TH-750/250 Series Steam or Boiler Water Fired Water Heater Startup Operation & Maintenance Manual

READ THIS MANUAL COMPLETELY BEFORE ATTEMPTING START UP
THIS IS GENERAL INFORMATION PLEASE REVIEW FINAL DRAWING OR CONSULT YOUR LOCAL REPRESENTATIVE OR THERMAFLO

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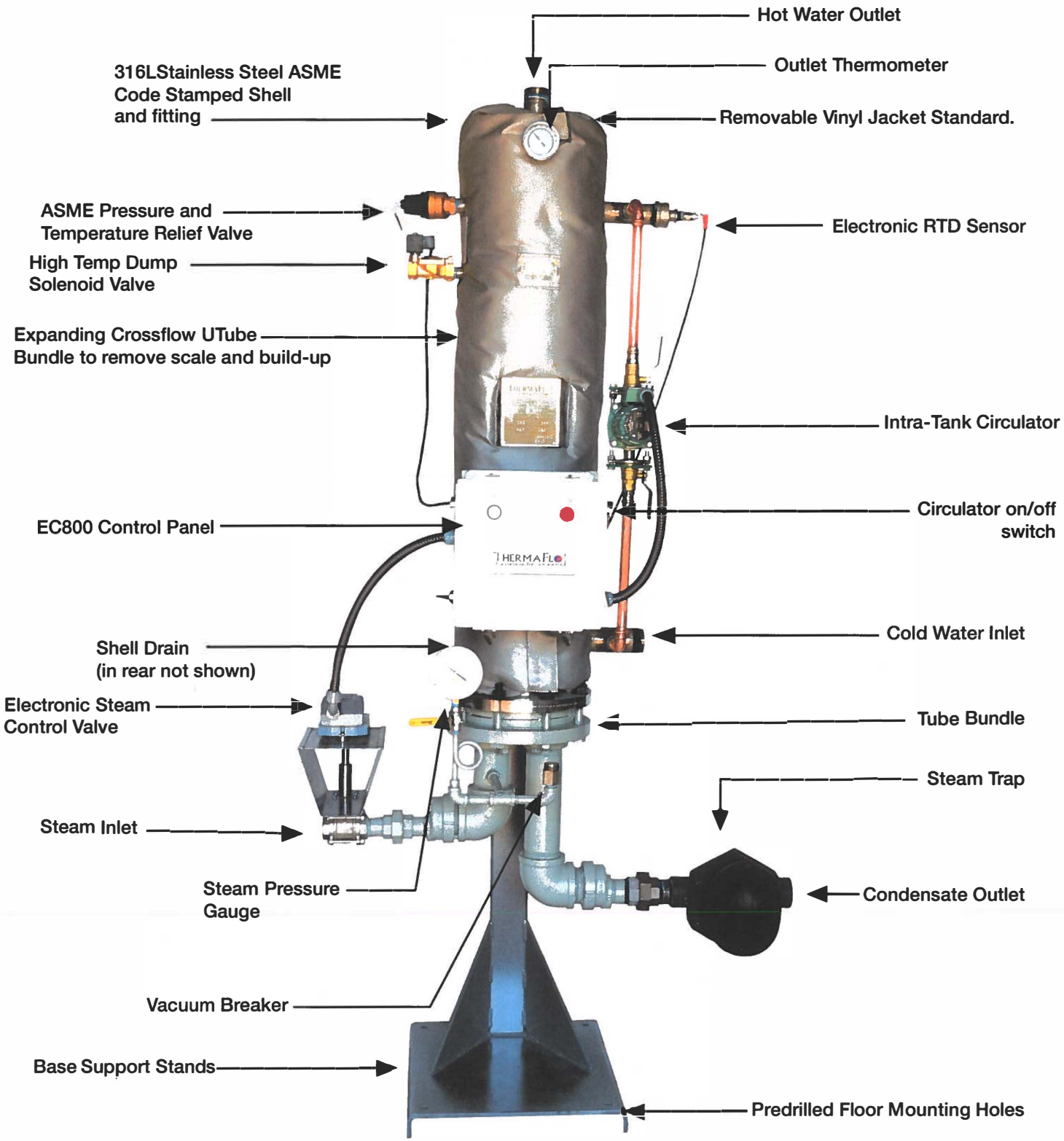
TH-750-IMI-2020
Rev 7

TH750 CONNECTIONS AND ACCESSORIES IDENTIFICATION

TH-750 Steam Fired Water Heater



Electronic Version Shown

Section 1 – Hookup and Installation

1. The TH-750/250 should be located in an area so that it will be easily accessible for any inspection and repairs Min 24". Secure to the floor using the four mounting holes in the base floor stand. Pipe clean water or fluid to be heated to the inlet on the lower side making provision for the loop recirculation. Install a check valve and suitable "Y" strainer on the inlet. Check Local Codes.

2. Pipe the heater outlet from the top of the TH-750/250 to the users. A recirculation loop for the hot circuit is always recommended. Size flow loop at 20-25% of max demand on the system.

3. Service (isolation) valves should be located at all inlets and outlets.

4. Always open the cold water side first and check for any leaks. Leaks occur due to transit and install.

5. Pipe steam (150 psig Max) to the control inlet valve. If a "Y" strainer and drip steam trap were not supplied with the TH-750/250 heater, they should be installed with the isolation valve.

6. If a "Y" strainer and drip trap are not installed, dirt and condensate will build up on zero or low load conditions. **Failure to install a "Y" strainer and drip trap on the steam supply line voids the warranty.**

7. Be sure the steam supply is sized correctly – consult Thermaflo Engineering if you are unsure of the size. The steam supply line is NOT the same size as the control valve!

8. Always open the cold (WATER) side first very slowly so as not to wave shock the shell before opening the hot (STEAM) side and always introduce steam to the unit very slowly over time. A flow of recirculated water of 25% min flow of max flow should be maintained at all times thru the heaters. Example 100 GPM Max - 25 GPM recirculation. It is recommended not to totally isolate the water flow side of any heater to dead head or no usage or over heating will occur.

9. For gravity return systems, the TH-750/250 will be supplied with a factory sized Float & Thermostatic steam trap. **Never substitute with another manufacturer's steam trap or a different trap other than that supplied with the TH-750V unit as this could effect operation and will void the warranty**. If the steam trap cannot be located at the time of installation, contact your local Thermaflo Engineering representative.

10. **For TH-750/250 units installed where the condensate drains into a gravity return system, the condensate piping must not be elevated or lifted as this will cause water hammer, erratic control, flooding of the tube steam space, premature tube failure and will void the warranty.**

11. For pressurized condensate return systems or where a lift is required, the TH-750 should be supplied and fitted with a Thermaflo Engineering POP pump trap on pressure powered pump in place of the F & T trap. Consult your Thermaflo Representative.

12. Pipe the high temperature dump valve shell drain valve and P&T Valve to suitable drain. This valve will discharge a considerable amount of water when it opens. Never allow this valve to be piped to drain that will not carry full flow discharge. Installer is responsible for selecting adequate drain size. If the drain pipe is PVC install a cooler to quench the drain to 140F Max.

13. Always leave the vacuum breaker, located below the inlet steam pressure gauge, open to atmosphere. Pipe all air vents and drain valves to a proper drain never to open atmosphere.

14. As a general rule all TH750/250 Heaters after 2017 come equipped with the JVV steam control valve. These valves are shipped loose and required reinstall by union or flg plus control wires reattached.

15. The EC800 control panel requires a single-phase 120 V/60Hz power supply. Supply wiring connections are furnished so that only one simple connection is required. **Supply circuit should be fitted with a minimum 10 amp breaker with fused disconnect and should comply with local codes. The internal controller has been factory programmed for your conditions. Do not attempt to reprogram the PID controller without proper supervision by your Thermaflo representative. The setpoints are sensetive and you may void the warranty.**

16. **VERY IMPORTANT - Prior to connecting power to the unit, ensure that the re-circulation pump ON-OFF switch (black in color and located on the right side of the EC800 control panel) is in the OFF position to prevent the pump from running dry and damaging the seals which will consequently fail on start up. Evidence of the pump being run dry will void the warranty. Most TH500 Panels are not equipped with On-Off switches**

17. The EC800 panel powers the re-circulation pump and all of the controls on the TH-750 unit. No additional wiring is required. Each TH-750 Digital Temperature Controller is "Factory Set-up and Tested" for the stated operating conditions. NO ADJUSTMENTS should be made unless the operating conditions have changed from conditions stated on the purchase order. However EC800 PM6 Panels can be setup to accept a remote input signal.

18. For TH-750/250 units supplied with a pneumatic steam control valve, connect a clean 40-psig Min (120 Max) air supply to the bottom supply port tubing connection. The outlet tubing to the control valve is supplied with the unit but is disconnected for shipping and will have to be reconnected during the installation process. Simple slide fittings allow easy connection of the poly air tubing. Units with electric or self acting actuation of the steam control valve require no outside air source.

19. Prior to startup, all head flange bolts should be retightened as these may have loosened during shipping or due to piping stress during installation. Bolts should be torqued incrementally and in the sequential order shown in the tables and drawings in Appendix A.

20. Retightening of head flange bolts is important and failure to complete this procedure can lead to head gasket leaks. The bolts should also be checked and adjusted as necessary after startup and annually to stop future leaks. Heat exchangers expand and contract requiring this.

