

# 1/8" Poppet Block Control

**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.



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# Section 1: Poppet Block Gas or Oil Flow

## 1.1 Introduction

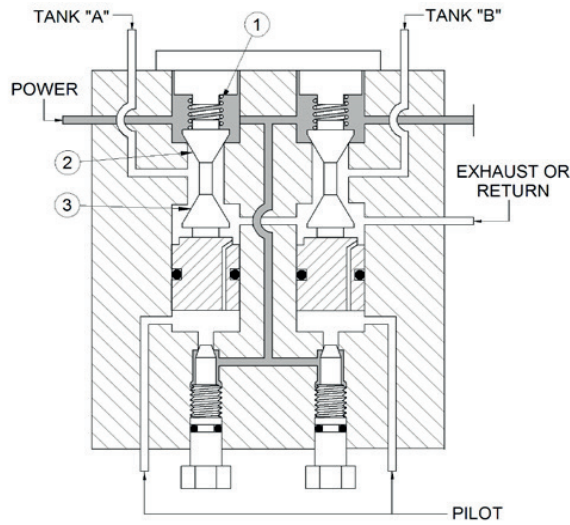
The poppet block is the heart of most Shafer control systems. A double three-way, manual and pilot actuated, control valve is designed to provide selective directional operation of Shafer actuators. The poppet block control may direct power gas to a set of gas/hydraulic tanks (generating hydraulic pressure 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 contaminants in the power source.

## Section 2: Basic Construction

The poppet block consists of a double three-way ported valve body containing two sets of inexpensive, easily replaced nylon poppets to provide tight sealing, poppet springs, push pins, manual needle screw override assemblies and pilot pistons for remote operation.

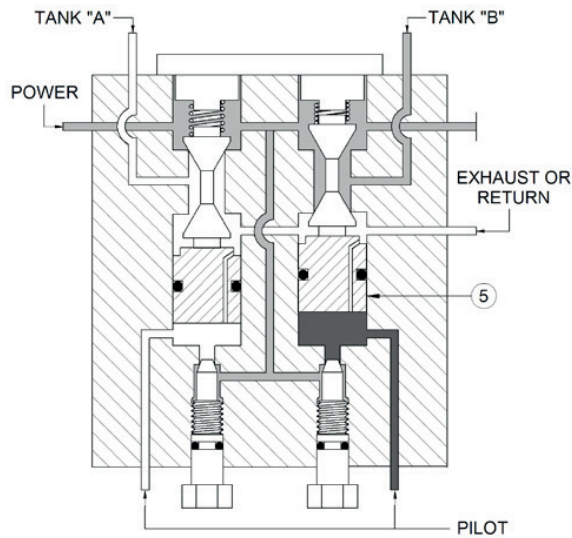
## Section 3: Operation

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 2 Pilot Activation



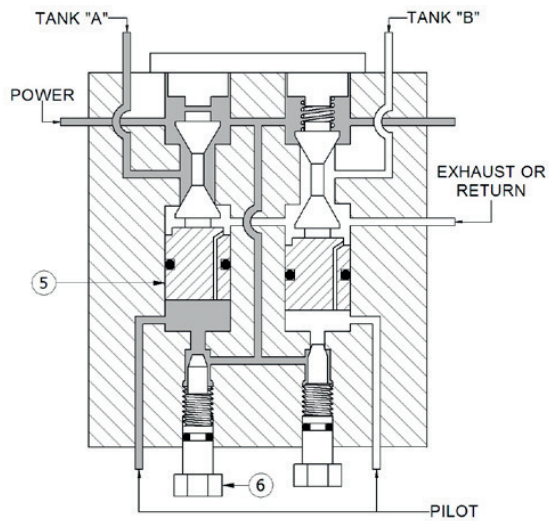
Pilot pressure to the pilot piston (5) illustrates force applied to the piston seating the exhaust poppet and simultaneously unseating the power poppet. Power gas is directed through tank port "B".

**NOTE:**

Pilot pressure to the opposite pilot piston shown in Figure 3 will activate the opposite set of poppets and direct power gas to tank port "A".

Pilot pistons are equipped with an orifice in order to vent the pilot pressure and allow the control to neutralize after stroking an actuator.

**Figure 3 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".

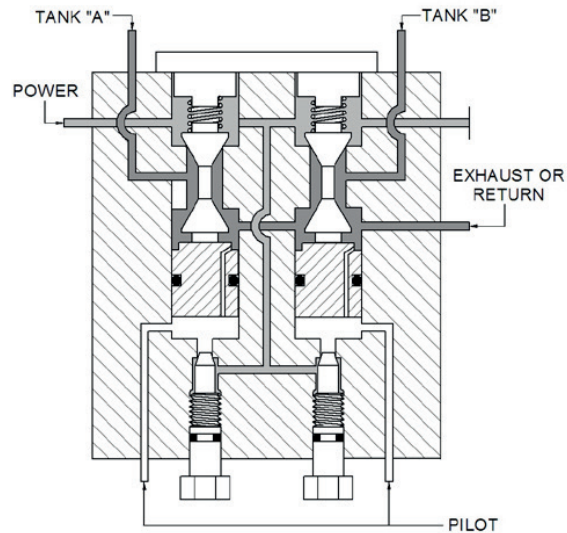
**NOTE:**

Turn Needle Screw counterclockwise to open, clockwise to close.

**⚠ CAUTION:**

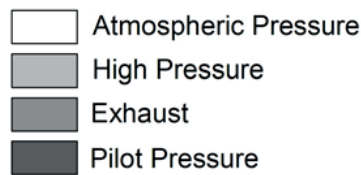
Do not over torque Needle Screws. For positive shut-off, use a conventional 3/8" open or box end wrench.

**Figure 4 Neutralization**



Closing the Needle Screw Manual Override will allow the compressed poppet spring and power gas to reseal 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.

**Figure 5 Legend**





## Section 4: 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.

### 4.1 Check No. 1

There should be zero leakage throughout the control system. 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.

### 4.2 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.

After gas/hydraulic tank is completely exhausted, check the exhaust port for any gas leakage.

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.)

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# Section 5: Bill of Material

Figure 6 Section View

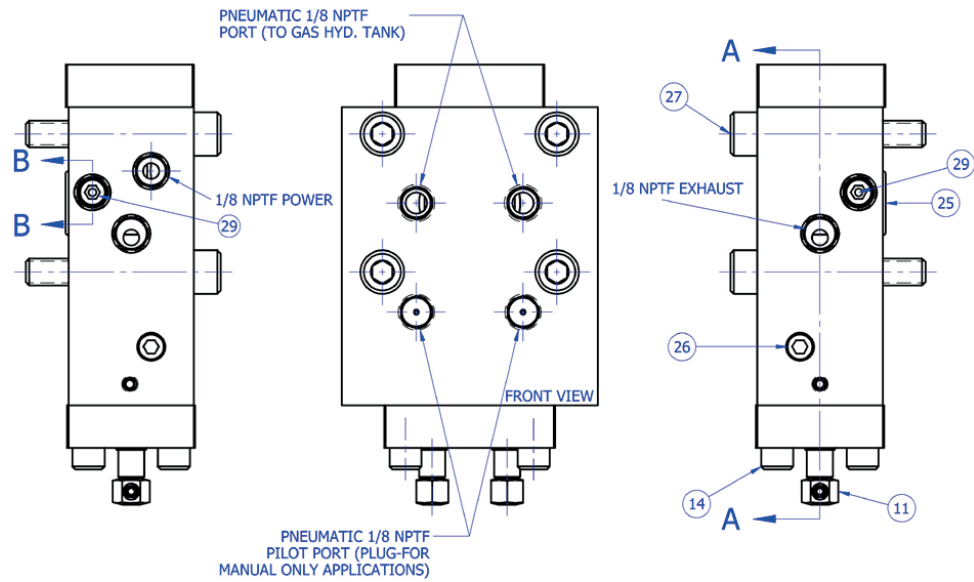
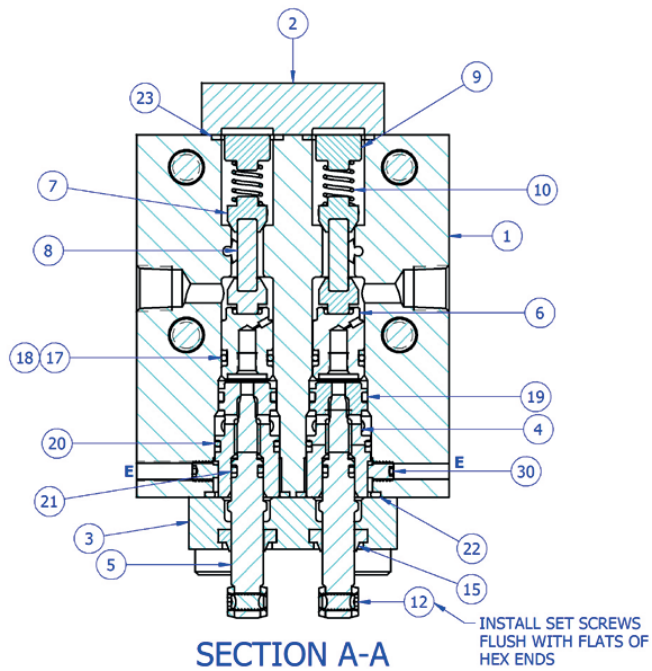


Figure 7 Section A-A



**Table 1. Bill of Material**

Item	Quantity	Description
1	1	1/8" Poppet Block Body
2	1	1/8" Poppet Block End Cap
3	1	1/8" Poppet Block Exhaust Poppet Cap
4	2	1/8" Poppet Block Seat Insert
5	2	1/8" Poppet Block Needle Screw
6	2	1/8" Poppet Block Pilot Piston
7	4	1/8" Poppet Block Poppet
8	2	1/8" Poppet Pin
9	2	1/8" Poppet Block Spring Spacer
10	2	Spring
11	2	1/8" Poppet Block Hex End
12	2	Socket Headset Screw Flat PT
13	4	Socket Head Cap Screw - Top
14	4	Socket Head Cap Screw - Bottom
15	2	Slotted Heal Wiper
17	2	O-ring - Piston
18	2	Back-up Ring - Piston
19	2	O-ring - Seat Insert
20	2	O-ring - Seat Insert
21	2	O-ring - Needle Screw
22	2	O-ring - Bottom Cap
23	2	O-ring - Top Cap
25	2	O-ring - Manifold
26	2	Flush Plug Level Seal
27	4	Socket Head Cap Screw
29	2	Orifice Plug
30	2	Socket Set Screw HFDOG
31	1	O-ring - Upper Cap

# Section 6: Disassembly and Assembly Procedure

## 6.1 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 M8x50 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 10-32x1/4" 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 8.

### **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 10-32x1/4" 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 8-32x3/8" 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"-20x1" Socket Head cap Screws Item (14), one end Cap Item (3) and two O-Rings Item (22).

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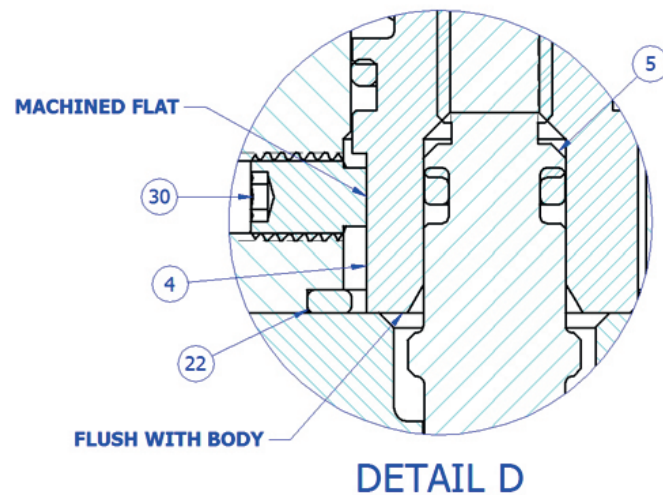
**NOTE:**

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.

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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 10-31x5/8 Socket Head Cap Screws Item (13).
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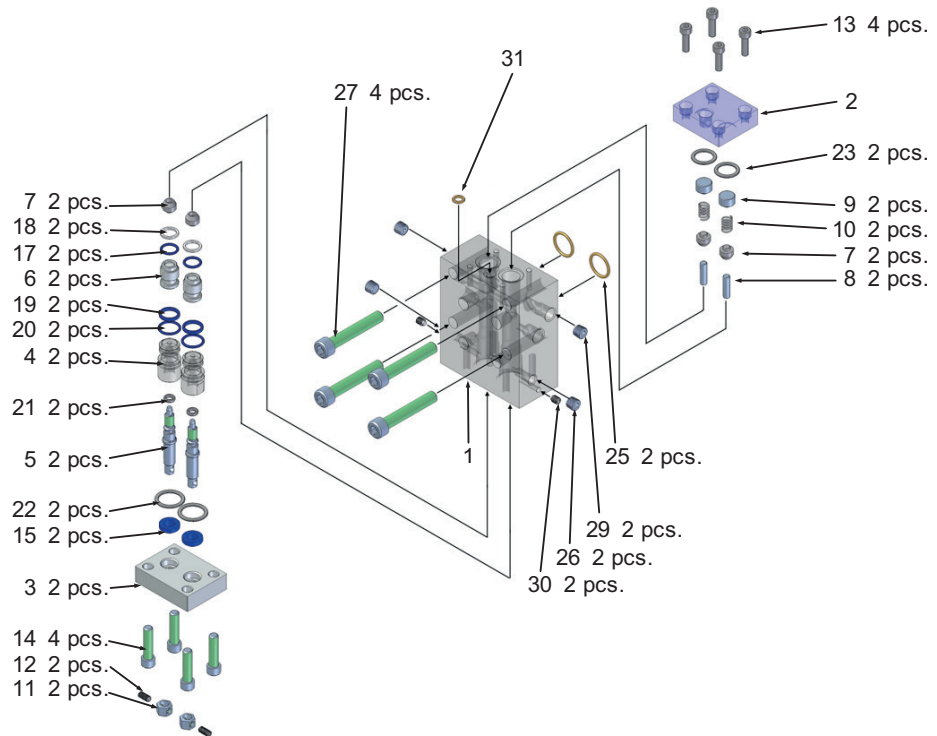
**Figure 8**     **Detail D**



**NOTE:**

Do not remove Pipe Plugs Items (29) and (26) located on both sides of Body Item (1).  
See Figure 9.

**Figure 9 Exploded View**



## 6.2 Assembly

1. Replace all O-rings, Back-up Rings, Wipers, Poppets and Springs listed in the Seal Kit Table 2.
2. During Reassembly, refer to Figure 8 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 8.

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### 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).

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3. During reinstallation 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 overtorque Socket Head Cap Screws Items (13) and (14).
  - Maximum torque for 10-32x5/8" Socket Head Cap Screws Item (13) is 13 in-lbs.
  - Maximum torque for 1/4-20x1" 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 M8x50mm Socket Head Cap screws Item (27) to 52 in-lbs. maximum.

**Table 2. Seal Kit**

Item Number	Quantity	Description
23	2	O-ring
10	2	Spring
7	4	Poppets
31	1	O-ring
25	2	O-ring
17	2	O-ring
18	2	Back-up Ring
19	2	O-ring
20	2	O-ring
21	2	O-ring
22	2	O-ring
15	2	Wiper

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