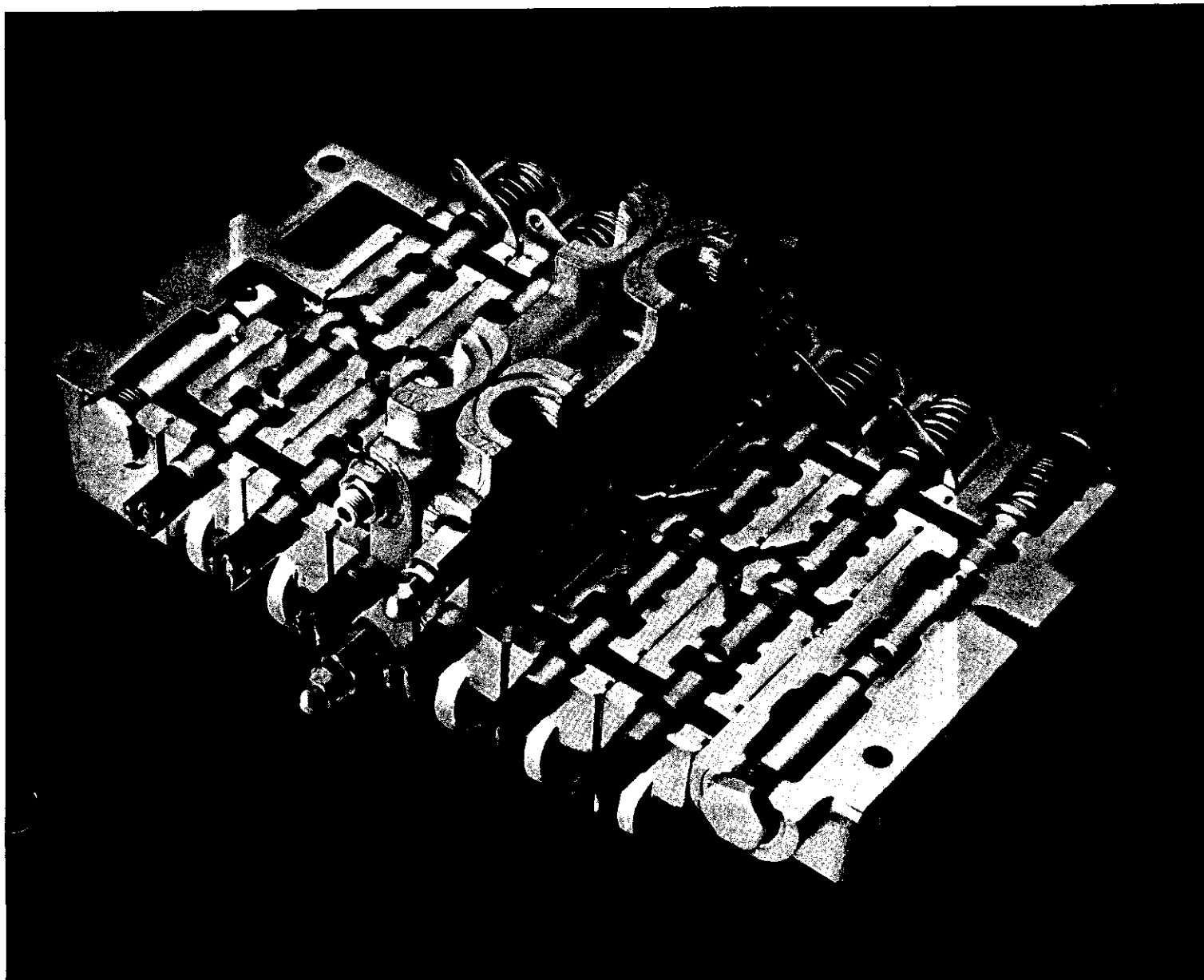


*A20™/A35™
Directional Control
Valve Service
Instructions*



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This manual has been prepared to assist you in the proper maintenance of Commercial Shearing's A20 and A35 directional control valves. To facilitate repairs — and before any work is done — we suggest that you read these disassembly and assembly instructions completely.

general information

All A-line valve components, except spools and housings, are available as replacement parts or subassemblies. Spools are hone-fitted to their individual housings. Therefore, damage to either of these components means the entire section must be replaced.

