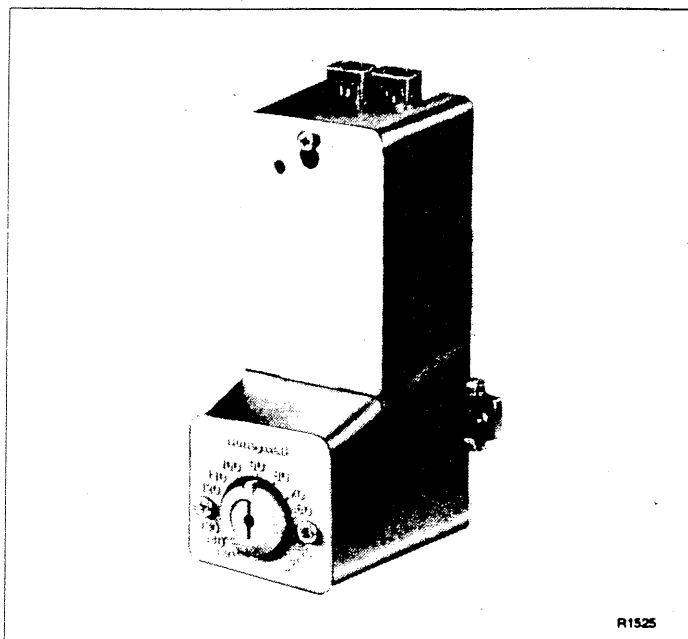


LP920A-D Temperature Controllers

Service Data



R1525

General

Description

The LP920 is a single-temperature, high-capacity pneumatic controller with direct or reverse action. The LP920A and B models, with liquid filled element, control dampers and valves in HVAC systems, regulating air and liquid temperatures. The LP920C and D Zero Energy Band models were designed for control of sequenced heating/cooling unit ventilators and fan coil units.

Older models of the LP920A and B have the scaleplate at the top; all newer models have the scaleplate at the bottom.

Application

LP920A and B

The LP920A and B have a liquid-filled element, for direct duct mounting, well mounting, and remote bulb and averaging capillary application.

LP920C and D

The LP920C and D Unit Mounted Controllers, in conjunction with RP971A Sequencing Relays, provide Zero Energy Band control of sequenced heating/cooling unit ventilators and fan coil units.

Specifications

Models:

LP920A: Direct acting
LP920B: Reverse acting
LP920C: Direct acting
LP920D: Reverse acting

Maximum Safe Air Pressure:

30 psi (207 kPa)

Maximum Safe Temperature:

Element: 230F (100C)
Controller: 150F (66C)

Maximum Operating Temperature:

Element: -40F (-40C)
Controller: 35F (1.7C)

Air Consumption:

0.011 scfm (0.005 l/s)

Operation

General

NOTE: Refer to Figure 10 in the Parts and Accessories section for a cross-sectional view of the LP920.

The LP920 operates in three phases. It senses the temperature being monitored, seeks to balance its internal lever system, and adjusts its pilot pressure to counterbalance the main lever force. This results in a readjustment of the branchline output pressure and the controller device.

Temperature sensing is accomplished in the following ways. The well-mounted bulb senses water temperature in pipes. The integral duct bulb, remote bulb, and averaging element sense air temperature in ductwork. The unit mounted model senses return air in fan coil units. As these elements sense a rise in temperature, the liquid in the element expands. This expansion increases the tension on the sensing element spring and changes the balance on the throttling range lever. A fall in temperature contracts the liquid and decreases the spring tension.

The setpoint spring tension, reacting to adjustments in the setpoint, can also change the balance on the main lever. The setpoint adjustment and sensing element springs exert forces in opposite directions. These opposing forces establish a net force on one end of the lever system. This force is transmitted across the main lever pivot point through the other end of the lever system to the throttling range lever. The throttling range lever rests on the flapper which covers the nozzle. Lever position determines the ratio between the lever force and the pilot pressure.

The pilot pressure counterbalances the lever force at the nozzle. Pilot pressure is established when the main air passes through a 0.005-inch (0.13-mm) restriction into the pilot chamber and nozzle. The pressure in the chamber builds to meet the lever force and the excess bleeds to atmosphere. Pilot pressure lacks sufficient capacity to operate most pneumatic devices; so it is fed to the pilot chamber of the valve unit where the capacity is amplified to the branchline at the same pressure. Any change in temperature, setpoint or throttling range establishes a new pilot pressure. Each change in pilot pressure establishes a new branchline pressure which is transmitted to the controlled device.

The wide throttling range of the LP920C and D permits use of RP971A relays to establish a Zero Energy Band for energy conservation.

LP920 Discharge Controller

When using an LP920A in a heating system (Fig. 1), a drop in temperature at the sensor lowers the branchline pressure. This opens the N.O. valve further to increase the flow of heating medium to the coil.

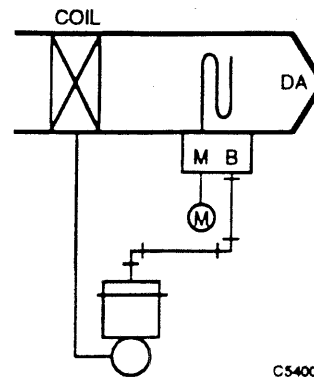


Fig. 1. LP920 Discharge Controller.