21. Included in Appendix B of this manual are drawings showing typical hookups for various applications. It is recommended that the drawing outlining the relevant application is carefully reviewed before startup is attempted. If you are uncertain about correct hookup contact your local Thermaflo Engineering representative or the factory.

22. As water expands when heat is applied, installation of a properly sized thermal expansion tank is recommended if the TH-750 does not have continuous usage. Failure to install an expansion tank may cause excessive popping of the relief valve and or high pressure which could cause damage to the tube bundle or shell.

23. **SAFETY NOTE:** The TH-750 is supplied as standard with a double safety shutdown system. However it is strongly recommended that when the TH-750 heater supplies hot water for domestic use, a secondary blending valve system be installed to prevent any chance of a scalding situation. Consult your engineering consultant or local Thermaflo Engineering representative if this is not in place. TH250 Units have a single shutdown.

YOU ARE NOW READY FOR STARTUP

Section 2 – Startup Procedure and Operation

HAVE YOU COMPLETED YOUR THERMAFLO CHECKLIST?

1. Verify that all manual valves are **CLOSED** on the water and heat (steam HTHW) sources.

2. Locate the black circulation pump On-Off switch (on side of EC800 panel) and make sure that it is in the OFF position. **Failure to turn the recirculation pump off will run the pump dry causing failure.**

3. Power up the panel. This will close the high temp drain solenoid valve and activate the temperature controller. This will take 4 to 6 seconds. The high temp solenoid valve is normally closed, so it should close off after power up. Turn on Main Power before water!

4. Now Slowly open the water supply valve to the shell of the TH-750 and allow the shell to fill with water (checking for leaks). Repair any leaks before proceeding with startup.

5. Open valves on the recirculation loop and when shell is full of water turn the recirculation pump ON and make sure the hot water loop has flow.

6. With a small user turned on and calling for hot water (sink hot water faucet or shower), slowly open the hot water outlet valve. This will allow the shell to completely fill with water and remove any air from the shell. **Never use the Pressure & Temperature relief valve to remove air.**

7. The digital controller will sequence for a few minutes following initial power up and then return to its operation mode. The controller has been preset at the factory before shipment and should not require adjustment. The RED top number should read approx 60F.

8. Two numbers will appear on the front of the controller. The GREEN lower number is the outlet water temperature set point. The RED upper number is the actual water temperature in the shell. The red number can be changed with the up and or down arrow key. **See Page 7 It is suggested to startup gradually with the Green number set 5F above actual and raise it with the UP and DOWN Arrow key 5F every 5 minutes until desired set point is reached. For Domestic Water 120F should be the maximum setpoint for startup. If your inlet steam pressure exceeds 15 PSIG this is a MUST FOLLOW recommendation.**

9. Gradually open the main steam supply valve while following Step 8 above to warm system up and fully open the condensate discharge valve before steam is sent to the control valve.

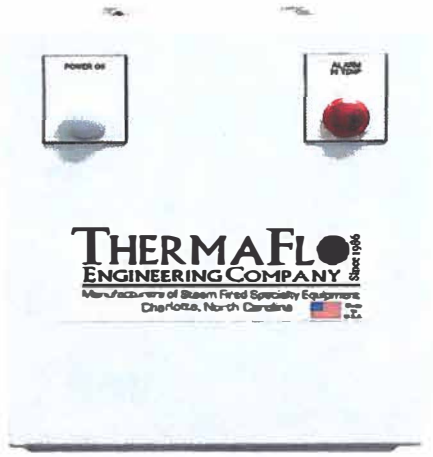
10. The EC800 panel for pneumatic control includes a pressure gauge. This gauge indicates the air pressure to modulate the control valve. Make sure clean dry air source is piped 40 psig min.

11. When the system is first turned on, the water in the shell will be cold and controller will be sending out its maximum air signal to the control valve which will register 15 to 30 psig on the air gauge with a pneumatic unit.

12. As the system nears set point, the pressure will begin to drop until the gauge finally reads zero when set point temperature has been achieved.

13. As the system functions normally, the pressure reading on the air gauge will rise and fall, modulating the steam valve.

EC800 Panel with Electronic Control



Circulation Pump Switch located here.

14. Be sure Fully Open the condensate isolation valve to allow condensate to drain from the steam trap. Please be sure that no condensate is being elevated or lifted, gravity return only.

15. As the system nears set point, the pressure will begin to drop until the gauge finally reads zero when set point temperature has been achieved. Pneumatic Unit Only.

16. Very slowly open the inlet steam isolation valve to about 10% and allow steam to flow into the heater. The steam control valve will be modulating open at this point as the water in the shell is cold. Steam must be slowly introduced through the inlet valve at a controlled rate manually for warm up. The upper number on the controller will begin to increase as the steam is being introduced to the heating coil. SEE NOTE 8 and 9 Above.

17. After about 10 minutes of warm up, slowly open fully the inlet steam isolation valve and allow the TH-750 to come up to full operating temperature. This may take several minutes as described above. During this time the control valve will begin to take over and fully control.

18. Gradually close the hot water users (sink hot water faucet or shower) used for set up and allow the TH-750 to function in the automatic normal mode. It will take several minutes for a new system to settle down into a normal operating mode. Systems need some type of demand to assure a smooth startup.

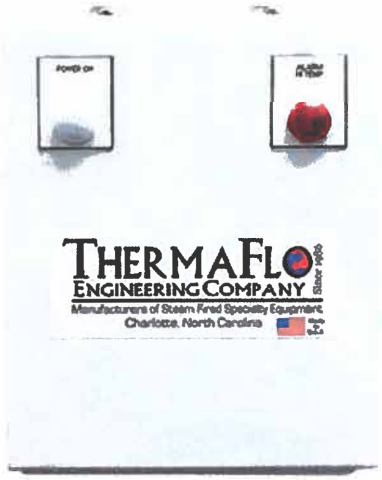
19. Often a new system will have no users on line demanding hot water. If this is the case, after the system reaches operating set point it will enter a hold mode. It is advisable for the owner. High temperature shutdown is standard at 160F.When or if the outlet water reaches 160F the saftey shutdown closes the steam valve and opens the solenoid shell drain valve so that cold water is introduced into the shell. When the heater water shell temperature drops below limit the high temperature light will turn off, along with the shell drain valve and the steam valve will reopen. If cycling occurs this is a sign of little to no demand or recirculation. Often when a building is new no demand whatsoever exist. It is advisable to drop the set point to 100F until the building is put into operation. If this condition persist the factory can recommend a setting change in the EC800 to adapt the control to your system signature.

20. Recheck the head bolt torque levels and repair any system leaks as required.

21. For TH-750 units with **electric control**, no instrument air supply is require

22. The electric actuated valve is a "Fail Closed" electronic V Segmented type valve with a soft Teflon seat that closes tight on shutdown.

EC800 Panel with Electric Control



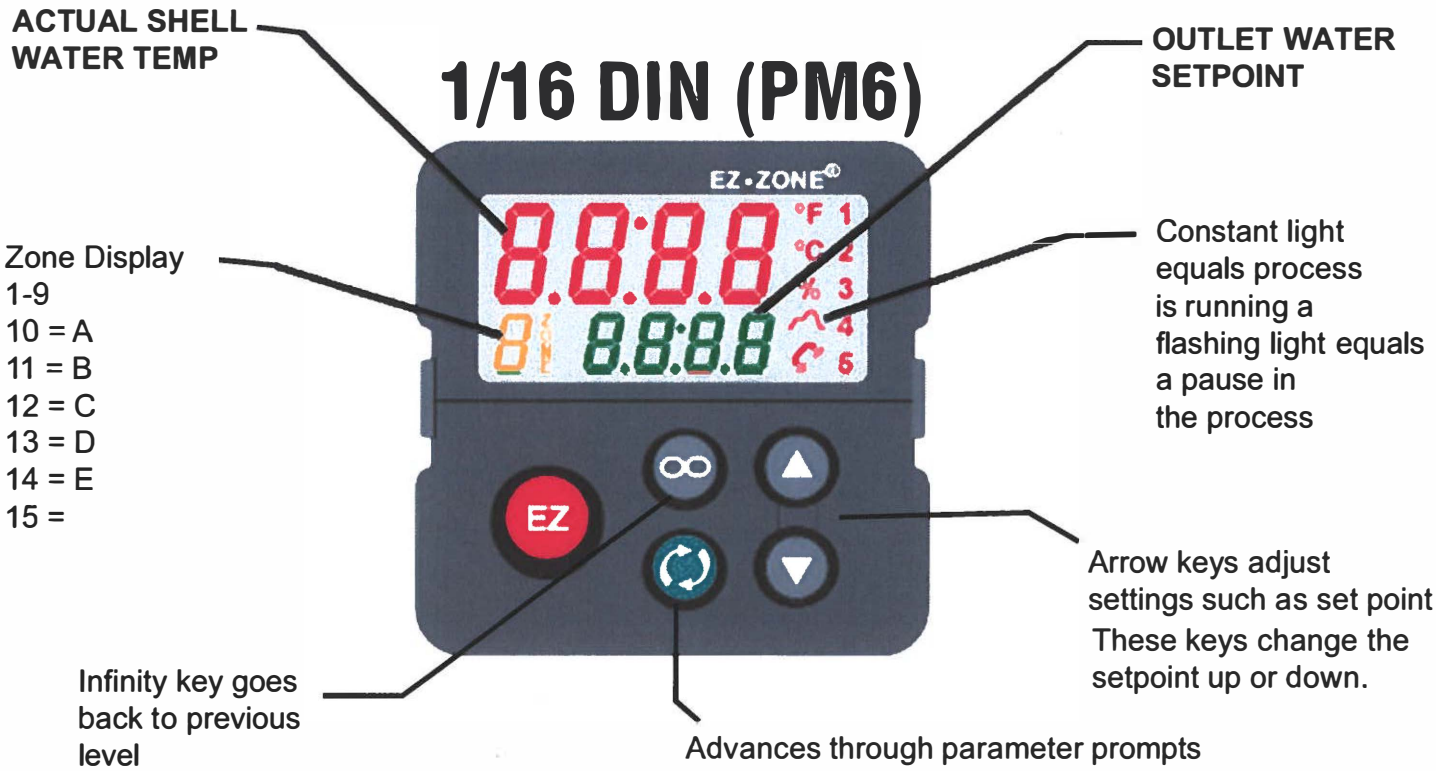
23.The self acting (SA) version of the TH-750 will utilize the Thermaflo Engineering type 3010 series valve. It is rare that a TH750 is equipped with self acting controls as of 2015.
A manual corresponding with the valve type supplied is included in the documentation package that accompanies the TH-750 heater.

