## F VALVE SERIES

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<td>F5 Sandwich Flow Controls, Installation Instructions</td>
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<tr>
<td>V436BP</td>
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<td>F5 Sandwich Regulator, Installation &amp; Operating Instructions</td>
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<td>V437BP</td>
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<td>F5 Sandwich Regulator, Service / Conversion Instructions</td>
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<tr>
<td>V438CP</td>
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</tr>
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<tr>
<td>V441BP</td>
<td></td>
<td>F Valve Service, Installation &amp; Service Instructions</td>
</tr>
<tr>
<td>V443P</td>
<td></td>
<td>F Manifold, Installation &amp; Service Instructions</td>
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<td>V445P</td>
<td></td>
<td>F Sandwich Flow Control, Installation &amp; Service Instructions</td>
</tr>
<tr>
<td>V446P</td>
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<td>F5 Sandwich Regulators, Installation &amp; Service Instructions</td>
</tr>
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<td>V447P</td>
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</tr>
<tr>
<td>V448BP</td>
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<td>F Manifold Base with Interconnect Wiring, Installation &amp; Service Instructions</td>
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<td>V476BP</td>
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<td>F6 Sandwich Regulator, Installation &amp; Service Instructions</td>
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<tr>
<td>V486BP</td>
<td>Rev. 4</td>
<td>F7 Sandwich Regulator, Installation &amp; Service Instructions</td>
</tr>
<tr>
<td>Safety Guide</td>
<td></td>
<td>PDN Safety Guide</td>
</tr>
</tbody>
</table>
Pneumatic Division
Richland, Michigan 49083

![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 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, 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.

**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.
7. 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).
8. 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.

<table>
<thead>
<tr>
<th>Basic Kit Number</th>
<th>B</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS2982 Standard Flow, Opp. Side, NC</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>PS2981 Standard Flow, Same Side, NO</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>PS3201 Standard Flow, Opp. Side, NO</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>PS3441 Standard Flow, Same Side, NC</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PS3541 High Flow, Same Side, NC</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

- **Override**
  - A: No Override
  - B: Non-Locking Flush
  - C: Locking Flush
  - D: Non-Locking Extended
  - E: Locking Extended

- **Voltage**
  - A: 24VAC
  - B: 12VDC
  - C: 42VAC
  - D: 115VAC
  - E: 230VAC

- **Viton**
  - Blank: No Viton
  - V: Viton (Not Available with kit number PS3541)

**Solenoid Replacement Kits**

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

**WARNING**

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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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Solenoid Replacement Kits

### Female Electrical Connectors / Accessories

#### 30x30 Square 3-Pin – ISO 4400, DIN 43650A

<table>
<thead>
<tr>
<th>Connector</th>
<th>Connector with 6 foot cord (2 meters)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS2932P</td>
<td>PS2932JP</td>
<td>Unlitied</td>
</tr>
<tr>
<td>PS294675P</td>
<td>PS2946J75P</td>
<td>Light - 12VAC or 12VDC</td>
</tr>
<tr>
<td>PS294679P</td>
<td>PS2946J79P</td>
<td>Light - 24VAC or 24VDC</td>
</tr>
<tr>
<td>PS294683P</td>
<td>PS2946J83P</td>
<td>Light - 110 / 120VAC</td>
</tr>
<tr>
<td>PS294687P</td>
<td>N/A</td>
<td>Light - 240/230VAC</td>
</tr>
</tbody>
</table>

* LED with surge suppression.

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

#### 22x30 Rectangular 3-Pin – Type B Industrial

<table>
<thead>
<tr>
<th>Connector</th>
<th>Connector with 6’ (2m) Cord</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS2429BP</td>
<td>PS2429JP</td>
<td>Unlitied</td>
</tr>
<tr>
<td>PS243079P</td>
<td>PS2430J79P*</td>
<td>Light – 24V60Hz, 24VDC</td>
</tr>
<tr>
<td>PS243083P</td>
<td>PS2430J83P*</td>
<td>Light – 120V/60Hz</td>
</tr>
<tr>
<td>PS243087P</td>
<td>N/A</td>
<td>Light – 240V/60Hz</td>
</tr>
</tbody>
</table>

* 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

### Operator Kits

#### Option A

- 30mm Square, 3-Pin ISO 4400, DIN 43650A
- Option G & Q (22mm) Grommet, 18” or 72” Leads
- Option H & R (22mm) 1/2” Conduit, 18” or 72” Leads

**CNOMO Connection**

2-Pin Male / Single Solenoid

(Encl. Option 6, Auto Option F)

#### Option B

- 22mm Rectangular, 3-Pin DIN, Type B Industrial

**Series**

P20P

**Pinout**

<table>
<thead>
<tr>
<th>Pin 1</th>
<th>Pin 2</th>
<th>Pin 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>24VAC</td>
<td>24VAC</td>
<td>24VAC</td>
</tr>
</tbody>
</table>

**Function**

3/2, Normally Closed

**Pressure / Temperature**

N: Standard, 1/2 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: NC Override
C: Flush, Locking (Bistable), Plastic
D: Extended, Non-Locking, (Monostable), Metal

**Option A (30mm Coil)**

**Figure 2**

**Option B (22mm Coil)**

**Figure 3**

---

**Figure 2**

**Figure 3**
WARNING

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- Disconnect air supply and depressurize all air lines connected to this product before installation, servicing, or conversion.
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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:

<table>
<thead>
<tr>
<th>Port #</th>
<th>Single Pressure</th>
<th>Dual Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inlet</td>
<td>Exhaust</td>
</tr>
<tr>
<td>2</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>3</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
<tr>
<td>4</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>5</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
</tbody>
</table>

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

Port Identification/Connections/Symbols

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 DTEZ4 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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Pneumatic Division North America
Richland, Michigan 49083

Supersedes: October, 1999
Issued: September, 2000
ECN# P27805
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.

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 interface gasket and the small plugs. This is accessed by loosening the three main body mounting screws (item A) with a 3 mm wrench and removing the valve from its base. These holes have identification alongside as shown in the figure and must be located in the holes as described in Table 1. (See the two identification methods located in Table 1.)

Service Kits Available

<table>
<thead>
<tr>
<th>Kit Description</th>
<th>Code (**)</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solenoid Kit* - No Override</td>
<td>PS3441A</td>
<td>12V/60Hz, 12V/50Hz</td>
</tr>
<tr>
<td>Solenoid Kit* - Non-Locking Flush Override</td>
<td>PS3441B</td>
<td>24V/60Hz, 22V/50Hz</td>
</tr>
<tr>
<td>Solenoid Kit* - Locking Flush Override</td>
<td>PS3441C</td>
<td>12VDC</td>
</tr>
<tr>
<td>Solenoid Kit* - Non-Locking Extended Override</td>
<td>PS3441D</td>
<td>24VDC</td>
</tr>
<tr>
<td>Solenoid Kit* - Locking Extended Override</td>
<td>PS3441E</td>
<td>240V/60Hz, 220V/50Hz</td>
</tr>
</tbody>
</table>

Instruction Sheets Available:

- V-411DP - Valve Body Service Instructions
- V-412DP - Solenoid Service Instructions
- V-413DP - Manifold Installation Instructions
- V-414DP - 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)

<table>
<thead>
<tr>
<th>3rd Digit in Model No.</th>
<th>6th Digit in Model No.</th>
<th>Pilot Supply Holes: (See key code below)</th>
<th>Method 2: Using Attributes of Valve &amp; Operator(s) to Determine Plug Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 or E</td>
<td></td>
<td>Pilot Supply</td>
<td>Main Press Supply Type</td>
</tr>
<tr>
<td></td>
<td>B or C</td>
<td>M M X X</td>
<td>Int. Port 1</td>
</tr>
<tr>
<td></td>
<td>P or Q</td>
<td>X M M X</td>
<td>Ext. Port 12</td>
</tr>
<tr>
<td></td>
<td>L or M</td>
<td>X M M X</td>
<td>Ext. Port 14</td>
</tr>
<tr>
<td>2, 5, 6, 7</td>
<td>B or C</td>
<td>M M X X</td>
<td>Int. Port 1</td>
</tr>
<tr>
<td></td>
<td>E or F</td>
<td>X X X X</td>
<td>Int. Port 3</td>
</tr>
<tr>
<td></td>
<td>H or J</td>
<td>X X X X</td>
<td>Int. Port 5</td>
</tr>
<tr>
<td></td>
<td>P or Q</td>
<td>X M M X</td>
<td>Ext. Port 12</td>
</tr>
<tr>
<td></td>
<td>L or M</td>
<td>X M M X</td>
<td>Ext. Port 14</td>
</tr>
<tr>
<td>3 or F</td>
<td>0 or C</td>
<td>M M X X</td>
<td>Int. Port 1</td>
</tr>
<tr>
<td></td>
<td>P or Q</td>
<td>X M M X</td>
<td>Ext. Port 12</td>
</tr>
<tr>
<td></td>
<td>E or F</td>
<td>X X X X</td>
<td>Int. Port 3</td>
</tr>
<tr>
<td></td>
<td>P or Q</td>
<td>X M M X</td>
<td>Ext. Port 12</td>
</tr>
<tr>
<td>4, 8, 9, 0</td>
<td>0</td>
<td>X M M X</td>
<td>None</td>
</tr>
</tbody>
</table>

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

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**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:**

<table>
<thead>
<tr>
<th></th>
<th>kPa</th>
<th>PSIG</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min.</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min.</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max.</td>
<td>1030</td>
<td>150</td>
<td>10.3</td>
</tr>
</tbody>
</table>

**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).

**Connections**

<table>
<thead>
<tr>
<th>Valves with Wires</th>
<th>14 Solenoid</th>
<th>12 Solenoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valves with Terminal Block</td>
<td>Black Wires</td>
<td>Red Wires</td>
</tr>
<tr>
<td>(Will accept 18 to 24 Gauge Wires)</td>
<td>14 and Com Terminals</td>
<td>12 and Com Terminals</td>
</tr>
</tbody>
</table>

**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**

**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.**
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.

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).

