AERCO
A Watts Water Technology Company

Natural Gas Modulating & Condensing Modular Hot Water Boiler

LIGHT COMMERCIAL SERIES

Covering Models:

- **EXT 321**
- **EXT 481**
- **EXT 641**
- **EXT 802**
- **EXT 962**
- **EXT 1123**

USER MANUAL

Installation, Operation and Maintenance

MODULEX EXT

Light Commercial Series

Modular Condensing Boilers

AERCO Modulex EXT Unical

Latest Update: 07/13/2015

ASME H

AHRI CERTIFIED www.ahridirectory.org Commercial Boilers AHRI Standard BTS-2000

GAS-FIRED C UL US LISTED

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AERCO
A Watts Water Technology Company

AERCO Technical Support:
(Mon–Fri, 8am-5pm EST)
1 (800) 526-0288

AERCO Document Conventions

In this document, some types of information are presented as shown in the following examples:

Message Type	Example and Description
Notes	**NOTE** **NOTE** messages indicate specific information related to the surrounding contextual information, and highlighted for special attention.
Cautions	**CAUTION!** **CAUTION** messages inform of potential problems relating to the functioning of equipment, safety to persons, harm to the environment, and/or damage to property or equipment.
Warnings	**WARNING!** **WARNING** messages warn of potential dangerous situations that may result in serious injury and/or death to persons or animals. Text is red within a red box.
Instructions	**How Instructions are Presented** 1. Instructions are shown in a blue box with an underlined title. 2. All text, excepting in accompanying illustrations, is colored blue. 3. All procedures are listed in steps starting with "1." and using letters [a), b), c), etc.] indicating sub=steps. 4. Steps that are continued on the next page have a "**- Continued**" appended to the instruction title.

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CHAPTER 1: GENERAL INFORMATION

1.1 Correct Use of the Appliance

The MODULEX EXT boiler has been designed utilizing the latest heating technologies and in compliance with the current safety regulations. However, if not used or operated properly, the unit may cause injury or death to persons, or serious damage to the equipment or surrounding objects.

The MODULEX EXT boiler is designed to be used in pumped hot water central heating systems. Any other use of this appliance shall be considered improper, and AERCO declines any responsibility for damages or injuries caused by the improper use of this equipment. In order to use the equipment appropriately and safely according to its design, it is essential to carefully follow the instructions in this manual.

1.2 Water Treatment

- It is vital to maintain the pH of boiler water between 6.5 and 8. Failure to do so could result in severe damage to the boiler.
- The hardness of the main water supply influences the frequency with which the heat exchanger must be cleaned.
- In hard water areas where the main water can exceed 15°f total hardness, a scale reducing device is recommended. The choice of this device has to be made taking into consideration the characteristics of the water.
- In order to improve the resistance to lime scale it is recommended that the domestic hot water temperature be as near as possible to the temperature required for end use.
- AERCO recommends inspecting the state of cleanliness of the domestic hot water heat exchanger at the end of the first year and subsequently, on the basis of the lime scale found, this period can be extended to two years after the initial inspection.

1.3 Information to Be Made Available To The User

Go through the information in this manual with the owner/operator and make sure that he or she is familiar with all necessary operating instructions, in particular:

- These instructions shall be made available to the end user, together with any other literature regarding this appliance. It is highly recommended that the user keep these documents in a safe and convenient place in order to always have them at hand for future reference.
- It is imperative that a proper venting and exhaust system be implemented with this unit. Refer to the AERCO Venting Application Guide (GF-115-V).
- It is absolutely forbidden to make any alterations to the boiler not in keeping with the manufacturers recommendations and instructions.
- It is critical to check the system's water pressure and ensure it is at the correct pressure.
- For optimal operation of time and temperature controls, thermostats, heating controls and radiators, refer to separate E8 Controller User Manual (GF-115-C).
- It is obligatory to carry out comprehensive maintenance services annually with a combustion analysis every two years (in compliance with national and local laws).
- If the appliance is sold or transferred to another owner, or if the present user moves from the installation site and leaves the appliance installed, ensure that the manual stays with the boiler so that it can be consulted by the new owner and/or installer.

Failure to follow the instructions indicated in this manual, which is supplied with the boiler, could cause injury to persons, animals or damage to property. The manufacturer shall not be held liable for any such injury and/or damage.

1.4 Safety Warnings

WARNING!

- Children must be supervised so they do not play on, around, or with the appliance.
- The installation, adjustment, and servicing of this appliance must be carried out by a competent person and installed in accordance with the current standards and regulations. Failure to correctly install this appliance could cause injury to persons, animals or damage to property. The manufacturer shall not be held liable for any injury and/or damage.
- Servicing or repairs of the appliance must be carried out by AERCO authorized service technicians; AERCO recommends drawing up a service contract. Incomplete, inappropriate, or irregular servicing could compromise the safe operation of the appliance, and could cause injury to persons, animals or damage to property for which AERCO shall not be held liable.

1.5 Modifications To Parts Connected To The Appliance

Do not carry out any modifications to the following parts:

- The boiler
- To the gas, air, water supply pipes and electrical power
- To the flue pipe, safety relief valve and its drainage pipe
- To the constructive components which influence the appliance's safe operation

WARNING!

When tightening or loosening the screw pipe connections, use only properly sized wrenches. The improper use of inadequate equipment can cause damage (for example, water or gas leakages) to the equipment.

1.6 For Appliances Operating With Propane Gas

Before installing the appliance, ensure that the gas tank has been purged. For correct instructions on purging the tank, contact the liquid gas supplier or a competent person who is legally authorized to provide such information. If the tank has not been correctly purged, problems may occur during ignition. If this happens contact the liquid gas tank's supplier.

WARNING!

Do not store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS:

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

WARNING!

The boiler must be installed in such way as to avoid, under the foreseen operation conditions, the freezing of the water and to prevent the control devices from being exposed to temperatures lower than 5°F (15°C) or higher than 104°F (40°C). The boiler must be protected against environmental variations with:

- The insulation of the hydraulic pipelines and the condensate drain.
- The adoption of specific antifreeze products in the Cold/Hot water installation.

1.7 Data Plate

A sample Data Plate for a MODULEX EXT boiler is shown in the left figure below. A sample of the Data Packaging label is shown in the right image below.

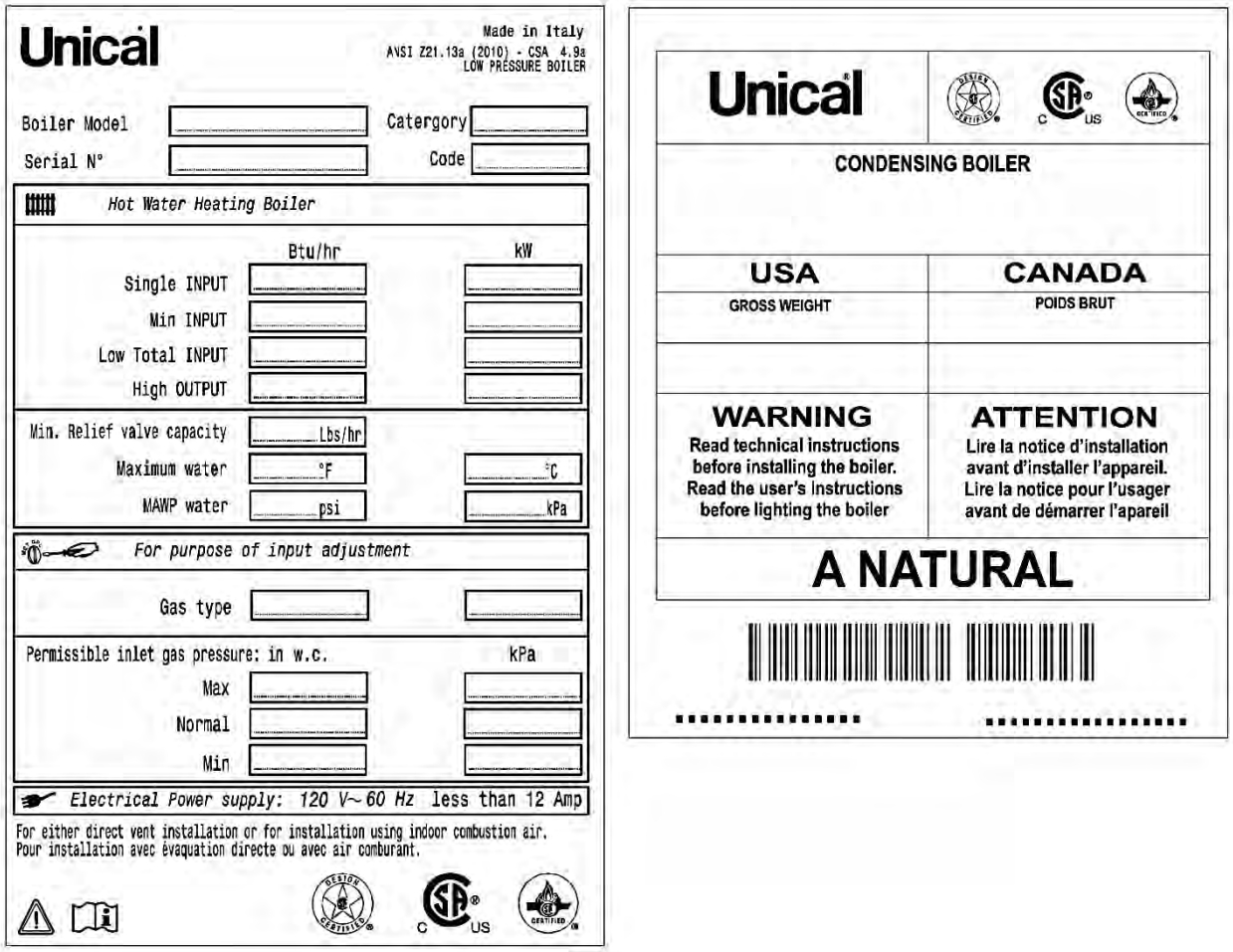

Figure 1-1: MODULEX EXT Data Plate (L) and Data Packing Label (R)

Each unit is fitted with a data plate, which may be consulted for the details on gas type, power source and venting classification.

1.8 Operational Requirements

1.8.1 General Requirements

The following instructions MUST be followed:

- The boiler must only be used for its designated purpose as described in these Installation Instructions.
- Each unit is fitted with a data plate. Consult the details on this plate to verify whether the boiler is compliant with its intended location, e.g.: gas type, power source and venting classification.
- Only use the boiler with the accessories and spare parts listed.
- Other combinations of accessories and products must only be used if they are specifically designed for the intended application and do not affect the system performance or the safety requirements.
- Maintenance and repairs must only be performed by trained professionals.
- Installation of a condensing gas boiler must be approved per all federal and local government codes, regulations, and laws.
- Operation of a condensing gas boiler must use a vent system that has been specifically designed and approved for this type of boiler.
- Note that local permission and approval for the vent system and condensate water connection to a public sewage system may be required.

1.8.2 Regulatory Requirements

You must also conform to any rules, regulations, or laws concerning the following:

- Local building codes regarding the installation.
- Local building codes concerning the air intake and outlet systems and the vent connection.
- Regulations for the power supply connection.
- Technical rules laid down by the gas utility company concerning the connection of the gas connection to the local gas mains.
- Instructions and standards concerning the safety equipment for the water/space heating system.
- Installation instructions for building heating systems.
- The boiler must be located in an area where leakage of the boiler or connections will not result in damage to the area adjacent to the boiler or to lower floors of the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan be installed under the boiler.
- Do not restrict or seal any air intake or outlet openings.
- If you find any defects, you must inform the owner, in writing, of the system defect and the associated hazard.

WARNING!

Should overheating occur, or the gas supply fail to shut off, do not turn off or disconnect the electrical supply to the pump. Instead, shut off the gas supply at a location external to the boiler.

1.8.3 Water Quality Requirements

NOTE

For additional information concerning water quality and treatment, refer to AERCO technical documents Glycol Directive and AERCO Piping Application Guide (GF-136-P).

Unsuitable heating system water can cause the formation of scale or sludge, which affects system efficiency. It can also cause corrosion and reduce life of the heat exchanger.

- You must follow guidelines for boiler water quality.
- Thoroughly flush the system prior to filling.
- Follow the cleaning instructions.
- Never use water to fill the heating system that has been treated by reverse osmosis, deionization, or distilled water in order to soften the water.
- Do not use inhibitors or other additives unless approved by AERCO for that purpose.
- When frost protection of the heating system is desired, only use AERCO-approved antifreezes. The allowed maximum concentration is 50%.
- When using oxygen-permeable pipes, e. g. for under floor heating systems, you must separate the system from the boiler using plate heat exchangers.
- Close the valves of the boiler while flushing the system, do not introduce any system cleaner into the boiler loop. Flush system thoroughly to remove all system cleaner before filling boiler.

Approved antifreeze (maximum concentration of 50%):

- Rhomar RhoGard Mutli-Metal (AL safe)
- Noble Noburst AL

Approved system cleaners:

- Noble Noburst Hydronic System Cleaner
- Fernox F3 Cleaner
- Rhomar Hydro-Solv 9100

The system cleaners from NoBurst, Rhomar, and Fernox are NOT to be used in the boiler itself. The boiler must be closed off (valves closed) from the rest of the system or not connected while the cleaners are in the system. The system should then be drained and then thoroughly flushed with clean water to remove all the system cleaner.

Approved inhibitors:

- Rhomar Pro-tek 922
- Noble Noburst AL inhibitor
- AERCO/Sentinel products. See list in GF-136-P, section 2.3 - System Flushing, Treatment, and Cleansing.

1.9 Tools, Materials, And Additional Equipment

For the installation and maintenance of the boiler you will need:

- Standard tools for space heating, gas and water fitting
- Manometer that is capable of reading both positive and negative pressures
- Combustion analyzer
- Digital multimeter
- pH digital meter
- Metric Allen wrenches
- Metric socket wrenches

1.10 Disposal

- Dispose of the boiler packaging in an environmentally sound manner.
- Dispose of components of the heating system (e.g. boiler or control device), that must be replaced in an environmentally responsible manner.

1.11 General Warnings

1.11.1 Using the Operation and Maintenance Manual

This instruction manual is an integral and indispensable part of the product and must be retained by the person in charge of the appliance. Please read the instructions contained in this manual carefully as they provide important information regarding the safe installation, use and servicing of this appliance. Keep this manual in a safe place for future reference.

1.11.2 Installation and Servicing Personnel

Installation and servicing must be carried out in accordance with the regulations in force according to the manufacturer's instructions and by legally competent authorized persons. By definition, a competent person is a person who has a specific technical qualification in the field of components for central heating systems for domestic use, domestic hot water production, and servicing. This person must have the qualifications legitimized by the current laws and regulations in force.

Inappropriate, incomplete, or irregular servicing could compromise the safe operation of the appliance, and could cause injury to persons, animals or damage to property. The manufacturer shall not be held liable for any such injury and/or damage.

Any repairs must be carried out by AERCO authorized technicians and using only original spare parts. Non-observance of the above requirement may jeopardize the safety of the appliance and void any warranties.

In the event of failure and/or faulty functioning of the appliance, switch off the boiler. Do not attempt to make any repairs, but instead contact qualified technicians.

To guarantee the efficiency and correct functioning of the appliance it is required that the boiler be serviced annually by a qualified person.

1.11.3 Installation Materials

The installations for the domestic hot water production MUST be built, in their entirety, with materials (taps, pipes, fittings, etc.) approved for drinkable water.

1.11.4 **Preparing Boiler for Servicing**

Before carrying out any cleaning or servicing turn off the electrical supply to the boiler by means of the ON/OFF switch and/or by means of the appropriate shutdown devices.

1.11.5 **Returning a Boiler to Service**

Before putting a boiler, which has been unused for a length of time, back into service, rinse the entire domestic hot water system, allowing the water to flow an appropriate amount of time in order to circulate throughout the entire system.

1.11.6 **Change in Ownership**

If the appliance is sold or transferred to another owner, or if the present user moves from the installation site and leaves the appliance installed, ensure that the manual stays with the appliance so that it can be consulted by the new owner and/or installer.

1.12 Operational Limits of the Boiler

- Max. boiler temperature: 180° F
- Max Allowable Working Temperature ASME: 200 °F
- Max. Allowable Working Pressure ASME: 92 psi

CHAPTER 2: TECHNICAL FEATURES AND DIMENSIONS

2.1 Modulex EXT Technical Features

- Compact, gas fired, Low NO_x, condensing boiler.
- Comprised of one sectional boiler body, suitable as a single boiler or in a cascaded group.
- May be installed in either an inside or outside location.
- Low internal water volume.
- Fast response to load variations.
- Flue exhaust outlet positionable on three sides.
- Manifold delivery and return (reversible).
- Made up of two or more heating elements (2 to 7), cast aluminum / silicon / magnesium.
- Full range of modulation by variable speed blowers and premix burners.
- Each heating element monitors its own water temperature, and will individually shutdown if flow is interrupted, without affecting the other burner sections.
- One gas supply line (reversible).
- Individual modules capable of between 46 and 160.5 kBTU/hr.

These boilers are designed for use with category IV venting.

The boiler is supplied complete with all the safety and control devices in accordance with all current regulations, and its technical and functional features comply with the regulations prescribed by: **ANSI Z21.13 / CSA 4.9 - Gas-fired low pressure steam and hot water boilers.**

2.1.1 Temperature Control Devices:

- Local NTC sensor (each heating element)
- Limit thermostat room (each heating element)
- Flow NTC sensor (General)
- Return NTC sensor (General)
- Safety thermostat approved (manual reset)
- Flow sensor BCM

2.1.2 Control Panel (E8) Includes:

- ON-OFF switch
- Temperature control / Boiler operation
- Fuses
- High limit sensors
- Air pressure fans
- Condensate level sensor
- Air pressure switch (anti-obstruction)

2.1.3 Other Features Include:

- NTC heat sensors for global temperature control on the flow and return.
- 0-10V output to control variable speed primary pump.
- Integral insulation with hypoallergenic synthetic wool.
- Premix fiber mesh modulating burner (premixes into the fan with automatic diaphragm backflow separation from the combustion chamber).

- Less than 49 dBA of noise at maximum power.
- Heating operation: instantaneous power microprocessor control, with preset parameters for comparison between temperature (or calculated from the external temperature regulation) and global temperature flow.
- Operation modes:
  - Ability to control power to the individual heating elements for any calibration with or without confidential code access.
  - Production of A.C.S. (Active Cooling System) by NTC sensor of priorities for control by boiler feed pump or by three-way diverter valve controller.
- E8 electronic controller included.
- BCM (Boiler Communication Manager) included.
- Ability to control power of the individual heating elements.
- Control of heat demand: constant or remote setpoint.
- Monitoring of operating status and temperature.
- Reporting of alarms.
- Setting of parameters.
- Emergency operation prevents the boiler from shutting down as a result of the interruption of communication with a control system or any remote control unit.
- Alarm management.
- Alarm reset input.
- Warning alarm relay.
- Stainless steel condensate collector tank with siphon, drain trap, and smoke chamber.
- Easily removable stainless steel panels painted for outdoor installation.
- Built-in air vent

2.2 General Boiler Operation

The boiler may be operated from the E8 controller or alternatively from a BCM (Boiler Cascade Manager).

The boiler management logic provides the maximum number of simultaneously operating heating elements in order to maximize heat production and overall efficiency. Burner efficiency and a high heat exchange between surfaces contribute to the reliable and efficient output power. The various components are designed to work together so that operating time is shared equally among the components, thus reducing maintenance and labor costs.

The hot water moved by the pump is pushed to the return of the primary flow of the hydraulic separator. From here a second pump will distribute the hot water to the various destinations. The cooled return water is drawn by the pump through the hydraulic separator to resume the cycle via the boiler.

WARNING!

If installing to an outdoor location where freezing temperatures may occur, it is necessary to install devices and/or materials to prevent any freezing in the condensate drain and the Flow and Return manifolds. Failure to do so may cause serious damage to the equipment.

2.3 Dimensional Drawings

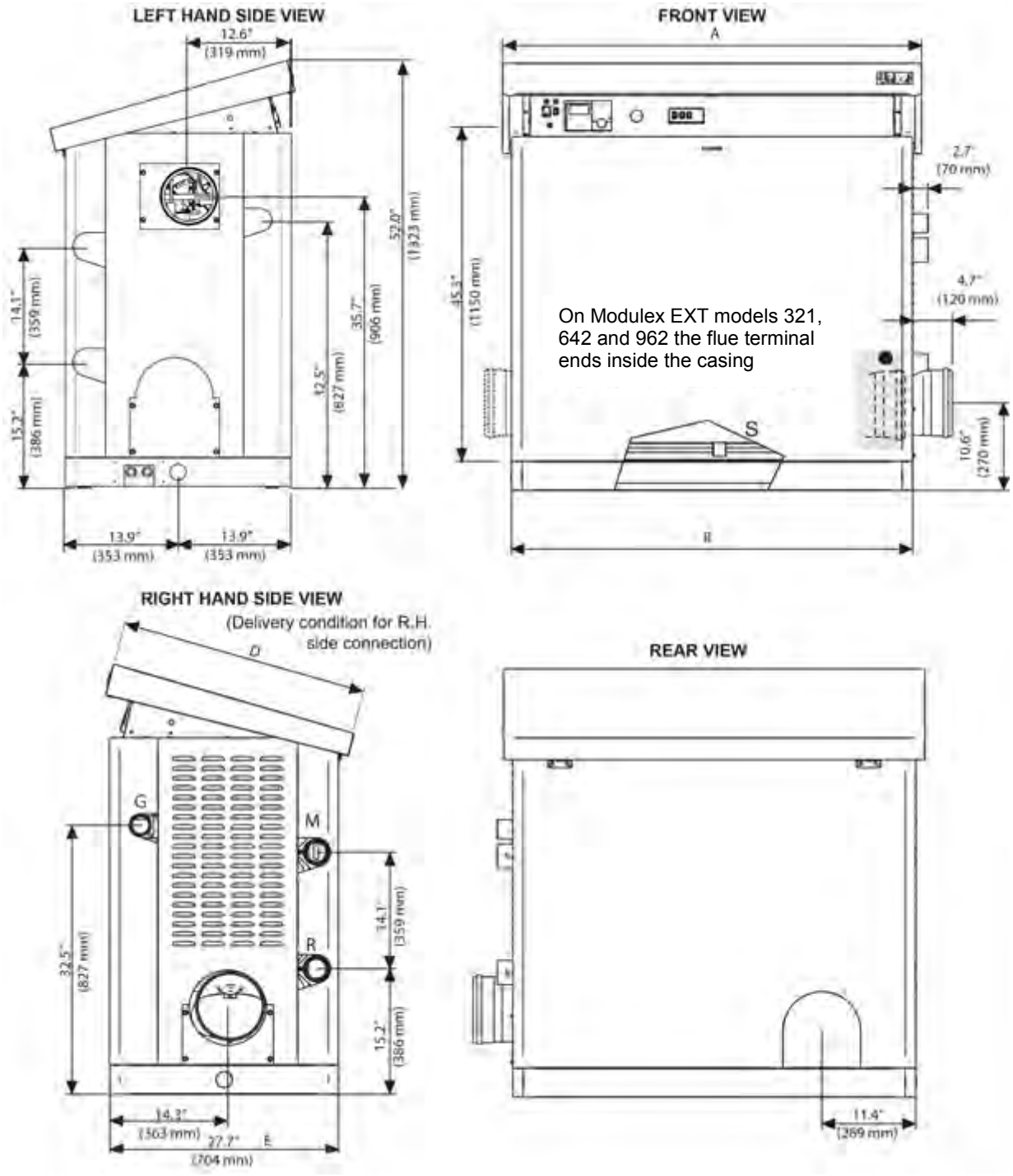

Figure 2-1: MODULEX EXT Dimensional Drawings (Side Views)

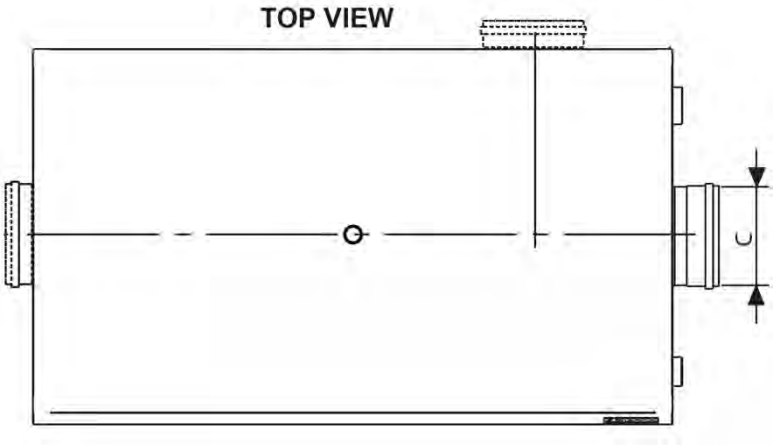

Figure 2-2: MODULEX EXT Dimensional Drawings (Top View)

Table 2-1: MODULEX EXT Dimensions and Sizes

Model	321	481	641	802	962	1123
Dimensions:						
No. of Modules	**2**	**3**	**4**	**5**	**6**	**7**
Height (Open) - inches/mm	52.1“ 1323	52.1“ 1323	52.1“ 1323	52.1“ 1323	52.1“ 1323	52.1“ 1323
Height (Closed) - inches/mm	45.3“ 1150	45.3“ 1150	45.3“ 1150	45.3“ 1150	45.3“ 1150	45.3“ 1150
Width ‘’A’’ - inches/mm	30.0“ 764	30.0“ 764	40.6“ 1032	40.6“ 1032	51.2“ 1300	51.2“ 1300
Width ‘’B’’ - inches/mm	27.8“ 707	27.8“ 707	38.4“ 975	38.4“ 975	48.9“ 1243	48.9“ 1243
Depth ‘’D’’ - inches/mm	30.3“ 770	30.3“ 770	30.3“ 770	30.3“ 770	30.3“ 770	30.3“ 770
Depth ‘’E’’ - inches/mm	27.7“ 704	27.7“ 704	27.7“ 704	27.7“ 704	27.7“ 704	27.7“ 704
Connections:						
Gas - inches/mm	2“ 60.3	2“ 60.3	2“ 60.3	2“ 60.3	2“ 60.3	2“ 60.3
M C/H System Flow - inches/mm	2½“ 76.1	2½“ 76.1	2½“ 76.1	2½“ 76.1	2½“ 76.1	2½“ 76.1
R C/H System Return - inches/mm	2½“ 76.1	2½“ 76.1	2½“ 76.1	2½“ 76.1	2½“ 76.1	2½“ 76.1
Vent Connection ‘’C’’ - inches/mm	5.9“ 150	5.9“ 150	5.9“ 150	5.9“ 150	7.8“ 200	7.8“ 200
Condensate drain diameter - inches/mm	1.57“ 40	1.57“ 40	1.57“ 40	1.57“ 40	1.57“ 40	1.57“ 40

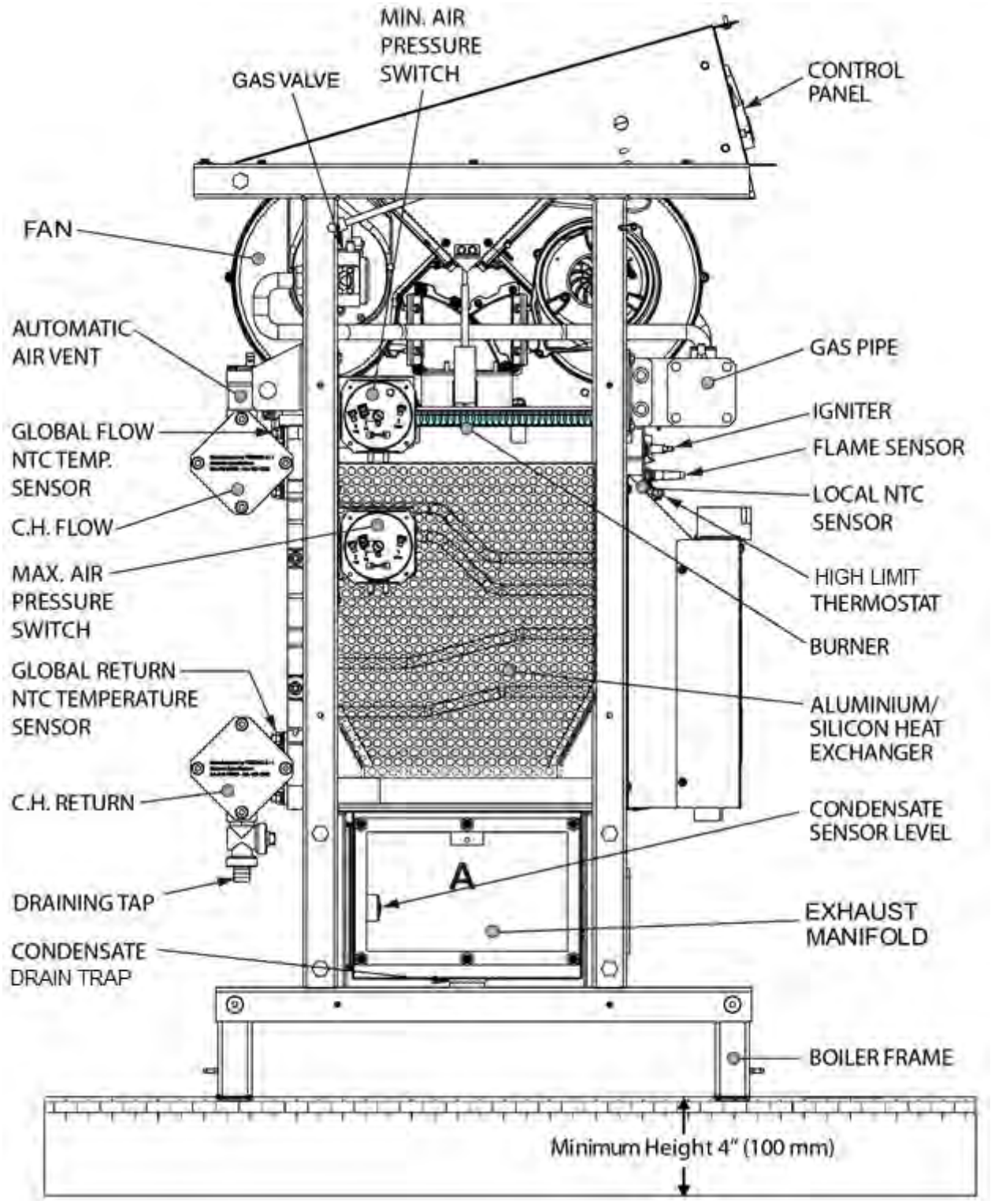

Figure 2-3a: MODULEX EXT Main Components (Left Side View)

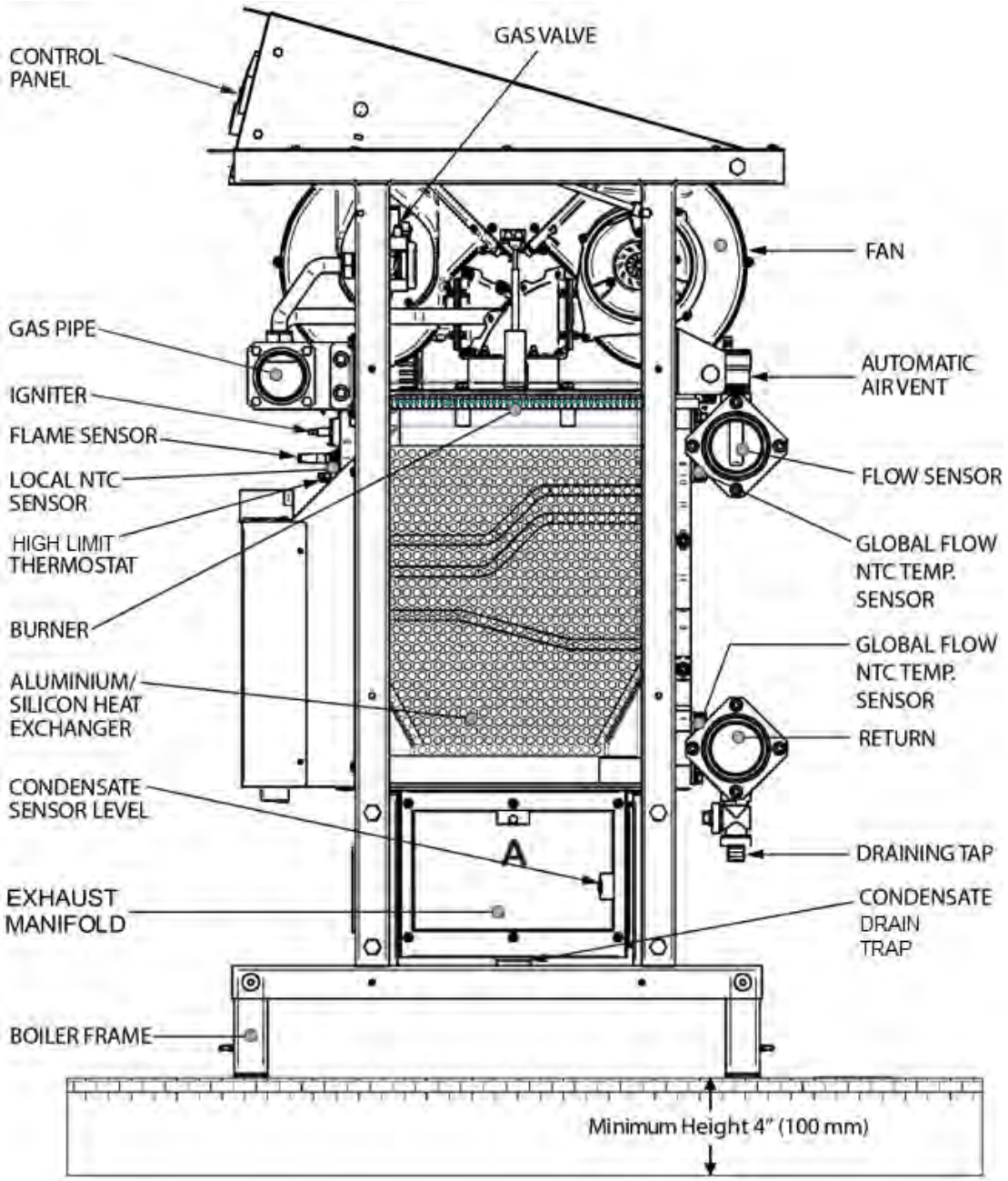

Figure 2-3b: MODULEX EXT Main Components (Right Side View)

- **Exhaust and condensate evacuation connections:** are on the RIGHT HAND side (supply condition), but may be moved to the RIGHT HAND or REAR positions.
- **Air intake connection**: located on the LEFT HAND side.
- **Cold/Hot flow connection:** on the RIGHT HAND side (supply condition), but may be moved to the LEFT HAND position.
- **Cold/Hot return connection:** on the RIGHT HAND side (supply condition) , but may be moved to the LEFT HAND position.
- **Gas connection:** on the RIGHT HAND side (supply condition) , but may be moved to the LEFT HAND position.

