DPLL D

Site Prep and Installation Guide
Notice

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Contact TLS Systems Technical Support for additional troubleshooting information at 800-323-1799.

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.

CUSTOMER’S PREFERRED CARRIER

1. It is the customer’s responsibility to file a claim with their carrier.
2. Customer may submit a replacement purchase order. Customer is responsible for all charges and freight associated with replacement order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
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.
4. Veeder-Root will NOT be responsible for any compensation when a customer chooses their own carrier.

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.

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This manual contains instructions for installing the components for Veeder-Root Digital Pressurized Line Leak Detection (DPLLDD). The DPLLDD equipment performs 3.0 gph line leak tests following each dispense. Depending on the software enhancement module installed, the DPLLDD equipment will also allow, with certain pump types, 0.2 and/or 0.1 gph line tests at full pump pressure. The DPLLDD equipment executes leak tests automatically to eliminate the need for separate annual line leak testing.

1. The DPLLDD, Digital Pressure Line Leak Detector, Form Number 8590, is Intrinsically Safe when installed according to Control Drawing Number 331940-008.

2. The TLS-450PLUS/TLS-450 console/DPLLDD sensors are not supported by the Red Jacket Variable Speed Flow Controller (VSFC). The VSFC is designed for use with PLLD sensors/TLS-350 consoles only!

3. You must consult the Veeder-Root Line Leak Detection Systems Application Guide (P/N 577013-465) for all information relating to DPLLDD applicable pipe types, equipment requirements, installation kits, and pump compatibilities.

4. A Sump Sensor is recommended for sites with line leak in the event the pump develops a leak. Line leak will only detect a leak in the line, not in the pump.

**Contractor Certification Requirements**

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

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

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

- Wireless 2
- Tall Tank

**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):
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 on the accompanying Compact Disk (TECH DOCS CD) or on the INTERNET at veeder.com under SUPPORT; VR TECHNICAL DOCUMENTS; DRAWINGS.

### Product Label Contents

**VEEDER-ROOT**

I.S. CIRCUIT FOR HAZLOC SENSOR

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

**MANUAL NO. 577013-933**

- -40°C ≤ Ta ≤ +60°C
- S/N XXXXXXX
- F/N 8590XX-XXX
- SECURITE INTRINSEQUE

---

**Table:**

<table>
<thead>
<tr>
<th>Associated Apparatus</th>
<th>UL/cUL Control Drawing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLS-450PLUS&amp;TLS-450/8600</td>
<td>331940-008</td>
</tr>
</tbody>
</table>
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 DPLL D Transducer must not share a conduit with any non-intrinsically safe device's wiring.

7. To prevent ignition of flammable or combustible atmospheres, turn off, tag and lockout power to console and pumps before servicing.

8. Before installing or taking the transducer into a hazardous area, earth the unit in a safe area to remove any static charge. Then immediately transport the unit to the installation site. Do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions. Do not rub or clean the unit after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of a static discharge. When fitting or removing the unit, use of anti-static footwear or clothing is required.

9. Materials used in the construction of this device do not contain, by mass, more than 10% in total of aluminum, magnesium, zirconium and titanium or 7.5% in total of magnesium, titanium and zirconium.

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

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

<table>
<thead>
<tr>
<th>EXPLOSIVE</th>
<th>FLAMMABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuels and their vapors are extremely explosive if ignited.</td>
<td>Fuels and their vapors are extremely flammable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELECTRICITY</th>
<th>TURN POWER OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage exists in, and is supplied to, the device. A potential shock hazard exists.</td>
<td>Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEAR EYE PROTECTION</th>
<th>INJURY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel spray from residual pressure in the lines can cause serious eye injuries. Always wear eye protection.</td>
<td>Careless or improper handling of materials can result in bodily injury.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GLOVES</th>
<th>APPROVED CONTAINERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear gloves to protect hands from irritation or injury.</td>
<td>Use nonbreakable, clearly marked containers, suitable for collecting and transporting hazardous fuels during service.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.</td>
<td>CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USE SAFETY BARRICADES</th>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always use safety cones or barricades, safety tape, and your vehicle to block the work area.</td>
<td>NOTICE is used to address practices not related to physical injury.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>READ ALL RELATED MANUALS</th>
<th>USE SAFETY BARRICADES</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>Always use safety cones or barricades, safety tape, and your vehicle to block the work area.</td>
</tr>
</tbody>
</table>

