

Pneumatic Division

Richland, Michigan USA

www.parker.com/pneumatics



F VALVE SERIES

Bulletin Number			Bulletin Description
☐	V402EP	Rev. 8	15mm Solenoid Replacement Kits
☐	V410EP		F3 Installation & Operating Instructions
☐	V411DP		F3 Valve Body, Installation & Service Instructions
☐	V412DP		F3 Solenoid, Installation & Service Instructions
☐	V413DP		F3 Manifold, Installation Instructions
☐	V414CP		F3 Subbase, Installation Instructions
☐	V415CP		F3 Sandwich Flow Controls, Installation Instructions
☐	V416CP		F3 Sandwich Regulators, Installation & Operating Instructions
☐	V417DP		F3 Sandwich Regulators, Service / Conversion Instructions
☐	V418EP		Collective Wiring Manifold, Installation Instructions
☐	V419DP	Rev. 5	F3 Manifold Bases with Interconnect Wiring, Installation & Service Instructions
☐	V430DP		F5 Installation & Operating Instructions
☐	V431BP		F5 Valve Body, Installation & Service Instructions
☐	V432BP		F5 Solenoid, Installation & Service Instructions
☐	V433CP	Rev. 4	F5 Manifold, Installation Instructions
☐	V434BP	Rev. 3	F5 Subbase, Installation Instructions
☐	V435BP		F5 Sandwich Flow Controls, Installation Instructions
☐	V436BP		F5 Sandwich Regulator, Installation & Operating Instructions
☐	V437BP		F5 Sandwich Regulator, Service / Conversion Instructions
☐	V438CP		F3, F5 Manifold with Flexboard - Option D & E, Installation Instructions
☐	V440P	Rev. 3	F Valve, Installation & Service Instructions
☐	V441BP		F Valve Service, Installation & Service Instructions
☐	V443P		F Manifold, Installation & Service Instructions
☐	V445P		F Sandwich Flow Control, Installation & Service Instructions
☐	V446P		F5 Sandwich Regulators, Installation & Service Instructions
☐	V447P	Rev. 1	F6, F7 Sandwich Regulators, Installation & Service Instructions
☐	V448BP	Rev. 3	F Manifold Base with Interconnect Wiring, Installation & Service Instructions
☐	V449P		F Selector Regulator, Installation & Service Instructions
☐	V476BP	Rev. 6	F6 Sandwich Regulator, Installation & Service Instructions
☐	V486BP	Rev. 4	F7 Sandwich Regulator, Installation & Service Instructions
☐	Safety Guide		PDN Safety Guide



Pneumatic Division
Richland, Michigan 49083

Service Instructions:
V402EP

Solenoid Replacement Kits

ISSUED: September, 2011
Supersedes: September, 2006
Doc. #V-402P, EN #110749, Rev. 8

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Safety Guide

For more complete information on recommended application guidelines, see the Safety Guide section of Pneumatic Division catalogs or you can download the **Pneumatic Division Safety Guide** at: www.parker.com/safety

Service Instructions

NOTE: See Figures for torque values.

1. After electrically de-energizing unit and relieving air pressure, remove the electrical connector. Remove snap-on type connector by squeezing the latches on the sides to disengage the latch tangs, then pull it off the solenoid (Item 1). If the snap-on connector is also held in place with a holding screw, this screw must be removed before the connector can be removed (see Figure 1). A cable plug requires unscrewing its holding screw from the center of the plug, then pulling it off of the solenoid (see Figure 2).
2. If several electrical connectors/cable plugs are removed, identify their locations to determine correct reconnection.
3. Remove the two screws or nut (Item 2) which secure the solenoid assembly to the solenoid adapter or operator, and remove the solenoid assembly (see Figure 1 & 3).
4. Inspect the surface of the solenoid adapter to be sure it is free of debris, that the seal (s) (Item 3) is not nicked or torn (replace with new seal in kit if in doubt), and that the seal is fully contained in its groove (see Figure 3).
5. Place the new solenoid assembly onto the surface of the solenoid adapter and fasten it in place with the two appropriate mounting screws or nut (Item 2). **15mm solenoid only:** If solenoid adapter contains brass inserts, use the machine screws. If solenoid adapter does not contain inserts, use the self tapping screws.
6. Replace the electrical connector using the previous identifications to correctly match solenoids and electrical connectors. When installing connector, engage the ground terminal first when pushing the connector onto the solenoid terminal.

To install a snap-on type connector, spread the side latch tangs and then push connector until the tangs engage. If high levels of vibration exist, or a taut connection is desired, connect the optional holding screw.

To install a cable plug, place the seal (Item 4) over the solenoid terminal before attaching the cable plug to the solenoid. Secure plug in place by inserting the holding screw through the plug's center hole, and then fastening it into the solenoid (Figure 2).
7. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat this process until satisfactory.

Wiring

Follow all requirements for local and national electrical codes.

Service Kits Available

The following service kits contain the appropriate seals and parts necessary for ordinary field service.

PS2982		B	40		P
Basic Kit Number					
PS2982	Standard Flow, Opp. Side, NC (B3)				
PS3201	Standard Flow, Same Side, NO (T1)				
PS3202	Standard Flow, Opp. Side, NO (T1)				
PS3441	Standard Flow, Same Side, NC (F3)				
PS3541	Hi Flow, Same Side, NC (F5)				
Override					
A	No Override				
B	Non-Locking Flush				
C	Locking Flush				
D	Non-Locking Extended				
E	Locking Extended				
6	30mm M12 (Euro), 2-pin				
Voltage					
40	12 VAC				
42	24 VAC				
45	12 VDC				
47	12 VDC Mobile (Not Available)				
48	24 VDC Mobile (Not Available)				
49	24 VDC				
51	48 VDC (Only available with kit number PS3541)				
53	115/120 VAC				
57	230/240 VAC				
Viton					
Blank	No Viton				
V	Viton (Not Available with kit number PS3541)				
Label Suffix					
Blank	Generic				
P	Parker North America				

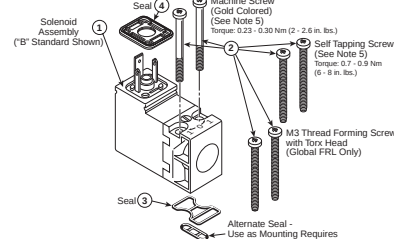


Figure 1

⚠ WARNING

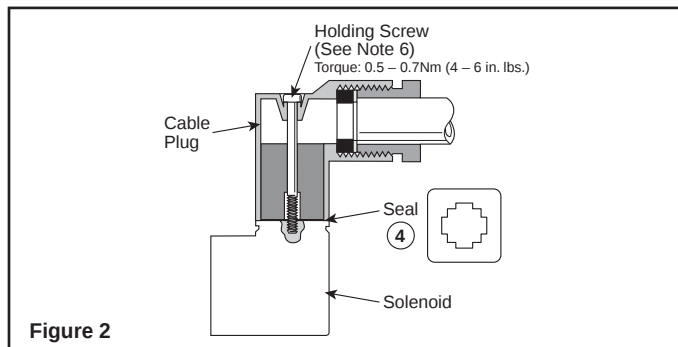
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This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

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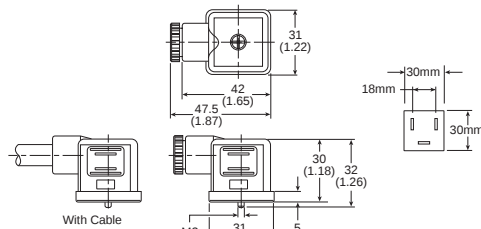
EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

15mm Solenoid Replacement Kits



Connector	Connector with 6 foot cord (2 meters)	Description
PS2932P	PS2932JP	Unlighted
PS294675P	PS2946J75P	Light - 12VAC or 12VDC
PS294679P	PS2946J79P	Light - 24VAC or 24VDC
PS294683P	PS2946J83P	Light - 110 / 120VAC
PS294687P	N/A	Light - 240/230VAC

Female Electrical Connectors / Accessories

30x30 Square 3-Pin – ISO 4400, DIN 43650A
(Use with Enclosure “A”)

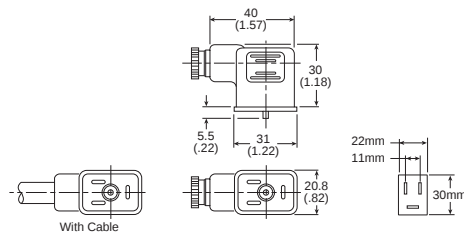
Connector	Connector with 6' (2m) Cord	Description
PS2028BP	PS2028JCP	Unlighted
PS203279BP	PS2032J79CP*	Light – 6-48V, 50/60Hz, 6-48VDC
PS203283BP	PS2032J83CP*	Light – 120V/60Hz
PS203287BP	N/A	Light – 240V/60Hz

* LED with surge suppression.

Note: Max ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

Engineering Data:

Conductors: 2 Poles Plus Ground; Cable Range (Connector Only): 8 to 10mm (0.31 to 0.39 Inch); Contact Spacing: 18mm

22x30 Rectangular 3-Pin – Type B Industrial
(Use with Enclosure “B”)

Connector	Connector with 6' (2m) Cord	Description
PS2429BP	PS2429JBP	Unlighted
PS243079BP	PS2430J79BP*	Light – 24V60Hz, 24VDC
PS243083BP	PS2430J83BP*	Light – 120V/60Hz
PS243087BP	N/A	Light – 240V/60Hz

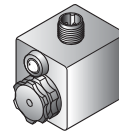
* LED with surge suppression.

Note: Max ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

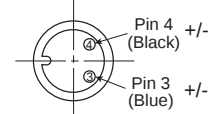
Engineering Data:

Conductors: 2 Poles Plus Ground; Cable Range (Connector Only): 6 to 8mm (0.24 to 0.31 Inch); Contact Spacing: 11mm

Solenoid Kits

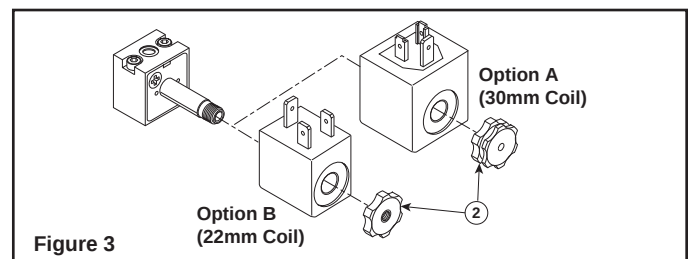


CNOMO Connection
2-Pin Male / Single Solenoid
(Encl. Option 6, Auto Option F)



P2FC		A	4	49
Series				
P2FC	Solenoid Kit			
Coil Type				
A	30mm, 3-Pin, ISO Form A (Voltages: 42, 45, 47, 48, 49, 53, 57, 70, 71, 74, 77)			
B	22mm, 3-Pin, DIN43650B (Voltages: 42, 45, 47, 48, 49, 53, 57, 65)			
F	30mm, 3-Pin, Hazardous Duty (Voltages: 45, 49, 53, 57)			
G	22mm, 3-Pin, Grommet, 18" Leads (Voltages: 42, 45, 47, 48, 49, 53, 57)			
H	22mm, 3-Pin, Conduit, 18" Leads (Voltages: 42, 45, 47, 48, 49, 53, 57)			
Q	22mm, 3-Pin, Grommet, 2M Leads (Voltages: 42, 45, 47, 48, 49, 53, 57)			
R	22mm, 3-Pin, Conduit, 2M Leads (Voltages: 42, 45, 47, 48, 49, 53, 57)			
Power Level				
4	Power Level 4			
Voltage				
42	24 VAC	57	240 / 230 VAC	
45	12 VDC	65	75 VDC (Mobile)	
47	12 VDC (Mobile)	70	72 VDC (Mobile)	
48	24 VDC (Mobile)	71	96 VDC (Mobile)	
49	24 VDC	72	110 VDC (Mobile)	
51	48 VDC	74	48 VDC (Mobile)	
53	120 / 110 VAC	77	32 VDC (Mobile)	

Operator Kits



P2FP		1	3	N	4	C
Series						
P2FP	Pilot Operator Kit					
Base Type						
1	22x22MM (Not Shown)					
2	22x30MM, CNOMO					
Function						
3	3/2, Normally Closed					
Pressure / Temperature						
N	Standard, 10 bar, -10°C to 50°C					
H	Extreme, 16 bar, -30°C to 70°C (Override A or D Only)					
Power Level						
4	Power Level 4					
Overrides						
A	No Override					
C	Flush, Locking (Bistable), Plastic					
D	Extended, Non-Locking, (Monostable), Metal					



Pneumatic Division North America
Richland, Michigan 49083

Installation & Operating Instructions:
V-410EP

F3 Series Valves
2 & 3-Position, 4-Way, 5-Ports

ISSUED: September, 2000
Supersedes: October, 1999

ECN# P27805

! WARNING

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- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when the assembled valve(s) are installed, and for proper operation. Manifold base installations are described in instruction sheet V-413DP; subbase installations are described in V-414CP.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Inlet Pressure:

	kPa	PSIG	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

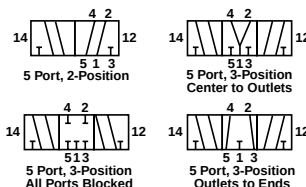
Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Port Identification/Connections/Symbols

Port No.	Single Pressure	Dual Pressure
1	Inlet	Exhaust
2	Outlet	Outlet
3	Exhaust	Inlet
4	Outlet	Outlet
5	Exhaust	Inlet



Valves may be used for single outlet (3-Way) by plugging an outlet port.

NOTE: The operator identification describes the ports that are connected when the operator is energized: operator 12 connects port 1 to port #2; operator 14 connects port #1 to port #4. Other ports may also be connected, or blocked – see symbols on the valve.

NOTE: For dual pressure, the higher pressure is to be at port #3 for single air operated valves. Solenoid types may have the highest pressure at either port #3 or #5, as specified.

Installation/Operating Instructions

! CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

Valve should be installed with reasonable accessibility for service whenever possible – repair service kits are available. Keep pipe or tubing lengths to a minimum with inside clean and free of dirt and chips. Pipe joint compound should be used sparingly and applied only to the male pipe – never into the female port. Do not use PTFE tape to seal pipe joints – pieces have a tendency to break off and lodge inside the unit, possibly causing malfunction.

Air applied to the valve must be filtered to realize maximum component life.

! CAUTION: It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the valve spool is in the horizontal plane.

Life Expectancy - Normal multi-million cycle life expectancy of these valves is based on the use of properly filtered and lubricated air at room temperature. These valves are also designed to be operated under non-lubricated conditions and will yield millions of maintenance free cycles.

Factory Pre-Lubrication - All valves are pre-lubricated at assembly with Petroleum Base - Lithium Content grease.

In-Service Lubrication - In-service lubrication is not required; however, if lubrication is to be used, ISO VG32 oil is recommended. This oil is specially formulated to provide peak performance and maximum service life from all air operated equipment. Alternative compatible lubricants should be of a paraffin based mineral oil having 150 to 200 SSU viscosity @ 100°F and an aniline point greater than 200°F. (Mobil DTE24 and Sun Company Sunvis 932 are good examples).

! CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

! WARNING

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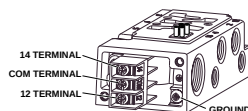
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F3 Series Valves

Wiring Instructions

- Follow all requirements for local and national electrical codes.
- Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).
- An external ground connection must be attached to the green ground screw.
- Disregard unused wires or terminals.



Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

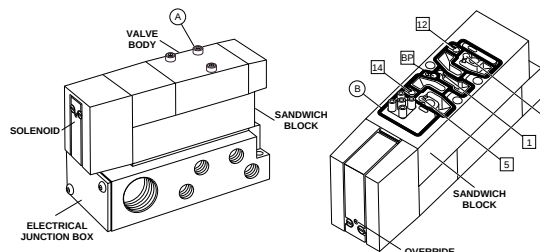
Manual Override

A manual override (if supplied) is located on the body of the solenoid pilot. A non-locking override is blue and must be twisted approximately 45° in either direction (and held at that position) in order to actuate the solenoid pilot. When released, the solenoid pilot will de-actuate. A flush type override requires use of a small screwdriver engaged in a slot on the end of the override button; an extended override can be turned by finger. Locking overrides are yellow and must be twisted approximately 90° in either direction in order to actuate the solenoid pilot. They must be returned with a reverse twist to de-actuate. These are also either flush or extended types and operate as described above.

Pilot Pressure Supply

This valve requires a source of pressure for shifting - a pilot supply. The sixth character in the model number identifies this supply when the valve was assembled at the factory. If changes have occurred in the field, the character will no longer represent that pilot arrangement. If a new valve is ordered with the same model number as the old one, perform an examination at the time of replacement and move the plugs (if necessary) so that the new valve has them in the same locations as the old one (described in steps 1-3 following).

Conversion in the field from an internal pilot supply to an external type, or vice versa, is possible. However, conversion from a single pressure valve to a dual pressure type is not possible in the field - special parts are required. (However, dual pressure valves can be converted back to single pressure in the field.) All of these conversions are performed by relocating small plugs as follows:



- The bottom surface of the sandwich block has several holes which receive the small plugs. This is accessed by loosening the three main body mounting screws (item A) with a 3 mm hex wrench and removing the valve from its base. These holes have identification alongside as shown in the figure and plugs must be located in the holes as described in Table 1. (See the two identification methods located in Table 1.)
- To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.
- Replace the valve on its base, making certain first that the interface gasket (item B) is in place in its grooves in the sandwich block. Engage the electrical plug carefully during this process. Tighten the 3 main body mounting screws from 2.5 to 2.9 Nm (22 to 26 in-lbs).
- Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Service Kits Available

Valve Body 2-Position	PS3401P
Valve Body 3-Position - All Ports Blocked	PS3402P
Valve Body 3-Position - Cylinder to Exhaust	PS3403P
Valve Body 3-Position - Pressure Center	PS3404P
Solenoid Kit* - No Override	PS3441A**P
Solenoid Kit* - Non-Locking Flush Override	PS3441B**P
Solenoid Kit* - Locking Flush Override	PS3441C**P
Solenoid Kit* - Non-Locking Extended Override	PS3441D**P
Solenoid Kit* - Locking Extended Override	PS3441E**P

Valve Coil Suffix	Kit Suffix Code (**)	Voltage
10, 40	40	12V/60Hz, 12V/50Hz
12, 42	42	24V/60Hz, 22V/50Hz
15, 45	45	12VDC
19, 49	49	24DC
23, 53, 83	53	120V/60Hz, 115V/50Hz
27, 57, 87	57	240V/60Hz, 220V/50Hz

* - When ordering solenoid service kits, be sure to specify the two digit solenoid code (**) as given above. Consult catalog for more details.

Instruction Sheets Available:

V-411DP - Valve Body Service Instructions
V-412DP - Solenoid Service Instructions
V-413DP - Manifold Installation Instructions
V-414CP - Subbase Installation Instructions
V-415CP - Sandwich Flow Control Installation Instructions
V-416CP - Sandwich Regulator Installation & Operating Instructions
V-417CP - Sandwich Regulator Conversions & Service Instructions
V-418CP - Manifold With Electrical Interconnect Installation
V-439BP - Manifold Installation

Table 1 - Sandwich Block Pilot Plug Locations (Reference Illustrations Above)

Method 1: Using Model No. to Determine Plug Locations		Pilot Supply Holes: (See key code below)						Method 2: Using Attributes of Valve & Operator(s) to Determine Plug Locations			
3rd Digit in Model No.	6th Digit in Model No.	1	3	5	BP	12	14	Pilot Supply	Main Press Supply Type	Control Mechanism Operator Types	
1 or E	B or C		M	M		X	X	Int. Port 1	Single	All Solenoids	
	P or Q	X	M	M			X	Ext. Port 12			
	L or M	X	M	M		X		Ext. Port 14			
2, 5, 6, 7	B or C		M	M		X	X	Int. Port 1	Dual		
	E or F	X		X		X	X	Int. Port 3			
	H or J	X	X			X	X	Int. Port 5			
	P or Q	X	M	M			X	Ext. Port 12			
	L or M	X	M	M		X		Ext. Port 14			
3 or F	0 or C		M	M	X	X		Int. Port 1	Single	Single Air Pilot on 14 End AND Air Return or Spring/Air Return on 12 End	
	P or Q	X	M	M	X			Ext. Port 12	Dual		
	E or F	X		X	X	X		Int. Port 3			
	P or Q	X	M	M	X			Ext. Port 12			
4, 8, 9, 0	0	X	M	M	X			None	Single or Dual	Double Air Pilot	

Key Code: X = Pilot hole must be plugged.
Blank = Pilot hole must be left open.

M = Pilot holes may be molded shut and will not need a plug; however some holes may be open and therefore will require a plug. Use a probe to test if holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.



Pneumatic Division North America
Richland, Michigan 49083

Installation and Service
Instructions: V-411DP

F3 Series Valves - Valve Body Service
2 & 3-Position, 4-Way, 5-Ports

ISSUED: October, 1999

Supersedes: March, 1999

ECN# P27372

! WARNING

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- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

! CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-410CP) packed with valve.

Operating Pressure Range:

	kPa	PSIG	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

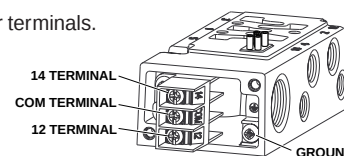
Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).

3. An external ground connection must be attached to the green ground screw.
4. Disregard unused wires or terminals.



Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Servicing Valve Body

Refer to figures to aid with disassembly and reassembly. Servicing a 3-position valve is very similar to servicing a 2-position valve.

1. Using a clean, lint free cloth, clean the valve unit prior to servicing.
2. Using a 2mm hex wrench for button head or 3mm hex wrench for socket head, back out the three captive mounting screws (item #21) until the valve unit can be removed from the base.

! CAUTION: Do not remove the valve body from the sandwich block. Doing so could risk possible seal contamination. There are no parts between the valve body and sandwich block that require servicing.

3. On solenoid valves, loosen the two captive mounting screws (item #11) and then remove the solenoid coil (item #9) and sandwich adapter (item #13) as a unit from the operator adapter (item #15).
4. To remove the operator adapter from the valve body, remove its two mounting screws (item #14). You will now be able to service the piston's seal, as well as the gasket which is located between the operator adapter and the valve body.
5. On air operated and single solenoid valves, loosen the two screws (item #25) until their end cap(s) can be removed from the valve body (item #22).
6. Gently press on one end of the spool assembly until it slides out of its bore, taking care not to scratch bore. Using a clean, lint free cloth, clean the body bore and all sealing surfaces for gaskets prior to their installation.

NOTE: If more aggressive cleaning is required, use mineral spirits or equivalent solvent and dry thoroughly.

Inspect bore for nicks, scratches, or surface imperfections. If present, reduced service life is probable and future replacement should be planned.

! WARNING

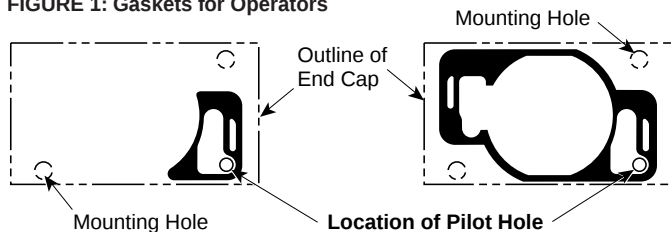
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7. Remove a new spool assembly (item #19) from its protective bag and grease seals and bore. Then insert spool into valve bore, taking care to install squarely and push slowly to avoid damaging seals or the valve bore.
8. Lightly grease new gasket (item #18) and place into its gasket track on operator. Depending upon the type of valve being serviced, certain seals in the service kit may not be used. See Figure 1 for the correct gasket. Lightly press the gasket into its gasket track, pushing knob projections into body slot.
9. Apply a light film of grease to piston bores and all surfaces of piston seals. Install seals onto piston with the lips of the seals facing away from the support flange. (See Figure 3).
10. Install the piston (item #16) & lip seal (item #17) subassembly into its operator bore, taking care to assure that the lips of the seal pass smoothly into the bore.

FIGURE 1: Gaskets for Operators

- Gasket - Solenoid Pilot Operator to Valve Body
- Gasket - Return Operator to Valve Body

NOTE: This gasket is used on valves with piston vent and pilot exhaust out the valve side.

- Gasket - Solenoid Pilot Operator to Valve Body
- Gasket - Return Operator to Valve Body

NOTE: This gasket is used on valves with piston vent and pilot exhaust internally exhausted.

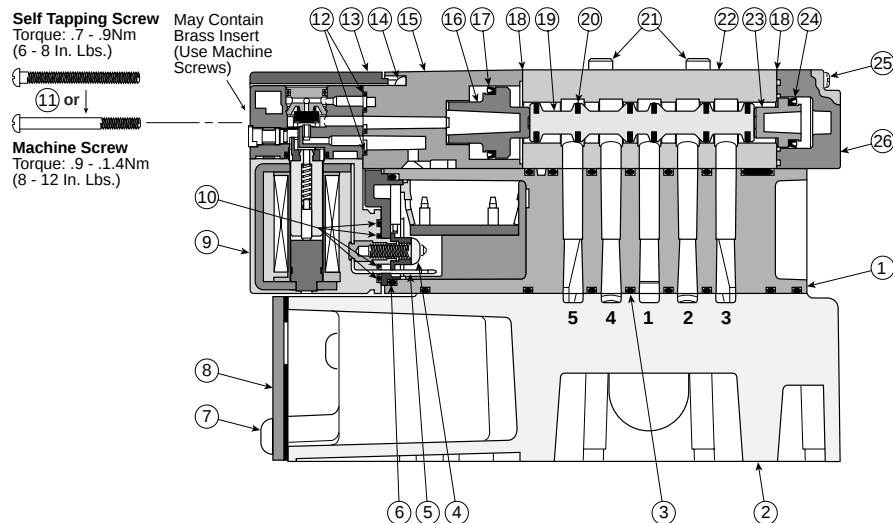
11. Assemble the operator adapter (item #15) to the valve body (item #22) using its two mounting screws (item #14). Tighten screws from 0.9 to 1.4 Nm (8 to 12 in-lbs).

NOTE: Be sure to lightly grease the new rectangular gasket (item #6) and then place it into the bottom of the rectangular cavity in the sandwich block.

12. Assemble the solenoid subassembly (items #4, 9, 10, & 13) onto the operator adapter (item #15) using two mounting screws (item #11). (See Figure 2 for Torque).

13. Assemble the end cap &/or air operator onto the valve body (item #22) using two mounting screws (item #25). Be sure to position end cap so that its gasket lines up with the air supply hole in the valve body. Tighten these screws from 0.9 to 1.4 Nm (8 to 12 in-lbs).

14. Check to insure that the gasket (item #3) on the bottom of the sandwich block is still properly seated in its gasket track. Then place valve assembly on top of base (item #2). Line up electrical plug with socket in base and gently press down on valve to seat plug properly.

**Figure 2: Single Solenoid 2-Position Valve Shown**

15. Line up the mounting holes and tighten the captive mounting screws (item #21). Torque screws using progressive steps with a criss-cross pattern. Correct hex sizes and torque values are shown in the table below.
16. Apply inlet pressure and check for leaks. If any are present, do not operate the valve - repeat this assembly process until satisfactory.

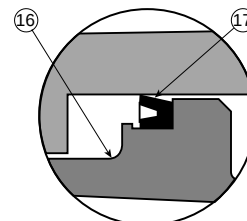
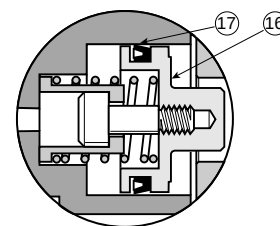
Part Identification List

Item #	Description
1	Sandwich Block
2	Base (subbase or modular manifold)
3	Molded Gasket - sandwich block to base
4	Screw - solenoid coil to operator adapter
5	Electrical Pin
6	Rectangular Gasket - sandwich block to solenoid coil
7	Captive Mounting Screws - end cover to base
8	End Cover
9	Solenoid Coil
10	Gasket - solenoid coil to sandwich adapter
11	Mounting Screw - solenoid coil to operator adapter
12	Gasket - operator to operator adapter
13	Sandwich Adapter
14	Screw - operator adapter to valve body
15	Operator Adapter
16	Piston (2-position) or Piston Assembly (3-position) - for operator adapter
17	Lip Seal - piston to operator adapter
18	Gasket - operator adapter to valve body (not shown)
19	Spool Assembly
20	Seals - spool to valve body
21	Captive Mounting Screw - valve body to base
22	Valve Body
23	Piston (2-position only) - for end cap
24	Lip seal - piston to end cap
25	Screw - end cap to valve body
26	End Cap

Instruction Sheets Available:

V-410DP - Valve Installation & Operating Instructions
 V-412DP - Solenoid Service Instructions
 V-413DP - Manifold Installation Instructions
 V-414CP - Subbase Installation Instructions
 V-415CP - Sandwich Flow Control Installation Instructions
 V-416CP - Sandwich Regulator Installation & Operating Instructions
 V-417CP - Sandwich Regulator Conversions & Service Instructions
 V-418CP - Manifold With Electrical Interconnect Installation

Screw Type	Hex Wrench Size	Torque
Button Head	2mm	1.4 to 1.7 Nm (12 to 15 in-lbs.)
Socket Head	3mm	2.5 to 2.9 Nm (22 to 26 in-lbs.)

**Figure 3: Enlarged View of Piston & Lip Seal****Figure 4: Piston Assembly for 3-Position Valves**



Pneumatic Division
Richland, Michigan 49083

Installation and Service
Instructions: V-412DP

F3 Series Valves - Solenoid Service
2 & 3-Position, 4-Way, 5-Ports

ISSUED: October, 1999
Supersedes: March, 1999
ECN# P27372



WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.



CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-410DP) packed with valve.

Operating Pressure Range:

	kPa	PSIG	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

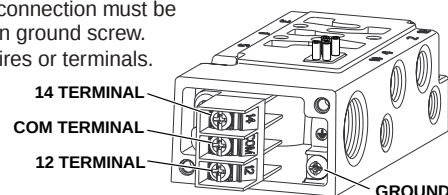
Voltage Range: Rated Voltage +10%, -15%



CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).
3. An external ground connection must be attached to the green ground screw.
4. Disregard unused wires or terminals.



Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Servicing Solenoid Pilot

Refer to Figure 1 to aid with disassembly and reassembly. Servicing a 3-position valve is very similar to servicing a 2-position valve.

1. Using a clean, lint free cloth, clean the valve unit prior to servicing solenoid.
2. Removal of valve from base is not necessary, but is recommended. To do so, use a 2mm hex wrench or a 3mm hex wrench for socket head to back out the three captive mounting screws (item #21) until the valve unit can be removed from the base.
3. Loosen the two captive mounting screws (item #11) and then remove the solenoid coil (item #9) and sandwich adapter (item #13) as a unit from the operator adapter (item #15).
4. Back out screw (item #4) until the solenoid coil can be removed from the sandwich adapter. This screw is located between the flat electrical pins (item #5) of the solenoid coil; this screw will remain captive.

NOTE: Using a clean, lint free cloth, clean all sealing surfaces for gaskets prior to their installation.

NOTE: Except for the gasket that is located between the solenoid coil and sandwich adapter, apply a light coating of grease (supplied with kits) to all gaskets.

5. Replace the gasket (item #10) which is located between the solenoid coil and the sandwich adapter (using a new gasket from a service kit).



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- 6. Slide the new replacement solenoid coil into the sandwich adapter, such that the 3 pins line up with the three slots in the sandwich adapter.
- 7. Secure the solenoid coil (item #9) to the sandwich adapter (item #13) with the captive screw (item #4) which is attached to the sandwich adapter. Tighten this screw from 0.5 to 0.7 Nm (4 to 6 in-lbs) of torque.
- 8. Replace the gasket (item #12) which is located between the solenoid coil and the operator adapter with a new gasket (from a service kit).
- 9. Replace the rectangular gasket (item #6) with a new one (from a service kit). Lightly grease this gasket and then place it into the bottom of the rectangular cavity in the sandwich block.
- 10. Line up the solenoid's three flat pins (item #5) and then gently press the solenoid subassembly (items #4, 9, 10, & 13) into the sandwich block until it makes contact with the operator adapter. Then tighten the solenoid's two mounting screws. (See Figure 1 for Torque).
- 11. If unit had been removed from base, check to insure that the gasket (item #3), located between the sandwich block and base, is properly seated in its gasket track on sandwich block.
- 12. If applicable, place valve assembly on top of base (item #2). Line up electrical plug with socket in base and gently press down on valve to seat plug properly.
- 13. Line up the mounting holes and tighten the captive mounting screws (item #21). Torque screws using progressive steps with a criss-cross pattern. Correct hex sizes and torque values are shown in the table below.
- 14. Apply main pressure and check for leaks. If any are present, do not operate the valve – repeat this assembly process until satisfactory.

- 8 End Cover
- 9 Solenoid Coil
- 10 Gasket - solenoid coil to sandwich adapter
- 11 Mounting Screw - solenoid coil to operator adapter
- 12 Gasket - operator to operator adapter
- 13 Sandwich Adapter
- 14 Screw - operator adapter to valve body
- 15 Operator Adapter
- 16 Piston (2-position) or Piston Assembly (3-position) - for operator adapter
- 17 Lip Seal - piston to operator adapter
- 18 Gasket - operator adapter to valve body (not shown)
- 19 Spool Assembly
- 20 Seals - spool to valve body
- 21 Captive Mounting Screw - valve body to base
- 22 Valve Body
- 23 Piston (2-position only) - for end cap
- 24 Lip seal - piston to end cap
- 25 Screw - end cap to valve body
- 26 End Cap

Part Identification List

Item #	Description
1	Sandwich Block
2	Base (subbase or modular manifold)
3	Molded Gasket - sandwich block to base
4	Screw - solenoid coil to operator adapter
5	Electrical Pin
6	Rectangular Gasket - sandwich block to solenoid coil
7	Captive Mounting Screws - end cover to base

Instruction Sheets Available:

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- V-411DP - Valve Body Service Instructions
- V-413DP - Manifold Installation Instructions
- V-414CP - Subbase Installation Instructions
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- V-417CP - Sandwich Regulator Conversions & Service Instructions
- V-418CP - Manifold With Electrical Interconnect Installation

Screw Type	Hex Wrench Size	Torque
Button Head	2mm	1.4 to 1.7 Nm (12 to 15 in-lbs.)
Socket Head	3mm	2.5 to 2.9 Nm (22 to 26 in-lbs.)

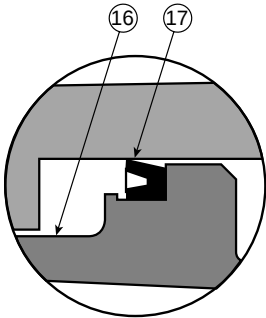
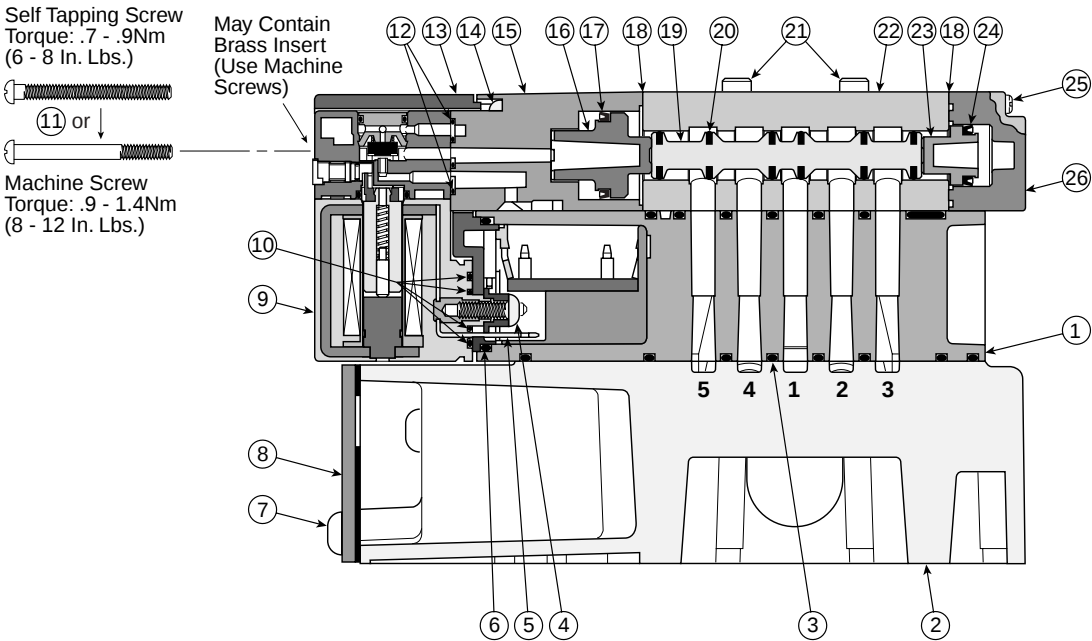


Figure 2: Enlarged View of Piston & Lip Seal

Figure 1: Single Solenoid 2-Position Valve Shown



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions: Form V-413DP
F3 Series Valves - Manifold Installation
2 & 3-Position, 4-Way, 5-Ports
ISSUED: October, 1999
Supersedes: July, 1999
ECN# P27372



WARNING

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- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
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Introduction

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1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-410BP) packed with valve.

Operating Pressure Range:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

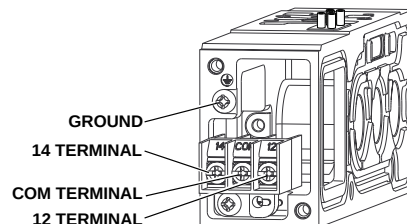
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Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 N•m (7 to 9 in-lbs).
3. An external ground connection must be attached to the green ground screw of every base in an assembly.
4. Disregard unused wires or terminals.

Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals



NOTE: For units used with 25 pin sub D connectors (D, E, F, G in the 8th digit of model number) containing interconnect circuit boards, see Instruction Sheet for wiring instructions.

Manifold Application

Valves may be arranged into a modular manifold assembly. This may have up to any number of stations providing that sufficient pressure is obtained in the circuits downstream of the valve outlets; and sufficient pressure is available for shifting the valves. Means to



WARNING

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F3 Series Valves - Manifold Installation

increase pressure levels include supply air at both end plates (Items #1 & 10), at intermediate inlets and sequencing the valve operation to maximize time between different valve shifts.

⚠ WARNING: Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.

Valve Mounting Procedures

If valve and manifold are purchased separately, use the following procedure to mount valve to manifold:

1. Using a clean, lint free cloth, clean top surface of manifold and bottom surface of valve body of dirt and dust.
2. Check to insure that gasket (not shown) is properly seated in gasket track on sandwich block.
3. Place valve assembly (Item #15) on top of manifold (Items #3, 7, 9). On electrically operated valves, line up plug with socket in manifold and gently press down on valve to seat plug properly.
4. Then line up the mounting holes and insert valve mounting screws (Item #16). Tighten using a 3 mm hex wrench; torque from 2.5 to 2.9 N•m (22 to 26 in-lbs) using progressive steps with a criss-cross pattern.
5. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Assembly Procedures for Manifolds

Manifolds may be assembled to one another either before or after assembling valves to manifolds. If inlet or exhaust common galleries are to be isolated from neighboring manifolds, follow instructions given in the **Manifold Isolation Procedures** section before proceeding with this section. If air pilot valves are part of the manifold assembly, be sure to isolate their pilot signals so that they do not supply undesirable pressure to other valves in the manifold assembly.

1. Line up manifolds (Items #3, 7, 9) in order of assembly while viewing cylinder ports #2 and #4. Place the right end plate (Item #1) at the right end of the bank. See Figure 2.
2. Each manifold should be accompanied with three tie rods. Screw together all the tie rods into three sets of equal length — each set will number the same as the number of manifolds to be stacked.
3. Thread each set of tie rods into the right end plate then place the end so that the tie rods are pointing up away from the assembly surface.
4. Apply a light coating of grease to molded gasket (Item #2) and place it in groove of right end plate (Item #1).
5. Assemble first manifold in sequence to right end plate allowing the three tie rod sets to pass through the manifold holes.
6. In like manner, install another greased gasket and place the second manifold in sequence over the first. Assemble remaining manifolds by repeating steps 4 and 5.
7. Assemble the last gasket to the last manifold, then mount the left end plate (Item #10) with three socket head cap screws with flat & lock washers (Items #11). Start the screws into the last tie rods but do not tighten the screws at this stage.

⚠ CAUTION: If the socket head cap screws do not engage the last tie rod, it is because the stack of uncompressed gaskets causes the manifolds and gaskets to be longer than the tie rod sets. It will be necessary to lengthen the tie rod sets by backing away each tie rod from its adjacent tie rod about one or two turns. This stack up length problem is likely to occur at 6 or 7 manifold bases and worsens with each additional manifold.

V-413DP

8. Place the entire assembly on a flat surface — Square up each manifold (by lightly tapping on the manifold) and each of the end plates with the flat surface. Then tighten each screw in an alternating tightening pattern so that each screw tightens nearly equally. Final torque should be 4.5 to 5.1 Nm (40 to 45 in. lb.)
9. If valves (Item #15) or top blanking plate (Item #18) were not attached to their respective manifolds, mount them per **Valve Mounting Procedures** or **Station Blanking Plate Procedures**.
10. Apply pressure and check for leaks and proper function. If any leaks are present, do not operate the valves - repeat the assembly process until satisfactory performance has been obtained.

Manifold Isolation Procedures

Inlet & exhaust galleries, and pilot supply/signal galleries may be isolated from those in adjacent manifolds through the use of isolation plugs. Note: air piloted valves, whether single or double, will need to be isolated at 14 and/or 12 galleries to prevent improper air pressure signals reaching adjacent valves. Figure 1 schematically indicates where to place plugs (shown as "X" marks) for typical air piloted valves. Figure 2 pictorially indicates assembly locations of main gallery plugs (Item #8), which are assembled on the left side of the base. The pilot gallery plugs (Item #5), are assembled on the right side of the base.

The following describes how to install these plugs:

1. Determine which gallery is to be isolated between two manifolds.
2. As displayed in Figure 2, use the large plugs (Item #8) from the service kits to isolate manifolds from the main gallery(s). The middle plug is used to isolate port #1 (inlet air supply), the left plug is used to isolate port #5 and the right plug is used to isolate port #3.
3. Apply a light coating of grease to isolation plug and insert it into counterbore.
4. Apply a light coating of grease to gasket (Item #2) and assemble in manifold groove.
5. Assemble plugged manifold into manifold bank in its proper position.
6. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Port Connections

(Below is a brief summary of typical port connections. See Technical Data section of the F3 catalog for more details.)

1. Connect an inlet air supply to manifold inlet gallery by one of the following methods:
 - a. All valves being supplied with a common pressure:

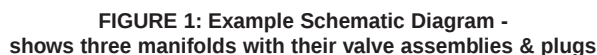
Connect air supply to port marked #1 on either end of manifold package and plug port on other end marked #1 (or connect air supply to both ends for applications requiring a larger volume of air).
 - b. Two groups of valves - each requiring a different single pressure supply:

Isolate valves into two groups using steps outlined in the **Manifold Isolation Procedures** section. Connect appropriate air supply to each end of manifold package at port #1.
2. For dual pressure applications, connect air supply to ports #3 and #5.
3. Pipe exhaust at ports #3 and #5 for single air supply. For dual pressure applications, connect to port #1. If mufflers are being used, connect mufflers to the same ports.

V-413DP

- Convert all valves to be of the external type to external pilot supply from 12 or 14 depending on which was chosen.

Apply main pressure and check for leaks. If any are present, do not operate valves on the manifold bank - repeat the assembly process until satisfactory.



