

Veeder-Root TLS-3XX Consoles
Gilbarco EMC Series Consoles
ProPlus/ProMax Series Consoles

Site Prep and Installation Manual



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Introduction

This manual describes site preparation and installation procedures for the following consoles:

FIXED-FEATURE CONSOLES

- Veeder-Root TLS-300 Consoles,
- ProPlus Consoles
- Gilbarco EMC Basic Consoles

MODULAR CONSOLES

- Veeder-Root TLS-350 Series Consoles,
- ProMax Consoles
- Gilbarco EMC Consoles

This manual assumes that you are installing the console in a new site (before pavement is put down and with no wiring runs in place). Among the topics covered are:

- Site layout considerations.
- Installing the console and connecting wiring from the AC power panel.
- Probe installation procedures.
- Sensor installation procedures.
- Installing wiring conduit between the console and the probes and sensors.
- Probe and sensor field junction box wiring diagrams.
- Attaching sensor wiring to the console.

Contractor Certification Requirements

Veeder-Root requires the following minimum training certifications for contractors who will install and setup the equipment discussed in this manual:

Installer (Level 1) Certification: Contractors holding valid Installer Certification are approved to perform wiring and conduit routing; equipment mounting; probe, sensor and carbon canister vapor polisher installation; wireless equipment installation; tank and line preparation; and line leak detector installation.

ATG Technician (Level 2/3 or 4) Certification: Contractors holding valid ATG Technician Certifications are approved to perform installation checkout, startup, programming and operations training, system tests, troubleshooting and servicing for all Veeder-Root Series Tank Monitoring Systems, including Line Leak Detection. In addition, Contractors with the following sub-certification designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- Wireless 2
- Tall Tank

VR Vapor Products Certification: Contractors holding a certification with the following designations are approved to perform installation checkout, startup, programming, system tests, troubleshooting, service techniques and operations training on the designated system.

- ISD – In Station Diagnostics
- PMC – Pressure Management Control
- CCVP - Veeder-Root Vapor Polisher

- Wireless – ISD/PMC Wireless
- A current Veeder-Root Technician Certification is a prerequisite for the VR Vapor Products course.

Warranty Registrations may only be submitted by selected Distributors.

Related Documents

DOCUMENTS REQUIRED TO INSTALL EQUIPMENT

This equipment must be installed according to the applicable installation document:

Equipment	ATEX Descriptive System	IECEX Descriptive System	UL/cUL Control Drawing
	Document No.	Document No.	Document No.
Associated Apparatus			
TLS-450/8600	331940-006	331940-106	331940-008
TLS-350R or TLS-350 Plus	331940-001	331940-101	331940-011
TLS-300	331940-002	331940-102	331940-013
TLS-50 or TLS2 or TLS-IB	331940-003	331940-103	331940-014
TLS-4/8601	331940-017	331940-117	331940-018
Intrinsically Safe Apparatus for Wireless Applications			
Tank Gauge Accessories	331940-005	331940-105	331940-012










Related Documents

After the console is wired to power, probes, and sensors, you should power up and program the console following the instructions contained in the System Setup manual.

- 576013-623 TLS-3XX System Setup Manual
- 576013-858 Direct Burial Cable Installation Manual
- 577013-744 Mag Plus Probe Installation Guide
- 577013-528 Serial Comm Modules Installation Instructions for Modular Consoles
- 331940-011 Control Drawing for TLS-350

Safety Precautions

The following safety symbols may be used throughout this manual to alert you to important safety hazards and precautions.

 <p>EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.</p>	 <p>FLAMMABLE Fuels and their vapors are extremely flammable.</p>
 <p>ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.</p>	 <p>TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.</p>
 <p>WARNING Heed the adjacent instructions to avoid equipment damage or personal injury.</p>	 <p>WEAR EYE PROTECTION Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.</p>
 <p>GLOVES Wear gloves to protect hands from irritation or injury.</p>	 <p>INJURY Careless or improper handling of materials can result in bodily injury.</p>
 <p>READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.</p>	

National Electrical Code Compliance

The following information is for general reference and is not intended to replace recommended National Electric Code (NEC) procedures. It is important for the installer to understand that electrical equipment and wiring located in Class I, Division 1 and 2 installations shall comply with the latest appropriate Articles found in the National Electric Code (NFPA 70) and the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA) 30A.

PROBE- AND SENSOR-TO-CONSOLE WIRING

Wire Type

To ensure the best operating systems available, Veeder-Root **REQUIRES** the use of shielded cable for all probes and sensors regardless of conduit material or application. In these installations, shielded cable must be rated less than 100 picofarad per foot and be manufactured with a material suitable for the environment, such as Carol™ C2534 or Belden™ 88760, 8760, 8770 or similar.

Note: Throughout this manual, when mentioning any cable or wire being used for probe and sensor to console wiring, it will be referring to shielded cable.

Wire Length

Improper system operation could result in undetected potential environmental and health hazards if the probe- or sensor-to-console wire runs exceed 1000 feet. Wire runs must be less than 1000 feet to meet intrinsic safety requirements.

Splices

Veeder-Root recommends that no splices be made in the wire run between a sensor or probe junction box and the console. Each splice degrades signal strength and could result in poor system performance.

Wire Gauges - Color coded

- Shielded cable must be used in all installations. Sensor-to-console wires should be #14-#18 AWG stranded copper wire and installed as a Class 1 circuit. As an alternate method when approved by the local authority having jurisdiction, 22 AWG wire such as Belden 88761 may be suitable in installations with the following provisions:
 - Wire run is less than 750 feet
 - Capacitance does not exceed 100 pF/foot
 - Inductance does not exceed 0.2 μ H/foot

POWER WIRING

- Wires carrying 120 or 240 Vac from the power panel to the console should be #14 AWG (or larger) copper wire for line, neutral and chassis ground (3); and #12 AWG copper wire for barrier ground.
- Wires carrying 120 Vac from power panel to a Pump Sense Module, Mechanical Dispenser Interface Module, or Wireless PLLD Controller module should be #14 AWG copper wire.
- Wires carrying 240 Vac from power panel to a Wireless PLLD AC Interface Module should be #12 AWG copper wire.

SENSOR AND PROBE JUNCTION BOXES

Weatherproof electrical junction boxes with a gasketed cover are required on the end of each probe and sensor conduit run at the manhole or monitoring well location. Gasketing or sealing compound must be used at each entry to the junction box to ensure a waterproof junction. The interior volume of each junction box must be a minimum of 16 cubic inches.

Veeder-Root recommends the following junction boxes or equivalent:

- Appleton Electric Co. - JBDX junction box, JBK-B cover and JB-GK-V gasket.
- Crouse-Hinds Co. - GRFX-139 junction box, GRF-10 cover and GASK-643 gasket.

Permissible Console Input/Output Connections

TLS-300/PROPLUS/EMC BASIC CONSOLES

Figure 1 illustrates the permissible devices that can be connected to the console. Note that the number of inputs/outputs in your console may differ from those shown below.

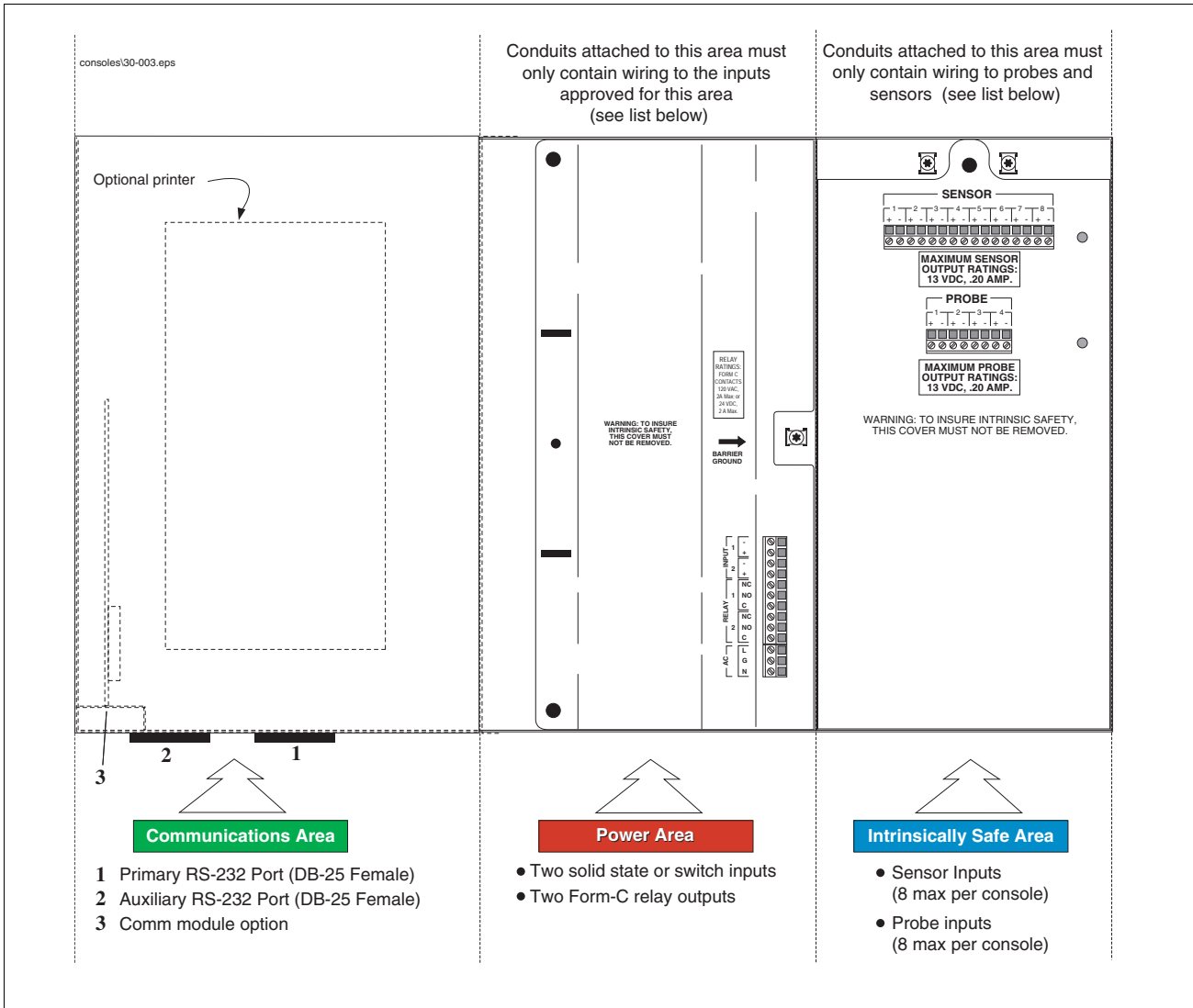


Figure 1. Permissible Inputs/Outputs by Area - TLS-300/ProPlus/EMC Basic Console

TLS-350/PROMAX/EMC CONSOLES

Figure 2 illustrates the console's plug in module locations and the maximum number allowed in each of the three module sections of the console: Communications Bay, Power Bay, and Intrinsically Safe Bay. Input/output cables to the console's Comm modules attach to connectors on each module's end plate, and are accessible through an opening in the base of the console. Note that the number/type of modules in your console may differ from those in the figure below.

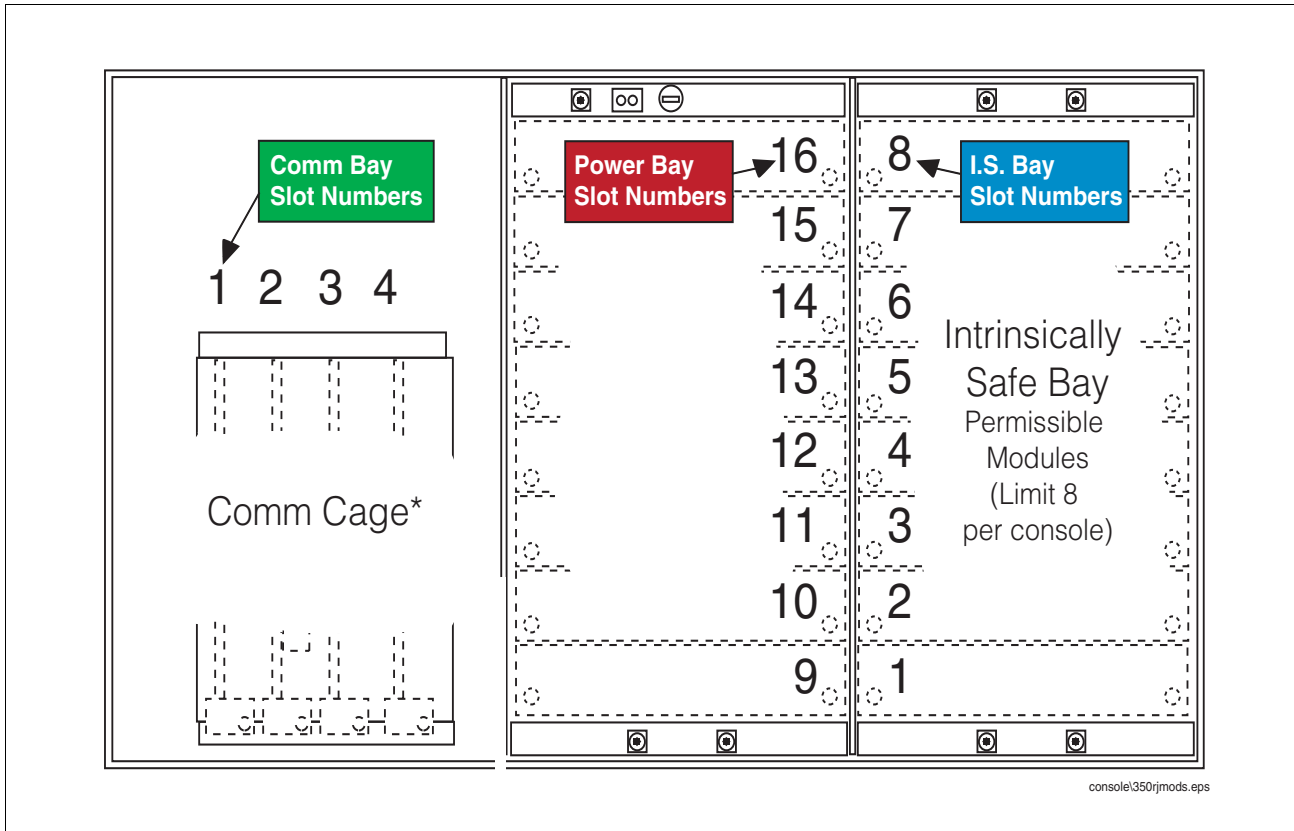


Figure 2. TLS-350 Series/ProMax/EMC Consoles - Plug-in Module Compartments

Planning Probe and Sensor Installations

The contractor should diagram, all proposed trench and conduit runs between the console's intended location and its deployed sensors and probes. A site diagram will help you to calculate conduit and wiring lengths, and necessary quantities of junction boxes, sealing boxes, clamps, brackets, etc.

Throughout this planning process and in the actual installation, you must follow the latest National Electric Codes, federal, state, and local codes, as regards conduit type, depth below grade, sealing, grounding, wire capacities, etc.

Reminder: to ensure optimum signal strength, plan sensor and probe wiring lengths so that there will be no splices between the field junction box connection and the interface module connection in the console. Every splice in the hazardous area requires the use of an epoxy sealing kit which should not be pulled through the conduit and must be located in a separate waterproof, sealed junction box.

To maintain the intrinsically-safe integrity of the installed console, sensor and probe conduits can share the same trenches with power conduits, but the intrinsically safe sensor and probe wiring can NOT share the same conduit with any other wiring. Also, the intrinsically safe wiring for console can NOT share the same conduit with another device's intrinsically safe wiring.

Install conduit (3/4, 1, or 1-1/4" I.P.S.) from all probe and sensor locations to the console's location. Knockouts for 3/4, 1, or 1-1/4" I.P.S. conduit are provided in the intrinsically safe area of the console for probe and sensor wiring.

The conduit must be properly sealed in accordance with the latest National Electric Code (NFPA 70) and the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A) since they pass from a Class I, Division 1 or 2 hazardous area into a non-hazardous area. Figure 3 and Figure 4 illustrate a typical site deployment of probes and sensors.

If the console is being installed into a paved site, you can either dig out trenches in the pavement to run conduit out to sensors and probes as described above, or you can cut grooves in the pavement, run direct burial cable to these devices, and then seal over the cable grooves (if permitted).

NOTE: Installation of the Direct Burial System can only be done in those locations where local codes permit the use of buried cable instead of conduit, and epoxy splices instead of junction boxes.

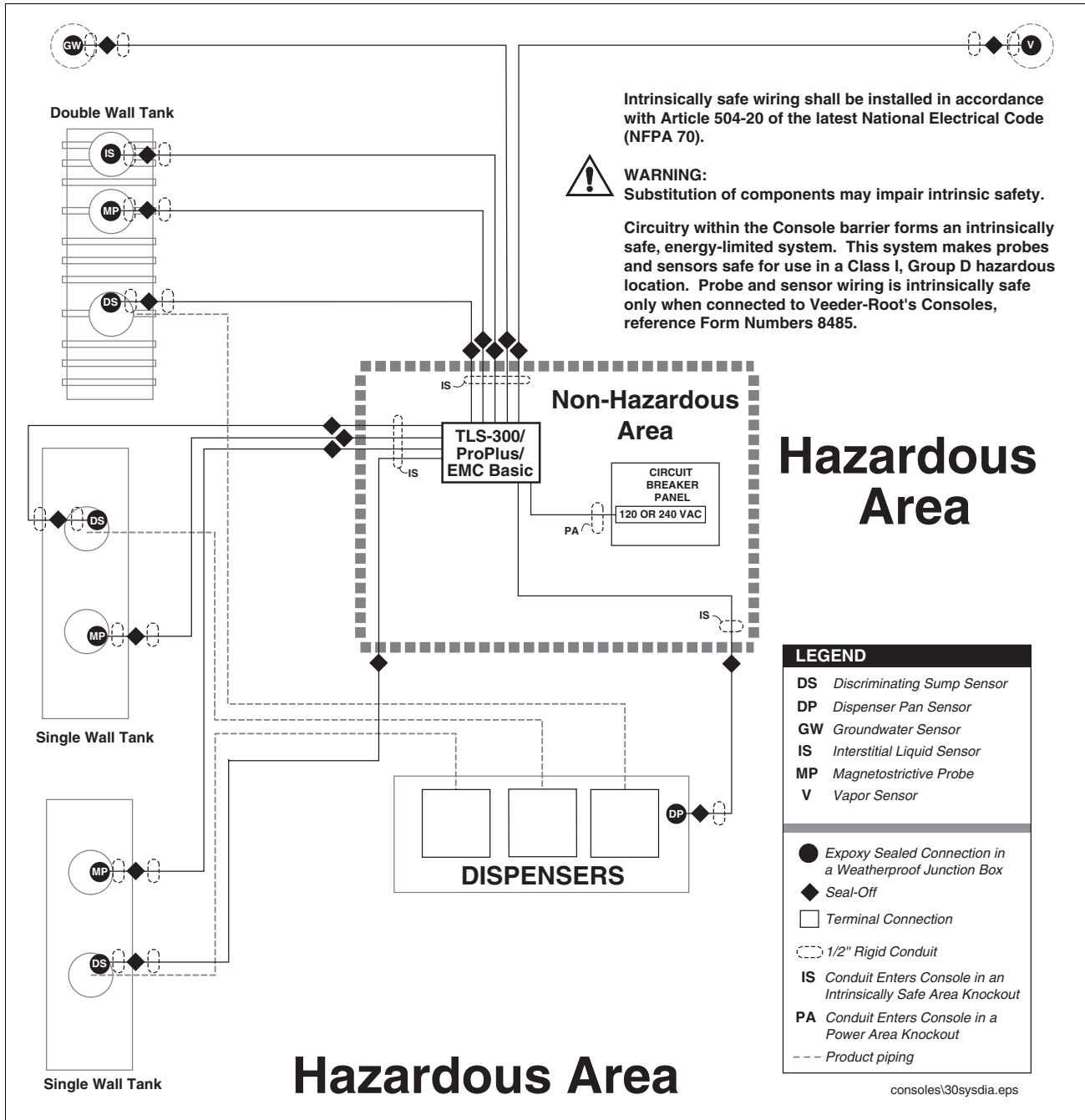


Figure 3. TLS-300/ProPlus/EMC Basic Typical Site/Forecourt Layout

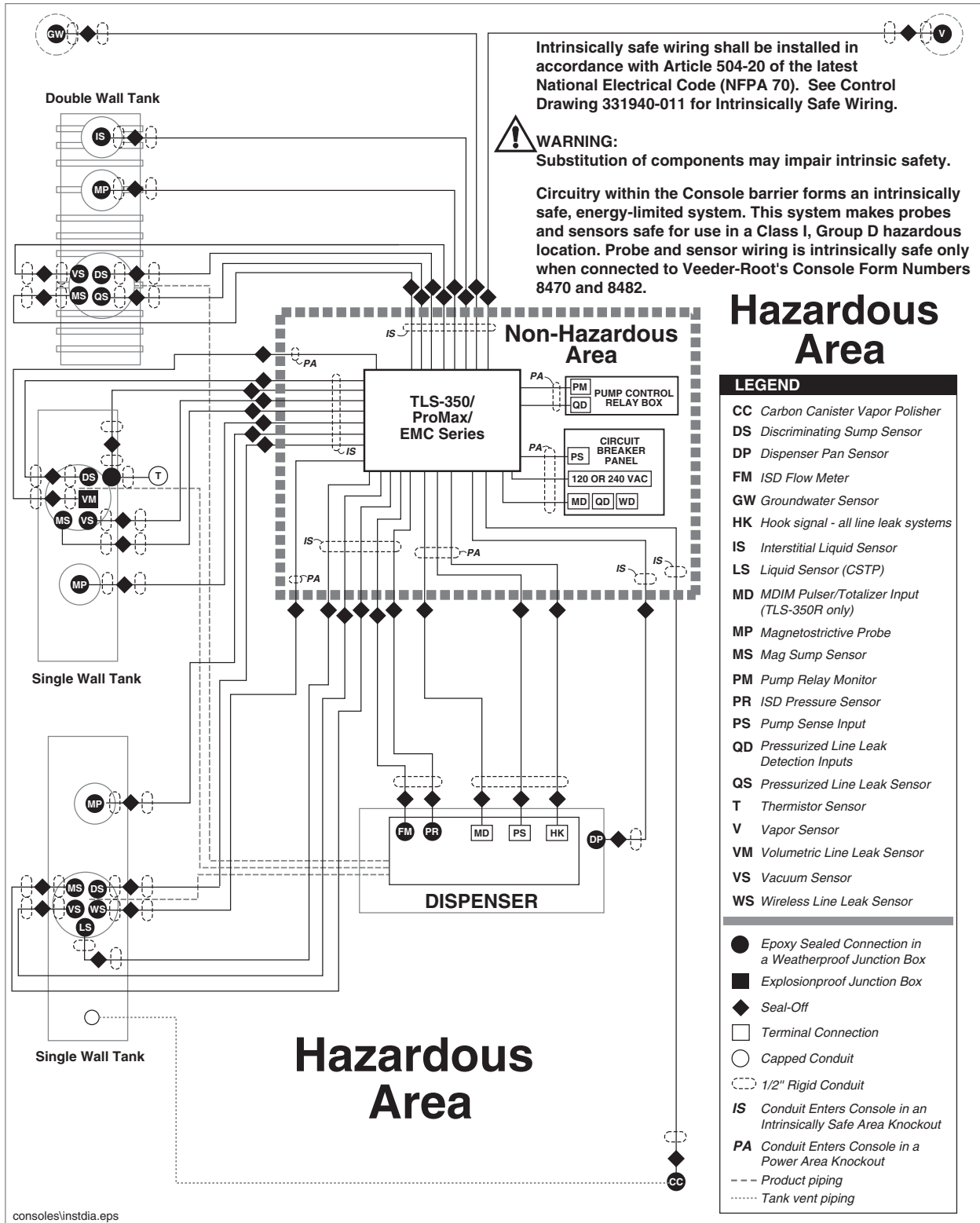


Figure 4. TLS-350/ProMax/EMC Typical Site/Forecourt Layout

Console Installation

Locating the Console

⚠ WARNING	
	<p>Explosive vapors or flammable liquids could be present near locations where fuels are stored or being dispensed.</p> <p>This console is not explosion proof. Do not install this console in a volatile, combustible, or explosive atmosphere.</p> <p>An explosion or fire resulting in serious injury or death, property loss and equipment damage could occur if the console is installed in a volatile, combustible or explosive atmosphere (Class I, Division 1 or 2).</p>

Select a mounting location on the inside of any building. The console must be protected from severe vibration, extremes in temperature and humidity, rain, and other conditions that could harm computerized electronic equipment. The console's operating temperature range is 32 to 104°F (0 to 40°C), and its storage temperature range is -40 to +162°F (-40 to +74°C).

The mounting surface should be strong enough to support the console's weight which could exceed 22 pounds for the TLS-300/ProPlus/EMC Basic Console, or 40 pounds for the TLS-350/ProMax/EMC Console with a full complement of modules. You should also consider wall space for routing the power wiring conduits and probe and sensor wiring conduits that must be connected to the console.

Mounting the Console

Install the console fastening devices to the mounting surface using the hole pattern shown in Figure 5 or Figure 6, Up to 1/4" diameter screws may be used.

Mount the console to the mounting surface using the four mounting flanges on the back of the unit. Install metal conduit (3/4, 1, or 1-1/4" I.P.S.) between the console and the power panel. Figure 5 and Figure 6 show the four designated knockouts (2 on top and 2 on bottom) through which power wiring can safely enter the consoles.

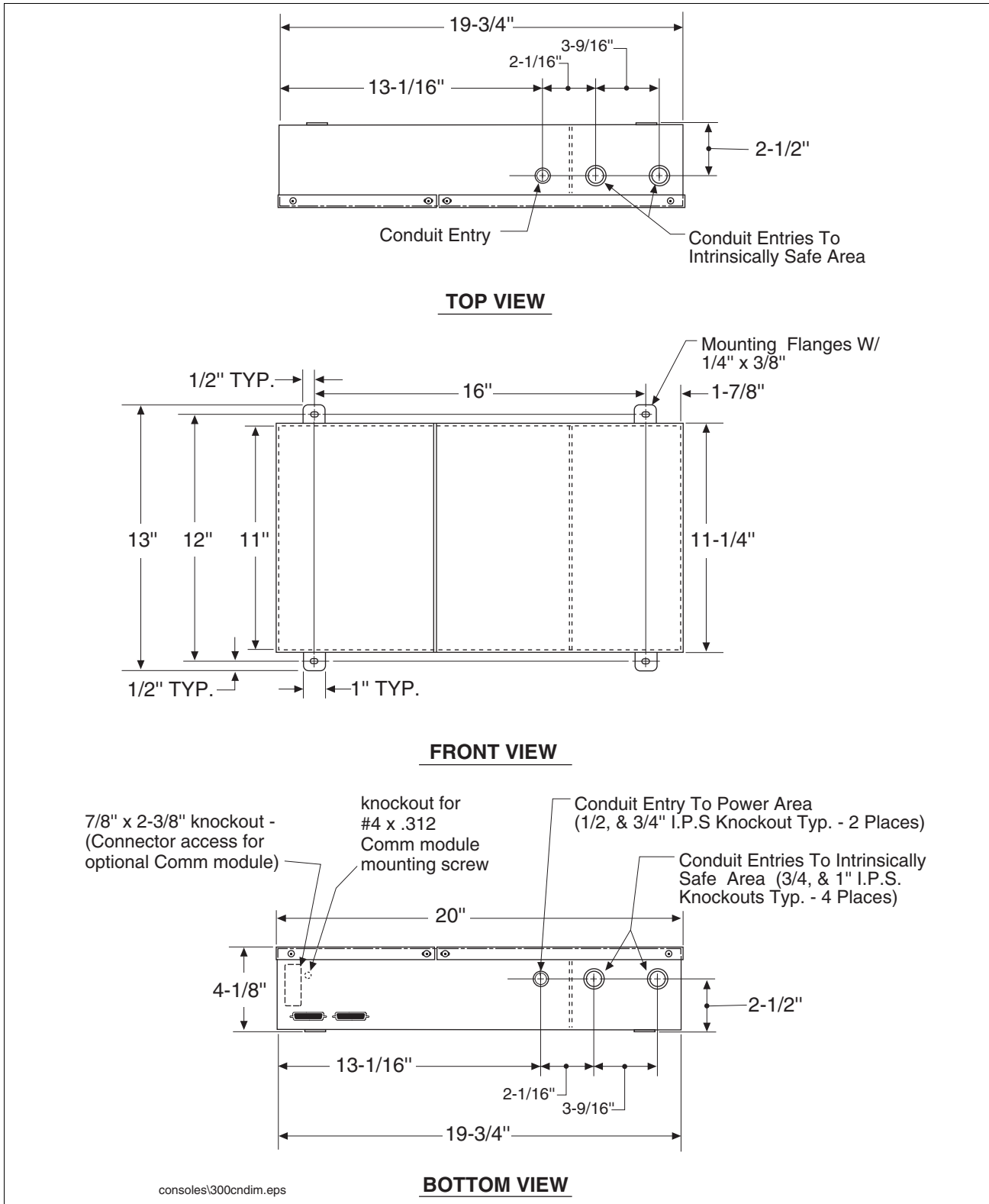
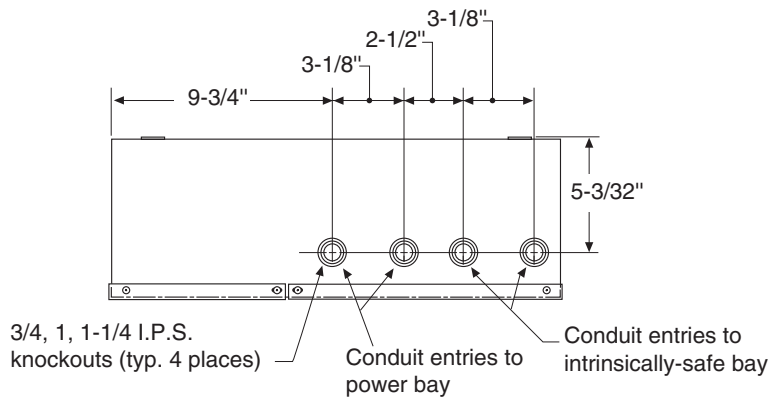
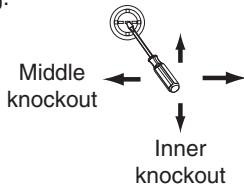
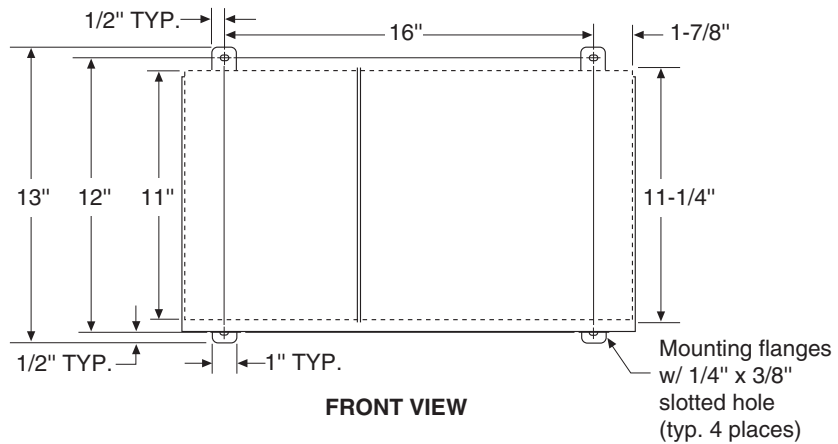


Figure 5. TLS-300/ProPlus/EMC Basic Console Dimensions and Designated Conduit Knockouts

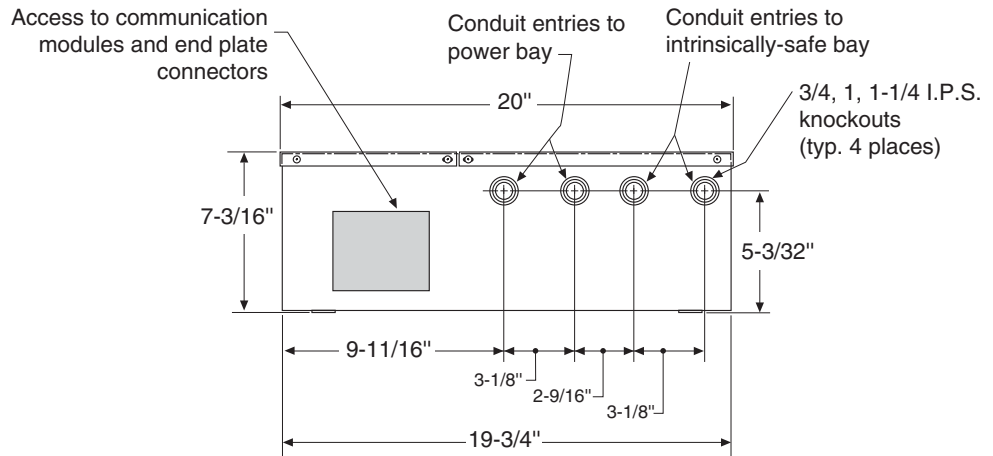
To remove a knockout, insert a flat head screwdriver into the slot in the center of the knockout and gently move the screwdriver up and down to remove the inner knockout, or left and right to remove the middle knockout. Keep up this movement until the connecting tabs break off. To remove the outer or largest knockout, use pliers to break out the remaining large ring.



TOP VIEW



FRONT VIEW




BOTTOM VIEW

consoles\350cndim.eps

Figure 6. TLS-350/ProMax/EMC Console Dimensions and Designated Conduit Knockouts

Wiring the Console

⚠ WARNING



This console contains high voltages which can be lethal. It is also connected to low power devices that must be kept intrinsically safe.

1. Turn power Off at the circuit breaker. Do not connect the console AC power supply wires at the breaker until all devices are installed.
2. Attach conduit from the power panel to the console's Power Area knockouts only.

Connecting power wires to a live circuit can cause electrical shock that may result in serious injury or death.

Routing conduit for power wires into the intrinsically safe compartment can result in fire or explosion resulting in serious injury or death.

1. Check the Input Power Rating on the label affixed to the underside of the console to verify whether input power requirements are 120 Vac or 240 Vac.
2. Pull four wires between the power panel and the console; three #14 AWG or larger color-coded wires for AC line (hot), AC neutral and chassis ground; and one #12 AWG wire for barrier ground.
3. Depending on the console, connect the input AC power wires as shown in Figure 7 or Figure 8.

