

3-Way Valves

INSTALLATION AND SERVICING INSTRUCTIONS
SD-114 / 82015



GENERAL INFORMATION

Installation Precautions

1. Do not attempt installation of the valve before pumping the entire system down. Make absolutely certain system pressure is no more than 2 or 3 psi above atmospheric pressure.
2. The solenoid coil must not be energized unless it is installed on the valve. To do so would cause coil to overheat and burn out.
3. The solenoid coil should be fused in accordance with local codes.
4. If a service valve is installed ahead of a solenoid valve, it should be closed during service procedures. **Do not use a solenoid valve as a safety shutoff while making repairs to the system. Be sure there is no liquid in the line between the service and solenoid valves when they are in the closed position that could create dangerous hydraulic pressures.**
5. Do not twist the valve assembly by pulling or pushing on the enclosing tube or coil assembly.
6. Do not carry a coil assembly or complete valve by the coil leads. This could damage the coil and cause a coil burnout. Do not carry the valve by the pilot tube. This could cause damage to the flare (SAE) joint, creating an external leak.
7. Electrically ground the valve body. Typically this is done through the fluid piping or the electrical conduit.
8. Before energizing the valve, verify that the supply voltage and frequency matches the solenoid coil marking.

Soldering Precautions

Solder connections on Sporlan Heat Reclaim Valves are copper. Any of the commonly used types of solder are satisfactory with these materials. Regardless of the type of solder used, it is important to avoid overheating the valve. **Extreme care should be taken when brazing connections to avoid damage to internal synthetic parts.** The torch tip should be large enough to avoid prolonged heating of the connection during the brazing operation. Overheating can also be minimized by directing the flame away from the valve body. As an extra precaution, a wet cloth may be wrapped around the body. **Cool body thoroughly**

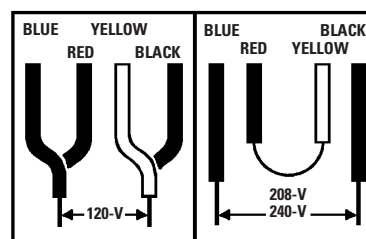
after making each connection. As an extra precaution, a wet cloth may be wrapped around the body during the soldering operation.

CAUTION: When installing 1/4" flare pilot line connections, flare body **MUST** be supported with another wrench. On the B5D valve, the pilot valve body **MUST** be supported when tightening the 1/4" flare connection. **Failure to do either of the above may cause leaks or valve damage.**

Wiring

Check the electrical specifications of the coil to be sure that they correspond to the available electrical service. See page 4 for typical wiring schematics for single compressor systems.

The 1/2" BX conduit connection of junction box on the coil of Heat Reclaim Valves may be rotated to any position by loosening the coil screw. Valves with four-wire dual voltage coil have a wiring diagram decal (see diagram below) on the coil housing or bracket. This illustrates which wires to connect for either 120, 208, or 240 volt operation. Wiring and fusing (when used) must comply with prevailing local and national wiring codes and ordinances.



Transformer Selection

Coil Kit	24v/50-60c		120v/50-60c		240v/50-60c		Transformer Rating Volt-Amperes
	Current Amperes						
	In-rush	Holding	In-rush	Holding	In-rush	Holding	
MKC-1	1.9	.63	.39	.14	.19	.09	60
MKC-2	3.1	1.4	.60	.26	.31	.13	100

Temperature Ratings

Basic Valve Type	Coil Type	Ambient Temp. Rating	Max. Fluid Temp. Rating	Min. Fluid Temp. Rating
(S)8D(-HP), (S)12D(-HP), (S)16D (11-03 & after), 10G	MKC-1	120°F 49°C	240°F 116°C	-40°F -40°C
16D (10-03 & before) 180	MKC-2	120°F 49°C	240°F 116°C	-40°F -40°C

Suitable for use with all Halogenated refrigerants.



ENGINEERING YOUR SUCCESS.

Replacement Part Kits for (S)8D, (S)12D, (S)16D, (S)8D-SC, (S)12D-SC, (S)16D-SC, 10G

The parts kit for the 3-Way Heat Reclaim Valves includes the piston assembly. The Bleed “B” and Non-Bleed “C” versions of the 3-Way valves use different pistons; therefore, different parts kits are required.

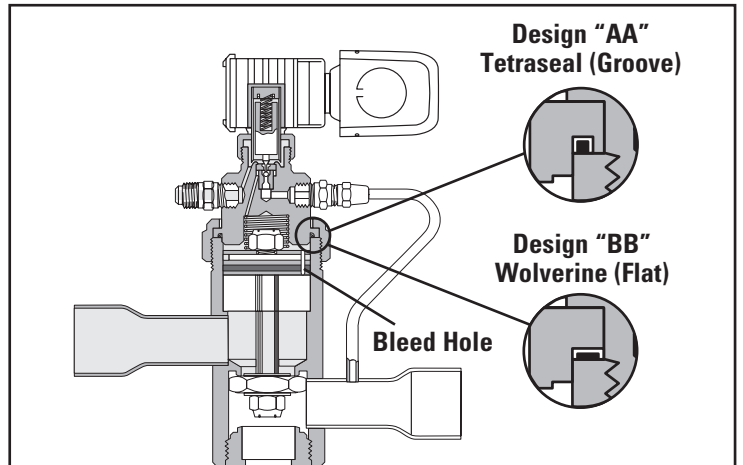
CAUTION: If you are replacing the internal parts on an older “B” style valve with split piston rings, you must use the existing piston and piston rings. **Do not use the new piston assembly supplied with your parts kit.**

The parts kits contain gaskets for both of two different pilot valve designs shown below. Use only the gasket that matches the design, as shown.