Dirt is the natural enemy of any hydraulic system. The first rule of good maintenance is cleanliness, including the work environment. **MAKE SURE YOU DISASSEMBLE AND ASSEMBLE YOUR HYDRAULIC EQUIPMENT IN A CLEAN AREA.**

genuine parts

The illustrations in this manual and instructions which refer to them, apply only to Commercial Shearing assemblies, sub-assemblies and components.

We recommend that you use only original CSI replacement parts in your service program. Manufactured on the same production lines to the same exacting tolerances and quality controls as the original equipment, genuine Commercial Shearing replacement parts are your best hedge against premature component failure and costly downtime.

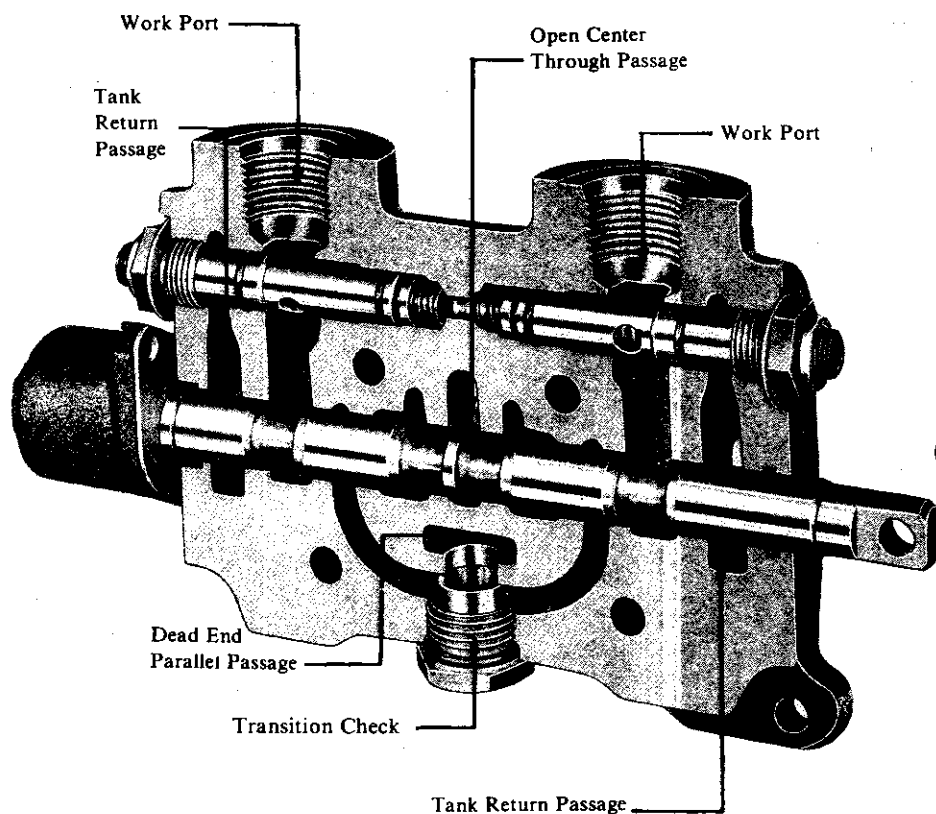
Service parts and assemblies are available through your original equipment dealer or any authorized Commercial Shearing distributor. Write Commercial Shearing, Inc., P.O. Box 239, Youngstown, OH 44501 for a listing of authorized distributors.

description

Commercial's A20 and A35 open-center, directional control valves are designed for use in either parallel or series circuits. They are of sectional, or stack-type construction which permits additional work sections to be added to the valve bank. This design also makes possible the combination of sections for parallel or series hydraulic circuits in a single bank. The type of circuit will determine the internal coring of the valve sections and the number of gasket seals required. All sections with optional features such as port relief valves, crossover reliefs and anti-cavitation checks are dimensionally larger as measured from the top of the port to the bottom of the housing. These are referred to as hi-boy sections. Those without, are low profile or lo-boy sections.