2.4 Performance Data

Table 2-2: MODULEX EXT Performance Data

PARAMETER	MODULEX EXT	EXT 321	EXT 481	EXT 641	EXT 802	EXT 962	EXT 1123
Minimum heat input	[Btu/hr]	46,000	46,000	46,000	46,000	46,000	46,000
	[kW]	13.48	13.48	13.48	13.48	13.48	13.48
Nominal heat input (low)	[Btu/hr]	321,000	481,000	641,500	802,000	962,000	1,123,000
	[kW]	94.08	140.98	188.02	235.06	281.96	329.15
(*) Nominal heat input (high) (reduction for Altitude)	[Btu/hr]	288,900	432,900	577,350	721,800	865,800	1,010,700
	[kW]	84.67	126.88	169.22	211.56	253.76	296.23
Nominal heat output (HT)	[Btu/hr]	281,000	422,000	564,000	707,000	850,000	993,000
	[kW]	82.36	123.68	165.30	207.22	249.13	291.04
Minimum heat output (HT)	[Btu/hr]	40,300	40,300	40,300	40,300	40,300	40,300
	[kW]	11.81	11.81	11.81	11.81	11.81	11.81
Efficiency at full load (100%)	[%]	87.58	87.76	87.94	88.12	88.30	88.48
Efficiency at min load	[%]	87.54	87.54	87.54	87.54	87.54	87.54
Nominal heat output in condensing mode	[Btu/hr]	290,000	437,000	579,000	726,000	875,000	1,031,000
	[kW]	84.99	128.08	169.70	212.79	256.46	302.18
Minimum heat output in condensing mode	[Btu/hr]	44,200	44,200	44,200	44,200	44,200	44,200
	[kW]	12.95	12.95	12.95	12.95	12.95	12.95
Efficiency at nominal load in condensing mode	[%]	90.19	90.82	90.28	90.55	90.91	91.81
Efficiency at min load in condensing mode	[%]	95.96	95.96	95.96	95.96	95.96	95.96
Combustion efficiency at nominal load	[%]	88.1	88.1	88.1	88.3	88.4	88.6
Combustion efficiency at min load	[%]	88.6	88.6	88.6	88.6	88.6	88.6
Stand-by losses	[%]	0.1	0.1	0.1	0.1	0.1	0.1
Flue gas temperature (Flue gas temp - room temp)	[°F]	113	113	113	113	113	113
	[°C]	45	45	45	45	45	45
Air excess l	[%]	20.57	20.57	20.57	20.57	20.57	20.57
Condensate production max	[kg/hr]	12.96	19.50	25.92	32.44	38.90	45.40
	[lb/hr]	28.57	42.99	57.14	71.52	85.76	100.09
Boiler category		IV	IV	IV	IV	IV	IV
Minimum water flow rate in CH circuit ⊠t 68 °F (20 °C)	[gal/min]	2.24	2.24	2.24	2.24	2.24	2.24
	[l/min]	8.47	8.47	8.47	8.47	8.47	8.47
Min. pressure in CH circuit	[psi]	7.25	7.25	7.25	7.25	7.25	7.25
	(kPa)]	50	50	50	50	50	50
Max. pressure in CH circuit	[psi]	92	92	92	92	92	92
	[kPa]	630	630	630	630	630	630
Water content in primary circuit	[gal]	2.67	3.75	4.83	5.92	7.00	8.08
	[L]	10.10	14.20	18.30	22.40	26.50	30.60
Maximum operating temperature	[°F]	176	176	176	176	176	176
	[°C]	80	80	80	80	80	80
Minimum operating temperature	[°F]	86	86	86	86	86	86
	[°C]	30	30	30	30	30	30
Electrical supply	[V-Hz]	120 - 60	120 - 60	120 - 60	120 - 60	120 - 60	120 - 60
Electrical req: 120 V 15 AMP max:	[FLA]	1.4	2.1	2.8	3.5	4.2	4.9
Net weight	[lb]	381	454	568	634	756	828
	[kg]	173	206	258	288	343	376
Gross weight	[lb]	448	520	650	717	851	924
	[kg]	203	236	295	325	386	419
Max dynamic gas pressure A (natural)	[in wc (kPa)]			10.5	(2.61)		
Nominal dynamic gas pressure A (natural)	[in wc (kPa)]			7.0	(1.74)		
Min. dynamic gas pressure A (natural)	[in wc (kPa)]			3.5	(0.87)		
Max dynamic gas pressure E (Propane HD)	[in wc (kPa)]			13.0	(3.23)		
Nominal dynamic gas pressure E (Propane HD)	[in wc (kPa)]			11.0	(2.74)		
Min. dynamic gas pressure E (Propane HD)	[in wc (kPa)]			8.0	(1.99)		

(*) For adjustments, refer to section 3.26 and 3.27

NOTE

The Technical data plate is placed under the casing.

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CHAPTER 3: INSTALLATION INSTRUCTIONS

3.1 General Warnings

3.1.1 Appropriate Use of the Boiler

This boiler MUST be used for the use for which it has been expressively designed. Any other use shall be considered improper and therefore dangerous.

This boiler is designed to heat water at a temperature below the boiling point at atmospheric pressure.

3.1.2 Prerequisite System Flushing

Before installing the boiler the following actions **MUST** be carried out by a competent engineer or technician:

a) The whole system should be thoroughly flushed in order to remove any residual dirt or grime which could compromise correct boiler operation.

b) Check that the boiler has been preset for operating with the gas type available. This is verifiable via the indication on the packaging and on the data badge;

c) Check that the flue pipe has an adequate draft, does not have any constrictions or obstructions, and that no other appliance's flue outlets have been fitted, unless the flue pipe is serving more than one heating appliance, according to the specific standards and regulations in force. The connection between the boiler and flue outlet can be made only after this verification has been carried out.

3.1.3 Installation Personnel Qualifications

The appliance must be installed by a qualified engineer or technician, who complies with the technical requirements, who, under his own responsibility, guarantees the compliance of the standards according to the latest regulations.

The appliance must be positioned so that at least the minimum operational and servicing clearances are provided.

The boiler must be connected to a heating system which is compatible to its performance and output.

FOR MASSACHUSETTS INSTALLATIONS: The boiler **MUST** be installed by a plumber or gas fitter licensed within the Commonwealth of Massachusetts.

3.1.4 Carbon Monoxide Detector Installation

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/NFPA 54**.
- **Canada:** Installation must conform to the requirements of **CAN/CSA-B149.1** - Natural Gas and Propane Installation Code
- Where required by the authority having jurisdiction, the installation must conform to the Standard ASME CSD-1 Controls and Safety Devices for Automatically Fired Boilers.

3.2 Code and Standards Approvals

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

- **ANSI Z21.13/CSA 4.9:** Gas-fired low pressure steam and hot water boilers
- **ASME SECTION IV:** ASME Boiler and Pressure Vessel Code with addenda, Section IV: Rules for Construction of Heating Boilers
- **BTS – 2000:** Testing standard method to determine efficiency of commercial space heating boilers.
- **SCAQMD RULE 1146.2:** Emissions of oxides of nitrogen from large water heaters and small boilers and process heaters.
- **CSD-1:** Controls and safety devices for automatically gas-fired boilers.

3.3 Packaging

The MODULEX EXT boiler is delivered assembled and protected by a plastic bag inside a strong cardboard box and fixed on a pallet. This allows the boiler to be handled by a forklift.

CAUTION!

Remove both straps and the cardboard box from above, making sure the product is intact. The packing elements (cardboard box, straps, plastic bags, etc…) should be **kept away from children**, as these present suffocation and choking hazards.

AERCO refuses all liability for injury to persons, animals or damage to property derived from not respecting the above mentioned recommendations.

In the packaging, in addition to the boiler, you will also find the following contents (see Figures 3-1 and 3-2):

ON THE BOILER FRONT:

- The flue exhaust terminal screwed to the front of the frame
- The sealing gasket for flue outlet mounted in the flue assembly.
- **A cardboard box containing:**
  - The sealing gasket for connection between condensate tray and terminal
  - 4 elbows + 1 Tee piece + 1 plastic plug, Ø 1.6” (40 mm) for condensate drain.
  - the screws necessary for installing the flue exhaust terminal
- External sensors: Remote Temperature, D.H.W. storage tank & Outdoor temperature
- Nipple/cap for flue exhaust gas sampling tests
- Resistor kit for emergency operation
- Cable glands for electrical supply
- Pins for mounting sockets
- Kit sheet for output cables 120 / 24 V

- **A cardboard box containing:**
  - Four (4) frame support feet
  - 3 hole covers for switching flue exhaust location
  - 3 insulation gaskets (for installation outside).
- **A cardboard box containing:**
  - CSD-1 header
  - Relief valve

ON THE BOILER RIGHT SIDE:

- One 39.3 inch (1 meter) pipe for the condensate evacuation system. -
- Left and right side covers.

ON THE BACK OF THE BOILER

- Socket, front and rear.

ON THE BOILER TOP:

- a plastic bag containing:
  - This installation manual for the installer.
  - User manual for the user.
  - E8 controller instruction manual.
- Pins to hold the fan assembly in a raised position.

IN A SEPARATE BOX

- PVC venting starter piece and pipe clamps
- Temperature & Pressure gauge
- Flow Switch
- Pipe adaptor (rubber)

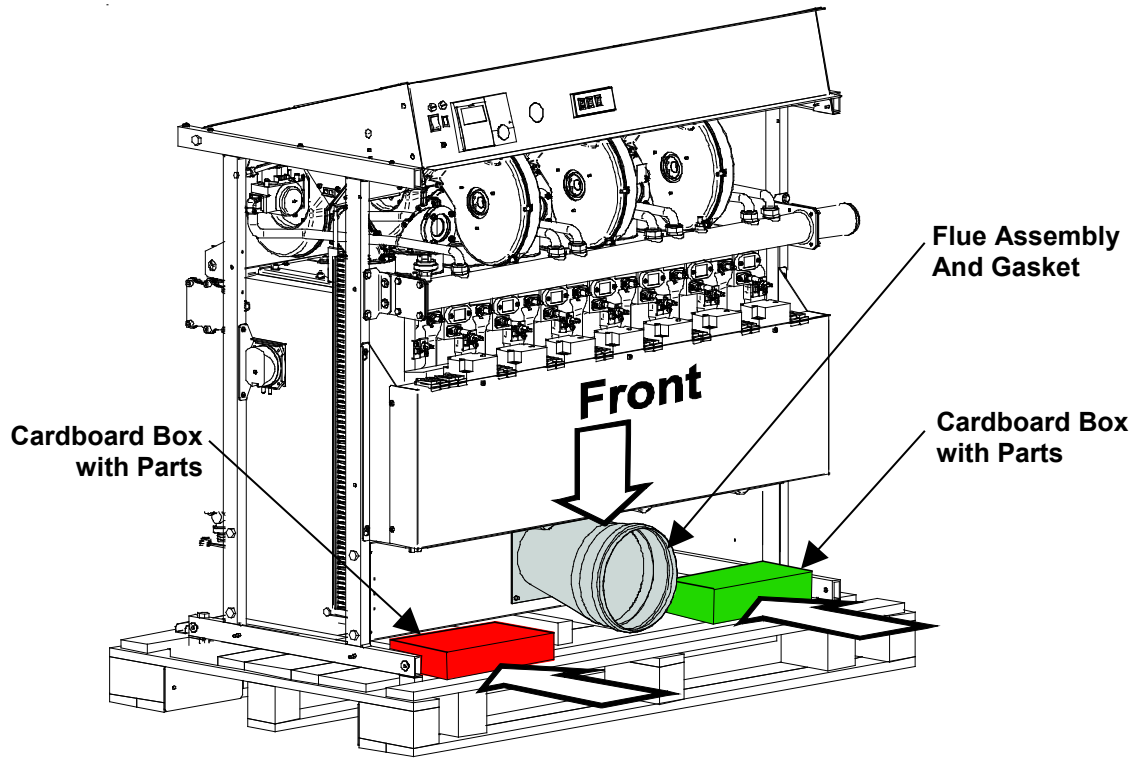


Figure 3-1: MODULEX EXT Unpacking (Front View)

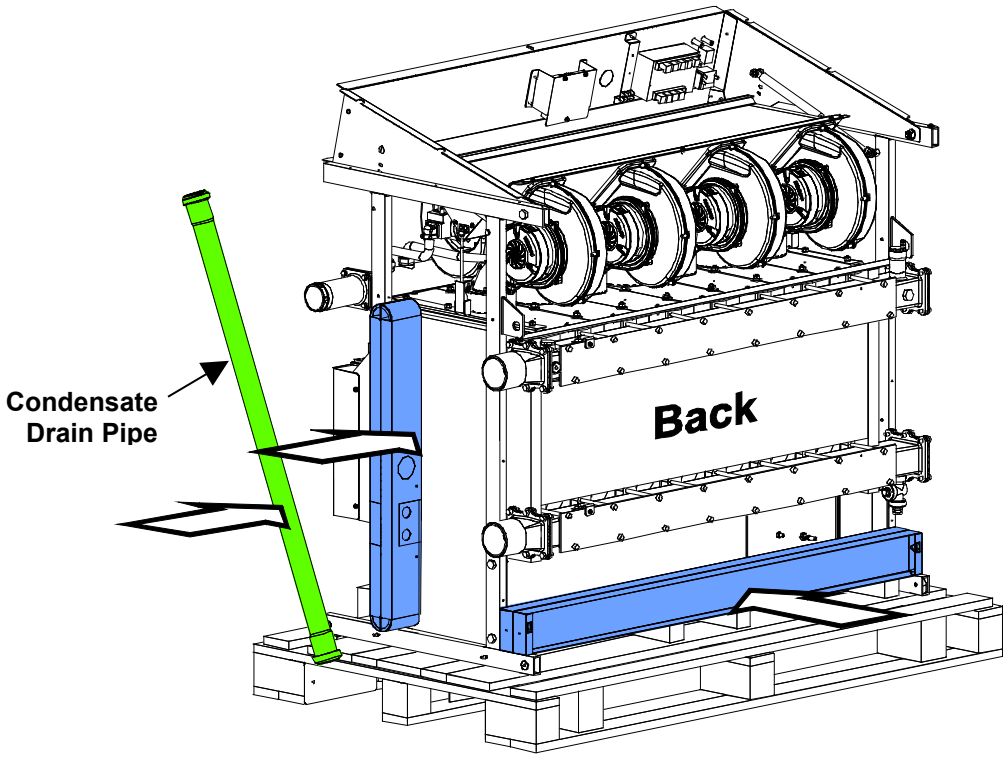


Figure 3-2: MODULEX EXT Unpacking (Rear View)

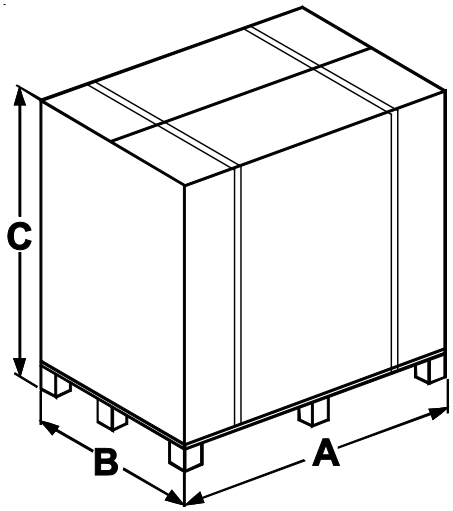


Figure 3-3: MODULEX EXT Shipping Package

Table 3-1: MODULEX EXT Shipping Package Dimensions

Model	A	B	C	Gross Weight
321	43.7“ 1110 mm	35.0“ 890 mm	49.2“ 1250 mm	448 lb. 203 kg
481	43.7“ 1110 mm	35.0“ 890 mm	49.2“ 1250 mm	520 lb. 236 kg
641	43.7“ 1110 mm	35.0“ 890 mm	49.2“ 1250 mm	650 lb. 295 kg
802	43.7“ 1110 mm	35.0“ 890 mm	49.2“ 1250 mm	716 lb. 325 kg
962	54.1“ 1375 mm	35.0“ 890 mm	49.2“ 1250 mm	851 lb. 386 kg
1123	54.1“ 1375 mm	35.0“ 890 mm	49.2“ 1250 mm	924 lb. 419 kg

3.4 Transporting and Securing the Boiler Safely

The boiler is susceptible to serious damage when not secured properly.

- Follow the transportation instructions on the packaging.
- Only transport the boiler using appropriate transportation equipment, such as a hand-truck with a fastening belt or special equipment for transporting heavy equipment.
- When moving the boiler, it must be secured on the transportation equipment to prevent it from falling off.
- Protect all parts against impacts, during transportation.

3.5 Removal From Boiler Bed And Installation Of Boiler Feet

Follow the directions below to prepare the boiler for installation:

1) Remove the covers of the boiler (Figure 3-4).
2) Lift the boiler with a hoist or forklift bands (Figure 3-4).
3) Remove the 4 screws ''A'' (Figure 3-4).

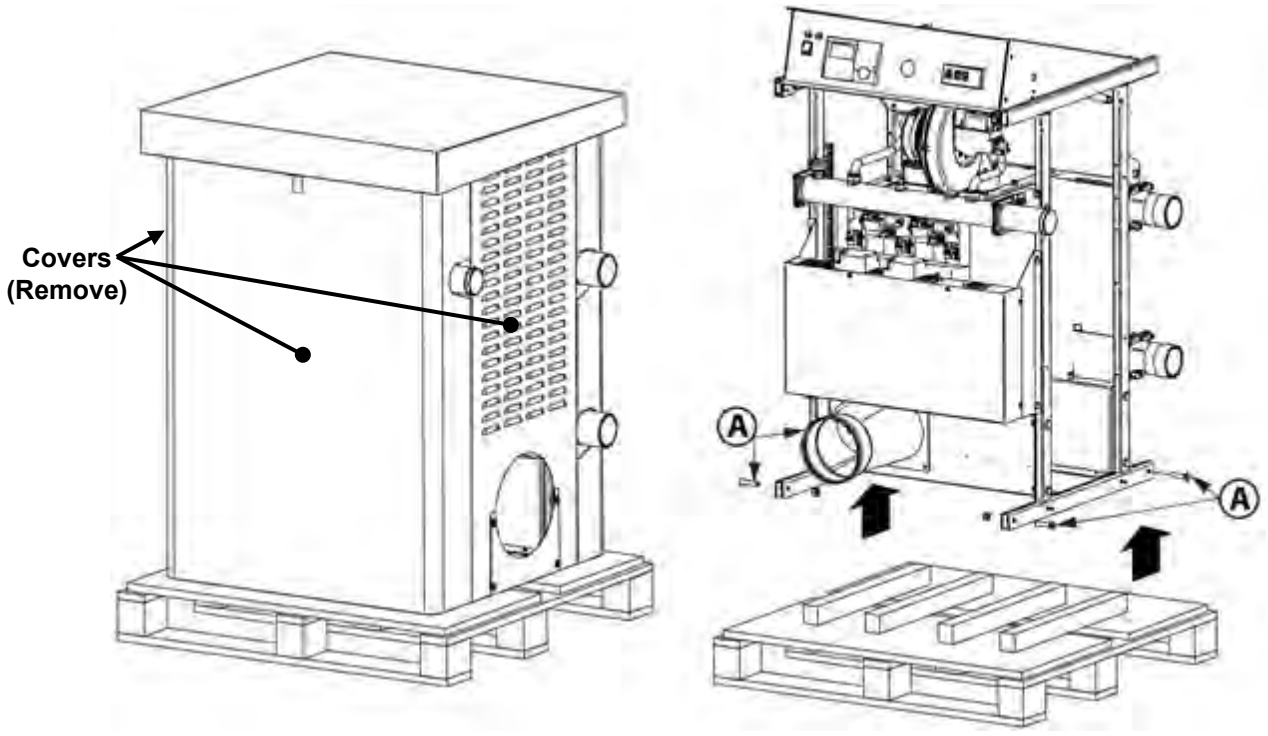


Figure 3-4: EXT Unpacking (Left = With Covers, Right = Lifted Without Covers)

4) Retrieve the four (4) support feet from one of the cardboard boxes packaged with the boiler.
5) Attach the four (4) support feet to the chassis using the four ''A'' screws removed in Step 3 (Figure 3-5).
6) Place the boiler on concrete slab and re-mount the cover(s) over the boiler.

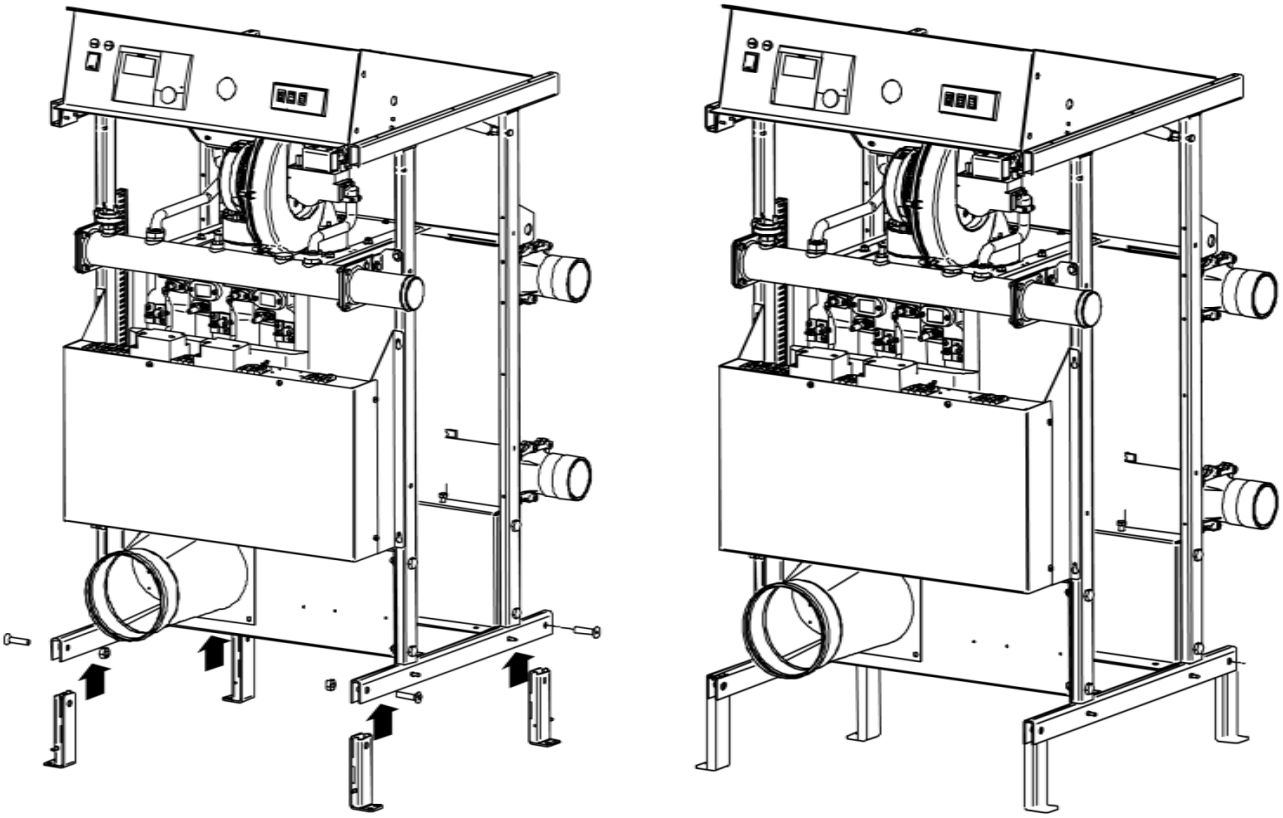


Figure 3-5: MEXT Unpacking (Left = Attach Feet, Right = Ready for Cover)

3.6 Boiler Location Inside A Boiler Room

Special attention shall be paid to local regulations and laws about boiler enclosures and boiler rooms, particularly to the minimum clearances around the boiler. The installation shall be in compliance with all the latest regulations and laws about boiler enclosures, boiler rooms, installations of heating and hot-water systems, ventilation, vents capable of exhausting the flue gases of condensing boilers, and any other applicable requirements.

The boiler can be put on a flat and sufficiently strong base with the same dimensions as the boiler and at least 3.93'' (100 mm) high (see Figure 3-6), in order to assemble the condensate trap. An alternative to this base may be a 100mm deep well or trench next to the boiler to accommodate the condensate "U" drain pipe (see Figure 3-6). After installation the boiler shall be perfectly horizontal and stable, to reduce any possible vibrations or noises.

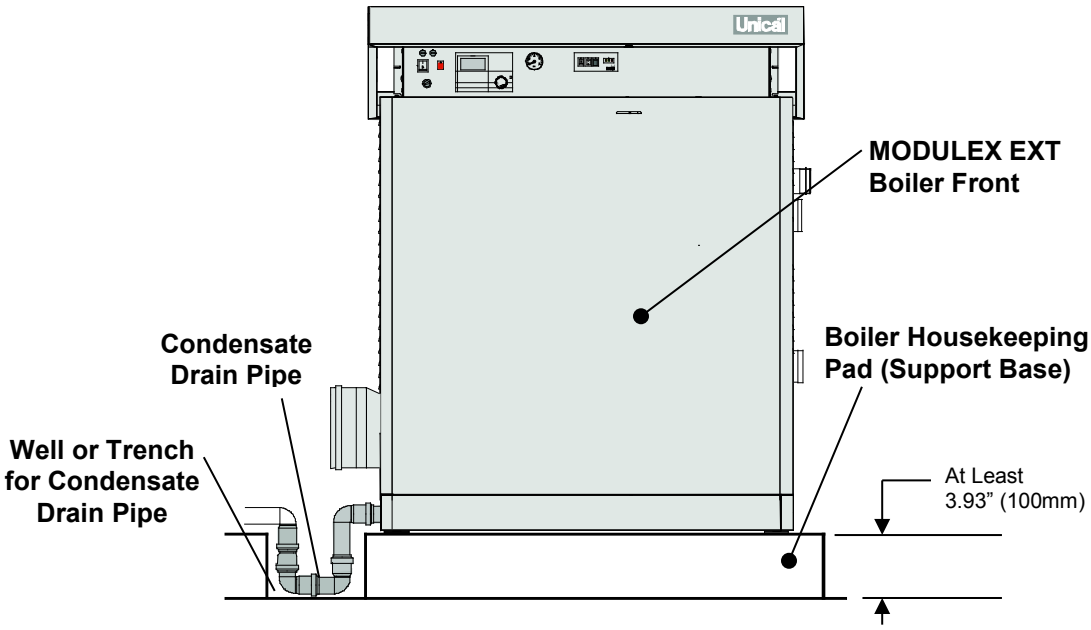


Figure 3-6: Boiler (Front View) on Housekeeping Pad with Condensate Drain Pipe

3.6.1 **Boiler Room Safety Concerns**

When selecting the position for the installation of the boiler please comply with the following safety requirements:

- Ensure easy access to the components of the boiler to facilitate maintenance.
- The room where the boiler will be placed must always be frost free.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Never use or store any chlorinated detergents or halogenated hydrocarbons (e.g. in spraycans, solvents and detergents, paints, adhesives) in proximity to the boiler.
- For outdoor installation see **Warning for Outdoor installation** on page 16.

3.6.2 **Products to Avoid in the Boiler Room**

Do NOT store the following products in the boiler room and/or around combustion air intake vents.

- Spray cans containing chlorocarbons/fluorocarbons
- Ammonium and/or ammonium solutions
- Permanent wave solutions
- Chlorinated waxes and/or cleaners
- Chlorinated swimming pool chemicals
- Calcium chloride used for thawing
- Sodium chloride used for water softening
- Refrigerant leaks
- Paint or varnish removers

- Hydrochloric acid/muriatic acid
- Cements and glues
- Antistatic fabric softeners used in clothes dryers
- Chlorine-type bleaches, detergents, and cleaning solvents
- Adhesives used to fasten building products
- other damaging or flammable products

3.7 Recommended Clearances for Servicing

Recommended clearances around the boiler are listed below (see Figure 3-7):

TOP of the boiler:	24“	(600 mm)
FRONT of the boiler:	24’’	(600 mm)
RIGHT side:	24’’	(600 mm)
LEFT side:	24’’	(600 mm)
FLOOR/GROUND:	4’’	(100 mm)
BACK of the boiler:	24’’	(600 mm)

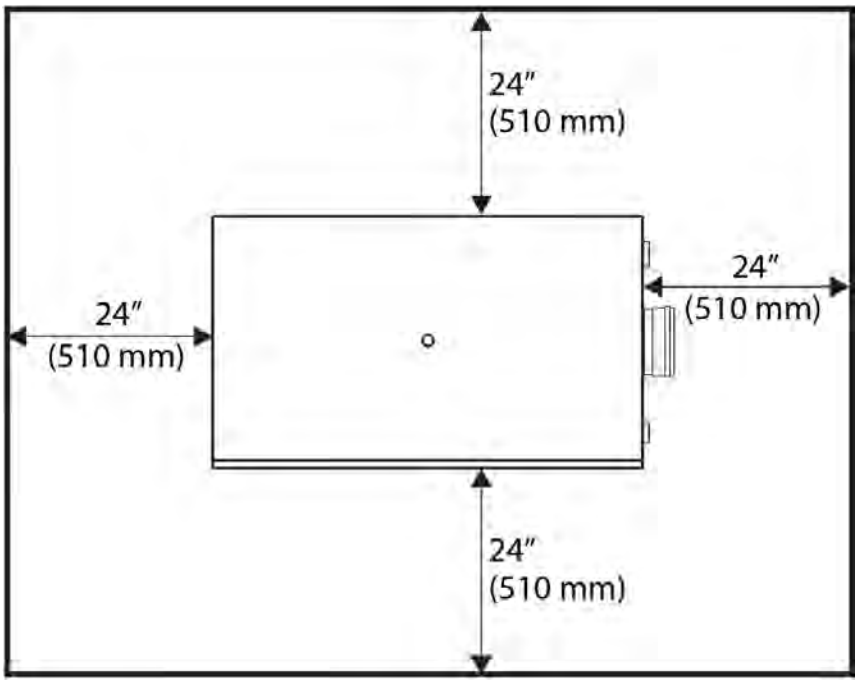


Figure 3-7: EXT Boiler Clearances

It is recommended to provide the boiler with the clearances as shown in the drawing in order to be able to perform normal service and cleaning operations. Minimum required clearances depend on the piping and venting configuration. For further details, contact your loal manufacturer’s representative.

3.8 Boiler Connections

At delivery, the MODULEX EXT boiler is setup with all connections, (i.e. cold/hot water flow & return, gas, and exhaust outlet) on its RIGHT HAND side.

3.8.1 **Changing Exhaust Outlet Location**

To move the flue exhaust outlet terminal from the RIGHT HAND side (standard delivery position) to the REAR position, it is necessary to request the Rear Exhaust kit (P/N **00364937**), which includes a cover for closing off the RIGHT HAND side panel exhaust opening (see Figure 3-9).

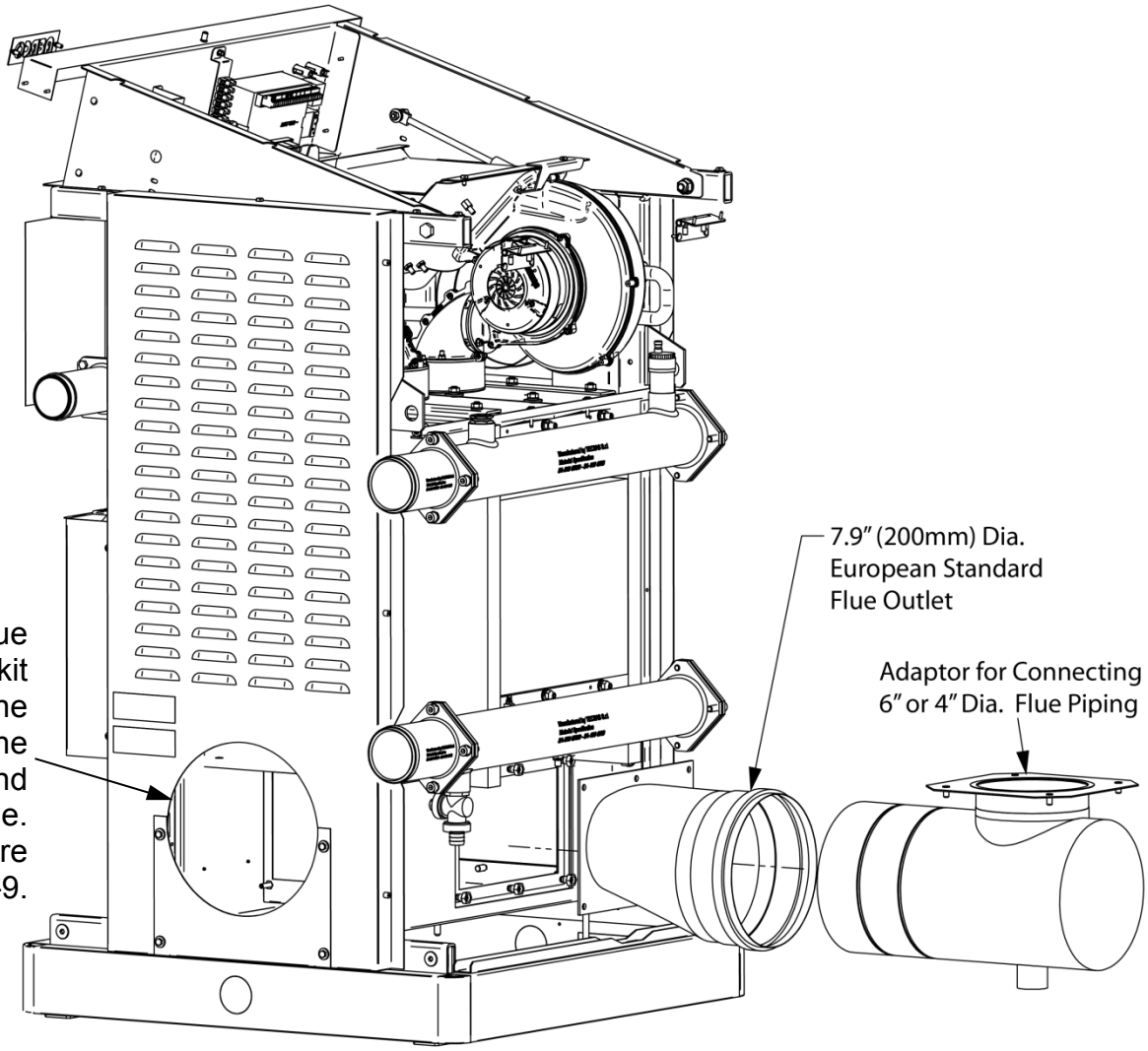


Figure 3-8: Rear Exhaust Kit (P/N* 00364937) for Changing Exhaust Outlet from RIGHT HAND side to REAR on *EXT 802, 962, 1123 (only)

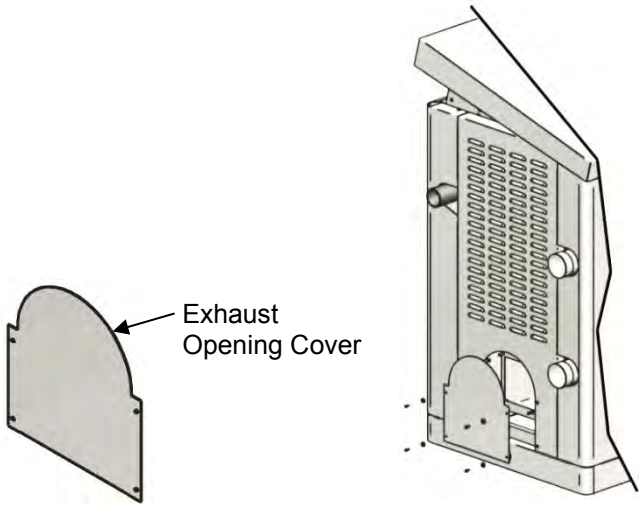


***Figure 3-9: Rear Exhaust Kit (P/N* 00364937) for Changing Exhaust Outlet from RIGHT HAND side to REAR**

3.8.2 Reversing Gas Manifold Connections

To move the gas connection from the RIGHT HAND side (standard delivery position) to the LEFT HAND side, swap the end plate and the gas supply connector screwed onto the gas manifold ends as shown in Figure 3-10. Ensure that the gaskets for ALL connections are reversed along with the connectors themselves.