24. The controller illustration below is a quick reference for startup use. A dedicated controller manual containing more detailed information is also included in the documentation package.

25. Note that all controllers, prior to shipment, are factory set for the operating parameters provided by the end user at time of order. Each controller is configured so that only the outlet temperature set point can be changed. All other critical control settings are locked out (password protected) to prevent inadvertent change or tampering by unauthorized personnel.

THIS CONTROLLER HAS BEEN SET UP SO THAT ONLY THE SETPOINT CAN BE CHANGED WITHOUT PASS CODE

Do Not Attempt to change any parameter other than setpoint without Thermaflo Rep



SEE ELECTRICAL SCHEMATICS ON PAGES 19 - 26 OF THIS MANUAL

Consult the Factory if BacNet or Lonworks Communicators are Installed

FOR COMPLETE PID CONTROLLER GUIDE CONSULT THERMAFLO

Section 3 – Shutdown Procedure

1. Turn off all power to the circulating pump and / or electric controls, if so equipped.

2. Close all valves in the water inlet line (or boiler water / high temperature water line).

3. Relieve the pressure from the energy source line (water, boiler water, or high temperature water), where possible.

4. Close all remaining valves in the system in this order:
   a) Hot water outlet line
   b) Cold water inlet line
   c) Condensate return line (or boiler / high temperature water return line).

5. After the system has cooled, drain the unit by opening the tank drain valve and holding the pressure relief valve in the open position. This will prevent the formation of a vacuum and increase the drainage flow. Consider any freezing situation.

6. Proceed with required maintenance or repairs. For correct maintenance procedures see pages 9 – 12.

7. After performing the required maintenance or repairs, return the unit to operation by following the start up procedures detailed on pages 4 - 7.

Section 4 – Maintenance

1. Gasket creep is inherent to most gasketed joints, and retorquing is required. The greater the operating temperature and pressure, the greater the problem can become. It is imperative that the head bolts be torqued after installation, after initial setup, and inspected several times a year to be sure that the bolts are torqued correctly and there are no leaks. See section 1 paragraph 19 for correct torque procedure.

2. Located at the lower rear of the unit, the TH-750 has a manual, shell blow down valve that should be piped to a suitable drain. On a monthly to quarterly frequency, this valve should be quickly opened for 2 seconds to remove scale buildup and any normal sediment that may collect in the shell.

3. The intra-tank circulation pump is critical for the accurate operation of the TH-750. This pump circulates the water in the shell across the temperature sensor and back into the shell through the cold water supply inlet. This action allows the system to not only detect changes in flow demand, but also temperature changes as well. The recirculation pump is fitted with permanently lubricated bearings and therefore does not require any additional lubrication. If however the TH-750 suddenly becomes unable to maintain accurate control, the pump should be checked for operation.

4. On a yearly basis, the operation of the recirculation pump should be verified, and isolation valves have been fitted on each side of the pump for this service. If the pump is not running, make sure the pump ON-OFF switch (black in color and located on the right side of the EC800 control panel) is in the ON position.

5. If the recirculation pump requires replacement, turn the pump ON-OFF switch to the OFF position, isolate pump and remove.

6. Install new pump, open isolation valves and turn pump ON-Off switch to the ON position. This can be done while the TH-750 heater remains in service so that hot water flow to end users is not interrupted.

7. All TH-750 units must be fitted with a steam drip trap station (trap and strainer) at the steam inlet before the control valve. The satisfactory operation of this trap is critical. On at least a quarterly basis, this trap should be checked for condition and operation and the strainer should be blown down to clean.

8. On a yearly basis it is good practice to operate each valve on the TH-750 unit to ensure all valves operate and shut off as required.

9. Each TH-750 heater is fitted with a pressure gauge and steam siphon. At least once a year the operation of this gauge should be verified by closing off the steam inlet valve and making sure the gauge registers zero. If it does not, the accuracy may be off and it should be replaced.

10. Each TH-750 heater is fitted with a pressure and temperature relief valve. Scale from hard water can build up on the element and cause the valve to malfunction. We recommend that this valve be replaced every two years to make sure operation is verified. A record of the

replacement schedule should be kept and adhered to by the operator/owner. **THIS IS VERY IMPORTANT.**

11. TH-750 heaters are engineered and constructed to last for many years when the supply steam is of good quality, the feedwater has been softened and the condensate is removed correctly

12. The internal U type heating coil commonly referred to as the heating bundle is very important to the overall operation of the TH-750. Every 2 years of operation, this bundle should be removed and cleaned so that effective heat transfer can continue to take place.

13. Tube bundle removal procedure is as follows:

14. When removing tube bundle there are two gaskets that will need to be replaced with new. These gaskets are located: one between the tube face of the coil and the flange welded to the tank, and one with a divider to fit between the head and the tube sheet.

15. **SAFETY NOTE:** Water, boiler water, or high temperature water present situations that can be very dangerous because of the high temperatures and pressures. To avoid possible injury or death, use common sense and follow all accepted and recommended procedures when performing installation, operation, and maintenance procedures. **Caution!** The combination of electricity and water can pose a **very dangerous situation**. Turn off and disconnect all power before attempting any maintenance procedures.

16. Follow Steps 1 through 7 of the shutdown procedures (page 8) to take the unit offline before attempting to remove and inspect the heat exchanger coil.

17. Assure that the energy source, condensate / water return line, cold water inlet, and hot water outlet have been shut off; that the tank has been completely drained; that the pressure has been bled from both the water and energy source system; and that the water, all components, and surfaces have cooled.

18. Carefully break the joint between the heat exchanger coil head and the small line leading to the energy source pressure gauge.

19. Carefully break the connections between the heat exchanger coil head and the energy source inlet and outlet lines. **Note: It may be necessary to break the lines at a second location, and for the lines to be rotated to allow clearance for the heat exchanger coil to be removed from the tank. If it is necessary, care should be taken to insure that in-line components are not damaged.**

20. Break the bolts loose that secure the heat exchanger coil head to the tank. After all bolts have been broken loose, remove them from the unit.

21. Carefully separate the heat exchanger coil head from the mounting flange and remove the coil assembly from the tank. **Caution!** There may still be residual water condensate (or boiler/high temperature water) in the coil that can run out during removal of the coil from the tank. If sufficient time has not been allowed for cooling, this residual condensate/water could present **a danger of injury.**

22. Examine the heat exchanger coil for scale buildup and signs of leakage. If no leakage is detected, carefully clean any excess scale from the coils and prepare the heat exchanger coil for installation. If leakage is detected between the coils and water in the tank, either repair the leaking coil(s) or replace the heat exchanger coil. Water should be of quality that is compatible with materials of construction.

23. Remove the old gaskets and completely clean the mating surfaces. Install the two (2) new gaskets: one (1) between the tube face of the coil and the flange welded to the tank, and one (1) gasket with a divider to fit between the heat and the tube sheet.

24. Carefully insert the heat exchanger coil into the tank. The coil should be installed so that the divider in the head lines up with the coil, and that the divider is parallel to the horizon.

25. After assuring that the heat exchanger unit is correctly aligned, clamp the flanges together and proceed with the torque procedures detailed below.

Note: Bolts used to secure the heat exchanger unit in the TH-750V Heaters are rated as B7. Grade B7 bolts are designated by B7 on the head OF THE BOLT.

a. Lubricate the bolt threads and the nut faces with a suitable lubricant.

b. Insert the bolts through the flanges, and then start and finger tighten the nuts.

c. Number all bolts so that torque requirements can be followed.

d. Apply torque in three steps of 60%, 80% then 100% of required final torque, loading all bolts at each step before proceeding to the next step.

Note: Appendix A contains tables listing ANSI approved target torques for Grade B7 bolts. The correct target torque can be determined by the nominal pipe size, number and grade of bolts used to secure the flange, and the size of the bolt used. Be sure of the bolt grade used in the unit.
When replacing bolts, be sure to use the same type of bolt and corresponding nuts. Grade B7 bolts can be used in all cases.

e. Tighten bolts in the applicable sequential order (0º- 180°, 90°- 270°, 45°- 225°, 135°-315° etc.) at each step until final target torque is reached (see applicable diagram contained in Appendix A).

f. Use rotational tightening until all bolts are stable at final torque level. Two (2) complete times around is usually required.

