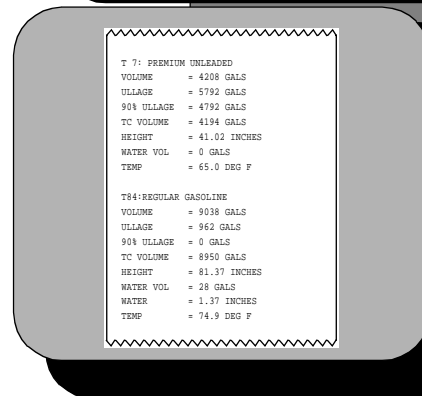
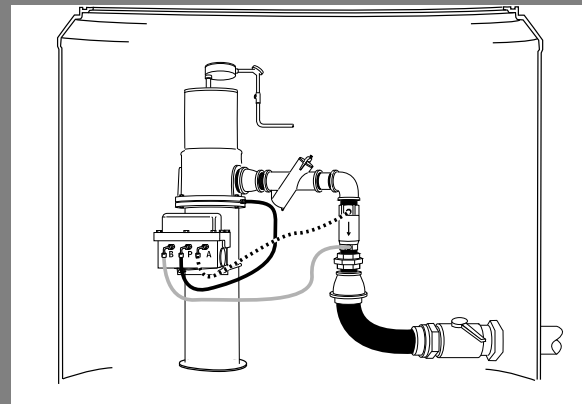
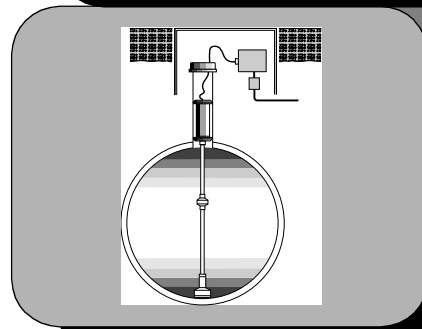
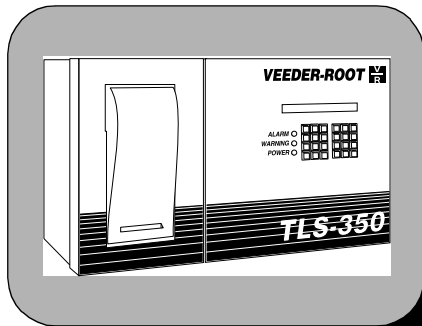


Site Preparation and Installation Instructions

Volumetric Line Leak Detection System for High-Capacity Pumps

For TLS-350 and TLS-350R Systems

Manual Number 576013-972, Revision C



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Instructions are complete.	5	4	3	2	1
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There are enough illustrations.	5	4	3	2	1
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Introduction

This manual describes installation procedures for the Volumetric Line Leak Detection (VLLD) for High Capacity Pump System, Part Number 847590-101 in an TLS-350 or TLS-350R with Business & Inventory Reconciliation (BIR) System designed and manufactured by Veeder-Root

Safety Symbols

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. Always turn power off to the device and associated accessories when servicing the unit.



No Smoking

Sparks and embers from burning cigarettes or pipes can ignite fuels and their vapors



No Open Flames

Open flames from matches, lighters, welding torches, etc. can ignite fuels and their vapors.



No Power Tools

Sparks from power tools (such as drills) can ignite fuels and their vapors.



No Vehicles

Moving vehicles in the area during service can create a potential for personal injury to you or others. Sparks from starting vehicles can ignite fuels and their vapors

**Vehicular Danger**

Serious injury or death could result if you are struck by a vehicle.

**No People in the Area**

Unauthorized people in the area during service can create a potential for personal injury to you and them.

**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.

**Wear Eye Protection**

Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.

**Injury**

Careless or improper handling of materials can result in bodily injury.

**Gloves**

Wear gloves to protect hands from irritation or injury.

**Wear a Mask**

Wear a mask when cutting or grinding or when using epoxy sealant.

**Collect Fuel in Approved Containers**

NFPA-30A, Section 2, requires use of approved containers to collect, transport, and dispose of fuel.


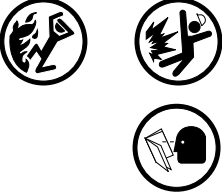
**Clean Up Spills**



Fuel spills in the work area are extremely dangerous. Clean up all spills promptly. Use an acceptable "fuel or gasoline absorbent" material. Dispose of hazardous absorbent as outlined by your local EPA, fire department, or state resources.



**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.

Warnings and Important Notes

 WARNING	
	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p>Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified. Serious contamination of the environment may also occur.</p> <ol style="list-style-type: none">1. Read and follow all instructions in this manual, including all safety warnings.2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.3. Do not alter or modify any component or substitute components in this kit.4. Do not use this component for other systems aside from the TLS-350 or TLS-350R. Install only as described in this manual.5. Do not share wiring conduit for the Volumetric Line Leak Detection (VLLD) system controller with wiring from intrinsically safe devices such as probes, sensors, and thermistors.6. Ensure that conduit enters the TLS-350 or TLS-350R console through the proper preformed knockouts. See wiring diagram and field wiring instructions for detailed information.

 WARNING	
	<p>You are working in an area where vehicle traffic may occur.</p> <p>Serious injury or death could result if you are struck by a vehicle.</p> <p>To protect yourself and others from being struck by vehicles, block off your work area during installation or service.</p>

 WARNING	
	<p>This device is installed in equipment where potentially lethal voltages may exist.</p> <p>Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.</p> <p>Before installing this device, turn off power to the system, including console and submersible pumps.</p>

Important 

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

To help ensure proper installation and unit performance, we recommend that a Veeder-Root Authorized Service Contractor install this equipment.

Safeguarding Existing System Data

At existing sites where a TLS-350 or TLS-350R is already in operation, you will be asked, for personal and equipment safety reasons, to turn OFF the TLS-350 or TLS-350R system before beginning any installation procedures for the Line Leak Detector.

Important 

Before you turn off power to the TLS-350 or TLS-350R console be sure to print out or record all setup data which has been entered into the system and all alarm history and last leak test data which has been stored by the system. In addition, check to be sure that the Battery Backup Switch is in the ON position. If the Battery Backup Switch is OFF, all inventory, leak test, setup and alarm history data WILL BE LOST when AC power to the system is turned OFF.

Refer to the TLS-350 or TLS-350R *System Setup Instructions* for information on activating the Battery Backup feature. Refer to the TLS-350 or TLS-350R *System Operating Instructions* for instructions on viewing and printing inventory, leak test, setup and alarm history data.

VLLD System Contents

The VLLD System for High Capacity Pumps, Part No. 847590-101, contains the following:

- 1 - Mounting Bracket Assembly
- 1 - VLLD Controller
- 1 - VLLD Check Valve
- 3 - Flexible Fuel Control Lines
- 1- Port Fittings
- 10 - “WARNING” Tags
- Epoxy Packs and Wire Nuts
- Site Preparation and Installation Manual

Additional Requirements

Important 

The TLS-350 or TLS-350R console must have certain interface modules installed to accept inputs from a VLLD System and temperature thermistor (if present).

A maximum of eight VLLD's can be installed per console.

Install the VLLD System with an **in-line strainer** upstream of the VLLD System with check valve. The in-line strainer should have a 60-mesh or finer screen. A typical UL-Listed in-line strainer is available from Morrison Brothers of Dubuque, Iowa, Part Number 286-U.

Important 

Failure to install a strainer will result in premature check valve failure and subsequent disabling of the submersible pump.

TLS-350 or TLS-350R Version 4 and higher software can perform line leak testing without requiring that in-tank probes and the ground thermistor be present. All prior software versions use the probes and thermistor to determine a “wait time” for thermal stability before initiating line leak testing.

Beginning with Version 5, the wait time mode is programmable in the TLS-350 or TLS-350R Setup mode under the heading “Wait Mode”. The traditional wait mode using thermistor and probe temperature readings is labelled “Temp. Meas.” mode. The new mode is labelled “Vol. Chg. Meas.” mode. Refer to the TLS-350 or TLS-350R with BIR *System Setup Instructions* for detailed instructions on changing this selection, if required (the system defaults to the “Temp. Meas.” mode).

Use of the “Vol. Chg. Meas.” mode is only recommended in sites where it is required, since using this mode may reduce the frequency of the line tests. Sites requiring “Vol. Chg. Meas.” include:

- Sites that do not have in-tank probes.
- Sites with pipelines exceeding 500 feet of 2-inch diameter pipe (or 225 feet of 3-inch pipe).

For “Temp. Meas.” mode, the TLS-350 or TLS-350R system must have an in-tank probe installed in each tank and a Four-Probe/Thermistor Interface Module, Part No.847490-104, installed in the Intrinsically Safe Area of the console. For each VLLD, one VLLD System Interface Module, Part No. 847490-202, must be installed in the Power Area. These are required to interface a VLLD System to the TLS-350 or TLS-350R console.

Use of a ball valve between the VLLD and dispensers is also required (see Figure 3). The valve will help minimize product drainage during service and will help verify correct VLLD operation.