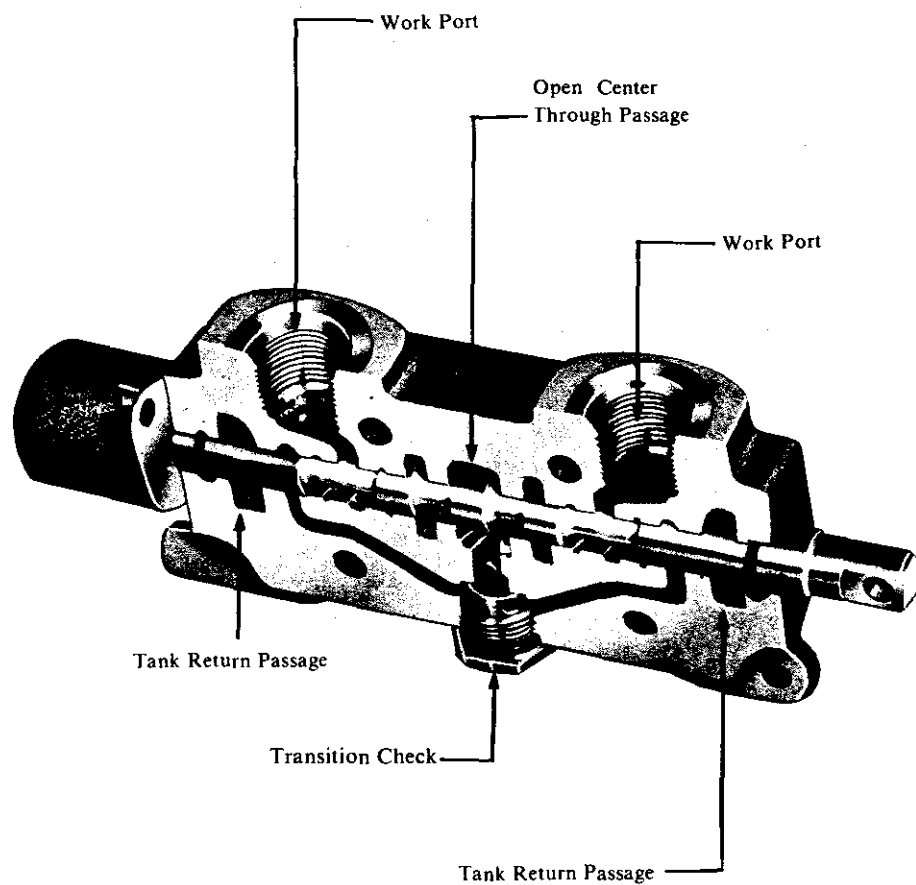
types of profile

hi-boy



Parallel Circuit

lo-boy



Series Circuit

Remove the valve bank from the equipment and thoroughly clean its exterior surfaces before beginning disassembly. Mark each section in sequential order from inlet to outlet to ensure that it will be properly reassembled. If individual sections are to be disassembled, tag each spool with the number of the section from which it was taken. Spools are hone-fitted to their housings and are not interchangeable. All work should be performed in a clean area.

Figure 1 illustrates the proper relationship of parts in a typical valve bank, and should be used as a guide for reassembly.

disassembly

1. **Control Handles** — Remove all control handles and linkage connectors attached to the spool clevis.

2. **Tie Bolts** — Remove the four tie bolts which hold the bank together, and separate the sections.

3. **Valve Backcap** — Remove the two screws (Item 2, figure 1) which fasten the backcap to the housing and remove the backcap.

