D-2.90
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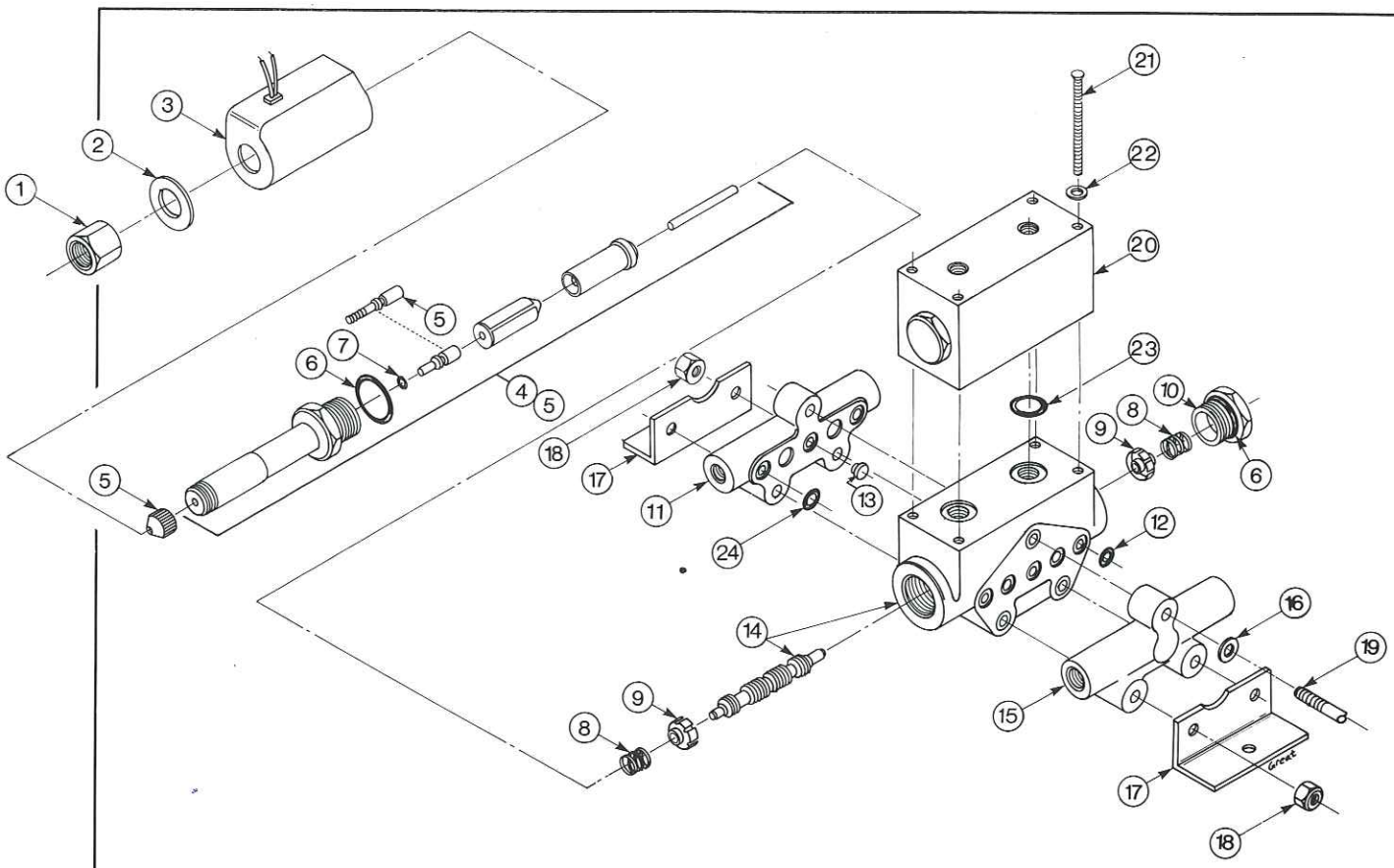
FPS Mini Pak Valves

Maintenance and service bulletin



Parts List

Item	Part No.	Description
1.	4017370	Nut
2.	—	Nameplate
3.	See page 6	Solenoid coil
4.	6013132	Tube S/A (standard)
5.	6013133	Tube S/A (palm button)
6.	0102912	O-ring
7.	0101008	O-ring
8.	4025350	Spring
9.	6004100	Spring retainer
10.	4017391	Plug
11.	See page 5	Outlet section
12.	0101012	O-ring (5)
13.	4011702	Closed center plug
14.	—	Body & spool
15.	See page 4	Inlet section
16.	1008008	Washer
17.	4014240	Mounting bracket
18.	1005013	Nut
19.	See page 6	Tie rod
20.	See page 5	Attachment (optional)
21.	1011317	Bolt
22.	1009027	Washer
23.	0101117	O-ring
24.	0101013	O-ring (5)