Note: Appendix A contains drawings depicting the typical flange configurations (number of bolts, location, tightening sequence, etc.) for the TH-750 Heater. Reference the applicable drawing for the unit being serviced.

26. Reconnect the energy source inlet and outlet lines to the heat exchanger coil. If these lines were broken at an additional location to allow for removal of the coil, be sure to also tighten those connections. Follow recommendations contained in the manufacturer's documentation,

local codes, or accepted contractor practices as to the use and/or type of joint compound or sealer at the connections.

27. Reconnect the small line leading to the energy source pressure gauge.

28. If the unit is equipped with a circulating pump, the pump relay **must be interlocked with the temperature control valve** so that the energy source will shut off if the pump is not operational. Failure to do so could create a **very dangerous situation** if the pump were to fail.

29. Follow the startup procedures (page 5) to put the unit back online. Carefully check all connections for any sign of leakage.

Cleaning Procedure:

On an annual basis when using extremely hard water the inner bundle will need cleaning to remove lime and scale deposits. This is simply done by draining the unit and following these steps:

1. Close the outlet isolation valve to the domestic system and turn off recirculation pump.

2. Close the inlet isolation vales to the heater domestic supply and loop recirculation. This will totally isolate the shell.

3. Remove the top thermometer from the shell. The connection will be a ¾" and is located at the very top of the shell.

4. Than using a small flexible funnel completely fill the shell with "DD518" biodegradable descaling fluid (approx. 4 gallons) for a 10" unit, and install the thermometer. Wear protective eye wear and gloves.

5. With the unit full turn on the recirculation pump for 2 hours. Do not operate over 2 hours. Open lower drain valve and drain the shell of the fluid as the fluid is biodegradable and can be sent to the drain.

6. After the shell is drained fill with cold domestic water twice and flush. The system is now ready for use.

APPENDIX A

Garlock Bolt Torque Values
B7 Bolts

.062" Ring Gaskets **ANSI – 150# Flanges**

Nominal Pipe Size (IN)	Number of Bolts	Size of Bolts (IN)	Grade A Target Torque (FT - LBS)
2"	4	5/8"	120
2 1/2"	4	5/8"	120
3"	4	5/8"	120
4"	8	5/8"	120
5"	8	3/4"	200
6"	8	3/4"	200
8"	8	3/4"	200
10"	12	7/8"	320
12"	12	7/8"	320
14"	12	1"	490
16"	16	1"	490
18"	16	1 1/8"	710
20"	20	1 1/8"	710
24"	20	1 ¼"	1000

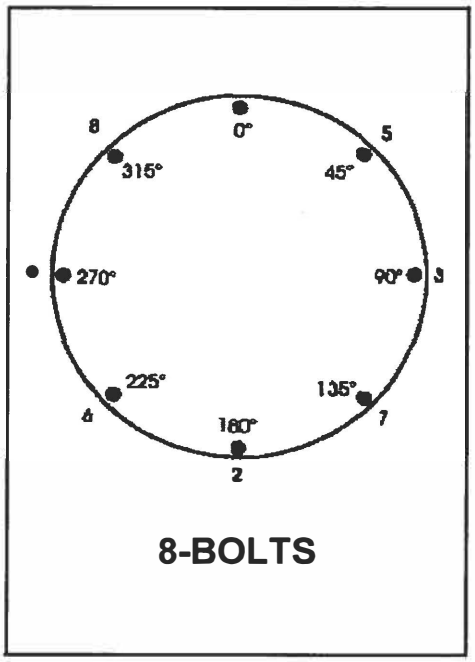
Garlock Bolt Torque Values
B7 Bolts

.062" Ring Gaskets **ANSI – 300# Flanges**

Nominal Pipe Size (IN)	Number of Bolts	Size of Bolts (IN)	Grade 5 Target Torque (FT - LBS)
2"	8	5/8"	120
2 1/2"	8	3/4"	200
3"	8	3/4"	200
4"	8	3/4"	200
5"	8	3/4"	200
6"	12	3/4"	200
8"	12	7/8"	320
10"	16	1"	490
12"	16	1 1/8"	710
14"	20	1 1/8"	710
16"	20	1 1/4"	1000
18"	24	1 ¼"	1000
20"	24	1 ¼"	1000
24"	24	1 ½"	1600

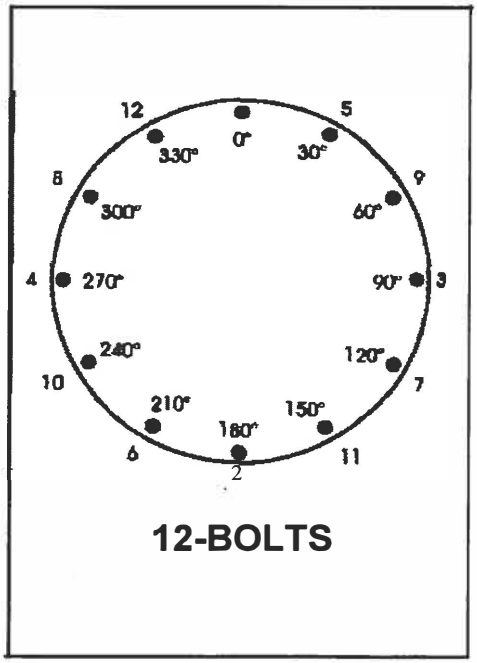
APPENDIX A

Bolt Torque Procedure



8-BOLTS

SEQUENCIAL ORDER	ROTATIONAL ORDER
1 - 2	1
3-4	5
5-6	3
7-8	7
	2
	6
	4
	8

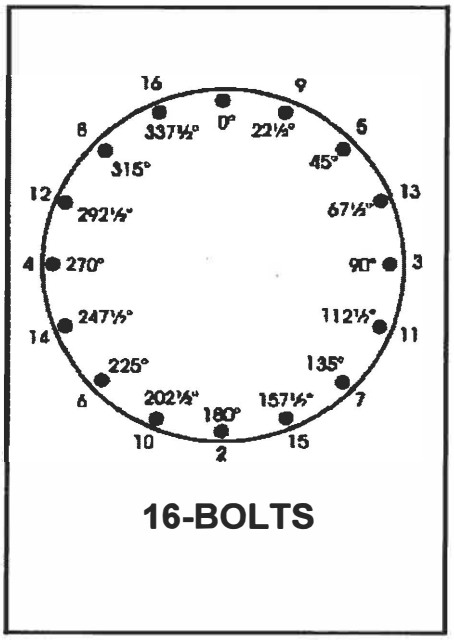


12-BOLTS

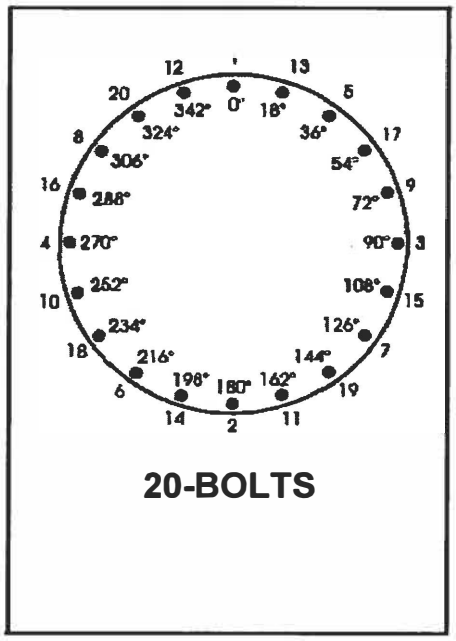
SEQUENCIAL ORDER	ROTATIONAL ORDER
1 - 2	1
3-4	5
5-6	9
7- 8	3
9 - 10	7
11 - 12	11
	2
	6
	10
	4
	8
	12

