Manual No: **577013-797** · Revision: **P**

Vapor Pressure Sensor

TLS-450PLUS & TLS-3XX Consoles

Installation Guide

VEEDER-ROOT

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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.

FOR INSTALLATIONS IN THE STATE OF CALIFORNIA

Please refer to the Vapor Recovery Certification Phase II EVR Executive Orders at the California Air Resources Board website (www.arb.ca.gov) for the latest manual revisions pertaining to Executive Orders VR-202 (Assist Phase II EVR System Including ISD System), VR-203 (Balance Phase II EVR System) or VR-204 (Balance Phase II EVR System Including ISD System).

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VPS Installation

This manual contains instructions to install a Veeder-Root (In-Station Diagnostic) Vapor Pressure Sensor (VPS) in the dispenser vapor return line or in a vapor vent stack enclosure.

For a VPS sensor that will be direct wired to a TLS console, this manual assumes all preliminary site preparation is completed, and that wiring from the console to a VPS intrinsically-safe junction box is in place and meets the requirements set out in the appropriate console Site Prep manual.

For wireless VPS sensor installations, follow the steps herein to install the VPS sensor itself, but refer to manual 577013-964 for installation of, and connection to, the wireless components.

NOTICE **Installation of the VPS on the vapor vent stack is only allowed at facilities equipped with a "Veeder-Root Vapor Polisher" or "Franklin Fueling System Healy Clean Air Separator.**

Contractor Certification Requirements

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

Veeder-Root Contractor Certification Requirements	Installer Certification[6]	ATG Technician Certification[7]	VR Vapor Products Certification[8]	TLS-450PLUS EVR for CA Certification
Install[1] ISD	X	X	X	X
Install PMC	X	X	X	X
Install CCVP	X	X	X	X
Install Wireless ISD/PMC	X	X	X	X
Installation Checkout[2]		X	X	X
ATG Startup[3] / Training[4] / Service[5]		X	X	X
ISD Startup / Training / Service			X	X
PMC Startup / Training / Service			X	X
CCVP Startup / Training / Service			X	X
Wireless ISD/PMC Startup / Training / Service			X	X
Install Pressure Sensor (ATG)	X	X	X	X
Maintain Pressure Sensor (ATG)		X	X	X
Calibrate Pressure Sensor (ATG)		X	X	X
Clear ATG Pressure Sensor Alarm (ATG)		X	X	X
Clear ISD/PMC Alarms (ISD/PMC)			X	X

[1]Perform wiring and conduit touting; equipment mounting
[2]Inspect wiring and conduit routing; equipment mounting
[3]Turn power on, program and test the systems
[4]Provide supervised field experience in service techniques and operations
[5]Troubleshoot and provide routing maintenance
[6]UST Monitoring Systems – Installer (Level 1)
[7]Certified UST Monitoring Technician
[8]VR Vapor Products

All service personel on site must comply with all recommended safety practices identified by OSHA and your employer.

Review and comply with all the safety warnings in this an any related documents, and any other Federal, State, or Local requirements

Warranty Registrations may only be submitted by selected Distributors.

Related Documents

For Sites With TLS-3XX Consoles

- 576013-879 TLS-3XX Series Consoles Site Prep and Installation Manual
- 577013-800 ISD Setup and Operation Manual - Healy Assist EVR (TLS-350)
- 577013-801 PMC Setup and Operation Manual - VST Processors
- 577013-937 In-Station Diagnostics (ISD) Install, Setup, & Operation Manual (TLS-350)

For Sites With TLS-450PLUS Consoles

- 577014-073 TLS-450PLUS Site Prep and Installation Manual
- 577014-484 Veeder-Root ISD For TLS-450PLUS Consoles Install Manual - V-R Polisher/Franklin CAS
- 577014-461 Veeder-Root ISD For TLS-450PLUS Consoles Install Manual - Healy Assist EVR
- 577014-033 TLS-XB Site Prep and Installation Manual

For All Sites With TLS-RF Wireless Devices

- 331940-012 TLS-RF System Control Drawing
- 577013-964 TLS RF Wireless 2 System (W2) Installation and Maintenance Guide

Safety Precautions

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

 **EXPLOSIVE** Fuels and their vapors are extremely explosive if ignited.	 **FLAMMABLE** Fuels and their vapors are extremely flammable.
 **ELECTRICITY** High voltage exists in, and is supplied to, the device. A potential shock hazard exists.	 **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.
WARNING **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.	 **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.
 **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.	**NOTICE** **NOTICE** is used to address practices not related to physical injury.

⚠ WARNING






This product is to be installed and operated in the highly combustible environment of a gasoline dispenser where flammable liquids and explosive vapors may be present.

FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

The following hazards exist:

1. **Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.**
2. **Product leakage could cause severe environmental damage or explosion resulting in death, serious personal injury, property loss and equipment damage.**

Observe the following precautions:

1. **Read and follow all instructions in this manual, including all safety warnings.**
2. **To be installed in accordance with the National Electrical Code (NFPA 70) and the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A).**
3. **Before installing this device, turn Off, tag/lock out power to the system, including console and submersible pumps.**
4. **To protect yourself and others from being struck by vehicles, block off your work area during installation or service.**
5. **Substitution of components may impair intrinsic safety.**

Before You Begin

- Comply with all recommended safety practices identified by OSHA (Occupational Safety and Health Administration) and your employer.
- Review and comply with all the safety warnings in the installation manuals and any other national, State or Local requirements.
- When direct wiring to the TLS console, a 2-conductor, 18 AWG shielded cable must be installed in intrinsically safe conduit from the dispenser or from the vapor vent stack to the TLS console. The cable length between the console and sensor must not exceed the distance stated in the appropriate console's site prep manual. Conduit for direct-wired installations 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.
- Conductors of different intrinsically safe circuits run in the same cable/conduit must have at least 0.01 inch (0.25 mm) of insulation.
- For all connections requiring sealant, use only UL classified yellow Gas/TFE plumbing tape.
- Intrinsically safe devices must be installed in accordance with Article 504 of the National Electrical Code, ANSI/NFPA 70, for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.
- When installing on a vent stack, customer supplied pipe and pipe fittings shall be standard full-weight (ASTM Schedule 40) wrought iron or steel.
- Customer supplied copper tubing shall be soft tempered, 1/4-inch O.D., with a minimum wall thickness of 0.0265 inches.
- Pipe threads shall be in accordance with the Standard for Pipe Threads, General Purpose (Inch) ANSI/ASME B1.20.1-1983.

Veeder-Root Parts

Veeder-Root parts and kits required to install the VPS are listed in Table 1 and Table 2.