LP920A and B Limit Controllers

When used as an economizer controller in a mixed air system (Fig. 2), the LP920A primary controller, located in the mixed air duct, modulates outside and return air dampers to maintain a constant mixed air temperature. When mixed air temperature exceeds the primary controller setpoint, 100 percent outside air results. The LP920B Limit Controller, located in the outside air duct, closes the outside air damper and opens the return air damper as the outside air temperature exceeds the LP920B setpoint.

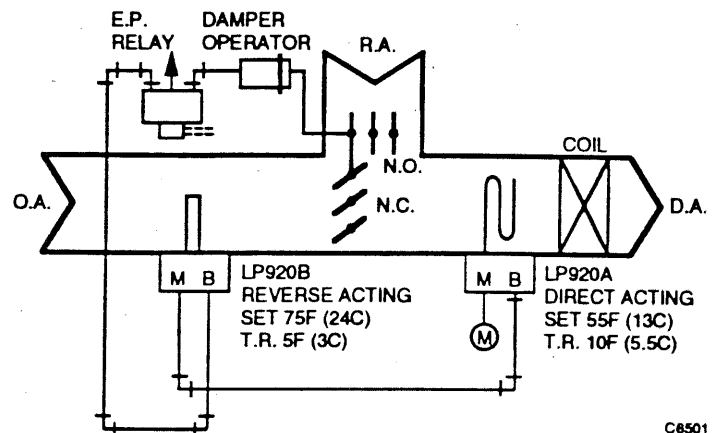


Fig. 2. LP920 Outdoor Air Limit Controller (Economizer).

LP920C and D Zero Energy Band Controllers

For Zero Energy Band control, two RP971A pneumatic ratio relays are used in conjunction with the LP920C or D controller (Fig. 3). In direct acting conditions (Fig. 4), one relay begins closing the heating valve at 3 psi (21 kPa) and concludes at 6 psi (41 kPa). The other relay begins opening the cooling valve at 10 psi (69 kPa) and concludes at 13 psi (90 kPa). An LP920 throttling range with a 10 psi (69 kPa) span, gives heating and cooling ranges 30 percent of the TR, separated by a Zero Energy Band 40 percent of the TR.

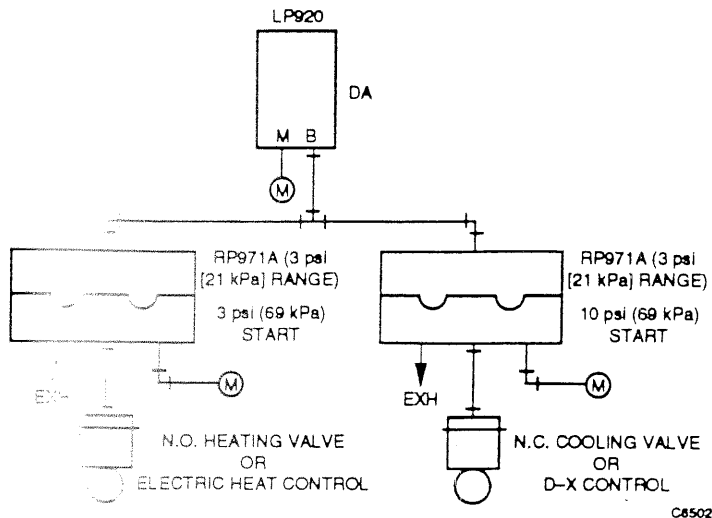


Fig. 3. LP920 Zero Energy Band Controller.

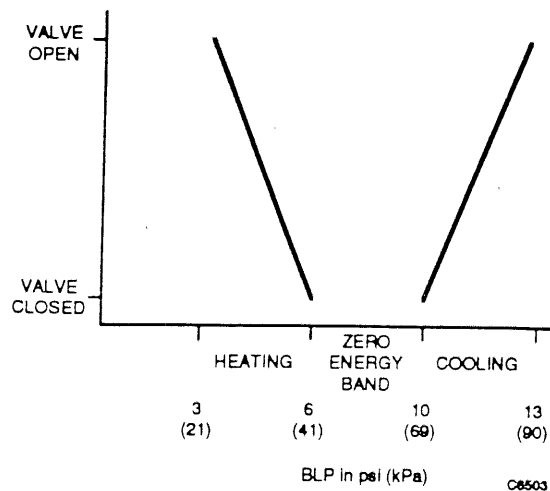


Fig. 4. Zero Energy Band (LP920C—Direct Acting).

Maintenance

Equipment Needed

- OCT729 Gage Port Needle
- 305965 Gage, 0 to 30 psi (0 to 207 kPa)

Operational Check

Primary Controller

Verify device operation by checking the pressure at the branchline tap (Fig. 5), located below and to the left of cover holding screw. The branchline pressure should build up and bleed down through its full range as the setpoint knob is rotated.

LP920A (Direct Acting)

1. Turn the setpoint knob to 150F (66C). The branchline pressure bleeds down to below 1 psi (7 kPa).
2. Turn the setpoint knob to 35F (2C). The branchline pressure builds up to within 1 psi (7 kPa) of the main line pressure.

LP920B (Reverse Acting)

1. Branchline pressure builds to within 1 psi (7 kPa) of main line pressure when setpoint knob is set at 150F (66C).
2. Branchline pressure bleeds below 1 psi (7 kPa) when setpoint knob is set to 35F (2C).

LP920C (Direct Acting)

Turn the setpoint knob full to the right (WARMER). The branchline pressure bleeds down to below 1 psi (7 kPa); bulb must be below 80F (26.7C).

LP920D (Reverse Acting)

1. Turn the setpoint knob fully to the right (WARMER). The branchline pressure builds up to within 1 psi (7 kPa) of the MPL; bulb must be below 80F (26.7C).
2. Turn the setpoint knob fully to the left (COOLER). The branchline pressure bleeds down to below 1 psi (7 kPa); bulb must be above 70F (21.1C).

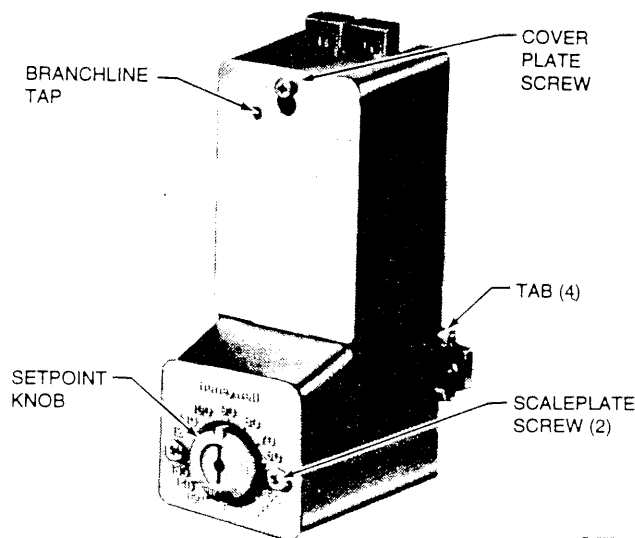


Fig. 5. Branch Line Tap Location.

Limit Controller (LP920A and B Only)

1. Set the primary controller to supply full MLP to the limit controller.
2. Proceed as in primary controller above.

Adjustments and Calibration

Scaleplate Adjustment

The LP920A and B are shipped with the Fahrenheit side of the Scaleplate displayed. For Celsius conversion:

1. Remove the two screws that hold the Scaleplate (Fig. 5).
2. Turn the Scaleplate over and replace the screws.

Setpoint Adjustment

Rotate the setpoint knob to the desired temperature.

Throttling Range Adjustment

The Throttling Range is factory set and does not require readjustment for most applications. The throttling range lever (Fig. 6) is accessible after removing the cover. The lever and attached sliding indicator comprise the throttling range adjustment mechanism. Graduation marks from bottom to top translate as 5, 10, 15, 20, and 25F (3, 6, 9, 12, and 15C) throttling ranges.

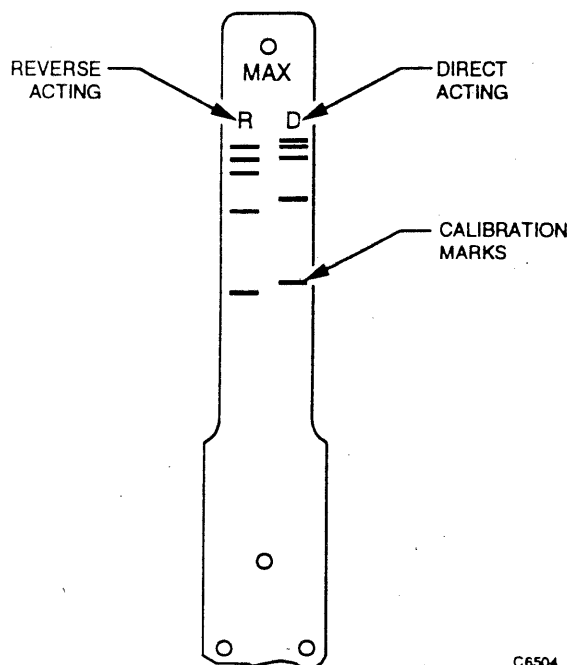


Fig. 6. Throttling Range Lever.

1. Remove the cover by loosening one screw and sliding cover so keyhole clears screwhead (Fig. 5).
2. Move the sliding indicator to achieve the predetermined TR. This is usually at the lowest point where rapid cycling does not occur.
3. Replace the cover and check setpoint calibration.

Calibration Procedures

NOTE: *The LP920 is factory calibrated and will not normally require field calibration.* The LP920A and B are calibrated at 90F (32C), mid-scale range. Recalibrate only if better accuracy is required at operating setpoint.

LP920A and B

1. Measure the element temperature.
2. Move the setpoint to indicated temperature.
3. Measure the branchline pressure.
4. Using a 5/64-in. (1.98 mm) allen wrench, adjust the hex screw in the center of the setpoint knob to achieve a branchline pressure of 8 psi (55 kPa).

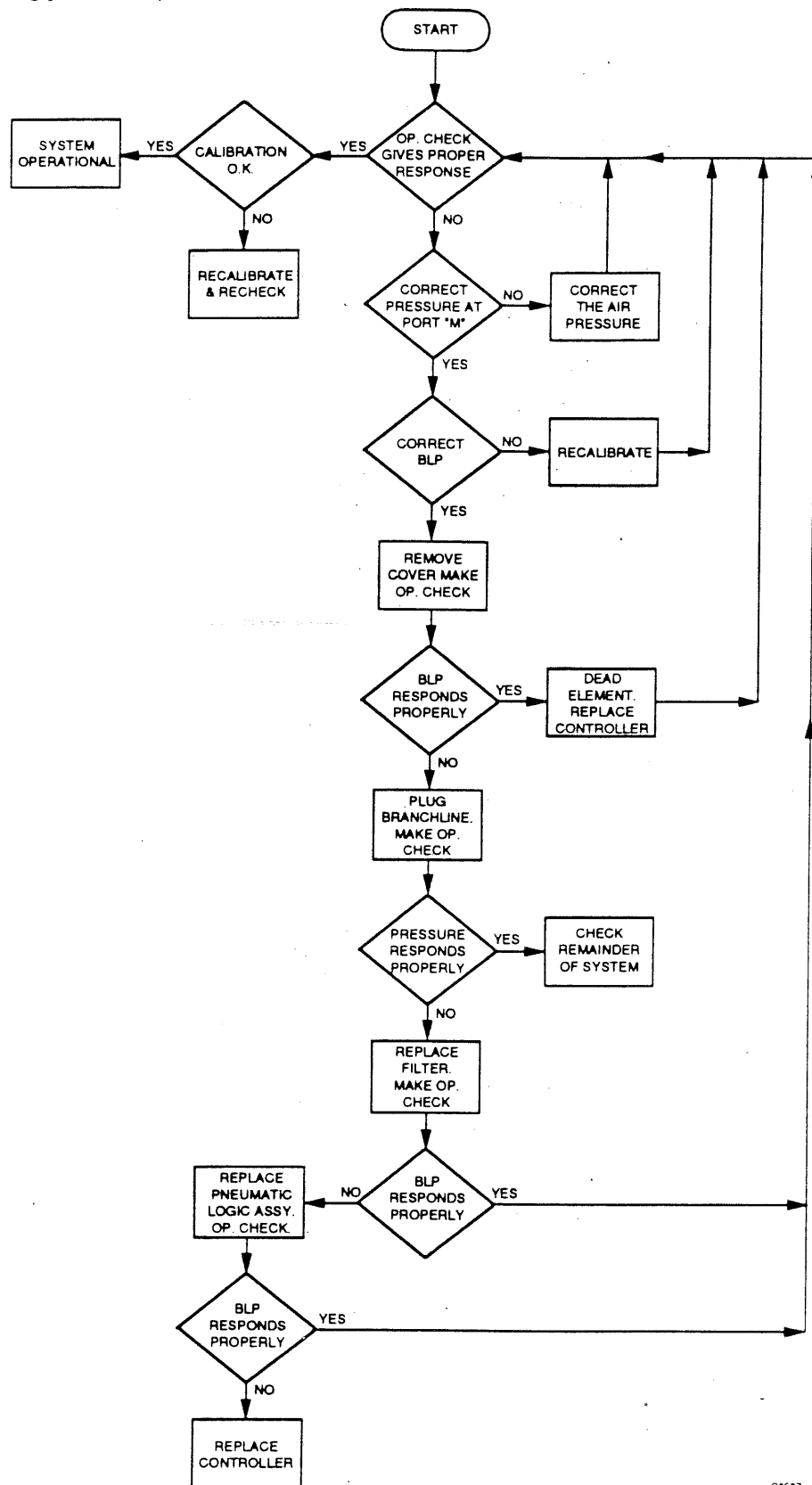
LP920C and D

1. Measure the element temperature.
2. Loosen lock screw on setpoint knob.
3. Remove knob.
4. Measure branchline pressure.
5. Rotate setpoint shaft to achieve a branchline pressure of 8 psi (55 kPa).
6. Replace setpoint knob, matching setpoint to temperature. The Warmer-Cooler scale ranges from 60 to 80F (15.6 to 26.7C) with 3F (1.6C) intervals.

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Troubleshooting

See Troubleshooting Flowchart, Figure 7 for operational check and troubleshooting procedures.



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Fig. 7. LP920 Troubleshooting Flowchart.

NOTE: After each repair procedure is completed, perform an operational check.

Filter Replacement

1. Remove three screws (Fig. 8) holding Connector Plate Assembly.
2. Remove Connector Plate Assembly.
3. Remove and discharge Gasket and Filter Assembly.
4. Install new 14001865-001 Filter Assembly and 14003655-001 Gasket.
5. Reinstall Connector Plate Assembly and three screws.

Connector Plate Assembly Replacement

1. Disconnect the tubing to the controller (Fig. 8) and cap or plug main line.
2. Remove three screws holding Connector Plate Assembly.
3. Remove Connector Plate Assembly.
4. Install new 14003611-001 Connector Plate Assembly.
5. Reinstall three screws and reconnect tubing.

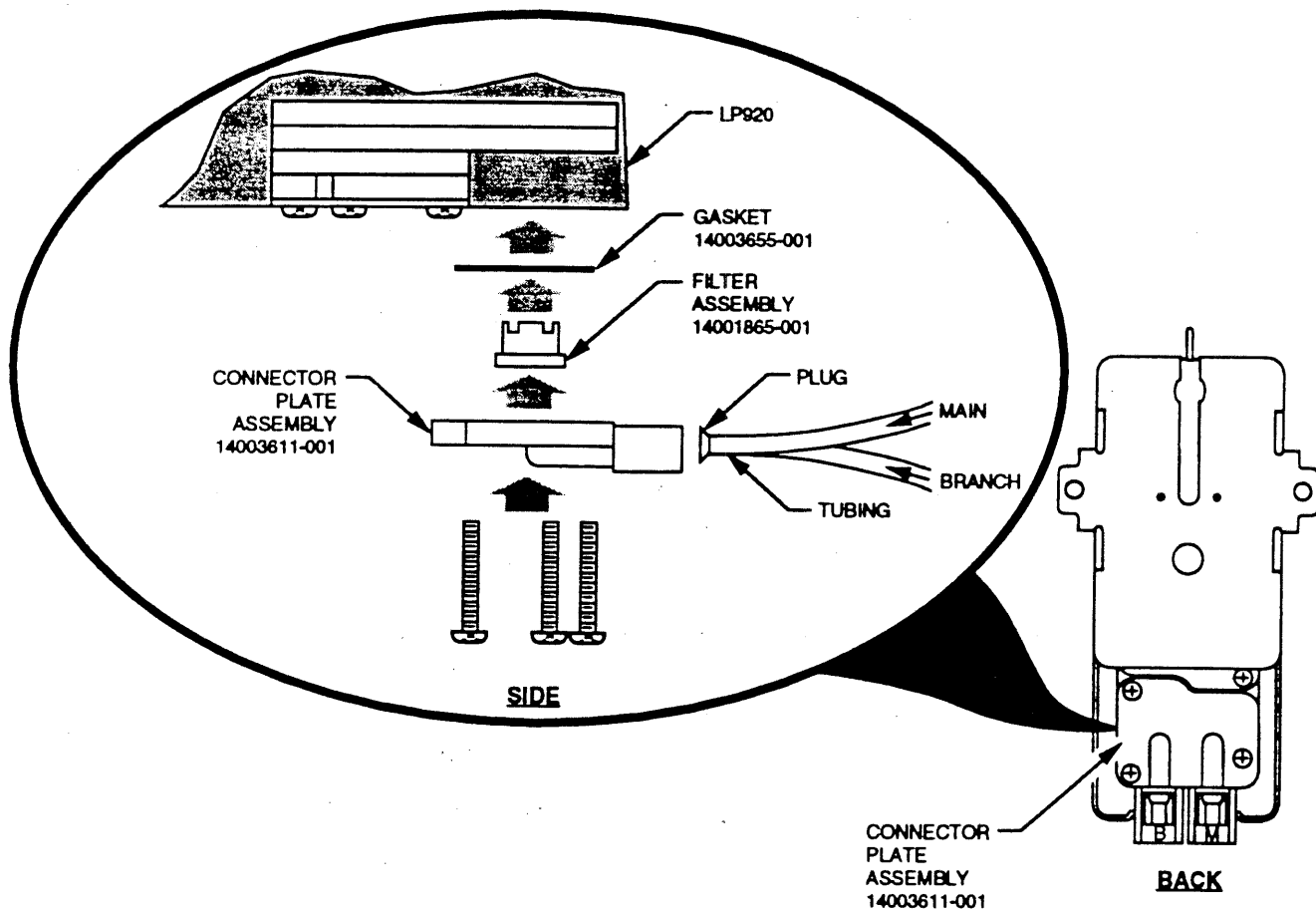
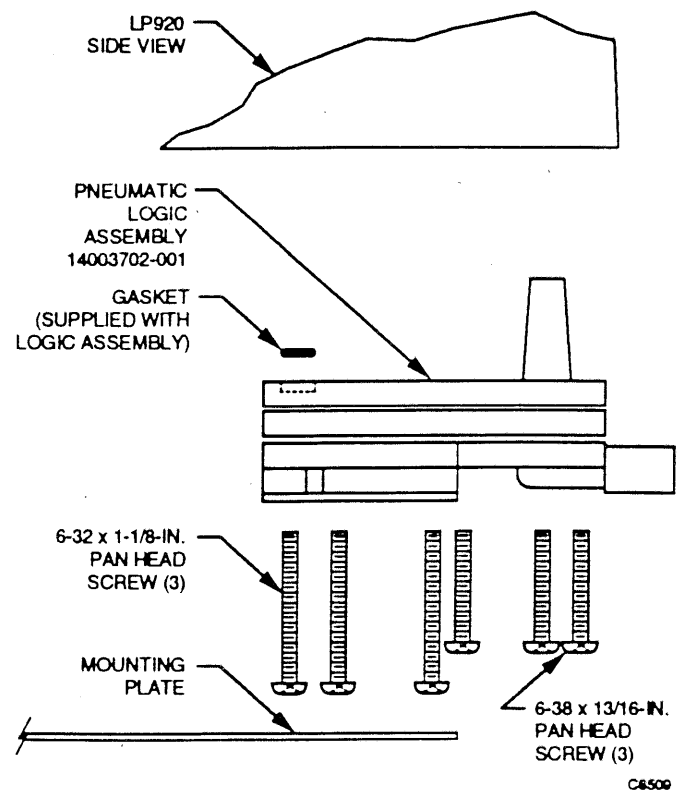


Fig. 8. LP920 Connector Plate and Filter Assembly.

Pneumatic Logic Assembly Replacement

1. Disconnect tubing to the controller (Fig. 8) and cap or plug main line.
2. Straighten four tabs and remove the Mounting Plate (Fig. 5).
3. Remove six holding screws, Pneumatic Logic Assembly and Gasket (Fig. 9).
4. Install new Gasket and new 14003702-001 Pneumatic Logic Assembly.
5. Replace screws and Mounting Plate and rebend the four tabs (Fig. 5).
6. Reconnect tubing and recalibrate the device (See Adjustments and Calibration Section.)



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Fig. 9. LP920 Exploded View Showing Pneumatic Logic Assembly.

