

# The Red Jacket VSFC Submersible Turbine Pump

## Installation, Service, & Parts Lists

Red Jacket<sup>®</sup> Quick-Set<sup>®</sup> Submersible Pump



# Notice

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## **DAMAGE GOODS/LOST EQUIPMENT**

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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.

VR 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**

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1. Fax Bill of Lading to V/R Customer Service at 800-234-5350.
2. Call V/R Customer Service at 800-873-3313 with the specific part numbers and quantities that were received damaged or lost.
3. VR 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**

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1. Customer files claim with carrier.
2. Customer may submit a replacement purchase 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, VR will allow a Return to Stock without a restocking fee.
4. VR will NOT be responsible for any compensation when a customer chooses their own carrier.

## **RETURN SHIPPING**

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For the parts return procedure, please follow the instructions in the "General Returned Goods Policy" pages of the "Policies and Literature" section of the Veeder-Root North American Red Jacket Mechanical Products Price Book. 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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# Introduction

## Overview

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The Red Jacket VSFC STP ensures a constant flow to each nozzle in the fuel line, regardless of the number of nozzles in use at anytime. The Red Jacket VSFC STP fits 4-inch NPT threaded, thin-wall risers and is adjustable to fit the requirements of most installations.

Newly designed features of The Red Jacket VSFC STP are:

- **Service spill elimination**

The check valve can be raised to provide a larger path to depressurize the line and return fuel to the tank.

- **Vacuum monitoring applications**

The vacuum sensor siphon is a monitoring-grade siphon system. It is designed specifically for use in vacuum monitoring applications, and to integrate with V-R vacuum sensors. The two-port vacuum sensor-siphon system incorporates a redesigned one-piece rubber check valve with an inline filter screen that reduces the clogs and failures that can cause false alarms and downtime in vacuum monitoring applications.

- **Plug-in yoke electrical connection**

Current safety practice when servicing existing STPs requires turning off the circuit breaker, backing off the bolts by up to one inch, and then manually pulling the electrical yoke connection apart. With The Red Jacket VSFC STP you turn off the circuit breaker, then simply back off the two nuts holding the extractable in place and the yoke electrical connection is broken as the extractable is removed. After service is complete, the electrical circuit reconnects when the two nuts are retightened. Safe, simple, and easy.

- **Extractable is easy to service**

The Red Jacket VSFC STP incorporates industrial die springs that break loose the o-ring seals when the nuts holding the extractable in place are removed. No physical effort or special equipment is required to break the seal. In addition, all connected parts have been moved to the manifold. There is no need to remove parts, pressure transducers, leak detectors, or siphons when service or upgrades require removing the extractable.

Utilize the lifting eyebolt to lift out the extractable unit. Removal of the extractable section of the pump must be conducted with caution. Make certain that the extractable section remains centered within the riser pipe and that no portion of the extractable binds during the removal process. If binding occurs during removal, stop and determine the cause of the binding and correct the situation before proceeding with removal.

- **Manifold allows for vertical or horizontal discharge**

The Red Jacket VSFC STP has been designed for vertical product discharge via a 2-inch NPT threaded port, but with adequate swinging radius to allow for the addition of an elbow to accommodate a side discharge. In fact, the discharge is now located higher on the manifold so that a side discharge is on the same plane as the rest of the pump.

- **Built-in contractor's box**

An electrical connection housing (contractor's box) is built into The Red Jacket VSFC STP's manifold and is completely isolated from the fuel path. Unlike existing systems, there is no adjustment required to fit the yoke, making this pump easy to install.

- **Pressurized Line leak detection (PLLD) compatibility**

The Red Jacket VSFC STP's pressure transducer does double duty by supplying the product line's pressure measurements for both variable speed flow control and Veeder-Root's PLLD system.

## Red Jacket VSFC Operation Selections

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### Stand Alone Pump Operation

The VSFC Controller's microprocessors are preprogrammed from the factory for stand alone operation, i.e., one VSFC Controller and one VSFC STP pressurize the product line.

### Tandem Pump Operation

When multiple VSFC STPs are required to maintain proper flow, their VSFC Controllers can be programmed to operate in tandem. The master VSFC Controller varies the speed of the primary pump depending on the pressure in the line. When the primary pump can no longer maintain proper pressure, additional pump(s) come on line to supplement the pressure and maintain proper flow. Instructions in the VSFC Installation Guide (P/N 577013-815) explain how to setup for tandem operation.

### Master-Slave Operation

The installer can designate one VSFC Controller as the master unit and the others as the slave units. The master VSFC Controller monitors line pressure and determines when a supplemental pump is required. Additional pumps will turn on if they have received a dispense-enable signal.

### Alternating Operation

This feature allows the pumps to alternate and prevent the problem of having one tank run dry. It also ensures that one pump does not wear excessively. For each dispensing cycle, the master VSFC Controller determines which VSFC STP will be the primary pump. When the master controller receives the dispense-enable signal, the primary pump starts. The master VSFC Controller monitors line pressure and determines when a supplemental pump is required. Additional pumps will turn on even if they have not received a dispense-enable signal.

### Tank-Based Operation

Individual pumps will turn on when they have received a dispense-enable signal. The master VSFC Controller monitors line pressure and determines when a supplemental pump is required. Additional pumps will turn on even if they have not received a dispense-enable signal.



### IMPORTANT NOTICE!

**For VSFC stand alone installations a V-R PLLD Pressure Transducer is required in the VSFC STP. To install this transducer, refer to the relevant section of the PLLD Site Prep guide (P/N 576013-902).**

**For VSFC Tandem, Master-Slave, Alternating, or Tank-based installations, a V-R PLLD Pressure Transducer is required only in the VSFC STP that is connected to the Master VSFC Controller. To install this transducer, refer to the relevant section of the PLLD Site Prep guide (P/N 576013-902).**

**For VSFC installations in sites that have a TLS-350 Console with PLLD line leak detection monitoring the product line, a separate PLLD transducer is not required because the VSFC unit and the PLLD system will share the same transducer that is installed in the VSFC STP.**

**For all VSFC STP installations you must make wiring connections in the pump (i.e., pressure transducer, I.S. Barrier, and pump power connections) following the instructions in the VSFC Installation Guide (P/N 577013-815).**








### Required Kits







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- VSFC Tubing kit (P/N 410370-001)
- VSFC Controller (P/N 330020-450) for I.S. wiring - includes pressure transducer, or
- VSFC Controller (P/N 330020-451) for non-I.S. wiring - includes pressure transducer and I.S. Barrier.

## Safety Precautions

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

 <p><b>EXPLOSIVE</b> Fuels and their vapors are extremely explosive if ignited.</p>	 <p><b>FLAMMABLE</b> Fuels and their vapors are extremely flammable.</p>
 <p><b>ELECTRICITY</b> High voltage exists in, and is supplied to, the device. A potential shock hazard exists.</p>	 <p><b>TURN POWER OFF</b> Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.</p>
 <p><b>WARNING</b> Heed the adjacent instructions to avoid equipment damage or personal injury.</p>	 <p><b>READ ALL RELATED MANUALS</b> Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.</p>
 <p><b>WEAR EYE PROTECTION</b> Wear eye protection when working with pressurized fuel lines or epoxy sealant to avoid possible eye injury.</p>	

 <b>WARNING</b>	
<div style="display: flex; flex-wrap: wrap;">      </div>	<p><b>This product operates in the highly combustible atmosphere of a gasoline storage tank. FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.</b></p> <ol style="list-style-type: none"> <li>1. All installation work must comply with the latest issue of the National Electrical Code (NFPA 70), the Code for Motor Fuel Dispensing Facilities and Repair Garages (NFPA 30A), and any European, national, state, and local code requirements that apply.</li> <li>2. Turn off, tag, and lockout power to the STP before connecting or servicing the STP.</li> <li>3. Do not step on STP when entering or leaving the sump.</li> <li>4. Before installing pipe threads apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant. For E85AG applications, Loctite 564 is recommended for all field serviceable pipe threads<sup>1</sup>.</li> <li>5. When servicing unit, use non-sparking tools and use caution when removing or installing equipment to avoid generating a spark.</li> <li>6. To protect yourself and others from serious injury, death, or substantial property damage, carefully read and follow all warnings and instructions in this manual.</li> </ol>

In addition to the specified torque values noted in this manual, when properly tightened, all flanged fittings should have metal-to-metal contact.

<sup>1</sup>For the E85 AG Product, the interface connection to the 2" NPT Discharge Port on the manifold was evaluated with steel piping during the UL Listing evaluation and therefore, this material should be used when installing this product. All materials must be fully compatible with the products being stored.



## Warnings and Instructions

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### IMPORTANT SAFETY INFORMATION

This section introduces the hazards and safety precautions associated with installing, inspecting, maintaining or servicing this product. Before performing any task on this product, read this safety information and the applicable sections in this manual, where additional hazards and safety precautions for your task will be found. Fire, explosion, electrical shock or pressure release could occur and cause death or serious injury, if these safe service procedures are not followed.

### PRELIMINARY PRECAUTIONS

You are working in a potentially dangerous environment of flammable fuels, vapors, and high voltage or pressures. Only trained or authorized individuals knowledgeable in the related procedures should install, inspect, maintain or service this equipment.

#### Read the Manual

Read, understand and follow this manual and any other labels or related materials supplied with this equipment. If you do not understand a procedure, call 1-800-323-1719 to locate a qualified technician. It is imperative to your safety and the safety of others to understand the procedures before beginning work. **Make sure your employees and any service contractors read and follow the instructions.**

#### Follow the Regulations

Applicable information is available in National Fire Protection Association (NFPA) 30A; *Code for Motor Fuel Dispensing Facilities and Repair Garages*, NFPA 70; *National Electrical Code* (NEC), Occupational Safety and Hazard Association (OSHA) regulations and federal, state, and local codes. All these regulations must be followed. Failure to install, inspect, maintain or service this equipment in accordance with these codes, regulations and standards may lead to legal citations with penalties or affect the safe use and operation of the equipment.

#### Prevent Explosions and Fires

Fuels and their vapors will explode or burn, if ignited. Spilled or leaking fuels cause vapors. Even filling customer tanks will cause potentially dangerous vapors in the vicinity of the dispenser or island.

#### Working Alone

It is highly recommended that someone who is capable of rendering first aid be present during servicing. Familiarize yourself with Cardiopulmonary Resuscitation (CPR) methods, if you work with or around high voltages. This information is available from the American Red Cross. Always advise the station personnel about where you will be working, and caution them not to activate power while you are working on the equipment. Use the OSHA Lockout/Tagout procedures. If you are not familiar with this requirement, refer to OSHA documentation.

#### Working With Electricity Safely

Ensure that you use safe and established practices in working with electrical devices. Poorly wired devices may cause a fire, explosion or electrical shock. Ensure that grounding connections are properly made. Ensure that you do not pinch wires when replacing covers. Follow OSHA Lockout/Tagout requirements. Station employees and service contractors need to understand and comply with this program completely to ensure safety while the equipment is down. Before you start work, know the location of the Emergency Power Cutoff Switch (the E-STOP). This switch cuts off power to all fueling equipment and submerged turbine pumps and is to be used in the event of an emergency. The buttons on the console at the cashier's station WILL NOT shut off electrical power to the pump/dispenser. This means that even if you press a button on the console labeled EMERGENCY STOP, ALL STOP, PUMP STOP, or something similar, fuel may continue to flow uncontrolled.

#### Hazardous Materials

Some materials may present a health hazard if not handled correctly. Ensure that you clean hands after handling equipment. Do not place any equipment in the mouth.

**WARNING! FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD RESULT IN PROPERTY DAMAGE, INJURY OR DEATH.**

**FIRE HAZARD!** Do **NOT** use **power tools** (Class I Division I and Class I Division II) during the installation or maintenance of equipment. Sparking could ignite fuel or vapors, resulting in fire.

**CHEMICAL EXPOSURE HAZARD!** Wear appropriate **safety equipment** during installation or maintenance of equipment. Avoid exposure to fuel and vapors. Prolonged exposure to fuel may cause severe skin irritations and possible burns.

## REQUIREMENTS FOR USE

- The VSFC is designed for use only at facilities dispensing motor fuels.
- Application of VSFC must be consistent with NFPA Code 30A, OSHA regulations, and federal, state and local fire codes, and other applicable local regulations.
- The selection of any Veeder-Root product must be based upon physical specifications and limitations and the product's compatibility with the materials to be handled. Veeder-Root makes no warranty of fitness for a particular purpose.
- All Veeder-Root products should be used in accordance with applicable federal, state and local laws, ordinances and regulations.

## OPERATING PRECAUTIONS

- **NO SMOKING.** Extinguish all open flames and pilot lights, such as on RV appliances.
- **TURN OFF** cell phones and other electronic devices to avoid distractions while fueling.
- **GASOLINE CAN BE HARMFUL OR FATAL IF SWALLOWED.** Long-term exposure may cause cancer. Keep eyes and skin away from liquid gasoline and gasoline vapors. Avoid prolonged breathing of gasoline vapors.

## Reference Manuals - As Required

- Variable Speed Flow Controller Installation Guide- P/N 577013-815
- PLLD (Pressurized Line Leak Detection) Site Prep and Installation Guide - P/N 576013-902
- FXV Leak Detectors Installation Instructions - P/N D042-106-1

## Fuel Compatibilities

Pumps are designed to operate in a Class 1, Group D atmosphere and in accordance with CENELEC standard and the European Directive 94/9/EC "Equipment for Potentially Explosive Atmosphere" (II2 G Ex IIA T4).

All Models of the STP are UL Listed for the Following Fuel Compatibility						
Diesel	Gasoline	Gasoline and up to				
		15% Ethanol	15% Methanol	20% MTBE	20% ETBE	20% TAME

The STP is designed to be compatible with 100 percent gasoline, or diesel and 80 percent gasoline with 20 percent methanol, ethanol, TAME, ETBE, or MTBE . All UMPs having the model numbers including the AG prefix are designed to be compatible with 100 percent gasoline, methanol, ethanol, or diesel and 80 percent gasoline with 20 percent TAME, ETBE, or MTBE (see Table 1 for UMP models and working parameters).

**Table 1. Maximum Specific Gravity and Maximum Viscosity**

UMP Model	Maximum Specific Gravity	Maximum Viscosity
AGUMP200T20-2, UMP200U20-2	.95	70SSU at 60°F (15°C)

The Red Jacket features an adjustable column pipe and electrical conduit that allows the overall length to be adjusted to a wide range of overall pump lengths. By loosening a collet on the column pipe, the length of the UMP may be varied by extending or retracting the column pipe. Three sizes of adjustable column pipe are available to cover most pump length requirements (RJ1, RJ2, and RJ3).

## Operation with Mechanical Leak Detection

A Red Jacket FXV Series leak detector can be installed in the pressure transducer port when mechanical leak detection is desired.



Important! When a mechanical leak detector is installed in place of the pressure transducer, the STP will automatically revert to fixed speed operation **due to the absence of a pressure transducer signal**. Flow rates will be lower than what can be obtained with variable speed operation.

To maintain variable speed operation with mechanical leak detection, a pressure transducer must be mounted in a 2-inch tee fitting that is installed in the discharge line within the submersible sump, and before the ball valve.

## Installation and Manifold Dimensions

Figure 1 shows several views and dimensions of The Red Jacket pac/man.

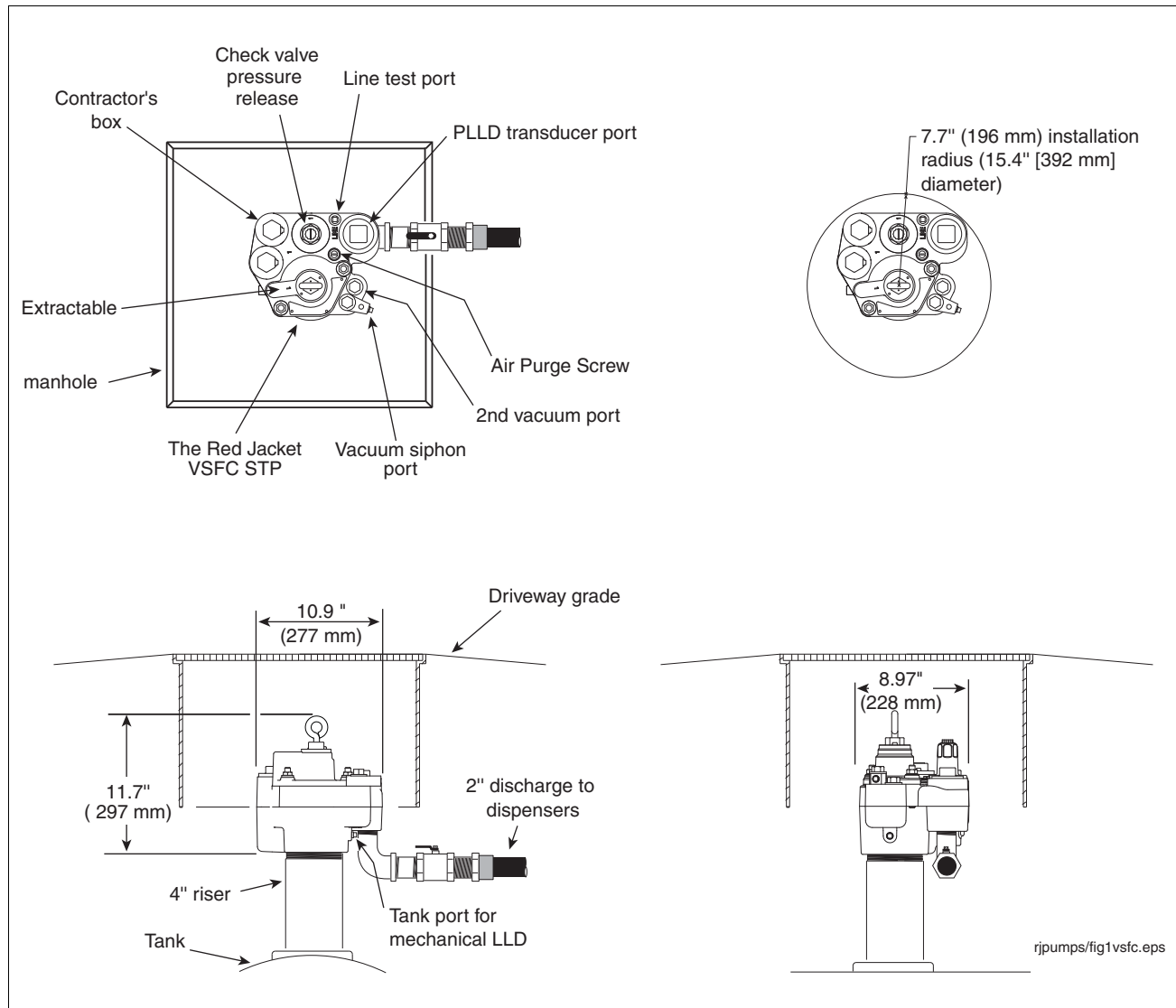


Figure 1. Red Jacket pac/man components and dimensions

## Recommended Floating Suction Installation

Figure 2 is an example of a floating suction installation. The floating suction arm can be mounted to pump previous to installing in tank.

**NOTE:** Veeder-Root supplies adapter only, not the apparatus.

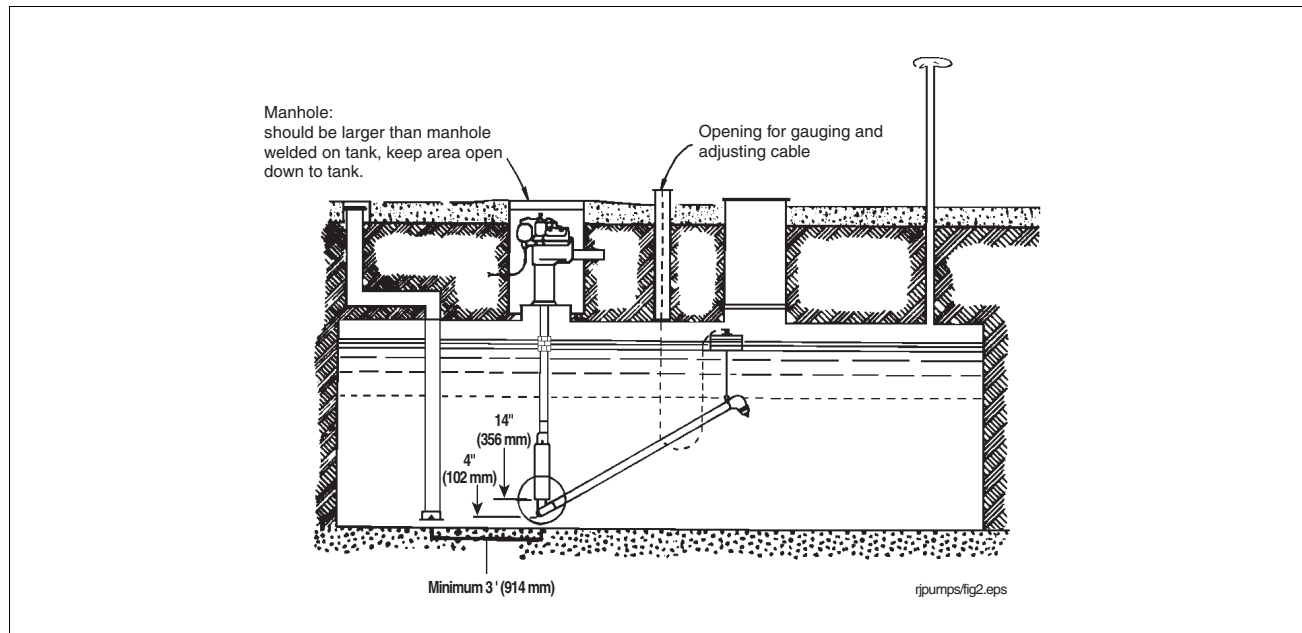


Figure 2. Floating suction installation

Figure 3 is an enlarged view within the circle in the above figure.