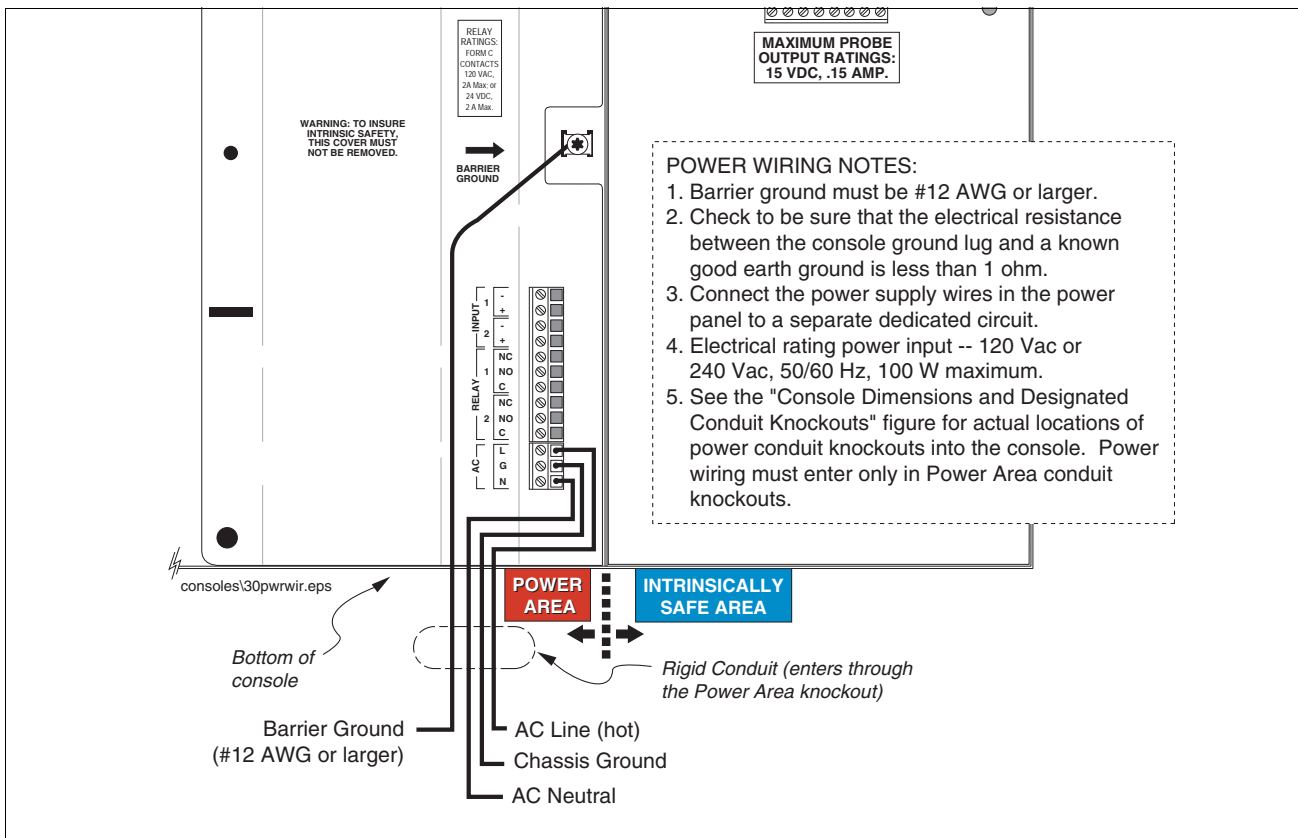


Figure 7. Wiring AC Power to the TLS-300/ProPlus/EMC Basic Console

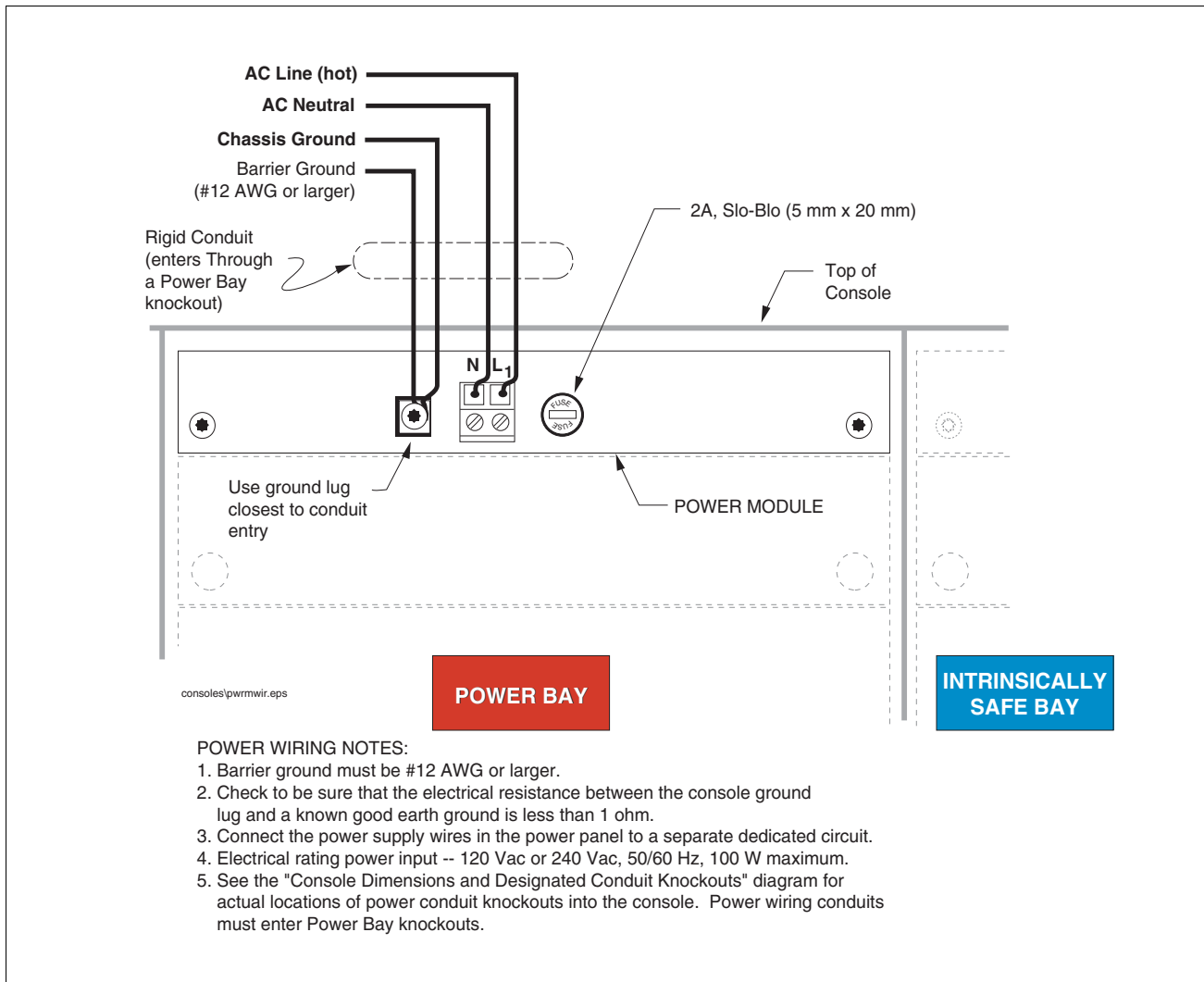



Figure 8. Wiring AC Power to the TLS-350/ProMax/EMC Console

CHECKING THE GROUND CONNECTION

Use an ohmmeter to check the electrical resistance between the console's metal case and the earthing ground wire's connection at the "known good earth ground". It should read less than 1 ohm.

Wiring Conduit Safety Issues

⚠ WARNING	
	<p>Probes and sensors operate in areas where flammable liquids and explosive vapors may be present.</p> <p>Improper installation may result in fire or explosion causing serious injury or death.</p> <p>Practice the following:</p> <ol style="list-style-type: none">1. Read thoroughly and follow the instructions shipped with each probe and sensor.2. Probe and sensor wiring conduit must not contain any other wires.3. Probe and sensor wiring and conduits must enter the console only through their designated areas.4. Power and communication wires and conduit must not enter the intrinsically safe area of the console.

Wiring between the console and the probes and sensors is of limited electrical power so that there is insufficient energy to ignite fuel. In the console, the low power, probe and sensor wiring is considered intrinsically safe because it is physically isolated from all high power wiring. To maintain the integrity of this safety feature, you must install probe and sensor wiring in separate conduits from all other wiring. In addition, probe and sensor conduits can only enter the console through the designated intrinsically safe area knockouts.

NOTE: Wiring from separate probes and sensors may be run in the same conduit or trough provided they are powered by the same console. Improper system operation will result if probe and sensor wiring to separate consoles share the same conduit. Do not run probe and sensor wiring to separate consoles in the same conduit. Do not run probe and sensor wiring with other equipment's intrinsically safe wiring in the same conduit. Improper system operation could also occur if the conduit locking nuts attaching conduit to the console are not tightened sufficiently to score the console's paint film and make good metal-to-metal contact. For proper grounding use grounding/bonding set screw conduit locknuts to achieve a good conduit-to-console metal bond.

Determining Mag Probe Riser Size

Probe Riser Pipe Installation

A riser assembly consisting of a riser and riser cap, should be used for Mag Probe installation. Riser caps (see page 19) are normally fitted at the time of probe installation. If the probes are not to be installed immediately, cap the riser.

Table 1 lists minimum riser dimensions for use with Veeder-Root mag probe float sizes.

Table 1. Dimensions for Steel Riser Pipes and Mag Probe Floats

V-R Nominal Float Size (inch)	V-R Float OD inch (mm)	Riser Size				Recommended NPS Riser Size inch (mm)
		NPS Nom Pipe (inch)	DN Nom Pipe (mm)	ID Nom Pipe (inch)	ID Nom Pipe (mm)	
1	1.155 (29.34)	1	25	1.049	26.65	2 (50)
2	1.875 (47.63)	2	50	2.067	52.51	2 (50)
3	3.015 (76.58)	3	80	3.068	77.93	3 (80)
4	3.765 (95.63)	4	100	4.026	102.26	4 (100)

DN = Diameter Nominal, NPS = Nominal pipe size, Pipe type is iron or schedule 40 steel

Determining Mag Probe Length

Determining Mag Probe Length

1. Measure the distance from the bottom of the tank to the top of the probe manway, or the 2-, 3- or 4-inch tank opening- this is the minimum probe length (ref. Figure 9).
2. The probe canister must be within the riser pipe (minimum length of 10 inches [254mm]).

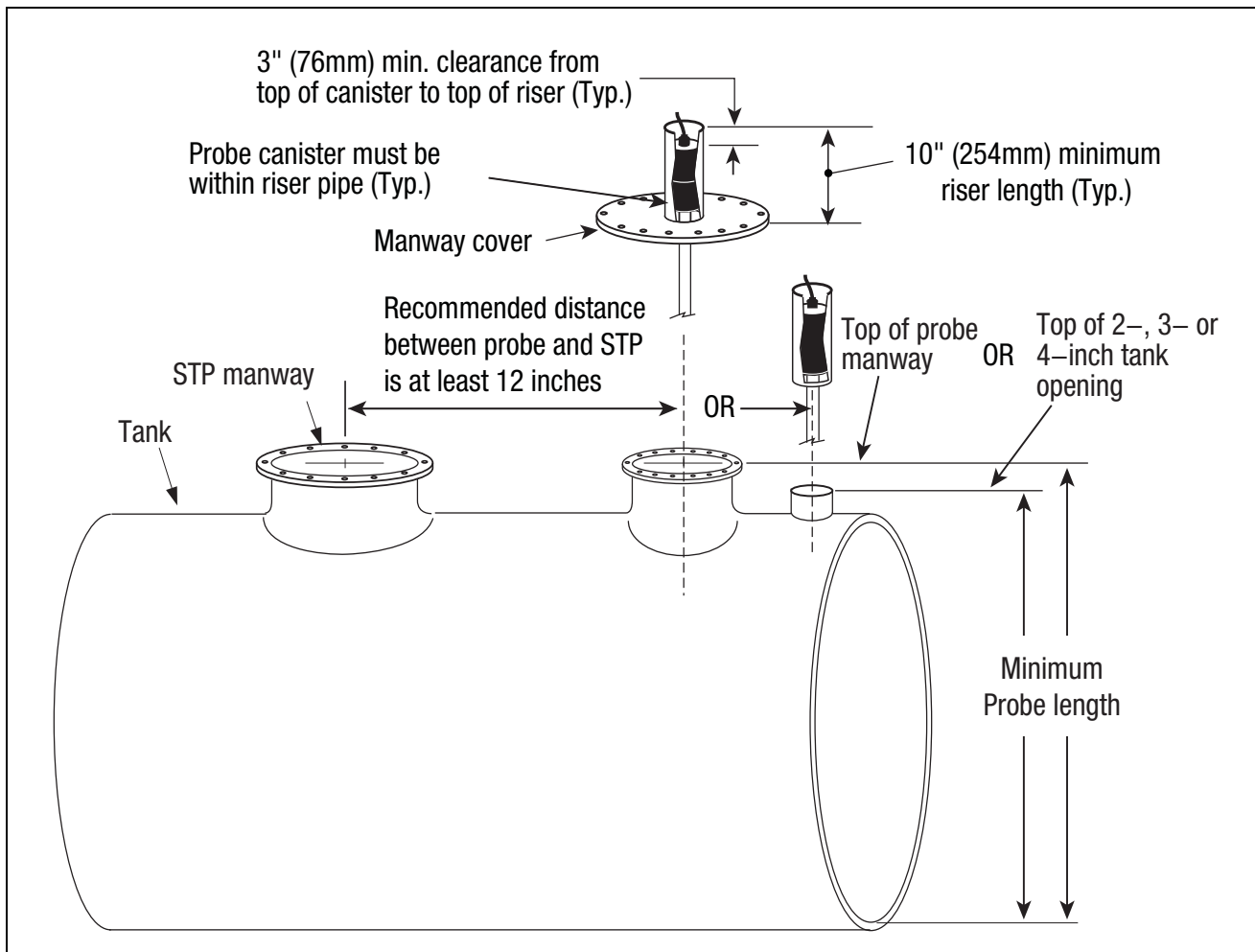


Figure 9. Determining the Minimum Mag Probe Length

Determining Mag Probe Length for Installation in a Vapor Extractor Riser

1. Measure the distance from the top of the riser to the Extractor Cage Cross Pin (see Figure 10). Record this distance as "D1" (Important - Dimension "D1" must be at least 25 inches).
2. Use the extractor wrench tool (OPW Part Number: 89-0044) to remove the Ball Float Check Valve Assembly from the riser.

3. Measure from the top of the riser to the bottom of the tank and record this distance as "D2".
4. Subtract "D1" from "D2", then add 7 inches, to determine the correct probe length.

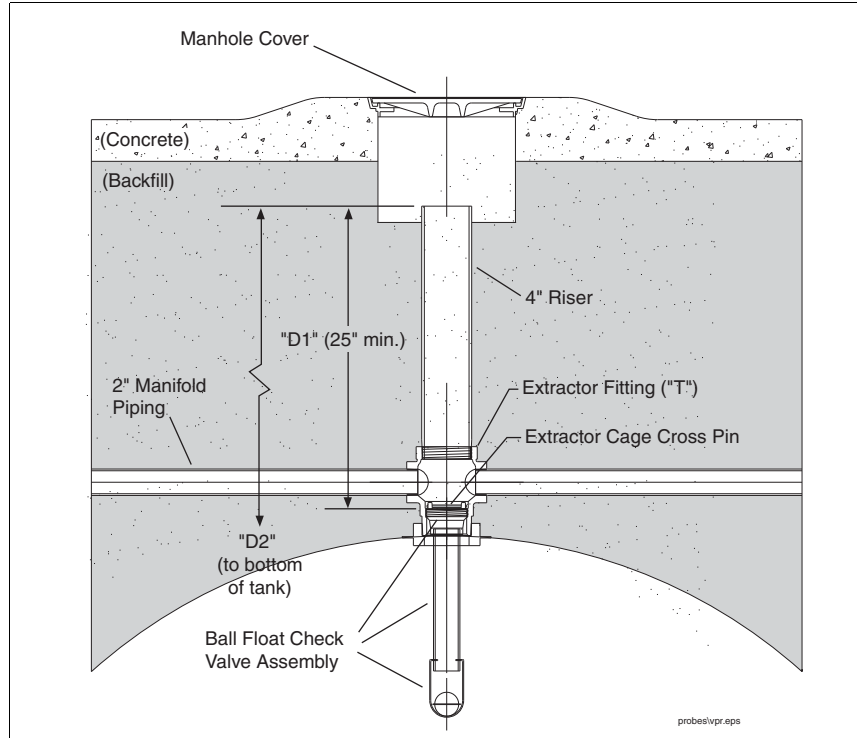


Figure 10. Determining Mag Probe Length for Installation in a Vapor Extractor Riser

Determining Mag Probe Length for Media-Isolated Installations

If tank's inside diameter is unknown, perform the following procedure (ref. Figure 11):

1. Measure the distance from the inside bottom of the tank to the inside top of the tank (A).
2. Order a probe length of B (where $B = A + 6"$).

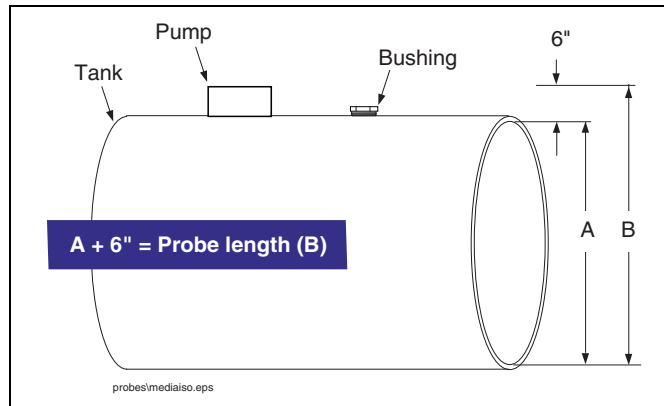


Figure 11. Calculating the Correct Mag Probe Length for Media-Isolated installation

Special Mag Probe Installation Kits

In addition to the Mag Probe installation kits shipped with each probe (containing floats, spacer rings, cable, etc.), your installation may also require one or more of the special kits described in this section.

AST Installation Kit

This kit is recommended when installing Mag Probes into an above ground storage tank (AST). This kit contains a length of flexible conduit, connectors, etc., for easier probe access. The kit contents are listed in Table 2 and shown in Figure 12.

Table 2. Mag Probe AST installation kit - Part No. 312020-984

Quantity	Description	Part Number
5 feet	3/8" Flexible conduit	576008-294
1	3/8" Adaptor nut	329972-002
2	3/8" Straight liquidtight connectors and related parts	576008-295
1	Cord Grip Group	331028-001

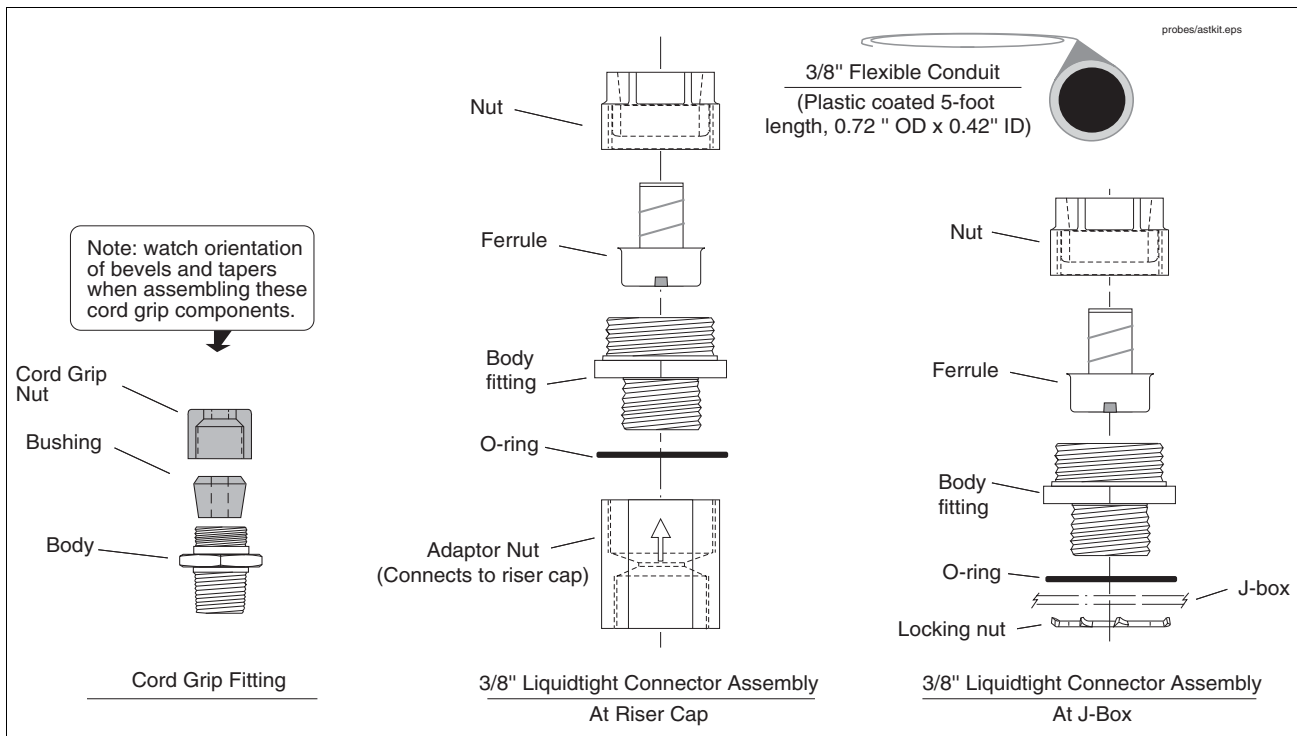


Figure 12. Mag Probe AST Installation Kit

Vapor Extraction Riser Kit w/ Coupling Adaptor

This kit contains parts needed to install a Mag Probe into a Vapor Extractor Riser that has a Coupling Adaptor (parts listed in Table 3 and shown in Figure 13):

Table 3. Vapor Extraction Riser Kit (w/ coupling adaptor) - Part No. 846500-001

Quantity	Description	Part Number
2	Wire Nut	576008-461
1	Cable Tie	576008-482
1	Splice Enclosure	514100-357
1	Splice Kit Instructions Manual	576013-861
1	PG7 / 1/4" Cord Grip Fitting	576008-637
1	Modified OPW Adaptor	331448-001
1	Shield -Fitting	331449-001
1	4" Hose Clamp	576008-638
12 inches	Flex Conduit	576008-294

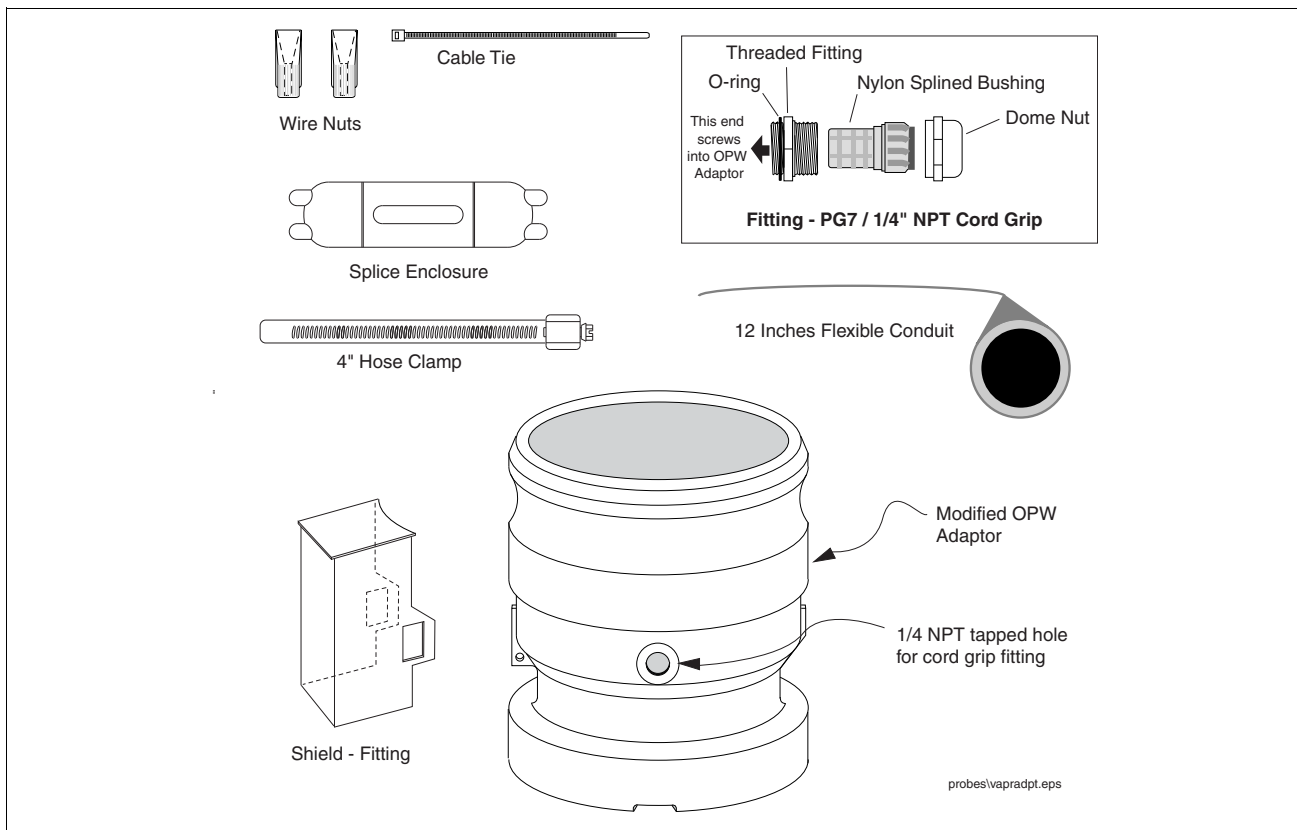


Figure 13. Mag Probe Vapor Extractor w/Coupling Adaptor Installation Kit

Vapor Extraction Riser Kit w/o Coupling Adaptor

This kit contains parts needed to install a probe in a Vapor Extractor Riser that does not have a coupling adaptor (parts listed in Table 4 and shown in Figure 14):

Table 4. Vapor Extraction Riser Kit (w/o coupling adaptor) - Part No. 846500-002

Quantity	Description	Part Number
2	Wire Nut	576008-461
1	Cable Tie	576008-482
1	Splice Enclosure	514100-357
1	Splice Kit Instructions Manual	576013-861
1	Riser Cap	331106-001
1	Gasket	331140-001
1	Cord Grip Bushing	330787-001
1	Cord Grip Nut	330594-001
12 inches	Flex Conduit	576008-294

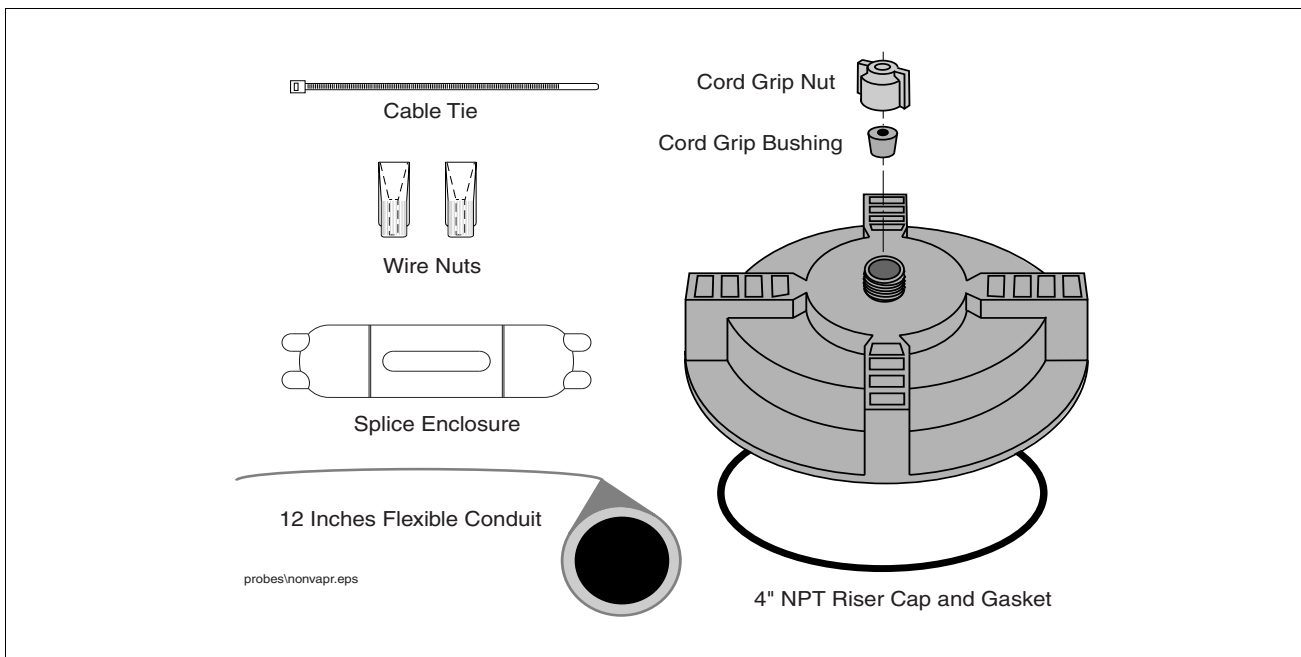


Figure 14. Mag Probe Vapor Extractor w/o Coupling Adaptor Installation Kit

Chem-ISO kit

This probe kit is intended to be installed in a tank that has a threaded 2" NPT opening to accept the probe and connectors.

The parts listed in Table 5 and shown in Figure 15 below are included in the Installation kit (P/N 331824-000) and are required to install a Veeder-Root Form No. 8463 Series Mag Probe into a tank.

Table 5. Chem-ISO Kit, P/N 331824-000

Qty.	Part Description	Part No.
1	Tube group	331800-XXX
1	Float/Magnet group	331823-001
1	Male connector 7/8" tube to 1" NPT	576008-643
1	Reduction bushing 2" NPT to 1" NPT	576008-645
1	Float retaining ring	511805-378
1	Cable	330272-XXX
1	Cable Seal Kit (cord grip fitting, sealant pack, wire nuts, and tie wraps)	330020-067
1	Rain shield	331880-001

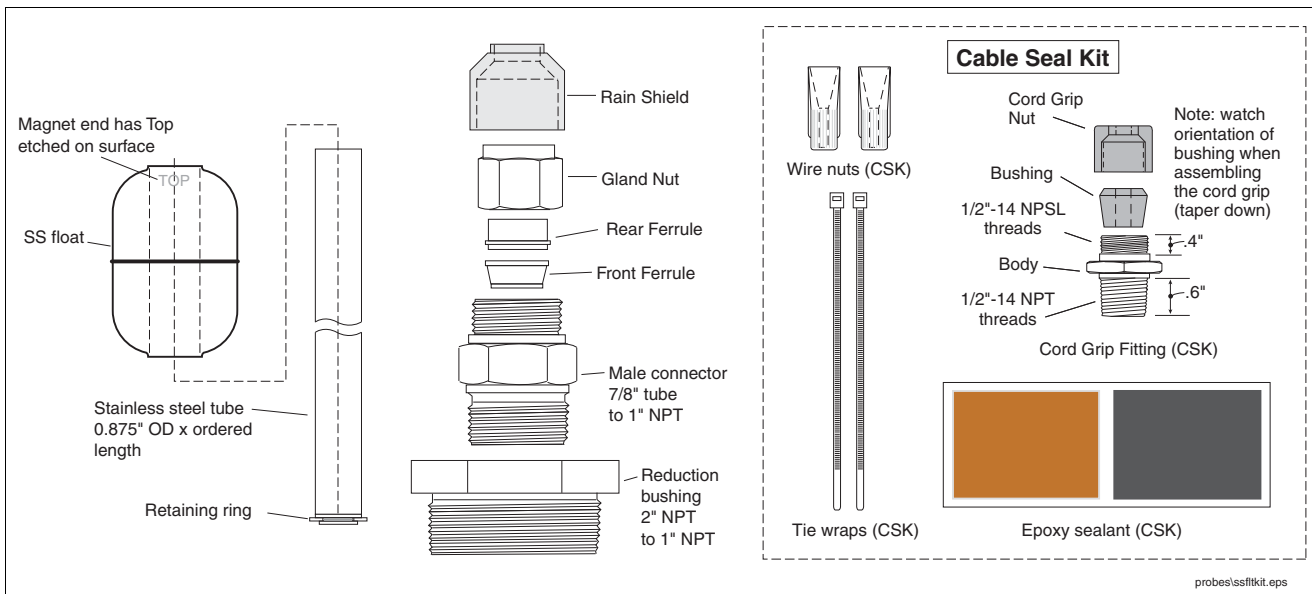


Figure 15. Mag Plus Probe Chem-ISO Kit

LPG-ISO kit

This probe kit is intended to be installed in a tank that has a threaded 1-1/2" NPT opening to accept the probe and connectors. The threaded opening must meet local codes for pressure vessels.

The parts listed in Table 6 and shown in Figure 16 below are included in the installation kit (P/N 331807-000) and are required to install a Veeder-Root Form No. 8463 Series Mag Probe into a liquefied petroleum gas (LPG) tank.

Table 6. LPG-ISO Kit, P/N 331807-000

Qty.	Part Description	Part No.
1	Tube group	331800-XXX
1	Float/Magnet group	331797-001
1	Male connector 7/8" tube to 1" NPT	576008-643
1	Reduction bushing 1-1/2" NPT to 1" NPT	576008-644
1	Float retaining ring	511805-378
1	Cable	330272-XXX
1	Cable Seal Kit (cord grip fitting, sealant pack, wire nuts, and tie wraps)	330020-067
1	Rain shield	331880-001
1	Warning tag	331879-001

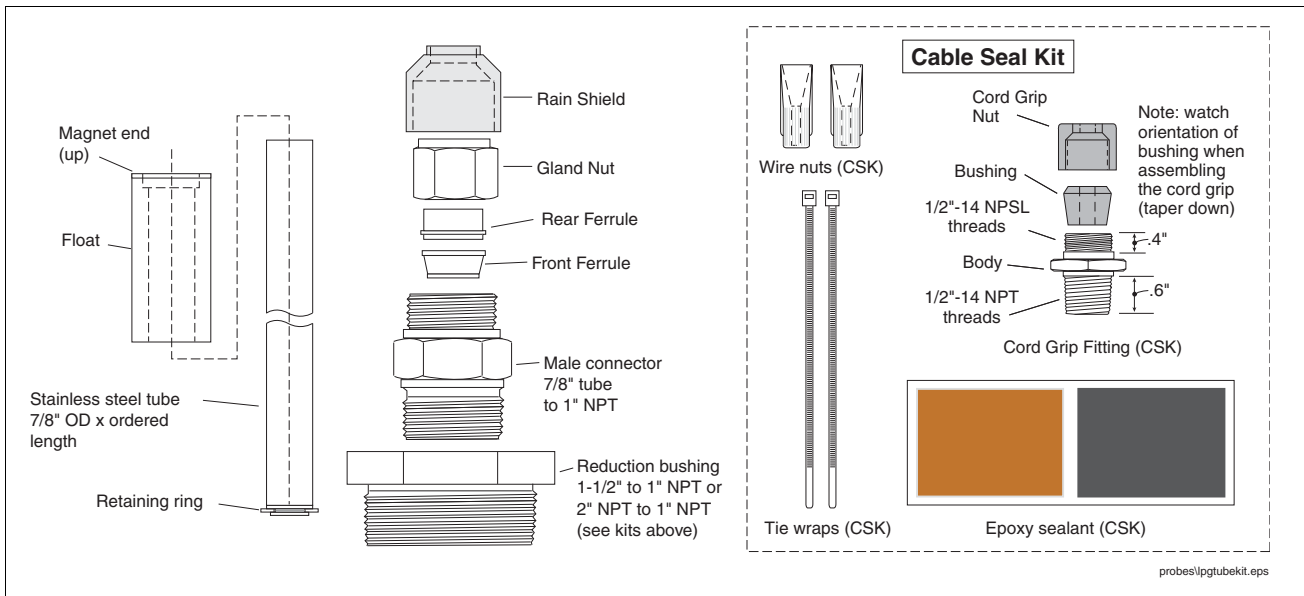


Figure 16. Mag Plus Probe LPG-ISO Kit

Riser Cap Kit for Mag Probe Installations

The cap on the riser containing the Mag Probe must be modified to allow the probe's cable to exit the riser. This modification requires making a 1/2"-14 NPT tapped hole in the cap for a cord grip. Two types of drilled and tapped Riser Cap kits are available for purchase, or you may be able to modify the existing riser cap.

CAP AND CORD GRIP KIT

This Riser Cap kit (Table 7) contains a non-metallic cap which screws onto the 4" NPT riser (Figure 17). The cap comes drilled and tapped with a cord grip.

Table 7. Cap and cord grip kit - Part No. 330020-282

Quantity	Description	Part Number
1	Cap Riser	331106-001
1	Gasket	331140-001
1	Bushing - Cord Grip	330787-001
1	Nut - Cord Grip	330594-001

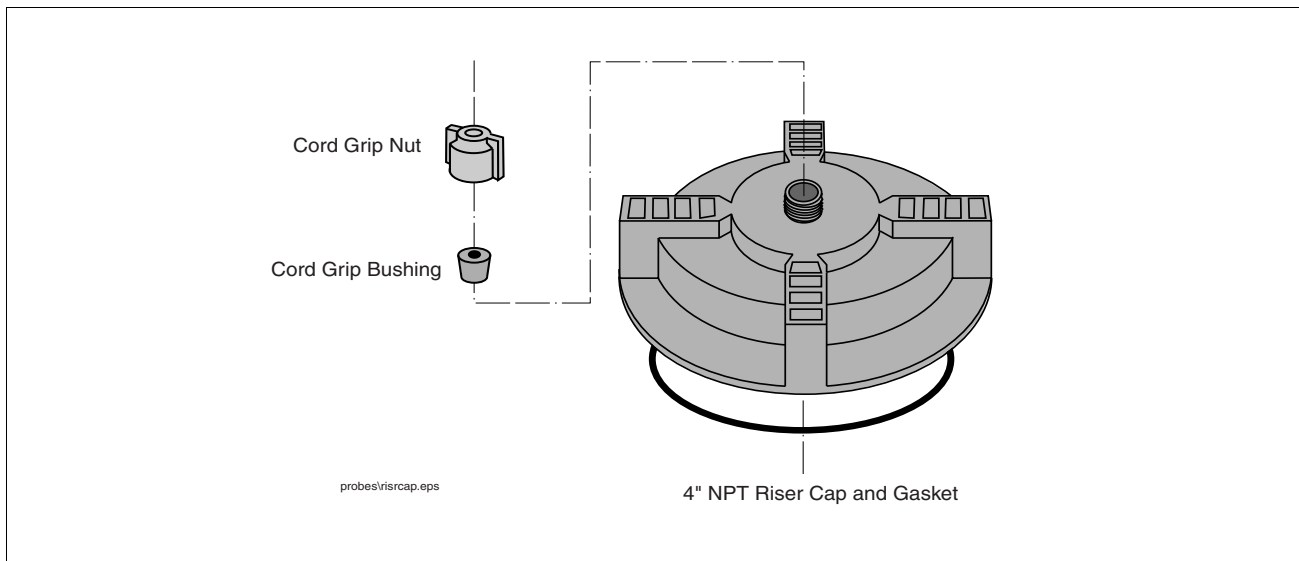


Figure 17. Cap and Cord Grip Kit

METAL CAP AND RING KIT

This riser cap kit contains an adapter ring which screws onto the 4"NPT riser and a quick-release metal cap which clamps onto the ring (Table 8). The cap comes drilled and tapped with a cord grip (Figure 18).

