Applicable to Serial Numbers **H-09-430** and above

Installation, Operation & Maintenance Instructions

Double-Wall Heat Exchanger

Model DW

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SAFETY PRECAUTIONS

Personnel involved in the installation, operation and maintenance of the SmartPlate Water Heater must, at all times, observe all safety regulations. The following Warnings are general and must be given the same attention as specific Warnings and Cautions appearing throughout this Instruction Manual.

WARNING

FLUIDS UNDER PRESSURE MAY CAUSE INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT WHEN RELEASED. BE SURE TO SHUT OFF ALL INCOMING AND OUTGOING WATER SHUTOFF VALVES. CAREFULLY DECREASE ALL TRAPPED PRESSURES TO ZERO BEFORE PERFORMING MAINTENANCE.

WARNING

ELECTRICAL VOLTAGES UP TO 240 VAC MAY BE USED IN THIS EQUIPMENT. DEATH ON CONTACT OR SERIOUS PERSONAL INJURY MAY RESULT IF EXPOSED CONNECTIONS ARE TOUCHED.

WARNING

CLOSE ALL SHUT-OFF VALVES AND CAREFULLY DECREASE TRAPPED PRESSURES TO ZERO BEFORE PERFORMING ANY MAINTENANCE TASKS. TAG THE UNIT “OUT OF SERVICE” WHILE PERFORMING MAINTENANCE TASKS.

CHAPTER 1 GENERAL INFORMATION

1.1 INTRODUCTION

AERCO's DW-series heat exchangers provide potable hot water for commercial and institutional applications. These heat exchangers are available in steam-to-water configurations and are equipped with electronic controls. This manual addresses the steam-to-water double-wall heat exchanger with electronic controls.

The three steam-to-water DW heat exchangers available from AERCO include the:

- DW-24 with 24 square feet of heating surface
- DW-45 with 45 square feet of heating surface
- DW-68 with 68 square feet of heating surface

Figure 1-1 illustrates a typical AERCO DW-series heat exchanger.

Figure 1-1. DW-24 Heat Exchanger

This chapter provides a top-level mechanical overview of the DW-series heat exchanger (1.2), its electronic control system (1.3) and the options and accessories available from AERCO (1.4) for units in this series

1.2 MECHANICAL OVERVIEW

The AERCO double-wall steam-to-water heat exchanger is illustrated in Figure 1-2:

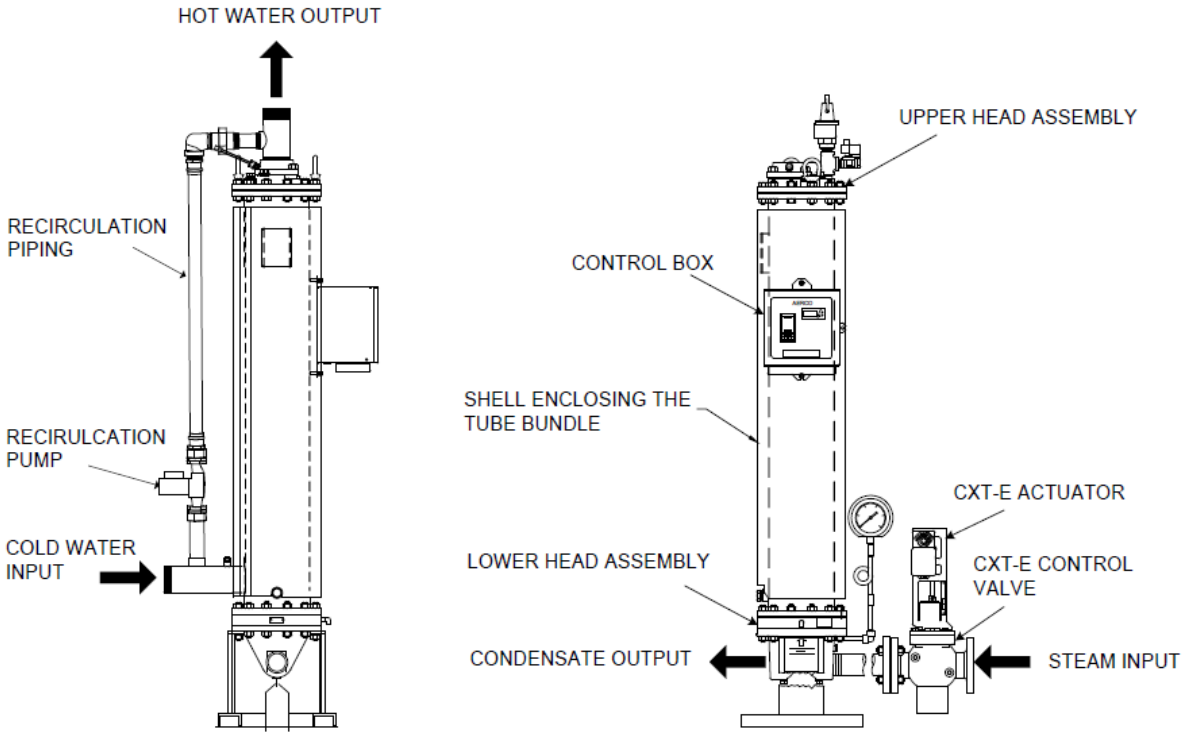

Figure 1-2. Mechanical Overview of the AERCO Double-Wall Steam-to-Water Heat Exchanger

The DW steam-to-water heat exchanger includes the following principal mechanical parts and assemblies:

- Shell and upper/lower head assemblies
- Enclosed double-wall tube bundle and tubesheets
- Input/output connections for steam, condensate and hot/cold water
- Control Valve
- Recirculation piping and pump

1.3 ELECTRONIC CONTROL SYSTEM

The Electronic Control System (ECS; illustrated in Figure 1-3) includes the Control Box components and associated temperature sensors and actuators. The ECS:

- Controls the temperature of the hot water output to within ±4°F of the Control Box setting under normal, diversified load conditions (load fluctuations of up to 25% of water heater capacity)
- Shuts down the heat exchanger when the maximum safe water temperature is exceeded
- Relays commands and alarms from/to the MODBUS Communication Option

The ECS and its components are described in Chapter 3.

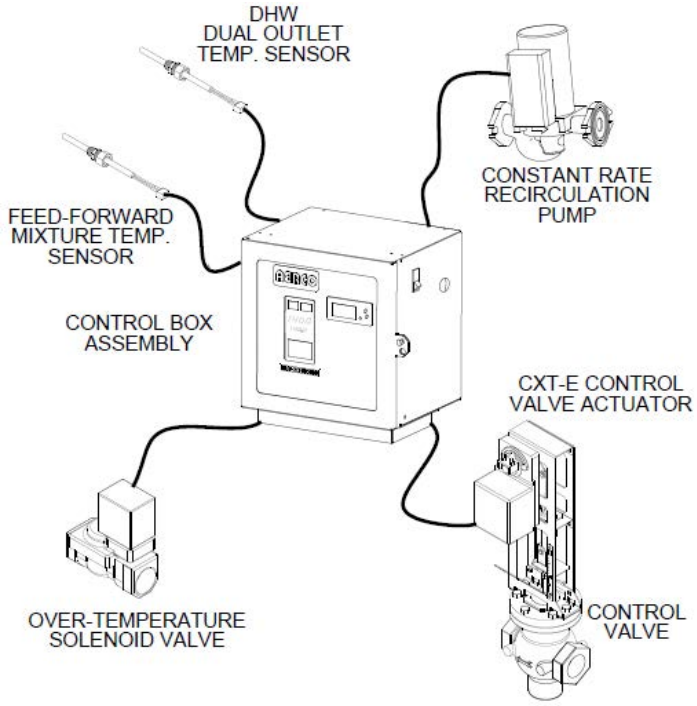

Figure 1-3. Electronic Control System Components

1.4 OPTIONS AND ACCESSORIES

1.4.1 MODBUS Communication Option

The ECS can be ordered with the MODBUS Communication Option to enable the ECS to be externally controlled by an Energy Management System, Building Automation System or computer (supplied by others).

1.4.2 Accessories

Accessories available for the DW-series steam-to-water heat exchangers equipped with the CXT-E Electronic Control Valve are listed in

Table 1. Required accessories may be supplied separately by AERCO if they are not factory-installed on the heater.

The accessories required will depend on the specific application. Detailed installation instructions, including typical installation drawings are provided in *Chapter 2 Installation*. Please ensure that ALL mandatory items are available for installation.

If any of these items have been furnished by AERCO, the necessary drawings and/or instructions are included with the shipment.

Table 1. DW-Series Heat Exchanger and CXT-E Actuator/Valve Accessories

Description	AERCO Supplied	Remarks
I. DW-Series Heat Exchanger		
Temperature Controller	Yes	Required
Pressure and Temperature Relief Valve	Yes	Required
Over-temperature Limit System, including: • Solenoid valve • Water temperature sensor in heat exchanger upper head • Over-temperature indicating switch	Yes	Required
Steam Flow Control Valve, sized as required for the application	Yes	Required
Compound Steam Pressure Gauge, mounted on steam inlet connection	Yes	Required
Traps • Drip trap • Valve trap • Condensate trap	No	Required
Vacuum Breaker	Yes	Required
II. CXT-E Actuator and Valve		
Upstream Shutoff Valve	No	Required
Downstream Shutoff Valve	No	• Suggested for ease of maintenance • Required if a bypass line is used
Strainer and Blow-Off Valve	No	Required
High Side Pressure Gauge	No	Recommended for adjustment and maintenance
Low Side Pressure Gauge, compound-type for steam flow	No	Recommended for adjustment and maintenance.

CHAPTER 2 INSTALLATION

2.1 INTRODUCTION

This chapter provides instructions for:

- Receiving the heat exchanger and installing it in a suitable location (2.2)
- Piping into the steam and water systems (2.3)
- Installing and connecting the Electronic Control System (2.4)

2.2 RECEIVING, UNPACKING AND INSTALLING

To prepare the heat exchanger for installation:

1. Carefully uncrate the heat exchanger.
2. Set the heat exchanger upright using a block and tackle or hoist attached to the lifting lugs (eye-bolts) on the top head.

CAUTION

ALWAYS USE THE LIFTING LUGS to lift and/or move the heat exchanger.

3. To simplify in-place maintenance, install the heat exchanger in a location having the following clearances:
   a. Horizontal clearance: At least two (2) feet all-around
   b. Headroom: At least six (6) feet measured upward from the top of the upper shell flange.

   The dimensions of the AERCO Model DW-heat exchangers are presented in Figures 2-1 through 2-3.
4. Secure the heat exchanger in place, preferably, by attaching it to the floor. If you use piping to secure the heat exchanger in position, be sure to include ample provision for pipe expansion.

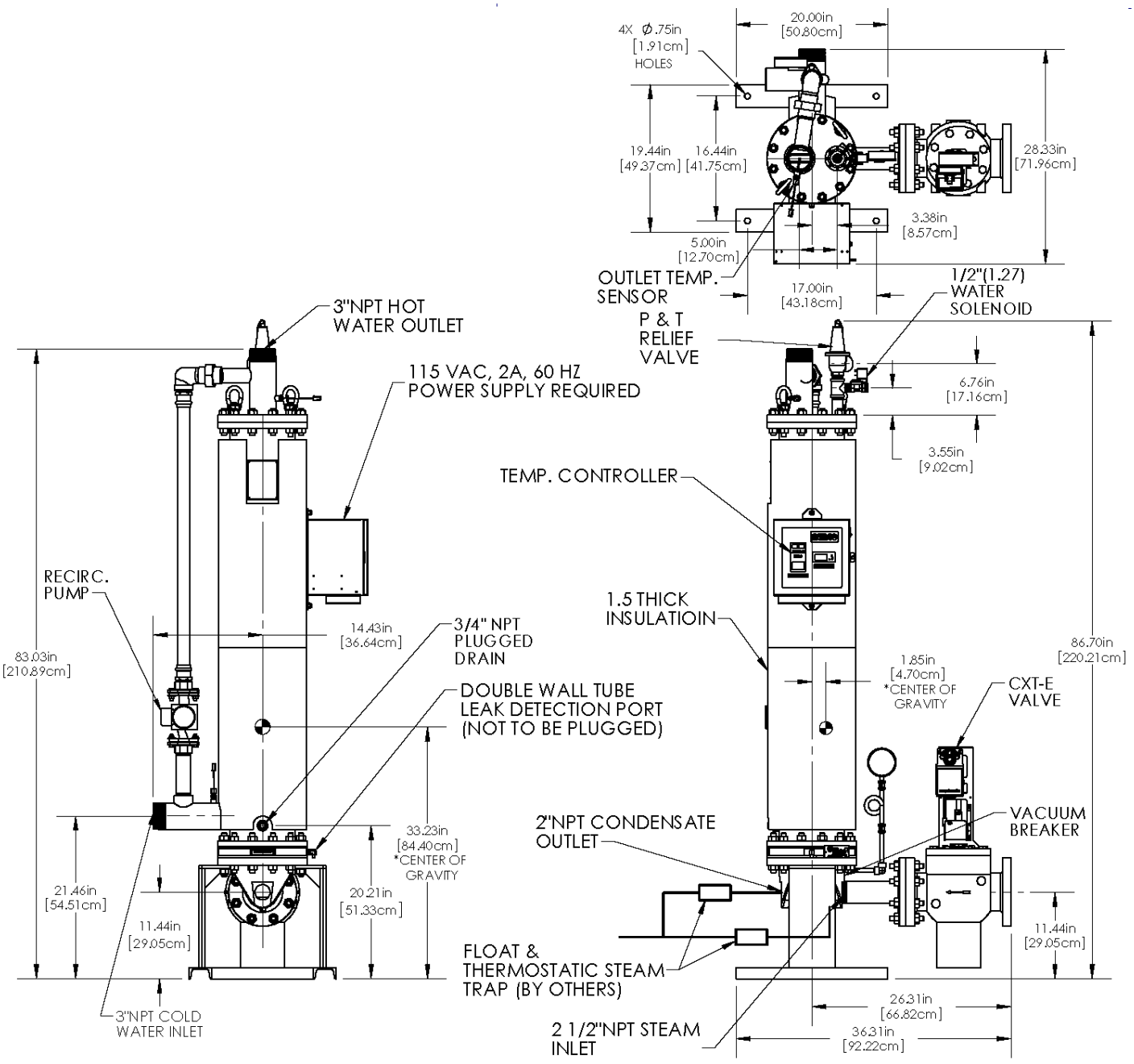

Figure 2-1. AERCO Model DW-24 Heat Exchanger Dimensions (Reference AP-A-928 rev C)

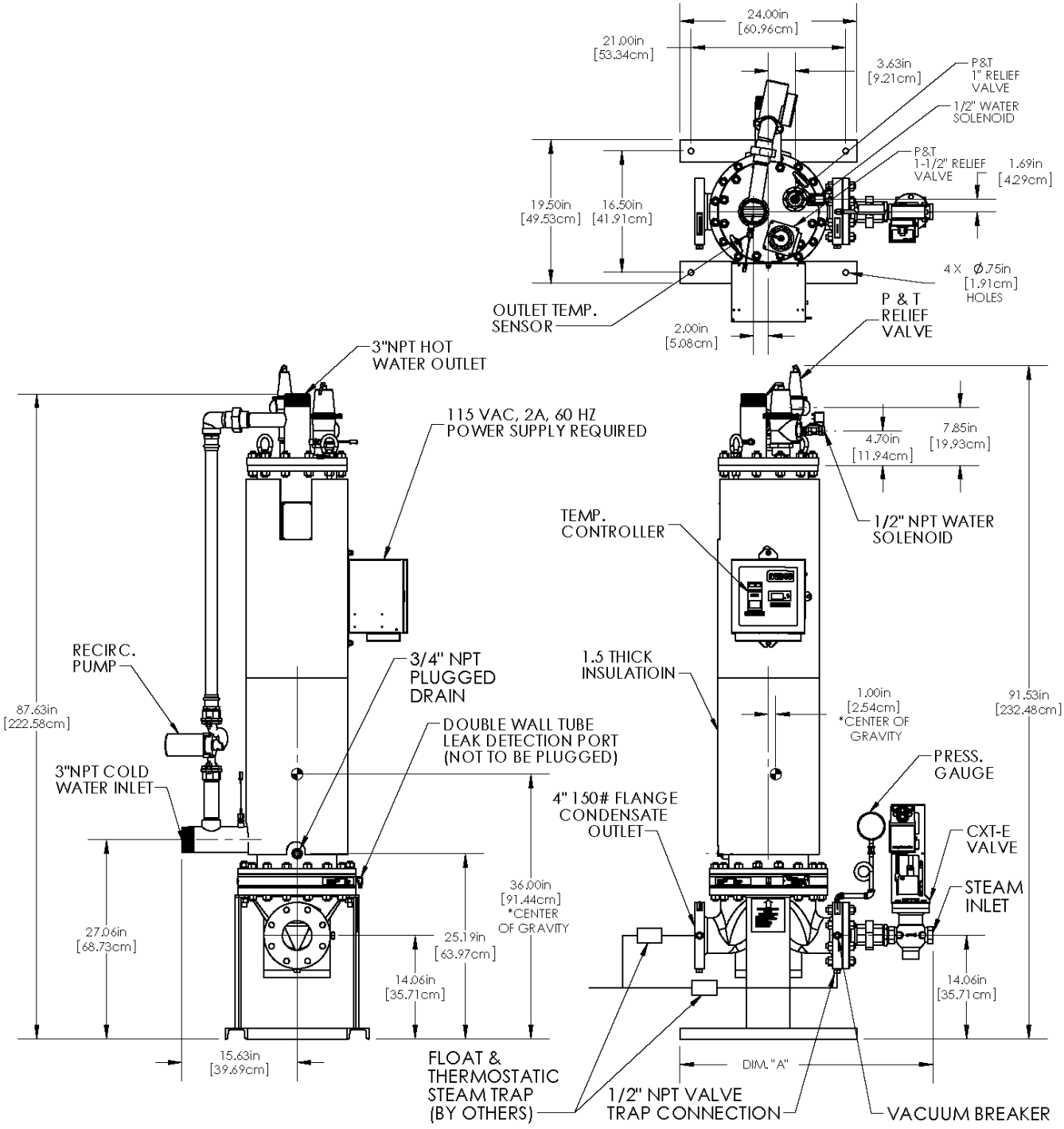

Figure 2-2. AERCO Model DW-45 Heat Exchanger Dimensions (reference AP-A-930 rev C)

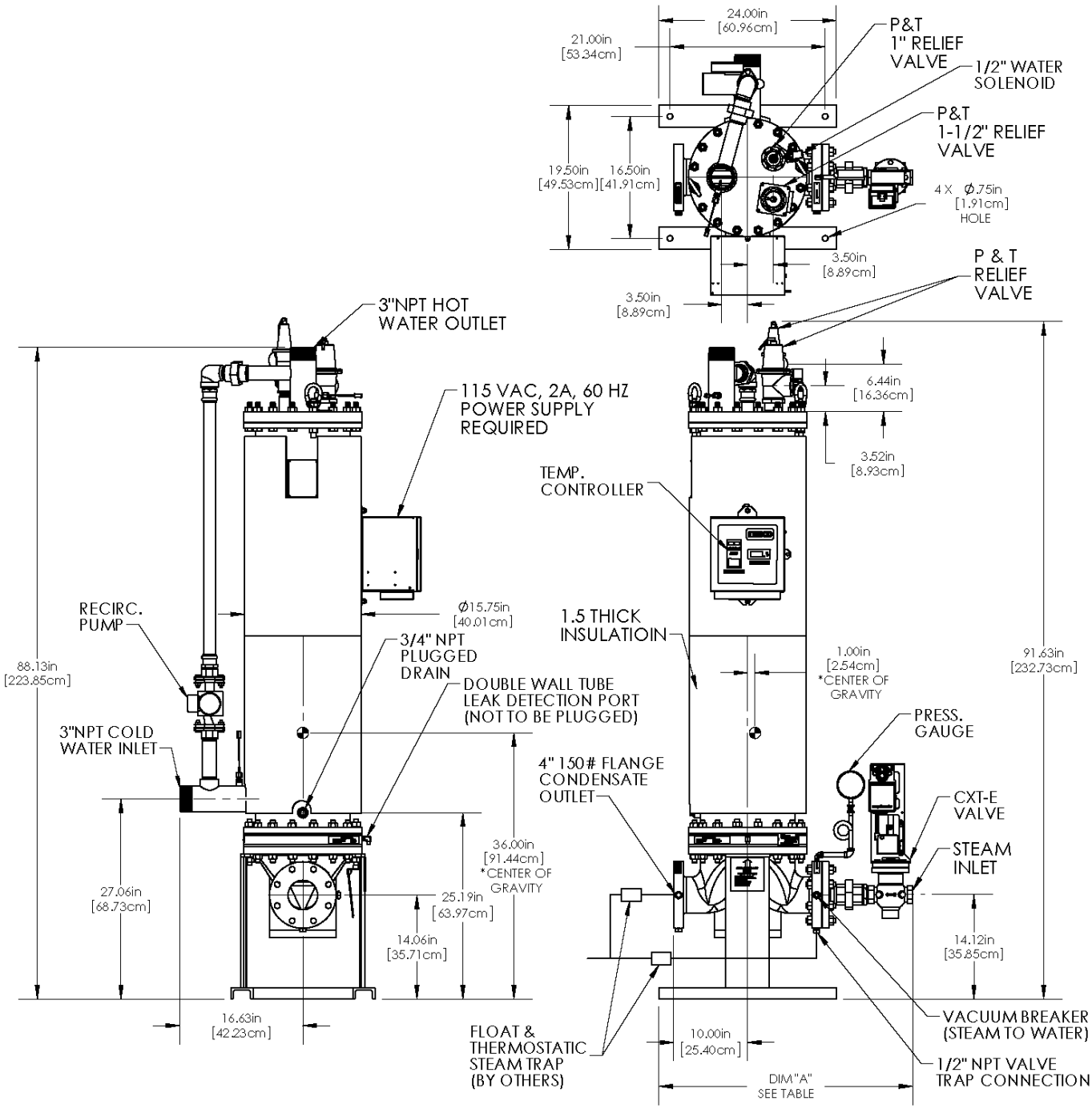

Figure 2-3. AERCO Model DW-68 Heat Exchanger Dimensions (Reference AP-A-959 rev B)

2.3 MAKING THE PIPING CONNECTIONS

Figure 2-4 illustrates the recommended CXT-E Control Valve installation for steam flow.

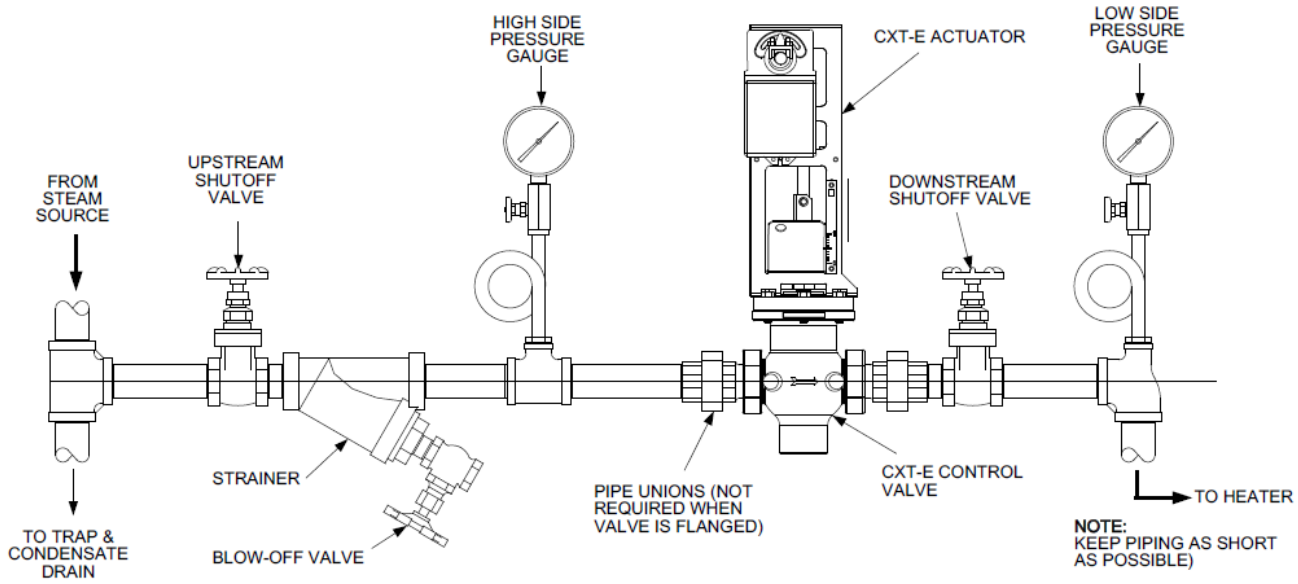

Figure 2-4. Recommended Control Valve, CXT-E Installation for Steam Flow

1. Install the CXT-E Control Valve with the Actuator linkage in the vertical, upright position, as shown.
2. For maintenance purposes, install pipe unions with threaded ends to simplify removal from the steam line. 3. Blow out all pipe lines to remove dirt chips, scale or other foreign matter which could adversely affect Control Valve ("Valve") operation when in service.
4. Install an in-line strainer upstream of the Valve (as illustrated on the left side of Figure 2-4) to protect against foreign matter entering the Valve during service operation.
5. Ensure that the steam line is properly trapped to prevent accumulation of condensate ahead of the Valve.
6. Install metal-seated, gate-type shutoff valves upstream and downstream of the Valve so that it can be readily removed from the line for maintenance.
7. Install pressure gauges on both sides of the Control Valve, as shown in Figure 2-4.
8. The high-side pressure gauge is provided for adjustment and maintenance purposes. The low-side pressure gauge is intended to ensure that the correct pressure is available to monitor the operation of the temperature regulator valve. The low-side pressure gauge measures the pressure of the steam`.

CAUTION

When installing the Valve, DO NOT use the Actuator linkage frame at the top of the Valve body for leverage. Use pipe wrenches on the inlet and outlet hex of the Valve body.

9. Install the Valve so that the arrow on the Valve body points in the direction of steam flow.
10. After the Valve has been installed in the steam or hot water line, ensure that all piping connections are secure and leak-tight.

The AERCO recommended heat exchanger and Control Valve piping arrangements for single and parallel heat exchanger installations are presented in Appendix C.

11. For best heat exchanger performance, OBSERVE THE FOLLOWING VERY CAREFULLY when installing the heat exchanger piping:

    a. Do not use cement or red lead when assembling pipe joints.

    b. For heat exchanger connection types, sizes, and exact locations, see Figure 2-1, Figure 2-2 or Figure 2-3.

    c. All piping to the heat exchanger top head should be provided with unions or flanges LOCATED BEYOND THE OUTSIDE DIAMETER OF THE HEAT EXCHANGER HEAD to permit removal of the head and shell for in-place maintenance.

    d. Include all of the stop valves, check valves, steam traps, strainers and other elements shown in Appendix C, or as specified separately by AERCO.

    e. If the heat exchanger is furnished with the Control Valve not connected as shown in Figure 2-1, Figure 2-2, or Figure 2-3, make the piping between the Control Valve and the heat exchanger as short as possible, with sufficient unions or flanges included to allow easy Valve removal.

    f. Reductions from a pipe to a smaller size connection at the heat exchanger or Control Valve should be made directly at the heat exchanger or Valve connection. Expansions from a pipe to a larger size connection at the heat exchanger or Control Valve should be made as far as practical from the heat exchanger or Valve connection.

    g. The condensate return piping must be arranged to permit condensate to drain freely by gravity from the heat exchanger connection. If condensate drain by gravity is not feasible, you may substitute a pumping steam trap. Refer to the trap manufacturer's instructions for sizing and installation procedures.

CAUTION

Failure to provide proper condensate drainage can result in improper operation of the heat exchanger and/or damage to the heat exchanger condensate drainage system.

    h. All drain discharges — relief valve, over-temperature solenoid valve and heat exchanger shell drain — should be piped directly to a convenient floor drain.

IMPORTANT

Before making final piping connections to and from the heat exchanger and Control Valve, blow out all piping thoroughly.

2.4 INSTALLING THE CXT-E ELECTRONIC CONTROL SYSTEM

The Control Box and all other Electronic Control System (ECS) components are installed on the heat exchanger assembly before it is shipped from the factory, so that the ECS installation consists of connecting AC power to the Control Box and making the internal power and control connections to the CXT-E Control Valve. However, if your ECS was ordered with the MODBUS Communication option, you are required to make several additional connections (starting with step 8, below) to enable the ECS to be controlled by an external Energy Management System (EMS), Building Automation System (BAS) or computer.

2.4.1 Accessing the Control Box Interior

NOTE

After installing the Control Box, you can install a lock (not supplied) on its front door to prevent unauthorized access to ECS settings.

1. Loosen the captive screw on the Control Box (Figure 2-5) front cover and open the hinged panel door.

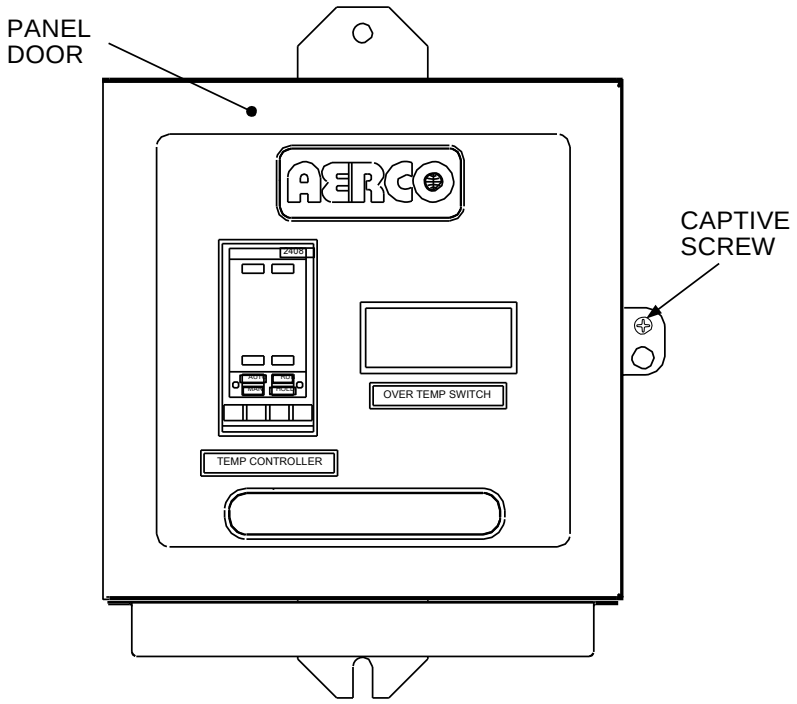

Figure 2-5. ECS Control Panel Front View

2. Loosen the captive screw at the top of the recessed panel (Figure 2-6). Swing down the recessed panel to access Terminal Block TB-2 on the bottom interior surface of the Control Box (see Figure 2-7).

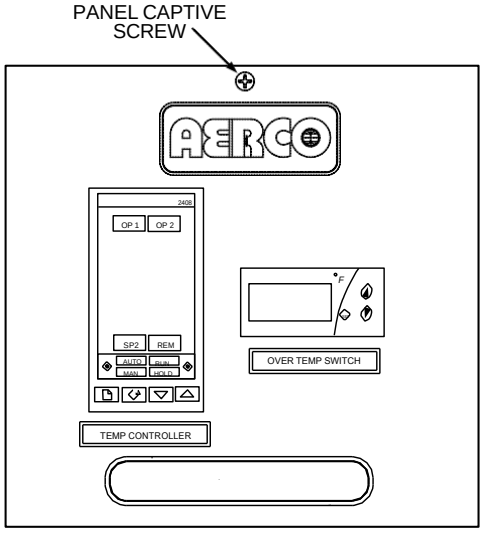

Figure 2-6. Recessed Panel Behind Control Box Door

2.4.2 Connecting AC Power to the Control Box

3. Feed the external 120 VAC power leads through the cutout labeled “POWER IN” on the right side of the Control Box.
4. Connect the LINE, NEUTRAL and GROUND leads to the TB-2 terminals shown in Figure 2-7.

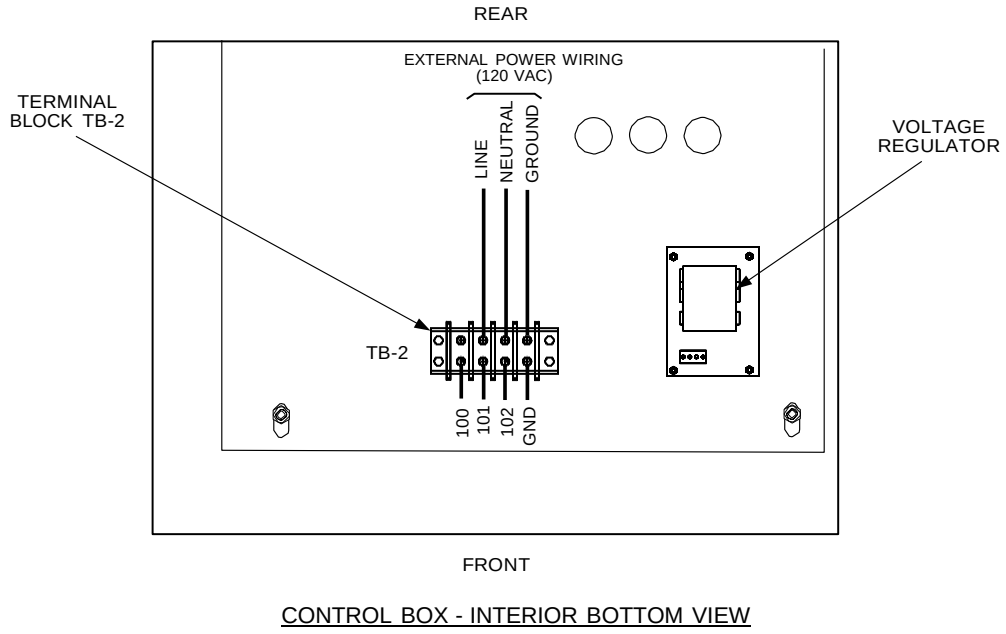

Figure 2-7. ECS Control Box AC Power Connections

2.4.3 Wiring the CXT-E Actuator

5. Connect the Control Box cable labeled ACTUATOR to the 3-pin connector plug on the CXT-E Actuator.

2.4.4 Verifying Pre-wired Connections

6. Check to ensure that all pre-wired cable harness connectors and wire leads between the Control Box and the following ECS components are secure:
   - Recirculation Pump
   - Over-Temperature Solenoid
   - Outlet Dual Temperature Sensor
   - Mixed Temperature Sensor

7. If the ECS was ordered with the MODBUS Communication Option, proceed to step 8. Otherwise, the ECS installation is complete.

2.4.5 Wiring the Temperature Controller to the MODBUS Control System

Step 8, below, applies to the Eurotherm, Mode 2408 Temperature Controller equipped with a MODBUS communication board and connected to an Energy Management System (EMS), Building Automation System (BAS) or computer. The type of communication port (RS232-9, RS232-25, or RS485) mounted on the EMS, BAS or computer determines the relevant signal leads (Ground, Receive and Transmit) in the control cable that you connect to the MODBUS device and the Temperature Controller, as described in Table 2-1.

NOTE

If required, the procedure for adding a communication board to the Temperature Controller is provided in Appendix A

Table 2-1. MODBUS Communication Signal Connections

2408 TEMP. CONTROLLER		**COMPUTER CONTROL CABLE**			
			RS232 9-PIN	**RS232 25-PIN**	**RS485**
SIGNAL NAME	TERMINAL	SIGNAL NAME	PIN NO.	PIN NO.	PIN NO.
GROUND	HD	GROUND	5	7	GROUND
RECEIVE	HE	TRANSMIT	3	2	A(-)
TRANSMIT	HF	RECEIVE	2	3	B(+)

8. Refer to Table 2-1, Figure 2-8 and/or the ECS wiring diagram in Appendix B to wire the Ground (HD), Receive (HE) and Transmit (HF) terminals of the Temperature Controller to the RS232-9, RS232-25 or RS485 connector on the EMS, BAS or computer.

   Examples of cable types suitable for this purpose are: Belden 9841, 8761, 3105A, or equivalent. Ensure that the RS232 or RS485 cable connections do not exceed the following lengths:

   - RS232 Cable: 50 feet, maximum
   - RS485 Cable: 4,000 feet, maximum

NOTE

For best results, DO NOT run MODBUS communication wiring in the same conduit as power wiring which can couple excessive noise and/or hum into the MODBUS lines.

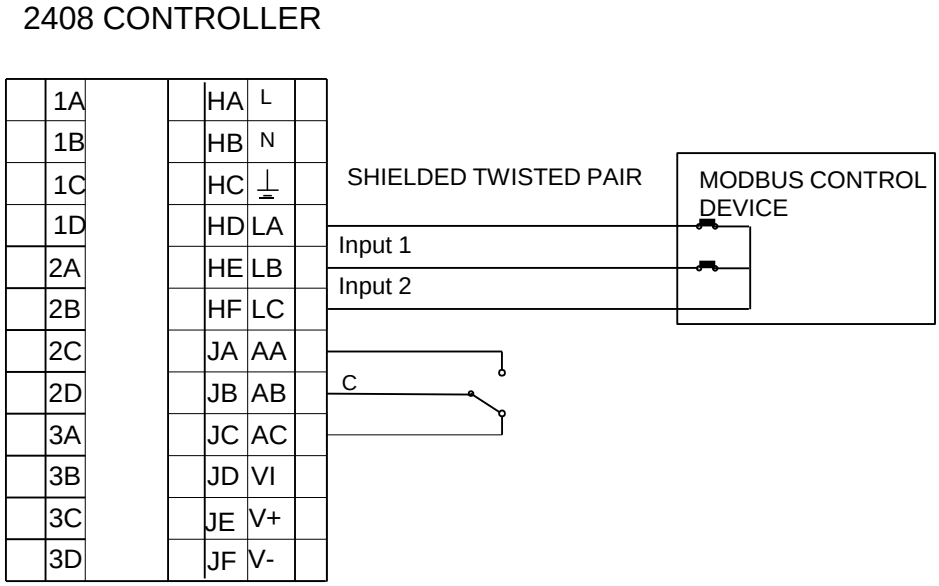

Figure 2-8. Cable Connections for Eurotherm 2408 Temperature Controller

2.4.6 Control System Programming Information

Appendix A lists the MODBUS data addresses for the 2408 Controller. The procedures for changing the Controller address is also provided in Appendix A. Also included are references to the manufacturer's handbooks covering the Temperature Controller communication option.

CHAPTER 3 FUNCTIONAL DESCRIPTION

3.1 INTRODUCTION

The AERCO DW-series steam-to-water heat exchangers incorporate double–wall heat tubes, in which steam circulating in a bundle of immersed double-wall primary tubes heats the service water in the heat exchanger's shell. The following Mechanical Description (3.2) briefly discusses how double-wall heat tubes work and describes each of the principal steam-to-water heat exchanger components. The Mechanical Description is followed by a discussion of the Electronic Control System (3.3), which regulates the heat exchanger water temperature and activates alarms and shutdown processes in the event safety limits are exceeded.

3.2 MECHANICAL DESCRIPTION

3.2.1 Overview

Referring to Figure 3-1, cold service water entering the heat exchanger through the Cold Water Input is dispersed evenly throughout the heat exchanger shell. As the cold water flows upward, it is heated by steam circulating through the immersed tube bundle. The heated service water exits through the Hot Water Output connection in the upper head assembly.

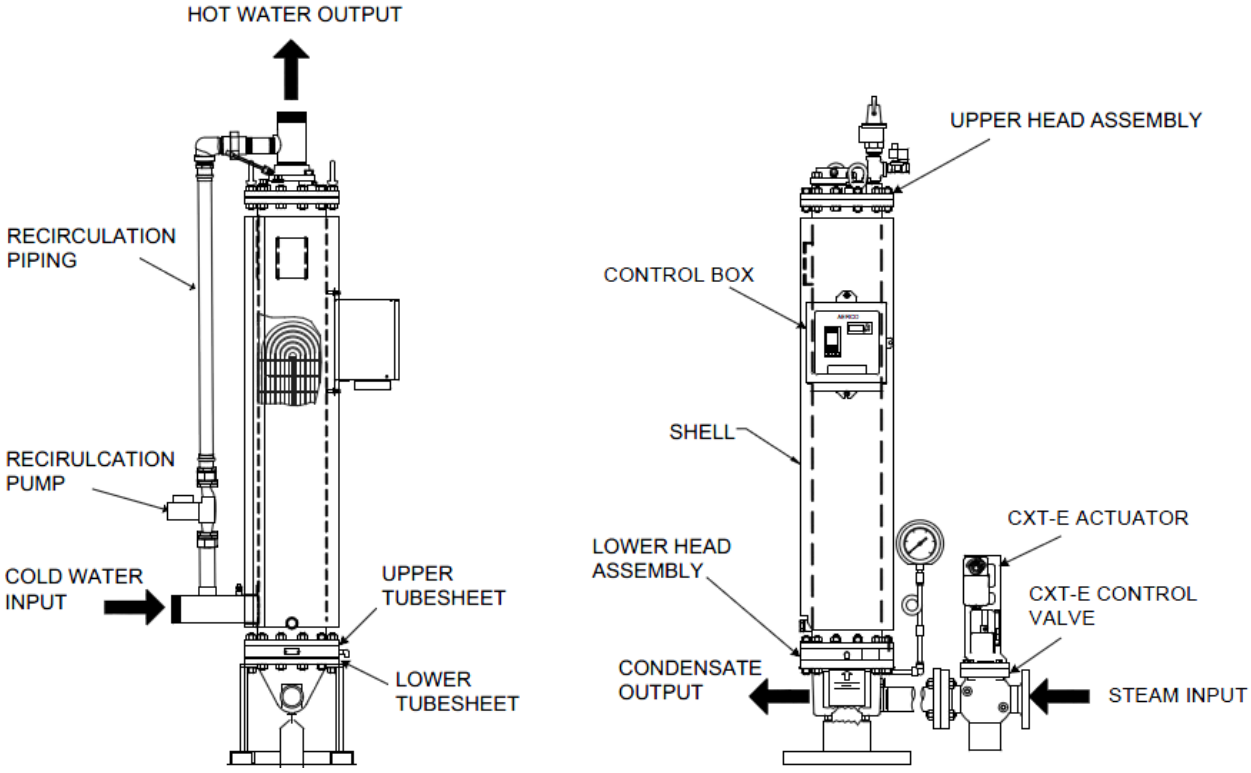

Figure 3-1. AERCO Steam-to-Water Double-Wall Heat Exchanger

The heating steam enters through the CXT-E Control Valve at the bottom of the heat exchanger assembly and flows through the inner tubes of the double-wall tube bundle. The flowing steam transfers its heat to the service water contained within the shell, condenses and exits through the Condensate Output connection.

The flow rate of the heated water varies according to the demand for hot water. The flow rate of the steam is regulated by the Temperature Controller in the Control Box so as to maintain the temperature of

the delivered hot water to within ±4°F of the Control Box setting, under normal, diversified load conditions (load fluctuations of up to 25% of water heater capacity).

3.2.2 Double-Wall Heat Transfer and Water Leakage

As illustrated in Figure 3-2, the heat exchanger's primary tubes incorporate double-wall construction in which the inner and outer tube walls are separated by air space. The steam flows within the double-wall primary tubes' inner walls. Any condensate leaking outward through the inner walls is trapped within vented air space between the inner and outer tube walls. Any service water that leaks inward through the outer tube walls is similarly contained within the air space. The accumulated leakage water is conducted along these air spaces, collected in the bottom head (see 3.2.3.2) and discharged through an atmospherically vented leak detection port. This construction effectively provides double protection against primary steam or condensate leaking into the service water, or vice versa. However, it is not unusual for moisture to appear at the leak detection port at initial heat exchanger start-up, even when there are no tube leaks. This moisture results from water condensing during the manufacturing process and being expelled when the system is initially operated.

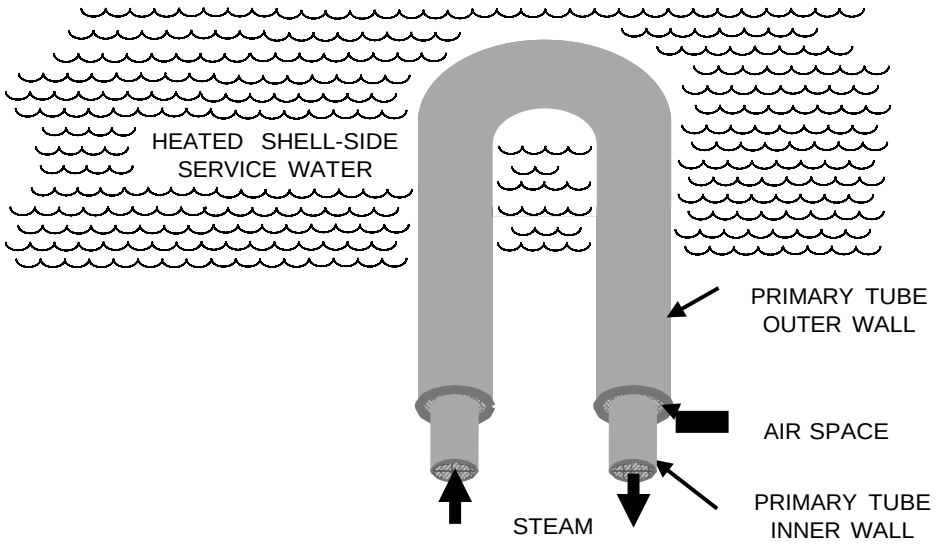

Figure 3-2. Segment of a Double-Wall Primary Tube

3.2.3 Principal Mechanical Components

The AERCO DW-series heat exchanger consists of the following principal mechanical components (see Figure 3-3):

- Shell and heads (3.2.3.1)
- Double-wall U-bend tube bundle and tubesheet (3.2.3.2)
- Recirculation pipe and pump (3.2.3.3)
- Electronic CXT-E Control Valve (3.2.3.4)

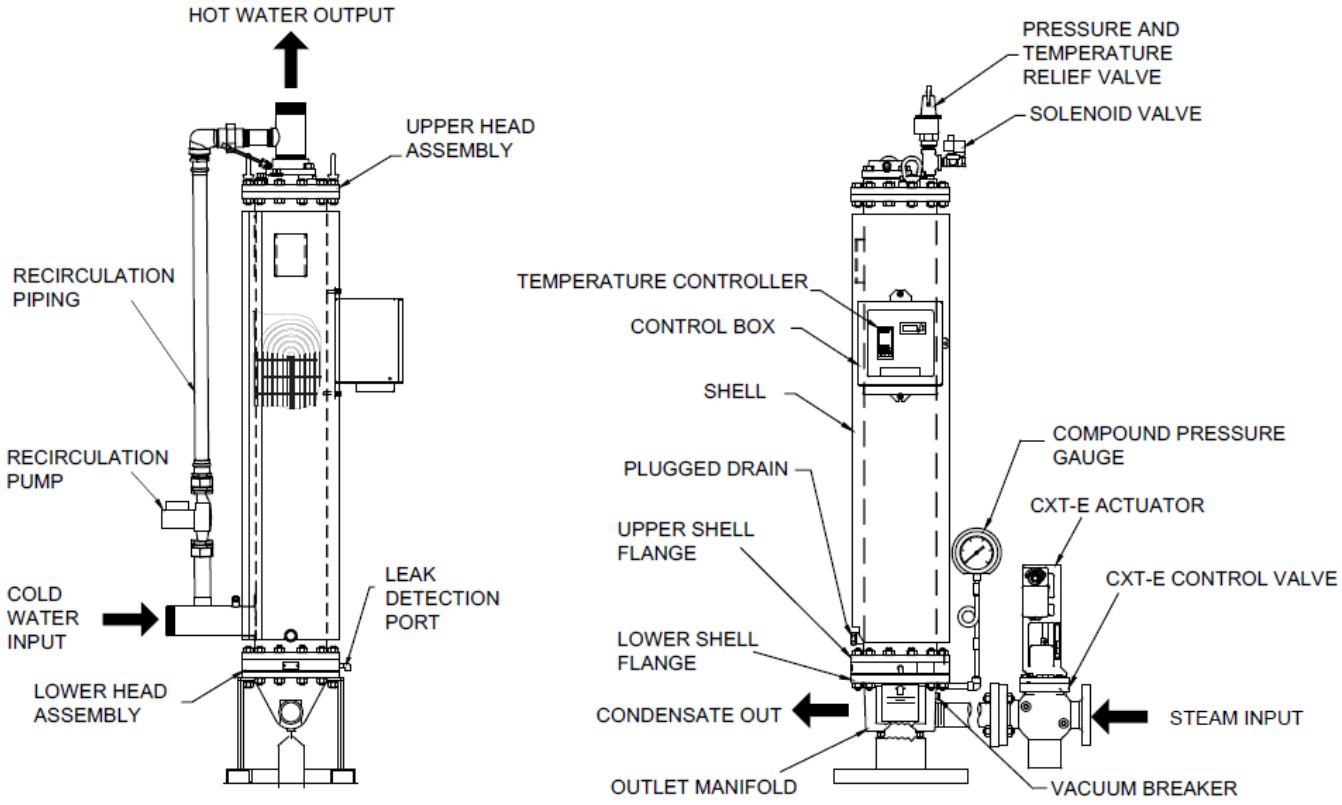

Figure 3-3. AERCO Double-Wall Heat Exchanger, Model DW-24

3.2.3.1 Shell and Heads

The heat exchanger body incorporates a stainless steel shell, bronze upper head and navy brass tubesheets, forming a pressure vessel that conforms to ASME standards. The heat exchanger body encloses the tube bundle and tubesheets.

3.2.3.2 Double-Wall U-Tube Bundle and Tubesheets

The double-wall U-bend copper tubes that conduct steam through the heater shell conform to BOCA (National Plumbing Code), IAPMO (Uniform Plumbing Code) and NAPHCC (National Standard Plumbing Code), the three national standards that address double-wall construction. The outer wall of each double-wall tube is brazed to the upper tubesheet, and the inner wall is brazed to the navy brass lower tubesheet. Any tube leakage from the air spaces between the inner and outer walls of the double-wall tubes accumulates in the space between the bottom shell flanges which make up the bottom head. The accumulated leakage water is discharged through the leak detection port.

3.2.3.3 Recirculation Pipe and Pump

Referring to Figure 3-3, the recirculation pipe and constant-rate recirculation pump deliver a continuous sample of the heated output water to a 1½-inch pipe junction with the Cold Water Input pipe to regulate steam flow at the Steam Input (see 3.3.2).

3.2.3.4 CXT-E Control Valve

The CXT-E Control Valve regulates the flow rate of steam into the heat exchanger in response to positioning control signaling from the Temperature Controller (see 3.3.2). The CXT-E Control Valve consists of a valve body and linkage to the CXT-E Actuator. The CXT-E Actuator is discussed in 3.3.4.5.

3.3 ELECTRONIC CONTROL SYSTEM

The Electronic Control System consists of the internal Control Box components and a number of sensor and safety devices distributed throughout the heat exchanger assembly (see Figure 3-4).

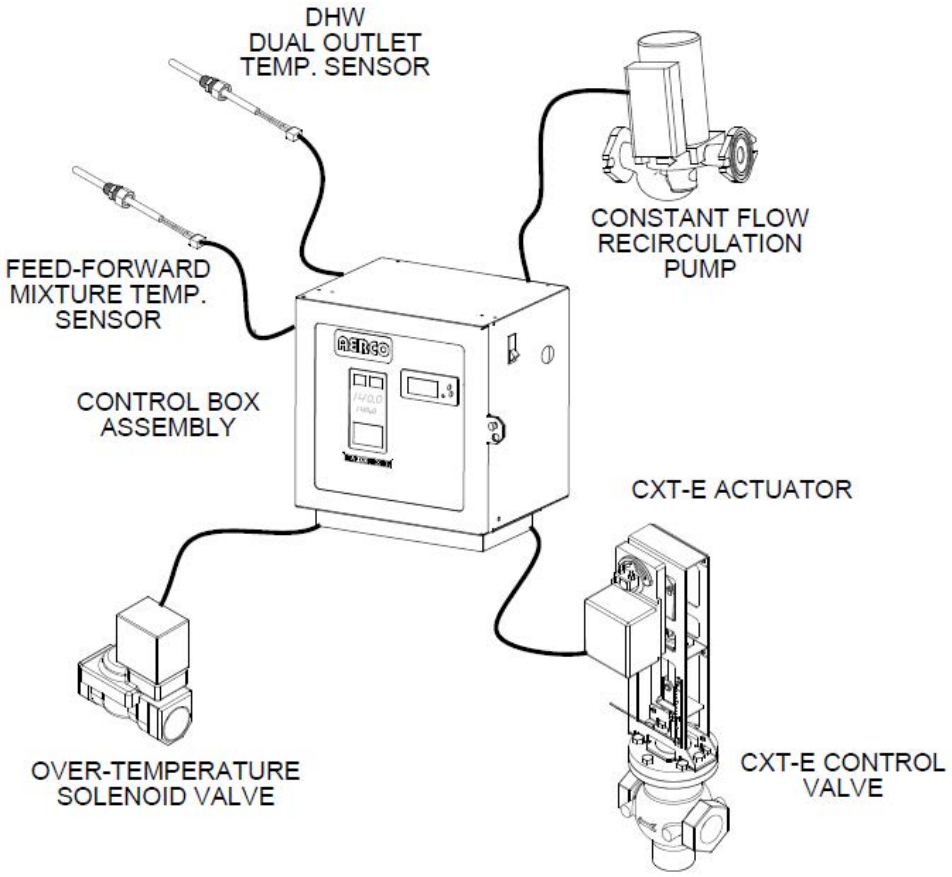

Figure 3-4. Electronic Control System Components

3.3.1 ECS Block Diagram

A simplified block diagram of the ECS is presented in Figure 3-5.

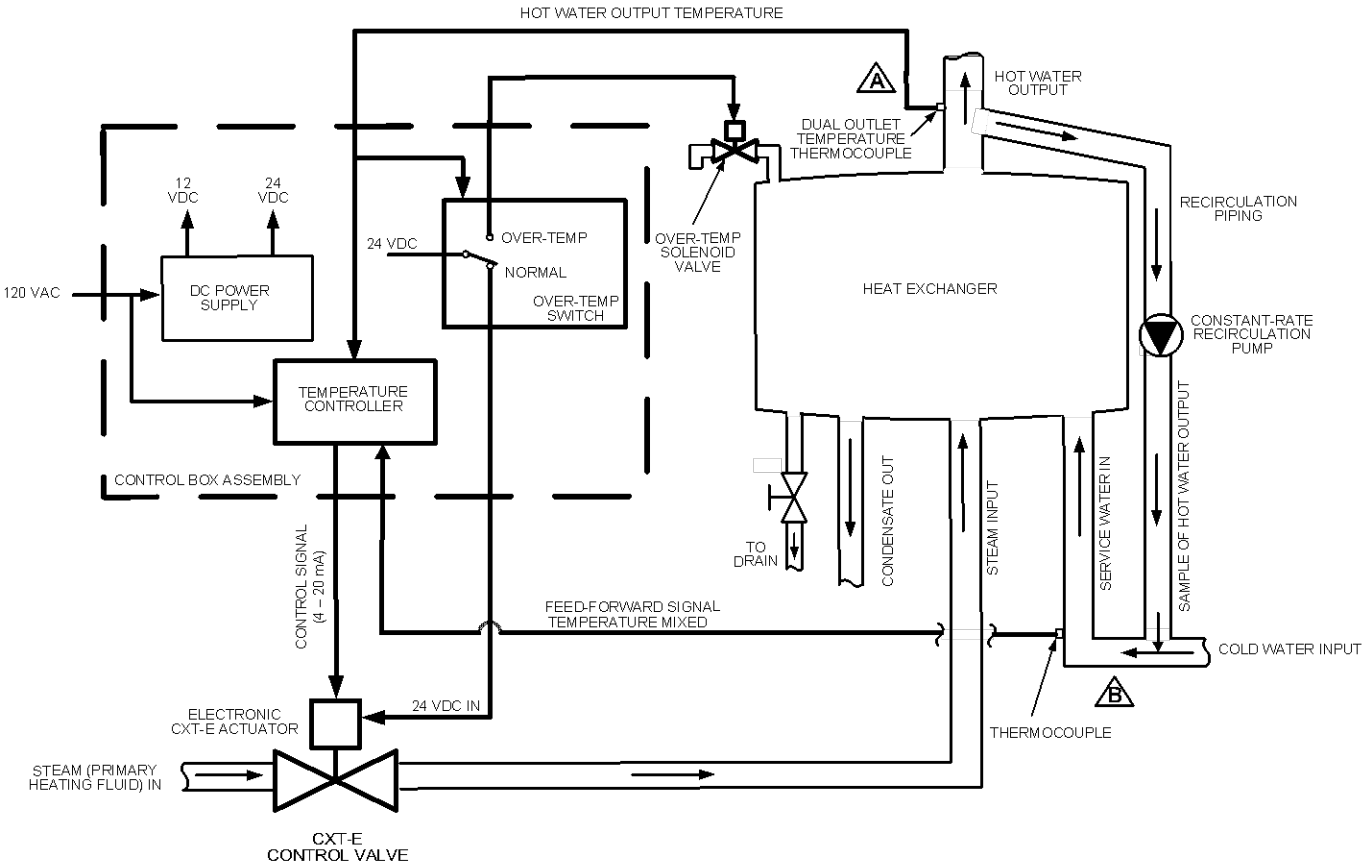

Figure 3-5. ECS Simplified Block Diagram

3.3.2 ECS Operational Summary

The ECS adjusts the flow rate of steam into the heat exchanger in response to:

- The water temperature at the Hot Water Output (at A)
- The water temperature of the sampled Hot Water Output mixed with the Cold Water Input (at B)

Changes in hot water demand vary the flow rate of service water through the heat exchanger, requiring compensating adjustments of the steam flow rate to maintain the service water temperature. To determine what steam flow rate adjustments are required, the Temperature Controller monitors (via the feed-forward signal) the temperature of a continuous sample of output hot water mixed (at B) with the cold water input. The mixture temperature changes according to the flow rate of the incoming cold water, which in turn depends on the hot water demand.

The Temperature Controller calculation of the optimum steam flow rate into the heat exchanger is based on a mathematical process known as the Proportional Integral Derivative (PID) algorithm, which accepts as inputs the measured outlet and inlet temperatures of the system.

3.3.3 Over-temperature Condition

At startup, the operator programs the maximum safe water temperature into the Control Box. During operation, the Temperature Controller monitors the Hot Water Output temperature to ensure that the programmed maximum safe temperature is not exceeded. If it is, the Temperature Controller operates the Over-temperature Solenoid Valve (see 3.3.4.4) to relieve excessive temperature buildup in the heat exchanger.

3.3.4 Principal ECS Components

3.3.4.1 Control Box Assembly

The Control Box Assembly houses the components that monitor heat exchanger temperatures and operate system controls. The Control Box is illustrated in Figure 3-6. The Control Box components include the Temperature Controller, Over-temperature Switch and dc Power Supply/Voltage Regulator (not shown).

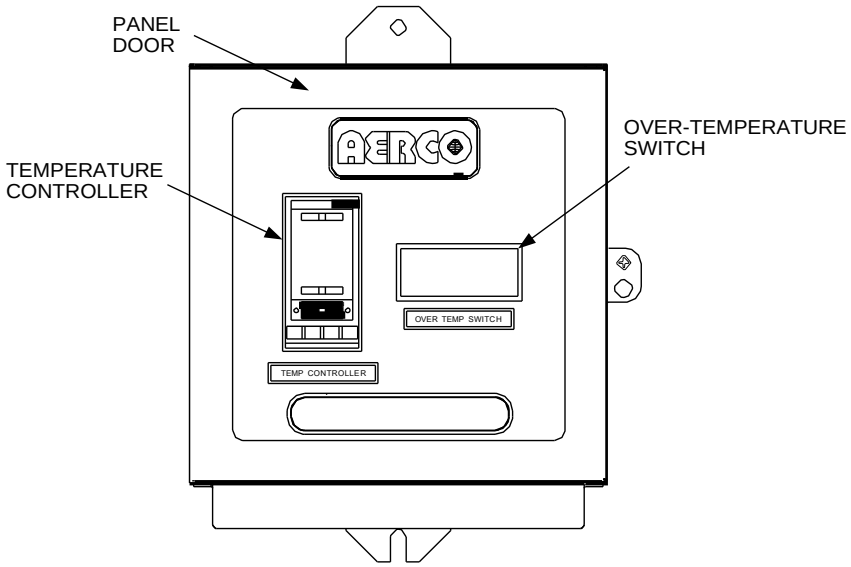

Figure 3-6. Control Box Front View

Temperature Controller. The Temperature Controller processes data received from the temperature and flow sensors. Using the PID algorithm, the Temperature Controller calculates the optimum steam flow rate to maintain the Hot Water Output temperature within the programmed range. The Temperature Controller translates the optimum flow rate into a 4-to-20 mA control signal to the CXT-E Control Valve Actuator to adjust the Control Valve opening.

Over-temperature Switch. The Over-temperature Switch compares the output hot water temperature to the programmed high temperature limit, typically 20°F above the heater setpoint. If the measured Hot Water Output temperature exceeds the maximum setting, the Over-temperature Switch sounds an audible alarm and activates the Over-temperature Solenoid Valve, causing the overheated water to be dumped from the heater shell. Simultaneously, the Over-temperature Switch cuts off dc power to the CXT-E Control Valve Actuator, shutting off the flow of steam into the heat exchanger.

DC Power Supply/Voltage Regulator. The dc power supply within the Control Box converts the 120 VAC primary power to 12 VDC and 24 VDC to operate the Control Box components, Over-temperature Switch, Over-temperature Solenoid Valve and the CXT-E Actuator.

3.3.4.2 DHW Outlet Dual Temperature Sensor

The DHW outlet dual temperature sensor consists of dual thermocouple sensing elements mounted in the top head. The DHW outlet dual temperature sensor continuously monitors the service water temperature at the Hot Water Output and transmits it simultaneously to both the Temperature Controller and the Over-temperature Switch in the Control Box.

3.3.4.3 Feed-Forward Mixture Temperature Sensor

The feed-forward mixture temperature sensor is installed in the Cold Water Inlet nozzle to measure the mixture temperature of the combined input cold water and the recirculated sample of the Hot Water Output.

3.3.4.4 Over-temperature Solenoid Valve

The Over-temperature Solenoid Valve is operated by the Over-temperature Switch in the Control Box. When the preset high temperature limit is exceeded at the Hot Water Output, The DHW Outlet Dual Temperature Sensor signals the Over-temperature Switch, energizing the Solenoid Valve and relieving the temperature build-up in the heat exchanger.

3.3.4.5 Electronic CXT-E Control Valve Actuator

The Electronic CXT-E Actuator operates the CXT-E Control Valve, as discussed in 3.2.3.4. Control Valves are available in pipe sizes ranging from 1 inch to 4 inches. Figure 3-7 identifies the basic dimensions for each size Electronic CXT-E Control Valve. The CXT-E Actuator is identical for each size valve. The linkage assemblies used with each size valve body are nearly identical, except for minor differences in the shaft adapter stroke of the mechanical linkage.

	VALVE SIZES (INCHES)						
Dimension	1.00	1.25	1.50	2.00	2.50	3.00	4.00
A	21.12	21.12	21.12	24.25	24.25	24.25	24.25
B	7.75	7.75	7.75	7.75	10.87	10.87	10.87
C	3.56	3.56	3.56	3.56	6.38	6.38	6.38
D	6.00	6.00	6.00	6.00	10.87	10.87	10.87

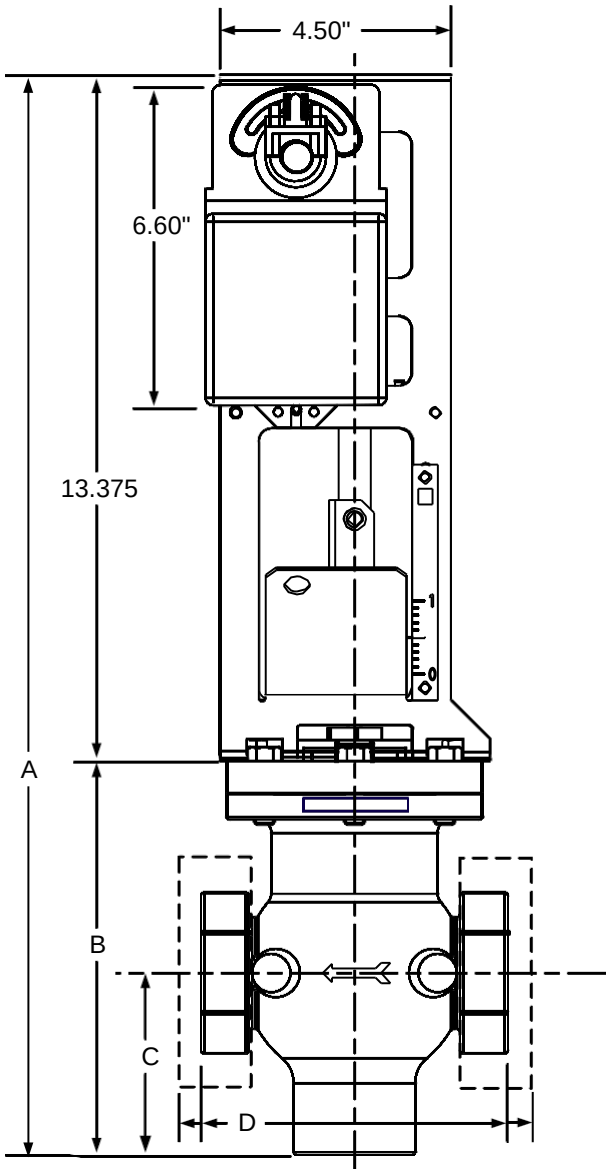

Figure 3-7. CXT-E Control Valve and Actuator

CHAPTER 4 ADJUSTMENT

4.1 INTRODUCTION

This chapter explains the procedures you use to adjust the CXT-E Control Valve ("Valve"), Electronic CXT-E Actuator ("Actuator") and Electronic Control System (ECS). The ECS is factory adjusted to the setpoint temperature specified on the sales order, and the Actuator is factory adjusted (auto-stroked) to ensure that it correctly operates the Valve from the fully-open to the fully-closed positions.

To the extent necessary, perform all the procedures listed in 4.2 and 4.3 before placing the system into operation and after replacing the Valve or any ECS components.

CAUTION

BE SURE that all steam shutoff valves are fully closed before performing any of the following adjustment procedures.

4.2 ADJUSTING THE ELECTRONIC CXT-E ACTUATOR

The Actuator is self-calibrating for all size Valves. The Actuator is powered by 24 VDC and controlled by a linear 4-to-20 mA control signal, as follows:

- A 4 mA control signal input operates the Valve to the fully-closed position (Valve shaft down)
- A 20 mA signal strokes the Valve to the fully-open position (Valve shaft up).

When properly connected to the ECS, applying power to the Control Box applies +24 VDC power to the Actuator. The power switch is located on the right side of the Control Box, as illustrated in Figure 4-2.

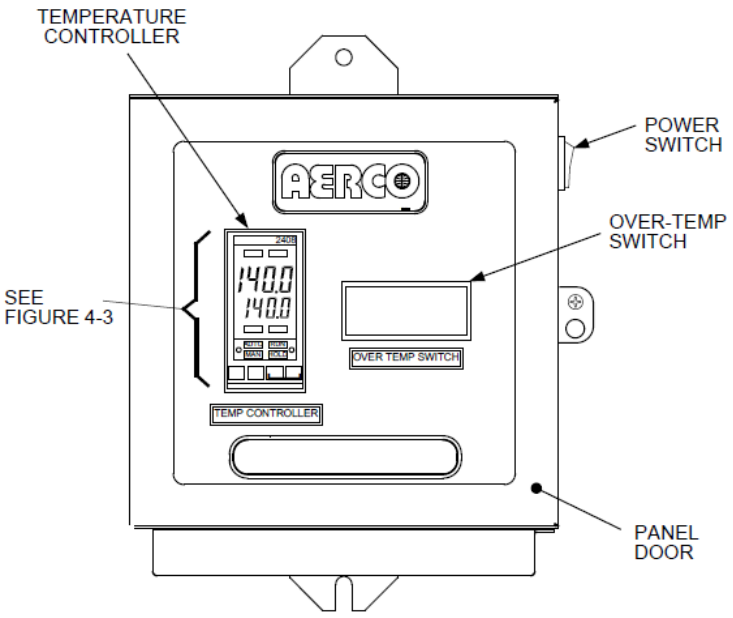

Figure 4-1. Control Box – Front View

IMPORTANT

Perform this adjustment after three months of use and annually thereafter. Also, this adjustment is mandatory each time the Actuator is replaced or when mechanical adjustments are made to the Valve or its linkage.

Automatically adjust the Actuator as follows:

1. Referring to Figure 4-2, loosen the set screw on the Actuator cover.
2. Remove the Actuator cover to access the PC board containing the terminal connections, DIP switches, Auto-Stroke (Reset) Button and LED.
3. Referring to Figure 4-1, use the power switch to turn on the Control Box and apply 24 VDC power to the Actuator. (On the terminal strip: pin 2 = +24 VDC, pin 1 = Common).

   The LED will light indicating that power is applied to the Control Box.
4. Wait approximately 10 seconds for the unit to perform its self-test. The LED will blink from one to four times, depending on the size of the Valve, as follows:

Blinks	Valve Size
1	1”
2	1.25” and 2.5”
3	1.5” and 3”
4	2” and 4”

5. For full-stroke automatic adjustment, press the Reset button. The LED will light and the Actuator will rotate in both directions to find its open and closed Valve position stops.
6. When the automatic adjustment is complete, the LED will blink from one to four times, depending on the size of the valves, as described in step 4, above.
7. Turn the Control Box power off to disconnect power to the Actuator.
8. Replace the Actuator cover and tighten the set screw.

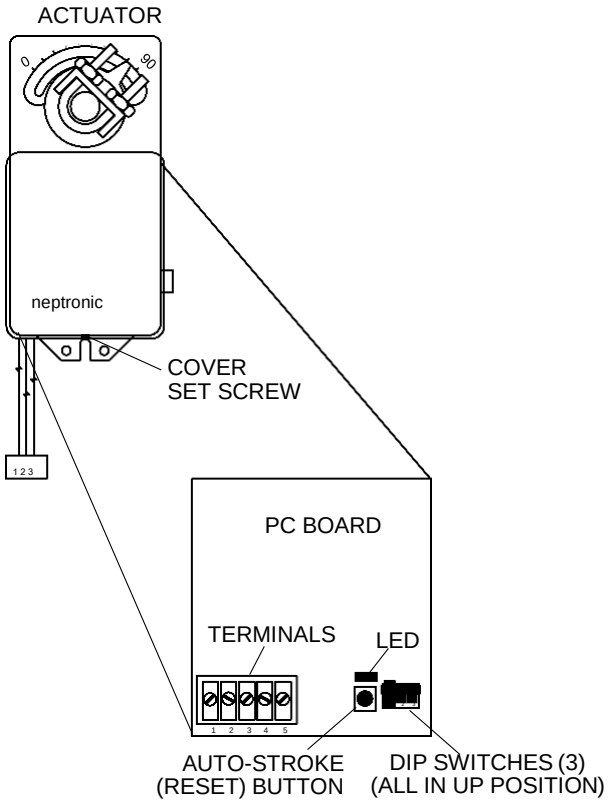

Figure 4-2. Actuator Adjustment

4.3 ADJUSTING THE ELECTRONIC CONTROL SYSTEM

The ECS is factory set by AERCO to the setpoint temperature specified on the sales order. Normally, the over-temperature alarm limit is set 20°F above the specified setpoint. If no setpoint or over-temperature alarm limit is specified, the ECS is set to the factory default values of 140°F (setpoint) and 160°F (over-temperature alarm limit).

To change the setpoint and over-temperature alarm limits, use the controls provided on the Temperature Controller and the Over-temperature Switch. These controls are visible through the Control Box front door window and can be accessed by opening the panel door (Figure 4-1).

4.3.1 Adjusting the Setpoint Temperature

Figure 4-3 illustrates and Table 4-1 describes the Temperature Controller controls and indicators. Use these controls/indicators to adjust the setpoint temperature as follows:

1. Turn the Control Box power switch on and open the Control Box door.
2. Wait approximately 3 seconds while the Temperature Controller performs its self-test. When the test is completed, the upper display will indicate the current heat exchanger Hot Water Output temperature, and the lower display will indicate the setpoint temperature stored in memory (default = 140°F), as illustrated in Figure 4-3.
3. Ensure that the Temperature Controller is set to the AUTO(matic) mode and the AUTO indicator is lit. If the MAN(ual) indicator is lit, press the AUTO/MAN pushbutton to toggle the mode setting. Indicator OP1 should also be lit.
4. Press the ▲ or ▼ arrow buttons, as necessary, to change the display to the desired value.
5. Two seconds after the ▲ or ▼ arrow button is released, the display will blink to indicate that the Temperature Controller has accepted and stored the displayed value.

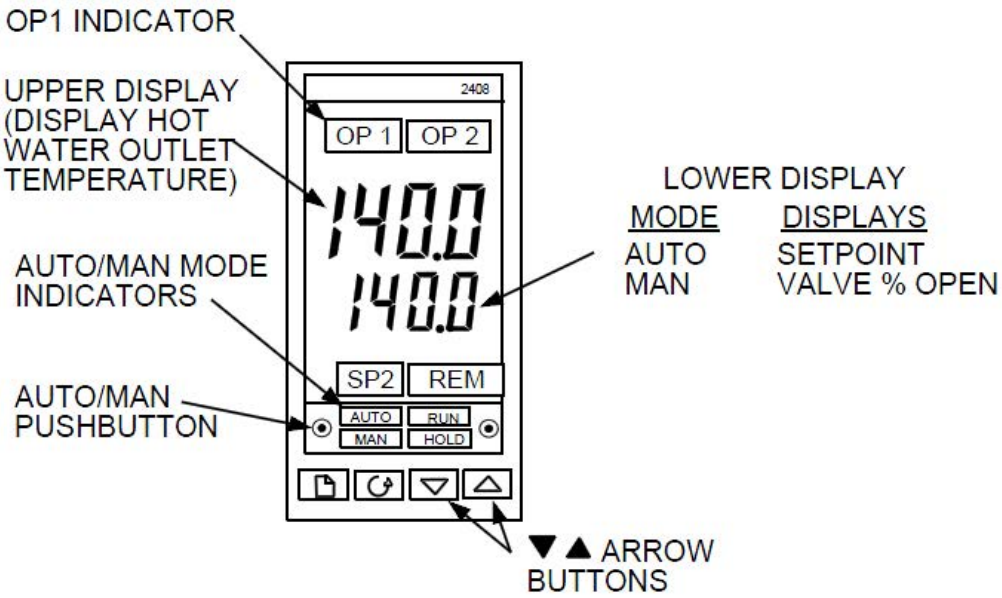

Figure 4-3. Temperature Controller

Table 4-1. Temperature Controller Operating Controls, Indicators and Displays

CONTROL / INDICATOR	MEANING	FUNCTION
OP1	Output 1 Indicator	OP1 lights when a 4-to-20 mA signal is supplied to the Actuator, or when the valve position is above 0%.
OP2	Output 2 Indicator	Not used for the ECS application
SP2	Setpoint 2 Indicator	Not used for the ECS application
REM	Remote Setpoint Indicator	REM lights when the ECS is set up to be controlled by a Remote (MODBUS) signal. REM will flash when MODBUS communication is active.
	Auto/Manual Button and Indicators	Pressing the button toggles the Controller between the automatic (AUTO) and manual (MAN) modes. • AUTO lights when in the automatic mode. • MAN lights when in the manual mode. When entering the MAN mode, the Valve position is reset to 0%.
	Run/Hold Button and Indicators	Not used for ECS application
	Page Button	Press the Page button to select a new list of parameters
	Scroll Button	Press the Scroll button to select a new parameter in a list
	Down Button	Press the Down button to decrease the value shown in the lower display
	Up Button	Press the UP button to increase the value shown in the lower display

4.3.2 Adjusting the Over-Temperature Alarm Limit

Adjust the over-temperature alarm limit setting using the controls and displays illustrated in Figure 4-4 and described in Table 4-2. Adjust the over-temperature alarm limit as follows:

OVER-TEMPERATURE ALARM LIMIT ADJUSTMENT

The over-temperature alarm limit setting is adjusted using the controls and display on the Over-Temperature Switch. The controls and display are illustrated and described in Figure 4-4 and Table 4-2. If necessary, over-temperature alarm limit adjustment is accomplished as follows:

1. With the Control Box door open, set the ON/OFF POWER switch on the right side to the ON position.

2. Press the SET button on the Over-Temperature Switch. SP will appear in the display.

3. Press the SET button again. The current over-temperature limit value stored in memory will be displayed (default = 160°F).

4. If the display does not show the desired over-temperature alarm setting, press the ▲ or ▼ arrow button to change the display to the desired temperature setting.

5. Once the desired over-temperature alarm setting is displayed, press the SET button to store the setting in memory.

6. To exit the programming mode, press the SET and ▼ buttons simultaneously, or simply wait one minute.

7. Once the programming mode has been exited, the display will show the current outlet water temperature of the Heater.

Figure 4-4. Over-Temperature Switch

Table 4-2. Over-Temperature Switch Controls and Indicators

CONTROL or INDICATOR	MEANING	FUNCTION
LED Display	TEMP status	Displays current water temperature or setpoint.
RST	RESET Button	Resets the unit after an alarm condition.
△	UP Button	Increases the displayed temperature.
▽	DOWN Button	Decreases the displayed temperature.
SET	SET Button	Used to access and store parameters in the unit.

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CHAPTER 5 OPERATION

5.1 INTRODUCTION

This chapter provides instructions for:

- Preparing your heat exchanger and Electronic Control System (ECS) for operation (5.2)
- Turning on the heat exchanger and setting it to run automatically (5.3)
- Shutting down and draining the heat exchanger (5.4)

5.2 PRE-OPERATIONAL

1. Refer to Chapter 2 Installation and verify that:

a. Electrical power is properly connected to the ECS and the CXT-E Control Valve.

b. All piping connections have been made according to recommended configurations.

c. All connecting piping has been cleaned (blown) out.

2. Refer to Chapter 4 Adjustments and verify that the Temperature Controller setpoint (4.3.1) and Over-temperature Switch alarm limit (4.3.2) have been set properly.

5.3 STARTUP PROCEDURES

1. Referring to Figure 5-1, press the power switch on the right side of the Control Box to apply power to both the Electronic Control System (ECS) and the CXT-E Control Valve. When power is initially applied, the Temperature Controller automatically performs a self-test sequence for approximately three seconds.
2. When the self-test is complete, the Temperature Controller will show the present hot water outlet temperature in the upper display and the setpoint temperature in the lower display.
3. Set the temperatures to the desired setpoints on the Over-temperature switch and the Eurotherm.
4. Set the Eurotherm into the Man mode and set the Valve position to 0%. If the temperature in the heater increases, see Chapter 7 Troubleshooting.
5. Open the stop valve in the Cold Water Input line and hold the relief valve in the heat exchanger upper head assembly open to enable air to escape (to avoid an air pocket build-up which could prevent the heat exchanger from filling with water). When water flows out of the relief valve, the heat exchanger is full.
6. Open any stop valves in the building or process recirculation system, if such a system is included in the Heater installation.
7. Open the stop valve in the Hot Water Output line. Open hot water faucets or valves in the building or process to ensure a flow of water through the heat exchanger.
8. Slowly open all stop valves in the Steam Input and Condensate Output lines. If double block and bleed valving is used, make sure that the drain (bleed) valve is closed tight.

IMPORTANT

To prevent a possible over-temperature condition during initial start-up, be sure to perform the following steps in the order specified:

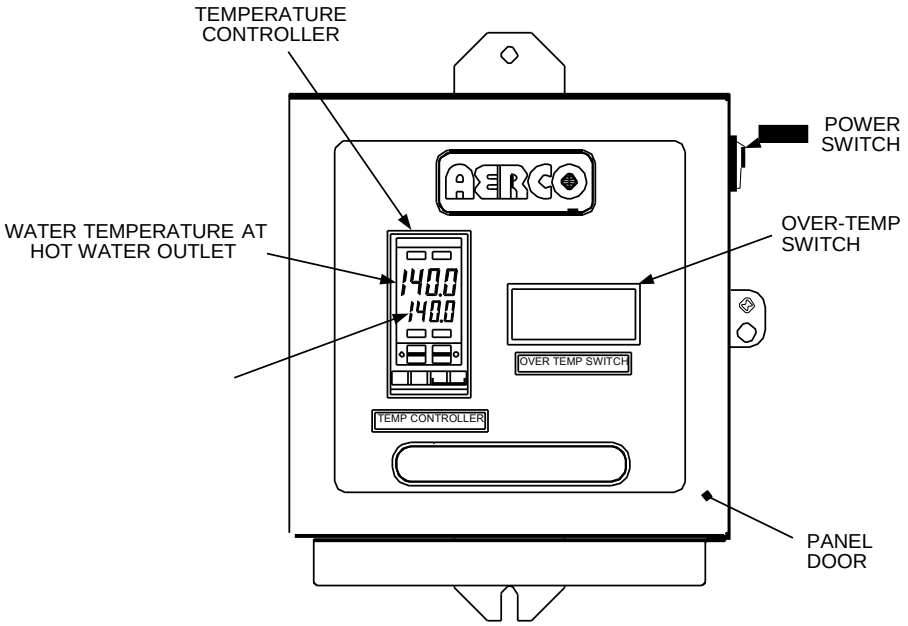

Figure 5-1. Control Box

9. Referring to Figure 5-2, press the AUTO/MAN pushbutton to toggle the AUTO/MAN display to the MAN (Manual) mode. The MAN indicator will light.

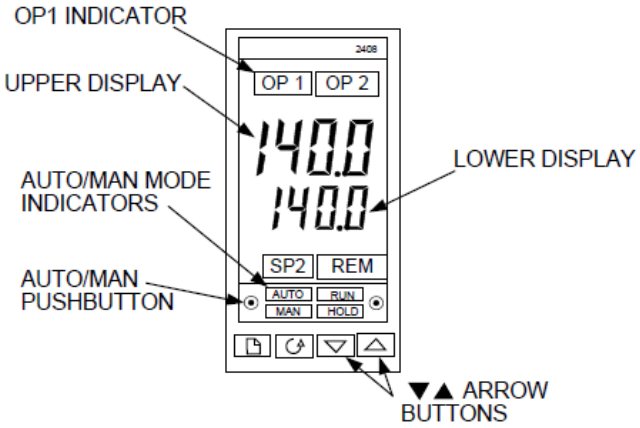

Figure 5-2. Temperature Controller

10. The upper display will continue to show the current heat exchanger outlet water temperature, and the lower display will show the position of the CXT-E Control Valve Actuator in %. When the Manual mode is initially selected, the lower display will show 0%, indicating that the Control Valve is fully closed.
11. Using the ▲ arrow button, set the CXT-E Control Valve to the 10% position and monitor the heat exchanger Hot Water Output water temperature.
12. Continue to open the valve further in 5% increments until the Hot Water Output temperature begins to increase at a moderate rate.
13. When the Hot Water Output water temperature has increased to within 20°F of the desired setpoint, press the AUTO/MAN button to set the Temperature Controller to the AUTO mode. The AUTO indicator will light and the MAN indicator will go off. When the Temperature Controller is in the AUTO

mode, the upper display will continue to show the heat exchanger Hot Water Output water temperature, and the lower display will show the selected setpoint temperature.

14. In the AUTO mode, the ECS will stabilize at the selected setpoint temperature. When stabilized, the ECS is set for unattended operation and no further operator intervention is required.
15. Close the Hot Water faucets or valves that were opened in step 7.

5.4 SHUTTING DOWN AND DRAINING THE HEAT EXCHANGER

To shut down the heat exchanger:

1. Set the Eurotherm to the MAN(ual) in the 0% Valve position.
2. Close all stop valves in the Steam Input and Condensate Output lines.
3. IN THIS ORDER, close the stop valves in the:
   a. Hot Water Output line
   b. Recirculation line
   c. Cold Water Input line

When the heat exchange has been shut down according to steps 1 and 2, drain the heat exchanger as follows:

4. CAREFULLY open the relief valve in the heat exchanger upper head assembly to relieve pressure in the heat exchanger shell. If water continues to flow from the relief valve, one of the cold water stop valves is either leaking or is not shut tightly. Stop the flow from the relief valve and proceed.
5. Holding the relief valve open (to prevent creating a vacuum in the shell), open the plugged drain at the bottom of the heater exchanger shell and drain the heat exchanger completely.

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CHAPTER 6 SCHEDULED MAINTENANCE

6.1 INTRODUCTION

This chapter lists the preventive maintenance procedures recommended for the heat exchanger and Electronic Control System (ECS). These recommendations include procedures to be performed each week (6.2), month (6.3), quarter (6.4), six-month interval (6.5) and year (6.6).

The recommended preventive maintenance schedule is summarized in Table 6-1 at the end of this chapter.

6.2 WEEKLY MAINTENANCE

☐ Tube Leaks

Check the leak detection tube once each week for evidence of leaks in the heat exchanger tubes. MAKE CERTAIN THAT THE DETECTION TUBE NEVER GETS PLUGGED. If any fluid is escaping from the detection tube, shut down the heat exchanger as outlined in Section 5.4 and see Section 9.2 to investigate the leak.

6.3 MONTHLY MAINTENANCE

☐ Steam Strainer

After the first month of operation, clean the strainer in the Steam Input line in accordance with the instructions furnished with the strainer.

☐ CXT-E Control Valve

Check the CXT-E Control Valve ("Valve") for leaks, as follows:

1. Referring to Figure 6-1, check the packing nut and Valve top for evidence of leakage.

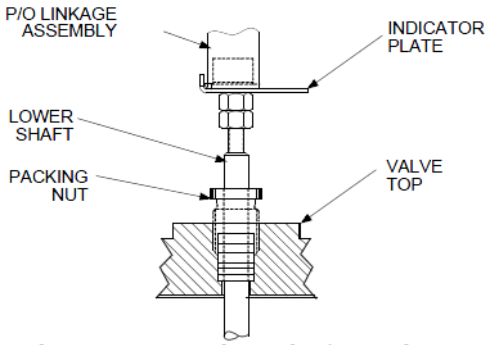

Figure 6-1. Valve Shaft Seals

2. If there is leakage between the packing nut and Valve top, tighten the packing nut until the leakage stops. DO NOT FORCE the packing nut.

CAUTION

Take care not to over-tighten the packing nut to avoid trapping the valve stem and slowing or stopping Valve motion.

3. If tightening the packing nut does not stop the leak, the packing nut and packing assembly must be replaced in accordance with the procedures specified in Sections 8.2.2 and 8.2.3.

6.4 QUARTERLY MAINTENANCE

6.4.1 First Three Months

☐ Accumulated Shell Solids

After the first three months of initial operation, drain the heat exchanger as follows:

1. Close all stop valves in the Steam Input and Condensate Output lines.
2. IN THIS ORDER, close the stop valves in the:
   a. Hot Water Output line
   b. Recirculation line
   c. Cold Water Input line
3. CAREFULLY open the relief valve in the upper head assembly to relieve pressure in the shell. If fluid continues to flow from the relief valve, one of the Cold Water Input stop valves is either leaking or is not completely shut off. Securely close all Cold Water Input stop valves until there is no more flow from the relief valve.
4. WITH THE RELIEF VALVE HELD OPEN (to prevent creating a vacuum in the shell), open the plugged drain at the bottom of the shell (see Figure 3-3), and drain the heat exchanger completely.
5. Examine the water being drained.
   a. If the amount of solids in the water being drained appears to be heavy, set a schedule to drain the heat exchanger every 3 months.
   b. If the amount of solids appears to be light, set a schedule to drain the heat exchanger every 6 months.
   c. Even if the amount of solids appears to be very light or not at all, set a schedule to drain the heat exchanger at least once each year.
6. To refill the heat exchanger and place it back into operation, replace the drain plug and perform the Pre-Operational and Operational steps listed in Chapter 5.

6.4.2 Each Quarter

☐ Valve Calibration

Refer to 4.2 and perform the CXT-E Actuator adjustment procedure as instructed.

☐ Over-temperature Switch

Check the operation of the Over-temperature Switch as follows:

1. Refer to 4.3.2 and lower the over-temperature setting to approximately 5°F below the present setpoint, as shown in the lower display of the Temperature Controller.
2. Verify that an over-temperature alarm is generated and the following events occur:
   a. The CXT-E Control Valve closes.
   b. The Over-temperature Solenoid (located at top of heat exchanger) opens and expels water from the system.
   c. The Over-temperature Switch generates an audible alarm.
3. When you have successfully completed the over-temperature alarm check, return the Over-temperature Switch to its original setting.

6.5 SEMI-ANNUAL MAINTENANCE

☐ Actuator

Refer to Section 4.2 and perform the Actuator adjustment procedure presented there. Verify that the Actuator strokes the Control Valve from the fully closed to the fully open position.

☐ Temperature Controller

Check the Temperature Controller operation at least every 6 months. Make any necessary adjustments per Section 5.3, steps 7 through 11.

☐ Steam Strainer

Clean the strainer in the Steam Input line in accordance with the instructions furnished with the strainer.

6.6 ANNUAL MAINTENANCE

☐ Temperature Sensors

AERCO recommends that you check the temperature sensors once a year to ensure that there is no scale build-up or clogging that may degrade system operation. To check the temperature sensors, proceed as follows:

1. Close the upstream and downstream water supply valves to the heat exchanger.
2. Check the DHW Outlet Temperature Sensor at the Hot Water Output port. If necessary, clean it using the following procedure:
   a. Disconnect and remove the DHW Outlet Temperature Sensor (dual thermocouples).
   b. Inspect for evidence of scale buildup on the stainless steel sleeve.
   c. If necessary, clean the thermocouples using a wire brush.
3. After cleaning, reinstall both thermocouples and ensure they are tightened securely.
4. Open all valves that were closed in Step 1 and restore the heat exchanger to operation.

☐ Recirculation Pump

The recirculation pump is located in the recirculation line, just above the Cold Water Input.

1. Turn the power switch on the Control Box to OFF.
2. Ensure that the water has been drained from the unit (see 6.4.1, steps 1-4).

WARNING

BEFORE PERFORMING THE FOLLOWING STEPS, ENSURE THAT THE POWER SWITCH ON THE SIDE OF THE ECS CONTROL BOX IS OFF AND THE HEATER HAS BEEN DRAINED AS SPECIFIED IN 6.4.1, STEPS 1 THROUGH 4.

3. Locate the recirculation pump and disconnect the flanges from the recirculation piping.
4. Without pulling on the electrical conduit attached to the recirculation pump, carefully slide it out and inspect it.

5. If there is evidence of scale build-up, disconnect the conduit and electrical power lines from the pump and service or replace it, as necessary.
6. If there is no evidence of scale build-up on the recirculation pump, reinstall it and reconnect the wiring and flanges.

Table* 6-1*. Recommended Maintenance Schedule

Maintenance Check	Week (6.3)	Month (6.4)	Quarter (6.5)	Six Months (6.6)	Year (6.7)
☐ Tube Leak	√				
☐ Control Valve Leak		√			
☐ Vacuum Breaker(s)		√			
☐ Shell Solids*			√		
☐ Over-temperature Switch Alarm			√		
☐ Temperature Controller				√	
☐ Actuator Adjustment				√	
☐ Steam Strainer				√	
☐ Over-temperature Switch				√	
☐ Temperature Sensor					√
☐ Recirculation Pump					√

* Perform the first test for shell solids upon completion of the first three months of heat exchanger operation. Depending upon the results (see 6.4.1, Step 5), repeat this test quarterly, semi-annually or annually.

CHAPTER 7 TROUBLESHOOTING

7.1 INTRODUCTION

This section provides you with troubleshooting procedures for isolating faults to the most probable cause whenever malfunctions occur in the heat exchanger (Table 7-1), CXT-E Electronic Control Valve (Table 7-2), or Electronic Control System (ECS; Table 7-3). Table 7-4 provides troubleshooting tips for correcting control system faults, and Table 7-5 provides the dynamic temperature control settings for the three models of the DW-Series water heater product line.

Before performing the troubleshooting steps and procedures provided in Tables 7-1 through 7-4, complete the following preliminary checks:

1. ELECTRONIC CONTROL VALVE, CXT-E
   a. Verify that all piping connections have been made in accordance with Figure 2-4 and that all electrical connections have been made in accordance with Figure 2-7.
   b. Ensure that the Electronic Control Valve ("Valve") is installed with the flow arrow on the Valve body pointing in the direction of flow.
   c. Ensure that both the upstream and downstream shutoff valves are fully open.
2. ELECTRONIC CONTROL SYSTEM
   a. Ensure that all ECS electrical cable connections are secure.
   b. Ensure that the CXT-E Control Valve actuator is connected to the Control Box cable plug.

NOTE

When system malfunctions occur, check the troubleshooting sections of the manuals for any other equipment included in this installation, as necessary, in addition to the procedures provided in this section. Appendix A of this manual contains process fault and diagnostic alarm information for the Eurotherm, Model 2408 Temperature Controller.

