

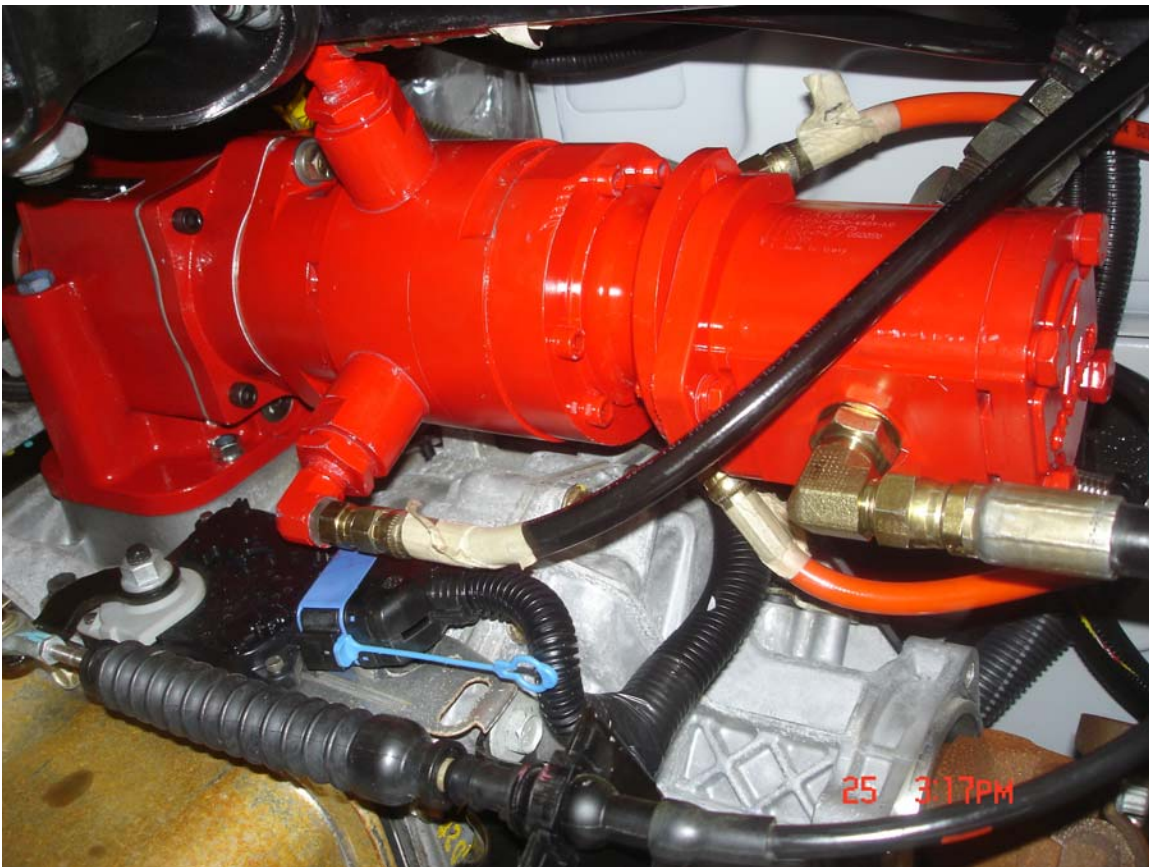


**PTO Powerhouse – Ford F-Super Duty  
Installation and Operators Manual**

**Ford F Series Trucks with 5R110 Torqshift 2 & 4 Wheel Drive  
Transmissions**

**GMC 5500**

**Matrix System:**





**XRT PTO Powerhouse Installation Manual:  
Ford 5-R110 TorqShift Automatic Transmission & GMC 5500  
& Matrix System**

**Table of Contents**

Installation Layout

Introduction

Pump I.D. & Hose Runs to Open Center Valve

XRT Component Installation

Hose Specifications

Fluid Specifications

Oil Reservoir Tank

Open Center Valve

Installation Check List

System Test

Maintenance Guide

Certificate of Warranty

Contact Numbers

**MANUFACTURED BY:  
XRT Power Systems  
A division of Hansen Marine Engineering, Inc.  
32 Tioga Way  
Marblehead, MA 01945**

## **Introduction:**

The **XRT Powerhouse** PTO is a dual level hydraulic pump designed to operate one, two or three hydraulic extrication tools at the same time. Each pump circuit has two pumps assigned providing a total of 6 possible pumps for three circuits. Each individual circuit is completed with a control block assembly and an open center valve. The XRT system provides rescue personnel the ability to operate 3 extrication tools simultaneously, independent of each other, in order to implement a rapid rescue attempt. The Matrix System adds a seventh pump to provide hydraulic power to drive an XRT ready hydraulic generator.

**XRT Power Systems** manufactures models for both low-pressure systems (5,000 PSI) and high-pressure systems (10,000 PSI). The XRT PTO pump is powered from a PTO output shaft, and regulated flow is delivered to each open center valve assembly. Full flow and full pressure is provided at each power port via an engineered, dual level, pump system. The dual level system utilizes an individual pump for each level and an individual system for each power port. The transmission PTO port is an option available on automatic transmissions including: Ford 5R110, 4R100, Allison 1000, 2000, EVS, MD and HD World Transmissions. (Consult your apparatus builder for additional transmission specifications and model availability).

**XRT Powerhouse Systems** include; Installation accessories, XRT Pump with fittings, control block and Open Center Valve assemblies per power port ordered, reservoir tank with filter, reservoir to pump supply hose, and installation manuals. **Note: Pressure and return hose for installation are optional equipment. Hose lengths are dictated by the distance of the control valve from the pump.**

The **Ford 5R110 Transmission XRT Powerhouse systems** include the following components:

- Chelsea F-Series Power Take Off# 246-02
- XRT Powerhouse Hydraulic Pump
- 1,2 or 3 Open Center Valves, with integrated control block.
- Reservoir Tank Assembly with pump supply hose.

The **Allison EVS, MD 3060 and HD 4060 Transmission XRT Powerhouse systems** include the following components:

- XRT Powerhouse Hydraulic Pump
- 1,2 or 3 Open Center Valves, with integrated control block.
- Reservoir Tank Assembly with pump supply hose.

## **Pump Identification & Hose Run to Open Center Valve**

The XRT Powerhouse is designed specifically to mount onto the PTO port of Ford and Allison EVS, MD & HD transmissions.

### **Engineering / Pre-installation Notes**

Installation of the XRT Powerhouse System will be faster and easier if the following steps are completed before mounting the system.

- Take care that all the components remain clean, organized, and handled carefully during the installation process.

### **Location of**

Determine the location of

- Hydraulic reservoir/filter tank
- XRT Open Center Valves
- Tool hose reels
- Location of Hydraulic Generator (refer to generator manual)

### **Valves**

- Determine the number of Open Center Valves that will be required for you installation. One XRT Open Center Valve with integral control block is required for each tool port on the system. Each valve is delivered with a stainless steel mounting plate.

### **Hose**

**Alert:** XRT manufactures “5000 PSI Hurst Fluid Systems”, and “10,000 PSI Hydraulic Oil Systems”. Each system has specific hose and fluid requirements. Hose, seal and total system contamination will occur if the wrong fluid is introduced into the system. **This type of installation error will void the XRT Warranty.** If you are not sure about what type of system you are installing, please contact XRT Power Systems for system confirmation.

- Measure the hose run for the entire system along the most accessible and shortest route for ease of installation and annual maintenance.
- Each power port for the system requires the following:
  - (2) Hoses in a run from the pump to the Control Blocks. These are the pressure hoses.
  - (1) Hose in a run from the Control Block to the return manifold at the filter on the reservoir tank. This is the return line.

- One set of jumper hoses from each XRT Open Center Valve to each hose reel.
- Hose Lengths: Measure the distance of the hose runs, and add 12" at each end to allow for installation sweeps.
- **Note:** Hoses are cut and fitted specifically for your vehicle. Be careful to allow for proper hose length for your installation. Should you decide to order the hose from a local supplier, please refer to the Hose Specification Sheet for proper hose selection.

Please contact **XRT Power Systems** at (800)-343-0480 to order the measured hose lengths, and for all engineering and installation questions.

## **Component Installation : Matrix System**

The following location guidelines should be observed during installation.

**Note:** The XRT Pump System is delivered separate from the Chelsea PTO # 246-02. Disassembly of the pump is not necessary for the installation. **(See Photo 4)**

Chelsea PTO Installation Guide: **(Refer to: Chelsea Installation Instructions and Safety Information – delivered with system)**. The XRT pump is a constant RPM pump that needs to turn at 1800 PRM. **Specified engine RPM at high idle Ford pre-set high idle of 1200 RPM is required to provide required pressure and flow to rescue tools.**

Included:

**Chelsea PTO Owners Manual**

Chelsea PTO Parts List

This section is specific to the **Chelsea PTO**. XRT Power Systems utilize **Chelsea PTO** units exclusively in the XRT Powerhouse system to transfer power to the XRT pumps.

Please reference Generator Owners/Installation Manual for location, installation and connection requirements of the hydraulic generator for the Matrix System.

If you have any technical questions before, during or after installation, please call the XRT Power Systems technical assistance line at 1-800-343-0480 ext. 126 (International Direct line 781-639-7126).

**Please keep the following in mind during installation.**

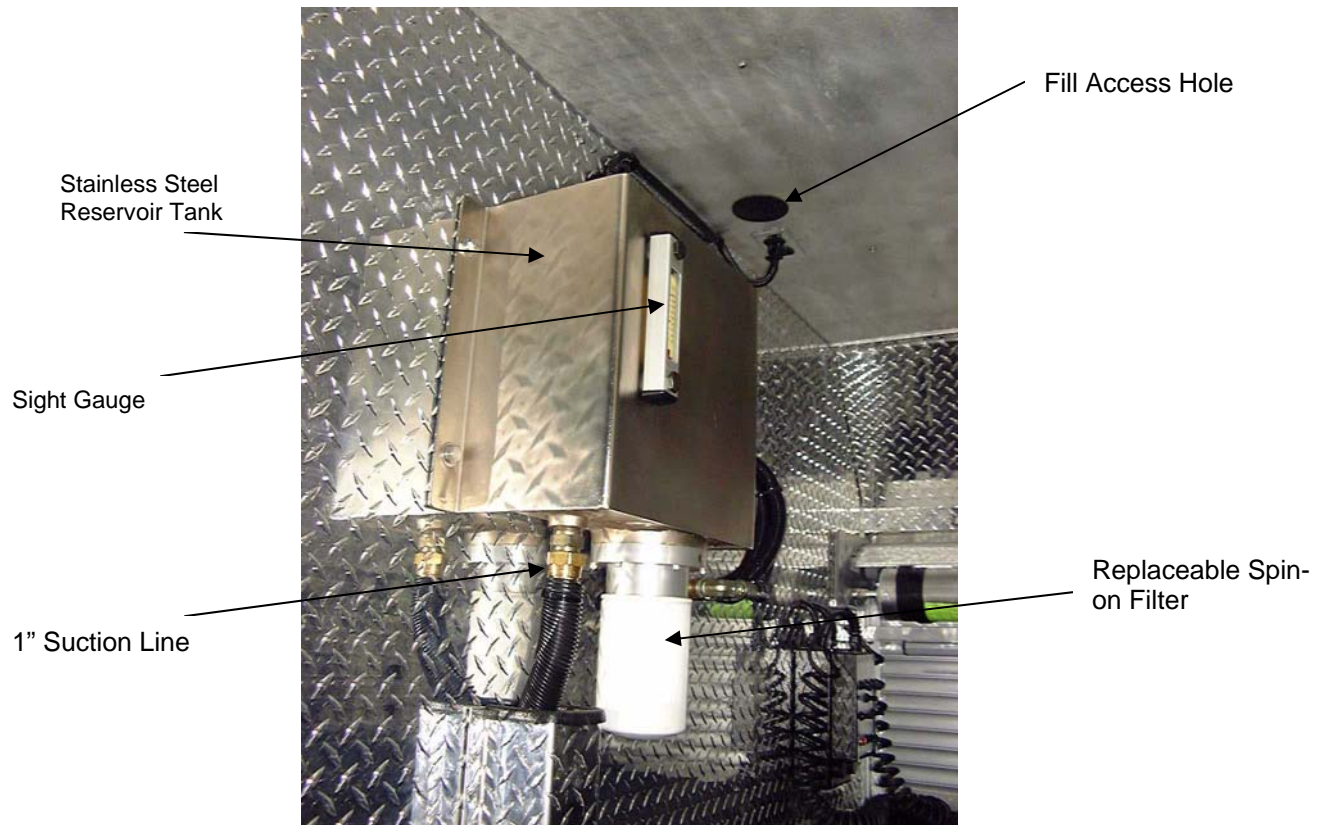
Behind the PTO, is a 90-degree brass elbow. **The elbow must be threaded deep enough into the transmission in order to prevent any protrusion or interference with the PTO bolting flush to the transmission case.** If the PTO is not mounted flush to the transmission, the result will be a transmission fluid leak.

Once the PTO is properly installed, you can begin installation of the XRT portion of the system, starting with System Layout.

**Caution:** Do not engage the PTO until the XRT Powerhouse is properly installed, and filled with the tool manufactures specified fluid (see Fluid Specifications on page 15), and generator is connected and fluid levels are at recommended levels for the Matrix system.

## XRT Reservoir Installation:

1. Install the XRT reservoir tank on the vehicle where it will be out of the way, but accessible for service requirements. Leave ample room underneath the filter for filter replacement, and enough room above the tank for fluid re-fill. **(See Photo 1)**



**Photo 1**

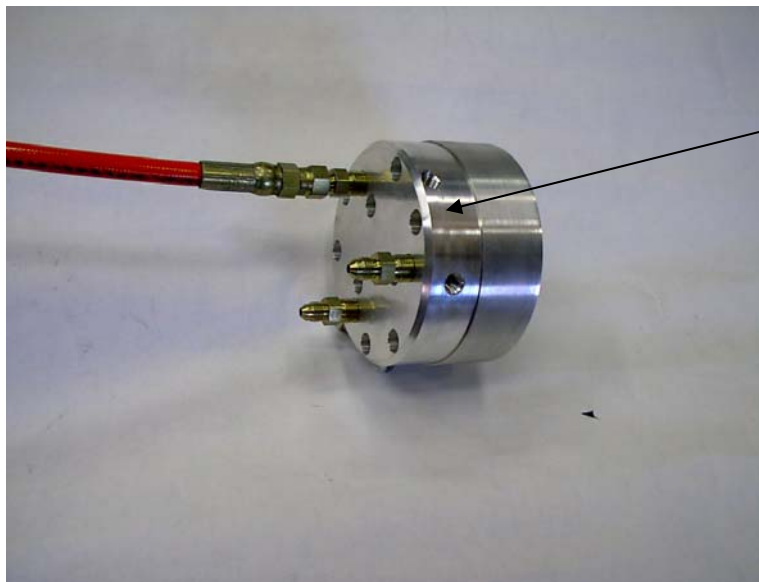
2. The XRT hydraulic pump is gravity fed from the reservoir. The reservoir tank should be installed at least 1 foot above the top of the pump, and no farther than 15 feet from the XRT pump.
3. The suction hose line used to supply oil to the XRT pump must be free from dips or loops in the line. It is recommended that this 1" line be straight whenever possible. This will eliminate any air pockets within the line. This line should be shortened to proper length if possible.

## Connecting the Hose Lines:

4. Connect one end of the 1" Suction line to the bottom fitting supplied on the reservoir tank. Connect the other end of the 1" Suction line to the port on the XRT pump. There are no return lines from the pump, only from the control blocks.
5. Connect one end of each 3/8" ID return line to one 3/8" fitting on the Control Block (on the back side of each **Open Center Valve Assembly**, see picture 5). Connect the other end of each 3/8" line to the fitting supplied on the oil filter manifold. Ensure that all fittings are sealed and tight.

**Pump Group "A", (See Photo 2)** is the high volume, low-pressure pump group. Pictured here along with the assembly, it houses up to a total of three independent pumps. The orange hoses are attached to this pump.

The maximum pressure delivered from this pump is 2,000 PSI. **See hose specifications.**

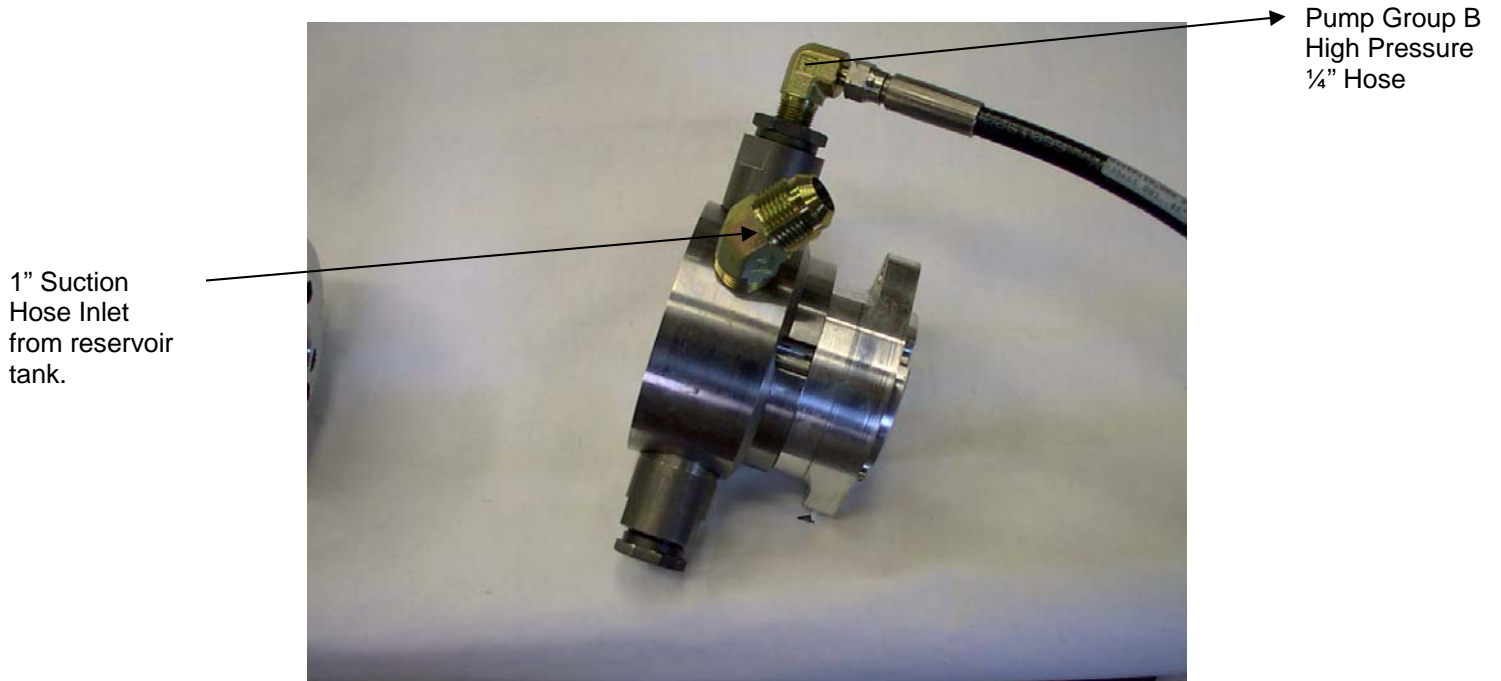


**Pump Group  
A**

**Photo 2  
Group A Low Pressure  
High Volume**

**Pump Group “B” (See Photo 3)** is the high pressure, low volume-cutting pump. Each radial tower is a pumping element. The black hoses are attached here. The hydraulic fluid used dictates the type and pressure rating of this hose.

The maximum pressure of this pump is 5000PSI if you have a Hurst System and 10,000PSI if you have a Hydraulic Oil System. **See hose specifications.**



**Photo 3**  
**Pump Group B**  
**High Pressure – Low Volume**

The complete pump assembly will look like this:

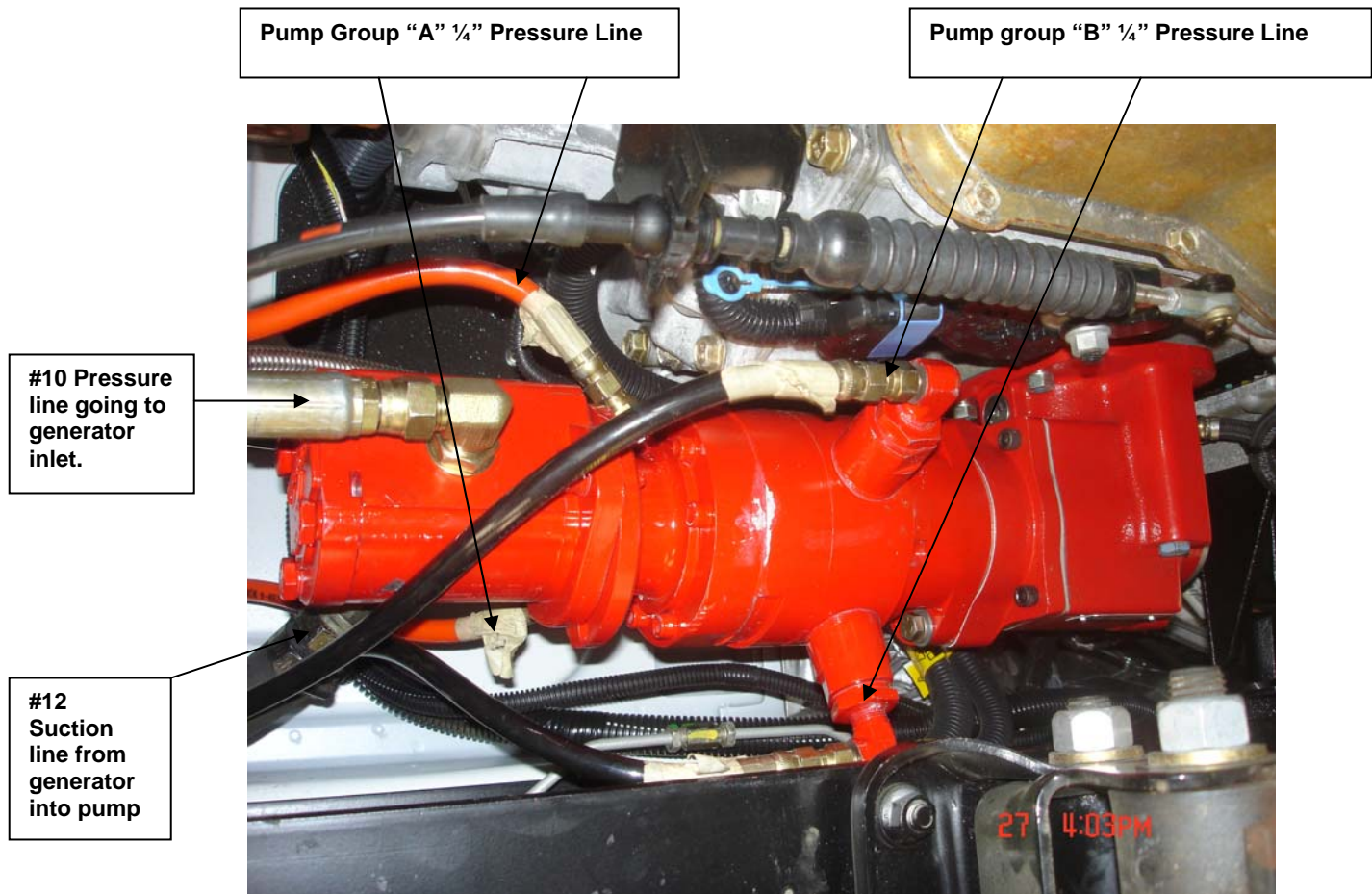


**Photo 4**  
**Ford F 550**

Matrix System Addendum:

The Matrix system incorporates a high flow, low pressure (2000-2400 PSI) hydraulic pump at the opposite end from the Chelsea PTO. This places the Pump group "A" pressure ports on the radius collar of the aluminum housing instead of at the end of the pump. (See pictures below).





The pump group "A" Lines connect to the ports on the collar shown above in orange color 1/4" pressure lines with 1/4" female JIC fittings.

The pump group "B" line connect to the high-pressure ports shown above with black 1/4" pressure lines with 1/4" female JIC fittings.

The High Flow, low-pressure hydraulic pump at the end of the assembly is the pump that drives the hydraulic generator. There is a #12 suction port and a #10 pressure port that needs to be connected to the generator. (See generator owner's manual for hose connection and hose specifications).

If you have any additional question during installation, please contact XRT Power System Technical Assistance at 781-639-7126.

## Control Blocks:

Each Control Block, (See Photo 5) has three hose connections. A label has been placed on the back of each block to help identify the connections.

Connect the orange line to the Group "A" fittings. Connect the black line to the Group "B" fittings. Since all line hoses (black or orange) originate from independent pumps, each Control Block requires (1) Black and (1) Orange hose to complete the circuit. The third line connected to each control block is the 3/8 Return line that connects to the tank manifold.

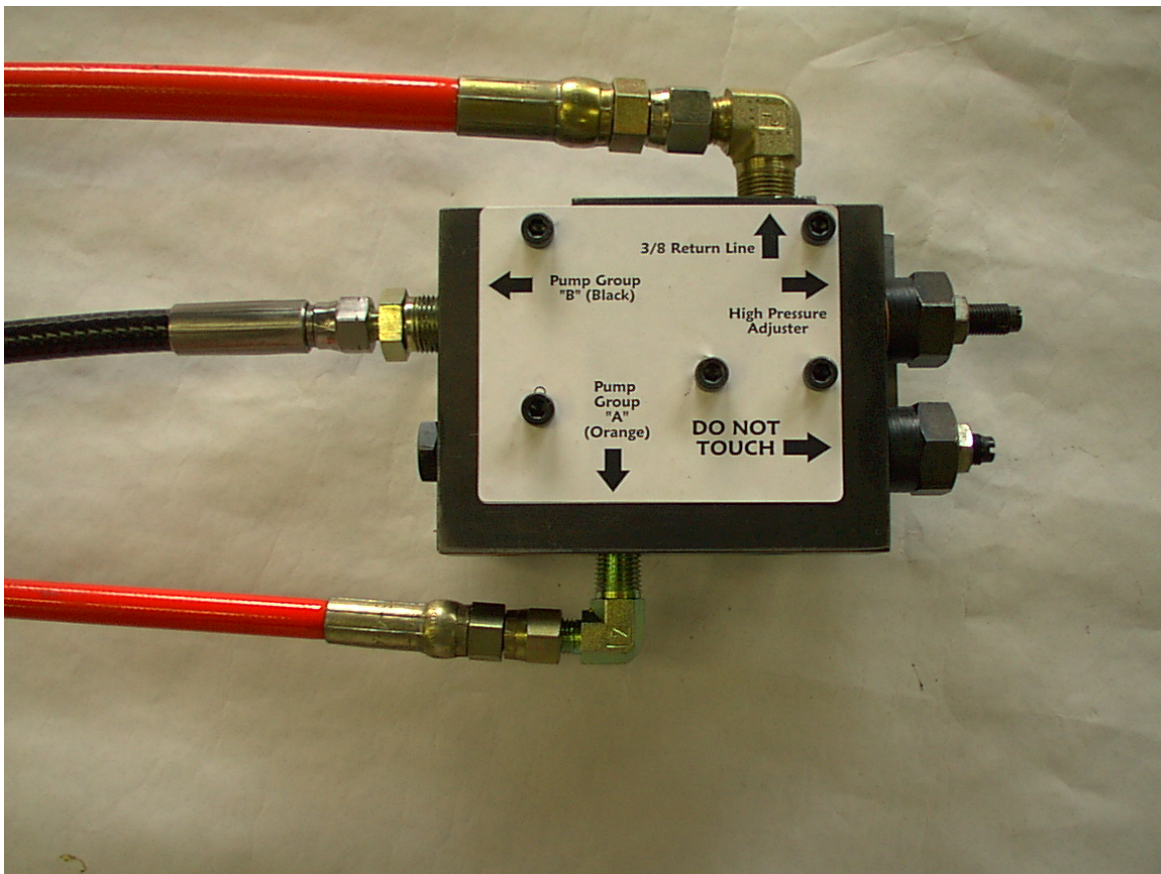


Photo 5 – Control Block Hook-up, Backside

## **Hose Specifications:**

### **Suction Line**

Hydraulic Oil - 1SAR 100R4-16 – Black Rubber hose (supplied)  
Phosphate Ester - 12 PTFE with stainless steel over-braid (supplied)

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### **Return Line**

**Return Line** from control blocks to oil reservoir tank - Always use 3/8" for the return line.

**Parker Parflex** 518-C SAE-100R7 3/8" diameter

Both ends have 3/8" Female JIC fittings

**Note:** This hose can be used with both Hydraulic Oil and Phosphate Ester fluid. The pressure on the return line is approximately 30 PSI. XRT recommends 518C Hose to allow for sharper bends in the hose routing.

