System Principles & Diagnosis

When the engine is running and the pump is producing flow, the check valve in the steering valve housing will be seated to prevent any supply flow from entering the exhaust passages of the housing. (See Fig. 45)

If the engine is stopped and oil flow ceases, the check ball becomes unseated. The original purpose for this feature is to enable manual steering when there is no hydraulic flow. Human effort applied to the steering wheel causes the gerotor to act as a pump to overcome loads on the steering cylinders. During this action, the inner spool is fully deflected and exhaust oil passing the check valve is used to act as supply oil. The remaining internal passages (except the LOAD SENSE) will operate as previously described (see Fig. 46).

As explained earlier, any pump flow that is not used by the closed center steering system must enter the open center implement circuit. Once in this circuit, the oil flow may be used to control implement demands or return to the reservoir. The route taken by the oil is determined by the spool positions of the FLOW REGULATOR and IMPLEMENT CONTROL valves. (Fig. 47)

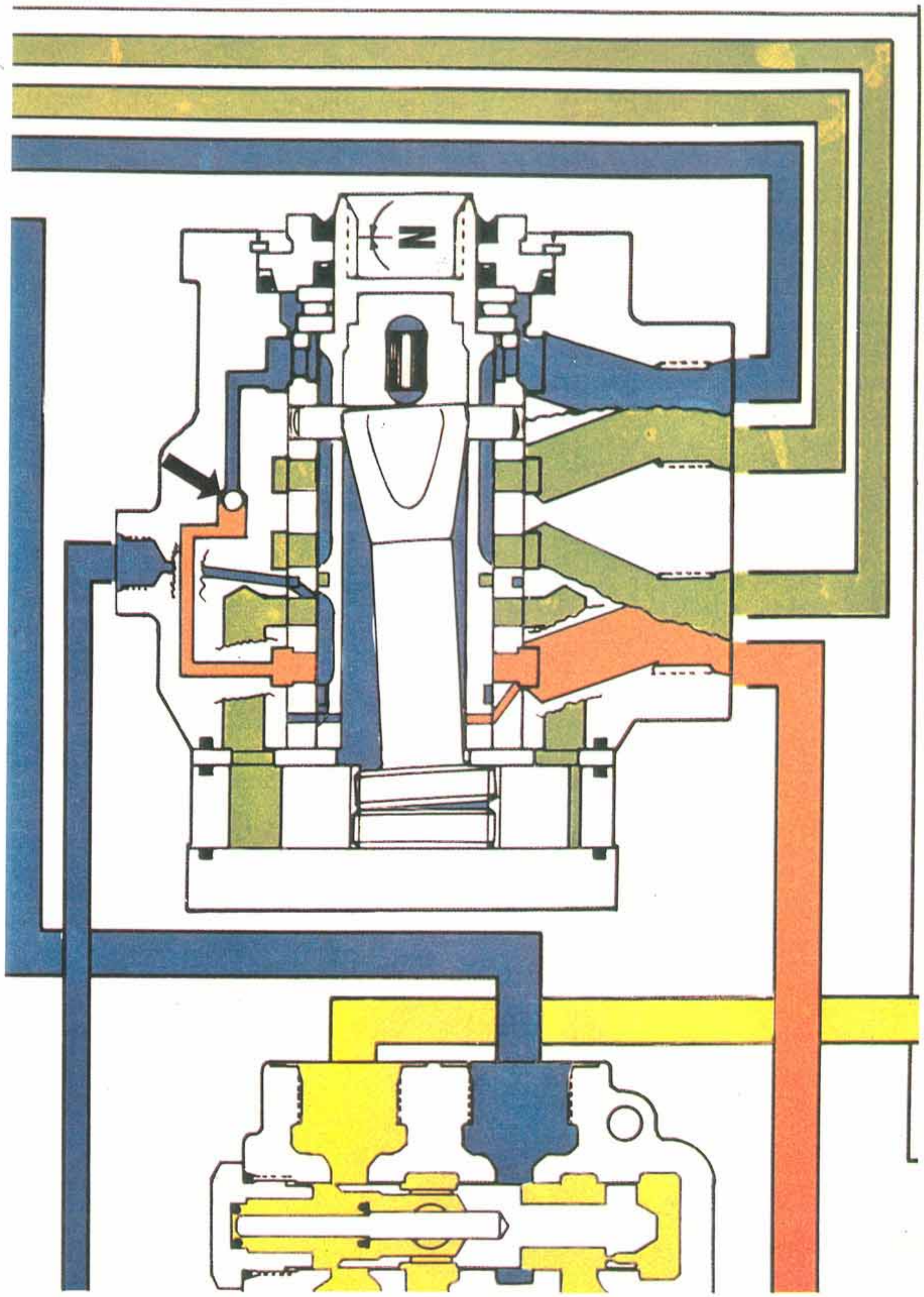

Figure 45:

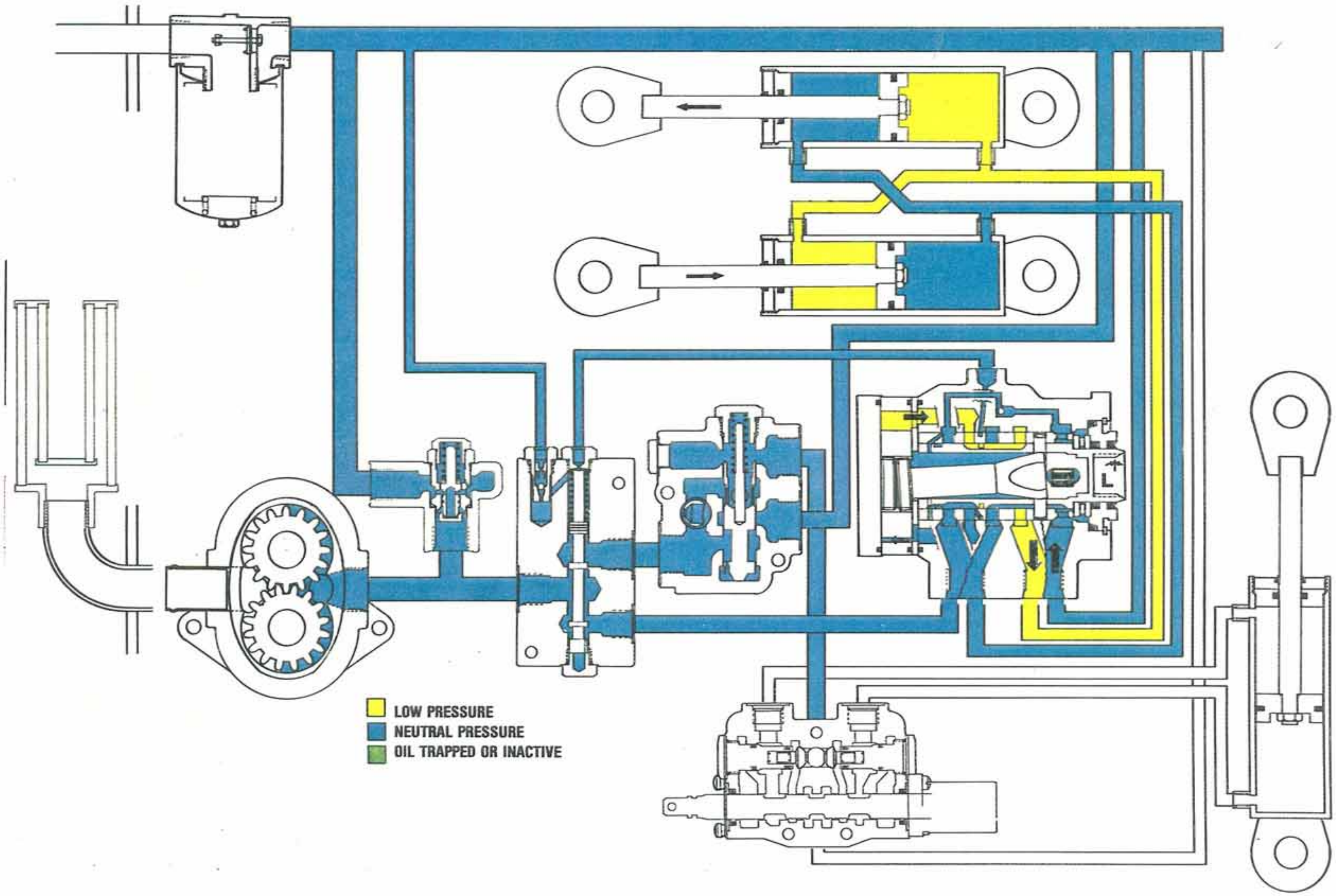

Figure 46:

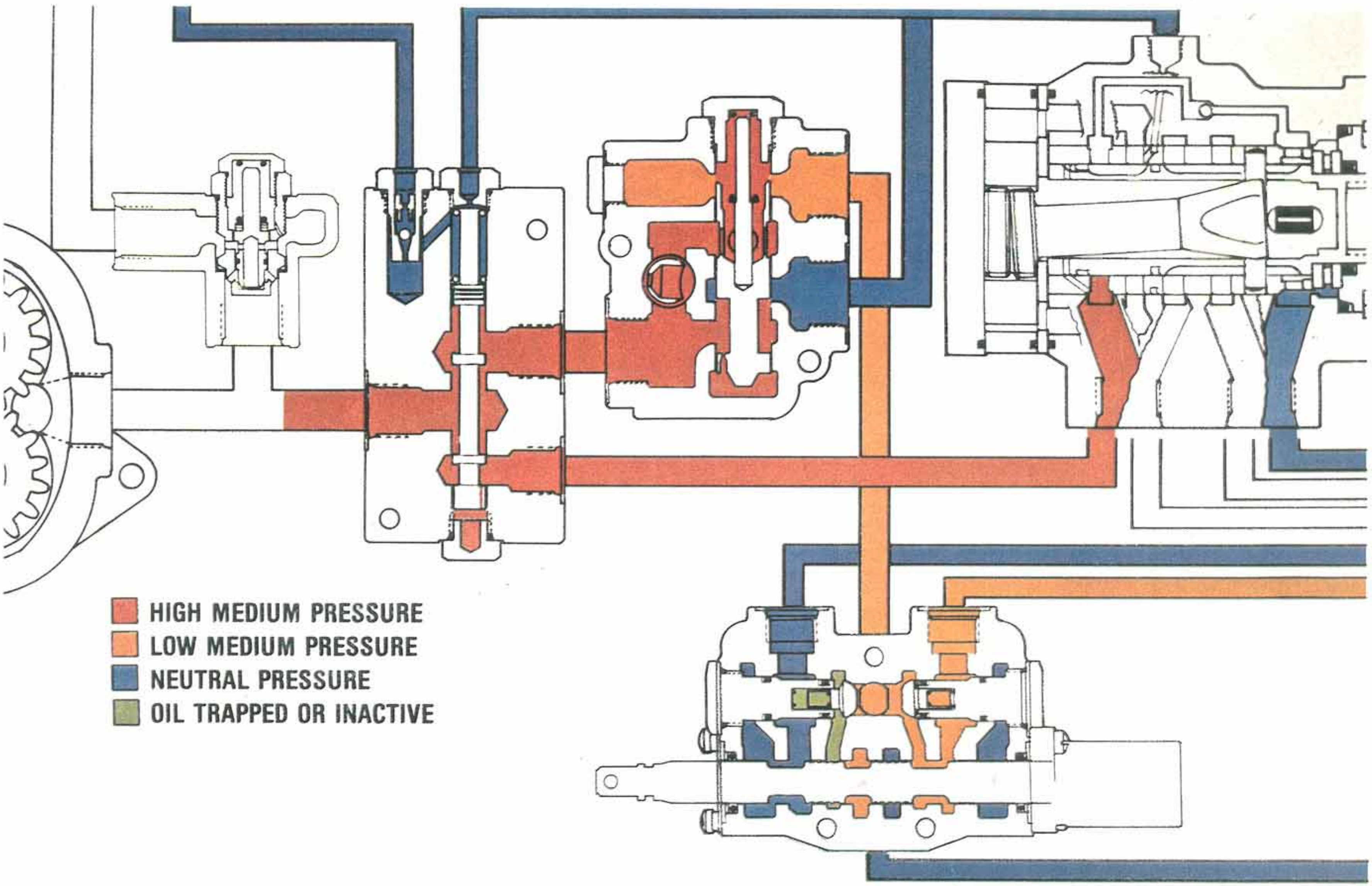
HIGH MEDIUM PRESSURE
LOW MEDIUM PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 47:

The flow regulator has the function of controlling the AMOUNT of oil being furnished to the implement control valve. Because of fluctuation in the implement circuit flows (caused by varying engine speeds and steering commands) and pressures (caused by implement demands), the oil flow to the implement control valve must be controlled to give smooth response. The flow regulator maintains a nearly constant output flow regardless of the varying pressures and flows exposed to it. The manual adjustment spool can be turned in a 90° band to give the range of flows advertised for implement functions. (See Fig. 48)

