



LESLIE
CONTROLS, INC.

A subsidiary of CIRCOR International, Inc.

12501 Telecom Drive, Tampa Florida 33637

**Installation, Operating and
Maintenance Instructions
PARTS LIST**

**90/1.5.1.3
Rev. 1**

**CONSTANTEMP
HIGH PRESSURE STEAM-WATER HEATERS**

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Model Number and Material of Construction				
Model Number				Description
E1500	E300	E4500	E600	Ductile Iron Shell, Copper Coils
E1501	E301	E4501	E601	Ductile Iron Shell, Admiralty Coils
E1502	E302	E4502	E602	Ductile Iron Shell, Cupro-Nickel Coils
E1520	E320	E4520	E620	Steel Shell, Copper Coils
E1521	E321	E4521	E621	Steel Shell, Admiralty Coils
E1522	E322	E4522	E622	Steel Shell, Cupro-Nickel Coils
E1540	E340	E4540	E640	Steel Shell, Copper Coils, ASME "U" Stamp
E1541	E341	E4541	E641	Steel Shell, Admiralty Coils, ASME "U" Stamp
E1542	E342	E4542	E642	Steel Shell, Cupro-Nickel Coils, ASME "U" Stamp
E1550	E350	E4550	E650	Steel Shell, Copper Coils, ASME "UM" Stamp
E1551	E351	E4551	E651	Steel Shell, Admiralty Coils, ASME "UM" Stamp
E1552	E352	E4552	E652	Steel Shell, Cupro-Nickel Coils, ASME "UM" Stamp



LESLIE CONTROLS

instructions for

90/1.5.1.3

Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

INSTALLATION, OPERATION, AND MAINTENANCE

SECTION I — INSTALLATION (Refer to Section V, pages 12 and 13)

- **HEATER MAY BE WALL OR FLOOR STAND MOUNTED** — Allow recommended clearances shown on Piping Layout, Section V, pages 12 and 13

WARNING: When connecting heater to other than copper pipe use dielectric unions, (isolators) to prevent possible galvanic action

- **LOCATE STEAM CONTROL VALVE** on the same level as the heater, if possible. If necessary, steam control valve may be located above or below heater. See Table I

WARNING To prevent water hammer damage, provide adequate condensate drainage leg and trap at low point in steam line to Steam Control Valve

A small sized trap is provided for installation in the steam line from the Control Valve to the Heat Exchanger to keep the line free of condensate during standby periods

When steam supply pressure exceeds 75 psig a Safety Valve should be installed between control valve and heater as shown on page 12

- **AIR OPERATION** — Where air is used as the operating force the steam control valve can be located any reasonable distance either above or

below the heater. The limitations imposed upon the elevation of the condensate lines still apply and must be adhered to

If air is used to operate heater a relief valve adjusted for 160 psig should be installed in cold water between check valve and cold water inlet connections to heater to protect against Thermal Expansion. Relief valve is not needed where water is used to operate unit

- **WATER OPERATION** — Where water is used as the operating force the steam control valve must not be installed at distances (above or below heater) in excess of maximum allowable elevations shown in Table I below

• CONNECTION OF STEAM TRAP DISCHARGE LINE

Connect steam trap discharge line to an atmosphere or sub-atmospheric return system

Where condensate lift is necessary DO NOT discharge against a lift elevation greater than figures shown in Table II on page 2

Table I

Heater Model	Inlet Steam Press. (PSIG)	Valve Size (In.)	Max. Elev. Steam Valve Above Heater (Ft.)	Max. Elev. Cond. Disch Above Heater (Ft.)	Max. Elev. Steam Valve Below heater (Ft.)	Nominal Pipe Dia. After Steam Valve (In.)
E-1500	125-250	1	28	15	10	2
	75-125	1½	20	15	12	2
	50-75	1½	30	15	8	2
E-300	40-50	2	30	15	8	3
	20-40	2½	30	15	8	3
	15-20	3	30	15	8	3
E-4500	125-250	1½	10	15	10	3
	75-125	2	10	15	14	3
	40-75	2½	20	15	6	3
E-600	30-40	3	20	15	8	3
	15-30	4	16	15	6	4

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Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION I — INSTALLATION (CONT.)

Table II

Maximum Elevation (Ft.) Trap Discharge Line Above Heater	1'	2'	3'	4'	5'	6'	8'	10'	12'	15'
Set Steam Pressure (PSIG) to Heater with Zero Water Flow at:	10	15	20	25	27	30	45	55	65	80

When both the steam valve and the condensate discharge line are mounted above the heater the maximum elevation of the steam valve above the heater must be reduced by the elevation of the condensate discharge above the heater

SECTION II — START-UP PROCEDURE (See Fig. 1 Page 4)

INITIAL START-UP

1. Turn on cold water supply (Min 40 psig with steam valve below heater, 50 psig with valve mounted above the heater) Maximum pressure 150 psig
2. Loosen nut on the formed tubing (7) where it attaches to the fitting (4) in the upper diaphragm case (1) of the hot water control valve complete and allow air to vent from the case until a steady flow of water is noted Re-tighten nut to fitting
3. With no water flow through heater turn on steam supply to steam control valve NOTE Make sure that condensate is being properly drained from steam line ahead of the steam control valve
4. Remove clamp complete (42) from loading valve Using adjusting pin, move AWR spring seat (44) downward to load diaphragm of steam control valve until the steam pressure to the heater is 1/2 psig (or when condensate lift exists, pressure as shown in Table II) Replace clamp (42) and rubber seal so that both windows are sealed
5. Vent air from steam side of heater by loosening vent plugs in top of heater casing After venting air re-tighten vent plugs
6. Start water flow through heater Adjust water temperature moving lock nut (21) away from valve body (33) until there is a clearance between nut and body Move adjustor (25) to the left to increase water temperature or right to decrease water temperature See HOT and

COLD direction arrow on body above adjustor handle For best results, temperature should be adjusted with an approximate water flow of 15 gpm for E-300 and 20 gpm flow thru heater for E-600

When desired water temperature is obtained, relock lock nut to prevent adjustor from moving

NORMAL OPERATING PROCEDURE AFTER INITIAL START-UP

7. Heater is now adjusted and operating No further adjustments are necessary To shut down system close water and steam valves To restart open valves

TO DRAIN UNIT FOR PROLONGED SHUT-DOWN (Where drainage is necessary)

1. Turn off steam supply
2. Turn off water supply Release water pressure from steam control valve diaphragm by breaking copper tubing fitting
3. Open a vent line in high point of system
4. Open nut on formed tubing (7) at the fitting in upper diaphragm case of hot water control valve
5. Open drain connections in steam and condensate lines
6. Drain all water out of system
7. When restarting system, tighten all connections and close all vents



Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION III — MAINTENANCE OF SYSTEM COMPONENTS

DISMANTLING OF CONTROL VALVE COMPLETE (See Fig. 1 Page 4)

1. Close all steam and water inlet and outlet stop valves. Disconnect all tubing from the valve body, upper and lower diaphragm cases and the AWR loading valve. Match mark all parts and subassemblies prior to dismantling.
2. Remove AWR complete by removing V-retaining coupling (41) and pulling the AWR loading valve out of the outlet manifold (37) in a straight line until it clears the spring loader complete (38). See section on maintenance of E-300 or E-600 Class AWR loading valves for complete dismantling and assembly.
3. Disconnect Victaulic couplings (36) and (78) and remove them from the outlet manifold (37). Manifold is then removed by lowering it down and past the spring loader complete (38).
4. Loosen and remove casing nuts and bolts (5), (14). Lift off upper diaphragm case (1).
5. Hold upper stem (18) fast by placing an open end wrench on the upper stem flats and remove the jam nut (10) with another wrench.

CAUTION: Do not allow valve plug assembly to fall from lower end of the valve body.

6. Remove valve plug assembly from the lower opening of the valve body (33) by pulling straight down on the spring loader complete (38).
7. Valve plug assembly should not be disassembled unless parts replacement is necessary due to damaged or worn parts. For disassembly, see instructions for disassembly of valve plug.
8. Take out the shouldered washer (12), o-ring (11), the diaphragm (2), the diaphragm plate (15), control valve spring (16), the spring guide washer (13) and the spacer (3) (type E-300 only) from the lower diaphragm case (6).
9. Remove socket head cap screws (8) and take off lower diaphragm case (6). Take out o-ring (9) from top of valve body (33).

10. Unscrew lock nut (21) and adjusting handle (25) from valve plug adjusting collar (24).
11. Remove stem support (17), o-rings (22), (23) and the valve plug adjusting collar complete (24) from the top of the valve body (33).
12. All parts should be cleaned with an approved solvent. Wipe off with a clean cloth. Do not use abrasives on the teflon coated surface of the spring loader compl (38). Care should be taken in handling parts so as not to damage critical surfaces. Replace any badly worn or damaged parts.

NOTE: If a complete dismantling of the control valve complete is required, it is recommended that the valve be removed from heater and the dismantling be done on a bench.

CONTROL VALVE COMPLETE ASSEMBLY

IMPORTANT: Lubricate all "O"-rings with silicone grease and apply a light coating of this lubricant to all teflon-coated surfaces before installation of parts.

1. Install o-ring (23) into the valve plug adjusting collar complete (24). Insert collar into the top of the valve body (33) bore and seat. Position collar so that the threaded hole in the side of the collar which accepts the adjusting handle, and the hole in the side of the valve body are lined up. Insert adjusting handle (25) through hole in the side of the valve body and screw it into the adjusting collar until tight.
2. Insert o-rings (22) and (23) onto stem support (17) and install assembly into valve body (33) with o-ring (23) seal facing downward.
3. Place o-ring (9) in the top of the valve body (33). Position and attach lower diaphragm case (6) to the valve body. Fasten case to the valve body with cap screws (8) sequentially and across from each other until tight.
4. Install valve plug assembly up into the lower end of the valve body (33) by pushing it up through the stem support (17) until the snap ring (26) face seats against the bottom face of the stem.



Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION III — MAINTENANCE (CONT.)

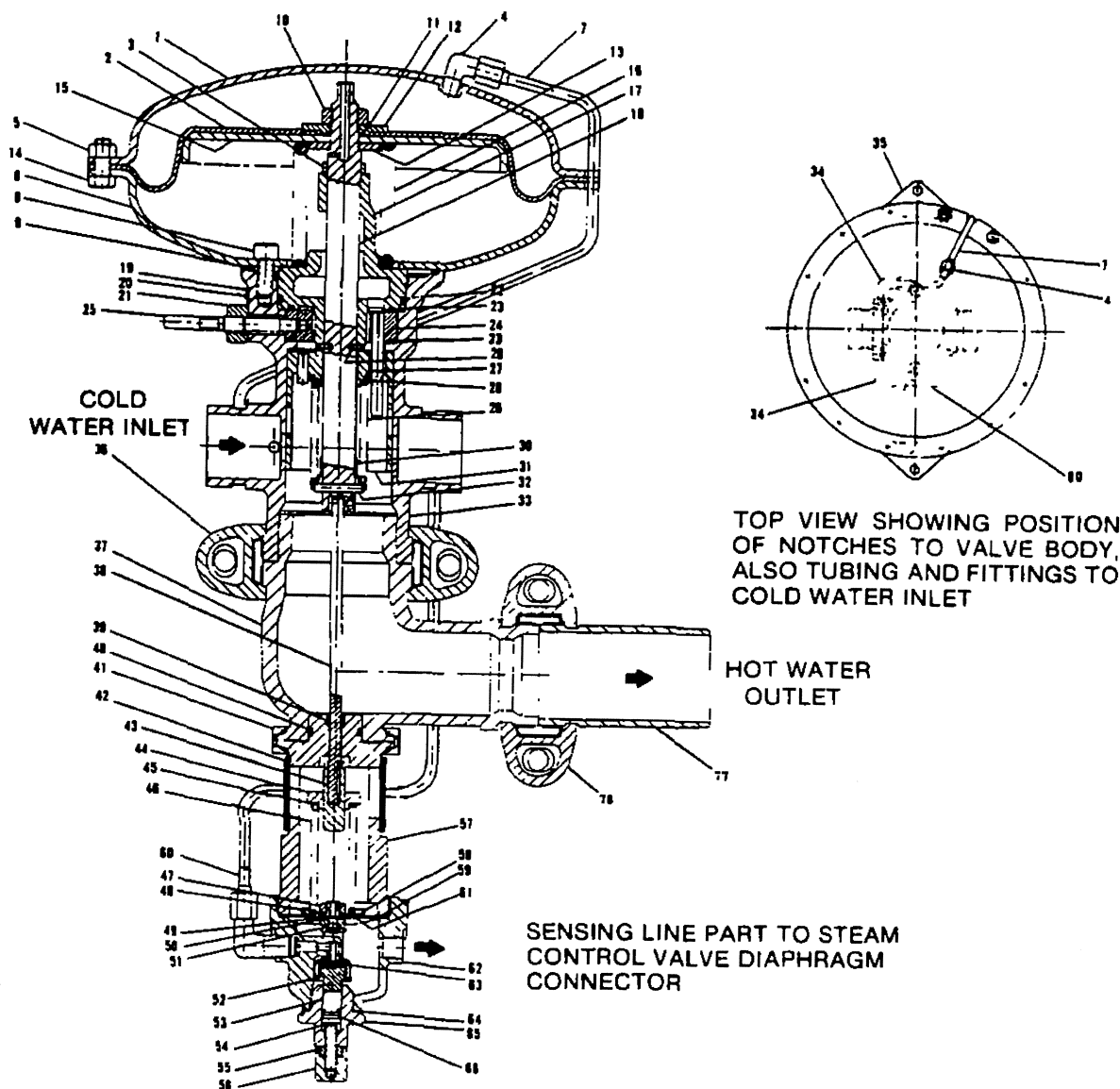


Figure 1
Control Valve Complete

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Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION III — MAINTENANCE (CONT.)

support (17) Holding the assembly up in place install the Control Valve Spring (16) Make sure spring seats properly on stem support (17) spring seat area Install spacer (3) (type E-300 only) over upper stem (18) and seat on top of stem support Place spring guide washer (13) over upper stem and seat Install diaphragm plate (15), diaphragm (2), o-ring (11), shouldered washer (12) and jam nut (10) over upper stem Tighten jam nut after positioning diaphragm holes over lower diaphragm case (6) holes

5. Install upper case (1) and position over diaphragm holes Make sure diaphragm lays flat on flange and is not pinched or twisted Fasten bolts (14) and nuts (5) sequentially and across from each other until tight
6. Place Victaulic coupling gasket on hot water outlet nipple (77) Place nipple against outlet manifold (37) Pull gasket into place Attach two halves of Victaulic coupling (78) over gasket and seat in radial grooves in nipple and outlet manifold Insert bolts and screw on nuts Pull up fitting halves evenly until tight Install gasket for Victaulic coupling (36) over lower outlet end of valve body (33) until gasket edge is flush Raise outlet manifold and nipple assembly into place against the lower end of the valve body (33) and position Pull Victaulic gasket down into position over the mating interface of the body and the outlet manifold Attach two halves of the Victaulic coupling (36) over the gasket and position Insert bolts and screw on nuts Pull up fitting halves evenly until tight
7. Lubricate spring loader (38) lower end with silicon grease Push AWR unit upward until spring loader enters packing (39) Continue to push unit upward until loader enters spring adjustor (43) Loader and spring adjustor flats must be lined up otherwise packing may be damaged Seat AWR spring case (57) pilot end against lower end of the outlet manifold (37) Install and tighten V retaining coupling (41)
8. Install formed tubing (7) from the flared male elbow (4) in the upper diaphragm case (1) to the

male elbow fitting (34) in the cold water inlet on the valve body (33) Formed tubing (60) is then installed from the male elbow fitting (34) in the AWR inlet to another male elbow fitting (34) in the cold water inlet of the valve body (33)

9. To readjust heater steam preload and temperature follow instructions under Section II, Start-Up Procedure before reinstalling AWR clamp (42)

DISMANTLING VALVE PLUG ASSEMBLY

NOTE: Dismantle only if parts are worn or broken

1. Place plug assembly in a soft jawed vice
2. Remove spring loader complete (38) from the lower end of the upper stem (18) by tilting the spring loader and pulling out on the spring loader complete stem
3. Using a slotted tubular tool and straddling pin (32) push down on the spring seat (30) When the pin is clear of the spring seat retaining lip remove it from the upper stem (18)
4. Remove the spring seat (30), the yielding spring (29), special washer (28) temperature adjusting disc (27) and the valve plug-complete (31) from the upper stem (18)

ASSEMBLING VALVE PLUG ASSEMBLY

NOTE: Inspect parts for worn areas, broken spring, etc Discard and replace all worn parts with LESLIE genuine parts

1. Install the valve plug-complete (31) over the stem (18) and seat against snap ring (26) Next insert the temperature adjusting disc (27), special washer (28), the yielding spring (29) and the spring seat (30)
2. Using a slotted tubular tool, replace the spring seat (30) compress the assembly and insert pin (32) thru upper stem (18) Release pressure on seat until seat retaining lip locks in pin

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Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION III — MAINTENANCE (CONT.)

THE E-300 OR E-600 CLASS AWR LOADING VALVES DISMANTLING (See Fig. 1 Page 4)

1. Remove clamp and rubber gasket (42) from spring case (57)
2. Hold AWR in a protected jaw vise and unscrew spring case (57) from body (62) Lift out top spring seat washer (45) and spring adjustor assembly (43) Remove adjusting spring (57)
3. Carefully remove diaphragm washer (59) and lift out diaphragm nozzle assembly
4. Unscrew and remove bottom cap (56) and spring (53) **DO NOT DISTURB ADJUSTMENT OR REMOVE ANY PARTS FROM BOTTOM CAP (65) ASSEMBLY UNLESS DISASSEMBLY IS NECESSARY FOR CLEANING OR PARTS REPLACEMENT ETC IF UNIT IS DISASSEMBLED READJUST THERMAL RELIEF PRESSURE AS DESCRIBED IN THE FOLLOWING PARAGRAPH**

Remove lock cap (56) Using water, air or nitrogen provide inlet supply pressure to AWR that can be adjusted from 150 to 170 psig Loosen nut (55) and turn adjusting screw (54) until AWR just starts to open at 160 to 170 psig After making adjustment hold adjusting screw (54) and tighten nut (55) Recheck to make sure valve will relieve with inlet pressure between 160 and 170 psig

Remove main valve and yoke assembly through upper opening of body

- 5 Clean all parts in an approved solvent and wipe dry Replace any worn or damaged parts
- 6 TO REPLACE DIAPHRAGM (61), disassemble diaphragm nut (47), lock washer (48), diaphragm disc (58), nozzle washer (49) and nozzle (50)
- 7 TO REPLACE VALVE DISC (63) clamp yoke (51) in vise and remove main valve (52) and insert new part Replace main valve (52) and tighten
- 8 TO REPLACE SPRING ADJUSTOR SEAL (66) remove from spring case (53) by picking out seal

(66) with a paper clip or thin wire Lubricate new seal with silicone grease prior to re-installing

9. Reassemble regulator using drawing as a guide
10. Readjust AWR per instructions SECTION II, Start-Up Procedure After readjusting replace clamp (42) with rubber seal covering window openings

SYSTEM COMPONENTS—HEAT EXCHANGER

Check tightness of all casing bolts and nuts after unit has been in operation for a few hours and again in twenty-four hours

DISASSEMBLY

1. Disconnect water piping
- 2 Remove all nuts around casing
3. Remove casing from base plate
4. Remove manifold nuts and lock rings Coil manifold and manifold gaskets may now be removed

ASSEMBLY

Clean all parts and replace any damaged parts Use new gaskets

- 5 Install manifold gaskets between manifold collar and base plate Insert coil manifolds into base plate
6. Place lock rings over manifold ends with locks fitted into slots Install manifold nuts and tighten securely (A light coating of thread lubricant should be used on manifold threads before assembly of nuts)
7. Place casing gasket on base plate and follow with casing Make sure recesses inside casing line up with top of manifolds
8. Install nuts and bolts and tighten evenly to assure a tight leakproof seal
- 9 Reinstall water piping
- 10 Vent steam side of heater as described under SECTION II — Start-Up Procedure

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Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION III — MAINTENANCE (CONT.)

GP TYPE REGULATORS DISASSEMBLY

1. Shut off loading pressure. Disconnect loading line to release pressure from diaphragm area.
2. Close stop valves on inlet and outlet sides of control valve and open strainer blowdown valve to vent trapped fluid.
3. Remove bolts and nuts from diaphragm cover and lift off cover. Take out diaphragm(s) and diaphragm disc.
4. Remove bottom cap and bottom cap gasket, main valve and spring.
5. To remove seat ring, place seat ring wrench over lugs of ring and strike end of wrench with a hammer several times while holding wrench in place to loosen seat ring for removal.
6. Clean diaphragm disc, diaphragm cover and main body diaphragm seating surface including the rounded portion below diaphragm face. Cleaning is important as diaphragm life can be decreased if diaphragm is allowed to flex over any rough or scaled areas. A rotary wire brush is excellent for cleaning these surfaces. Check diaphragm cover loading connection making sure it is not plugged.
7. Clean and polish seat ring threads and flat face, bottom cap gasket face and threads, main valve guide in main body and main valve guide bushing in bottom (bottom cap bushings are removable in 1/2" through 2" sizes). To polish main valve and guides, place them in a lathe and spin rapidly. Use 320 Aluminum Oxide cloth as a polishing agent.

8. After cleaning check all parts for erosion or damage. Replace if necessary.
9. Use a rotary wire brush and clean main body seat ring face and threads. Check for any erosion or damage to threads or flat face. All deposits must be removed from flat face as a metal to metal steam seal must be obtained between ring face and main body. Gasket face must be flat and square, minor nicks should be removed with fine emery.
10. Blow out all loose scale, etc. from body with air.

ASSEMBLY

1. Use a light coating of Never-Seez or similar lubricant on the first two threads only of seat ring. Blue in seat ring before final tightening making sure there is a full, all-around contact between seat ring and main body flat faces. Tighten seat ring to 150 foot pounds torque. Install main valve guide and tighten.
2. Place a small amount of extra fine lapping compound (Carborundum Grade CF) evenly spaced on main valve seating surface and lightly lap valve to seat ring. Remove all traces of compound from parts before reassembly.
3. Install main valve, main valve spring, bottom cap with guide bushing and bottom cap gasket. Tighten bottom cap.
4. Replace diaphragm disc.
5. Check height of disc. IMPORTANT: Height of diaphragm disc MUST be correct to obtain TIGHT SHUT-OFF of main valve. See Clearance Table and sketch for details. If MINIMUM

CLEARANCE TABLE

VALVE SIZE	GAGE BLOCK HEIGHT	MINIMUM CLEARANCE	MAXIMUM CLEARANCE
1/2" — 1 1/4"	187 + 000 - 002	073 to 071	100
1 1/2" — 2"	218 + 000 - 002	076 to 074	103
2 1/2" — 4"	312 + 000 - 002	024 to 022	066

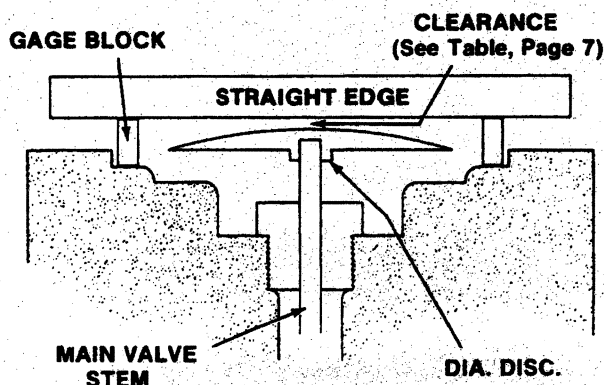
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Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION III — MAINTENANCE (CONT.)

clearance is LESS than that shown in Clearance Table, remove main valve and grind just enough metal from diaphragm disc end of main valve stem to obtain proper clearance. If MAXIMUM clearance is MORE than that shown in Clearance Table, the rated travel of main valve will be reduced causing a reduction in the rated steam capacity of valve. If reduced capacity is great enough to affect system operation, a new seat ring and main valve should be installed.



To check disc height, place two gage blocks on flat of diaphragm face opposite each other. Place a straight edge across blocks and measure clearance between bottom edge of straight edge and top of diaphragm as shown.

6. Replace the two diaphragms making sure the lower leaf is one having a small bleed hole. The upper or top diaphragm is solid and does not have a bleed hole.
7. Center diaphragm(s) and replace diaphragm cover. Install diaphragm cover and tighten nuts evenly.
8. If possible check valve for tight seating, using steam pressure equal to actual operating pressure before installing valve in line.
9. BEFORE INSTALLING VALVE: Clean strainer at inlet of valve and blow out piping including impulse pipe. Check traps for proper operation. Check pressure gages to make sure they read pressure correctly.

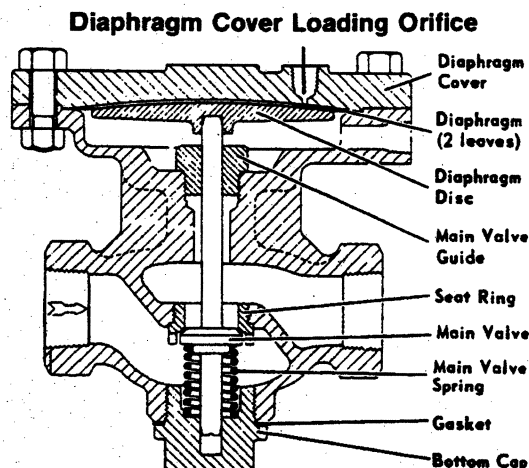


Figure 2 — GP Type Regulator

- Do not remove seat ring unless remachining or replacement is necessary.

REPLACING SEAT RINGS (Screwed Types)

To remove seat ring use the special wrench which is available on request. See Figure 3.

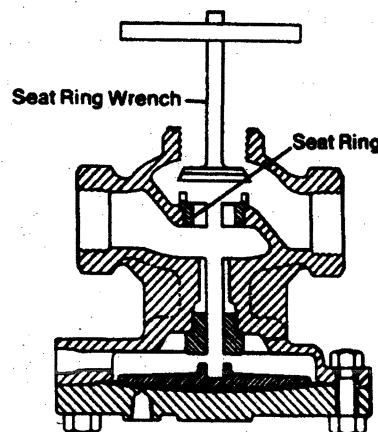


Figure 3

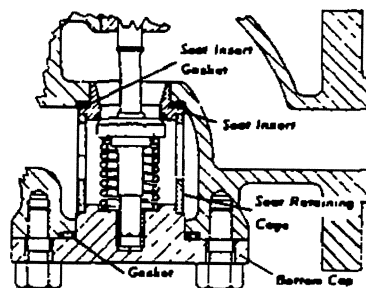


Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION III — MAINTENANCE (CONT.)

When dismantling steel valves the seat insert, seat retaining guide and the seat insert gasket may be easily removed for inspection, cleaning or rework, after the bottom cap and other parts have been taken out. When reassembling always use new seat insert and bottom cap gaskets. Tighten bottom cap down evenly until faces of bottom cap and main body meet.

Figure 4 — Steel Valves
Fitted With Cage Type Trim



SECTION IV — TROUBLE SHOOTING GUIDE FOR LESLIE CONSTANTEMP HEATERS — Types E-300 and E-600

IMPORTANT! FIRST REFER TO THIS CONSTANTEMP HEATER MANUAL. Study installation drawings and CAREFULLY read the details concerning installation of your Heater and Trapping System. Following these recommendations will insure that you obtain the maximum efficiency from your CONSTANTEMP HEATER.

TROUBLE SHOOTING GUIDE Recirculating Systems

1 PROBLEM EXCESSIVE RISE IN WATER TEMPERATURE OCCURRING DURING OR AFTER PROLONGED PERIODS WHEN NO WATER IS BEING USED FROM HEATER AND A RECIRCULATING SYSTEM IS PROVIDED.

- 1 Too much water is being recirculated through the heater. Reduce the water flow through the heater by throttling in on the recirculation stop valve, allowing enough time for the water in the piping system to cool and assume the new temperature setting.

If the piping system is extensive and contains a large volume of water, readjustment of the temperature can be speeded up by closing the steam supply stop valve to the heater exchanger and by then opening the faucets etc., preferably at the end of the loop until the water temperature drops a few degrees below the heater's temperature.

Close off the recirculation stop valve and open the steam-stop valve to the heater. With recirculating pump in operation, open recirculation stop valve in small increments while allowing adequate time for the water to be recirculated throughout the piping before proceeding to the next increment of adjustment. Continue until the desired recirculation water temperature is achieved.

- 2 IF A THREE-WAY THERMOSTATIC VALVE IS USED, the port connected to the heater's cold water supply MUST CLOSE to prevent excessive flow of the water back to the heater. An excessive flow will cause the water temperature in the piping to rise above the adjusted temperature setting of the heater. If the port does not close, check for dirt or an obstruction between the seating surfaces or for a damaged element or seals.
- 3 TO CHECK FOR A FAULTY ELEMENT immerse the unit in an agitated bath of hot water. With a rise in the water temperature of from 10 to 12° F above the rated operating range of the element, the port connected to the heater's cold water supply pipe should be closed. If the port does not close, the element and gaskets should be replaced.
- .. CHECK THE OPERATING RANGE OF THE ELEMENT TO MAKE SURE THAT THE RANGE IS THE ONE NEEDED FOR YOUR SYSTEM.



Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION IV — TROUBLE SHOOTING (CONT.)

- 4 **NOTE** The operating range of the thermostatic valve should normally be from 10 to 15° F lower than that of the heater's adjusted water-operating temperature. If the heater is adjusted for 140° F hot water and a 110° F three-way valve is used, the recirculated water will assume a temperature of 110° F during prolonged periods when no water is being used from the heater. If a 180° F range unit is used under the same conditions as above, the recirculated water temperature will rise to 180° F.

2. PROBLEM: EXCESSIVE DROP IN WATER TEMPERATURE OCCURRING DURING OR AFTER PROLONGED PERIODS WHEN NO WATER IS BEING USED FROM HEATER AND A RECIRCULATING SYSTEM IS PROVIDED.

- 1 **HIGH PRESSURE HEATERS** Incorrect adjustment of the steam pressure to the heat exchanger for heater **NO FLOW** condition. See Section II, Start-Up Procedure and readjust the steam pressure according to the instructions.
- 2 No water is being recirculated back to the heater. Check the recirculating system for proper operation of the pump, recirculation valves and controls.

**TROUBLE SHOOTING GUIDE FOR
heat exchanger and blending valve**

3. PROBLEM: DROP IN CONTROLLED WATER TEMPERATURE OCCURRING BEFORE RATED CAPACITY (GPM) OF YOUR HEATER IS OBTAINED

- 1 Check for the correct inlet water operating pressure and steam pressure to the heater before and during any operational tests. The **MINIMUM** water pressure for **HIGH PRESSURE** heaters is 40 psig with the steam valve installed below the heater and 50 psig with the steam valve above the heater.

The **MAXIMUM** water pressure for all heaters is 150 psig.

- 2 Check to make sure that all the steam strainers are clean and that all the traps are functioning efficiently. A flooded or partly flooded heat

exchanger will cause little or no heat transfer. Excessive back pressure in the trap discharge piping system or partly clogged piping can restrict the flow of the condensate from the heater and cause flooding. Dirty or partly plugged strainer screens can also cause this problem.

The above systems **MUST BE OPERATING EFFICIENTLY BEFORE ANY CHECK FOR FOULED COILS CAN BE MADE**.

- 3 To check for fouled coils, remove the pipe plugs from the blending valve base and cover and install a gage in each connection. The temperature of the water from the heat exchanger outlet piping should be approximately 200 to 215° F when the heater is being operated within its rated capacity. (The temperature may be checked by using a contact Pyrometer held against a smooth-filed section of the exchanger outlet piping.)

For **HIGH PRESSURE HEATERS** the steam pressure to the heat exchanger should increase as the water flow increases. The steam pressure should **NOT BE LESS** than 30 psig when the flow reaches the rated capacity of the heater as indicated by a 7 psig differential across the blending valve diaphragm. (Read on gages in the base and cover of the blending valve.)

TEST PROCEDURE With the traps functioning efficiently and with flow adjusted for 60% of the heater rated capacity (approximately 5 psig differential across the blending valve diaphragm) the heat exchanger outlet water temperature drops below 200° F. This continues to drop as the flow is increased to the heater's rated capacity in GPM and indicates that the coils are fouled and should be cleaned or replaced. A coil-cleaning adaptor kit is available through your Leslie representative along with instructions for its use. If the quality of the water being used is poor, the coils may foul rapidly, indicating that corrective water treatment may be necessary.

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LESLIE CONTROLS, INC., TAMPA, FL 33637



Steam Water Heaters Models E-1500, E-300, E-4500 and E-600

SECTION IV — TROUBLE SHOOTING (CONT)

4 PROBLEM. INSUFFICIENT STEAM TO HEAT EXCHANGER.

- 1 See Paragraphs 1 and 2 above of trouble shooting guide
- 2 HIGH PRESSURE HEATER Shut off the steam and water supply to the heater. Remove the tubing which connects the AWR loading valve to the steam-control valve diaphragm cover. Blow out the tubing. Check for broken diaphragms and be sure the diaphragm cover loading orifice is not plugged. See Section III, Maintenance of GP-Type Regulators if disassembly of the steam control valve is necessary.
- 3 To check the operation of the AWR loading valve and blending valve, shut off the water supply to the heater. Remove the tubing and fitting from the outlet connection of the AWR loading valve and install a gage in the connection. Remove the pipe plugs from the blending valve base and cover and install gages in the connection. Turn on the water supply to the heater making sure that the water pressure is correct for the operating conditions — not exceeding 50 psig. Check the gages to be sure they indicate the same pressure reading at zero flow. Open the hot water supply valve and slowly increase the flow through the heater until there is a 7 psig differential between the gage readings. At this differential the gage in the outlet connection of the AWR loading valve should read a MINIMUM PRESSURE of 30 to 35 psig. If a 7 psig differential or the proper travel of the blending valve plug cannot be obtained, check out the blending valve per Section III, Maintenance of Hot Water Control Valves. If the AWR loading valve outlet pressure is less than 30 psig, the loader should be disassembled and checked in accordance with Section III, Maintenance of the AWR Loading Valves.

5 PROBLEM. EXCESSIVE STEAM PRESSURE TO HEAT EXCHANGER.

- 1 HIGH PRESSURE HEATERS AWR loading valve drain pipe plugged or frozen (drain pipe MUST BE protected from freezing temperatures). Regulator has a slight, constant

leak-off. If the unit is not properly drained, it will pressurize the diaphragm of the steam control valve causing a rise in the steam pressure to the heat exchanger by opening the main valve, although there may be no demand for hot water. BE SURE there is no backpressure in the piping to which the drain pipe is connected. Correct by blowing out and cleaning the drain pipe and fittings. Check the AWR main valve disc and main body seat for dirt or damage. Check for dirt or foreign material between the main valve and the seat or on guides of the steam control valve that could prevent the valve from closing tightly. BE SURE THE STEAM CONTROL VALVE DIAPHRAGM COVER ORIFICE IS NOT PLUGGED. For disassembly of either of the units, see the appropriate section.

6. PROBLEM. EXCESSIVE RISE IN WATER TEMPERATURE ABOVE HEATERS SET POINT OCCURRING AT LOW FLOWS

- 1 The above problem may occur if the heater controlled temperature is overset due to
 - a. fouled coils
 - b. drop in the inlet water supply pressure
 - c. adjustment of the controlled water temperature while exceeding the heater's rated capacity in GPM

See Paragraphs 1 and 2 of the second problem for further information.

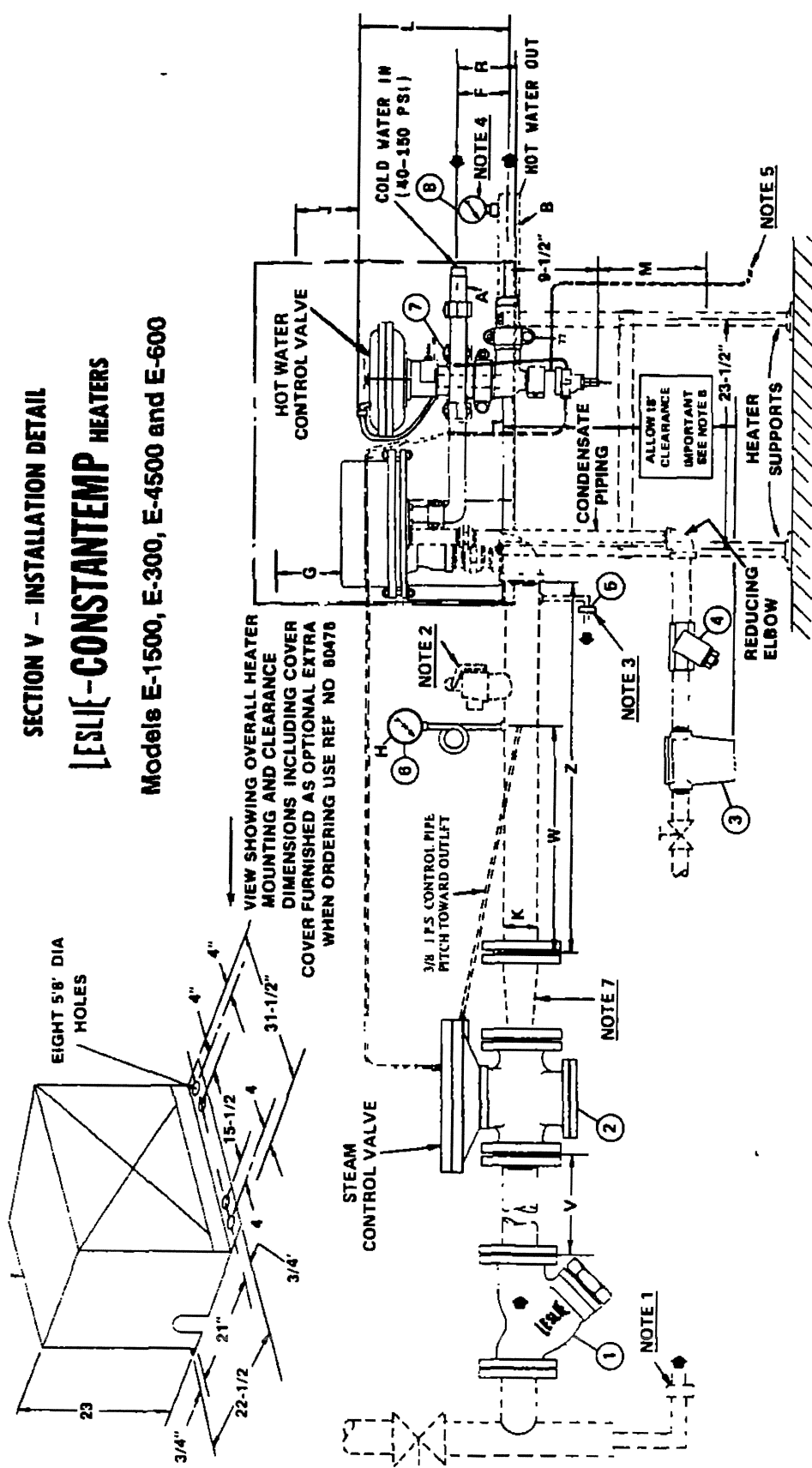
7 PROBLEM: EXCESSIVE DROP IN WATER TEMPERATURE BELOW HEATERS ADJUSTED SET POINT OCCURRING DURING LOW FLOW.

- 1 See Paragraph 1 of Problem 2 above
- 2 Inefficient trap operation or increase in the trap discharge drain piping backpressure. See Paragraph 2 of Problem 3.

NOTE A 3°F change in the inlet water temperature to the heater will produce a change in the heater's adjusted water temperature of 1°F.

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RECOMMENDED PIPING LENGTH*

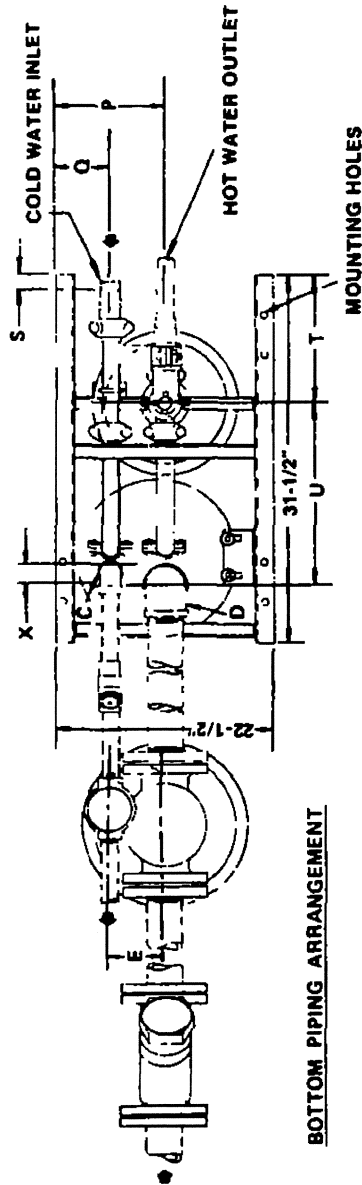
VALVE SIZE	V	W	Z
1" - 1 1/2"	2'	2'-3"	4'
2 - 4"	4'	2-3'	6'

* IF INSUFFICIENT SPACE DOES NOT PERMIT INSTALLATION AS SHOWN ABOVE, THEN THE STEAM VALVE MAY BE PLACED ABOVE OR BELOW THE HEATER.

APPROXIMATE WEIGHT

Approximate Weight including Strainer and Steam Trap - Model E-1500 & E-300	270 lb
Model E-4500 & E-600	360 lb
Approximate Weight Steam Trap	27 lb
Approximate Weight 1" Iron Strainer	5 lb

Heater may be supported by floor suspension or wall bracket type - Floor type shown



DIMENSIONS IN INCHES

MODEL	PIPE SIZES					F MIN	H PSI	K PIPE SIZE	L	(NOTE 6)			P	Q	R	S	T	U	X
	A	B	C	D	E					G	J	M							
E-1500 E-300	1 1/2	2	1 1/4	3	4 5/8	5 1/4	30 HG VAC 100	3	17-5/16	6	3	8	12 1/16	6 11/16	5 23/32	1 1/4	10 1/2	17 1/16	13/16
E-1520 E-320													11 1/4	5 7/8	5 3/4	1 11/16	10-1/16	17 1/16	13/16
E-4500 E-800 E-1520 E-320	2	2	2	4	5-1/8	5 1/4	PSIG	4	21-1/4	10	3	6	12 1/2	5-5/8	5 3/4	3 7/8	7 7/8	17 13/16	1

COMPONENTS SUPPLIED BY LESLIE CO

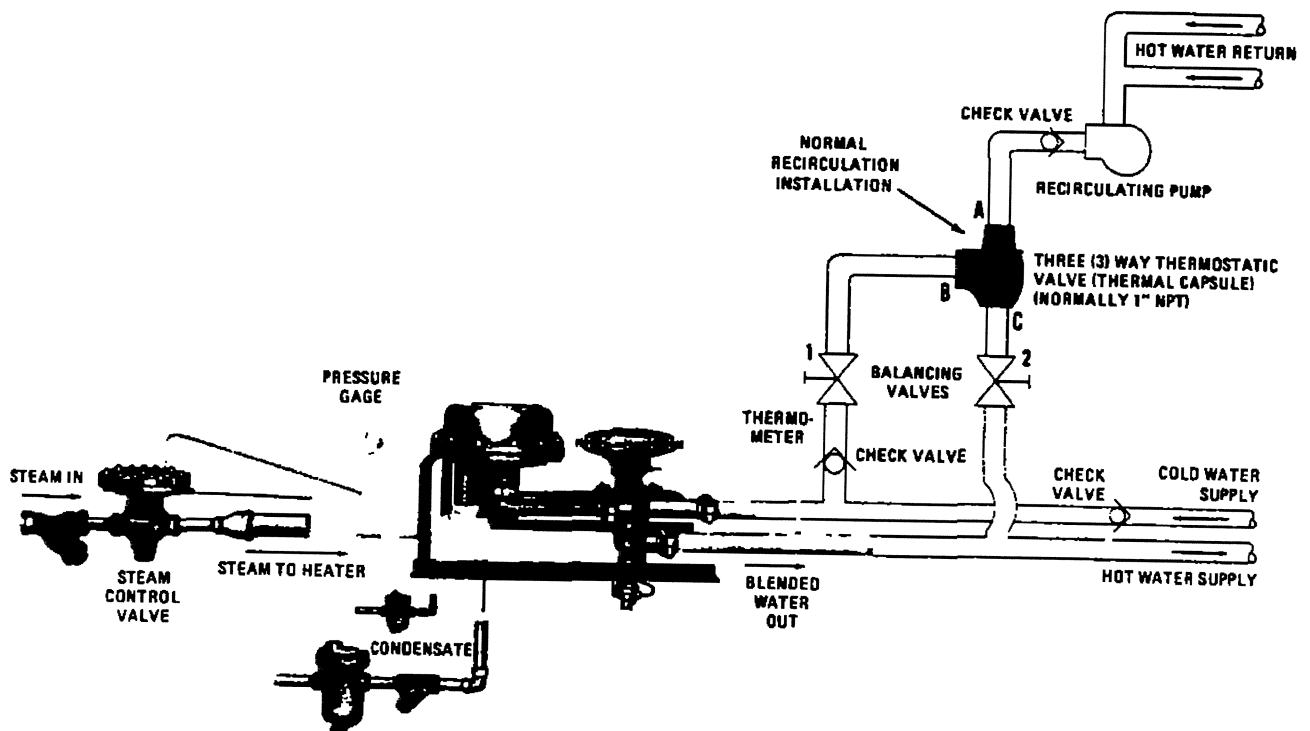
- 1 Inlet steam strainer
 - 2 Steam control valve
 - 3 Main condensate trap
 - 4 Strainer for condensate trap
 - 5 Small 1/2 trap for steam line
 - 6 Pressure gage
 - 7 Heater package including
 - Heat Exchanger
 - Blending valve
 - Loading valve
 - Manifold piping
 - Frame
 - 8 Hot water thermometer
- NOTF Installer must supply all piping and copper tubing shown in dotted lines

IMPORTANT NOTE

Install stop valves (not shown) in domestic water inlet and outlet lines

INSTALLATION NOTES

- | | | | |
|--------|---|--------|--|
| NOTE 1 | Provide adequate drip leg and trap to keep steam supply line free of condensate | NOTE 5 | Pipe this connection to open drain |
| NOTE 2 | Install safety valve at this connection when steam supply pressure may exceed 75 PSIG | NOTE 6 | Min clearance required for maintenance or parts replacement |
| NOTE 3 | Install small trap to drain condensation during no load or standby condition | NOTE 7 | When expanding from valve outlet to steam pipe use gradual taper expander directly at valve |
| NOTE 4 | Install thermometer supplied in outlet hot water line | NOTE 8 | IMPORTANT Condensate pipe from Heat Exchanger to Trap must be a vertical run of piping having a minimum length of 18 inches to prevent flooding of heat exchanger. |



LESLIE - CONSTANTEMP[®] RECIRCULATION SYSTEM DETAIL

The normal recirculation loop will require a one-inch thermostatic capsule. The setting of this capsule should be at least 20°F lower than the intended setpoint of the heater. The recirculating pump need only handle about 10 to 15% of the heater capacity with enough head to move the water around the recirculation loop.

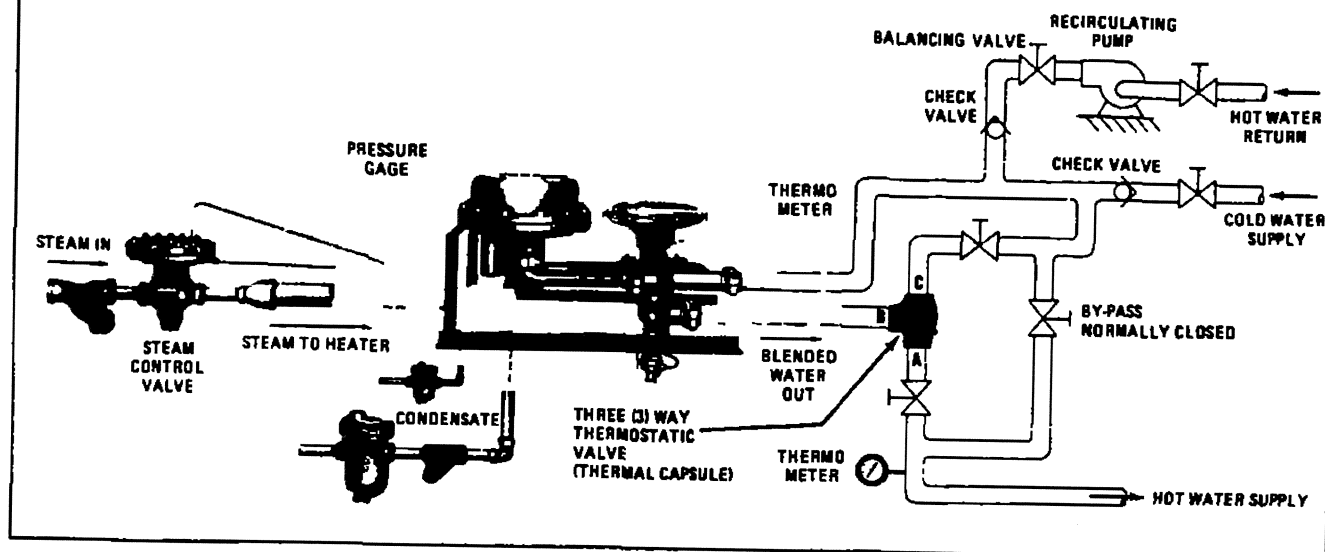
NOTE The exception to this is drenching showers used in chemical plants for the protection of personnel. In these applications the recirculating pump capacity should be equal to the heater capacity and have a discharge pressure close to the pressure of the cold water. The thermostatic capsule should also be large enough to handle full system capacity.

START-UP OF THE STANDARD RECIRCULATION SYSTEM

1. Close off balancing valves 1 and 2
2. Start recirculating pump
3. Open balancing valve until an increase of 1 to 2 psi above the required 1/2 psig steam is observed

NOTE: It is important that there is no additional hot water flow in the building other than the recirculating pump when adjusting balancing valve.

TYPICAL INSTALLATION FOR DRENCHING SHOWERS



MISCELLANEOUS DATA

RELIEF VALVE SIZING

A relief valve is required when the shell pressure can exceed 75 psig

The selection and sizing of the relief valve should be done on the following basis

The relief valve should be set to start relieving at 50 psi and be sized to handle the following flows when its inlet pressure had risen to 75 psi

HEATER SIZE	STEAM REGUL. VALVE SIZE	INLET PRESS PSIG	RELIEF VALVE CAPACITY LBS/HR SAT STEAM
E-300	1	100	2650
		125	3950
		150	5100
		175	6000
		200	6800
		225	7550
		250	8350
E-600	1 1/2	100	3650
		125	5000
		100	4900
		125	7300
		150	9400
		175	11100
		200	12500
	2	225	14000
		250	15450
		100	4900
		125*	7300

With steam pressures over 125 PSIG a 1 steam valve should be used with a 30 GPM heater

*With steam pressures over 125 PSIG a 1 1/2 steam valve should be used with a 60 GPM heater

AIR OR WATER CONSUMPTION OF LESLIE-CONSTANTEMP HEATER LOADING VALVES AWR 300 AND AWR 600

The approximate steady-load bleed rates are as follows

LOADER OUTPUT PRESSURE	AIR CONSUMPTION	WATER CONSUMPTION
2 PSI	026 SCFM	007 GPM
5 PSI	043 SCFM	010 GPM
10 PSI	065 SCFM	015 GPM
20 PSI	100 SCFM	020 GPM
50 PSI	185 SCFM	033 GPM