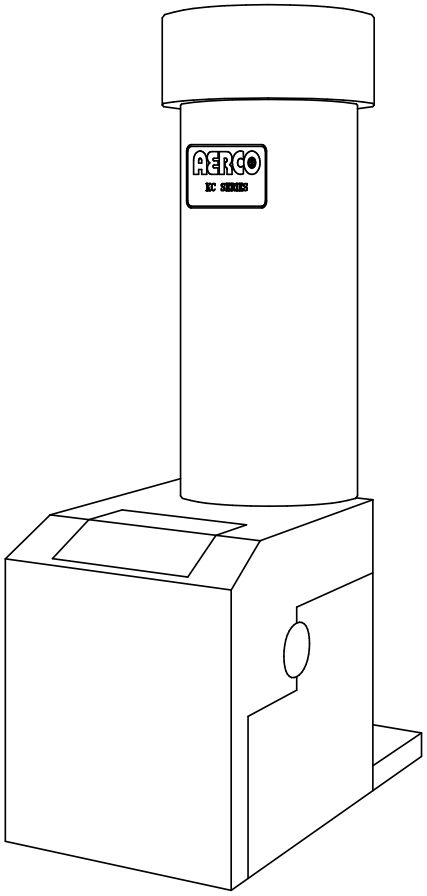
Applicable to Serial Numbers G-01-026 and above

KC Series Gas Fired Water Heating System



Natural Gas or Propane Fired,
Condensing and Forced Draft Hot Water Heater
1,000,000 BTU/HR Input

Patent No. 4,852,524

Telephone Support

Direct to AERCO Technical Support
(8 to 5 pm EST, Monday through Friday)
(800) 526-0288

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100 Oritani Drive
Blauvelt, NY 10913

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Northvale, NJ 07647-0128

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GF-105 THE AERCO KC1000 GAS FIRED DOMESTIC WATER HEATER
Operating & Maintenance Instructions

FOREWORD

Foreword

The AERCO KC Hot Water Heating System is a true industry advance that meets the needs of today's energy and environmental concerns. Designed for use in any potable water heating system, it provides constant temperature water regardless of flow rate. It's small space requirements and venting capabilities allows installations without normal restrictions yet with maximum flexibility. The KC Heater's load tracking controls modulate over a 14:1 turndown ratio to match the system demand and yield thermal efficiencies in excess of 93%.

Because of its compact design with direct or chimney venting, the KC Water Heating System is applicable to any installation with excellent results. Efficiency, reliability and longevity make the KC Water Heating System a true step forward in Water Heating System design.

After prolonged shutdown, it is recommended that the startup procedures in Section 4 and test procedures in Section 5 of this manual be performed, to verify system operating parameters. If there is an emergency, turn off the electrical power supply to the AERCO Heater or close the Manual Gas Valve located before the AERCO heater. The Installer is to identify the emergency shut-off device. FOR SERVICE OR PARTS, contact your local Sales Representative listed below or AERCO INTERNATIONAL.

NAME: _____

ORGANIZATION: _____

ADDRESS: _____

TELEPHONE: _____

INSTALLATION DATE: _____

SECTION 1 -- SAFETY PRECAUTIONS

Installing or operating personnel MUST, at all times, observe all safety regulations. The following warnings are general and must be given the same attention as specific precautions included in these instructions. In addition to the requirements included in this instruction manual, the installation of units MUST conform with local building codes, or, in the absence of local codes, ANZI Z223.1 (National Fuel Gas Code, Publication No. NFPA-54) for gas-fired heaters and ANSI/NFPASB for LP gas-fired heaters. Where applicable, the equipment shall be installed in accordance with CGA B149.

WARNING!
DO NOT USE MATCHES, CANDLES, FLAMES, OR OTHER SOURCES OF IGNITION TO CHECK FOR GAS LEAKS.

WARNING!
THE EXHAUST VENT PIPE OPERATES UNDER POSITIVE PRESSURE AND MUST BE COMPLETELY SEALED TO PREVENT LEAKAGE OF COMBUSTION PRODUCTS INTO LIVING SPACES.

WARNINGS!
MUST BE OBSERVED TO PREVENT SERIOUS INJURY TO PERSONNEL.

CAUTIONS!
Must be observed to prevent equipment damage or loss of operating effectiveness.

WARNING!
BEFORE PERFORMING ANY MAINTENANCE ON THE UNIT, SHUT OFF THE GAS SUPPLY AND THE ELECTRICAL POWER SUPPLY TO THE UNIT.

CAUTION!
Many soaps used for gas pipe leak testing are corrosive to metals. The piping must be rinsed thoroughly with clean water after leak checks have been completed.

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 AND CAREFULLY DECREASE ALL TRAPPED PRESSURES TO ZERO BEFORE PERFORMING ANY MAINTENANCE.

CAUTION!
Do not use this unit if any part has been under water. Call a qualified service technician to inspect and replace any part that has been under water.

NOTES:
Must be observed for effective operating procedures & conditions

SECTION 2 - INSTALLATION PROCEDURES

2.1 RECEIVING THE UNIT

Each KC unit is shipped as a single crated unit. The shipping weight is approximately 1500 lb. and must be moved with the proper rigging equipment for safety and to avoid damages. The unit should be completely inspected at the time of receipt from the carrier before the bill of lading is signed. Each unit has Tip-N-Tell indicator on the outside of the crate. This indicates if the unit has been turned on its side. If the Tip-N-Tell indicator is tripped, do not sign for the shipment. Note the information on the carrier's paperwork and request a freight claim and inspection by a claims adjuster before proceeding. Any other visual damage to the packaging materials should also be made clear to the delivering carrier.

2.2 UNPACKING

Carefully unpack the unit by removing the packaging material. Take care not to damage the unit jacket when cutting away packaging materials. A close inspection of the unit should be made to determine if there has been any damage during shipment that was not indicated by the Tip-N-Tell.

The freight carrier should be notified immediately if any damage is detected. The following accessories come standard with each unit and are packed separately within the unit's packing container

- Spare Spark Ignitor
- Spare Flame Detector
- Manual 1-1/4" Gas Shutoff Valve
- Drain Valve Assembly
- ASME Pressure/Temperature Relief Valve
- Ignitor Removal Tool (One per Site)
- Regulator Adjustment Tool (One
- per Site)
- 2 Lifting Lugs
- Stainless Steel Condensate Cup
- Flue Clamps (2 Pieces)

Optional accessories are also separately packed within the unit's packing container. Standard and optional accessories shipped with the unit should be identified and put in a safe place until installation/use.

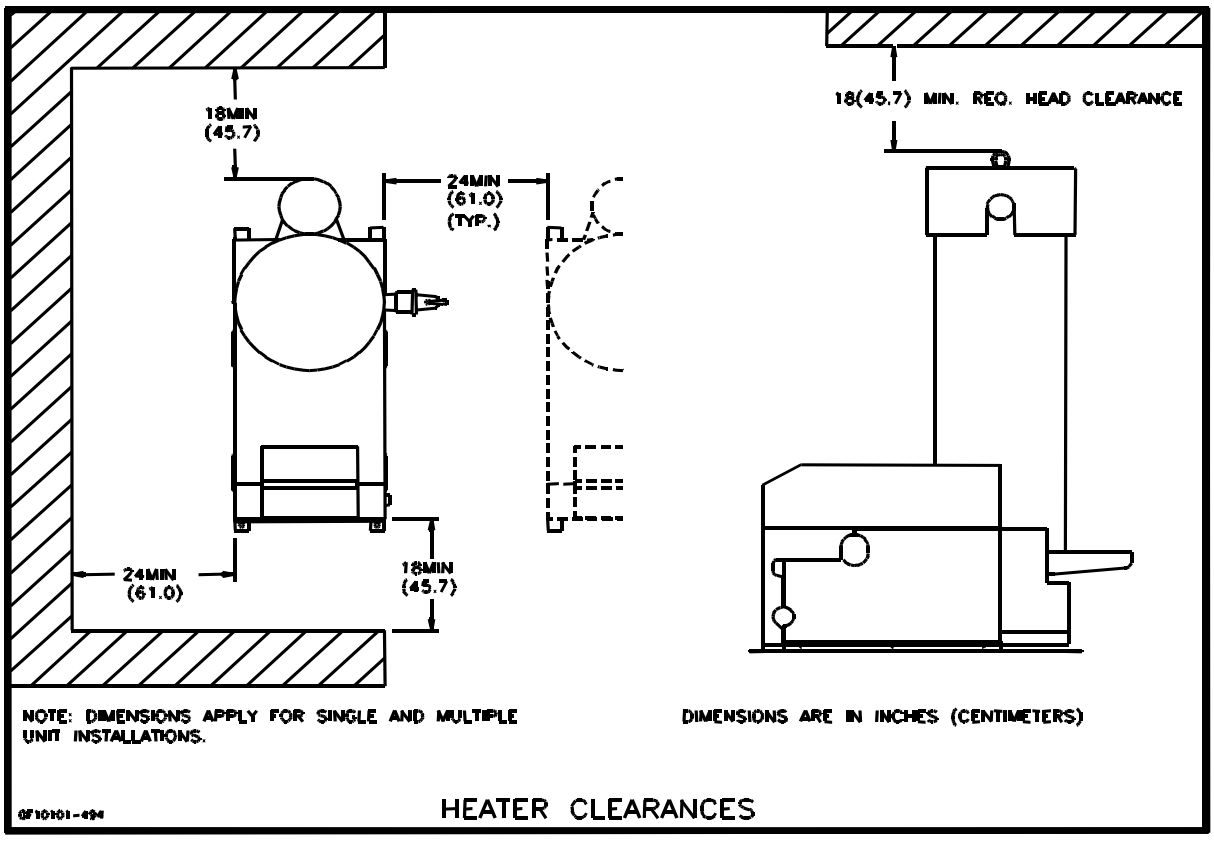


Figure 2.1
Heater Clearances

2.3 INSTALLATION

The unit must be installed with the prescribed clearances for service as shown in Fig 2.1 These are the minimum clearance dimensions required by AERCO. Local building codes may require more clearance and take precedence.

WARNING !

KEEP UNIT AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS AND FLAMMABLE VAPORS AND LIQUIDS.

2.3.1 SETTING THE UNIT

Locate the lifting lugs, shipped with the unit, and attach them to the 5/8" x 11 studs at the top of the unit. Remove the unit from the wooden skid and place in position using a block and tackle or hoist attached to the lifting lugs. (see Fig. 2.2). USE THE LIFTING LUGS TO MOVE THE UNIT.

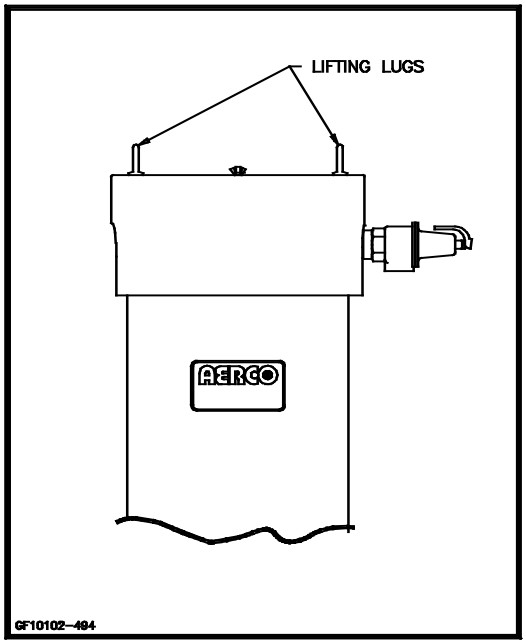


Figure 2.2
Lifting Lug Location

The KC-1000 is U/L approved for installation on combustible flooring. A 4" to 6" high housekeeping concrete pad is recommended and allows for sufficient drainage of the condensate.

The unit must be secured using only the holes provided in the frame base. Do not use piping to secure the unit in place. See drawing AP-A-576 in Appendix E for the base frame dimensions. In multiple unit installations it is important to plan the position of each unit. Sufficient space for piping connections and maintenance requirements must be given. All piping must include ample provision for expansion**.**

2.3.2 WATER INLET AND OUTLET PIPING

The locations of the 2" NPT cold water inlet and hot water outlet piping connections are shown in Figure 2.4. Flow rates through the unit are limited to 30 gpm continuous and 40 gpm intermittent.

Shut-off valves and union conections must be installed in the inlet and outlet lines for maintenance. The use of dielectric unions is recommended. Install the piping and accessories as per the following drawings, located in Appendix F of this manual.

- SD-B-424 for single units
- SD-B-425 for multiple units
- SD-B-432 for single units with a stratified tank
- SD-B-434 for multiple units with a stratified storage tank

NOTE:

All piping must be arranged so that it does not interfere with removal of any cover, inhibit service or maintenance, or prevent access between the unit and walls, or another unit.

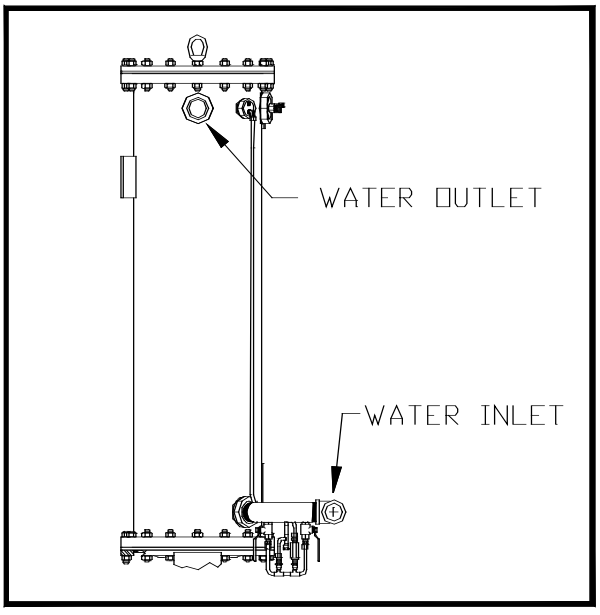


Figure 2.3
Inlet and Outlet Location

2.3.3 TEST HOSE BIB

A Test Hose Bib connection, upstream of the shut off valve on the hot water outlet, is required

for startup and testing. It should be a minimum of 3/4". **It cannot be omitted** (See Fig. 2.4a)

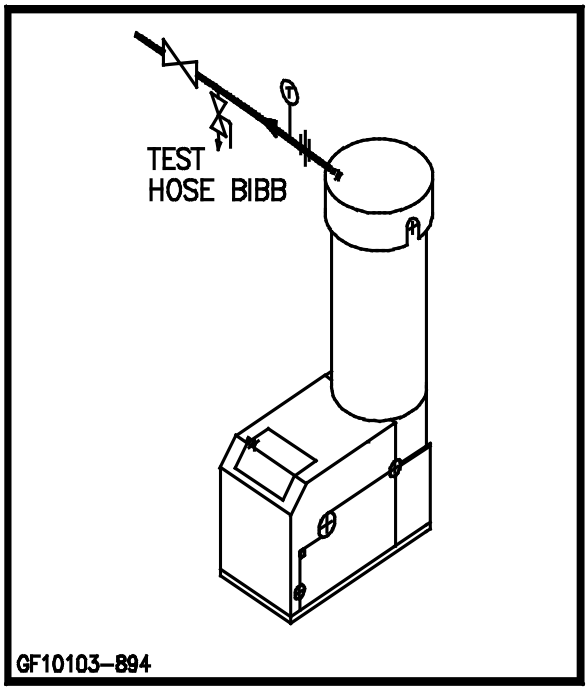


Figure 2.4a
Hose Bibb Location

2.3.4 PRESSURE/TEMPERATURE RELIEF AND DRAIN VALVE INSTALLATION

An ASME rated Pressure/Temperature Relief Valve is supplied with each unit. The valve setpoint is 150 psig/210^{0}F. Install the relief valve as shown in Fig. 2.4. A suitable pipe compound should be used on the threaded connections. Any excess should be wiped off to avoid getting any into the valve body. The relief valve should be pipied to within 12 inches of the floor to prevent injury in the event of a discharge. The relief piping must be full size, 1-1/2", without reduction. No valves, restrictions, or other blockages are allowed in the discharge line. In multiple unit installations the discharge lines must not be manifolded together. Each must be individually run to a suitable discharge location.

A 1" drain valve assembly is furnished with each unit. The assembly should be installed as shown in Figure 2.4. The drain should be hard piped to a suitable drain.

2.3.5 SYSTEM RECIRCULATION

The system recirculating line ties into the unit at the recirculating tee fitting provided in the drain valve assembly (see Fig. 2.4b). Shut off valves and union connections are recommended for maintenance. Recirculation flow rates must be kept to 8 gpm or less. In a multiple unit installation, each unit must be tied into the system recirculation system.

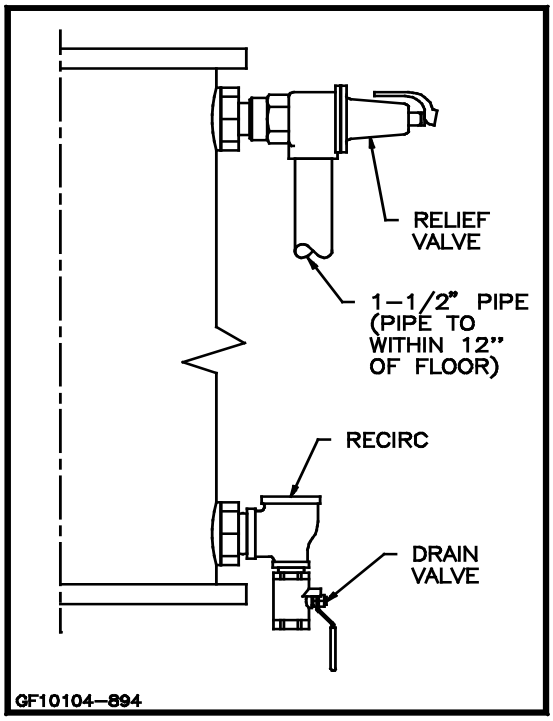


Figure 2.4b
Pressure/Temperature Relief and Drain Valve Installation Location

2.3.6 CONDENSATE PIPING

The KC Heater is designed to condense and the installation must have provisions for suitable drainage. A 1 inch ID silicone hose, supplied with the unit, directs condensate from the exhaust manifold to a stainless steel condensate cup. The condensate cup is shipped loose and should be installed inside the unit directly under the manifold's condensate drainage hole. The condensate drain fitting is attached to the cup and should be located at the rear of the unit as shown in Figure 2.5. A *5/8*-inch ID flexible polypropylene tubing (or suitable equivalent) should be used to carry the condensate by gravity to a nearby floor drain. If a floor drain is not available, a condensate pump can be used to remove the condensate to a convenient drain. The maximum condensate flow rate is 5 GPH. The condensate cup and line must be removable for routine maintenance. Do not hard pipe.

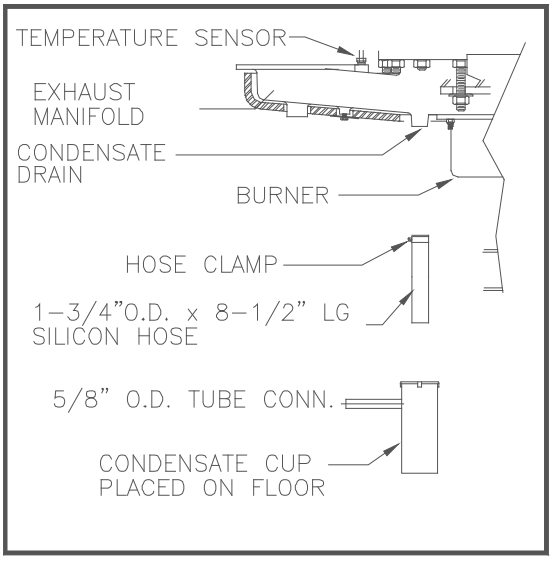


Figure 2.5
Condensate Drain Assembly Location

2.4 GAS SUPPLY PIPING

AERCO Gas Fired Equipment Gas Components and Supply Design Guide (GF-1030) should be consulted before any gas piping is designed or started.

WARNING !
DO NOT USE MATCHES, CANDLES, FLAMES OR OTHER SOURCES OF IGNITION TO CHECK FOR GAS LEAKS.

CAUTION !
Many soaps used for gas pipe leak testing are corrosive to metals. The piping must be rinsed thoroughly with clean water after leak checks have been completed.

NOTE:
All gas piping must be arranged so that it does not interfere with removal of any cover, inhibit service or maintenance, or prevent access between the unit and walls, or another unit**.**

The location of the 1-1/4" inlet gas connection on the right side of the unit is shown in Figure 2.6.

All pipe should be de-burred and internally cleared of any scale or iron chips before installation. No flexible connectors or non-approved gas fittings should be installed. Piping should be supported from floor or walls only and must not be secured to the unit.

A suitable piping compound approved for use with gas should be used sparingly. Any excess must be wiped off to prevent clogging of components.

To avoid damage to the unit when pressure testing gas piping, isolate the unit from the gas supply piping. At no time should there be more than 1 psig maximum to the unit. Bubble test all external piping thoroughly for leaks using a soap and water solution or suitable equivalent. The gas piping must meet all applicable codes.

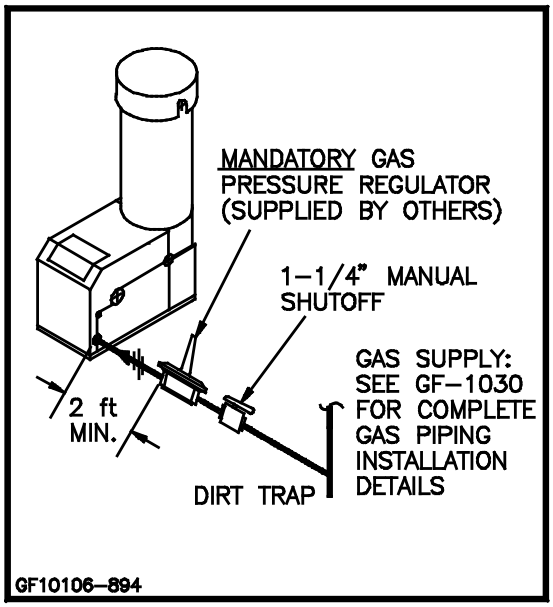


Figure 2.6
Gas Supply Regulator and Manual Shut -Off Valve Location

2.4.1 GAS SUPPLY PRESSURE REGULATOR

A mandatory external, in line, supply gas regulator (**supplied by others**) should be positioned as shown in Figure 2.6. Union connections should be placed in the proper locations to allow maintenance of the regulator if required.

NOTE:
An individual gas pressure regulator must be installed upstream of each unit. The regulator must regulate gas pressure to 8.5" W.C. for FM gas train and 8.9" W.C. for IRI gas trains at 1,000,000 BTU/H for natural gas and propane units.

The maximum static inlet pressure to the unit must be no more than 14" water column. Minimum gas pressure is 8.5" W.C. for FM gas trains and 8.9" W.C. IRI gas trains when the unit

is firing at maximum input. Gas pressure should not exceed 10.5" W.C. at any time when the unit is firing. Proper sizing of the gas supply regulator in delivering the correct gas flow and outlet pressure is mandatory. The gas supply pressure regulator must maintain the gas pressure at a minimum of 8.5" W.C. (FM) or 8.9" W.C. (IRI) when the unit is at maximum BTU input (1,000,000 BTU/HR). The supply gas regulator must be able to supply sufficient capacity volume, (1000 cfh), to the unit and should have no more than 1" droop from minimum to full fire. The supply gas regulator must also be rated to handle the maximum incoming gas pressure. When the gas supply pressure will not exceed 14" W.C. a non-lock up, or flow through style regulator, may be used. When supply gas pressure will exceed 14" W.C., a lock up style regulator must be used. The gas supply regulator must be propery vented to outdoors. Consult the local gas utility for exact requirements concerning venting of supply gas regulators.

CAUTION!
A lockup style regulator must be used when gas supply pressure exceeds 14" W.C.

2.4.2 MANUAL GAS SHUTOFF VALVE

A 1-1/4" manual gas shutoff valve is furnished with each unit and should be positioned as shown in Figure 2.6. The valve must be installed upstream of the gas supply regulator in a readily accessible location.

2.4.3 IRI GAS TRAIN KIT

The IRI gas train is an optional gas train required in some areas by code or for insurance purposes. The IRI gas train may be ordered pre-assembled or as separate components. If either IRI gas train option is ordered a complete instructional package, detailing field installation will be included. To obtain a copy of an IRI instructional package prior to the equipment shipping contact your local representative or AERCO.

2.5 ELECTRIC SUPPLY

AERCO Gas Fired Equipment Electrical Power Wiring Guide (GF-1060) must be consulted in addition to the following material before wiring to the unit is started. The location of the electrical wiring box is on the front right side of the unit as shown in Figure 2.7.

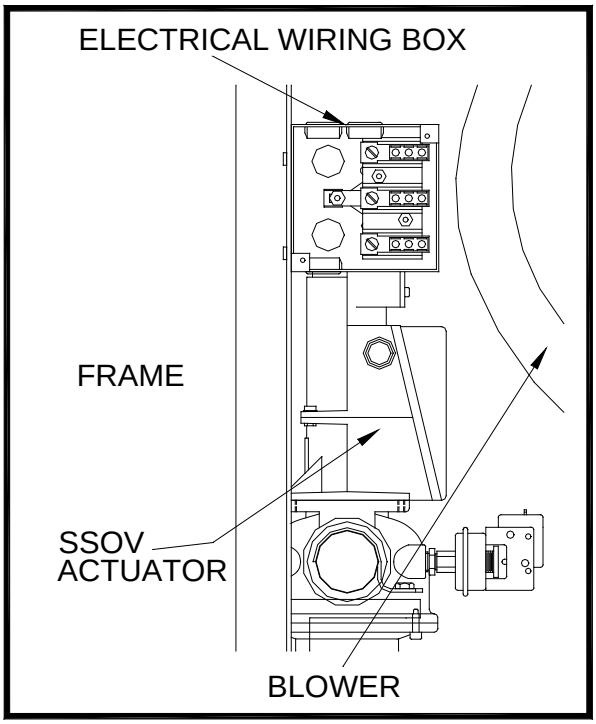


Figure 2.7
AC Wiring Box Location

NOTE:
All electrical conduit and hardware should be installed so that it does interfere with the removal of any cover, inhibit service or maintenance, or prevent access between the unit and walls or another unit.

2.5.1 ELECTRICAL REQUIREMENTS

Electrical requirements for each unit are 120 VAC, 1 Phase, 60 Hz, 20 Amps from a dedicated electrical circuit. No other devices should be on the same electrical circuit as a KC unit. A disconnecting means such as a service switch must be installed near the unit for normal operation and maintenance. All electrical connections should be made in accordance with the National Electrical Code and/or with any applicable local codes.

The electrical wiring diagram is shown in Figure 2.8. Conduit should be run from the knockouts provided in the side of the electrical box in such a manner that it does not interfere with the removal of any sheet metal covers. A flexible electrical connection may be utilized to allow the covers to be removed easily.

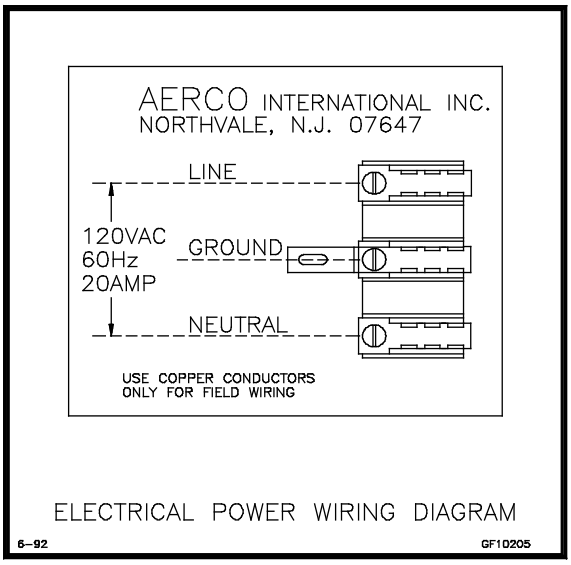


Figure 2.8
Electrical Wiring Diagram

2.6 FIELD CONTROL WIRING

Each unit is fully wired from the factory with an internal operating control system. No field control wiring is required for normal operation. However a fault relay, for remote fault indication, and enable/disable interlock circuits are provided. Wiring for these circuits can be accomplished in the Field Control Wiring Box behind the left side panel (see Fig. 2.9).

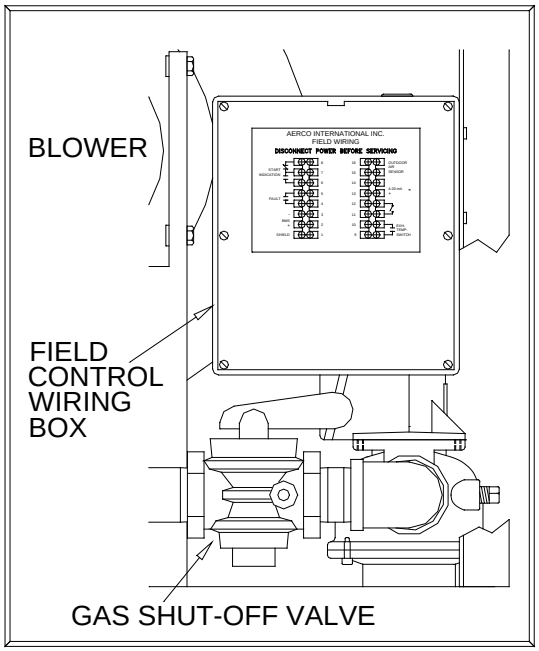


Figure 2.9
Field Control Wiring Box Location

2.6.1 ENABLE/DISABLE INTERLOCK

Each unit has an enable/disable interlock circuit located in the field wiring box (see Figure 2.10). This interlock must be closed,(jumped), to allow the unit to fire. When the interlock is open, the control panel Annunciator will display 'INTERLOCK DISABLED' and the unit will not fire. The unit comes factory wired with the interlock closed.

2.6.2 THE FAULT RELAY

The fault relay is a single pole single throw relay, that is energized upon any fault condition. The relay will remain energized until the fault is cleared and the CLEAR button is pushed The normally open field connections are shown in Figure 2.10. The relay contacts are rated for 5 amps at 250 VDC and 5 amps at 30 VDC.

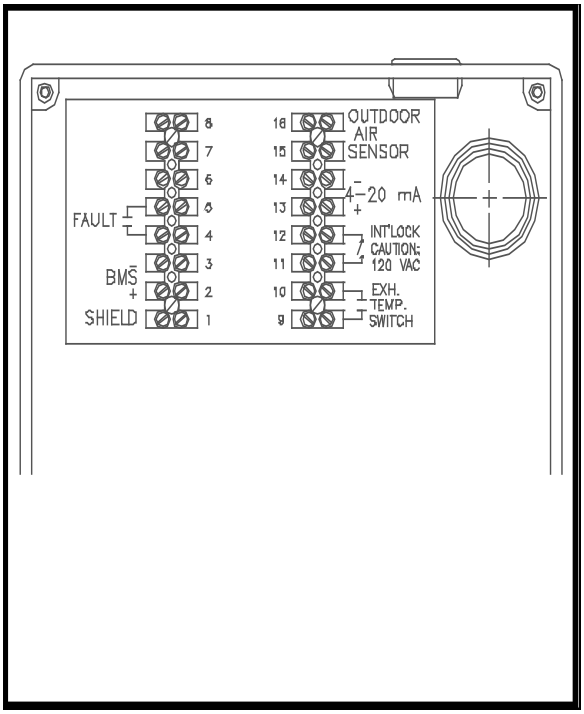


Figure 2.10
Field Control Box Wiring

2.7 FLUE GAS VENT INSTALLATION

AERCO Gas Fired Venting and Combustion Air Guide, GF-1050, must be consulted before any flue or combustion air venting is designed or installed. Suitable, U/L approved, positive pressure, watertight vent materials MUST be used for safety and UL certification. Because the unit is capable of discharging low temperature exhaust gases, the flue must be pitched back towards the unit a minimum of 1/4" per foot to avoid any condensate pooling and to allow for proper drainage.

While there is a positive flue pressure during operation, the combined pressure drop of vent and combustion air systems must not exceed 140 equivalent feet of 0.81" W.C. Fittings as well as pipe lengths must be calculated as part

of the equivalent length. For a natural draft installation the draft must not exceed - 0.25" W.C. These factors must be planned into the vent installation. If the maximum allowable equivalent lengths of piping are exceeded, the unit will not operate properly or reliably.

2.8 COMBUSTION AIR

The AERCO Gas-Fired Heater Venting and Combustion Air Guide, GF-1050 MUST be consulted before any flue or inlet air venting is designed or installed. Air supply is a direct requirement of ANSI 223.1, NFPA-54, and local codes. These codes should be consulted before a permanent design is determined.

The combustion air must be free of chlorine, halogenated hydrocarbons or other chemicals that can become hazardous when used in gas-fired equipment. Common sources of these compounds are swimming pools, degreasing compounds, plastic processing, and refrigerants. Whenever the environment contains these types of chemicals, combustion air MUST be supplied from a clean area outdoors for the protection and longevity of the equipment and warranty validation.