**REFERENCE MANUALS**

- 577013-465 Line Leak Application Guide
- 577014-073 TLS-450PLUS Site Prep and Installation Manual
- 577013-879 TLS-450 Console Site Prep and Installation Manual

**Before You Begin**

1. Ensure that the submersible turbine pump (STP) is properly grounded as per the manufacturer’s instructions.
2. A shutoff valve installed between the DPLLD transducer and the product pipeline is recommended. Although not required for the DPLLD equipment to work, the valve will aid in troubleshooting the system and in reducing any product spillage when performing service work in the sump.
3. The SwiftCheck valve requires a 3” hex socket (or wrench) for tightening it in the pump’s leak detector port. The non-vented SwiftCheck valve requires a 1-1/2” hex socket (or wrench) for tightening it in the pump’s leak detector port.

**Warning Tags**

⚠️ **WARNING** Turn off, tag (using the warning tags provided), and lockout power to the console and submersible pumps while installing the DPLLД equipment. This will prevent either a dispense attempt or the DPLLД equipment from automatically starting up the pump.

Warning tags [Figure 1] are provided with the DPLLД equipment. For your safety and the safety of others who may service dispensers, submersible pumps, or DPLLД equipment, you must attach a tag to each of the following devices where it can clearly be seen by a service person performing work on the system:

- Console
- Submersible pump
- Dispenser filter

---

**WARNING**

THE SUBMERGED PUMP SYSTEM SUPPLYING THE DISPENSERS MAY TURN ON UNEXPECTEDLY TO PERFORM A LINE LEAK TEST. THIS MAY RESULT IN FUEL SPRAYING DURING DISPENSER, PRODUCT LINE, LEAK DETECTOR OR STP SERVICE.

PERFORM THE FOLLOWING BEFORE BEGINNING SERVICE:

1. CLOSE AFFECTED DISPENSER SHEAR VALVE AND TEST FOR PROPER SHUTOFF OF THE VALVE IF PERFORMING DISPENSER HYDRAULIC SERVICE.
2. REMOVE POWER TO THE SUBMERGED PUMP (STP) AND TO THE CONSOLE AND THE LINE LEAK DETECTOR SYSTEM.
3. WEAR EYE PROTECTION.
4. COLLECT FUEL IN APPROVED CONTAINERS. DO NOT CONTAMINATE ENVIRONMENT.

TO ORDER TAGS - USE PART NO. 329801-001

---

Figure 1. Warning tag
Site Considerations

Manholes

When using a SwiftCheck Valve, the manhole must provide at least 8 inches of clearance above the pump head to install the DPLLD components.

Unused Piping Runs

Where piping runs have been installed for future use, but are connected to the active piping system, isolate the inactive lines from the active lines using a shutoff valve. Failure to do so may harm system performance.

Existing Check Valves

You must ensure that there are no existing check valves already installed in the pipeline. The presence of any check valve (other than the one used with the DPLLD equipment) can prevent the DPLLD equipment from detecting line leaks in the area of pipeline downstream from the check valve.

Manifolded Product Lines

Follow these guidelines as you install a DPLLD equipment into multiple manifolded tanks:

- Dielectric unions and flexible piping elements should be used as required by federal, state, and local requirements for the specific piping application. Location of unions may vary with configuration.
- An I/O Module in the console is required to control the pump on the higher-numbered tank and pump control output for the primary tank, and the “Pump In” (Dispenser ON) signal for the set.
- A DPLLD transducer is only required in the master pump.
- Remove any other check valve or leak detect device in the line that is not shown.
- Refer to the Line Leak Application Guide for check valve requirements.
DPLL D Equipment Overview

DPLL D Components

- TLS-450/TLS-450PLUS console with DPLL D feature.
- DPLL D pressure transducer (one for each product line monitored) - vented or non-vented check valves may be required depending on pump type and application
- USM Module to monitor DPLL D transducers
- I/O Module to control site master and slave STPs

DPLL D Installation Example

Figure 2 shows an example DPLL D installation for a single tank and a manifolded tank set having Red Jacket Standard pumps.

