ISD Balance Vapor Flow Meter

TLS-450PLUS & TLS-3XX Consoles

Installation Guide

VEEDER-ROOT

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DAMAGE CLAIMS / LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

Veeder-Root must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Contact Veeder-Root Customer Service at 800-873-3313 with the specific part numbers and quantities that were missing or received damaged.

2. Fax signed Bill of Lading (BOL) to Veeder-Root Customer Service at 800-234-5350.

3. Veeder-Root will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

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1. It is the customer's responsibility to file a claim with their carrier.

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3. If "lost" equipment is delivered at a later date and is not needed, Veeder-Root will allow a Return to Stock without a restocking fee.

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RETURN SHIPPING

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).

Introduction

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Introduction

This manual contains instructions to install the Balance model of a Veeder-Root Vapor Flow Meter (VFM) in the dispenser vapor return line.

NOTICE **The Vapor Flow Meter described herein is referred to in the 450+ GUI setup/report/ diagnostic screens as an Air Flow Meter (AFM).**

For a VFM 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 an intrinsically-safe junction box is in place for the VFM and meets the requirements set out in the appropriate console Site Prep manual.

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

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 Mon itoring Systems – Installer (Level 1)
[7]Certified UST Monitoring Technician
[8]VR Vapor Products

All service personnel 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.
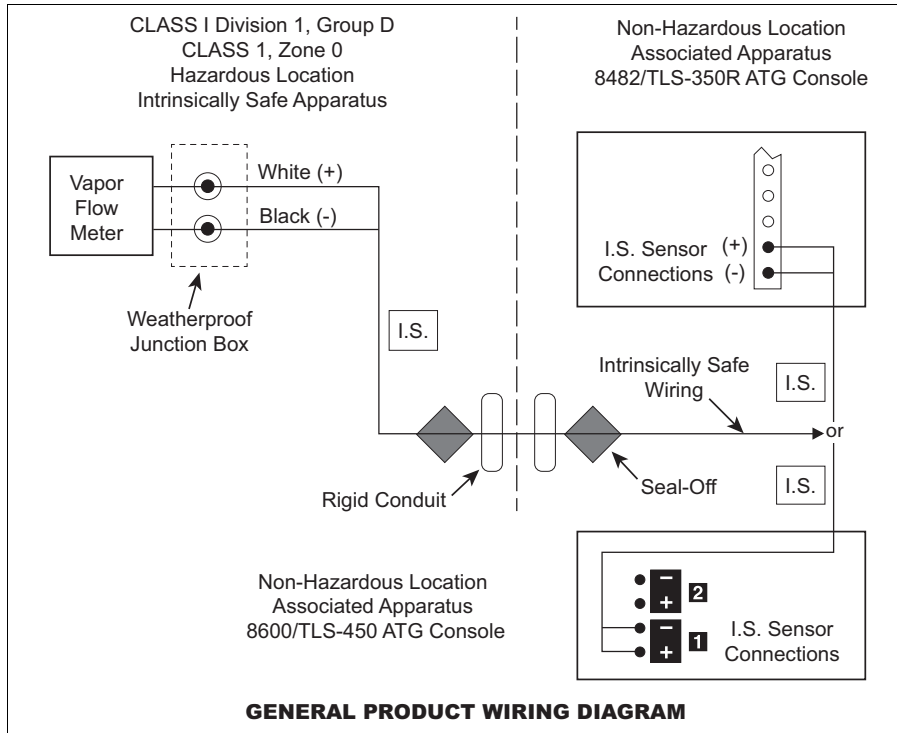
Product Marking Information

RELATED DOCUMENTS
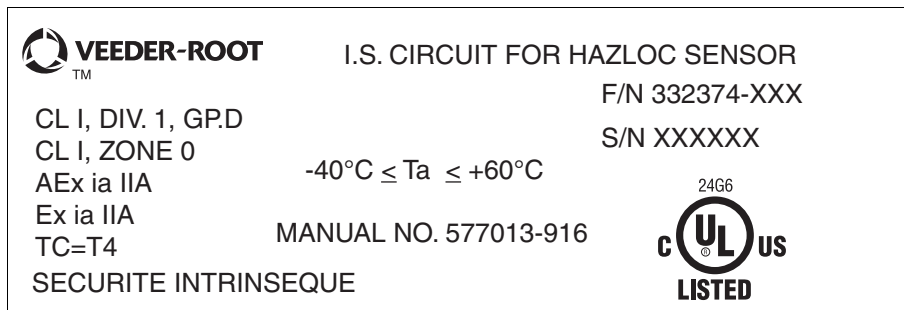
Documents Required to Install Equipment