The more common methods of combustion air supply are outlined below. For combustion air supply from ducting, consult the AERCO GF-1050, Gas Fired Venting and Combustion Air Guide.

2.8.1 COMBUSTION AIR FROM OUTSIDE THE BUILDING

Air supplied from outside the building must be provided through two permanent openings. For each unit these two openings must have a free area of not less than one square inch for each 4000 BTUs input of the equipment or 250 square inches of free area. The free area must take into account restrictions such as louvers and bird screens.

2.8.2 COMBUSTION AIR FROM INSIDE THE BUILDING

When combustion air is provided from within the building, it must be supplied through two permanent openings in an interior wall. Each opening must have a free area of not less than one square inch per 1000 BTUH of total input or 1000 square inches of free area. The free area must take into account any restrictions such as louvers.

2.8.3 SEALED COMBUSTION

The unit is UL approved for a 100% sealed combustion application when installed properly. When a sealed combustion air application is installed, the sealed combustion air piping must be deducted from the maximum allowable discharge piping amounts. Each unit must have a minimum 6" diameter connection made to the optional Inlet Air Adapter # GM-18917 available from AERCO. This Adapter bolts directly on to the air inlet of the unit blower. See installation instructions with Adapter. All inlet air ducts must be sealed air tight.

2.9 UNIT INITIAL FILL

Before filling the shell for the first time, blow out all the connecting water and gas piping and check thoroughly for leaks. Rinse all soap suds from the gas piping with clean water. Do not allow water to get on the Control Panel or electrical connections. Check that all installation procedures have been completed.

The following steps should be followed to fill the unit:

1. Close the unit's drain valve.
2. Open the shut-off valves at the water inlet and outlet.
3. Open the temperature/pressure relief valve to allow air to escape from the shell. The shell is full when water flows out of relief valve discharge piping.
4. Close the temperature/pressure relief valve and open fixtures in building to free the system of air.

SECTION 3- CONTROL PANEL OPERATING PROCEDURES

The following is a guide to the operation of the unit's control panel. Initial startup of this unit must be performed by factory trained startup personnel. Operation prior to initial startup by factory trained personnel will ***void*** the warranty.

CAUTION:
All initial installation procedures must be satisfied before attempting to start the unit**.**

WARNING:
DO NOT ATTEMPT TO DRY FIRE THE KC 1000. STARTING THE UNIT WITHOUT A FULL WATER LEVEL CAN SERIOUSLY DAMAGE THE UNIT AND MAY RESULT IN PERSONNEL INJURY OR PROPERTY DAMAGE. THIS SITUATION WILL VOID ANY WARRANTY.

3.1 THE CONTROL PANEL

The KC 1000 Control Panel has been designed to provide the operator with all the necessary information required for operation and troubleshooting the unit. There are six separate accessible controls or displays, available to the operator (see Figure 3.1). These are:

1. The Temperature Controller
2. The Annunciator & Function Switches
3. The Combustion Safeguard Controller
4. Water Level Test and Reset Switches
5. On/Off Switch
6. Fault Indicator Light

The following sections will describe the above components in more detail.

WARNING
CONTROL BOX INTERNALS MUST NOT BE SERVICED OR ACCESSED BY OTHER THAN FACTORY CERTIFIED SERVICE TECHNICIANS. ALL CONTROL BOX INTERNALS HAVE THE CAPABILITY OF HOLDING AN ELECTRICAL VOLTAGE OF 120 VOLTS AC.

3.2 THE TEMPERATURE CONTROLLER

The temperature controller is a PID programmable controller that utilizes feed forward and feedback information to accurately maintain a desired set point. It is the primary source for programming and viewing operating parameter settings. It also plays a part in the start sequence and includes other features such as:

- 2- eight segment LED displays
- 5 indicator status lights
- 3 menu levels
- RS-485 communications capability,

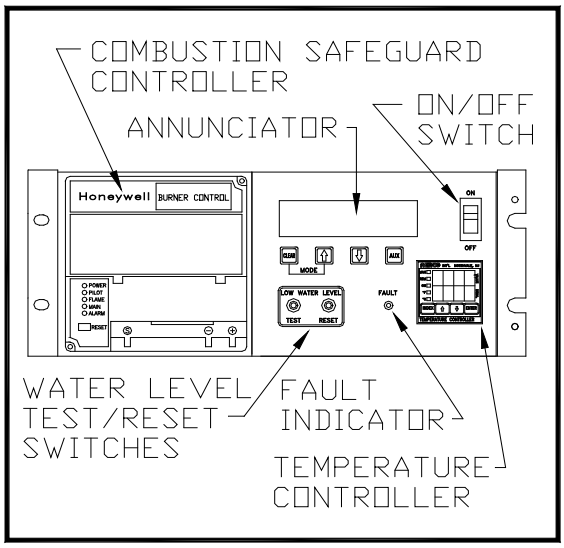


FIGURE 3.1
Front Panel Controls Location

3.2.1 LED DISPLAYS

The upper and lower displays each consist of four 8 segment LED's' (see figure 3.2). When an operating parameter is chosen to be changed or looked at, the lower led display indicates the parameter being looked at in the form of a code. The upper display indicates the parameter's value. For a complete listing of the operating parameters see Appendix A of this manual.

3.2.2 INDICATOR STATUS LIGHTS

The first LED indicator light, "MAN") indicates whether the controller is in auto or manual mode, (see Fig. 3.2). When lit the controller is in manual mode and the operator is responsible for operation of the unit. When the LED is not lit the controller is in auto mode. In auto mode the controller is operating the unit from signals generated by sensors located on the unit.

The second LED, "REM", designates whether the controller is being controlled locally or remotely. (see Fig. 3.1). When lit the controller is in remote mode and can accept commands from an external source via the RS-485 interface. When this LED is not lit the controller is in local mode and will respond to whatever the current internal settings are. All external commands are ignored.

The third LED, "ON", indicates the status of the start relay, (Fig. 3.2). The start relay is internal to the controller and is part of the start string for the unit. When this LED is lit there is a demand for heat and the start relay is closed.

The last two LED's, **"°F" and "°C",** indicate whether the temperature displayed is °F or °C.

NOTE:
When the temperature controller is displaying in °C only the temperature being displayed is affected. All other settings remain in °F.

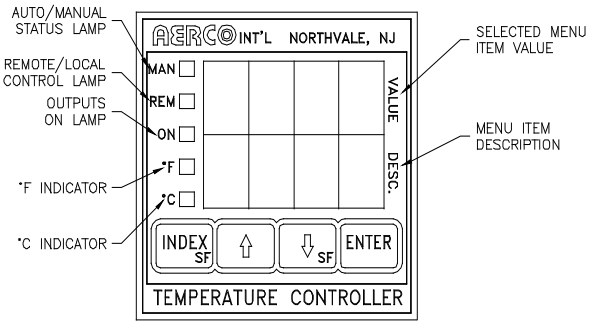


Figure 3.2
Temperature Controller Operating Status Lights

3.2.3 MENU LEVELS

The temperature controller has two menu levels that are operator accessible for programming the unit functions and parameters. These are the Primary and Secondary menus.

To change from the primary menu to the secondary menu simultaneously depress the ⇧ arrow key and ENTER button. To change from the secondary to the primary menu simultaneously press the ⇩ arrow key and the INDEX button.

To scroll through a menu, depress the INDEX button. To change a parameter scroll through the menu until the desired parameter is indicated on the controller's lower LED display. Then use the ⇧ and ⇩ arrow keys to change the parameters value. Once the desired parameters value has been changed the ENTER key must be pushed for the change to be recognized by the controller. Leaving the desired parameter without entering the new value will result in that parameter value defaulting back to the previous value. Detailed descriptions and instructions for accessing each menu parameter are listed within this section. For more data concerning the minimum and maximum range, and factory defaults of menu parameters, see the Appendix D of this manual.

3.3 PRIMARY MENU

The primary menu is the default menu. When in another menu level and there is no activity for five minutes the temperature controller will default back to the primary menu. The Primary menu allows the operator access to the controller parameters listed below.

Code	Meaning
tout	Actual unit outlet water temperature.
pct	Current firing rate of the unit in percent.
Setp	The desired set-point of outlet water temperature.
Auto	Automatic controlling mode ON or OFF.

3.3.1 OUTLET TEMPERATURE (TOUT)

Outlet temperature is the actual outlet water temperature of the unit. To access outlet temperature, press the INDEX button until (tout) is displayed in the lower LED. The variable under this feature may not be manually changed. Fig 3.3, below, shows an outlet temperature of 120º F

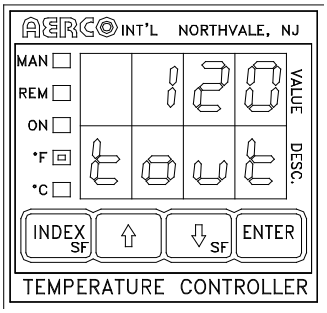


Figure 3.3
Outlet Temperature Display

3.3.2 PERCENTAGE OF FIRING RATE (Pct)

Percentage of firing rate is a number, in percent, that is related to the input BTU's of the unit. For instance a 50% signal equals approximately 500,000 BTU gas input while a 75 % signal equals approximately 750,000 BTU gas input.

CAUTION:
Do not leave the unit unattended while in the manual mode of operation.

To access the percent of firing rate press the INDEX button while in the primary menu until (Pct) is displayed in the lower LED. Use the ⇧, ⇩ arrow key to increase or decrease the percentage of firing rate. Press the ENTER button to accept the desired change. Figure 3.4 shows the temperature controller displaying a 100% firing rate.

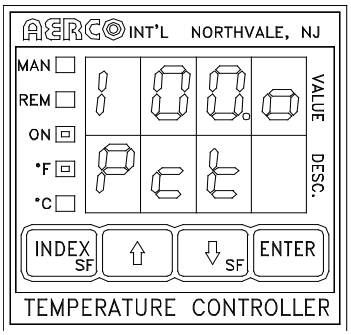


Figure 3.4
Percent of Firing Rate Display

WARNING:
WHEN SWITCHING FROM AUTO TO MANUAL MODE, THE FIRING RATE DOES NOT CHANGE. THE UNIT WILL CONTINUE TO OPERATE AT THE SAME FIRING RATE PERCENTAGE AS WHEN THE UNIT WAS IN AUTO MODE.

3.3.3 SETPOINT (SETP)

Setpoint is the desired outlet water temperature that is to be maintained by the unit when in automatic mode. Fig 3.5 shows the controller with a setpoint of 120º F.

To access the unit's setpoint press the INDEX button until (Setp) is displayed in the lower LED. To increase or decrease the unit's setpoint press the⇧ ⇩ arrow keys. Press the ENTER button to accept the change.

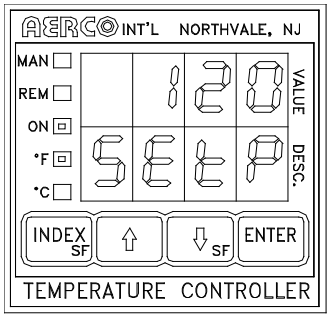


Figure 3.5
Setpoint Display

NOTE:
Changing the setpoint will only be recognized when the unit is in the automatic mode.

3.3.4 AUTOMATIC\MANUAL (AUTO)

When set to automatic mode the controller is receiving and processing inputs from temperature sensor(s) located externally or on the unit. The controller uses these inputs to automatically decrease or increase the firing rate to match the load.

In manual mode the controller no longer automatically controls the firing rate of the unit. It is up to the operator to control the outlet temperature and firing rate. Manual mode is commonly used for service and troubleshooting the unit. All safety limits remain functional whether the controller is in automatic or manual mode.

To place the controller in automatic mode press the INDEX button until (Auto) is displayed in the lower LED.

Now press the ⇧ ⇩ arrow keys until ON is displayed in the upper LED, (see Fig. 3.6). Press the enter button to accept the change. The MAN LED should not be lit.

To place the KC 1000 in manual mode, press the ⇧ ⇩ arrow keys until OFF is displayed in the upper LED (See Fig. 3.7). Press the enter button to accept the change. The MAN LED should now be lit.

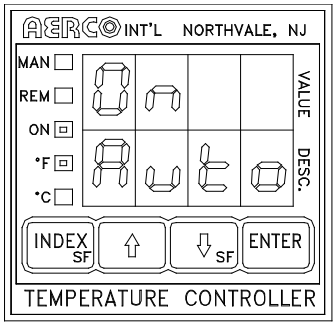


Figure 3.6
Auto/Manual Display with Auto On

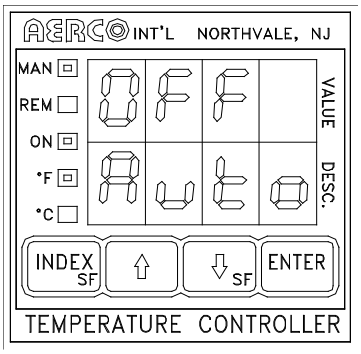


Figure 3.7
Auto/Manual Display with Manual ON

3.4 SECONDARY MENU

The secondary menu is primarily related to temperature control. It is necessary to access this menu when temperature calibrating the unit.

To access the secondary menu, press the ⇧ arrow key and ENTER simultaneously. To scroll through the menu press the INDEX button. The secondary menu allows access to the following temperature control features:

Func	Unit's mode of operation
tout	Outlet water temperature
FFt	Water temperature at the BTU transmitter sensor
Pct	Firing rate of the unit in percent
SetP	The desired set point of outlet water temp
SEnS	High flow temperature adjustment
OFSt	Low flow temperature adjustment
LLt	Low temperature alarm
HLt	High temperature alarm
Pb1	Proportional Band
Int	Integral Rate
Drt	Derivative Time
Fdb	Feedback on or off
Addr	Controller address for external communication
LOre	Local/ remote status of the control

For a complete explanation of the secondary menu parameters see the Appendix A of this manual.

3.5 THE ANNUNCIATOR CIRCUIT

The annunciator consists of the annunciator circuit board, the front panel LCD display, and 4 function switches (see Fig. 3.8). The annunciator circuit board is the interface between the LCD display and the combustion safeguard system. It monitors the unit during every phase of operation and prompts the LCD display with start sequence and fault messages. The function switches are used to reset the annunciator and gain access to the annunciator's three function displays.

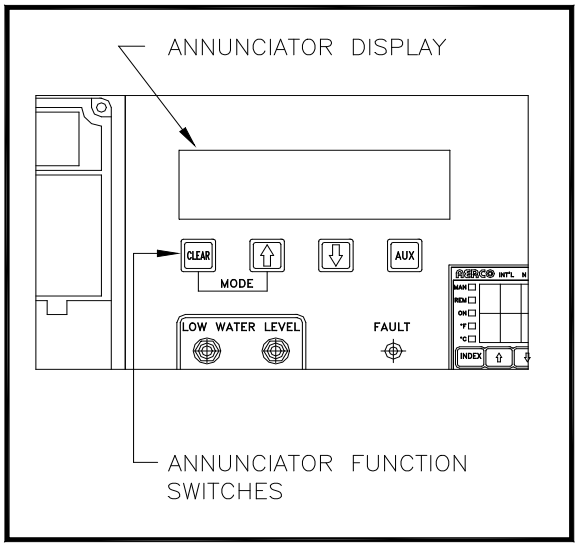


Figure 3.8
Annunciator Function Switches and LCD Display

The annunciator circuit board and LCD display are not an integral part of the start sequence or combustion safeguard system. If either should fail the unit will still operate with no adverse effects.

The annunciator start sequence messages, fault messages, function switches and function displays are explained below.

3.5.1 ANNUNCIATOR FUNCTION DISPLAYS AND SWITCHES

The annunciator has three function displays that are available to the operator. These are the MAIN, the CYCLES, and the SET DATE displays. These displays are accessed using the four membrane switches located directly under the

LCD display on the front of the control panel. They are labeled CLEAR, ⇧, ⇩, and AUX.

The MAIN display is used during normal operation of the unit. In the MAIN display, start sequence and fault messages can be viewed. To return to the MAIN display from any other display, simultaneously press CLEAR and the ⇧ arrow key. To reset the MAIN display after a fault has occurred press the CLEAR button.

The CYCLES display indicates the date and time, and the number of cycles the unit has started. When in the CYCLES display only the number of cycles can be reset. To reset the number of cycles to zero, simultaneously press the ⇧ ⇩ arrow keys and hold them for approximately four seconds.

In the SET DATE display, both the time and date are displayed and can be changed.
To access the SET DATE display, press the CLEAR button while in the CYCLES display. Continue pressing the CLEAR button to move through the SET DATE display fields. Use the ⇧ ⇩ arrow keys to set the date and time.

The following table shows the messages displayed after accessing the CYCLES and SET DATE DISPLAYS.

# CYCLES = "DATE" "TIME"	The number of times the controller has completed it's start cycle, and the time and date
SET DATE: "DATE" "TIME"	Displays and allows setting of the date and time

3.5.2 ANNUNCIATOR FAULT MESSAGES

The following table lists the Annunciator fault messages and their meanings.

MESSAGE	MEANING
RESET MAIN POWER	AC power has been interrupted. Power must be shut off for 20 seconds to reset the display.
HIGH WATER TEMP	Outlet water temperature has exceeded the high temperature limit setting.
LOW GAS PRESSURE	The unit has tripped due to low gas pressure.
LOW WATER LEVEL	The unit water level is below the probe level.
REMOTE DISABLED	The interlock terminals, in the relay box, are not closed.
PURGE INTLK OPEN	The proof of closure switch or the purge switch did not prove closed during the start sequence.
LOW AIR FLOW	The air flow switch did not proved closed during the start sequence.
SYSTEM FAULT PURGE INTERLOCKS	The proof of closure switch or purge switch did not proved closed 45 seconds after the unit attempted to start.
SYSTEM FAULT LOW AIR PRESSURE	The air pressure switch did not prove closed 45 seconds after the unit attempted to start.
FLAME FAULT DURING IGNITION TRIAL	Flame did not prove at the end of the trial for ignition period.
LOCKOUT RUN AIR FLOW	The air pressure switch opened after flame was proven.
LOCKOUT RUN FLAME	Flame signal was lost after flame was proven.
LOCKOUT RUN	The combustion safeguard is locked out.
HI EXHAUST TEMP	The exhaust gas temperature has exceeded 500º F

3.5.3 ANNUNCIATOR START SEQUENCE MESSAGES

The following table lists the annunciator start sequence messages.

MESSAGE	MEANING
STANDBY	The unit is in standby mode waiting for a call for heat
PURGING	The unit is in the 7 sec purge.
IGNITION TRIAL	The unit is in ignition position attempting to light the burner
FLAME PROVEN	The unit has established flame and is running normally.

3.6 THE COMBUSTION SAFEGUARD CONTROLLER

The Combustion Safeguard is responsible for monitoring the safety components during the start sequence, and after flame is established. It is also responsible for timing of the purge and ignition cycles during the start sequence.

The combustion safeguard is located on the left side of the control panel as shown in Figure 3.9. There are five status LEDs that indicate the status of operation. Along with the annunciator, these are useful as a double check for proper system operation and troubleshooting. The table below defines the function of each light. The reset button located under the LEDs is to reset the combustion safeguard on lockout.

DESCRIPTION	FUNCTION
POWER	Lights upon power up of the unit.
PILOT	Lights when there is a call for heat.
FLAME	Lights once flame has been detected.
MAIN	Lights after flame has been detected and stabilized
ALARM	This lights when the controller is in a LOCKOUT condition.

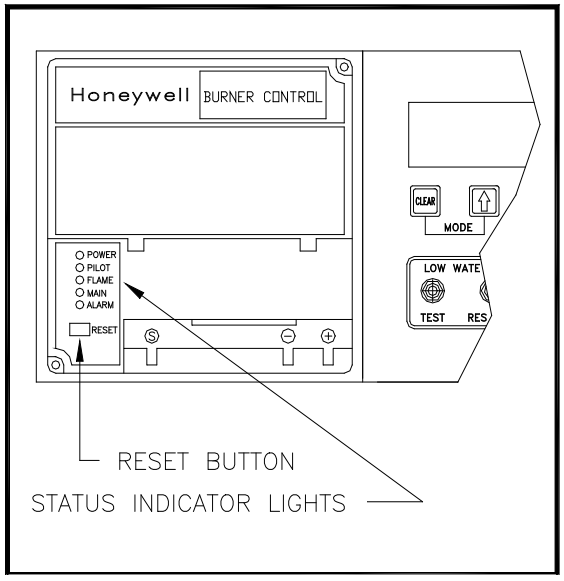


Figure 3.9
Combustion Safeguard Status Indicator LED Location

3.7 WATER LEVEL TEST and RESET SWITCHES

The water level switches are located on the left side of the panel (see Fig. 3.10). When depressed the TEST switch simulates a low water level condition by breaking the connection between the water level probe and the sensing circuitry. To test the water level circuitry, depress the test switch for 3 seconds. The unit should fault resulting in the red fault light blinking and the LED display indicating LOW WATER LEVEL.

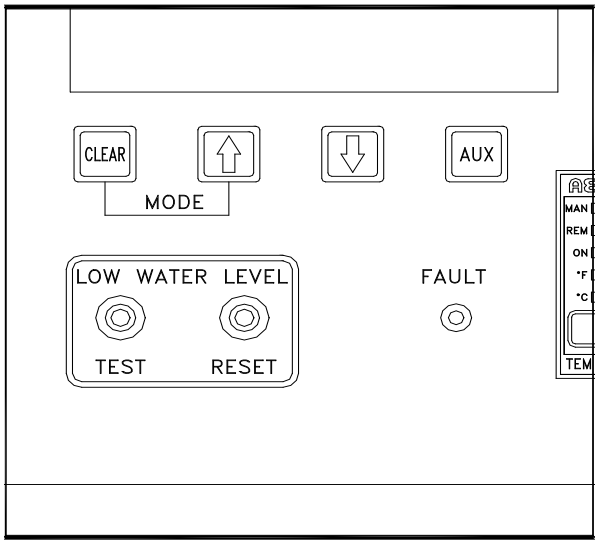


Figure 3.10
Water Level Test and Reset Switch Locations

Note:
Only water level circuitry is tested during the above test. To determine if the probe is functioning properly, the water level must be reduced below the level of the probe.

To reset the unit, depress the water level reset switch, the annunciator clear button, and if necessary, the reset button on the combustion safeguard.

3.8 ON/OFF SWITCH

The ON/OFF switch is located on the right side of the control box above the temperature controller (see Figure 3.1). It is part of the start string and must be in the ON position to enable the unit to fire. When the switch is in the ON position and illuminated, it is indicating that the start limit string, consisting of water temperature, gas pressure, water level, and the interlock is satisfied. The unit, at this point, is in standby mode and ready to run.

3.9 START SEQUENCE

When the unit is in the standby mode, and there is a demand for hot water, the following will occur:

1. Upon demand the temperature controller's ON status indicator will light.

2. The combustion safeguard's PILOT LED lights, and the blower contactor energizes, starting the blower.

3. The system next checks for proof of closure from the safety shut-off valve, (see Fig. 3.11), and the air fuel valve rotates open engaging the air /fuel valve open switch (see Fig. 3.12).

4. The LCD display shows PURGE INTLK OPEN until the above conditions are met. Once met the LCD display will show LOW AIR FLOW.

5. The blower proof switch closes, (See Fig. 3.13), and the LCD display will show PURGING.

6. Closure of the blower proof switch signals the combustion safeguard to begin its 7-second purge cycle.

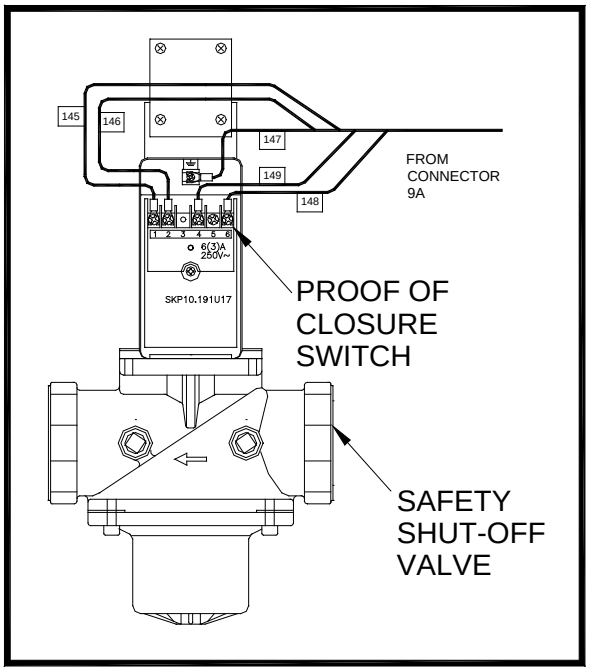


Figure 3.11
Proof of Closure Switch Location

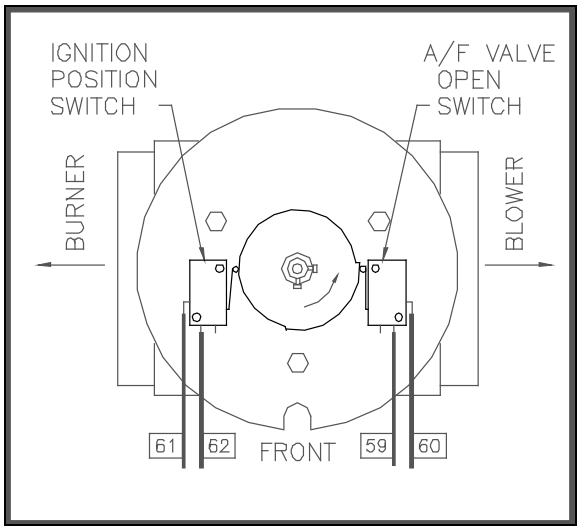


Figure 3.12
Air/Fuel Valve Open and Engaging the Air/Fuel Valve Open Microswitch

7. At the end of the purge cycle the combustion safeguard initiates a 10 second trial for ignition and the following simultaneously occurs:

- The LCD displays the message IGNITION TRIAL.
- The ignition transformer energizes.
- The air/fuel valve rotates to its low fire position. This engages the air-fuel valve closed switch, energizing the safety shut-off valve, (see Fig. 3.14).

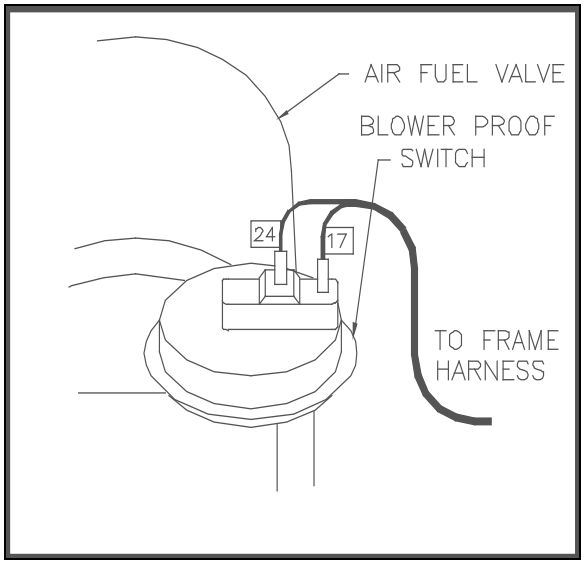


Figure 3.13
Blower Proof Switch Location

8. Once the combustion safeguard detects flame, its flame LED lights. Power is removed from the ignition transformer and the MAIN LED lights of the combustion safeguard.

At this point, the annunciator will display FLAME PROVEN. The unit, in the automatic mode, is released to modulate through the PID controls.

3.10 AFTER FLAME

Once the control signal has gone below the stop level (see section 3.12 for Stop Level explanation), the temperature controller's green ON light extinguishes, indicating there is no longer a call for heat. This signals the combustion safeguard to shut down the burner. The POWER LED of the combustion safeguard remains illuminated and the annunciator displays the message STANDBY.

3.11 FLAME TEST JACKS

The front of the combustion safeguard has two test jacks marked + and - for flame monitoring, (see Fig. 3.15). To access the test jacks remove the combustion safeguard cover by turning the center screw counterclockwise. A standard voltmeter is required to monitor the flame signal strength. A flame signal of 1.5 to 5VDC is typical during proper operation of the unit.

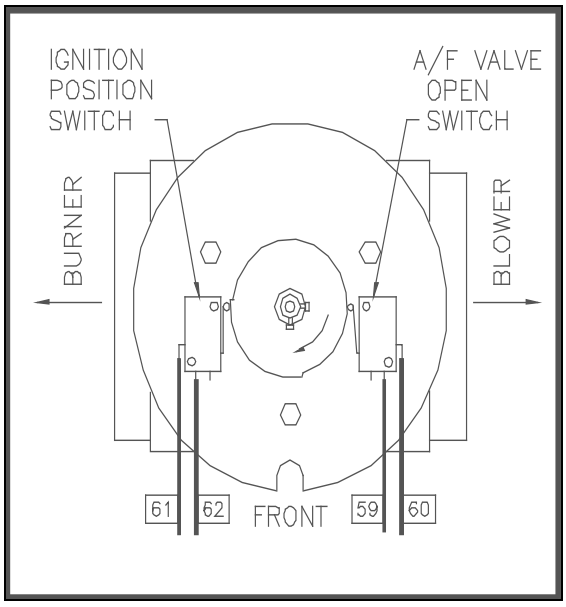


Figure 3.14
Air/Fuel Valve in Ignition Position, Engaging the Ignition Microswitch

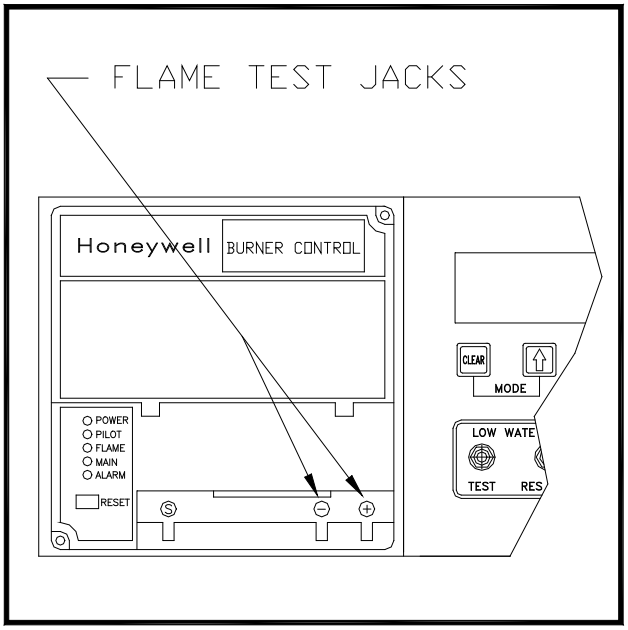


Figure 3.15
Flame Test Jack Location

3.12 START STOP LEVELS

The start and stop levels are the firing rate percentages that represent a call for heat and an indication that the call for heat has been satisfied. The start level is preset to 20% and the stop level is preset to 16%. These are factory preset and should not require adjustment.

SECTION 4 - INITIAL START UP

4.1 INITIAL START- UP REQUIREMENTS

The Initial Start-Up of the KC-1000 Boiler is comprised of the following steps:

- installation completed 100%
- combustion calibration
- proper setting of controls and limits
- temperature calibration
- safety device testing (see Section 5)

Installation procedures should be completed 100% before performing initial start-up and the start-up must be complete prior to putting the unit into service. Starting a unit without the proper piping, venting, or electrical systems can be dangerous and void the product's warranty. These start-up instructions should be precisely followed in order for the unit to operate safely, at a high thermal efficiency, and with low flue gas emissions.

Initial unit start-up is to be performed ONLY by AERCO factory trained start-up and service personnel. After following the steps in this section, it will be necessary to perform the mode of operation settings in section 5, and the safety control test procedures in section 6 to complete the initial unit start-up.

An AERCO Gas Fired Startup Sheet included with each KC-1000 must be completed for each unit for warranty validation and a copy must be returned promptly to AERCO at:

AERCO International, Inc.
159 Paris Ave.
Northvale, NJ 07647

WARNING!
DO NOT ATTEMPT TO FIRE THE UNIT WITHOUT FULL WATER LEVEL. THIS CAN SERIOUSLY DAMAGE THE UNIT AND MAY RESULT IN PERSONAL INJURY OR PROPERTY DAMAGE. THIS IS NOT COVERED BY WARRANTY.

CAUTION!
All installation procedures in Section 2 must be completed before attempting to start the unit.

4.2 TOOLS AND INSTRUMENTATION FOR COMBUSTION CALIBRATION

To properly perform combustion calibration, the proper instruments and tools must be used and correctly installed on the unit. The following sections outline the necessary tools and instrumentation as well as their installation.