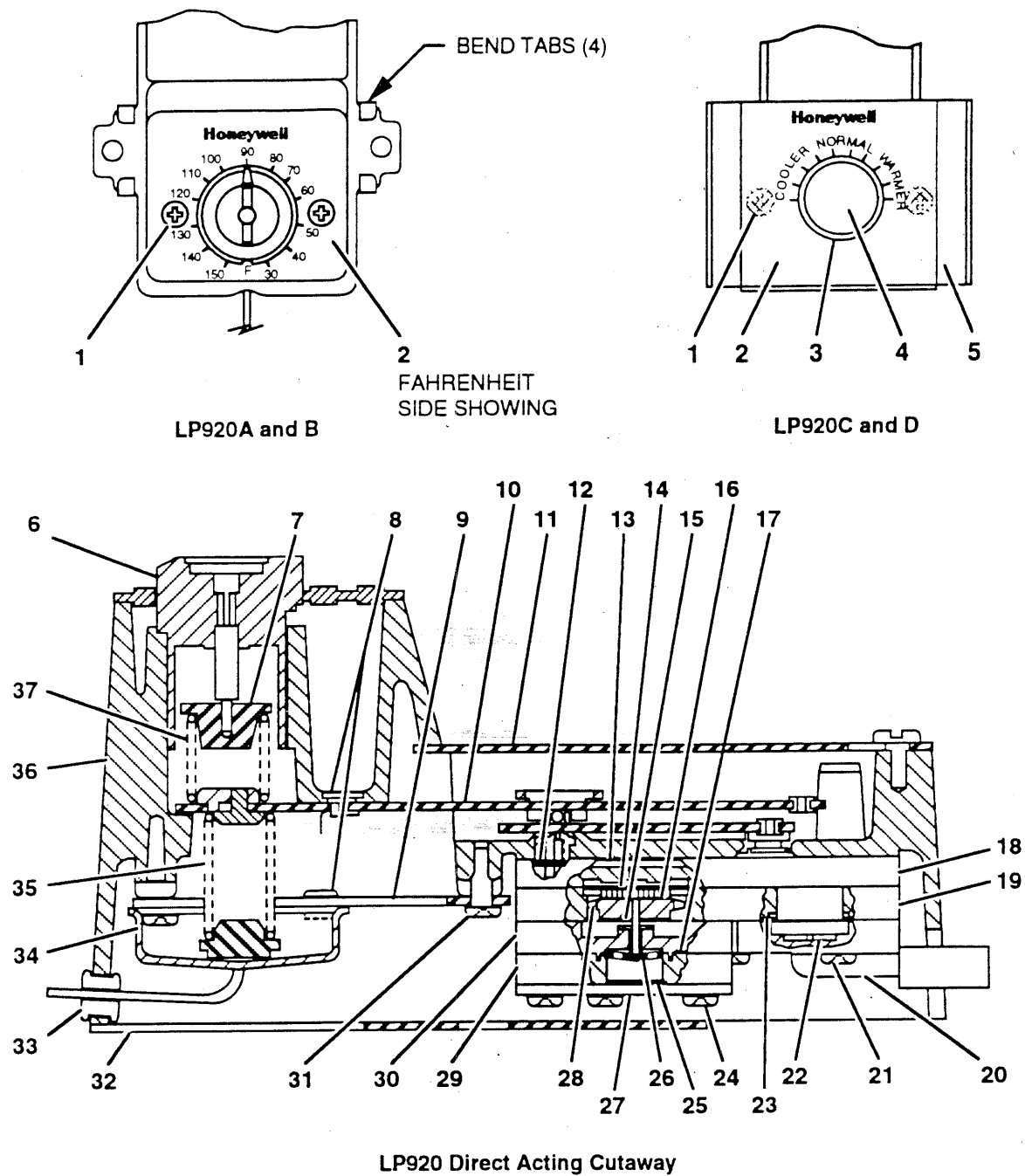
Parts and Accessories

Parts List

Only those parts listed with part numbers are available for ordering.