4. **Valve Spool** — Grasp the spring end of the spool with a clean rag and pull the spool from the housing with a steady, twisting motion.

The retaining plate, back-up ring and spool seal (Items 6, 7, 8) will generally come out with the spool. **CAUTION:** For detented spool models, be careful not to remove the detent poppet sleeve (Item 9) unless it is to be serviced. Without the sleeve, the spring-loaded steel balls (Item 12) can pop free and be lost.

5. **Spool Seals** — Remove and discard rubber spool seals.

6. **Centering Spring and Spring Guides** — These parts should not be removed from the spool unless they are to be replaced. Once the spool is free of the housing, it must be carefully handled to avoid damage. If it is necessary to remove the spring, place the spool in a soft-jawed vise and remove the stripper bolt with a wrench. (Note: **Cautious** application of heat may be required to free the stripper bolt or detent retainer as an anaerobic thread adhesive is used in their assembly.)

7. **Detent Sleeve, Spring and Steel Balls** — Remove items 9, 11, and 12 by placing a rag around the sleeve to keep the parts from springing loose, and pulling firmly to free them from the poppet retainer.

cleaning, inspection and repair

1. Inspect the spool bores and spools for deep scratches, gouges or excessive wear. If any of these conditions exist, replace the section. Minor surface damage on the spool may be polished away with very fine crocus cloth.

2. Examine the machined surfaces of the valve housings for nicks or burrs that could cause leakage between sections. Lightly stone these surfaces to remove any rough spots.

CAUTION: A shallow, machined relief band extends across the "O" ring face of the valve housing and should not be stoned or ground off.

