

Vacuum Sensors

Installation Guide

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For the parts return procedure, please follow the appropriate instructions in the "General Returned Goods Policy" pages in the "Policies and Literature" section of the Veeder-Root **North American Environmental Products** price list. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

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1 Introduction

These instructions describe the installation of Veeder-Root Vacuum sensors in a STP containment sump to monitor the interstitial space of:

- Double-wall product lines
- Double-wall vapor return lines
- Double-wall tank vent lines
- Double-wall tanks*
- Double-wall containment sumps

**Double-walled tanks must provide access for installation of a liquid sensor at the lowest point of the interstice.*

Product Marking Information

RELATED DOCUMENTS

Documents Required to Install Equipment

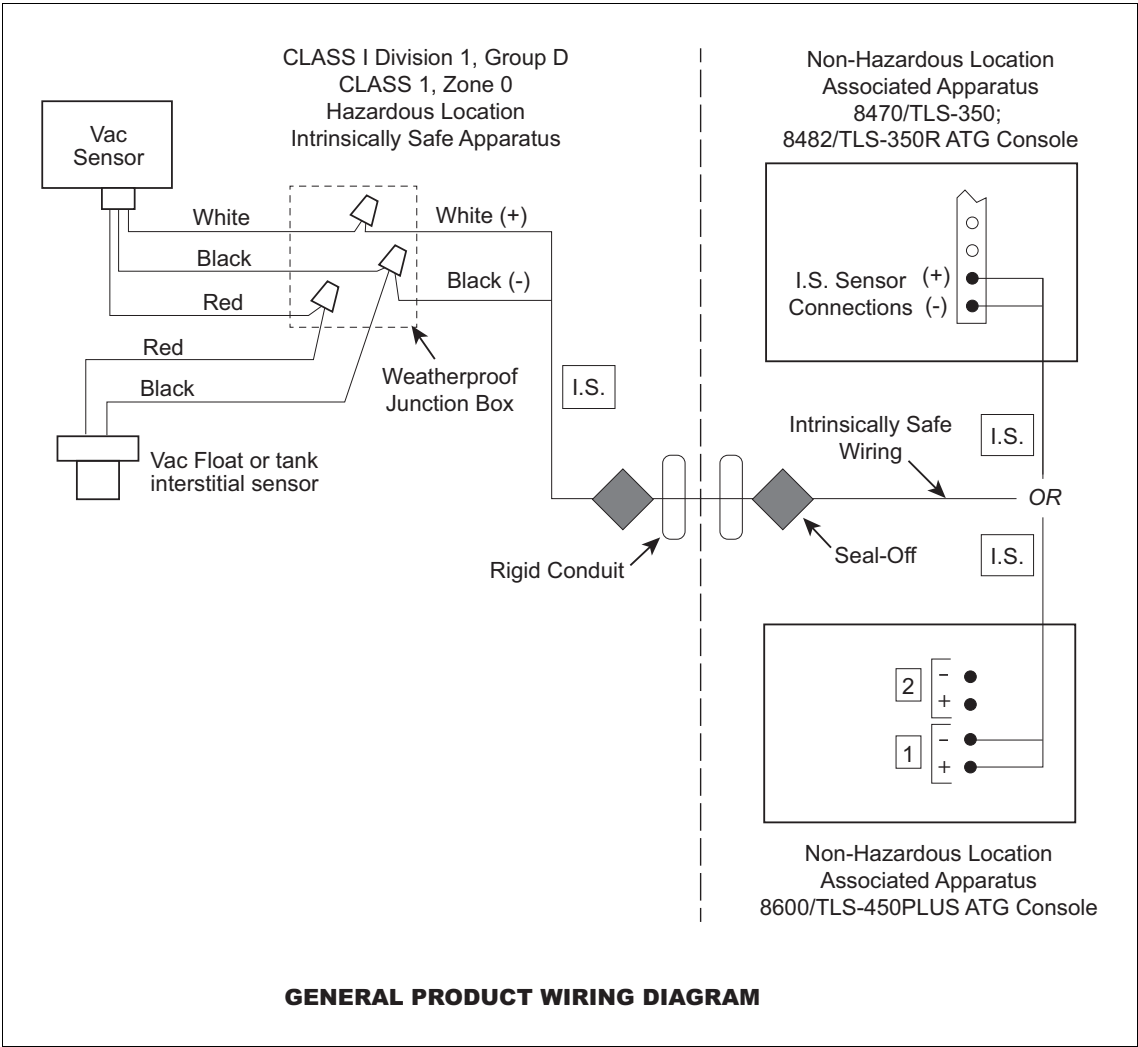
This intrinsically safe apparatus is only for use as part of a Veeder-Root Automatic Tank Gauging System (ATG Console with probes and sensors). To install intrinsically safe apparatus, use the specific control drawing that appears on the nameplate of the applicable associated apparatus (ATG Console):

Associated Apparatus	UL/cUL Control Drawing Number
TLS-350, TLS-350R	331940-011
TLS-450/8600 Consoles	331940-008
TLS-XB/8603	331940-019


The control drawings contain information related to the correct installation of the overall intrinsically Safe System. This includes information such as maximum number of apparatus, specific apparatus allowed in the system, maximum cable lengths, references to codes, proper grounding and so on. Control drawings can be found at veeder.com.

RELATED MANUALS

TLS-3XX Setup Manual	576013-623
V-R Sensor Operability Testing Guide	577013-814
Vacuum Sensor System Troubleshooting Manual	577013-873
TLS-450PLUS/TLS4 Operator's Manual	577014-110
TLS-450PLUS Consoles Module Replacement	577014-077




Product Label Contents

**VEEDER-ROOT**TM

CL I, DIV. 1, GP.D
CL I, ZONE 0
AEx ia IIA
Ex ia IIA
TC=T4
SECURITE INTRINSEQUE

I.S. CIRCUIT FOR HAZLOC SENSOR
F/N 857280-XXX
S/N XXXXXX
-40°C ≤ Ta ≤ +60°C
MANUAL NO. 577013-836

2466

LISTED

















NOTICE Failure to install this product in accordance with its instructions and warnings will result in voiding of all warranties with this product.



Safety Warnings

To protect yourself and your equipment, observe the following warnings and important information:

Safety Precautions

The following safety symbols are 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>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>	 <p>INJURY Careless or improper handling of materials can result in bodily injury.</p>
 <p>NO POWER TOOLS Sparks from power tools (such as drills) can ignite fuels and their vapors.</p>	 <p>NO OPEN FLAMES Open flames from matches, lighters, welding torches, etc. can ignite fuels and their vapors.</p>
 <p>NO SMOKING Sparks and embers from burning cigarettes or pipes can ignite fuels and their vapors.</p>	 <p>TURN OFF CELL PHONES/PAGERS Sparks from electronic devices in the vicinity of gasoline storage tanks could cause an explosion or fire resulting in bodily injury or death.</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>WARNING WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.</p>	 <p>CAUTION CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</p>
 <p>NOTICE NOTICE is used to address practices not related to physical injury.</p>	 <p>USE SAFETY BARRICADES Unauthorized people or vehicles in the work area are dangerous. Always use safety cones or barricades, safety tape, and your vehicle to block the work area.</p>

 WARNING	
	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p>FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.</p> <ol style="list-style-type: none"> 1. Read and follow all instructions in this manual, including all safety warnings to protect yourself and others from serious injury, explosion, or electrical shock. 2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes. 3. To protect yourself and others from being struck by vehicles, block off your work area during installation or service. 4. Turn off, tag, and lockout power to the STP before connecting or servicing wiring to the STP. 5. Do not alter or modify any component or substitute components in this kit. 6. Substitution of components may impair intrinsic safety. 7. Field wiring to the Sensor must not share a conduit with any non-intrinsically safe device's wiring. 8. Before installing or taking the unit into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required. 9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

Before You Begin

Prior to backfilling the tank top (i.e. covering the lines, UDC, etc.) the contractor is strongly advised to test all of the secondary containments for leaks, and to monitor the vacuum during the backfill process. Any leakage detected must be repaired to prevent future vacuum system alarms.

⚠ CAUTION Do not exceed equipment manufacturer's recommended vacuum levels!

NOTICE While it is common practice to use an independent vacuum source to provide the initial vacuum, you must ensure that pump lubricating oil and any other foreign substance is not introduced into the SCVS system. Failure to do so may damage the SCVS system and will void warranty.

Hardware Requirements For Vac Sensors - Verifying Installation

TLS-350/TLS-350R CONSOLES

- TLS-350/350R with version 24C or later software
- At least one Smart Sensor with Pressure Sensor Module
- Line leak (PLLD or WPLLD), OR w/o line leak, a Pump Sense and a 4-Relay module is required for STP control.

TLS-450PLUS CONSOLE

- TLS-450PLUS with version 9B or later software
- At least one Universal Sensor Module (USM) with attached ATM pressure board
- At least one Input/Output Module (IOM) for STP control

STP/TANK

NOTICE Only V-R supplied vacuum hose (P/N 332310-001, -002, -003) is approved for use with the SCVS system).

- STP siphon port with Siphon Check Valve (P/N 188-241-5) installed. An external Siphon Check Valve (P/N 188-241-5) must be used when making a vacuum source connection between the SCVS system sensors and the siphon port cartridge for the following STPs including Red Jacket Standard, Red Jacket Quantum and FE pumps.
- Schrader Fitting 576008-672 (optional for North American installations; not required for EU - fitting is included)
- Siphon manifolded tank requirements:
 - The Red Jacket STP requires a secondary siphon assembly (P/N 410151-001).
 - The Quantum STP comes with two siphons as standard equipment - no additional parts are required.
 - FE pumps require a secondary siphon kit (FE P/N 402-507-930).

Available Vac Sensor Kits

Vac sensor kits are available in several configurations.

1, 2, 3 or 4 Vac Sensor/Vac Float Pre-Assembled Kits - includes mounting hardware, tubing/connections, and cables (for one containment sump)

- 1, 2, 3 or 4 Vac Sensor kit w/steel float
- 1, 2, 3 or 4 Vac Sensor kit w/fiberglass 4', 6', 8', or 10' float (includes relief valve)
- 1,2, 3 or 4 Vac Sensor kit w/o tank interstitial sensor
- 1, 2, 3 or 4 Vac Sensor kits w/o tank float for EU installations (ATEX approved)

Individual Kits (requires Vac Sensor/Vac Float field assembly)

NOTICE Individual kits require assembly of the Vac Sensor/Vac Float components in the field. V-R recommends purchasing pre-assembled kits.

- Mounting kit - one is required per containment sump.
- Secondary piping vacuum monitoring kit - one each is required for product line, vapor recovery line, or containment sump interstice monitoring - includes mounting hardware, tubing/connections and cables.
- Interstitial sensor kit for steel tank - includes Vac Sensor, mounting hardware, tubing/connections, riser cap, 3-way valve and cables.
- 4', 6', 8', or 10' diameter fiberglass tank interstitial sensor kit - includes Vac Sensor, mounting hardware, tubing/connections, riser cap, relief valve, 3-way valve and cables.

How To Use This Manual

The sections to follow in this manual when installing and setting up the Vac Sensor System depend on the console being used.

<u>Console</u>	<u>Applicable Sections</u>
TLS-350/350R	Sections 1, 2, 3, 4 and Appendix A
TLS450PLUS	Sections 1, 2, 5, 6 and Appendix A

2 Vac Sensor Installation

Overview

A simplified Veeder-Root vacuum sensor installation in an STP containment sump is shown in Figure 2-1. Vac Sensor (VS) and Vac Float (VF) modules are assembled in a housing which is shown in Figure 2-2. A separate mounting bracket (see Figure 2-2) is easily attached to the STP riser to support the Vac Sensor housing. Approximately 12 inches (304.8mm) of clearance is required below the pump manifold for the Vac Sensor components. Final vacuum connections are made once the housing and bracket are in place. A 1/4" NPT port into the interstitial space of the double-wall vapor return line, double-wall product line, and/or double-wall containment sump must be accessible in the containment sump. For installations requiring tank interstice monitoring, a riser must be in the same containment sump for the tank interstitial sensor. Field wiring connections of the Vac Sensor components are sealed in a customer supplied containment sump junction box (JB).

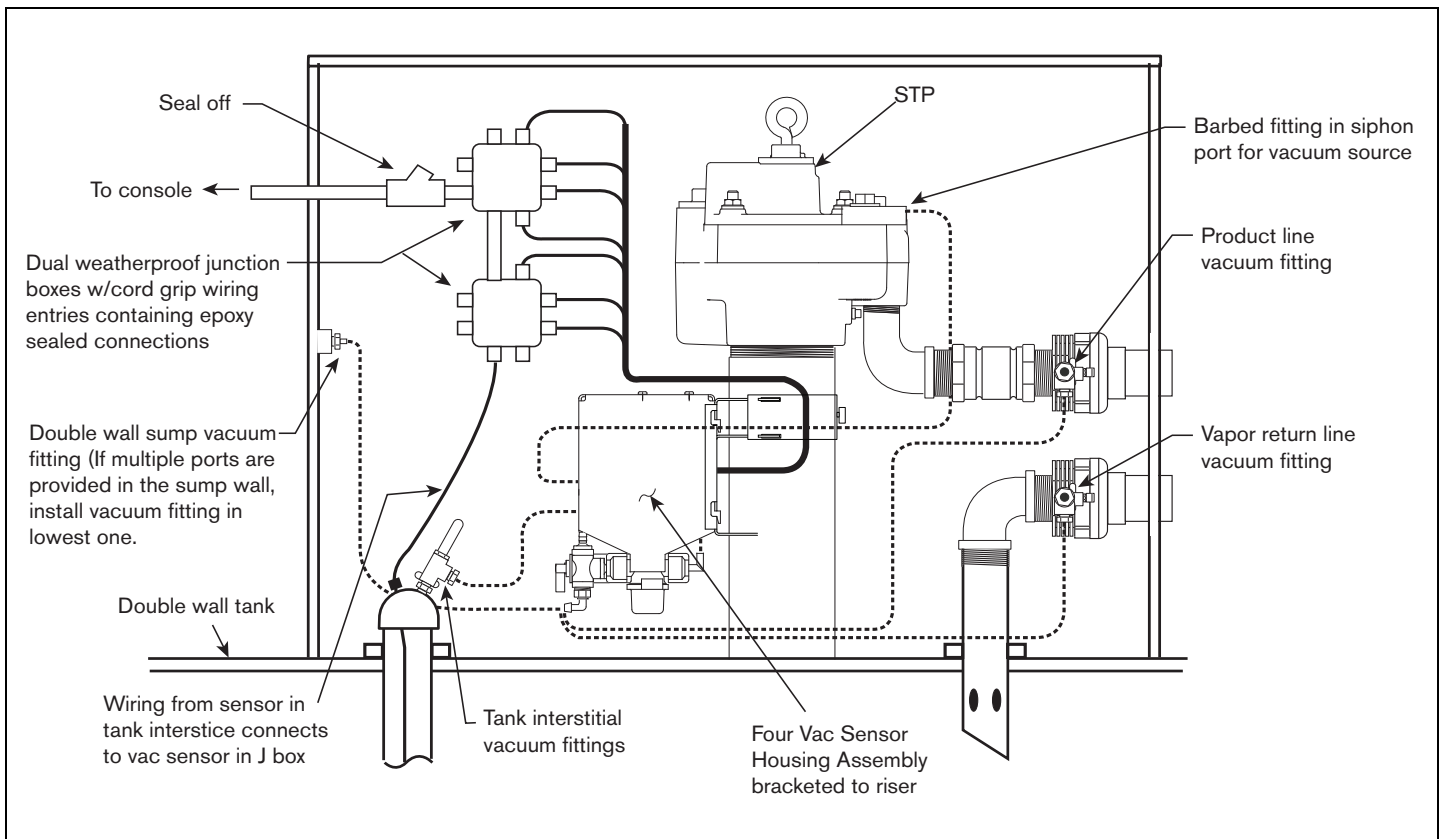


Figure 2-1.- Installation Example Of Four Vac Sensor W/Tank Interstitial Monitoring

⚠CAUTION Use only the materials specified in this manual during installation. Use of any other materials or lubricants may damage the SCVS system and will void warranty. Lubricate fittings only with soapy water - do not use any other material.