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):

Equipment	UL/cUL Control Drawing Document No.
Associated Apparatus	
TLS-450/8600	331940-008
TLS-350, TLS-350R	331940-011
Intrinsically Safe Apparatus for Wireless Applications	
Tank Gauge Accessories	331940-012
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.

GENERAL PRODUCT WIRING DIAGRAM

Product Label Contents

⬡ **VEEDER-ROOT** ™	I.S. CIRCUIT FOR HAZLOC SENSOR
	F/N 332374-XXX
CL I, DIV. 1, GP.D	S/N XXXXXX
CL I, ZONE 0	
AEx ia IIA	-40°C ≤ Ta ≤ +60°C
Ex ia IIA	24G6
TC=T4	MANUAL NO. 577013-916
SECURITE INTRINSEQUE	c (UL) US LISTED

Safety Warnings

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

⚠ WARNING

This product is to be installed in systems operating near locations where highly combustible fuels or 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.

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. **Do not alter or modify any component or substitute components in this kit.**

5. **Warning! Substitution of components may impair intrinsic safety.**

6. **Field wiring to the Vapor Flow Meter must not share a conduit with any non-intrinsically safe device's wiring**

7. **Warning! To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.**

8. **Materials used in the construction of this device contain aluminum. Care must be taken to avoid ignition hazards due to impact or friction.**

9. **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.**

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

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.
	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.		**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.
	INJURY Careless or improper handling of materials can result in bodily injury.	**NOTICE**	**NOTICE** is used to address practices not related to physical injury.
⚠WARNING	**WARNING** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.		**WEAR EYE PROTECTION** Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.
	GLOVES Wear gloves to protect hands from irritation or injury.		

Reference Manuals

576013-879	TLS-3XX Series Consoles Site Prep Manual
577014-073	TLS-450PLUS Site Prep & Installation Manual
577013-937	In-Station Diagnostics Install, Setup & Operation Manual
577014-461	ISD Install, Setup & Operation Manual For TLS-450PLUS
331940-012	TLS-RF System Control Drawing
577013-964	TLS RF Wireless 2 System (W2) Installation and Maintenance Guide
577014-033	TLS-XB Site Prep and Installation Manual

Before You Begin

- Comply with all recommended safety practices identified by OSHA (Occupational Safety and Health Administration) and your employer.

- Follow all installation requirements as per NFPA (National Fire Protection Association) 30, 30A, and 70.

- Review and comply with all the safety warnings in the installation manuals and any other national, State or Local requirements.

- When direct wiring to a TLS console, a 2-conductor, 18 AWG shielded cable must be installed in intrinsically safe conduit from each dispenser to the intrinsically safe wiring compartment of the TLS console. The cable length between the console and sensor must not exceed the distance stated in the appropriate 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.

- Debris from plumbing modifications should be flushed through the piping system prior to installing the ISD Vapor Flow Meter.

- Use only UL recognized Gas/TFE yellow plumbing tape on all fittings. Do not use pipe dope to seal pipe threads or fittings in and out of the Vapor Flow Meter.

- 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.

Veeder-Root Parts

- The Balance VFM installation kit is shown in Table 1.