3-Way Valve	Manufactured with Split Cast Iron Piston Rings and Honed Body Bore
8D7B	7-96 & Earlier
8D9B	7-96 & Earlier
12D11B	1-94 & Earlier
12D13B	1-94 & Earlier
16D17B	4-91 & Earlier

The Tetraseal, Part Number 641-6 is a flexible gasket and is used on design “AA” valves. These valves can be identified by the square groove on the bottom of the pilot valve.

The bottom of the pilot valve on the design “BB” valve is machined flat to accommodate the metal “Wolverine” gasket Part Number 14000-5.



Listed by Underwriters’ Laboratories, Inc. Guide-Y10Z File No. MH4576
 Listed by Canadian Standards Association Guide-440-A-0 File No. 19953

REPLACEMENT PARTS KITS

Valve Type	Kit Number	Description of Contents
Heat Reclaim Valves / Split Condenser Valves		
(S)8D7B / (S)8D9B(-HP)	KS-8DB	1 Pilot Body Gasket 1 Stem and Seat Assembly 1 Piston Assembly* 1 Lower Body O-Ring 1 Lower Body Gasket (8D ONLY) 1 Upper Valve Seat (12D & 16D ONLY)
(S)8D7C / (S)8D9C(-HP)	KS-8DC	
(S)8D9B-SC	KS-8DB-SC	
(S)8D9C-SC	KS-8DC-SC	
(S)12D11B / (S)12D13B(-HP)	KS-12DB	
(S)12D11C / (S)12D13C(-HP)	KS-12DC	
(S)12D11B-SC / 12D13B-SC	KS-12DB-SC	
(S)12D11C-SC / 12D13C-SC	KS-12DC-SC	
16D17B	KS-16DB	1 Stem and Seat Assembly 1 Upper Valve Seat 1 Piston Assembly* 1 or 2 Lower Body O-Ring (16D Valves dated 6-06 and after are welded construction. Stem and Seat Assembly Kits are not available.)
(S)16D17B (12-03 and after)	KS-16DB-A	
16D17C	KS-16DC	
(S)16D17C (12-03 and after)	KS-16DC-A	
16D17B-SC	KS-16DB-SC	
(S)16D17B-SC (12-03 and after)	KS-16DB-SC-A	
16D17C-SC	KS-16DC-SC	
(S)16D17C-SC (12-03 and after)	KS-16DC-SC-A	
Pilot Assembly		
8D / 12D(-HP)	KS-8D / 12DP-HP	1 Enclosing Tube Tetraseal 1 Coil Housing Screw 1 Pilot Valve Assembly
S8D / S12D(-HP)	KS-S8D / S12DP-HP	
(S)8D-SC & 12D-SC	KS-8D / 12DP-SC	1 Coil Housing Screw 1 Pilot Valve Assembly
16D	KS-16DP	
(S)16D (12-03 and after)	KS-16DP-A / KS-S16DP-A	
16D-SC	KS-16DP-SC	
(S)16D-SC (12-03 and after)	KS-16DP-SC-A / KS-S16DP-SC	
Hot Gas Defrost Valves		
10G79B	KS-10G	1 Enclosing Tube Gasket, 2 Pilot Assembly Gaskets 1 Plunger Assembly, 1 Pushrod 1 Seat Assembly, 1 Piston Assembly, 1 Valve Spring
10G711A, B, C		
10G713		
Pilot Assembly		
10G-B	KS-10GP-B	2 Pilot Assembly Gaskets 1 Pilot Valve Assembly 1 Coil Housing Screw, 1 Bottom Plate
10G-C	KS-10GP-C	
Enclosing Tube Kits		
10G, (S)16D, (S)16D-SC (12-03 and after)	KE-6	1 Enclosing Tube Assembly 1 Enclosing Tube Gasket 1 Coil Housing Screw
16D/16D-SC (before 12-03)	KE-9	
8D/12D, 8D-SC/12D-SC	KE-8D/12D	

* Use existing piston on valves with honed bore. See caution note on page 2.

The (S)8D, (S)12D, and (S)16D cannot be changed to a “-SC” version nor can a (S)8D-SC, (S)12D-SC, (S)16D-SC be changed to a “non-SC” version.

Recommended Torque

Valve Series	Enclosing Tube Locknut	Pilot Valve Assembly Locknut	Lower Body Locknut	Body Flange Cap Screw	Coil Screw
S8D, S8D-HP, 8D, 8D-SC, 8D-HP, S8D-SC	10-15	60-65	25	—	2.3
S12D, S12D-HP, 12D, 12D-SC, S12D-SC	10-15	60-65	—	15-18	2.3
16D, 16D-SC	30-35	***	—	20-24	2.3
S16D, S16D-SC, 16D, 16D-SC (12-03 and after)	10-15	60-65	—	20-24	2.3
10G	10-15	60-65	60-65	—	2.3
180	—	—	—	—	2.3

*** The 16D pilot assembly is connected to the body with a pipe connection. Apply a light coat of #242 (blue) Loctite to the male pipe threads and torque to 30-60 ft.-lb.

3-WAY HEAT RECLAIM VALVES

Types B5D, SB5D, 8D, 8D-HP, S8D, S8D-HP, 12D, 12D-HP, S12D, S12D-HP, 16D, S16D

Installation

PIPING SUGGESTIONS

Valves may be installed in a horizontal or vertical position. The coil must be level with or above the valve body. Install Heat Reclaim Valves so the connections are in the proper flow direction.

