



## The Servo Manifold



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## **SECTION I**

### **General Description**

The Servo Manifold allows the user to:

1. Monitor flow rates being used by the servo valve and actuator.
2. Protect the Servo Valve from contamination by incorporating filters before the fluid passes through the servo strainer. Pre-filters can be changed online and replaced as needed by indication of the delta-p sensor 50 psid.
3. Isolate the Servo Valve while on line and replace as needed. Test /bleed points are used to verify any stored pressure between servo valve and isolation valve.

### **DUPLEX SERVO STRAINER**

The Duplex Servo Strainer consists of a 3-way filter selector valve, two (2) cartridge type 40-micron beta 200 removable filters, a delta-p sensor.

Hydra-Lube's Servo Manifold is designed to mount between a 25 GPM, Abex Model 425 or Moog Model 743 servo valve and a steam turbine valve actuator manifold.

#### **NOTE**

If the installation uses a jet supply line (FJS) from the hydraulic power unit, this line may be capped or removed after installing the Servo Manifold

Jet supply fluid then passes through the 3-way filter selector valve and into one of the filters. The 3-way filter selector valve is designed such that pressurized jet supply fluid is always supplied to the servo valve when transitioning from one filter to the other.

### **FLOW METER**

Hydra-Lube's Servo Manifold incorporates a turbine flow meter; this allows the operator to monitor flow rates for each actuator that has a servo valve. Most systems have numerous servo valves and when fluid contamination is high there may be more than one servo valve failing. Sometimes it is very difficult to determine which servo is bad. With the online flow indication, servo valves problems can be identified in a very short period of time.



## **SERVO ISOLATION VALVE**

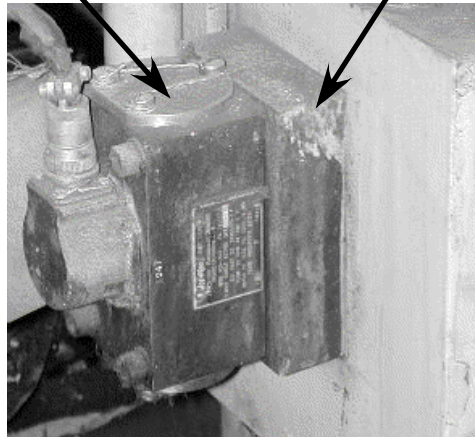
Servo Isolation Valve allows for the complete removal and replacement of a servo valve with the unit on-line.

In order to isolate all of the hydraulic fluid from the servo valve, both the main fluid supply and jet supply to the servo valve must be shut off with assurances that no pressure is present.

On EHC systems manufactured before 1980, GE offered an upgrade modification to allow for on-line servo isolation. Part of this modification (Servo Isolation Scheme) consisted of adding an adapter plate between the servo valve and the hydraulic actuator. This plate is no longer needed since The Servo Manifold incorporates the functionality of this adapter plate.

On EHC systems manufactured after 1980 GE either provided the adapter plate or drilled holes in the hydraulic actuator. The Servo Manifold will eliminate the adapter plate and the drilled passages will have no effect of the servo valve operation following the Installation.