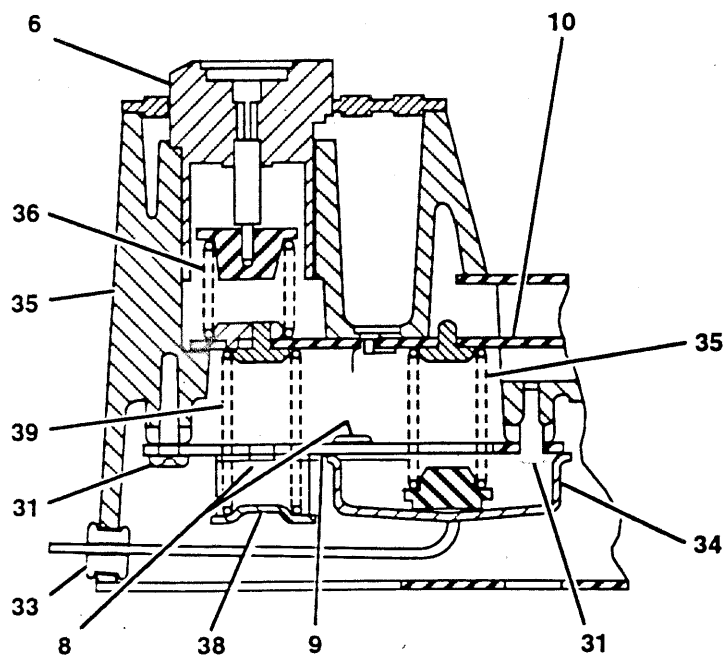
Key No.	Part No.	Description
1	—	* Screw, Cross-recessed Thread-Forming Pan Head - No. 6 x 1/4 in. (3)
2	14003602-001	Scaleplate, Direct Acting - LP920A
	14003602-002	Scaleplate, Reverse Acting - LP920B
	14003832-001	Scaleplate, Direct Acting - LP920C
	14003832-002	Scaleplate, Reverse Acting - LP920D
3	316732	Knob Assembly - LP920C, D
4	14003835-001	Screw, Adjustment - LP920C, D
5	—	Baseplate - LP920C, D
6	14003661-001	Knob Assembly - LP920A, B
	14003590-001	Knob Assembly - LP920C, D
7	—	Spring Retainer
8	—	Rivet - LP920A, C (4) and LP920B, D (6)
9	—	Adjusting Plate
10	—	Lever Assembly, Direct Acting - LP920A, C
	—	Lever Assembly, Reverse Acting - LP920B, D
11	—	Cover
None	14003702-001	Pneumatic Logic Assembly - includes items 12 through 29
12	—	O-Ring
13	—	Gasket
14	—	Diaphragm
15	—	Diaphragm
16	—	Exhaust Disc Assembly
17	—	Diaphragm
18	—	Pilot Plate Assembly
19	—	Exhaust Plate Assembly
20	14004325-001	Connector Plate Assembly
21	—	* Screw, Cross-recessed Pan Head - No. 6-32 x 13/16 in (3)
22	14001865-001	Filter Assembly
23	—	Gasket
24	—	* Screw, Cross-recessed Pan Head - No. 6-32 x 1-1/8 in. (3)
25	—	Gasket
26	—	Flat Spring
27	—	Plate
28	—	Washer - LP920A, B (1) and LP920C, D (2)
29	—	Main Plate
30	—	Valve Plate Assembly
31	—	* Screw, Cross-recessed Pan Head - No. 6-32 x 1/4 in. (4)
32	—	Mounting Plate - LP920A1005, A1013, A1039, B1003, B1011, B1037, C1001, D1009
33	—	Grommet, Slit - LP920A1005, A1039, B1003, B1037, C1001, D1009
34	14003553-001	Element Assembly - LP920A1005, B1003
	14003553-002	Element Assembly - LP920A1013, B1011, C1001, D1009
	14003553-003	Element Assembly - LP920A1021, B1029
	14003553-004	Element Assembly - LP920A1039, B1037
35	—	Spring Element, D.A. - LP920A, C
36	—	Housing Assembly
37	—	Spring Knob
38	—	Spring Bracket - LP920B, D
39	—	Spring Element, R.A. - LP920B, D
40	316297-21	Bulb Hanger - LP920C, D
41	304528A	Bag Assembly, Mounting Hardware - LP920C, D
42	—	Well Bracket - LP920A1013, B1011
43	—	Nut, Spring Clip - LP920A1013, B1011 (2)
44	—	* Screw Pan Head - No. 8 x 3/4 in., LP920A1013, B1011 (2)
45	—	Cable Tie - LP920A1021, A1039, B1029, B1037 (3)
46	—	Gasket - LP920A1021, A1039, B1029, B1037
47	—	Mounting Plate Assembly - LP920A1021, A1039, B1029, B1037

*Common hardware, obtain locally.

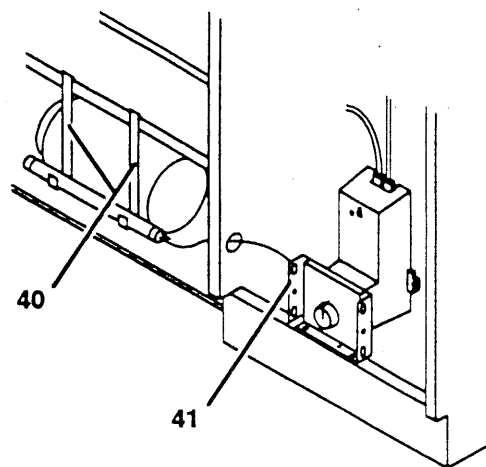


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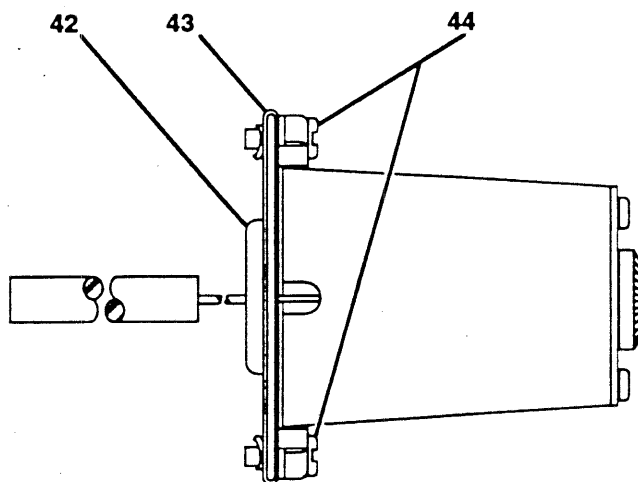
Fig. 10. (Part 1 of 2). LP920 Remote Bulb Temperature Controller.



