RAP R22: Automatic Line Break Control
Adjustment and Set-up Procedure
ALBC Pre 1983
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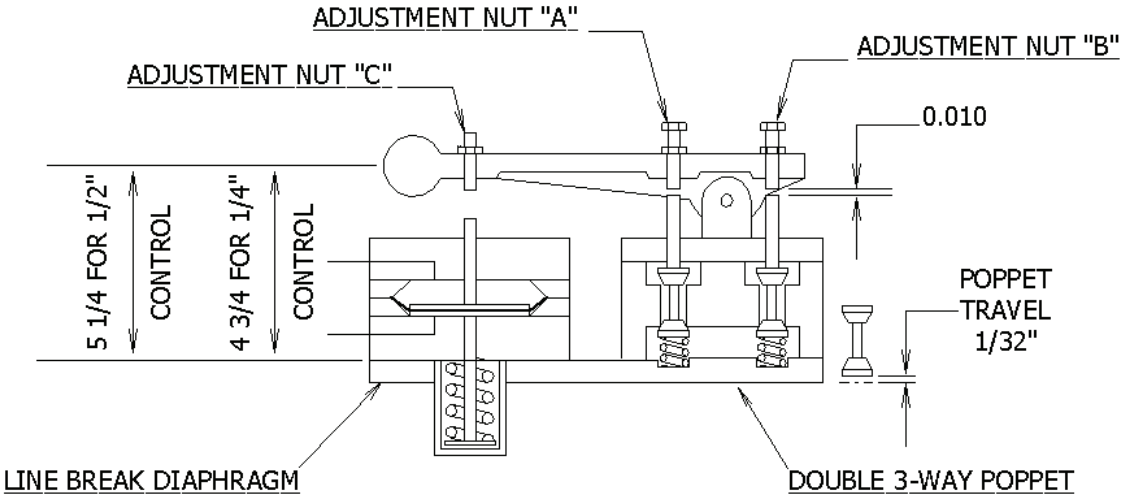
Function

The Shafer Automatic Line Break Control is designed to sense a predetermined rate of pressure drop, which occurs for a definite length of time. Both of these conditions must be satisfied before the control is tripped.

Adjustment of Double Three-way Poppet Control

The “heart” of all Shafer™ Controls is the double three-way poppet. Correct adjustment of this part of the control is essential for it to function properly.



When replacing poppets, it is essential that poppet travel be 1/32 inch. Less than this will cause leakage of power gas to the exhaust. More than this amount will cause the poppets to be crushed and will eventually cause leakage. Poppet pins may have to be lengthened or shortened to insure this 1/32 inch travel. Poppet pins may be made from 1/4 inch stainless steel round bar.

Alignment of the control lever can be obtained by tightening adjustment nut “B” until a dimension of 4-3/4 inches for 1/4 control (5-1/4 inches for 1/2 inch control) is obtained. Adjustment nut “A” should then be tightened until a dimension of approximately 0.010 inch is obtained between the pushrod and the adjustment nut “B” with power pressure on the poppets.

Control Lever “Play”

There should always be a slight amount of “play” in the control lever. To adjust lever screw “C” first loosen completely, then drop pressure on front side of diaphragm. This will cause the diaphragm stem to be fully extended. Pull lever forward sufficiently to eliminate escape of

power gas through the exhaust. Then tighten lever screw “C” to just touch the diaphragm stem. Tighten jam nut to maintain setting.

Setting the Line Break Control

Normal line pressure fluctuations must be known before fine adjustment of this control can be made. Any rate of pressure drop, whether caused by a line rupture or not, in excess of the setting of the control will cause the control to trip.

First, the pressure selector must be connected to both the upstream and down stream sides of the valve. Line pressure from both sides of the valve should then be permitted to enter the pressure selector. (See Schematic 2336-S for Plug Valves or 3879-S for Gate Valves) The double check valve in the pressure selector will select the higher pressure on either side of the valve and will permit it to pass to the poppet block. This will be used as power gas.

The shuttle in the pressure selector will shift to the low pressure side of the valve. This pressure drop will be caused by a line break. The control will react to a pressure drop in the pipeline and the shuttle will insure full closure of the valve.

When pressurizing the control, equal pressure must be supplied to both sides of the pressure selector. This pressure will then pass on to the front side of the diaphragm, through the orifice and pressurize the expansion tank and the back side of the diaphragm. At this time, the control is ready to test and be put unto service.

Note: *The Mainline Valve should not be reopened until the control line break sensing mechanism can be repositioned.*

Assume it has been decided that any rate of pressure drop in excess of 20 psi per minute can only be caused by a line rupture. The control needs to be set to trip at that rate.

1. Make a trial setting, say two notches on the adjustable orifice “A”, or use a fixed orifice calculated to the size of the expansion tank.

2. Close the Shut Off Valve “G”. This shuts off the supply of pilot pressure to Gauge “F”. Replace with a calibrated gauge.