Part Identification List

Item #	Description
1	Right End Plate
2	Molded Gasket - manifold base to manifold base or end plate
3	Manifold Base
4	Tie Rod
5	Isolator Plugs - for pilot galleries (PS3433)
6	Pipe Plug - for 12 &/or 14 end ports
7	Manifold Base
8	Isolator Plugs - for main galleries (PS3432)
9	Manifold Base
10	Left End Plate
11	Screw, Flat & Lock Washers - end plate to tie rod
12	End Cover Assembly
13	Flat Gasket
14	Captive Screw
15	Valve Assembly

- 16 Mounting Screws - for valve & sandwich block to base
 17 Flat Gasket - blanking plate to manifold base
 18 Blanking Plate
 19 Mounting Screw - for blanking plate
 20 Pipe plugs - for bottom or end ports (shown on #3 manifold only)

Instruction Sheets Available:

- V-410DP - Valve Installation & Operating Instructions
 V-411DP - Valve Body Service Instructions
 V-412DP - Solenoid Service Instructions
 V-414CP - Subbase Installation Instructions
 V-415CP - Sandwich Flow Control Installation Instructions
 V-416CP - Sandwich Regulator Installation & Operating Instructions
 V-417CP - Sandwich Regulator Conversions & Service Instructions
 V-418CP - Manifold With Electrical Interconnect Installation

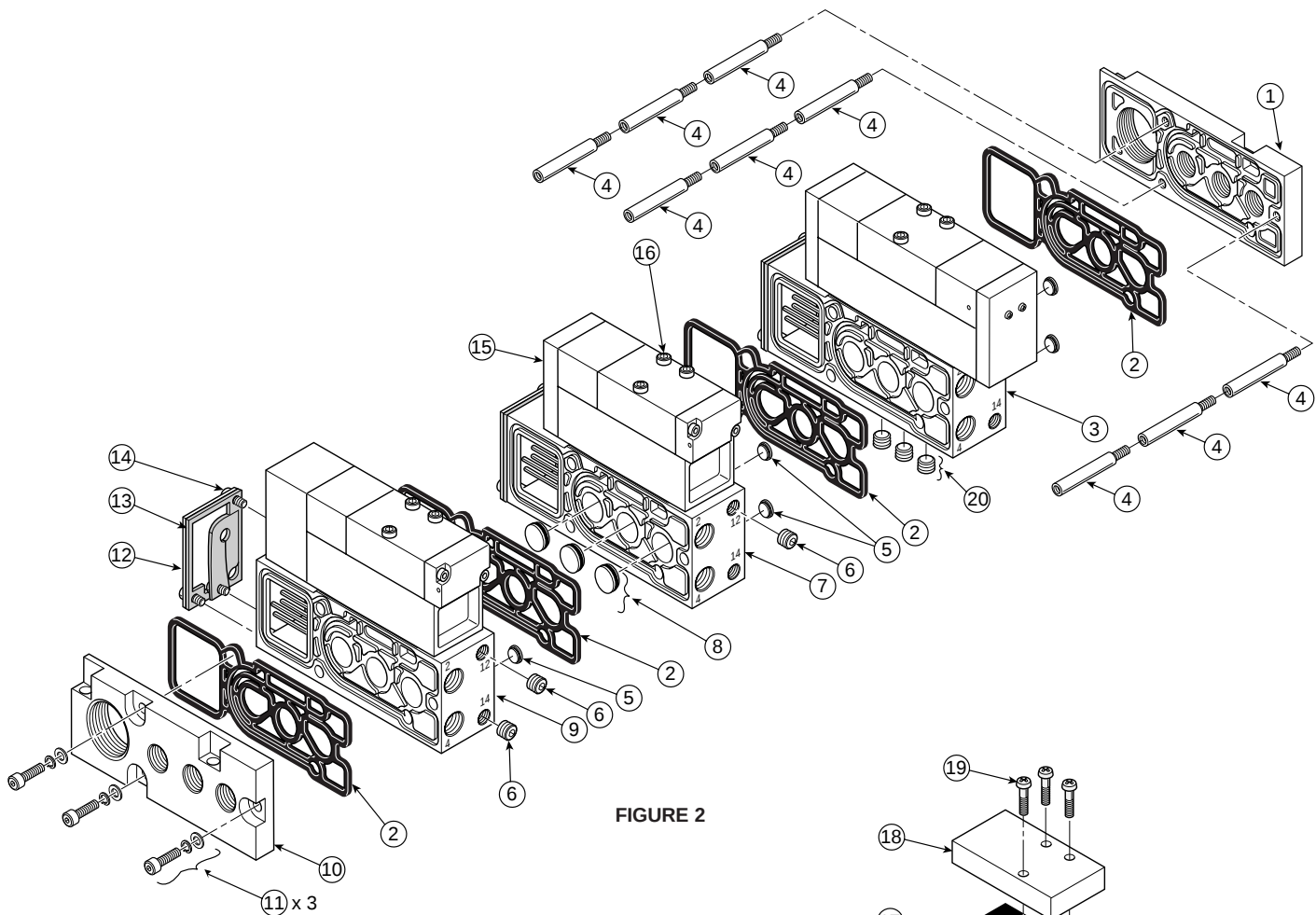


FIGURE 2

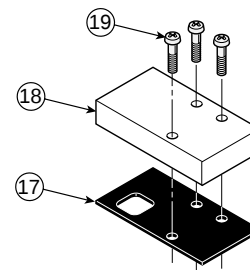


FIGURE 3: Blanking Plate, Gasket, & Mounting Screws



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions: Form V-414CP
F3 Series Valves - Subbase Installation
2 & 3-Position, 4-Way, 5-Ports;
ISSUED: October, 1999
Supersedes: October, 1997
ECN# P27372

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

! CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-410BP) packed with valve.

Operating Pressure Range:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

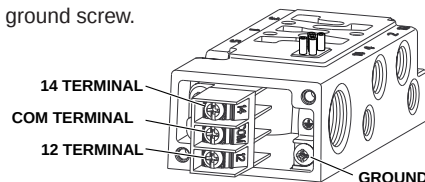
Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 N•m (7 to 9 in-lbs).
3. An external ground connection must be attached to the green ground screw.
4. Disregard unused wires or terminals.



Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Valve Mounting Procedures

If valve and subbase are purchased separately, use the following procedure to mount valve to base:

1. Using a clean, lint free cloth, clean top surface of subbase and bottom surface of valve body of dirt and dust.
2. Check to insure that gasket is properly seated in gasket track on sandwich block.
3. Place valve assembly on top of subbase. On electrically operated valves, line up plug with socket in base and gently press down on valve to seat plug properly.

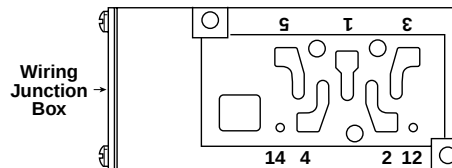


FIGURE 1: Top View (Ports located on side)

! WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

- Line up the captive mounting screws. Tighten using a 3 mm wrench; torque from 2.5 to 2.9 N•m (22 to 26 in-lbs) using progressive steps with a criss-cross pattern.
- Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Port Connections

(Below is a brief summary of typical port connections. See Technical Data section of the F3 catalog for more details.)

- Connect a single inlet air supply to port #1. (For dual pressure applications connect inlet air supplies to ports #3 and #5.)
- Connect mufflers (or pipe exhaust) to ports #3 and #5 for single air supply. For dual pressure applications, connect to port #1.
- Connect cylinder ports marked #2 and #4 to cylinder or other device to be supplied air.
- External pilot supply may be applied to ports #12 or #14. Double air piloted valves need to use both #12 and #14 ports for remote pilot signal; and single air piloted valves have to use port #14 for remote pilot signal.
- For 2-way and 3-way functions, you will need to plug some of the ports - consult the Technical Data section of the F3 catalog.

NOTE: Some subbase kits come with pipe plugs. These plugs should be located as desired. The common exhaust port is common to ports #3 and #5, side and bottom.

Instruction Sheets Available:

V-410DP - Valve Installation & Operating Instructions

V-411DP - Valve Body Service Instructions

V-412DP - Solenoid Service Instructions

V-413DP - Manifold Installation Instructions

V-415CP - Sandwich Flow Control Installation Instructions

V-416CP - Sandwich Regulator Installation & Operating Instructions

V-417CP - Sandwich Regulator Conversions & Service Instructions

V-418CP - Manifold With Electrical Interconnect Installation

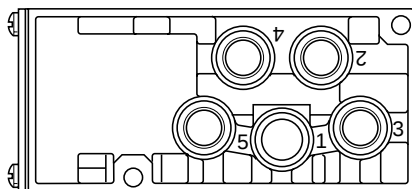


FIGURE 2: Bottom View of Subbase - showing optional bottom ports

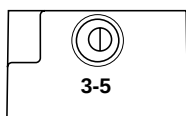


FIGURE 3: End View of Subbase - showing optional common exhaust port

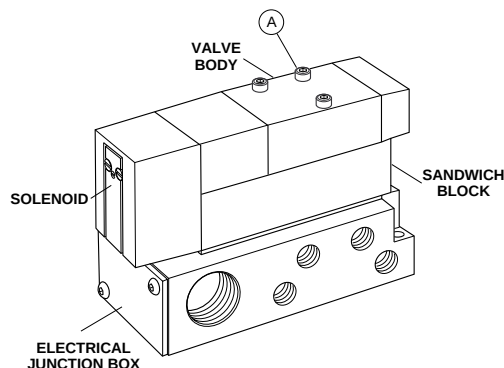


FIGURE 4

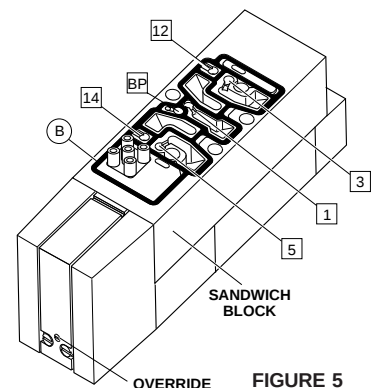


FIGURE 5

Pilot Pressure Supply

This valve requires a source of air pressure for shifting - a pilot supply. The sixth character in the model number identifies this supply when the valve was assembled at the factory. If changes have occurred in the field, the character will no longer represent that pilot arrangement. If a new valve is ordered with the same model number as the old one, perform an examination at the time of replacement and move the plugs (if necessary) so that the new valve has them in the same locations as the old one (described in steps 1-3 following).

Conversion in the field from an internal pilot supply to an external type, or vice versa, is possible. However, conversion from a single pressure valve to a dual pressure type is not possible in the field - special parts are required. (However, dual pressure valves can be converted back to single pressure in the field.) All of these conversions are performed by relocating small plugs as follows:

- The bottom surface of the sandwich block has several holes which receive the small plugs. This is accessed by loosening the three main body mounting screws (item A) with a 3 mm hex wrench and removing the valve from its base. These holes have identification alongside as shown in Figure 5 and plugs must be located in the holes as described in Table 1. (See the two identification methods located in Table 1.)
- To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.
- Replace the valve on its base, making certain first that the interface gasket (item B) is in place in its grooves in the sandwich block. Engage the electrical plug carefully during this process. Tighten the 3 main body mounting screws from 2.5 to 2.9 N•m (22 to 26 in-lbs).
- Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Table 1 - Sandwich Block Pilot Plug Locations (Reference Illustrations Above)

Method 1: Using Model No. to Determine Plug Locations		Pilot Supply Holes: (See key code below)						Method 2: Using Attributes of Valve & Operator(s) to Determine Plug Locations					
3rd Digit in Model No.	6th Digit in Model No.	1	3	5	BP	12	14	Pilot Supply	Main Press Supply Type	Control Mechanism Operator Types			
1 or E	B or C		M	M		X	X	Int. Port 1	Single	All Solenoids			
	P or Q	X	M	M			X	Ext. Port 12					
	L or M	X	M	M		X		Ext. Port 14					
2, 5, 6, 7	E or F	X		X		X	X	Int. Port 3	Dual				
	H or J	X	X			X	X	Int. Port 5					
	P or Q	X	M	M			X	Ext. Port 12					
	L or M	X	M	M		X		Ext. Port 14					
3 or F	0 or C		M	M	X	X		Int. Port 1	Single	Single Air Pilot on 14 End Air Return or Spring/Air Return on 12 End			
	P or Q	X	M	M	X			Ext. Port 12					
	E or F	X		X	X	X		Int. Port 3	Dual				
	P or Q	X	M	M	X			Ext. Port 12					
4, 8, 9, 0	0	X	M	M	X			None	Single or Dual	Double Air Pilot			

Key Code: X = Pilot hole must be plugged.

Blank = Pilot hole must be left open.

M = Pilot holes may be molded shut and will not need a plug; however some holes may be open and therefore will require a plug. Use a probe to test if holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions: V-415CP
F3 Sandwich Flow Controls
ISSUED: October, 1999
Supersedes: October, 1997
ECN# P27372



WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

Application Limits

Flow Control Sandwiches can only be used with single pressure valves to control valve exhaust in a meter-out mode. They can not be used with dual pressure valves for meter-in.

Both valve exhausts will exit from port #3 in the valve subbase or manifold.

A Flow Control Sandwich controls the flow of air from the valve exhaust ports to atmosphere. The F3 valve (4-way) is typically used with a double acting cylinder alternately pressurizing one end while exhausting the other. Cylinder speed can be influenced by restricting the exhaust path.

NOTE: If the complete blockage of air to atmosphere or extremely fine adjustments are required DO NOT use a Flow Control Sandwich. Instead connect Micrometer Flow Control Valves to cylinder ports of subbase or manifold with the free flow direction pointing away from the subbase or manifold.

Flow Control Sandwich is intended for use with subbase or manifold mounted F3 Valves. It may be used in combination with Sandwich Regulator option, and should be mounted between the regulator and base.

NOTE: When Sandwich Flow Control is used with an Independent Port Regulator (Function 5), both valve exhausts exit through port 3 of the regulator sandwich and consequently, the adjusting screw for exhaust port 5 has no effect.

These products are intended for use in general purpose compressed air systems only.

Instruction Sheets Available:

V-410DP - Valve Installation & Operating Instructions
V-411DP - Valve Body Service Instructions
V-412DP - Solenoid Service Instructions
V-413DP - Manifold Installation Instructions
V-414CP - Subbase Installation Instructions
V-416CP - Sandwich Regulator Installation & Operating Instructions
V-417CP - Sandwich Regulator Conversion & Service Instructions
V-418CP - Manifold With Electrical Interconnect Installation

Operating Inlet Pressure:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/ Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.



WARNING

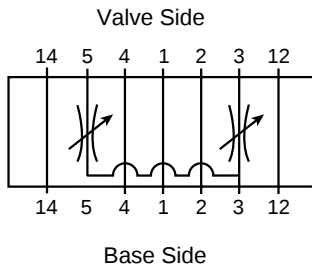
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This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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Symbol

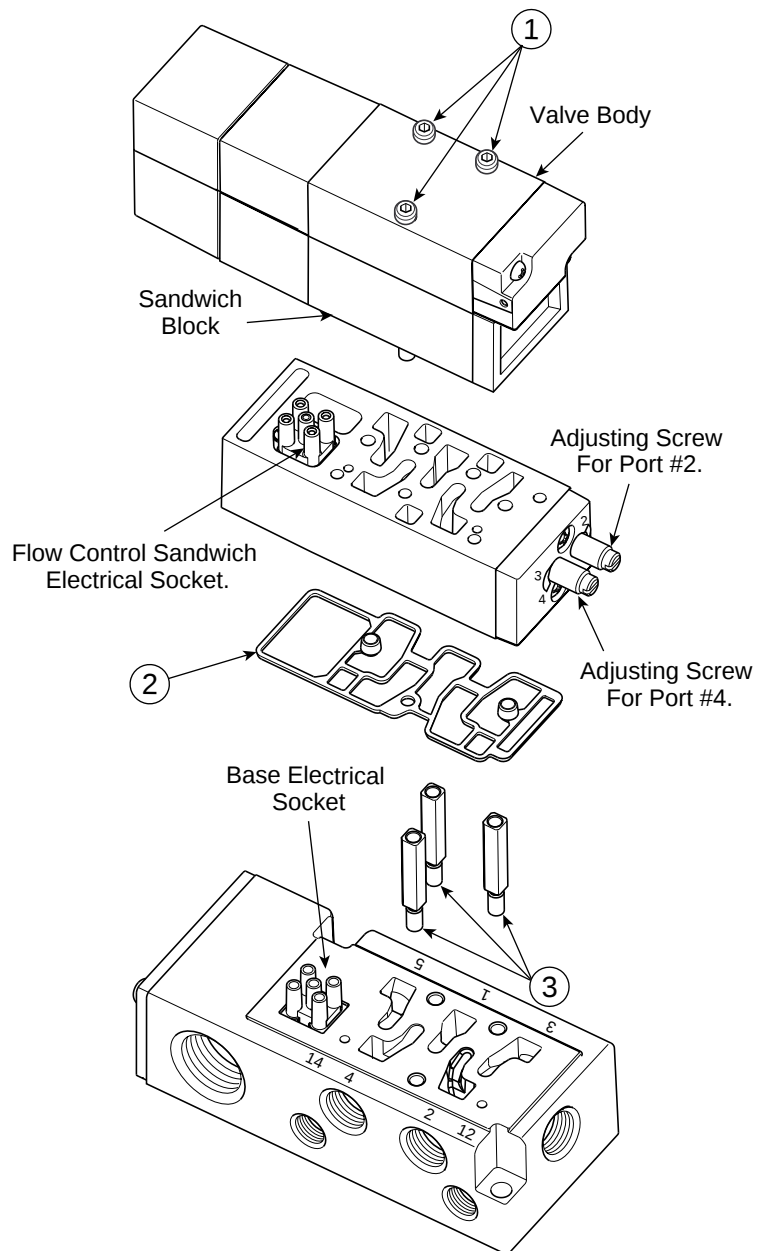


NOTE: Sandwich flow controls can only be used with F3 valves manufactured after 3/1/97 (date code CB3). These units will have socket head cap screws for holding the valve body to the base. Sandwich units will not fit units with button head screws.

Installation of Flow Control Sandwich

(For valve installation see the instruction sheet(s) shipped with the product)

- 1) Remove the valve from the subbase or manifold (if assembled) by loosening the three main body mounting screws (item #1) with a 3 mm hex wrench.
- 2) Clean all mating surfaces of valve, subbase or manifold and Flow Control Sandwich of dust and dirt.
- 3) Apply a light coating of grease (in kit) to gasket (item #2) and place in gasket track on bottom of Flow Control Sandwich.
- 4) Install three mounting studs (item #3) to base, turning finger tight and then backing off so the flats of the studs are parallel to side of base.
- 5) Place Flow Control Sandwich on top of subbase or manifold, lining up all three mounting studs. Electrically operated valves also require lining up electrical plug with socket in base and gently pressing down on Flow Control Sandwich to seat plug properly.
- 6) Check to insure that the gasket on the bottom of the valve sandwich block is still properly seated in its gasket track. Then place valve assembly on top of flow control. Line up electrical plug with socket in flow control and gently press down on valve to seat plug properly.
- 7) Tighten the three captive mounting screws (item #1) using a 3 mm hex wrench. Torque screws from 2.5 to 2.9 N•m (22 to 26 in-lbs) using progressive steps with a criss-cross pattern.
- 8) Apply inlet pressure and check for leaks. If any are present, do not operate the valve - repeat this assembly process until satisfactory.



Adjustment Procedures

Both adjusting screws are located at the 12 end of the assembly. When viewed from this end, the screw to the left (marked 4-3) controls flow from valve cylinder port #4 to exhaust, the screw to the right (marked 2-3) controls flow from valve cylinder port #2 to exhaust.

- 1) Turn both adjustment screws clockwise until fully closed and then counterclockwise slightly.
- 2) While cycling cylinder with valve turn adjusting screws counterclockwise to increase exhaust flow or clockwise to decrease exhaust flow.



Pneumatic Division North America
Richland, Michigan 49083

Installation & Operating Instructions
V-416CP
F3 Series Valves Sandwich Regulators
ISSUED: October, 1999
Supersedes: October, 1997
ECN# P27372

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Installation/Operating Instructions

! CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

A sandwich regulator is used to provide regulated pressure to individual valves in a manifolded valve arrangement. Three basic modes of regulation are available as follows:

Common Port Regulation - Provides adjustable regulated air pressure to the valve inlet. The regulator is always on the 14 end of the assembly.

Independent Port Regulation - Provides (2) separately adjustable regulated air pressures, one to each of the valves exhaust passages, or when used with the by pass plate option on either the 14 or 12 end, one outlet port pressure is adjustable, the other is at supply pressure.

Selector Regulator - Provides two pressures to port #2 that can be selected by shifting the main valve. This requires a special manifold.

NOTE: With independent port regulation the valves flow functions are reversed as indicated by the diagrams to right. Wiring and plumbing must be adjusted accordingly. (Common Port Regulation does not affect the valve function.)

! CAUTION: The reverse valve porting utilized with Independent Port will reverse the function of 4-way, 3-position cylinder to exhaust and 4-way, 3-position inlet to cylinder valves. Utilize the opposite function valve for normal operation.

Air applied to the sandwich regulator must be filtered to realize maximum component life.

Factory Pre-Lubrication - Sandwich regulators are pre-lubricated at assembly with Texaco Marfak MP-2 grease.

! CAUTION: Do not use synthetic, reconstituted, or oils with an alcohol content or detergent additive.

! CAUTION: It is recommended that double solenoid and double remote air pilot operated 2-position valves be mounted so that the axis of the valve spool is in the horizontal plane.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Inlet Pressure:

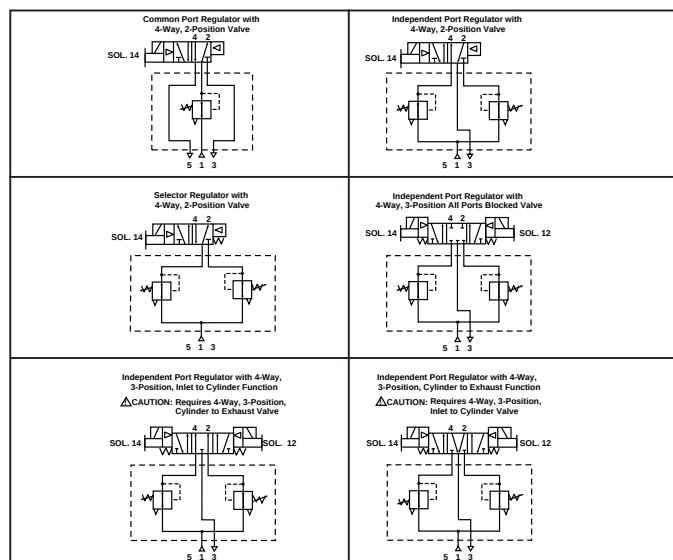
	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/ Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above. Valves with sandwich regulators are designed to use unregulated pilot pressure from the inlet for valve operation. Table 1 on page 2 shows proper assembly to assure this function.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.



NOTE: The regulators shown on the 14 and 12 end of Independent Port and Selector Units may be replaced with a by pass plate to provide unregulated pressure.

! WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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Pilot Pressure Supply

This valve requires a source of pressure for shifting - a pilot supply. The sixth character in the model number identifies this supply when the valve was assembled at the factory. If changes have occurred in the field, the character will no longer represent that pilot arrangement. If a new valve is ordered with the same model number as the old one, perform an examination at the time of replacement and move the plugs (if necessary) so that the new valve has them in the same locations as the old one (described in steps 1-3 following). If a sandwich regulator kit is being used with an existing valve, examination and conversion is necessary per the following.

1. The bottom surface of the valve sandwich block has several holes which receive the small plugs. These holes have identification alongside as shown in the figure and plugs must be located in the holes as described in Table 1.
2. To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.

Table 1

Operator Callout	Pilot Supply	Sandwich Plug Locations			
		14	12	BP	1
3, F	0	—	—	X	X
4, 8, 9, 0	0	—	—	X	X
1, 2, 5, 6, 7, E	B, C	X	—	—	X
1, 2, 5, 6, 7, E	L, M	—	X	—	X
1, 2, 5, 6, 7, E	P, Q	X	—	—	X
3, F	P, Q	—	—	X	X

N/A	E, F	N/A	N/A	N/A	N/A
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NOTE: X indicates plug locations.

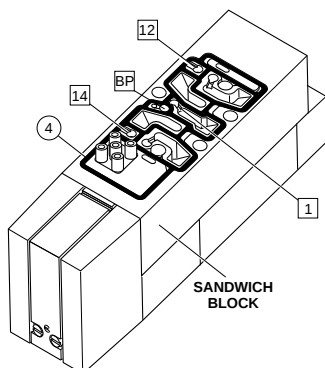
NOTE: Sandwich regulators can only be used with F3 valves manufactured after 3/1/97 (date code CB3). These units will have socket head cap screws for holding the valve body to the base. Sandwich units will not fit units with button head screws.

Installation

Remove pressure and electrical connections before installation.

If valve is not mounted to base skip steps 1 and 2.

1. Loosen body to base mounting bolts (item #1) using a 3 mm hex wrench and lift valve body from subbase or manifold. Retain the gasket (item #4).
2. Thoroughly clean both valve body and base mounting surfaces of all foreign residue.
3. Install the three mounting studs (item #3) contained in the regulator kit to the base finger tight. Back studs off so that the flats on the studs are parallel to side of base.
4. Place the gasket (item #2) that came with the sandwich regulator into the grooves on the bottom of the regulator after lightly greasing.
5. Install the regulator over the studs, engaging the electrical plug carefully during this process.
6. Replace the valve on the regulator, making certain first that the interface gasket (item #4) is in place in its grooves in the valve sandwich block.



Engage the electrical plug carefully during this process. Tighten the three main body mounting screws (item #1) from 2.5 to 2.9 N•m (22 to 26 in-lbs).

7. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

NOTE: If both a sandwich flow control and sandwich regulator are to be installed, the flow control should be installed between the regulator and the base. Both studs should be installed to base before installing the flow control.

Remote Operated Only - Connect outlet of pilot regulator to 1/8" port on end of function block next to regulator. Perform outlet pressure adjustment on pilot regulator.

Gage Installation

Units are shipped with gage ports plugged, and gages must be ordered separately.

Standard Gage

Remove 1/8" pipe plug from gage port. Apply pipe sealant (not tape) to gage male threads, install gage into gage port.

Liquid Filled Gage

The diameter of this type gage requires that method of installation be alternated between valve stations. The first, third, etc. will be installed using a nipple and coupling. The second, fourth, etc. are installed with an elbow, nipple and coupling.

Outlet Pressure Adjustment

1. To avoid minor readjustment after making a change in pressure setting, always approach the desired pressure setting from a lower pressure.
2. Before turning on system air pressure, disengage lock by pulling adjusting knob outward, and then turn knob counterclockwise until knob stops.
3. Turn on system pressure.
4. Turn adjusting knob clockwise to increase pressure until the desired pressure setting is reached.
5. To reduce pressure setting, turn adjusting knob counterclockwise until pressure decreases to at least 10 PSI lower than desired setting. Then turn adjusting knob clockwise until the desired pressure setting is reached.
6. Push the adjusting knob inward to engage lock.
7. Resetting may be required to compensate for flow after the valve is cycling in normal use.

(For remote air operated regulator, follow instructions for the pilot regulator for setting, using the technique above.)

Instruction Sheets Available:

V-410DP - Valve Installation & Operating

V-411DP - Valve Body Service

V-412DP - Solenoid Service

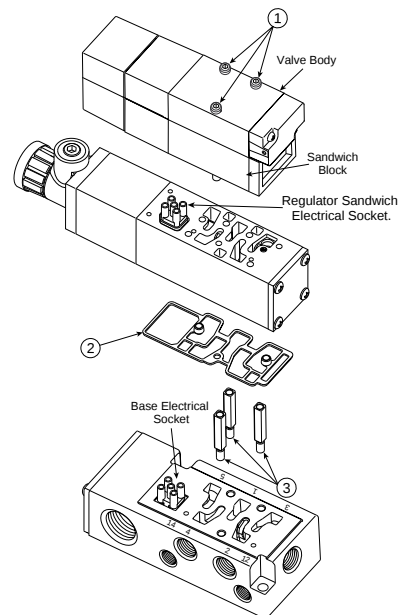
V-413DP - Manifold Installation

V-414CP - Subbase Installation

V-415CP - Flow Control Installation

V-417CP - Regulator Conversion & Service

V-418CP - Manifold With Electrical Interconnect Installation





Pneumatic Division North America
Richland, Michigan 49083

Service/Conversion Instructions
V-417DP
F3 Series Valves Sandwich Regulators
ISSUED: July, 2000
Supersedes: October, 1999
ECN# P27712

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Installation/Operating Instructions

! CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

A sandwich regulator is used to provide regulated pressure to individual valves in a manifolded valve arrangement. Three basic modes of regulation are available as follows:

Common Port Regulation - Provides adjustable regulated air pressure to the valve inlet. The regulator is always on the 14 end of the assembly.

Independent Port Regulation - Provides (2) separately adjustable regulated air pressures, one to each of the valves exhaust passages, or when used with the by pass plate option on either the 14 or 12 end, one outlet port pressure is adjustable, the other is at supply pressure.

Selector Regulator - Provides two pressures to port #2 that can be selected by shifting the main valve. This requires a special manifold.

NOTE: With independent port regulation the valves flow functions are reversed as indicated by the diagrams to right. Wiring and plumbing must be adjusted accordingly. (Common Port Regulation does not affect the valve function.)

! CAUTION: The reverse valve porting utilized with Independent Port will reverse the function of 4-way, 3-position cylinder to exhaust and 4-way, 3-position inlet to cylinder valves. Utilize the opposite function valve for normal operation.

Air applied to the sandwich regulator must be filtered to realize maximum component life.

Factory Pre-Lubrication - Sandwich regulators are pre-lubricated at assembly with Texaco Marfak MP-2 grease.

! CAUTION: Do not use synthetic, reconstituted, or oils with an alcohol content or detergent additive.

! CAUTION: It is recommended that double solenoid and double remote air pilot operated 2-position valves be mounted so that the axis of the valve spool is in the horizontal plane.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Inlet Pressure:

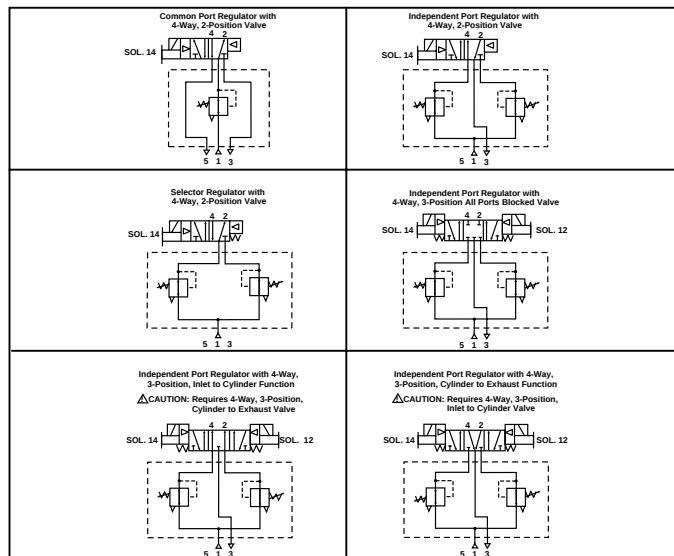
	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/ Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure from the inlet and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above. Valves with sandwich regulators are designed to use unregulated pilot pressure from the inlet for valve operation. Table 1 on page 2 shows proper assembly to assure this function.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.



NOTE: The regulators shown on the 14 and 12 end of Independent Port and Selector Units may be replaced with a by pass plate to provide unregulated pressure.

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Conversion Procedures

Remove pressure and electrical connections and perform conversion per instructions below. Tighten all fasteners per Table 3. Liberally grease all seals.

- Loosen three body to base mounting bolts (item #1) using a 2 mm hex wrench and lift valve body from sandwich.
- Thoroughly clean valve body, regulator, and base mounting surfaces of all foreign material.
- Perform conversion procedures per instructions below.
- Assure the proper location of the plug located at 12 in either the 12 end or bottom surface per Table 2. Also assure the location of plugs in holes marked SP or DP at the 14 and 12 ends as well as the top and bottom surfaces.
- Assure gaskets (items #2 & 4) are installed on valve and regulator mounting surfaces and flats on studs (item #3) are still parallel to base edge.
- Install the regulator over the studs, engaging the electrical plug carefully during this process.
- Certain conversions (notably from internal to external pilot supply or vice versa, or from or to Air Pilot Operated valves) require the pilot supply plugs in the valve sandwich to be moved. Always verify the proper plug locations in the valve sandwich prior to reassembly per Table 1. If necessary to relocate plugs simply remove by prying up with a narrow tool. Assure the o-ring is not nicked or torn, and that it has a coating of grease. Install o-ring end first into the appropriate hole.
- Replace the valve on the regulator, engaging the electrical plug carefully during this process.
- Tighten the 3 main body mounting screws (item #1) using a 3 mm hex wrench from 2.5 to 2.9 N•m (22 to 26 in.-lbs).
- Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.
- Assure gasket (item #27) remains in regulator block track.

Common Port to Independent Port

12 End of Regulator Block

- Remove & discard stamped plate (item #5) and screws (item #6).
- Remove & retain plug (item #7) from area marked SP.
- Install regulator body assembly (item #8).
- Install o-ring (item #9), piston o-ring (item #10), lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using new screws (item #15) from kit.

14 End of Regulator Block

- Remove bonnet assembly (item #14), lipseal (item #11), piston (item #12), & spring (item #13) by removing screws (item #15).
- Remove regulator body assembly (item #8).
- Move plug (item #7) from SP to DP.
- Reinstall regulator body assembly (item #8).
- Reinstall lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).

Top Surface of Regulator Block

- Install plug (item #7) removed from 12 end to DP.

Bottom Surface of Regulator Block

- Install plug (item #7) from kit into DP.

Independent Port to Common Port

Top Surface of Regulator Block

- Remove & retain plug (item #7) from DP.

12 End of Regulator Block

- Remove & discard lipseal (item #11), piston (item #12), spring (item #13), bonnet assembly (item #14) and existing screws (item #15).
- Remove & discard regulator body assembly (item #8).
- Install plug (item #7) removed from top surface into SP.
- Install stamped plate (item #5) using new screws (item #6) from kit.

14 End of Regulator Block

- Remove bonnet assembly (item #14), lipseal (item #11), piston (item #12), & spring (item #13) by removing screws (item #15).
- Remove regulator body assembly (item #8).
- Move plug (item #7) from DP to SP.
- Reinstall regulator body assembly (item #8).
- Reinstall lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).

Bottom Surface of Regulator Block

- Remove & discard plug (item #7) from DP.

Regulator to By Pass Plate

14 or 12 End of Regulator Block

- Remove & discard lipseal (item #11), piston (item #12), spring (item #13), bonnet assembly (item #14) and existing screws (item #15).
- Remove & discard regulator body assembly (item #8).
- Install by pass plate (item #16) using new screws (item #17) from kit.

By Pass Plate to Regulator

14 or 12 End of Regulator Block

- Remove & discard by pass plate (item #16) & existing screws (item #17).
- Install regulator body assembly (item #8).
- Install o-ring (item #9), piston o-ring (item #10), lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using new screws (item #15) from kit.

Common Port to Selector

12 End of Regulator Block

- Remove & discard stamped plate (item #5) & screws (item #6).
- Install regulator body assembly (item #8).
- Install o-ring (item #9), piston o-ring (item #10), lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using new screws (item #15) from kit.

Top Surface of Regulator Block

- Install plug (item #7) from kit to DP.

Independent Port to Selector

Bottom Surface of Regulator Block

- Remove & retain plug (item #7) from DP.

12 End of Regulator Block

- Remove bonnet assembly (item #14), lipseal (item #11), piston (item #12), & spring (item #13) by removing screws (item #15).
- Remove regulator body assembly (item #8).
- Move plug (item #7) from DP to SP.
- Reinstall regulator body assembly (item #8).
- Reinstall lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).

14 End of Regulator Block

- Remove bonnet assembly (item #14), lipseal (item #11), piston (item #12), & spring (item #13) by removing screws (item #15).
- Remove regulator body assembly (item #8).
- Move plug (item #7) from DP to SP.
- Reinstall regulator body assembly (item #8).
- Reinstall lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).

Selector to Common Port

12 End of Regulator Block

- Remove & discard lipseal (item #11), piston (item #12), spring (item #13), bonnet assembly (item #14) and existing screws (item #15).
- Remove & discard regulator body assembly (item #8).
- Install stamped plate (item #5) using new screws (item #6) from kit

Top Surface of Regulator Block

- Remove & discard plug (item #7) from DP.

Selector to Independent

12 End of Regulator Block

- Remove bonnet assembly (item #14), lipseal (item #11), piston (item #12), & spring (item #13) by removing screws (item #15).
- Remove regulator body assembly (item #8).
- Remove & retain plug (item #7) from SP.
- Reinstall regulator body assembly (item #8).
- Reinstall lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).

14 End of Regulator Block

- Remove bonnet assembly (item #14), lipseal (item #11), piston (item #12), & spring (item #13) by removing screws (item #15).
- Remove regulator body assembly (item #8).
- Move plug (item #7) from SP to DP.
- Reinstall regulator body assembly (item #8).
- Reinstall lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).

Bottom Surface of Regulator Block

- Install plug (item #7) removed from 12 end into DP.

Spring Controlled to Air Controlled

(Note: Plug (item #21) on 12 end must be removed and retained regardless of which end is to be converted)

14 &/or 12 End of Regulator Block

- Remove & discard spring (item #13), & bonnet assembly (item #14) by removing screws (item #15).
- Install spacer (item #18), lipseal (item #11), non venting piston (item #19), & air pilot bonnet (item #20) using existing screws (item #15).

Bottom Surface of Regulator Block

- Install plug (item #21) removed from 12 end into 12.

Spring Ranges

14 &/or 12 End of Regulator Block

- Remove bonnet assembly (item #14) by removing screws (item #15) & discard old spring (item #13).
- Install spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).

Air Controlled to Spring Controlled

Bottom Surface of Regulator Block

- Remove and retain plug (item #21) from 12.

14 &/or 12 End of Regulator Block

- Remove & discard spacer (item #18), lipseal (item #11), non venting piston (item #19), & air pilot bonnet (item #20) by removing screws (item #15).
- Remove regulator body assembly (item #8).
- Install plug (item #21) removed from bottom surface into 12 (12 end only).
- Reinstall regulator body assembly (item #8).
- Install piston o-ring (item #10), lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).

Pilot Pressure Supply

This valve requires a source of pressure for shifting - a pilot supply. The sixth character in the model number identifies this supply when the valve was assembled at the factory. If changes have occurred in the field, the character will no longer represent that pilot arrangement. If a new valve is ordered with the same model number as the old one, perform an examination at the time of replacement and move the plugs (if necessary) so that the new valve has them in the same locations as the old one (described in steps 1-3 following). If a sandwich regulator kit is being used for an existing valve, examination and conversion is necessary per the following.

- 1) The bottom surface of the valve sandwich block has several holes which receive the small plugs. These holes have identification alongside as shown in the figure and plugs must be located in the holes as described in Table 1.
- 2) To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.
- 3) Re-assemble using Installation Instructions on page 4.

Table 1

Valve						Regulator Pilot	
Operator Callout	Pilot Supply	Sandwich Plug Locations					
		14	12	BP	1	12 End	Bottom
3, F	0	—	—	X	X	—	X
4, 8, 9, 0	0	—	—	X	X	X	—
1, 2, 5, 6, 7, E	B, C	X	—	—	X	—	X
1, 2, 5, 6, 7, E	L, M	—	X	—	X	X	—
1, 2, 5, 6, 7, E	P, Q	X	—	—	X	X	—
3, F	P, Q	—	—	X	X	X	—
N/A	E, F	N/A	N/A	N/A	N/A	N/A	N/A

NOTE: X indicates plug locations.

Table 2

Regulator Block Plug Locations					
Function	Digit 11	14 End	12 End	Top	Bottom
Common Port	1 or 4	SP	SP	—	—
Independent Port	2	DP	—	DP	DP
Selector	3	SP	SP	DP	—

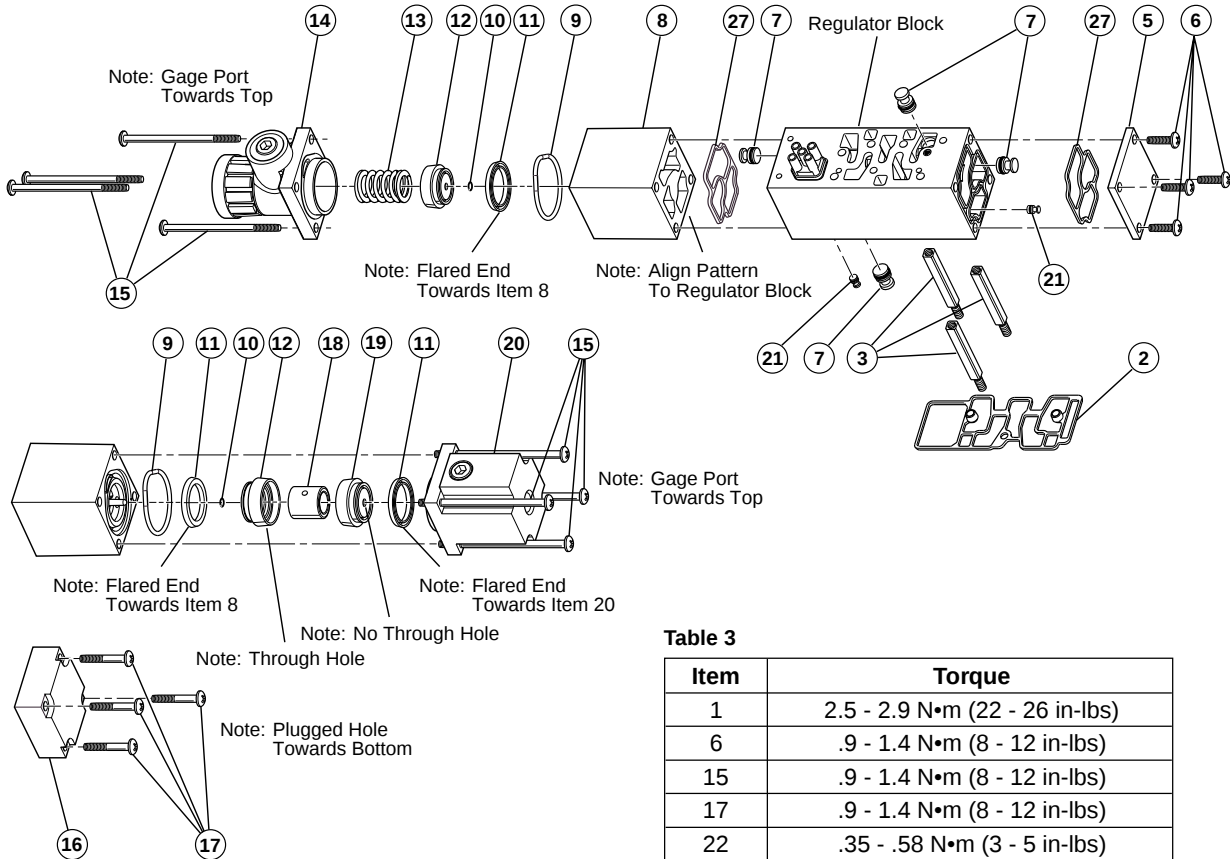
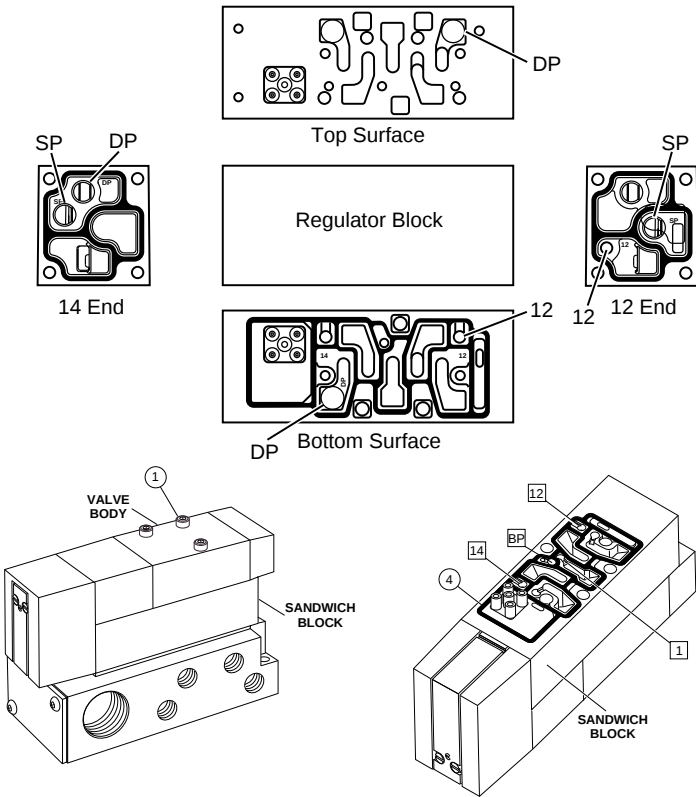


Table 3

Item	Torque
1	2.5 - 2.9 N•m (22 - 26 in-lbs)
6	.9 - 1.4 N•m (8 - 12 in-lbs)
15	.9 - 1.4 N•m (8 - 12 in-lbs)
17	.9 - 1.4 N•m (8 - 12 in-lbs)
22	.35 - .58 N•m (3 - 5 in-lbs)

Installation

Remove pressure and electrical connections before installation.

If valve is not mounted to base skip steps 1 and 2.

