



Bulletin HY14-2705-M5/US
Service and Parts Bulletin

Model V20 and CP

Effective: September 1, 2003
Supersedes: Cat. No. SC-1103 dated 3/87



Solenoid Controlled
Directional Control Valve





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 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.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the "Offer of Sale".

© Copyright 2003, Parker Hannifin Corporation, All Rights Reserved

bul2705-m5.p65,jz



Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

Contents

	Page No.
Section I Introduction	1-1
Section II Description	2-0
Section III Maintenance	3-0
Section IV Parts Listing	4-0

List of Illustrations

Figure 1-1. Schematic View of Typical Model V20 and CP Control Valve Assembly	1-1
Figure 2-1. Optional Spacer Tube Assembly	2-1
Figure 2-2. Optional Tee Fitting	2-2
Figure 3-1. Actuator Assembly and 3-Position, 4-Way Work Section	3-0
Figure 3-2. Seal Replacement	3-1
Figure 4-1. Models V20 and CP Solenoid-Controlled Directional Control Valve Assembly	4-0
Figure 4-2. Adjustable Speed Control Fittings	4-1
Figure 4-3. Non-Adjustable Fittings	4-2
Figure 4-4. Actuator Assembly	4-3
Figure 4-5. Solenoid Valve Cartridge Assembly	4-4
Figure 4-6. Utility Section Assembly	4-5
Figure 4-7. Pressure Reducing Cartridge Assembly	4-6
Figure 4-8. Solenoid-Operated Pressure Build-Up Valve Assembly	4-7
Figure 4-9. Mechanical Pressure Build-Up Valve Assembly	4-8

Manufacturing reserves the right to discontinue or modify parts listed in these instructions.
All specifications herein are approximate and may vary depending upon installation.

SECTION I INTRODUCTION

This manual contains pertinent step-by-step instructions for maintenance and parts ordering for the actuator, utility section, and related component parts for Models V20 and CP Solenoid-Controlled Directional Control Valves.

Maintenance instructions and parts ordering information for the work section portion (and its component parts) of Model V20 Solenoid-Controlled Directional Control Valves are contained in the Model V20 Service and Parts Manual, Catalog No. SC-1102. Similar information for the Model CP Solenoid-Controlled Directional Control Valves is contained in the Model CP and CT Service and Parts Manual, Catalog No. SC-1101. It is important that you have a copy of these Manuals and follow their instructions for service and parts ordering.

If further assistance is required, contact Your Gresen Distributor or Representative.

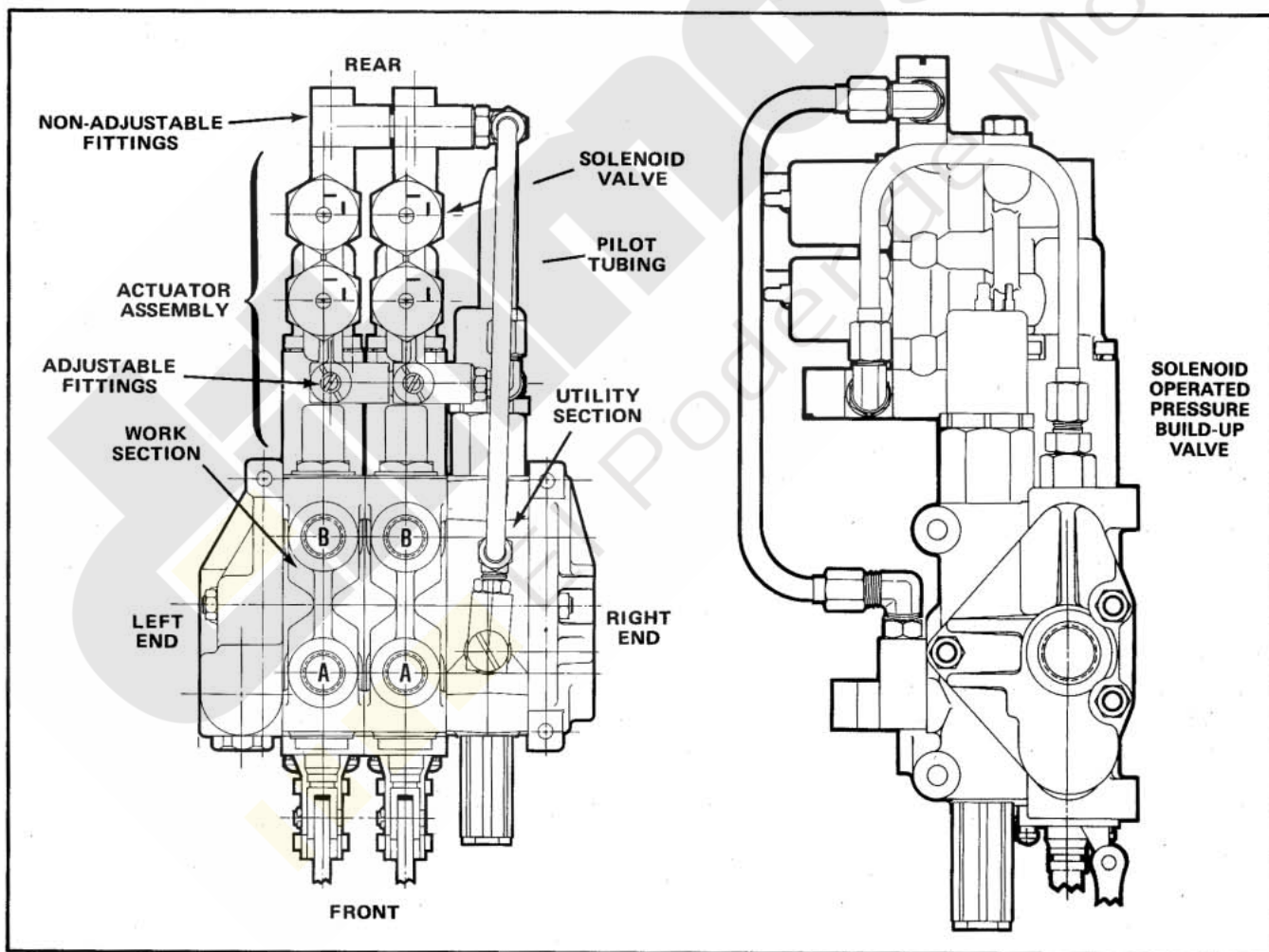


Figure 1-1. Schematic View of Model V20 and CP Control Valve Assembly.

SECTION II DESCRIPTION

Gresen's on-off, solenoid-controlled, pilot-operated actuators are designed to provide remote operation of Models V20 and CP Directional Control Valves having 3-position spools. The standard free flow spool cannot be used with a solenoid actuator. A modified free flow spool (part no. 8397-001) is available for solenoid operated valve sections. Solenoids are available for either 12 VDC, 24 VDC, or 120 VAC. A hydraulic pilot source of 2 to 4 GPM at 300 PSI [7,6 to 15,1 litres/min at 21 bar] is required to operate each valve.

The solenoid-controlled actuator assembly contains two 3-way, normally closed, solenoid-operated valves and a pilot operated piston coupled directly to the control valve spool. When a solenoid is energized, the solenoid valve opens and pilot pressure is applied to one side of the piston causing the spool to shift from its neutral position. When both solenoids are de-energized, both sides of the piston are open to exhaust and the spool is spring-returned to neutral. An externally adjustable needle valve controls the spool's rate of travel to the power positions by restricting the exhaust pilot flow.

The pilot flow may be supplied by the customer from a source external to the control valve (pilot tubing must be a minimum of 3/8 inch [9,5 mm] tubing with SAE #6 fittings) or by a utility section which is assembled as an integral part of the control valve.

The Utility Section incorporates a Pressure Reducing Valve, a Check Valve, and a Pressure Build-Up Valve; eliminating the need for any external pilot lines. The entire control valve is self-contained.

The utility section must be installed between the last work section in a directional control valve assembly and the right or outlet cover. When a combination of solenoid-controlled work sections and manually-operated work sections are assembled, all of the solenoid-controlled work sections may be installed adjacent to each other and directly upstream from the utility section or an optional spacer tube assembly

may be installed. (Refer to page 2-1.) Both open center and closed center applications are available. The tank port may be located in either the inlet or outlet cover of the control valve assembly.

Pressure Reducing Valve reduces oil pressure to the solenoid-controlled actuator to 300 PSI [21 bar].

Check Valve (Part No. K-6062) **MUST BE INSTALLED IN THE SOLENOID-CONTROLLED ACTUATOR RETURN OR EXHAUST PORT TO PREVENT SYSTEM SHOCK PEAKS FROM AFFECTING THE ACTUATOR.**

Pressure Build-Up Valve. Because of the low open center pressure drop found in the Models V20 and CP Directional Control Valves, a pressure build-up valve is necessary to maintain minimum oil pressure necessary to shift the valve spools. For closed center applications, the pressure build-up valve is not required. However, the system must have a standby pressure of 300 PSI [21 bar] available.