7.2 TROUBLESHOOTING PROCEDURES

When a heat exchanger fault occurs, proceed as follows:

1. Refer to the FAULT INDICATION column in the following tables and locate the fault that best describes the existing conditions.
2. Proceed to the PROBABLE CAUSE column. If more than one item is listed, start with the first item shown for the fault condition.
3. Perform the corresponding checks and procedures listed in the CORRECTIVE ACTION column for the first PROBABLE CAUSE.
4. Continue checking each additional PROBABLE CAUSE for the existing fault until the fault has been corrected.
5. If component removal and/or replacement is required, refer to the applicable procedures in Chapter 8 Corrective Maintenance.

Table 7-1. TROUBLESHOOTING – HEAT EXCHANGER

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
T1	The heat exchanger does not maintain the required temperature at rated capacity.	1. The Control Valve does not open.	1. Check the instructions in Table 7-2.
		2. There is a leak in either the inside or outside wall of one or more of the heat exchanger tubes, as indicated by a flow from the leak detection port.	2. Refer to Chapter 9, section 9.2, and proceed as instructed.
		3. Recirculating pump failure.	3. Proceed as follows: a. Check input power to the recirculation pump. b. Check the temperature of the copper tube above the pump. It should be the same as the outlet DHW temperature. If cold, repair or replace the pump, as needed.
		4. The heat exchanger tubes are scaled up.	4. Contact AERCO or your nearest AERCO representative.
		5. The heat exchanger is being used at a rate higher than its design capacity.	5. Contact AERCO or your nearest AERCO representative.
		6. Steam pressure is too low.	6. Check the supply pressure gauge ahead of the Control Valve. If the reading is low, adjust the steam supply pressure to the required value. If the steam supply line is restricted, the gauge reading will drop excessively when the heat exchanger calls for full steam, even though the pressure seems to be normal when the load is light. If the steam supply pressure is correct, the steam pressure compound gauge reading should reach design pressure for steam in the heat exchanger tubes as the Hot Water Output temperature starts to drop. If it does not, check the operation of the Control Valve.
		7. Condensate is backing up into the heat exchanger because of a restriction in the condensate drain line.	7. Contact AERCO or the nearest AERCO representative for the trap size required and make the necessary correction.
		8. The condensate return piping has not been installed so as to enable the condensate to drain freely by gravity, and/or the condensate check valve leaks or has failed.	8. If necessary, rearrange the condensate return piping to permit condensate to drain freely from the heat exchanger connection. Inspect the condensate check valve and replace it if it is leaking or has failed. Also, ensure that there is no restriction in the condensate drain line.
		9. Thermocouple is not installed in the water flow.	9. Check to ensure that the thermocouple sheath does not protrude more than ½“ from the compression fitting.
		10. The Temperature Controller reads wrong.	10. Check by replacing the Temperature Controller with one known to be correct.

Table 7-1. TROUBLESHOOTING – HEAT EXCHANGER, continued

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
T2	Heat exchanger overheats	1. Temperature Controller is indicating the wrong value.	1. Check by replacing the Temperature Controller with one known to be correct.
		2. Water is preheated too hot.	2. Reduce the preheating to a temperature at least 10°F below the desired Hot Water Output temperature.
		3. Termocouple is not installed in the water flow.	3. Check to ensure that the thermocouple sheath does not protrude more than ½“ from the compression fitting.
		4. Leaking valve in by-pass line, if any, around the Control Valve.	4. Maintain the valve to shut tight.
		5. The Steam Input does not close.	5. Check the instructions in Table 7-2, Item T11.
T3	Hot water outlet temperature fluctuates widely	1. The Control Valve does not close.	1. Determine if the packing is too tight. See the instructions in Table 7-2.
		2. The Control Valve does not open.	2. Determine if the packing is too tight. See the instructions in Table 7-2.
		3. There is a leak in either the inside or outside wall of one or more of the heat exchanger tubes, as indicated by a flow from the leak detection port.	3. Refer to Chapter 9, Section 9.2, and proceed as instructed.
		4. The heat exchanger is being used at a rate higher than its design capacity.	4. Contact AERCO or your nearest AERCO Representative for advice in remedying this problem.
		5. Steam pressure is too low.	5. Check the supply pressure gauge ahead of the Control Valve. If the reading is low, adjust the steam supply pressure to the required value. If there is a restriction in the steam supply line, the gauge reading will drop excessively when the heat exchanger calls for full steam, even though the pressure seems to be normal when the load is light. If the steam supply pressure is correct, the steam pressure compound gauge reading should reach design pressure for steam in the heat exchanger tubes as the Hot Water Output temperature starts to drop. If it does not, check the operation of the Control Valve.

Table 7-1. TROUBLESHOOTING – HEAT EXCHANGER, continued

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
	(Continued)	6. No check valve in the condensate drain line.	6. Lack of this check valve can allow condensate — and live Steam, if present — to be drawn back into the heat exchanger from the condensate line. This can result in a high back pressure, water hammer, and, if live steam is present, over-heating. Install a check valve in the condensate drain line as indicated in Appendix C, Figure C1 through Figure C5.
		7. Condensate is backing up into the heat exchanger because of a restriction in the condensate drain line such as an undersized or faulty trap.	7. Check AERCO or the nearest AERCO Representative for the trap size required and make the necessary correction
		8. The condensate return piping has not been installed so that the condensate drains freely by gravity and/or the condensate check valve leaks or has failed.	8. If necessary, rearrange the condensate return piping to permit condensate to drain freely from the heat exchanger connection. Inspect the check valve and replace it if it is leaking or has failed. Also, check to make sure that there is no restriction in the condensate drain line.
		9. Recirculation pump is malfunctioning.	9. Proceed as follows: a. Check input power to the recirculation pump. b. Check the temperature of the copper tube above the pump. It should be the same as the outlet DHW temperature. If cold, repair or replace the pump, as required.
T4	Insufficient water flow rate through the heat exchanger	1. Cold Water Input pressure is low.	1. Check the pressure to the heater and correct, if necessary.
		2. There is a leak in either the inside or outside wall of one or more of the heat exchanger tubes, as indicated by a flow from the leak detection port.	2. Refer to Section 9.2 and proceed as instructed.
		3. Check valves may not be fully open.	3. Verify that the check valves on the CW and DHW sides are fully open.

Table 7-1. TROUBLESHOOTING – HEAT EXCHANGER, continued

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
T5	Excess or insufficient condensate being returned from the heat exchanger	1. There is a leak in either the inside or outside wall of one or more of the heat exchanger tubes, as indicated by a flow from the leak detection port. 2. Condensate is backing up into the heat exchanger because of a restriction in the condensate drain line, such as an undersized or faulty trap. 3. The condensate return piping has not been installed so as to enable the condensate to drain freely by gravity, and/or the condensate check valve leaks or has failed.	1. Refer to Section 9.2 and proceed as instructed. 2. Check AERCO or the nearest AERCO Representative for the trap size required and make the necessary correction 3. If necessary, rearrange the condensate return piping to permit condensate to drain freely from the heat exchanger connection. Inspect the check valve and replace it if it is leaking or has failed. Also, check to make sure that there is no restriction in the condensate drain line.
T6	Steam being discharged from heat exchanger at too high a temperature	The heat exchanger tubes are scaled up.	Contact AERCO or your nearest AERCO Representative for advice concerning the required remedy.
T7	Pressure/temperature relief valve pops	1. Static pressure of the Cold Water is too high. 2. Fluid to be heated is preheated too hot. 3. Leaking valve in by-pass line, if any, around the Control Valve. 4. Lack of expansion capability in the hot water system. 5. Insufficient shock absorbers. 6. The Control Valve does not close. 7. The Over-temperature Limit Switch is out of adjustment, or some component of the system has failed.	1. Make corrections necessary to bring the pressure below the relief valve setting. 2. Reduce the preheating to a temperature at least 10°F below the desired Hot Water Output temperature. 3. Maintain the valve to shut tight. 4. Insert an expansion tank in the Hot Water Output line near the heat exchanger. 5. Insert shock absorbers (water hammer arrestors) in both the cold and hot water systems, as needed to eliminate shock waves. 6. Check the instructions in Table 7-2. 7. Check the Over-temperature Limit Switch setting and adjust to the specified setting (usually 20°F higher than the desired Hot Water Output temperature) (See 4.3.2). Inspect and repair or replace each component as necessary.

Table 7-1. TROUBLESHOOTING – HEAT EXCHANGER, continued

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
	(Continued)	8. The condensate return piping has not been installed so as to enable the condensate to drain freely by gravity, and/or the condensate check valve leaks or has failed.	8. If necessary, rearrange the condensate return piping to permit condensate to drain freely from the heat exchanger connection. Inspect the Check Valve and replace it if it is leaking or has failed. Also, check to make sure that there is no restriction in the condensate drain line.
T8	Heat exchanger shuts down below Hot Water Output temperature.	The Over-temperature Limit Switch is out of adjustment or some component of the system has failed.	Check the over-temperature Limit Switch setting per 4.3.2. Inspect and repair or replace each component as necessary.
T9	Loud banging in heat exchanger or in steam piping - not to be confused with the normal clicking noise	1. Faulty vacuum breaker. 2. Lack of expansion capability in the hot water system. 3. Insufficient shock absorbers. 4. No check valve in the condensate drain line. 5. Supply steam line is not properly trapped. 6. The condensate return piping has not been installed so as to enable the condensate to drain freely by gravity, and/or the condensate check valve leaks or has failed.	1. Check the vacuum breaker for faulty operation. If faulty, replace vacuum breaker. 2. Insert an expansion tank in the Hot Water Output line near the heat exchanger. 3. Insert shock absorbers (water hammer arresters) in both the cold and hot water systems, as needed to eliminate shock waves. 4. Lack of this check valve can enable condensate — and live steam, if present — to be drawn back into the heat exchanger from the condensate line. This can result in a high back pressure, water hammer, and if live steam is present, over-heating. Install a check valve in the condensate drain line as indicated in Appendix C, Figure C1 through Figure C5. 5. Install a trap as indicated in Appendix C, Figure C1 through Figure C5. 6. If necessary, rearrange the condensate return piping to permit condensate to drain freely from the heat exchanger connection. Inspect the check valve and replace it if it is leaking or has failed. Also, check to make sure that there is no restriction in the condensate drain line.

Table 7-2 TROUBLESHOOTING – ELECTRONIC CONTROL VALVE CXT-E

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
T10	System not operating. Control Valve is closed and Hot Water Output water temperature is far below setpoint. **CAUTION** Over-tightening the packing nut may trap the Valve stem and slow or stop Valve motion.	1. Power is not being supplied to the Control Valve. 2. The Actuator has failed. 3. Control signal is not being supplied from the Temperature Controller. 4. The Actuator linkage has failed.	1. Disconnect Actuator plug and verify that 24 VDC power is present at pin 2 of the Actuator cable. Restore power as necessary. Proceed to Table 7-3, Item T17, and verify that the Over-temperature Switch is not tripped. 2. Replace Actuator. 3. Verify presence of 4 – 20 mA control signal at pin 3 of the Actuator cable. If the control signal is not present, troubleshoot ECS per Table 7-3. 4. Check Actuator linkage and verify that it is properly connected and that the pin in the linkage is in the correct position for the installed Valve size
T11	System overheats by more than 10°F above the desired setpoint. Outlet temperature is below the over-temperature limit setting. **CAUTION** Over-tightening the packing nut may trap the Valve stem and slow or stop Valve motion.	1. Control Valve is not fully closed. 2. Actuator U-bolt loose. 3. The Actuator has failed. 4. Temperature Controller is not set properly or is defective. 5. Actuator is not properly secured to the linkage assembly. 6. Foreign matter in the Control Valve seat 7. Recirculation pump failure.	1. Check the 4 – 20 mA control signal being supplied to the Actuator. If the signal is greater than 4 mA when the heater outlet temperature is 10°F (or more) above the desired setpoint, proceed to next item ion the list. 2. Check Actuator U-bolt securing it to the linkage assembly. Tighten as needed (per 8.2.4, Step 55) and readjust the CXT-E Control Valve per 4.2. 3. Replace Actuator. 4. Refer to Chapter 4 Adjustments. Check the current setting of the Temperature Controller. Readjust if necessary. If adjustment does not clear the fault, proceed to Table 7-3, Item T16, and proceed as instructed. 5. Check the Actuator U-bolt that secures the linkage assembly. Tighten if needed and readjust the Control Valve per section 4.2. 6. If the Valve still does not close after checking the above items, disassemble the Valve and clean the seat per 8.2.2, steps 18 –28. 7. Proceed as follows: a. Check input power to the recirculation pump. b. Check the temperature of the copper tube above the pump. It should be the same as the outlet DHW temperature. If cold, repair or replace the pump, as required.

Table 7-2. TROUBLESHOOTING – ELECTRONIC CONTROL VALVE CXT-E, continued

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
T12	System outlet water temperature is below desired setpoint. **CAUTION** Do not over-tighten the packing nut, as it may trap the Valve stem and slow or stop Valve motion.	1. Temperature Controller is not set properly. 2. Control Valve is not opening properly. 3. Steam pressure is too low 4. Trap in Condensate Output line is malfunctioning.	1. Refer to 4.3.1 and check the current Temperature Controller setting. If the setting is below the desired setpoint, readjust as necessary. 2. Proceed as follows: a. Ensure that the Actuator is correctly secured to the Control Valve linkage assembly. Tighten mounting bolts, as needed. b. Verify that 24 VDC power and 4 - 20 mA control signal are present at Actuator pins 2 and 3, respectively. c. To ensure that the Valve is not binding, check the Valve shaft seal retainer per 8.2.1, steps 1 through 10. Replace items as necessary. 3. Check the high-side steam pressure to the Control Valve to ensure it is correct. a. If steam pressure is lower than the system design specification, correct as necessary. b. If the high-side steam pressure drops as the Control Valve opens, the strainer may be clogged, or there may be a partially closed valve in the upstream line. Correct as required. 4. Check for improper operation of the trap in the Condensate Output line, as follows: a. If the low-side pressure gauge shows pressure, but steam does not heat properly, CAREFULLY break the Condensate Output line connection AHEAD of the trap. b. Allow condensate to run out into the floor drain. c. If the heat exchanger outlet temperature rises to the desired setpoint with the condensate connection open, repair or replace the trap.

Table 7-2. TROUBLESHOOTING – ELECTRONIC CONTROL VALVE CXT-E, continued

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
T13	Wide variations in heat exchanger outlet temperature during wide flow variations.	1. Mixed water temperature sensor is malfunctioning. 2. Recirculation pump is malfunctioning.	1. Refer to Table 7-3 Item T21, and check the operation of the mixed water temperature sensor. 2. Proceed as follows: a. Check input power to the recirculation pump. b. Check the temperature of the copper tube above the pump. It should be the same as the outlet DHW temperature. If cold, repair or replace the pump, as required.
T14	Rapid fluctuations in heater outlet temperature which do not follow load changes	1. Temperature Controller is malfunctioning. 2. Steam Trap or orifice fault	1. Refer to Table 7-3, Items T16 and T19 to troubleshoot the Temperature Controller. 2. Refer to T12, Corrective Action 4 above and proceed as directed.
T15	System not operating. All displays are blank.	1. External 120 VAC power is disconnected. 2. Defective ON/OFF power switch on Control Box.	1. Ensure that the external circuit breaker is ON. Check for 120 VAC power across TB-2 terminal leads 101 (Line) and 102 (Neutral). 2. Set ON/OFF power switch to the ON (Up) position and verify that the switch indicator lights. Also: a. Verify that 120 VAC is present across TB-2 terminal leads 100 (Line) and 102 (Neutral). b. If voltage is not present, replace theON/OFF power switch.
T16	Love Over-temperature Switch display is blank.	Defective DC Power Supply	Disconnect the DC output connector on the left internal wall of the Control Box (Figure 8-12b). Verify that 24 VDC is present across the V+ and V- terminals. If 24 VDC is not present, replace the DC Power Supply.
T17	Hot Water Output temperature consistently above setpoint by 10°F, or more. However, temperature is below over-temperature limit setting.	1. Temperature Controller is not set properly. 2. Faulty Temperature Sensor (thermocouple) is connected to Temperature Controller. 3. Valve Actuator is not properly secured to the linkage assembly. 4. Polarity of J-Thermocouple connection is reversed. [Should be Red (-) White (+)]	1. Refer to Chapter 4 Adjustments and check current setting of Temperature Controller. Readjust as necessary. 2. Verify that Hot Water Outlet Temperature Sensor is securely connected to the cable plug. Replace the DHW Outlet Temperature Sensor, if necessary. 3. Verify that the Actuator is securely fastened to the linkage assembly. Tighten as needed and readjust the CXT-E Control Valve per Chapter 4. 4. Check polarity of J-Thermocouple connection. Correct, if necessary.

Table 7-3 TROUBLESHOOTING – ELECTRONIC CONTROL SYSTEM

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
T18	Over-temperature alarm occurs repeatedly. **NOTE** Audible alarms will be generated if the Hot Water Output temperature sensor is open. Erroneous temperature readings will be displayed if sensor is shorted.	1. Over-temperature Switch is not set properly. 2. Open or shorted Hot Water Outlet temperature sensor (thermocouple) is connected to the Over-temperature Switch. 3. Over-temperature Switch is defective.	1. Refer to Chapter 4 and check the current setting of the Over-temperature Switch. Readjust as necessary. 2. Check thermocouple connections between Hot Water Outlet sensor connector plug and TB-1 terminal leads 111 (+) and 112 (-). If connections are secure, replace the Dual-temperature Sensor. 3. Replace the Over-temperature Switch.
T19	Over-temperature alarm condition cannot be cleared. Over-temperature Switch displays erroneous temperature readings	1. Shorted Hot Water Output temperature sensor. 2. Defective Over-temperature Switch 3. A “No-Flow” condition is causing a gradual buildup of heat in the vessel water. 4. External recirculation pump has shut off or has failed. 5. Over-temperature Switch setting is too low. 6. Packing nut is too tight. 7. Over-temperature Solenoid Valve is leaking or open.	1. Replace Hot Water Output Temperature Sensor. 2. Replace Over-temperature Switch. 3. Open heat exchanger Hot Water Outlet to see if fault clears. If there is no flow through the heat exchanger, see Probable Cause 4. 4. Check pump to ensure that it is turned on and functioning properly. Also, check for blockage in the incoming flow. 5. Refer to Chapter 4 and check the current setting of the Over-temperature Switch. Readjust as necessary. 6. Loosen the packing nut and re-tighten it avoiding the use of excessive force. 7. Inspect the solenoid valve for evidence of leaks. If leaks are detected, replace the solenoid valve.

Table 7-3. TROUBLESHOOTING – ELECTRONIC CONTROL SYSTEM, continued

NO.	FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
T20	Outlet water temperature is far below setpoint	1. Incorrect Temperature Controller setting 2. Defective Temperature Controller. 3. Linkage not properly connected. 4. Defective Actuator. 5. Control Valve shaft may be binding	1. Refer to Chapter 4 and check the current setting of the Over-temperature Switch. Readjust as necessary. 2. Disconnect the cable plug from the Valve Actuator and verify that the Temperature Controller is generating a control signal greater than 4 mA. If not, replace the Temperature. Controller. 3. Check the Control Valve linkage to verify that it is properly connected and that the pin in the linkage is in the correct position for the selected Valve size. 4. Replace the Valve Actuator. 5. Refer to Table 7-2, Fault T12, Corrective Action 2c and perform the indicated action.
T21	Wide fluctuations occur in Hot Water Output water temperature during large flow changes.	1. Heat exchanger recirculation pump is not operating. 2. Over-temperature Switch setting is too low. 3. Over-temperature Solenoid Valve is leaking or open.	1. Check the power to the recirculation pump. 2. Refer to Chapter 4 and check the current setting of the Over-temperature Switch. Readjust as necessary. 3. Inspect the solenoid valve for evidence of leaks. If leaks are detected, replace the solenoid valve.
T22	Wide fluctuations occur in Hot Water Output water temperature under low flow conditions.	1. DHW Outlet Temperature Sensor connected to the Temperature Controller is intermittent. 2. Mixed water temperature sensor is open, shorted or gives inconsistent readings. 3. Recirculation pump has failed	1. Replace DHW Outlet Temperature Sensor at the heat exchanger Hot Water Output port. 2. Replace mixed water temperature sensor. 3. Replace recirculation pump.
T23	Hot Water Output temperature above over-temperature limit, but solenoid (Dump) valve does not open.	1. Disconnected or defective solenoid 2. Defective Over-temperature Switch 3. Solenoid valve wiring is loose or reversed.	1. Verify that 24 VDC is present at the solenoid plug between leads 103(+) and 104 (-). If voltage is present and the solenoid is connected, replace the solenoid. If 24 VDC is not present, proceed to Item 2, below. 2. Replace Over-Temperature Switch. 3. Verify that solenoid valve wiring is secure and connected per Figure B-1.

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CHAPTER 8 CORRECTIVE MAINTENANCE

8.1 INTRODUCTION

This chapter documents AERCO's recommended corrective maintenance procedures for the packaged assembly of the DW-series heat exchanger, the CXT-E Control Valve and the Electronic Control System (ECS). This chapter is organized as follows:

- CXT-E Control Valve (8.2)
- Electronic Control System (8.3)

8.2 CXT-E ELECTRONIC CONTROL VALVE

The corrective maintenance procedures for the CXT-E Control Valve are organized as follows:

- Valve Shaft Seal Retainer Replacement (8.2.1)
- Valve Disassembly (8.2.2)
- Valve Reassembly (8.2.3)
- Actuator Replacement (8.2.4)
- Linkage Assembly Replacement (8.2.5)

Refer to the following drawings and parts list tables to perform the indicated operations on the AERCO Type CXT-E Actuator and Valve Assembly:

Size	Figure	Table
1.00" to 2.00"	Figure 8-1	Table 8-1
2.50" to 4.00"	Figure 8-2	Table 8-2

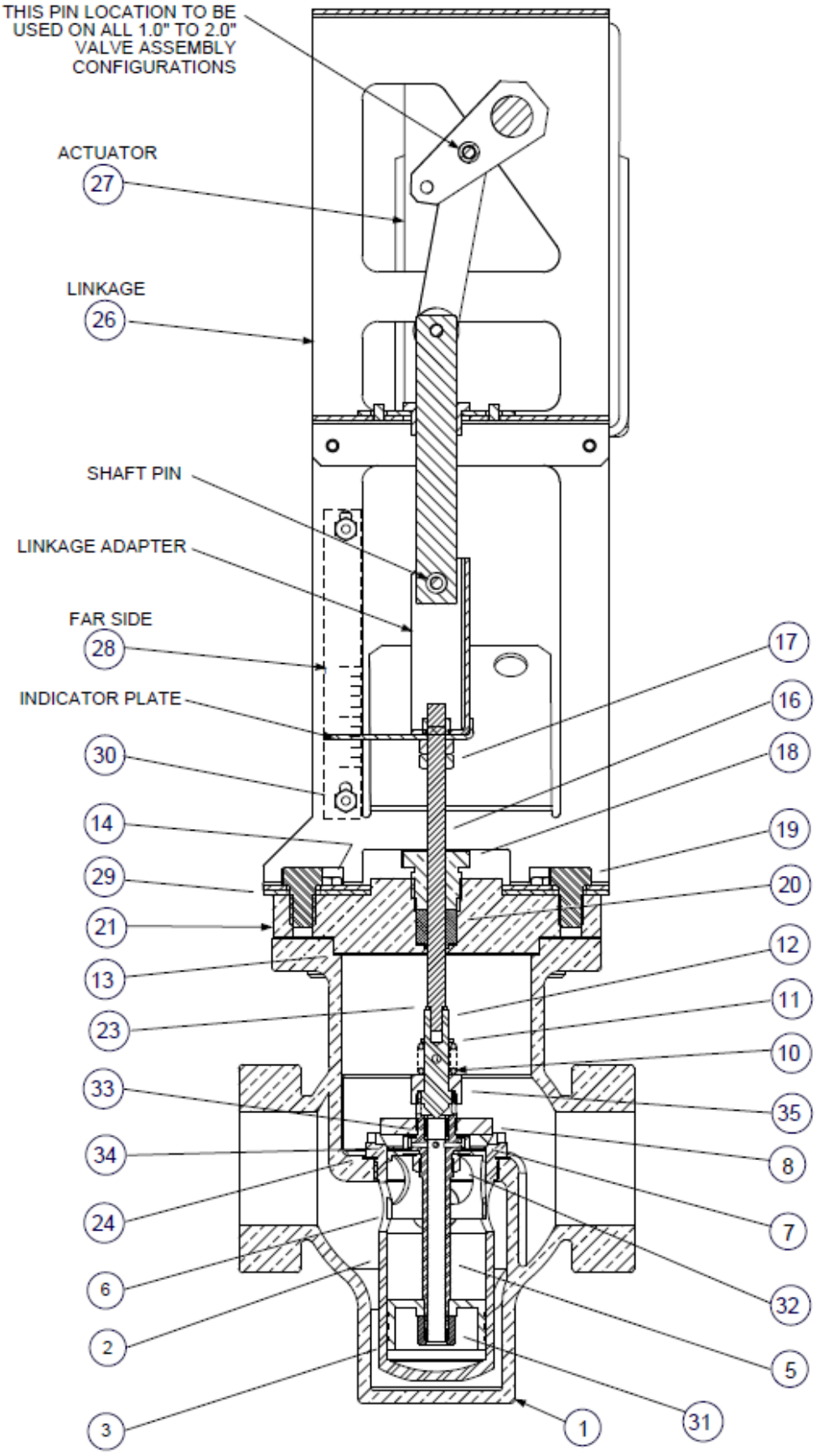


Figure 8-1. CXT-E Actuator and Control Valve Assemblies, (Sizes 1.00" To 2.00")

Table 8-1. PARTS LIST FOR VALVE ASSEMBLIES, TYPE CXT-E (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
26	1	LINKAGE	24038-1	24038-1	24038-1	24038-1
27	1	ACTUATOR	69009	69009	69009	69009
28	1	SCALE	59028-1	59028-1.25	59028-1.5	59028-2

Table 8-1. PARTS LIST FOR VALVE ASSEMBLIES, TYPE CXT-E (SIZES 1.00" TO 2.00"), continued

ITEM	QTY	PART NAME	VALVE SIZE AND PART NUMBERS			
			1.00 INCH	1.25 INCH	1.50 INCH	2.00 INCH
9999 9929	1	GASKET	81046	81046	81046	81046
30	2	HEX NUT, #8-32	123322	123322	123322	123322
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

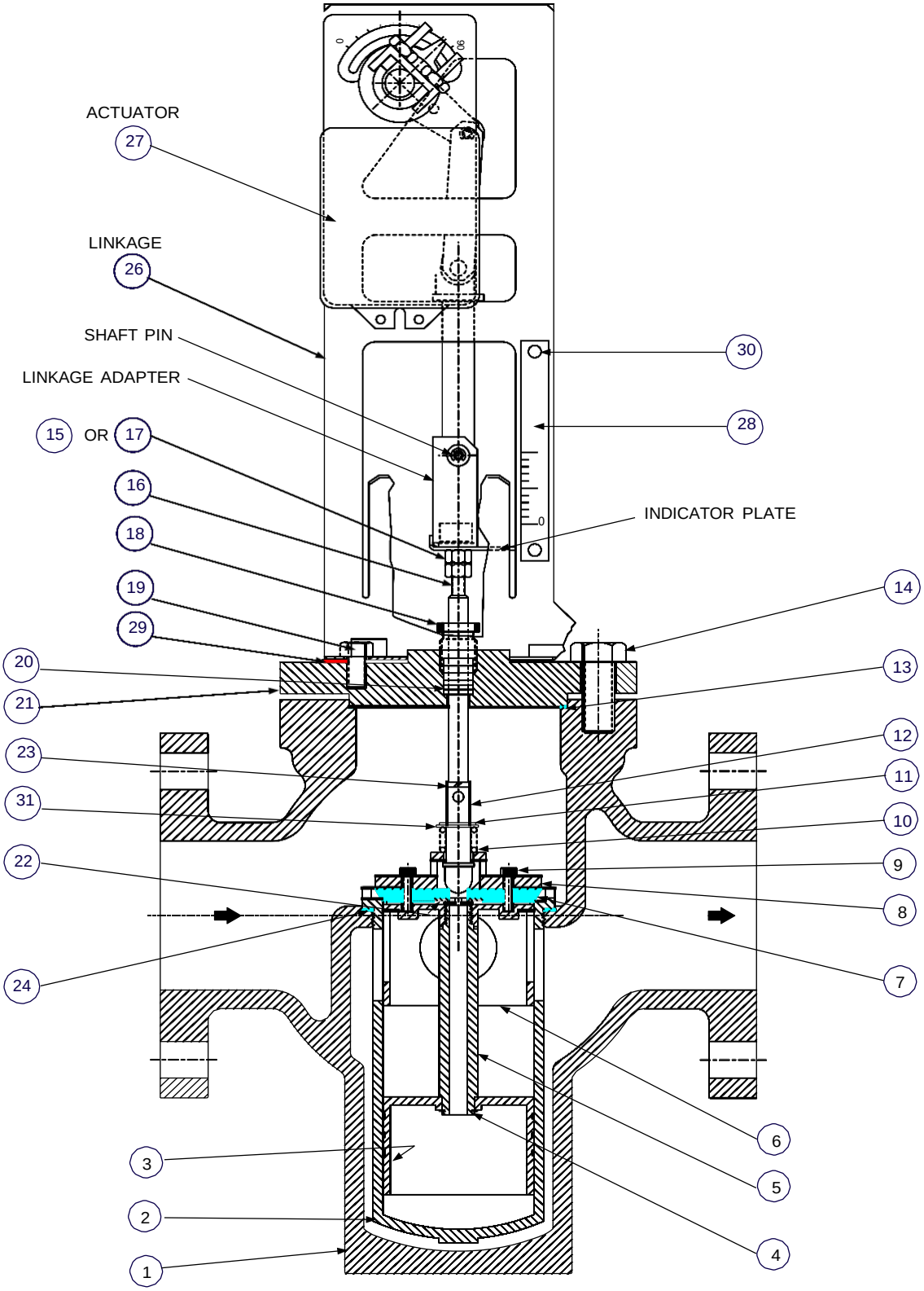


Figure 8-2. CXT-E Actuator and Control Valve Assemblies (Sizes 2.50” To 4.00”)

Table 8-2. PARTS LIST FOR VALVE ASSEMBLIES, TYPE CXT-E (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 SCREW	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	HEX NUT, 1/4-20	6-226	6-226	N/A
18	1	PACKING NUT	122664	122665	122665
19	2	3/8-16 x 5/8" LG. CAP SCREWS	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
25	2	1/4" HEX HD. NPT PLUG	9-22	9-22	9-22

Table 8-2. PARTS LIST FOR VALVE ASSEMBLIES, TYPE CXT-E (SIZES 2.50" TO 4.00"), continued

ITEM	QTY	PART NAME	VALVE SIZE AND PART NUMBERS		
			2.50 INCH	3.00 INCH	4.00 INCH
26	1	LINKAGE	24038-1	24038-1	24038-2
27	1	ACTUATOR	69009	69009	69009
28	1	SCALE	59028-2.50	59028-3	59028-4
29	1	GASKET	81046	81046	81046
30	2	HEX NUT, 8-32	123332	123322	123322
31	1	PILOT SPRING BACKUP WASHER	N/A	N/A	122246

8.2.1 Valve Shaft Seal Retainer Replacement

WARNING

BEFORE PROCEEDING WITH THIS OPERATION, ENSURE THAT THE CONTROL VALVE HAS BEEN ISOLATED FROM THE STEAM SUPPLY. LIVE STEAM CAN CAUSE SERIOUS BURNS TO PERSONNEL.

WARNING

ENSURE THAT ELECTRICAL POWER TO THE ELECTRONIC CONTROL SYSTEM AND ACTUATOR HAS BEEN DISCONNECTED. SERIOUS INJURY TO PERSONNEL CAN RESULT IF THIS WARNING IS NOT OBSERVED.

To replace the valve shaft seal retainer proceed as follows:

1. Referring to Figure 8-1 or Figure 8-2, loosen the hex nuts (17) under the indicator plate approximately one-half turn clockwise.
2. Disconnect the linkage adapter from the valve shaft (16) by turning the shaft clockwise (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 disengages the linkage adapter threads.
3. Remove the indicator plate from the Valve shaft (16).
4. Remove the two cap screws (19) securing the linkage assembly (26) to the Valve top (21).
5. With the Actuator assembly (27) still attached, remove the complete linkage assembly (26) from the valve top. Also, remove the gasket (29).
6. If the packing nut (18) is leaking or binding the Valve shaft, replace it.
7. Measure and record the current position of the hex nuts (17) from the end of the Valve shaft (16). This will simplify adjustment of the Actuator linkage during reassembly.
8. Completely remove the hex nuts (17) from the Valve shaft (16).
9. Remove the packing nut (18) and the packing assembly (20) from the Valve body.

CAUTION

In the following steps, avoid over-tightening the packing nut (18), which can trap the Valve stem and slow or stop Valve motion.

10. Replace BOTH the packing nut (18) and the packing assembly (20) with a NEW packing nut and packing assembly.
11. Replace the hex nuts (17) onto the Valve shaft (25) and position them in the same location noted in step 7.
12. Attach the Actuator (27), linkage (26) and gasket (29) to the Valve top using the two cap screws (19) provided.
13. Install the indicator plate on the Valve lower shaft (16) and secure it in place with the linkage adapter.
14. Reconnect the linkage adapter to the linkage shaft by replacing the shaft pin.
15. ***CriticaStepl:*** Autostroke the Valve and check for leaks.

8.2.2 Valve Disassembly

Refer to Figure 8-1 or Figure 8-2 and proceed as follows:

16. Close the upstream and downstream shutoff valves before and after the CXT-E Control Valve.
17. If the CXT-E Control Valve is easily accessible for disassembly and reassembly, leave it installed in the Steam Input line. If it is not easily accessible, remove the Valve from the line and clamp it in a bench vise for easy accessibility.
18. Completely remove the Actuator (27) and linkage assembly (26) from the Valve body, as described in steps 1 through 5, above.
19. The following steps cover complete Valve disassembly, in the event it should ever be required. IT IS STRONGLY RECOMMENDED, however, that the Valve be disassembled only to the extent necessary to restore it to proper operation. When disassembling the Valve, USE EXTREME CARE not to mar or scratch any surfaces.

    The following steps assume that the Actuator and linkage assemblies have been removed from the Valve body.

20. Remove the following Valve parts in the order specified:

CAUTION

CAREFULLY remove the packing nut (18) and cap screws (14) (listed below) to relieve any trapped pressure.

a. Hex nuts (17)
b. Packing nut (18)
c. Packing assembly (20)
d. Cap screws (14)
e. Valve top (21)
f. Valve top gasket (13)

21. Grasp the lower shaft (16) and carefully remove the ENTIRE shaft/seat/piston assembly.
22. For 1-inch through 2-inch Control Valves (Figure 8-1), disassemble the shaft/seat/piston assembly in the following order:

    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)

23. For 2.5-inch, 3-inch and 4-inch Control Valves, (Figure 8-2), disassemble the shaft/seat/piston assembly in the following order:

    a. Lock washer (23)

    b. Pilot spring retainer (11)

    c. Pilot spring backup washer (31), 4-inch Valve only

    d. Pilot spring (10)

    e. Cap screws (9)

    f. Valve seat retaining disc (8)

    g. Lower shaft (16) and Valve stern (12)

    h. Valve seat (7)

    i. Top piston (6) and bottom piston (3) assembly

24. DO NOT DISASSEMBLE the seat cage (2) unless you need to replace it. If seat cage replacement is required, see Step 30.

NOTE

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

25. CLEAN ALL PARTS THOROUGHLY. ALL DIRT AND/OR SCALE MUST BE REMOVED from the outer surfaces of the Valve Plug shaft (5) (Figure 8-1), or the Top Piston (6) and Bottom Piston (3) (Figure 8-2) and from the surface of the Valve stem (12).

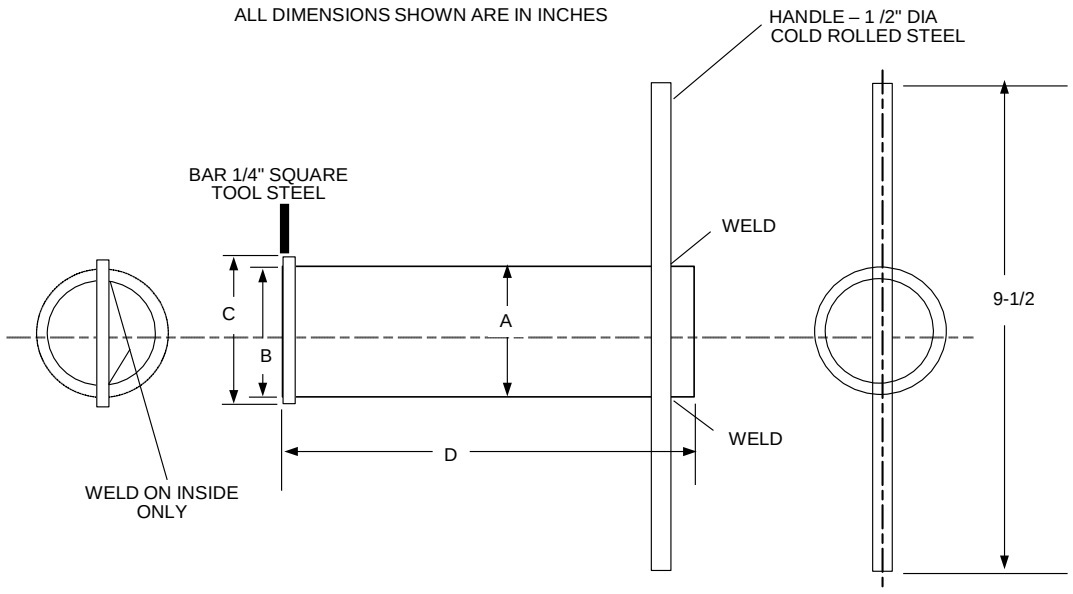
26. Inspect the Valve stem (12). If the Valve stem (12) is damaged or does not seat properly on the Valve seat (7), or if it does not move freely in the Valve seat retaining disc (8), replace the Valve stem (12), pilot spring retainer (11) and pilot spring (10).

27. Inspect the outer surfaces of the Valve plug (5) or the top piston (6) and bottom piston (3). If they are scored or damaged such that they will not move freely up and down in the Seat Cage (2), the Valve plug or pistons must be replaced. Reassembly instructions are provided below beginning with step 33.

28. Inspect the Valve seat (7). Replace the Valve seat if it is worn and does not seat properly with the seat cage (2) (or with the Valve stem (12), in the case of 2.5 to 4 inch Valves).

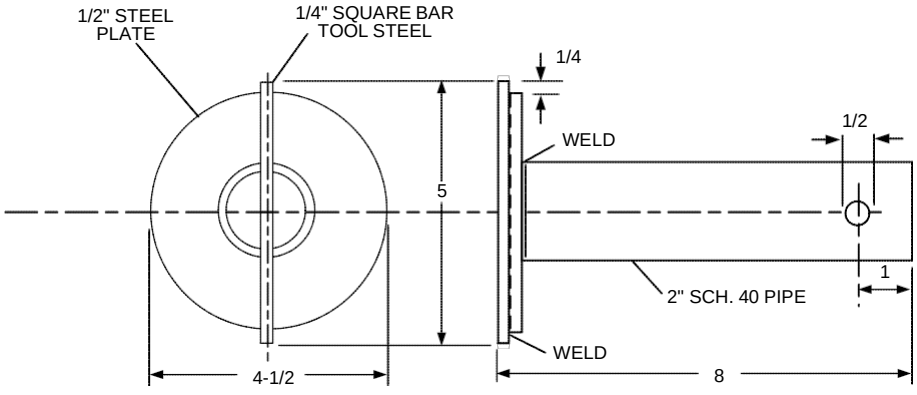
29. THOROUGHLY clean and inspect the seating and inner surfaces of the seat cage (2). Replace the cage (2) if the seating surface around the top of the cage is worn or so damaged that the Valve seat (7) will not seat properly, or if the inner surfaces of the cage are scored or are so damaged that the Valve plug (5) or pistons (3) and (6) do not move up and down freely.

30. If it is necessary to remove the cage (2) from the Valve body (1), first fabricate a tool similar to the one illustrated in Figure 8-3. Insert the tool into the slots on top of the cage (2) and turn the cage out of the Valve body. You may also obtain a cage removal tool from AERCO by contacting AERCO directly or through your nearest sales representative.



VALVE 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	3.476	3-15/16	8-1/4

TOOLS FOR 1-INCH TO 3-INCH VALVES



TOOL FOR 4-INCH VALVE ONLY

Figure 8-3. Cage Removal Tool

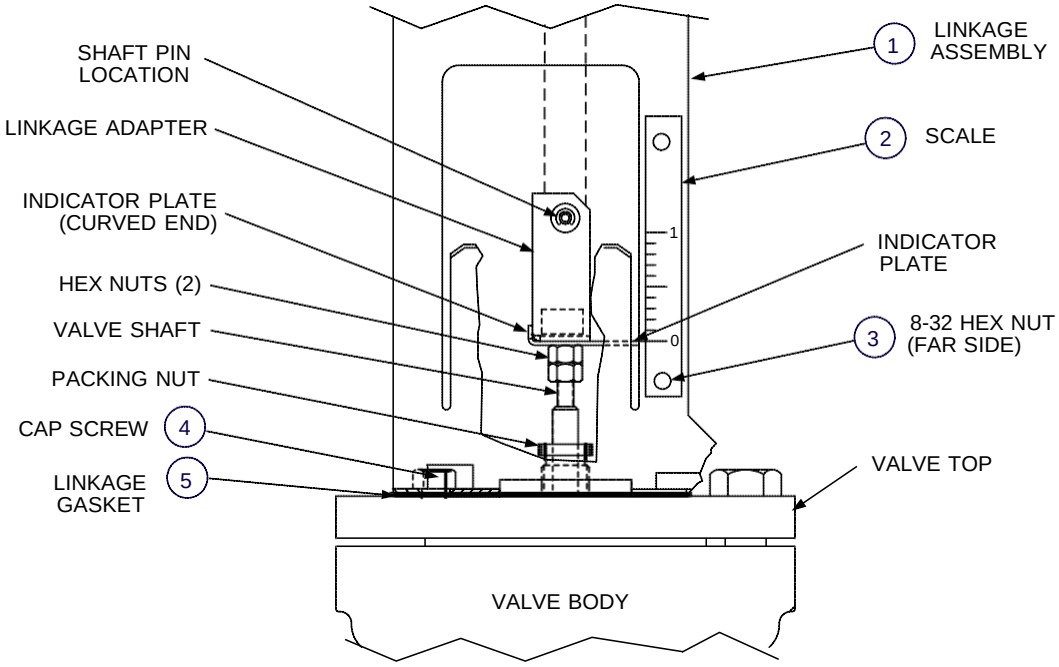
8.2.3 Valve Reassembly

Refer to Figure 8-1 or Figure 8-2 when performing the following procedures.

31. If the seat cage has been removed, place a NEW seat cage gasket (24) on the seating surface of the Valve body. When this has been accomplished, use the tool described in Step 29 to replace the seat cage (2) in the Valve body (1). Ensure that the seat cage fits tightly.
32. If they have been disassembled or are being replaced, reassemble the top piston (6) and bottom piston (3) onto the Valve plug shaft (5) using the top piston retaining nut (46) (for 1-inch through 2-inch Valves), and the bottom piston retaining nut (50) or bottom piston retaining ring (4).
33. For 1-inch through 2-inch Control Valves, (Figure 8-1), reassemble the valve plug/seat/shaft assembly in the following order:
    a. Valve plug (5)
    b. Seat retainer (34)
    c. Valve seat (7)
    d. Retaining disc (8)
    e. Valve stem (12) and lower shaft (16)
    f. Valve stem retaining nut (35)
    g. Pilot spring (10)
    h. Pilot spring retaining clip (3)
    i. Lock washer (23)
34. For 2.5-inch, 3-inch and 4-inch Control Valves (Figure 8-2), reassemble the piston/seat/shaft assembly in the following order:
    a. Top piston (6) and bottom piston (3) assembly
    b. Valve seat (7)
    c. Valve stem (12) and lower shaft (16)
    d. Valve seat retaining disc (8)
    e. 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)
35. Holding the lower shaft (16), carefully replace the entire shaft/seat/piston assembly into the Valve body (1) and seat cage (2).
36. Thoroughly clean the gasket surfaces of the Valve body (1) and Valve top (21) of all dirt and scale. If necessary, use a wire brush, emery cloth or both.

37. Referring to Figure 8-1 or Figure 8-2, reassemble the following parts in the order indicated:
    a. NEW Valve top gasket (13)
    b. Valve top (21)
    c. Cap screws or hex-head bolts (14):
        - For valve sizes 2-1/2” to 4” use 1/2-13 cap screws
        - For valve sizes 1” to 2” use 3/8-16 hex-head bolts

        Tighten the cap screws using an alternating pattern to provide a uniform seal and prevent Valve leakage.
    d. NEW packing assembly (20)
    e. Packing nut (18)
    f. Hex nuts (17)
    g. Indicator plate (See Figure 8-1 or Figure 8-2)
38. Replace the Actuator (27), linkage (26) and gasket (29) onto the Valve top (21) and secure with cap screws (19).
39. Position the hex nuts (17) in the original location noted during the removal process (Step 7).
40. Install the indicator plate on the Valve shaft (16) with the curved end facing upward (Figure 8-6).
41. Attach the Valve shaft (16) 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. Insert the shaft into the linkage adapter until the hex nuts (17) are snug against the indicator plate.
42. Press down on the Valve shaft (16) to compress the pilot spring (10) in the Valve body.
43. With the pilot spring compressed, verify that the indicator plate is aligned with the “0” (zero) marking on the scale (28). If necessary, rotate the Valve shaft until the plate is aligned with the “0” scale marking.
44. If the Valve had been removed from the steam line, replace it and reconnect the electrical connector plug to the Actuator.
45. Before placing the Valve back into service, adjust the CXT-E Actuator according to Section 4.2.



ITEM	QTY	PART DESCRIPTION	PART NUMBER
1	1	LINKAGE ASSEMBLY	24038-1 (1” TO 3” VALVES) 24038-2 (4” Valve)
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	HEX NUT, 8-32	123322
4	2	CAP SCREW, 3/8-16 x 5/8 LONG	54014
5	1	LINKAGE GASKET	81046

Figure 8-4. linkage Assembly Installation Details

8.2.4 Actuator Replacement

The Actuator includes no repairable parts. Therefore, if the troubleshooting procedures point to the Actuator as the cause of the fault, replace it as described in the following steps:

46. Disconnect and lock-out/tag-out the AC power supplied to the Control Box. Use a voltmeter to ensure that all voltages are zero before continuing.
47. Disconnect the Control Box cable connected to the Actuator.
48. Use an 8-mm wrench to loosen the hex nuts securing the Actuator to the linkage shaft.
49. Completely remove the defective Actuator from the shaft.
50. To install a replacement Actuator, depress and hold the clutch button (see Figure 8-5) and rotate the pointer to approximately 80° on the dial. Release the clutch.

51. Slide the Actuator onto the linkage shaft.
52. Ensure that the pin on the linkage assembly is inserted in the center slot on the bottom of the Actuator (Figure 8-5).
53. Verify that the indicator plate on the linkage assembly is aligned with “0” (zero) on the linkage scale. Also, ensure that the Actuator dial is approximately at the 80° position.
54. Ensure that the pin on the linkage is inserted in the center slot on the Actuator.
55. Use an 8-mm wrench to tighten the hex nuts on the U-bolt to secure the Actuator to the shaft. Torque the hex nuts to 60 inch-pounds.
56. Reconnect the Control Box cable to the Actuator.
57. When you have completed the Actuator replacement, perform the Control Valve adjustment procedure in Section 4.2.

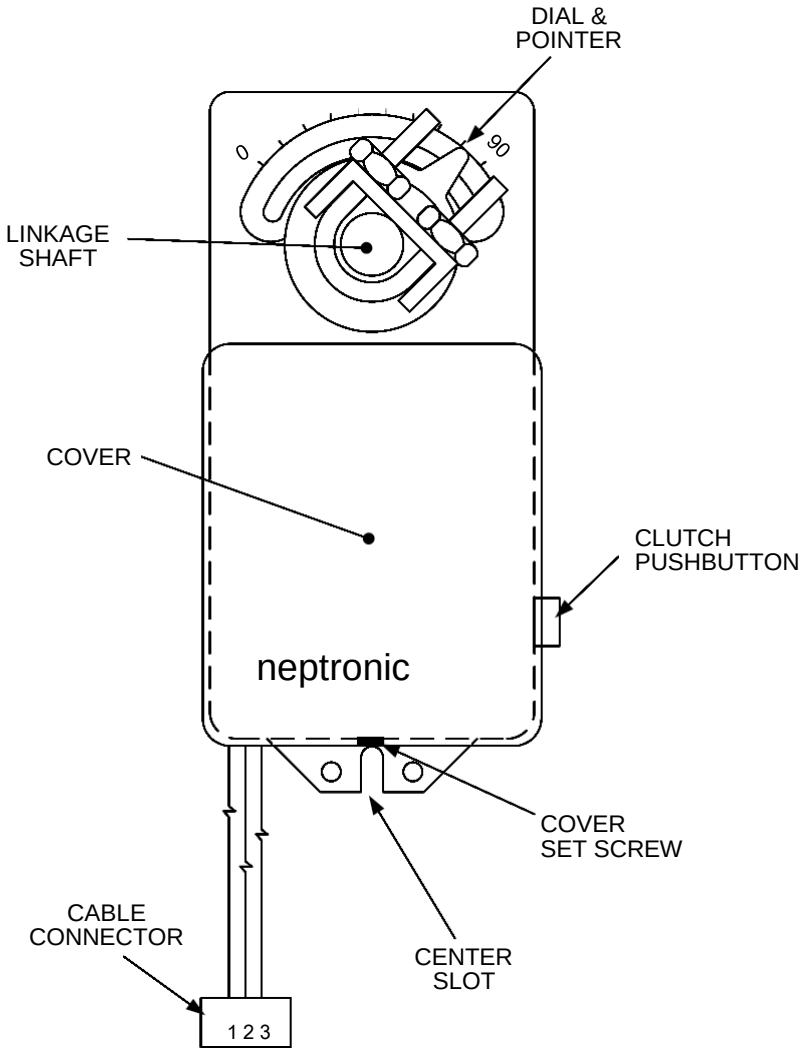


Figure 8-5. Actuator

8.2.5 Linkage Assembly Replacement

As illustrated in Figure 8-6, the linkage assembly part number will vary according to the valve size. The CXT-E valve sizes ranging from 1.00 to 3.00 inches use linkage assembly Part No. 24038-1. The 4.00-inch CXT-E Valves use linkage assembly, Part No. 24038-2. The primary difference between the 24038-1 and 24038-2 linkage assemblies is the adapter shown in Figure 8-6. In addition, the linkage pin location for the 24038-1 assembly is different for 1.00 to 2.00-inch valves and 2.50 to 3.00-inch valves.

IMPORTANT

FOR PROPER OPERATION OF THE CONTROL VALVE, IT IS IMPERATIVE THAT YOU USE THE CORRECT ADAPTER AND PIN LOCATION FOR THE VALVE SIZE BEING REPAIRED.

The linkage assembly is attached to the Control Valve top with two cap screws. Be sure to replace the linkage gasket (Part No. 81046) each time you install a new linkage assembly.

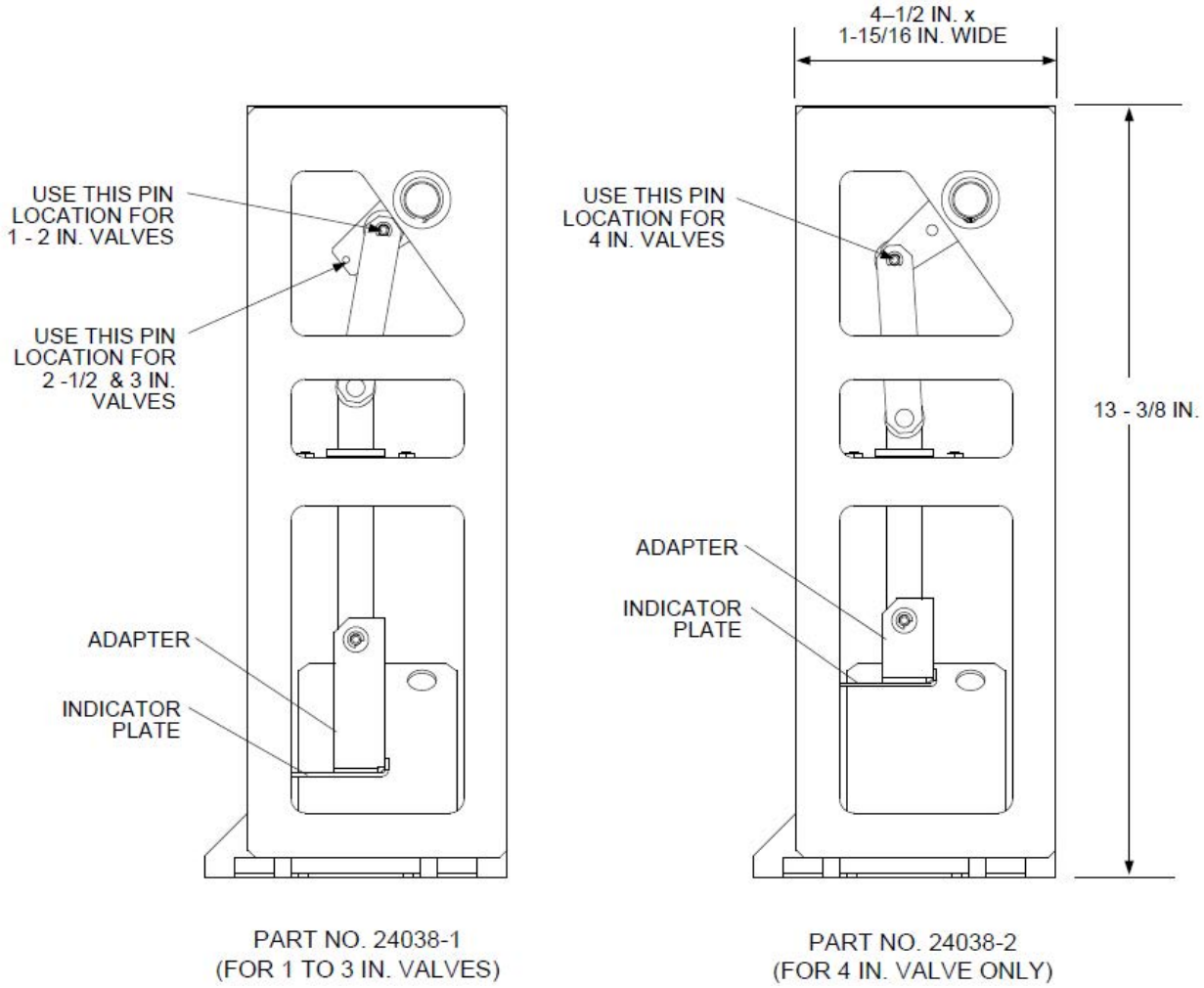


Figure 8-6. Linkage Assemblies

Use the following procedure when you need to remove and replace the linkage assembly:

58. Remove the Actuator per steps 46 through 49.
59. Refer to Figure 8-1 (for 1 to 2-inch Valves) or Figure 8-2 (for 2 ½ to 4-inch Valves) to locate the items identified in parentheses in the following steps.
60. Rotate (loosen) the hex nuts (17) under the indicator plate approximately one half-turn clockwise.
61. Disconnect the linkage adapter from the Valve shaft (16) by turning the shaft clockwise (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 disengages the linkage adapter threads.
62. Remove the indicator plate from the Valve shaft (16).
63. Remove the two cap screws (19) securing the linkage assembly (26) to the Valve top (21).
64. Remove the linkage assembly (26) from the Valve top. Also, remove the gasket (29) (which will not be retained).

CAUTION

Ensure that the replacement linkage assembly, adapter and scale are identical to those removed in previous steps. Also, ensure that the linkage pin (Figure 8-6) is set to the proper position for the Control Valve size. ***Failure to observe this precaution may result in improper Control Valve operation.***

65. Using a new gasket (29), position the replacement linkage assembly on the Valve top (21). Secure the linkage assembly to the Valve top using the previously removed cap screws (29).
66. Install the indicator plate on the Valve shaft (16) with the curved end facing upward (Figure 8-4)
67. Attach the Valve shaft (16) 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. Insert the shaft into the linkage adapter until the hex nuts (17) are snug against the indicator plate.
68. Press down on the Valve shaft (16) to compress the pilot spring (10) in the Valve body.
69. With the pilot spring compressed, verify that the indicator plate is aligned with the "0" (zero) on the scale (28). If necessary, rotate the Valve shaft until the plate is aligned with "0".
70. Replace the Actuator using steps 50 through 57, above.

8.2.6 Recirculation Pump Replacement

The recirculation pump is required to assure proper heat exchanger operation and has an expected service life of five years. The pump is installed in the recirculation piping (see Figure 8-7) to continuously circulate domestic water through the heat exchanger, even when there is no DHW demand.

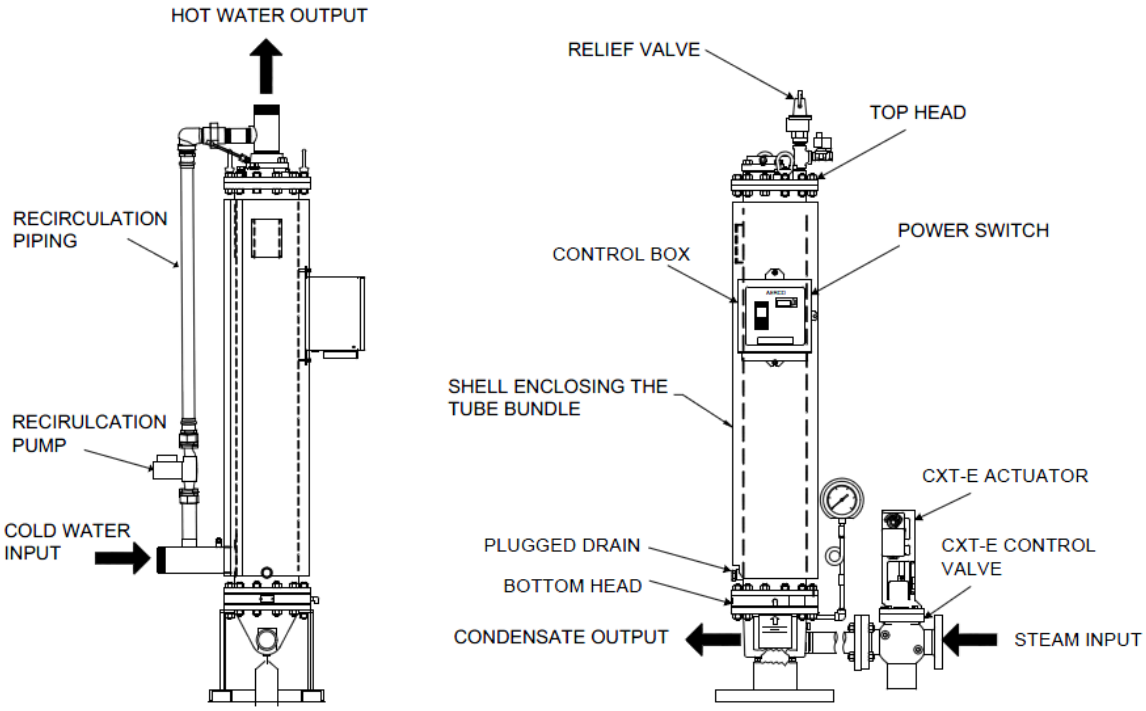


Figure 8-7. Recirculation Pump Mounted in Recirculation Piping

Use the following procedure to replace the recirculation pump:

1. Turn OFF both the external power circuit breaker to the DW-series heat exchanger and the power switch on the side of the Control Box.
2. Close all stop valves in the Steam Input and Condensate Output lines.

3. IN THE FOLLOWING ORDER, close the stop valves in the:
   a. Hot Water Output line
   b. Recirculation line
   c. Cold Water Input line

When the heat exchange has been shut down according to steps 1 and 2, drain the heat exchanger as follows:

4. CAREFULLY open the relief valve in the heat exchanger upper head assembly to relieve pressure in the heat exchanger shell. If fluid continues to flow from the relief valve, one of the cold water stop valves is either leaking or is not shut tightly. Stop the flow from the relief valve and proceed.
5. Holding the relief valve open (to prevent creating a vacuum in the shell), open the plugged drain at the bottom of the Heater Shell and drain the heat exchanger completely.
6. Disconnect the power leads from the recirculation pump.
7. Remove the bolts on the recirculation pump flanges and slide the pump out from between the flanges.
8. When installing the replacement recirculation pump, ensure that the seals are in place and not pinched.
9. Reinstall the flange bolts and reconnect the power leads to the pump.
10. Refill the heat exchanger and put it back into operation in accordance with section 5.3, steps 1 through 14.

8.3 ELECTRONIC CONTROL SYSTEM

The corrective maintenance procedures for the ECS consist of replacing the Control Box components and subassemblies that were identified as being faulty following the procedures listed in Chapter 7 Troubleshooting. The ECS replaceable items include the:

- Control Box Assembly (8.3.1)
- Temperature Controller (8.3.2)
- Over-temperature Switch (8.3.3)
- DC Power Supply (8.3.4)
- DC Voltage Regulator (8.3.5)

WARNING

BE SURE TO TURN OFF THE CONTROL BOX POWER SWITCH (see Figure 8-7) AND DISCONNECT AC POWER BEFORE PERFORMING ANY CORRECTIVE MAINTENANCE PROCEDURES LISTED IN THIS SECTION. FAILURE TO OBSERVE THIS WARNING CAN RESULT IN SERIOUS PERSONAL INJURY.