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### **Pump Group A – ¼" Low Pressure Line**

**Low pressure line from group "A"** pumps to control blocks.

**Parker Parflex** 520N-4-100R8 x ¼" diameter (Working pressure of 5,000 PSI.)

The hose can be used for any fluid. The pressure on this circuit is approximately 2000 PSI. We suggest using **orange** color hose.

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### **Pump Group B – ¼" High Pressure Line – 5000 PSI**

For All Hurst Fluid (Phosphate Esther Systems)

**High Pressure lines from group "B"** pumps to control blocks.

**Parker Parflex** 520N-4-100R8 x ¼" diameter with Female JIC fittings on both ends.

The pressure on this circuit is 5000-5200 PSI, for phosphate ester systems.

For **Phosphate Ester Systems** use the same spec as group "A" but use a different color, we suggest **black** hose

### **Pump Group B – ¼" High Pressure Line – 10,500 PSI**

For all 10,500 PSI Hydraulic Oil Systems:

**Parker Polyflex** 2245N-04U00 ¼" diameter with Female JIC fitting on both ends.

The pressure on this circuit is approximately 10,000 PSI. We suggest **black** hose.

This hose can be used only on hydraulic oil systems

# Fluid Specifications

## CAPACITY

3.5 Gallons Systems I/II/III

Not including vehicle hoses

## FLOWS

0-2000 PSI                      240 cu in., 4 liters

2000-10000 PSI                60 cu in., 1 liter

2000-5000 PSI                60 cu in., 1 liter for Phosphate Ester Systems

## FILTRATION

10 micron absolute

Filter No.        **XP921999H**    for 10,000 PSI Hydraulic Oil Systems

**XP921999PE** for 5000 PSI Phosphate Ester/Hurst Systems

## OIL REQUIREMENTS

5000 PSI Hurst Systems – **Hurst Oil – Phosphate Esther**

10,000 PSI Systems – **Hydraulic Oil AW ISO 22**

**Oil for Hydraulic Generator: Refer to generator manual.**

## XRT Oil Reservoir Tank

**Location**  
**Suction Hose**  
**Filter**  
**Cooler**

The oil reservoir is a three-gallon tank. (See photo 1) Its features are:

1. Sight Gauge
2. Temperature gauge
3. 10 micron Filter
4. Vented oil fill

Location of the tank must be above the PTO, and in an area to be out of the way as much as possible. Remember that the filter needs to be changed and a bucket placed under it when changing the filter. The oil fill on top of the tank needs to be accessible as well, when replacing oil. The tank should be mounted to a robust compartment wall with 3/8 bolts. It is recommended that the walls around the hydraulic reservoir as well as the rescue tool compartment be outfitted with stainless steel veneer walls to prevent oil contamination, and to allow for easy cleaning.

For operations in EXTREME high ambient air temperature, a radiator (See photo 3) to cool the oil is available as an option. (Consult XRT Power Systems if you think you may require this option.)



Photo 1 - Oil Reservoir Tank



## Open Center Valves

The Open Center Valves are used to stop flow of oil to the extrication tools this feature allows the tools to be interchanged without disengaging the Powerhouse PTO Pump from the engine.

The design features are:

1. 180-Degree Open Center Valve. (See Photo 1)
2. Four bolts attaching the valves to the control block thus allowing the valve to be removed and replaced without removing the control block from the truck.
3. **Open Center Valve** assemblies can be mounted anywhere on the vehicle.
4. Stainless Steel cover plate included with each valve.

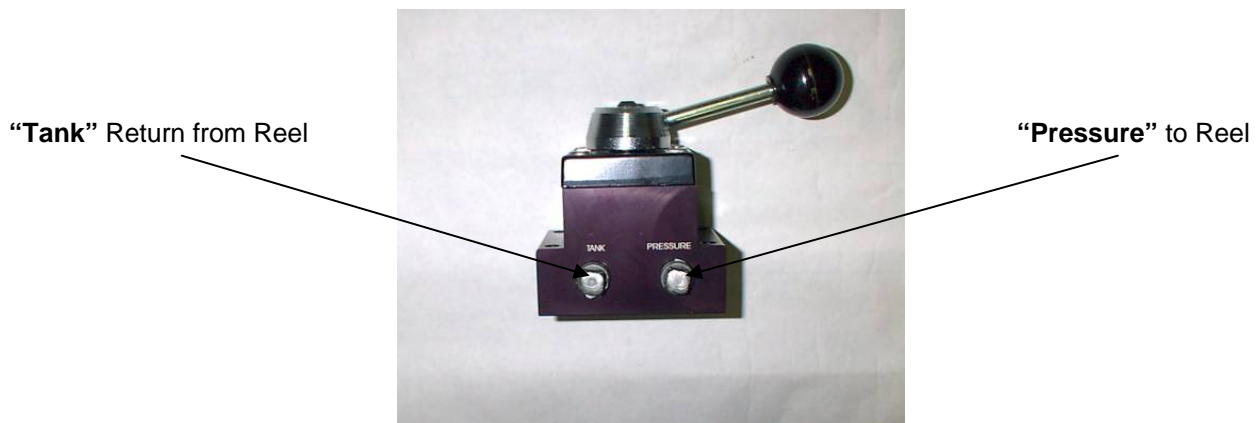
Installation:

The Open Center Valve has two ports for hose connections. The 3/8" NPT ports will accommodate the Lead-In lines to the hose reel assembly. The ports are labeled "Tank" and "Pressure" on the side of the valve assembly.

Two square headed plugs are placed in these ports for dirt control during installation. Remove them and place proper fittings to connect the hose reels.

Note:

1. **Pressure** to the hose reel
2. **Tank** from the hose reel.



Both ports are 3/8 NPT

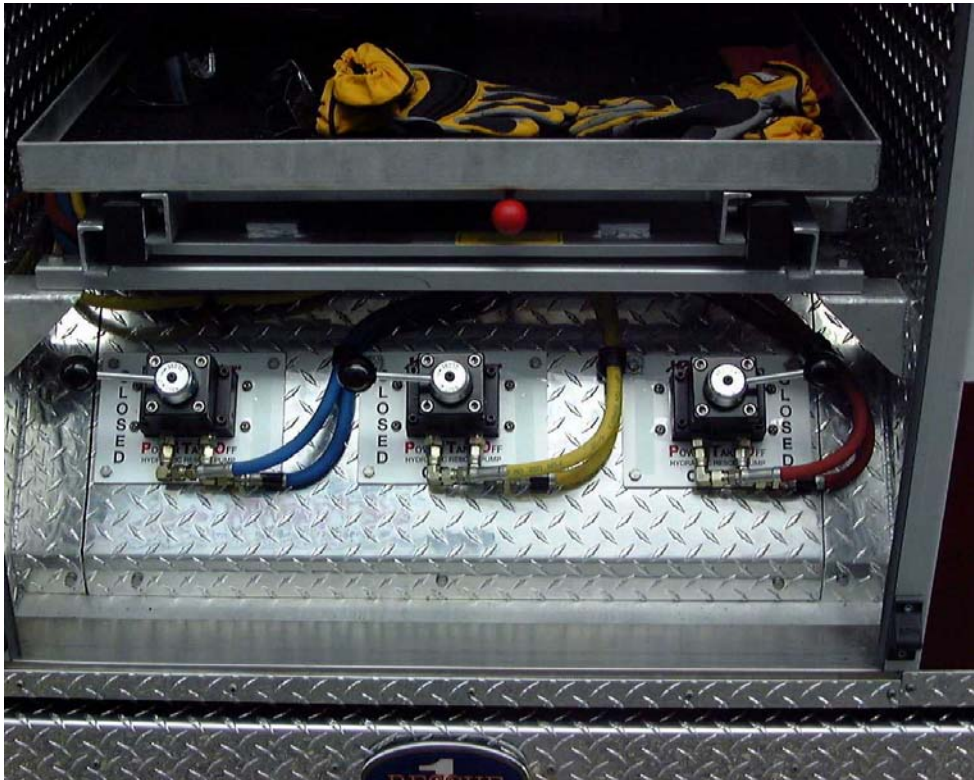
Caution: If reducer bushings are used, they must be hydraulic steel fittings, **water fittings or brass fittings are not acceptable.**



**Photo 1 – Open Center Valve w/Mounting Plate**



**Front Bumper Two tool Installation**



**Three tool - Rear Compartment Installation**

O-Rings

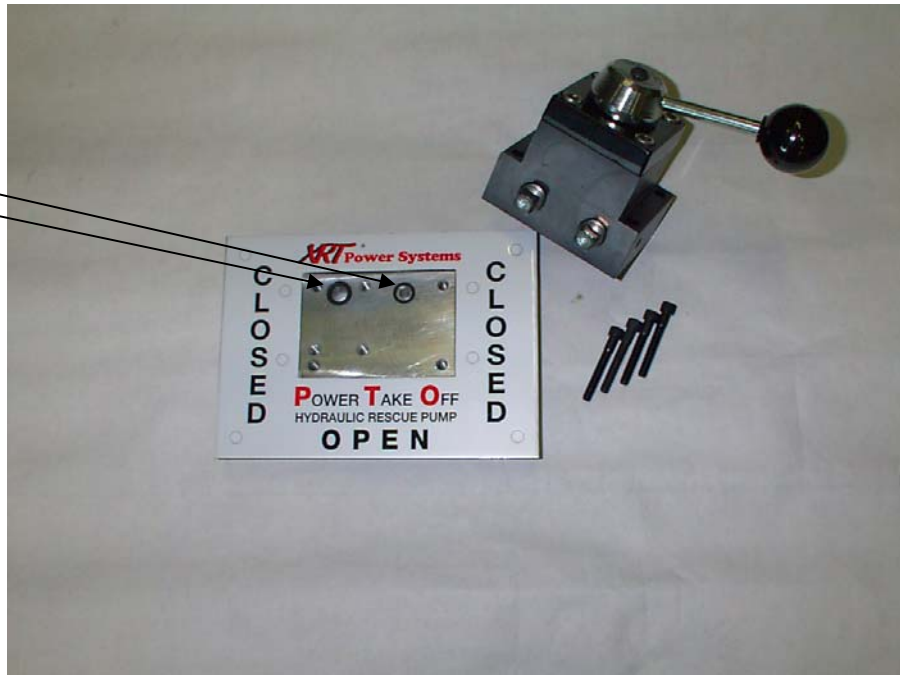


Photo 3 – Open Center Valve with Mounting Plate

## Installation Check List

- ❑ 1. All bolts holding the PTO to transmission are in place and tight.
- ❑ 2. The oil suction line to the XRT Pump is tight and secured level to frame of the truck.
- ❑ 3. The high-pressure oil lines from the XRT pump are tight and secured to the frame of the truck. Protective sleeves are used in high chafe areas.
- ❑ 4. The high pressure and return lines at the control blocks are tight and protected from chaffing.
- ❑ 5. Set all open center valves in the CLOSED position to prepare for test.
- ❑ 6. Partially fill the hydraulic oil tank for the XRT PTO system with the appropriate oil for the tool system. CAUTION! Do not fill system with more than (1) gallon before looking under truck for leaks. Fill tank.
- ❑ 7. Start truck, engage PTO and check for leaks. Run for 30 minutes before going to System Test.
- ❑ 8. Proceed with **System Test**.

**To operate extrication tools using the XRT Powerhouse System:  
Refer to Chelsea PTO Owners manual:**

1. With engine at idle, and transmission in **Park**.
2. Press the **PTO Engage Button**, located on the dashboard.
3. **Open the XRT Valves.**  
The extrication tools are active.
  
4. **PTO will disengage when foot brake is pressed.**

## System Test

Once the system is operational, it is necessary to check all functions and make any calibrations.

1. Let the system run for approximately 30 minutes before initial test. This lets all pumps run before being put under a high-pressure load. When the PTO is engaged the diesel engine should automatically go to a preset elevated idle. This is the proper speed for the PTO to operate. Contact XRT Power Systems with any questions regarding PTO Ratio.
2. All **open center valves** are to be set in the closed position. One at a time connect, the hose reel ends together. Smoothly "open" the valve handle, this action will charge or bleed air from the hose reels. Repeat this for each valve and reel station.
3. Check fluid level in the tank and add as necessary. Filling one, two or three reels of hose will take some fluid.
4. Close one **open center valve** and disconnect the two hoses from each other at the end of the hose reel.
5. Connect a pressure gauge to the male fitting on the end of the hose reel.
6. Smoothly "open" the **open center valve**. The pressure gauge should immediately start to climb and go to the preset pressure for the system, if the pressure is too high or too low, then adjust the pressure on the **control block** and reseal. (See Control Block)
7. If the pressure does not climb when the **open center valve** is "opened" then check the hoses from the **open center valve** to the hose reels. The hoses are probably backwards. Swap the hoses and recheck.
8. Once all the **open center valve** stations are checked and calibrated, hook up the tools and check operation.
9. Make sure all warning and operation labels are in place, reservoir is topped off, **and open center valves** are in the **closed** position. Inspect for leaks again. Disengage the PTO. The engine speed will return to idle and the system test is done.

**See Specifications for pressures and fluid requirements**

## **MAINTENANCE GUIDE**

1. When truck goes in for oil changes, inspect pump and PTO for leaks or damage.
2. Inspect all hoses under body for chaffing of road damage. Replace and or re-secure as needed.
3. Check for chaffing where hoses go through drilled holes in body panels.
4. Check for damaged or unreadable warning labels, replace as necessary

### **Annually**

#### **Repeat all of the above**

1. Replace oil filter on reservoir tank. (See Tank section for filter location)
2. Check fluid level and add as necessary.
3. Do a maximum pressure test. Check all high-pressure hoses for weeping or bulging, pay special attention to the crimped end of the hose. Replace as necessary

For technical service, parts or questions, please call

**Toll free, 1-800-343-0480**

### **Installation Warning**

**XRT Combi system must be pressure checked before apparatus is put in service. Failure to check and confirm proper pressure to each tool port, may void warranty, and or cause failure during operation.**



## Certificate of Warranty For XRT Hydraulic Rescue Pump

### **Warranty:**

- Each XRT hydraulic rescue pump is guaranteed against defects in material or workmanship from the original date of installation for two years or 2000 hours of use, whichever comes first, subject to the general limitations and exclusions set forth below.
- If it is determined, by an independent 3<sup>rd</sup> party representative of said tool manufacture, that the XRT pump system has caused damage to the hydraulic rescue tool that the system was built to power (as identified by the XRT serial number on the pump system), XRT Power Systems will repair, replace, or pay for repair or replacement of said tool, as set forth in tool manufactures warranty statement, subject to the general limitations and exclusions set forth below.

### **Warranty Terms:**

The obligation of XRT Power Systems under this warranty include free replacement of the necessary parts and shipping costs to return the equipment to the user, provided the inspection of the equipment has proved that the parts were defective at the time of purchase or where improperly designed or manufactured. An authorized XRT Power Systems representative can only perform the warranty inspection, and the purchaser will pay the shipping cost to the repair center. Said warranty shall remain in effect only if (1) such goods are used normally and properly in accordance with XRT Power Systems instructions as to maintenance and operation, whether given orally or set forth in manuals furnished by XRT Power Systems, and (2) the purchaser gives prompt notice to XRT Power Systems of any such defects and preserves and turns over all allegedly defective goods, parts or items.

### **Exclusions:**

This warranty covers all defects in material and workmanship except:  
Any damage occurring during shipment of the goods (for which claims shall be presented to the carrier). Normal wear and tear parts and consumable parts and items including, o-ring replacement, hydraulic hose wear. Goods sold but not manufactured by XRT Power Systems, such as Parker Hannifin Hydraulic hose. Damage caused by repairs performed by persons other than authorized XRT service centers, or damage resulting from the use of parts other than genuine XRT parts. Damage as the result of improper or neglected reasonable maintenance.

### **Limitation of Damages:**

XRT Power Systems obligation under this warranty is limited to repair and/or replacement, at XRT's option. If XRT Power Systems determines, in its sole and final discretion, that the nature of the defect precludes remedy by repair and or replacement, XRT Power Systems reserves the right to satisfy any warranty obligation by refunding the full purchase price, on return of all defective goods to XRT Power Systems, shipping cost prepaid. Any action of breach of warranty or other action must be commenced within one year after such action arises, except where applicable law prohibit any such time restriction on the bringing of such an action.



Dear XRT Power System Customer,

Congratulations on choosing XRT Power Systems & Westerbeke for your Fire Rescue apparatus. We value your business and will work with you from today on, to assure that our product surpasses your expectations in the field.

Whether you are receiving a Westerbeke diesel generator with XRT, or an XRT Powerhouse system, we would like you to be advised of the various phone/fax numbers as well as other way to communicate questions, and or problems to us. We are ready to provide technical support, and to fill your parts orders 24/7 and look forward to hearing from you on any given day.

**Phone Numbers to remember:**

Domestic & International:

Sales Order Department: 1-781-639-7125

Parts Department: 781-631-3282

Technical Service: 781-639-7126

Warranty Department: 781-631-3282

Accounts Payable: 781-639-7124

General Questions: 781-631-3282

**Fax Number:** 781-639-1467

**Email:** [info@xrtcombi.com](mailto:info@xrtcombi.com)

**Web Site:** [www.xrtcombi.com](http://www.xrtcombi.com)

We hope you keep these numbers for future reference. Please remember, we are here to provide you the support and service you need, and when you need it. Thank you again for you support of our product, we look forward to hearing from you.