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.

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**

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

**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**
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:

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<td>30</td>
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</tr>
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<td>Max. (2 &amp; 3-Position)</td>
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<td>10.3</td>
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**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

<table>
<thead>
<tr>
<th>Valves with Wires</th>
<th>14 Solenoid</th>
<th>12 Solenoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)</td>
<td>14 and Com Terminals</td>
<td>12 and Com Terminals</td>
</tr>
</tbody>
</table>

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).
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.

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<td>Screw - operator adapter to valve body</td>
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<td>16</td>
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</tr>
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<td>17</td>
<td>- for operator adapter</td>
</tr>
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<td>18</td>
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<tr>
<td>19</td>
<td>Gasket - operator adapter to valve body (not shown)</td>
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<td>23</td>
<td>Valve Body</td>
</tr>
<tr>
<td>24</td>
<td>Piston (2-position only) - for end cap</td>
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<tr>
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**Instruction Sheets Available:**

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<table>
<thead>
<tr>
<th>Screw Type</th>
<th>Hex Wrench Size</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Button Head</td>
<td>2mm</td>
<td>1.4 to 1.7 Nm (12 to 15 in-lbs.)</td>
</tr>
<tr>
<td>Socket Head</td>
<td>3mm</td>
<td>2.5 to 2.9 Nm (22 to 26 in-lbs.)</td>
</tr>
</tbody>
</table>

Figure 1: Single Solenoid 2-Position Valve Shown

Figure 2: Enlarged View of Piston & Lip Seal
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:

| 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 of every base in an assembly.
4. Disregard unused wires or terminals.

Connections

| 14 Solenoid | 12 Solenoid |
| Black Wires | Red 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
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.

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.
F3 Series Valves - Manifold Installation

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 (Item #20) 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 (Item #6).

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 (Item #18) with a manifold (Items #3, 7, 9) 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 3.)

Place gasket (Item #17) and blanking plate (Item #18) on manifold and assemble using mounting screws (Item #19) provided with kit. Tighten screws from 1.4 to 1.7 N•m (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.

Special Assembly Procedures for manifolds with auxiliary inlet and outlet 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 on 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 between the two stations per the instructions on the opposite page.

The outlet ports of the supply manifold should be plugged with pipe plugs.

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.

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

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

The valve used to supply pilot pressures to other valves must be the unit at 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.
F3 Series Valves - Manifold Installation

Part Identification List

<table>
<thead>
<tr>
<th>Item #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Right End Plate</td>
</tr>
<tr>
<td>2</td>
<td>Molded Gasket - manifold base to manifold base or end plate</td>
</tr>
<tr>
<td>3</td>
<td>Manifold Base</td>
</tr>
<tr>
<td>4</td>
<td>Tie Rod</td>
</tr>
<tr>
<td>5</td>
<td>Isolator Plugs - for pilot galleries (PS3433)</td>
</tr>
<tr>
<td>6</td>
<td>Pipe Plug - for 12 &amp;/or 14 end ports</td>
</tr>
<tr>
<td>7</td>
<td>Manifold Base</td>
</tr>
<tr>
<td>8</td>
<td>Isolator Plugs - for main galleries (PS3432)</td>
</tr>
<tr>
<td>9</td>
<td>Manifold Base</td>
</tr>
<tr>
<td>10</td>
<td>Left End Plate</td>
</tr>
<tr>
<td>11</td>
<td>Screw, Flat &amp; Lock Washers - end plate to tie rod</td>
</tr>
<tr>
<td>12</td>
<td>End Cover Assembly</td>
</tr>
<tr>
<td>13</td>
<td>Flat Gasket</td>
</tr>
<tr>
<td>14</td>
<td>Captive Screw</td>
</tr>
<tr>
<td>15</td>
<td>Valve Assembly</td>
</tr>
<tr>
<td>16</td>
<td>Mounting Screws - for valve &amp; sandwich block to base</td>
</tr>
<tr>
<td>17</td>
<td>Flat Gasket - blanking plate to manifold base</td>
</tr>
<tr>
<td>18</td>
<td>Blanking Plate</td>
</tr>
<tr>
<td>19</td>
<td>Mounting Screw - for blanking plate</td>
</tr>
<tr>
<td>20</td>
<td>Pipe plugs - for bottom or end ports (shown on #3 manifold only)</td>
</tr>
</tbody>
</table>

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
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:

<table>
<thead>
<tr>
<th>Ratings</th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min. (2-Position w/ Spring and Air Return)</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min. (3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. (2 &amp; 3-Position)</td>
<td>1030</td>
<td>150</td>
<td>10.3</td>
</tr>
</tbody>
</table>

**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%

**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 how 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 or altered.

**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

<table>
<thead>
<tr>
<th>Valves with Wires</th>
<th>14 Solenoid</th>
<th>12 Solenoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valves with Terminal Block</td>
<td>14 and Com Terminals</td>
<td>12 and Com Terminals</td>
</tr>
<tr>
<td>(Will accept 18 to 24 Gauge Wires)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 sandwich block.
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. 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.

**WARNING**

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

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
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- Medium must be moisture-free if ambient temperature is below freezing.
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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.

**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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**EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.**
F3 Series Valves - Subbase Installation

4. 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.

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 F3 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 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-414CP - 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

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 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.)

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 (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.)

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

Instruction Sheets Available:
V-410DP - Valve Installation & Operating Instructions
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V-418CP - Manifold With Electrical Interconnect Installation

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.

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

<table>
<thead>
<tr>
<th>Method 1: Using Model No. to Determine Plug Locations</th>
<th>Pilot Supply Holes: (See key code below)</th>
<th>Method 2: Using Attributes of Valve &amp; Operator(s) to Determine Plug Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd Digit in Model No.</td>
<td>6th Digit in Model No.</td>
<td>1</td>
</tr>
<tr>
<td>1 or E</td>
<td>B or C</td>
<td>M</td>
</tr>
<tr>
<td>2 or L</td>
<td>P or Q</td>
<td>X</td>
</tr>
<tr>
<td>3 or F</td>
<td>0 or C</td>
<td>X</td>
</tr>
<tr>
<td>4, 5, 6, 7</td>
<td>E or F</td>
<td>X</td>
</tr>
<tr>
<td>8, 9, 0</td>
<td>P or Q</td>
<td>X</td>
</tr>
</tbody>
</table>

Key Code: X = Pilot hole must be plugged.  
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.

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

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

<table>
<thead>
<tr>
<th></th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min.</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min.</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max.</td>
<td>1030</td>
<td>150</td>
<td>10.3</td>
</tr>
</tbody>
</table>

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.
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.
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 manifolde valve arrangement. Three basic modes of regulation are available as follows:

Common Port Regulation - Provides adequate 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 Marflak 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:

<table>
<thead>
<tr>
<th>Pressure</th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min. (2-Position w/Spring and Air Return)</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min. (3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. (2 &amp; 3-Position)</td>
<td>1030</td>
<td>150</td>
<td>10.3</td>
</tr>
</tbody>
</table>

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.

WARNING

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.
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

<table>
<thead>
<tr>
<th>Operator Callout</th>
<th>Pilot Supply</th>
<th>Sandwich Plug Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>3, F</td>
<td>0</td>
<td>E</td>
</tr>
<tr>
<td>4, 8, 9, 0</td>
<td>0</td>
<td>E F</td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>B, C</td>
<td>X</td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>L, M</td>
<td>X</td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>P, Q</td>
<td>X</td>
</tr>
<tr>
<td>3, F</td>
<td>P, Q</td>
<td>X</td>
</tr>
</tbody>
</table>

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 - Valve Installation & Operating
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 Marflak 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:

<table>
<thead>
<tr>
<th>Min. (2-Position - Air Return)</th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>140</td>
<td>20</td>
<td>1.4</td>
<td></td>
</tr>
</tbody>
</table>

| 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.

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.

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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.
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 removing by prying up with a narrow tool. Assure the orifice is not nicked or torn, and that it has a coating of grease. Install orifice first and fit 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 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.
- 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).
- Install 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).
- Install 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
- 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).
- Install plug (item #7) from kit into DP.
- Install stamped plate (item #5) using new screws (item #6) from kit.
Top Surface of Regulator Block
- Install plug (item #7) removed from bottom surface into 12 (12 end only).
Bottom Surface of Regulator Block
- Install plug (item #7) removed from top surface into SP.
- Install plug (item #7) from SP to DP.
- Install spacer (item #18), lipseal (item #11), non venting piston (item #19), & air pilot bonnet (item #20) using existing screws (item #15).
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
- Install & retain plug (item #7) from DP.
- Remove & discard lipseal (item #11), piston (item #12), & spring (item #13) by removing screws (item #15).
- Install & discard regulator body assembly (item #8).
- Install plug (item #7) from kit into DP.
- Reinstall lipseal (item #11), piston (item #12), spring (item #13), & bonnet assembly (item #14) using existing screws (item #15).
14 End of Regulator Block
- 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
- Install plug (item #7) removed from 12 end to DP.
Select to Independent
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) from kit into DP.
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 & 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).
Selector to Spring Controlled
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).
- Install & discard regulator body assembly (item #8).
- Install plug (item #7) from SP to DP.
- 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 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

<table>
<thead>
<tr>
<th>Operator Callout</th>
<th>Pilot Supply</th>
<th>Sandwich Plug Locations</th>
<th>Regulator Plug Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>3, F</td>
<td>0</td>
<td>-- X X</td>
<td>-- X</td>
</tr>
<tr>
<td>4, 8, 9, 0</td>
<td>0</td>
<td>-- X X</td>
<td>X</td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>B, C</td>
<td>X -- X X</td>
<td>X</td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>L, M</td>
<td>X -- X X</td>
<td>X</td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>P, Q</td>
<td>-- X X X</td>
<td>--</td>
</tr>
<tr>
<td>3, F</td>
<td>P, Q</td>
<td>-- X X X</td>
<td>--</td>
</tr>
<tr>
<td>N/A</td>
<td>E, F</td>
<td>N/A N/A N/A N/A N/A N/A N/A N/A</td>
<td></td>
</tr>
</tbody>
</table>

NOTE: X indicates plug locations.