4.2.1 REQUIRED TOOLS AND INSTRUMENTATION

The following tools and instrumentation are necessary to perform combustion calibration of the unit:

1. A digital combustion analyzer with oxygen accuracy to 0.4%, and carbon monoxide in PPM
2. ** A 16" W.C. manometer and plastic tubing
3. Three, 1/8" NPT to barbed fittings for use with manometers
4. Aerco differential gas pressure regulator adjustment tool P/N GM-122643 (one supplied per installation)
5. Small and large flat blade screwdrivers
6. 7/16" open end wrench and small adjustable wrenches
7. Tube of silicone adhesive
8. * Digital multimeter with 10 amp and volt capability

**Although not necessary for actual start-up procedures, recommended for troubleshooting.*

***For propane fired units: an additional 8" W.C. manometer and 1/2" NPT to barbed fitting is needed.*

4.2.1 INSTALLING THE SUPPLY GAS MANOMETER

1. Close the manual gas supply valve upstream of the unit.

2. Remove the 1/8" NPT pipe plug from the gas train assembly. This pipe plug is located below the low gas pressure switch before the safety shut off valve (see Fig. 4.1).

3. Install a barbed fitting into the pipe plug tapping.

4. Attach one end of a length of plastic tubing to the barbed fitting and one end to the 16" W.C. manometer.

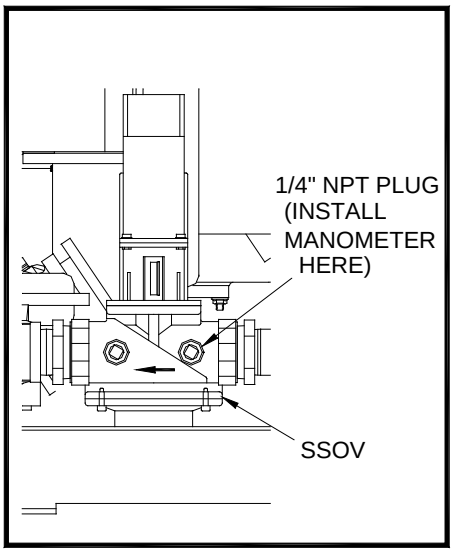


Figure 4.1
1/8” Gas Plug Location

4.2.2 PREPARING THE FLUE VENT PROBE HOLE

1. If the unit has been installed using the recommended AL29-4C vent, there will be a 3/8” hole, 18” to 24” above the exhaust manifold. The outer vent section, that covers vent section connections must be loosened and slid down to uncover the hole (see Fig. 4.2).

2. If equipped with one, adjust the stop on the combustion analyzer probe so that it extends into the flue gas flow without hitting the opposite wall of the flue. Do not insert the probe at this time.

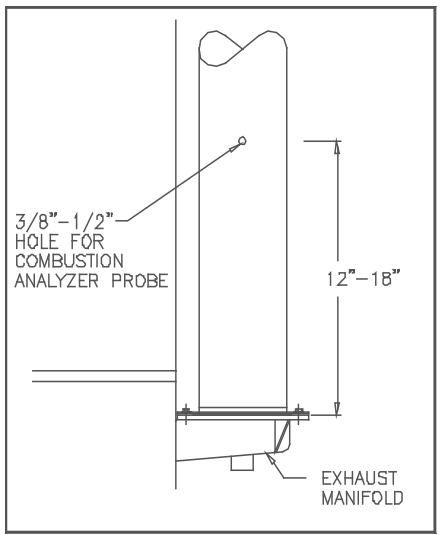


Figure 4.2
Analyzer Probe Hole Location

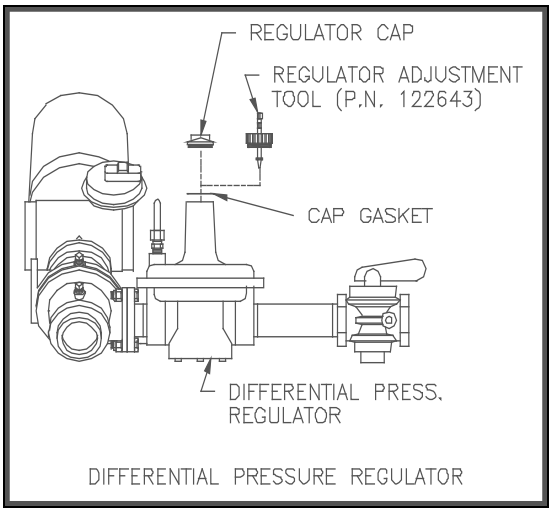


Figure 4.3
Differential Regulator Adjustment Tool Installation

4.2.3 INSTALLING THE DIFFERENTIAL REGULATOR ADJUSTMENT TOOL

1. Remove the cap from the differential pressure regulator (see Fig. 4.3).

2. Place the gasket from the regulator cap onto the regulator adjustment tool.

3. Prior to Installing the tools on the regulator pull up the tool's screwdriver blade. Then thread the tool into the regulator.

4. Engage the tool’s screwdriver blade into the regulator’s adjustment screw slot.

4.3 COMBUSTION CALIBRATION

The KC-1000 ships combustion calibrated from the factory. Recalibration as part of a start-up is necessary due to altitude, gas BTU content, gas supply piping and supply regulators. Factory test data sheets are shipped with each unit as a reference.

The following combustion calibration procedure closely follows the factory procedure. By following this procedure readjustment of combustion will be kept to a minimum.

NOTE:
If the instructions in section 4.2 have not yet been performed, go back and do so before continuing**.**

1. Open the supply and return valves to the unit and ensure that the system pumps are running.
2. Open the gas supply valve(s) to the unit.

3. Using the 16" manometer installed as per Section 4.2.1, adjust the gas supply regulator until a reading of 12" W.C. static pressure is obtained.

4. Place the green ON/OFF switch in the OFF position. Turn on AC power to the unit. The temperature controller and annunciator displays should light.

5. Put the temperature controller in manual mode

NOTE:
For a review of control panel operating procedures, see Section 3.

6. Change the firing rate (Pct) to 0.0%.

7. Place the green ON/OFF switch in the ON position.

8. Change the firing rate (Pct) to 25%. This will put the unit into the starting sequence.

NOTE:
On initial start-up or return to service from a fault condition, a warm-up timer of 2 minutes is activated by the controller. This prevents the BTU input from exceeding 400,000 BTUs/HR even though the control signal may indicate a greater input.

9. Observing the 2 minute warm-up period increase the firing rate in 10 % increments while monitoring the gas pressure after every increase. If gas pressure dips below 8.5" W.C. for FM gas trains and 8.9" W.C. for IRI gas trains at any input percentage, stop and raise the pressure. Once 100% is reached adjust the gas pressure for 8.5" W.C. for FM and 8.9" W.C. for IRI.

NOTE:
If 8.5" W.C. (FM) or 8.9" (IRI) gas pressure cannot be obtained at the 100% firing rate, it will be necessary to stop calibration and contact the local AERCO representative in your area. Running the unit on insufficient gas pressure will void the warranty

10. Once 8.5" W.C. is set at the 100% level, change the firing rate (Pct) to 30%. Insert the combustion analyzer probe into the stack.

NOTE:
Always go to a percentage of firing rate from the same direction, (i.e., 100% to 30% or 30% to 20%). Whenever going to a firing rate from below (i.e., 20% to 30%), first go above then back down to the desired firing rate. This is necessary due to hysteresis in the air/fuel stepper motor. Hysteresis causes the air/fuel valve to stop in a slightly different position if the firing rate percentage is approached from below or above. This results in a difference in oxygen readings for the same firing rate percentage causing unnecessary recalibration**.**

11. Allow enough time for the combustion analyzer to settle. Compare the measured oxygen level to the oxygen range for intake air temperature in Table 1.

Table 1

Inlet Air Temp	Oxygen	Carbon Monoxide
20°F	5.7%	<50ppm
40°F	5.5%	<50ppm
60°F	5.2%	<50ppm
80°F	5.0%	<50ppm
100°F	4.9%	<50ppm

Combustion Oxygen Levels for a 30% Firing Rate

12. If the measured oxygen level is within the range, at the current intake air temperature in Table 1, no adjustment is necessary. Proceed to step 17.

13. If the measured oxygen level is below the range in Table 1, rotate the differential regulator adjustment tool counter clockwise 1/4-1/2 revolution to decrease gas flow.

14. Wait for the combustion analyzer to settle, then compare the new oxygen reading to Table 1. Repeat adjustment until oxygen is within the specified range.

15. If the measured oxygen level is above the oxygen range in Table 1, rotate the differential regulator adjustment tool clockwise, 1/4-1/2 turns, to increase gas flow.

16. Wait for the analyzer reading to settle, then compare the new reading to Table 1. Repeat adjustment until oxygen is within the specified range.

NOTE:
Adjust only the differential regulator at 30% control signal, do not adjust the air shutter

17. Once the oxygen level is within the specified range at 30%, change the firing rate to 20%.

18. Oxygen levels at the 16% firing rate should be 10% or less as shown in Table 2. If the measured oxygen level is less then 10%, no adjustment is necessary. If the measured oxygen levels are greater than 10%, rotate the regulator adjustment tool clockwise 1/4 to 1/2 revolution to add gas.

19. Wait for the analyzer to settle. Repeat adjustment until the measured oxygen reading is 10% or less.

20. If the oxygen level cannot be brought to 10% or less, check the oxygen level in 1% increments above the 16% firing rate until an oxygen level of 10%, or less, is measured. Reset the unit' stop level at that firing rate. Go back and recheck the oxygen level at 30% before continuing.

Table 2

Inlet Air Temp	Oxygen	Carbon Monoxide
20°F	10% or less	<25ppm
40°F	10% or less	<25ppm
60°F	10% or less	<25ppm
80°F	10% or less	<25ppm
100°F	10% or less	<25ppm

Combustion Oxygen Levels for a 20% Firing Rate

21. Change the firing rate to 100%. After the combustion analyzer has settled, compare the measured oxygen level with the levels in Table 3.

22. If the measured oxygen reading is below the oxygen range in Table 3, loosen the two bolts that secure the inlet air shutter to the unit using a 7/16” wrench (see Fig. 4.4). Open the shutter 1/4” to 1/2”, to increase the oxygen level then tighten the nuts.

23. Wait for the analyzer to settle, then compare the new oxygen reading to Table 3. Repeat the inlet air shutter adjustment until the oxygen is within the specified range. Firmly tighten the inlet air shutter locking nuts when finished.

Table 3

Inlet Air Temp	Oxygen	Carbon Monoxide
20°F	5.4%	<150ppm
40°F	5.4%	<150ppm
60°F	5.2%	<150ppm
80°F	4.9%	<150ppm
100°F	4.7%	<150ppm

Combustion Oxygen Levels for a 100% Firing Rate

REMINDER:
At 30% firing rate adjust only the differential pressure regulator. At 100% firing rate, adjust only the inlet air shutter.

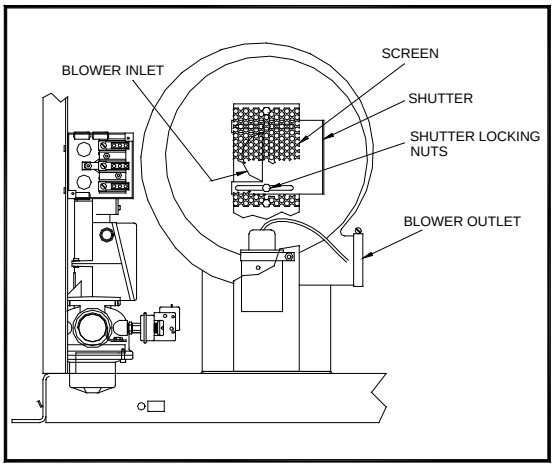


Figure 4.4
Air Shutter Locking Nut Location

24. If the measured oxygen reading is above the oxygen range in Table 3, loosen the two 7/16" locking nuts securing the inlet air shutter. Close the air shutter 1/4” to 1/2” to decrease the oxygen level and tighten the two nuts.

25. Allow the analyzer to settle, then compare the new oxygen reading to Table 3.

26. Allow the analyzer to settle. Repeat the adjustment until the oxygen is within the specified range. Firmly tighten the inlet air shutter locking nuts when finished.

NOTE:
Adjust the inlet air shutter only at 100% firing rate. Do not adjust the differential pressure regulator.

27. Change the firing rate to 30%. Allow time for the combustion analyzer to settle. Check the measured oxygen reading to insure that it is still within the range as per Table 1.

28. Continue this procedure until all oxygen levels are within the ranges specified in Tables 1,2, and 3.

29. Record all readings on the AERCO start-up sheet provided with each unit. Proceed to Section 4.5.

4.4 PROPANE COMBUSTION CALIBRATION

For propane units it will be necessary to install an additional 8" W.C. manometer as described below. This is used to measure the pressure drop across the air/propane mixing orifice.

1. Referring to Fig. 4.5 remove the 1/8" NPT plug from the gas inlet pipe ahead of the burner and install an 1/8" NPT barbed fitting.

2. Remove the 1/2" NPT plug from the tee located after the air pressure regulator and install a 1/2" barbed fitting (see fig. 4.5).

3. Attach the 8" W.C. manometer to the barbed fittings installed in steps 1, and 2.

4. While following the combustion calibration procedure in Section 4.3 measure the pressure drop across the air/propane mixing orifice using the 0-8" W.C. manometer.

5. This reading should remain a constant 3.8" to 4" W.C. throughout the operating range.

6. If the pressure drop is not within this range, remove the cap from the air pressure regulator.

7. Using a flat blade screwdriver adjust the regulator until 3.8"-4.0" W.C. is obtained. Clockwise will increase the reading and counter-clockwise will decrease the reading.

8. If adjustments are made to this regulator it will be necessary to recheck oxygen settings at 16%, 30%, and 100% firing rates

NOTE:
After an adjustment is made to the air regulator, the cap must be put back on securely to obtain an accurate reading

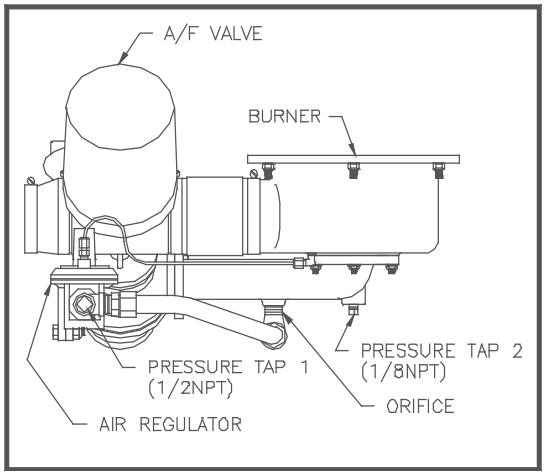


Figure 4.5
Propane Air Differential Pressure Taps

4.5 UNIT REASSEMBLY

Once combustion calibration is set properly, the unit can be re-assembled for permanent operation.

1. Put the green ON/OFF switch in the off position. Disconnect the AC power supply to the unit.

2. Shut off the gas supply to the unit.

3. Remove the regulator adjustment tool by first pulling up the screwdriver blade to disengage it from the regulator adjusting screw, and then turning the tool out of the top of the regulator.

4. Remove the gasket from the tool and place it back onto the regulator cap.

5. Apply a drop of silicone to the regulator adjusting screw to lock its setting.

6. Reinstall the cap and gasket back on the regulator. Tighten the cap using a screwdriver or wrench.

7. Remove all of the manometers and barbed fittings and reinstall the pipe plugs using a suitable thread compound.
8. Replace the unit's panels and hood.

9. Remove the combustion analyzer probe from the vent hole. Seal the probe hole and replace the vent connection cover.

4.6 TEMPERATURE CONTROL CALIBRATION

Although the unit comes factory set and calibrated for a 130^0 F setpoint it is usually necessary to recalibrate temperature control. There are two main adjustments for performing temperature calibration. These are OfSt (offset), and SENS (sensitivity).

Adjustments to OfSt and SENS are made at minimum and maximum load conditions and should be made in increments of 1 to 3. After making an adjustment, outlet water temperature must be allowed to settle for several minutes prior to making further adjustments.

When calibrating temperature control observe the following:

A) The unit must be in operation and in AUTO mode.
B) Use the outlet temperature and percent input displays to set load conditions and see the effect of adjustments.
C) Perform the calibration in the SECONDARY menu of the temperature controller.
D) Make small adjustments and allow time between adjustments for the outlet temperature to stabilize.
E) Maintain water flow as constant as possible during these adjustments.
F) Ensure that recirculation loops are operational while the calibration is being performed.

4.6.1 SETTING THE OUTLET WATER TEMPERATURE SETPOINT

The setpoint of the unit may be changed by following the procedure below. Once a setpoint has been changed recalibration may be necessary. The temperature calibration procedure is outlined in step Sections 4.6.2 and 4.6.3

1. Enter the SECONDARY menu of the temperature controller by simultaneously pressing ⇧ and ENTER.

2. Press INDEX until SEtP is displayed. This is the unit's desired outlet temperature.

3. Adjust this value to the desired set point using ⇧ ⇩ then press ENTER to accept the value.

4.6.2 MINIMUM LOAD ADJUSTMENT

1. Place the control in the secondary menu by simultaneously pressing ⇧ and ENTER.

2. Press INDEX until Pct is displayed. This is the unit's percentage of firing rate.

3. Create a minimum load on the system that will yield a steady percentage of firing rate between 25% to 35%.

NOTE:
It may be desirable to shut off the outlet valve and use the hose bib to simulate a minimum flow load condition.

4. Press the INDEX button until tout appears in the lower display. The upper display will be indicating the outlet water temperature.

5. Wait a few minutes to allow the outlet temperature to stabilize.

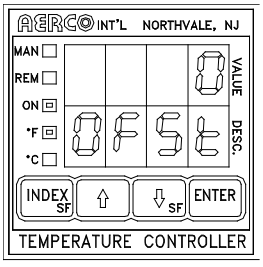
NOTE:
Keep toggling between the outlet temperature and input percentage to ensure that both have stabilized.

6. Once stabilized the outlet temperature should be 2 to 3 degrees above the unit's set point. If it does not stabilize to 2 or 3 degrees above the setpoint, Offset (OfSt) must be adjusted.

7. To adjust OfSt press INDEX until OfSt appears in the lower display (see figure 4.6).

8. Raise or lower OfSt as needed using the ⇧&⇩ buttons. Increasing this value will increase water temperature, decreasing it will decrease water temperature.

9. Press ENTER to accept new values and allow time for the system to settle between adjustments.



Fligure 4.6
Secondary Menu Displaying Offset

4.6.3 MAXIMUM LOAD ADJUSTMENT

1. Enter the SECONDARY menu of the temperature controller by simultaneously pressing ⇧ and ENTER.

2. Press INDEX until Pct is displayed. This is the unit's percentage of firing rate.

3. Create a maximum load on the system that will yield a steady percentage of firing rate between 80% to 90%.

NOTE:
It may be necessary to open the outlet valve if it was closed during minimum load adjustment to obtain a sufficient flow rate for maximum adjustment.

4. Press the INDEX button until tout appears in the lower display. The upper display will be indicating the outlet water temperature.

5. Wait a few minutes to allow the outlet temperature to stabilize.

6. Once stabilized the outlet temperature should be 2 to 3 degrees below the set point temperature. If it does not stabilize to 2 to 3 degrees then the Sensitivity (SEnS) must be adjusted.

7. To adjust the SEnS press INDEX until SEnS appears in the lower display (see figure 4.7).

8. Raise or lower this value as needed using the ⇧,⇩arrow keys. Increasing this value will increase water temperature, decreasing it will decrease water temp
9. Press ENTER to accept the new value. Allow time for the system to settle between adjustments.

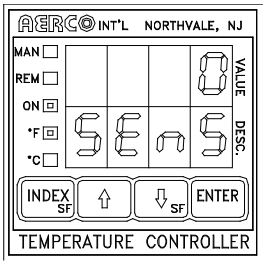


Figure 4.7
Secondary Menu Displaying Sensitivity

10. If the outlet temperature holds setpoint temperature stable, and within the +/_ 4^0 F, no further control adjustment is required.

11. If the outlet temperature does not maintain setpoint after a reasonable amount of time and adjustment contact your local AERCO representative.

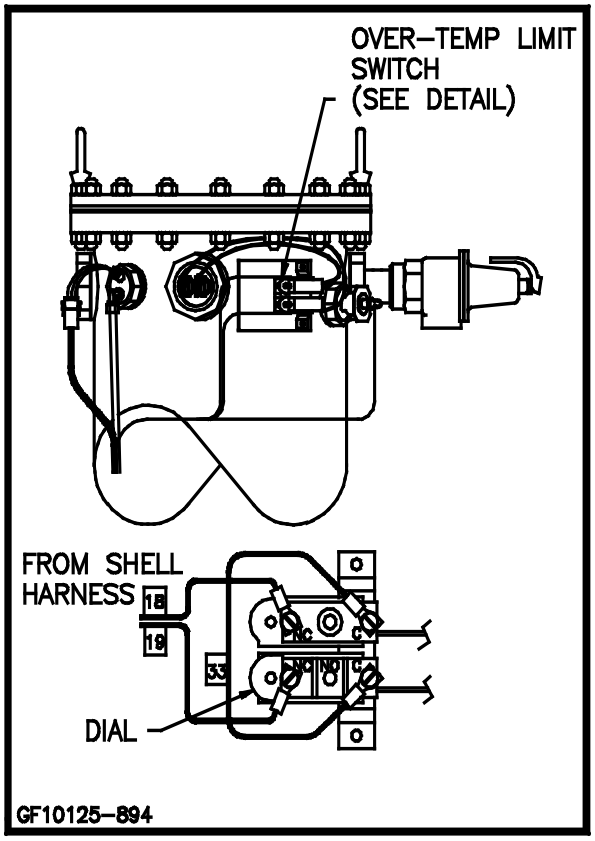


Figure 4.8
Over Temperature Limit Switch Location

4.7 OVER TEMPERATURE LIMIT SWITCH ADJUSTMENTS

There are two over-temperature limit switches that will turn off the unit when the outlet water temperature becomes too hot. The lower over-temperature limit switch is adjustable and should be adjusted to 20^o F above the highest operating temperature the system will see. The upper over-temperature limit switch is a locked manual non-adjustable reset device. It will trip the unit off at

200° F water temperature. Do NOT attempt to adjust it's set point.

To adjust the lower over temperature switch limit switch:

1. Remove the wing nut from the top center of the shell cap. Lift the cap off the shell.

2. The two over-temperature limit switches are located at the top of the shell (see Fig. 4.8). Do not adjust the upper switch. It has been factory preset. Adjust the lower switch 20° F higher than the unit's set point.

3. Replace the shell cap and wing nut.

SECTION 5-SAFETY DEVICE TESTING PROCEDURES

5.1 TESTING OF SAFETY DEVICES

Periodic testing of all controls and safety devices is required to insure that they are operating as designed. Precautions must be taken while tests are being performed to protect against bodily injury and property damage.

Systematic and thorough testing of the operating and safety controls should be performed on a scheduled basis, or whenever a control component has been serviced or replaced. All testing must conform to local jurisdictions or codes such as ASME CSD-1.

NOTE:
MANUAL and AUTO modes are required to perform the following tests. For a complete explanation of these modes, see Section 3.

NOTE:
It will be necessary to remove the sheet metal covers and cap from the unit to perform the following tests.

WARNING!
THIS IS A 120 VOLT AC COMBUSTION SAFEGUARD SYSTEM. POWER MUST BE REMOVED PRIOR TO PERFORMING WIRE REMOVAL OR OTHER TESTING PROCEDURES THAT CAN RESULT IN ELECTRICAL SHOCK.

5.2 GAS PRESSURE FAULT TEST

1. Shut off the gas supply to the unit.
2. Install an 0-16” W.C. manometer in the gas pipe assembly below the low gas pressure switch. (See Fig. 5.1)
3. Open the gas supply to the unit.
4. Start the unit.
5. Slowly close the manual gas supply valve while monitoring the gas pressure. The unit should fault and shutdown on “LOW GAS PRESSURE” when the manometer indicates approximately 7” W.C.
6. Open the gas supply to the unit.
7. The unit should start upon restoration of gas pressure.

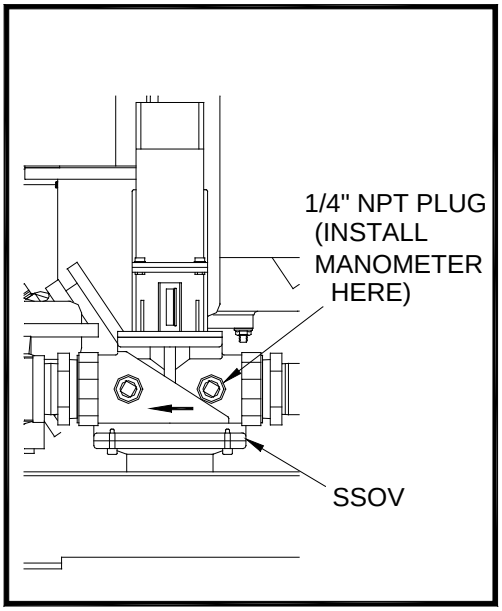


Figure 5.1
1/8” Pipe Plug Position for Manometer installation

NOTE:
After faulting the unit, the fault message will be displayed and the fault indicator light will flash until the CLEAR button is pressed.

5.3 LOW WATER LEVEL FAULT TEST

1. Place the ON/OFF switch in the OFF position.
2. Close shut-off valves in the supply and return piping to the unit.
3. Open the drain valve on the unit.
4. Allow air-flow into the unit by either opening the relief valve or by removing the 1/4” plug in the top of the unit.
5. The LOW WATER LEVEL message will be displayed and the fault LED will flash after the water level has gone below the level of the probe.
6. The ON-OFF switch should not illuminate when placed in the ON position and the unit should not start.
7. Close the drain and pressure relief valve or reinstall the plug in the top of the unit if removed.
8. Open the water shut-off valve in the return piping to the unit to fill the shell.

9. Open the water shut-off valve in the supply piping to the unit.

10. Press the LOW WATER LEVEL RESET button to reset the low water cutoff and press the CLEAR button to reset the annunciator and LCD displays once the shell is full.

11. Place the ON-OFF switch in the ON position. The unit is now ready for operation.

5.4 WATER TEMPERATURE FAULT TEST

1. In AUTO mode, allow the unit to stabilize at its setpoint.

2. Lower the operating temperature limit switch setting to match the outlet water temperature. (See Fig. 5.2).

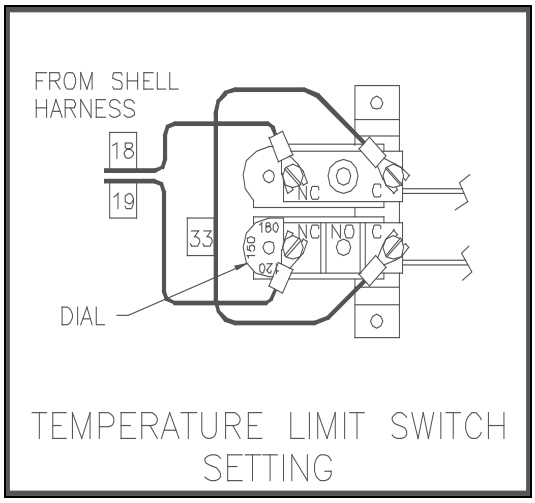


Figure 5.2
Temperature Limit Switch Setting

3. Once the limit switch setting is approximately at the actual water temperature indicated by tout, the unit should shutdown. The fault light should be flashing and the message “HIGH WATER TEMP” should be displayed. The ON/OFF switch should not be illuminated and the unit should not start.

4. Reset the temperature limit switch setting to a minimum of 20^{o}F above the set point temperature.

5. The unit should start once the temperature limit switch setting is above the actual outlet water temperature.

5.5 FLAME FAULT TEST

1. Start the unit.

2. Once the unit is firing, close the manual leak-detection valve. This is the valve located between the safety shut off valve and the differential gas pressure regulator (See Fig. 5.3).

3. The unit should shut down within 1-2 seconds and indicate a LOCKOUT RUN FLAME fault on the LCD display.

4. Leaving the manual leak detection valve closed, reset the combustion safeguard and CLEAR the annunciator

5. Restart the unit.

6. The unit should lockout and display LOCKOUT START FLAME during ignition.

7. Open the leak detection valve.

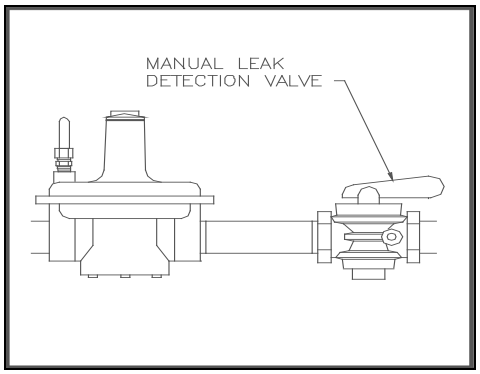


Figure 5.3
Manual Leak Detection Valve

9. Reset the Combustion safeguard and CLEAR the annunciator.

10. Start the unit.

5.6 AIR PRESSURE FAULT TEST

WARNING!
THIS IS A 120 VOLT AC COMBUSTION SAFEGUARD SYSTEM. POWER MUST BE REMOVED PRIOR TO PERFORMING WIRE REMOVAL, OR TESTING PROCEDURES THAT CAN RESULT IN ELECTRICAL SHOCK.

1. Disconnect AC power from the unit.

2. Disconnect wire #17 from the air pressure switch located on the air/fuel valve (See Fig. 5.4).

3. Restore AC power to the unit.

4. Produce a “call for heat” to start the unit. The unit should fault and display the message SYSTEM FAULT AIR FLOW SWITCH.

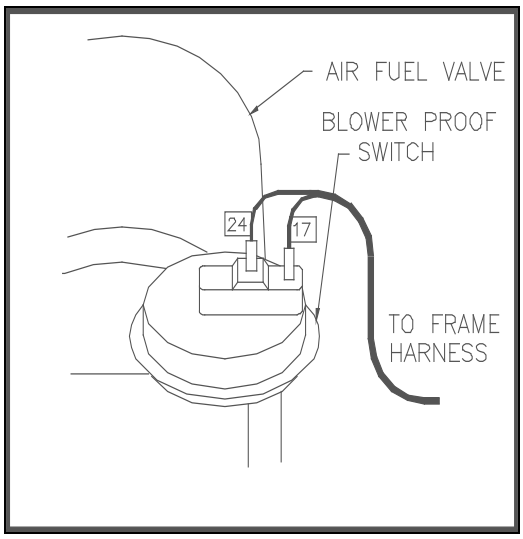


Figure 5.4
Blower Proof Switch Location and Wiring

5. Disconnect AC power from the unit.

6. Replace wire #17

7. Restore AC power to the unit.

8. Reset the combustion safeguard and clear the annunciator display.

5.7 PURGE INTERLOCKS FAULT TEST

1. Turn the ON/OFF switch to the OFF position.

2. Loosen the two set screws that attach the safety shut off valve actuator to its valve body. (See Fig. 5.5).

3. Lift the SSOV Actuator clear of the valve body. This will open the proof of closure switch.

4. Start the unit in manual mode

5. The unit should shutdown and display the message SYSTEM FAULT PURGE INTERLOCKS.

6. Clear the annunciator. Turn the ON/OFF switch to the OFF position.

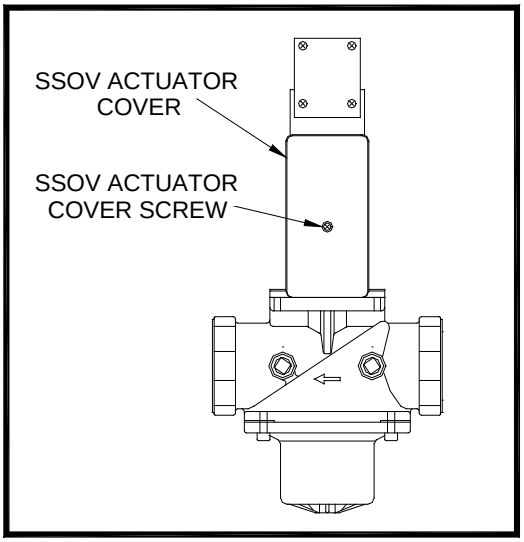


Figure 5.5
SSOV Actuator Set Screw Location

5. Disconnect AC power to the unit.

6. Remove the air/fuel valve cover by loosening the 3 screws securing it in place. (See Fig. 5.6).

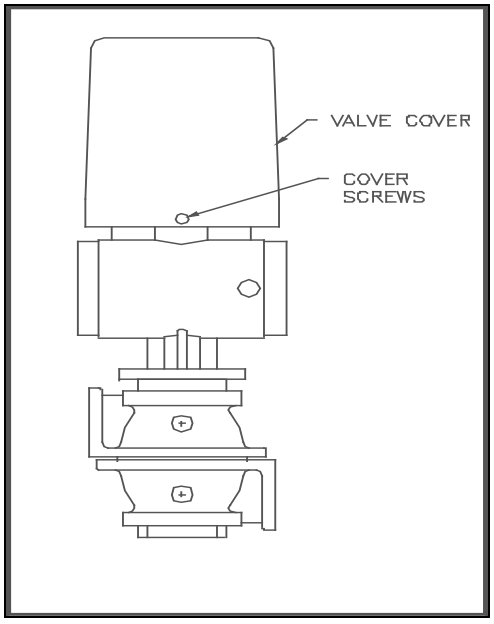


Figure 5.6
Air/Fuel Valve Cover Screw Locations

9. Disconnect wire #60 from the air/fuel valve open position switch. This is the switch closest to the blower (See Fig. 5.7).

