

System drawings shown in this bulletin are for illustration purposes only. Refrigeration systems should only be serviced by a qualified technician. Always observe proper safety procedures when servicing a refrigeration system. For more information see the latest revision of Phillips Safety Bulletin SGRV.

### GENERAL INFORMATION

**Pressure Rating:** 300 psig (21 bar, gauge)

**Temperature Rating:** -20°F to 240°F  
(-29°C to 116°C)

The 701S Series low-side valves are flanged piston-type modulating valves used for ammonia and halocarbon applications. Valves in this series include the 701JRS, 701S, 701AS, 701BS and 701BXS. If the valve is applied to a halocarbon system, the suffix "F" is applied to the valve designation (example: 701JRSF).

The 701S Series valves meter high pressure liquid refrigerant into a low pressure vessel or evaporator. The 701S is controlled by a separate pilot float valve which responds to liquid level. The pilot float is most typically a 101 or 301E Series, although a 300H Series float valve may also be used.

When the pilot float valve is closed (indicating a high liquid level), the PTFE seat disc on the 701S piston is held closed against the valve seat by the high pressure liquid which flows above the piston through an orifice (Figure 1A). A spring, chosen for the specific application, provides additional closing force. When the float valve is open (indicating a low liquid level) the pressure above the piston bleeds to the low-pressure vessel. The reduction in pressure above the piston allows it to rise against the spring force, opening slots in the V-Ported metering plug. (Figure 1B) Note that the flow is downward through the valve port. When flow through the 701S restores the liquid level in the vessel, the float valve closes and the

pressure above the piston increases. This forces the piston downward, sealing the PTFE seat disc against the valve seat.

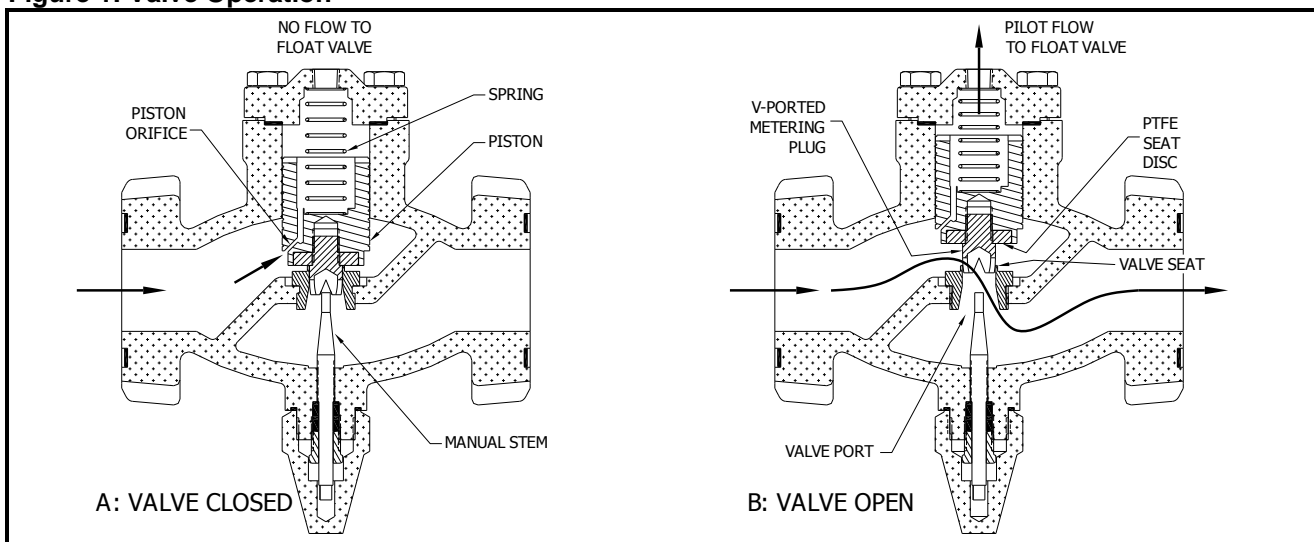
The 701S valve will modulate between fully open and closed, depending on the condition of the pilot float valve. The manual opening stem must be screwed fully outward for the valve to close completely.

