

TECHNICAL SERVICE BULLETIN

Date: 04/11/07 REV.	Number: 2006-02
Subject: ELECTRONIC CONTROL SYSTEM (ECS) & CONTROL VALVE, CXT-E RETROFIT INSTRUCTIONS	
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1. INTRODUCTION

This Service Bulletin provides the procedures necessary to remove an existing Control Valve Actuator and Control Box and replace it with a new CXT-E Electronic Control Valve Actuator and Electronic Control System (ECS). These procedures are applicable to all AERCO Indirect-Fired Water Heaters with Control Valves ranging in size from 1 inch to 4 inches and currently equipped with pneumatic, electro-hydraulic or self-contained valve actuators. In addition, this Service Bulletin applies to both steam-to-water and water-to-water heaters. The types and models covered include:

- HELITHERM HEATER MODELS:
 - A-Plus
 - B-Plus
 - B-Plus II (Water Wizard)
 - E-Plus

- DOUBLE-WALL HEATER MODELS:
 - DW-24
 - DW-45
 - DW-68

These instructions must be performed by a skilled service technician capable of exercising the necessary safety precautions when working with high temperature, pressurized steam and water systems.

The following paragraphs in this Section describe the safety precautions to be followed, the tools and test equipment required to perform all procedures in this Service Bulletin and the contents of the Retrofit Kits for all Heater Models.

1.1 SAFETY PRECAUTIONS

Installation, maintenance and operating personnel must, at all times, observe all safety regulations. The following warnings are general and must be given the same attention as specific precautions included in these instructions.

WARNING!

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

Shut off all incoming and outgoing steam and water stop valves and carefully decrease all trapped pressures to zero before performing any maintenance.

WARNING!

LIVE STEAM CAN CAUSE SEVERE BURNS

Never search for leakage in a live steam line by sight alone or by "feel". Use a mirror or other suitable polished object.

Always provide yourself with personal protective equipment, (PPE) such as gloves, eye protection, dust mask, hard hat, etc.

1.2 Tools Required

The following tools are required to perform the retrofit procedures specified in this Service Bulletin:

- Combination Wrenches: 7/16", 9/16", 5/8", 13/16", 1-1/16", 1-1/8", 8 mm
- Pipe Wrenches: 12", 24"
- Vise-Grip Pliers
- Flat Tip Screwdriver, 1/2" Blade
- Phillips Head Screwdriver, No. 3
- Brass Wire Brush
- Needle Nose Pliers
- Tape Measure
- Black Marker

1.3 Retrofit Kit Contents

The contents of the Retrofit Kits, Part No. 27004-[] are included in Appendices A through D of this Bulletin. The contents included in these Appendices are as follows:

- Appendix A: Lists the Basic ECS Retrofit Kit contents for each Water Heater Model
- Appendix B: Lists Optional Items based on: valve size, flow rate, type of actuator currently installed
- Appendix C: Lists Valve Kits required for previously installed Pneumatic and Electro - Hydraulic Actuators
- Appendix D: Lists Valve Kits required for previously installed Self-Contained Actuators

WARNING

HIGH VOLTAGE OF 120 VAC IS USED IN AERCO INDIRECT FIRED WATER HEATERS. USE EXTREME CARE WHEN ACCESSING CIRCUITS AND ELECTRICAL CONNECTIONS WITHIN THE EQUIPMENT. SERIOUS PERSONAL INJURY OR DEATH MAY OCCUR IF THIS WARNING IS NOT OBSERVED. FOLLOW OSHA APPROVED LOCKOUT/TAGOUT PROCEDURES.

2. EQUIPMENT ISOLATION AND REMOVAL PROCEDURES

The locations of the major items to be removed from an AERCO Indirect Fired Water Heater are shown in Figures 2-1 (Helitherm Models) and 2-2 (Double-Wall Models). These items include:

- Currently Installed Control Valve Actuator (Pneumatic, Self-Contained or Electro-Hydraulic)
- Control Box
- Top Head Solenoid Valve
- Thermal Element
- Shunt Tube
- Temperature Gauges & Capillaries
- Existing Feedback Sensor
- Load Alert Components (Except for Units With Electro-Hydraulic Valves)

In addition to the items listed above, the Drain Ball Valve (if installed) and Cold Water Inlet piping will be temporarily disconnected to permit installation of a Flow Meter and Orifice Disk.

NOTE

Figure 2-1 shows the locations of the affected components and assemblies for a typical Helitherm, Model SW1B-Plus II Water Wizard installation. Figure 2-2 shows component locations for a typical Double-Wall, Model DW-24.

The actual size and location of affected components and assemblies may vary, depending on Packaged Water Heater Model, size, and type of Control Valve being retrofitted. Refer to the applicable AERCO Heat Exchanger Manual provided with your installation for additional details.

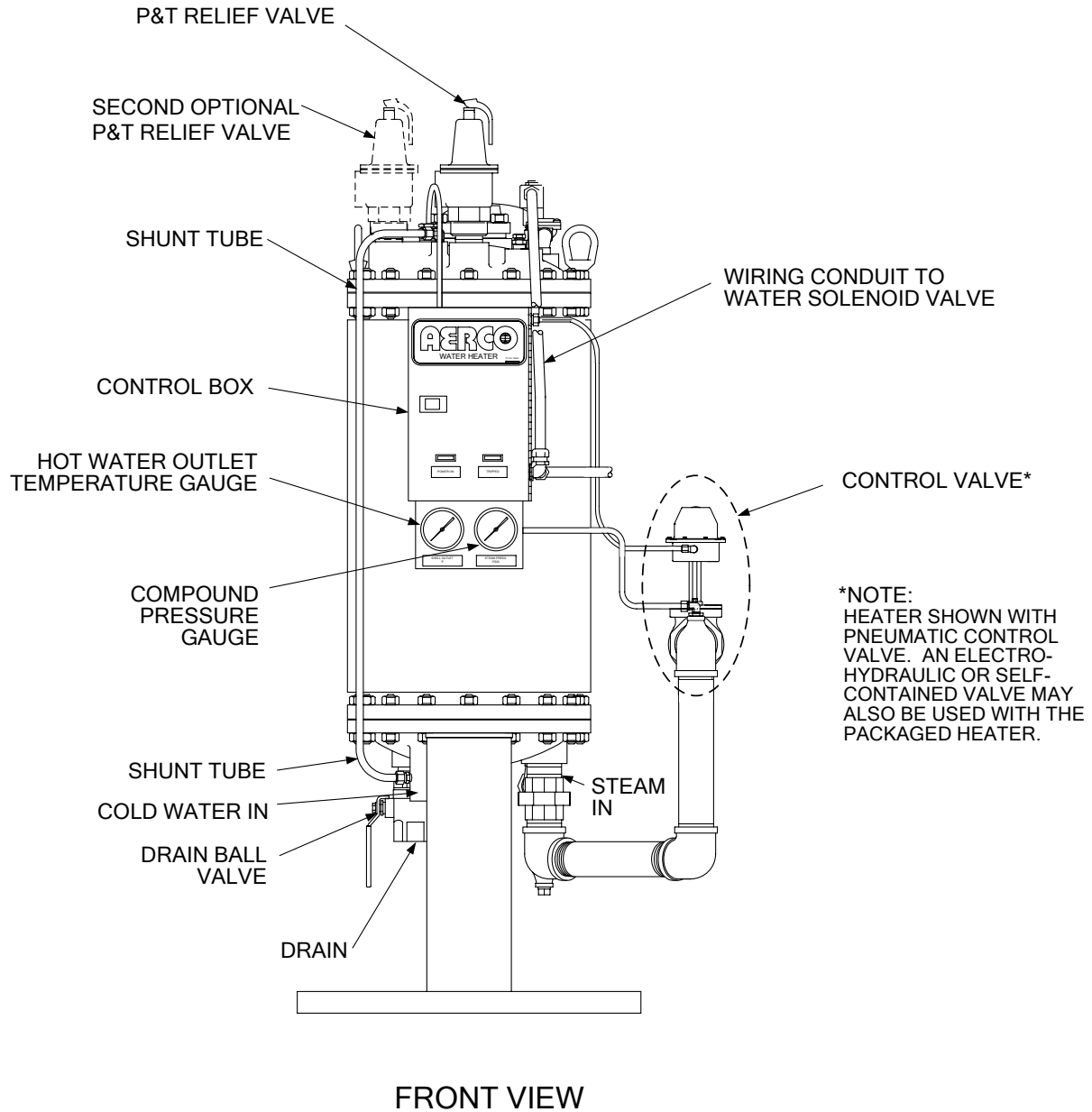
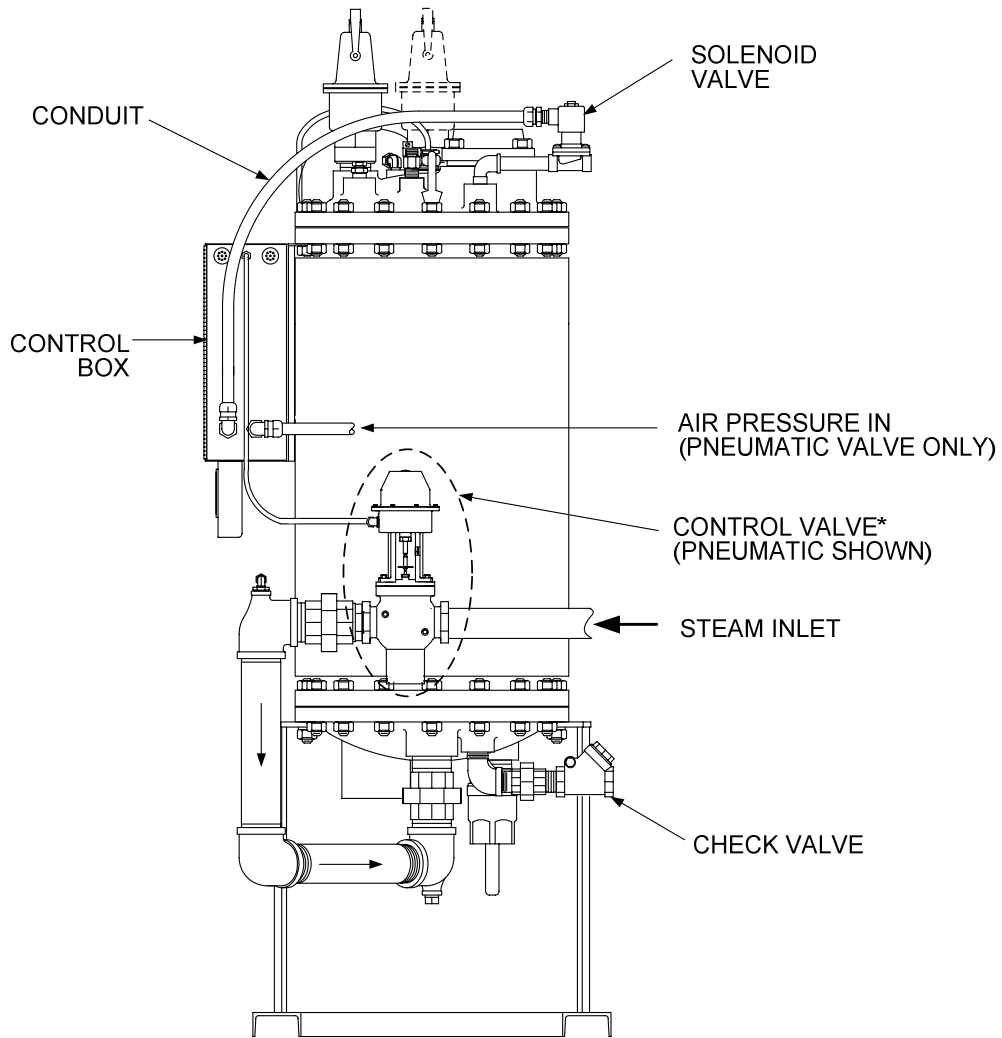


Figure 2-1. Typical Helitherm Water Heater Component Locations (Sheet 1 of 3)



SIDE VIEW

Figure 2-1. Typical Helitherm Water Heater Component Locations (Sheet 2 of 3)

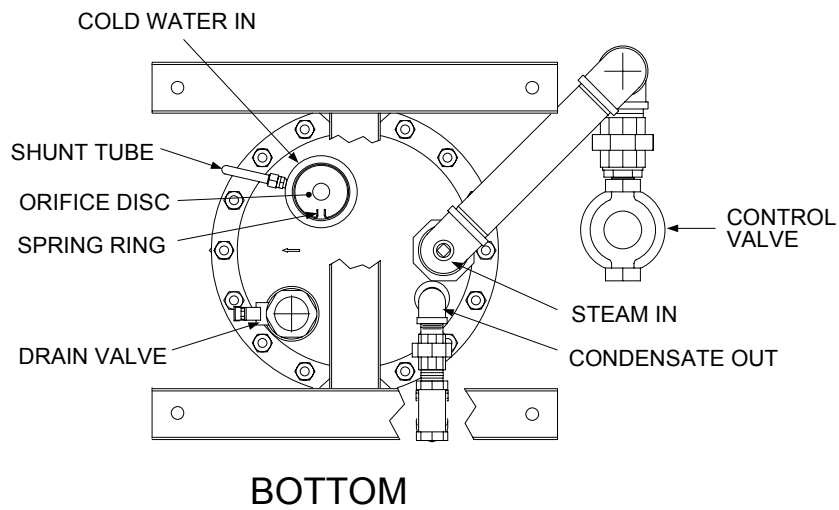
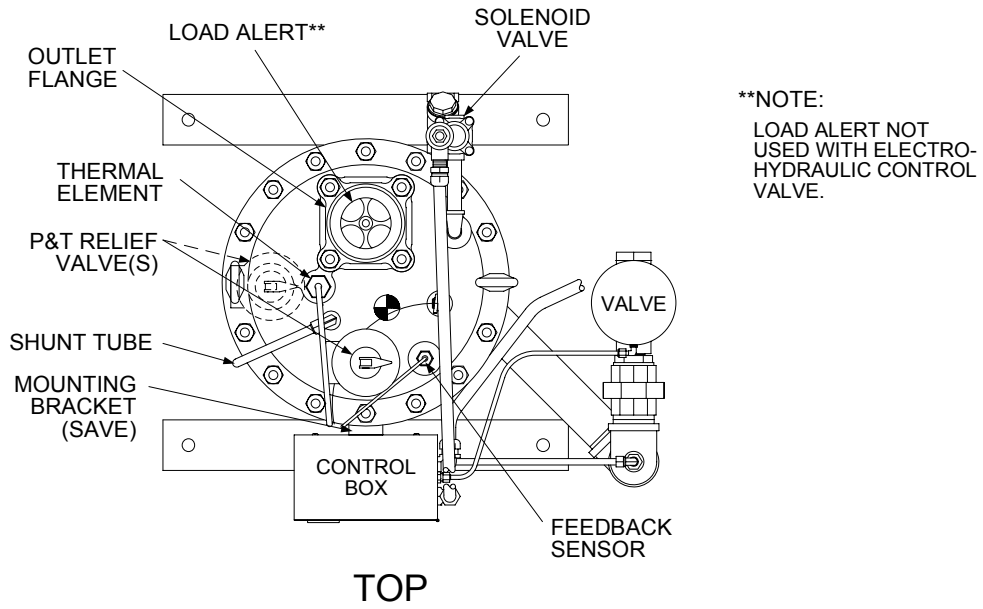


Figure 2-1. Helitherm Water Heater Component Locations (Sheet 3 of 3)

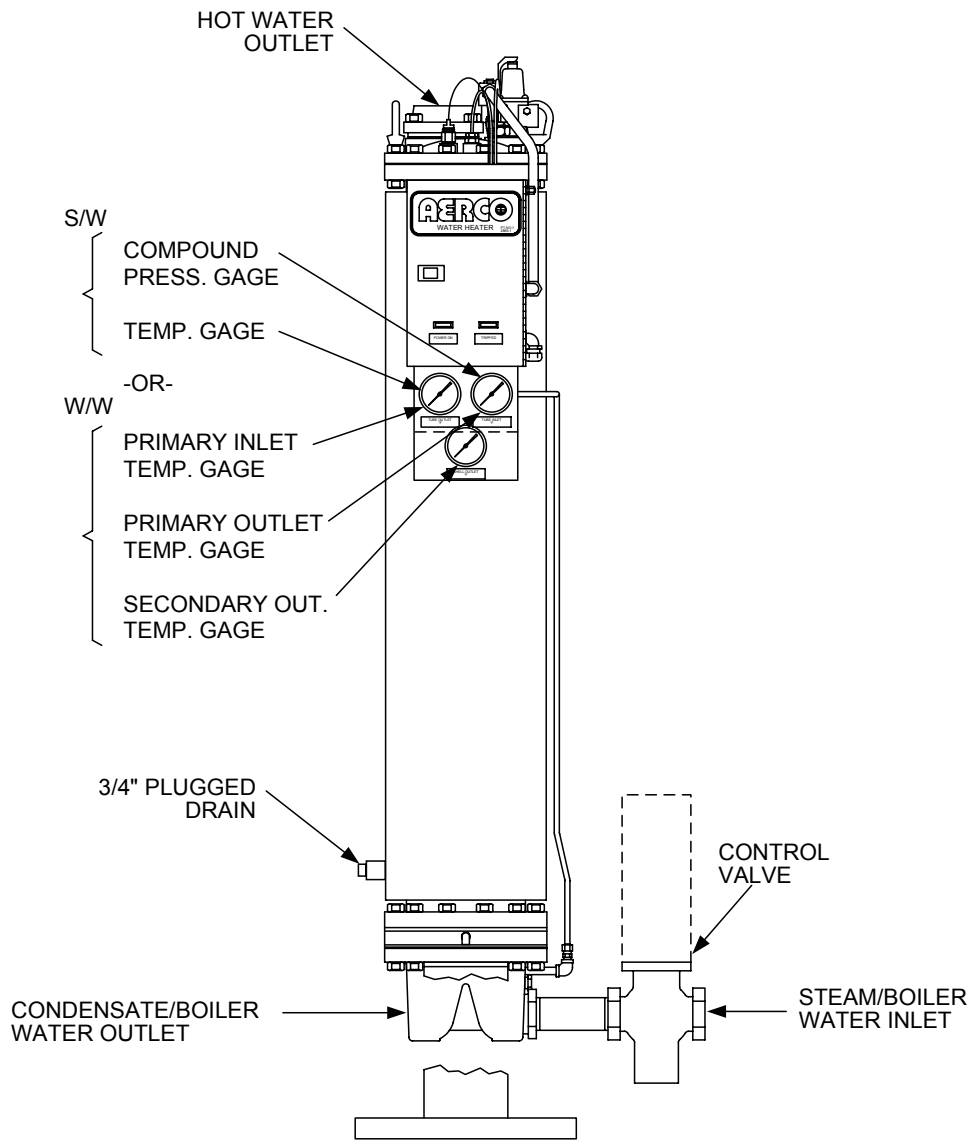
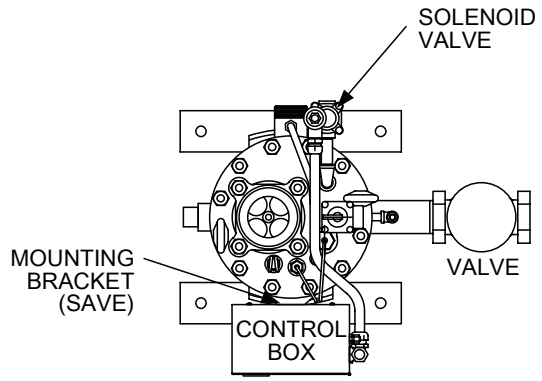


Figure 2-2. Double-Wall Heater Component Locations (Sheet 1 of 2)

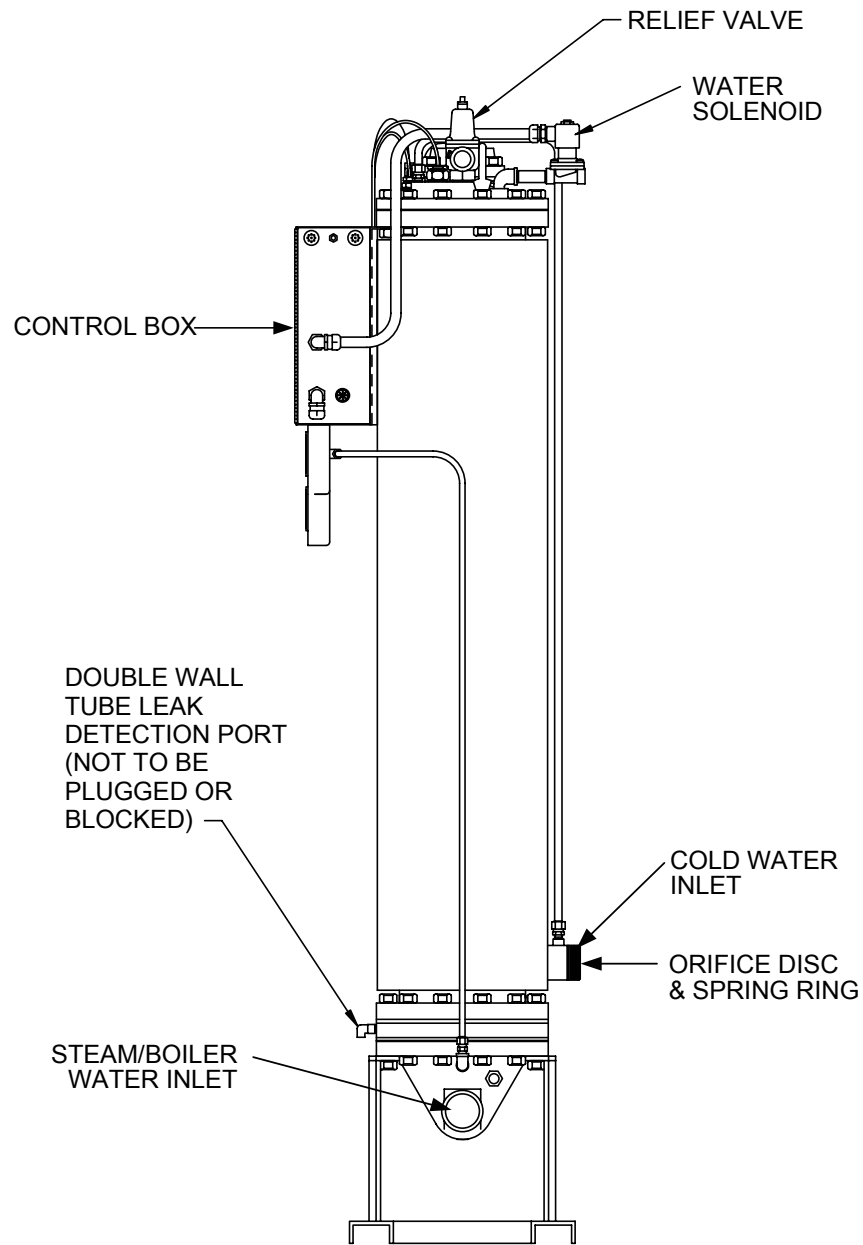


Figure 2-2. Double-Wall Heater Component Locations (Sheet 2 of 2)

NOTE

The majority of illustrations contained in these instructions show a typical Water Wizard, Model SW1B Plus II Packaged Water Heater. Additional supporting illustrations are provided only where significant differences exist between the Water Wizard and the AERCO Heater being retrofitted. For example: E-Plus Water-to-Water Heaters or Double-Wall (DW) Models.

2.1 Isolating Water Heater

To isolate the Water Heater from all facility energy sources (steam, water, electrical power), proceed as follows:

1. Disconnect and Lock-Out/Tag-Out external AC power supplied to the Control Box and any other devices connected to the Heater.
2. Using a voltmeter, check to ensure that all incoming voltage readings are zero Before continuing.
3. If the Heater is equipped with a Pneumatic Control Valve Actuator, close the valve supplying air inlet pressure to the Pneumatic Controller.
4. Close all stop valves in the Steam Inlet and Condensate Outlet lines. On water-to-water systems, do not rely on the Boiler Water Out Check Valve to stop the flow of water.
5. On the water-side, close the stop valves in the following order:
 - (a) Hot water outlet line
 - (b) Recirculation line
 - (c) Cold water inlet line
6. Carefully open the Relief Valve located on the Top Head to relieve pressure in the Heater Shell. Water should stop flowing from the valve within one minute. If water continues to flow from the Relief Valve, one of the water stop valves is not securely closed.

2.2 Draining Water Heater

Allow the Water Heater to cool sufficiently prior to draining the unit. When sufficiently cooled, drain as follows:

1. After ensuring there is no pressure build-up in the Heater Shell (para. 2.1, step 6), block open the Relief Valve in the Top Head to avoid creating a vacuum in the Heater Shell when it is drained.
2. Open the Drain Ball Valve in the Bottom Head and allow the potable water in the Heater Shell to drain completely. If the unit is a Double-Wall Heater (DW-24, DW-45 or DW-68), the Drain is located on the Shell and may either be plugged with a 3/4" NPT Plug or equipped with a Ball Valve and additional drain piping. Remove Plug or open Drain Ball Valve as applicable.

CAUTION

DO NOT DISCARD ANY OF THE REMOVED PARTS OR ASSEMBLIES UNLESS IT IS SPECIFICALLY INDICATED THAT THEY WILL NO LONGER BE USED. IT IS RECOMMENDED THAT ALL REQUIRED ITEMS BE REMOVED AS INDICATED IN THE FOLLOWING STEPS PRIOR TO PERFORMING ANY OF THEREPLACEMENT PROCEDURES IN SECTION 3.

2.3 Removal of Components on Top Head Assembly

Virtually all components currently installed in the Water Heater Top Head must be removed prior to installing the new Electronic Control System and Electronic Valve Actuator. Refer to Figure 2-1, sheet 3 to locate the applicable Top Head components and proceed as follows:

1. Disconnect the pipe drain from the Water Solenoid Relief valve in the Top Head.
2. Disconnect the electrical leads between the Water Solenoid and the Control Box.
3. Remove the 120 VAC Water Solenoid from the nipple connecting it to the Heater Top Head. This Solenoid will be replaced with a new 24 VDC Solenoid provided in the Retrofit Kit.
4. If a Self-Contained Control Valve is installed with the Heater, remove the Valve's Temperature Control Thermal Element from the Thermowell bushing in the Top Head.
5. If a Pneumatic Control Valve is installed with the Heater, remove the Thermal Element and Bushing.
6. Remove the Dial Thermometer and Thermowell from the Top Head.
7. Remove the Aquastat Capillary and Thermowell from the Top Head.
8. Remove the Anticipator Check Valve (Load Alert) as follows:
 - (a) Disconnect the union or flange in the hot water outlet piping (located beyond the outside diameter of the Top Head).
 - (b) Refer to Figure 2-3. Remove the four hex nuts securing the hot water Outlet Flange to the Top Head. Remove the Flange, Flange Gasket and outlet piping connected to the Flange. Retain the four hex nuts for reinstallation of a new Outlet Flange (Section 4).
 - (c) Remove the Spring Plate Assembly, Spring and Valve Plug Assembly from the Load Alert. These removed components will no longer be used. Also, the Outlet Flange and Gasket will be replaced with new components provided in the Retrofit Kit.

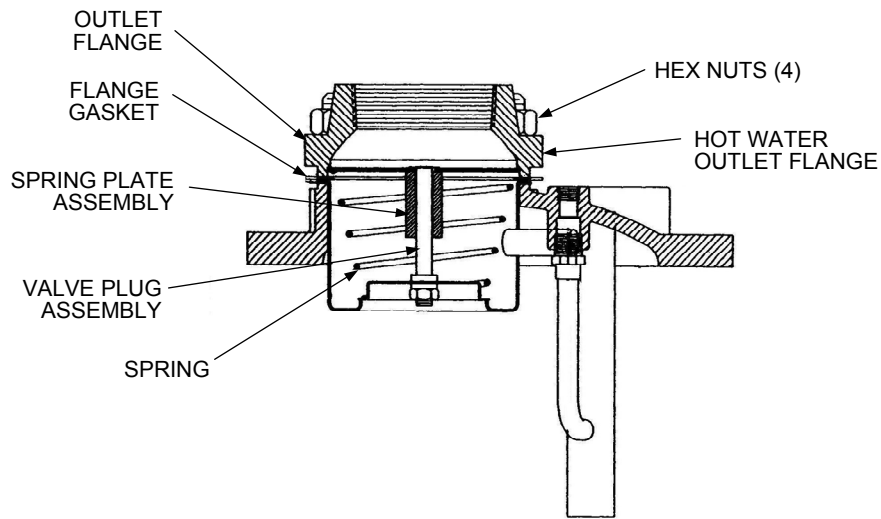


Figure 2-3. Anticipator Check Valve (Load Alert) Assembly

NOTE

For Double-Wall Heater Models (DW-24, DW-45, DW-68), the items removed in paragraph 2.4 are located on the Shell of the Heater instead of the Bottom Head. Therefore, refer to Figure 2-2 for Double-Wall Models.

2.4 Removal of Items Connected to Bottom Head

In order to install several new ECS components, the Drain Ball Valve must be disconnected and the Cold Water Inlet Orifice Disc replaced. The locations of these items are shown in Figure 2-1, sheet 3. Proceed as follows:

1. Disconnect any external piping connected to the Cold Water Inlet and Drain Ball Valve Outlet on the Bottom Head.
2. Locate the Orifice Disc in the Cold Water Inlet (Figure 2-1, sheet 3).
3. Using a pair of pliers, disconnect the snap ring securing the Disc in the Bottom Head.
4. Remove the clip and the Orifice Disc from the Bottom Head. This Orifice Disc will be replaced in Section 4 with a new Disc provided in the Retrofit Kit.
5. Next, temporarily remove the Drain Ball Valve from the Bottom Head (Figure 2-1, sheet 3). Retain this Ball Valve for reinstallation in Section 4.

2.5 Control Valve Actuator Removal

The Water Heater may currently be equipped with a Pneumatic, Self-Contained or Electro-Hydraulic Control Valve Actuator. Therefore, refer to the appropriate paragraph for the type of Control Valve Actuator currently installed.

NOTE

Following removal of the existing Control Valve Actuator, AERCO recommends that the Valve Seat and Packing be replaced using the appropriate items included with the Retrofit Kit. If the Valve is relatively new (less than 1 year) and is currently equipped with a Pneumatic or Electro-Hydraulic Actuator, replacement of these items may be omitted at the discretion of the user. However, if the Valve is currently equipped with a Self-Contained Actuator, replacement of these items is mandatory, since the Valve must be virtually disassembled to remove the installed Actuator. A new Valve Top (plus other items) must also be added to Self-Contained Valves before an ECS Actuator and Linkage Assembly can be installed.

2.5.1 Pneumatic Control Valve Actuator Removal

Refer to Figure 2-4 and remove the Pneumatic Control Valve Actuator as follows:

1. Disconnect the compression fitting connecting the control air line from the Actuator Top.
2. Loosen the hex nut under the indicator disk.
3. Insert a 1/8 inch steel rod in the hole provided in the upper shaft. Hold the rod to keep the upper shaft from turning when performing the next step.
4. Using a pair of pliers, grasp the lower shaft and rotate it counterclockwise to separate it from the upper shaft. Use care to avoid scratching the lower shaft.
5. Remove the two 3/8-16 cap screws securing the Pneumatic Actuator to the Valve Body. Remove the entire Actuator from the Valve.

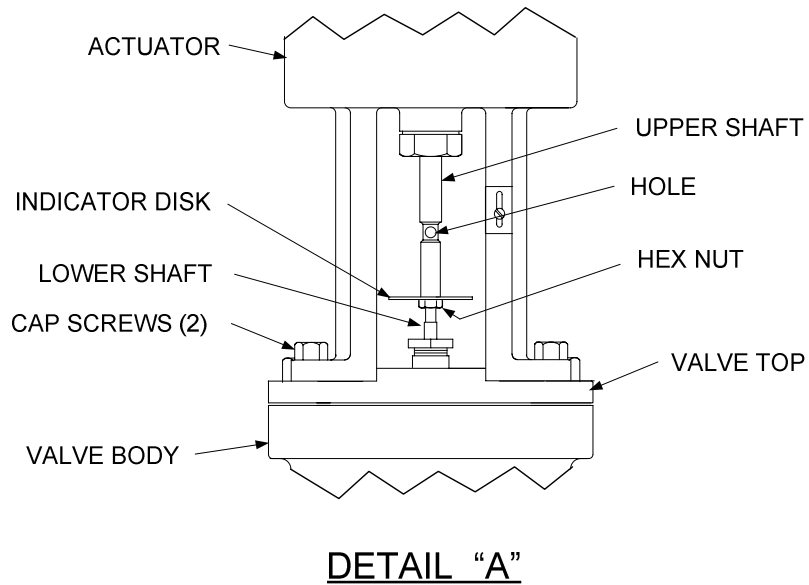
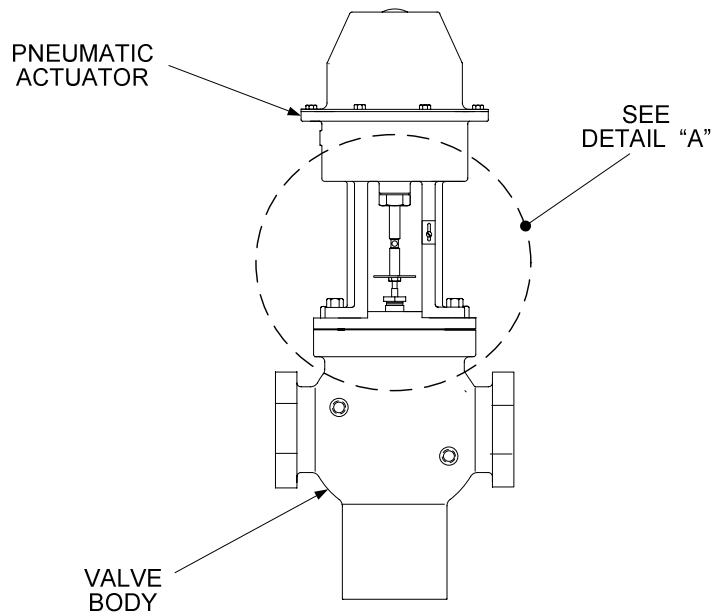


Figure 2-4. Pneumatic Control Valve Actuator Removal

2.5.2 Electro-Hydraulic Control Valve Actuator Removal

Refer to Figure 2-5 and remove the Control Valve Actuator as follows:

1. Disconnect the electrical connectors from the Actuator.
2. Loosen the Upper Hex Nut above the Lower Crossbar shown in Figure 2-5.
3. While holding the Lower Shaft with a pair of pliers, completely remove the Upper Hex Nut.
4. Remove the four hex head bolts securing the Electro-Hydraulic Actuator to the Valve Top.
5. Lift the entire Actuator off the Valve Top. Also, remove the Actuator Gasket.

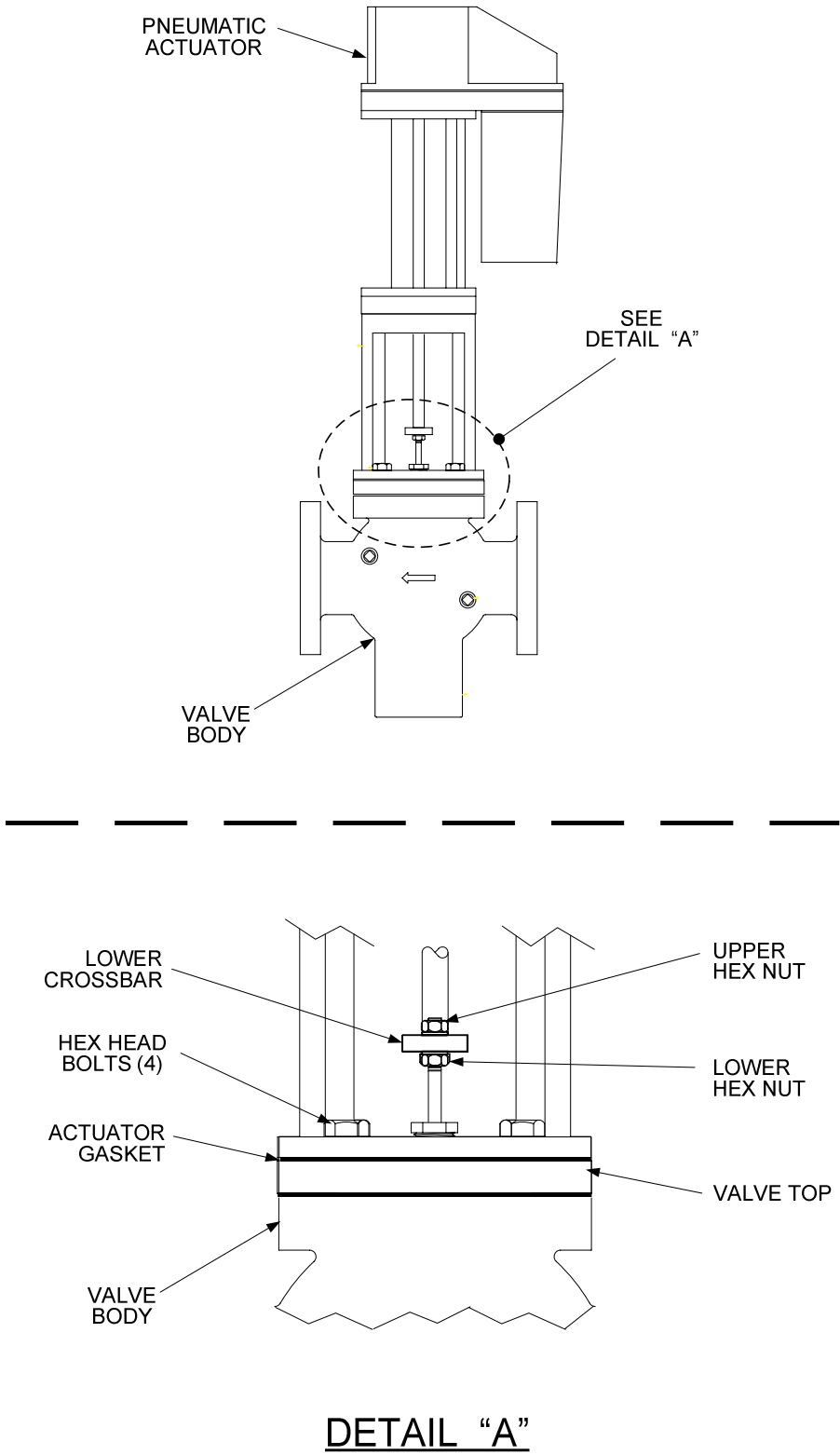


Figure 2-5. Electro-Hydraulic Control Valve Actuator Removal

2.5.3 Self-Contained Control Valve Actuator Removal

Refer to Figure 2-6 and remove the Self-Contained Valve Actuator as follows:

1. Loosen the locknut on the thermal element adjustment sleeve. Unscrew the adjustment sleeve to remove the sleeve and thermal element from the Actuator.
2. Carefully loosen the compression fittings on the upstream and downstream tubing to relieve any trapped pressure buildup. Completely remove both the upstream and downstream tubing assemblies and compression fittings. The tapped NPT ports in the Valve Body will be plugged during the replacement procedures in Section 3.
3. Remove the hex head cap screws securing the Actuator to the Valve Body. Valve sizes from 1" to 2" have 6 cap screws, while sizes 2 ½" to 4" Valves have 8 cap screws.

CAUTION

Use care when performing step 4 to avoid damaging or scratching internal Valve Body parts. It is imperative that the Actuator be lifted straight up to avoid sticking or binding.

4. Lift the Actuator Housing straight up and off the Valve Body. Doing so will also remove the entire inner valve assembly (Figure 2-7), including the Valve Stem, Seat, Valve Plug Shaft and Top/Bottom Pistons. Depending on the age and condition of the valve, considerable force may be required to pull the Pistons through the Valve Body. If it cannot be removed, the Valve Stem may be used as an impact hammer to remove scale build-up on the internal valve surfaces and allow Piston removal.

Replacement parts for these removed items are provided in the applicable Retrofit Kit for the Valve size being retrofitted. These items will be replaced in Section 3. The Retrofit Kit also contains a new Lower Shaft, Valve Top/Gasket, plus additional replacement items for the Valve being retrofitted.

5. Proceed as follows, depending on the size of the Valve being retrofitted:
 - (a) For 2 ½ to 4 inch Valves, separate the Valve Seat Retaining Disc from the Valve Seat by removing the four (4) cap screws (Figure 2-7).
 - (b) For 1 to 2 inch Valves, hold the Valve Plug Shaft with a pair of pliers and remove the Valve Stem Retaining Nut from the Shaft (Figure 2-8).
6. Insert a 1/8 inch steel rod through the hole near the top of the Valve Stem (Figure 2-7 or 2-8).

NOTE

If "flats" are provided on the Actuator Connecting Shaft and Valve Stem, open-end wrenches may be used in step 7 to disconnect the Valve Stem and Actuator Shaft.

7. Grasp the Actuator Connecting Shaft (Figure 2-7 or 2-8) with a pair of pliers. Carefully turn the Valve Stem counterclockwise and separate it from the Actuator Connecting Shaft.

8. Replacement of all required Valve parts will be accomplished using the appropriate instructions and illustrations in Section 3.

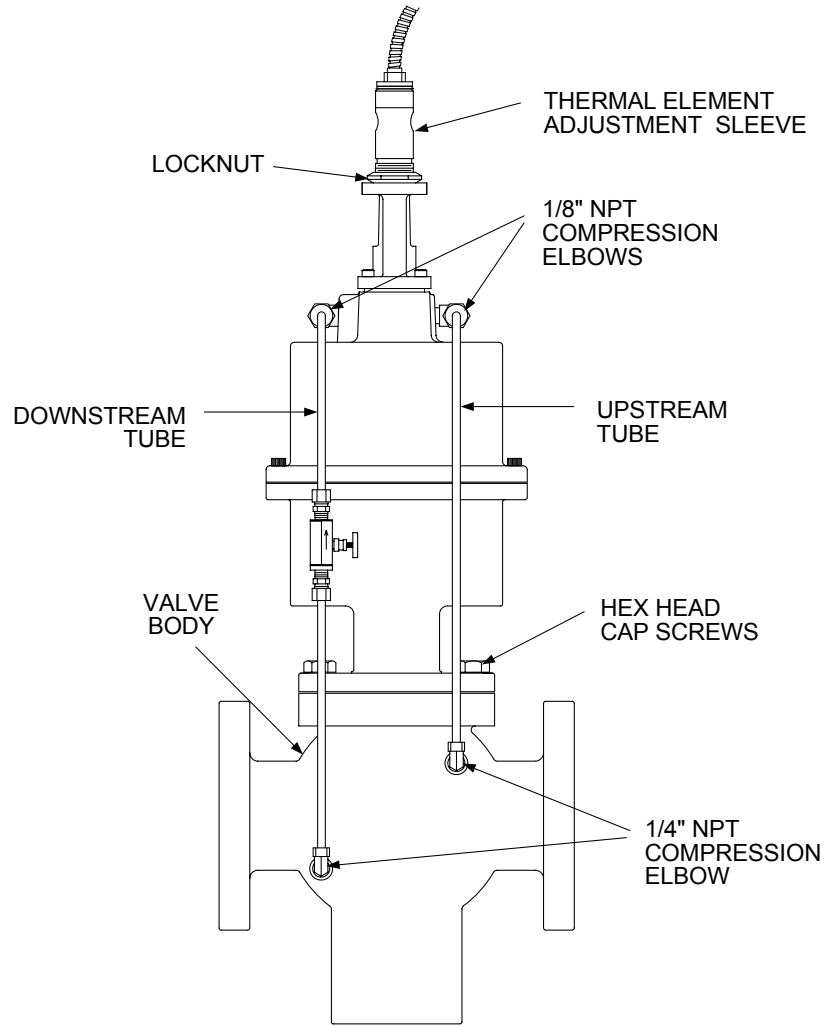


Figure 2-6. Self-Contained Control Valve Actuator Removal

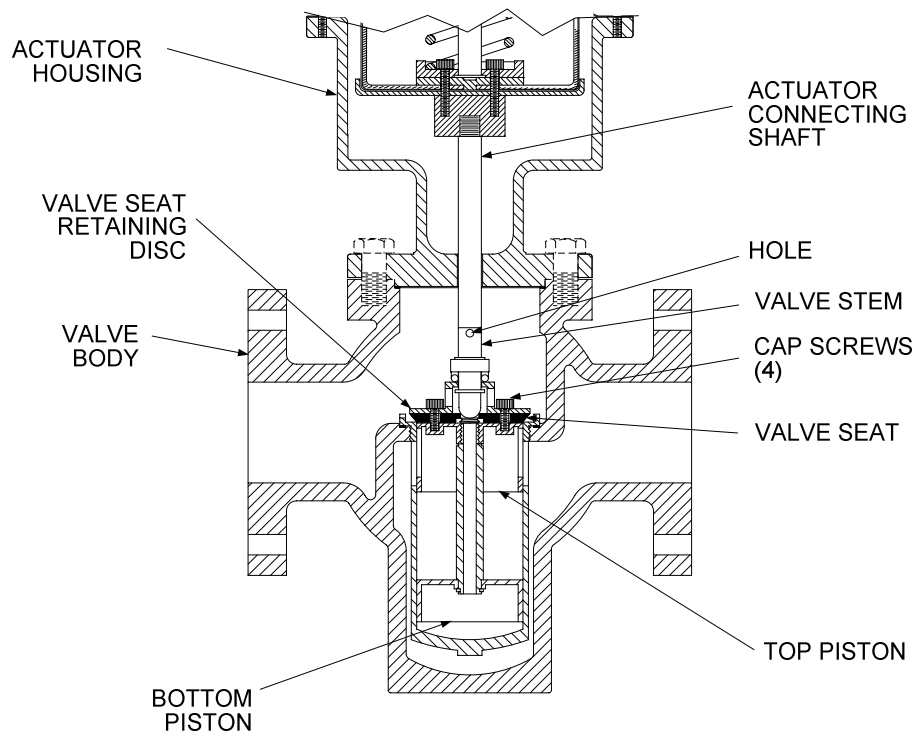


Figure 2-7. Self-Contained Control Valve Actuator Removal – 2 ½” to 4”

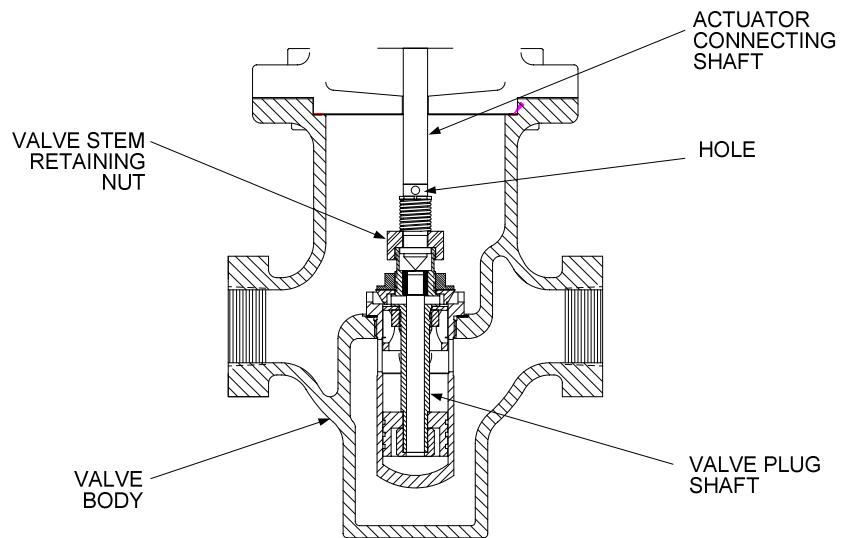


Figure 2-8. Self-Contained Control Valve Actuator Removal – 1” to 2”

2.6 Control Box Removal

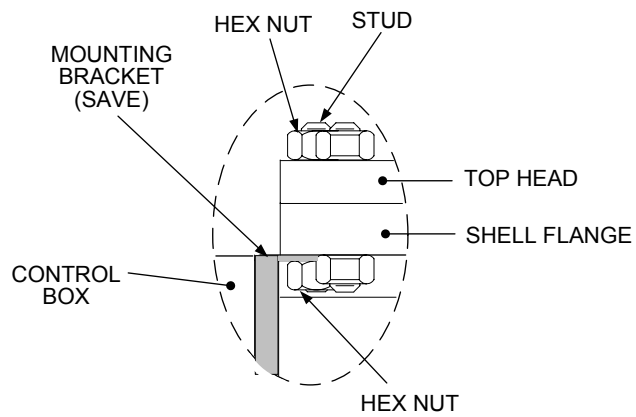
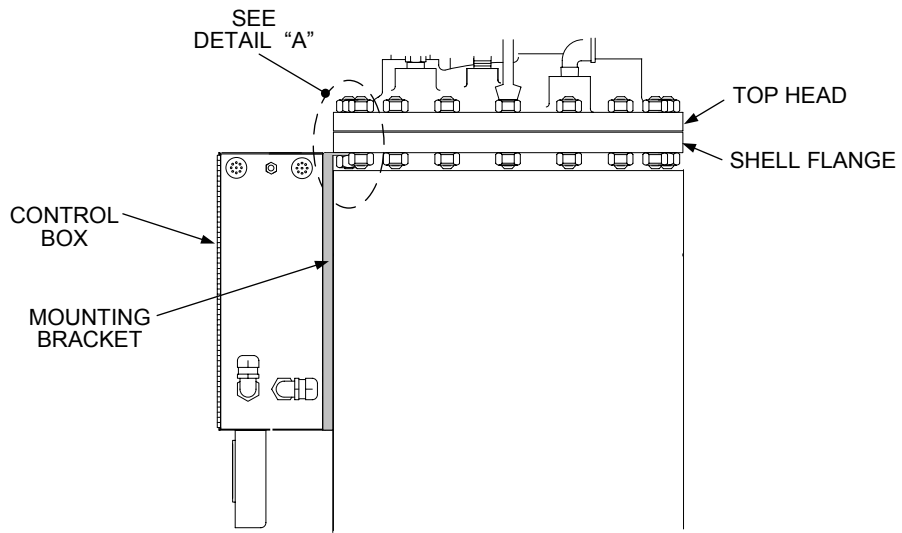
The existing Control Box (Figure 2-1) is secured to the Heat Exchanger using a special mounting bracket. The top end of this mounting bracket contains a slotted cutout which is inserted around one of the studs securing the top head to the shell flange. A hex nut secures the bracket in place. The currently installed Control Box will no longer be used. However, the mounting bracket will be reused to mount the new ECS Control Box. Remove the Control Box and mounting bracket assemblies as follows:

1. Check to ensure that the external power source has been turned off.
2. Disconnect all power supply wiring to the Control Box. Also, disconnect all wiring between the Control Box and any external Solenoid Valves.
3. If a Pneumatic Control Valve Actuator is currently installed on the Heater, disconnect the air supply and control air tubing from the Control Box.
4. Disconnect the Pressure Gauge compression fittings.
5. Cut all wire ties leading to the Control Box. Do not cut the thermal element.
6. Loosen, but do not remove, the hex nut securing the Control Box Mounting Bracket to the Top Head stud (Figure 2-9).
7. Completely remove the Control Box and Mounting Bracket from the Water Heater.
8. Open the Control Box door. From the rear of the Control Box, remove the six 8-32 screws securing the Rear Mounting Panel to the enclosure (Figure 2-10).
9. Remove the Rear Mounting Panel from the Control Box to access the two screws securing the Mounting Bracket to the Box

IMPORTANT

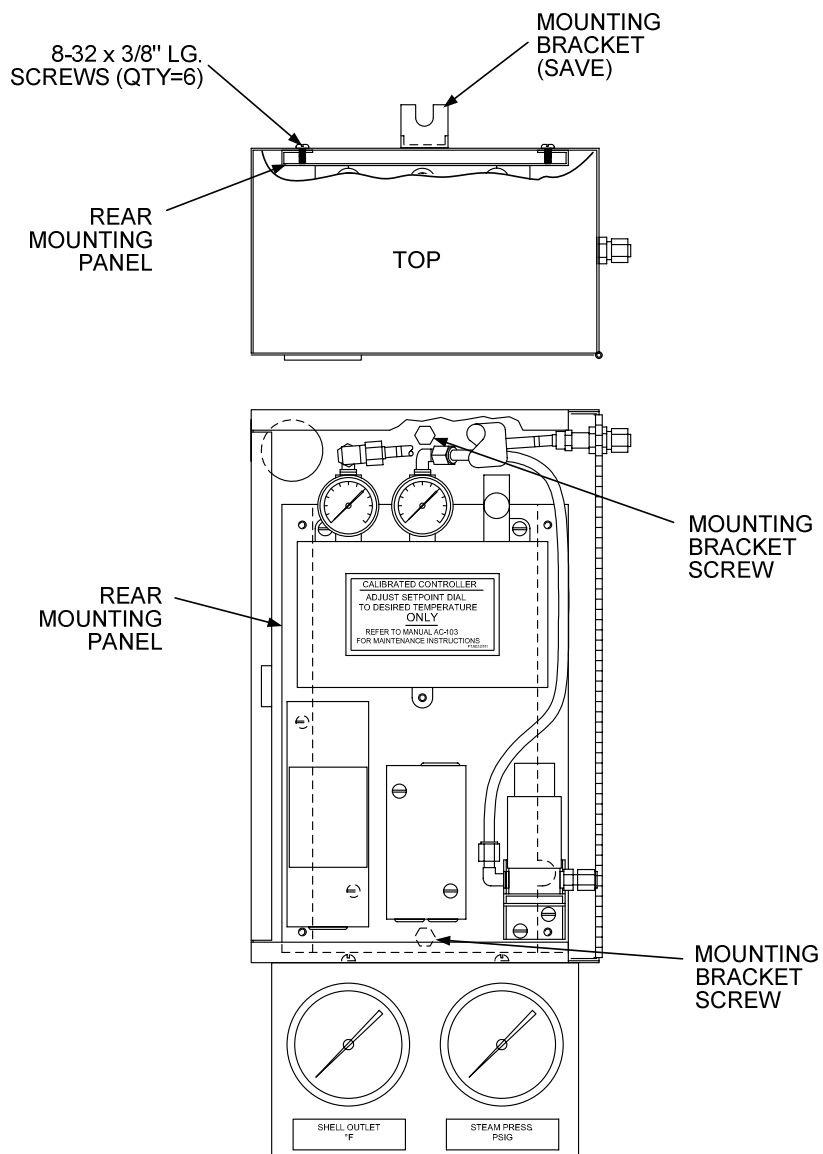
Save the Control Box Mounting Bracket when it is removed from the Control Box. This Mounting Bracket will be used to install the new ECS Control Box.

10. Remove the two screws securing the Mounting Bracket to the Control Box. Separate the Control Box and Mounting Bracket. This Control Box will no longer be used and can be discarded. However, the Mounting Bracket will be reused to attach the new ECS Control Box to the Heater in Section 4.



DETAIL "A"

Figure 2-9. Control Box Mounting Details



CONTROL BOX USED WITH PNEUMATIC CONTROL VALVE

Figure 2-10. Control Box With Door Open

3. RECOMMENDED REPLACEMENT OF VALVE ASSEMBLY PARTS

As mentioned in paragraph 2.5, AERCO recommends that the Valve Seat and Packing be replaced on the Valve Body, prior to installing the ECS Retrofit Kit items described in Section 4. Valve Bodies which previously utilized Self-Contained Actuators must be modified to include new additional items such as: a Valve Top, Valve Stem and a Packing Nut.

Refer to the applicable paragraphs which follow for the Valve size and Actuator type used on your system.

NOTE

The procedures in paragraphs 3.1 and 3.2 which follow, assume that the previously installed Pneumatic, Electro-Hydraulic or Self-Contained Actuator has already been removed.

3.1 Valves Previously Equipped With Pneumatic or Electro-Hydraulic Actuators

The parts replacement items required for Valve Bodies which previously used Pneumatic or Electro-Hydraulic Actuators are basically identical. Only minor variations exist for the various Valve Body sizes. The Valve Body components for 1.00" to 2.00" and 2.50" to 4.00" are shown in Figures 3-1 and 3-2, respectively.

3.1.1 Valve Disassembly Procedure

Proceed as follows:

NOTE

Steps 1 through 5 which follow apply to all valve sizes shown in Figure 3-1 and 3-2.

1. Remove the Hex Nut (17) from the Valve Body Shaft.
2. Remove the Packing Nut (18) and Packing Assembly (20).
3. Remove the Bolts or Cap Screws (14) securing the Valve Top (21).
4. Remove the Valve Top (21) and Valve Top Gasket (13).
5. Carefully lift out the entire Shaft /Seat/Piston Assembly.
6. For 1 inch to 2 inch Valve sizes, refer to Figure 3-1 and remove the following items in the order specified:
 - (a) Lock Washer (23)
 - (b) Retaining Ring (11)
 - (c) Pilot Spring (10)

- (d) Valve Stem Retaining Nut (35)
 - (e) Lower Shaft (16) and Valve Stem (12)
 - (f) Retaining Disc (8)
 - (g) Disc Seat (7)
 - (h) Seat Retainer (34)
 - (i) Valve Plug Shaft (5)
7. For 2 ½, 3 and 4 inch Valve sizes, refer to Figure 3-2 and remove the following items in the order specified:
- (a) Lock Washer (23)
 - (b) Pilot Spring Retainer (11)
 - (c) Pilot Spring Backup Washer (31), - 4 inch Valve Only
 - (d) Pilot Spring (10)
 - (e) Socket Head Cap Screws (9)
 - (f) Valve Seat Retaining Disc (8)
 - (g) Lower Shaft (16) and Valve Stem (12)
 - (h) Valve Seat (7)
 - (i) Top Piston (6) and Bottom Piston (3) Assemblies
8. Clean all parts thoroughly and remove all dirt and/or scale.
9. Next, proceed to the Valve Reassembly procedures in paragraph 3.1.2 and replace the items indicated with the new parts provided in the Retrofit Kit.

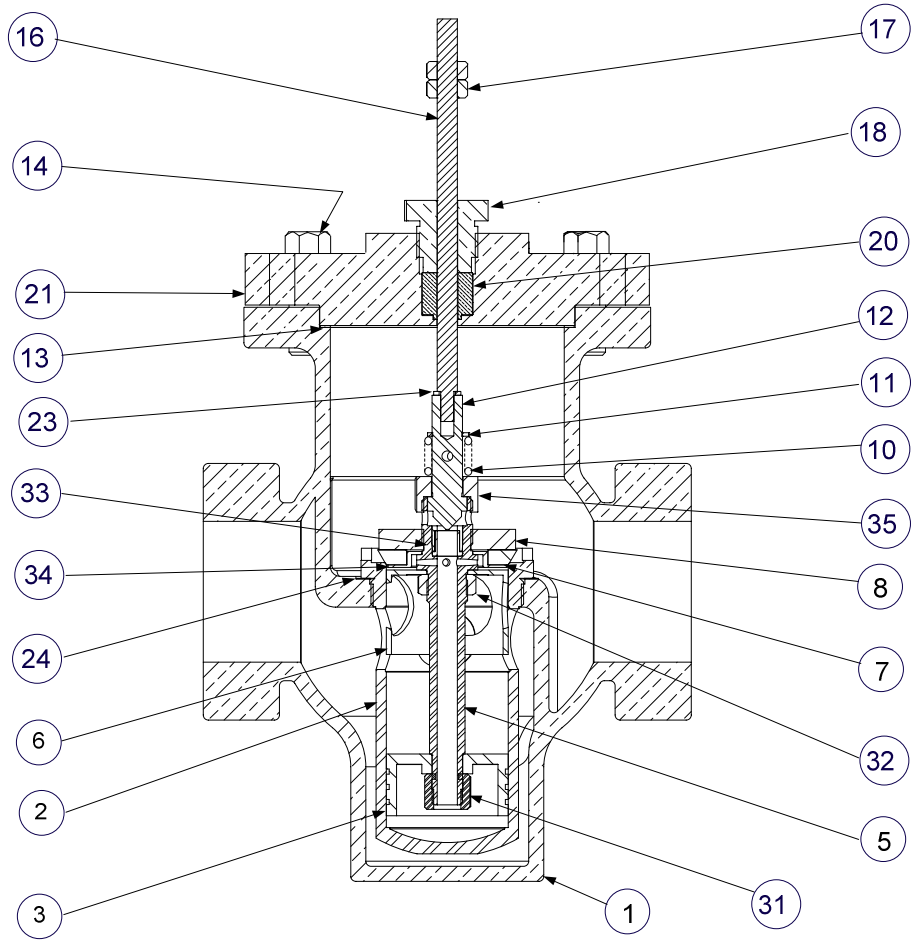


Figure 3-1. Valve Assembly Sizes 1.00" to 2.00"

PARTS LIST TABLE FOR VALVE ASSEMBLY SIZES 1.00" TO 2.00"

ITEM	QTY	PART NAME	VALVE SIZE AND PART NUMBERS			
			1.00 INCH	1.25 INCH	1.50 INCH	2.00 INCH
1	1	VALVE BODY	20762	20759	20758	20761
2	1	SEAT CAGE	16844	16845	16837	16843
3	1	BOTTOM PISTON	121540	121525	121502	121529
4		NOT USED				
5	1	VALVE PLUG SHAFT	16849	16839	16838	16848
6	1	TOP PISTON	121539	12154	121501	121530
7	1	DISC SEAT	121541	121527	121510	121531
8	1	RETAINING DISC	121542	121513	121504	121532
9		NOT USED				
10		PILOT SPRING	121528	121528	121528	121528
11	1	RETAINING RING	121545	121545	121545	121545
12	1	VALVE STEM	122655	122654	122651	122650
13	1	VALVE TOP GASKET	122136	122136	122136	122136
14	6	BOLT, HEX, 3/8-16	122405	122405	122405	122405
16	1	LOWER SHAFT	121979	121980	121980	121982
17	2	HEX NUT, 1/4-20	6-226	6-226	6-226	6-226
18	1	PACKING NUT	122664	122664	122664	122664
19	2	BOLT, HEX 3/8-16 x 5/8 LG	54014	54014	54014	54014
20	1	PACKING ASSY	121567	121567	121567	121567
21	1	VALVE TOP	16943	16943	16943	16943
22		NOT USED				
23	1	LOCKWASHER	122666	122666	122666	122666
24	1	SEAT CAGE GASKET	123080	123081	123082	123083
ITEMS 25 THRU 30		NOT SHOWN				
31	1	BOTTOM PISTON RETAINING NUT	122982	122982	122982	122982
32	1	TOP PISTON RETAINING NUT	121543	121543	121543	121543
33	1	LOWER PILOT SEAT ASSY	121505	121505	121505	121505
34	1	SEAT RETAINER	N/A	121559	121506	121506
35	1	VALVE STEM RETAINING NUT	121503	121503	121503	121503

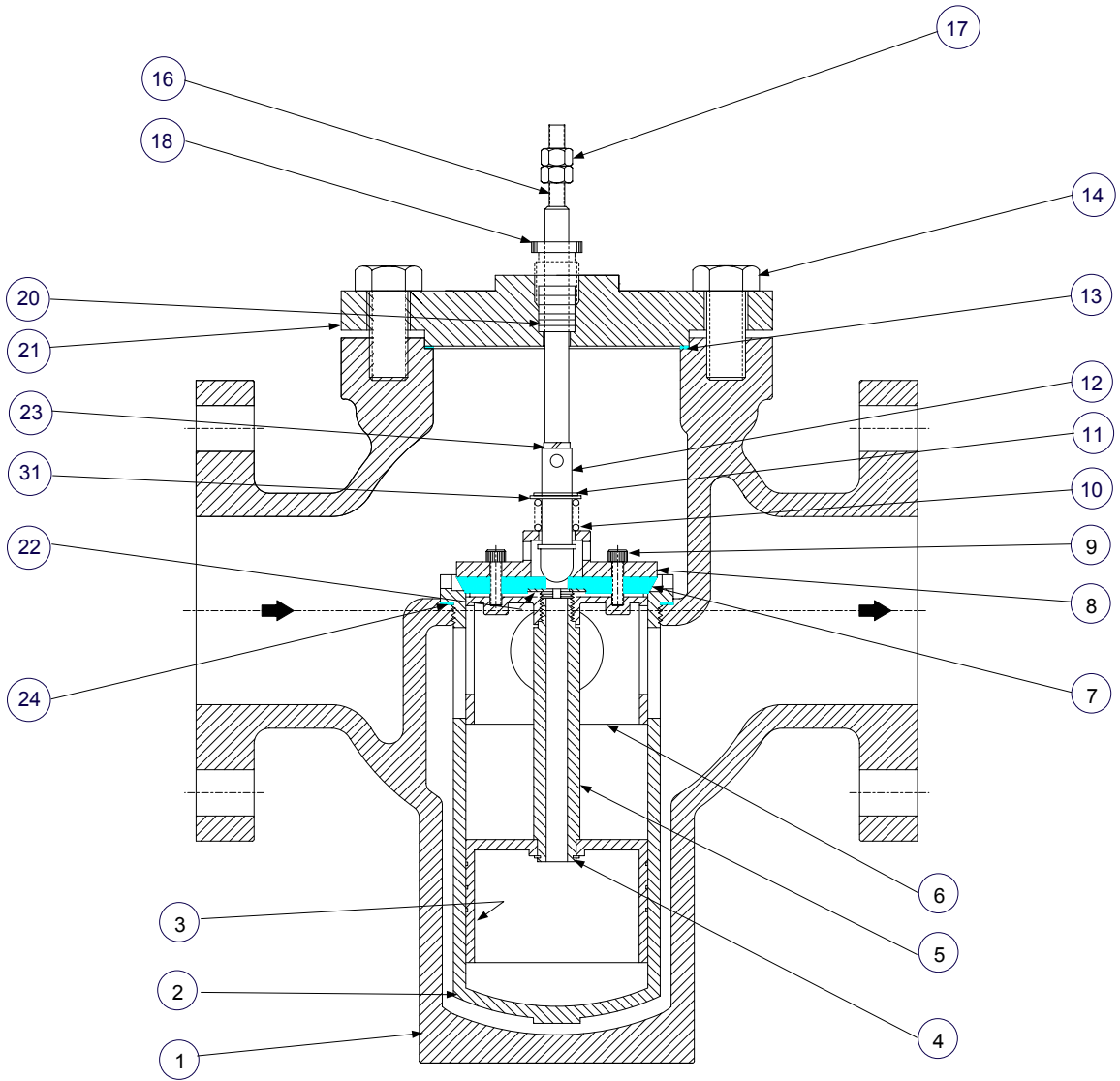


Figure 3-2. Valve Assembly Sizes 2.50" to 4.00"

PARTS LIST TABLE FOR VALVE ASSEMBLY SIZES 2.50" TO 4.00"

ITEM	QTY	PART NAME	VALVE SIZE AND PART NUMBERS		
			2.50 INCH	3.00 INCH	4.00 INCH
1	1	VALVE BODY	20765-1	20766-1	20775
2	1	SEAT CAGE	16961	161004	161046
3	1	BOTTOM PISTON	16962	161007	161048
4	1	PISTON RETAINING RING	122173	122173	122234
5	1	VALVE PLUG SHAFT	16972	161006	161047
6	1	TOP PISTON	16970	161005	161050
7	1	VALVE SEAT	121935	122032	122178
8	1	VALVE SEAT RETAINING DISC	121934	122031	122177
9	4	10-32 x 3/4" LG. SOCKET HD. CAP	122174	122174	122238
10	1	PILOT SPRING	122081	122232	121823
11	1	PILOT SPRING RETAINER	122082	122082	122173
12	1	VALVE STEM	122648	122658	122659
13	1	VALVE TOP GASKET	122083	122204	122203
14	4	CAP SCREW 5/8-11 x 1-1/2" LG.	N/A	6-310	6-310
15	2	3/8-16 NUT (4" VALVE ONLY)	N/A	N/A	6-264
16	1	LOWER SHAFT	122223	122230	122224
17	2	1/4-20 NUT	6-226	6-226	N/A
18	1	PACKING NUT	122664	122665	122665
19	2	3/8-16 x 5/8" LG. CAP SREWS	54014	54014	54014
20	1	PACKING ASSY	121567	121568	121568
21	1	VALVE TOP	18781	18823	18824
22	1	SEAT BACK-UP RING	122326	122327	122328
23	1	LOCKWASHER	122666	122667	122667
24	1	SEAT CAGE GASKET	123084	123085	123086
ITEMS 25 THRU 30		NOT SHOWN			
31	1	PILOT SPRING BACKUP WASHER	N/A	N/A	122246

3.1.2 Valve Reassembly Procedure

Reassembly is accomplished by basically reversing the previous Disassembly steps. Refer to Figure 3-1 or 3-2 for the applicable Valve size. Perform the following steps in the order specified and REPLACE the items shown in **BOLD** type with the new parts provided in the Retrofit Kit.

1. For 1 inch to 2 inch Valve sizes, refer to Figure 3-1 and reassemble or **replace** the following items in the order specified:
 - (a) Valve Plug Shaft (5)
 - (b) Seat Retainer (34)
 - (c) **Replace Disc Seat (7)**
 - (d) Retaining Disc (8)
 - (e) Lower Shaft (16) and Valve Stem (12)
 - (f) Valve Stem Retaining Nut (35)
 - (g) Pilot Spring (10)
 - (h) Retaining Ring (3)
 - (i) Lock Washer (23)
 - (j) Proceed to step 3 and continue the Valve Reassembly process. Steps 3 through 6 apply to ALL valve sizes.
2. For 2 ½, 3 and 4 inch Valve sizes, refer to Figure 3-2 and reassemble or **replace** the following items in the order specified:
 - (a) Top Piston (6) and Bottom Piston (3) Assemblies
 - (b) **Replace Valve Seat (7)**
 - (c) Lower Shaft (16) and Valve Stem (12)
 - (d) Valve Seat Retaining Disc (8)
 - (e) Socket Head Cap Screws (9)
 - (f) Pilot Spring (10)
 - (g) Pilot Spring Backup Washer (31), - 4 inch Valve Only
 - (h) Pilot Spring Retainer (11)
 - (i) Lock Washer (23)
 - (j) Proceed to step 3 and continue the Valve Reassembly process. Steps 3 through 6 apply to ALL valve sizes.
3. **Replace Valve Top Gasket (13)** and reassemble Valve Top (21) on Valve Body (1).
4. Secure Valve Top (21) to Valve Body (1) with the Bolts or Cap Screws (14).

5. **Replace Packing Assembly (20)** and reassemble Packing Nut (18) in Valve Top (21).
6. The last step of the Valve Reassembly procedure is to **replace two Hex Nuts** on the Valve Shaft. Valve sizes from 1 to 3 inches contain **two 1/4-20 Hex Nuts** in the Retrofit Kit. However, 4 inch Valves contain **two 3/8-16 Hex Nuts** in the Kit. Replace the appropriate Hex nuts on the Valve Shaft.

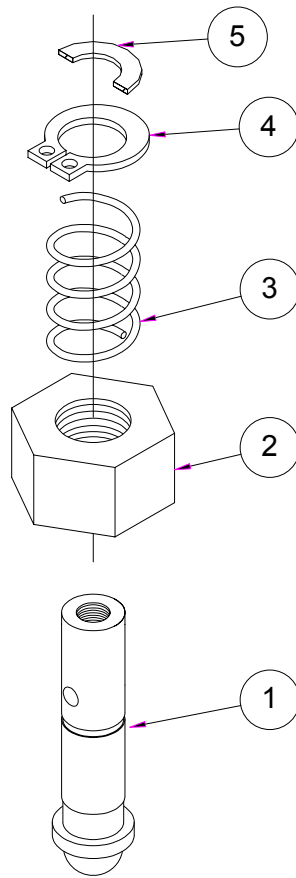
3.2 Valves Previously Equipped With Self-Contained Actuators

The internal parts and assemblies contained in Valves which were previously equipped with Self-Contained Actuators must basically be rebuilt with the items provided in the Retrofit Kit. The Retrofit Kit for Valve sizes from 1.00" to 2.00" include an Inner Pilot Assembly Kit (29021-[]) and a Valve Piston Assembly Kit (12168-[]). The items in these kits are shown in Figures 3-3 and 3-4. Kits for Valve sizes from 2.50" to 4.00" include a Main Valve Assembly Kit (27006-[]) containing the items shown in the exploded view in Figure 3-5.

In addition to replacement the parts contained in these Kits, new items must be added to ALL Valve Bodies which previously used Self-Contained Actuators. These items include:

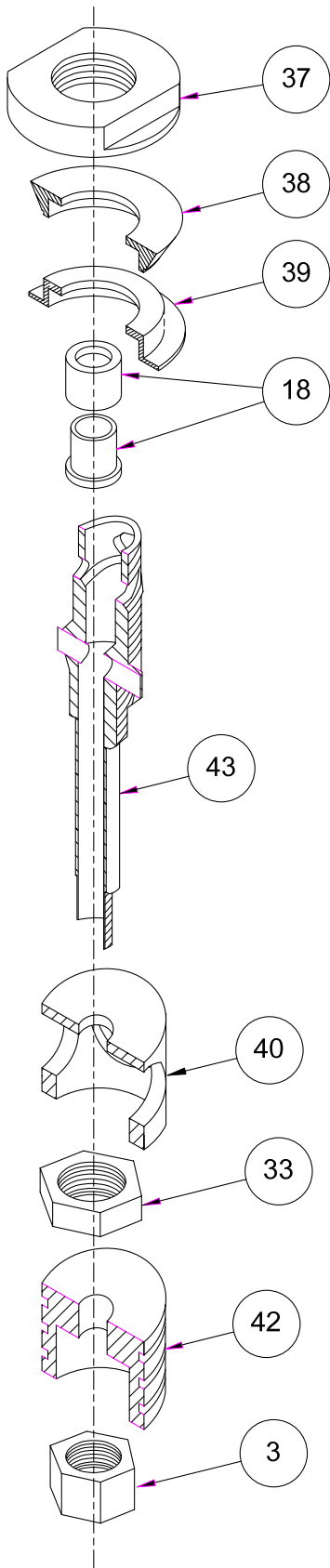
- Lower Shaft
- Valve Top
- Valve Top Gasket
- Hex Bolts (1" to 2" Valves) or Cap Screws (2.5" to 4.0" Valves) to secure Valve Top
- Packing Assembly
- Packing Nut
- 1/4" NPT Plugs which get inserted into tapped holes in Valve Body

Refer to Figure 3-1 (1" to 2" Valves) or Figure 3-2 (2.5" to 4" Valves) for the locations of these items.



1.00"-2.00" CXT-P (PNEUMATIC)						
ITEM	REQ	DESCRIPTION	1.00"	1.25"	1.50"	2.00"
1	1	VALVE STEM	122655	122654	122651	122650
2	1	VALVE STEM RETAINING NUT	121503	121503	121503	121503
3	1	LOWER PILOT PRE-LOAD SPRING	121528	121528	121528	121528
4	1	PRE-LOAD SPRING RETAINING RING	121545	121545	121545	121545
5	1	LOCKWASHER	122666	122666	122666	122666

Figure 3-3. Inner Pilot Assembly Kit (29021-[]) for 1.00" to 2.00" Valves



43	16848	1	VALVE PLUG SHAFT
42	121529	1	BOTTOM PISTON
40	121530	1	TOP PISTON
39	121506	1	SEAT RETAINER (SEE NOTE 2)
38	121531	1	DISC SEAT
37	121532	1	DISC RETAINER
33	121543	1	TOP PISTON RETAINING NUT
18	121505	1	LOWER PILOT SEAT ASSEMBLY
3	122982	1	BOTTOM PISTON RETAINING NUT
ITEM	PART NO.	REQ	DESCRIPTION
121618-2.00 (2.00 PARTS LIST)			

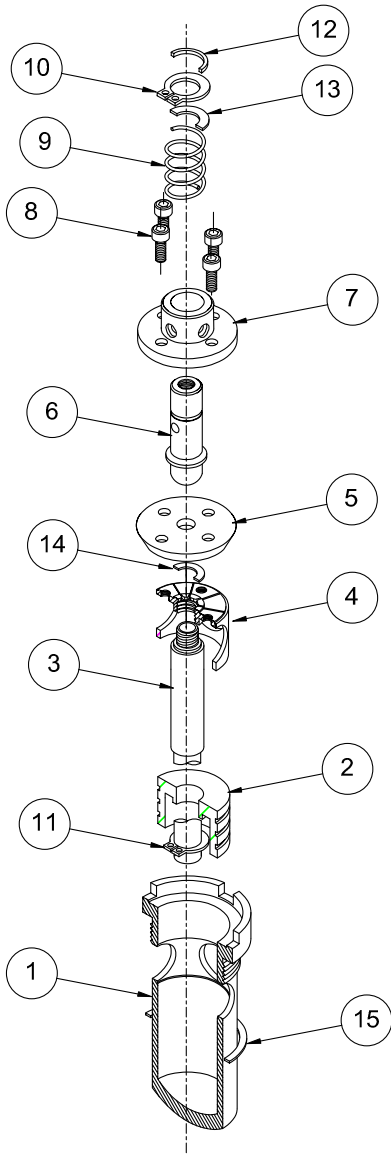
43	16838	1	VALVE PLUG SHAFT
42	121502	1	BOTTOM PISTON
40	121501	1	TOP PISTON
39	121506	1	SEAT RETAINER (SEE NOTE 2)
38	121510	1	DISC SEAT
37	121504	1	DISC RETAINER
33	121543	1	TOP PISTON RETAINING NUT
18	121505	1	LOWER PILOT SEAT ASSEMBLY
3	122982	1	BOTTOM PISTON RETAINING NUT
ITEM	PART NO.	REQ	DESCRIPTION
121618-1.50 (1.50 PARTS LIST)			

43	16839	1	VALVE PLUG SHAFT
42	121525	1	BOTTOM PISTON
40	121514	1	TOP PISTON
39	121559	1	SEAT RETAINER (SEE NOTE 2)
38	121527	1	DISC SEAT
37	121513	1	DISC RETAINER
33	121543	1	TOP PISTON RETAINING NUT
18	121505	1	LOWER PILOT SEAT ASSEMBLY
3	122982	1	BOTTOM PISTON RETAINING NUT
ITEM	PART NO.	REQ	DESCRIPTION
121618-1.25 (1.25 PARTS LIST)			

43	16849	1	VALVE PLUG SHAFT
42	121540	1	BOTTOM PISTON
40	121539	1	TOP PISTON
39	-	-	SEAT RETAINER (SEE NOTE 1)
38	121541	1	DISC SEAT
37	121542	1	DISC RETAINER
33	121543	1	TOP PISTON RETAINING NUT
18	121505	1	LOWER PILOT SEAT ASSEMBLY
3	122982	1	BOTTOM PISTON RETAINING NUT
ITEM	PART NO.	REQ	DESCRIPTION
121618-1.00 (1.00 PARTS LIST)			

NOTES:
REQUIRED FOR 1.00 VALVE

Figure 3-4. Valve Piston Assembly Kit (121618-[]) for 1.00" to 2.00" Valves



15	123084	123085	123086	1	SEAT CAGE GASKET
14	122326	122327	122328	1	SEAT BACK-UP RING
13	N/A	N/A	122246	1	PILOT SPRING BACK-UP WASHER
12	122666	122667	122667	1	LOCKWASHER
11	122173	122173	122234	1	PISTON RETAINING RING
10	122082	122082	122173	1	LOWER PILOT SPRING RETAINER
9	122081	122232	122233	1	LOWER PILOT SPRING
8	122174	122174	122238	4	SOCKET HEAD CAP SCREW
7	121934	122031	122177	1	RETAINING DISC
6	122648	122658	122659	1	VALVE STEM
5	121935	122032	122178	1	SEAT
4	16970	161005	161050	1	TOP PISTON
3	16972	161006	161047	1	VALVE PLUG SHAFT
2	16962	161007	161048	1	BOTTOM PISTON
1	16961	161004	161046	1	SEAT CAGE
ITEM	2 1/2"	3"	4"	QTY.	DESCRIPTION
PARTS LIST					

Figure 3-5. Main Valve Assembly Kit (27006-[]) for 2.50" to 4.00" Valves

4. INSTALLATION OF RETROFIT KIT ITEMS

When installing the new Electronic Control Valve Actuator and Electronic Control System (ECS) Control Box, a number of ancillary items must also be installed or replaced. These include a new Flow Meter, a replacement Water Solenoid Valve and several Temperature Sensors.

To install the Retrofit Kit items, proceed as follows:

4.1 Installation of Control Valve Actuator and Linkage Assembly

Identical Actuator Assemblies, part no. 69009 are used on all AERCO Control Valve sizes from 1 inch to 4 inches. However, there are two types of Linkage Assemblies designated part no. 24038-1 and -2 used with different sizes of AERCO Control Valves. Linkage Assembly, part no. 24038-1 is used on AERCO Valve sizes ranging from 1 inch to 3 inches. The 24038-2 Linkage Assembly is used only on 4 inch Valves. The primary difference between these two assemblies is the Linkage Assembly Adapter shown in Figure 4-1. In addition, the linkage pin location for 24038-1 assemblies will vary for 1 to 2 inch Valves and for 2 ½ to 3 inch Valves as shown in the upper portion of Figure 4-1.

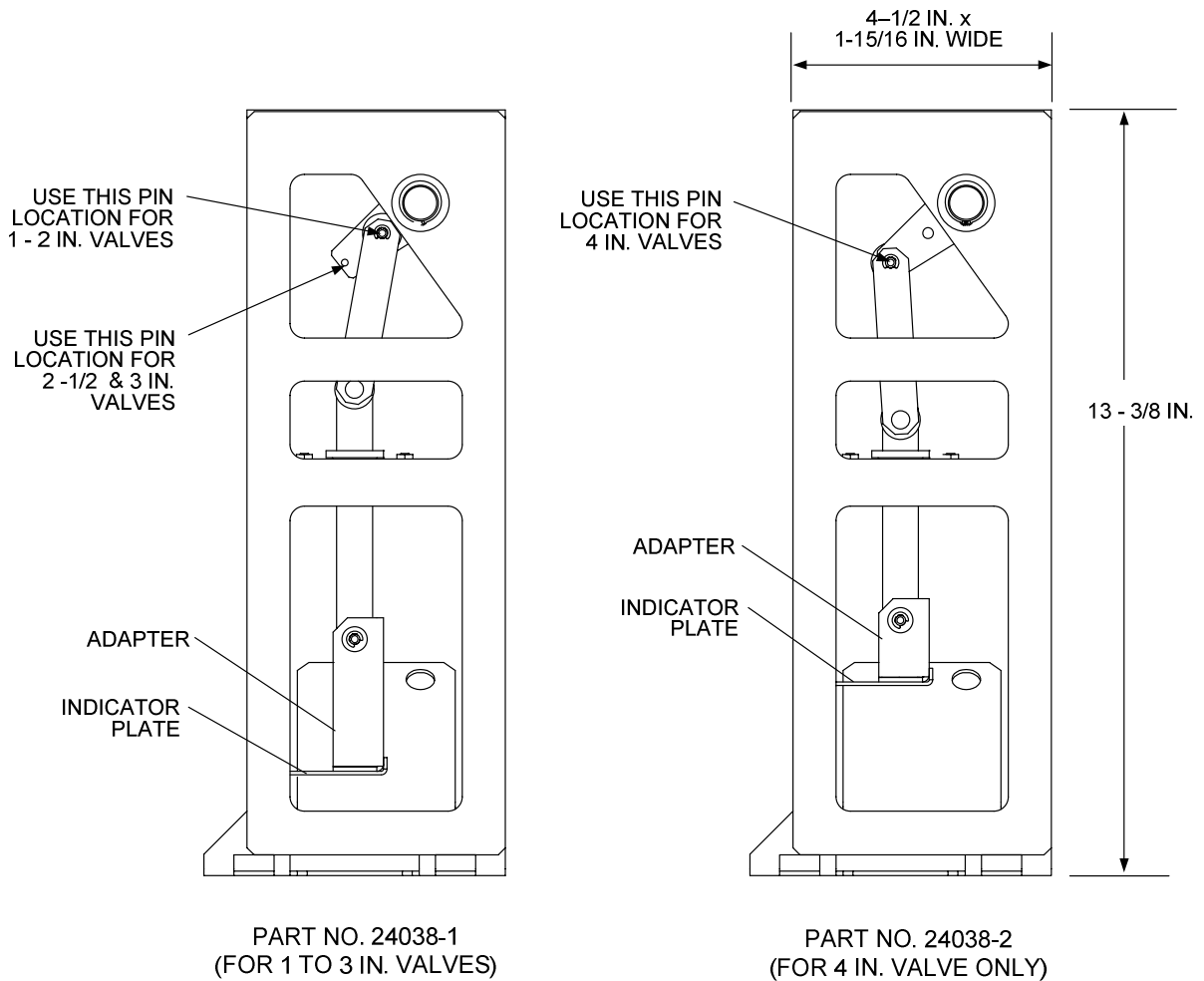


Figure 4-1. Linkage Assemblies Part No. 24038-1 & 24038-2

The installation procedures for the Linkage Assembly and Actuator Assembly are provided in paragraphs 4.1.1 and 4.1.2 which follow.

4.1.1 Linkage Assembly Installation

Remove the Linkage Assembly from the Retrofit Kit and install as follows:

1. Check to ensure that the correct Linkage Assembly and Adapter are provided for the valve size being retrofitted (Figure 4-1). Also, ensure that the Linkage pin is inserted in the correct location for this valve size.

CAUTION

It is imperative that the Gasket provided with the Linkage Assembly be installed between the Valve Top and Linkage Assembly. Failure to do so will void the equipment warranty.

2. Refer to Figure 4-2 and position the Gasket and Linkage Assembly on the Valve Top as shown.
3. Secure the Linkage Assembly to the Valve Top using the two 3/8-16 Hex Head Bolts provided.
4. Install two 1/4-20 Hex Nuts (1 to 3 inch Valves), or two 3/8-16 Hex Nuts (4 inch Valve) on the Valve Shaft (Figure 4-2).
5. Rotate the two Hex Nuts clockwise towards the lower end of the Valve Shaft.
6. Install the Indicator Plate on the Valve Shaft with the curved end facing upward as shown in Figure 4-3.
7. Attach the Valve Shaft to the Linkage Adapter by rotating the Shaft counterclockwise (as viewed from above). If the Valve Shaft cannot be turned by hand, use an open-end wrench to turn the “double-nuts” on the Shaft until it engages the Linkage Adapter threads.
8. Press down on the Valve Shaft to compress the Pilot Spring in the Valve Body.
9. Raise the Indicator Plate so it is contacting the bottom of the Adapter and observe the position on the Linkage Scale. Rotate the Valve Shaft as necessary until the raised Indicator Plate is aligned with the “0” (zero) marking on the Linkage Scale.
10. When properly aligned, raise the Hex Nuts on the Valve Shaft by rotating them counterclockwise. Position the Hex Nuts so they are snug against the Indicator Plate.
11. Proceed to paragraph 4.1.2 to install the Actuator Assembly.

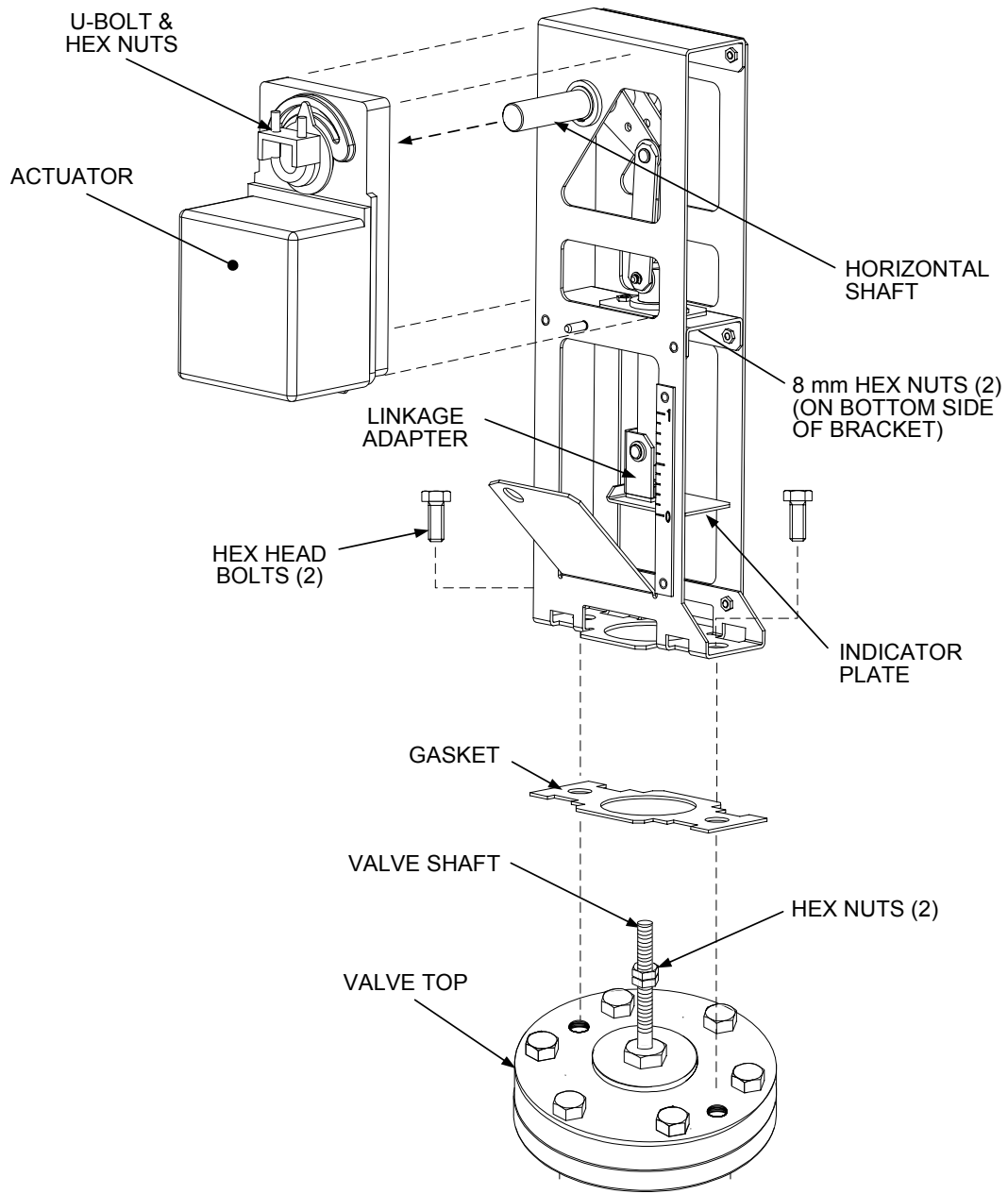
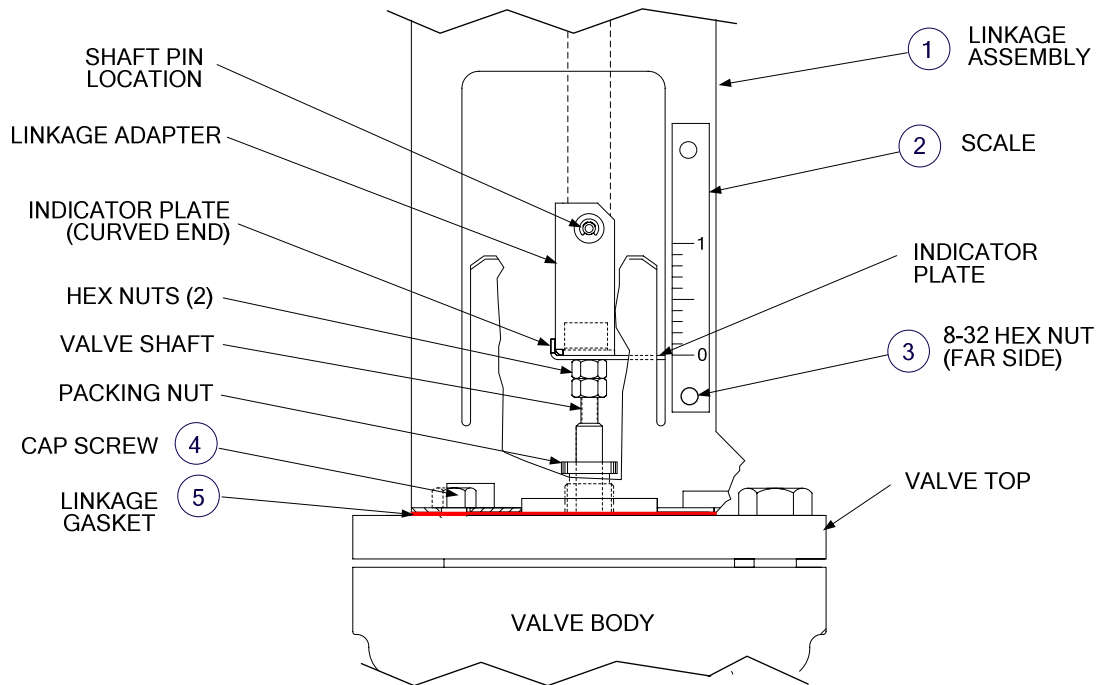


Figure 4-2. Actuator and Linkage Installation Details



ITEM	QTY	PART DESCRIPTION	PART NUMBER
1	1	LINKAGE ASSEMBLY	24038-1 (1" TO 3" VALVES)
2	1	SCALE	59028-1 (1" VALVE) 59028-1.25 (1.25" VALVE) 59028-1.5 (1.5" VALVE) 59028-2 (2" VALVE) 59028-2.5 (2.5" VALVE) 59028-3 (3" VALVE) 59028-4 (4" VALVE)
3	2	8-32 HEX NUT	123322
4	2	3/8-16 X 5/8 LONG CAP SCREW	54014
5	1	GASKET	81046

Figure 4-3. Linkage Installation Details

4.1.2 Actuator Installation

Remove the Actuator Assembly (69009) from the Retrofit Kit and install as follows:

1. Depress and hold the Clutch Button (Figure 4-4) and rotate the pointer to approximately 80° on the dial. Release the Clutch Button when properly positioned.

CAUTION

DO NOT DEPRESS THE CLUTCH BUTTON WITH POWER APPLIED TO THE ACTUATOR

2. Slide the Actuator onto the Linkage Assembly Shaft (Figures 4-2 & 4-4). Ensure that the pin on the Linkage Assembly is inserted in the center slot on the bottom of the Actuator (Figure 4-4).

3. Press down on the Linkage Adapter and verify that the Indicator Plate is aligned with the "0" Scale marking.
4. With the Indicator Plate properly aligned, tighten the U-bolt hex nuts using an 8 mm wrench. Torque the nuts to 60 in-lbs.
5. This completes the mechanical installation of the Actuator Assembly. The electrical connections will be made during installation of the Control Box in paragraph 4.7.

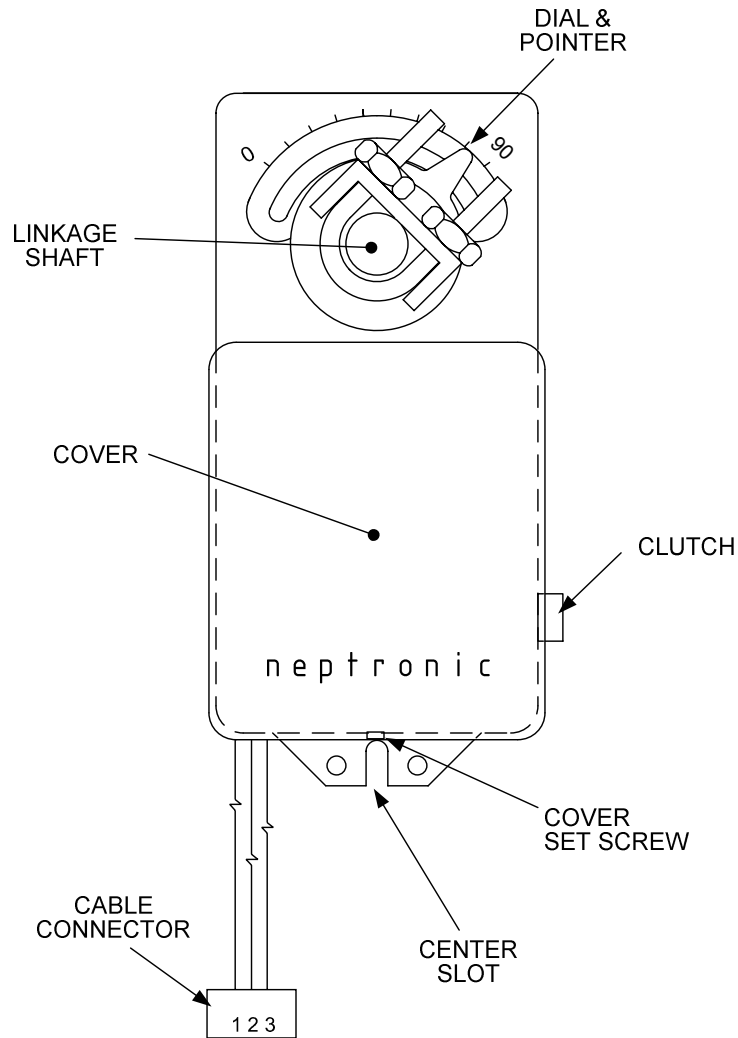


Figure 4-4. Actuator Assembly, Part No. 69009

4.2 Installation of ECS Components on Top Head Assembly

The ECS to be installed on the Top Head Assembly include:

- Outlet Flange & Gasket
- Outlet Temperature Dual Sensor
- Water Solenoid Valve and piping
- Plugs for previously installed: Shunt Tube, Thermal Element, Feedback Sensor, etc., etc.

4.2.1 Outlet Flange

New Outlet Flange (95015) and Gasket (122152) are provided in the Retrofit Kit. This new Flange contains a tapped hole which permits easy installation of the new Outlet Temperature Dual Sensor described in para. 4.2.2. To install the new Outlet Flange and Gasket:

1. Ensure that the Outlet opening in the Top Head (see Figure 2-1, sht. 3) has been thoroughly cleaned of any gasket residue from the previously installed gasket.
2. Position the new Outlet Flange and Gasket on the four studs protruding from the Top Head on the Heater.
3. Secure the Outlet Flange to the Top Head using the four hex nuts previously removed in para. 2.3, step 8. Tighten the hex nuts using an alternating pattern to obtain a uniform seal. Reconnect the outlet piping to new Outlet Flange.

4.2.2 Outlet Temperature Dual Sensor

The Outlet Temperature Dual Sensor (61008-1) provided in the Retrofit Kit includes two Type J Thermocouples which are housed in a thermowell. The Thermocouple leads are terminated with a 4-pin connector.

1. Install the Outlet Temperature Dual Sensor in the tapped hole provided on the new Outlet Flange installed in the previous paragraph.
2. Connection of the Dual Sensor electrical connector will be accomplished following installation of the ECS Control Box (para. 4.4).

4.2.3 Water Solenoid

The 120 VAC Water Solenoid removed in Section 2 will be replaced with the 24 VDC Solenoid Valve provided in the Retrofit Kit. Proceed as follows:

1. Attach the new Solenoid Valve (49029) to the nipple in the Top Head (ref. Figure 2-1, sht. 3)
2. Reconnect the previously installed drain piping to the Solenoid Valve outlet.
3. Electrical connection of the Solenoid Valve will be accomplished following installation of the ECS Control Box.

4.2.4 NPT Plugs

Each Retrofit Kit contains four NPT Plugs in the following sizes:

- 1/4 inch
- 1/2 inch
- 3/4 inch
- 1 inch

These plugs are installed in the remaining tapped holes in the Top Head where components used with the previous Control System were installed. The location and size of the required Plugs may vary depending on the specific AERCO Heater Model being retrofitted. Refer to Figure 2-1 for reference.

Ensure that all tapped holes in the Top Head have been plugged before proceeding with the installation.

4.3 Flow Meter Installation

As part of the Electronic Control System (ECS) Retrofit, a new Flow Meter must be added to the Packaged Heater. The purpose of this meter is to provide a feed-forward signal to the Temperature Controller contained in the ECS Control Box. The installation location will vary depending on whether the AERCO Water Heater Model being retrofitted is a Helitherm Heat Exchanger (A-Plus, B-Plus, B-Plus II and E-Plus), or a Double-Wall Heat Exchanger (DW-24, DW-45, DW-68). For Helitherm Model Heaters, the Flow Meter is installed between the Cold Water Inlet and the Drain Outlet on the Bottom Head of the Heater (Figures 4-5 and 4-6). However, for Double Wall Heater Models, the Flow Meter is installed between the Cold Water Inlet and Drain Outlet on the Heater Shell. See Figure 4-7. All required installation components are included in the Retrofit Kit. Proceed to paragraph 4.3.1 (Helitherm) or 4.3.2 (Double-Wall), as applicable.

IMPORTANT

Prior to installing the inlet or outlet tubes to the Flow Meter (step 2 of paragraphs 4.3.1 and 4.3.2), it will be necessary to first temporarily remove the strain relief assembly shown in Figure 4-8. After removal, perform the following steps:

1. First, hand-tighten the inlet and outlet tube compression fittings to the Flow Meter. Position the “flats” on the fitting to avoid interfering with reinstallation of the strain relief in the next step.
2. Next, attach the strain relief to the Flow Meter cable (Figure 4-8).
3. After the strain relief is installed, fully tighten the inlet and outlet tube compression fittings to the Flowmeter.

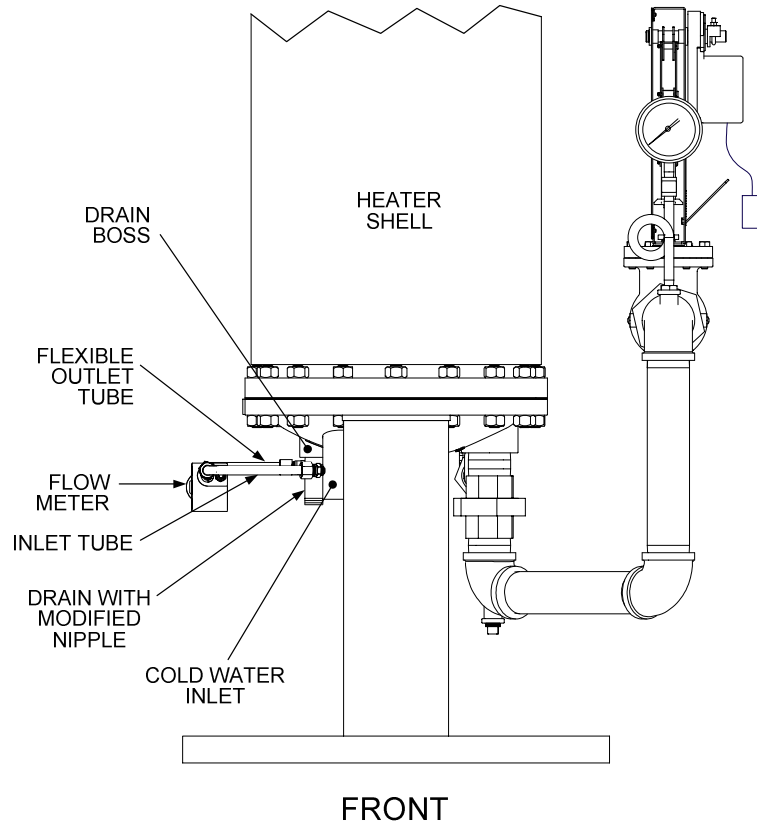


Figure 4-5. Typical (B+) Helitherm Heater Flow Meter Location – Front View

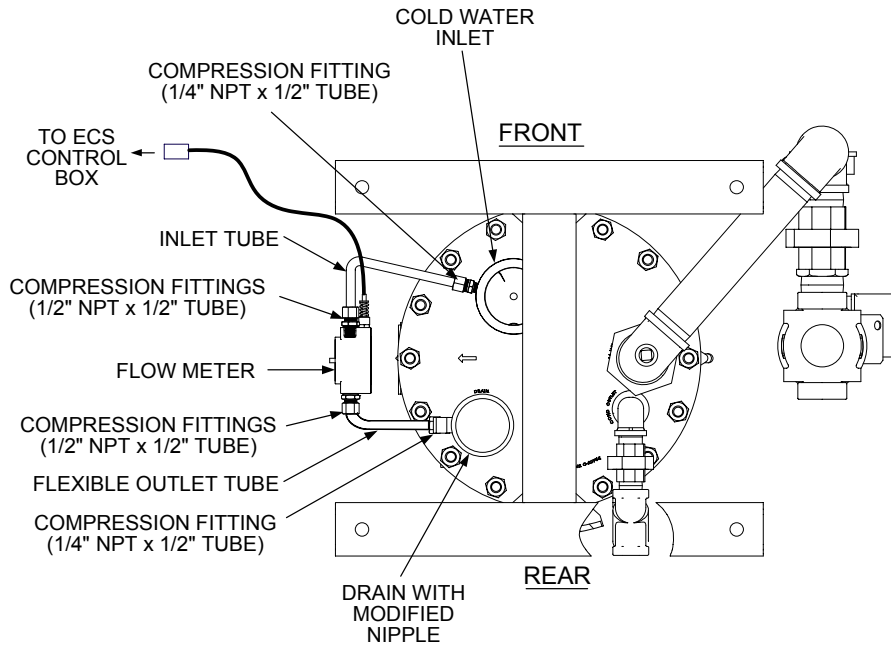


Figure 4-6. Typical (B+) Helitherm Heater Flow Meter Location – Bottom View

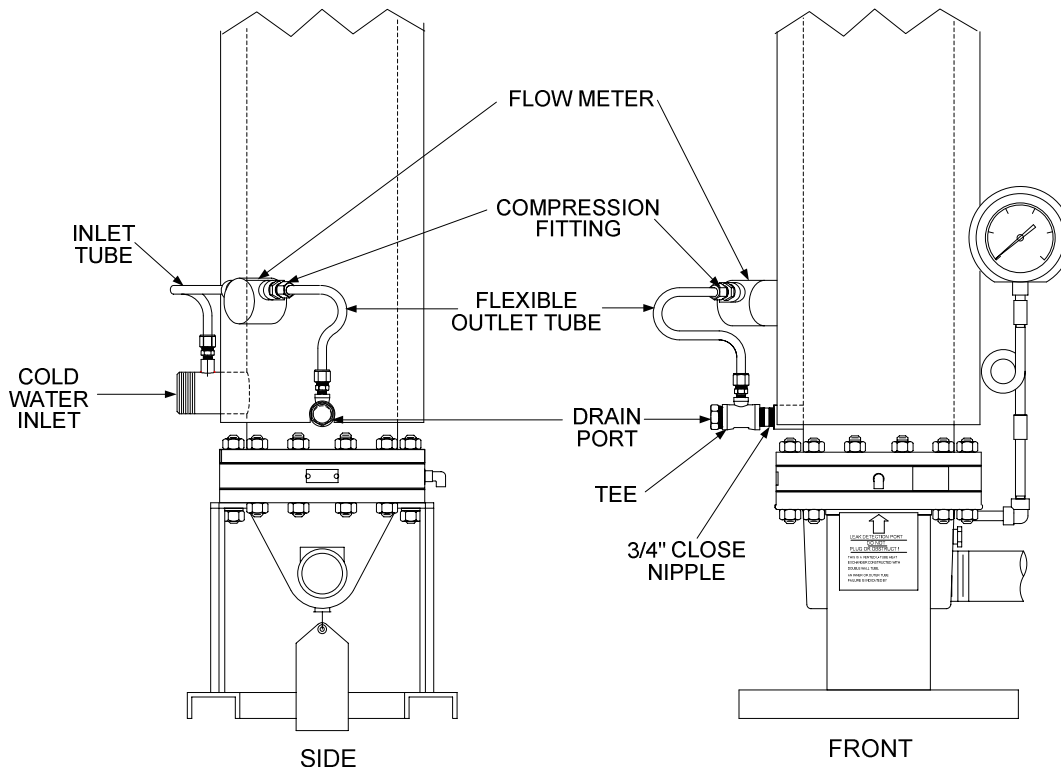


Figure 4-7. Double-Wall Heater Flow Meter Location

4.3.1 Flow Meter Installation For Helitherm Heaters

For A-Plus, B-Plus, B-Plus II and E-Plus Heaters, the Flow Meter connections are made at the Bottom Head of the Heater. The Flow Meter Inlet side connects to the Cold Water Inlet using Rigid Tubing. However, the Outlet side of the Flow Meter connects to the Drain Outlet using Flexible Tubing. A typical B-Plus or B-Plus II installation is shown in Figures 4-5 and 4-6. Refer to these Figures when performing the following steps:

1. Obtain the Flow Meter, Rigid Inlet Tube, Flexible Outlet Tube and Compression Fittings from the Retrofit Kit. Refer to Appendix A for the applicable part numbers for the tubing and fittings required for the unit being retrofitted.
2. Attach the Rigid Inlet Tube and Flexible Outlet Tube to the Flow Meter using the fittings provided in the kit.
3. Next, obtain the Modified 2" NPT Nipple (9006) from the Retrofit Kit.
4. Remove the existing 2" NPT Nipple from the Drain Outlet on the Bottom Head.
5. Install the new Modified 2" NPT Nipple in the Bottom Head. Attach the ¼ NPT coupling to the tapped hole in the Modified Nipple.

6. Connect the Flow Meter Outlet Flexible Hose to the Modified Nipple on the Drain Outlet using the compression fitting. Connect the Rigid Flow Meter Inlet Tube to the Cold Water Inlet using the compression fitting provided in the kit.
7. Position the Flow Meter so that the Paddle Wheel is in the “Vertical” plane as shown in Figure 4-8. Tighten all Flow Meter connection fittings.

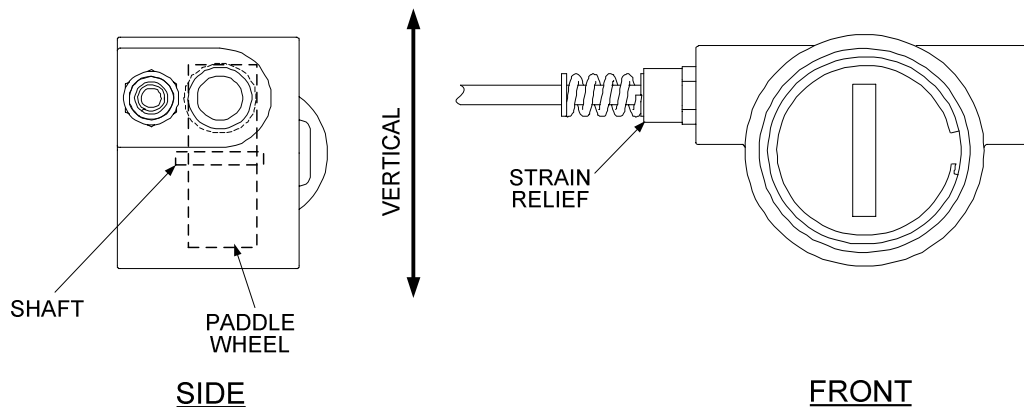


Figure 4-8. Flow Meter Orientation

4.3.2 Flow Meter Installation For Double-Wall Heaters

Flow Meter connections for Double-Wall Heater Models DW-24, DW-45 and DW-68 are made on the Shell as shown in Figure 4-7. As with Helitherm Models, Rigid Tubing is used for the Flow Meter Inlet connection to the Cold Water Inlet and Flexible Tubing is used for the Outlet connection at the Drain. Flow Meter installation is accomplished as follows:

1. Obtain the Flow Meter, Rigid Inlet Tube, Flexible Outlet Tube and Compression Fittings from the Retrofit Kit.
2. Attach the Rigid Inlet Tube and Flexible Outlet Tube to the Flow Meter using the fittings provided in the kit.
3. Next, obtain the 3/4" Close Nipple (9-234) and 3/4 x 1/4 x 3/4" Tee (59032) from the Retrofit Kit.
4. If installed, remove the 3/4" NPT Plug from the Drain Port on the Heater Shell (Ref. Figure 2-2, sht 1).
5. Install the Close Nipple and Tee in the Drain Port (Figure 4-7)
6. Connect the Flow Meter Outlet Flexible Tubing to the Drain Outlet Tee as shown in Figure 4-7. Connect the Rigid Inlet Tube from the Flow Meter to the Cold Water Inlet using the compression fitting provided.
7. Position the Flow Meter so that the Paddle Wheel is in the “Vertical” plane as shown in Figure 4-8.

NOTE

Paragraph 4.4 applies ONLY to Water-to-Water Heater Models which include E-Plus and Water-to-Water Double-Wall Models. Disregard the procedures in paragraph 4.4 for ALL Steam-to-Water Heater Models and proceed directly to paragraph 4.5.

4.4 Boiler Water Inlet and Outlet Temperature Sensors – (Water-to-Water Heaters)

If the Water Heater being retrofitted is an E-Plus or a Water-to-Water Double-Wall, two additional Temperature Sensors (Type J Thermocouples) must be added. These are the Boiler Water Inlet Temperature Sensor and Boiler Water Outlet Temperature Sensor. For E-Plus (Helitherm) Heaters, the Inlet and Outlet Sensors are mounted in the Bottom Head and Top Head, respectively as shown in Figure 4-9. For Water-to-Water Double-Wall Heaters, the Boiler Water Inlet and Outlet Temperature Sensors are mounted at the locations shown in Figure 4-10.

These two additional Temperature Sensors are identical (part no. 61009-1) and therefore can be installed in either location.

4.4.1 E-Plus Water Heaters

Refer to Figure 4-9 and install the Boiler Water Inlet and Outlet Sensors as follows:

1. Check to ensure that the capillary tubes and compression fittings have been removed from the Boiler Inlet and Outlet Valve Spool Piece Assemblies shown in Figure 4-9. If they have not been previously removed, disconnect and remove these items at this time.
2. Install the Boiler Water Inlet Temperature Sensor in the tapped opening in the Valve Spool Piece Assembly which connects to the Boiler Water Inlet on the Bottom Head Heater.
3. Install the Boiler Water Outlet Temperature Sensor in the tapped opening in the Valve Spool Piece Assembly which connects to the Boiler Water Outlet on the Top Head of the Heater.
4. The electrical connector plugs on the Inlet and Outlet Boiler Water Temperature Sensors will be connected after the ECS Control Box is installed (paragraph 4.5).

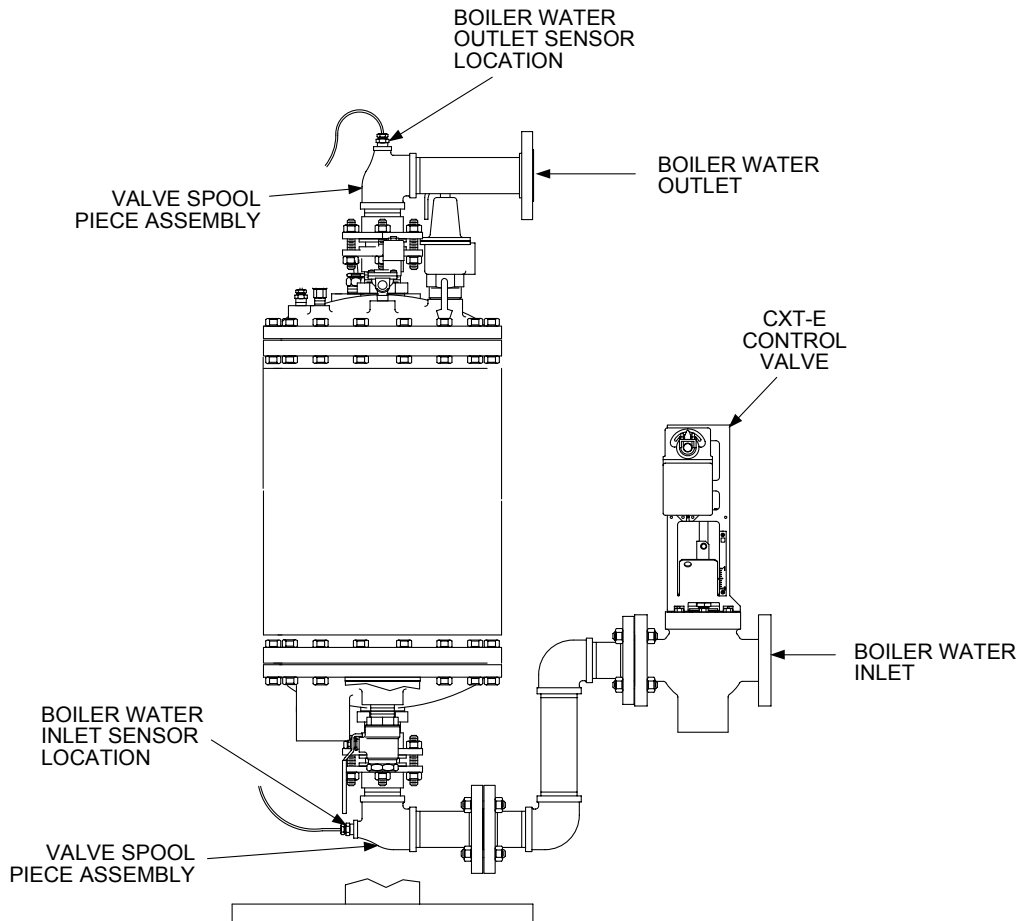
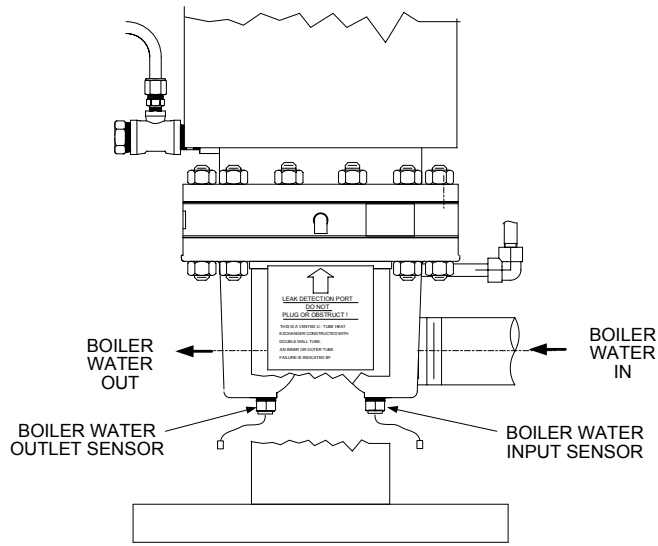


Figure 4-9. E-Plus Boiler Water Inlet and Outlet Temperature Sensor Locations

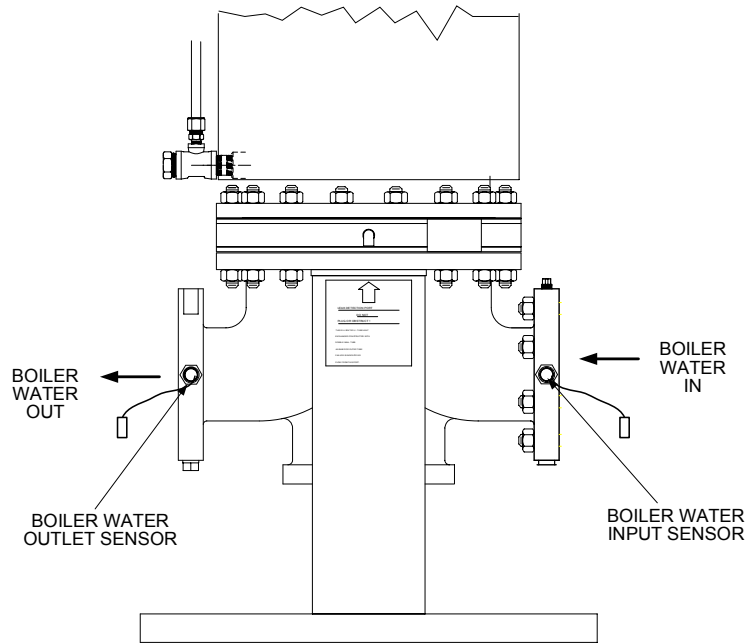
4.4.2 Double-Wall Water Heaters

The sensor installation locations for a Water-to-Water Model DW-24 differ slightly from the locations used for DW-45 and DW-68 Models as shown in Figure 4-10. DW-45 and DW-68 Sensors are mounted on the Boiler Water Inlet and Outlet Flanges. However, since these flanges do not exist for the DW-24, the Sensors are mounted on the bottom of the Boiler Water Inlet and Outlet as shown in Figure 4-10. Install the Boiler Water Inlet and Outlet Sensors as follows for the Model being retrofitted:

1. Check to ensure that the capillary tubes and compression fittings have been removed from the Boiler Inlet and Outlet Flanges shown in Figure 4-10. If they have not been previously removed, disconnect and remove these items at this time.
2. For DW-45 and DW-68 Models, install the Boiler Water Inlet Temperature Sensor in the tapped opening in the Boiler Water Inlet Flange shown in Figure 4-10. For a DW-24 Model, install the Sensor in the tapped hole at the bottom of the Boiler Water Inlet as shown.
3. For DW-45 and DW-68 Models, install the Boiler Water Outlet Temperature Sensor in the tapped opening in the Boiler Water Outlet Flange shown in Figure 4-10. . For a DW-24 Model, install the Sensor in the tapped hole at the bottom of the Boiler Water Inlet as shown.
4. The electrical connector plugs on the Inlet and Outlet Boiler Water Temperature Sensors will be connected after the ECS Control Box is installed (paragraph 4.5).



DW-24



DW-45, DW-68

Figure 4-10. Boiler Water Inlet and Outlet Temperature Sensor Locations for Water-to-Water Double-Wall Heaters

NOTE

Paragraph 4.5 applies ONLY to Steam-to-Water Heater Models which include A-Plus, B-Plus, B-Plus II Helitherm Models and Steam-to-Water Double-Wall Models. Disregard the procedures in paragraph 4.5 for ALL Water-to-Water Heater Models and proceed directly to paragraph 4.6.

4.5 Compound Pressure Gauge

If the Water Heater being retrofitted is Steam-to-Water Model, a Compound Pressure Gauge is included in the Retrofit Kit. The Compound Pressure Gauge range will be sized to match the requirements of the Heater being retrofitted. In addition to the Gauge, all required fittings necessary for installation will be included in the kit.

For Steam-to-Water Helitherm Models, the Compound Pressure Gauge will be mounted downstream of the CXT-E Control Valve as shown in Figure 4-11. For Steam-to-Water Double-Wall Models, the Gauge will be mounted on the steam inlet flange as shown in Figure 4-12.

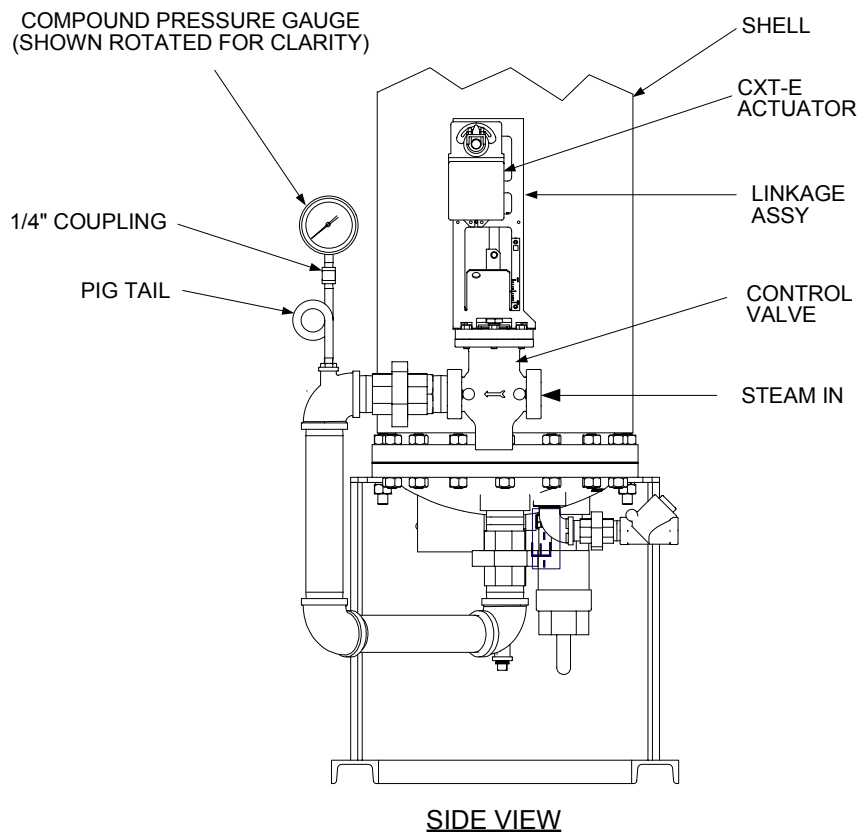
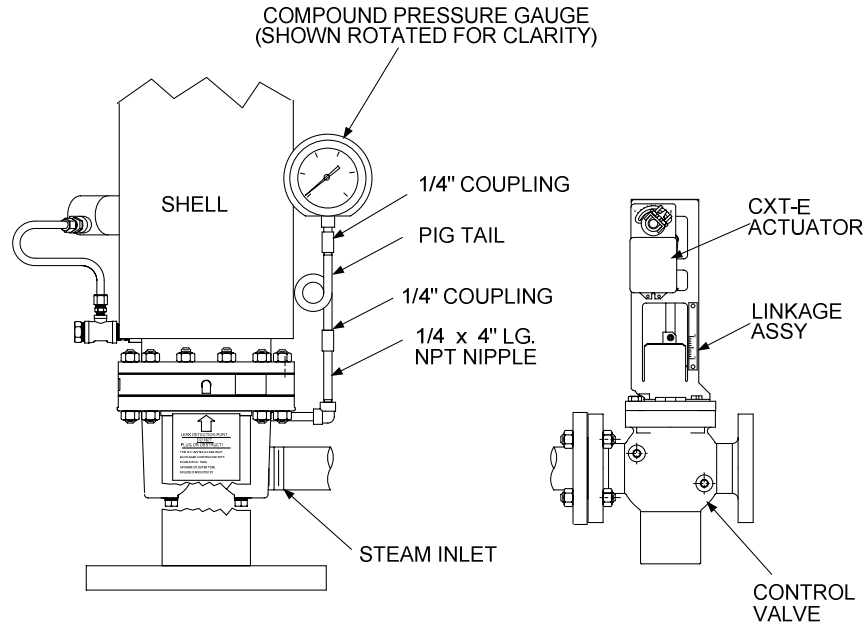
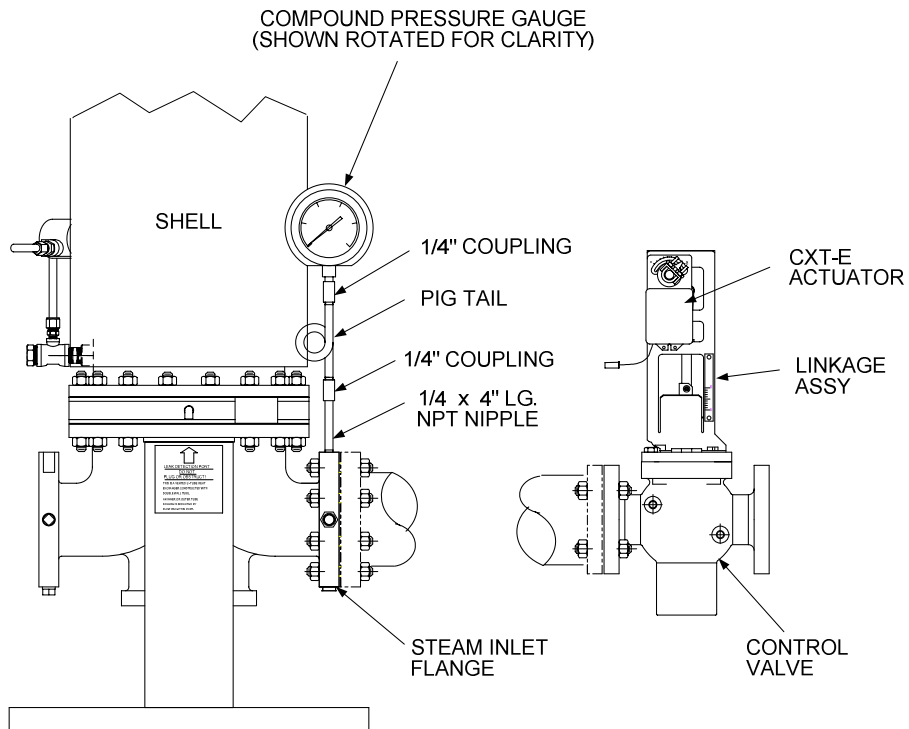


Figure 4-11. Compound Pressure Gauge Installation – Helitherm S/W Unit



DW-24 (STEAM-TO-WATER)



DW-68 (STEAM-TO-WATER)

Figure 4-12. Compound Pressure Gauge Installation – Double-Wall S/W Unit

4.5.1 Helitherm Steam-to-Water Units

For Helitherm Steam-to-Water units, refer to Figure 4-11 which shows a typical B-Plus Heater. Proceed as follows:

1. Remove the Compound Pressure Gauge (8356-[]), Pig Tail (8-20) and 1/4" Coupling (9-3) from the Retrofit Kit.
2. Install the Pig Tail in the tapped hole downstream of the CXT-E Control Valve.
3. Attach the 1/4" NPT Coupling and Pressure Gauge to the Pig Tail as shown in Figure 4-11. Tighten all connections.

4.5.2 Double Wall Steam-to-Water Units

For Double-Wall Steam-to-Water units, refer to Figure 4-12. This Figure shows typical Compound Pressure Gauge installation locations for DW-24 and DW-68 units.

1. Remove the Compound Pressure Gauge (8356-[]), Pig Tail (8-20), 1/4" NPT x 4" long Nipple (91024) and two 1/4" NPT Couplings (9-3) from the Retrofit Kit.
2. For a DW-24 unit, install the 4" long NPT Nipple to the existing elbow on the Steam Inlet. For DW-68 or DW-45 units, install the 4" long NPT Nipple to the Steam Inlet Flange.
3. Next install one of the 1/4" Couplings to the end of the 4" long Nipple.
4. Attach the Pig Tail, 1/4" Coupling and Compound Pressure Gauge as shown in Figure 4-12. Tighten all connections

4.6 Installation of New Orifice Disc

The Retrofit Kit contains a new Orifice Disc (part no. 49032-[]) sized for the applicable flow range used by the Heater being retrofitted. The Orifice Disc is located in the Cold Water Inlet on the Water Heater. For Helitherm Heater Models, the Cold Water Inlet is on the Bottom Head of the Heater as shown in Figure 4-13. However, for Double-Wall Models, the Cold Water Inlet is located on the Shell of the Heater as shown in Figure 4-14.

Refer to the applicable Figure for the unit being modified and install the new Orifice Disc and Spring Ring as follows:

1. Obtain the Orifice Disc and Spring Ring from the Retrofit Kit.
2. Insert the Orifice Disc fully into the Cold Water Inlet until it contacts the stops. Ensure that the Orifice is seated evenly in the Inlet.
3. Using a pair of needle-nose pliers, compress the ends of the Spring Ring and insert it fully into place.
4. This completes the installation of the new Orifice Disc.

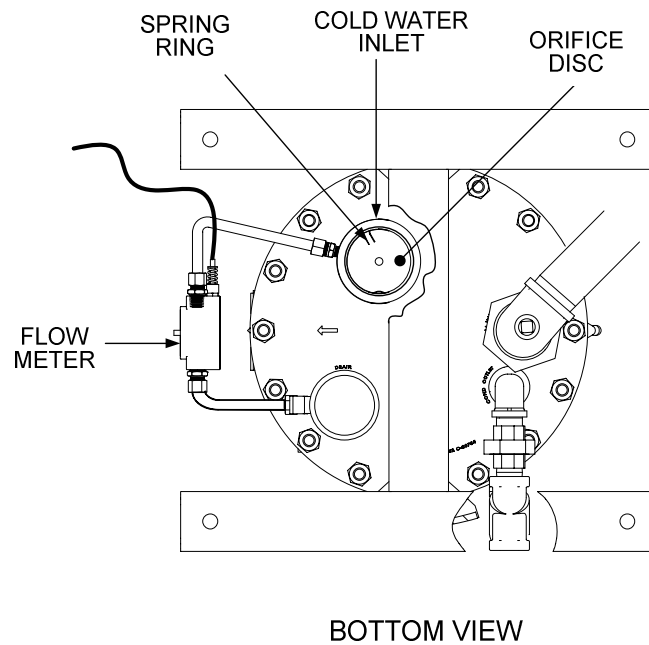


Figure 4-13. Cold Water Inlet Orifice Location – Typical Helitherm Heater

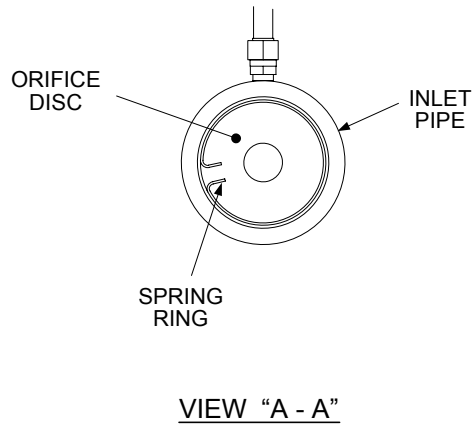
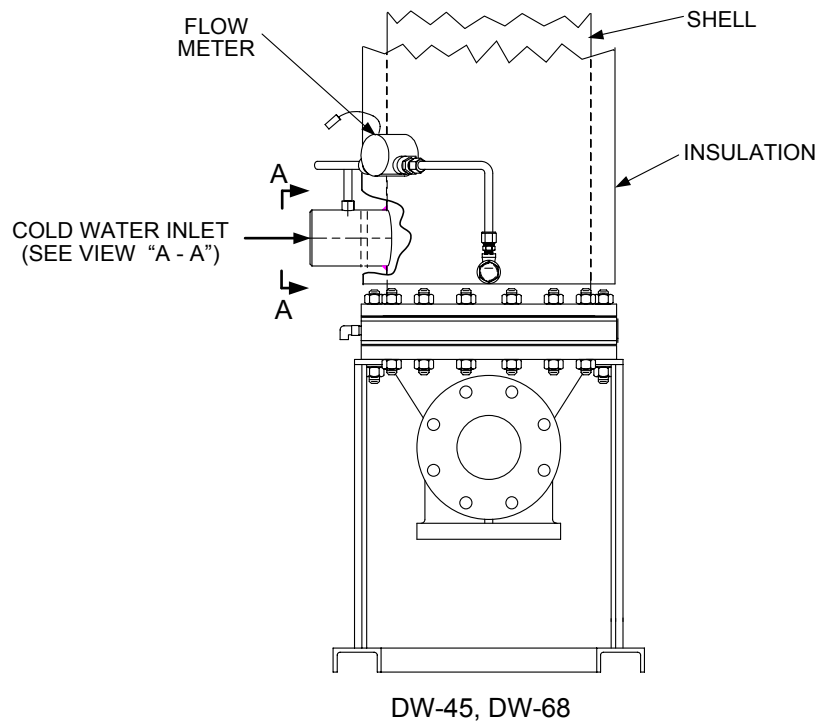


Figure 4-14. Cold Water Inlet Orifice Location – Double-Wall Heater

4.7 ECS Control Box Installation

The ECS Control Box is attached to the Water Heater using the old Control Box Mounting Bracket removed in Section 2. Install the new ECS Control Box in accordance with the following steps:

1. Attach the ECS Control Box to the Mounting Bracket using the two 1/4-20 x 1/2 " screws and washers provided in the Retrofit Kit.
2. Insert the top end of the Mounting Bracket under the previously loosened hex nut at the top of the Heater Shell (Figure 4-15). After the Bracket is vertically aligned, tighten the hex nut to secure the Mounting Bracket and ECS Control Box to the Water Heater.

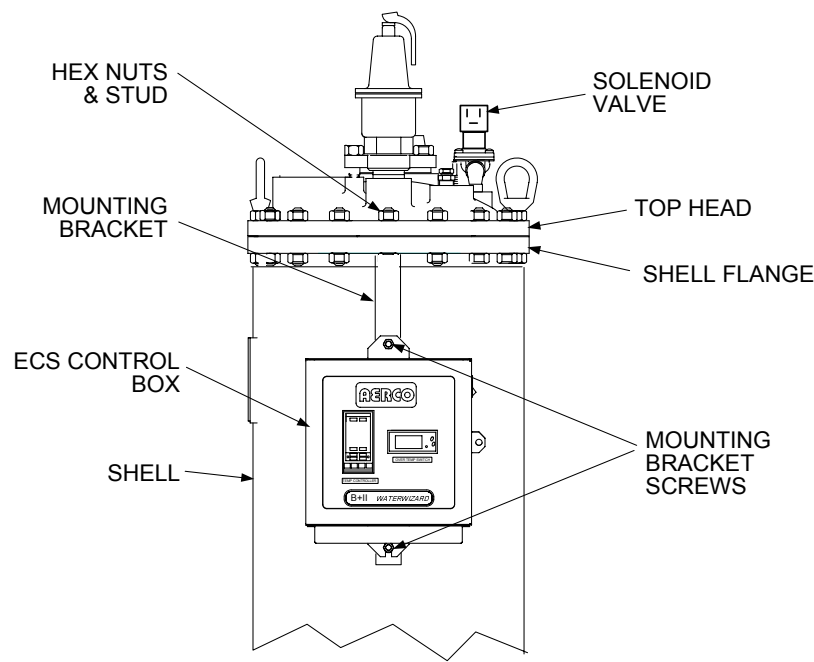


Figure 4-15. ECS Control Box Mounting Location

NOTE

External power at 120 to 240 VAC, 50/60 Hz is required to operate the circuitry contained in the ECS Control Box. Power connections are made internally by routing the power wiring through the cutout provided on the right side of the Control Box.

3. Next, loosen the captive Phillips head screw on the right front portion of the Control Box (Figure 4-16) to open the hinged door.
4. Swing open the door and loosen the captive Phillips head screw at the top of the recessed panel (Figure 4-17). Swing down the panel to access terminal block TB-2 (Figure 4-18)
5. Feed the external 120 to 240 VAC, 60 Hz) power leads through the cutout in the right side of the ECS Control Box.

6. Connect the Line, Neutral and Ground leads to the TB-2 terminals shown in Figure 4-18.
7. Close the swing-down panel after the power leads are secured to TB-2. Tighten the captive screw to secure the recessed panel.
8. Close the front door of the ECS Control Box and tighten the captive screw to secure it in the closed position.
9. Check the labels on the Control Box cables and connect them to the following components:

NOTE

The BOILER WATER IN and BOILER WATER OUT cables shown with an asterisk (*) are used on Water-to-Water Heaters ONLY (E-Plus or Double-Wall Models).

<u>Label</u>	<u>Connect To:</u>
VALVE ACTUATOR	3-Pin Molex Connector on Actuator
FLOWMETER	5-Pin Connector on Flow Meter
OUTLET TEMP	4-Pin Connector on Dual Sensor (Outlet Port)
*BOILER WATER IN	2-Pin Connector at Heating Fluid Inlet
*BOILER WATER OUT	2 Pin Connector at Heating Fluid Outlet

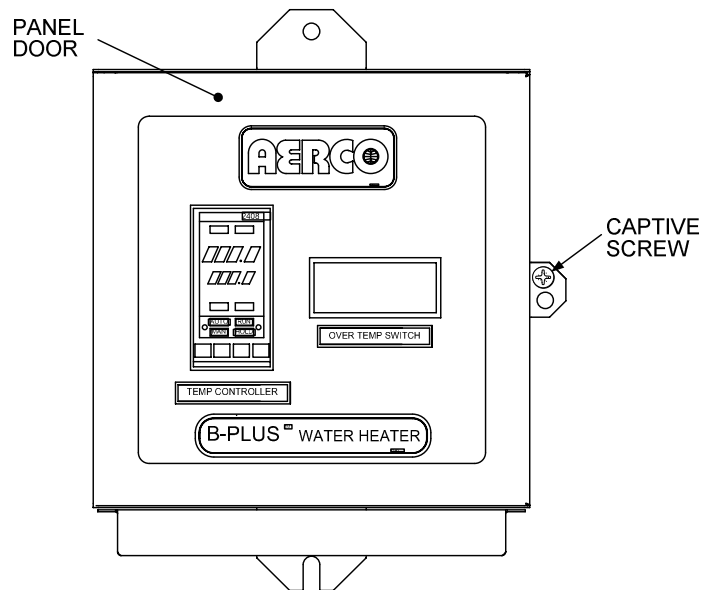


Figure 4-16. ECS Control Panel Front View

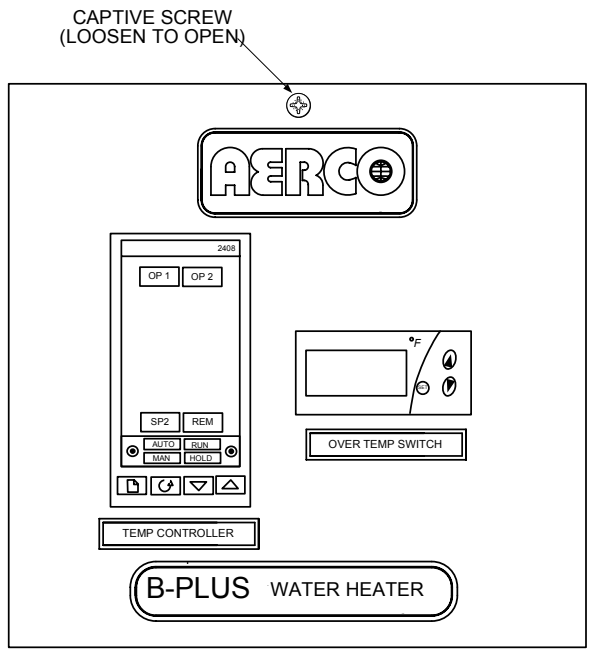


Figure 4-17. Recessed Panel Behind Control Box Door

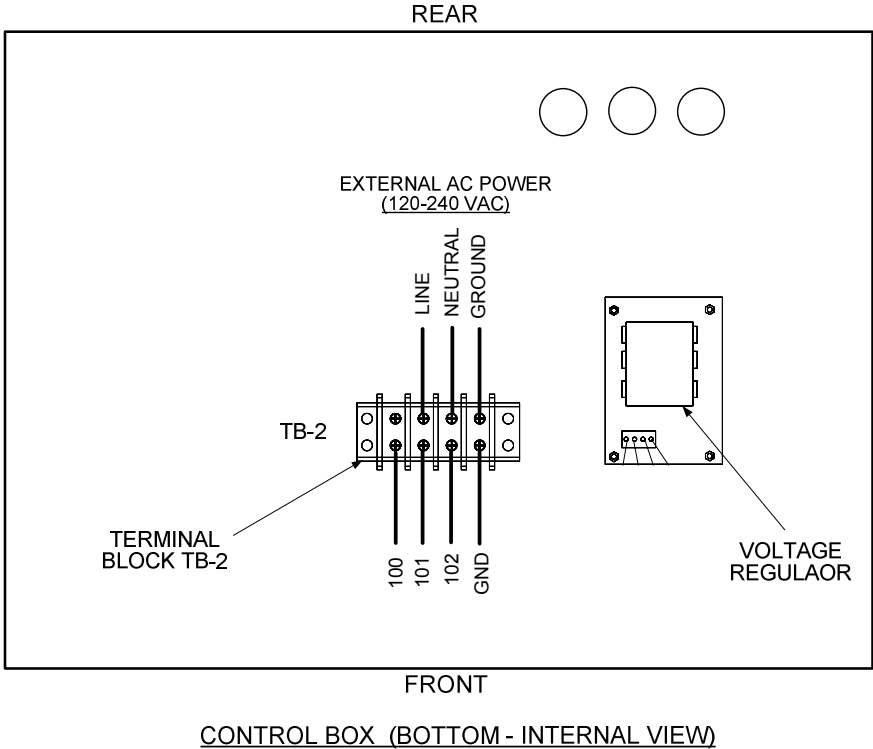


Figure 4-18. ECS Control Box AC Power Connections

5. POST INSTALLATION CONNECTIONS AND ADJUSTMENTS

Figures 5-1 and 5-2 show a typical B-Plus Helitherm Water Heater and a DW-68 Double Wall S/W Heater with all ECS and CXT-E Retrofit items installed. Upon completion of all retrofit procedures in Section 4, the ECS Retrofit heater must be thoroughly checked to ensure that all required external connections have been made to the modified Heater. In addition, CXT-E Actuator and ECS Control system adjustments must be made prior to placing the Heater back into service.

5.1 Input and Output Water Heater Connections

The following items must be checked to ensure the proper connections have been made:

1. **Drain Connection**
Ensure that the Drain Ball Valve has been replaced and that all external drain piping is reconnected.
2. **Cold Water Inlet**
Ensure that the Cold Water Inlet Flange is connected to the cold water inlet piping.
3. **Steam or Boiler Water Line**
Ensure that the Steam or Boiler Water supply line is connected to the inlet of the CXT-E Control Valve.
4. **Condensate Line**
Ensure it is connected to a nearby drain or condensate collection system.
5. **Electrical Power**
Ensure that AC power (120 to 240 volts) is connected to the ECS Control Box

5.2 Adjustments

Prior to placing the unit into operation, the CXT-E Actuator, ECS Temperature Controller and ECS Over-Temperature Switch must be set. The adjustment procedures for these items are provided in Section 3 of Operation and Maintenance Manual AC-105. A copy of this manual is included in the Retrofit Kit.

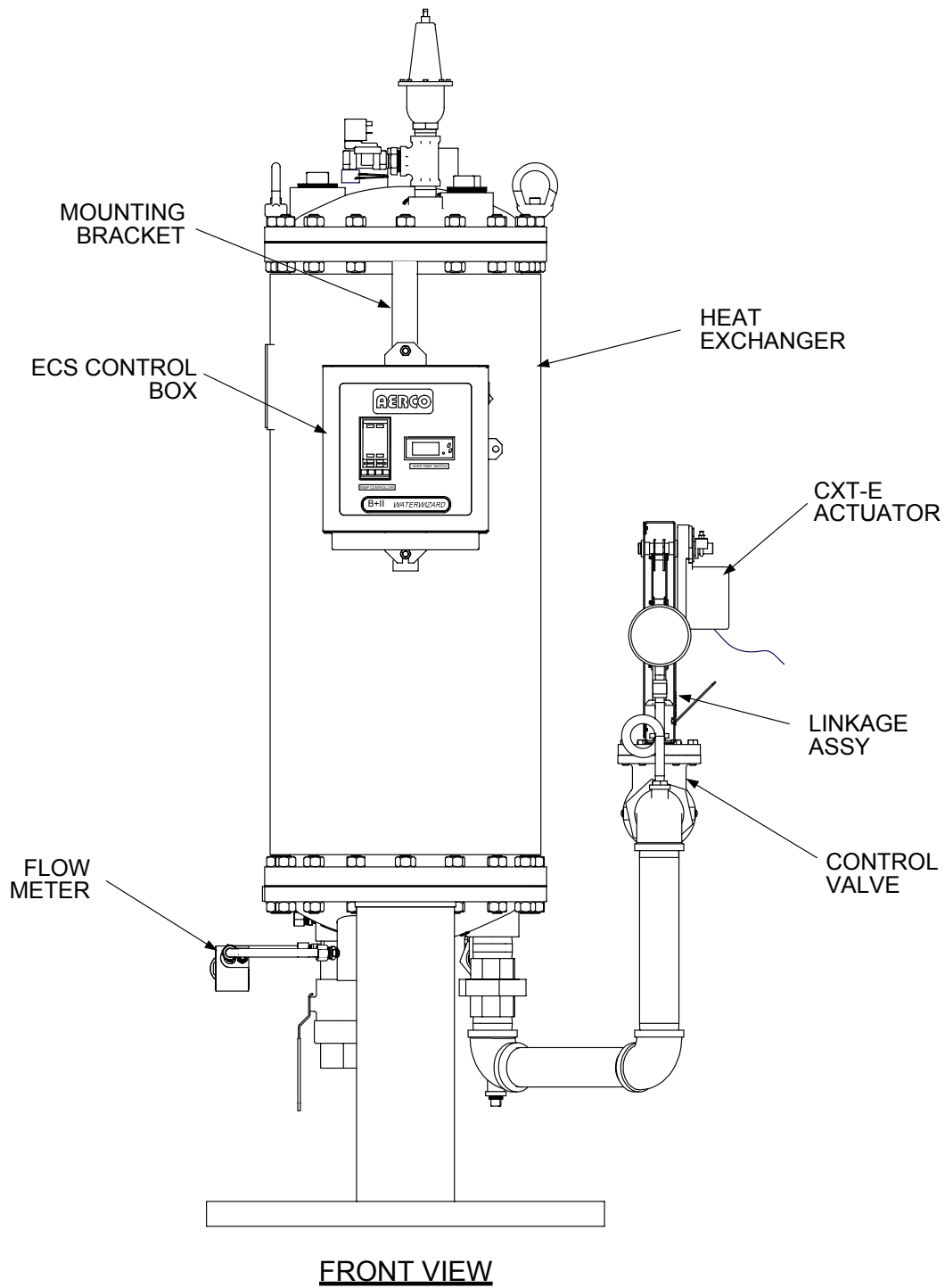
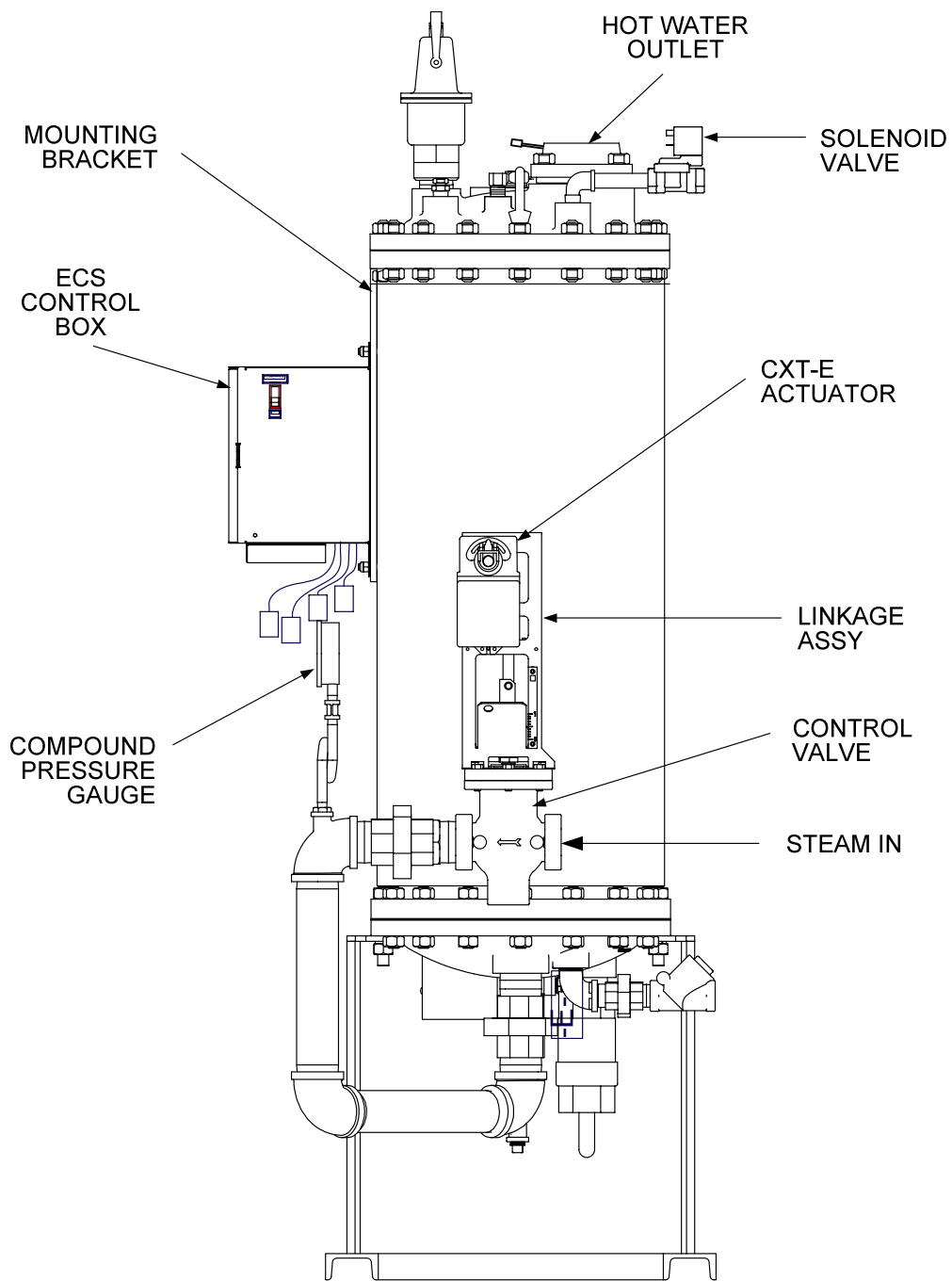


Figure 5-1. B-Plus Package Water Heater With ECS Control System & CXT-E Control Valve (Sheet 1 of 2)



SIDE VIEW

**Figure 5-1. B-Plus Package Water Heater With ECS Control System & CXT-E Control Valve
(Sheet 2 of 2)**

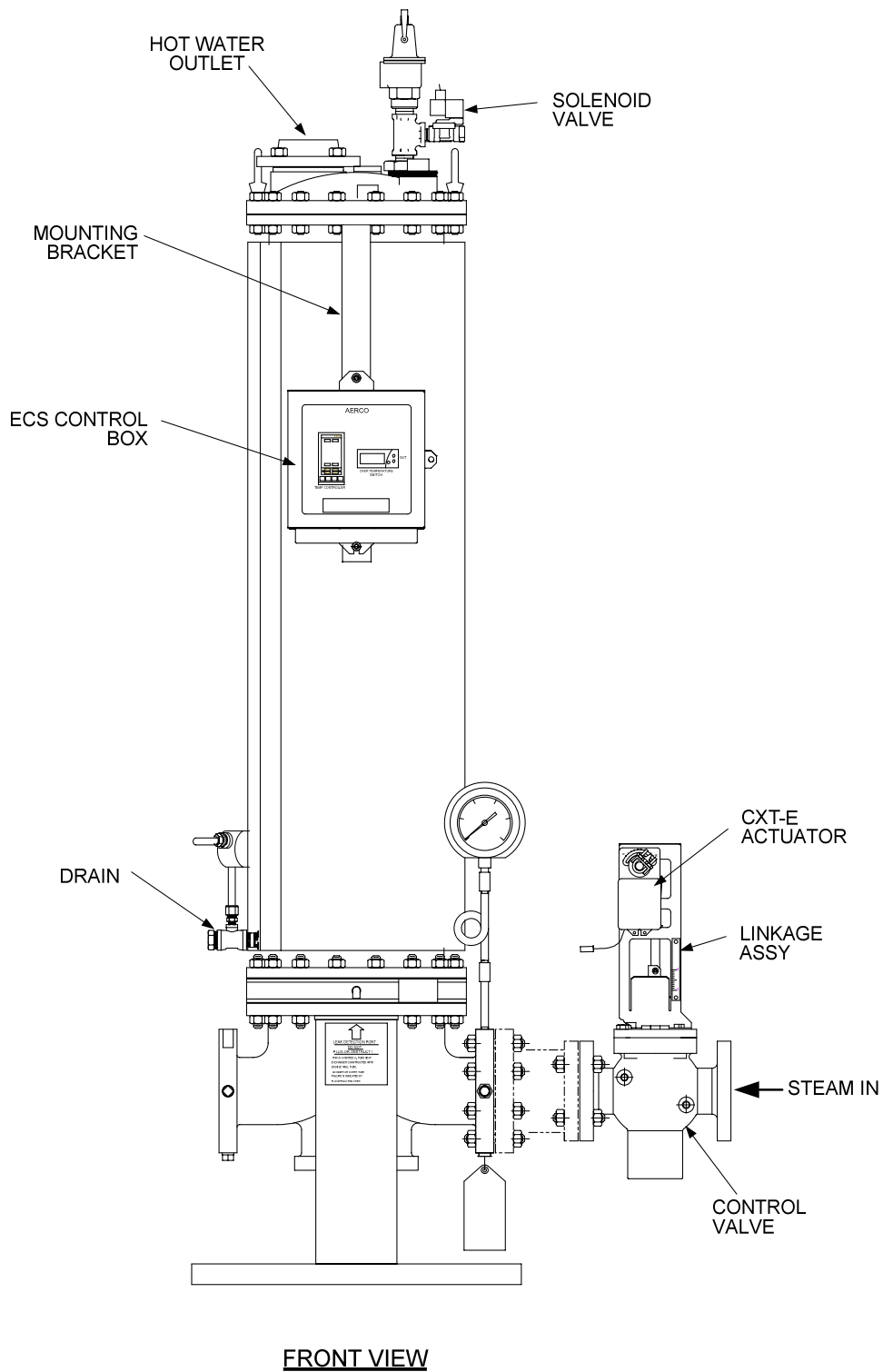
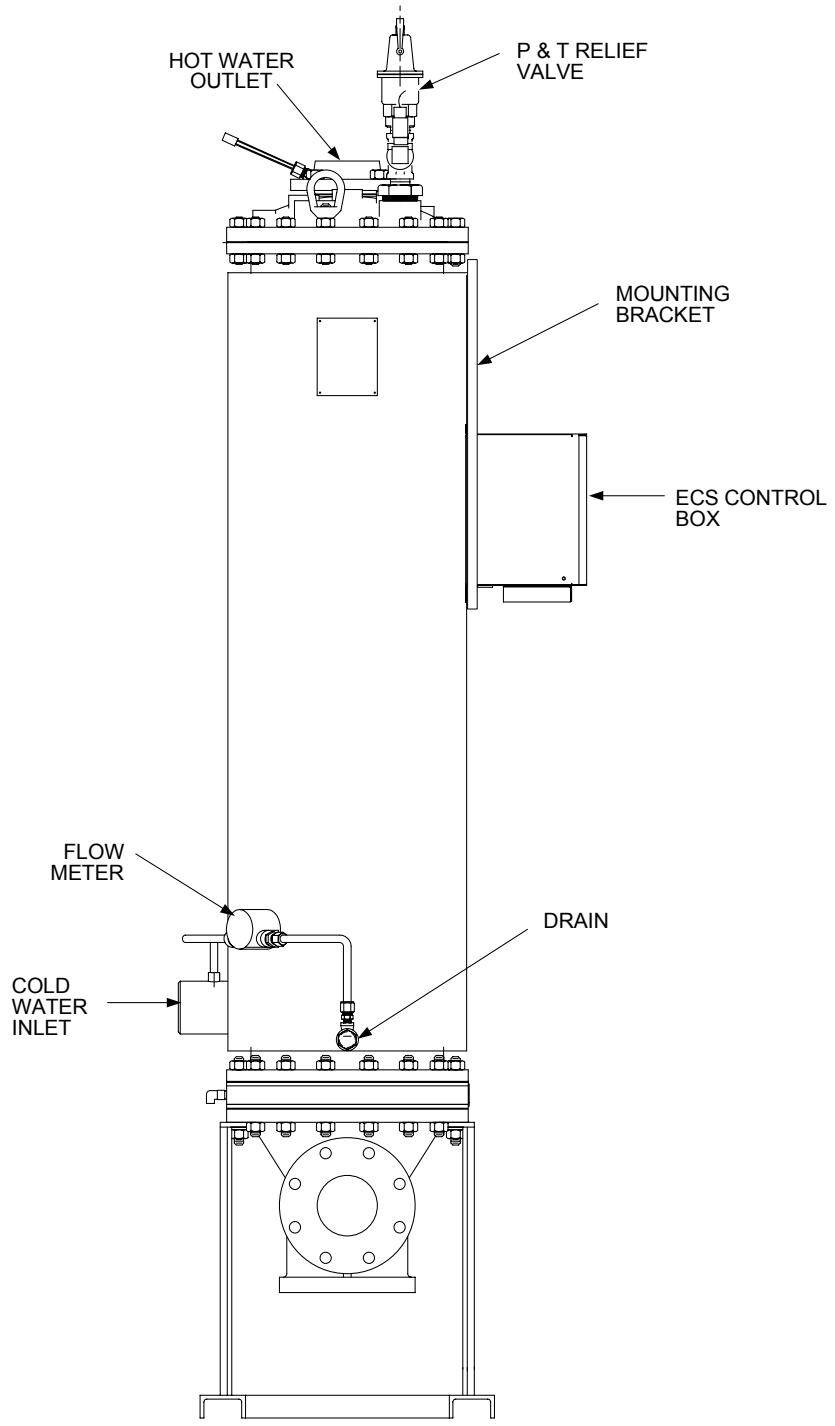
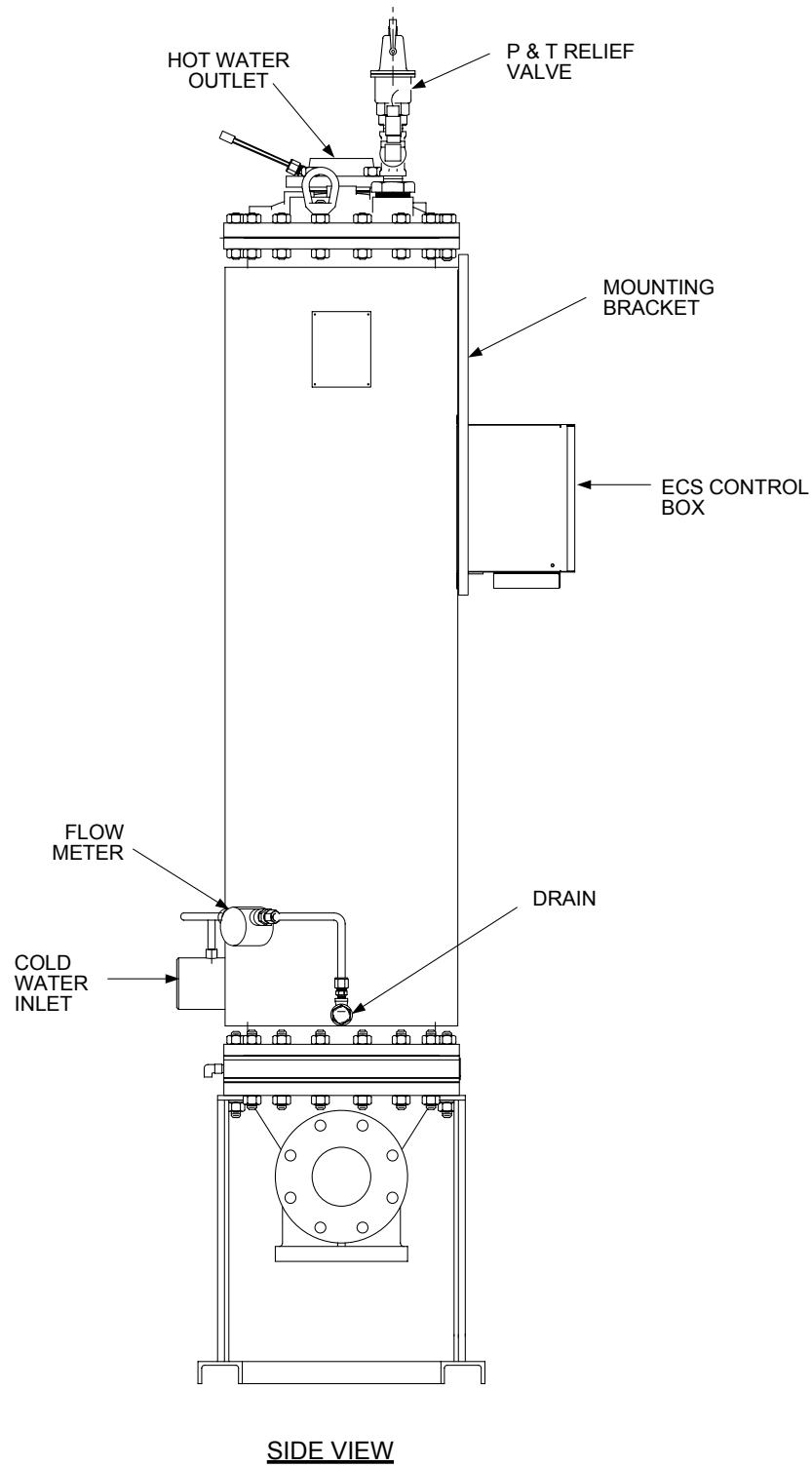


Figure 5-2. DW-68 Double Wall Water Heater With ECS Control System & CXT-E Control Valve (Sheet 1 of 2)



SIDE VIEW



**Figure 5-2. DW-68 Double Wall Water Heater With ECS Control System & CXT-E Control Valve
(Sheet 2 of 2)**

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APPENDIX A

**ECS RETROFIT KIT CONTENTS
FOR
PART NO. 27004-[]**

The basic ECS Retrofit Kit Contents for each type of AERCO Indirect Fired Water Heater are listed in Tables A-1 through A-14 which follow

TABLE A-1. RETROFIT KIT PART NO. 27004-1 FOR SW1-A PLUS WATER HEATERS

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	1	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	93029
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-1
11	1	LABEL	ELECTRIC BOX	72010-2
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91018
18	1	NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	90003
19	1	NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20	1	COUPLING, 1/4"	PRESSURE GAUGE	9-3
21	1	PIG TAIL	PRESSURE GAUGE	8-20
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	N/A
23	1	CLOSE NIPPLE, 3/4"	SHELL	N/A
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	N/A
25	1	J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	N/A
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-2. RETROFIT KIT PART NO. 27004-2 FOR SW1-B PLUS WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	1	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	93029
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-1
11	1	LABEL	ELECTRIC BOX	72010-3
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91018
18	1	NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	90003
19	1	NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20	1	COUPLING, 1/4"	PRESSURE GAUGE	9-3
21	1	PIG TAIL	PRESSURE GAUGE	8-20
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	N/A
23	1	CLOSE NIPPLE, 3/4"	SHELL	N/A
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	N/A
25	1	J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	N/A
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-3. RETROFIT KIT PART NO. 27004-3 FOR SW1-B PLUS II WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	1	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	93029
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-1
11	1	LABEL	ELECTRIC BOX	72010-4
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91018
18	1	NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	90003
19	1	NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20	1	COUPLING, 1/4"	PRESSURE GAUGE	9-3
21	1	PIG TAIL	PRESSURE GAUGE	8-20
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	N/A
23	1	CLOSE NIPPLE, 3/4"	SHELL	N/A
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	N/A
25	1	J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	N/A
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-4. RETROFIT KIT PART NO. 27004-5 FOR SW1-E PLUS WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	3	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	93029
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-1
11	1	LABEL	ELECTRIC BOX	72010-5
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91020
18	1	NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	90003
19	1	NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20	1	COUPLING, 1/4"	PRESSURE GAUGE	N/A
21	1	PIG TAIL	PRESSURE GAUGE	N/A
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	N/A
23	1	CLOSE NIPPLE, 3/4"	SHELL	N/A
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	N/A
25	1	J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	61009-1
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-5. RETROFIT KIT PART NO. 27004-6 FOR 8" SW DOUBLE WALL WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	3	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	N/A
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-1
11	1	LABEL	ELECTRIC BOX	72010-6
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91026
18	1	NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	N/A
19	1	NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20	2	COUPLING, 1/4"	PRESSURE GAUGE	9-3
21	1	PIG TAIL	PRESSURE GAUGE	8-20
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	91024
23	1	CLOSE NIPPLE, 3/4"	SHELL	9-234
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	59032
25		J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	N/A
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-6. RETROFIT KIT PART NO. 27004-7 FOR 8" WW DOUBLE WALL WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	2	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	93029
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-2
11	1	LABEL	ELECTRIC BOX	72010-6
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91026
18		NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	N/A
19		NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20		COUPLING, 1/4"	PRESSURE GAUGE	N/A
21		PIG TAIL	PRESSURE GAUGE	N/A
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	N/A
23	1	CLOSE NIPPLE, 3/4"	SHELL	9-234
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	59032
25	2	J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	61009-1
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-7. RETROFIT KIT PART NO. 27004-8 FOR 10" SW DOUBLE WALL WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	3	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	N/A
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-1
11	1	LABEL	ELECTRIC BOX	72010-6
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91023
18	1	NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	N/A
19	1	NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20	2	COUPLING, 1/4"	PRESSURE GAUGE	9-3
21	1	PIG TAIL	PRESSURE GAUGE	8-20
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	91024
23	1	CLOSE NIPPLE, 3/4"	SHELL	9-234
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	59032
25		J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	N/A
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-8. RETROFIT KIT PART NO. 27004-9 FOR 10" WW DOUBLE WALL WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	2	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	93029
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-2
11	1	LABEL	ELECTRIC BOX	72010-6
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91023
18		NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	N/A
19		NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20		COUPLING, 1/4"	PRESSURE GAUGE	N/A
21		PIG TAIL	PRESSURE GAUGE	N/A
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	N/A
23	1	CLOSE NIPPLE, 3/4"	SHELL	9-234
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	59032
25	2	J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	61009-1
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-9. RETROFIT KIT PART NO. 27004-10 FOR 12" SW DOUBLE WALL WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	3	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	N/A
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-1
11	1	LABEL	ELECTRIC BOX	72010-6
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91028
18	1	NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	N/A
19	1	NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20	2	COUPLING, 1/4"	PRESSURE GAUGE	9-3
21	1	PIG TAIL	PRESSURE GAUGE	8-20
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	91024
23	1	CLOSE NIPPLE, 3/4"	SHELL	9-234
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	59032
25		J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	N/A
26		BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	N/A
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

TABLE A-10. RETROFIT KIT PART NO. 27004-11 FOR 12" WW DOUBLE WALL WATER HEATER

ITEM	QTY	PART DESCRIPTION	LOCATION ON UNIT	PART NUMBER
1	1	OUTLET FLANGE	TOP HEAD	95015
2	1	PLUG. 1"	TOP HEAD	9-75
3	1	PLUG. 3/4"	TOP HEAD	9-73
4	1	PLUG 1/2"	TOP HEAD	9-368
5	1	PLUG. 1/4"	TOP HEAD	9-40
6	1	J THERMOCOUPLE, DUAL	TOP HEAD	61008-1
7	2	COMP. FITTING, 1/4 NPT x 3/16" TUBE	TOP HEAD/ VALVE LINE/ BOTTOM MANIFOLD	93029
8	1	OUTLET GASKET	TOP HEAD	16949
9	1	GASKET	TOP HEAD	122152
10	1	CONTROL BOX	ELECTRIC BOX	69012-2
11	1	LABEL	ELECTRIC BOX	72010-6
12	1	SOLENOID VALVE	TOP HEAD	49029
13	1	FLOW METER	BYPASS	64006
14	1	FLEXIBLE HOSE, SS BRAID	BYPASS	97009
15	1	COMP. FITTING, 1/2 NPT x 1/2" TUBE	BYPASS	93028
16	1	COMP. FITTING, 1/4 NPT x 1/2" TUBE	BYPASS	93027
17	1	INLET TUBE, FLOW METER	BYPASS	91028
18		NIPPLE, MODIFIED, 1-1/4"	BOTTOM HEAD	N/A
19		NIPPLE, MODIFIED 2 NPT SCH. 80	BOTTOM HEAD	N/A
20		COUPLING, 1/4"	PRESSURE GAUGE	N/A
21		PIG TAIL	PRESSURE GAUGE	N/A
22	1	NIPPLE, 1/4 NPT x 4" LG	PRESSURE GAUGE	N/A
23	1	CLOSE NIPPLE, 3/4"	SHELL	9-234
24	1	TEE, 3/4" x 1/4" 3/4"	SHELL	59032
25	2	J THERMOCOUPLE, SINGLE	VALVE LINE/ BOTTOM MANIFOLD	61009-1
26	1	BUSHING, 1/2" x 1/4"	VALVE LINE/ BOTTOM MANIFOLD	9-43
27	1	WIRING DIAGRAM	ECS	69008
28	2	BOLT, 1/4-20 x 1/2"	CONTROL BOX MTG.	6-138
29	4	FLAT WASHER, 1/4"	CONTROL BOX MTG.	124664

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APPENDIX B

ECS RETROFIT KIT OPTIONAL ITEMS

INTRODUCTION

The information included in this Appendix lists optional items which may vary, depending on:

- Type of Water Heater being retrofitted
- Required Water Heater flow rate
- Type of Control Valve Actuator previously installed
- Control Valve size

Table B-1 and the Tables/Appendices referenced therein, list the applicable items included in the Retrofit Kit for the specific Water Heater being retrofitted.

TABLE B-1. ECS RETROFIT KIT OPTIONAL ITEMS

ITEM	DESCRIPTION	LOCATION ON UNIT	QTY.	REFERENCE TABLE/APPENDIX
1	Orifice Disc	Cold Water Inlet	1	Table B-2
2	Compound Pressure Gauge (Steam-to Water Units ONLY)	Steam Inlet to Heater	1	Table B-3
3	Valve Flange Gaskets (2.50" to 4.00" Valves ONLY)	Control Valve Inlet & Outlet Flanges	2	Table B-4
4	Pneumatic or Electro-Hydraulic Actuator Replacement Kit	Control Valve	1	Appendix C
5	Self-Contained Actuator Replacement Kit	Control Valve	1	Appendix D

TABLE B-2. ORIFICE DISC OPTIONS (Table B-1, Item 1)

AERCO PART NO.	QTY	WATER HEATER FLOW RATE (GPM)	APPLICABLE UNITS
49032-1	1	0 – 45	B-Plus, B-Plus II, E-Plus
49032-2	1	0 – 70	B-Plus, B-Plus II, E-Plus
49032-3	1	0 – 125	B-Plus, B-Plus II, E-Plus
49032-4	1	> 125	B-Plus, B-Plus II, E-Plus
49032-5	1	0 – 45	A-Plus, DW-24
49032-6	1	0 – 70	A-Plus
49032-7	1	0 – 100	DW-45, DW-68
49032-8	1	0 – 45	DW-45, DW-68
49032-9	1	0 – 125	DW-45, DW-68
49032-10	1	> 125	DW-68

TABLE B-3. COMPOUND PRESSURE GAUGE OPTIONS (Table B-1, Item 2)

AERCO PART NO.	QTY	PRESSURE RANGE
8356-15	1	30" Vacuum to 15 ps1/kPa
8356-30	1	30" Vacuum to 30 ps1/kPa
8356-60	1	30" Vacuum to 60 ps1/kPa
8356-100	1	30" Vacuum to 100 ps1/kPa
8356-150	1	30" Vacuum to 150 ps1/kPa

TABLE B-4. VALVE FLANGE GASKET OPTIONS (Table B-1, Item 3)

AERCO VALVE PART NO.	DESCRIPTION	FLANGE GASKET PART NO.	FLANGE GASKET QTY
24036-1.00	1" CXT-E Control Valve	N/A	None
24036-1.25	1-1/4" CXT-E Control Valve	N/A	None
24036-1.50	1-1/2" CXT-E Control Valve	N/A	None
24036-2.00	2" CXT-E Control Valve	N/A	None
24036-2.50	2-1/2" CXT-E Control Valve	4-52	2
24036-3.00	3" CXT-E Control Valve	4-55	2
24036-4.00	4" CXT-E Control Valve	4-58	2

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APPENDIX C

**VALVE KITS REQUIRED
FOR
PREVIOUSLY INSTALLED PNEUMATIC OR
ELECTRO-HYDRAULIC ACTUATOR**

**TABLE C-1. VALVE KITS FOR PREVIOUSLY INSTALLED PNEUMATIC OR ELECTRO-HYDRAULIC ACTUATOR
(FOR VALVE SIZES FROM 1.00" TO 2.00")**

ITEM	QTY	PART NAME	VALVE SIZE AND PART NUMBERS			
			1.00"	1.25"	1.50"	2.00"
1	1	ACTUATOR	69009	69009	69009	69009
2	1	LINKAGE	24038-1	24038-1	24038-1	24038-1
3	1	GASKET	81046	81046	81046	81046
4	2	BOLT, HEX 3/8-16 x 5/8 LG	54014	54014	54014	54014
5	1	SCALE	59028-1	59028-1.25	59028-1.50	59028-2
6	2	NUT, HEX, #8-32	123322	123322	123322	123322
7	2	HEX NUT, 1/4-20	6-226	6-226	6-226	6-226
8	1	PACKING ASSY	121567	121567	121567	121567
9	1	DISC SEAT	121541	121527	121510	121531
10	1	LOWER PILOT SEAT ASSY	121505	121505	121505	121505
11		LOWER SHAFT	121979	121980	121980	121982

**TABLE C-2. VALVE KITS FOR PREVIOUSLY INSTALLED PNEUMATIC ACTUATOR
(FOR VALVE SIZES FROM 2.50" TO 4.00")**

ITEM	QTY	PART NAME	VALVE SIZE AND PART NUMBERS		
			2.50 INCH	3.00 INCH	4.00 INCH
1	1	ACTUATOR	69009	69009	69009
2	1	LINKAGE	24038-1	24038-1	24038-2
3	1	GASKET	81046	81046	81046
4	2	3/8-16 x 5/8" LG. CAP SREWS	54014	54014	54014
5	1	SCALE	59028-2.50	59028-3	59028-4
6	2	8-32 HEX NUT	123332	123322	123322
7	2	1/4-20 NUT	6-226	6-226	N/A
8	2	3/8-16 HEX NUT	N/A	N/A	6-264
9	1	PACKING ASSY	121567	121568	121568
10	1	VALVE SEAT	121935	122032	122178
11	1	LOWER SHAFT	122223	122230	122224

APPENDIX D

**VALVE KITS REQUIRED
FOR
PREVIOUSLY INSTALLED SELF-CONTAINED ACTUATOR**

**TABLE D-1. VALVE KITS FOR PREVIOUSLY INSTALLED SELF-CONTAINED ACTUATOR
(FOR VALVE SIZES FROM 1.00" TO 2.00")**

ITEM	QTY	PART NAME	VALVE SIZE AND PART NUMBERS			
			1.00"	1.25"	1.50"	2.00"
1	1	ACTUATOR	69009	69009	69009	69009
2	1	LINKAGE	24038-1	24038-1	24038-1	24038-1
3	1	GASKET	81046	81046	81046	81046
4	2	BOLT, HEX 3/8-16 x 5/8 LG	54014	54014	54014	54014
5	1	SCALE	59028-1	59028-1.25	59028-1.50	59028-2
6	2	NUT, HEX, #8-32	123322	123322	123322	123322
7	2	HEX NUT, 1/4-20	6-226	6-226	6-226	6-226
8	1	PACKING ASSY	121567	121567	121567	121567
9	1	VALVE TOP GASKET	122136	122136	122136	122136
10	1	VALVE TOP	16943	16943	16943	16943
11	1	LOWER SHAFT	121979	121980	121980	121982
12	1	PACKING NUT	122664	122664	122664	122664
13	2	HEX HEAD PLUG, 1/4"	9-22	9-22	9-22	9-22
14	6	HEX BOLT, 3/8-16	122405	122405	122405	122405
15	1	INNER PILOT ASSEMBLY KIT	29021-1.00	29021-1.25	29021-1.50	29021-2.00
16	1	VALVE PISTON ASSEMBLY KIT	121618-1.00	121618-1.25	121618-1.50	121618-2.00

**TABLE D-2. VALVE KITS FOR PREVIOUSLY INSTALLED SELF-CONTAINED ACTUATOR
(FOR VALVE SIZES FROM 2.50" TO 4.00")**

ITEM	QTY	PART NAME	VALVE SIZE AND PART NUMBERS		
			2.50 INCH	3.00 INCH	4.00 INCH
1	1	ACTUATOR	69009	69009	69009
2	1	LINKAGE	24038-1	24038-1	24038-2
3	1	GASKET	81046	81046	81046
4	2	3/8-16 x 5/8" LG. CAP SREWS	54014	54014	54014
5	1	SCALE	59028-2.50	59028-3	59028-4
6	2	8-32 HEX NUT	123332	123322	123322
7	2	1/4-20 NUT	6-226	6-226	N/A
8	2	3/8-16 HEX NUT	N/A	N/A	6-264
9	1	PACKING ASSY	121567	121568	121568
10	1	VALVE TOP GASKET	122083	122204	122203
11	1	VALVE TOP	18781	18823	18824
12	1	LOWER SHAFT	122223	122230	122224
13	1	PACKING NUT	122664	122665	122665
14	2	HEX HEAD PLUG, 1/4"	9-22	9-22	9-22
15	4	CAP SCREW, 1/2-13 x 1-1/4"	6-24	N/A	N/A
16	4	CAP SCREW, 5/8-11 x 1-1/2"	N/A	6-310	6-310
17	1	MAIN VALVE ASSEMBLY KIT	27006-2.50	27006-3.00	27006-4.00

