

SUNDSTRAND TRANSMISSION
TROUBLESHOOTING GUIDE
BULLETIN 9645

V40431



TROUBLE SHOOTING GUIDE FOR SUNDSTRAND HEAVY DUTY HYDROSTATIC TRANSMISSIONS

INTRODUCTION

The information contained in this bulletin provides a guide for trouble shooting the Sundstrand Heavy Duty hydrostatic transmissions. It is a problem solving tool aimed at eliminating unnecessary machine downtime. Following the fault-logic approach presented in this guide should result in the expedient correction of transmission problems.

INSTRUCTIONS

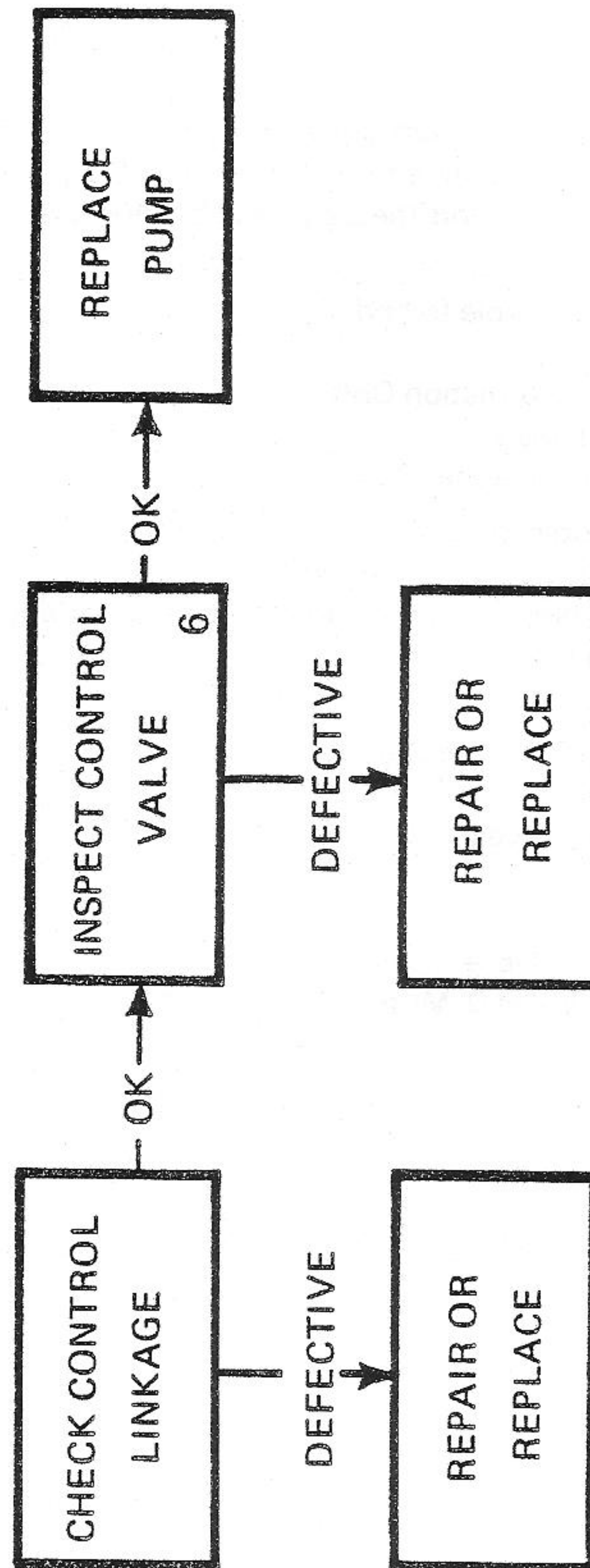
Our experience shows that there are five (5) problem statements that cover the majority of problems encountered with the Heavy Duty hydrostatic transmissions. These problem statements and the page number for the corresponding fault-logic diagrams are listed below.

Neutral Difficult or Impossible to find	Page 1
System Operating Hot	Page 2
System Operates in one Direction Only	Page 3
System Response Sluggish	Page 4
System will not operate in either Direction	Page 5

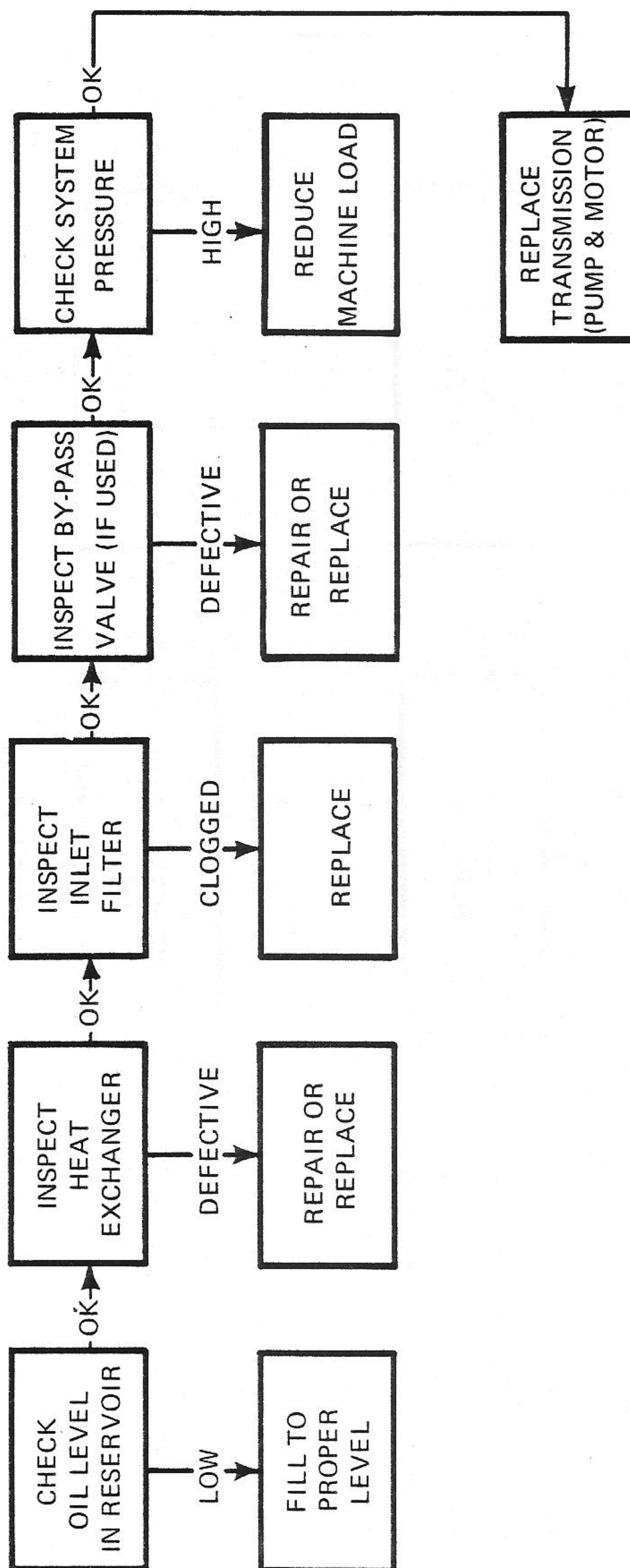
Following the fault-logic diagrams are descriptions of some of the action steps shown in the diagrams. Where applicable the page number for this description appears in the action block of the diagram. These descriptions and the corresponding page numbers are listed below.

Inspect Control Valve	Page 6
Inspect High Pressure Relief Valves	Page 7
Inspect Shuttle Valve	Page 7
Inspect Charge Check Valves	Page 8
Check Charge Pressure	Page 9
Inspect Charge Pump	Page 9
Inspect Charge Relief Valve @ Pump	Page 9
Inspect Charge Relief Valve @ Motor	Page 9