8.3.1 Replacing the Control Box Assembly

If necessary, replace the complete Control Box assembly as follows:

1. Referring to Figure 8-8, loosen the captive screws on the Control Box door and the recessed panel.

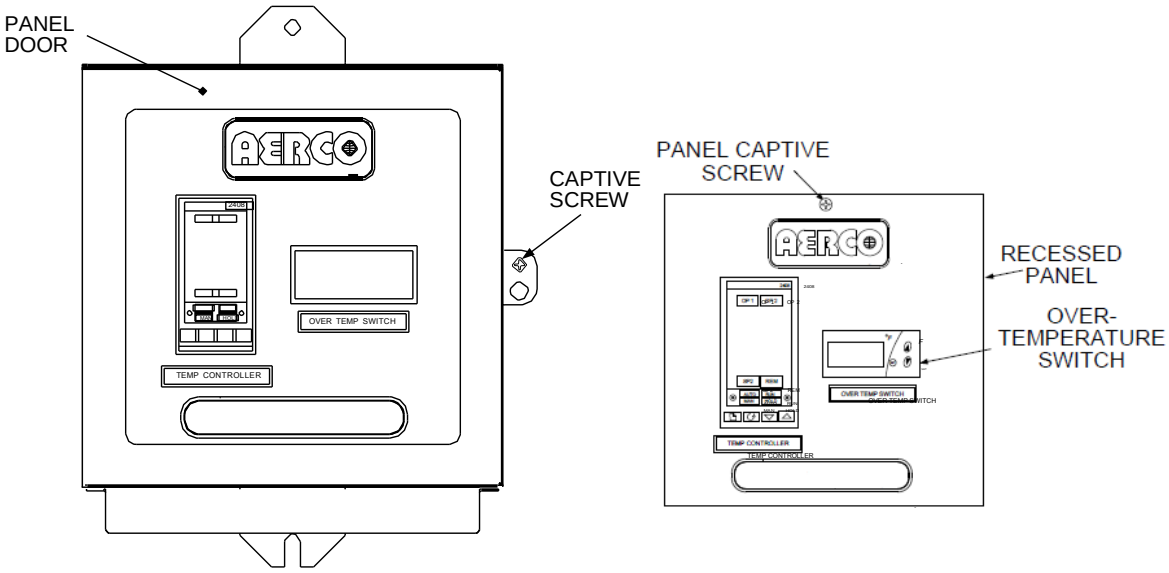


Figure 8-8. Control Box and Recessed Panel

2. Swing down the recessed panel and locate Terminal Block TB-2 (Figure 8-9).

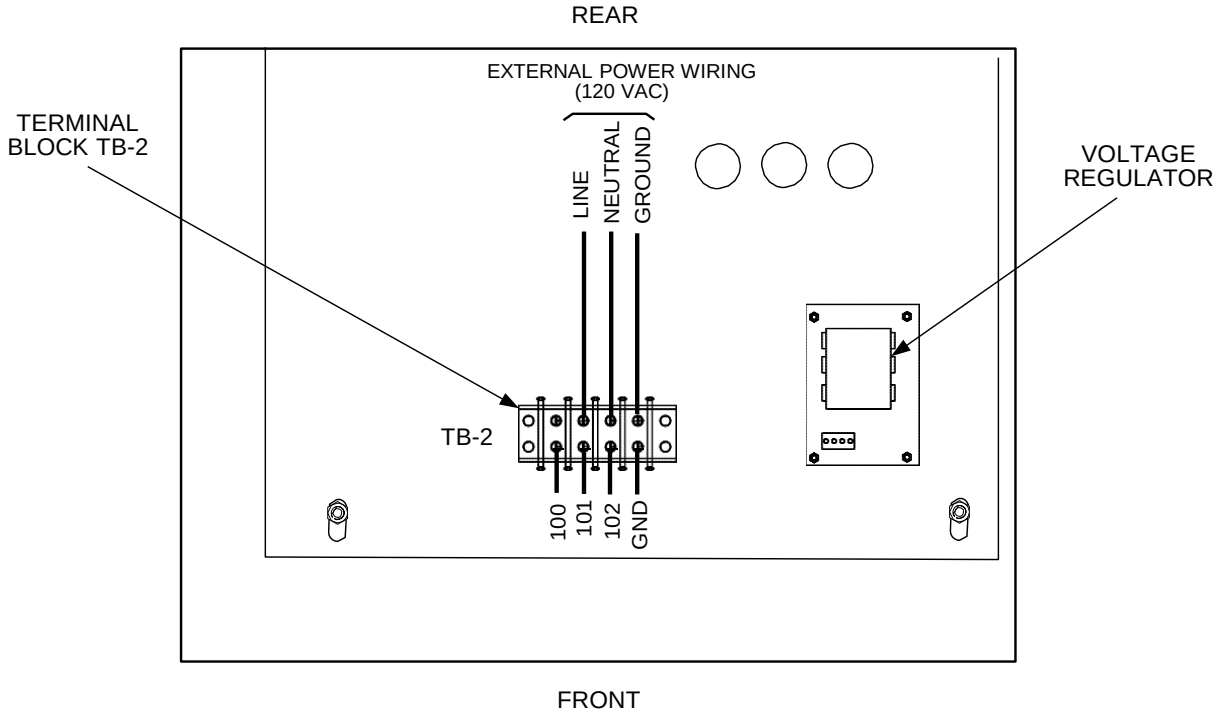


Figure 8-9. Control Box Interior Bottom View Showing Power Connections

3. Disconnect the Line, Neutral and Ground leads connected to Terminal Block TB-2.
4. Referring to figures in previous chapters (identified below), disconnect the Control Box cables from the following devices:
    a. Figure 1-3: Disconnect the Actuator cable (terminated in a 3-pin Molex connector) from the Control Valve Actuator.
    b. Figure 2-1. Disconnect the outlet temperature dual sensor cables (terminated in 4-pin Molex connectors) from the DHW outlet dual temperature sensor installed in the upper head

assembly of the heat exchanger.

c. Figure 2-1. Disconnect the solenoid cable (terminated in a 3-pin DIN connector) from the Over-temperature Solenoid Valve on the upper head assembly of the heat exchanger.

d. Disconnect the mixed temperature cable (terminated in a 2-pin Molex connector) from the mixed temperature sensor mounted at the Cold Water Input to the heat exchanger.

5. After the Control Box cables have been disconnected, remove the two hex nuts securing the Control Box top and bottom mounting attachments to the heat exchanger. Completely remove the Control Box from the heat exchanger.

6. To replace the Control Box, reverse Steps 1 through 5.

8.3.2 Replacing the Temperature Controller

The Temperature Controller is located on the recessed panel behind the Control Box door, as shown in Figure 8-8. Remove and replace the Temperature Controller as follows:

1. Open the Control Box door to access the Temperature Controller.

2. The Temperature Controller is installed in a sleeve as shown in Figure 8-10. To unplug and remove the Temperature Controller from its sleeve, pry the latching ears outward and pull the Temperature Controller out of the panel.

3. To install a replacement Temperature Controller, slide it into the front panel sleeve until the latching ears click into place. When the new Temperature Controller is in place, adjust the setpoint to the required temperature using the adjustment procedures in 4.3.1.

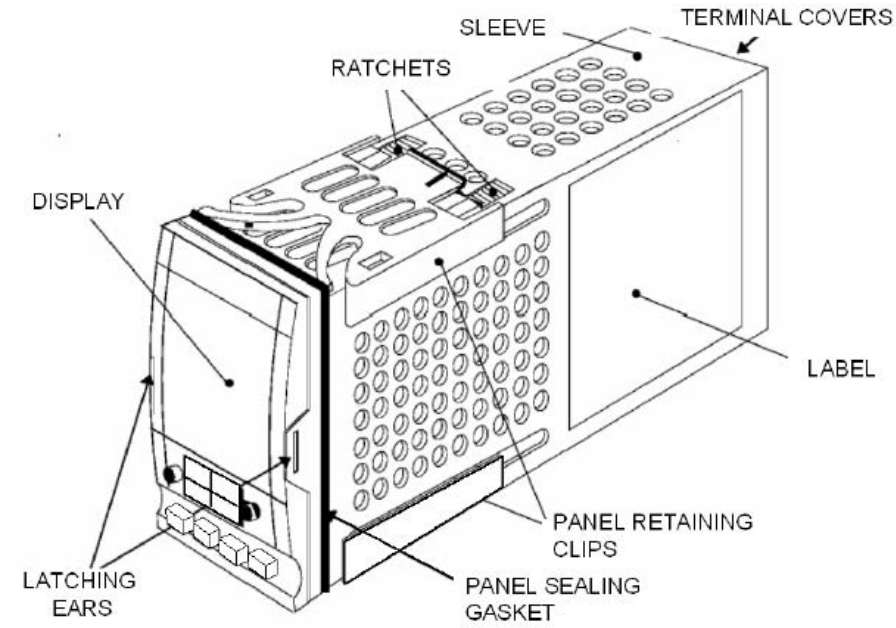


Figure 8-10. Temperature Controller Installation

4. Close and secure Control Box front door.

8.3.3 Replacing the Over-temperature Switch

The Over-temperature Switch performs a switching function and generates an alarm when the preset temperature limit is exceeded. Remove and replace the Over-temperature Switch as follows:

1. Open the Control Box door and locate the Over-temperature Switch (Figure 8-11a).

2. Loosen the captive screw on upper part of recessed panel behind the door and open the swing-down panel to access the terminal wiring connections and retaining clips of the Over-temperature Switch assembly.

3. Loosen the terminal wiring connection screws on the rear of the Over-temperature Switch assembly and disconnect the wires.
4. To remove the Over-temperature Switch assembly, push in tab of each of two side retaining clips (Figure 8-11b), slide toward rear and remove.

Figure 8-11a. Over-Temperature Switch & Temperature Indicator

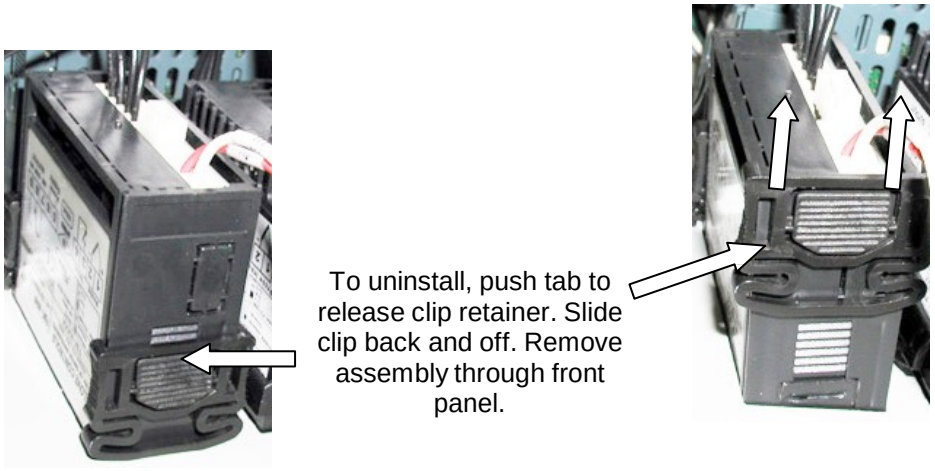


Figure 8-11b. Over-Temperature Switch & Temperature Indicator Installation

5. If the replaced unit is an Over-temperature Switch, set the desired over-temperature alarm limit using the adjustment procedures in Chapter 4, Section 4.3.2.
6. Following adjustment (if necessary), raise and secure the swing-down panel. Close and secure the Control Box door.

8.3.4 Replacing the DC Power Supply

To replace the DC Power Supply, please refer to Figure 8-11a through 8-12d and proceed as follows:

1. Open the Control Box door and loosen the captive screw on the recessed panel inside the door.
2. Open the swing-down panel and locate the DC Power Supply on the left interior wall of the Control Box (View A - A).
3. Disconnect the AC input power connector near the bottom of the Power Supply and the DC output connector near the top.
4. Remove the four hex standoffs and lock washers securing the DC Power Supply to the studs on the interior side wall of the Control Box. Completely remove the DC Power Supply from the Control Box.
5. Replace the DC Power Supply by reversing the previous steps.

8.3.5 Replacing the DC Voltage Regulator

To replace the DC Voltage Regulator, please refer to Figure 8-11a through 8-12d and proceed as follows:

1. Open the Control Box door and loosen the captive screw on the recessed panel behind the door.
2. Open the swing-down panel and locate the DC Voltage Regulator on the bottom of the chassis interior (View D – D).

3. Disconnect the wiring connector plug shown in View D – D.
4. Remove the four hex nuts and lock washers securing the Regulator to the studs on the bottom of the chassis. Completely remove the DC Voltage Regulator from the Control Box.
5. Replace the DC Voltage Regulator by reversing the previous steps.

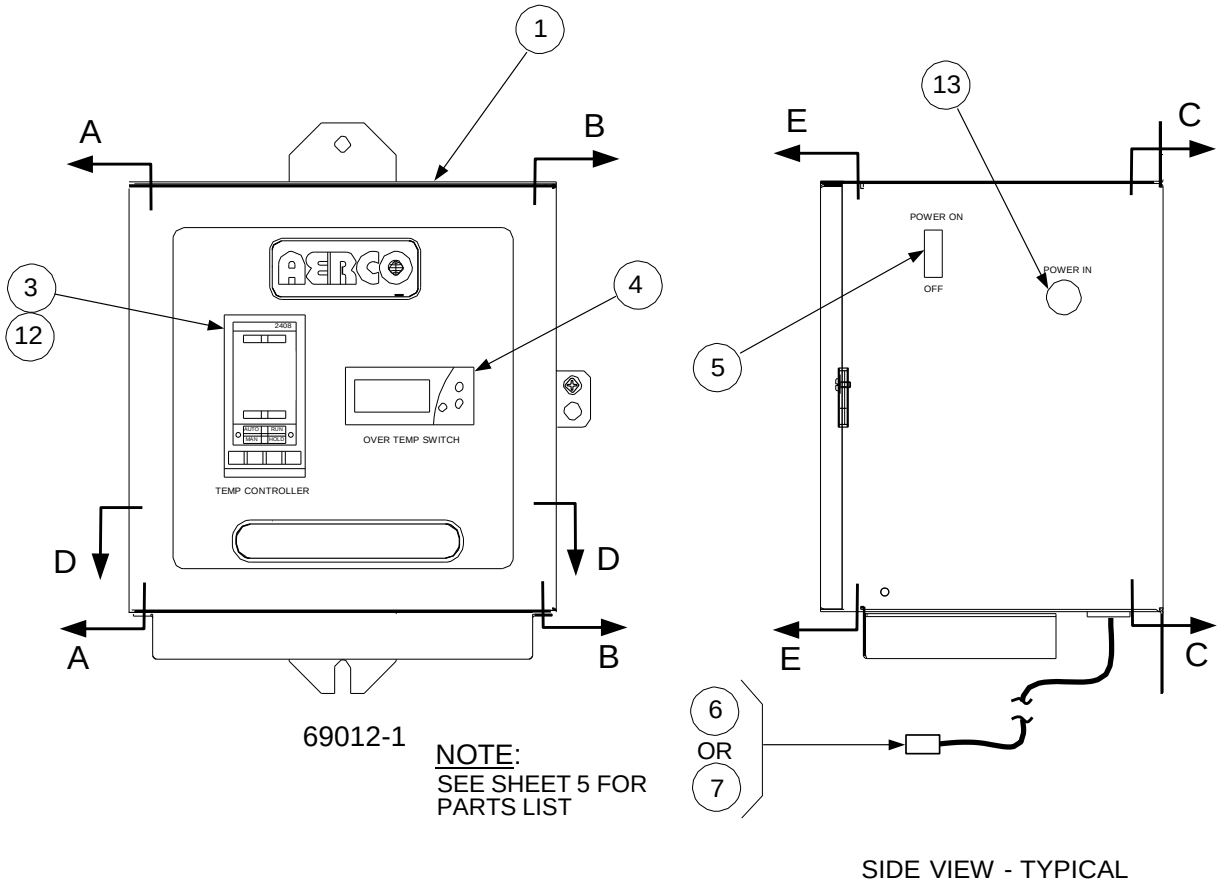
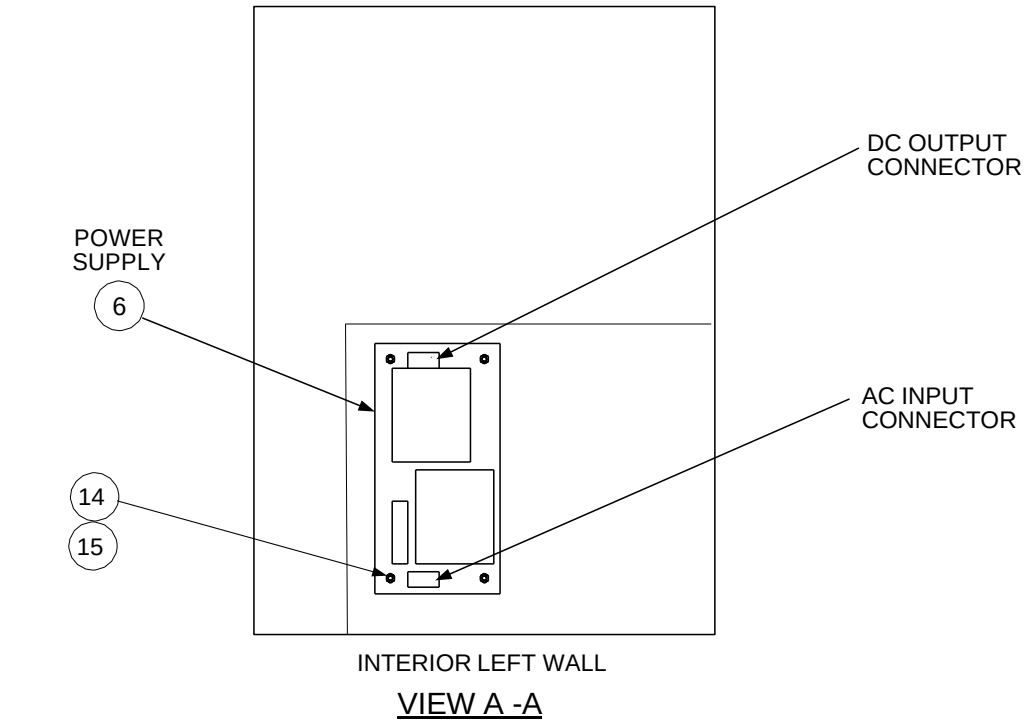
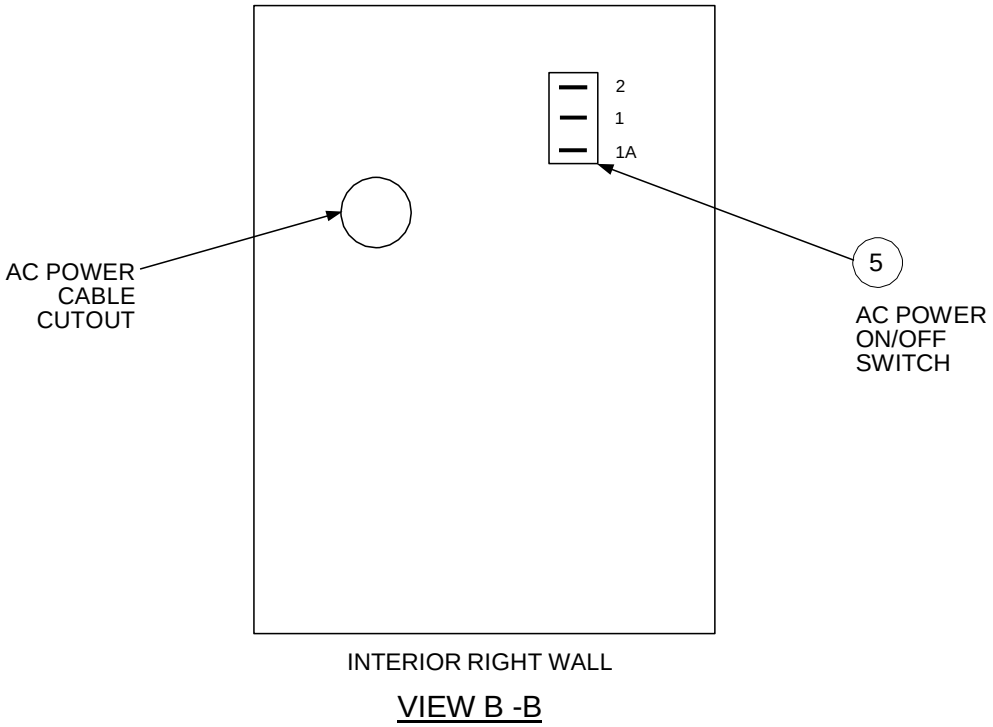


Figure 8-11a. ECS Control Box Assembly Component Locations



VIEW A -A



VIEW B -B

Figure 8-12b. ECS Control Box Assembly Component Locations

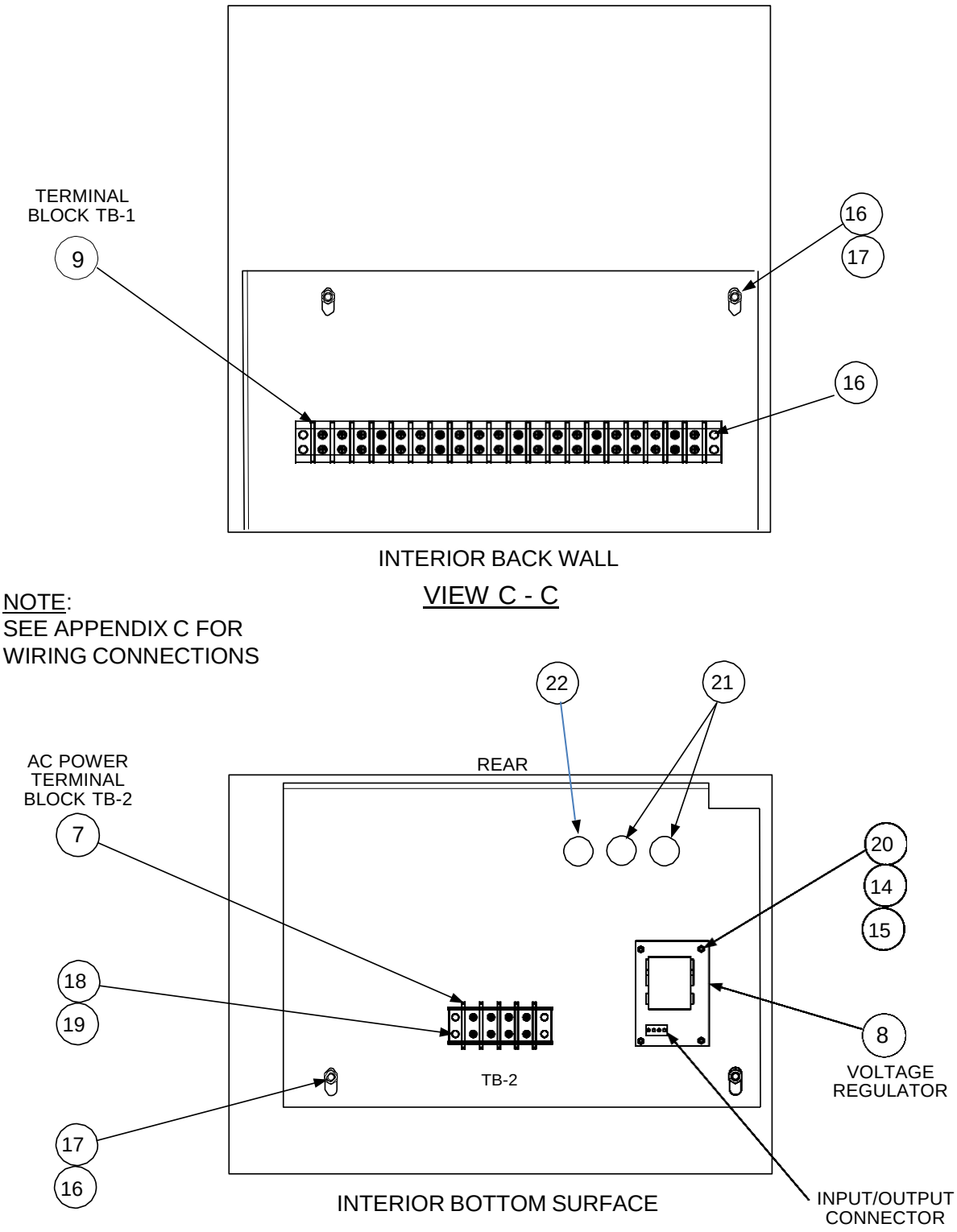
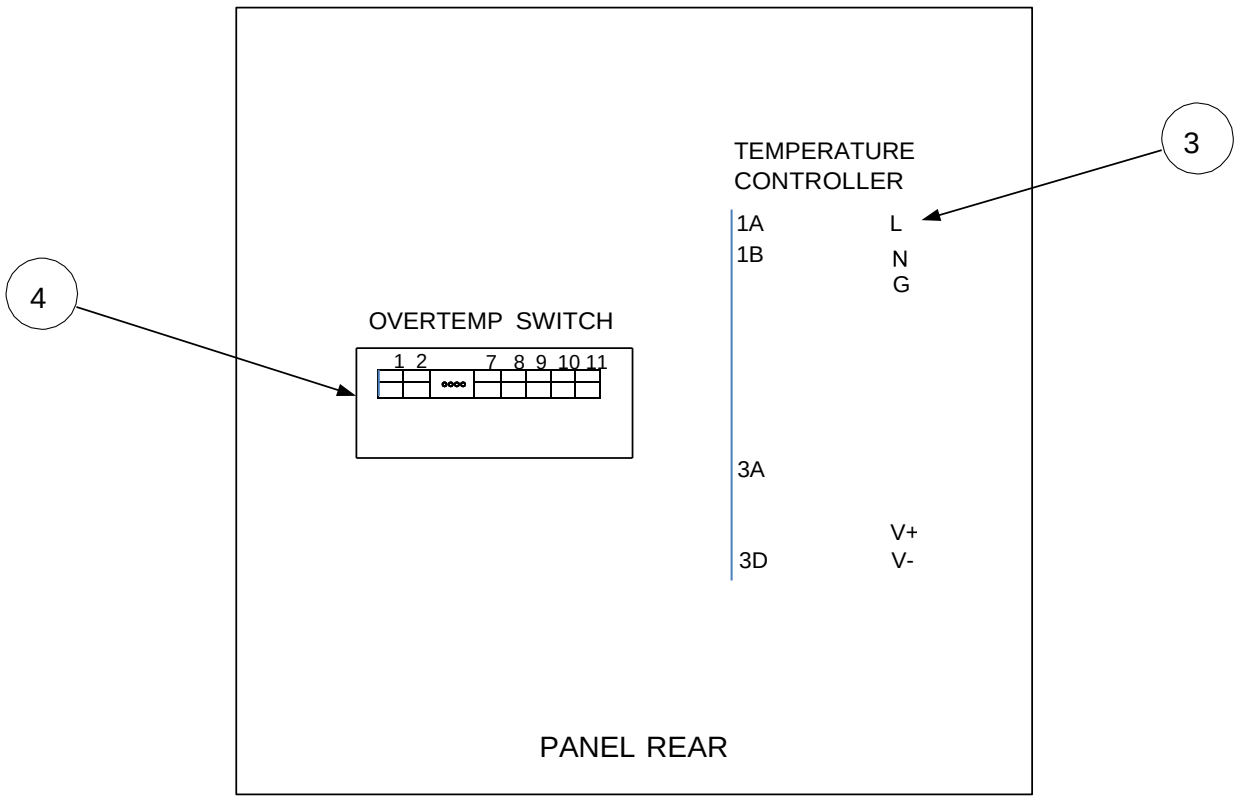


Figure 8-12c. ECS Control Box Assembly Component Locations



VIEW E – E

Figure 8-12d. ECS Control Box Assembly Component Locations

Table 8-3. ECS Control Box Assembly Parts List

ITEM	QTY	PART NO.	DESCRIPTION
1	1	69011-1	CONTROL BOX (STEAM/WATER)
2	NOT USED		
3	1	64028-12	TEMPERATURE CONTROLLER
4	1	64007	OVER-TEMP SWITCH/TEMP INDICATOR
5	1	60003	ON/OFF SWITCH
6	1	63009-4	CONTROL BOX, COMPLETE EXTERNAL HARNESS (S/W)
7	NOT USED		
8	1	65006	POWER SUPPLY
9	1	65007	TERMINAL BLOCK, 4-POSITION (TB-2)
10	1	64011	VOLTAGE REGULATOR
11	1	65008	TERMINAL BLOCK, 20-POSITION (TB-1)

Table 8-3. ECS Control Box Assembly Parts List, continued

ITEM	QTY	PART NO.	DESCRIPTION
12	AS REQ'D	SEE TABLE 8-5	COMMUNICATION BOARD
13	1	62004	PLUG
14	8	53011	LOCK WASHER, #4
15	12	65010	STANDOFF
16	4	53010	LOCK WASHER, #8
17	4	56012	HEX NUT, #8-32
18	2	56011	HEX NUT, #6-32
19	2	53012	LOCK WASHER, #6
20	4	56010	HEX NUT, #4-40
21	2	62002	STRAIN RELIEF
22	1	62003	PLUG
THE FOLLOWING INTEMS ARE NOT ILLUSTRATED IN FIGURE 8-12			
23	1	63007	AC WIRE HARNESS
24	1	63008-1	CONTROL BOX CONN. WIRE HARNESS

Table 8-4. Individual Component Wiring Harnesses

ITEM	QTY	PART NO.	DESCRIPTION
All Heat Exchangers			
1		63009-51	SOLENOID VALVE WIRING HARNESS
2		63009-52	HOT WATER OUT –TO-TEMPERATURE CONTROLLER WIRING HARNESS
3		63009-53	HOT WATER OUT –TO-OVER-TEMPERATURE SWITCH WIRING HARNESS
4		63009-59	ACTUATOR WIRING HARNESS
All Steam-to-Water Double-Wall Heat Exchangers with Serial Number H-09-430 and Above			
5		63009-58	MIXED INLET TEMPERATURE WIRING HARNESS
6		63009-61	RECIRCULATION PUMP WIRING HARNESS

Table 8-5. Communication Board Options

PART NUMBER	DESCRIPTION
64009-1	RS232 COMMUNICATIONS BOARD
64009-2	RS485 COMMUNICATIONS BOARD

8.4 RECOMMENDED SPARE PARTS

AERCO recommends the DW-Series Spare Parts listed in Table 8-6.

Table 8-6. Recommended Spare Parts

ITEM	QTY	PART NO.	DESCRIPTION
Recommended Emergency Spare Parts			
1	1	123196-24	DW24 GASKET KIT
2	1	123196-45	DW45 GASKET KIT
3	1	123196-68	DW68 GASKET KIT
4	1	69101	CIRCULATOR PUMP
5	1	69009	VALVE ACTUATOR
6	1	122770	VACUUM BREAKER
7	1	64028-12	TEMPERATURE CONTROLLER
8	1	99042-1	DOMESTIC WATER INLET THERMOCOUPLE
9	1	99042-2	DOMESTIC WATER OUTLET THERMOCOUPLE
Spare Parts Recommended for Pump Maintenance			
12	1	89011-1	PUMP FLANGE GASKET SET
13	1	89011-2	PUMP CASING O-RING
14	1	89011-3	PUMP CAPACITOR
15	1	89011-5	PUMP CARTRIDGE ASSEMBLY

Spare Parts Recommended for Control Valve Maintenance								
ITEM	**DESCRIPTION**	**PART NUMBER (Valve Size)**						
		1″	**1¼″**	**1½″**	**2″**	**2½″**	**3″**	**4″**
16	DISC/VALVE SEAT	121541	121527	121510	121531	121935	122032	122178
17	VALVE TOP GASKET	122136	122136	122136	122136	122083	122204	122203
18	PACKING ASSEMBLY	121567	121567	121567	121567	121567	121568	121568
19	ACTUATOR/LINKAGE ASSEMBLY GASKET	81046	81046	81046	81046	81046	81046	81046
20	LOWER PILOT SEAT ASSEMBLY	121505	121505	121505	121505	N/A	N/A	N/A

Optional Spare Parts			
ITEM	**QTY**	**PART NO.**	**DESCRIPTION**
21	1	64007	Over-temperature Switch
22	1	65006	Power Supply 24VDC Output
23	1	64011	Voltage Regulator 12VDC Output

CHAPTER 9 DISASSEMBLY AND REASSEMBLY

9.1 INTRODUCTION

This chapter tells you how to disassemble your DW-Series heat exchanger, check it for tubing leaks, reassemble it and put it back into service.

9.1.1 Tools required

- Torque wrench for 5/8" nuts
- Block and tackle or ratchet or winch hoist (for lifting the heat exchanger upper head assembly and shell, or for lifting and moving the heat exchanger)

9.2 CHECKING FOR A TUBING LEAK

To check for a tube leak:

1. Shut down and drain the heat exchanger in accordance with 6.4.1, Steps 1 through 5.
2. Open the stop valves in the Steam Input line to introduce steam into the heat exchanger tubes.
3. If there is no flow from the leak detection tube — whereas there had been a flow when the heat exchanger was in operation — the leak or leaks are in the outer wall (or walls) of the tubing. Similarly, if there is a flow from the leak detection tube, the leak or leaks are in the inside wall (or walls) of the tubing. When either type of leak occurs, it will be necessary to return the U-bend tube assembly or the entire heat exchanger to AERCO for repair.

   Step 12 explains how to disassemble the U-bend tube assembly from the heat exchanger, and step 14 explains how to obtain instructions for returning equipment to AERCO for repair.

9.3 REMOVING THE HEAT EXCHANGER SHELL

Normally, there is no reason for the heat exchanger shell to be removed. However, if a leak has been detected in the heat exchanger tubing, and it has been determined to be in the outer tubing walls (per section 9.3, step 3), or if there is other valid justification for doing so, the heat exchanger shell may be removed as follows:

1. If the heat exchanger has not already been shut down and drained, shut down and drain the heat exchanger in accordance with 6.4.1, Steps 1 through 5.

Please refer to Figure 9-1.

2. Disconnect ALL EXTERNAL PIPING from the heat exchanger upper head assembly, including the piping to the relief valve (1) and the water solenoid valve (2). Disconnect the Hot Water Output piping (not shown) at the union or flange located beyond the outside diameter of the heat exchanger upper head assembly.
3. Disconnect the Cold Water Input piping from the heat exchanger inlet pipe.
4. Disconnect any power supply wiring to the heat exchanger Control Box (4).
5. Disconnect the pressure gauge (5) from the Steam Input flanges (6).
6. Disconnect recirculation piping (7) at unions 26 and 27.

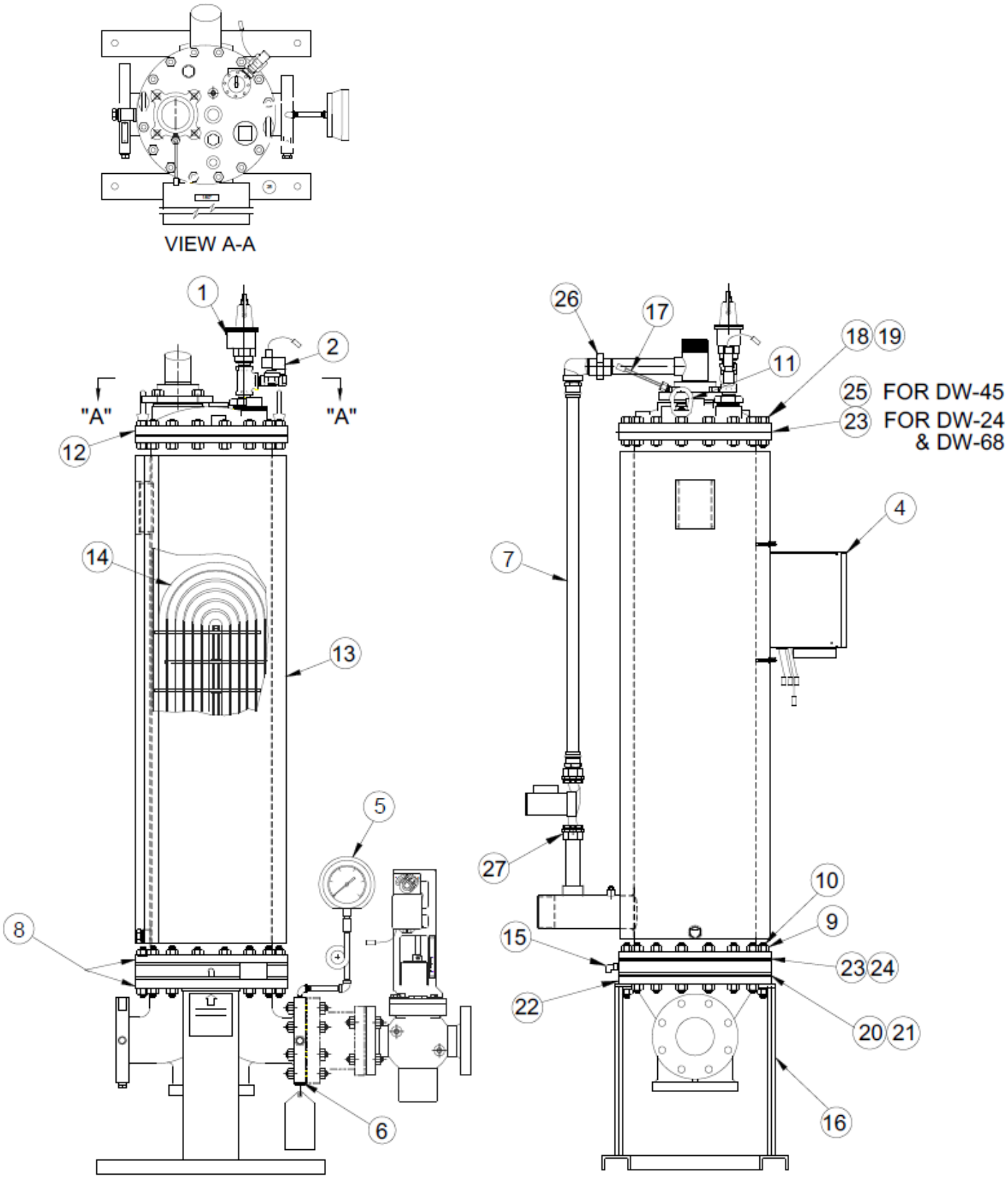


Figure 9-1. Typical DW-Series Heat Exchanger

7. Mark the edge of the heat exchanger lower head assembly flanges (8) in order to indicate their correct relative positions for reassembly.

8. Remove nuts (9) and studs (10) from the heat exchanger lower head assembly flanges.

9. Using a hoist or block and tackle attached to the lifting lugs (11) on the heat exchanger upper head assembly, CAREFULLY lift the upper head assembly (12) and shell (13) STRAIGHT UP off the heat exchanger U-bend tubing assembly. AVOID SCRAPING THE SHELL AGAINST THE TUBING (14).

10. Clean and inspect the inside of the shell and the U-bend tubing assembly for obvious damage.

11. If a leak in the tubing has been detected (see steps 1 through 4) and it has been determined that the leak is in the outside wall of one or more of the double-wall tubes, the leak may be found either by a thorough inspection or as follows:

    a. Connect a source of cold water to the leak detection port (15).

    b. Turn the water on and locate the source of the leak or leaks.

    c. You may either reassemble the heat exchanger and return it in its entirety to AERCO for repair, or remove the U-bend tubing assembly and return only that assembly to AERCO for repair. See step 14 for equipment return information.

12. To disassemble the U-bend tubing assembly (14) from the heat exchanger, remove nuts (9) and studs (10) and lift the assembly off the manifold and skid assembly (16).

13. If for any reason it is necessary to remove the heat exchanger upper head assembly (12) from the shell (13):

    a. Remove the thermocouple (17) from its location in the heat exchanger upper head assembly.

    b. Remove all connecting wiring, if any, from the heat exchanger upper head assembly.

    c. Remove all piping and wiring to the relief valve (1) and water Solenoid Valve (2).

    d. Remove the nuts (18), studs (19), and lifting lugs (11).

    e. Lift the upper head assembly off the shell.

14. If the heat exchanger or any of its assemblies are to be returned to the AERCO factory for repair, consult AERCO or your nearest AERCO sales representative for instructions.

CAUTION

Inspect and replace any lugs, nuts and studs that show signs of corrosion with new properly rated hardware.

9.4 REASSEMBLING THE HEAT EXCHANGER

1. BEFORE REASSEMBLING, CLEAN ALL GASKET SURFACES THOROUGHLY, using a wire brush or emery cloth, if necessary. ALWAYS USE NEW GASKETS in a reassembly.

2. If the heat exchanger U-bend tubing assembly (14) must be reassembled onto the manifold and skid assembly (16), then proceed as follows:

    a. Place a lower tubesheet release gasket (20), a lower tubesheet gasket (21), and a second lower tubesheet release gasket (ALL NEW) onto the manifold flange (22).

    b. Lower the U-bend tubing assembly over the four studs in the manifold flange and onto the manifold gaskets, making sure the bottom flange of the U-bend assembly seats onto the locating pin in the top surface of the manifold flange, and that the U-bend assembly is lined up for insertion of the studs through the flanges.

3. To replace the heat exchanger shell (13) on a DW-45 heat exchanger, skip the rest of this step and all of step 4 and proceed to step 5. For DW-24 and DW-68 heat exchangers, proceed as follows:

   a. Place a Teflon upper tubesheet release gasket (24), the shell gasket (23) and another upper tubesheet release gasket (ALL NEW) onto the U-bend assembly flange.

   b. Using a hoist or block and tackle attached to the lifting lugs (11) on the heat exchanger upper head assembly (or to bolt holes in the shell top flange, if the upper head assembly has been removed), CAREFULLY lower the upper head assembly and shell STRAIGHT DOWN over the U-bend tubing assembly (14). DO NOT SCRAPE THE SHELL AGAINST THE TUBING.

   c. Make sure that the shell is positioned properly by lining up the marking you put on the edges of the flanges in 9.3, step 7.

   d. Assemble the studs (10) and nuts (9) into the manifold, U-bend assembly flange and shell flange. Cross-tighten the nuts to approximately 75 foot-pounds of torque to obtain uniform seating. Then progressively tighten the nuts to approximately 150 foot-pounds of torque for a tight seat.

4. If the heat exchanger upper head assembly (12) has been removed from the shell (13):

   a. Place a NEW shell gasket (23) onto the gasket surface of the shell top flange.

   b. Replace the heat exchanger upper head assembly onto the shell top flange making sure that the stud holes line up.

   c. Reassemble the studs, lifting lugs (11), and nuts (18) into the head and shell flanges. Tighten the nuts in the same manner as outlined in step 3d above.

   d. Replace the water solenoid valve (2), the relief valve (1), and all piping. Reconnect all connecting wiring, if any, required for accessories on the upper head assembly. Replace the thermocouple into their proper locations in the upper head assembly.

   Continue assembling the heat exchanger at step 7.

5. If you are replacing the heat exchanger shell (13) on a DW-45 heat exchanger, proceed as follows:

   a. Place an upper tubesheet release gasket, the lower shell gasket (23) and another upper tubesheet release gasket (24) (ALL NEW) onto the U-bend assembly flange.

   b. Using a hoist or block and tackle attached to the lifting lugs (11) on the heat exchanger upper head assembly (or to bolt holes in the shell top flange, if the upper head assembly has been removed), CAREFULLY lower the upper head assembly and shell STRAIGHT DOWN over the U-bend tubing assembly (14). DO NOT SCRAPE THE SHELL AGAINST THE TUBING.

   c. Make sure that the shell is positioned properly by lining up the marking you put on the edges of the flanges in 9.3, step 7.

   d. Assemble the studs (10) and nuts (9) into the manifold, U-bend assembly flange and shell flange. Cross-tighten the nuts to approximately 75 foot-pounds of torque to obtain uniform seating. Then progressively tighten the nuts to approximately 150 foot-pounds of torque for a tight seat.

6. If the heat exchanger upper head assembly (12) has been removed from the shell (13):

   a. Place a NEW upper shell gasket (25) onto the gasket surface of the shell top flange.

   b. Replace the heat exchanger upper head assembly onto the shell top flange making sure that the stud holes line up.

c. Reassemble the studs, lifting lugs (11), and nuts (18) into the head and shell flanges. Tighten the nuts in the same manner as outlined in step 3d above.

d. Replace the water solenoid valve (2), if any, the relief valve (1), and all piping. Reconnect all connecting wiring, if any, required for accessories on the upper head assembly. Replace the thermocouple into its proper locations in the upper head assembly.

7. Reinstall the circulation piping.

8. Reconnect the pressure gauge to the Steam Input flange.

9. Reconnect any power supply wiring to the heat exchanger Control Box, and reconnect any wiring between the Control Box and any solenoid valves included in the system.

10. Reconnect all external piping to the heat exchanger upper head assembly, including the piping to the relief valve (1) and the water solenoid valve (2).

11. Refill and put the heat exchanger back into service in accordance with 5.3, steps 1 through 15.

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APPENDIX A

CONTROL AND COMMUNICATION

A.1 TEMPERATURE CONTROLLER PROCEDURES

A.2 MODBUS COMMUNICATION INFORMATION

A.3 PROCESS / DIAGNOSTIC ALARM MESSAGES

A.1 TEMPERATURE CONTROLLER PROCEDURES

A.1.1 Adding a Communication Board to the Temperature Controller

A.1.1.1 Parts Needed

1. Control Box Assembly ECS, P/N: 69012-[ ]
2. Temperature Indicating Controller, P/N: 64008
3. Communications Board, P/N: 64009-[ ]

A.1.1.2 Procedure for Adding the Communication Board

1. Turn off power to Control Box Assembly ECS (P/N 69012-[ ])
2. Slide out Temperature Indicating Controller (P/N: 64008) from Control Box Assembly by gently pushing the indicated latching ears to the side (See Figure 1).

Figure 1

3. Slide Communications Board (P/N 64009-[ ]) into Temperature Indicating Controller slot (COMMS 1). See Figure 2. Make sure to push Communications Board all the way in to ensure it is firmly seated in its slot.

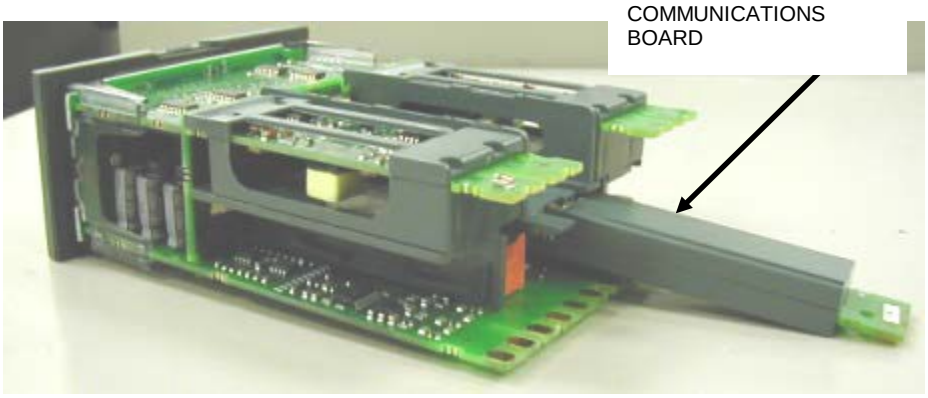


Figure 2

4. Place Temperature Indicating Controller back into Control Box Assembly and power up unit. The following screen will appear. (See Figure 3)

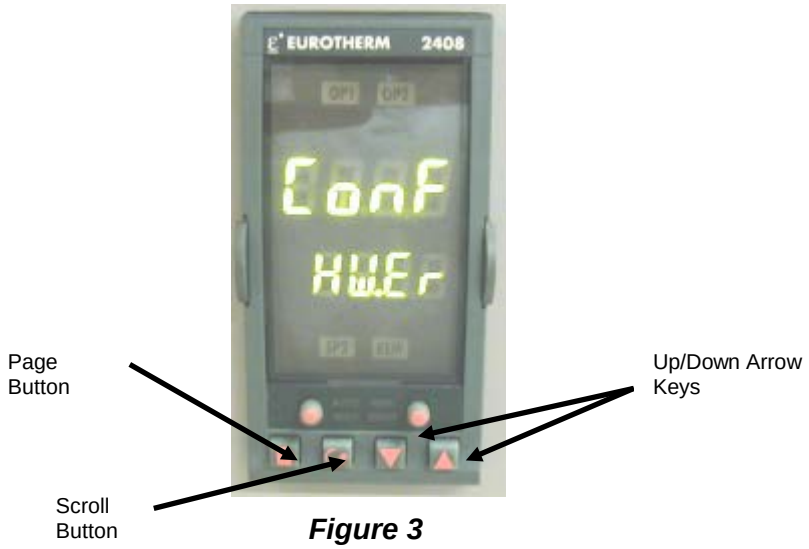


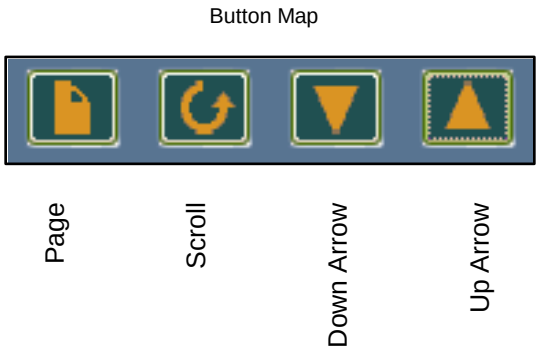
Figure 3

5. The Controller will report a hardware error as indicated on Figure 3. Press the ▲(up) arrow key located on the right side of the Temperature Controller until “8” appears on the lower half of the screen.
6. Press the page button located on the left side of the Temperature Indicating Controller until “Exit” appears on the top half of the screen.
7. Press the ▲ / ▼ (up/down) arrow key to choose “yes”.
8. Wait a moment as the screen updates. The hardware error will no longer be displayed.
9. This completes installation of the Communications Board.

A.1.2 Changing the Temperature Controller Communication Addresses

NOTE

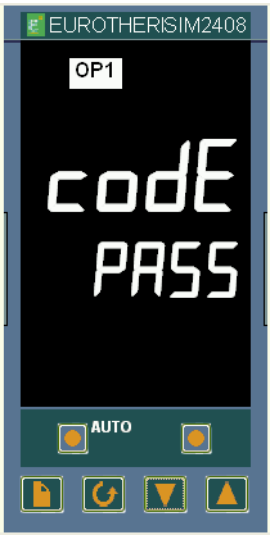
Refer to the button map at the bottom of the display for all panel navigation instructions.



The Temperature Controller address is defaulted to 1 from the factory. To change the MODBUS address, proceed as follows:

1. **Page** to the *ACCS* list and **Scroll** down to *codE*.

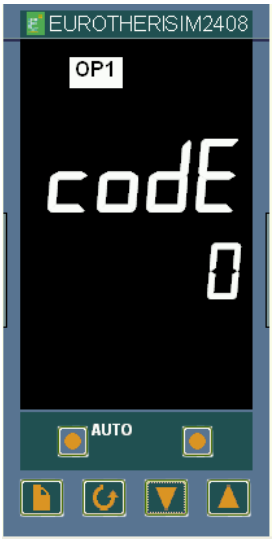
2. Enter 24 using the **Up Arrow**. The number will flash and display PASS.
3. **Scroll** to *Goto* (current value is OPEr) and use the **Down Arrow** to enter a value of Full. The entry confirms by flashing the lower display momentarily off and then on.



4. Go to the home screen by pressing the **Page** and **Scroll** buttons at the same time.

5. **Page** to the *cmS* list.
6. **Scroll** to the *Addr* screen.
7. Use the **Up Arrow** to select the desired address number.

8. Go to the home screen by pressing the **Page** and **Scroll** buttons at the same time.
9. **Page** to the *ACCS* list and change the code to anything other than 24. The *codE* number you enter will flash off and then on to 0 to confirm that access is now set to the OPEr level and it is safe to return to use.



10. Confirm that the *Addr* is set properly by pressing the **Page** button until the cmS list is displayed. **Scroll** to *Addr.* If the value is correct you are done; if not, repeat the steps in this procedure.

A.2 MODBUS COMMUNICATION INFORMATION

NOTE

The Eurotherm 2400 Controller supports the MODBUS RTU mode of transmission. The default settings are as follows: 9600 Baud Rate, one start bit, eight data bits, one stop bit and no parity bit.

Table A-1. Eurotherm Series 2400 Controller MODBUS Points

MODBUS Data Address	Menu Item	Menu Item Description	Units & Range	Default/Comments	Register Type	Ref. 1 Comm. Guide
5	w.SP	Setpoint	40-205°F	140°F, Address to read value	Read Only	5-4
24	SP 1	Setpoint	40-180°F	140°F, Address to change value	Write	5-11
1	Top Value	Outlet Temp	40-205°F	Same value as front display	Read Only	5-3
133	LoGH	Peak Temp	40-205°F	Resets on Power Loss	Read Only	5-15
135	LoGA	Average Temp	40-205°F	Resets on Power Loss	Read Only	5-15
134	LoGL	Low Temp	40-205°F	Resets on Power Loss	Read Only	5-15
13 (set) 74 (status, 0 = safe 1 = alarm)	AL 1	Over Temp Alarm	40-205°F	20°F above setpoint; Alarm Type 17: Deviation High	Read Only	5-7 5-20
14 (set) 74 (status, 0 = safe 1= alarm)	AL 2 (FSH)	Full Scale High Alarm	205°F	205 ° F Alarm Type 2: Full Scale High	Read Only	5-7 5-20
258	Sbr	Feedback Sensor Break	Status: 0: Good 1: Failed	Denotes Feedback Sensor Failure/Open Circuit	Read Only	5-18
289	Li 1	Feedback Sensor Temp	40-180°F	Sensor input to controller, same as display temp.	Read Only	5-14
290	Li 2	Flow	GPM		Read Only	5-14
3	OP	Control Output Signal	%	Correlates to valve position	Read Only	5-4
131	Addr	Communication Address	Integer (0-63)	Default – 1. Temperature Controller communication address	Read Only	5-14

REFERENCE DOCUMENTS

1. Eurotherm 2000 Series Communications Handbook, # HA026230
2. Eurotherm 2404/2408 Control Setpoint Programmer Installation and Operation Handbook, # HA025132

A.3 PROCESS AND DIAGNOSTIC ALARMS

A.3.1 Process Alarms

The following are the process alarms that can appear on the Temperature Controller display.

Table A-2. Process Alarms

DISPLAY	MEANING
_FSL*	PV Full Scale Low Alarm.
_FSH*	PV Full Scale High Alarm.
_dEu*	PV Deviation Band Alarm
_dHi*	PV Deviation High Alarm
_dLo*	PV Deviation Low Alarm

A.3.2 Diagnostic Alarms

The following are the diagnostic alarms that can appear on the Temperature Controller display.

Table A-3. Diagnostic Alarms

DISPLAY	MEANING	WHAT TO DO
EE.Er	*Electrically Erasable Memory Error:* The value of an operator, or configuration, parameter has been corrupted.	This fault will automatically take you into Configuration level. Check all of the configuration parameters before returning to Operator level. Once in Operator level, check all of the operator parameters before resuming normal operation. If the fault persists, or occurs frequently, contact your supplier
S.br	Sensor Break: Input sensor is unreliable or the input signal is out of range.	Check that the sensor is correctly connected
Hw.Er	Hardware Error Indication that a module is of the wrong type, missing, or faulty.	Check to ensure that the correct items are installed. See A.3.3 for procedure to clear the hardware error.
no.io	No I/O None of the expected I/O items are installed.	This error message normally occurs when pre-configuring a controller without installing any of the required I/O modules.
rmt.F	Remote input failure. The remote DC input is open or shorted.	Check for open or short circuit wiring on the remote DC input.
LLLL	Out of range low reading	Check the value of the input
HHHH	Out of range high reading	Check the value of the input
Err1	Error 1: ROM self-test fail	Return Controller for repair

Table A-3. Diagnostic Alarms - continued

DISPLAY	MEANING	WHAT TO DO
Err2	Error 2: RAM self-test fail	Return Controller for repair
Err3	Error 3: Watchdog fail	Return Controller for repair.
Err4	Error 4: Keyboard failure. Stuck button or button was pressed during power-up	Switch power off and then on, without touching any of the controller buttons
Err5	Error 5: Faulty internal communication	Check printed circuit board interconnections. If the fault cannot be cleared, return the controller for repair.
Err6	Digital filter chip faulty or loose board inside controller	Return Controller for repair
Err7	PV ID failure	Return Controller for repair
Err8	Module 1 ID failure	Faulty or loose module, or isolation problem
Err9	Module 2 ID failure	Faulty or loose module, or isolation problem
ErrA	Module 3 ID failure	Faulty or loose module, or isolation problem
dCF	DC output failure	Return Controller for repair.
OPEn	Secondary Input Missing or Disconnected	This error may result from no power to the flow meter (check for green power light on rear of meter or 0-5V flowmeter signal connections), or a disconnection of the Molex connector between feedforward sensor and the Eurotherm controller.

A.3.3 Clearing the Hardware Error Display

To clear a hardware error (HW.ER) and reset the Temperature Controller, proceed as follows:

1. Simultaneously press the **Page** ( ) and **Scroll** ( ) buttons on the Temperature Controller.
2. Using the **Up** (▲) arrow button, change the password to **"8"**.
3. Simultaneously press the **Page** ( ) and **Scroll** ( ) buttons again and observe the Temperature Controller display. The top line will display **"8"** and the bottom line will display **"NO"**.
4. Press the **Up** (▲) arrow button to toggle the display from **"NO"** to **"YES"**.
5. Simultaneously press the **Page** ( ) and **Scroll** ( ) buttons to "Reset" the Temperature Controller and clear the hardware error.

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APPENDIX B

B.1 WIRING DIAGRAMS

B.2 TERMINAL BLOCK CONNECTIONS

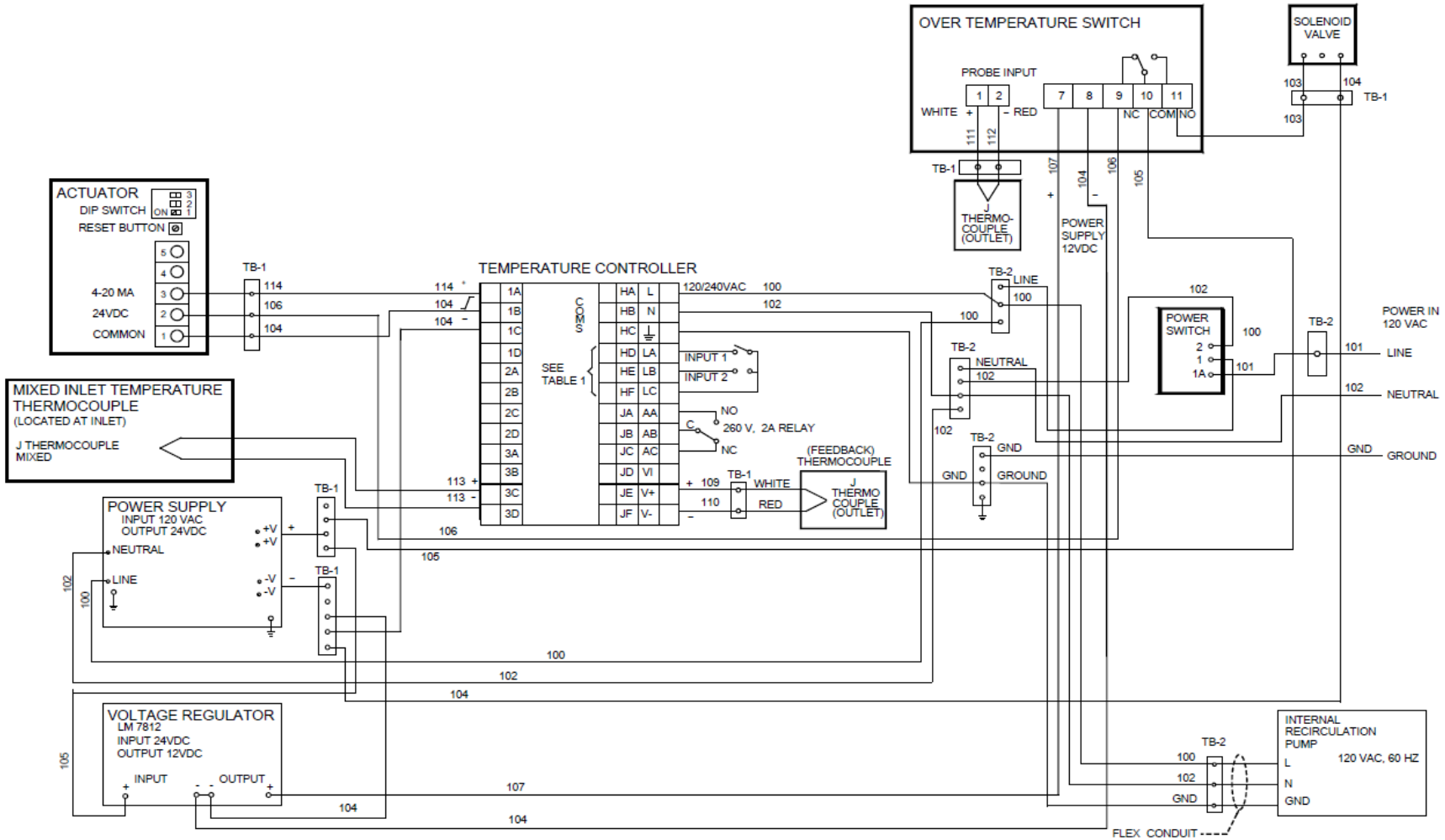


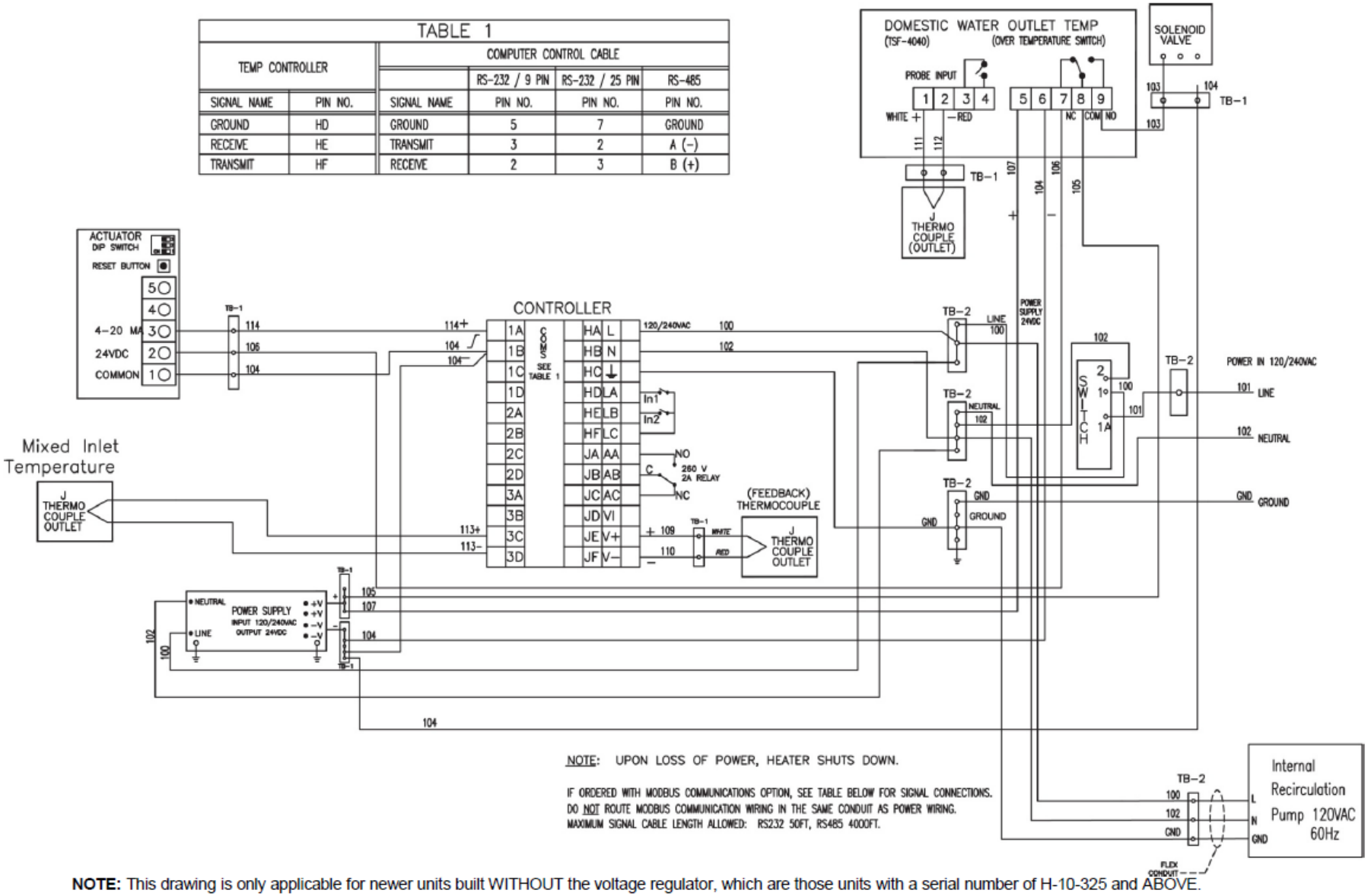
TABLE 1

TEMP CONTROLLER		COMPUTER CONTROL CABLE			
			RS-232 / 9 PIN	RS-232 / 25 PIN	RS-485
SIGNAL NAME	PIN NO.	SIGNAL NAME	PIN NO.	PIN NO.	PIN NO.
GROUND	HD	GROUND	5	7	GROUND
RECEIVE	HE	TRANSMIT	3	2	A
TRANSMIT	HF	RECEIVE	2	3	B

NOTE: This drawing is only applicable for older units built WITH the voltage regulator, which are those units with a serial number BEFORE H-10-324.