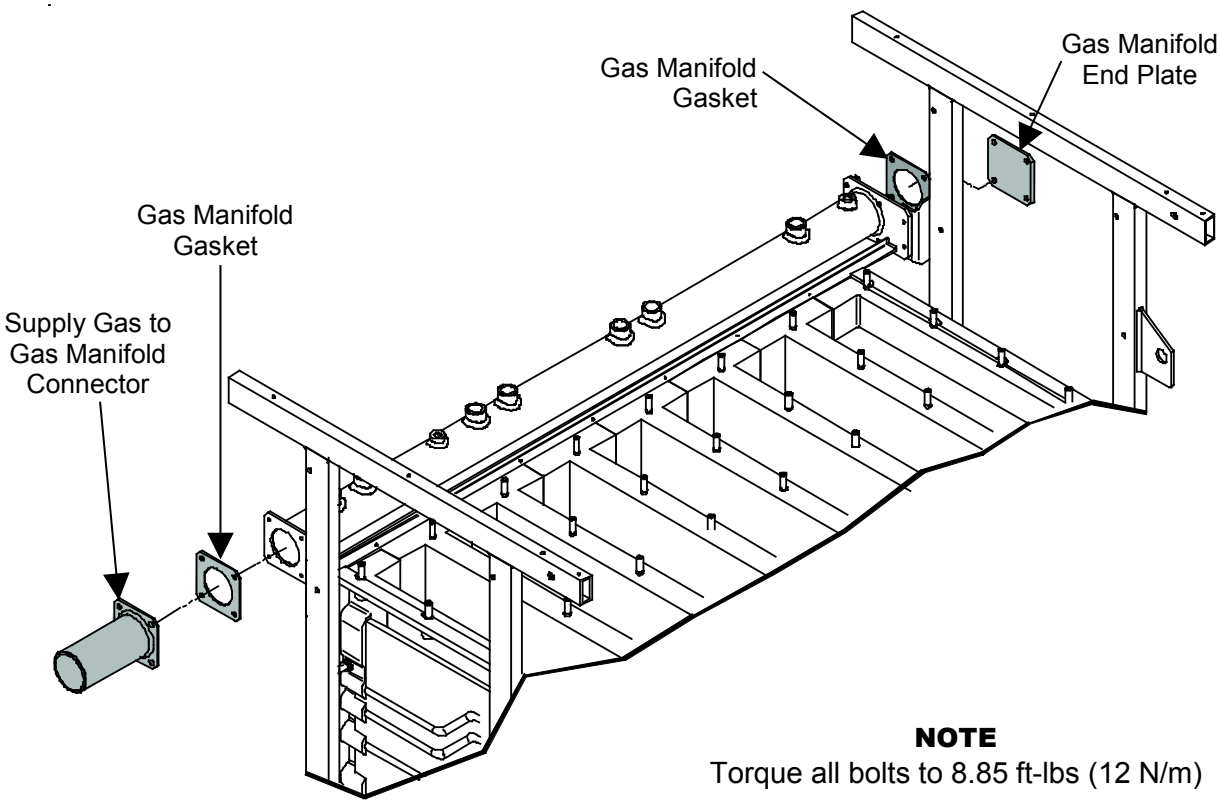


Figure 3-10: Reversing Gas Connections from RIGHT HAND to LEFT HAND

3.8.3 Reversing Cold/Hot Water Flow & Return Connections

Change of Water Flow and Return connections from RIGHT hand to LEFT hand requires reversing connectors, moving the Flow and Return Temperture Sensors to other end, and exchanging positions of the Boiler Sensor KF and Automatic Air Vent.

WARNING!

Ensure that the **gaskets** for ALL connections are reversed along with the connectors themselves.

3.8.3.1 Reversing Cold/Hot Water Flow & Return Piping Connectors

Refer to Figure 3-11 and reverse the connectors and end caps on Supply, Flow, and Return pipes. Ensure that all gaskets are also reversed.

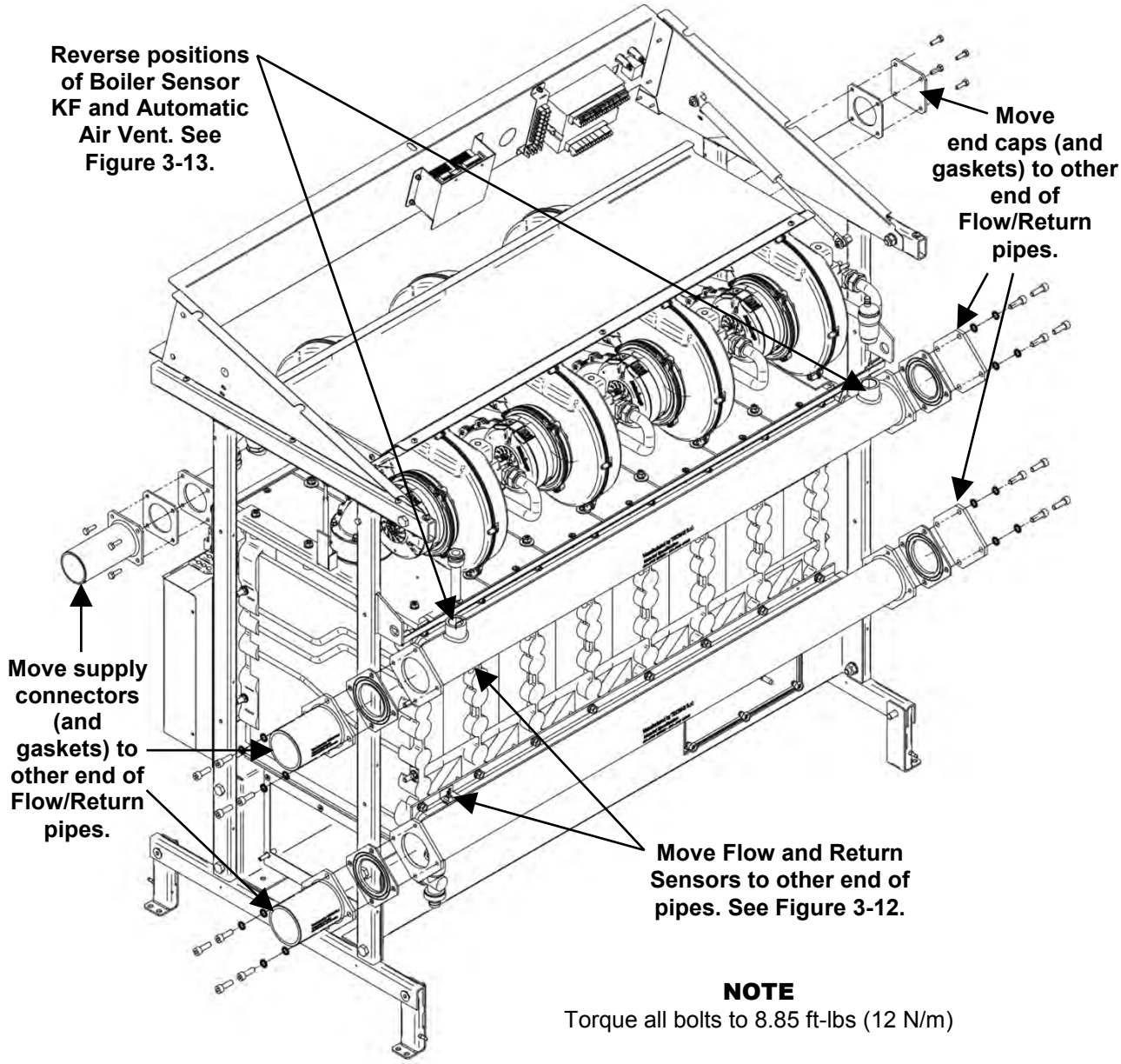


Figure 3-11: Reversing Cold/Hot Water Flow and Return Connections and Sensors from RIGHT HAND to LEFT HAND

3.8.3.2 Reversing Flow & Return Temperature Sensors

One sensor is located on top of the lower Return pipe railing, while the other one is located under the upper Flow pipe railing. Move these two sensors to other end of Flow/Return pipes.

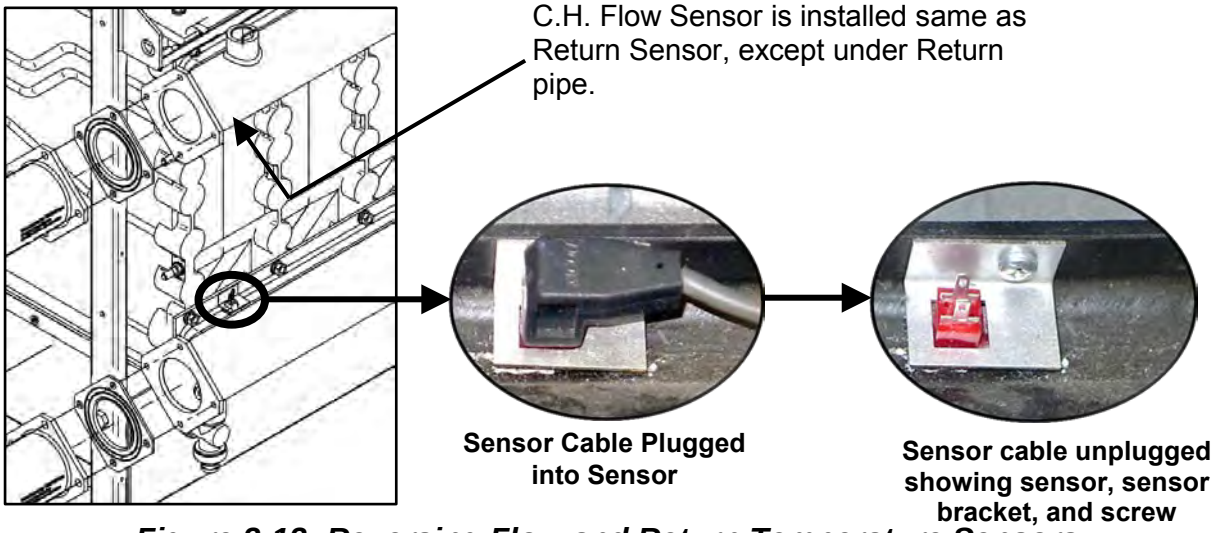


Figure 3-12: Reversing Flow and Return Temperature Sensors

3.8.3.3 Reversing Boiler Sensor Kf And Automatic Air Vent

Reverse the positions of the Boiler Sensor KF and Automatic Air Vent located on the top Flow pipe.

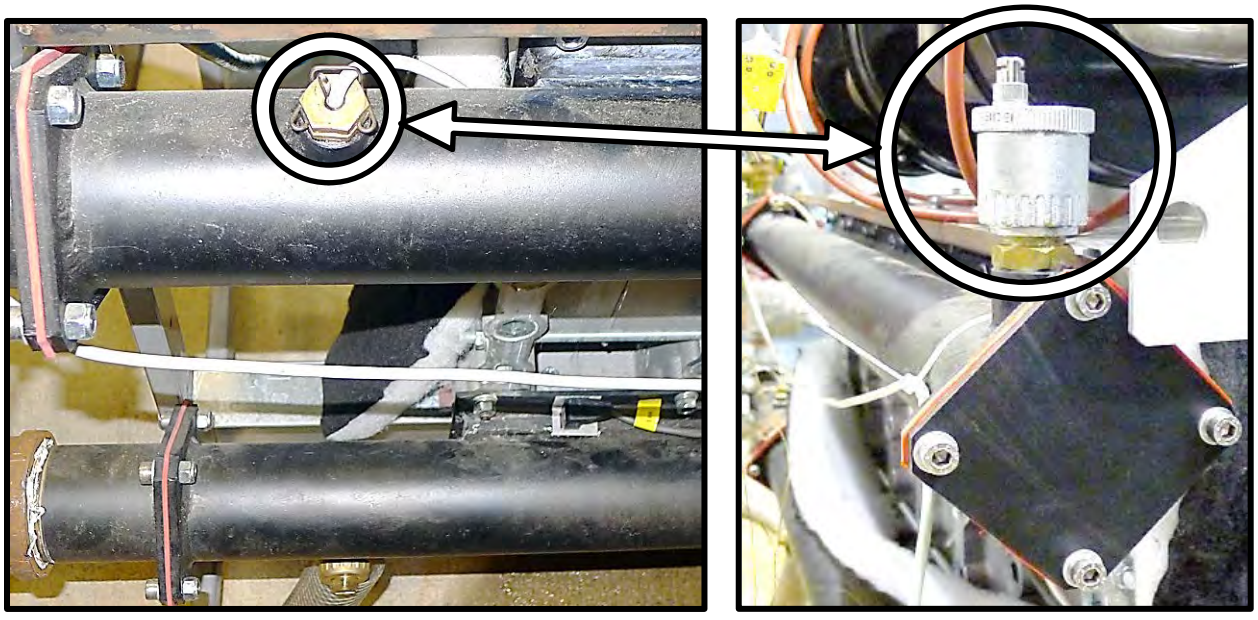


Figure 3-13: Reversing Boiler Sensor KF with Automatic Air Vent

NOTE

When reversing hydraulic and gas pipe connections, you must close up the chassis openings vacated after the change. See Figure 3-14.

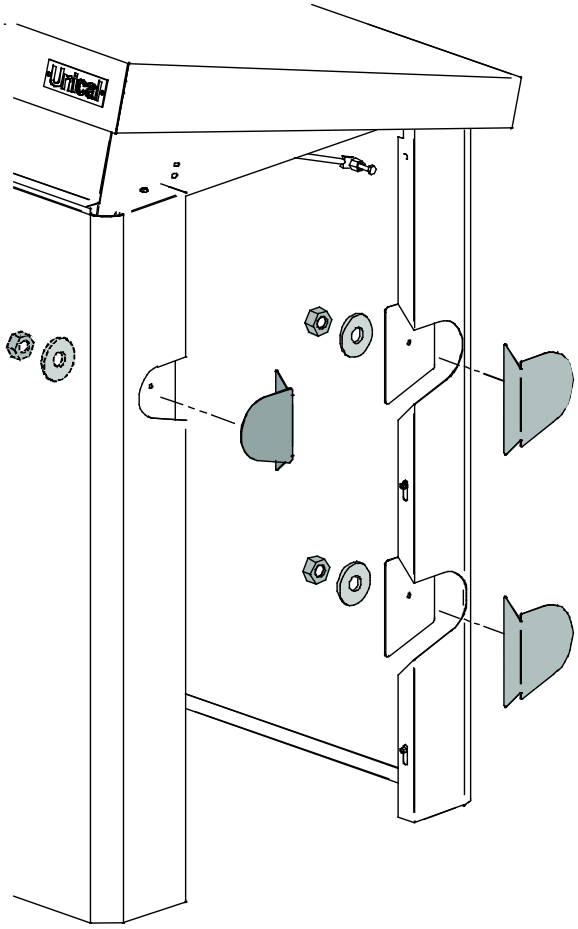


Figure 3-14: Caps and Plugs Used for Closing Up Vacated Gas and Hydraulic Connection Openings

3.9 Gas Connection General Information

For natural gas connections, refer to section 3.9.1. For propane gas connections, refer to section 3.9.2.

The gas supply connection must comply with local regulations or, if such regulations do not exist, with the National Fuel Gas Code, **ANSI Z223.1/NFPA 54**.

For Canada, the gas connection must comply with local regulations or, if such regulations do not exist, with the **CAN/CSA-B149.1** - Natural Gas and Propane Installation Code.

Before installing the boiler it is recommended that all the supply piping be thoroughly cleaned in order to remove any residual grime which could compromise the boilers correct functioning.

As a safety measure against gas leaks, AERCO recommends installing a surveillance and protective system made up of a gas leakage detector combined with an on-off solenoid valve on the gas supply line.

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 1/2 PSI (3.5kPa).

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 1/2 PSI (3.5 kPa).

WARNING!

- THE GAS CONNECTION MUST BE INSTALLED BY A REGISTERED ENGINEER WHO MUST COMPLY WITH THE REGULATIONS IN FORCE AND TO THE REQUIREMENTS INDICATED BY THE LOCAL GAS SUPPLIER. AN INCORRECT INSTALLATION CAN CAUSE INJURY OR DEATH TO PERSONS, ANIMALS OR DAMAGE TO PROPERTY. THE MANUFACTURER SHALL NOT BE HELD LIABLE FOR ANY INJURY AND/OR DAMAGE DUE TO INAPPROPRIATE INSTALLATION.
- Do not use the boiler for another type of gas than indicated on the identification plate of the boiler. This will cause improper functioning and can damage the boiler.
- Always check the safety of the gas pipe system by means of a soap bubble test using a leak-search spray.

3.9.1 Natural Gas Connections

3.9.1.1 Natural Gas Piping Sizes

Contact your local gas supplier for natural gas pipe sizes and meter types.

3.9.1.2 Natural Gas Piping Connections

The boiler gas pipe is equipped with external 2" M-NPT thread, onto which the tail piece of the gas shut off valve can be connected. Use appropriate sealing.

The connection to the boiler must include a suitable method of disconnection and a gas control valve must be installed adjacent to the boiler for isolation purposes.

3.9.1.3 Natural Gas Supply Pressure Requirements

The nominal inlet working gas pressure measured at the boiler should be **7" W.C.** (18 mbar) for Natural Gas (Gas A). Maximum pressure with no flow (lockup) or with the boiler running is 10.5 inches W.C. Minimum pressure with the gas flowing (verify during boiler startup) is 4.0 inches W.C.

3.9.2 Propane Gas Connections

3.9.2.1 Propane Gas Piping Sizes

Contact your local gas supplier for Propane gas pipe sizes, tanks, and 100% lockup gas pressure regulator.

3.9.2.2 Propane Gas Piping Connections

- Use a gas shut off valve compatible with propane gases.
- A sediment trap must be installed upstream of the gas controls.

The boiler pipe is provided with an external 2" MNPT thread, onto which the tail piece of the gas shut off valve can be screwed. Use appropriate sealing.

The connection to the boiler must include a suitable method of disconnection.

The nominal inlet working gas pressure measured at the boiler should be 11" W.C. (27 mbar) for Propane gas (Gas E).

A gas control valve must be installed adjacent to the boiler for isolation purposes.

3.9.2.3 Propane Gas Supply Pressure Requirements

Pressures required at gas valve inlet pressure port:

- Nominal gas pressure – 11 inches W.C.
- Maximum gas pressure – 13 inches W.C. with no flow (lockup) or with boiler running.
- Minimum gas pressure – 8 inches W.C. with gas flowing (verify during boiler startup).

NOTE

Ensure that the high gas pressure regulator is installed at least 6 to 10 feet upstream of the boiler.

3.10 Flow And Return Pipe Connections

The cold and hot water flow and return circuits must be connected to the boiler via the respective 2½" M and R connections as indicated in Table 2-1.

When determining the size of the cold/hot water circuit pipes it is essential to bear in mind the pressure losses induced by any of the system's components and by the configuration of the system.

When planning the routing of the cold/hot water piping, take the necessary precautions to avoid air traps and pockets and to facilitate the continuous purging of the system.

WARNING!

- Before installing the boiler we recommend that the system is flushed out with a suitable cleaning product in order to eliminate any metallic tooling or welding residues, or oil and grime, which could reach the boiler and affect the proper functioning of the boiler.
- Ensure that the system piping is NOT used for earth grounding of electrical or telephone systems. Such grounding of system piping is unsuitable and can cause serious damage to the piping, boiler, and radiators.
- It is absolutely forbidden to fit on-off valves in the piping before the required saftey devices.

3.11 Pressure Relief Valve

The included pressure relief valve (Figure 3-15) must be fitted on the CSD-1 manifold, which is installed on the flow pipe per instructions in the next section, 3.12, below. It complies with the ANSI/ASME **ANSI Z21.13 / CSA 4.9** Boiler and Pressure Vessel Code, **Section IV** (''Heating Boilers''), and **CSA B51**, Boiler, Pressure vessel, and Pressure Piping Code, as applicable.

The boiler ships with an 80 psi pressure relief valve for installation into the CSD-1 manifold header. Lower system pressures will require lower rated pressure relief valves (not supplied).

Figure 3-15: Pressure Relief Valve

3.12 CSD-1 Manifold Assembly (Supplied)

The installation of a flow switch, pressure/temperature gauge, and an ASME compliant safety pressure relief valve designed for the boiler output capacity are required. These major components 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 (Figure 3-15)
- Flow Switch
- Pressure/Temperature Gauge

The pressure relief valve and other manifold components are shown in Figure 3-16.

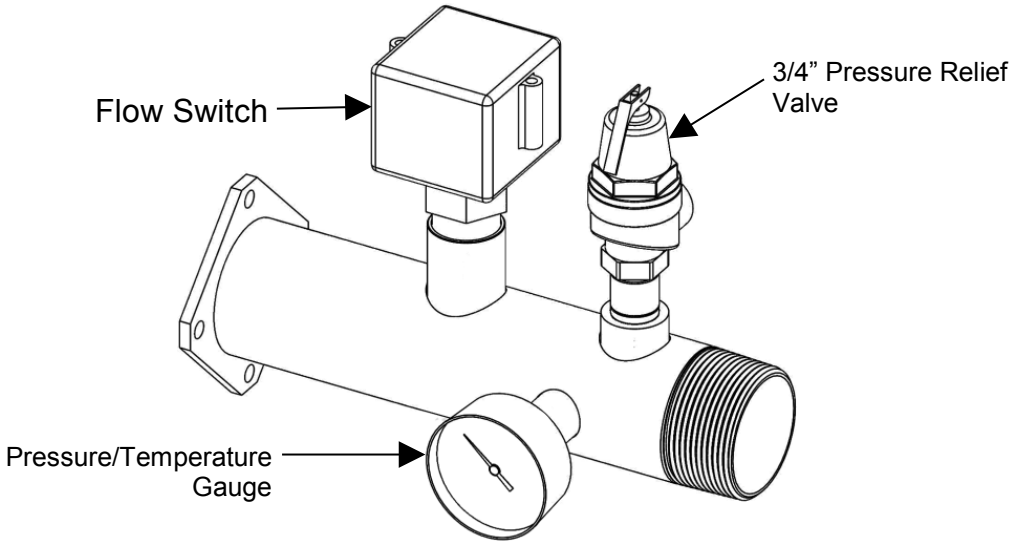


Figure 3-16: Manifold Assembly and Components

To install the pressure relief valve and the other components shown, proceed as shown in instructions below.

NOTE

Use Teflon tape or a suitable pipe joint compound for component and piping connections described in the following steps. Refer to Figure 5 for component identification.

Installing the Pressure Relief Valve and Other Components

1. Attach manifold to the outlet supply connection on the boiler via the flanged connections.
2. Cut the flow switch for 2-1/2" pipe, as directed in the flow switch paddle packaging. For installations expecting less than a 10 gpm flow, the switch must be adjusted as follows:
   a) With no flow, turn adjustment screw on the switch counter-clockwise until the switch trips.
   b) Then turn screw 1/2 turn clock-wise and continue installation.
3. Connect the following components to the tapped holes in the manifold assembly (see Figure 3-16):
   - 3/4" Pressure Relief Valve
   - Flow Switch
   - Pressure/Temperature Gauge
4. Check to ensure that all components are securely tightened and that the flow switch paddle moves freely without interference.
5. Locate the BMM module, with the "FL" label, at the unit front (Figure 3-17) and remove the black jumper wire from the terminals of the connector shown in the detail of Figure 6. Connect the two flow switch wires to the two terminals. Flow switch wires have no polarity, so can be inserted without regard to position.

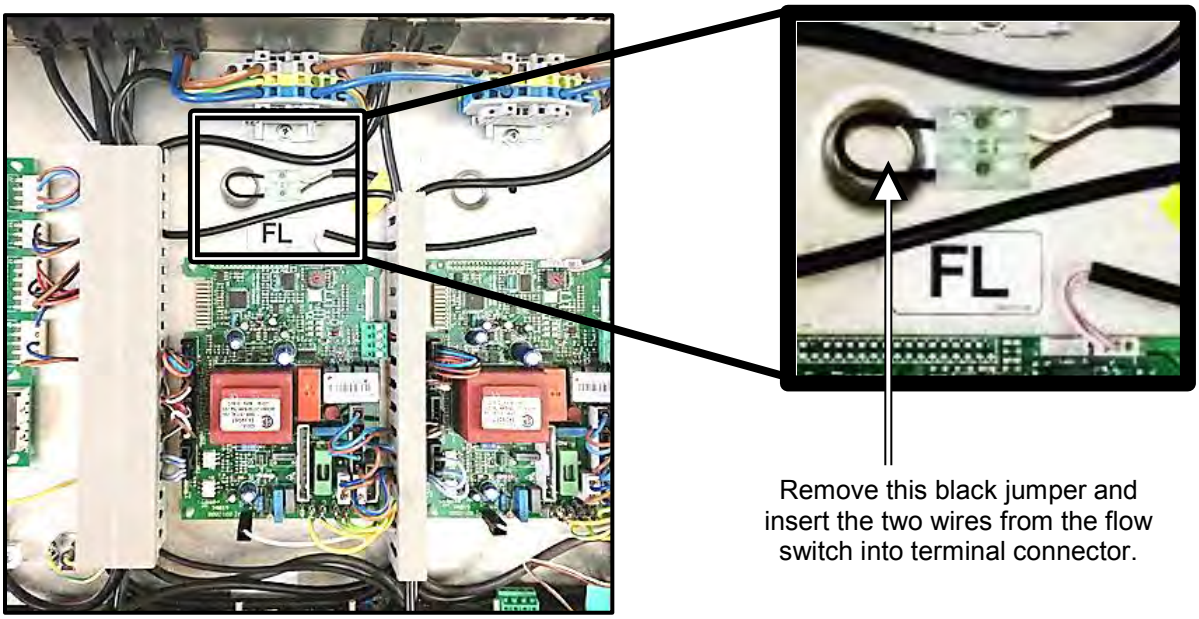


Figure 3-17: BMM Location and Flow Switch Connection

3.13 Determination of Primary Boiler Pump Or Boiler System Pump

The following table gives an indication of the pump's flow rate in function of the Δt of the primary circuit if the installation has a mixing header.

The size of the pumps must be determined by installers or technical engineers according to boiler data and system design.

Table 3-2: MODULEX EXT Minimum/Maximum Flow Rates

Boiler Model	321	481	641	802	962	1123
Min. flow rate demanded in gal/min ΔT 27°F (15°C)	2.5	2.5	2.5	2.5	2.5	2.5
Min. flow rate demanded in gal/min ΔT 36°F (20°C)	1.9	1.9	1.9	1.9	1.9	1.9
Max flow rate demanded in gal/min ΔT 27°F (15°C)	24.5	36.8	49.2	61.7	74.2	86.8
Max flow rate demanded in gal/min ΔT 36°F (20°C)	18.4	27.6	36.9	46.3	55.6	65.1

The water side resistance curve of the boiler is shown in the diagram in Figure 3-18.

The pump is not an integral part of the boiler. It is recommended to choose a pump with the rate and delivery head at about 2/3 of its characteristic heating curve.

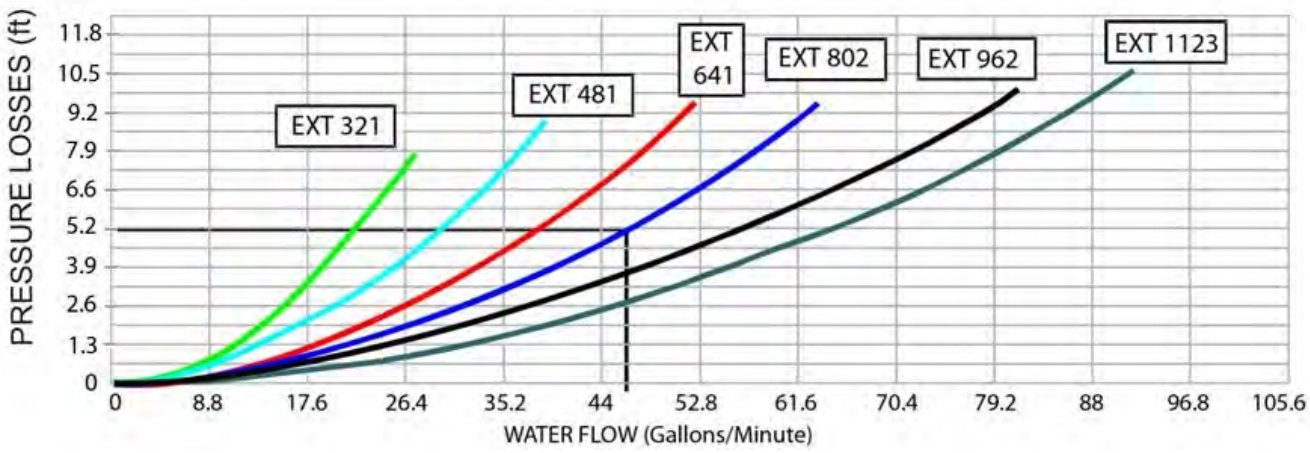


Figure 3-18: MODULEX EXT Water Side Pressure Losses

NOTE

The use of a mixing header fitted between the boiler circuit and the system circuit is always advisable. It becomes INDISPENSABLE if the system requires flow rates superior to the maximum permitted boiler flow rates, which is to say lower than 27° F (15 K).

3.14 Condensate Piping and Drain

To avoid condensate collecting inside the combustion exhaust system, the condenate piping must have an inclination toward the drain of at least 3/8 in./ft (30 mm/m).

The liquid column, inside the condensate siphon, (see Condensate Siphon Plug in Figure 3-19) needs to be filled with water after installation. The minimum height of the water in the column, when all the fans are in operation, must be at least 25 mm (1 in.).

In order to avoid ice formation while the boiler is operating, which can cause the boiler to stop functioning, the entire condensate evacuation system must be well insulated. Note that it is forbidden to evacuate the condensate through an open gutter to prevent the risk of ice forming and avoid exposure of the corrosive condensate to the external environment.

The condensate must be neutralized before being evacuated to the sewer, which can be achieved by mixing the condensate with lime or with drain water coming from washing machines, dish washing machines, etc., which normally has a base pH.

The connection to the sewer will be through a closed, but visible drain. Given the high acidity (pH 3 to 5) of the condensate, only plastic material may be used for the condensate evacuation pipes. Moreover it must be dimensioned and constructed so as to allow the correct out-flow to the drain, preventing any bottleneck and any leakage.

Consult local codes regarding condensate neutralization. Neutralization may be obtained by mixing it with the buildings drain water or with limestone, which normally has a base pH. AERCO offers a condensate neutralizing kit and a neutalizing tank for preparing condensate waste for safe evacuation into a sewer system.

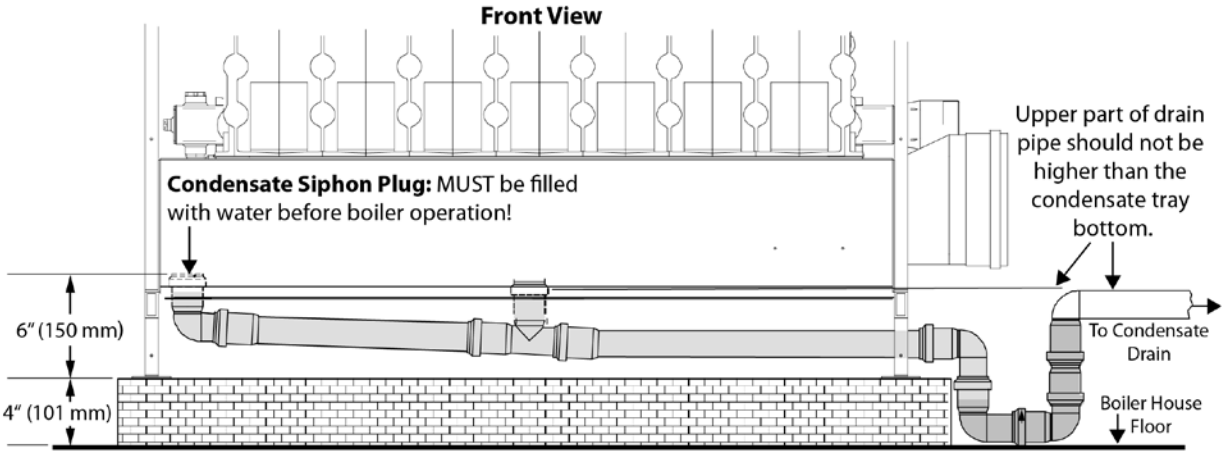


Figure 3-19: MODULEX EXT Condensate Piping

The outlet of the condensate drain pipe exits from the right side of the boiler, just below the RIGHT-SIDE flue outlet opening.

IMPORTANT NOTE

If it is not possible to use a 4'' (101mm) base or housekeeping pad on which to place the boiler, install the boiler on the floor and provide a well or trough (minimum of 4'' - 101 mm deep) in which to lodge the U of the condensate piping. See Figure 3-19.

WARNING!

Before commissioning the boiler, fill the condensate drain pipe with water, at the dedicated filling-up plug. See Figure 3-19.

WARNING!

Do not install the condensate drain where freezing may occur.

Use materials approved by the authority having jurisdiction in your area. In the absence of such authority, PVC and CPVC pipe must comply with **ASTM D1785**, **F441** or **D2665**. Cement and primer must comply with **ASTM D2564** or **F493**.

For Canada, use ULC certified PVC or CPVC pipe, fittings and cement.

Periodic cleaning of the condensate disposal system must be carried out.

3.15 Water Treatment

The chemical/physical composition of the heating system's water is fundamental for the boiler's correct operation and safety.

Among the problems caused by poor quality of feed water, the most frequent and the most serious is the buildup of deposits on boiler thermal exchange surfaces.

Less frequent, but also serious, are deposits on the water circulating piping surfaces. Because of the low thermal conductivity of mineralization desposits caused by improperly treated water, the thermal exchange efficiency may be seriously reduced, and can result in very dangerous localized overheating.

AERCO suggests treating and conditioning feed water for the heating circuit in the following cases:

- When the hardness of the water is higher than 9 grains (15°f).
- For cold/hot water installations with large water content.
- Renewal of the water system due to uncontrolled leakages.
- Subsequent refilling of the system due to maintenance work on the installation.
- Presence of different metals in the water circuit.

Properly treated system and feed water will eliminate or substantially reduce the following problems:

- lime scale deposit
- corrosion sludge
- deposits
- microbiological growths (molds, bacteria etc.)

An appropriate treatment of the supply water will prevent the above stated problems and will maintain the correct operation and efficiency of the boiler over time.

In order to properly treat water for use in a hydronic boiler heating system, the following physical/chemical characteristics must be addressed.

Water Hardness: If water hardness is over 6 to 9 grains, a water softener must be used.

Sediment: If sediment is present in the system, a sediment filter or other appropriate device, must be used.

Water pH: If water has a pH above 8, or below 5, then the water must be treated to provide a medium pH of between 5 and 8.

The system water to be judged for water characteristics should be taken from the return pipe of the primary circuit downstream of the circulating pump.

3.16 Important Installation Warnings

3.16.1 **Oxygen Levels in the System Water Warning**

All necessary precautions must be taken for preventing the formation and localization of oxygen in the system's water. For this reason, ensure that the plastic piping used in under-floor heating systems is impermeable to oxygen.

3.16.2 **Antifreeze Compatibility Warning**

If any anti-freeze solutions are used ensure that they are compatible with aluminum and any other boiler components and materials.

3.16.3 **Lime Scale and Corrosive Water Damage Warning**

Any damage caused to the boiler due to the formation of lime scale or by corrosive water will not be covered by the warranty. Appropriate steps must be taken to ensure the indirect tank water heater does not become plugged by scale caused by hard water or sediment. If the indirect tank water heater becomes plugged by either scaling from hard water or sediment it is not the responsibility of AERCO International.