3. Wash all parts thoroughly in clean solvent and blow dry before beginning reassembly.

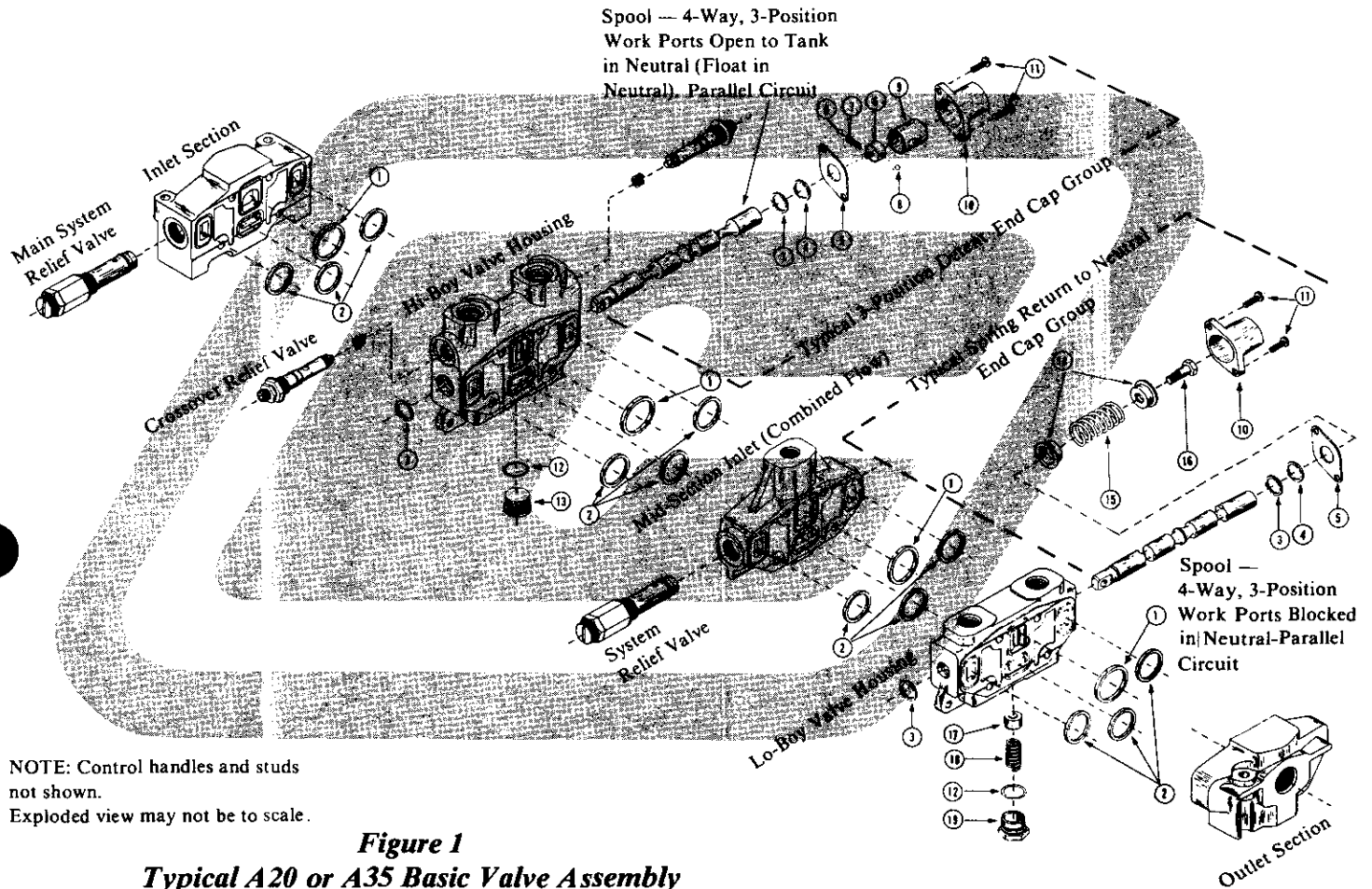
assembly

1. **Centering Spring and Detent Mechanism** — Clamp the spool in a soft-jawed vise. Apply a small amount of Loctite™ 262 or equivalent anaerobic adhesive to the stripper bolt (Item 3) before assembly. Note: Follow the adhesive manufacturer's instructions for proper curing. Assemble the spring (Item 5) spring guide, (Item 4) and stripper bolt (Item 3) on the spool. The detent poppet retainer (Item 10) is assembled in similar fashion.

2. **Valve Section Assembly** — Apply a light coating of clean hydraulic oil to the valve spool. Place the retaining plate (Item 6), back up ring (Item 7) and spool seal (Item 8) over the spool. These items rest against the spring guide or poppet retainer in the order illustrated in figure 1. Install the spool seal (Item 8) into the groove at the clevis end of the valve body. Carefully insert the spool into the housing. The spring and spring guides should be lightly coated with a high temperature grease to prevent rusting. The detent mechanism should be packed with a high temperature, extreme pressure grease for lubrication and ease of operation. Place Loctite™ 262 or its equivalent on the valve cap screws prior to attaching the cap to the valve body.

3. **Valve Bank Assembly** — Coat the section seals (Items 13 and 14) with grease to help keep them in place during assembly. Place the valve sections on the tie bolts in their numbered sequence. **Torque the tie bolt nuts to 29 ft. lbs. for A20 models, 33 ft. lbs. for A35 models.**

parts list



NOTE: Control handles and studs not shown.
Exploded view may not be to scale.

