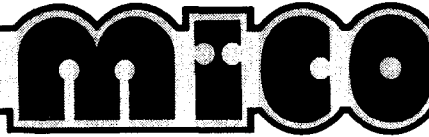


20 GPM Single  
**ACCUMULATOR  
CHARGING  
VALVE**

**SERVICE MANUAL**



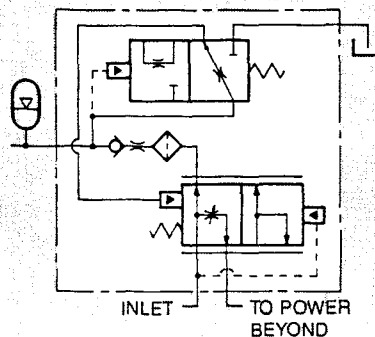
1911 Lee Boulevard / P.O. Box 2118  
North Mankato, Minnesota U.S.A. 56002-2118  
Telex: 910-565-2444(MICO INC)  
Fax: (507) 625-3212  
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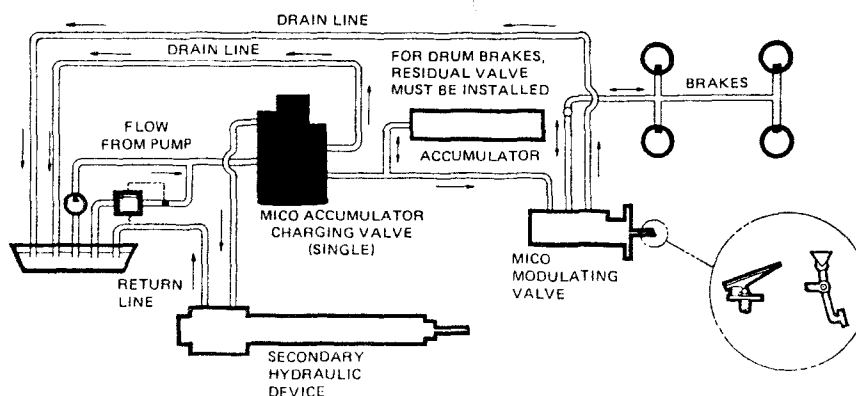
701 East Francis Street / P.O. Box 9058  
Ontario, California U.S.A. 91762-9058  
Telex: 510-600-0132(MICO WEST CA)  
Fax: (714) 947-6054  
Phone: (714) 947-4077



# SINGLE accumulator charging valve



**TYPICAL SYSTEM AS USED IN A BRAKE CIRCUIT**  
Figure 1



## REPRESENTATIVE PERFORMANCE DATA

System pressure	to 3,500 psi
Flow thru capacity	2 - 20 gpm
Flow thru pressure drop	70 psi at 15 gpm
Accumulator pressure, maximum	to 3,000 psi
Accumulator charging rate	0.5 to 3.2 gpm at 1,000 psi (in three ranges)
Accumulator capacity	Determined from brake line pressure, displacement and number of off power emergency brake applications.

Technical Data for any specific model furnished upon request.

# DESCRIPTION AND OPERATION OF THE MICO SINGLE ACCUMULATOR CHARGING VALVE

The MICO Single Accumulator Charging Valve is designed for installation in an open center hydraulic system between the pump and its relief valve and the downstream secondary hydraulic devices; for example, a power steering control valve and cylinder installed in the same hydraulic circuit (see Typical System Schematic - Figure 1).

The charge valve supplies oil to an accumulator from an open center circuit on demand. This is accomplished at a preset rate (gpm) at a selected pressure and is relatively constant within the preset pressure limits.

The flow to the downstream secondary hydraulic devices will be reduced fractionally for a short time when the accumulator is charging. This does not noticeably affect the operation of these components. Full system pressure is available to the downstream secondary hydraulic devices at all times provided oil delivery and pressure from the pump and relief valve are not impeded.

The accumulator charging flow rates and upper and lower accumulator pressure limits are set at the time of manufacture. Various charge rates, high and low limit settings, and band widths between high and low limits are available to conform to specific customer requirements.

An internal filter is incorporated in the charge valve through which all the oil must flow that is used in the accumulator. Hydraulic system cleanliness and adequate circuit filtration is imperative in any hydraulic system. Therefore, 10 micron filtration is desired. The internal filter can also be removed in certain applications where additional filtration is not required.

System schematics of the internal circuitry and individual component function under typical conditions of operation are shown and described below.

When the accumulator is charged above its lower limit, the CHARGING VALVE SPOOL is held against the SPOOL STOP by normal system back pressure through drilled passage which directs the pressure to one end of the spool. The LOWER LIMIT CHECK BALL is held on its seat by accumulator pressure.

When the pressure in the accumulator reaches its lower limit, the PILOT VALVE SPRING will unseat the LOWER LIMIT CHECK BALL and, at the same time, seat the UPPER LIMIT CHECK BALL. The PILOT VALVE SPOOL permits only one of these balls to be seated at any time. When the LOWER LIMIT CHECK BALL is unseated, pressure from the accumulator enters the chamber back of the CHARGING VALVE SPOOL. This allows the CHARGING VALVE SPRING and the accumulator hydraulic force to balance the hydraulic force due to the pump pressure acting on the opposite end of the CHARGING VALVE SPOOL. This means that the pump pressure is always higher than the accumulator pressure which causes the accumulator to charge. The rate at which the accumulator is charged depends on the orifice in the CHECK VALVE SEAT. When the accumulator is charged to its high limit, this pressure will unseat the UPPER LIMIT CHECK BALL and seat the LOWER LIMIT CHECK BALL. When the UPPER LIMIT CHECK BALL is unseated, the pressure in the chamber back of the CHARGING VALVE SPOOL is allowed to flow to return; thus permitting the CHARGING VALVE SPOOL to unload the pump. When the operating pressure in the system is greater than the pressure in the accumulator, the CHECK VALVE at the accumulator charging orifice forced off its seat; thus charging the accumulator to system pressure without the aid of the charging valve.

## CHARGING VALVE SCHEMATICS

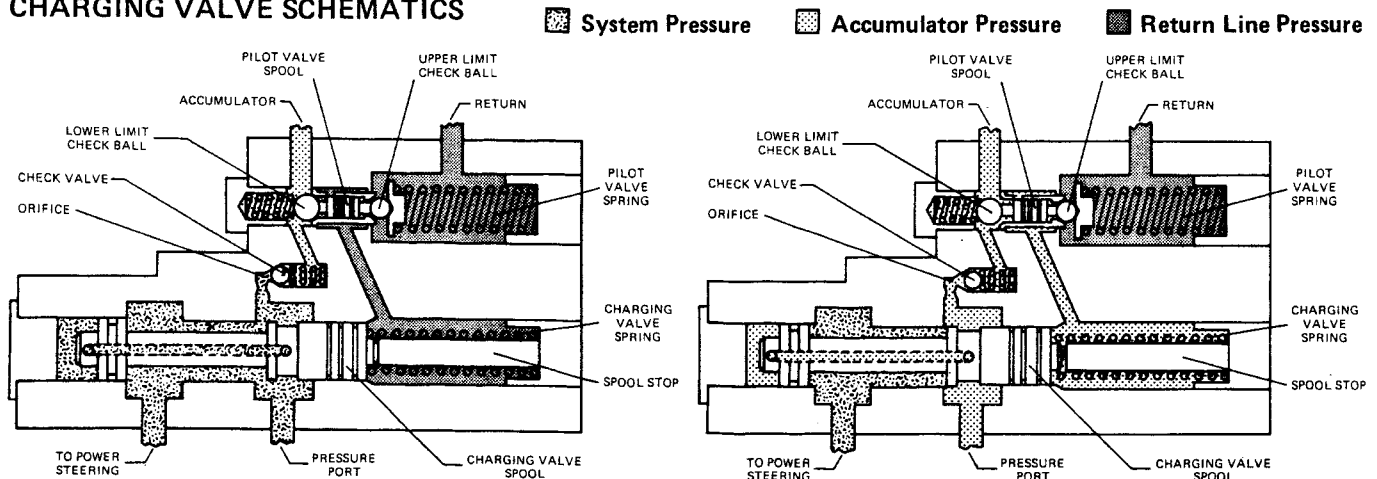
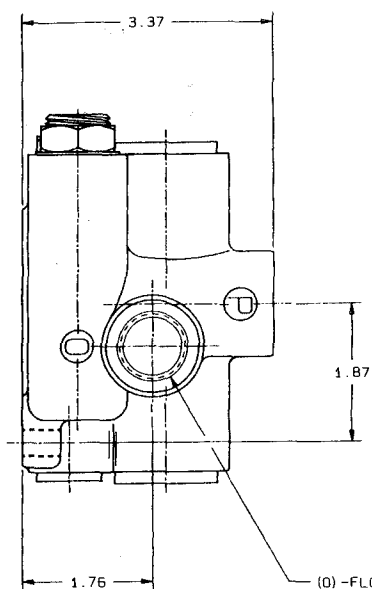


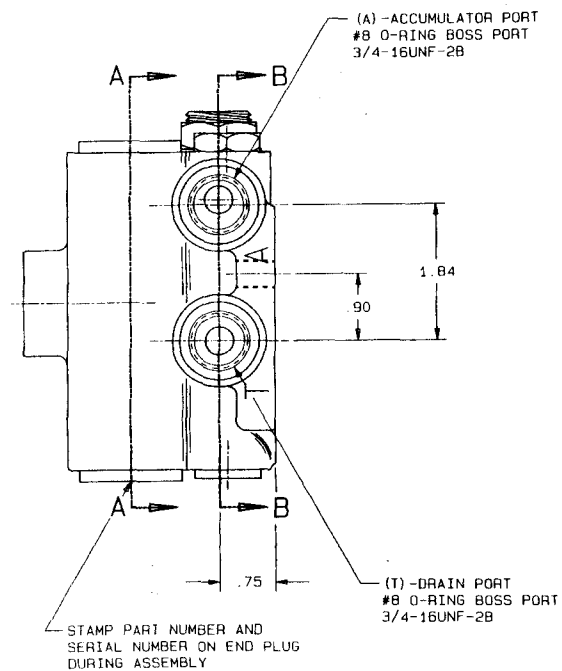
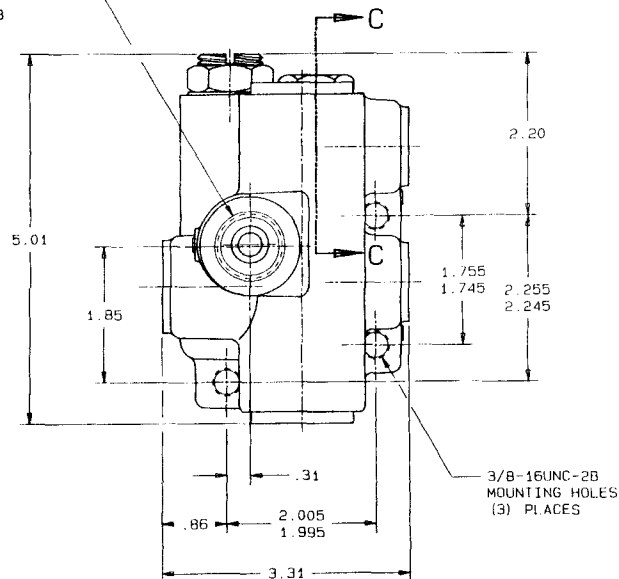
Figure 3 (Accumulator Charged)

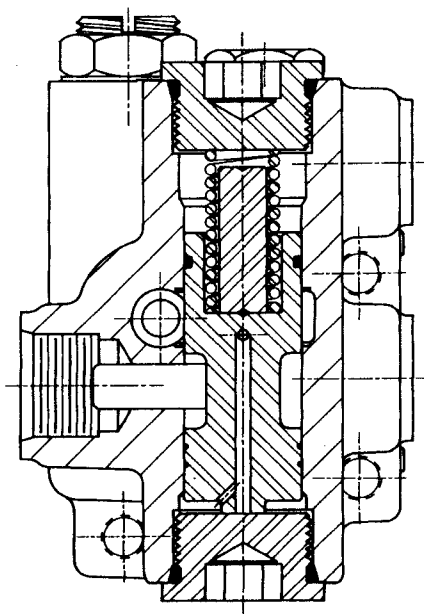
Figure 4 (Accumulator Being Charged)



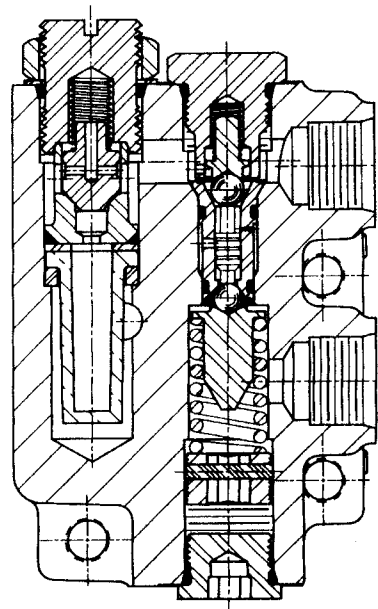
(O) - FLOW THRU PORT  
#10 S.A.E. O-RING BOSS PORT  
7/8-14UNF-2B

(P) - PRESSURE PORT  
#10 S.A.E. O-RING BOSS PORT  
7/8-14UNF-2B

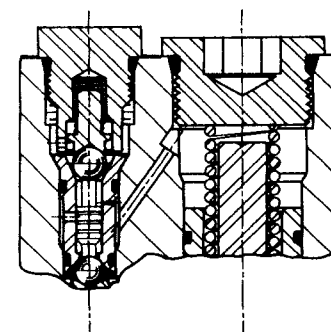




**SECTION A-A**



**SECTION B-B**



**SECTION C-C**

**SPECIFICATIONS**

Model Number	Accumulator Charge Rate - GPM	Accumulator High Limit - PSI	Accumulator Low Limit - PSI
06-463-006	1.2 - 2.2	1450 - 1550	1150 - 1250
06-463-008	2.0 - 3.2	1350 - 1400	925 - 1025
06-463-010	2.0 - 3.2	1275 - 1325	550 - 650

## DISASSEMBLY

1. Remove plug (1) from housing (7) - plug is under spring tension. Remove o-ring (2) from plug.
2. Remove spring (4) and rod (3) from housing (7).
3. Remove plug (9) from housing. Remove o-ring (8) from plug.
4. Remove spool (6) from housing thru plug (1) end ONLY. Remove seal (5) from spool.
5. Loosen nut (10) and remove screw assembly (11) from housing. Remove o-ring (12) from screw assembly.
6. Remove spring (13), poppet (14), seat (15), o-ring (16), washer (17), filter (18) and washer (19) from housing.
7. Remove plug (34) from housing. Remove o-ring (33) from plug.
8. BEFORE moving screw (32), ACCURATELY MEASURE ITS DEPTH from the end of housing and record for reassembly purposes. Remove screw (32) from housing.
9. Remove spring (31), retainer (30) and ball (29). Be sure to keep ball separate for reassembling.
10. Remove pin (35) from screw (32) using a drive pin punch. Take care not to damage threads.
11. Remove plug (20) from housing. Remove o-ring (21) from plug.
12. Remove spring (22), stop (23) and ball (24) from housing.
13. Place housing on bench with plug (20) end down. Spool (25) may or may not fall out at this point.
14. Using a 1/4 - 5/16 dia. wood or plastic dowel, carefully remove insert (26) and spool (25) from housing. Insert (26) must come out plug (20) end of housing. Be careful not to scratch or mar valve seats on insert.

15. Remove spool (25) from insert (26). Remove o-rings (27 & 28) from insert.

## ASSEMBLY

CLEAN ALL PARTS WITH CLEAN SOLVENT AND DRY. LUBRICATE ALL RUBBER PARTS WITH CLEAN SYSTEM FLUID PRIOR TO ASSEMBLY. BE SURE ENTIRE ASSEMBLY PROCEDURE IS DONE WITH CONTAMINATION FREE METHODS.

1. Install new o-ring (8) on plug (9) and torque into housing 40 - 50 ft. lbs.
2. Install new seal (5) on spool (6). Be sure seal does not twist in groove.
3. Lubricate spool (6) and properly insert into housing.
4. Install spring (4) and rod (3) into housing.
5. Install new o-ring (2) on plug (1) and torque into housing 40 - 50 ft. lbs.
6. Install new o-rings (27 & 28) on insert (26) and place into housing. Note direction of assembly. Seat insert with 1/2" dia. wood dowel.
7. Install spool (25) into insert (26) in housing. Note direction of spool - long shoulder end is up toward end plug (20).
8. Install ball (24), .281 dia., on insert (26) in housing. Install stop (23) over ball and spring (22) over stop correctly.
9. Install new o-ring (21) on plug (20) and carefully install into housing, centering spring (22). Torque 40 - 50 ft. lbs.
10. Turn housing so plug (34) is vertically upward. Install ball (29), .250 dia. Be sure ball is centered in bottom of hole in housing. Drop retainer (30) and spring

(31) into housing.

11. Insert new pin (35) in screw (32). Be sure plug is aligned properly and is evenly driven into screw. Do not damage threads.
12. Thread screw (32) in housing to the depth recorded during disassembly.
13. Install new o-ring (33) on plug (34) and install plug in housing. Tighten.
14. Install new o-ring (12) on screw (11).
15. Install washer (19), new filter (18), washer (17), new o-ring (16), seat (15), poppet (14), spring (13) and screw (11) into housing. Torque screw 18 - 22 ft. lbs.
16. Install nut (10) on screw (11) and torque 18 - 22 ft. lbs.

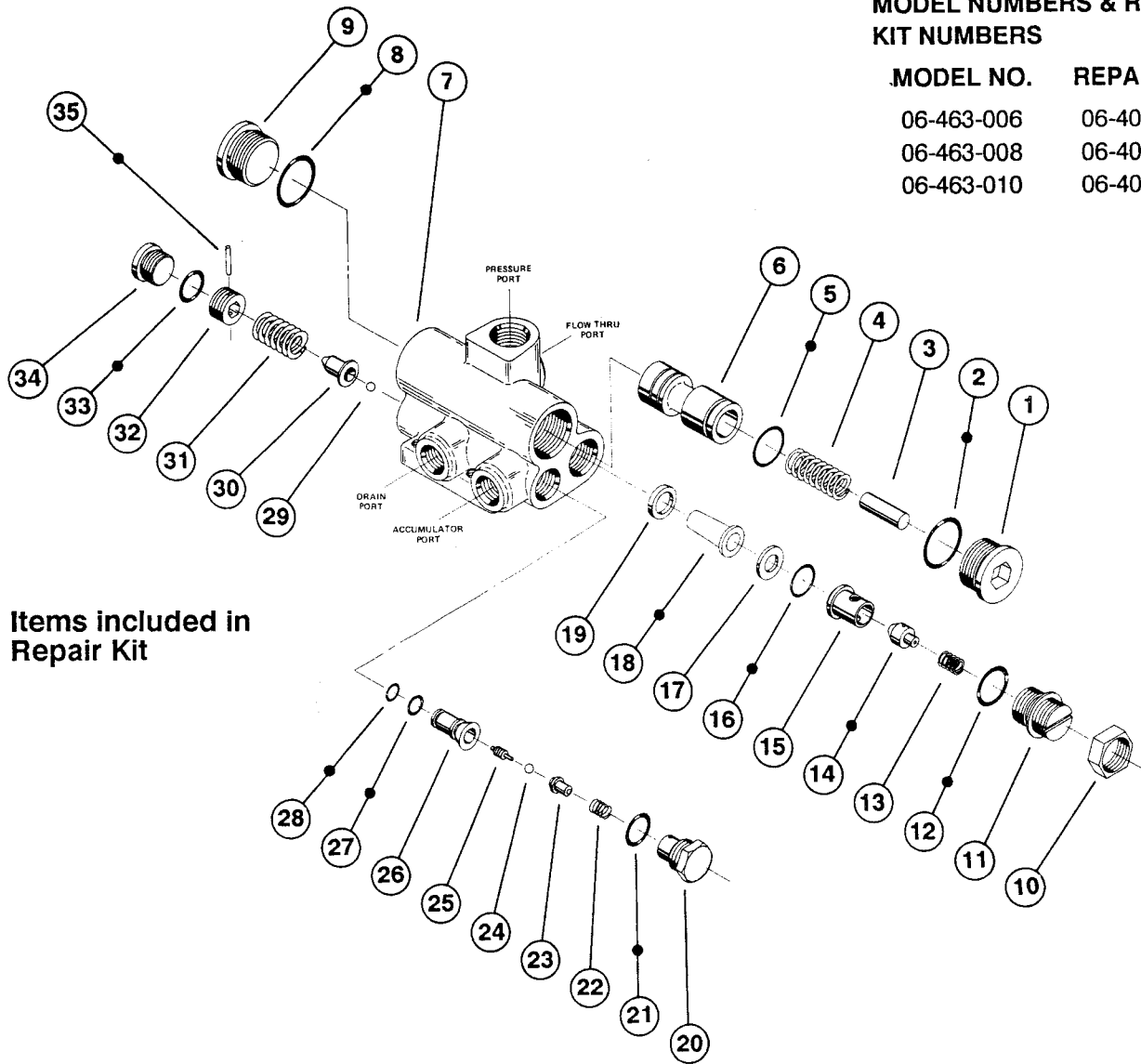
## VALVE ADJUSTMENT

1. Reinstall valve correctly. Tee an accurate pressure gauge into the accumulator line.
2. Start pump and allow approximately one minute for charging to start (pressure in gauge will read accumulator pre-charge plus). If valve does not begin to charge, turn screw (32) in, stopping when gauge shows an increase in pressure. Check the high limit specifications (1500 - 1550) and adjust screw (32) until the high limit setting is met. This pressure can be checked correctly only if after each adjustment of screw (32) the accumulator pressure is reduced to below the low limit setting of 1000 and the system recharges the accumulator pressure to its high limit.
3. Once the high limit setting is accurately adjusted, install o-ring (33) and plug (34) into housing. Torque 25 - 35 ft. lbs.

# **MODEL NUMBERS & REPAIR KIT NUMBERS**

MODEL NO.	REPAIR KIT
06-463-006	06-400-099
06-463-008	06-400-099
06-463-010	06-400-099

- Items included in Repair Kit



## **PARTS LIST**

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	PLUG	18	• FILTER
2	• O-RING	19	WASHER
3	ROD	20	PLUG
4	SPRING	21	• O-RING
5	• SEAL	22	SPRING
6	SPOOL	23	STOP
7	HOUSING	24	BALL
8	• O-RING	25	SPOOL
9	PLUG	26	INSERT
10	NUT	27	• O-RING
11	SCREW ASSEMBLY	28	• O-RING
12	• O-RING	29	BALL
13	SPRING	30	RETAINER
14	• POPPET	31	SPRING
15	SEAT	32	SCREW
16	• O-RING	33	• O-RING
17	WASHER	34	PLUG
		35	• PIN

## SERVICE CHECKS FOR HYDRAULIC SYSTEMS

### ACCUMULATOR CHARGING CYCLE REPEATS FREQUENTLY WHEN ACCUMULATOR IS NOT NORMALLY BEING DIS-CHARGED IN SERVICE

1. Leaking accumulator lines or fittings
1. **Check lines and fittings for leaks and correct**
2. Accumulator gas charge too low
2. **Check accumulator gas charge**
3. Accumulator gas charge too high
3. **Check accumulator gas charge**
4. Line to accumulator plugged
4. **Replace line**
5. Defective charging valve
5. **Replace charging valve**

### ACCUMULATOR STARTS TO CHARGE BUT DOESN'T REACH HIGH LIMIT

1. No oil or low oil level in tank
1. **Check oil level**
2. Defective or worn pump (pump doesn't deliver full flow or pressure)
2. **Check pump pressure and flow**
3. Defective system relief valve (valve leaking or has low setting so full flow and pressure are not available)
3. **Check relief valve**
4. Defective charging valve
4. **Replace charging valve**

### ACCUMULATOR CHARGING TIME TOO LONG

1. No oil or low oil level in tank
1. **Check oil level**
2. Relief valve setting too low
2. **Check valve setting**
3. Pump worn or defective and not delivering full flow or pressure
3. **Check pump**
4. Defective charging valve
4. **Replace charging valve**

### ACCUMULATOR FAILS TO START CHARGING

1. No oil or low oil level in tank
1. **Check oil level**
2. Worn or defective pump
2. **Check pump pressure and flow**
3. Defective relief valve
3. **Check relief valve setting**
4. Defective charging valve
4. **Replace charging valve**

### VERY RAPID CYCLING OF CHARGING VALVE

1. Accumulator gas charge too low
1. **Check gas charge**
2. Accumulator gas charge too high
2. **Check gas charge**
3. No gas charge in accumulator
3. **Check gas charge**
4. Defective charging valve
4. **Replace charging valve**

### LACK OF ADEQUATE FLOW THRU VALVE

1. Defective pump
1. **Check pump pressure and delivery**
2. Defective relief valve
2. **Check relief valve setting**
3. Blocked lines
3. **Replace lines**
4. Defective charging valve
4. **Replace charging valve**

## SERVICE DIAGNOSIS

All numbers shown refer to Figure on page 7

### ACCUMULATOR CHARGING CYCLE REPEATS FREQUENTLY WHEN ACCUMULATOR IS NOT NORMALLY BEING DIS-CHARGED IN SERVICE

1. Poppet (14) leaking.
2. O-ring (16) leaking.
3. Pilot Valve Ball (24) leaking.
4. Defective seat on insert (26).

### ACCUMULATOR STARTS TO CHARGE BUT DOESN'T REACH HIGH LIMIT

1. O-rings (27 & 28) on Pilot Valve

(8)

- Body defective or damaged.
2. Seal (5) on Charging Valve Spool (6) has been damaged or worn.

### ACCUMULATOR CHARGING TIME TOO LONG

1. Broken Charging Valve Spring (4).
2. Charging Valve Spring (4) has taken a set.
3. Dirt in Filter (18).
4. Poppet (14) stuck, partially closed.

### ACCUMULATOR FAILS TO START CHARGING

1. Broken Pilot Valve Spring (31).
2. Broken Charging Valve Spring (4).
3. O-ring (2) defective.
4. Charging Valve Spool (6) stuck.
5. Dirt in Filter (18).

### VERY RAPID CYCLING OF CHARGING VALVE

1. Pilot Valve (25 & 26) worn.