Make sure the system is configured with this equipment before proceeding with the VLLD System installation. In addition, one Thermistor (Part Number 576010-856) is required per site (not one per VLLD System). For the “Vol. Chg. Meas.” mode (that is, sites not equipped with in-tank probes), the Four-Probe Module and Thermistor are not required.

Preparing the Site

Manholes

The recommended manhole size for installation of the VLLD System on a high-capacity submersible pump is 48-inch diameter.

If it is necessary to accommodate smaller existing manholes, the check valve can be oriented vertically or at any angle. See Figure 3 on page 29 for a typical installation.

Pump Riser Pipe

There must be at least 2-inch clearance between the bottom of the pump and the top of the tank to provide room for the VLLD controller mounting bracket.

Submersible Pump

For proper system operation, the submersible pump must have a fully operational check valve/functional element.

Stage II Vapor Recovery

If a Stage II Vapor Recovery system that includes a device in the pressurized piping is installed, contact Veeder-Root for proper installation procedures.

Piping Runs


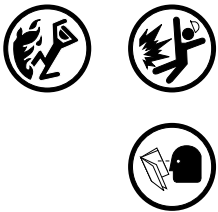
Where unused piping runs have been installed for future use, but are connected to the active piping system, you must isolate the inactive lines from the active lines using a shutoff valve. Failure to do so may cause erratic system performance. Piping runs should be installed so as to prevent entrapped air in the piping system.



Vertical Rise of Pipeline

The total vertical rise of the pipeline must not exceed 8-feet above the VLLD Controller, if pumpside leak testing is required.

Installing Conduit

Safety Warnings

 WARNING	
	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p>Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified. Serious contamination of the environment may also occur.</p> <ol style="list-style-type: none">1. Read and follow all instructions in this manual, including all safety warnings.2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.3. Do not alter or modify any component or substitute components in this kit.4. Do not use this component for other systems aside from the TLS-350 or TLS-350R. Install only as described in this manual.5. Do not share wiring conduit for the Volumetric Line Leak Detection (VLLD) system controller with wiring from intrinsically safe devices such as probes, sensors, and thermistors.6. Ensure that conduit enters the TLS-350 or TLS-350R console through the proper preformed knockouts. See wiring diagram and field wiring instructions for detailed information.

 WARNING	
	<p>You are working in an area where vehicle traffic may occur.</p> <p>Serious injury or death could result if you are struck by a vehicle.</p> <p>To protect yourself and others from being struck by vehicles, block off your work area during installation or service.</p>

 **WARNING**



This device is installed in equipment where potentially lethal voltages may exist.



Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.

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

Conduit Run Guidelines

Prior planning of conduit runs can save time and costs when installing a VLLD System in new installations or at sites where submersible pump conduit and TLS-350 or TLS-350R probe conduit already exists.

VLLD Controller wiring from the TLS-350 or TLS-350R console to the submersible pump manhole can share the same conduit with pump wiring.

Important


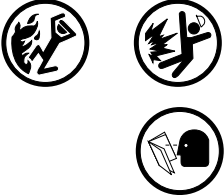
It is recommended for ease of installation that in place of individual wires, you use Veeder-Root VLLD Field Wiring Cable:

8-conductor: 330221-001 (250 feet) or 330221-002 (500 feet)

11-conductor: 330221-101 (250 feet) or 330221-102 (500 feet)

In new installations, consider running a single conduit large enough to accept the eight VLLD controller wires and the required number of pump wires between the submersible pump controller box and the junction box in the submersible manhole.

At existing sites, check to see if existing submersible pump conduit is large enough to accept the eight VLLD controller wires. Be sure to comply with the National Electrical Code and any other applicable codes when determining conduit capacity.

 WARNING	
	<p>VLLD controller wiring is NOT intrinsically safe.</p> <p>Fire or explosion could occur if the Volumetric Line Leak Detection (VLLD) system controller is not properly wired.</p> <ol style="list-style-type: none"> 1. Read and follow all instructions in this manual, including all safety warnings. 2. Do not share wiring conduit for the Volumetric Line Leak Detection (VLLD) system controller with wiring from intrinsically safe devices such as probes, sensors, and thermistors. 3. Ensure that conduit enters the TLS-350 or TLS-350R console through the proper preformed knockouts. See wiring diagram and field wiring instructions for detailed information.

The thermistor can be installed in probe conduit at existing sites, although a separate dedicated thermistor conduit, located as described under “Thermistor Conduit” on page 14, is preferred.

Conduit must be run from:

- The power area of the TLS-350 or TLS-350R console to the Submersible Pump Relay Control Box(es)
- The power area of the TLS-350 or TLS-350R console to the submersible pump manhole
- The intrinsically safe area of the TLS-350 or TLS-350R console to the thermistor junction box in the submersible pump manhole (except when “Vol. Chg. Meas.” is programmed. See “Additional Requirements” on page 5.)
- The VLLD controller junction box to the VLLD controller.

Knockouts for $\frac{3}{4}$ -inch, 1-inch or $1\frac{1}{4}$ -inch conduit are provided in the console. Consider the number of wires entering the console when deciding on the size and number of conduits required, and design the layout to best suit the requirements of the site. The design must conform to the National Electrical Code and all other applicable state and local codes.

Conduit Between Console and Pump Relay Control Box

Run conduit from the power area of the TLS-350 or TLS-350R console to the submersible pump relay control box. The conduit must be large enough to accommodate three (3) #14 AWG wires for each VLLD System being installed.


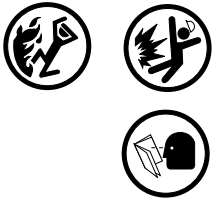
Important

If VLLD controller wires and pump wires are to share the same conduit between the submersible pump relay control box and pump manhole, be sure the conduit from the TLS-350 or TLS-350R console to the submersible pump relay control box is large enough to accommodate eleven wires for each VLLD being installed.

Conduit Between the Console and Submersible Pump Manhole

Wiring from TLS-350the EMC or TLS-350R console to the VLLD controller can share conduit with wiring from the submersible pump relay control box to the submersible pump. If room exists in this conduit, the cost and time of installing new conduit to the manhole can be eliminated.

The pump conduit must have room for the eight #18 AWG wires required by the VLLD controller.

 WARNING	
	<p>VLLD controller wiring is not intrinsically safe.</p> <p>Fire or explosion could occur if the Volumetric Line Leak Detection (VLLD) system controller is not properly wired.</p> <ol style="list-style-type: none">1. Read and follow all instructions in this manual, including all safety warnings.2. Do not share wiring conduit for the Volumetric Line Leak Detection (VLLD) system controller with wiring from intrinsically safe devices such as probes, sensors, and thermistors.3. Ensure that conduit enters the TLS-350 or TLS-350R console through the proper preformed knockouts. See wiring diagram and field wiring instructions for detailed information.

If there is enough room in the existing pump conduit to accommodate VLLD controller wiring, branch off the pump conduit in the manhole to provide for conduit connection to the VLLD controller junction box.

Otherwise, run new conduit from the TLS-350 or TLS-350R console to the submersible pump manhole.

Important 

The VLLD controller junction box in the submersible pump manhole must be within 4 feet of the VLLD Controller location.

Conduit Between the VLLD Controller and Junction Box

It will be necessary to run conduit between the VLLD controller and its junction box in the manhole after the controller has been installed. The controller has eight (8) 6-foot leads extending from a 3/4-inch threaded conduit entry.

Important 

The conduit between the VLLD controller and its junction box must be properly sealed within the submersible pump manhole and the boundary where they pass from a Class I, Division I area into a nonhazardous area in accordance with the National Electrical Code (NFPA 70) and the Automotive and Marine Service Station Code (NFPA 30A).

Thermistor Conduit

The VLLD System thermistor must be installed in conduit to measure ground temperature near the product pipelines. Since this information is used as part of the line leak test calculations, thermistor position is critical.

At newly excavated sites, a separate, dedicated conduit should be used for thermistor wiring and thermistor installation. At existing sites, it is acceptable to insert the thermistor into a conduit that contains intrinsically safe wiring from a Veeder-Root probe or sensor. In either case, it is essential to follow certain thermistor positioning guidelines to help ensure proper system operation.

Important

Do not share conduit with probes or sensors connected to a different second console.

Installing Conduit at Newly Excavated Sites

At newly excavated sites, **two methods** may be used when installing dedicated conduit. In either case, it is important that the conduit reach **a point 8 feet from the thermistor junction box** and be positioned:

- 1 foot or more from any product pipeline
- At the same average depth from ground level as the pipeline to which the VLLD is connected
- In the same backfill and under the same surface covering as the pipeline
- At least 3 feet from any heat source or heat sink such as a building or underground tank
- Away from heavy water drainage

When installed, the thermistor will be positioned at this point, 8 feet into the conduit from the thermistor junction box, for optimal temperature measurement.

New Installation: Method #1

Run conduit between the Intrinsically Safe Area of the TLS-350 or TLS-350R console to the submersible pump manhole. BE SURE that the conduit is positioned so that, at a point 8 feet from the thermistor junction box, the conduit will be positioned as described above under “Installing Conduit at Newly Excavated Sites”.

