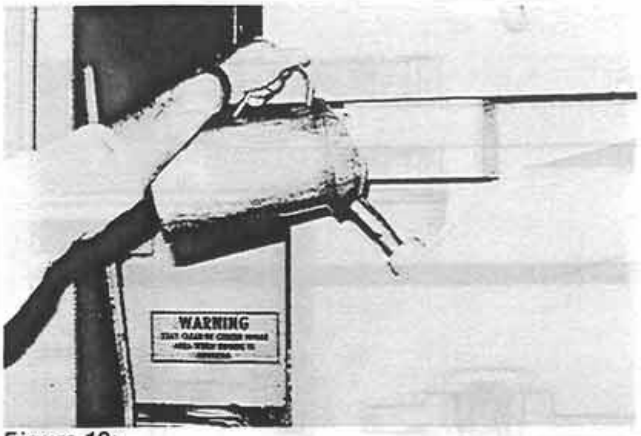

Figure 12:

Stress on your customers the importance of storing and handling hydraulic fluids properly and when refilling the system to use ONLY perfectly clean containers. When checking hydraulic oil reservoir fluid levels, the oil level should reach the "full" mark on the dipstick with "warm" oil and the engine "stopped." "Recheck" the level again after all the hydraulic circuits have been filled. (See Fig. 12)

Figure 13:

Service and maintenance procedures are a valuable tool for the technician to use in respect to judging what type of care the system has had, and a "probable cause" when diagnosing system problems. Customer satisfaction is "important" and YOU hold the key by using these basic tools of knowledge coupled with good customer communications for the purpose of failure "prevention" or "analysis." (See Fig. 13)

SYSTEM PRINCIPLES AND DIAGNOSIS

Because the pump is gear driven by the engine, the hydraulic system is always active to some degree when the engine is operating. Two basic variables govern the system. They are "flow" which is affected by pump speed and size, and "pressure" which is affected by restrictions and/or demands that are placed upon the system.

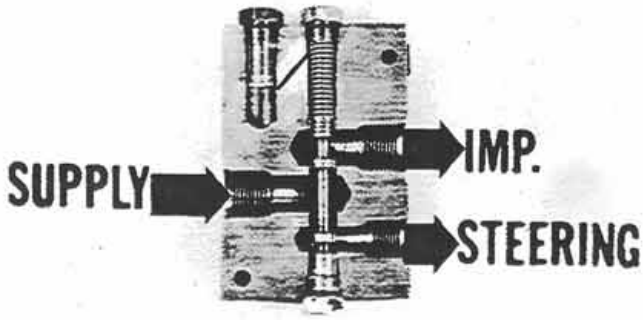

Figure 14:

But, here is where the commonality with other systems must stop. The single element pump must furnish oil to two separate systems, the "steering" and "implement" circuits. To accomplish the energizing of two circuits properly with a single pump, a "priority valve" is used to route oil flow where it is needed. The priority valve is designed to permit oil flow to the steering circuits whenever there are steering demands. Proper steering control must always be available so the demands of the steering circuit are satisfied before all others. When there are no steering demands, all the pump flow (except 1/4 to 1/2 gallon per minute) (1-2 liters) is directed toward the implement circuit.(Fig. 14)