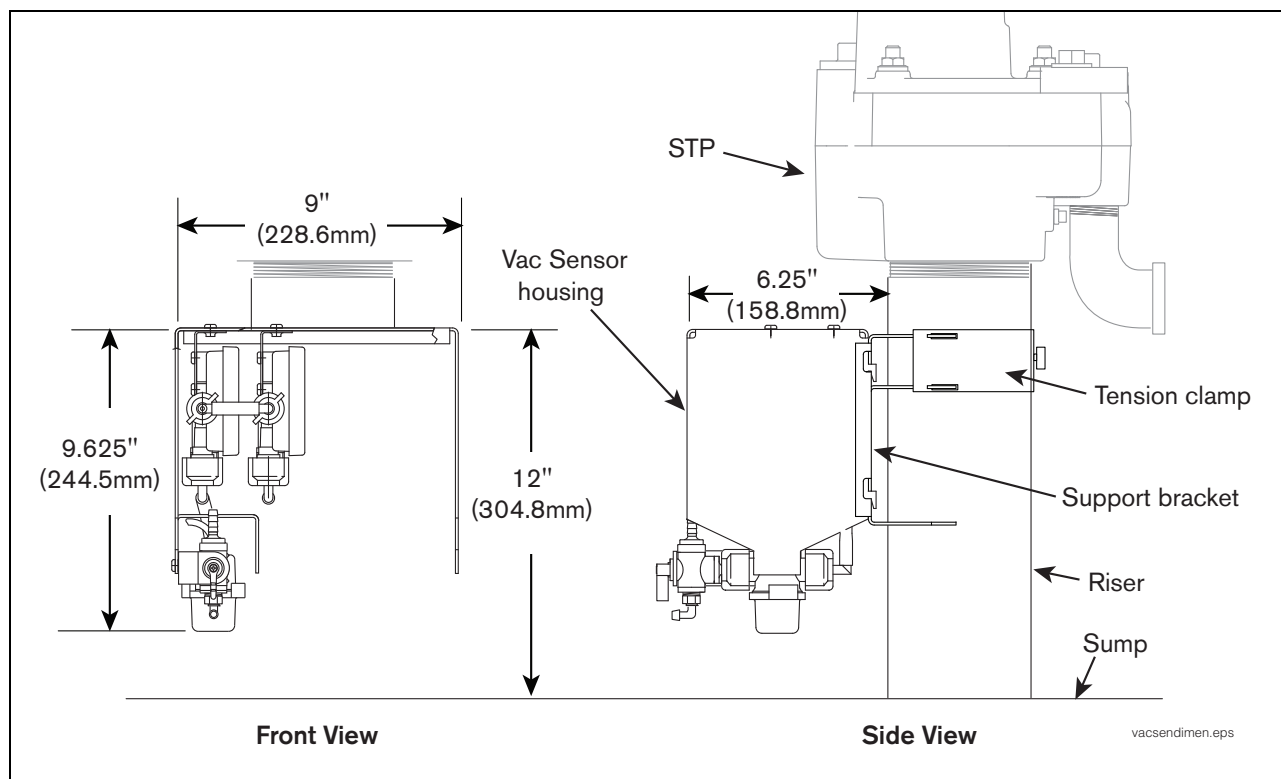


Figure 2-2.- Vac Sensor Assembly Dimensions

Field Assembling Vac Sensor/Vac Float modules

If you are field assembling the Vac Sensor/Vac Floats into the Vac Sensor housing continue to Step 1. If you are installing the pre-assembled 2, 3, or 4 Vac Sensor kit go to "Installing Vac Sensor Housing Support Bracket" on page 2-5.

1. Get the Vac Sensor modules and brackets from each of the secondary piping vacuum monitoring kits. If a tank interstice is being monitored, also get the Vac Sensor module and bracket from that kit.
2. Get the Vac Sensor housing from the mounting kit and attach each of the Vac Sensors (up to 4) to the top of the housing using #10 x 3/8" self-tapping screws as shown in Figure 2-3. Mount the Vac Sensors with the 'STP Siphon' labeled port facing the front of the housing.
3. For Vac Sensors requiring Vac Floats, continue to Step 4. For the Vac Sensor monitoring the tank interstice skip to step.
4. Get the Vac Floats, support brackets, plastic valves and #10 x 1/2" self-tapping screws from the secondary piping vacuum monitoring kits.

If you are not monitoring a tank interstice, there is a maximum of two left-hand Vac Sensor/Float mounting positions and two right-hand Vac Sensor/Float mounting positions in the Vac Sensor Housing (Figure 2-3). If a tank interstice is being monitored, then one of the four Vac Sensors will have no Vac Float attached.

5. Get the plastic valves, barbed elbows, tapered bushings and cord grip nuts from the Vac Float kits. Insert bushings and screw cord grip nuts into the two ports of the Vac Float. Insert a valve into one port and a barbed

elbow into the other port of each Vac Float. Orient elbow and valves in Vac Floats as shown in Figure 2-4 then tighten nuts to secure the fittings.

6. Get the angled support brackets from each Vac Float kit. Depending on the Vac Float's position in the housing, orient the bracket so that when you slip the large hole in the front of the bracket over the valve handle, the two holes in the side of the bracket are in line with the two holes in the side of the Vac Float body as shown in Figure 2-3. Secure the Vac Float assembly to the housing using two #10 x 1/2" self-tapping screws which screw into the two holes in the side of the Vac Float.

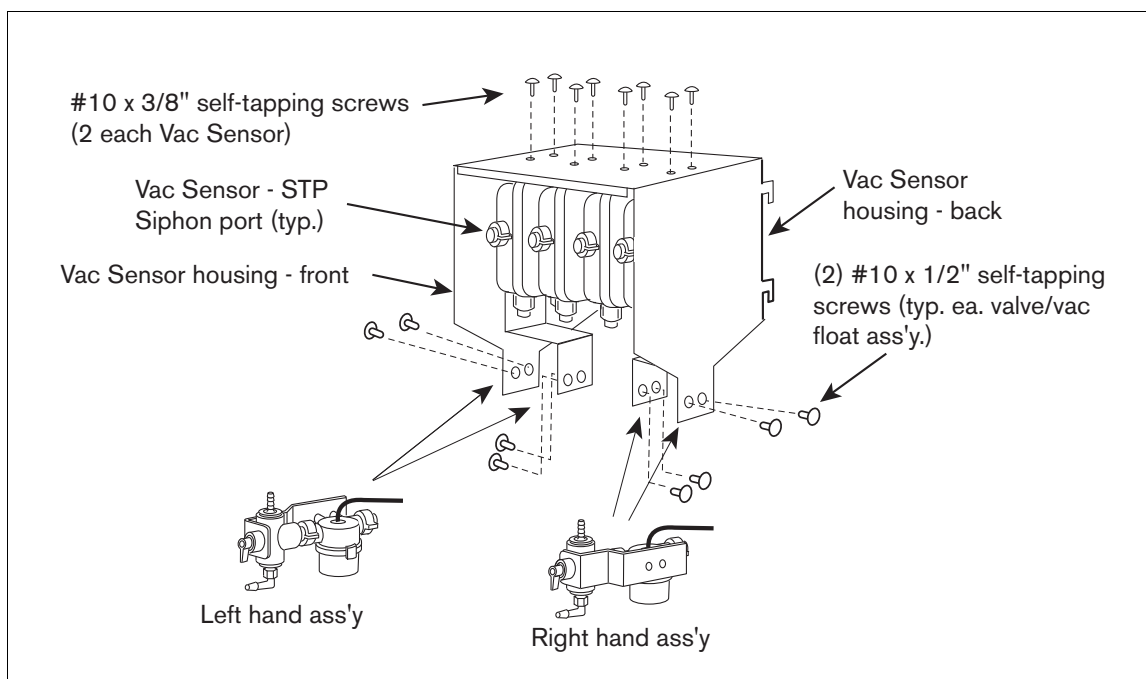


Figure 2-3.- Attaching Four Vac Sensors/floats To The Housing

7. Get barbed elbows, tapered bushings and cord grip nuts (1 each for each Vac Sensor) from the secondary piping vacuum monitoring kits. Insert a tapered bushing and barbed elbow in the bottom port labeled VAC TEST (embossed on cover) of one of the Vac Sensors. Orient the elbows as shown in the Figure 2-4, then tighten the cord grip nut.
8. From the kit's 1/4" tubing, cut a piece of the 1/4" tubing and connect the VAC TEST port in one of the Vac Sensors to the rear elbow fitting in one of the Vac Floats (preferably the one under it). Keep the connection kink free and as short as possible (see Figure 2-4). Repeat this procedure for each additional Vac Sensor/Vac Float pair. Skip to Step 10.
9. If the tank interstice is monitored, get a barbed elbow, tapered bushing and cord grip nut (1 each) from the Vac Sensor tank interstice monitoring kit. Insert a tapered bushing and barbed elbow into the bottom port labeled VAC TEST (embossed on cover) of the Vac Sensor without a Vac Float. Orient the elbow as shown in the Figure 2-5, then tighten the cord grip nut.
10. Get the barbed tees, tapered bushings, cord grip nuts and one barbed elbow from the vacuum monitoring kits.
11. Looking at the front of the Vac Sensor housing, insert the elbow in the side vacuum port bushing labeled 'STP Siphon' (on the Vac Sensor cover) in the Vac Sensor closest to the side of the housing. Orient the elbow so that the open half is horizontal and pointing to the other Vac Sensors (see Figure 2-6). Insert a tee in the same vacuum port in each of the other Vac Sensors. Orient the tees in the horizontal position, except the Vac Sensor closest to the other side of the Vac Sensor housing. Remove this tee and orient it so that one end points

toward the other tees and one end points out at you then insert the inlet end into the bushing. Measure and cut a piece of the tubing approximately 1-3/4" (44.5mm) long to connect each of the tees and elbow as shown in Figure 2-6. Once the tubing pieces are cut, remove the barbed elbows and tees to push on the tubing pieces, then reinsert this connected assembly back into the Vac Sensor bushings and tighten the nuts.