Table 1. Under Dispenser - VPS Installation Kit (P/N 330020-433 [included in kit 330020-515])

Item	Qty.	Description	P/N
1	1	Vapor Pressure sensor	331946-001 or 861190-201
2	4	Male connector 68CA-4-4, brass 1/4" tube to 1/4" pipe	514100-430
3	1	Union 62CA-4, brass 1/4" tube size	514100-431
4	1	Plug 59CA-4, brass 1/4" tube size	514100-432
5	1	Universal sensor mounting kit - miscellaneous assortment of U-bolts, brackets, clamps, and fasteners	330020-012
6	2	Wire nut	576008-461
7	1	Sealing pack	514100-304
8	1	Cord grip	331028-011
9	2	Tie wrap	510901-337
10	1	Shim	332061-001

Table 1. Under Dispenser - VPS Installation Kit (P/N 330020-433 [included in kit 330020-515])

Item	Qty.	Description	P/N
11	1	Ball Valve, 3-way, 1/4”	576008-649
12	1	Copper tube, soft, 1/4” OD, 36” length	332151-001

Table 2. Vapor Vent Stack - VPS Installation Kit (P/N 330020-630)

Item	Qty.	Description	P/N
1	1	Vapor Pressure sensor	331946-001 or 861190-201
2	1	Enclosure, NEMA 4X- modified w/included fasteners	333004-001
3	1	Panel, composite, modified	333005-001
4	2	Male elbow 169CA-4-4, brass 1/4" tube to 1/4" pipe	579066-001
5	2	Male connector 68CA-4-4, brass 1/4" tube to 1/4" pipe	514100-430
6	1	Plug 59CA-4, brass 1/4" tube size	514100-432
7	1	Bulkhead union 62CABH-4, brass 1/4" tube size	514100-476
8	2	Washer, 0.469 x 1.125 x 0.063”, zinc	510904-573
9	1	Tube - copper, 1/4” OD, short S bend	333006-001
10	1	Tube - copper, 1/4” OD x 8” length	333018-001
11	1	Ball valve, 3-way, 1/4”	576008-649
12	1	Hub, conduit, liquid tight, 1/2”, zinc	576010-715
13	3	Conduit clamp, 2”, steel - std duty	514100-478
14	3	1/4-20 x 0.75” hex bolt - steel	026-620-1
15	3	Washer, flat, 1/4”, zinc	514100-374
16	3	1/4-20, hex nut w/lock washer	511000-251
17	1	Vent, porous, flanged, 0.17 x 0.42”	514100-477
18	2	Wire nut	576008-461
19	1	Sealing pack	514100-304
20	1	Cord grip	331028-011
21	2	Tie wrap	510901-337
22	1	Shim	332061-001
23	1	Vapor Pressure Sensor Installation Guide	577013-797
24	1	ISD Quick Reference Guide - TLS-3XX Consoles	577013-842
25	1	ISD Quick Reference Guide - TLS-450PLUS Consoles	577014-462
26	1	Warranty card, ISD system	577013-868
27	2	Conduit clamp, 3”, steel, std duty	514100-482

An desiccant tube is recommended for the VPS in wired/wireless vent stack installations (see kit in Table 3).

Table 3. Kit - VPS Drying Tube (P/N 330020-717)

Item	Qty.	Description	P/N
1	1	Drying tube - non-indicating desiccant	514100-424
2	36”	Tubing - Tygon fuel and lube	514110-425
3	4	Tie wrap	510901-337
4	2	Self-adhesive mount - tie wrap	576008-437

Tools Required

1. Wrenches suitable for tightening tubing/pipe fittings.
2. Necessary pipe fitter’s equipment (including threading equipment as needed) and a non-hazardous work space suitable to modify the dispenser vapor line or the vapor vent stack for VPS sensor installation.
3. T25 Torx bit for tamper-resistant screws to secure vent stack enclosure door.

Under Dispenser Installation Steps

1. Before installing this device, turn Off, tag/lock out power to the system, including console and submersible pumps.
2. Determine which dispenser is closest to the tank/tanks being monitored. Remove that dispenser’s lower sheet metal doors to gain access to the vapor plumbing.
3. Refer to VPS dispenser installation examples in Figure 1 through Figure 5 to locate a suitable port or plumb a suitable fitting for the VPS tubing in either the vapor return shear valve or in the vapor return line.
4. Install one of the 68CA-4-4 male connectors (item 2 in Table 1) from the kit into the tapped hole.
5. Install VPS (item 1 in Table 1) vertically to the dispenser frame or piping using the 2-inch conduit clamp, rubber shim, and necessary bolts, nuts, and washers from the included Universal Sensor Mounting kit. Wrap the rubber shim (item 10 in Table 1) around the sensor before inserting it into the clamp.

NOTICE **The VPS sensor must be installed in a VERTICAL position with the sensing port pointing down. Its connection in the base of the dispenser in the vapor return line must be made BELOW the vapor return line shear valve mechanism, AND BELOW the Air Flow Meter (AFM) outlet (if an AFM is installed).**

6. Attach one end of the 62CA-4 union (item 3 in Table 1) to the pressure sensing port in the base of the VPS.
7. Install the remaining 68CA-4-4 male connectors (item 2 in Table 1) from the kit into each of the three ports in the 3-way calibration valve (item 13 in Table 1).
8. Measure, fabricate, and install a ¼" OD copper tube (item 12 in Table 1) that runs between the 62CA-4 union in the base of the VPS and the center port of the 3-way calibration valve.
9. Measure, fabricate, and install a ¼" OD copper tube that runs between the ¼" tube end of the male connector fitting installed beneath the shear valve mechanism and the right port on the 3-way valve, being careful not to create any potential liquid traps (Note 3-way valve orientation in Figure 5).

10. Screw the 59CA-4 plug, item 4, from the kit onto the left port's male connector. Make sure the valve's handle is set to connect the VPS to the vapor return line and not to the capped (ambient) port.

NOTICE **All plumbing's pitch to drain should be 1/4" vertical per 12" horizontal to eliminate liquid traps.**

11. Install a cord grip from the kit into a I.S. junction box knockout. Route the VPS cable into the I.S. junction box and tighten the cord grip. Observing polarity, connect the field wiring from the TLS console to the VPS wiring with wire nuts (see Figure 6).

NOTICE **For Wireless installations skip Steps 11 - 13. The VPS sensor connects to a TLS RF transmitter, not to field wiring from the TLS Console (see manual 577013-964 for instructions).**

12. Seal wire nuts in epoxy sealant following the instructions in Figure 7. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.
13. For TLS-450PLUS console, connect VPS field wiring to a USM module (see Figure 8). For TLS-350 Consoles, connect VPS field wiring to a Smart Sensor Module (see Figure 9).
14. Replace lower dispenser sheet metal doors onto dispensers.
15. After the VPS has been installed, pressurize the tank ullage space and vapor piping to at least 2 inches WC and test for leaks using leak detection solution.