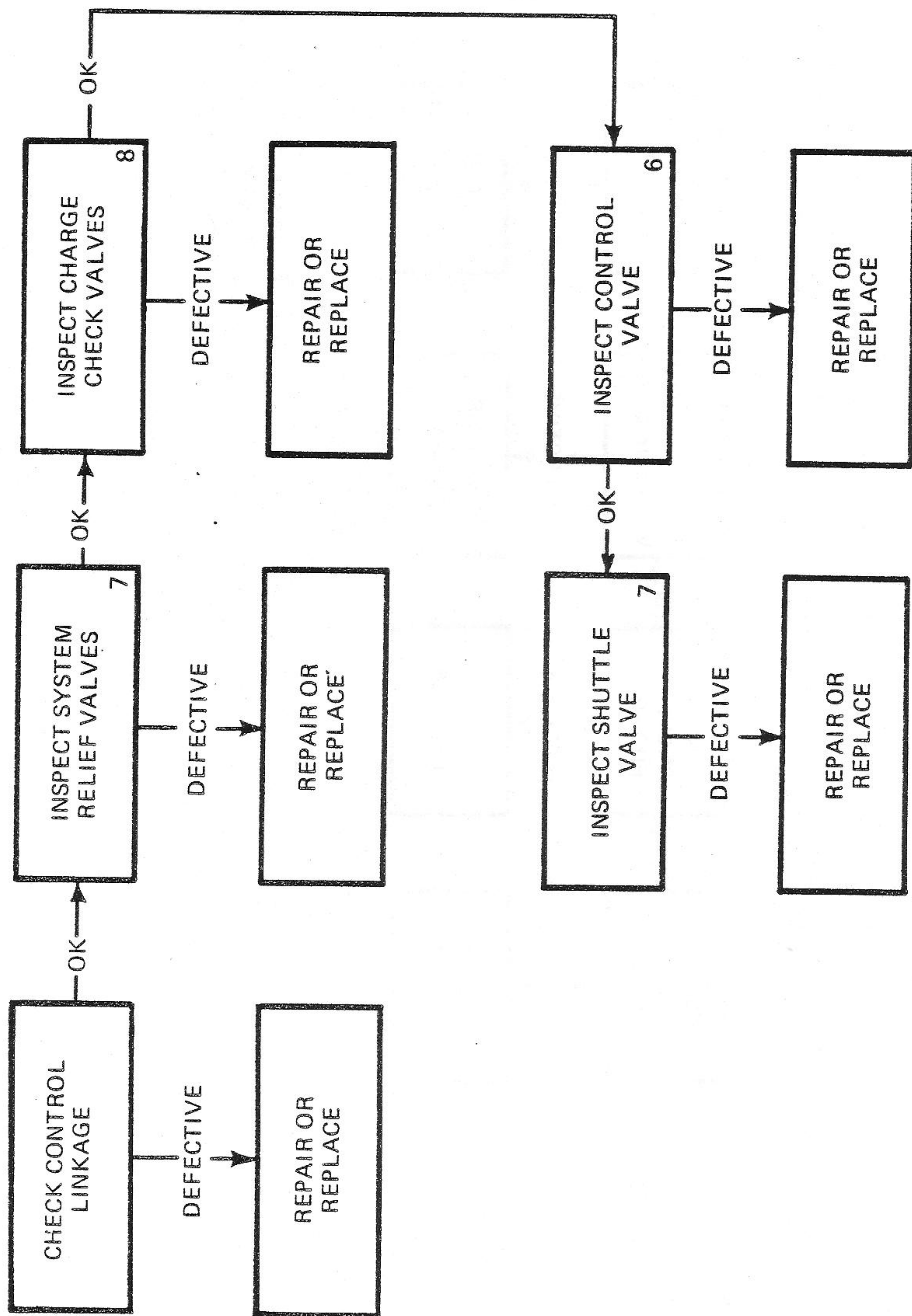
**NEUTRAL DIFFICULT
OR
IMPOSSIBLE TO FIND**



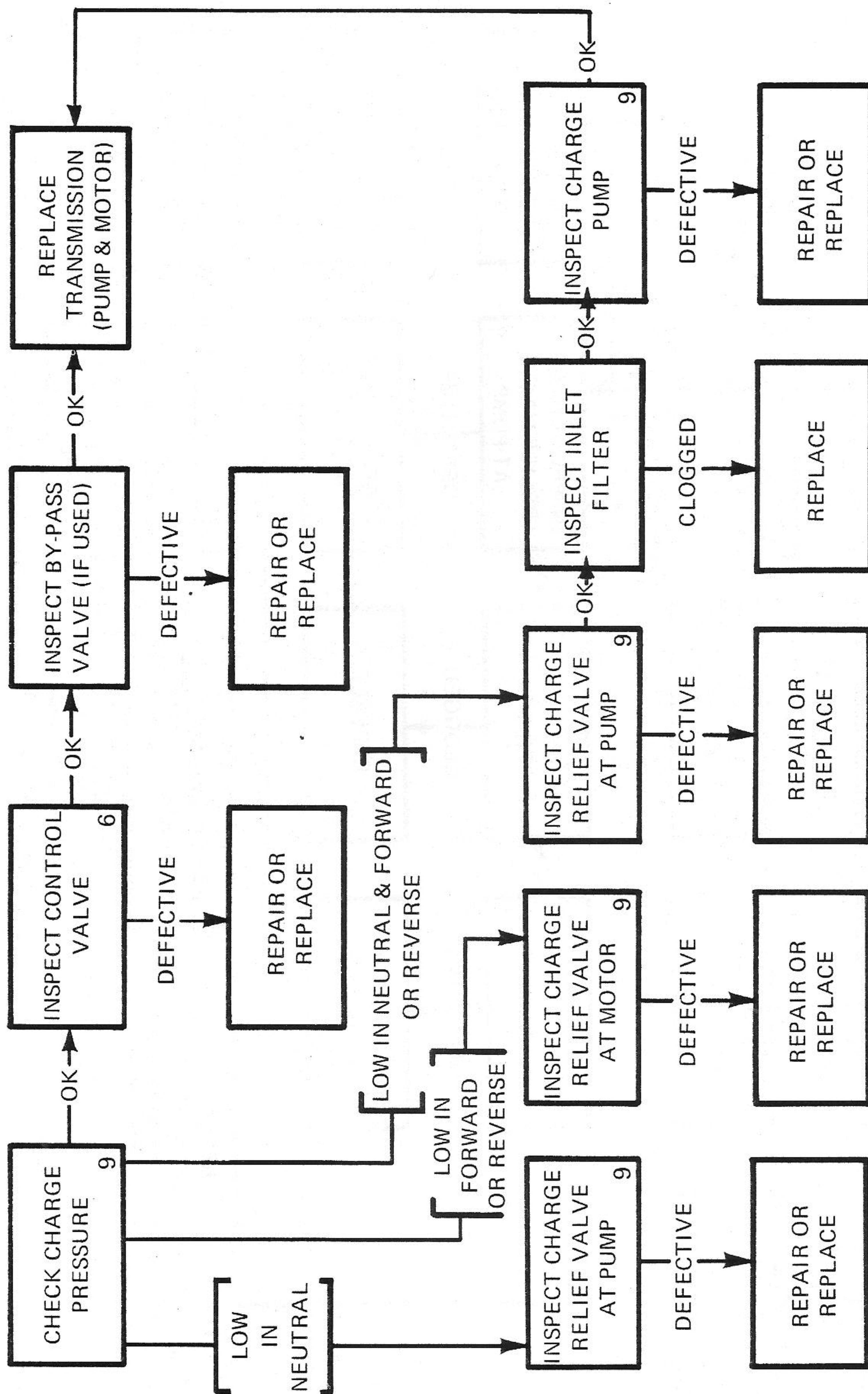
SYSTEM OPERATING HOT



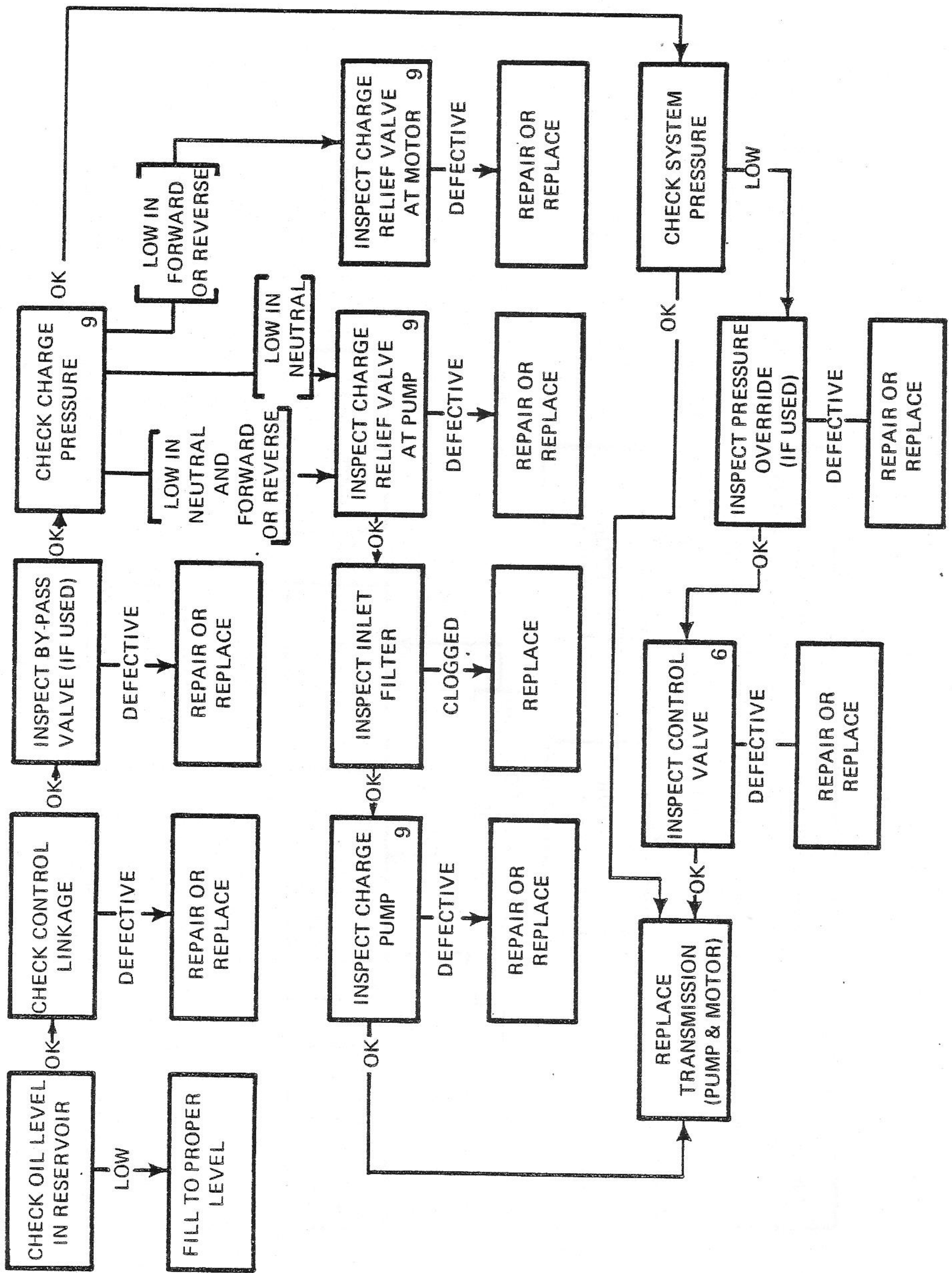
TRANSMISSION OPERATES IN ONE DIRECTION ONLY



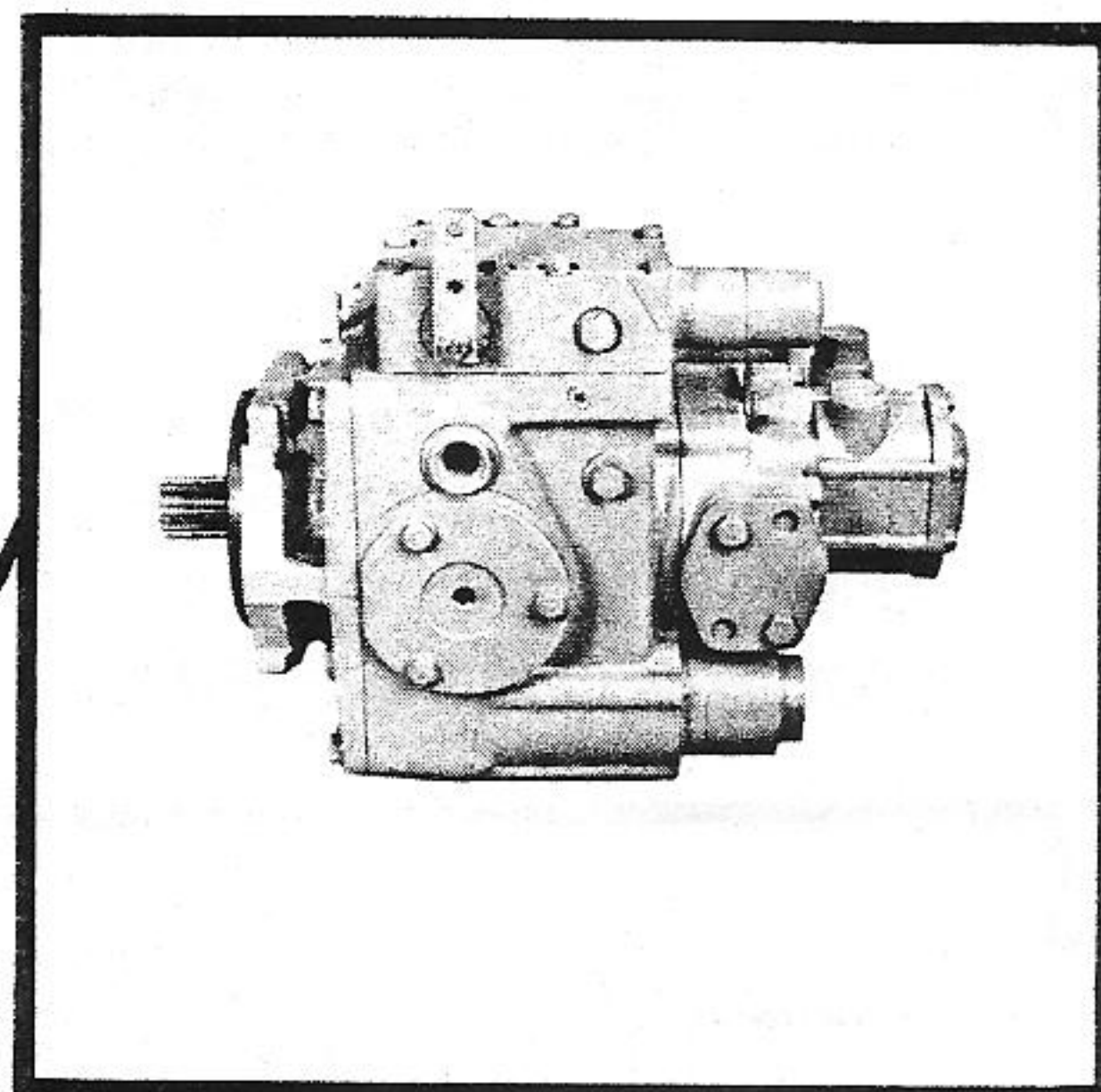
SYSTEM RESPONSE SLUGGISH



SYSTEM WILL NOT OPERATE IN EITHER DIRECTION

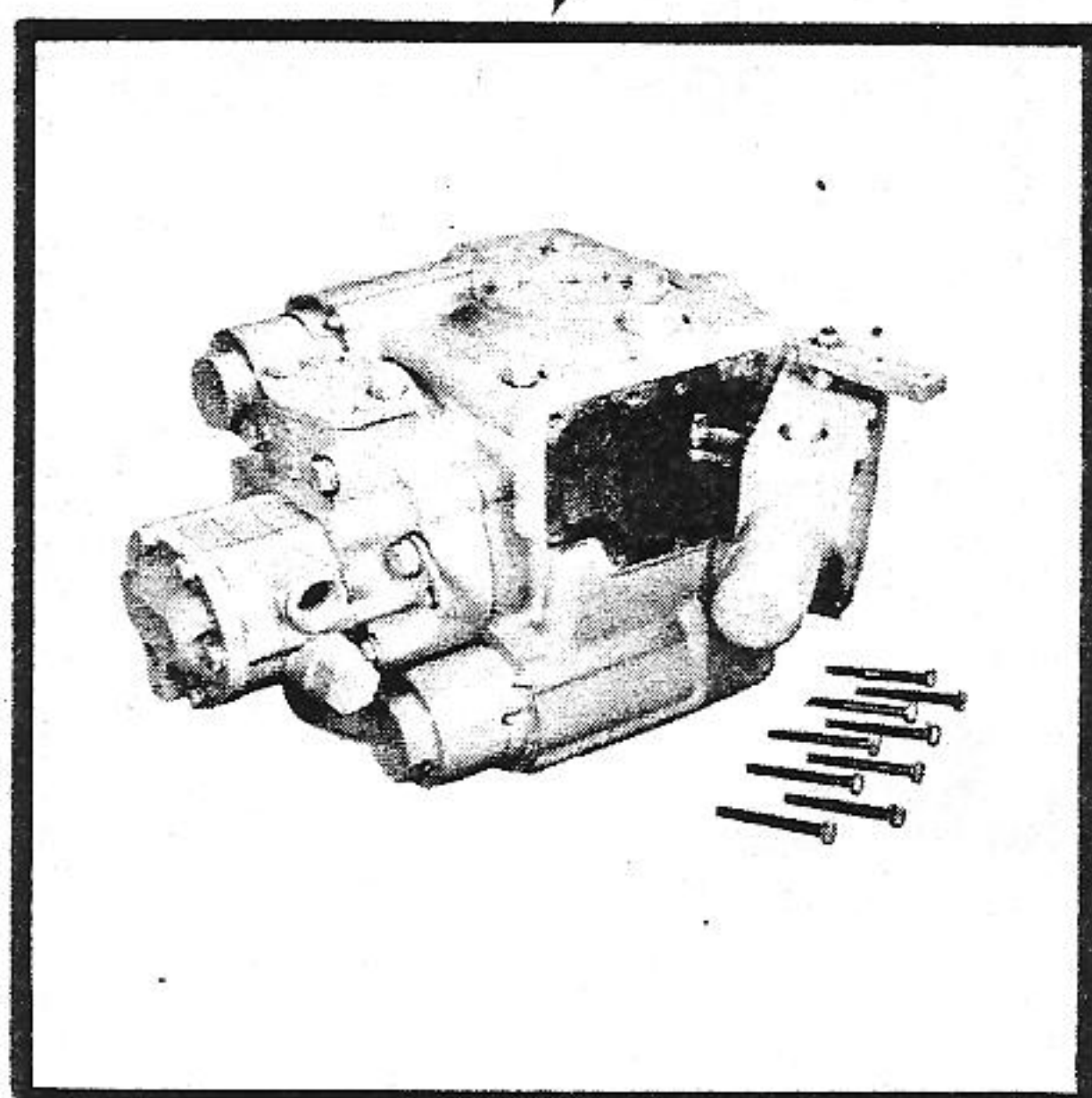


INSPECT CONTROL VALVE

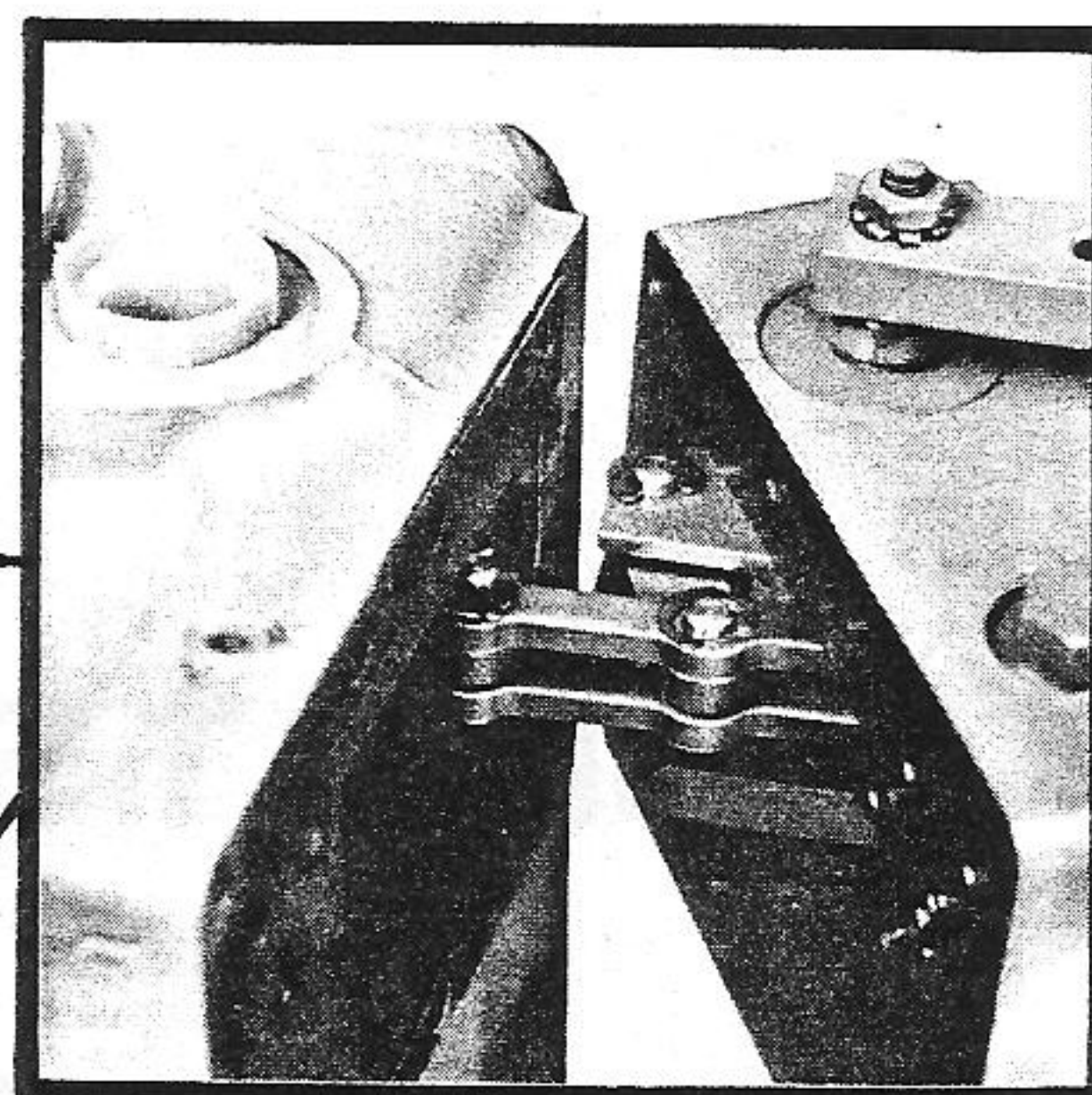