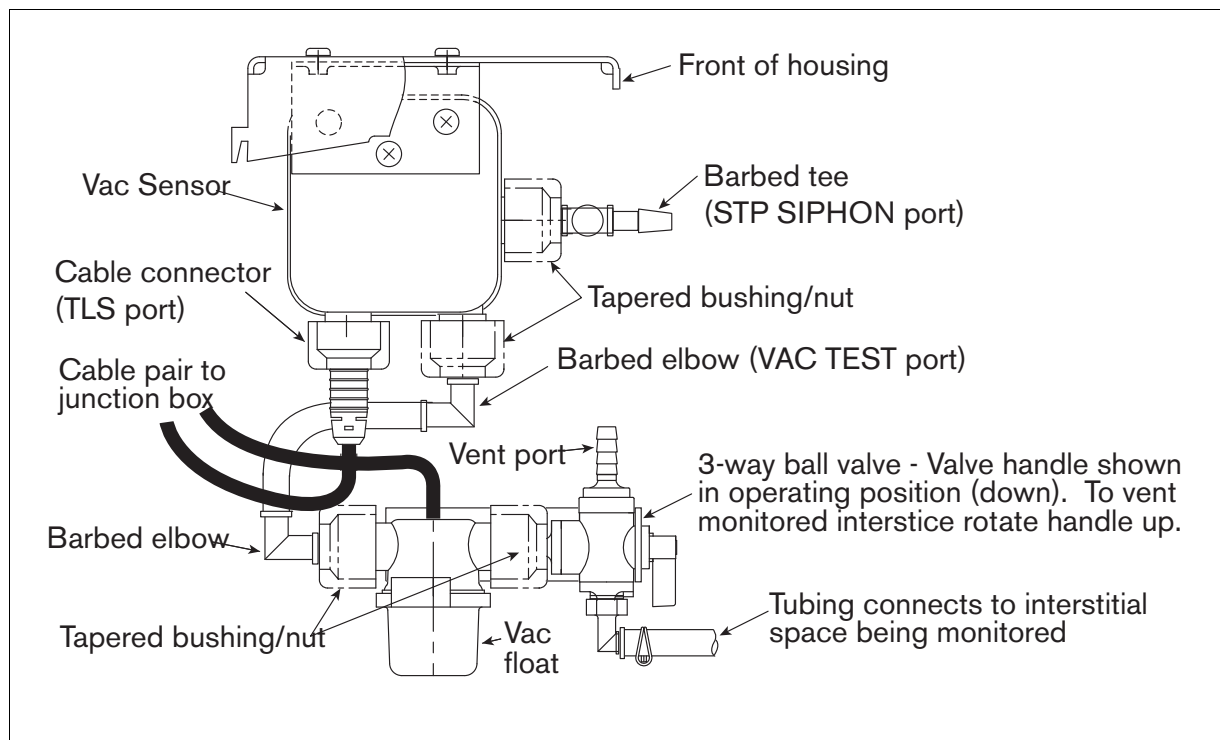


Figure 2-4.- Vac Sensor/Vac Float Tubing Connections

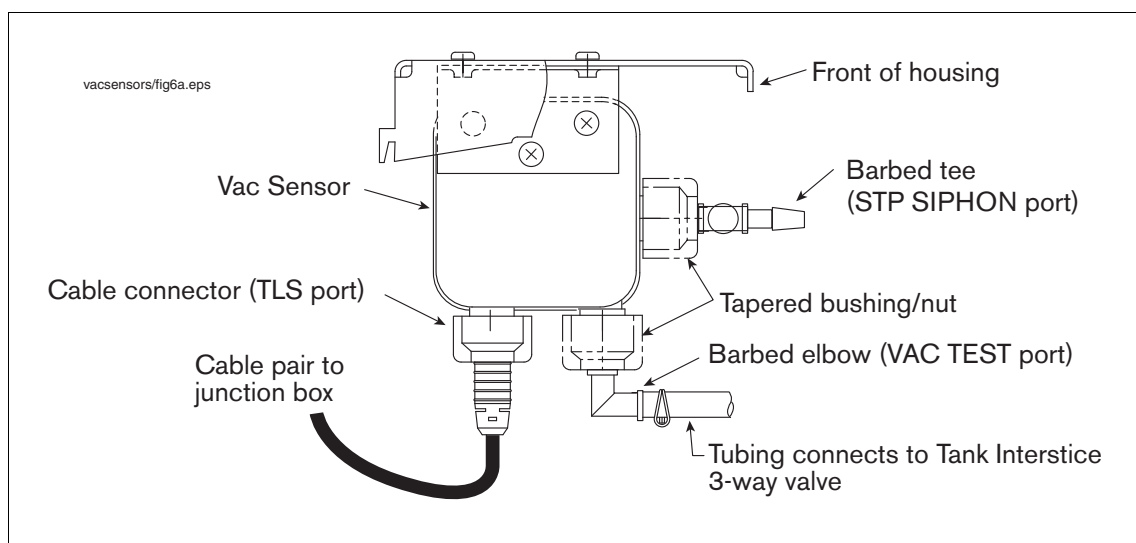


Figure 2-5.- Vac Sensor /Tank Interstice Tubing Connections

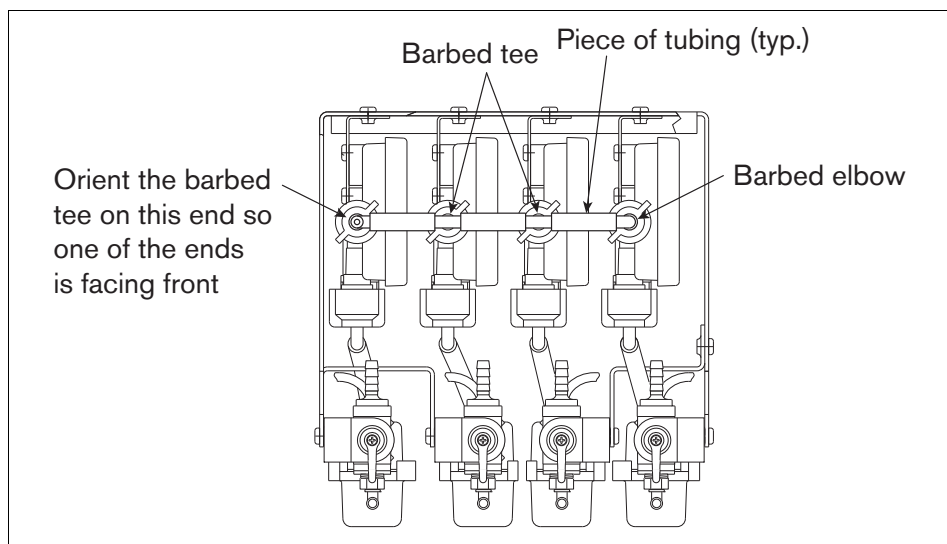


Figure 2-6.- Attaching Vacuum Tubing Between Vac Sensors

Installing Vac Sensor Housing Support Bracket

Get the Vac Sensor housing support bracket and the curved tensioning clamp from the mounting kit. Hold the bracket against the STP riser. Place the curved clamp around the back of the riser and hook the four notches in the clamp over the four barbs in the top of the bracket (see Figure 2-7). Position the bracket so the top of bracket is at least 12 inches (304.8mm) above the containment sump floor and hand tighten the tension adjust knob on the back of the clamp until the assembly is secure.

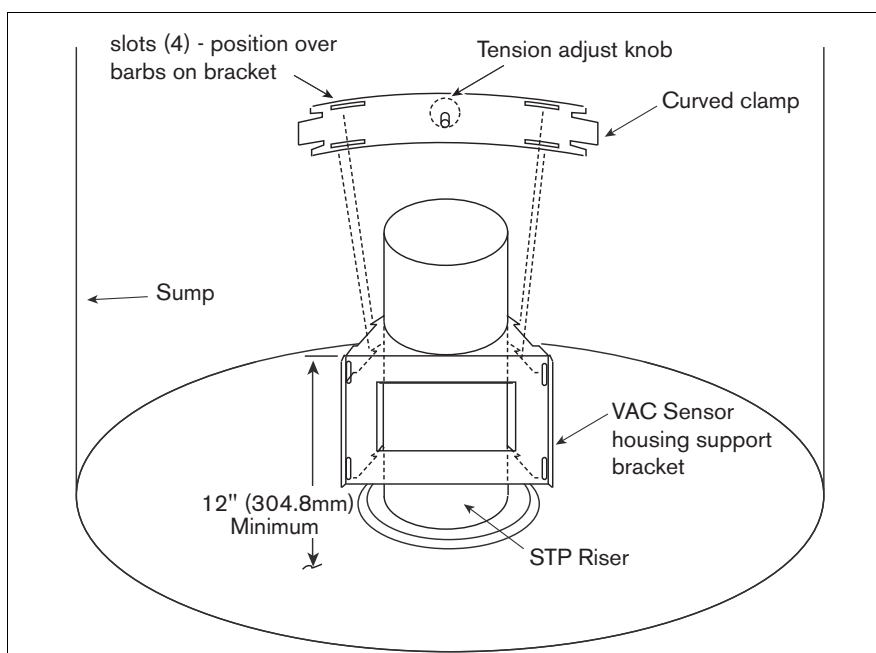


Figure 2-7.- Attaching Vac Sensor Housing Support Bracket

Attaching Vac Sensor Cables and Tagging Vac Sensor/Vac Float Pairs

1. Next get the Vac Sensor cables (with connectors on one end) from the kit(s) and attach the connector of each cable to each of the Vac Sensor ports labeled TLS (on the Vac Sensor cover). Uncoil each of the Vac Float cables. Notice that each Vac Sensor, except the one for the tank interstice, has a short piece of tubing connecting it to a Vac Float beneath it (Figure 2-8). A Vac Sensor/Vac Float tubing connected pair must be wired together in the junction box.
2. Use a felt pen and write on the top of the Vac Sensor housing to what device each of the Vac Sensors below will be attached (see Figure 2-9). For example, P = product line, S = containment sump interstice, V = vapor line, and T = tank interstice. NOTE: If the mark you wrote on the housing over the first Vac Sensor was 'P', locate the cable ends of this Vac Sensor/Vac Float pair, tape them together about every foot along their length and at their ends, and tag the end of this cable pair 'P' or 'Product Line Vac Sensor'. Repeat this taping and tagging for each of the Vac Sensor/Vac Float pairs. The Vac Sensor marked 'T' will only have one cable, so tag the end of this cable 'T' for 'Tank Vac Sensor'.

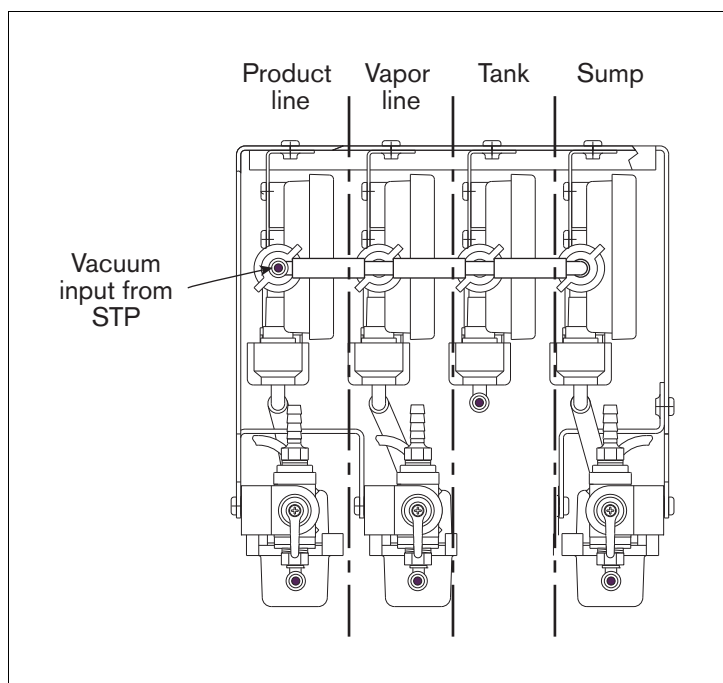


Figure 2-8.- Identifying Vac Sensor/Vac Float Pairs

Installing Vac Sensor Housing onto Support Bracket

Route all of the cables through the opening in the mounting bracket and attach the Vac Sensor housing to the bracket by pushing the four hooks on the rear of the housing into the four slots in the bracket (see Figure 2-9)

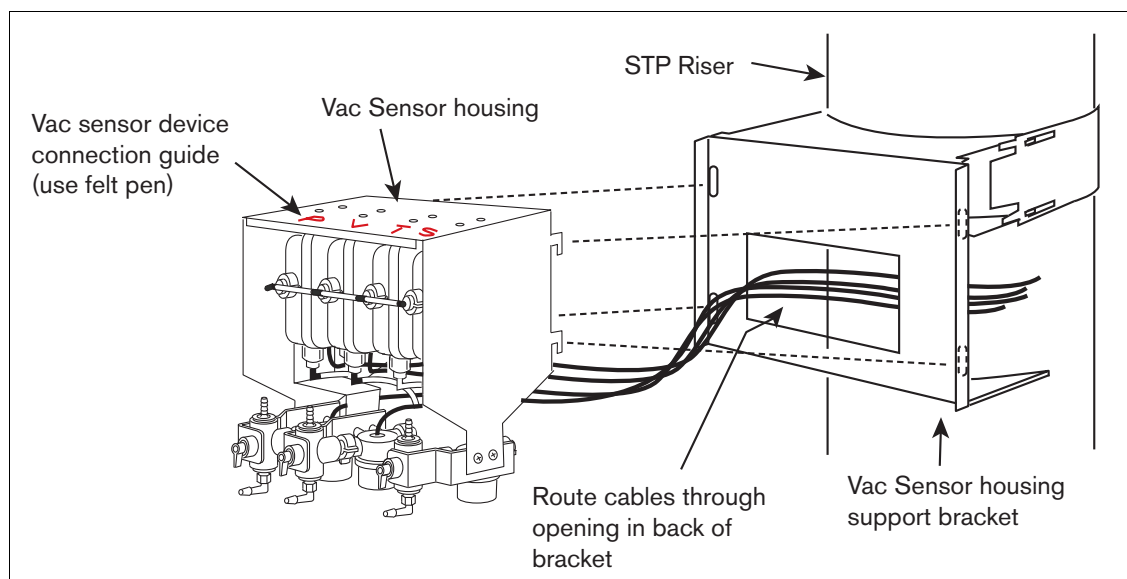


Figure 2-9.- Attaching Vac Sensor Housing To Support Bracket

Vacuum Connections within Containment Sump

VACUUM CONNECTIONS TO A DOUBLE-WALL PRODUCT LINE

1. Get a 1/4" NPT/ barbed adapter and spring clamp from the Vac Sensor install kit.
2. Apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant (herein after referred to as sealant) to the threads of the 1/4" NPT barbed fitting and screw it into the 1/4" NPT port in the vacuum termination fitting of the product line (Figure 2-10).

NOTICE In some installations, the double-walled piping is equipped with one or more Schrader valves. You can connect the vacuum tubing directly to the Schrader valve using the Schrader fitting (P/N 576008-672 for North American installations; P/N 576008-504 for EU installations). Any unused Schrader fittings must be capped to avoid leaks.

3. Get the 1/4" ID tubing from the install kit and measure a piece that will reach the barbed fitting on the bottom of the plastic valve (see Figure 2-4) that is connected to the Vac Sensor/Vac Float pair you labeled 'P'. Plan enough tubing so that it isn't stretched between fittings or have any sharp bends/kinks in it. Cut and install this tubing and secure tubing ends with spring clamps.

VACUUM CONNECTIONS TO A DOUBLE-WALL VAPOR RETURN LINE

Repeat steps 1 - 2 of the Product Line connection instructions for the vapor return line connection, except:

- Install the 1/4" NPT barbed fitting in the vacuum termination port of the vapor return line (see Figure 2-10),
- Connect one end of the tubing to the vapor return line barbed adapter and the other end to the barbed fitting on the bottom of the plastic valve that is connected to the Vac Sensor/Vac Float pair you labeled 'V'. Plan enough tubing so that it isn't stretched between fittings or have any sharp bends/kinks in it. Cut and install this tubing and secure tubing ends with spring clamps.

VACUUM CONNECTIONS TO A DOUBLE-WALL CONTAINMENT SUMP

Repeat steps 1 - 2 of the Product Line connection instructions for the sump interstice connection, except:

- Install the 1/4" NPT barbed fitting in the interstitial space access port provided in the sump's wall (if multiple ports are provided, select the lowest one).
- Connect one end of the tubing to the sump interstice barbed fitting and the other end to the barbed fitting on the bottom of the plastic valve that is connected to the Vac Sensor/Vac Float pair you labeled 'S'. Plan enough tubing so that it isn't stretched between fittings or have any sharp bends/kinks in it. Cut and install this tubing and secure tubing ends with spring clamps.

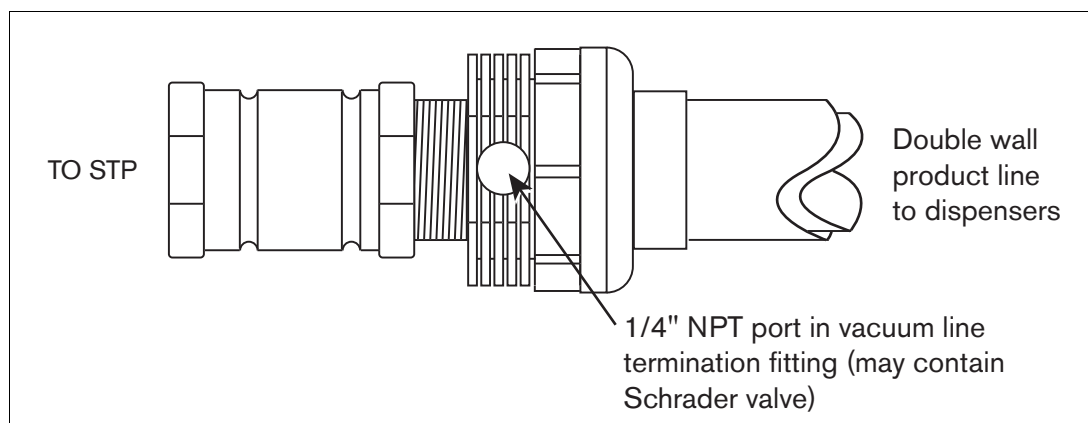


Figure 2-10.- Example Vacuum Termination Fitting - Double-wall Pipe

VACUUM CONNECTIONS TO A DOUBLE-WALL STEEL TANK

NOTICE Double-walled tanks must provide access for installation of a liquid sensor at the lowest point of the interstice.