Figure 2. Example DPLL D Equipment Installation
DPLL Transducer Installation

This section discusses DPLL transducer installation for the following DPLL approved pumps:

- Red Jacket Standard and Quantum pumps - DPLL transducer/SwiftCheck valve (page 8)
- Red Jacket Standard and Quantum pumps - DPLL transducer/Pressurstat (page 12)
- Red Jacket Quantum with SpikeCheck Valve (page 13)
- The Red Jacket (page 14)
- Red Jacket Maxxum Big-Flo (page 15)
- FE-Petro (page 16)

Red Jacket Standard and Quantum Pumps (DPLL w/SwiftCheck)

Use this installation procedure to install a DPLL transducer with a SwiftCheck valve in a Red Jacket Standard or Quantum pump.

**WARNING** Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps.

![Image of warning symbol]

When servicing equipment, use non-sparking tools and use caution when removing or installing equipment to avoid generating a spark.

1. If a ball valve is installed down line from the pump, close it.
2. Do one of the following:
   a. If the submersible turbine pump is equipped with a mechanical LLD, remove the mechanical unit and any related tubing and fittings, or
   b. If the submersible turbine pump is **not** equipped with a mechanical LLD, remove the 2-inch mechanical LLD port plug.
3. Ensure that the sealing surface for the SwiftCheck valve’s external o-ring is smooth and free from corrosion, pitting, and any material build-up [Figure 3].

**WARNING** Failure to ensure a smooth seal surface can result in false line leak alarms.
4. Lubricate the external o-ring on the SwiftCheck valve using mineral oil or other suitable lubricant.

5. If there is a Stage II vapor recovery device installed, go to Step 7. If there is no Stage II vapor recovery, install the SwiftCheck valve [Figure 4] in the mechanical LLD pump port. Thread the DPLL sensor into the SwiftCheck Valve.

**WARNING** Do not overtighten the SwiftCheck valve when installing it into the pump. Over tightening the valve can cause a flow restriction in the line!

**WARNING** Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.
6. If there is a Stage II vapor recovery device installed in the pressurized piping you must install the SwiftCheck valve into a Red Jacket leak detector fitting (P/N 038-072) as shown in Figure 5 instead of in the pump's leak detector port. Because the DPLL D transducer must be installed downstream from these devices, a monitored containment sump is required.

![WARNING](plldhealy.png)

**There must not be a check valve installed between the SwiftCheck valve and the pump for DPLL to function properly.**

Ensure that the Healy pump is wired according to the manufacturer's instructions and utilizes isolation relays.

Lubricate the external o-ring on the SwiftCheck valve using mineral oil or other suitable lubricant and thread the valve into the Red Jacket fitting.

![Figure 5. DPLL D Install W/Healy Mini-Jet System (Required Dielectric Union And Shutoff Valve Not Shown)](plldhealy.png)

![WARNING](plldhealy.png)

7. Thread the DPLL D transducer into the SwiftCheck valve (ref. Figure 4 or Figure 5 as appropriate).

![WARNING](plldhealy.png)

**Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.**

8. Get a watertight cord grip from the transducer installation kit and coat its 1/2" NPT threaded end with UL-Classified, nontoxic pipe sealant suitable for the fuel involved. Screw the cord grip into one of the openings in the weatherproof junction box. Feed the end of the DPLL D transducer cable through the cord grip and then tighten the nut to ensure a watertight seal. Connect and seal the pressure transducer wires to the wires from the TLS console as described in ‘Epoxy Sealing DPLL D Transducer Field Wiring Connections’ on page 20.

9. The DPLL D SwiftCheck valve eliminates the need for the pump’s Pressurstat or functional element relief valve so it must be modified as part of the DPLL D equipment installation. Remove the six 1/4-28 slot-head screws from the Pressurstat or functional element [Figure 6].

10. Remove the spring, piston and diaphragm.

11. Carefully reassemble the Pressurstat or functional element using a new diaphragm suitable for the fuel involved. Be sure that all mating surfaces are free from debris when reinstalling.
12. Torque the six slot-head screws to 40-65 in-lbs.
13. Open the ball valve down line from the pump.