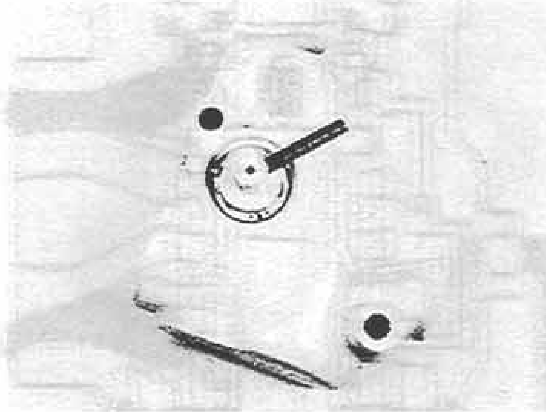

Figure 48:

The housing of the flow regulator has three ports that are used in relation to the Steiger Hydraulic System. The supply port receives oil flow from the priority valve and is able to deliver that flow to the CONTROLLED FLOW and EXCESS FLOW ports. (See Fig. 49)

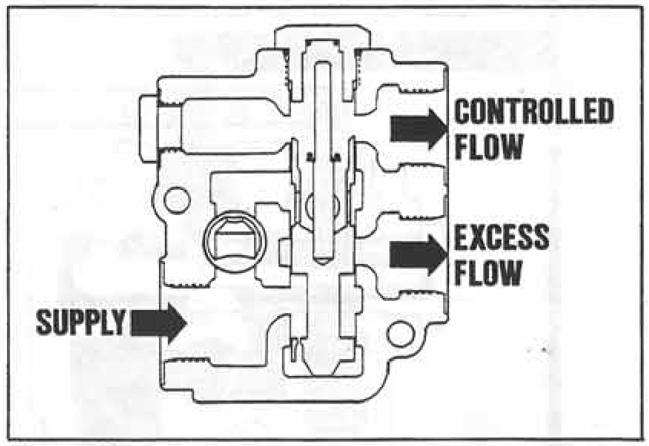

Figure 49:

The adjusting spool is located in a passage between the supply and controlled flow ports. The spool bears external and internal passages which the oil must pass before it can reach the spring end of the METERING PISTON and controlled flow port. When the adjusting spool is at its minimum flow setting, the oil must follow the external passage, but if the spool is rotated, the flow will increase gradually as the inner passage is being exposed to the supply port. At the maximum flow position of the spool, both passages permit oil flow. (See Fig. 50)

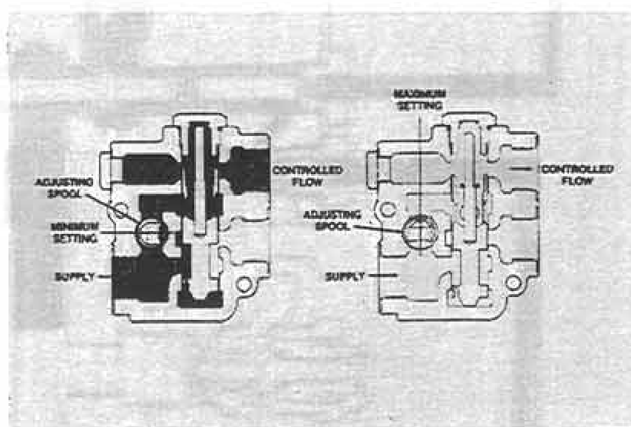

Figure 50:

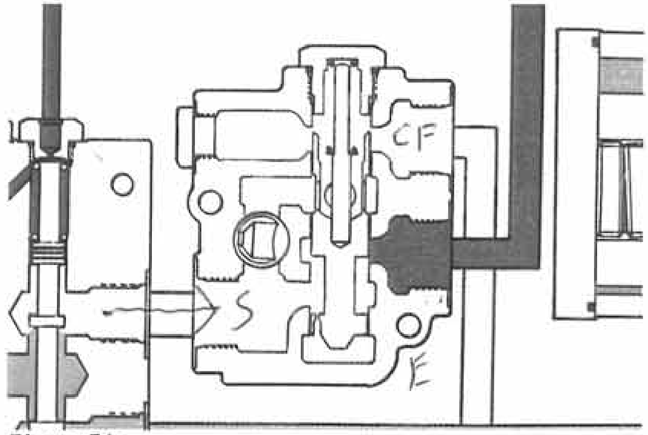

Figure 51:

The flow regulator is pressure compensated across its entire adjustment range to automatically maintain the controlled flow rate. When supply pressure increases, the flow past the adjusting spool will tend to increase. However, the increase in pressure causes the metering piston to shift against spring pressure to let part of the supply oil escape into the excess flow port. Therefore, flow leaving the controlled flow port always remains constant. Supply pressure has acted upon the unsprung end of the metering piston through a control orifice in the land. This action is called pressure compensating. (See Fig. 51)

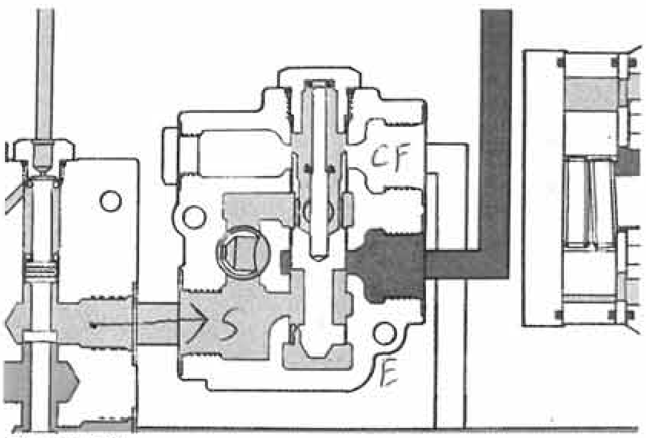

Figure 52:

If supply oil pressure is forced to increase further, the metering piston will shift harder against spring pressure. The spring end of the piston also has a metering edge to THROTTLE the flow of oil enroute to the controlled flow port. Again, the controlled flow is constant or Pressure Compensated. Flow stoppage due to piston overtravel is prevented by the spring loaded piston stop. The control orifice in the opposite end of the piston helps control the speed at which the piston can act. (See Fig. 52)