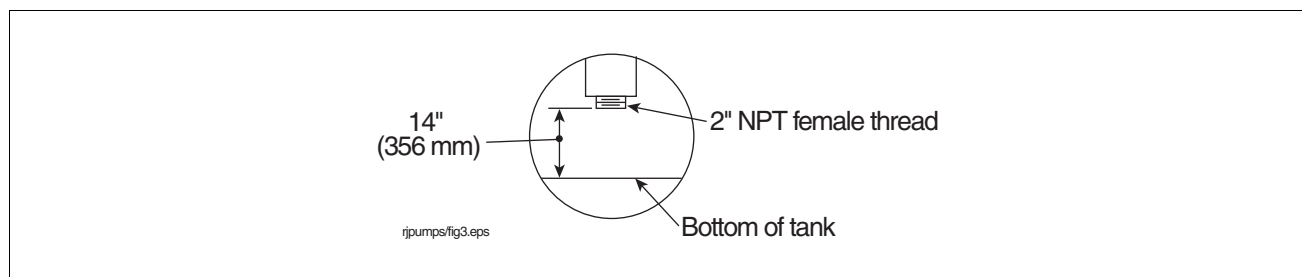


Figure 3. Floating suction adapter

Easy service access is provided by unbolting manhole lid through which pump is mounted and removing entire assembly. Use proper thread sealant and insert gasket between flanges of floating suction and pump. This prevents hindrance to pump performance when product level is below this point.

**NOTE: The Red Jacket is a centrifugal type pump and is not designed to pump product when the level is below the bottom end of the UMP.**

## Dimensions for Pump Selection

Figure 4 shows the dimensions needed to ensure a correctly sized pump.

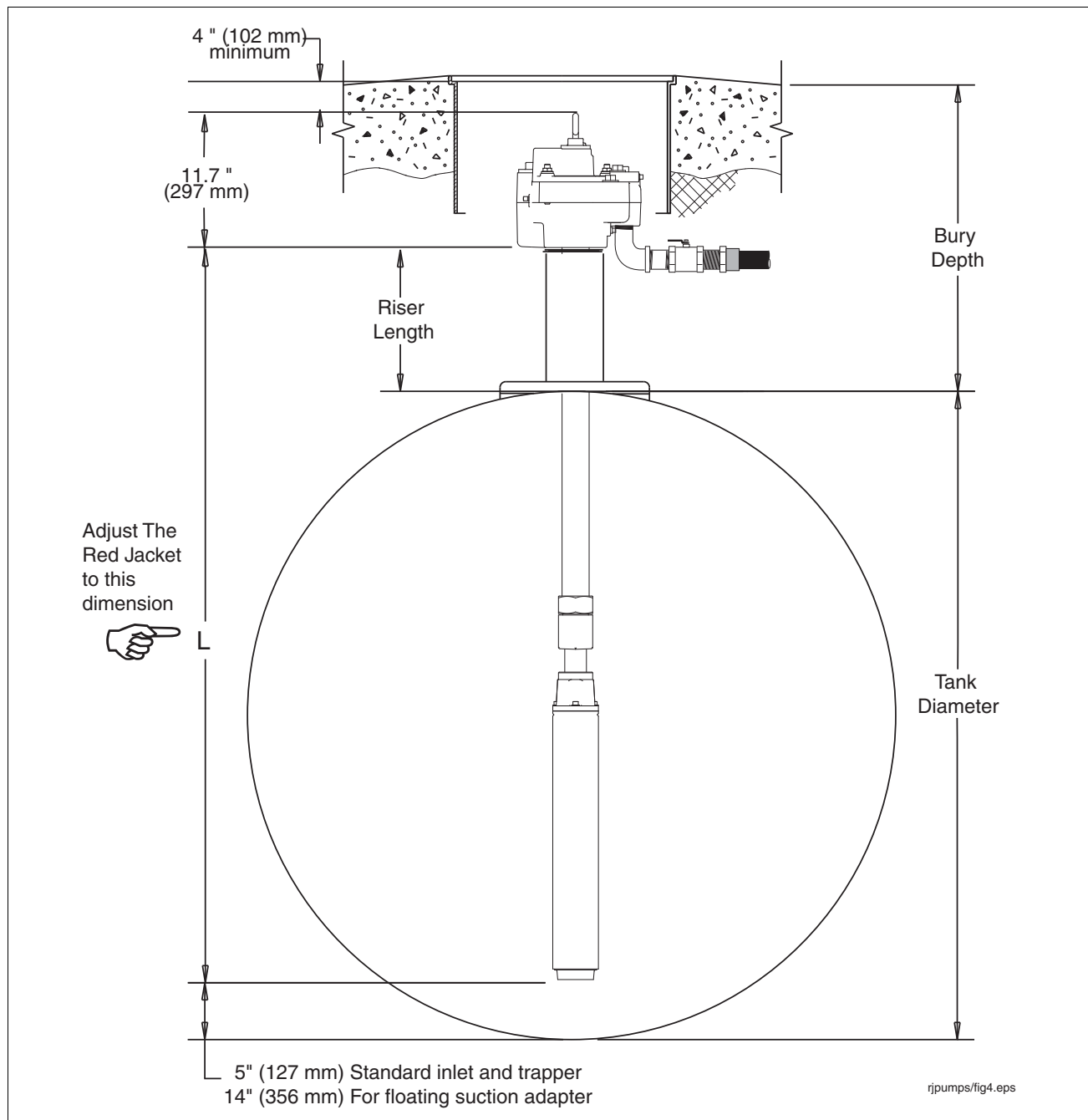


Figure 4. Measuring the tank (see Table 2 for adjustment ranges).

**NOTE:** Distance between centerline of UMP and centerline of bottom fill tube should be 3 feet (914 mm) minimum. Air locking of pump after product delivery may occur at distances less than this.

## Specifications

Table 2 shows the adjustable pump lengths by model

**Table 2. Distances from Top of Lifting Screw to Inlet**

Model#	Retracted		Extended	
	in.	mm	in.	mm
AGP200T20-2RJ1, P200U20-2RJ1	75	1902	105.5	2673
AGP200T20-2RJ2, P200U20-2RJ2	105	2665	165.5	4197
AGP200T20-2RJ3, P200U20-2RJ3	165	4188	225.5	5721

Table 3 shows pump electrical service requirements.

**Table 3. Electrical Service Information**

Required power supply rating for 60 Hz, 1 phase is 208 - 230 Vac. For 50 Hz, 1 phase, required rating is 220 - 240 Vac. For 3 phase, required rating is 200 - 240 Vac.

UMP Model No.	HP	Hz	PH	Voltage Fluctuation Range		Max. Load Amps	Locked Rotor Amps	Winding Resistance (Ohms)		
				Min.	Max.			Black-Orange	Red-Orange	Black-Red
AGUMP200T20-2, UMP200U20-2	2	60/50	1	180	265	16	—	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
		60/50	3			10	—			

Table 4 lists UMP weights and lengths.

**NOTE: The weights and lengths listed below are approximate values and will vary due to manufacturing tolerances.**

The optional trapper intake screen is available as a field installed accessory. Trapper options will increase the length of the UMP by 3.3 inches (83 mm). For installation instructions, see Red Jacket installation instructions #051-256-1. For models with floating suction adapter, add 2-3/8 inches (59 mm) and 4 pounds (1.8 kg).

**Table 4. UMP Model Dimensions**

UMP Model	HP	A (Use these lengths for UMPs with end view A shown in Figure 5)		B (Use these lengths for UMPs with end view B shown in Figure 5)		Weight	
		in.	mm	in.	mm	lb.	kg
UMP200U20-2, AGUMP200T20-2	2	20	508	20¾	527	37	16.8

Figure 5 identifies UMP models by their end view.

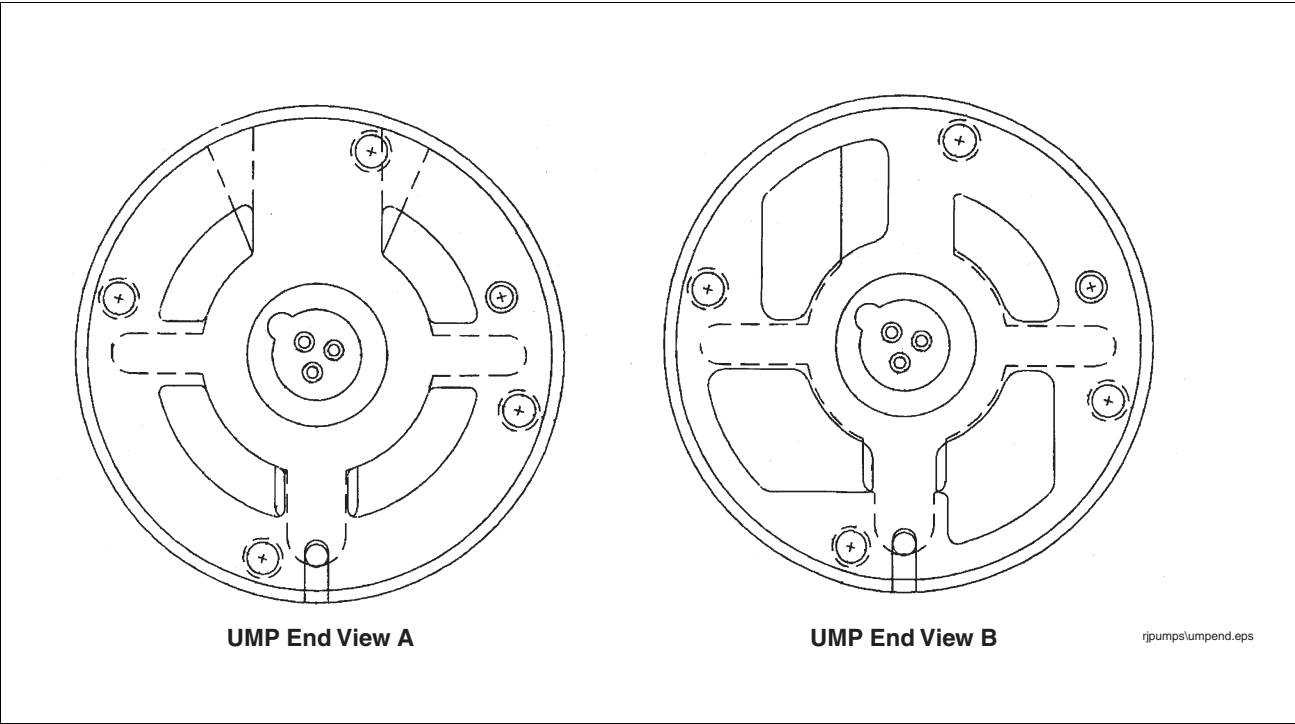


Figure 5. Identifying UMP models by their end view

Table 5 lists pump shut off pressure range.

Note: Instructions in the VSFC Installation and Operation manual explain how to set desired pressure.

Table 5. Approximate Pump Shut Off Pressure Range

UMP Model	Approximate Shut Off Pressure Range
AGUMP200T20-2, UMP200U20-2	14 - 45 psi (96.5 - 297 kPa)



# Installation

## Attaching the UMP

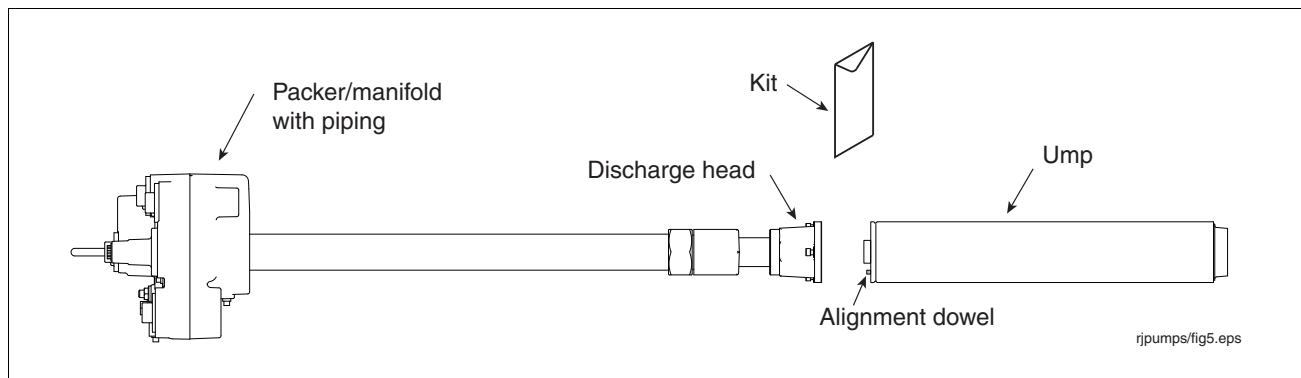
Table 6 lists the applicable UMPs for each packer/manifold.

**Table 6. UMP and Packer/Manifold Combinations**

Packer/Manifold	UMP	Packer/Manifold	UMP
AGP200T20-2RJ1, RJ2, RJ3	AGUMP200T20-2	P200U20-2RJ1, RJ2, RJ3	UMP200U20-2

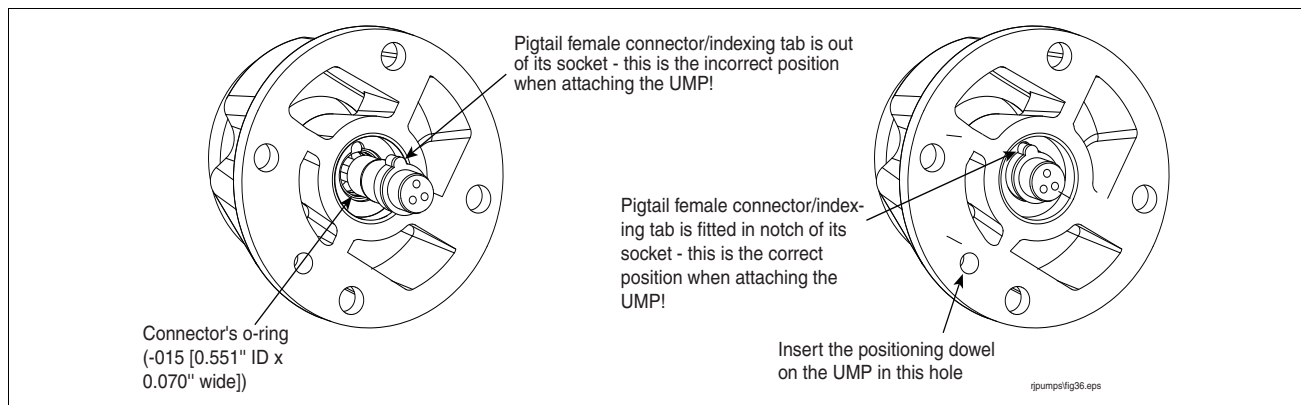
The UMP is identified by the model number marked on the shell. The packer/manifold with piping is identified by the catalog number on the packer nameplate. The hardware kit consists of four 5/16-18 socket head cap screws, four 5/16 lock washers and one discharge head gasket identified by the kit number (144-327-4) marked on the bag (see Figure 6).

The UMP attaches to the packer/manifold column piping discharge head using hardware kit number 144-327-4.



**Figure 6. Packer/manifold with piping attaching to UMP**

1. Visually inspect the pigtail connector in the end of the discharge head. Be certain the pigtail connector is seated in its socket and its index tab is in the socket's notch (see Figure 7).



**Figure 7. Verifying pigtail's female connector is seated properly**



2. Place the new gasket on the new UMP so that all holes align (see Figure 8).

**Gaskets from competitive UMPs will not seal properly and performance will be reduced.**

3. Align the UMP positioning dowel insert in the proper hole in the discharge head (see Figure 7) and push the UMP into position using hand force only. The UMP should be snug against the discharge head prior to installing the UMP retaining bolts.

**NOTE: Use hand force to push the UMP onto the discharge head. If the UMP does not seat snug against the discharge head, remove the UMP and correct the problem.**

4. Install the UMP retaining bolts and lock washers (see Figure 8). Snug and then torque the bolts using a cross pattern technique. Torque to 7 ft-lbs (11 N•m).

**NOTE: Do not use the bolts to pull the UMP into position. Use the cross pattern technique. Do not over torque the bolts. Not following instructions may cause parts to fail.**

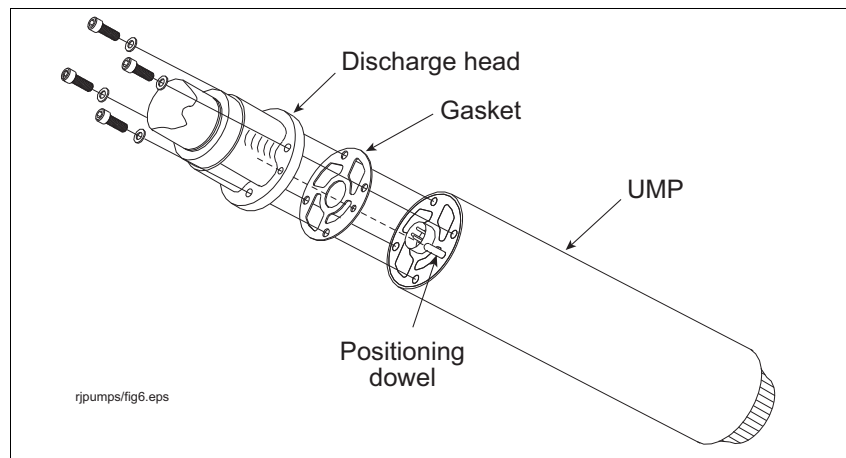


Figure 8. Aligning the UMP gasket

## Installing the Pump



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

### NOTES:

- The Red Jacket STP is designed to operate in a Class 1, Group D atmosphere.
  - The manufacturer may recommend new specifications and installation instructions.
  - The product temperature must not exceed 105°F (41°C) because the thermal overload protectors in the submersible motor may trip.
1. Install the riser pipe into the 4-inch tank opening. Before installing pipe threads, apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant. Tighten the riser pipe in the tank until watertight.
  2. Measure the distance from the bottom of the tank to the top of the 4-inch riser pipe as shown in Figure 9.

**FOR FIXED-LENGTH PUMPS, SKIP TO Step 7.**

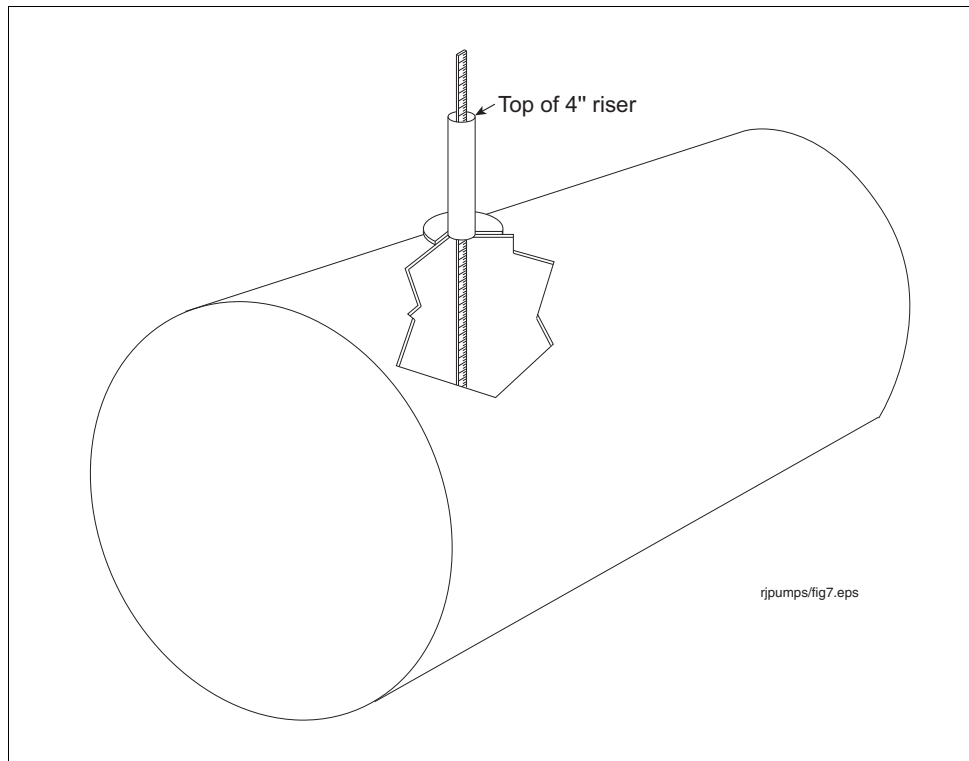


Figure 9. Measuring tank

3. Uncoil the pigtail at the top of the packer and lay it flat so it will feed into the packer without knotting or kinking.
4. Loosen the clinch assembly on the column pipe by unscrewing the set screw in the side of locking nut, then backing off the locking nut (see Figure 10).

NOTE: A slight twisting of the UMP will loosen the seals and facilitate adjusting it to the correct length.



**WARNING! Do not rotate piping beyond 1/4 turn.**

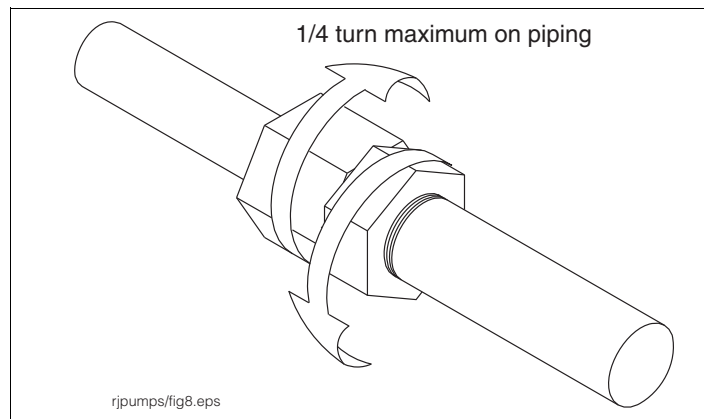


Figure 10. Loosening column pipe locking nut

- Referencing Figure 11, pull the UMP end until the distance between the bottom of the manifold and the bottom of the UMP is 5 inches (125 mm) (15 inches [381 mm] for floating suction) shorter than the distance measured in Step 2.

NOTE: If UMP is equipped with floating suction adapter, see section entitled "Recommended Floating Suction Installation" on page 7.

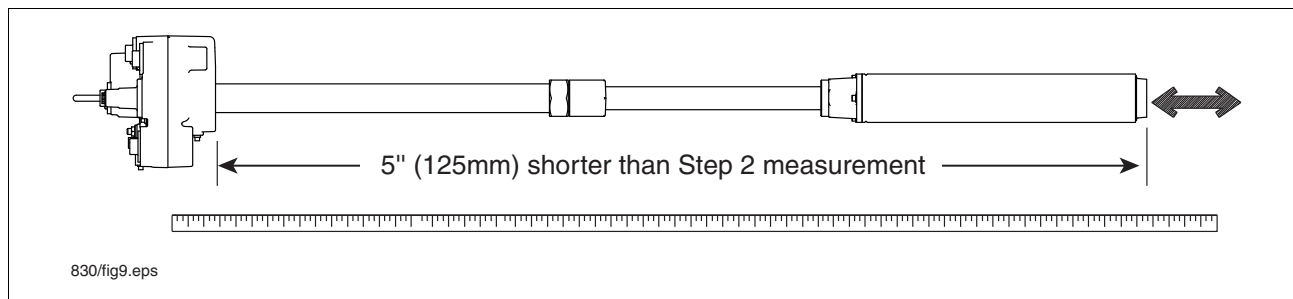


Figure 11. Adjusting pump length

NOTE: Take care not to damage the pigtail. If pump is to be adjusted shorter, keep tension on the pigtail to eliminate kinking.