Figure 1 shows piping schematics only to illustrate the general installation of the Heat Reclaim Valves. Sporlan recommends that recognized piping

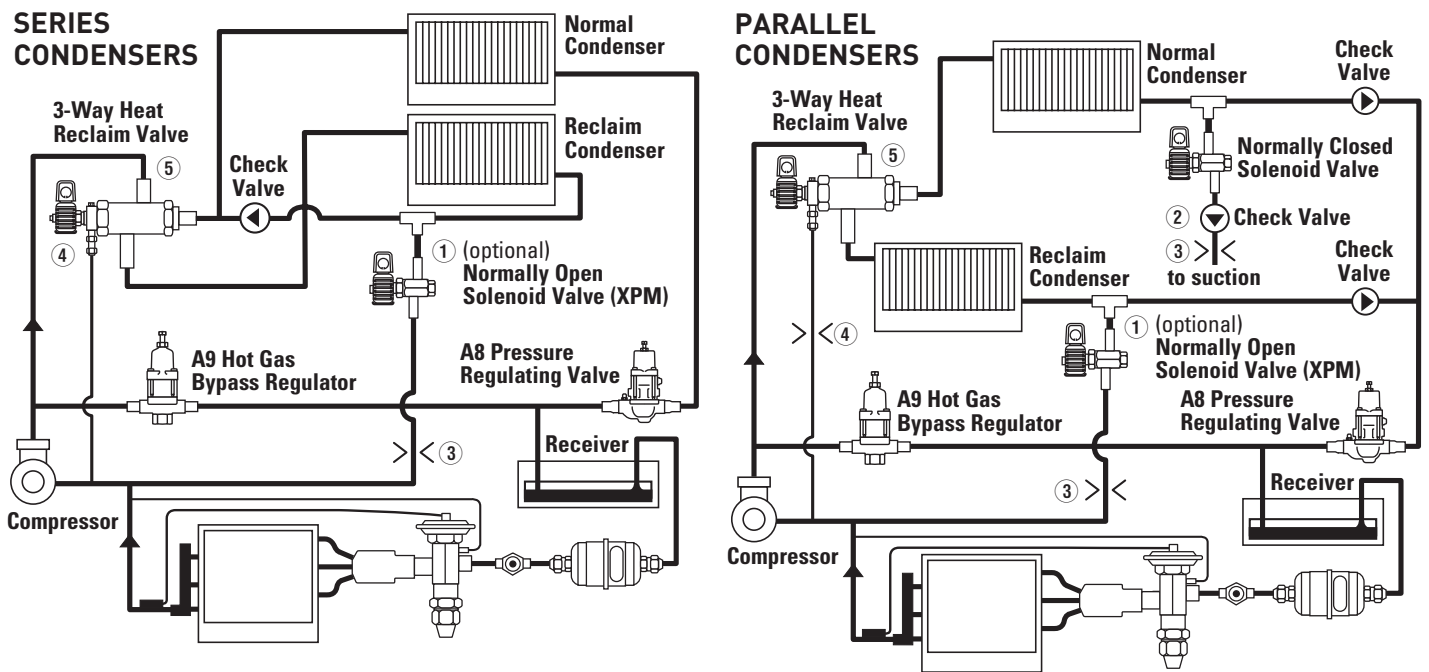
references be consulted for assistance in piping procedures. Sporlan is not responsible for system design, any damage resulting from system design, or for misapplication of its products.

Proper support of heat reclaim valves is essential. Concentrated stresses resulting from thermal expansion or compressor vibrations can cause fatigue failure of tubing, elbows and valve fittings. **Fatigue failures can also result from vapor propelled liquid slugging, and condensation induced shock. The use of piping brackets close to each of the three-way valve fittings is recommended.**

Head Pressure Control for Reclaim

Typical Piping Schematics

Figure 1



- ① Use normally open solenoid valve and piping if pump out is required and "C" model Heat Reclaim Valve is used, see note 4. Or, if a normally closed valve can be used then use XSP-10. It has a 0.031" orifice, this may eliminate use of cap tube or Sporlan Restrictor 2449-004.
- ② This check valve required if lowest operating ambient temperature is lower than evaporator temperature.
- ③ Restrictor 2449-004 may be required to control pump out rate on inactive condenser.
- ④ Pilot suction line must be open to common suction whether or not Heat Reclaim Coil is installed at time of installation and regardless of Heat Reclaim Valve model/type.
- ⑤ Proper support of heat reclaim valves is essential. Concentrated stresses resulting from thermal expansion or compressor vibrations can cause fatigue failure of tubing, elbows and valve fittings. Fatigue failures can also result from vapor propelled liquid slugging, and condensation induced shock. The use of piping brackets close to each of the three way valve fittings is recommended.

Systems

When employing heat reclaim on a refrigeration system, the addition of head pressure controls is important not only to maintain liquid pressure at the expansion valve inlet, but also to assure the availability of quality hot gas at the reclaim heat exchanger.

NOTE: To calculate additional charge required for head pressure control, see Bulletin 30-20.

Service

TYPICAL MALFUNCTIONS

There are only three possible malfunctions:

1. Coil burnout.
2. Failure to shift to Reclaim Mode.
3. Failure to shift to Normal Mode.

Each typical malfunction is discussed below:

COIL BURNOUT

Coil burnouts are extremely rare unless caused by one of the following:

1. Improper electrical characteristics.
2. Continuous over-voltage, more than 10%.
3. Under-voltage of more than 15%. This applies only if the operating conditions are such that the reduced MOPD causes stalling of the plunger, which results in excessive current draw.
4. Incomplete magnetic circuit due to the omission of the plunger assembly during reassembly.
5. Mechanical interference with movement of plunger which may be caused by a deformed enclosing tube.
6. Coil energized while not installed on a valve.