APPENDIX A

Bolt Torque Procedure



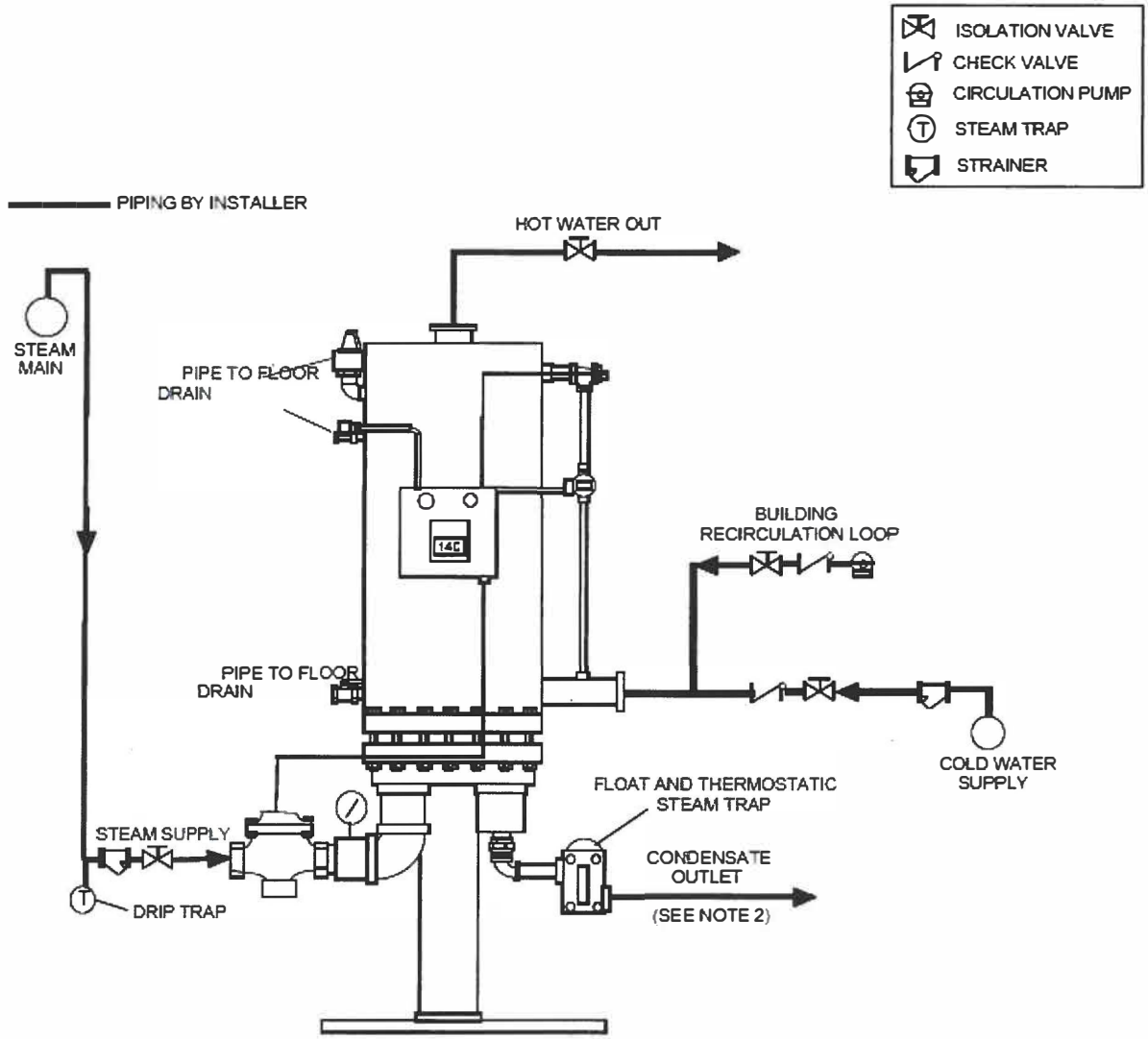
SEQUENCIAL ORDER	ROTATIONAL ORDER
1 - 2	1
3–4	9
5-6	5
7- 8	13
9 - 10	3
11 - 12	11
13- 14	7
15- 16	15
	2
	10
	6
	14
	4
	12
	8
	16



SEQUENCIAL ORDER	ROTATIONAL ORDER
1 - 2	1
3–4	13
5 - 6	5
7 - 8	17
9 - 10	9
11 - 12	3
13- 14	15
15- 16	7
17- 18	19
19- 20	11
	2
	14
	6
	18
	10
	4
	16
	8
	20
	12

APPENDIX B

TH-750 Steam Fired Single Unit Piping Hookup

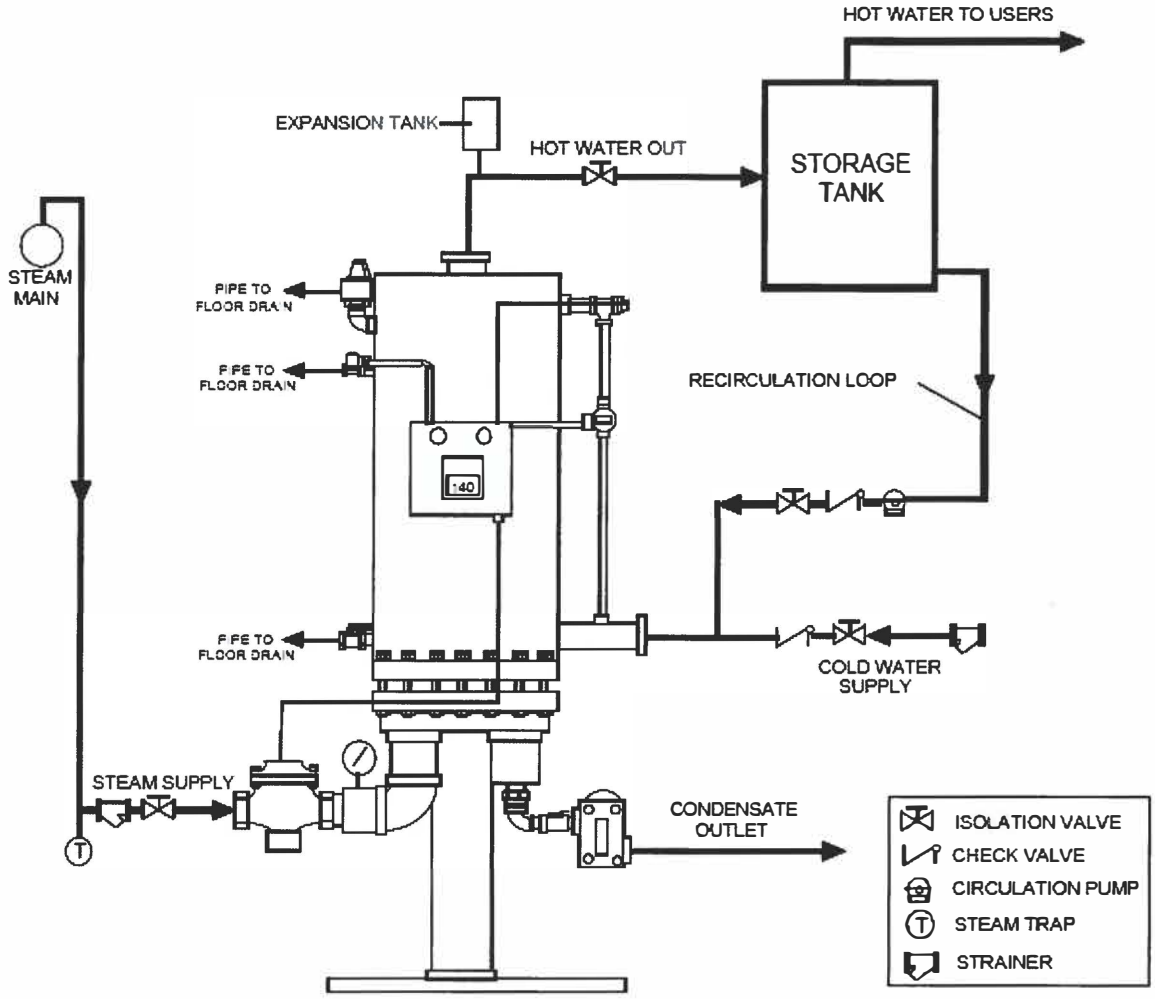


Notes:

1. Suggested piping design. Designer should consult local codes to verify compliance.
2. Hookup shown with Float & Thermostatic steam trap piped to gravity atmospheric condensate return line. For pressurized condensate return systems or where a lift is required, the TH-750 must be fitted with a Thermaflo Engineering pump trap on pressure powered pump in place of the F & T Trap.
3. Always pipe supply steam from the top of the header as shown and install a main drip before the control valve inlet.
4. When using the TH-750 for domestic hot water supply, it is highly recommended to install a master blend valve to prevent any chance of scalding