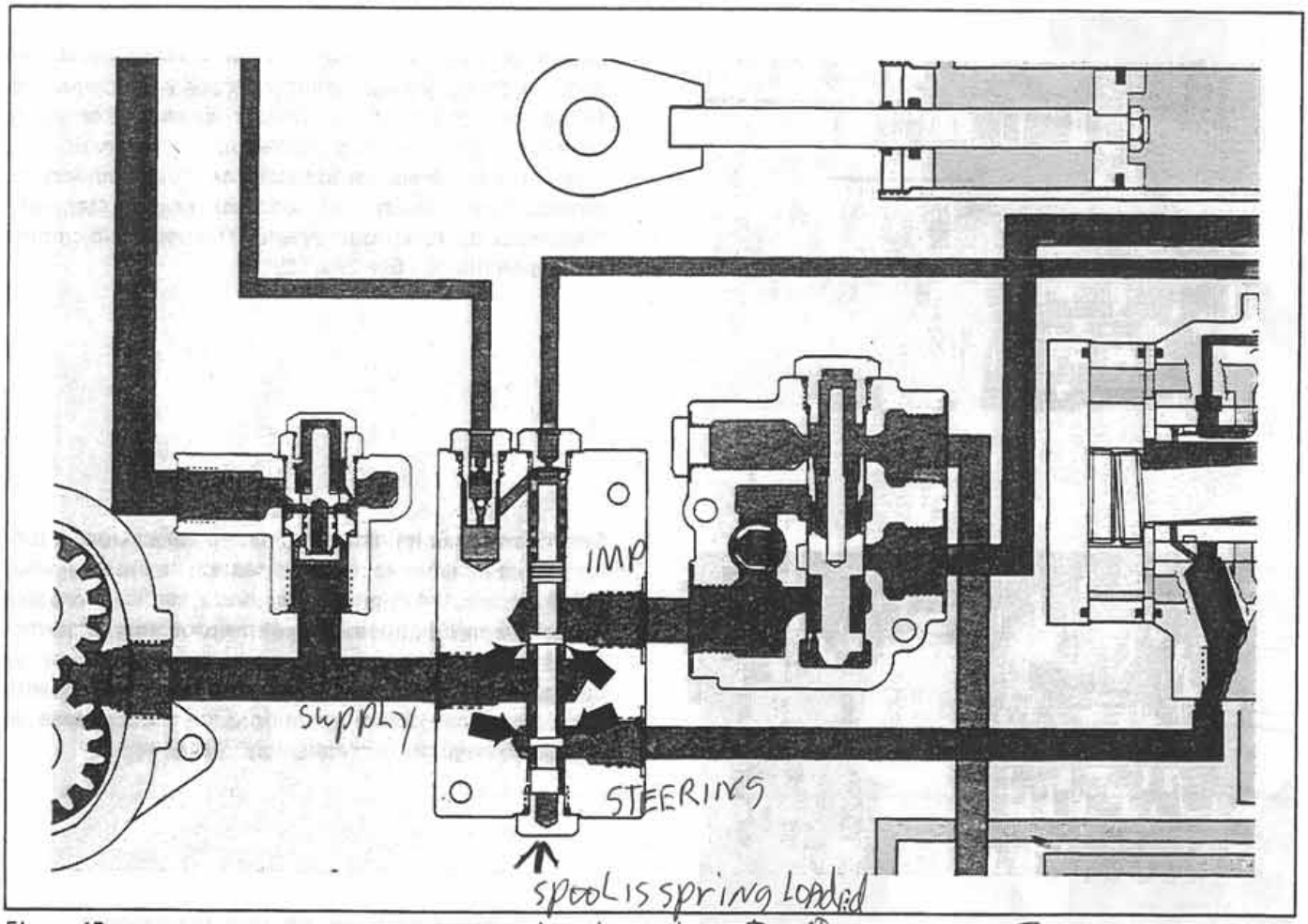

Figure 15:

The priority valve is fitted with a spool which has two metering edges. When the spool moves in its bore, it is able to route oil flow to either the steering or the implement circuit or both circuits simultaneously. The spool is spring loaded to allow flow to the steering circuit first. (See Fig. 15)

The steering system is a closed center type. The only time it will accept any significant flow is during a steering command. As pump flow begins during neutral steering, pressure is increased because the steering circuit is closed. The flow leaving the pump increases in pressure until it rises far enough to overcome spring pressure on the spool. (See Fig. 16)