FAILURE TO SHIFT TO RECLAIM MODE

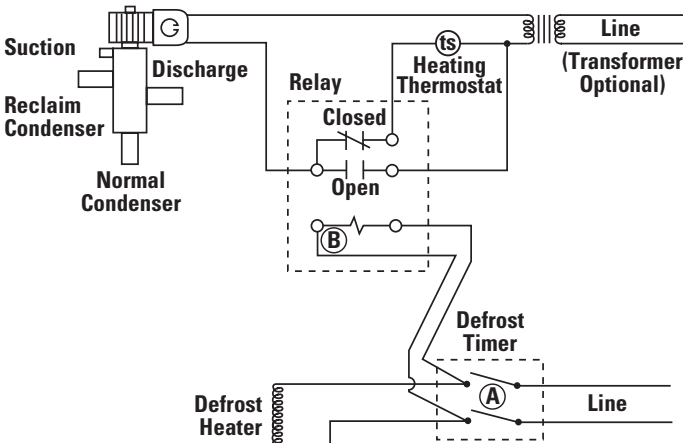
1. Coil burnout (see Coil Burnout section on page 4).
2. MOPD greater than specifications.

Typical Wiring Schematics & Electrical Considerations

SINGLE COMPRESSOR SYSTEMS

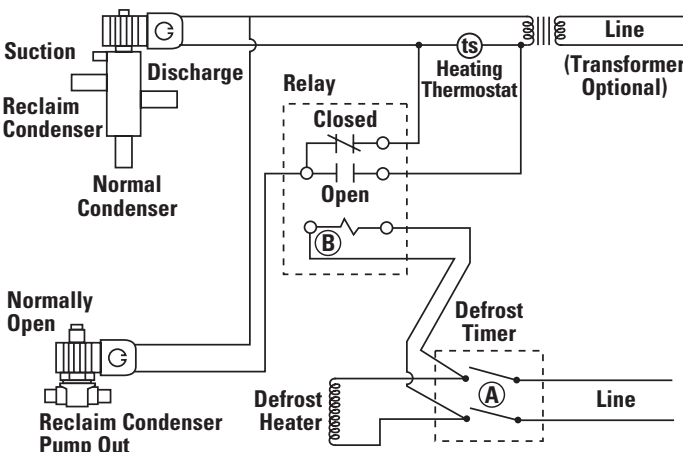
Wiring of single compressor units may require the use of relays to prevent high to low side bleed during periods when the compressor is not circulating refrigerant. This is necessary to prevent refrigerant migration to the low side of the system where it may condense into liquid and damage system components when the compressor restarts.

“B” Type - OFF CYCLE ELECTRIC DEFROST SYSTEM



Defrost timer (A) energizes relay coil (B) to close normally open contact. This bypasses the (ts) when defrosting to energize the heat reclaim coil and shut off the valve's bleed to suction.

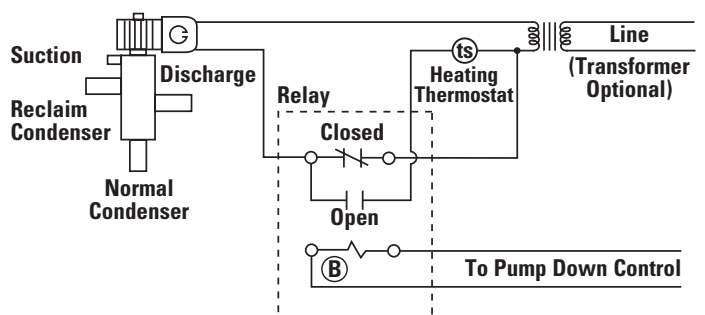
“C” Type - OFF CYCLE ELECTRIC DEFROST SYSTEM



Defrost timer (A) energizes relay coil (B) to close the normally open contacts. This bypasses the (ts) when defrosting to close the pump out solenoid and shut off the valve's pump out to suction.

It is always a good idea to check with the equipment manufacturer for recommendations on the application of heat reclaim on the specific type of equipment. It is necessary to adhere to local piping and electrical codes that apply to each application. For complete product information, refer to Bulletin 30-20.

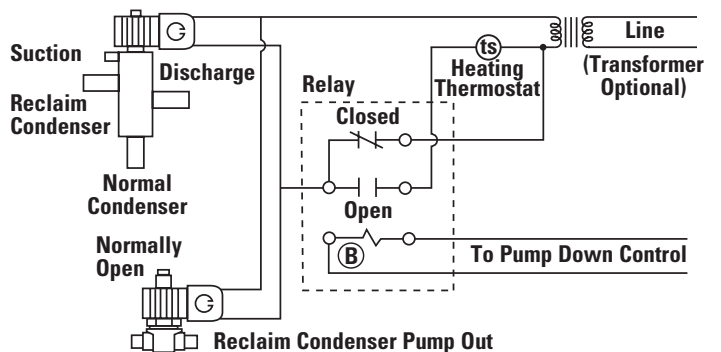
“B” Type - PUMP DOWN or ELECTRIC DEFROST with PUMP DOWN (unit off)



When the pump down control is energized, relay coil (B) is energized. This allows the heating (ts) to control the 3-Way Heat Reclaim Valve operation.

When the pump down control is de-energized, the normally closed contact is closed. This bypasses the heating (ts) to energize the coil and shut off the valve's bleed to suction.