- Tighten the column pipe locking nut and torque to 150 ft-lbs (200 N•m) minimum, then torque the set screw in the locking nut to 30 - 35 in. lb. (3.5 - 4 N•m).
- Attach the siphon return line tubing to the barbed fitting in the base of packer and secure with a clamp (see Figure 12).

NOTE: Return line should be installed on every application to reduce nuisance trips of electronic tank monitoring.

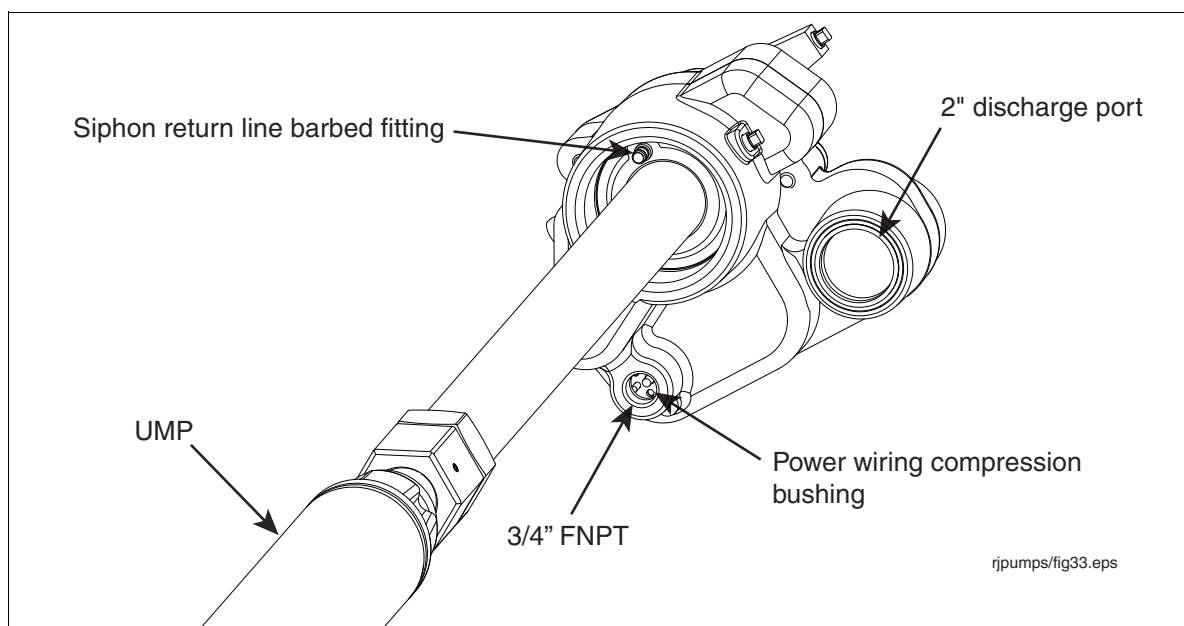


Figure 12. Locating return line fitting on packer

8. Lay the siphon return line tubing beside the column pipe. Stop 1 - 3 inches (25 - 76 mm) above the discharge head.
9. Secure the siphon return line tubing to the column pipe with tie straps. Locate the tie straps approximately 6 inches (152 mm) from the manifold, 6 inches from the discharge head and in the middle of the tubing (see Figure 13).

NOTE: Do not overtighten tie straps as a pinched or flattened return line will restrict flow, interfering with proper operation of siphon system.

**FOR FIXED-LENGTH PUMPS, SKIP TO Step 14.**

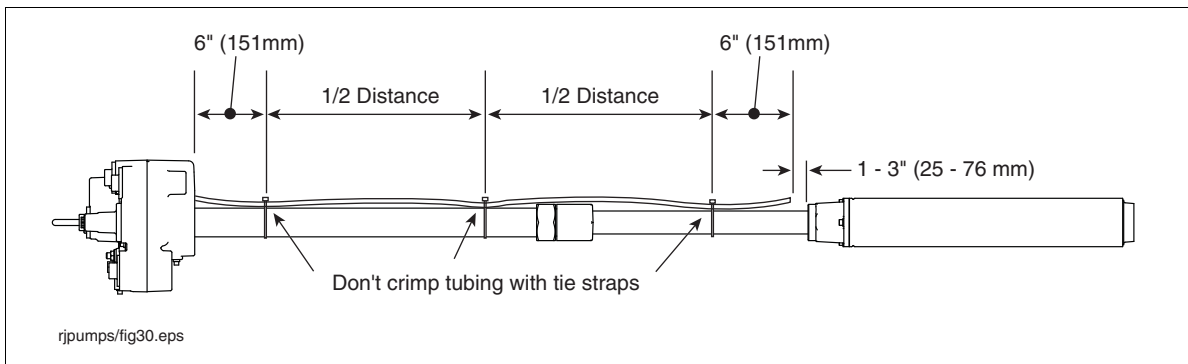


Figure 13. Attaching return line tubing to pump

10. Pull on the pigtail wires where they exit the packer wiring compartment. Snip pigtail wires approximately 8 inches (200 mm) beyond the top of the packer.
11. There will be six wires - three wires from the male connector installed in the packer's housing and three-wires from the UMP's pigtail.
12. Strip insulation off all six wires 3/8 inch (10 mm).
13. Connect like colored wires from the UMP to like colored wires from the male connector with wire nuts. When finished connecting the wires, neatly coil them inside the packer's wiring compartment (see Figure 14).
14. Lubricate the o-ring on the packer wiring compartment cover (with lifting eyebolt) with petroleum based jelly. Screw in the packer wiring compartment cover (thread sealant should not be used). Torque to 35 ft-lbs (50 N•m).



15. **WARNING!**  
Confirm that the lifting eyebolt is properly torqued to 10 ft-lbs (13.6 N•m) with a minimum of 6 full threads installed. Occasionally, eyebolts are removed after pump installation and corrosion may occur in the threaded areas of the wiring compartment cover (eyebolt plug) and the eyebolt. If corrosion has occurred, the cover and eyebolt should be replaced.

Utilize the lifting eyebolt to suspend the pump vertically and then install the pump onto the riser pipe using UL classified for petroleum, non-setting thread sealant until watertight and align appropriately to connect to the product line piping. For E85AG applications, Loctite 564 is recommended for all field serviceable pipe threads.

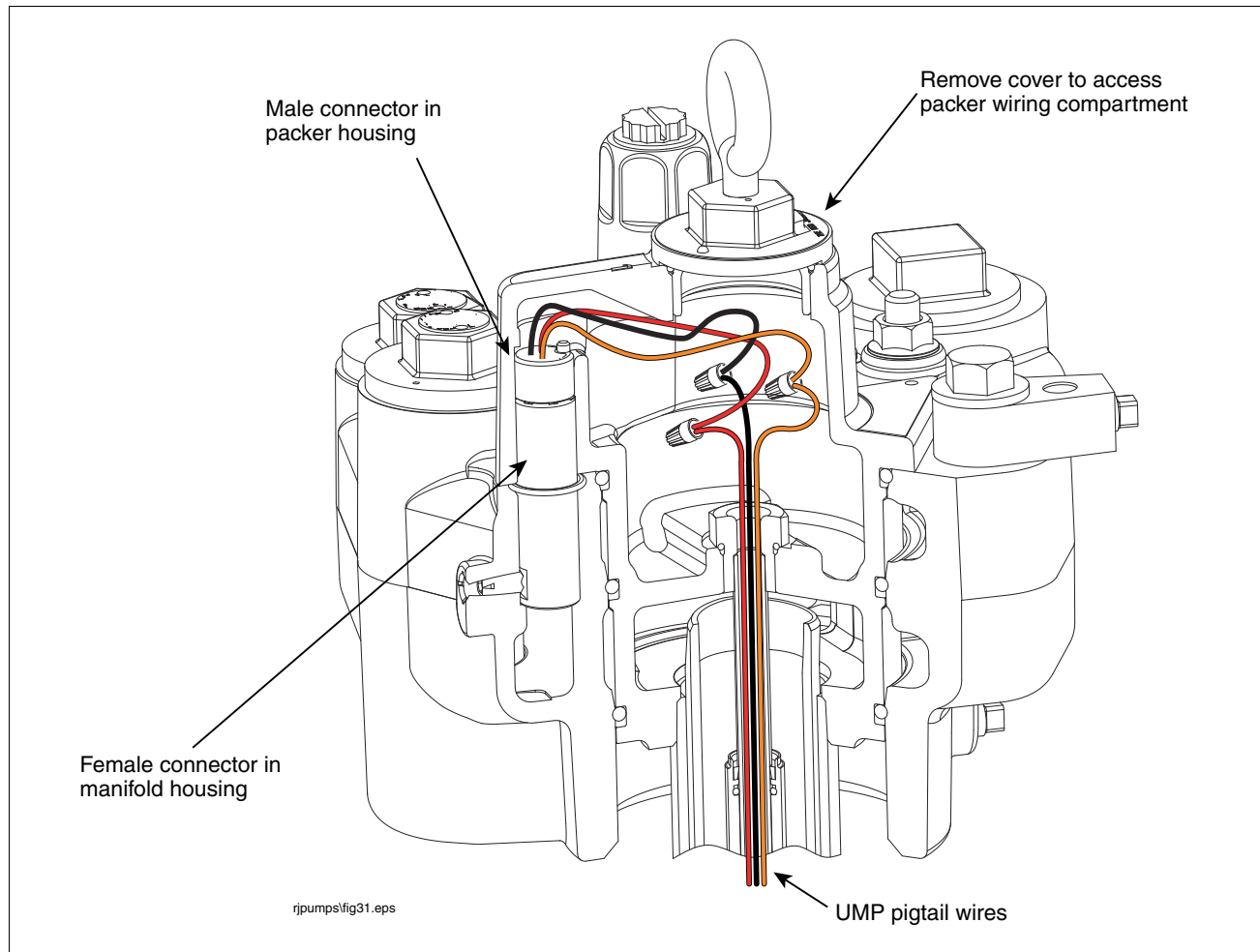


Figure 14. Connecting UMP to packer wiring

## Pressure Transducer Installation

Refer to the appropriate section of the PLLD Site Prep manual (P/N 576013-902) for transducer installation in the Leak Detector Port (see Figure 15).

## I.S. Barrier Installation

If an I.S. Barrier is being installed, refer to the appropriate section of the VSFC Site Prep manual (P/N 577013-815) for installation instructions (refer to Figure 15 for installation port).

## Tubing Kit Installation

1. Remove and set aside the cover of the contractor's box over the wiring entry compression bushing (refer to Figure 15).

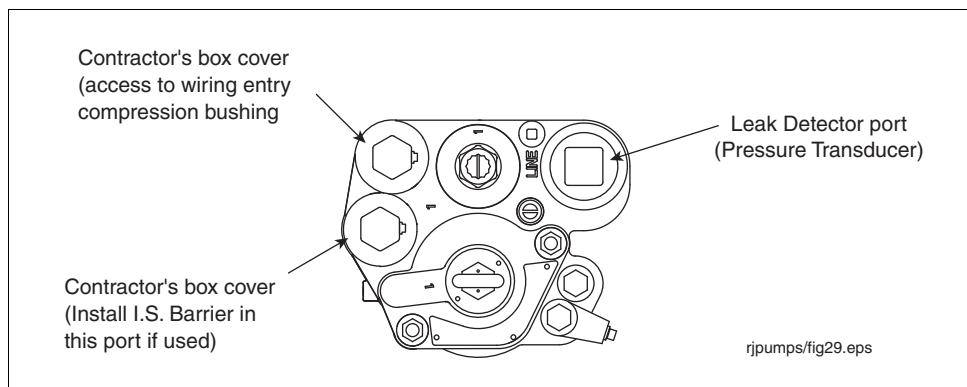


Figure 15. VSFC Component installation ports

2. If necessary loosen the two screws in the top of the compression bushing until you can lift it out of the manifold (see Figure 16).

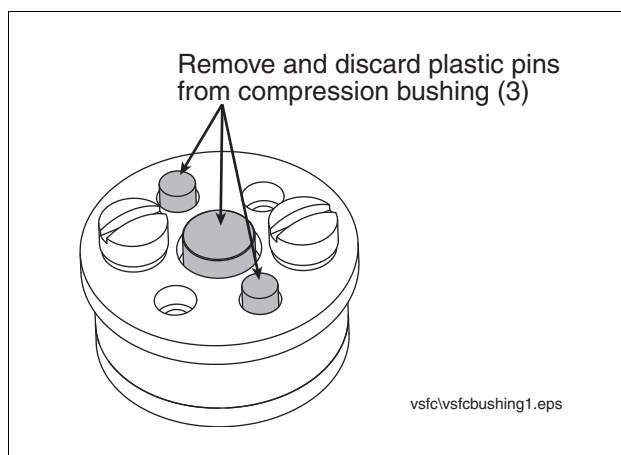


Figure 16. Compression bushing

3. The compression bushing is used to water seal the wiring entry port of the VSFC STP. Figure 17 through Figure 19 illustrate the recommended installation of the bushing in the VSFC STPs with and without an I.S. Barrier.



**WARNING! YOU MUST FOLLOW THE WIRING INSTRUCTIONS IN THE VARIABLE SPEED FLOW CONTROLLER INSTALLATION GUIDE- P/N 577013-815 WHEN CONNECTING POWER AND PRESSURE TRANSDUCER/I.S. BARRIER WIRING TO THE RED JACKET VSFC STP.**

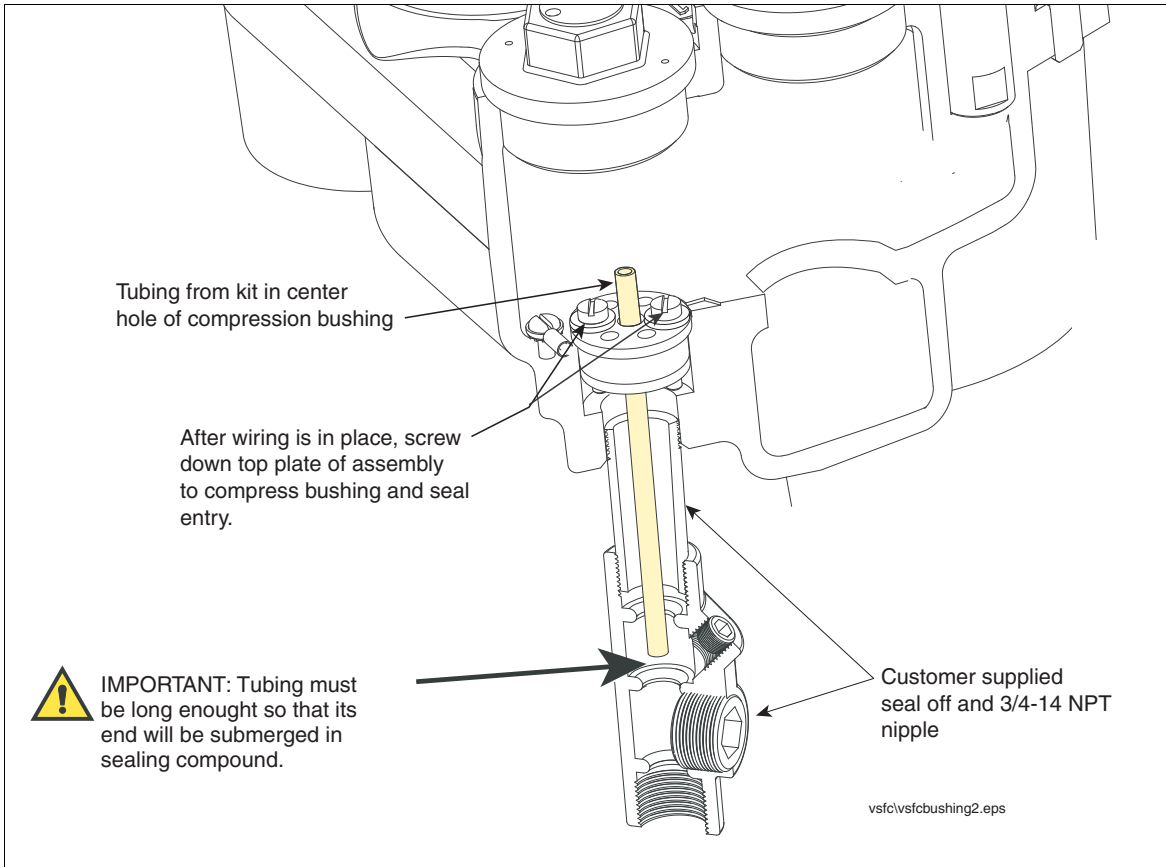


Figure 17. Installed tubing from kit in compression bushing

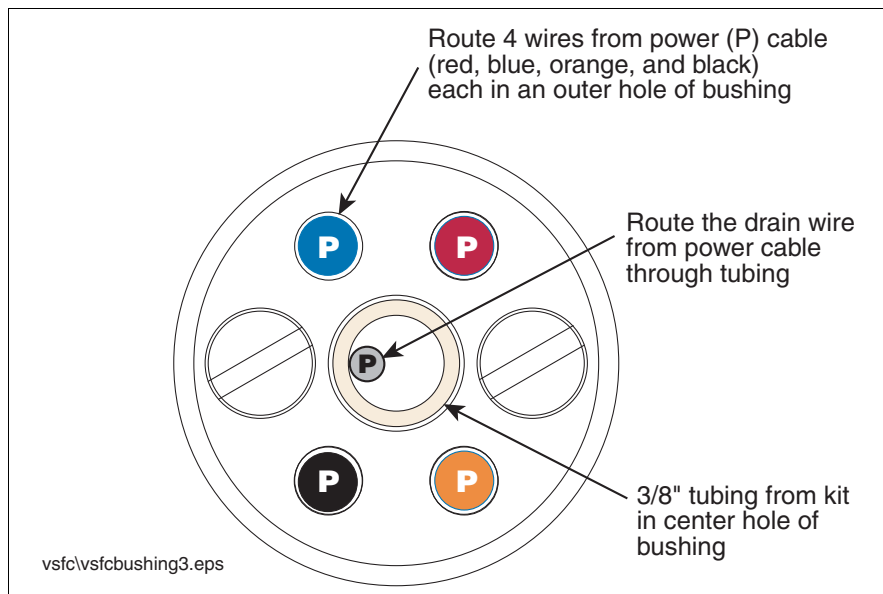


Figure 18. Recommended power wire entry through the compression bushing



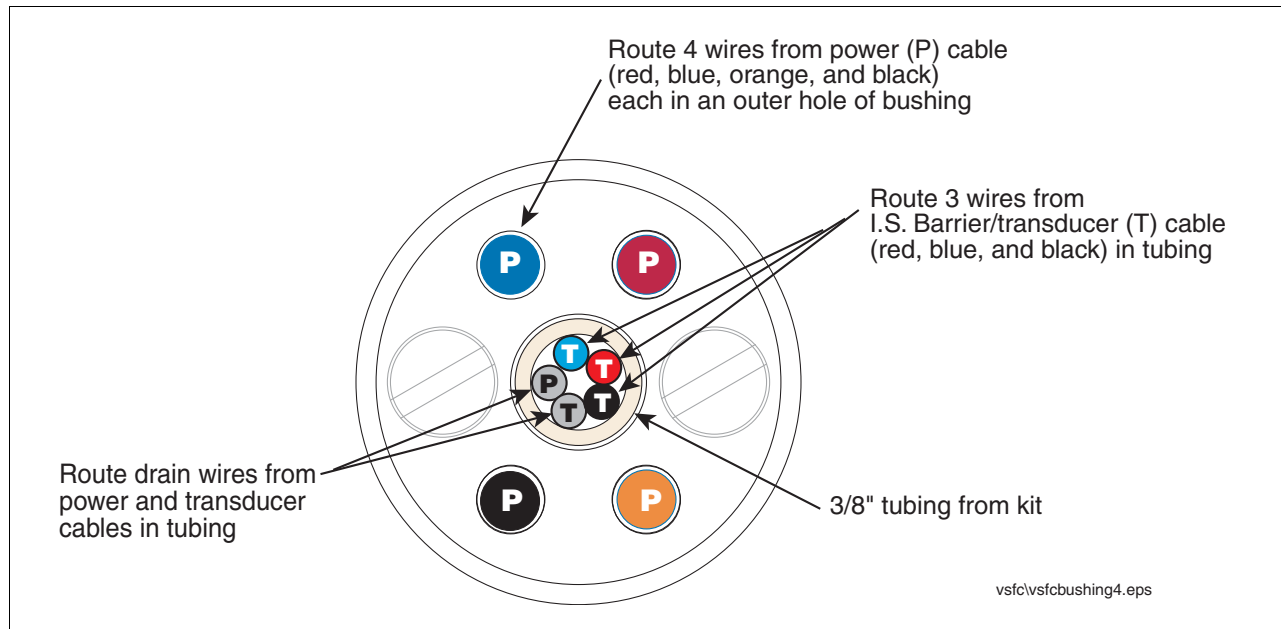


Figure 19. Recommended power wire/I.S. Barrier (transducer) wire entry through the compression bushing

## Installing Pumps for Multiple Pump Operation

When greater flow rates are needed, up to four pumps may be installed in the same piping system by means of a manifold. If installed according to the Figure 20, operations can continue if one pump stops working.



**CAUTION!** proper check valves with pressure relief are required to be installed in the discharge line of each pump to prevent product from being pumped through the pressure relief system of the adjacent pump when it is not operating.

NOTE: Ball valves should be installed at the pump end of the discharge line for ease of maintenance and troubleshooting (see Figure 20).