**WARNING**

Failure to properly reseal the Pressurstat or functional element may result in product leakage, which could create serious environmental and safety hazards.
Fire, explosion, or ground contamination could occur.
Carefully reassemble and reseal the Pressurstat or functional element, following the procedures described in this manual.

---

**Figure 6. Modifying The Pressurstat/Functional Element In Red Jacket Pumps**
Red Jacket Standard and Quantum Pumps (DPLL D w/Pressurstat)

Use this installation procedure to install a DPLL D transducer in a Red Jacket Standard or Quantum pump that has a Pressurstat that will be used for leak detection. NOTE: This installation method is approved for 3.0 gph testing only and cannot be used if there is a Stage II vapor recovery device installed in the pressurized piping.

1. If a ball valve is installed down line from the pump, close it.
2. Do one of the following:
   a. If the submersible turbine pump is equipped with a mechanical LLD, remove the mechanical unit and any related tubing and fittings, or
   b. If the submersible turbine pump is not equipped with a mechanical LLD, remove the 2-inch mechanical LLD port plug.
3. Thread the DPLL D transducer into the LLD port (Figure 5).

4. Get a watertight cord grip from the transducer installation kit and coat its 1/2” NPT threaded end with UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.

5. Open the ball valve down line from the pump.
Red Jacket Quantum Pumps with SpikeCheck Valve

**WARNING** Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps.

When servicing equipment, use non-sparking tools and use caution when removing or installing equipment to avoid generating a spark.

1. If a ball valve is installed down line from the pump, close it.
2. If the pump does not have a Stage II vapor recovery device installed in the pressurized piping, do one of the following:
   a. If the submersible turbine pump is equipped with a mechanical LLD, remove the mechanical unit and any related tubing and fittings, or
   b. If the submersible turbine pump is not equipped with a mechanical LLD, remove the 2-inch mechanical LLD port plug.
3. Thread the DPLLD transducer directly into the mechanical LLD port on the pump (see Figure 8).

**WARNING** Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.

4. If the pump does have a Stage II vapor recovery device installed in the pressurized piping remove the mechanical LLD unit and any related tubing and fittings if present and plug the ports.
Lubricate the external o-ring on the SwiftCheck valve using mineral oil or other suitable lubricant and thread the valve into the Red Jacket leak detector fitting (P/N 038-072) as shown in Figure 5 on page 10 instead of in the pump's leak detector port. Next thread the DPLLD transducer into the SwiftCheck valve.

**WARNING** Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.

Because the DPLLD transducer must be installed downstream from these devices, a monitored containment sump is required.

---

Figure 8. DPLLD Installation In Red Jacket Quantum Pumps (W/ SpikeCheck Valve Ass'y.)
The Red Jacket Pump

The DPLLD transducer mounts directly into the line leak detector pump port. It eliminates the need to break product lines for installation and service.

Since the DPLLD transducer replaces the existing mechanical device, it is suitable in applications where there is no sump.

**WARNING** Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps.

When servicing equipment, use non-sparkling tools and use caution when removing or installing equipment to avoid generating a spark.

1. If a ball valve is installed down line from the pump, close it.
2. If the pump does not have a Stage II vapor recovery device installed in the pressurized piping, remove the 2” NPT plug from line leak detector port. Install the DPLLD transducer into the 2” NPT port (see Figure 9).

**WARNING** Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.

3. If the pump does have a Stage II vapor recovery device installed in the pressurized piping, lubricate the external o-ring on the SwiftCheck valve using mineral oil or other suitable lubricant and thread the valve into the Red Jacket leak detector fitting (P/N 038-072) as shown in Figure 5 on page 10 instead of in the pump’s leak detector port. Next thread the DPLLD transducer into the SwiftCheck valve.

---

**WARNING** There must not be a check valve installed between the SwiftCheck valve and the pump for DPLLD to function properly.

Ensure that the Healy pump is wired according to the manufacturer’s instructions and utilizes isolation relays.

