

Almost Everything You Need to Know About Trouble Shooting

When a hydraulic circuit quits working the problem must be quickly diagnosed and fixed. The responsibility for doing the work usually falls on the area mechanic. Often the mechanic is not well versed in troubleshooting techniques and only has a minimal understanding of fluid power symbols. This text will attempt to address these areas with information on methods of logical trouble-shooting and how to read the symbols used in fluid power.

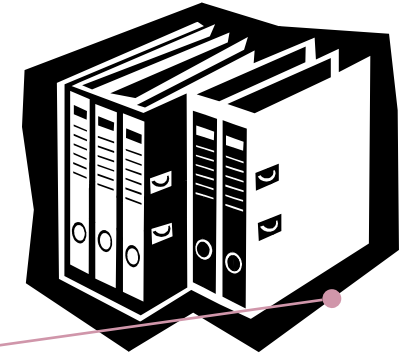
- Step 1* Look Over Machine And Hydraulic Components For Obvious Faults
Low Oil, Bad Wiring, Damaged Parts, Etc.
- Step 2* Question Maintenance Persons About Any Work On The Machine
Prior To Start Of Problem
- Step 3* Question Operator On What Happened When
Problem Started
- Step 4* Try To Cycle Machine To See If Fault Is Related To
Flow, Pressure Or Movement
- Step 5* Study Circuit Schematic And Note Any And All Valves That Could Cause The Problem
- Step 6* If The Problem Appears To Be An Adjustment Make Changes And Cycle Again, If Not:
- Step 7* Lower Or Mechanically Contain Suspended Loads
Lockout And Tagout Electrical Circuit
Bleed Off All Trapped Pressurized Fluid
- Step 8* Check Out The Most Obvious Component, Then The Next Most Obvious Component
For Correct Part Number, Damage, Setting, Etc.
Until Finding An Obvious Problem Or Depleting All The Obvious Components
- Step 9* Adjust, Repair, Replace All Parts That Are Not Operating As Designed
- Step 10* Restart Machine To See If Problem Is Resolved

Chart 1 General Troubleshooting Procedure

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Information and Logical
Steps to Find Design

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INTRODUCES



Trouble Shooting Industrial Hydraulics

A Generic Training Book
for Maintenance
Mechanics and
Technicians that Work on
Fluid Power Systems

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Information From the Table of Contents

Chapter 1

General Trouble Shooting information and guidelines. Procedures for systematically approaching an ailing circuit to quickly determine the correct component to work on or change.

Recommended equipment and helpful tools to make the Trouble Shooting process faster and easier. Recommendations on how to use the information gleaned from these instruments and tools.

Chapter 2

Contains many Fluid Power circuits with emphasis on how they work, normal troubles experienced with each circuit type and ways to diagnose them quickly. All these circuits are laid out in schematic form and show valve and actuator changes as they go through normal operations.

Chapter 3

This chapter covers specific problems that are common to a given component. Many valves have internal orifices or clearances that can get clogged or wear in such a way to cause a recognizable symptom to the trained person. Pressure control valves, directional control valves, flow controls and others are shown in cutaway with an explanation of how they work and what to expect in the way of problems.

Chapter 4

Circuits in this chapter help the trouble shooter learn to quickly identify symbols in a schematic drawing. After identifying the component it must be integrated into the circuit to show how its function interacts with other parts.

Chapter 5

The circuits in this chapter are missing parts or lines, have wrong valves in place, have faulty adjustments, lack power or a combination of problems.

It is the student's job to find the reason for the malfunction called out on the facing page and determine what to do to fix it.

Chapter 6

Chapter 6 shows several multifunction circuits with a sequence of operation on the facing page. The student must explain the symptoms of failure for the called out components.

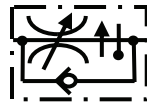
Chapter 7

Here are several schematics from the students on machine in the plant. The circuits must be studied to see how they work and then determine the importance of each part to the operation.

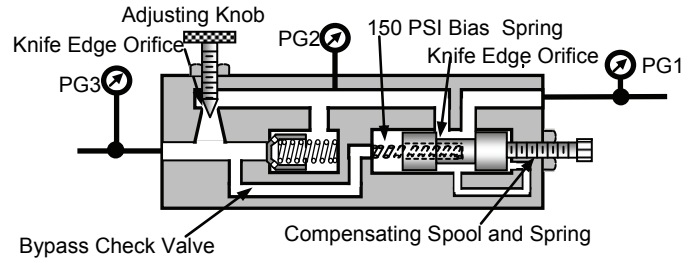
Chapter 8

This is a set of symbols that meet ISO (International Standards Organization) criteria and may be used for reference in all the foregoing exercises.

Pressure Compensated Flow Control Valve Cutaway



Symbol



Explanation of Function

UNI-DIRECTIONAL PRESSURE COMPENSATED FLOW CONTROL

Fig. 11B shows a generic cutaway of a pressure compensated uni-directional flow control that accurately controls flow even when input or output pressures change. This type flow control is 2-4 times more expensive than the non-compensated type but is worth the money when accurate flow is required.

Flow entering the **Inlet Controlled Flow** port passes through the **Compensator Spool And Spring** chamber and on to the adjustable orifice. Back pressure at the orifice builds at the right end of the compensator spool and forces it against the spring. The compensator spring takes approximately 75-150 PSI to compress it so the compensator spool moves over enough to restrict flow so pressure on gauge PG2 reads 150 PSI. When pressure at PG2 reads zero PSI then pressure drop across the orifice is 150 PSI. No matter how much input pressure changes the **Compensator Spool And Spring** maintains the 150 PSI drop across the orifice and flow stays constant.

If pressure increases at the outlet, gauge PG3, it adds to spring pressure at the compensator spool and causes pressure at PG2 to increase by the amount of back pressure plus the 150 PSI compensator spring. If outlet pressure climbs to 400 PSI then pressure at PG2 would increase to 550 PSI keeping pressure drop across the orifice at 150 PSI.

When pressure at the inlet or outlet fluctuates the **Compensator Spool And Spring** adjusts flow to the control orifice to maintain a constant pressure drop across it. When pressure drop remains constant flow also remains constant. The schematic symbol indicates pressure compensation by the perpendicular arrow on the inlet to the orifice.

When this type valve is used at low flows it sometimes becomes unstable when it first receives flow. The **Compensator Spool And Spring** jumps shut too fast and too far causing a pressure drop which then allows it to open too far and too fast. It takes a few seconds for the valve to settle in to a constant flow and could cause problems. To overcome this fault a **Spool Over Speed Adjustment (No Jump)** screw is added to adjust spool starting position close to the minimum flow setting so it does not have as far to move at first flow. If the valve is fitted with a **Spool Over Speed Adjustment (No Jump)** it needs to be changed especially when speeding up the actuator.

To compensate for viscosity changes primarily due to temperature changes a **Knife Edged Orifice** replaces the standard needle and orifice. This sharp edged restriction causes less change from different viscosity's and keeps an actuator operating at the same speed from start up to operating temperature. Temperature compensation is shown on the schematic symbol as a temperature bulb perpendicular to the inlet line to the orifice.

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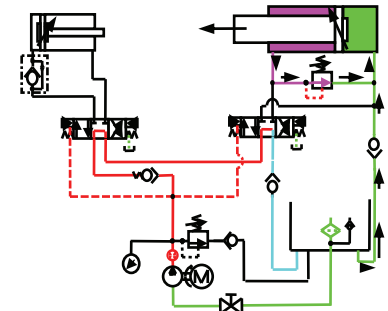
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