Table 2

<table>
<thead>
<tr>
<th>Regulator Block Plug Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
</tr>
<tr>
<td>Common Port</td>
</tr>
<tr>
<td>Independent Port</td>
</tr>
<tr>
<td>Selector</td>
</tr>
</tbody>
</table>

Table 3

<table>
<thead>
<tr>
<th>Item</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.5 - 2.9 N·m (22 - 26 in-lbs)</td>
</tr>
<tr>
<td>6</td>
<td>0.9 - 1.4 N·m (8 - 12 in-lbs)</td>
</tr>
<tr>
<td>15</td>
<td>0.9 - 1.4 N·m (8 - 12 in-lbs)</td>
</tr>
<tr>
<td>17</td>
<td>0.9 - 1.4 N·m (8 - 12 in-lbs)</td>
</tr>
<tr>
<td>22</td>
<td>0.35 - 0.58 N·m (3 - 5 in-lbs)</td>
</tr>
</tbody>
</table>
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. 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.

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 operated regulator, follow instructions for the pilot regulator for setting, using the technique above.

Instruction Sheets available:
V-410DP - Valve Installation & Operation
V-411DP - Valve Body Service
V-412DP - Solenoid Service
V-413DP - Manifold Installation
V-414DP - 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)
The suggested wiring sequence is to attach the first address Collective Wiring Module per Figures 1 and 2. These signals are connected directly to the provided labels. Input signals to the 19-Pin Round Connector to be labeled either “Single Address” or “Double Address” with the assembled manifold. The end cover of each manifold station is solenoid or double solenoid valves. When ordering a factory collective wiring system will accommodate either single - 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.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>25-Pin Sub-D</th>
<th>19-Pin Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>24VAC</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>24VDC</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>120VAC</td>
<td>24</td>
<td>16</td>
</tr>
</tbody>
</table>

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 “1” 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

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Manifold Address</th>
<th>Pin Number</th>
<th>Manifold Address</th>
<th>Pin Number</th>
<th>Wire Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Brown</td>
</tr>
<tr>
<td>Yellow</td>
<td>4</td>
<td>14</td>
<td>14</td>
<td>2</td>
<td>Orange</td>
</tr>
<tr>
<td>Blue</td>
<td>6</td>
<td>16</td>
<td>7</td>
<td>3</td>
<td>Purple</td>
</tr>
<tr>
<td>Grey</td>
<td>8</td>
<td>18</td>
<td>15</td>
<td>4</td>
<td>White</td>
</tr>
<tr>
<td>Black</td>
<td>10</td>
<td>20</td>
<td>17</td>
<td>5</td>
<td>Orange</td>
</tr>
<tr>
<td>Red</td>
<td>12</td>
<td>22</td>
<td>18</td>
<td>6</td>
<td>Green</td>
</tr>
<tr>
<td>Yellow</td>
<td>14</td>
<td>24</td>
<td>19</td>
<td>7</td>
<td>Green</td>
</tr>
<tr>
<td>Blue</td>
<td>16</td>
<td>26</td>
<td>20</td>
<td>8</td>
<td>White</td>
</tr>
<tr>
<td>Grey</td>
<td>18</td>
<td>28</td>
<td>21</td>
<td>9</td>
<td>Brown</td>
</tr>
<tr>
<td>Black</td>
<td>20</td>
<td>30</td>
<td>22</td>
<td>10</td>
<td>Orange</td>
</tr>
<tr>
<td>Red</td>
<td>22</td>
<td>32</td>
<td>23</td>
<td>11</td>
<td>Brown</td>
</tr>
<tr>
<td>Yellow</td>
<td>24</td>
<td>34</td>
<td>24</td>
<td>12</td>
<td>Orange</td>
</tr>
</tbody>
</table>

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 0.75 = 1.8 total amp rating.

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.

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.
19-Pin Round Addressing

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 x .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.
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. Comply with the rated pressure, temperature, and voltage necessary - see Installation & Operating Instructions (V-410BP) packed with valve.

Operating Pressure Range:

<table>
<thead>
<tr>
<th></th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min. (2-Position w/ Spring and Air Return)</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min. (3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. (2 &amp; 3-Position)</td>
<td>1030</td>
<td>150</td>
<td>10.3</td>
</tr>
</tbody>
</table>

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 the pressure 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%

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.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>25-Pin Sub-D</th>
<th>19-Pin Round</th>
<th>12-Pin Round Single</th>
<th>12-Pin Round Double</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>18</td>
<td>16</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>24VAC</td>
<td>24</td>
<td>16</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>24VDC</td>
<td>24</td>
<td>16</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>120VAC</td>
<td>24</td>
<td>16</td>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

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 F3162BiGM23A 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.
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 pressure 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.
F3 Manifold Bases With Interconnect Wiring

**Figure 4**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Right End Plate</td>
</tr>
<tr>
<td>2</td>
<td>Tie Rod</td>
</tr>
<tr>
<td>3</td>
<td>Molded Gasket</td>
</tr>
<tr>
<td>4</td>
<td>Manifold Base</td>
</tr>
<tr>
<td>5</td>
<td>Interface Plate</td>
</tr>
<tr>
<td>6</td>
<td>Mounting Screw</td>
</tr>
<tr>
<td>7</td>
<td>Interconnect Wiring Module Gasket</td>
</tr>
<tr>
<td>8</td>
<td>Interconnect Wiring Module</td>
</tr>
<tr>
<td>9</td>
<td>Tie Rod</td>
</tr>
<tr>
<td>10</td>
<td>Interconnect Wiring Module Cover</td>
</tr>
<tr>
<td>11</td>
<td>Cover Screw</td>
</tr>
<tr>
<td>12</td>
<td>Cover Washer</td>
</tr>
<tr>
<td>13</td>
<td>Pipe Plug - for 12 &amp;/or 14 end ports</td>
</tr>
<tr>
<td>14</td>
<td>Pipe plugs - for bottom or end ports</td>
</tr>
<tr>
<td></td>
<td>(shown on manifold only)</td>
</tr>
<tr>
<td>15</td>
<td>Plug</td>
</tr>
<tr>
<td>16</td>
<td>O-ring</td>
</tr>
</tbody>
</table>

25-Pin, Sub-D Shown

---

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

- Plug Location Not Plugged
- Passage Not Drilled Through
- Plug Location Plugged
- Isolator Plug In Galley Or Pipe Plug In Port

3 of 4
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.

**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.)

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 #1.
   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, exhaust will be at 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 (Item 14) 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 (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.

**Special Assembly Procedures**

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

1. 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.

2. 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
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:

<table>
<thead>
<tr>
<th>Pressure Type</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>kPa</td>
<td>140</td>
<td>996</td>
</tr>
<tr>
<td>psig</td>
<td>20</td>
<td>145</td>
</tr>
<tr>
<td>bar</td>
<td>1.4</td>
<td>10.0</td>
</tr>
</tbody>
</table>

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 supply 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

<table>
<thead>
<tr>
<th>Port No.</th>
<th>Single Pressure</th>
<th>Dual Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inlet</td>
<td>Exhaust</td>
</tr>
<tr>
<td>2</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>3</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
<tr>
<td>4</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>5</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
</tbody>
</table>

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 Surviv 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

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This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provides 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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EXTRA COPIES OF THESE INSTRUCTIONS ARE AVAILABLE FOR INCLUSION IN EQUIPMENT / MAINTENANCE MANUALS THAT UTILIZE THESE PRODUCTS. CONTACT YOUR LOCAL REPRESENTATIVE.
### 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 installation to determine which 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 in the model number 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 installation to determine which 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 in the model number will no longer represent that pilot arrangement.

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.)

### 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 Kit Suffix

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Code (+)</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>10, 40</td>
<td>40</td>
<td>12V/60Hz, 12V/50Hz</td>
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<tr>
<td>12, 42</td>
<td>42</td>
<td>24V/60Hz, 22V/50Hz</td>
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<tr>
<td>15, 45</td>
<td>45</td>
<td>12VDC</td>
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<tr>
<td>19, 49</td>
<td>49</td>
<td>24DC</td>
</tr>
<tr>
<td>23, 53</td>
<td>53</td>
<td>120V/60Hz, 115V/50Hz</td>
</tr>
</tbody>
</table>

* 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)

<table>
<thead>
<tr>
<th>3rd Digit in Model No.</th>
<th>6th Digit in Model No.</th>
<th>Pilot Supply Holes</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>BP4</th>
<th>BP2</th>
<th>12</th>
<th>14</th>
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<tr>
<td>1 or E</td>
<td>B or C</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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<td></td>
<td>P or Q</td>
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<td>M</td>
<td>M</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>L or M</td>
<td>X</td>
<td>M</td>
<td>M</td>
<td></td>
<td></td>
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<tr>
<td>2, 5, 6, 7</td>
<td>B or C</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E or F</td>
<td>X</td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H or J</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>P or Q</td>
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<td></td>
<td>X</td>
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<tr>
<td></td>
<td>L or M</td>
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<tr>
<td>3 or F</td>
<td>0 or C</td>
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<td>X</td>
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<td></td>
<td>P or Q</td>
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<td>H or J</td>
<td>X</td>
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<td>X</td>
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<td>4, 8, 9, 0</td>
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<td>M</td>
<td>M</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**Pilot Supply**
- Internal @ Port 1
- External @ Port 12
- Internal @ Port 1
- Internal @ Port 3
- Internal @ Port 5
- External @ Port 12
- Internal @ Port 1
- External @ Port 12
- Internal @ Port 3
- Internal @ Port 5

**Main Press Supply Type**
- Single
- Dual
- All Solenoids
- Single Air Pilot
- Double Air Pilot

**Control Mechanism**
- None
- Single or Dual

**Operetor Types**
- None
- Single or Dual

Key Code:
- X = Pilot hole must be closed. 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.
- 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.