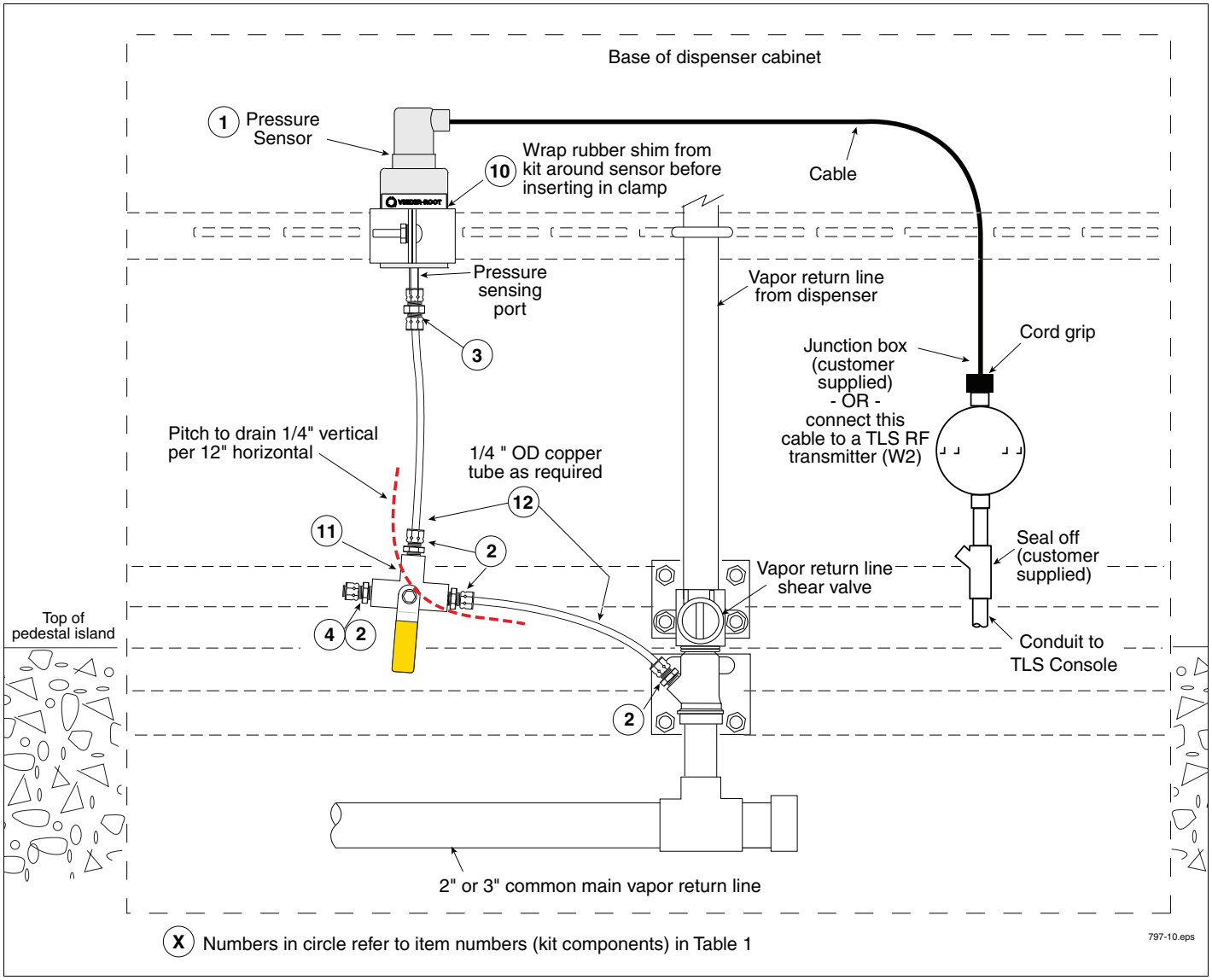

Figure 1. Example VPS Installation In Shear Valve Port - Preferred Non-ISD Installation (without Air Flow Meter)

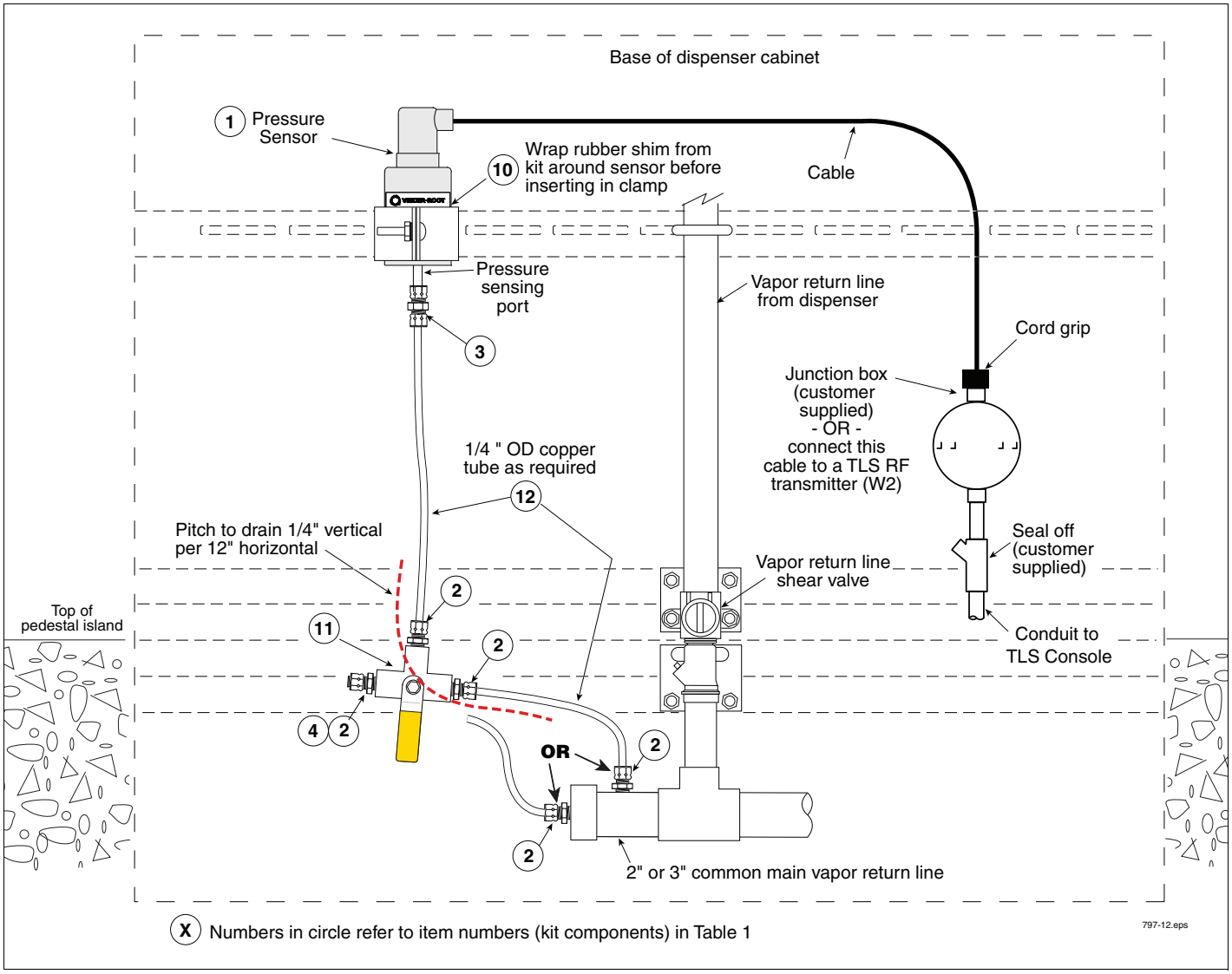

Figure 2. Example VPS Installation in Vapor Return Line - Non-ISD Installation (without Air Flow Meter)

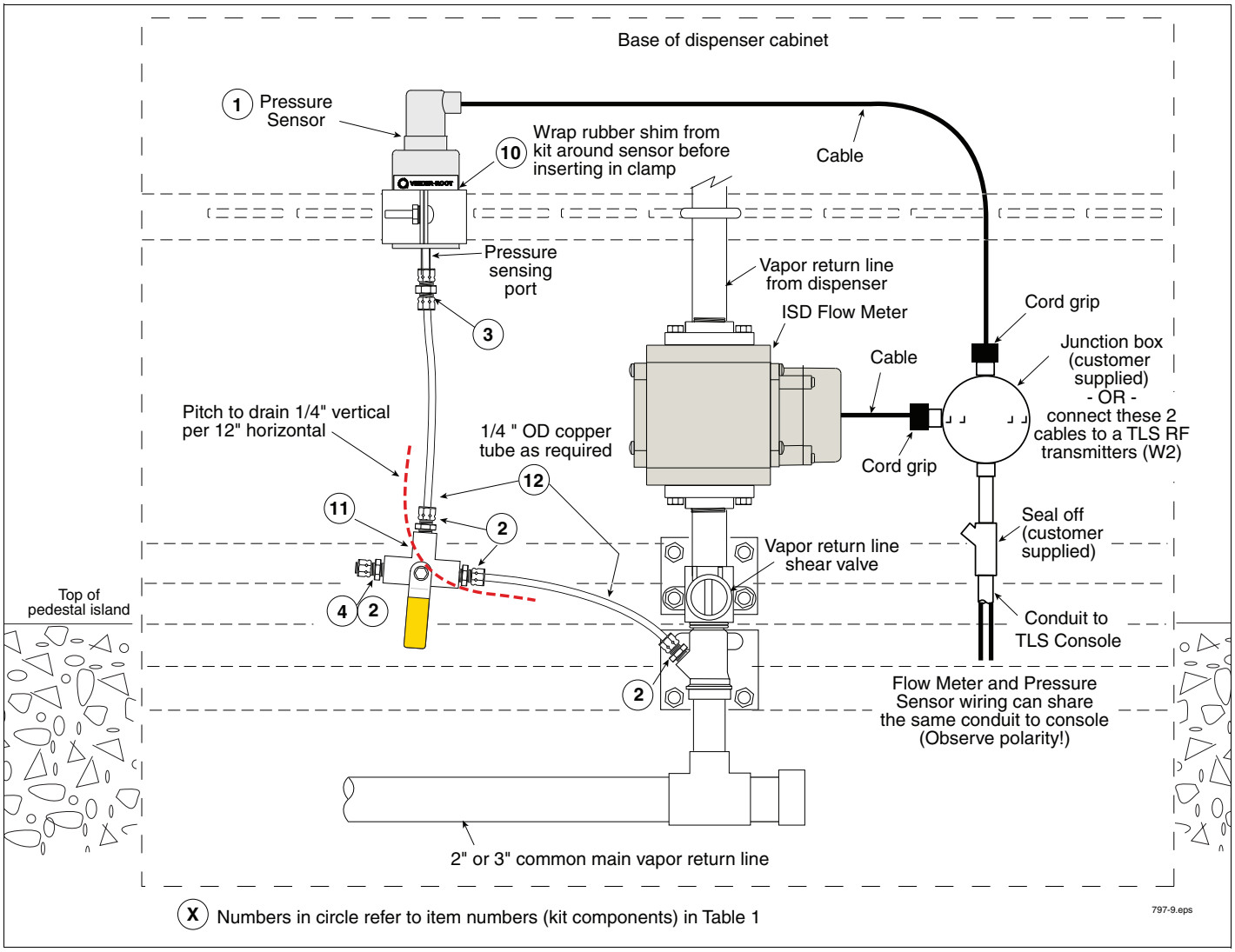

Figure 3. Example VPS Installation in Shear Valve Port - Preferred ISD Installation (with Air Flow Meter Above Shear Valve)