Table 1. Vapor Flow Meter Installation Kit (P/N 330020-585)

Item	Qty.	Description	P/N
1	1	Balance Vapor Flow Meter	332374-002
2	2	Flange with 1" NPT threaded hole	332091-002
3	4	5/16-18 UNC-2B x 3/4" hex head bolt	514100-426
4	2	1-11.5 NPT x 2"me to male threaded steel nipple	576008-655
5	2	O-ring (Parker size # 2-218, Nitrile)	512700-258
6	1	Cord grip group	331028-001
7	1	Sealing pack	514100-304
8	2	Wire nut	576008-461
9	2	Tie wrap	510901-337
10	4	5/16" Lock washer	514100-436
11	1	Manual, Install VR Balance Vapor Flow Meter	577013-916
12	1	Warranty Card, ISD System	577013-868

Tools Required

- Pipe wrench suitable for tightening 1-inch NPT pipe.
- 1/2'' socket wrench to install Vapor Flow Meter flange bolts.
- Necessary pipe fitter's equipment and a non-hazardous work space suitable to modify dispenser vapor line for Vapor Flow Meter installation, when necessary.

Installation

Before installing this device, turn off, tag/lock out power to the system, including console and submersible pumps.

Remove the dispenser's lower sheet metal doors to access the vapor plumbing.

NOTICE **Prior to modifying any piping in the dispenser, consult the dispenser manufacturer to determine if ISD ready retrofit kits are available. Any factory installed plumbing that must be modified in order to install the VFM, must be removed to a non hazardous work area before any cutting or threading takes place. After modifications to any plumbing, it must be reinstalled in accordance with the dispenser manufacturers installation guidelines.**

Above Shear Valve Installs

1. Loosen any factory installed mounts and/or brackets in order to provide room to disconnect any factory installed vapor return plumbing from the shear valve.

2. Disconnect the factory installed vapor return plumbing from the vapor shear valve (see Figure 1).

3. Remove any unneeded field installed plumbing above the vapor shear valve. The Vapor Flow Meter with flanges attached can be used for sizing the required head space of approximately 8 inches. Approximately 3 inches of clearance is required on both sides of the piping to accommodate the width of the meter body.

4. Thread one of the flanges (two provided in installation kit) onto the dispenser vapor return piping.

5. Install any necessary plumbing and the lower flange above the vapor shear valve. The use of 90° elbows should be kept to a minimum to minimize pressure drop, maximize vapor collection efficiency and to prevent liquid traps. All horizontal plumbing must pitch to drain.

NOTICE **IMPORTANT! Upper and lower flanges must align to within 1/16" center-to-center before installing flow meter. If piping is improperly aligned, torque could damage the flow meter and result in vapor leakage.**

6. Clean all debris around the inlet and outlet plumbing prior to installing the VFM. DO NOT blow compressed air through the VFM to prevent damaging the internal screens.

7. Install the o-ring into the lower mounting flange.

8. Taking care that foreign material (chips, debris, sealant, etc.) does not enter the open piping or VFM, carefully insert the o-ring and then connect the VFM to the upper flange. Note that the flow arrow on the side of the meter body must point down.

9. Connect the lower flange to the VFM.

10. Tighten any loose fittings and hardware.

11. Install a cord grip from the kit into the I.S. junction box. Route the VFM cable into the I.S. junction box and tighten the cord grip. Observing polarity, connect the VFM wiring to the field wiring from the TLS console with wire nuts (see Figure 4). Seal wire nuts in epoxy sealant following the instructions in Figure 5.

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

12. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.

13. Connect VFM field wiring in the TLS Console to the USM Module (TLS-450PLUS - Figure 6), or to the Smart Sensor Module (TLS-3XX - Figure 7), as appropriate.

14. Replace the lower sheet metal doors in the dispenser

15. After all Vapor Flow Meters are installed, pressurize the tank ullage space and vapor piping to at least 2 inches WC and test piping connections for leaks using leak detection solution.

NOTICE Important: Upper and lower flanges must align to within 1/16" center-to-center before installing flow meter. If piping is improperly aligned, torque could damage the flow meter and result in vapor leakage.

Figure 1.   Example Vapor Flow Meter Installation Above Shear Valve

Below Shear Valve Installs

1. Remove any unneeded field installed plumbing between the vapor shear valve and the vapor return line fitting. Figure 2 shows two example installations of the Vapor Flow Meter with the required lateral or wye fitting for

running the TP-201.4 back-pressure test. Approximately 3 inches of clearance is required on both sides of the piping to accommodate the width of the meter body.