5. Get a watertight cord grip from the transducer installation kit and coat its 1/2” NPT threaded end with UL-Classified, nontoxic pipe sealant suitable for the fuel involved. Screw the cord grip into one of the openings in the weatherproof junction box. Feed the end of the DPLLD transducer cable through the cord grip and then tighten the nut to ensure a watertight seal. Connect and seal the pressure transducer wires to the wires from the TLS console as described in ‘Epoxy Sealing DPLLD Transducer Field Wiring Connections’ on page 20.

6. Open the ball valve down line from the pump.
Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.

Because the DPLLD transducer must be installed downstream from these devices, a monitored containment sump is required.

**WARNING** There must not be a check valve installed between the SwiftCheck valve and the pump for DPLLD to function properly.

Ensure that the Healy pump is wired according to the manufacturer’s instructions and utilizes isolation relays.

4. Get a watertight cord grip from the transducer installation kit and coat its 1/2” NPT threaded end with UL-Classified, nontoxic pipe sealant suitable for the fuel involved. Screw the cord grip into one of the openings in the weatherproof junction box. Feed the end of the DPLLD transducer cable through the cord grip and then tighten the nut to ensure a watertight seal. Connect and seal the pressure transducer wires to the wires from the TLS console as described in ‘Epoxy Sealing DPLLD Transducer Field Wiring Connections’ on page 20.

5. Open the ball valve down line from the pump.

**Red Jacket Maxxum Big-Flo**

**WARNING** Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps.

**WARNING** When servicing equipment, use non-sparking tools and use caution when removing or installing equipment to avoid generating a spark.

1. If a ball valve is installed down line from the pump, close it.
2. If any in-line check valves or Big-Flo Diaphragm Valve are installed in the line, they must be removed.
3. Remove the cap from the 2-inch Transducer port next to the 3-inch discharge port. Thread the DPLLD transducer into the transducer port (see Figure 10).

**WARNING** Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.

---

Figure 10. Example DPLLD Installation In A Red Jacket Maxxum Big-Flo Pump
4. Get a watertight cord grip from the transducer installation kit and coat its 1/2" NPT threaded end with UL-Classified, nontoxic pipe sealant suitable for the fuel involved. Screw the cord grip into one of the openings in the weatherproof junction box. Feed the end of the DPLLD transducer cable through the cord grip and then tighten the nut to ensure a watertight seal. Connect and seal the pressure transducer wires to the wires from the TLS console as described in ‘Epoxy Sealing DPLLD Transducer Field Wiring Connections’ on page 20.

5. Open the ball valve down line from the pump.

**FE Petro Pumps**

![WARNING]

**Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps.**

When servicing equipment, use non-sparking tools and use caution when removing or installing equipment to avoid generating a spark.

1. If a ball valve is installed down line from the pump, close it.

2. If the pump does not have a Stage II vapor recovery device installed in the pressurized piping, remove the 2" NPT plug from line leak detector port.

   Install the DPLLD transducer into the 2" NPT port as shown in Figure 11.

![WARNING]

**Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.**

3. If the pump does have a Stage II vapor recovery device installed in the pressurized piping, lubricate the external o-ring on the SwiftCheck valve using mineral oil or other suitable lubricant and thread the valve into the Red Jacket leak detector fitting (P/N 038-072) as shown in Figure 5 on page 10 instead of in the pump’s leak detector port. Next thread the DPLLD transducer into the SwiftCheck valve.

![WARNING]

**Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.**

Because the DPLLD transducer must be installed downstream from these devices, a monitored containment sump is required.

![WARNING]

**There must not be a check valve installed between the SwiftCheck valve and the pump for DPLLD to function properly.**

Ensure that the Healy pump is wired according to the manufacturer’s instructions and utilizes isolation relays.

4. For DPLLD operation there must be a FE Petro model R precision check valve in the pump. If necessary, replace the current check valve with a model R precision check valve (ref. Figure 11).
5. Get a watertight cord grip from the transducer installation kit and coat its 1/2” NPT threaded end with UL-Classified, nontoxic pipe sealant suitable for the fuel involved. Screw the cord grip into one of the openings in the weatherproof junction box. Feed the end of the DPLL transducer cable through the cord grip and then tighten the nut to ensure a watertight seal. Connect and seal the pressure transducer wires to the wires from the TLS console as described in 'Epoxy Sealing DPLL Transducer Field Wiring Connections' on page 20.