Optional Mechanical Pressure Build-Up Valve is available for use in the utility section in place of the standard solenoid-operated pressure build-up valve.

Optional Power Beyond Sleeve is available for use in the utility section in place of the pressure build-up valve. If a power beyond sleeve is used, the pressure build-up valve must be installed in the outlet cover of the downstream valve. Use outlet cover, Part No. 6770-019 in downstream valve.

Optional Closed Center Plug is available to replace the pressure build-up valve. System must have standby pressure of 300 PSI [21 bar] available.

Optional Spacer Tube Assembly (Part No. K-6117) is available to allow installation of a manually operated section or a mid-inlet section between two solenoid controlled sections. Spacer tubes cannot be stacked. See Figure 2-1.

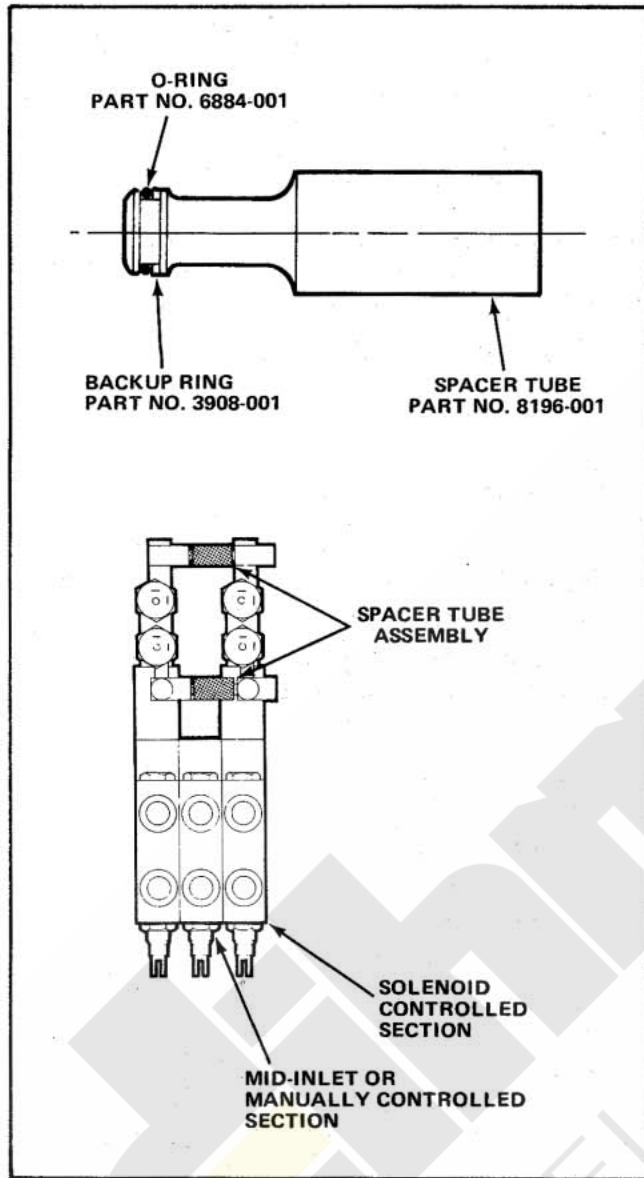


Figure 2-1. Optional Spacer Tube Assembly.

Optional Tee Fitting (Part No. K-6118-B) is available to connect an upstream control valve assembly and a downstream control valve assembly to one utility section. A power beyond sleeve must be used in the utility section in the upstream valve assembly and a pressure build-up valve must be used in the outlet cover (Part No. 6770-019) in the downstream valve assembly. See Figure 2-2.

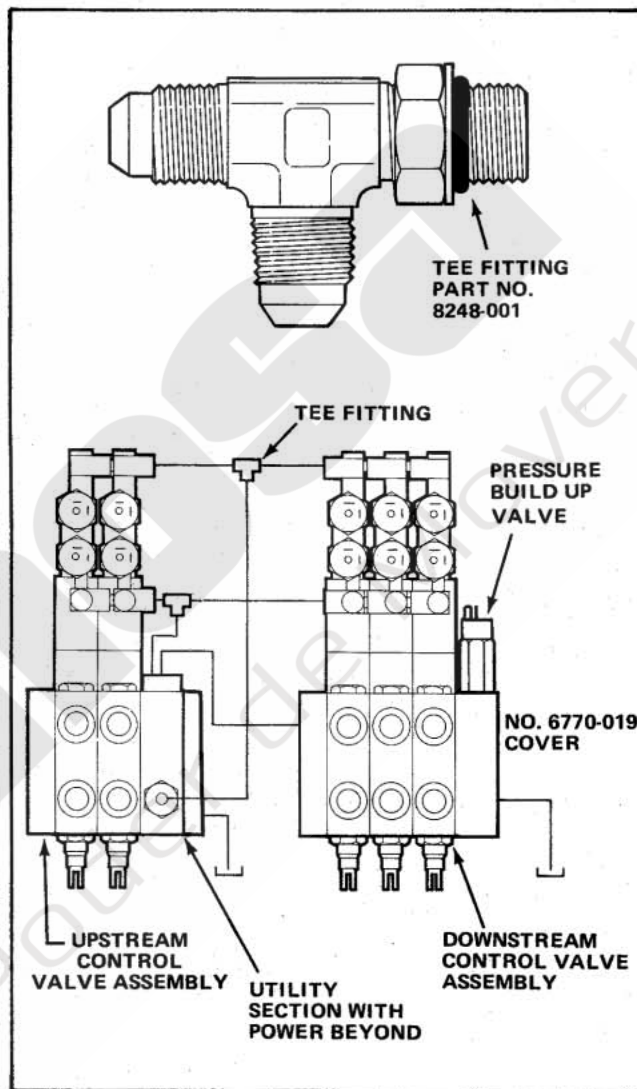


Figure 2-2. Optional Tee Fitting.

See Figure 1-1 for typical view of a Model V20 or CP Solenoid Control Valve Assembly. See Figure 4-1 for specific parts information.

SECTION III MAINTENANCE

REMOVAL OF ACTUATOR ASSEMBLY FROM WORK SECTION

In order to remove an actuator assembly from a valve work section, all pressure connections, return line connections, and electrical connections must be discontinued.

Refer to Figure 3-1 and proceed as follows:

1. Remove four housing screws. The actuator housing can now be removed from the work section. This will expose the centering spring assembly, piston rod guide, and piston assembly.
2. Slide piston rod guide away from spring centering assembly. This will expose spool screw.
3. Move clevis end of valve spool into valve work section approximately 1/2 inch [12,7 mm]. Slide spool sleeve toward valve work section to expose spool centering collar.
4. Compress spool centering collar. Piston rod can now be slipped out of the spool screw head. Slip rod guide over the end of the piston rod.

5. Using either a screwdriver or a rod inserted through clevis end of spool to hold spool steady, remove spool screw. Clean internal threads in valve spool and external threads on spool screw to remove all residue of Loctite.

To replace actuator assembly:

6. Install spool screw. Apply a small amount of Loctite, grade 262, to screw threads before installing. Torque to 10-12 foot pounds [14-16 Nm].
7. Replace piston rod guide on piston rod.
8. Compress spool centering collar and insert piston rod into spool screw head.
9. Replace actuator housing.

NOTE

Make sure that all seals are lubricated before slipping housing over piston and rod guide.