### INSTALLATION INSTRUCTIONS

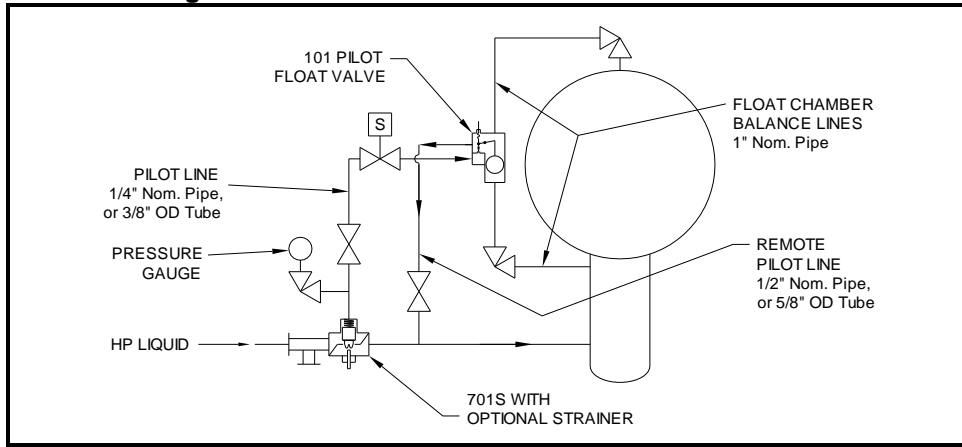
Typical valve installations are shown schematically in Figures 2 and 3. Several important features should be noted.

- Flow through the 701S valve should always be downward through the valve port. (See Figure 1)
- The pilot line **MUST** be either 3/8" OD copper tubing (halocarbon applications) or 1/4" nominal pipe (halocarbon or ammonia applications).
- The pilot line should include a shut-off valve, pressure gauge and gauge valve for diagnostics. (See Troubleshooting section, pages 3 & 4)
- The pilot line should include a solenoid valve to instantly close the 701S when the compressor shuts down.
- The remote pilot line **MUST** be either 5/8" OD copper tubing (halocarbon applications) or 1/2" nominal pipe (halocarbon or ammonia applications).
- A strainer upstream of the 701S will help ensure long, dependable service. See Table 1 for matching strainers.
- Always install in a horizontal pipe line with the pilot line port pointing up.