Table 8. Metal cap and ring kit - Part No. 312020-952

Quantity	Description	Part Number
1	Adapter ring and gasket	514100-332
1	Cap and gasket	327869-003
1	Group Cord Grip	331028-001

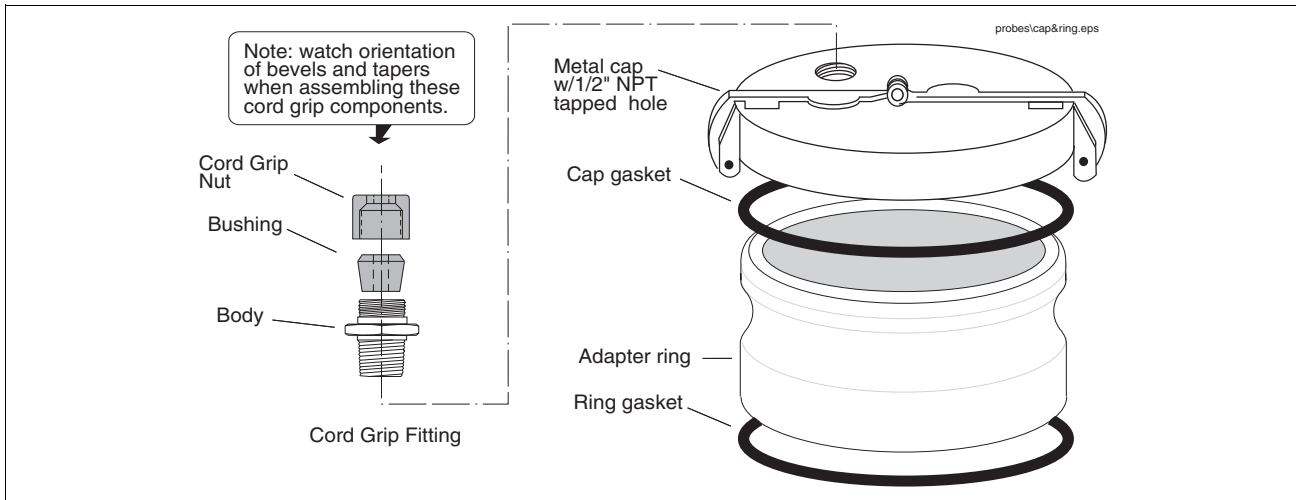


Figure 18. Metal Cap and Ring Kit

Modifying an Existing Metal Cap

In order to ensure that the riser cap seals properly to the probe cable and riser, we recommend that you purchase one of the kits available for this purpose. Riser Caps from other manufacturers may require modification. If you use your own metal riser cap, you must drill and tap it for a cord grip fitting (P/N 331028-001) as follows.

1. Remove the cap to a non-hazardous location.
2. Drill and tap the cap for a 1/2"-14 NPT cord grip thread [Figure 19].

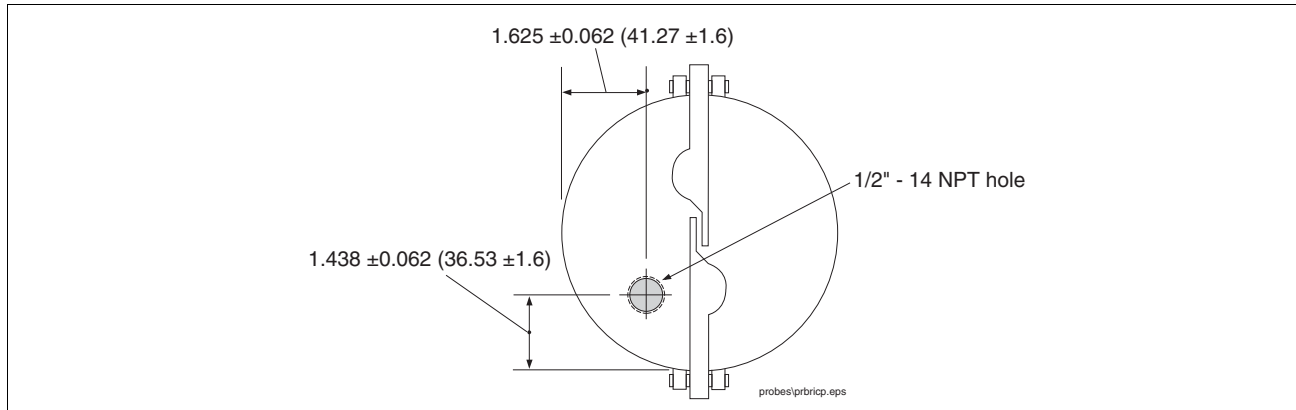


Figure 19. Modifying an Existing Metal Riser Cap

Mag Probe Installation

UST/AST Tank - Dedicated Riser



1. Turn OFF power to the console.
2. Remove any sludge from the bottom of the tank.
3. Check that floats, boot, and cable are assembled correctly on probe (ref. Mag Probe Assembly Manual).
4. Gently slide the float(s) to the bottom of the probe shaft before raising the probe. Carefully lower the probe into the riser pipe until the boot rests on the bottom of the tank [See Figure 20 for UST installation or Figure 21 for AST installation].

CAUTION! Handle probes carefully. Striking or dropping the probe will result in loss of calibration and could cause permanent damage.

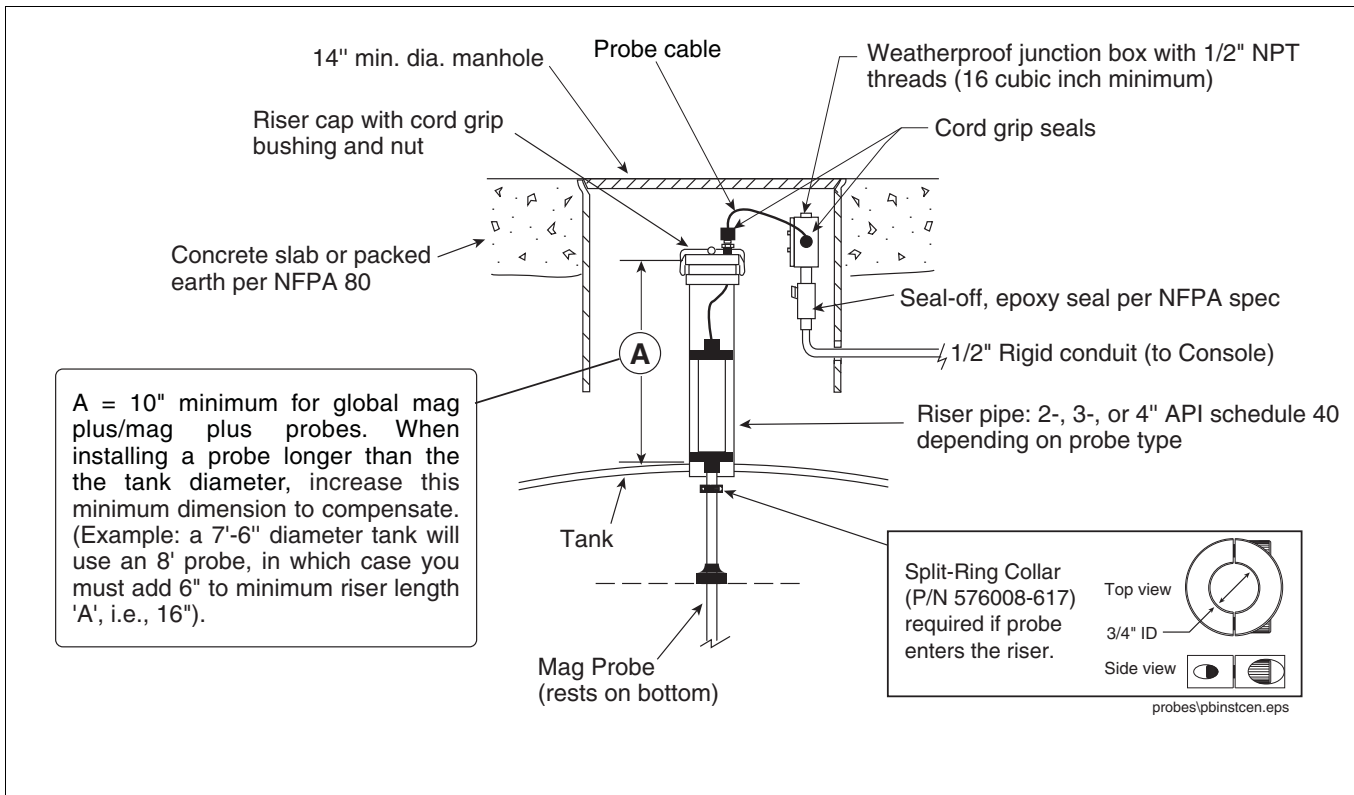


Figure 20. UST Probe Installation - Dedicated Riser

UST RISER CAP ATTACHMENT

1. If you are using the one piece cap (see Figure 17 on page 24), push the end of the probe cable through the cord grip bushing and nut on the cap, leaving a minimal amount of slack between the probe and cap. Screw the cap onto the riser by hand until the gasket first contacts the pipe. Then lightly tap the cap with a hammer to tighten it an additional 3/4 turn. Go to Step 3.

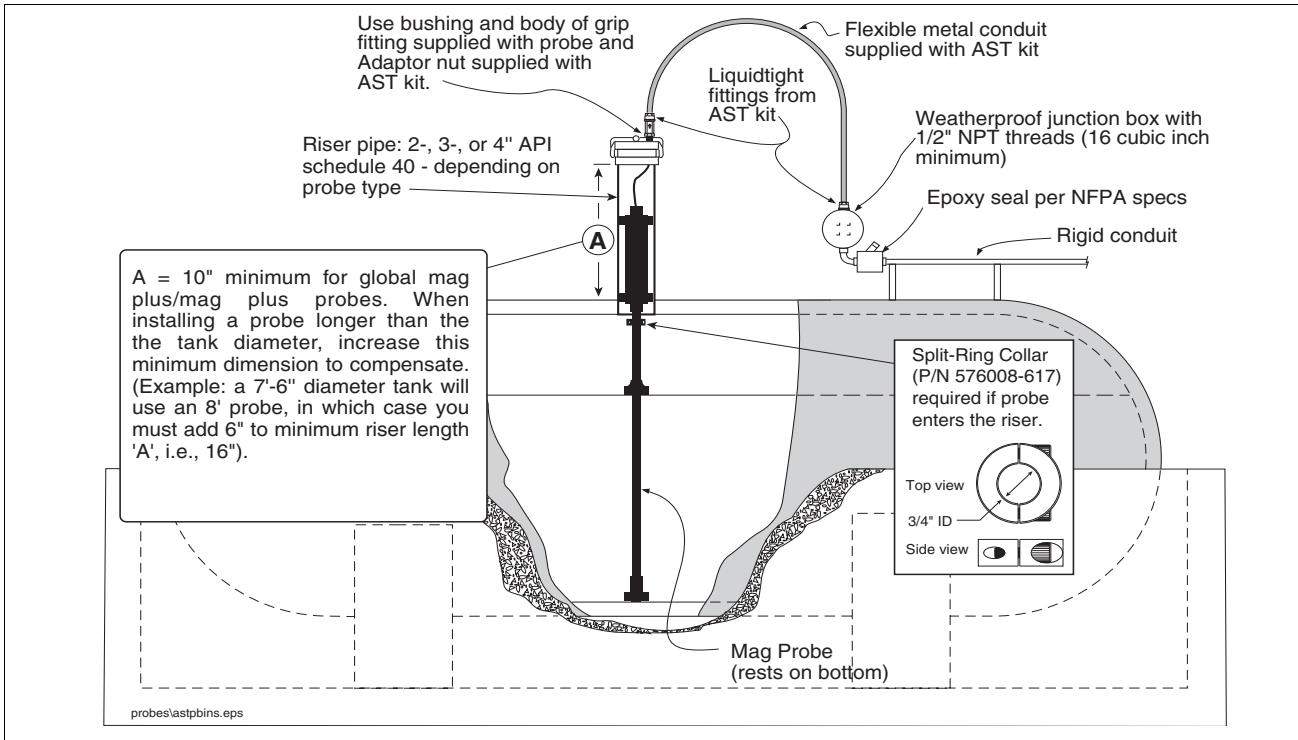


Figure 21. AST Probe Installation - Dedicated Riser

2. If you are installing the metal cap and adapter ring (see Figure 18 on page 25), screw the ring onto the 4" riser until the gasket contacts the pipe, then use a pipe wrench to tighten it an additional 3/4 turn. Push the cable through the metal cap and cord grip, then clamp the cap onto the ring.

At sites that require installation of a riser adaptor (Phil-Tite M/F 4X4 or equivalent) at the top of the riser, do so following the manufacturer's instructions. Next screw the adapter ring from the Veeder-Root kit (P/N 312020-952) onto the riser adaptor by hand until the gasket contacts the sealing surface. Then use a torque wrench attached to an appropriate strap wrench (K-D Specialty tools nylon strap oil filter wrench, or equivalent) and tighten the ring to 35 - 45 ft-lbs. Loosen the cord grip nut and push the cable through the metal cap and cord grip, then clamp the cap onto the ring (see Figure 22).

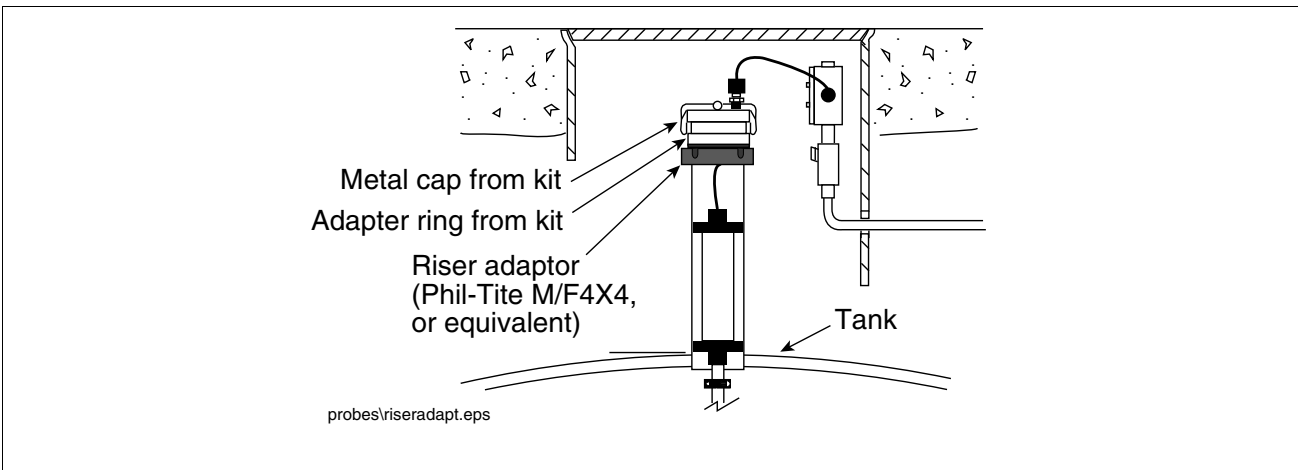


Figure 22. Installing a Riser Adaptor Beneath the Metal Cap and Adapter Ring

3. Make sure there is a minimal amount of slack between the probe and cap, then tighten the cord grip nut until the cable is held firmly. Push the end of the cable through the field J-box cord grip, then tighten that cord grip nut as well. Splice and seal the wires in the J-box as shown in the Probe and Sensor Field Wiring on page 51.

AST RISER CAP ATTACHMENT

1. If you are using the one piece cap (see Figure 17 on page 24), push the end of the probe cable through the cap and cord grip bushing, leaving a minimal amount of slack between the probe and cap. Discard the cord grip nut and attach the Adaptor Nut from the AST kit to the cap (see Figure 12 on page 19). Tighten the Adaptor Nut until the cable is held firmly. Go to Step 3.
2. If you are installing the metal cap and ring (see Figure 18 on page 25), screw the ring onto the 4" riser until the gasket contacts the pipe, then use a pipe wrench to tighten it an additional 3/4 turn. Using UL-classified pipe sealant (suitable for the fuels involved), screw the cord grip fitting into the tapped hole and tighten. Place the cord grip bushing in the fitting. Discard the cord grip nut and loosely screw the Adaptor Nut from the AST kit onto the cord grip fitting (see Figure 12 on page 19). Push the cable through the metal cap, bushing, and Adaptor nut, then clamp the cap onto the ring. Make sure there is a minimal amount of slack between the probe and cap, then tighten the Adaptor Nut until the cable is held firmly.
3. Next assemble the liquidtight connectors on both ends of the flexible conduit as shown in Figure 12. Push the cable through the flexible conduit assembly and into the J-box. Connect the flexible conduit assembly to the Adaptor Nut on one end and the J-box on the other.
4. Tighten the fittings until snug. Splice and seal the wires in the J-box as shown in the Probe and Sensor Field Wiring on page 51.

UST Installation - Vapor Extractor Riser w/ Coupling Adaptor

This type installation is usually a retrofit and is usually connected to the console via direct burial cabling. The site should already be prepped (all digging, saw cutting, and jackhammering done) prior to probe installation (see Figure 23). A piece of flex conduit should be in place as shown to protect the cable.

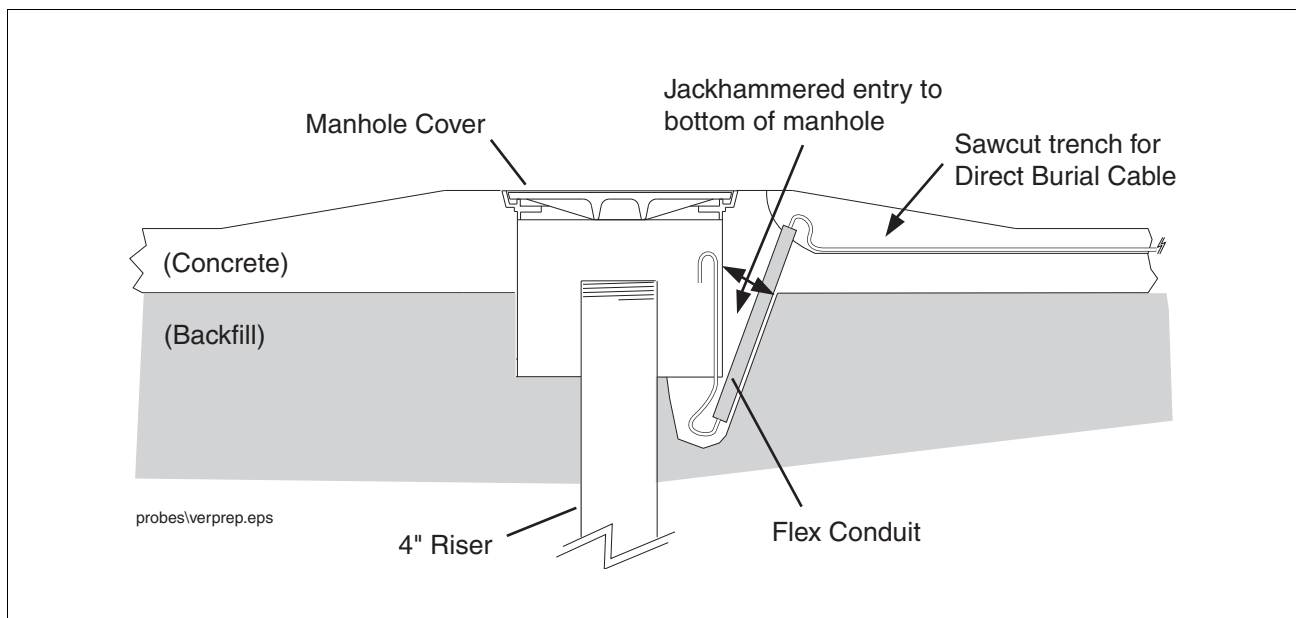


Figure 23. Vapor Extractor Cabling Entry

1. Remove any existing hardware from the Vapor Extractor Riser so that it's 4" NPT riser threads are exposed.
2. Use the extractor wrench tool (OPW Part Number: 89-0044) to remove the Ball Float Check Valve and Extractor Cage inside the bottom of the 4" riser (ref. Figure 10 on page 18). Important! - Ball Float Check Valve and Extractor Cage may be difficult to remove; **use caution.**
3. Remove any sludge from the bottom of the tank.
4. Assemble the probe floats, spacer rings, and cable as per the Mag Probe Assembly Manual.
5. Gently slide the float(s) to the bottom of the probe shaft. Important! - Handle probes carefully. Striking or dropping the probe will result in loss of calibration and could cause permanent damage.
6. Carefully lower the probe into the riser pipe until the boot rests on the bottom of the tank.
7. Thread the probe cable through the bottom of the new Coupling Adaptor and out the tapped opening in its side.
8. Screw the Coupling Adaptor onto the 4" riser until the gasket first contacts the riser pipe. Then use a pipe wrench to tighten the Coupling Adaptor an additional 3/4 turn.
9. Test pull the cable to insure that it is free of spring and that the probe is resting on the bottom of the tank. (Make sure there is some slack in the cable.)
10. Slip the PG7 cord grip fitting ("O" ring end first) over the cable and screw it into the tapped hole in the Coupling Adaptor (ref Figure 13 on page 20 for the correct PG7 cord grip assembly). Tighten snugly - **Be careful not to overtighten.** Slide the domed nut of the PG7 fitting down the cable and tighten securely onto the PG7 fitting so that the cable stays firmly in place. **Again, be careful not to overtighten.**
11. Reattach the riser cap from the original installation onto the Coupling Adaptor.
12. Position the Shield-Fitting over the PG7 cord grip and secure with the hose clamp (see Figure 24 on page 30).
13. Splice the probe cable to the direct burial cable as shown in the Probe and Sensor Field Wiring on page 51, and seal following instructions shipped with the splice kit. Observe polarity!
14. Secure splice enclosure against the Shield-Fitting with the tie wrap.

CAUTION: If Ball Float Check Valve was part of your Overfill Protection System, you now need to consider another form of overfill protection (i.e. TLS alarm or drop tube with overfill protection valve or some other accepted means).

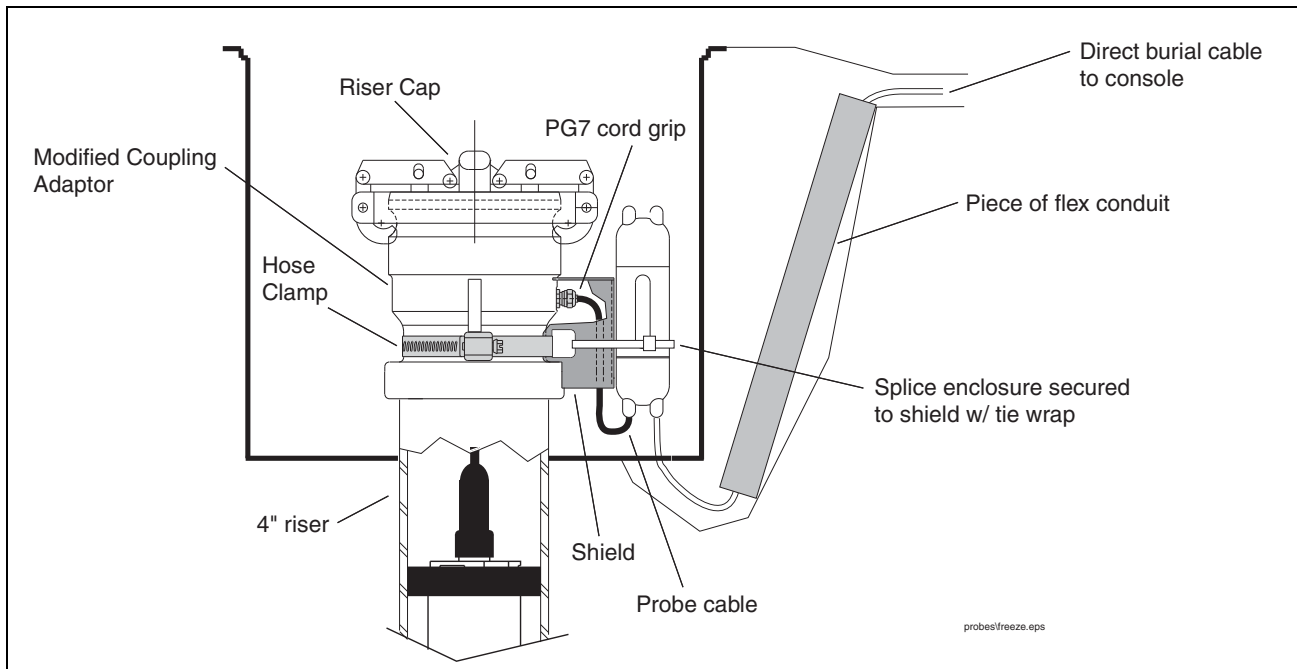


Figure 24. Mag Probe Vapor Extractor Riser Installation - w/ Coupling Adaptor

UST Installation - Vapor Extractor Riser w/o Coupling Adaptor

This type installation is usually a retrofit and is usually connected to the console via direct burial cabling. The site should already be prepped (all digging, saw cutting, and jackhammering done) prior to Probe Installation (see Figure 23 on page 28). A piece of flex conduit should be in place as shown to protect the cable.

1. Remove any existing hardware from the Vapor Extractor Riser so that it's 4" NPT riser threads are exposed.
2. Use the extractor wrench tool (OPW Part Number: 89-0044) to remove the Ball Float Check Valve and Extractor Cage inside the bottom of the 4" riser (ref. Figure 10 on page 18). Important! - Ball Float Check Valve and Extractor Cage may be difficult to remove; **use caution**.
3. Remove any sludge from the bottom of the tank.
4. Assemble the probe floats, spacer rings, and cable as per the Mag Probe Assembly Manual.
5. Gently slide the float(s) to the bottom of the probe shaft. Important! - Handle probes carefully. Striking or dropping the probe will result in loss of calibration and could cause permanent damage.
6. Carefully lower the probe into the riser pipe until the boot rests on the bottom of the tank.
7. Ensure that the cord grip nut on the new cap is loose so that the bushing can rotate freely.
8. Thread the probe cable through the bushing and nut on the cap, leaving a minimal amount of slack between the probe and cap.
9. Install the cap onto the riser, threading it by hand until the gasket first contacts the riser pipe. Then lightly tap the cap with a hammer to tighten it an additional 3/4 turn.
10. Splice the probe cable to the direct burial cable as shown in the Probe and Sensor Field Wiring on page 51, and seal following instructions shipped with the splice kit. Observe polarity!
11. Bring the cable down the side of riser and secure into place with the tie wrap.

CAUTION: If Ball Float Check Valve was part of your Overfill Protection System, you now need to consider another form of overfill protection (i.e. a console alarm, a drop tube with overfill protection valve, or some other accepted means).

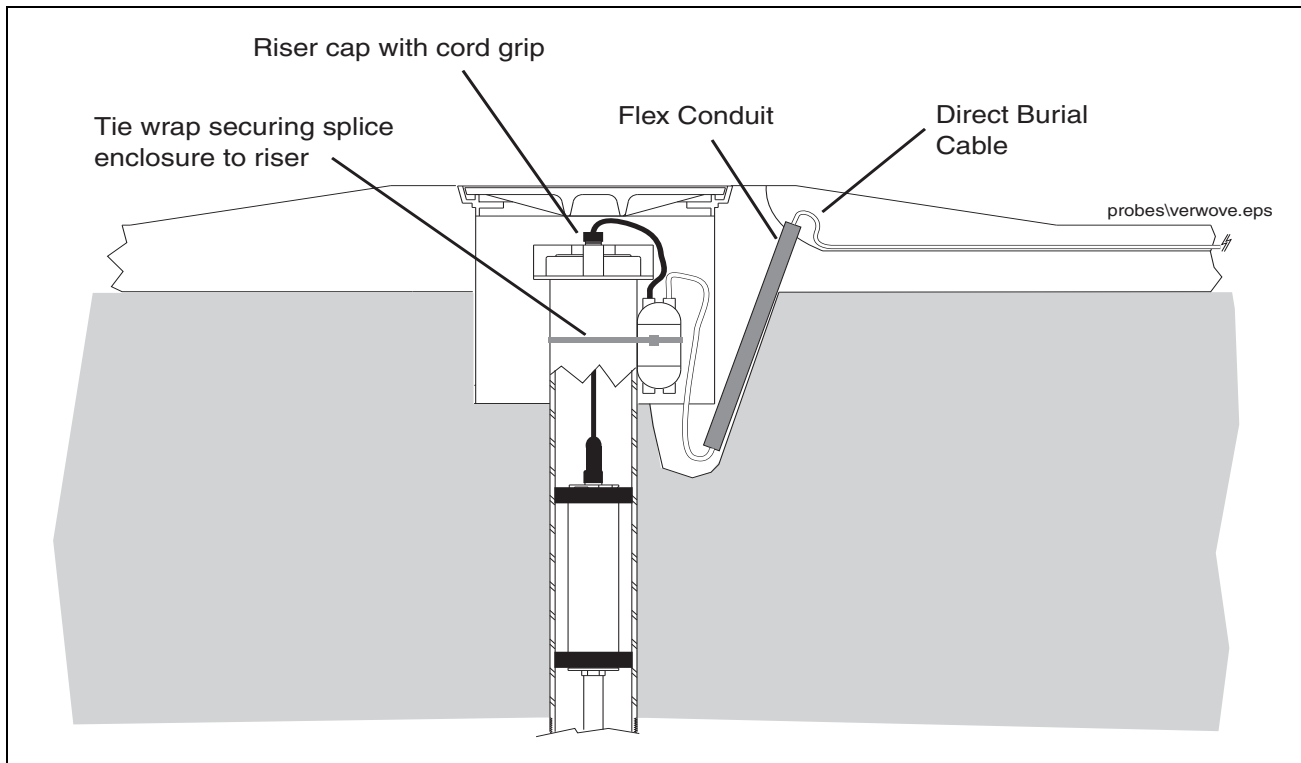


Figure 25. Mag Probe Vapor Extractor Riser Installation - w/o Coupling Adaptor


Installing a Chem-ISO Mag Probe

BEFORE YOU BEGIN

Before you begin installation, read the following guidelines:

- It is essential that you carefully read and follow the warnings and instructions in this manual to protect yourself and others from serious injury, explosion, or electrical shock.
- For safety reasons, we have taken particular care in the design of this product to limit the power in the wiring to the product tanks and to keep that wiring physically separated from any other wiring. It is your responsibility to maintain the effectiveness of these safety features by installing this product in accordance with the instructions and warnings which follow. Your failure to do so could create danger to life and property.
- Failure to install this probe kit in accordance with its instructions and warnings will result in voiding of all warranties connected with this product. This unit does not contain any user controls. Opening or tampering with a magnetostrictive probe will result in voiding the warranty.

Note: Remove any sludge from the bottom of the tank. Sludge can interfere with the proper operation of the float.

⚠ WARNING	
	<p>Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified.</p> <ol style="list-style-type: none"> 1. It is essential that you carefully read and follow the warnings and instructions in this manual to protect yourself and others from serious injury due to fire or explosion. Failure to do so could result in undetected potential environmental and health hazards. 2. Comply with all federal, state, and local codes, and other applicable safety codes. All wiring must comply with UL/cUL standards and other local electrical and pressure vessel codes. 3. Failure to comply with these requirements could result in death, serious personal injury, property loss, or equipment damage. 4. Substitution of components may impair intrinsic safety. 5. Circuitry within the probe and console barrier form an intrinsically safe, energy limited system. The probe wiring is intrinsically safe only when connected to Veeder-Root consoles having form numbers 8470, 8482, 8485, or 8560.

ATTACHING THE FLOAT TO THE TUBE

Slide the large shipping washer off of the stainless steel tube and discard it. Carefully slide the stainless steel float, non-magnet end first, onto the tube and down against the retaining ring at the bottom of the tube (the float end marked "TOP" should be facing up). The float must be installed magnet-end up to measure fuel correctly (see Figure 26).

INSTALLING THE STAINLESS STEEL TUBE INTO THE TANK

1. With the float against the retaining ring, carefully lift the open end of the tube up and lower the assembly, float end first, into the tank until the tube rests on the bottom of the tank (Figure 26). Carefully slide the 1" x 2" stainless steel bushing, 2" end first, down over the tube until it rests against the tank opening. Apply UL classified sealant suitable for use with the product in the tank to the outside bushing threads that will be screwed into the tank fitting. Screw the bushing into the tank fitting. Tighten the bushing as required to ensure a proper seal.

SEALING THE STAINLESS STEEL TUBE IN THE TANK OPENING

2. Loosen the gland nut on the male connector. Carefully slide the male connector, 1" end first, down onto the tube until it rests against the bushing. Apply UL classified sealant suitable for use with the product in the tank to the threads of the connector's NPT threads. Screw the connector into the bushing. Tighten the connector as required to ensure a proper seal.
3. Push the tube down until it rests on the tank's bottom. Using a felt marker, make a mark on the tube at the top of the gland nut. Raise the tube until the mark is 1-inch above the nut, then hand tighten the gland nut until the tube is held in place (this distance is necessary for expansion and contraction of the tank). Tighten the gland nut one and one quarter full turns beyond hand tight to crimp the ferrules to the tube and create the proper seal.

INSTALLING THE PROBE IN THE STAINLESS STEEL TUBE

4. Slide the rubber rain shield onto the probe shaft (narrow end up) and push it all the way up to the probe canister. Gently slide the probe down into the tube until it rests on the bottom of the tube. Slide the rain shield down the shaft until it rests against the top end of the tube. The lower (wide) end of the shield may be a little

over the top of the gland nut. Note: the rain shield is intended to keep water out from between the probe's shaft and the inside of the tube so you don't want to force the shield down below the top end of the tube (see Figure 27).

5. Attach the probe cable connector to the mating plug on the top of the probe canister. Hand tighten the connector securely.
6. If required by local regulations, install a protective housing. A typical housing consists of a reducer, 4-inch diameter pipe, and union. The final assembly must comply with local codes.
7. Splice and seal the wires as shown in the Probe and Sensor Field Wiring on page 51.