10. Secure actuator housing to work section with four housing screws. Torque to 8-10 foot pounds [10-14 Nm].

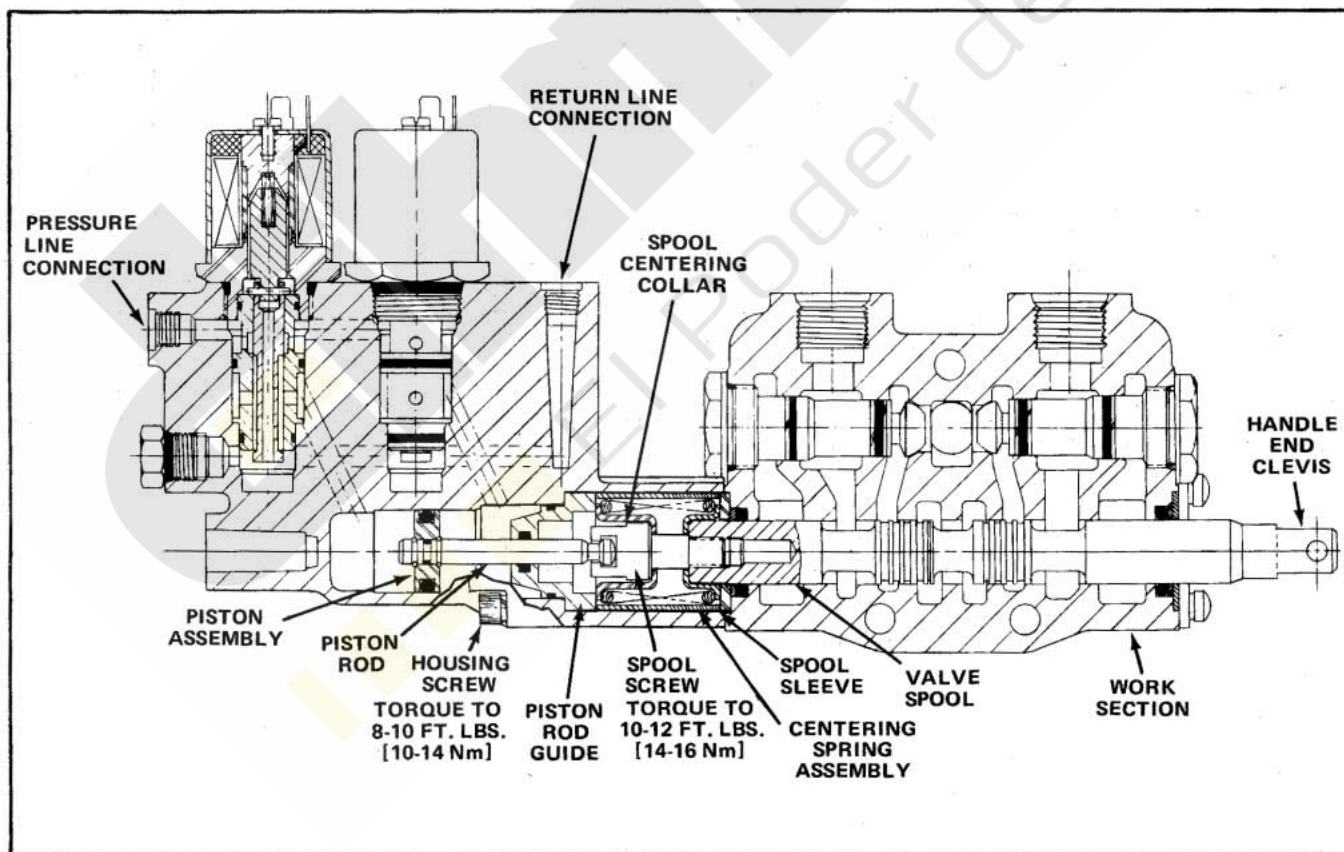


Figure 3-1. Actuator Assembly and 3-Position, 4-Way Work Section.

11. Re-connect all pressure and return line connections to actuator assembly.
12. Re-connect all electrical connections.

SEAL REPLACEMENT

Seal Replacement in Handle End of Work Section

Refer to Figure 3-2 and proceed as follows:

1. Remove seal plate or handle bracket.
2. Remove seal washer and Teflon backup washer.
3. Remove spool seal O-ring.
4. Install new spool seal O-ring in seal cavity. Lubricate O-ring before installing.
5. Install Teflon backup washer and seal washer.
6. Replace seal plate or handle bracket. Torque to 6 foot pounds [8 Nm].

Seal Replacement in Actuator End of Work Section

Refer to Figure 3-2 and proceed as follows:

1. Complete steps 1 thru 4 described in "Removal of Actuator Assembly From Work Section."
2. Remove spool sleeve, centering spring and stop collar.
3. Remove seal plate and Teflon backup washer.

4. Remove spool seal O-ring.
5. Install new spool seal O-ring in seal cavity. Lubricate O-ring before installing.
6. Install Teflon backup washer and seal washer.
7. Install stop collar, centering spring and spool sleeve.

NOTE

Stop collar and spool centering collar are not interchangeable. Make sure that assembly is in the reverse order of disassembly.

8. Complete steps 6 thru 12 described in "Removal of Actuator Assembly from Work Section."

Seal Replacement in Actuator Assembly

Refer to Figure 3-2 and proceed as follows:

1. Complete steps 1 thru 4 described in "Removal of Actuator Assembly From Work Section."
2. Remove piston. All seals are now exposed and can be changed. Refer to Parts Listing, Figure 4-4, for ordering information. Use a good grade of hydraulic oil to lubricate seals when re-assembling.

To re-assemble actuator assembly:

3. Complete steps 7 thru 12 described in "Removal of Actuator Assembly From Work Section."

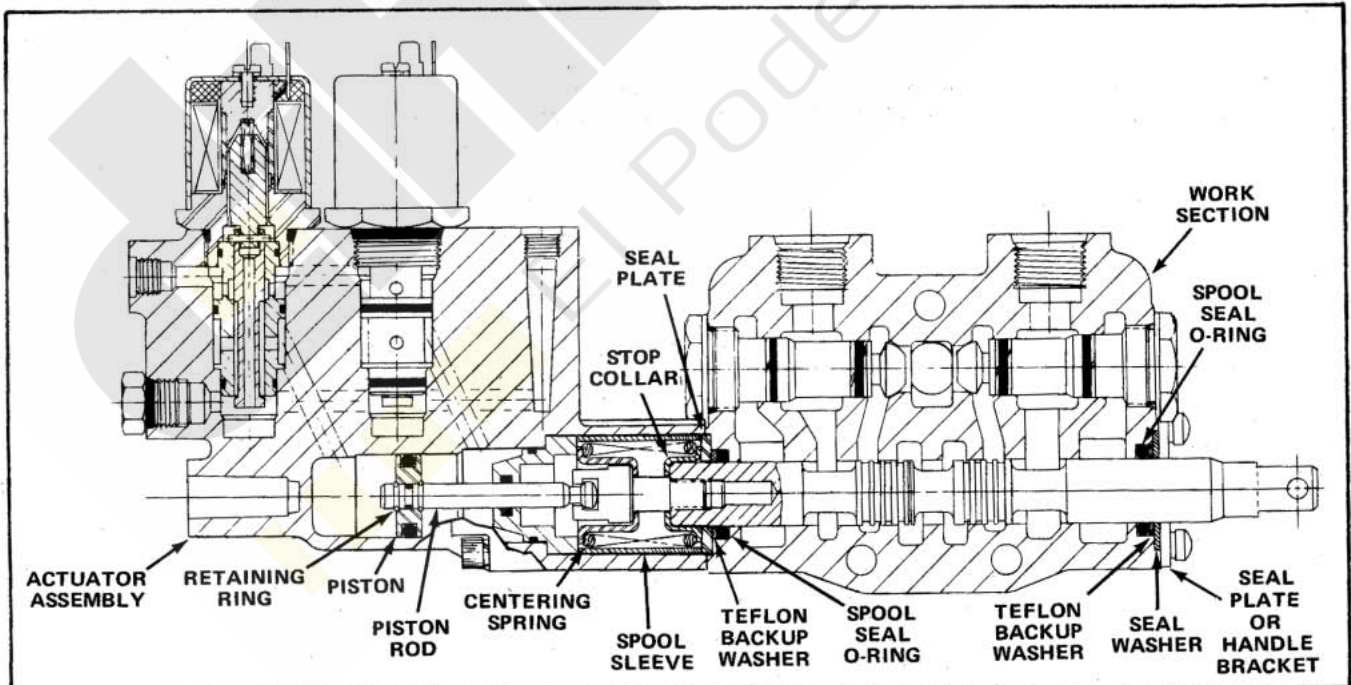


Figure 3-2. Seal Replacement.

SECTION IV PARTS LISTING

The following parts ordering information covers only those parts and components directly related to the actuator assembly portion of the entire directional control valve assembly. Parts ordering information concerning end covers, reliefs, and restrictors for the Model V20 work section is

included in the Model V20 Service and Parts Manual, Catalog No. SC-1102. Similar information for the Model CP Work Section is included in the Model CP and CT Service and Parts Manual, Catalog No. SC-1101.