1. Get the tank's interstitial riser cap, interstitial sensor, cord grip components, 3-way ball valve, 1/4" NPT close nipple, 1/4" NPT/barbed adapter fitting, and spring clamps from the kit.
2. Assemble the cord grip components and apply sealant to its threads. Screw it into the 1/2" NPT hole in the cap.
3. Slowly lower the steel tank interstitial sensor into the tank riser until it rests on the bottom of the riser. Push the end of the sensor's cable through the loosened cord grip in the cap - being careful not to lift the sensor off bottom. Apply sealant to the threads of the riser pipe and screw on the cap until tight. Tighten the cable cord grip.
4. Apply sealant onto the threads of one end of the nipple and screw it into the 1/4" NPT port in the cap. Apply sealant to the other end of the nipple and screw on the 3-way ball valve. Apply sealant to the threaded end of the barbed adapter and screw it into the side port of the 3-way ball valve. (see Figure 2-11).
5. Measure a length of 1/4" ID tubing to connect the VAC TEST port on the Vac Sensor (labeled 'T') to the tank's interstitial 3-way ball valve. Plan enough tubing to avoid sharp bends in it or stretching it. Cut and install this tubing and secure tubing ends with spring clamps.
6. The Vac Sensor labeled 'T', and which is connected to the 3-way ball valve in the tank interstice riser cap, must be wired together with the tank interstice liquid sensor in the junction box. Locate the ends of the Vac Sensor cable labeled 'T' and the tank interstitial liquid sensor cable, tape them together, and tag them 'Tank Vac Sensor'.

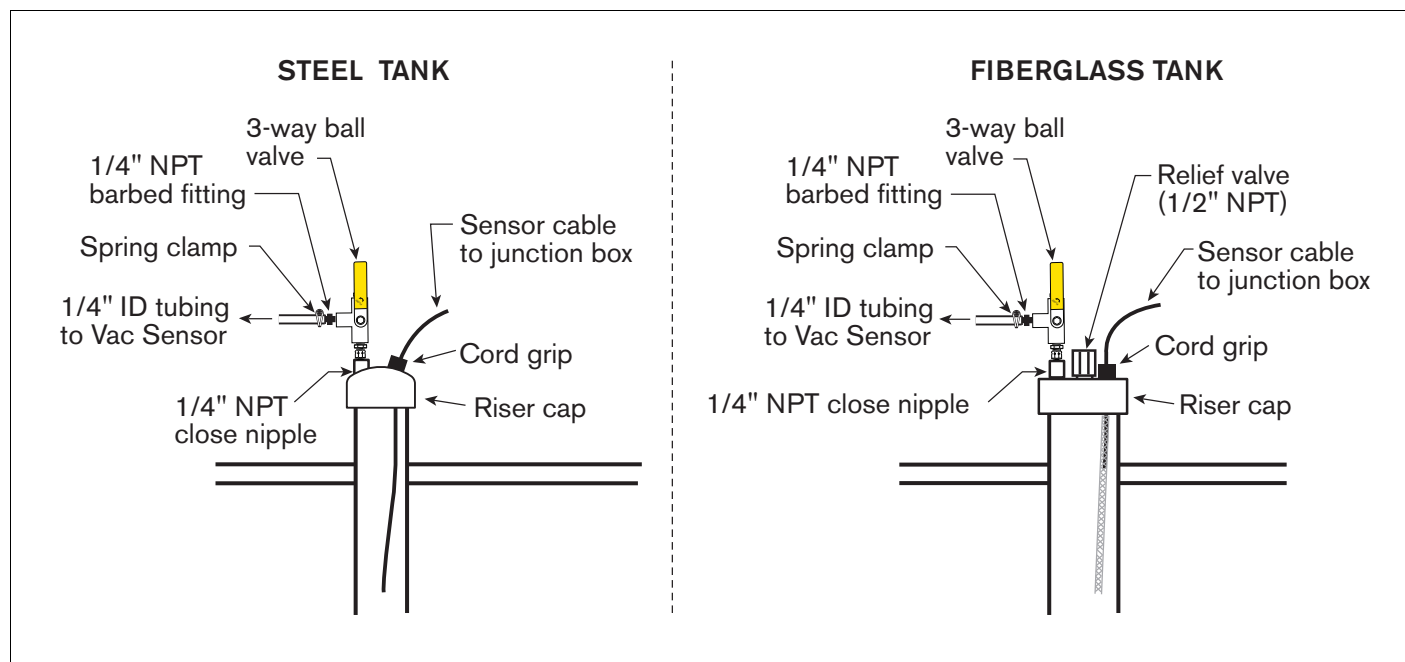


Figure 2-11.- Example Tank Interstitial Sensor Riser Cap Connections - Steel And Fiberglass Tanks

VACUUM CONNECTIONS TO A DOUBLE-WALL FIBERGLASS TANK

1. Get the tank's interstitial riser cap, interstitial sensor, cord grip components, 3-way ball valve, 1/4" NPT close nipple, 1/4" NPT/barbed adapter fitting, spring clamps, and relief valve from the kit.
2. Assemble the cord grip components and apply sealant onto its threads. Screw it into one of the 1/2" NPT holes in the cap.
3. Install the fiberglass tank interstitial sensor into the tank riser following the instructions accompanying the sensor (manual P/N 576013-617). Once installed, push the end of the sensor's cable through the loosened cord grip in the cap - being careful not to alter the sensor's position. Apply an adequate amount of sealant to the threads of the riser pipe and screw on the cap until tight. Tighten the cable cord grip.
4. Apply sealant onto the threads of one end of the nipple and screw it into the 1/4" NPT port in the cap. Apply sealant to the other end of the nipple and screw on the 3-way ball valve. Apply sealant to the threaded end of the barbed adapter and screw it into the side port of the 3-way ball valve. (see Figure 2-11).
5. Apply sealant onto the threads of the relief valve and screw it into the other 1/2" NPT hole in the cap.

⚠ CAUTION You must install the relief valve in the fiberglass tank riser cap or damage to the tank may occur!

6. Measure a length of 1/4" ID tubing to connect the VAC TEST port (ref. Figure 12) on the Vac Sensor labeled 'T' to the tank's interstitial 3-way ball valve. Plan enough tubing to avoid sharp bends in it or stretching it. Cut and install this tubing and secure tubing ends with spring clamps.
7. The Vac Sensor labeled 'T', and which is connected to the 3-way ball valve in the tank interstice riser cap, must be wired together with the tank interstice liquid sensor in the junction box. Locate the ends of the Vac Sensor cable labeled 'T' and the tank interstitial liquid sensor cable, tape them together, and tag them 'Tank Vac Sensor'.

VACUUM CONNECTIONS TO SIPHON PORT OF THE PUMP

- Figure 2-12 is an example diagram of the vacuum connection at the The Red Jacket STP.

NOTICE It is recommended that you replace the Siphon Jet assembly on FE Petro pumps used with the Vac Sensor.

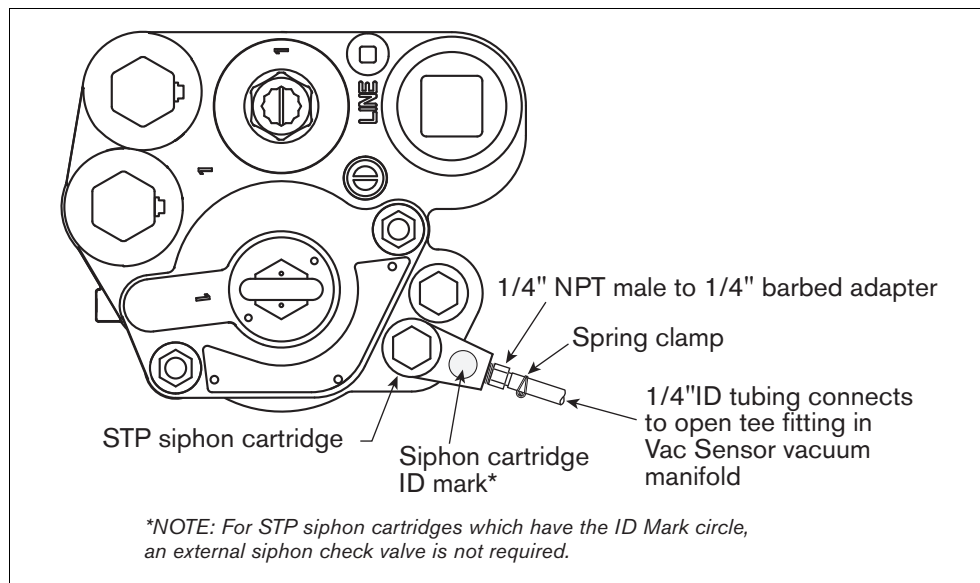


Figure 2-12.- Example Vacuum Source Connection At The Red Jacket STP

- Measure a length of 1/4" ID tubing to connect 1/4" ID barbed tubing fitting in the siphon cartridge port and the vacuum input open tee of the Vac Sensor (see Figure 2-13). Plan enough tubing to avoid sharp bends in it or stretching it. Cut and install this tubing and secure tubing ends with spring clamps.

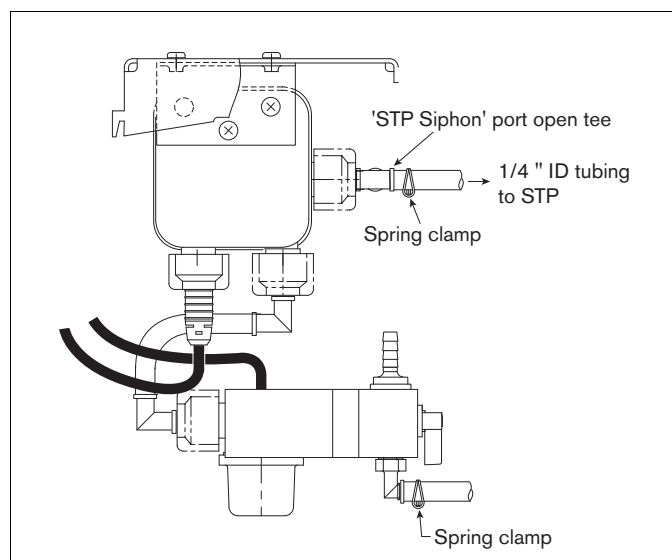


Figure 2-13.- Connecting Vacuum Tubing From Pump Siphon Port To Vac Sensor

Epoxy Sealing Vac System Field Wiring Connections

1. Tie wrap the loose cable pairs into a bundle going from the Vac Sensor housing to the containment sump junction box(es).
2. Get necessary cord grip bushings from the kits - one for each Vac Sensor, Vac Float, and the Tank interstitial sensor cable that will enter the junction box(es) in the containment sump. Loosen the cord grips and screw each one into a junction box port.
3. Push the first Vac Sensor/Vac Float cable pair into adjacent cord grips (keep the pairs together as the two cables will typically be wired to one cable going to the TLS Console). Make sure all of the cables to the console are tagged (e.g., Tank 1 product line, Tank 1 vapor line) to facilitate TLS setup.
4. Strip back the leads of one of the cables from the TLS Console 3/8" (10mm). Strip back the leads of the Vac Sensor/Vac Float pairs 3/8". Using wire nuts from the kits attach the wires as per the diagram in Figure 2-14. the

NOTICE The Vac Sensor cable has three wires and the Vac Float cable has two wires.

5. Seal wire nuts with epoxy sealant following the instructions in Figure 2-15.
6. Connect the remaining Vac Sensor/Vac Float pairs and the Vac Sensor/Tank Float pair as discussed above, sealing each set of wires in epoxy sealant packs.

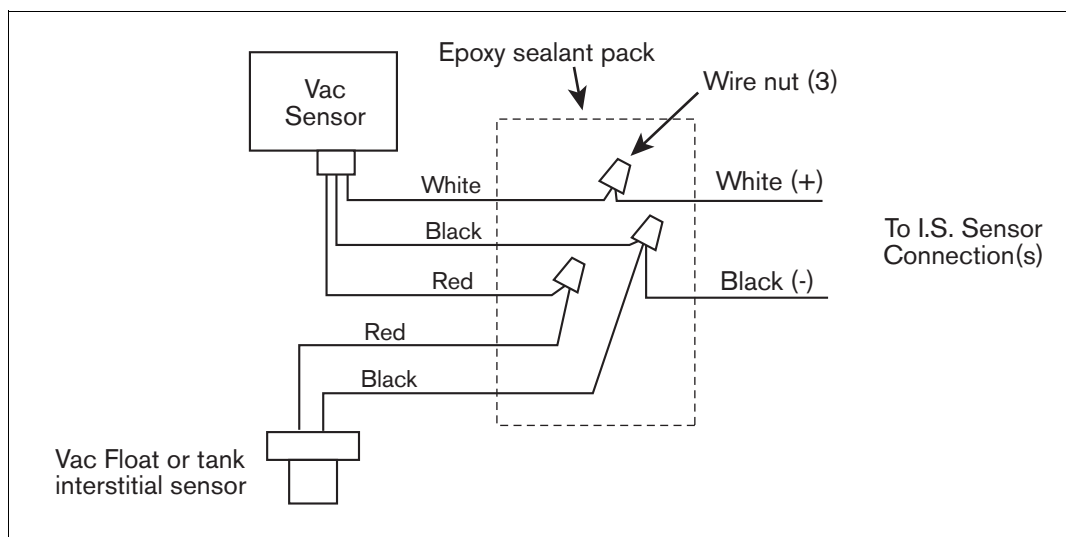
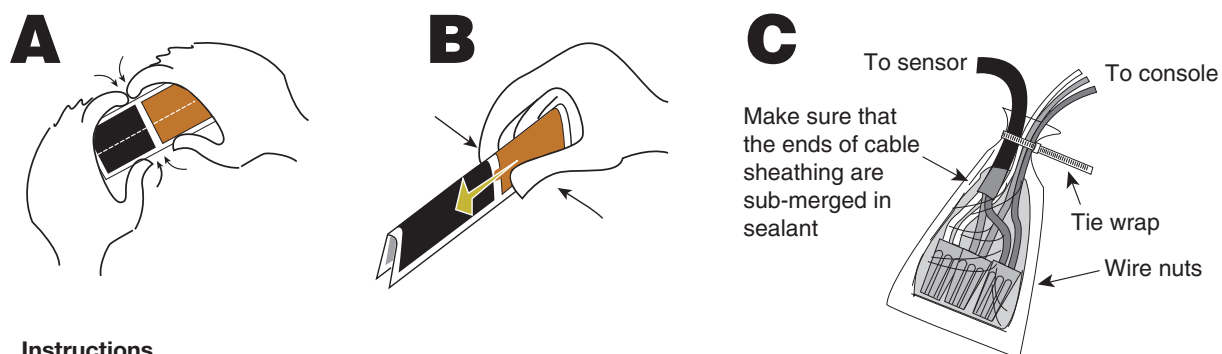


Figure 2-14.- Field Wiring Connections



Instructions

NOTICE When temperature is below 50°F (10°C), keep resin in a warm place prior to mixing (e.g., in an inside pocket next to body).

