



INSTRUCTION
NO. **VA-106**

AERCO INTERNATIONAL, INC., NORTHVALE, NEW JERSEY 07647, U.S.A.

**INSTALLATION, OPERATION,
and MAINTENANCE INSTRUCTIONS**

CONTROL VALVE

PNEUMATIC

TYPE CXT-P

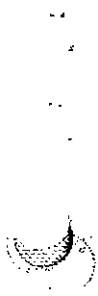


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SAFETY PRECAUTIONS

Installing or operating personnel must, at all times, observe all safety regulations. The following warnings are general but must be given the same attention as specific precautions in the instructions.

WARNING!

FLUIDS UNDER PRESSURE MAY CAUSE INJURY TO PERSONNEL
OR DAMAGE TO EQUIPMENT WHEN RELEASED.

Close all shutoff valves and carefully decrease all trapped pressures to zero before performing any maintenance (see instructions concerning relieving trapped pressures). Tag the pressure source "Out of Service" while performing maintenance tasks.

WARNING!

LIVE STEAM CAN CAUSE SEVERE BURNS.

Never search for leaks in a live steam or hot water system by "feel" or with any part of the body close to where leakage is suspected. Use a mirror or other suitable polished object for leakage detection.

Always wear gloves and long sleeves when carrying out maintenance tasks



GENERAL INFORMATION

This instruction manual covers the installation, adjustment, operation, and maintenance of an AERCO Pneumatic Control Valve, Type CXT-P, for Steam Flow or High Temperature Hot (Boiler) Water Flow. The materials of construction, dimensions, and size variations are indicated in Figure VA-106-1.

ACCESSORIES

Accessories required for use with the AERCO Pneumatic Control Valve generally depend upon the application. Refer to the INSTALLATION instructions below and to the installation schematic drawing furnished by AERCO for the specific system requirements. However, accessories normally required, as shown in Figures VA-106-2 and VA-106-3, are:

Upstream Shutoff Valve --- mandatory.

Downstream Shutoff Valve --- suggested for ease in maintenance --- required if a by-pass line is used.

Strainer and Blow-Off Valve --- mandatory.

High Side Pressure Gage --- recommended for adjustment and maintenance.

Low Side Pressure Gage --- Compound type for Steam Flow --- recommended for adjustment and maintenance.

High Side Temperature Gage for High Temperature Hot (Boiler) Water Flow --- recommended for adjustment and maintenance.

By-Pass Line and Shutoff Valve --- suggested for ease in maintenance and for emergency operation.

Over-Temperature Limit System --- may be furnished as an optional accessory --- if so, instructions for the system are included in the shipment.

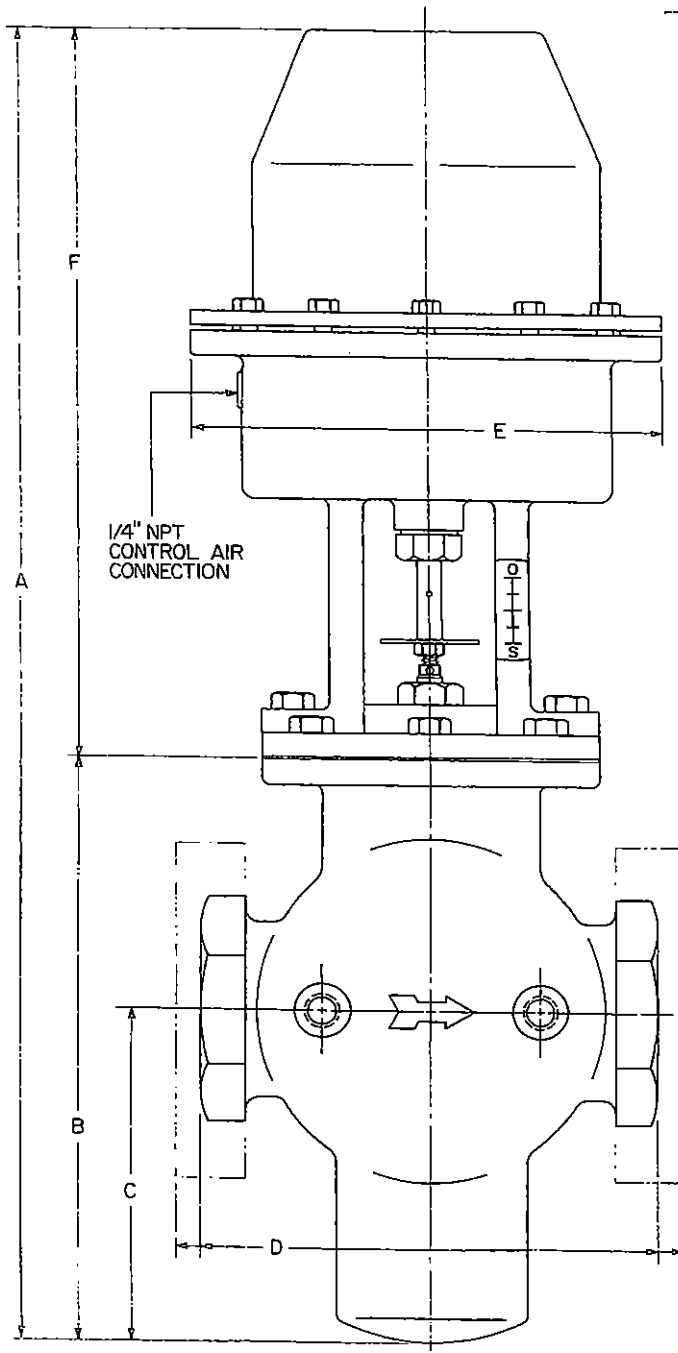
If any of these accessories have been furnished by AERCO with the Control Valve, drawings and/or instruction, as required, are included with the shipment.

NOTE

The AERCO Pneumatic Control Valve carries the standard AERCO warranty against defective material and workmanship. However, AERCO cannot honor its warranty if the installer or user deviates in any way from the instructions and precautions included herein.

INSTRUCTIONS -- AERCO PNEUMATIC CONTROL VALVE, TYPE CXT-P

DIMENSIONS - INCHES							
	NOMINAL VALVE SIZE - INCHES						
	1	1-1/4	1-1/2	2	2-1/2	3	4
A	20	20	20-1/4	21-7/8	24-3/8	29-1/8	31-7/8
B	6-5/8	6-5/8	6-7/8	8-1/2	10-1/8	12	14-3/4
C	3-1/8	3-1/8	3-7/16	5	6-3/8	7-3/8	10
D	6	6	6	7	10-7/8	11-3/4	13-7/8
E	7	7	7	7	7	10	10
F	13-3/8	13-3/8	13-3/8	13-3/8	14-1/4	17-1/8	17-1/8



MATERIALS OF CONSTRUCTION	
BODY	BRONZE BODY/DUCTILE IRON CONNECTION
SEATS	REINFORCED TEFLON
TRIM,	STAINLESS STEEL

Figure VA-106-1 -- Dimensions for AERCO Air Operated Control Valve, Type CXT-P

INSTALLATION

1. See Figure VA-106-1 for dimensions. Install the Control Valve in accordance with Figure VA-106-2 for Steam Flow or Figure VA-106-3 for High Temperature Hot (Boiler) Water Flow, plus the following steps 2 through 16.
2. Locate the Control Valve in a line as close to its Temperature Controller as practical in order to keep the air piping between the Controller and Valve as short as possible.
3. Wherever practical, install the Control Valve in the vertical UPRIGHT position. If available clearance is insufficient, the Valve may be mounted in any position from vertical upright to horizontal, but additional support for the overhung weight may be required. Under no circumstances should the Control Valve be installed with its Actuator (diaphragm head) below the horizontal position.
4. Unions are required on each side of a Control Valve with threaded ends to permit easy removal of the Valve from the line for maintenance.
5. Blow out all pipe lines before installation of the Control Valve to clear the lines of all dirt, chips, or scale that might get into the Valve and cause faulty operation.
6. Install an in-line Strainer, as shown in Figures VA-106-2 and VA-106-3, ahead of the Control Valve to protect against foreign matter reaching the Valve when in service.
7. If the Valve is controlling Steam Flow, make sure that the Steam line is properly trapped to prevent accumulation of condensate ahead of the Valve.
8. Install Shutoff Valves (metal seated gate type) upstream and downstream of the Control Valve to permit the Valve to be removed from the line for maintenance.
9. Pressure gages should be provided on either side of the Control Valve as shown in Figures VA-106-2 and VA-106-3. The gage on the high side is for adjustment and maintenance purposes. That on the low side should be a compound gage for Steam Flow and is for assuring that the correct pressure is being introduced to the Control Valve. For either Steam or Water Flow, the low side gage denotes the pressure of the fluid in the line which may create a hazardous condition.
10. A temperature gage should be provided in the high side of a High Temperature Hot (Boiler) Water line, as shown in Figure VA-106-3, for adjustment and maintenance purposes.
11. The optional By-Pass Line shown in Figures VA-106-2 and VA-106-3 should be included if it is necessary to keep the AERCO Heater with which the Control Valve is being used must be kept in operation while the Valve may be out of service for maintenance. The Shutoff Valve in the By-Pass Line should be a manually operated metal seated globe valve.
12. Install the Control Valve so that the arrow on the Valve body points in the direction of flow.
13. Instructions for the installation, adjustment, operation, and maintenance of the Pneumatic Temperature Controller furnished to be used with the Control Valve are included with the shipment with the Controller.

Depending on the type of Controller and on the AERCO Heater model (or other equipment) furnished, mount the Controller on the Heater (or other equipment being controlled). One type of Controller is mounted by inserting its direct-connected thermal element directly into the Heater thermostat connection in the top or side of the Heater (see the Heater instruction). The type of Controller which includes a remote temperature sensitive bulb may be attached to a bolt on the head of the Heater or to a mounting strip on the side of the Heater (or in a control box, if furnished), with the bulb inserted in the thermostat connection in the top or side of the Heater.

When a Controller using a remote thermal element is furnished, be very careful not to make any sharp bends in the capillary between the Controller and its thermal element. Any leakage of liquid from the capillary and thermal element assembly will render it inoperative.
14. Connect the control air piping from the Temperature Controller to the connection in the Control Valve Actuator (diaphragm head) -- see Figure VA-106-1.
15. If your system includes an Over-Temperature Limit System, install its Solenoid Valve in the control air line as shown in Figures VA-106-2 and VA-106-3 and as described in the instruction included with and covering the Limit System (the Solenoid Valve may be installed already in a control box mounted on the Heater). Before proceeding with any further adjustment or operation, set the Limit System's Temperature Switch at 15 to 20 degrees F above the desired Heater hot water outlet temperature.
16. After the Control Valve has been installed in the fluid line in accordance with the above, make sure that all piping connections and fittings are pulled up leak tight.

1
2
3

4

5

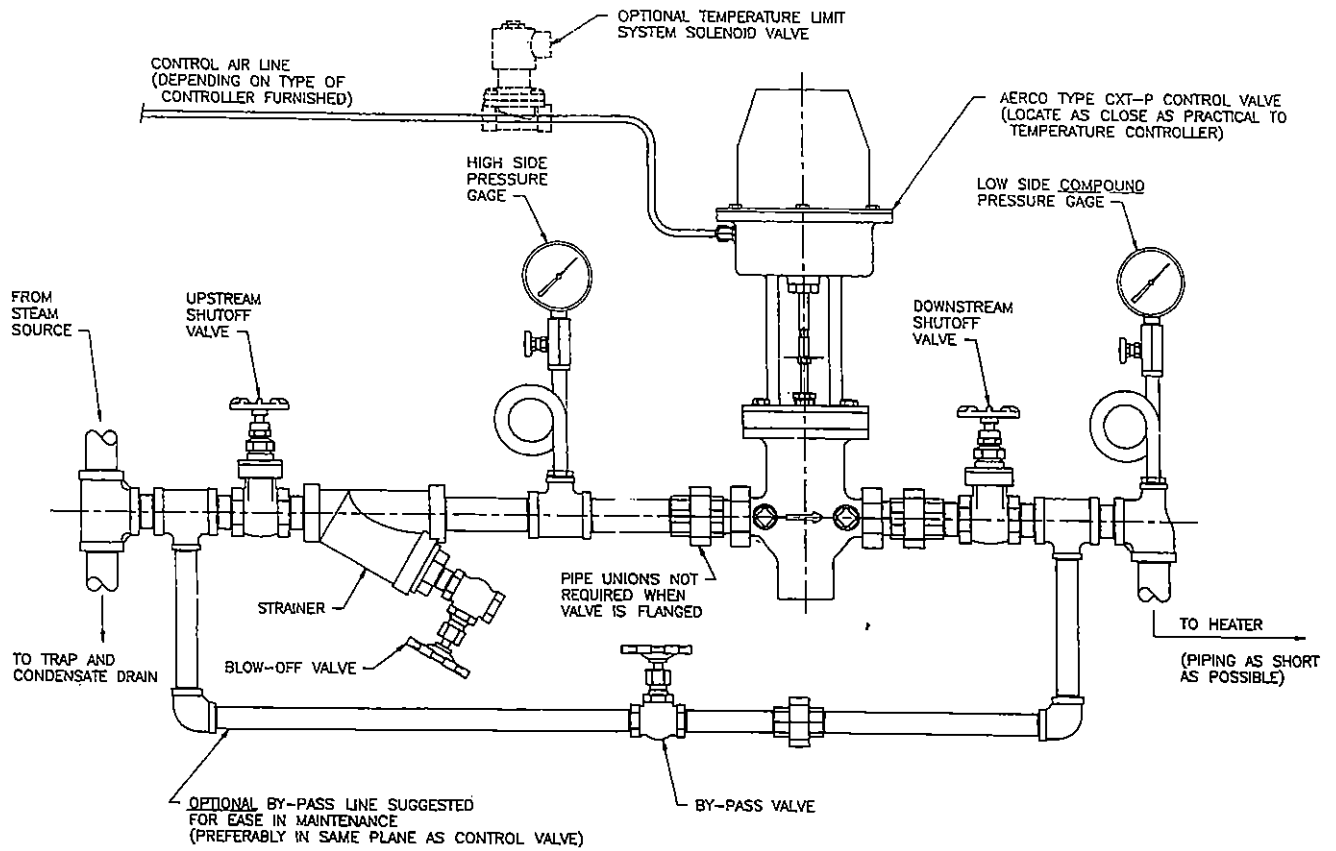


Figure VA-106-2 -- Recommended Installation for Control Valve, Type CXT-P for STEAM FLOW

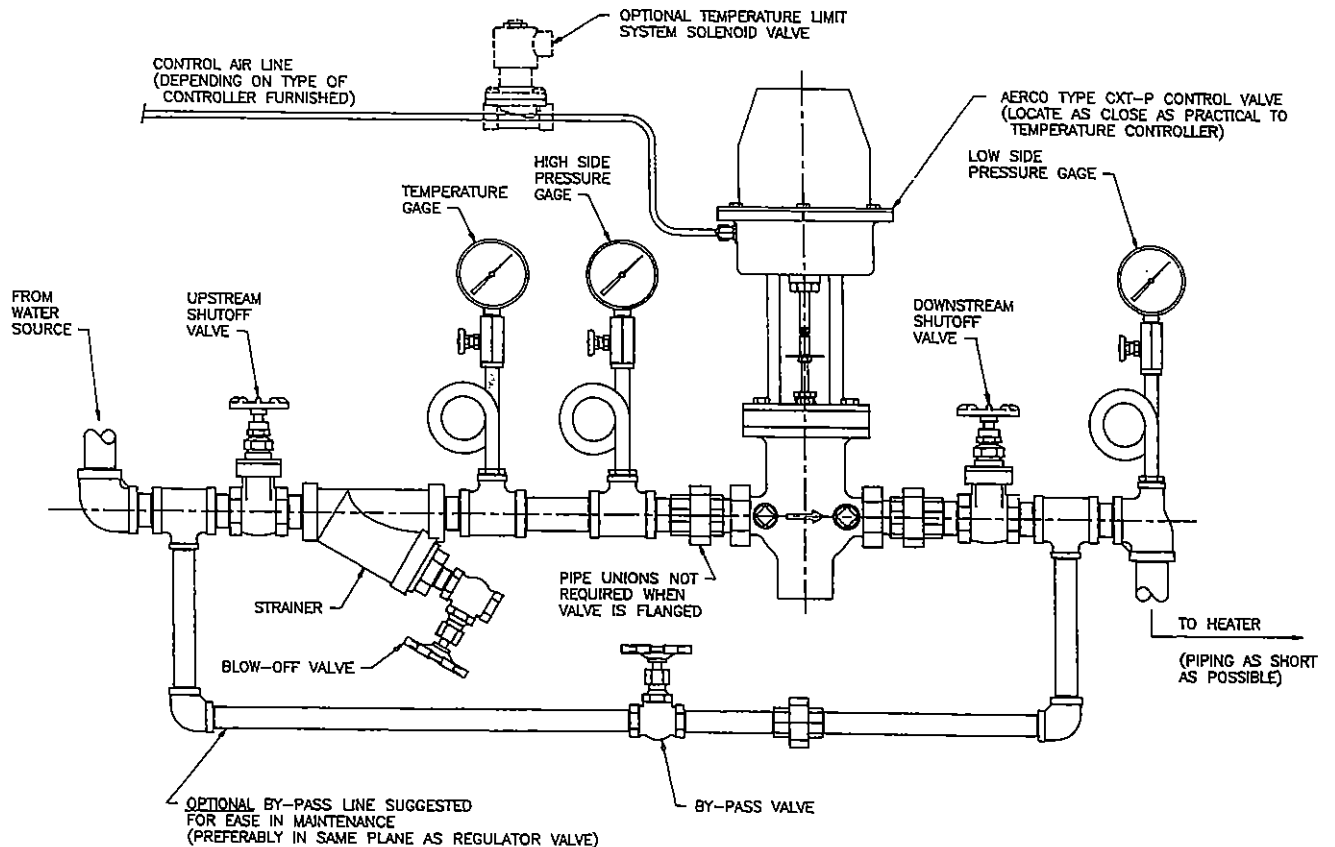


Figure VA-106-3 -- Recommended Installation for Control Valve, Type CXT-P for HIGH TEMPERATURE HOT (BOILER) WATER FLOW

ADJUSTMENT

- A1. Put the AERCO Heater (or other equipment being controlled) into operation in accordance with the instructions furnished with the Heater (or other equipment).
- A2. SET THE TEMPERATURE CONTROLLER AT THAT TEMPERATURE WHICH IS DESIRED TO BE HELD AT THE HEATER HOT WATER OUTLET. MAKE SURE THAT 25 PSIG SUPPLY AIR PRESSURE IS BEING SUPPLIED TO THE TEMPERATURE CONTROLLER. The Controller has been factory calibrated and checked, and should need no further adjustment. However, if the Controller and Control Valve do not provide adequate temperature control, refer to TROUBLESHOOTING below and/or to the instructions provided with the Temperature Controller.
- A3. The Control Valve operates on a nominal 3 to 15 psig range of control air pressure. It was adjusted at the factory to open at approximately 3 psig when installed and subjected to the inlet (or differential) fluid pressure specified in the purchase order. No adjustment should be necessary unless there is a substantial change in service conditions. In such a case, see the instructions for adjusting the Actuator Compression Spring under CORRECTIVE MAINTENANCE below.

OPERATING PROCEDURES

- OP1. Refer to Figure VA-106-2 for Steam Flow or Figure VA-106-3 for High Temperature Hot (Boiler) Water Flow. To place the Control Valve and Heater System into automatic operation:
- Make sure that the AERCO Heater is ready for operation in accordance with the instructions furnished with the Heater
 - SLOWLY open, first, the upstream and then the downstream shutoff valves.
 - Close the by-pass valve (if included) tight.
 - MAKE SURE that 25 psig supply air pressure is being supplied to the Temperature Controller and that the Controller is fully in operation.
- OP2. To take the Control Valve and Heater system out of operation, close the upstream, downstream, and by-pass (if included) shutoff valves tight.
- OP3. If for any reason it is necessary to take the Control Valve out of service while maintaining the Heater in operation:
- SLOWLY open the by-pass valve.
 - Close the upstream and downstream shutoff valves tight.
 - Watch the hot water temperature at the Heater outlet and manually open and Close the by-pass valve to hold the temperature within 10 degrees F of that desired.
- OP4. If the Control Valve/Heater System is not operating properly (not holding the desired hot water outlet temperature as it should), refer to the TROUBLESHOOTING section below.

ROUTINE MAINTENANCE

RM1. MONTHLY

- See Figure VA-106-4. Check the Upper Seal Retainer (19) for leakage of air and the Lower Seal Retainer (Packing Nut) (26) for leakage of steam or hot water.
 - If there is leakage between the Upper Retainer (19) and the Actuator (Air Top) Body (17) or between the Lower Retainer Packing Nut (26) and the Valve Top (31), tighten the leaking Retainer until the leakage stops, but DO NOT FORCE the Retainer. If tightening the leaking Retainer does not stop the leak, the faulty Retainer and O-Ring or Packing must be replaced in accordance with the instructions given below under CORRECTIVE MAINTENANCE.
 - If there is a leakage between either Retainer and the Valve Shaft (20) or (25), the leaking Retainer is faulty and must be replaced in accordance with the instructions given below under CORRECTIVE MAINTENANCE.
- Blow down the supply air and control air pressure lines in order to remove any water or other foreign matter which may have collected in the lines.
 - Observe the total Control Valve/Heater operation during both a period of low hot water usage and a period of high hot water usage. If the control is poor and/or if the Control Valve is not operating properly, check the TROUBLESHOOTING section below.
- ### RM2. QUARTERLY
- Clean the Strainer in the steam or heating fluid line (see Figure VA-106-2 or VA-106-3) in accordance with instructions furnished with the Strainer.
 - If your system includes the Solenoid Valve of an Over-Temperature Limit System, check its operation in accordance with the instructions furnished with the Limit System.

TROUBLESHOOTING

- T1. Besides the following, also check the TROUBLESHOOTING section of the instructions furnished with the AERCO Heater.
- T2. FIRST, when troubleshooting, ALWAYS make sure that all system conditions are OK. Check the following and make the necessary corrections.
- All connections and hookups are in accordance with Figure VA-106-2 or VA-106-3 and installation steps 1 through 16, and that ALL CONNECTIONS ARE TIGHT.
 - The Control Valve is installed with the flow arrow on the Valve Body pointing in the correct direction of flow.
 - Both upstream and downstream shutoff valves are full open, and the by-pass valve (if included) is closed tight.
 - The Temperature Controller is set for the desired Heater hot water outlet temperature.
 - 25 PSIG AIR PRESSURE IS BEING SUPPLIED TO THE TEMPERATURE CONTROLLER.
 - The Temperature Controller thermal element is installed in the Controller and in the correct thermostat connection in the Heater.

After any necessary correction to any of the above has been made, observe the Control Valve action before proceeding further -- it is possible that no further correction need be made.

IF THE SYSTEM OVERHEATS

(A) BY-PASS VALVE MAY LEAK

- T3. If there is a by-pass line around the Control Valve, check by closing the upstream and downstream shutoff valves and by CAREFULLY removing the low side pressure gage (or a low side connection point). If steam or heating fluid flows out of the connection hole, it is probable that the by-pass valve leaks and must be repaired or replaced.

OR (B) CONTROL VALVE DOES NOT CLOSE

- T4. Make sure that, when the Heater hot water outlet temperature is 10 degrees F higher than the desired control temperature, the control air pressure from the Temperature Controller to the Control Valve is 3 psig or lower. If not, check the temperature setting of the Temperature Controller. If the setting is correct, check the operation of the Controller (see the instructions furnished with the Controller).
- T5. Check the Valve Actuator Compression Spring adjustment in accordance with the instructions for adjusting the Compression Spring under CORRECTIVE MAINTENANCE below. Make sure that the Valve is or

should be closed at a control air pressure of 3 psig or lower. If not, correct the adjustment.

- T6. If the control air pressure is correct as noted in step T4 above, and the Actuator Compression Spring adjustment is set correctly per T5 above, but the Valve still does not close, probably there is foreign matter in the Valve Seat. Disassemble the Valve and clean the Seat in accordance with steps CM21 through CM31 under CORRECTIVE MAINTENANCE below.

IF THE SYSTEM WILL NOT MAINTAIN THE DESIRED (SET) TEMPERATURE

(A) THE TEMPERATURE CONTROLLER IS NOT WORKING PROPERLY

- T7. Make sure that the temperature setting of the Controller is that which is desired to be held at the Heater hot water outlet.
- T8. If the Controller still does not hold the desired temperature, check the operation of the Controller in accordance with the instructions furnished with the Controller.

OR (B) CONTROL VALVE DOES NOT OPEN

- T9. Make sure that the setting of the Valve Actuator Compression Spring adjustment is correct in accordance with the instructions covering the Compression Spring adjustment under CORRECTIVE MAINTENANCE below. Also, check to make sure that the Temperature Controller is sending out control air pressure and that the control air pressure line is not clogged.
- T10. The Upper and Lower Shaft Seal Retainers may be binding (see Figure VA-106-4). Check the Seal Retainers. See steps CM1 through CM5 under CORRECTIVE MAINTENANCE below. Make any necessary adjustments or replacements.

OR (C) STEAM PRESSURE OR HEATING FLUID TEMPERATURE OR PRESSURE IS LOW

- T11. Check the high side pressure to the Control Valve to make sure that the steam pressure is correct or that there is good circulation of the high temperature hot water. For high temperature hot water, check the temperature to make sure that it is correct as specified.
- If the steam pressure or HT hot water temperature is lower than that for which your system is designed, correct whatever condition is the cause.
 - If the high side steam pressure drops, or if there is no HT hot water circulation, as the Control Valve opens, there probably is a partially closed valve in the upstream line or the strainer is clogged. Make the necessary correction.

OR (D) IN A STEAM HEATING SYSTEM, THE TRAP OR ORIFICE IN THE HEATER CONDENSATE LINE IS NOT WORKING PROPERLY

T12. If the heating fluid being used is steam, a broken or improperly operating trap or a clogged orifice in the Heater condensate discharge line will cause condensate to build up in the Heater and prevent free flow of steam through the Heater. If the low side pressure gage shows pressure but the system does not heat adequately, such a trap or clogged orifice usually is the cause. To check, CAREFULLY break the condensate connection AHEAD of the trap or orifice and allow condensate to bleed or run out into a floor drain. If the Heater outlet water temperature remains low, the trouble is elsewhere. But, if the temperature rises to that which is desired with the condensate connection open, the problem is with the condensate trap or orifice. Repair or replace the trap or unplug the orifice.

IF THE TEMPERATURE FLUCTUATES WIDELY

T13. If the temperature fluctuations tend to follow load changes, this usually is a symptom either of the inability of the system to maintain the desired temperature or of overheating. That is, the fluctuations may indicate overheating only under light or no load conditions while maintaining relatively good temperature control under heavier load conditions. Or, a system may be unable to hold the desired temperature only under heavy load conditions while controlling relatively well at light or no load. These problems may be dealt with as described above under steps T3 through T12.

T14. If the temperature fluctuations are rapid and do not follow load changes, they may be caused by one or more of the following:

- a. Improper Temperature Controller adjustment (sensitivity). See the instructions furnished with the Controller.
- b. If your system includes an Over-Temperature Limit System, its solenoid valve may not be operating properly. See the instructions furnished with the Limit System.
- c. If your system is steam and includes a trap or orifice in the Heater condensate discharge line, the trap or orifice may be faulty. See step T12 above.
- d. A restriction in the steam or HT hot water supply line, that is, a partially closed valve, a clogged strainer, etc., may be causing the high side pressure to fluctuate or fall below the pressure for which the system is designed. See step T11 above.

CORRECTIVE MAINTENANCE

VALVE SHAFT SEAL RETAINER REPLACEMENT

See Figures VA-106-4 and VA-106-6.

- CM1. Take the Control Valve out of service per step OP2 under OPERATING PROCEDURES above.
- CM2. Loosen Hex Nut (24) under the Indicator Disc (23). Using a 1/8-inch steel rod inserted in the hole supplied in the Upper Shaft (20), hold the Shaft from turning, and holding the Lower Shaft (25) with a pair of pliers close to the threads, turn the Lower Shaft out of the Upper Shaft. Be careful not to scratch the surfaces of the Shafts.
- CM3. Disconnect the control air piping from the Actuator Top (17). Remove the two Screws (28) holding the Actuator to the Valve Body and lift off the entire Actuator.
- CM4. If the Upper Seal Retainer (19) has been found faulty -- leaking or binding the Shaft (20), turn it out of the Actuator Body and replace BOTH the Retainer and Seal Retainer O-Ring (18) with a NEW Retainer and O-Ring.
- CM5. If the Packing Nut (26) has been found faulty -- leaking or binding the Shaft (25) -- remove the Indicator Disc (23) and Hex Nut (24) from the Lower Shaft (25), turn the Packing Nut out of the Valve Body, and replace BOTH the Packing Nut (26) and the Packing Assembly (27) with a NEW Packing Nut and Packing.
- CM6. Replace the Hex Nut (24) and Indicator Disc (23) onto the Lower Shaft (25).
- CM7. Replace the Actuator onto the Valve Body and reconnect the control air piping to the Actuator.
- CM8. Holding the Upper Shaft (20) with the 1/8-inch steel rod inserted through the hole in the Upper Shaft so that the Shaft does not turn, grasp the Lower Shaft (25) with pliers close to the threads and turn the Lower Shaft into the Upper Shaft to approximately its original depth. Be careful not to scratch the surfaces of the Shafts.
- CM9. Adjust the Actuator Compression Spring (3) in accordance with steps CM10 through CM16 below.

ACTUATOR COMPRESSION SPRING ADJUSTMENT

- CM10. With the complete Control Valve/Heater system in operation (hot water in the Heater), close the heating fluid shutoff valve on the DOWNSTREAM side of the Control Valve (see Figure VA-106-2 or VA-106-3), make sure that the by-pass valve (if any) is closed tight, and leave the upstream shutoff valve open so that full line pressure is applied to the Control Valve body.
- CM11. Change the Temperature Controller setting to a lower temperature indication -- until 3 psig control air pressure is being applied to the Valve Actuator. At this point the Valve should be fully closed.

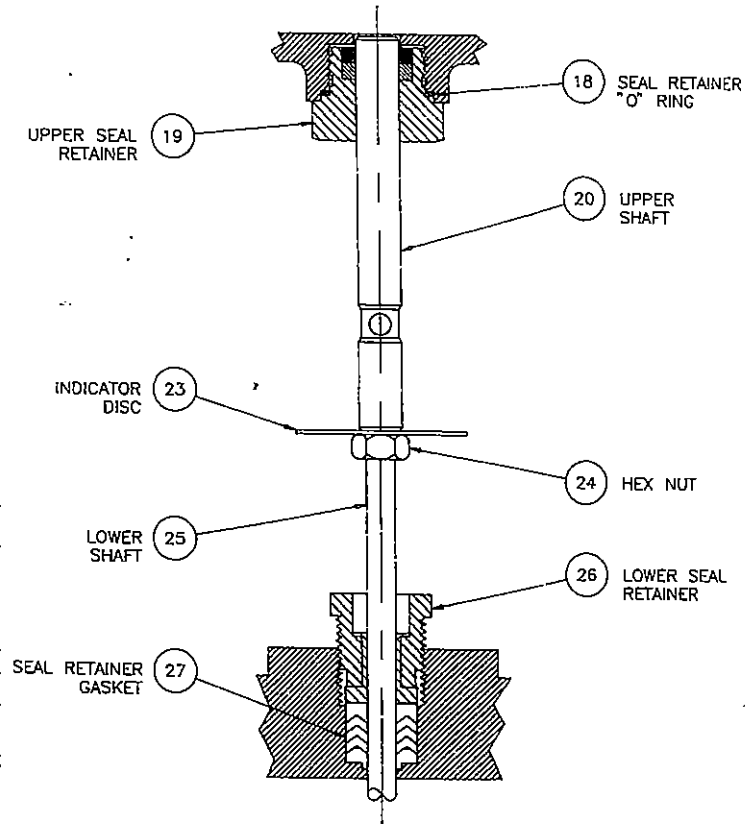


Figure VA-106-4 -- Valve Stem Adjustment and Seals

- CM12. If decreasing the control air pressure below 3 psig causes the Valve Shaft to move down into the Valve Body, the Actuator Spring COMPRESSION MUST BE INCREASED.
- CM13. Change the Temperature Controller setting to a higher temperature indication until 4 to 6 psig control air pressure is being applied to the Actuator. The Valve Shaft should begin to move up out of the Valve Body from a closed Valve position. If it does not, the Actuator Spring COMPRESSION MUST BE DECREASED.
- CM14. To INCREASE the Spring compression (see Figure VA-106-4):
- As in Step CM11 above, apply 3 psig control air pressure to the Actuator.
 - Loosen Hex Nut (24) under the Indicator Disc (23).
 - Holding the Upper Shaft (20) with a 1/8-inch steel rod through the hole in the Shaft so that the Shaft does not turn, grasp the top of the Lower Shaft (25) close to the threads with pliers and turn the Lower Shaft COUNTERCLOCKWISE until the downward movement of the Shaft, as in Step CM12

above, stops -- the Valve is then closed. Be careful not to scratch the surfaces of the Valve Shafts.

- d. Tighten the Hex Nut (24) to hold the adjustment in place.

CM15. To DECREASE the Spring compression (see Figure VA-106-4):

- a. As in Step CM13 above, apply 4 to 6 psig control air pressure to the Actuator.
- b. Loosen Hex Nut (24) under the Indicator Disc (23).
- c. Holding the Upper Shaft (20) with a 1/8-inch steel rod through the hole in the Shaft so that the Shaft will not turn, grasp the top of the Lower Shaft (25) close to the threads with pliers and turn the Lower Shaft CLOCKWISE until the Shaft starts to move upward out of the Valve Body. Be careful not to scratch the surfaces of the Valve Shafts.
- d. Change the control air pressure to 3 psig per Step CM11 above. If the Valve Shaft does not move down to a closed position, repeat Steps CM14c and CM15c until the adjustment is correct per Steps CM11 and CM14 above.
- e. Tighten Hex Nut (24) to hold the adjustment in place.

CM16. Repeat Steps CM11 and CM13 to make sure that the adjustment is correct.

VALVE DISASSEMBLY

See Figures VA-106-6 and VA-106-7 for Steam Flow or VA-106-8 for Steam or HT Hot Water Flow.

CM17. Close the upstream and downstream shutoff valves around the Control Valve. If necessary to keep your Heater on operation, proceed per step OP3 under OPERATING PROCEDURES above before going further. If not, proceed as follows.

CM18. Leave the Control Valve in the heating fluid line if it is easily accessible for disassembly and reassembly. If not, remove the Valve from the line and clamp it in a bench vise for easy accessibility.

CM19. Remove the Actuator from the Valve Body in accordance with Steps CM2 and CM3 above.

CM20. See Figure VA-106-6. Normally there should be no reason to disassemble the Actuator. However, if such should be necessary, remove its parts in the following order, but only as far as necessary to carry out any needed maintenance.

Upper Seal Retainer (19)
Seal Retainer O-Ring (18)
Air Top Screws (6)
Air Top Cap (2)
Compression Spring (3)

Upper Shaft (20), being careful not to scratch the surface of the Shaft
Flat Washer (16) (not on 4-inch Valve)
Shoulder Bolt (9)
Spring Seat (10)

Thrust Washers (11) and Thrust Bearing (12)

Fender Washer (13) (not included on 3 and 4-inch Valves)

Air Top Piston (4)

Diaphragm (8)

Diaphragm Retainer (15)

For reassembly of the Actuator, see Step CM41.

CM21. See Figure VA-106-7 or VA-106-8. It is recommended that disassembly of the Valve be limited to that which is necessary to carry out needed maintenance. However, the following steps cover complete disassembly. In all Valve disassembly, be VERY CAREFUL not to mar or scratch any surfaces.

It is assumed, at this point, that the Actuator, Figure VA-106-6, has been removed in accordance with Steps CM2 and CM3 above.

CM22. Remove these parts in the following order:
Indicator Disc (23)
Hex Nut (24)
Packing Nut (26), CAREFULLY to relieve any trapped pressure
Packing Assembly (27)
Cap Screws (29), CAREFULLY to relieve any trapped pressure
Valve Top (31)
Valve Top Gasket (32)

CM23. Grasp the Lower Shaft (25) and carefully lift out the ENTIRE Shaft/Seat/Valve Plug or Piston Assembly.

CM24. For STEAM Valves, 1-inch through 2.5-inch, Figure VA-106-7, disassemble the Shaft/Seat/Valve Plug assembly in the following order:

Lock Washer (34)
Pilot Spring Retaining Clip (36)
Pilot Spring (37)
Valve Stem Retaining Nut (41), Detail A, not on 2.5-inch Valve
Cap Screws (39), 2.5-inch Valve only

Retaining Disc (38), 2.5-inch Valve only
Lower Shaft (25) and Valve Stem (35)
Retaining Disc (42), Detail A, not on 2.5-inch Valve
Valve Seat (40)
Seat Retainer (44), Detail A, not on 1-inch or 2.5-inch Valves
Valve Plug (49)

CM25. For STEAM Valves, 3-inch and 4-inch, and HT HOT WATER Valves, all sizes, Figure VA-106-8, disassemble the Shaft/Seat/Piston Assembly in the following order:

Lock Washer (34)
Pilot Spring Retainer (30)
Pilot Spring Back-Up Washer (33), 4-inch Valve only
Pilot Spring (37)

Valve Stem Retaining Nut (41), Detail A, 1-inch through 2-inch Valves

Cap Screws (39), 2.5-inch through 4-inch Valves
Retaining Disc (38), 2.5-inch through 4-inch Valves

Lower Shaft (25) and Valve Stem (35)
Retaining Disc (42), Detail A, 1-inch through 2-inch Valves

Valve Seat (40)
Seat Retainer (44), Detail A, 1-1/4-inch through 2-inch Valves
Top Piston (47) and Bottom Piston (51) assembly

CM26. It is recommended that the Seat Cage (52) NOT BE DISASSEMBLED unless it must be replaced. See Step CM33 below.

NOTE: In any cleaning operation called for in these instructions, ALWAYS clean all denoted parts thoroughly of all dirt and scale. Always use a clean cloth and, if necessary, a solvent. NEVER use emery cloth or sandpaper unless instructed otherwise herein.

CM27. CLEAN ALL PARTS THOROUGHLY. ALL DIRT AND/OR SCALE MUST BE REMOVED from the outer surfaces of the Valve Plug (49) (Figure VA-106-7) or the Top Piston (47) and Bottom Piston (51) (Figure VA-106-8) and from the surface of the Valve Stem (35).

CM28. Inspect the Valve Stem (35). If it is damaged so that it does not seat properly on the Lower Pilot Seat (45) (1-inch through 2-inch Valves) or the Valve Seat (40) (2.5-inch through 4-inch Valves), or does not move freely in the Valve Stem Retaining Nut (41) or Retaining Disc (38), the Valve Stem (35), Pilot Spring Retainer (30) or (36), and Pilot Spring (37) must be replaced.

CM29. Inspect the outer surfaces of the Valve Plug (49) or the Top Piston (47) and Bottom Piston (51). If they are scored or damaged so that they will not move freely up and down in the Seat Cage (52), the Valve Plug or Pistons must be replaced. Also see Step CM32 below.

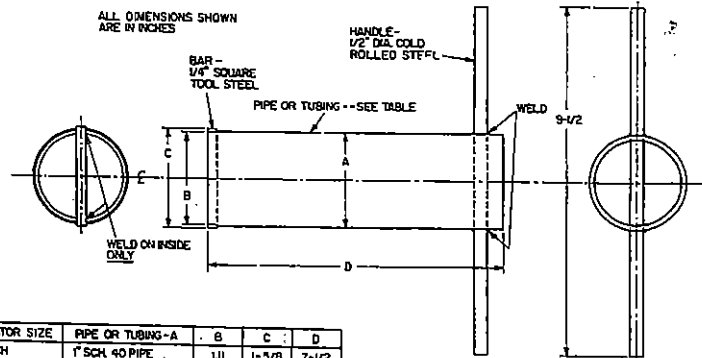
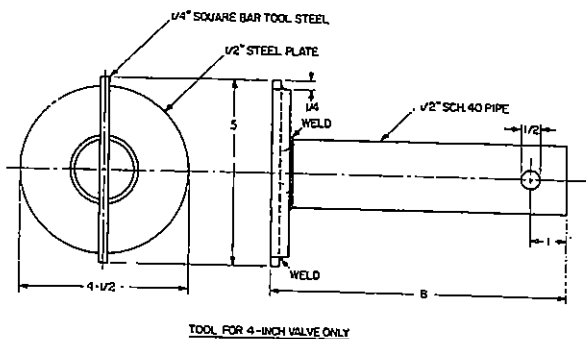
CM30. Inspect the Lower Pilot Seat (45) (1-inch through 2-inch Valves). If it is worn so that the Valve Stem (35) will not seat properly, it must be replaced. To make the replacement:

- a. Insert a rod up through the Valve Plug or Valve Plug Shaft (49) and push the Seat (45) out.
- b. Press a new Seat (45) into the Plug Shaft (49).

CM31. Inspect the Valve Seat (40). If it is worn so that it will not seat properly with the Seat Cage (52), or, in the case of 2.5-inch through 4-inch Valves, with the Valve Stem (35), it must be replaced. In making the replacement, put some white compound, such as No. 59241 Loctite Pipe Sealant with Teflon, on the top of the Valve Seat (40) where it will mate with the Retaining Disc (38) or (42).

CM32. THOROUGHLY clean and inspect the seating and inner surfaces of the Seat Cage (52). If the seating surface around the top of the Cage is worn or damaged so that the Valve Seat (40) will not seat properly, or if the inner surfaces of the Cage are scored or damaged so that the Valve Plug (49) or Pistons (47) and (51) will not move up and down freely, the Cage (52) must be replaced.

CM33. If the Cage (52) must be removed from the Valve Body (48), it is necessary to make up a tool, such as shown in Figure VA-106-5, for making the removal. Insert the tool into the slots on top of the Cage (52) and turn the Cage out of the Valve Body. To obtain such a tool, contact AERCO or its nearest Sales Representative.



REGULATOR SIZE	PIPE OR TUBING - A	B	C	D
1-INCH	1" SCH. 40 PIPE	1.11	1-5/8	7-1/2
1-1/4-INCH	1-1/4" SCH. 40 PIPE	1.42	2	7-1/2
1-1/2-INCH	1-1/2" SCH. 40 PIPE	1.67	2-3/8	8
2-INCH	2-1/2" OD x .120 WALL SEAMLESS STEEL TUBING	2.40	2-5/8	8
2-1/2-INCH	2-1/2" OD x .120 WALL SEAMLESS STEEL TUBING	2.895	3-3/8	8-1/4
3-INCH	3" OD x .120 WALL SEAMLESS STEEL TUBING	3.475	3-15/16	8-1/4

Figure VA-106-5 Seat Cage Tool

VALVE REASSEMBLY

- See Figure VA-106-7 or VA-106-8 for Steam Flow or Figure VA-106-8 for HT Hot Water Flow.
- CM34. If the Seat Cage has been removed, place a NEW Seat Cage Gasket (53) on the seating surface of the Valve Body. Then replace the Seat Cage into the Valve Body, using the tool described in Step CM33 above. Make the Seat Cage tight.
- CM35. If disassembled or being replaced, reassemble the Top Piston (47) and Bottom Piston (51) onto the Valve Plug Shaft (49), using the Top Piston Retaining Nut (46) (1-inch through 2-inch Valves), and Bottom Piston Retaining Nut (50) or Bottom Piston Retainer (36).
- CM36. For STEAM Valves, 1-inch through 2.5-inch, Figure VA-106-7, reassemble the Valve Plug/Seat/Shaft assembly in the following order:
- Valve Plug (49)
 - Seat Retainer (44), Detail A, not on 1-inch or 2.5-inch Valves
 - Valve Seat (40)
 - Retaining Disc (42), Detail A, not on 2.5-inch Valve
 - Valve Stem (35) and Lower Shaft (25)
 - Retaining Disc (38), 2.5-inch Valve only
 - Cap Screws (39), 2.5-inch Valve only
 - Valve Stem Retaining Nut (41), Detail A, not on 2.5-inch Valve
 - Pilot Spring (37)
 - Pilot Spring Retaining Clip (36)
 - Lock Washer (34)
- CM37. For STEAM Valves, 3-inch and 4-inch, and HT HOT WATER Valves, all sizes, Figure VA-106-8, reassemble the Piston/Seat/Shaft assembly in the following order:
- Top Piston (47) and Bottom Piston (51) assembly
 - Seat Retainer (44), Detail A, 1-1/4-inch through 2-inch Valves
 - Valve Seat (40)
 - Retaining Disc (42), Detail A, 1-inch through 2-inch Valves
 - Valve Stem (35) and Lower Shaft (25)
 - Retaining Disc (38), 2.5-inch through 4-inch Valves
 - Cap Screws (39), 2.5-inch through 4-inch Valves
 - Valve Stem Retaining Nut (41), Detail A, 1-inch through 2-inch Valves
 - Pilot Spring (37)
 - Pilot Spring Back-Up Washer (33), 4-inch Valve only
 - Pilot Spring Retainer (30)
 - Lock Washer (34)
- CM38. Holding the Lower Shaft (25), carefully replace the entire Shaft/Seat/Valve Plug or Piston assembly into the Valve Body (48) and Seat Cage (52)
- CM39. Thoroughly clean the gasket surfaces of the Valve Body (48) and Valve Top (31) of all dirt and scale. If necessary, use a wire brush or emery cloth.
- CM40. See Figure VA-106-7 or VA-106-8. Reassemble these parts in the following order:
- NEW Valve Top Gasket (32)
 - Valve Top (31)
 - Cap Screws (29) -- tighten evenly and sufficiently all around so that Valve does not leak.
 - NEW Packing Assembly (27)
 - Packing Nut (26)
 - Hex Nut (24)
 - Indicator Disc (23)
- CM41. See Figure VA-106-6. If the Actuator has been disassembled, reassemble into the Air Top Body (17) in the following order:
- Diaphragm Retainer (15)
 - Diaphragm (8)
 - Air Top Piston (4)
 - Fender Washer (13), not on 3-inch or 4-inch Valves
 - Thrust Washers (11) and Thrust Bearing (12)
 - Spring Seat (10)
 - Shoulder Bolt (9)
 - Flat Washer (16), not on 4-inch Valve
 - Upper Shaft (20) into the Air Top Body (17) and assembled to the Shoulder Bolt (9), being careful not to scratch the surface of the Shaft
 - Compression Spring (3)
 - Air Top Cap (2)
 - Cap Screws (6)
 - NEW Seal Retainer O-Ring (18)
 - Upper Seal Retainer (19)
- CM42. Replace the Actuator onto the Valve Top (31) and replace Cap Screws (28).
- CM43. Using a 1/8-inch steel rod inserted in the hole supplied in the Upper Shaft (20) to hold the Shaft from turning, grasp the Lower Shaft (25) with a pair of pliers close to the threads and turn the Lower Shaft onto the Upper Shaft to approximately its original depth. Be careful not to scratch the surfaces of the Shafts.
- CM44. If it had been removed, replace the Valve in the heating fluid line and reconnect the control air piping to the Actuator Air Top Body (17).
- CM45. Adjust the Actuator Compression Spring in accordance with Steps CM10 through CM16 above.
- CM46. Place the Valve back into service per Step OP1 under OPERATING PROCEDURES above.

RECOMMENDED SPARE PARTS

It is recommended that the following Spare Parts be kept on hand for maintenance replacement purposes for each 1 to 5 Control Valves of the same size.

<u>Recommended Quantity</u>	<u>Name</u>	<u>Item No. in Figures VA-106-6, VA-106-7, and/or VA-106-8</u>
1	Diaphragm	8
2	Gasket, Seat & Packing Kit, as listed below by Valve size and each containing the following:	
	1 Seal Retainer O-Ring	18
	1 Packing Assembly	27
	1 Valve Top Gasket	32
	1 Valve Seat	40
	1 Lower Pilot Seat	45
	1 Seat Cage Gasket	53

Gasket, Seat & Packing Kit Part Numbers:

1-inch Valve	.....	Part No. 161331-1.00
1-1/4-inch Valve	.....	Part No. 161331-1.25
1-1/2-inch Valve	.....	Part No. 161331-1.50
2-inch Valve	.....	Part No. 161331-2.00
2-1/2-inch Valve	.....	Part No. 161331-2.50
3-inch Valve	.....	Part No. 161331-3.00
4-inch Valve	.....	Part No. 161331-4.00

For Replacement Parts or Kits, order by Part Number as indicated in Figures VA-106-VA-106-6, VA-106-7, and/or VA-106-8, or by Kit Part Number noted above, from

**AERCO INTERNATIONAL, INC.
159 PARIS AVENUE
NORTHVALE, NEW JERSEY 07647, U.S.A.**

ITEM NO.	QUAN REQ'D	PART NAME	VALVE SIZE -- PART NUMBER							
			1 INCH	1-1/4 INCH	1-1/2 INCH	2 INCH	2-1/2 INCH	3 INCH	4 INCH	
1	1	AIR TOP CAP PLUG	I22140	I22140	I22140	I22140	I22140	N/A	N/A	
2	1	AIR TOP CAP	I8786	I8786	I8786	I8786	I8786	I8833	I8833	
3	1	COMPRESSION SPRING	I22041	I22041	I22041	I22041	I22057	I22200	I22200	
4	1	AIR TOP PISTON	I61010	I61010	I61010	I61010	I61010	I61059	I61059	
5	1	AIR TOP VENT	N/A	N/A	N/A	N/A	N/A	I22262	I22262	
6	SEE ()	CAP SCREW, 1/4-20x 1/2" LG	(6) 6-138	(6) 6-138	(6) 6-138	(6) 6-138	(6) 6-138	(1) 216-234	(1) 216-234	
7										
8	1	DIAPHRAGM	I22037	I22037	I22037	I22037	I22037	I22244	I22244	
9	1	SHOULDER BOLT	I22088	I22088	I22088	I22088	I22088	I22226	I22226	
10	1	SPRING SEAT	I22053	I22053	I22053	I22053	I22053	I61058	I61058	
11	2	THRUST WASHER	I21986	I21986	I21986	I21986	I21986	I21986	I21986	
12	1	THRUST BEARING	I21985	I21985	I21985	I21985	I21985	I21985	I21985	
13	1	FENDER WASHER	I22247	I22247	I22247	I22247	I22247	N/A	N/A	
14										
15	1	DIAPHRAGM RETAINER	I22054	I22054	I22054	I22054	I22054	I22217	I22217	
16	1	FLAT WASHER	I22213	I22213	I22213	I22213	I22213	I22213	N/A	
17	1	AIR TOP BODY	20779	20779	20779	20779	20779	20831	20831	
18	1	SEAL RETAINER O'RING	I22689	I22689	I22689	I22689	I22689	I22202	I22202	
19	1	UPPER SEAL RETAINER	I22216	I22216	I22216	I22216	I22216	I22228	I22222	
20	1	UPPER SHAFT	I21983	I21983	I21983	I21983	I22095	I22231	I22225	
21	SEE ()	10-32x3/16 LG CAP SCREW	(1) 8806	(1) 8806	(1) 8806	(1) 8806	(1) 8806	(2) 8806	(2) 8806	
22	1	INDICATOR SCALE	I22115	I22115	I22114	I22114	I22175	I22235	I22235	
23	1	INDICATOR DISC	I22058	I22058	I22058	I22058	I22058	I22058	I22245	
24	1	HEX NUT	6-226	6-226	6-226	6-226	6-226	6-226	6-264	
25	1	LOWER SHAFT	I21979	I21980	I21980	I21982	I22223	I22230	I22224	
26	1	PACKING NUT	I22664	I22664	I22664	I22664	I22664	I22665	I22665	
27	1	PACKING ASSEMBLY	I21567	I21567	I21567	I21567	I21567	I21568	I21568	
28	2	3/8-16 CAP SCREW	6-234	6-234	6-234	6-234	6-234	6-234	6-234	
29	SEE ()	CAP SCREW	(6) 6-298	(6) 6-298	(6) 6-298	(6) 6-298	(4) 6-309	(4) 6-310	(6) 6-310	
30										
31	1	VALVE TOP	I6943	I6943	I6943	I6943	I8781	I8823	I8824	
32	1	VALVE TOP GASKET	I22136	I22136	I22136	I22136	I22083	I22204	I22203	

N/A=NOT APPLICABLE IN THIS SIZE VALVE

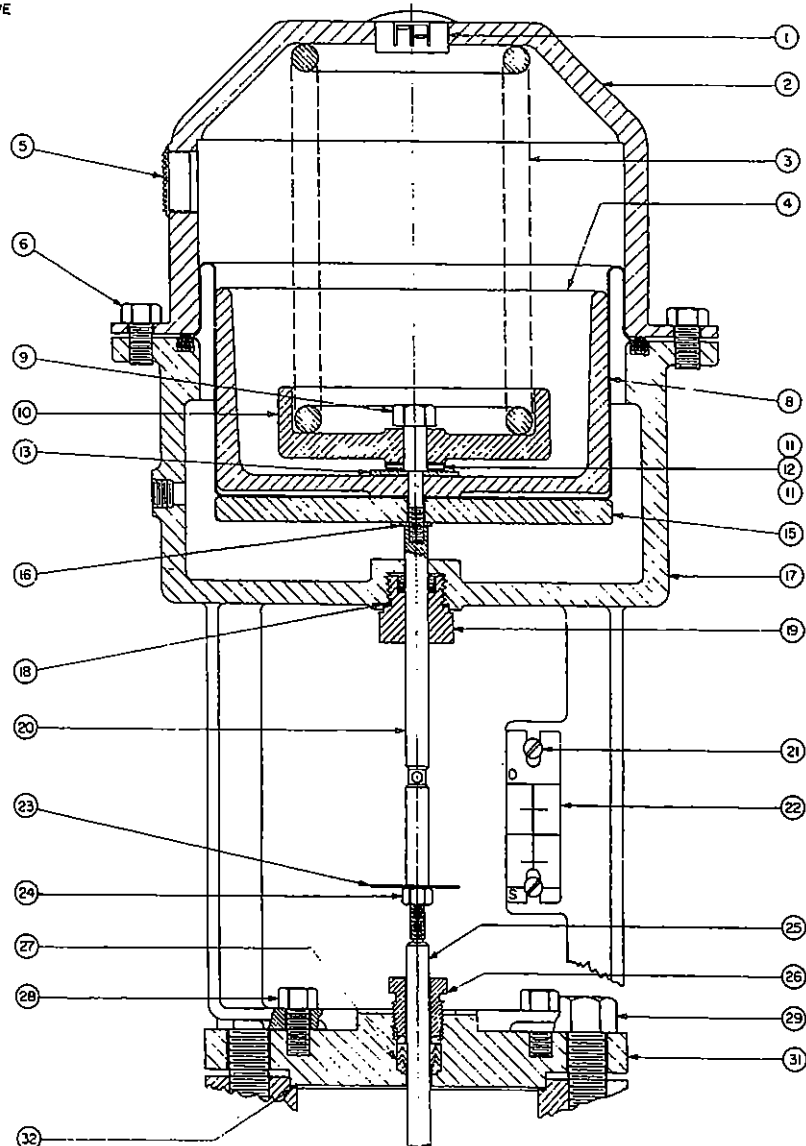


Figure VA-106-6 -- Actuator Assembly, AERCO Air Operated Control Valve, Type Cxt-P

INSTRUCTIONS -- AERCO PNEUMATIC CONTROL VALVE, TYPE CXT-P

ITEM NO	QUAN REQ'D	PART NAME	VALVE SIZE--PART NUMBER				
			1 INCH	1-1/4 INCH	1-1/2 INCH	2 INCH	2-1/2 INCH
23	1	INDICATOR DISC	122058	122058	122058	122058	122058
24	1	HEX NUT	6-226	6-226	6-226	6-226	6-226
25	1	LOWER SHAFT	121979	121980	121980	121982	122223
26	1	PACKING NUT	122664	122664	122664	122664	122664
27	1	PACKING ASSEMBLY	121567	121567	121567	121567	121567
28	2	3/8-16 CAP SCREW	6-234	6-234	6-234	6-234	6-234
29	SEE ()	CAP SCREW	(6) 6-298	(6) 6-298	(6) 6-298	(6) 6-298	(4) 6-24
30							
31	1	VALVE TOP	16943	16943	16943	16943	18781
32	1	VALVE TOP GASKET	122136	122136	122136	122136	122083
33	1	PILOT SPRING BACK-UP WASHER	N/A	N/A	N/A	N/A	N/A
34	1	LOCK WASHER	122666	122666	122666	122666	122666
35	1	VALVE STEM	122655	122654	122651	122650	122648
36	1	PILOT SPRING RETAINING CLIP	121545	121545	121545	121545	122082
37	1	PILOT SPRING	121528	121528	121528	121528	122081
38	1	RETAINING DISC	N/A	N/A	N/A	N/A	121934
39	4	SOCKET HEAD CAP SCREW	N/A	N/A	N/A	N/A	12174
40	1	VALVE SEAT	121541	121527	121510	121531	121935
41	1	VALVE STEM RETAINING NUT	121503	121503	121503	121503	N/A
42	1	RETAINING DISC	121542	121513	121504	121532	N/A
43	1	SEAT BACK-UP RING	N/A	N/A	N/A	N/A	122326
44	1	SEAT RETAINER	N/A	121559	121506	121506	N/A
45	1	LOWER PILOT SEAT	121505	121505	121505	121505	N/A
46							
47							
48	1	VALVE BODY	20762	20759	20758	20761	20765
49	1	VALVE PLUG	161313	161314	161315	161316	161317
50							
51							
52	1	SEAT CAGE	16844	16845	16837	16843	16961
53	1	SEAT CAGE GASKET	123080	123081	123082	123083	123084

N/A - NOT APPLICABLE IN THIS SIZE VALVE

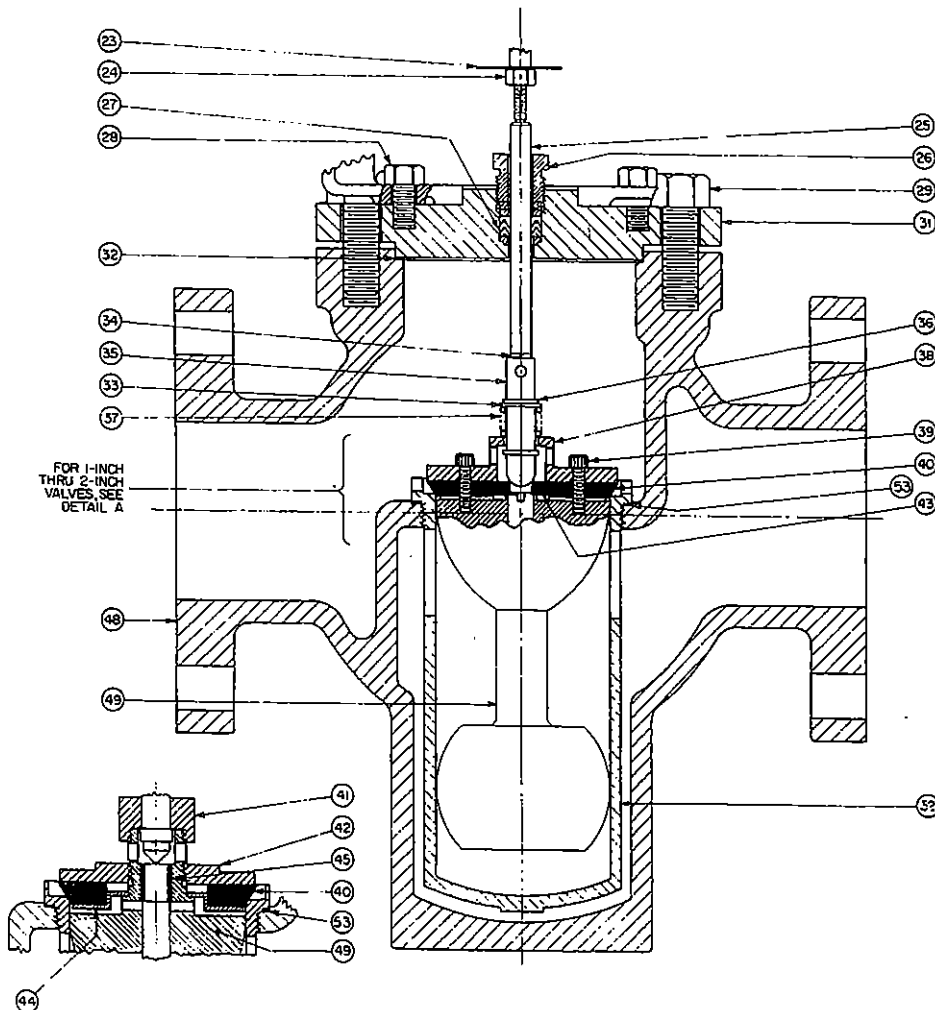


Figure VA-106-7 -- Valve Assembly, AERCO Air-Operated Control Valve, Type CXT-P for STEAM FLOW, Sizes 1-inch thru 2.5 inch

ITEM NO	QUN REQ'D	PART NAME	VALVE SIZE -- PART NUMBER							
			1 INCH	1-1/4 INCH	1-1/2 INCH	2 INCH	2-1/2 INCH	3 INCH	4 INCH	
23	1	INDICATOR DISC	122058	122058	122058	122058	122058	122058	122058	
24	1	HEX NUT	6-226	6-226	6-226	6-226	6-226	6-226	6-264	
25	1	LOWER SHAFT	121979	121980	121980	121982	122223	122230	122224	
26	1	PACKING NUT	122664	122664	122664	122664	122664	122665	122665	
27	1	PACKING ASSEMBLY	121567	121567	121567	121567	121567	121568	121568	
28	2	3/8-16 CAP SCREW	6-234	6-234	6-234	6-234	6-234	6-234	6-234	
29	SEE I	CAP SCREW	(6) 6-298	(6) 6-298	(6) 6-298	(6) 6-298	(4) 6-24	(4) 6-310	(8) 6-310	
30	1	PILOT SPRING RETAINER	121545	121545	121545	121545	122082	122082	122173	
31	1	VALVE TOP	16943	16943	16943	16943	18781	18823	18824	
32	1	VALVE TOP GASKET	122136	122136	122136	122136	122083	122204	122203	
33	1	PILOT SPRING BACK-UP WASHER	N/A	N/A	N/A	N/A	N/A	N/A	122246	
34	1	LOCK WASHER	122666	122666	122666	122666	122666	122667	122667	
35	1	VALVE STEM	122655	122654	122651	122650	122648	122658	122659	
36	1	BOTTOM PISTON RETAINER	N/A	N/A	N/A	N/A	122173	122173	122234	
37	1	PILOT SPRING	121528	121528	121528	121528	122081	122232	122233	
38	1	RETAINING DISC	N/A	N/A	N/A	N/A	121934	122031	122177	
39	4	SOCKET HEAD CAP SCREW	N/A	N/A	N/A	N/A	122174	122174	122238	
40	1	VALVE SEAT	121541	121527	121910	121531	121935	122032	122178	
41	1	VALVE STEM RETAINING NUT	121503	121503	121503	121503	N/A	N/A	N/A	
42	1	RETAINING DISC	121542	121513	121504	121532	N/A	N/A	N/A	
43	1	SEAT BACK-UP RING	N/A	N/A	N/A	N/A	122326	122327	122328	
44	1	SEAT RETAINER	N/A	121539	121506	121506	N/A	N/A	N/A	
45	1	LOWER PILOT SEAT	121505	121505	121505	121505	N/A	N/A	N/A	
46	1	TOP PISTON RETAINING NUT	121543	121543	121543	121543	N/A	N/A	N/A	
47	1	TOP PISTON	121539	121514	121501	121530	16970	161005	161050	
48	1	VALVE BODY	20762	20759	20758	20761	20765	20766	20775	
49	1	VALVE PLUG SHAFT	16849	16839	16838	16848	16972	161006	161047	
50	1	PISTON RETAINING NUT	122982	122982	122982	122982	N/A	N/A	N/A	
51	1	BOTTOM PISTON	121540	121525	121502	121529	16962	161007	161048	
52	1	SEAT CAGE	16844	16845	16837	16843	16961	161004	161046	
53	1	SEAT CAGE GASKET	123080	123081	123082	123083	123084	123085	123086	

N/A - NOT APPLICABLE IN THIS SIZE VALVE
 NOTE: 3 IN & 4 IN. SIZE VALVES CAN BE USED
 ON S/W OR W/W APPLICATIONS.

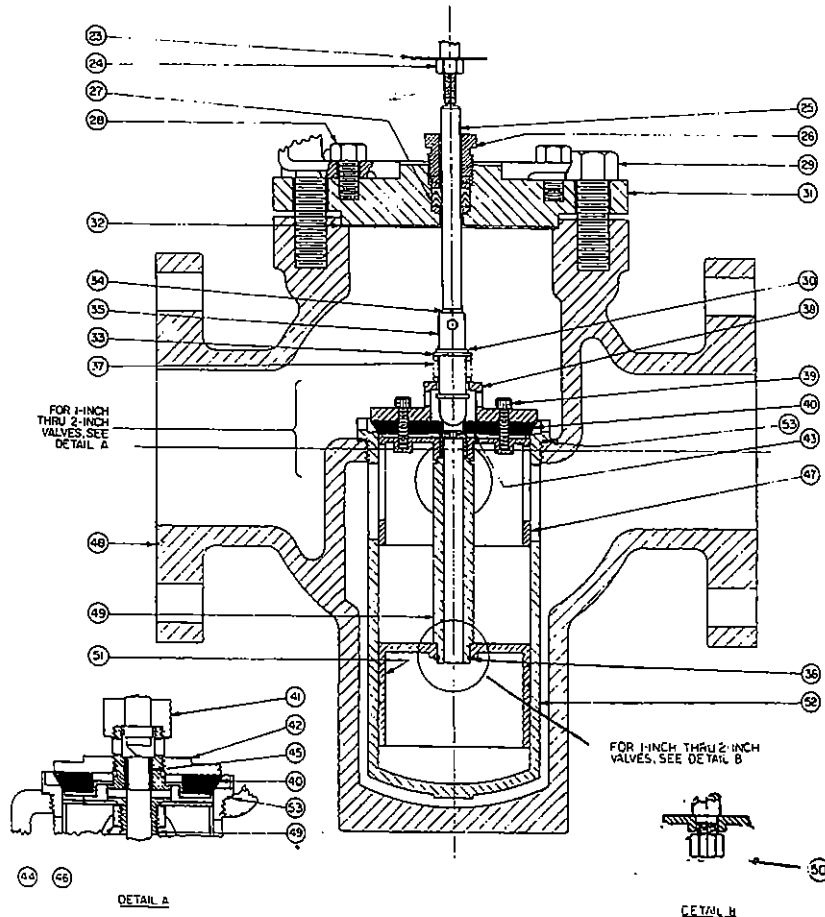


Figure VA-106-8 -- Valve Assembly, AERCO Air-Operated Control Valve, Type CXT-P
 for STEAM FLOW, Sizes 3-inch and 4-inch
 and For HIGH TEMPERATURE HOT (BOILER) WATER FLOW, All Sizes