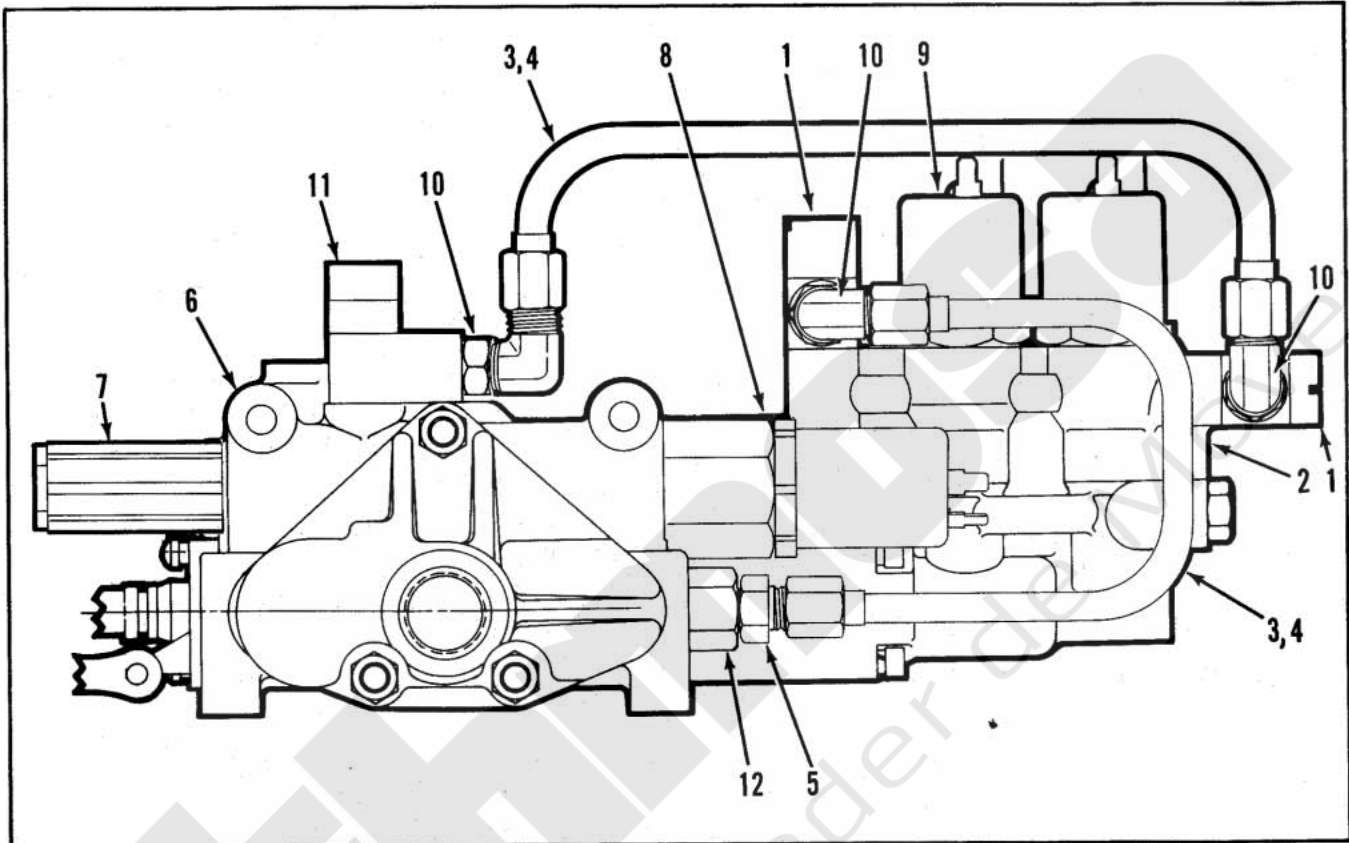


Figure 4-1. Models V20 and CP Solenoid-Controlled Directional Control Valve Assembly.

MODELS V20 and CP SOLENOID-CONTROLLED DIRECTIONAL CONTROL VALVE ASSEMBLY

Item No.	Part No.	Description	Quantity
1		FITTINGS (See Figures 4-2 and 4-3)	A/R
2		ACTUATOR ASSEMBLY (See Figure 4-4)	A/R
3	K-6070	TUBING KIT (Contains all tubing and fittings)	1
4	K-6071	SEAL KIT (Contains all seals necessary for tubing and fittings)	1
5	7867-001	FITTING, Short, Straight Thread, with O-Ring	1
6		UTILITY SECTION (See Figure 4-6)	1
7		PRESSURE REDUCING VALVE (See Figure 4-7)	1
8		PRESSURE BUILD-UP VALVE, Solenoid Operated (See Figure 4-8)	1
		PRESSURE BUILD-UP VALVE, Mechanical (See Figure 4-9)	1
9		CARTRIDGE, Solenoid Valve (See Figure 4-5)	2
10	7869-001	FITTING, 90°, Straight Thread, with O-Ring	3
11	K-6119	FITTING, Utility Section, with gage port	1
12	K-6062	CHECK PLUG, Utility Section (See Figure 4-6)	1

ADJUSTABLE AND NON-ADJUSTABLE FITTINGS

In order to make the proper pressure and return line connections between the actuator assembly and the utility section, special fittings are used — adjustable speed control fittings, Figure 4-2, and non-adjustable fittings, Figure 4-3.

Adjustable speed control fittings are installed in the actuator housing and are connected to the return line to the utility

section. They enable the operator to adjust the speed of the spool shift in the section in which they are installed. Four configurations are available depending on application.

Non-adjustable fittings are installed in the actuator pressure line to make connections between each actuator and between the last actuator and the utility section. Non-adjustable fittings may also be used as an optional fitting where the adjustable feature in the actuator return line is not desired. Four configurations are available.

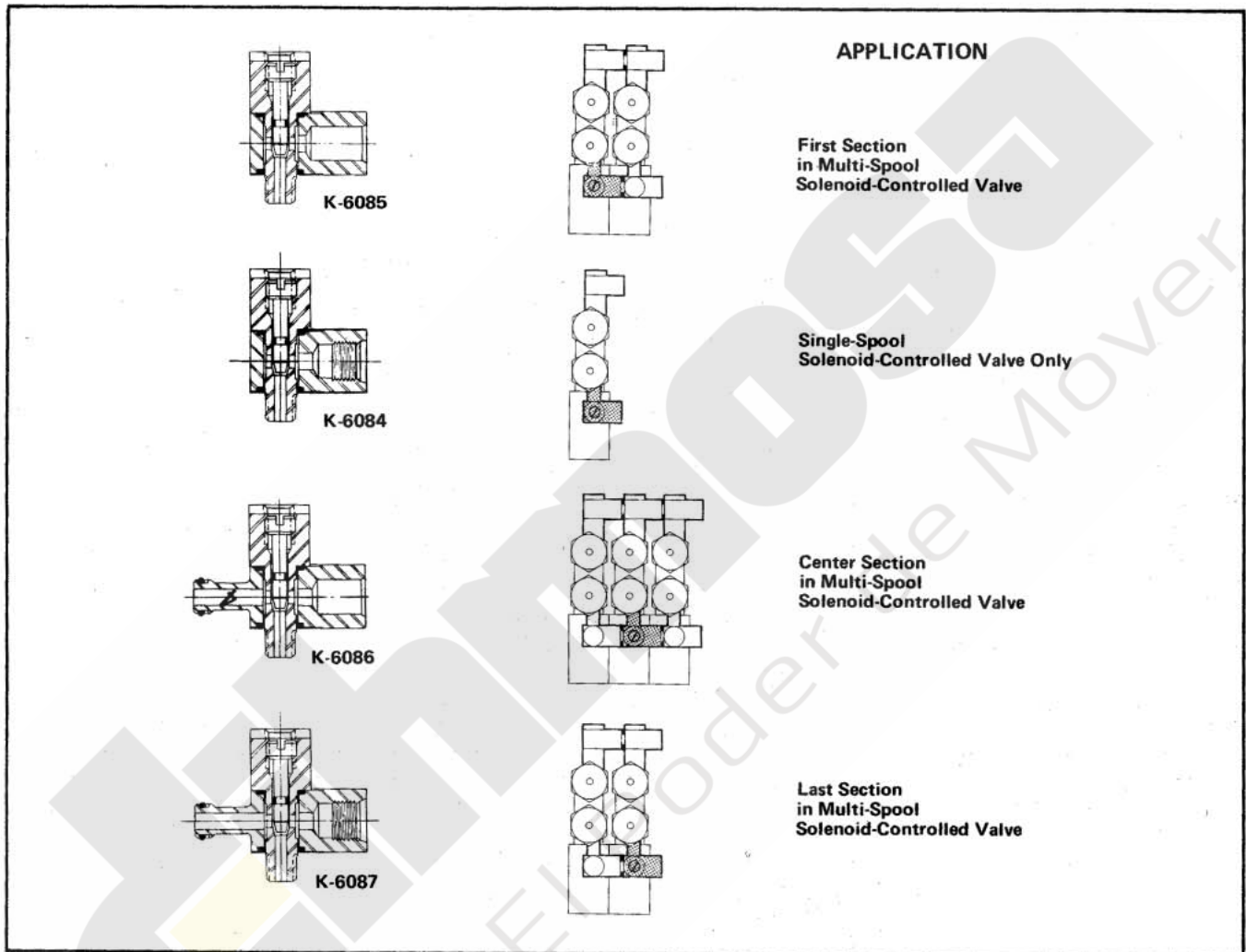


Figure 4-2. Adjustable Speed Control Fittings.