Figure B-1a. DW-Series Heat Exchanger Wiring Diagram (S/N H-10-323 and Below)

TABLE 1					
TEMP CONTROLLER		COMPUTER CONTROL CABLE			
			RS-232 / 9 PIN	RS-232 / 25 PIN	RS-485
SIGNAL NAME	PIN NO.	SIGNAL NAME	PIN NO.	PIN NO.	PIN NO.
GROUND	HD	GROUND	5	7	GROUND
RECEIVE	HE	TRANSMIT	3	2	A (-)
TRANSMIT	HF	RECEIVE	2	3	B (+)



NOTE: This drawing is only applicable for newer units built WITHOUT the voltage regulator, which are those units with a serial number of H-10-325 and ABOVE.

Figure B-1b. DW-Series Heat Exchanger Wiring Diagram (S/N H-10-325 and Above)

TERMINAL BLOCK TB-1 (REAR WALL)

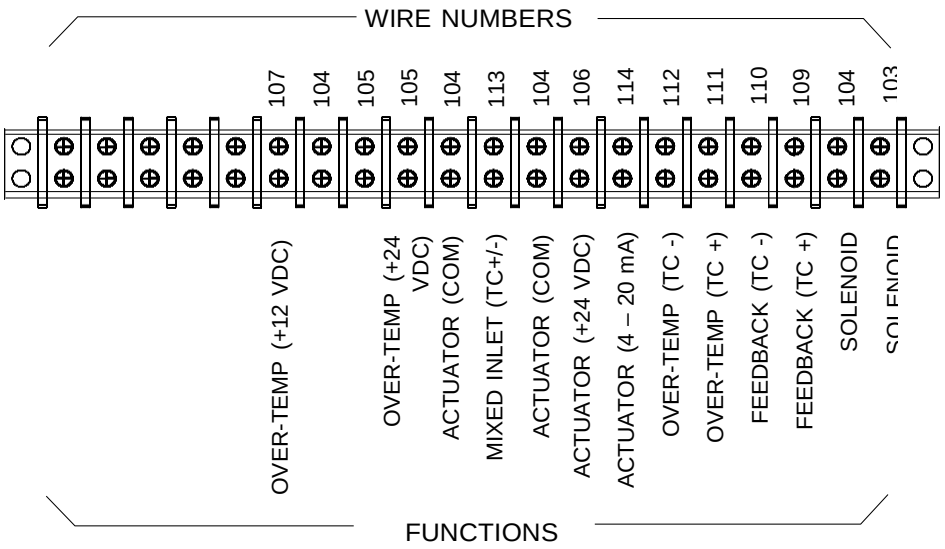


Figure B-2. Terminal Block TB-1 Connections

TERMINAL BLOCK TB-2
(BOTTOM SURFACE)

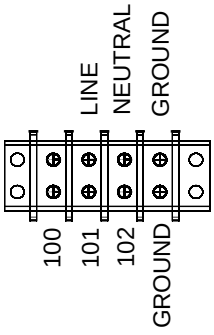


Figure B-3. Terminal Block TB-2 Connections

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APPENDIX C

PIPING CONNECTIONS

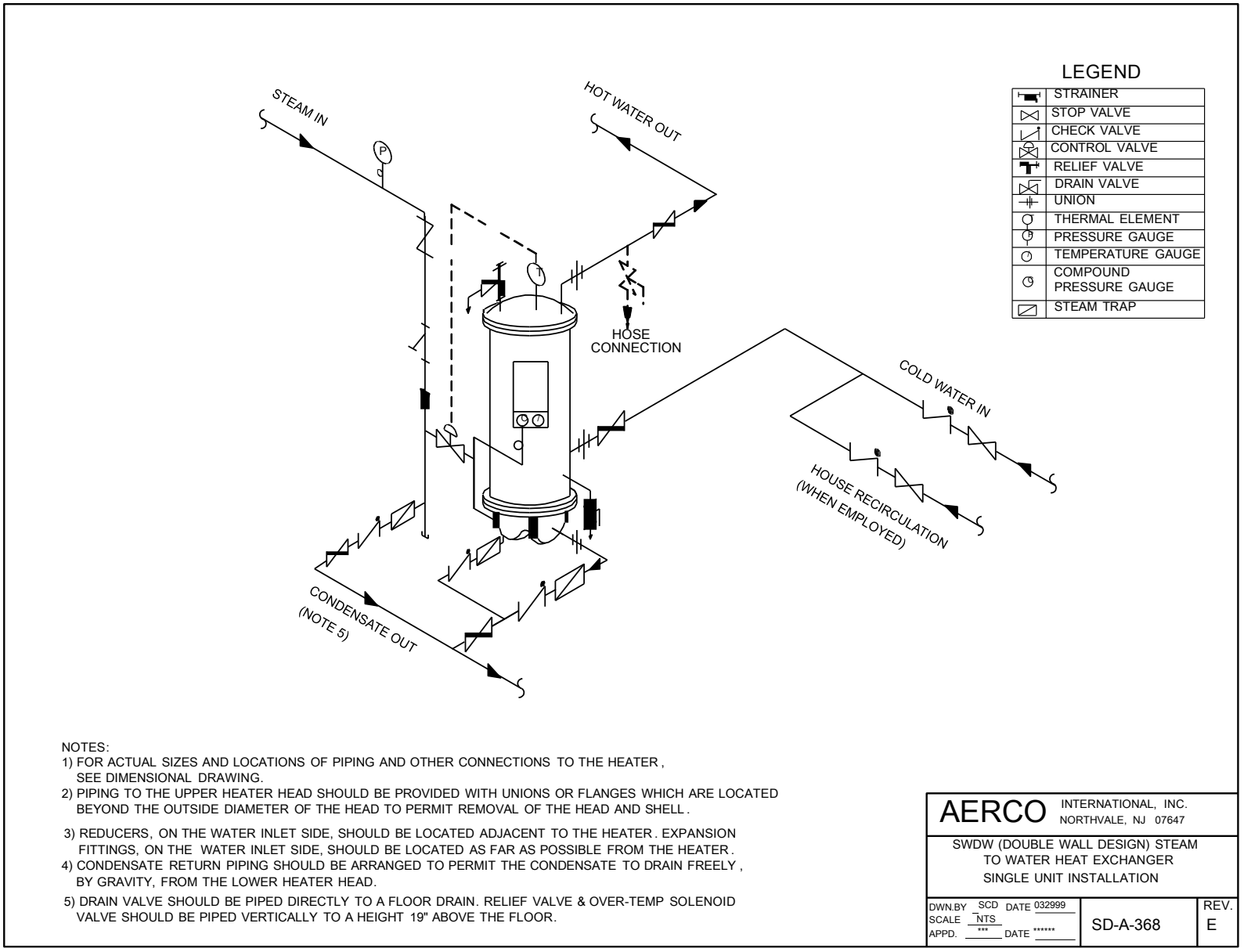
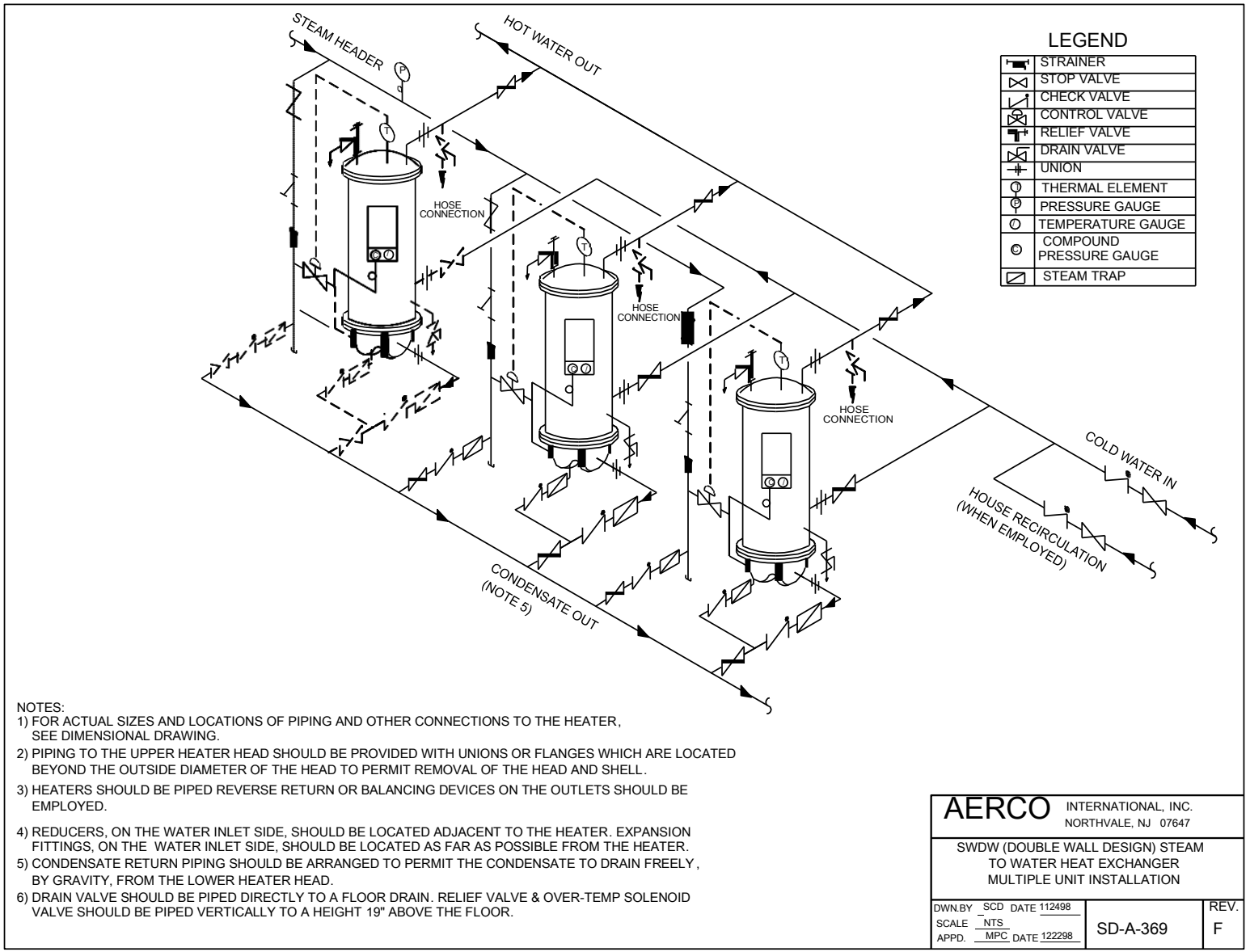


Figure C-1. Piping Connection for Singe Heat Exchanger



NOTES:
1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWING.
2) PIPING TO THE UPPER HEATER HEAD SHOULD BE PROVIDED WITH UNIONS OR FLANGES WHICH ARE LOCATED BEYOND THE OUTSIDE DIAMETER OF THE HEAD TO PERMIT REMOVAL OF THE HEAD AND SHELL.
3) HEATERS SHOULD BE PIPED REVERSE RETURN OR BALANCING DEVICES ON THE OUTLETS SHOULD BE EMPLOYED.
4) REDUCERS, ON THE WATER INLET SIDE, SHOULD BE LOCATED ADJACENT TO THE HEATER. EXPANSION FITTINGS, ON THE WATER INLET SIDE, SHOULD BE LOCATED AS FAR AS POSSIBLE FROM THE HEATER.
5) CONDENSATE RETURN PIPING SHOULD BE ARRANGED TO PERMIT THE CONDENSATE TO DRAIN FREELY, BY GRAVITY, FROM THE LOWER HEATER HEAD.
6) DRAIN VALVE SHOULD BE PIPED DIRECTLY TO A FLOOR DRAIN. RELIEF VALVE & OVER-TEMP SOLENOID VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 19" ABOVE THE FLOOR.

AERCO INTERNATIONAL, INC.
NORTHVALE, NJ 07647

SWDW (DOUBLE WALL DESIGN) STEAM TO WATER HEAT EXCHANGER MULTIPLE UNIT INSTALLATION

DWN.BY SCD DATE 112498
SCALE NTS
APPD. MPC DATE 122298

SD-A-369

REV. F

Figure C-2. Piping Connection for Parallel Heat Exchanger

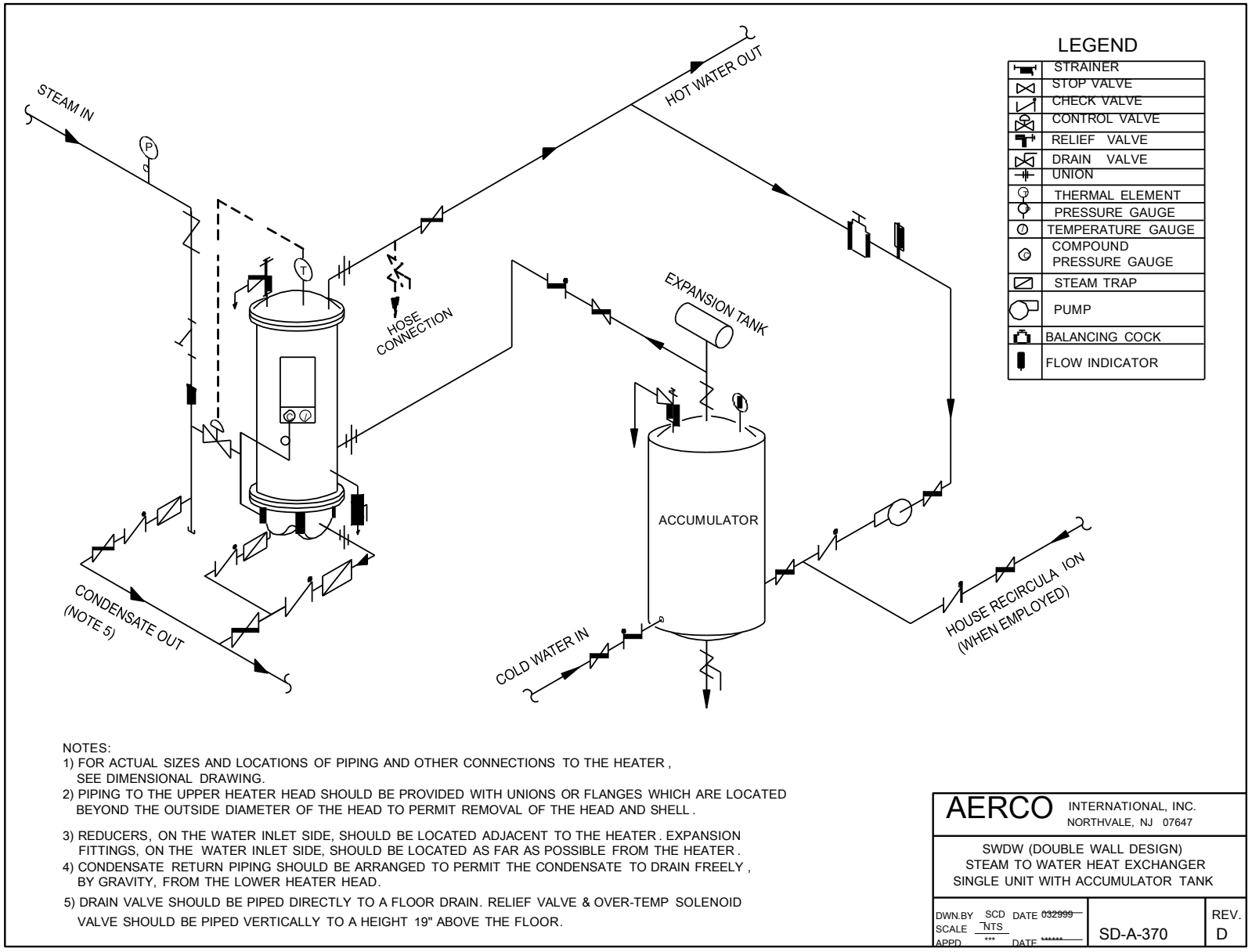


Figure C-3. Piping Connection for Single Heat Exchanger with an Accumulator

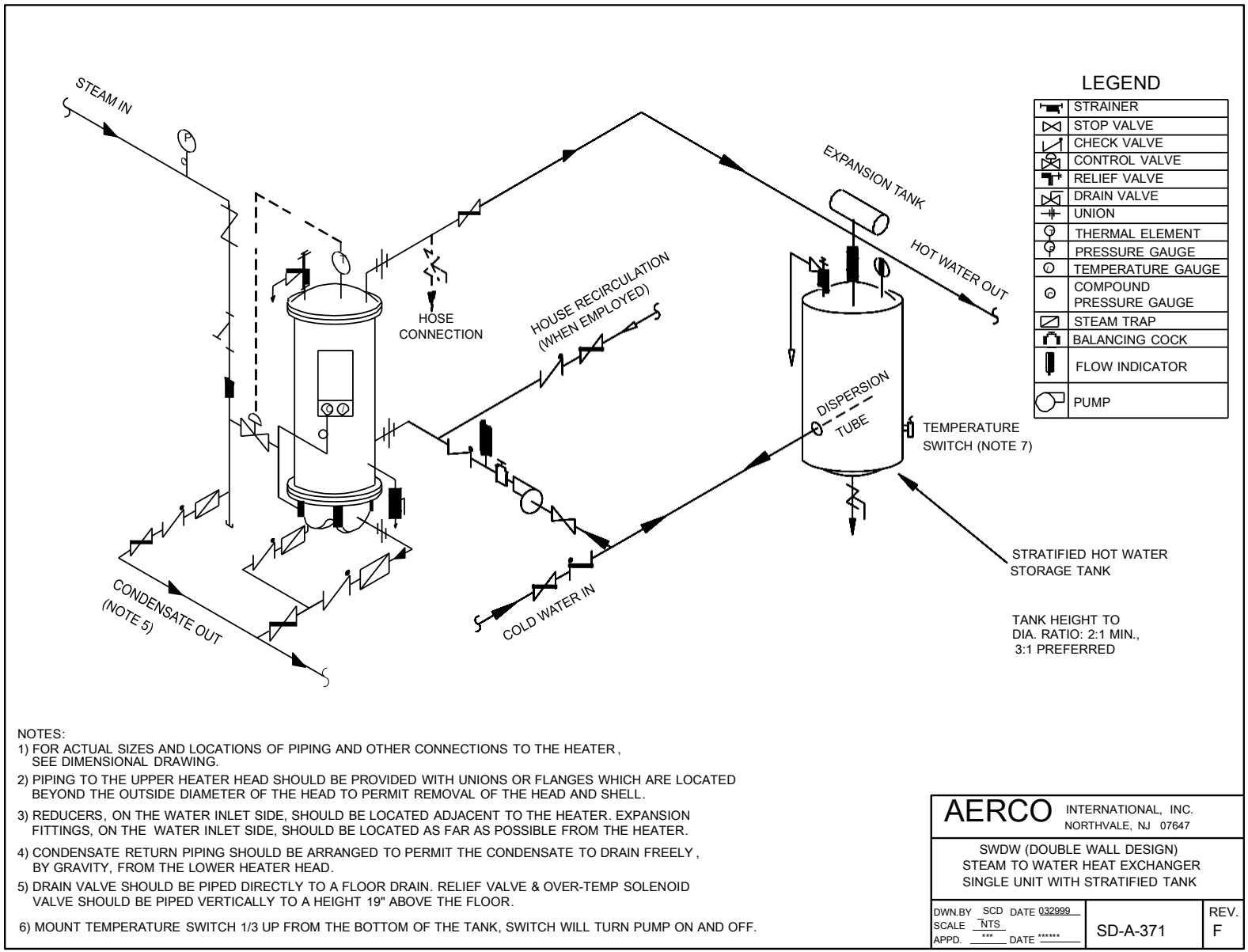
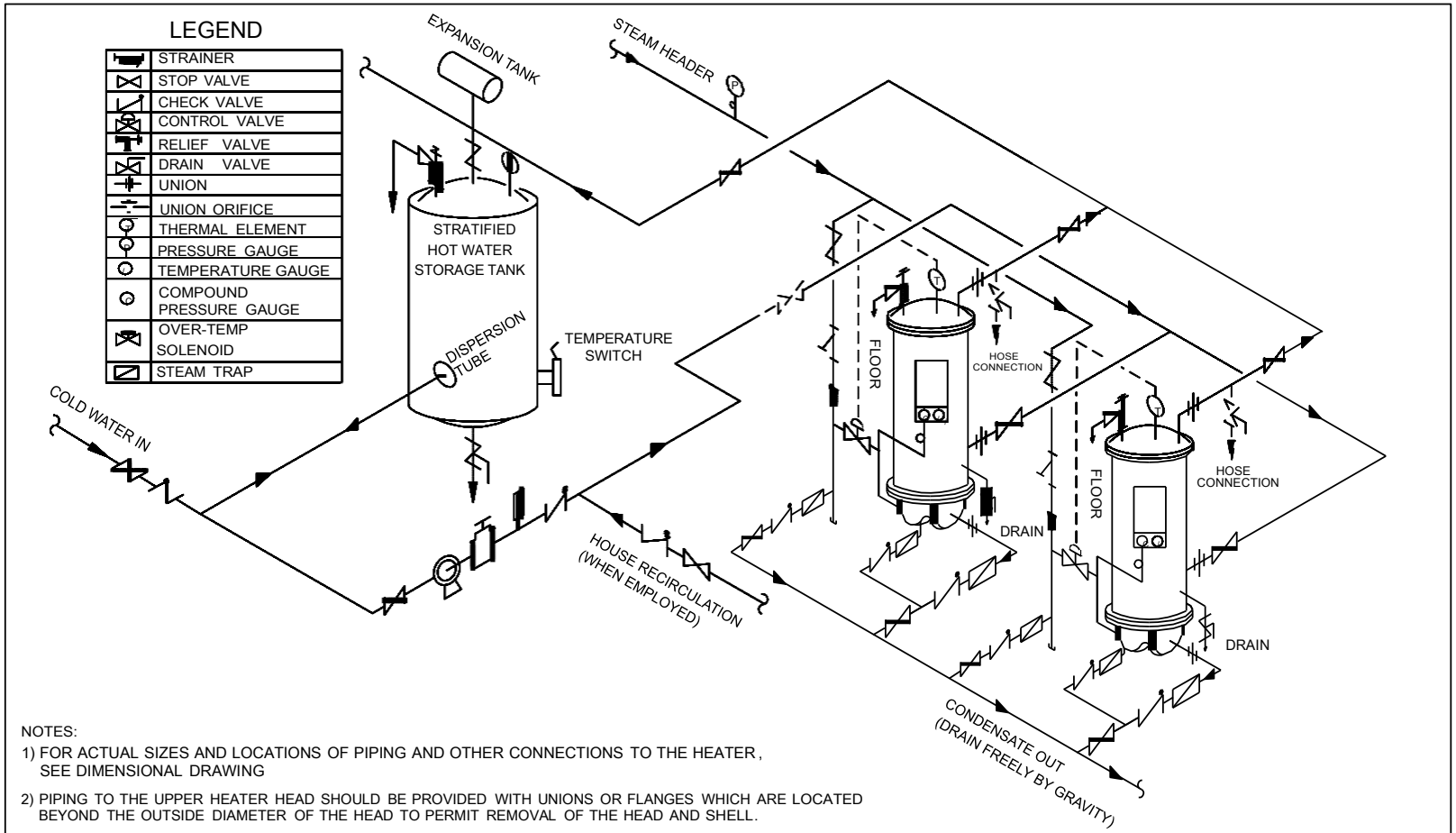


Figure C-4. Piping Connection for Single Heat Exchanger with a Stratified Storage Tank



NOTES:

1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWING
2) PIPING TO THE UPPER HEATER HEAD SHOULD BE PROVIDED WITH UNIONS OR FLANGES WHICH ARE LOCATED BEYOND THE OUTSIDE DIAMETER OF THE HEAD TO PERMIT REMOVAL OF THE HEAD AND SHELL.
3) HEATERS SHOULD BE PIPED REVERSE RETURN OR BALANCING DEVICES ON THE OUTLETS SHOULD BE EMPLOYED.
4) REDUCERS, ON THE WATER INLET SIDE, SHOULD BE LOCATED ADJACENT TO THE HEATER. EXPANSION FITTINGS, ON THE WATER INLET SIDE, SHOULD BE LOCATED AS FAR AS POSSIBLE FROM THE HEATER.
5) CONDENSATE RETURN PIPING SHOULD BE ARRANGED TO PERMIT THE CONDENSATE TO DRAIN FREELY, BY GRAVITY, FROM THE LOWER HEATER HEAD.
6) DRAIN VALVE SHOULD BE PIPED DIRECTLY TO A FLOOR DRAIN. RELIEF VALVE & OVER-TEMP SOLENOID VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 19" ABOVE THE FLOOR.
7) PUMP SHOULD BE CAPABLE OF HEATERS' TOTAL RATED FLOW AT DESIGN TEMPERATURE RISE.
8) MOUNT TEMPERATURE SWITCH 1/3 UP FROM THE BOTTOM OF THE TANK, SWITCH WILL TURN PUMP ON AND OFF.

AERCO INTERNATIONAL, INC.
NORTHVALE, NJ 07647

STRATIFIED STORAGE TANK WITH SWDW-1 OR SWDW-2 STEAM TO WATER DOUBLE WALL - MULTIPLE HEATERS

DWN.BY DMM DATE 08/21/01	SD-A-501	REV. G
SCALE NTS		
APPD. ____ DATE ____		

Figure C-5. Piping Connection for Multiple Heat Exchangers with a Stratified Storage Tank

Double-Wall Series Heat Exchanger Warranty

AERCO'S EXTENDED WARRANTY

AERCO's Extended Warranty from shipment covers any SWDW and WWDW heater that is applied in a commercial potable water heating application. These consist of any domestic service: i.e. showers, tubs, lavs, kitchens, etc. Please contact your local representative for complete details regarding application.

Seller makes no warranty of merchantability, fitness for particular purpose, or any other express or implied warranties which extend beyond the description contained in Seller's Quotation. If any item manufactured by the Seller shall not comply with the applicable specifications, or shall prove defective in material and/or workmanship, within eighteen (18) months from the date of delivery. Buyer shall notify Seller, in writing, of such defect or non-compliance within thirty (30) days of discovery of such defect or non-compliance.

The following components of the AERCO Heater are covered by the Extended Warranty:

Pressure Vessel: The pressure vessel (shell and heads) shall carry a non-prorated 20-year guarantee against leakage due to internal corrosion.

Anticipator: The integral demand anticipator unit shall carry a non-prorated 20-year guarantee against any failure.

AERCO'S STANDARD WARRANTY: 18 MONTHS FROM SHIPMENT

All other components of the heater assembly including control valve and all other external accessories are guaranteed against failure from defect in material and/or workmanship for a period of 18 months from shipment.

Seller shall, at its option, modify, repair, exchange the product, or refund the purchase price of said item. Seller shall have the option of having the item returned, FOB its factory, or to make sure adjustment at the point of installation. In no event shall Seller be held responsible for replacement labor charges or for freight or handling charges. Total liability to the seller shall not exceed the purchase price of the item. Seller shall accept no responsibility if such item has been improperly installed, operated, or maintained or if Buyer has permitted any unauthorized modifications, adjustments, and/or repairs to the item. The use of replacement parts not manufactured or sold by AERCO will void any warranty, express or implied. Items not manufactured by the Seller shall be covered by the warranty of the manufacturer or supplier thereof. The foregoing shall be Sellers sole and exclusive obligation and Buyer's sole and exclusive remedy for any action, whether in breach of contract or for negligence

This warranty coverage is only applicable within the United States and Canada. All other geographical areas carry a standard warranty of 18 months from date of shipment or 12 months from startup, whichever comes first.