NOTICE   **IMPORTANT: Upper and lower flanges must align to within 1/16" center-to-center before installing flow meter. If piping is improperly aligned, torque could damage the flow meter and result in vapor leakage.**

2. Connect the lower flange to the pipe that is connected to the lateral or wye access fitting (see Figure 3).

3. Install the Vapor Flow Meter over the lower flange.

4. Connect the upper flange with o-ring above the Vapor Flow Meter.

5. Using a close nipple, thread the shear valve into the upper flange.

6. Using nipples, unions, and other plumbing as required, connect the plumbing outlet to the shear valve.

7. Install a cord grip from the kit into the I.S. junction box. Route the VFM cable into the I.S. junction box and tighten the cord grip. Observing polarity, connect the VFM wiring to the field wiring from the TLS console with wire nuts (see Figure 4). Seal wire nuts in epoxy sealant following the instructions in Figure 5.

NOTICE   **For Wireless installations skip Steps 7 - 9. The VFM connects to a TLS RF transmitter, not to field wiring from the TLS Console (see manual 577013-964 for instructions).**

8. Push the epoxy sealed bag into the junction box. Replace and tighten the junction box cover.

9. Connect VFM field wiring in the TLS Console to the USM Module (TLS-450PLUS - Figure 6), or to the Smart Sensor Module (TLS-3XX - Figure 7), as appropriate.

10. Replace the lower sheet metal doors in the dispenser.

11. After all Vapor Flow Meters are installed, pressurize the tank ullage space and vapor piping to at least 2 inches WC and test piping connections for leaks using leak detection solution.
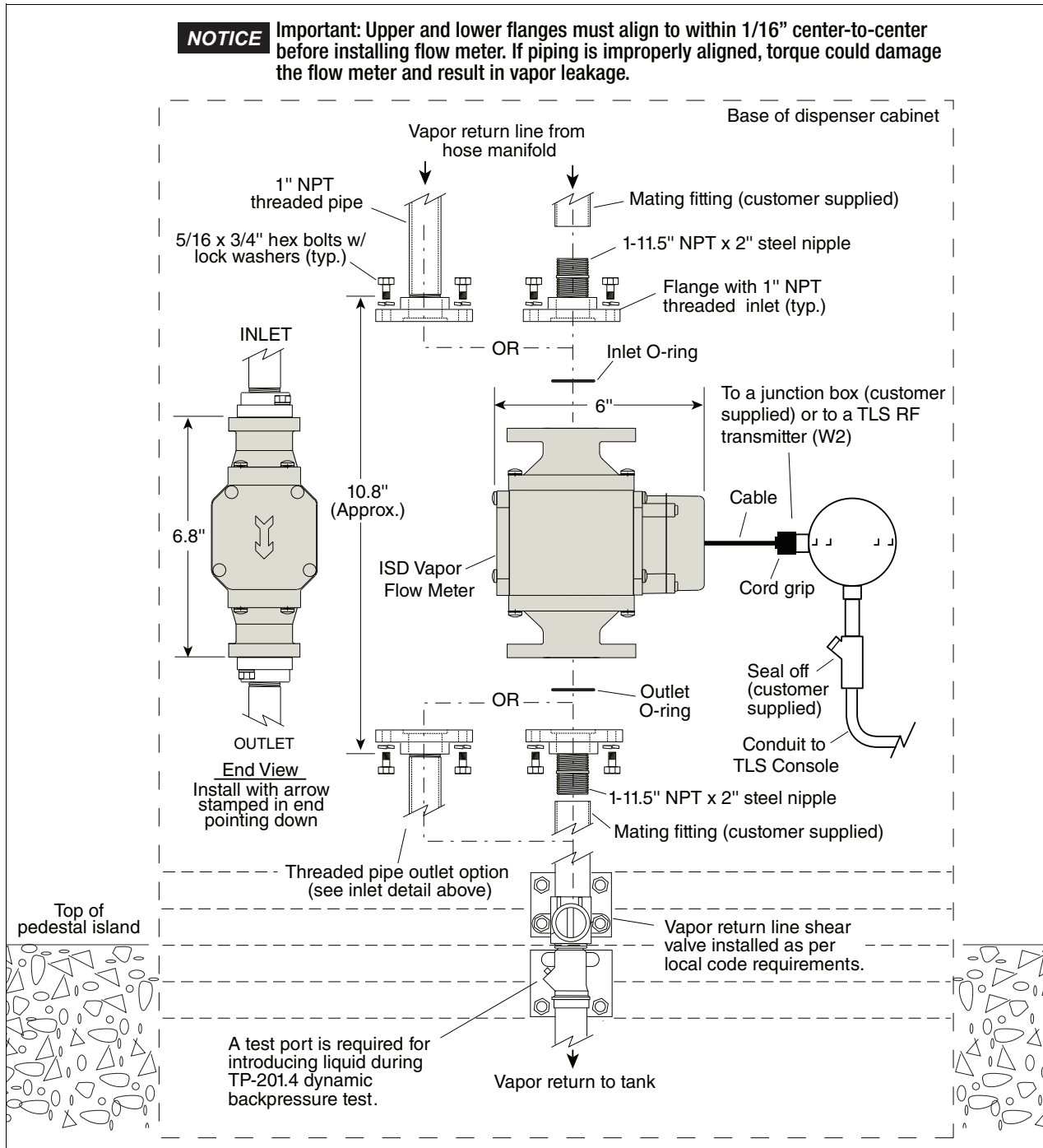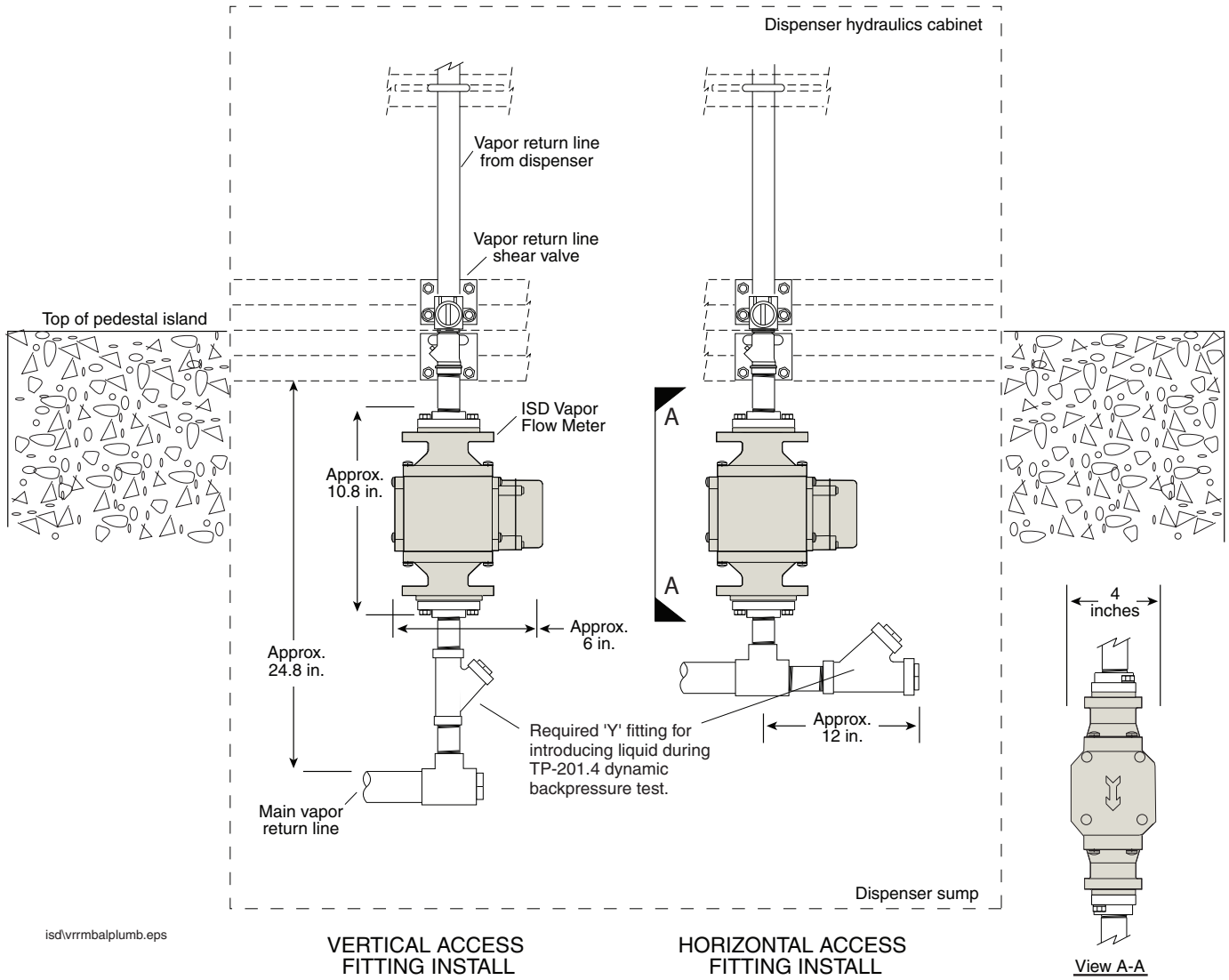
Dispenser hydraulics cabinet

Vapor return line
from dispenser

Vapor return line
shear valve

Top of pedestal island

ISD Vapor
Flow Meter

Approx.
10.8 in.

Approx.
24.8 in.

Approx.
6 in.

A

A

4
inches

Required 'Y' fitting for
introducing liquid during
TP-201.4 dynamic
backpressure test.

Approx.
12 in.

Main vapor
return line

Dispenser sump

isd\vrrmbalplumb.eps

VERTICAL ACCESS
FITTING INSTALL

HORIZONTAL ACCESS
FITTING INSTALL

View A-A

Figure 2.   Example Flow Meter Installations with Approximate Clearances

NOTICE Important: Upper and lower flanges must align to within 1/16" center-to-center before installing flow meter. If piping is improperly aligned, torque could damage the flow meter and result in vapor leakage.
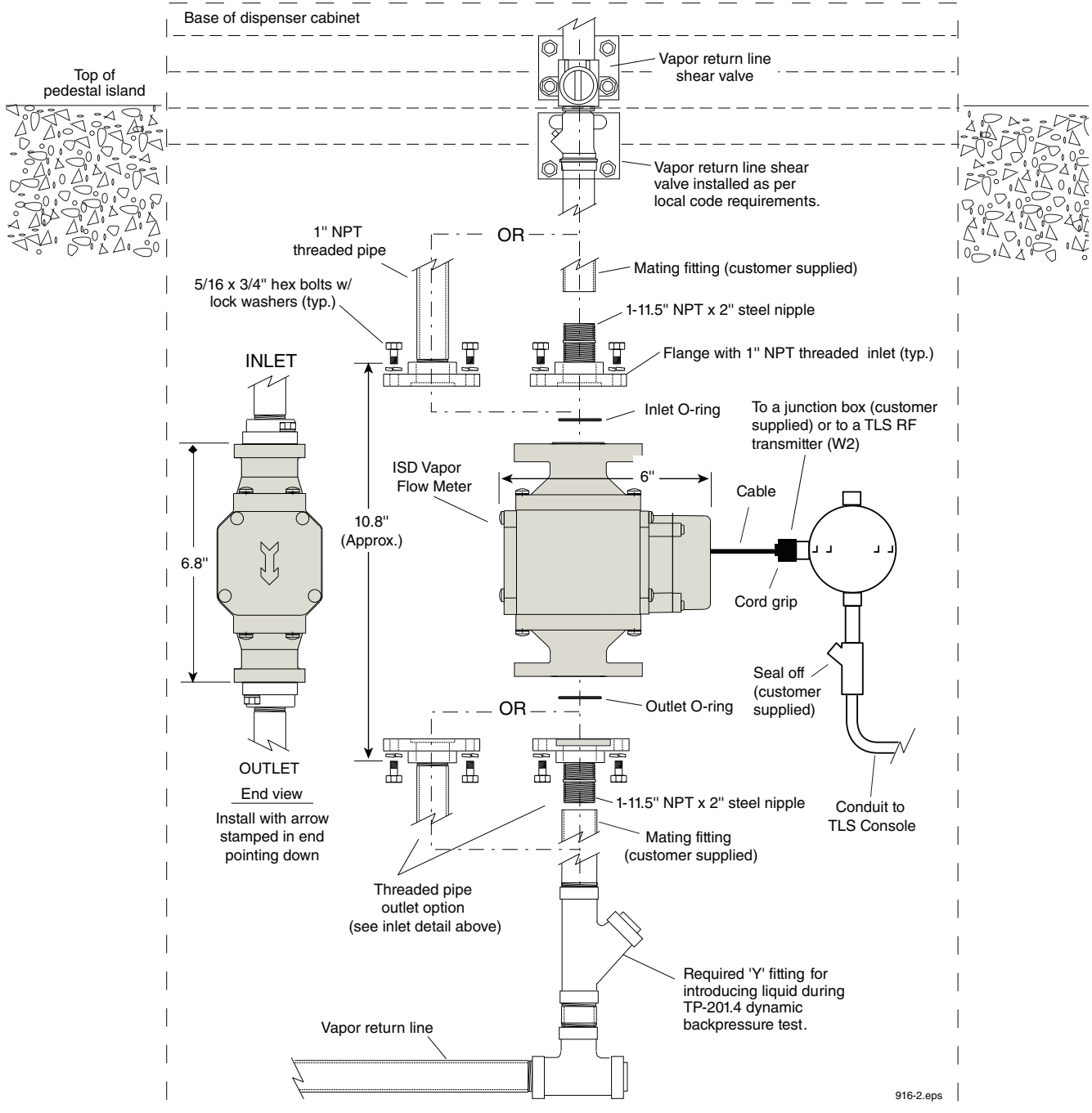
Base of dispenser cabinet