**Servo Valve**                      **Adapter Plate**

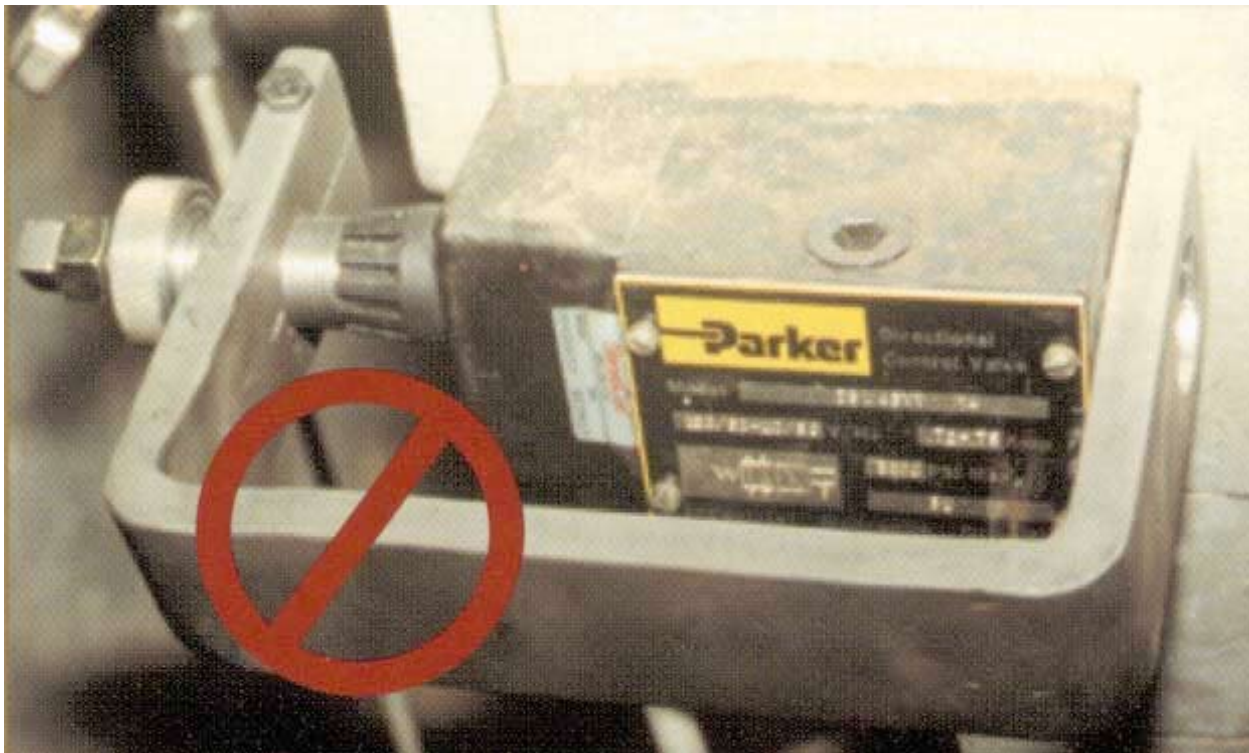




By isolating the main pressure supply, which is also supplying the servo jet supply, the servo valve is hydraulically isolated from the high pressure fluid system and can be safely removed.

The Servo Manifold incorporates a manual isolation valve, which is capable of completely isolating the hydraulic fluid to the servo valve.

In order to verify there is no fluid pressure on any of the servo valve ports, a series of test points are attached to The Servo Manifold that allow either pressure gauges or vent line hoses to be attached to visually check for pressure.





The test points are:

- TP PR (Test Port Pressure Connection) – With the 0-3,000-psig pressure gauge connected to this port, pressure between The Servo Manifold isolation valve discharge and the inlet to the servo valve including the jet supply can be verified.
- TP BLEED (Test Port Pressure Bleed) – This is the line that serves as an atmospheric bleed downstream of The BLOCK II isolation valve. With a hose assembly (no pressure gauge) connected to this port, a visual observation can be made to determine there is no flow of fluid to the servo valve. This is done following the closing of the isolation valve and verification that the TP PR pressure gauge is indicating zero pressure.
- TP 1 (Control Port 1 Gauge Connection) – With the 0-15 psig pressure gauge connected to this port the pressure between the servo valve discharge to the hydraulic actuator can be verified to be zero. **This port is connected to the piston side of the actuator.**
- TP 2 (Control Port 2 Gauge Connection) This port is connected to the cylinder rod side of the actuator; generally this port is used on a double acting cylinder.

Once the isolation valve has been closed and zero pressure and flow to the servo valve has been verified, the servo valve can be safely removed and replaced.



## SECTION II

### Installation Instructions

In order to install The Servo Manifold all hydraulic fluid to the servo must be isolated. On turbines that have the GE Servo Isolation Scheme, The Servo Manifold can be installed on-line by hydraulically isolating the servo valve. Follow GE's recommended procedures.

On units that don't have this modification or if it is not desirable to use the GE Servo Isolation Scheme, the unit will need to be shut down, the high pressure fluid system shut down and depressurized prior to beginning the installation.

Once the servo valve has been totally isolated from the high pressure fluid system, remove the servo valve from the hydraulic actuator. If there is an adapter plate between the servo valve and hydraulic actuator, remove this plate.

Clean the surface on the mounting surfaces. Install the Servo Manifold with new viton o-rings. Mount The Servo Manifold in place of the servo valve on the hydraulic actuator. Use a small amount of clean hydraulic fluid to lubricate each of the 5 o-rings. Make sure the pilot supply hole (the small o-ring) lines up with the small hole in the hydraulic actuator. Verify the o-rings on The Servo Manifold remain in place during the mounting process. Torque the mounting bolts to 20-25 ft-lbs.

Prior to mounting the servo valve to The Servo Manifold it is recommended that a new servo strainer be installed in the servo valve. Even though The Servo Manifold incorporates two 40 micron Filters (in duplex), the OEM 90 micron strainer will serve as a last line of protection for the servo valve. The OEM servo strainer should not experience any further contamination and therefore won't require replacement in the future. Replace the servo valve o-rings with the new Viton o-rings. Verify the o-rings on the servo valve remain in place during the mounting procedure. Torque the servo valve mounting bolts to 20-25 ft-lbs.

Reconnect the servo valve amphenol connector.

This completes The Servo Manifold installation.

In order to check for leaks, the high-pressure fluid system must be returned to normal operation, the turbine trip system must be reset and each valve that has The Servo Manifold attached should be stroked open. If any leaks are indicated, the high pressure fluid system should be immediately shut down and all leaks repaired.



## SECTION III

### Operating Instructions

#### Duplex Servo Strainer

##### Selecting On-line Filter to Off-line Filter

1. To select flow to the off-line filter, pull up on the selector knob and turn until the guard covers the filter. This action transfers the jet supply fluid from the one filter to the other.
2. With the safety guard covering the filter the filter is now in service.
3. The visual delta-P indicator and pressure switch will now indicate the condition of the on-line filter (the one that is covered with the Safety Locking guard).

##### Servicing Off-Line Filter

1. Refer to Figure 2 is designed to prevent an operator from removing the on-line filter by the 3-way valve Selector valve. The on-line filter is covered by the safety guard, which is held firmly in place. Now the uncovered Filter is serviceable. Only the filter accessible with a deep socket ratchet wrench should be serviced.

#### **WARNING**

Removing an on-line filter assembly may result in personal injury. Only use a deep socket ratchet wrench to remove filter assembly.

2. Select the filter to be serviced.
3. Remove the filter by pulling directly upwards using your fingertips.
4. Discard old filter.
5. Apply clean EHC fluid to O-rings of new filter and insert into filter cavity. Apply downward pressure. The filter will seat into place once enough force is applied.
6. Install the filter cover and tighten to 20-25 ft-lbs.



## Servo Hydraulic Isolation and Removal

1. On The Servo Manifold, unscrew the cover over the “TP PR” connector and connect the 0-3000 psig gauge assembly to this fitting. Note this can be done with the unit running since the fitting incorporates a ball type check valve that will not be opened until the gauge is connected.

This pressure gauge is reading the FAS pressure to the servo valve.

2. Using the Turbine Control System, test the valve fully closed. Note the Fast Acting Solenoid should become energized. This can be determined by observing zero pressure on the “TP PR” pressure gauge. If there is pressure indicated on this pressure gauge do not proceed. Determine why the Fast Acting Solenoid has not become energized and correct the problem before continuing.
3. While continuing to hold the valve test button (the valve should remain closed and the “TP PR” pressure should continue to read zero pressure, shift the isolation valve from its opened position to its closed position.
4. Lock the isolation valve in the closed position before proceeding.
5. Release the valve test button and assure the valve remains closed and “TP PR” pressure gauge remains a zero pressure.
6. On The Servo Manifold unscrew the cover over the “TP 1” connector and connect the 0-15 psig gauge assembly to this fitting. Verify that this pressure gauge reads zero pressure.

This Pressure gauge is reading pressure between the servo valve discharge port TP1 and the hydraulic actuator cylinder.

7. On The Servo Manifold unscrew the cover over the “TP Bleed” connector and connect the hose assembly (no pressure gauge) to this fitting. Verify there is no leakage from this hose.

This is the atmospheric bleed of the supply pressure line to the servo valve.

8. If there is no leakage from the “P Bleed” line and the “TP PR” pressure gauge is reading zero pressure, the servo valve is hydraulically isolated from the system and can be safely removed from The Servo Manifold.



**WARNING**

Note, only remove the mounting bolts holding the servo valve to The Servo Manifold. The Servo Manifold must remain tightly mounted to the hydraulic actuator since The Servo Manifold is the device that is providing the hydraulic isolation for the servo valve

9. With a new servo valve in place, verify the o-rings are properly positioned and tighten the servo valve mounting bolts to 20-25 ft-lbs.
10. On The Servo Manifold, remove the two gauge assemblies (“TP PR” and “TP 1”) and the hose assembly connected to “TP Bleed”. Screw the covers back onto all three of the connectors.
11. Using the Turbine Control System, depress and hold the valve test button.
12. While continuing to hold the valve test button, unlock the isolation valve on the Servo Manifold and return it to its opened position and lock it in this position.
13. Release the valve test button. The valve should return to its normal position.

Note if any hydraulic leaks are detected it will be necessary to hydraulically isolate the servo (as described earlier) and correct the leaks.

17. Store the two gauge assemblies and the hose assembly in clean containers for future use.



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**DELTA-P GAUGE**

Measures different pressure for servo strainers.

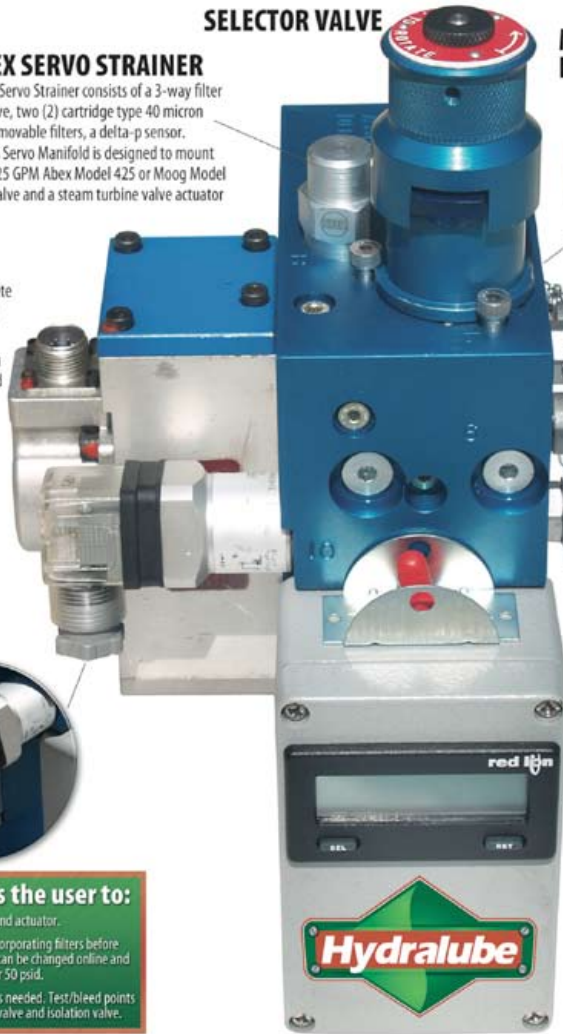


**SELECTOR VALVE**

**MOUNTING HOLE**



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**A-PORT**  
Activator Port

**PRESSURE TEST BLEED POINTS**

**B-PORT**

**BLEED**



**FLOW METER**

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The flow meter LED screen can be remote mounted for multiple units. The flow meter LED screen can be remotely monitored to a touch screen monitor.

**The Servo Manifold allows the user to:**

- 1) Monitor flow rates being used by the servo valve and actuator.
- 2) Protect the Servo Valve from contamination by incorporating filters before the fluid passes through the servo strainer. Prefilters can be changed online and replaced as needed by indication of the delta-P sensor 50 psid.
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