1. Open epoxy sealant package, and remove resin pack.
2. Holding resin pack as shown in A, bend pak along long length.
3. As shown in B, firmly squeeze the RED SIDE of the resin, forcing it through the center seal and into BLACK SIDE.
4. Mix thoroughly to a uniform color by squeezing contents back and forth 25–30 times.
5. Squeeze mixed, warm resin into one end of pack and cutoff other end.
6. Slowly insert wiring connections into sealing pack until they fit snugly against the opposite end as shown in C.
7. Twist open end of bag and use tie wrap to close it off and position the tie wrapped end up until the resin jells.



CAUTION

Epoxy sealant is irritating to eyes, respiratory system, and skin. Can cause allergic skin reaction. Contains: epoxy resin and Cycloaliphatic epoxycarboxylate.

Precautions: Wear suitable protective clothing, gloves, eye, and face protection. Use only in well ventilated areas. Wash thoroughly before eating, drinking, or smoking.

consoles/epxy3warn.eps

Figure 2-15.- Epoxy Sealing Wiring Connections

3 Vac System Field Wiring - TLS-350/350R Consoles

Connecting Vac Sensor to TLS-350/350R Console

1. Connect each Vac Sensor/Vac Float pair and the Vac Sensor/ Tank Interstitial Float pair cables to either a Smart Sensor with Pressure Sensor module or a Smart Sensor Interface module as shown in Figure 3-1. Note: at least one Smart Sensor with Pressure Sensor module must be installed in the console for proper Vac Sensor operation.
2. System programming of the Vacuum Sensors is performed following instructions in the TLS-3XX Setup Manual.

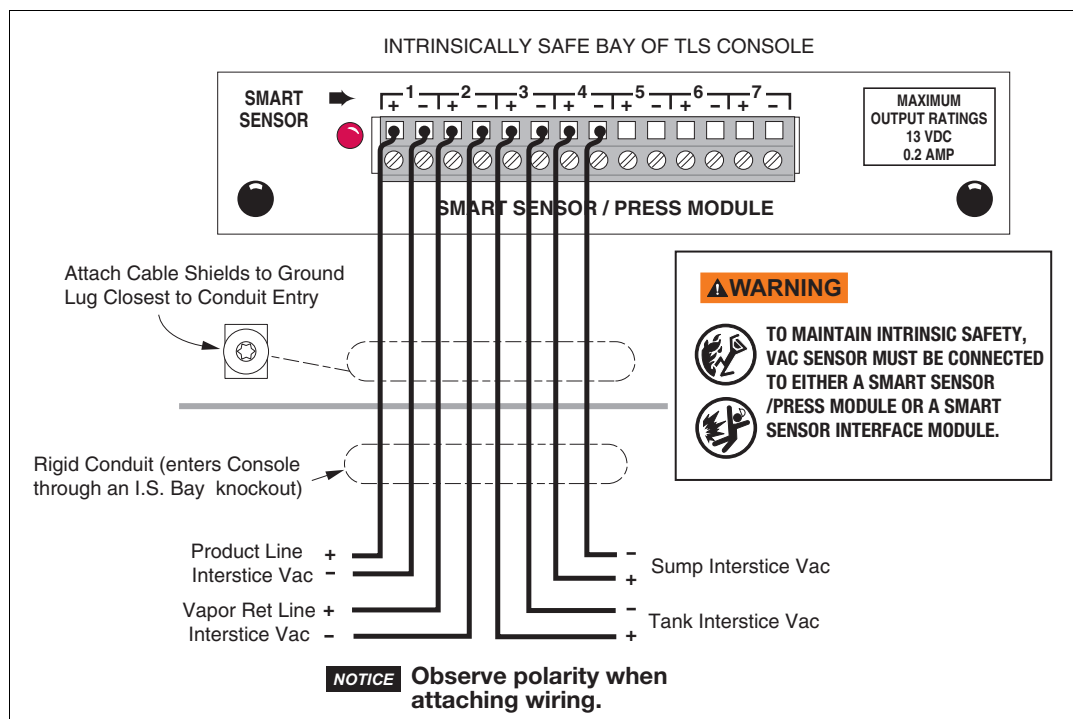


Figure 3-1.- Attaching Vac Sensors To Smart Sensor With Pressure Sensor Module

Connecting Pump Control to TLS-350/350R Console

FOR SITES WITH PLLD OR WPLLD LEAK DETECTION

Pump control for Vac Sensors is shared with PLLD or WPLLD line leak detection. Connecting PLLD/WPLLD leak detection as per the instructions provided with that equipment is all that is required.

FOR SITES WITHOUT PLLD OR WPLLD LEAK DETECTION

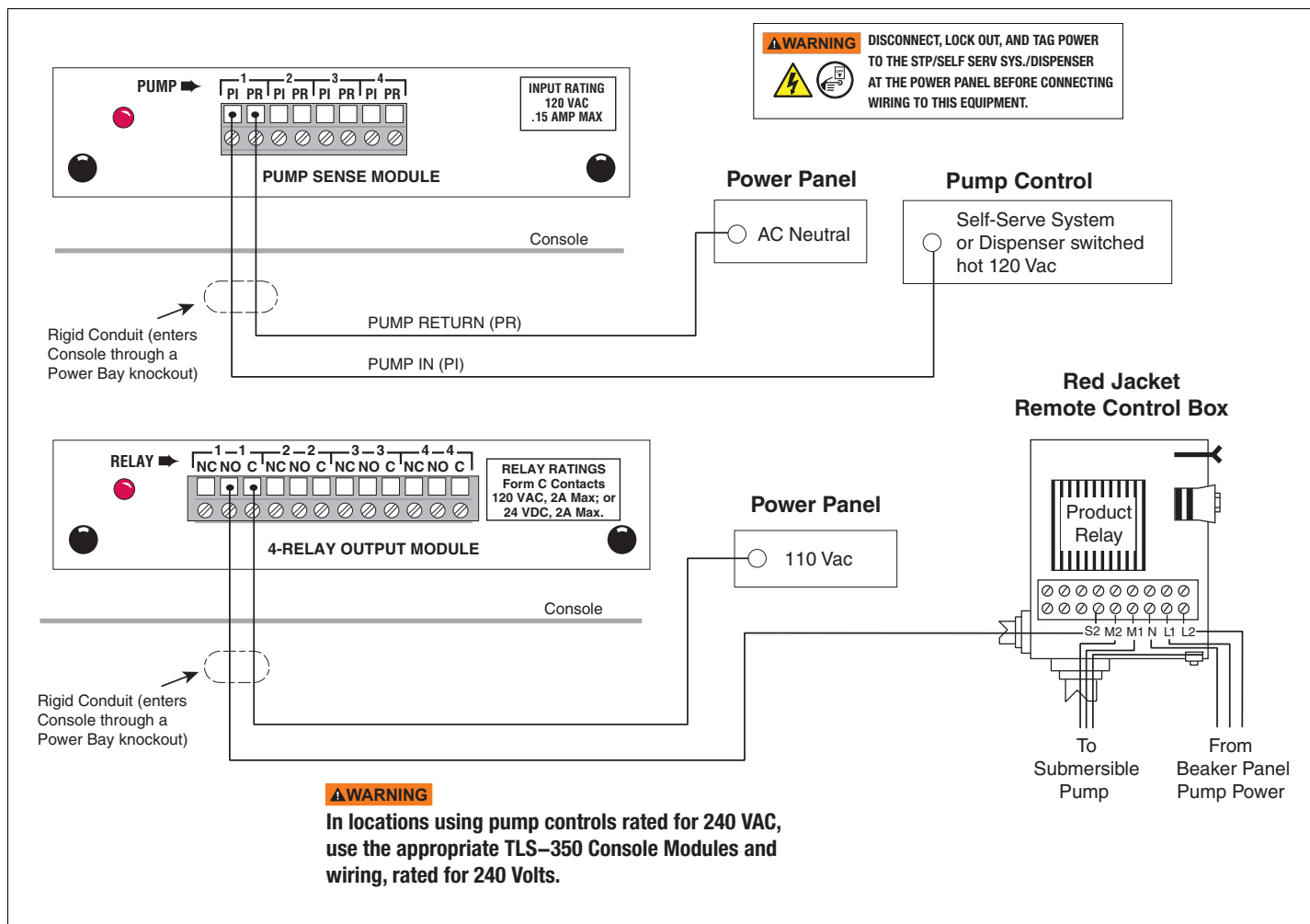
A Pump Sense module and a 4-Relay module are required in the TLS Console for Vac Sensor pump control.

Field Wiring:

- For module connections with Red Jacket pumps see Figure 3-2. For module connections with non-Red Jacket pumps see Figure 3-3.

Console Setup:

- Pump Sense setup - assign each tank to Pump Sense device
- Output Relay setup - select 'Pump Control Output'

**Figure 3-2.- Connecting Pump Sense And 4-Relay Modules - Red Jacket Pumps**

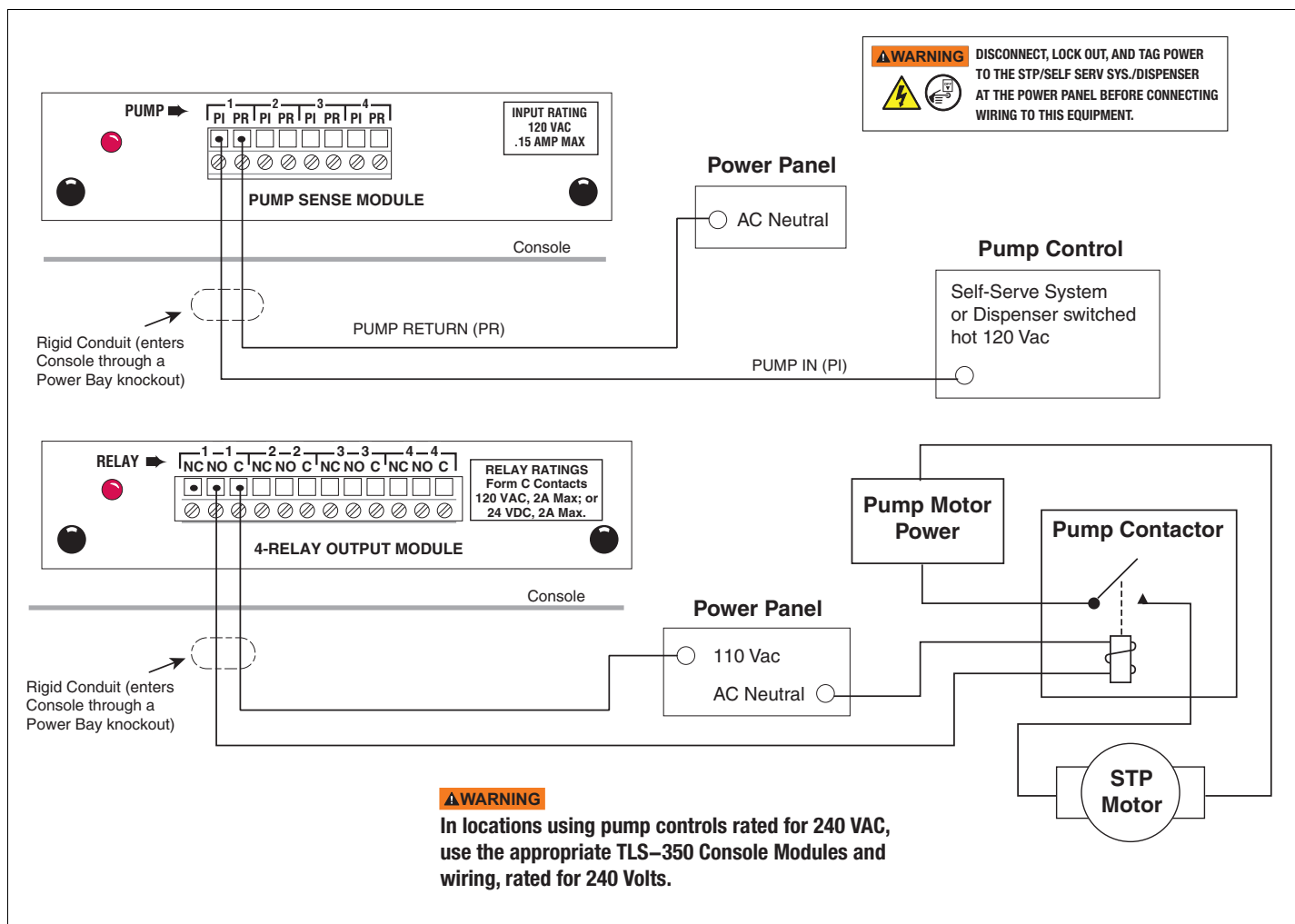


Figure 3-3.- Connecting Pump Sense And 4-Relay Modules - Non-Red Jacket Pumps

Disable Extended Run Feature in the Pump Controller

NOTICE Certain pump controllers may be programmed to turn off the pump after an extended run period and post an ER (Extended Run) error in the controller. Because the Vac Sensors may require the pumps to run for several hours and possibly triggering this error, disable this ER feature in the pump controller. Refer to the Pump Controller's documentation for instructions on how to disable the Extended Run feature.

4 Vac System Testing - TLS-350/350R Consoles

This section describes a sequence of procedures and tests necessary to complete the Vac Sensor installation:

1. ATM Pressure Sensor setup
2. Vac Sensor setup
3. Vacuum integrity test prior to filling tank*
4. Manual test*
5. Operability test

**Only one of these two tests is required to complete the installation.*

ATM Pressure Sensor Setup

The ATM Pressure Sensor is factory installed in the Smart Sensor / Press module and preassigned to channel 8. At least one Smart Sensor / Press module, which contains the ATM Pressure Sensor, must be installed in the console. You must configure at least one ATM Pressure Sensor for use by the Vac Sensors or a Setup Data Warning will occur. NOTE: if more than one Smart Sensor / Press module is installed, only one ATM Pressure Sensor needs to be configured.

Look in console and note the slot position of the SmartSensor / Press module. Enter the Setup Mode and press the FUNCTION key until you see the message:

**SMARTSENSOR SETUP
PRESS <STEP> TO CONTINUE**

Press STEP until you see the message:

**SS CONFIG - MODULE *n*
SLOT *x* - X X X X X X X X**

Where *x* is the slot number containing the SmartSensor / Press module. Press the → key to move the cursor to the last (8th) X. Press CHANGE and the message below should appear:

**SLOT *x* - X X X X X X X 8
PRESS <STEP> TO CONTINUE**

Press STEP:

**ENTER SMARTSENSOR LABEL
s 8:**

NOTE: In the example above, the ATM P sensor position is 8 but it could be 16, 24, 32, or 40 depending on the Smart Sensor's module number.

Press CHANGE and enter a label:

**ENTER SMARTSENSOR LABEL
s 8: (ATMP Sensor Label)**

Press ENTER to accept your label:

s 8: (ATMP Sensor Label)
PRESS <STEP> TO CONTINUE

Press STEP:

s 8: SELECT SS CATEGORY
UNKNOWN

Press CHANGE until you see the message:

s 8: SELECT SS CATEGORY
ATM P SENSOR

Press ENTER to accept the category. Press STEP, then BACKUP to return to the configuration display for Smart Sensor module 1:

SS CONFIG - MODULE 1
SLOT x - X X X X X X X

This completes the ATM Pressure Sensor configuration.