3.16.4 **Connection to Refrigeration System Warning**

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 the boiler water during the cooling cycle.

3.17 Air Intake Connection

Install air intake as shown in Figure 3-20. For air intake connection piping use only:

- Ø 4'' PVC Pipes Schedule 40/80 for Modulex EXT 321, EXT 481, EXT 641
- Ø 6'' PVC Pipes Schedule 40/80 for Modulex EXT 802, EXT 962, EXT 1123

NOTE

Use silicone to lubricate the internal surface of the seals before assembling.

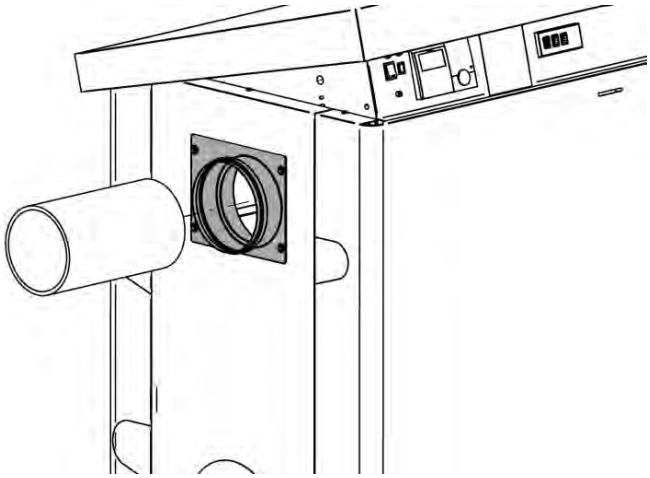


Figure 3-20: MODULEX EXT Air Intake Connection

3.18 Flue Manifold Connection

To assemble the flue manifold to the boiler flue exhaust opening, retrieve the six (6) nuts and washers from the plastic bag, shipped with the boiler, and affix to the boiler opening per Figure 3-21. The Manifold may be installed on the left, front, or rear. If switching to left or rear positions, the unused outlet should be covered with the plate and gasket removed from outlet being used.

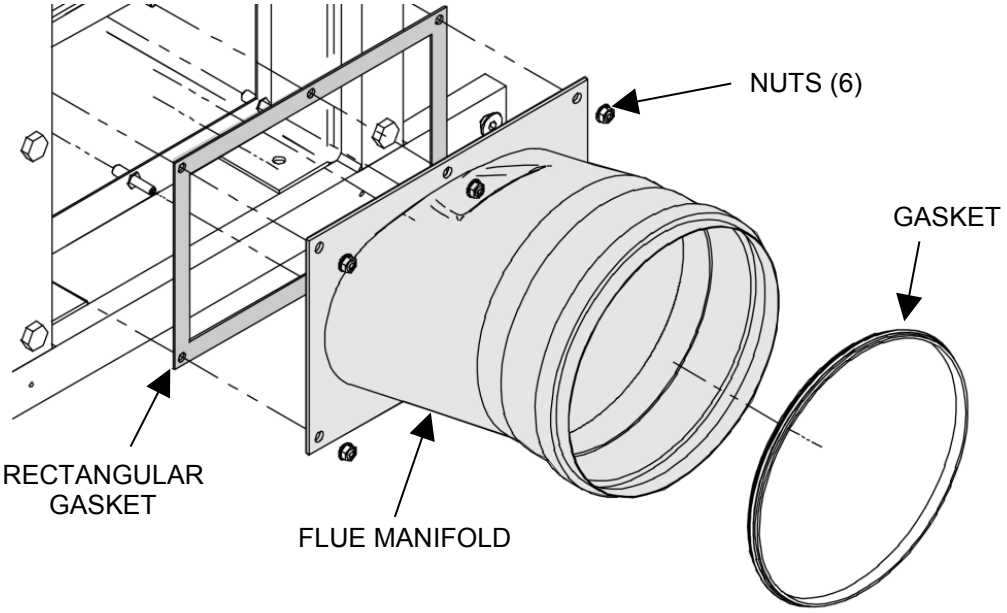


Figure 3-21: Connection of Flue Manifold To Boiler Exhaust Opening

For venting systems in the USA, it is necessary to assemble the Euro-to-USA adaptor to the flue manifold as shown in Figure 3-22.

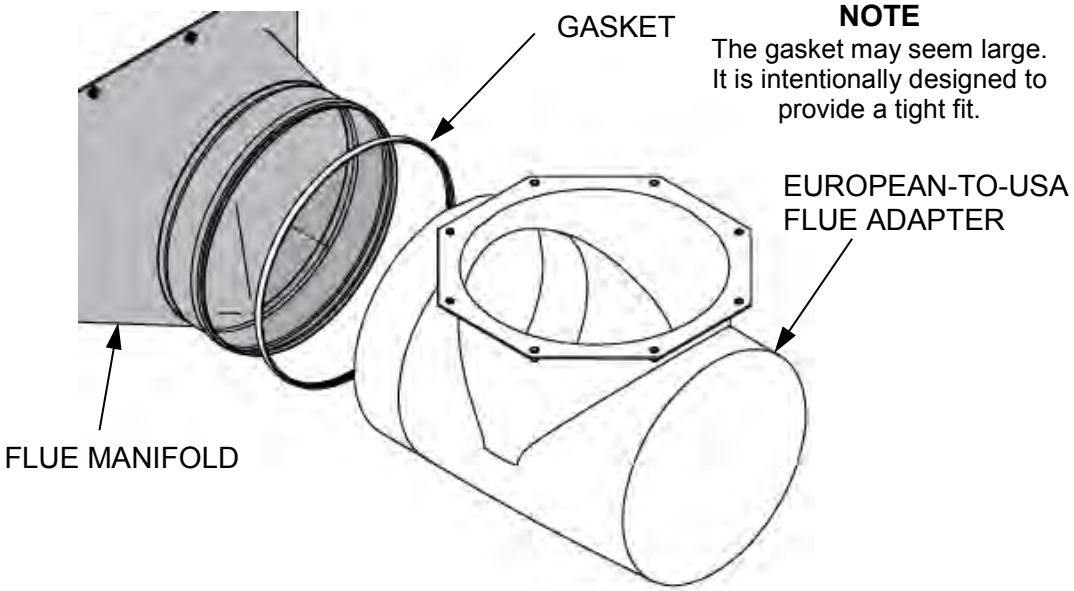


Figure 3-22: Assembly of USA-to-European Flue Adaptor to Flue Manifold

3.19 Flue Exhaust Piping to Vent

In a condensing boiler, the flue exhaust is evacuated at a very low temperature (maximum of about 183°F - 84°C). Thus, it is necessary that the chimney be impermeble to the condensate of the combustion products and is made of corrosion resistant materials.

The different joints must be well sealed and equipped with suitable gaskets in order to prevent the escape of condensate and prevent the ingress of air.

To determine the proper cross section and height dimensions of the flue exhaust piping, it is necessary to make reference to national and local rules.

In order to prevent the formation of ice during the operation, the temperature of the internal wall of the flue exhaust system should not be below 32 °F (0 °C) throughout its length.

For efficient venting of the combustion exhaust and to address condensation due to lower external temperatures, ensure that combustion condensation is discharged into the boiler condensate tray or into another separate collection pan according to the installation.

A test nipple, for measuring combustion gases, should be installed onto the first three feet of the exhaust manifold flue. To do this, a hole with a diameter of 0.83“is drilled in a convenient location for testing and the test nipple hardware assembled to the flue pipe as shown in Figure 3-23, below.

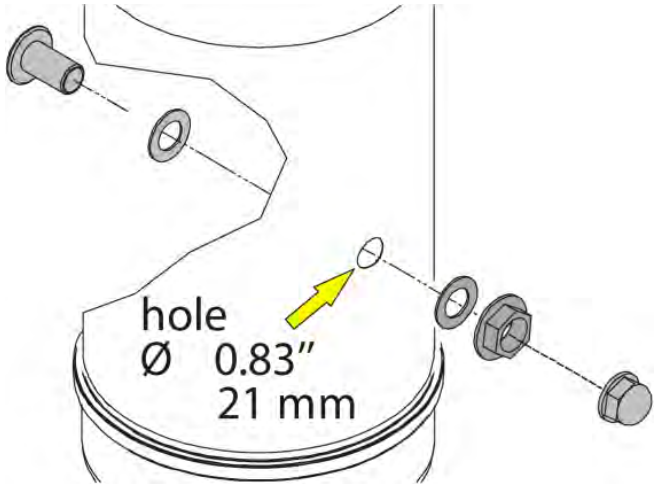


Figure 3-23: Installation of Test Nipple into Flue Manifold Piping

NOTE

Damage caused by mistakes in installation, failure to complete the instructions as written, or the improper use of the flue system are not the responsibility of the supplier.

3.20 Vent Starter Pieces

Table 3-3 lists the vent starter pieces. See Figure 3-25 for an illustration of a fully assembled kit.

PVC starter pieces are included with every unit. Stainless steel starter pieces may by purchased from AERCO or directly from the vent manufacturer.

Table 3-3: Starter Pieces

Boiler Models	Diameter	Material	Kit Part Number
EXT321, 481, 641	4" Diameter	Stainless Steel	Contact vent manufacturer directly
		Polypropylene	Contact vent manufacturer directly
		PVC	P/N 49051 (included)
EXT 802, 962, 1123	6" Diameter	Stainless Steel	Contact vent manufacturer directly
		Polypropylene	Contact vent manufacturer directly
		PVC	P/N 49050 (included)

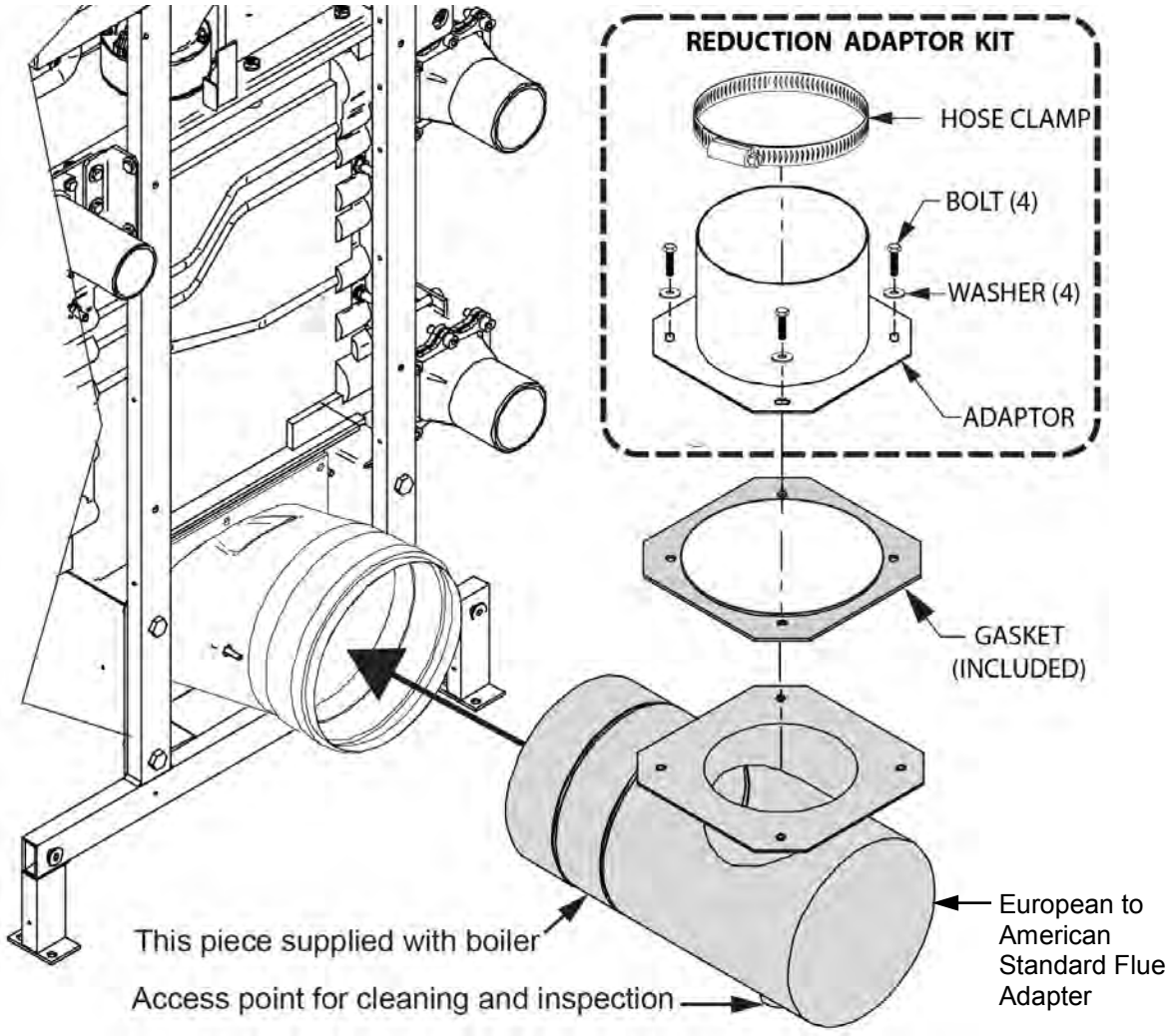


Figure 3-24: Flue Exhaust Diameter Reduction Adaptor Kit and Parts

The flue venting pipe is affixed to the adapter using RTV liquid silicone and then clamped with a worm-driven Hose Clamp.

When using non-metallic (plastic) venting materials, use Schedule 40 or thicker, Single-wall, uninsulated pipes. When using non-metallic (plastic) vent systems for Canadian installations,

per CSA B149.1, use vent systems that are certified to the standard for Type BH Gas Venting Systems, ULC-S636.

The plastic components, primers and glues of the certified vent system must be from a single system manufacturer and not mixed with other manufacturer's vent system parts.

The Inspection Port should be plugged with an appropriate plug (not included).

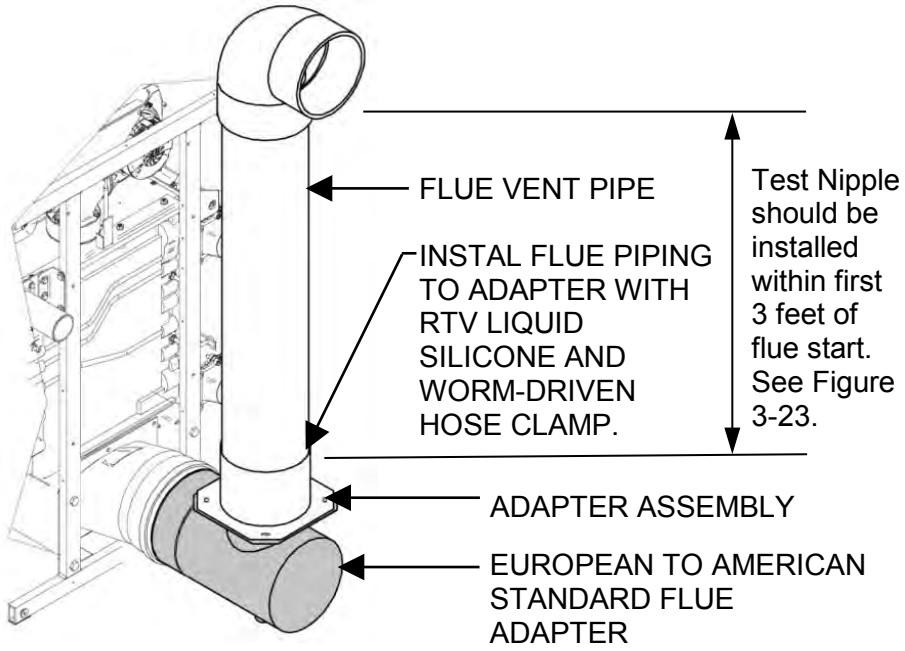


Figure 3-25: Installed Flue Exhaust Diameter Reduction Adaptor Kit

3.21 Combustion Air and Ventilation Openings

Provisions for combustion and ventiiation air must be made in accordance with **section 5.3**, Air for **Combustion and Ventilation, of the National Flue Gas Code**, **ANSI Z223.1/NFPA 54.**, or **Sections 7.2, 7.3** or **7.4** of **CAN/CSA-B149.1-05**, installation codes, or appilcable provisions of the local building codes.

3.21.1 **Insufficient Ventilations and Combustion Air**

BOILER DAMAGE AND OPERATIONAL FAILURES may occur due to insufficient or improper openings for combustion air and/or ventilation of the boiler room.

Provisions for combustion air and ventilation are always required, regardless of whether the combustion air is taken from the outside (sealed combustion) or inside (room air used as combustion air).

Insufficient ventilation of the boiler room can lead to high air temperatures. This can result in boiler damage. Note the following:

- Make sure that intake and exhaust openings are sufficiently sized and no reduction or closure of any openings takes place.
- When a combustion air or ventilation problem is not resolved, do not operate the boiler.
- Please note these restrictions and its dangers to the operator of the boiler.

When one expects contaminated combustion air (near swimming pools, chemical cleaning operations, hair salons, etc.), sealed combustion operation is recommended.

WARNING!

Fire danger due to flammable materials or liquids. Do not store flammable materials and liquids in the immediate vicinity of the boiler.

See Section 3.6.2 for warnings and guidelines concerning materials and contaniments that should be avoided in the boiler room and near air inlets when operating the boiler.

3.21.2 Room Air Combustion

The boiler closet or room shall be provided with two permanent openings communicating directly with an additional room(s). The total input of all gas utilization equipment installed in the combined space shall be considered in making this determination. Each opening shall have a minimum free area of 1 square inch per 1,000 Btu per hour of total input rating of all gas utilization equipment in the confined space, but no less than 100 square inches. One opening shall commence within 12 inches (305 mm) of the top, and one opening shall commence within 12 inches (305 mm) of the bottom of the enclosure. The minimum dimension of air openings shall not be less than 4 inches (101.6 mm).

3.21.3 Sealed Combustion

The boiler closet or room shall be provided with two permanent openings, one commencing within 12 inches (305 mm) from the top of the enclosure, and one commencing within 12 inches (305 mm) from the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors. The minimum dimension of air openings shall be no less than 4 inches (101.6 mm).

1. Where directly communicating with the outdoors, each opening shall have a minimum free area of 1 square inch per 4,000 Btu/hr of total input rating of all equipment in the enclosure.

2. Where communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4,000 Btu/hr of total input rating of all equipment in the enclosure.

3. Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 square inch per 2,000 Btu/hr of total input rating of all equipment in the enclosure.

4. Where ducts are used, they shall be of the same cross-sectional area as the free area of the opening to which they connect.

3.22 Installation of the Exhaust and Air Intake System

NOTE

Consult local and state codes pertaining to special building code and fire department requirements. Adhere to national code requirements.

NOTE

Observe the listed maximum lengths of vent system, which are dependent on boiler model. The maximum permissible lengths are listed in section 3.23, below.

Minimum clearance of 4 ft. (1.22m) horizontally from, and in no case above or below, unless a 4 ft (1.22 m) horizontal distance is maintained, from electric meters, gas meters, regulators and relief equipment.

The minimum distance from adjacent public walkways, adjacent buildings, openable windows and building openings shall not be less than those values specified in the National Fuel Gas Code, ANI Z223.1 / NFPA 54 and/or the Natural Gas and Propabne Installation Code CAN/CSA B149.1.

Do not extend exposed vent pipe outside the building beyond recommended distance. Condensate could freeze and block vent pipe.

Vent should terminate at least 3 ft (915 mm) away from adjacent walls, inside corners and 5 ft. (1525 mm) below roof overhang (see Figure 3-26).

It is not recommended to terminate vent above any door or window, as condensate can freeze causing ice formations.

Do not use a chimney as a raceway if another boiler or fireplace is vented into or through the chimney.

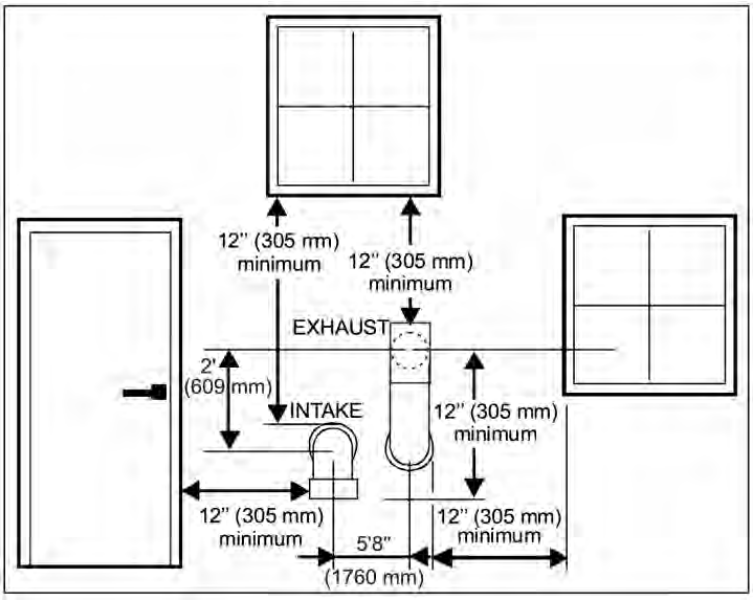


Figure 3-26: Minimum Distances of Exhaust Opening and Building Features

3.22.1 **Important Factors for Terminal Orientation and Location**

Terminals should be positioned so as to avoid products of combustion from entering openings into the buildings or other vents.

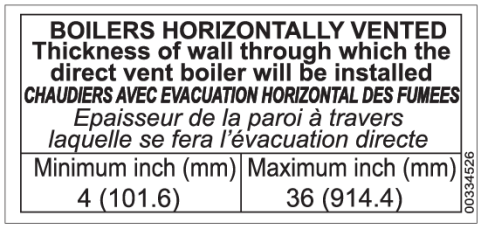
The terminal should be located where dispersal of combustion products is not impeded and with due regard for the damage or discoloration that might occur to building surfaces in the vicinity. In certain weather conditions condensation may also accumulate on the outside of the air inlet pipe. Such conditions must be considered and where necessary insulation of the inlet pipe may be required. In cold and/or humid weather water vapor may condense when leaving the vent terminal. The effect of such condensation must be considered. The terminal must be located in a place not likely to cause a nuisance.

Maintain 12" of clearance above the highest anticipated snow level or grade or whichever is greater. Please refer to your local codes for the snow level in your area.

The whole route of the vent system must be installed upwards and never completely nor partly downwards.

3.22.2 **Minimum and Maximum Wall Thickness**

The label at right, which is placed on the unit, indicates the minimum and maximum wall thickness through which venting is allowed to penetrate *horizontally*. However, if venting is *vertical*, then there is no minimum wall thickness.



3.23 Vent Pipe Sizing

The maximum length is the combined length of straight horizontal and vertical runs, and the equivalent straight length of fittings. The required lengths for each boiler are as follows:

NOTE

The examples referenced in the table below are on the next page.

Table 3-4: Modulex EXT Vent and Piping Diameter Chart

Model	No. of Modules	Vent Diameter Inches (mm)	Max. Vent Equiv. Feet (M) Examples 1 & 2	Max. Vent Equiv. Feet (M) Examples 3 & 4
EXT 321	2	4" (101 mm)	100 ft. (30 m)	6 + 6 (1.8 + 1.8)
EXT 481	3	4" (101 mm)	100 ft. (30 m)	6 + 6 (1.8 + 1.8)
EXT 641	4	4" (101 mm)	100 ft. (30 m)	6 + 6 (1.8 + 1.8)
EXT 802	5	6" (152 mm)	100 ft. (30 m)	6 + 6 (1.8 + 1.8)
EXT 962	6	6" (152 mm)	100 ft. (30 m)	6 + 6 (1.8 + 1.8)
EXT 1123	7	6" (152 mm)	100 ft. (30 m)	6 + 6 (1.8 + 1.8)

Table 3-5: Modulex EXT Vent and Piping Length Chart

Model	Vent Pipe Diameter	Sharp 90° Elbow Equivalent Feet (m)	Sweep 90° Elbow Equivalent Feet (m)	45° Elbow Equivalent Feet (m)	Maximum Length Equivalent Feet (Meters)
EXT 321	4" (101 mm)	10 Feet (3 m)	5 Feet (1.5 m)	5 Feet (1.5 m)	100 Feet (30 m)
EXT 481					
EXT 641					
EXT 802	6" (152 mm)	10 Feet (3 m)	5 Feet (1.5 m)	5 Feet (1.5 m)	100 Feet (30 m)
EXT 962					
EXT 1123					

NOTE: The maximum pressure drop of the combustion air piping is also 100 equivalent feet (30 m).

NOTE

The flue system must be installed in accordance with the local and national Standards.

Example 1:
A 40 foot (12.2 m) length of vent pipe and 1 sharp 90° elbow add up to 40 ft. + 10 ft. = 50 equivalent ft. (17.4 m).

Example 2:
A 30 foot (10.4 m) length of vent pipe and 2 sharp 90° elbows add up to 30 ft. + (2 x 10 ft.) = 50 equivalent ft. (17.4 m).

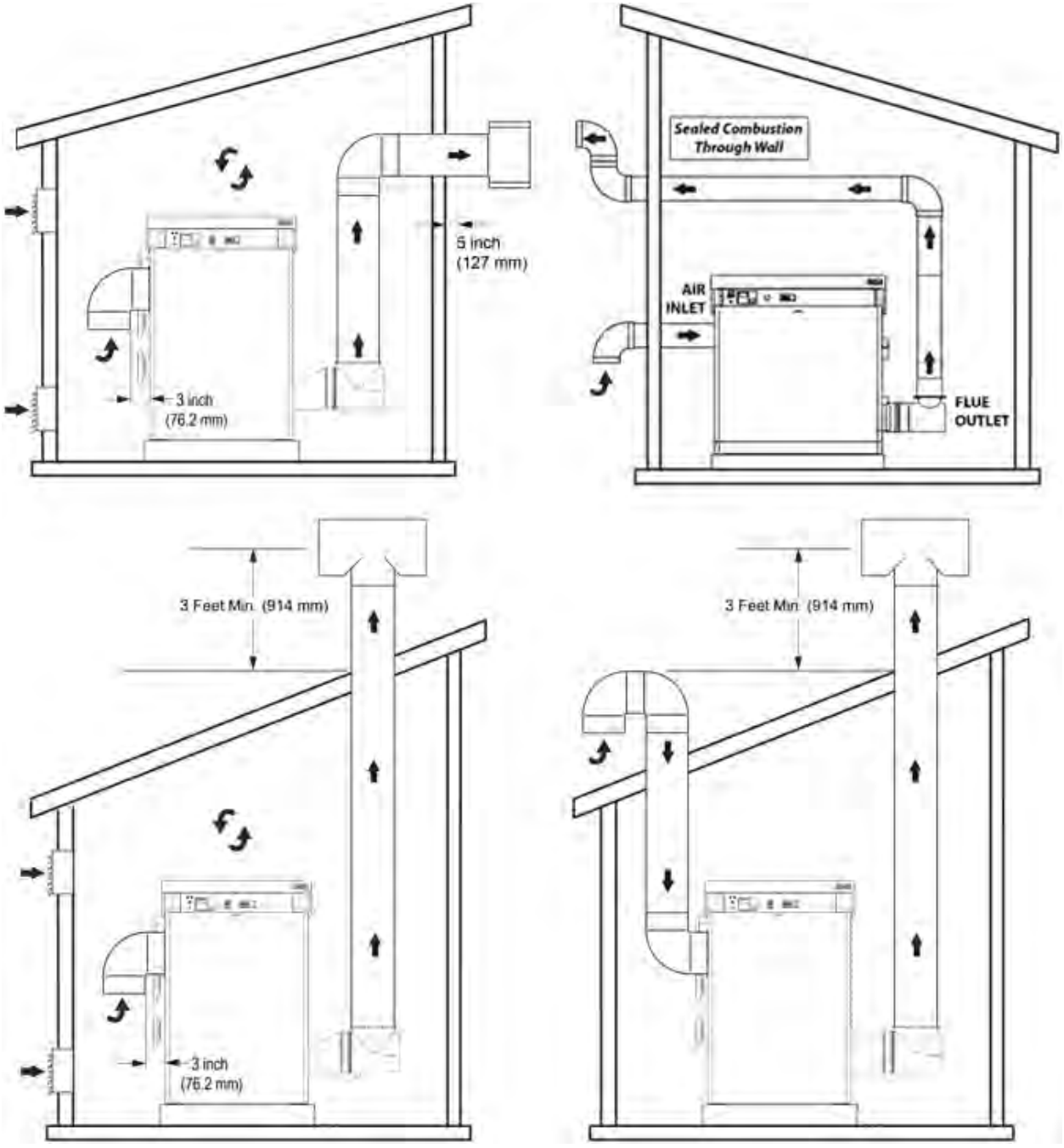


Figure 3-27: Modulex EXT Allowable Venting Solutions

3.24 Electrical Connections

3.24.1 Regulations in Force

The electrical connections to the boiler must be made in accordance with all applicable local codes and the latest revision of the National Electrical Code, **ANSI/NFPA-70**.

Installations should also conform with **CSA C22.1** Canadian Electrical Code Part 1, if installed in Canada.

WARNING!

The boiler must be electrically grounded in accordance with local codes, or in absence of local codes, with the National Electrical Code, **ANSI/INFPA 70** and/or the **CSA C22.1**, Electrical Code.

The gas, D.H.W. (Domestic Hot Water), and C/H system pipes must NEVER be used for electrical grounding.

Ensure that the above safety electrical requirements are instituted. If in doubt, ask a professionally qualified technician to check the appliance's electrical system.

AERCO does not accept responsibility for any damages arising from failure to correctly electrically ground the boiler.

It is necessary that a qualified technician verify that the electrical system is adequate to satisfy the appliance's maximum power requirements, indicated on the data plate, verifying in particular that the cables are suitable for the appliance's maximum power use.

CAUTION!

For the appliance's general electrical supply, the use of adaptors, multiple sockets, and/or extension cords is strictly forbidden.

The use of any power supply equipment implies the observance of several fundamental rules, such as:

- Do not touch the appliance with any wet part of your body and/or while barefooted.
- Do not pull the supply cables.
- Do not expose the boiler to sunlight, rain, etc., unless it is explicitly prepared and installed for such use.
- Do not permit children or inexpert people to use the appliance.

3.24.2 Mains Electrical Supply Connection (120 V – 60 Hz)

Mains electrical requirements call for a 120V, 60 Hz power source. The electric power connections to the junction box of the boiler are shown in Figure 3-29.

The power supply to the boiler, 120 VAC - 60 Hz single phase, must be made in the JUNCTION BOX of the boiler, with three core cable H05VV-F (PHASE - NEUTRAL - EARTH) according to the polarity of the phase and neutral power supply, with phase and neutral terminals indicated on the plug.

It is necessary to fit a double pole switch on the electrical supply line, having a contact separation in both poles, in an easily accessible position in order to provide a means to remove power from the unit during servicing.

WARNING!

Danger of fatal accident due to electric shock! 120 VAC connections may be present on the external connection board when power is supplied to the boiler.

The electrical connections must be carried out only by a qualified engineer. Before carrying out the connections or any other operation on the electrical parts, always switch off and disconnect the electricity supply and ensure for yourself that it cannot be accidentally turned on.

3.24.3 Service Relay Requirement

Upstream of the electrical connection, a service relay is required (not supplied) which, when the additional electrical safety devices intervene, shuts down the electrical supply to the on-off fuel valve fitted on the gas supply circuit, but not to the boiler so as to guarantee the running of the pump and permit the boiler to cool down.

3.24.4 Electrical Requirements

- No changes may be made to the wiring of the boiler.
- All connections should be designed in accordance with the applicable regulations.
- Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.
- Verify proper operation after operation servicing.

NOTE

Verify proper operation of the boiler after all servicing operations.

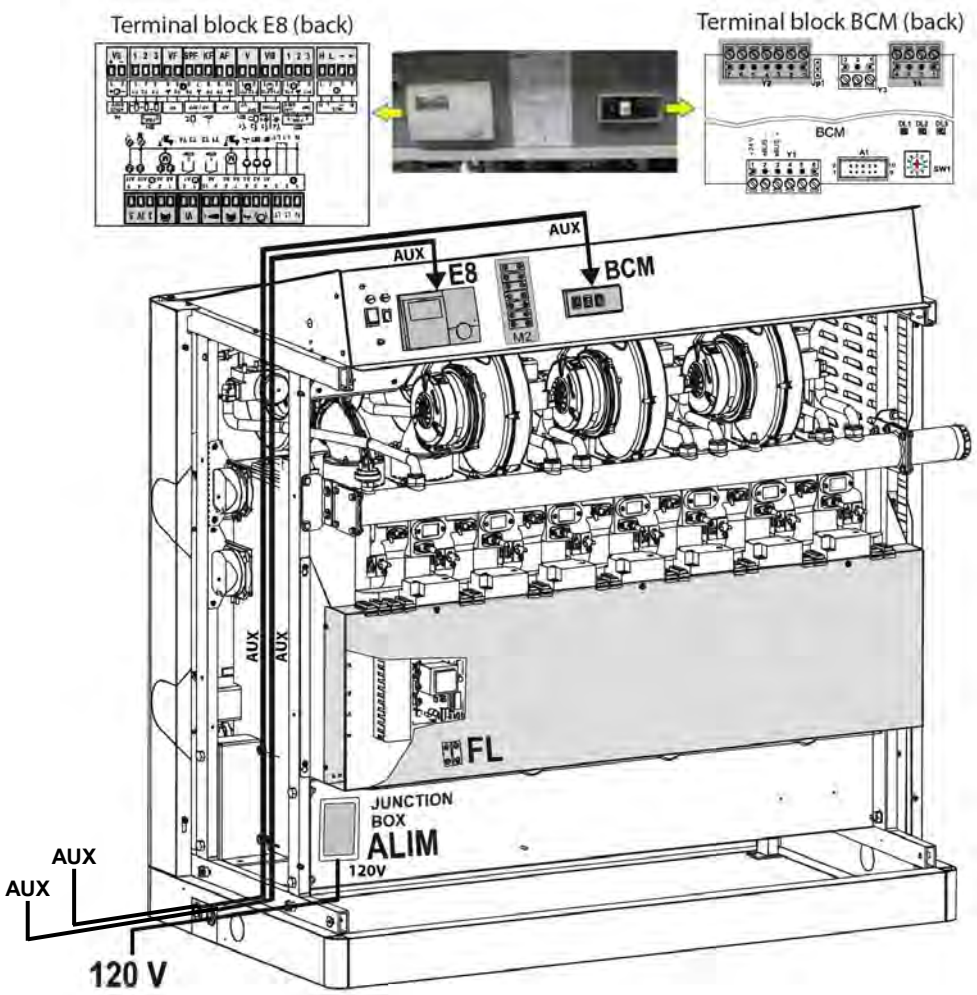


Figure 3-28: 120VAC Power Wiring for Main Electrical Junction Box and Signal Wiring for E8 Controller and Boiler Control Module (BCM)

WARNING!

120 VAC cables shall be separated from 24VAC and signal wires, using the two plastic conduits supplied within the boiler casing LEFT-HAND side panel.