ADJUSTABLE SPEED CONTROL FITTING KITS

Item No.	Part No.	Description	Quantity
	K-6072	SEAL KIT (for items 1, 2, 3 or 4)	
1	K-6085	FITTING ASSEMBLY, Adjustable	1
2	K-6084	FITTING ASSEMBLY, Adjustable	1
3	K-6086	FITTING ASSEMBLY, Adjustable	1
4	K-6087	FITTING ASSEMBLY, Adjustable	1

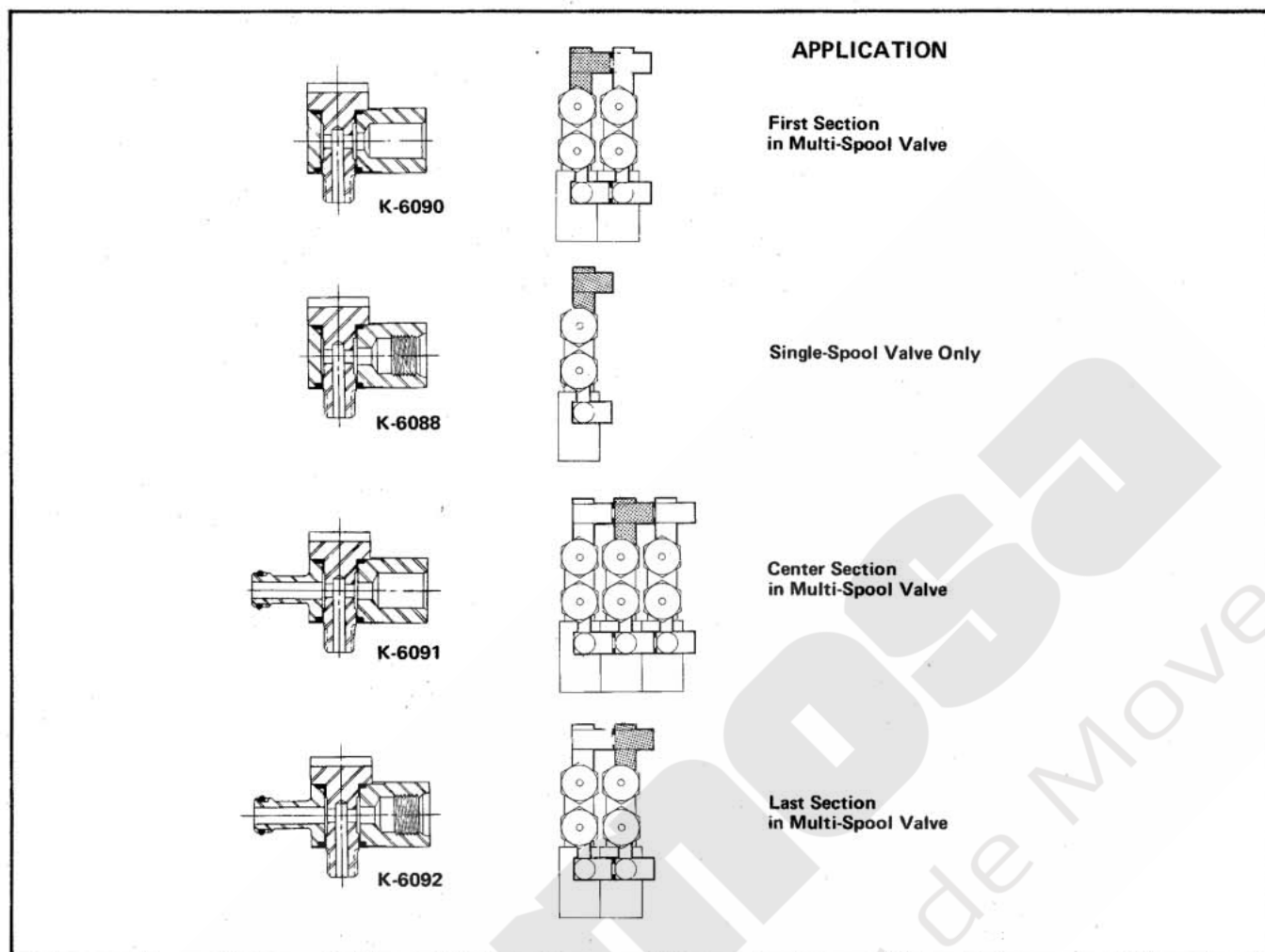


Figure 4-3. Non-Adjustable Fittings.

NON-ADJUSTABLE FITTING KITS

Item No.	Part No.	Description	Quantity
	K-6073	SEAL KIT (For items 1, 2, 3 or 4)	1
1	K-6090	FITTING ASSEMBLY, Non-Adjustable	1
2	K-6088	FITTING ASSEMBLY, Non-Adjustable	1
3	K-6091	FITTING ASSEMBLY, Non-Adjustable	1
4	K-6092	FITTING ASSEMBLY, Non-Adjustable	1

ADJUSTABLE/NON-ADJUSTABLE FITTING KITS

Each Kit contains one adjustable speed control fitting assembly and one non-adjustable fitting assembly for one actuator assembly.

K-20-S2	For the first section (closest to valve inlet) in a multi-spool solenoid valve.	K-20-S3	For the center sections in a multi-spool solenoid valve.
		K-20-S4	For the last section (closest to utility section) in a multi-spool solenoid valve.
		K-20-S1	For single-spool solenoid valve.

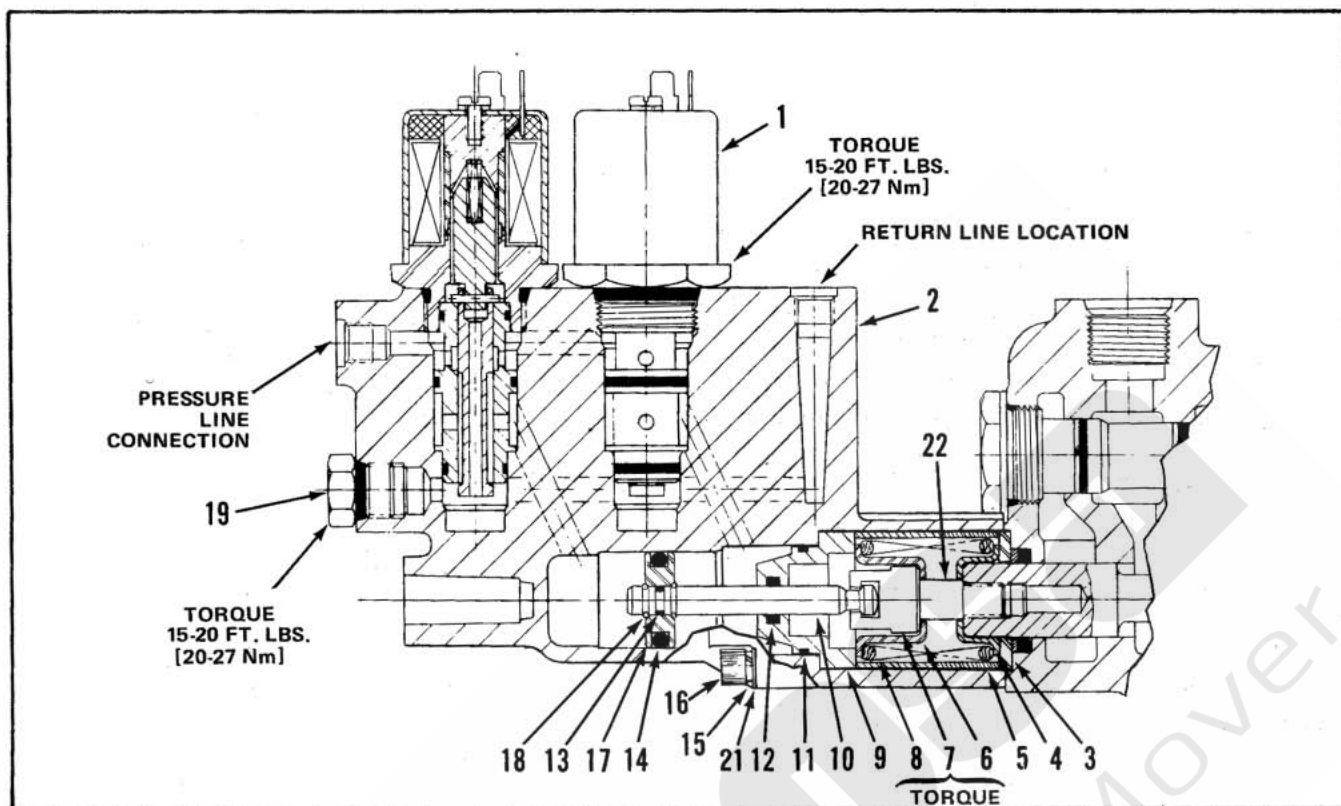


Figure 4-4. Actuator Assembly.

ACTUATOR ASSEMBLY

Item No.	Part No.	Description	Quantity
	CK-6080	REPLACEMENT KIT (Contains items 2 thru 22)	
	K-6074	SEAL KIT (Contains items 11 thru 14)	
	K-6079	PISTON KIT (Contains items 10, 13, 14, 17 and 18)	
1	CK-6083	CARTRIDGE, Solenoid Valve, 12 VDC (See Figure 4-5)	2
	CK-6093	CARTRIDGE, Solenoid Valve, 24 VDC (See Figure 4-5)	2
	CK-6169	CARTRIDGE, Solenoid Valve, 120 VAC (See Figure 4-5)	2
2	7850-001	HOUSING, Actuator	1
3	7572-001	PLATE, Seal	1
4	10816-001	COLLAR, Stop	1
5	7851-001	SLEEVE, 1.43 x 1.49 inches [36,3 x 37,8 mm]	1
6	10815-001	COLLAR, Spool Centering	1
7	11640-001*	SCREW, Spool	1
8	7853-001	SPRING, 1.250 x .156 inches [31,8 x 4,0 mm]	1
9	7858-001	GUIDE, Piston Rod	1
10	7857-001	ROD, PISTON	1
11	7028-002	SEAL, O-Ring	1
12	7854-001	SEAL, O-Ring	1
13	3191-001	SEAL, O-Ring	1
14	11779-001	SEAL, O-Ring	1
15	0563-001	WASHER, Lock	4
16	3731-111	SCREW, Socket Head Cap, 1/4-20 x 3.25	4
17	7856-001	PISTON	1
18	7855-001	RING, Retaining	2
19	3637-001	PLUG, SAE 6 (with O-Ring)	1
20	8006-001	LOCTITE TUBE, Grade 262	1
21	7904-001	BEARING PLATE	4
22	11639-001	SPACER	1

*Clean and apply Type II, Grade 0, Thread Locking Compound, item 20 (Ref. Loctite No. 262, red).

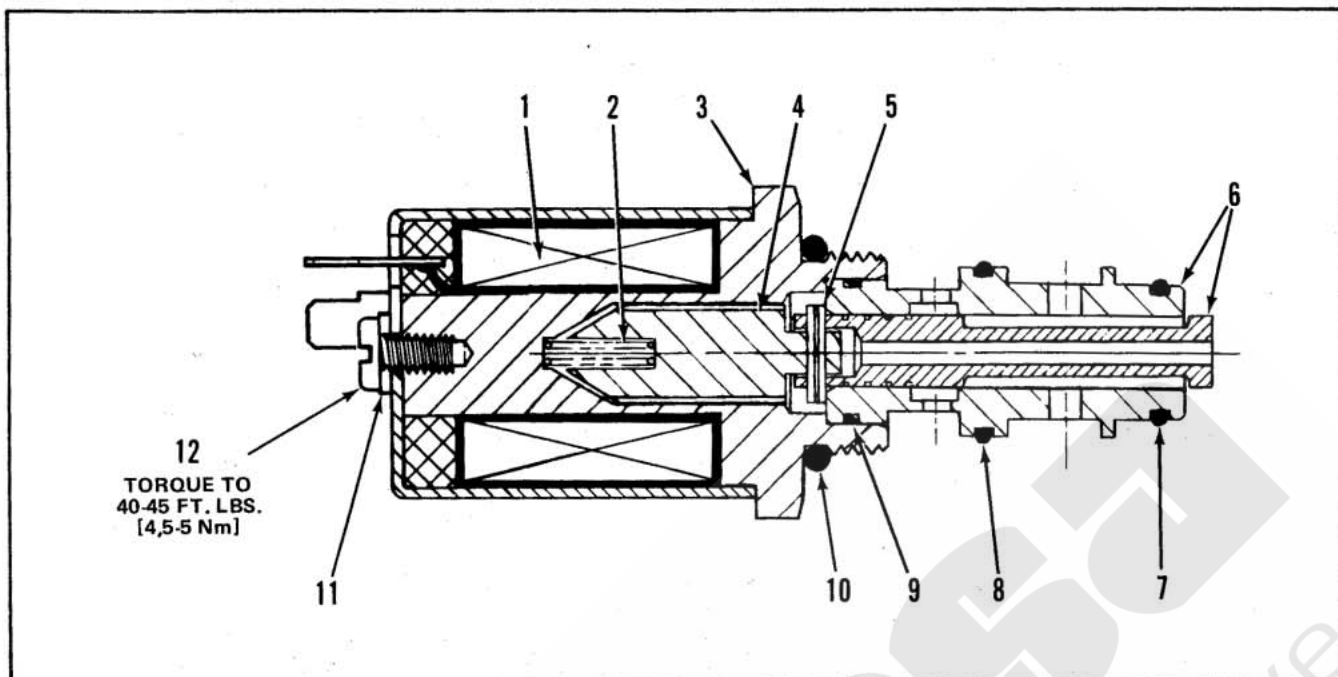


Figure 4-5. Solenoid Valve Cartridge Assembly.

SOLENOID VALVE CARTRIDGE ASSEMBLY

Item No.	Part No.	Description	Quantity
	CK-6083	REPLACEMENT ASSEMBLY, 12 VDC (Contains all items listed below)	
	CK-6093	REPLACEMENT ASSEMBLY, 24 VDC (Contains all items listed below)	
	CK-6169	REPLACEMENT ASSEMBLY, 120 VAC (Contains all items listed below)	
	K-6077	SEAL KIT (Contains items 7 thru 10)	
	K-6143	COIL KIT, 12 VDC (Contains items 1, 3 and 10)	
	K-6144	COIL KIT, 24 VDC (Contains items 1, 3 and 10)	
1	8512-001	COIL, Solenoid, 12 VDC	1
	8511-001	COIL, Solenoid, 24 VDC	1
	11430-001	COIL, Solenoid, 120 VAC	1
2	7838-001	SPRING	1
3	7840-002	CORE, Solenoid	1
4	8515-001	PLUNGER, Solenoid	1
5	7846-001	PIN, Spring	1
6	8507-001	SPOOL and SLEEVE ASSEMBLY	1
7	7829-001	SEAL, O-Ring	1
8	1910-001	SEAL, O-Ring	1
9	6839-001	SEAL, O-Ring	1
10	2708-001	SEAL, O-Ring	1
11	7837-001	WASHER, Lock	1
12	7836-001	SCREW, Pan Hd, No. 10-24 x .31 inch long	1

See Note

Not Sold Separately Order Seal Kit No. K-6077

Note: Items 2 thru 6 are matched parts and are not sold separately.

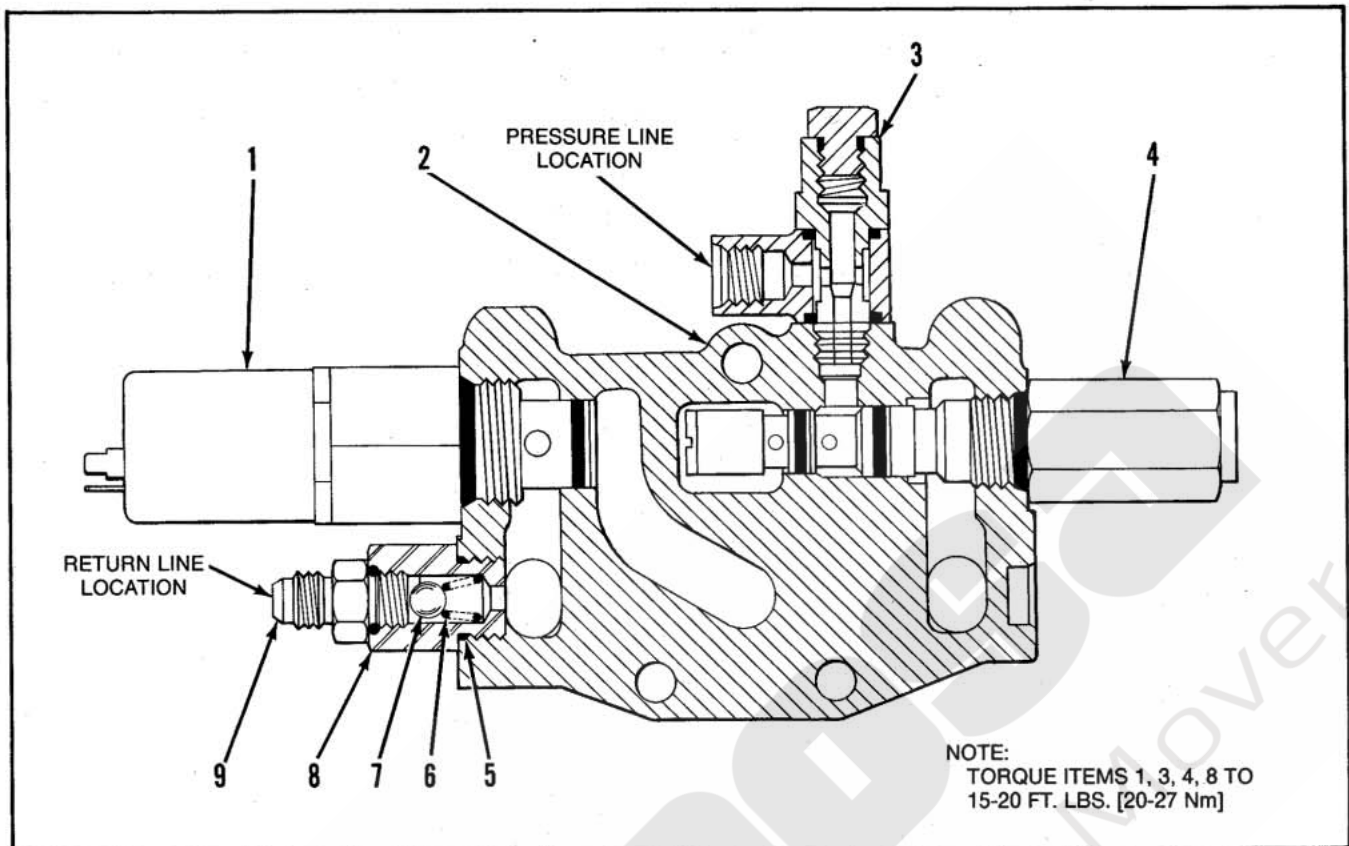


Figure 4-6. Utility Section Assembly

UTILITY SECTION ASSEMBLY

Item No.	Part No.	Description	Quantity
1	K-6062	CHECK VALVE KIT (Contains items 5 thru 9) PRESSURE BUILD-UP VALVE, Solenoid Operated (See Figure 4-8) PRESSURE BUILD-UP VALVE, Mechanical (Not Shown) (See Figure 4-9)	1 1 1
2	7820-001	HOUSING, Utility Section	1
3	K-6119	FITTING, Utility Section, with gage port	1
4		PRESSURE REDUCING VALVE (See Figure 4-7)	1
5	2706-001*	SEAL, O-Ring	1
6	7833-001	SPRING, Conical	1
7	3269-001	BALL, Steel	1
8	7832-001	BODY, Check	1
9	7867-001	FITTING, Short, with O-ring	1

Not sold separately. Order K-6062

*Buna-N seals standard for all Gresen valve assemblies. For Viton seals contact the factory.

The following Kits are available:

CK-6095	Utility Section, Complete, 12 VDC	CK-6116	Utility Section, Complete with SAE 12 (1-1/16"-UN) Power Beyond Sleeve
CK-6096	Utility Section, Complete, 24 VDC	CK-6120	Utility Section, Complete with 3/4"-14 NPT Power Beyond Sleeve
CK-6180	Utility Section, Complete with Mechanical Pressure Build-up Valve	K-20-S12-Y	Power Beyond Sleeve, SAE 12 (1-1/16"-UN), with seals
CK-6115	Utility Section, Complete with Closed Center Plug	K-20-S75-Y	Power Beyond Sleeve, 3/4"-14 NPT, with seals
		K-20-SC	Closed Center Plug, with seals

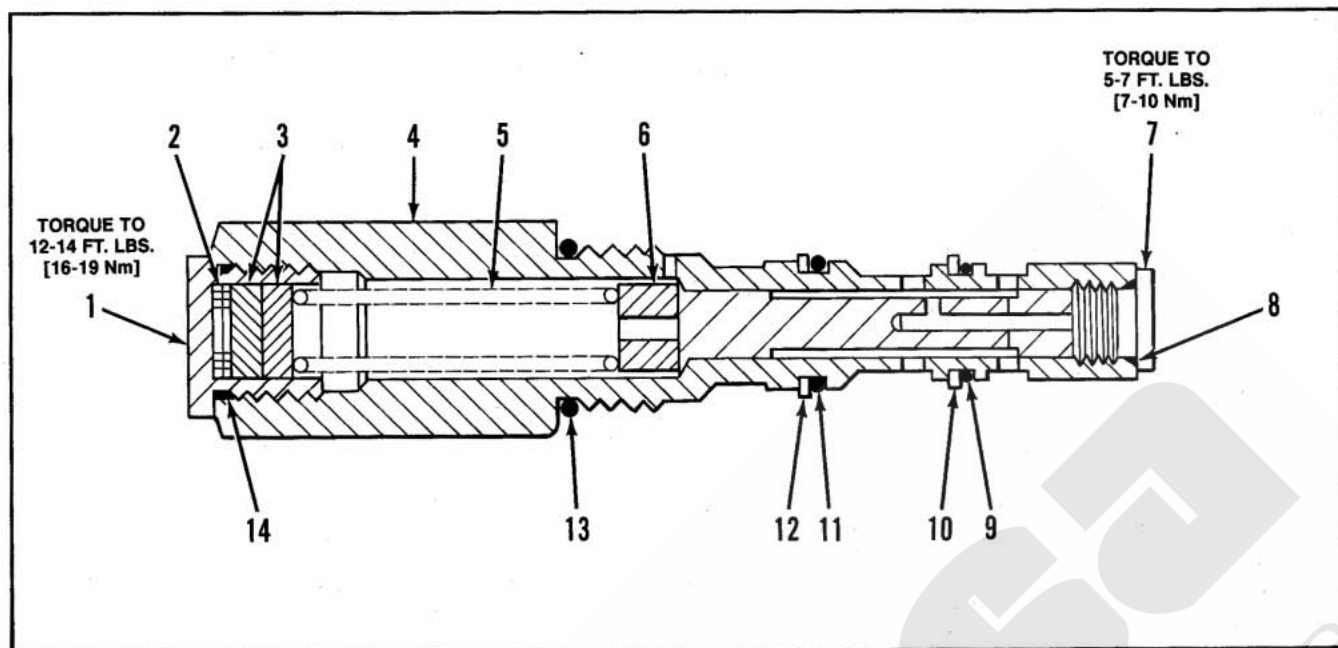


Figure 4-7. Pressure Reducing Cartridge Assembly.

PRESSURE REDUCING CARTRIDGE ASSEMBLY

Item No.	Part No.	Description	Quantity
	CK-28096	REPLACEMENT KIT, 300 PSI (Contains all items listed below)	
	K-28078	SEAL KIT (Contains items 8 thru 14)	
1	11381-001	PLUG, SAE 8	1
2	0462-001	SHIM (.010 inch [0,25 mm] thick)	A/R
	0459-001	SHIM (.020 inch [0,5 mm] thick)	A/R
3	11417-001	SPACER (Not required for 300 PSI assembly)	A/R
4	11384-001	BODY ASSEMBLY	1
5	3458-001	SPRING	1
6	11383-001	SPACER	1
7	9435-104	PLUG, SAE 4	1
8	7830-001*	SEAL, O-Ring	1
9	1091-001*	SEAL, O-Ring	1
10	0682-001	RING, Back-up, Cut	1
11	7829-001*	SEAL, O-Ring	1
12	3092-001	RING, Back-Up Cut	1
13	2707-001*	SEAL, O-Ring	1
14	2706-001*	SEAL, O-Ring	1

} Not sold separately Order K-28078

*Buna-N seals are standard for all Gresen valve assemblies. For Viton seals contact the factory.

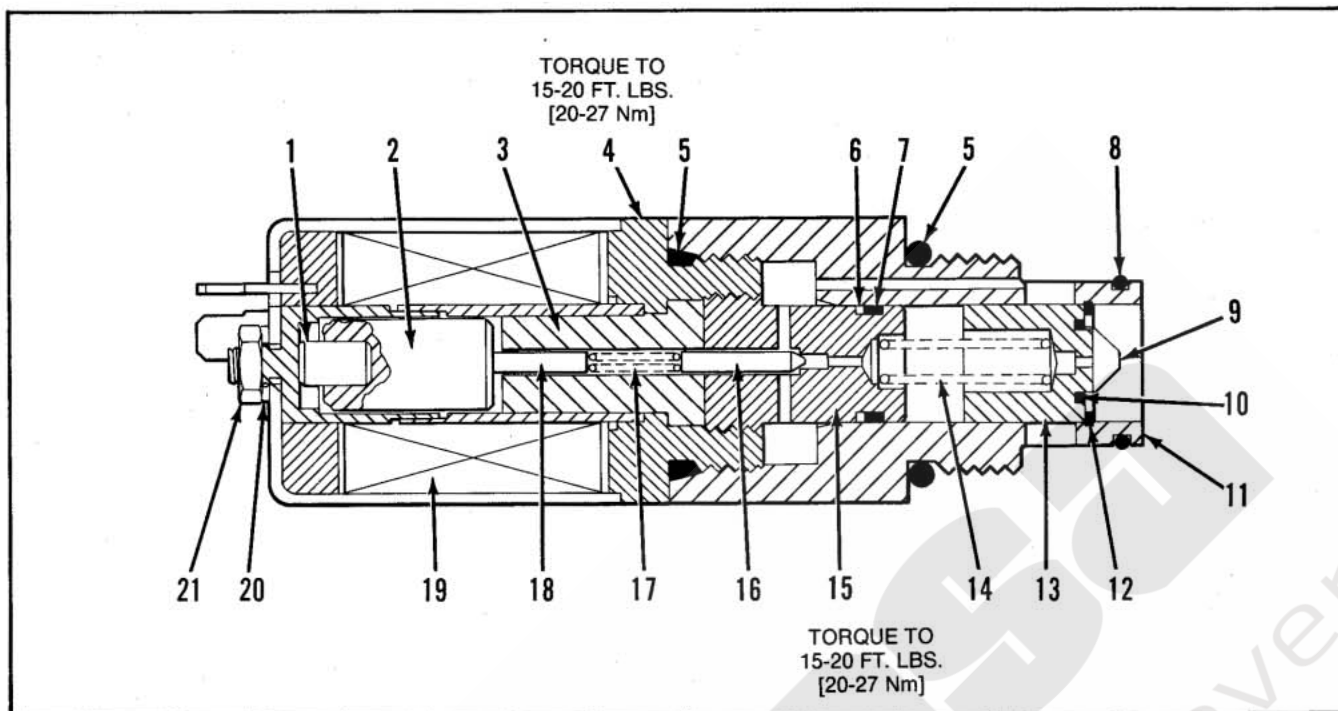


Figure 4-8. Solenoid Operated Pressure Build-Up Valve Assembly.

SOLENOID OPERATING PRESSURE BUILD-UP VALVE ASSEMBLY

Item No.	Part No.	Description	Quantity
	CK-6177	REPLACEMENT KIT, 12 VDC (Contains all items listed below)	
	CK-6178	REPLACEMENT KIT, 24 VDC (Contains all items listed below)	
	K-6184	SEAL KIT (Contains items 5 thru 10)	
1	10723-001	PIN	1
2	10724-001	PLUNGER, Flat Faced	1
3	10725-001	POLE, Solenoid	1
4	10718-001	CORE, Solenoid	1
5	6277-001*	SEAL, O-Ring	2
6	0682-001	RING, Back-Up, Cut	1
7	9002-014*	SEAL, O-Ring	1
8	9002-018*	SEAL, O-Ring	1
9	11671-001	SCREEN, Filter	1
10	11199-001	RING, Retaining	1
11	11804-001	BODY	1
12	1649-001	RING, Retaining	1
13	11803-001	PISTON	1
14	1266-001	SPRING	1
15	11805-001	SEAT	1
16	10727-001	POPPET	1
17	8417-001	SPRING	1
18	10728-001	PIN	1
19	8512-001	COIL, 12 VDC	1
	8511-001	COIL, 24 VDC	1
	11430-001	COIL, 120 VAC	1
20	7837-001	WASHER, Lock	1
21	9300-003	NUT, Hex Jam, #10-32	1

Not Sold Separately. Order K-6184

*Buna-N seals are standard for all Gresen valve assemblies. For Viton seals contact the factory.

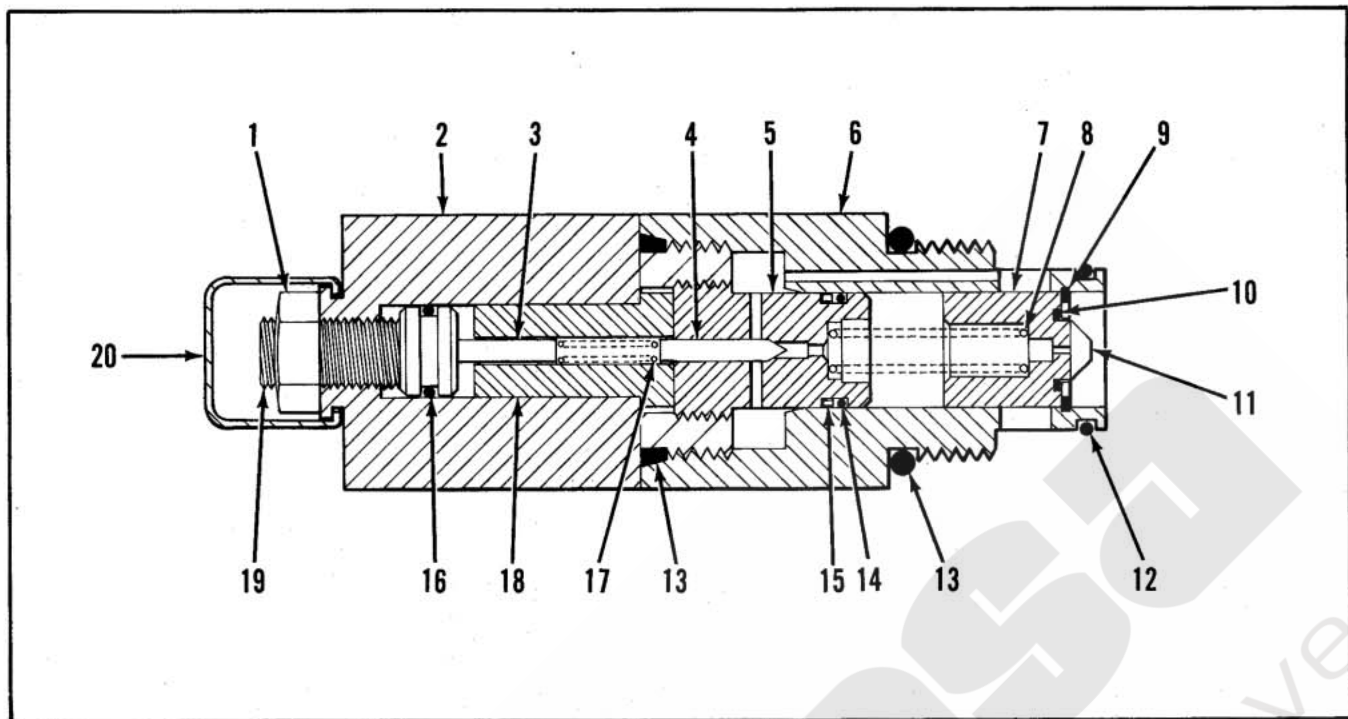


Figure 4-9. Mechanical Pressure Build-Up Valve Assembly.

MECHANICAL PRESSURE BUILD-UP VALVE ASSEMBLY

Item No.	Part No.	Description	Quantity
	CK-6179	REPLACEMENT KIT, Adjustable (Contains all items listed below except item 20)	
	K-6188	SEAL KIT, (Contains items 10 thru 16)	
1	9302-006	NUT, Hex Jam, 3/8-24	1
2	11138-001	BODY	1
3	10728-001	PIN	1
4	10727-001	POPPET	1
5	11805-001	SEAT	1
6	11804-001	BODY	1
7	11803-001	PISTON	1
8	1266-001	SPRING	1
9	1649-001	RING, Retaining	1
10	11199-001	RING, Retaining	1
11	11671-001	SCREEN, Filter	1
12	9002-018*	SEAL, O-Ring	1
13	6277-001*	SEAL, O-Ring	2
14	9002-014*	SEAL, O-Ring	1
15	0682-001	RING, Back-Up, Cut	1
16	6884-001*	SEAL, O-Ring	1
17	8417-001	SPRING	1
18	10725-001	POLE	1
19	11816-001	PISTON, Adjusting	1
20	10034-001	COVER, Tamperproof (Used on tamperproof model only)	1

Not sold separately. Order K-6188

*Buna-N seals are standard for all Gresen valve assemblies. For Viton seals contact the factory.

Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges

paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights. If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

9/91-P



phnmosa
El Poder de Mover



Parker Hannifin Corporation
Hydraulic Valve Division
520 Ternes Avenue
Elyria, Ohio, USA 44035
Tel: (440) 366-5200
Fax: (440) 366-5253
www.parker.com/hydraulicvalve

Bulletin HY14-2705-M5/US,
5C, 9/03, PHD