Vac Sensor Setup

IDENTIFYING VAC SENSOR ZONES

Before configuring the Vac Sensors, enter the Monitored Zone, Smart Sensor module number, and channel number for each Vac Sensor attached to the console in the worksheet in Table 4-1 below. NOTE: The Vac Sensor Zone Worksheet and the Secondary Containment Volumes By Manufacturer index are both included in the installation kit (P/N 577013-849). Use the Containment Volume index to calculate a zone's interstice volume in gallons. For example, if Tank 1's double wall product piping uses 100 feet of Ameron Dualoy 3000/L piping, you would multiply 0.2186 (from the Secondary Containment Volume index) x 100 feet = 21.86 gallons. For the Tank 1 product piping zone you would enter 21.9 (round to nearest tenth of a gallon) as the calculated zone volume. If the Tank 1 sump is a Containment Solutions 42" Double wall tank sump, you would multiply 0.8216 (from the Secondary Containment Volume index) x 3.5 feet = 2.88 gallons as the calculated zone volume.

Table 4-1.- Vac Sensor Zone Worksheet

Vac Sensor Monitored Zone	SS Module Number	SS Module Channel Number	Calculated Zone Volume (Gallons)
	1	1	
	1	2	
	1	3	
	1	4	
	1	5	
	1	6	
	1	7	

Table 4-1.- Vac Sensor Zone Worksheet

Vac Sensor Monitored Zone	SS Module Number	SS Module Channel Number	Calculated Zone Volume (Gallons)
	1	8	
	2	9	
	2	10	
	2	11	
	2	12	
	2	13	
	2	14	
	2	15	
	2	16	
	3	17	
	3	18	
	3	19	
	3	20	
	3	21	
	3	22	
	3	23	
	3	24	
	4	25	
	4	26	
	4	27	
	4	28	
	4	29	
	4	30	
	4	31	
	4	32	
	5	33	
	5	34	
	5	35	
	5	36	
	5	37	
	5	38	
	5	39	
	5	40	

PERFORMING VAC SENSOR SETUP

After filling in the Vac Sensor Zone Worksheet, enter the Setup Mode and press the FUNCTION key until you see the message:

SMARTSENSOR SETUP
PRESS <STEP> TO CONTINUE

Press STEP until you see the message:

SS CONFIG - MODULE 1
SLOT x - X X X X X X X

Following the completed Vac Sensor Zone Worksheet, configure each Vac Sensor channel for all SmartSensor modules. NOTE: Once the console communicates with a Vac Sensor (approximately 2 minutes after configuration), it automatically selects the Vac Sensor SS Category for that sensor.

When all Vac Sensors have been configured, if necessary, press Tank/Sensor until you see the message:

s 1: VAC SENSOR SETUP
PRESS <ENTER>

Press ENTER:

s 1: SELECT PUMP #
NONE

You must select the pump that will provide the source of vacuum for this Vac Sensor or a Setup Data Warning will be posted for this Vac Sensor. If necessary, press CHANGE until the correct pump's control device displays [QX (PLLD), WX (WPLLD), or RX (Output Relay)]. NOTE: an Output Relay must be set to Pump Control Output to be assigned as a pump. If the selected pump output relay is not assigned to a pump sense device, a Setup Data Warning for this Vac Sensor will be posted.

Press ENTER to confirm your entry. Press STEP to continue:

s 1: (Vacuum Label)
VOLUME: 501

Referring to your previously completed volume worksheet, enter the volume in gallons of the interstitial space being monitored by this Vac Sensor. The permitted range is 0.1 to 500 gallons (0.378 to 1892.7 litres). Default is 501 (1896.4 Litres). A Setup Data Warning alarm will activate if a volume between 0.1 and 500 is not entered.

Press CHANGE and enter the interstitial space volume. Press ENTER to confirm your entry.

Press STEP to continue:

s 1: (Vacuum Label)
RELIEF VALVE: NO

For all Vac Sensors except the one monitoring a fiberglass tank's interstitial space, a relief valve is usually not needed. For Vac Sensors not requiring a relief valve press STEP to accept the default NO. Press Tank/Sensor to setup another Vac Sensor.

For the Vac Sensor that monitors a fiberglass tank's interstitial space, a relief valve is required to prevent excess vacuum from damaging the tank. Press CHANGE and select YES. Press ENTER to confirm your entry.

Press STEP to continue.:

s 1: (Vacuum Label)
RELIEF VALVE PRESSURE: -9.0

Enter the pressure at which the installed Relief Valve is rated to open (the vent pressure is stamped on the body of the V-R Relief Valve). The permitted range is -5 to -9 psi (-34 to -62 kPa). Default vent pressure is -9 psi. Press ENTER to confirm your entry. Press Tank/Sensor to setup another Vac Sensor.

Vacuum Integrity Test Prior to Filling Tank (Optional)

Skip to 'Running a Manual Test' below if this optional test is not going to be performed. If an external vacuum source is not used to produce a vacuum in the monitored zones prior to startup, you must perform a 'Manual Test' on each sensor to clear the 'No Vac' alarm.

A procedure to test the integrity of the interstitial spaces monitored by the Veeder-Root Vacuum Sensors is discussed in this section. An external vacuum source and necessary fittings must be supplied by the customer.

Before beginning this procedure all vacuum sensor components in the containment sump must be installed as described in this manual and be connected to a Smart Sensor module in the TLS Console.



1. Shut off, tag, and lock out power to the pump.
2. At the TLS Console, configure each of the monitored Vac Sensors in the containment sump (ref. TLS-3XX Setup Manual, P/N 576013-623). Go to the Smart Sensor Diag and place each of the monitored Vac Sensors in EVAC HOLD (ref. TLS-3XX Troubleshooting Manual, P/N 576013-818).
3. At the 3-way ball valve connected to the tank's interstitial riser cap, connect the external vacuum source to the valve's top barbed fitting. Rotate the valve handle to its up position and pull a vacuum down to -8 psi (-55.1 kPa), or if a relief valve is present, down to 1 psi (6.89kPa) above the relief valve's opening pressure (e.g., if relief valve opens at -7 psi [-48.26 kPa], pull the vacuum down to -6 psi [-41.36kPa]). When the desired vacuum is attained, rotate the valve handle to its down position. Remove the external source from the valve's upper barbed fitting.
4. If necessary, repeat this procedure for the product line's interstitial space, the vapor line's interstitial space and the double-wall containment sump's interstitial space.
5. With all of the monitored interstitial spaces under vacuum, at the TLS Console, stop the EVAC HOLD for each Vac Sensor. After a minimum wait of 12 minutes, monitor the Leak Rate and Time to No Vac display for each Vac Sensor. Record the displayed values for each of the containment sump's Vac Sensor in the chart in Appendix A.

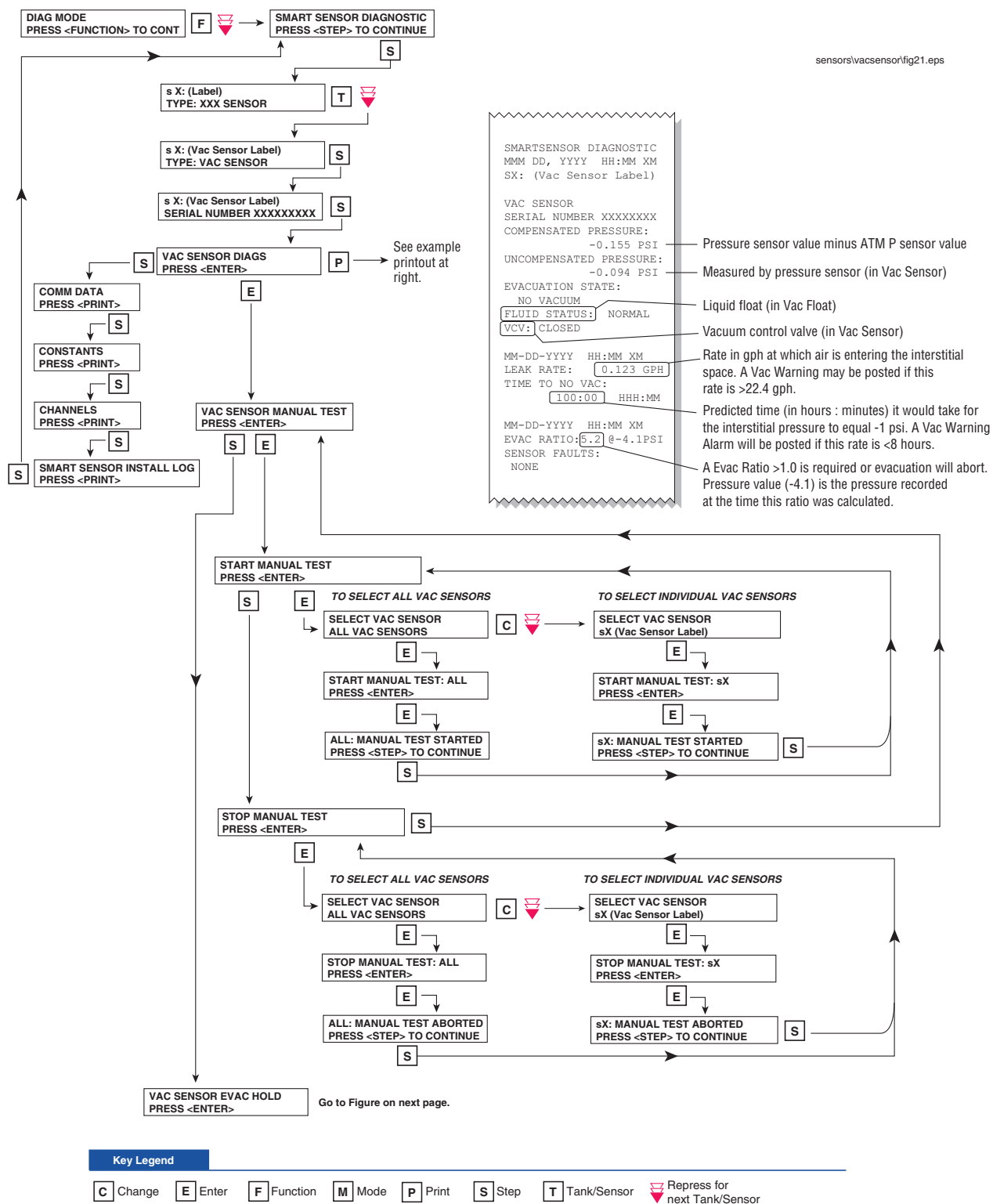
As a general guideline, the Time to No Vac should ideally be 100 hours, and should not be less than 24 hours. Also, a Leak Rate greater than 22.4 gph (84.79 litre) will generate a Vacuum Warning. Both of these diagnostics are indicators of whether the system has a significant vacuum leak. If either diagnostic exceeds the guideline, the source of the leak should be corrected before the system is started up. Once the leak(s) is corrected, repeat steps 2-5.

6. When the monitored interstitial spaces under vacuum are within normal operating limits as described in Step 5, fill the tank.
7. Once the tank is full, restore power to the pump.

Running a Manual Test

NOTICE This test is required for each sensor.

You enter the DIAG MODE of the TLS Console by pressing the MODE key until its display appears. Press the FUNCTION key to select diagnostic functions and the STEP key to view each of the Function's displays. To enter changes to displayed data, use the same front keys used enter to system programming selections (i.e., ENTER, CHANGE, etc.). Figure 4-4 displays the Vac Sensor Manual Test procedure steps and Figure 4-5 displays the Vac Sensor Evac Hold procedure steps.



Continued from
previous page.

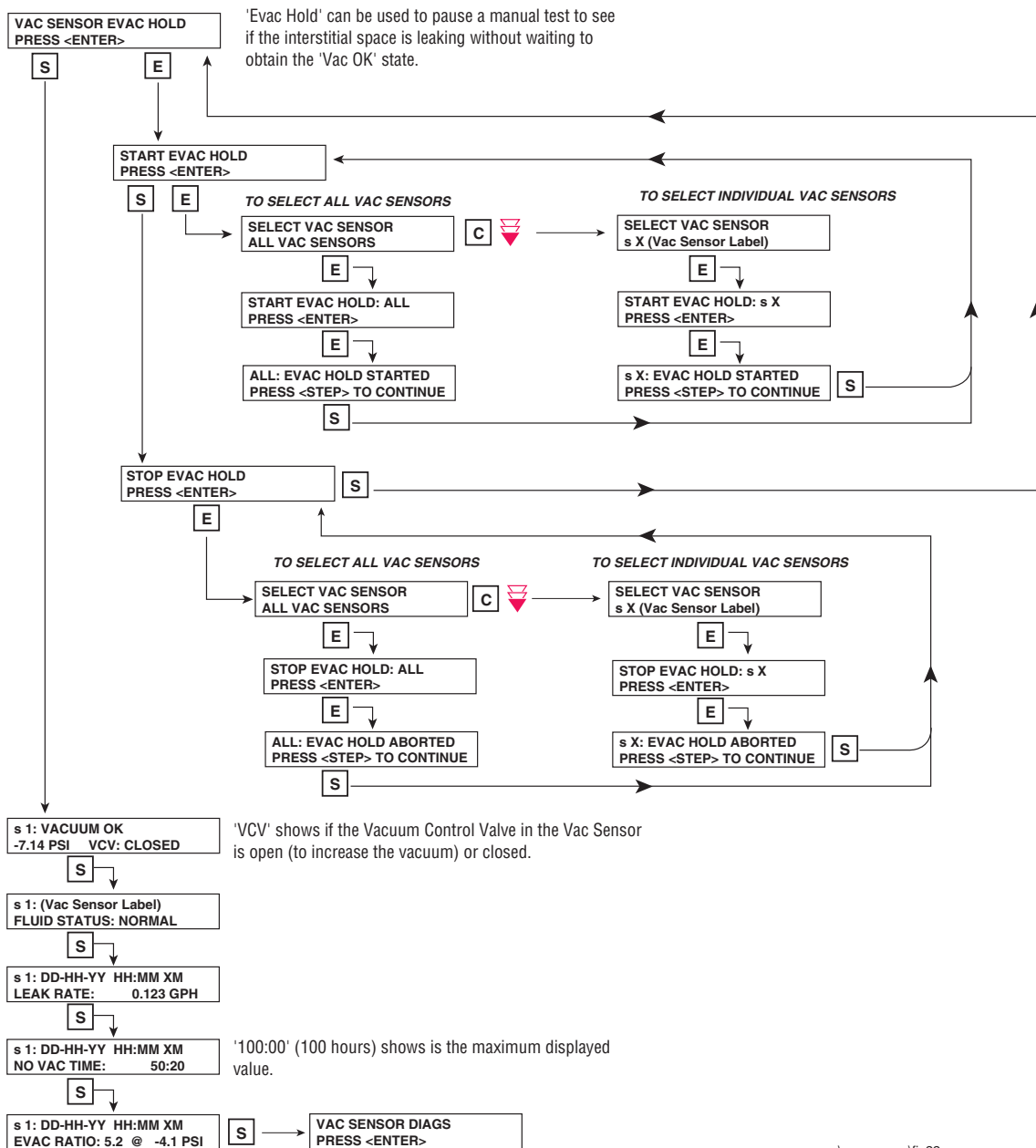


Figure 4-5.- TLS Console Vac Sensor Evac Hold Procedure

Vacuum Sensor Operability Test

NOTICE This test is required for each Vac Sensor prior to startup.