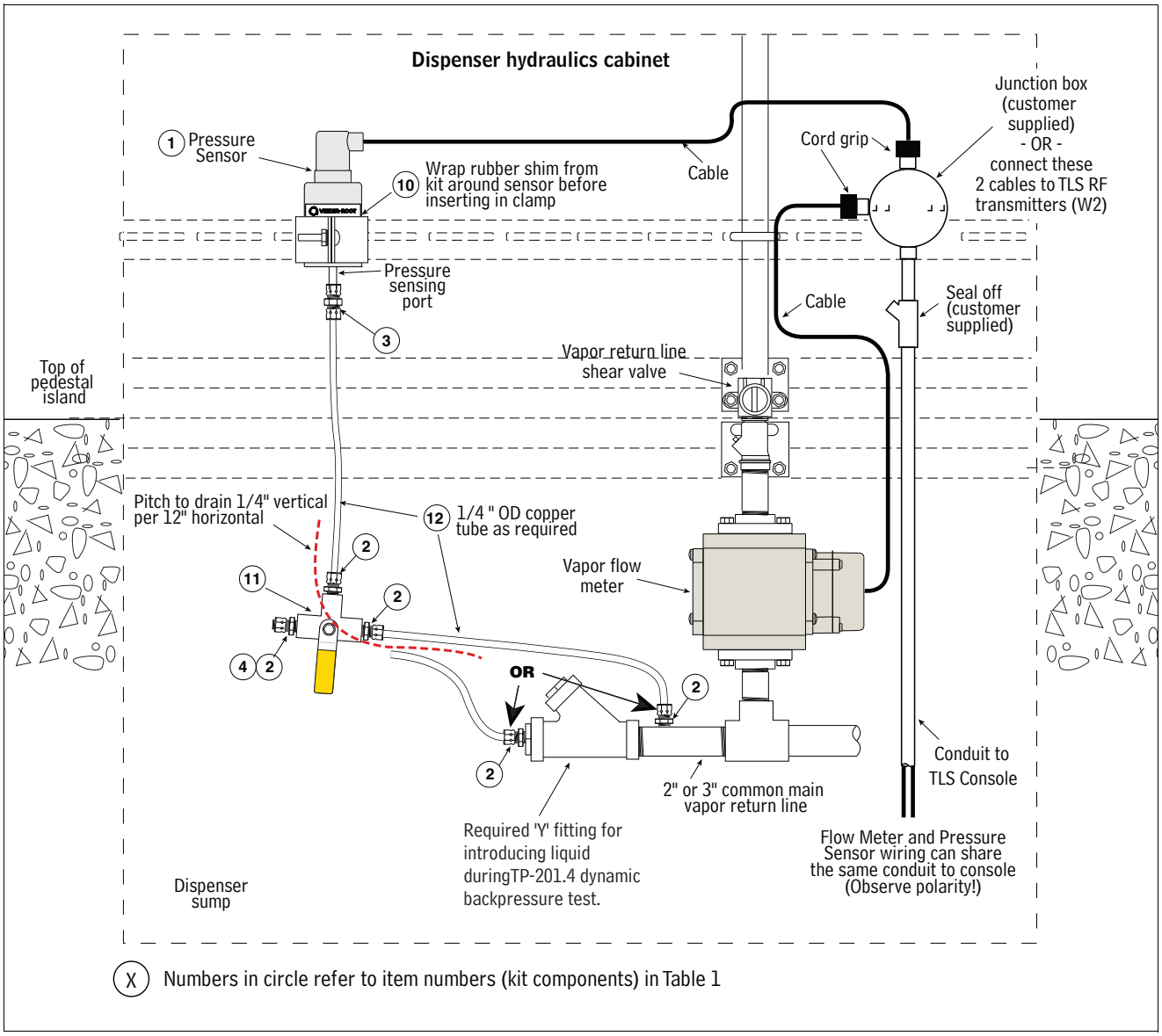

Figure 4. Example VPS Install in Horizontal Access Fitting or Vapor Return Line - ISD Installation (with Air Flow Meter Below Shear Valve)

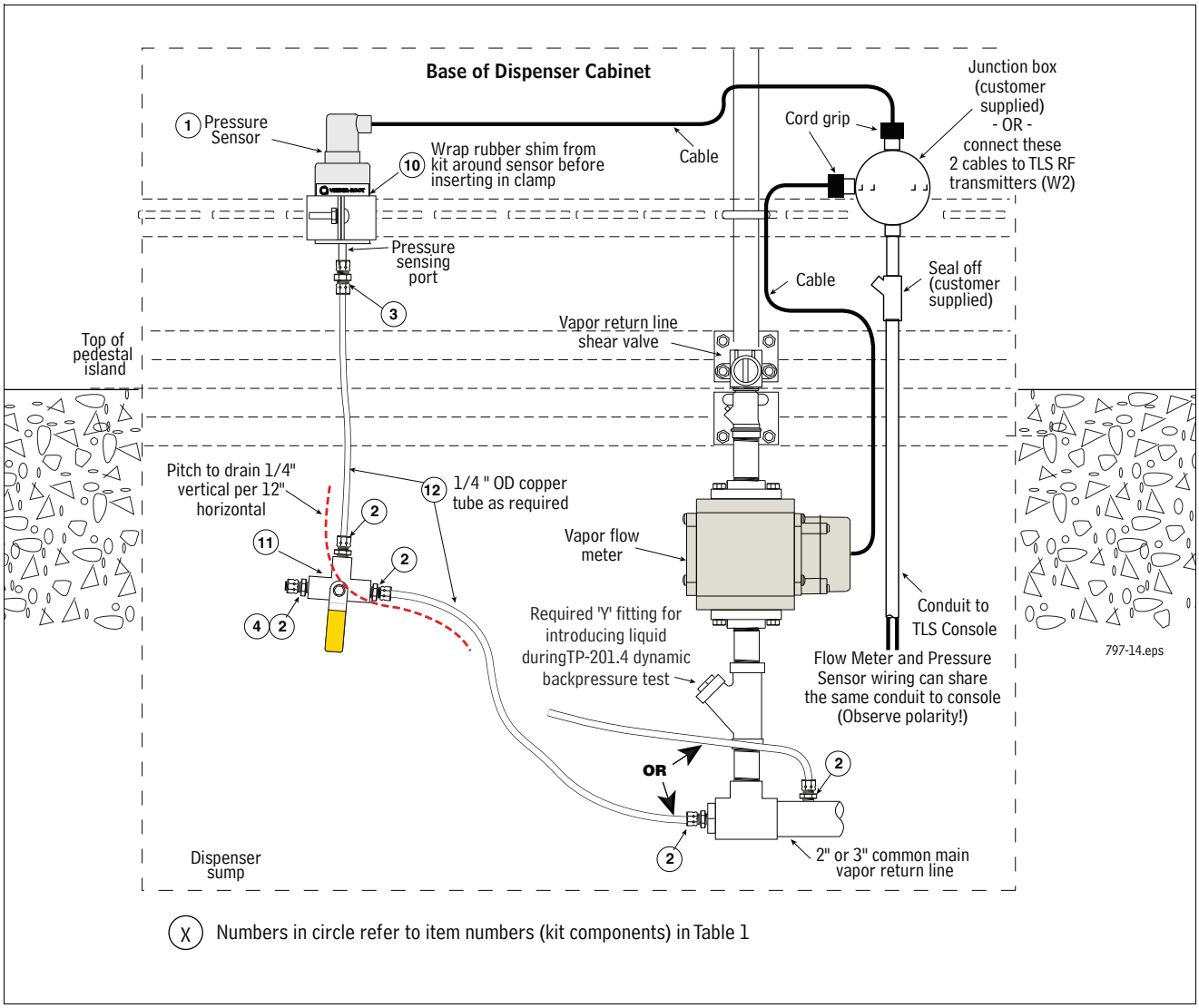

Figure 5. Example VPS Installation Below Vertical Access Fitting or Vapor Return Line - ISD Installation (with Air Flow Meter Below Shear Valve)

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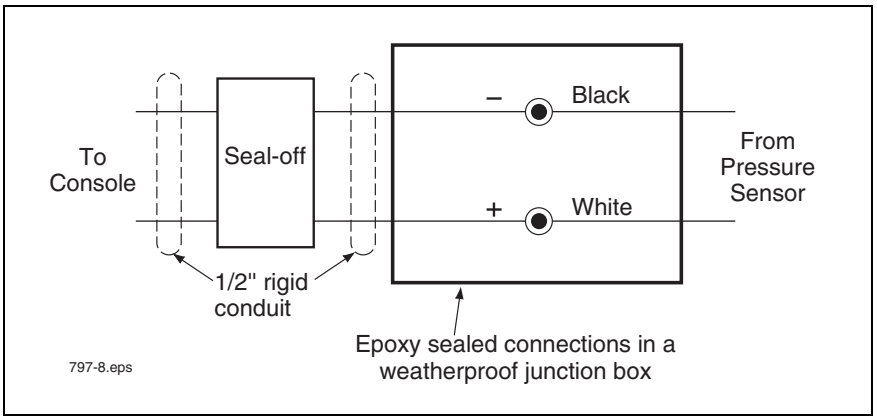
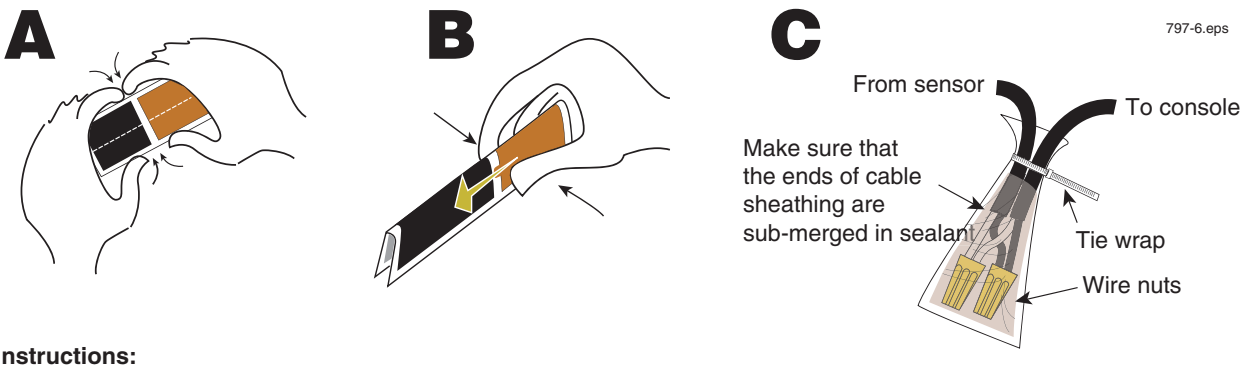


Figure 6. Field wiring Connections for Direct- Wired VPS Sensor Only - Observe Polarity



Instructions:

NOTE: 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 pak.
2. Holding resin pak 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 bag 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.

NOTE: Not required for wireless installations!

Figure 7. Epoxy Sealing Field Wiring for Direct- Wired VPS Sensor Only

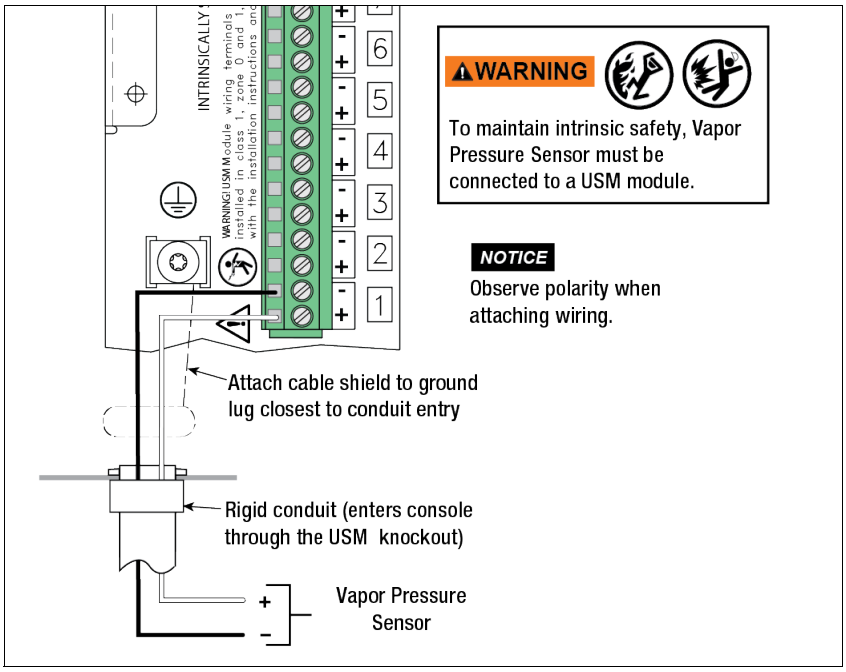


Figure 8. Direct-Wired VPS Connects to Available TLS-450PLUS USM Module Position

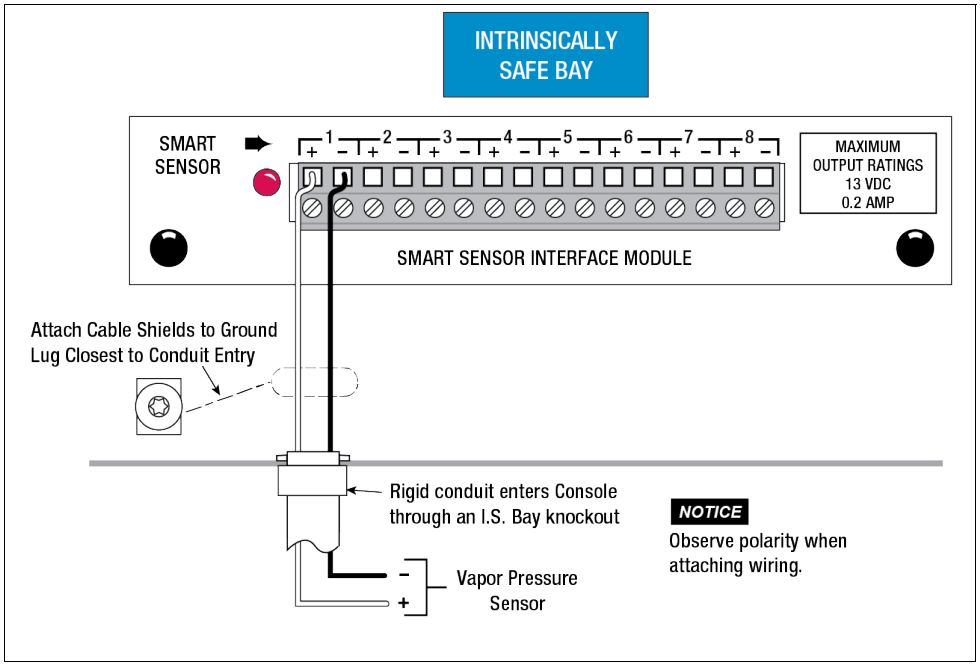


Figure 9. Direct-Wired VPS Connects to Available TLS-3XX Smart Sensor Interface Module Position

NOTICE For wireless configurations, see TLS RF System Control Drawing P/N 331940-012.

Vapor Vent Stack Installation - Wired VPS

NOTICE **Installation of the VPS on the vapor vent stack is only allowed at facilities equipped with a Veeder-Root Vapor Polisher or Franklin Fueling System Healy Clean Air Separator.**

1. Before installing this device, perform all required safety procedures to gain access inside the vapor vent stack.
2. The VPS is installed in the vent line for the tank/tanks being monitored.
3. Locate a suitable port in an existing Schedule 40 piping fitting (tee, cross, etc.) or plumb a suitable Schedule 40 pipe fitting (tee, cross, etc.) into the vapor vent stack line (maximum length of copper tubing limited by dimension in Figure 10).
4. Install the VPS (item 1 in Table 2) vertically onto the center of the composite panel (item 3 in Table 2) using a 2-inch conduit clamp, rubber shim, and necessary bolts, nuts, and washers included in the kit. Be sure the ⇑⇑ symbol on the panel is facing upwards (see Figure 11). Wrap the rubber shim (item 22 in Table 2) around the sensor before inserting it into the clamp. Also make sure the VPS cable outlet is facing up and the pressure sensing port tube in the base of the VPS is facing down. Locate the VPS in the clamp, but leave the conduit clamp screw somewhat loose for later height adjustment.
5. Install two169CA-4-4 male elbows (item 4 in Table 2) into each end of the 3-way calibration valve (item 11 in Table 2) as shown (see Figure 11).
6. Install one 68CA-4-4 male connector (item 5 in Table 2) into the center port of the 3-way calibration valve, and then directly attach it to the VPS inlet port (see Figure 7).
7. Screw the 59CA-4 plug (item 6 in Table 2) onto the left port's male elbow (see Figure 11).
8. Install the two plastic enclosure mounting plates to the back of the enclosure. Use the four short flat-head screws included in the enclosure hardware bag.
9. Install the composite panel into the enclosure (item 2 in Table 2) such that the VPS cable outlet is facing up and the pressure sensing port tube in the base of the sensor is facing down. The ⇑⇑ symbol on the panel should be facing upward. Use the four short screws included in the enclosure hardware bag.
10. Make sure that the white flanged porous vent (factory installed - item 17 in Table 2) is still securely installed into the hole in the bottom of the enclosure (see Figure 11).
11. Insert the S-bend ¼" OD copper tube (item 9 in Table 2) into the right-side male elbow of the 3-way calibration valve, but do not fully tighten the compression nut (see Figure 11).
12. Locate the 62CABH-4 bulkhead union (item 7 in Table 2) and remove the compression nut and the adjustable nut then place a large washer (item 8 in Table 2) against the fixed, integral body nut. Slide the compression nut that was removed onto the bottom portion of the S-bend tube.
13. Partially insert the bulkhead union into the bottom center hole in the enclosure. Slide a large washer over the body, and thread the adjustable nut back onto the body.
14. Insert the bottom portion of the S-bend tube into the bulkhead union and fully tighten the bulkhead union adjustable nut against the large washer and enclosure wall. Adjust the VPS vertically in the shim/ conduit clamp to make sure the S-bend tube is fully inserted into the union and male elbow.
15. Fully tighten the compression nuts to connect the S-bend tube to the union and to the male elbow. Tighten the sensor conduit clamp screw to secure the sensor in its final vertical position (see Figure 11).
16. Mount the plastic enclosure onto the vapor vent stack or suitable rigid structure ABOVE the vapor vent stack port using two conduit clamps (for 2" or 3" pipe), bolts, nuts, and washers included, or use other customer supplied suitable mounting hardware (Example: Unistrut®). Leave the mounting hardware somewhat loose for later enclosure height adjustment (see Figure 10).
17. Measure, fabricate, and install customer supplied pipe and pipe fittings between the vapor vent stack port and within a few inches of the bulkhead union in the bottom of the enclosure.

18. Install one 68CA-4-4 male connector (item 5 in Table 2) onto the top of the new pipe (see View A-A, Figure 10).
19. Measure, fabricate, and install ¼" OD copper tubing (item 10 in Table 2) between the bulkhead union and the male connector. Adjust the enclosure vertically on vent pipe to make sure the copper tube is fully inserted into the bulk head union and male connector.
20. Fully tighten the compression nuts to secure the fabricated tube to the bulkhead union and to the male connector. Tighten the enclosure mounting hardware to secure the enclosure in its final vertical position.

NOTICE **All pitch of all vapor plumbing to drain should be 1/4" vertical per 12" horizontal to eliminate any potential liquid traps.**

21. Make sure the 3-way valve handle is set as shown in Figure 11.
22. Get the contents of the VPS drying tube kit (Table 3). Thread a tie wrap (item 3)through the slots in each of the self-adhesive mounts (item 4). Place the top mount against the large cap on one end of the tube and tighten the tie wrap until it is against the tube cap but you can still rotate the tube. Place the second mount against the other end cap of the tube, again pulling the tie wrap through the mount until it is against the tube cap but you can still rotate the tube.
23. Remove the two soft plastic seals from each end port of the drying tube. Get the Tygon tubing (item 2) from the kit and attach one end of the tubing to one end of the drying tube. Slide the tubing onto the drying tube as far as you can (snug). Referring to Figure 11, position the drying tube vertically in the enclosure with the open port of the tube up, and estimate the length needed to loop from the bottom of the drying tube over to the vent port (off center) of the VPS. Cut the Tygon tubing at the estimated length (approximately a foot or so). Remove the paper cover from the self-adhesive base of the two tie wrap mounts and stick the drying tube to the inside of the enclosure as shown in Figure 11. Pull each of the tie wraps snug and cut off the excess. Attach the other end of the Tygon tubing to the vent port (off center) of the VPS.

NOTICE **The upper port of the drying tube must remain open and be oriented up as shown in Figure 11.**

NOTICE **For VPS sensor wireless installations, install the desiccant tube after installing the wireless transmitter and battery pack components.**

24. Install ½" electrical conduit from the conduit hub in the bottom of the enclosure to the customer supplied weather-proof junction box (see Figure 10).

NOTICE **For Wireless installations skip Steps 24 - 27. The VPS sensor connects to a TLS RF transmitter, not to field wiring from the TLS Console (see manual 577013-964 for instructions).**

25. Route the VPS cable into the I.S. junction box below the enclosure. Observing polarity, connect the VPS wiring to the field wiring from the TLS console to the VPS wiring with wire nuts (see Figure 6). Seal wire nuts in epoxy sealant following the instructions in Figure 7.
26. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.
27. For TLS-450PLUS console, connect VPS field wiring to a USM module (see Figure 8), For TLS-350 Consoles, connect VPS field wiring to a Smart Sensor Module (see Figure 9).
28. Close and secure the enclosure door by tightening the two T25 tamper-resistant Torx screws.
29. After the VPS sensor is installed, pressurize the tank ullage space and vapor piping to at least 2 inches WC and test for leaks using leak detection solution.

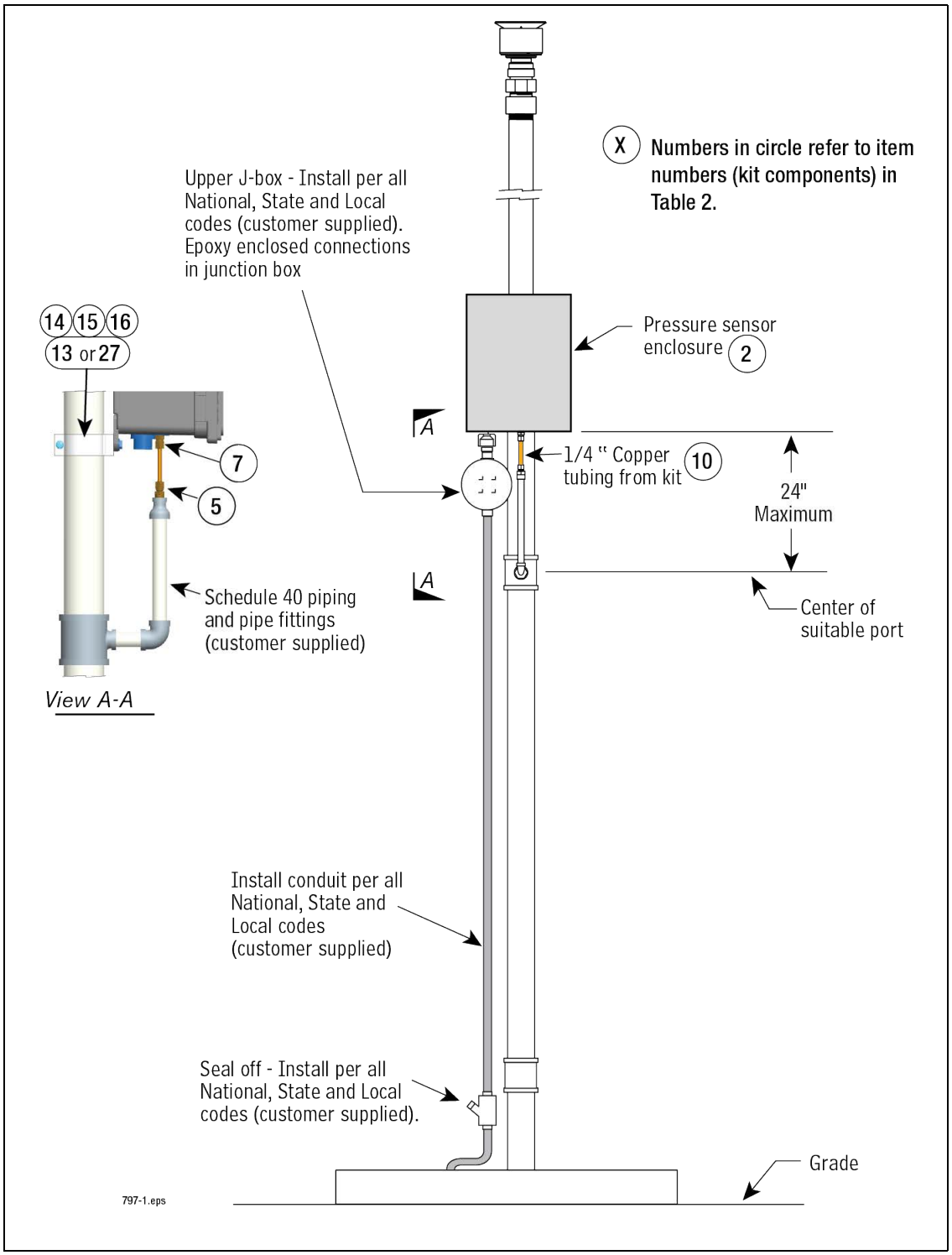


Figure 10. Locating Direct-Wired VPS Sensor Enclosure on Vapor Vent Stack

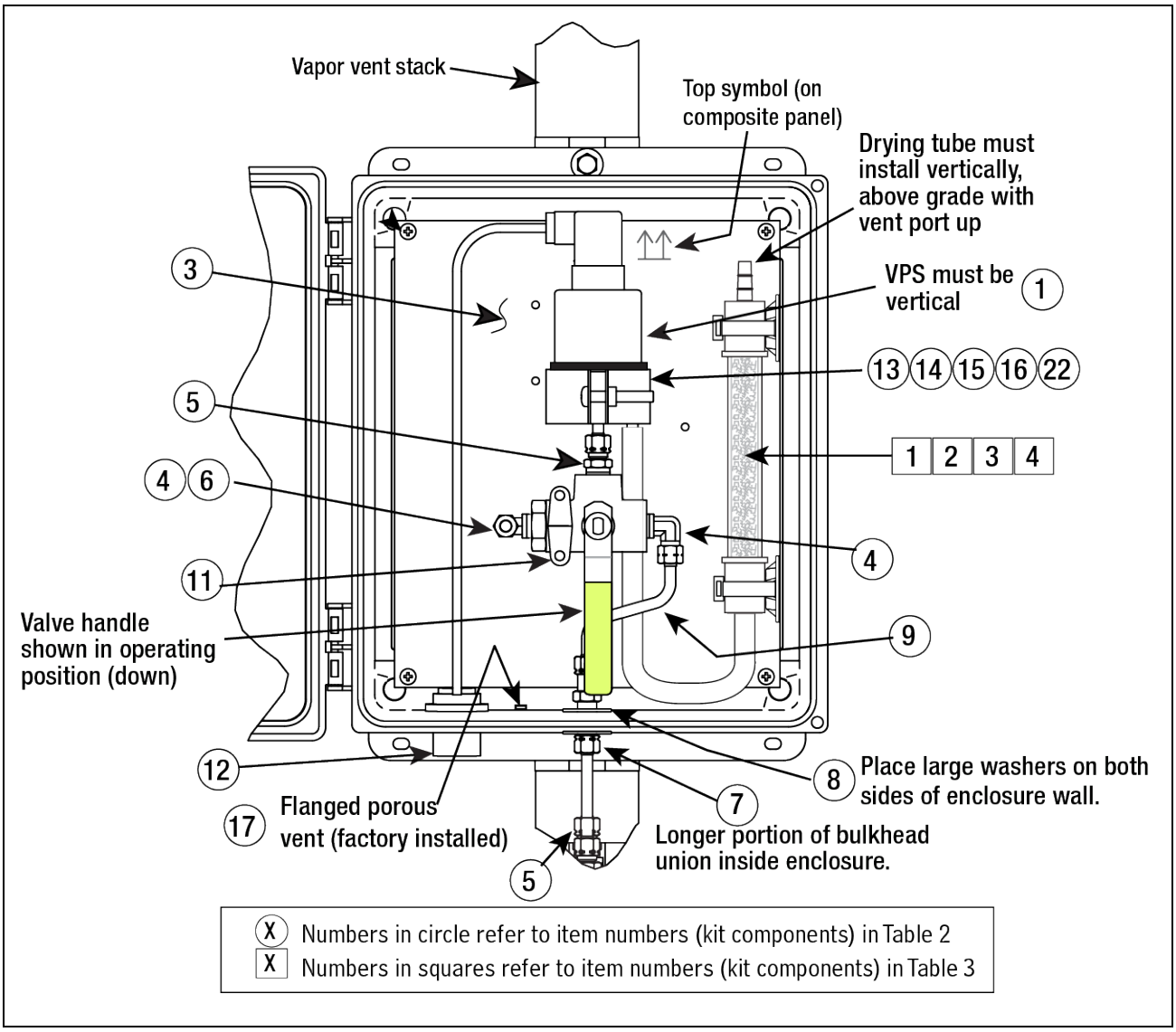


Figure 11. Direct-Wired VPS Sensor Installed in Vapor Vent Stack Enclosure

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