Disconnect machine linkage, check for neutral & spring centering @ pump control. Operate machine @ pump control if possible.

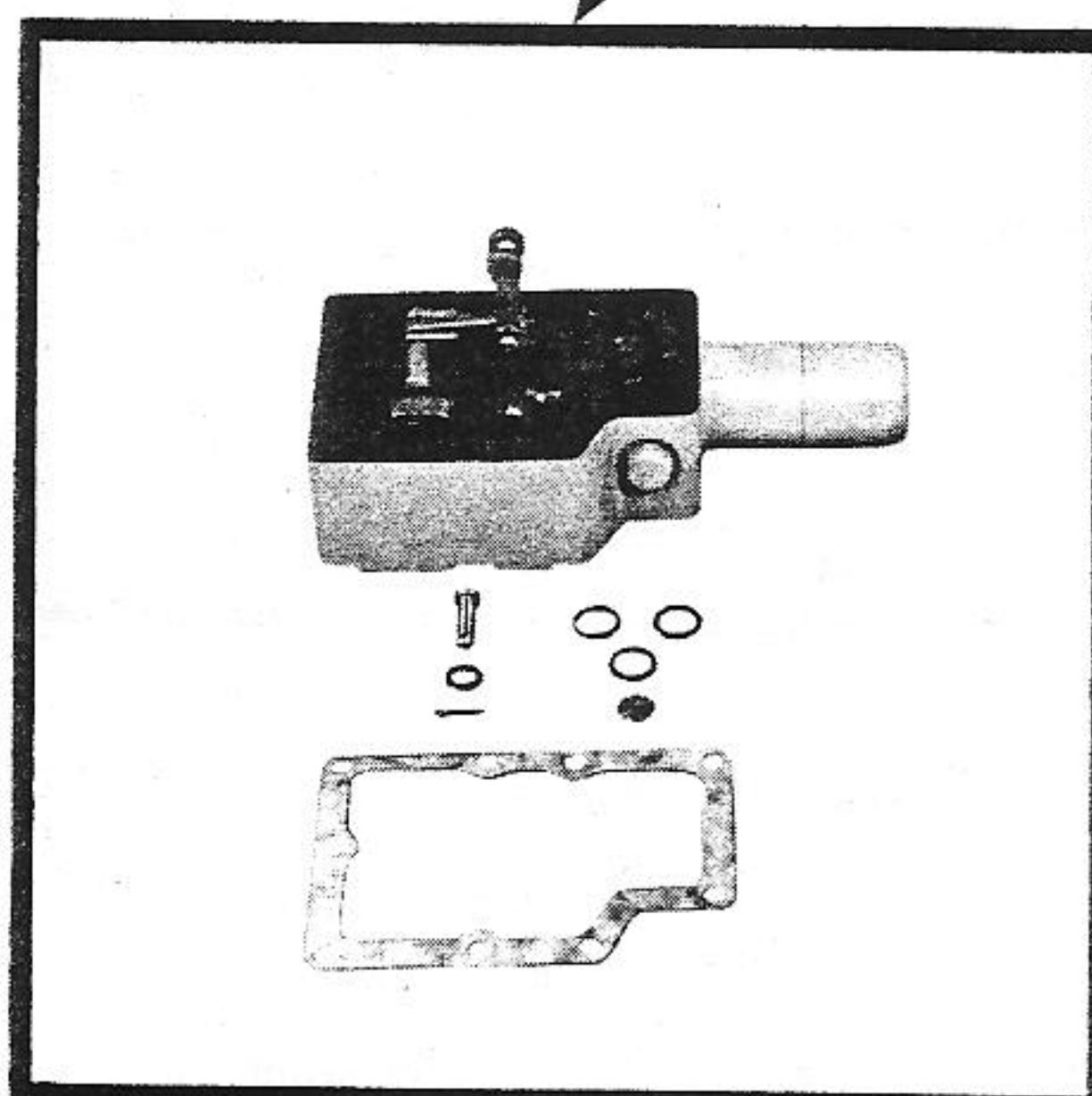
Remove cap screws & pull control away from pump housing.



Inspect linkage, pins & retaining rings for proper assembly. Inspect for broken spring or plugged orifice.

