1/8" POPPET BLOCK CONTROL
MAINTENANCE AND SERVICE MANUAL

USASI SCHEMATIC

1. 3-WAY NORMALLY CLOSED PILOT VALVE
2. 2-WAY MANUAL VALVE
3. IN LINE FILTER
4. EXHAUST MUFFLER

Normally closed, double three-way valve. Shown manually operated.
INTRODUCTION
The poppet block is the heart of most Shafer control systems. A double three-way, manual and pilot actuated, control valve is designed to provide selective directional operation of Shafer actuators. The poppet block control may direct power gas to a set of gas/hydraulic tanks (generating hydraulic pressure for powering valve actuators), or it may direct central hydraulic system pressure directly into a valve actuator. It is engineered to provide reliable and durable-operation and toleration of contaminates in the power source.

OPERATION
FIGURE 1 – NEUTRAL POSITION
Spring compression (1) and power gas force the power poppets (2) on their respective seats and simultaneously hold exhaust poppets (3) in the open position via interconnecting poppet pins. Tank porting is open to exhaust.

FIGURE 2A – PILOT ACTIVATION
Pilot pressure to the pilot piston (5) illustrates force applied to the piston seating the exhaust poppet and simultaneously unseating the power poppet. Power gas is directed through tank port “B”.

NOTE: Pilot pressure to the opposite pilot piston shown in Figure 2A will activate the opposite set of poppets and direct power gas to tank port “A”.

NOTE: Pilot pistons are equipped with an orifice in order to vent the pilot pressure and allow the control to neutralize after stroking an actuator.
POPPET BLOCK
GAS OR OIL FLOW

FIGURE 2B – MANUAL ACTIVATION
Opening the Needle Screw Manual Override (6) will admit power pressure to the pilot piston (5) seating the exhaust poppet and simultaneously unseat the power poppet. Power gas is directed through the tank port “A”.

NOTE: Turn Needle Screw counter-clockwise to open, clockwise to close.

CAUTION: Do Not over torque Needle Screws. For positive shut-off, use a conventional 3/8” open or box end wrench.

FIGURE 3 – NEUTRALIZATION
Closing the Needle Screw Manual Override will allow the compressed poppet spring and power gas to reseat the power poppet and simultaneously unseat the exhaust poppet. Power gas pressure remaining in the gas/hydraulic tank is now vented through port “B” to the exhaust, thus neutralizing tank and actuator pressures.
BASIC CHECK-OUT PROCEDURES

The following two checks can verify the proper working functions of the Shafer Poppet Block/Failure of either of these procedures may result in operating problems with the valve actuator. This description is for gas service, but the unit can also be used in hydraulic service.

CHECK NO. 2
Open the Manual Needle Screw Manual Override and stroke the actuator partially open or closed.

NOTE: The Manual Needle Screw for open and close are indicated on the attached tag.

After stroking the actuator partially open or closed, close the Needle Screw thus exhausting the gas/hydraulic tank.

CHECK NO. 1

After gas/hydraulic tank is completely exhausted, check the exhaust port for any gas leakage. There should be zero leakage throughout the control system.

NOTE: The exhaust port should be free of any restrictions or piping size reductions less than 1/8, unless factory supplied. (Standard factory supplied units will include a high pressure Exhaust Muffler.)

In the neutralized position there should be zero leakage from the exhaust port.

Power gas leakage is usually attributed to debris lodged between the power poppet and seat.

BILL OF MATERIAL

FIGURE 4A
## BILL OF MATERIAL

<table>
<thead>
<tr>
<th>ITM</th>
<th>QTY</th>
<th>DESCRIPTION</th>
<th>ITM</th>
<th>QTY</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1/8&quot; POPPET BLOCK BODY</td>
<td>17</td>
<td>2</td>
<td>O-RING – PISTON</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1/8&quot; POPPET BLOCK END CAP</td>
<td>18</td>
<td>2</td>
<td>BACK-UP RING - PISTON</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1/8&quot; P. BLK. EXHAUST POPPET CAP</td>
<td>19</td>
<td>2</td>
<td>O-RING – SEAT INSERT</td>
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<tr>
<td>4</td>
<td>2</td>
<td>1/8&quot; POPPET BLOCK SEAT INSERT</td>
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<td>2</td>
<td>O-RING – SEAT INSERT</td>
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<td>5</td>
<td>2</td>
<td>1/8&quot; POPPET BLK NEEDLE SCREW</td>
<td>21</td>
<td>2</td>
<td>O-RING – NEEDLE SCREW</td>
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<tr>
<td>6</td>
<td>2</td>
<td>1/8&quot; POPPET BLOCK PILOT PISTON</td>
<td>22</td>
<td>2</td>
<td>O-RING – BOTTOM CAP</td>
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<tr>
<td>7</td>
<td>4</td>
<td>1/8&quot; POPPET BLOCK POPPET</td>
<td>23</td>
<td>2</td>
<td>O-RING – TOP CAP</td>
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<tr>
<td>8</td>
<td>2</td>
<td>1/8&quot; POPPET PIN</td>
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<td>2</td>
<td>O-RING – MANIFOLD</td>
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<tr>
<td>9</td>
<td>2</td>
<td>1/8&quot; POPPET BLK SPRING SPACER</td>
<td>26</td>
<td>2</td>
<td>FLUSH PLUG LEVEL SEAL</td>
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<tr>
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<td>2</td>
<td>SPRING</td>
<td>27</td>
<td>4</td>
<td>SOCKET HEAD CAP SCREW MTG.</td>
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<td>2</td>
<td>1/8&quot; POPPET BLOCK HEX END</td>
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<td>2</td>
<td>ORFICE PLUG</td>
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<tr>
<td>12</td>
<td>2</td>
<td>SOCKET HEAD SET SCREW FLAT PT</td>
<td>30</td>
<td>2</td>
<td>SOCKET SET SCREW HFDOG</td>
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<tr>
<td>13</td>
<td>4</td>
<td>SOCKET HEAD CAP SCREW - TOP</td>
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<td>14</td>
<td>4</td>
<td>SOCKET HEAD CAP SCREW – BTM.</td>
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<tr>
<td>15</td>
<td>2</td>
<td>SLOTTED HEAL WIPER</td>
<td>31</td>
<td>1</td>
<td>O-RING - UPPER CAP</td>
</tr>
</tbody>
</table>

**FIGURE 4B**

**SECTION A-A**

*INSTALL SET SCREWS FLUSH WITH FLATS OF HEX ENDS*
DISASSEMBLY & ASSEMBLY PROCEDURE

DISASSEMBLY

WARNING: Isolate and disarm control. Turn off power gas, bleed off gas volume in power storage tank if so equipped, open and close both Needle Screws Item (5) to vent any entrapped pressure.

NOTE: Before continuing assure the availability of spare o-rings and poppets.

1. Remove four M8 x 50 mm Socket Head Cap Screws Item (27) releasing the Poppet Block Assembly from the actuator.

NOTE: Take caution with the two manifold O-rings Item (25) located between the Poppet Block and actuator.

2. Remove two 10-32 x 1/4" Socket Head Set Screws Item (30) from Poppet Block Body Item (1). Access to these Set Screws is located on the sides of the body, Illustrated in Figure 5.

NOTE: These two set screws are located deep inside the body Item (1) and require a long Allen Wrench to remove and reinstall.

3. Remove four 10-32 x 1/4" Socket Head Set Screws Item (30) located on the top of the Poppet Block Assembly.

4. Remove one end Cap Item (2) and O-rings Item (23).

5. Remove two Spring Spacers Item (9), Spring Item (10), Two Poppets Item (7) & two Poppet Pins Item (8).

6. Remove two 8-32 x 3/8" Socket Head Set Screws Item (12) from the two Hex Ends Item (11) located on the bottom of the assembly and remove the two Hex Ends from the Needle Screws Item (5).

7. Remove four 1/4"-20 x 1" Socket Head cap Screws Item (14), one end Cap Item (3) and two O-Rings Item (22).

NOTE: When removing the End Cap Screws Item (3), the two Needle Screws Item (5) and two Seat Inserts Item (4) can all be removed as an assembly.

8. Unthread two Needle Screws Item (5) from Seat Insert Item (4).

9. Remove two Pilot Pistons Item (6) and two Poppets Item (7). Each Pilot Piston has a 10-31 tapped hole in the bottom and can be removed from the Body with one of the 10-31 x 5/8 Socket Head Cap Screws Item (13).

FIGURE 5

NOTE: Do not remove Pipe Plugs Items (29) and (26) located on both sides of Body Item (1). See Figure 6.
ASSEMBLY

1. Replace all O-rings, Back-up Rings, Wipers, Poppets and Springs listed in the Seal Kit Table Figure 7.

2. During Reassembly refer Figure 5 to ensure two Needle Screws Item (5) and two Seat Inserts Item (4) are located inside the Body Item (1) correctly. It is extremely important not to install the two Seat Inserts Item (4) too deep inside the Body. The Seat Inserts must be flush with the Body surface Item (1). Install both Needle Screws Item (5) and rotate the Seat Inserts Item (4) until the flats are outward towards the sides of the Body as illustrated in Figure 5.

NOTE: To prevent installation error, once both Seat Inserts and Needle Screws are installed inside the Body, install the End Cap Item (3) and tighten the Socket Head Cap Screws Item (14). Now pull on both Needle Screws to position the Seat Inserts before installing the Socket Head Set Screws Item (30).

3. During re-installation take caution that both sets of Poppets, top and bottom, are engaged correctly onto the two Poppet Pins Item (8).

4. It is recommended that small amounts of petroleum based grease or hydraulic fluid be used to assist in the reassembly process and ensure O-ring seals are not damaged.
5. When installing the End Cap fasteners, Items (13 and 14) use a fastener lubrication grease such as Never-Seez® and do not overtighten Socket Head Cap Screws Items (13) and (14).
   - Maximum torque for 10-32 x 5/8" Socket Head Cap Screws Item (13) is 13 in-lbs.
   - Maximum torque for 1/4-20 x 1" Socket Head Cap Screws is 25 in-lbs.

6. Take caution not to pinch or damage the two manifold O-rings Item (25) while mounting the completed poppet control assembly on the actuator footprint. Install and tighten the four M8 x 50mm Socket Head Cap screws Item (27) to 52 in-lbs. max.

<table>
<thead>
<tr>
<th>SEAL KIT</th>
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<tr>
<td>Item #</td>
</tr>
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<tr>
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<td>22</td>
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<td>15</td>
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</tbody>
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FIGURE 7
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