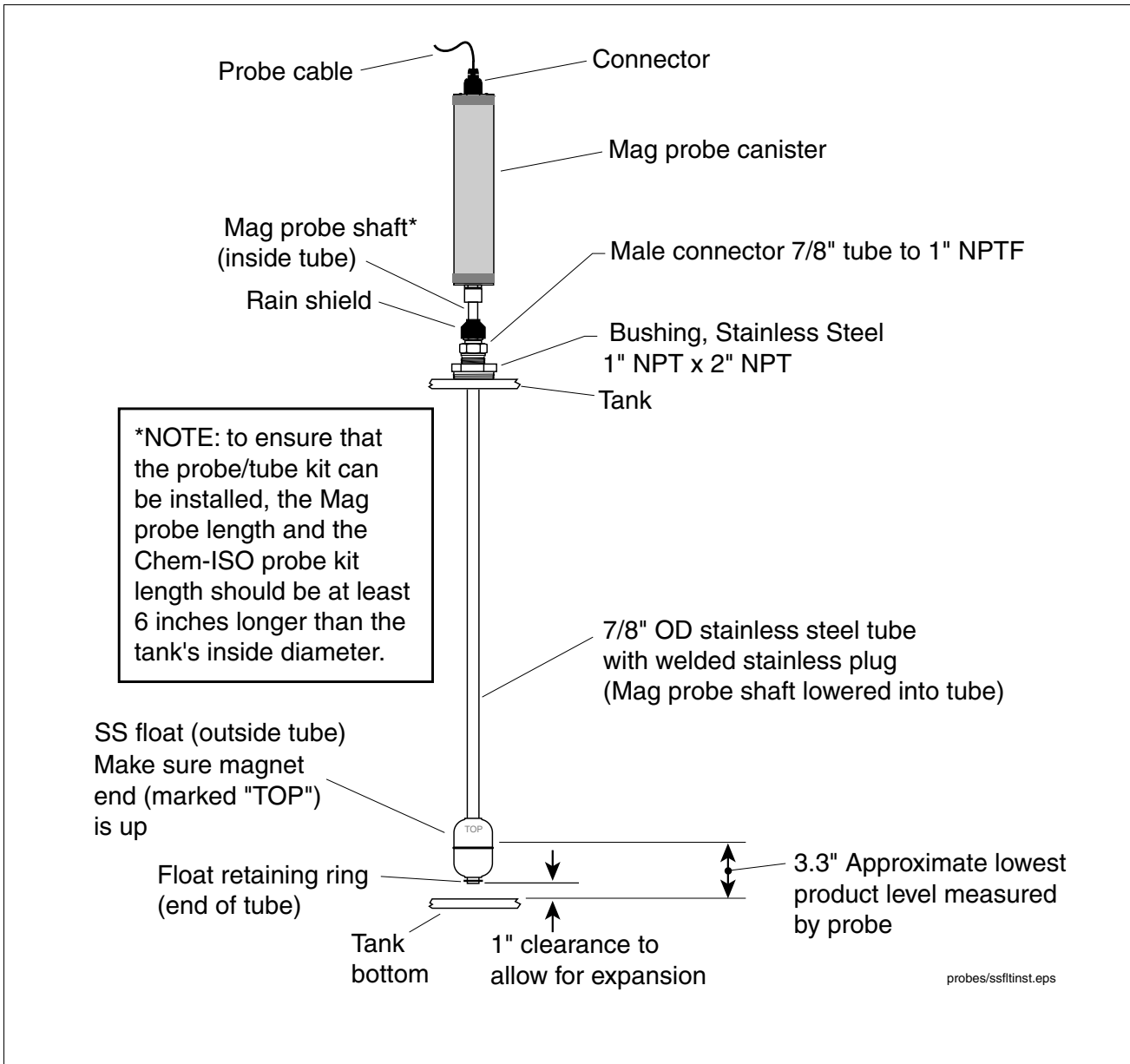


Figure 26. Media Isolated Mag Plus Probe Installation Example

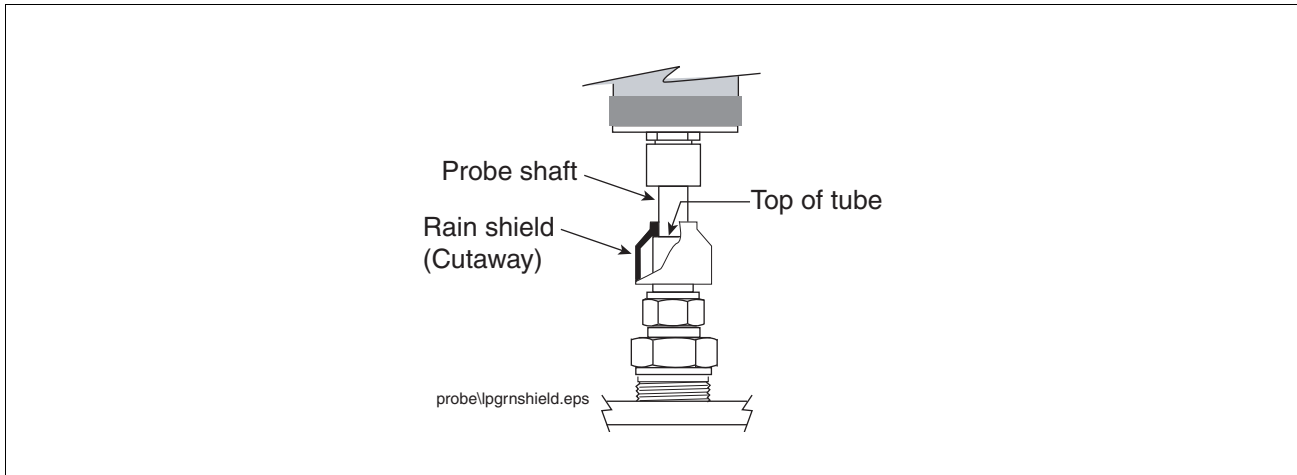


Figure 27. Rain Shield Installed Position

ENTERING CUSTOM FLOAT SIZE (IN-TANK SETUP - VER. 22 OR LATER)

At the console, select Setup Mode/In-Tank Setup/Float Size. Press Change to display "Float Size: Custom"¹. For the Media-Isolated probe's stainless steel float you need to enter a Fuel Offset value of +1.000 and an Invalid Fuel value of +0003.300. (Water Offset and Water Minimum values are ignored for this probe so no changes are necessary). The probe is now installed and setup.

Installing a LPG-ISO Mag Probe

- This product is to be installed and operated in the highly combustible environment of an LPG storage tank. It is essential that you carefully read and follow the warnings and instructions in this manual to protect yourself and others from serious injury, explosion, or electrical shock.
- For safety reasons, we have taken particular care in the design of this product to limit the power in the wiring to the fuel tanks and to keep that wiring physically separated from any other wiring. It is your responsibility to maintain the effectiveness of these safety features by installing this product in accordance with the instructions and warnings which follow. Your failure to do so could create danger to life and property.
- Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties connected with this product. This unit does not contain any user controls. Opening or tampering with a magnetostrictive probe will void the warranty.

BEFORE YOU BEGIN



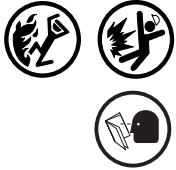
1. Make sure that the tank is depressurized (drained) and free of liquid and combustible vapors.
2. Remove any sludge from the bottom of the tank. Sludge can interfere with the proper operation of the float.

1. This offset can be entered using a "Tilt" value of +0.94" and 2-inch float entry on earlier software versions.

ATTACHING THE FLOAT TO THE TUBE

Slide the large shipping washer off of the stainless steel tube and discard it. Carefully slide the float, non-magnet end first, onto the tube and down against the retaining ring at the bottom of the tube. The float must be installed magnet-end up to measure fuel correctly (see Figure 28).

⚠ WARNING



The Veeder-Root Mag Plus probe is installed and operated in the highly combustible environment of an LPG tank.

Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified.

1. It is essential that you carefully read and follow the warnings and instructions in this manual to protect yourself and others from serious injury due to fire or explosion. Failure to do so could result in undetected potential environmental and health hazards.
2. Comply with all federal, state, and local codes, and other applicable safety codes. All wiring must comply with UL/CUL standards and other local electrical and pressure vessel codes.
3. All work on LPG systems must comply with NFPA 58, Liquefied Petroleum Gas Code and other applicable code requirements.
4. LPG tanks must be depressurized (drained) and free of liquid and combustible vapors before work begins.
5. Failure to comply with these requirements could result in death, serious personal injury, property loss, or equipment damage.
6. Substitution of components may impair intrinsic safety.
7. Circuitry within the probe and console barrier form an intrinsically safe, energy limited system. The probe wiring is intrinsically safe only when connected to Veeder-Root consoles having form numbers 8470, 8482, 8485, or 8560.

INSTALLING THE STAINLESS STEEL TUBE INTO THE TANK

With the float against the retaining ring, carefully lift the open end of the tube up and lower the assembly, float end first, into the tank until the tube rests on the bottom of the tank (Figure 28). Carefully slide the 1" x 1-1/2" stainless steel bushing, 1-1/2" end first, down over the tube until it rests against the tank opening. Apply UL classified sealant suitable for use with LPG to the outside bushing threads that will be screwed into the tank fitting. Screw the bushing into the tank fitting. Tighten the bushing as required to ensure a proper seal.

SEALING THE STAINLESS STEEL TUBE IN THE TANK OPENING

1. Loosen the gland nut on the male connector. Carefully slide the male connector, 1" end first, down onto the tube until it rests against the bushing. Apply UL classified sealant suitable for use with LPG to the threads of the connector's NPT threads. Screw the connector into the bushing. Tighten the connector as required to ensure a proper seal.
2. Push the tube down until it rests on the tank's bottom. Using a felt marker, make a mark on the tube at the top of the gland nut. Raise the tube until the mark is 1-inch above the nut, then hand tighten the gland nut until the tube is held in place (this distance is necessary for expansion and contraction of the tank). Tighten the gland nut one and one-quarter full turns beyond hand tight to crimp the ferrules to the tube and create the proper seal.

INSTALLING THE PROBE IN THE STAINLESS STEEL TUBE

1. Slide the rubber rain shield onto the probe shaft (narrow end up) and push it all the way up to the probe canister. Gently slide the probe down into the tube until it rests on the bottom of the tube. Slide the rain shield down the shaft until it rests against the top end of the tube. The lower (wide) end of the shield may be a little over the top of the gland nut. Note: the rain shield is intended to keep water out from between the probe's shaft and the inside of the tube so you don't want to force the shield down below the top end of the tube (see Figure 29).
2. Attach the warning tag as shown in Figure 28. Attach the probe cable connector to the mating plug on the top of the probe canister. Hand tighten the connector securely.
3. If required by local regulations, install a protective housing. A typical housing consists of a reducer, 4-inch diameter pipe, and union. The final assembly must comply with local codes.
4. Splice and seal the wires as shown in the Probe and Sensor Field Wiring on page 51.

Entering Custom Float Size (In-Tank Setup - Ver. 22 or later)

At the console, select Setup Mode/In-Tank Setup/Float Size. Press Change to display "Float Size: Custom"¹. For the LPG probe you need to enter a Fuel Offset value of +0001.120 and an Invalid Fuel value of +0003.250. (Water Offset and Water Minimum values are ignored for this probe so no changes are necessary). The probe is now installed and setup.

1. This offset can be entered using a "Tilt" value of +1.06" and 2-inch float entry on earlier software versions.

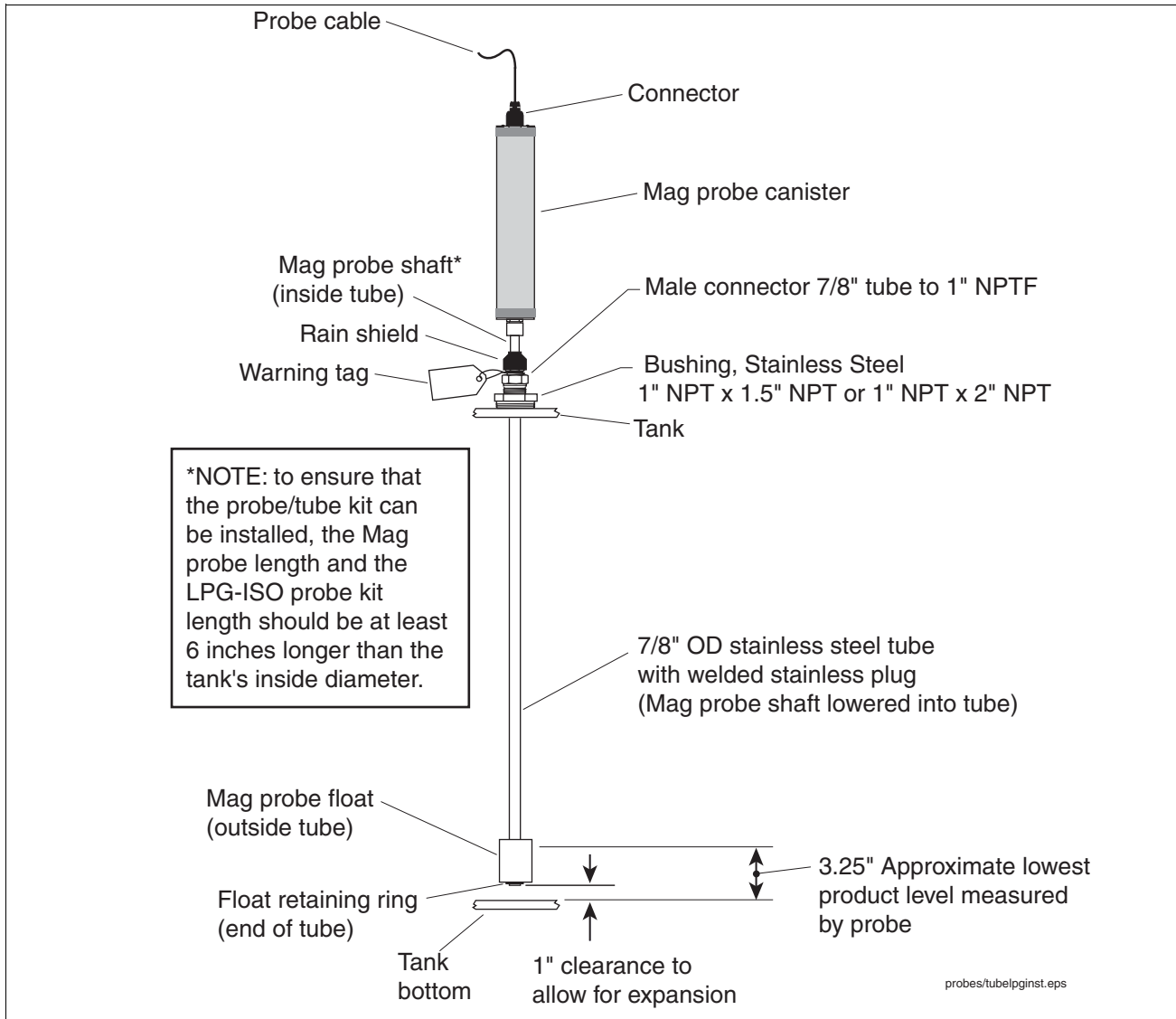


Figure 28. Media Isolated Mag Plus Probe Installation Example

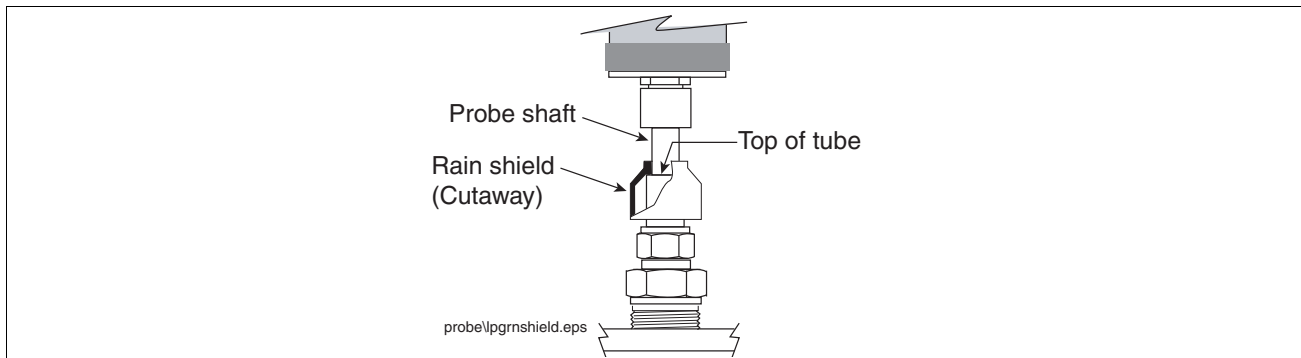


Figure 29. Rain Shield Installed Position.

Sensor Installation

Sensor Installation Diagrams

General installation diagrams for various Veeder-Root sensors are shown in Figure 30 through Figure 47. When installing sensors you must adhere to the procedures shown in these figures, unless a separate manual is shipped with your sensor, in which case you should follow that manual's installation guidelines. For those sensor installations requiring the Universal Mounting Kit (P/N 331144-001), refer to Appendix B for suggested attachment configurations.

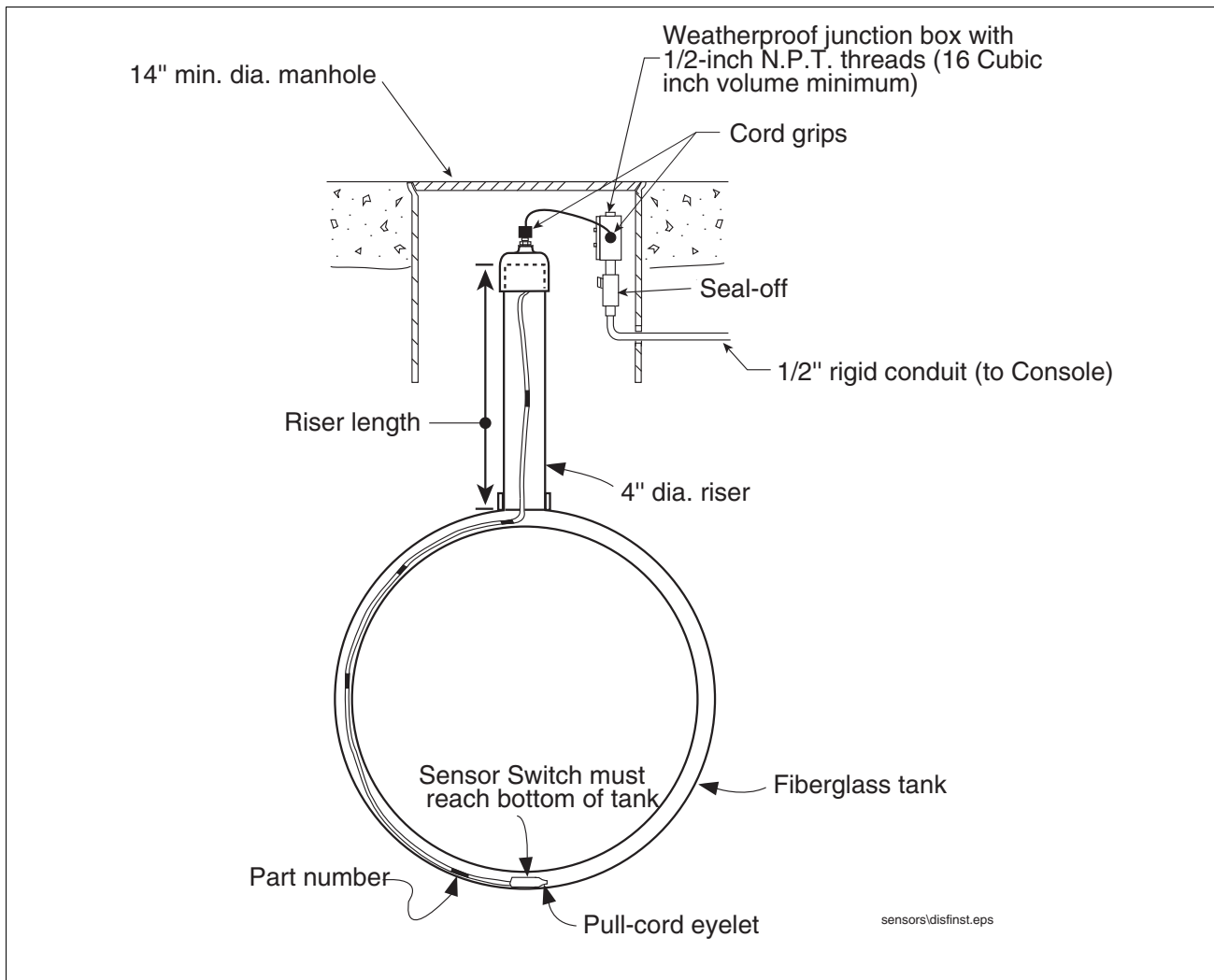


Figure 30. Example Interstitial Sensor Installation - Fiberglass UST

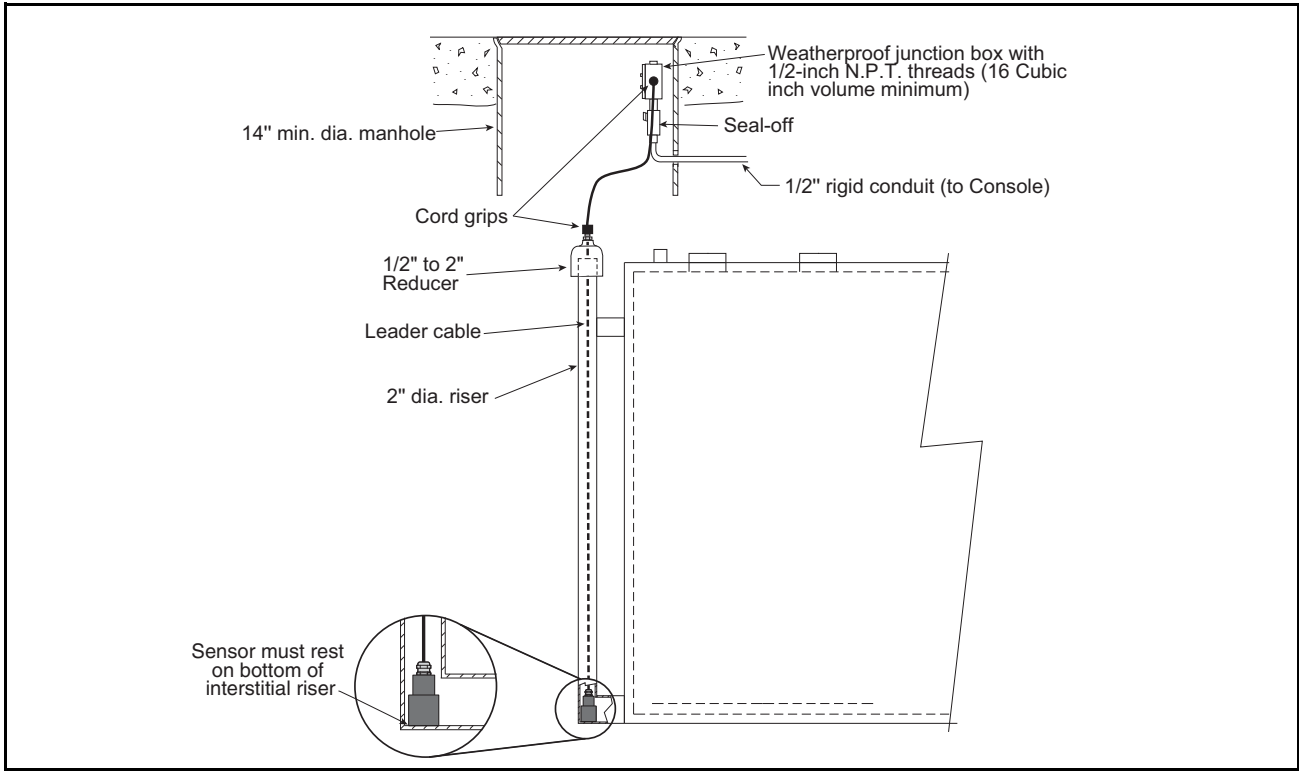


Figure 31. Example Interstitial Position Sensitive Sensor Installation - Steel UST