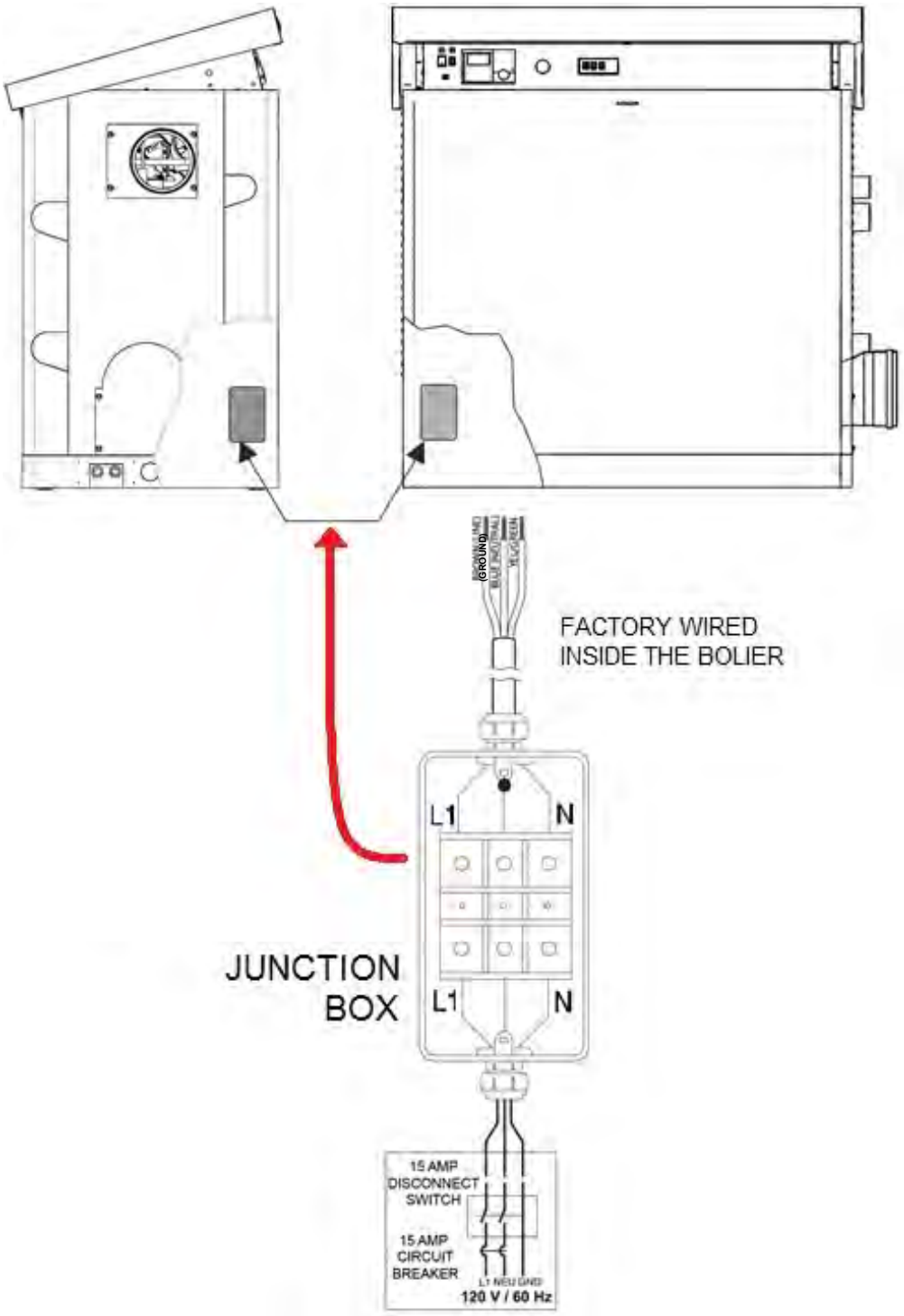
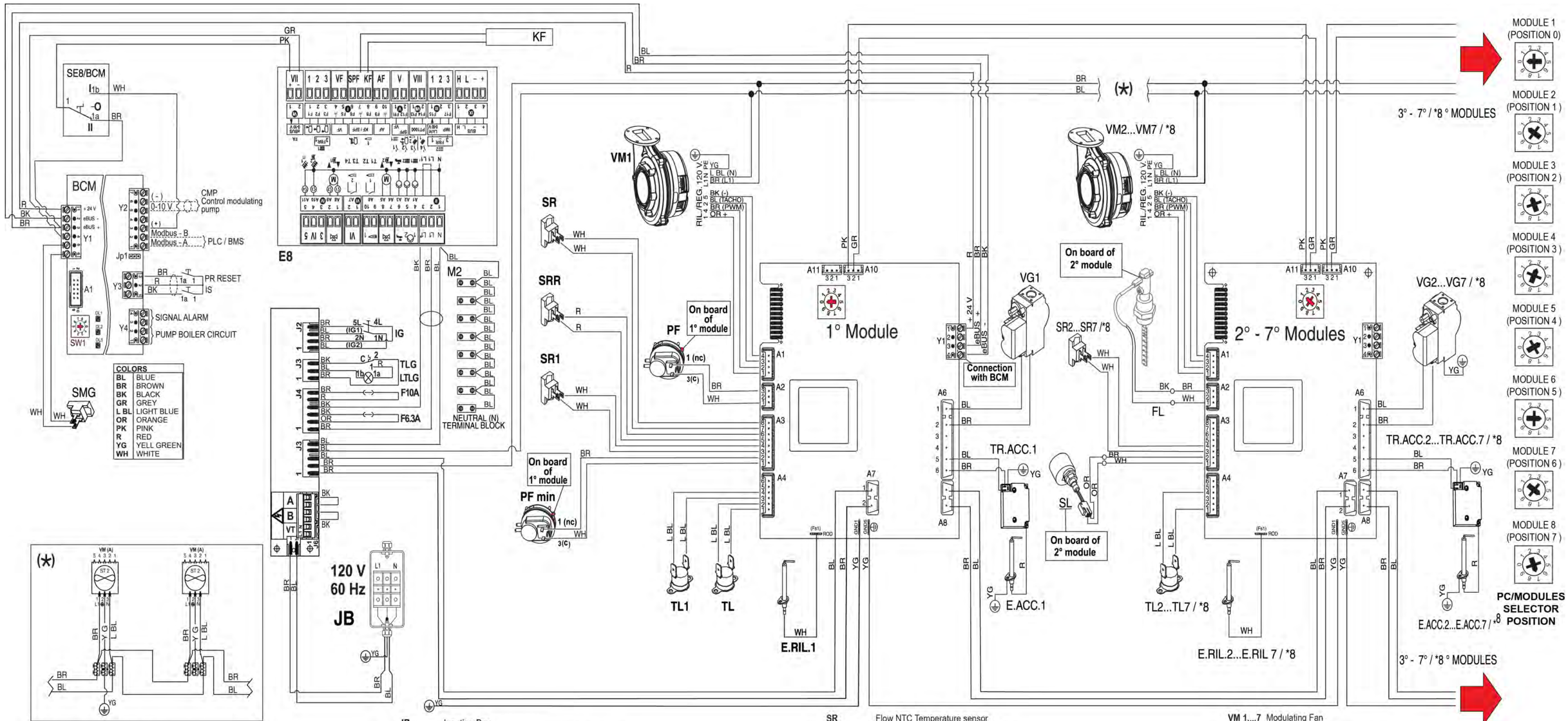


Figure 3-29: Main Power Junction Box Location and 120VAC Wiring

3.25 Functional Wiring Diagram



E.ACC 1....7/8* Ignition electrode
E.RIL 1....7/8* Ionization electrode
FL Flow switch
IG Main switch
IS Request for emergency manual

JB Junction Box
LTLG Warning lamp for the General Limit Thermostat
PF Fan pressure switch
PF Fan minimum pressure switch
SL Condensate level sensor
SMG Global Flow NTC Temperature sensor

SR Flow NTC Temperature sensor
SR 1....7/8* Local Flow NTC Temperature sensor
SRR Global Return NTC Temperature sensor
TL High limit thermostat
TL 1....7/8* Local High limit thermostat
TLG Global High limit thermostat
VG 1....7/8* Gas Valve
TRA.ACC 1....7/8* Ignition Transformer

VM 1....7 Modulating Fan
DI1 Yellow LED = Blinking (communication between BMM and BCM) OK
DI2 Green LED = ON (Active Pump / Pompe active)
DI3 Red LED = ON (Failure code detected)
SW Address selector
***8** Only for Modulex 900

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3.26 Ladder Diagrams

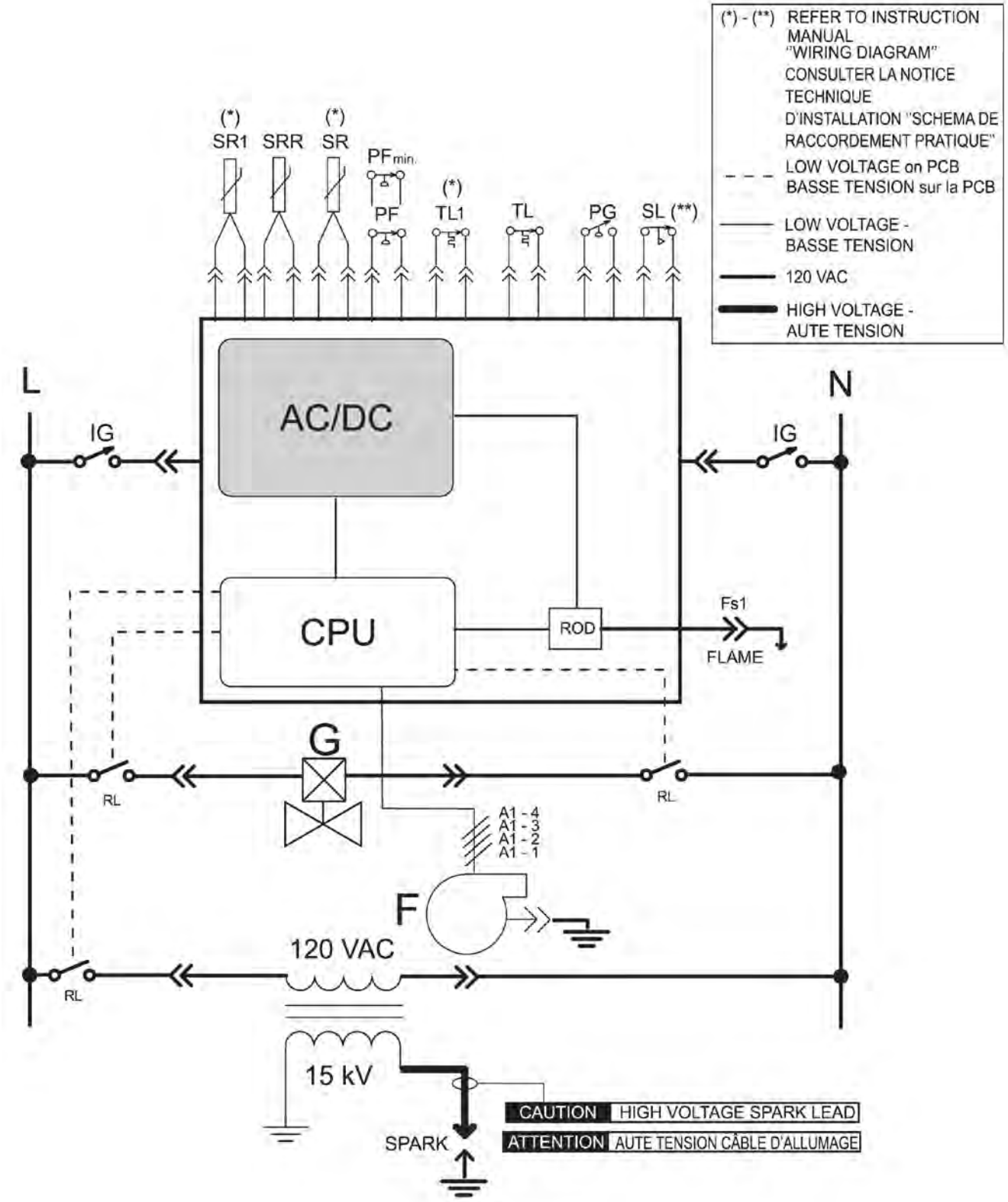


Figure 3-30: Module Ladder Diagram

3.27 General Ladder Diagram

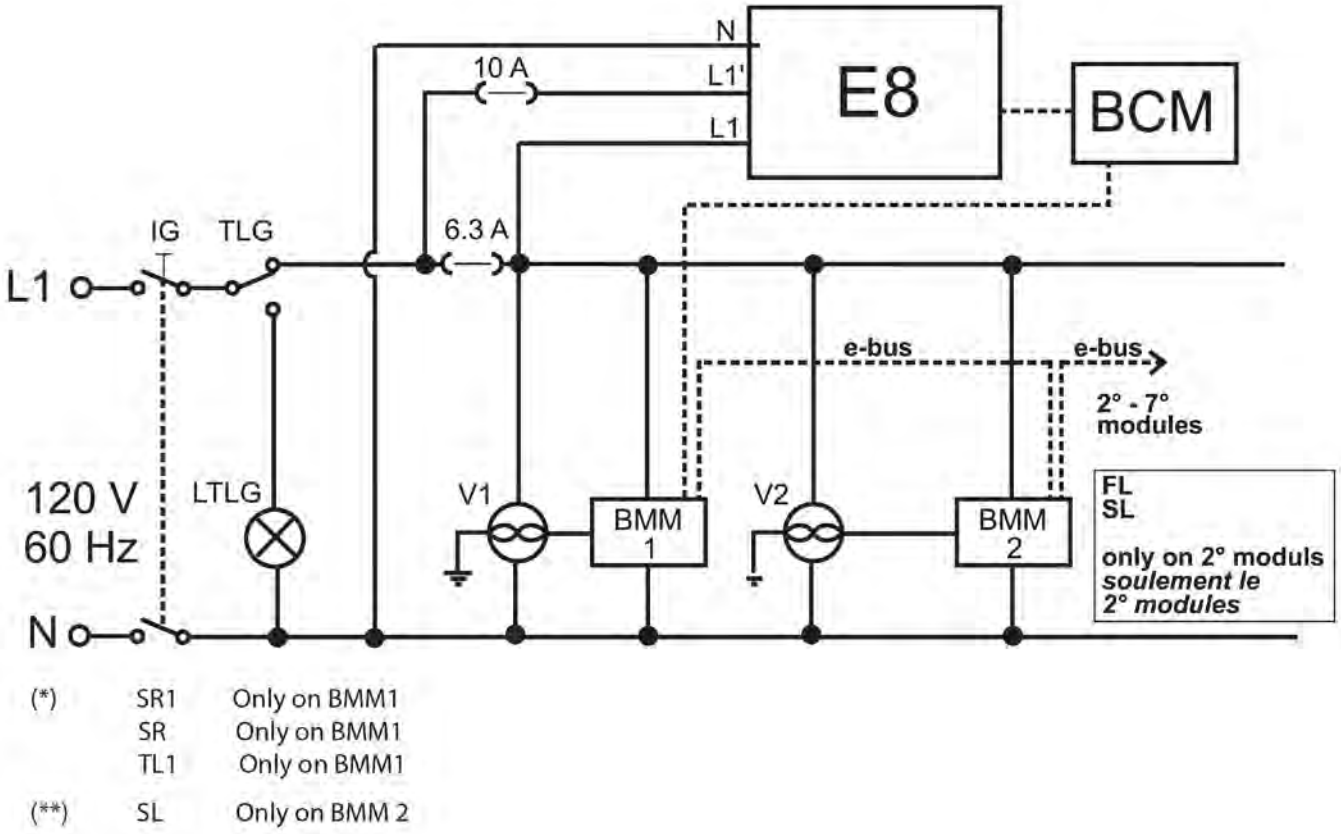


Figure 3-31: General Ladder Diagram

3.28 E8 Controller and BCM Terminal Assignments

On the rear panel of the E8 controller, there are two terminal blocks, one of which is for the mains (120 V) connections, and the other for the low voltage connections.

The main controls, necessary for the C/H system management and for the boiler control, as well some components which are part of the boiler housing, must be connected to the terminal blocks. See Figure 3-32 for a wiring diagram showing the E8 controller terminal wiring, and see Figure 3-33 for a wiring diagram of sensor and BCM terminal wiring.

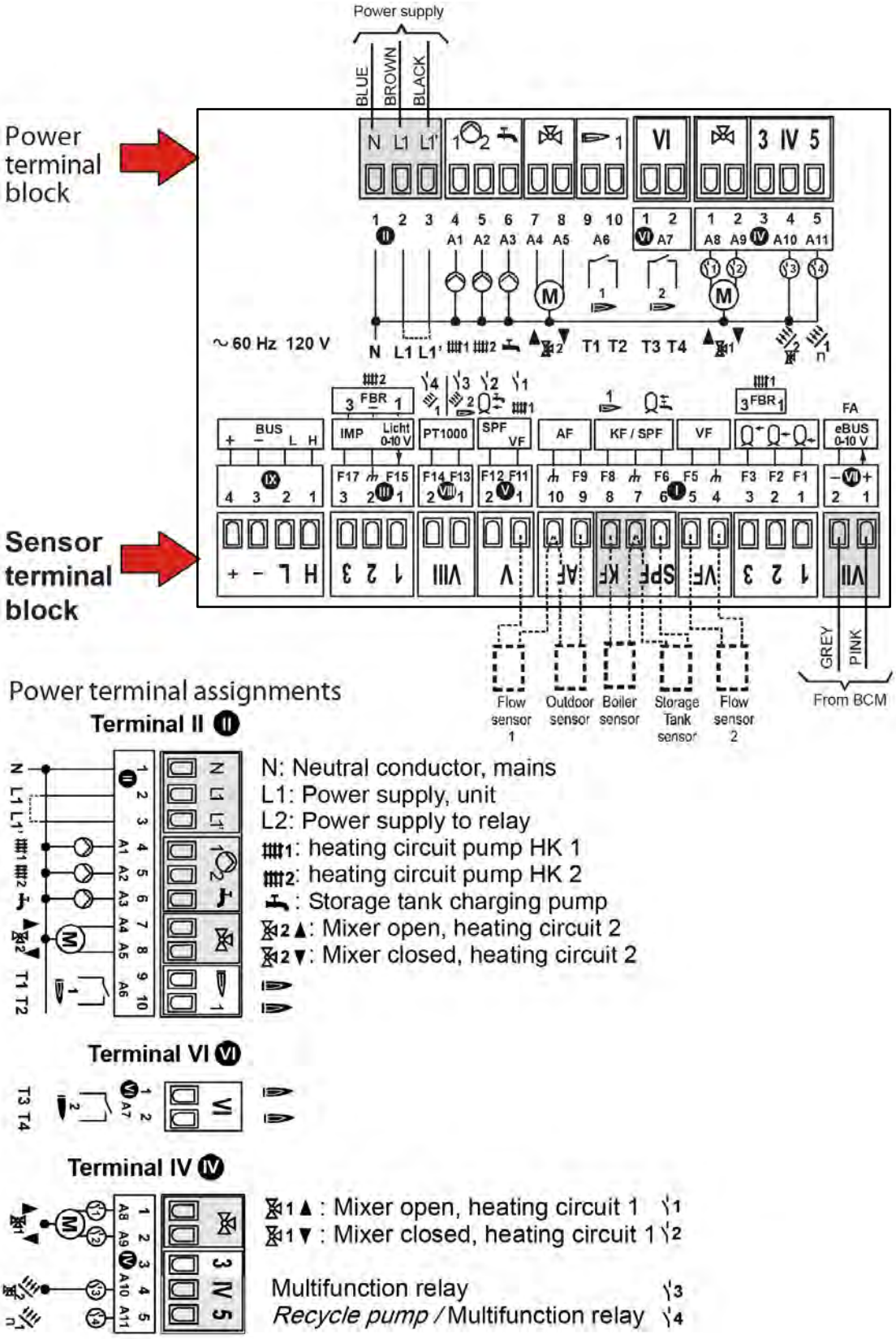


Figure 3-32: E8 Controller Terminal Assignments

Terminal VII (VII) **Connection to BCM**

Pin 1: eBUS (FA) or 0-10V output
Pin 2: (Ground)

Terminal I (I)

Buffer storage tank low sensor
Buf. stor. tank middle sensor / FBR heat. circ. 1 (room sensor)
Buf. stor. tank top sensor / FBR heat. circ. 1 (set value)

VF Pin 4: Flow sensor, heating circuit 2 (ground)
VF Pin 5: Flow sensor, heating circuit 2
SPF Pin 6: Storage tank sensor
SPF Pin 7: Storage tank and boiler sensor (ground)
KF Pin 8: Boiler sensor
AF Pin 9: Outdoor sensor
AF Pin 10: Outdoor sensor (ground)

Terminal V (V)

VF Pin 1: Flow sensor heating circuit 1 / sensor multifunction 1
SPF Pin 2: Service water low sensor / sensor multifunction 2

Terminal VIII (VIII)

F13 Pin 1: Sensor HS2 / Solar 2 / Multifunction relay 3
F14 Pin 2: Sensor Solar 1 / Sensor multifunction relay 4

Terminal III (III)

F15 Pin 1: FBR heating circuit 2 (room sensor) / 0-10V IN / Light
Pin 2: FBR heating circuit 2 (ground)
F17 Pin 3: FBR heating circuit 2 (set value) / Pulse counter for

Morsetto IX (IX) **For connection to remote control devices**

H CAN Bus Pin 1 = H (Data)
L CAN Bus Pin 2 = L (Data)
- CAN Bus Pin 3 = - (ground, Gnd)
+ CAN Bus Pin 4 = + (12V supply)

Terminal assignments BCM

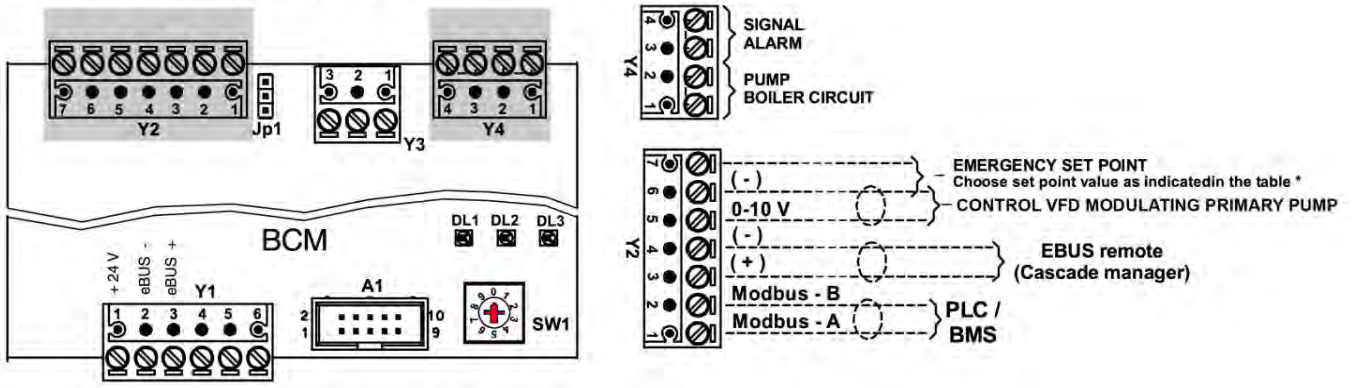
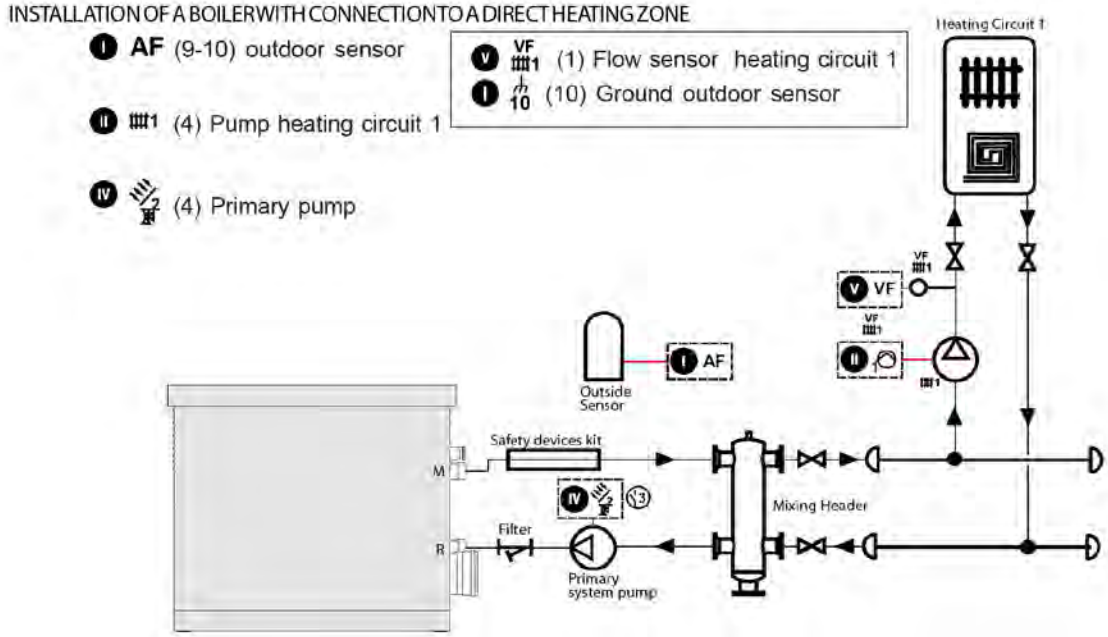


Figure 3-33: Sensor and BCM Terminal Assignments

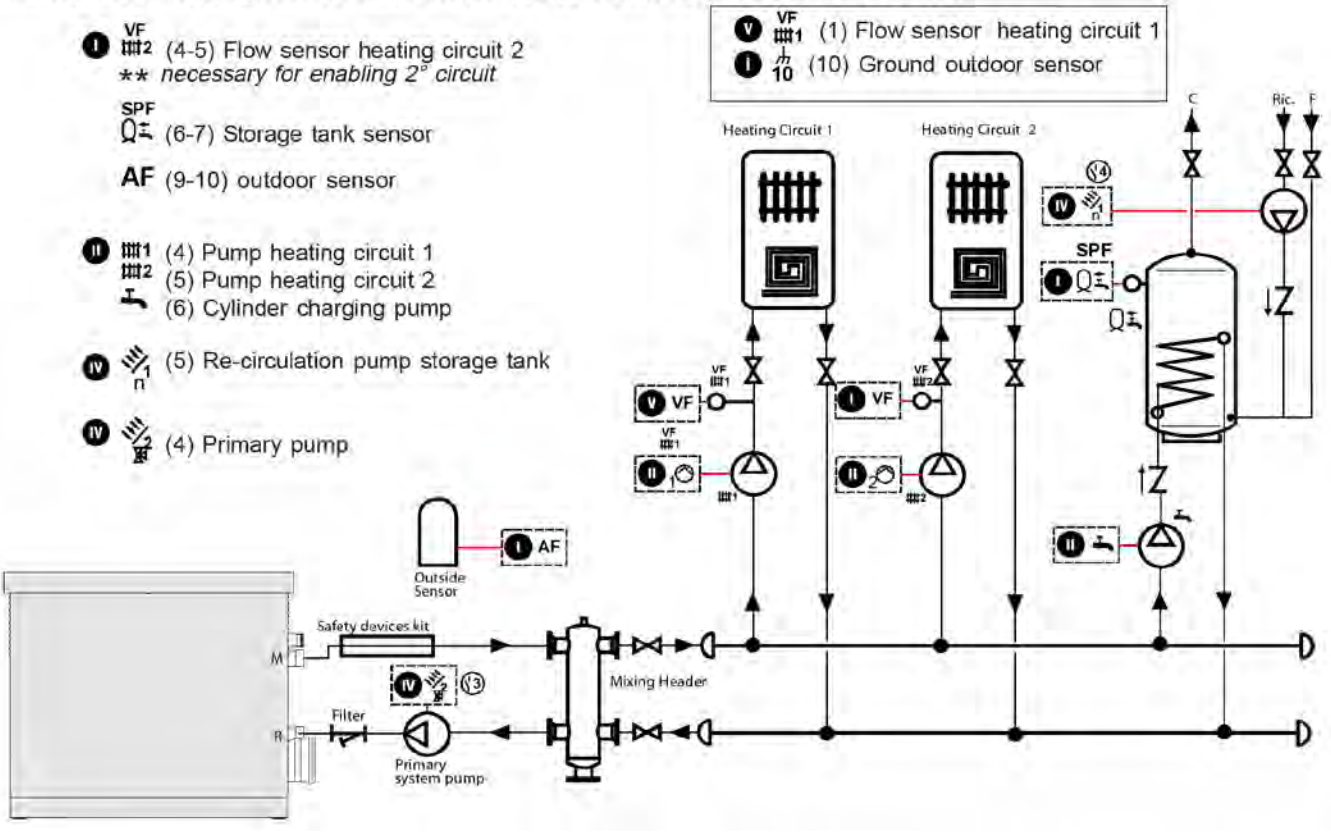
3.29 Installation Examples

(Functional Wiring and Connections Description)

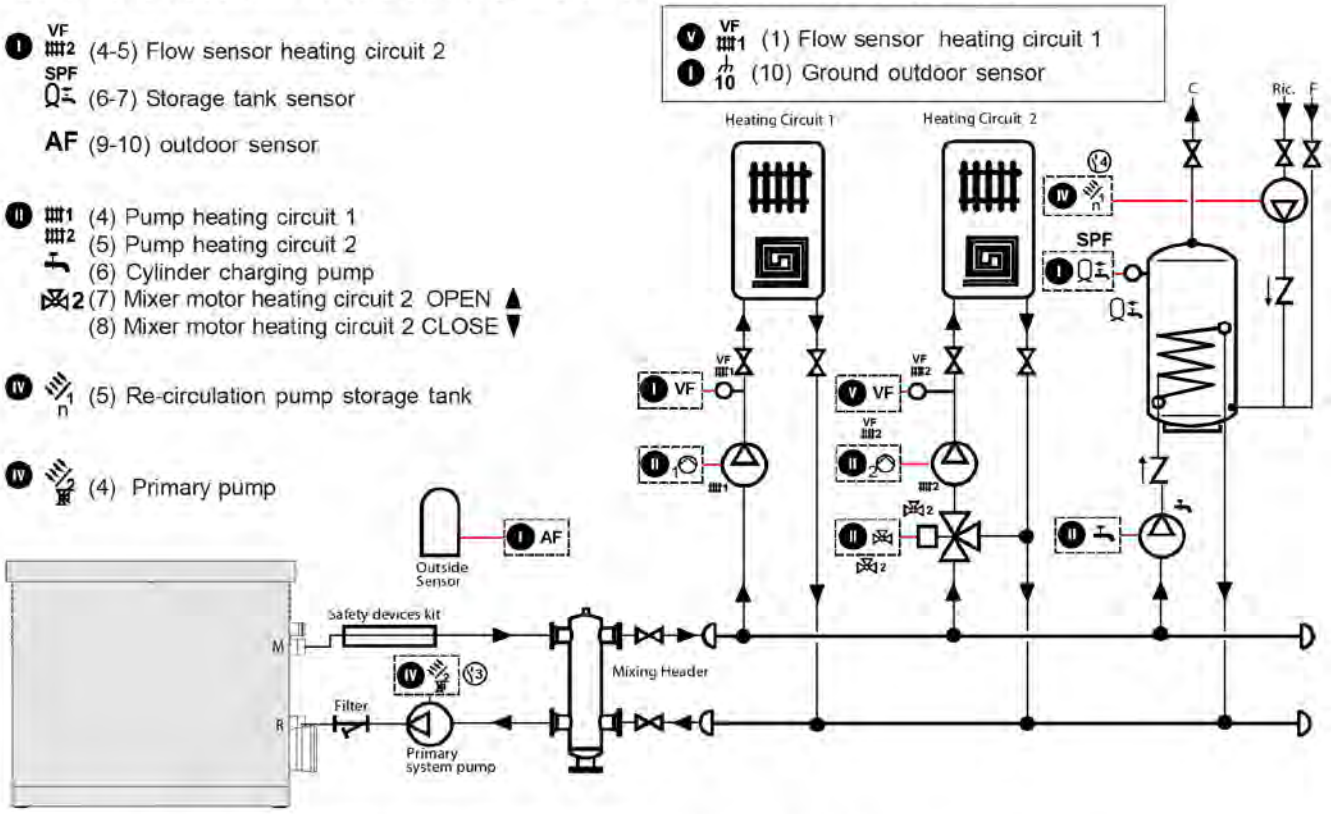
INSTALLATION OF A BOILER WITH CONNECTION TO A DIRECT HEATING ZONE



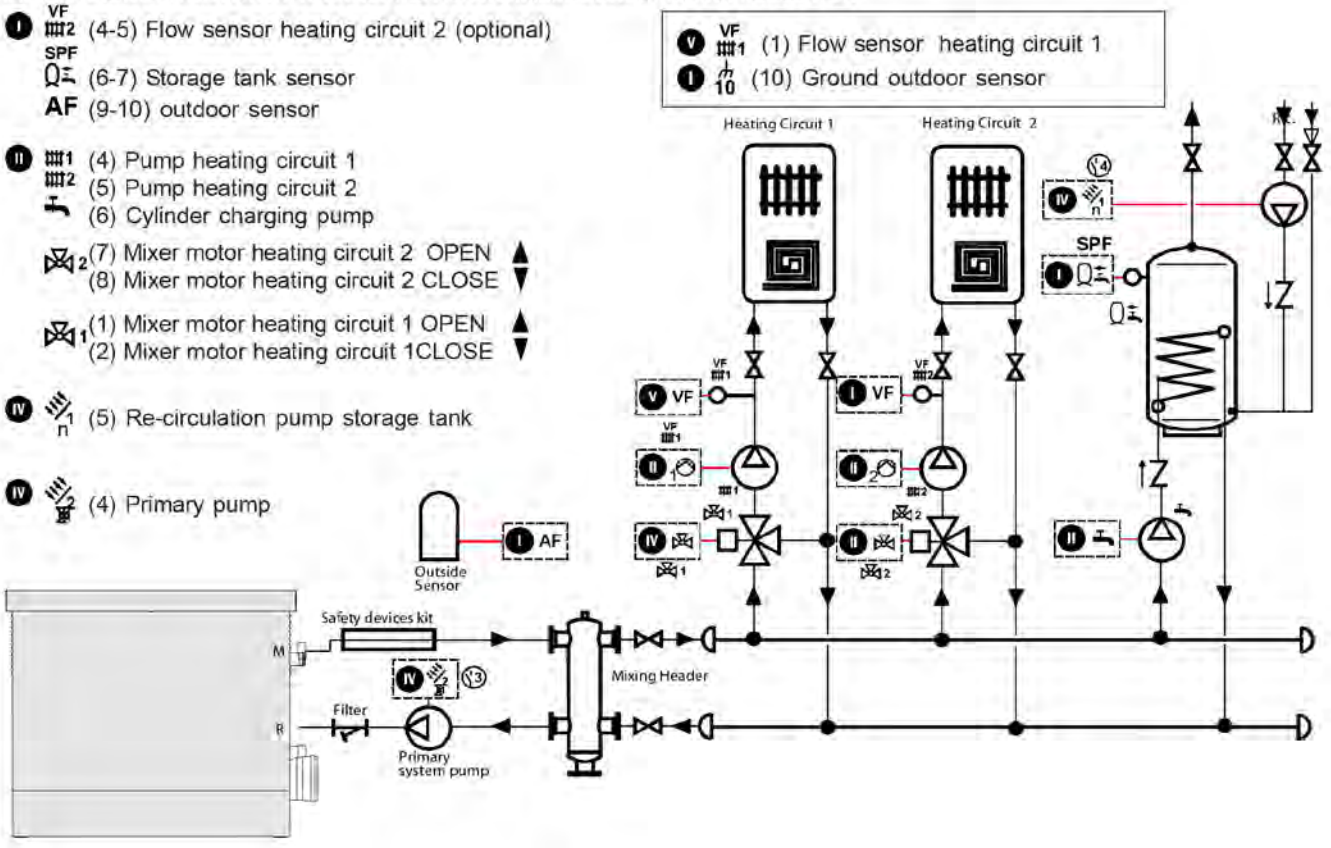
INSTALLATION OF A BOILER WITH CONNECTION TO TWO DIRECT HEATING ZONES + D.H.W. PRODUCTION



INSTALLATION OF A BOILER WITH CONNECTION TO ONE MIXED AND ONE DIRECT HEATING ZONES + D.H.W. PROD.



INSTALLATION OF A BOILER WITH CONNECTION TO TWO MIXED ZONES + D.H.W. PRODUCTION



3.30 Starting Up: Filling and Deaerating the Boiler

Carry out the following tasks in connection with maintenance, etc. to an already installed unit:

- Shut down all programs
- Close the gas shutoff valve upstream from the boiler
- Shut off the power at the main power switch
- Close the C/H service valves (supply and return)

3.30.1 Necessary Precautions for Safety

Observe the following rules of safety:

- All work on the unit must take place in a dry environment.
- AERCO units should never be in operation without their cover panels, except in connection with maintenance or adjustments.
- Never allow electrical or electronic components to come into contact with water.

3.30.2 Supply Voltage, Gas Pressure, and Water pressure

The unit must be able to function during maintenance procedures or when adjustments are performed. For this reason, the unit's supply voltage, gas pressure and water pressure must be maintained and available during these activities.

WARNING!

Following maintenance or other activities, always check the integrity of all parts through which gas flows with a bubble test using soap spray to ensure there are no gas leaks.

3.31 Filling the System

3.31.1 Necessary Precautions While Filling the System

Do not mix the C/H system's water with anti-freeze or anti-corrosion solutions using incorrect concentrations! Doing so can cause damage to the gaskets and might cause noise during normal boiler operation.

WARNING!

AERCO refuses all liability for injury to persons, animals or damage to property deriving from not having respected the above mentioned recommendations.

Before filling the heating system, the complete system, including all zones, must be thoroughly cleaned and flushed to remove sediment.

Flush until clean water runs free of sediment. AERCO suggests using an approved system cleaner to flush the system, but not the boiler. Always use AERCO approved antifreezes. See the list in section 1.9.3, Water Quality Requirements.

Never use reverse osmosis, deionized, distilled water or mineral treated water for filling the heating system.

WARNING!

Do not use petroleum-based cleaning or sealing compounds in the boiler system. Damage of seals and gaskets in boiler and system could occur, resulting in substantial property damage and/or danger.

The central heating installation needs to be filled with clean water. Use only clean water or approved glycol for filling the heating system.

When the water hardness of the filling water exceeds 9 grains, the water must be treated until below the maximum value of 9 grains.

The pH value of the installation water must be between 6.5 and 8.5. Check the pH value using proper equipment or by having the water analyzed by a water treatment company.

If pH differs from above, contact AERCO engineering for further assistance.

WARNING!

Failure to adhere to the water quality requirements will result in a voidance of warranty.

3.31.2 Filling Locations and Preparation

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

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions, a fire or explosion may result causing property damage, personal injury, or loss of life.

A. This appliance does not have a pilot light. It is equipped with an ignition device, which automatically lights the burner. Do NOT try to light the burner by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor, as some gas is heavier than air and will settle on the floor.

C. Use only your hand to turn the gas ball-valve knob. Never use tools. If the knob will not turn by hand, do NOT try to repair it, but rather call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been submerged under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control device that has been submerged under water.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance
- Do not touch or operate any electric switch
- Do not use any phone in the building
- Immediately call your gas supplier from a neighbors phone or from outside with your cell phone and follow the gas supplier's instructions.

OPERATING INSTRUCTIONS

1. **STOP! Read the safety information above on this warning.**
2. Turn off all electric power to the appliance.
3. Open the gas valve.
4. Check gas and water pressure.
5. Wait five (5) minutes to clear out any gas, then smell for gas, including near the floor.
6. If you smell gas, STOP! Follow the instructions "WHAT TO DO IF YOU SMELL GAS" that are printed above in these warnings. If you do not smell gas, go to the next step.
7. Turn on all electric power to the appliance.
8. Turn the start-up switch (next to the E8 controller) to the ON position. Replace the control access panel.
9. Set Thermostat to the desired temperature.
10. If the appliance will not operate, follow instructions to turn off the gas (see below), and then call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to its lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Close the gas valve.

3.32 Testing The Ignition Safety Shut Off Device

Ignition Safety Shutoff Device Test

1. Power on by switching on the ON-OFF switch.
2. Create a request in C/H Central Heating using the E8 controller.
3. Turn burners ON.
4. Disconnect the igniter cable (WHITE) of BURNER 1 (See Figure 7-2).

NOTE

Ensure the cable end is not grounded to the enclosure frame, or to any other grounded part.

5. The display will show ERROR CODE **E05** (Loss of Flame). See Figure 3-34.

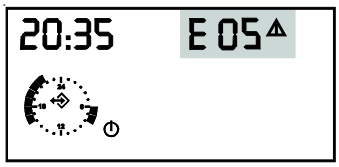


Figure 3-34: "Loss of Flame" Error Code (E 05)

6. Press Reset Button on E8 Controller.

7. The boiler will retry the ignition cycle and the display will show ERROR CODE **E04** (No Flame Detected During Ignition). See Figure 3-35.

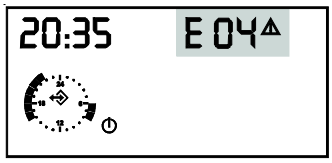


Figure 3-35: "No Flame Detected During Ignition" Error Code (E 04)

8. Reconnect the ignition cable of BURNER 1.
9. Press Reset Button

10. Check that the boiler starts correctly.

WARNING!

Do not touch the inside of the ignition cable while it is disconnected during start-up of the boiler.

3.33 Burner Calibration

WARNING!

All the instructions indicated below are for the exclusive use of qualified AERCO service technicians or installers.

All the boilers are supplied already calibrated and tested. However, if it is necessary to change the calibration due to gas conversion or adaptation to the mains supply system, the gas valve must be re-calibrated (using **Service Mode** function in the E8 controller).

3.33.1 Installing the Gas Analyzer Probe

Before making adjustments, a gas analyzer sensor probe must first be installed into the flue exhaust outlet as shown in Figure 3-36.

Installing the Gas Analyzer Probe into Flue Outlet

1. Remove the cap (#2) from the gas outlet (#1)
2. Install the probe adapter (#3) into the gas outlet (#1) where cap was removed.
3. Insert the analysis probe (#4) into hole of the probe adaptor.
4. After measurements are taken and adjustments made, remove the probe, probe adaptor, then reinstall the cap (#2) onto the gas outlet (#1).

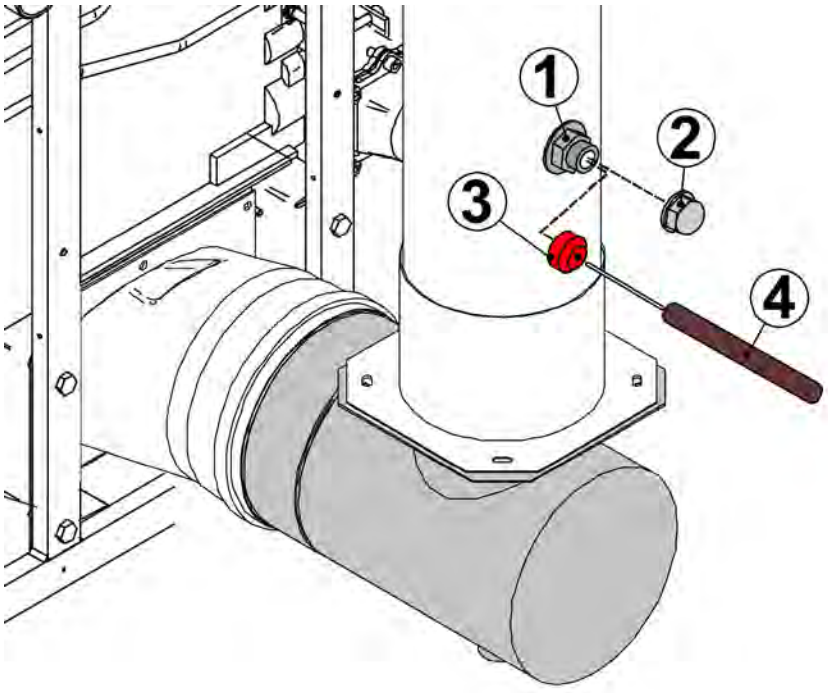


Figure 3-36: Gas Analyzer Probe Location in Flue Outlet

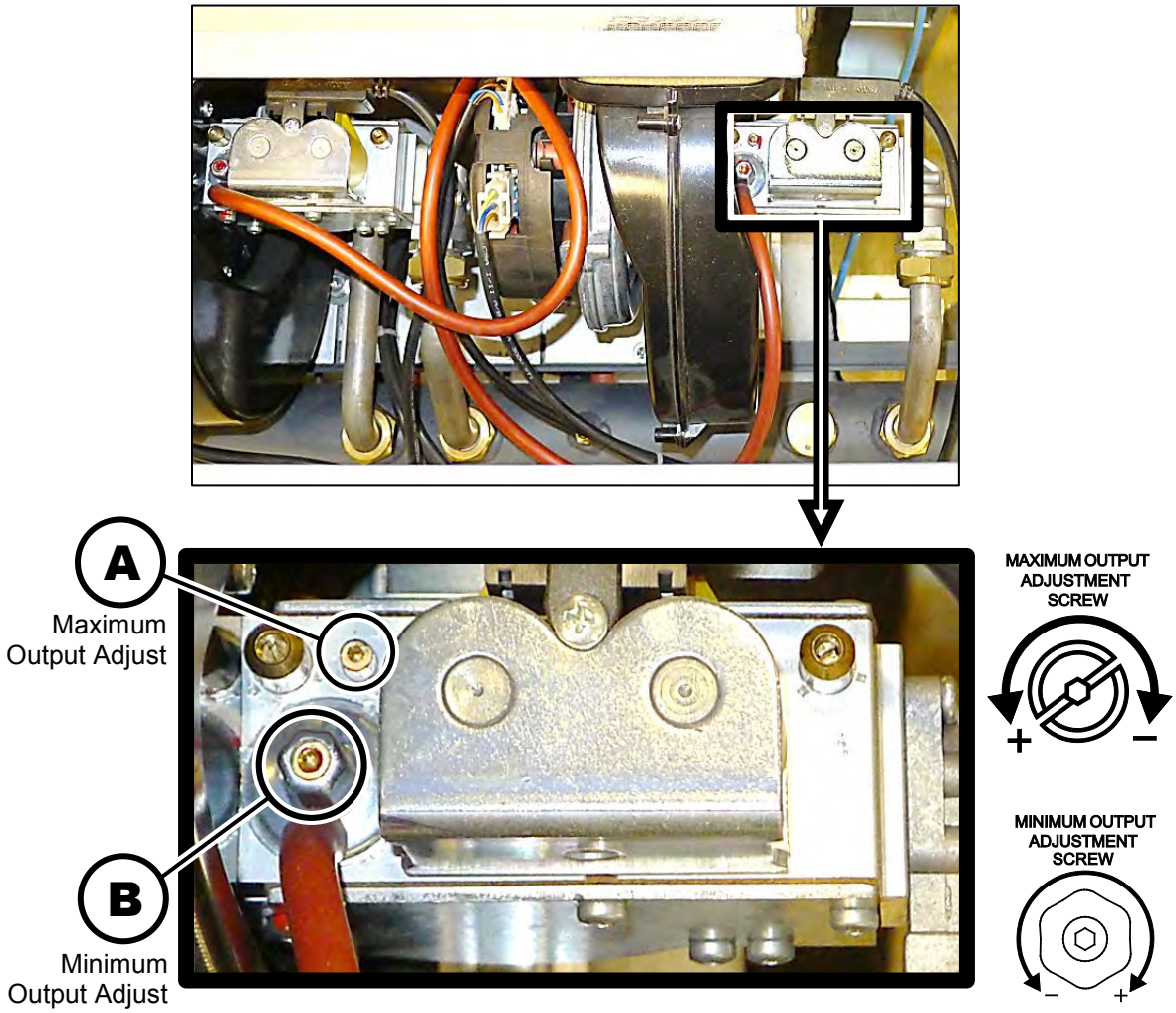


Figure 3-37: Location of Minimum and Maximum Adjustments (Top View)

3.33.2 **Maximum Output Calibration**

After installing the gas analyzer probe (Figure 3-36), refer to Figure 3-37 to locate the gas valves and the Maximum Gas Adjustment screw (A) on each valve. Follow the instructions below to set the maximum gas output level for each valve.

Adjusting the Maximum (A) Gas Output Setting

1. Remove the cap of the combustion gases sampling point (Figure 3-36) and connect a suitable gas analyzer.
2. Operate the burner to a minimum power following the procedure described in Section 3.34 (Figure 3-39) ''Sweeper'' function (CASCADE MAN 100%).
3. Check that the CO_2 values are within the values indicated in Table 3-6.
4. If necessary, correct the value by turning the adjustment screw “A” in a CLOCKWISE direction to decrease the value or ANTICLOCKWISE to increase the value.
5. Repeat the adjustment for all gas valves in the boiler.

3.33.3 Minimum Output Calibration

After setting the maximum gas output for each valve (section 3.33.2), refer to Figure 3-37, above, to locate the Minimum Gas Adjustment screw (B) on each valve. Follow the instructions below to set the minimum gas output level for each valve.

Adjusting the Minimum (B) Gas Output Setting

1. Operate the burner to a minimum power following the procedure described in section 3.34 (Figure 3-39) ''Sweeper'' function (CASCADE MAN 10%).
2. Check that the CO_2 values are within the values indicated in Table 3-6.
3. If necessary, correct the value by turning the adjustment screw "B" in a CLOCKWISE direction to increase the value or ANTICLOCKWISE to decrease it the value.
4. Repeat the adjustment for all gas valves in the boiler.

NOTE

If the CO_2 percentage is too low, check if the air and exhaust flue are obstructed. If they are not obstructed, check if the burner and/or the exchanger (aluminum sections) are properly cleaned. After confirmation, check the maximum gas settings again, as described in section 3.33.2, above.

3.33.4 Final Check and Ignition Failure Adjustment Procedure

After completing the Minimum and Maximum output adjustments, check the CO_2 minimum and maximum values at the flue outlet and, if necessary, make any required adjustments.

If the boiler fails to ignite, perform the following procedure:

Ignition Failure Adjustment Procedure

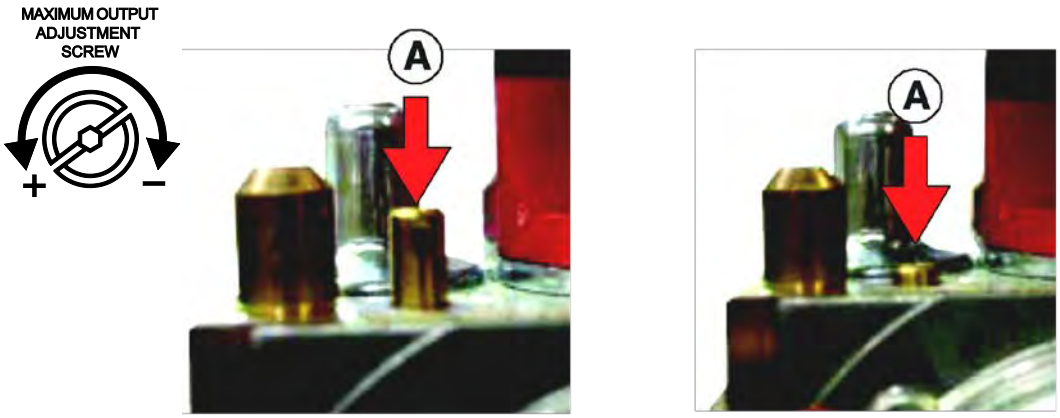


Figure 3-38: Maximum Output Adjustment Screw

1. Tighten the maximum adjustment screw "A" in a clockwise direction until it is fully abutted into the gas valve body, than slacken back out for nine (9) turns.
2. Verify boiler ignition.
3. If the boiler goes into lockout, slacken the screw "A" again for one turn, than retry ignition.
4. If the boiler goes into lockout again, repeat step 3 and retry ignition.
5. Once ignition succeeds, carry out the minimum and maximum gas output burner adjustments as previously described in sections 3.33.2 and 3.33.3, above.

Table 3-6: Modulex EXT Pressure, CO_2 and O_2 Level Calibration Tables

EXT 321											
Gas Type	Supply Pressure Wc (kPa)	CO_2 Level		O_2 Level		Fan Speed		Ø Mixer Injectors Ø in. (mm)	Min. Gas Consumption ft^3/hr (m^3/hr)	Max. Gas Consumption ft^3/hr (m^3/hr)	Start Output % IG
		(%) Min.	(%) Max.	(%) Min.	(%) Max.	Min. (FL)	Max. (FH)				
NOMINAL ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	31	91	0.27 (7)	45 (1.29)	316 (8.95)	50
Propane	11 (2.74)	10	11	1.3	3.1	30	84	0.27 (7)	18 (0.50)	122 (3.46)	50
HIGH ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	35	100	0.27 (7)	45 (1.29)	316 (8.95)	50
Propane	11 (2.74)	10.8	10.8	1.3	3.1	30	73	0.27 (7)	18 (0.50)	109 (3.11)	50

EXT 481											
Gas Type	Supply Pressure Wc (kPa)	CO_2 Level		O_2 Level		Fan Speed		Ø Mixer Injectors Ø in. (mm)	Min. Gas Consumption ft^3/hr (m^3/hr)	Max. Gas Consumption ft^3/hr (m^3/hr)	Start Output % IG
		(%) Min.	(%) Max.	(%) Min.	(%) Max.	Min. (FL)	Max. (FH)				
NOMINAL ALTITUDE											
Natural	7 (1.74)	7.5	10	3.1	5.8	31	91	0.27 (7)	45 (1.29)	474 (13.43)	50
Propane	11 (2.74)	10	11	1.3	3.1	30	84	0.27 (7)	18 (0.50)	183 (5.19)	50
HIGH ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	35	100	0.27 (7)	45 (1.29)	474 (13.43)	50
Propane	11 (2.74)	10.8	10.8	1.3	3.1	30	73	0.27 (7)	18 (0.50)	164 (4.67)	50

EXT 641											
Gas Type	Supply Pressure Wc (kPa)	CO_2 Level		O_2 Level		Fan Speed		Ø Mixer Injectors Ø in. (mm)	Min. Gas Consumption ft^3/hr (m^3/hr)	Max. Gas Consumption ft^3/hr (m^3/hr)	Start Output % IG
		(%) Min.	(%) Max.	(%) Min.	(%) Max.	Min. (FL)	Max. (FH)				
NOMINAL ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	31	91	0.27 (7)	45 (1.29)	631 (17.87)	50
Propane	11 (2.74)	10	11	1.3	3.1	30	84	0.27 (7)	18 (0.50)	243 (6.88)	50
HIGH ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	35	100	0.27 (7)	45 (1.29)	631 (17.87)	50
Propane	11 (2.74)	10.8	10.8	1.3	3.1	30	73	0.27 (7)	18 (0.50)	219 (6.23)	50

NOTE

Check the O_2 levels often, especially at low flow rates.

For high altitude installations, consult document number C302.6 (MLX EXT Alt Derate).

Table 3-6: Modulex EXT Pressure, CO_2 and O_2 Level Calibration Tables

EXT 802											
Gas Type	Supply Pressure Wc (kPa)	CO_2 Level		O_2 Level		Fan Speed		Ø Mixer Injectors Ø in. (mm)	Min. Gas Consumption ft^3/hr (m^3/hr)	Max. Gas Consumption ft^3/hr (m^3/hr)	Start Output % IG
		(%) Min.	(%) Max.	(%) Min.	(%) Max.	Min. (FL)	Max. (FH)				
NOMINAL ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	31	91	0.27 (7)	45 (1.29)	790 (22.39)	50
Propane	11 (2.74)	10	11	1.3	3.1	30	84	0.27 (7)	18 (0.50)	306 (8.65)	50
HIGH ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	35	100	0.27 (7)	45 (1.29)	790 (22.39)	50
Propane	11 (2.74)	10.8	10.8	1.3	3.1	30	73	0.27 (7)	18 (0.50)	274 (7.79)	50

EXT 962											
Gas Type	Supply Pressure Wc (kPa)	CO_2 Level		O_2 Level		Fan Speed		Ø Mixer Injectors Ø in. (mm)	Min. Gas Consumption ft^3/hr (m^3/hr)	Max. Gas Consumption ft^3/hr (m^3/hr)	Start Output % IG
		(%) Min.	(%) Max.	(%) Min.	(%) Max.	Min. (FL)	Max. (FH)				
NOMINAL ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	31	91	0.27 (7)	45 (1.29)	948 (26.87)	50
Propane	11 (2.74)	10	11	1.3	3.1	30	84	0.27 (7)	18 (0.50)	367 (10.39)	50
HIGH ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	35	100	0.27 (7)	45 (1.29)	948 (26.87)	50
Propane	11 (2.74)	10.8	10.8	1.3	3.1	30	73	0.27 (7)	18 (0.50)	329 (9.35)	50

EXT 1123											
Gas Type	Supply Pressure Wc (kPa)	CO_2 Level		O_2 Level		Fan Speed		Ø Mixer Injectors Ø in. (mm)	Min. Gas Consumption ft^3/hr (m^3/hr)	Max. Gas Consumption ft^3/hr (m^3/hr)	Start Output % IG
		(%) Min.	(%) Max.	(%) Min.	(%) Max.	Min. (FL)	Max. (FH)				
NOMINAL ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	31	91	0.27 (7)	45 (1.29)	1,106 (31.34)	50
Propane	11 (2.74)	10	11	1.3	3.1	30	84	0.27 (7)	18 (0.50)	428 (12.12)	50
HIGH ALTITUDE											
Natural	7 (1.74)	8.5	10	3.1	5.8	35	100	0.27 (7)	45 (1.29)	1,106 (31.34)	50
Propane	11 (2.74)	10.8	10.8	1.3	3.1	30	73	0.27 (7)	18 (0.50)	384 (10.91)	50

NOTE

Check the O_2 levels often, especially at low flow rates.

For high altitude installations, consult document number C302.6 (MLX EXT Alt Derate).

3.34 Sweeper Mode (Manual Control)

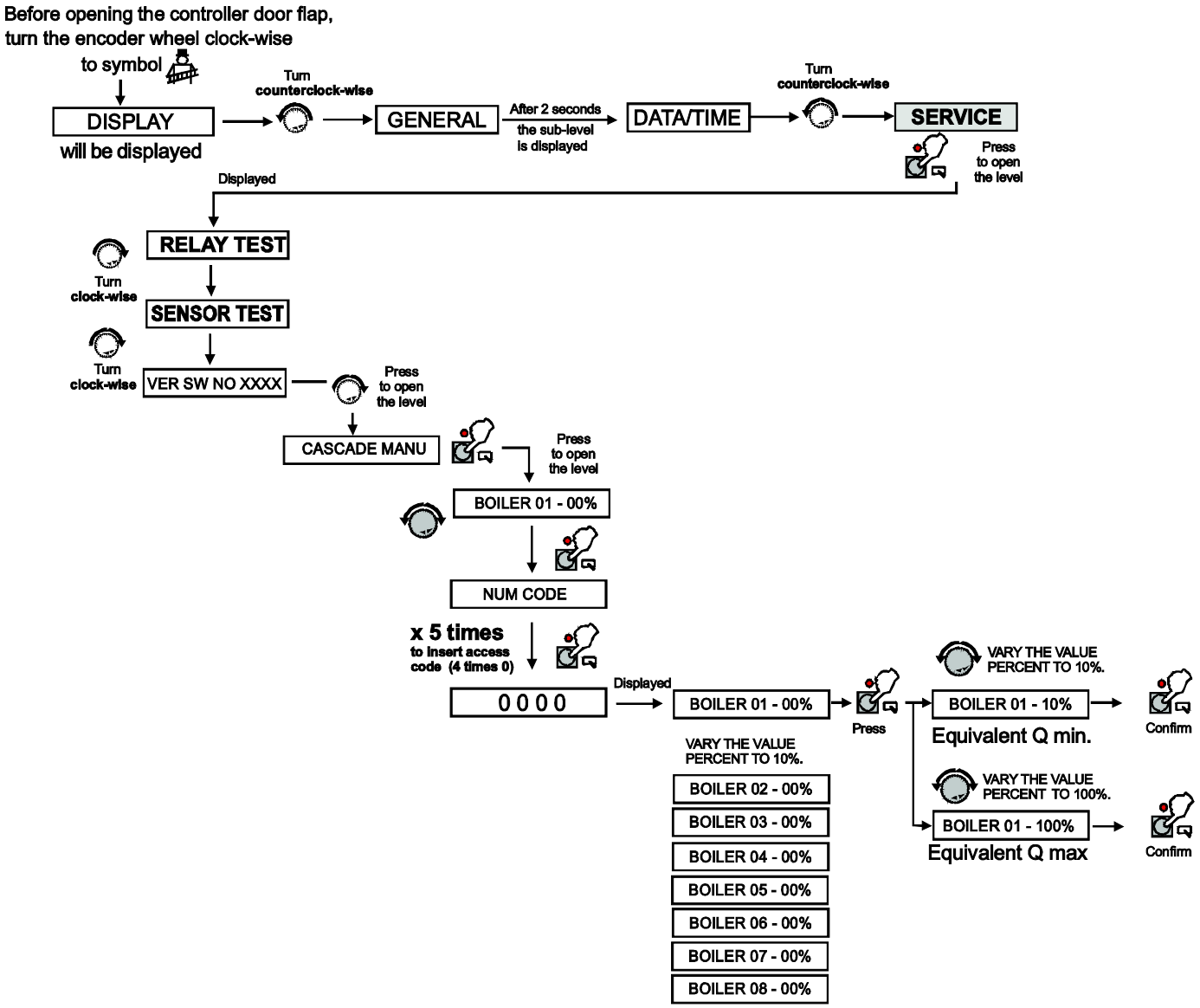


Figure 3-39: Sweeper Mode (Manual Control)

NOTE

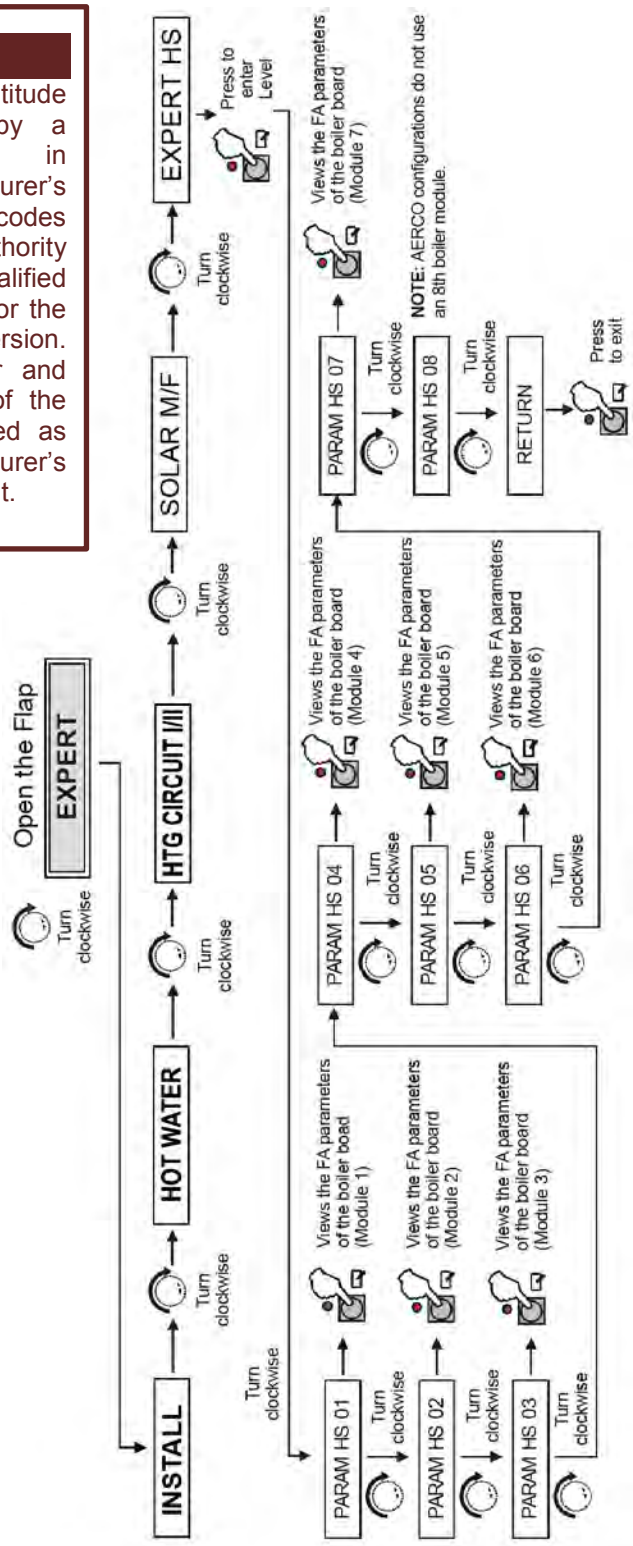
The function is active for 15 minutes, after which, if there is no input, it defaults to the previous parameters.

3.35 High Altitude Adjustment

It is necessary to adjust the fan speed at altitudes at or above 5,000 feet. Modify the parameter FAN MAX from the E8 Control Panel. Note that it is modifiable only with an access code. See Table 3-7 on the next page for a list of the FA (Factory) parameters.

WARNING!

This conversion to high altitude operation shall be made by a qualified service agency in accordance with the manufacturer's instructions and all applicable codes and requirements of the authority having jurisdiction. The qualified service agency is responsible for the proper installation of this conversion. The installation is not proper and complete until the operation of the converted appliance is checked as specified in the manufacturer's instructions supplied with the unit.



NOTE
See the value of parameter FH (FAN MAX) in **Table 3-7**, and Modulex EXT Pressure and CO_2 Level Calibration in **Table 3-6**.

Figure 3-40: Adjusting Fan Speed to Set Input Range for High Altitude

Table 3-7: MODULEX EXT FA (Factory) Parameters Set in PARAM HS xx Menu

Parameters	MODULEX EXT	
	For Low Altitude	For High Altitude
FAN MOD IGN	80	No Change
FAN MOD STBY	26	No Change
FAN MAX (FH)	91	78
FAN MIN (FL)	31	No Change
MAX DIFF PRO	30	No Change
MIN FLOW PRO	00	No Change
MIN FLOW RAT	200	No Change
BOIL HYS	5	No Change
BOIL SLP LIM	10	No Change
BOIL P VAL	25	No Change
BOIL I VAL	12	No Change
BOIL D VAL	00	No Change
PUMP OVERRUN	05	No Change
PUMP MIN MOD	----	----
CAP FLOW RATE	----	----
FAN P VAL	04	No Change
FAN I VAL	08	No Change
FAN SLP		
FAN SLP POS	----	----
FAN SLP NEG	----	----
FAN START PW	----	----
FAN ADAPT	----	----
RESTARTS	----	----
SW NO	Software N°	Software N°
SW RWV	Software Revision	Software Revision

3.36 High Altitude Conversion Label

After calibration of the unit from Normal Altitude (0 - 2,000 feet) to High Altitude (2,000 – 4,500 feet) operation, the label below must be filled out with the appropriate information and applied to the unit in close proximity to the rating label. If the unit is calibrated again for normal altitude operation, the label should be removed.

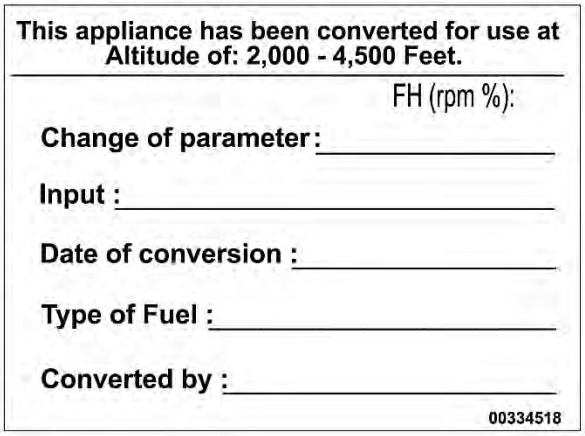


Figure 3-41: High Altitude Conversion Label

3.37 Conversion From Natural Gas To Propane Gas

To convert the unit to use propane gas, instead of natural gas, do the following:

Converting From Natural Gas to Propane Gas

1. Set nominal heat by adjusting the fan speed parameter FH (FAN MAX) from the E8 controller as shown in Table 3-7, and Modulex EXT Pressure and CO_2 Level Calibration in Table 3-6, above. This parameter requires a password to change.
2. Adjust CO_2 (%) minimum and maximum levels according to the type of gas as shown in table below. See section 3.33, Burner Calibration for more information.

Gas Type	CO_2 Level (%) Minimum	CO_2 Level (%) Maximum
Natural Gas	8.5	10
Propane Gas	10	11

3. After gas conversion to propane and calibration, the gas installer should complete and apply this label, or equivalent, as close to the rating label as possible:

Boiler model number: _____

		w.c.	kPa
Inlet gas pressure of the converted boiler:	Max.	13.0	3.23
	Normal	11.0	2.74
	Min.	8.0	1.99
Normal altitude (0 - 2,000 ft)	FH (rpm %)	86	
High altitude (2,000 - 4,500 ft)	FH (rpm %)	73	

Manifold pressure: Factory Set (not adjustable)

Input Rating: _____

This boiler was converted on:

DAY	MONTH	YEAR

To gas: **(E) Propane**

By: name _____

address _____

(name and address of organization making this conversion), which accepts the responsibility that this conversion has been properly made.

00334524

Figure 3-42: MODULEX EXT Label

3.38 Controls And Emergency Functions

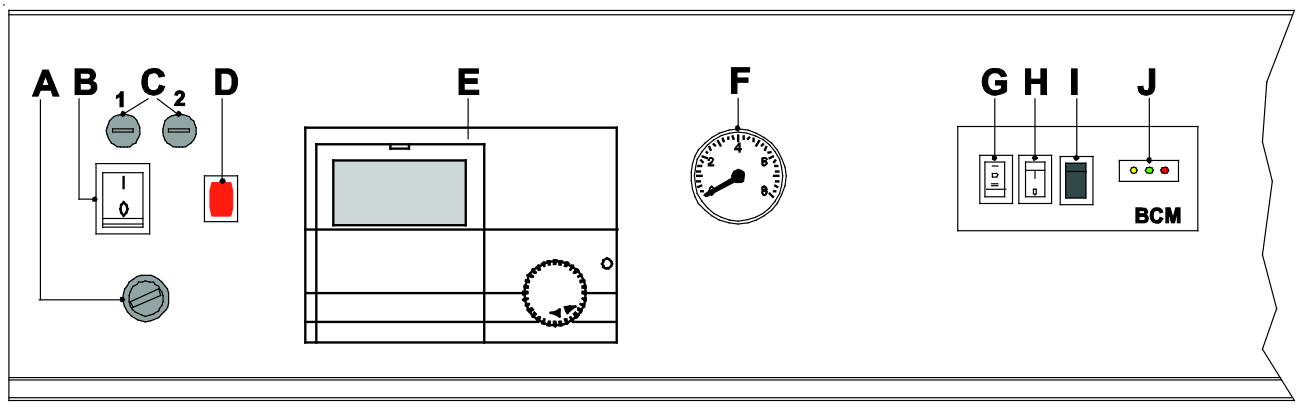


Figure 3-43: MODULEX EXT Panel Controls and Indicators

ITEM	COMPONANT/FUNCTION
A	GLT (General Limit Thermostat): when enabled, it cuts the power supply to the boiler and lights the warning lamp (Item D). To reset, remove the cap and push the reset button.
B	Main Power Switch
C	Fuses: 1 = 6.3 A 2 = 10 A
D	Warning lamp of the Thermostatic Lockout from GTL (General Limit Thermostat).
E	E8 Controller Module
F	Hydrometer (Optional)
G*	Change-over Series/Parallel: 0 = Emergency is active or the control is managed by PLC or BMS. I = Series connection (the cascade is managed by the BCM) II = Parallel connection (condition of supply).
H*	In position “I” the plant will operate when requested at “CONSTANT SETPOINT”: 70°C – Max heat output 50%.
I*	Enables burner reset in case of lock-out.
J*	YELLOW LED = Blinking = Communication between BMM and BCM is OK. GREEN LED = ON = Active Pump RED LED = ON = Failure Code Detected

*See section 4.2, below, for more information regarding the BCM (Boiler Communication Module).

NOTE

The emergency function enables the boiler’s burners to fire only at 50% and at 50°C in system return. All the system’s heating loads, including the header pump, must be controlled manually.

3.39 Initial Boiler Ignition

3.39.1 **Preliminary Checks**

WARNING!

To ensure the continued safe operation of the boiler it is highly recommended that it is checked at regular intervals and serviced when necessary, and that only original spare parts are used. Regular attention will prolong the life of the boiler.

Before igniting the boiler check that:

- The boiler installation has been carried out in accordance with the specific standards as instructed in this manual.
- The combustion air inlet and the discharge of combustion exhaust occur in the correct manner in accordance to the specific standards in force.
- The gas supply system is correctly configured for the boiler's output.
- The boiler's electrical supply is 120 V - 60 Hz.
- The system has been filled with water (pressure registered on the gauge 0.8/1 bar with pump not running).
- All of the system's on/off valves are in the appropriate position (open or closed as required)
- The mains gas supply corresponds to the one which the boiler has been calibrated for. Otherwise convert the boiler to use the available gas (refer to section: "GAS CONVERSION"). This operation must be carried out by a qualified technician in compliance with the regulations in force.
- The gas supply valve is open.
- There are no gas leaks.
- There are no water leaks.
- The external mains electrical supply switch is on.
- The boiler system's safety valve is not blocked and is connected to the waste water system.
- The condensate drain line (section 3.14) has been filled with water and that it is connected to the waste water system.

WARNING!

Before firing up the appliance, be sure to fill up the condensate drain line (see section 3.14) through the filling hole and check the correct drainage of the condensate.

Using the boiler with the condensate drain pipe empty could cause a dangerous condition due to poisonous emissions from the flue exhaust gasses.

- All the necessary ventilation conditions and minimum clearance distances are in place for subsequent servicing in case the boiler is sited in a cupboard compartment.
- There are no water leaks.

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CHAPTER 4: E8 CONTROLLER AND BCM MODULES

MODULEX boilers contain advanced and reliable electronic controls, the E8 Controller and the BCM (Boiler Communications Module), which provide comprehensive programming and monitoring of the MODULEX boiler and its functions. Features and functions of the E8 Controller and BCM are described in this chapter.

CAUTION!

This chapter instructs how to operate and navigate the E8 Controller menus, sub-menus, and parameters, as well as describing the functions of the BCM (Boiler Control Module). However, before the boiler may be used, the E8 controller **MUST** be first intitialized by entering language, year, month, day, and hour in the Installation Menu, described in section 5.1.

4.1 E8 Controller

A standard component included in MODULEX units, the E8 Controller is responsible for the staging and modulation of individual thermal heating modules in a MODULEX boiler and also monitors supply and return water temperatures and domestic hot water zones.

The E8 Controller is housed in a compact enclosure measuring 5.7” (145 mm) x 3.9” (100 mm). The Controller is mounted on the front of the MODULEX Boiler and contains all of the controls, indicators and displays necessary to adjust, operate and troubleshoot the MODULEX Boiler. The main components of the closed E8 Controller include the display, door, and data wheel (see Figure 4-1).

4.1.1 E8 Controller Features and Functions

The E8 features the following functions for MODULEX boilers:

- Shares the heating load among as many of the boiler's thermal heating modules as possible, maximizing the overall operating efficiency of the boiler.
- Provides access to all testing/programming parameters of each individual heating module: operation test, operation time, boiler freeze protection and pump's anti seize program.
- Drives lead-lag burner operation based on 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.
- Supports DHW (Domestic Hot Water) production using a dedicated sensor to control a dedicated pump or 3-way diverting valve for storage tank temperature control.
- Supports a manual operation service mode to control individual modules during troubleshooting or combustion calibration procedures.
- Drives diagnostics such as relay and senor testing.
- Supports Modbus integration with AERCO BMS II and AERCO Control System (ACS) or Building Automation Systems. AERCO also offers a Communication Gateway to support BACnet, Lonworks and N2 system integration.

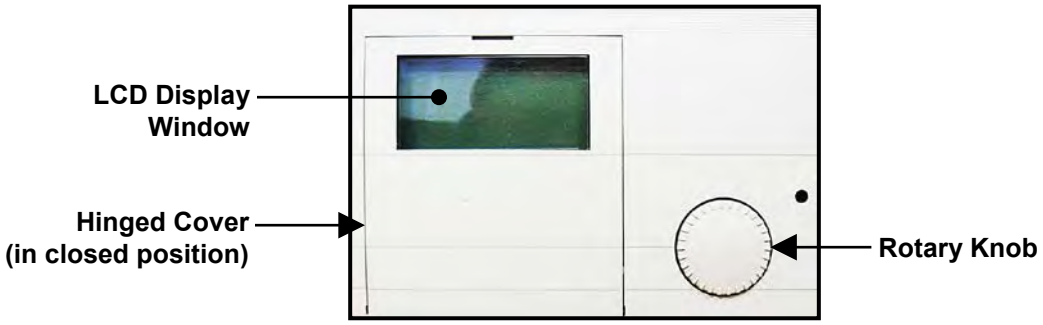


Figure 4-1: MODULEX E8 Controller Front Panel (Cover Closed)

4.1.2 E8 Display Functions

The E8 Controller operates in NORMAL Mode when the controller door is closed, which allows for monitoring the boiler status through the display window and setting the HEATING Mode. When the door is opened, the unit enters MENU Mode, and in this mode the boiler may be initialized, configured, and adjusted. The controls and display for the E8 controller are described in the following sub-sections.

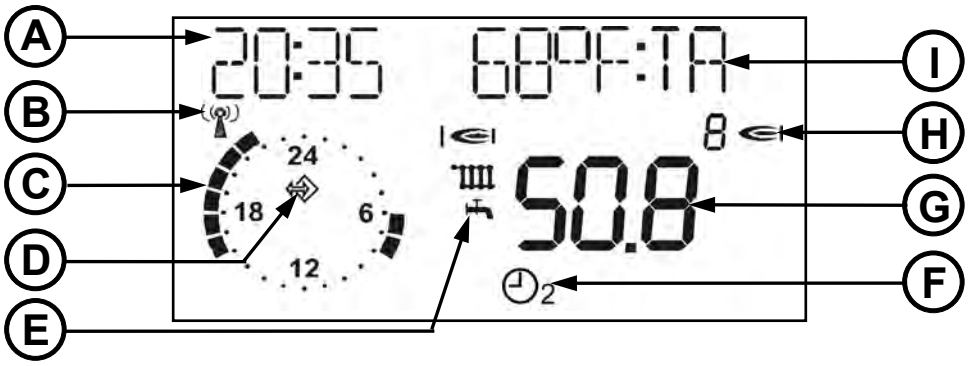


Figure 4-2: E8 (NORMAL Mode) Display Features

Table 4-1: E8 (NORMAL Mode) Display Features and Functions

Item	Function
A	Current time (24 hour format)
B	DCF reception OK (only if receiver is connected via eBUS)
C	Display of the active heating program for the first heating circuit (here: 6:00 to 08:00 a.m. and 4:00 to 10:00 p.m.)
D	Bus icon (if this icon does not appear, check data line to connected CAN controllers => check eBUS via DISPLAY level)
E	Status display: Shows symbols for Internal Burner 1 Relay ON; Heating Mode; Hot Water Preparation.
F	Heating Mode display symbol. The display symbols apply to all internal heating circuits for which a separate heating mode has been selected. Note that each symbol occupies a different space across the display bottom. See **Figure 4-3**.
G	Display of current temperature of HS 1 or header temperature when cascading.
H	Display of number of active heat generators (only applies when cascading).
I	Selectable display and Error Codes (refer to "DISPLAY SEL" parameter in the USER menu).

4.1.3 E8 HEATING Mode Selection

Heating modes may be selected using the Rotary Knob on the controller when the hinged door is in the closed position (NORMAL Mode). As the Rotary Knob is turned, each appropriate heating mode symbol is displayed, in turn, along the lower edge of the display.

Mode changes take effect when the setting is not changed for 5 seconds. The symbols and description for the available heating modes are shown in Figure 4-3.

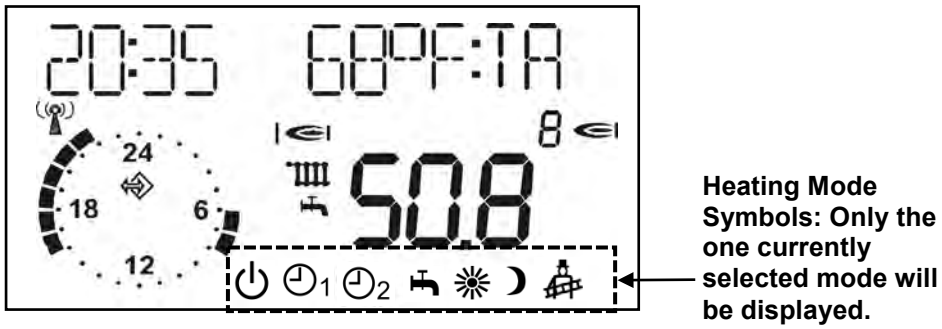


Figure 4-3: E8 HEATING Mode Display Features (NORMAL Mode)

Table 4-2: E8 HEATING Mode Features and Functions (NORMAL Mode)

SYMBOL	MODE NAME	DESCRIPTION
	Heating Mode Selection	Turn the Rotary Knob to select the heating mode required. The heating mode is indicated by a symbol at the bottom of the display. It takes effect when the setting is not changed for 5 seconds.
	Standby / OFF	Heat OFF and hot water (HW) preparation OFF, only frost protection mode.
	Automatic Mode 1	Heat according to timer program 1; HW according to HW program.
	Automatic Mode 2	Heat according to timer program 2; HW according to HW program.
	Summer Mode	Heating OFF, HW according to HW program.
	Day Mode	24 Hour heating with comfort temperature 1; HW according to HW program.
	Night Mode	24 Hour heating with reduced temperature; HW according to program.
	Service Mode	Automatic reset after 15 minutes. Boiler regulated at max boiler temperature.

4.1.4 E8 MENU Mode Operation (Door Open)

Opening the E8 controller hinged door reveals the E8 controls (Figure 4-4) and initiates the MENU Mode, which enables access to an extensive set of software menus.

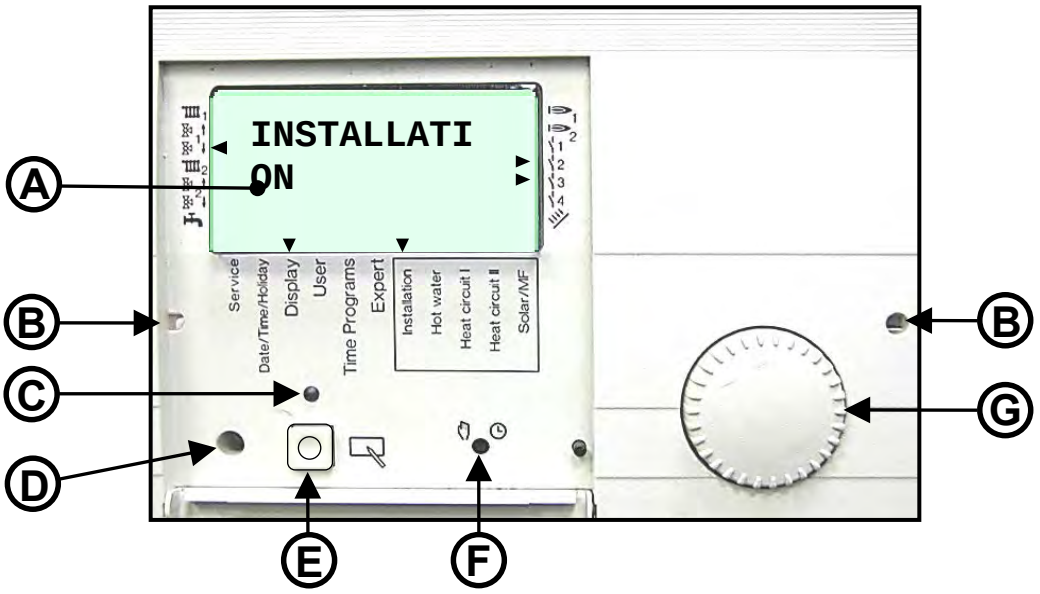


Figure 4-4: E8 MENU Mode Display Features

Table 4-3: E8 MENU Mode Features and Functions

ITEM	FEATURE	FUNCTION
A	LCD display	Selected Menu/Sub-menus, parameter names/values, and selected busses are indicated in the LCD display when in MENU Mode.
B	Mounting Key Access Holes	Insert narrow screwdriver deep into holes and lift up controller to remove.
C	Change LED	When lit, this LED indicates that the value shown in the display can be changed using the Rotary Knob (A).
D	Optical Adaptor	For PC connection
E	Program Key	Used to select a sub-menu level, select a parameter value to change, or save a new parameter value.
F	Manual/ Automatic Switch	A 2-position (10/2 o'clock) screwdriver adjustable switch. Normally, this switch is set to the Automatic (2 o'clock) position to allow program control of the boiler. When set to the Manual (10 o'clock) position, a flashing "EMERG – MODE" message is displayed. Heating Circuit 1 (HC1) pump and the first burner stage are switched on. Pumps for Heating Circuit 2 (HC2) and Domestic Hot Water (DHW) will also be switched on if sensors are installed and enabled. The pump(s) will turn off when the flow temperature reaches the value set for MAX T-FLOW (in EXPERT/HEAT CIRCUIT 1 menu). The first burner stage will cut off when the boiler temperature reaches the value set for MAX T-MODUL (in EXPERT/INSTALLATION menu).
G	Rotary Knob	Used to navigate through menus and parameters or adjust parameters.

4.1.5 E8 MENU Navigation and Parameter Settings

The selected Menu and Sub-menu are indicated by two black arrows at display bottom pointing to the Menu and Sub-menu names silk-screened below the display (Figure 4-5).

Following initial startup and one-time entry of the required INSTALLATION menu items (see section 5.1), to access, view and/or change menu items follow these instructions:

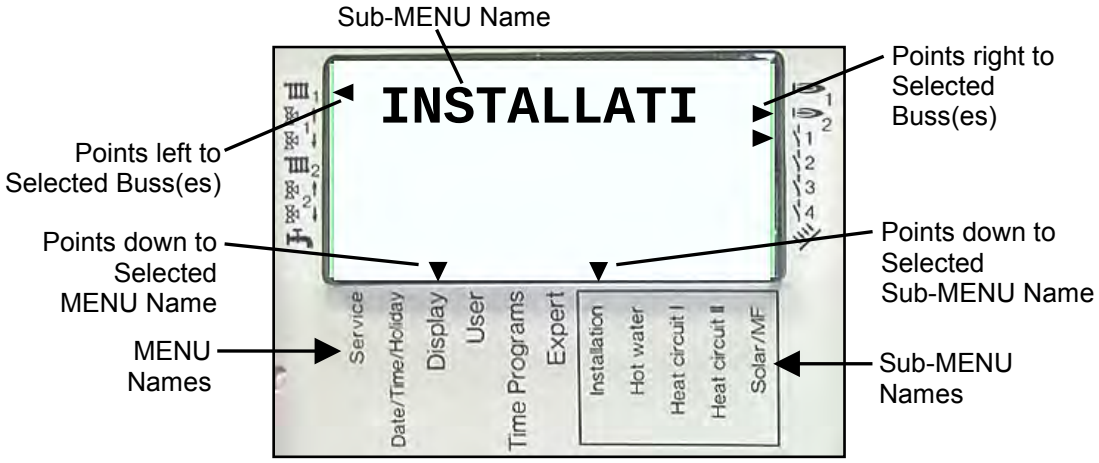


Figure 4-5: MODULEX E8 Controller Front Panel

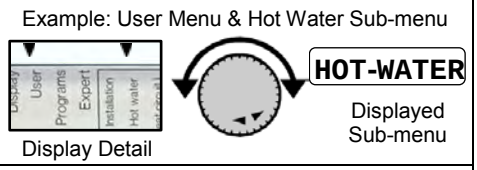
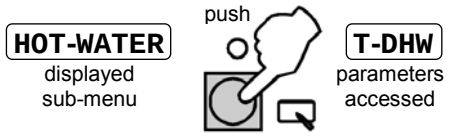
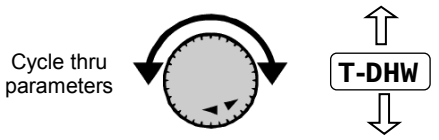
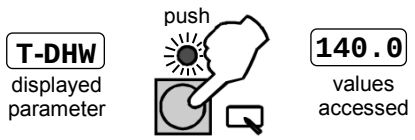
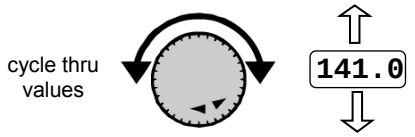
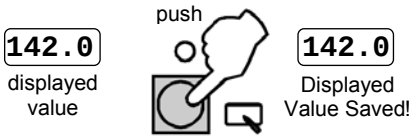
E8 Controller Menu Navigation Procedure

1. When the ON/OFF switch on the front of the boiler is turned ON and the swing-down hinged panel is opened, the controller will enter MENU Mode and INSTALLATION will be displayed (Figure 4-5) in the LCD. This is the initial INSTALLATION menu and it is assumed that all entries have already been made. See sub-section 4.8 of the E8 Controller User Manual (GF-115-C) for INSTALLATION menu initial entry information.
2. Turn the Rotary Knob clockwise until the display advances to the DISPLAY menu. The dial on the clock face will rotate one revolution counterclockwise and then go off. The display will then show INSTALLATION, which is the first sub-menu in the DISPLAY menu group (Figure 4-5). The two small black arrows at the bottom of the display will point down to the menu and submenu names, in this case DISPLAY and INSTALLATION, respectively.
3. To view functions included in the INSTALLATION sub-menu, press the Program Key (Item E, Figure 4-4). If desired, turn the Rotary Knob to scroll through the functions in the INSTALLATION sub-menu. As previously mentioned, these display functions are read-only and cannot be changed. Once you reach the end of the sub-menu, RETURN will appear in the display.
4. To exit this sub-menu and advance to the next sub-menu in the DISPLAY menu, press the Program Key while RETURN is displayed. INSTALLATION will again be displayed. Turn the Rotary Knob clockwise until the next sub-menu is displayed.
5. Repeat steps 2, 3 and 4 to view the remaining main menus and their associated sub-menus. The remaining main menus are: USER, TIME PROGRAM, EXPERT, EXPERT HS (Not Applicable to MODULEX), and GENERAL.

4.1.6 E8 Parameter Navigation, Selection, and Setting

When in the USER, TIME PROGRAM, EXPERT, or GENERAL Main Menu, virtually all sub-menu items can be changed, if desired. Perform the following steps to access, view, and/or change menu item parameters:

Table 4-4: E8 Parameter Navigation, Selection, and Setting

Description	Examples
Use Rotary Knob to navigate to the desired Menu/Sub-menu. Menu and sub-menu are indicated by two small black arrows at the bottom of the LCD display pointing down to menu/sub-menu names below the display (see Figure 4-5).	
Press Program Key to access parameters in the selected (displayed) sub-menu.	
Turn Rotary Knob to sequence through the available parameters.	
To change a parameter value, press the Program Key when the desired parameter is displayed. The Change LED will light up indicating the displayed parameter may now be changed.	
To change the displayed parameter value, turn the Rotary Knob; clockwise to increase value and counter-clockwise to decrease the value.	
To save the displayed parameter value to the controller memory, press the Program Key. The Change LED will turn off indicating the new value has been saved.	

4.2 BCM (Boiler Communication Module)

NOTE

Only the basic features and functions of the BCM are described in the following sections. Refer to the E8 Controller User Manual (GF-115-C) for detailed information and diagrams for wiring and using the BCM in its various capacities.

The BCM (Boiler Communication Module) is an electronic module in MODULEX boilers, which supports full interoperability to BAS (Building Automation Systems) via Modbus protocol to make remote communications and control possible. In addition, it provides customers with a remote alarm contact to notify customers of faults detected within any of the boiler's multiple thermal modules. Finally, in the event the boiler's master controller stops working, the BCM also takes over operations of the boiler.

As a back-up controller, the BCM further increases the reliability of a product line already known for its uniquely redundant design. Each MODULEX boiler combines between two and seven independent, 160,500 BTU/hr., pre-assembled thermal modules housed in a common enclosure. Each module has its own dedicated controller with a combustion safeguard, variable-speed fan, modulating gas valve, electronic ignition, modulating burner, flow temperature sensor, thermostat and heat exchanger. The independent operation of these thermal modules increases each boiler's overall reliability. If a single module requires maintenance or repair, the other module(s) in the boiler can maintain the system load requirements -- thereby providing a level of redundancy that was previously only realized in multi-boiler installations.

A photo of the module is shown in Figure 4-6. Additional information for the BCM component can be found in Section 7, 9, and 10 of the E8 Controller User Manual (GF-115-C).

4.2.1 BCM Features and Functions

When installed and enabled, the BCM enhances the range of control functions offered by the Modulex Boilers. These additional control functions include the following:

- Providing a fault relay which energizes when any fault condition occurs in the Modulex Boiler.
- Serving as a Back-up Controller in the event that the primary E8 Controller fails.
- Providing a 0-10V output to control a variable speed primary pump.
- May be selected as the Primary Controller instead of the E8.
- Functioning as a “Slave” to a “Master” Energy Management System (EMS), Building Automation System (BAS) or AERCO’s Boiler Management System II (BMS II/AERCO Control System [ACS]) on a Modbus Network.

4.2.2 BCM Description

The BCM shown in Figure 4-6 is housed in a compact enclosure measuring 4.13” (105 mm) x 3.50” (89 mm). The BCM is installed on the front of the Modulex Boiler control panel.

Input/Output (I/O) connections to the BCM are made via four connectors mounted on the Printed Circuit Board (PCB) of the BCM. Three Control Switches are mounted on the clear plastic cover on the front of the BCM. Three LED Status Indicators are mounted directly on the BCM PCB and can be viewed through the clear plastic cover. In addition, the PCB contains an on-board, screwdriver-adjustable 10-position address switch, which is used to set the corresponding address of the boiler on the input Modbus or EBUS Network.

Refer to Tables 4-5 and 4-6 for details on the features and functions of the BCM.

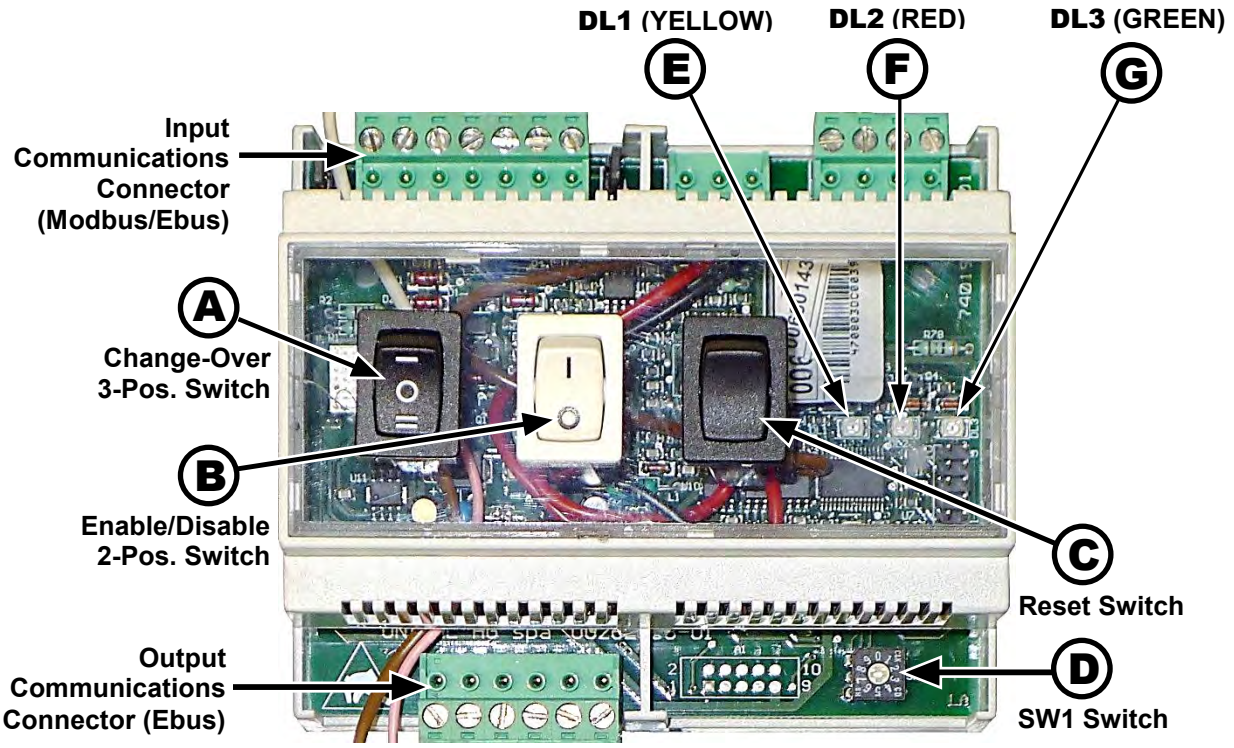


Figure 4-6: BCM (Boiler Control Module) Features

Table 4-5: BCM (Boiler Control Module) Features and Functions

Item	Feature	Function
A	**Change-Over Series/Parallel, 3-Position Switch**	Three-position rocker switch for setting internal/external boiler control.
B	**Enable/Disable (I/0), 2-Position Switch**	Two-position rocker switch enables the BCM to act as a Back-Up Controller when placed in the ON (I) position. See Table 4-6 for description of settings related to Item B switch.
C	**Reset Switch**	Momentary two-position rocker switch resets (clears) fault relay and LED when activated.
D	**SW1, 10-Position Rotary Switch**	Rotary switch labeled 0 – 9. Sets the corresponding address of Boiler on the input Modbus or EBUS Network.
E	**DL1 LED: (YELLOW)**	Communication Status Indicator functions as follows: **OFF** – No devices detected by either communication interface. **BLINKING** – Only one communication device detected at one communication interface (input or output). **ON** – Both communication interfaces (input & output) are active.
F	**DL2 LED: (RED)**	Alarm Status LED lights when a fault is detected by the BCM. Activating the Reset Switch will clear the faults.
G	**DL3 LED: (GREEN)**	Pump Status Indicator lights when Pump is running.

Table 4-6: BCM 3-Position and 2-Position Switch Functions

2-Pos Switch (Enable/Disable)	**3-Pos Switch** (I/O/II)		
	Position I (NOTE 1)	**Position O (see NOTE 2)**	**Position II (See NOTE 3)**
O = OFF (Disable)	**DO NOT USE**	The BCM is the Gate-way for Modbus and external control. The E8 does **not** control the boiler and the BCM will **not** take over the boiler if the Modbus signal fails.	The E8 **is** the primary controller and the BCM allows monitoring through Modbus, but **will not** take over boiler if the E8 fails.
I = ON (Enable)	**DO NOT USE**	The BCM is the Gate-way for Modbus and external control. The E8 does **not** control the boiler and the BCM **will** take over the boiler if the Modbus signal fails. If E8 is in Standby Mode, BCM will cycle the pump with the boiler. If E8 is in Day Mode, the E8 will continuously run the pump.	The E8 **is** the primary controller and the BCM allows monitoring, and the BCM **will** take over the boiler if E8 fails. If E8 is in Standby Mode, E8 will cycle the pump (must use Enable/Disable). If E8 is in Day Mode, the E8 will continuously run the pump.

NOTES:

1) **DO NOT** set the 3-Position Switch to Position **I**.
2) Set the 3-Position Switch to Position **O** ONLY when controlling Boilers from an external Controller via Modbus Communication. See **Paragraph 3.1.2** of the E8 Controller User Manual (GF-115-C) for setting HEAT Modes.
3) Position **II** is the **Default** position for the 3-Position Switch. Ensure it is set to this position when it arrives from the Factory. See **Paragraph 3.1.2** of the E8 Controller User Manual (GF-115-C) for setting HEAT Modes.

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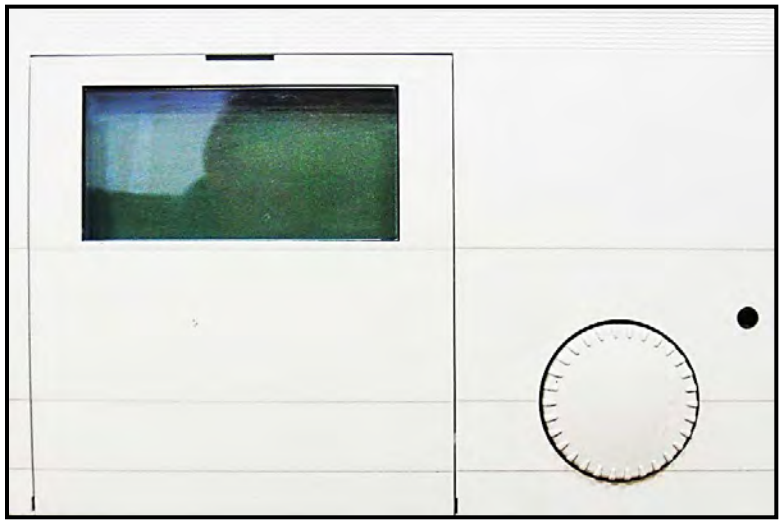
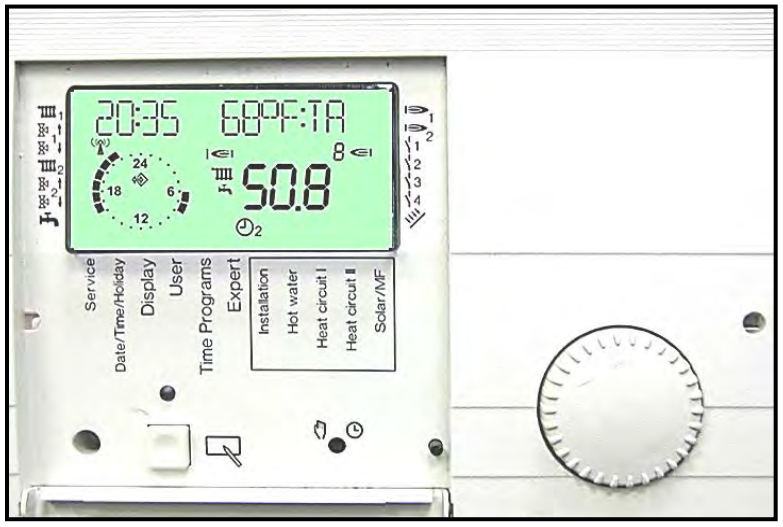
CHAPTER 5: OPERATION

This chapter introduces the E8 controller basic menus/sub-menus needed to set up the MODULEX EXT boiler. Refer to Chapter 4 for instructions for using the E8 controls to navigate and change settings. For more detailed information concerning the E8 controller menus, sub-menus, and functions, refer to the E8 Controller User Manual (GF-115-C).



Modulex E8 Controller Front Panel (Cover Closed)



Modulex E8 Controller Front Panel (Cover Open)

5.1 Installation Menu: Initializing the E8 Controller

Each time power is applied to the boiler and the E8 controller cover (Figure 4-1) is opened, the **INSTALLATION** Menu is displayed once (only). These values MUST be entered in order to initialize the boiler for operation. Once the values grouped here have been entered and accepted, the controller is initiated and operatable and may be configured for your boiler installation. To re-enter the **INSTALLATION** menu, cycle the boiler power and open the cover again.

To initialize the E8 Controller, set the following values in the **INSTALLATION** Menu:

- Set the parameters: **ENGLISH**, **HOUR**, **YEAR**, **MONTH**, and **DAY**.
- Leave the **BUS – ID HS** parameter blank.
- Remaining parameters are already set and do not require any entry.

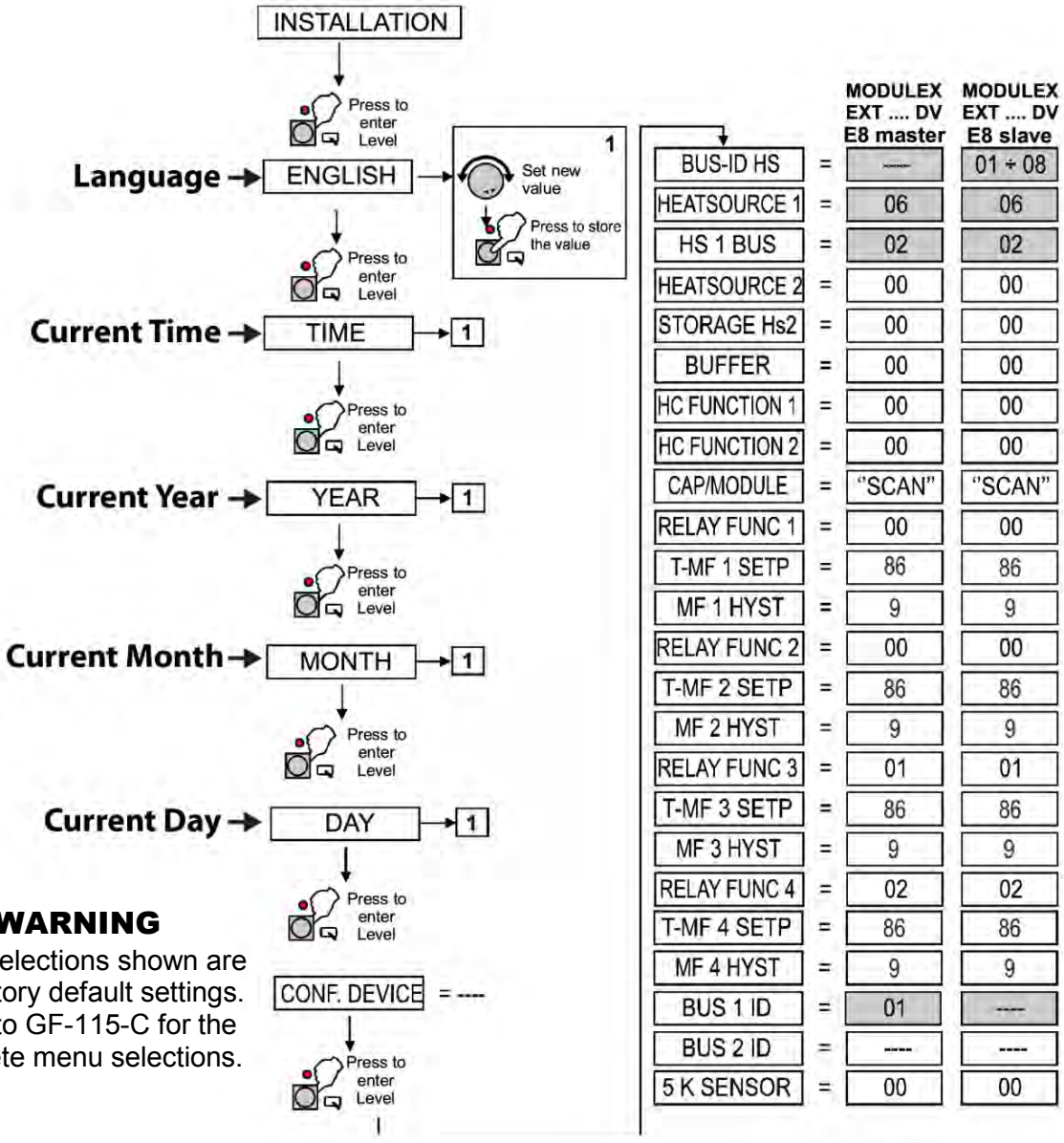


Figure 5-1: INSTALLATION Menu

WARNING

Menu selections shown are the factory default settings. Refer to GF-115-C for the complete menu selections.