Up until now there have been no implement demands on the system. But, if there suddenly were, the oil at controlled flow would suddenly increase in pressure. The pressure reading would be determined by the force required to operate the implement. Let's say, for now, only mild pressures or load forces are encountered. The pressure in the controlled flow port acts upon the spring loaded end of the spool, shifting it with spring pressure. Now the excess flow opening is reduced and the controlled flow opening is increased to let flow overcome pressure caused by implement demands. (See Fig. 53)

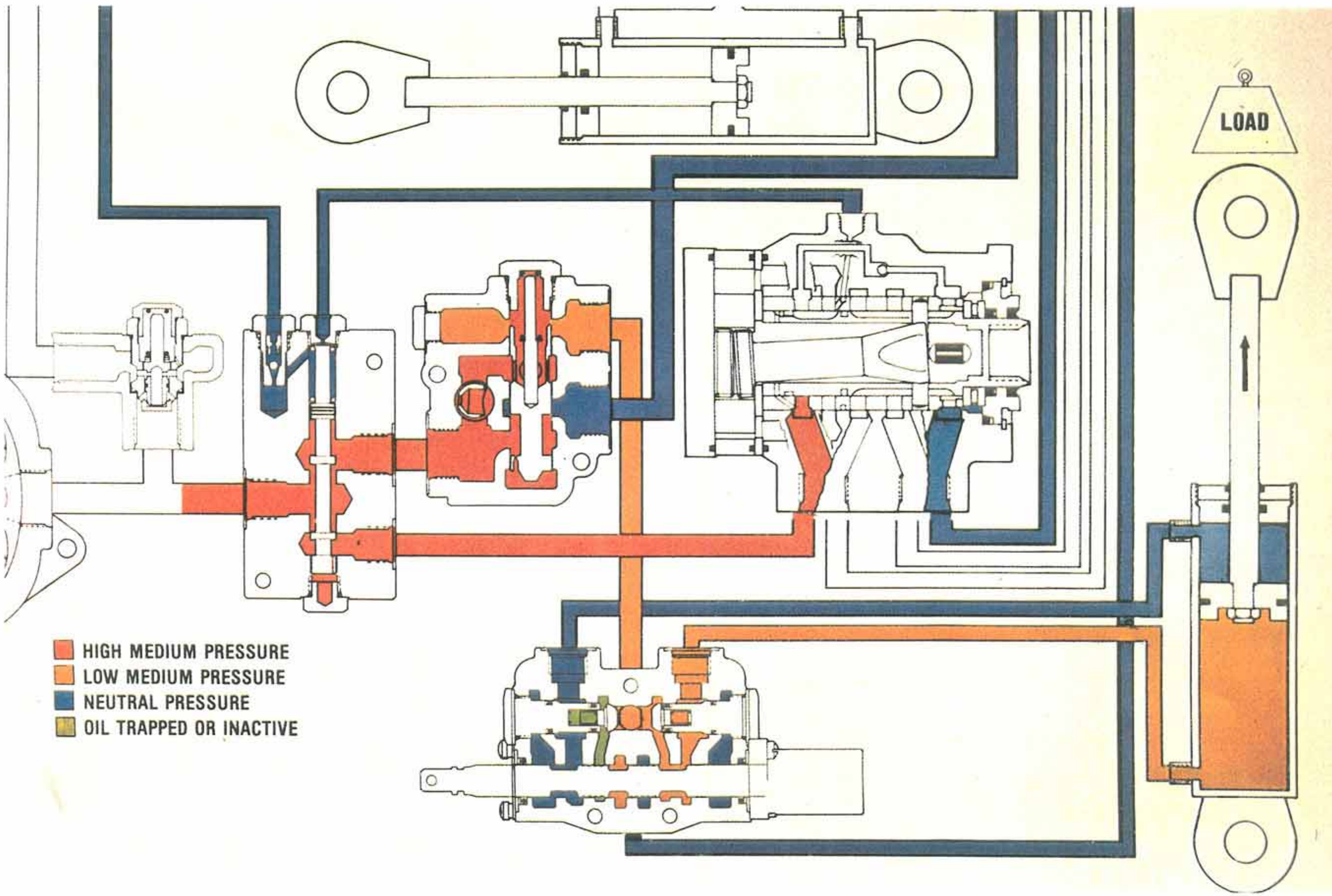
LOAD
HIGH MEDIUM PRESSURE
LOW MEDIUM PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 53:

The metering piston modulates in its housing bore to either expose or close the excess and controlled flow ports according to varying inlet and outlet pressures. If high pressures are developed in the controlled flow circuit, the metering piston moves farther in the direction of spring pressure to restrict the excess flow passage and maintain the controlled flow as previously set. This effect also occurs when flow changes are caused by changing engine speeds and/or steering demands. (See Fig. 54)

When extremely high pressures are required by the implement circuit and flow is fully restricted, the metering piston assumes a full open position. This position is caused by equal hydraulic pressures on both ends of the metering piston thus enabling the spring only to fully shift the piston. During a condition of this type, the main system relief valve must function to prevent damage to the system. A full open metering piston can also associate with low engine speeds while steering is using a portion of the pump flow. The metering piston tries to overcompensate, but cannot since adequate supply is not available. (Fig. 55)

The main system relief valve is a direct acting poppet type and is adjustable by adding or removing shims. It is located between the pump and priority valve assemblies. Although it occupies this area of the hydraulic system, it is normally activated only during high pressure demands of the implement circuit. Remember, the pressure in the steering circuit is limited by the LOAD SENSE RELIEF VALVE, not the main system relief valve. But should a malfunction occur elsewhere in the system, the main relief valve stands ready to protect the pump. (See Fig. 56)