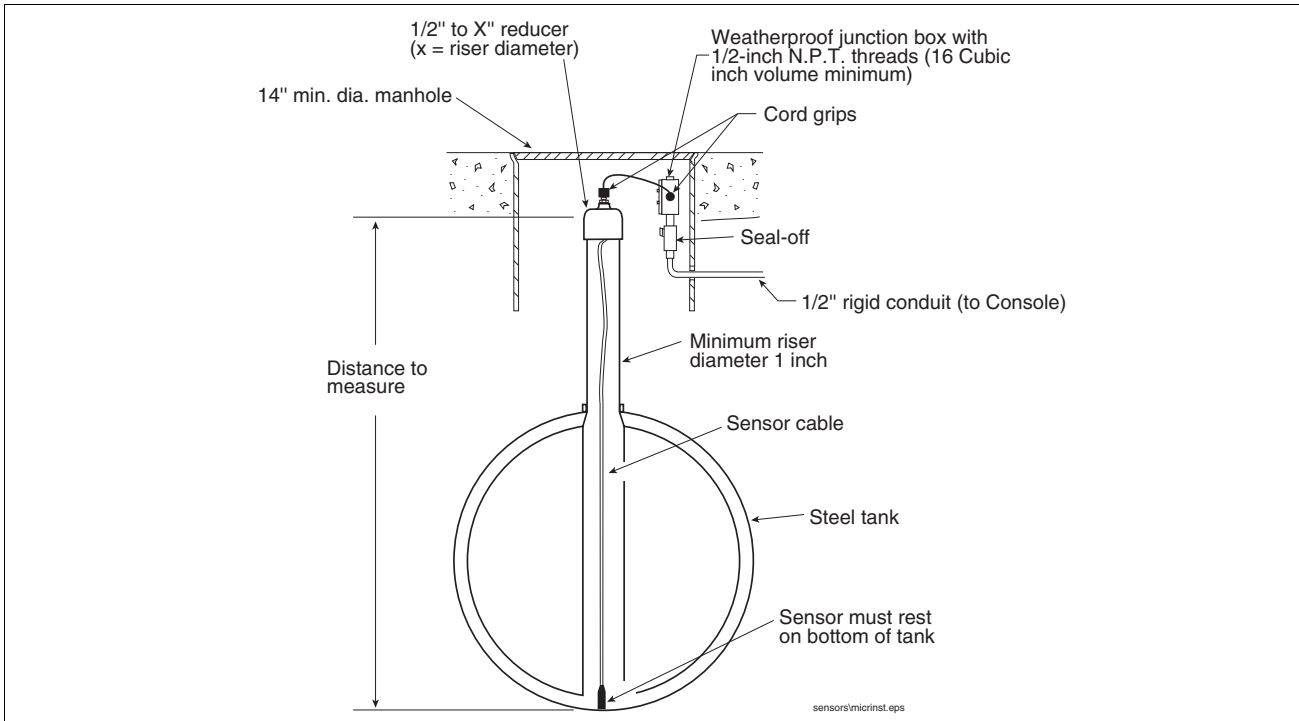


Figure 32. Example Interstitial MicroSensor Installation - Steel UST

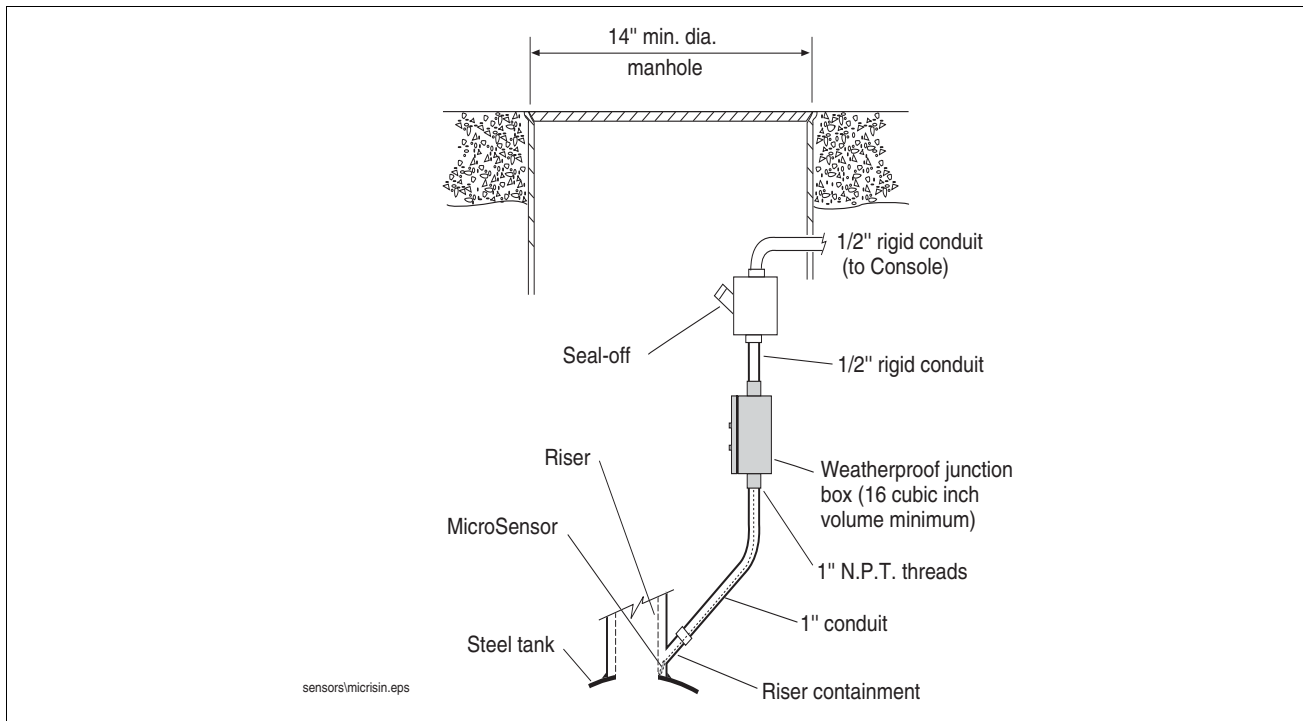


Figure 33. Example MicroSensor Installation in Riser Containment - Steel UST

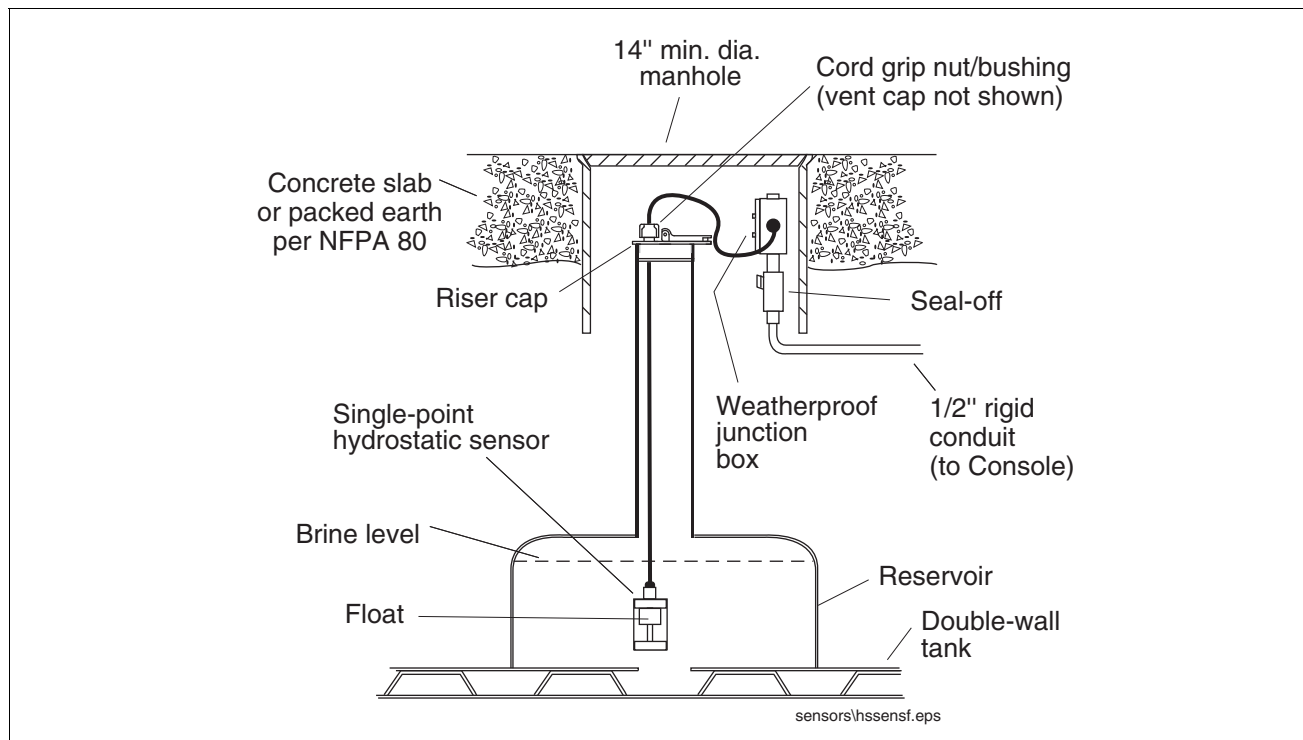


Figure 34. Example Hydrostatic Reservoir Single Float Sensor Installation

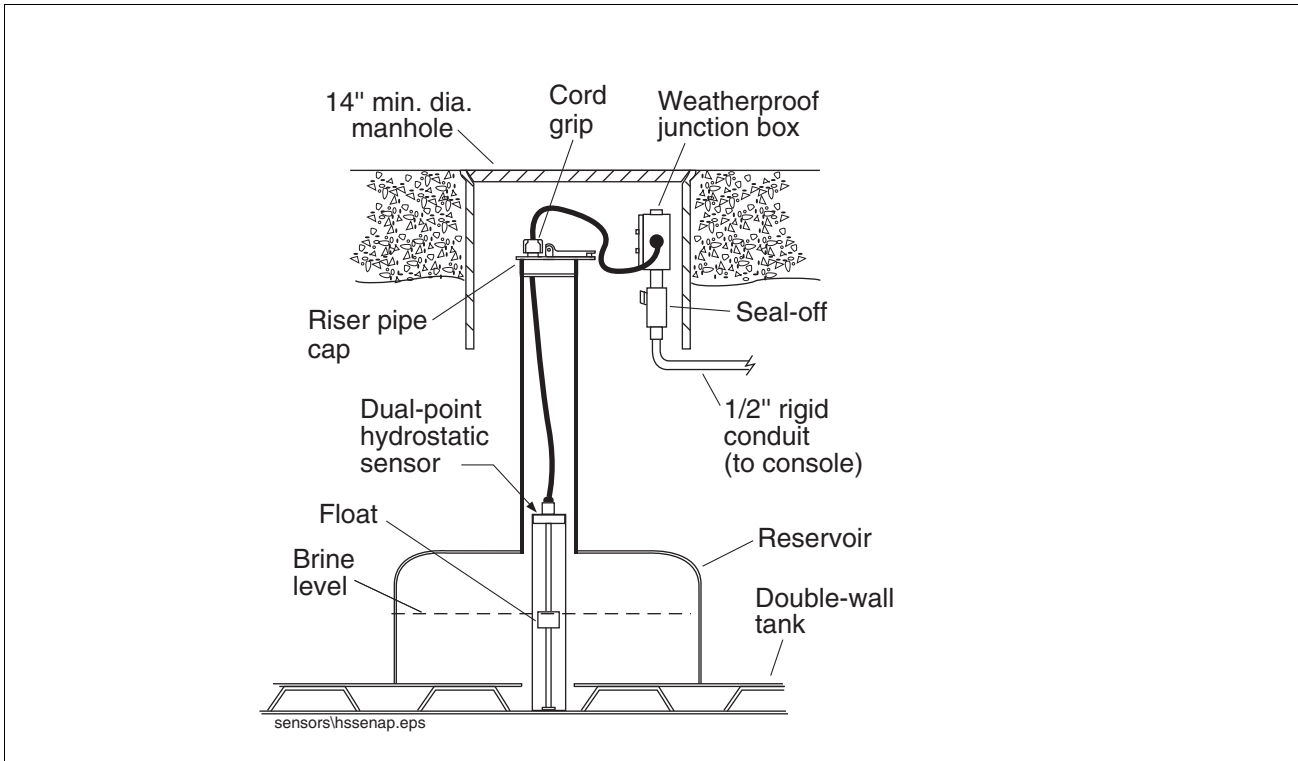


Figure 35. Example Hydrostatic Reservoir Dual Float Sensor Installation

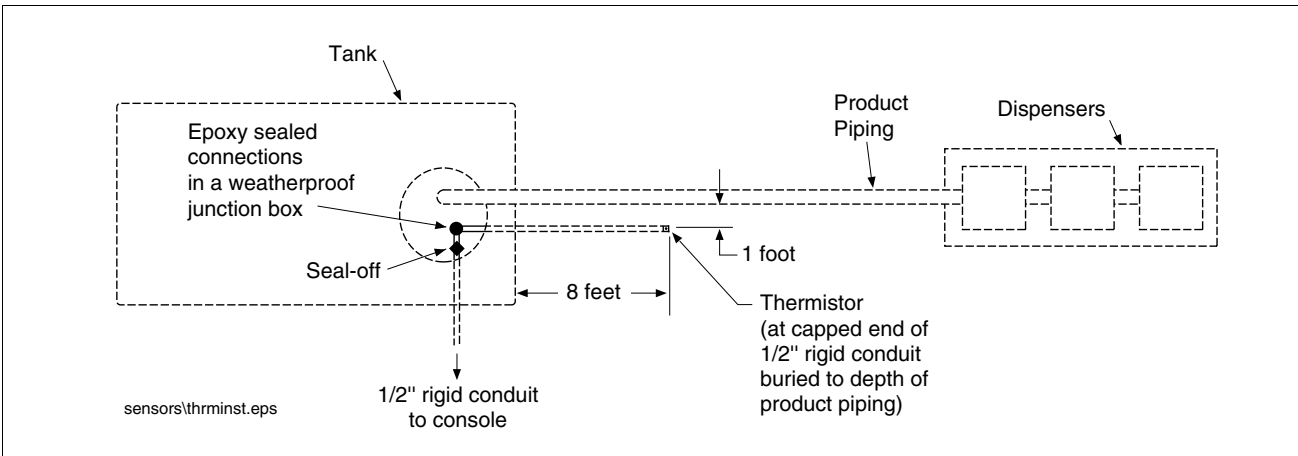


Figure 36. Example Ground Temperature Thermistor Installation

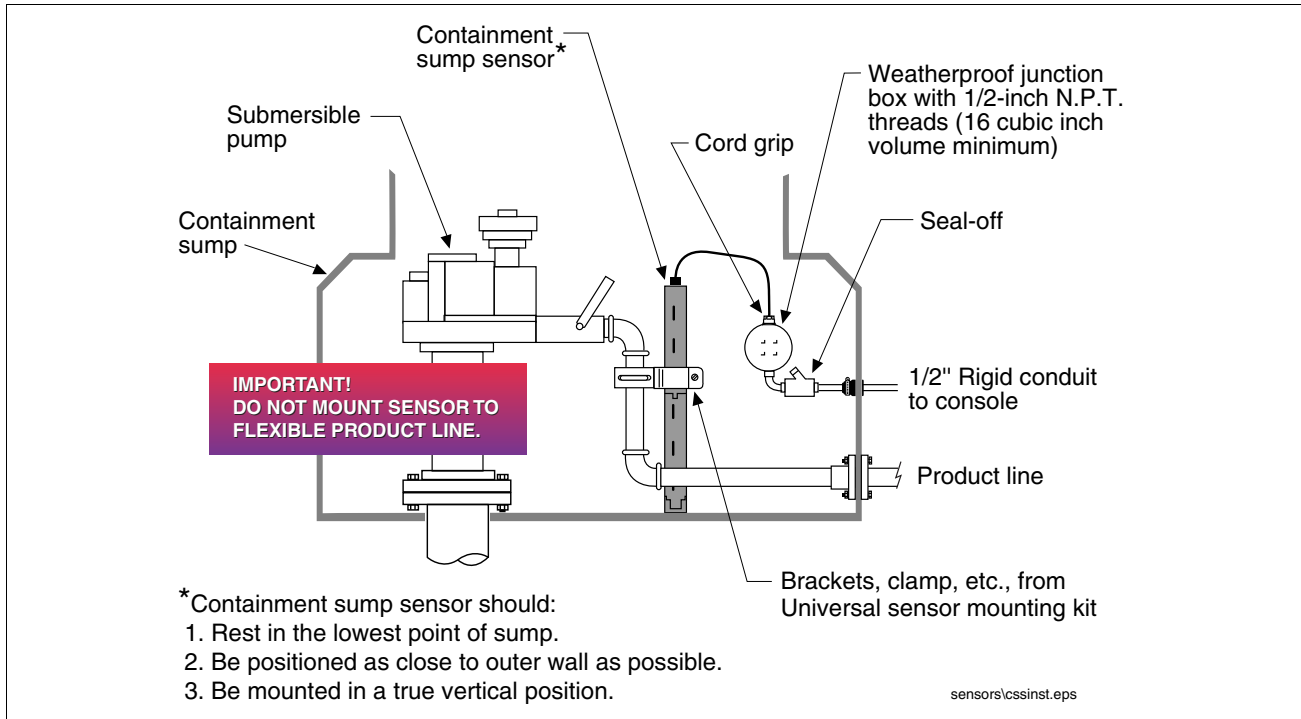


Figure 37. Example Containment Sump Sensor Installation

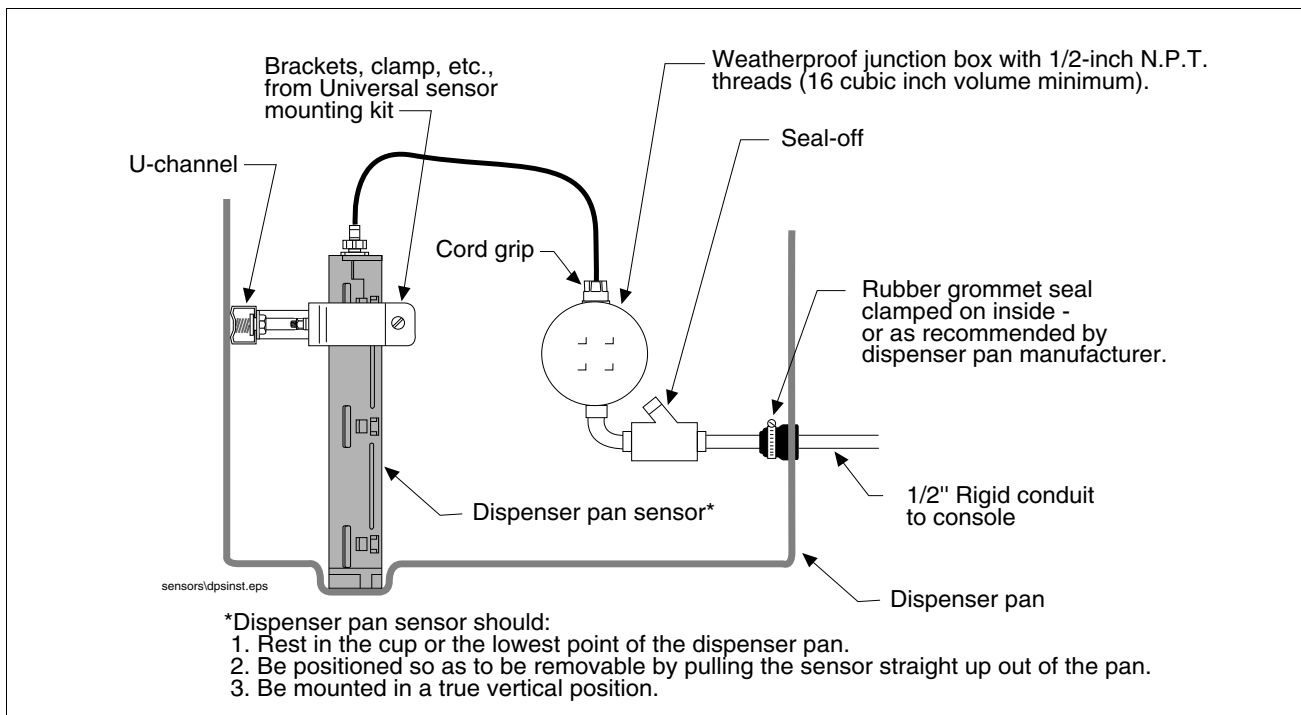


Figure 38. Example Dispenser Pan Sensor Installation

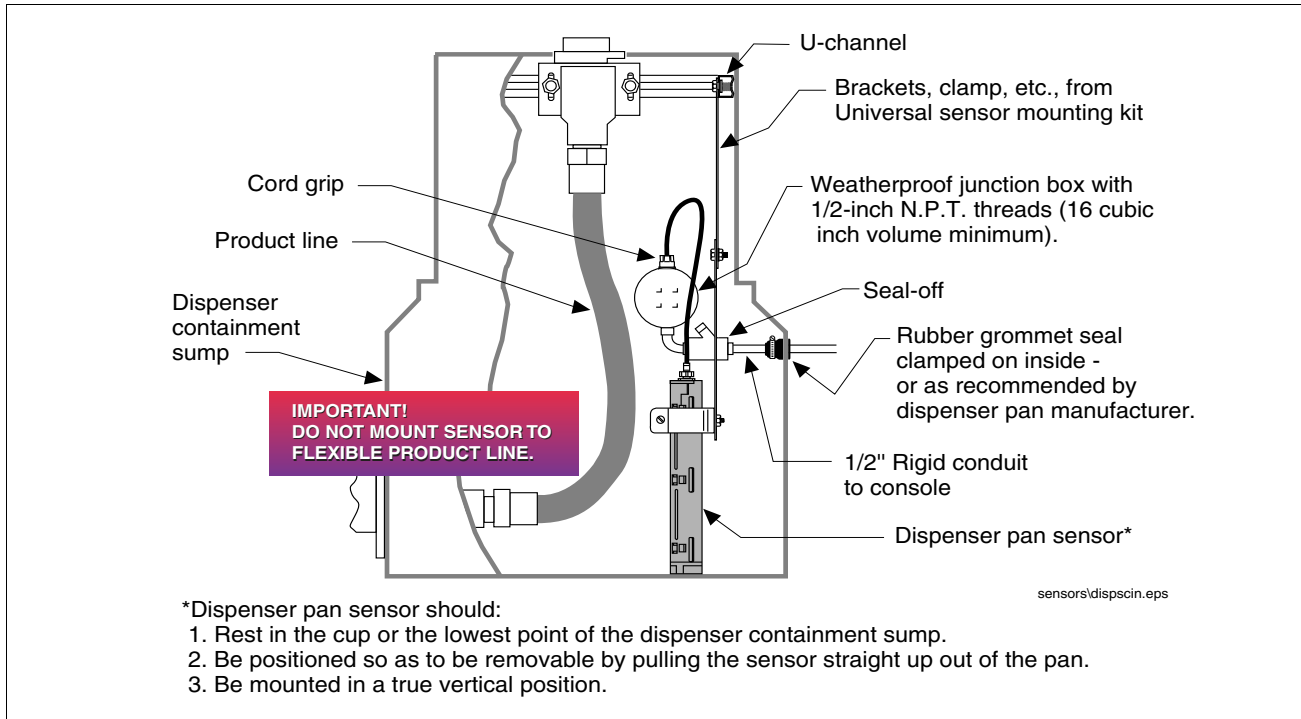


Figure 39. Example Dispenser Pan Sensor Installation in a Containment Sump

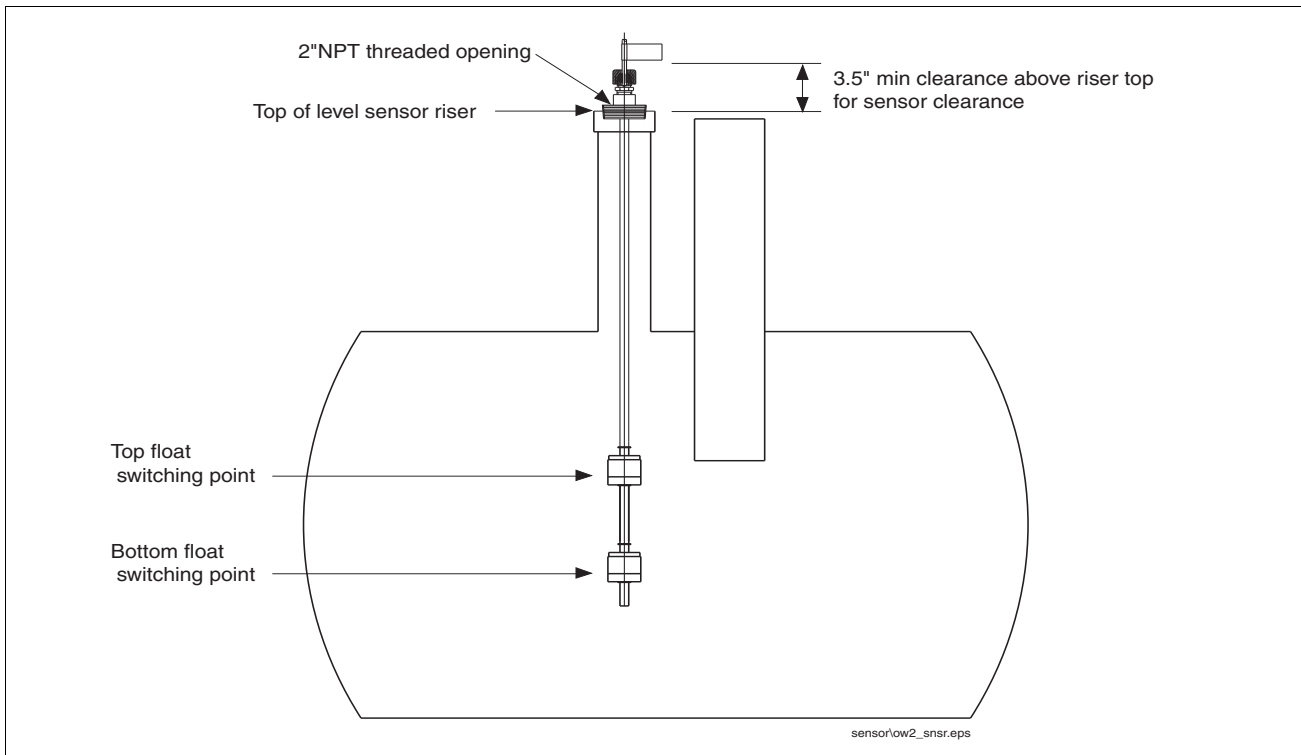


Figure 40. Typical Oil/Water Separator Sensor Installation

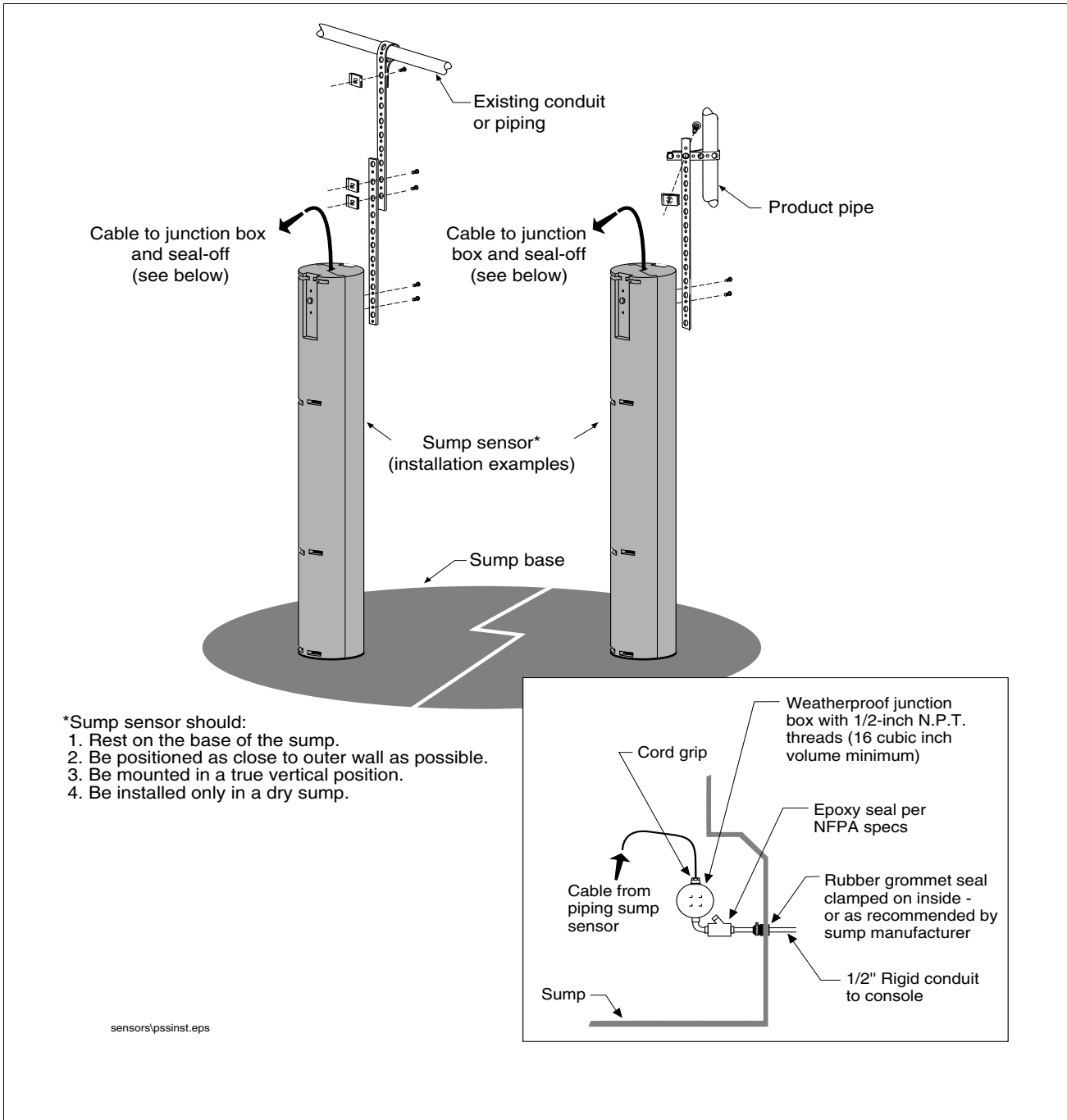


Figure 41. Example Sump Sensor Installations in Sump

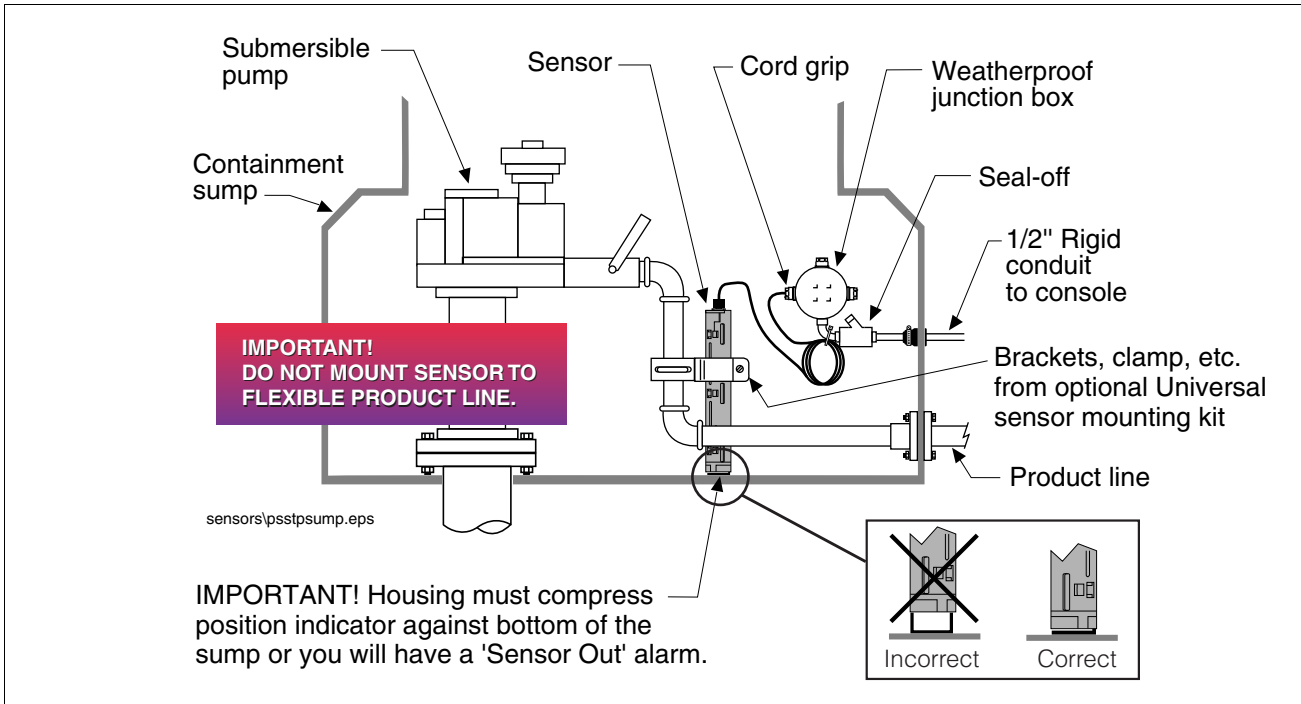


Figure 42. Example Position-Sensitive Sensor Installation

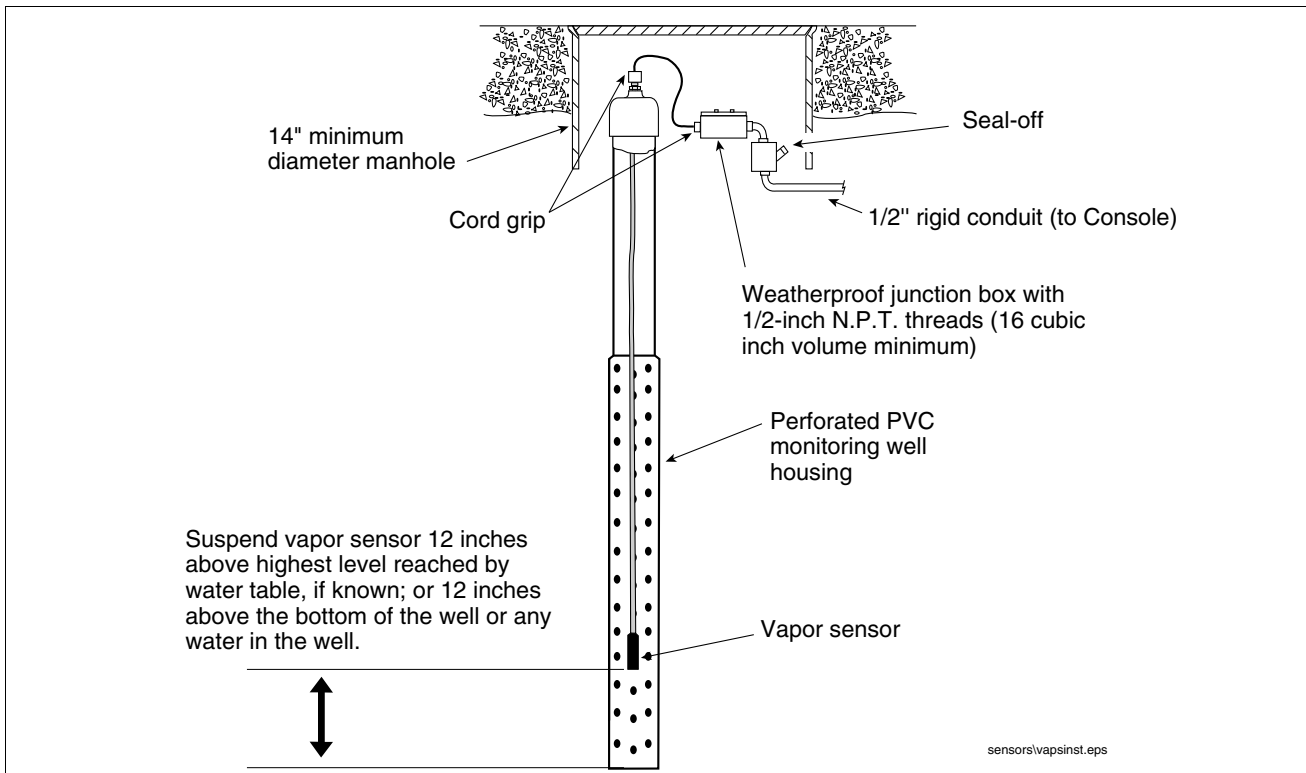


Figure 43. Example Vapor Sensor Installation

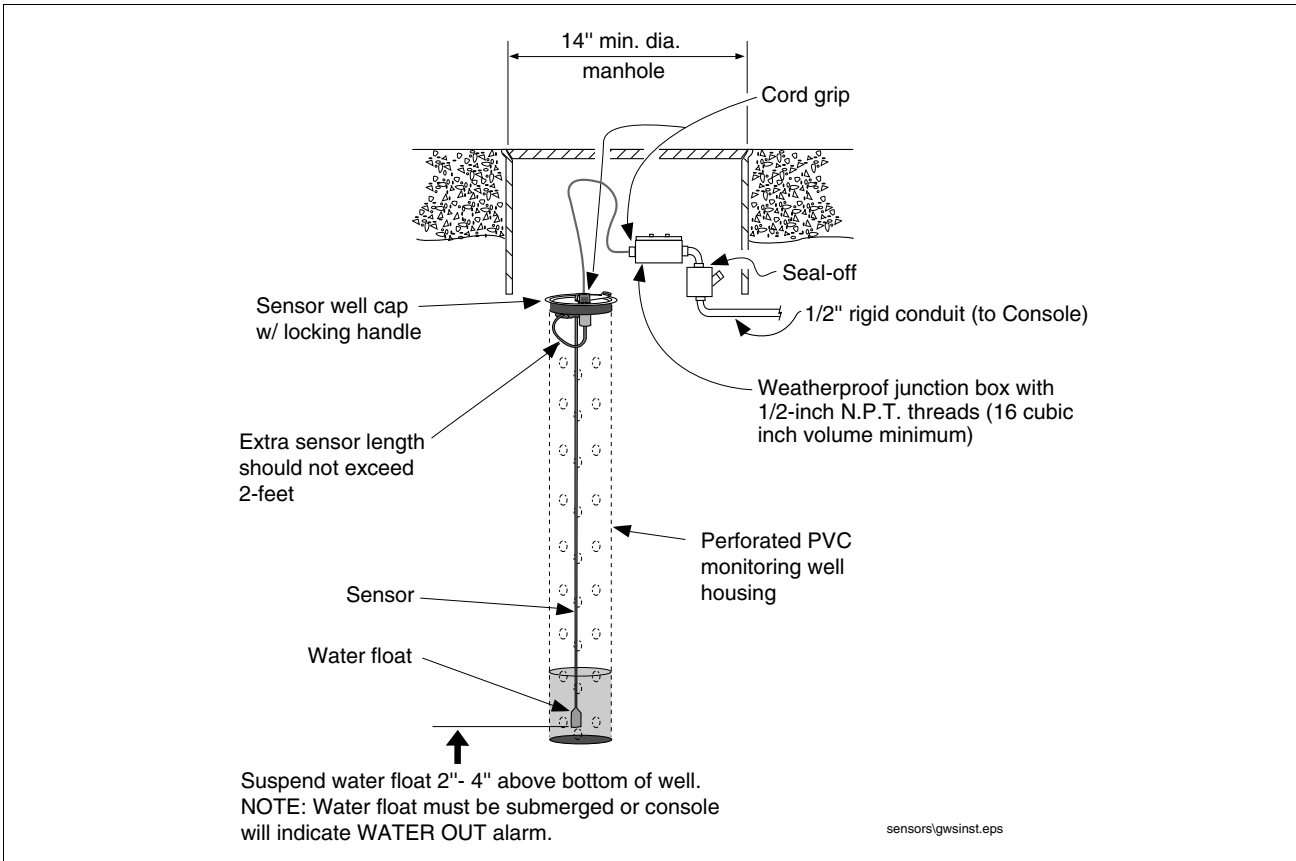


Figure 44. Example Groundwater Sensor Installation

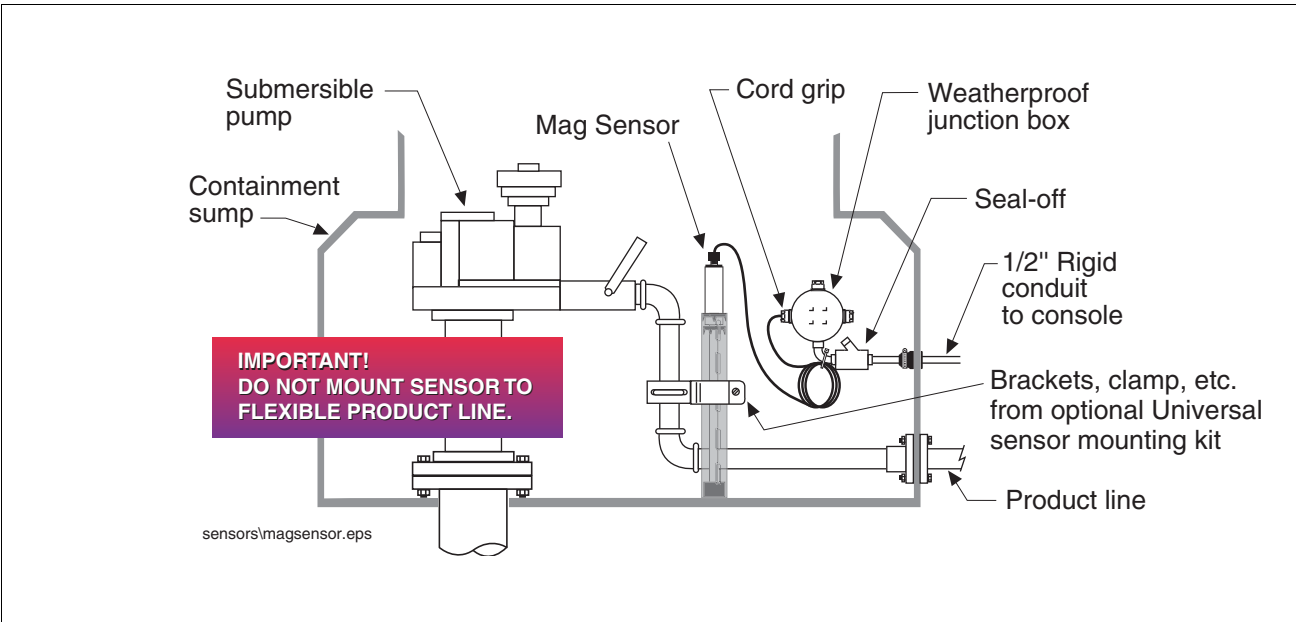


Figure 45. Example Mag Sensor Installation

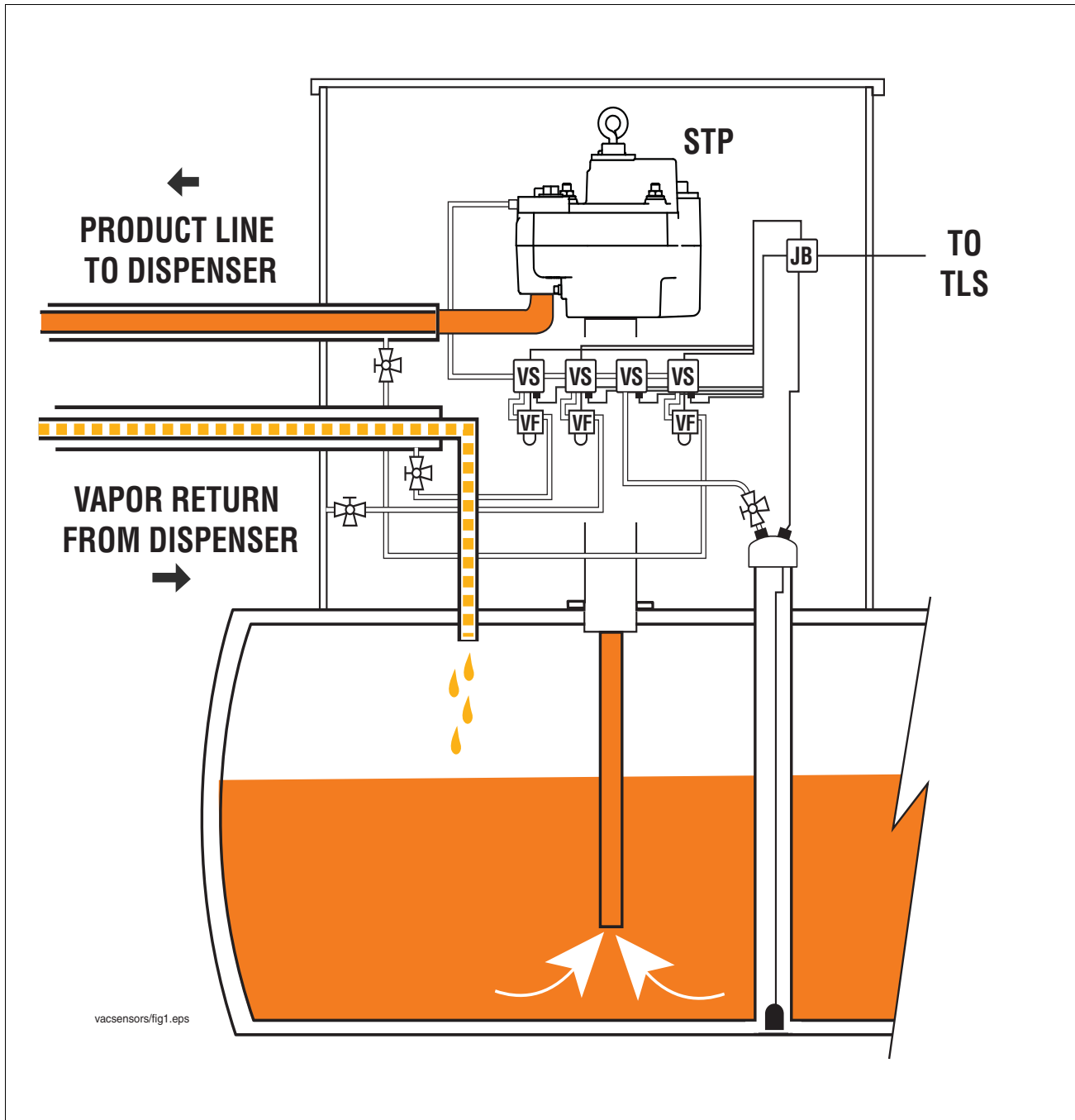


Figure 46. Simplified Vacuum Sensor Installation

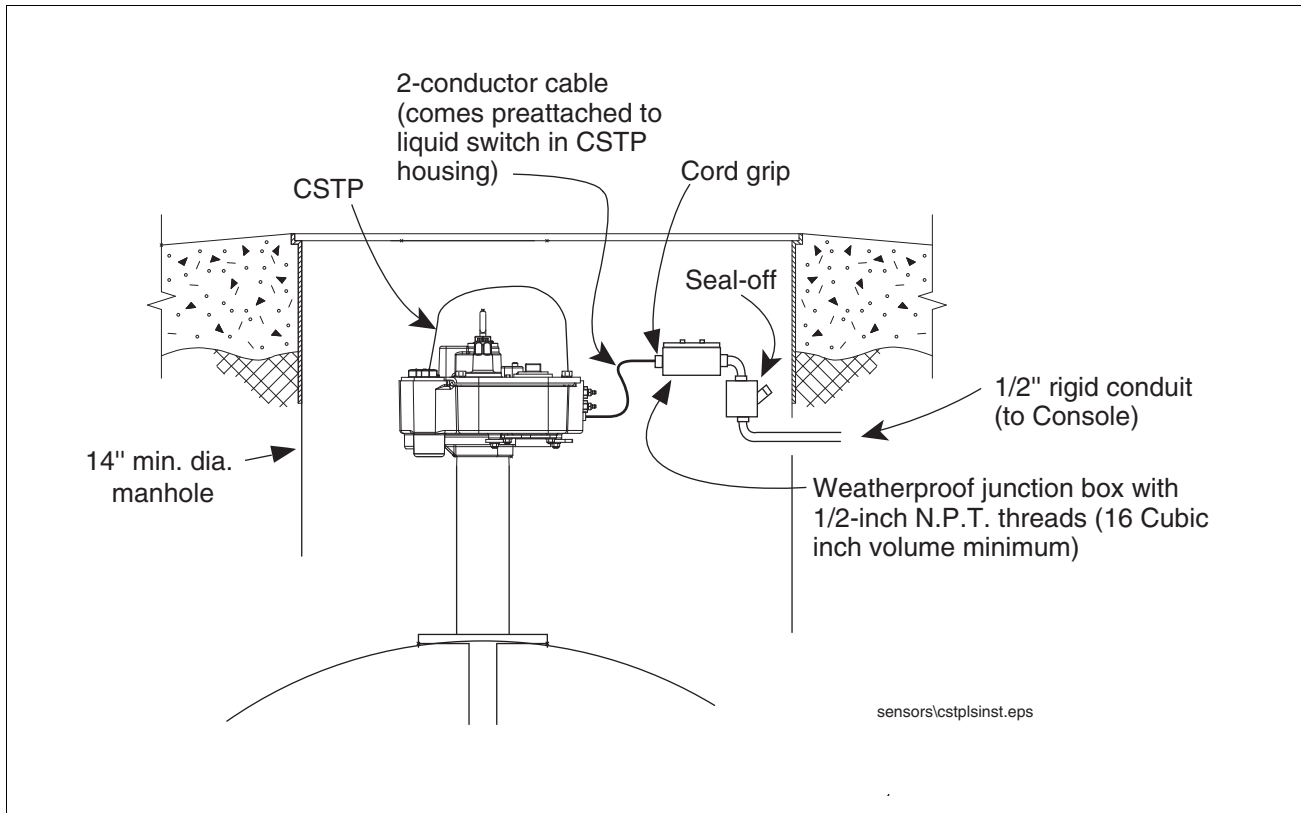


Figure 47. CSTP Liquid Sensor Wiring Installation

Probe and Sensor Conduit Installation

⚠ WARNING



Probes and sensors operate in areas where flammable liquids and explosive vapors may be present.

Improper installation may result in fire or explosion causing serious injury or death.

Practice the following:

1. Read thoroughly and follow the instructions shipped with each probe and sensor.
2. Probe and sensor wiring conduit must not contain any other wires.
3. Probe and sensor wiring and conduits must enter the console only through their designated areas.
4. Power and communication wires and conduit must not enter the intrinsically safe compartment of the console.

Wiring Run Methods

Two wiring run methods are commonly used for probes and sensors - Wiring pulled through buried, sealed 1/2" conduit; or direct burial cable. NOTE: PVC conduit is an acceptable alternate where accepted by local codes [ref. "National Electrical Code Compliance" on page 3 for more detail on cable requirements].

BURIED RIGID CONDUIT

The preferred method, especially in new sites before driveway surfaces are paved, is to pull probe and sensor wiring through buried 1/2" rigid conduit [Figure 48].

Pull two or three conductors shielded cable (as required). Individual wires should be color-coded between the console and the junction box at each probe and sensor location (do not gang wires together, i.e., splicing all sump sensor + wires together to run one wire back to console). Use single lengths of wire with no splices to ensure optimum signal strength.

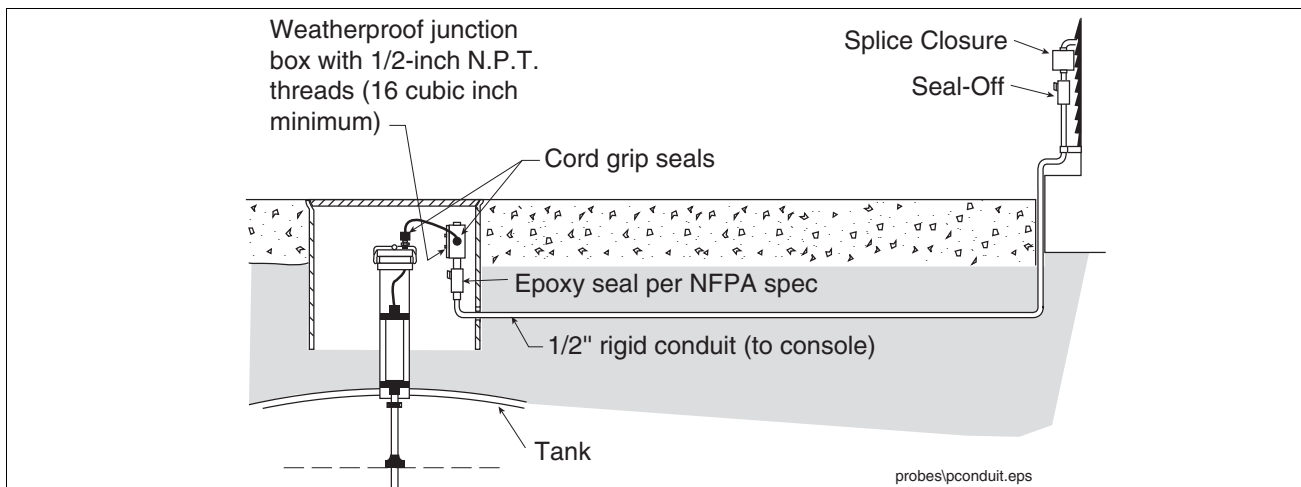


Figure 48. Example Probe Wiring Run in Buried Rigid Conduit

CAUTION: Since wires for multiple sensors may enter the console through a single conduit, it is recommended that you use a different color-code for each wire or individually mark each wire to identify sensor inputs. Also, if the intrinsically safe wires enter the building in a wiring trough, only Veeder-Root intrinsically safe wire can be in the trough. Keep all low power (intrinsically safe) wiring isolated from high power wires in all wiring troughs.

DIRECT BURIAL CABLE

An alternative to trenching through existing pavement is to use direct burial cable. Before considering the direct burial method, check to be sure that direct burial practices are acceptable at this location. The direct burial method requires grinding using an abrasive wheel, a 1/4" to 3/8" wide by 1-1/4" deep groove (adding 1/4" of depth for each additional cable) in the pavement surface, laying Veeder-Root supplied direct burial cable down in the bottom of the groove, laying an expanded polyethylene foam backer rod over the cable(s), and then a placing a 1/4" to 1/2" bead of silicone sealant over the backer rod to within a minimum of 3/8" below the pavement surface [see Figure 49].

If you decide upon the direct burial method, consult the direct burial cable installation manual for detailed installation instructions (reference manual 576013-858).

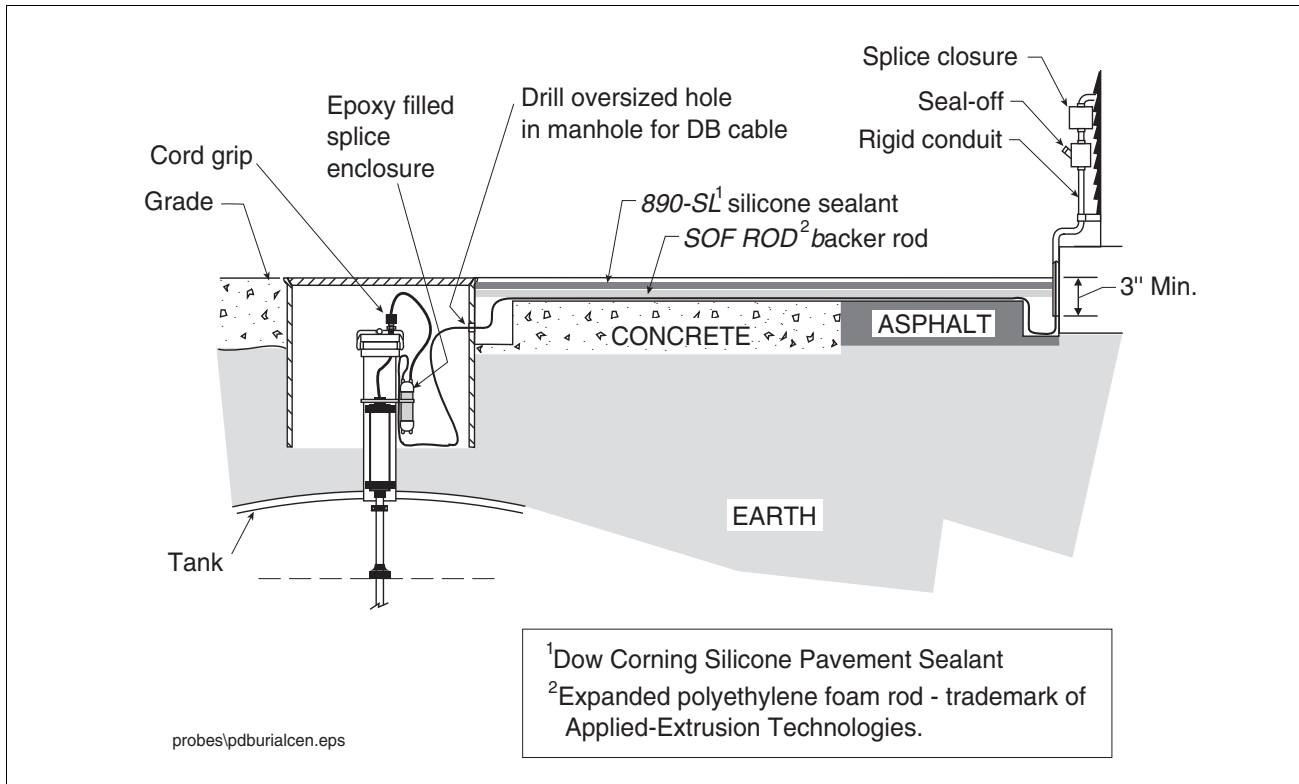


Figure 49. Example Probe Wiring Run via Direct Burial Cable

Probe and Sensor Field Wiring

Figure 50 contains diagrams for connecting, at the field junction box, cables from the probe and sensor to cables from the console. Check diagrams closely for polarity requirements.

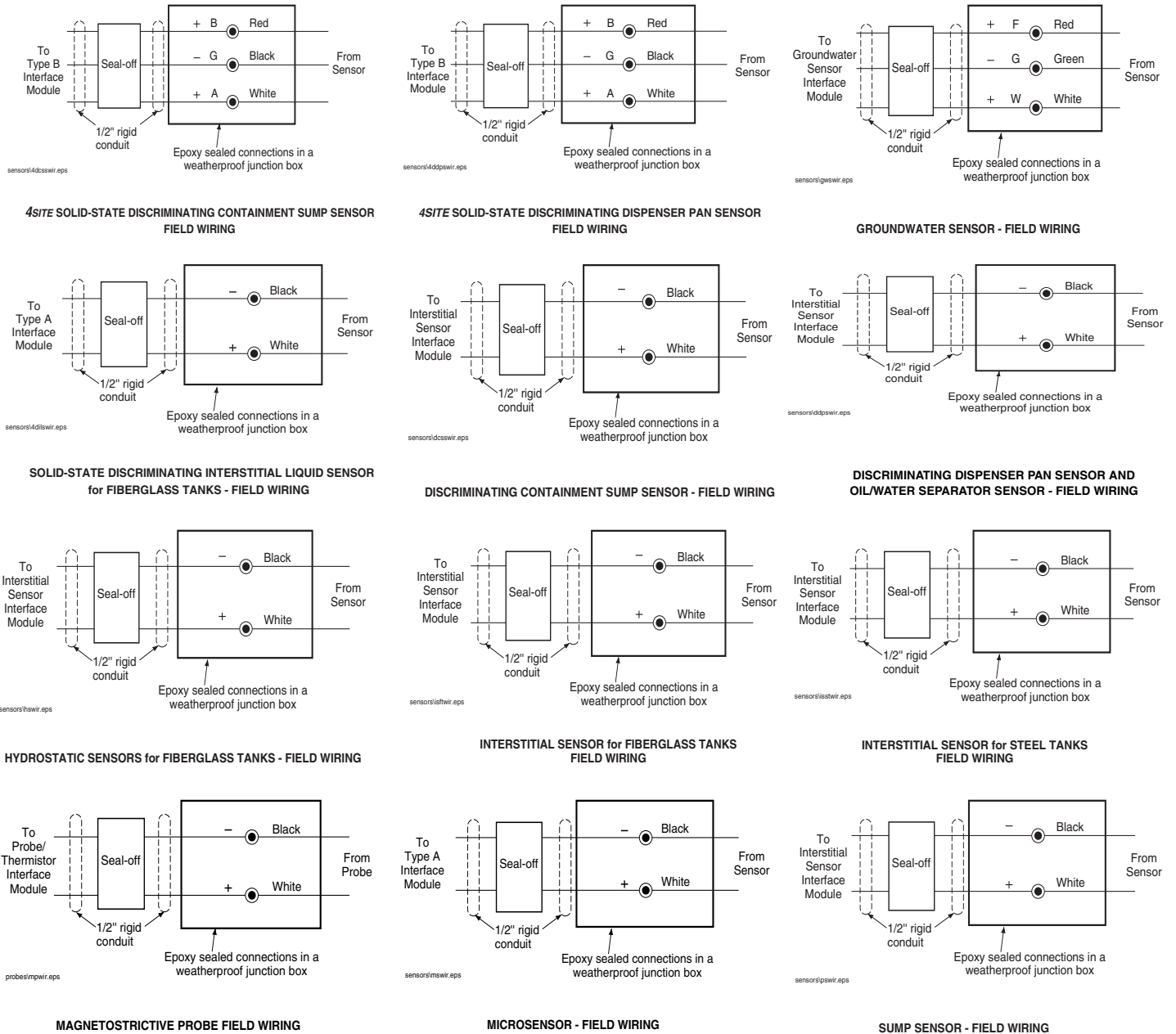


Figure 50. Field Wiring Probes and Sensors Cables to Console Cables

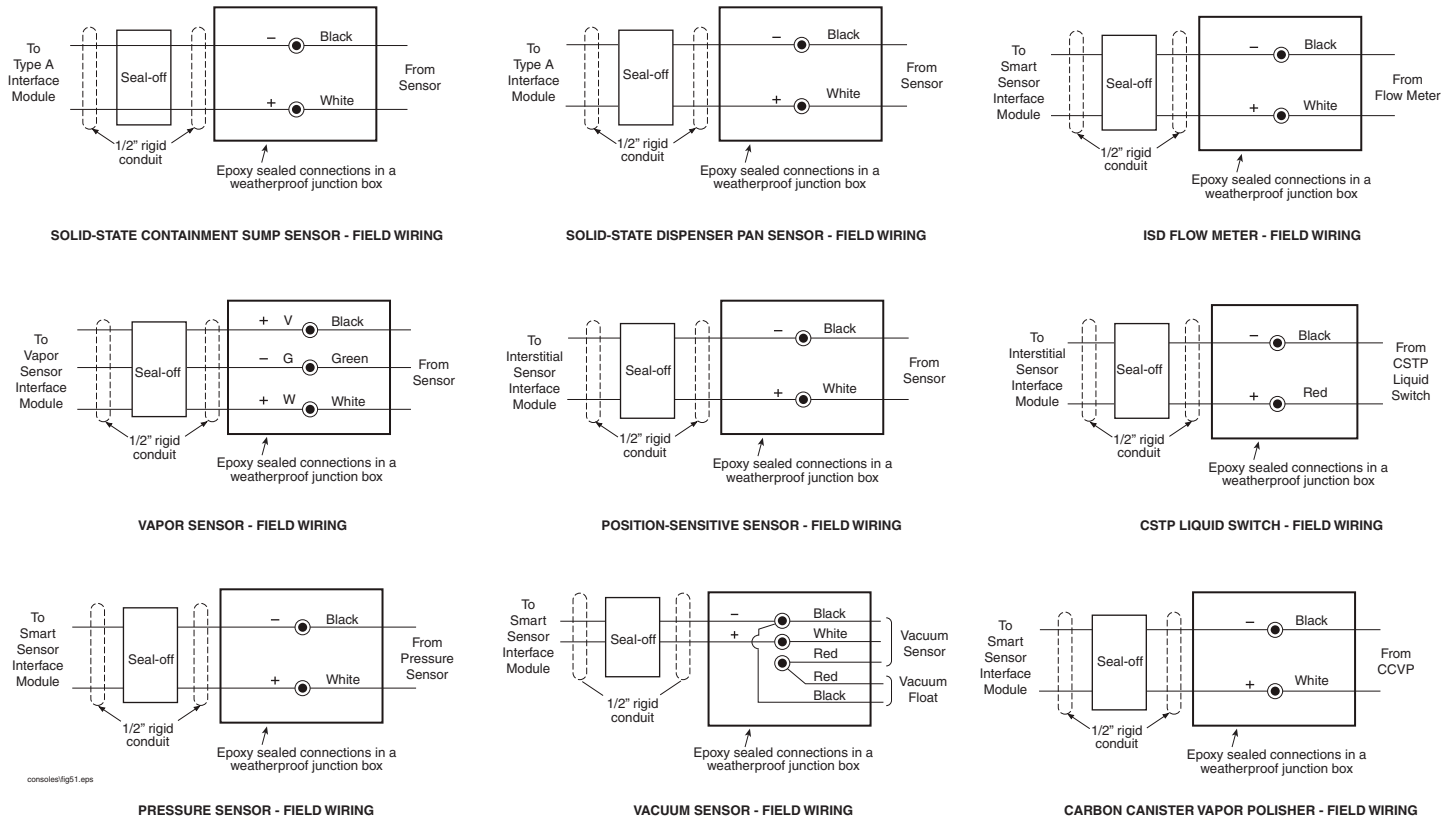


Figure 51. Field Wiring Probes and Sensors Cables to Console Cables - concluded.

Sealing Field Connections

WIRING RUN THROUGH RIGID CONDUIT

1. Pull the wires from the probe or sensor into the junction box. Pull the two or three wires from the console through the seal-off box, the conduit attaching the junction box to the seal-off box and into the junction box.
2. Using wire nuts, connect the two or three wires from the probe or sensor to the two or three wires coming from the console. Be sure to observe color codes or tags when making these connections so that the sensor or probe outputs are attached to the correct terminals in the console.
3. Seal wire nuts with epoxy sealant following the instructions in Figure 52.



CAUTION: Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction.
Contains: epoxy resin and Cycloaliphatic epoxy-carboxylate. **Precautions:** Wear suitable protective clothing,

gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

4. Do NOT terminate shield or drain wire in the field junction box, ground shield and drain wires at console only.
5. Place the bag with the resin sealed wiring connections in the junction box. Replace and tighten the junction box cover.

DIRECT BURIAL CABLE

When using direct burial cable for probe- or sensor-to-console wiring runs, the sealing materials and procedure are completely different. Refer to the Direct Burial Cable Installation Manual 576013-858.

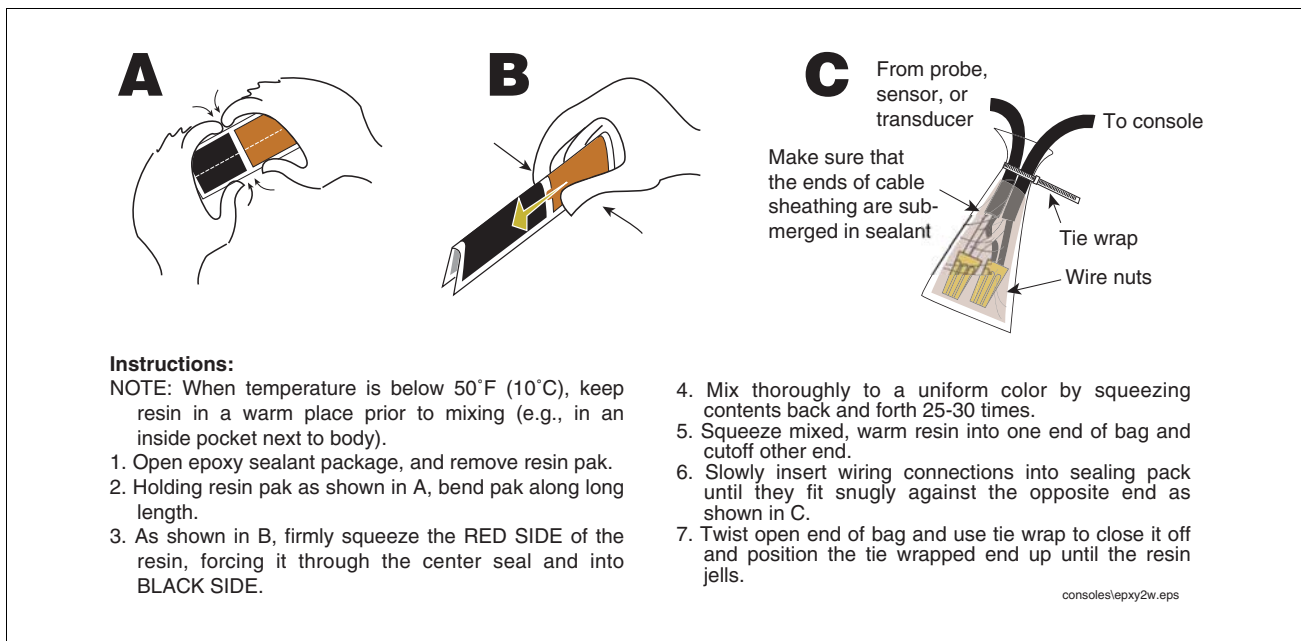




Figure 52. Epoxy Sealing Probe and Sensor Field Connections

Connecting Probe/Sensor Wiring to Consoles

⚠ WARNING	
 	<p>The equipment is used in location where lethal voltages and explosive vapors or flammable fuels may be present.</p> <p>Care must be taken when installing, servicing or replacing parts in the system or serious injury or death from explosion, fire or shock may occur.</p> <p>For this system:</p> <ol style="list-style-type: none">1. Comply with the latest National Electric Code, federal, state, and local codes, and any other applicable safety codes. In addition, take necessary precautions during installation, service, and repair to prevent personal injury, property loss and equipment damage.2. Refer servicing to trained and qualified personnel only.3. Substitution of components may impair intrinsic safety.4. Be sure AC power is "OFF" before opening the console panel covers and connecting probe and sensor wires. Do not short any voltage across any barrier terminal including sensors or probes.

TLS-300/ProPlus/EMC Basic Consoles

PROBE AND SENSOR WIRING PRECAUTIONS



To The Installer! You Must Read And Understand This Information.

Input/Output Wiring Positions and Labeling

In all cases, the devices wired to the console's input/output terminal blocks must be recorded to prevent improper replacement during installation or service.

IMPORTANT! During programming, the devices wired to each terminal are identified and stored in system memory. If a device is removed and reconnected to a different set of console terminals after programming, the system will not properly recognize the data being received. To ensure trouble-free operation, you should fill out the Circuit Directory as you connect each device.

CIRCUIT DIRECTORY

The circuit directory is adhered to the inside of the right-hand door. It should be filled out by the installer as the console's input/output devices are being connected to the console to record the physical location and type of device wired to each input or output terminal of the console.

In the example directory shown in Figure 36, Input 1 connects to the Backup Generator. Relay 1 is connected to an overfill alarm device. Sensor locations 1, 2, and 3 connect to two different sensors on the three tanks. Probe locations 1 - 3 connect to Mag probes in the three tanks.

Wiring Assignments

Identify all wires according to their terminal block location using the self-adhesive numbering labels furnished. Accurately record on the circuit directory the location of each device as you attach wires to the terminal block.

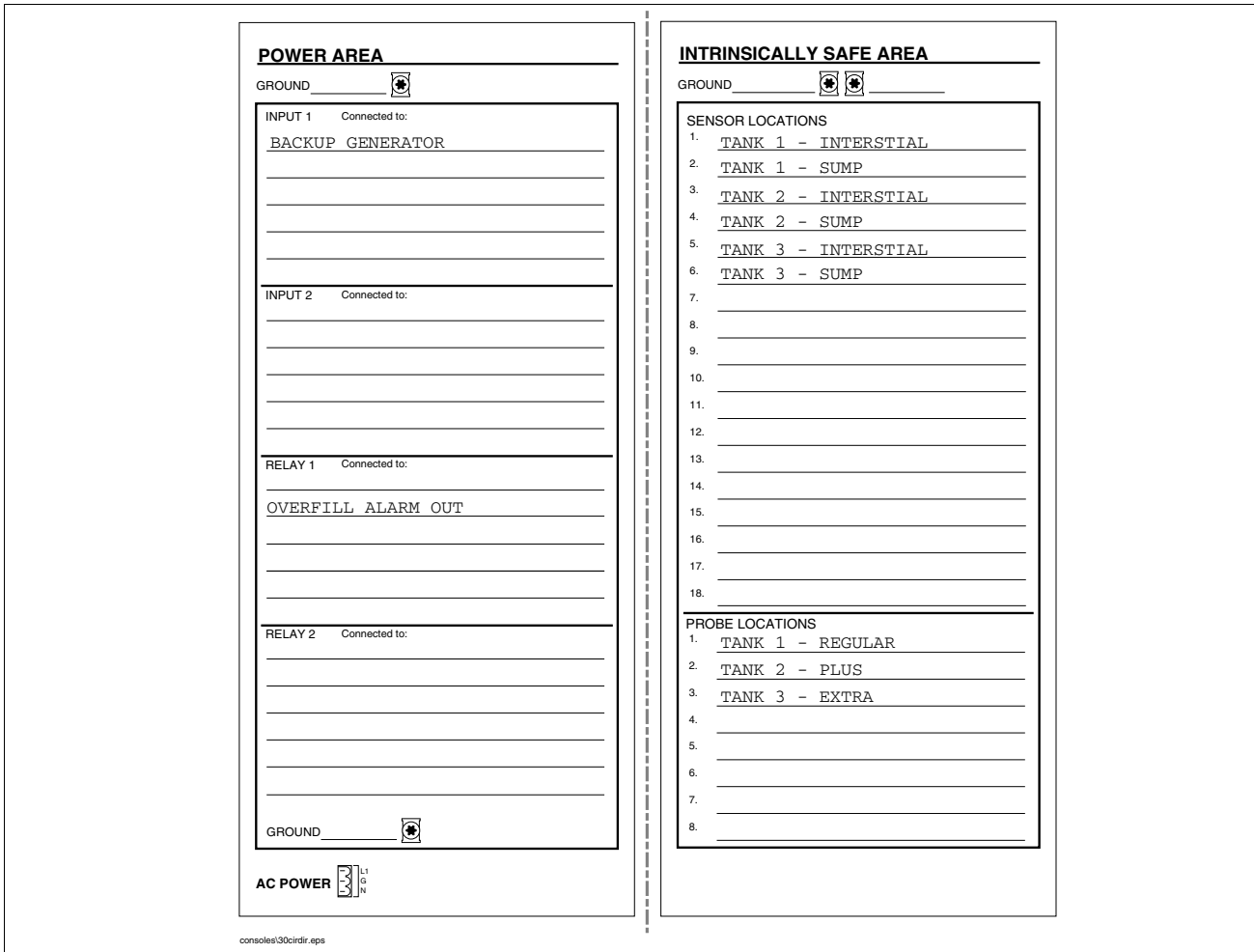


Figure 53. Fixed-Feature Console System Circuit Directory

CONNECTING PROBES AND SENSORS TO THE CONSOLE

Figure 54 contains wiring connection examples for the probes and sensors listed below. Only ground the probe/sensor shields at the console, not at their field junction boxes. Probes wires connect to the probe terminal block and sensors connect to the sensor terminal block.

Device	Wires	Observe Polarity
Mag Probe	2	Yes
Interstitial sensors for fiberglass/steel tanks	2	No
Sump sensors	2	No
Discriminating Dispenser Pan sensors	2	No
Discriminating containment sump sensors	2	No
Hydrostatic sensors (for all double-wall tanks)	2	No

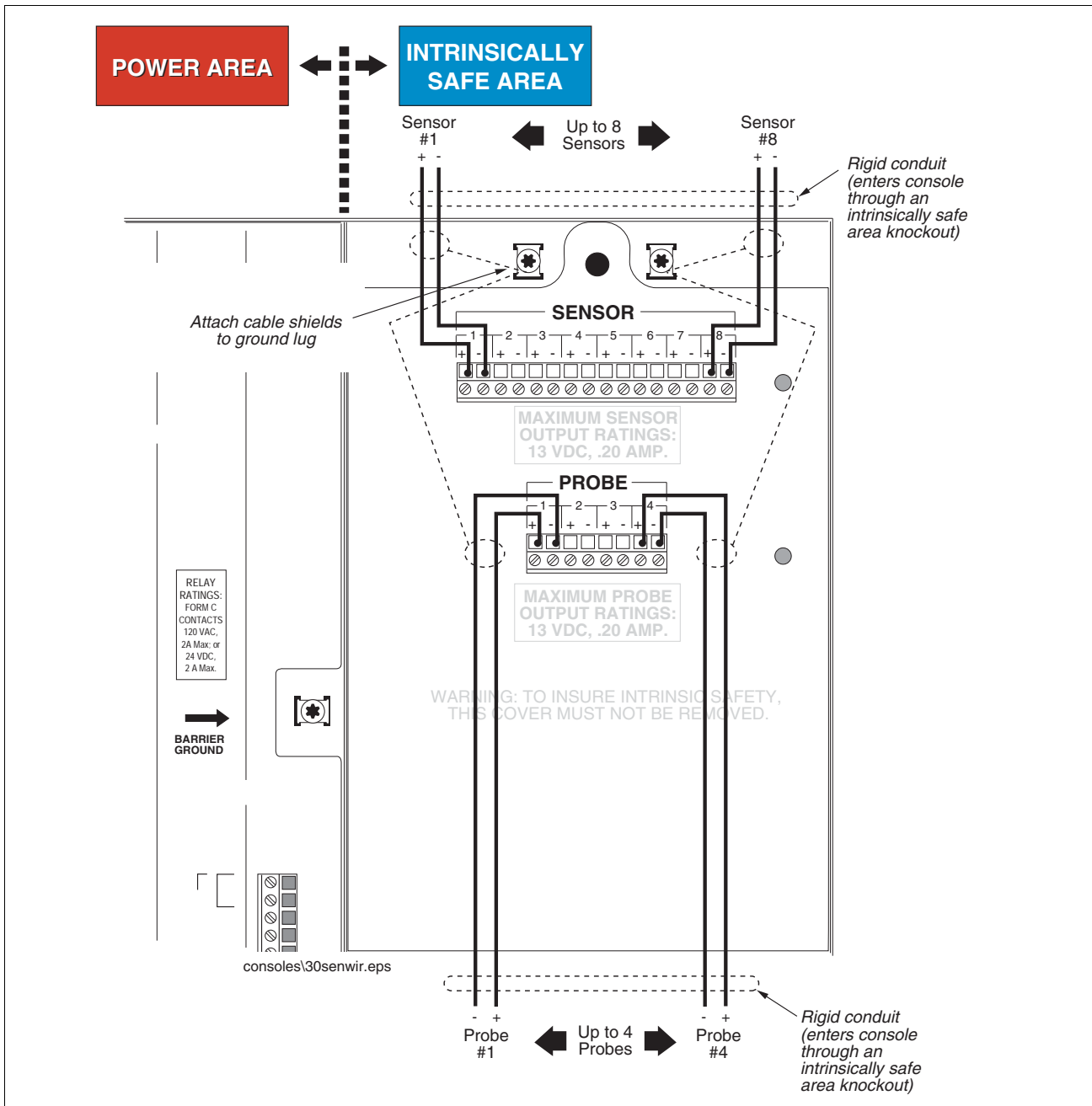


Figure 54. Example of Probe and Sensor Wiring to a TLS-300/ProPlus/EMC Basic Console

CONNECTING DEVICES TO POWER AREA I/O TERMINALS

Relay Outputs

Depending on the model console installed, you may have one or two Form-C relay outputs which you can connect to overflow alarms and external audible/visual warning devices. Note – there are important output relay connection restrictions:

1. Do not connect output relays to a device that draws more than 2 amperes of current. Output power: output relay contact, resistive load - 120 Vac, 2 A max.; or 24 Vdc, 2 A max.
2. Alarm relays cannot be used for flow control. Alarm relays provide only a momentary closure and cannot actuate flow control devices such as valves and pump motor relays for extended periods of time.

Connect the wires from the external device to the appropriate RELAY connector(s) on the I/O terminal block [see 2-relay output version in Figure 55].

External Inputs

The INPUT 1 and 2 terminals can accept two dry-contact switch closure inputs from an external device such as a backup generator.

For each external input, connect a shielded cable consisting of two #18 AWG conductors to the INPUT connectors on the I/O terminal block [see Figure 55].

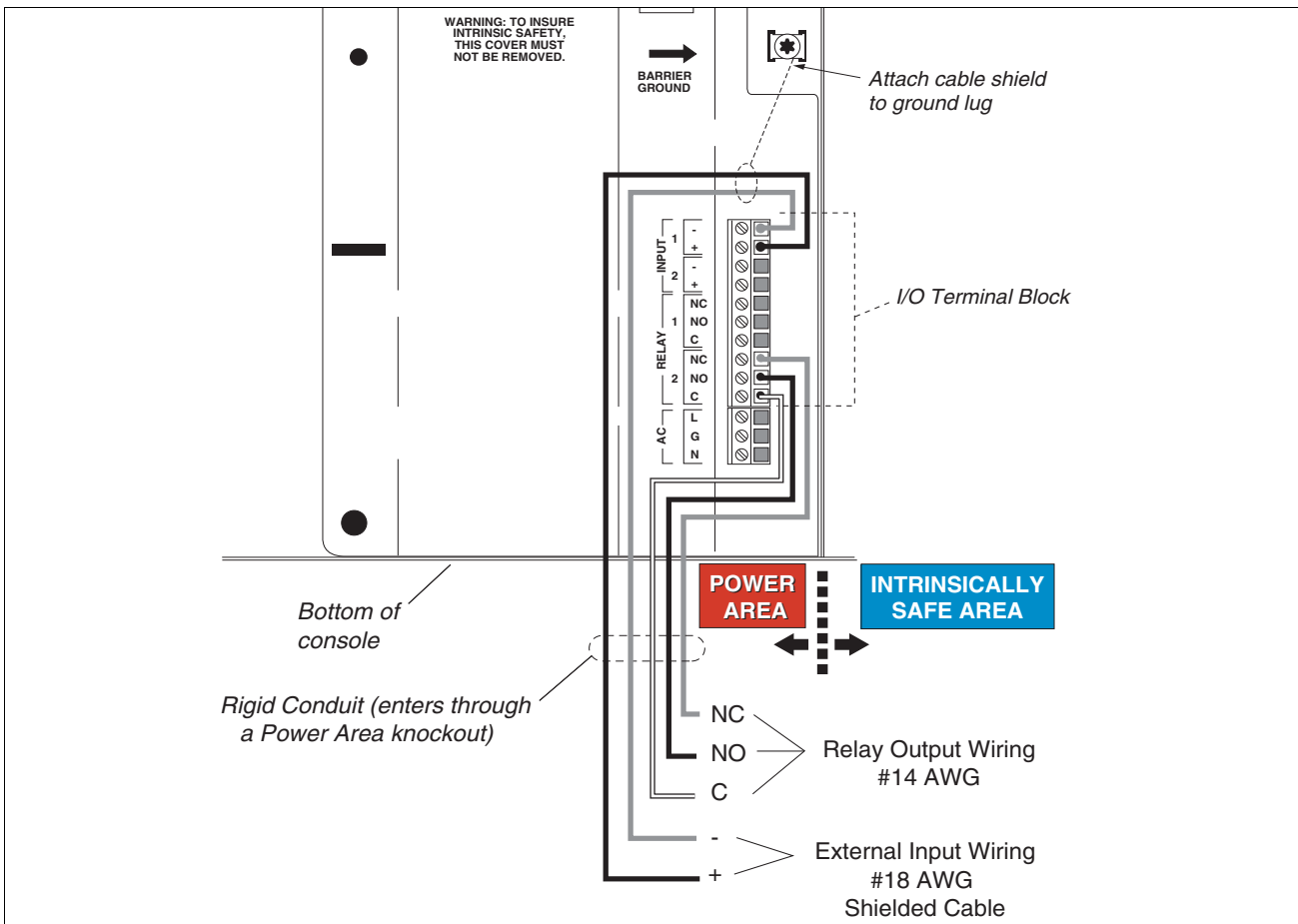


Figure 55. Example of Wiring I/O Devices to a TLS-300/ProPlus/EMC Basic Console

TLS-350/ProMax/EMC Consoles

MODULE/CONNECTOR POSITIONS AND LABELING

Modular consoles have three bays in which interface modules can be installed; Comm bay (left door) and Power and Interstitially Safe bays (right door).

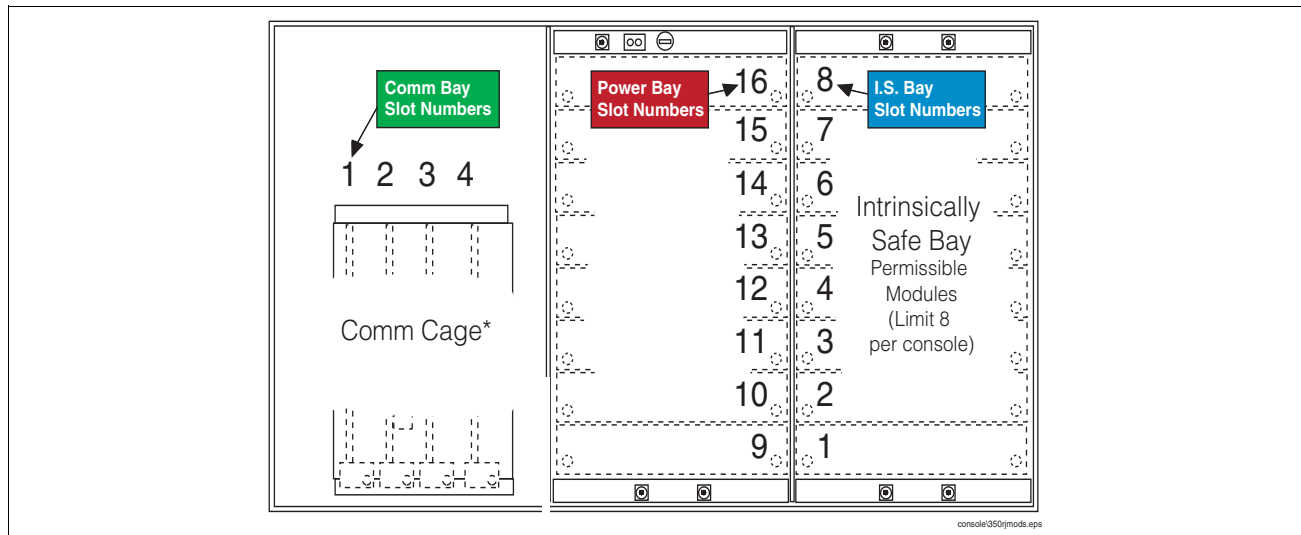


Figure 56. Console Interface Module Bays

Most consoles will be shipped with modules installed as ordered. If additional features are added at a later date, modules will be field installed.

In all cases, the position of the modules, their respective connectors and the devices wired to the connectors must be recorded to prevent improper replacement during installation or service. A circuit directory for Power and I.S. bay Interface Modules is adhered to the back of the right-hand door for this purpose.

During programming, module positions and the devices wired to each module are identified and stored in memory. If a connector is removed and reinstalled on a different module after programming, or if an entire module with its connector is removed and reinstalled in a different module slot, the system will not properly recognize the data being received.

Module Position

1. Record on the circuit directory the type of module in each slot location.
2. If a system contains multiple modules of a single type (i.e., two Probe/Thermistor Interface Modules), they may be swapped between their respective slot locations, **however, the connectors must remain with their original locations, not with the original modules.**

Connector Position

1. Identify all connectors according to their slot location using the self-adhesive numbering labels furnished with each module. Accurately record on the circuit directory the location of each device wired to the connector as you attach wires to the module.
2. Once a device has been wired to certain terminals on a connector and the system has been programmed, the wires from that device may not be relocated to other terminals without reprogramming the system.

Grounding Probe and Sensor Shields

Connect probe and sensor cable shields to ground at the console only. Do not ground both ends of the shield.

CIRCUIT DIRECTORY

A circuit directory is adhered to the inside of the right-hand door. It should be filled out by the installer as the module's connectors are being wired.

The following information should be recorded for each slot:

- Module Type: record what type of module has been installed in the slot, e.g., Probe/Thermistor Interface Module.
- Position Record: record the physical location and/or type of device wired to each terminal of the module connector in the slot, e.g., Tank 1.

In the example directory shown in Figure 57, slot 4 contains a Probe/Thermistor Interface Module. Position 1 on the connector receives the + and – wires from the probe in Tank 1, position 2 from the probe in Tank 2, etc. Since this system has five tanks, a second Probe/Thermistor Interface Module is installed in slot 5 and its connector position 1 receives the wires from the probe in Tank 5.

Positions on each module are numbered and each connector terminal is identified with the acceptable input. There are eight positions for each slot even though some modules accept fewer devices.

Power Bay Slots		Intrinsically Safe (IS) Bay Slots	
16	MODULE TYPE:		
	POSITION RECORD:		
	1	5	
	2	6	
	3	7	
	4	8	
	MODULE TYPE:		
	POSITION RECORD:		
15	1	5	
	2	6	
	3	7	
	4	8	
14	1	5	
	2	6	
	3	7	
	4	8	
13	1	5	
	2	6	
	3	7	
	4	8	
12	1	5	
	2	6	
	3	7	
	4	8	
11	1	5	
	2	6	
	3	7	
	4	8	
10	MODULE TYPE: M D I M		
	POSITION RECORD:		
	1 M E T E R 1	5	
	2 M E T E R 2	6	
9	MODULE TYPE: I/O C O M B O		
	POSITION RECORD:		
	1 L I N E L E A K I N P .	5	
	2	6	
	3 O V E R F L L A L M O U T	7	
	4	8	
8	MODULE TYPE:		
	POSITION RECORD:		
	1	5	
	2	6	
	3	7	
	4	8	
	MODULE TYPE:		
	POSITION RECORD:		
7	1	5	
	2	6	
	3	7	
	4	8	
6	1	5	
	2	6	
	3	7	
	4	8	
5	MODULE TYPE: P R O B E		
	POSITION RECORD:		
	1 T A N K 5	5	
	2	6	
4	MODULE TYPE: P R O B E		
	POSITION RECORD:		
	1 T A N K 1	5	
	2 T A N K 2	6	
3	MODULE TYPE: I N T E R S T I T A L		
	POSITION RECORD:		
	1 T A N K 5 - I N T	5	
	2 T A N K 5 - S U M P	6	
2	MODULE TYPE: I N T E R S T I T A L		
	POSITION RECORD:		
	1 T A N K 1 - I N T	5 T A N K 3 - I N T	
	2 T A N K 1 - S U M P	6 T A N K 3 - S U M P	
1	MODULE TYPE: V A P O R		
	POSITION RECORD:		
	1 W E L L # 1	5	
	2 W E L L # 2	6	
	3 W E L L # 3	7	
	4	8	

Figure 57. Modular Console System Circuit Directory

PROBE/THERMISTOR INTERFACE MODULE - I.S. BAY

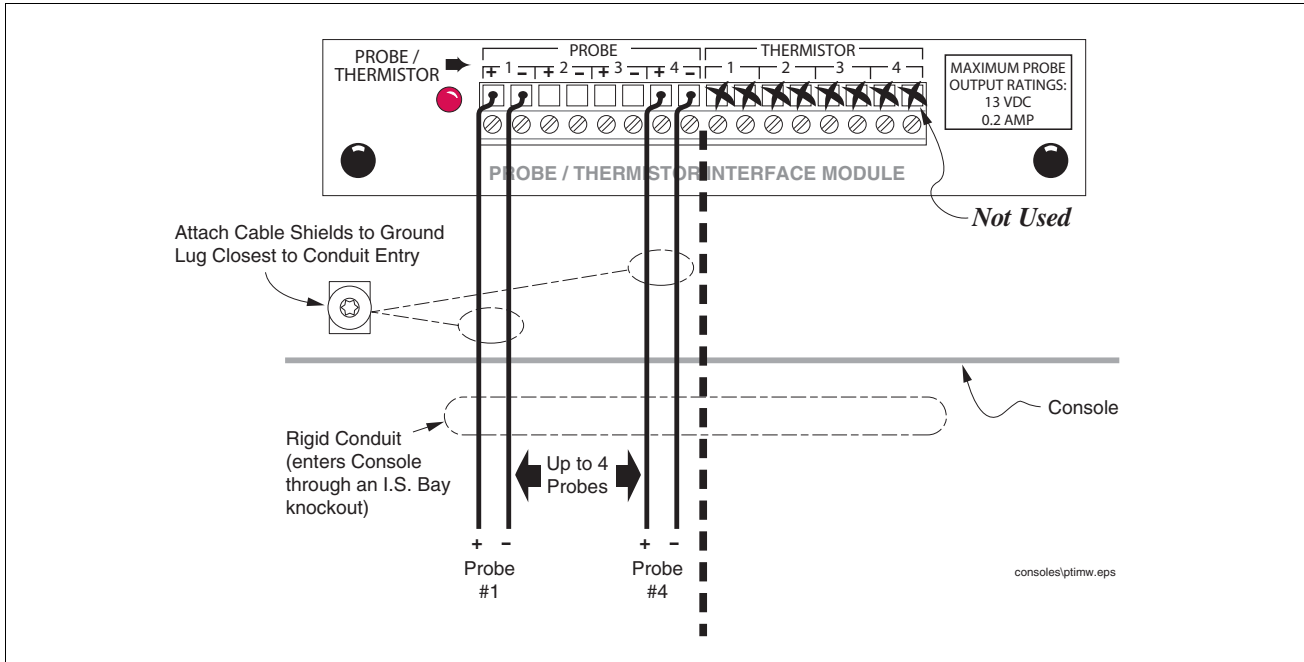


Figure 58. Probe/Thermistor Interface Module Wiring

Connecting Devices

Connect Mag Probes and Thermistor in the table below to the appropriate terminals on the Probe/Thermistor Interface module as shown in Figure 58.

Device	Wires	Observe Polarity
Mag Probe	2	Yes
Ground temperature thermistor - When using volumetric line leak detection (VLLD), only one ground temperature thermistor is needed per site and the thermistor must be wired to thermistor position number 1 (positions 2 - 4 are not used).	2	No

3 PROBE/3 SENSOR INTERFACE MODULE - I.S. BAY

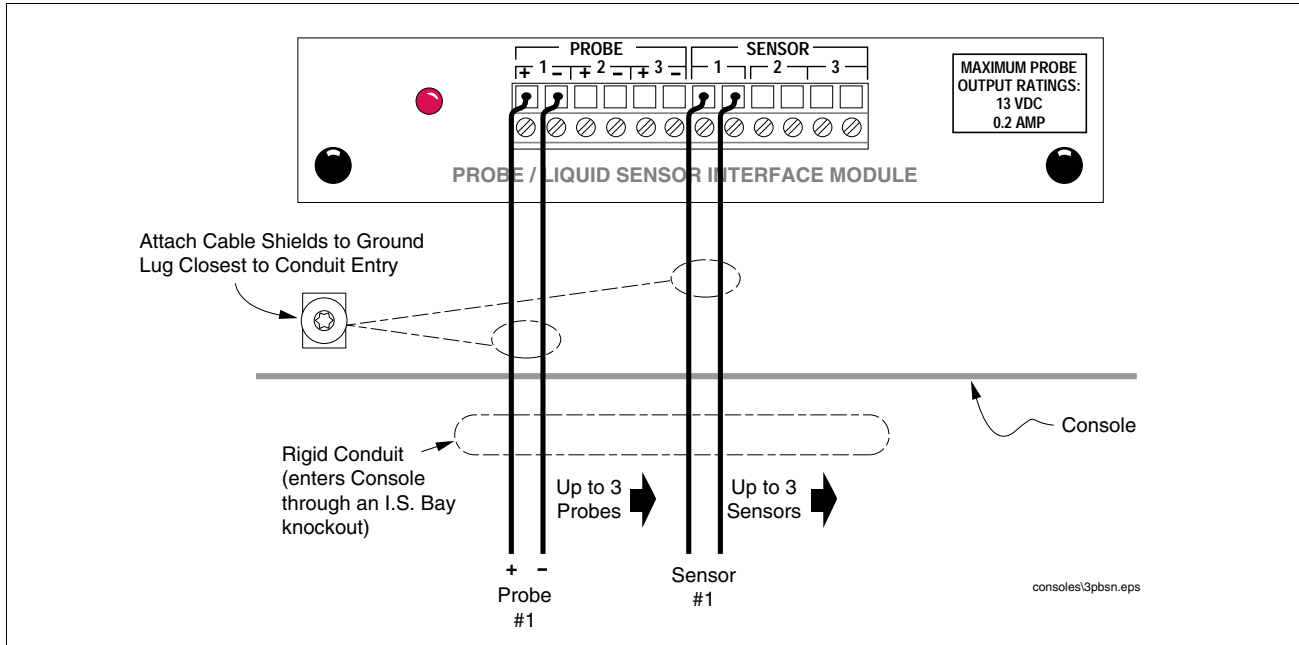


Figure 59. 3 Probe / 3 Sensor Interface Module Wiring

Connecting Devices

Connect Mag Probes and sensors in the table below to the appropriate terminals (Probe or Sensor) on the Probe/ Liquid Sensor Interface module as shown in Figure 60.

Device	Wires	Observe Polarity
Mag Probe	2	Yes
Interstitial sensor for fiberglass/steel tanks	2	No
Sump sensor	2	No
Discriminating dispenser pan sensor	2	No
Discriminating containment sump sensor	2	No
Hydrostatic sensor (for all double-wall tanks)	2	No

INTERSTITIAL SENSOR INTERFACE MODULE - I.S. BAY

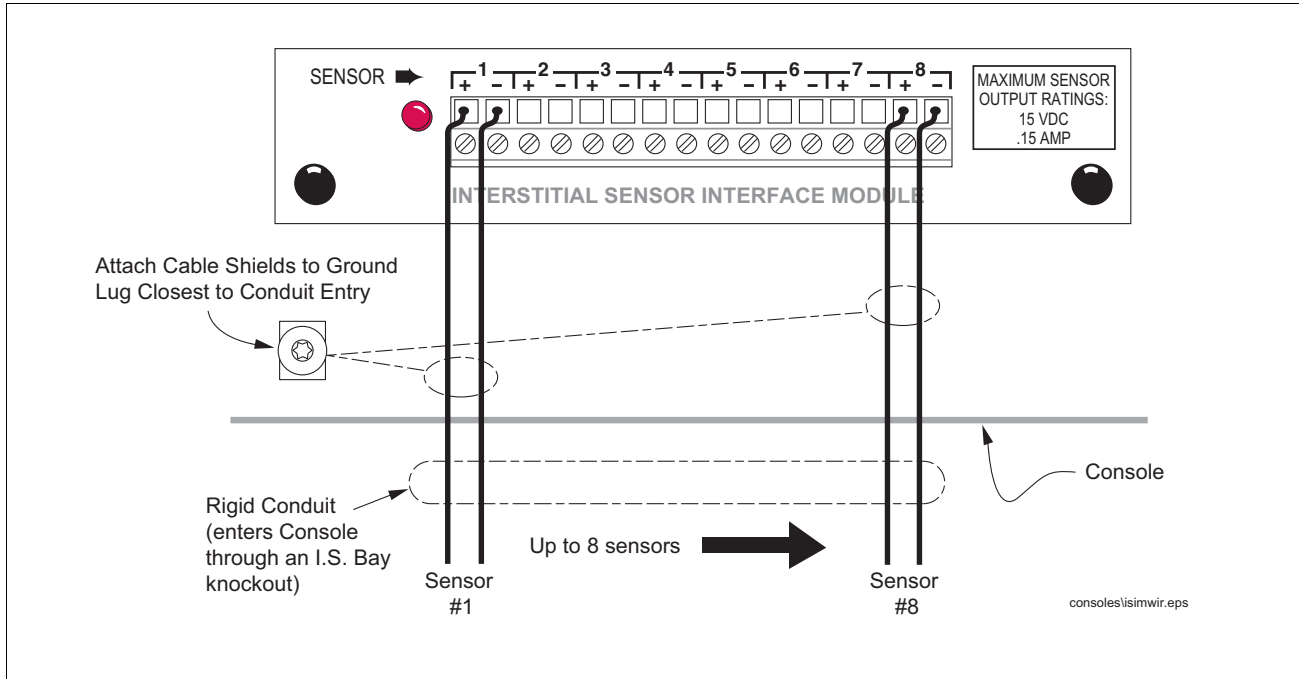


Figure 60. Interstitial Sensor Interface Module Wiring

Connecting Devices

Connect sensors in the table below to the appropriate terminals on the Interstitial Sensor Interface module as shown in Figure 60.

Device	Wires	Observe Polarity
Interstitial sensors for fiberglass/steel tanks	2	No
Sump sensor	2	No
Position-Sensitive Sensor	2	No
Discriminating dispenser pan sensor	2	No
Discriminating containment sump sensor	2	No
Hydrostatic sensor (for all double-wall tanks)	2	No
Oil/water separator sensor	2	No
CSTP Liquid Switch	2	No

TYPE B INTERFACE MODULE - I.S. BAY

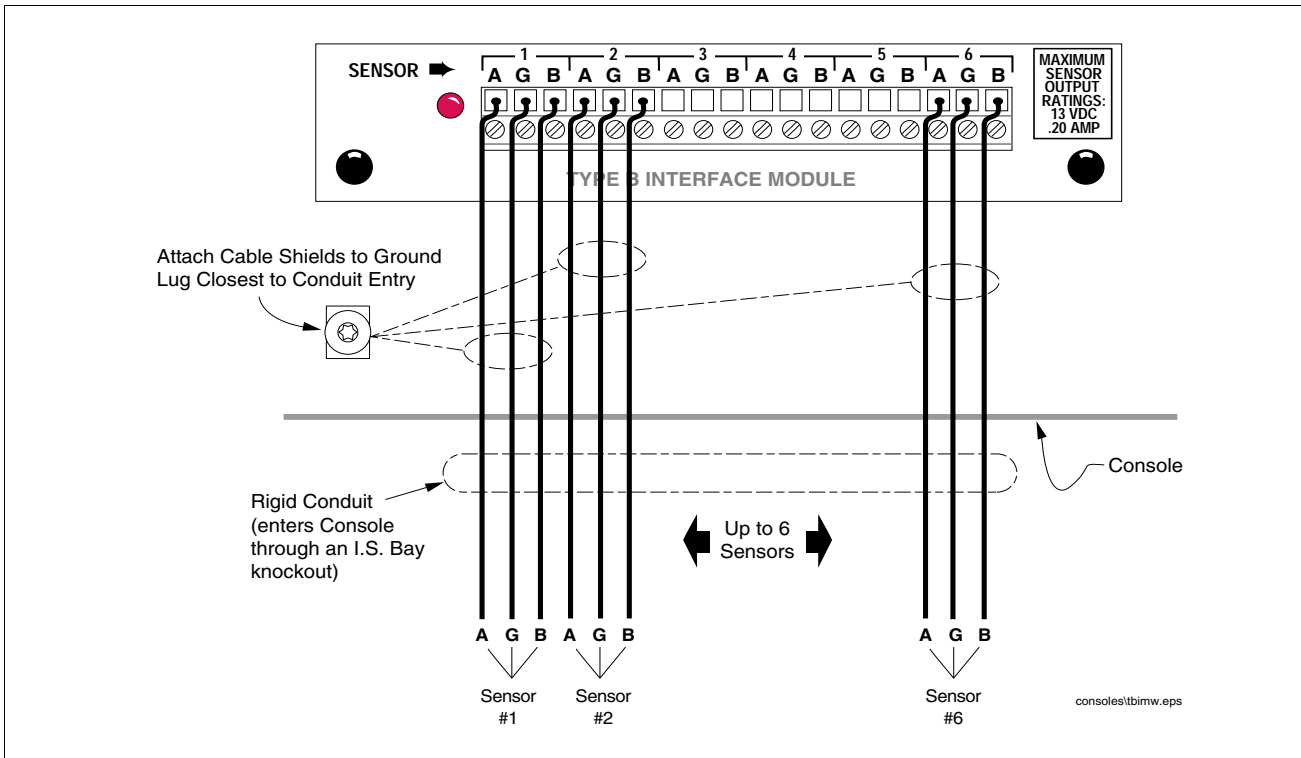


Figure 61. Type B Interface Module Wiring

Connecting Devices

Connect sensors in the table below to the appropriate terminals on the Type B Interface module as shown in Figure 61.

Device	Wires	Observe Polarity
4SITE solid-state discriminating dispenser pan sensor	3	Yes
4SITE solid-state discriminating containment sump sensor	3	Yes

TYPE A INTERFACE MODULE - I.S. BAY

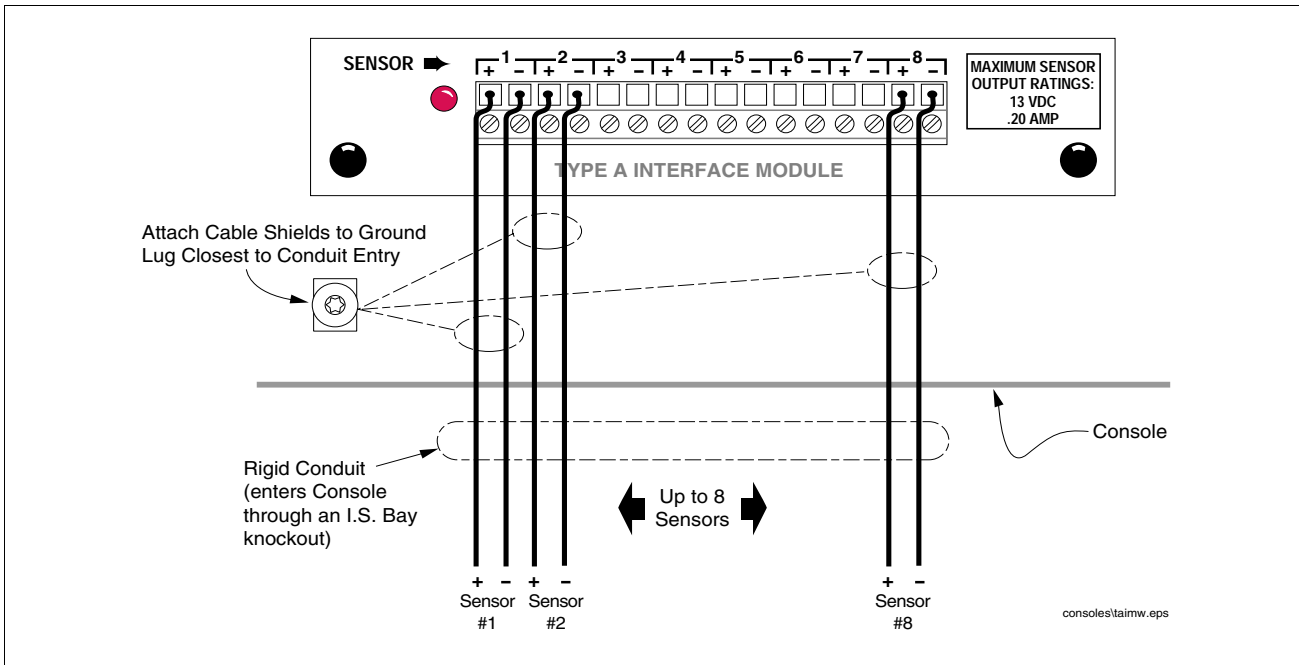


Figure 62. Type A Interface Module

Connecting Devices

Connect sensors in the table below to the appropriate terminals on the Type A Interface module as shown in Figure 62.

Device	Wires	Observe Polarity
4SITE discriminating Interstitial sensor for fiberglass tanks	2	Yes
Micro sensor	2	Yes
Solid-state dispenser pan sensor	2	Yes
Solid-state containment sump sensor	2	Yes

GROUNDWATER SENSOR INTERFACE MODULE - I.S. BAY

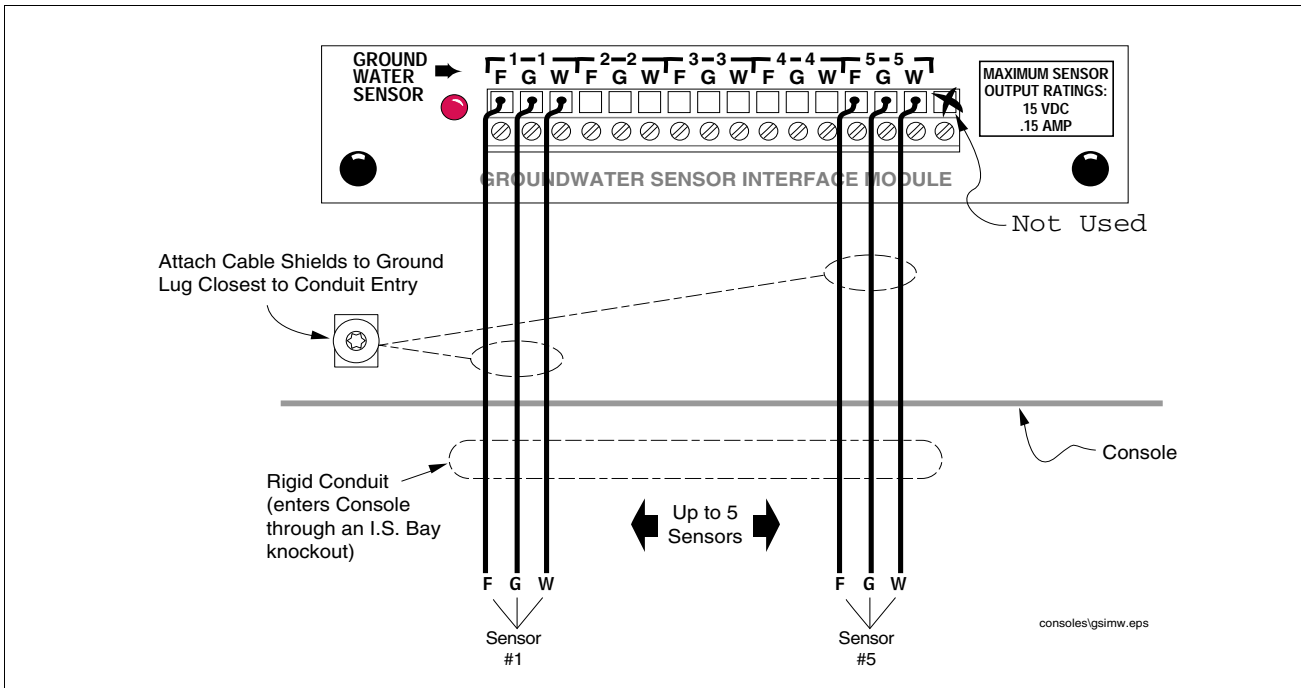


Figure 63. Groundwater Sensor Interface Module Wiring

Connecting Device

Connect sensor in the table below to the appropriate terminals on the Groundwater Sensor Interface module as shown in Figure 63.

Device	Wires	Observe Polarity
4SITE Groundwater Sensor	3	Yes

VAPOR SENSOR INTERFACE MODULE - I.S. BAY

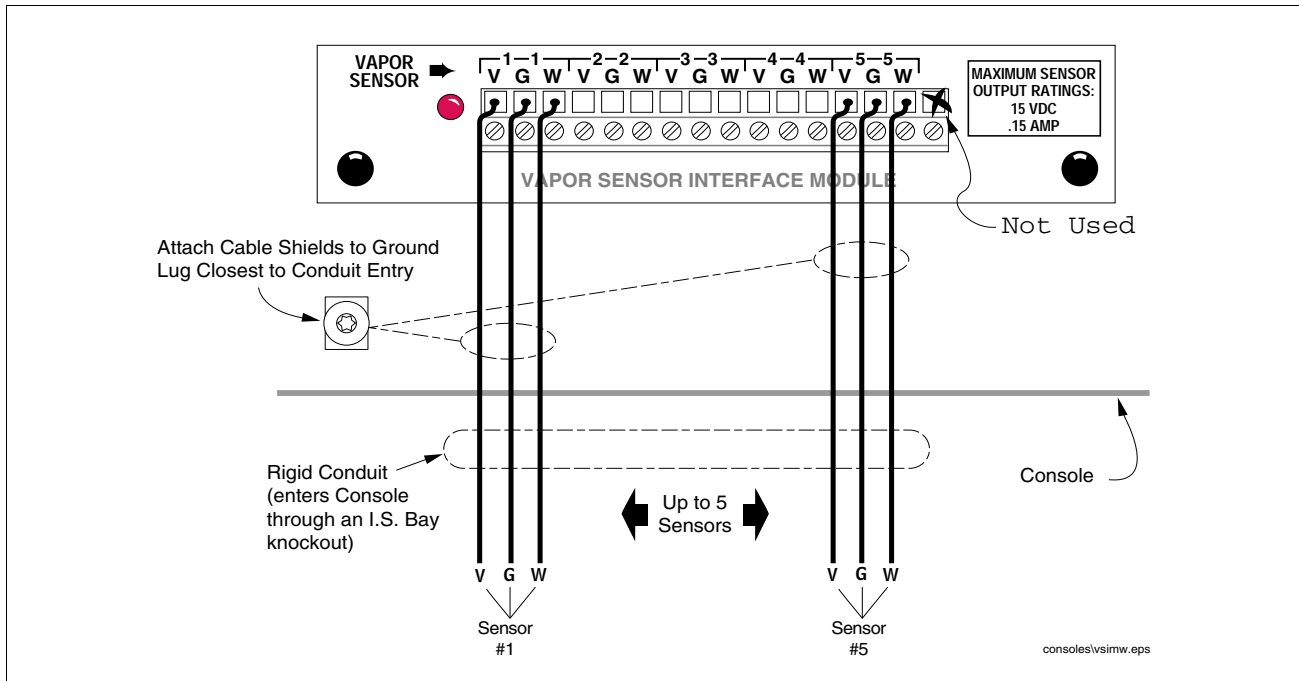


Figure 64. Vapor Sensor Interface Module Wiring

Connecting Device

Connect sensor in the table below to the appropriate terminals on the Vapor Sensor Interface module as shown in Figure 64.

Device	Wires	Observe Polarity
Vapor Sensor	3	Yes

SMART SENSOR INTERFACE MODULE - I.S. BAY

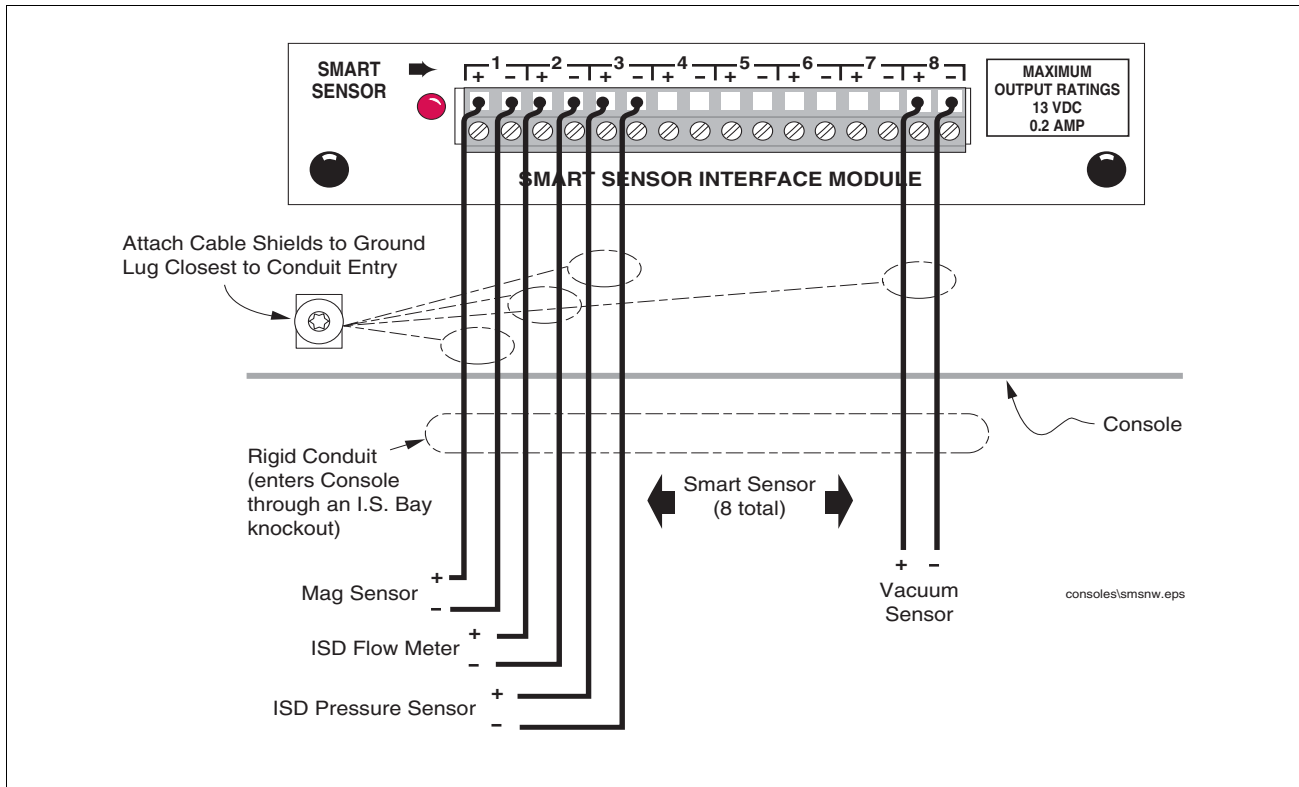


Figure 65. Smart Sensor Interface Module

Connecting Devices

Connect sensors in the table below to the appropriate terminals on the Smart Sensor Interface module as shown in Figure 65.

Device	Wires	Observe Polarity
Mag Sensor	2	Yes
ISD Vapor Flow meter	2	Yes
ISD Vapor Pressure Sensor	2	Yes
Vacuum Sensor	2	Yes
Carbon Canister Vapor Polisher	2	Yes

WIRING ADDITIONAL IS BAY MODULES

The connection diagram for Pressurized Line Leak Interface Modules (also an Intrinsically Safe bay module) is covered in the PLLD Site Prep and Installation Manual which is shipped with that system.

4-RELAY OUTPUT MODULE - POWER BAY

The 4-Relay Output Module incorporates four Form-C relay outputs and the I/O Combination Module incorporates two Form-C relay outputs.

Important Output Relay Connection Restrictions

1. Do not connect output relays to a device that draws more than 2 amperes of current. Output power: output relay contact, resistive load - 120 Vac, 2 A max.; or 24 Vdc, 2 A max.
2. Alarm relays cannot be used for flow control. Alarm relays provide only a momentary closure and cannot actuate flow control devices such as valves and pump motor relays for extended periods of time.

Connect the wires from each external device to the appropriate terminals on the output module [see Figure 66].

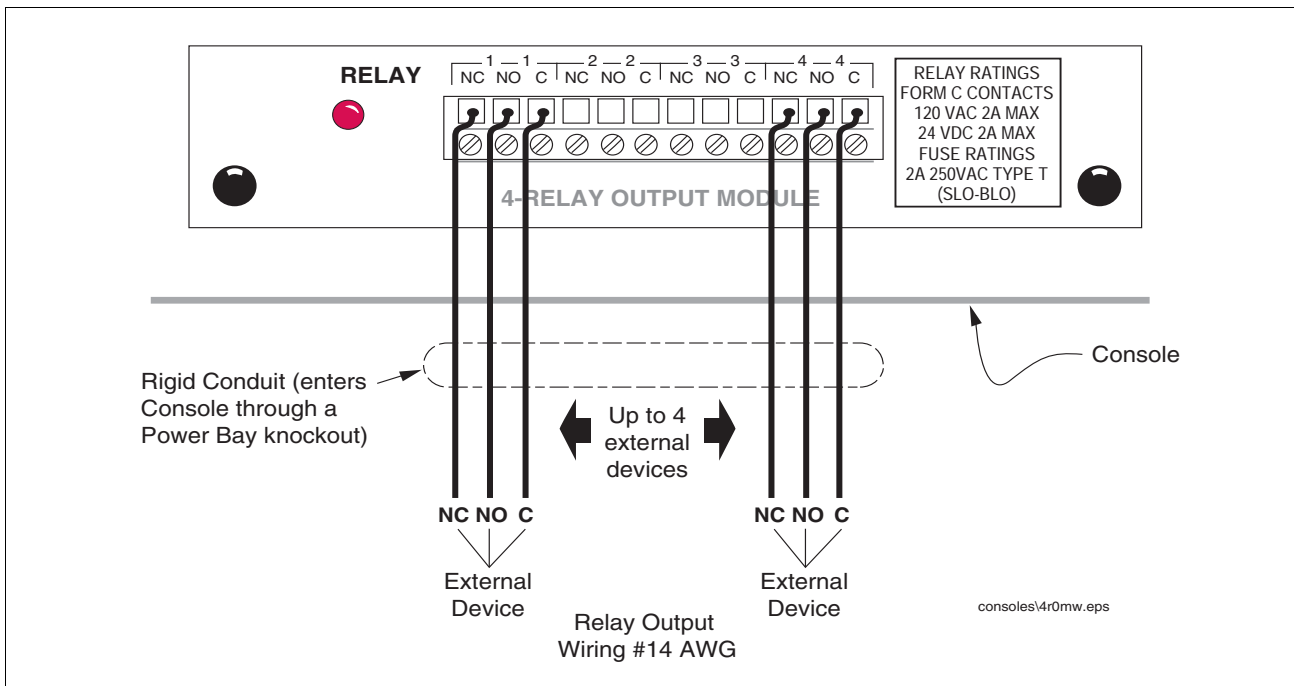


Figure 66. 4-Relay Output Module Wiring

I/O COMBINATION MODULE - POWER BAY

The I/O Combination Module can accept two dry-contact switch closure inputs from an external device such as a line leak detector or well monitoring system [Figure 67].]

For each external input, connect a shielded cable consisting of two #18 AWG conductors to the appropriate input terminals on the module.

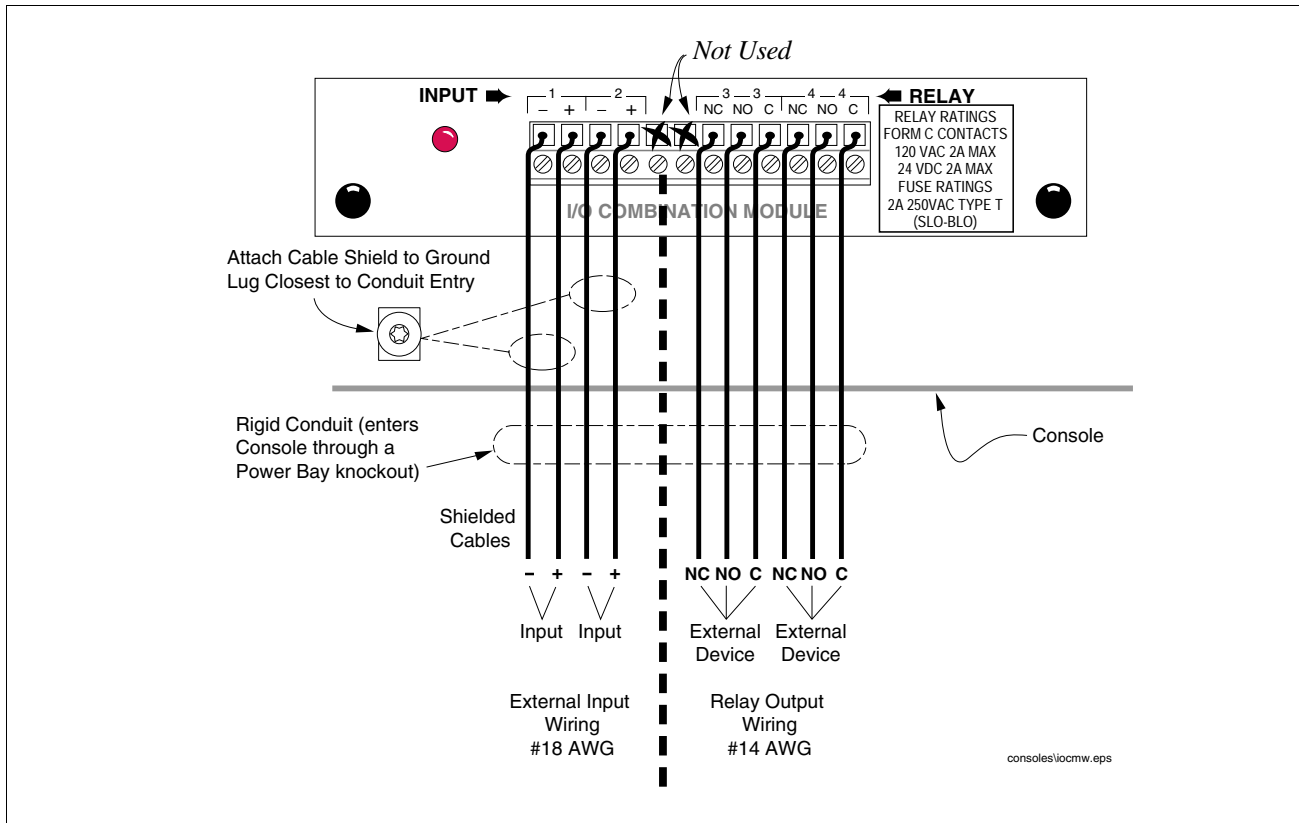


Figure 67. I/O Combination Module Wiring

PUMP RELAY MONITOR MODULE - POWER BAY

The Pump Relay Monitor Module can accept ac inputs from the STP's Remote Control Box [Figure 68].