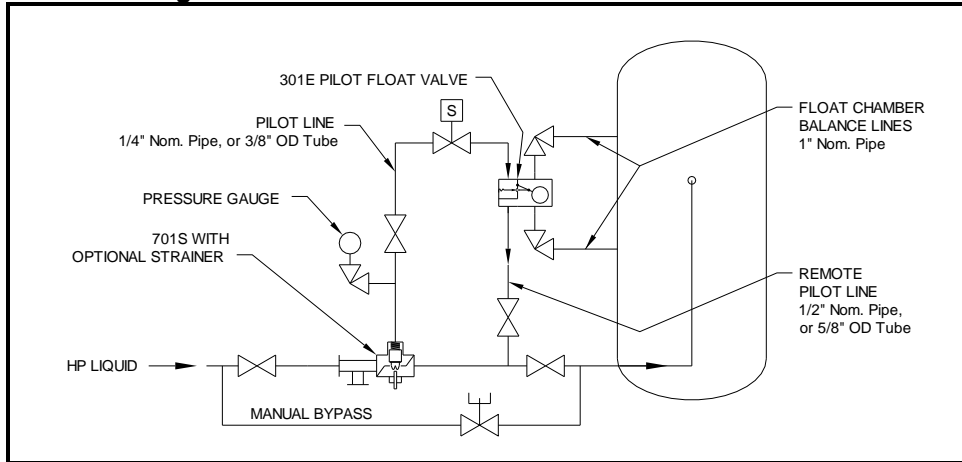
**Figure 1: Valve Operation**



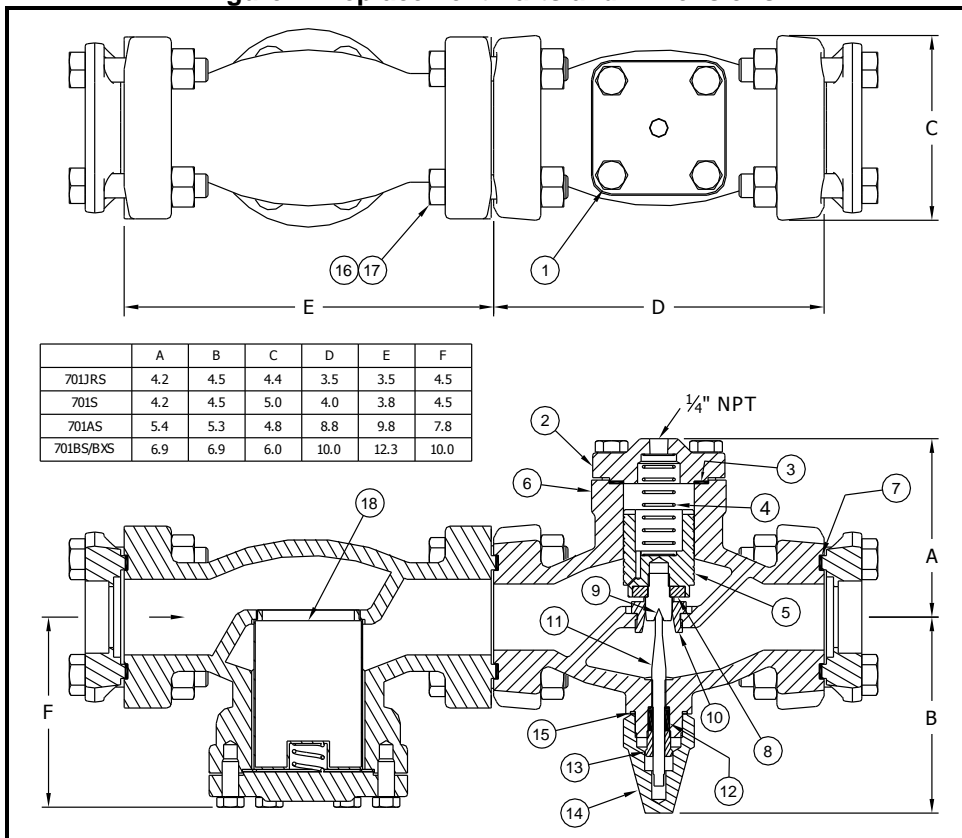
**Figure 2: 701S Installation with 101 Pilot Float Valve**



**Figure 3: 701S Installation with 301E Pilot Float Valve**



**Figure 4: Replacement Parts and Dimensions**



**Table 1: Replacement Parts**

Item #	Description	701JRS	701S	701AS	701BS	701BXS
1	Bonnet Screw	577 (4)	577 (4)	718 (4)	1459 (4)	1459 (4)
2	Bonnet	702JRS	702S	702AS	702BS	702BXS
3	Bonnet Gasket*	710JR	710	710A	710B	710B
4	Spring	See Valves & Accessories Book – Low Side Controls Section or Consult Factory				
5	Piston	704JR	704	704A	704B	700-4BXH
6	Valve Body	701JR-VB	701-VB	701AS-VB	701BS-VB	701BXS-VB
7	Flange Gasket*	506 (2)	725N (2)	73 (2)	326Y (2)	326Y (2)
8	Seat Disc*	703JR	703	703A	703B	703BXS
9	Metering Plug	Consult Factory				
10	Seat	706JR	706	706A	706B	--
11	Manual Stem	711	711	711A	711B	711B
12	Packing Ring	775	775	775	777BN	777BN
13	Gland	8	8	8	8B	8B
14	Seal Cap	714	714	714	714B	714B
15	Seal Cap Gasket	720	720	720	720B	720B
16	Flange Bolt	Valve without Strainer: 726B (2)	Valve without Strainer: 726 (2)	Valve without Strainer: 23 (8)	Valve without Strainer: 24A (8)	Valve without Strainer: 24A (8)
		Valve with Strainer: 726D (2)	Valve with Strainer: 726E (2)	Valve with Strainer: 23 (12)	Valve with Strainer: 24A (12)	Valve with Strainer: 24A (12)
17	Flange Nut	Valve without Strainer: 58 (2)	Valve without Strainer: 58 (2)	Valve without Strainer: 58 (8)	Valve without Strainer: 59 (8)	Valve without Strainer: 59 (8)
		Valve with Strainer: 58 (2)	Valve with Strainer: 58 (2)	Valve with Strainer: 58 (12)	Valve with Strainer: 59 (12)	Valve with Strainer: 59 (12)
-	Strainer	S701JRP	S701	S701A	S701B	S701B
18	Strainer Kit (Includes Filter Element & Gasket)	S701JR-SA	S701-SA	S701A-SA	S701B-SA	S701B-SA
-	*Spare Parts Kit (Includes Items 3, 7, 8)	K701JR	K701	K701A	K701B	-

**REPLACEMENT PARTS**

When contacting Phillips for replacement parts, have the complete valve model and serial number (See Figure 5: Valve Nameplate) available to ensure you receive the correct components. For example: “701JRSF-PGNFA” is a complete valve model, and “990123” or “E-12345” are complete serial numbers. Basic replacement parts are illustrated in Figure 4 and listed in Table 1.

**Figure 5: Valve Nameplate**



**SERVICE INSTRUCTIONS**

The metering plug is threaded tightly into the piston and secured with thread locking compound. Be careful not to damage the piston surface when replacing a metering plug. Always use thread locking compound when installing the replacement plug. If the piston needs replacing, we advise you to order a new seat disc and metering plug as well. These parts can be assembled in our factory before shipment upon request.

**TROUBLESHOOTING**

Always be sure flow through the valve is in the proper direction. An arrow is affixed to each valve at the time it is manufactured. This arrow may not be visible in all installations. To ensure the 700H is installed properly, note the following.

- Flow through the 701S valve should always be downward through the valve port. (See Figure 1)
- Contact Phillips if you are unsure which direction the valve is supposed to be installed

**Valve Chatters:** Chattering, banging and/or general vibrations can be caused by an over-sized metering plug opening and closing rapidly in an attempt to satisfy a low refrigeration load. Consider using a smaller capacity plug.

**Spring Broken:** A broken spring in a 701S valve that is less than a few years old can also indicate an over-sized metering plug. Continual, rapid opening and closing to satisfy a small load will fatigue the spring. When replacing the spring, also consider replacing the metering plug with one having a smaller capacity.

**Poor Liquid Level Control:** Many problems with the operation of the pilot-operated 701S should be diagnosed in conjunction with the pilot float valve. Figures 2 & 3 show schematically how these valves operate together.

## **TROUBLESHOOTING (continued)**

As the liquid level falls in the vessel, the float valve opens to bleed flow from the top of the 701S. The pressure above the piston drops and the piston rises, opening the valve port and allowing flow. Conversely, as the liquid level rises, the pilot float valve closes and pressure above the piston rises, closing the 701S port with spring-assist. When the table below indicates float valve repairs are needed, refer to the specific float valve service bulletin.

### **Liquid Level Too High**

A high liquid level may be due to a failure of the float valve to close. Check the pilot line pressure gauge. If the pressure is lower than that upstream of the 701S, it indicates the float valve may not be fully closed.

If closing the shut-off valve in the pilot line causes the pilot pressure to increase and the 701S to close, the problem is with the float valve. Possible reasons for float valve malfunction include:

- Float valve needle/seat worn. Repair float valve.
- Float valve parts jammed. Repair float valve.
- Float ball filled with liquid. Replace float ball.

If closing the shut-off valve in the pilot line does not close the 701S, and the manual stem is fully backed out of the valve, the problem may be:

- A broken spring may have jammed the 701S in the open position. Replace spring. (A broken spring may indicate an oversized metering plug)
- The 701S seat disc may be damaged or worn and will not seal. Replace seat disc.
- The 701S piston may be jammed by debris.
- The 701S piston may be worn sufficiently so that it tilts and jams in the bore. Replace the piston.

### **Liquid Level Too Low**

A low liquid level may be due to one or more of the following:

- Improperly configured 701S. Refer to the *Phillips Valve Identifier* bulletin and *Valves & Accessories Book - Low Side Controls Section* to confirm that the spring and orifice are correct for the prevailing operating conditions.
- Too-small float valve orifice. Refer to the *Valves & Accessories Book - Low Side Controls Section* to determine what the correct float valve orifice size is. Then confirm the correct float valve is installed using the *Phillips Valve Identifier* bulletin to check the orifice size.
- Too-small pilot line diameter. Confirm that the pilot line and the remote pilot line piping are sized per Figures 2 and 3.

On older installations the piston may wear, allowing excessive flow to raise the pressure above the piston. Proper pressure above the piston can be confirmed as follows. First determine which spring is installed inside the valve using the *Phillips Valve Identifier* bulletin. Then refer to Table 2 to determine the pressure drop required between the valve inlet and the pilot line pressure gauge.

**Table 2: Pressure Drop Needed to Fully Open Valve**

Valve Number	Pressure Drop Available Across Valve (PSI)				
	10-20	20-40	40-60	60-100	100-160
<b>701JRS 701S</b>	705-5L	705-10L	705-20L	705-35R	705-60R
<b>701AS</b>	705A-10L	705A-20L	705A-30L	705A-60L	705A-110L
<b>701BS 701BXS</b>	705B-10L	705B-30L	705B-60L	705B-100L	705B-160L
<b>Pilot Pressure Drop to Open (PSIG)</b>	5-6	10-12	16-20	30-40	50-70

For example if a 701AS valve has a 705A-60L spring, the pressure measured in the pilot line would need to be 40 psi lower than upstream for the valve to open fully. If the upstream pressure is 180 psig, the pressure gauge should read no higher than 140 psig when the float valve is open. Higher pressure indicates one of the following conditions:

- The piston has worn, allowing excess flow to the cavity above.
- The pilot line or float valve orifice is partially blocked, preventing proper flow.
- Operating conditions have changed, and the original spring is no longer the correct choice for the application.