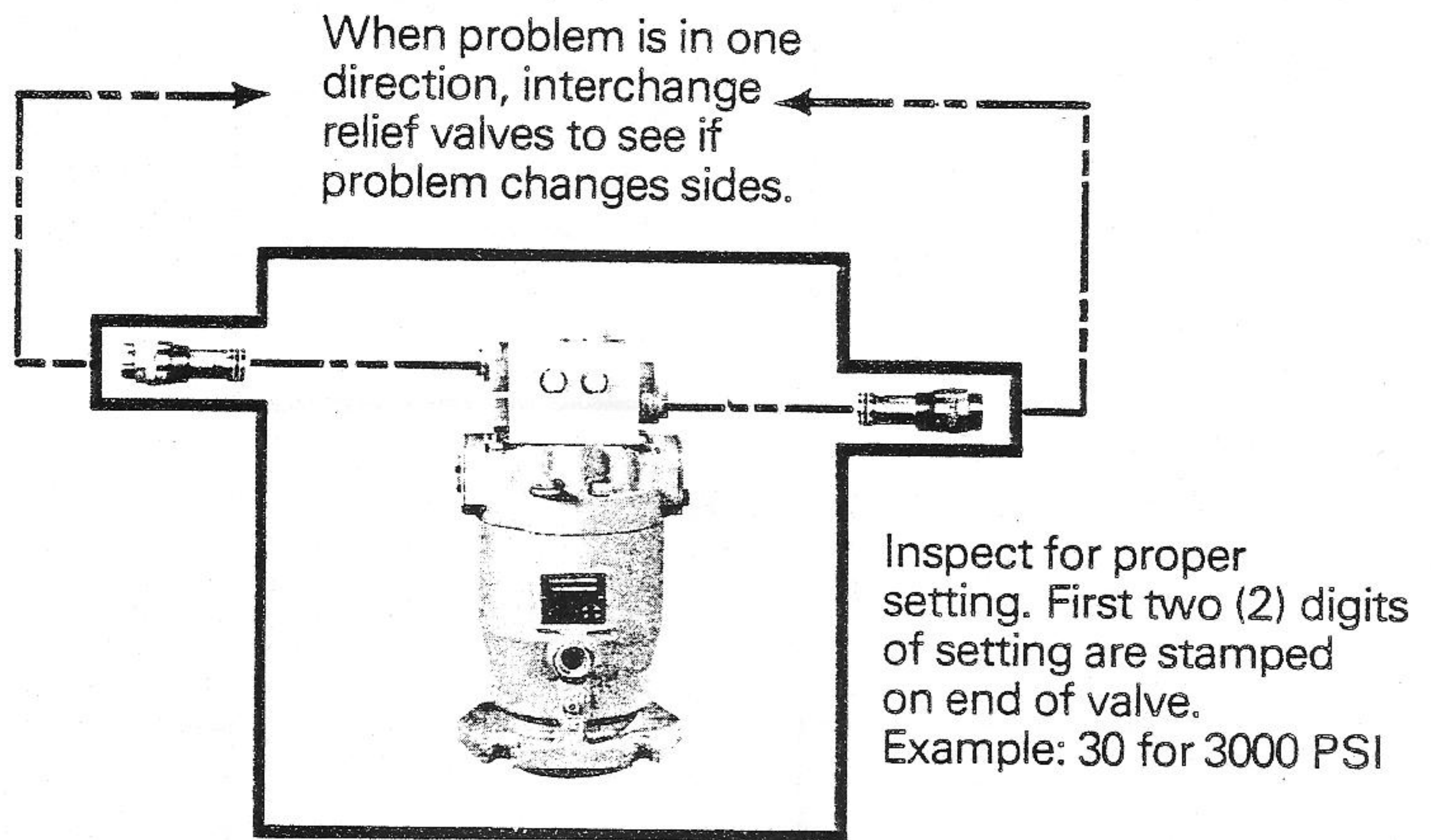


Remove control from pump and replace.

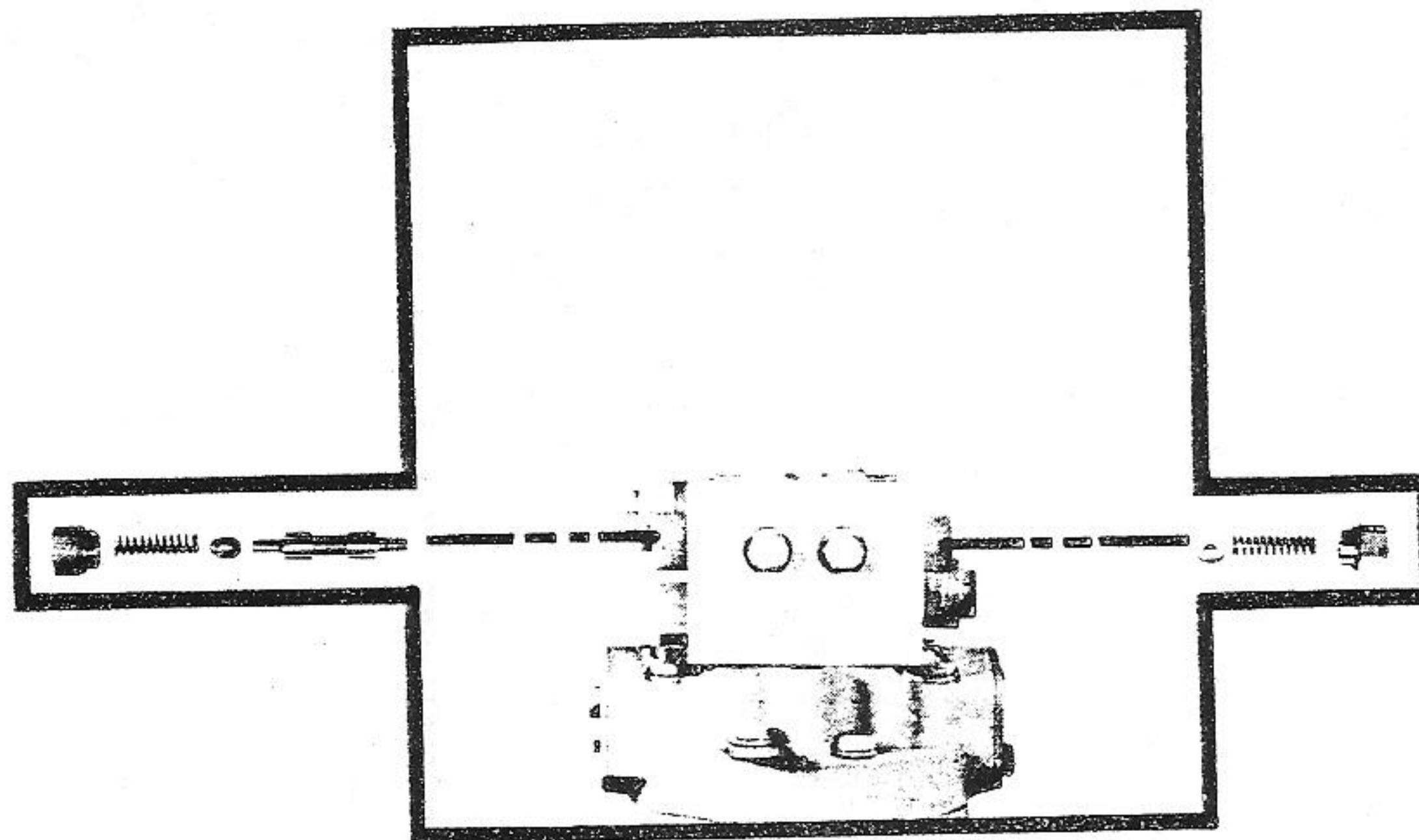


Further disassembly of control is not recommended.

INSPECT SYSTEM RELIEF VALVES

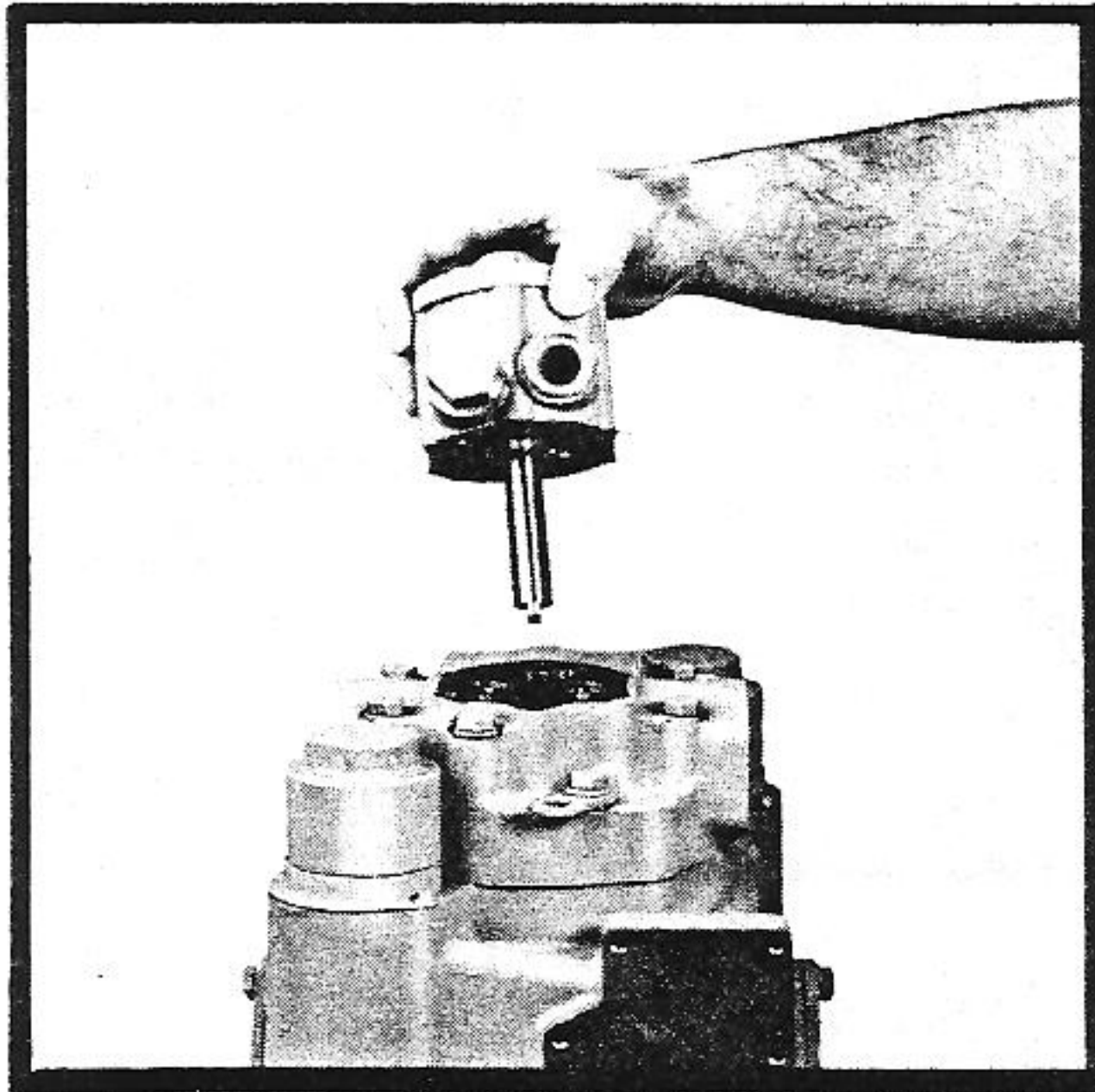


INSPECT SHUTTLE VALVE

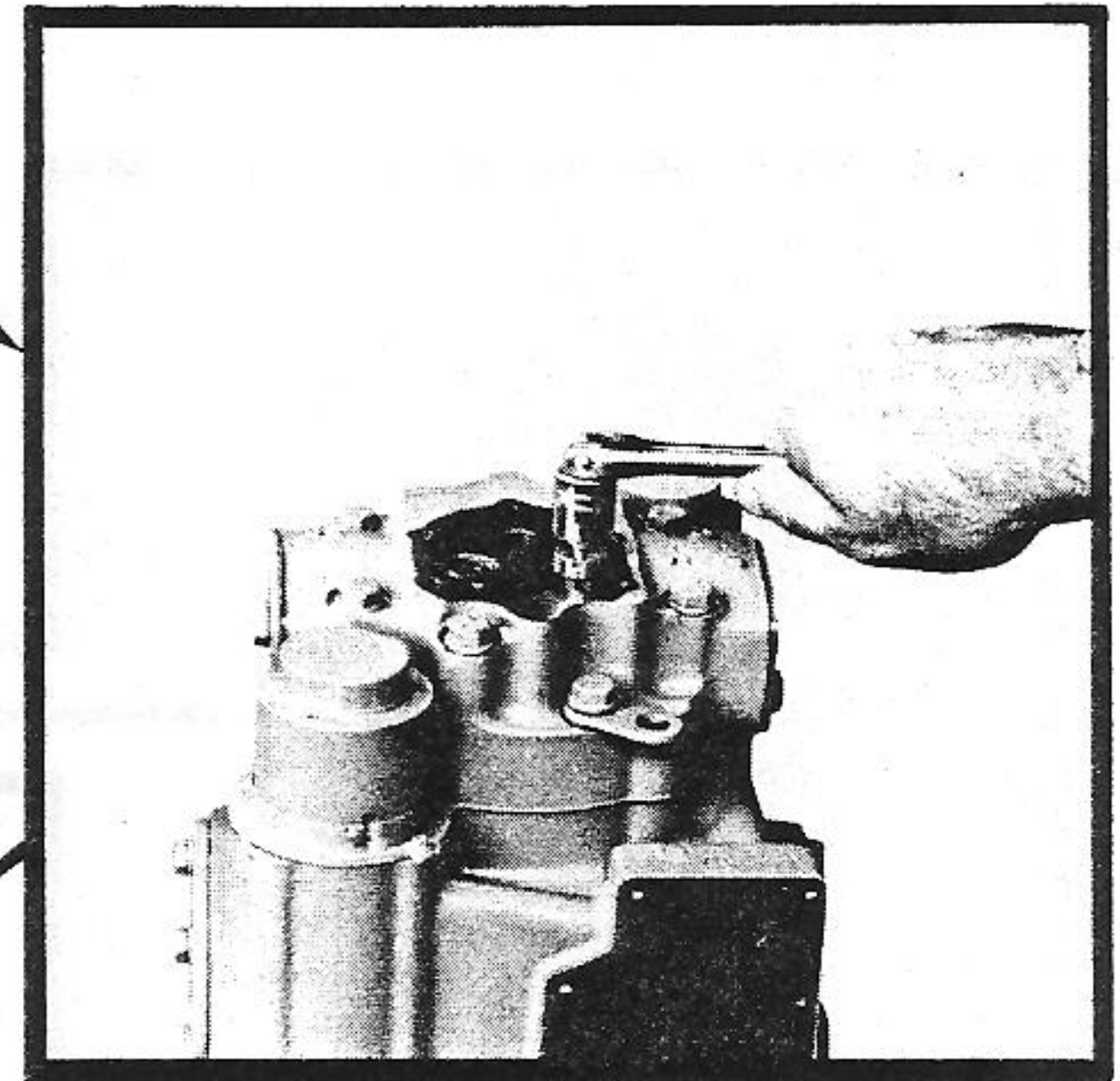


Spool must move smoothly in bore. Inspect for worn, galled or broken parts. Spool & manifold are matched & must be replaced as a set.

INSPECT CHARGE CHECK VALVES



Remove Charge Pump
& Charge Check Valves

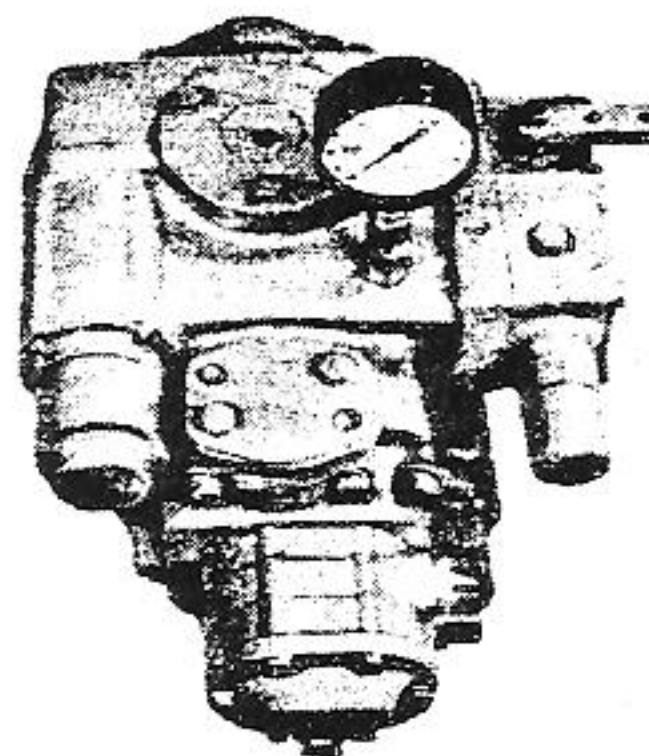


When problem is in one direction,
interchange check valves to see
if problem changes sides.



Inspect valves for spring load,
proper seating & foreign material.