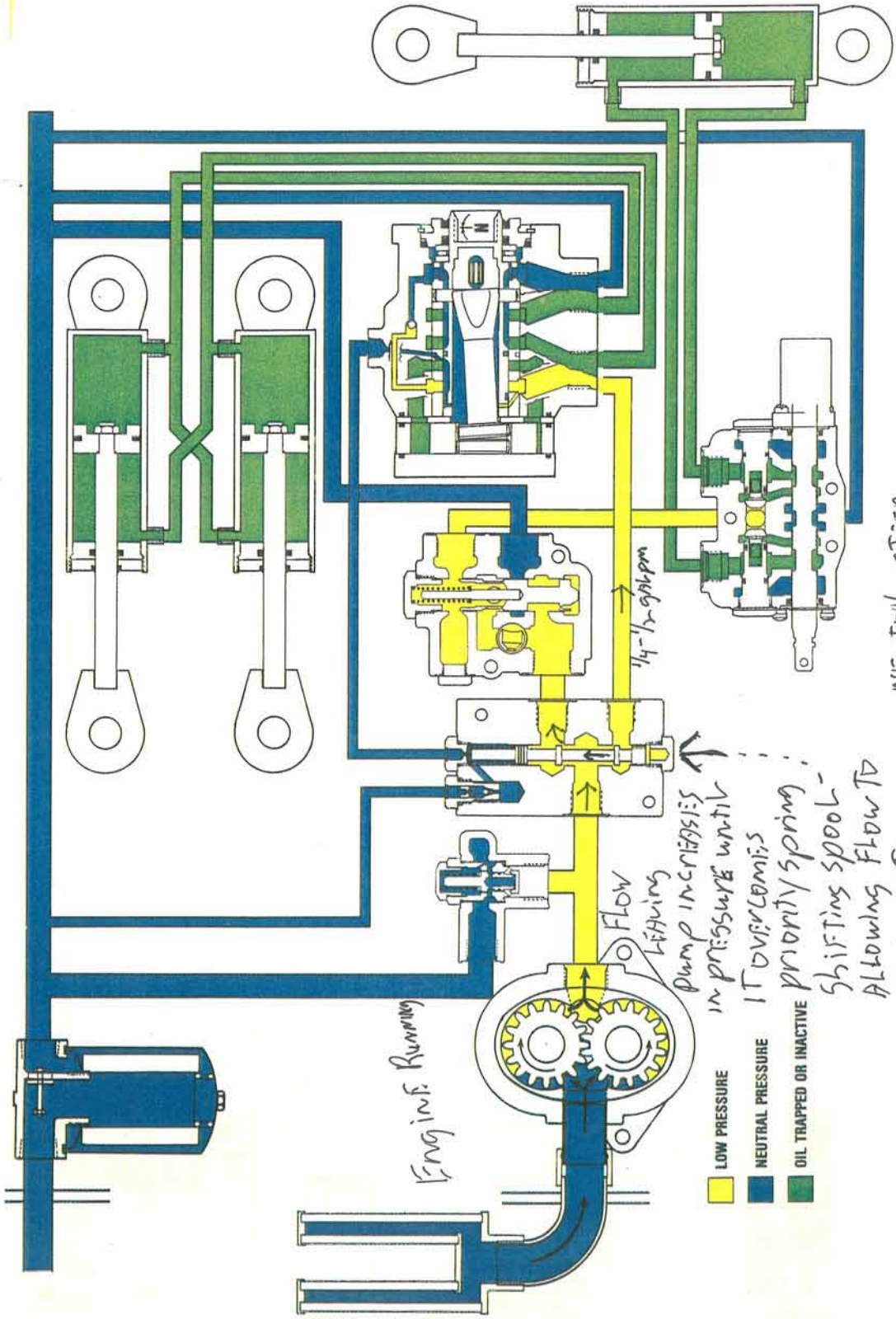
Engine Running
Flow leaving pump increases in pressure until it overcomes priority spring shifting spool allowing flow to move on to flow control
1/4-1/2 system
Neutral steer
Neutral Imp
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 16:

This pressure acts against the unsprung end of the spool by means of a small drilled passage which has a control orifice at one end. The spool begins to shift when hydraulic pressure exceeds spring pressure. It then maintains a position which allows oil flow to the open center implement circuit. Movement of the spool in this manner is called MODULATING since it regulates the degree of opening required according to pressure of the passing flow. A condition known as CONTROL PRESSURE now exists between the pump and priority valve. (See Fig. 17)

How does MODULATING and CONTROL PRESSURE relate? Control pressure is present when there are no demands on the system, and is variable in proportion to the amount of flow produced. For example, a typical Steiger ST 210 may have a control pressure of 190 PSI at an engine speed of 830 RPM, but increases to 320 PSI at approximately 2800 RPM. This increase in flow sees more resistance to flow, and therefore an increase in pressure. If priority spool positions could be compared during these conditions, we would be able to see the spool shifted farther against spring pressure when flow rates are high. (See Fig. 18)

CONTROL PRESSURES are influenced by varying neutral pressures in the implement circuit. For example, flow regulator setting, oil filter condition and oil temperatures, etc. Neutral pressure exists on any flow which is enroute to the reservoir either directly or indirectly. The only pressure present is that required to move the flow since there is no load or force to overcome. (See Fig. 19)