6. Open the ball valve down line from the pump.

**FE PETRO HIGH CAPACITY PUMPS**

When installing PLLD in a FE Petro High Capacity pump, a FE Petro Model ‘R’ Relief Valve (P/N 401330902) must be installed in the pump. Refer to the manufacturer’s documentation to verify that this relief valve is present. If the ‘R’ relief valve is not present install as per manufacturer’s instructions.
You will also need to install a reducing tee (customer supplied) in the 3-inch discharge port of the pump with the 2-inch opening facing up. Thread the PLLD transducer into the 2-inch opening of the tee.

⚠️ **WARNING** Seal the NPT threads only with a UL-Classified, nontoxic pipe sealant suitable for the fuel involved (for high-alcohol fuel blend applications, Loctite 564 is recommended). Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.

**FE PETRO VARIABLE SPEED PUMP SYSTEM MODIFICATIONS**

The FE Petro variable speed pump system contains a submersible pump and adjustable frequency drive. For satisfactory operation with the DPLLD System, you need to change the following in the adjustable frequency drive as described below:

- Dip switch (SW2) settings
- Rotary switch positions

⚠️ **WARNING** The correct hardware and switch settings must be used for the system to detect leaks less than 3.0 gph. If the correct hardware and switch settings are not used, the system will always pass 0.1 gph tests, but the passing results will be invalid.

**IST-VFC Software Versions 1.1 and 1.2**

The settings and positions depend on the software version of the FE Petro IST-VFC (Intelligent Submersible Turbine-Variable Speed Controller). To determine the software version of the IST-VFC, remove its cover and check the label on the FE Petro chip, which is on the printed circuit board. The instructions below are for Version 1.1 and 1.2 of the IST-VFC.

**Dip Switch SW2**

Pole 1 on dip switch SW2 (Figure 13) controls the pump start up time. Set this switch to OFF so that the submersible pump will run at 34 psi for 6 seconds each time it is started. Pole 2 does not affect DPLLD operation; it sets the product type for the IST-VFC (ref. Table 1).

<table>
<thead>
<tr>
<th>Pole 1</th>
<th>Pole 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF (required)</td>
<td>ON-gasoline, OFF-diesel</td>
</tr>
</tbody>
</table>

**Rotary Switch**

The rotary switch (Figure 13) controls the pump pressure of the submersible pump. As shown in Table 2, use positions 1, 2, 3, or 4 to run the pump at a pressure range compatible with DPLLD operation.

**NOTICE** Do not use positions 0, 5, 6, 7, 8, or 9 with versions 1.1 or 1.2 software.
Figure 13. Dip Switch SW2 And Rotary Switch Locations In The FE-Petro IST-VFC Unit

<table>
<thead>
<tr>
<th>Position</th>
<th>Pressure (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>32</td>
</tr>
</tbody>
</table>

**IST-VFC Software Version 1.3**

The settings for software version 1.3 are the same as versions 1.1 and 1.2, except that the rotary switch can be set to any position from 1 to 9.
DPLLD Field Wiring

**NOTICE** Refer to the appropriate Site Prep manual (P/N 577014-073 - TLS-450PLUS or P/N 577013-879 TLS-450) for required wiring types/lengths for pressure transducer and pump control field wiring.

**DPLLD Transducers**

1. Pull a shielded, 2-conductor cable from each DPLLD transducer’s sump junction box to the appropriate USM module in the TLS console. NOTE: The transducer is an intrinsically safe device and its wiring must not share a conduit with any non-intrinsically safe device.

   ![WARNING](image)
   **WARNING** Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps.

2. Using wire nuts, connect the white and black wires from the DPLLD transducer to field wires in the weatherproof sump junction box (ref. Figure 14). Be sure to maintain correct polarity between the color-coded or marked field wires and DPLLD transducer wires when making all connections. Cut off the transducer shielded ground wire (if present) flush with the cable jacket. Do the same for the cable shield.

   ![NOTICE](image)
   **NOTICE** The shielded cable drain wire must be connected to the ground lug in the intrinsically safe area of the console, not to the transducer!