1. Loosen body to base mounting bolts (item #1) using a 3 mm hex wrench and lift valve body from subbase or manifold. Retain the gasket (item #4).
2. Thoroughly clean both valve body and base mounting surfaces of all foreign residue.
3. Install the three mounting studs (item #3) contained with the regulator to the base finger tight. Back studs off so that the flats on the studs are parallel to side of base.
4. Place the gasket (item #2) that came with the sandwich regulator into the grooves on the bottom of the regulator after lightly greasing.
5. Install the regulator over the studs, engaging the electrical plug carefully during this process.
6. Replace the valve on the regulator, making certain first that the interface gasket (item #4) is in place in its grooves in the sandwich block. Engage the electrical plug carefully during this process. Tighten the three main body mounting screws (item #1) from 2.5 to 2.9 N•m (22 to 26 in-lbs).
7. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

NOTE: If both a sandwich flow control and sandwich regulator are to be installed, the flow control should be installed between the regulator and the base. Both studs should be installed to base before installing the flow control.

Remote Operated Only - Connect outlet of pilot regulator to 1/8" port on end of function block next to regulator. Perform outlet pressure adjustment on pilot regulator.

Gage Installation

Units are shipped with gage ports plugged, and gages must be ordered separately.

Standard Gage

Remove 1/8" pipe plug from gage port. Apply pipe sealant (not tape) to gage male threads, install gage into gage port.

Liquid Filled Gage

The diameter of this type gage requires that method of installation be alternated between valve stations. The first, third, etc. will be installed using a nipple and coupling. The second, fourth, etc. are installed with an elbow, nipple and coupling.

Outlet Pressure Adjustment

1. To avoid minor readjustment after making a change in pressure setting, always approach the desired pressure setting from a lower pressure.
2. Before turning on system air pressure, disengage lock by pulling adjusting knob outward, and then turn knob counterclockwise until knob stops.
3. Turn on system pressure.
4. Turn adjusting knob clockwise to increase pressure until the desired pressure setting is reached.
5. To reduce pressure setting, turn adjusting knob counterclockwise until pressure decreases to at least 10 PSI lower than desired setting. Then turn adjusting knob clockwise until the desired pressure setting is reached.

6. Push the adjusting knob inward to engage lock.
7. Resetting may be required to compensate for flow after the valve is cycling in normal use.

(For remote air operated regulator, follow instructions for the pilot regulator for setting, using the technique above.)

Regulator Service

Remove pressure and electrical connection before service.

NOTE: Service kit contains components to service both spring and pilot controlled regulators. When servicing spring controlled units discard extra piston and lipseal.

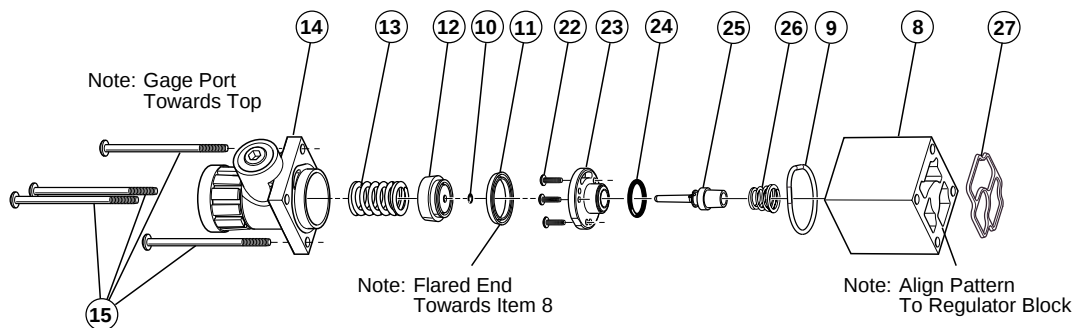
1. Remove and retain screws (item #15), bonnet assembly (item #14) and spring (item #13). Remove and discard piston (item #12), piston lipseal (item #11) and o-ring (item #10).
2. Remove and retain three seat plate screws (item #22) and seat plate (item #23). Remove and discard seat plate o-ring (item #24), bonnet o-ring (item #9), poppet assembly (item #25), and poppet spring (item #26).
3. Install new poppet spring (item #26) and poppet assembly (item #25).
4. Install new seat plate o-ring (item #24) to seat plate (item #23) and insert seat plate into regulator body (item #8) aligning kidney shape in seat plate with kidney shape in regulator body. Fasten seat plate with three screws (item #22), tightening to .35 to .58 N•m (3 to 5 in-lbs).
5. Liberally grease new lipseal (item #11) and vent o-ring (item #10) and install on new relieving piston (item #12). Flared edge of lipseal faces away from the piston.
6. Place new o-ring (item #9) in groove of regulator body (item #8).
7. Place spring into bonnet assembly (item #14), followed by piston/lipseal assembly, with flared edges of seal facing towards body (item #8).
8. Assure gasket (item #27) is in regulator block track and install body to regulator block, followed by bonnet assembly. Install screws (item #15) and torque to .9 to 1.4 N•m (8 to 12 in-lbs).
9. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the assembly process until satisfactory.

NOTE: For remote air pilot regulators, follow the above procedures, but replace both pistons and lipseals. The lipseal for the air operator has flared edge towards air operator cavity.

Instruction Sheets available:

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 V-411DP - Valve Body Service
 V-412DP - Solenoid Service
 V-413DP - Manifold Installation
 V-414CP - Subbase Installation
 V-415CP - Flow Control Installation
 V-416CP - Regulator Installation
 V-418CP - Manifold With Electrical Interconnect Installation

NOTE: Sandwich regulators can only be used with F3 valves manufactured after 3/1/97 (date code CB3). These units will have socket head cap screws for holding the valve body to the base. Sandwich units will not fit units with button head screws.



Item	Torque
15	.9 - 1.4 N•m (8 - 12 in-lbs)
22	.35 - .58 N•m (3 - 5 in-lbs)



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions: Form V-418EP
F3, F5, F6, F7, H1, H2, H3 Series Valves
Collective Wiring Manifold
ISSUED: February, 2001
Supersedes: November, 2000
ECN# P28014

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Collective Wiring Manifold Installation

1. Assemble Manifold (s), End Plates and Interface Plate together.
 - F3 Manifold Assembly per instruction V-413DP
 - All other Manifold Assemblies per instructions V-443P
2. Assemble Collective Wiring Module SCD251CB or SCC191CB by feeding wires into wiring gallery and assemble Collective Wiring Module to Interface Plate.
3. Connect wires to Manifold Terminal Block(s) per wiring instructions below

Assembly Limitations

Maximum solenoids energized simultaneously per chart.

	25-Pin Sub-D	19-Pin Round
12VDC	18	16
24VAC	22	16
24VDC	24	16
120VAC	24	16

Wiring Instructions

The collective wiring system will accommodate either single solenoid or double solenoid valves. When ordering a factory assembled manifold, the end cover of each manifold station is to be labeled either "Single Address" or Double Address" with the provided labels. Input signals to the 25-Pin Sub-D Connector are per Figure 1. Input signals to the 19-Pin Round Connector are per Figure 2. These signals are connected directly to the individual manifolds by the colored ribbon cable from the Collective Wiring Module per Figures 1 and 2.

1. The suggested wiring sequence is to attach the first address (ribbon lead colored brown) to the first solenoid (Terminal "14" on the Manifold Terminal Block - see Figures 4 and 5) of the closed manifold. If that same manifold has a second solenoid, then the second address (ribbon lead colored red) is attached to the second solenoid (Terminal "12" on

the Manifold Terminal Block). Or if the second solenoid is on the second manifold, then the second address (ribbon lead colored red) is attached to terminal "14" of the second manifold. Continue this sequence until all addresses have been connected to their respective solenoids.

2. The colored leads are to be shortened appropriately to fit each individual manifold base. Strip 1/4" of the insulation from each lead and insert bare wire under wire clamp of the appropriate terminal.
3. Use the provided jumper leads between manifolds to supply the common signal. Attach the bare wire to the "COM" terminal at each manifold.

25-Pin Sub-D Addressing

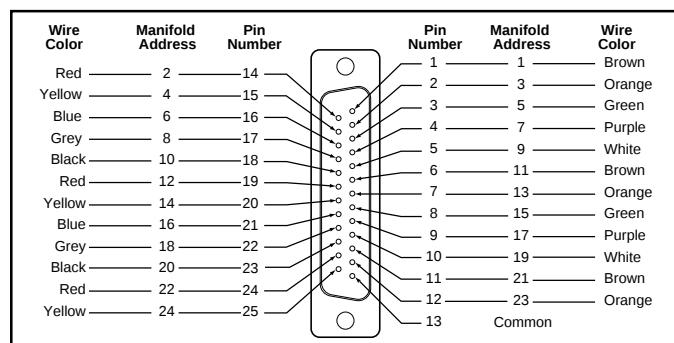


Figure 1
25-Pin Sub-D Pin Callouts

25-Pin Sub-D Cable Specifications

Common Pin "13" is rated for 3 amps. Common wire rating MUST be greater than total amperage of all solenoids on a Add-A-Fold assembly.

Example: 12 station manifold, 24 solenoids, 24VDC
24 x .075 = 1.8 total amp rating.

! WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

F3, F5, F6, F7, H1, H2, H3 Collective Wiring Manifold

19-Pin Round Addressing

V-418EP

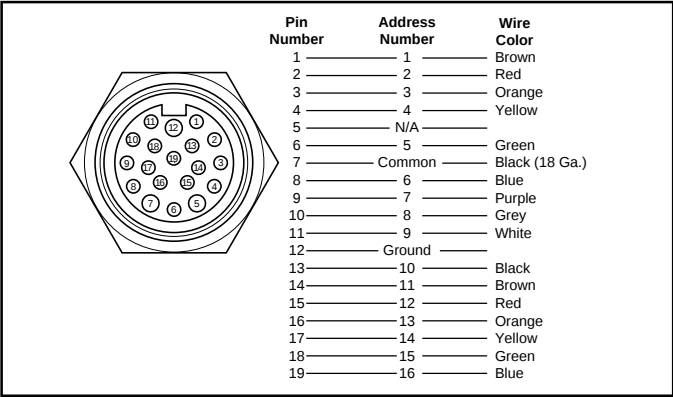


Figure 2

19-Pin Round Pin Callouts

19-Pin Round Cable Specifications

Common Pin “7” is rated for 8 amps. Common wire rating MUST be greater than total amperage of all solenoids on a Add-A-Fold assembly.

Example: 8 station manifold, 16 solenoids, 120VAC
 $16 \times .075 = 1.20$ total amp rating.

Grounding Instructions

The Collective Wiring 25-Pin Sub-D addressing system is grounded by connecting a user supplied case wire to the outside ground screw on the Interface Plate. Use 18 gage, or larger, case wire. (See Figure 3)

The Collective Wiring 19-Pin Round addressing system is grounded by connecting the 19-Pin Connector Ground Pin #12 to an inside ground screw on the Interface Plate. The Interface Plate also includes an outside machined hole for the addition of a grounding screw. (See Figure 3)

An earth ground is recommended for all voltages. Follow standard electrical protocol.

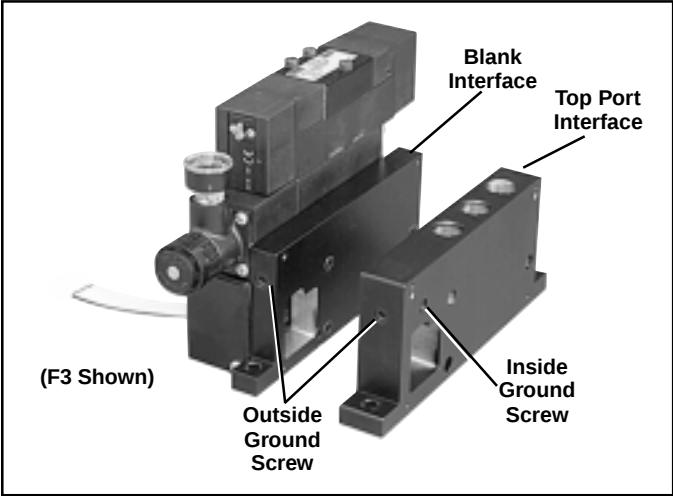


Figure 3

Collective Wiring Interface Plate Grounding

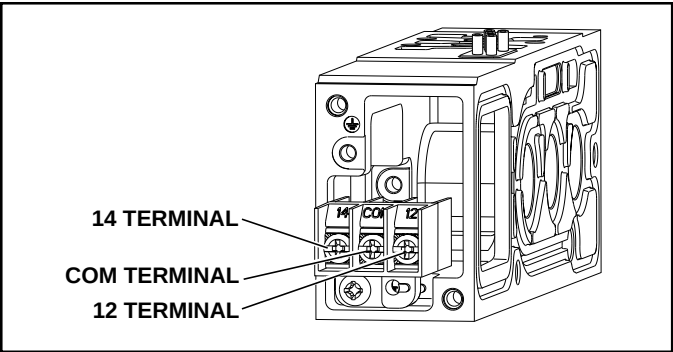


Figure 4

F3 Manifold End View of Terminal Block

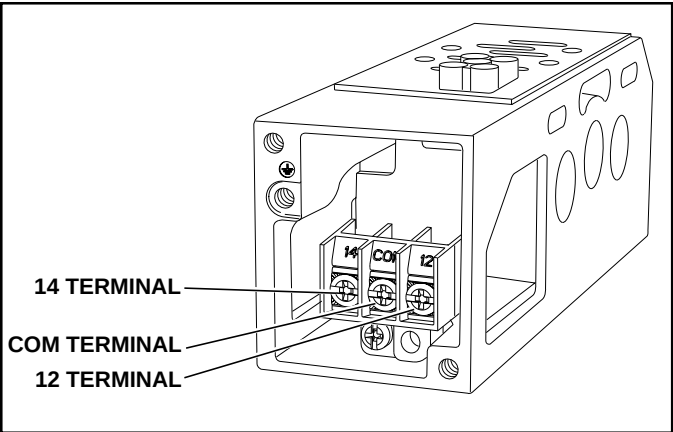


Figure 5

F5, F6, F7, H1, H2, H3 Manifold End View of Terminal Block (F5 Manifold Shown)



Pneumatic Division
Richland, Michigan 49083

Installation & Service Instructions:
V419DP

F3 Manifold Bases With
Interconnect Wiring

ISSUED: August, 2004
Supersedes: February, 2003
Doc. #V-419P, ECN #040722, Rev. 5

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

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- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

! CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-410BP) packed with valve.

Operating Pressure Range:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	1030	150	10.3

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Wiring Instructions

For connection simplicity, the Interconnect Wiring System has a single common lead with an amperage limit of 3 amps continuous service. The following chart indicates the upper limit of solenoids that can be energized simultaneously.

Voltage	25-Pin Sub-D	19-Pin Round	12-Pin Round Single	12-Pin Round Double
12VDC	18	16	8	16
24VAC	24	16	N/A	N/A
24VDC	24	16	8	16
120VAC	24	16	8	16

The Interconnect Wiring System has great flexibility to meet user wiring needs. Each manifold base has been ordered with either a single or double address function. The single address circuit board works with single solenoid valves only. The double address circuit board works with single or double solenoid valves. As an example, model F3162BGM23A is a single solenoid valve, but with a double address solenoid circuit board to accommodate a potential conversion to a double solenoid valve in the future. The end cover of each manifold base is labeled either "Single Address" or "Double Address". Power signals are connected at the 25-Pin Sub-D, Figure 1, 19-Pin round Collective Wiring Module (Figure 2), or 12-Pin round Collective Wiring Module (Figure 3). A single address base uses one signal: a double address base uses two signals, the first to the 14 solenoid, the second to the 12 solenoid. Signal usage is sequential through the bases. Any combination of single or double addresses may be used. For 12-Pin round collective wiring module connectivity to a PLC, please refer to Allen-Bradley Catalog 1667-SG001A-EN-P for additional PanelConnect™ information.

! WARNING

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F3 Manifold Bases With Interconnect Wiring

V419DP

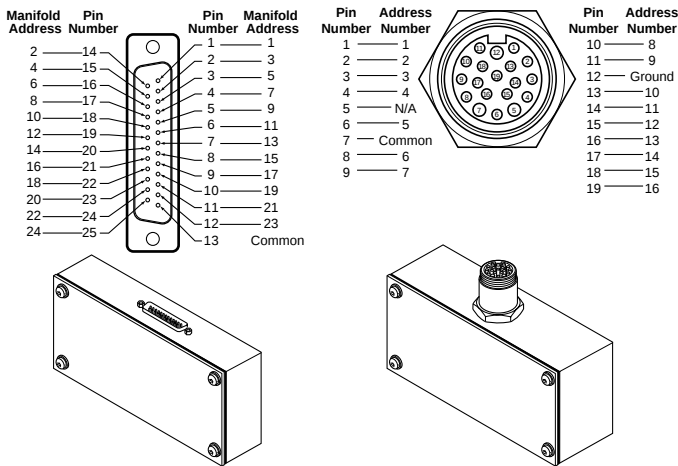


Figure 1 (25-Pin Sub-D)

Figure 2 (19-Pin Round)

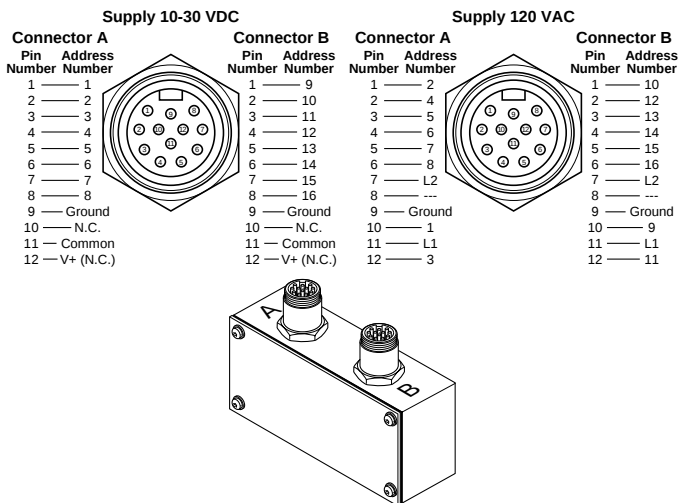


Figure 3 (12-Pin Round Dual Shown)

Manifold Application

Valves may be arranged into a modular manifold assembly. This may have up to any number of stations providing that sufficient pressure is obtained in the circuits downstream of the valve outlets; and sufficient pressure is available for shifting the valves. Means to increase pressure levels include supply air at both end plates (Item 1), at intermediate inlets and sequencing the valve operation to maximize time between different valve shifts.

⚠ WARNING: Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.

Manifold Assembly

The Interconnect Wiring System makes the electrical connection user friendly. Each individual manifold base carries its own connector circuit board which self aligns and plugs into the circuit board of the mating manifold base. So no special attention is required. The power is supplied at the left end of the stack (as you are viewing the cylinder ports) by means of a plug-in harness emerging from a Interconnect Wiring Module Kit.

Manifolds may be assembled to one another either before or after assembling the valves to manifolds. If inlet or exhaust common galleries are to be isolated from neighboring manifolds, follow instructions given in the **Manifold Isolation Procedures** section before proceeding with this section. If air pilot valves are part of the manifold assembly, be sure to isolate their pilot signals so that they do not supply undesirable pressure to other valves in the manifold assembly.

1. Line up Manifolds (Item 9) in order of assembly while viewing cylinder ports #2 and #4. Assembly is from right to left. Place the Right End Plate (Item 1) at the right end of the bank. See Figure 4.
2. Each manifold should be accompanied with three Tie Rods (Item 2). Screw together all the tie rods into three sets of equal length — each set will number the same as the number of manifolds to be stacked.
3. Thread each set of Tie Rods into the Right End Plate then place the end so that the tie rods are pointing up away from the assembly surface. **NOTE: When assembling a manifold greater than 5 stations, back each tie rod out 2 turns. This will allow engagement of the End Plate Screws to the last station.**
4. Apply a light coating of grease to molded gasket (Item 3) and place it in groove of right end plate (Item 1).
5. Assemble first manifold in sequence to right end plate allowing the three tie rod sets to pass through the manifold holes.
6. In like manner, install another greased gasket and place the second manifold in sequence over the first. Assemble remaining manifolds by repeating steps 4 and 5.
7. Assemble the last gasket to the last manifold, then mount the Interface Plate (Item 5) with three socket head cap screws (Item 6). Start the screws into the last tie rods but do not tighten the screws at this stage.
8. Place the entire assembly on a flat surface, align for straightness and alternately tighten each screw incrementally. Final torque should be 4.5 to 5.1 Nm (40 to 45 in. lb.)
9. Attach four Tie Rods (Item 9) to the Interface Plate (Item 5) then mount the Gasket (Item 7), Interconnect Wiring Module (Item 6), Gasket (Item 7) and Cover Item 10) over the Tie Rods. Attach these components with the four Screws (Item 11) and Washers (Item 12) provided. **NOTE: The 25-Pin Sub-D Interconnect Wiring Module has a ground wire with ring terminal which must be attached to the inner green screw on the Interface Plate before cover is attached.**
10. **NOTE:** Transition Plates or Isolation Plugs must be properly placed as the construction of the stack progresses. See individual sections of this bulletin.
11. Add valves and accessories to the manifold (if not already attached). The final assembly should be leak and electrically tested before operation.

Accessory Assembly

Manifold Isolation Procedures:

Inlet & exhaust galleries, and pilot supply / signal galleries may be isolated from those in adjacent manifolds through the use of isolation plugs. Note: air piloted valves, whether single or double, will need to be isolated at 14 and/or 12 galleries to prevent improper air pressure signals reaching adjacent valves. Figure 5 schematically indicates where to place plugs (shown as "X" marks) for typical air piloted valves. Figure 4 pictorially indicates assembly locations of main gallery plugs (Item 1), which are assembled on the left side of the base. The pilot gallery plugs (Item 2), are assembled on the right side of the base.

The following describes how to install these plugs:

1. Determine which gallery is to be isolated between two manifolds.
2. As displayed in Figure 6, use the large plugs (Item 1) from the service kits to isolate manifolds from the main gallery(s). The middle plug is used to isolate port #1 (inlet air supply), the left plug is used to isolate port #5 and the right plug is used to isolate port #3.
3. Apply a light coating of grease to isolation plug o-ring and insert it into counterbore.
4. Apply a light coating of grease to gasket (Item 3) and assemble in manifold groove.

Item #	Description
--------	-------------

- | | |
|----|---|
| 1 | Right End Plate |
| 2 | Tie Rod |
| 3 | Molded Gasket |
| 4 | Manifold Base |
| 5 | Interface Plate |
| 6 | Mounting Screw |
| 7 | Interconnect Wiring Module Gasket |
| 8 | Interconnect Wiring Module |
| 9 | Tie Rod |
| 10 | Interconnect Wiring Module Cover |
| 11 | Cover Screw |
| 12 | Cover Washer |
| 13 | Pipe Plug - for 12 &/or 14 end ports |
| 14 | Pipe plugs - for bottom or end ports (shown on manifold only) |
| 15 | Plug |
| 16 | O-ring |

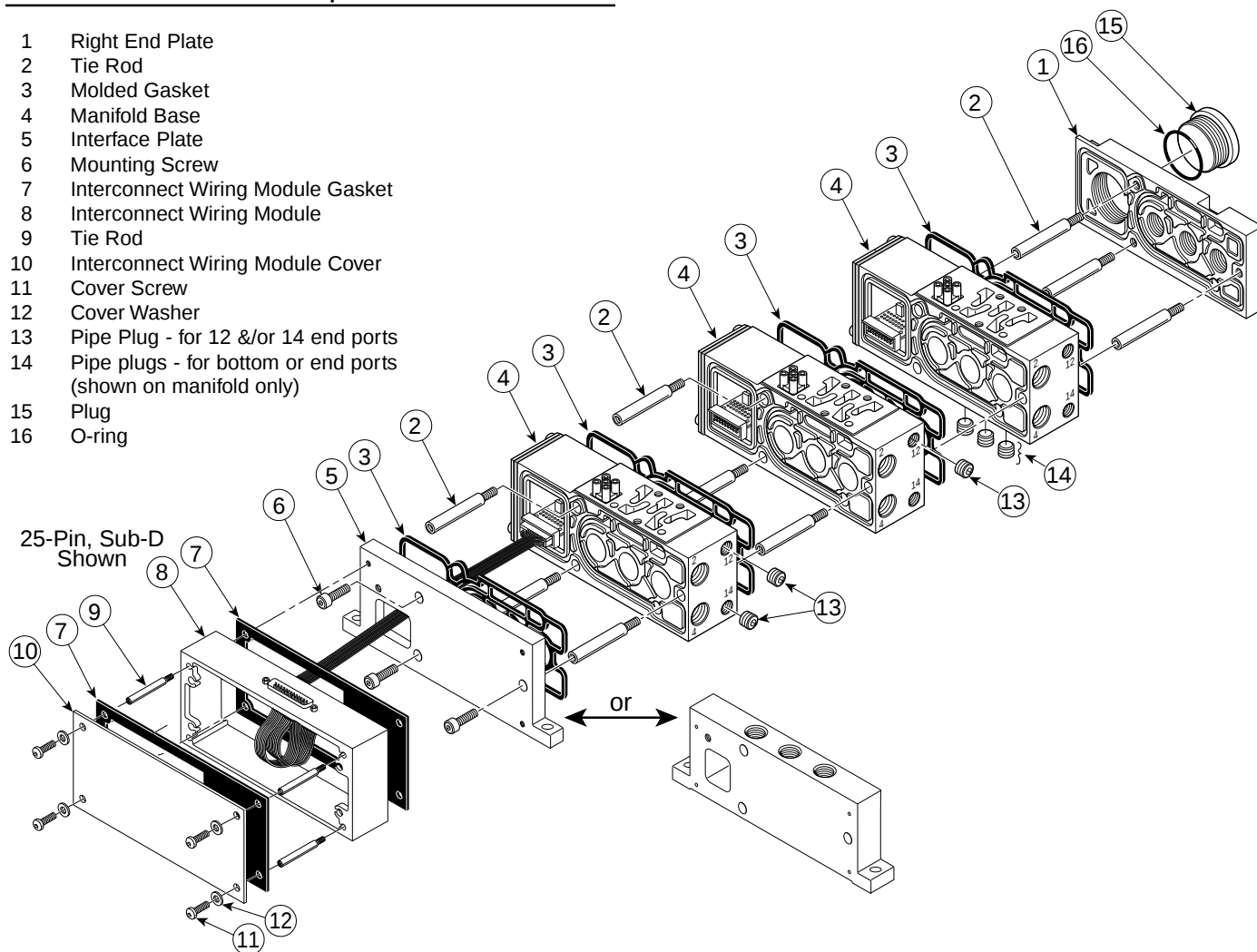


Figure 4

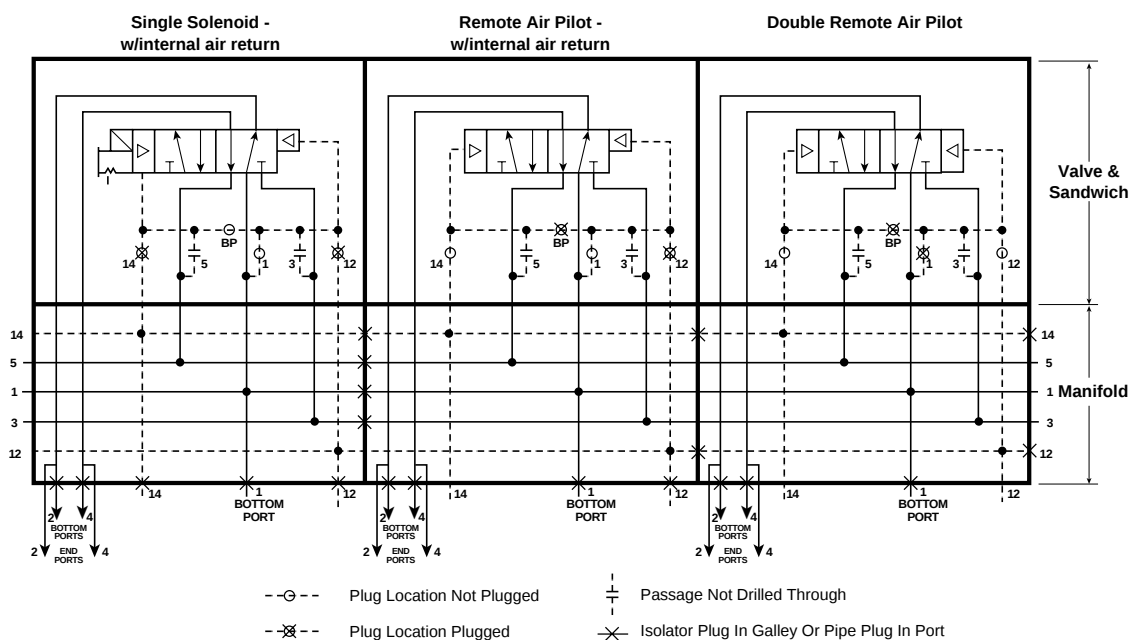


Figure 5: Example Schematic Diagram -
shows three manifolds with their valve assemblies & plugs

- Assemble plugged manifold into manifold bank in its proper position.
- Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

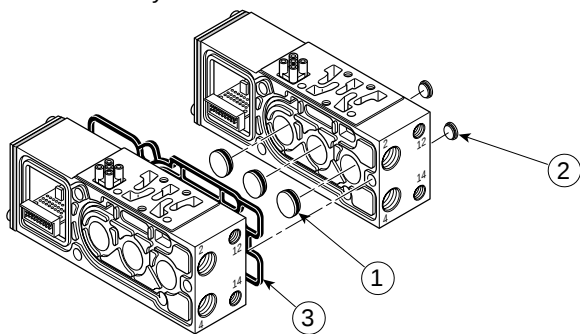


Figure 6

Air Piping Assembly

Port Connections:

(Below is a brief summary of typical port connections. See Technical Data section of the F3 catalog for more details.)

- Connect an inlet air supply to manifold inlet gallery by one of the following methods:
 - All valves being supplied with a common pressure: Connect air supply to Port #1.
 - Two groups of valves - each requiring a different single pressure supply: Isolate valves into two groups using steps outlined in the **Manifold Isolation Procedures** section. Connect appropriate air supply to each end of manifold package at Port #1.
- For dual pressure applications, connect air supply to Ports #3 and #5.
- Pipe exhaust at Ports #3 and #5 for single air supply. For dual pressure applications, exhaust will be at port #1. If mufflers are being used, connect mufflers to the same ports.
- Connect Cylinder Ports marked #2 and #4 to cylinder or other device to be supplied air. Connections are commonly made to ports on end of manifold opposite wiring cavity. If bottom ports were ordered and are more accessible to your application, plug end cylinder ports and remove plugs (Item 14) from bottom ports.
- Three-Way function can be obtained by plugging Ports #2 or #4.

External Pilot Connections

Use an external pilot supply when inlet pressures are below minimum valve ratings, or any other application requiring pilot pressure different than main supply pressure. Common external pilot supply may be applied to either Port #12 or #14. The other manifold base's pilot supply ports need to be plugged (Item 13).

Perform pilot supply conversion outlined on Installation and Operating Instructions (V-410BP) packed with valve.

If you ordered the valve with external pilot having an "L" or "P" in digit 6 of the Model Number, mount valve as received. You will also need to isolate the #12 or #14 Port of this valve from other valves in the manifold bank.

Station Blanking Plate

Use top Blanking Plate with a Manifold to reserve a place for a valve that will be added later to the manifold bank or to remove a valve from a manifold without having to remove the manifold block from the manifold bank. (See Figure 7)

Place Gasket and Blanking Plate on Manifold and assemble using Mounting Screws provided with kit. Tighten screws from 1.4 to 1.7 Nm (12 to 15 in-lbs).

Apply main pressure and check for leaks. If any are present, do not operate valves on the manifold bank - repeat the assembly process until satisfactory.

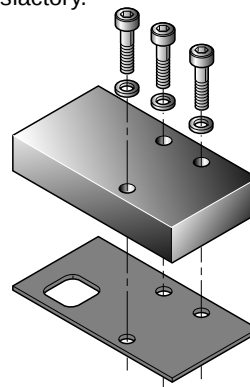


Figure 7

Special Assembly Procedures

Manifolds with Auxiliary Inlet and Outlet and / or Selector Type Sandwich Regulators.

- Auxiliary inlet and outlet manifolds (Bases specified with an "8" in digit 4 of the valve model number) use the outlet of one valve to supply the inlet of the next valve. Both manifold stations must be of the auxiliary inlet and outlet type and should be considered as a set.

The valve to be used as the supply to the next valve must be on the right hand side of the valve to be supplied when viewing the end outlet ports.

Port #1 of the supply manifold must be isolated from Port #1 of the left valve of the set. A main gallery plug has been included. Use instructions found on page 2. The outlet ports of the supply manifold should be plugged with pipe plugs.

- If a selector type sandwich regulator is being used as a supply valve for other valves and the adjusted pressure is less than the minimum operating pressure shown in chart shown on page 1, the valve(s) being supplied should be converted to external pilot supply.

Using the Pilot Pressure of one Valve as External Pilot Pressure for other Valves.

Perform initial pilot plug conversions per Instruction Sheet V-410BP shipped with the valve.

Select the valve used to supply pilot pressures to other valves. It must be the unit with the highest pressure.

Remove and discard the pilot plug from the area either marked 12 or 14 from the valve to be used for pilot supply.

Convert all valves to be of the external type to external pilot supply from 12 or 14 depending on which was chosen.

For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402 - F & H ISO 5599-2 Solenoid Service
 V-410 - F3 Series Valves 2 & 3-Position, 4-Way, 5-Ports
 V-411 - F3 Series Valves - Valve Body Service 2 & 3-Position, 4-Way, 5-Ports
 V-413 - F3 Series Valves - Manifold Installation 2 & 3-Position, 4-Way, 5-Ports

V-414 - F3 Series Valves - Subbase Installation 2 & 3-Position, 4-Way, 5-Ports
 V-415 - F3 Sandwich Flow Controls
 V-416 - F3 Series Valves Sandwich Regulators
 V-417 - F3 Series Valves Sandwich Regulators
 V-418 - F3, F5, F6, F7, H1, H2, H3 Series Valves Collective Wiring Manifold



Pneumatic Division North America
Richland, Michigan 49083

Installation & Operating Instructions:
V-430DP

F5 Series Valves

ISSUED: September, 2000
Supersedes: October, 1999

ECN# P27805

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when the assembled valve(s) are installed, and for proper operation. Manifold base installations are described in instruction sheet V-433BP; subbase installations are described in V-434BP.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Inlet Pressure:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

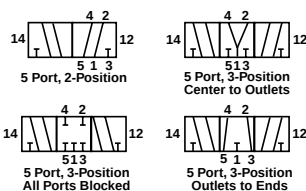
Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Port Identification / Connections / Symbols

Port No.	Single Pressure	Dual Pressure
1	Inlet	Exhaust
2	Outlet	Outlet
3	Exhaust	Inlet
4	Outlet	Outlet
5	Exhaust	Inlet



Valves may be used for single outlet (3-Way) by plugging an outlet port.

NOTE: The operator identification describes the ports that are connected when the operator is energized: operator 12 connects port 1 to port 2; operator 14 connects port 1 to port 4. Other ports may also be connected, or blocked – see symbols on the valve.

NOTE: For dual pressure, the higher pressure is to be at port 3 for single air operated valves. Solenoid types may have the highest pressure at either port 3 or 5, as specified.

Installation / Operating Instructions

Valve should be installed with reasonable accessibility for service whenever possible – repair service kits are available. Keep pipe or tubing lengths to a minimum with inside clean and free of dirt and chips. Pipe joint compound should be used sparingly and applied only to the male pipe – never into the female port. Do not use PTFE tape to seal pipe joints – pieces have a tendency to break off and lodge inside the unit, possibly causing malfunction.

Air applied to the valve must be filtered to realize maximum component life.

! CAUTION: It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the valve spool is in the horizontal plane.

Life Expectancy - Normal multi-million cycle life expectancy of these valves is based on the use of properly filtered and lubricated air at room temperature. These valves are also designed to be operated under non-lubricated conditions and will yield millions of maintenance free cycles.

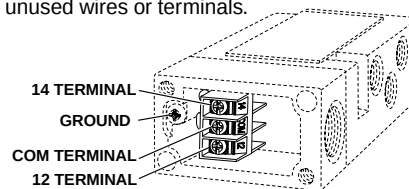
Factory Pre-Lubrication - All valves are pre-lubricated at assembly with Petroleum Base - Lithium Content grease.

In-Service Lubrication - In-service lubrication is not required; however, if lubrication is to be used, Parker F442 oil is recommended. This oil is specially formulated to provide peak performance and maximum service life from all air operated equipment. Alternative compatible lubricants should be of a paraffin based mineral oil having 150 to 200 SSU viscosity @ 100°F and an aniline point greater than 200°F. (Mobil DTE24 and Sun Company Sunvis 932 are good examples.)

! CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).
3. An external ground connection must be attached to the green ground screw.
4. Disregard unused wires or terminals.



! WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

F5 Series Valves

Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Manual Override

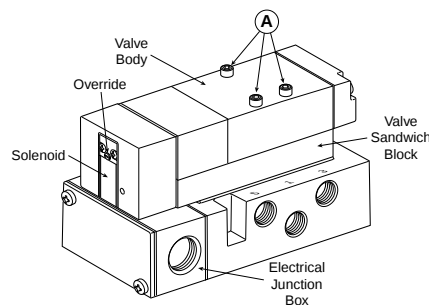
A manual override (if supplied) is located on the body of the solenoid pilot. A non-locking override is blue and must be twisted approximately 45° in either direction (and held at that position) in order to actuate the solenoid pilot. When released, the solenoid pilot will de-actuate. A flush type override requires use of a small screwdriver engaged in a slot on the end of the override button; an extended override can be turned by finger. Locking overrides are yellow and must be twisted approximately 90° in either direction in order to actuate the solenoid pilot. They must be returned with a reverse twist to de-actuate. These are also either flush or extended types and operate as described above.

Pilot Pressure Supply

This valve requires a source of pressure for shifting - a pilot supply. The sixth character in the model number identifies this supply when the valve was assembled at the factory. If changes have occurred in the field, the character will no longer represent that pilot arrangement. If a new valve is ordered with the same model number as the old one, perform an examination at the time of replacement and move the plugs (if necessary) so that the new valve has them in the same locations as the old one (described in steps 1-3 following).

Conversion in the field from an internal pilot supply to an external type, or vice versa, is possible. However, conversion from a single pressure valve to a dual pressure type is not possible in the field - special parts are required. (However, dual pressure valves can be converted back to single pressure in the field.) All of these conversions are performed by relocating small plugs as follows:

1. The bottom surface of the sandwich block has several holes which receive the small plugs. This is accessed by loosening the three main body mounting screws (item A) with a 4 mm hex wrench and removing the valve from its base. These holes have identification alongside as shown in the figure and plugs must be located in the holes as described in Table 1. (See the two identification methods located in Table 1.)



2. To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.
3. Replace the valve on its base, making certain first that the interface gasket (item B) is in place in its grooves in the sandwich block. Engage the electrical plug carefully during this process. Tighten the 3 main body mounting screws from 2.5 to 2.9 Nm (22 to 26 in.-lbs.).
4. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Service Kits Available

Valve Body 2-Position	PS3501P
Valve Body 3-Position - All Ports Blocked	PS3502P
Valve Body 3-Position - Cylinder to Exhaust	PS3503P
Valve Body 3-Position - Pressure Center	PS3504P
Solenoid Kit* - No Override	PS3541A**P
Solenoid Kit* - Non-Locking Flush Override	PS3541B**P
Solenoid Kit* - Locking Flush Override	PS3541C**P
Solenoid Kit* - Non-Locking Extended Override	PS3541D**P
Solenoid Kit* - Locking Extended Override	PS3541E**P

Valve Coil Suffix	Kit Suffix Code (**)	Voltage
10, 40	40	12V/60Hz, 12V/50Hz
12, 42	42	24V/60Hz, 22V/50Hz
15, 45	45	12VDC
19, 49	49	24DC
23, 53, 83	53	120V/60Hz, 115V/50Hz

* When ordering solenoid service kits, be sure to specify the two digit solenoid code (**) as given above. Consult catalog for more details.

Instruction Sheets Available:

V-431BP - Valve Body Service Instructions
V-432BP - Solenoid Service Instructions
V-433BP - Manifold Installation Instructions
V-434BP - Subbase Installation Instructions
V-435BP - Sandwich Flow Control Installation Instructions
V-436BP - Sandwich Regulator Installation & Operating Instructions
V-437BP - Sandwich Regulator Conversions & Service Instructions
V-438BP - Manifold With Electrical Interconnect Installation

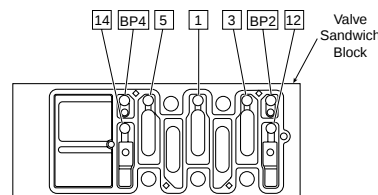


Table 1 - Sandwich Block Pilot Plug Locations (Reference Illustrations Above)

Method 1: Using Model No. to Determine Plug Locations		Plug Locations							Method 2: Using Attributes of Valve & Operator(s) to Determine Plug Locations		
3rd Digit in Model No.	6th Digit in Model No.	Pilot Supply Holes							Pilot Supply	Main Press Supply Type	Control Mechanism Operator Types
		1	3	5	BP4	BP2	12	14			
1 or E	B or C		M	M			X	X	Internal @ Port 1	Single	All Solenoids
	P or Q	X	M	M				X	External @ Port 12		
	L or M	X	M	M			X		External @ Port 14		
2, 5, 6, 7	B or C		M	M			X	X	Internal @ Port 1	Dual	
	E or F	X		X			X	X	Internal @ Port 3		
	H or J	X	X				X	X	Internal @ Port 5		
	P or Q	X	M	M				X	External @ Port 12		
	L or M	X	M	M			X		External @ Port 14		
3 or F	O or C		M	M	X		X		Internal @ Port 1	Single	Single Air Pilot
	P or Q	X	M	M	X				External @ Port 12		
	L or M	X	M	M		X			External @ Port 14		
	E or F	X		X	X		X		Internal @ Port 3	Dual	
	H or J	X	X		X		X		Internal @ Port 5		
4, 8, 9, 0	0		M	M	X	X			None	Single or Dual	Double Air Pilot

Key Code: X = Pilot hole must be plugged.
Blank = Pilot hole must be left open.

M = Pilot holes may be molded shut and will not need a plug; however some holes may be open and therefore will require a plug. Use a probe to test if holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions: Form V-431BP
F5 Series Valves - Valve Body Service
2 & 3-Position, 4-Way, 5-Ports
ISSUED: October, 1999
Supersedes: March, 1998
ECN# P27372

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-430CP) packed with valve.

Operating Pressure Range:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

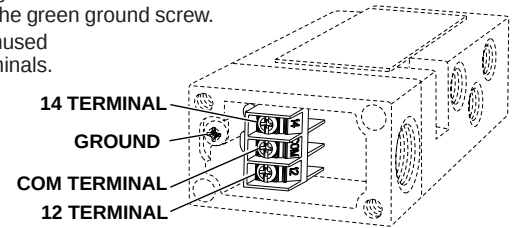
Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 N•m (7 to 9 in-lbs).

3. An external ground connection must be attached to the green ground screw.
4. Disregard unused wires or terminals.



Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Servicing Valve Body

Refer to figures to aid with disassembly and reassembly. Servicing a 3-Position valve is very similar to servicing a 2-Position valve.

1. Using a clean, lint free cloth, clean the valve unit prior to servicing.
2. Using a 4 mm hex wrench for socket head, back out the three captive mounting screws (21) until the valve unit can be removed from the base.
- ! CAUTION:** Do not remove the valve body from the sandwich block. Doing so could risk possible seal contamination. There are no parts between the valve body and sandwich block that require servicing.
3. On solenoid valves, loosen the two captive mounting screws (11) and then remove the solenoid coil (9) and sandwich adapter (13) as a unit from the operator adapter (15).
4. To remove the operator adapter from the valve body, remove its two mounting screws (14). You will now be able to service the piston's seal, as well as the gasket which is located between the operator adapter and the valve body.
5. On air operated and return operators of single solenoid valves, loosen the two screws (23) until their end cap(s) can be removed from the valve body (22).
6. Gently press on either end of the spool assembly until it slides out of its bore, taking care not to scratch bore. Using a clean, lint free cloth, clean the body bore and all sealing surfaces for gaskets prior to their installation. Inspect bore for nicks, scratches, or surface imperfections. If present, reduced service life is probable and future replacement should be planned.

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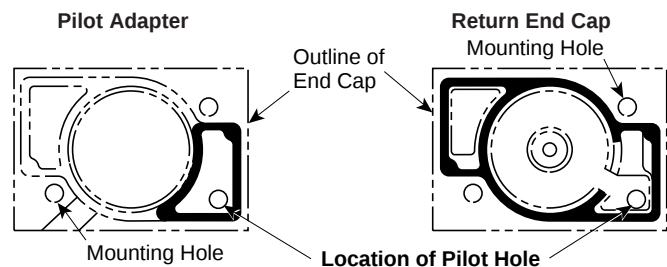
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F5 Series Valves - Valve Body Service

V-431BP

7. Remove a new spool assembly (19) from its protective bag and grease seals and bore. Then insert spool into valve bore, taking care to install squarely and push slowly to avoid damaging seals or the valve bore.
8. Lightly grease new gasket (18) and place into its gasket track on operator. Depending upon the type of valve being serviced, certain seals in the service kit may not be used. See Figure 1 for the correct gasket. Lightly press the gasket into its gasket track, pushing knob projections into gasket holes.
9. Apply a light film of grease to piston bores and all surfaces of piston seals. Install seals onto piston with the lips of the seals facing away from the support flange. See Figure 3.
10. Install the piston (16) & lip seal (17) subassembly into its operator bore, taking care to assure that the lips of the seal pass smoothly into the bore.

FIGURE 1: Gaskets for Operators



NOTE: This gasket is used on valves with piston vent and pilot exhaust out the valve side.

NOTE: This gasket is used on valves with piston vent and pilot exhaust internally exhausted.

11. Assemble the operator adapter (15) to the valve body (22) using its two mounting screws (14). Tighten screws from 0.9 to 1.4 N•m (8 to 12 in-lbs).

NOTE: Be sure to lightly grease the new rectangular gasket (6) and then place it into the bottom of the rectangular cavity in the sandwich block.

12. Assemble the solenoid subassembly (4, 9, 10, & 13) onto the operator adapter (15) using its two mounting screws (11). Tighten these screws from 0.9 to 1.4 N•m (8 to 12 in-lbs).
13. Assemble the end cap &/or air operator onto the valve body (22) using two mounting screws (25). Be sure to position end cap so that its gasket lines up with the air supply hole in the valve body. Tighten these screws from 0.9 to 1.4 N•m (8 to 12 in-lbs).
14. Check to insure that the gasket (3) on the bottom of the sandwich block is still properly seated in its gasket track. Then place valve assembly on top of base (2). Line up electrical plug with socket in base and gently press down on valve to seat plug properly.

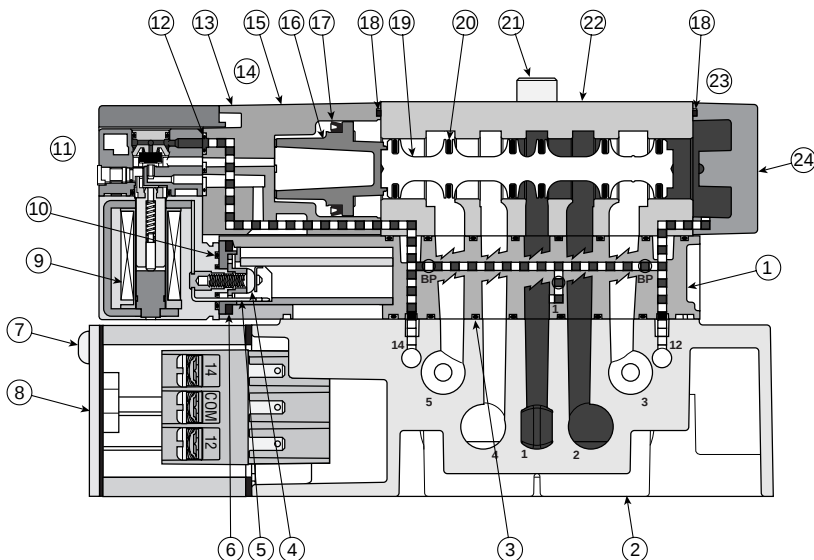


FIGURE 2: Single Solenoid 2-Position Valve Shown

15. Line up the mounting holes and tighten the captive mounting screws (21). Torque screws at 2.8 to 3.9 N•m (25 to 35 in-lbs) using progressive steps with a criss-cross pattern.
16. Apply inlet pressure and check for leaks. If any are present, do not operate the valve - repeat this assembly process until satisfactory.

Part Identification List

Item #	Description
1	Sandwich Block
2	Base (subbase or modular manifold)
3	Molded Gasket - sandwich block to base
4	Screw - solenoid coil to operator adapter
5	Electrical Pin
6	Rectangular Gasket - sandwich block to solenoid coil
7	Captive Mounting Screws - end cover to base
8	End Cover
9	Solenoid Coil
10	Gasket - solenoid coil to sandwich adapter
11	Mounting Screw - solenoid coil to operator adapter (not shown)
12	Gasket - operator to operator adapter
13	Sandwich Adapter
14	Screw - operator adapter to valve body (not shown)
15	Operator Adapter
16	Piston (2-Position) or Piston Assembly (3-Position) - for operator adapter
17	Lip Seal - piston to operator adapter
18	Gasket - operator adapter to valve body
19	Spool Assembly
20	Seals - spool to valve body
21	Captive Mounting Screw - valve body to base
22	Valve Body
23	Screw - end cap to valve body (not shown)
24	Return End Cap

Instruction Sheets Available:

V-430CP - Valve Installation & Operating Instructions
V-432BP - Solenoid Service Instructions
V-433BP - Manifold Installation Instructions
V-434BP - Subbase Installation Instructions
V-435BP - Sandwich Flow Control Installation Instructions
V-436BP - Sandwich Regulator Installation & Operating Instructions
V-437BP - Sandwich Regulator Conversions & Service Instructions
V-438BP - Manifold With Electrical Interconnect Installation

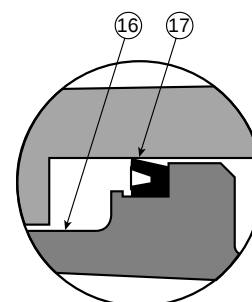


FIGURE 3: Enlarged View of Piston & Lip Seal

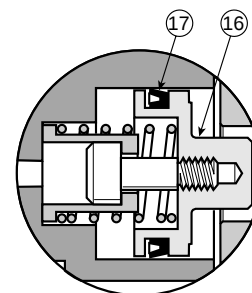


FIGURE 4: Piston Assembly for 3-Position Valves



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions: Form V-432BP
F5 Series Valves - Solenoid Service
2 & 3-Position, 4-Way, 5-Ports
ISSUED: October, 1999
Supersedes: March, 1998
ECN# P27372

! WARNING

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- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-430CP) packed with valve.

Operating Pressure Range:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

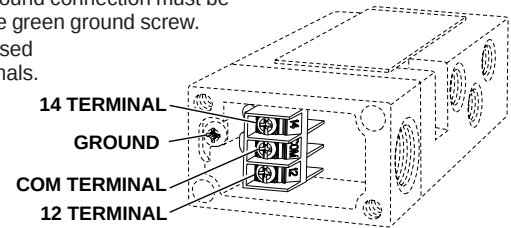
Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 N•m (7 to 9 in-lbs).

3. An external ground connection must be attached to the green ground screw.
4. Disregard unused wires or terminals.



Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Servicing Solenoid Pilot

Refer to Figure 1 to aid with disassembly and reassembly. Servicing a 3-Position valve is very similar to servicing a 2-Position valve.

1. Using a clean, lint free cloth, clean the valve unit prior to servicing solenoid.
2. Removal of valve from base is not necessary, but is recommended. To do so, use a 4 mm hex wrench to back out the three captive mounting screws (21) until the valve unit can be removed from the base.
3. Loosen the two captive mounting screws (11) and then remove the solenoid coil (9) and sandwich adapter (13) as a unit from the operator adapter (15).
4. Back out screw (4) until the solenoid coil can be removed from the sandwich adapter. This screw is located between the flat electrical pins (5) of the solenoid coil; this screw will remain captive.

NOTE: Using a clean, lint free cloth, clean all sealing surfaces for gaskets prior to their installation.

NOTE: Except for the gasket that is located between the solenoid coil and sandwich adapter, apply a light coating of grease (supplied with kits) to all gaskets.

5. Replace the gasket (10) which is located between the solenoid coil and the sandwich adapter (using a new gasket from a service kit).
6. Slide the new replacement solenoid coil into the sandwich adapter, such that the 3 pins line up with the three slots in the sandwich adapter.

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F5 Series Valves - Solenoid Service

V-432BP

7. Secure the solenoid coil (9) to the sandwich adapter (13) with the captive screw (4) which is attached to the sandwich adapter. Tighten this screw from 0.5 to 0.7 N•m (4 to 6 in-lbs) of torque.
8. Replace the gasket (12) which is located between the solenoid coil and the operator adapter with a new gasket (from a service kit).
9. Replace the rectangular gasket (6) with a new one (from a service kit). Lightly grease this gasket and then place it into the bottom of the rectangular cavity in the sandwich block.
10. Line up the solenoid's three flat pins (5) and then gently press the solenoid subassembly (4, 9, 10, & 13) into the sandwich block until it makes contact with the operator adapter. Then tighten the solenoid's two mounting screws (11) from 0.9 to 1.4 N•m (8 to 12 in-lbs).
11. If unit had been removed from base, check to insure that the gasket (3), located between the sandwich block and base, is properly seated in its gasket track on sandwich block.
12. Place valve assembly on top of base (2). Line up electrical plug with socket in base and gently press down on valve to seat plug properly.
13. Line up the mounting holes and tighten the captive mounting screws (21). Torque screws 2.9 to 3.8 N•m (25 to 35 in-lbs) using progressive steps with a criss-cross pattern.
14. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat this assembly process until satisfactory.

- 10 Gasket - solenoid coil to sandwich adapter
- 11 Mounting Screw - solenoid coil to operator adapter (not shown)
- 12 Gasket - operator to operator adapter
- 13 Sandwich Adapter
- 14 Screw - operator adapter to valve body (not shown)
- 15 Operator Adapter
- 16 Piston (2-Position) or Piston Assembly (3-Position) - for operator adapter
- 17 Lip Seal - piston to operator adapter
- 18 Gasket - operator adapter to valve body
- 19 Spool Assembly
- 20 Seals - spool to valve body
- 21 Captive Mounting Screw - valve body to base
- 22 Valve Body
- 23 Screw - end cap to valve body (not shown)
- 24 End Cap

Part Identification List

Item #	Description
1	Sandwich Block
2	Base (subbase or modular manifold)
3	Molded Gasket - sandwich block to base
4	Screw - solenoid coil to operator adapter
5	Electrical Pin
6	Rectangular Gasket - sandwich block to solenoid coil
7	Captive Mounting Screws - end cover to base
8	End Cover
9	Solenoid Coil

Instruction Sheets Available:

- V-430CP - Valve Installation & Operating Instructions
- V-431BP - Valve Body Service Instructions
- V-433BP - Manifold Installation Instructions
- V-434BP - Subbase Installation Instructions
- V-435BP - Sandwich Flow Control Installation Instructions
- V-436BP - Sandwich Regulator Installation & Operating Instructions
- V-437BP - Sandwich Regulator Conversions & Service Instructions
- V-438BP - Manifold With Electrical Interconnect Installation

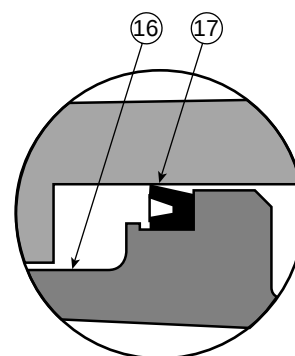
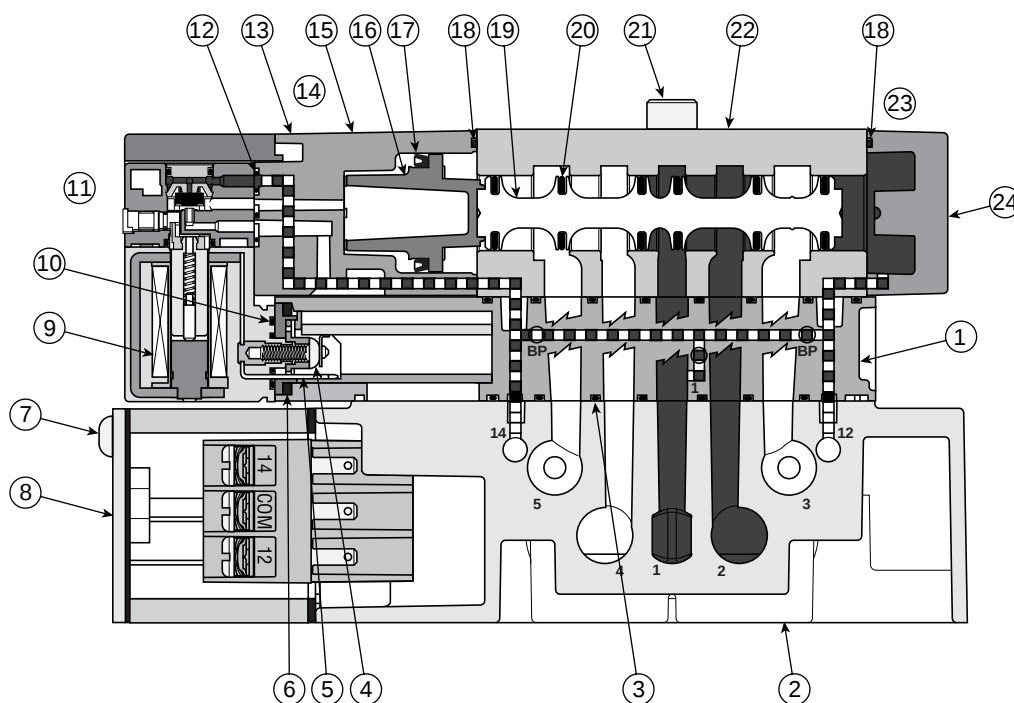


FIGURE 2: Enlarged View of Piston & Lip Seal



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions: Form V-433CP

H1 & F5 Series Valves - Manifold
Installation 2 & 3-Position, 4-Way,
5-Ports

ISSUED: November, 2000

Supersedes: October, 2000

ECN# P27873, Rev. 4



WARNING

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- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.



CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

1. If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.
2. Operating voltage is 85-110% of rated voltage. These limits should not be exceeded.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-430DP) packed with valve.

Operating Pressure Range:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%



CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the four captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).
3. An external ground connection must be attached to the green ground screw of every base in an assembly.
4. Disregard unused wires or terminals.

Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

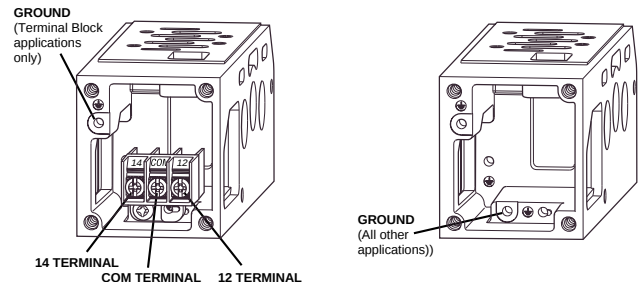


FIGURE 1



WARNING

Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.



WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

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Manifold Application

Valves may be arranged into a modular manifold assembly. This may have up to any number of stations providing that sufficient pressure and capacity is obtained in the circuits downstream of the valve outlets; sufficient pressure is available for shifting the valves; and enough exhaust capacity is available to minimize back-pressure effects. Means to increase inlet / exhaust capacity include supplying and exhausting air at both end plates (Figure 5, Items 1 & 15), with auxiliary access manifolds (Figure 3, Item 25) and by sequencing the valve operation to maximize time between different shifts.

Valve Mounting Procedure (See Figure 5)

If valve and manifold are purchased separately, use the following procedure to mount valve to manifold.

1. Using a clean, lint free cloth, clean top surface of manifold and bottom surface of valve body sandwich of dirt and dust.
2. Check to insure that valve gasket (not shown) is properly seated in gasket track on sandwich block.
3. Place valve assembly (10) on top of manifold (8). On electrically operated valves, align plug with socket in manifold and gently press down on valve to seat plug properly.
4. Then line up the mounting holes and insert valve mounting screws (9). Tighten using a 4-mm hex wrench; torque from 2.9 to 3.8 Nm (25 to 35 in.-lbs.) using progressive steps with a criss-cross pattern.
5. Apply main pressure and check for leaks. If any are present, do not operate any valves - repeat the reassembly process until satisfactory.

Assembly Procedures for Manifolds

Manifolds may be assembled to one another either before or after assembling valves to manifolds. If inlet or exhaust common galleries are to be isolated from neighboring manifolds, follow instructions given in the **Manifold Isolation Procedure** section before proceeding with this section. If remote air pilot valves are part of the manifold assembly, be sure to isolate their pilot signals so that they do not supply undesirable pressure to other valves in the manifold assembly, follow instructions given in the **External Pilot Connections** section. **Transition Plate** (Figure 2, Item 24) and **Auxiliary Access Manifold** (Figure 3, Item 25) installation is covered below. Numbers shown in parentheses refer to items in Figure 2, 3 & 5.

1. Line up manifolds, valve mounting or auxiliary access type, (8 or 25) in order of assembly while viewing cylinder ports "2" and "4". Place the end plate at the left end. **NOTE:** If F3 and F5 manifolds are being assembled into a common manifold, the F3 "family" must be on the left end. The transition plate (24) acts as a combination F3 right end plate and F5 left end plate. F3 manifolds are assembled per Instruction Sheet V-413DP.
2. Each manifold should be accompanied with three tie rods. Screw together all the tie rods into three sets of equal length - each set will number the same as the number of manifolds to be stacked.
3. Thread each set of tie rods into the left end plate then place the end so that the tie rods are pointing up away from the assembly surface.

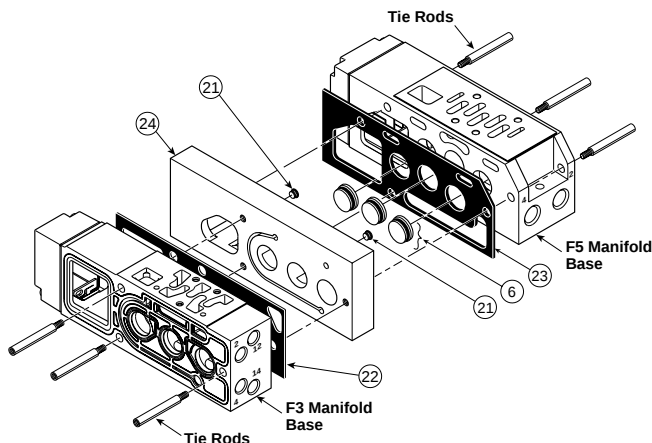


Figure 2 - Transition Plate

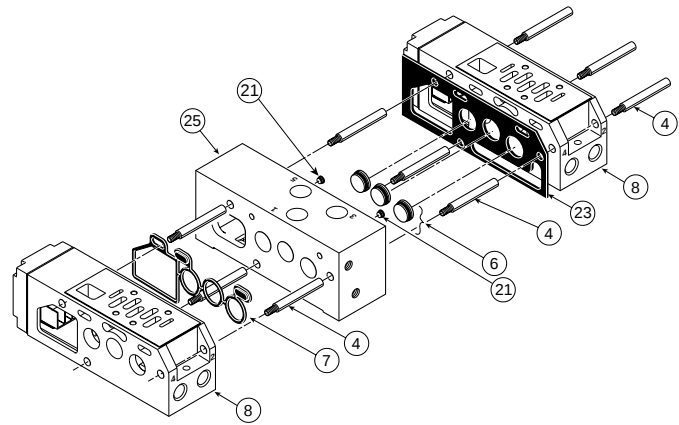


Figure 3 - Auxiliary Access Manifold

4. Apply a light coating of grease to appropriate molded gasket (2, 5, 7 or 14) and place it in the groove on right side of manifold (8) or apply a light coating of grease to flat gaskets (22 and/or 23) and place in appropriate locations as shown in Figures 2 and/or 3.
 5. Assemble the first manifold in sequence to the left end plate allowing the three tie rod sets to pass through the manifold holes.
 6. In like manner, install another greased gasket and place the second manifold in sequence over the first. Assemble the remaining manifolds by repeating steps 4 and 5.
 7. Assemble the last gasket to the manifold, mount the right end plate (1). Start the screws into the last tie rods but do not tighten at this stage.
- CAUTION:** If the socket head cap screws do not engage the last tie rod, it is because the stack of uncompressed gaskets causes the manifolds and gaskets to be longer than the tie rod sets. It will be necessary to lengthen the tie rod sets by backing away each tie rod from its adjacent tie rod about one or two turns. This stack length problem is likely to occur at 6 or 7 manifold bases and worsens with each additional manifold.
8. Place the entire assembly on a flat surface. Square up each manifold (by lightly tapping on the manifold) and each of the end plates with the flat surface. Then tighten each screw in an alternating tightening pattern so that each screw tightens nearly equally. Final torque should be 4.5 to 5.1 Nm (40 to 50 in.-lb.).
 9. If valve assembly (10) or top blanking plate (18) were not attached to manifold (8), mount them onto manifolds per **Valve or Station Blanking Plate Mounting Procedures**.
 10. Apply pressure to applicable galleries and check for leaks. If any are present, do not operate any valves. Troubleshoot and correct leakage as necessary. Once manifold assembly is leak-free, operate valves to check remainder of circuit components for proper operation and minimize any leakage.

Manifold Isolation Procedures

Inlet & exhaust galleries, and pilot supply galleries may be isolated from those in adjacent manifolds through the use of isolation plugs. Note: air piloted valves, whether single or double, will need to be isolated at 14 and/or 12 galleries to prevent improper air pressure signals reaching adjacent valves. Figure 4 schematically indicates where to place plugs (shown as "X" marks) for typical air piloted valves. Figure 5 pictorially indicates assembly locations of main gallery plugs (6), which are assembled on the right side of the bases under the gasket. The pilot galleries are plugged using the appropriate gasket (5, 7, 14) which is assembled on the right side of the bases. Figures 2 & 3 pictorially indicate assembly locations of main gallery plugs (6) and pilot gallery plugs (21) which are assembled on the right side of the transition plate (24) or the auxiliary access manifold (25).

The following describes how to install these plugs:

1. Determine which gallery is to be isolated between two manifolds.
2. Locations:
 - a. MANIFOLD (8) AUXILIARY ACCESS MANIFOLD (25) AND TRANSITION PLATE (24) MAIN GALLERY ISOLATION - As displayed in Figures 3, 4 and 5, use the large plugs (6) from the service kit to isolate manifold main gallery(s). The middle

plug is used to isolate port "1", the left plug is used to isolate port "5" and the right plug is used to isolate port "3".

- b. **AUXILIARY ACCESS MANIFOLD (25) AND TRANSITION PLATE (24) PILOT GALLERY ISOLATION** - As displayed in Figures 3 and 4, use pilot gallery plugs (21) from the service kit, to isolate the auxiliary access manifold (25) from the manifold pilot galleries and to isolate the pilot galleries when using the F3 to F5 transition plate.
3. Apply a light coating of grease to isolation plug O-ring and insert it into counterbore from the right side.
4. Apply a light coating of grease to appropriate gasket (2, 5, 7, or 14) as shown in Figure 5 and assemble in manifold groove or apply a light coating of grease to F3 (22) and/or F5 (23) flat gasket(s) and place in appropriate locations as shown in Figures 2 and 3.
5. Assemble plugged manifold into manifold bank in its proper position.
6. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Port Connections

(Below is a brief summary of typical port connections. See Technical Information in the catalog for more details.)

1. Connect an inlet air supply to manifold inlet gallery by one of the following methods:
 - a. All valves being supplied with a common pressure:
Connect air supply to port marked "1" on either end of manifold package and plug port on other end marked "1" (or connect air supply to both ends for applications requiring a larger volume of air).
 - b. Two groups of valves - each requiring a different single pressure supply:
Isolate valves into two groups using steps outlined in the **Manifold Isolation Procedures** section. Connect appropriate air supply to each end of manifold package at port "1".
2. For dual pressure applications, connect air supply to ports "3" and "5".
3. Pipe exhaust at ports "3" and "5" for single air supply. For dual pressure applications, connect to port "1". If mufflers are being used, connect mufflers to the same ports.
4. Connect cylinder ports marked "2" and "4" to cylinder or other device to be supplied air. Connections are commonly made to ports on end of manifold opposite wiring cavity. If bottom ports were ordered and are more accessible to your application, plug end cylinder ports and remove plugs (3) from bottom ports.
5. Three-Way function can be obtained by plugging ports "2" or "4".

External Pilot Connections

Use an external pilot supply when inlet pressures are below minimum valve ratings, or any other application requiring pilot pressure different than main supply pressure. Common external pilot supply may be applied to either port 12 or 14. The other manifold base's pilot supply ports need to be plugged with the appropriate gasket (5, 7, or 14).

Perform pilot supply conversion outlined on Installation and Operating Instructions (V-430DP) packed with valve.

If you ordered the valve with external pilot having an "L", "M", "P" or "Q" in digit 6 of the Model Number, mount valve as received. You will also need to isolate the 12 or 14 port of this valve from other valves in the manifold bank.

Station Blanking Plate

Use top blanking plate (18) with a manifold (8) to reserve a place for a valve that will be added later to the manifold bank or to remove a valve from a manifold without having to remove the manifold block from the manifold bank. (See Figure 6.)

Place gasket (19) and blanking plate (18) on manifold and assemble using mounting screws (17) provided with kit. Tighten screws from 2.9 to 3.8 Nm (25 to 35 in-lbs).

Apply main pressure and check for leaks. If any are present, do not operate valves on the manifold bank - repeat the assembly process until satisfactory.

Assembly Procedures for Specially Machined Manifolds and Accessories

1. Instructions for manifolds with **auxiliary inlet and outlet** (call out 8 in 4th position of model number) and/or selector type sandwich regulators.

Auxiliary inlet and outlet manifolds use the outlet of one valve to supply the inlet of the next valve. Both manifold stations must be of the auxiliary inlet and outlet type (any additional manifold stations may be standard).

The valve to be used as the supply to the next valve must be on the left hand side of the valve to be supplied when viewing the end outlet ports.

Gallery port #1 of the supply manifold must be isolated between the two stations per the manifold isolation procedures section. Further, the auxiliary seal (eyebrow shaped gasket, Item 20 in Figure 5) must be installed in mating gasket tracks, between and on both sides, of the supply and outlet manifolds. For every pair of these manifolds, there are three (3) places where these gaskets must be fitted.

The outlet ports of the supply manifold should be plugged.

If a selector type sandwich regulator is being used with the supply valve and the adjusted pressures are less than the minimums stated on the front, the valve(s) being supplied should be converted to external pilot supply.

2. Instructions for using the **pilot pressure** of one valve as **external pilot pressure** for other valves.

Perform pilot conversions per Instruction Sheet V-430DP shipped with the valve.

The valve used to supply pilot pressures to other valves must be the unit at the highest pressure.

Remove and replace the appropriate gasket (2, 5, 7, or 14) from the valve manifold to be used for pilot supply.

Convert all valves to be of the external type to external pilot supply from 12 or 14 depending on which was chosen.

3. Instructions for joining F5 manifolds using **transition plate**. The transition plate acts as a F3 left end plate and a F5 right end plate. Line up manifolds while viewing cylinder ports "2" and "4" in order of assembly and by "family". The F3 family of manifolds will be to the left of the transition plate. Assemble the F3 manifolds per Instruction Sheet V-413DP, except exchange the phrase "left end plate" with "transition plate". Now assemble the F5 manifolds, using procedures mentioned earlier in this instruction sheet and substituting "transition plate" for "left end plate". Manifold assembly hardware should be tightened to the values mentioned in this (V-433CP) instruction sheet. See Figure 2 for a pictorial representation.
4. Instructions for increasing inlet and exhaust air capability by installing an **auxiliary access manifold**. Use the **Assembly Procedures for Manifolds** to install this accessory, keeping in mind that this manifold has a supply source for the pilot supply/signal galleries. **Manifold Instruction Procedures** and design constraints for special functions (**auxiliary inlet and outlet**) still apply. Manifold assembly hardware should be tightened to the values mentioned in this (V-433CP) instruction sheet. See Figure 3 for a pictorial representation.

Instruction Sheets Available:

V-430DP - Valve Installation & Operating Instructions
 V-431BP - Valve Body Service Instructions
 V-432BP - Solenoid Service Instructions
 V-434BP - Subbase Installation Instructions
 V-435BP - Sandwich Flow Control Installation Instructions
 V-436BP - Sandwich Regulator Installation & Operating Instructions
 V-437BP - Sandwich Regulator Conversions & Service Instructions

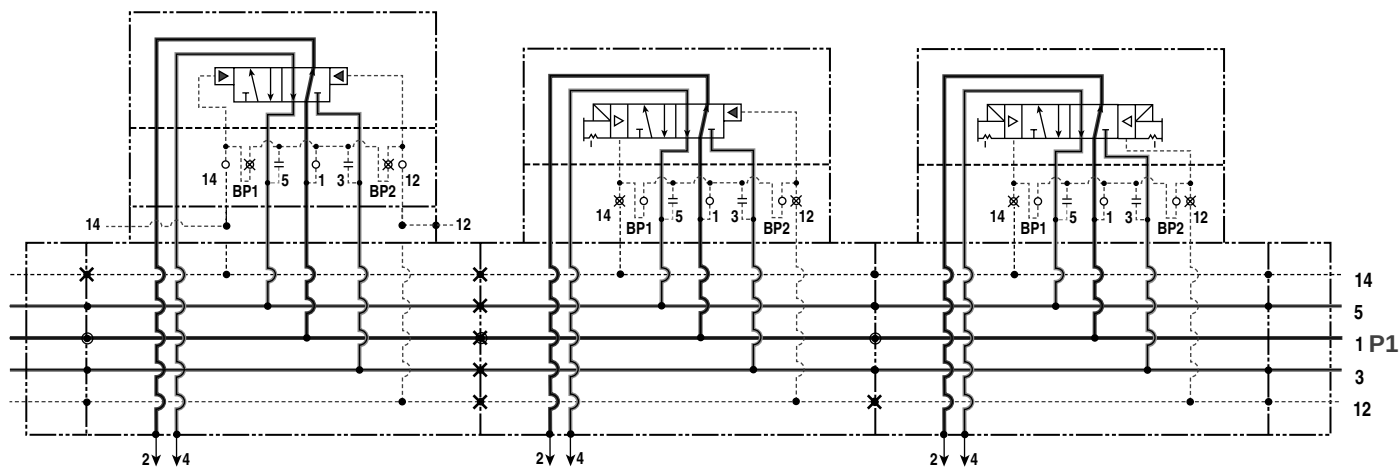


FIGURE 4

Part Identification List

Item #	Description	Item #	Description
1	Right End Plate	15	Left End Plate
2	Molded Gasket - manifold base to manifold base or end plate (12 & 14 pilot open PS353303P)	16	Mounting Screw - end plate to base
3	Pipe Plug (For bottom or end ports)	17	Mounting Screw - for blanking plate
4	Tie Rod	18	Blanking Plate
5	Molded Gasket - manifold base to manifold base or end plate (12 closed & 14 pilot open PS353301P)	19	Flat Gasket - blanking plate to manifold base
6	Isolator Plugs - Main Gallery (PS3532P)	20	Molded Gasket - auxiliary inlet / outlet seal
7	Molded Gasket - manifold base to manifold base or end plate (12 & 14 pilot closed PS353302P)	21	Isolator Plugs - Pilot Gallery (PS3433P)
8	Manifold Base	22	Flat Gasket - F3
9	Mounting Screws - for valve & sandwich block to base	23	Flat Gasket - F5
10	Valve Assembly	24	Transition Plate
11	Captive Screw	25	Auxiliary Access Manifold
12	Flat Gasket		
13	End Cover Assembly		
14	Molded Gasket - manifold base to manifold base or end plate (12 open & 14 pilot closed PS353300P)		

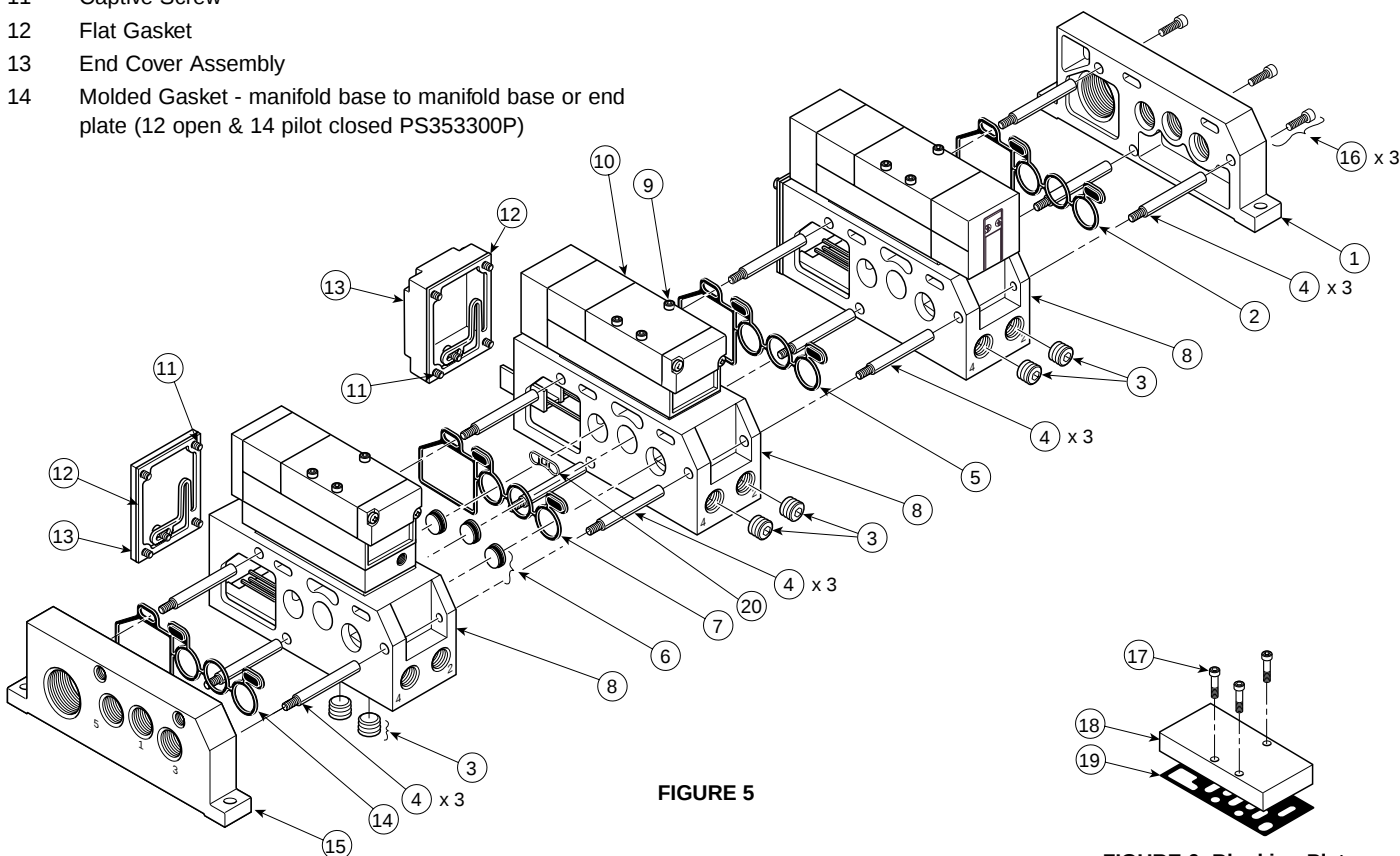


FIGURE 5

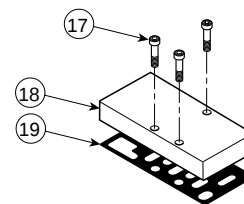


FIGURE 6: Blanking Plate, Gasket, & Mounting Screws



Pneumatic Division
Richland, Michigan 49083

Installation Instructions: Form V-434BP

H1 & F5 Series Valves - Subbase
Installation 2 & 3-Position, 4-Way,
5-Ports

ISSUED: November, 2000
Supersedes: October, 1999

ECN# P27873, Rev. 3

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-430CP) packed with valve.

Operating Pressure Range:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

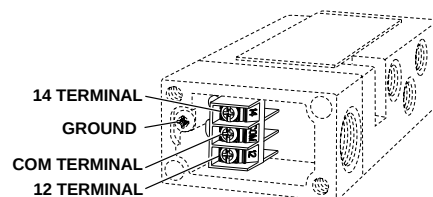
Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).
3. An external ground connection must be attached to the green ground screw.
4. Disregard unused wires or terminals.



Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Valve Mounting Procedures

If valve and subbase are purchased separately, use the following procedure to mount valve to base:

1. Using a clean, lint free cloth, clean top surface of subbase and bottom surface of valve body of dirt and dust.
2. Check to insure that gasket is properly seated in gasket track on sandwich block.
3. Place valve assembly on top of subbase. On electrically operated valves, line up plug with socket in base and gently press down on valve to seat plug properly.
4. Line up the captive mounting screws. Tighten using a 4 mm wrench; torque from 2.9 to 3.8 Nm (25 to 35 in-lbs) using progressive steps with a criss-cross pattern.
5. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Port Connections

(Below is a brief summary of typical port connections. See Technical Data section of the F Series catalog for more details.)

1. Connect a single inlet air supply to port "1". (For dual pressure applications connect inlet air supplies to ports "3" and "5".)
2. Connect mufflers (or pipe exhaust) to ports "3" and "5" for single air supply. For dual pressure applications, connect to port "1".
3. Connect cylinder ports marked "2" and "4" to cylinder or other device to be supplied air.
4. External pilot supply may be applied to ports 12 or 14. Double air piloted valves need to use both 12 and 14 ports for remote pilot signal; and single air piloted valves have to use port 14 for remote pilot signal.
5. For 2-Way and 3-Way functions, you will need to plug some of the ports - consult the Technical Data section of the F Series catalog.

NOTE: Some subbase kits come with pipe plugs. These plugs should be located as desired.

! WARNING

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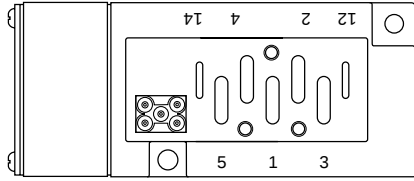
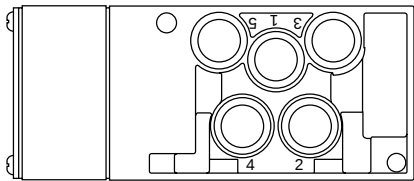
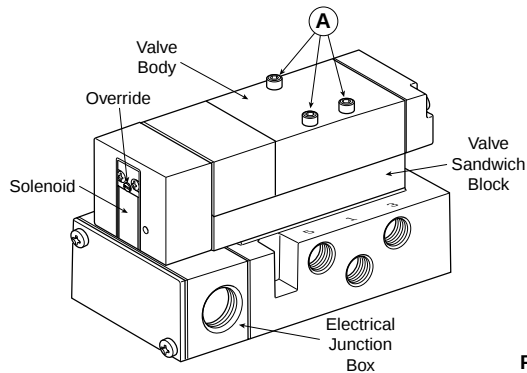
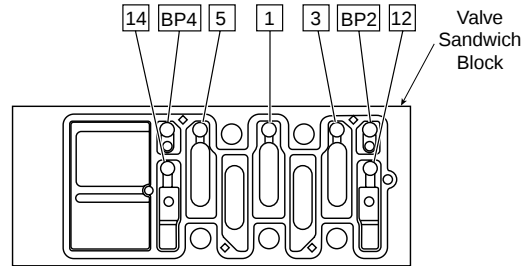
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 V-435BP - Sandwich Flow Control Installation Instructions
 V-436BP - Sandwich Regulator Installation & Operating Instructions
 V-437BP - Sandwich Regulator Conversions & Service Instructions
 V-438BP - Manifold With Electrical Interconnect Installation

**FIGURE 1: Top View (Ports located on side)****FIGURE 2: Bottom View of Subbase - showing optional bottom ports****FIGURE 3****FIGURE 4****Pilot Pressure Supply**

This valve requires a source of air pressure for shifting - a pilot supply. The sixth character in the model number identifies this supply when the valve was assembled at the factory. If changes have occurred in the field, the character will no longer represent that pilot arrangement. If a new valve is ordered with the same model number as the old one, perform an examination at the time of replacement and move the plugs (if necessary) so that the new valve has them in the same locations as the old one (described in steps 1-3 following).

Conversion in the field from an internal pilot supply to an external type, or vice versa, is possible. However, conversion from a single pressure valve to a dual pressure type is not possible in the field - special parts are required. (However, dual pressure valves can be converted back to single pressure in the field.) All of these conversions are performed by relocating small plugs as follows:

1. The bottom surface of the sandwich block has several holes which receive the small plugs. This is accessed by loosening the three main body mounting screws (item A) with a 4 mm hex wrench and removing the valve from its base. These holes have identification alongside as shown in Figure 4 and plugs must be located in the holes as described in Table 1. (See the two identification methods located in Table 1.)
2. To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.
3. Replace the valve on its base, making certain first that the interface gasket (item B) is in place in its grooves in the sandwich block. Engage the electrical plug carefully during this process. Tighten the 3 main body mounting screws from 2.9 to 3.8 N•m (25 to 35 in-lbs).
4. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

Table 1 - Sandwich Block Pilot Plug Locations (Reference Illustrations Above)

Method 1: Using Model No. to Determine Plug Locations		Method 2: Using Attributes of Valve & Operator(s) to Determine Plug Locations									
3rd Digit in Model No.	6th Digit in Model No.	Pilot Supply Holes							Pilot Supply	Main Press Supply Type	Control Mechanism Opertor Types
		1	3	5	BP4	BP2	12	14			
1 or E	B or C		M	M			X	X	Internal @ Port 1	Single	All Solenoids
	P or Q	X	M	M				X	External @ Port 12		
	L or M	X	M	M			X		External @ Port 14		
2, 5, 6, 7	B or C		M	M			X	X	Internal @ Port 1	Dual	
	E or F	X		X			X	X	Internal @ Port 3		
	H or J	X	X				X	X	Internal @ Port 5		
	P or Q	X	M	M				X	External @ Port 12		
	L or M	X	M	M			X		External @ Port 14		
3 or F	0 or C		M	M	X		X		Internal @ Port 1	Single	Single Air Pilot
	P or Q	X	M	M		X			External @ Port 12		
	L or M	X	M	M	X				External @ Port 14		
	E or F	X		X			X	X	Internal @ Port 3	Dual	
	H or J	X	X				X	X	Internal @ Port 5		
4, 8, 9, 0	0	X	M	M	X				None	Single or Dual	Double Air Pilot

Key Code: X = Pilot hole must be plugged.
 Blank = Pilot hole must be left open.

M = Pilot holes may be molded shut and will not need a plug; however some holes may be open and therefore will require a plug. Use a probe to test if holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions:
V-435BP
F5 Sandwich Flow Controls
ISSUED: October, 1999
Supersedes: March, 1998
ECN# P27372

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Application Limits

Flow Control Sandwiches can only be used with single pressure valves to control valve exhaust in a meter-out mode. They can not be used with dual pressure valves for meter-in.

Both valve exhausts will exit from port #3 in the valve subbase or manifold.

A Flow Control Sandwich controls the flow of air from the valve exhaust ports to atmosphere. The F5 valve (4-Way) is typically used with a double acting cylinder alternately pressurizing one end while exhausting the other. Cylinder speed can be influenced by restricting the exhaust path.

NOTE: If the complete blockage of air to atmosphere or extremely fine adjustments are required DO NOT use a Flow Control Sandwich. Instead connect Micrometer Flow Control Valves to cylinder ports of subbase or manifold with the free flow direction pointing away from the subbase or manifold.

Flow Control Sandwich is intended for use with subbase or manifold mounted F3 Valves. It may be used in combination with Sandwich Regulator option, and should be mounted between the regulator and base.

NOTE: When Sandwich Flow Control is used with an Independent Port Regulator (Function 5 of Model Index), both valve exhausts exit through port 3 of the regulator sandwich and consequently, the adjusting screw for exhaust port 5 has no effect.

These products are intended for use in general purpose compressed air systems only.

Instruction Sheets Available:

- V-430CP - Valve Installation & Operating Instructions
- V-431BP - Valve Body Service Instructions
- V-432BP - Solenoid Service Instructions
- V-433BP - Manifold Installation Instructions
- V-434BP - Subbase Installation Instructions
- V-436BP - Sandwich Regulator Installation & Operating Instructions
- V-437BP - Sandwich Regulator Conversion & Service Instructions
- V-438BP - Manifold With Electrical Interconnect Installation

Operating Inlet Pressure:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/ Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

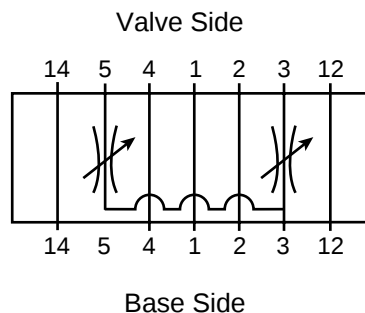
NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Symbol



! WARNING

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This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

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Installation of Flow Control Sandwich

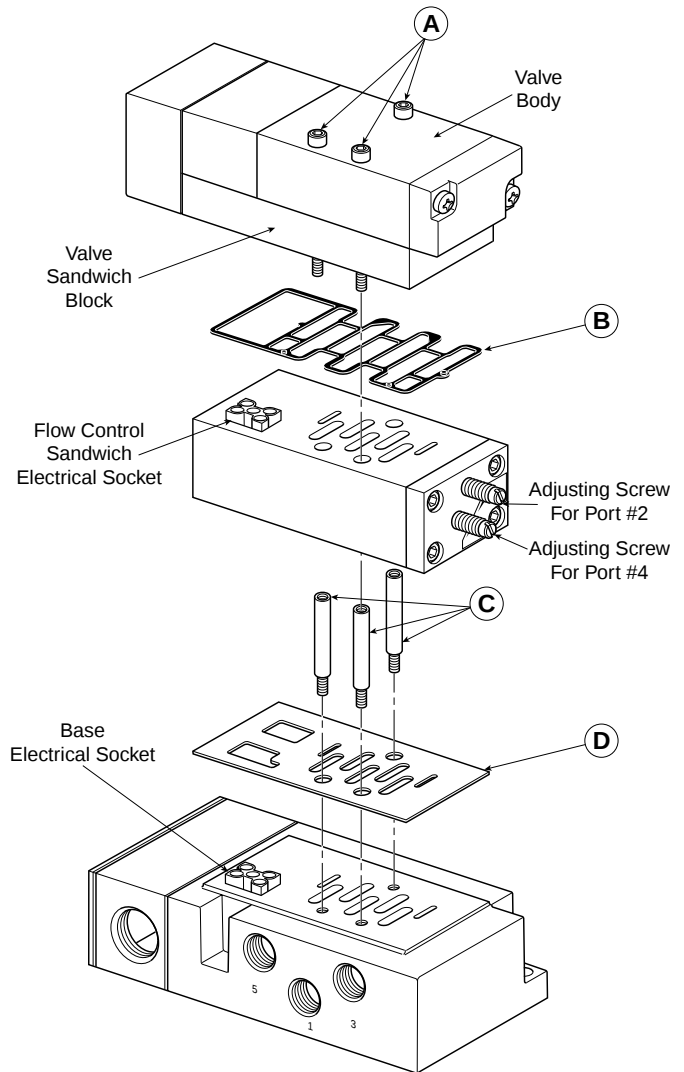
(For valve installation see the instruction sheet(s) shipped with the product)

- 1) Remove the valve from the subbase or manifold (if assembled) by loosening the three main body mounting screws (item A) with a 4 mm hex wrench.
- 2) Clean all mating surfaces of valve, subbase or manifold and Flow Control Sandwich of dust and dirt.
- 3) Install three mounting studs (item C) to base, tighten to 2.9 to 3.8 N•m (25 to 35 in-lbs).
- 4) Place the gasket (item D) that came with the Flow Control Sandwich over the studs and on top of the subbase or manifold.
- 5) Place Flow Control Sandwich on top of subbase or manifold, lining up all three mounting studs. Electrically operated valves also require lining up electrical plug with socket in base and gently pressing down on Flow Control Sandwich to seat plug properly.
- 6) Check to insure that the gasket on the bottom of the valve sandwich block is still properly seated in its gasket track. Then place valve assembly on top of flow control. Line up electrical plug with socket in flow control and gently press down on valve to seat plug properly.
- 7) Tighten the three captive mounting screws (item A) using a 4 mm hex wrench. Torque screws from 2.9 to 3.8 N•m (25 to 35 in-lbs) using progressive steps with a criss-cross pattern.
- 8) Apply inlet pressure and check for leaks. If any are present, do not operate the valve - repeat this assembly process until satisfactory.

Adjustment Procedures

Both adjusting screws are located at the 12 end of the assembly. When viewed from this end, the screw to the left (marked port 4) controls flow from valve cylinder port 4 to exhaust, the screw to the right (marked port 2) controls flow from valve cylinder port 2 to exhaust. Both valves exhaust the base at port 3. Adjustment technique:

- 1) Turn both adjustment screws clockwise until fully closed and then counterclockwise slightly.
- 2) While cycling cylinder with valve, turn adjusting screws counterclockwise to increase exhaust flow or clockwise to decrease exhaust flow.





Pneumatic Division North America
Richland, Michigan 49083

Installation & Operating Instructions
V-436BP

F5 Series Valves Sandwich Regulators

ISSUED: October, 1999

Supersedes: March, 1998

ECN# P27372

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Installation/Operating Instructions

A sandwich regulator is used to provide regulated pressure to individual valves in a manifolded valve arrangement. Three basic modes of regulation are available as follows:

Common Port Regulation - Provides adjustable regulated air pressure to the valve inlet. The regulator is always on the 14 end of the assembly.

Independent Port Regulation - Provides (2) separately adjustable regulated air pressures, one to each of the valves exhaust passages, or when used with the by pass plate option on either the 14 or 12 end, one outlet port pressure is adjustable, the other is at supply pressure.

Selector Regulator - Provides two pressures to port #2 that can be selected by shifting the main valve. This requires a special manifold.

NOTE: With independent port regulation the valves flow functions are reversed as indicated by the diagrams to right. Wiring and plumbing must be adjusted accordingly. (Common Port Regulation does not affect the valve function.)

! CAUTION: The reverse valve porting utilized with Independent Port will reverse the function of 4-Way, 3-Position cylinder to exhaust and 4-Way, 3-Position inlet to cylinder valves. Utilize the opposite function valve for normal operation.

Air applied to the sandwich regulator must be filtered to realize maximum component life.

Factory Pre-Lubrication - Sandwich regulators are pre-lubricated at assembly with Texaco Marfak MP-2 grease.

! CAUTION: Do not use synthetic, reconstituted, or oils with an alcohol content or detergent additive.

! CAUTION: It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the valve spool is in the horizontal plane.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Inlet Pressure:

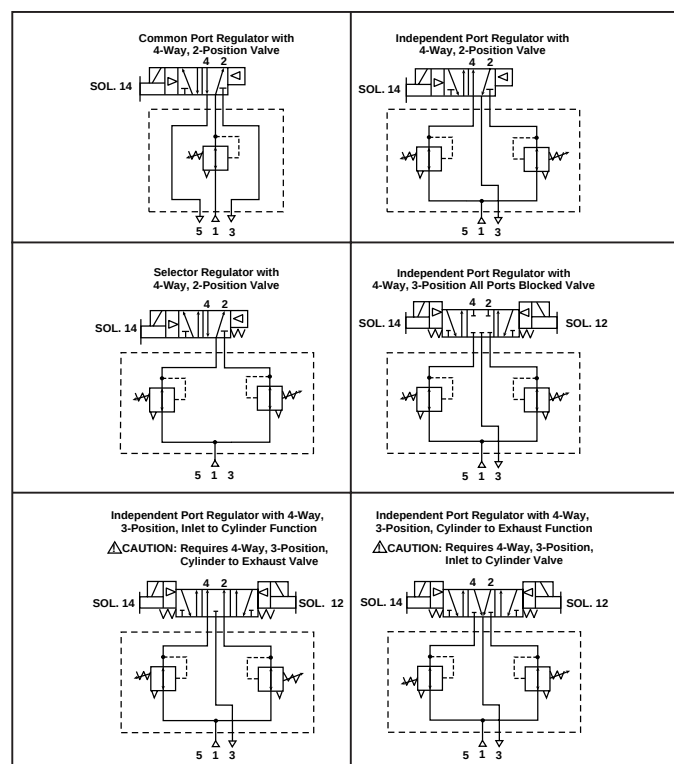
	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/ Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above. Valves with sandwich regulators are designed to use unregulated pilot pressure from the inlet for valve operation. Table 1 on page 2 shows proper assembly to assure this function.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.



NOTE: The regulators shown on the 14 and 12 end of Independent Port and Selector Units may be replaced with a by pass plate to provide unregulated pressure.

! WARNING

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Pilot Pressure Supply

This valve requires a source of pressure for shifting - a pilot supply. The sixth character in the model number identifies this supply when the valve was assembled at the factory. If changes have occurred in the field, the character will no longer represent that pilot arrangement. If a new valve is ordered with the same model number as the old one, perform an examination at the time of replacement and move the plugs (if necessary) so that the new valve has them in the same locations as the old one (described in steps 1-2 following). If a sandwich regulator kit is being used with an existing valve, examination and conversion is necessary per the following.

- 1. The bottom surface of the valve sandwich block has several holes which receive the small plugs. These holes have identification alongside as shown in the figure and plugs must be located in the holes as described in Table 1.
- 2. To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.

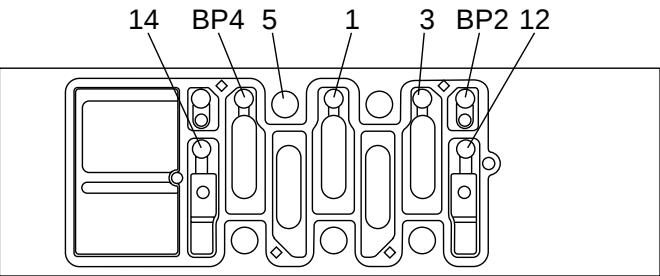


Table 1

Model Code Digits 3 and 6		Pilot Supply Holes						
Operator/ Function	Pilot Source	1	3	5	BP4	BP2	12	14
1, E 2, 5, 6, 7	B	X	M	M				
	E	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	L	X	M	M			X	
	P	X	M	M				X
3 or F	O	X	M	M	X			
	E	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	P	X	M	M	X			
4, 8, 9, 0	O		M	M	X	X		

Installation

Remove pressure and electrical connections before installation.

If valve is not mounted to base skip steps 1 and 2.

- 1. Loosen body to base mounting bolts (item A) using a 4 mm hex wrench and lift valve body from subbase or manifold. Retain the gasket (item B).
- 2. Thoroughly clean both valve body and base mounting surfaces of all foreign residue.
- 3. Install the three mounting studs (item C) contained in the regulator kit to the base and tighten to 2.9 to 3.8. N•m (25 to 35 in-lbs).
- 4. Place the gasket (item D) that came with the sandwich regulator over the studs and on top of the subbase or manifold.
- 5. Install the regulator over the studs, engaging the electrical plug carefully during this process.
- 6. Replace the valve on the regulator, making certain first that the interface gasket (item B) is in place in its grooves in the valve body. Engage the electrical plug carefully during this process. Tighten the three main body mounting screws (item A) from 2.9 to 3.8 N•m (25 to 35 in-lbs).
- 7. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

NOTE: If both a sandwich flow control and sandwich regulator are to be installed, the flow control should be installed between the regulator and the base. Both sets of studs should be installed to base before installing the flow control.

Gage Installation

Units may be shipped with a standard gage installed. Larger gages (if so ordered) are shipped loose with fittings to include a pipe nipple, coupling and Street EL 45°. Consider visibility of gage and valve indicator lights along with valve override accessibility during gage installation.

Standard size gage: 24mm (15/16") diameter.

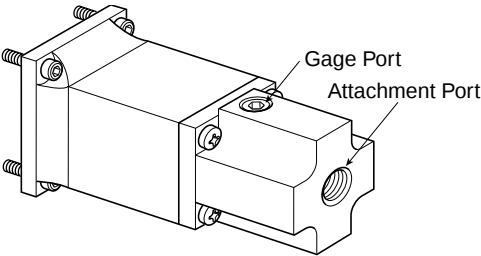
Larger size gages: 45mm (1-3/4") diameter. Liquid and non-liquid filled versions of this size are available.

When installing gages and mating fittings, remove 1/8" pipe plug from gage port and apply thread sealant (not tape) to male threads as required to accommodate gage installation. Gage / fitting clearance to valve operator dictates components be assembled sequentially.

Outlet Pressure Adjustment

- 1. To avoid minor readjustment after making a change in pressure setting, always approach the desired pressure setting from a lower pressure.
- 2. Before turning on system air pressure, disengage lock by pulling adjusting knob outward, and then turn knob counterclockwise until knob stops.
- 3. Turn on system pressure.
- 4. Turn adjusting knob clockwise to increase pressure until the desired pressure setting is reached.
- 5. To reduce pressure setting, turn adjusting knob counterclockwise until pressure decreases to at least 10 PSI lower than desired setting. Then turn adjusting knob clockwise until the desired pressure setting is reached.
- 6. Push the adjusting knob inward to engage lock.
- 7. Resetting may be required to compensate for flow after the valve is cycling in normal use.

Remote Operated Only - Connect outlet of pilot regulator (customer supplied) to the attachment port in the end of the machined air pilot bonnet. Adjust the remote pilot regulator for desired F5 operation which can be monitored by means of an air gage mounted in the gage port.



Instruction Sheets Available:

- V-430CP - Valve Installation & Operating
- V-431BP - Valve Body Service
- V-432BP - Solenoid Service
- V-433BP - Manifold Installation
- V-434BP - Subbase Installation
- V-435BP - Flow Control Installation
- V-437BP - Regulator Conversion & Service
- V-438BP - Manifold With Electrical Interconnect Installation



Pneumatic Division North America
Richland, Michigan 49083

Service/Conversion Instructions V-437BP
F5 Series Valves Sandwich Regulators
ISSUED: October, 1999
Supersedes: March, 1998
ECN# P27372

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
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Installation/Operating Instructions

A sandwich regulator is used to provide regulated pressure to individual valves in a manifolded valve arrangement. Three basic modes of regulation are available as follows:

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Independent Port Regulation - Provides (2) separately adjustable regulated air pressures, one to each of the valves exhaust passages, or when used with the by pass plate option on either the 14 or 12 end, one outlet port pressure is adjustable, the other is at supply pressure.

Selector Regulator - Provides two pressures to port #2 that can be selected by shifting the main valve. This requires a special manifold.

NOTE: With independent port regulation the valves flow functions are reversed as indicated by the diagrams to right. Wiring and plumbing must be adjusted accordingly. (Common Port Regulation does not affect the valve function.)

! CAUTION: The reverse valve porting utilized with Independent Port will reverse the function of 4-Way, 3-Position inlet to exhaust and 4-Way, 3-Position inlet to cylinder valves. Utilize the opposite function valve for normal operation.

Air applied to the sandwich regulator must be filtered to realize maximum component life.

Factory Pre-Lubrication - Sandwich regulators are pre-lubricated at assembly with Texaco Marfak MP-2 grease.

! CAUTION: Do not use synthetic, reconstituted, or oils with an alcohol content or detergent additive.

! CAUTION: It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the valve spool is in the horizontal plane.

Application Limits

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Operating Inlet Pressure:

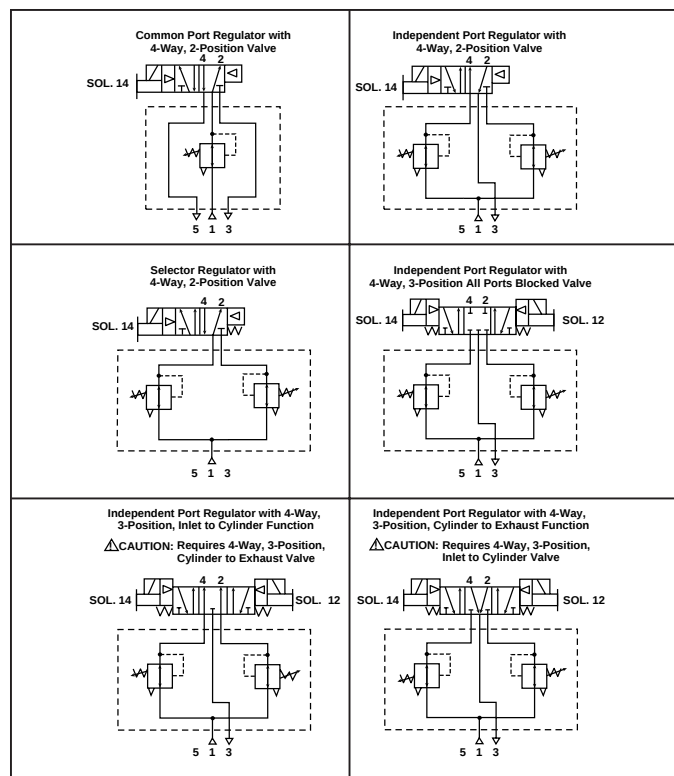
	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/ Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure from the inlet and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above. Valves with sandwich regulators are designed to use unregulated pilot pressure from the inlet for valve operation. Table 1 on page 2 shows proper assembly to assure this function.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.



NOTE: The regulators shown on the 14 and 12 end of Independent Port and Selector Units may be replaced with a by pass plate to provide unregulated pressure.

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Conversion Procedures

Remove pressure and electrical connections and perform conversion per instructions below. Tighten all fasteners per Table 3. Liberally grease all seals.

- Loosen three body to base mounting bolts (item 1) using a 2 mm hex wrench and lift valve body from sandwich.
- Thoroughly clean valve body, regulator, and base mounting surfaces of all foreign material.
- Perform conversion procedures per instructions below.
- Assure the proper location of the plug located at 12 in either the 12 end or bottom surface per Table 2. Also assure the location of plugs in holes marked SP or DP at the 14 and 12 ends as well as the top and bottom surfaces.
- Assure gaskets (items 2 & 4) are installed on valve and regulator mounting surfaces and flats on studs (item 3) are still parallel to base edge.
- Install the regulator over the studs, engaging the electrical plug carefully during this process.
- Certain conversions (notably from internal to external pilot supply or vice versa, or from or to Air Pilot Operated valves) require the pilot supply plugs in the valve sandwich to be moved. Always verify the proper plug locations in the valve sandwich prior to reassembly per Table 1. If necessary to relocate plugs simply remove by prying up with a narrow tool. Assure the o-ring is not nicked or torn, and that it has a coating of grease. Install o-ring end first into the appropriate hole.
- Replace the valve on the regulator, engaging the electrical plug carefully during this process.
- Tighten the 3 main body mounting screws (item 1) using a 3 mm hex wrench from 2.5 to 2.9 N•m (22 to 26 in.-lbs).
- Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.
- Assure gasket (item 27) remains in regulator block track.

Common Port to Independent Port

12 End of Regulator Block

- Remove & discard stamped plate (item 5) and screws (item 6).
- Remove & retain plug (item 7) from area marked SP.
- Install regulator body assembly (item 8).
- Install o-ring (item 9), piston o-ring (item 10), lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using new screws (item 15) from kit.

14 End of Regulator Block

- Remove bonnet assembly (item 14), lipseal (item 11), piston (item 12), & spring (item 13) by removing screws (item 15).
- Remove regulator body assembly (item 8).
- Move plug (item 7) from SP to DP.
- Reinstall regulator body assembly (item 8).
- Reinstall lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using existing screws (item 15).

Top Surface of Regulator Block

- Install plug (item 7) removed from 12 end to DP.

Bottom Surface of Regulator Block

- Install plug (item 7) from kit into DP.

Independent Port to Common Port

Top Surface of Regulator Block

- Remove & retain plug (item 7) from DP.

12 End of Regulator Block

- Remove & discard lipseal (item 11), piston (item 12), spring (item 13), bonnet assembly (item 14) and existing screws (item 15).
- Remove & discard regulator body assembly (item 8).
- Install plug (item 7) removed from top surface into SP.
- Install stamped plate (item 5) using new screws (item 6) from kit.

14 End of Regulator Block

- Remove bonnet assembly (item 14), lipseal (item 11), piston (item 12), & spring (item 13) by removing screws (item 15).
- Remove regulator body assembly (item 8).
- Move plug (item 7) from DP to SP.
- Reinstall regulator body assembly (item 8).
- Reinstall lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using existing screws (item 15).

Bottom Surface of Regulator Block

- Remove & discard plug (item 7) from DP.

Regulator to By Pass Plate

14 or 12 End of Regulator Block

- Remove & discard lipseal (item 11), piston (item 12), spring (item 13), bonnet assembly (item 14) and existing screws (item 15).
- Remove & discard regulator body assembly (item 8).
- Install by pass plate (item 16) using new screws (item 17) from kit.

By Pass Plate to Regulator

14 or 12 End of Regulator Block

- Remove & discard by pass plate (item 16) & existing screws (item 17).
- Install regulator body assembly (item 8).
- Install o-ring (item 9), piston o-ring (item 10), lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using new screws (item 15) from kit.

Common Port to Selector

12 End of Regulator Block

- Remove & discard stamped plate (item 5) & screws (item 6).
- Install regulator body assembly (item 8).
- Install o-ring (item 9), piston o-ring (item 10), lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using new screws (item 15) from kit.

Top Surface of Regulator Block

- Install plug (item 7) from kit to DP.

Independent Port to Selector

Bottom Surface of Regulator Block

- Remove & retain plug (item 7) from DP.

12 End of Regulator Block

- Remove bonnet assembly (item 14), lipseal (item 11), piston (item 12), & spring (item 13) by removing screws (item 15).
- Remove regulator body assembly (item 8).
- Move plug (item 7) from DP to SP.
- Reinstall regulator body assembly (item 8).
- Reinstall lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using existing screws (item 15).

14 End of Regulator Block

- Remove bonnet assembly (item 14), lipseal (item 11), piston (item 12), & spring (item 13) by removing screws (item 15).
- Remove regulator body assembly (item 8).
- Move plug (item 7) from DP to SP.
- Reinstall regulator body assembly (item 8).
- Reinstall lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using existing screws (item 15).

Selector to Common Port

12 End of Regulator Block

- Remove & discard lipseal (item 11), piston (item 12), spring (item 13), bonnet assembly (item 14) and existing screws (item 15).
- Remove & discard regulator body assembly (item 8).
- Install stamped plate (item 5) using new screws (item 6) from kit

Top Surface of Regulator Block

- Remove & discard plug (item 7) from DP.

Selector to Independent

12 End of Regulator Block

- Remove bonnet assembly (item 14), lipseal (item 11), piston (item 12), & spring (item 13) by removing screws (item 15).
- Remove regulator body assembly (item 8).
- Remove & retain plug (item 7) from SP.
- Reinstall regulator body assembly (item 8).
- Reinstall lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using existing screws (item 15).

14 End of Regulator Block

- Remove bonnet assembly (item 14), lipseal (item 11), piston (item 12), & spring (item 13) by removing screws (item 15).
- Remove regulator body assembly (item 8).
- Move plug (item 7) from SP to DP.
- Reinstall regulator body assembly (item 8).
- Reinstall lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using existing screws (item 15).

Bottom Surface of Regulator Block

- Install plug (item 7) removed from 12 end into DP.

Spring Controlled to Air Controlled

(Note: Plug (item 21) on 12 end must be removed and retained regardless of which end is to be converted)

14 &/or 12 End of Regulator Block

- Remove & discard spring (item 13), & bonnet assembly (item 14) by removing screws (item 15).
- Install spacer (item 18), lipseal (item 11), non venting piston (item 19), & air pilot bonnet (item 20) using existing screws (item 15).

Bottom Surface of Regulator Block

- Install plug (item 21) removed from 12 end into 12.

Spring Ranges

14 &/or 12 End of Regulator Block

- Remove bonnet assembly (item 14) by removing screws (item 15) & discard old spring (item 13).
- Install spring (item 13), & bonnet assembly (item 14) using existing screws (item 15).

Air Controlled to Spring Controlled

Bottom Surface of Regulator Block

- Remove and retain plug (item 21) from 12.

14 &/or 12 End of Regulator Block

- Remove & discard spacer (item 18), lipseal (item 11), non venting piston (item 19), & air pilot bonnet (item 20) by removing screws (item 15).
- Remove regulator body assembly (item 8).
- Install plug (item 21) removed from bottom surface into 12 (12 end only).
- Reinstall regulator body assembly (item 8).
- Install piston o-ring (item 10), lipseal (item 11), piston (item 12), spring (item 13), & bonnet assembly (item 14) using existing screws (item 15).

Pilot Pressure Supply

This valve requires a source of pressure for shifting - a pilot supply. The sixth character in the model number identifies this supply when the valve was assembled at the factory. If changes have occurred in the field, the character will no longer represent that pilot arrangement. If a new valve is ordered with the same model number as the old one, perform an examination at the time of replacement and move the plugs (if necessary) so that the new valve has them in the same locations as the old one (described in steps 1-3 following). If a sandwich regulator kit is being used for an existing valve, examination and conversion is necessary per the following.

- 1) The bottom surface of the valve sandwich block has several holes which receive the small plugs. These holes have identification alongside as shown in the figure and plugs must be located in the holes as described in Table 1.
- 2) To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.
- 3) Re-assemble using Installation Instructions on page 4.

Table 1

Valve						Regulator Pilot	
Operator Callout	Pilot Supply	Sandwich Plug Locations					
		14	12	BP	1	12 End	Bottom
3, F	0	—	—	X	X	—	X
4, 8, 9, 0	0	—	—	X	X	X	—
1, 2, 5, 6, 7, E	B, C	X	—	—	X	—	X
1, 2, 5, 6, 7, E	L, M	—	X	—	X	X	—
1, 2, 5, 6, 7, E	P, Q	X	—	—	X	X	—
3, F	P, Q	—	—	X	X	X	—

N/A	E, F	N/A	N/A	N/A	N/A	N/A	N/A
-----	------	-----	-----	-----	-----	-----	-----

NOTE: X indicates plug locations.

Table 2

Regulator Block Plug Locations					
Function	Digit 11	14 End	12 End	Top	Bottom
Common Port	1 or 4	SP	SP	—	—
Independent Port	2	DP	—	DP	DP
Selector	3	SP	SP	DP	—

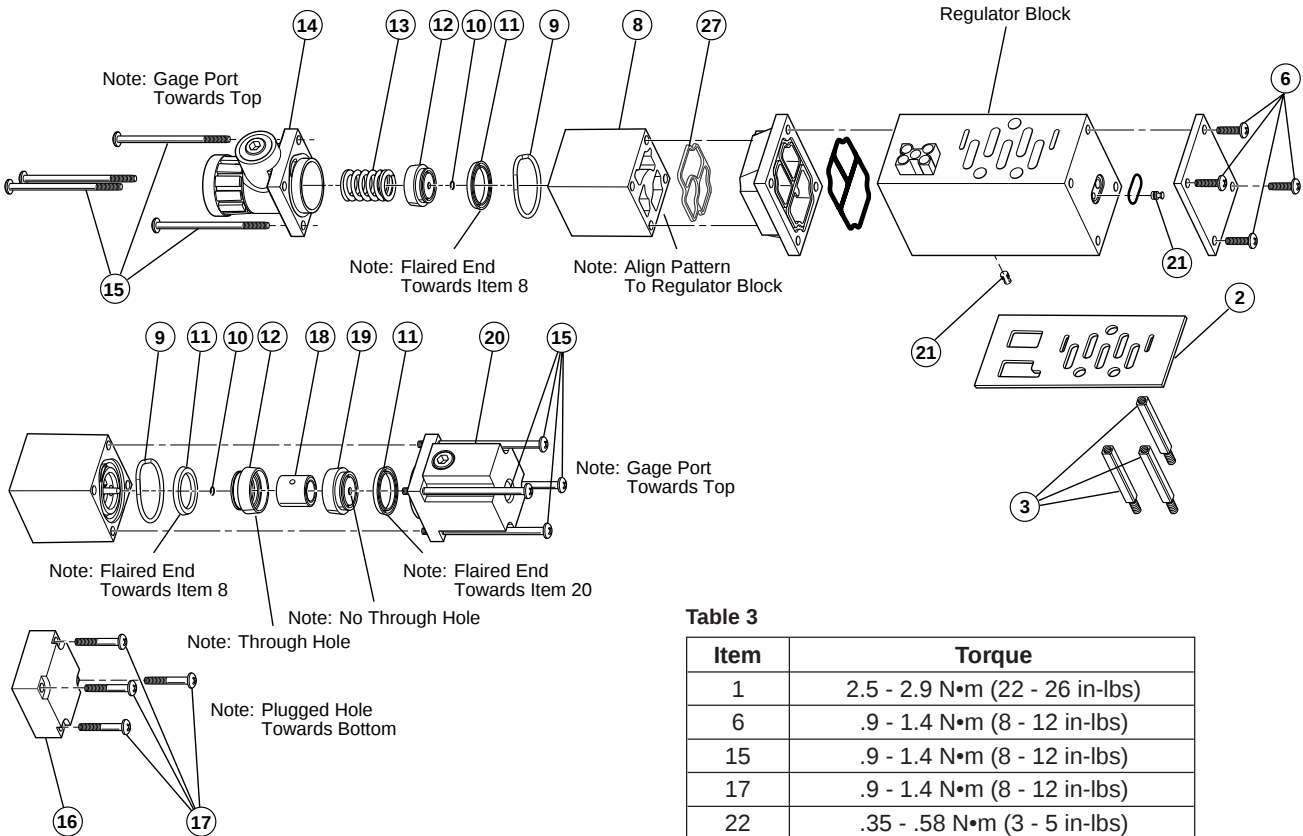
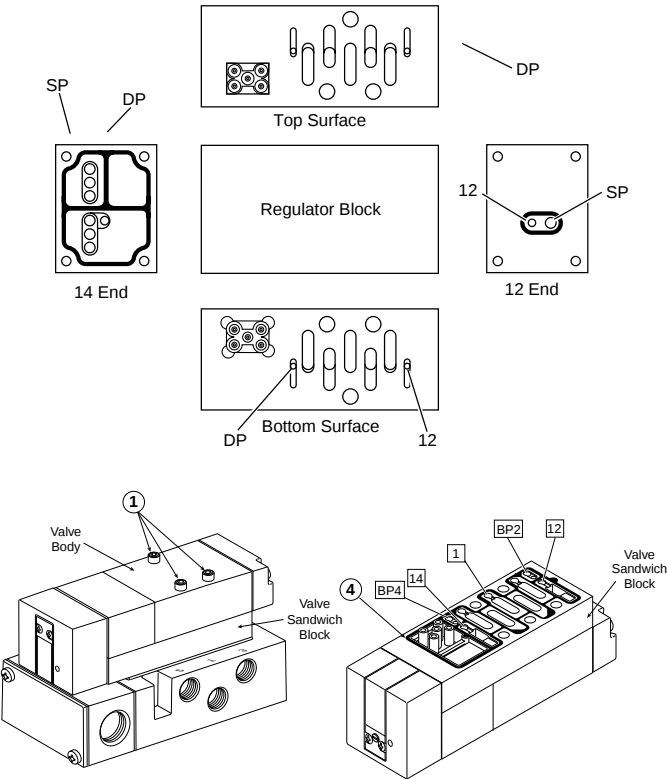


Table 3

Item	Torque
1	2.5 - 2.9 N•m (22 - 26 in-lbs)
6	.9 - 1.4 N•m (8 - 12 in-lbs)
15	.9 - 1.4 N•m (8 - 12 in-lbs)
17	.9 - 1.4 N•m (8 - 12 in-lbs)
22	.35 - .58 N•m (3 - 5 in-lbs)

Installation

Remove pressure and electrical connections before installation.

If valve is not mounted to base skip steps 1 and 2.

1. Loosen body to base mounting bolts (item 1) using a 3 mm hex wrench and lift valve body from subbase or manifold. Retain the gasket (item 4).
2. Thoroughly clean both valve body and base mounting surfaces of all foreign residue.
3. Install the three mounting studs (item 3) contained with the regulator to the base finger tight. Back studs off so that the flats on the studs are parallel to side of base.
4. Place the gasket (item 2) that came with the sandwich regulator into the grooves on the bottom of the regulator after lightly greasing.
5. Install the regulator over the studs, engaging the electrical plug carefully during this process.
6. Replace the valve on the regulator, making certain first that the interface gasket (item 4) is in place in its grooves in the sandwich block. Engage the electrical plug carefully during this process. Tighten the three main body mounting screws (item 1) from 2.5 to 2.9 N•m (22 to 26 in-lbs).
7. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

NOTE: If both a sandwich flow control and sandwich regulator are to be installed, the flow control should be installed between the regulator and the base. Both studs should be installed to base before installing the flow control.

Remote Operated Only - Connect outlet of pilot regulator to 1/8" port on end of function block next to regulator. Perform outlet pressure adjustment on pilot regulator.

Gage Installation

Units are shipped with gage ports plugged, and gages must be ordered separately.

Standard Gage

Remove 1/8" pipe plug from gage port. Apply pipe sealant (not tape) to gage male threads, install gage into gage port.

Liquid Filled Gage

The diameter of this type gage requires that method of installation be alternated between valve stations. The first, third, etc. will be installed using a nipple and coupling. The second, fourth, etc. are installed with an elbow, nipple and coupling.

Outlet Pressure Adjustment

1. To avoid minor readjustment after making a change in pressure setting, always approach the desired pressure setting from a lower pressure.
2. Before turning on system air pressure, disengage lock by pulling adjusting knob outward, and then turn knob counterclockwise until knob stops.
3. Turn on system pressure.
4. Turn adjusting knob clockwise to increase pressure until the desired pressure setting is reached.
5. To reduce pressure setting, turn adjusting knob counterclockwise until pressure decreases to at least 10 PSI lower than desired setting. Then turn adjusting knob clockwise until the desired pressure setting is reached.

6. Push the adjusting knob inward to engage lock.
7. Resetting may be required to compensate for flow after the valve is cycling in normal use.

(For remote air operated regulator, follow instructions for the pilot regulator for setting, using the technique above.)

Regulator Service

Remove pressure and electrical connection before service.

NOTE: Service kit contains components to service both spring and pilot controlled regulators. When servicing spring controlled units discard extra piston and lipseal.

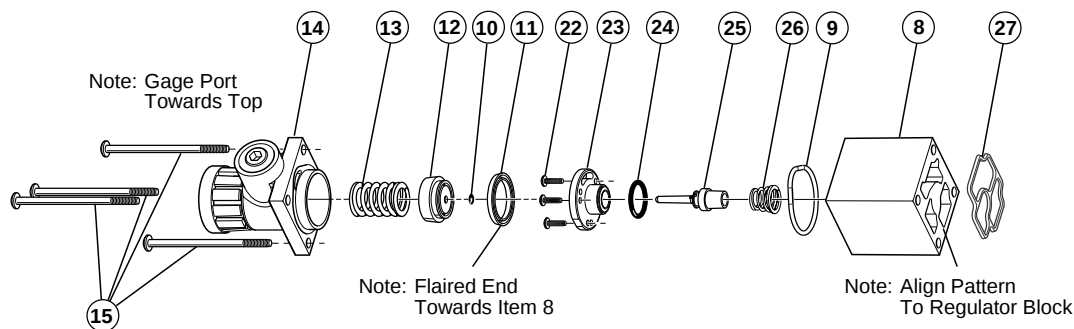
1. Remove and retain screws (item 15), bonnet assembly (item 14) and spring (item 13). Remove and discard piston (item 12), piston lipseal (item 11) and o-ring (item 10).
2. Remove and retain three seat plate screws (item 22) and seat plate (item 23). Remove and discard seat plate o-ring (item 24), bonnet o-ring (item 9), poppet assembly (item 25), and poppet spring (item 26).
3. Install new poppet spring (item 26) and poppet assembly (item 25).
4. Install new seat plate o-ring (item 24) to seat plate (item 23) and insert seat plate into regulator body (item 8) aligning kidney shape in seat plate with kidney shape in regulator body. Fasten seat plate with three screws (item 22), tightening to .35 - .58 N•m (3 - 5 in-lbs).
5. Liberally grease new lipseal (item 11) and vent o-ring (item 10) and install on new relieving piston (item 12). Flaired edge of lipseal faces away from the piston.
6. Place new o-ring (item 9) in groove of regulator body (item 8).
7. Place spring into bonnet assembly (item 14), followed by piston/lipseal assembly, with flaired edges of seal facing towards body (item 8).
8. Assure gasket (item 27) is in regulator block track and install body to regulator block, followed by bonnet assembly. Install screws (item 15) and torque to .9 - 1.4 N•m (8 - 12 in-lbs).
9. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the assembly process until satisfactory.

NOTE: For remote air pilot regulators, follow the above procedures, but replace both pistons and lipseals. The lipseal for the air operator has flaired edge towards air operator cavity.

Instruction Sheets available:

V-430CP - Valve Installation & Operation
 V-431BP - Valve Body Service
 V-432BP - Solenoid Service
 V-433BP - Manifold Installation
 V-434BP - Subbase Installation
 V-435BP - Flow Control Installation
 V-436BP - Regulator Installation
 V-438BP - Manifold With Electrical Interconnect Installation

NOTE: Sandwich regulators can only be used with F3 valves manufactured after 3/1/97 (date code CB3). These units will have socket head cap screws for holding the valve body to the base. Sandwich units will not fit units with button head screws.



Item	Torque
15	.9 - 1.4 N•m (8 - 12 in-lbs)
22	.35 - .58 N•m (3 - 5 in-lbs)



Pneumatic Division North America
Richland, Michigan 49083

Installation Instructions: Form V-438CP

F3 / F5 Series Valves - Manifold with
Flexboard - Option D & E

ISSUED: May, 2000

Supersedes: Oct, 1999

ECN# P27661

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Operating Instructions (V-430CP) packed with valve.

Operating Pressure Range:

	kPa	psig	bar
Min. (2-Position - Air Return)	140	20	1.4
Min. (2-Position w/Spring and Air Return)	240	35	2.4
Min. (3-Position)	210	30	2.1
Max. (2 & 3-Position)	996	145	10.0

NOTE: Solenoid operated valves, when specified with external pilot, may have operating pressures down to vacuum in the main valve. External pilot pressure and air pilot signals must be greater than or equal to that in the main valve, but not outside the ratings above.

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.



(F3 Shown)

Current (Amp) Limits

- Common Pin (13) rated for 3 amp maximum.

Maximum Solenoids Energized Simultaneously

	25-Pin Sub-D	Serial Bus
12VDC	18	—
24VAC	22	—
24VDC	24	32
120VAC	24	32

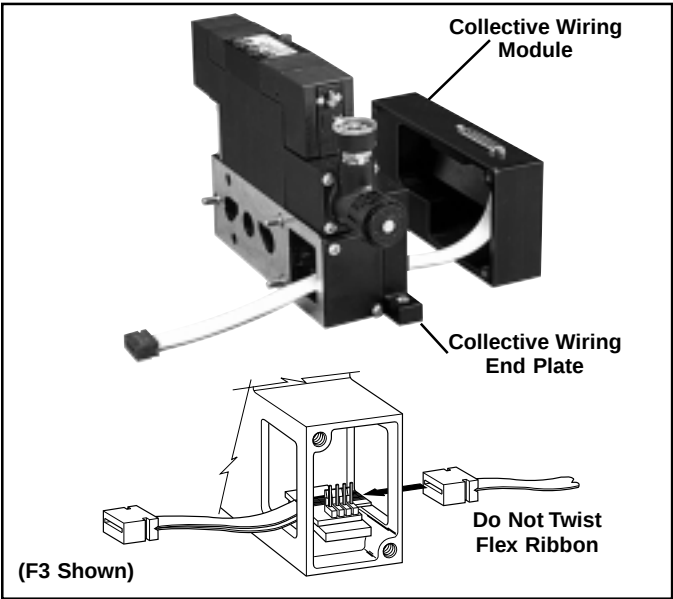
! WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

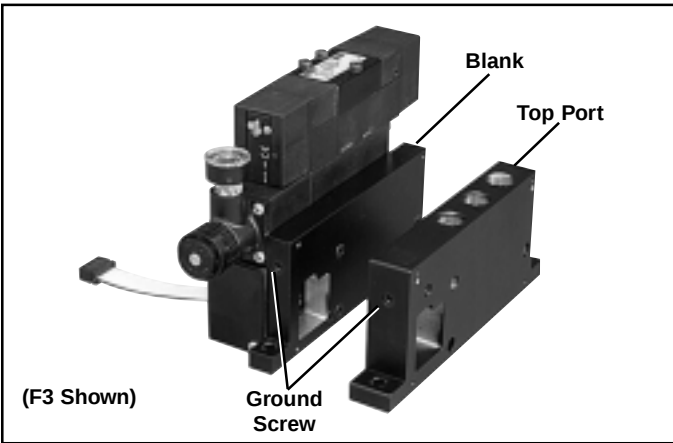
This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.



Collective Wiring End Plate / Transition Plate Kit



Interface plate includes a machined hole for the addition of a ground screw. An earth ground is recommended for all voltages. Follow standard electrical protocol.

Note: With CW Transition Plate or F5 Auxiliary Access Manifold, "Flexboard" is long enough to pass through to the next valve.

25-Pin Sub-D Addressing

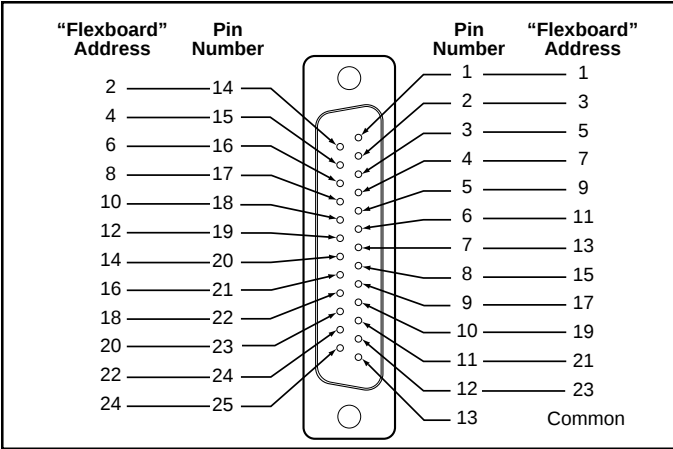


Figure 1
25-Pin Sub-D Pin Callouts

Collective Wiring Module



Size		Kit Number
F3	F5	25-Pin Sub-D
		SCD251CA

Kit includes: (1) wiring box, (1) gasket, (4) tie rods and (4) bolts.

Collective Wiring Manifold Configuration:

- Choose desired number of Valves / Manifolds with "Flexboard".
- Choose CW End Plate or CW Transition Plate Kit – Plug-in and assemble Manifolds and End Plates together.
- Collective Wiring Module SCD251CA – Plug-in and assemble Collective Wiring Module to Collective Wiring Left Hand End Plate.

- Single And Double Address "Flexboard" can be interchanged on the same Add-A-Fold.
- Single Address "Flexboard" works with Single Solenoid valves ONLY.
- Double Address "Flexboard" works with Single or Double Solenoid valves.
- Control address schematic determined by "Flexboard" type, not number of solenoids.
- Valves with LED / Surge Suppression recommended.

Wiring Instructions

Manifolds can have "Flexboard"s that will accommodate either single solenoid or double solenoid valves, regardless of the actual valve. As an example, model F51630GE23 is a single solenoid valve, but with a double solenoid "Flexboard" to accommodate a potential conversion to double solenoid type valve. Care must be taken when wiring to the 25-Pin Sub-D connector to assure this option is considered. The end cover of each manifold station is labeled either "Single Address" or "Double Address".

Signals to the 25-Pin Sub-D connector are per Figure 1. These are directed to the individual manifolds by the "Flexboard". A single "Flexboard" uses one signal. A double "Flexboard" uses two signals, the first to the 14 solenoid, the second to the 12 solenoid. Signal usage is sequential through the boards. Any combination of manifolds with single or double interconnect boards may be used.

Manifold Application

Valves may be arranged into a modular manifold assembly. This may have up to 24 stations providing that sufficient pressure and capacity is obtained in the circuits downstream of the valve outlets; sufficient pressure is available for shifting the valves; and enough exhaust capacity is available to minimize back-pressure effects. Means to increase inlet / exhaust capacity include supplying and exhausting air at both end plates, and by sequencing the valve operation to maximize time between different shifts.



WARNING

Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.

Valve Mounting Procedure

If valve and manifold are purchased separately, use the following procedure to mount valve to manifold.

1. Using a clean, lint free cloth, clean top surface of manifold and bottom surface of valve body sandwich of dirt and dust.
2. Check to insure that valve gasket (not shown) is properly seated in gasket track on sandwich block.
3. Place valve assembly on top of manifold. On electrically operated valves, align plug with socket in manifold and gently press down on valve to seat plug properly.
4. Then line up the mounting holes and insert valve mounting screws. Tighten using a 4-mm hex wrench; torque from 2.9 to 3.8 N m (25 to 35 in-lbs.) using progressive steps with a criss-cross pattern.
5. Apply pressure to applicable galleries and check for leaks. If any are present, do not operate any valves. Troubleshoot and correct leakage as necessary.

Assembly Procedures for Manifolds

Manifolds may be assembled to one either before or after assembling valves to manifolds. If inlet or exhaust common galleries are to be isolated from neighboring manifolds, follow instructions given in the **Manifold Isolation Procedure** section before proceeding with this section. If remote air pilot valves are part of the manifold assembly, be sure to isolate their pilot signals so that they do not supply undesirable pressure to other valves in the manifold assembly, follow instructions given in the **External Pilot Connections** section.

Manifold Isolation Procedures

Inlet & exhaust galleries, and pilot supply galleries may be isolated from those in adjacent manifolds through the use of isolation plugs. Note: air piloted valves, whether single or double, will need to be isolated at 14 and / or 12 galleries to prevent improper air pressure signals reaching adjacent valves. Figure 2 schematically indicates where to place plugs (shown as "X" marks) for typical air piloted valves.

External Pilot Connections

Use an external pilot supply when inlet pressures are below minimum valve ratings, or any other application requiring pilot pressure different than main supply pressure. Common external

pilot supply may be applied to either port 12 or 14. The other manifold base's pilot supply ports need to be plugged with the appropriate gasket.

Perform pilot supply conversion outlined on Installation and Operating Instructions packed with valve.

If you ordered the valve with external pilot having an "L", "M", "P" or "Q" in digit 6 of the Model Number, mount valve as received. You will also need to isolate the 12 or 14 port of this valve from other valves in the manifold bank.

Port Connections

Below is a brief summary of typical port connections.

1. Connect an inlet air supply to manifold inlet gallery by one of the following methods:
 - a. All valves being supplied with a common pressure:
Connect air supply to port marked "1" on either end of manifold package and plug port on other end marked "1" (or connect air supply to both ends for applications requiring a larger volume of air).
 - b. Two groups of valves - each requiring a different single pressure supply:
Isolate valves into two groups using steps outlined in the **Manifold Isolation Procedures** section. Connect appropriate air supply to each end of manifold package at port "1".
2. For dual pressure applications, connect air supply to ports "3" and "5".
3. Pipe exhaust at ports "3" and "5" for single air supply. For dual pressure applications, connect to port "1". If mufflers are being used, connect mufflers to the same ports.
4. Connect outlet ports marked "2" and "4" to cylinder or other device to be supplied air. Connections are commonly made to ports on end of manifold opposite wiring cavity. If bottom ports were ordered and are more accessible to your application, plug end cylinder ports and remove plugs (3) from bottom ports.
5. Three-Way function can be obtained by plugging ports "2" or "4".

Station Blanking Plate

Use top blanking plate with a manifold to reserve a place for a valve that will be added later to the manifold bank or to remove a valve from a manifold without having to remove the manifold block from the manifold bank.

Place gasket and blanking plate on manifold and assemble using mounting screws provided with kit. Tighten screws from 2.9 to 3.8 Nm (25 to 35 in-lbs).

Apply main pressure and check for leaks. If any are present, do not operate valves on the manifold bank - repeat the assembly process until satisfactory.

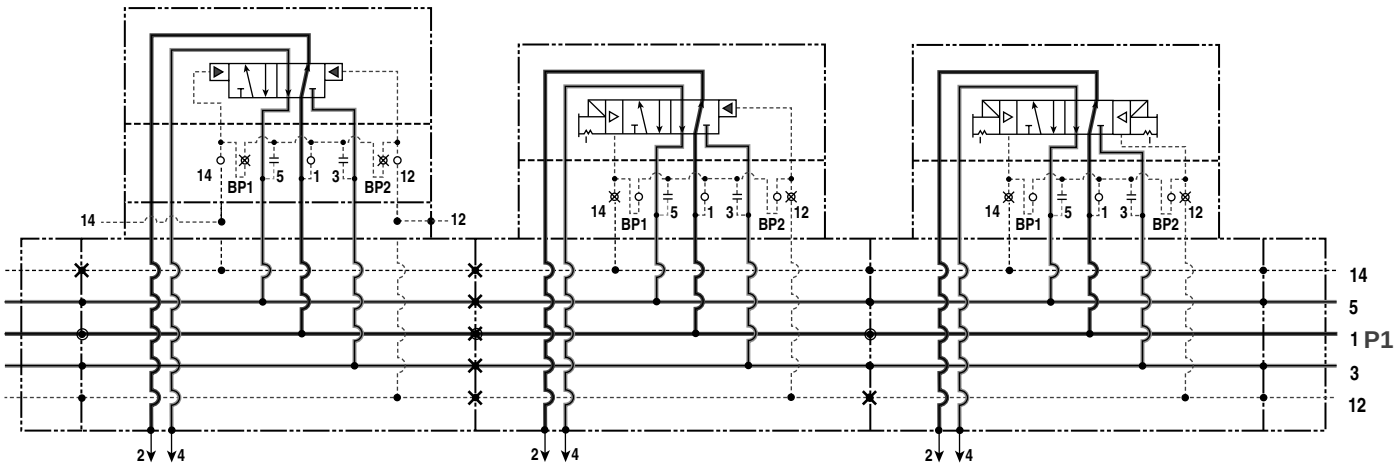


FIGURE 2: Example Schematic Diagram - shows manifolds with valve assemblies and plugs



Pneumatic Division
Richland, Michigan 49083

Installation & Service Instructions:
V440P
F & H ISO 5599-2 Valve Installation
ISSUED: September, 2002
Supersedes: February, 2001
Doc.# V-440P, ECN# 060870, Rev. 3

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Safety Guide

For more complete information on recommended application guidelines, see the Safety Guide section of Pneumatic Division catalogs or you can download the **Pneumatic Division Safety Guide** at: www.parker.com/safety

Introduction

Follow these instructions when installing, operating, or servicing the product.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Pressure Range:

Maximum: 145 PSIG (1000 kPa)

Minimum: See Chart

Operator / Function	Internal Pilot	Min. PSIG (kPa) F5/H1	Min. PSIG (kPa) F6/H2, F7/H3
1	Single Solenoid - 2-Pos	20 (138)	30 (207)
2	Double Solenoid- 2-Pos		
3	Single Remote - 2-Pos		
4	Double Remote Pilot - 2-Pos	Vacuum	Vacuum
5, 6, 7	Double Solenoid - 3-Pos	30 (207)	45 (310)
8, 9, 0	Double Remote Pilot - 3-Pos	Vacuum	Vacuum
E	Single Solenoid - 2-Pos Air Return / Spring Assist	35 (241)	45 (310)
F	Single Remote Pilot - 2-Pos Air Return / Spring Assist		
	External Pilot*		
All	F & H Series	Vacuum	Vacuum

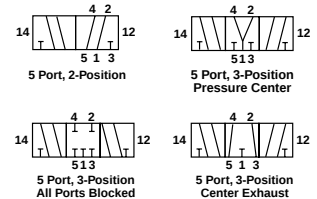
*External Pilot Pressure / Remote Pilot Signal - 45-145 PSIG (310-1000 kPa).

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

Port Identification / Connections / Symbols

Port No.	Single Pressure	Dual Pressure
1	Inlet	Exhaust
2	Outlet	Outlet
3	Exhaust	Inlet
4	Outlet	Outlet
5	Exhaust	Inlet
12, 14	Pilot ports for External Pilot or Remote Pilot	



Valves may be used for single outlet (3-Way) by plugging an outlet port.

NOTE: The operator identification describes the ports that are connected when the operator is energized: operator 12 connects port 1 to port 2; operator 14 connects port 1 to port 4. Other ports may also be connected, or blocked – see symbols on the valve.

NOTE: For dual pressure, the higher pressure is to be at port 3 for single air operated valves. Solenoid types may have the highest pressure at either port 3 or 5, as specified.

⚠ CAUTION: It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the valve spool is in the horizontal plane.

Lubrication

Factory Pre-lubed. If lubricating in service, use Parker F440 oil or equivalent paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

⚠ CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

⚠ CAUTION: Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

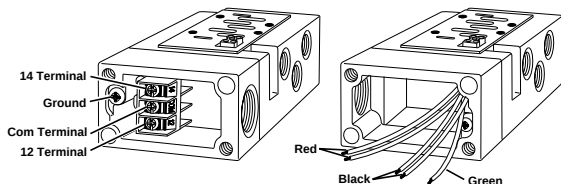
EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws.
3. An external ground connection must be attached to the green ground screw.
4. Disregard unused wires or terminals.
5. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).

⚠ WARNING

This valve / base has a standard ISO 5599/2: 1990 mounting interface. Valve bodies labeled Parker Model 45_, and bases marked ISO 2E, 3E, or 4E or simply O 2E, O 3E, or O 4E (opposite the junction box under the valve body) - and without blue wires in the base - can be connected to this valve/base, but may have incompatible wiring. Base wiring may be reversed, resulting in unpredictable machine function that may cause injury, property damage, or **death**. Completely test the machine for correct function before using, and rewire if necessary. Call 1-800-272-7537 for special ISO Valve Service Bulletin No. VAL-SIF73.

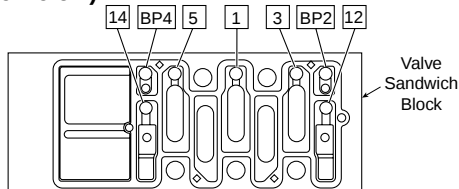


Connections

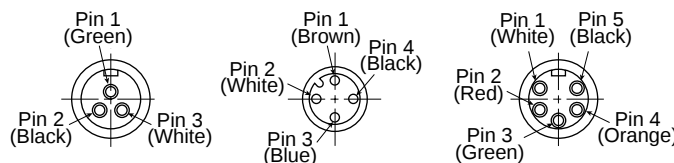
	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 26 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

Sandwich Block Pilot Plug Locations

(See Table Below)



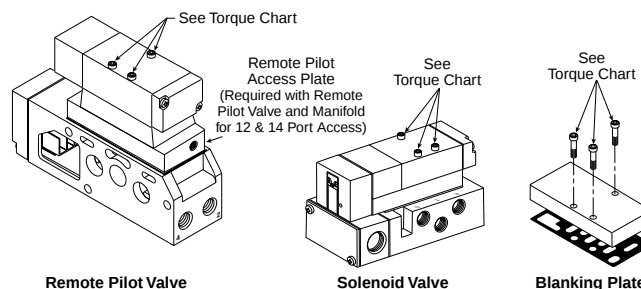
Wiring - Auto C, F, G



	3-Pin Mini Encl '1', '7'	4-Pin M12 - Encl '2', '4', '8'			5-Pin Mini Encl '3', '5', '9'		
Wiring Type	C, F, G	C	F	G	C	F	G
Pin #1	Grd	14	N/A	12	12	14	12
Pin #2	14	Grd	12	N/A	12	12	14
Pin #3	Com	Com	Com	Com	Grd	Grd	Grd
Pin #4	N/A	12	14	14	14	12	14
Pin #5	N/A	N/A	N/A	N/A	14	14	12

⚠ Caution: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

Valve Mounting Torque Specifications



Valve to Base	F5 / H1	F6 / H2	F7 / H3
Torque - in.lb. (Nm)	25 to 35 (3 to 4)	115 to 130 (13 to 15)	120 to 140 (14 to 16)

Using Model No. to Determine Plug Locations		Plug Locations							Using Attributes of Valve & Operator(s) to Determine Plug Locations		
3rd Digit in Model No.	6th Digit in Model No.	Pilot Supply Holes							Pilot Supply	Main Press Supply Type	Control Mechanism Operator Types
		1	3	5	BP4	BP2	12	14			
1, 2, 5, 6 7 or E	B or C		M	M			X	X	Internal @ Port 1	Single	All Solenoids
	P or Q	X	M	M				X	External @ Port 12		
	L or M	X	M	M			X		External @ Port 14		
	E or F	X		X			X	X	Internal @ Port 3	Dual	
	H or J	X	X				X	X	Internal @ Port 5		
	P or Q	X	M	M				X	External @ Port 12		
	L or M	X	M	M			X		External @ Port 14		
3 or F	O or C		M	M	X		X		Internal @ Port 1	Single	Single Air Pilot
	P or Q	X	M	M	X				External @ Port 12		
	L or M	X	M	M		X			External @ Port 14		
	E or F	X		X	X		X		Internal @ Port 3	Dual	
	H or J	X	X		X		X		Internal @ Port 5		
4, 8, 9, 0	0		M	M	X	X			None	Single or Dual	Double Air Pilot

Key Code: X = Pilot hole must be plugged.
Blank = Pilot hole must be left open.

M = Pilot holes may be molded shut and will not need a plug; however some holes may be open and therefore will require a plug. Use a probe to test if holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.

For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402CP - F & H ISO 5599-2 Solenoid Service
V-440P - F & H ISO 5599-2 Valve Installation
V-441P - F & H ISO Valve Service

V-442P - H ISO 5599-1 Auto Valve Installation
V-443P - F & H ISO 5599-2 Manifold Installation
V-444P - H ISO 5599-1 CNOMO Valve Installation
V-445P - F & H ISO Flow Control Installation

V-446P - F5/H1 Sandwich Regulator
V-447P - F6/H2 & F7/H3 Sandwich Regulator
V-449P - F & H Selector Regulator Installation



Pneumatic Division North America
Richland, Michigan 49083

Installation & Service Instructions
V-441BP

F & H ISO Valve Service

ISSUED: May, 2001

Supersedes: February, 2001

ECN# 28254

⚠ WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

⚠ **CAUTION:** It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the valve spool is in the horizontal plane.

Body Service Kits (Items referenced next page)

Valve	Kit Number	Description	Kit Includes Item# (Qty.)
F5 / H1	PS3501P	2-Position Body Service Kit	5 (2), 8/9/10, 14, 15, 22 (2), 32 (2), 33 (2)
F6 / H2	PS3601P		
F7 / H3	PS3701P		
F5 / H1	PS3502P	3-Position APB Body Service Kit	5 (2), 8/9/11, 22 (2), 32 (2), 33 (2)
F6 / H2	PS3602P		
F7 / H3	PS3702P		
F5 / H1	PS3503P	3-Position CE Body Service Kit	5 (2), 8/9/11, 22 (2), 32 (2), 33 (2)
F6 / H2	PS3603P		
F7 / H3	PS3703P		
F5 / H1	PS3504P	3-Position PC Body Service Kit	5 (2), 8/9/11, 22 (2), 32 (2), 33 (2)
F6 / H2	PS3604P		
F7 / H3	PS3704P		

Lubrication

Factory Pre-lubed. If lubricating in service, use Parker F440 oil or equivalent paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

⚠ **CAUTION:** Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Pressure Range: Maximum 145 PSIG (1000 kPa)

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

5599-1 CNOMO Solenoid Information and Kits (Item #32 referenced next page)

Code	Voltage		DC	3-Pin 30mm 'L'	3-Pin 22mm 'P'
	60Hz	50Hz		Coil Kit	Coil Kit
19	—	—	24	PS2828619P*	—
42	24	24	—	PS2828A42P	PS2828B42P
45	—	—	12	PS2828A45P	PS2828B45P
49	—	—	24	PS2828A49P	PS2828B49P
53	120	120	—	PS2828A53P	PS2828B53P
57	230	230	—	PS2828A57P	PS2828B57P

* Enclosure '6' - 2-pin M12 Euro with LED & Surge Suppression

CNOMO Pilot Kits (Items referenced next page)

Kit Number	Description	Kit Includes Item# (Qty.)
PS1552	CNOMO Pilot / LMOR	1, 3, 4 (2), 23 (2)
PS1553	CNOMO Pilot / NLMOR	1, 3, 4 (2), 23 (2)
PS1556	Diffuser Nut	1 (5)

⚠ **CAUTION:** Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.

⚠ WARNING

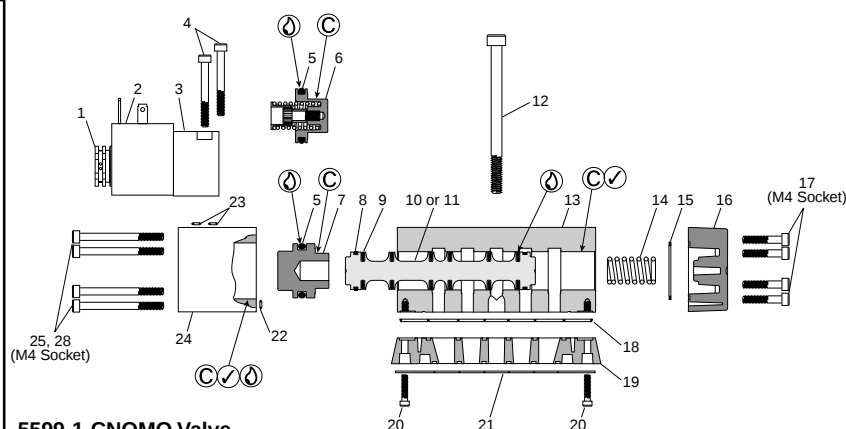
FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

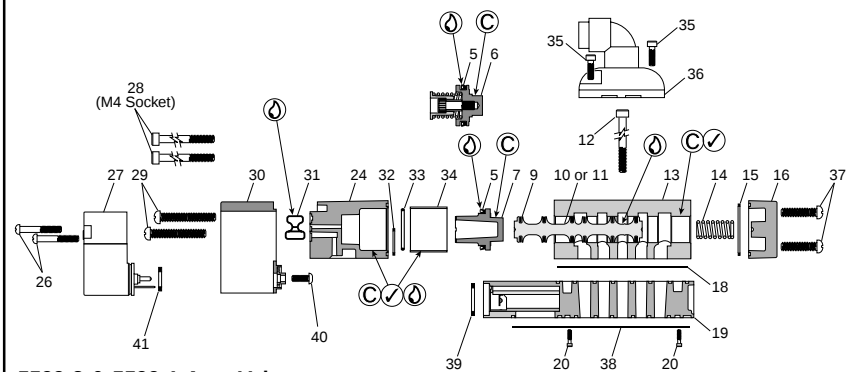
The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Item	Description	Torque (In. / Lb.)
1	Nut, Diffuser	
2	Coil, CNOMO	
3	Pilot, CNOMO	
4	Screws, CNOMO Mount	15 - 20
5	Seal - Operator Piston	
6	Operator Piston - 3-Position	
7	Operator Piston - 2-Position	
8	Wear Ring	
9	Seal - Spool	
10	Spool - 2-Position (Seals Assembled)	
11	Spool - 3-Position (Seals Assembled)	
12	Screw, Body to Base (F5 / H1)	25 - 35
	Screw, Body to Base (F6 / H2)	115 - 130
	Screw, Body to Base (F7 / H3)	120 - 140
13	Body	
14	Spring, Return Assist	
15	Gasket, Return Operator	
16	Operator, Return	
17	Screws, Return Operator (F6 / F7 / H2 / H3)	15 - 20
18	Gasket, Body to Sandwich Block	
19	Sandwich Block	
20	Screws, Sandwich Block to Body	4 - 6
21	Gasket, Valve to Base - 5599-1 CNOMO	
22	O-ring, Adapter to Body	
23	O-ring, Solenoid to Adapter	
24	Adapter, Operator	
25	Screw, Operator Adapter (F5 / H1)	15 - 20
26	Screw - Solenoid to Adapter	6 - 8
27	Solenoid Operator (See V-402CP)	
28	Screw, Operator Adapter (F6 / H2 / F7 / H3)	15 - 20
29	Screw, Operator Adapter (F5 / H1)	15 - 20
30	Adapter, Lighted, Solenoid to Sandwich Block	
31	Gasket, Solenoid to Operator Adapter	
32	Gasket, Operator Adapter to Body	
33	O-ring, Sleeve (H1 / F6 / F7 / H2 / H3)	
34	Piston Sleeve (H1 / F6 / F7 / H2 / H3)	
35	Screw, Auto Plate	
36	Auto Plate & Connector	
37	Screws, Return Operator (F5 / H1)	15 - 20
38	Gasket, Valve to Base - 5599-2 / 5599-1 Auto	
39	Gasket, Adapter to Sandwich Block	
40	Screw, Solenoid Adapter to Solenoid	4 - 6
41	Gasket, Solenoid to Adapter	

NOTE ON CNOMO PILOT KITS:
For H 'A' CNOMO valves, use Parker o-ring size 2006 for item 23.



5599-1 CNOMO Valve
H1, H2, H3



5599-2 & 5599-1 Auto Valve
H1, H2, H3 & F5, F6, F7

① Lightly grease with provided lubricant.

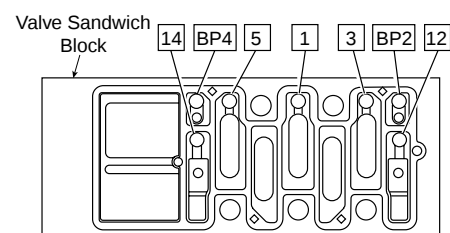
✓ Inspect for nicks, scratches, and surface imperfections. If present, reduced service life is probable and future replacement should be planned.

Ⓒ Clean with lint-free cloth.

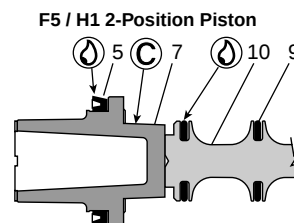
Valve to Base Gaskets - Item# 21 & 38 (Qty 5 per Kit)

	5599-2 / 5599-1 Auto	5599-1 CNOMO
F5 / H1	PS3505P	PS3506P
F6 / H2	PS3605P	PS3606P
F7 / H3	PS3705P	PS3706P

Sandwich Block Pilot Plug Kits - PS3509P (Qty. 20)

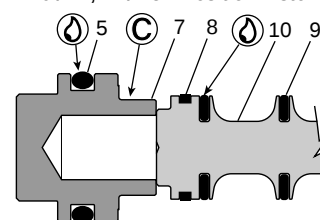


⚠ CAUTION: Do not remove the valve body from the sandwich block. Doing so could risk possible seal contamination. There are no parts between the valve body and sandwich block that require servicing.

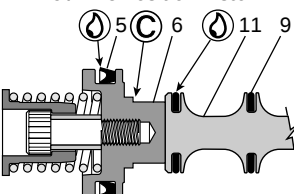


F5 / H1 2-Position Piston

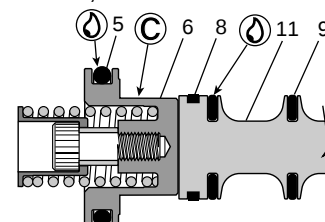
F6 / H2, F7 / H3 2-Position Piston



F5 / H1 3-Position Piston



F6 / H2, F7 / H3 3-Position Piston



For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402CP - F & H ISO 5599-2 Solenoid Service
V-440P - F & H ISO 5599-2 Valve Installation
V-441P - F & H ISO Valve Service

V-442P - H ISO 5599-1 Auto Valve Installation
V-443P - F & H ISO 5599-2 Manifold Installation
V-444P - H ISO 5599-1 CNOMO Valve Installation
V-445P - F & H ISO Flow Control Installation

V-446P - F5/H1 Sandwich Regulator
V-447P - F6/H2 & F7/H3 Sandwich Regulator
V-449P - F & H Selector Regulator Installation



Pneumatic Division
Richland, Michigan 49083

Installation & Service Instructions
V-443P
F & H ISO 5599-2 Manifold Installation
ISSUED: November, 2001
Supersedes: February, 2001
Rev. 1 NPR# R06988

! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

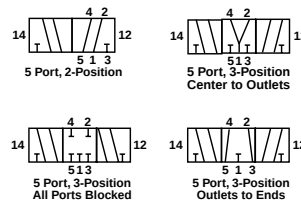
- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Port Identification / Connections / Symbols

Port No.	Single Pressure	Dual Pressure
1	Inlet	Exhaust
2	Outlet	Outlet
3	Exhaust	Inlet
4	Outlet	Outlet
5	Exhaust	Inlet
12, 14	Pilot ports for External Pilot or Remote Pilot	



Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Service Instructions (V-440P) packed with valve.

Operating Pressure Range: Maximum 145 PSIG (1000 kPa)

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

! WARNING

Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.

Wiring Instructions

1. Follow all requirements for local and national electrical codes.
2. Remove end cover from base by backing off the two captive screws. Reassemble cover to base by tightening screws from 0.8 to 1.0 Nm (7 to 9 in-lbs).

3. An external ground connection must be attached to the green ground screw of every base in an assembly.
4. Disregard unused wires or terminals.

Connections

	14 Solenoid	12 Solenoid
Valves with Wires	Black Wires	Red Wires
Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)	14 and Com Terminals	12 and Com Terminals

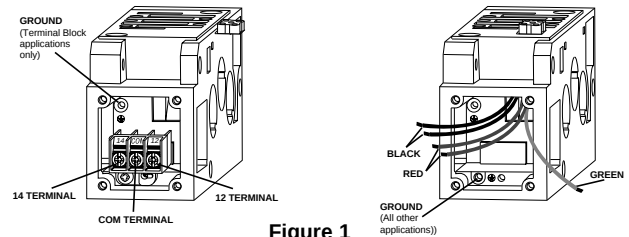
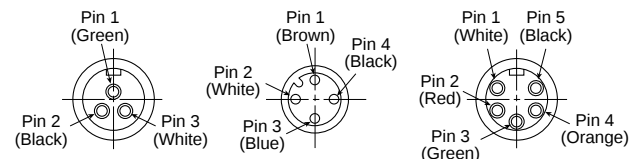


Figure 1

Wiring - Auto C, F, G



	3-Pin Mini Encl '1', '7'	4-Pin M12 - Encl '2', '4', '8'			5-Pin Mini Encl '3', '5', '9'		
Wiring Type	C, F, G	C	F	G	C	F	G
Pin #1	Grd	14	N/A	12	12	14	12
Pin #2	14	Grd	12	N/A	12	12	14
Pin #3	Com	Com	Com	Com	Grd	Grd	Grd
Pin #4	N/A	12	14	14	14	12	14
Pin #5	N/A	N/A	N/A	N/A	14	14	12

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

! WARNING

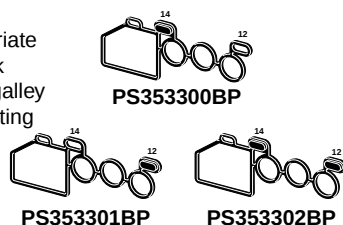
FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

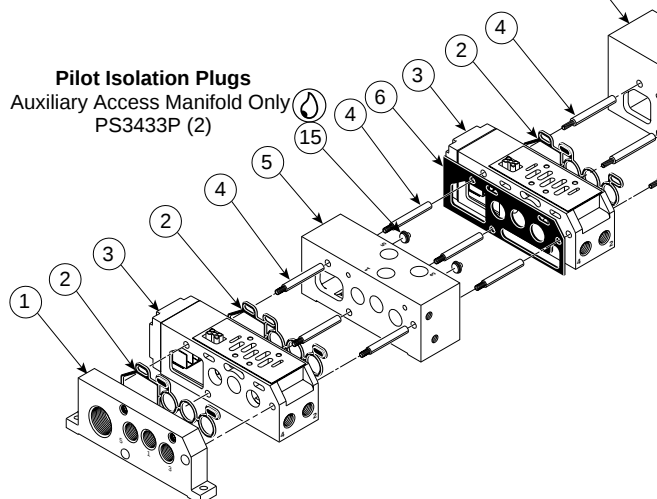
F5 / H1 Manifold Gaskets

Select appropriate gasket to block external pilot gallery for special piloting applications.

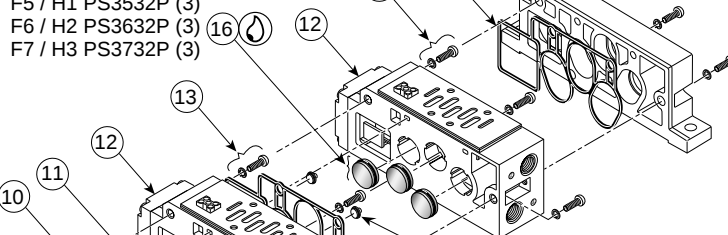


Lightly grease with provided lubricant.

Pilot Isolation Plugs
Auxiliary Access Manifold Only
PS3433P (2)

**Isolation Plugs**

F5 / H1 PS3532P (3)
F6 / H2 PS3632P (3)
F7 / H3 PS3732P (3)



Pilot Isolation Plugs
F6 / H2, F7 / H3
PS3633P (2)

O-ring Seal
Only for
PS3627***P and P3727***P

Isolator Plug Location with Transition Plates

Left	Right		
		F3 to F5	R
		F3 to F6	R
		F5 / H1 to F6 / H2	L
		F5 / H1 to F7 / H3	L
		F5 / H1 to F7 / H3	L
		F6 / H2 to H4	L
		F7 / H3 to H4	L

Item #	Description
--------	-------------

1	Left End Plate
2	Molded Gasket
3	Manifold Base (F5 / H1)
4	Tie Rod
5	Auxiliary Access Manifold
6	Flat Gasket - manifold base to auxiliary access manifold
7	Transition Plate
8	Mounting Screws
9	O-ring Seal Washer
10	O-rings - transition plate to manifold
11	Pilot Gallery O-rings
12	Manifold Base (F6 / H2, F7 / H3)
13	Mounting Screw & Lock Washers
14	Manifold Gasket
15	Isolation Plugs - Pilot Gallery (2)
16	Isolation Plugs - Main Gallery (2)
17	Collective Wiring End Plate (Blank or Top Port)
18	Collective Wiring End Plate Gasket

Assembly Techniques**F5 / H1**

1. Lay Left Hand End Plate (when looking at cylinder ports) port side down.
2. Place Gasket in gasket track (and Isolator Plugs if required).
3. Screw in Tie Rods and build manifold vertically.
4. Place Right Hand End Plate and lightly tighten the screws.
5. Lay manifold on flat surface and check for straightness.
6. Tighten End Plate Bolts per torque specs, alternating each bolt incrementally.

Note: When assembling a manifold greater than 5 stations, back each tie rod out 1 to 2 turns. This will allow engagement of the end plate screws to the last station.

F6 / H2, F7 / H3

1. Lay Left Hand End Plate (when looking at cylinder ports) port side down.
2. Place Gasket in gasket track (and Isolator Plugs if required).
3. Tighten all 3 bolts per torque spec for each station and build manifold vertically.
4. Place Right Hand End Plate and lightly tighten screws to torque.
5. Check the manifold for straightness. Loosen and tighten bolts if needed.

Add Valves and Accessories. All Manifold Assemblies should be leak tested before operation.

Manifold / End Plate Assembly Torque Values

Valve Series	F5 / H1	F6 / H2	F7 / H3
Torque - in.lb. (Nm)	40 to 50 (4.5 to 5.1)	195 to 205 (22.0 to 23.2)	195 to 205 (22.0 to 23.2)

Hi-Flow Manifold Repair Kits

Kit Number	Description	Item Number
PS3512BP	H1 / F5 Manifold Tie Rod (12)	4
PS3513BP	H1 / F5 Manifold to Manifold Gasket (1)	2
PS3612P	H2 / H3, F6 / F7 Manifold Hardware (12)	13
PS3613P	H2 / F6 Manifold to Manifold Gasket (1)	14
PS3713P	H3 / F7 Manifold to Manifold Gasket (1)	14

For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402CP - F & H ISO 5599-2 Solenoid Service
V-440P - F & H ISO 5599-2 Valve Installation
V-441P - F & H ISO Valve Service

V-442P - H ISO 5599-1 Auto Valve Installation
V-443P - F & H ISO 5599-2 Manifold Installation
V-444P - H ISO 5599-1 CNOMO Valve Installation
V-445P - F & H ISO Flow Control Installation

V-446P - F5/H1 Sandwich Regulator
V-447P - F6/H2 & F7/H3 Sandwich Regulator
V-448P - F5/H1, F6/H2 & F7/H3 Interconnect Wiring
V-449P - F & H Selector Regulator Installation



Pneumatic Division North America
Richland, Michigan 49083

Installation & Service Instructions:
V-445P

F & H ISO Sandwich Flow Control
Installation

ISSUED: February, 2001

Supersedes: February, 2001

Rev. 2 ECN# 9347

WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Installation & Operating Instructions:

A Flow Control "Sandwich" controls the flow of air from the valve exhaust ports to atmosphere. The F5 / H1, F6 / H2, & F7 / H3 4-Way valve is typically used with a double acting cylinder alternately pressurizing one end while exhausting the other. Cylinder speed can be influenced by restricting the exhaust path.

The Flow Control "Sandwich" is intended for use with the respective subbase or manifold mounted valves. F5 / H1, F6 / H2, & F7 / H3 valves and flow controls are designed in conformance to ISO 5599/1, 5599/2, Sizes 1, 2, & 3.

H1, H2, & H3 Flow Control "Sandwiches" are only recommended for use with Common Port versions of Sandwich Regulators. The Flow Control is to be assembled between the regulator and the subbase or manifold.

If used with Single Port or Independent Port versions of Sandwich Regulators functionality is limited as follows:

Flow Control "Sandwich" used in conjunction with Single or Independent Port versions of Sandwich Regulator - Adjust speed with the adjusting screw labeled "3". It adjusts the speed of exhaust flow from cylinder ports "2" and "4". Independent speed adjustment is not possible. This could result in different exhaust speeds for cylinder ports "2" and "4" since line pressure is supplied to one cylinder port and a regulated pressure is supplied to the other. The other adjusting screw is non-functional.

Lubrication

Factory Pre-lubed. If lubricating in service, use Parker F440 oil or equivalent paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

 **CAUTION:** Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

Application Limits:

These products are intended for use in general purpose compressed air systems only.

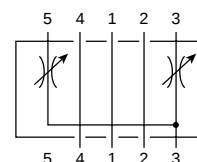
Operating Pressure Range: Maximum 145 PSIG, 1000kPa

Ambient Temperature Range: -18°C to 60°C (0°F to 140°F)

Voltage Range: +10% to -15% of Valve Rating
(Applicable only for solenoid operated valves)

NOTE: The above ratings are those of the associated valve.

ANSI Symbol:



Installation:

1. Remove the valve from the subbase or manifold (if assembled) by removing and retaining the four mounting screws (A).
2. Clean all mating surfaces of valve, subbase or manifold and Flow Control "Sandwich" of dust and dirt.
3. Install male-female tie rods (C) to base. Tighten the tie rods using hex broached on the inside of the female end.

Internal Hex		
F5 / H1	F6 / H2	F7 / H3
M3	M4	M5

4. Slide gasket (D) over the male-female tie rods protruding from top of subbase or manifold, lining up electrical plug cavity.
5. Slide Flow Control "Sandwich" over the male-female tie rods (C) protruding from top of subbase or manifold and press down on flow control to seat electrical plug (if applicable).
6. Check to insure that the gasket (B) on the bottom of the valve sandwich block is still properly seated in its gasket track.

WARNING

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EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.

- Place valve on top of Flow Control "Sandwich" lining up all mounting holes and press down on flow control to seat electrical plug (if applicable).
- Assemble valve, flow control and subbase or manifold together with the valve mounting screws (A). Tighten as follows:

ISO Spec	Size	Sandwich Flow Control Model No.	Torque
5599/1	H1	PS4042P	3.4 to 4.0 Nm (30 to 35 in-lb)
5599/2	H1	PS4035P	
No Plug With Plug	F5 F5	PS3542P PS3535P	
5599/1	H2	PS4142P	5.1 to 5.6 Nm (45 to 50 in-lb)
5599/2	H2	PS4135P	
No Plug With Plug	F6 F6	PS3642P PS3635P	
5599/1	H3	PS4242P	9.0 to 11.3 Nm (80 to 100 in-lb)
5599/2	H3	PS4235P	
No Plug With Plug	F7 F7	PS3742P PS3735P	

- Apply inlet pressure and check for leaks. If any are present, do not operate the valve, repeat this assembly process until satisfactory.

Adjustment Procedures:

For F6 / H2 & F7 / H3

Adjustment screw labeled "5" controls the flow of air from cylinder Port 4 to exhaust Port 3. With a double solenoid valve this occurs when operator #12 is actuated. With a single solenoid valve this occurs when operator #14 is not actuated. Adjustment screw labeled "3" controls air from cylinder Port 2 to exhaust Port 3.

- Turn both adjustment screws clockwise until fully closed and then counterclockwise slightly.
- While cycling valve with cylinder adjust clockwise to decrease speed or counterclockwise to increase speed.

For F5 / H1

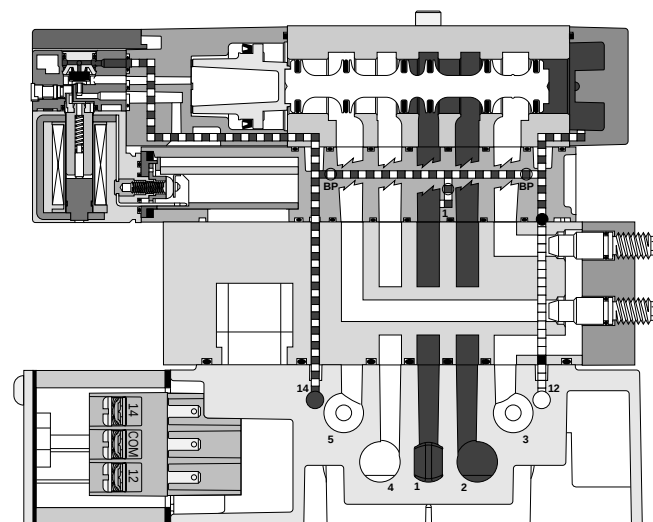
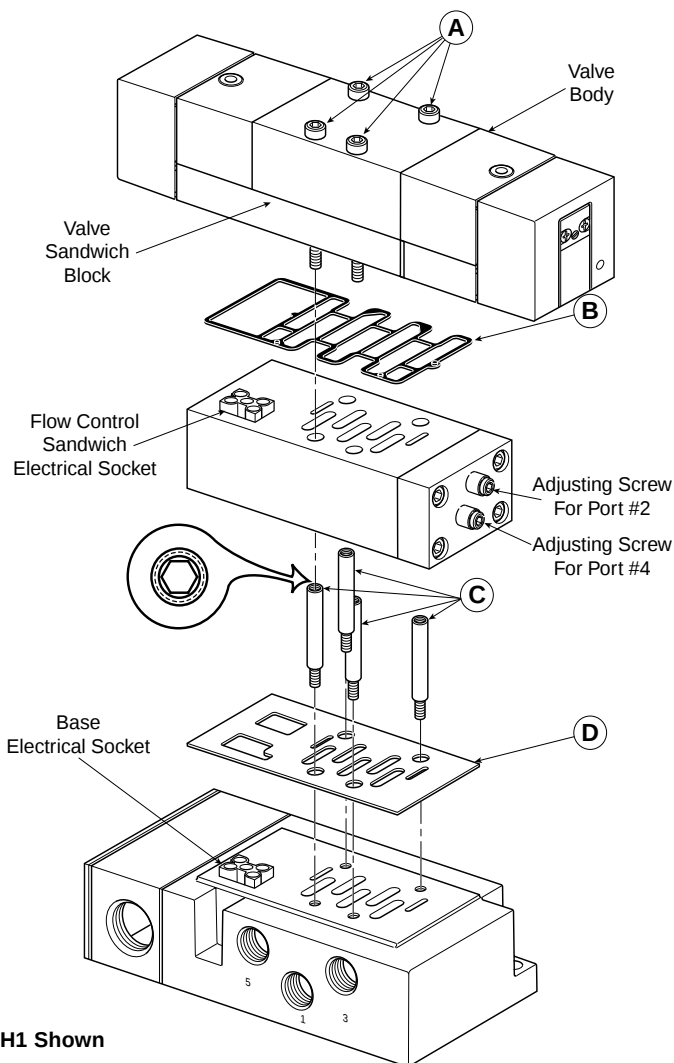
Both adjusting screws are located at the 12 end of the assembly. When viewed from this end, the screw to the left (marked port 4) controls flow from valve cylinder port 4 to exhaust. The screw to the right (marked port 2) controls flow from valve cylinder port 2 to exhaust. Both valves exhaust the base at port 3.

Cv Values

			Flow Control	Cv			
				1-2	1-4	2-3	4-3
H1	PS401165AP	3/8"	H11VXBG019B PS4042P	1.4	1.2	.09	.08
H2	PS411167AP	1/2"	H21VXBG019B PS4142P	2.2	2.2	1.5	1.6
H3	PS421169AP	3/4"	H31VXBG019B PS4242P	4.3	4.4	2.8	3.7

Tie Rods

Valve	Qty.	Kit Number
F5 / H1	Tie Rods (12)	PS3536P
F6 / H2	Tie Rods (12)	PS3636P
F7 / H3	Tie Rods (12)	PS3736P



For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402CP - F & H ISO 5599-2 Solenoid Service
V-440P - F & H ISO 5599-2 Valve Installation

V-441P - F & H ISO Valve Service
V-442P - H ISO 5599-1 Auto Valve Installation
V-443P - F & H ISO 5599-2 Manifold Installation
V-444P - H ISO 5599-1 CNOMO Valve Installation

V-445P - F & H ISO Flow Control Installation
V-446P - F5/H1 Sandwich Regulator
V-447P - F6/H2 & F7/H3 Sandwich Regulator
V-449P - F & H Selector Regulator Installation



Pneumatic Division North America
Richland, Michigan 49083

Installation & Service Instructions
V-446P

F5 / H1 Sandwich Regulators

ISSUED: March, 2001

Supersedes: None

NPR# 1998

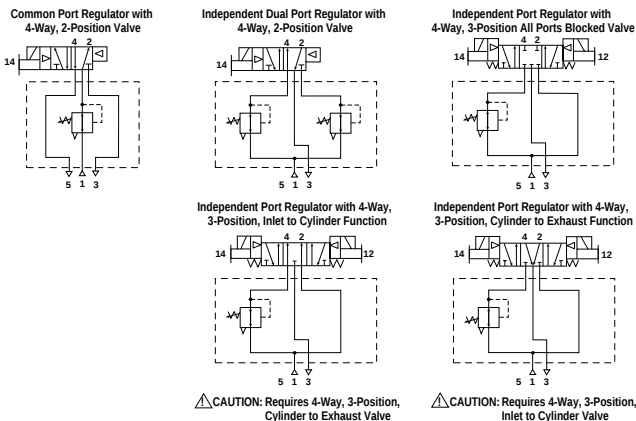
! WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.



NOTE: The Independent Regulators shown are with regulators on the 14 end. Regulators may also be on the 12 end, or both the 12 and 14 end.

! CAUTION: The reverse valve porting utilized with Independent Port will reverse the function of 4-Way, 3-Position cylinder to exhaust and 4-Way, 3-Position inlet to cylinder to valves. Utilize opposite function valve for normal operation.

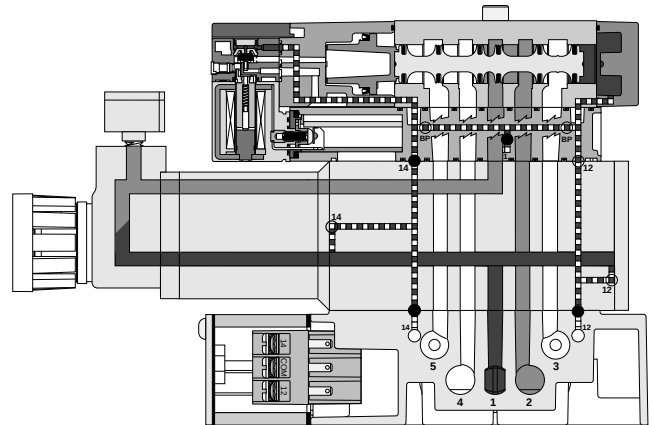
Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Pressure Range: Maximum 145 PSIG (1000 kPa)

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

F5 / H1 Sandwich Regulator - Common Port / Internal Pilot Shown



Installation (See assembly on next page)

Remove pressure and electrical connections before installation.

1. After removing Valve from Base, install three (F5) or four (H1) Mounting Studs (24) from Regulator Kit to the Base, torque finger tight.
2. Place the Gasket (23) over the Studs and on the Base.
3. Install Regulator over Studs. Carefully engage the Electrical Plug (F5 / H1 5599-2).
4. Install Valve onto Regulator. Carefully engage the electrical plug (F5 / H1 5599-2).
5. Tighten Valve Bolts (19) - three (F5) or four (H1) - from 2.8 to 3.9 Nm (25 to 35 in-lbs).
6. Apply main pressure and check for leaks - repeat assembly if leaks are present.

NOTE: If both a sandwich flow control and sandwich regulator are to be installed, the flow control should be installed between the regulator and the base. Both sets of studs should be installed to base before installing the flow control.