APPENDIX B

TH-750 Steam Fired Single Unit Piping Hookup With Storage Tank For Peak Use

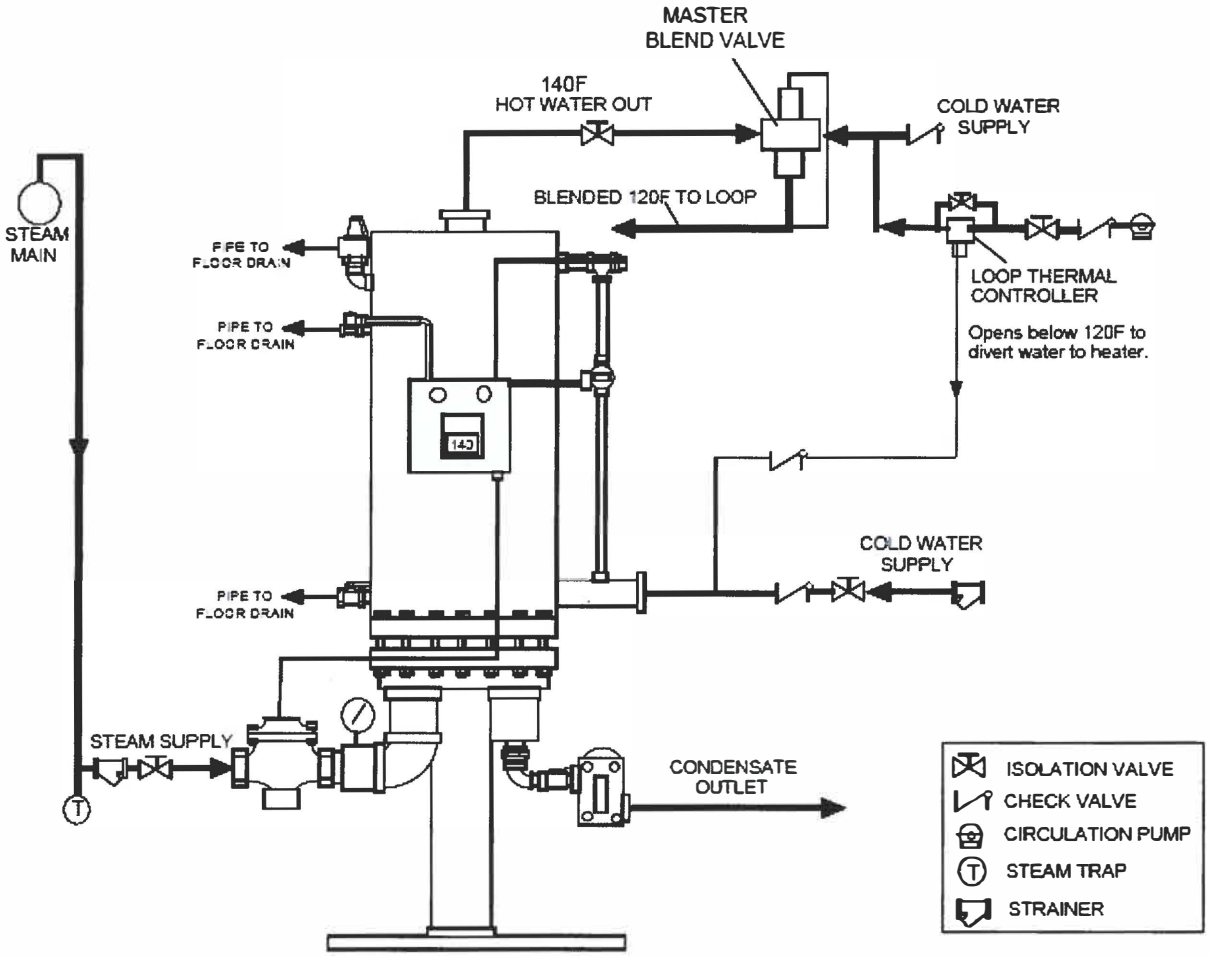


Notes:

1. Suggested piping design. Designer should consult local codes to verify compliance.
2. Hookup shown with Float & Thermostatic steam trap piped to gravity atmospheric condensate return line. For pressurized condensate return systems or where a lift is required, the TH-750 must be fitted with a Thermaflo Engineering pump trap in place of the F & T trap.
3. Always pipe supply steam from the top of the header as shown and install a main drip before the control valve inlet.
4. When using the TH-750 for domestic hot water supply, it is highly recommended to install a master blend valve to prevent any chance of scalding.
5. Not Installing an expansion tank will cause overpressure issues and cause the relief valve to open.

APPENDIX B

TH-750 Steam Fired Single Unit Piping Hookup With Blend Valve & Thermal Loop Diverter



Notes:

1. Suggested piping design. Designer should consult local codes to verify compliance.
2. Hookup shown with Float & Thermostatic steam trap piped to gravity atmospheric condensate return line. For pressurized condensate return systems or where a lift is required, the TH-750 must be fitted with a Thermaflo Engineering pump trap in place of the F & T trap.
3. Always pipe supply steam from the top of the header as shown and install a main drip before the control valve inlet.
4. When using the TH-750 for domestic hot water supply, it is highly recommended to install a master blend valve to prevent any chance of scalding.

SUBMITTAL DATA

PROJECT:

ENGINEER:

---

1. Model# ECU800+0+0+0
   The NEMA4 ECU800 Universal Temperature Controller is UL508A listed. The controller utilizes a 100 ohm platinum RTD sensor input. The primary control output is 0-1 0VDC to control a proportional valve, 4-20ma option is available. A high temperature alarm is standard. The high temperature alarm is indicated by red illuminated pilot light. The high temperature is interlocked with the output as a safety feature. Circulating Pump OFF/ON switch comes standard. Terminals are available for connection to external devices such as dump or blow- down valves. The controller has 24VDC power available to power external devices such as valve positioners up to 100 watts. There are three customer selectable remote safety interlocks. Power OFF/ON illuminated selector switch is standard. The controller is powered by a 120VAC, 1p, 5 amp service and is housed in 12x12x6, NEMA 4 enclosure.
   Enclosure finish is powder coated, white. Modbus RTU communications is standard.

   This control panel can be configured to perform two different purposes;

   Standard (EC800)- Input 2 is set for 2-10VDC, valve positioning feedback. Output 3 has been set for 4-20ma temperature re-transmit signal.

PROJECT QUOTES: QUOTES@THERMAFLOENGINEERING.COM
PURCHASE ORDERS: ORDERS@THERMAFLOENGINEERING.COM
PRODUCT INFORMATION: INFO@THERMAFLOENGINEERING.COM
INVOICING: ACCOUNTING@THERMAFLOENGINEERING.COM
THERMAFLOENGINEERING.COM | 2880 FAIR AVE. NEWBERRY, SC. | 704-940-1228

STANDARD EC800
UNIVERSAL
TEMPERATURE AND PUMP CONTROL PANEL

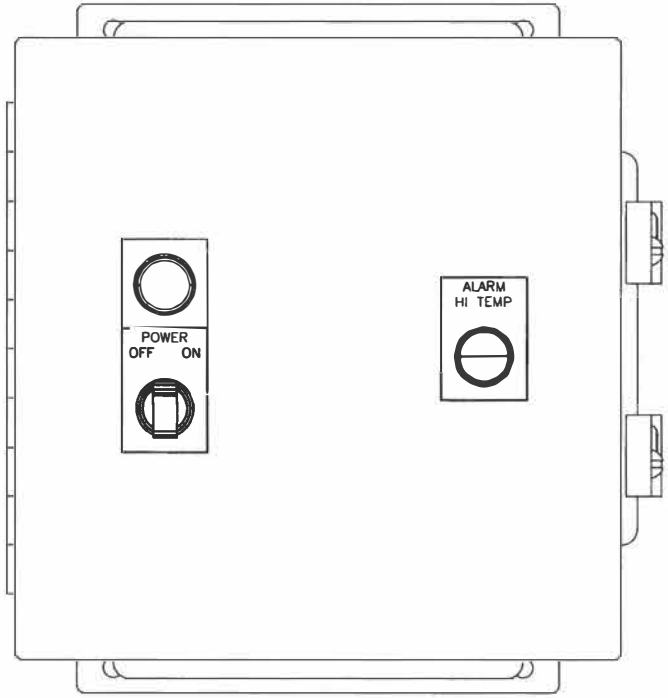
EC800

Client Job No.

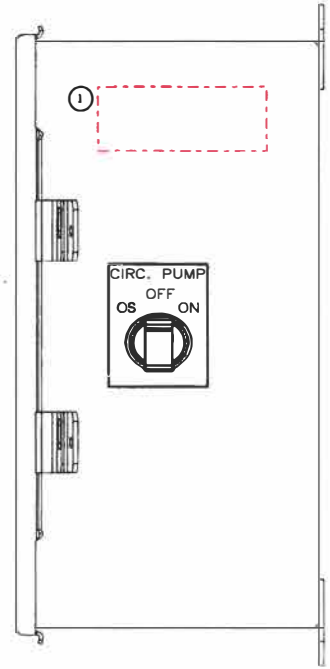
Drawn by	ROG	FEB 2018	Proj. No. SSI-4623
Checked	RLS	FEB 2018	Product Code
Appr. Cust.			

COVERSHEET

Scale NONE
Size 17X11



FRONT VIEW



RIGHT VIEW

GENERAL NOTES

1 SEE SIDE OF ENCLOSURE TO DETERMINE WHICH CONTROL PANEL SCHEMATIC TO REFERENCE EC800 / EC800VX

2 EC800 - SHEET# 3-4
3 EC800VX - SHEET# 5-8

*EXAMPLE

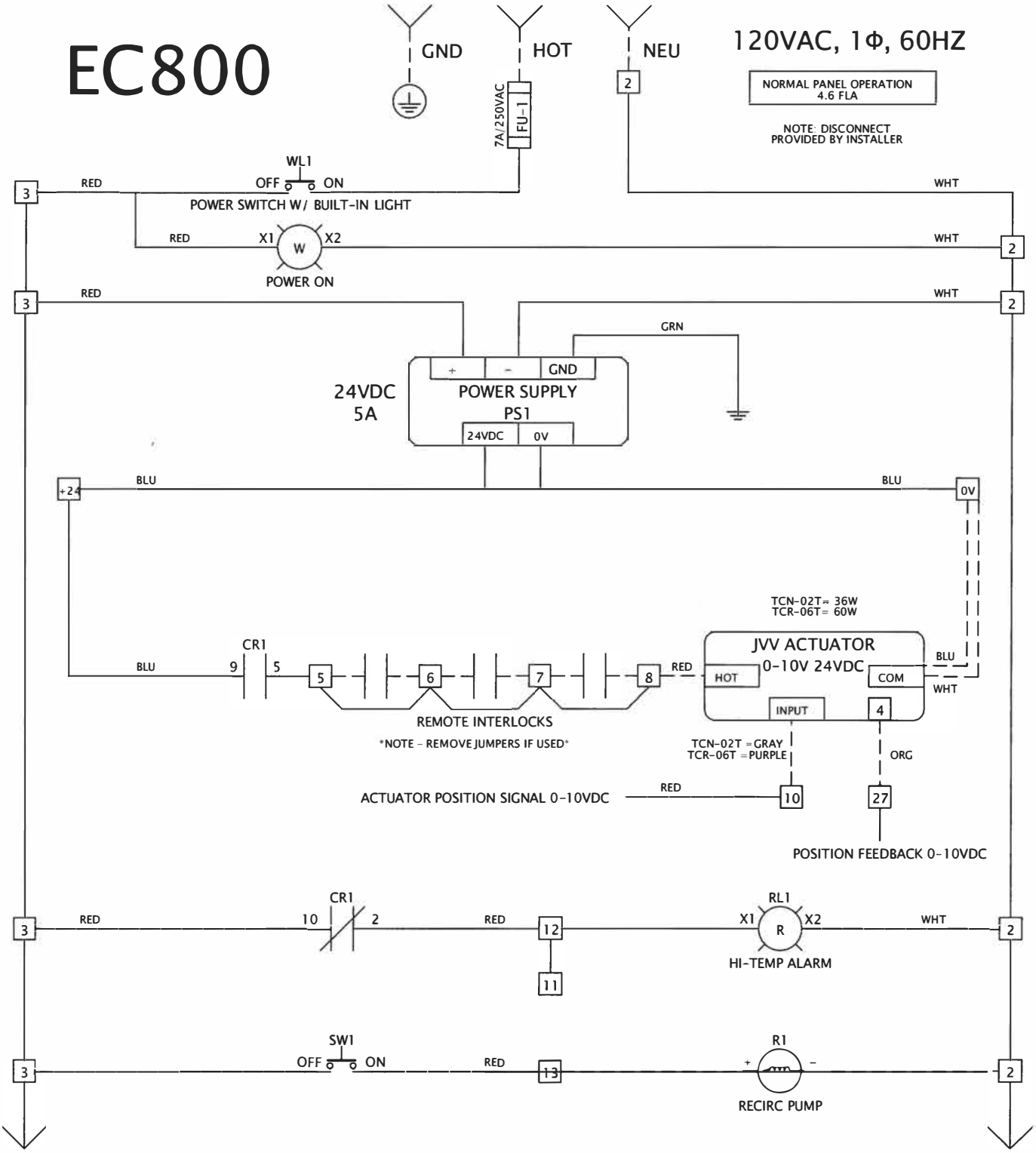
Client Job No.