“C” Type - PUMP DOWN SYSTEM (unit off)



When the pump down control is energized, relay coil (B) is energized. This allows the heating (ts) to control the 3-Way Heat Reclaim Valve operation.

When the pump down control is de-energized, the normally closed contact is closed. This bypasses the heating (ts) to energize the reclaim condenser pump out solenoid and shut off the valve's pump out to suction.

3. Restricted high pressure pilot connection.
4. May not have allowed sufficient time to pump out the reclaim coil while in the normal mode.

FAILURE TO SHIFT TO NORMAL MODE

1. Stray voltage holding plunger up.
2. Restricted, closed service valve, or capped suction connection on pilot.

3-WAY SPLIT CONDENSER VALVES

Types 8D-SC, S8D-SC, 12D-SC, S12D-SC, 16D-SC, S16D-SC

The Split Condenser Valves are a relatively simple modification of the standard Heat Reclaim Valves. Figure 3 shows that the Split Condenser Valves only use the upper port; the lower port is always open. The location of the seat disc has been optimized such that when the valve is in the two condenser mode, the flow is split evenly between the two condensers.

The pilot valve is different from the standard heat reclaim valve. It is normally open to high pressure.

Installation

ELECTRICAL

Energize for condenser A operation. De-Energize for both A & B condenser operation. Install Split Condenser Valves so the connections are in the proper flow direction as shown in Figure 3.

PIPING SUGGESTIONS

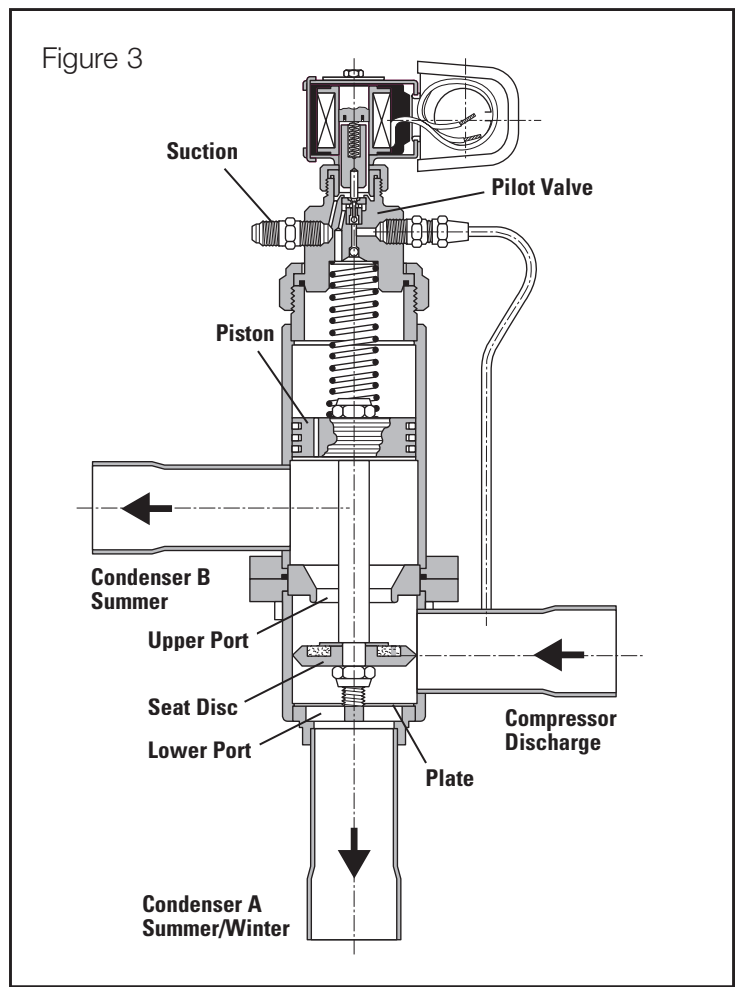
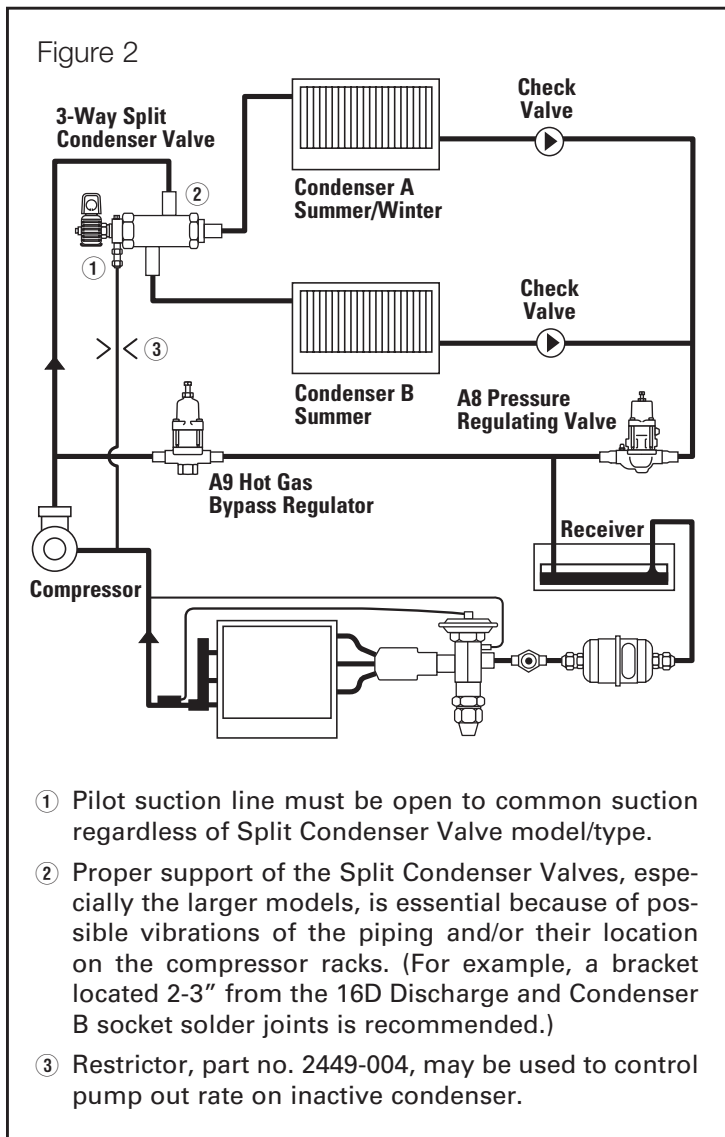