---

### Connections

<table>
<thead>
<tr>
<th>14 Solenoid Wire</th>
<th>Black Wire</th>
<th>Red Wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Solenoid Wire</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Plugs with Wires*
- Black Wires: Com 12 and Com 12
- Red Wires: Terminals 14 and Com 14

*Plugs with Terminal Block (Will accept 18 to 24 Gauge Wires)*
- Black Wires: Com 12 and Com 12
- Red Wires: Terminals 14 and Com 14
**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:**

<table>
<thead>
<tr>
<th></th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min. (2-Position w/Spring and Air Return)</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min. (3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. (2 &amp; 3-Position)</td>
<td>996</td>
<td>145</td>
<td>10.0</td>
</tr>
</tbody>
</table>

**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%

**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.

---

**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.

---

**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**

<table>
<thead>
<tr>
<th></th>
<th>14 Solenoid</th>
<th>12 Solenoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valves with Terminals</td>
<td>Black Wires</td>
<td>Red Wires</td>
</tr>
<tr>
<td>Valves with Terminal Block</td>
<td>(Will accept 18 to 24 Gauge Wires)</td>
<td>14 and Com Terminals</td>
</tr>
</tbody>
</table>

---

**WARNING**

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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.

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).

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.

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

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

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
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**Introduction**

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

**Application Limits**

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**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**

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<th>Valves with Wires</th>
<th>14 Solenoid</th>
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<tbody>
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<td>12 and Com Terminals</td>
</tr>
</tbody>
</table>

**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.

**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 - Solenoid Service

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.

**Part Identification List**

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

**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**
**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 prevent 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:**

<table>
<thead>
<tr>
<th></th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min. (2-Position w/Spring and Air Return)</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min. (3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. (2 &amp; 3-Position)</td>
<td>996</td>
<td>145</td>
<td>10.0</td>
</tr>
</tbody>
</table>

**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%

**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.

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.
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.

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 counterclockwise 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, 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” and substitute “transition plate” for “left end plate”. Manhattan assembly hardware should be tightened to the values mentioned in (V-433CP) instruction sheet. See Figure 2 for a pictorial representation.

4. Instructions for increasing inlet and exhaust air capacity 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. Manhattan 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
### Part Identification List

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

<table>
<thead>
<tr>
<th></th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min. (2-Position with Spring and Air Return)</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min. (3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. (2 &amp; 3-Position)</td>
<td>996</td>
<td>145</td>
<td>10.0</td>
</tr>
</tbody>
</table>

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.
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-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

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)

<table>
<thead>
<tr>
<th>3rd Digit in Model No.</th>
<th>6th Digit in Model No.</th>
<th>Pilot Supply Holes</th>
<th>Pilot Supply</th>
<th>Main Press Supply Type</th>
<th>Control Mechanism Operator Types</th>
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</thead>
<tbody>
<tr>
<td>1 or E</td>
<td>B or C</td>
<td>M M X X</td>
<td>Internal @ Port 1</td>
<td>Single</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P or Q</td>
<td>X M M X</td>
<td>External @ Port 12</td>
<td>All Solenoids</td>
<td></td>
</tr>
<tr>
<td></td>
<td>L or M</td>
<td>X M M X</td>
<td>External @ Port 14</td>
<td>Dual</td>
<td></td>
</tr>
<tr>
<td>2, 5, 6, 7</td>
<td>B or C</td>
<td>M M X X</td>
<td>Internal @ Port 1</td>
<td>Single</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E or F</td>
<td>X X X X</td>
<td>Internal @ Port 3</td>
<td>Single Air Pilot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H or J</td>
<td>X X X X</td>
<td>Internal @ Port 5</td>
<td>Double Air Pilot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P or Q</td>
<td>X M M X</td>
<td>External @ Port 12</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td>L or M</td>
<td>X M M X</td>
<td>External @ Port 14</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E or F</td>
<td>X X X X</td>
<td>Internal @ Port 3</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H or J</td>
<td>X X X X</td>
<td>Internal @ Port 5</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

Key Code: X = Pilot hole must be plugged. 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.

FIGURE 1: Top View (Ports located on side)

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

FIGURE 3

FIGURE 4
Operating Inlet Pressure:

<table>
<thead>
<tr>
<th>Type</th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min. (2-Position w/ Spring and Air Return)</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>Min. (3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. (2 &amp; 3-Position)</td>
<td>996</td>
<td>145</td>
<td>10</td>
</tr>
</tbody>
</table>

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

![Symbol Diagram]

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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.
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.
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:

<table>
<thead>
<tr>
<th></th>
<th>kPa</th>
<th>psig</th>
<th>bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. (2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>Min. (2-Position w/ Spring and Air Return)</td>
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<td>2.4</td>
</tr>
<tr>
<td>Min. (3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. (2 &amp; 3-Position)</td>
<td>996</td>
<td>145</td>
<td>10.0</td>
</tr>
</tbody>
</table>

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.

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. To reduce pressure setting, turn adjusting knob clockwise until pressure decreases to at least 10 PSI lower than desired setting. Then turn adjusting knob clockwise until the desired pressure setting is reached.

7. Push the adjusting knob inward to engage lock.

8. 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

Table 1

<table>
<thead>
<tr>
<th>Model Code Digits 3 and 6</th>
<th>Pilot Supply Holes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator/ Function</td>
<td>Pilot Source</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>1, E</td>
<td>B</td>
</tr>
<tr>
<td>2, 5, 6, 7</td>
<td>E</td>
</tr>
<tr>
<td>L</td>
<td>X</td>
</tr>
<tr>
<td>P</td>
<td>X</td>
</tr>
<tr>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td>3 or F</td>
<td>E</td>
</tr>
<tr>
<td>P</td>
<td>X</td>
</tr>
<tr>
<td>4, 8, 9, 0</td>
<td>0</td>
</tr>
</tbody>
</table>
**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.
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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:

**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:**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Min. (kPa)</th>
<th>Min. psig</th>
<th>Min. bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2-Position - Air Return)</td>
<td>140</td>
<td>20</td>
<td>1.4</td>
</tr>
<tr>
<td>(2-Position w/ Spring and Air Return)</td>
<td>240</td>
<td>35</td>
<td>2.4</td>
</tr>
<tr>
<td>(3-Position)</td>
<td>210</td>
<td>30</td>
<td>2.1</td>
</tr>
<tr>
<td>(2 &amp; 3-Position)</td>
<td>996</td>
<td>145</td>
<td>10.0</td>
</tr>
</tbody>
</table>

**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**:

- Minimum: -15°C to 49°C (5°F to 120°F)
- Maximum: 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.

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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 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.
- 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 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).

**12 End of Regulator Block**
- Remove bonnet assembly (item 14), lipseal (item 11), piston (item 12), & spring (item 13) by removing screws (item 15).
- Reinstall regulator body assembly (item 8).
- Install stamped plate (item 5) using new screws (item 6) from kit.

**Top Surface of Regulator Block**
- Install plug (item 7) from SP to DP.
- Install plug (item 7) removed from 12 end into 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**
- Install plug (item 7) removed from 12 end into DP.
- Install plug (item 7) from kit 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).
F5 Sandwich Regulators

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) Reassemble using Installation Instructions on page 4.

Table 1

<table>
<thead>
<tr>
<th>Operator Callout</th>
<th>Pilot Supply</th>
<th>Sandwich Plug Locations</th>
<th>Regulator Pilot</th>
</tr>
</thead>
<tbody>
<tr>
<td>3, F</td>
<td>0</td>
<td>— — X X X X</td>
<td></td>
</tr>
<tr>
<td>4, 8, 9, 0</td>
<td>0</td>
<td>— — X X X X</td>
<td></td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>B, C</td>
<td>X — — X</td>
<td></td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>L, M</td>
<td>— X — — X</td>
<td></td>
</tr>
<tr>
<td>1, 2, 5, 6, 7, E</td>
<td>P, Q</td>
<td>X — — X</td>
<td></td>
</tr>
<tr>
<td>3, F</td>
<td>P, Q</td>
<td>— — X X</td>
<td></td>
</tr>
<tr>
<td>N/A</td>
<td>E, F</td>
<td>N/A N/A N/A N/A N/A N/A</td>
<td>N/A N/A</td>
</tr>
</tbody>
</table>

NOTE: X indicates plug locations.