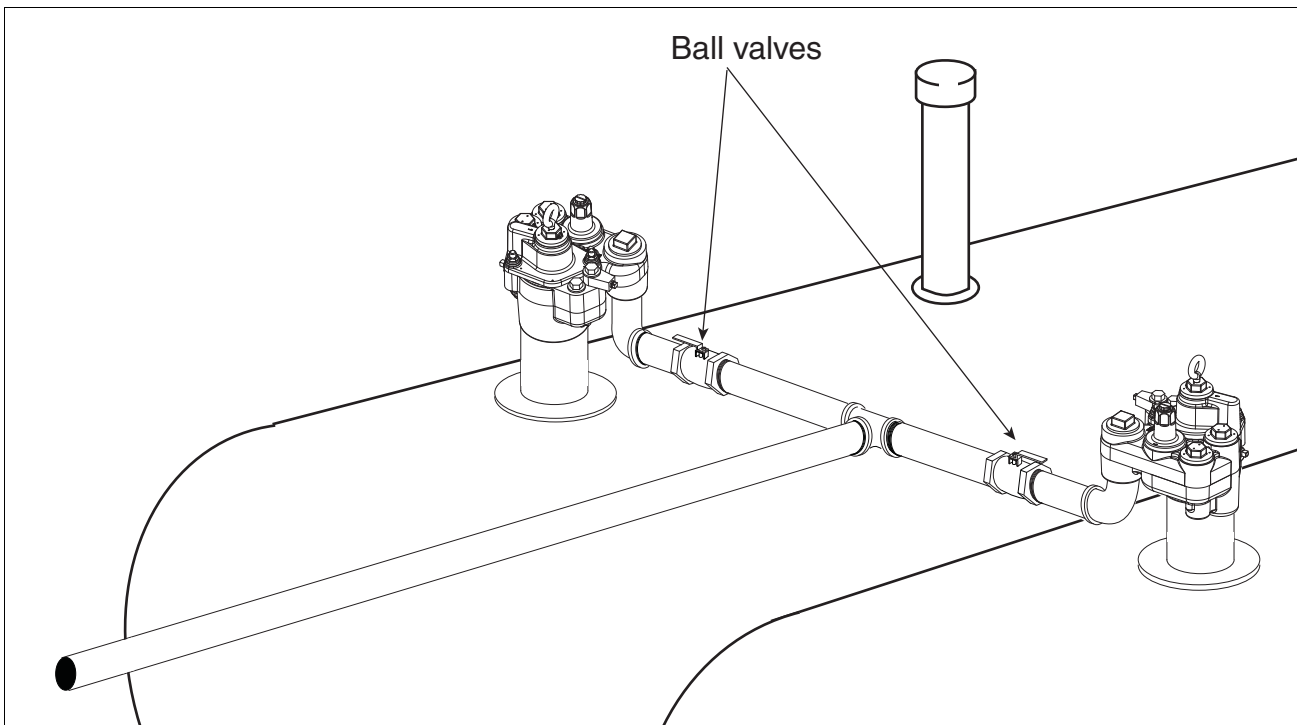


Figure 20. Multiple pumps

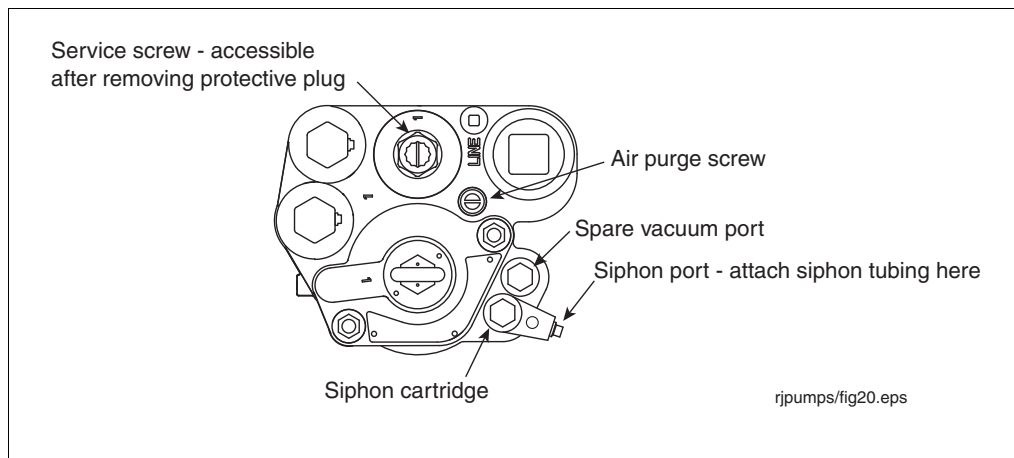
## Siphon Ports

The siphon port for The Red Jacket VSFC STP is in a siphon assembly that fits into one of the two vacuum ports (see Figure 21). The port end can be swiveled after loosening the hex on top to accommodate the incoming siphon tube. Torque the siphon assembly to 15-30 ft-lbs (20-41 N•m) after positioning.

NOTE: The 1/4" NPT plug in the siphon assembly should be removed and the siphon line attached.



**CAUTION!** - Before installing pipe threads, apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant. For E85AG applications, Loctite 564 is recommended for all field serviceable pipe threads. Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.



**Figure 21. Siphon connection**

## Service And Repair

### Replacing the UMP



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

#### Kits Required:

- UMP replacement kit (P/N 144-327-4) - P/N 410594-001 for E85AG Applications
- Hardware/seal kit (E85AG) P/N 410154-001

#### Procedure:

1. If a ball valve is installed down line from the pump, close it.
2. Remove the two extractable lock-down nuts (see Figure 22). The springs on the lock-down studs between the extractable's flange and the manifold will push the extractable up, breaking the seals.

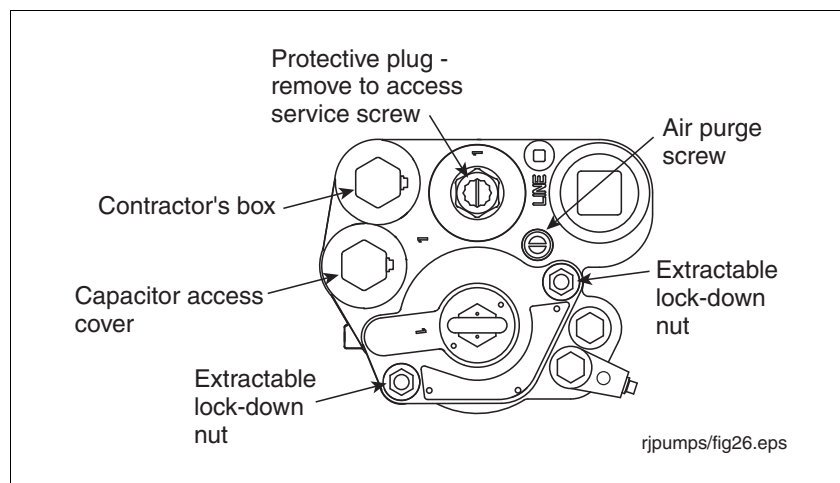


Figure 22. Extractable lock-down nuts



3. **WARNING!** Confirm that the packer wiring compartment cover (with lifting eyebolt) is properly torqued to 10 ft-lbs (13.6 N•m) with a minimum of 6 full threads installed. Occasionally, eyebolts are removed after pump installation and corrosion may occur in the threaded areas of the wiring compartment cover (eyebolt plug) and the eyebolt. If corrosion has occurred, the cover and eyebolt should be replaced.

Utilize the lifting eyebolt to lift out the extractable unit and place it on a clean surface. Removal of the extractable section of the pump must be conducted with caution. Make certain that the extractable section remains centered within the riser pipe and that no portion of the extractable binds during the removal process. If binding occurs during removal, stop and determine the cause of the binding and correct the situation before proceeding with removal.

4. Remove the old UMP by removing the four bolts holding the discharge head as shown in Figure 23. Discard the old gasket and fasteners.
5. Place the new gasket from the UMP replacement kit on the new UMP so that all the holes align.



**CAUTION!** Gaskets from competitive UMPs will not seal properly and performance will be reduced.

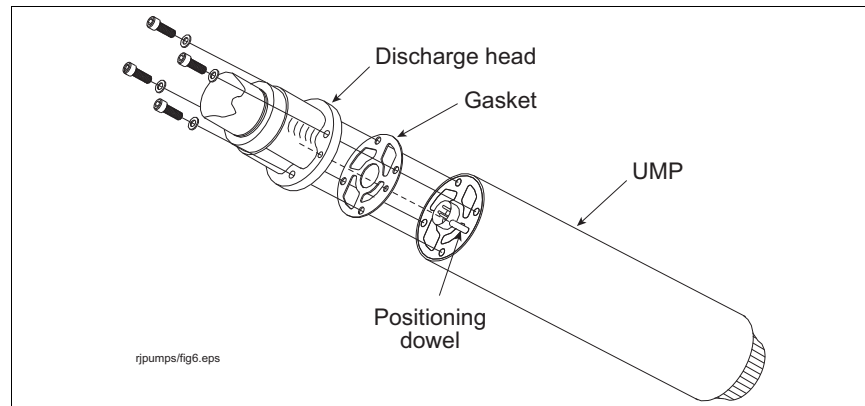


Figure 23. UMP bolts and gasket

6. Pull the pigtail connector in the discharge head out far enough to see the o-ring in the sidewall of its socket (see Figure 24). Remove the connector's o-ring from the connector's socket and discard it. Get a 0.551" ID x 0.070" wide o-ring from the kit and lubricate it with petroleum jelly. Slide the new o-ring over the pigtail connector and push it in the groove in the wall of the connector's socket. Lubricate the pigtail connector body with petroleum jelly and push it back into its socket, making sure its index tab is in the socket's notch.

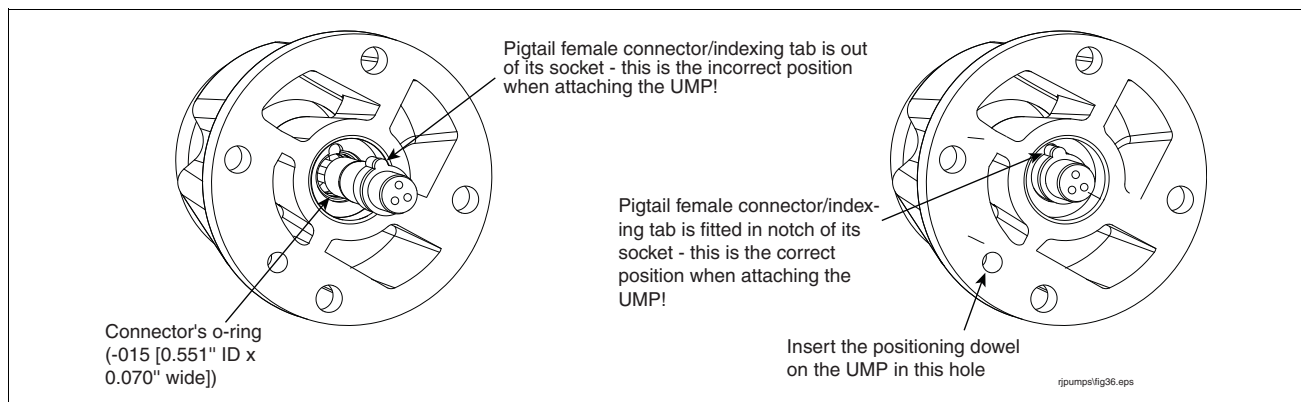


Figure 24. Verifying pigtail's female connector is seated properly

7. Align the UMP positioning dowel so it inserts in the proper hole in the discharge head (see Figure 24) and push the UMP into position using hand force only. The UMP should be snug against the discharge head prior to installing the UMP retaining bolts.

**NOTE: Use hand force to push the UMP onto the discharge head. If the UMP does not seat snug against the discharge head, remove the UMP and correct the problem.**

8. Install the four UMP retaining bolts and lock washers. Snug and then torque the bolts using a cross pattern technique. Torque to 7 ft-lbs (11 N•m).

**NOTE: Do not use the bolts to pull the UMP into position. Use the cross pattern technique. Do not over torque the bolts. Not following instructions may cause parts to fail.**

9. Get the three extractable o-ring seals (3.975" ID x 0.210" wide [upper], 3.850" ID x 0.210" wide [middle], and 3.725" x 0.210" wide [lower]) from the hardware/seal kit. The three o-rings are very close in size so take extra care to distinguish each one before replacing them in the extractable. Lubricate each o-ring with petroleum jelly and then install them in their assigned grooves in the extractable (see Figure 25).

10. Remove the manifold's female connector's o-ring (see Figure 25). Get a 0.862" ID x 0.103" wide o-ring from the kit and lubricate it with petroleum jelly. Slide the o-ring over the female connector and push it down into its groove.
11. Reinstall the extractable unit into the manifold and tank. Torque the extractable lock-down nuts in an alternating pattern to 50 ft-lbs (68 N•m).
12. Turn the air purge screw 2 - 3 turns counterclockwise (see Figure 22).



**CAUTION! The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.**

13. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
14. If applicable, open the ball valve down line from the pump.

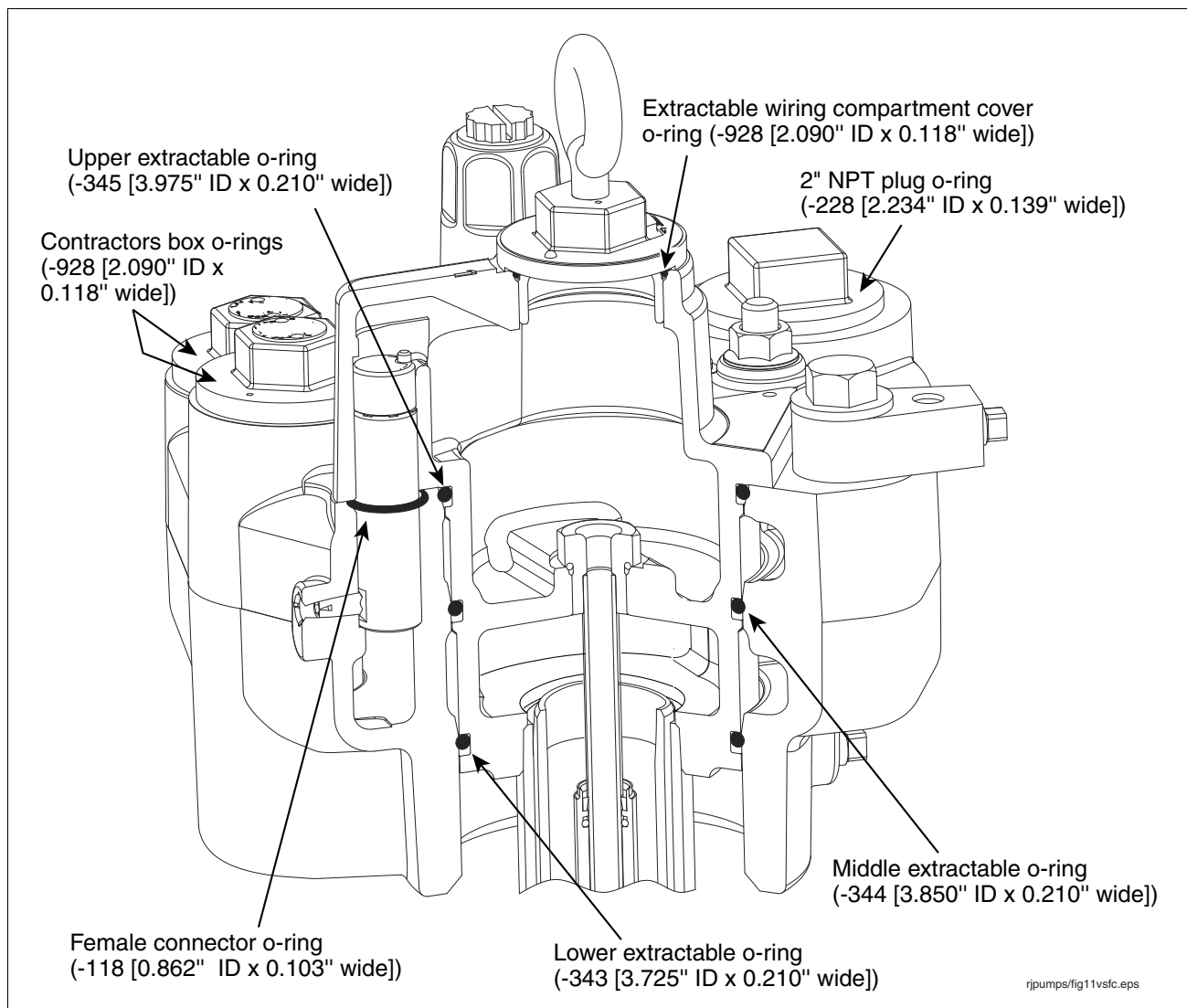


Figure 25. Locating packer and manifold o-rings

## Installing a Siphon Assembly



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

### Kits Required:

- Siphon Cartridge Kit (P/N 410151-001)

### Procedure:

1. If a ball valve is installed down line from the pump, close it.
2. Remove and save the protective plug over the service screw and turn the screw clockwise (see Figure 26). As the screw approaches its bottom position, you will hear the system depressurizing. Continue turning the screw until it can go no further. When the screw is all the way down, back off the screw 4 turns to lift the check valve and let the fuel drain out of the manifold's hydraulic cavities.
3. Remove one of the two siphon port plugs from the manifold (see Figure 26).

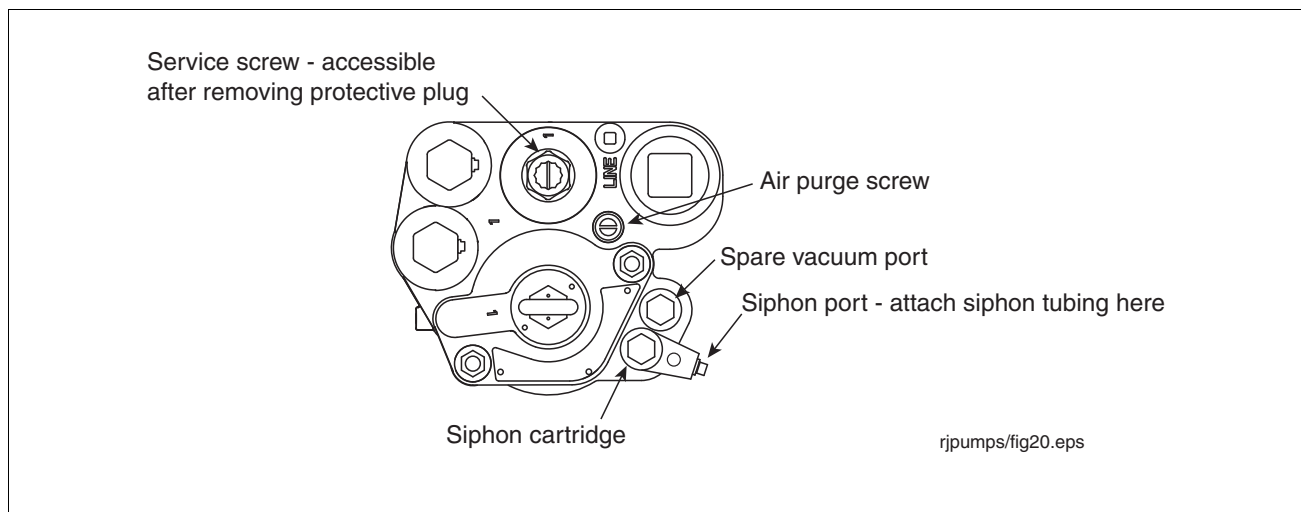


Figure 26. Siphon ports

4. Get the siphon cartridge from the kit and apply a coating of petroleum jelly onto the three o-rings on the outside of the siphon cartridge.
5. Insert the siphon cartridge into the siphon port (see Figure 27). Swivel the outlet port of the siphon in the desired direction, and then hand tighten the siphon's retaining hex body. Torque the body to 25 - 30 ft-lbs (34 - 41 N•m).
6. Remove the 1/4" NPT plug from the siphon outlet port and attach siphon system tubing.



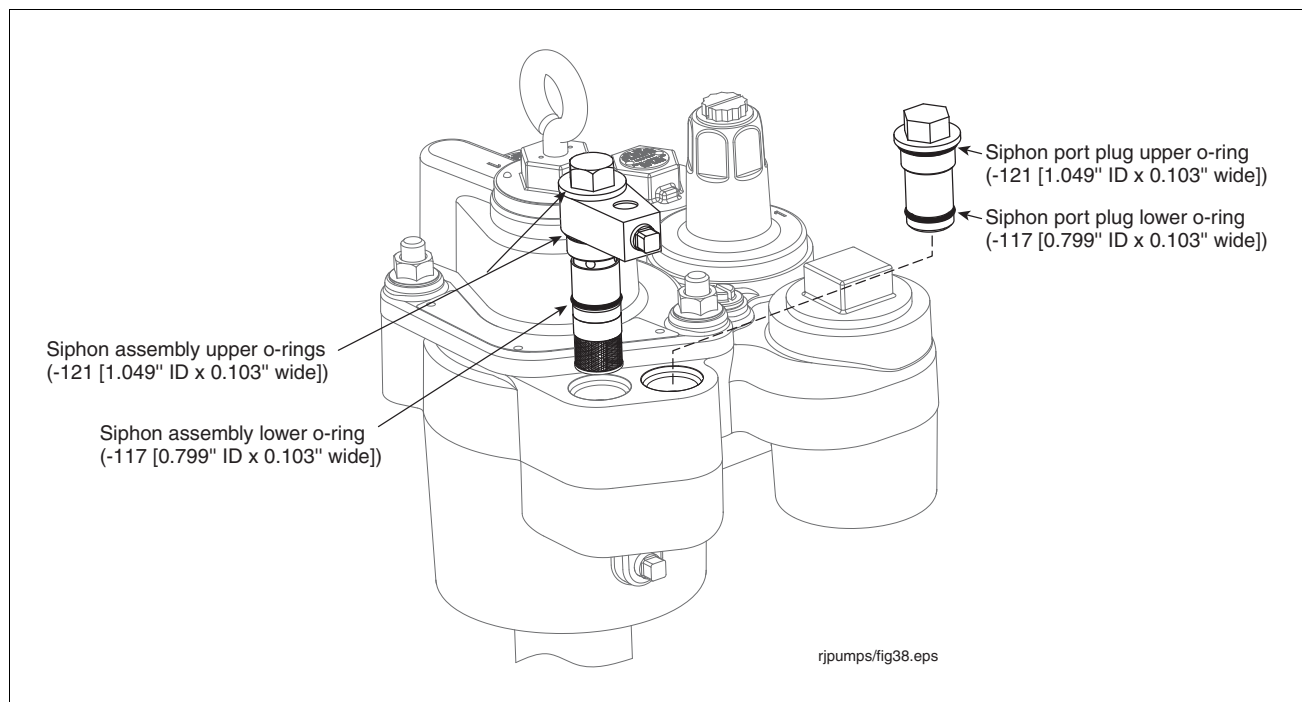
**CAUTION!** - Before installing pipe threads, apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant. For E85AG applications, Loctite 564 is recommended for all field serviceable pipe threads. Apply sealant in a manner that prevents it from entering and contaminating hydraulic cavities.