For each STP to be monitored, connect a shielded cable consisting of two #14 AWG conductors to the appropriate input terminals on the module.

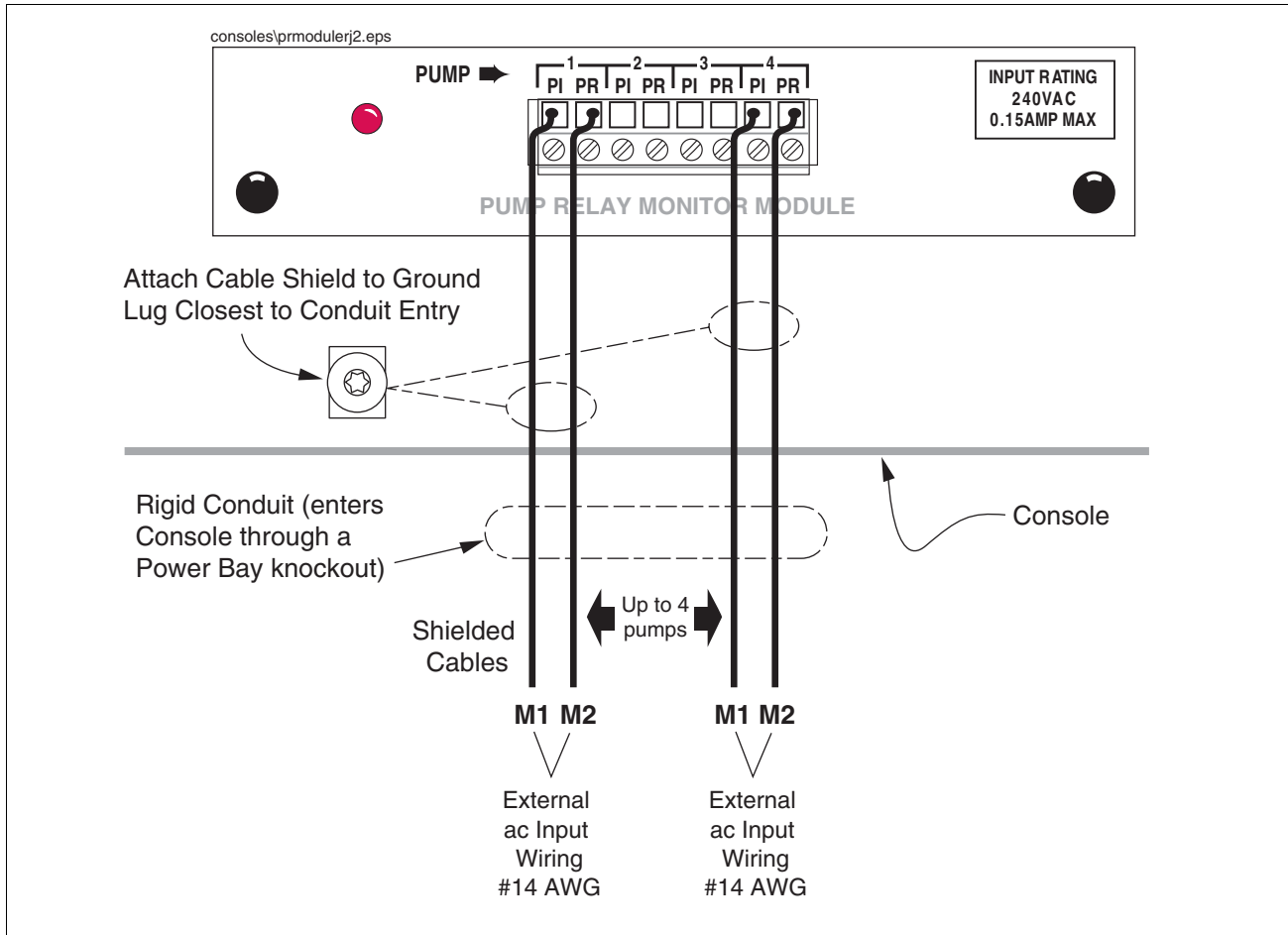


Figure 68. Pump Relay Monitor Module Wiring

PUMP SENSE MODULE - POWER BAY

Connect the two color-coded or marked wires from the pump controls to the appropriate terminals on the Pump Sense Module [see Figure 69].

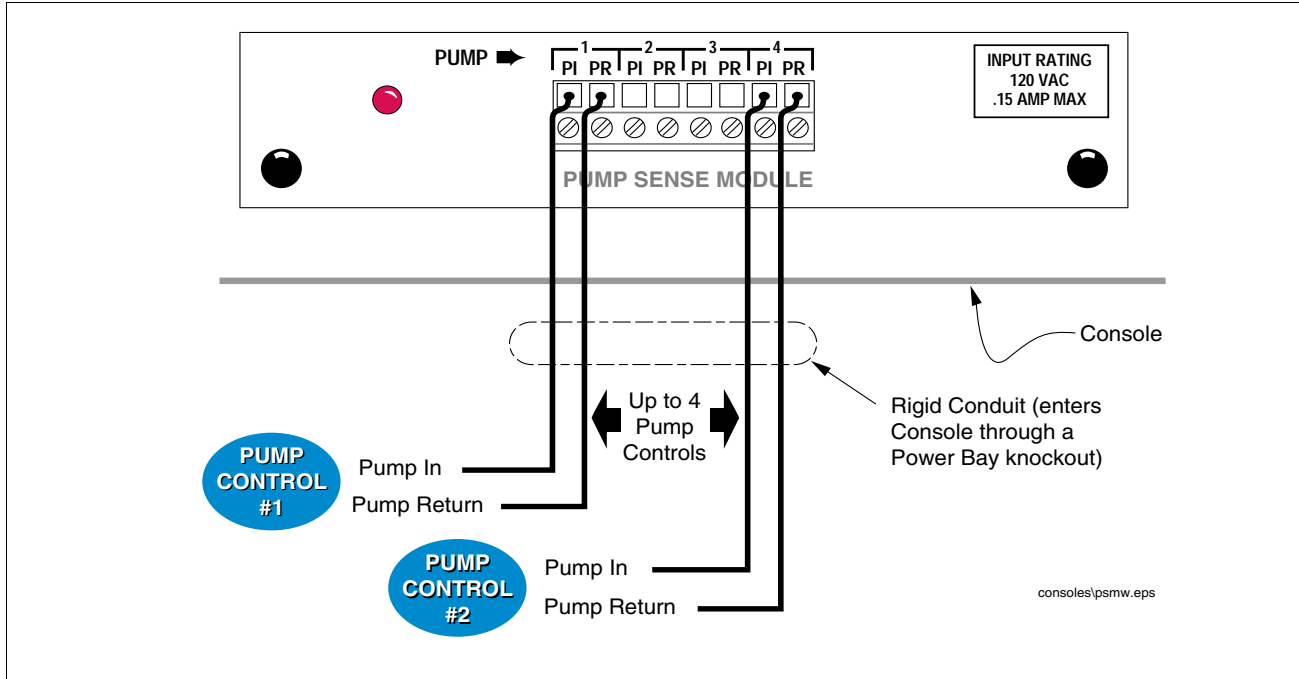


Figure 69. Pump Sense Module Wiring

WIRING ADDITIONAL POWER BAY MODULES

The wiring diagrams for Power Bay modules not covered in this manual can be found in the separate Veeder-Root manuals listed below. Follow the instructions in the manual shipped with the module.

Module	Description	Manual No.
Pressure Line Leak Controller Modules	Required with Pressure Line Leak Detection.	576013-499
Line Leak Interface Module	Required with Volumetric Line Leak Detection.	576013-765
WPLLD Controller Module	Required with Wireless Pressurized Line Leak Detection.	577013-481
WPLLD AC Interface Module	Required with Wireless Pressurized Line Leak Detection.	577013-481
Mechanical Dispenser Interface Module	Consoles w/BIR only - Dispensing system input from mechanical dispensers. Accepts inputs from up to 4 pulsers or pulse/totalizers.	576013-893

CONNECTING SERIAL COMM MODULES

The Comm cage, in the Communication Bay (left compartment of the console), can accept a wide variety of modules; Serial Comm modules, miscellaneous modules, such as the WPLLD Communications Module, and Dispenser Interface Modules (except Mechanical Dispenser Interface Modules which install in the Power Bay of the console).

SERIAL COMM MODULES

The Comm cage also accepts the Serial Comm modules such as the SiteFax module, RS-232 Interface Module, The Remote Printer Interface module, etc. Follow the installation instructions shipped with these modules.

MISCELLANEOUS MODULES

Follow the installation instructions shipped with these modules:

- WPLLD Communications Module - component of the WPLLD line leak system.
- Printer Interface Module - interfaces between a CPU board and an integral printer.
- TCP/IP Interface Module - allows communication between a console and a PC over the internet.

DISPENSER INTERFACE MODULES (DIMS) - CONSOLES W/BIR ONLY

BIR equipped consoles must be able to communicate with many different dispensing systems to perform Business Inventory Reconciliation (BIR) functions. This communication is done via Dispenser Interface Modules (DIM) that are designed in cooperation with major dispenser manufacturers. The DIM gives the console real-time access to dispenser activity. Connecting a DIM to your particular Dispensing System must be done following instructions found in the installation manual accompanying the DIM.

Before Applying Power to the Console

After all connections have been made to the console, connect the wires carrying ac power to the console at the breaker panel - Check the Input Power Rating on the label affixed to the underside of the console to verify whether input power requirements are 120 Vac or 240 Vac [see Figure 7 on page 13].

Refer to the System Setup manual prior to applying power to the system.

Appendix A: Wiring Record

Wiring Record

The wiring record forms in this appendix are intended for the installer's use to accurately record the wiring scheme and wiring identification for probes and sensors connected to the console. A definition of each record heading is given below.

NOTE: Failure to identify and maintain the relationship of wiring between probe and sensor locations and their positions on console module connectors could result in the incorrect identification of a leak type or leak location, or improper system operation. It is critical that you properly identify, record, and maintain these wiring relationships.

MODULE POSITION

The slot in the intrinsically safe bay of the console where this module is installed. (See the Circuit Directory located on the inside of the console's right-hand door.)

MODULE TYPE

Enter the type of module installed in this slot, i.e., Probe #1, Vapor Sensor - NW Corner.

PROBE/SENSOR IDENTIFICATION

Identify the device connected to this module location, i.e., Tank #1 Probe, Vapor Sensor - NW corner.

TERMINAL IDENTIFICATION

Probe and interstitial sensor connectors have 2 terminals per probe or sensor position (+ and -). Vapor sensor, groundwater sensor, and Type B sensor connectors have 3 terminals per sensor.

COLOR CODE OR MARKING

Enter the color or marking that identifies the probe or sensor wire connecting to this module terminal.

Module Position # 1

Module Type: _____

Module Position # 2

Module Type: _____

Probe/ Sensor Identification	Terminal Identification				Color Code or Marking
	2-Wire Probe/Sensor	Vapor Sensor	Groundwater Sensor	Type B Sensor	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	

Probe/ Sensor Identification	Terminal Identification				Color Code or Marking
	2-Wire Probe/Sensor	Vapor Sensor	Groundwater Sensor	Type B Sensor	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	

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Module Position # 3

Module Type: _____

Module Position # 4

Module Type: _____

Probe/ Sensor Identification	Terminal Identification				Color Code or Marking
	2-Wire Probe/Sensor	Vapor Sensor	Groundwater Sensor	Type B Sensor	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	

Probe/ Sensor Identification	Terminal Identification				Color Code or Marking
	2-Wire Probe/Sensor	Vapor Sensor	Groundwater Sensor	Type B Sensor	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	

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Module Position # 5

Module Type: _____

Module Position # 6

Module Type: _____

Probe/ Sensor Identification	Terminal Identification				Color Code or Marking
	2-Wire Probe/Sensor	Vapor Sensor	Groundwater Sensor	Type B Sensor	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	

Probe/ Sensor Identification	Terminal Identification				Color Code or Marking
	2-Wire Probe/Sensor	Vapor Sensor	Groundwater Sensor	Type B Sensor	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	

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Module Position # 7

Module Type: _____

Module Position # 8

Module Type: _____

Probe/ Sensor Identification	Terminal Identification				Color Code or Marking
	2-Wire Probe/Sensor	Vapor Sensor	Groundwater Sensor	Type B Sensor	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	

Probe/ Sensor Identification	Terminal Identification				Color Code or Marking
	2-Wire Probe/Sensor	Vapor Sensor	Groundwater Sensor	Type B Sensor	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	
	+	V	F	A	
	-	G	G	G	
		W	W	B	

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Appendix B: Universal Sensor Mounting Kit

Introduction

This addendum describes installation procedures for the Universal Mounting Kit for Dispenser Pan and Containment Sump Sensors, Part Number 331144-001.

Since you can use the Universal Mounting Kit in a variety of ways, only the most commonly used mounting methods are described.

Product Description

The Universal Mounting Kit is compatible with most manufacturer's dispenser pans and containment sumps and provides added flexibility when mounting the sensors.

KIT CONTENTS

The Universal Mounting Kit, Part No. 331144-001 consists of:

Quantity	Description
2	Extension brackets (see Item 1, Figure B-1)
1	L-bracket (see Item 2, Figure B-1)
1	3/4-inch U-bolt (see Item 3, Figure B-1)
1	1-inch U-bolt (see Item 3, Figure B-1)
1	2-inch U-bolt (see Item 3, Figure B-1)
1	3/8-inch spring nut (see Item 4, Figure B-1)
1	3/8-16 X 7/8-inch bolt (see Item 4, Figure B-1)
4	1/4-20 nut
3	1/4-20 x 3/4-inch bolt
4	1/4 flat washer
1	1/4-20 x 1-1/2 inch machine screw (See Item 5, Figure B-1)
1	2-inch sensor clamp (See Item 5, Figure B-1)
1	1/4 X 1-inch spacer (See Item 5, Figure B-1)

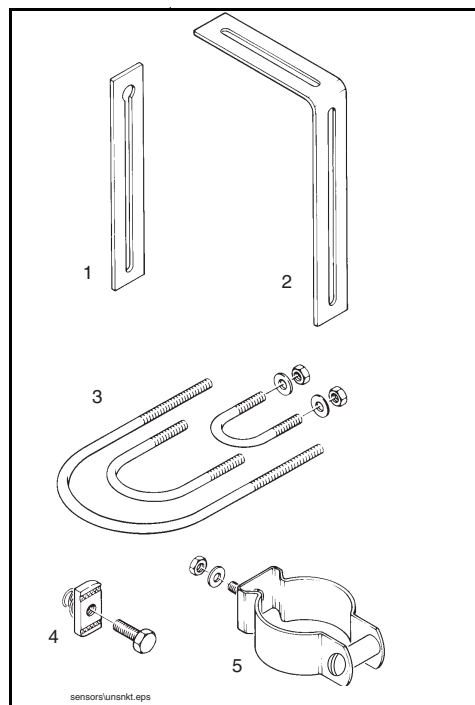


Figure B-1. Universal Mounting Kit Contents

Mounting Sensors

Depending on the type of pan you are using, you can configure the Universal Mounting Kit in several different ways. Some of the more frequently used mounting methods are illustrated in the following figures using selected components from the kit as required. The spacer for the 1-1/2 inch machine screw is only needed with a stabilizer

tube to prevent excess clamping pressure on the sensor (see Figure B-2).

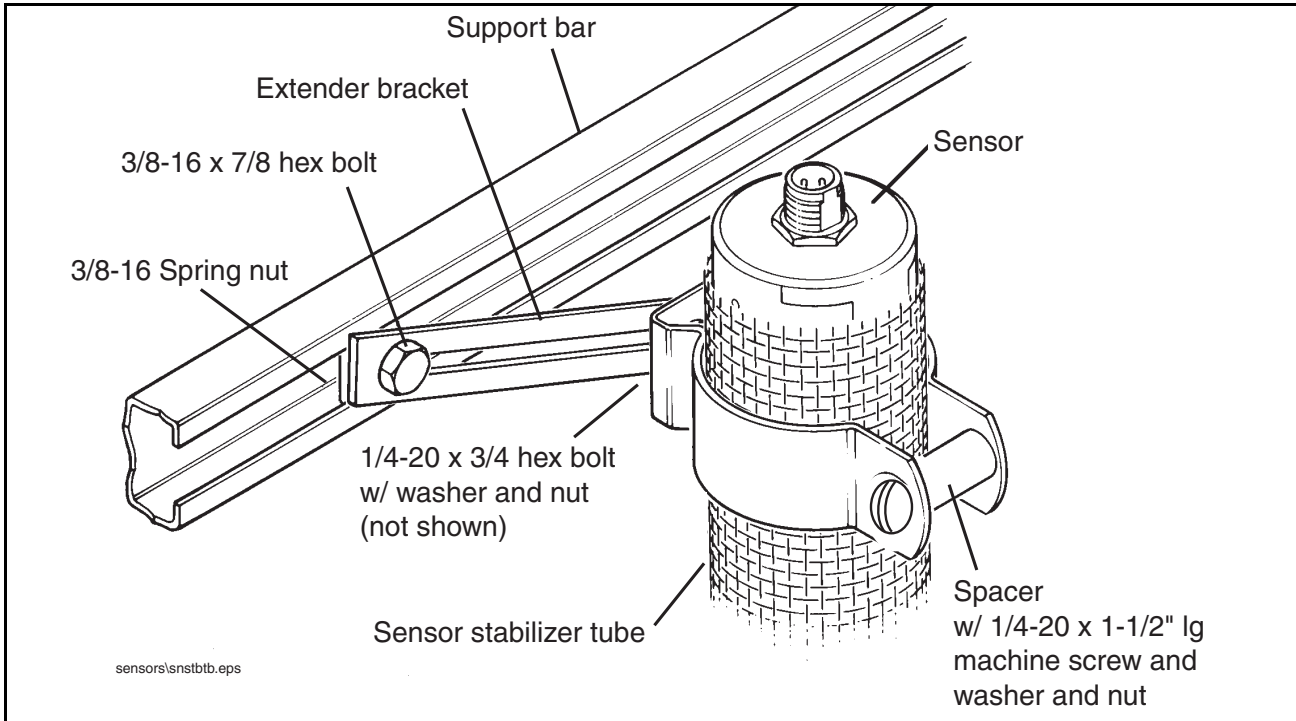


Figure B-2. Mounting the Sensor in a Stabilizer Tube to a Support Bar

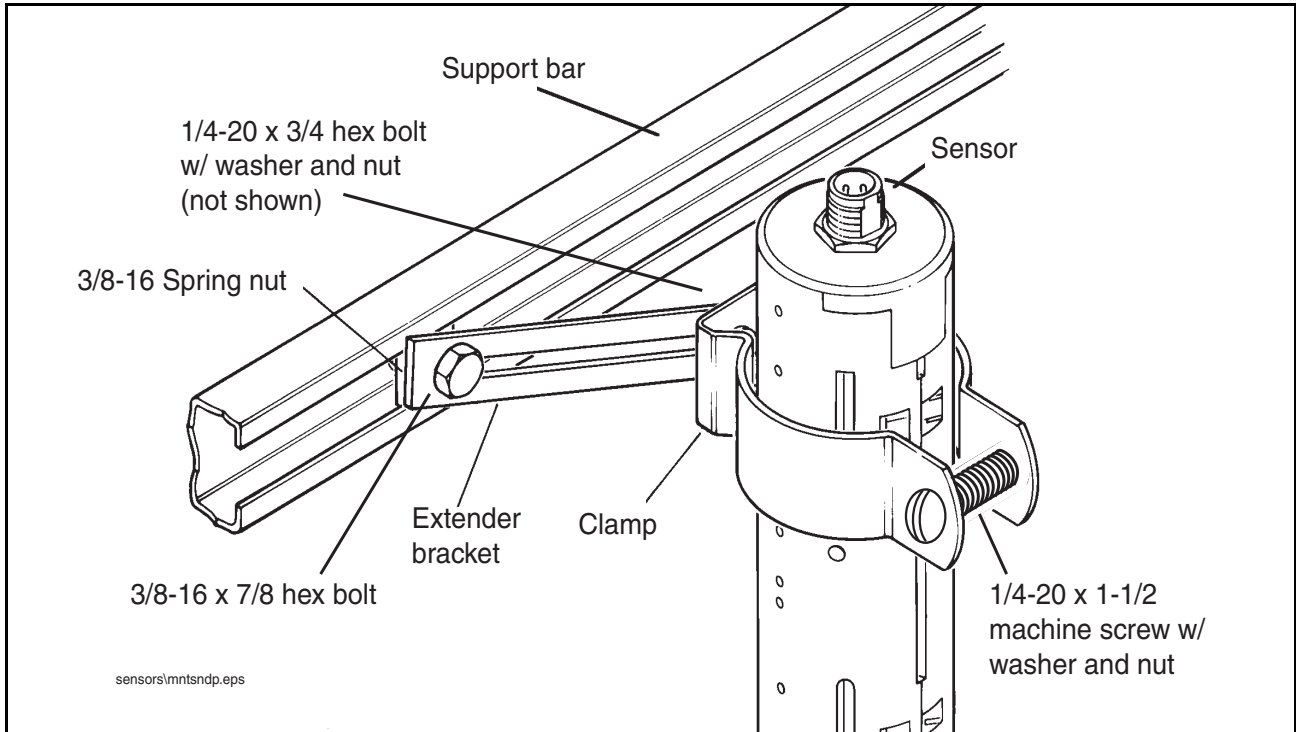


Figure B-3. Mounting the Sensor in the Dispenser Pan

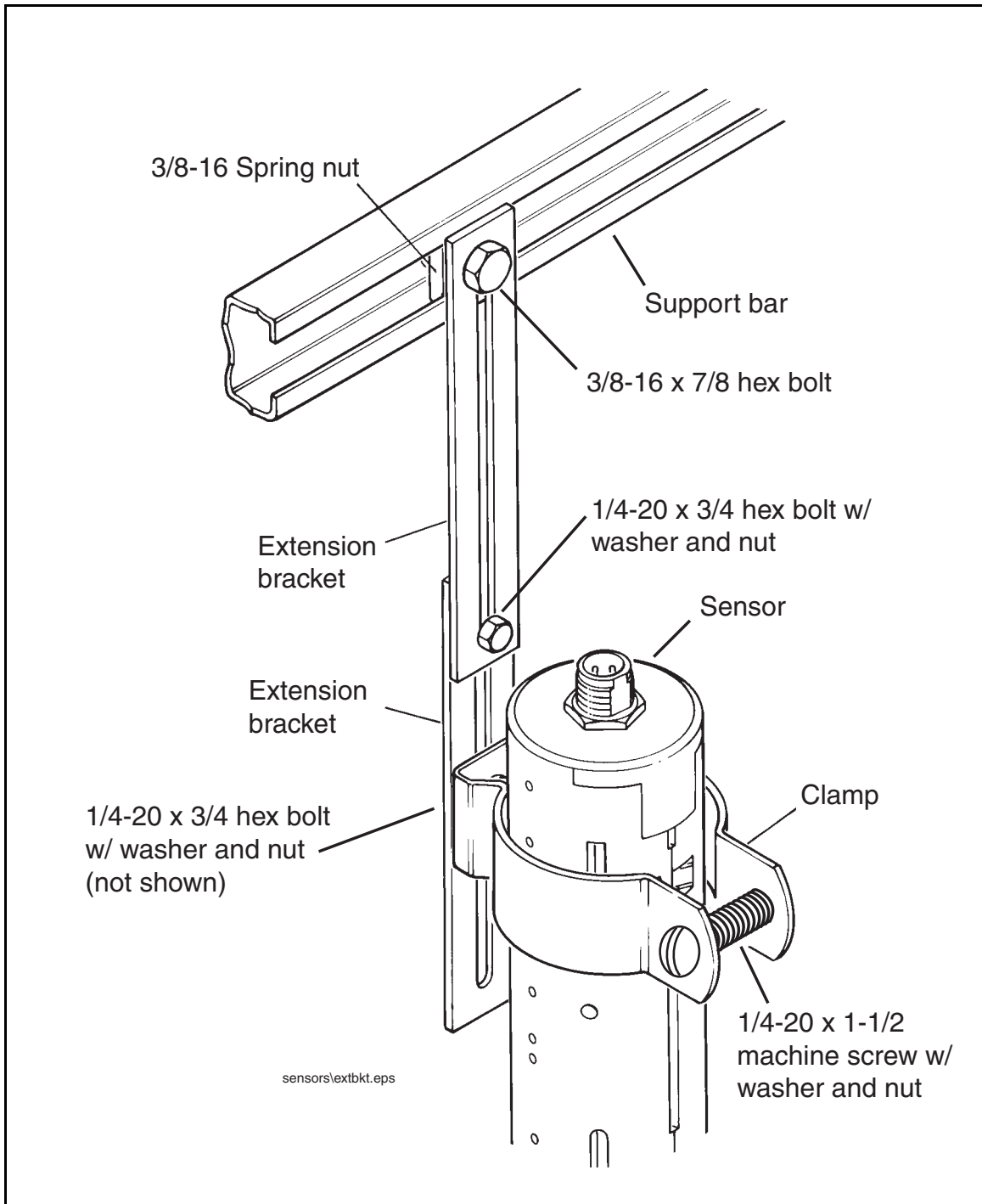


Figure B-4. Mounting the Sensor using Two Extension Brackets

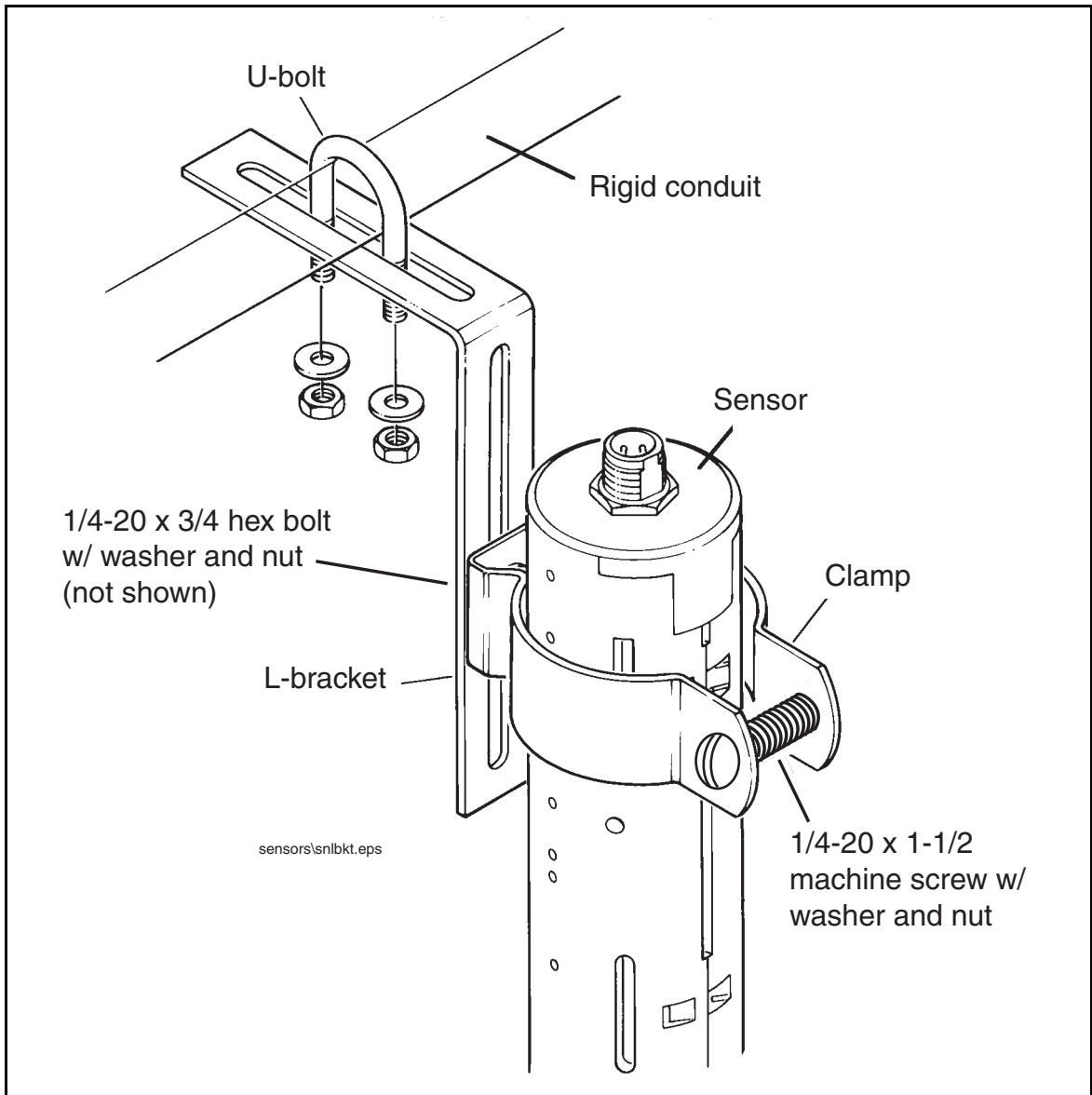


Figure B-5. Mounting the Sensor to Rigid Conduit

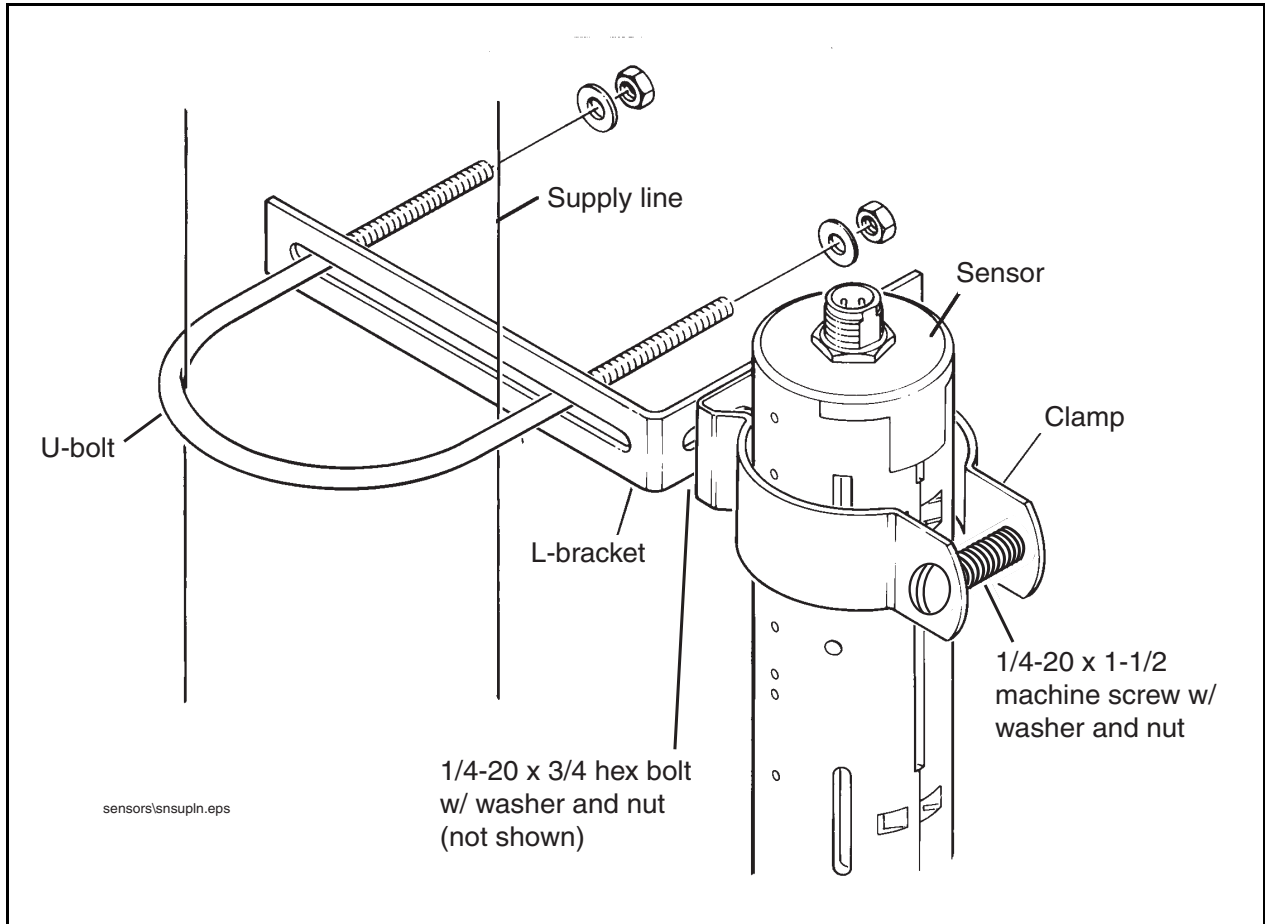


Figure B-6. Mounting the Sensor to a Supply Line

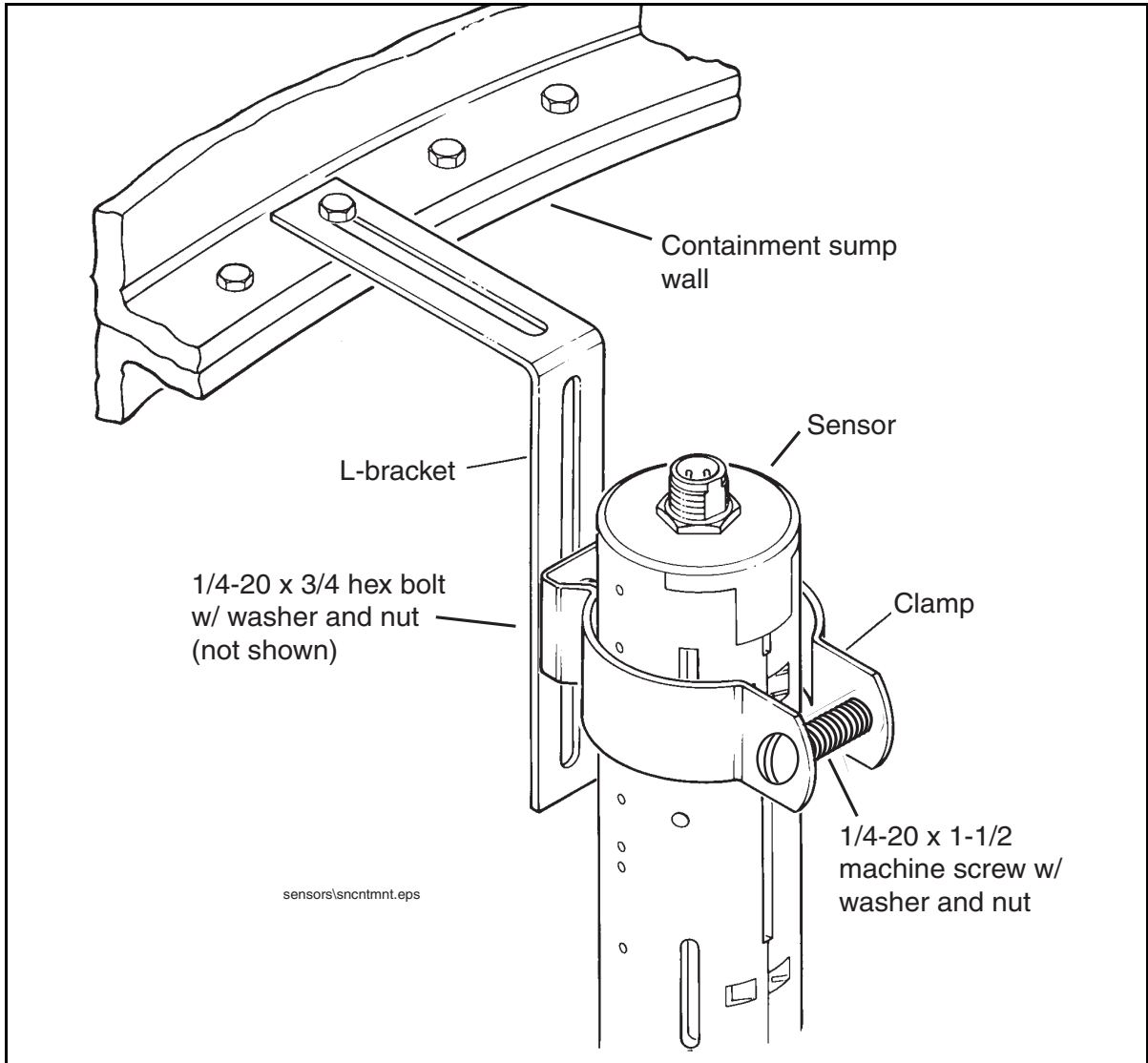


Figure B-7. Mounting the Sensor in a Containment Sump