Table 2

<table>
<thead>
<tr>
<th>Function</th>
<th>Digit 11 14 End 12 End Top Bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Port</td>
<td>1 or 4 SP SP — —</td>
</tr>
<tr>
<td>Independent Port</td>
<td>2 DP — DP DP</td>
</tr>
<tr>
<td>Selector</td>
<td>3 SP SP DP —</td>
</tr>
</tbody>
</table>

Table 3

<table>
<thead>
<tr>
<th>Item</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.5 - 2.9 N•m (22 - 26 in-lbs)</td>
</tr>
<tr>
<td>6</td>
<td>.9 - 1.4 N•m (8 - 12 in-lbs)</td>
</tr>
<tr>
<td>15</td>
<td>.9 - 1.4 N•m (8 - 12 in-lbs)</td>
</tr>
<tr>
<td>17</td>
<td>.9 - 1.4 N•m (8 - 12 in-lbs)</td>
</tr>
<tr>
<td>22</td>
<td>.35 - .58 N•m (3 - 5 in-lbs)</td>
</tr>
</tbody>
</table>
F5 Sandwich Regulators

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). 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 - 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 flared 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 Installation
V-437BP - Subbase Installation
V-439BP - Solenoid Service

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>.9 - 1.4 N-m (8 - 12 in-lbs)</td>
</tr>
<tr>
<td>22</td>
<td>.35 - .58 N-m (3 - 5 in-lbs)</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th></th>
<th>Min. (2-Position - Air Return)</th>
<th>Min. (2-Position w/Spring and Air Return)</th>
<th>Min. (3-Position)</th>
<th>Max. (2 &amp; 3-Position)</th>
</tr>
</thead>
<tbody>
<tr>
<td>kPa</td>
<td>140</td>
<td>240</td>
<td>210</td>
<td>996</td>
</tr>
<tr>
<td>psig</td>
<td>20</td>
<td>35</td>
<td>30</td>
<td>145</td>
</tr>
<tr>
<td>bar</td>
<td>1.4</td>
<td>2.4</td>
<td>2.1</td>
<td>10.0</td>
</tr>
</tbody>
</table>

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.
Collective Wiring Assembly

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

<table>
<thead>
<tr>
<th>&quot;Flexboard&quot; Address</th>
<th>Pin Number</th>
<th>&quot;Flexboard&quot; Address</th>
<th>Pin Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>13</td>
<td>22</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td>16</td>
<td>25</td>
</tr>
</tbody>
</table>

Figure 1
25-Pin Sub-D Pin Callouts

Collective Wiring Module

<table>
<thead>
<tr>
<th>Size</th>
<th>Kit Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-Pin Sub-D</td>
<td>SCD251CA</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

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 Nm (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 Procedures 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.

<table>
<thead>
<tr>
<th>Port Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below is a brief summary of typical port connections.</td>
</tr>
</tbody>
</table>

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
**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)** | **Min. PSIG (kPa)** | **Dual Pressure** |
--- | --- | --- | --- | --- |
1 | Single Solenoid - 2-Pos | (20) (138) | 30 | 
2 | Double Solenoid - 2-Pos | (30) (207) | 45 | 
3 | Single Remote - 2-Pos | Vacuum | Vacuum | 
4 | Double Remote Pilot - 2-Pos | (30) (207) | 45 | 
5 | Double Solenoid - 3-Pos | (30) (207) | 45 | 
6 | Double Remote Pilot - 3-Pos | Vacuum | Vacuum | 
7 | Single Solenoid - 2-Pos | Air Return / Spring Assist | (35) (241) | 45 | 
8 | Single Remote Pilot - 2-Pos | Air Return / Spring Assist | (35) (241) | 45 | 
F | Single Remote Pilot - 2-Pos | Air Return / Spring Assist | (35) (241) | 45 |
G | All | F & H Series | Vacuum | Vacuum |

---

**Ambient Temperature Range:** -15°C to 40°C (5°F to 120°F)

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

---

### Port Identification / Connections / Symbols

<table>
<thead>
<tr>
<th>Port No.</th>
<th>Single Pressure</th>
<th>Dual Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inlet</td>
<td>Exhaust</td>
</tr>
<tr>
<td>2</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>3</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
<tr>
<td>4</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>5</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
<tr>
<td>12, 14</td>
<td>Pilot ports for External Pilot or Remote Pilot</td>
<td></td>
</tr>
</tbody>
</table>

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 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**

**FAILSAFE** or **IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/O 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. Basic 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 Wires
- 12 Solenoid Wires
- Valves with wires
- Black Wires
- Red Wires
- Valves with Terminal Block
- 14 and Com Terminals
- 12 and Com Terminals

Sandwich Block Pilot Plug Locations
(See Table Below)

Using Model No.
3rd Digit in Model No.
Plugs Locations
6th Digit in Model No.
Using Attributes of Valve & Operator(s)
3-5
BP4
BP2
12
14
Pilot Supply Holes
Pilot Supply
Main Press Supply Type
Control Mechanism Operator Types

<table>
<thead>
<tr>
<th>3rd Digit in Model No.</th>
<th>6th Digit in Model No.</th>
<th>Pilot Supply Holes</th>
<th>Pilot Supply</th>
<th>Main Press Supply Type</th>
<th>Control Mechanism Operator Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 5, 6, 7 or E</td>
<td>B or C</td>
<td>X</td>
<td>Internal @ Port 1</td>
<td>Single</td>
<td>All Solenoids</td>
</tr>
<tr>
<td></td>
<td>P or Q</td>
<td>X</td>
<td>External @ Port 12</td>
<td>Single</td>
<td>Single Air Pilot</td>
</tr>
<tr>
<td></td>
<td>L or M</td>
<td>X</td>
<td>External @ Port 14</td>
<td>Single</td>
<td>Double Air Pilot</td>
</tr>
<tr>
<td></td>
<td>E or F</td>
<td>X</td>
<td>Internal @ Port 3</td>
<td>Single</td>
<td>Double Air Pilot</td>
</tr>
<tr>
<td></td>
<td>H or J</td>
<td>X</td>
<td>Internal @ Port 5</td>
<td>Single</td>
<td>Double Air Pilot</td>
</tr>
<tr>
<td>3 or F</td>
<td>0 or Q</td>
<td>X</td>
<td>Internal @ Port 1</td>
<td>Single</td>
<td>Single Air Pilot</td>
</tr>
<tr>
<td></td>
<td>L or M</td>
<td>X</td>
<td>External @ Port 12</td>
<td>Single</td>
<td>Double Air Pilot</td>
</tr>
<tr>
<td></td>
<td>E or F</td>
<td>X</td>
<td>Internal @ Port 3</td>
<td>Single</td>
<td>Double Air Pilot</td>
</tr>
<tr>
<td></td>
<td>H or J</td>
<td>X</td>
<td>Internal @ Port 5</td>
<td>Single</td>
<td>Double Air Pilot</td>
</tr>
<tr>
<td>4, 8, 9, 0</td>
<td>0</td>
<td>M</td>
<td>None</td>
<td>Single or Dual</td>
<td>Double Air Pilot</td>
</tr>
</tbody>
</table>

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
Pneumatic Division North America
Richland, Michigan 49083

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)

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

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Voltage</th>
<th>3-Pin 30mm 'L'</th>
<th>3-Pin 22mm 'P'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AC 60Hz</td>
<td>DC 50Hz</td>
<td>AC 60Hz</td>
</tr>
<tr>
<td>19</td>
<td>—</td>
<td>24</td>
<td>PS2828619P*</td>
</tr>
<tr>
<td>42</td>
<td>24</td>
<td>24</td>
<td>PS2828A42P</td>
</tr>
<tr>
<td>45</td>
<td>—</td>
<td>12</td>
<td>PS2828A45P</td>
</tr>
<tr>
<td>49</td>
<td>—</td>
<td>24</td>
<td>PS2828A49P</td>
</tr>
<tr>
<td>53</td>
<td>120</td>
<td>120</td>
<td>PS2828A53P</td>
</tr>
<tr>
<td>57</td>
<td>230</td>
<td>230</td>
<td>PS2828A57P</td>
</tr>
</tbody>
</table>

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

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.

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.

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Voltage</th>
<th>3-Pin 30mm 'L'</th>
<th>3-Pin 22mm 'P'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AC 60Hz</td>
<td>DC 50Hz</td>
<td>AC 60Hz</td>
</tr>
<tr>
<td>19</td>
<td>—</td>
<td>24</td>
<td>PS2828619P*</td>
</tr>
<tr>
<td>42</td>
<td>24</td>
<td>24</td>
<td>PS2828A42P</td>
</tr>
<tr>
<td>45</td>
<td>—</td>
<td>12</td>
<td>PS2828A45P</td>
</tr>
<tr>
<td>49</td>
<td>—</td>
<td>24</td>
<td>PS2828A49P</td>
</tr>
<tr>
<td>53</td>
<td>120</td>
<td>120</td>
<td>PS2828A53P</td>
</tr>
<tr>
<td>57</td>
<td>230</td>
<td>230</td>
<td>PS2828A57P</td>
</tr>
</tbody>
</table>

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

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.

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.

Application Limits

These products are intended for use in general purpose compressed air systems only.
NOTE ON CNOMO PILOT KITS:
For H 'A' CNOMO valves, use Parker o-ring size 2006 for item 23.

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.