3. Seal wire nut connections using the epoxy sealant furnished with each transducer. Use one packet for no more than two wire nut connections. **Ensure the end of the cable jacket is submerged in the epoxy.** Refer to Figure 15 as you prepare epoxy and seal connections.

   ![WARNING](image)
   **WARNING** Do not put more than two wire nut connections in one epoxy sealant bag or the connections will not be properly sealed. Improper sealing of the connections will result in inaccurate system readings and possibly false alarms.

---

Figure 14. Field Connections Of DPLLD Transducer

![Diagram of field connections](image)
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 15. Epoxy Sealing Pressure Transducer Field Connections
DPLL Wiring Connections In the Console

DPLL Transducer Wiring Connections

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

**NOTICE** Once a connector has been wired to a module and the console has been programmed, the connector and module cannot be moved to another slot without reprogramming the system.

- Record the location (e.g., Line #1 (regular), Line #2 (super), etc.) of each DPLL transducer on the circuit directory inside the right-hand console door.

**WARNING** Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps.

1. Connect the two color-coded or marked wires from each DPLL transducer to the USM module. (see Figure 16). Maintain correct polarity between the color-coded or marked field wires and the connector terminals during wiring.

2. Connect the transducer cable’s bare wire (shield) to one of the ground lugs in the TLS console.

![Figure 16. DPLL Transducer Wiring To USM Module](dpildwir.ep)

**Pump Wiring Connections**

The console must be able to detect when dispensers are switched On or Off so it only initiates line leak tests when the dispenser is switched Off. The console must also be able to start the submersible pump to perform a line leak test, and shut off the pump if a leak is detected.

**WARNING** Dispensers and TLS console must be wired to the same leg of incoming power at the main electrical panel; otherwise damage to both may result.

The console, when wired correctly, will control the pump independent of the dispenser control circuits. It is imperative that when the emergency stop switch is wired and tested, the console's pump control circuitry CANNOT start up the pump. To ensure that the pumps are unable to be activated in an emergency situation, have the emergency stop switch interrupt pump power at the circuit breaker panel via shunt breakers.
 Warn Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps.

1. Referring to the appropriate wiring diagrams below, pull the necessary number of #14 AWG color-coded or marked copper wires from STP control boxes, self-serve system/dispenser, and power panel to the appropriate I/O module of the TLS console. Since wiring for multiple pump controls may be entering the console through the same conduit opening, **color code or mark each wire to identify its source!**

**WARNING** The dispensers and TLS console must be wired to the same leg of incoming power at the main electrical panel; otherwise damage may result to dispensers and console.

2. DPLLD pump control wiring varies depending on the pump manufacturer’s relay control box. Refer to the appropriate wiring diagram example below to connect DPLLD controlled pumps to the I/O Module in the TLS console (circuit diagrams are for switched ‘hot’ dispensers):
   - Red Jacket (ref. Figure 17, Figure 18, and Figure 19)
   - Non-Red Jacket (ref. Figure 20)
   - Manifolded tanks (ref. Figure 21, Figure 22, and Figure 24)
   - Gilbarco dispenser isolation box (ref. Figure 22)

**Figure 17**. DPLLD Pump Control Diagram For Red Jacket Relay Control Box
Figure 18. Red Jacket Maxxum Big-Flo Single-Phase Wiring
Figure 19. Red Jacket Maxxum Big-Flo 3-Phase Wiring

WARNING
Disconnect, lock out, and tag power at the power panel before wiring the pump.

NOTICE
Make ground connection in accordance with local codes.

I/O Module

Pump In (PI)
Pump Out (PO)
Line In (LI)
Pump Return (PR)
Circuit Breaker Panel
AC Line 115 Vac
AC Neutral

208/230V, 3-Phase Power Supply
L1 L2 L3
T1 T2 T3

Control Box Relay

Thermal Overload

Red
Orange
Black

To ext. pilot light 115V supply

Note: Observe color code L1, L2, L3 phase sequence for proper rotation of motor

208/230V, 3-Phase Power Supply

Disconnect, lock out, and tag power at the power panel before wiring the pump.

NOTICE
Make ground connection in accordance with local codes.
Figure 20. DPLLD Pump Control Diagram For Non-Red Jacket Relay Control Box

WARNING
Disconnect, lock out, and tag power at the power panel before wiring the pump.

NOTICE
Make ground connection in accordance with local codes.
Disconnect, lock out, and tag power at the power panel before wiring the pump.

**WARNING**

Make ground connection in accordance with local codes.

**NOTICE**

Figure 21. Wiring Diagram - Manifolded Lines DPLL - Multiple Tanks (RJ Relay Control Box Shown In This Example)
Figure 22. DPLL D Pump Control Diagram For Gilbarco Dispenser Isolation Box

**WARNING**
Disconnect, lock out, and tag power at the power panel before wiring the pump.

**NOTICE**
Make ground connection in accordance with local codes.

*For sites without line leak detection, a jumper wire will be installed between PO and PI terminals. This jumper wire comes installed from Gilbarco and must be removed when wiring in line leak pump control wiring.*
Figure 23. Manifolded Product Lines - Dual FE Petro IST-VFC Controllers
Disconnect, lock out, and tag power at the power panel before wiring the pump.

I/O Module

WARNING

Make ground connection in accordance with local codes.

NOTICE

Figure 24. Manifolded Product Lines - Dual Red Jacket IQ Controllers
DPLL Equipment Checkout

**WARNING** Do not switch On power to the console. This must be done by an Authorized Service Contractor during the warranty checkout and start-up procedure! An Authorized Service Contractor must program the DPLL set-up information into the console before beginning these DPLL equipment checks.

Repeat the four steps below for each DPLL monitored line.

1. **VENT THE LINE**

   **WARNING** Disconnect, lock out, and tag all AC power to the TLS console, dispensers and submersible pumps. Turn Off, lock out, tag power to the STP.

   ![Non-Sparking Tools](image)

   When servicing equipment, use non-sparking tools and use caution when removing or installing equipment to avoid generating a spark.

   a. Vent the line to zero.
   b. Reseal the line.
   c. Turn On power to the STP.

   **WARNING** If the pump has a functional element or PressurStat, verify that it is not leaking!

2. **RED JACKET STANDARD, QUANTUM, AND MAXXUM PUMPS WITH DPLL TRANSDUCER AND PRESSURSTAT ONLY**

   **WARNING** You **MUST** reset the Pressurstat's relief pressure as part of the DPLL installation.

   a. Unscrew the protective brass cap from the adjustment screw (Figure 25).
   b. When the adjustment screw is fully down, the relief pressure is approximately 40 psi.
   c. Install a pressure gauge in the line.
   d. Set the relief pressure to 20 - 25 psi (verify the relief pressure by using the console - [refer to “5. Enable the Line for Dispensing” on page 32 for the procedure to obtain pressure readings]).
   e. Check the sealing surface for the cap’s o-ring and the condition of the o-ring. Clean or replace as required.
   f. Replace the brass cap and hand tighten (the o-ring completes the seal between the body and cap).
3. DETERMINE DPLL D TRANSDUCER PRESSURE OFFSET

New transducers are now factory sealed and their internal chamber cannot be equalized to atmospheric pressure by opening a vent screw as in the past. The Pressure Offset test procedure described in this step MUST be performed when using new DPLL transducers with serial numbers of 100,000 or above, in sites located at altitudes above 2,000 feet. Note: this procedure can also be used with transducers having serial numbers below 100,000 instead of using the vent screw to equalize pressure.

Before this procedure is performed, the pressure in the line MUST be vented to zero. It is recommended that this procedure be performed after installing the transducer, before energizing the STP. Consult the TLS-450 console's online help to perform the following steps:

• Run Pressure Offset Test
• Enter the Pressure Offset Value for the DPLL D Transducer

4. PURGE AIR FROM THE LINE

Follow accepted procedures, or appropriate pump manual, to purge all air from the product line being enabled for dispensing.

5. ENABLE THE LINE FOR DISPENSING

After completing the DPLL D installation, the console will not enable dispensing from a line until a 3.0 gph test on the line has been passed. In this step, as you run the required 3.0 gph test, you will also verify that the Pump On and Pump Off pressures are within their proper operating ranges.