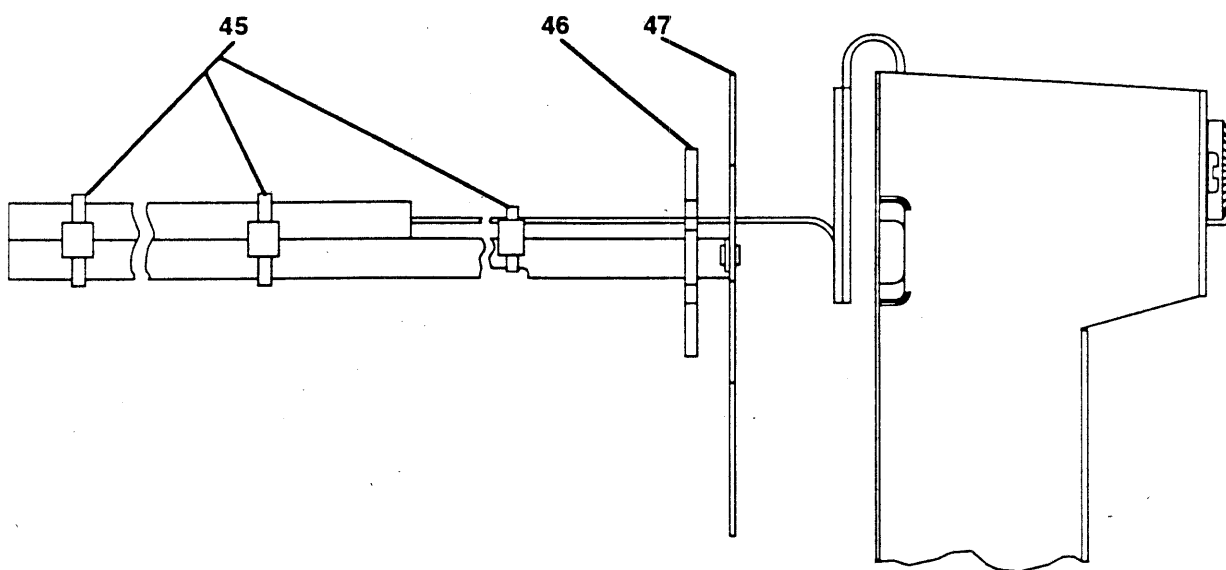
LP920 Reverse Acting Cutaway



LP920 Unit Vent Model



LP920 Well Mounted Model



LP920 Integral Duct Model

C6512

Fig. 10. (Part 2 of 2). LP920 Remote Bulb Temperature Controller.

Accessories

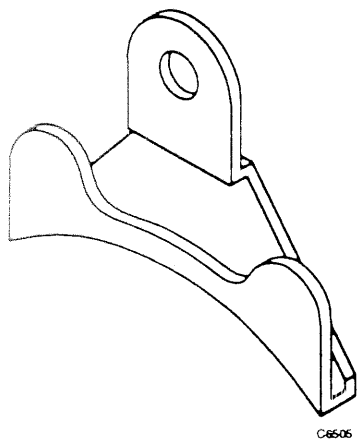


Fig. 11. 314439 Capillary Clip, Used for Capillary Mounting within Duct.

MODEL NO.	DESCRIPTION
315046B	7-3/8 IN. (187mm) COPPER
315904B	7-5/16 IN. (186mm) STAINLESS STEEL

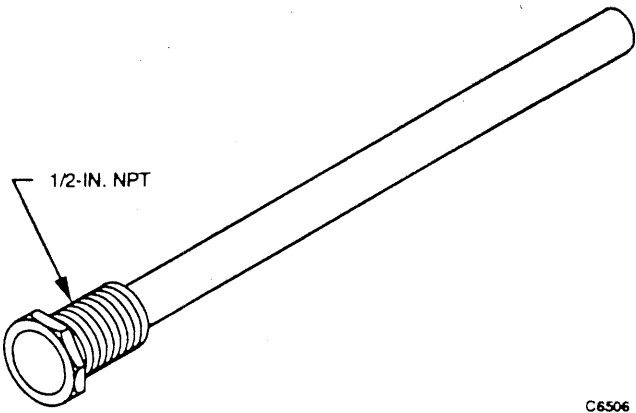
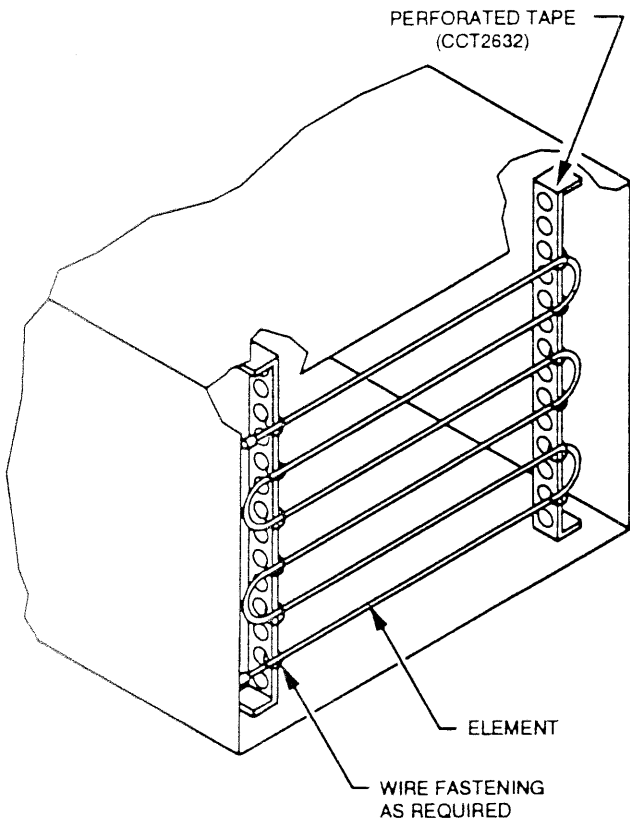


Fig. 13. Wells Available for LP920 Controller.



CAUTION:
WHEN USING WIRE TIES BE CAREFUL NOT TO CRUSH ELEMENT.

C6506

Fig. 12. CCT2632 Perforated Strap Used in Duct Mounting.



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