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

Instruction Sheets Available:
V-402P - F & H ISO 5599-2 Solenoid Service  V-442P - F5/H1 Sandwich Regulator
V-443P - F & H ISO 5599-2 Valve Installation  V-444P - H ISO 5599-1 CNOMO Valve Installation
V-444P - F & H ISO Flow Control Installation  V-445P - F & H Selector Regulator Installation
V-446P - F5/H1 Sandwich Regulator  V-447P - F6/H2 & F7/H3 Sandwich Regulator
**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**

<table>
<thead>
<tr>
<th>Port No.</th>
<th>Single Pressure</th>
<th>Dual Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inlet</td>
<td>Exhaust</td>
</tr>
<tr>
<td>2</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>3</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
<tr>
<td>4</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>5</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
<tr>
<td>12, 14</td>
<td>Pilot ports for External Pilot or Remote Pilot</td>
<td></td>
</tr>
</tbody>
</table>

**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**

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**

<table>
<thead>
<tr>
<th>Valves with Wires</th>
<th>Valves with Terminal Block (Will accept 18 to 24 Gauge Wires)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Solenoid</td>
<td>Black Wires</td>
</tr>
<tr>
<td>12 Solenoid</td>
<td>Red Wires</td>
</tr>
<tr>
<td>14 and Com Terminals</td>
<td>12 and Com Terminals</td>
</tr>
</tbody>
</table>

**Wiring - Auto C, F, G**

<table>
<thead>
<tr>
<th>Wiring Type</th>
<th>Pin 1</th>
<th>Pin 2</th>
<th>Pin 3</th>
<th>Pin 4</th>
<th>Pin 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>C, F, G</td>
<td>Grd</td>
<td>14</td>
<td>N/A</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>Pin #1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pin #2</td>
<td>14</td>
<td>Grd</td>
<td>12</td>
<td>N/A</td>
<td>14</td>
</tr>
<tr>
<td>Pin #3</td>
<td>Com</td>
<td>Com</td>
<td>Com</td>
<td>Grd</td>
<td>Grd</td>
</tr>
<tr>
<td>Pin #4</td>
<td>N/A</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Pin #5</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>14</td>
</tr>
</tbody>
</table>

**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.
F & H ISO 5599-2 Manifold Installation

**F5 / H1 Manifold Gaskets**

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

- PS353300BP
- PS353301BP
- PS353302BP

Lightly grease with provided lubricant.

**Hi-Flow Manifold Repair Kits**

<table>
<thead>
<tr>
<th>Kit Number</th>
<th>Description</th>
<th>Item Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS3512BP</td>
<td>H1 / F5 Manifold Tie Rod (12)</td>
<td>4</td>
</tr>
<tr>
<td>PS3513BP</td>
<td>H1 / F5 Manifold to Manifold Gasket (1)</td>
<td>2</td>
</tr>
<tr>
<td>PS3612P</td>
<td>H2 / H3, F6 / F7 Manifold Hardware (12)</td>
<td>13</td>
</tr>
<tr>
<td>PS3613P</td>
<td>H2 / F6 Manifold to Manifold Gasket (1)</td>
<td>14</td>
</tr>
<tr>
<td>PS3713P</td>
<td>H3 / F7 Manifold to Manifold Gasket (1)</td>
<td>14</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Valve Series</th>
<th>F5 / H1</th>
<th>F6 / H2</th>
<th>F7 / H3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque - in.lb.</td>
<td>40 to 50</td>
<td>195 to 205</td>
<td>195 to 205</td>
</tr>
<tr>
<td>(Nm)</td>
<td>(4.5 to 5.1)</td>
<td>(22.0 to 23.2)</td>
<td>(22.0 to 23.2)</td>
</tr>
</tbody>
</table>

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

**Instruction Sheets Available:**
- V-442P - F & H ISO 5599-1 Auto Valve Installation
- V-443P - F & H ISO 5599-2 Manifold Installation
- V-444P - F & 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
**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” 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 at 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:**

<table>
<thead>
<tr>
<th>Internal Hex</th>
<th>F5 / H1</th>
<th>F6 / H2</th>
<th>F7 / H3</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>M4</td>
<td>M5</td>
<td></td>
</tr>
</tbody>
</table>

**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.
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**

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.

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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.
7. 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).

8. Assemble valve, flow control and subbase or manifold together with the valve mounting screws (A). Tighten as follows:

<table>
<thead>
<tr>
<th>ISO Spec</th>
<th>Size</th>
<th>Sandwich Flow Control Model No.</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>5599/1</td>
<td>H1</td>
<td>PS4042P</td>
<td>3.4 to 4.0 Nm (30 to 35 in-lb)</td>
</tr>
<tr>
<td>5599/2</td>
<td>H1</td>
<td>PS4035P</td>
<td></td>
</tr>
<tr>
<td>No Plug</td>
<td>F5</td>
<td>PS3542P</td>
<td>5.1 to 5.6 Nm (45 to 50 in-lb)</td>
</tr>
<tr>
<td>With Plug</td>
<td>F5</td>
<td>PS3535P</td>
<td></td>
</tr>
<tr>
<td>5599/1</td>
<td>H2</td>
<td>PS4142P</td>
<td></td>
</tr>
<tr>
<td>5599/2</td>
<td>H2</td>
<td>PS4135P</td>
<td></td>
</tr>
<tr>
<td>No Plug</td>
<td>F6</td>
<td>PS3642P</td>
<td>9.0 to 11.3 Nm (80 to 100 in-lb)</td>
</tr>
<tr>
<td>With Plug</td>
<td>F6</td>
<td>PS3635P</td>
<td></td>
</tr>
<tr>
<td>5599/1</td>
<td>H3</td>
<td>PS4242P</td>
<td></td>
</tr>
<tr>
<td>5599/2</td>
<td>H3</td>
<td>PS4235P</td>
<td></td>
</tr>
</tbody>
</table>

9. 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.

1. Turn both adjustment screws clockwise until fully closed and then counterclockwise slightly.
2. 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**

<table>
<thead>
<tr>
<th>Flow Control</th>
<th>Cv</th>
<th>1-2</th>
<th>1-4</th>
<th>2-3</th>
<th>4-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 3/8&quot;</td>
<td>1.4</td>
<td>1.2</td>
<td>0.9</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>H2 1/2&quot;</td>
<td>2.2</td>
<td>2.2</td>
<td>1.5</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>H3 3/4&quot;</td>
<td>4.3</td>
<td>4.4</td>
<td>2.8</td>
<td>3.7</td>
<td></td>
</tr>
</tbody>
</table>

**Tie Rods**

<table>
<thead>
<tr>
<th>Valve Qty.</th>
<th>Kit Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>F5 / H1</td>
<td>PS3536P</td>
</tr>
<tr>
<td>F6 / H2</td>
<td>PS3636P</td>
</tr>
<tr>
<td>F7 / H3</td>
<td>PS3736P</td>
</tr>
</tbody>
</table>

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

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.
Service Instructions

Sandwich Regulator Kits

<table>
<thead>
<tr>
<th>Kit Number</th>
<th>Description</th>
<th>Kit Includes Item# (Qty.)</th>
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<tbody>
<tr>
<td>PS3439P</td>
<td>Repair Kit</td>
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<td>PS3445P</td>
<td>Regulator Kit</td>
<td>1 (4), 2, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14</td>
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<td>Pilot Conversion Kit</td>
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<td>Spring - 30 PSIG</td>
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<td>PS3450060P</td>
<td>Spring - 60 PSIG</td>
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<tr>
<td>PS3450125P</td>
<td>Spring - 125 PSIG</td>
<td>3</td>
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<tr>
<td>PS3509P</td>
<td>Pilot Plug Kit</td>
<td>21 (20)</td>
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<tr>
<td>PS3540P</td>
<td>Mounting Studs</td>
<td>24 (12)</td>
</tr>
<tr>
<td>PS3548P</td>
<td>By-Pass Plate</td>
<td>25, 26, 27 (4)</td>
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</table>

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.

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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Torque Nm (In. / Lb.)</th>
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</thead>
<tbody>
<tr>
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<td>Screw, Regulator Block</td>
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<tr>
<td>2</td>
<td>Bonnet Assembly</td>
<td>0.3 to 0.6 (3 to 5)</td>
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<td>3</td>
<td>Spring, Control (30, 60 or 125 PSIG)</td>
<td>1.1 to 1.7 (10 to 15)</td>
</tr>
<tr>
<td>4</td>
<td>Piston, Relieving (Includes vent hole)</td>
<td>2.8 to 3.9 (25 to 35)</td>
</tr>
<tr>
<td>5</td>
<td>O-ring, Piston Vent</td>
<td>Finger Tight</td>
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<tr>
<td>6</td>
<td>Lip Seal, Piston</td>
<td>1.1 to 1.7 (10 to 15)</td>
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<td>7</td>
<td>Screw, Seat Plate</td>
<td>2.8 to 3.9 (25 to 35)</td>
</tr>
<tr>
<td>8</td>
<td>Seat Plate</td>
<td>1.1 to 1.7 (10 to 15)</td>
</tr>
<tr>
<td>9</td>
<td>O-ring, Seat Plate</td>
<td>Finger Tight</td>
</tr>
<tr>
<td>10</td>
<td>Poppet Assembly</td>
<td>2.8 to 3.9 (25 to 35)</td>
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<td>11</td>
<td>Spring, Poppet Return</td>
<td>Finger Tight</td>
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<tr>
<td>12</td>
<td>O-ring, Bonnet / Body Seal</td>
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<td>13</td>
<td>Body, Regulator</td>
<td>Finger Tight</td>
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<td>14</td>
<td>Gasket, Regulator Block</td>
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</tr>
<tr>
<td>15</td>
<td>Screw, End Plate</td>
<td>Finger Tight</td>
</tr>
<tr>
<td>16</td>
<td>Adapter, Regulator</td>
<td>1.1 to 1.7 (10 to 15)</td>
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<td>17</td>
<td>Gasket, Regulator Block</td>
<td>Finger Tight</td>
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<td>18</td>
<td>Gasket, Valve to Regulator Block</td>
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<tr>
<td>19</td>
<td>Screw, Valve to Mtg. Stud</td>
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<td>O-ring</td>
<td>Finger Tight</td>
</tr>
<tr>
<td>21</td>
<td>Plug, Pilot</td>
<td>1.1 to 1.7 (10 to 15)</td>
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<td>22</td>
<td>End Plate</td>
<td>Finger Tight</td>
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<tr>
<td>23</td>
<td>Gasket, Regulator Base</td>
<td>1.1 to 1.7 (10 to 15)</td>
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<tr>
<td>24</td>
<td>Stud, Mounting</td>
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<td>25</td>
<td>Gasket, Bypass Plate</td>
<td>1.1 to 1.7 (10 to 15)</td>
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<td>Bypass Plate, Dual Pressure</td>
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<td>27</td>
<td>Screw, Bypass Plate</td>
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<td>28</td>
<td>Spacer, Air Pilot</td>
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<td>30</td>
<td>Bonnet, Air Pilot</td>
<td>1.1 to 1.7 (10 to 15)</td>
</tr>
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</table>

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

Instruction Sheets Available:
- 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
WARNING

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

- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
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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.

