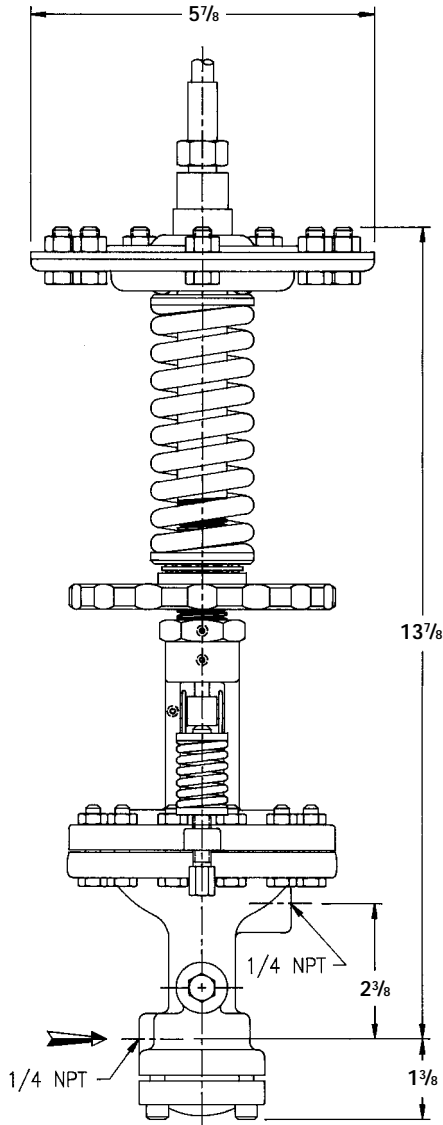




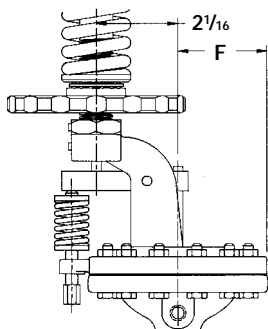
A division of CHCOR International, Inc.

**SPENCE ENGINEERING COMPANY, INC.** 150 COLDENHAM ROAD, WALDEN, NY 12586-2035

SD 4512A/0503



**T124/T134 PILOT-FRONT VIEW**



**T124/T134 PILOT SIDE VIEW**

PILOT TYPE	DIMENSION
	F
T124	1 5/8"
T134	1 1/4"

## TYPE T124 & T134 TEMPERATURE PILOT

The combination of a Spence Type T124 or T134 with a Spence Type E or Type C main valve produces a steam pressure reducing valve and temperature regulator in a single pilot-operated valve. Steam pressure on the heater is modulated in proportion to temperature and load variations. Pressure control provides fast, accurate adjustment of heat transfer rate to demand requirements.

This pilot is primarily intended for use on instantaneous heaters. By combining both temperature and pressure control in one pilot, unusually close regulation of temperature is achieved through the anticipation of fast load changes. An additional benefit of this pilot is that pressure reduction and temperature control can be provided with a single regulator. For pressures not to exceed 20 psi, the T134 should be used. For pressures between 20 and 125 psi, the T124 should be used.

### RATINGS (Maximum Inlet Conditions)

Construction	Pressure	(Temperature)
<input type="checkbox"/> Cast Iron	.....250 PSIG.....	.....(450°F)
<input type="checkbox"/> Cast Steel (T134 only)	.....600 PSIG.....	.....(750°F)

### TEMPERATURE RANGES

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> 20° to 120°F  | <input type="checkbox"/> 150° to 300°F | <input type="checkbox"/> 300° to 400°F |
| <input type="checkbox"/> 50° to 150°F  | <input type="checkbox"/> 170° to 270°F | <input type="checkbox"/> 330° to 430°F |
| <input type="checkbox"/> 70° to 170°F  | <input type="checkbox"/> 250° to 350°F | <input type="checkbox"/> 400° to 500°F |
| <input type="checkbox"/> 120° to 220°F | <input type="checkbox"/> 290° to 390°F | <input type="checkbox"/> _____         |

### THERMOSTAT ASSEMBLY

Standard Thermostat Assemblies and Wells:

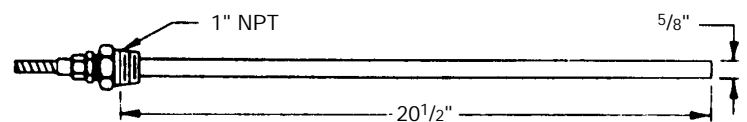
- Stainless Steel       Bronze

Flexible tubing and capillary are available to 50 feet.

### OPTIONS

- Thermostat Well       Adjustment Indicator  
 Dial Thermometer       Integral Mount Body

### THERMOSTAT



Style #700 bronze bulb with 10 feet of brass flexible tubing will be furnished unless otherwise specified. For other bulb styles, see SD9501.

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## OPERATING PRINCIPLE

The regulator is operated by its initial steam pressure. The main valve is normally closed, being held so by initial pressure on the disc and by an internal main spring. The pilot is opened by compressing the pressure limit spring.

When steam is turned on, it flows to the pilot through the connecting nipple and union (see Fig. 1). At the No. 8B tee on the pilot outlet, the flow divides. One branch is connected to bleedport No. 4A and the other to restriction elbow No. 5A and the underside of the main valve diaphragm. Bleedport No. 4A restricts the flow, builds pressure under the diaphragm and opens the main valve. Restriction No. 5A steadies the operation of the regulator.

Steam flowing to the heater creates a rising delivery pressure which is feed back through the control pipe to the underside of the pilot diaphragm. As the pressure on this diaphragm approaches a balance with the thrust of the pressure limit spring, the pilot throttles. This, in turn, allows the main valve to assume a position where just enough steam flows to maintain the set maximum delivery pressure.

As the temperature of the heated medium rises, vapor pressure is generated in the thermostat bulb and transmitted to the pilot temperature diaphragm. When the vapor pressure becomes sufficient to over-balance the combined thrust of the temperature adjusting and pressure limit springs, the regulator throttles to maintain the set temperature.

## RECOMMENDED INSTALLATION

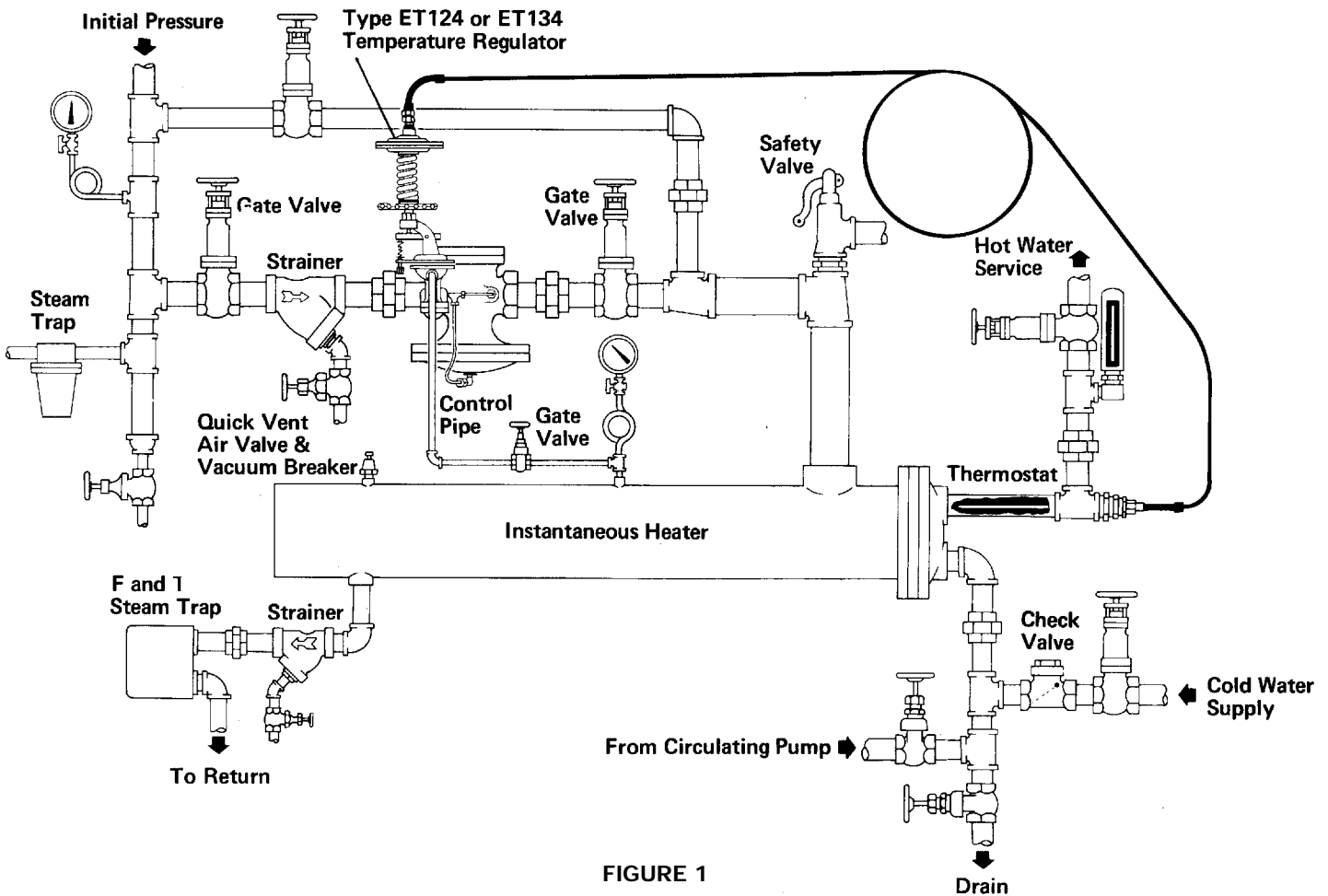


FIGURE 1

# INSTALLATION

## PLANNING

Locate the regulator in a horizontal pipe. Prevent water hammer and erratic operation by providing a trap ahead of the regulator. Avoid damaging effects of scale and dirt in pipelines by using a strainer to protect the regulator. Provide a three valve bypass to facilitate inspection of the regulator without interrupting service.

The preferred thermostat position is horizontal. When vertical or slanting, the tip end of the bulb must point downward. Locate the thermostat as close to the heater outlet as practical. Expose the entire length of the bulb to the active flow leaving the heater. If the pressure rating of the heater or connected equipment is less than the initial steam pressure, provide a safety valve.

Hot water and similar liquid systems require a relief valve to prevent dangerous overpressure due to expansion. Instantaneous heaters, when operated on intermittent demand (as in domestic water heating), require the following conditions for best temperature regulation.

- Constant forced recirculation of fluid through the heater.
- Omission of thermostat well to reduce temperature lag. Use of a thermostat compatible with the heated medium is preferred over the use of a standard thermostat installed in a well which is compatible with the heated medium. When the use of a well is unavoidable, an appropriate heat transfer medium should be installed between the well and the thermostat.

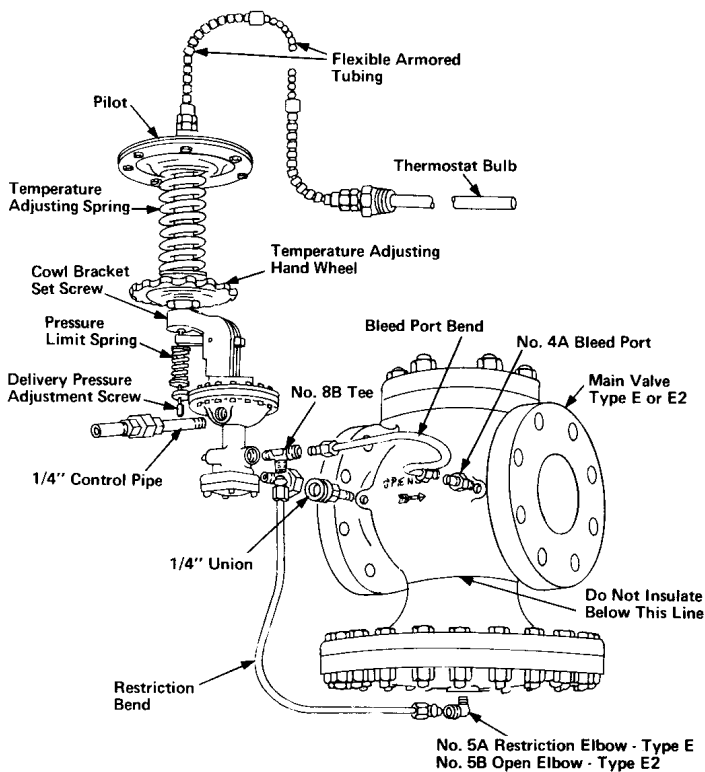


FIGURE 2

## MAIN VALVE

Flush the piping system thoroughly to clear it of welding beads, scale, sand, etc. Mount the main valve with diaphragm chamber down and arrow on body pointing in the direction of flow. Screwed end valves should be mounted in unions.

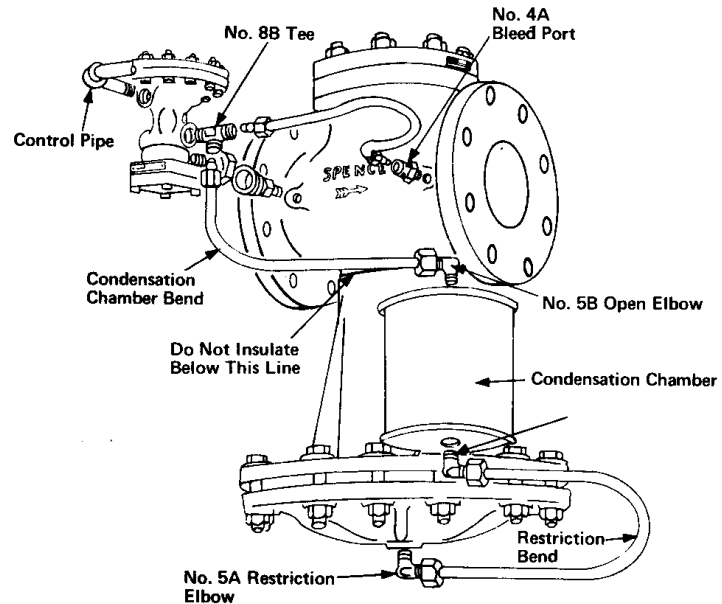


FIGURE 3

## PILOT

Mount the pilot on either side of the main valve by means of 1/4" nipple and union provided. Make this connection the the 1/4" pipe tap at the inlet side of the main valve as shown in Figure 2.

Screw No. 4A bleedport fitting into the 1/8" pipe tap at the outlet side of the main valve body. Note bleed orifice in this fitting – vital to operation of regulator.

Screw No. 8B tee into 1/8" pipe tap in pilot. Select tap facing downstream.

Screw No. 5A elbow containing restriction orifice into 1/8" pipe tap on underside of main valve diaphragm chamber. If the initial pressure or pressure drop is less than 15 psi, a No. 5B open elbow without orifice.

Connect tubing bends as illustrated in Fig. 2. Valves with condensation chamber are fitted up according to Figure 3.

## CONTROL PIPE (if required)

Use 1/4" pipe for this line which connects the pilot pressure diaphragm chamber (Fig. 2) to the desired point of pressure control. On instantaneous heaters with steam in shell (Fig. 1), tap the control pipe into the shell. Otherwise, enter the delivery steam pipe at point of entrance to heater. Pitch the control pipe away from the pilot and avoid water pockets. Insulation may be applied to the upper portion (globe and flanges) of the main valve. Do not insulate the diaphragm chamber or any part of the pilot (Fig. 1).

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## START-UP AND SETTING

Best temperature control will result when the delivery pressure setting is the lowest steam pressure capable of sustaining the desired temperature at maximum load. The following adjustments should be made under full load conditions or as near to such as possible.

Close bypass, open 1/4" control pipe valve and turn up the temperature adjusting wheel (Fig. 1) until 1/2" of thread is exposed. Back off pressure adjusting screw to remove all compression from pressure limit spring.

Crack open the outlet stop valve. Crack open the inlet stop valve, blow down strainer and then slowly open the inlet valve

wide. Slowly turn up the pressure adjustment. When steam begins to flow, gradually open the outlet stop valve.

Continue delivery pressure adjustment until heater output temperature is 5°F above required. If the temperature adjustment made at the beginning of this procedure limits this operation, set the adjusting wheel a little higher. Lower the temperature adjusting wheel until the desired operating temperature is reached.

If the adjustment is made at partial load, the temperature will sag under heavier loads. When maximum load occurs, increase the pressure setting just enough to restore the temperature to normal.

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## TROUBLE SHOOTING

### FAILURE TO OPEN OR SAGGING DELIVERY PRESSURE

1. Adjusting spring on pilot may have been tampered with.
2. Initial pressure may be down due to partially closed supply valve, clogged strainer or other obstruction.
3. Bleedport may have been omitted and an open coupling substituted.
4. Orifice in No. 5A restriction elbow may be plugged.
5. Control pipe may be plugged. Most likely points of obstruction are at shutoff valve and entrance to delivery main.
6. Make sure heater is properly trapped and free of condensate.
7. Pilot or main valve diaphragm may be broken. Check for leakage around stem between lever and diaphragm on pilot. Check the main valve with air pressure in diaphragm chamber before dismantling.
8. Leak in the thermostat bulb may allow heated fluid pressure if sufficiently high to back up into the thermal system to hold pilot closed.

### FAILURE TO CLOSE – OVERHEATING

1. Adjusting spring on pilot may have been tampered with.
2. By-pass may be leaking.
3. Thermostat located too far from instantaneous heater outlet.
4. Thermostat may be kinked or broken or have lost it's fill. Alternately warm and cool thermostat 10°F above and below it's set point. If thermostat is operative, the pin between the lever and pressure diaphragm will become loose and snug as the temperature stem on opposite end of the lever moves up and down.

5. A lift of condensate to a hot well may require more pressure in heater than the heated medium. Arrange drainage of the heater by gravity or install a pump to lift condensate.
6. Main valve or pilot may be held open by foreign matter. To determine which valve leaks:
  - a. Close inlet stop valve and 1/4" control valve.
  - b. Remove bleedport bend so pilot will exhaust to atmosphere.
  - c. Remove all compression from pressure adjusting spring.

If steam issues from the end of the bleedport bend on the pilot, there is an obstruction between it's seat and disc. Steam blowing back from the bleedport on the downstream side of the valve indicates that the main valve disc is held open by foreign matter. Leakage of either valve requires dismantling. See dismantling and valve grinding for instructions.

### ERRATIC TEMPERATURE CONTROL

1. Thermostat installed too far from heater outlet.
2. Improper trapping or erratic discharge of trap.
3. Lift of condensate to hot well may require more pressure than that called for by the medium flowing through the heater. Arrange to drain condensate by gravity or lift it with a pump.
4. Sticky check valve in return line.
5. Poor circulation through heater. Constant circulation should be employed.
6. Valve too large for the heater or heater too large for the load.
7. Valve installed too far from heater.

# MAINTENANCE

(Brackets refer to item number)

## DISMANTLING

- 1 - Remove diaphragm nuts (4) and lift off top works and diaphragms.
- 2 - Remove the blind flange bolts (7) and take off the blind flange (26). Remove the screen (46) and gasket.
- 3 - Hold the pusher plate (41) with a socket wrench and remove stem nuts (25). The disc (24) will drop off. Lift out the stem (22) and valve spring (43).

## ASSEMBLY

- 1 - Reassemble the pilot in the reverse of the procedure described above.
- 2 - Take particular care that diaphragm screw (37) and cowl bracket (19) are centered on diaphragm flange of the pilot body (44). Misalignment can cause erratic performance.
- 3 - When replacing diaphragms, apply sealing compound (Copaltite or equal) sparingly to the shoulder of the diaphragm screw (37). For steel pilot only, apply sealing compound to the diaphragm flange of the pilot body.

## SEAT, DISC AND STEM REPLACEMENT

- 1 - Examine the seat and disc sealing surfaces for nicks or other signs of damage by pipeline debris. If sealing surfaces are damaged, they must be replaced.
- 2 - When seat, disc or stem is replaced, the sealing surfaces must be lapped.

**Lap sparingly using 500 grit lapping compound and light pressure. Heavy grinding may cause galling, wide sealing surfaces and a grooved disc, all of which tend to produce leakage.**

After the sealing surfaces are lapped in, disassemble and clean all parts.

- 3 - Remove the seat ring (23) from the body with a socket wrench. Clean the body threads of old sealing compound using a wire brush. Apply new sealing compound (Copaltite or equal) sparingly to shoulder of the new seat ring. Let stand until tacky before assembling into the pilot body.
- 4 - Lap in joint between new stem (22) and disc (24).
- 5 - Apply lapping compound to the disc, place it on the stem and secure with a stem nut (25). Slip the stem into its normal position and lap the disc to seat joint.
- 6 - Screw on the pusher plate (41), omitting the valve spring. Hold the disc on the seat and adjust the pusher plate until dimension (C=11/64") is obtained (Fig. 4).
- 7 - Remove stem nut, being careful not to disturb the pusher plate adjustment and lift stem out the top of the pilot. Grind off stem projection B flush with upper surface of pusher plate.
- 8 - Reinsert stem in the pilot with disc and a stem nut attached. Check dimension c and, if correct, lock the position by prick punching the thread at several points. Work carefully to avoid bending the stem.
- 9 - Scrape away burrs raised by prick punching. Upper surface must be smooth and flat.
- 10 - Check that valve travel is A=3/64". This need not be exact. Stem should move smoothly. Binding indicates a bent stem.
- 11 - Remove stem nut a disc and withdraw stem. Install stem with valve spring, disc and both stem nuts in place.

## THERMOSTAT REPLACEMENT

- 1 - Cool the thermostat bulbs of original and replacement elements below the low end of their temperature range (See range tag on flexible tubing). Maintain bulbs at this temperature during replacement process.
- 2 - Back off temperature adjusting wheel (14) to within a turn or two of the barrel nut (1). Back off pressure adjusting screw (20) to remove all compression from spring. This will allow temperature diaphragm plate (7) to remain seated in correct alignment on balls (10) after disengagement of thermostat assembly.

**Unless pilot is upright, balls will fall out of position.**

- 3 - Remove diaphragm nuts (8) and detach thermostat assembly from pilot. Similarly, detach shipping plate from replacement thermostat.

**When removing diaphragm nuts, be sure cowl assembly (29) does not turn in threaded joint at barrel nut (1). If movement is observed, reset position as per instructions for temperature stem position adjustment below.**

- 4 - Install replacement thermostat on pilot and install shipping plate on original thermostat. Tighten bolts evenly.

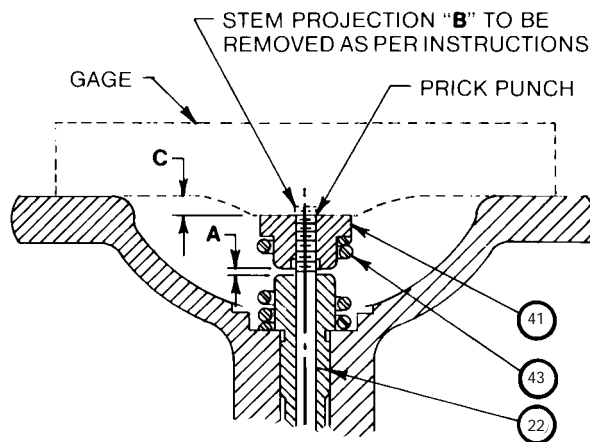


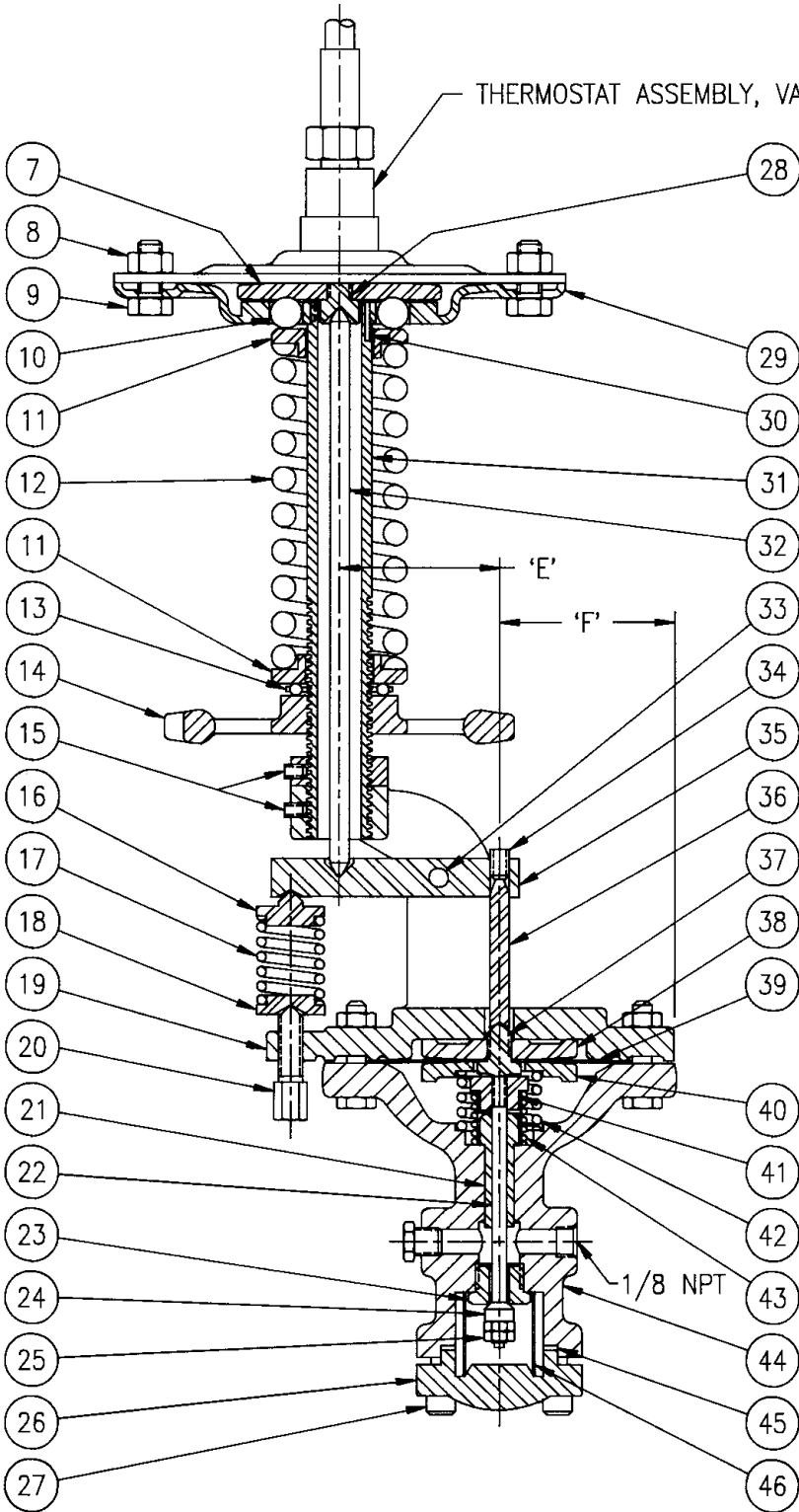
FIGURE 4 - TRAVEL SETTING

## TEMPERATURE STEM ADJUSTMENT

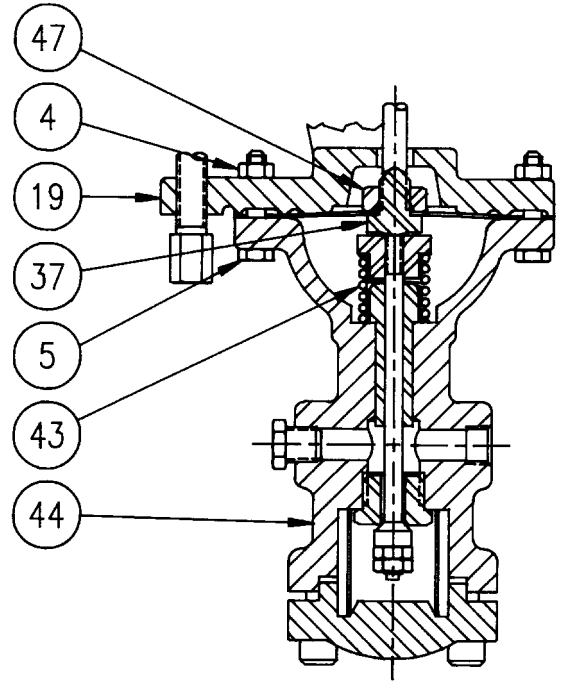
The temperature stem adjustment is factory set and locked by a barrel nut (1). If the setting is accidentally disturbed, readjust as follows:

- 1 - Remove thermostat assembly per instructions above.
- 2 - Clamp a flat bar to the cowl (29) so that the pressure plate (7) is flush with the cowl's pinch ring.
- 3 - Loosen cowl bracket set screw (30) and turn cowl assembly (29) up about one turn. Remove putty from barrel nut set screw (1), loosen set screw and back off barrel nut about one turn.
- 4 - Crack inlet stop valve or apply shop air to the pilot inlet. Turn up pressure adjusting screw (20) until flow issues from pilot outlet tee. Rotate the cowl assembly (29) down until flow stops.
- 5 - Lock this adjustment with the cowl bracket's set screw (30). Turn down the barrel nut (1) to jam against cowl bracket and lock with its set screw (5).
- 6 - Reinstall the thermostat assembly.

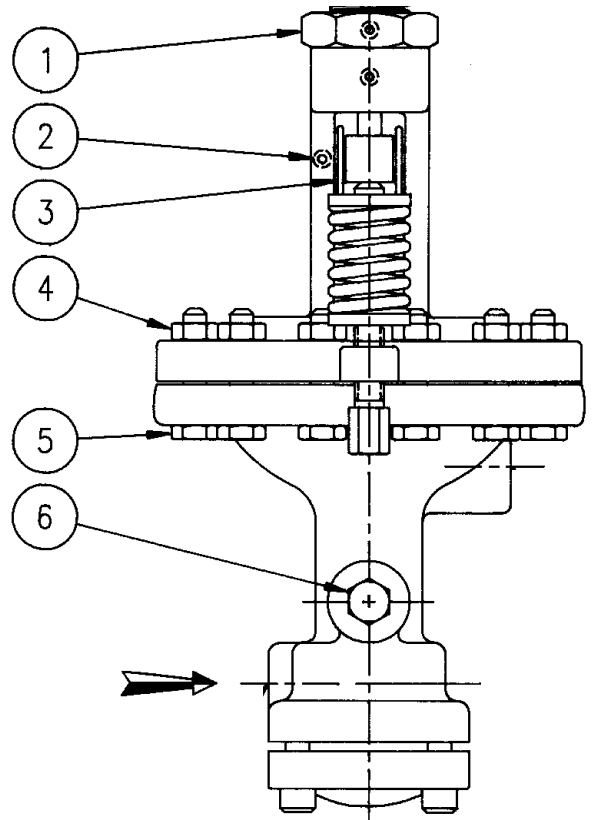
THERMOSTAT ASSEMBLY, VARIES



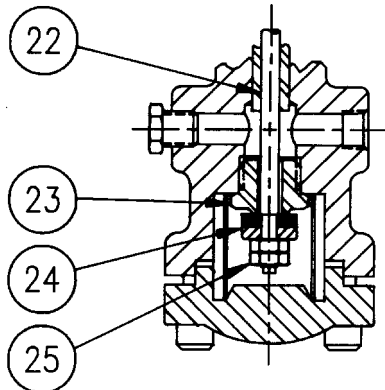
T134 SIDE VIEW



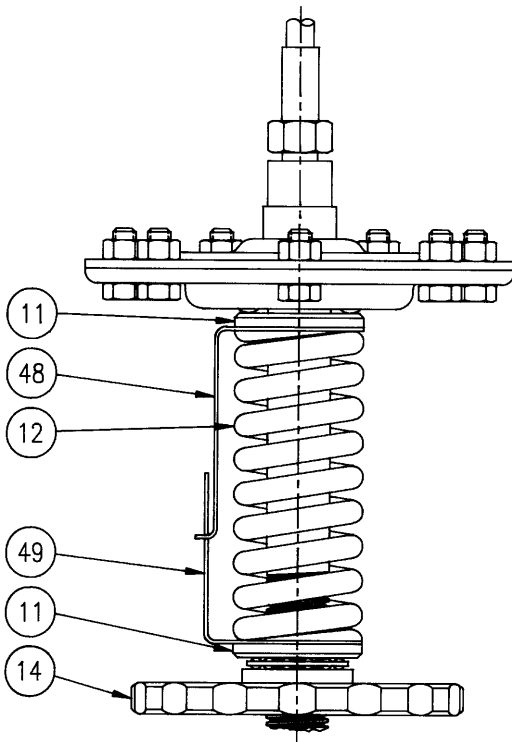
T124 BODY



FRONT VIEW



**COMPOSITION DISC**



**ADJUSTMENT INDICATOR**

When ordering parts, it is essential that the pilot type, service and serial number be stated.