Top of pedestal island

Vapor return line shear valve

Vapor return line shear valve installed as per local code requirements.

OR

1" NPT threaded pipe

Mating fitting (customer supplied)

5/16 x 3/4" hex bolts w/ lock washers (typ.)

1-11.5" NPT x 2" steel nipple

INLET

Flange with 1" NPT threaded inlet (typ.)

Inlet O-ring

To a junction box (customer supplied) or to a TLS RF transmitter (W2)

ISD Vapor Flow Meter

6"

6.8"

10.8" (Approx.)

Cable

Cord grip

OUTLET

OR

Outlet O-ring

End view

Seal off (customer supplied)

Install with arrow stamped in end pointing down

1-11.5" NPT x 2" steel nipple

Conduit to TLS Console

Threaded pipe outlet option (see inlet detail above)

Mating fitting (customer supplied)

Required 'Y' fitting for introducing liquid during TP-201.4 dynamic backpressure test.

Vapor return line

916-2.eps

Figure 3.   Example Vapor Flow Meter Installation Below Shear Valve

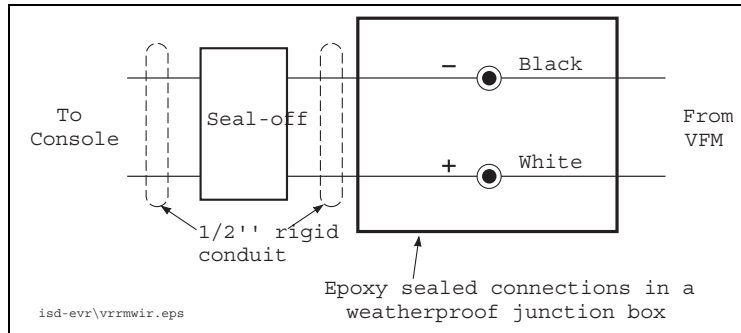**Figure 4.   Field wiring Connections for Direct-Wired VFM Only - Observe Polarity**

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.

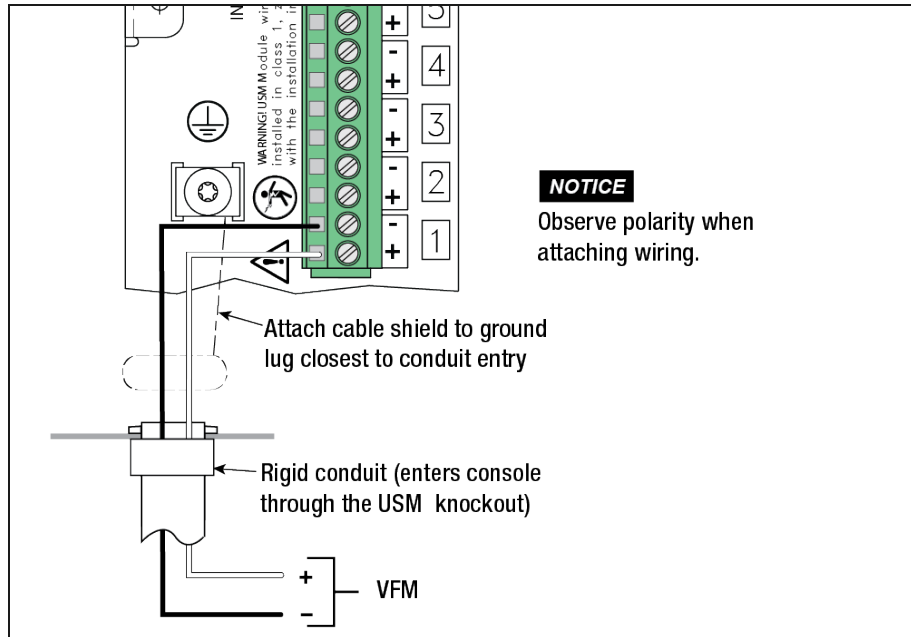**Figure 5.   Epoxy Sealing Field Wiring for Direct-Wired VFM Only**

Figure 6.   Direct-Wired VFM Connects to Available TLS-450PLUS USM Module Position
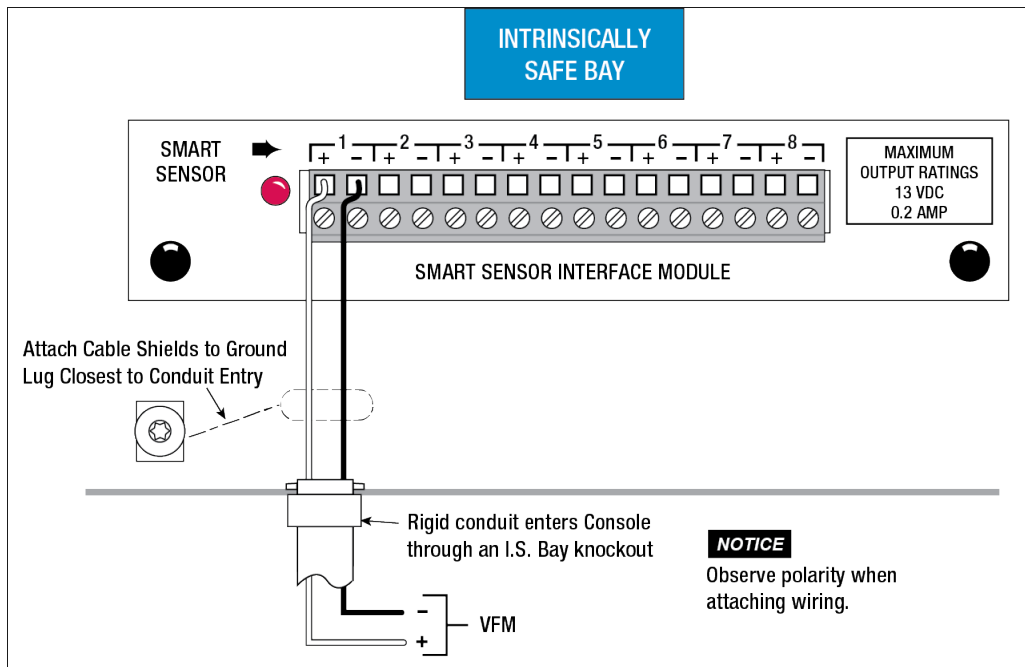

Figure 7.   Direct-Wired VFM Connects to Available TLS-3XX Smart Sensor Interface Module Position

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