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.

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).


5. Tighten Valve Bolts (20) as follows:

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>No. of Bolts</th>
<th>Wrench Size</th>
<th>Torque Nm (In.-Lb.)</th>
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<tbody>
<tr>
<td>F6 / H2B</td>
<td>3 / 4</td>
<td>M5</td>
<td>13 to 15 (115 to 130)</td>
</tr>
<tr>
<td>F7 / H3B</td>
<td>3 / 4</td>
<td>M6</td>
<td>14 to 16 (120 to 140)</td>
</tr>
</tbody>
</table>

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.

F6 / H2B, F7 / H3B Sandwich Regulator

Installation & Service Instructions

Y-447P
F6 / H2B, F7 / H3B
Sandwich Regulators
ISSUED: December, 2001
Supersedes: None
ECN# P28681 Rev. 1

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.

WARNING
F6 / H2B, F7 / H3B Sandwich Regulators

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.)

- Hand Tight + 1/4 Turn
- 3.4 to 4.5 (30 to 40)
- F6/H2B: 13 to 15 (115 to 130)
- F7/H3B: 14 to 16 (120 to 140)

**Finger Tight**

**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.

Sandwich Regulator Kits

- 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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bonnet Assembly</td>
</tr>
<tr>
<td>2</td>
<td>Collar</td>
</tr>
<tr>
<td>3</td>
<td>Thrust Washer</td>
</tr>
<tr>
<td>4</td>
<td>Control Screw Assembly</td>
</tr>
<tr>
<td>5</td>
<td>Spring, Control (30, 60 or 125 PSI)</td>
</tr>
<tr>
<td>6</td>
<td>Diaphragm Assembly, Relieving (Includes vent hole)</td>
</tr>
<tr>
<td>7</td>
<td>O-ring, Lower Seat Insert</td>
</tr>
<tr>
<td>8</td>
<td>Seat Insert Assembly</td>
</tr>
<tr>
<td>9</td>
<td>O-ring, Upper Seat Insert</td>
</tr>
<tr>
<td>10</td>
<td>Pilot/Actuator Assembly, Interface</td>
</tr>
<tr>
<td>11</td>
<td>Poppet Assembly</td>
</tr>
<tr>
<td>12</td>
<td>Screw, Regulator Housing</td>
</tr>
<tr>
<td>13</td>
<td>M5 Lockwasher</td>
</tr>
<tr>
<td>14</td>
<td>Vee Packing</td>
</tr>
<tr>
<td>15</td>
<td>Retainer, Seal</td>
</tr>
<tr>
<td>16</td>
<td>Retainer, Gasket</td>
</tr>
<tr>
<td>17</td>
<td>Spring, Poppet Return</td>
</tr>
<tr>
<td>18</td>
<td>Housing, Regulator</td>
</tr>
<tr>
<td>19</td>
<td>Seal, Regulator Track</td>
</tr>
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<td>20</td>
<td>Screw, Valve Mounting - F6 / H2B</td>
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<tr>
<td>21</td>
<td>Screw, Valve Mounting - F7 / H3B</td>
</tr>
<tr>
<td>22</td>
<td>Gasket, Valve to Regulator Base</td>
</tr>
<tr>
<td>23</td>
<td>Block Assembly, Interface</td>
</tr>
<tr>
<td>24</td>
<td>Screw, Bypass Cap</td>
</tr>
<tr>
<td>25</td>
<td>Screw, Bypass Cap</td>
</tr>
<tr>
<td>26</td>
<td>Stud, Mounting</td>
</tr>
<tr>
<td>27</td>
<td>Plug, Pilot (F6/H2B Regulator)</td>
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<tr>
<td>28</td>
<td>Plug, Pilot (F7/H3B Regulator, F6/H2B Valves, F7/H3B Valves)</td>
</tr>
<tr>
<td>29</td>
<td>Seal, Interface Block Track</td>
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<tr>
<td>30</td>
<td>Bonnet, Air Pilot</td>
</tr>
<tr>
<td>31</td>
<td>O-ring, Piston</td>
</tr>
<tr>
<td>32</td>
<td>Piston</td>
</tr>
<tr>
<td>33</td>
<td>0-ring, Air Pilot Cap</td>
</tr>
</tbody>
</table>

**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)**

Service Instructions

**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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>1</td>
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</tr>
<tr>
<td>2</td>
<td>Collar</td>
</tr>
<tr>
<td>3</td>
<td>Thrust Washer</td>
</tr>
<tr>
<td>4</td>
<td>Control Screw Assembly</td>
</tr>
<tr>
<td>5</td>
<td>Spring, Control (30, 60 or 125 PSI)</td>
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<tr>
<td>6</td>
<td>Diaphragm Assembly, Relieving (Includes vent hole)</td>
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<tr>
<td>7</td>
<td>O-ring, Lower Seat Insert</td>
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<tr>
<td>8</td>
<td>Seat Insert Assembly</td>
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<tr>
<td>9</td>
<td>O-ring, Upper Seat Insert</td>
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<tr>
<td>10</td>
<td>Pilot/Actuator Assembly, Interface</td>
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<td>11</td>
<td>Poppet Assembly</td>
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<td>Screw, Regulator Housing</td>
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<td>M5 Lockwasher</td>
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<td>Retainer, Seal</td>
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<td>Retainer, Gasket</td>
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<td>Housing, Regulator</td>
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<td>21</td>
<td>Screw, Valve Mounting - F7 / H3B</td>
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<td>Gasket, Valve to Regulator Base</td>
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<td>23</td>
<td>Block Assembly, Interface</td>
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<td>24</td>
<td>Screw, Bypass Cap</td>
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<td>Screw, Bypass Cap</td>
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<td>26</td>
<td>Stud, Mounting</td>
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<td>Plug, Pilot (F6/H2B Regulator)</td>
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<td>Seal, Interface Block Track</td>
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<td>Bonnet, Air Pilot</td>
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<td>O-ring, Piston</td>
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Valve Model Number

- Sandwich Regulator Block
- Valve Sandwich Block

<table>
<thead>
<tr>
<th>Operator Function Digit #3</th>
<th>Pilot Source</th>
<th>Valve Supply Holes</th>
<th>#14 End</th>
<th>Valve Actuator Type / Pilot Source</th>
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<td>I</td>
<td>X</td>
</tr>
<tr>
<td>1, 2, 5, 6, or 7 E</td>
<td>X</td>
<td>X</td>
<td>S</td>
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</tr>
<tr>
<td>1, 2, 5, 6, or 7 E</td>
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<td>1, 2, 5, 6, or 7 E</td>
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<td>I</td>
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</tr>
<tr>
<td>1, 2, 5, 6, or 7 E</td>
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</tr>
<tr>
<td>1, 2, 5, 6, or 7 E</td>
<td>X</td>
<td>X</td>
<td>I</td>
<td>X</td>
</tr>
<tr>
<td>1, 2, 5, 6, or 7 E</td>
<td>X</td>
<td>X</td>
<td>S</td>
<td>X</td>
</tr>
</tbody>
</table>

* 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:**

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-402P</td>
<td>F &amp; H ISO 5599-2 Solenoid Service</td>
</tr>
<tr>
<td>V-442P</td>
<td>H ISO 5599-1 Auto Valve Installation</td>
</tr>
<tr>
<td>V-443P</td>
<td>F &amp; H ISO 5599-2 Manifold Installation</td>
</tr>
<tr>
<td>V-444P</td>
<td>H ISO 5599-1 CNOMO Valve Installation</td>
</tr>
<tr>
<td>V-445P</td>
<td>F &amp; H ISO Flow Control Installation</td>
</tr>
<tr>
<td>V-446P</td>
<td>F5/H1 Sandwich Regulator</td>
</tr>
<tr>
<td>V-447P</td>
<td>F6/H2 &amp; F7/H3 Sandwich Regulator</td>
</tr>
<tr>
<td>V-448P</td>
<td>F &amp; H Selector Regulator Installation</td>
</tr>
</tbody>
</table>


**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

<table>
<thead>
<tr>
<th>Port No.</th>
<th>Single Pressure</th>
<th>Dual Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inlet</td>
<td>Exhaust</td>
</tr>
<tr>
<td>2</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>3</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
<tr>
<td>4</td>
<td>Outlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>5</td>
<td>Exhaust</td>
<td>Inlet</td>
</tr>
<tr>
<td>12, 14</td>
<td>Pilot ports for External Pilot or Remote Pilot</td>
<td></td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>25-Pin Sub-D</th>
<th>19-Pin Round</th>
<th>12-Pin Round Single</th>
<th>12-Pin Round Double</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>18</td>
<td>16</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>24VDC</td>
<td>24</td>
<td>16</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>24VDC</td>
<td>24</td>
<td>16</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>120VAC</td>
<td>24</td>
<td>16</td>
<td>8</td>
<td>16</td>
</tr>
</tbody>
</table>

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 F5165BG23A 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.

**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.
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.

The stack assembly is built from left to right (viewing the cylinder ports) by means of a plug-in harness track seal (for F7 / H3) and base to the previous base. Lay the right hand end plate (Item 12) on and lightly tighten the screws (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.