Important

Avoid any sharp bends in this conduit since the thermistor will be pushed into the conduit from the open end.

New Installation: Method #2

Run conduit between the Intrinsically Safe Area of the TLS-350 or TLS-350R console to the submersible pump manhole.

Run a conduit from the location of the thermistor junction box out of the manhole in the same approximate direction as the product pipeline. The conduit must be sealed on the outside end and extend no more than 8 feet from the location of the junction box. **Be sure** that the conduit is positioned as described above under “Installing Conduit at Newly Excavated Sites”.

Important


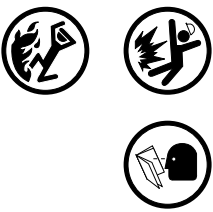
Avoid any sharp bends in this conduit since the thermistor will be pushed into the conduit from the open end.



Installing Conduit at Existing Sites




For existing sites, select a conduit containing intrinsically safe probe or sensor wiring that passes a point 8 feet from the thermistor junction box and meets the criteria listed earlier under “Installing Conduit at Newly Excavated Sites”. If existing conduit does not allow a thermistor location that meets these criteria, it may be necessary to install new thermistor conduit to insure proper system operation.

Installing VLLD Controller and Thermistor Junction Boxes

Safety Warnings

 WARNING	
	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p>Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified. Serious contamination of the environment may also occur.</p> <ol style="list-style-type: none">1. Read and follow all instructions in this manual, including all safety warnings.2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.3. Do not alter or modify any component or substitute components in this kit.4. Do not use this component for other systems aside from the TLS-350 or TLS-350R. Install only as described in this manual.5. Do not share wiring conduit for the Volumetric Line Leak Detection (VLLD) system controller with wiring from intrinsically safe devices such as probes, sensors, and thermistors.6. Ensure that conduit enters the TLS-350 or TLS-350R console through the proper preformed knockouts. See wiring diagram and field wiring instructions for detailed information.

 WARNING	
	<p>You are working in an area where vehicle traffic may occur.</p> <p>Serious injury or death could result if you are struck by a vehicle.</p> <p>To protect yourself and others from being struck by vehicles, block off your work area during installation or service.</p>

 WARNING	
 	<p>This device is installed in equipment where potentially lethal voltages may exist.</p> <p>Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.</p> <p>Before installing this device, turn off power to the system, including console and submersible pumps.</p>

Requirements

Important

The VLLD Controller junction box in the submersible pump manhole must be within 4 feet of the VLLD Controller location.


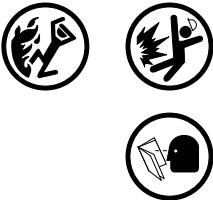
Install a weatherproof electrical junction box with gasketed cover on the manhole end of the conduit run for the thermistor and an explosion-proof junction box for each VLLD controller. Gasketing or sealing compound must be used at each entry to the box to ensure a waterproof junction. The interior of the VLLD controller junction box must be a minimum of 16 cubic inches.




Installing Field Wiring




See Figure 1 on page 22.

To the installer: Read and adhere carefully to the instructions in the following warnings during wiring installation!

Safety Warnings


 WARNING	
	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p>Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified. Serious contamination of the environment may also occur.</p> <ol style="list-style-type: none">1. Read and follow all instructions in this manual, including all safety warnings.2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.3. Do not alter or modify any component or substitute components in this kit.4. Do not use this component for other systems aside from the TLS-350 or TLS-350R. Install only as described in this manual.5. Do not share wiring conduit for the Volumetric Line Leak Detection (VLLD) system controller with wiring from intrinsically safe devices such as probes, sensors, and thermistors.6. Ensure that conduit enters the TLS-350 or TLS-350R console through the proper preformed knockouts. See wiring diagram and field wiring instructions for detailed information.

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Notes to System Wiring Diagram

The following notes are referenced in Figure 1 on page 22 and the following page.

1. Wiring to probes and sensors must be gas and oil resistant sizes from AWG #18 to AWG #14. Barrier ground wiring must be AWG #12 or larger.
2. Connect with AWG #12 (or larger) conductor the barrier ground to the earth ground bus at the power distribution panel.
3. A  denotes field wiring connection using waterproof connectors supplied with the probe(s) and sensor(s).
4. Intrinsically safe wiring shall be installed in accordance with Article 504-20 of the NEC ANSI/NFPA 70, 1990.
5. To maintain intrinsic safety and proper system operation, probe and sensor wiring must be installed within sealed conduit.
6. Electrical rating power input: 120 VAC, 50/60 Hz, 600 Watts maximum.
7. Use existing knockouts for conduit entry into appropriate console compartment.
8. See “Pump Control Wiring” on page 45.

VLLD Controller Field Wiring Installation

Pull eight #18 AWG color-coded or marked wires between the Power Area of the TLS-350 or TLS-350R console and the junction box at each VLLD Controller location.

Important

It is recommended for ease of installation that in place of individual wires, you use Veeder-Root VLLD Field Wiring Cable:

8-conductor: 330221-001 (250 feet) or 330221-002 (500 feet)

11-conductor: 330221-101 (250 feet) or 330221-102 (500 feet)

We suggest that you match the field wire colors with the color-coded leads from the VLLD controller. Use the following sizes and colors:

- #18 Blue #18 Red
- #18 Violet #18 White
- #18 Yellow #18 Grey
- #18 Orange #18 Green

All wires must be of a type designed for use in the presence of gasoline and oil, and must be #18 AWG or larger. The conduit must be sealed in accordance with the National Electrical Code (NFPA 70) and the Automotive and Marine Service Station Code (NFPA 30A) since they pass from a Class I, Division I or Division II area into a nonhazardous area.

Since wiring for multiple VLLD Controllers may be entering the TLS-350 or TLS-350R console through the same conduit opening, be sure to color code or mark each wire to identify its source.