Select part by item number, but order by part number. Specify complete part number when ordering.

ITEM NO.	PART NAME	MATERIAL	PART NO.	REMARKS
1	Barrel Nut	Aluminum	04-02908-00	
2	Set Screw, Pivot Pin	Steel	05-04875-00	
3	Cotter Pin	Steel	05-03265-00	
4	Diaphragm Nut	Steel	05-02890-00	T124
	Diaphragm Nut	Steel	05-02871-00	T134
5	Diaphragm Bolt	Steel	05-04879-00	T124
	Diaphragm Bolt	Steel	05-04764-00	T134
6	Pipe Plug	Ledloy	04-03769-00	Iron, Steel
7	Temperature Plate	Ledloy	04-03602-01	
8	Temp. Diaphragm Nut	Steel	05-02992-00	
9	Temp. Diaphragm Bolt	Steel	05-05634-00	
10	Temp. Plate Ball	Steel	05-00553-00	
11	Temp. Spring Button	Ledloy	04-01052-00	
12	Temperature Spring	Oil Temp. Stl.	05-05122-00	
13	Thrust Bearing	Steel	05-00550-00	
14	Handwheel	Cast Iron	04-02502-00	
15	Set Screw, Barrel	Steel	05-04874-00	
16	Spring Button, Upper	Ledloy	04-01039-01	
17	Pressure Spring	Oil Temp. Stl.	05-05076-00	T124
	Pressure Spring	Oil Temp. Stl.	05-04980-00	T134
18	Spring Button, Lower	Ledloy	04-01079-00	
19	Cowl Bracket	Cast Iron	04-01014-00	Iron T124
	Cowl Bracket	Cast Iron	04-01016-00	Iron T134
	Cowl Bracket	Ductile Iron	04-01017-00	Steel T134
20	Adjusting Screw	416 St. Stl.	04-04756-01	
21	Stem Bushing	203 PB	04-01080-00	
22*	Stem	303 St. Stl.	04-05229-00	Standard
	Stem	303 St. Stl.	04-05381-00	Composition Disc
23*	Seat Ring	420 FH St. Stl.	04-04057-90	Standard
	Seat Ring	303 St. Stl.	04-04060-00	Composition Disc
24*	Disc	440 CH	04-01772-90	Standard
	Disc	Brass, Hycar	07-53512-00	Composition
25*	Stem Nut	Steel	05-02888-00	Steam Service
	Stem Nut	Brass	05-02886-00	Water Service
26	Blind Flange	Cast Iron	04-02151-00	Iron
	Blind Flange	Cast Steel	04-11678-00	Steel
27	Blind Flange Bolt	Steel	05-04803-00	Iron
	Blind Flange Bolt	Steel	05-11720-00	Steel
28	Temp. Plate Center	Ledloy	04-03715-00	
29	Cowl	Steel	04-01525-00	
30	Cowl Pin	Steel	05-03243-00	
31	Barrel	Aluminum	04-01247-00	
32	Temperature Stem	Aluminum	04-05653-00	
33	Pivot Pin	416 St. Stl.	04-03273-00	
34	Set Screw, Press. Stem	Steel	05-04850-00	
35	Lever	Steel	04-02758-00	T124
	Lever	Steel	04-02760-00	T134
36	Pressure Stem	416 St. Stl.	04-05426-00	
37*	Diaphragm Screw	Ledloy	04-02926-00	T124
	Diaphragm Screw	Ledloy	04-04822-00	T134
38*	Pressure Plate	Ledloy	04-03679-00	T134
39*	Diaphragm	301 St. Stl.	04-01623-00	
40*	Floating Plate	Iron	04-03710-00	T134
41*	Pusher Plate	Ledloy	04-03718-00	
42*	Vacuum Spring	302 St. Stl.	05-05055-00	T134
43*	Valve Spring	Inconel	05-09353-00	T124
	Valve Spring	Inconel	05-04985-00	T134
44	Body	Cast Iron	04-00950-00	Iron T124
	Body	Cast Iron	04-00630-00	Iron T134
	Body	Cast Steel	04-10439-01	Steel T134
45*	Gasket	Non-asbestos	05-02378-01	Iron
	Gasket	Flexitalic	05-11718-00	Steel
46*	Screen	301 St. Stl.	04-04700-00	Steam Service
	Screen	301 St. Stl.	04-04701-00	Water Service
47*	Diaphragm Nut	Ledloy	04-02925-00	T124
48	Adj. Indicator Plate	Aluminum	05-03512-00	
49	Adj. Indicator Pointer	Aluminum	05-03513-00	

\*These parts furnished in Repair Kit