UNITED TECHNOLOGIES AUTOMOTIVE

FLUID POWER SYSTEMS

Assembly Information

Disassembly: (See Figure 1)

NOTE: Before attempting to disassemble this or any other hydraulic component, prepare a **CLEAN** work area.

1. Remove coil nut (1) and slide coil (3) off tube (4).
2. Remove nuts (18), mounting bracket (17) and washer (16) from the inlet end of the valve bank.
3. Remove inlet (15), attachments (20) as necessary, and O-rings.
4. Remove valve sections (14), one at a time, removing O-rings (12) or (13) between each section. Remove only those sections to be repaired or replaced.
5. Use a 1¼" box or open end wrench to loosen tubes (4) from body.

CAUTION: Use proper tools to avoid damaging tube subassembly.

6. Remove tube subassembly by hand. Spring (8) and spring retainer (9) may fall from valve body.
7. Slide pin, plug and plunger out of tube.

NOTE: Pin, plug and plunger are a matched set. Do **NOT** mix parts.

8. Use a small punch to gently push manual override pin into tube until it is free and falls out.
9. If valve has manual override option "JJ," use a screwdriver inside the tube to hold pin (5) from turning while removing the palm button.
10. Repeat steps 5 through 8 to remove tubes on the opposite side of the valve.
11. Gently slide spool (14) from valve body. Make note of its position in the valve body. Spool cannot be turned around. It must slide into the body in the same position it came out.

CAUTION: BODY AND SPOOL ARE A MATCHED SET. If either one is damaged, **BOTH must be replaced.**

12. Wash all parts in cleaning solvent and dry with air gun. Be sure to remove all traces of solvent.

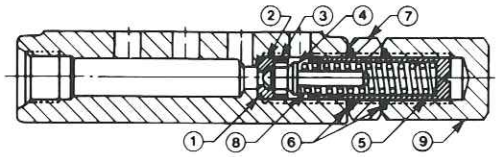
Assembly:

NOTE: Before re-assembly, discard all used O-rings.

1. All parts should be individually inspected to verify they are free from wear, burrs, nicks, scratches or any other defect that could cause poor performance.
2. Lubricate all system parts and O-rings with clean system oil before assembly.
3. Lubricate spool (14) and valve body and carefully slide spool into body making sure it is in the same position as when it was removed. Spool should slide freely in body.
4. Install O-ring (7) on manual override pin. Lubricate inside of tube where pin is installed. Carefully push pin into place. Install O-ring (6) on tube. Install plunger, plug and pin. Make sure that these parts are lubricated with oil. Pin should slide freely in plug.
5. Place spring retainer (9) onto spool with prongs towards spool. Place spring (8) over retainer and install tube subassembly into valve body by hand.
6. Repeat steps 4 and 5 for the opposite side of the valve.
7. For single solenoid sections, place O-ring (6) on plug (10), retainer (9) on spool with prongs towards spool and spring (8) over retainer. Tighten plug and/or tube subassembly to 100 in./lbs.
8. Install one nut (18) on each tie rod (19). Place two tie rods through the mounting bracket (17). Place one flat washer (16) on the third tie rod. Place outlet section (11) over the tie rods. An aid in banking sections is to place the mounting bracket in a vice or on the edge of a flat surface with the tie rods in a vertical position. Place five O-rings (24). Install a valve section over the tie rods. Place the O-rings (12) on this section. Replace remaining sections as above.
9. Install inlet section (15). Place mounting bracket (17) over lower tie rods and install two nuts (18). Place a flat washer (16) over top tie rod only.
10. Torque tie rods in three steps of 50 in./lbs., 90 in./lbs. and finally 115 in./lbs. **THIS IS VERY IMPORTANT! OVERTORQUEING WILL CAUSE BORE DISTORTION & MAY CAUSE SPOOL BINDING OR INCREASED LEAKAGE.**
11. In order to set the relief, if installed, the complete valve must be placed on a test stand capable of flow from 1 to 5 GPM. Remove the cap over the adjustment screw and loosen the lock nut (see below). Set incoming pressure on test stand to desired valve setting and adjust screw in to increase relief setting or out to decrease relief setting. Setting is correct when .25 GPM flows out of valve at desired pressure.
12. If painting is required make sure all ports are plugged and electrical connections are masked.

Inlets

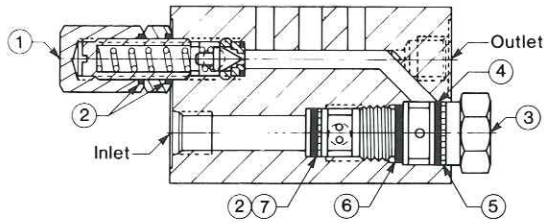
INLET WITH RELIEF



INLET KITS		
Standard Inlet with Load Checks	SI	6401000
Dual Inlet with Load Checks	DIP	6401002
Reverse Inlet with Load Checks	RI	6401001
Priority Inlet with Relief & 0-500 Load Checks	PR	6401008
Priority Inlet with Relief & 500-3000 Load Checks	PR	6401009
Load Check and Relief (0-500)	R	6401004
Load Check and Relief (500-3000)	R	6401005

Item	Part No.	Description
1.	0101012	O-ring
2.	4015850	Seat
3.	4015860	Retainer
4.	4015870	Poppet
5.	4011170	Adj. screw
6.	0101015	O-ring (2)
7.	4011240	Lock nut
8.	4011231	Spring
9.	4011180	Cap nut

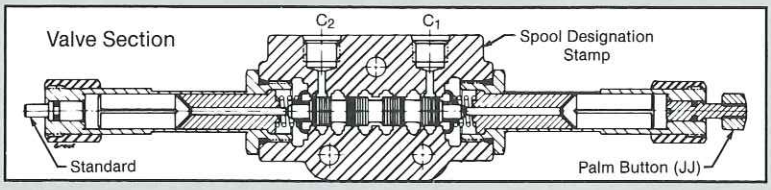
Priority Inlet with Direct Acting Relief "PR"



Item	Part No.	Description
1.	6013041	Repair Kit 100-500 psi (1)
	6013040	Repair Kit 501-3000 psi (1)
2.	0101015	O-ring
3.		Cartridge
4.	0101018	O-ring
5.	0108018	Back up ring
6.	0101017	O-ring
7.	0108015	Back up ring

Valve Sections

Spool Type	Section Assemblies Standard w/12 VDC Coils	Section Assemblies/Less Coils	
		Standard	Palm Button (JJ)
10	7103130	6420000	6420001
14	7103136	6420040	6420041
15		6420030	
17	7103506	6420010	
20	7103442	6420020	
23		6420230	
24		6420240	
25	7106650	6420150	6420151
51		6420510	
71		6420710	

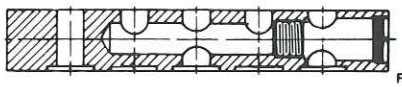


Valve sections are interchangeable. Stacks are made closed center by adding a closed center plug (4011702) between the outlet and last valve section.

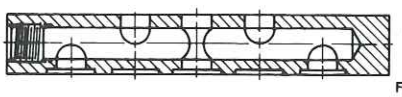
Circuit Conversion Options

Isolator Plate	IP	6403001
Series Conversion Plate	SP	6403002

Isolator Plate "IP"



Series Conversion Plate "SP"



Attachments

Cylinder Port Attachment Valves					
U.S.A.S.I. Symbol	Valve Type	Code	Standard (SAE-6)	Sandwich	Press Setting
	Lock Valve	A	6426001	6008291	
		B	6426002		3000 psi
		C	6426003		3000 psi
	Crossover Relief Valve			6008310	100 psi
				6008311	250 psi
				6008312	500 psi
					750 psi
				6015190	800 psi
				6008313	1000 psi
		F			1200 psi
			6426004	6008314	1500 psi
				6008319	1800 psi
				6008315	2000 psi
				6008316	2500 psi
			6426005	6008317	3000 psi
				6008318	3500 psi
	Adj. Crossover Relief	TT	6426006		750-2000 psi
	Pilot Operated Check Valve	L	6426007	6008321	
		Y	6426008		

Attachment Mounting Hardware
(Kits include screws, washers and O-rings)
Single Attachment Kit 6426101
Sandwich Attachment Kit 6426102

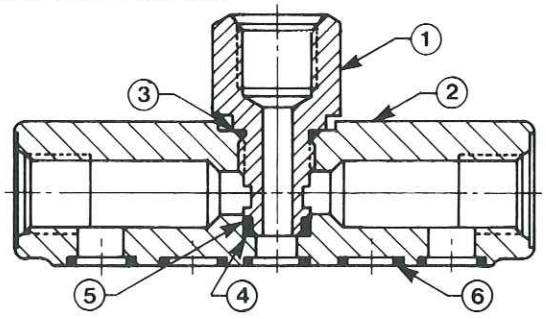
Outlets

OUTLET KITS		
SO	Open Center	6402000
SC	Closed Center (Use closed center plug)	6402003
PB	Power Beyond	6402001
DTO	Dual Tank Outlet Open Center	6402002
DTC	Dual Tank Outlet Closed Center	6402004
NO	Standard Outlet w/Reverse Check	6402005

Outlet kits include mylar shims and O-rings.

Item	Part No.	Description
1.	4014283	Power beyond plug
2.	4030530	Body
3.	0102906	O-ring
4.	0115012	Quad ring
5.	0220012	Back up ring
6.	0101013	O-ring (5)

OUTLET WITH POWER BEYOND



Coils & Raceways

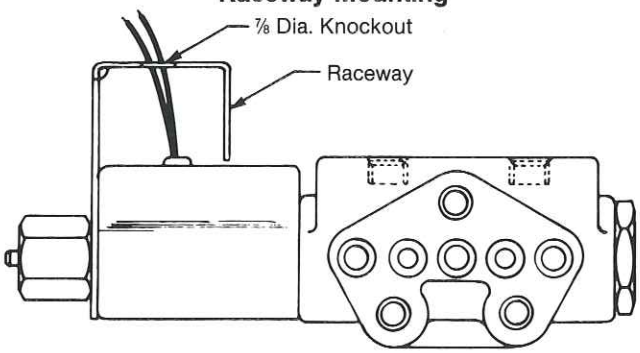
Coils		
Voltage	**Part No.**	**Description**
6VDC	6003410	20 ga. — 18″ — grey leads
12VDC	6003420	20 ga. — 18″ — red leads
12VDC - TD	6003422	Internal ground with ¼″ spade terminal on coil
24VDC	6003430	20 ga. — 18″ — green leads
24VDC - TD	6003431	Internal ground with ¼″ spade terminal on coil
115VAC - LD	6003491	20 ga. — 18″ — blue leads, internally rectified
220VAC - LD	6003500	20 ga. — 18″ — yellow leads, internally rectified

12VDC - NA 6003438

Raceways	
Left side cover	4025733
Right side cover	4025734
Center cover	4025735

Raceways are standard for A.C. coils but may be used for special D.C. applications.

Raceway Mounting



Seal Kits & Banking Kits

O-Ring Cross Reference				Seal Kits						
FPS No.	Dash No.	Duro	Material	A		C	D	E	F	G
0101008	-008	70	Buna-N				2			
0101012	-012	70	Buna-N	1			10			
0101014	-014	70	Buna-N							
0101015	-015	70	Buna-N	2						
0101016	-016	70	Buna-N					1		
0101018	-018	70	Buna-N							
0101021	-021	70	Buna-N			1				
0101117	-117	70	Buna-N				2	2		
0102906	-906	90	Buna-N						1	
0102910	-910	90	Buna-N					2		
0102912	-912	90	Buna-N				2			
0102916	-916	90	Buna-N			1				
0106008	-008	70	Special							
0108008	Back up ring									
0108016	Back up ring							2		
0108021	Back up ring					1				
0115012	Quad ring								1	
0220012	Back up ring								1	
0101013	-013	70	Buna-N						5	5

A — 6009250 — Direct acting inlet relief

C — 6010107 — Inlet dump valve with direct acting relief (solenoid cartridge only)

D — 6009400 — Single section

E — 6009410 — "A", "B", "C" and "F" attachments

F — 6029522 — Power beyond outlet

G — 6029521 — Standard outlet

No. of Valve Banks	Banking Kits		Tie Rods	
	Standard	Isolator or Series Conversion Plate (1)	Standard	Series Conversion Plate (1)
1	6424001		4023773	
2	6424002	6424003	4023775	4023775
3	6424003	6424004	4023779	4023782
4	6424004	6424005	4023782	4023784
5	6424005	6424006	4023784	4023788

Banking kits include tie rods, nuts, washers, mounting brackets.