3. Open Isolation Valve “H” and pressurize to mid-range pipeline pressure (i.e. 500 – 1000 psi working = 750 psi calibration pressure). Close valve “H” and record that pressure.

4. Open vent orifice “B” sufficiently to cause diaphragm stem to just touch adjustment screw “C” of control lever. Record the time. A stopwatch is best for repeated tests. Allow this rate of bleeding for exactly five minutes and close the vent orifice “B”. Then record the second pressure reading on the calibrated gauge.

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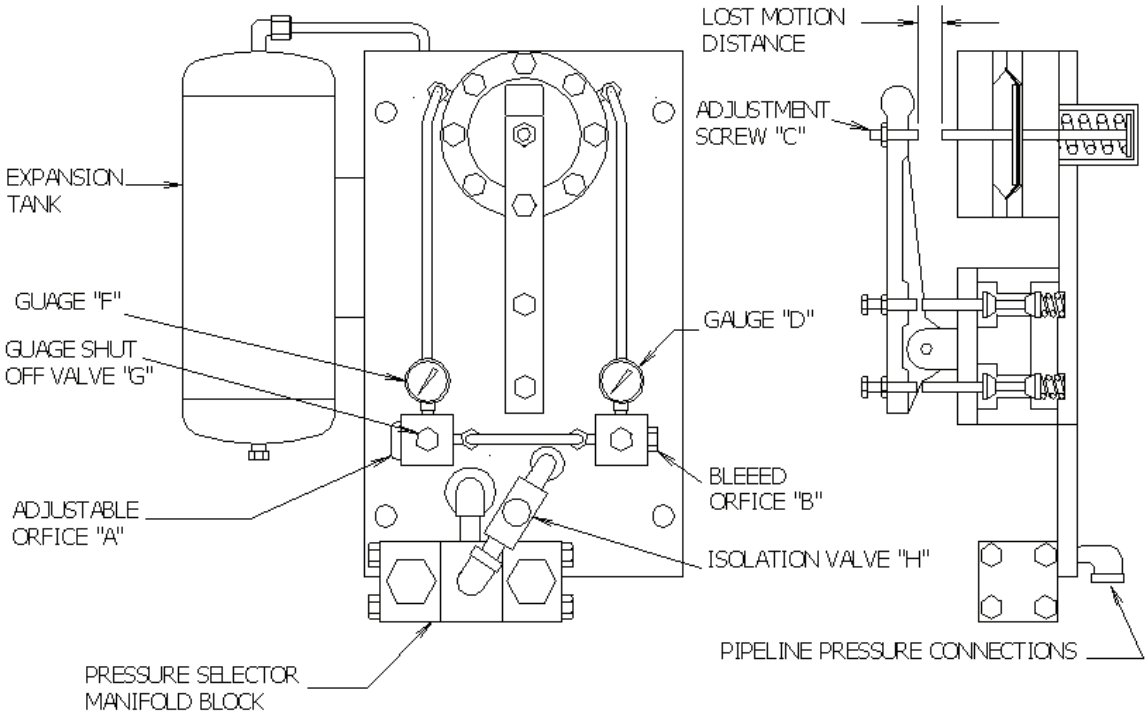

5. To determine the adjustable orifice setting, subtract the final pressure reading from the initial pressure reading and divide by five. Example:

$$\text{Rate of pressure drop} \quad \frac{\text{P1 800 PSI} - \text{P2 600 PSI}}{\text{5 Minutes}} = 40 \text{ PSI per Min.}$$

6. This is in excess of the desired rate of 20 PSI/Min. Therefore make the adjustable orifice or fixed orifice smaller and repeat Steps 2. – 5. above.

7. Repeat until the desired rate of pressure drop is obtained.

It should be noted that the control will trip if there is an excessive rate of pressure drop that occurs long enough to permit the diaphragm stem to travel the “lost motion” distance.

Because of the “lost motion” feature, excessive pressure drops, which occur for a short length of time, will not cause the control to be tripped. Any rate of pressure drop less than the vent rate of the adjustable orifice will not cause the diaphragm stem to move.

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When an excessive rate of pressure drop occurs the diaphragm stem will stay fully extended until the pressure in the expansion tank vents down to approximately 2 psi permitting sufficient time for the valve to fully close.

The control must be reset if there are major changes in the operating pressure.

Once the valve has been closed, it may be re-opened with power gas by depressing the control lever.

Note: *The higher the pressure gets, above the calibrating test pressure, the more sensitive the control becomes. For example, a calibration pressure of 750 psi and a rate of 20 psi per min. will change to approximately 16 psi per min. as the pressure increases to 1000 psi. The control will be less sensitive at pressures below the test pressure. For example, a calibration pressure of 750 psi and a rate of 20 psi per min. will change to approximately 24 psi per min as the pressure decreases to 500 psi.*

If any further information is required, please feel free to contact:

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