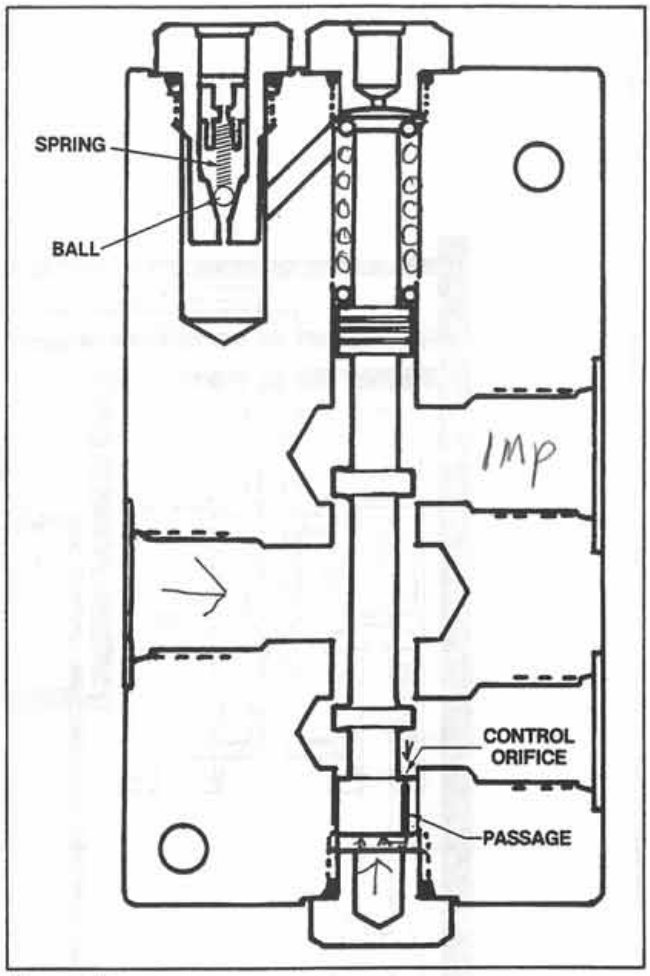

Figure 17:

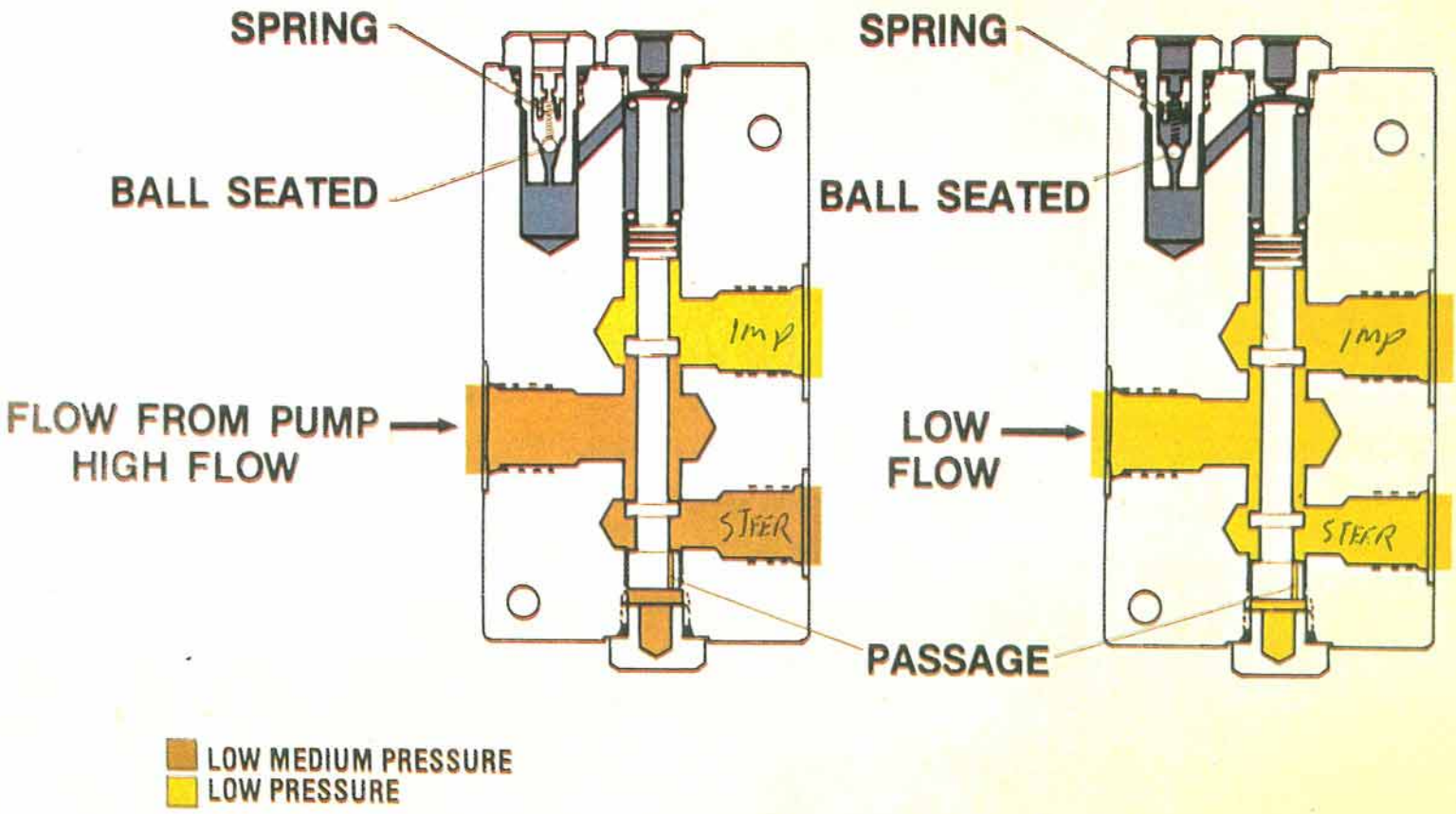
SPRING
BALL SEATED
FLOW FROM PUMP
HIGH FLOW
IMP
STEER
SPRING
BALL SEATED
LOW
FLOW
IMP
STEER
PASSAGE
LOW MEDIUM PRESSURE
LOW PRESSURE