Lubrication

Factory pre-lubed. If lubricating in service, use Parker F440 oil or equivalent paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

! CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

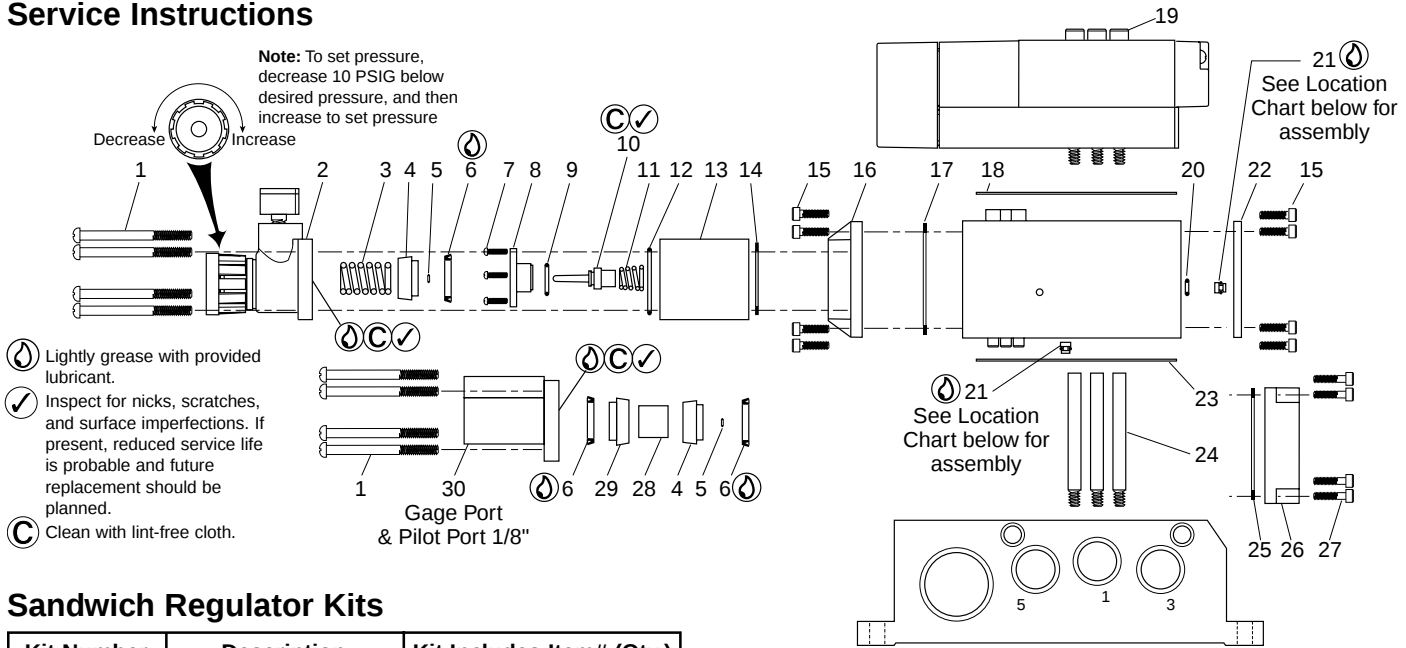
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Service Instructions



Sandwich Regulator Kits

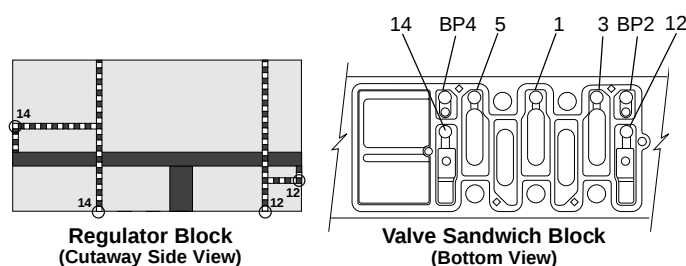
Kit Number	Description	Kit Includes Item# (Qty.)
PS3439P	Repair Kit	4, 5, 6, 9, 10, 11, 12, 29
PS3445P	Regulator Conversion Kit	1 (4), 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14
PS3447P	Pilot Conversion Kit	1 (4), 6, 28, 29, 30
PS3450030P	Spring - 30 PSIG	3
PS3450060P	Spring - 60 PSIG	3
PS3450125P	Spring - 125 PSIG	3
PS3509P	Pilot Plug Kit	21 (20)
PS3540P	Mounting Studs	24 (12)
PS3548P	By-Pass Plate	25, 26, 27 (4)

Component List

The components listed below are for identification purposes only. Some of these components are available in various Sandwich Regulator Kits, some are not available due to special factory assembly. Individual components are not sold separately since all kit components should be installed when serviced.

Sandwich Block Pilot Plug Locations

Pilot Plugs in the Valve Sandwich must also be changed per the chart below when assembled together with a Sandwich Regulator.



Valve & Reg. Model Number			Regulator Block				Valve Sandwich Block							
Operator Function	Pilot Source	Regulator Blk. Func.	Bottom		Ends									
Digit #3	Digit #6	Digit #11	14	12	14	12	14	BP4	5	1	3	BP2	12	
1, 2, 5, 6, 7, E	B, C	1, 2, 3, 4, 5	X	X			X			X				
	L, M				X	X	X			X			X	
	P, Q				X	X	X			X				
3 or F	0, C			X	X			X		X				
	P, Q					X	X	X		X				
4, 8, 9, 0	0				X	X		X				X		
All	E, F, H, J	Regulator Not Available with Pilot Source Codes Listed												

Item	Description	Torque Nm (In. / Lb.)
1	Screw, Regulator Block	0,9 to 1,4 (8 to 12)
2	Bonnet Assembly	
3	Spring, Control (30, 60 or 125 PSIG)	
4	Piston, Relieving (Includes vent hole)	
5	O-ring, Piston Vent	
6	Lip Seal, Piston	
7	Screw, Seat Plate	0,3 to 0,6 (3 to 5)
8	Seat Plate	
9	O-ring, Seat Plate	
10	Poppet Assembly	
11	Spring, Poppet Return	
12	O-ring, Bonnet / Body Seal	
13	Body, Regulator	
14	Gasket, Regulator Block	
15	Screw, End Plate	1,1 to 1,7 (10 to 15)
16	Adapter, Regulator	
17	Gasket, Regulator Block	
18	Gasket, Valve to Regulator Block	
19	Screw, Valve to Mtg. Stud	2,8 to 3,9 (25 to 35)
20	O-ring	
21	Plug, Pilot	
22	End Plate	
23	Gasket, Regulator Base	
24	Stud, Mounting	Finger Tight
25	Gasket, Bypass Plate	
26	Bypass Plate, Dual Pressure	
27	Screw, Bypass Plate	1,1 to 1,7 (10 to 15)
28	Spacer, Air Pilot	
29	Piston, Non-Relieving (No vent hole)	
30	Bonnet, Air Pilot	

For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402CP - F & H ISO 5599-2 Solenoid Service
V-440P - F & H ISO 5599-2 Valve Installation
V-441P - F & H ISO Valve Service

V-442P - H ISO 5599-1 Auto Valve Installation
V-443P - F & H ISO 5599-2 Manifold Installation
V-444P - H ISO 5599-1 CNOMO Valve Installation
V-445P - F & H ISO Flow Control Installation

V-446P - F5/H1 Sandwich Regulator
V-447P - F6/H2 & F7/H3 Sandwich Regulator
V-449P - F & H Selector Regulator Installation



Pneumatic Division
Richland, Michigan 49083

Installation & Service Instructions
V-447P

F6 / H2B, F7 / H3B
Sandwich Regulators

ISSUED: December, 2001

Supersedes: None

ECN# P28681 Rev. 1

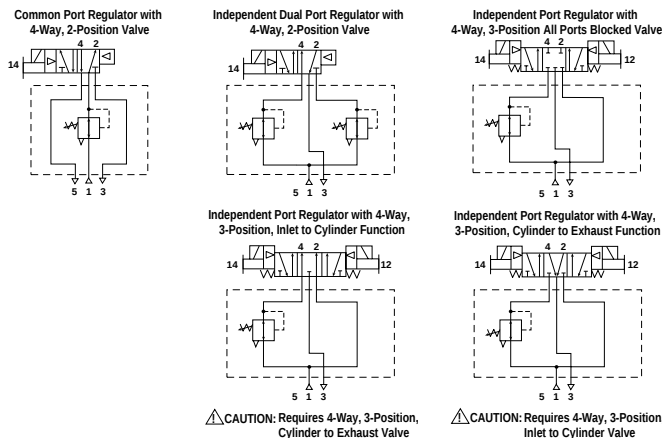
⚠ WARNING

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- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
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Introduction

Follow these instructions when installing, operating, or servicing the product.



NOTE: The Independent Regulators shown are with regulators on the 14 end. Regulators may also be on the 12 end, or both the 12 and 14 end.



CAUTION: The reverse valve porting utilized with Independent Port will reverse the function of 4-Way, 3-Position cylinder to exhaust and 4-Way, 3-Position inlet to cylinder to valves. Utilize opposite function valve for normal operation.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Pressure Range: Maximum 145 PSIG (1000 kPa)

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

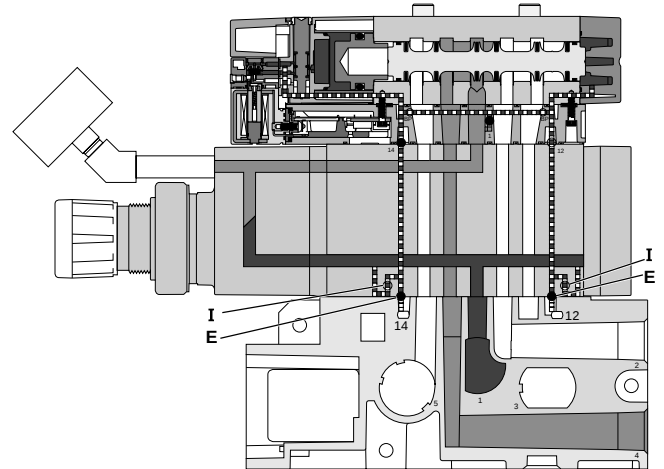
Lubrication

Factory pre-lubed. If lubricating in service, use Parker F442 oil or equivalent paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.



CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

F6 / H2B, F7 / H3B Sandwich Regulator



Installation

Remove pressure and electrical connections before installation.

1. After removing Valve from Base, install three (F6, F7) or four (H2B, H3B) Mounting Studs (26) from Regulator Kit to the Base, torque finger tight.
2. **F6 / H2B Common & Independent Port Versions** – Place Interface Block Track Seal (29) into Interface Block Assembly (22).
- F7 / H3B All Versions & F6 / H2B Selector Regulator Version-** Place the Gasket (29) over the Studs and on the Base.
3. Install Regulator over Studs. Carefully engage the Electrical Plug (F6 / H2B 5599-2, F7 / H3B 5599-2).
4. Install Valve onto Regulator. Carefully engage the Electrical Plug (F6 / H2B 5599-2, F7 / H3B 5599-2).
5. Tighten Valve Bolts (20) as follows:

Valve Type	No. of Bolts	Wrench Size	Torque Nm (In.-Lb.)
F6 / H2B	3 / 4	M5	13 to 15 (115 to 130)
F7 / H3B	3 / 4	M6	14 to 16 (120 to 140)

6. Apply main pressure and check for leaks – repeat assembly if leaks are present.

NOTE: If both a sandwich flow control and sandwich regulator are to be installed, the flow control should be installed between the regulator and the base. Both sets of studs should be installed to base before installing the flow control.

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Service Instructions

Ⓐ Lightly grease with provided lubricant.

✓ Inspect for nicks, scratches, and surface imperfections. If present, reduced service life is probable and future replacement should be planned.

Ⓒ Clean with lint-free cloth.

Ⓐ Torque: Nm (In.-Lb.)

1 Hand Tight + 1/4 Turn

2 3,4 to 4,5 (30 to 40)

3 F6/H2B: 13 to 15 (115 to 130)
F7/H3B: 14 to 16 (120 to 140)

4 Finger Tight

Note: To set pressure, decrease 10 PSIG below desired pressure, and then increase to set pressure

Decrease Increase

Decrease Increase

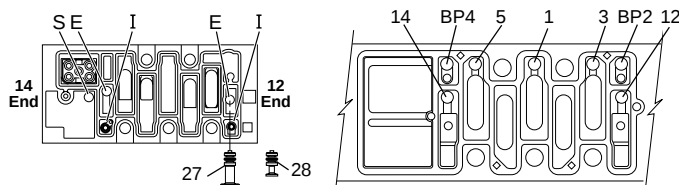
Gage Port & Pilot Port 1/8"

Sandwich Regulator Kits

Kit Number	Description	Kit Includes Item# (Qty.)
PS3639P	Repair Kit (F6/H2B, F7/H3B)	6, 7, 8, 9, 10, 11, 17, 19 (2), 31, 33
PS3645P	Regulator Conversion Kit (F6/H2B, F7/H3B)	1, 3, 4, 6, 7
PS3647P	Pilot Conversion Kit (F6/H2B, F7/H3B)	7, 30, 31 (2), 32, 33
P04427	Spring - 30 PSIG (F6/H2B, F7/H3B)	5
P04426	Spring - 60 PSIG (F6/H2B, F7/H3B)	5
P04425	Spring - 125 PSIG (F6/H2B, F7/H3B)	5
PS3609P	Pilot Plug Kit (F6/H2B)	27 (20)
PS3709P	Pilot Plug Kit (F7/H3B)	28 (20)
PS3640P	Mounting Studs (F6/H2B)	26 (12)
PS3740P	Mounting Studs (F7/H3B)	26 (12)
PS3648P	By-Pass Cap (F6/H2B, F7/H3B)	13 (4), 23, 24, 25 (4)
PS3654P	Regulator to Base Gasket Kit (F6/H2B Common & Independent Port)	29 (5)
PS365401P	Regulator to Base Gasket (F6/H2B Selector)	29 (5)
PS3754P	Regulator to Base Gasket Kit (F7/H3B)	29 (5)

Sandwich Block Pilot Plug Locations

Pilot Plugs in the Valve Sandwich Block and Sandwich Regulator must be changed per the chart below when assembled together.



Regulator Block (Bottom View)

Valve Sandwich Block (Bottom View)

Component List

The components listed below are for identification purposes only. Some of these components are available in various Sandwich Regulator Kits, some are not available due to special factory assembly. Individual components are not sold separately since all kit components should be installed when serviced.

Item	Description	Item	Description
1	Bonnet Assembly	18	Housing, Regulator
2	Collar	19	Seal, Regulator Track
3	Thrust Washer	20	Screw, Valve Mounting - F6 / H2B
4	Control Screw Assembly	21	Screw, Valve Mounting - F7 / H3B
5	Spring, Control (30, 60 or 125 PSIG)	22	Gasket, Valve to Regulator Base
6	Diaphragm Assembly, Relieving (Includes vent hole)	23	Block Assembly, Interface
7	O-ring, Piston Vent	24	Seal, Bypass Cap Track
8	Seat Insert Assembly	25	Bypass Cap, Dual Pressure
9	O-ring, Upper Seat Insert	26	Screw, Bypass Cap
10	O-ring, Lower Seat Insert	27	Stud, Mounting
11	Poppet Assembly	28	Plug, Pilot (F6/H2B Regulator)
12	Screw, Regulator Housing	29	Plug, Pilot (F7/H3B Regulator, F6/H2B Valves, F7/H3B Valves)
13	M5 Lockwasher	30	Seal, Interface Block Track
14	Retainer, Seal	31	Bonnet, Air Pilot
15	Vee Packing	32	O-ring, Piston
16	Retainer, Backflow	33	Piston
17	Spring, Poppet Return		O-ring, Air Pilot Cap

Valve Model Number		Sandwich Regulator Block				Valve Sandwich Block				Valve Actuator Type / Pilot Source			
Operator Function Digit #3	Pilot Source Digit #6	14 End				12 End				Pilot Supply Holes			
		S	E	I	E	I	S	E	I	14 BP4	5	1	3 BP2
1, 2, 5, 6, 7 or E	B or C*	X	X		X		X		X		M	X	M
	L or M*			X	X	X			M	X	M		X
	P or Q*		X	X		X	X		M	X	M		
3 or F	0 or C*	X		X	X				X	M	X	M	
3 or F	P or Q*	X		X		X			X	M	X	M	
4, 8, 9, 0	0	X		X		X			X	M		M	X
All	E, F, H, J												

Regulator Not Available with Pilot Source Codes Listed

* Valve Model Numbers with C, M or Q (Internal Pilot Exhaust) when used in combination with Independent or Selector Regulators (Kit No's: PS***2**P or PS***3**P) require that the valve be purchased in combination with the Sandwich Regulator to insure proper function.

Key Code: X = Pilot hole must be plugged.

Blank = Pilot hole must be left open.

M = Pilot holes may be molded shut and will not need a plug; however, some holes may be open and therefore will require a plug.

Use a probe to test if holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.

For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402CP - F & H ISO 5599-2 Solenoid Service
V-440P - F & H ISO 5599-2 Valve Installation
V-441P - F & H ISO Valve Service

V-442P - H ISO 5599-1 Auto Valve Installation
V-443P - F & H ISO 5599-2 Manifold Installation
V-444P - H ISO 5599-1 CNOMO Valve Installation
V-445P - F & H ISO Flow Control Installation

V-446P - F5/H1 Sandwich Regulator
V-447P - F6/H2 & F7/H3 Sandwich Regulator
V-449P - F & H Selector Regulator Installation

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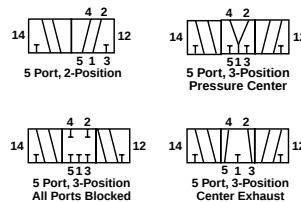
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Introduction

Follow these instructions when installing, operating, or servicing the product.

Port Identification / Connections / Symbols

Port No.	Single Pressure	Dual Pressure
1	Inlet	Exhaust
2	Outlet	Outlet
3	Exhaust	Inlet
4	Outlet	Outlet
5	Exhaust	Inlet
12, 14	Pilot ports for External Pilot or Remote Pilot	



Application Limits

These products are intended for use in general purpose compressed air systems only. Compliance with the rated pressure, temperature, and voltage is necessary - see Installation & Service Instructions (V-440P) packed with valve.

Operating Pressure Range: Maximum 145 PSIG (1000 kPa)

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Wiring Instructions

For connection simplicity, the Interconnect Wiring System has a single common lead with an amperage limit of 3 amps continuous service. The following chart indicates the upper limit of solenoids that can be energized simultaneously.

Voltage	25-Pin Sub-D	19-Pin Round	12-Pin Round Single	12-Pin Round Double
12VDC	18	16	8	16
24VAC	24	16	N/A	N/A
24VDC	24	16	8	16
120VAC	24	16	8	16

The Interconnect Wiring System has great flexibility to meet user wiring needs. Each manifold base has been ordered with either a single or double address function. The single address circuit board works with single solenoid valves only. The double address circuit board works with single or double solenoid valves. As an example, model F5165BGM23A is a single solenoid valve, but with a double address solenoid circuit board to accommodate a potential conversion to a double solenoid valve in the future. The end cover of each manifold base is labeled either "Single Address" or "Double Address". Power signals are connected at the 25-Pin Sub-D (Figure 1), 19-Pin round Collective Wiring Module (Figure 2), or 12-Pin round Collective Wiring Module (Figure 3). A single address base uses one signal; a double address base uses two signals, the first to the 14 solenoid, the second to the 12 solenoid. Signal usage is sequential through the bases. Any combination of single or double addresses may be used. For 12-Pin round collective wiring module connectivity to a PLC, please refer to Allen-Bradley Catalog 1667-SG001A-EN-P for additional PanelConnect™ information.

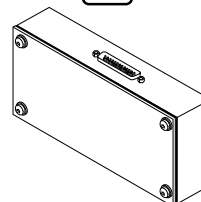
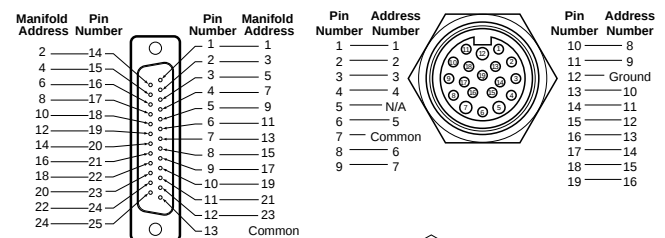


Figure 1 (25-Pin Sub-D)

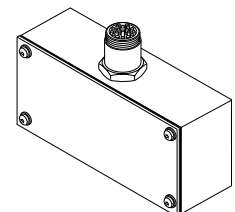


Figure 2 (19-Pin Round)

! CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

! WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or systems in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

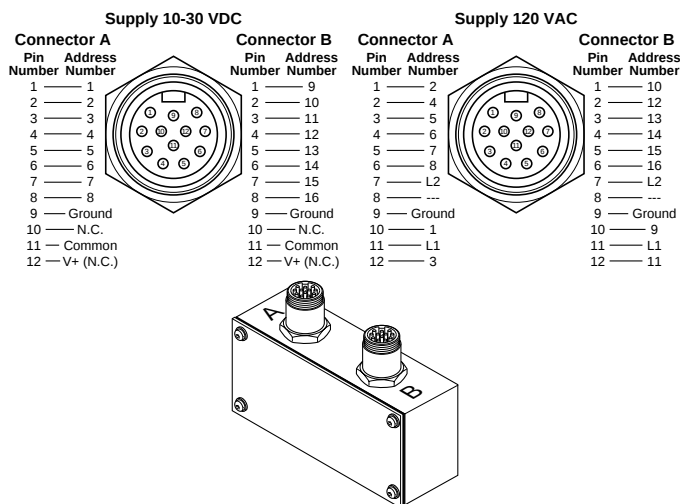


Figure 3 (12-Pin Round Dual Shown)

Manifold Assembly

The Interconnect Wiring System makes the electrical connection user friendly. Each individual manifold base carries its own connector circuit board which self aligns and plugs into the circuit board of the mating manifold base. So no special attention is required. The power is supplied at the left end of the stack (as you are viewing the cylinder ports) by means of a plug-in harness emerging from a Interconnect Wiring Module Kit.

The stack assembly is built from left to right (viewing the cylinder ports). Start with the Interconnect Wiring Module Kit and add manifold bases as required. If the stack includes transitions from one valve size to another, the left most size is the smallest and then progressing to successively larger sizes. Follow the techniques described below for the easiest assembly. Consult the torque chart for screw tightening specifications.

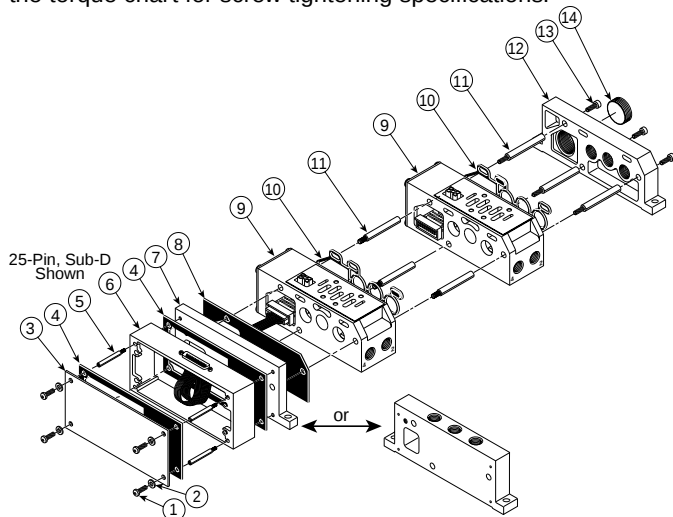


Figure 4 (F5 / H1 Valves Shown)

Item #	Description
1	Cover Screw
2	Cover Washer
3	Interconnect Wiring Module Cover
4	Interconnect Wiring Module Gasket
5	Tie Rod
6	Interconnect Wiring Module
7	Interface Plate
8	Interface Plate Gasket
9	Manifold Base (F5 / H1)
10	Molded Gasket
11	Tie Rod
12	Right Hand End Plate
13	Mounting Screw
14	Plug

Manifold / End Plate Assembly Torque Values

Valve Series	F5 / H1	F6 / H2	F7 / H3
Torque - in. lb. (Nm)	40 to 50 (4.5 to 5.1)	195 to 205 (22.0 to 23.2)	195 to 205 (22.0 to 23.2)

1. Attach four Tie Rods (Item 5) to the Interface Plate (Item 7) then mount the Gasket (Item 4), Interconnect Wiring Module (Item 6), Gasket (Item 4) and Cover Item 3) over the Tie Rods. Attach these components with the four Screws (Item 1) and Washers (Item 2) provided. NOTE: The 25-Pin Sub-D Interconnect Wiring Module has a ground wire with ring terminal which must be attached to the inner green screw on the Interface Plate before cover is attached.
2. Flip the Connector Module over to expose the wiring harness. Locate Gasket (Item 8) in place on the Interface Plate (Item 7).

For F5 / H1 Valves (See Figure 4): Screw in the three sets of Tie Rods (Item 11). **NOTE: When assembling a manifold greater than 5 stations, back each tie rod out 2 turns. This will allow engagement of the End Plate Screws to the last station.** Place the first station Manifold Base (Item 9) over the Tie Rod sets and plug in the two black connectors from the harness into the base connector circuit board. The connectors are keyed, there is only one assembly possible. Do not twist cables. Continue to build the balance of the stack vertically, alternating Gasket and Manifold Bases. Place the right hand End Plate (Item 12) on and lightly tighten the Screws (Item 13). Lay the entire manifold on a flat surface, align for straightness and alternately tighten each screw incrementally to torque specifications in the torque chart.

For F6 / H2, F7 / H3 Valves: Bring the first station Manifold Base to the Interface Plate and plug in the two black connectors from the harness into the base connector circuit board. The connectors are keyed, there is only one assembly possible. Do not twist cables. Tighten the Base to the Interface Plate with the three Bolt / Washers provided with each Base to torque specifications shown in the torque chart. Continue to mount each successive O-ring (for F6 / H2) or Molded Track Seal (for F7 / H3) and Base to the previous Base. Lay the entire manifold on a flat surface, align for straightness and alternately tighten each screw incrementally to torque specifications in the torque chart. Place the right hand End Plate on last base and tighten screws (see torque chart).

3. NOTE: Transition Plates, Access Plates or Isolation Plugs must be properly placed as the construction of the stack progresses. See individual sections of this bulletin.
4. Add valves and accessories to the manifold (if not already attached). The final assembly should be leak and electrically tested before operation.

WARNING

Air exhausting from one valve into the exhaust gallery of the manifold assembly may momentarily pressurize other valve circuits open to the same gallery. Design the circuit such that there is no hazard or consequence of damage from this action.

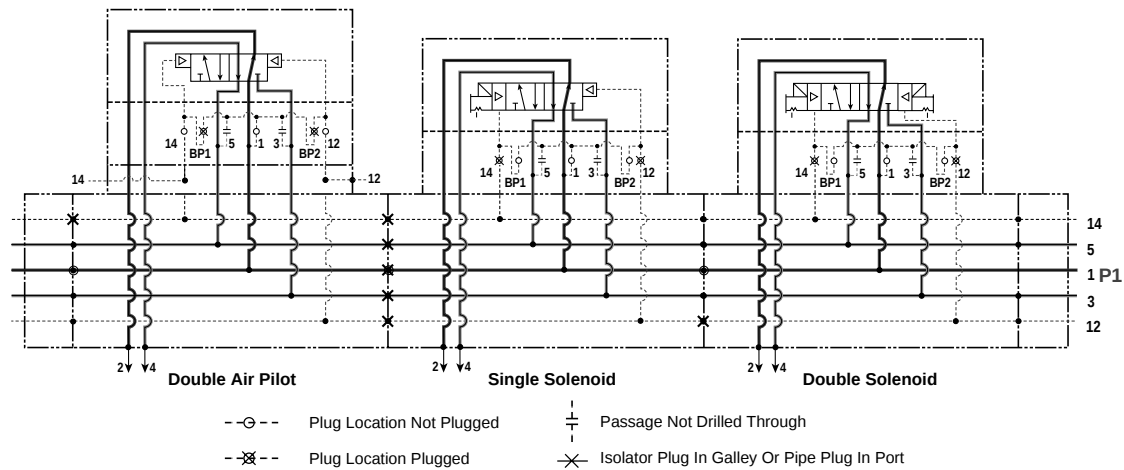


Figure 5

Air Piping Assembly

Port Connections:

The manifold stack has three common air passage galleries. For Single pressure piping, connect the inlet supply to Port #1; Ports #3 and #5 are then the exhaust ports. For Dual pressure piping, connect the two inlet supplies to Port #3 and Port #5; Port #1 is then the exhaust port. See **Manifold Isolation**, if the application requires groups of valves with different pressure supplies. Connect the cylinder ports #2 and #4, to the cylinder or other device to be supplied with air from the valve. These ports are at the end and/or bottom of each individual base.

External Pilot Connections:

An external pilot supply, a 1/8" port on the right hand end plate, is used when the main inlet pressure is below the minimum valve operating pressure, or when the pilot pressure is different from the main inlet pressure. The valves needing external pilot supply should have a "L, M, P or Q" at the sixth digit (Pilot Source) of the model number. Supply pilot air to Port #14 for digits L & M; port #12 for digits P & Q.

Remote Pilot Signal Connections:

For remote pilot signal valves, connect the pilot signal to the remote pilot plate mounted directly under the valve body. NOTE: Signals into the remote pilot plate do not connect to the #12 or #14 galleries on the End Plates. See Remote Pilot Access Plate instructions.

Accessory Assembly

Manifold Isolation Procedures:

Inlet & exhaust galleries, and pilot supply/signal galleries may be isolated from those in adjacent manifolds through the use of isolation plugs. Note: air piloted valves, whether single or double, will need to be isolated at 14 and/or 12 galleries to prevent improper air pressure signals reaching adjacent valves. Figure 5 schematically indicates where to place plugs (shown as "X" marks) for typical air piloted valves. Figure 6 indicates typical assembly locations of the Main Gallery Plugs (Item 1) and the Pilot Gallery Plugs (Item 2), for the F6 / H2 & F7 / H3 bases. Pilot Gallery plugs for the F5 / H1 are integral with the gasket (Item 10).

The following describes how to install plugs:

1. Determine which gallery is to be isolated between two manifolds.
2. Use the large Plugs (Item 1) from the service kits to isolate manifolds from the main gallery(s). The middle plug is used to isolate port #1 (inlet air supply), the left plug is used to isolate port #5 and the right plug is used to isolate port #3.
3. Apply a light coating of grease to isolation plug and insert it into counterbore of left manifold base.
4. Apply a light coating of grease to Gasket (Item 3) and assemble in manifold groove.
5. Assemble plugged manifold into manifold bank in its proper position.
6. Apply main pressure and check for leaks. If any are present, do not operate the valve - repeat the reassembly process until satisfactory.

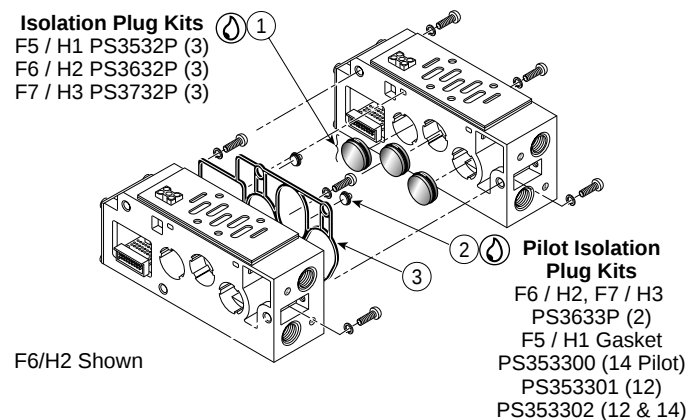


Figure 6

Transition Plate (F5 / H1 to F6 / H2 Shown)

1. See Figure 7. The F5 / H1 "family" must be on the left side. The Transition Plate (A) acts as a combination F5 / H1 right end plate and F6 / H2 left end plate. Assemble the Transition Plate to the F5 / H1 "family" per instructions under Manifold Assembly first, do not forget to install the o-ring seal washer (B) in the Transition Plate if screw hole is in flow gallery. Then assemble the F6 / H2 "family" to the Transition Plate.

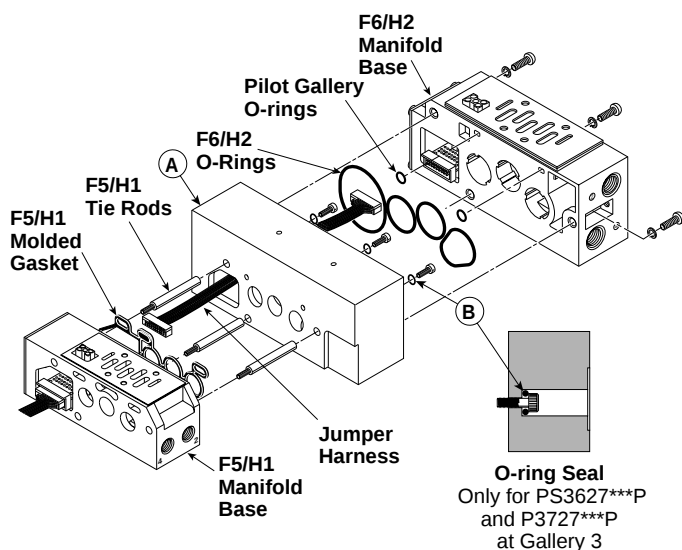
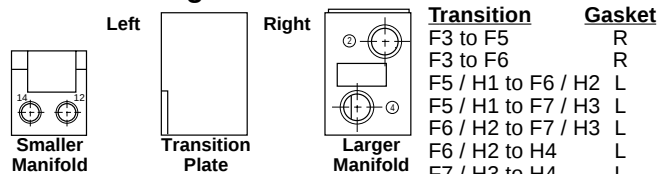


Figure 7

Isolator Plug Location with Transition Plates



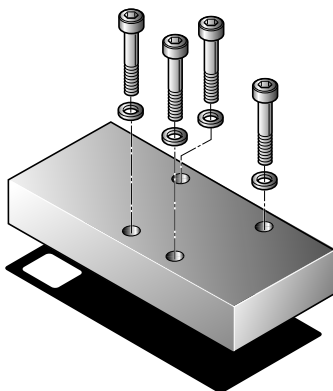
Station Blanking Plate

Use top Blanking Plate on a Manifold to reserve a place for a valve that will be added later to the manifold bank or to remove a valve from a manifold without having to remove the manifold block from the manifold bank.

Place Gasket and Blanking Plate on Manifold and assemble using Mounting Screws provided with kit. Tighten screws to torque specifications shown in the torque chart.

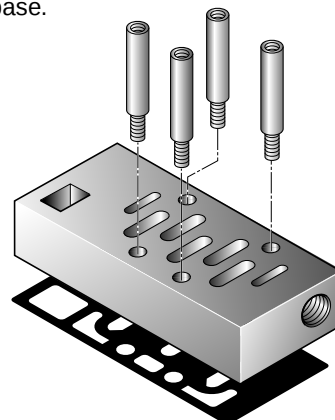
Apply main pressure and check for leaks. If any are present, do not operate valves on the manifold bank - repeat the assembly process until satisfactory.

Valve Series	F5 / H1	F6 / H2	F7 / H3
Torque - in. lb. (Nm)	25 to 35 (2.8 to 3.9)	115 to 130 (12.9 to 14.7)	120 to 140 (13.6 to 15.8)



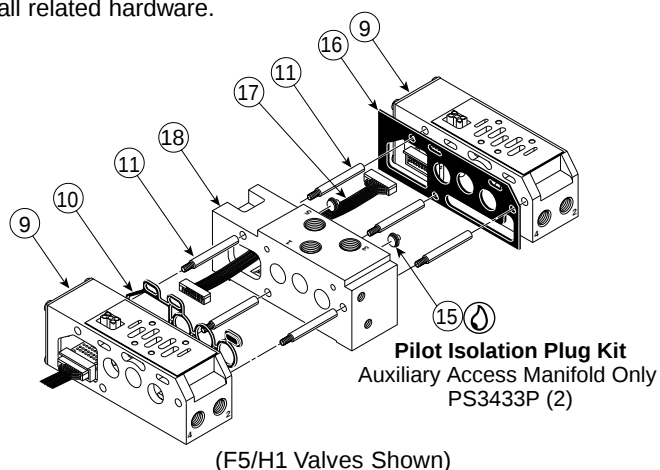
Remote Pilot Access Plate

The Remote Pilot Access Plate provides access to the #12 and #14 valve pilot galley for an F5 / H1, F6 / H2 & F7 / H3 manifold. It is required for Single or Double Remote Pilot Valves on a manifold. It is included when you order the valve/manifold combination, not included with valve only. Hand tighten the tie rods into the base.



Auxiliary Access Manifold (F5 / H1 Valves Only)

The Auxiliary Access Manifold provides auxiliary access to the #1, #3 and #5 ports. Kit includes Access Manifold, Gasket and all related hardware.



(F5/H1 Valves Shown)

Item # Description

9	Manifold Base (F5 / H1)
10	Molded Gasket
11	Tie Rod
15	Pilot Isolation Plug
16	Access Manifold Gasket
17	Jumper Harness
18	Access Manifold

Hi-Flow Manifold Repair Kits

Kit Number	Description
PS3512BP	H1 / F5 Manifold Tie Rod (12)
PS3513BP	H1 / F5 Manifold to Manifold Gasket (1)
PS3612P	H2 / H3, F6 / F7 Manifold Hardware (12)
PS3613P	H2 / F6 Manifold to Manifold Gasket (1)
PS3713P	H3 / F7 Manifold to Manifold Gasket (1)

For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402 - F & H ISO 5599-2 Solenoid Service
V-440 - F & H ISO 5599-2 Valve Installation
V-441 - F & H ISO Valve Service

V-442 - H ISO 5599-1 Auto Valve Installation
V-443 - F & H ISO 5599-2 Manifold Installation
V-444 - H ISO 5599-1 CNOMO Valve Installation
V-445 - F & H ISO Flow Control Installation

V-446 - F5/H1 Sandwich Regulator
V-447 - F6/H2 & F7/H3 Sandwich Regulator
V-448 - F5/H1, F6/H2 & F7/H3 Interconnect Wiring
V-449 - F & H Selector Regulator Installation



Pneumatic Division North America
Richland, Michigan 49083

Installation & Service Instructions
V-449P
F & H Selector Regulator Installation
ISSUED: February, 2001
Supersedes: None
NPR# 1978

⚠ WARNING

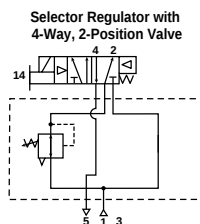
To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

⚠ **CAUTION:** It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the valve spool is in the horizontal plane.



Service Kits

PS3439P	Regulator Kit
PS3445P	Manual Bonnet Assembly
PS3447P	Air Pilot Bonnet Assembly
PS3450030P	30 PSIG Spring Conversion Kit
PS3450060P	60 PSIG Spring Conversion Kit
PS3450125P	125 PSIG Spring Conversion Kit
PS3509P	Pilot Plug Kit
PS3548P	Independent By-Pass Plate
PS3540P	Sandwich Regulator Mounting Stud Kit

Lubrication

Factory Pre-lubed. If lubricating in service, use Parker F440 oil or equivalent paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

⚠ **CAUTION:** Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

Application Limits

These products are intended for use in general purpose compressed air systems only.

Operating Pressure Range:

Maximum: 145 PSIG (1000 kPa)

Minimum: See Chart

Operator / Function	Internal Pilot	Min. PSIG (kPa)
1	Single Solenoid - 2-Pos	20 (138)
2	Double Solenoid- 2-Pos	
3	Single Remote - 2-Pos	
4	Double Remote Pilot - 2-Pos	Vacuum
5, 6, 7	Double Solenoid - 3-Pos	30 (207)
8, 9, 0	Double Remote Pilot - 3-Pos	Vacuum
E	Single Solenoid - 2-Pos Air Return / Spring Assist	35 (241))
F	Single Remote Pilot - 2-Pos Air Return / Spring Assist	
External Pilot *		
All	"F" Series	Vacuum

*External Pilot Pressure / Remote Pilot Signal - 35-145 PSIG (241-1000 kPa).

Ambient Temperature Range: -15°C to 49°C (5°F to 120°F)

Voltage Range: Rated Voltage +10%, -15%

⚠ **CAUTION:** Solenoid versions of this valve contain solid state components that can be damaged by transient voltage spikes, over-voltage or high temperature. To protect against premature solenoid failure, please read and adhere to the following:

If this solenoid operated valve is used in a circuit with other inductive loads. The solenoid should be electrically protected with a voltage suppression device (e.g. transient voltage suppressor or varistor) that has a minimum rating of 1.6 times the rated voltage of the solenoid valve and sufficient capacity to dissipate the energy of other inductive loads.

⚠ WARNING

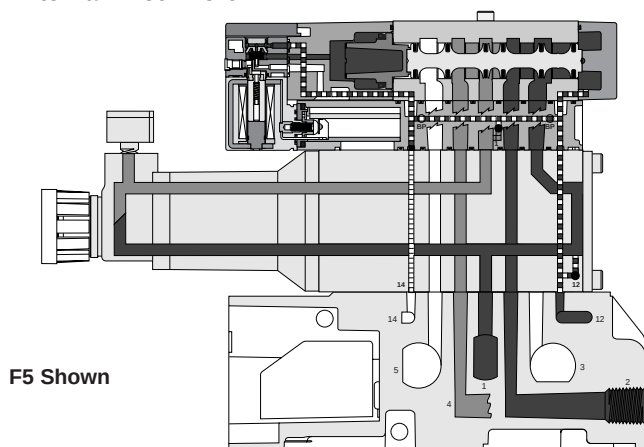
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Selector Regulator -

External Pilot - Port 14



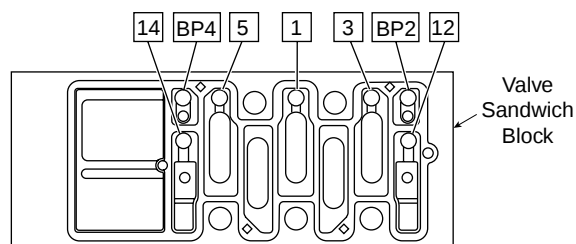
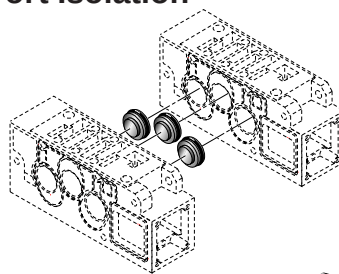
F5 Shown

Valve / Sandwich Torque Mounting Specifications

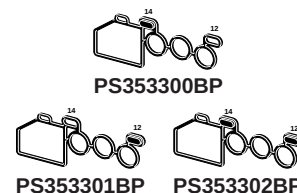
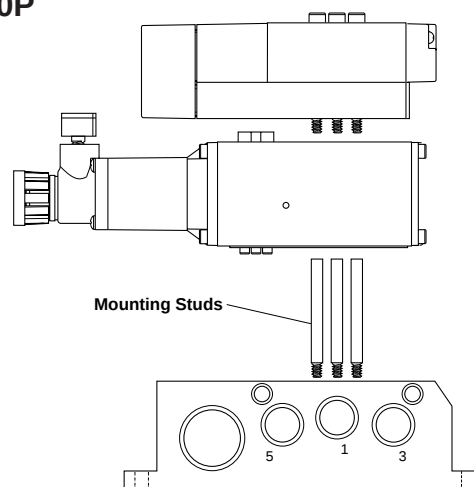
Torque 25 to 35 lb. in. (3 to 4 Nm)

Sandwich Block Pilot Plug Locations

(See Table Below)

**Manifold Port Isolation**

Select appropriate gasket to block external pilot galley for special piloting applications.

**Sandwich Regulator Mounting Stud Kit - PS3540P**

Using Model No. to Determine Plug Locations		Plug Locations							Using Attributes of Valve & Operator(s) to Determine Plug Locations		
3rd Digit in Model No.	6th Digit in Model No.	Pilot Supply Holes							Pilot Supply	Main Press Supply Type	Control Mechanism Operator Types
		1	3	5	BP4	BP2	12	14			
1, 2, 5, 6 7 or E	B or C		M	M			X	X	Internal @ Port 1	Single	All Solenoids
	P or Q	X	M	M				X	External @ Port 12		
	L or M	X	M	M			X		External @ Port 14		
	B or C		M	M			X	X	Internal @ Port 1	Dual	
	E or F	X		X			X	X	Internal @ Port 3		
	H or J	X	X				X	X	Internal @ Port 5		
	P or Q	X	M	M				X	External @ Port 12		
	L or M	X	M	M			X		External @ Port 14		
3 or F	0 or C		M	M	X		X		Internal @ Port 1	Single	Single Air Pilot
	P or Q	X	M	M	X				External @ Port 12		
	L or M	X	M	M		X			External @ Port 14		
	E or F	X		X	X		X		Internal @ Port 3	Dual	
	H or J	X	X		X		X		Internal @ Port 5		
4, 8, 9, 0	0		M	M	X	X			None	Single or Dual	Double Air Pilot

Key Code: X = Pilot hole must be plugged.
Blank = Pilot hole must be left open.

M = Pilot holes may be molded shut and will not need a plug; however some holes may be open and therefore will require a plug. Use a probe to test if holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.

For all Instruction Sheets, go to www.parker.com/pneumatic

Instruction Sheets Available:

V-402CP - F & H ISO 5599-2 Solenoid Service
V-440P - F & H ISO 5599-2 Valve Installation
V-441P - F & H ISO Valve Service

V-442P - H ISO 5599-1 Auto Valve Installation
V-443BP - F & H ISO 5599-2 Manifold Installation
V-444P - H ISO 5599-1 CNOMO Valve Installation
V-445P - F & H ISO Flow Control Installation

V-446P - F5/H1 Sandwich Regulator
V-447P - F6/H2 & F7/H3 Sandwich Regulator
V-449P - F & H Selector Regulator Installation



Pneumatic Division North America
Richland, Michigan 49083

Installation & Service Instructions:
V-476BP

H2, F6 and 4510 Sandwich Regulator

ISSUED: December, 2000
Supersedes: March, 1999

Rev. 6, ECN# 9319

WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Application Limits:

These products are intended for use in general purpose compressed air systems only.