Drawn By	RDG	FEB 2018	Proj. No	SSI-4623
Checked	RLS	FEB 2018	Product	
Approved			CMB	

ENCLOSURE DETAIL

Scale 6"=1'-0"	Drawing No.	Rev.
Size 17X11	SSI-2	1

EC800



THERMAFLO INCORPORATED SINCE 1986
MANUFACTURES OF STEAM FIRED SPECIALTY EQUIPMENT

PROJECT QUOTES: QUOTES@THERMAFLOENGINEERING.COM
PURCHASE ORDERS: ORDERS@THERMAFLOENGINEERING.COM
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INVOICING: ACCOUNTING@THERMAFLOENGINEERING.COM

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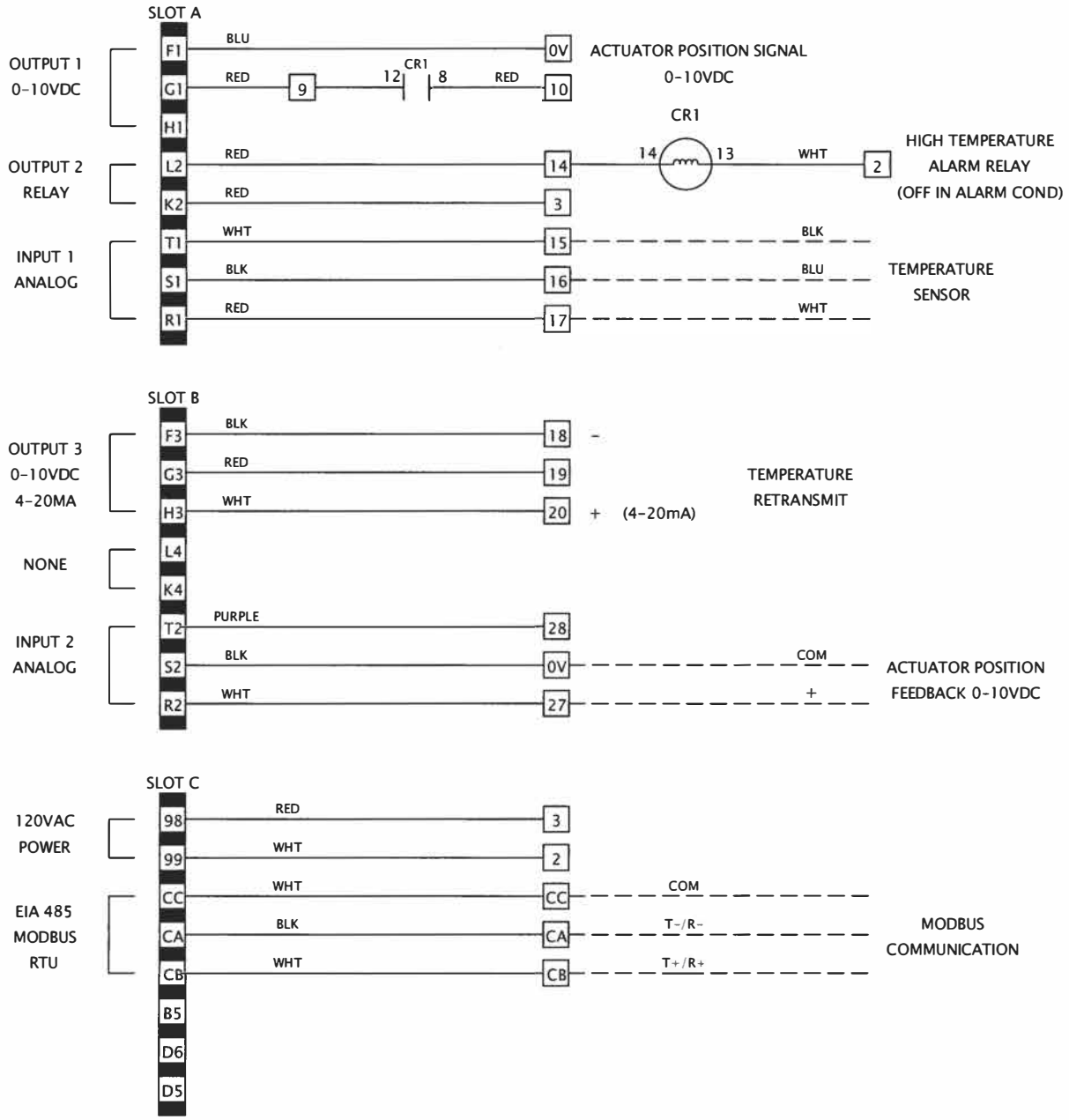
WATLOW CONTROLLER
PM6C1FJ-1RFAAAA



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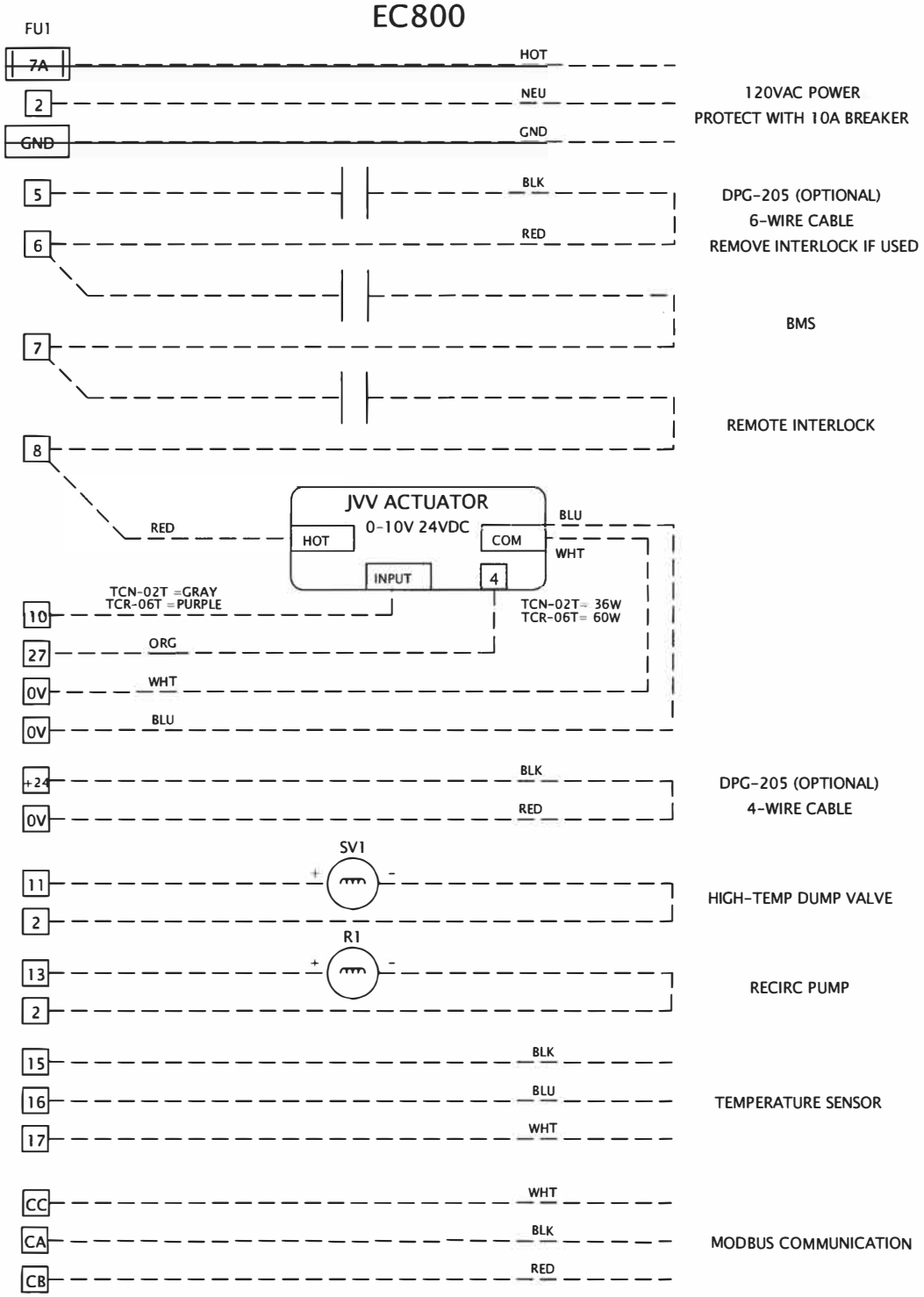
FIELD WIRING TERMINATION
EC800