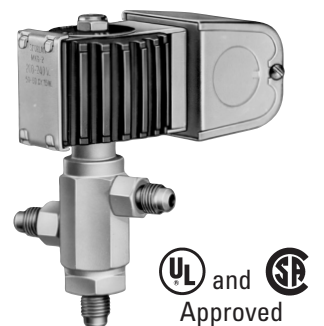
Figure 2 shows a piping schematic to illustrate the general installation of the Split Condenser Valves. Sporlan recommends that recognized piping references be consulted for assistance in piping procedures. Sporlan is not responsible for system design, any damage resulting from system design, or for misapplication of its products.

Proper support of Split Condenser Valves, especially the larger models, is essential because of possible vibrations of the piping and/or their location on the compressor racks. (For example, a bracket located 2 to 3 inches from the 16D Discharge and Condenser B socket solder joints is recommended.)

SOLENOID PILOT CONTROL VALVE

Type 180

The Type 180 has two ports in the valve body — one high pressure and one low pressure. When the solenoid coil is energized, the plunger moves upward sealing off the high-pressure port. With the high pressure excluded from the pilot control, true suction pressure acts on the underside of the expansion valve diaphragm through the equalizer line and the low pressure port. This is illustrated in Figure 4. When the solenoid coil is de-energized, the low pressure port is closed, thereby closing the equalizer line from the valve to the suction line. The high pressure port is open and liquid line pressure is applied to the underside of the thermostatic expansion valve diaphragm. This high-side pressure



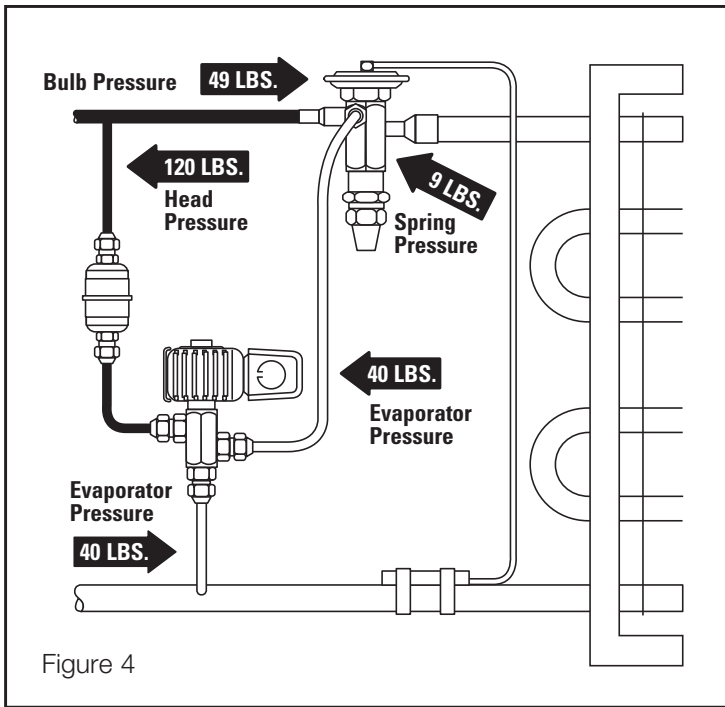


Figure 4

instantly overcomes the bulb pressure and supplements of the valve spring, immediately closing the port of the expansion valve.

Upon re-energizing the solenoid coil, the low pressure port of the 180 opens and allows instantaneous relief of pressure under the thermostatic expansion valve diaphragm and normal operation of the thermostatic expansion valve.

RECOMMENDATIONS

All refrigeration and air conditioning systems should be protected from moisture and other system contaminants by the Sporlan Catch-All® Filter-Drier. When using the Type 180 Solenoid Pilot Control, the expansion valve is used to shut off the liquid line in place of a standard liquid line solenoid valve. Therefore, it is essential that the system be free of these contaminants which might prevent the thermostatic expansion valve from seating tight.

The Type 180 may be installed either upright or on its side. However, it should not be mounted with the coil housing below the valve body.

INSTALLATION

In addition to first cost, flexibility of the Type 180 offers an installation savings. Standard 1/4" soft copper tubing is the only tubing required for the three valve connections. A C-032-F Catch-All Filter-Drier is furnished with each Type 180, since protection of the valve ports from system contaminants is important for proper operation.

ELECTRICAL

For normal summer operation of air conditioning systems, the Type 180 Solenoid Pilot Control may

Specifications - MKC-2 Coil

Type 180		Standard Coil Ratings	
Connections - 1/4 SAE Flare		Volts/Cycles	Watts
MOPD psi	300 AC	24/50-60	15
	225 DC	120/50-60	
Maximum Rated Pressure - psi 500		208-240/50-60	
		120-208-240/50-60	

be energized through any actuating device such as a thermostat, a micro-switch, or a manual switch. The compressor can be operated separately through the magnetic starter, wired with a low pressure cut-out switch for pump down control.