7. Turn the service screw counterclockwise all the way up. As the screw approaches its top position, the check valve will drop into position.
8. Replace the protective plug over the service screw, and fully thread into place to ensure a good seal.
9. Turn the air purge screw 2 - 3 turns counterclockwise (see Figure 26).



**CAUTION! The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.**

10. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
11. If applicable, open the ball valve down line from the pump.



**Figure 27. Inserting Siphon assembly into manifold**



## Replacing the Check Valve Assembly



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

### Kits Required:

- Check Valve Housing Kit (P/N 410152-001), or
- Check Valve Kit (P/N 410153-001) and Hardware/Seal Kit (E85AG) (P/N 410154-001)

### Procedure:

1. If a ball valve is installed down line from the pump, close it.
2. Remove and save the protective plug over the service screw and turn the screw clockwise (see Figure 26 on page 26). As the screw approaches its bottom position, you will hear the system depressurizing. Continue turning the screw until it can go no further. When the screw is all the way down, back off the screw 4 turns to lift the check valve and let the fuel drain out of the manifold's hydraulic cavities. Continue to turn the screw counterclockwise until you hear the check valve drop down into position.
3. Unscrew the check valve housing. Lift the spring and check valve out of the manifold. Discard the o-ring from the housing and from the check valve.  
  
NOTE: If replacing the check valve o-ring, avoid twisting or rotating the o-ring as it is being installed on the check valve.
4. Get the new check valve and spring from the kit. If you have the Check valve housing kit, get the new housing and o-ring (2.609" ID x 0.139" wide) from the kit, if you only have the check valve kit, get a new 2.609" ID x 0.139" wide housing o-ring from the hardware/seal kit.
5. Lubricate the new housing o-ring and the new 1.859" ID x 0.139" wide o-ring on the check valve with petroleum jelly.
6. With its lubricated o-ring in place, insert the check valve onto its seat in the manifold, and place the new spring over the check valve (see Figure 28). Place the check valve housing with o-ring over the spring and check valve and screw it in hand tight. Torque the housing to 40 - 50 ft-lbs (54 - 67 N•m).
7. Replace the protective plug over the service screw, and fully thread into place to ensure a good seal.
8. Open the air purge screw 2 - 3 turns counterclockwise (see Figure 26).



**CAUTION!** The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.

9. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
10. If applicable, open the ball valve down line from the pump.

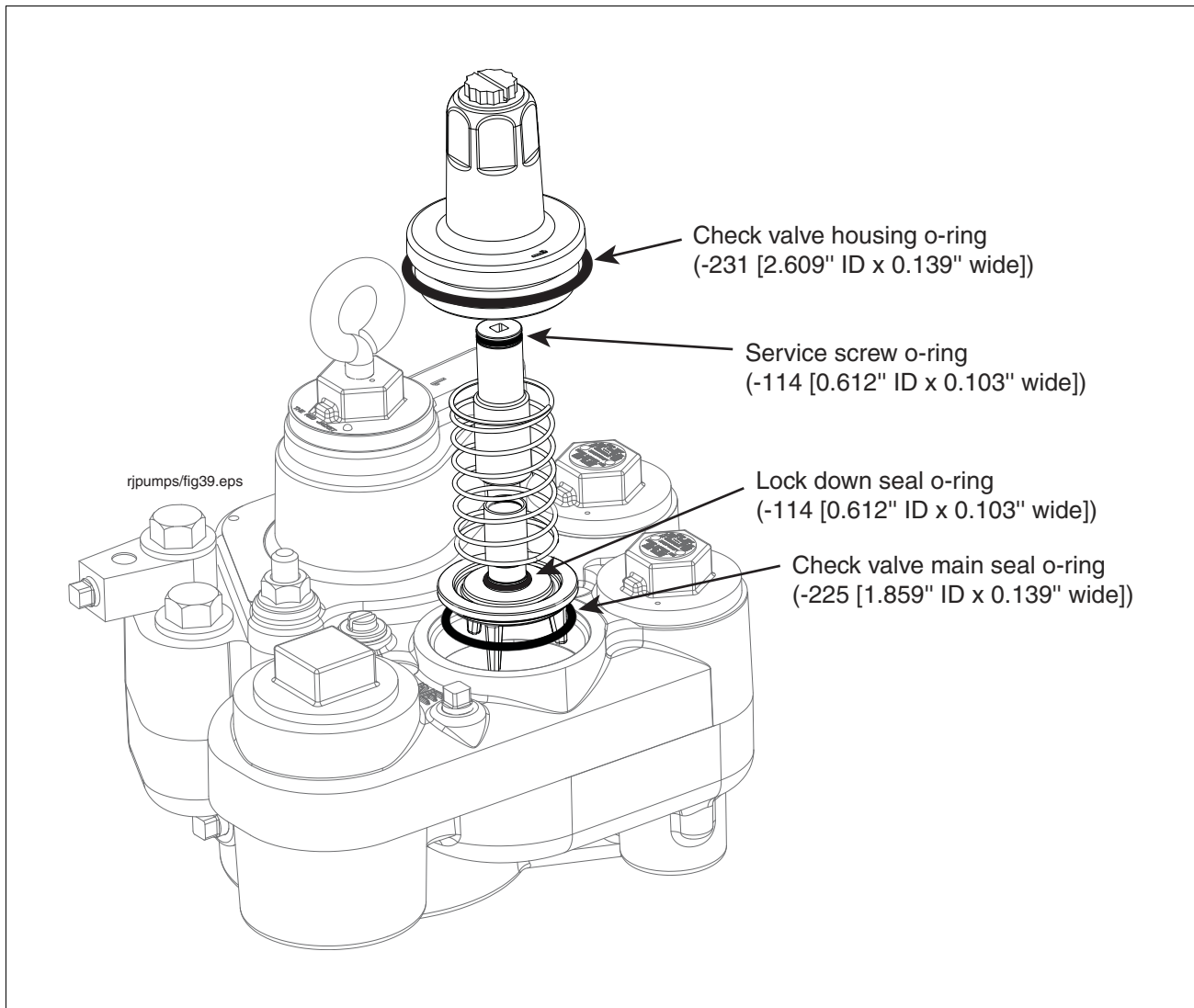


Figure 28. Inserting Check valve assembly into manifold

## Replacing the Conduit Bushing



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

### Kits Required:

- Conduit Bushing (P/N 410486-001),
- Hardware/Seal Kit (E85AG) (P/N 410154-001)

### Procedure:

1. Remove the contractor's box cover over the compression bushing (see Figure 15 on page 18). Remove and discard the o-ring from the cover. Set aside the cover.
2. Locate the conduit bushing at the base of the contractor's box (see Figure 16 on page 18). Make a note of which incoming wire connects to which pump wire then disconnect the incoming power wires from the pump wires and set aside the wire nuts. Disconnect the blue ground wire and drain wire(s) from the green ground wire (attached to the manifold) and set aside the wire nut.

If an I.S. Barrier is installed, make a note of which of the three inner tubing wires connect to the I.S. Barrier then disconnect these 3 wires from I.S. Barrier wires. Also disconnect the I.S. Barrier cable's drain wire in the tubing from the green ground wire.

3. Loosen the two screws in the conduit bushing just enough so the bushing can be lifted from its socket in the bottom of the manifold's contractor box. Continue lifting the bushing up, until it is free of the power/drain wires.
4. Orient the replacement bushing so the screws are facing up, and push each of the incoming power wires through an empty outer hole in the bushing and push the tubing through the larger center hole in the bushing as shown in Figure 18 on page 19 or Figure 19 on page 20 as required.
5. Slide the bushing down over the power wires (outer holes) and tubing (center hole) until it seats in its socket in the base of the manifold's contractor box and then tighten the two screws in the top plate of the bushing assembly to compress the bushing and seal the wiring entry.
6. Reconnect the incoming wires to the pump wires as recorded in Step 2 above. Reconnect the blue power wire and drain wire(s) to the green ground wire (attached to the manifold). Reconnect the incoming wires to the I.S. Barrier wires as recorded in Step 2 above. Also reconnect the incoming drain wire in the cable to I.S. Barrier to the green ground wire.
7. Get a 2.090" ID x 0.118" wide o-ring from the hardware/seal kit. Lubricate the o-ring with petroleum jelly and slide it over the cover's threads up to the flange. Reinstall the cover. Do not use thread sealant. Torque the cover to 35 ft-lbs (50 N•m).

## Replacing the Pigtail



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

### Kits Required:

- UMP Replacement Kit (P/N 144-327-4) - P/N 410594-001 for E85AG Applications
- Pigtail (P/N 410156-001)
- Hardware/Seal Kit (E85AG) (P/N 410154-001)

### Procedure:

1. If a ball valve is installed down line from the pump, close it.
2. Remove the two extractable lock-down nuts (see Figure 29). The springs on the lock-down studs between the extractable's flange and the manifold will push it up, breaking the seals.

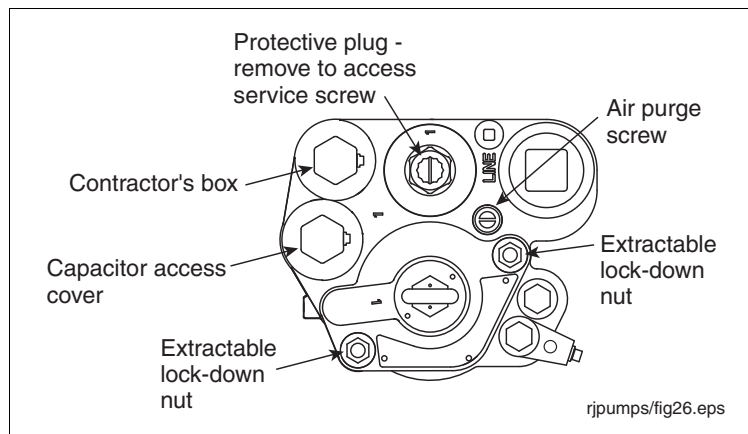


Figure 29. Extractable lock-down nuts



### 3. WARNING!

Confirm that the packer wiring compartment cover (with lifting eyebolt) is properly torqued to 10 ft-lbs (13.6 N•m) with a minimum of 6 full threads installed. Occasionally, eyebolts are removed after pump installation and corrosion may occur in the threaded areas of the wiring compartment cover (eyebolt plug) and the eyebolt. If corrosion has occurred, the cover and eyebolt should be replaced.

Utilize the lifting eyebolt to lift out the extractable unit and place it on a clean surface. Removal of the extractable section of the pump must be conducted with caution. Make certain that the extractable section remains centered within the riser pipe and that no portion of the extractable binds during the removal process. If binding occurs during removal, stop and determine the cause of the binding and correct the situation before proceeding with removal.

4. Remove the UMP by removing the four bolts holding the discharge head as shown in Figure 23 on page 24. Discard the old gasket and fasteners.
5. Place the new gasket from the UMP replacement kit on the new UMP so that all the holes align.



**CAUTION!** Gaskets from competitive UMPs will not seal properly and performance will be reduced.

6. Remove the packer wiring compartment cover. Remove and discard the o-ring from the cover and set aside the cover. Observe the three wiring connections in the compartment. Make a note of which wire from the packer connects to which wire from the pigtail (it should be like colored wires connecting to like colored wires). Disconnect the wires and set aside the wire nuts.

7. Look at the end of the discharge head. Pull the pigtail connector out of its socket in the discharge head and remove and discard the pigtail. Remove the o-ring in the sidewall of the connector's socket in the discharge head.
8. Get the new pigtail assembly and uncoil the pigtail so it lays flat.
9. Get a 0.551" ID x 0.070" wide o-ring from the hardware/seal kit. Lubricate the o-ring with petroleum jelly and insert it in the sidewall of the connector's socket in the end of the discharge head.
10. Push the pigtail wires into the connector's socket until they exit into the packer's wiring compartment. At the discharge (connector) end of the pigtail, rub some petroleum jelly over the connector's outside surface and push it into its socket in the discharge head. Take care to align the connector index tab with the notch in the socket as shown in the drawing on the right in Figure 24 on page 24.
11. Align the UMP positioning dowel so it inserts in the proper hole in the discharge head (see Figure 24) and push the UMP into position using hand force only. The UMP should be snug against the discharge head prior to installing the UMP retaining bolts.

**NOTE: Use hand force to push the UMP onto the discharge head. If the UMP does not seat snug against the discharge head, remove the UMP and correct the problem.**

12. Install the four UMP retaining bolts and lock washers. Snug and then torque the bolts using a cross pattern technique. Torque to 7 ft-lbs (11 N•m).

**NOTE: Do not over torque the bolts. Not following these instructions may cause parts to fail.**

13. Carefully pull on the pigtail wires where they exit the packer wiring compartment until any excess length is out of the column pipe. Snip the pigtail wires approximately 8 inches (200 mm) beyond the top of the packer.
14. Strip insulation off the three pigtail wires 3/8 inch (10 mm).
15. Connect like colored wires from the pigtail to like colored wires from the packer's male connector with wire nuts. When finished connecting the wires, neatly tuck them inside the packer's wiring compartment (see Figure 14 on page 17).
16. Get a 2.090" ID x 0.118" wide o-ring from the hardware/seal kit. Lubricate the o-ring on the packer wiring compartment cover (with lifting eyebolt) with petroleum based jelly. Screw in the packer wiring compartment cover (thread sealant should not be used) and torque to 35 ft-lbs (48 N•m). Insure that the eyebolt has at least five threads of engagement.
17. Get the three extractable o-ring seals (3.975" ID x 0.210" wide [upper], 3.850" ID x 0.210" wide [middle], and 3.725" x 0.210" wide [lower]) from the hardware/seal kit. The three o-rings are very close in size so take extra care to distinguish each one before replacing them in the extractable. Lubricate each o-ring with petroleum jelly and then install them in their assigned grooves in the extractable - see Figure 25 on page 25.
18. Remove the manifold's female connector's o-ring - see Figure 25 on page 25. Get a 0.862" ID x 0.103" wide o-ring from the kit and lubricate it with petroleum jelly. Slide the o-ring over the female connector and push it down into its groove.
19. Reinstall the extractable unit into the manifold and tank. Torque the extractable lock-down nuts in an alternating pattern to 50 ft-lbs (68 N•m).
20. If applicable, open the ball valve down line from the pump.

## Replacing the Packer-to-Manifold Wiring Connectors



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

### Kits Required:

- Electrical Connector Kit (P/N 410165-001)
- Hardware/Seal Kit (E85AG) (P/N 410154-001)

Special tools - not supplied in kits:

- 3/16" hex wrench, Medium point felt-tip pen, small piece of masking tape, a small ruler and needle nose pliers

### Procedure:

1. If a ball valve is installed down line from the pump, close it.
2. Remove the two extractable lock-down nuts (see Figure 22 on page 23). The springs on the lock-down studs between the extractable's flange and the manifold will push it up, breaking the seals.

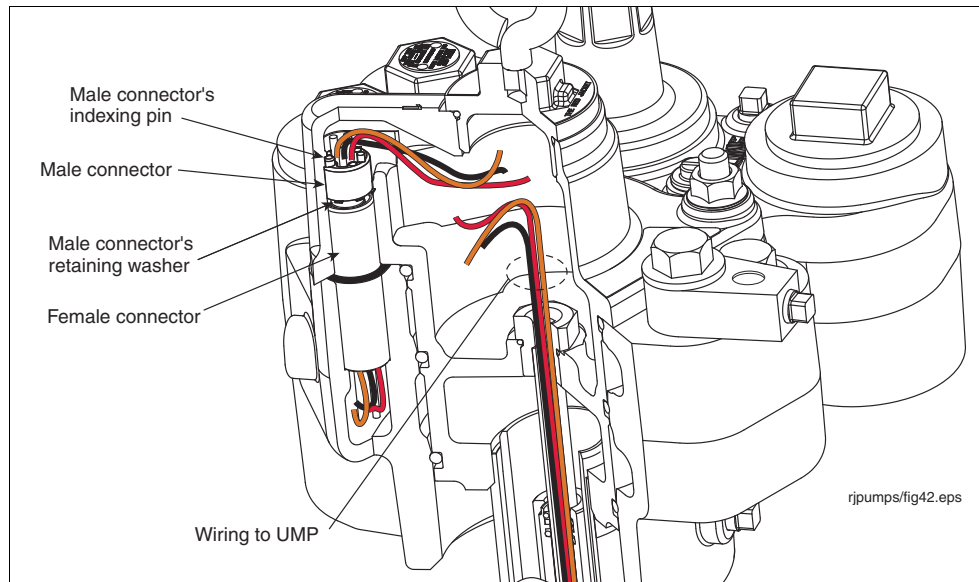


**3. WARNING!**

**Confirm that the packer wiring compartment cover (with lifting eyebolt) is properly torqued to 10 ft-lbs (13.6 N•m) with a minimum of 6 full threads installed. Occasionally, eyebolts are removed after pump installation and corrosion may occur in the threaded areas of the wiring compartment cover (eyebolt plug) and the eyebolt. If corrosion has occurred, the cover and eyebolt should be replaced.**

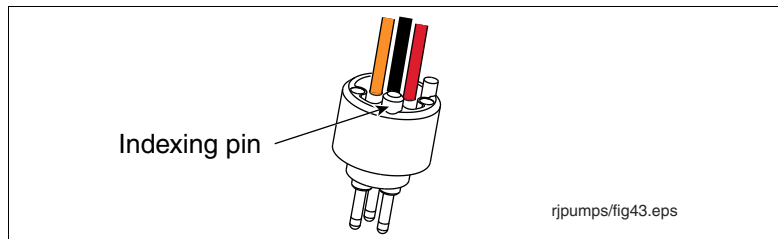
**Utilize the lifting eyebolt to lift out the extractable unit and place it on a clean surface. Removal of the extractable section of the pump must be conducted with caution. Make certain that the extractable section remains centered within the riser pipe and that no portion of the extractable binds during the removal process. If binding occurs during removal, stop and determine the cause of the binding and correct the situation before proceeding with removal.**

4. Remove the packer wiring compartment cover (see Figure 25 on page 25). Remove and discard the o-ring from the cover and set aside the cover. Observe the three wiring connections inside the compartment. Make a note of which wire from the packer connects to which wire from the pigtail (it should be like colored wires connecting to like colored wires). Disconnect the wires and set aside the wire nuts.
5. Locate the male connector inside the packer (see Figure 30).



**Figure 30. Packer-to-manifold wiring connectors**

6. Use a pair of needle nose pliers to remove the retaining washer that holds the male connector in its socket.
7. Remove the male connector.
8. Get the new male connector and retaining washer from the electrical connector kit.
9. Notice the small indexing pin on the back of the male connector (see Figure 31).



**Figure 31. Male connector's indexing pin**

10. The indexing pin on the back of the connector must seat in the index hole in the base of the male connector's socket (see Figure 32) for the connector to be correctly oriented relative to the female connector.
11. Place a mark on the facing of the Packer using a felt pen to indicate the position of the index hole (see Figure 32).

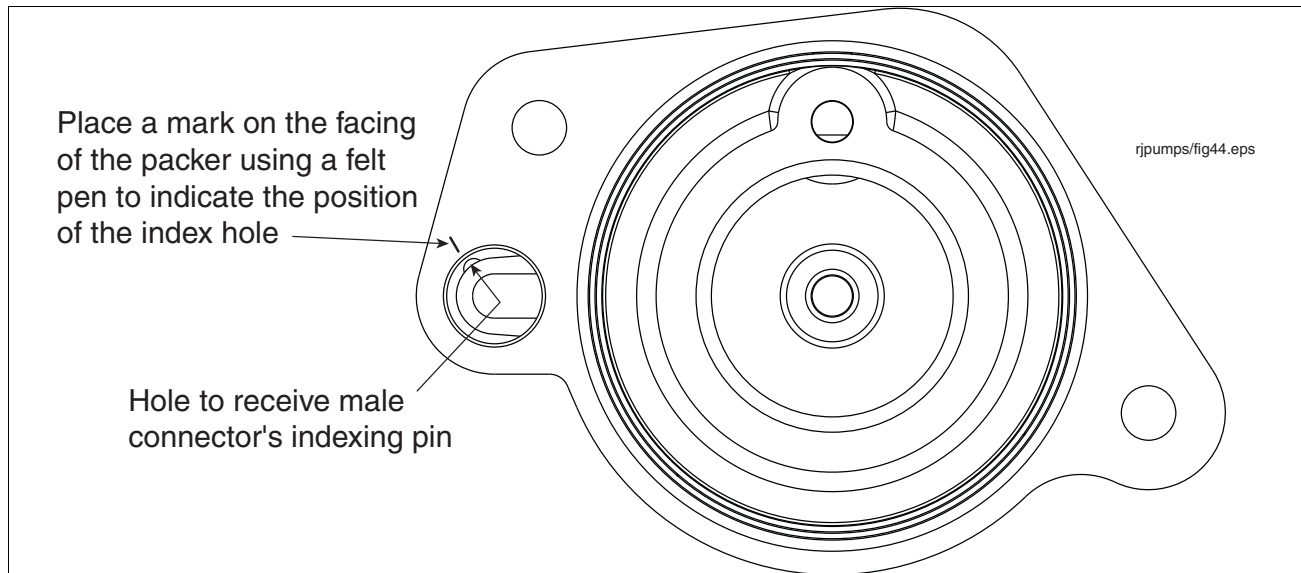


Figure 32. Male connector index hole in base of socket

12. Place a small piece of masking tape on the pins side of the connector in line with the indexing pin (see Figure 33).

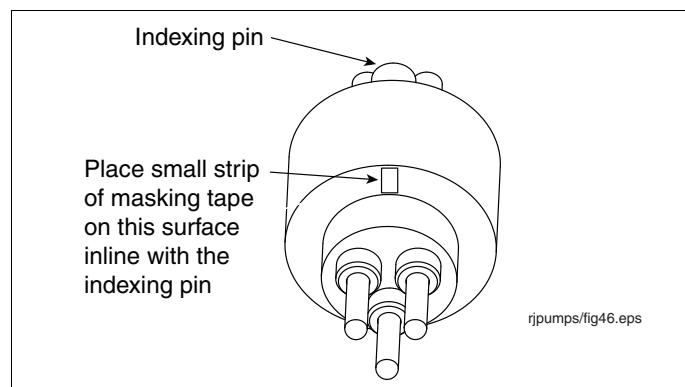


Figure 33. Placing masking tape alignment marker on front of male connector

13. Thread the wires of the new male connector down into the socket and out through the opening in the base of the socket into the packer wiring compartment. Gently pull the wires into the wiring compartment as you align the masking tape mark on the connector with the felt tip mark on the packer facing. When you have pushed the connector all the way into its socket it should not rotate if the indexing pin is in the index hole. Using the small ruler, measure the distance from the packer facing down to the connector, it should be a little more than 1-3/8" (see Figure 34). Hold the wires tight to keep the connector in position and insert the retaining washer (with upturned teeth facing out) forcing it down until it is firmly against the connector. Recheck the 1-3/8" measurement after installing the retaining washer to confirm that the connector is at the proper depth.