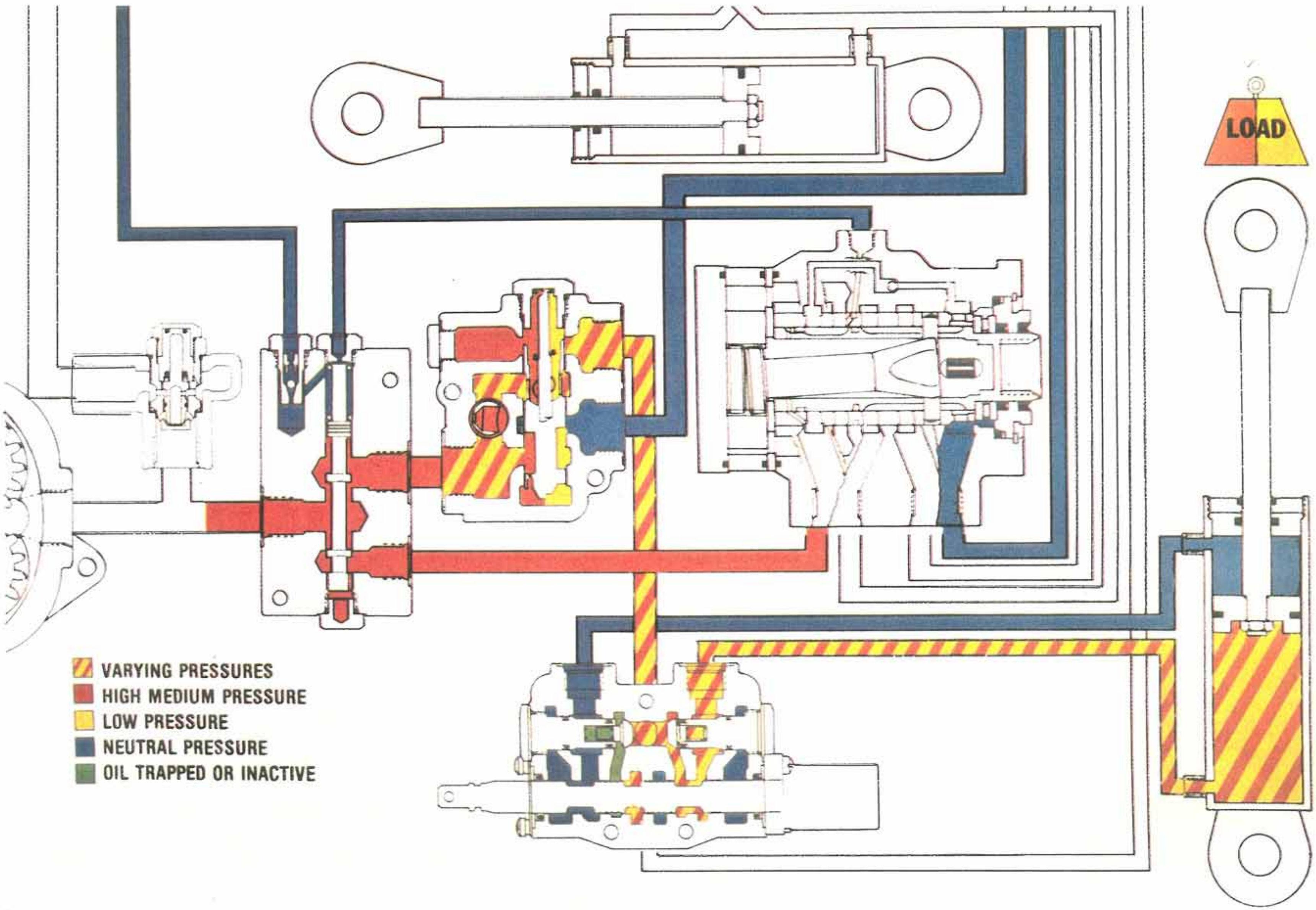
LOAD
VARYING PRESSURES
HIGH MEDIUM PRESSURE
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 54:

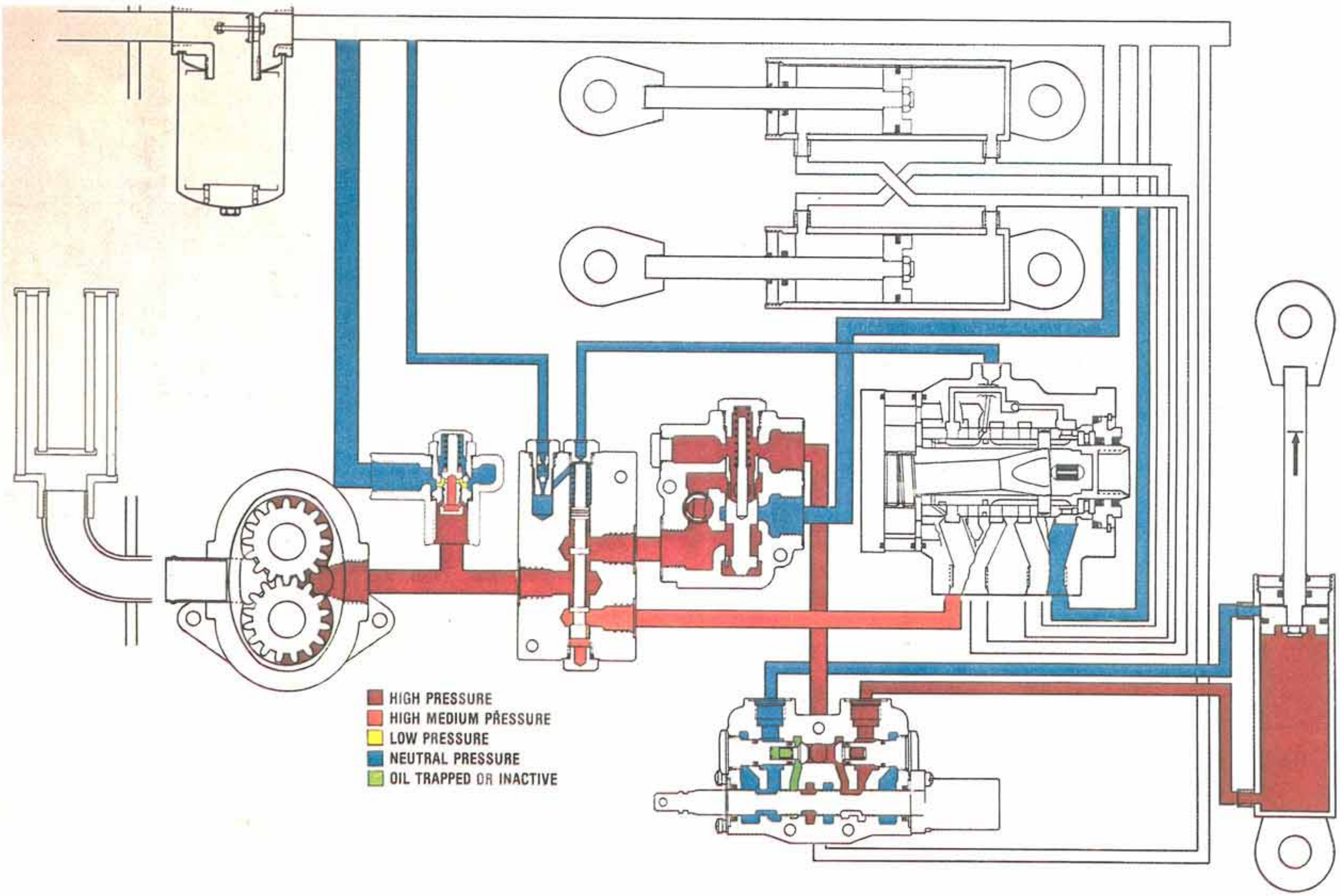
HIGH PRESSURE
HIGH MEDIUM PRESSURE
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 55:

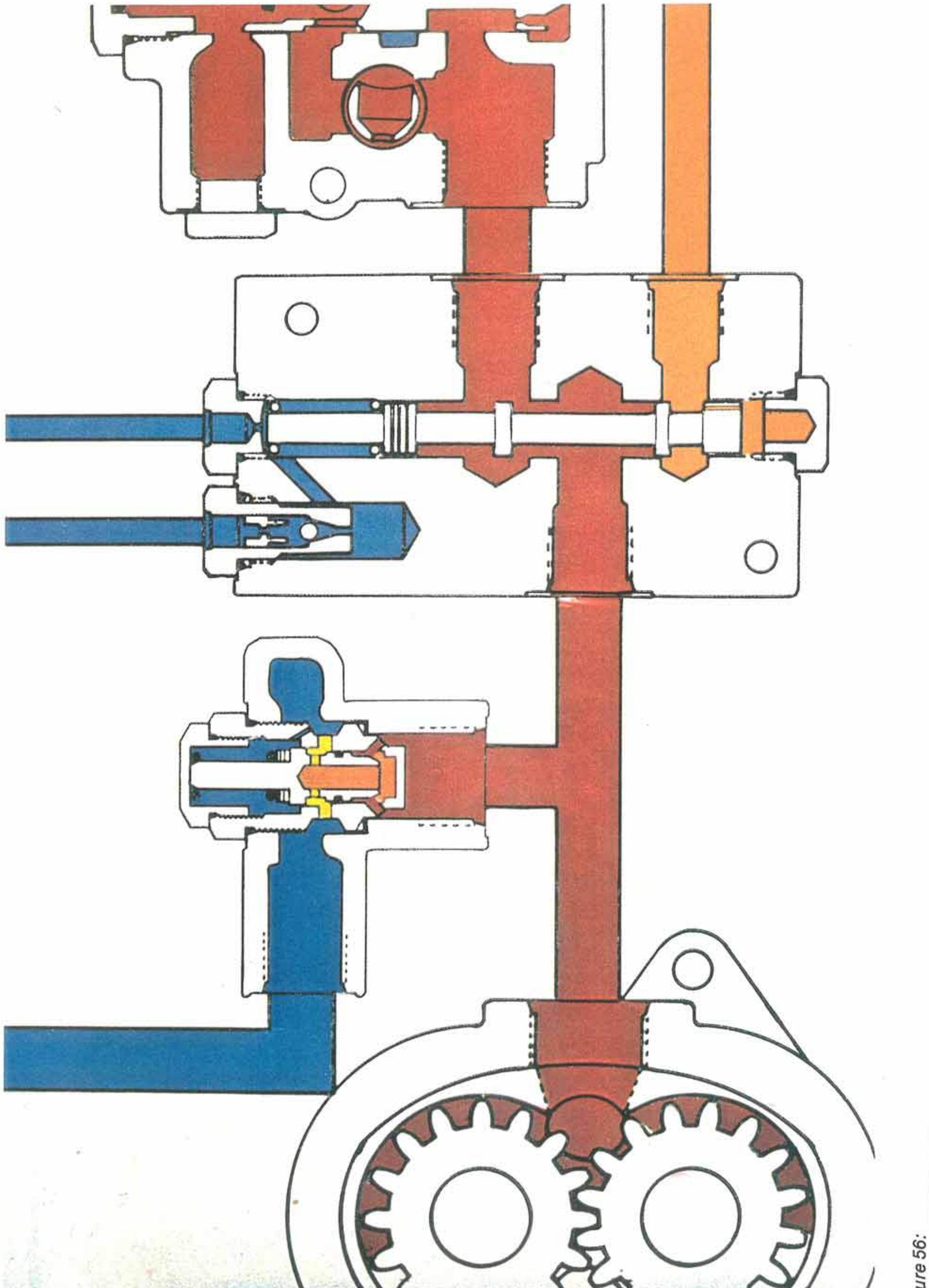

Figure 56:

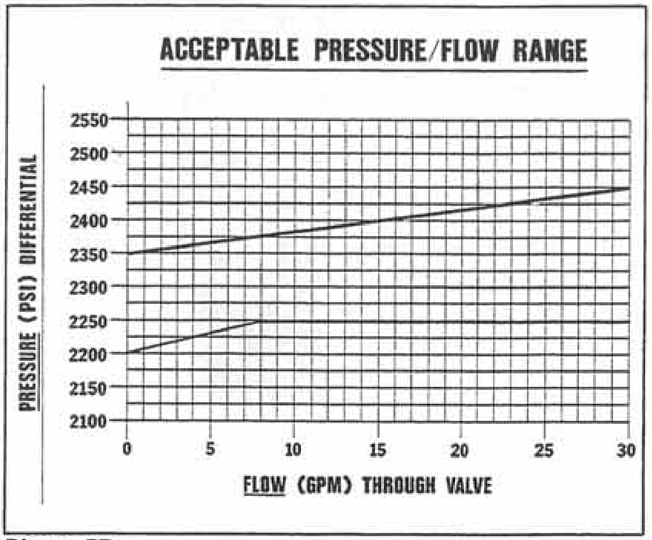

Figure 57:

To ensure proper performance of the hydraulic system, the relief valve must maintain the minimum and maximum pressure within the range shown on the chart. The use of a flow pressure tester is highly recommended to test or adjust the valve since the pressure acting on the poppet varies with the flow rate crossing or escaping through it. (See Fig. 57)