Figure 1
Typical A20 or A35 Basic Valve Assembly

			Model							Model			
			A20		A35					A20		A35	
Item	Description	Req'd.	Part Number	Engineering Number	Part Number	Engineering Number	Item	Description	Req'd.	Part Number	Engineering Number	Part Number	Engineering Number
1	Section Seal	1	391 2881 200	L3006-106	391 2881 403	AC3006-133	10	End Cap	1	341 6000 100	AN1311	342 6000 100	AH1311
1a†	Section Seal	1	391 2881 627	AC3006-140	391 2881 628	AC3006-145	11	Fillister Head Screw	2	391 1433 020	X45-20	391 1433 009	X45-9
2	Section Seal	3	391 2881 206	L3006-112	391 2881 200	L3006-106	12	O-Ring Seal	1	391 2881 207	L3006-113	391 2881 095	L3006-1
2a†	Section Seal	2	391 2881 206	L3006-112	391 2881 200	L3006-106	13	Plug	1	391 0581 030	---	391 0581 031	---
3	Spool Seal	2	391 1985 014	MA3006-14	391 2881 101	L3006-7	14	Spring Guide	2	341 1642 045	GA1023	391 1642 013	DA1023
4	Back-up Ring	1	391 2681 007	UI352-1	391 2681 001	SI352-1	15	Spring	1	391 3581 212	A1327-218	391 3581 124	A1327-129
5	Retaining Plate	1	391 2183 001	RA1532	391 2183 005	P1532	16	Stripper Bolt	1	391 1432 022	H1048	311 1432 021	G1048
6	Detent Poppet Retainer	1	391 2583 008	X1182	391 2583 006	V1182	17	Check Valve Poppet	1	391 2483 030	VA1530	391 2481 003	C1530-3
7	Poppet Spring	1	391 3531 130	X1327-135	391 3581 015	A1327-15	18	Check Valve Spring	1	391 3581 128	A1327-133	391 3581 114	A1327-119
8	Steel Ball	2	391 0282 010	X53-10	391 0282 009	X53-9	19	Check Valve Cap	1	391 0581 001	BB1021	391 0581 004	M1021
9	Detent Poppet Sleeve	1	391 3283 015	K1317	391 3283 008	G1317							

*Quantity required for one valve section.

†For series sections, substitute item 1a and 2a for items 1 and 2 (Not illustrated on Figure 1).

pilot operated endcaps

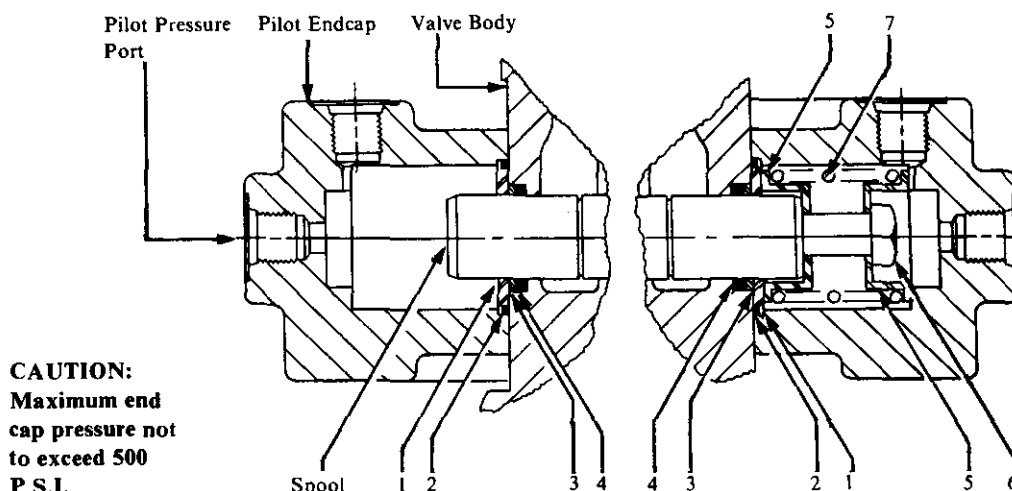


Figure 2 — Pilot Endcaps

Item	Description	† Req'd.	Model			
			A20 Engineering Number	Part Number	A35 Engineering Number	Part Number
1	Seal retainer plate	2	Z1352	391 2184 003	DA1352	391 2184 001
2	O-ring seal	2	L3006-148	391 2881 242	L3006-149	391 2881 243
3	Back-up ring	2	U1352-1	391 2681 007	S1352-1	391 2681 001
4	Spool seal	2	MA3006-14	391 1985 014	L3006-7	391 2881 101
5	Spring guide	2	GA1023-2	391 1642 019	DA1023	391 1642 013
6	Stripper bolt	1	H1048	391 1432 022	G1048	391 1432 021
7	Centering spring	1	A1327-218	391 3581 212	A1327-129	391 3581 124
*8	Socket head cap screw	4	X79-84	391 1402 084	X79-29	391 1402 029

* Not shown.

† Quantity required for one valve section.

Pilot operated valves are shifted by the application of hydraulic pressure to either end of the spool. The standard configuration is furnished with spring return to neutral. Each end of the valve section has an oil tight cap enclosing the spool end. Hydraulic pressure applied

to the spool end forces the spool to move from neutral to a work position.

Figure 2 illustrates the arrangement of the parts in the pilot operated valve endcaps. The pilot endcaps may be serviced by first removing the two (2) cap

screws (item 8) which hold them to the valve housing, thus allowing access to the spool seals, centering spring and endcap seals. Repair procedures are outlined in the section titled Overhaul (page 4).

system overload relief valve

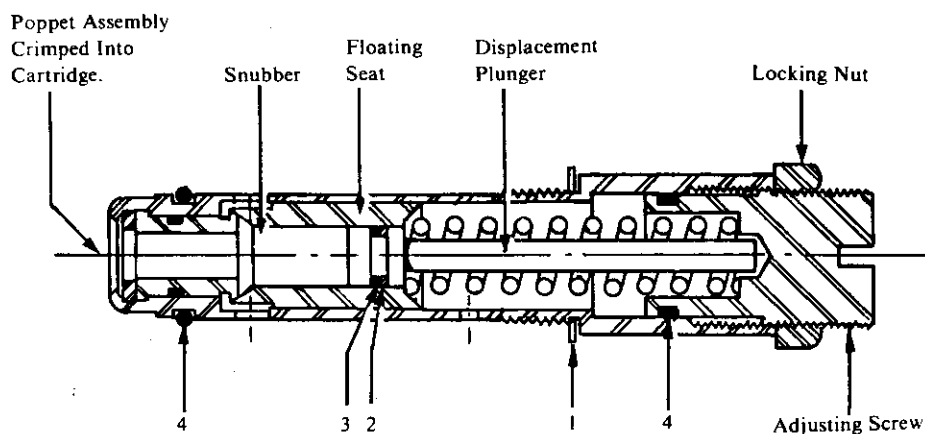


Figure 3
A20 Main Relief Valve Assembly — DZ6625K
A35 Main Relief Valve Assembly — BL6625K

Item	Description	Req'd	Model			
			A20	A20	A35	A35
			Engineering Number	Part Number	Engineering Number	Part Number
1	Gasket washer	1	B1025-13	391 1583 013	B1025-12	391 1583 012
2	Back-up ring	1	J3010-6	391 2681 163	J3010-8	391 2681 165
3	O-ring	1	L3006-62	391 2881 156	L3006-43	391 2881 137
4	O-ring	2	UA3006-13	391 2881 332	R3006-7	391 2881 260

The main relief valve protects the hydraulic system against overload pressures. Figure 3 illustrates the arrange-

ment of the parts and serviceable seals. This is a cartridge-type relief valve and

is removed from the control valve as an assembly for replacement or service.

cylinder port relief valve

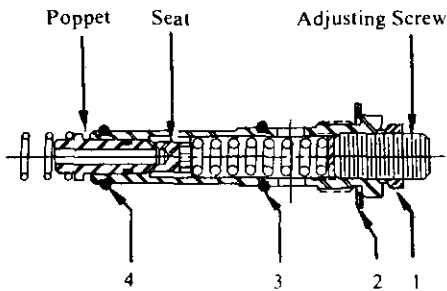


Figure 4

Cylinder Port Relief Valve Assembly — CA6625K

Item	Description	Req'd.	Engineering Number	Part Number
1	Tru-seal locknut	1	X146-4	391 1464 104
2	Gasket washer	1	B1025-7	391 1583 007
3	O-ring	1	UA3006-44	391 2881 363
4	O-ring	1	UA3006-5	391 2881 324

The cylinder port relief valve normally functions when the valve spool is in the neutral position. Fluid is discharged from the cylinder port to the tank return passage of the valve section. The pressure setting is normally higher than that of the main relief valve.

crossover relief valve

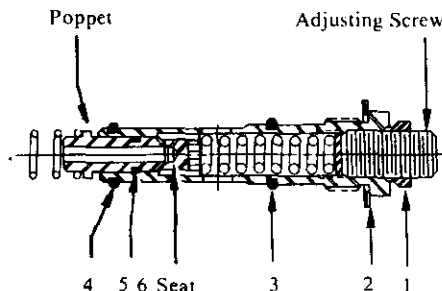


Figure 5

Crossover Relief Assembly — BX6625K

Item	Description	Req'd.	Engineering Number	Part Number
1	Tru-seal locknut	1	X146-4	391 1464 104
2	Gasket washer	1	B1025-7	391 1583 007
3	O-ring	1	UA3006-44	391 2881 363
4	O-ring	1	UA3006-43	391 2881 362
5	O-ring	1	UA3006-5	391 2881 324
6	O-ring	1	L3006-40	391 2881 134

The crossover relief valve protects circuit components from pressure due to over-running loads when the control valve spool is returned to neutral. Excessive pressure is relieved by venting oil from one work port to the other via a specially drilled passage in the valve section.

anti-cavitation check valve

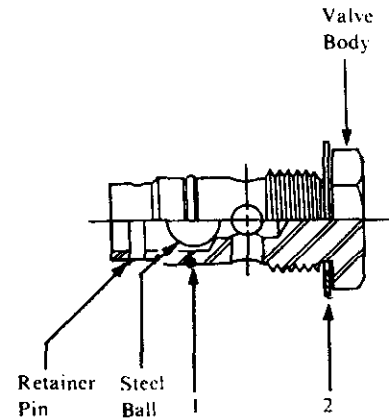


Figure 6

Anticavitation Check Valve — D1043

Item	Description	Req'd.	Engineering Number	Part Number
1	O-ring	1	L3006-114	391 2881 208
2	Gasket washer	1	B1025-7	391 1583 007

The anti-cavitation vacuum check is used to avoid cavitation in cylinders. When pressure in a cylinder port falls below the pressure in the tank return passage, make-up oil can flow to the cylinder port through the unseated anti-cavitation check valve.

Trouble	Probable Cause	Remedy
Oil leaks between sections	Pinched or blown section seal	Replace seal
	Stud fasteners not correctly torqued	Replace seals and re-torque
	Mounting plate not level.	Loosen mounting bolts and shim as required
Oil leaks at either end of spool	Worn or damaged spool seals	Replace seals
Spring centered spools do not return to neutral	Broken centering spring	Replace
	Misalignment of operating linkage.	Check linkage for mechanical binding
	Foreign particles in system	Clean valve and system
Load will not hold	Cylinder leaking or worn	Check cylinder—repair
	Port relief valve not holding	Remove and clean or replace
	Spool or housing scored or worn excessively	Replace section
Load drops when spool moved from neutral	Dirt or foreign particles lodged between check valve poppet and seat	Disassemble, clean and reassemble.
	Scored or sticking check valve poppet	Replace poppet
Detent spools won't stay in detent position	Worn detent poppet sleeve	Replace sleeve
	Weak or broken poppet spring	Replace spring
No motion, slow or erratic system operation	Worn pump	Check flow and pressure
	Defective cylinder or motor	Repair or replace
	Low reservoir oil level	Add oil to specs.
	Clogged suction strainer	Clean or replace
	Suction line restricted	Check lines
	Relief valve not properly set	Check pressure setting
	Relief valve poppet or seat scored & sticking	Replace relief valve
	Valve spool not shifted to full stroke	Check spool and linkage travel



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