Figure 18:

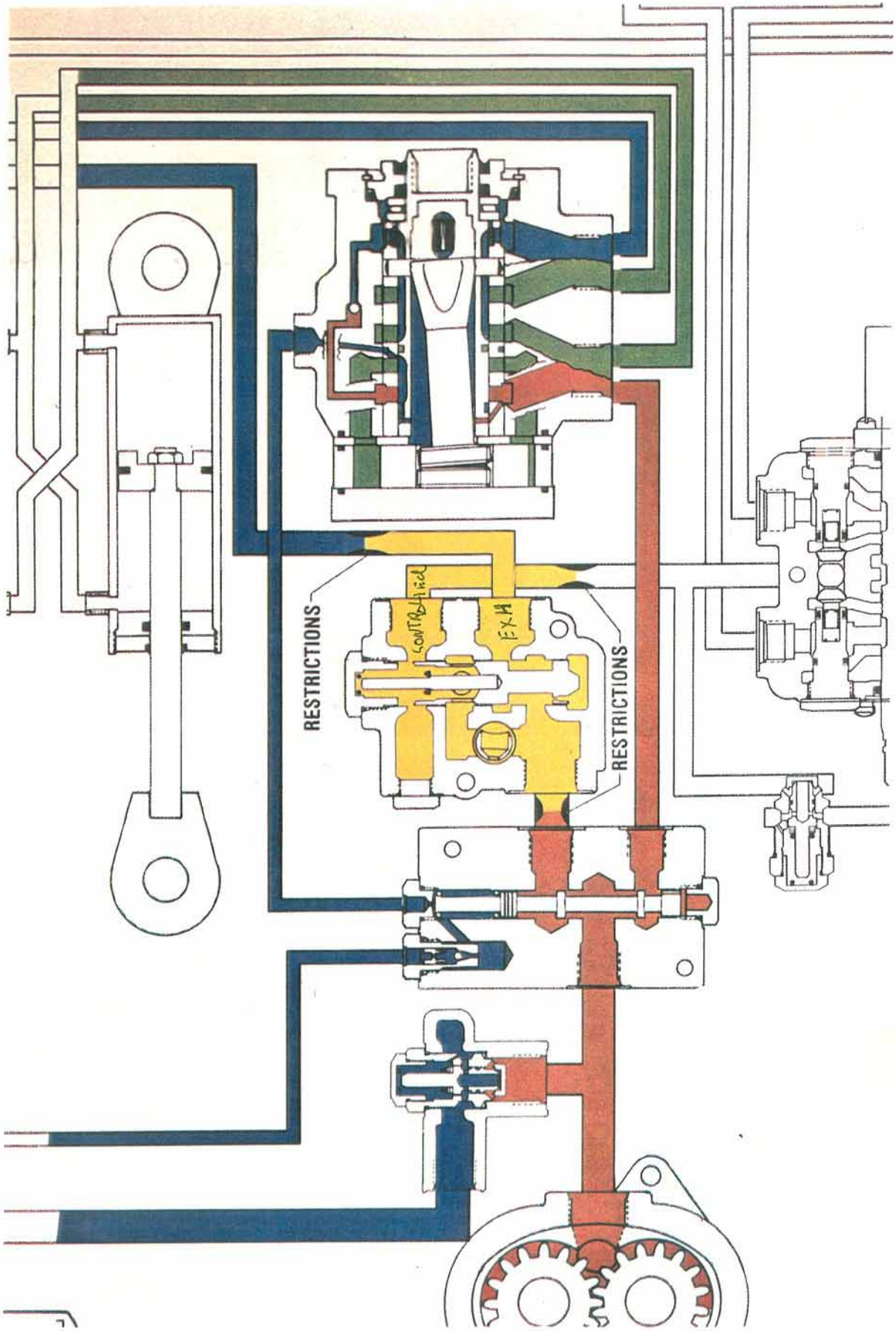

Figure 19:

When the priority spool is shifted against spring pressure, it modulates to allow flow at CONTROL PRESSURE to the steering valve. With one exception: flow to the steering circuit is never cut off completely by the spool's metering edge because it influences pressure on the unsprung end of the spool to cause modulation. (See Fig. 20)

The exception is this, the spool may travel fully against spring pressure when working pressure exists in the implement circuit during neutral steering and the speed of the spool is feathered by the load sense inlet orifice above the spool. (See Fig. 21)

Oil that is allowed past the spool edge to the steering circuit now flows to the closed center steering valve at the rate of 1/4 to 1/2 gallon (1 to 2 liters) per minute. The purpose is to equalize temperatures between the steering valve and the rest of the system, and then return to the tank. In the steering valve, the inner and outer spools contain passages that allow slight leak-through only during neutral steering commands. The fit and design of the mating spools determine the RATE of leakage through the steering valve. (See Fig. 22)

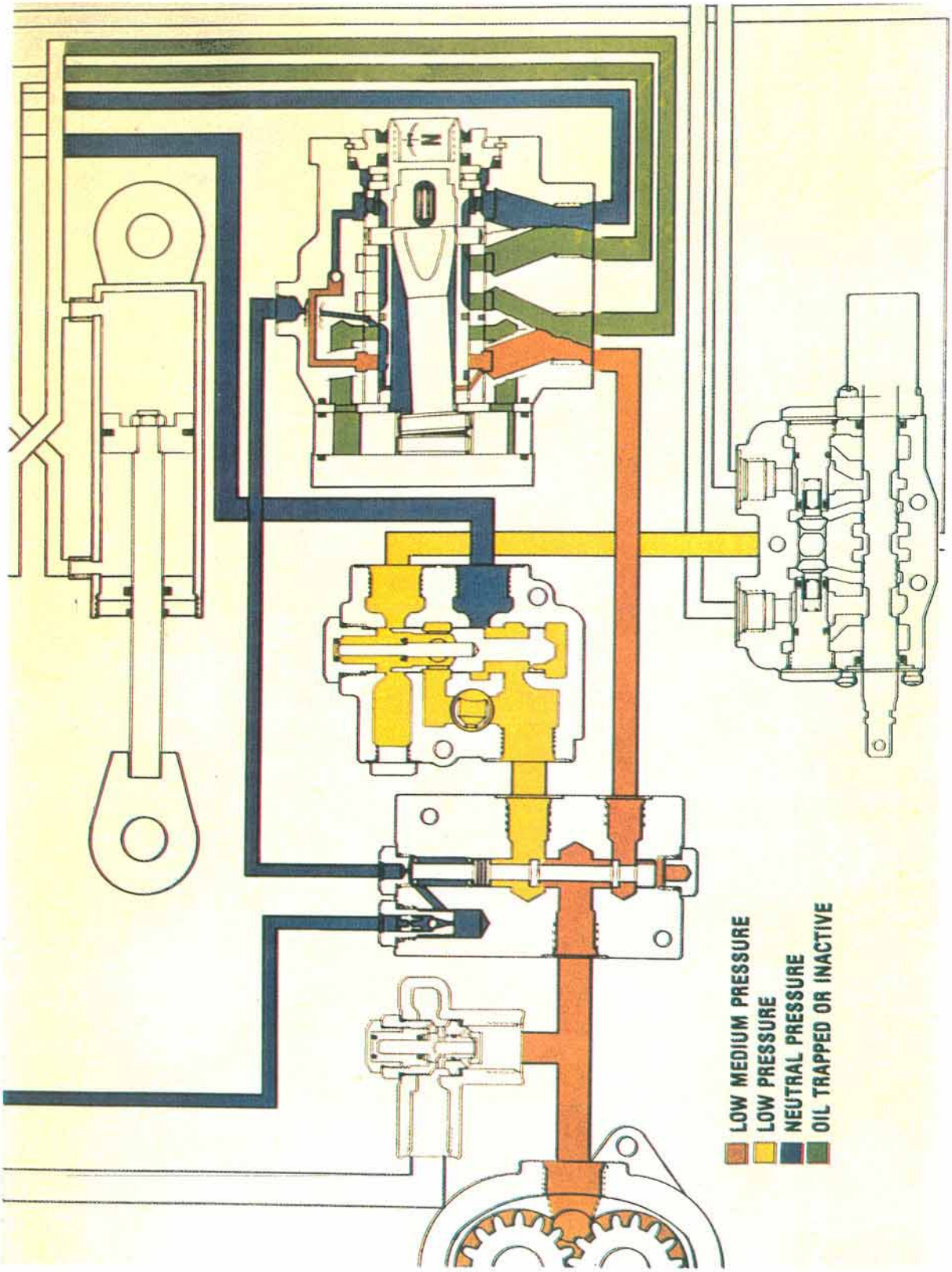
LOW MEDIUM PRESSURE
LOW PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 20:

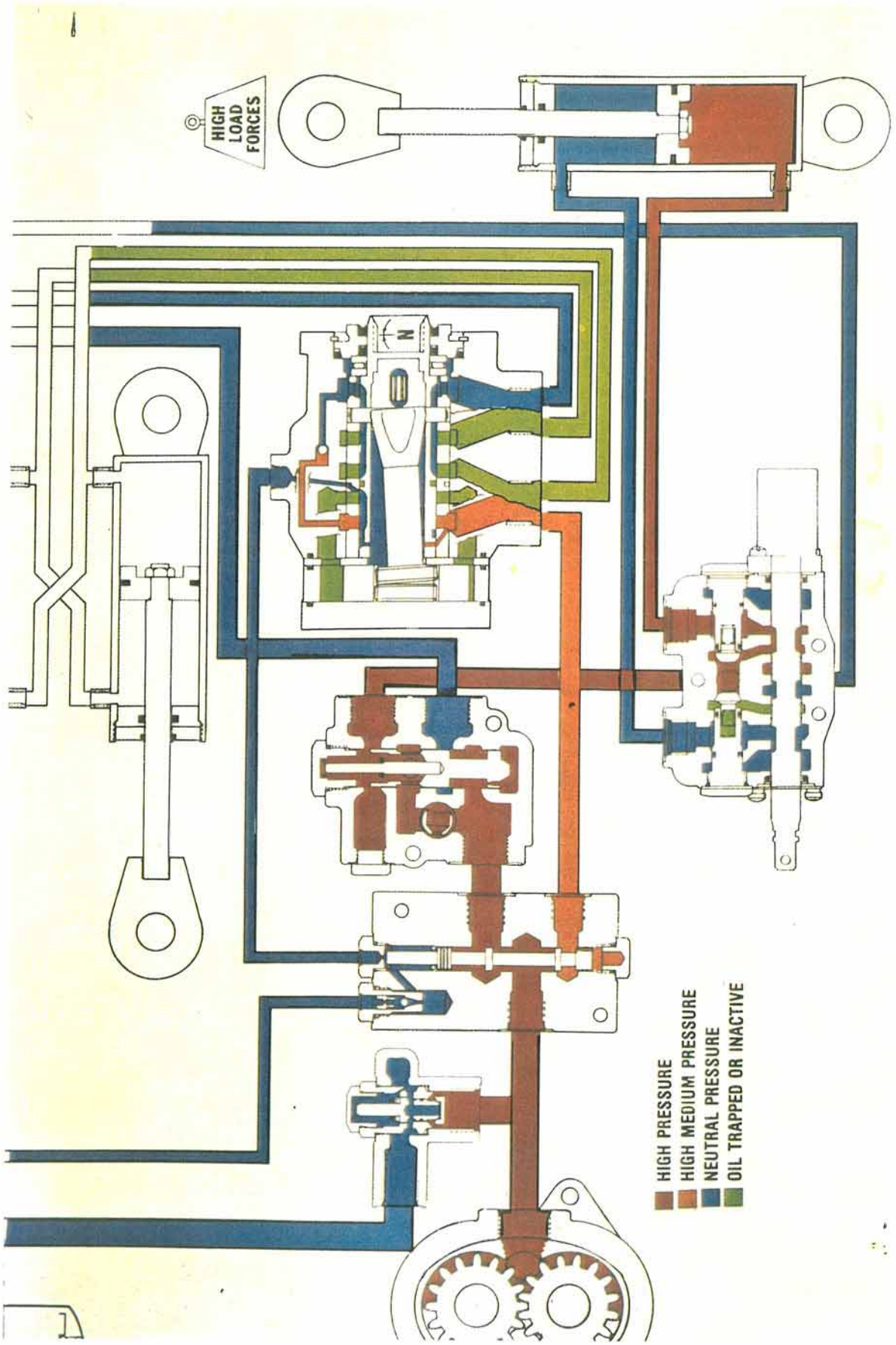
HIGH LOAD FORCES
N
HIGH PRESSURE
HIGH MEDIUM PRESSURE
NEUTRAL PRESSURE
OIL TRAPPED OR INACTIVE