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MANUFACTURES OF STEAM FIRED SPECIALTY EQUIPMENT

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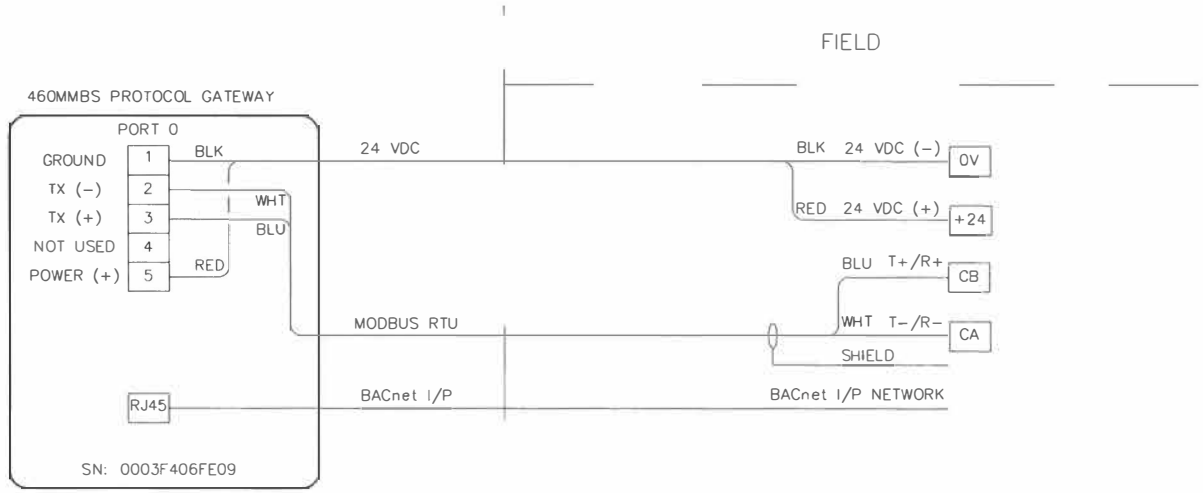
THERMAFLOENGINEERING.COM | 2880 FAIR AVE. NEWBERRY, SC. | 704-940-1228

OPTIONAL BACNET WIRING
BACNET IS NOT FURNISHED AS A STANDARD

PROTOCOL GATEWAY CONFIGURATION NOTES	MODBUS SPECIFIC CONFIGURATION NOTES
IP ADDRESS: 192.168.5.100 AND 192.168.5.1 SUBNET MASK: 255.255.255.0 DEVICE DESCRIPTION: GATEWAY 1 AND 2 UDP PORT: 47809 INSTANCE ID: 51 NAME: GATEWAY2 DESCRIPTION: GATEWAY2 LOCATION: GATEWAY2 LED 1: MODBUS RTU MASTER: CONNECTION STATUS LED 2: BACnet I/P SERVER: CONNECTION STATUS	MODBUS RTU SLAVE NAME: MMO1 MODBUS RTU ADDRESS: 1 MODBUS INSTANCE: MAP1 MODE: RS-485 (2 WIRE:HALF DUPLEX) BAUD: 9600 PARITY: NONE DATA BITS: 8 STOP BITS: 1 FLOW CONTROL: NONE



NOTE, IF MODBUS RTU COMMON IS REQUIRED
WIRE LANDS ON PORT 0, TERMINAL 1

DASHEDINDICATES FIELD WIRING.
TORQUE FIELD TERMINATIONS TO 7 POUND-INCHES
USE COPPER WIRE RATED FOR 60°C FIELD TERMINATIONS.

GENERAL NOTES

1. APPLY LEGENDS AS NOTED.
2. UL LISTING REQUIRED

NOTES

1 -

#	DATE	DESCRIPTION	DRN	CHK	APP
B	06/21/17	UPDATED DRAWING	MRO	MRO	MRO
A	02/26/16	ISSUED FOR RECORD	BDL	BDL	BDL

REVISIONS

Client

THERMAFLO INCORPORATED

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Drawn By	BDL	11/9/13	Proj. Name
Checked	BDL	11/9/13	Proj. no.
Approved	BDL	11/9/13	Check App

EC800-EN-PM6
SINGLE LOOP TEMPERATURE AND
PUMP CONTROL PANEL

ENGINEER OF RECORD

NTS	SSI-11364	0

OPTIONAL BACNET REGISTRY

Class Name	Page/Menu	Parameter Name / Member Name	Data Type	Read Write Eprom Set save	Modbus in Dec		Modbus in Hex		Offset to next inst.	Max Instance	BACnet MS/TP Address ID
					Relative Address	Absolute Address	Relative Address	Absolute Address			
AIN	Operation/Analog Input	Analog Input - Process Value	IEEE Float	R	360	400,361	168	061BE9	80	2	AI1
CLP	Operation/Control Loop	Control Loop - Time Derivative	IEEE Float	RWES	1966	401,967	07AE	06222F	70	2	AI10
CLP	Operation/Control Loop	Control Loop - Dead Band	IEEE Float	RWES	1968	401,969	07B0	62231	70	2	AI11
CLP	Operation/Control Loop	Control Loop - Heat Hysteresis	IEEE Float	RWES	1970	401,971	07B2	62233	70	2	AI12
ALM	Operation/Alarm	Alarm - High Set Point	IEEE Float	RWES	1480	401,481	05C8	62049	50	4	AI13
ALM	(none)	Alarm - Working Process Value	IEEE Float	R	1516	401,517	05EC	06206D	50	4	AI14
AIN	Operation/Analog Input	Analog Input - Process Value	IEEE Float	R	440	400,441	01B8	061C39	80	2	AI2
CLP	Operation/Control Loop	Control Loop - Heat Proportional Band	IEEE Float	RWES	1890	401,891	762	6.21E+05	70	2	AI3
CLP	Operation/Control Loop	Control Loop - Time Integral	IEEE Float	RWES	1894	401,895	768	6.21E+09	70	2	AI4
CLP	Operation/Control Loop	Control Loop - Time Derivative	IEEE Float	RWES	1896	401,897	768	6.21E+11	70	2	AI5
CLP	Operation/Control Loop	Control Loop - Dead Band	IEEE Float	RWES	1898	401,899	076A	0621EB	70	2	AI6
CLP	Operation/Control Loop	Control Loop - Heat Hysteresis	IEEE Float	RWES	1900	401,901	076C	0621ED	70	2	AI7
CLP	Operation/Control Loop	Control Loop - Heat Proportional Band	IEEE Float	RWES	1960	401,961	07A8	62229	70	2	AI8
CLP	Operation/Control Loop	Control Loop - Time Integral	IEEE Float	RWES	1964	401,965	07AC	06222D	70	2	AI9
SET	Operation/Control Loop	Control Loop - Closed-Loop Set Point	IEEE Float	RWES	2160	402,161	870	0622F1	80	2	AO1
SET	Operation/Control Loop	Control Loop - Open Loop Set Point	IEEE Float	RWES	2162	402,163	872	0622F3	80	2	AO2
SET	Operation/Monitor	Monitor - Closed-Loop Set Point	IEEE Float	R	2172	402,173	087C	0622FD	80	2	AO3
SET	Operation/Control Loop	Control Loop - Closed-Loop Set Point	IEEE Float	RWES	2240	402,241	08C0	62341	80	2	AO4
SET	Operation/Control Loop	Control Loop - Open Loop Set Point	IEEE Float	RWES	2242	402,243	08C2	62343	80	2	AO5
SET	Operation/Monitor	Monitor - Closed-Loop Set Point	IEEE Float	R	2252	402,253	08CC	06234D	80	2	AO6

-------- DASHED INDICATES FIELD WIRING
TORQUE FIELD TERMINATIONS TO 7 POUND-INCHES
USE COPPER WIRE RATED FOR 60°C FIELD TERMINATIONS.

GENERAL NOTES

1. APPLY LEGENDS AS NOTED.
2. UL LISTING REQUIRED

NOTES

1 -

B	06/21/17	UPDATED DRAWING	MRO	MRO	MRO
A	02/26/16	ISSUED FOR RECORD	BDL	BDL	BDL

REVISIONS

Drawn by	BDL	11/9/13	Proj. Name
Checked	BDL	11/9/13	Proj. No.
Approved	BDL	11/9/13	Check-up

EC800-EN-PM6
SINGLE LOOP TEMPERATURE AND PUMP CONTROL PANEL

ENGINEER OF RECORD

Scale NTS | Date | SSI-113618 | Rev 0