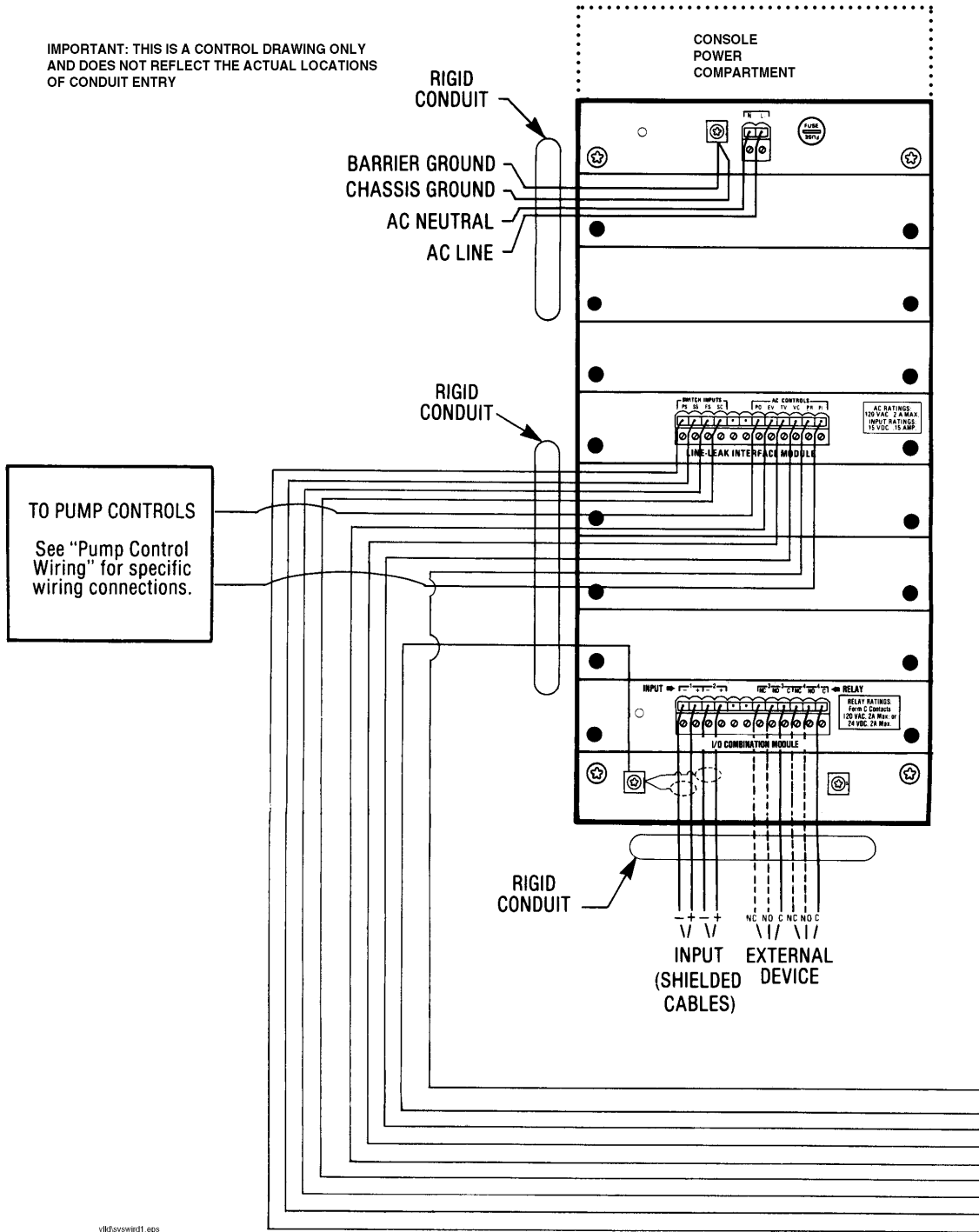
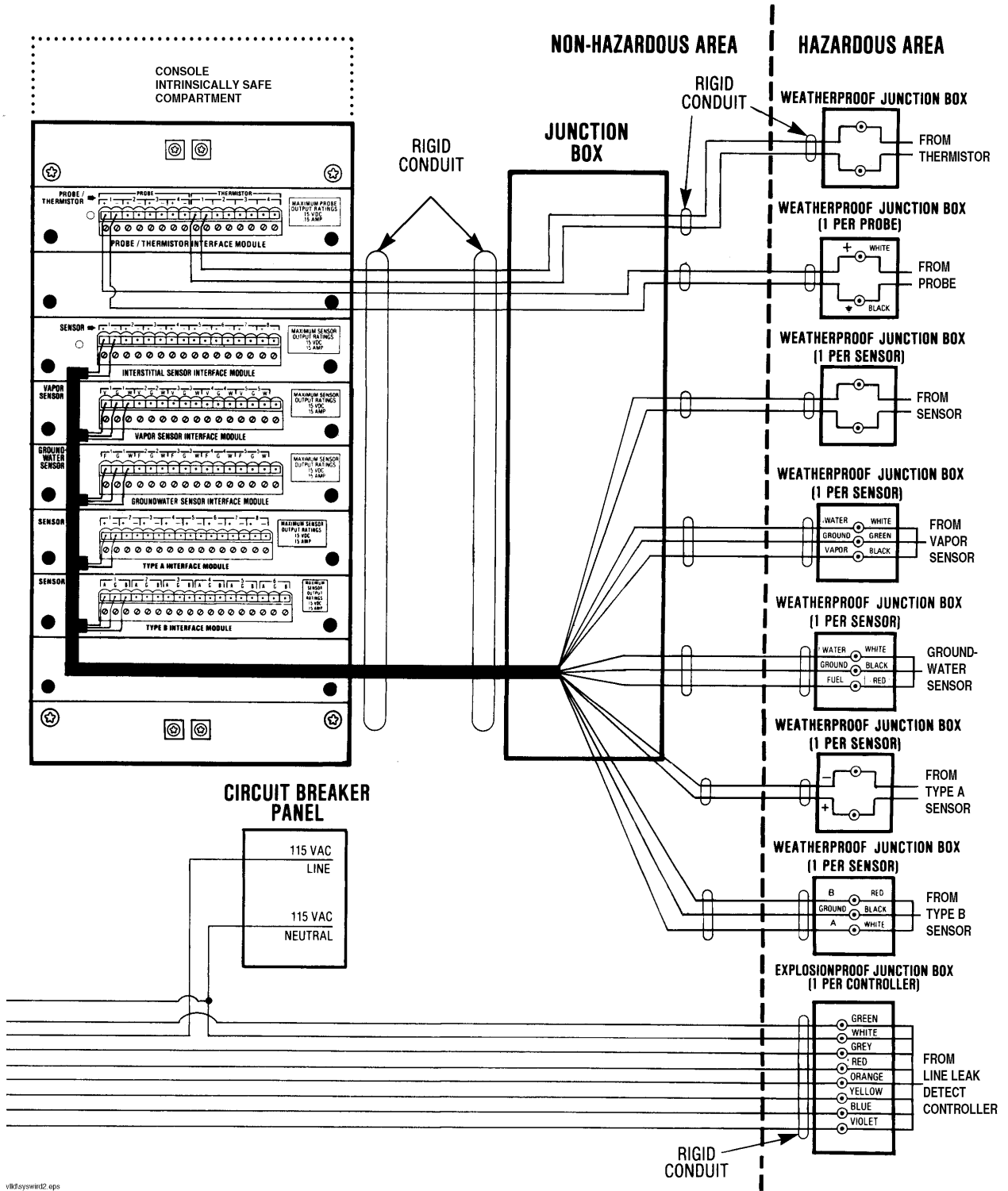


Figure 1. TLS-350/TLS-350R System Wiring Diagram



vlltayswind2.eps

Pump Control Field Wiring Installation

Pull three (3) #14 AWG color-coded or marked wires for each VLLD System Line Leak Interface Module between the Power Area of the TLS-350 or TLS-350R console and the submersible pump relay control box.

Since wiring for multiple pump controls may be entering the TLS-350 or TLS-350R console through the same conduit opening, be sure to color code or mark each wire to identify its source.

Thermistor Field Wiring Installation

Important

The following procedure is not required if the tank monitor is programmed for “Vol. Chg. Meas.”

Two methods may be used to install thermistor field wires. With either method, all wires must be of a type designed for use in the presence of gasoline and oil, and must be between #18 AWG or larger. The conduit must be sealed in accordance with National Electrical Code (NFPA 70) and the Automotive and Marine Service Station Code (NFPA 30A) since they pass from a Class I, Division I or Division II area into a nonhazardous area.

Installation in Existing Probe or Sensor Conduit or New Installation: Method #1

Pull two (2) #18 AWG color-coded or marked wires and one pull wire or cord from the Intrinsically Safe Area of the TLS-350 or TLS-350R console to the junction box at the thermistor location.

Important


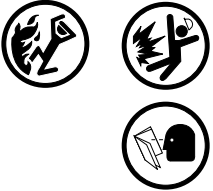
The pull wire or cord will be used to pull the thermistor into the conduit at the junction box end.



New Installation: Method #2

Pull two (2) #18 AWG color-coded or marked wires from the Intrinsically Safe Area of the TLS-350 or TLS-350R console to the junction box at the thermistor location.

Installing the System

Safety Warnings

 WARNING	
	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p>Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified. Serious contamination of the environment may also occur.</p> <ol style="list-style-type: none">1. Read and follow all instructions in this manual, including all safety warnings.2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.3. Do not alter or modify any component or substitute components in this kit.4. Do not use this component for other systems aside from the TLS-350 or TLS-350R. Install only as described in this manual.5. Do not share wiring conduit for the Volumetric Line Leak Detection (VLLD) system controller with wiring from intrinsically safe devices such as probes, sensors, and thermistors.6. Ensure that conduit enters the TLS-350 or TLS-350R console through the proper preformed knockouts. See wiring diagram and field wiring instructions for detailed information.

 WARNING	
	<p>You are working in an area where vehicle traffic may occur.</p> <p>Serious injury or death could result if you are struck by a vehicle.</p> <p>To protect yourself and others from being struck by vehicles, block off your work area during installation or service.</p>

! WARNING

This device is installed in equipment where potentially lethal voltages may exist.

Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.

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

Tank Port Fitting Installation

To install the submersible pump tank port fitting, proceed as follows:

1. Remove any fitting from the 1/4-inch tank port.

Important 

If the submersible turbine pump is not equipped with a “Tank” port, refer to the pump manufacturer's procedures for providing this port.

2. Install the Veeder-Root tank port fitting provided with the VLLD system into the tank port.

Important 

Seal the NPT threads only with a UL classified nontoxic pipe sealant compatible with the liquid involved.

3. Tighten all connections to prevent any leakage.

Thermistor Installation

Important 

A thermistor is installed if the console is programmed for “Temperature Meas.”

The thermistor installation method will depend on what type of conduit run was installed at the site (see “Thermistor Conduit” on page 14 for more information).

The thermistor has a pull loop attached to one end and 10-foot wire leads on the other, as shown in Figure 2.

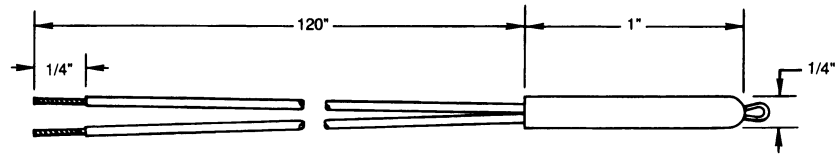


Figure 2. Thermistor

Turn Off Power

 WARNING	
	<p>This device is installed in equipment where potentially lethal voltages may exist.</p>
	<p>Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.</p> <p>Before installing this device, turn off power to the system.</p>



For all thermistor installations, be sure AC power to the submersible pump and TLS-350 or TLS-350R system is OFF before beginning installation.

Pull Cord Installation

If a pull cord was pulled with the two thermistor field wires through the conduit run (see “Thermistor Field Wiring Installation” on page 24), install the sensor as follows.

1. At the thermistor junction box in the submersible pump manhole, attach the pull cord securely to the pull loop in the end of the thermistor.
2. From the TLS-350 or TLS-350R console, pull the thermistor approximately 8 feet into the thermistor conduit. Leave at least 1 foot of the thermistor leads protruding from the junction box for connection to the thermistor field wiring.
3. Using an ohmmeter, test the thermistor by measuring resistance across the thermistor leads. Since the resistance will vary with temperature, a reading between 5,000 and 100,000 ohms is acceptable.
4. Cut off any excess pull cord and tuck the protruding end into the conduit.
5. Seal the conduit in accordance with the National Electrical Code (NFPA 70) and the Automotive and Marine Service Station Code (NFPA 30A) since they pass from a Class I, Division I or Division II area into a nonhazardous area.