---

**Manifold / End Plate Assembly Torque Values**

<table>
<thead>
<tr>
<th>Valve Series</th>
<th>F5 / H1</th>
<th>F6 / H2</th>
<th>F7 / H3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque - in. lb.</td>
<td>40 to 50</td>
<td>195 to 205</td>
<td>195 to 205</td>
</tr>
<tr>
<td>(Nm)</td>
<td>(4.5 to 5.1)</td>
<td>(22.0 to 23.2)</td>
<td>(22.0 to 23.2)</td>
</tr>
</tbody>
</table>

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.

---

**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
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 counterebore 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.

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.
Remote Pilot Access Plate

The Remote Pilot Access Plate provides access to the #12 and #14 valve pilot galleys 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.

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 Torque | F6 / H2 | F7 / H3
--- | --- | --- | ---
F5 / H1 | 25 to 35 (2.8 to 3.9) | 115 to 130 (12.9 to 14.7) | 120 to 140 (13.6 to 15.8)
F6 / H2 | 25 to 35 (2.8 to 3.9) | 115 to 130 (12.9 to 14.7) | 120 to 140 (13.6 to 15.8)

Hi-Flow Manifold Repair Kits

<table>
<thead>
<tr>
<th>Kit Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS3512BP</td>
<td>H1 / F5 Manifold Tie Rod (12)</td>
</tr>
<tr>
<td>PS3513BP</td>
<td>H1 / F5 Manifold to Manifold Gasket (1)</td>
</tr>
<tr>
<td>PS3612P</td>
<td>H2 / F5, H3 &amp; F7 Manifold Hardware (12)</td>
</tr>
<tr>
<td>PS3613P</td>
<td>H2 / F6 Manifold to Manifold Gasket (1)</td>
</tr>
<tr>
<td>PS3713P</td>
<td>H3 / F7 Manifold to Manifold Gasket (1)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Operator / Function</th>
<th>Internal Pilot</th>
<th>Min. PSIG (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single Solenoid - 2-Pos</td>
<td>20 (138)</td>
</tr>
<tr>
<td>2</td>
<td>Double Solenoid - 2-Pos</td>
<td>Vacuum</td>
</tr>
<tr>
<td>3</td>
<td>Single Remote - 2-Pos</td>
<td>30 (207)</td>
</tr>
<tr>
<td>4</td>
<td>Double Remote Pilot - 2-Pos</td>
<td>Vacuum</td>
</tr>
<tr>
<td>5, 6, 7</td>
<td>Double Solenoid - 3-Pos</td>
<td>35 (241)</td>
</tr>
<tr>
<td>8, 9, 0</td>
<td>Double Remote Pilot - 3-Pos</td>
<td>Vacuum</td>
</tr>
<tr>
<td>E</td>
<td>Single Solenoid - 2-Pos</td>
<td>Air Return / Spring Assist</td>
</tr>
<tr>
<td>F</td>
<td>Single Remote Pilot - 2-Pos</td>
<td>Air Return / Spring Assist</td>
</tr>
<tr>
<td></td>
<td>“F” Series</td>
<td>Vacuum</td>
</tr>
</tbody>
</table>


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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## Valve / Sandwich Torque Mounting Specifications

Torque ....................................................... 25 to 35 lb. in. (3 to 4 Nm)

## Sandwich Block Pilot Plug Locations

(See Table Below)

<table>
<thead>
<tr>
<th>3rd Digit in Model No.</th>
<th>6th Digit in Model No.</th>
<th>Pilot Supply Holes</th>
<th>Using Attributes of Valve &amp; Operator(s) to Determine Plug Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>B or C</td>
<td>X</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>P or Q</td>
<td>X</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>L or M</td>
<td>X</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>E or F</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>H or J</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>P or Q</td>
<td>X</td>
<td>M</td>
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<tr>
<td>L or M</td>
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<td>E or F</td>
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<td>0 or C</td>
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<td>H or J</td>
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<td>X</td>
</tr>
<tr>
<td>0</td>
<td>M</td>
<td>M</td>
<td>X</td>
</tr>
</tbody>
</table>

Key Code: X = Pilot hole must be plugged. 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.

## Sandwich Regulator Mounting Stud Kit - PS3540P

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

## F & H Selector Regulator Installation

### Using Model No. to Determine Plug Locations

- **Using Model No. to Determine Plug Locations**
- **Plug Locations**
- **Using Attributes of Valve & Operator(s) to Determine Plug Locations**

## Instruction Sheets Available:

- 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-448P - F & H Selector Regulator Installation

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- Warnings and specifications on the product should not be covered or the product does not operate properly, do not put into use.

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.

⚠️ 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.
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 Supply 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 threadlocking 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:

<table>
<thead>
<tr>
<th>Operator Type</th>
<th>Pilot Supply Option</th>
<th>Gasket Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single &amp; Double Solenoid</td>
<td>Common Internal Supply</td>
<td>P00636</td>
</tr>
<tr>
<td>Single &amp; Double Solenoid</td>
<td>Common External Supply</td>
<td>P00637</td>
</tr>
<tr>
<td>Single Remote Air / Air Return</td>
<td>Internal Supply to 12 end only</td>
<td>P00636</td>
</tr>
<tr>
<td>Double Remote Air</td>
<td>Separate External Supply</td>
<td>P00637</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Operator Type</th>
<th>Pilot Supply Option</th>
<th>Gasket Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single &amp; Double Solenoid</td>
<td>Common Internal Supply</td>
<td>P00271D*</td>
</tr>
<tr>
<td>Single &amp; Double Solenoid</td>
<td>Common External Supply</td>
<td>P00271D*</td>
</tr>
<tr>
<td>Single Remote Air / Air Return</td>
<td>Internal Supply to 12 end only</td>
<td>P00630*</td>
</tr>
<tr>
<td>Double Remote Air</td>
<td>Separate External Supply</td>
<td>P00273D*</td>
</tr>
</tbody>
</table>

* 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).
3. #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 damaged.
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 (E) 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

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>L00715B</td>
<td>Bonnet Assembly</td>
</tr>
<tr>
<td>B</td>
<td>P00411</td>
<td>1-30 PSI Spring (Green)</td>
</tr>
<tr>
<td></td>
<td>P78660B</td>
<td>2-60 PSI Spring (Blue)</td>
</tr>
<tr>
<td></td>
<td>P78648</td>
<td>5-125 PSI Spring</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>Socket Head Cap Screw</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>Regulator Base Gasket</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>Piston</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>O-Ring</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>Retaining Ring</td>
</tr>
<tr>
<td>H</td>
<td>NSS</td>
<td>Plug</td>
</tr>
<tr>
<td>J</td>
<td></td>
<td>Retaining Ring</td>
</tr>
<tr>
<td>K</td>
<td></td>
<td>Poppet Return Spring</td>
</tr>
<tr>
<td>L</td>
<td></td>
<td>Poppet Assembly</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td>Vee Packing</td>
</tr>
<tr>
<td>N</td>
<td>K183118</td>
<td>Subbase Gasket - H2</td>
</tr>
<tr>
<td>N</td>
<td>K183134</td>
<td>Subbase Gasket - F6</td>
</tr>
</tbody>
</table>

- Parts included in K352415 Service Kit. NSS Not Sold Separately.

Replacement Gauges

<table>
<thead>
<tr>
<th>PSI</th>
<th>Standard</th>
<th>Liquid Filled</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 60</td>
<td>PS30154</td>
<td>–</td>
</tr>
<tr>
<td>0 - 160</td>
<td>P77413</td>
<td>H03276</td>
</tr>
</tbody>
</table>

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

* Marfak MP-2 is a registered trademark of Texaco.
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, or the product does not operate properly, do not put into use.

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

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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Independent and Single Port Regulation with 4-Way, 3-Position, All Ports Blocked Valve (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).

- 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.
- 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.
- Reassemble solenoid coil (B) and nut (A) and tighten 5.1 to 6.2 Nm (45 to 55 in-lb.) torque.

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.

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. Place the plugs in the sandwich plate located on the bottom of the valve. These plugs are located in small holes which are identified as follows:

<table>
<thead>
<tr>
<th>Control Mechanism Operator Types</th>
<th>Plug Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pilot Supply Holes</td>
</tr>
<tr>
<td>All Solenoids</td>
<td>X M M BP4 BP2 12 14</td>
</tr>
<tr>
<td>Single Air Pilot</td>
<td>X M M X</td>
</tr>
<tr>
<td>Double Air Pilot</td>
<td>M M X X</td>
</tr>
</tbody>
</table>

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.
H3 & F7 Sandwich Regulator

Replacement Parts

| Item No. | Part Number | Description
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P01698</td>
<td>1-30 PSI Spring</td>
</tr>
<tr>
<td>2</td>
<td>P04062</td>
<td>1-60 PSI Spring (Blue)</td>
</tr>
<tr>
<td>3</td>
<td>P04063</td>
<td>2-125 PSI Spring</td>
</tr>
<tr>
<td>4</td>
<td>K183119</td>
<td>Subbase Gasket - F7</td>
</tr>
<tr>
<td>5</td>
<td>K183135</td>
<td>Subbase Gasket - H3</td>
</tr>
</tbody>
</table>

* Parts included in K352418 Service Kit.

Replacement Gauges

<table>
<thead>
<tr>
<th>PSI</th>
<th>Standard</th>
<th>Liquid Filled</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-60</td>
<td>P530154</td>
<td>–</td>
</tr>
<tr>
<td>0-160</td>
<td>P77413</td>
<td>H03276</td>
</tr>
</tbody>
</table>

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

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.
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

* Marfak MP-2 is a registered trademark of Texaco.
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.


1.4. 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, keytones, 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.


4.4. 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:
- 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.