For test procedure, refer to Testing Procedure K, which is found in the V-R Sensor Operability Testing Guide (P/N 577013-814).

5 Vac System Field Wiring - TLS-450PLUS Console

Connecting Vac Sensors To The TLS-450PLUS Console

1. Connect each Vac Sensor/Vac Float pair and the Vac Sensor/ Tank Interstitial Float pair cables to the Universal Sensor Module (USM) as shown in Figure 5-1.

NOTICE At least one USM with attached ATM Pressure Sensor must be installed in the console for proper Vac Sensor operation.

2. System programming of the Vacuum Sensors is performed following instructions in the TLS-450PLUS/TLS4 Operator's Manual (P/N 577014-110).

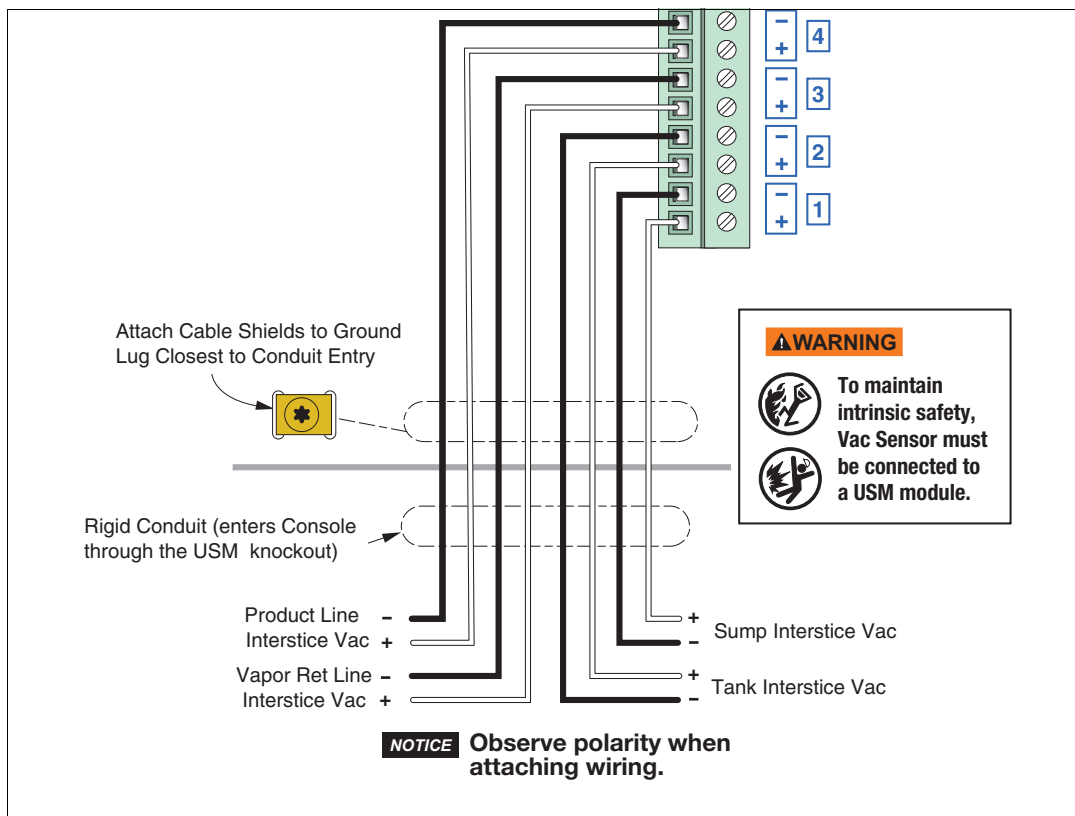


Figure 5-1.- Vac Sensor Inputs

Connecting Pump Control to TLS-450PLUS Console

FOR SITES WITH PLLD LEAK DETECTION

Pump control for Vac Sensors is accomplished with PLLD line leak detection. Connecting PLLD leak detection as per the instructions provided with that equipment is all that is required.

FOR SITES WITHOUT PLLD LEAK DETECTION

An IOM module is required in the TLS Console for Vac Sensor pump control if there is no PLLD. Refer to Figure 5-2 for Red Jacket pump control wiring and to Figure 5-3 for non-Red Jacket pump control wiring.

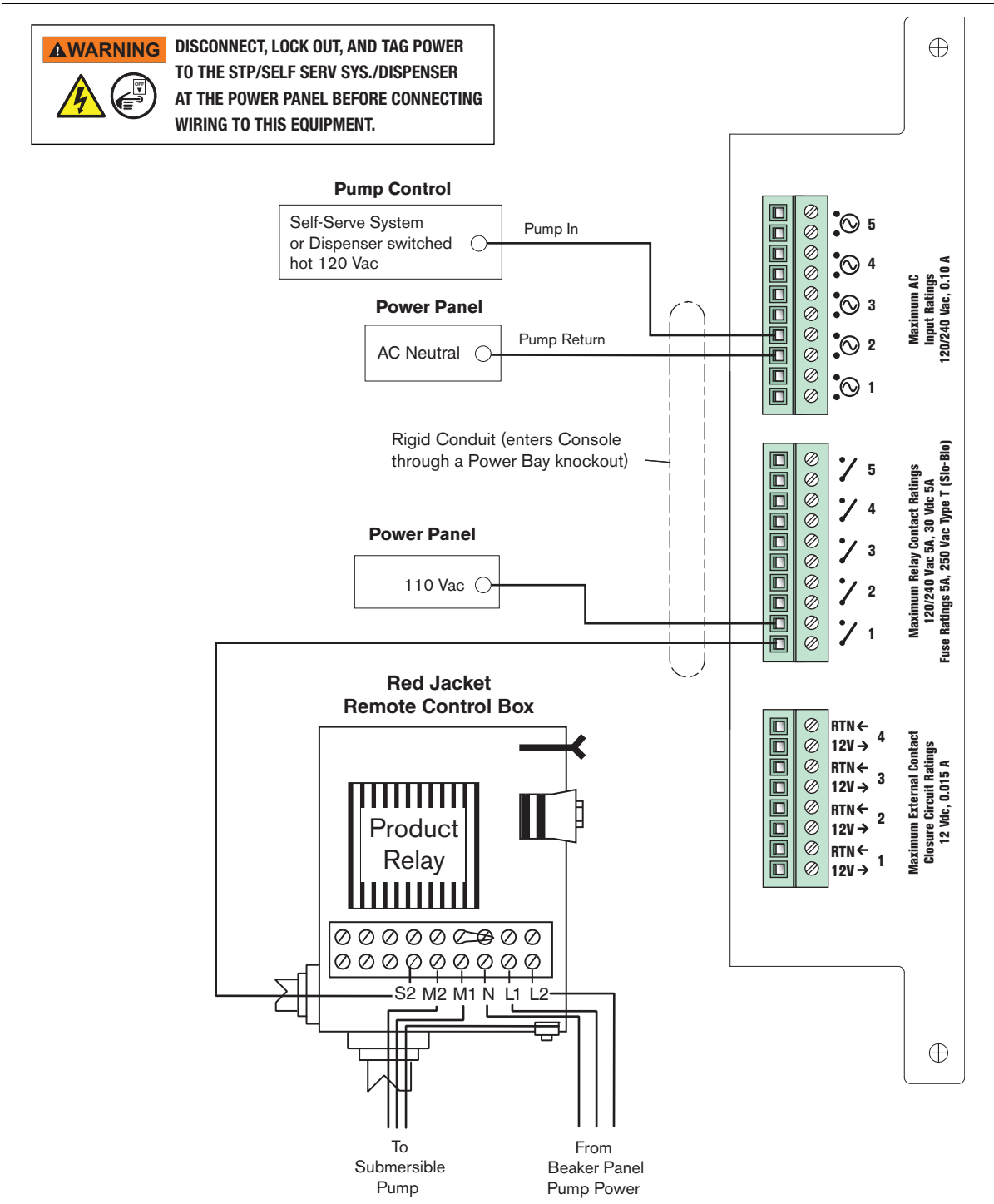


Figure 5-2.- Red Jacket STP Control And Pump Sense Inputs

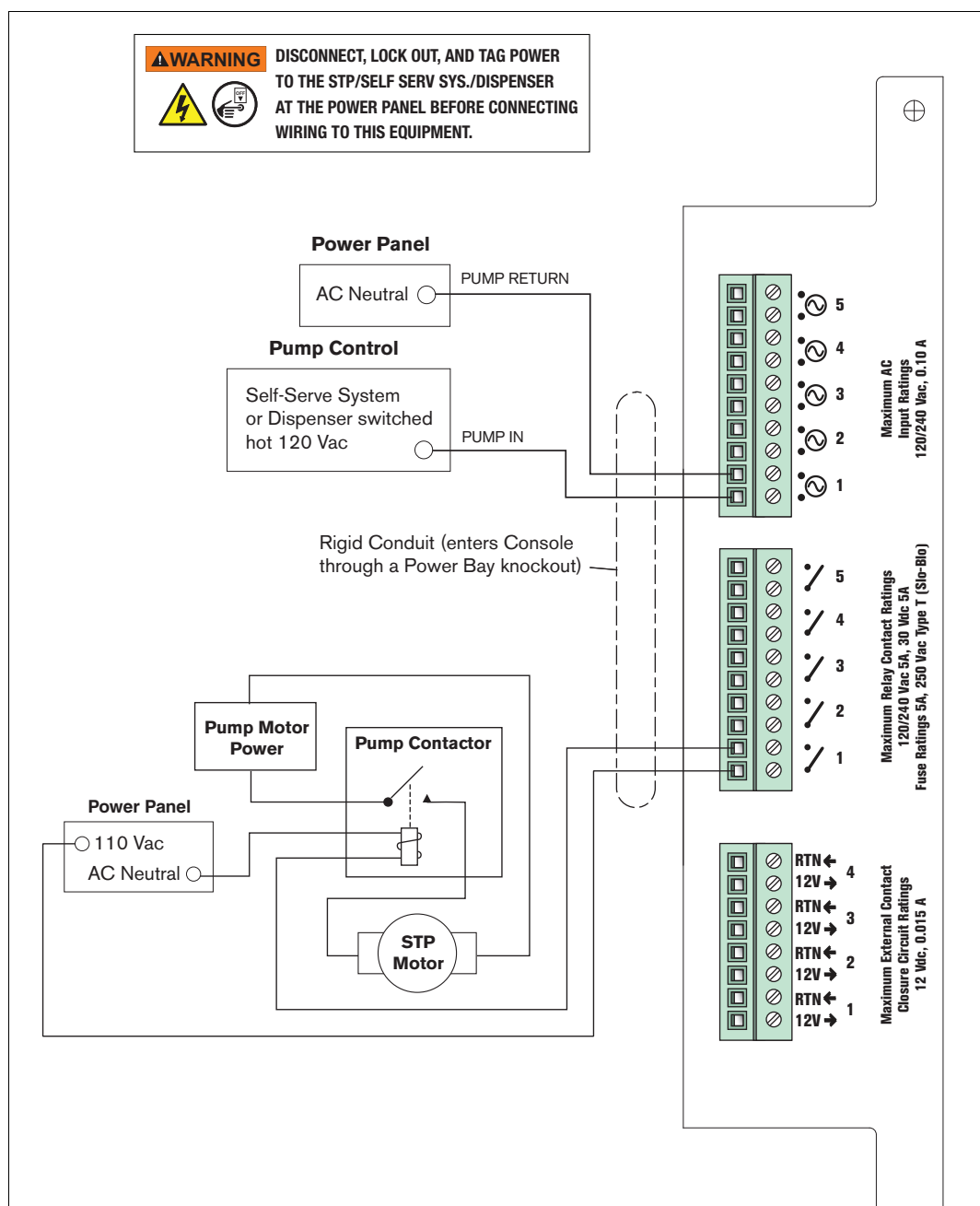


Figure 5-3.- Non-Red Jacket STP Control And Pump Sense Inputs

Disable Extended Run Feature in the Pump Controller

NOTICE

Certain pump controllers may be programmed to turn off the pump after an extended run period and post an ER (Extended Run) error in the controller. Because the Vac Sensors may require the pumps to run for several hours and possibly triggering this error, you must disable this ER feature in the pump controller. Refer to the Pump Controller's documentation for instructions on how to disable the Extended Run feature.

6 Vac System Testing - TLS-450PLUS Console

This section describes a sequence of procedures and tests necessary to complete the Vac Sensor installation:

1. ATM Pressure Sensor setup
2. Vac Sensor setup
3. Vacuum integrity test prior to filling tank*
4. Manual test*
5. Operability test

**Only one of these two tests is required to complete the installation.*

ATM Pressure Sensor Setup

The ATM Pressure Sensor can be factory installed on the USM or it can be field installed on a USM (refer to 577014-077 TLS-450 Plus Consoles Module Replacement Instructions). The ATM Pressure sensor is pre-assigned to input 17 on the USM.

At least one ATM Pressure Sensor, must be installed in the console. You must configure at least one ATM Pressure Sensor for use by the Vac Sensors or a Setup Data Warning will occur.

NOTICE If more than one ATM Pressure Sensor is installed in the console, only one needs to be configured.

Program the ATM Pressure Sensor following the steps below:

Select **Menu>Setup>Devices>Atmospheric Pressure Sensor**

This screen lets you setup sensors that measure atmospheric pressure data used by the vacuum sensors.

The screenshot shows the 'Setup' screen for the 'Atmospheric Pressure Sensor' in the TLS-450PLUS Console. The top status bar indicates 'R 2: DEVICE OUT WARNING', '0 Warning(s)', '29 Alarm(s)', and the date/time '10/18/2018 01:23 PM'. The left sidebar contains navigation icons for Home, Favorites, Menu, Actions, and a numbered '1' icon for the 'Atmp Sensor'. The main content area has tabs for 'Setup' and 'Devices'. Under the 'Devices' tab, there are radio buttons for 'Configured' (selected), 'Enabled', and 'Disabled'. Below this, there are input fields for 'Address' (set to 'B1.S1.17'), 'Label' (set to 'Atmp1'), and 'Serial Number' (set to '1050625617'). To the right of these fields are two large buttons: a checkmark and an 'X'. At the bottom, there is a row of seven sensor icons numbered 1 through 7, with icon 1 highlighted. A blue 'X' button is located at the bottom right of the sensor row.

- Select the address of the device from the drop-down list of available addresses.
- Enter the Label that describes this device. This description will appear on the console screen and reports.
- The Serial Number is auto-detected for this device.
- Configure the device.