10. Restore AC power to the unit.

11. Start the unit.

WARNING!
THIS IS A 120 VOLT AC COMBUSTION SAFEGUARD SYSTEM. POWER MUST BE REMOVED PRIOR TO PERFORMING WIRE REMOVAL, OR OTHER TESTING PROCEDURES THAT CAN RESULT IN ELECTRICAL SHOCK.

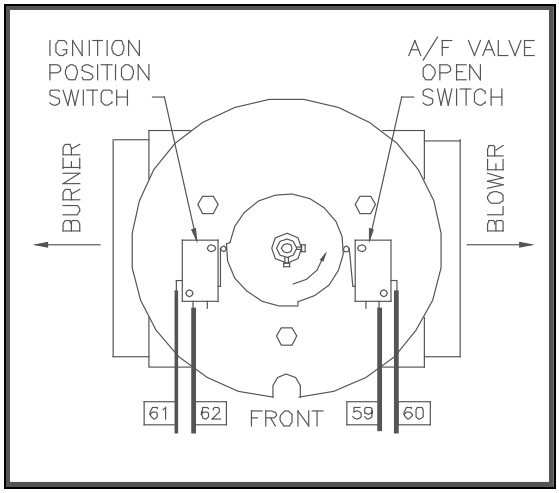


Figure 5.7
Air/Fuel Valve Open Position Switch Location

12. The unit should shutdown and display the message SYSTEM FAULT PURGE INTERLOCKS.

13. Disconnect AC power from the unit.

14. Reconnect wire #60 to the air/fuel valve open position switch.

15. Disconnect wire #62 from the ignition position switch. This is the switch closest to the burner of the unit (See Fig. 5.7).

16. Restore AC power to the unit, and reset the combustion safeguard.

17. Start the unit.

18. The unit should lockout and display the message LOCKOUT START FLAME

19. Disconnect AC power from the unit

20. Reconnect wire #62 to the ignition position switch

21. Replace the air/fuel valve cover.

22. Restore AC power to the unit
23. Set the unit to auto mode to resume normal operation.

5.8 SAFETY PRESSURE RELIEF VALVE TEST

Test the safety Pressure/Temperature Relief Valve in accordance with ASME Boiler and Pressure Vessel Code, Section VI.

SECTION 6 – MAINTENANCE

6.1 MAINTENANCE SCHEDULE

The KC1000 requires regular routine maintenance to keep up efficiency and reliability. For best operation and life of the unit, the following routine maintenance procedures must be performed in the specified time-periods.

WARNING!
TO AVOID PERSONAL INJURY, BEFORE SERVICING:
(A) *DISCONNECT AC POWERTO THE UNIT*
(B) *SHUT OFF THE GAS SUPPLY TO THE UNIT*
(C) *ALLOW THE UNIT TO COOL TO A SAFE TEMPERATURE*

6.2 SPARK IGNITOR

The spark ignitor assembly is located in the body of the burner (see Fig. 6.1). The ignitor may be HOT. Care should be exercised. It is easier to remove the ignitor from the unit after the unit has cooled to room temperature.

CAUTION!
The ignitor must be removed and installed using the ignitor removal tool provided with the unit(s). Damage to the burner due to using a socket for removal and installation of the ignitor is not covered under warranty

To inspect/replace the Ignitor

1. Put the green ON/OFF button on the control panel, to the OFF position and disconnect AC power to the unit. Disconnect the plastic tubing from the condensate cup to drain and remove the rear cover panels from the unit. Access to the spark ignitor may also be gained by removing the unit's right side panel

2. Disconnect the ignitor cable from the ignitor contactor and unscrew the ignitor contactor from the burner shell.

3. Insert the ignitor removal tool into the burner shell, where the ignitor contactor was removed. Screw the outer barrel of the tool into the burner shell. Push the inner barrel up and fit the hexagonal end of the tool over the ignitor. Unscrew the ignitor from the burner head and then the tool from the burner shell.

4. The ignitor is gapped at 1/8-inch. If there is substantial erosion of the spark gap or ground electrode, the ignitor should be replaced. If carbon build-up is present, clean the ignitor using fine emery cloth. Repeated carbon build-up on the ignitor is an indication that a check of the combustion settings is required, (see Sections 4.2 and 4.3 for Combustion Calibration)

.

Table 1 Maintenance Schedule

Section	Item	6 Mos.	12 Mos.	24 Mos.	Labor Time
6.2	SparkIgnitor	Inspect	Replace		15 mins.
6.3	Flame Detector	Inspect	Replace		15 mins.
6.4	Combustion Adjustments.	Check	Check		1 hr.
6.5	Testing of Safety Controls		Test		20 mins.
6.6	BTU Transmittert. Pump	Oil			15 mins.
6.7	BTU Transmitter			Inspect & clean if necessary	50 mins.
6.8	*Manifold & Tubes			Inspect & clean if necessary	4 hrs.
6.9	Heat Exchanger			Inspect	1.5 hrs.

** Recommended only when unit will be run in an extreme condensing mode for prolonged periods of time.*

5 Prior to reinstalling the ignitor, an anti-seize compound must be applied to the ignitor threads.

6 Reinstall the ignitor using the ignitor removal tool. Do not over tighten the ignitor a slight snugging up is sufficient. Reinstall the ignitor contactor (hand tight only) and reconnect the ignitor cable.

7. Replace the rear cover panels or right side panel. Replace the condensate cup to drain tubing.

6.3 FLAME DETECTOR

The flame detector assembly is located in the body of the burner (see Fig. 6.1). The flame detector may be HOT. Allow the unit to cool sufficiently before removing the flame detector.

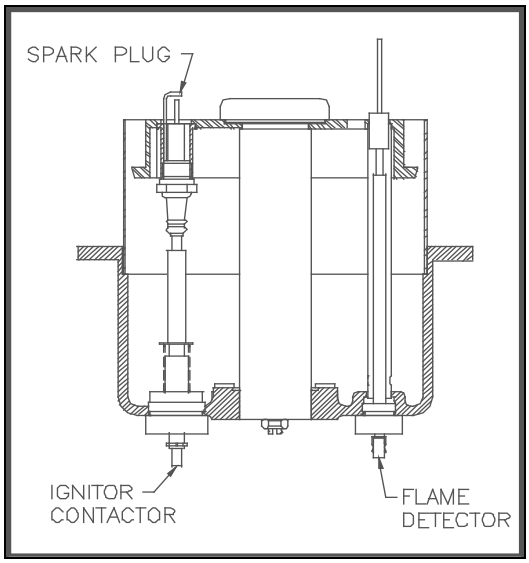


Figure 6.1
Spark Ignitor and Flame Detector Location

To inspect or replace the flame detector:

1. Put the green ON/OFF button on the control panel, to the OFF position and disconnect AC power to the unit.

2. Disconnect the plastic tubing from the condensate cup to drain and remove the rear covers from the unit.

3. Disconnect the flame detector lead wire.and unscrew the flame detector and remove it from its guide tube.

4. Inspect the detector thoroughly. If eroded, the detector should be replaced. Otherwise clean the detector with a fine emery cloth.

5. Reinstall the flame detector hand tight only, and reconnect the flame detector lead wire.

6. Replace the rear cover panels or left side panel. Replace the condensate cup to drain tubing.

6.4 COMBUSTION CALIBRATION

Combustion settings must be checked at the intervals shown in Table 1 as part of the maintenance requirements. Refer to Sections 4.2 and 4.3 for combustion calibration instructions.

6.5 SAFETY DEVICE TESTING

Systematic and thorough tests of the operating and safety devices should be performed to ensure that they are operating as designed. Certain code requirements, such as ASME CSD-1, require that these tests be performed on a scheduled basis. Test schedules must conform to local jurisdictions. The results of the tests should be recorded in a log- book. See Section 6-Safety Device Testing Procedures.

6.6 BTU TRANSMITTER PUMP LUBRICATION

The BTU Transmitter pump should be lubricated every six months. There are two oil ports located on the top of the pump, (see Fig. 6.2). Oil using 4 to 5 drops of SAE20 weight non-detergent oil at each port. DO NOT OVER OIL.

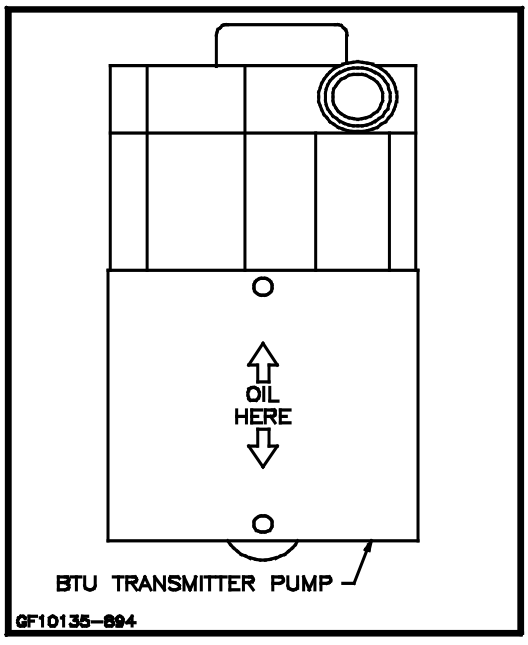


Figure 6.2
BTU Transmitter Pump Oil Hole Location

6.7 BTU TRANSMITTER ASSEMBLY

The BTU Transmitter is a crucial part of the unit's temperature control system. It must be inspected and kept free of scale and debris in order for the unit to maintain accurate outlet water temperatures.

To inspect the transmitter:

1. Place the ON\OFF switch in the OFF position.
2. Remove the sheet metal covers from the unit.
3. Shut the water inlet, outlet and recirculation valves to the unit.
4. Open the drain valve on the unit.
5. Slowly open the pressure relief valve to allow air-flow into the unit.
6. Drain the unit until the WATER LEVEL FAULT LED is illuminated. Drain slightly more, then release the relief valve and close the drain valve on the unit.
7. Disconnect electrical power to the unit.
8. Close the 3 ball valves on the BTU transmitter, (See Fig. 6.3).

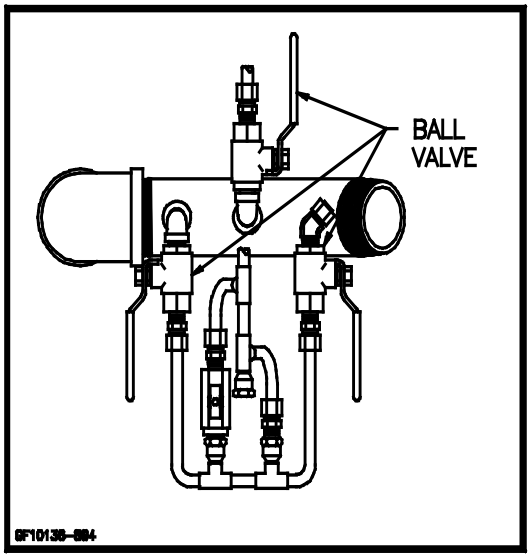


Figure 6.3
Ball Valve Locations

9. Remove the 4 screws holding the BTU transmitter pump to the impeller housing. Remove and set the pump aside, (See Fig. 6.4).

NOTE:
It is not necessary to disconnect the electrical wires to the pump

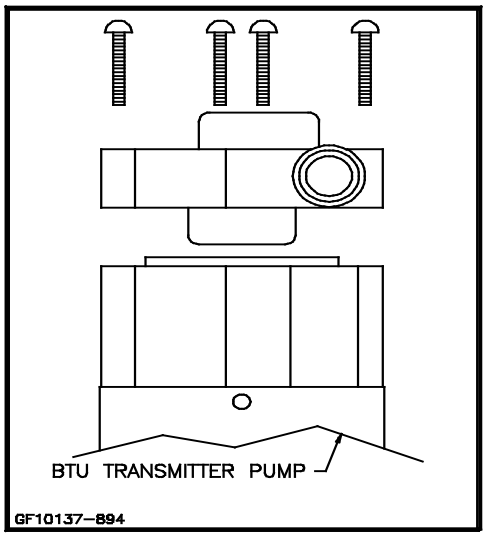


Figure 6.4
BTU Transmitter Pump Disassembly

10. Using a 5/8" and 9/16" wrench loosen the 4 compression fittings holding the lower tubing assembly in place, (See Fig. 6.5)

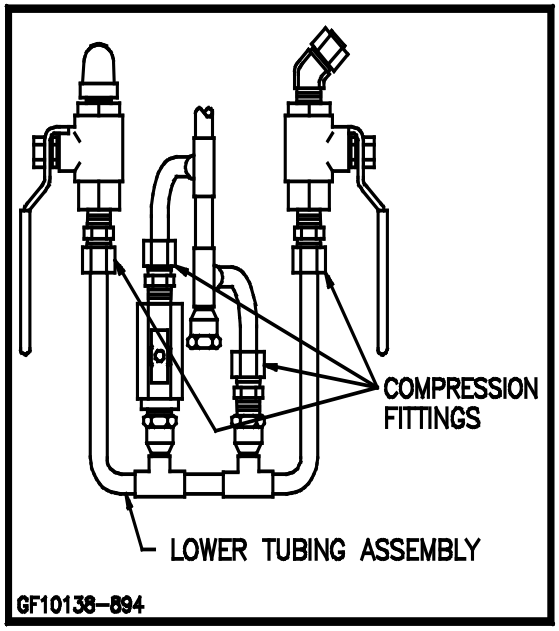


Figure 6.5
Compression Fitting Locations

11. Carefully remove the lower tubing assembly taking care not to lose either the cold water or hot water mixing orifice, (See Fig. 6.6).
12. Loosen the compression fitting holding the hydraulic zero and control orifice tube assembly to the pump's impeller housing, (See Fig. 6.6).

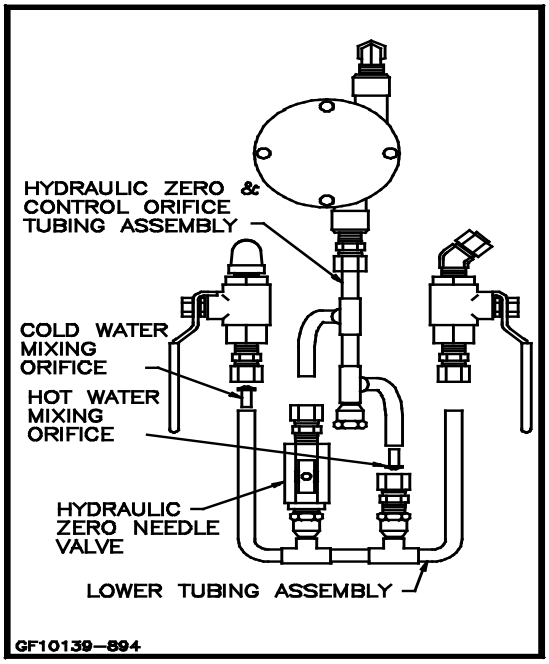


Figure 6.6
BTU Transmitter Disassembly

NOTE:
The cold water orifice is slightly larger than the mixing orifice. The orifice must be correctly installed for proper temperature control.

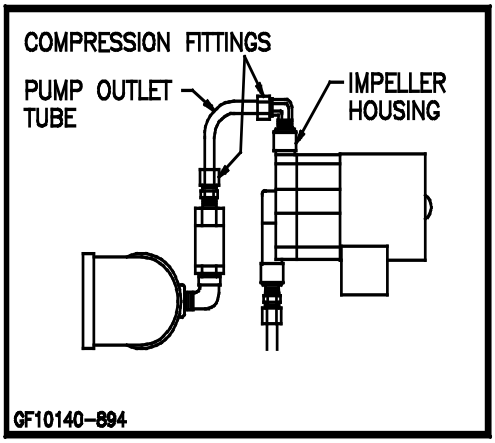


Figure 6.7
BTU Transmitter Pump Compression Fitting Locations

13. Remove the compression fitting at the top of the impeller housing and remove the impeller housing, (See Fig. 6.7).

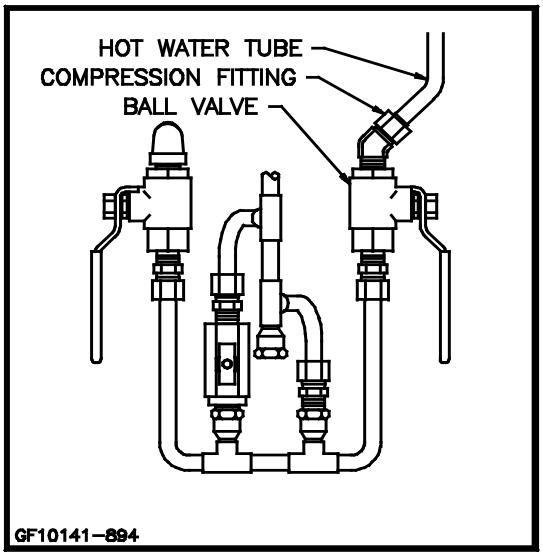


Figure 6.8
BTU Transmitter Hot Water Tube Disassembly

14. Remove the compression fitting securing the pump outlet tube to the ball valve and remove the pump outlet tube.
15. Remove the ball valve connected to the hot water tube coming from the top of the shell by loosening the compression fitting securing it to the hot water tube, (See Fig. 6.8).
16. Loosen the 90° compression fitting at the top of the shell holding the hot water tube, (See Fig. 6.9). Slide the hot water tube down slightly but do not remove it from the unit. Remove the 90° fitting.
17. Inspect all fittings and tubing for blockage due to scale or debris. Clean or replace as necessary.
18. Inspect the mixing orifice for blockage or degradation due to erosion, (See Fig. 6.6). Clean or replace as necessary.
19. The pump impeller may be checked by removing the 4 screws from the cover encasing the impeller in the housing, (See Fig. 6.10).

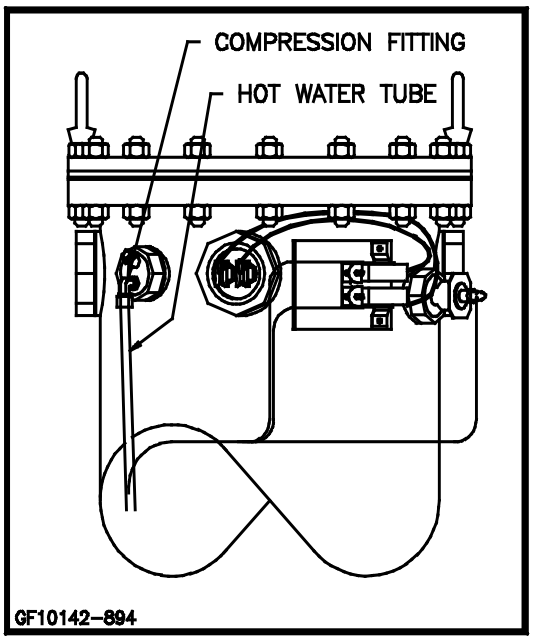


Figure 6.9
BTU Transmitter Shell Components

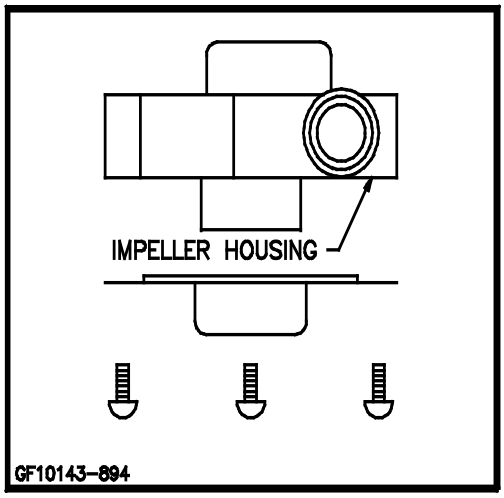


Figure 6.10
Impeller Housing Disassembly

21 Once the BTU transmitter has been inspected and cleaned, reassemble in the reverse order.

NOTE:
Do not attempt to adjust the Hydraulic Zero Needle Valve. This is a factory-preset item. Refer to Figure 6.6.

NOTE:
Compression fittings are nickel-plated and should be replaced only with nickel-plated fittings. Do not use brass fittings**.**

6.8 MANIFOLD AND EXHAUST TUBES

The presence of even trace amounts of chlorides and/or sulfur, in the combustion air and fuel sources, can lead to the formation of deposits on the inside of the exchanger tubes, the exhaust manifold, and/or the condensate cup. The degree of deposition is influenced by the extent of the condensing operation and the chloride and sulfur levels that vary significantly from application to application.

The following parts will be necessary for reassembly after inspection:

GP-122537	Exhaust Manifold to Combustion Chamber Gasket
GP-18900	Manifold to Tubesheet Gasket
GP-18899	Burner Gasket
GP-122551	Burner Release Gasket
GP-161151	Combustion Chamber Liner

To remove the manifold for inspection:

1. Disconnect AC power and turn off the gas supply to the unit.
2. Remove the sheet metal covers from the unit.
3. Disconnect the plastic tubing from the condensate cup to drain and remove the rear covers.
4. Remove the condensate cup from under the unit and the condensate drainage tubing from the manifold.
5. Disconnect the flame detector and ignition cable wires from the flame detector and ignitor contactor. Remove the flame detector and ignitor as per sections 6.2, and 6.3.
6. Remove the grounding terminal from the burner by loosening the upper screw and sliding the connector from the grounding rod, (See Fig. 6.11).
7. Using a 7/16” socket or open end wrench remove the four 1/4”-20 nuts on the gas inlet pipe flange at the burner, (See Fig. 6.12).
8. Using two 9/16” wrenches remove the 3/8"-16 hex nuts and bolts on the gas inlet pipe flange at the air/fuel valve, (see Fig. 6.12).

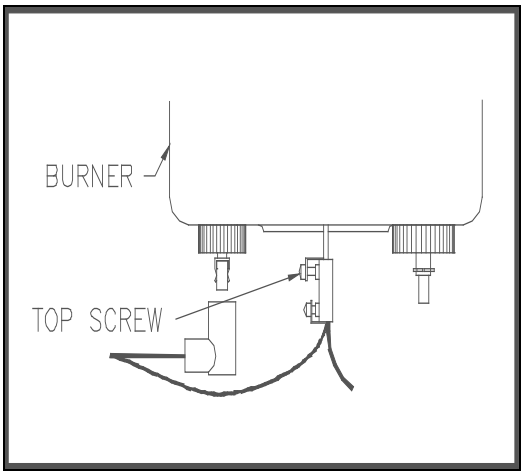


Figure 6.11
Grounding Terminal Location

9. Loosen the hose clamp at the air/fuel valve outlet and slide the clamp back towards the burner, (see Fig. 6.12).

10. Using a 1/2" socket wrench remove six 5/16-18 hex nuts supporting the burner, (see Fig. 6.12).

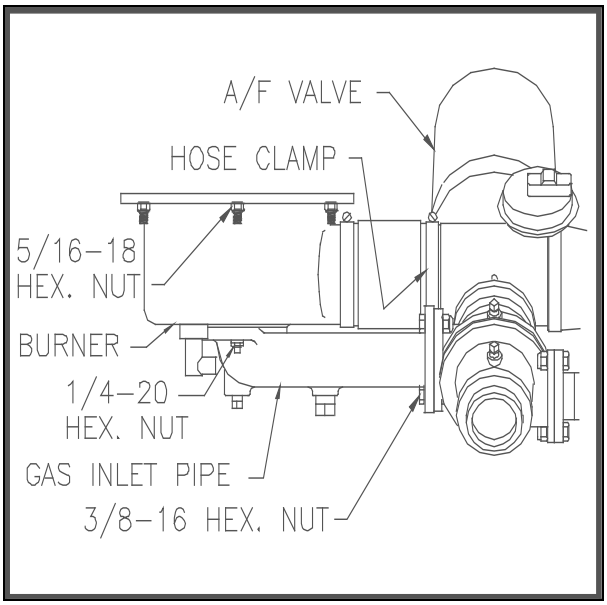


Figure 6.12
Burner Disassembly Diagram

11. Lower the burner while sliding the air hose off the air/fuel valve. Remove the burner through the rear of the unit.

12. Disconnect the exhaust temperature sensor by unscrewing it from the exhaust manifold, (See Fig. 6.13).

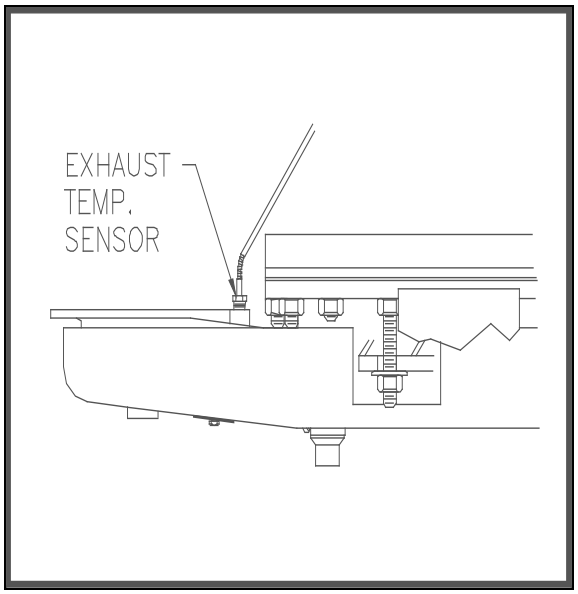


Figure 6.13
Exhaust Sensor Connector Location

13. Disconnect the air/fuel valve wire harness, the 12 pin connector, from the control panel.

14. Disconnect wires #24 and #17 from the blower proof switch (See Fig. 6.14).

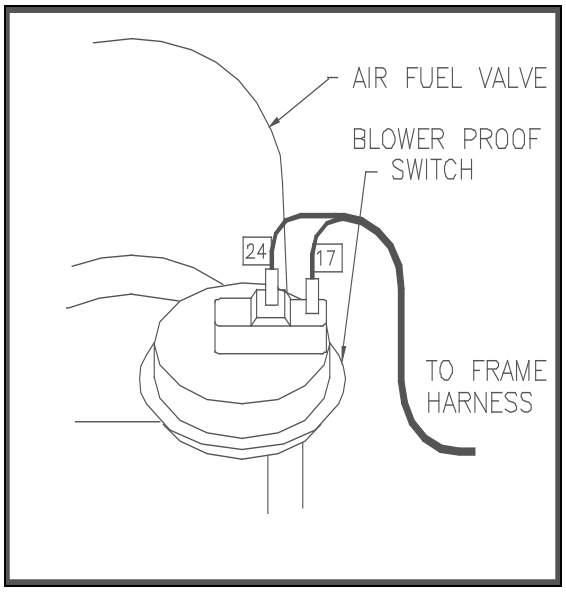


Figure 6.14
Blower Proof Switch Wire Locations

15. Loosen the hose clamp on the air/fuel valve inlet and slide the clamp back towards the blower, (See Fig. 6.15).

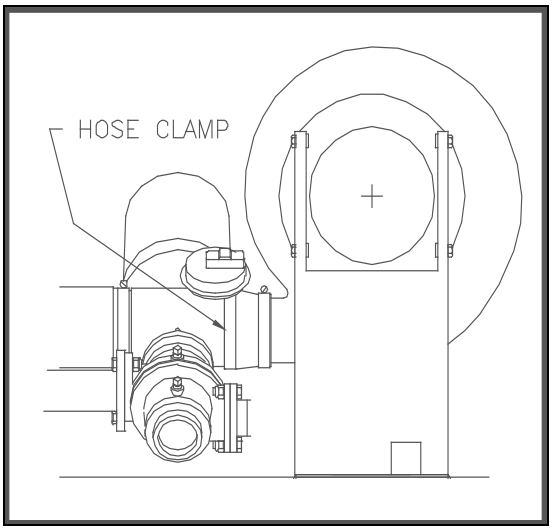


Figure 6.15
Air/Fuel Valve Inlet Hose Clamp

16. Using an 11/16” wrench, loosen the compression fittings on the feedback tube between the air/fuel valve and the differential pressure regulator. Remove the feedback tube, (See Fig. 6.16).

17. Using two 9/16” wrenches remove the two 3/8-16 hex nuts and bolts securing the air/fuel valve to the differential pressure regulator, (See Fig. 6.16).

18. Remove the air/fuel valve taking care not to damage the flange “O” ring.

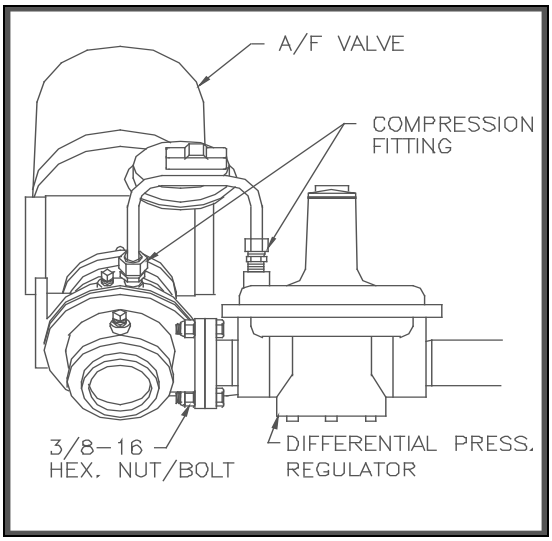


Figure 6.16
Feedback Tube and Air/Fuel Valve to Differential Regulator Bolts

19. Remove the flue venting from the exhaust manifold.

20. Removing the exhaust manifold insulation will prevent it from being damaged and will make it easier to handle the exhaust manifold once it is removed. Using a 7/16” wrench or socket remove the 3 bolts and fender washers securing the insulation to the exhaust manifold.

21. Loosen the three 1-1/16” nuts that hold the manifold. Remove the two side nuts**. DO NOT REMOVE THE FRONT NUT,** (See Fig. 6.17).

22. Carefully pull the manifold down and back, removing it through the back of the unit.

23. Inspect the manifold and exhaust tubes for debris. Clean out any debris as necessary.

24. Inspect the combustion chamber and the combustion chamber liner. Replace the liner if any signs of cracking or warpage are evident.

NOTE:
Install the combustion chamber liner prior to reinstalling the exhaust manifold

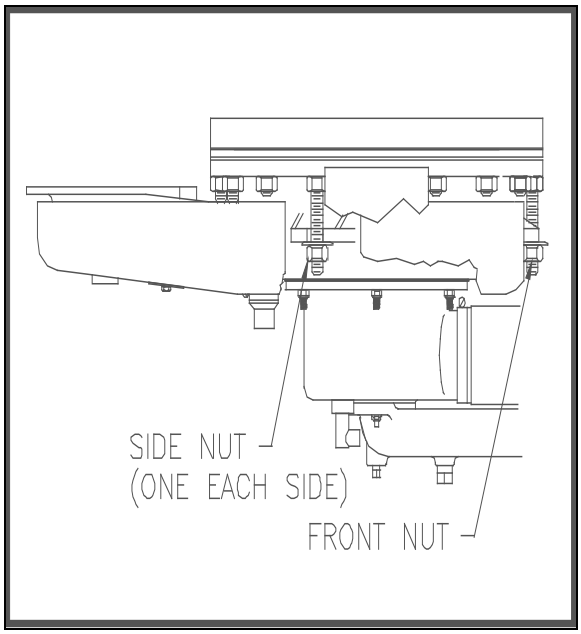


Figure 6.17
Manifold Nut and Bolt Locations

25. Replace the gasket between the manifold and the combustion chamber (P/N GP-

122537). The use of Permatex or a similar gasket adhesive is recommended.

26. Replace the gasket between the manifold and tubesheet (P/N GP-18900). Do not use any gasket adhesive; this gasket has an adhesive backing

27. Beginning with the manifold, reinstall all the components in the reverse order that they were removed.

6.8.1 PROPANE UNITS

For propane units it will be necessary to remove the air mix assembly in addition to the steps outlined in Section 6.8. Proceed as follows:

1. Follow steps 1 through 5 under Section 6.8

2. Using a wrench, loosen the two compression fittings holding the 1/4" feedback tube between the burner and air regulator and remove the feedback tube. (See Fig. 6.18)

3. Using a 1-1/16" wrench or an adjustable wrench loosen and remove the 12" flexible gas hose.

4. Proceed back to Section 6.8 and continue at Step #6.

NOTE:
Older propane units have a 1/8" Feedback Tube and 1/8" OD tube compression fittings.