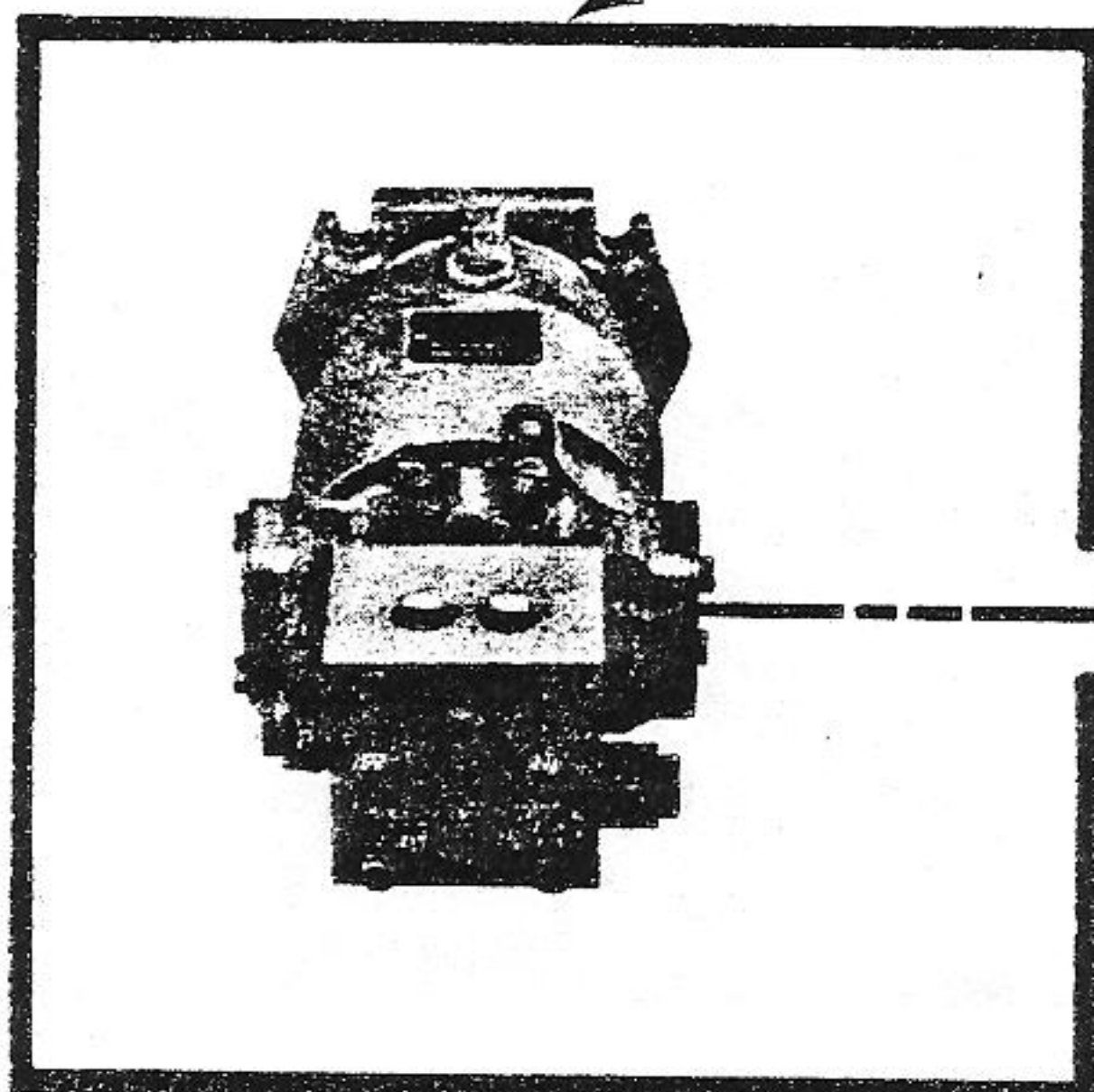
CHECK CHARGE PRESSURE



Neutral:
190/210ΔPSI
Forward & Reverse
160/180ΔPSI

Low in fwd. & reverse
(OK in neutral)

Inspect charge relief
valve @ motor

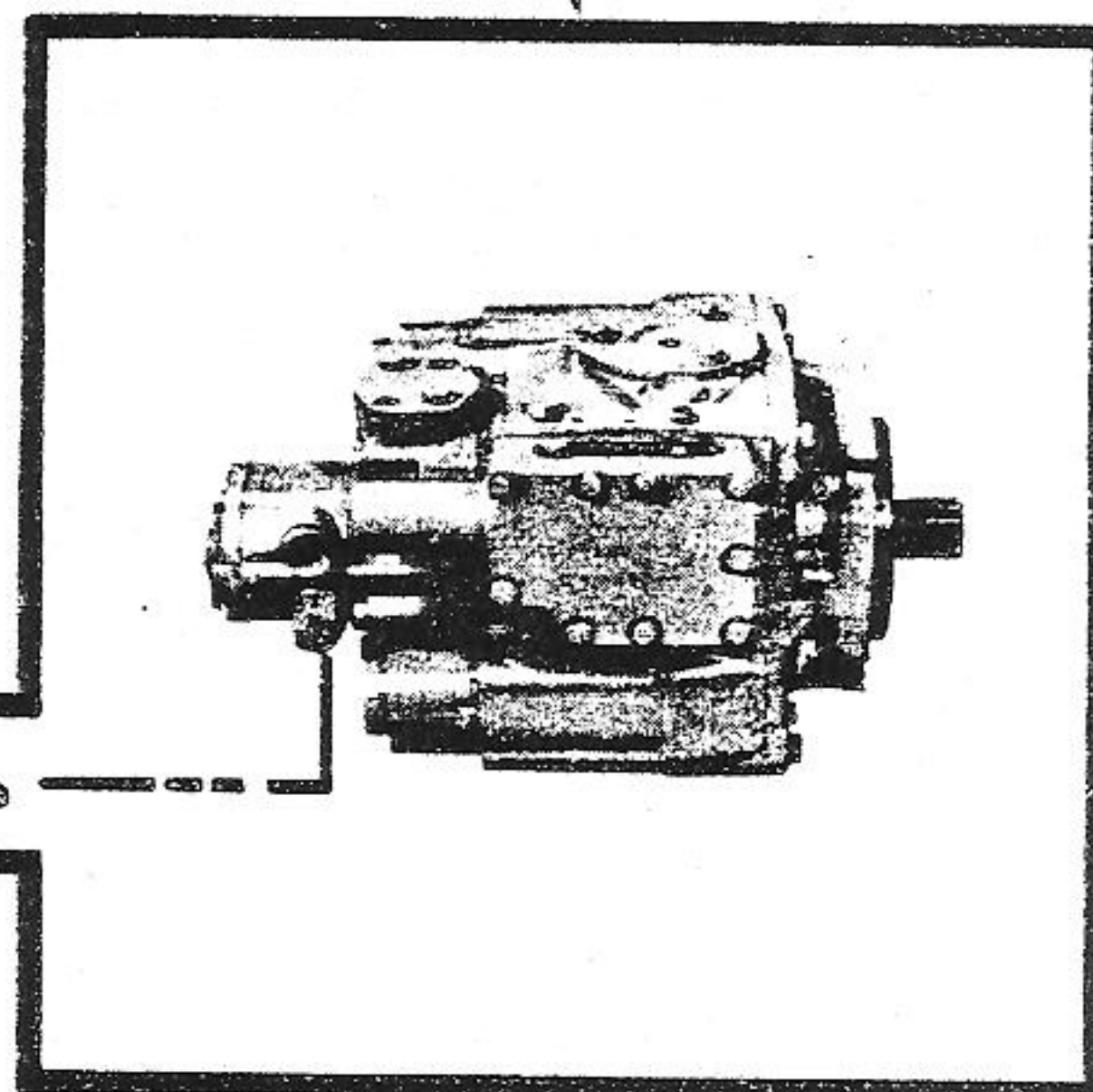


Inspect for foreign material
holding poppet open, galling
or wear on poppet & seat,
broken spring or improper
setting.

Shaft & internal gears
must turn smoothly.

Low in neutral
(Low or okay in fwd. & reverse)

Inspect charge relief
valve @ pump

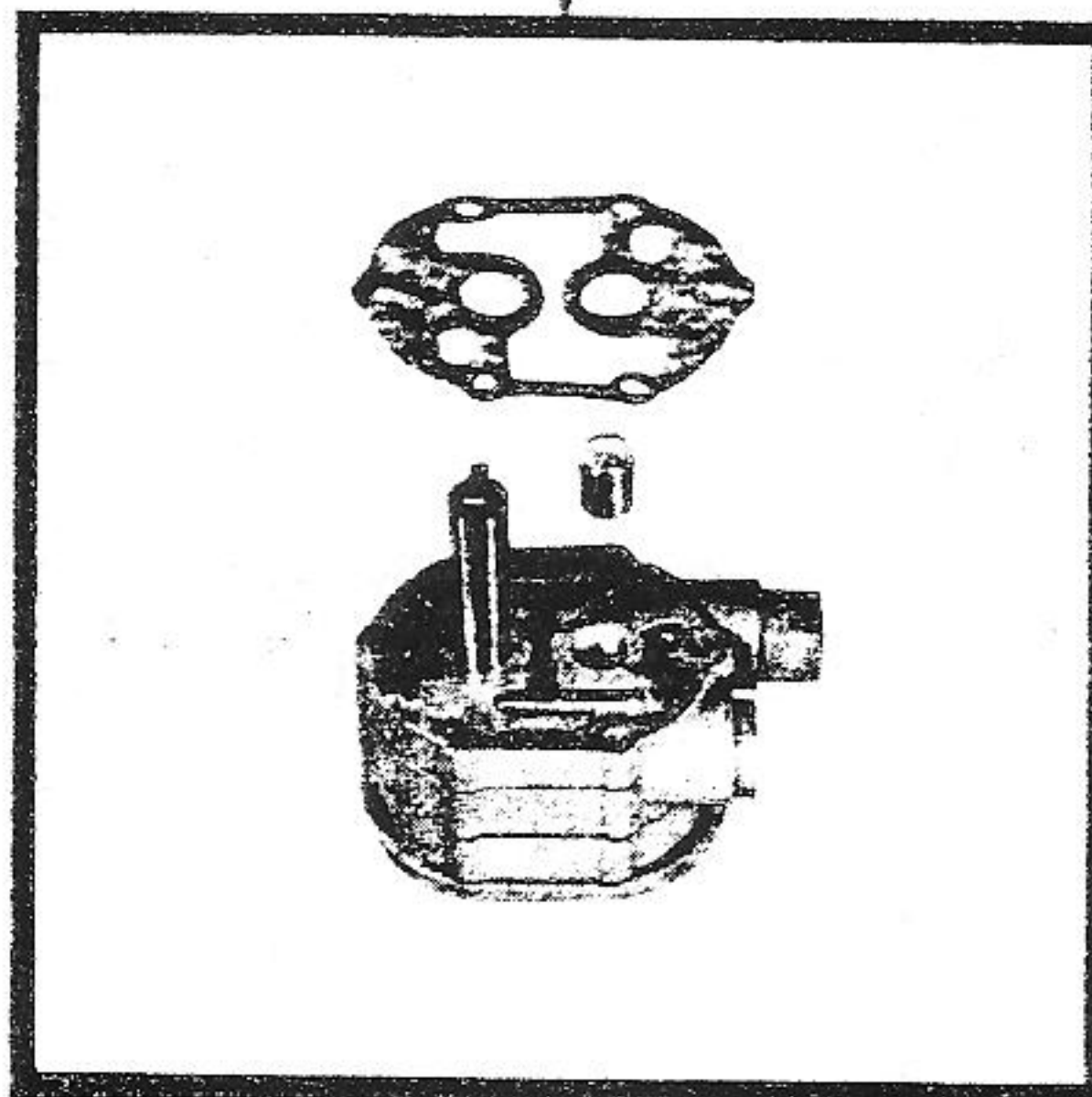


Inspect for foreign material
holding poppet open,
galling or wear on poppet
& seat, broken spring or
improper setting.

Further disassembly
of charge pump is
not recommended.

Low in neutral and fwd.
& reverse

Inspect charge pump



TROUBLESHOOTING
-- Continued --

LOSS OF SPEED OR LACK OF DIGGING FORCE

CAUSE	REMEDY
A. Too low a hydro-static shift pressure for changing ranges.	<ol style="list-style-type: none">1. The motor shifter should begin shifting the hydro-static transmission into low range when the drive pressure reaches to 2400 psi. This can be checked by installing a 5000 psi gauge at one of the two tramming hoses. (Pressure tap plugs are provided in the tramming hose connections at the hydro-static pump.) With the machine blocked from pivoting and with the service and parking brakes applied, operate engine at half throttle. Observe pressure gauge and motor shifter to determine at what pressure the motor shifter begins to move the motor control lever. If the motor shifter does not begin to operate at 2400 psi, this could be caused by a broken motor shifter spring, a binding control linkage, pressure override valve adjusted too low or a damaged motor.
B. Improper physical positioning of the motor shifter control cylinder.	<p>The motor shifter is operated by the drive oil pressure. When the machine is operating under no load or under light load, such as tramming on level ground, the shifter holds the motor in high speed range (minimum displacement). Drive pressure will increase with increasing load. When the drive pressure reaches 2400 psi, the shifter begins to extend and shifts the motor toward low speed range. Maximum low speed range (maximum displacement), which give maximum draw-bar-pull, should be reached when the drive pressure has increased to 4800 psi or less, depending on the pressure override valve adjustment.</p> <p>In some cases the two U-bolts, which secure the motor shifter cylinder in place, have become loose, allowing the cylinder to move. This prevents the cylinder piston from moving the motor control lever. Under this condition, the hydro-static transmission stays in low range. Effective with Serial Number 9110095 (also Serial Numbers 9110088, 9110092, and 9110093), a groove was machined around the motor shifter cylinder to prevent the cylinder from moving. An adjustable linkage between the motor shifter and the motor control lever was also installed to provide a new adjustment method. The following adjustment procedure may be used for adjusting the motor shifter on both old and new machines:</p>



Loss of Speed or Lack
of Digging Force
--CONTINUED--

<p>C. Motor swashplate not shifting full mechanical range due to internal problems.</p>	<ol style="list-style-type: none">1 - Disconnect the linkage or clevis from the end of the motor shifter rod.2 - Watch the motor control lever while the engine is started by a helper to make sure the lever moves to the low range position. The lever will be in the low range position when it has moved completely towards the valve end of the motor. Also, with the engine running at half throttle and with the service and parking brakes applied, check that the motor shifter rod extends easily when the direction control pedal is pushed into the forward or reverse position and that it retracts completely when the pedal is released.3 - With the motor shifter rod retracted completely and the motor control lever in the low range position, measure the distance from the center of the motor shifter rod hole to the center of the clevis or linkage hole. To obtain maximum tractive effort in low range and maximum high speed range this dimension should be 9/16 inch. <p style="text-align: center;">NOTE</p> <p>THE MOTOR CONTROL LEVER WILL MOVE FURTHER THAN THE 9/16 INCH REQUIRED, BUT THIS WILL ONLY UNWIND THE CONTROL LEVER SPRING. SUCH AN ADJUSTMENT WOULD PREVENT THE TRANSMISSION FROM BEING SHIFTED COMPLETELY INTO LOW RANGE.</p> <ol style="list-style-type: none">4 - Machines without adjustable linkage, loosen the U-bolts around cylinder and move cylinder to obtain the correct dimension. Machines with adjustable linkage, loosen clevis lock nut and turn clevis in or out to obtain correct adjustment.5 - Tighten cylinder U-bolts or clevis lock nut.6 - Pull the motor control lever towards motor shifter and connect linkage to cylinder rod with pin and cotter pin. <p>Improper positioning of the pump servo control valve, binding servo piston, disconnected internal control linkage, or damaged swashplate pistons and cylinder block would all possibly prevent obtaining correct swashplate angle. The hydro-static motor or pump should be replaced if this problem is suspected.</p>
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Loss of Speed or Lack
of Digging Force

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D. Poor castings or machining in parts of the hydro-static transmission.	Pin holes in control passages or inaccurate machining could cause problems to continue without true analysis. If this condition is suspected, because of misperformance or erratic charge pressure readings, replace unit.
E. Hose or Tubing Leaking.	Repair or replace hose or tubing.
F. Shifter Damaged or Worn Out.	Replace shifter.
G. Steel ball check missing from manifold on end of pressure override valve, special hose fittings damaged, or wrong hose fittings used.	Replace steel ball. Replace fittings. These fittings have a machined ball seat and must be replaced by a fitting with the same part number.

UNCONTROLLABLE WHEEL SPINNING

CAUSE	REMEDY
A. Pressure override valve not adjusted to match operating conditions.	<p>The pressure override valve must be adjusted according to the working conditions, so it is best to adjust the valve at the job site. (Before adjusting valve, be sure that the motor shifter is adjusted correctly -</p> <p>Drive the bucket into the muck pile and observe the wheels. If the wheels spin excessively loosen jam nut on adjusting screw and turn adjusting screw out (counterclockwise) a quarter of a turn at a time until the correct amount of traction force for the working conditions is achieved. (The override pressure setting will vary approximately 1000 psi per each full turn of the adjusting screw.) The loader should crowd the muck pile with limited wheel spin. If more traction force is required, turn adjusting screw in (clockwise).</p> <p>Tighten the lock nut on adjusting screw after correct adjustment is obtained.</p>
B. Improper positioning of the foot pedal for correct action.	<p>The foot pedal should be checked regularly to see that there is no interference or binding in the foot pedal linkage and to see that no foreign material has worked its way under the pedal to prevent full movement. The seat should be adjusted so the operator's foot can pivot the pedal easily.</p>



Uncontrollable wheel
spinning.

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	<p>The operator should rest his heel on the upper rear bar of the pedal when going in reverse. The foot pedal should be operated with a gradual and steady action to acquire the speed or power needed and to prevent wheels from spinning.</p>
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