If it is necessary to shut down a system for a long period, the main liquid line or receiver valve should be closed before de-energizing the entire system at the main electrical service switch. This will protect against compressor floodback if any unusual pressure conditions occur during shutdown.

SERVICING SUGGESTIONS

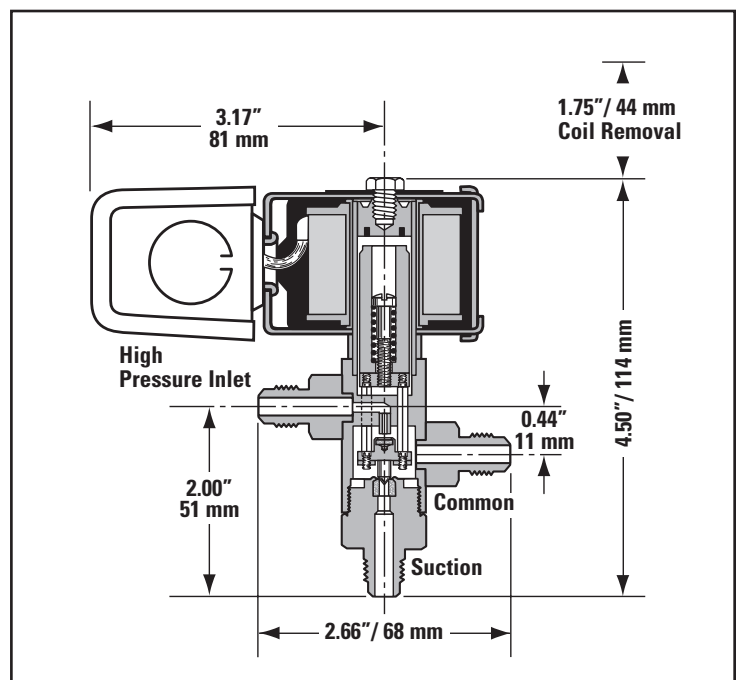
The Type 180 Solenoid Pilot Control cannot be taken apart in the field. To properly analyze suspected trouble on an installation, it is advisable to install a pressure gauge by means of a "T" fitting in the external equalizer connection to the thermostatic expansion valve.

By successively opening and closing the circuit to the Pilot Control only, with the refrigeration system and circulating fans or pumps in operation, variations approximating condensing pressure and suction pressure should be observed on this gauge.

A. If pressure does not build up rapidly to condensing pressure when the Pilot Control is de-energized, proceed as follows:

1. Make certain that the electrical circuit has been broken to the Pilot Control. Since the actuating device is generally at a remote point, we suggest that a means for temporarily interrupting the current be made near the valve installation to facilitate servicing the equipment.
2. Check to see that no restriction exists and pressure is ahead of both the Solenoid Pilot Control and the C-032-F Catch-All Filter-Drier.
3. Check to ascertain that the low pressure port is closing tightly. A leak in many instances can be detected by a much cooler line from the Pilot

Dimensions - Inches (mm)



Control to the suction line than the liquid inlet line of the control. A further check can be made by removing the suction line connection at the Pilot Control and temporarily plugging it. No leak should be indicated at the suction fitting of the Pilot Control.

4. In the event that full liquid line pressure is available and the bottom port is **NOT** leaking, then it is necessary to replace the Pilot Control valve.

B. If the Pilot Control functions satisfactorily, then the thermostatic expansion valve should be checked. Various causes could be the reason for operation difficulties: pushrod packing leak, seat leak, diaphragm failure, and several others. For a complete service analysis on thermostatic expansion valves, refer to Bulletin 10-11.

3-WAY HOT GAS DEFROST VALVES

Types 10G79B, 10G711B, 10G711C

Installation

CAUTION: The valve body must be wrapped with a wet cloth while soldering to avoid damage to synthetic internal parts. While the valve's steel body construction will help avoid overheating of internal parts due to conduction, convection of heat up through the tubing and valve body while making bottom connections can damage the internal parts. If possible, bench assemble the valve utilizing stub tubes in a horizontal plane. Cool the valve body thoroughly after making each connection.

Service

Service parts for these valves may be ordered through your local Sporlan wholesaler.

If a pilot assembly kit is required, note that they – unlike the internal parts kits – are not interchangeable. For a list of replacement parts kits, see table, page 3.