Vac Sensor Setup

IDENTIFYING VAC SENSOR ZONES

Before configuring the Vac Sensors, enter the monitored zone, and address for each Vac Sensor attached to the console in the worksheet in Table 6-2 below. NOTE: The Vac Sensor Zone Worksheet and the Secondary Containment Volumes By Manufacturer index are both included in the installation kit (P/N 577013-849). Use the Containment Volume index to calculate a zone's interstice volume in gallons. For example, if Tank 1's double wall product piping uses 100 feet of Ameron Dualoy 3000/L piping, you would multiply 0.2186 (from the Secondary Containment Volume index) x 100 feet = 21.86 gallons. For the Tank 1 product piping zone you would enter 21.9 (round to nearest tenth of a gallon) as the calculated zone volume. If the Tank 1 sump is a Containment Solutions 42" Double wall tank sump, you would multiply 0.8216 (from the Secondary Containment Volume index) x 3.5 feet = 2.88 gallons as the calculated zone volume.

Table 6-2.- Vac Sensor Zone Worksheet

Vac Sensor Monitored Zone Description	Address (Box.Slot.Channel) (e.g., B1.S1.1)	Calculated Zone Volume (Gallons)

Table 6-2.- Vac Sensor Zone Worksheet

[illegible]

Table 6-2.- Vac Sensor Zone Worksheet

Vac Sensor Monitored Zone Description	Address (Box.Slot.Channel) (e.g., B1.S1.1)	Calculated Zone Volume (Gallons)

PERFORMING VAC SENSOR SETUP

After filling in the Vac Sensor Zone Worksheet, setup each of the Vac Sensors as follows.

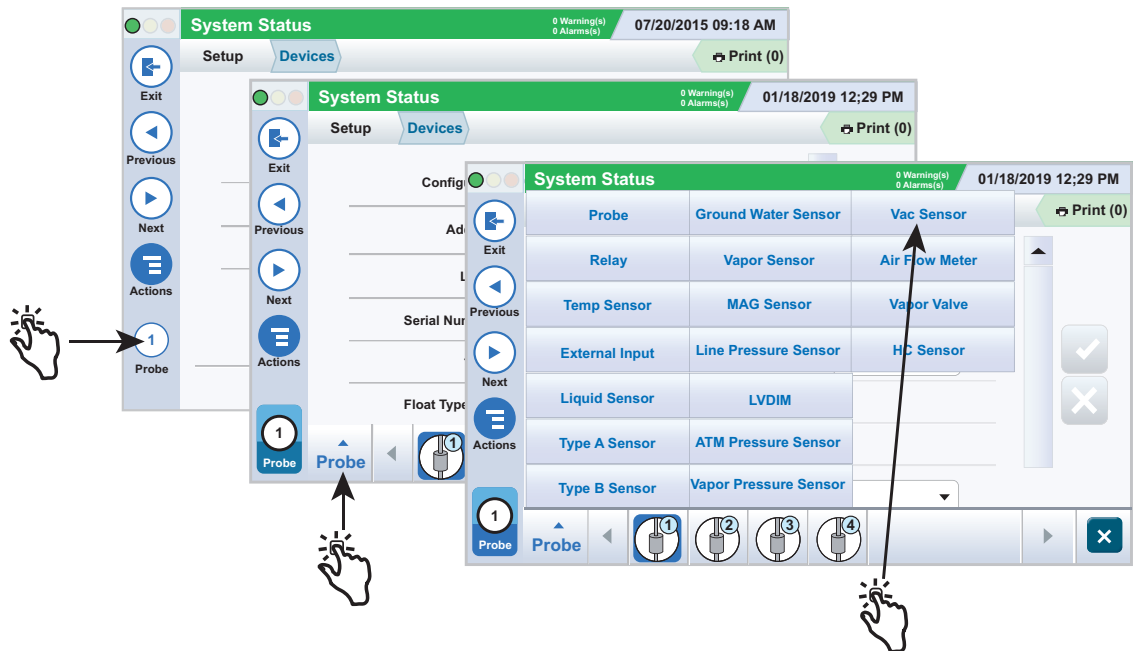
1. Go to the **Menu>Setup>Devices** screen.

The screenshot shows the 'Setup > Devices' screen on the TLS-450PLUS console. The top status bar indicates 'System Status' with '0 Warning(s)' and '0 Alarm(s)', and the date/time is '07/22/2015 02:30 PM'. The 'Print (0)' button is visible in the top right. The left sidebar contains navigation buttons: 'Exit', 'Previous', 'Next' (highlighted with a mouse cursor), 'Actions', and 'Probe' (labeled with a '1'). The main configuration area includes:

- 'Configured' status with radio buttons for 'Enabled' and 'Disabled' (selected).
- 'Address' dropdown menu set to 'Not Assigned'.
- 'Label' text input field.
- 'Serial Number' text input field containing '0000000000'.
- 'Type' dropdown menu set to 'Probe'.
- 'Float Type [in]' dropdown menu set to 'Unknown'.
- 'Water Minimum [in]' text input field containing '0'.

 On the right side of the configuration area, there are two large buttons: a checkmark (confirm) and an 'X' (cancel).

2. Initially the first device type to be displayed in the Devices setup screen is Probe 1. To select Vac Sensor device type, use the touch sequence shown in the illustration below to view the device matrix, then touch the Vac Sensor button to open the Vac Sensor number 1 setup screen.



The screenshot shows the TLS-450PLUS Console interface for configuring a Vac Sensor. The interface includes a sidebar on the left with 'Menu', 'Actions', and a numbered '1' icon. The main area has three fields: 'Volume [gal]' with a value of 100, 'Relief Valve' with radio buttons for 'Yes' and 'No' (selected), and 'Relief Pressure [psi]' with a value of -5. At the bottom, there is a row of seven icons representing Vac Sensors 1 through 7, with Sensor 1 highlighted. A 'Vac Sensor' label is also present on the left side of the bottom bar.

3. Select the address of the Vac Sensor from the drop-down list of available addresses.
4. Enter the Label that describes this device. This description will appear on the console screen and reports.
5. The Serial Number is auto-detected for this device.
6. Select the pump that will provide the source of vacuum for this vacuum sensor. You can select from all pumps that can be controlled by the console to turn on and off. An exclamation point before the pump indicates the pump is disabled. A Setup Data Warning will occur if a pump is not assigned. The default is Not Assigned. The console must have the SCVS feature for this field to be enabled.
7. Enter the volume in gallons/liters of the interstitial space being monitored by this vacuum sensor. The range is 0.1 to 500.0 gallons (0.4 to 1892.7 liters). The default is 0 (which is not in range and must be changed to a valid entry during setup). The console must have the SCVS feature for this field to be enabled.
8. Select Yes or No to indicate if the interstice contains a relief valve. The default is No. Note: When a vacuum sensor is used to monitor a fiberglass tank's interstitial space, a relief valve is required to prevent excess vacuum from damaging the tank.
9. Enter the pressure at which the installed Relief Valve is rated to open (the vent pressure is stamped on the body of the V-R Relief Valve). The permitted range is -5.0 to -9.0 psi (-34.5 to -62.1 kPa). The default vent pressure is -5.0 psi.
10. Configure the device.
11. Touch the Vac Sensor number 2 icon at the bottom of the screen to configure the second Vac Sensor. Repeat Steps 3 - 10 for Vac Sensor 2 and for each of the remaining Vac Sensors.

This completes the Vac Sensor configuration.

Vacuum Integrity Test Prior to Filling Tank (Optional)

Skip to 'Running a Manual Test' if this optional test is not going to be performed. If an external vacuum source is not used to produce a vacuum in the monitored zones prior to startup, you must perform a 'Manual Test' on each sensor to clear the 'No Vac' alarm.

A procedure to test the integrity of the interstitial spaces monitored by the Veeder-Root Vacuum Sensors is discussed in this section. An external vacuum source and necessary fittings must be supplied by the customer.

Before beginning this procedure all vacuum sensor components in the containment sump must be installed as described in this manual and be connected to a USM module in the TLS Console.



1. Shut off, tag, and lock out power to the pump.
2. At the TLS Console, configure each of the monitored Vac Sensors in the containment sump (ref. TLS-450PLUS Operator's Manual, P/N 577014-110). Go to the **Menu>Diagnostics>Vac Sensor>Status**

screen (below) and place each of the monitored Vac Sensors in EVAC HOLD (ref. Vacuum Sensor System Troubleshooting Manual, P/N 577013-873).

- At the 3-way ball valve connected to the tank's interstitial riser cap, connect the external vacuum source to the valve's top barbed fitting. Rotate the valve handle to its up position and pull a vacuum down to -8 psi (-55.1 kPa), or if a relief valve is present, down to 1 psi (6.89kPa) above the relief valve's opening pressure (e.g., if relief valve opens at -7 psi [-48.26 kPa], pull the vacuum down to -6 psi [-41.36kPa]). When the desired vacuum is attained, rotate the valve handle to its down position. Remove the external source from the valve's upper barbed fitting.
- If necessary, repeat this procedure for the product line's interstitial space, the vapor line's interstitial space and the double-wall containment sump's interstitial space.
- With all of the monitored interstitial spaces under vacuum, at the TLS Console, stop the EVAC HOLD for each Vac Sensor. After a minimum wait of 12 minutes, monitor the Leak Rate and Time to No Vac display for each Vac Sensor. Record the displayed values for each of the containment sump's Vac Sensor in the chart in Appendix A.

As a general guideline, the Time to No Vac should ideally be 100 hours, and should not be less than 24 hours. Also, a Leak Rate greater than 22.4 gph (84.79 litre) will generate a Vacuum Warning. Both of these diagnostics are indicators of whether the system has a significant vacuum leak.

If either diagnostic exceeds the guideline, the source of the leak should be corrected before the system is started up. Once the leak(s) is corrected, repeat steps 2-5.

- When the monitored interstitial spaces under vacuum are within normal operating limits as described in Step 5, fill the tank.
- Once the tank is full, restore power to the pump.

Running a Manual Test

- Go to **Menu>Diagnostics>Vac Sensor>Status** screen. Select the box at the beginning of each row to select an individual Vac Sensor.

Home

Favorites

Menu

Actions

System Status

0 Warning(s)
0 Alarms(s)

10/16/2018 08:51 AM

Diagnostics

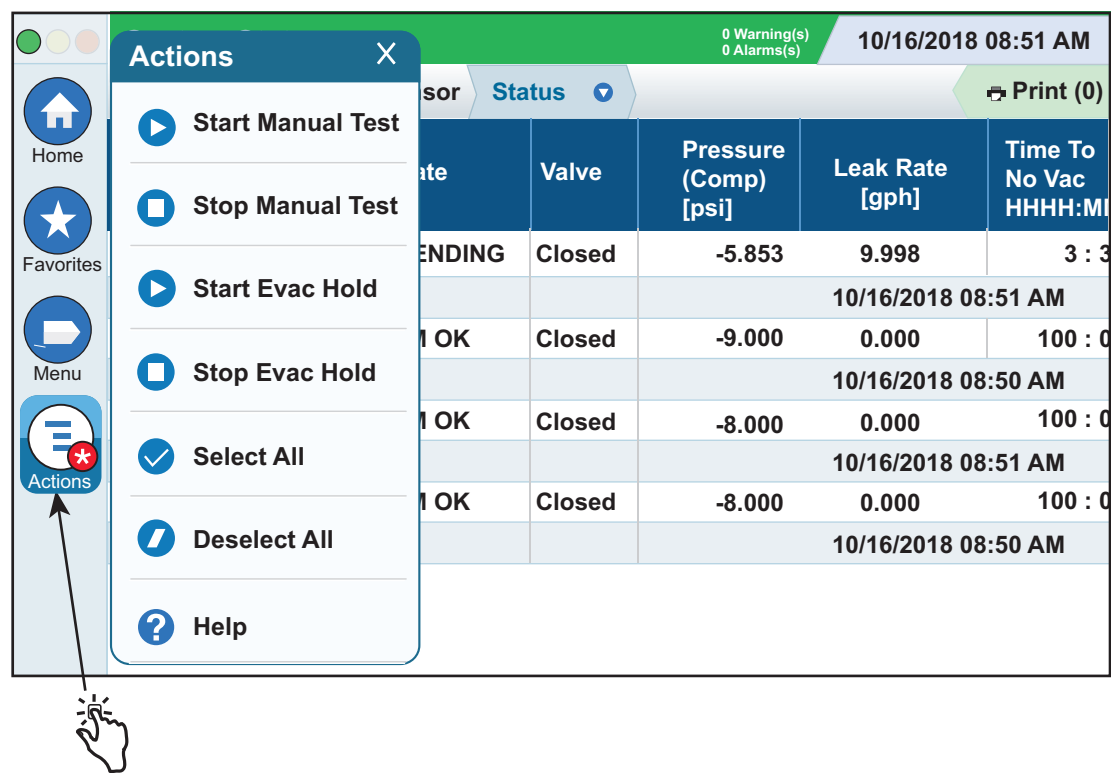
Vac Sensor

Status

Print (0)

Vac Sensor		Evac State	Valve	Pressure (Comp) [psi]	Leak Rate [gph]	Time To No Vac HHHH:MM
<input type="checkbox"/>	Vs 1: Vac1	EVAC PENDING	Closed	-5.853	9.998	3 : 3
10/16/2018 08:51 AM						
<input type="checkbox"/>	Vs 2: Vac2	VACUUM OK	Closed	-9.000	0.000	100 : 0
10/16/2018 08:50 AM						
<input type="checkbox"/>	Vs 3: Vac3	VACUUM OK	Closed	-8.000	0.000	100 : 0
10/16/2018 08:51 AM						
<input type="checkbox"/>	Vs 4: Vac4	VACUUM OK	Closed	-8.000	0.000	100 : 0
10/16/2018 08:50 AM						

2. Press the Actions button to Select All or to Deselect All Vac Sensors.



3. Select Start Manual Test or Start Evac Hold. Evac Hold can be used to pause a manual test to see if the interstitial space is leaking without waiting to obtain the 'Vac OK' state.

Vacuum Sensor Operability Test

NOTICE This test is required for each Vac Sensor prior to startup.

For procedure, refer to Testing Procedure K, which is found in the Line Leak Detection Systems, UST Line Leak Detection Equipment, Mag Sump Sensor, and Other Sensors Operability Testing Guide, P/N 577013-814.

Appendix A: Vac Sensor Test Values Record

The leak rate for each interstice will affect the 'Time to No Vac', which is the time it would take for the vacuum to be lost if the STP did not turn on to replenish it. However, the smaller the volume, the greater the impact of a small leak on the 'Time to No Vac'. A general guideline is to eliminate any leaks so that the 'Time to No Vac' reads 100 hours, which is the maximum displayed value.

Use the chart below to record Vac Sensor test values.

TANK	VAC SENSOR	LEAK RATE (gph)	TIME TO NO VAC (hr)
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		
	Product Line		
	Vapor Return Line		
	Tank or Tank Vent		
	Containment Sump		