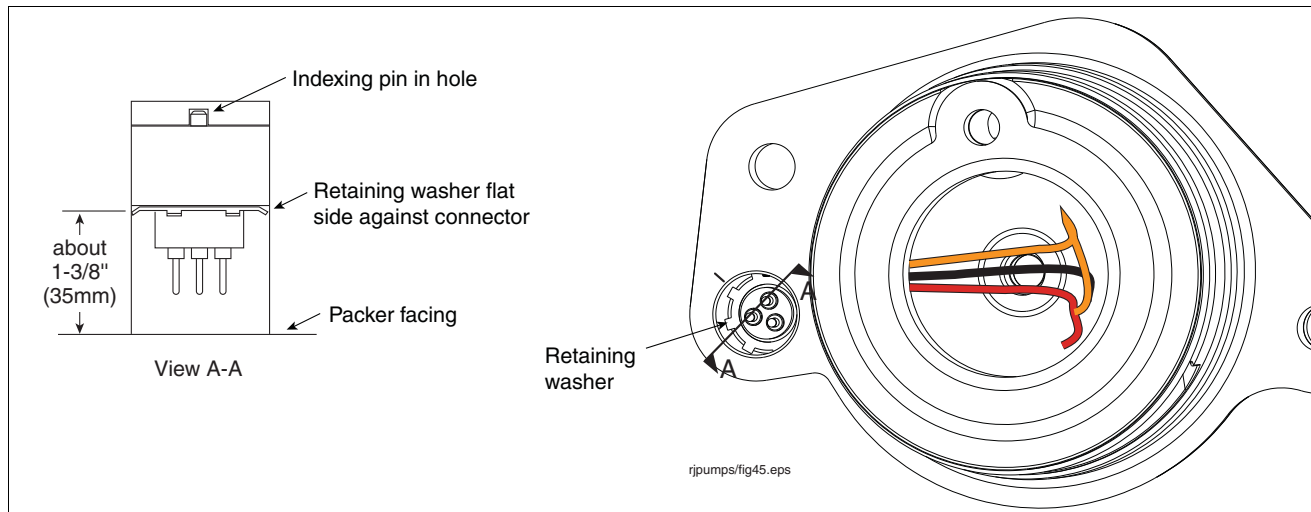


Figure 34. Correct depth of male connector in packer socket

14. Strip insulation off the three connector wires 3/8 inch (10 mm).
15. Connect like colored wires from the pigtail to like colored wires from the packer male connector with wire nuts. When finished connecting the wires, neatly coil wires inside the packer's wiring compartment (see Figure 14 on page 17).
16. Get a 2.090"ID x 0.118" wide o-ring from the hardware/seal kit. Lubricate the o-ring on the packer wiring compartment cover (with lifting eyebolt) with petroleum based jelly. Screw in the packer wiring compartment cover (thread sealant should not be used) and torque to 35 ft-lbs (50 N•m). Insure that the eyebolt has at least five threads of engagement.
17. Remove capacitor access cover (see Figure 22 on page 23). Remove and discard the o-ring from the cover and set aside the cover. Observe the three wiring connections from the female connector. Make a note of which wire from the connector connects to which wire from the capacitor and incoming power wiring. Disconnect the female connector wires and set aside the wire nuts.
18. Using a 3/16" hex wrench, turn the set screw that holds the female connector in place about 1-1/2 turns counterclockwise until you can lift out the connector (see Figure 35). **Note: Do not try to remove the set screw.**
19. Get the new female connector and its 0.862" ID x 0.103 wide o-ring from the kit. Push the three wires coming out of the connector down through the opening in the base of its socket and into the capacitor well. As you pull on its wires in the capacitor well, lower the connector with the flat cut in the side of the connector facing its retaining set screw. With the connector as far down as it can go (sitting on the ridge in the base of its socket), tighten the set screw firmly against the connector. As the set screw tightens it should rotate the connector to its proper position relative to the male connector.
20. Reconnect the connector's three wires as per your notes made in Step 15 above.
21. Get a 2.090" ID x 0.118" wide o-ring from the hardware/seal kit and lubricate with petroleum jelly. Insert this o-ring on the capacitor cover and screw in the cover. Do not use thread sealant. Torque the cover to 35 ft-lbs (50 N•m).

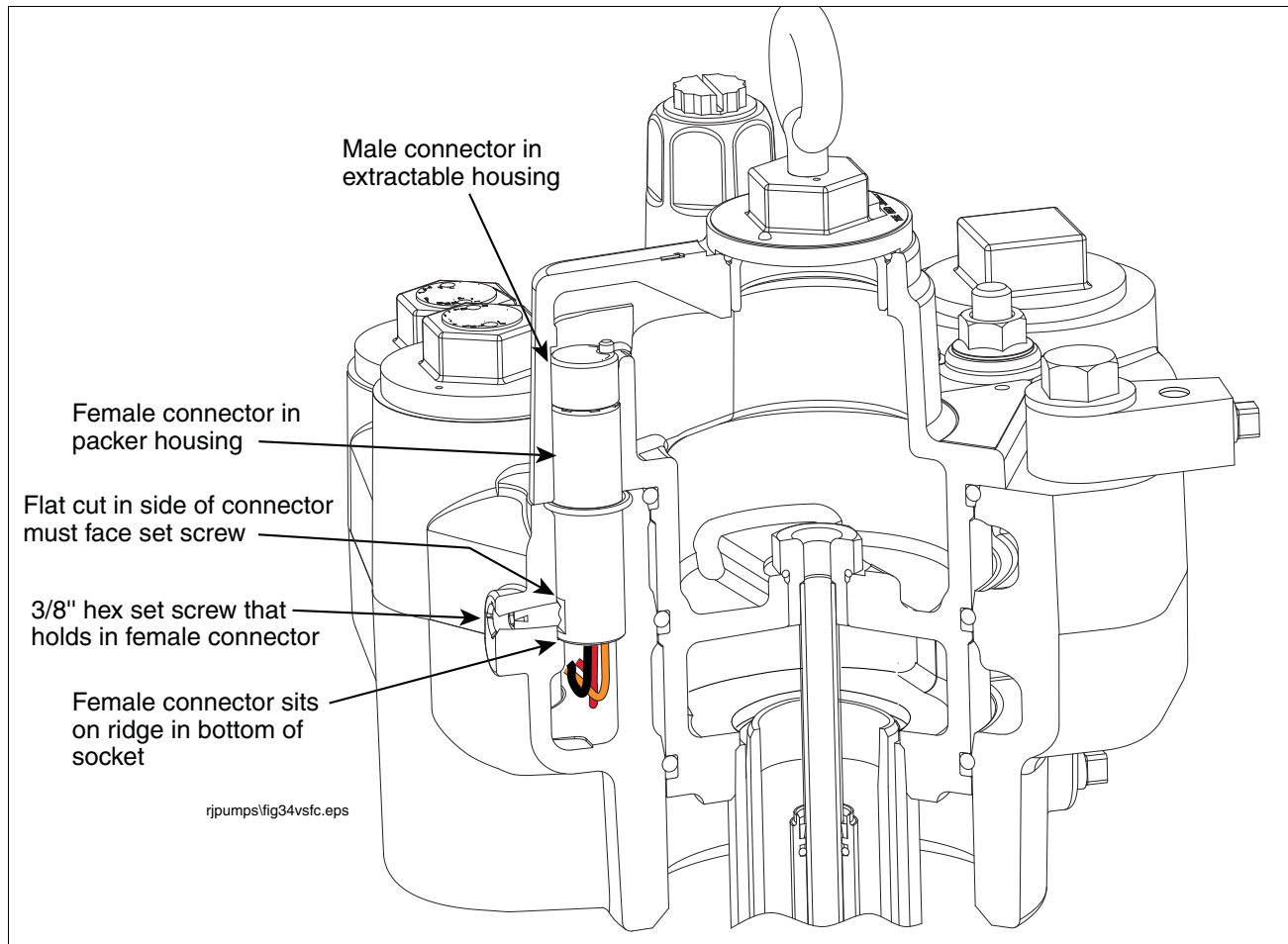


Figure 35. Locating female connector set screw

22. Remove the manifold's female connector o-ring.
23. Get the 0.862" ID x 0.103" wide o-ring from the connector kit and lubricate it with petroleum jelly. Insert this o-ring in its groove in the manifold around the female connector (see Figure 30 on page 34).
24. Get the three extractable o-ring seals (3.975" ID x 0.210" wide [upper], 3.850" ID x 0.210" wide [middle], and 3.725" x 0.210" wide [lower]) from the hardware/seal kit. The three o-rings are very close in size so take extra care to distinguish each one before replacing them in the extractable. Lubricate each o-ring with petroleum jelly and then install them in their assigned grooves in the extractable (see Figure 25 on page 25).
25. Reinstall the extractable unit into the manifold and tank. Torque the extractable lock-down nuts in an alternating pattern to 50 ft-lbs (68 N•m).
26. Turn the air purge screw 2 - 3 turns counterclockwise (see Figure 29).



**CAUTION! The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.**

27. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
28. If applicable, open the ball valve down line from the pump.

## Installing a Pressure Transducer



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

### Kits Required:

- Hardware/Seal Kit (E85AG) (P/N 410154-001)

### Other parts:

- Pressure transducer (master pump only)

### Procedure:

1. If a ball valve is installed down line from the pump, close it.
2. Remove and save the protective plug over the service screw and turn the screw clockwise (see Figure 36). As the screw approaches its bottom position, you will hear the system depressurizing. Continue turning the screw until it can go no further. When the screw is all the way down, back off the screw 4 turns to lift the check valve and let the fuel drain out of the manifold's hydraulic cavities.
3. Turn the service screw counterclockwise as far (up) as possible, (you will hear the check valve drop into place as the screw nears its up position).
4. Replace the protective plug over the service screw.
5. Remove the 2" NPT plug or pressure transducer from the pressure transducer port.

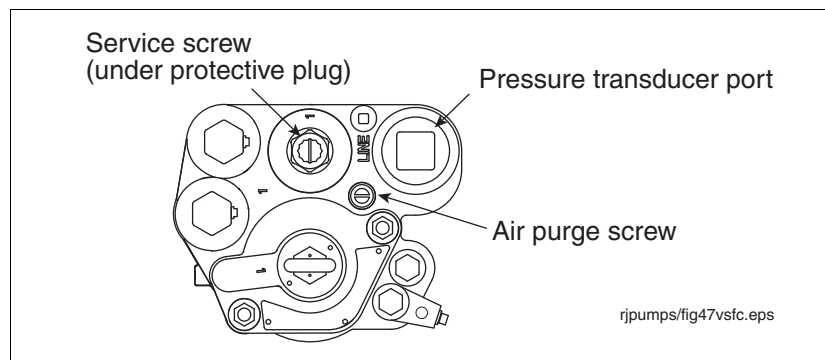


Figure 36. Locating discharge port plug for pressure transducer

6. Install the pressure transducer into the pressure transducer port as per instructions included with device.
7. Turn the service screw counterclockwise all the way up, as the screw approaches its top position, the check valve will drop into position.
8. Replace the protective plug over the service screw, and fully thread into place to ensure a good seal.
9. Turn the air purge screw 2 - 3 turns counterclockwise (see Figure 36).



**CAUTION!** The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.

10. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
11. If applicable, open the ball valve down line from the pump.

## Replacing the Air Purge Screw



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



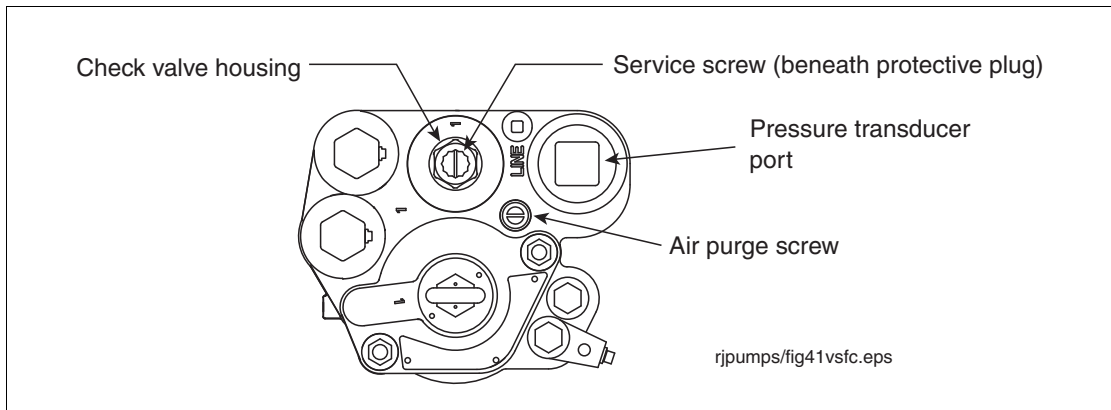
When servicing unit use non-sparking tools and use caution when removing or installing equipment to avoid generating a spark.

### Kits Required:

- Air Purge Screw (P/N 410134-001),
- Hardware/Seal Kit (E85AG) (P/N 410154-001)

### Procedure:

1. If a ball valve is installed down line from the pump, close it.
2. Remove and save the protective plug in the top of the check valve housing and turn the service screw clockwise (see Figure 37). As the screw approaches its bottom position, you will hear the system depressurizing. Continue turning the screw until it can go no further. When the screw is all the way down, back off the screw 4 turns to lift the check valve and let the fuel drain out of the manifold's hydraulic cavities.
3. Unscrew the check valve housing. Notice that the check valve and spring are still attached to the service screw. Remove and discard the housing o-ring (see Figure 28 on page 29). Set the housing/check valve assembly aside.
4. Remove the 2" NPT plug, pressure transducer, or MLLD from the pressure transducer port in the manifold. Remove the o-ring from the device and discard.
5. Locate the air purge screw on the top of the manifold (Figure 37).



**Figure 37. Locating air purge screw**

6. The air purge screw has a hitch pin that is set in the horizontal position to limit travel of the screw (see Figure 38).
7. Accessing the hitch pin through the check valve port, use your forefinger to push the pin all the way in as far as you can. As you unscrew the screw, the pin will be forced down into the vertical position as it contacts the surface of the manifold's cavity.

8. Lubricate the three o-rings on the new screw with petroleum jelly and install it with the hitch pin pushed on and hanging in the vertical position (see Figure 40).

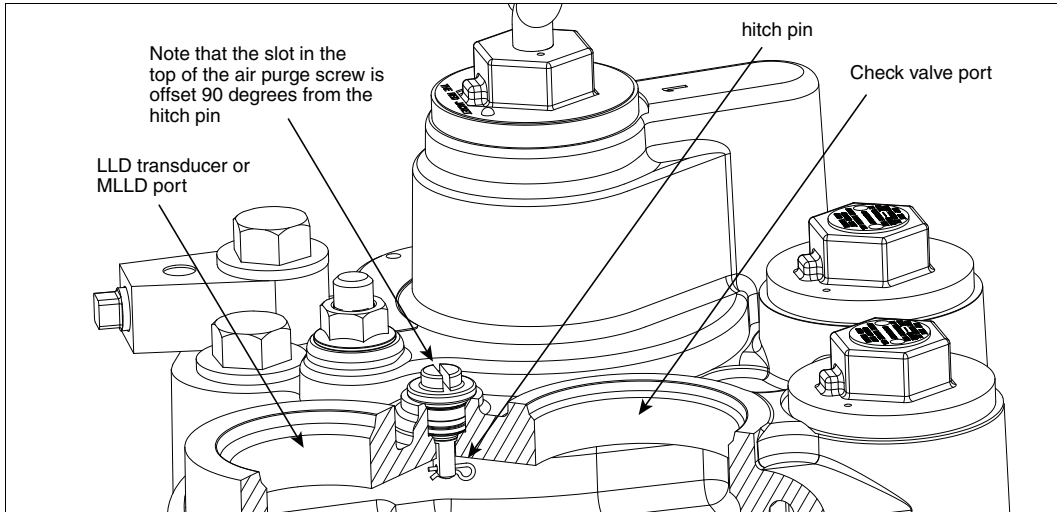


Figure 38. Locating air purge screw hitch pin

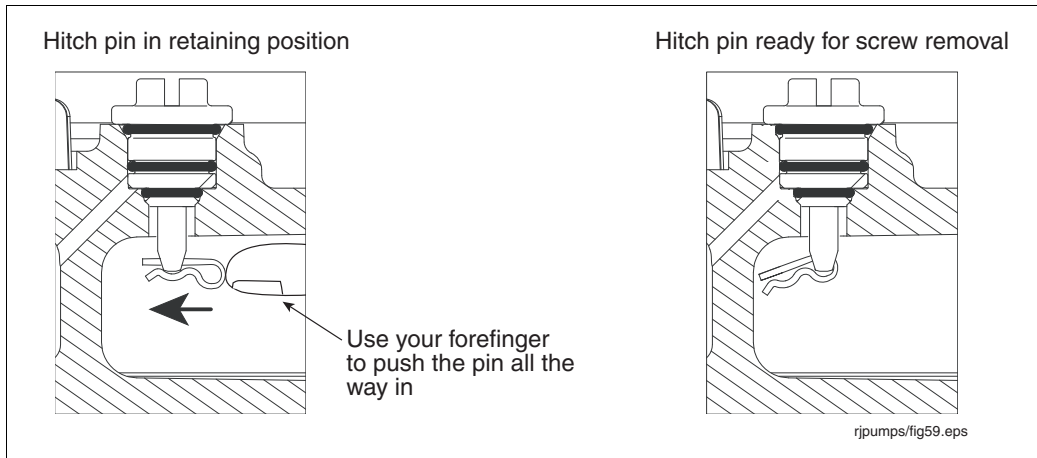


Figure 39. Reorienting the air purge screw's hitch pin

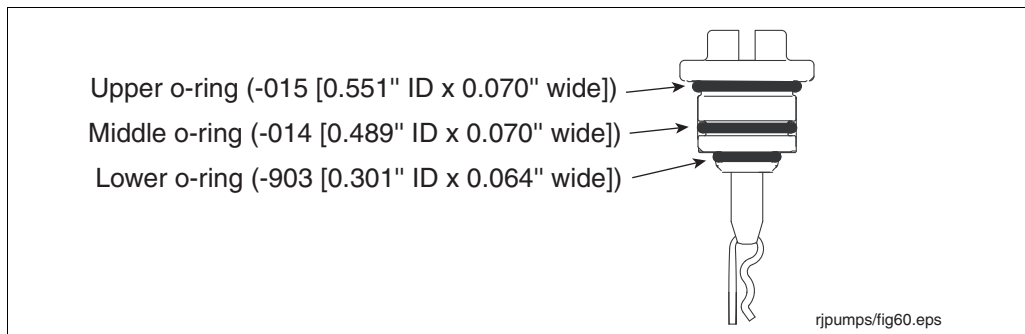
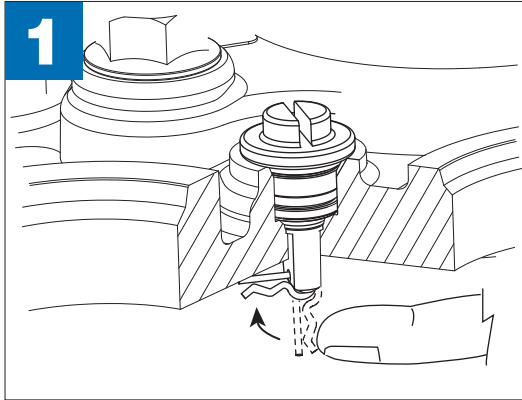
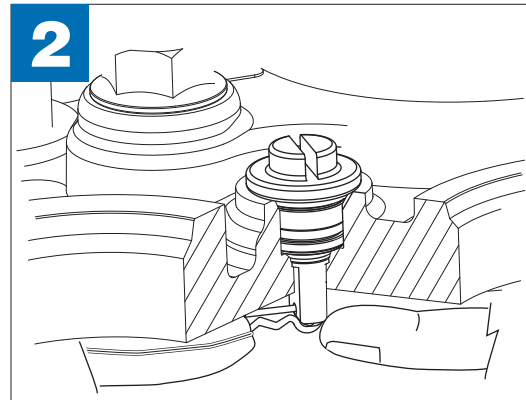


Figure 40. Hitch pin in position to install air purge screw

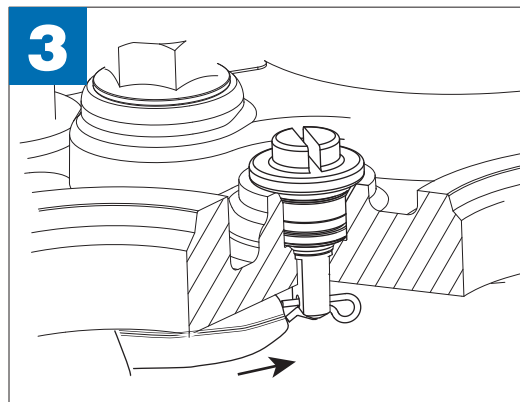
9. When the screw is turned clockwise all the way down, but not tight, use the forefinger of one hand to push the hitch pin up as shown in diagram 1 of Figure 41.
10. While holding the hitch pin up with the forefinger of one hand, place the gloved forefinger of your other hand against the end of the pin as shown in diagram 2 of Figure 41.
11. Push the end of the pin with the gloved forefinger until it snaps into the retaining position as shown in diagram 3 of Figure 41.



Push the hitch pin's up with one forefinger. Note that the crimped leg of the pin is facing down and the straight leg up.



While holding the pin up with one forefinger position the gloved forefinger of the other hand against the other end of the pin.



Push the end of the pin with the gloved forefinger until it snaps into the retaining position.

rjpumps\fig61.eps

**Figure 41. Installing air purge screw hitch pin in the retaining position**

12. If you removed the 2" NPT plug to access the screw, get a new 2.234" ID x 0.139" wide o-ring from the hardware/seal kit and install it on the 2" NPT plug. Lubricate the o-ring with petroleum jelly and install the plug into the leak detector port. Torque the plug to 20 - 50 ft-lbs (27 - 67 N•m).

If you removed a line leak detector or pressure transducer to access the air purge screw, apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant to the threads of the device and screw it into the 2" port. Torque the device until leak free.

13. Get a new check valve housing o-ring (2.609" ID x 0.139" wide) from the hardware/seal kit. Lubricate the o-rings with petroleum jelly and install it on the housing as shown in Figure 28 on page 29.
14. Screw the check valve into its port in the manifold. Torque the housing to 20 - 50 ft-lbs (27 - 67 N•m). Turn the service screw all the way up (CCW). You will hear the check valve drop into place just before the screw is all the way up. Replace the protective plug over the service screw, and fully thread into place to ensure a good seal.
15. Screw the air purge screw all the way down (cw), then back it off 2 - 3 turns counterclockwise.



**CAUTION! The air purge screw is retained by the hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.**

16. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
17. Open the ball valve down line from the pump.

## Pump Tests

### Verifying Relief Pressure

The relief pressure is factory set to 19 to 25 psi (131 - 172 kPa).

There are two methods used to verify the relief pressure setting;

- The pressure reading can be taken from the control unit of an electronic line leak detection system if one is in operation. Observe the pressure that occurs after the pump turns off - this is the relief pressure.
- Pressure may be observed using a gauge attached at the impact valve or to the pump's line test port (see Figure 42).

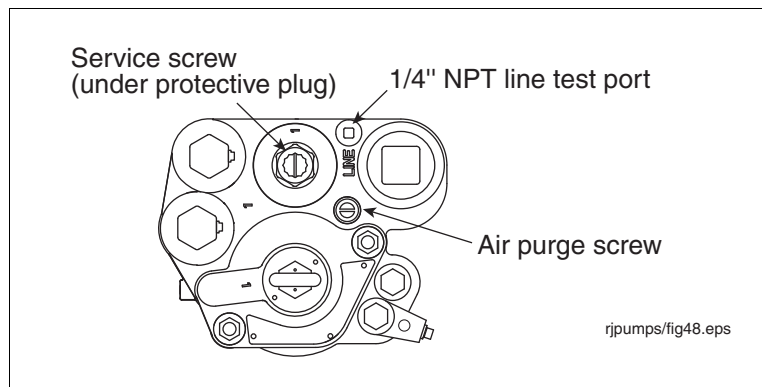


Figure 42. Locating pump line test port

### Checking Relief Pressure at the Pump



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

#### Equipment Required:

- Pressure gauge with appropriate fittings to connect to the 1/4" NPT line test port

#### Procedure:

1. If a ball valve is installed down line from the pump, close it.
2. Remove and save the protective plug over the service screw and turn the screw clockwise (see Figure 42). As the screw approaches its bottom position, you will hear the system depressurizing. Continue turning the screw until it can go no further. When the screw is all the way down, back off the screw 4 turns to lift the check valve and let the fuel drain out of the manifold's hydraulic cavities. Continue to turn the screw all the way counterclockwise. When the screw is almost up, the check valve will drop down into position.
3. Remove the line test port plug (see Figure 42) and attach test gauge.



4. Open the air purge screw 2 - 3 turns counterclockwise (see Figure 42).



**CAUTION! The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.**

5. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
6. Turn off the pump and measure the relief pressure.
7. Turn the service screw clockwise. As the screw approaches its bottom position, you will hear the system depressurizing. Continue turning the screw until it can go no further. When the screw is all the way down, back off the screw 4 turns to lift the check valve and let the fuel drain out of the manifold's hydraulic cavities.
8. Turn service screw counterclockwise as far (up) as possible (you will hear the check valve drop into place as the screw nears its up position).
9. Replace protective plug, and fully thread into place to ensure a good seal.
10. Remove the test gauge. Apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant on the 1/4" NPT plug and replace it in the line test port. Torque the plug to 14 to 21 ft-lbs (19.4 to 29 N•m). For E85AG applications, Loctite 564 is recommended for all field serviceable pipe threads.
11. Turn the air purge screw 2 - 3 turns counterclockwise.



**CAUTION! The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.**

12. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
13. Turn off pump and open ball valve (if applicable).
14. The pump is now ready for normal operation.

## Testing the Line



**DANGER! Always disconnect, lock out, and tag the power before starting to service the pump.**



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

### • Equipment Required:

- Pressure generating equipment with appropriate fittings to connect to the 1/4" NPT line test port

### Procedure:

1. Block lines at each dispenser.
2. Remove and retain the protective plug over the service screw and turn the screw clockwise (see Figure 42). As the screw approaches its bottom position, you will hear the system depressurizing. Continue turning the screw until it can go no further.

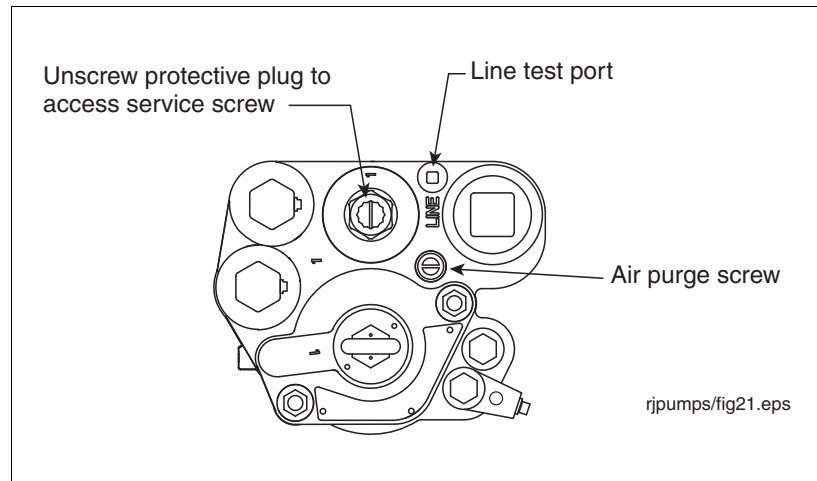


Figure 43. Service screw, line test port, and air purge screw locations

3. Remove line test port plug (see Figure 43). Apply line test pressure at line test port (50 psi [345 kPa] maximum).

**CAUTION! Excessive pressure (above the normal test pressure of 50 - 55 psi [345 - 380 kPa]) may damage check valve seat and other system components.**

4. Depressurize the line (as per Step 2 above) and remove test fixture. Apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant on the 1/4" NPT plug and replace it in the line test port. Torque the plug to 14 to 21 ft-lbs (19.4 to 29 N•m). For E85AG applications, Loctite 564 is recommended for all field serviceable pipe threads.
5. Turn the service screw counterclockwise all the way up. As the screw nears its top position you will hear the check valve drop into position. Replace the protective plug over the service screw, and fully thread into place to ensure a good seal.
6. Turn the air purge screw 2 - 3 turns counterclockwise (see Figure 43).



**CAUTION! The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.**

7. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
8. The pump is now ready for normal operation.
9. Enable lines at the dispensers.

## Testing the tank



**DANGER!** Always disconnect, lock out, and tag the power before starting to service the pump.



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

### Equipment Required:

- Pressure generating equipment with appropriate fittings to connect to the 1/4" NPT tank test port

### Procedure:

1. Remove and retain the protective plug over service screw and turn the screw clockwise (see Figure 43). As the screw approaches its bottom position, you will hear the system depressurizing. Continue turning the screw until it can go no further.
2. Remove and save the 1/4 " NPT tank test port plug and attach tank testing equipment (see Figure 44).

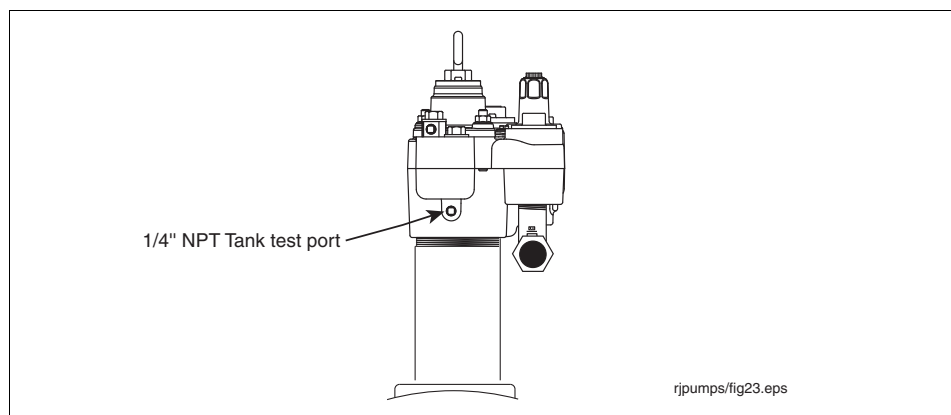


Figure 44. Tank test port on manifold

3. Depressurize tank and remove testing equipment. Apply an adequate amount of fresh, UL classified for petroleum, non-setting thread sealant on the 1/4" NPT plug and replace it in the tank test port. Torque the plug to 14 to 21 ft-lbs (19.4 to 29 N•m). For E85AG applications, Loctite 564 is recommended for all field serviceable pipe threads.
4. Turn the service screw counterclockwise all the way up. As the screw nears its top position you will hear the check valve drop into position. Replace the protective plug over the service screw, and fully thread into place to ensure a good seal.
5. Turn the air purge screw 2 - 3 turns counterclockwise (see Figure 43).



**CAUTION!** The air purge screw is retained by a hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.

6. Turn the pump on and let it run for about 2 minutes to purge air from the manifold's hydraulic cavities. While the pump is still running, turn the air purge screw clockwise until it is completely closed.
7. The pump is now ready for normal operation.

## Parts Lists

### Customer Service Number

After unpacking the equipment, please inspect the parts. Make sure all accessories are included and that no damage occurred during shipping. Report any damage to the shipper immediately and inform a customer service representative at 1-800-873-3313 of any equipment damage or missing parts.

### Pump Parts

Table 7 lists the pump parts list.

**Table 7. Pump Parts List**

Item (ref. Figure 45)	Part No.	Description	DOM
1	410156-001	20 ft. pigtail	1
2	852-209-5	UMP200U20-2	1
2	410184-027	UMP200U20-2 w/2" DH and pigtail	1
2	852-210-5	UMP200U20-2 w/FSA	1
2	852-175-5	E85AGUMP200T20-2	1
2	410184-028	E85AGUMP200T20-2 w/2" DH and pigtail	1
2	852-181-5	E85AGUMP200T20-2 w/2" FSA	1
3	144-327-4	Kit - flex syphon/UMP (includes gasket, lock washers and bolts)	1
—	144-194-5	Trapper - retrofit (not shown)	1
—	410161-001	Conduit adaptor assembly	1
—	410219-001	PACMAN - P200U20-2 20% w/ Conduit adaptor assembly	1
—	410219-002	PACMAN - AGP200T20-2 w/ Conduit adaptor assembly	1
3	410594-001	Kit- flex siphon/UMP E85AG (includes gasket, lockwashers and bolts)	1

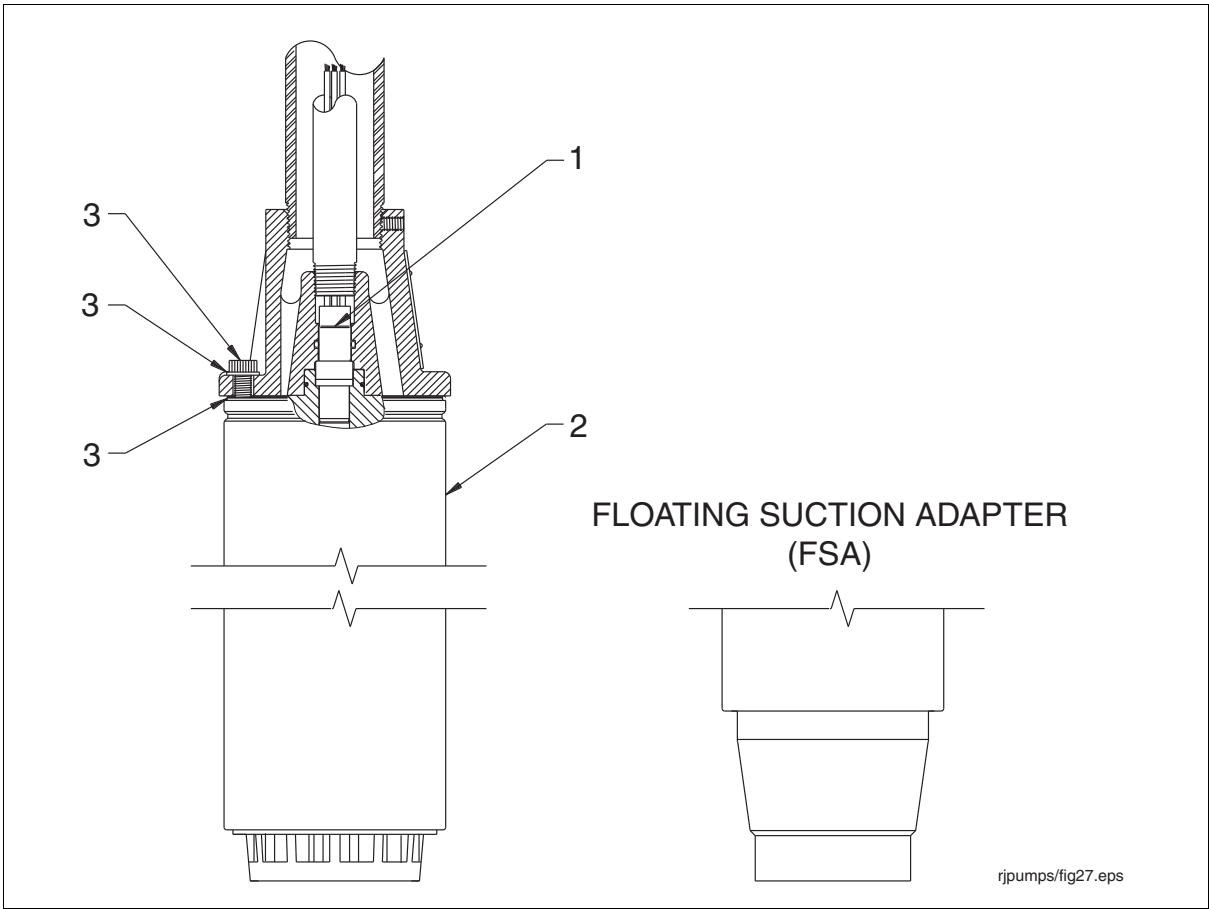


Figure 45. Pump parts

Siphon Cartridge Kit Parts

Table 8 lists the 410151-001 Siphon Cartridge Kit parts list.

Table 8. 410151-001 Siphon Cartridge Kit Parts List

Item (ref. Figure 46)	Part No.	Description	Qty.
1	410071-002	Siphon assembly	1

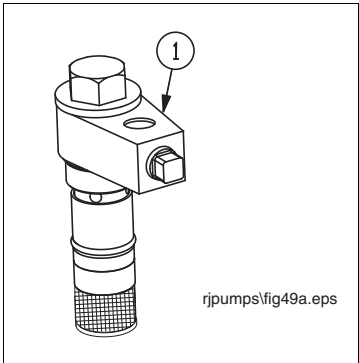


Figure 46. Siphon cartridge kit

Check Valve Housing Kit Parts

Table 9 lists the 410152-001 Check Valve Housing Kit and 410152-001 High Pressure Check Valve Housing Kit parts lists.

Table 9. Check Valve Housing Kits Parts Lists

P/N 410152-001 Check Valve Housing Kit Parts List				P/N 410152-002 High Pressure Check Valve Housing Kit Parts List			
Item (ref. Figure 47)	Part No.	Description	Qty.	Item (ref. Figure 47)	Part No.	Description	Qty.
1	410016-001	Housing assembly - chk/rlf vlv	1	1	410016-001	Housing assembly - chk/rlf vlv	1
2	410027-001	Spring	1	2	410027-001	Spring	1
3	410022-001	Poppet assembly - chk/rlf vlv	1	3	410022-002	Poppet assembly - chk/rlf vlv	1

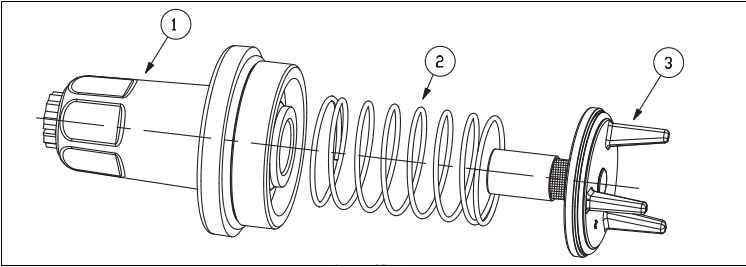


Figure 47. Check valve housing kit

Check Valve Kit Parts

Table 10 lists the 410153-001 Check Valve Kit parts list.

Table 10. 410153-001 Check Valve Kit Parts List

Item (ref. Figure 48)	Part No.	Description	Qty.
1	410022-001	Poppet assembly - chk/rlf vlv	1
2	410027-001	Spring	1

Table 11 lists the 410153-002 Hi Pressure Check Valve Kit parts list.

Table 11. 410153-002 Hi Pressure Check Valve Kit Parts List

Item (ref. Figure 48)	Part No.	Description	Qty.
1	410022-002	Hi press poppet assembly - chk/rlf vlv	1
2	410027-001	Spring	1

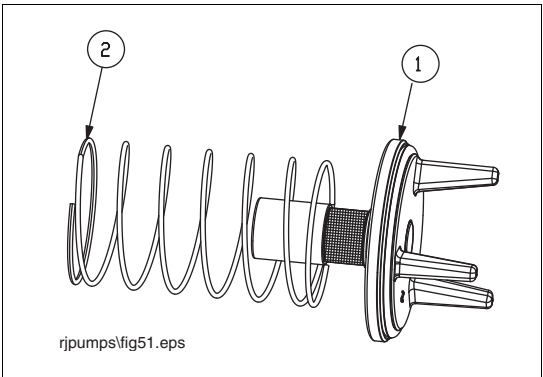


Figure 48. Check valve kit

Conduit Bushing Kit Parts

Table 12 lists the Conduit Bushing 410486-001 and Figure 49 depicts the kit.

Table 12. 410486-001 Conduit Bushing Kit Part List

Item (ref. Figure 49)	Part No.	Description	Qty.
1	410301-001	Bushing - Conduit	1

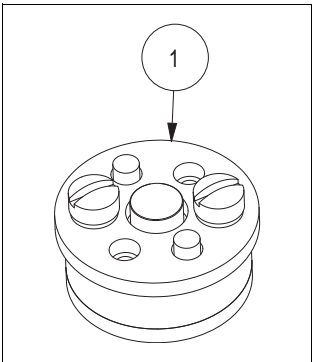


Figure 49. Conduit Bushing



O-Ring Kit Parts

Table 13 lists the 410154-001 O-ring Kit parts list.

Table 13. 410154-001 O-Ring Kit Parts List

(Ref. Figure)	Part No.	Description	Qty.
Figure 25 on page 25	072-541-1	O-ring - 118-V121	1
Figure 28 on page 29	072-578-1	O-ring - 225-V123/19757	1
Figure 28 on page 29	072-685-1	O-ring - 114-V123/19757	2
Figure 25 on page 25	072-686-1	O-ring - 228-V123/19757	1
Figure 25 on page 25	072-720-1	O-ring - 928-V75	3
Figure 25 on page 25	579005-001	O-ring - 343-V121	1
Figure 25 on page 25	579005-002	O-ring - 344-V121	1
Figure 25 on page 25	579005-003	O-ring - 345-V121	1
Figure 27 on page 27	579005-004	O-ring - 117-V121	2
Figure 27 on page 27	579005-005	O-ring - 121-V121	4
Figure 28 on page 29	579005-006	O-ring - 231-V121	1
Figure 40 on page 40	579005-007	O-ring - 014-V121	1
Figure 40 on page 40	579005-009	O-ring - 903-V121	1
Figure 7 on page 12, Figure 24 on page 24, and Figure 40 on page 40	072-690-1	O-ring - 015-19757	2
Figure 29 on page 31	410127-001	Nut - flanged - M12x1.75-6H	2
Figure 38 on page 40	579014-001	Hitch pin	1
Appendix A	577013-835	O-ring gauge	1

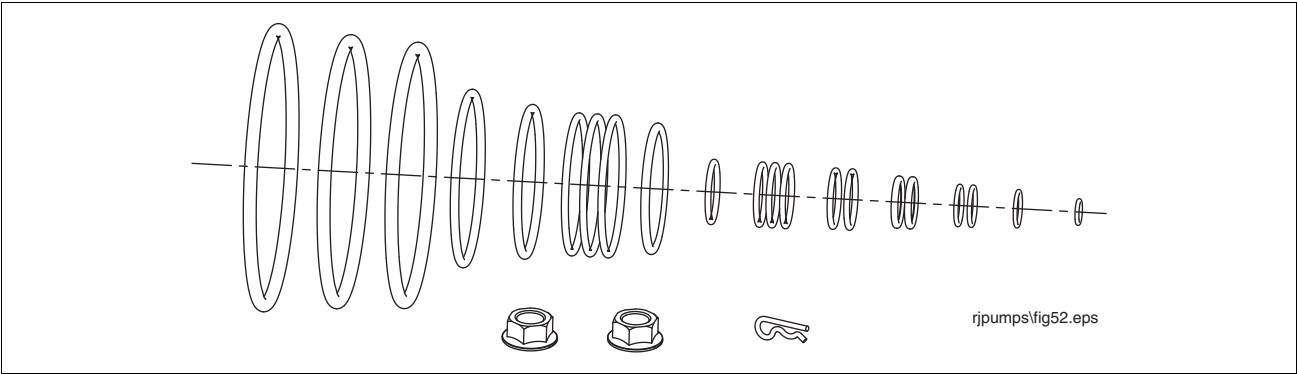


Figure 50. O-ring kit

Electrical Connector Kit Parts

Table 14 lists the 410165-001 Electrical Connector Kit parts list.

Table 14. 410165-001 Electrical Connector Kit Parts List

Item (ref. Figure 51)	Part No.	Description	Qty.
1	113-640-4	Connector - male	1
2	410117-001	Connector - electrical	1
3	072-541-1	O-ring - 118 - V121	1
4	072-214-1	Ring - internal lock - 5/8" ID x 7/8" OD	1

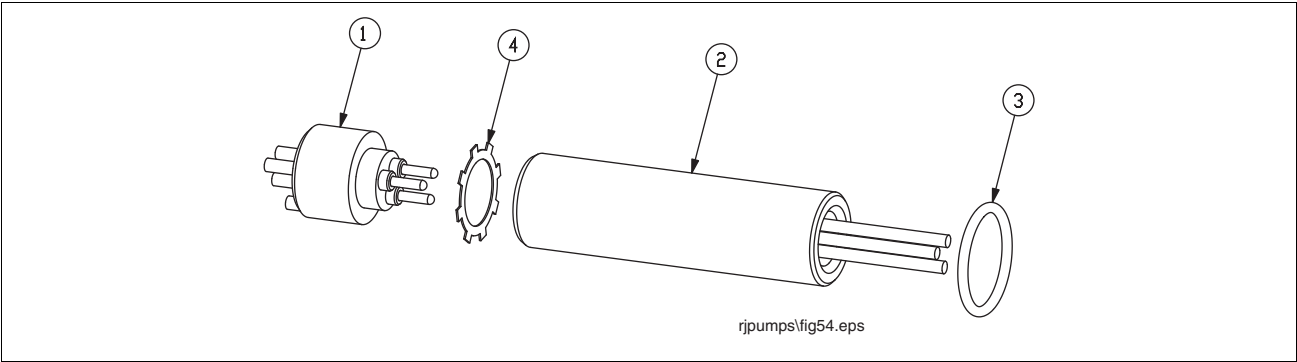
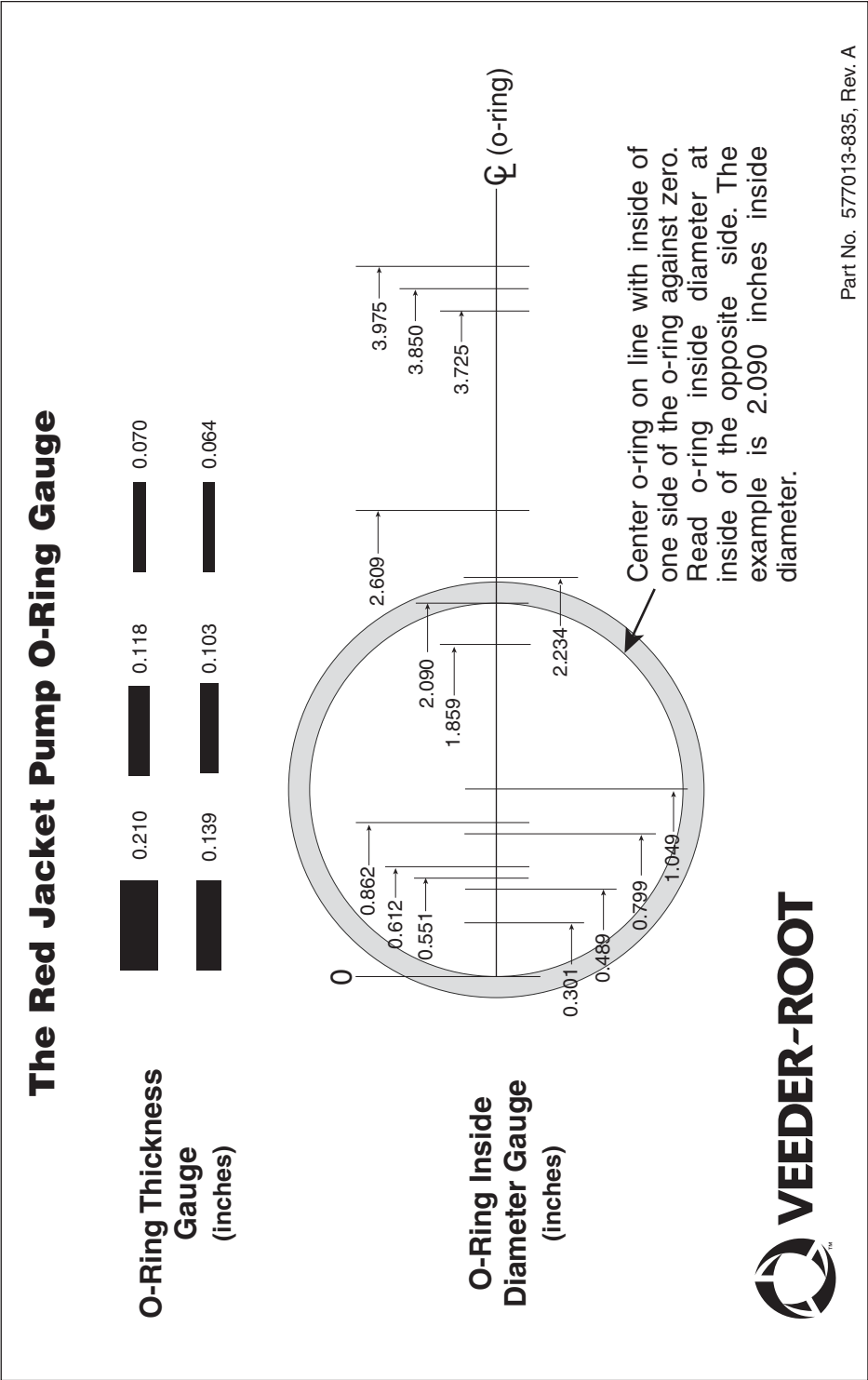


Figure 51. Electrical connector kit

Appendix A: Hardware/Seal Kit O-Ring Gauge



## Appendix B: Check Valve/Air Purge Screw Operation

This appendix discusses the theory of operation of the Red Jacket VSFC STP's check valve and air purge screw.

### Check Valve Operation

#### Pump On

As shown in the check valve cutaway diagram in Figure B-1, when the pump is On, the check valve is opened by fuel flow.

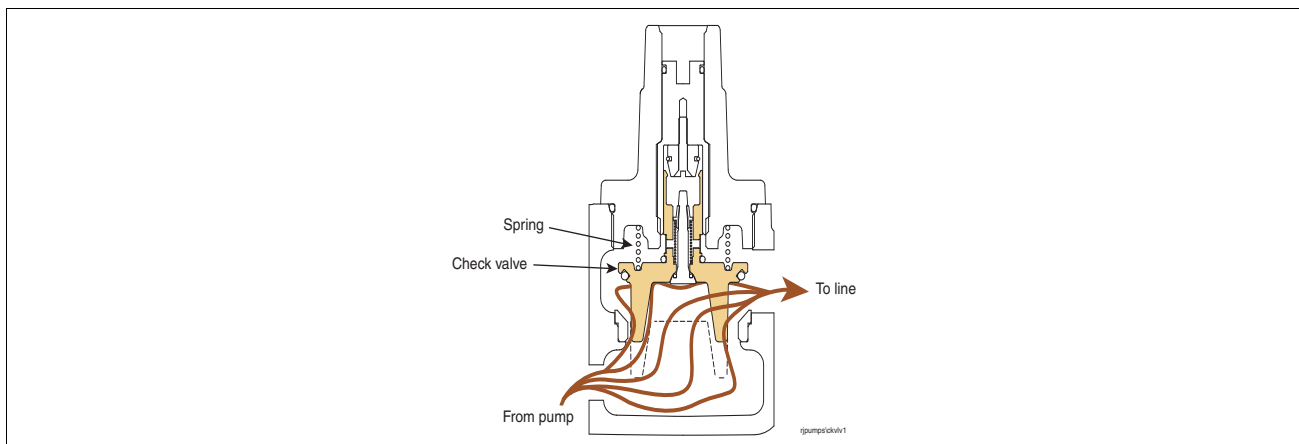


Figure B-1. Pump On condition

#### Pump Off

When the pump shuts off, the check valve reseats isolating the line. As pressure in the line builds due to thermal expansion, the excess pressure vents through the relief valve back into the tank as shown in Figure B-2.

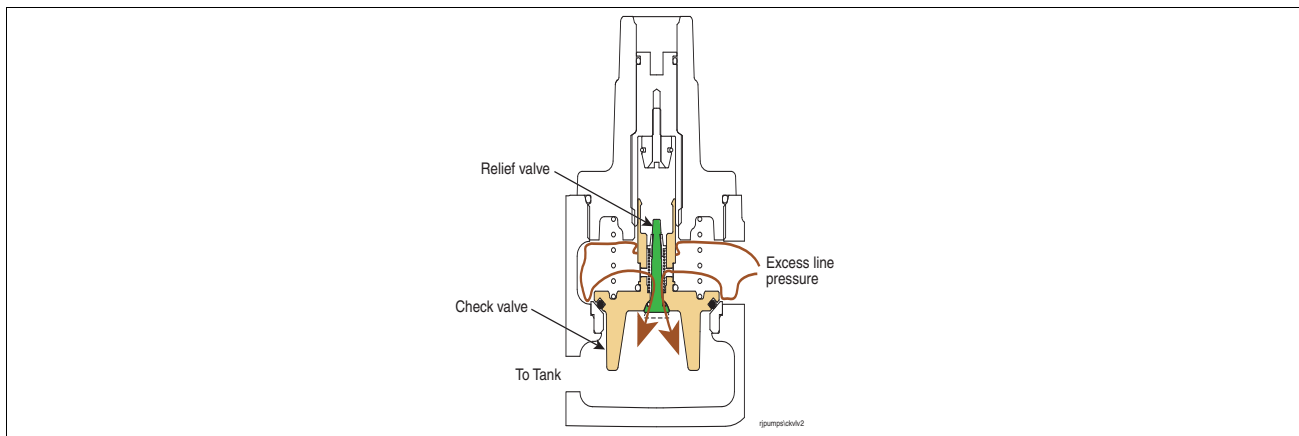


Figure B-2. Relief valve vents excess line pressure

## Locking Down Check Valve for Line Testing

Turning the service screw all the way clockwise, seals the relief valve and at the same time locks down and seals the check valve as shown in Figure B-3. The line is now isolated for pressure testing.

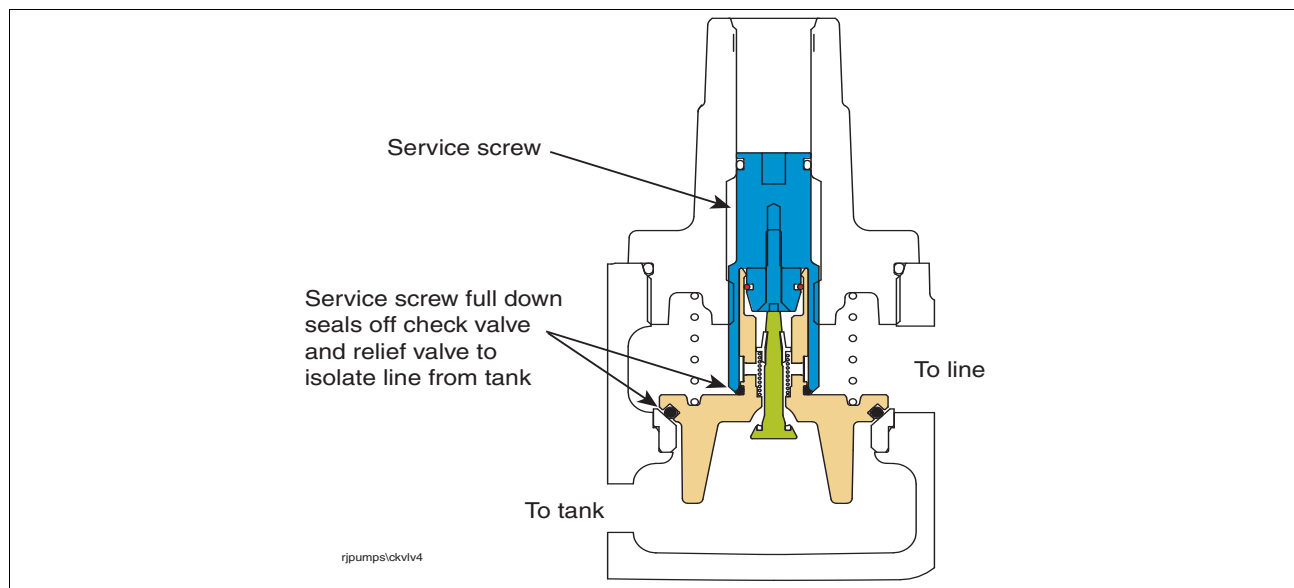


Figure B-3. Locking down the check valve for line testing

## Removing Check Valve

When removal of the check valve is desired, turn the service screw clockwise until it is all the way down as shown in Figure B-4. At about 7.5 clockwise turns, the relief valve will open (you will hear line pressure vent) and the service screw will lock onto the check valve. When you have turned the service screw all the way down, back off 3 or 4 turns (counterclockwise) and wait a few seconds for the product in the manifold to drain out. Unscrew the check valve housing and remove the complete valve assembly.

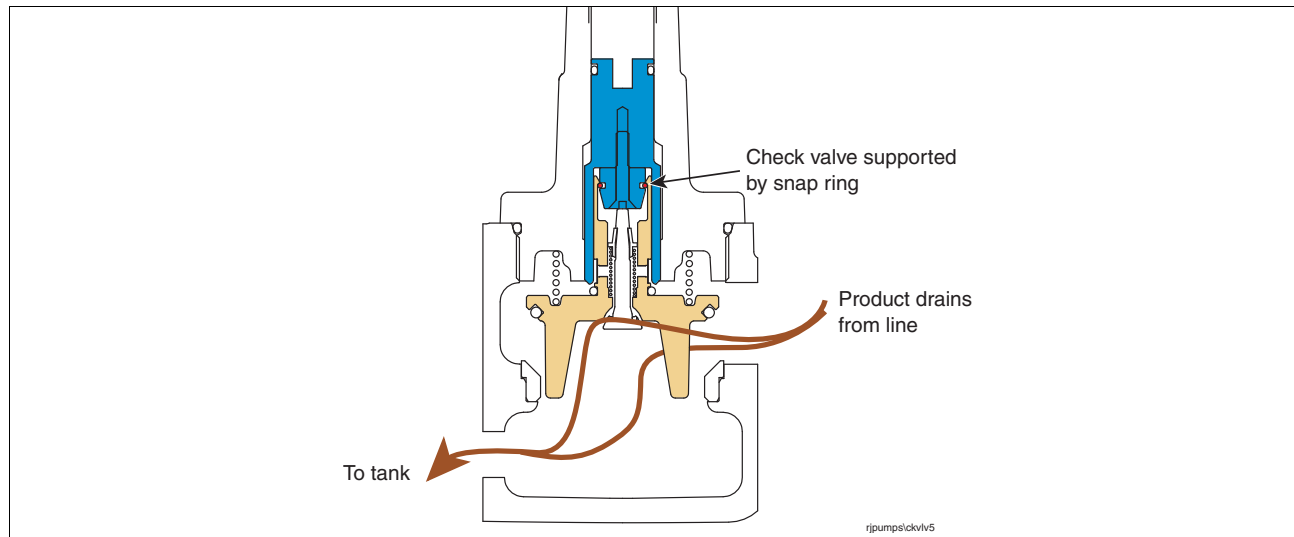


Figure B-4. Removal of check valve assembly for service

## How the Service Screw Lifts the Check Valve

When you turn the service screw clockwise 7.5 turns to push open the relief valve stem, a slightly compressible snap ring in the service screw squeezes past a rim on the inside of the top edge of the check valve as shown in Figure B-5. As the service screw is turned counterclockwise, the snap ring rises beneath the rim lifting the check valve. The check valve continues to rise as the service screw is turned ccw until the outer edge of the check valve contacts the bottom surface of the check valve housing (when you are unscrewing the service screw you will feel this 'stop'). Continuing to turn the service screw until it is all the way up, compresses the snap ring until it is past the rim to a degree that the spring in the check valve (and gravity) forces the check down onto its seat in the manifold. All the way up is the normal operating position of the service screw.

Always make sure to reinstall the plastic protective cap, and fully thread it into place to ensure a good seal.

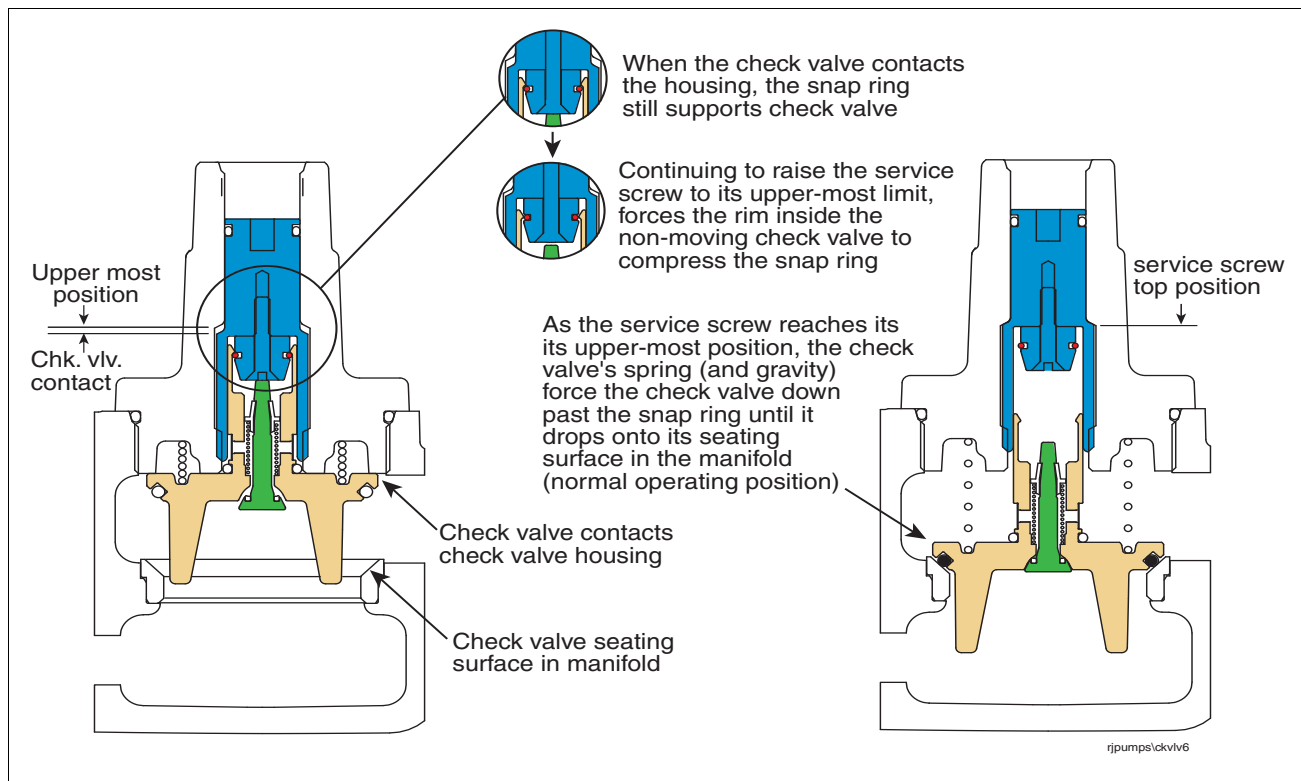


Figure B-5. Returning the check valve to its normal operating position

## Air Purge Screw Operation

The air purge screw is used to rid air from the line and manifold hydraulic cavities after opening a port in the manifold (e.g., after installing a line leak detector). When repairs to the pump have been made, the technician will need to purge the air within the manifold as shown in diagram 1 of Figure B-6. The air purge screw is rotated 2-3 turns counterclockwise, then the pump is turned on.



**CAUTION! The air purge screw is retained by the hitch pin to limit travel. Do not attempt to rotate beyond 3 turns.**

As the pump runs, any air in the cavities is pushed through the small tank return port as shown in diagram 2. After the pump has run for about 2 -3 minutes the air will have been removed from the manifold and piping as shown in diagram 3. While the pump is still running, turn the air purge screw clockwise until it is completely closed. Open the ball valve down line from the pump.

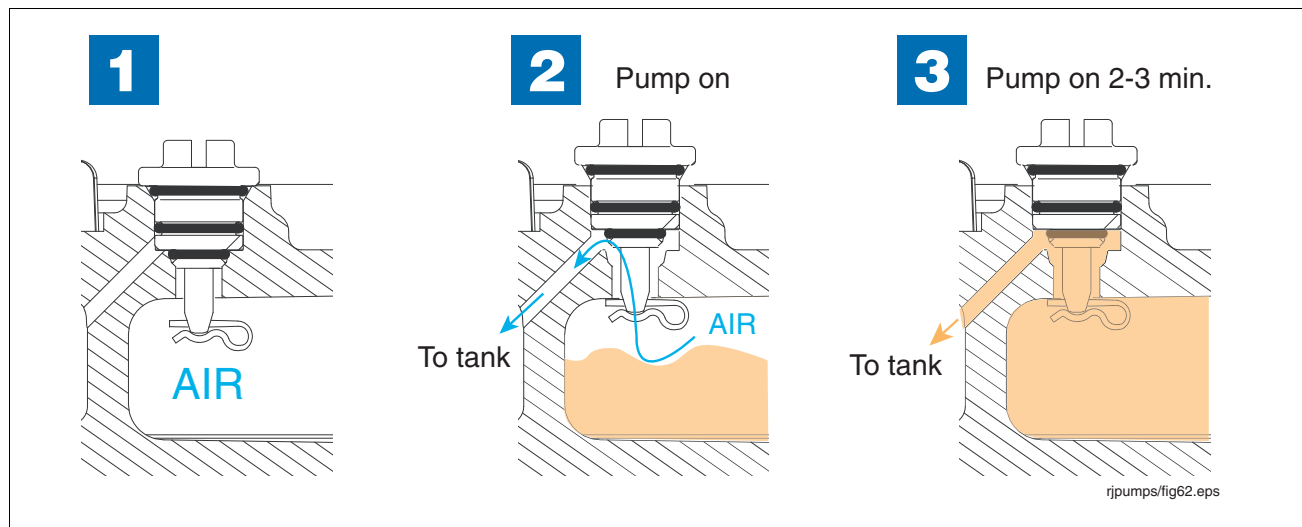


Figure B-6. Purging air from manifold