6.9 HEAT EXCHANGER INSPECTION

The water-side of the heating surfaces may be inspected by removal of the top heater head. (See Fig.'s 6.19 & 6.20) The following gaskets will be needed prior to performing the inspection:

GP-18856	Release Gasket
GP-18532	Shell Gasket

NOTE:
This manual covers two different style heater heads. The newer is a flat head, the older is a concave head**.**

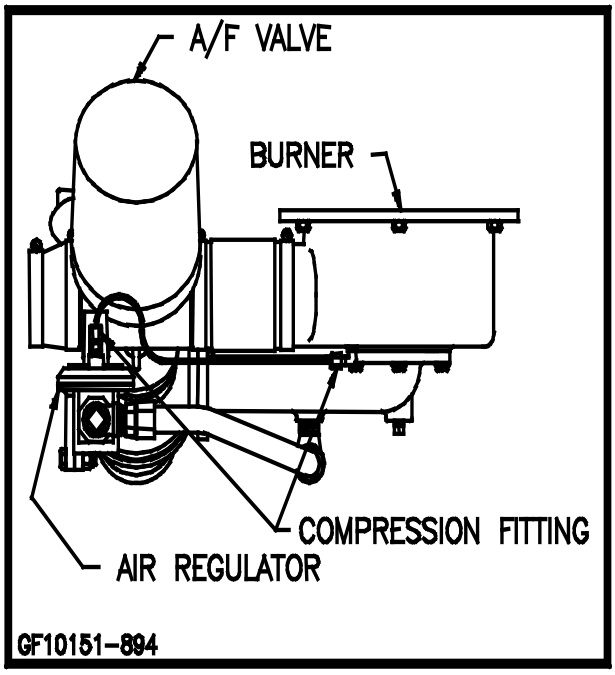


Figure 6.18
Propane Air Regulator Measuring Taps

6.9.1 FLAT (NEW) STYLE HEAD

To inspect the heat exchanger watersides:

1. Disconnect the electrical power to the unit.

2. Close the water inlet, outlet, and recirculation shut-off valves to the unit.

3. Open the drain valve carefully while opening the relief valve on the right side of the unit shell to relieve pressure and allow air into the shell.

CAUTION!
Do not drain the unit without venting the shell! A vacuum in the unit may displace the liner causing serious damage not covered by warranty.

4. Remove the wing nut from the top center of the shell cap and remove the cap.

5. Remove the nuts and studs from the upper head. Remove the upper head and upper head-liner, (See Fig. 6.19).

6. Inspect and clean the heat exchanger tubes of scale and all gasket surfaces thoroughly before reassembling the upper head. AERCO recommends that **NEW** gaskets be used when reassembling.

7. Place a shell head gasket on top of the shell ring first, then place the release gasket on top of the shell head gasket. Align the gasket holes with those in the shell ring.

8. Place the upper head liner on top of the gaskets.

9. Place the upper head on next aligning the holes.

10. Reassemble the studs and nuts through the upper head and shell ring. Cross tighten the nuts to approximately 75 ft./lb. torque to obtain a uniform seating, then progressively tighten the nuts to 150 ft./lb.

11. Replace the unit Cap. Close the drain valve and reopen the inlet, outlet, and recirculation valves to refill the unit as per Section 2.8.1.

6.9.2 CONCAVE (OLD) STYLE HEADS

To inspect the heat exchanger watersides:

1. Disconnect the electrical power to the unit.

2. Close the inlet, outlet and recirculation shutoff valves to the unit.

3. Open the drain valve while carefully opening the relief valve on the right side of the unit shell to relieve pressure in the shell.

4 Remove the wing nut from the top center of the shell cap and remove the cap.

CAUTION:
Do not drain the unit without venting the shell! A vacuum in the unit may displace the liner reulting in damage not covered by warranty.

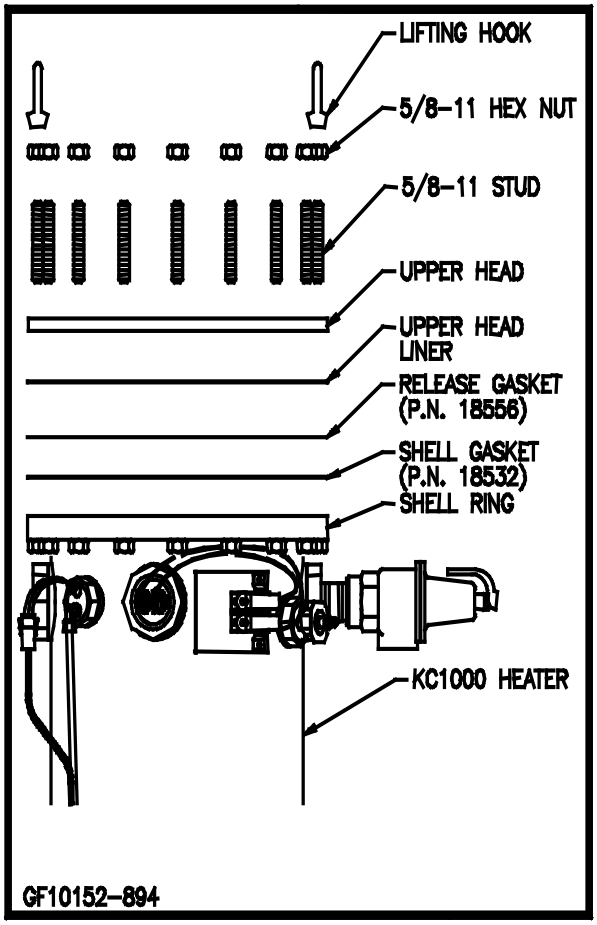


Figure 6.19
Flat Style Head Configuration

5. Remove the nuts and studs from the shell ring and remove the upper head ring. Remove the upper head and head liner, (See Fig. 6.20).

6. Inspect and clean the heat exchanger thoroughly before reassembling the upper head.

7. Clean all gasket surfaces thoroughly. AERCO recommends that **NEW** gaskets be used when reassembling the upper head to the unit shell.

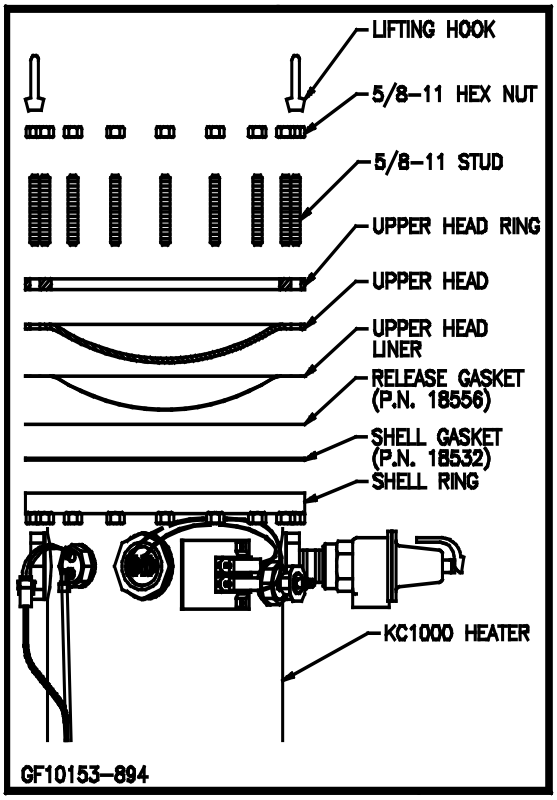


Figure 6.20
Concave Style Head

8. Place the shell gasket then the release gasket on top of the shell ring and align the gasket holes with those in the flange.

9. Place the upper head liner (dimple facing in/down) on top of the gasket, with all holes aligned. Then place the upper head on the upper head liner.

10. Place the upper head ring on top of the upper head.

11. Reassemble the studs and nuts through the upper head and shell ring. Cross tighten the nuts to approximately 75 ft./lb, to obtain uniform seating, and then progressively tighten the nuts to 150 ft./lb.

SECTION 7- TROUBLESHOOTING GUIDE

This troubleshooting section is intended to serve as a guideline to determining and solving faults on the unit. Whenever a fault occurs, proceed as follows:

1. Determine the cause of the fault by following the procedures within this section.
2. Once the cause has been determined, take the proper actions to remedy the fault.
3. Start the unit in accordance with this manual.

In the event that a fault cannot be remedied, contact your local AERCO Representative or the factory for Technical Assistance.

WARNING!
ELECTRIC SHOCK HAZARDS EXIST THAT CAN CAUSE SEVERE INJURY. DISCONNECT POWER BEFORE PERFORMING ANY MAINTENANCE AND/OR SERVICING.

WARNING!
NEVER JUMPER (BY-PASS) ANY SAFETY DEVICE. DAMAGE, OR PERSONAL INJURY COULD RESULT. USE AN OHM METER FOR CHECKING CONTINUITY ON SAFETY DEVICES.

WARNING!
TROUBLESHOOTING PROCEDURES, AS OUTLINED IN THIS SECTION, MUST BE PERFORMED BY QUALIFIED SERVICE PERSONNEL.

7.1 LOW GAS PRESSURE

The LOW GAS PRESSURE message indicates that gas pressure has gone below 7" W.C., tripping the low gas pressure switch.

7.1.1 LOW SUPPLY GAS PRESSURE
7.1.2 GAS PRESSURE SWITCHES

Recommended Troubleshooting Equipment:
16" Manometer
Analog or Digital Ohmmeter

7.1.1 LOW SUPPLY GAS PRESSURE

1. Install a manometer in the unit manifold as per Section 4.2.1
2. Check the static pressure to the unit. It should be 10" to 12" W.C.
3. If the static pressure to the unit is lower than 10" W.C., readjust the supply regulator until it's output is 10" to 12" W.C. If a static supply pressure of 10" to 12" W.C. cannot be obtained, proceed to Step 8.
4. If static pressure is already 10" to 12" W.C. or you have readjusted the static supply pressure, start the unit.
5. If gas pressure drops to below 7" W.C. during the Ignition cycle, proceed to Step 8.
6. If gas pressure does not drop below 7" W.C. in any one of the above steps slowly increase the input percentage in steps of 10% while monitoring gas pressure.
7. If gas pressure drops below 7" W.C. tripping the gas pressure switch, proceed to step 8.
8. If gas pressure stays within the unit's specifications of 8.5" at maximum firing rate and has a maximum static pressure of 14" proceed to Section 7.1.2.
9. Check the gas pressure to the unit's supply regulator. It should be 14" W.C. or greater. If the supply pressure is 14" W.C. or greater, check the supply regulator and supply piping for correct sizing.

7.1.2 GAS PRESSURE SWITCHES

1. If static pressure to the unit is correct, disconnect electric power to the unit. Remove wires #20 & #32 from the low gas pressure switch.
2. Using an ohmmeter, check the gas pressure switch for continuity. Be sure that the gas supply to the unit is on.
3. Replace the switch if it does not show continuity.
4. If the switch shows continuity, reconnect wires #20 and #32 to the switch. Remove the 15-pin connector from the control panel.

5. Referring to system schematic 161412 in the Appendix, locate and check continuity in wires #20 and #32 from the fifteen pin connector through the switch and back to the connector.

6. If there is no continuity, check for loose connectors at the switch end of the wires. Check the pins in the 15-pin connector for proper insertion or signs of wear.

7. If the 15-pin connector and the switch connections are okay, reconnect the 15-pin connector to the control panel. Restore electric power.

If the gas pressure fault does not clear it will be necessary to troubleshoot the control panel. Contact a qualified service technician or your local AERCO representative for more information.

7.2 HIGH EXHAUST TEMPERATURE

A HI EXHAUST TEMP message indicates that the exhaust temperature has exceeded 500°F. This fault only indicates on the display and WILL NOT SHUT DOWN the unit. The fault LED and the fault relay will trip indicating the fault.

A high exhaust temperature is an indication that the unit has a carbon coating on the fireside of the heat exchanger exhaust tubes. This condition results in a loss of heat transfer and therefore high exhaust temperatures. Carbon buildup can be due to due to improper combustion calibration, a defective air or fuel component, improper stop\start levels or improper supply gas pressure. The unit should be combustion calibrated to determine if one of the above is responsible. Refer to section 4.4 for combustion calibration, or contact your local AERCO representative further assistance.

7.2.1 Exhaust Temperature Sensor
7.2.2 Wiring & Connections

Recommended Troubleshooting Equipment
Digital Ohmmeter
Digital Temperature Meter

7.2.1 EXHAUST TEMPERATURE SENSOR

1. Start the unit and wait for the HI EXHAUST TEMP. message to display

2. Using an accurate temperature measurement device, measure the actual flue gas temperature. If the exhaust sensor measurement is less than 500°F, and pressing the clear button does not clear the fault message, shut the unit off and remove AC power from the unit.

3. Disconnect the exhaust sensor wires from the field wiring box.

4. Check continuity between the sensor wires. (ensure that the sensor has cooled below 400°). If there is continuity, replace the exhaust sensor.

5. If there is no continuity and the exhaust temperature fault will not clear, combustion calibrate the unit as per Section 4.4.

7.3 LOW WATER LEVEL

A LOW WATER LEVEL message indicates that water level in the unit is too low. Check that the shutoff valves on the supply and return of the unit are open and that there is water in the shell. (Momentarily opening the relief valve and looking for a strong flow of water will verify that the unit shell has sufficient water level). If the unit has water sufficient water level try to reset the unit by pressing the low water level reset button and the Annunciator clear button. If the unit fires but the message will not clear, replace the Annunciator. If the unit does not fire and the message will not clear, check the following.

7.3.1 Water Level Probe
7.3.2 Wiring & Connections
7.3.3 Water level Circuit

Recommended Troubleshooting Equipment
- Digital Volt/Ohmmeter

7.3.1 WATER LEVEL PROBE

1. Disconnect the electric power to the unit.

2. Remove the unit cap and remove wire #25 from the water level probe.

3. Connect an AC voltmeter between wire #25 and the unit frame.

4. Reapply electrical power to the unit. The AC voltmeter should read approximately 12 VAC. If approximately 12 VAC is not read on the AC voltmeter, proceed to section 7.3.2.

5. If 12 VAC is read on the AC voltmeter, disconnect power to the unit and ground the probe to the unit shell.

6. Restore electrical power to the unit. If the fault does not clear, proceed to section 7.3.3. If the fault clears replace the probe.

7.3.2 WIRING AND CONNECTIONS

1. Disconnect electric power to the unit.

2. Disconnect wire #25 from the water level probe and unplug the 9-pin connector from the control box.

3. Referring to system schematic 161412 in the Appendix, locate wire #25.

4. Using an ohmmeter check wire #25 for continuity

5. If wire #25 does not have continuity, repair as necessary.

6. If wire #25 has continuity, check the probe end of the wire for a loose connector.

7. Check the pin in the 9-pin connector for proper insertion or signs of wear.

8. If the connector and pin are okay, reconnect wire #25 to the water level probe.

9. Restore the 9-pin connector to the control panel.

10. Restore electric power to the unit. If the water level fault does not clear, see Section 7.3.3.

7.3.3 WATER LEVEL CIRCUIT

1. Remove power from the unit.

2. Open the control panel to expose the wiring and internal components.

WARNING!
This a 120 VAC system.
A shodk hazard exists.

3. Locate the low water level switch as shown in Appendix E.

4. Remove wires #96 and #99 from terminals LLCO and G.

5. Using an ohm meter, check continuity between wire #96 in the control box, and wire # 25 on the unit. Also check continuity between wire #99 in the control box and the unit's shell or frame.

6. If there is no continuity repair as necessary. If there is continuity, replace the low water level circuit.

7.4 HIGH WATER TEMPERATURE

A HIGH WATER TEMPERATURE fault indicates when the temperature of the discharge water has exceeded the setpoint of the over temperature switches.

First try to clear the fault message from the Annunciator and start the unit. If the unit fires but continues to display a HIGH WATER TEMP message, replace the Annunciator. If the fault message will not clear and the unit does not fire check the following.

7.4.1 Determining the Cause
7.4.2 Over Temperature Limit Switches
7.4.3 BTU Transmitter Pump
7.4.4 Temperature Sensors

Recommended Troubleshooting Equipment
Digital Voltmeter
Digital Ohmmeter

7.4.1 DETERMINING THE CAUSE

Remove the unit cap to expose the over temperature limit switches. Check the setpoint of the unit and the setpoint of the lower over temperature switch. The lower over temperature switch must be set a minimum of 20°F higher than the setpoint of the unit. Make adjustments if necessary.

1. If the over temperature switch was correctly set, 20°F above the unit setpoint, check that the feedback is set to ON in the temperature controller.

2. If the feedback was on, check that the 3 ball valves on the BTU Transmitter are open.
3. Check that the BTU transmitter is running. If the pump is not running, proceed to section 7.4.3.

4. If all the above are okay but the High Water Temp fault persists, recalibrate the unit for temperature control as per Section 4.7.

5. If the unit cannot be temperature calibrated, The BTU transmitter must be checked for scale or blockage as per Maintenance Section 6.7.

6. If the BTU transmitter has no blockage or scale, check the temperature sensor probes as per Section 7.4.4.

7. Reset the unit and if necessary, the upper over-temperature limit switch. If the unit will not reset proceed to section 7.4.2.

7.4.2. OVER TEMPERATURE LIMIT SWITCHES

1. Disconnect electrical power to the unit.
2. Raise the temperature limit switch setpoint a minimumof 10^0 F above the actual discharge water temperature.
3. Referring to system schematic 161412 in Appendix F, remove wires #18 and #33 from the lower switch and wires #19 and #33 from the upper switch.
4. Using an ohmmeter, check for continuity across the C, common, and NC, normally closed, terminals of both switches.
5. Replace the switches if either or both show no continuity
6. If the switches show continuity, disconnect the 15-pin connector from the control panel.
7. Using an ohmmeter, check wires #18, #19 and #33 back to the 15-pin connector for continuity.
8. Check for loose connectors on the switch end of wires #18, #19 and #33.]
9. Check the pins of the 15-pin connector for proper insertion or wear.
10. If the connectors, pins, and continuity are okay, restore wires #19 and #33 to the lower switch and wires #18 and #33 to the upper temperature switch.
11. Restore the 15-pin connector to the control panel.
12. Reapply electrical power to the unit.
13. If the over temperature fault does not clear consult your local AERCO representative or contact aqualified service technician.

7.4.3 BTU TRANSMITTER PUMP

1. Disconnect electric power to the unit.
2. Referring to system schematic 161412 in Appendix F, locate wires #10, #30, and #31.
3. Remove the wire nuts from wires #10 and #31 and connect an AC voltmeter across wires #10 and #31.
4. Restore electric power to the unit.
5. If there is 120 VAC across wires #10 and #31, and the pump is not runing, replace the pump.
6. If 120 VAC is not present across wires #10 and #31, disconnect electric power to the unit.
7. Disconnect the 9-pin connector from the control panel and remove the cover from the unit's AC wiring box.
8. Check for continuity in wires #10, #30 and #31. Check for loose connections on wires #30 and #31 located in the AC wiring box.
9. Check the pin in the 9-pin connector for proper insertion or signs of wear.
10. If all wire connectors and pins are okay, replace the control panel.

7.4.4. TEMPERATURE SENSORS

1. Close off the shutoff valves on the water inlet and outlet lines of the unit. Close off any recirculation lines to the unit.
2. Drain the unit while venting the shell, through the relief valve, until a water level fault light is observed.
3. Drain slightly more, then close the drain valve.
4. Close off the three ball valves on the BTU transmitter assembly.
5. Disconnect and remove the BTU transmitter sensor.
6. Remove the unit cap. Disconnect and remove the header sensor.
7. Allow the sensors to cool to ambient temperature.
8. Referring to the Temperature Sensor Chart in Appendix C of this manual, measure the resistance of the probe and determine the corresponding temperature from the chart.
9. Compare the reading with the ambient room temperature. If there is a significant discrepancy, greater than 10^o F, replace the erroneous sensor.

10. Place the entire length of the sensors in a water bath of known temperature. Measure the resistance of the probe, and determine the corresponding temperature from the temperature sensor chart. If there is a significant discrepancy, greater than 10°F then replace the sensor.

11. Disconnect the 6 pin connector from the control panel.

12. Referring to system schematic 161412 in Appendix F, locate wires #1, #2, #3, #4 and #5.

13. Check all wires for continuity and all connectors for proper pin insertion and/or worn pins. Repair as necessary.

14. If the sensors wiring and connectors are okay. Place a 1000Ω ± 1% accuracy resistor across the pins in the plugs that the sensors were removed from.

NOTE:
The resistors must be placed across the pins simultaneously to get accurate readings.

NOTE:
If the sensors are removed and power is applied to the unit the message bAd.InP will be displayed on the temperature control. To clear this error press and hold the INDEX and ENTER buttons simultaneously.

15. Reapply power to the unit.

16. Check the temperature control displays tout in the primary menu and FFt in the secondary menu. They should both read 70°F ± 10°F.

17. Place a 1.3 KΩ ± 1% resistor across the pins in the plugs that the sensors were removed from.

18. The temperature controller displays tout in the Primary menu and FFt in the Secondary menu should read 196° F ±10° F.

19. If the temperatures displayed are not within tolerance the control should be replaced.

NOTE:
If the display reads UFL or OFL or bAd InP, this is an indication that the sensor wires are shorted or in an open circuit condition, which may indicate a wiring problem.

20. If the sensors wiring and connectors are okay, reinstall the sensors.\

21. Reconnect the connectors to the sensors and control panel, ensuring that they lock firmly into place.

22. Refill the unit as per Section 2.8.1.

23. Restore electrical power to the unit.

7.5 LOCKOUT RUN FLAME

A LOCKOUT RUN FLAME message indicates that the flame signal was lost after the unit proved flame and was released to modulate. A FLAME FAULT DURING IGN TRIAL message indicates that flame was not recognized during the ignition trial period.

7.5.1 Flame Fault While Firing
7.5.2 Flame Fault During Ignition Cycle
7.5.3 Safety Shut Off Valve
7.5.4 Spark Ignitor
7.5.5 Flame Detector
7.5.6 Ignition Circuit
7.5.7 Air Fuel Valve Ignition Position witch
7.5.8 Flame Detector Voltage
7.5.9 Residual Flame

Recommended Troubleshooting Equipment
Digital or Analog Voltmeter
Combustion Analyzer
and 16" Manometers

7.5.1 FLAME FAULT WHILE FIRING

1. Install a DC voltmeter in the flame test jacks located on the front of the combustion safeguard. Start the unit in manual mode

2. Once flame is established, a steady reading of approximately 5 VDC should be observed.

3. While in manual mode, fire the unit at various firing rates (i.e., 16%, 30%, 50%, 100% etc.)

4. If flame signal is erratic at any time during the test, combustion calibrate the unit as per Section 4.this manual.

5. If combustion calibration is okay, remove the burner and inspect it for debris that may have fallen on it.

7.5.2 FLAME FAULT DURING IGNITION TRIAL

1. Check that all gas supply valves are open

2. If the gas supply valves were open, restart the unit.

3. Remove the cover to the Air Fuel Valve. Ensure that the Air Fuel Valve rotates to the ignition position, and engages the ignition position switch. If the air\fuel valve does not rotate to the ignition position, proceed to Section 7.7.7.

4. If the air\fuel valve rotates and engages the ignition position switch during the trial for ignition, then visually watch/inspect the safety shutoff valve, through the window on the actuator half, to determine if it is opening.

NOTE:
At the ignition cycle, the low fire switch is made, and the safety shutoff valve is energized. The *OPEN* disk in the safety shut-off valve actuator window should slowly move downward indicating that the valve is operating correctly. If the valve does not open, proceed to Section 7.5.3

5. If the safety shutoff valve opens, check the spark ignitor as per Section 7.5.4 and the flame detector, as per Section 7.5.5.

6. If the spark ignitor and flame detector are okay, or require replacement and the flame fault persists, check the ignition circuit as per Section 7.5.6.

7. If the flame fault persists after checking the above, measure the flame detector lead voltage as per Section 7.5.8.

8. If the flame fault persists, after checking the above, remove the burner and inspect for debris.'

9. If the flame fault persists after the above, replace the combustion control.

7.5.3 SAFETY SHUTOFF VALVE

1. Start the unit.

2. When the starting sequence reaches the Ignition trial cycle, observe the response of the safety shutoff valve through the window in the actuator portion

3. If the actuator does not open the valve, disconnect electrical power to the unit.

4. Remove the actuator portion from the valve body and inspect for signs of leaking hydraulic fluid.

5. If the actuator is not leaking, set it back on the valve body and remove the cover plate exposing the control wiring.

6. Temporarily re-secure the actuator to the valve body with the control wiring facing outward for easy access.

7. Referring to system schematic 161412 in Appendix F, connect an AC voltmeter across wires #14 and #28.

8. Restore electrical power to the unit.

9. Start the unit.

10. At the ignition trial cycle 120 VAC should be observed on the AC voltmeter.

11. If 120 VAC is observed on the voltmeter, replace the safety shutoff valve actuator.

12. If 120 VAC is not observed on the AC voltmeter, disconnect electrical power to the unit.

13. Disconnect the 9-pin connector from the control panel, and remove the cover from the AC wiring box.

14. Referring to system schematic 161412 in Appendix F, locate wire's #14, #28 and #27 and check each for continuity.

15. Check each wire for loose connectors at the safety shut-off valve end. Check wires #28 and #27 for loose connectors in the KC1000 AC wiring box

16. Check the pin on wire #9 at the 9-pin connector end, for proper insertion or wear.

17. If all wires show continuity and all connections are okay, reconnect wire's #14, #28 and #29 to the safety shutoff valve and wires #28 and #29 to their proper locations in the AC wiring box.

18. Replace the cover plates on the safety shutoff valve actuator and the AC wiring box.

19. Reconnect the 9-pin connector to the control panel ensuring that it locks into place.

20. Restore electrical power to the unit and restart the unit.

21. If the safety shutoff valve still does not open, proceed to section 7.7.8.

22. Be sure to return the safety shutoff valve to its original position and replace all cover plates.

7.5.4 SPARK IGNITOR

1. Disconnect electrical power to the unit.

2. Remove the spark ignitor as per Maintenance Section 6.3 of this manual.

3. Inspect the ignitor for signs of erosion.

4. Replace the ignitor if eroded.

Check for carbon buildup on the ignitor.

5. If there is carbon build-up on the ignitor, the combustion calibration settings must be checked as per Section 4. If the spark ignitor is not eroded, it may be cleaned and reused.

7.5.5 FLAME DETECTOR

1. Disconnect electrical power to the unit.

2. Remove the flame detector as per Maintenance Section 6.3.

3. Check the detector for signs of erosion or carbon buildup.
4. If the flame detector is eroded, replace it. Otherwise, clean it using emery cloth.

5. Carbon buildup on the flame detector indicates that unit may require combustion calibration.

6. Check the combustion calibration settings as per Start-Up Sections 4.3 and 4.4.

7.5.6 IGNITION CIRCUIT

1. Disconnect electrical power to the unit.

2. Close the manual-leak detection valve, located between the safety shutoff valve and the differential pressure regulator, on the unit's gas manifold.

3. Using either a spare ignitor, connect the ignition cable directly to the ignitor.

4. Ground the ignitor to the frame of the unit.

5. Restore electrical power to the unit.

6. Start the unit.

7. At ignition, an arc should be observed. It should last for approximately 15 seconds.

8. If there is no arc, disconnect electrical power to the unit.

WARNING!

ELECTRIC SHOCK HAZARD. THE SECONDARY OF THE IGNITION TRANSFORMER HAS A POTENTIAL OF 6000 VOLTS. DO NOT HOLD OR TOUCH ANY IGNITION CIRCUIT COMPONENTS WHILE TESTING.

9. Remove the ignition cable and check it for continuity or loose connections.

10. Replace the cable if there is no continuity. If there is a loose connection, replace or repair the cable as necessary.

11. If the ignition cable is okay, remove the ignition transformer cover plate.

12. Referring to system schematic 161412 in Appendix F, locate wires #12 and #29.

13. Connect an AC voltmeter across wires #12 and #29.

14. Restore electrical power to the unit and start the unit.

15. At the ignition cycle check for 120 VAC across wires #12 and #29.

16. If 120 VAC is observed across wires #12 and #29, replace the ignition transformer.

17. If 120 VAC is not observed on the AC voltmeter during the Ignition cycle, disconnect electrical power to the unit.

18. Disconnect the 9-pin connector from the control panel, and wires #12 and #29 from the ignition transformer.

19. Remove the cover plate from the AC wiring box.

20. Referring to system schematic 161412 in the Appendix, check wires #12 and #29 for continuity.

21. If wires #12 and #29 have continuity, inspect the pin on wire #12 in the 9-pin connector for proper insertion or signs of wear

22. Inspect the connector on wire #29 at the AC wiring box end for a loose connection.

23. Make any necessary repairs.

24. Once all wiring and connections have been inspected or repaired, reconnect wires #12 and #29 to the ignition transformer. Reconnect wire #29 to its proper position in the AC wiring box.

25. Reconnect the 9-pin connector to the control panel ensuring it is locked into place.

26. Reinstall the cover plates on the ignition transformer and the AC wiring box.

27. Be sure to reinstall the spark ignitor and ignitor contactor if necessary and reconnect the ignition cable to the ignition transformer and the ignition contactor.

28. Reopen the leak detection valve.

29. Restore electrical power to the unit and start the unit.

30. If the flame fault persists, replace the Combustion Control

7.5.7 FLAME DETECTOR VOLTAGE

1. Disconnect electrical power to the unit.

2. Remove the flame detector lead wire from the flame detector.

3. Connect an AC voltmeter between the flame detector lead wire and the unit's frame.

WARNING!
A SHOCK POTENTIAL OF 230 TO 400 VAC EXISTS ON THE FLAME DETECTOR LEAD WIRE.

4. Restore electrical power to the unit.

5. An AC voltage reading of approximately 345 VAC should be observed.

6. If 345 VAC is observed, proceed to Section 7.6.2, Step 8.

7. If 345 VAC is not observed, disconnect electrical power to the unit.

8. Disconnect the 9-pin connector from the control panel.

9. Referring to system schematic 161412 in Appendix F, locate wire #9.

10. Check wire #9 for continuity

11. Check the flame detector end of wire #9 for loose connections. Inspect the pins in the 9-pin connector for proper insertion and signs of wear.

12. Repair if necessary.

13. If wire #9 has continuity and all connections are okay or a repair was performed, reconnect the flame detector lead to the flame detector. Reconnect the 9-pin connector to the control panel.

14. Restore electrical power to the unit and restart the unit.

15. If the flame fault persists, replace the combustion control.

7.5.8 RESIDUAL FLAME

Once the KC1000 has stopped firing, it continues to monitor the flame circuit. If a residual flame exists, the unit will indicate a LOCKOUT fault. The source of a residual flame is a leaking safety shutoff valve. To check for a leaking safety shutoff valve proceed as follows:

1. Shut the unit off by switching the ON-OFF switch to the Off position

2. Locate the leak detection valve, between the safety shutoff valve and the differential pressure regulator.

3. Shut the valve and remove a set-screw from its 1/8" leak detection port.

4. Install an 8" or 16" manometer.

5. Monitor the manometer for signs of an increase in gas pressure.

6. If there is an increase in gas pressure, replace the gas train.

7.6 LOCKOUT RUN AIR FLOW

A LOCKOUT RUN AIR FLOW indicates that the air pressure while running is too low for operation. Oscillations or rumbling of the unit is also a common cause of Air Pressure faults.

Recommended Troubleshooting Equipment
AC Voltmeter
Ohmmeter

7.6.1 DETERMINING THE CAUSE OF THE FAULT

1. Clear the Annunciator and restart the unit.
2. If the unit does not fault after proving flame, proceed to Section 7.6.2.
3. If the blower does not start, proceed to Section 7.6.3.
4. If the blower starts but the Annunciator displays LOW AIR FLOW, proceed to Section 7.6.4.
5. If the unit has sealed combustion air ducted in right up to the blower, check the ducting for blockage.
6. If combustion air is ducted into the room or brought in through a louver, ensure that the sizing is adequate and that the louvers are open while the unit is firing.

7.6.2 OSCILLATIONS

Oscillations, also known as rumbling, typically occur when the air/fuel mixture is too lean. This causes the flame to burn at various distances from the burner at a rapid pace. Oscillations create pressure waves that can trip the air pressure switch shutting the unit down on an air pressure fault.

1. Start the unit in manual mode. Be sure to have sufficient water flow through the unit to avoid over temping.
2. Slowly increase the firing rate percentage while listening to the unit.
3. If a rumbling sound is heard when approaching firing rates above 75%, combustion calibrate the unit as per section 4 of this manual.

7.6.3 BLOWER

1. Disconnect power to the unit.
2. Remove the cover plate from the AC wiring box.
3. Locate wire #13 and the blower hot lead wire inside the AC wiring box. They will be the only two wires connected by a wire nut.
4. Remove the wire nut and separate wire #13 from the blower hot lead wire.
5. Connect an AC voltmeter between wire #13 and the unit frame.
6. Restore electrical power to the unit.
7. Restart the unit.
8. The AC voltmeter should display 120 VAC.
9. If 120 VAC is not displayed, proceed to section 7.6.5.
10. If 120 VAC is displayed, check the blower capacitor using an analog ohmmeter or substitute the capacitor.
11. If the capacitor is okay or has been substituted and the blower still does not start, replace the blower.

7.6.4 BLOWER PROOF SWITCH

1. Remove wires #17 and #24 from the blower proof switch
2. Connect an ohmmeter across the blower proof switch and restart the unit.
3. The blower proof switch should show continuity with the blower running.
4. If the blower proof switch does not show continuity, remove the switch and check for signs of blockage. Remove any debris and reinstall the switch. Retest as per Steps 2 through 3.
5. If the blower proof switch shows continuity, disconnect electrical power to the unit.
6. Disconnect the 15-pin connector from the control panel.