Figure 21:

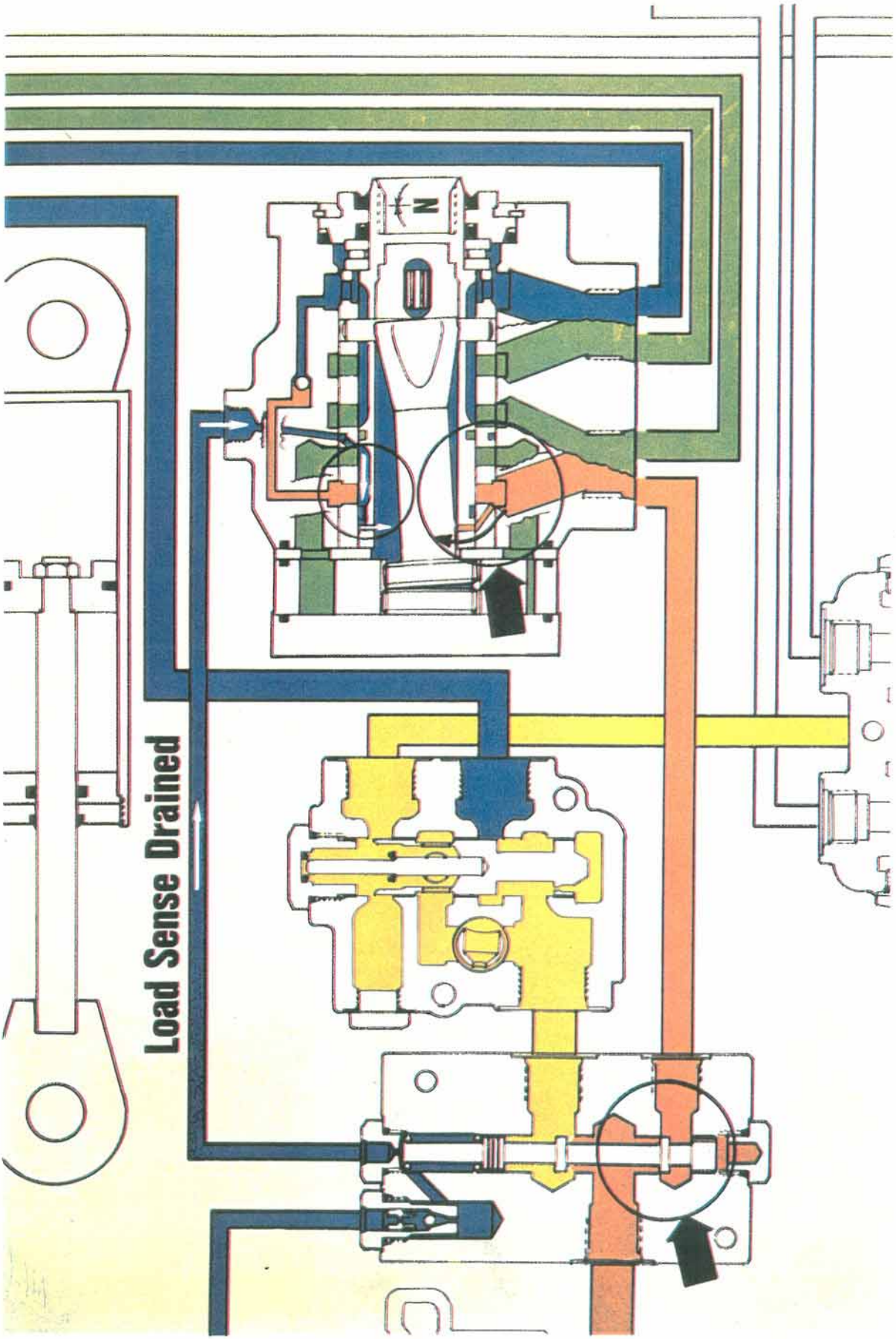

Figure 22: