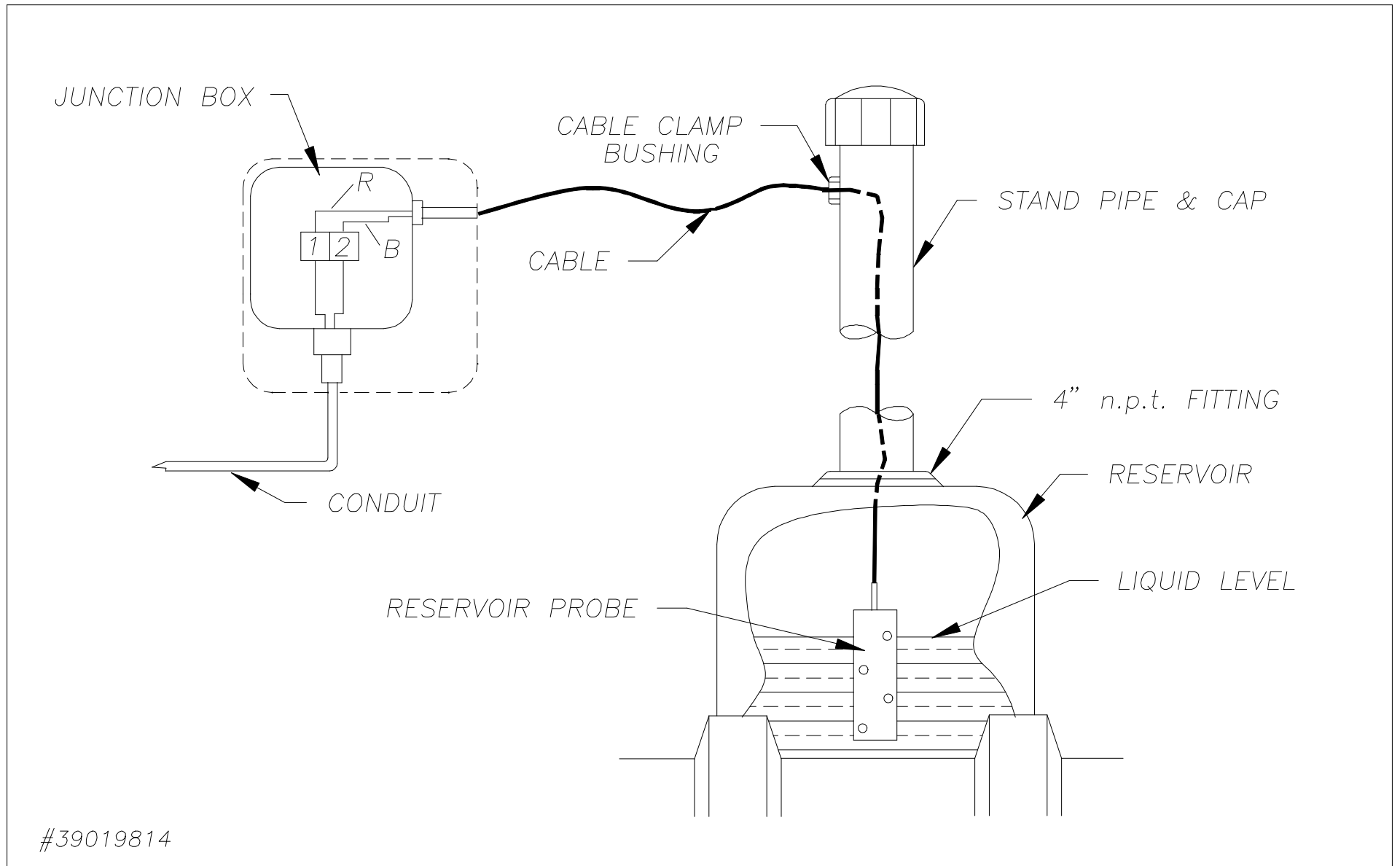


Figure 22 - Reservoir Sensor Installation

6.2.7 SUMP SENSOR INSTALLATION

The universal sump sensor (described on Page 13) is used in an attached manway riser, double-wall piping, or an attached collar riser. A sump sensor detects the presence of any liquid in a piping sump. When enough liquid enters the sump riser, it activates the sump sensor.

PROCEDURE

1. Place the universal sump sensor into the sump.
2. Route the lead wiring into the junction box.
3. Adjust the length of the wiring until the sensor is suspended on the sump floor (this dimension can be changed at your discretion). Secure the wiring into the box.
4. Connect the sensor to the Smart Module by splicing the sensor wires to TFFN, THHN or THWN wires. These wires, in turn, pass thru vapor seal-offs, and enter the Smart Module.
 - If the total distance from sensor to controller is 500 feet (152 m) or less, use 18 AWG wire for the wiring.
 - If the total distance is 500 to 1000 feet (152 m to 305 m), use 14 AWG wire.

Follow all applicable codes and use appropriate splicing materials and tools when splicing and wiring the sensor. Identify sensor wires to ensure proper wiring at the Smart Module. Follow all applicable codes.

5. Keep track of sensor wiring identity to ensure proper wiring at the Smart Module. *Follow all applicable codes.*
6. Run separate wiring from each sensor to the Smart Module.

Note that probe cables and sensor wiring can share the same conduit. Keep track of sensor wiring identity to ensure proper wiring at the Smart Module.

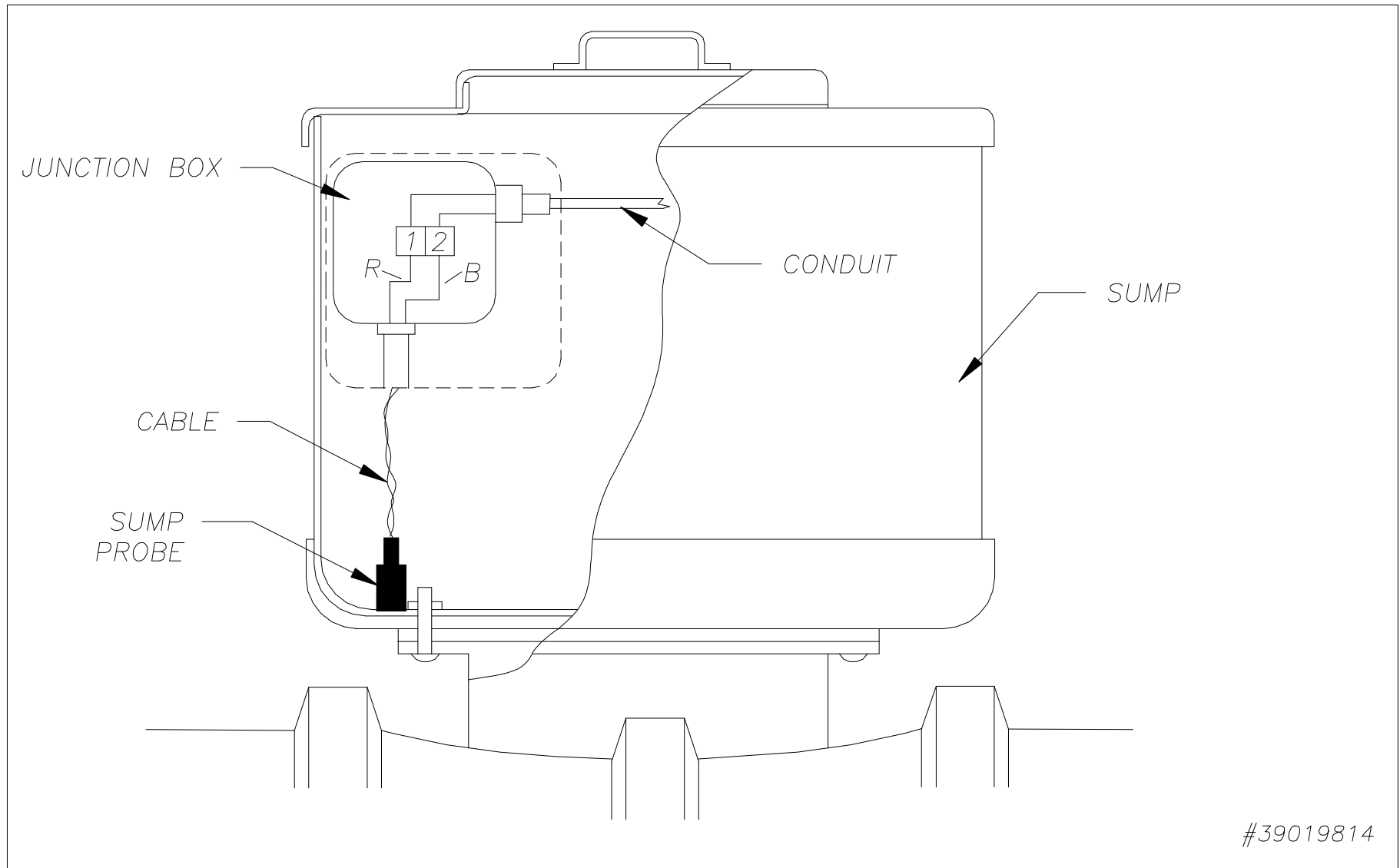


Figure 23 - Sump Sensor Installation

6.2.8 INTERSTITIAL SENSOR INSTALLATION

As shown in Figures 24 and 25, an interstitial sensor (described on Page 16) can be installed around the inside perimeter of the retaining wall or "snaked" under the length of an aboveground tank within the retaining wall area.

Figure 25 shows the interstitial sensor installed in a manway. The sensor can also be installed in trenches and inside of a sump.

PROCEDURE

1. Place the interstitial sensor in its intended location.

When installing the sensor in a sump, place the sensor at the bottom of the sump.

2. Connect the sensor to the Smart Module by splicing the sensor wires to TFFN, THHN or THWN wires. These wires, in turn, pass thru vapor seal-offs, and enter the Smart Module.
 - If the total distance from sensor to controller is 500 feet (152 m) or less, use 18 AWG wire for the wiring.
 - If the total distance is 500 to 1000 feet (152 m to 305 m), use 14 AWG wire.

Follow all applicable codes and use appropriate splicing materials and tools when splicing and wiring the sensor. Identify sensor wires to ensure proper wiring at the Smart Module. Follow all applicable codes.

3. Keep track of sensor wiring identity to ensure proper wiring at the

Smart Module. A below grade wiring work box can be used as a junction box for the splice when wiring underground. Follow all applicable codes.

4. Run separate wiring from each sensor to the Smart Module.

Note that probe cables and sensor wiring can share the same conduit. Keep track of sensor wiring identity to ensure proper wiring at the Smart Module.

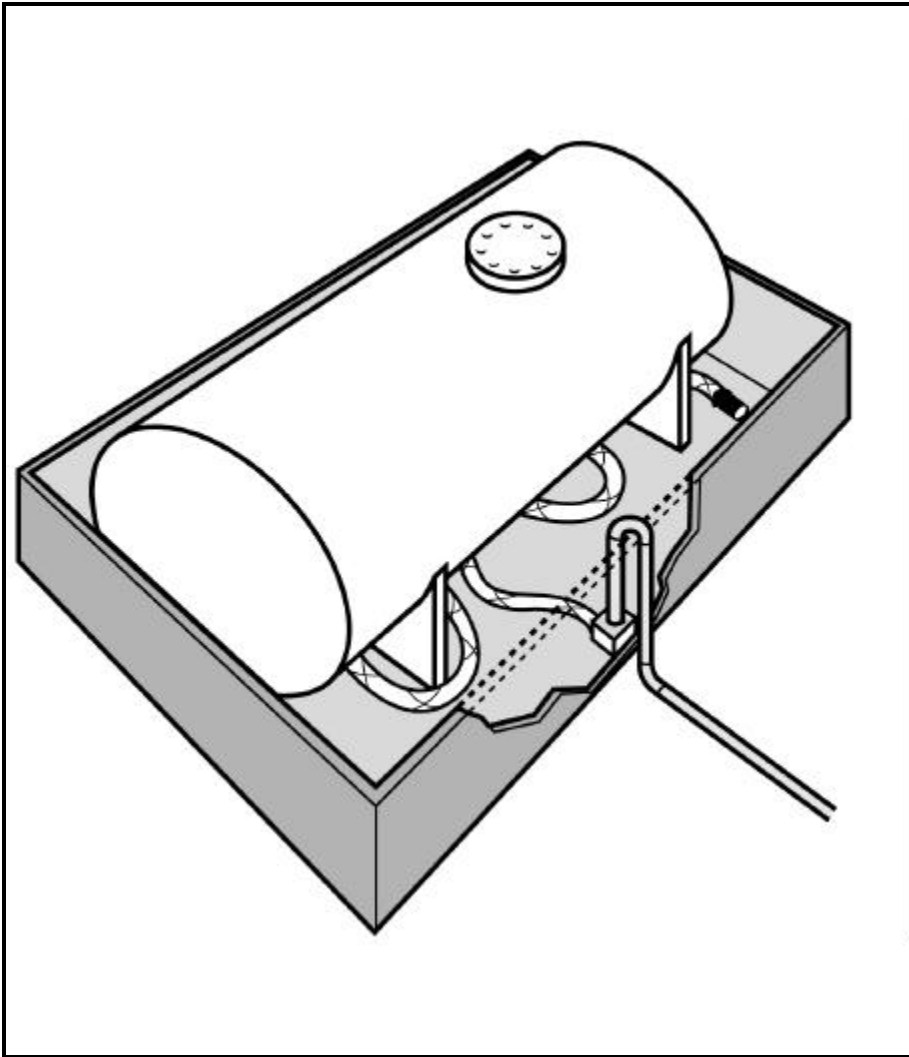


Figure 24 -Interstitial Sensor in Aboveground Tank Installation

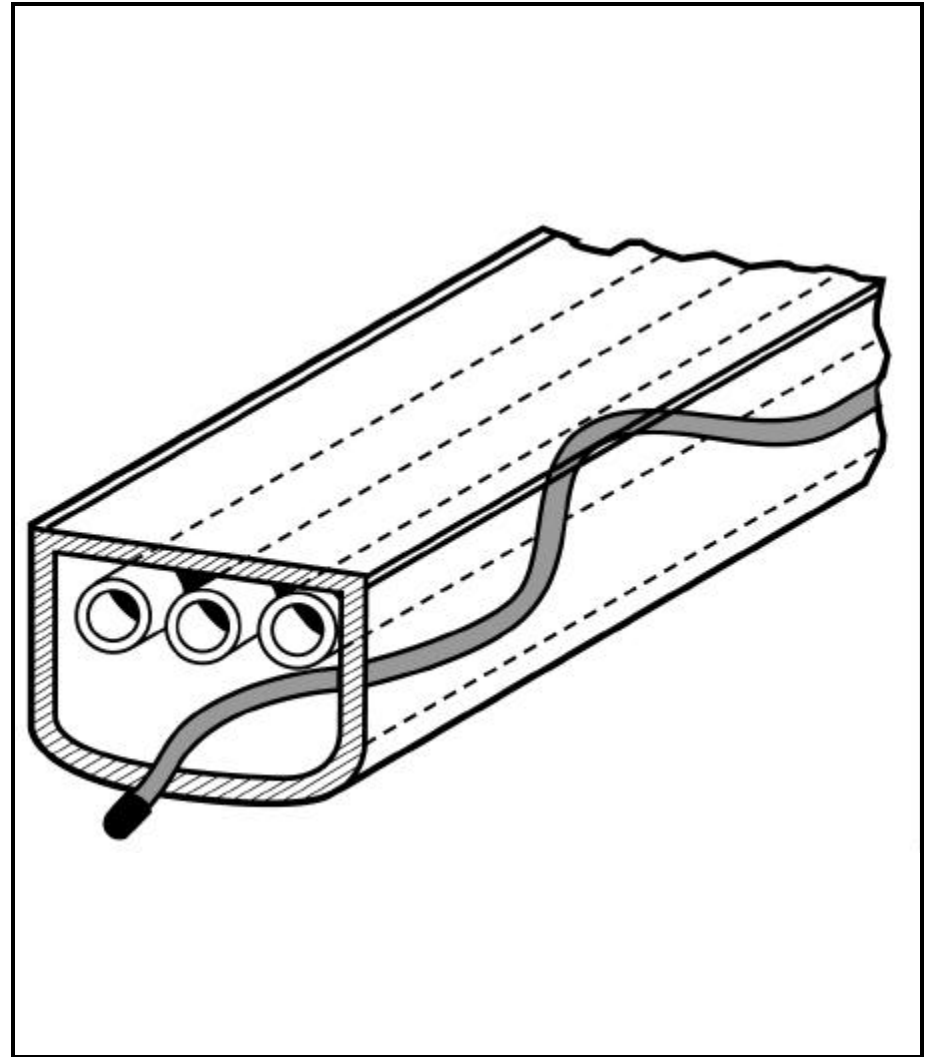


Figure 25 - Interstitial Sensor Installed in "Manway"

6.2.9 FREON SENSOR INSTALLATION

Freon sensors are described on Page 17. A typical installation is shown in Figure 26.

PROCEDURE

1. Place any combination of liquid and refrigerant gas sensors in the vicinity of the pipe or refrigeration system to be monitored.
2. Each freon sensor must be mounted in a standard 4"x4" (10 cm x 10 cm) junction box.
 - All freon sensor wiring must be protected by steel conduit to prevent contact with any non-intrinsically safe wiring.
3. Connect the sensor to the Smart Module by splicing the sensor wires to TFFN, THHN or THWN wires. These wires, in turn, pass thru vapor seal-offs, and enter the Smart Module.
 - If the total distance from sensor to controller is 500 feet (152 m) or less, use 18 AWG wire for the wiring.
 - If the total distance is 500 to 1000 feet (152 m to 305 m), use 14 AWG wire.

Follow all applicable codes and use appropriate splicing materials and tools when splicing and wiring the sensor. Identify sensor wires to ensure proper wiring at the Smart Module. Follow all applicable codes.
4. Keep track of sensor wiring identity to ensure proper wiring at the Smart Module. Follow all applicable codes.
5. Run a separate wiring from each sensor to the Smart Module. Note

that probe cables and sensor wiring can share the same conduit. Keep track of sensor wiring identity to ensure proper wiring at the Smart Module.

WARNING

DO NOT allow PV freon vapor sensors to be submerged in water! Submerged sensors may be damaged, causing improper monitoring. If submersed, always check for proper operation.

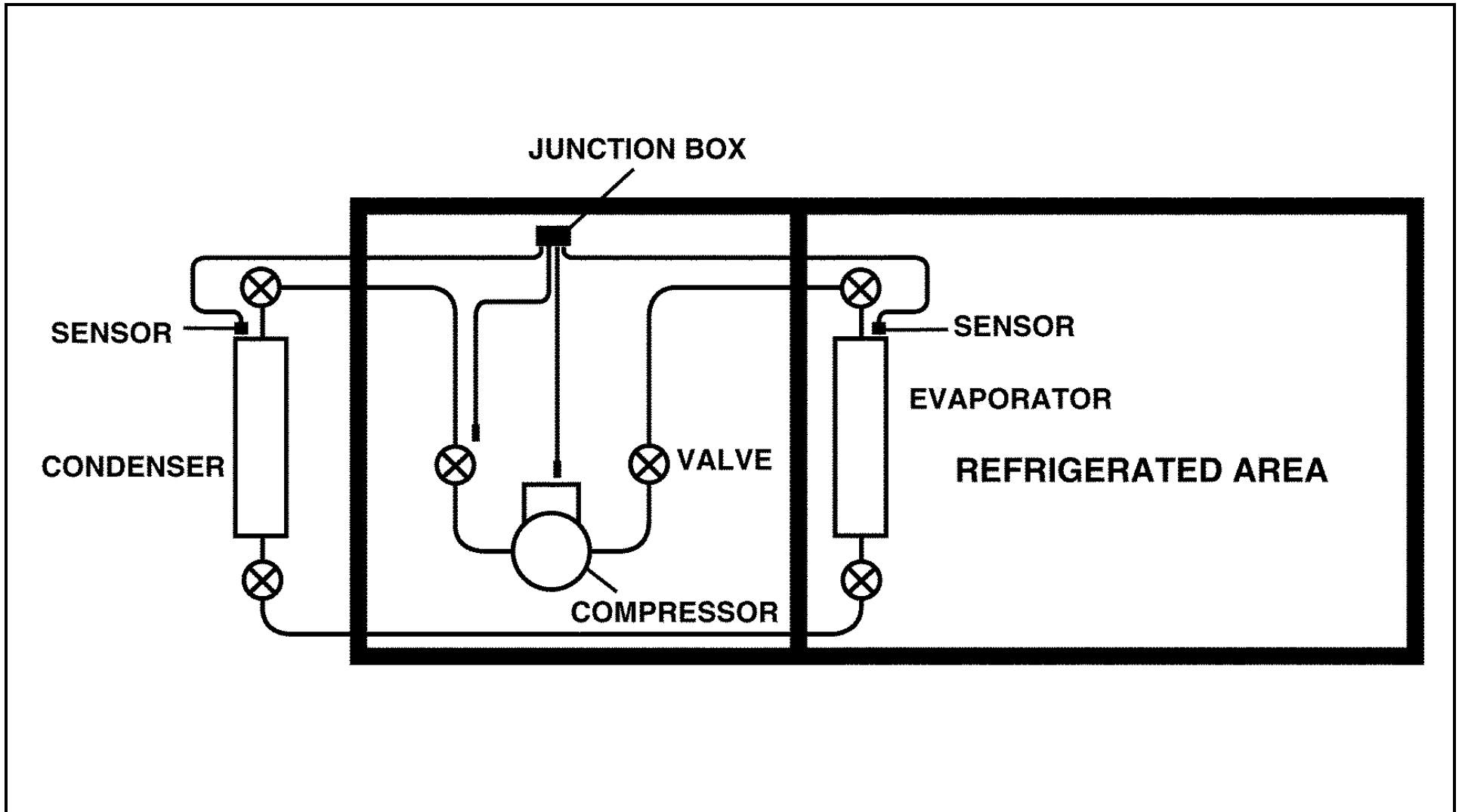


Figure 26 - Freon Sensor Installation

Notes:

7.0 Overall System Wiring

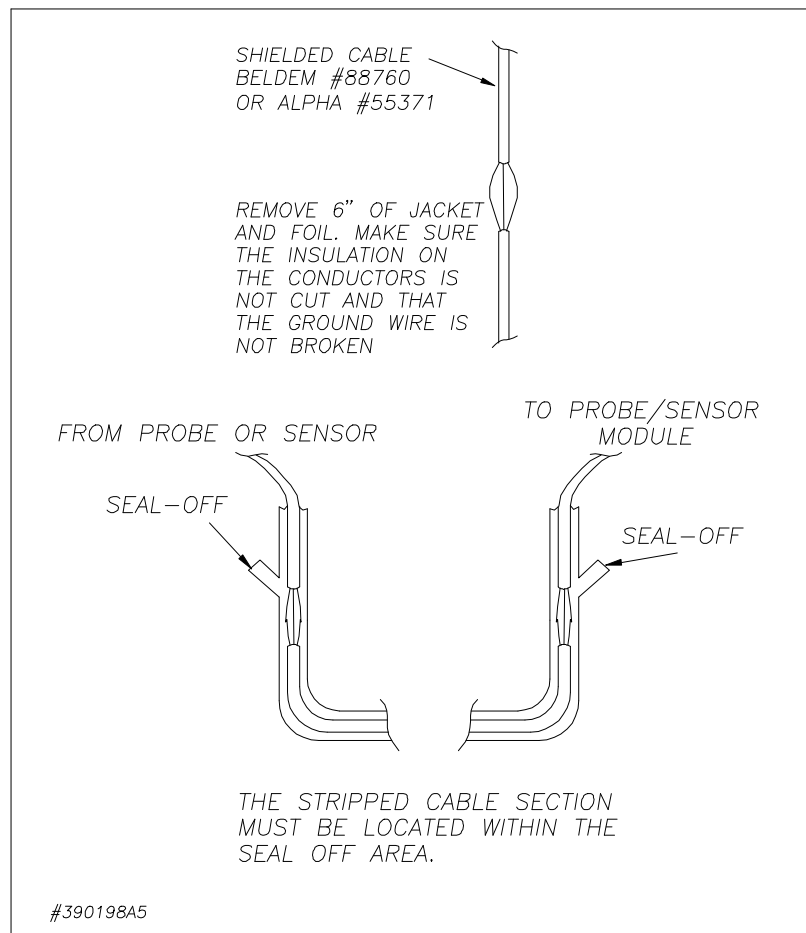


Figure 27 - Seal-off Creation

WARNINGS

Only Petro Vend probe cables and sensor wiring can share the conduit to the Smart Modules.

Improper cables, wiring, or conduit allow electronic noise to interfere with probe/sensor measurements. This may cause measurement readings at the controller resembling hardware failure.

The warranty is voided if improper cables, wiring, and/or conduit are installed.

The ground wire must be properly installed for the operation of the noise filtering circuitry. Do not rely on the conduit for the operation of the ground.

The controller must have a dedicated power circuit.

7.1 Probe Cable Seal-Offs

Seal off probe cables (Figure 27) before they enter the Smart Module! This prevents explosive vapors from entering the module. Remove enough of the jacket to allow approximately three inches of wire leads to extend past each sealoff. *DO NOT nick the wire installation.*

Probe or sensor wires come off the probe or sensor, connect to prepared Belden or Alpha cable, and then go through NPT bushing into a weatherproof junction box. *Bushings must be used in all junction boxes.* The cable is then routed - via rigid steel conduit - out of the box and

directly to the Smart Module. Label each cable and wire.

All probes for a manifold tank group must be connected to the same Smart Module

7.2 Smart Module Connections

See Figure 28. Each Smart Module handles up to 16 probes and sensors. Devices are identified via the **Module Number** and **Device Letter** (for example, “Module 1 Device A”) on the terminal strip to which it is wired. You must remove the intrinsically safe barrier panel to attach wiring. Connect the *probe* wires and cables according to the following chart (*sensor* wiring appears on the following page):

PROBE WIRING		
Probe Wire	Probe Cable (Belden #88760 or Alpha #55371)	Smart Module "Device" Terminal
white	red	PWR (power)
black	black	SIG (signal)
green	shield	GND (ground)

WARNING
Replace barrier panel in the Smart Module before power-up!

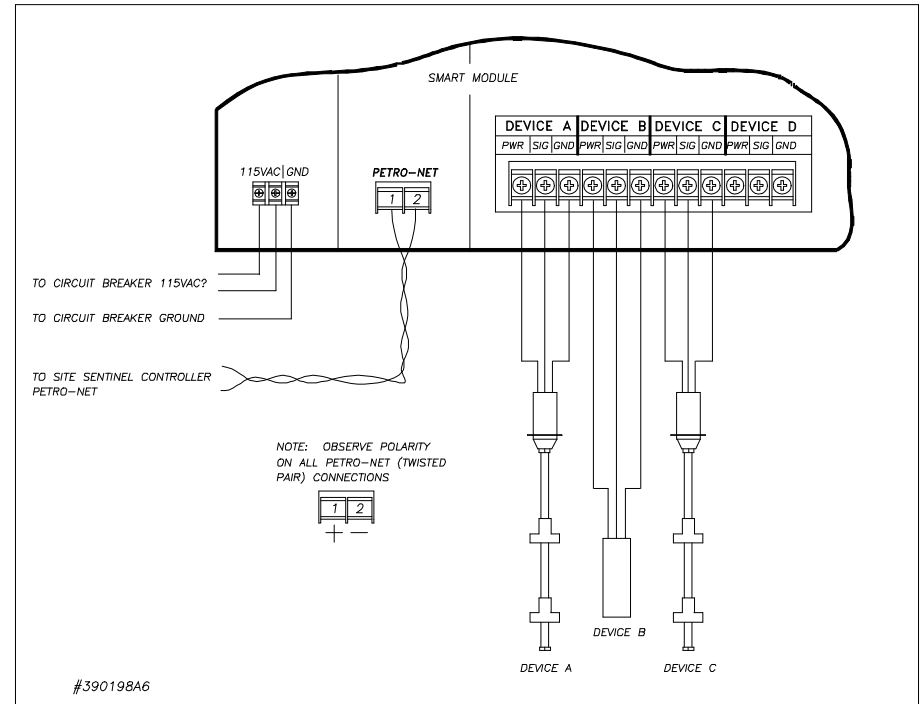


Figure 28 - Smart Module Connections

SENSOR WIRING									
Liquid	Hydrocarbon Vapor	Sump	Reservoir	Liquid Phase		Interstitial		Freon	Smart Module "Device" Terminal
				Hydrocarbon	Water	Hydrocarbon	Water		
white	white	red	red	red	red* (jumper)	red	red* (jumper)	white	PWR (power)
red	red	black	black	black	white	black	white	green	SIG (signal)
black	black	-----	-----	-----	-----	-----	-----	black	GND (ground)

Like probe wiring, sensor wires attach to prepared Belden or Alpha wiring in weatherproof junction boxes. The wiring is routed via rigid steel conduit to the Smart Module. Connect the sensor wires according to the table above.

IMPORTANT

The interstitial sensor has both hydrocarbon- and water-sensing elements. The liquid phase sensor is also available with both.

The two sensing elements *must* be wired to two separate terminal positions.

Install a jumper between the power terminals of the two positions.

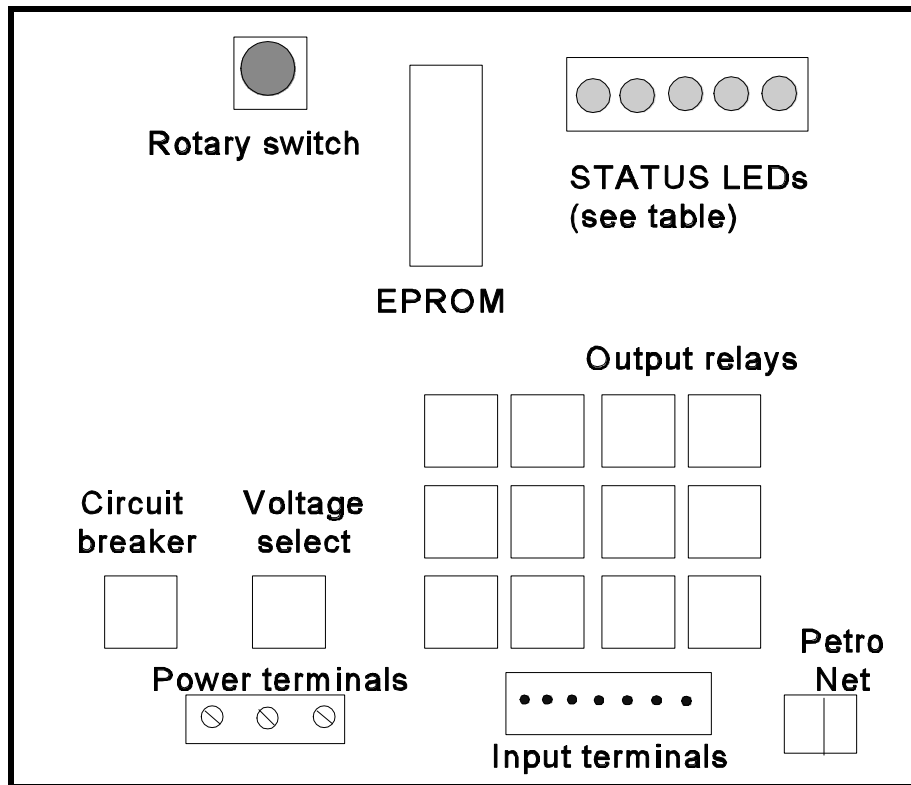


Figure 29 - I/O Module Board Overview

7.3 I/O Module Inputs & Outputs

7.3.1 INPUTS

See Figure 29. There are four pairs of pins (“Input Terminals”) in each I/O Module for input devices. Pins 2, 4, 6, and 8 are common. Pins 1, 3, 5, and 7 are at 5 VDC potential. Inputs are all optically isolated.

I/O input devices must be wired for "normally open" operation: The **SiteSentinel** defines an input device as "active" when the device terminals are *closed*.

7.3.2 OUTPUTS

There are 12 output relays (Figure 29) in each I/O Module for output devices. Each relay has three "quick connect" terminals: (1) common, (2) normally open, and (3) normally closed. Female "quick connect" terminals for the device wiring are provided with each I/O Module.

7.3.3 STATUS LEDs

STATUS LEDs	
COLOR	FUNCTION
Green	Status: slow = unconfigured; fast = data download
Yellow	Reset
Green	Petro-Net RX
Red	Petro-Net TX
Yellow	Petro-Net TX Enable

WARNINGS

Petro-Net wiring *must* be twisted pair wiring. Conduit is suggested, but not required, for Petro-Net. If conduit is *not* used, bushings must be installed in the cabinet knockouts to protect wiring and seal the enclosures.

Polarity must be observed for Petro-Net wiring!

PV250 TERMINAL BOARD (MODEL II ONLY)

The optional PV250 board is used to connect the SiteSentinel Model II controller to communication devices, such as a terminal, a PC, a printer and/or a modem. These connections are explained below:

Terminal Strip	Function
TB1	External Alarm & Phone Input
TB2	External Modem
TB3	Passthrough Port
TB4	External Printer
TB5	Terminal or PC
TB6	<i>Future use</i>

7.4 PETRO-NET Connections

Petro-Net is the communication link between the Smart Module(s), the I/O Modules, and the Model II or Model III controller. Two-wire, twisted pair wiring must be used. *Polarity must always be observed for Petro-Net connections* - the wire connected to the #1 position in each module must be connected to the #1 position in another device, etc.

Twisted pair wiring is available from **Petro Vend** as part #12-1029. You can easily make this type of wiring by twisting together two 18 AWG gas and oil resistant wires (THHN, TFFN, or THWN). Use between five and ten twists per foot (15 cm).

At each module, Petro-Net is connected to positions #1 and #2 of the PETRO-NET terminal block. Petro-Net can be "daisy-chained;" - modules may be connected to each other in various combinations as long as one module in the "chain" is connected to the controller. Refer to Figure 30 on the following page for a typical arrangement.

MODEL II CONTROLLER. At the Model II controller, Petro-Net is connected to either of the following:

- Positions 1, 2 of **TB4** terminal block on the PV250 board (if present) *OR*
- Positions 1, 2 of **P5** terminal block on the PV235 controller board.

MODEL II PETRO-NET WIRING		
Module	Controller	
"Petro Net" Terminal	PV250 Board "TB4" Terminal	PV235 Board "P5" Terminal
Position #	Position #	Position #
1	1	1
2	2	2

MODEL III CONTROLLER: At the Model III controller, plug the round 4-pin DIN connector end of the Controller Petro-Net cable into the PN socket on the controller (See Figure 30).

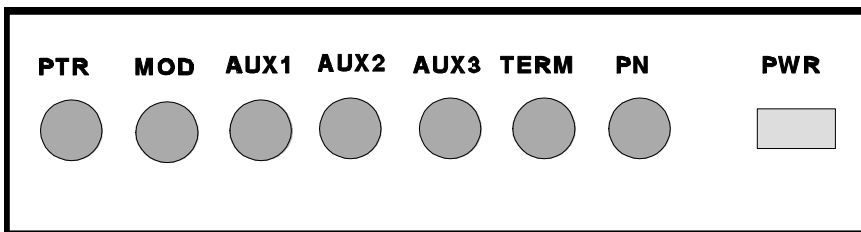


Figure 30 - Model III Controller Rear Panel

WARNING

Proper grounding is critical for safe system operation and the proper operation of the noise filtering circuitry.

Do *not* rely on conduit to provide a ground.

Only *power* wiring may share conduit with Petro-Net.

7.5 Model III Peripherals

IMPORTANT

If RS-232 communication will be used for a terminal, PC or other device more than six feet (1.8 m) from the controller, the comm cable must be inside conduit.

TERMINALS/PCs. Connect a terminal or PC to the TERMINAL socket on the Model III controller (Figure 30). The PC must be running emulation software.

PRINTER. To connect an optional journal printer, plug the connector at the end of the printer cable into the PTR socket. *Only a Petro Vend printer can be used with the Model III SiteSentinel.*

MODEM COMMUNICATION. To connect the local modem to the Controller, plug one end of the modem cable into the MOD socket; connect the other end to the modem. Configure the modem for the same baud rate as used by the SiteSentinel.

7.6 Connecting a Second System to the Model III

The SiteSentinel Model III has a passthrough mode that lets you communicate with a second system, such as Petro-Vend's System2 Fuel Management System. With PASSTHRU enabled, you can set up and operate the second system in the usual manner.

To connect the second system, plug the DIN connector of a modem cable into the AUX3 socket of the Model III controller. The other end of the cable connects to the second system, either directly or via modems. A gender adapter may be required to connect the modem cable to the second system hardware.

7.7 AC Power Connections

7.7.1 MODEL II CONTROLLER AC WIRING

1. Pull two AC power wires and one ground wire from the circuit breaker to the controller. Run through a bushing on the bottom of the controller.
2. Connect the neutral and hot wires (in either order) to the power input terminal block.

Be sure the controller is wired for the correct line voltages (115 VAC or 230 VAC) by checking the decal near the terminal block.

3. Connect the ground wire to the ground lug. Replace the safety cover over the terminal block when the wiring is done.

7.7.2 Model III CONTROLLER AC WIRING

Simply plug the Model III controller's "power-pak" into a wall outlet protected by the same circuit breaker that protects other system components.

7.7.3 SMART & I/O MODULE AC WIRING

1. See Figure 33 on Page 55. Pull two AC power wires from the circuit breaker to each module; you may "daisy chain" the wires from module to module, not to exceed the circuit breaker rating.
2. Connect the live and neutral power wires to the appropriate terminals in each module.
 - Make sure the modules are set for the correct voltages (115 or 230 VAC). For *Smart Modules*, check the decal near the terminal block. For *I/O Modules*, check the "line voltage selector" switch on the circuit board.
3. Determine grounding method: There are two versions of Smart Module: one has a single ground terminal, the other has a second ground terminal for the I.S. barrier. These grounding methods are illustrated in Figures 31 and 32 on the next page.

All ground connections must be done with 12 AWG wire.

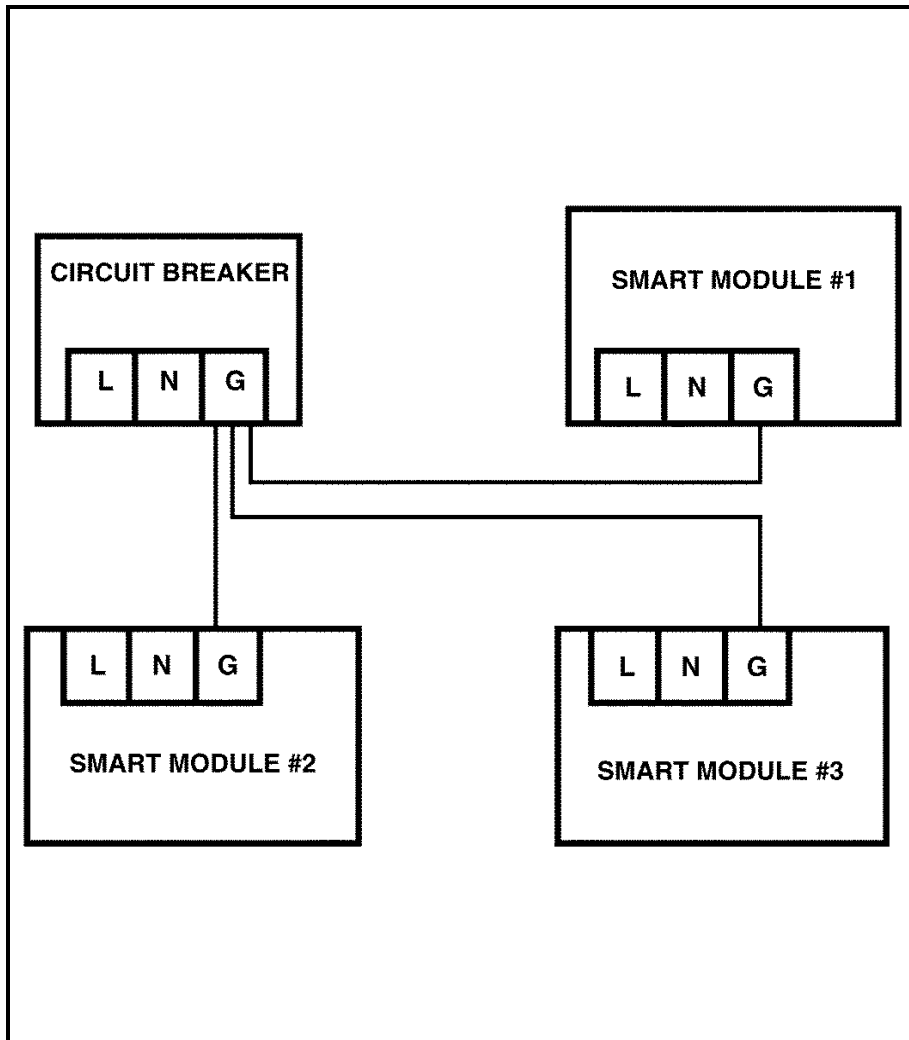


Figure 31 - Smart Module Single-Ground Wiring

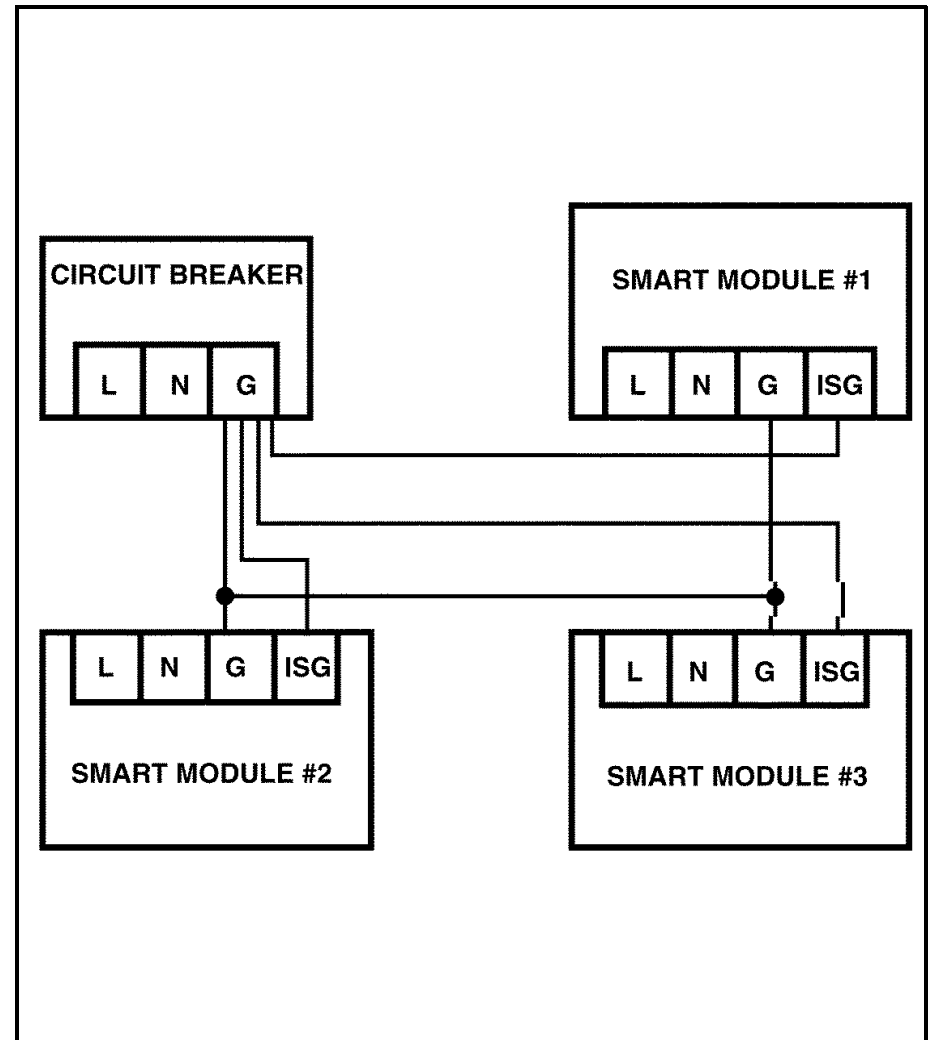


Figure 32 - Smart Module Dual-Ground Wiring

- For the *single ground* version (Figure 31), connect the ground terminal from each Smart Module directly to the ground bar in the circuit breaker. *Do not daisy chain the ground wires*
- For the *dual ground* version (Figure 32), connect the I.S. ground terminal from each Smart Module directly to the ground bar in the circuit breaker. *Do NOT daisy chain the I.S. ground wires!*

The second ground terminal must also be connected, but these connections may be daisy chained.

4. Each I/O Module has a single ground terminal, which can be connected to the circuit breaker ground bar directly or the wires may be daisy chained.
5. Replace the safety cover over the terminal block when the wiring is done.

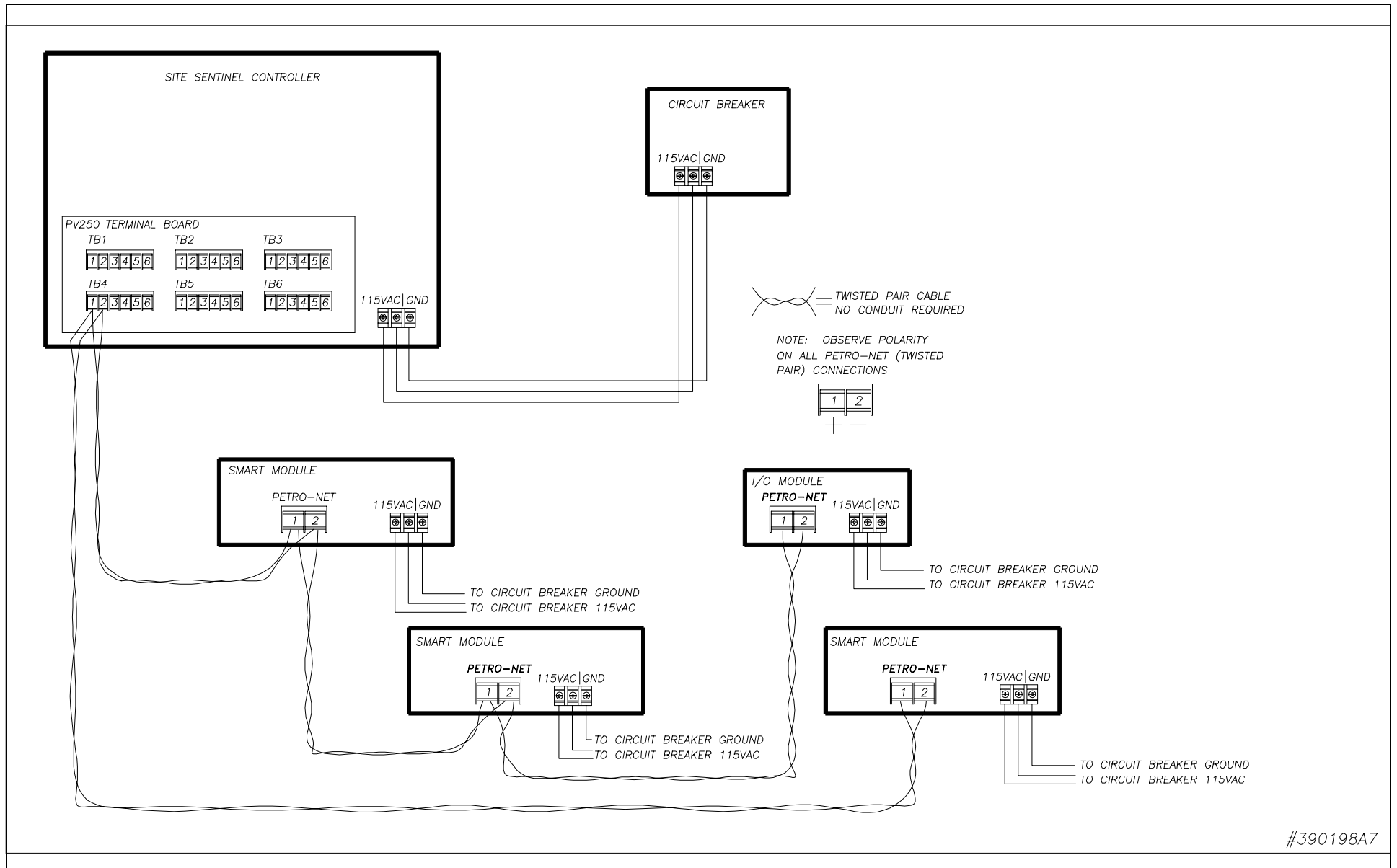


Figure 33 - Smart/IO Module Wiring, Site Sentinel Model II

7.8 Model II Alarm Wiring

Your **SiteSentinel Model II** has two built-in alarms: (1) a buzzer and (2) a lighted pushbutton switch (which turns either or both alarms off).

Your *SiteSentinel Operator's Guide* (Part number *M56-01.XX*) describes how to set up the buzzer or switch to buzz and/or light to signal various conditions in the system.

The buzzer and light are prewired to the 4-terminal block on the PV235 controller board (Figure 34) according to the table below. This terminal block is labeled **P4** on the PV235 board.

BUZZER/LIGHT/SWITCH WIRING (Model II ONLY)	
PV235 BOARD / "P4" Terminal	
Position #	Connection
1	+12 volt common
2	Buzzer
3	Light
4	Switch

To connect a remote buzzer, light, and/or switch, disconnect the prewired device(s) and wire the new alarm device(s) according to the table above. Note that the remote alarm devices must be rated at 12 VDC with a maximum of 0.5 amp. The switch must be rated at 0.5 amp minimum.

You can wire two external alarm inputs to the first terminal block on the Model II PV250 board (Figure 35) according to the following table. The inputs must be closed-contact type.

MODEL II EXTERNAL ALARM WIRING	
PV250 BOARD / "TB1" Terminal	
Position #	Connection
1	Ground
2	Input #1
3	Input #2
4	Ground

The optional PV250 board is required to connect the SiteSentinel Model II Controller to external devices.

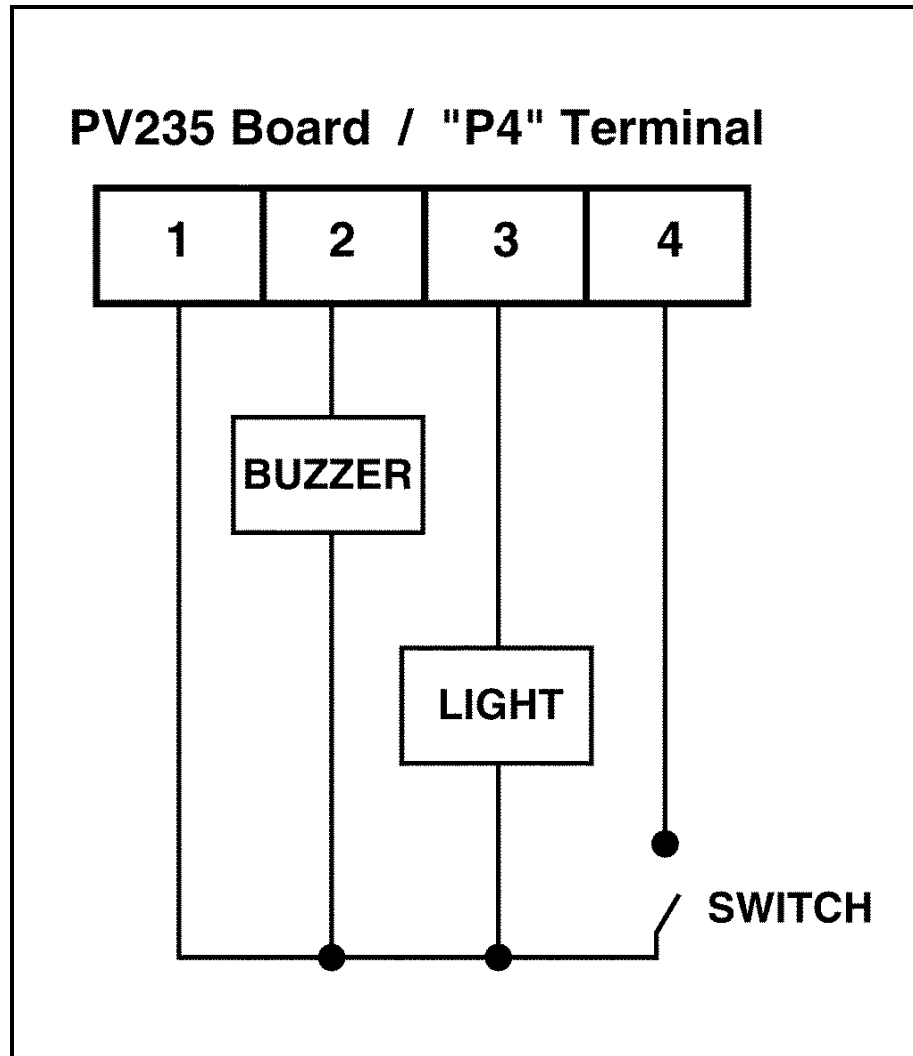


Figure 34 - Model II Buzzer/Light/Switch Wiring

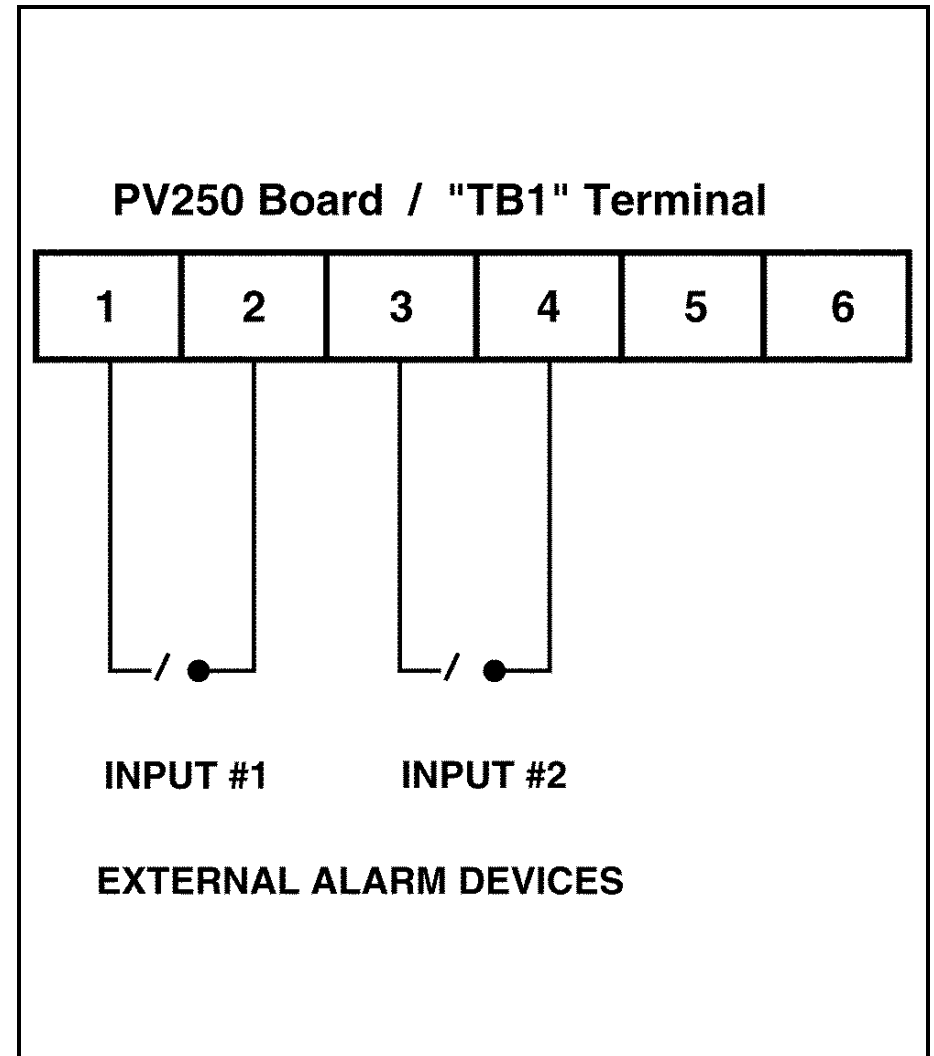


Figure 35 - Model II External Alarm Wiring

7.9 Model II External Printer Wiring

The *SiteSentinel Model II* works with all standard serial printers. Set the printer for 1200 baud, seven data bits, one stop bit, EVEN parity.

You must install a bushing in the controller knockout used by the printer cable. The bushing is available from **Petro Vend** (part # 30-0203) or from Appleton (part # CG1250S).

The wiring for the external printer is shown in the table below.

MODEL II EXTERNAL PRINTER WIRING				
PV250 BOARD "TB4" Terminal		DATA FLOW	CABLE & CONNECTOR	
Position #	Signal		Wire Color	Pin #
3	TX	---->	Orange	3
4	CTS	<----	White	20
5	DTR	<----	Blue	6
6	SIG GND	----	Black	7

The optional PV250 board is required to connect the SiteSentinel Model II controller to external devices.

7.10 Model II External Terminal or PC Wiring

(DB25 CONNECTOR) The Model II controller can be operated from a VT52, VT100 or WYSE 50 terminal, or from a PC using software to emulate one of these terminals.

Use a DB25 connector and cable to connect the terminal or PC to an RS-232 port in the Model II controller. This port is located at **TB5** on the PV250 board. You must install a bushing in the controller knockout used by the cable. The bushing is available from **Petro Vend** (part # 30-0203) or from Appleton (part # CG1250S)

The table below lists the Model II controller terminal connections and the standard connector and cable wiring. Set the **SiteSentinel** to the same baud rate as the external printer. See Page 61, 63 for more information about the baud rate.

MODEL II TERMINAL/PC WIRING				
PV250 BOARD "TB5" Terminal		DATA FLOW	CABLE & CONNECTOR	
Position #	Signal		Wire Color	Pin #
1	TX	---->	Orange	3
2	RX	<----	Red	2
3	CTS	<----	Green	4
4	RTS	---->	Yellow	5
5	SIG GND	----	Black	7
<i>no connections</i>			Blue, Brown, & White	6, 8, & 20

7.11 Model II Modem Wiring

7.11.1 INTERNAL MODEL II MODEM

An optional internal modem is available for the SiteSentinel Model II controller. Note that the **SiteSentinel** must be set to the same baud rate as the internal modem. See Page 61, 63 for more information about the baud rate.

If a **SiteSentinel** Model II controller does *not* have a PV250 board, a special cable is provided for the modem. One end of the cable connects to the RJ-11 socket located on the modem board. The cable must be threaded through one of the knockouts in the controller. The other end of the cable has a socket that can be attached to a telephone line with an RJ-11 plug.

If a PV250 board is installed in the Model II, you must connect the red and green telephone wires to the terminal block according to the table below:

INTERNAL MODEL II MODEM WIRING	
PV250 BOARD "TB1" Terminal	TELEPHONE WIRE
Position #	
5	Green
6	Red

7.11.2 EXTERNAL MODEL II MODEM

First, install a bushing to protect the cable and to complete the electrical enclosure in the appropriate Model II controller knockout. The table below shows the connections for an external modem. Note that the **SiteSentinel** must be set to the same baud rate as the external modem. See Page 61, 63 for more information about the baud rate.

MODEL II EXTERNAL MODEM				
PV250 BOARD "TB2" Terminal		DATA FLOW	CABLE & CONNECTOR	
Position #	Signal		Wire Color	Pin #
1	TX	---->	Red	2
2	RX	<----	Orange	3
3	CTS	<----	Green	5
4	RTS	---->	Yellow	4
5	DCD	<----	Brown	8
6	DTR	---->	White	20
"TB5" Terminal				
6	SIG GND	----	Black	7
	<i>no connection</i>		Blue	6

7.12 Model II Passthrough Port Wiring

7.12.1 OVERVIEW

Passthru Mode lets your Site Sentinel Model II communicate with another system, such as the Petro Vend's SYSTEM2 Fuel Management System. When passthru is enabled, you can program the second system in the usual manner.

Install a bushing in the controller knockout used by the cable. The bushing is available from Petro Vend (part # 30-0203) or from Appleton (part # CG1250S).

The wiring for the passthrough port is shown in the table below.

MODEL II PASSTHROUGH PORT				
PV250 BOARD "TB3" Terminal		DATA FLOW	CABLE & CONNECTOR	
Postion #	Signal		Wire Color	Pin #
1	TX	---->	Red	2
2	RX	<----	Orange	3
3	CTS	<----	Green	5
4	RTS	---->	Yellow	4
5	DCD	<----	Brown	6
6	DTR	---->	White	20
"TB6" Terminal				
6	SIG GND	----	Black	7
<i>no connection</i>			Blue	6

The second system, connected to the SiteSentinel passthru port, must possess the following traits:

1. It must be connected to the RS-232 passthrough port in the controller
2. It be set up for seven data bits, one stop bit, and even parity
3. Have the same baud rate as the controller.

Notes:

8.0 Other System Parameters

8.1 Model II Comm Port Setup

The SiteSentinel Model II has communication ports for a modem, a terminal, a PC and/or a point-of-sale device (POS) or Fuel Management System such as Petro Vend's **System2**.