7. Referring to system schematic 161412 in Appendix F, locate wire #17 and #24 and check both for continuity.

8. Check the switch end of wires #17 and #24 for loose connections.

9. Check the pins on the 15-pin connector for proper pin insertion or wear.

10. If continuity, the connector, and pins are okay, reconnect wires #17 and #24 to the blower proof switch.

11. Reconnect the 15-pin connector to the control panel.

12. Restore electrical power to the unit and start the unit.

13. If the blower proof fault persists, replace the Combustion Control

7.6.5 SOLID STATE RELAY

1. Open the control box and locate the solid state relay.

2. Locate wire 81 on terminal 6 of the relay. Measure the AC voltage on terminal 6 when the unit is attempting to start. There should be 120 VAC on terminal 6 at this point

3. If there is 120 VAC on terminal 6 and the blower still does not start, replace the solid state relay.

4. If 120 VAC is not measured, replace the combustion safeguard chassis.

7.7 SYSTEM FAULT

A system fault indicates when the unit faults during the starting sequence, but prior to ignition. An internal 30-second fault timer starts timing when the unit start sequence is initiated. If ignition is not reached within the specified time, the Annunciator displays the message SYSTEM FAULT LOW AIR PRESSURE or PURGE INTERLOCKS depending on the cause. A system fault usually occurs when the system does not acknowledge either the safety shutoff valve proof of closure switch, the blower proof switch, or the air/fuel valve open switch.

Recommended Troubleshooting Equipment
AC Voltmeter
Ohmmeter

7.7.1 DETERMINING THE CAUSE

1. Clear the Annunciator and restart the unit.

2. If the unit does not fire, and the message SYSTEM FAULT LOW AIR PRESSURE is displayed, proceed to section 7.7.2.

3. If the unit does not fire a and the message SYSTEM FAULT PURGE INTERLOCKS is displayed proceed to section 7.7.4.

4. If the unit does not fire and the message SYS FLT is displayed on the temperature controller but the Annunciator does not display a fault proceed to section 7.7.8.

7.7.2. BLOWER

1. Disconnect power to the unit

2. Remove the cover plate from the AC wiring box

3. Locate wire #13 and the blower hot lead wire inside the AC wiring box. These will be the only two wires connected by a wire nut.

4. Remove the wire nut and separate wire #13 from the blower hot lead wire.

5. Connect an AC voltmeter between wire #18 and the unit frame.

6. Restore electrical power to the unit.

7. Restart the unit.

8. The AC voltmeter should display 120 VAC.

9. If 120 VAC is not displayed, replace the control panel.

10. If 120 VAC is displayed, check the capacitor using an analog ohm meter or substitute the capacitor.

11. If the capacitor checks okay or is substituted and blower still does not start, replace the blower.

7.7.3 AIR SUPPLY AND BLOWER PROOF SWITCH

1. If the unit has sealed combustion, check the ducting for any signs of blockage
2. If combustion air is brought in through an opening in a wall, be sure that the size of the opening is adequate and that louvers are open while the unit is firing. (Refer to AERCO GF-1050 for sizing.)
3. If the combustion air supply is okay, remove wires #17 and #24 from the blower proof switch.
4. Connect an ohmmeter across the blower proof switch and restart the unit.
5. The blower proof switch should show continuity while the blower is running.
6. If the blower proof switch does not show continuity, remove the switch and check for signs of blockage. If blockage is present, clean the switch and retest.
7. If the blower proof switch shows continuity, disconnect electrical power to the unit.
8. Disconnect the 15-pin connector from the control panel.
9. Referring to system schematic 161412 in Appendix F, locate wires #17 and #24 and check both for continuity.
10. Check the switch end of wires #17 and #24 for loose connections.
11. Check the connector end for worn pins and/or proper pin insertion.
12. If continuity, the connectors, and pins are okay, reconnect wires #17 and #24 to the blower proof switch.
13. Reconnect the 15-pin connector to the control panel.
14. Restore electrical power to the unit and start the unit.
15. If the SYSTEM FAULT LOW AIR PRESSURE fault persists, replace the control panel.

7.7.4 PURGE INTERLOCKS

If SSOV proof of closure switch or the air\fuel valve purge position switch fail to prove during the start sequence, the unit will shut down and the Annunciator will display the message SYSTEM FAULT, PURGE INTERLOCKS. To determine the cause of the fault perform the following:

1. Remove the Air\Fuel valve cover.
2. Clear the Annunciator and restart the unit.
3. If the Annunciator displays the message PURGE INTLK OPEN and the air\fuel valve does not rotate, proceed to section 7.7.7.
4. If the air\ fuel valve rotates to its full open position and engages the valve open proving switch, and the Annunciator still displays SYSTEM FAULT, PURGE INTERLOCKS, proceed to section 7.7.6.

7.7.5 SSOV PROOF OF CLOSURE SWITCH

1. Disconnect electrical power to the unit.
2. Loosen the two set screws holding the safety shutoff valve actuator to the safety shutoff valve body.
3. Rotate the actuator portion clockwise exposing the cover plate and tighten the two previously loosened set screws.
4. Remove the cover plate exposing the control wiring

.

5. Referring to the system schematic 161412 in Appendix F, remove wires #21 and #22 from the proof of closure switch.
6. Connect an ohm meter across the NC, normally closed, and the C, common, terminals.
7. The switch should show continuity. If it does proceed to step 16.
8. If the switch does not show continuity, remove the actuator from the valve body.
9. Looking at the actuator from the bottom, push on the lever closest to the bottom of the actuator.
10. Observe the ohm meter while pushing on the lever. Pushing downward on the lever should make continuity. Releasing the lever should break continuity

.

11. If continuity makes and breaks, slightly bend the arm toward the bottom of the actuator.

12. Reset the actuator onto the valve body while observing the ohm meter

13. If continuity is now okay, reconnect wires #21 and #22, replace the cover plate and reassemble the actuator to the valve body

14. If there is no continuity, replace the actuator or switch

15. Restart the unit. If the unit sequence resumes normal operation, proceed no further. If the Lockout persists, proceed to Step 16.

16. Disconnect electrical power and remove wires #21 and #22 from the proof of closure switch. Disconnect the 15-pin connector from the control panel.

17. Referring to system schematic 161412 in the Appendix, locate wires #21 and #22, check each for continuity using an ohm meter.

18. Check for loose connectors at the proof of closure switch end.

19. Check wires #21 and #22 at the control panel connector for worn pins and/or proper pin insertion.

20. Repair as necessary.

21. If connections and continuity are okay, reconnect wires #21 and #22 to the proof of closure switch and reconnect the 15-pin connector to the control panel ensuring it locks into place.

22. Replace the cover plate on the actuator and reposition the actuator on the valve body and lock into place using the set screws.

23. Restore electrical power to the unit.

24. Restart the unit. If the condition persists, contact a certified Aerco Service personnel or your local Aerco representative.

7.7.6 AIR/FUEL VALVE OPEN PROVING SWITCH

1. Remove the air/fuel valve cover.

2. Restart the unit.

3. If the air/fuel valve rotates to its full open position and engages the valve open proving switch, proceed to Step 5.

4. If the air/fuel valve does not rotate, proceed to 7.7.7.

5. Disconnect electrical power to the unit.

6. Referring to system schematic 161412 in Appendix F, locate wires #59 and #60. Remove wires #59 and #60 from the air/fuel valve open proving switch, noting their location. (The air/fuel valve open proving switch is the one closest to the blower.)

7. Connect an ohm meter across the terminals of the switch, where wires #59 and #60 were located

8. Manually depress the switch and check the ohm meter for continuity.

9. If the switch does not show continuity, replace the switch.

10. If the switch shows continuity, disconnect the 12-pin connector from the control panel.

11. Referring to system schematic 161412 in Appendix F, locate wires #59 and #60. Check wires #59 and #60 for continuity.

12. Check for loose connectors, at the switch end, of wires #59 and #60.

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13. Check the 12-pin connector end for worn and/or properly inserted pins.

14. If connections and continuity are okay, replace wires #59 and #60 and rconnect the 12-pin connector to the control panel and restart the unit.

15. If the fault persists, restart the unit and check for AC voltage at wires #59 and #60.

16. If 120 VAC is present, go to section 7.7.3.

17. If 120VAC is not present proceed to section 7.7.5.

7.7.7 AIR/FUEL VALVE NOT ROTATING

1. Disconnect electrical power to the unit.

2. Remove the air/fuel valve cover.
3. Check for loose wires at the wire nuts connecting the air/fuel valve wiring harness to the stepper motor.

4. Holding the coupling between the top of the stepper motor and the potentiometer with your thumb and forefinger, rotate the valve.

NOTE:
Do not rotate the air/fuel valve with power applied to the unit.

5. If the air/fuel valve does not rotate or is extremely difficult to rotate, replace the air/fuel valve.

6. Disconnect the 12-pin connector from the control panel. Referring to schematic 161412 in Appendix F, check all wires for continuity.

7. Check all the pins in the 12-pin connector for proper insertion or signs of wear

8. If all connections, continuity, and the rotation of the air/fuel valve in Step 4 were okay, open the control box to expose the wiring and components

9. Locate the air\fuel valve stepper motor driver board.

10. Ensure the connectors and wires are not loose and are making good contact.

11. If the wiring to the driver board is okay, place a voltmeter across terminals 7 and 8 on the back of the temperature controller.

12. Apply power to the unit.

13. Place the ON-OFF switch in the off position.

14. Measure the DC voltage across these two terminals. It should be 15 V ± 2 V

15. Place the ON\OFF switch in the On position

16. Measure the DC voltage again it should be approximately 3 volts DC during PURGE and 1 to 1.3 volts during ignition.

17. If the voltage is correct, replace the stepper motor driver board.

18. If the voltage remains at 15 V ± 2 VDC during PURGE or remains at 3 V DC during ignition replace the *relay board*.

19. If the DC voltage is at 0 VDC, replace the temperature control.

7.7.8 AIR/FUEL VALVE IGNITION POSITION SWITCH

1. Disconnect electrical power to the unit.

2. Remove the air/fuel valve cover

3. Referring to system schematic 161412 in Appendix F, locate wires #60 and #61. Remove wires #60 and #61 from the air/fuel valve ignition position switch, noting their position. (The air/fuel valve ignition position switch is the one closest to the shell of the unit.)

4. Place an ohm meter across the terminals of the switch, where wires #60 and #61 were located

5. Manually depress the switch and check the ohm meter for continuity.

6. If the switch shows continuity, proceed to Step 8.

7. If the switch does not show continuity, replace the switch.

8. Disconnect the 12-pin connector from the control panel.

9. Referring to system schematic 161412 in Appendix F, locate wires #60 and #61. Check wires #60 and #61 for continuity.

10. Check for loose connectors, at the switch end of wires #60 and #61.

11. Check the 12-pin connector end for worn and/or properly inserted pins.

12. If continuity, pins and connections are okay, reattach wire #60 and #61 to the air/fuel valve ignition position. Reconnect the 12-pin connector to the control panel and restart the unit.

13. If the system fault persists, contact your local AERCO representative for further assistance.

APPENDICES

APPENDIX A
Temperature Controller Menus

APPENDIX B
Temperature Controller Quick Programming Guide

APPENDIX C
Temperature Sensor Resistance Chart

APPENDIX D
Mode of Operation Default Settings

APPENDIX E
Dimensional & Parts Drawings

APPENDIX F
Piping Drawings

APPENDIX G
Wiring Schematics

APPENDIX H
Control Box isometric drawing

PRIMARY MENU ITEM DESCRIPTIONS

tout	This is the actual outlet water temperature of the heater. It is designated by the code (tout).
pct	Percentage of firing rate is a number, in percent, that is related to the input BTU's of the unit. For instance a 50% signal equals approximately 500,000 BTU gas input while a 75 % signal equals approximately 750,000 BTU gas input and so on.
Setp	Setpoint is the desired outlet water temperature that is to be maintained by the heater when operating in automatic mode.
Auto	When set to automatic mode the temperature controller is receiving and processing inputs from temperature sensor(s) located externally or on the unit. The controller uses these inputs to automatically decrease or increase the firing rate to match the load. In manual mode the upper display shows OFF and the controller no longer automatically controls the firing rate of the heater. It is up to the operator who put it into manual mode to control the outlet temperature and firing rate.

Secondary Menu Item Description

FUNC	This indicates the mode of operation the temperature controller is in. Common modes are Oart, indoor\outdoor reset, Cont, constant setpoint, and FDFO for a water heater.
tout	Displays the current outlet water temperature of the heater.
FFt	Displays the temperature of the BTU transmitter sensor. Note: this temperature will be less than “tout” when there is flow through the heater.
Pct	Displays the output percentage of the heater. It can be adjusted when in manual mode.
SetP	Displays the desired outlet water temperature of the heater.
SEnS	This is maximum load adjust used during a water heater temperature calibration. It adjusts the controllers sensitivity relative to the temperature of the BTU transmitter sensor. This should be adjusted when the output of the controller is greater than 40% and th oulet temperature is below the desired setpoint temperature.

OFSt

It adjusts the controller's linear offset relative to the temperature of the BTU transmitter sensor. Similar to SEnS it is adjusted when the controllers output is less than 30%.

LLt

This is the Low Limit Temperature. It is the minimum value that the Setpoint, (SetP), can be set to.

HLt

This is the High Limit Temperature. It is the maximum value that the controllers setpoint, (SetP), can be adjusted to.

Pb1

This is the Proportional Band in °F for the feedback of the controller. This feature is useful in correcting outlet temperature errors when under steady load conditions.

int

This is the integral rate, in minutes, for the feedback of the controller.

drt

This is the derivative rate in % / .1°/sec. This is used to adjust the response time to temperature changes at the outlet of the heater.

Fdb

This is minimum load adjust used during a water heater temperature calibration.

Addr	Turns the outlet sensor feedback ON or OFF. Used during factory calibration of the BTU transmitter. Feedback should always be in the ON position during normal operation.
lore	This displays the address for the controller. It is used for external communication with a computer.
	This is used to change the local/remote status of the temperature controller. In local mode all external computer write commands are ignored. Read commands will still function.

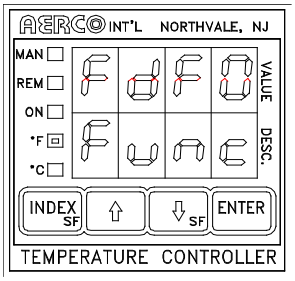
TEMPERATURE CONTROLLER QUICK REFERENCE PROGRAMMING GUIDE

The following is a “How To” guide that quickly shows how to access menu levels and their paramters, and how to make changes to them.

- **PRIMARY MENU to SECONDARY MENU**

Press ENTER and the ⇧ arrow key.

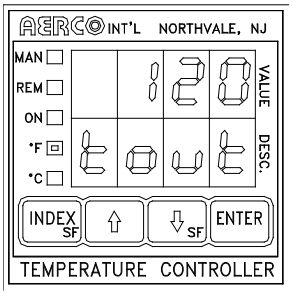
The display will indicate:



- **SECONDARY MENU to PRIMARY MENU**

Press INDEX and the ⇩ arrow key.

The display will indicate:



NOTE:
When in the Secondary menu the first menu parameter, (Func), must be displayed in order to switch to another menu.

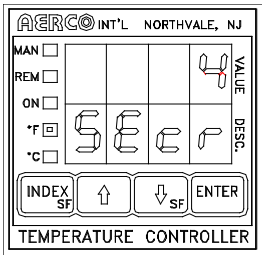
NOTE:
The number 120, shown above, is arbitrary. This number is dependent on the actual outlet water temperature of the unit being serviced.

NOTE:
The temperature controller defaults back to the PRIMARY menu from the SECONDARY menu or the SECURE menu if there is no activity in either of those menus after 4 minutes.

- **<u>TO CHANGE TO THE SECURE MENU</u>**

While in the primary menu press the INDEX key and ⇩ arrow key.
OR while in secondary menu press and hold ENTER and ⇧ for 5 seconds.

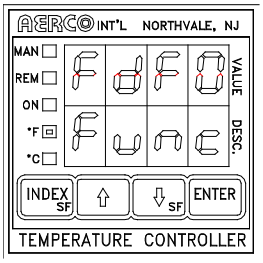
The display will indicate:



- **<u>SECURE MENU to the SECONDARY MENU</u>**

Pressing either INDEX and ⇩ arrow key or ENTER and the ⇧ arrow key will return you to the SECONDARY menu.

The display will indicate:

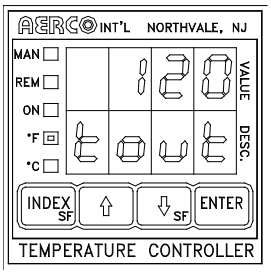


NOTE:
Anytime the SECURE menu is entered the unit will shut down. It will resume normal operation upon going back to the PRIMARY or SECONDARY menu.

- **SECURE MENU TO THE MAIN MENU**

While in the SECURE menu press INDEX and the ⇓ arrow key. This will place you in the SECONDARY menu. Press INDEX and the ⇓ arrow key again to return to the MAIN menu.

The display will indicate:



- **SCROLLING THROUGH MENU ITEMS**

To scroll through Menu items, in any menu level, Press INDEX.

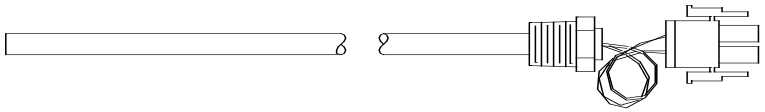
To scroll through the PRIMARY, SECURE, or SECONDARY menus in reverse, simultaneously press INDEX and the ⇓ arrow key.

To return to the first menu item of the SECONDARY menu from any other SECONDARY menu item, without scrolling, simultaneously press the ENTER and ⇑ arrow key.

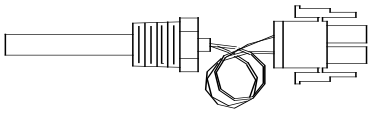
- **CHANGING MENU ITEM VALUES**

To change the value of a selected menu item press either the ⇑ arrow key to increase the item value or the ⇓ arrow key to decrease the item value. Press ENTER to accept the change.

NOTE:
ENTER must be pressed after changing the value of a parameter If ENTER is not pressed the controller will default to the value displayed prior to the change.



SHELL SENSOR
AERCO PN 123448



BTU TRANSMITTER SENSOR (WATER HEATER ONLY)
AERCO PN 123449

TEMP. °F	Res.in Ohms
−40	779.0
−30	797.5
−20	816.3
−10	835.4
0	854.8
10	874.6
20	894.7
30	915.1
40	935.9
50	956.9
60	978.3
70	1000.0
80	1022.0
90	1044.4
100	1067.0
110	1090.0
120	1113.3
130	1137.0
140	1160.9
150	1185.2
160	1209.5
170	1234.7
180	1260.0
190	1285.6
200	1311.4
210	1337.7
220	1364.2
230	1391.0
240	1418.2
250	1445.7

R(Ohms)=.00161T^2+1.961T+854.841
T=°F

AERCO INTERNATIONAL, INC.
NORTHVALE, NJ 07647

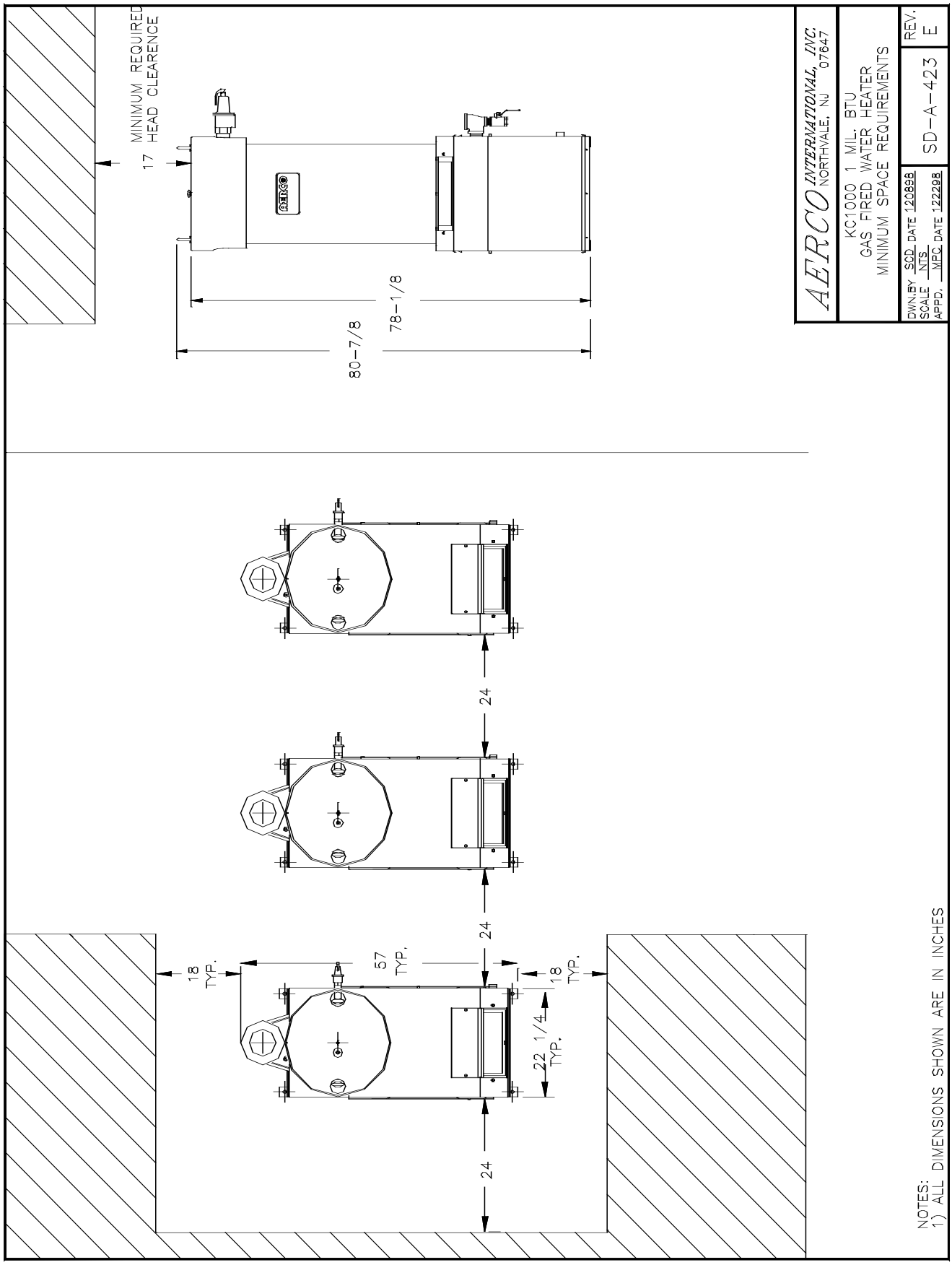
KC1000 TEMPERATURE SENSORS
RESISTANCE CHART
RESISTANCE IN 10°F STEPS

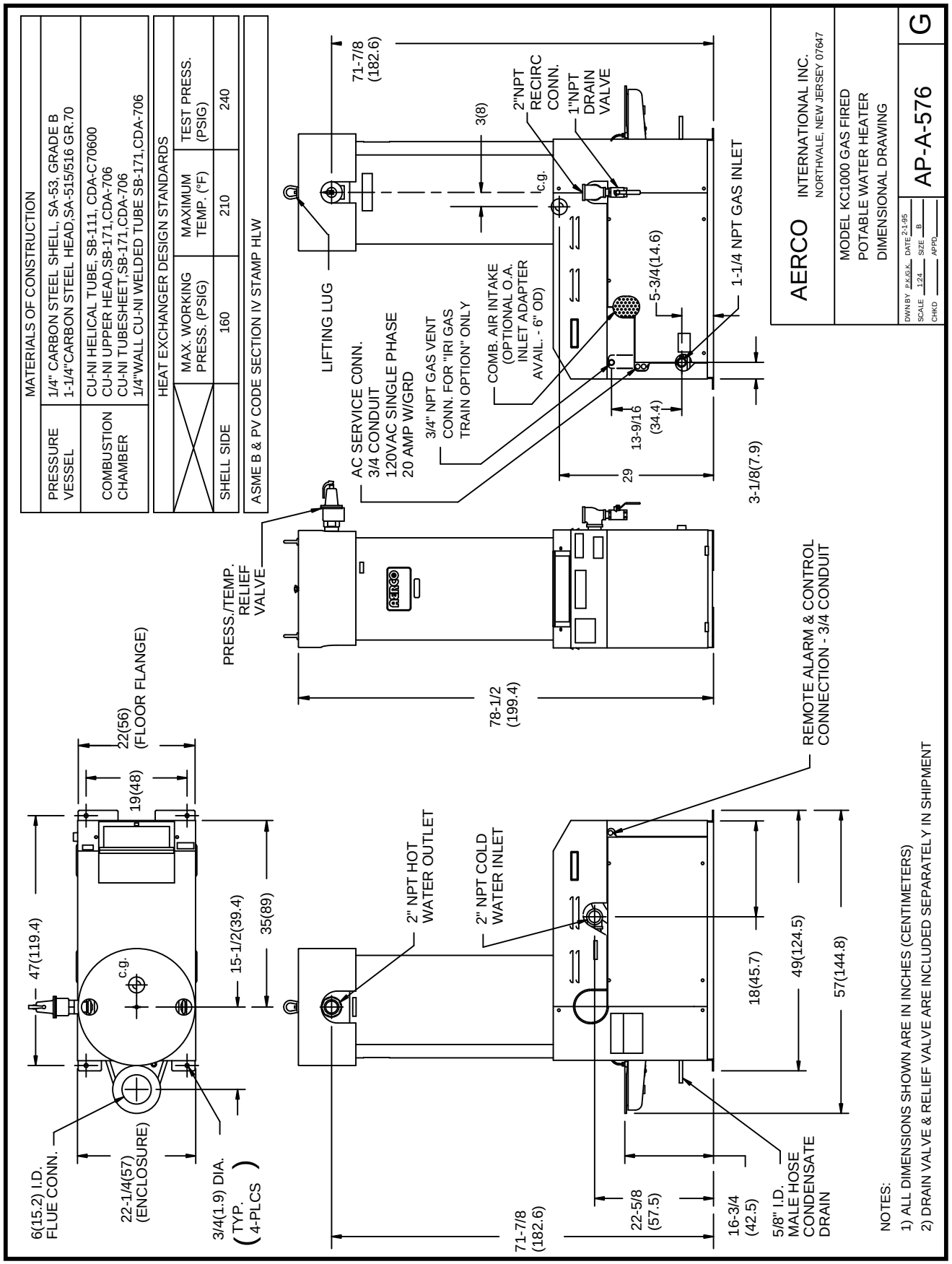
DWN.BY JES DATE 022799		REV.
SCALE ____ SIZE ____	AP−A−613	C
CHKD. ____ APPD. ____		

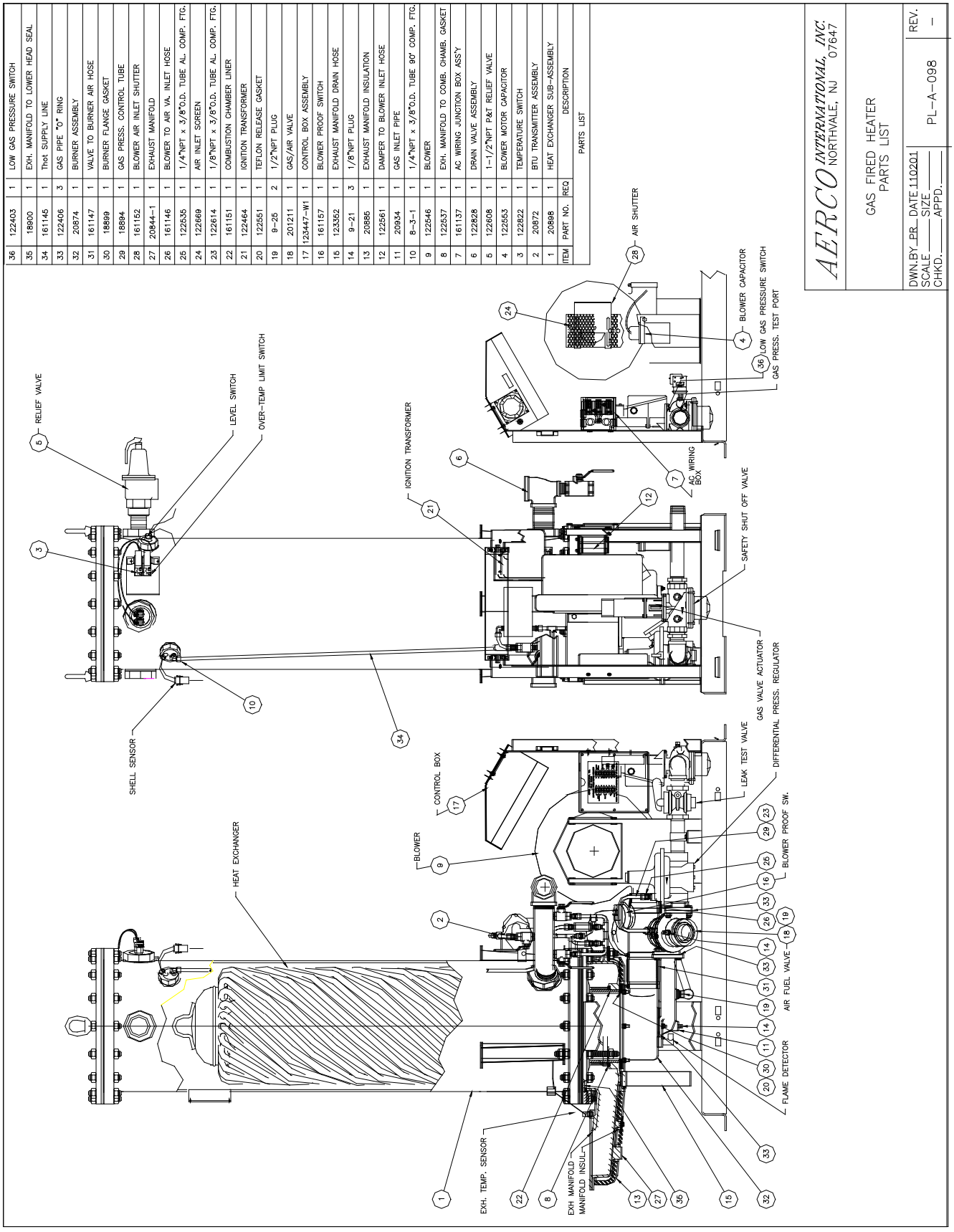
WATER HEATER DEFAULT SETTINGS

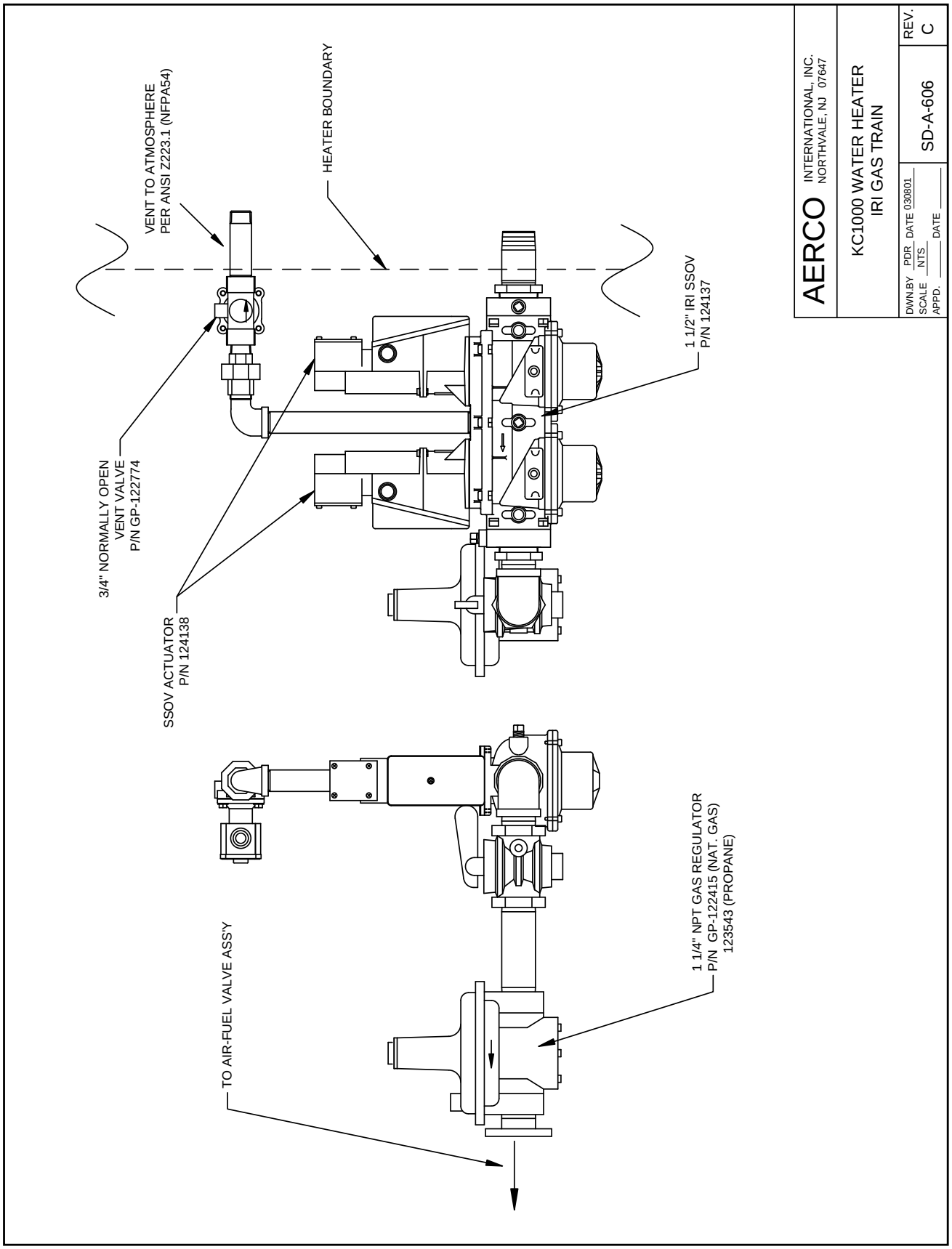
MENU LEVEL & CODE	DESCRIPTION OF CODE0	FACTORY DEFAULT
PRIMARY MENU		
tout	OUTLET TEMPERATURE	ACTUAL
pct	PERCENTAGE OF FIRING	ACTUAL
setp	UNIT'S SETPOINT TEMPERATURE	130
auto	AUTOMATIC\MANUAL MODE	AUTO ON
SECONDARY MENU		
func	MODE OF OPERATION	FDFO
tout	OUTLET TEMPERATURE	ACTUAL
fft	TEMPERATURE OF BTU TRANSMITTER SENSOR	ACTUAL
pct	PERCENTAGE OF FIRING RATE	ACTUAL
setp	UNIT'S SETPOINT TEMPERATURE	130
sens	MAX LOAD ADJUST	Factory Set
ofst	MNIMUM LOAD ADJUST	Factory Set
LLT	UNIT'S LOWEST SETPOINT TEMPERATURE	40
HLT	UNIT'S HIGHEST SETPOINT TEMPERATURE	200
pb1	PROPORTIONAL BAND	8
int	INTEGRAL	.6
drt	DERIVATIVE	.15
fdb	FEED BACK ON OR OFF	ON
addr	ADDRESS	32
lore	LOCAL/REMOTE MODE	LOC
bp_0	BREAK POINT 0	135
bp 0		
bp_1	BREAK POINT 1	128
bp 1		
bp_2	BREAK POINT 2	120
bp 2		
bp_3	BREAK POINT 3	115
bp 3		
bp_4	BREAK POINT 4	110
bp 4		
bp_5	BREAK POINT 5	105
bp 5		
bp_6	BREAK POINT 6	97
bp 6		
bp_7	BREAK POINT 7	91

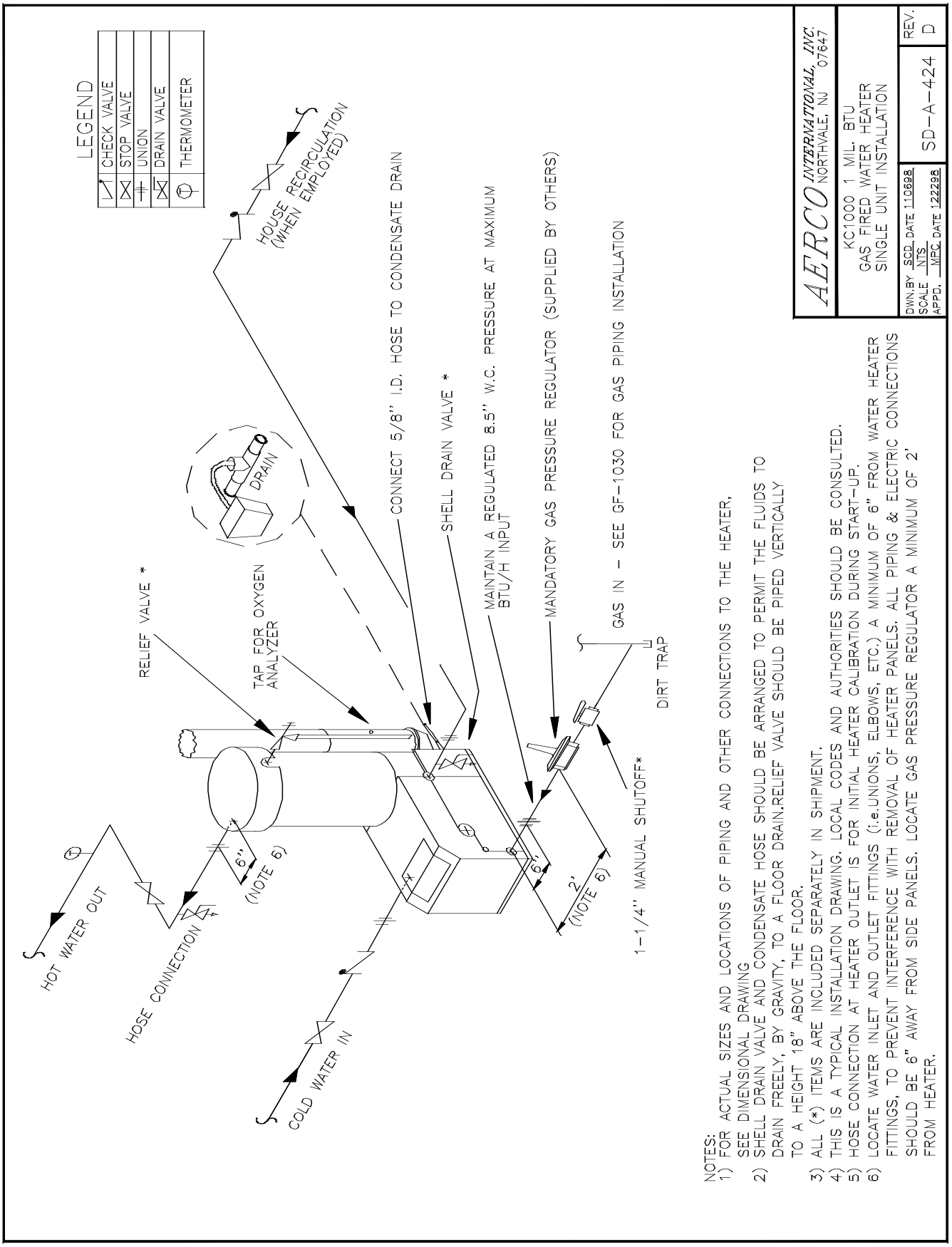
bp 7		
bp_8	BREAK POINT 8	85
bp 8		
bp_9	BREAK POINT 9	81
bp 9		
bp_A	BREAK POINT	79
bp A		
bp_B	BREAK POINT	77
bp B		
SECURE MENU		
SECr	SECURITY LEVEL	3
Func	MODE OF OPERATION	fDfO
gAin	GAIN	.05
Pb3	PROPORTIONAL BAND	5000
Lofi	LOW FIRE	29
LFti	LOW FIRE TIMER	0
Purg	PURGE	100
O2-O	STOP LEVEL	16%
O2-C	START LEVEL	20%
FLti	FAULT TIMER	0SEC.
dFil	DISPLAY FILTER	2
ArUP	ANTI RESET WINDUP	ON
PEA	PEAK(Highest Temp. Unit Has Seen Since Reset)	ACTUAL
VAL	VALLEY(Lowest Temp. Has Seen Since Reset)	ACTUAL
bp	BREAK POINTS ON or OFF	OFF
InPC	INPUT CORRECTION	0
InPt	INPUT TIMER	OFF
FiLt	SENSOR FILTER	4
Unit	UNIT OF DISPLAY	F
Addr	ADDRESS	32
bAUd	BAUD RATE	9600
InP	INPUT	CAL


MINIMUM REQUIRED
17 HEAD CLEARENCE
78-1/8
80-7/8
AERCO INTERNATIONAL, INC.
NORTHVALE, NJ 07647
KC1000 1 MIL. BTU
GAS FIRED WATER HEATER
MINIMUM SPACE REQUIREMENTS
DWN. BY SCD DATE 120898
SCALE NTS
APPD. WPC DATE 122298
SD-A-423
REV. E
24
24
24
18 TYP.
57 TYP.
18 TYP.
22 1/4 TYP.
NOTES:
1) ALL DIMENSIONS SHOWN ARE IN INCHES


MATERIALS OF CONSTRUCTION
PRESSURE VESSEL
1/4" CARBON STEEL SHELL, SA-53, GRADE B
1-1/4"CARBON STEEL HEAD,SA-515/516 GR.70
COMBUSTION CHAMBER
CU-NI HELICAL TUBE, SB-111, CDA-C70600
CU-NI UPPER HEAD,SB-171,CDA-706
CU-NI TUBESHEET,SB-171,CDA-706
1/4"WALL CU-NI WELDED TUBE SB-171,CDA-706
HEAT EXCHANGER DESIGN STANDARDS
MAX. WORKING PRESS. (PSIG)
MAXIMUM TEMP. (°F)
TEST PRESS. (PSIG)
SHELL SIDE
160
210
240
ASME B & PV CODE SECTION IV STAMP HLW
AERCO INTERNATIONAL INC.
NORTHVALE, NEW JERSEY 07647
MODEL KC1000 GAS FIRED
POTABLE WATER HEATER
DIMENSIONAL DRAWING
AP-A-576
G
71-7/8 (182.6)
3(8)
2"NPT RECIRC CONN.
1"NPT DRAIN VALVE
c.g.
LIFTING LUG
AC SERVICE CONN. 3/4 CONDUIT 120VAC SINGLE PHASE 20 AMP W/GRD
3/4" NPT GAS VENT CONN. FOR "IRI GAS TRAIN OPTION" ONLY
COMB. AIR INTAKE (OPTIONAL O.A. INLET ADAPTER AVAIL. - 6" OD)
5-3/4(14.6)
1-1/4 NPT GAS INLET
13-9/16 (34.4)
29
3-1/8(7.9)
PRESS./TEMP. RELIEF VALVE
78-1/2 (199.4)
22(56) (FLOOR FLANGE)
19(48)
47(119.4)
15-1/2(39.4)
35(89)
6(15.2) I.D. FLUE CONN.
22-1/4(57) (ENCLOSURE)
3/4(1.9) DIA. (TYP. 4-PLCS)
2" NPT HOT WATER OUTLET
2" NPT COLD WATER INLET
REMOTE ALARM & CONTROL CONNECTION - 3/4 CONDUIT
18(45.7)
49(124.5)
57(144.8)
71-7/8 (182.6)
22-5/8 (57.5)
16-3/4 (42.5)
5/8" I.D. MALE HOSE CONDENSATE DRAIN
NOTES:
1) ALL DIMENSIONS SHOWN ARE IN INCHES (CENTIMETERS)
2) DRAIN VALVE & RELIEF VALVE ARE INCLUDED SEPARATELY IN SHIPMENT


AERCO INTERNATIONAL, INC.
NORTHVALE, NJ 07647
GAS FIRED HEATER
PARTS LIST
DWN.BY PR DATE 110201
SCALE SIZE
CHKD. APPD.
PL-A-098
REV. -
PARTS LIST
ITEM | PART NO. | REQ | DESCRIPTION
36 | 122403 | 1 | LOW GAS PRESSURE SWITCH
35 | 18800 | 1 | EXH. MANIFOLD TO LOWER HEAD SEAL
34 | 161146 | 1 | Thot SUPPLY LINE
33 | 122406 | 3 | GAS PIPE "O" RING
32 | 20874 | 1 | BURNER ASSEMBLY
31 | 161147 | 1 | VALVE TO BURNER AIR HOSE
30 | 18899 | 1 | BURNER FLANGE GASKET
29 | 18894 | 1 | GAS PRESS. CONTROL TUBE
28 | 161162 | 1 | BLOWER AIR INLET SHUTTER
27 | 20844-1 | 1 | EXHAUST MANIFOLD
26 | 161146 | 1 | BLOWER TO AIR VA. INLET HOSE
25 | 122535 | 1 | 1/4"NPT x 3/8"O.D. TUBE AL. COMP. FTG.
24 | 122669 | 1 | AIR INLET SCREEN
23 | 122614 | 1 | 1/8"NPT x 3/8"O.D. TUBE AL. COMP. FTG.
22 | 161151 | 1 | COMBUSTION CHAMBER LINER
21 | 122464 | 1 | IGNITION TRANSFORMER
20 | 122551 | 1 | TEFLON RELEASE GASKET
19 | 9-25 | 2 | 1/2"NPT PLUG
18 | 201211 | 1 | GAS/AIR VALVE
17 | 123447-W1 | 1 | CONTROL BOX ASSEMBLY
16 | 161157 | 1 | BLOWER PROOF SWITCH
15 | 123362 | 1 | EXHAUST MANIFOLD DRAIN HOSE
14 | 9-21 | 3 | 1/8"NPT PLUG
13 | 20886 | 1 | EXHAUST MANIFOLD INSULATION
12 | 122561 | 1 | DAMPER TO BLOWER INLET HOSE
11 | 20934 | 1 | GAS INLET PIPE
10 | 8-3-1 | 1 | 1/4"NPT x 3/8"O.D. TUBE 90° COMP. FTG.
9 | 122546 | 1 | BLOWER
8 | 122537 | 1 | EXH. MANIFOLD TO COMB. CHAMB. GASKET
7 | 161137 | 1 | AC WIRING JUNCTION BOX ASS'Y
6 | 122828 | 1 | DRAIN VALVE ASSEMBLY
5 | 122608 | 1 | 1-1/2"NPT P&T RELIEF VALVE
4 | 122553 | 1 | BLOWER MOTOR CAPACITOR
3 | 122822 | 1 | TEMPERATURE SWITCH
2 | 20872 | 1 | BTU TRANSMITTER ASSEMBLY
1 | 20898 | 1 | HEAT EXCHANGER SUB-ASSEMBLY
RELIEF VALVE
LEVEL SWITCH
OVER-TEMP LIMIT SWITCH
IGNITION TRANSFORMER
AIR SHUTTER
BLOWER CAPACITOR
LOW GAS PRESSURE SWITCH
GAS PRESS. TEST PORT
AC WIRING BOX
SAFETY SHUT OFF VALVE
SHELL SENSOR
CONTROL BOX
LEAK TEST VALVE
GAS VALVE ACTUATOR
DIFFERENTIAL PRESS. REGULATOR
BLOWER
HEAT EXCHANGER
BLOWER PROOF SW.
AIR FUEL VALVE
FLAME DETECTOR
EXH. TEMP. SENSOR
EXH MANIFOLD MANIFOLD INSUL.


VENT TO ATMOSPHERE
PER ANSI Z223.1 (NFPA54)
HEATER BOUNDARY
3/4" NORMALLY OPEN
VENT VALVE
P/N GP-122774
SSOV ACTUATOR
P/N 124138
1 1/2" IRI SSOV
P/N 124137
TO AIR-FUEL VALVE ASS'Y
1 1/4" NPT GAS REGULATOR
P/N GP-122415 (NAT. GAS)
123543 (PROPANE)
AERCO INTERNATIONAL, INC.
NORTHVALE, NJ 07647
KC1000 WATER HEATER
IRI GAS TRAIN
DWN.BY PDR DATE 030801
SCALE NTS
APPD. ____ DATE ____
SD-A-606
REV.
C



NOTES:
1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWING
2) SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN.RELIEF VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 18" ABOVE THE FLOOR.
3) ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT.
4) THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5) HOSE CONNECTION AT HEATER OUTLET IS FOR INITIAL HEATER CALIBRATION DURING START-UP.
6) LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 6" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH REMOVAL OF HEATER PANELS. ALL PIPING & ELECTRIC CONNECTIONS SHOULD BE 6" AWAY FROM SIDE PANELS. LOCATE GAS PRESSURE REGULATOR A MINIMUM OF 2' FROM HEATER.

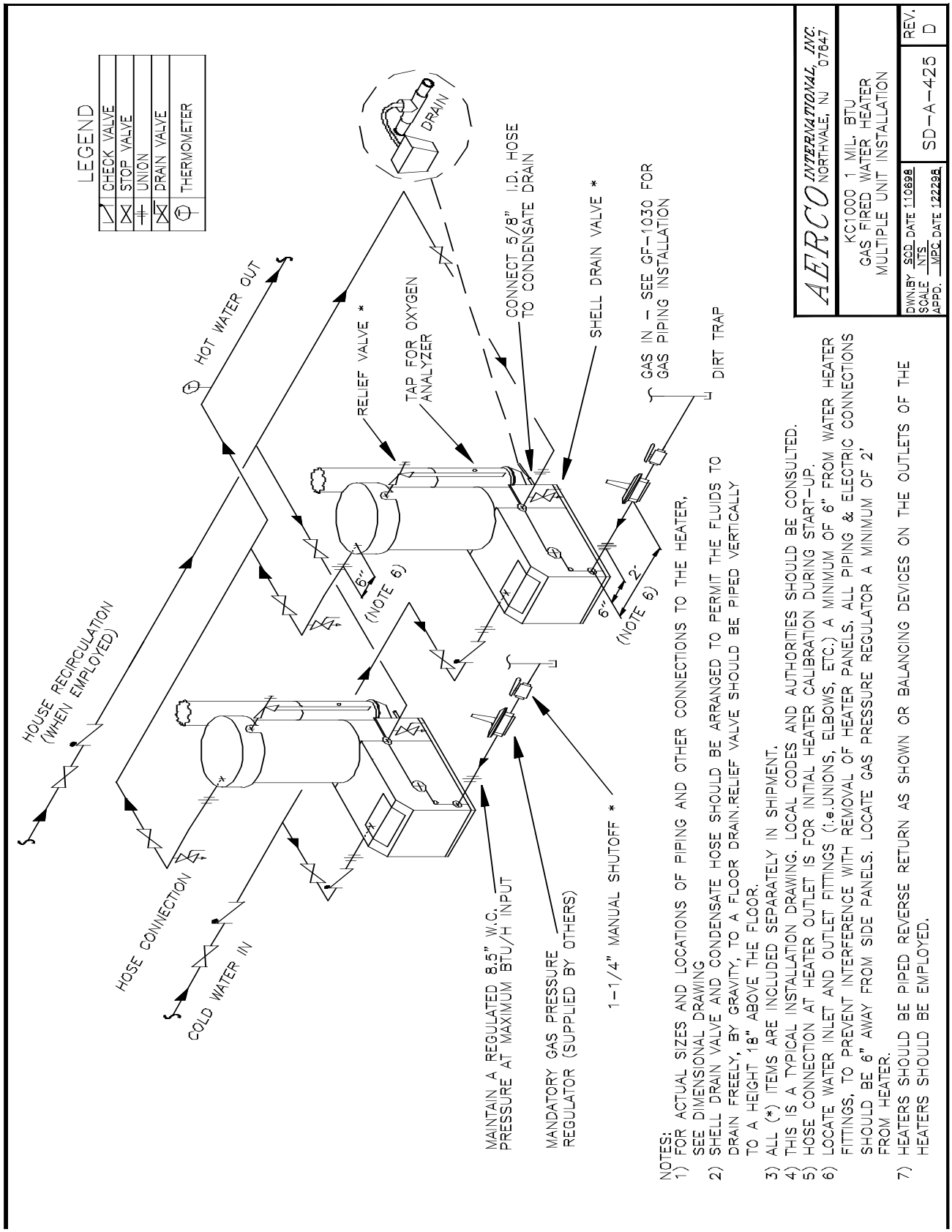
AERCO INTERNATIONAL, INC. NORTHVALE, NJ 07647

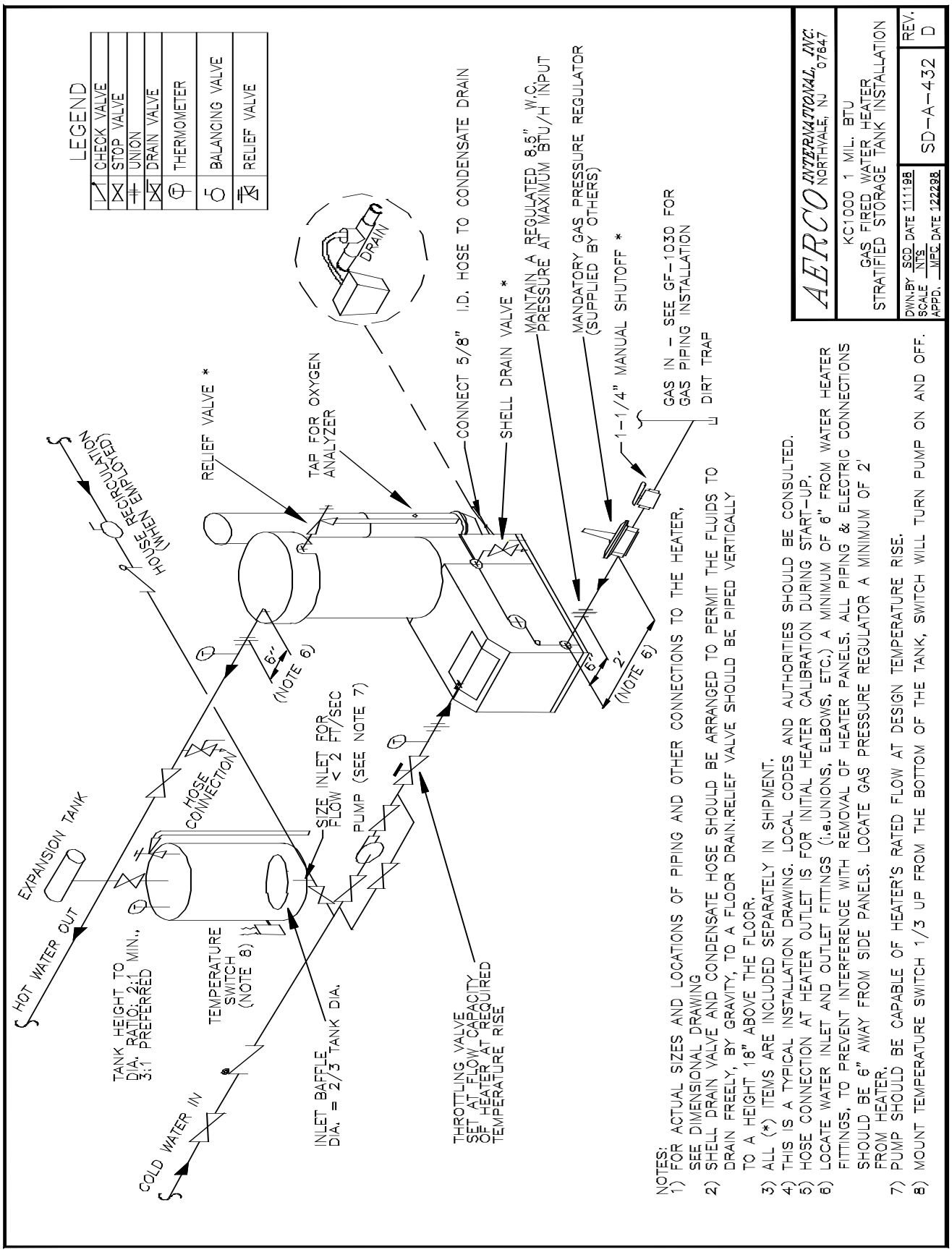
KC1000 1 MIL. BTU
GAS FIRED WATER HEATER
SINGLE UNIT INSTALLATION

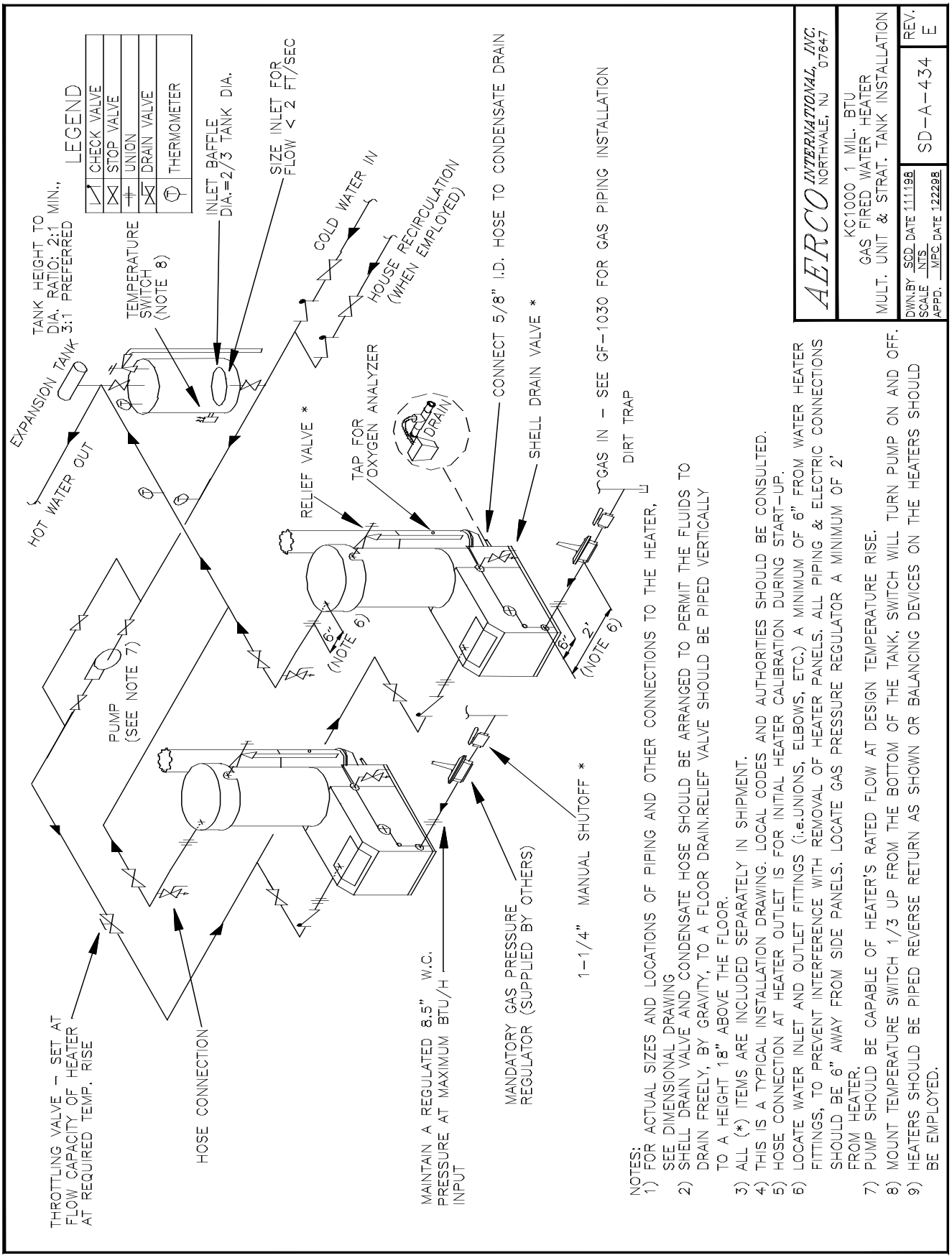
DWN. BY SCD DATE 11/06/98
SCALE NTS
APPD. MPC DATE 12/22/98

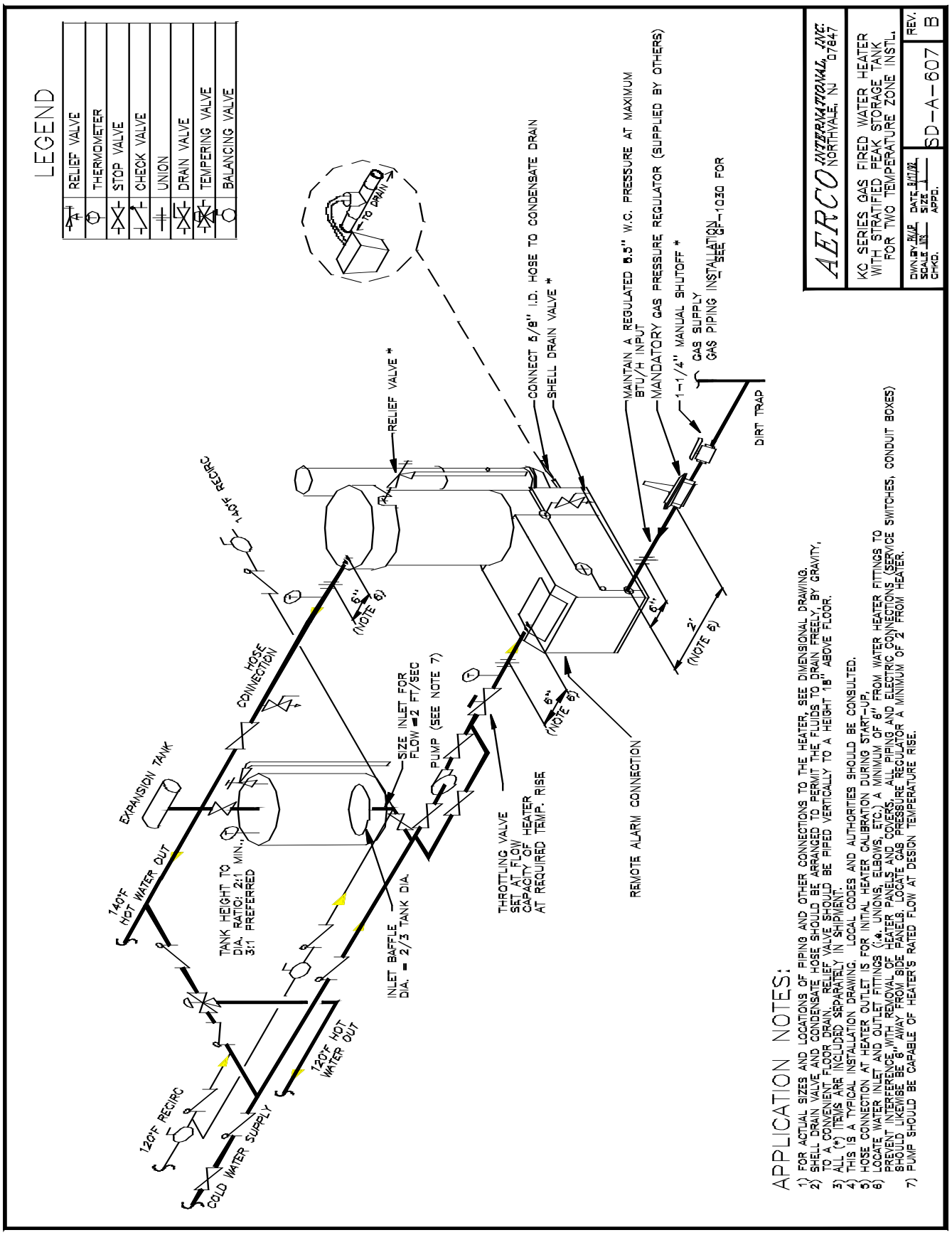
SD-A-424

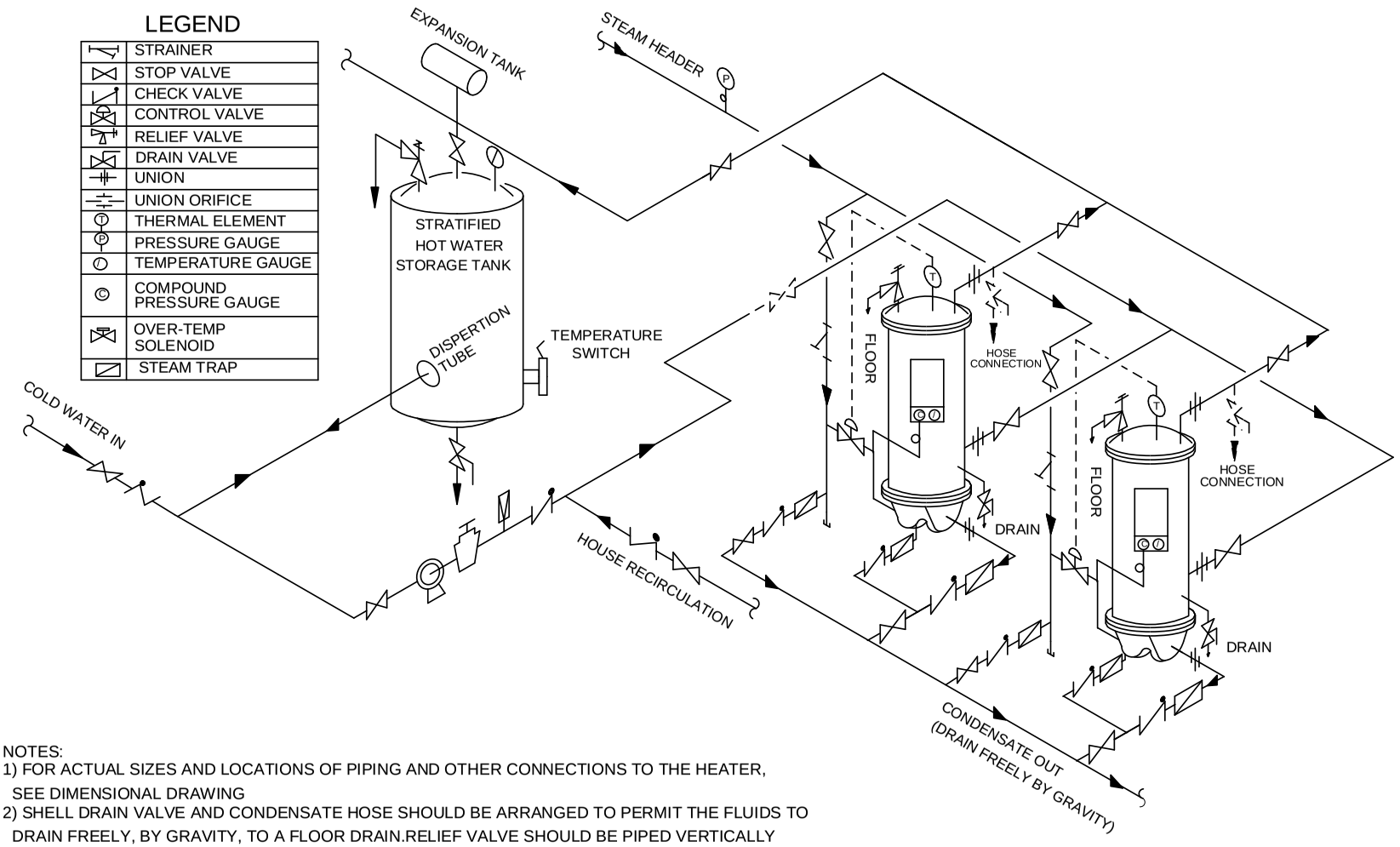
REV. D


LEGEND
CHECK VALVE
STOP VALVE
UNION
DRAIN VALVE
THERMOMETER
HOT WATER OUT
HOUSE RECIRCULATION (WHEN EMPLOYED)
HOSE CONNECTION
COLD WATER IN
RELIEF VALVE *
TAP FOR OXYGEN ANALYZER
CONNECT 5/8" I.D. HOSE TO CONDENSATE DRAIN
DRAIN
SHELL DRAIN VALVE *
GAS IN – SEE GF-1030 FOR GAS PIPING INSTALLATION
DIRT TRAP
6" (NOTE 6)
2"
6" (NOTE 6)
MAINTAIN A REGULATED 8.5" W.C. PRESSURE AT MAXIMUM BTU/H INPUT
MANDATORY GAS PRESSURE REGULATOR (SUPPLIED BY OTHERS)
1-1/4" MANUAL SHUTOFF *
NOTES:
1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWING
2) SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN.RELIEF VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 18" ABOVE THE FLOOR.
3) ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT.
4) THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5) HOSE CONNECTION AT HEATER OUTLET IS FOR INITIAL HEATER CALIBRATION DURING START-UP.
6) LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 6" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH REMOVAL OF HEATER PANELS. ALL PIPING & ELECTRIC CONNECTIONS SHOULD BE 6" AWAY FROM SIDE PANELS. LOCATE GAS PRESSURE REGULATOR A MINIMUM OF 2' FROM HEATER.
7) HEATERS SHOULD BE PIPED REVERSE RETURN AS SHOWN OR BALANCING DEVICES ON THE OUTLETS OF THE HEATERS SHOULD BE EMPLOYED.
AERCO INTERNATIONAL, INC. NORTHVALE, NJ 07647
KC1000 1 MIL. BTU
GAS FIRED WATER HEATER
MULTIPLE UNIT INSTALLATION
DWN.BY SCD DATE 110698
SCALE NTS
APPD. WPC DATE 122298
SD-A-425
REV. D


LEGEND
CHECK VALVE
STOP VALVE
UNION
DRAIN VALVE
THERMOMETER
BALANCING VALVE
RELIEF VALVE
HOT WATER OUT
EXPANSION TANK
COLD WATER IN
TANK HEIGHT TO DIA. RATIO: 2:1 MIN., 3:1 PREFERRED
INLET BAFFLE DIA. = 2/3 TANK DIA.
TEMPERATURE SWITCH (NOTE 8)
HOSE CONNECTION
SIZE INLET FOR FLOW < 2 FT/SEC
PUMP (SEE NOTE 7)
THROTTLING VALVE SET AT FLOW CAPACITY OF HEATER AT REQUIRED TEMPERATURE RISE
HOUSE RECIRCULATION (WHEN REQUIRED)
RELIEF VALVE *
TAP FOR OXYGEN ANALYZER
CONNECT 5/8" I.D. HOSE TO CONDENSATE DRAIN
DRAIN
SHELL DRAIN VALVE *
MAINTAIN A REGULATED 8.5" W.C. PRESSURE AT MAXIMUM BTU/H INPUT
MANDATORY GAS PRESSURE REGULATOR (SUPPLIED BY OTHERS)
1-1/4" MANUAL SHUTOFF *
GAS IN - SEE GF-1030 FOR GAS PIPING INSTALLATION
DIRT TRAP
6" (NOTE 6)
6"
2' (NOTE 6)
NOTES:
1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWING
2) SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN. RELIEF VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 18" ABOVE THE FLOOR.
3) ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT.
4) THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5) HOSE CONNECTION AT HEATER OUTLET IS FOR INITIAL HEATER CALIBRATION DURING START-UP.
6) LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 6" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH REMOVAL OF HEATER PANELS. ALL PIPING & ELECTRIC CONNECTIONS SHOULD BE 6" AWAY FROM SIDE PANELS. LOCATE GAS PRESSURE REGULATOR A MINIMUM OF 2' FROM HEATER.
7) PUMP SHOULD BE CAPABLE OF HEATER'S 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
KC1000 1 MIL. BTU
GAS FIRED WATER HEATER
STRATIFIED STORAGE TANK INSTALLATION
DWN. BY SCD DATE 111198
SCALE NTS
APPD. MFC DATE 122398
SD-A-432
REV. D


LEGEND
CHECK VALVE
STOP VALVE
UNION
DRAIN VALVE
THERMOMETER
TANK HEIGHT TO DIA. RATIO: 2:1 MIN., 3:1 PREFERRED
EXPANSION TANK
HOT WATER OUT
TEMPERATURE SWITCH (NOTE 8)
INLET BAFFLE DIA.=2/3 TANK DIA.
SIZE INLET FOR FLOW < 2 FT/SEC
COLD WATER IN
HOUSE RECIRCULATION (WHEN EMPLOYED)
RELIEF VALVE *
TAP FOR OXYGEN ANALYZER
DRAIN
CONNECT 5/8" I.D. HOSE TO CONDENSATE DRAIN
SHELL DRAIN VALVE *
GAS IN - SEE GF-1030 FOR GAS PIPING INSTALLATION
DIRT TRAP
6" (NOTE 6)
6" (NOTE 6)
2'
PUMP (SEE NOTE 7)
THROTTLING VALVE - SET AT FLOW CAPACITY OF HEATER AT REQUIRED TEMP. RISE
HOSE CONNECTION
MAINTAIN A REGULATED 8.5" W.C. PRESSURE AT MAXIMUM BTU/H INPUT
MANDATORY GAS PRESSURE REGULATOR (SUPPLIED BY OTHERS)
1-1/4" MANUAL SHUTOFF *
NOTES:
1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWING
2) SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN.RELIEF VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 18" ABOVE THE FLOOR.
3) ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT.
4) THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5) HOSE CONNECTION AT HEATER OUTLET IS FOR INITIAL HEATER CALIBRATION DURING START-UP.
6) LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 6" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH REMOVAL OF HEATER PANELS. ALL PIPING & ELECTRIC CONNECTIONS SHOULD BE 6" AWAY FROM SIDE PANELS. LOCATE GAS PRESSURE REGULATOR A MINIMUM OF 2' FROM HEATER.
7) PUMP SHOULD BE CAPABLE OF HEATER'S 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.
9) HEATERS SHOULD BE PIPED REVERSE RETURN AS SHOWN OR BALANCING DEVICES ON THE HEATERS SHOULD BE EMPLOYED.
AERCO INTERNATIONAL, INC. NORTHVALE, NJ 07647
KC1000 1 MIL. BTU
GAS FIRED WATER HEATER
MULT. UNIT & STRAT. TANK INSTALLATION
DWN.BY SCD DATE 111198
SCALE NTS
APPD. MPC DATE 122298
SD-A-434
REV. E


LEGEND
RELIEF VALVE
THERMOMETER
STOP VALVE
CHECK VALVE
UNION
DRAIN VALVE
TEMPERING VALVE
BALANCING VALVE
AERCO INTERNATIONAL, INC.
NORTHVALE, NJ 07647
KC SERIES GAS FIRED WATER HEATER
WITH STRATIFIED PEAK STORAGE TANK
FOR TWO TEMPERATURE ZONE INSTL.
SD-A-607
REV. B
APPLICATION NOTES:
1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWING.
2) SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A CONVENIENT FLOOR DRAIN. RELIEF VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 18" ABOVE FLOOR.
3) ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT.
4) THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5) HOSE CONNECTION AT HEATER OUTLET IS FOR INITIAL HEATER CALIBRATION DURING START-UP.
6) LOCATE WATER INLET AND OUTLET FITTINGS (i.e. UNIONS, ELBOWS, ETC.) A MINIMUM OF 6" FROM WATER HEATER FITTINGS TO PREVENT INTERFERENCE WITH REMOVAL OF HEATER PANELS AND COVERS. ALL PIPING AND ELECTRIC CONNECTIONS (SERVICE SWITCHES, CONDUIT BOXES) SHOULD LIKEWISE BE 6" AWAY FROM SIDE PANELS. LOCATE GAS PRESSURE REGULATOR A MINIMUM OF 2' FROM HEATER.
7) PUMP SHOULD BE CAPABLE OF HEATER'S RATED FLOW AT DESIGN TEMPERATURE RISE.
120°F RECIRC
COLD WATER SUPPLY
120°F HOT WATER OUT
EXPANSION TANK
140°F HOT WATER OUT
TANK HEIGHT TO DIA. RATIO: 2:1 MIN., 3:1 PREFERRED
INLET BAFFLE DIA. = 2/3 TANK DIA.
SIZE INLET FOR FLOW =2 FT/SEC
PUMP (SEE NOTE 7)
HOSE CONNECTION
140°F RECIRC
THROTTLING VALVE SET AT FLOW CAPACITY OF HEATER AT REQUIRED TEMP. RISE
REMOTE ALARM CONNECTION
RELIEF VALVE *
TO DRAIN
CONNECT 5/8" I.D. HOSE TO CONDENSATE DRAIN
SHELL DRAIN VALVE *
MAINTAIN A REGULATED 5.5" W.C. PRESSURE AT MAXIMUM BTU/H INPUT
MANDATORY GAS PRESSURE REGULATOR (SUPPLIED BY OTHERS)
1-1/4" MANUAL SHUTOFF *
GAS SUPPLY
GAS PIPING INSTALLATION SEE GP-1030 FOR
DIRT TRAP
6" (NOTE 6)
6" (NOTE 6)
6" (NOTE 6)
2' (NOTE 6)



NOTES:
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2) SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN.RELIEF VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 18" ABOVE THE FLOOR.
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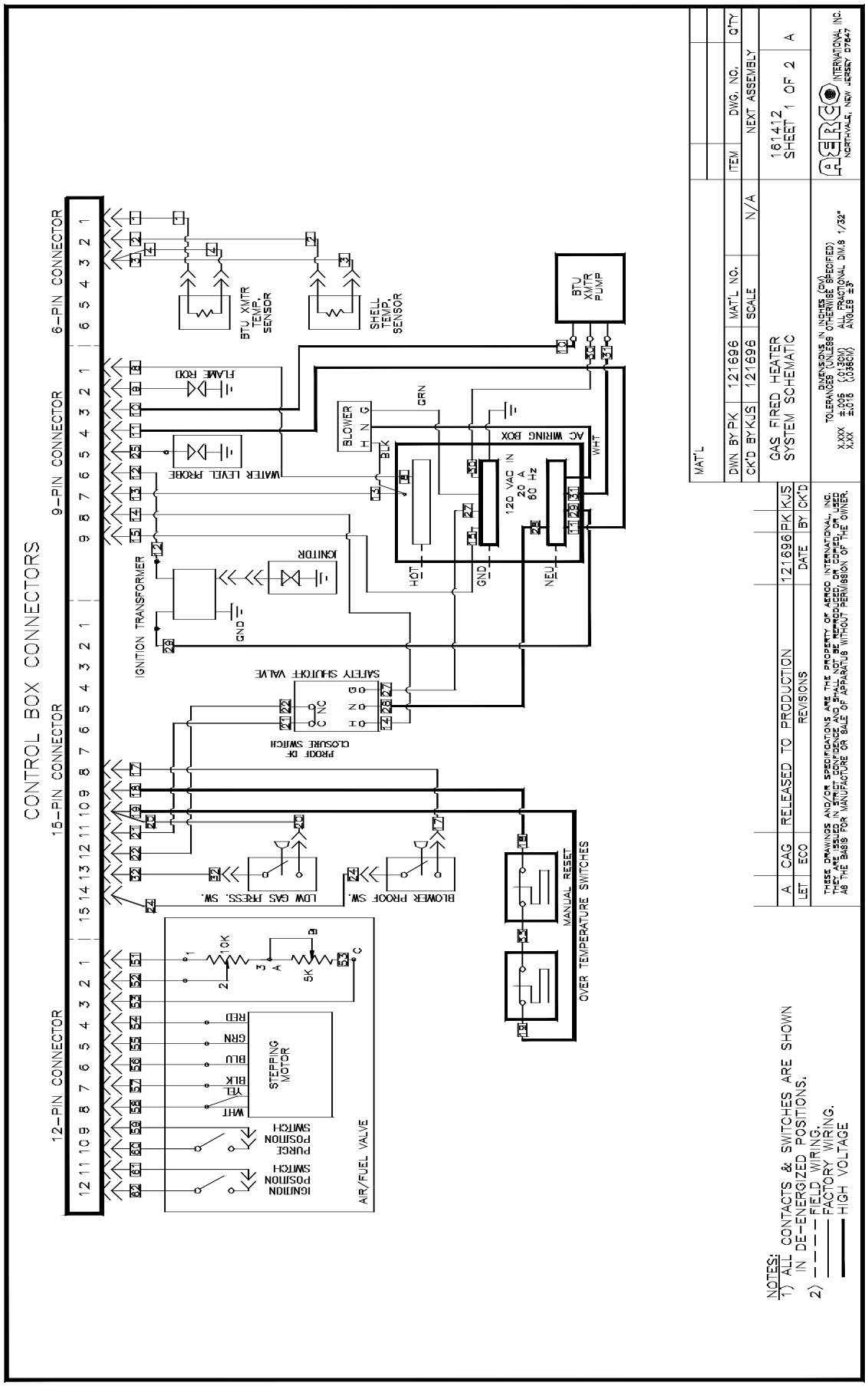
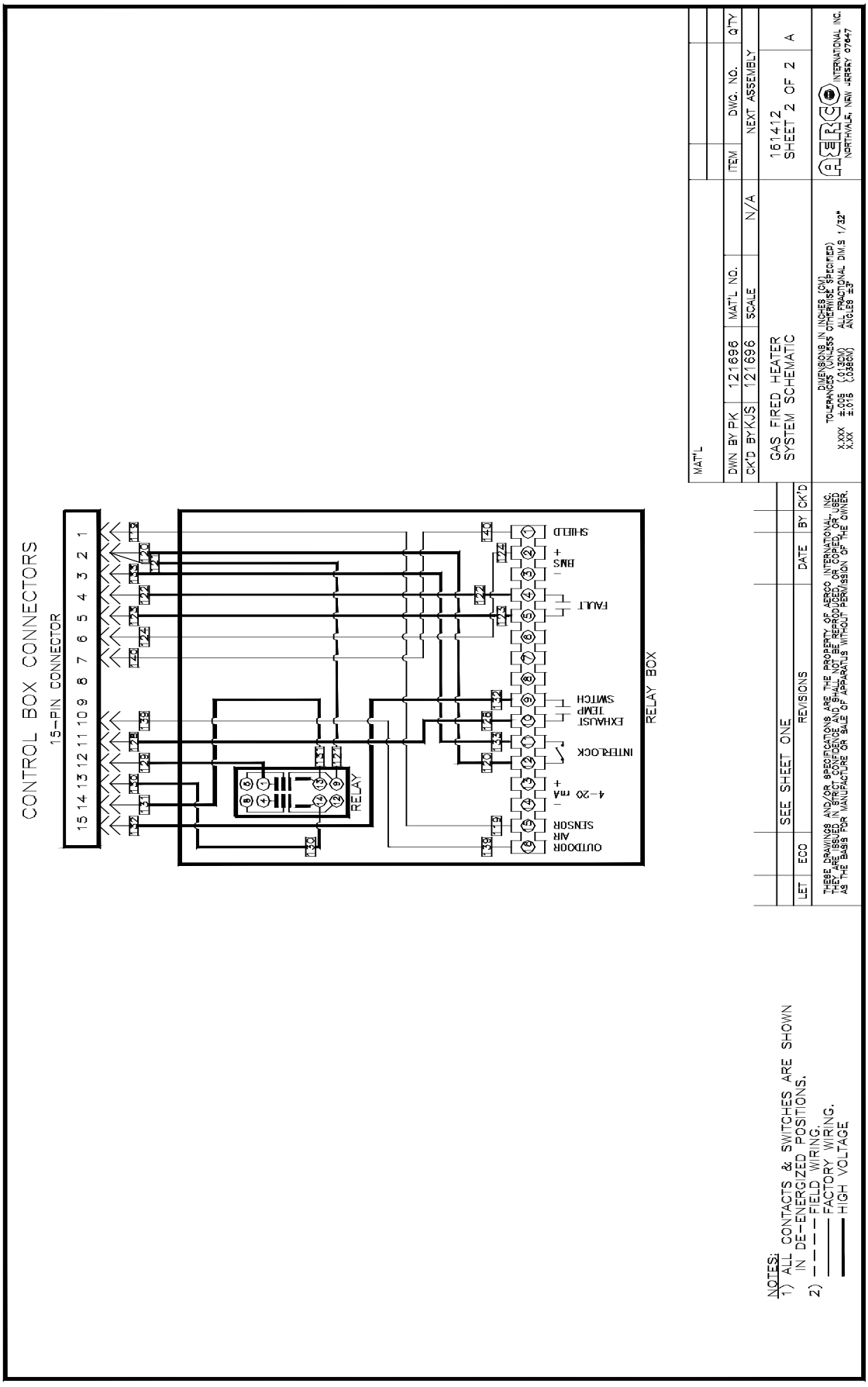
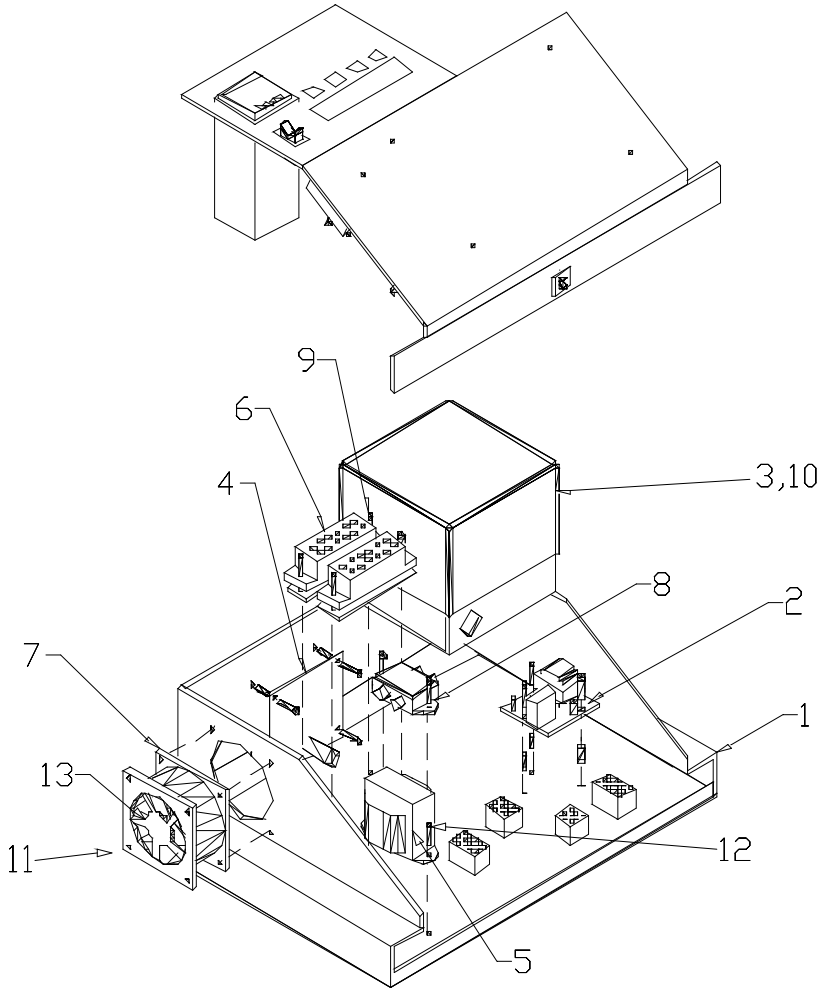
7) PUMP SHOULD BE CAPABLE OF HEATER'S RATED FLOW AT DESIGN TEMPERATURE RISE.

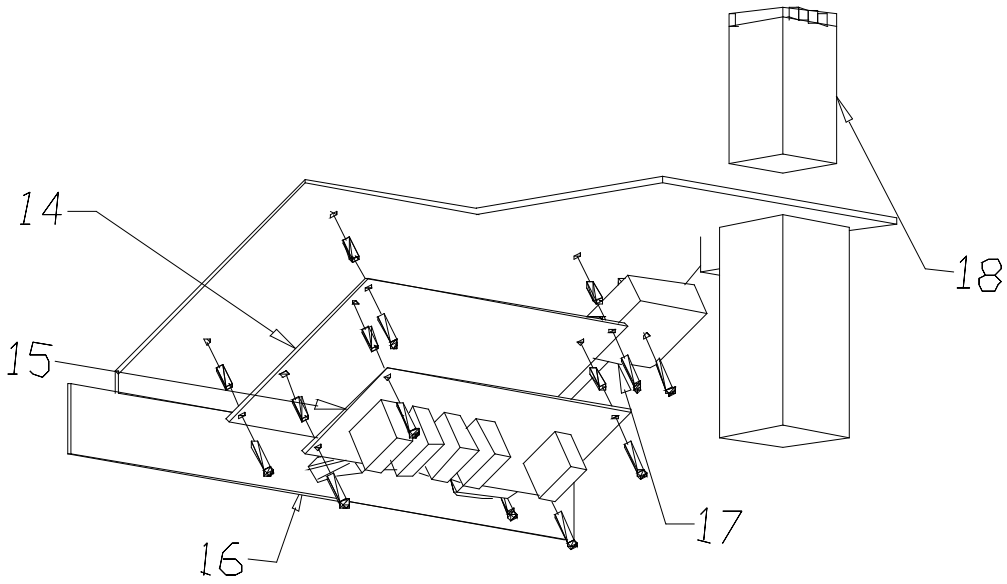
AERCO INTERNATIONAL, INC. NORTHVALE, NJ 07647		
STRATIFIED STORAGE TANK WITH SWDW-1 OR SWDW-2 STEAM TO WATER DOUBLE WALL - MULTIPLE HEATERS		
DWN.BY DMM DATE 08/21/01 SCALE NTS APPD. _____ DATE _____	SD-A-501	REV. D

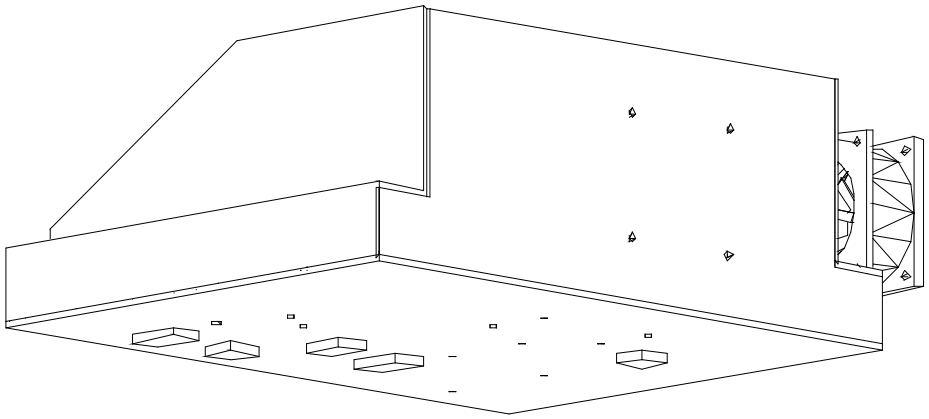

CONTROL BOX CONNECTORS
12-PIN CONNECTOR
15-PIN CONNECTOR
9-PIN CONNECTOR
6-PIN CONNECTOR
BTU XMTR TEMP. SENSOR
SHELL TEMP. SENSOR
BTU XMTR PUMP
FLAME ROD
WATER LEVEL PROBE
BLOWER
GRN
BLK
WHT
AC WIRING BOX
120 VAC IN 20 A 60 Hz
HOT
GND
NEU
IGNITOR
IGNITION TRANSFORMER
SAFETY SHUTOFF VALVE
PROOF OF CLOSURE SWITCH
LOW GAS PRESS. SW.
BLOWER PROOF SW.
MANUAL RESET OVER TEMPERATURE SWITCHES
AIR/FUEL VALVE
STEPPING MOTOR
RED
GRN
BLU
YEL
BLK
WHT
IGNITION POSITION SWITCH
PURGE POSITION SWITCH
10K
5K
MAT'L
DWN BY PK 121696
CK'D BY KJS 121696
SCALE N/A
GAS FIRED HEATER
SYSTEM SCHEMATIC
16141 2
SHEET 1 OF 2
A
ITEM DWG. NO. QTY
NEXT ASSEMBLY
A CAG RELEASED TO PRODUCTION 121696 PK KJS
LET ECO REVISIONS DATE BY CK'D
THESE DRAWINGS AND/OR SPECIFICATIONS ARE THE PROPERTY OF AERCO INTERNATIONAL, INC. THEY ARE ISSUED IN STRICT CONFIDENCE AND SHALL NOT BE REPRODUCED, OR COPIED, OR USED AS THE BASIS FOR MANUFACTURE OR SALE OF APPARATUS WITHOUT PERMISSION OF THE OWNER.
DIMENSIONS IN INCHES (DW) TOLERANCES (UNLESS OTHERWISE SPECIFIED) XXXX ±.005 (.013DW) XXX ±.010 (.038DW) ALL FRACTIONAL DIM.S 1/32" ANGLES ±2°
AERCO INTERNATIONAL INC. NORTHVALE, NEW JERSEY 07647
NOTES:
1) ALL CONTACTS & SWITCHES ARE SHOWN IN DE-ENERGIZED POSITIONS.
2) ---- FIELD WIRING.
FACTORY WIRING.
HIGH VOLTAGE


CONTROL BOX CONNECTORS
15-PIN CONNECTOR
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
RELAY
RELAY BOX
OUTDOOR AIR SENSOR
4-20 mA
INTERLOCK
EXHAUST TEMP SWITCH
FAULT
BMS
SHIELD
NOTES:
1) ALL CONTACTS & SWITCHES ARE SHOWN IN DE-ENERGIZED POSITIONS.
2) ---- FIELD WIRING.
FACTORY WIRING.
HIGH VOLTAGE
MATL
DWN BY PK 121696
CK'D BY KJS 121696
GAS FIRED HEATER
SYSTEM SCHEMATIC
161412
SHEET 2 OF 2
A
SEE SHEET ONE
REVISIONS
LET ECO DATE BY CK'D
AERCO INTERNATIONAL, INC.
NORTHVALE, NEW JERSEY 07647



13	123446	FAN GUARD
12	123402	#6-32 X 3/8 LG PAN HEAD MACH. SCREW
11	123459	#6-32 X 2 LG PAN HEAD MACH. SCREW
10	123452	#8-32 X 5/16 LG PAN HEAD MACH. SCREW
9	123437	#6-32 X 5/8 LG PAN HEAD MACH. SCREW
8	123389	LINE FILTER
7	123436	FAN
6	123393	TERMINAL BLOCK
5	123388	TRANSFORMER
4	123399	VALVE INTERFACE BOARD
3	123747	HONEYWELL FLAME RECIFICATION AMPLIFIER
	123746	HONEYWELL PURGE TIMER
	123745	HONEYWELL MODULE BASE
	123744	HONEYWELL RELAY MODULE
2	123435	LOW WATER CUT OFF
1	201076	CONTROL BOX BASE
ITEM	PART NUMBER	DESCRIPTION
PARTS LIST		





18	123280-W1	WATER HEATER TEMPERATURE CONTROLLER
17	123803	SOLID STATE TIMER-ARTISAN CORP(123469 FOR SSAC INC.)
16	123438	CIRCUIT BREAKER
15	123391	RELAY BOARD
14	123390	STATUS ANNUNCIATOR
ITEM	PART NUMBER	DESCRIPTION
PARTS LIST		

STANDARD WARRANTY:
Gas-Fired Water Heater & Hydronic Boiler
Model KC-1000GWW, GWB, PWW & PWB(Propane)

PRESSURE VESSEL: 10 YEARS NON-PRORATED

The shell shall carry an unconditional, non-prorated ten year guarantee from shipment against leakage due to thermal shock, mechanical defects or workmanship. The Hydronic boiler shell **will not** be covered for waterside corrosion. The water heater shell will carry the non-prorated 10 year guarantee for waterside corrosion.

HEAT EXCHANGER TUBES/COMBUSTION CHAMBER: 5 YEARS

The heat exchanger/combustion chamber shall carry a 5 year prorated, limited warranty against any condensate corrosion, thermal stress failure, mechanical defects or workmanship. Operation of the boiler using contaminated air will void the warranty. The heat exchangers combustion chamber shall not be warranted from failure due to scaling, liming, corrosion, or erosion due to water or installation conditions. **AERCO** will repair, rebuild or exchange, at its option the heat exchanger/combustion chamber according to the following schedule:

Year	Discount From Then Prevailing List Price
3	100%
4	70%
5	40%

CONTROL PANEL: 2 YEARS OR 26 MONTHS FROM SHIPMENT

AERCO labeled control panels are conditionally warranted against failure for (2) two years from start-up or 26 months from shipment, whichever occurs first.

OTHER COMPONENTS: 1 YEAR OR 18 MONTHS FROM SHIPMENT

All other components, with the exception of the ignitor and flame detector, are conditionally guaranteed against any failure for 12 months from start-up or 18 months from shipment, whichever first occurs.

AERCO shall accept no responsibility if such item has been improperly installed, operated, or maintained or if the buyer has permitted any unauthorized modification, adjustment, and/or repairs to the item.

The warranty as set forth on the back page of the Operations & Maintenance Manual is in lieu of and not in addition to any other express or implied warranties in any documents, or under any law. No salesman or other representative of **AERCO** has any authority to expand warranties beyond the face of the said warranty and purchaser shall not rely on any oral statement except as stated in the said warranty. An Officer of AERCO must do any modifications to this warranty in writing. **AERCO MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTIES.** AERCO disclaims all responsibility for any special, incidental or consequential damages. Any claim relating to the product must be filed with **AERCO** not later than 14 days after the event-giving rise to such claim. Any claims relating to this product shall be limited to the sale price of the product at the time of sale. The sale of the product is specifically conditioned upon acceptance of these terms.

CONDITIONS OF WARRANTY

Should an AERCO gas-fired (natural gas or propane only) water heater or Hydronic boiler fail for any of the above reasons within the specified time period from the date of original shipment(s), AERCO shall at its option modify, repair or exchange the defective item. AERCO shall have the option of having the item returned, FOB its factory, or to make field replacements at the point of installation. In no event shall AERCO be held liable for replacement labor charges or for freight or handling charges.

AERCO shall accept no responsibility if such item has been improperly installed, operated, or maintained or if the buyer has permitted any unauthorized modification, adjustment, and/or repairs to the item. The use of replacement parts not manufactured or sold by AERCO will void any warranty, express or limited.

In order to process a warranty claim a formal purchase order number is required prior to shipment of any warranty item. In addition, the returned item must include a Returned Goods Authorization (RGA) label, attached to the shipping carton, which identifies the item's return address, register number and factory authorized RGA number.

Warranty coverage for all components and equipment mentioned in said warranty are not valid unless the water heater or Hydronic boiler is started up by a factory certified SST (Service, Start-Up and Troubleshooting) Technician. Also, AERCO, (Northvale, NJ) must receive a copy of the start-up sheets, whichever comes first.