Installation Into a Sealed-End, Dedicated Conduit

Since no pull cord can be used in this type of installation, the thermistor must be pushed into the conduit. In some cases, the leads on the thermistor may be sufficient to push it in. In others, a more rigid push wire may be attached to the pull loop and used to push the thermistor into the conduit. For installation into a sealed-end, dedicated conduit, proceed as follows.

1. From the thermistor junction box in the submersible pump manhole, push the thermistor approximately 8 feet into the conduit.
2. Leave at least 1 foot of the thermistor leads protruding from the junction box for connection to the thermistor field wiring.
3. Using an ohmmeter, test the thermistor by measuring resistance across the thermistor leads. Since the resistance will vary with temperature, a reading between 5,000 and 100,000 ohms is acceptable.
4. Cut off any excess push wire (if used) and stuff the protruding end into the conduit.

In-Line Strainer and VLLD Check Valve Installation

The installation of the VLLD check valve and in-line strainer depends on the location of the submersible pump and product pipeline in the manhole and the size of the manhole. Figure 3 on page 29 shows a typical installation layout for a single pump. The instructions in this section describe only the mandatory guidelines that must be followed.

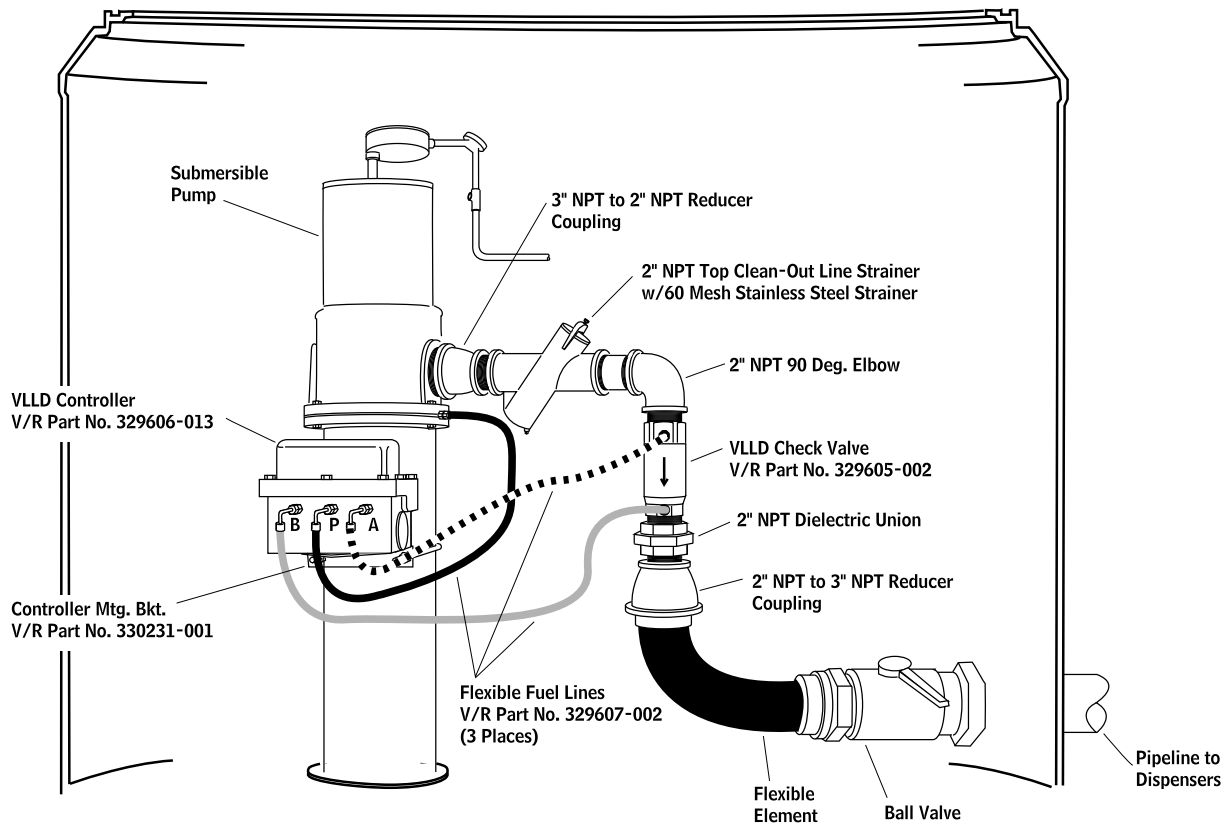



Figure 3. Typical Line Leak Detector Installation (single pump)

Turn Off Power

 WARNING	
	<p>This device is installed in equipment where potentially lethal voltages may exist.</p>
	<p>Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.</p> <p>Before installing this device, turn off power to the system.</p>





Be sure AC power to the submersible pump and TLS-350 or TLS-350R System is OFF before beginning the installation.

Preparing Existing Systems

If this is a new installation where no piping currently exists, proceed to “Installing the Check Valve”. In existing systems, where piping is currently installed, prepare your system as described below before installing the check valve.



1. Close the shutoff valve (if installed) in the manhole to prevent fuel from draining back from the dispensers.
2. Place a catch pan or container to collect draining product under the union where the piping will be disconnected from the submersible pump.

 WARNING	
	<p>Product spillage could create serious environmental and safety hazards.</p> <p>Fire, explosion, or ground contamination could occur.</p> <ol style="list-style-type: none"> 1. If the VLLD Check Valve is being installed at an existing site, drain the product pipeline using approved containers and procedures that will prevent product spillage. 2. Dispose of drained fuel properly. Used an approved suitable container for moving fuel. Dispose of fuel soaked materials properly and not into trash barrels that may be used by customers.

3. Loosen the union and drain the pipeline using procedures that will prevent product spillage.
4. Disconnect the pipeline at the union closest to the pump and remove existing plumbing between the product pipeline and submersible pump.

Installing the Check Valve

The following guidelines **must** be observed when installing the VLLD check valve:

- The VLLD check valve is threaded for a 2-inch NPT fitting at both ends.
- The VLLD check valve may be installed in either a horizontal or vertical position or at any angle.
- Be sure that the two (2) flexible fuel control line fittings are oriented on the side of the VLLD check valve facing the intended location of the VLLD controller. Avoid mounting the fittings directly on top or bottom.
- The arrow on the VLLD check valve must face in the direction of fuel flow (to the dispenser).
- A shutoff valve must be installed between the VLLD check valve and the product pipeline.

Important 

A shutoff valve is required to complete the VLLD start-up procedure.

- A dielectric union **must** be installed between the VLLD check valve and metal piping. A standard union may be used if the piping is made of fiberglass or other non-metallic material.
- Where it is either convenient or necessary for reasons of space, a flexible piping element can be used to connect the VLLD check valve to the shutoff valve on the product pipeline.
- When using rigid piping, a union must be installed on both sides of the VLLD check valve.
- Seal all joints with a UL-classified nontoxic pipe sealant that meets all national, state and local codes. Sealant must be suitable for use with the fuel type involved.

Important 

Do not use excessive amounts of sealant on the check valve threads or mating fittings. Excessive sealant could cause check valve failure.

- When installing the check valve, avoid creating traps where air can accumulate. (See Figure 4. This configuration creates an area which can collect air and may cause selftest failures.)

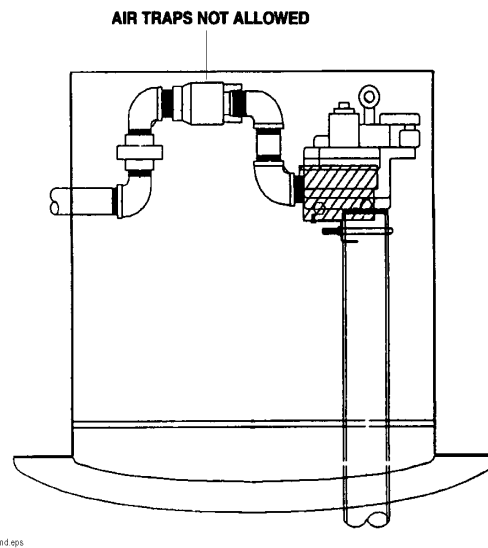


Figure 4. Incorrect Piping Method

VLLD Controller Installation

When planning the installation of an VLLD controller, consider the length (approximately 3 feet) of the three (3) flexible fuel control lines and the VLLD check

valve location. Two of the lines must reach between the controller and check valve. The third extends from the controller to the “Tank” port fitting on the submersible.

Important 

Do not mount the controller to piping, conduit or any part of the manhole or leave loose in the manhole. Improper system operation could result if the VLLD controller is not mounted on its bracket according to these instructions.