The *baud rate* for the terminal and modem ports is set by the first three positions of the DIP switch on the PV235 board. The switch is located on the left-hand side of the board. The table below lists how to set the switches.

MODEL II PASS-THRU, TERMINAL and MODEM PORT BAUD RATE			
PV235 BOARD DIP SWITCH 1			
Baud Rate	Switch 1 Position...		
	#1	#2	#3
110	OPEN	OPEN	OPEN
300	CLOSED	OPEN	OPEN
600	OPEN	CLOSED	OPEN
1200	CLOSED	CLOSED	OPEN
2400	OPEN	OPEN	CLOSED
4800	CLOSED	OPEN	CLOSED
9600	OPEN	CLOSED	CLOSED
19200	CLOSED	CLOSED	CLOSED

IMPORTANT!

- In STANDARD (non-POS or ACR) Site Sentinel controllers, the baud rates of the pass-through, terminal and modem ports are all set with Switch #1, positions 1, 2 and 3 (table opposite). Word length and parity are set with position #4 of Switch #1.
- In POS and ACR Site Sentinel controllers, Switch #1 positions 1-3 sets terminal and modem port baud rate.
- Position 4 of Switch #1 sets word length and parity in all models as follows: OPEN =7-bit word with EVEN parity. CLOSED = 8-bit word with NO parity.
- Positions 5, 6 and 7 of Switch #1 are *not* currently used and should be OPEN. Position 8 is used by the factory to enable a special hardware test. Under normal operating conditions, position 8 must be CLOSED.

ALL ports in all systems must all be set at the *same* baud rate and word length.

You MUST cycle power for any change to take effect.

8.2 Model III Comm Port Setup

IMPORTANT

Plug in the controller's battery *before* configuring the controller.

- In STANDARD (non-POS or ACR) Site Sentinel controllers, the baud rates of the pass-through, terminal and modem ports are all set with Switch #1, positions 1, 2 and 3. Word length and parity are set with position #4 of Switch #1.
- In POS and ACR Site Sentinel controllers, Switch #1 positions 1-3 sets terminal and modem port baud rate. Word length and parity are set with position #4 of Switch #1.
- Positions 5, 6 and 7 of Switch #1 are *not* currently used and should be OPEN. Position 8 is used by the factory to enable a special hardware test. Under normal operating conditions, position 8 must be CLOSED.

ALL ports in all systems must all be set at the *same* baud rate and word length.

MODEL III PAS-THRU, TERMINAL and MODEM PORT BAUD SETUP			
PV271 BOARD, DIP SWITCH #1			
Baud Rate	Switch 1 Position...		
	#1	#2	#3
110	OPEN	OPEN	OPEN
300	CLOSED	OPEN	OPEN
600	OPEN	CLOSED	OPEN
1200	CLOSED	CLOSED	OPEN
2400	OPEN	OPEN	CLOSED
4800	CLOSED	OPEN	CLOSED
9600	OPEN	CLOSED	CLOSED
19200	CLOSED	CLOSED	CLOSED

NOTE: Switch #1 does not affect Petro-Net or other port settings.

SWITCH 1 POSITION 4 - WORD LENGTH and PARITY

Position 4 OPEN = 7-bit word with EVEN parity
 Position 4 CLOSED = 8-bit word with NO parity

SWITCH 1 POSITIONS 5-7 - *Not currently used*

Use the RESET switch to reset ("warm start") the Controller. No completed measurement data or configuration data are lost or changed by resetting the Controller.

8.4 Model III Controller Board LEDs

CR35, 36, 38, and 40 are POS or ACR Site Sentinel specific.

MODEL III PV271 CONTROLLER BOARD LEDs		
Label	Color	Function
CR31	Yellow	Reset
CR23	Red	RS-485 Petro-Net Transmit
CR22	Green	RS-485 Petro-Net Receive
CR24	Yellow	RS-485 Petro-Net TX Enable
CR81	Red	RS-232 Terminal Transmit
CR86	Green	RS-232 Terminal Receive
CR36	Red	RS-232 POS (ACR) or POS2 (POS) Transmit
CR38	Green	RS-232 POS (ACR) or POS2 (POS) Receive
CR32	Red	RS-232 Printer Transmit
CR37	Green	RS-232 Printer Receive
CR80	Red	RS-232 Modem Transmit
CR85	Green	RS-232 Modem Receive
CR35	Red	RS-232 CONSOLE (ACR) or POS (POS) Transmit
CR40	Green	RS-232 CONSOLE (ACR) or POS (POS) Receive
CR41	Red	RS-232 AUX Transmit
CR39	Green	RS-232 AUX Receive

8.5 Module Assignment (Both Models)

Smart Modules and I/O Modules must each be assigned a unique identification number.

Module numbers must be unique within the *module group*; that is, you can assign the same number to both a Smart Module and to an I/O Module, but you can *not* assign the same number to more than one Smart Module or to more than one I/O Module.

The module numbers are used when the system is configured. Refer to your *SiteSentinel Operator's Manual* for details about system setup.

A small, red rotary switch is located at the top of the PC board inside each module. The switch has ten positions, marked "0" to "9". A small arrow on the switch points to the current position. Default switch setting is "1".

Although the switch has ten settings, only settings 1-8 are valid. DO NOT set the switch to either "0" or "9" - the module will NOT be recognized by the system!

1. Turn the module power *off*
2. Use a 1/4-inch (6 mm) blade screwdriver to gently rotate the small white screw inside the rotary switch to the desired location.
3. Turn the module power *on*.

DO NOT change the module number while the module power is ON.

Notes:

Index

AC power wiring	53	Reservoir	14
Alarm wiring	57	Sump	13
Ammonia, detecting	17	Vapor	11
Baud rates	63	Smart Module	48
Circuit breaker conduit	24	Specifications	6
Controller	23	Wiring	53
Specifications	3, 5	Sump sensor	13, 40
Wiring	53	Tank preparation	19
Floats		Terminal wiring	59
Water	27	Underground tank	20
Freon sensor	17, 44	Vapor sensor	11
I/O Module	50		
Specifications	8		
Interstitial sensor	16, 42		
Leak test	1		
LEDs	50		
Liquid phase sensor	12, 15		
Manifolded tanks	2		
Modems	60		
Module number	65		
Passthrough port	61		
Petro Net	26, 51		
Port setup	63		
Printer wiring	59		
Probe, Model 613	9, 19, 27		
Product offset	21		
PV250 board	51		
Reservoir sensor	14, 38		
RS232	24		
Seal-offs	47		
Sensors	28		
Freon	17		
Interstitial	16		
Liquid	12		
Liquid phase	15		

DECLARATION OF CONFORMITY

In accordance with ATEX Directive 94/9/EC, Annexes IV and VII Equipment intended for use in potentially explosive atmospheres.

Standard (s) to which conformity is declared:

EN 60079-0:2009
EN 60079-11:2007
EN 60079-26:2007

Manufacturers Name:

OPW Fuel Management Systems, Inc.

Manufacturers Address:

6900 Santa Fe Drive
Hodgkins, IL. 60525 USA

Type of Equipment:

Integrated Tank Monitoring System

Model:

SiteSentinel 1 (I.S. Module/924 Probe)

Marking:

I.S. Module:  II (1) G
[Ex ia] IIA

924 Probe:  II (1) G
Ex ia IIA T4

Notified Body:

Baseefa (2001) Ltd.
Notified Body Number 1180
Buxton, Derbyshire UK

EC Type Certificates:

Baseefa03ATEX0348X Dated: 30 June 2003
Baseefa03ATEX0349X Dated: 30 June 2003

The following additional European standards have been applied.
EN 60950 + A1: 1993 + A2: 1993 + A3: 1995 + A4: 1996

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive (s) and Standard (s).



Place: Hodgkins, IL.

Nicole Chavez

Date: 10 February 2011

Nicole Chavez
Engineering Compliance Technician

European Compliance

DEVICE	AGENCY	STANDARDS	MARKING	CERTIFICATE NUMBER
Model 924 Probe	BASEEFA	EN 50014 (1997) + Amds 1 & 2 EN 50020 (2002) EN 50284: 1999	 EEx ia IIA T4	BASEEFA03ATEX0349X (See below for Conditions of Safe Use)
Model 4323 Intrinsically Safe Module	BASEEFA	EN 50014 (1997) + Amds 1 & 2 EN 50020 (2002)	 [EEx ia] IIA	BASEEFA03ATEX0348X (See below for Conditions of Safe Use)

BASEEFA03ATEX0349X Conditions of Safe Use:

- 1.) The apparatus enclosure may contain light metals. The apparatus must be installed in such a manner as to eliminate the risk of impact or friction with other metal surfaces.
- 2.) Items of the apparatus are made of plastic. The apparatus must not be installed in a position where it may be subjected to an excessive air/fluid flow or be subjected to rubbing that may cause an electrostatic build-up.

BASEEFA03ATEX0348X Conditions of Safe Use:

- 1.) When installed, the terminals must be afforded a degree of protection of at least IP20.



OPW Fuel Management Systems
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