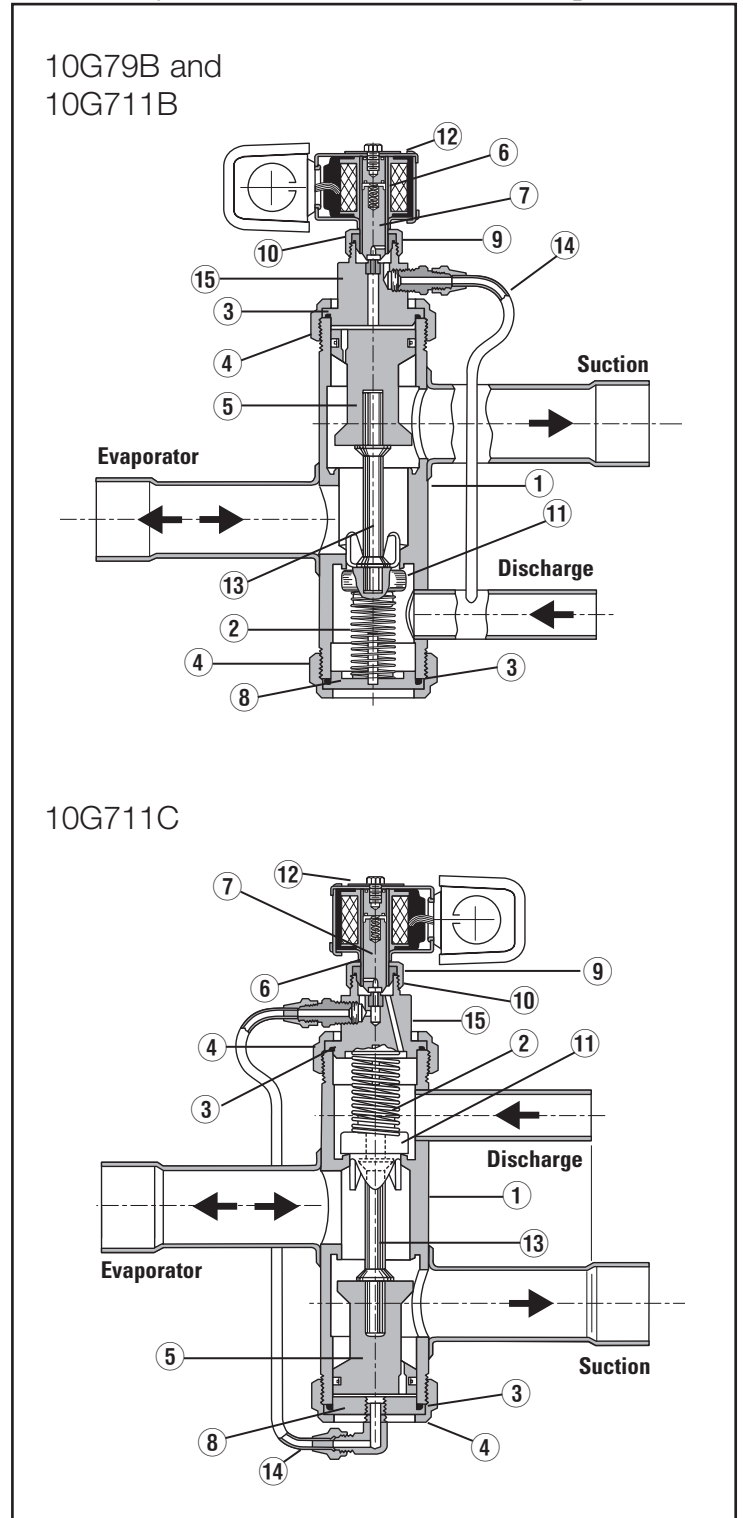
DISASSEMBLY

1. Disconnect the coil lead wires and remove the coil assembly ⑫.
2. Remove the enclosing tube locknut ⑩ to inspect the plunger assembly ⑦.
3. Loosen and disconnect the pilot tube ⑭ at the flare nut.
4. Loosen the suction end locknut ④ using a pipe wrench or other suitable wrench. Remove the pilot assembly ⑮ from the body.
5. Loosen the discharge end lock nut ④, but use care to prevent damaging the parts. Remove the locknut ④, bottom cap assembly ⑧, valve spring ② and seat assembly ⑪.
6. Slide the piston ⑤ up and out of the valve body bore.
7. Inspect the piston ⑤ and seat assembly ⑪ for damage. Replace all tetraseals or gaskets ③ ⑨ if valve has been in service.

OIL TETRASEALS and GASKETS BEFORE INSTALLATION.

REASSEMBLY

1. As a unit, install from the bottom of the body assembly ①: 10G79B, 10G711B – pushrod ⑬,



Item	Part Name
①	10G79 Body Assembly 10G711 Body Assembly
②	Valve Spring
③	Tetraseal (641-6) or Gasket 14000-5*
④	Locknut
⑤	Piston
⑥	Enclosing Tube Assembly
⑦	Plunger Assembly
⑧	Bottom Cap Assembly
⑨	Tetraseal (641-1) or Gasket 14000-1*
⑩	Enclosing Tube Locknut
⑪	Seat Assembly
⑫	Coil Assembly (MKC-1)
⑬	Pushrod
⑭	Pilot Tube
⑮	Pilot Assembly

*Part is available separately.

- seat assembly ⑪, valve spring ②, tetraseal ③, bottom cap assembly ⑧. **10G711C** – pushrod ⑬, piston ⑤, bottom cap assembly ⑧. Check center shaft adjustment by looking into the body from the top. Push down on the pushrod ⑬ to realign if necessary.
2. Install the bottom locknut ④ and tighten with a pipe wrench or torque wrench to 50-60 foot-pounds torque. This must be leak tight. Do not overtighten.
 3. From the top of the body assembly ① install: **10G79B, 10G711B** – piston ⑤ in body bore, compress the piston ring and slide the piston ⑤ all the way into the bore. **10G711C** – seat assembly ⑪, valve spring ②.
 4. Install the pilot assembly ⑮ on the body assembly ① and tighten the top locknut ④ with a pipe wrench or torque wrench to 50-60 foot-pounds torque. This must be leak tight. Do not overtighten.
 5. Connect the pilot tube ⑭ flare nut(s) and tighten to 80 inch-pounds torque. This must be leak tight. Do not overtighten.
 6. Install the plunger assembly ⑦, enclosing tube assembly ⑥, and enclosing tube locknut ⑩. Tighten the enclosing tube locknut to 10-15 foot-pounds torque.
 7. Reinstall the coil assembly ⑫ and connect the lead wires.

⚠ **WARNING – USER RESPONSIBILITY**

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