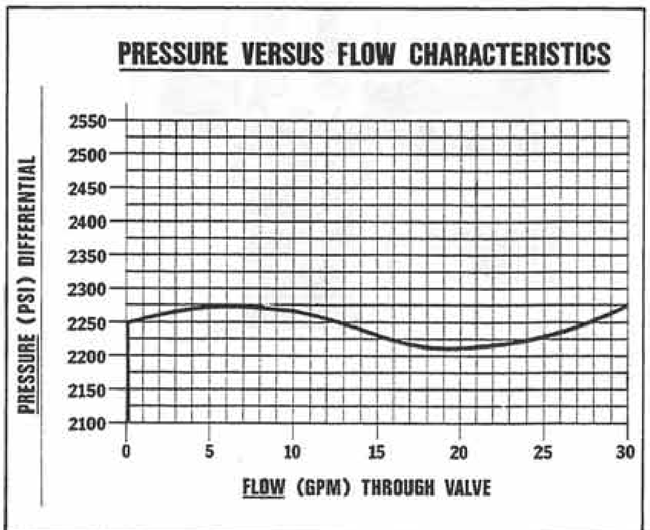

Figure 58:

A typical performance curve for this relief valve is shown on a graph to demonstrate the actual influence of pressures and flows. The purpose of this graph is to illustrate the importance of knowing the characteristics of the valve for testing, adjusting and troubleshooting purposes. (See Fig. 58)

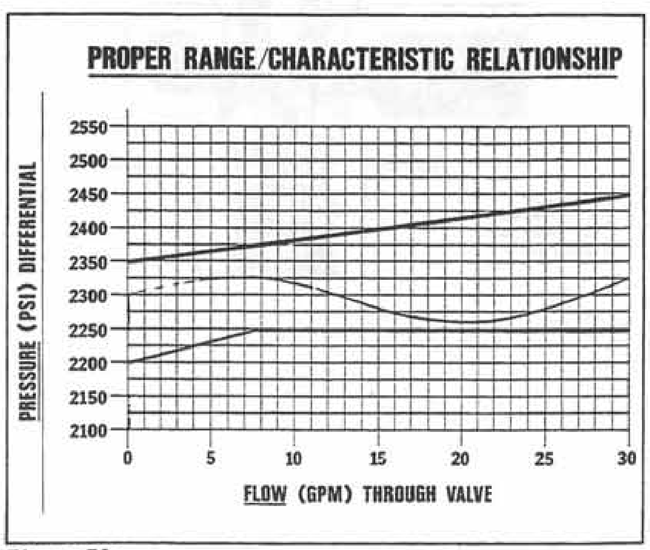

Figure 59:

Here the chart and graph have been combined to illustrate how the actual performance curve of the valve must fit the chart. As you can see, the pressure stays within the range of the chart but has higher and lower areas. Remember this and apply it to practical use in conjunction with specifications furnished later on. (See Fig. 59)

The higher and lower pressures are characteristics caused by the design of the valve. When the valve is closed, the rising pressure can only begin moving the poppet against spring pressure by acting upon the area shown. (See Fig. 60)

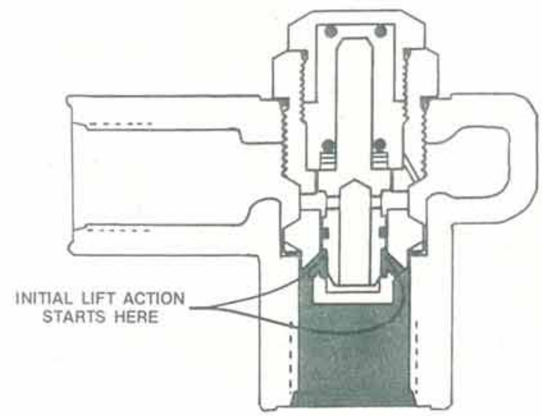

Figure 60:

After the poppet is lifted off its seat, additional surface area is exposed to cause greater flow and less pressure through the valve poppet. (See Fig. 61)

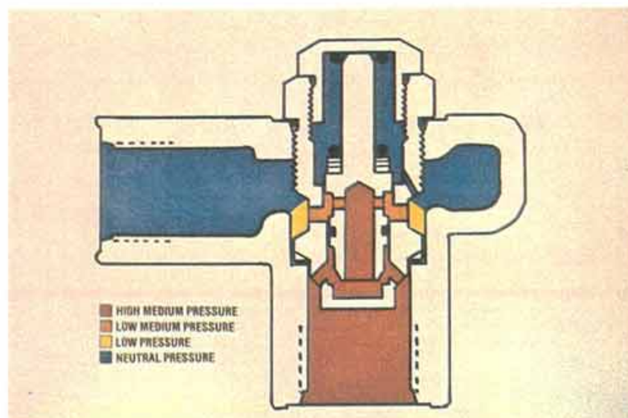

Figure 61:

The pressure will again rise after the poppet is unseated if the flow through it is increased. Force of the oil trying to escape through the poppet causes the increase in pressure. (See Fig. 62)

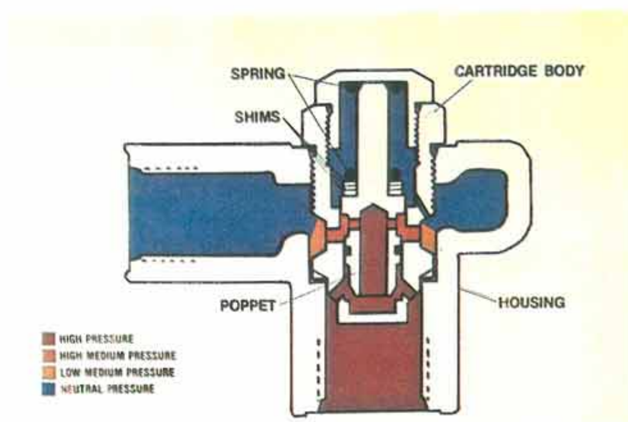

Figure 62:

Vicker's Relief Valve

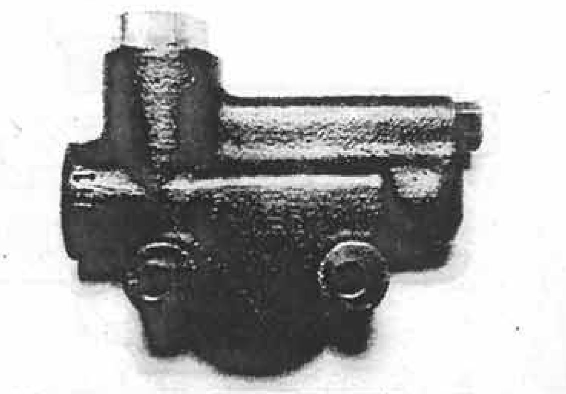

Figure 62A:

On later production tractors a VICKER'S relief valve is used as a direct replacement for the earlier main relief valve. Though the purpose of the two valves is the same, there is a difference in the operation and operating characteristics (Fig. 62-A).

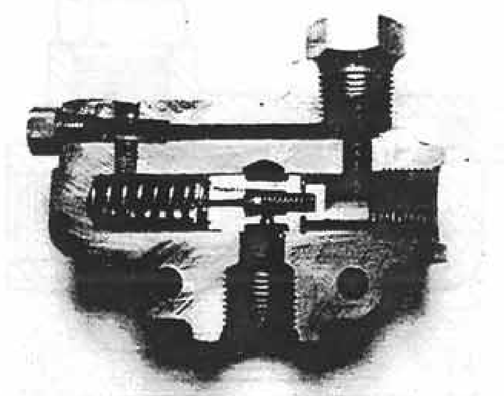

Figure 62B:

This later relief valve is PILOT - OPERATED instead of direct-acting. This allows a relief pressure that stays the same, even if the amount of flow through the valve changes. this CUT-AWAY VIEW shows all the internal parts (Fig. 62-B). A spring loaded piston is held against a retaining ring - this is a fully closed position. All pump flow, during this time, goes downstream toward the load.

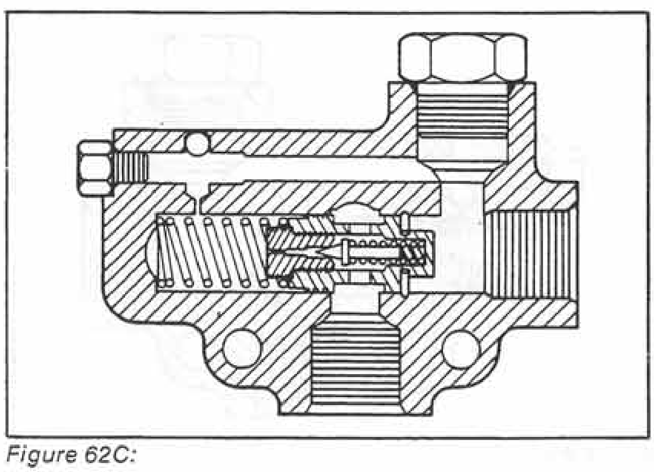

Figure 62C:

Whenever the SYSTEM pressure is LESS than RELIEF pressure, there will be EQUAL pressure on both ends of the relief piston - PLUS spring pressure to hold it closed (Fig. 62-C).

The valve housing and relief piston both have a CON— TROL ORIFICE. Oil under pressure tries to seek this way back to tank but cannot when the RELIEF POPPET stays seated (Fig. 62-D).

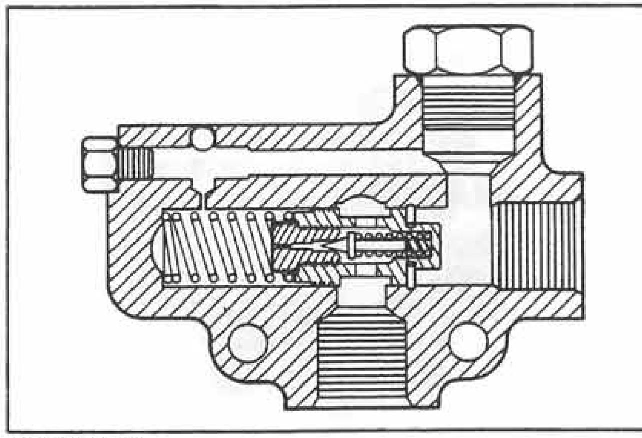

Figure 62D:

When pressure toward the load is high enough to raise the poppet off its seat, the oil from the spring side of the relief piston goes to the tank. This creates a pressure DIFFER- ENCE on the ends of the relief piston (Fig. 62-E).

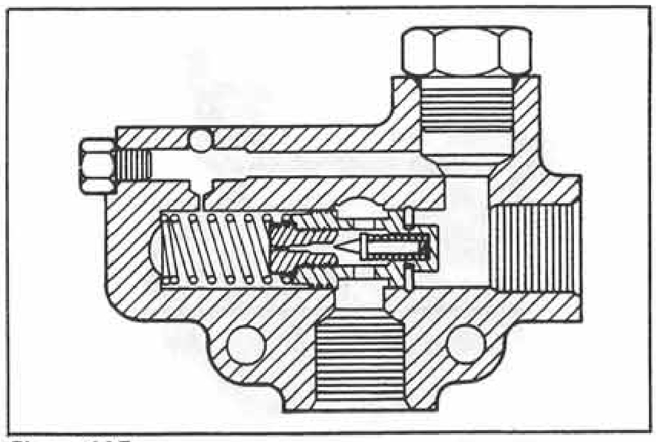

Figure 62E:

Relief pressure is obtained when incoming pressure is strong enough to shift the relief piston against the spring and oil pressure behind it. Pump supply goes to the tank as the piston land reveals the TANK port on the housing (Fig. 62-F).

Remember, the relief poppet inside the piston ALWAYS opens at the same pressure, but the piston position relative to the tank port is controlled by the amount of flow trying to escape.

Steiger tractors produced since January 1981 the Secondary Relief Valve has a revised pressure setting (See specifications) as do the Steering Load-Sense and Main Relief Valves.

The former Secondary Relief is now intended to function as the Implement Circuit Relief Valve and it also will retain all features and characteristics that it had before.

IMPORTANT: *When using the revised pressure specifications on an earlier tractor, be sure that ALL relief valves are adjusted to the new test values.*

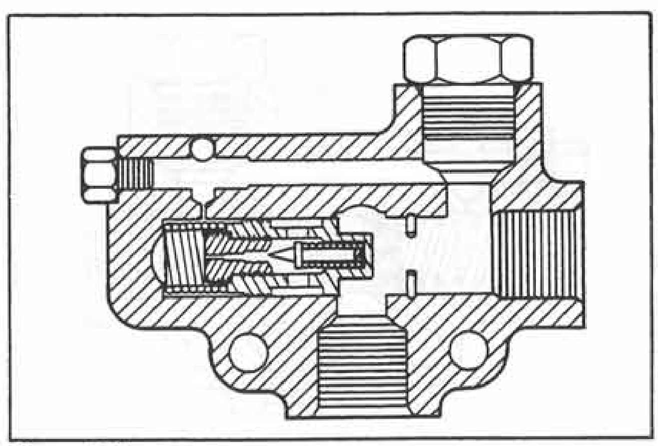

Figure 62F: