



Instruction  
No. **GF-115H**

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AERCO INTERNATIONAL, Inc., Northvale, New Jersey, 07647 USA

# Installation, Operation & Maintenance Instructions



## *Gas Fired Boiler Systems*

*Modular, Condensing, Hot Water Boilers  
Models: 303, 454, 606, 757, 909, 1060*

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# INSTALLATION, OPERATION & MAINTENANCE

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## SAFETY SYMBOLS

The following defined symbols are used throughout this manual to notify the reader of potential hazards of varying risk levels.

 **DANGER**  INDICATES AN IMMINENTLY HAZARDOUS SITUATION, WHICH IF NOT AVOIDED, **WILL** RESULT IN DEATH OR SERIOUS INJURY.

 **WARNING**  INDICATES A POTENTIALLY HAZARDOUS SITUATION, WHICH IF NOT AVOIDED, **COULD** RESULT IN DEATH OR SERIOUS INJURY.

 **CAUTION**  INDICATES A POTENTIAL HAZARDOUS SITUATION, WHICH IF NOT AVOIDED, **MAY** RESULT IN MINOR OR MODERATE INJURY. IT MAY ALSO BE USED TO ALERT AGAINST UNSAFE PRACTICES.

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### **IMPORTANT!**

**READ ALL INSTRUCTIONS BEFORE INSTALLING.**

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 **WARNING**  **The following WARNINGS appear here and in one or more Chapters of this manual.**

- KEEP THE UNIT AREA CLEAR AND FREE FROM ALL COMBUSTIBLE MATERIALS AND FLAMMABLE VAPORS OR LIQUIDS.
- NEVER USE MATCHES, CANDLES, FLAMES OR OTHER SOURCES OF IGNITION TO CHECK FOR GAS LEAKS.
- DO NOT ATTEMPT TO DRY FIRE THE BOILER. STARTING THE UNIT WITHOUT A FULL WATER LEVEL CAN SERIOUSLY DAMAGE THE UNIT AND MAY RESULT IN INJURY TO PERSONNEL OR PROPERTY DAMAGE. THIS SITUATION WILL VOID ANY WARRANTY.
- ELECTRICAL VOLTAGES IN THIS SYSTEM MAY INCLUDE 120 AND 24 VOLTS AC. IT MUST BE SERVICED BY TECHNICALLY COMPETENT SERVICE TECHNICIANS.
- ELECTRICAL POWER MUST BE REMOVED PRIOR TO PERFORMING WIRE REMOVAL OR OTHER TEST PROCEDURES THAT CAN RESULT IN ELECTRICAL SHOCK.
- TO AVOID PERSONAL INJURY, OBSERVE THE FOLLOWING WARNINGS:
  - DISCONNECT THE AC SUPPLY BY TURNING OFF THE SERVICE SWITCH AND AC SUPPLY CIRCUIT BREAKER
  - SHUT OFF THE GAS SUPPLY AT THE MANUAL SHUT-OFF VALVE
  - PROVIDED WITH THE UNIT
  - ALLOW THE UNIT TO COOL TO A SAFE TEMPERATURE TO PREVENT
  - SEVERE BURNS.

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## WARNINGS CONTINUED

- This INSTRUCTION MANUAL is an integral and indispensable part of the product. It must be given to the user by the installers and must be kept in a safe place for future reference. In the event that the boiler is transferred or sold, the manual must accompany the equipment.
- This boiler must be used only for the purposes for which it has been designed. Any other use shall be considered incorrect and dangerous, thereby voiding the warranty.
- The boiler must be installed in compliance with applicable laws and standards and according to the manufacturer's instructions given in this manual. Incorrect installation may cause injury to personnel and/or damage to property. The manufacturer shall not be held liable for any such injury and/or damage.
- Damage and/or injury caused by incorrect installation or use, or failure to observe the manufacturer's instructions shall relieve AERCO from any and all contractual and extra contractual liability.
- **DO NOT** obstruct the air suction to the boiler room and/or heat dissipation devices in any other room.
- Keep the packaging out of the reach of children as it may represent a choking and suffocation hazard.
- Non-observance of the above requirement may jeopardize the safety of the boilers and expose people, animals and property to danger.



## CAUTIONS appear here and in one or more Chapters of this manual.

- CAUTION, THE IGNITER MAY BE HOT. USE CARE TO AVOID SERIOUS BURNS
- Caution must be observed to prevent damage to the AERCO Modulex Boiler or associated equipment. Failure to observe precautions may also void the Boiler warranty.
- Prior to installing the boiler, check to ensure that the technical data corresponds to requirements for its intended use in the system.
- Check that the boiler is intact and that it has not been damaged during transport and handling. Do not install equipment, which is evidently damaged and/or faulty.
- Only original accessories must be used for all boilers supplied with options or kits (including electrical ones).
- Dispose of the packaging with care, as all the materials can be recycled. The packaging must therefore be sent to specific waste management sites.
- In the event of failure and/or faulty functioning, switch off the boiler. Do not attempt to make repairs: contact qualified technicians. Original parts must be used for all repairs to the boiler.
- In the event of long periods of inactivity of the boiler, disconnect it from the power mains and close the gas valve. (In this case, the boiler's electronic anti-freeze function will not be operative.) Should there be a risk of freezing, add anti-freeze: it is not advisable to empty the system as this may result in damage; use specific "aluminum-friendly", neutral pH anti-freeze products suitable for multi-metal heating systems.
- **To guarantee efficiency and correct functioning of the equipment it is legally binding to service the boilers once a year according to the schedule indicated in the relative section of this manual.**

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## FOR YOUR SAFETY



For boilers that use gaseous fuel, what to do if you smell gas.

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

**NEVER USE FLAMES TO DETECT GAS LEAKS.**



This boiler has been built for installation in the country indicated on the technical data plate. **Installation in any other country may be a source of danger for people, animals and property.**

**Carefully read the warranty conditions and clauses on the warranty certificate attached to the boiler.**

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### **IMPORTANT – FOR MASSACHUSETTS INSTALLATIONS**

Boiler Installations within the Commonwealth of Massachusetts must conform to the following requirements:

- Boiler must be installed by a plumber or a gas fitter who is licensed within the Commonwealth of Massachusetts.
- Prior to unit operation, the complete gas train and all connections must be leak tested using a non-corrosive soap.
  - If a glycol solution is used as anti-freeze protection, a backflow preventer must be installed upstream of the Fill/Makeup Valve.
- The vent termination must be located a minimum of 4 feet above grade level.
- If side-wall venting is used, the installation must conform to the following requirements **extracted from 248 CMR 5.08 (2)**:

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. **INSTALLATION OF CARBON MONOXIDE DETECTORS.** At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard wired carbon monoxide detectors

# INSTALLATION, OPERATION & MAINTENANCE

## Extracted Information From 248 CMR 5.08 (2) – Continued

- a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.
- b. In the event that the requirements of this subdivision can not be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery operated carbon monoxide detector with an alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "**GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS**".

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

(b) EXEMPTIONS: The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and
2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and
2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The identification of each "special venting system" shall include the listing of either the website, phone number or manufacturer's address where the venting system installation instructions can be obtained; and
2. The "special venting systems" shall be Product Approved by the Board, and the instructions provided with the system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for the Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

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[End of Extracted Information From 248 CMR 5.08 (2)]



# INSTALLATION, OPERATION & MAINTENANCE

## 1 GENERAL DESCRIPTION

### IMPORTANT

Each AERCO Modulex Boiler is shipped as either a Natural Gas Only Boiler OR a Propane Gas Only Boiler. It Is Not a Dual-Fuel Boiler. Ensure that the correct fuel and fuel pressure are used when operating the equipment.

### 1.1 – TECHNICAL FEATURES

Modulex is a compact, modular, gas fired, Low NOx, condensing boiler. The boiler body, is comprised of sections of cast aluminum/magnesium/silicon alloy. The boiler is designed to recover the sensible and the latent heat of the combustion gases, thereby allowing it to attain a thermal efficiency of 92% as tested by the Hydronics Institute, a Division of GAMA. These cast aluminum sections make up modules referred to as the heat modules. Each module can deliver an output between a maximum of 152 MBH and a minimum of 45 MBH and are composed of a pre mix combustion chamber, metallic mesh radiant burner, modulating fan with control pressure switch, gas valve, ignition device, flame detection, NTC sensor for local temperature control and a safety thermostat.

The heat modules are housed in a single enclosure and are connected to a single exhaust manifold. These modules are independent of each and are sequentially staged, known as cascading, to take advantage of higher efficiencies. Each heat module has its own printed circuit (PC) board that controls and monitors combustion as well as the temperature of each heat module providing operational safety. The entire boiler is controlled by a single microprocessor. This microprocessor is responsible for the staging and modulation of the heat modules, monitoring supply and return water temperatures as well as heating and domestic hot water (DHW) zones. Other features include:

- The heating load is shared with as many boiler modules as possible running at a minimum output to ensure the maximum efficiency at partial load operation.
- Access to all testing/programming parameters of each module: operation test, operation time, boiler freeze protection from 45°F (7°C), pump's anti seize program.
- Lead-lag burner operation based on burner operating hours. The boiler module with the least burner operating hours is the first to start and the burner with the most operating hours is the first to stop.
- D.H.W. production by a priority sensor, with control capability of a dedicated pump or a 3-way diverting valve for storage tank temperature control.
- A service mode for manual operation of individual heat modules capability for troubleshooting or combustion calibration
- Diagnostics including relay and sensor testing.

Reliability is improved by the modular design of the Modulex since each heat module is independent of the other, having its own ignition and combustion safeguard system. If one of the boiler's heat modules stops functioning, the remaining module(s) continue to operate.

The Modulex boiler can be comprised of from 2 to 7 modules and 3 to 8 cast aluminum sections. The input to each heat module is 151.5 MBTU/Hr. The smallest Modulex 303, comprised of two heat modules, has a combined total input of 303,000 BTU/Hr ( $2 \times 151.5 = 303$  MBTU) while the largest, the 1060 comprised of 7 heat modules has a total input of 1060 MBTU's (See Table 1-1).

For one Modulex 303 boiler consisting of two modules, the output modulates from 15% to 100%. For a Modulex 1060 boiler consisting of seven modules, the output modulates from 4.3% and 100%. If a system comprised of two boilers is installed, then the modulation range for each boiler increases to 7.5% to 100% for the Modulex 303 and 2.2% to 100% for the Modulex 1060.

# INSTALLATION, OPERATION & MAINTENANCE

## 1.2 - CODE AND STANDARDS APPROVALS

MODULEX has been reviewed for compliance with the applicable sections of the following North American Standards:

<b>Z21.13:</b>	GAS FIRED LOW PRESSURE STEAM AND HOT WATER BOILERS
<b>ASME SECTION IV:</b>	BOILER AND PRESSURE VESSEL CODE RULES FOR CONSTRUCTION OF HEATING BOILERS
<b>BTS 2000:</b>	TESTING STANDARD METHOD TO DETERMINE EFFICIENCY OF COMMERCIAL SPACE HEATING BOILERS
<b>SCAQMD Rule 1146.2:</b>	NO <sub>x</sub> EMISSIONS FROM WATER HEATERS AND SMALL BOILERS
<b>CSD-1-2004:</b>	CONTROLS AND SAFETY DEVICES FOR AUTOMATICALLY FIRED BOILERS

**Table 1-1. – Modulex Boiler Output Range, Turn-Down Ratio & Condensate Production**

Heat Modules	Model	Output Range MBH <sup>1</sup> (KW)		Turn Down Ratio	Condensate Production [gph (l/h)]	
		Min.	Max.		Min.	Max.
2	303	41(12)	279 (82)	6:1	1.3 (5)	3.4 (13)
3	454	41(12)	418 (122)	10:1	1.9 (7.3)	5.3 (20)
4	606	41(12)	558 (163)	13:1	2.7 (10.1)	7.1 (27)
5	757	41(12)	696 (204)	16:1	3.3 (12.6)	9.0 (34)
6	909	41(12)	835 (245)	20:1	4.0 (15.1)	10.6 (40)
7	1060	41(12)	975 (286)	23:1	4.6 (17.6)	12.4 (47)

<sup>1</sup>MBH = 1000 Btu/hr

## 1.3 INSTALLATION FLEXIBILITY

The Modulex boiler allows for installation flexibility, i.e. it is suitable to be connected with the water supply and return and the gas connections on the Right Hand (R.H.) side (standard delivery condition) or on the Left Hand (L.H.) side. This is accomplished by reversing the gas and water manifolds utilizing the instructions supplied with the boiler. The same is true for the vent pipe connection, which at the installation, can be moved from the R.H. side (standard delivery condition) to the L.H. side or to the rear of the boiler. The installation flexibility features include the following:

- Modulex can be installed in a multiple boiler system by the combination of two or more boilers.
- Gas connecting pipes, supply/return water pipes can be arranged for any connection (by either the left or right hand side of the unit, the unit is shipped with all connections on the right hand side as viewed from the front of the unit).
- Vent pipe, adjustable on the right, the left and behind the heating system.

# INSTALLATION, OPERATION & MAINTENANCE

## 1.4 DIMENSIONS AND WEIGHTS

The dimensions and weights for each Modulex Model are shown in sheets 1 and 2 of Figure 1-1.

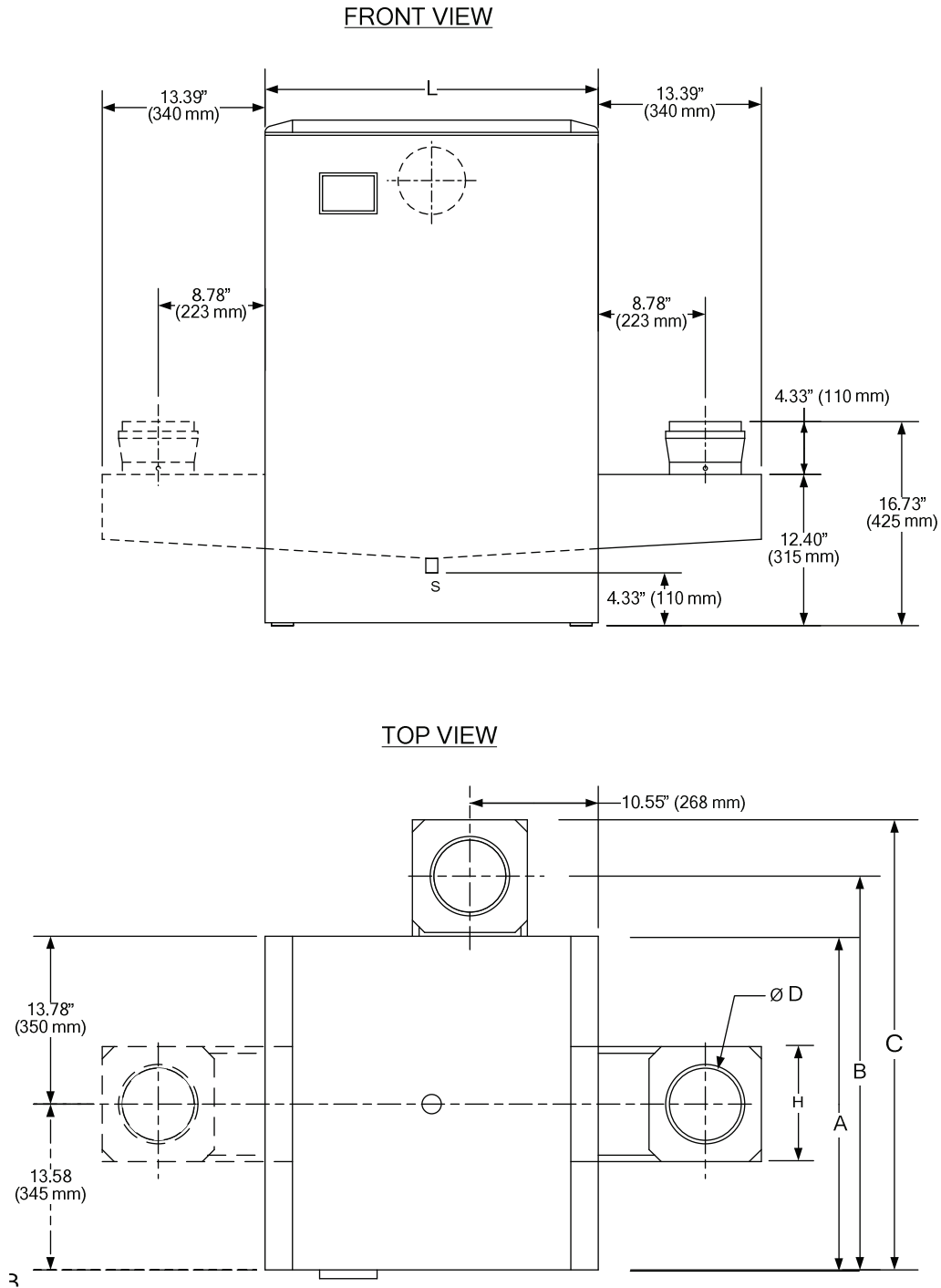
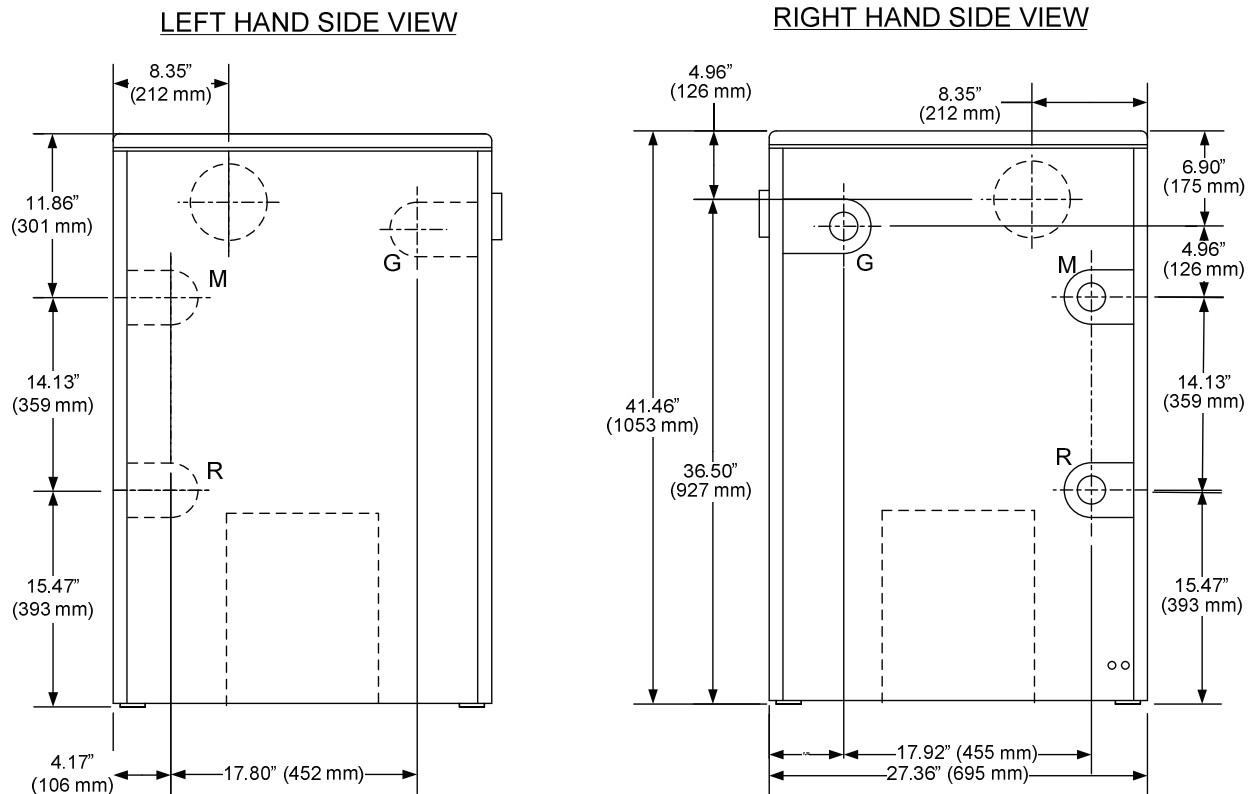


Figure 1-1. Modulex Dimensions and Weights (Sheet 1 of 2)

# INSTALLATION, OPERATION & MAINTENANCE



DIMENSIONS	MODULEX MODELS					
	MLX-303 (2 MODULES)	MLX-454 (3 MODULES)	MLX-606 (4 MODULES)	MLX-757 (5 MODULES)	MLX-909 (6 MODULES)	MLX-1060 (7 MODULES)
HEIGHT	IN (MM)	41.46 (1053)	41.46 (1053)	41.46 (1053)	41.46 (1053)	41.46 (1053)
WIDTH "L" NET	IN (MM)	27.36 (695)	27.36 (695)	32.83 (834)	38.11 (968)	43.39 (1102)
WIDTH W/PACKAGING	IN (MM)	30.32 (770)	30.32 (770)	35.7 (908)	41.0 (1042)	46.3 (1176)
DEPTH "C"	IN (MM)	37.09 (942)	37.09 (942)	37.09 (942)	37.09 (942)	37.09 (942)
DEPTH "A"	IN (MM)	27.36 (695)	27.36 (695)	27.36 (695)	27.36 (695)	27.36 (695)
DEPTH "B"	IN (MM)	32.28 (820)	32.28 (820)	32.28 (820)	32.28 (820)	32.28 (820)
DEPTH W/PACKAGING	IN (MM)	30.71 (780)	30.71 (780)	30.71 (780)	30.71 (780)	30.71 (780)
NET WEIGHT	LB (KG)	331 (150)	408 (185)	496 (225)	573 (260)	672 (305)
GROSS WEIGHT	LB (KG)	386 (175)	463 (210)	551 (250)	639 (290)	739 (335)
<b>CONNECTION</b>						
GAS	IN (MM)	1-1/2 (38)	1-1/2 (38)	1-1/2 (38)	1-1/2 (38)	1-1/2 (38)
WATER OUTLET (SUPPLY) M	IN (MM)	2 (50)	2 (50)	2 (50)	2 (50)	2 (50)
WATER INLET (RETURN) R	IN (MM)	2 (50)	2 (50)	2 (50)	2 (50)	2 (50)
EXH. VENT CONNECTION "D"	IN (MM)	4 (102)	4 (102)	4 (102)	6 (152)	6 (152)
EXH. VENT WIDTH "H"	IN (MM)	9.45 (240)	9.45 (240)	9.45 (240)	9.45 (240)	9.45 (240)
CONDENSATE DRAIN DIA.	IN (MM)	1.57 (40)	1.57 (40)	1.57 (40)	1.57 (40)	1.57 (40)

**Figure 1-1. Modulex Dimensions and Weights (Sheet 2 of 2)**

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## 1.5 - TECHNICAL DATA (THE NAME PLATE IS PLACED UNDER THE FRONT JACKET NEXT TO THE CONTROL PANEL.)

Model Number	Min Input	Max Input	Max Output*	Net IBR Rating
<b>MLX-303</b>	45,500	303,000	260,000-279,000	237,000
<b>MLX-454</b>	45,500	454,000	390,000-418,000	355,000
<b>MLX-606</b>	45,500	606,000	521,000-558,000	474,000
<b>MLX-757</b>	45,500	757,000	651,000-696,000	592,000
<b>MLX-909</b>	45,500	909,000	781,000-835,000	710,000
<b>MLX-1060</b>	45,500	1,060,000	912,000-975,000	829,000

### DIMENSIONS:

Model Number	Height	Width	Depth	Dry Weight
<b>MLX-303</b>	42" (1067 mm)	28" (711 mm)	27" (686 mm)	405 lbs. (183.7 kg)
<b>MLX-454</b>	42" (1067 mm)	28" (711 mm)	27" (686 mm)	484 lbs. (219.6 kg)
<b>MLX-606</b>	42" (1067 mm)	33" (838 mm)	27" (686 mm)	575 lbs. (260.8 kg)
<b>MLX-757</b>	42" (1067 mm)	38" (965 mm)	27" (686 mm)	673 lbs. (305.2 kg)
<b>MLX-909</b>	42" (1067 mm)	44" (112 mm)	27" (686 mm)	765 lbs. (346.8 kg)
<b>MLX-1060</b>	42" (1067 mm)	49" (1245 mm)	27" (686 mm)	869 lbs. (394.0 kg)

### SPECIFICATIONS:

Model Number	MLX-303	MLX-454	MLX-606	MLX-757	MLX-909	MLX-1060
Boiler Category	IV	IV	IV	IV	IV	IV
Type of Gas	Natural Gas (MLX-303H) or Propane (MLX-303HP)	Natural Gas (MLX-454H) or Propane (MLX-454HP)	Natural Gas (MLX-606H) or Propane (MLX-606HP)	Natural Gas (MLX-757HB) or Propane (MLX-757HP)	Natural Gas (MLX-909H) or Propane (MLX-909HP)	Natural Gas (MLX-1060H) or Propane (MLX-1060HP)
Gas Connections (NPT)	1.5"	1.5"	1.5"	1.5"	1.5"	1.5"
Max. Gas Pressure	14" W.C. (34.8 mbar)	14" W.C. (34.8 mbar)	14" W.C. (34.8 mbar)	14" W.C. (34.8 mbar)	14" W.C. (34.8 mbar)	14" W.C. (34.8 mbar)
Optimal Gas Pressure	7" W.C. (17.4 mbar)	7" W.C. (17.4 mbar)	7" W.C. (17.4 mbar)	7" W.C. (17.4 mbar)	7" W.C. (17.4 mbar)	7" W.C. (17.4 mbar)
Min. Gas Pressure	4" (10 mbar)	4" (10 mbar)	4" (10 mbar)	4" (10 mbar)	4" (10 mbar)	4" (10 mbar)
Max. Allowed Working Pressure	92 psi (634 kPa)	92 psi (634 kPa)	92 psi (634 kPa)	92 psi (634 kPa)	92 psi (634 kPa)	92 psi (634 kPa)
Electrical Req: 120V 15 Amp. Max.	1.2 FLA	1.8 FLA	2.4 FLA	3.0 FLA	3.6 FLA	4.2 FLA
Water Connections (NPT)	2-1/2"	2-1/2"	2-1/2"	2-1/2"	2-1/2"	2-1/2"
Min. Water Flow (GPM)	11	17	22	28	38	39
Max. Water Flow (GPM)	28	42	55	70	84	98
Water Pressure Drop @ Max. Flow (Ft. of Head)	10.5	10.6	11.6	12.6	13.7	16.1

# INSTALLATION, OPERATION & MAINTENANCE

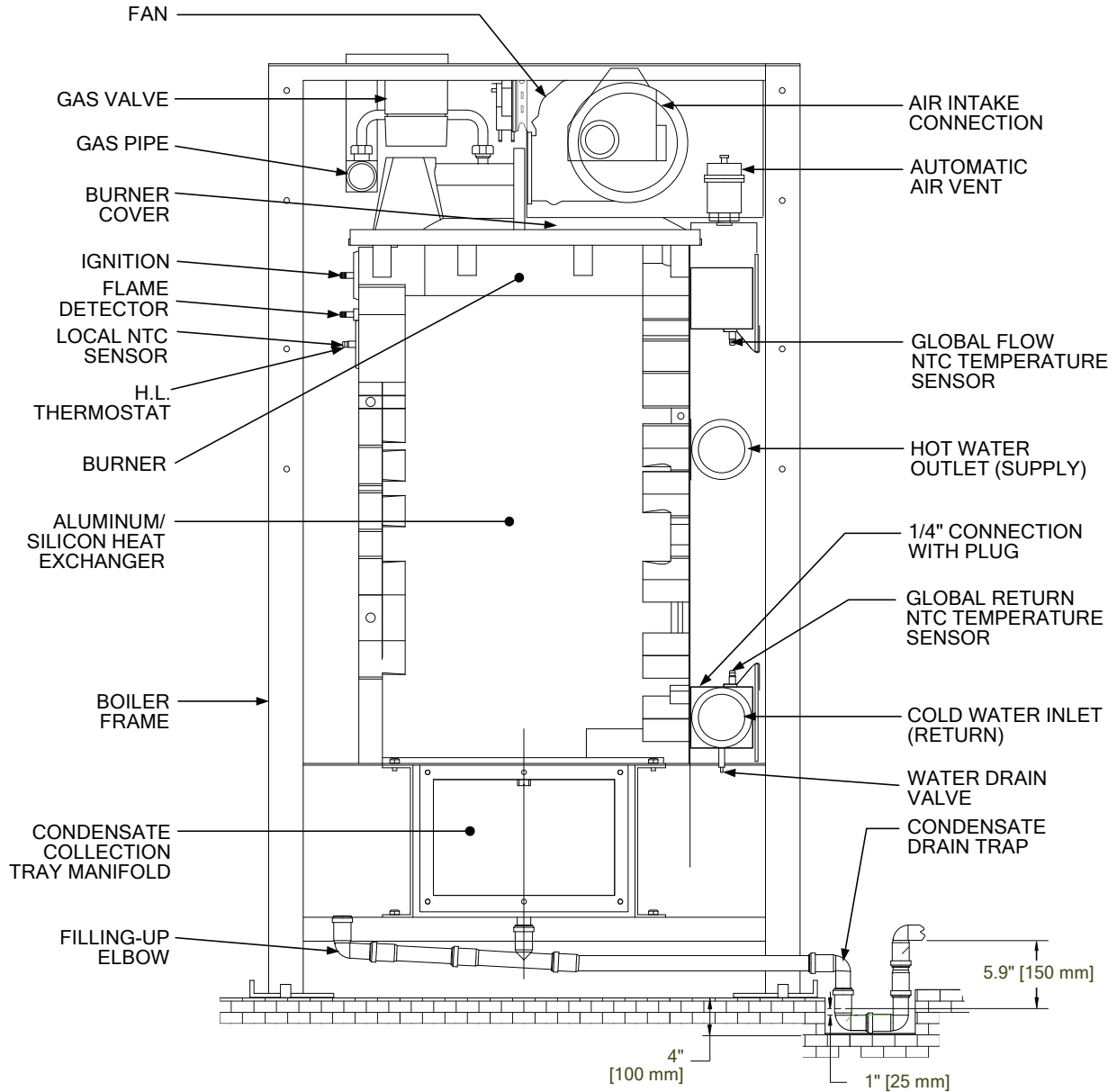
## SPECIFICATIONS: (continued)

Model Number	MLX-303	MLX-454	MLX-606	MLX-757	MLX-909	MLX-1060
Water Pressure Drop @ Max. Flow	5 psi (34.5 kPa)	6 psi (41.4 kPa)	9 psi (62.1 kPa)	10 psi (68.9 kPa)	13 psi (89.6 kPa)	15 psi (103.4 kPa)
Water Volume: Gallons	2.8	3.8	4.9	5.9	6.9	8.0
Water Volume: Liters	10.4	14.4	18.4	22.3	26.3	30.2
Thermal Modules	2	3	4	5	6	7
Turn-Down Ratio	6:1	10:1	13:1	16:1	20:1	23:1
Vent Size	4" (102 mm)	4" (102 mm)	4" (102 mm)	6" (152mm)	6" (152mm)	6" (152mm)
Vent Materials (per local code)	Can support PVC, ABS, CPVC, or AL29-4C venting materials.					
Temperature Control Range	All units can be applied to deliver 50°F to 185°F (10°C to 85°C) supply water.					
Maximum Noise Level	All units deliver <50 dBA when operating at or below full fire.					
NOx Emissions Certification	All units have been certified by SCAQMD and TCEQ for <30 ppm NOx.					
Standard Listings & Approvals	All units have been certified by CSA.					

## 1.6 MODULEX SIDE VIEW SHOWING MAIN COMPONENTS

Figure 1-2 on the following page illustrates the Main Components included in each Modulex Boiler Model. In addition, an exploded view parts list drawing is included in Appendix B.

# INSTALLATION, OPERATION & MAINTENANCE



**Figure 1-2.**  
**Modulex Main Components**

## 1.7 BOILER FREEZE PROTECTION

Should the boiler water outlet temperature decrease to less than 44.6°F (7°C), the system pump will start. Should temperature decrease to less than 37.4°F (3°C), all heat modules will start at minimum output until the return temperature reaches 50°F (10°C). Such a protection device is exclusively for the boiler. For the protection of the whole system, a second freeze protection thermostat is necessary to switch on the heating system pump.

### NOTE

If glycol is used as antifreeze in the boiler, a back flow preventer must be installed in the make-up/fill line.





## 2 INSTRUCTIONS FOR INSTALLERS

### 2.1 INTRODUCTION

The Modulex Boiler is intended to be installed as a Category IV vent installation and must be installed in compliance with all applicable laws and regulations including the ones below. See section 3.1 for Category descriptions.



**Before boiler installation, complete all of the following instructions:**

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to one of the following:

- United States - Installation must conform to the requirements of the National Fuel Gas Code, ANSI Z223.1 Installation Codes.
- Canada - Installation must conform to the requirements of CAN/CGA B149 Installation Codes.

Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.

#### NOTES:

- Installers must follow local regulations with respect to installation of Carbon Monoxide (CO) Detectors. Also, follow the maintenance recommendations in this manual.
- **FOR MASSACHUSETTS INSTALLATIONS:** The boiler must be installed by a plumber or gas fitter licensed within the Commonwealth of Massachusetts.

Also, for installations in buildings used for residential purposes, if a side-wall vent termination is less than 7 feet above grade, an NFPA 720 compliant, ANSI/UL 2034 listed and IAS certified carbon monoxide detector must be installed on the floor level where the boiler is installed and on each level of the building served by the boiler.

### 2.2 INSTALLATION INSTRUCTIONS

The following paragraphs in this Section provide the instructions to unpack and install the Modulex Boiler.

#### 2.2.1 Unpacking the Boiler

The Modulex Boiler is delivered assembled and protected by a plastic bag inside a rugged cardboard box, which is fixed on a pallet (see Figure 2-1). The pallet allows the boiler to be handled by a forklift or pallet jack. The boiler, with the packaging, can fit through a doorway of 32 in. (81 cm), whereas, without packaging, it can fit through a doorway of 28 in. (71 cm). To unpack the Modulex, remove both straps and then the cardboard box from above. Check to ensure that the product is intact.



**The packing elements (cardboard box, straps, plastic bags, etc...) must not be left in children's hands since they may be dangerous.**

# INSTALLATION, OPERATION & MAINTENANCE

## Packed inside the boiler packing you will find:

- Painted steel panels:
  - The front one connected to the back panel by a shrink wrap film
  - The right hand side panel connected to the left hand panel by shrink wrap

## **On the front of the boiler:**

- Flue collector, with exhaust connector screwed to the pallet: 6 inch for models 303 to 606 and 8 inch for models 757 to 1060. Use these items only when the specified flue pipe size is increased to 6" (for models 303 to 606) and 8" (for models 757 to 1060). Otherwise, use the exhaust connector "shipped in the separate carton" described below (4" for models 303 to 606, 6" for models 757 to 1060).
- A plastic bag containing 3 gaskets (1 rectangular for condensate tray and flue collector, 1 square for exhaust connector).
- Three (3) surface-mount strap-on sensors.
- Screws necessary for accessory installation.
- Piping for 1 ½" condensate drain, including one tee and two 90 degree elbows.

## **On the back of the boiler:**

- Plastic condensate drainpipe, 38.5 inches (1meter) long, placed under the casing rear panel.
- Outside air sensor with 49 feet, 2.5 inches (15 m) cable.
- Manual Gas Shutoff Valve.

## **Shipped in a separate carton are the following:**

- Accessory kit that includes a CSD-1 installation kit for Models 303 through 606 and Models 754 through 1060 as follows:

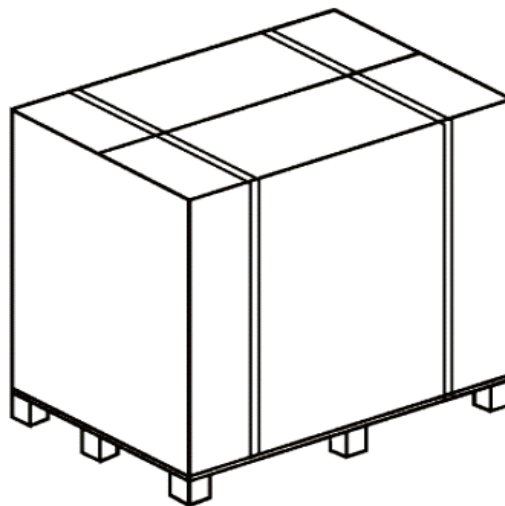
Kit P/N 29073: For Models 303-606 with 50 psig Relief Valve

Kit P/N 29074: For Models 707-1060 with 50 psig Relief Valve

Kit P/N 29075: For Models 303-606 with 90 psig Relief Valve

Kit P/N 29076: For Models 707-1060 with 90 psig Relief Valve

See the packing list shipped in this manual package for a complete listing of accessories. See paragraph 4.4 for more information about the CSD 1- kits.



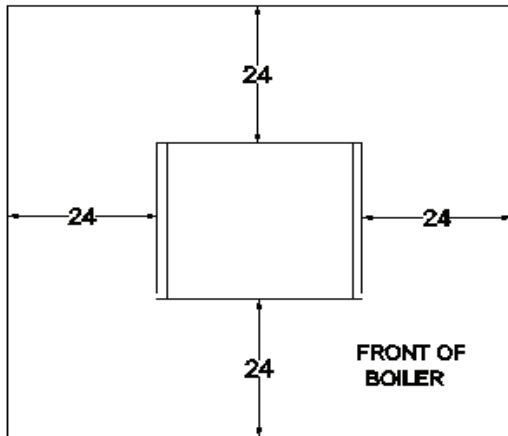
**Figure 2-1.  
Packaged Modulex Boiler**

# INSTALLATION, OPERATION & MAINTENANCE

## 2.2.2 Locating the Boiler

The boiler should be located on a level, solid area or base as near to the outside wall as possible and centrally located to the space heating distribution system. Special attention must be given to local regulations and codes about boiler rooms and particularly to the maintaining of minimum clearances and empty space around the boiler. The installation must be in compliance with all recent regulations and laws about boiler rooms, installations of heating and hot water systems, ventilation, boiler venting systems capable of evacuating the flue gases of condensing boilers and any other applicable requirement.

The minimum clearance dimensions for service access, required by AERCO, are listed below (Figure 2-2) and on the boiler Data Plate shown in Figure 2-7. Local building codes may require more clearance and take precedence.



### Minimum clearances required:

Sides	24" (510 mm)
Front	24" (510 mm)
Rear	24" (510 mm)
Top	24" (510 mm)

**Figure 2-2  
Boiler Clearances (Top View)**

**NOTE: All gas piping, water piping and electrical conduit or cable must be arranged so that they do not interfere with the removal of any cover, or inhibit service or maintenance of the unit.**



The boiler **MUST NOT** be installed on carpeting

## 2.2.3 Pad Height for Boiler

To properly drain and service the boiler's condensate system, attention must be given to installation requirements regarding the mounting height of the boiler as well as installation clearances for the removal of the condensate collector baffle.

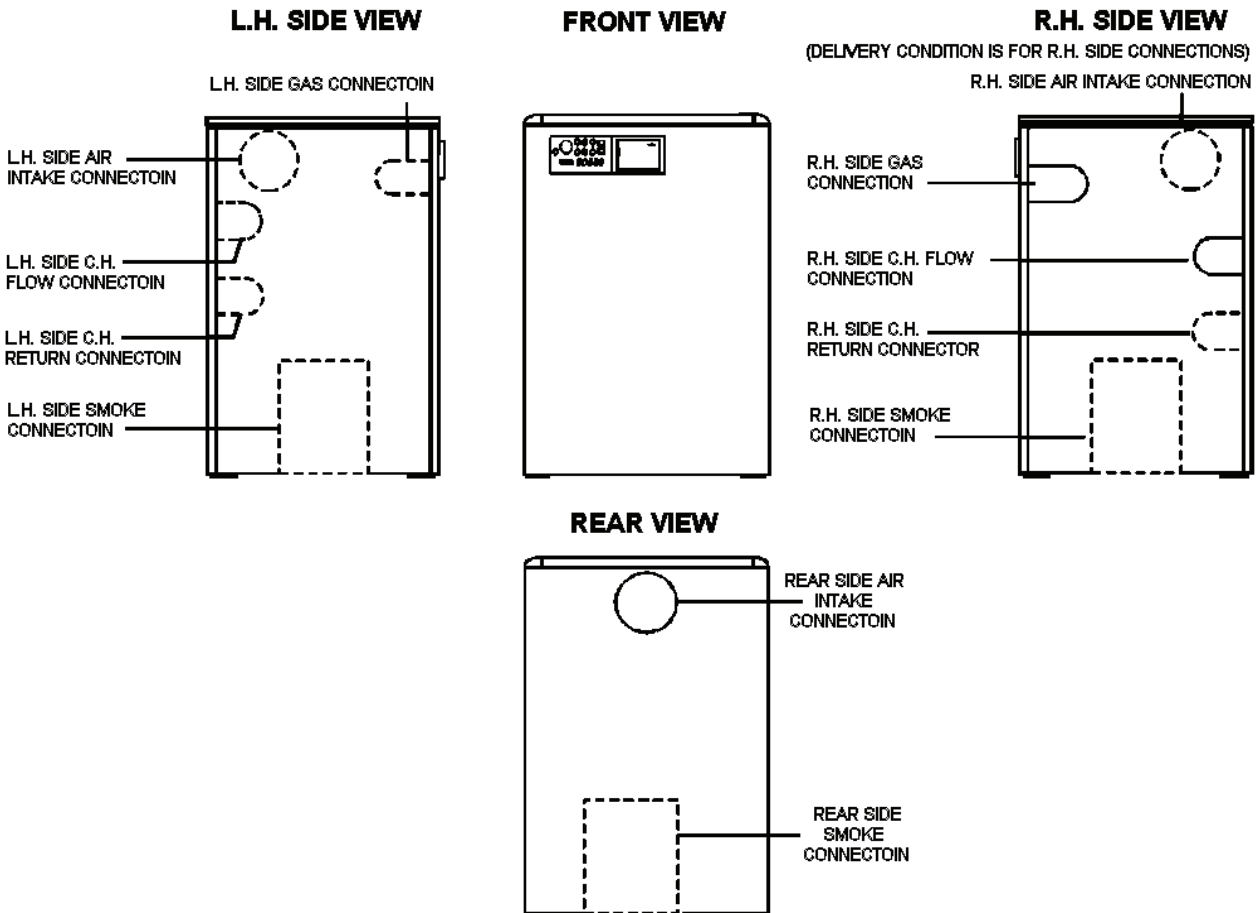
The boiler should be mounted on a flat and sufficiently strong base with the same dimensions as the boiler (see Figure 1-1) and at least 4 inches (100mm) high (see Figure 4-1 in paragraph 4.7), to allow for assembly of the condensate drain trap. An alternative to this base may be a 4 inch (100mm) deep well next to the boiler to house the condensate siphon.

The condensate collector baffle (see Section 7) can be fixed, from the Right Hand (R.H) or Left Hand (L.H.) side of the condensate tray. If no modification has been made, the boiler must have its R.H. side accessible, with the vent connection fitted on the R.H or L.H. side. However, if the flue collector terminal, with the exhaust connector, is left to of the R.H. side and if, from this same side, the baffle has to be removed, and then the exhaust connector must have the possibility to be also removed. If it is preferred, the baffle can be moved in order to have its mounting screw on the opposite side, regardless the position of the flue collector chamber terminal.

# INSTALLATION, OPERATION & MAINTENANCE

## 2.2.4 Boiler Connections

Upon delivery, the Modulex Boiler has all the connections on its R.H. side (Figure 2-3). Note that the R.H. orientation is the right hand side when viewed facing the front of the boiler. These connections include: water supply and return, gas, combustion air intake and flue collector outlet. The locations of the air intake and/or the flue collector outlet can be changed on site by removing knock-outs on the boiler right, left or back side panels. To attach the exhaust connector to the flue collector, use the screws and the gaskets supplied inside the plastic bag and use a cross-tip (Phillips) screwdriver at least 12 in. (300 mm) long.

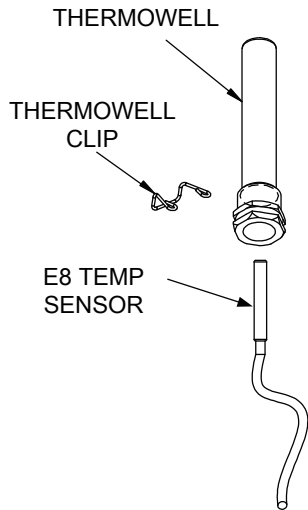
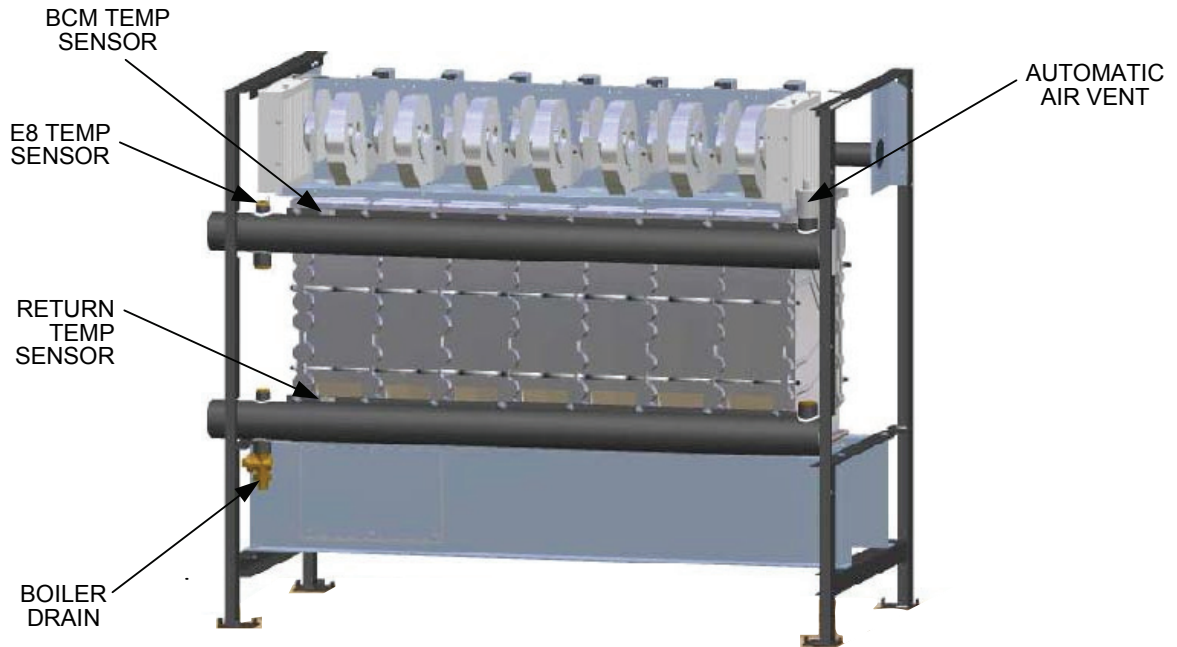


**Figure 2-3.**  
**Boiler Connections**

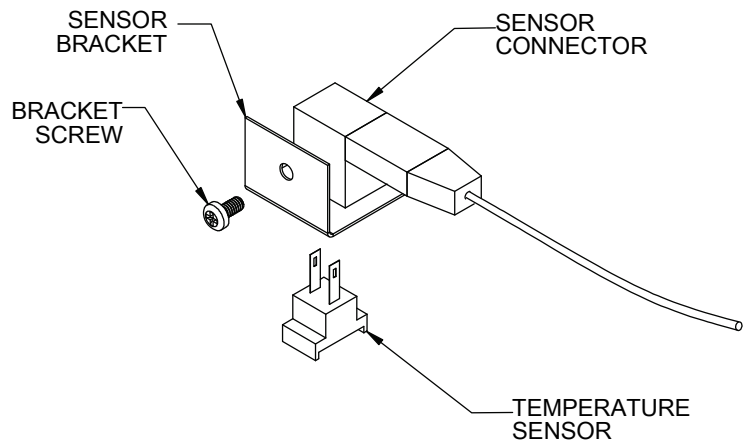
Water supply and return and gas connections can also be moved to the boiler's L.H. side by inverting the flow (supply)/return manifold on the left side using the following procedure:

1. Remove the front, side and rear panels from the boiler.
2. For reversal of the water flow (supply) and return manifolds from the R.H. to the L.H. side, remove the small plates securing the flow (supply) and return global temperature sensors (Figure 2-4).

# INSTALLATION, OPERATION & MAINTENANCE



E8 SENSOR

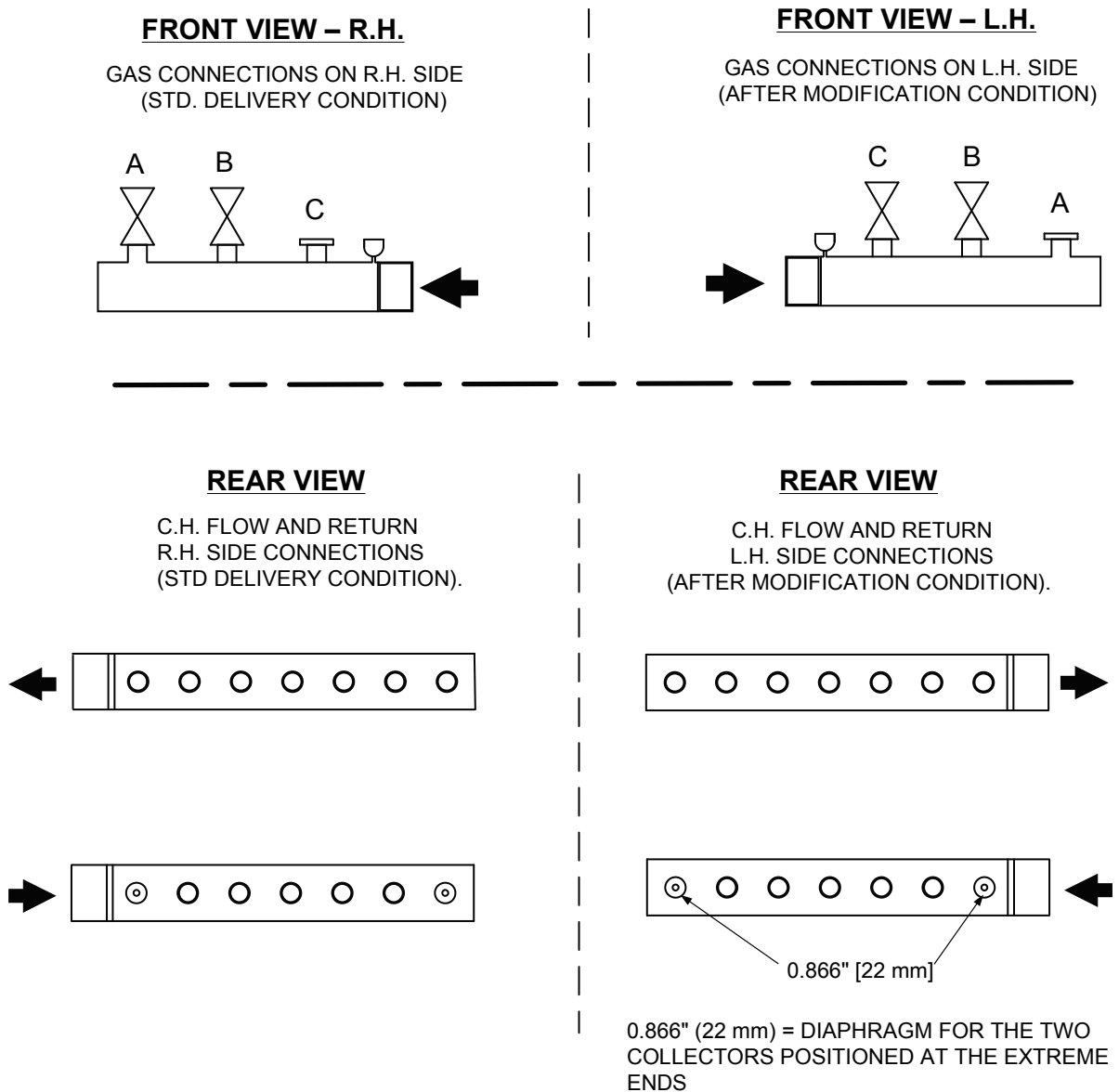


BCM & BOILER RETURN SENSORS

**Figure 2-4**  
**Right Hand (R.H.) Connection**

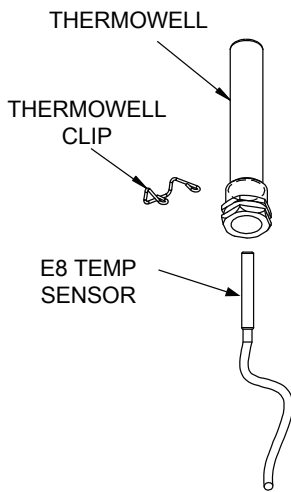
# INSTALLATION, OPERATION & MAINTENANCE

3. Disassemble the flow (supply) and return manifolds (Figure 2-5), leaving the rubber gaskets in place on the upper holes of the aluminum sections and the rubber gaskets/diaphragms in place on the lower holes. The diaphragms on the end sections have a hole diameter of .866 in. (22 mm).
4. Reassemble the manifolds with the threaded connection on the opposite side as shown in Figure 2-5. Change the position of the drain cock and the automatic air vent (Figure 2-6).
5. Reposition the temperature sensor white and red leads onto the new flow (supply) manifold and the temperature sensor white and green leads onto the new return manifold.

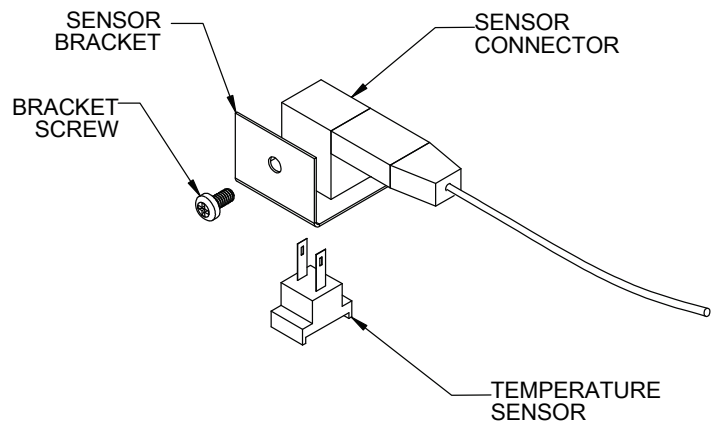


**Figure 2-5**  
**R.H. and L.H. Manifold Connection**

# INSTALLATION, OPERATION & MAINTENANCE



E8 SENSOR



BCM & BOILER RETURN SENSORS

**Figure 2-6**  
**Left Hand (L.H.) Connection**

## INSTALLATION, OPERATION & MAINTENANCE

6. For the gas connection, it is possible to keep the gas manifold inlet on the R.H. side, if desired, or it can be rotated 180° to have it on the L.H. side. In case of reversal from R.H. side to L.H. side of the gas manifold, only on the Modulex Model 303 will it be necessary to reverse plug C with the gas valve fitting A (see gas manifold connections in Figure 2-5).

The boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 0.5 psi (14" W.C., 3.5 kPa).

The boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 0.5 psi (3.5 kPa).

The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement etc.).





Before operating the boiler, the complete gas train and all connections must be leak tested using a non-corrosive soap solution.

### 2.3 DATA PLATE

A sample Data Plate for a Modulex Boiler is shown in Figure 2-7. The data in Table 2-1 following this Figure indicates the required entries for each Modulex Model.



# INSTALLATION, OPERATION & MAINTENANCE

<div style="text-align: center;">  <p>159 Paris Avenue, Northvale NJ 07647</p> </div> <p>MODEL NO. <input style="width: 50px;" type="text"/> REV. <input style="width: 50px;" type="text"/></p> <p>TYPE OF GAS <input style="width: 50px;" type="text"/> SERIAL NO. <input style="width: 50px;" type="text"/></p> <p style="text-align: center;"><u>RATINGS-BTUH</u></p> <p>MAX INPUT <input style="width: 50px;" type="text"/> BTU/HR</p> <p>MIN. INPUT <input style="width: 50px;" type="text"/> BTU/HR</p> <p>OUTPUT <input style="width: 50px;" type="text"/> BTU/HR</p> <p>NET I=B=R RATING <input style="width: 50px;" type="text"/> BTU/HR</p> <p>BOILER CATEGORY <input style="width: 50px;" type="text"/></p> <p style="text-align: center;"><u>FOR PURPOSE OF INPUT ADJUSTMENT</u></p> <p>PERMISSIBLE INLET GAS PRESSURE</p> <p>MAX. <input style="width: 50px;" type="text"/> IN. W.C.</p> <p>NORMAL <input style="width: 50px;" type="text"/> IN. W.C.</p> <p>MIN. <input style="width: 50px;" type="text"/> IN. W.C.</p> <p>NORMAL MANIFOLD PRESSURE <input style="width: 50px;" type="text"/> IN. W.C.</p> <p>ELECTRICAL INPUT 115V__LESS THAN 12AMPS</p> <p>ANSI Z21.13 <input style="width: 50px;" type="text"/> LOW PRESSURE BOILER CSA 4.9</p>	<p style="text-align: center;"><b>CAUTION</b></p> <p>BEFORE LIGHTING MAKE CERTAIN HOT WATER SYSTEM IS FULL OF WATER</p> <hr/> <p style="text-align: center;"><b>FOR YOUR SAFETY</b></p> <p>DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.</p> <hr/> <p style="text-align: center;"><b>IMPORTANT</b></p> <p>1. TURN POWER TO THE BOILER ON AND FOLLOW OPERATING INSTRUCTIONS FOR THIS BOILER WHICH ARE LOCATED NEAR THIS RATING.</p> <p>IN ORDER TO START UP THE BOILER:          1) OPEN THE GAS VALVE          2) CHECK GAS AND WATER PRESSURE          3) TURN THE START UP SWITCH ON.</p> <p>IN CASE THE BOILER DID NOT START WAIT 5 MINUTES AND REPEAT THIS PROCEDURE.</p> <hr/> <p>FOR INSTALLATION ON COMBUSTIBLE FLOORS, MINIMUM CLEARANCES TO COMBUSTIBLE CONSTRUCTION ARE:</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>INPUTS 400,000 BTU/HR. OR LESS</th> <th>INPUTS OVER 400,000 BTU/HR</th> </tr> </thead> <tbody> <tr> <td>TOP</td> <td>0</td> <td>24</td> </tr> <tr> <td>FRONT</td> <td>CLOSET</td> <td>24</td> </tr> <tr> <td>FLUE CONN.</td> <td>0</td> <td>24</td> </tr> <tr> <td>REAR</td> <td>0</td> <td>24</td> </tr> <tr> <td>SIDES</td> <td>0</td> <td>24</td> </tr> </tbody> </table> <hr/> <p>1. GREATER CLEARANCES FOR ACCESS SHOULD SUPERSEDE FIRE PROTECTION CLEARANCES.          2. ALLOW 24 INCHES AT FRONT AND TOP FOR SERVICING AND CLEANING.          3. FOR INSTALLATION ON COMBUSTIBLE FLOORS</p>		INPUTS 400,000 BTU/HR. OR LESS	INPUTS OVER 400,000 BTU/HR	TOP	0	24	FRONT	CLOSET	24	FLUE CONN.	0	24	REAR	0	24	SIDES	0	24
	INPUTS 400,000 BTU/HR. OR LESS	INPUTS OVER 400,000 BTU/HR																	
TOP	0	24																	
FRONT	CLOSET	24																	
FLUE CONN.	0	24																	
REAR	0	24																	
SIDES	0	24																	
<p style="text-align: center;">CERTIFIED BY: UNICAL AG SPA</p> <p>MAWP, Water 92psi Maximum Water 200°F Minimum relief valve capacity <input style="width: 50px;" type="text"/> BTU/HR</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>"BLUE FLAME"</p> </div> <div style="text-align: center;">  <p>"BLUE STAR"</p> </div> </div>																			

**Figure 2-7  
Sample Data Plate**

# INSTALLATION, OPERATION & MAINTENANCE

**Table 2-1. Modulex Data Plate Entries**

<b>MODEL NUMBER</b>	<b>MLX-303</b>	<b>MLX-454</b>	<b>MLX-606</b>	<b>MLX-757</b>	<b>MLX-909</b>	<b>MLX-1060</b>
<b>REVISION</b>	A	A	A	A	A	A
<b>TYPE OF GAS</b>	NATURAL GAS (MLX-303H) OR PROPANE (MLX-303HP)	NATURAL GAS (MLX-454H) OR PROPANE (MLX-454HP)	NATURAL GAS (MLX-606H) OR PROPANE (MLX-606HP)	NATURAL GAS (MLX-757H) OR PROPANE (MLX-757HP)	NATURAL GAS (MLX-909H) OR PROPANE (MLX-909HP)	NATURAL GAS (MLX-1060H) OR PROPANE (MLX-1060HP)
<b>*SERIAL NO.</b>	303-XX-XXXX	454-XX-XXX	606-XX-XXXX	757-XX-XXXX	909-XX-XXXX	1060-XX-XXXX
<b>MAX INPUT</b>	303,000	454,000	606,000	757,000	909,000	1,060,000
<b>MIN INPUT</b>	45,000	45,000	45,000	45,000	45,000	45,000
<b>OUTPUT</b>	279,000	418,000	558,000	696,000	835,000	975,000
<b>NET IBR RATING</b>	237,000	355,000	474,000	592,000	710,000	829,000
<b>BOILER CATEGORY</b>	IV	IV	IV	IV	IV	IV
<b>MAX INLET (SUPPLY) GAS PRESSURE</b>	14" W.C (34.8 mbar).	14" W.C (34.8 mbar).	14" W.C (34.8 mbar).	14" W.C (34.8 mbar).	14" W.C (34.8 mbar).	14" W.C (34.8 mbar).
<b>MIN INLET (SUPPLY) GAS PRESSURE</b>	4" (10 mbar)	4" (10 mbar)	4" (10 mbar)	4" (10 mbar)	4" (10 mbar)	4" (10 mbar)
<b>*NORMAL MANIFOLD GAS PRESSURE</b>	3.2" Nat. Gas (MLX-303H) 2.5" Propane (MLX-303HP)	3.2" Nat. Gas (MLX-454H) 2.5" Propane (MLX-454HP)	3.2" Nat. Gas (MLX-606H) 2.5" Propane (MLX-606HP)	3.2" Nat. Gas (MLX-757H) 2.5" Propane (MLX-757HP)	3.2" Nat. Gas (MLX-909H) 2.5" Propane (MLX-909HP)	3.2" Nat. Gas (MLX-1060H) 2.5" Propane (MLX-1060HP)
<b>OPTIMAL INLET (SUPPLY) GAS PRESSURE</b>	7.0" (17.4 mbar)	7.0" (17.4 mbar)	7.0" (17.4 mbar)	7.0" (17.4 mbar)	7.0" (17.4 mbar)	7.0" (17.4 mbar)

\* **NOTE:** Normal manifold gas pressure measured at downstream port of gas valve ((Figure 6-2).

## 3 GENERAL INFORMATION FOR VENTING

**Note:** See Venting Guide GF-115-V for venting specifications and materials.

### 3.1 VENT PIPE CONNECTION



The Modulex boiler is approved for a Category IV vent configuration as well as for sealed combustion installations. Provisions for combustion and ventilation air in accordance with section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas code, ANSI Z223.1, or Sections 7.2, 7.3, or 7.4 of CAN/CGA B149, Installation codes, or applicable provisions of the local building codes.



Maintain clearances from combustible construction for boiler, vent connector, and steam and hot-water pipes.

### 3.2 GAS VENT CATEGORIES

Federal Codes have categorized gas appliances by the vented flue gas pressure and temperature. These categories are defined as follows:

- **Category I**, being a gas appliance that operates with a non-positive vent (or natural drafted vent) connector with a flue gas pressure and temperature at least 140°F (60°C) above its dew point.
- **Category II**, being a gas appliance that operates with a non-positive vent (or natural drafted vent) connector with a flue gas pressure and temperature less than 140 degrees F (60 degrees C) above its dew point.
- **Category III**, being a gas appliance that operates with a positive vent (fan forced vent) connector with a flue gas pressure and temperature at least 140 degrees F (60 degrees C) above its dew point.
- **Category IV**, being a gas appliance that operates with a positive vent (fan forced vent) connector with a flue gas pressure and temperature less than 140 degrees F (60 degrees C) above its dew point.
- **Direct Vent**, a gas appliance is constructed and installed so that all air for combustion is derived directly from the outdoors and all flue gases are discharged to the outdoors.

### 3.3 INSTALLATION AND SIZING

The AERCO Venting Guide, GF-115-V, must be consulted before any flue gas vent or air inlet piping is designed or installed. Certified venting materials specified in GF-115-V must be used for safety and code compliance. Because the Modulex boiler is capable of discharging low temperature exhaust gases, the flue must be pitched back to the unit a minimum of ¼" per foot to avoid any condensate pooling and to allow for proper drainage.

**For side wall venting in Massachusetts:**

- The vent termination must be located at a minimum of 4 feet above grade level.
- **IMPORTANT:** See pages v and vi of this manual (GF-115H) for detailed information pertaining to side wall venting within the Commonwealth of Massachusetts.

# INSTALLATION, OPERATION & MAINTENANCE

Pipe lengths and fittings must be calculated as part of the equivalent length. The pressure drop of the vent and combustion air systems must not exceed 100 equivalent feet each. Note that this **DOES NOT** mean the allowed combined pressure drop between the vent and combustion air is 200 equivalent feet. That is, the vent cannot go above 100 equivalent feet, even if the combustion air is less than 100 equivalent feet, and vice versa. (See GF-115-V for detailed sizing guidelines.)

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 compounds 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.

The Modulex is CSA listed for 100% sealed combustion or can be installed using room air as long as there is an adequate supply. (See GF-115-V for detailed sizing guidelines.)

## 3.4 REMOVAL OF EXISTING BOILER FROM COMMON VENTING SYSTEM

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there are no blockages or restrictions, leakage, corrosion and other deficiencies that could cause an unsafe condition.
3. When practical, close all building doors and windows as well as all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on any appliances not connected to the common venting system, such as clothes dryers. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Turn on the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous state of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms to the National Fuel Gas code, ANSI Z223.1 and/or CAN/CGA B149, Installation Codes. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 of the National Fuel Gas Code, ANSI Z223.1 and/or CAN/CGA B149, Installation Codes.

# 4 PIPING

**NOTE: For in depth piping information for the boiler, see Piping Guide GF-115-P-H**

## 4.1 MAKEUP WATER QUALITY

Water at the installation should be checked, monitored, maintained and treated as described in GF-115-P-H.

**NOTE: Failure of the boiler due to water quality is not covered under warranty.**

## 4.2 - MAXIMUM ALLOWABLE WORKING PRESSURE



The Modulex boiler has a maximum allowable working pressure of 92 psi (634kPa, 6.34 bar), and a minimum of 15 psi (103 kPa, 1 bar).

## 4.3 BOILER LOOP DESIGN GUIDELINES

For proper and safe operation of the water tube Modulex boiler, the primary (boiler) loop piping and the associated fittings and accessories must be designed/selected as discussed in the following sections

## 4.4 CSD-1 MANIFOLD ASSEMBLY (SUPPLIED)

The installation of a low water cutoff, manual reset high limit aquastat and an ASME compliant safety pressure relief valve designed for the boiler output capacity are required. These major components along with a manifold and several others are supplied with the boiler and must be assembled and wired when installing the boiler at the site. The manifold assembly components supplied are:

- 3/4" Pressure Relief Valve
- Manifold Assembly [2-1/2" x 16" long (64 mm x 406 mm)]
- 2-1/2" NPT Union
- Low Water Cut-Off Switch
- Aquastat
- Pressure/Temperature Gauge

## 4.5 CONNECTING SUPPLY AND RETURN PIPING (PER ANSI Z21.13A)

- The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.
- The boiler piping system of a hot water boiler connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of boiler water during the cooling cycle.
- A hot water boiler installed above radiation level or as required by Authority having jurisdiction, must be provided with a low water cutoff device either as a part of the boiler or at the time of the installation.

# INSTALLATION, OPERATION & MAINTENANCE

## 4.6 SYSTEM FILLING & DRAINING

- For filling-up the system a filling tap has to be inserted on the system return pipe.
- The filling-up can also be made through the draining tap on the boiler return manifold.
- In both cases, an approved hydraulic disconnection system has to be fitted.
- Before connecting the boiler, carefully rinse out the whole system with running water.

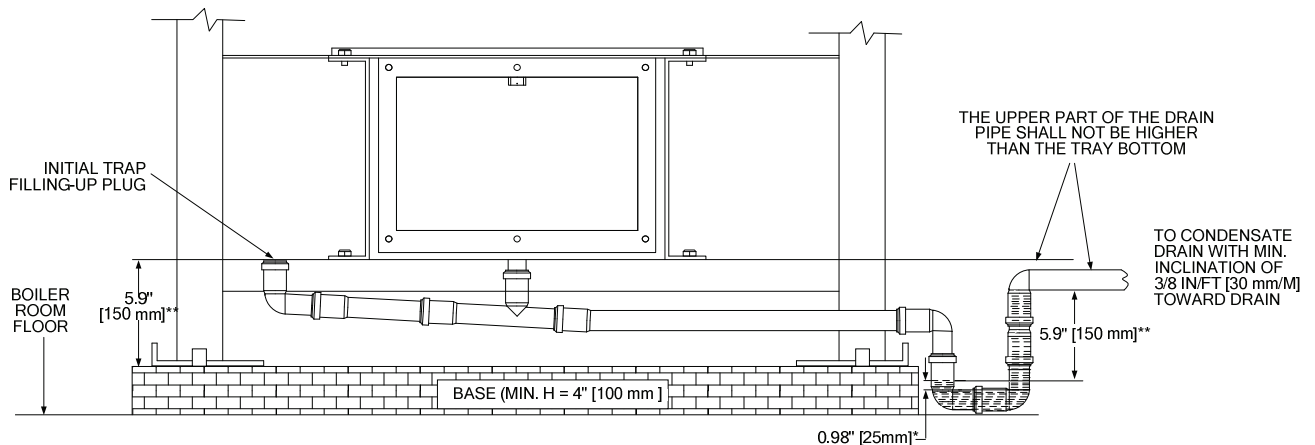
## 4.7 NOTES ON CONDENSATE DRAIN

To maintain proper flow of condensate the drain pipe must slope toward the drain of at least 3/8 in./ft. (30 mm/m). The liquid column inside the condensate siphon needs to be filled with water after installation. Its minimum height when all the fans are in operation must be at least 1 in. (25 mm). See Figure 4-1. In order to help avoid ice from forming, the condensate piping system must be well insulated.



**DO NOT INSTALL THE CONDENSATE DRAIN WHERE FREEZING MAY OCCUR.**

Consult local codes with regard to condensate neutralization. Neutralization can be obtained by mixing it with the buildings drain water or with limestone, which normally have a base pH.



**Figure 4-1**  
**Typical Condensate Drain Installation**

## 4.8 GAS MAINS AND CONNECTIONS

- Connect gas service meter to control assembly in accordance with the current version of the ANSI Z223.1 and the local codes or utility.
- Prior to operation, the complete gas train must be leak tested using a non-corrosive soap.
- For gas pipe sizing and additional details, see GF-115-P-H.

## **5** ELECTRICAL

**NOTE: For additional electrical information, see Electrical Power Guide GF-115-E**

### 5.1 ELECTRICAL CONNECTIONS

A complete electrical wiring diagram for the Modulex is provided under separate cover in the manual package. For electrical ratings, refer to the technical data in paragraph 1.5. The boiler installation requires a 120 VAC, 60 Hz – single-phase power input. The electrical connections must conform to local and NEC or CEC requirements. Utilization of adapters, multiple sockets or extensions cords are not permitted. It is imperative that these safety requirements be adhered to. If in doubt, request an accurate assessment of your electric system by highly qualified personnel.

AERCO is not liable for any damage caused by connection to an improper grounding system. The gas and water feeding pipes and the central heating system pipes cannot be used as grounding means. Boiler electric safety is guaranteed only when it is properly connected to an effective grounding system, which is in compliance with the regulations in force.

The use of any electrically powered equipment implies the observance of some fundamental rules, such as:

- **Do not touch the boiler with any wet part of your body and/or barefooted; do not pull the supply cable.**
- **Do not expose the boiler to sunlight, rain, etc.**
- **Keep the boiler away from untrained people.**

#### **WARNING**

The boiler's electrical supplying cable must not be replaced by the user. In case of any damage to the cable, stop the boiler and contact qualified personnel for its replacement.

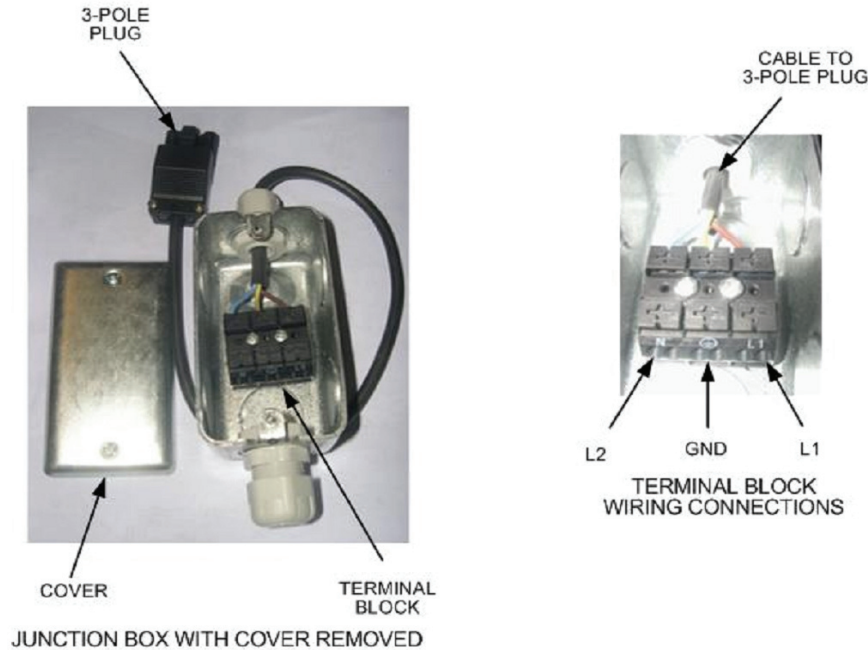
#### **IMPORTANT**

Prior to connecting external AC power to the Modulex boiler, the CSD-1 Supply Manifold must be installed using the procedures described Piping Manual GF-115-P-H.

1. External power at 120 VAC, 60 Hz, single phase is first connected to the Low Water Cutoff and Aquastat provided on the CSD-1 Supply Manifold. Refer to Wiring Diagram 68004 provided in the manual package for connections to the CSD-1 Manifold.
2. Following connection of 120 VAC power to the CSD-1 Manifold, the power leads are routed to the Junction Box shown in Figure 5-1. The Junction Box is accessed by removing the front panel from the boiler.
3. Route the wires from the CSD-1 Manifold through the cutout labeled **120V** on the Left side of the boiler. If necessary, the cutout labeled **24V** is used for low voltage signals such as external sensors.
4. The boiler's Junction Box contains a polarized terminal block. Therefore, the **Red (Line - L1)** and **White (Neutral - L2)** wires from the CSD-1 Manifold **MUST BE** connected to terminals **L1** and **L2** respectively on the terminal block in the Junction Box. The output cable from the Junction Box is terminated with a 3-pole plug, which connects to the boiler's electrical components. If incorrectly wired, the boiler goes into a "lockout" condition.

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- It is necessary to install a double-pole switch on the supply line in an easily accessible position in order to quickly and safely disconnect service. **Do Not** affix switch to boiler sheet metal enclosure.



**Figure 5-1. Junction Box Wiring Connections**

After placing the boiler in operation, the ignition system safety shutoff device must be tested. If an external electrical source is utilized, the boiler, when installed, must be electrically bonded to ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the National Electrical code (NEC), ANSI/NFPA 70 and/or the Canadian Electrical Code (CEC) Part I, CSA C22.1, Electrical Code.

### 5.2 DHW STORAGE TANK

Domestic hot water (DHW) production by an external storage tank connected to the boiler can be implemented by an electric diverting valve or a separated storage tank loading pump. See Figure 5-2.

The DHW tank temperature sensor will be connected to the terminals 3 (F3) and 4 (GND) of E8 Controller connector number I.

### 5.3 ENABLE/ DISABLE

**Enable/Disable:** it shall be connected to the terminals 3 (F3) and 4 (GND) of E8 Controller connector number I.

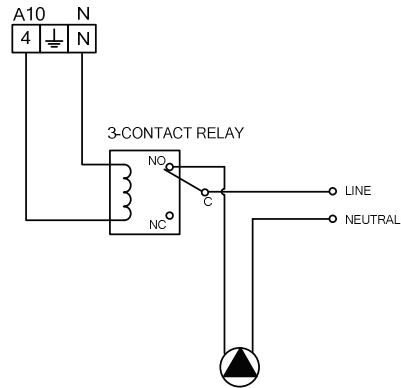
### 5.4 INSTALLATION OF SENSORS

To avoid electromagnetic interference, it is necessary to separate any external sensor wiring (between sensor and terminal strip) from any 120 VAC power wiring.



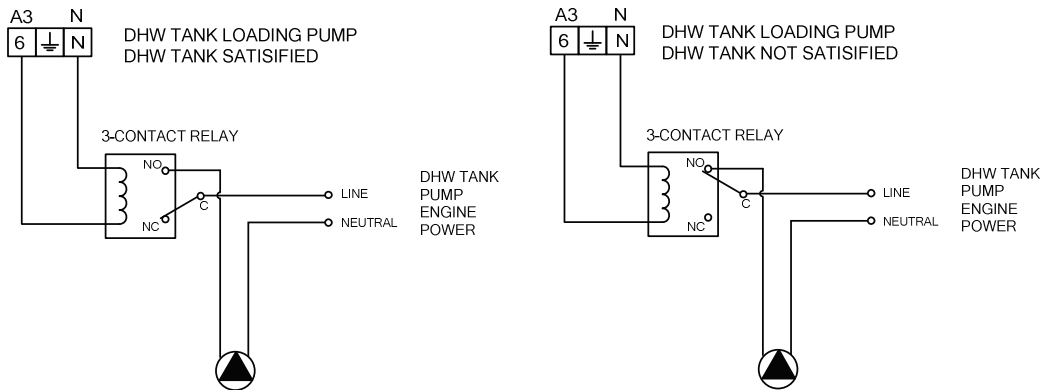
# INSTALLATION, OPERATION & MAINTENANCE

## ELECTRICAL CONNECTION OF PRIMARY (BOILER) PUMP



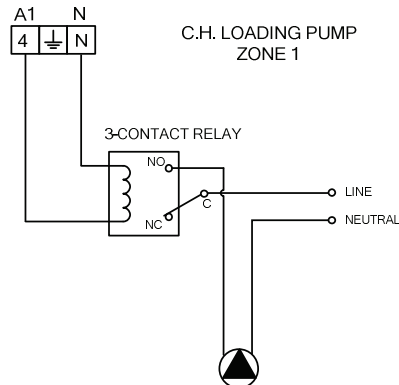
**⚠ WARNING ⚠** THERE IS 120 VAC BETWEEN TERMINALS A10 AND N WHENEVER THE E8 BOILER CONTROLLER IS ON

## ELECTRICAL CONNECTION OF A DHW TANK LOADING PUMP



**⚠ WARNING ⚠** THERE IS 120 VAC BETWEEN TERMINALS A3 AND N WHEN THERE IS A HEATING DEMAND BY THE DHW NTC SENSOR OR BY A DHW THERMOSTAT

## ELECTRICAL CONNECTIONS OF SECONDARY (MAIN SYSTEM LOOP) PUMP



**⚠ WARNING ⚠** THERE IS 120 VAC BETWEEN TERMINALS A1 AND N WHEN THERE IS A HEATING DEMAND

**Figure 5-2.**



## **6** BOILER OPERATION

### **6.1 GENERAL DESCRIPTION AND OPERATION**

The Modulex is a cast aluminum body boiler consisting of mutually connected combustion chambers, each having its own burner, blower and air pressure switch, gas valve, ignitor and flame detection. Each group of these components is referred to as a module.

The boiler has supply and return temperature sensors that the System (E8) Manager uses to monitor total outlet temperature from each module and the system return water temperatures before being redistributed to each module. These sensors are negative temperature coefficient (NTC) sensors and are designated the Global Flow Sensor for the supply sensor and the Global Return for the return sensor (see Figures 2-4 and 2-6). Each module has its own temperature sensor called the Local Flow NTC, which monitors the water temperature of each module. The water temperature measured by the Local NTC sensor is compared to the return supply water temperature. If for any reason the **temperature difference** between the Local Flow and the Global Return temperatures becomes greater than 54°F (30°C), the module or modules will begin to modulate as follows:

0°F to 54°F (0°C to 30°C)	Normal Operation
54°F to 63°F (30°C to 35°C)	Burner will begin Modulating down
63°F to 72°F (35°C to 40°C)	Burner will stay at 45,500 BTU's
Above 72°F (40°C)	Burner will shut off

The variable speed fan's pressure drives the gas valve to allow gas to enter into the pre-combustion chamber where it mixes with the combustion air. The mixed air and gas pass thru the check valve on to the burner surface for ignition. Combustion gases pass thru the heat transfer surfaces. Flue gases and condensate then exit the heat exchanger entering into the condensate tray.

### **6.2 MODULATION THEORY**

One of the operating principles for this boiler is to have as many modules as possible operate simultaneously at minimum load to reach the maximum efficiency. This is maintained by the System Manager (E8) which determines a percent of modulation based on the difference between the set point temperature and the actual supply water (global flow) temperature. This operating principle provides efficiencies much higher than those obtained in traditional groups of small boilers installed in cascade.

Each of the boiler's modules represents a maximum output of 151.5 MBH (44.4 kW). The number of modules x 100% determines the maximum output expressed in percent. For example, if a four module boiler is requested to operate at its max output, this shall be 400% i.e.

**151.5 MBH (44.4 kW) x 4 modules =606 MBH (177.6 kW) = 400%.**

If the required percentage is 200%, each module will operate at 50% output. This equals a total of 303 MBH (88.8 kW) out of a possible 606MBH (177.6 kW), and each module will be operating at 75.75 MBH (22.2 kW) out of a possible 151.5 MBH (44.4 kW).

When the output shared on each module is less than approximately 30%, one module after the other is automatically turned off and the remaining output is shared on modules having the smallest number of operation hours (by the automatic operation-time calculating system).

# INSTALLATION, OPERATION & MAINTENANCE

## 6.3 IGNITION SEQUENCE

The ignition sequence is described below and shown in the following diagram (Figure 6-1). The Ignition Burner Management Module (BMM) is powered on and, after 5 seconds the fan starts at minimum speed. The fan remains running, actuating the air pressure switch and pre-purging the combustion chamber for 10 seconds. Actuating the air pressure switch toggles it from normally open (NO) to normally closed (NC). This energizes the ignition transformer permits the gas valve to be opened after 5 to 8 seconds allowing the AIR/GAS mixture into combustion chamber through the check valve. If the burner does not light within the ignition time frame, the burner is put in lockout position for 5 sec, after which it repeats the ignition sequence once again. If no positive result is obtained, then a lockout conditions occurs and the display on the System Manager will show an error message.

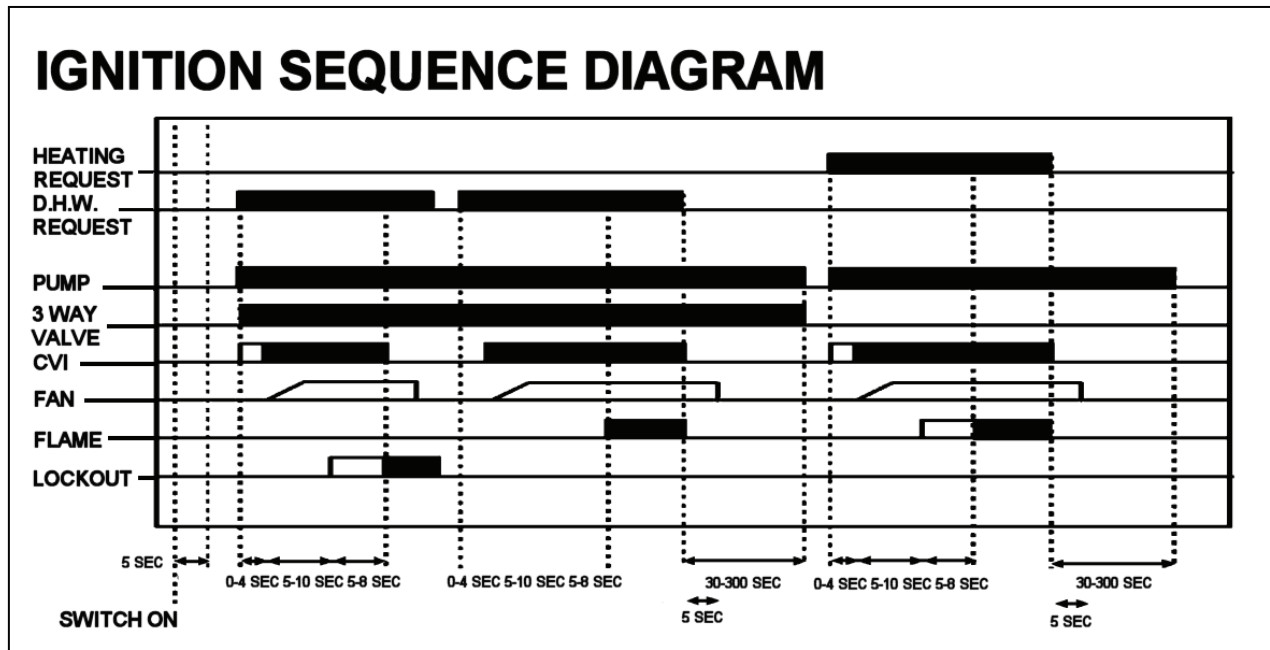


Figure 6-1.

## 6.4 MODES OF OPERATION

The Modulex boiler is capable of operating in several control modes including, Indoor/Outdoor Reset, 0 to 10 Volt Remote Setpoint and Constant Setpoint. The following subordinate paragraphs briefly describe each of these modes.

### NOTE

Refer to Modulex E8 Controller Manual GF-115-C for additional information on operating modes, set-up and programming.

### 6.4.1 Indoor/Outdoor Reset

In indoor/outdoor reset mode the Modulex boiler will adjust its set-point based on the outside air temperature and the programmed heating curve. The heating curve can be customized by changing the Slope parameter found in the User/ Heating Circuit 1 menu in the boilers controller.

# INSTALLATION, OPERATION & MAINTENANCE

The outside air sensor, supplied with the boiler, should be mounted on an outer North or Northeast, wall at a minimum height from floor of 8 feet, 2.5 inches (2.5 m) away from windows, doors and ventilation grates. Never mount the outside air sensor in a sunny position. The connections for the sensor are at connector number 1, terminals 9 (F9) and 10 (GND) of the boiler controller.

## 6.4.2 0 To 10 Volt Remote Set-Point

The unit's set-point can be controlled using a 0 to 10 volt signal. The Modulex controls allow for full scaling capabilities of voltage and set-point through use of the V-Curve in the Expert Menu of the Controller. Input wiring for this mode will be to terminals 1 (F15) and 2 (GND) of the E8 Controller connector number 3 (III).

## 6.4.3 Constant Set-Point

The constant set-point mode is used when a fixed header temperature is desired. Common uses for this mode of operation include water source heat pump loops and indirect heat exchangers for potable ho water systems or processes. No external connections are required for this mode of operation.

## 6.4.4 Boiler Operation In Case Of Troubleshooting (Manual Mode)

For service and test purposes, any single module, or all simultaneously, can be kept operating at full or reduced load. In this way the CO<sub>2</sub> level can be checked and, if necessary, adjusted at full or reduced load (for any single module or for all simultaneously). With this option, troubleshooting failures on each module is simplified.

## 6.5 MODULEX BOILER INITIAL STARTUP

Prior to initial start-up of the complete Modulex Boiler, check the following items:

- Ensure that all Installation procedures in Section 2 of GF-115H (including the referenced documents GF-115-G, GF-115-P-H and GF-115-V) have been completed.
- Ensure that all operating controls, menu settings and limits have been properly set in accordance with Section 3 of the Modulex E8 Controller Operation & Wiring Guide GF-115-C.
- Ensure that the mode of operation settings have been made in accordance with document GF-115-C.

Upon completion of the above items, perform the initial startup and combustion calibration procedures as described in the following paragraphs.

### **CAUTION**

ALL INSTALLATION PROCEDURES SPECIFIED IN GF-115H, SECTION 2 MUST BE COMPLETED BEFORE ATTEMPTING TO START THE UNIT.

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

# INSTALLATION, OPERATION & MAINTENANCE

## 6.5.1 Tools and Instrumentation Required For Combustion Calibration

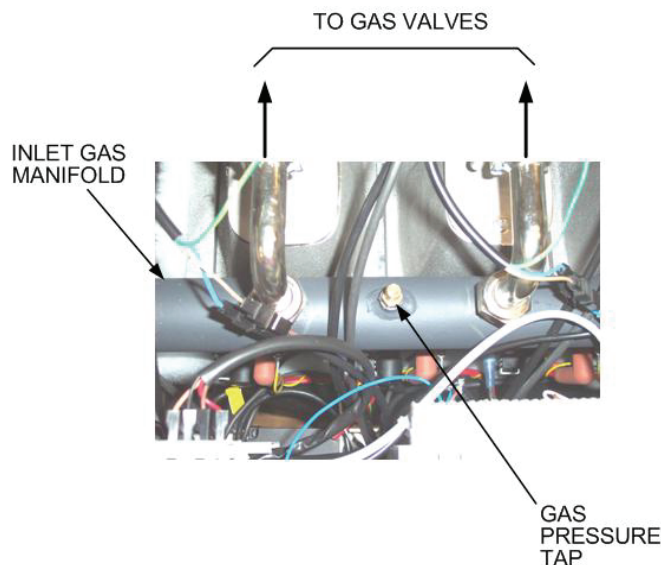
The following tools and instrumentation are necessary to perform combustion calibration of the unit:

- Digital Combustion Analyzer: Oxygen (O<sub>2</sub>) and Carbon Dioxide (CO<sub>2</sub>) accuracy to ±0.4%; Carbon Monoxide (CO) resolution to 1 ppm
- One 16" W.C. manometer or equivalent gauge
- Small and large flat-tip screwdrivers
- T40 Torx tool
- Length of plastic tubing (3/8" I.D.)

## 6.5.2 INSTALLING THE SUPPLY GAS MANOMETER

Install the W.C. manometer (or gauge) as follows:

1. Turn off the external main gas supply valve to the unit.
2. Remove the top panel from the Modulex boiler to provide access to gas supply manifold.
3. Refer to Figure 6-1 and locate the gas pressure tap on the gas supply manifold.
4. Using a flat-tip screwdriver, rotate the pressure tap screw counterclockwise three full revolutions to the open position.
5. Attach one end of the length of plastic tubing to the gas pressure tap. Attach the other end to the W.C. manometer (or gauge).



**Figure 6-1. Partial Top View Showing Gas Pressure Tap**

# INSTALLATION, OPERATION & MAINTENANCE

## 6.5.3 Preparing The Flue For Use With The Combustion Analyzer

In order to provide an opening for the combustion analyzer, proceed as follows:

1. Drill a 3/8" hole in the PVC vent pipe, approximately 2 feet above the boiler exhaust manifold.
2. If necessary, adjust the stop on the combustion analyser probe so that it will extend mid-way into the flue gas flow. DO NOT install the probe at this time.

## 6.5.4 SUPPLY GAS PRESSURE CHECK & ADJUSTMENT

The optimum gas pressure for the Modulex Boiler is 7.0" W.C. and is used as the desired pressure in the Combustion Calibration procedures in paragraph 6.5.5. However, it should be noted that the Modulex Boiler can be safely operated at gas pressures ranging from 4.0" W.C. (minimum) to 14" W.C. (maximum) as specified in the Gas Supply Design Guide GF-115-G.

An external gas pressure regulator is mandatory for the state of Massachusetts. For all other jurisdictions, a lock-up style regulator is required when supply gas pressure is greater than 14" W.C.

In order to ensure that the supply gas pressure is adequate for the Modulex installation, the pressure must be checked under full-fire conditions using the following procedure:

1. Open the water supply and return valves to the unit and ensure that the system pumps are running.
2. Open the external gas supply valve to the boiler.
3. Measure the gas pressure using the W.C. manometer connected to the inlet gas manifold. If an external regulator is installed, adjust the pressure to obtain 7.0" W.C. If an external regulator is not installed, ensure that the supply gas pressure is at least 4.0" W.C.

### NOTE

When performing the remaining steps in this procedure, refer to Figures 1 and 2 in Modulex E8 Controller Operation & Wiring Guide GF-115-C for locations and descriptions of the controls and displays on the Controller.

4. Set the **ON/OFF** switch on the front of the boiler to the **ON** position.
5. With the Controller hinged panel closed, turn the Rotary Knob clockwise and monitor the displayed symbols on the lower right portion of the display. The symbols will increment from left to right and show the appropriate symbols for each mode: AUTO MODE 1, AUTO MODE 2, SUMMER MODE, DAY MODE, NIGHT MODE and finally SERVICE MODE. The SERVICE MODE symbol will appear at the far right of the display and will look as follows:



6. With the above symbol displayed, open the swing-down hinged panel of the Controller. INSTALLATION will be displayed.
7. Next, turn the Rotary Knob counterclockwise until SERVICE appears in the display.
8. With SERVICE displayed, press the Program Key on the Controller.

# INSTALLATION, OPERATION & MAINTENANCE

## NOTE

The CASCADE MANU (Cascade Manual) mode will time out after a period of 15 minutes. When this occurs, the boiler will revert the Auto mode function under program control.

9. Turn the Rotary Knob clockwise until CASCADE MANU is displayed.
10. Press the Program Key. BOILER 1 will be displayed.
11. Press the Program Key again. The display will show CODE NO., requesting the valid code to be entered.
12. Enter code 0000 (4 zeros) by pressing the Program Key four times. The red LED will remain lit while the four code digits are entered. The LED will turn off after the last code digit is entered.
13. With BOILER 1 displayed, press the Program Key. The red LED will light.
14. Turn the Rotary Knob clockwise and select a fire rate of 100%. Press the Program Key to store the 100% fire rate.
15. Wait until the Boiler stage fires at the 100% fire rate.
16. Next, turn the Rotary Knob clockwise until BOILER 2 is displayed.
17. Repeat steps 13 through 16 for each Boiler stage.
18. With all Boiler stages firing at 100%, check the inlet manifold gas pressure. Verify that the pressure is at least 4.0" W.C.
19. If the gas pressure is less than 4.0" W.C., contact your gas supplier. Do Not proceed until the supply gas pressure is corrected.
20. If the gas pressure is adequate at full-fire, close the hinged panel of the Controller.
21. Set the **ON/OFF** switch on the front of the boiler to the **OFF** position.
22. Turn off the gas supply to the boiler by closing the external shut-off valve.
23. Remove the manometer from the gas manifold pressure tap. Close the tap by rotating the adjustment screw fully clockwise to its stop. This manometer will be used to measure gas valve outlet pressure for each stage during the Combustion Calibration procedure in paragraph 6.5.5.

## 6.5.5 COMBUSTION CALIBRATION.

The Modulex boiler is combustion calibrated prior to shipment from the factory. However, AERCO recommends that the following calibration and adjustments be performed due to possible differences in altitude, BTU content, installed gas supply piping and regulators used.

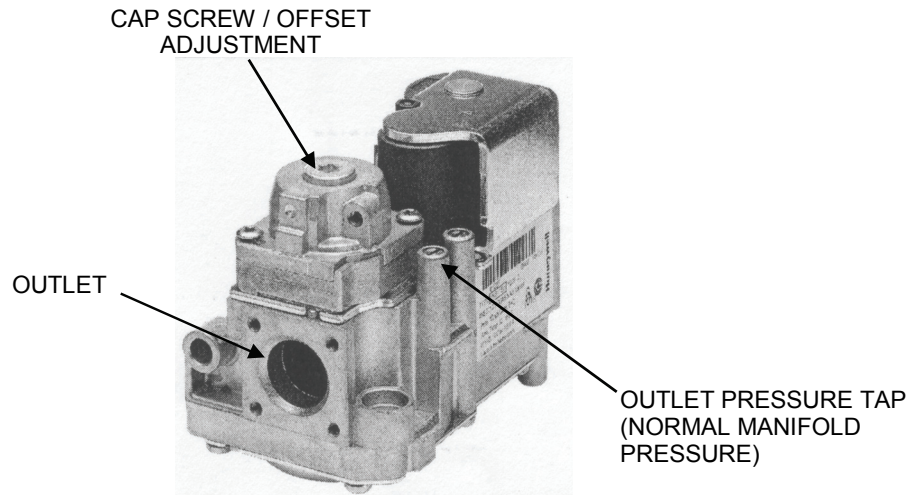
In addition to checking the oxygen (O<sub>2</sub>), carbon dioxide (CO<sub>2</sub>) and carbon monoxide (CO) combustion readings, this procedure will also check the gas valve outlet pressure for each Boiler stage. This is accomplished by connecting the 16" W.C. manometer (or gauge) to the outlet pressure tap of the valve (Figure 6-2) for the boiler stage being checked.

## NOTE

The manometer installed in steps 1, 2 and 3 will be moved each time the next Boiler stage is calibrated. Ensure that the outlet pressure port of the gas valve is fully closed (rotated fully clockwise) prior to connecting the manometer to the valve for the next Boiler stage to be calibrated.



# INSTALLATION, OPERATION & MAINTENANCE



**Figure 6-2. Gas Valve Adjustment**

1. Refer to Figure 6-2 and locate the outlet pressure tap for the gas valve of the first Boiler Stage.
2. Rotate the outlet pressure tap screw 1/2 turn counterclockwise to open.
3. Attach the plastic tubing between the pressure tap and the manometer.
4. Open the water supply and return valves to the unit and ensure that the system pumps are running.
5. Ensure that the external gas supply valve to the boiler is open.
6. Set the **ON/OFF** switch on the front of the boiler to the **ON** position.

## NOTE

When performing the remaining steps in the combustion calibration procedure, refer to Figures 1 and 2 in ModuleX E8 Controller Operation & Wiring Guide GF-115-C for locations and descriptions of the controls and displays on the Controller.

7. With the Controller hinged panel closed, turn the Rotary Knob clockwise and monitor the displayed symbols on the lower right portion of the display. The symbols will increment from left to right and show the appropriate symbols for each mode: AUTO MODE 1, AUTO MODE 2, SUMMER MODE, DAY MODE, NIGHT MODE and finally SERVICE MODE. The SERVICE MODE symbol will appear at the far right of the display and will look as follows:



8. With the above symbol displayed, open the swing-down hinged panel of the Controller. INSTALLATION will be displayed.
9. Next, turn the Rotary Knob counterclockwise until SERVICE appears in the display.
10. With SERVICE displayed, press the Program Key on the Controller.

# INSTALLATION, OPERATION & MAINTENANCE

## NOTE

The CASCADE MANU (Cascade Manual) mode will time out after a period of 15 minutes. When this occurs, the boiler will revert the Auto mode and will function under program control. If this occurs prior to completing the combustion calibration for each Boiler stage, it will be necessary to repeat steps 7 through 15 and then sequence the Boiler stage to the one which was in-process when the time out occurred.

11. Turn the Rotary Knob clockwise until CASCADE MANU is displayed.
12. Press the Program Key. BOILER 1 will be displayed.
13. Press the Program Key again. The display will show CODE NO., requesting the valid code to be entered.
14. Enter code 0000 (4 zeros) by pressing the Program Key four times. The red LED will remain lit while the four code digits are entered. The LED will turn off after the last code digit is entered.
15. With BOILER 1 displayed, press the Program Key. The red LED will light.
16. Turn the Rotary Knob clockwise and select a fire rate of 10%. Press the Program Key to store the setting.
17. Wait until the first Boiler stage fires and stabilizes at the 10% fire rate.
18. Insert the combustion analyzer probe into the 3/8" hole in the flue. Allow enough time for the combustion analyzer to settle.
19. Verify that the oxygen (O<sub>2</sub>) level is within the range shown below. Also, ensure that the carbon dioxide (CO<sub>2</sub>) and carbon monoxide (CO) are within the ranges shown.

<b>GAS SUPPLY</b>	<b>OXYGEN (O<sub>2</sub>)</b>	<b>CARBON DIOXIDE (CO<sub>2</sub>)</b>	<b>CARBON MONOXIDE (CO)</b>
NATURAL GAS	4.7% to 5.3%	9.1% to 8.8%	<100 ppm
PROPANE	4.4% to 5.0%	10.7% to 10.4%	<100 ppm

20. If the oxygen level is not within the required tolerance, the gas valve (Figure 6-2) for the Boiler stage must be adjusted. This is accomplished by removing the cap shown in Figure 6-2 using a T40 Torx tool. Once the cap is removed, slowly rotate the internal valve adjustment screw (approximately 1/4 turn increments). Allow time for the combustion analyzer to stabilize following each gas valve adjustment. Clockwise rotation reduces the oxygen level, while counterclockwise rotation increases the oxygen level.
21. Once the oxygen level is within the required range for the first BOILER stage, measure the gas pressure at the outlet pressure tap. The pressure should be approximately 0.50" W.C. at the 10% fire rate.
22. Press the Program Key.
23. Using the Rotary Knob, set the displayed fire rate to zero. Press the Program key and wait until the Boiler stage turns off.
24. This completes the combustion calibration procedure for the first BOILER stage.
25. Disconnect the manometer connected in step 3 and close the outlet pressure tap.
26. Turn the Rotary Knob clockwise to the next Boiler stage. Repeat steps 16 through 25 for each remaining Boiler stage (up to 7, depending on boiler size).

# INSTALLATION, OPERATION & MAINTENANCE

## 6.6 UNIT REASSEMBLY

Once the combustion calibration procedures have been completed for each Boiler stage, the unit can be reassembled for service operation.

1. Set the **ON/OFF** switch on the front of the Modulex Boiler to the **OFF** position.
2. Turn off the gas supply to the boiler by closing the external shut-off valve.
3. Disconnect AC power.
4. Remove the manometer from the gas valve outlet pressure tap. Close the tap by rotating the screw fully clockwise to its stop.
5. Cover the hole drilled in the PVC flue pipe with foil tape.
6. Replace the top and front panels on the Modulex Boiler.

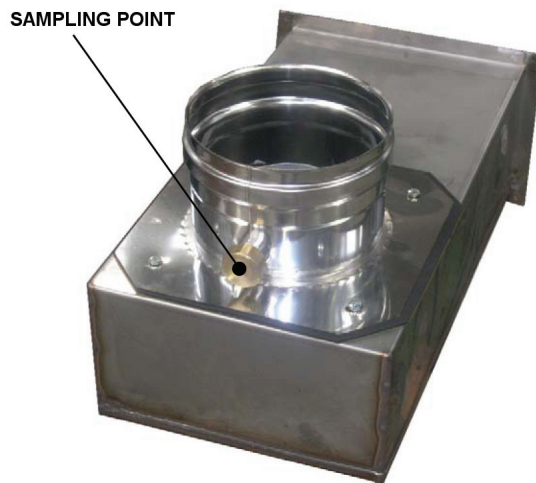


## 7 MAINTENANCE

### 7.1 - MAIN FEATURES

If the boiler is correctly adjusted, it needs very little maintenance. It only needs to be checked once a year and, if necessary, be cleaned. See the Annual Maintenance Schedule in Table 7-1 at the end of this section. In any case the frequency of the cleaning depends on the cleanliness of the air for the combustion. Dust presence in the air will find its way into the combustion chamber, will increase resistance, and will result in a reduced heat input and consequently a reduced output.

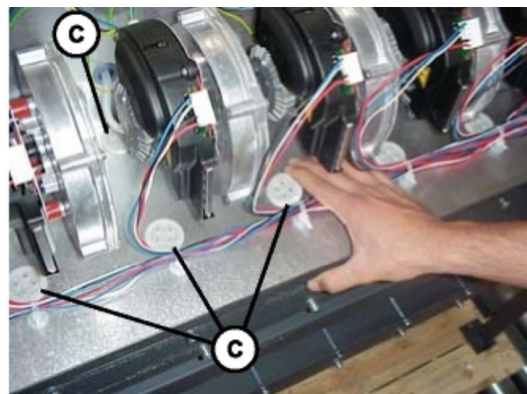
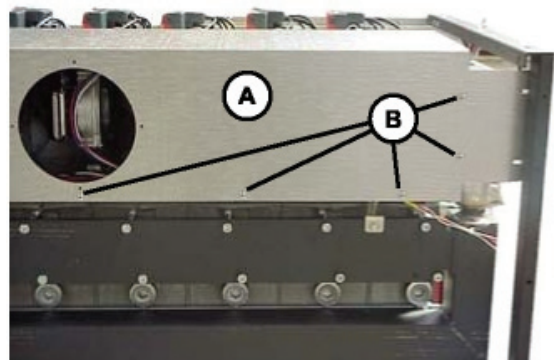
Before washing the boiler body sections, check the boiler input and the CO<sub>2</sub> percentage. If the actual input (with the correct CO<sub>2</sub>) is within 5% of the value shown in paragraph 1.5, the boiler does not need to be cleaned. The operation then can be limited to the cleaning of the condensate drain.



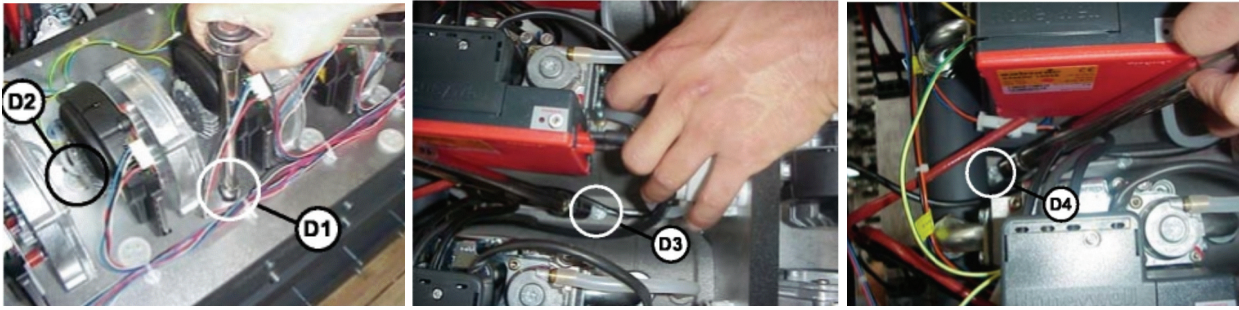
**NOTE:** A reduction of the input can be caused by the obstruction of the flue outlet or of the air intake. Check, first of all, that this is not the reason.

### Disassembly

1. Switch off power and gas supply and verify that the gas cock is fully closed.
2. Unscrew the union at the gas inlet.
3. Remove the front, rear and top panels of the boiler.
4. After the removal of "B" screws, remove the cover "A" of the fan chamber.
5. Remove the diaphragms "C" from the bottom of the fan chamber to get access to the screws securing the burner covers.
6. Using a 13 mm socket wrench, remove the screws "D1 - D2 - D3 - D4", securing the burner covers.

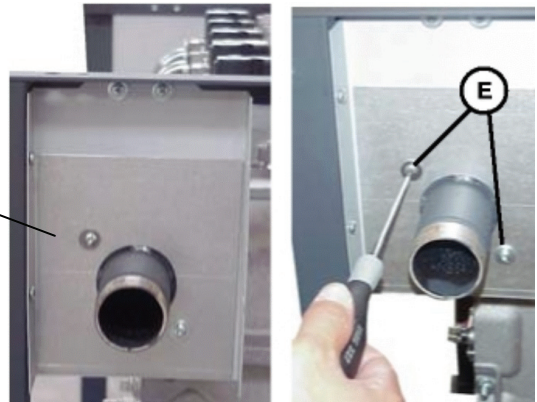


# INSTALLATION, OPERATION & MAINTENANCE

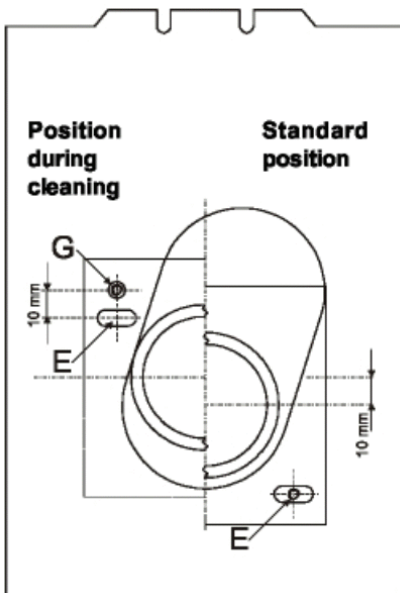


7. Remove the “E” screws on the two sides of the burner manifold.

8. Remove the sheet metal protections “F” on the two sides of the burner manifold.

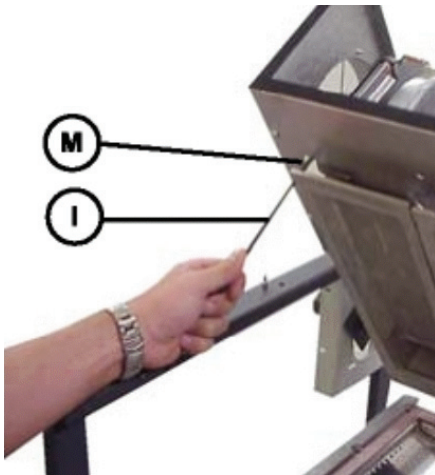
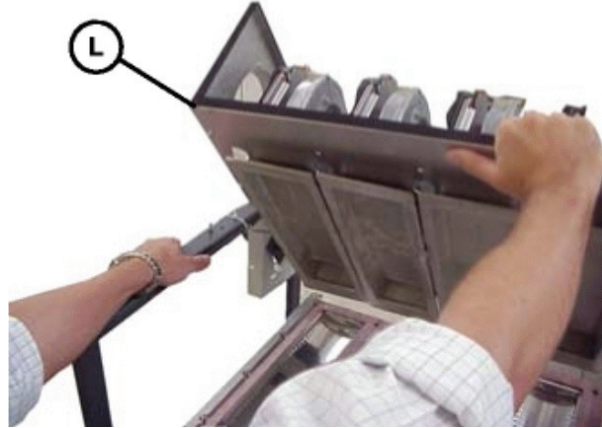
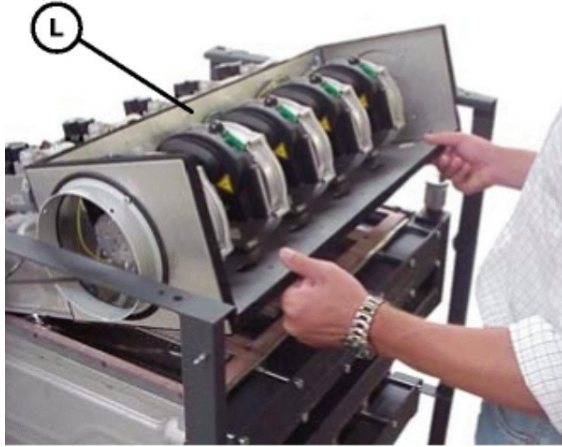


9. Position the burner manifold, at the two sides, 3/8” (10 mm) higher than the standard position shown below. It is possible to achieve this by positioning the tapped hole of the gas pipe flange relative to the “G” hole of the side support and inserting one of the two screws “E” previously removed (see following pictures and drawing).

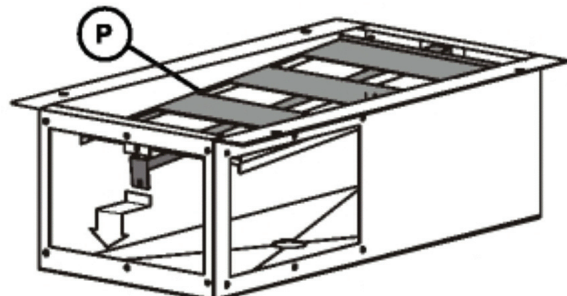
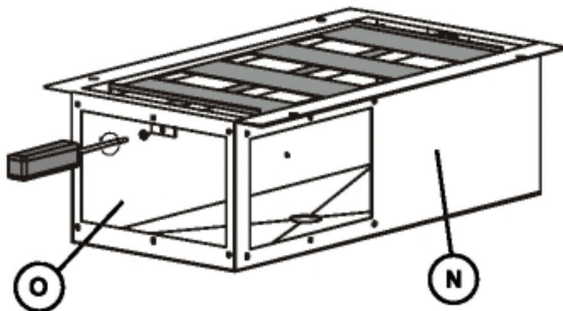


# INSTALLATION, OPERATION & MAINTENANCE

10. Lift up the fan group “L” by rotating it on the gas manifold axis and keep it up by inserting the support rods “I”, attached to the frame, in the holes “M”.

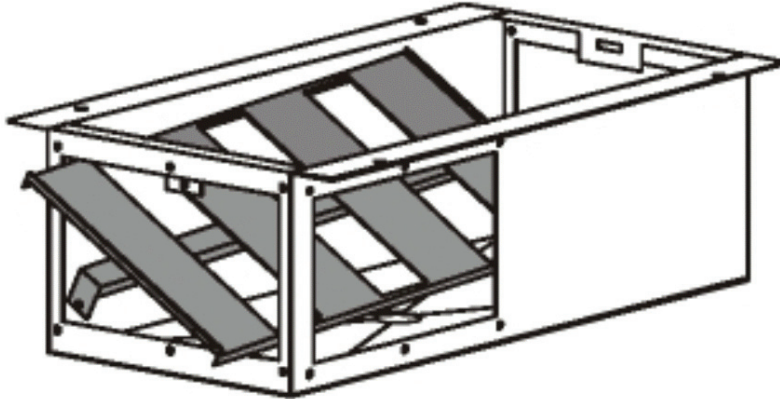


11. Access the condensate tray “N” and remove the cleaning plate “O” from the opposite side of the flue collector, or remove the complete tray terminal with the flue collector: This depends on which side the baffle “P” is attached (R.H. side or L.H. side). Remove the screw securing the baffle “P” and lower the baffle onto the tray bottom.



## INSTALLATION, OPERATION & MAINTENANCE

12. If you want to remove the baffle from the tray, rotate it within the tray before starting to remove it.



### Cleaning

1. **Refer to the burner removal illustrations on the next page.** Remove the burners and sealing gaskets from their seats. Using compressed air blow them from the convex side to the dished side.
2. **The burner sealing gaskets must be replaced after each burner cleaning.** Position the replacement gaskets above the burners and not between the burners and aluminum boiler body.
3. Using a water jet, wash the combustion chamber. Use care to avoid wetting the electrical wiring. During this operation, ensure that the condensate drain pipe is free of blockage so water does not accumulate in the tray.
4. Using compressed air, blow out the combustion chamber between the sections to remove all dirt and foreign particles from the aluminum protrusions. Inspect the flue duct and flue collector.

### Reassembly

1. Replace the burner sealing gaskets · Reassemble all the components previously removed by reversing the order of the disassembly steps.
2. Before starting the boiler, verify that the condensate siphon is filled with water.
3. Before opening the gas cock on the burner manifold, make sure that the coupling is securely tightened. To do this, open the gas cock and check the union for leaks using a soap solution.
4. As soon as a burner is put into operation, check immediately for leakage between the gas valve and the relevant premixing chamber.
5. Perform the combustion analysis and check the combustion parameters.

**Make sure that all the gas pressure test nipples previously opened, are closed and tight.**

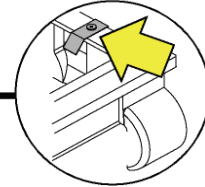
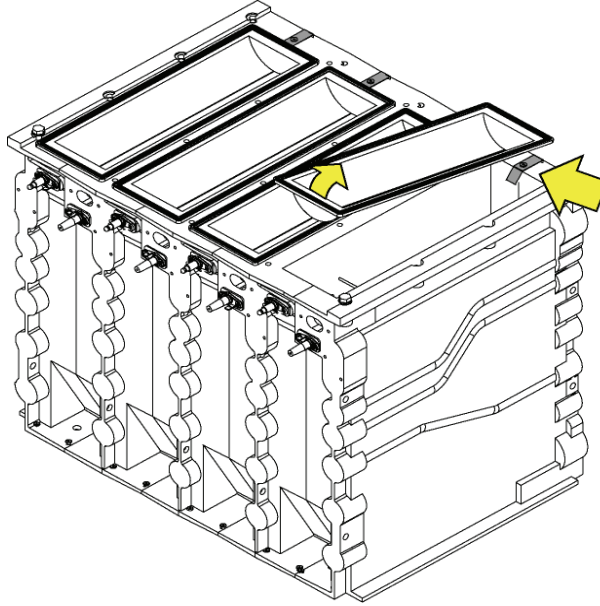


# INSTALLATION, OPERATION & MAINTENANCE

## INSTRUCTIONS FOR BURNER REMOVAL WITH REAR GROUND TAB

### Warning.

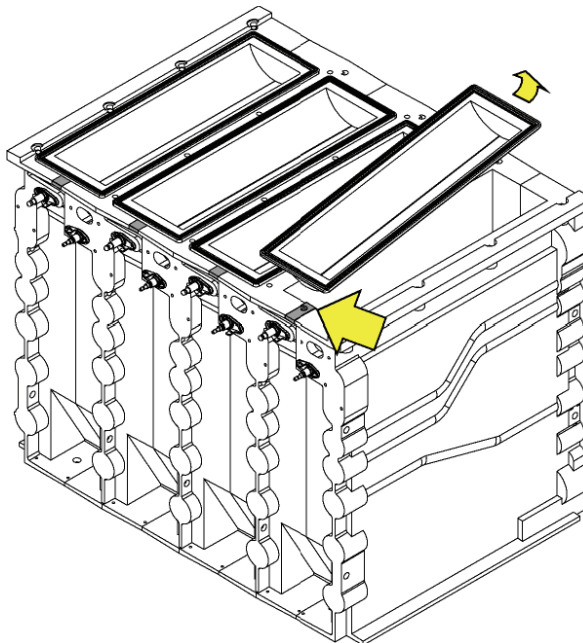
Remove the burners as shown in the illustration by first lifting up the side opposite to the ground tab indicated by the arrow.



## INSTRUCTIONS FOR BURNER REMOVAL WITH FRONT GROUND TAB

### Warning.

Remove the burners as shown in the illustration by first lifting up the side opposite to the ground tab indicated by the arrow.



# INSTALLATION, OPERATION & MAINTENANCE

**Table 7-1. Annual Maintenance Schedule**

<b>TASK</b>	<b>RECOMMENDED</b>	<b>REQUIRED</b>
Inspect air filters		X
Inspect vent pipe		X
Inspect condensate drain lines		X
Inspect flue collector & condensate tray		X
Wash heat exchanger	X	
Check and adjust air/fuel ratio	X	
Inspect and clean burner surface		X
Check for gas leaks using a soapy solution		X
Inspect igniter and flame sensor		X
Inspect heat transfer surfaces		X
Clean strainer mesh (Monthly)	X	
Check inlet gas pressure	X	
Check pH of boiler system water		X
Check vent and inlet air terminations	X	
Check electrical supply voltages	X	
Check flame safeguard system		X

## APPENDIX A

### Temperature Sensor Resistance Charts

## APPENDIX A

### TEMPERATURE SENSOR RESISTANCE CHART

TEMPERATURE °F (°C)	RESISTANCE (OHMS)
-76 (-60)	698961
-58 (-50)	33908
-40 (-40)	167835
-22 (-30)	88340
-4 (-20)	48487
14 (-10)	27648
32 (0)	16325
50 (10)	9952
68 (20)	6247
77 (25)	5000
86 (30)	4028
104 (40)	2662
122 (50)	1801
140 (60)	1244
158 (70)	876
176 (80)	628
194 (90)	458
212 (100)	339
230 (110)	255
248 (120)	194

The temperature sensors used in the Modulex boiler are 5k Ohm Negative Temperature Coefficient (NTC). The relationship between temperature (°F or °C) and the nominal resistance (Ohms) of the sensor are inversely proportional. That is; when temperature increases, sensor resistance decreases and vice versa.

For Example:

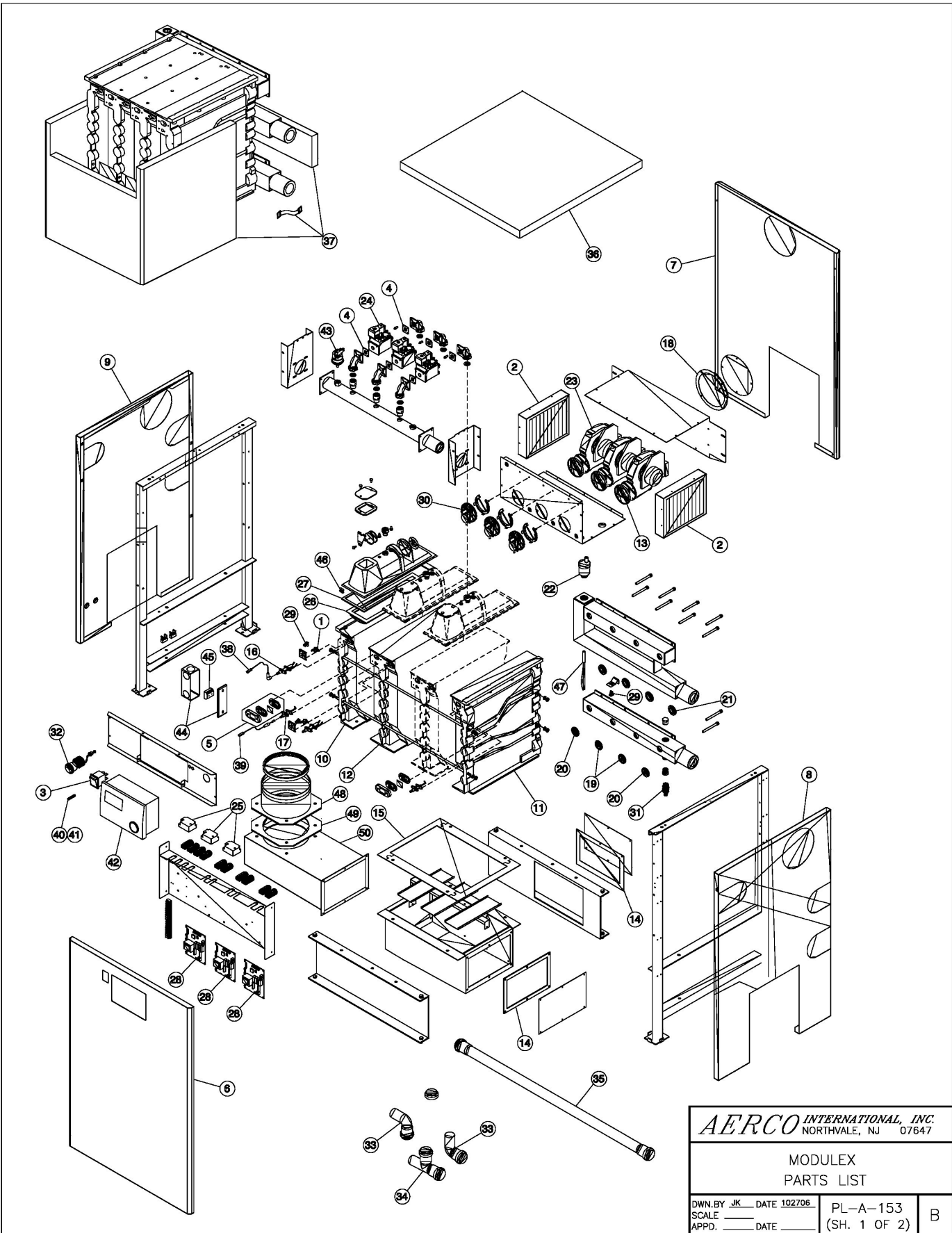
At 77°F (25°C), the resistance is 5000 Ohms

At 194°F (90°C), the resistance is 458 Ohms

**APPENDIX B**

**Modulex Parts List**

APPENDIX B



**AERCO** INTERNATIONAL, INC.  
NORTHVALE, NJ 07647

MODULEX  
PARTS LIST

DWN. BY JK	DATE 102706	PL-A-153	B
SCALE		(SH. 1 OF 2)	
APPD.	DATE		

**APPENDIX B**

ITEM	PART NO.	QTY	DESCRIPTION	ITEM	PART NO.	QTY	DESCRIPTION
1	95000708	1	HIGH WATER TEMP SWITCH	26	95262226	1	MESH BURNER
2	95261879	1	LOW EFFICIENCY FILTER	27	95261173	5	BURNER GASKET MODULEX
3	95261558	1	MAIN SWITCH	28	95630109	1	ELECTRONIC BOARD
4	95000709	10	GASKET KIT - GAS VALVE	29	95000021	1	HEATING SENSOR (GLOBAL RETURN SENSOR & LOCAL FLOW SENSOR)
5	95000467	1	SIGHTGLASS KIT - COMB CHAMBER	30	95261215	1	AIR PRESSURE SWITCH HUBA 605 38-53
6	95212535	1	FRONT PANEL MLX-303 & MLX-454	31	95261357	1	BOILER DRAIN COCK 3/4"
	95212536	1	FRONT PANEL MLX-606	32	95262218	1	PRESSURE GAUGE 120 PSI
	95212537	1	FRONT PANEL MLX-757	33	95310512	1	DRAIN ELBOW HTB DN40
	95212538	1	FRONT PANEL MLX-909	34	95310513	1	DRAIN TEE HTEA DN 40/40
	95212539	1	FRONT PANEL MLX-1060	35	95310515	1	DRAIN PIPE 1M LG. DN 40
7	95371711	1	BACK PANEL SHEET METAL ENCLOSURE MLX-1060	36	95371724	1	TOP PANEL ENCLOSURE MLX-1060
	95371710	1	BACK PANEL SHEET METAL ENCLOSURE MLX-909		95371723	1	TOP PANEL ENCLOSURE MLX-909
	95371709	1	BACK PANEL SHEET METAL ENCLOSURE MLX-757		95371722	1	TOP PANEL ENCLOSURE MLX-757
	95371708	1	BACK PANEL SHEET METAL ENCLOSURE MLX-606		95371721	1	TOP PANEL ENCLOSURE MLX-606
	95371707	1	BACK PANEL SHEET METAL ENCLOSURE MLX-303 & MLX-454		95371720	1	TOP PANEL ENCLOSURE MLX-303 & MLX-454
8	95212545	1	RIGHT SIDE PANEL	37	95250847	1	BOILER BODY INSULATION MLX-303
9	95212546	1	LEFT SIDE PANEL		95250848	1	BOILER BODY INSULATION MLX-454
10	95240031	1	END SECTION LH		95250849	1	BOILER BODY INSULATION MLX-606
11	95240032	1	END SECTION RH		95250850	1	BOILER BODY INSULATION MLX-757
12	95240033	1	CENTER SECTION		95250851	1	BOILER BODY INSULATION MLX-909
13	95250489	1	FAN GASKET		95250852	1	BOILER BODY INSULATION MLX-1060
14	95250612	1	SEALING GASKET-FLUE BOX OUTLET	38	95262216	1	IGNITOR CABLE
15	95250618	1	SEALING GASKET - FLUE BOX MLX-1060	39	95611085	1	FLAME DETECTOR CABLE
	95250619	1	SEALING GASKET - FLUE BOX MLX-909	40	95262220	1	10 A FUSE
	95250620	1	SEALING GASKET - FLUE BOX MLX-757	41	95262221	1	6.3 A FUSE
	95250621	1	SEALING GASKET - FLUE BOX MLX-606	42	95262207	1	MODULEX E8 CONTROLLER
	95250622	1	SEALING GASKET - FLUE BOX MLX-454	43	95262333	1	MINIMUM GAS PRESSURE SWITCH
	95250623	1	SEALING GASKET - FLUE BOX MLX-303	44	95000721	1	JUNCTION BOX WITH 3 POLE TERMINAL BLOCK
16	95251245	1	IGNITOR	45	95261720	1	TERMINAL STRIP
17	95251246	1	FLAME DETECTOR	46	95262367	1	COPPER PLATE (1 METER)
18	95250634	1	SEALING GASKET - AIR INLET	47	95262210	1	GLOBAL FLOW SENSOR
19	95250639	5	SEAL - LOWER - CENTER SECTION	48	49051	1	4" EXHAUST CONN. TO ADAPT TO PVC FLUE
20	95250638	2	SEAL - LOWER - END SECTION		49052	1	4" EXHAUST CONN. TO ADAPT TO STAINLESS STEEL FLUE
21	95250667	7	SEAL - UPPER - SECT TO MANIFOLD		49050	1	6" EXHAUST CONN. TO ADAPT TO PVC FLUE
22	95260588	1	AUTOMATIC AIR VENT		49053	1	6" EXHAUST CONN. TO ADAPT TO STAINLESS STEEL FLUE
23	95262204	1	BLOWER	49	95250632	1	EXHAUST CONNECTOR GASKET
24	95262205	1	GAS VALVE	50	95211568	1	FLUE COLLECTOR
25	95262214	1	IGNITION TRANSFORMER				

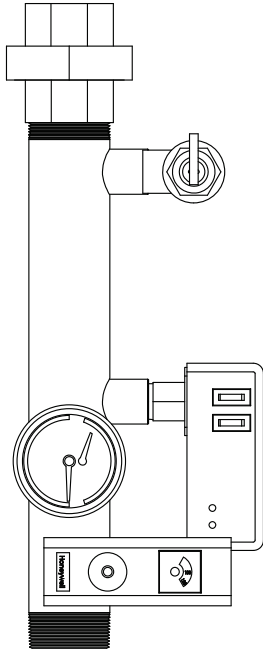
<b>AERCO</b> INTERNATIONAL, INC. NORTHVALE, NJ 07647	
<b>MODULEX PARTS LIST</b>	
DWNBY JK DATE 102706	PL-A-153
SCALE _____	(SH. 2 OF 2)
APPD: _____ DATE _____	<b>B</b>

## APPENDIX B

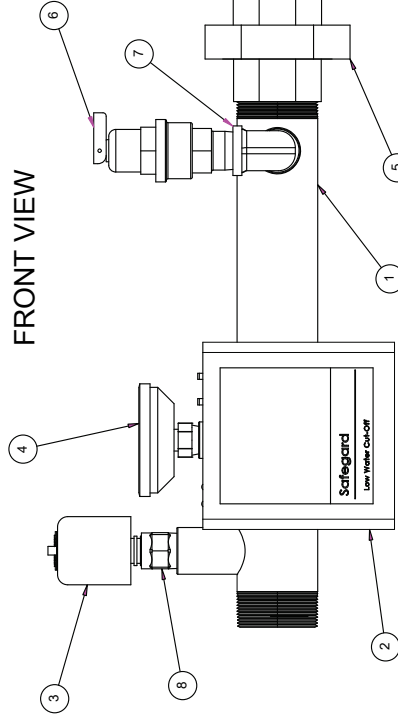


LEFT HAND BOILER WATER CONNECTION

TOP VIEW

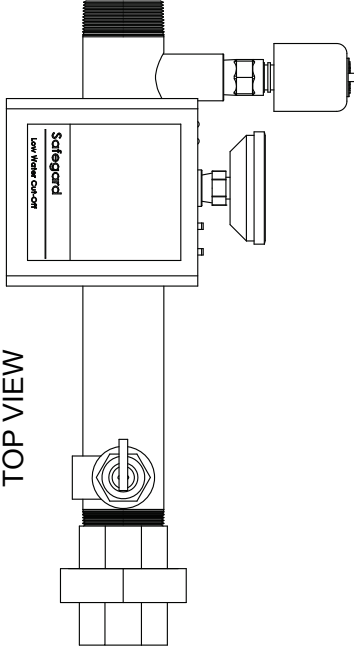


FRONT VIEW

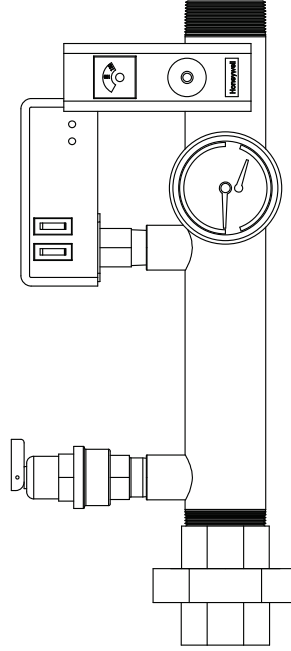


RIGHT HAND BOILER WATER CONNECTION

TOP VIEW



FRONT VIEW



ITEM	PART NO.	QTY	DESCRIPTION
1	SEE TABLE 2	1	SEE TABLE 2
2	64015	1	LOW WATER CUT-OFF
3	64013	1	AQUASTAT, 100°F TO 200°F
4	SEE TABLE 1	1	GAGE, PRESS/TEMP
5	SEE TABLE 2	1	SEE TABLE 2
6	SEE TABLE 1	1	3/4" PRESSURE RELIEF VLV.
7	9-320	1	3/4" STREET ELL 90 B/I
8	99023	1	3/4" THERMOWELL

TABLE 1

BOILER MODEL	RELIEF VLV. SETTING (PSIG)	ITEM #4 PART NO.	ITEM #6 PART NO.
MLX-303B, 454B, 606B	50	123675-2	92013
MLX-303H, 454H, 606H	50	123675-2	92014
MLX-757B, 909B, 1060B	90	123675-3	92029
MLX-757H, 909H, 1060H			

TABLE 2

BOILER MODEL	ITEM #1 PART NO.	ITEM #1 DESC.	ITEM #5 PART NO.	ITEM #5 DESC.
MLX-303B, 454B	22033	2" X 16" LG. MANIFOLD ASSY	9-294	2" NPT UNION
MLX-606B, 757B	22057	2-1/2" X 16" LG. MANIFOLD ASSY	59066	2-1/2" NPT UNION

**AERCO**

INTERNATIONAL, INC.  
NORTHVALE, NJ 07647

MODULEX GAS FIRED BOILER  
CSD-1 WATER MANIFOLD ASSEMBLY

OWNED BY: \_\_\_\_\_ DATE: 09/18/06  
SCALE: \_\_\_\_\_ DATE: \_\_\_\_\_  
APPD: \_\_\_\_\_ PL-A-152 REV. C

\* - APPLIES ONLY TO UNITS WITH BOILER WATER CONNECTED TO THE LEFT HAND SIDE





AERCO INTERNATIONAL INC.  
159 PARIS AVENUE, NORTHVALE, N.J. 07647  
PHONE 201-768-2400 FAX 201 784-8073

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