Operating Inlet Pressure:	kPa	psig	bar
Maximum	1034	150	10.4

Ambient Temperature Range: 0°C to 52°C (32°F to 125°F)

Voltage Range: +10% to -15% of rating
(Applicable only for solenoid operated valves)

NOTE: Some of the above ratings are those of the associated valve.

Lubrication

Factory Pre-lubed. If lubricating in service, use Parker F442 oil or equivalent paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

Wiring Instructions

Sandwich Regulators for electrically operated valves include a bridge plug which directly connects the valve electrical plug with the subbase or manifold plug.

CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

NOTE: Follow all requirements for local and national electrical codes.

Installation & Operating Instructions:

A sandwich regulator is used to provide regulated pressure to individual valves in a manifolded valve arrangement. Three basic modes of regulation are available as follows:

Common Port Regulation - Provides adjustable regulated air pressure to the valve inlet.

Independent Port Regulation - Provides (2) separately adjustable regulated air pressures to the outlet ports, one through each of the valves exhaust passages. The valves exhaust (coming out of its inlet passage) is directed to manifold or subbase exhaust port "3".

Single Port Regulation - Provides adjustable regulated air pressure to one outlet port through the corresponding valve exhaust passage and full inlet pressure to the other. The valves exhaust (coming out of its inlet passage) is directed to manifold or subbase exhaust port "3".

CAUTION: With Independent Port and Single Port Regulation the valves' flow functions are reversed as indicated by the diagrams on page 2 of these instructions. Wiring and plumbing must be adjusted accordingly. Common Port Regulation does not affect the valves function.

Sandwich regulator should be installed with reasonable accessibility for service whenever possible — repair service kits are available. Keep pipe or tubing lengths to a minimum with inside clean and free of dirt and chips. Pipe joint compound should be used sparingly and applied only to the male pipe — never into the female port. Do not use PTFE tape to seal pipe joints — pieces have a tendency to break off and lodge inside the unit, possibly causing malfunction.

Air applied to the sandwich regulator must be filtered to realize maximum component life.

If used in conjunction with an H2 or F6 Sandwich Flow Control, assemble between the valve and the Sandwich Flow Control.

H2 or F6 Valves: H2 or F6 Flow Control "Sandwiches" are only recommended for use with Common Port versions of Sandwich Regulators. If used with Single Port or Independent Port versions of Sandwich Regulators, functionality is limited as follows:

Flow Control "Sandwich" used in conjunction with Single or Independent Port versions of Sandwich Regulator - Adjust speed with the adjusting screw labeled "3". It adjusts the speed of exhaust flow from cylinder ports "2" and "4". Independent speed adjustment is not possible. This could result in different exhaust speeds for cylinder ports "2" and "4" since line pressure is supplied to one cylinder port and a regulated pressure is supplied to the other. The other adjusting screw is non-functional.

WARNING

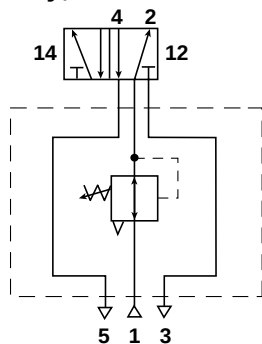
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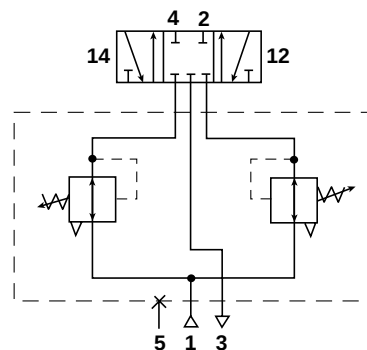
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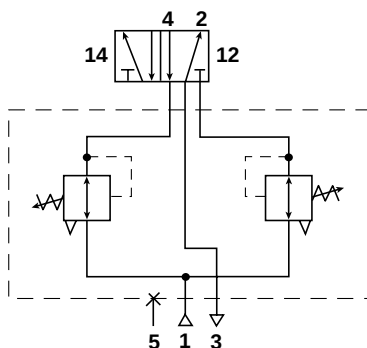
**Common Port Regulator with
4-Way, 2-Position Valve**



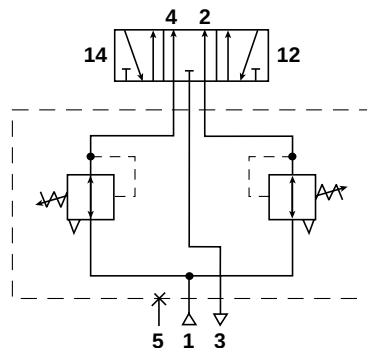
**Independent and Single Port Regulation with
4-Way, 3-Position, All Ports Blocked Valve
(Independent Port Regulation Shown)**



**Independent and Single Port Regulation with
4-Way, 2-Position Valve
(Independent Port Regulation Shown)**

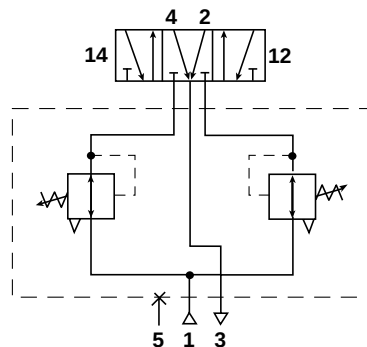


**Independent and Single Port Regulation with
4-Way, 3-Position, Inlet to Cylinder Function
(Independent Port Regulation Shown)**



**⚠ CAUTION: Requires 4-Way, 3-Position,
Cylinder to Exhaust Valve**

**Independent and Single Port Regulation with
4-Way, 3-Position, Cylinder to Exhaust Function
(Independent Port Regulation Shown)**



**⚠ CAUTION: Requires 4-Way, 3-Position,
Inlet to Cylinder Valve**

Installation

H2, F6 & 4510C Series Valves:

1. Remove the valve from the subbase or manifold (if assembled) by removing and retaining the mounting screws.
2. Convert the valve to external pilot supply per the *Conversion of Valve to External Pilot Configuration* procedure found below.
3. Clean all mating surfaces of valve, subbase or manifold and sandwich regulator of dust and dirt.
4. Add a drop of low strength thread locking compound to male threads of male-female tie rods and screw into subbase or manifold finger tight.
5. Slide gasket and Sandwich Regulator over male-female tie rods protruding from top of subbase or manifold and press down on Sandwich Regulator to seat electrical plug.
6. Place valve on top of Sandwich Regulator lining up all mounting holes and press down on valve to seat electrical plug.
7. Assemble valve to sandwich regulator with valve mounting screws. Tighten 5.1 to 5.6 Nm (45 to 50 in-lb).
8. Apply pressure to subbase or manifold and check for audible leakage at joints.
9. Adjust outlet pressure per *Outlet Pressure Adjustment* procedure at right to verify proper function.

4510A and 4510B Series Valves:

1. Remove the valve from the subbase or manifold (if assembled) by removing and discard the (4) mounting screws.
2. Clean all mating surfaces of valve, subbase or manifold and sandwich regulator of dust and dirt.
3. Place gasket on top of subbase or manifold. Select the proper gasket per the following chart:

Operator Type	Pilot Supply Option	Gasket Part No.
Single & Double Solenoid	Common Internal Supply	P00636
Single & Double Solenoid	Common External Supply	P00637
Single Remote Air / Air Return	Internal Supply to 12 end only	P00636
Double Remote Air	Separate External Supply	P00637

4. Assemble regulator to subbase or manifold and press down on Sandwich Regulator to seat electrical plug.
5. Place gasket on top of regulator interface block. Select the proper gasket per the following chart:

Operator Type	Pilot Supply Option	Gasket Part No.
Single & Double Solenoid	Common Internal Supply	P00271D*
Single & Double Solenoid	Common External Supply	P00271D*
Single Remote Air / Air Return	Internal Supply to 12 end only	P00630*
Double Remote Air	Separate External Supply	P00273D*

* Must be ordered separately.

6. Place valve on top of Sandwich Regulator lining up all mounting holes and press down on valve to seat electrical plug.
7. Attach valve and sandwich regulator to base with long mounting screws (contained in kit). Tighten 13.0 to 14.7 Nm (115 to 130 in-lb).
8. Apply pressure to subbase or manifold and check for audible leakage at joints.
9. Adjust outlet pressure per *Outlet Pressure Adjustment* procedure at right to verify proper function.

Outlet Pressure Adjustment

1. Before turning on the air supply, turn the adjusting knob counterclockwise until compression is released from the pressure control spring then turn on air supply. Proceed to adjust the desired downstream pressure by turning adjusting knob clockwise. This permits pressure to build up slowly in the downstream line.
2. To decrease regulated pressure setting, always reset from a pressure lower than the final setting required. Example, lowering the secondary pressure from 550 kPa (80 PSIG) to 410 kPa (60 PSIG) is best accomplished by dropping the secondary pressure to 345 kPa (50 PSIG), then adjusting upward to 410 kPa (60 PSIG).

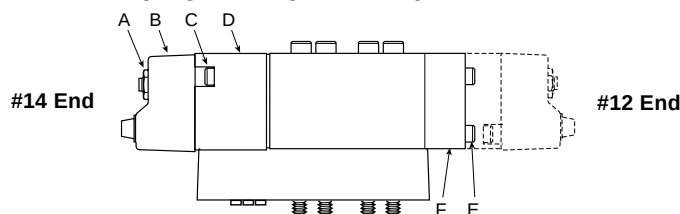
3. When desired secondary pressure setting has been reached, push the adjusting knob down to lock the adjusting knob.

Conversion Of Valve To External Pilot Supply Configuration (H2 & F6 Valves Only)

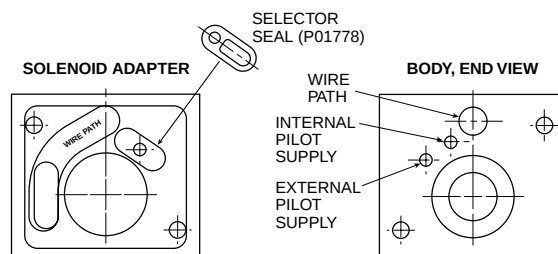
CAUTION: H2 & F6 valves equipped with solenoid operators or remote operated valves with air return must be converted to external pilot supply in order to insure proper valve operation.

Sandwich Regulator Model Numbers L95423*** and L95424*** will provide inlet air from the subbase or manifold to external pilot supply connection "12" in the valve. Model Numbers L95421*** and L95422*** require that pilot supply air 241 to 1034 kPa (35 to 150 PSIG) be connected to pilot supply connection "12" in the subbase or manifold.

H2 Valves (Engineering Level 'A')



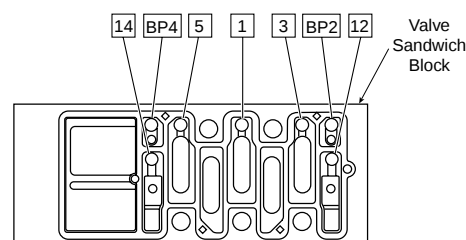
1. **#14 End** - Remove nut (A) solenoid coil (B), adapter block screws (C) and adapter block (D).
2. **#12 End - Double Solenoid Operated Valves** - Remove nut (A) solenoid coil (B), adapter block screws (C) and adapter block (D).
#12 End - Single Solenoid Operated Valves - Remove screws (E) and air return end cap (F).
3. Position selector seal on solenoid adapter(s) and air return end cap (where required) as shown below: The cylindrical projection on the selector seal will block the internal pilot supply located on the end of the valve body.



4. Reassemble solenoid end cap(s) (D) and air return end cap (F) (where required). Tighten screws (C & E) 4.5 to 5.6 Nm (40 to 50 in-lb.) torque.
5. Reassemble solenoid coil (B) and nut (A) and tighten 3.4 to 4.5 Nm (30 to 40 in-lb.) torque.

H2 Valves (Engineering Level 'B') & F6 Valves

Conversion to external pilot supply is accomplished by inserting small plugs in the sandwich plate located on the bottom of the valve. These plugs are located in small holes which are identified as follows:



Place the plugs in the proper holes per Table 1 on page 4.

To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or

nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.

Table 1 - Sandwich Block Pilot Plug Locations

Control Mechanism Operator Types	Plug Locations						
	Pilot Supply Holes						
	1	3	5	BP4	BP2	12	14
All Solenoids	X	M	M				X
Single Air Pilot	X	M	M	X			
Double Air Pilot		M	M	X	X		

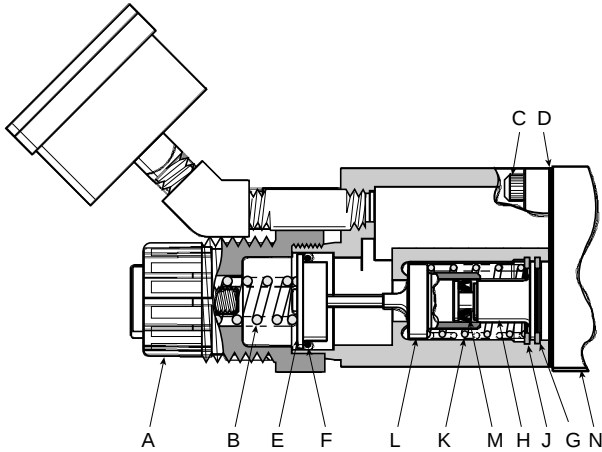
Key Code:

X = Pilot hole must be plugged

Blank = Pilot hole must be left open

M = Pilot holes may be molded shut and will not need a plug; however, some holes may be open and therefore will require a plug. Use a probe to test if the holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.

Service Instructions



1. Disconnect air supply and depressurize the unit.
2. Pull the locking knob on bonnet assembly (A) outward and then turn it counterclockwise until all downstream air is exhausted.
3. Remove (4) socket head cap screws (C). Remove regulator and gasket (D) from function block. Discard screws (C) and gasket (D).
4. Turn bonnet assembly (A) counterclockwise and remove. Retain bonnet assembly and pressure control spring (B).
5. Remove and discard piston (E) and o-ring (F).
6. Remove first retaining ring (G), plug (H), second retaining ring (J), poppet return spring (K) and poppet (L). Discard retaining rings (G & J), poppet return spring (K) and poppet (L). Retain plug (H).
7. Remove and discard vee packing (M) from plug (H).
8. Clean all parts with warm water and soap. Dry thoroughly.
9. Inspect all parts.
10. Replace damaged parts.
11. Lightly lubricate o-ring (F), piston (E), vee packing (M) and poppet (L) with Marfak MP-2* grease (tube in kit).
12. Replace vee packing (M) on plug (H) with open end of vee facing large end of plug.
13. Insert poppet (L) and poppet return spring (K) into housing. Secure using retaining ring (J) in the inner of the two grooves.
14. Slide plug (H) into poppet (L) and secure in housing with retaining ring (G).

15. Place o-ring (F) onto piston (E) and slide into housing.
16. Place spring (B) into bonnet assembly (A) and screw onto housing. Tighten to 6.2 to 7.3 Nm (55-65 in-lb.) torque.
17. Assemble gasket (D) and housing to interface block using (4) socket head cap screws. Tighten screws to 6.2 to 6.8 Nm (55-60 in-lb.) torque.
18. Reapply pressure to unit and check for audible leakage at joints or out bleed holes.
19. Adjust outlet pressure per *Outlet Pressure Adjustment* procedure above to verify proper function.

Regulator Spring Conversion

1. Disconnect air supply and depressurize the unit.
2. Pull the locking knob on bonnet assembly (A) outward and then turn it counterclockwise until all downstream air is exhausted.
3. Turn bonnet assembly (A) counterclockwise and remove. Remove and discard spring (B).
4. Replace spring (B) with one for new pressure range and assemble into bonnet assembly (A). Screw bonnet assembly (A) onto housing and tighten to 6.2 to 7.3 Nm (55-65 in-lb.) torque.
5. Reapply pressure to unit and check for audible leakage at joints or out bleed holes.
6. Adjust outlet pressure per *Outlet Pressure Adjustment* procedure on page 2 of these instructions to verify proper function.

Replacement Parts

Item No.	Part Number	Description
A	L00715B	Bonnet Assembly
B	P00411 P78660B P78648	1-30 PSI Spring (Green) 2-60 PSI Spring (Blue) 5-125 PSI Spring
C	•	Socket Head Cap Screw
D	•	Regulator Base Gasket
E	•	Piston
F	•	O-Ring
G	•	Retaining Ring
H	NSS	Plug
J	•	Retaining Ring
K	•	Poppet Return Spring
L	•	Poppet Assembly
M	•	Vee Packing
N	K183118	Subbase Gasket - H2
N	K183134	Subbase Gasket - F6

• Parts included in K352415 Service Kit.

NSS Not Sold Separately.

Replacement Gauges

PSI	Standard	Liquid Filled
0 - 60	P530154	—
0 - 160	P77413	H03276

H2 Sandwich Flow Control w/ Electrical Plug PS4135
H2 Sandwich Flow Control w/o Electrical Plug PS4142
F6 Sandwich Flow Control w/ Electrical Plug PS3635
F6 Sandwich Flow Control w/o Electrical Plug PS3642

For all Installation & Service Instructions, go to www.parker.com/pneumatic



Pneumatic Division North America
Richland, Michigan 49083

Installation & Service Instructions:
V-486BP

H3 & F7 Sandwich Regulator

ISSUED: December, 2000
Supersedes: July, 1999

Rev. 4, ECN# 9319

WARNING

To avoid unpredictable system behavior that can cause personal injury and property damage:

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
- Operate within the manufacturer's specified pressure, temperature, and other conditions listed in these instructions.
- Medium must be moisture-free if ambient temperature is below freezing.
- Service according to procedures listed in these instructions.
- Installation, service, and conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversion, air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or the product does not operate properly, do not put into use.
- Warnings and specifications on the product should not be covered by paint, etc. If masking is not possible, contact your local representative for replacement labels.

Introduction

Follow these instructions when installing, operating, or servicing the product.

Application Limits:

These products are intended for use in general purpose compressed air systems only.

Operating Inlet Pressure:	kPa	psig	bar
Maximum	1034	150	10.4

Ambient Temperature Range: 0°C to 52°C (32°F to 125°F)

Voltage Range: +10% to -15% of rating
(Applicable only for solenoid operated valves)

NOTE: Some of the above ratings are those of the associated valve.

Lubrication

Factory Pre-lubed. If lubricating in service, use Parker F442 oil or equivalent paraffin based mineral oil with 150 to 200 SSU viscosity @100°F.

CAUTION: Do not use oils that are synthetic, reconstituted, have an alcohol content or a detergent additive.

Wiring Instructions

Sandwich Regulators for electrically operated valves include a bridge plug which directly connects the valve electrical plug with the subbase or manifold plug.

CAUTION: An interruption of 10 milliseconds or greater to the power supplied to the solenoid of a solenoid operated valve may cause the valve to shift. Provision must be made to prevent power interruption of this duration to avoid unintended, potentially hazardous, consequences.

NOTE: Follow all requirements for local and national electrical codes.

Installation & Operating Instructions:

A sandwich regulator is used to provide regulated pressure to individual valves in a manifolded valve arrangement. Three basic modes of regulation are available as follows:

Common Port Regulation - Provides adjustable regulated air pressure to the valve inlet.

Independent Port Regulation - Provides (2) separately adjustable regulated air pressures to the outlet ports, one through each of the valves exhaust passages. The valves exhaust (coming out of its inlet passage) is directed to manifold or subbase exhaust port "3".

Single Port Regulation - Provides adjustable regulated air pressure to one outlet port through the corresponding valve exhaust passage and full inlet pressure to the other. The valves exhaust (coming out of its inlet passage) is directed to manifold or subbase exhaust port "3".

CAUTION: With Independent Port and Single Port Regulation the valves' flow functions are reversed as indicated by the diagrams on page 2 of these instructions. Wiring and plumbing must be adjusted accordingly. Common Port Regulation does not affect the valves function.

Sandwich regulator should be installed with reasonable accessibility for service whenever possible – repair service kits are available. Keep pipe or tubing lengths to a minimum with inside clean and free of dirt and chips. Pipe joint compound should be used sparingly and applied only to the male pipe – never into the female port. Do not use PTFE tape to seal pipe joints – pieces have a tendency to break off and lodge inside the unit, possibly causing malfunction.

Air applied to the sandwich regulator must be filtered to realize maximum component life.

If used in conjunction with an H3 or F7 Sandwich Flow Control, assemble between the valve and the Sandwich Flow Control.

H3 or F7 Valves: H3 or F7 Flow Control "Sandwiches" are only recommended for use with Common Port versions of Sandwich Regulators. If used with Single Port or Independent Port versions of Sandwich Regulators, functionality is limited as follows:

Flow Control "Sandwich" used in conjunction with Single or Independent Port versions of Sandwich Regulator - Adjust speed with the adjusting screw labeled "3". It adjusts the speed of exhaust flow from cylinder ports "2" and "4". Independent speed adjustment is not possible. This could result in different exhaust speeds for cylinder ports "2" and "4" since line pressure is supplied to one cylinder port and a regulated pressure is supplied to the other. The other adjusting screw is non-functional.

WARNING

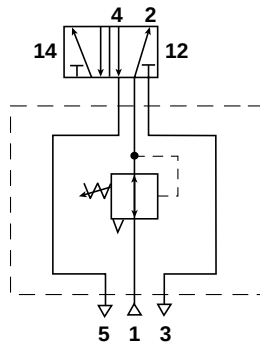
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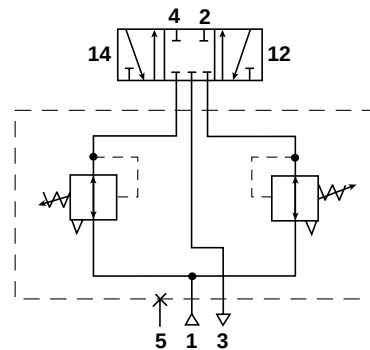
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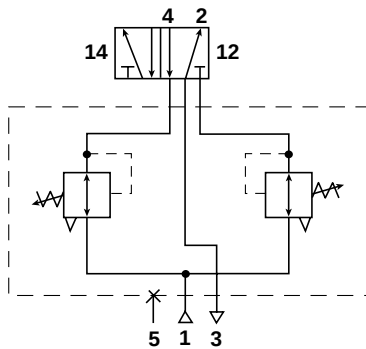
**Common Port Regulator with
4-Way, 2-Position Valve**



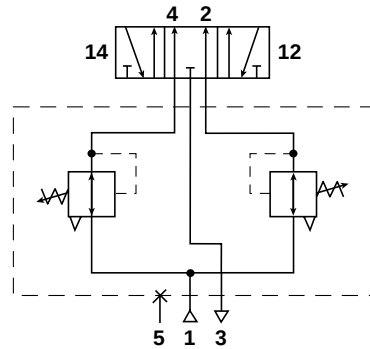
**Independent and Single Port Regulation with
4-Way, 3-Position, All Ports Blocked Valve
(Independent Port Regulation Shown)**



**Independent and Single Port Regulation with
4-Way, 2-Position Valve
(Independent Port Regulation Shown)**

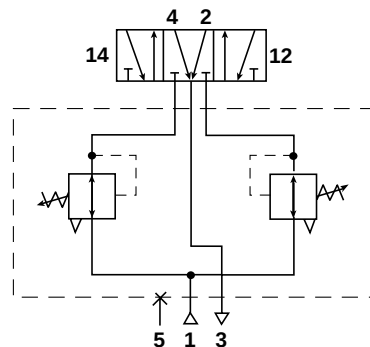


**Independent and Single Port Regulation with
4-Way, 3-Position, Inlet to Cylinder Function
(Independent Port Regulation Shown)**



**⚠ CAUTION: Requires 4-Way, 3-Position,
Cylinder to Exhaust Valve**

**Independent and Single Port Regulation with
4-Way, 3-Position, Cylinder to Exhaust Function
(Independent Port Regulation Shown)**



**⚠ CAUTION: Requires 4-Way, 3-Position,
Inlet to Cylinder Valve**

Installation

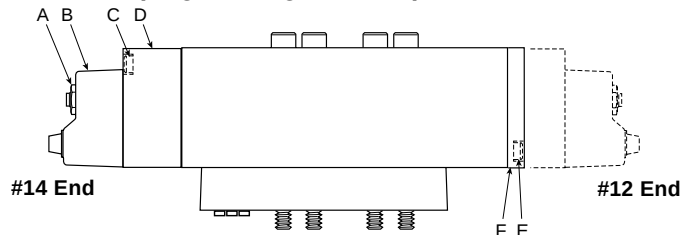
1. Remove the valve from the subbase or manifold (if assembled) by removing and retaining the mounting screws.
2. Convert the valve to external pilot supply per the *Conversion of Valve to External Pilot Configuration* procedure found below.
3. Clean all mating surfaces of valve, subbase or manifold and sandwich regulator of dust and dirt.
4. Add a drop of low strength thread locking compound to male threads of male-female tie rods and screw into subbase or manifold and tighten 9.0 to 11.3 Nm (80 to 100 in-lb).
5. Slide gasket and Sandwich Regulator over male-female tie rods protruding from top of subbase or manifold and press down on Sandwich Regulator to seat electrical plug.
6. Place valve on top of Sandwich Regulator lining up all mounting holes and press down on valve to seat electrical plug.
7. Assemble valve to sandwich regulator with valve mounting screws. Tighten 9.0 to 11.3 Nm (80 to 100 in-lb).
8. Apply pressure to subbase or manifold and check for audible leakage at joints.
9. Adjust outlet pressure per *Outlet Pressure Adjustment* procedure at right to verify proper function.

Conversion Of Valve To External Pilot Supply Configuration

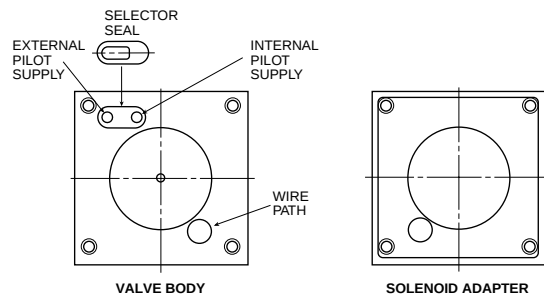
CAUTION: H3 & F7 valves equipped with solenoid operators or remote operated valves with air return must be converted to external pilot supply in order to insure proper valve operation.

Sandwich Regulator Model Numbers L95433*** and L95434*** will provide inlet air from the subbase or manifold to external pilot supply connection "12" in the valve. Model Numbers L95431*** and L95432*** require that pilot supply air 241 to 1034 kPa (35 to 150 PSIG) be connected to pilot supply connection "12" in the subbase or manifold.

H3 Valves (Engineering Level 'A')



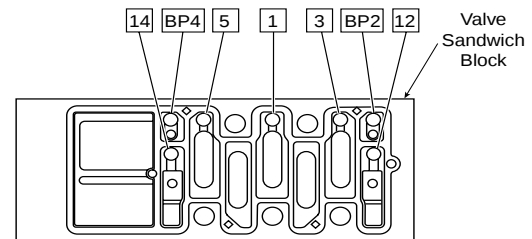
1. **#14 End - All Solenoid Operated and Remote Pilot Operated Valves** - Remove nut (A) solenoid coil (B), adapter block screws (C) and adapter block (D).
2. **#12 End - Double Solenoid Operated Valves** - Remove nut (A) solenoid coil (B), adapter block screws (C) and adapter block (D).
3. **#12 End - Single Solenoid Operated Valves** - Remove screws (E) and air return end cap (F).
3. Position selector seal on valve body as shown below: The cylindrical projection on the selector seal will block the internal pilot supply located on the end of the valve body.



4. Reassemble solenoid end cap(s) (D) and air return end cap (F) (where required). Tighten screws (C & E) 4.5 to 5.6 Nm (40 to 50 in-lb.) torque.
5. Reassemble solenoid coil (B) and nut (A) and tighten 5.1 to 6.2 Nm (45 to 55 in-lb.) torque.

H3 Valves (Engineering Level 'B') & F7 Valves

Conversion to external pilot supply is accomplished by inserting small plugs in the sandwich plate located on the bottom of the valve. These plugs are located in small holes which are identified as follows:



Place the plugs in the proper holes per the table below as follows:

To remove a plug, insert a narrow tool under the side of the nib and pry it upward slightly. Then, grasp the projecting nib (long nose pliers may help) and pull it out. Examine the o-ring to be sure it is not torn or nicked, and that it has a coating of grease. Install the plug into the appropriate hole (o-ring end enters first) by pushing it in place until it comes to a stop and the nib is flush with the surface of the sandwich block.

Control Mechanism Operator Types	Plug Locations						
	Pilot Supply Holes						
	1	3	5	BP4	BP2	12	14
All Solenoids	X	M	M				X
Single Air Pilot	X	M	M	X			
Double Air Pilot		M	M	X	X		

Key Code:

X = Pilot hole must be plugged

Blank = Pilot hole must be left open

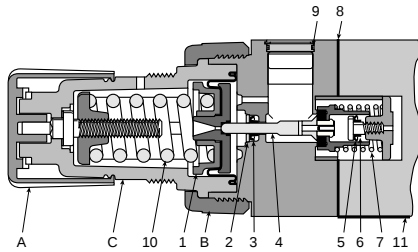
M = Pilot holes may be molded shut and will not need a plug; however, some holes may be open and therefore will require a plug. Use a probe to test if the holes are open - the probe must be able to pass through the thickness of the sandwich block for the holes to be open.

Outlet Pressure Adjustment

1. Before turning on the air supply, turn the adjusting knob counterclockwise until compression is released from the pressure control spring then turn on air supply. Proceed to adjust the desired downstream pressure by turning adjusting knob clockwise. This permits pressure to build up slowly in the downstream line.
2. To decrease regulated pressure setting, always reset from a pressure lower than the final setting required. Example, lowering the secondary pressure from 550 kPa (80 PSIG) to 410 kPa (60 PSIG) is best accomplished by dropping the secondary pressure to 345 kPa (50 PSIG), then adjusting upward to 410 kPa (60 PSIG).
3. When desired secondary pressure setting has been reached, push the adjusting knob down to lock the adjusting knob.

Regulator Spring Conversion

1. Shut off main and pilot air supplies and depressurize the unit.
2. Disengage the adjusting knob (A) by pulling outward. Turn adjusting knob counterclockwise until the compression is released from the pressure control spring (10).
3. Unscrew the collar (B) and remove the bonnet assembly (C). Remove diaphragm assembly (1) and spring (10).
4. Replace spring (10) with one for new pressure range and assemble along with diaphragm assembly (1) into bonnet assembly (C).
5. Assemble bonnet assembly (C) and collar (B) to regulator body. Tighten collar hand tight plus 1/4 turn.
6. Reapply pressure to unit and check for audible leakage at joints or out bleed holes.
7. Adjust outlet pressure per *Outlet Pressure Adjustment* procedure above to verify proper function.



Replacement Parts

Item No.	Part Number	Description
1	•	Diaphragm Assembly
2	•	Retaining Ring
3	•	Vee Packing
4	•	Poppet Assembly
5	•	Vee Packing
6	•	Backflow Retainer
7	•	Poppet Spring
8	•	Gasket
9	•	O-Ring
10	P01698 P04062 P04063	1-30 PSI Spring 1-60 PSI Spring (Blue) 2-125 PSI Spring
11	K183119	Subbase Gasket - H3
11	K183135	Subbase Gasket - F7

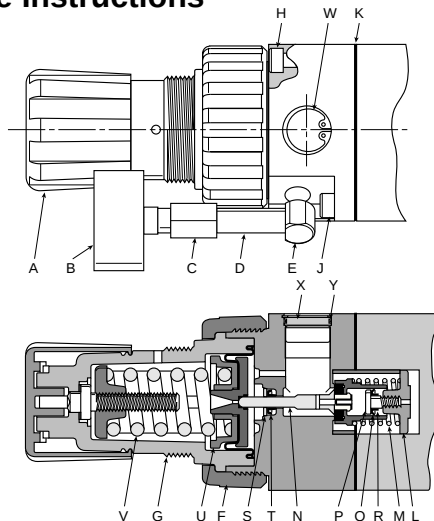
• Parts included in K352418 Service Kit.

Replacement Gauges

PSI	Standard	Liquid Filled
0 - 60	P530154	—
0 - 160	P77413	H03276

H3 Sandwich Flow Control w/ Electrical Plug **PS4235**
H3 Sandwich Flow Control w/o Electrical Plug **PS4242**
F7 Sandwich Flow Control w/ Electrical Plug **PS3735**
F7 Sandwich Flow Control w/o Electrical Plug **PS3742**

Service Instructions



Disassembly

1. Shut off air supply and depressurize the unit.
2. Disengage the adjusting knob (A) by pulling outward. Turn adjusting knob (A) counterclockwise until the compression is released from the pressure control spring (V).
3. Using a small pipe wrench, turn nipple (D) counterclockwise and remove along with coupling (C) and gauge (B). Remove elbow (E).

4. Unscrew the collar (F) and remove the bonnet assembly (G).
5. Remove (3) M6 X 40MM LG. socket head cap screws (H) and (1) M6 X 20MM LG. socket head cap screw (J). Remove regulator and gasket (K) to interface block.
6. Unscrew poppet retainer (L). Remove and discard spring (M) and poppet assembly (N).
7. Remove seal retainer (P) using a T15 Torx driver. Remove and discard vee packing (Q) and backflow retainer (R).
8. Remove retaining ring (S) from regulator body using needle nosed pliers and discard. Remove and discard vee packing (T).
9. Remove and discard diaphragm assembly (U). Remove and retain spring (V).
10. **OPTIONAL:** Remove retaining ring (W) using snap ring pliers. Use a small hex key to pry plug (X) out of regulator body. Remove and discard o-ring (Y).

NOTE: This step need not be performed unless leakage is detected around retaining ring.

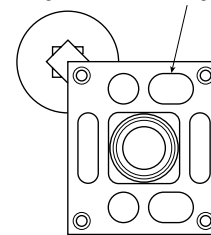
Cleaning And Lubrication

1. Clean all parts with warm water and soap. Dry thoroughly.
2. Inspect all parts.
3. Replace damaged parts.
4. Lubricate all o-rings and vee packings with Marfak MP-2* grease (tube in kit).

Reassembly

1. **OPTIONAL:** Perform only if step 10 of disassembly was performed. Apply lubricant around top of hole in top of regulator body. Assemble o-ring (Y) to plug (W) and insert into regulator body. Assemble retaining ring (W) into groove in regulator body using snap ring pliers.
2. Insert vee packing (T) into regulator body with open end of vee facing towards interior of regulator body. Press retaining ring (S) into regulator body using a 7/16 diameter wooden dowel.
3. Assemble vee packing (Q) and backflow retainer (R) to seal retainer (P). Vee on vee packing (Q) and flat side of backflow retainer (R) should face the threaded end of the seal retainer (P).
4. Assemble the seal retainer (P) to the poppet retainer (L) using a T15 Torx driver.
5. Apply a drop of low strength thread locker to poppet retainer. Assemble poppet assembly (N), spring (M) and poppet retainer (L) into regulator body. Poppet retainer (L) need only be hand tight.
6. Place gasket (K) over end of regulator body lining up long slot in gasket with outlet in regulator body.

Long slot in Gasket / Regulator outlet



7. Using (3) M6 X 40MM LG. Socket head cap screws (H) and (1) M6 X 20MM LG. Socket head cap screw (J) assemble regulator body and gasket (K) to interface block. Tighten 5.1 to 5.6 Nm (45 to 50 in-lb).
8. Place spring (V) and diaphragm assembly (U) into bonnet assembly (G).
9. Assemble bonnet assembly (G) and collar (F) to regulator body. Tighten collar hand tight plus 1/4 turn.
10. Apply pipe sealant to male threads of elbow (E) and assemble to regulator body. Apply pipe sealant to male threads of nipple (D) and screw into elbow (E).
11. Reapply pressure to unit and check for audible leakage at joints or out bleed holes.
12. Adjust outlet pressure per Outlet Pressure Adjustment procedure at top left of this page to verify proper function.

For all Installation & Service Instructions, go to www.parker.com/pneumatic



Pneumatic Division
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PDNSG-1

Pneumatic Division Safety Guide

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Safety Guide For Selecting And Using Pneumatic Division Products And Related Accessories

WARNING:

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF PNEUMATIC DIVISION PRODUCTS, ASSEMBLIES OR RELATED ITEMS ("PRODUCTS") CAN CAUSE DEATH, PERSONAL INJURY, AND PROPERTY DAMAGE. POSSIBLE CONSEQUENCES OF FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THESE PRODUCTS INCLUDE BUT ARE NOT LIMITED TO:

- Unintended or mistimed cycling or motion of machine members or failure to cycle
- Work pieces or component parts being thrown off at high speeds.
- Failure of a device to function properly for example, failure to clamp or unclamp an associated item or device.
- Explosion
- Suddenly moving or falling objects.
- Release of toxic or otherwise injurious liquids or gasses.

Before selecting or using any of these Products, it is important that you read and follow the instructions below.

1. GENERAL INSTRUCTIONS

- 1.1. Scope:** This safety guide is designed to cover general guidelines on the installation, use, and maintenance of Pneumatic Division Valves, FRLs (Filters, Pressure Regulators, and Lubricators), Vacuum products and related accessory components.
- 1.2. Fail-Safe:** Valves, FRLs, Vacuum products and their related components can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of associated valves, FRLs or Vacuum products will not endanger persons or property.
- 1.3. Relevant International Standards:** For a good guide to the application of a broad spectrum of pneumatic fluid power devices see: ISO 4414:1998, Pneumatic Fluid Power – General Rules Relating to Systems. See www.iso.org for ordering information.
- 1.4. Distribution:** Provide a copy of this safety guide to each person that is responsible for selection, installation, or use of Valves, FRLs or Vacuum products. Do not select, or use Parker valves, FRLs or vacuum products without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the products considered or selected.
- 1.5. User Responsibility:** Due to the wide variety of operating conditions and applications for valves, FRLs, and vacuum products Parker and its distributors do not represent or warrant that any particular valve, FRL or vacuum product is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:
 - Making the final selection of the appropriate valve, FRL, Vacuum component, or accessory.
 - Assuring that all user's performance, endurance, maintenance, safety, and warning requirements are met and that the application presents no health or safety hazards.
 - Complying with all existing warning labels and / or providing all appropriate health and safety warnings on the equipment on which the valves, FRLs or Vacuum products are used; and,
 - Assuring compliance with all applicable government and industry standards.
- 1.6. Safety Devices:** Safety devices should not be removed, or defeated.
- 1.7. Warning Labels:** Warning labels should not be removed, painted over or otherwise obscured.
- 1.8. Additional Questions:** Call the appropriate Parker technical service department if you have any questions or require any additional information. See the Parker publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2. PRODUCT SELECTION INSTRUCTIONS

- 2.1. Flow Rate:** The flow rate requirements of a system are frequently the primary consideration when designing any pneumatic system. System components need to be able to provide adequate flow and pressure for the desired application.
- 2.2. Pressure Rating:** Never exceed the rated pressure of a product. Consult product labeling, Pneumatic Division catalogs or the instruction sheets supplied for maximum pressure ratings.
- 2.3. Temperature Rating:** Never exceed the temperature rating of a product. Excessive heat can shorten the life expectancy of a product and result in complete product failure.
- 2.4. Environment:** Many environmental conditions can affect the integrity and suitability of a product for a given application. Pneumatic Division products are designed for use in general purpose industrial applications. If these products are to be used in unusual circumstances such as direct sunlight and/or corrosive or caustic environments, such use can shorten the useful life and lead to premature failure of a product.
- 2.5. Lubrication and Compressor Carryover:** Some modern synthetic oils can and will attack nitrile seals. If there is any possibility of synthetic oils or greases migrating into the pneumatic components check for compatibility with the seal materials used. Consult the factory or product literature for materials of construction.
- 2.6. Polycarbonate Bowls and Sight Glasses:** To avoid potential polycarbonate bowl failures:
 - Do not locate polycarbonate bowls or sight glasses in areas where they could be subject to direct sunlight, impact blow, or temperatures outside of the rated range.
 - Do not expose or clean polycarbonate bowls with detergents, chlorinated hydro-carbons, ketones, esters or certain alcohols.
 - Do not use polycarbonate bowls or sight glasses in air systems where compressors are lubricated with fire resistant fluids such as phosphate ester and di-ester lubricants.

2.7. Chemical Compatibility: For more information on plastic component chemical compatibility see Pneumatic Division technical bulletins Tec-3, Tec-4, and Tec-5

- 2.8. Product Rupture:** Product rupture can cause death, serious personal injury, and property damage.
- Do not connect pressure regulators or other Pneumatic Division products to bottled gas cylinders.
 - Do not exceed the maximum primary pressure rating of any pressure regulator or any system component.
 - Consult product labeling or product literature for pressure rating limitations.

3. PRODUCT ASSEMBLY AND INSTALLATION INSTRUCTIONS

- 3.1. Component Inspection:** Prior to assembly or installation a careful examination of the valves, FRLs or vacuum products must be performed. All components must be checked for correct style, size, and catalog number. DO NOT use any component that displays any signs of nonconformance.
- 3.2. Installation Instructions:** Parker published Installation Instructions must be followed for installation of Parker valves, FRLs and vacuum components. These instructions are provided with every Parker valve or FRL sold, or by calling 1-800-CPARKER, or at www.parker.com.
- 3.3. Air Supply:** The air supply or control medium supplied to Valves, FRLs and Vacuum components must be moisture-free if ambient temperature can drop below freezing

4. VALVE AND FRL MAINTENANCE AND REPLACEMENT INSTRUCTIONS

- 4.1. Maintenance:** Even with proper selection and installation, valve, FRL and vacuum products service life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a component failure, and experience with any known failures in the application or in similar applications should determine the frequency of inspections and the servicing or replacement of Pneumatic Division products so that products are replaced before any failure occurs. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.10.
- 4.2. Installation and Service Instructions:** Before attempting to service or replace any worn or damaged parts consult the appropriate Service Bulletin for the valve or FRL in question for the appropriate practices to service the unit in question. These Service and Installation Instructions are provided with every Parker valve and FRL sold, or are available by calling 1-800-CPARKER, or by accessing the Parker web site at www.parker.com.
- 4.3. Lockout / Tagout Procedures:** Be sure to follow all required lockout and tagout procedures when servicing equipment. For more information see: OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – (Lockout / Tagout)
- 4.4. Visual Inspection:** Any of the following conditions requires immediate system shut down and replacement of worn or damaged components:
- Air leakage: Look and listen to see if there are any signs of visual damage to any of the components in the system. Leakage is an indication of worn or damaged components.
 - Damaged or degraded components: Look to see if there are any visible signs of wear or component degradation.
 - Kinked, crushed, or damaged hoses. Kinked hoses can result in restricted air flow and lead to unpredictable system behavior.
 - Any observed improper system or component function: Immediately shut down the system and correct malfunction.
 - Excessive dirt build-up: Dirt and clutter can mask potentially hazardous situations.

Caution: Leak detection solutions should be rinsed off after use.

- 4.5. Routine Maintenance Issues:**
- Remove excessive dirt, grime and clutter from work areas.
 - Make sure all required guards and shields are in place.
- 4.6. Functional Test:** Before initiating automatic operation, operate the system manually to make sure all required functions operate properly and safely.
- 4.7. Service or Replacement Intervals:** It is the user's responsibility to establish appropriate service intervals. Valves, FRLs and vacuum products contain components that age, harden, wear, and otherwise deteriorate over time. Environmental conditions can significantly accelerate this process. Valves, FRLs and vacuum components need to be serviced or replaced on routine intervals. Service intervals need to be established based on:
- Previous performance experiences.
 - Government and / or industrial standards.
 - When failures could result in unacceptable down time, equipment damage or personal injury risk.
- 4.8. Servicing or Replacing of any Worn or Damaged Parts:** To avoid unpredictable system behavior that can cause death, personal injury and property damage:
- Follow all government, state and local safety and servicing practices prior to service including but not limited to all OSHA Lockout Tagout procedures (OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – Lockout / Tagout).
 - Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
 - Disconnect air supply and depressurize all air lines connected to system and Pneumatic Division products before installation, service, or conversion.
 - Installation, servicing, and / or conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
 - After installation, servicing, or conversions air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or if the product does not operate properly, do not put product or system into use.
 - Warnings and specifications on the product should not be covered or painted over. If masking is not possible, contact your local representative for replacement labels.
- 4.9. Putting Serviced System Back into Operation:** Follow the guidelines above and all relevant Installation and Maintenance Instructions supplied with the valve FRL or vacuum component to insure proper function of the system.