To install the VLLD controller:

1. Remove the mounting bracket assembly from its packaging and remove the nuts and lockwashers to separate the U-bolt from the bracket.
2. Place the U-bolt around the pump riser, and insert the ends of the U-bolt into the holes on the bracket.
3. Position the bracket to ensure the flexible fuel lines will be able to reach the check valve ports and not be kinked during installation. Re-install the nuts and lockwashers onto the bracket and tighten to secure it in place.
4. Place the controller onto the bracket so the locating studs on the controller drop into the mating holes on the bracket.
5. Secure the controller to the bracket using the two thread-forming screws provided with the mounting bracket assembly. Securely tighten the screws.
6. Prepare **watertight** conduit to run from the conduit entry on the controller to the controller junction box.

Important 

The conduit between the VLLD controller and its junction box must be properly sealed in accordance with the National Electrical Code (NFPA 70) and the Automotive and Marine Service Station Code (NFPA 30A).

If the conduit location requires that the VLLD controller wires exit on the opposite sides of the controller, follow these steps:

- a. Remove the eight bolts securing the VLLD controller cover in place and set aside for later reinstallation.
- b. Carefully remove the cover from the housing, taking care not to remove the O-ring on the housing.
- c. Remove the 3/4-inch plug on the unused conduit port and set aside for reuse.
- d. Carefully pull the wires and sealing grommet out of the conduit port.

- e. Thread the wires through the opposite conduit port. Push the sealing grommet into the port until the shoulder of the grommet is against the housing (see Figure 5).

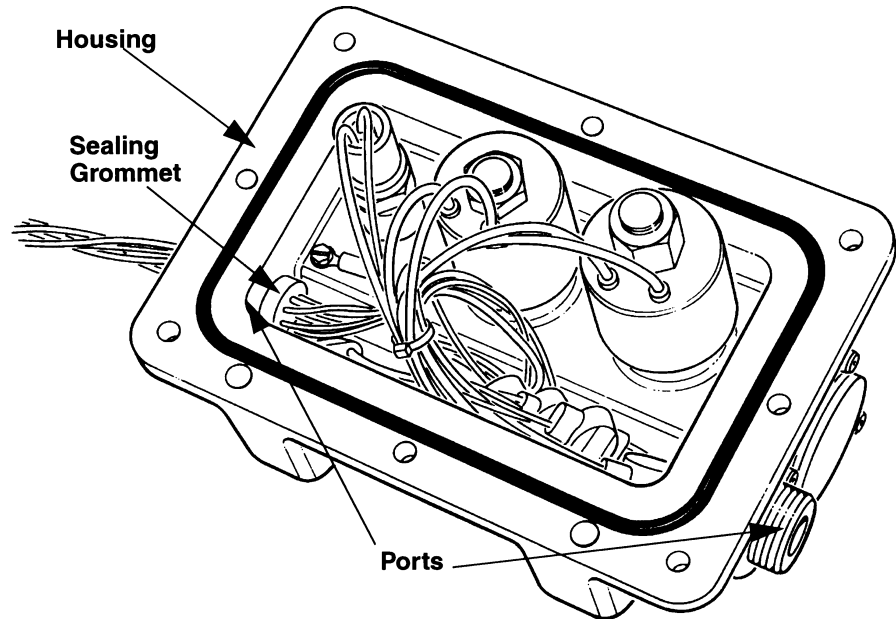





Figure 5. Controller with Grommet Installed

- f. Tuck wire connectors into the VLLD controller housing recess, ensuring they are clear of the cover and housing joint.

Important 



Failure to position the wires away from the joint will cause pinched wires, resulting in controller failure and exclusion of warranty!

- g. Ensure the O-ring on the housing flange is fully seated in the groove, and that mating surfaces on the cover and housing area clean.
- h. Place the cover back onto the housing, ensuring all holes on the cover match the holes on the housing.
- i. Reinstall the eight bolts securing the cover to the housing. Torque to 45 +/- 5 inch-lbs.

 WARNING	
 	<p>A loose cover represents a serious safety hazard.</p> <p>Failure to install and properly secure the cover could result in severe environmental damage or explosion resulting in death, serious personal injury, property loss, and damage.</p> <p>Reinstall and secure the housing cover exactly as described in these instructions.</p>

7. While the conduit is still detached from the controller and junction box, feed the eight VLLD controller wires through the conduit and into the junction box
8. Install the conduit.

Flexible Fuel Control Line Installation

 WARNING	
	<p>Flexible fuel control lines can be easily crimped or punctured.</p> <p>The use of tools could crimp or puncture the lines resulting in improper system operation or dangerous fuel leaks that could cause explosion or other safety and environmental hazards.</p> <p>Do not use tools to bend flexible fuel control lines. Bend lines by hand only.</p>

Three flexible fuel control lines that must be installed. Two run from the check valve to the controller and one runs from the controller to the “Tank” port fitting on the submersible pump.

Clearly marked fittings are provided on the check valve (fittings “A” and “B”) and on the controller (fittings “A”, “B” and “P”).

Important

Do not use thread sealant on flexible fuel lines or mating fittings on the Controller or Check Valve.

1. Install the flexible fuel control lines.

Important 

To avoid damaging flexible fuel lines, install by attaching the end with a 90-degree elbow first and hand-tightening. Next, install the straight end and tighten.

2. Connect flexible fuel control lines between:
 - a. Fitting “A” on the check valve and fitting “A” on the controller.
 - b. Fitting “B” on the check valve and fitting “B” on the controller.
 - c. Fitting “P” on the controller and the Tank port fitting on the submersible pump.

Important 

When installing flexible fuel lines, ensure the lines do not contact each other or other piping system components. Contact between flexible fuel lines and other parts may cause premature failure of the lines, resulting in product leaking into the environment.



3. Tighten all connections to prevent any leakage.




Connecting the Wiring

Refer to Figure 1 on page 22.

To the installer: Read and adhere carefully to the instructions in the following warnings during wiring installation!

Safety Warnings

 WARNING	
	<p>This product is to be installed in systems operating near locations where highly combustible fuels or vapors may be present.</p> <p>Fire or explosion resulting in serious injury or death could result if the equipment is improperly installed or modified. Serious contamination of the environment may also occur.</p> <ol style="list-style-type: none">1. Read and follow all instructions in this manual, including all safety warnings.2. Comply with all applicable codes including: the National Electrical Code; federal, state, and local codes; and other applicable safety codes.3. Do not alter or modify any component or substitute components in this kit.4. Do not use this component for other systems aside from the TLS-350 or TLS-350R. Install only as described in this manual.5. Do not share wiring conduit for the Volumetric Line Leak Detection (VLLD) system controller with wiring from intrinsically safe devices such as probes, sensors, and thermistors.6. Ensure that conduit enters the TLS-350 or TLS-350R console through the proper preformed knockouts. See wiring diagram and field wiring instructions for detailed information.

 WARNING	
 	<p>This device is installed in equipment where potentially lethal voltages may exist.</p> <p>Electrical shock resulting in serious injury or death may result if power is on during installation and the device is improperly installed.</p> <p>Before installing this device, turn off power to the system, including console and submersible pumps.</p>

General Wiring Practices

Be sure all wires are color-coded or carefully marked to identify their source.

The VLLD System Interface Module in the TLS-350 or TLS-350R console comes with a connector in place. Do not remove the connector from the module or remove the module from its slot in the console during wiring.

Terminal identifications appear only on the module bracket. Removing the connector from the module increases the risk of wiring errors.

Label all connectors using the self-adhesive labels supplied according to the slot in which the modules are installed.

Important

Once a connector has been wired on a module and the TLS-350 or TLS-350R system has been programmed, the connector and module cannot be moved to another slot without reprogramming the system.

Record the location (i.e., Tank #1, Tank #2, etc.) of each VLLD wired to a module on the circuit directory located inside the TLS-350 or TLS-350R door.

VLLD Interface Module Wiring Connections



To connect the VLLD system interface module:

1. Turn OFF all AC power to the TLS-350 or TLS-350R console and submersible pumps.
2. Connect the green ground wire from each VLLD controller to a ground lug in the Power Area of the TLS-350 or TLS-350R console.
3. Connect the seven remaining color-coded or marked wires from each VLLD controller and the three wires from the pump controls to the proper terminals on

the VLLD System Interface Module connector (see Figure 7 on page 41 and Figure 8 on page 42).



4. Be sure to maintain correct circuit orientation between the color-coded or marked field wires and connector terminals during wiring.

VLLD Controller Field Wiring Connections



To connect field wires to the VLLD controller:

1. Turn OFF all AC power to the TLS-350 or TLS-350R system and submersible pump.
2. Using wire nuts, connect the wires from the VLLD controller to field wires in the junction box (see Figure 7 on page 41 and Figure 8 on page 42). Be sure to maintain correct circuit orientation between the color-coded or marked field wires and VLLD controller wires during wiring.

 CAUTION	
 	<p>Epoxy sealant may be irritating to skin and eyes, absorbed through the skin, or cause skin sensitization in susceptible individuals.</p> <p>Minor injury may result. Also materials contained in epoxy have caused skin cancer in animal tests.</p> <p>Avoid skin and eye contact. Wear appropriate safety equipment. Use only in well ventilated areas.</p>
 	

3. Seal wire nut connections at this time using the epoxy sealant furnished with each VLLD. Use one packet for no more than two wire nut connections. To prepare epoxy and seal connections:
 - a. Alternately squeeze each end of packet until wall between two chambers breaks, allowing contents to mix. Continue to knead packet until color is uniform and contents are completely blended.

- b. Cut one end of packet. Insert wire nuts and wires into packet [Figure 6].

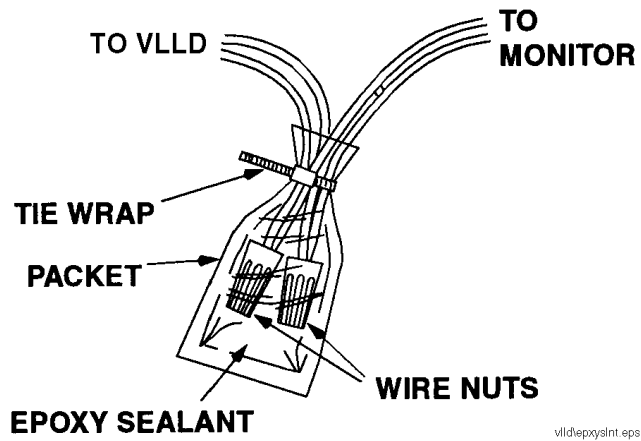


Figure 6. Epoxy Sealant Connections

- c. Tie open end of packet with tie wrap.

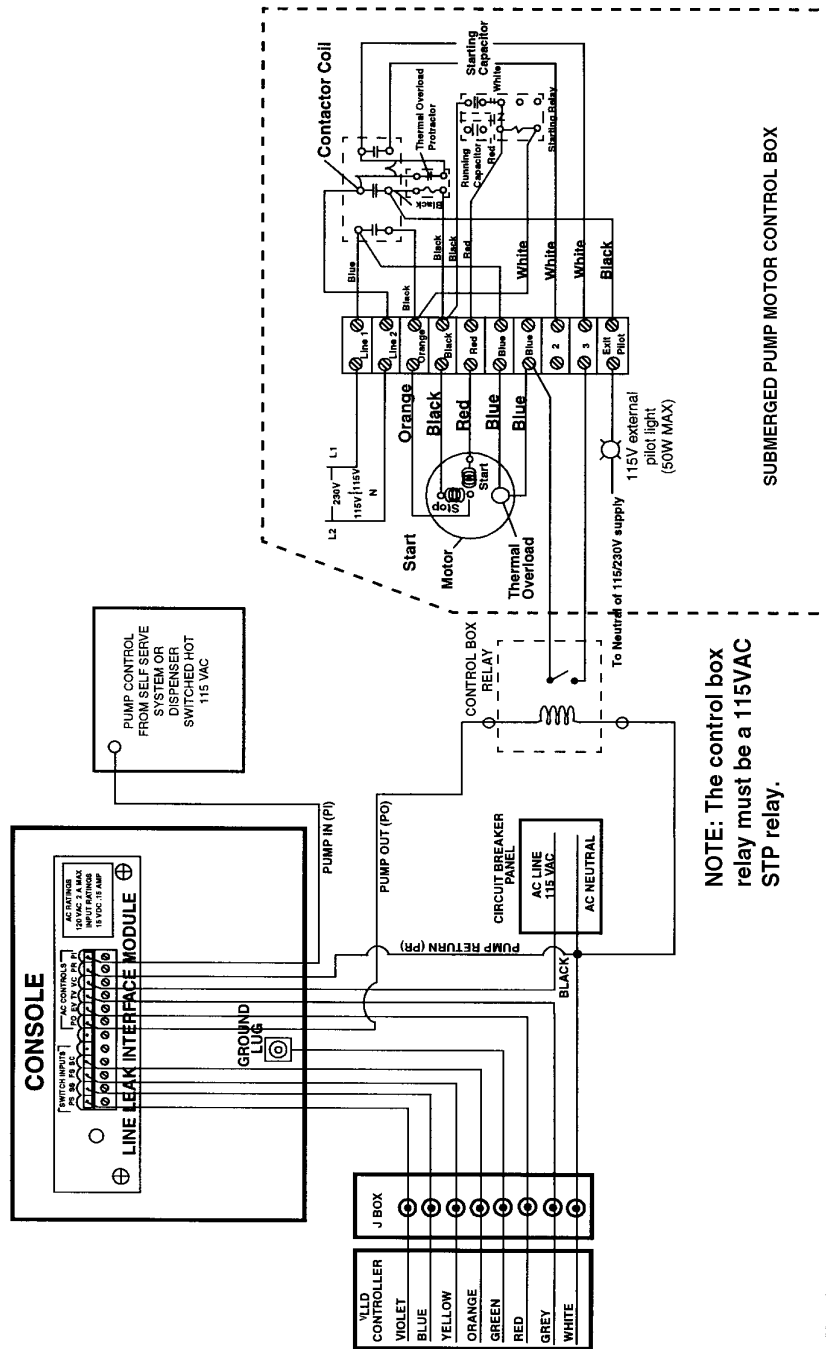
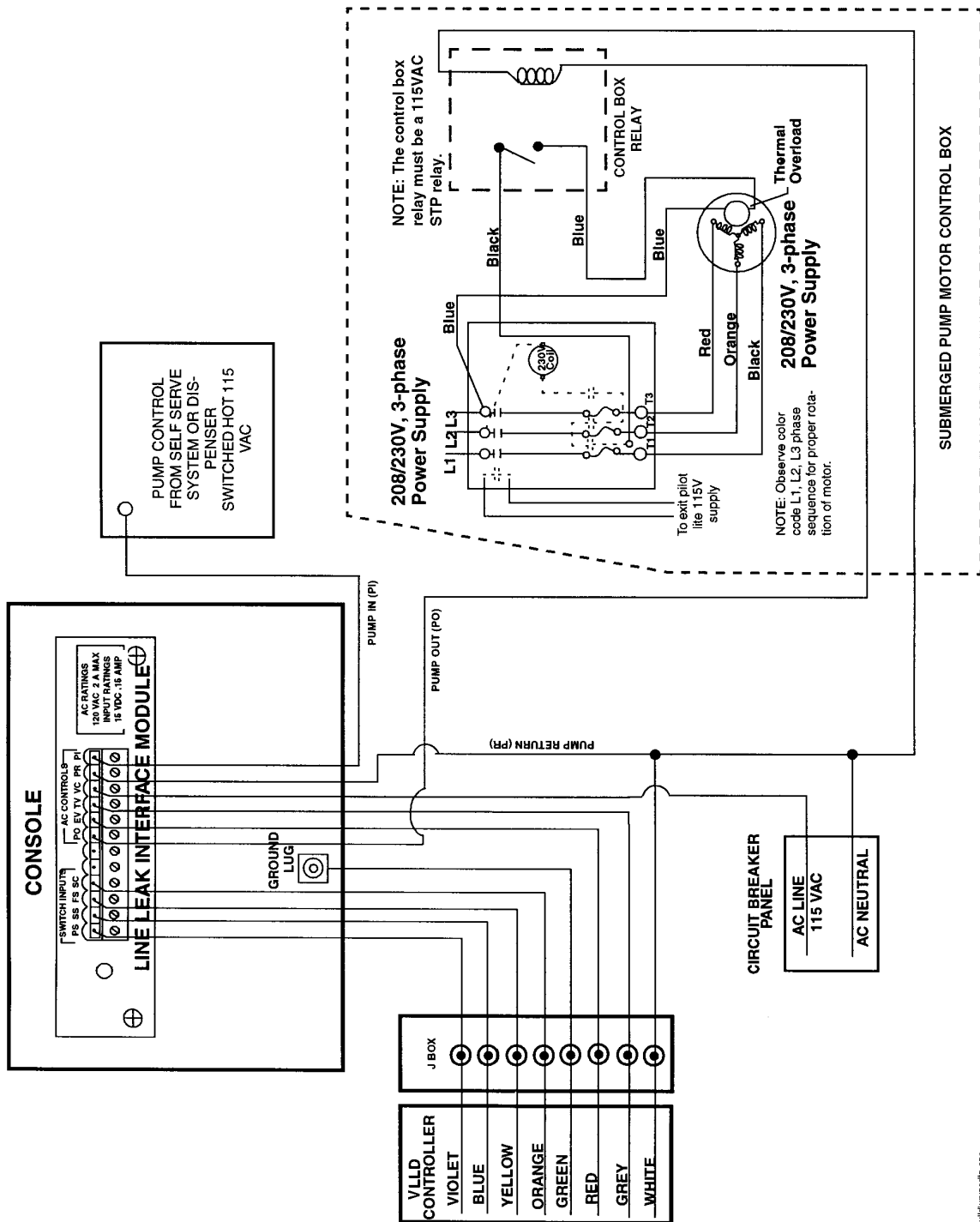


Figure 7. VLLD and Pump Control Diagram for Single-Phase, 230V Red Jacket Pump



vlldmpc01p-eps

Figure 8. VLLD and Pump Control Diagram for Three-Phase, 230V Red-Jacket Pump

Important 

You must seal the wire nuts or warranty will be void!

If more than two wire nut connections share an epoxy sealant bag, the connections will not be properly sealed. Improper sealing of the connections may result in inaccurate system readings and false alarm conditions.

Thermistor Interface Module Wiring Connections



To connect the thermistor interface module:

1. Turn OFF all AC power to the TLS-350 or TLS-350R console and submersible pumps.
2. Connect the two color-coded or marked wires from the thermistor to the terminals for Thermistor #1 on the Thermistor Interface Module connector (see Figure 9 on page 44).

Important 

Only terminal position #1 on Thermistor Interface Module can read the thermistor.

Thermistor Field Wiring Connections

Important 

Refer to “General Wiring Practices” on page 38 for important wiring information.



To connect field wires to the thermistor:

1. Turn OFF all AC power to the TLS-350 or TLS-350R system and submersible pump.

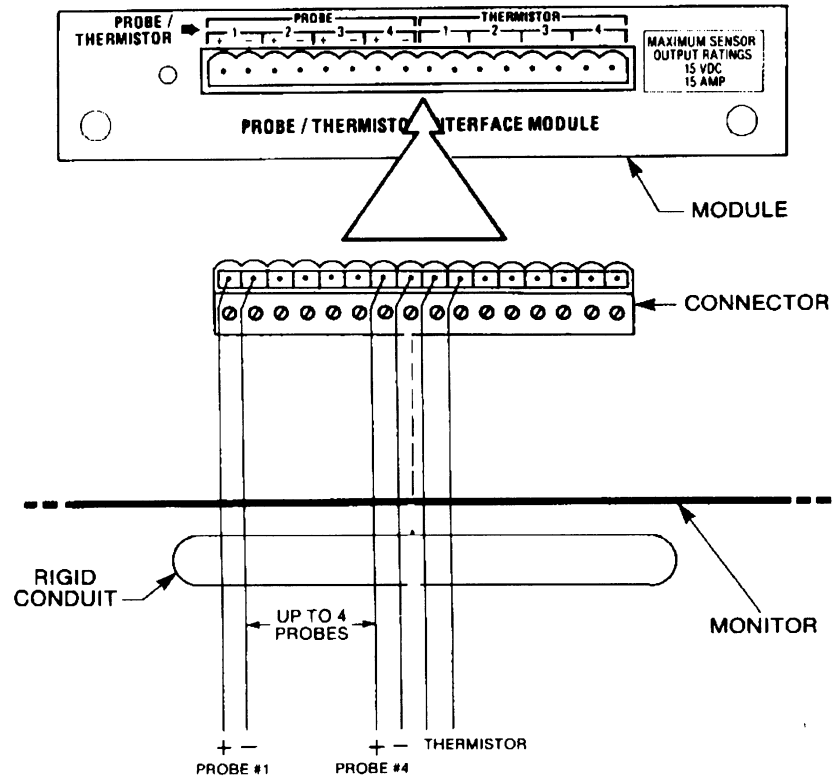


Figure 9. Thermistor Interface Module Wiring Diagram

2. Using wire nuts, connect the wires from the thermistor to field wires in the junction box (see Figure 10).

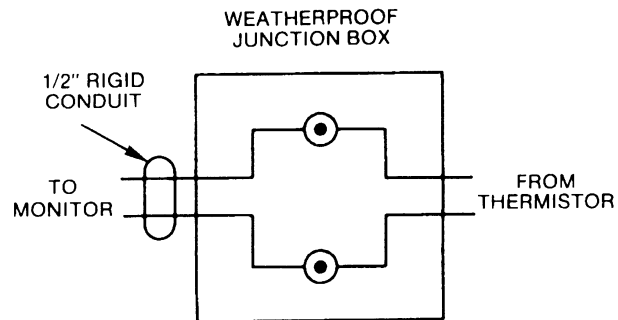






Figure 10. Thermistor Field Wiring Diagram

 CAUTION	
  	<p>Epoxy sealant may be irritating to skin and eyes, absorbed through the skin, or cause skin sensitization in susceptible individuals.</p> <p>Minor injury may result. Also materials contained in epoxy have caused skin cancer in animal tests.</p> <p>Avoid skin and eye contact. Wear appropriate safety equipment. Use only in well ventilated areas.</p>

- Seal wire nut connections at this time using the epoxy sealant furnished with each VLLD. Use one packet for no more than two wire nut connections (see detailed procedure and Figure 6 on page 40).

Important

You must seal the wire nuts or warranty will be void!

If more than two wire nut connections share an epoxy sealant bag, the connections will not be properly sealed. Improper sealing of the connections may result in inaccurate system readings and false alarm conditions.

Pump Control Wiring

Refer to Figure 7 on page 41 and Figure 8 on page 42.

The TLS-350 or TLS-350R console must be able to detect when dispensers are ON or OFF so it only initiates line leak tests when the dispenser is OFF. The console must also be able to start the submersible pump to perform a line leak test, and shut the pump off if a leak is detected.

Detection and control is accomplished by monitoring and interrupting or simulating the STP (Submerged Turbine Pump) control signal from the dispenser to the STP relay control box

The “Dispenser ON” signal may come from a Point-of-Sale terminal, self-serve console, a solid state relay in an electronic dispenser, or a switch inside a mechanical dispenser. This is the STP control signal normally sent directly to the STP relay control box.

Important

When installing pump control wiring for line leak detection systems, you MUST ensure that the Emergency Stop circuitry at the site is not circumvented!

VLLD wiring for Red Jacket single-phase submersible pumps may differ from wiring for Red Jacket three-phase pumps. See Figure 7 on page 41 and Figure 8 on page 42.



To connect pump control wiring:

1. Turn OFF all AC power to the TLS-350 or TLS-350R, dispensers and submersible pumps.
2. Connect AC Line from the “Dispenser ON Switch” to the wire leading to the PI (PUMP IN) terminal on the VLLD Line Leak Interface Module.
3. Connect the wire from the PO (PUMP OUT) terminal on the VLLD system interface module to the AC Line side of the pump control box relay.
4. Connect the PR (PUMP RETURN) wire from the module to AC Neutral side of the pump control box relay as shown in Figure 7 or Figure 8.
5. Connect a wire from the (blue 1) terminal screw in the Red Jacket pump control box to one side of the pump control box relay contact as shown in Figure 7 or Figure 8.
6. Connect a wire from the #3 terminal screw in the Red Jacket pump control box to the other side of the pump control box relay contact as shown in Figure 7 or Figure 8.
7. Verify that the Emergency Stop circuit has not been circumvented by initiating a 3 gph test on each line. To do this, confirm that the pump relay is NOT energized at any time during the test.

Checking the System

WARNING Tags

Ten “WARNING” tags (329801-001) (see Figure 11) have been provided with the VLLD (see Figure 11).

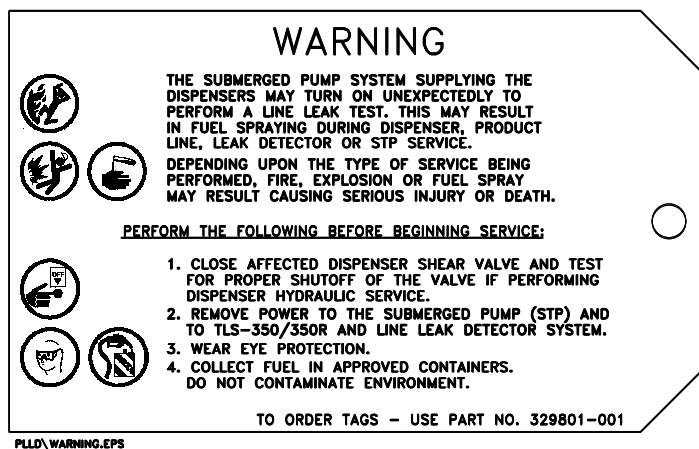


Figure 11. WARNING Tag

For your safety and the safety of others who may service dispensers, submersible pumps or VLLDs, you must attach a tag to or near each of the following items in a location such that it will be likely read before starting service:

- TLS-350 or TLS-350R console
- Submersible pump
- Each dispenser filter

Additional tags may be ordered per the instructions on the tag.

Plumbing Checkout

Important 

Do not turn on power to the TLS-350 or TLS-350R console. This must be done by an authorized Veeder-Root distributor during the warranty checkout and start-up procedure!

To perform plumbing checkout:

1. Turn on power to the submersible pump.

Important 

Failure to purge air from the lines can cause the system to falsely indicate leaks or create other problems.

2. Purge air from the product lines as follows:
 - a. Turn on the dispenser farthest from the tank.
 - b. Wait approximately 2 minutes.
 - c. Pump 10 to 20 gallons, or until no more air is present.
 - d. Repeat these steps for each dispenser, working from the farthest from the tank to the closest to the tank.
3. Carefully check all fittings for leaks.
4. Tighten any leaking fittings until the leak is stopped. **Be careful** not to overtighten and strip the threads.
5. If the leak cannot be stopped, turn off power to the submersible and check the fitting for thread damage or improper sealing.
6. Replace or reseal the fitting as required.

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