5.2 Quick Start Instructions

Below are instructions for setting the most basic settings in the E8 controller, including maximum and minimum flow temperature, room temperature settings, heat slope, and initiation of heating programs.

IMPORTANT NOTE!

Before the boiler may be used, the E8 controller **MUST** be first intitialized by entering language, year, month, day, and hour in the Installation Menu, as described in section 5.1, above.

5.2.1 Setting Maximum and Minimum Flow Temperature

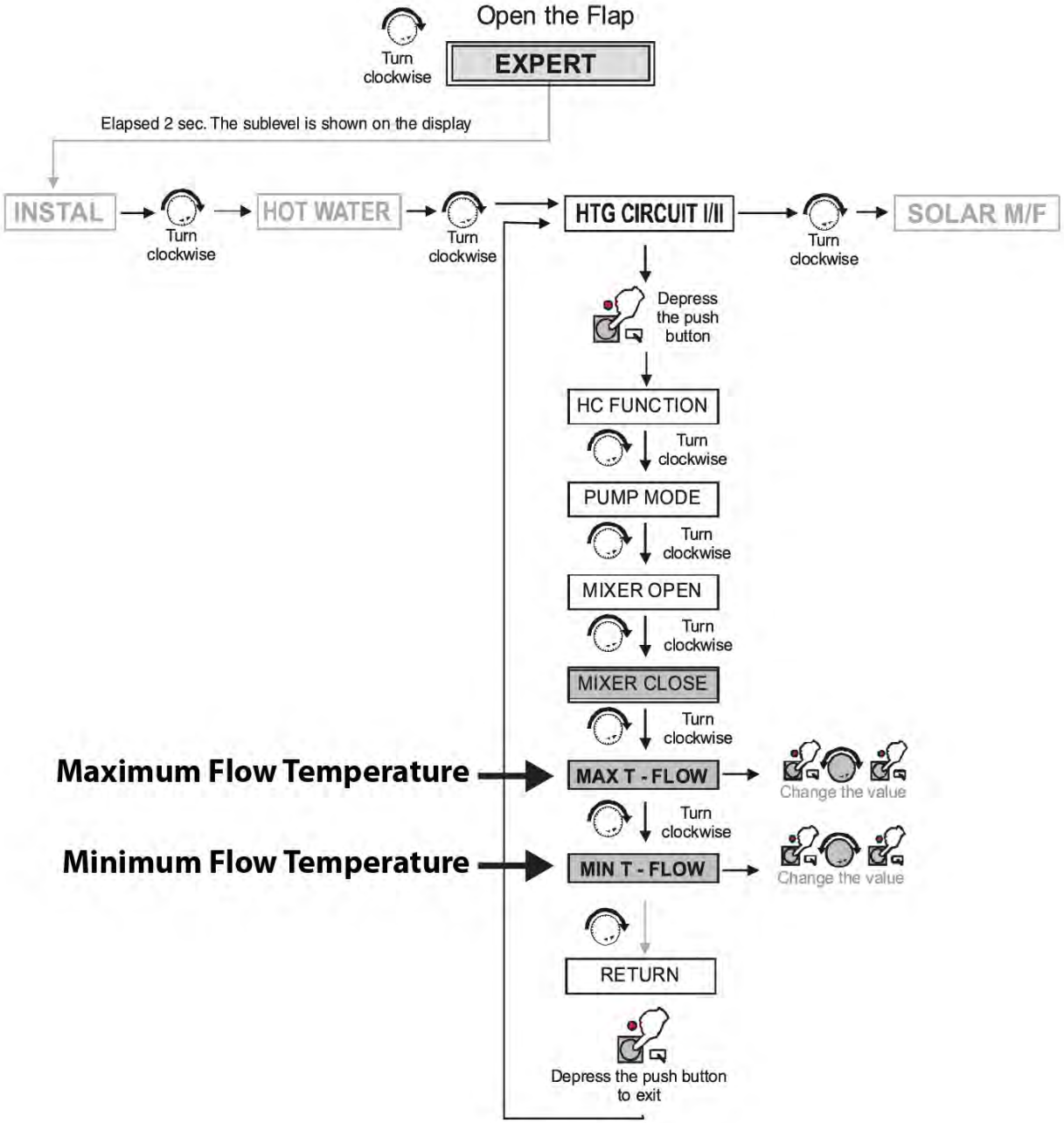


Figure 5-2: E8 Quick Start, Max. & Min. Flow Temperature Settings

5.2.2 Setting Room Temperature and Outdoor Compensation

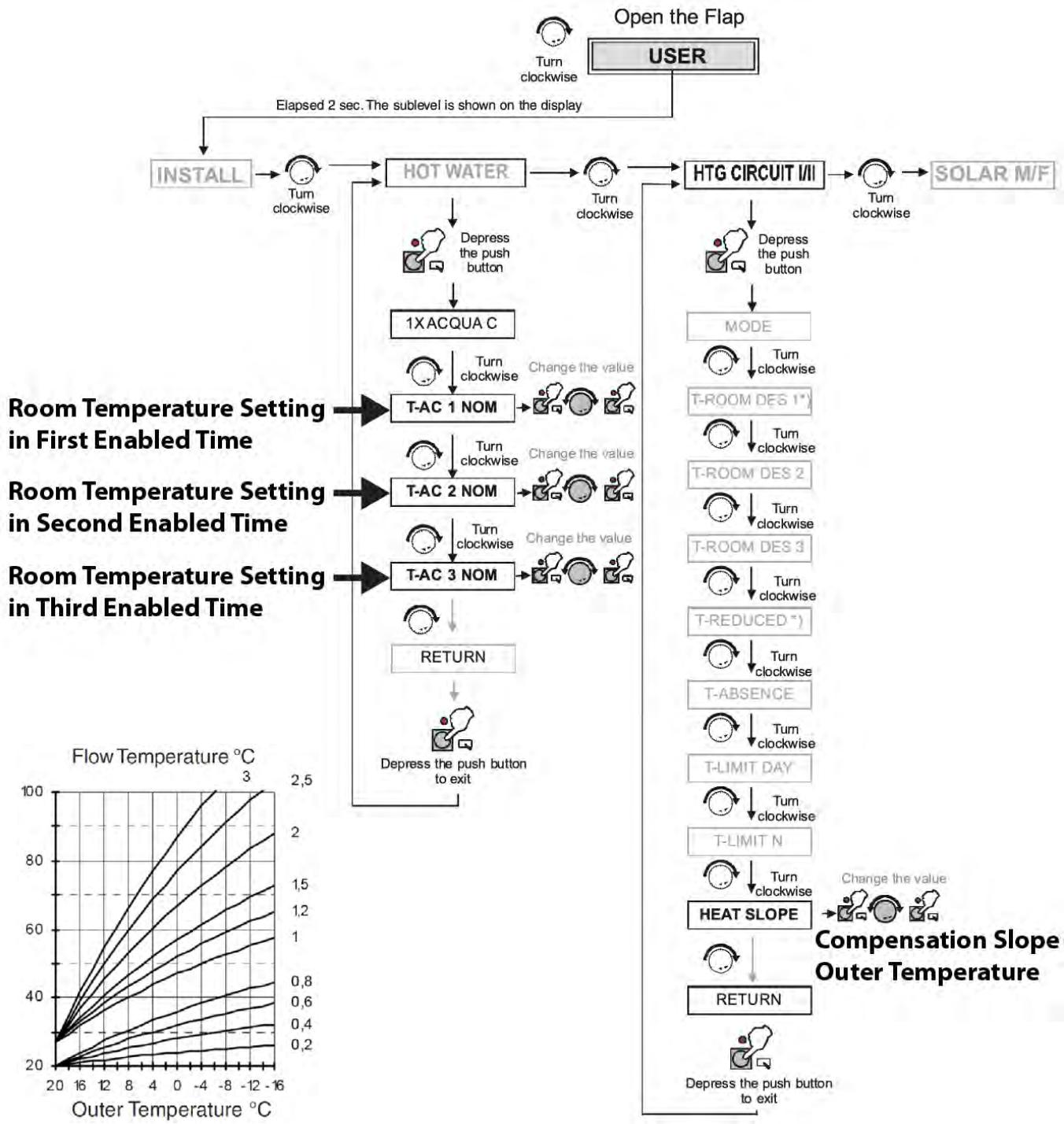


Figure 5-3: E8 Quick Start, Room Temperature and Outdoor Compensation Settings with Outdoor Temperature (Slope) Chart

5.2.3 **Setting Heating Programs and Pumps**

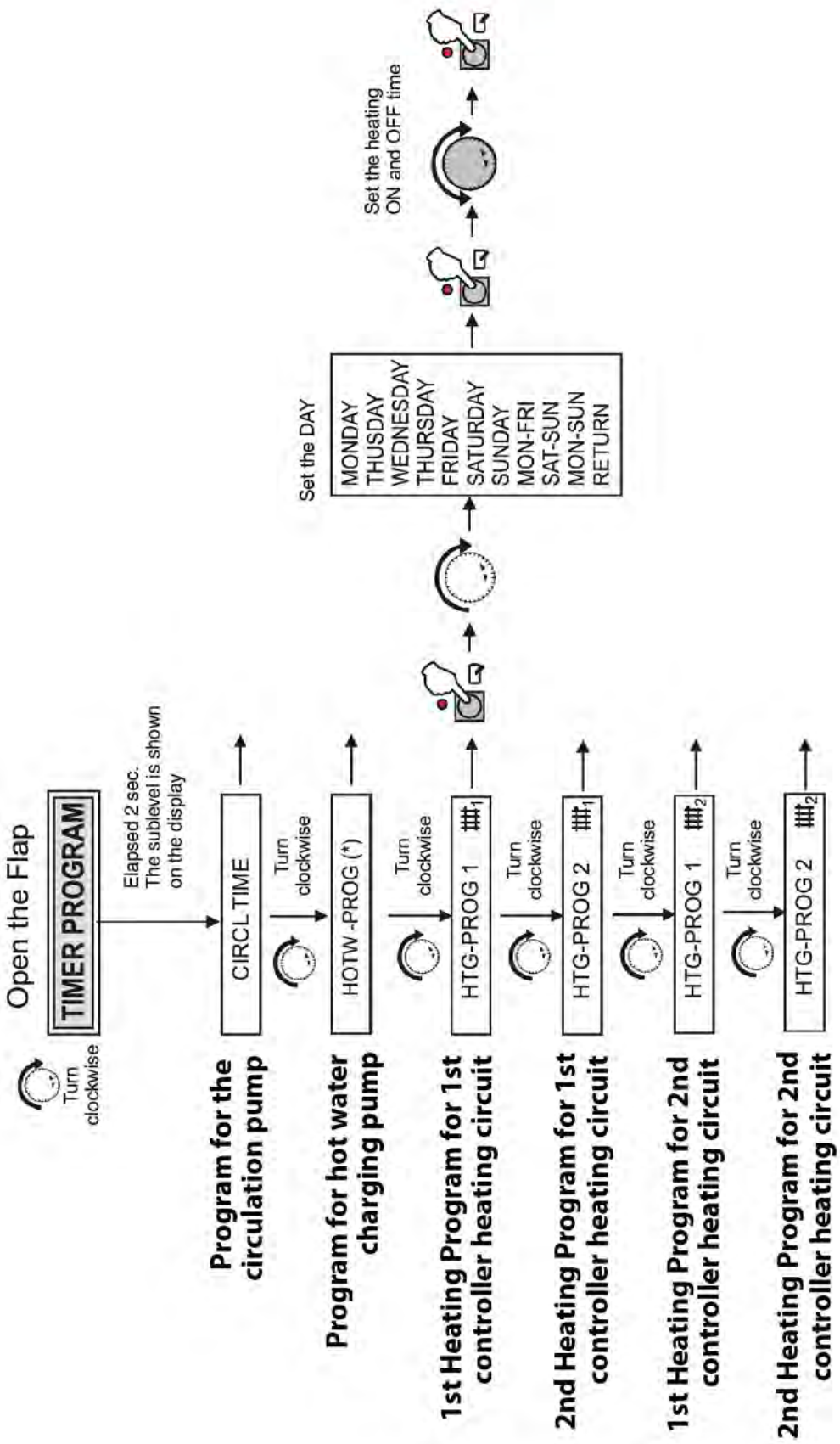


Figure 5-4: E8 Quick Start, Heating and Pump Program Settings

5.3 Menu And Sub-Menu Descriptions

There are six top level menus and five sub-menus as listed below.

5.3.1 **Menus (Top Level):**

- **GENERAL**
  Value selection summary. Service => for service engineers. Date/Time/Holiday => for users.
- **DISPLAY**
  System value display (e.g. sensor values and setpoints). No adjustments can be made. Operating errors are therefore excluded in this area.
- **USER**
  Summary of settings that can be made by the operator.
- **TIME PROGRAMS**
  Summary of time programs for heating circuits, the hot water circuit and extra functions where applicable
- **EXPERT**
  Summary of values for which expert knowledge is required to make settings (installation technician). Values in the expert level are protected by a code number.
- **EXPERT FA (Only for FA via BUS)**
  Summary of values transmitted by the automatic firing device.

5.3.2 **Sub-Menus:**

- **INSTALLATION**
  All display values and settings that relate to the unit or the entire system and cannot be assigned to a consumer circuit.
- **HOT WATER**
  All display values and settings that affect central hot water preparation and circulation.
- **HEATING CIRCUIT I**
  All indicator and set values that relate to the consumer circuit 1 (also, for example, as decentralized hot-water circuit).
- **HEATING CIRCUIT II**
  All indicator and set values that relate to the consumer circuit 2 (also, for example, as decentralized hot-water circuit).
- **SOLAR/MF**
  All indicator and set values that relate to solar energy recovery and settings for the multifunction relay.

5.4 General Menu

The GENERAL menu contains the sub-menus DATE/TIME, HOLIDAY, and CLOCK CHANGE.

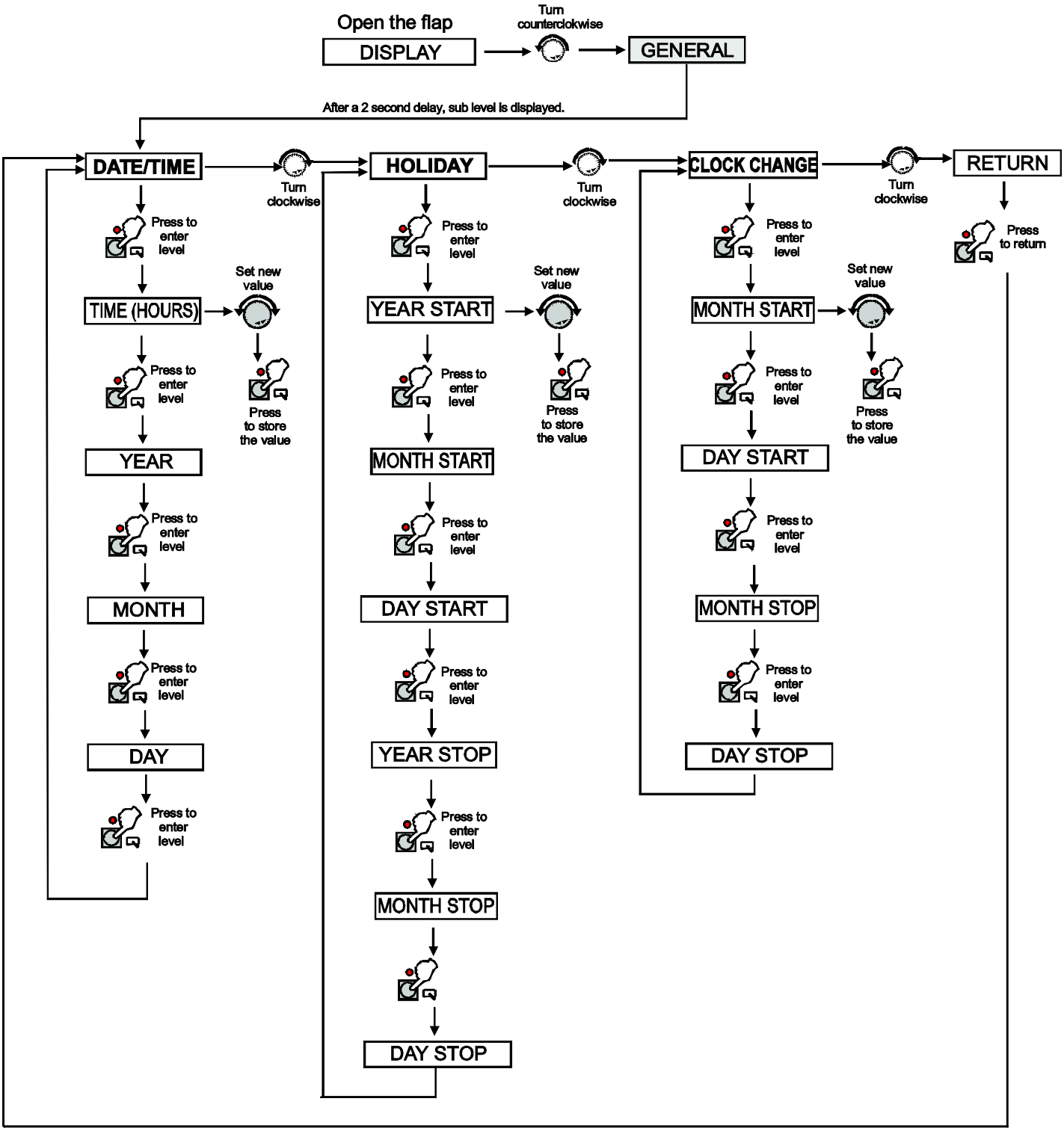


Figure 5-5: GENERAL Menu

Table 5-1: GENERAL Menu

LEVEL	DESCRIPTION	ENTRY RANGE
DATE/TIME		
TIME (HOURS)	Current hours blink and can be adjusted	00:00 - 24:00
YEAR	Adjust current year	XXXX
MONTH	Adjust current month	01 - 12
DAY	Adjust current day	01 - 31
HOLIDAY		
YEAR START	Set current holliday start year	XXXX
MONTH START	Set current holliday start month	01 - 12
DAY START	Set current holliday start day	01 - 31
YEAR STOP	Set current holliday end year	XXXX
MONTH STOP	Set current holliday end year	12 - 31
DAY STOP	Set current holliday end day	01 - 31
CLOCK CHANGE		
MONTH START	Set month for start of summer time	01 - 12
DAY START	Set earliest day for start of summer time	01 - 31
MONTH STOP	Set month for start of winter time	12 - 31
DAY STOP	Set earliest day for start of winter time	01 - 31

5.5 Service Menu

The SERVICE menu contains the TEST RELAY, SENSOR TEST, and OTHER PARAMETERS sub-menus as shown below:

NOTE

The **SERVICE** menu is accessed as shown below. However, **SERVICE MODE** ( ) is different and can only be accessed when the E8 cover is closed.

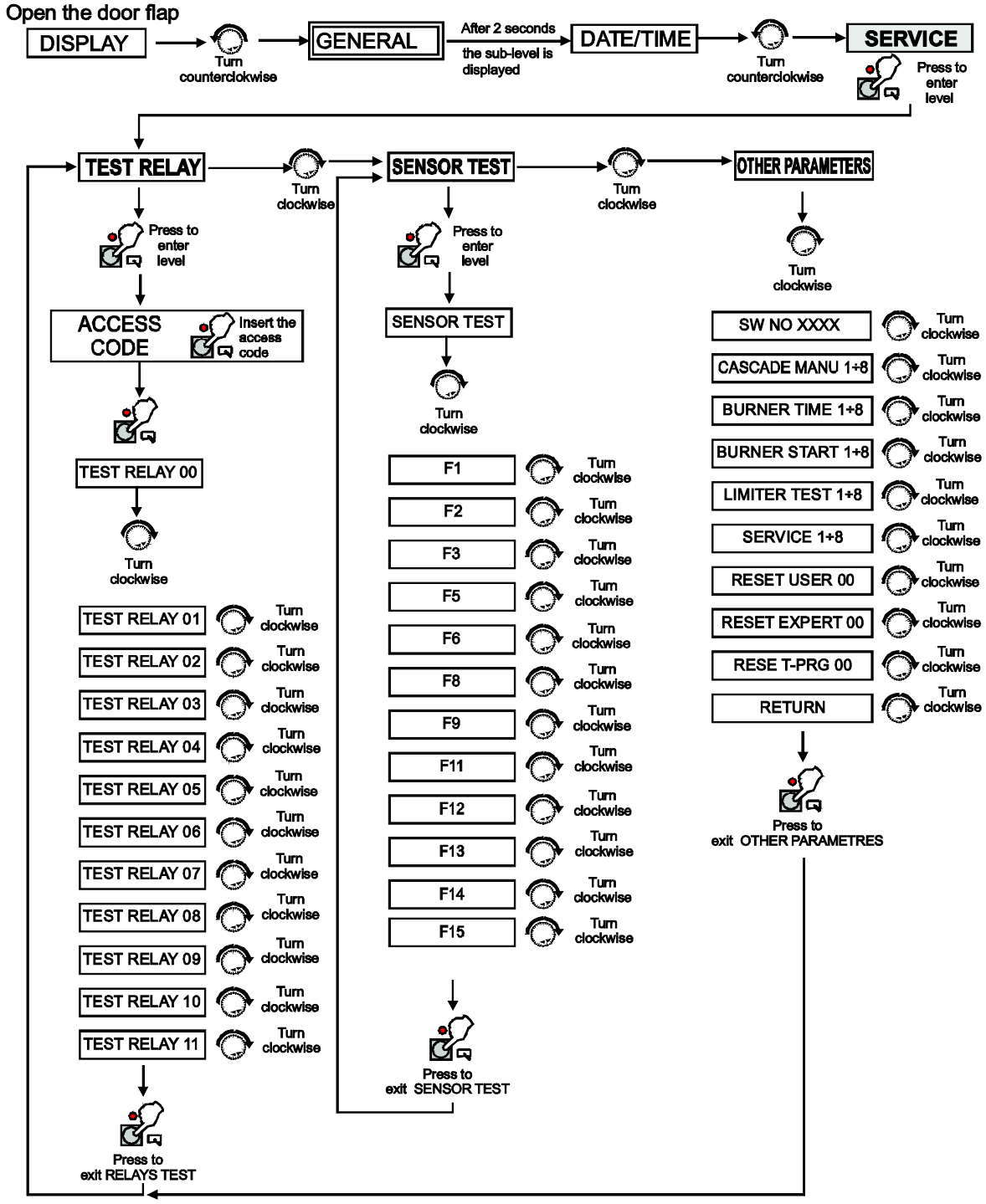


Figure 5-6: SERVICE Menu

Table 5-2: SERVICE Menu

LEVEL	DESCRIPTION
TEST RELAYS	
RELAY TEST 00	No relay
RELAY TEST 01	A1: Pump heating circuit 1
RELAY TEST 02	A2: Pump heating circuit 2
RELAY TEST 03	A3: Hot water charging pump
RELAY TEST 04	A4: Mixer OPEN heating circuit 2
RELAY TEST 05	A5: Mixer CLOSED heating circuit 2
RELAY TEST 06	A6: Heat Source 1 ON
RELAY TEST 07	A7: Heat Source 2 ON [2 stage: HS 1+2 (after 10s) ON]
RELAY TEST 08	A8: Mixer OPEN heating circuit 1 / Multifunction 1
RELAY TEST 09	A9: Mixer CLOSED heating circuit 1 / Multifunction 2
RELAY TEST 10	A10: Multifunction 3
RELAY TEST 11	A11: Collector pump / Multifunction 4
SENSOR TEST	
F1	Lower buffer storage temperature
F2	Middle buffer storage temperature or room temperature heating circuit 1
F3	Upper buffer storage temperature
F5	Flow temperature heating circuit 2
F6	Upper hot water temperature
F8	Boiler/Header temperature
F9	Outside temperature
F11	Flow temperature heating circuit 1 or temperature multifunction 1
F12	Hot water temperature lower or temperature multifunction 2
F13	Solid fuel boiler temperature or collector 2 or temperature multifunction 3
F14	Collector 1 temperature or temperature multifunction 4
F15	Room temperature heating circuit 2 or measured value of the sensor or voltage value 0-10V input
OTHER PARAMETERS	
SW NO XXX-XX	Software number with index
CASCADE MANU	Manual control of each module
BURNER TIME (1÷8)	Burner time for all stages
BURNER START (1÷8)	Burner start for all stages
LIMITER TEST (1÷8)	Safety temperature limiter test: press and hold button
SERVICE	Date/Hour setting for service purposes
RESET USER 00	Do not use
RESET EXPERT 00	Do not use
RESET T-PRG 00	Do not use
RETURN	

5.6 Display Menu

The DISPLAY menu contains the INSTALLATION, HOT-WATER, HTG CIRCUIT 1/2, and SOLAR / MF sub-menus as shown below:

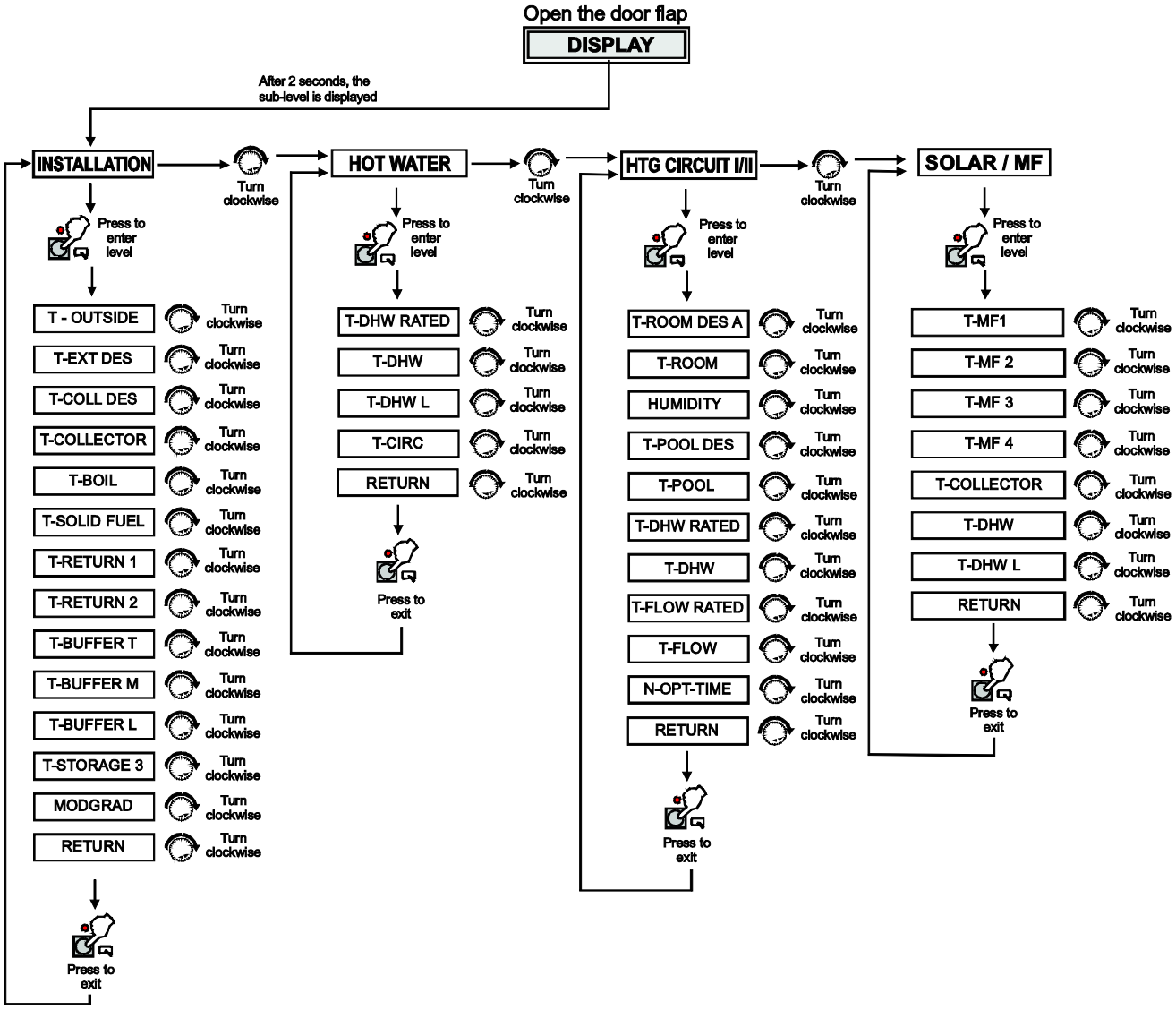


Figure 5-7: DISPLAY Menu

NOTE

Some menus are visible only if the relevant sensor is wired (e.g. HOT WATER is displayed only if the DHW storage sensor is wired).

Table 5-3: DISPLAY Menu

LEVEL	DESCRIPTION
INSTALLATION	
T-OUTSIDE	Outside temperature
T-EXT DES	External set value specification (0-10 V)
T-COLL DES	HS / Header set value (cascade)
T-COLLECTOR	HS / Header temperature (cascade)
T-BOIL	Temperature and status of the HS (HS1 - HS8)
T-SOLID FUEL	For HS2 = Solid fuel boiler
T-RETURN 1	Return flow temperature of HS 1
T-RETURN 2	Return flow temperature of HS 2
T-BUFFER T	Buffer storage tank temperature: top position
T-BUFFER M	Buffer storage tank temperature: midle position
T-BUFFER L	Buffer storage tank temperature: lower position
T-STORAGE 3	Temperature of storage tank 3 (e.g. solar pool-heating)
MODGRAD	Modulation level for each module
RETURN	
HOT-WATER	
T-DHW RATED	Hot water set temperature value
T-DHW	Hot water temperature value
T-DHW L	Hot water temperature in infeed area
T-CIRC	Recirculating temperature
RETURN	
HTG CIRCUITC 1/2	
T-ROOM DES A	Current value for set room temperature
T-ROOM	Room temperature
HUMIDITY	Displays room humidity (if value is available)
T-POOL DES	Pool set temperature
T-POOL	Pool temperature
T-DHW RATED	Hot water set temperature value
T-DHW	Hot water temperature value
T-FLOW RATED	Current flow temperature setting
T-FLOW	Current flow temperature
N-OPT-TIME	Display of the time last required for heating-up
RETURN	
SOLAR / MF	
T-MF1	Temperature MF sensor 1 (=F11)
T-MF2	Temperature MF sensor 2 (=F12)
T-MF3	Temperature MF sensor 3 (=F13)
T-MF4	Temperature MF sensor 4 (=F14)
T-COLLECTOR	Temperature collector 1
T-DHW	Upper hot water temperature
T-DHW L	Hot water temperature infeed
RETURN	

5.7 User Menu

The USER menu contains the INSTALLATION, HOT-WATER, HTG CIRCUIT 1/2, and SOLAR / MF sub-menus as shown below:

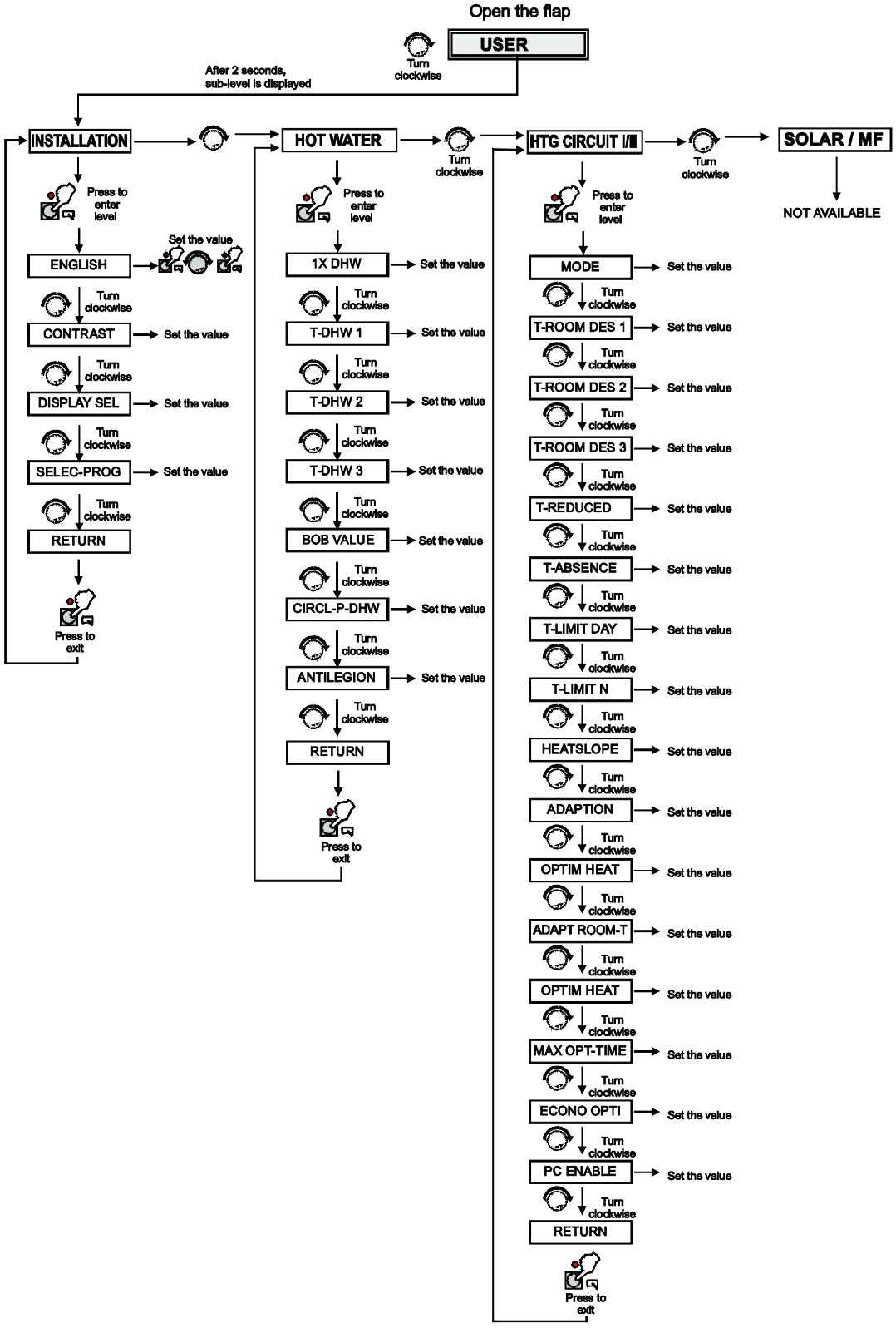


Figure 5-8: USER Menu

Table 5-4: USER Menu

LEVEL	DESCRIPTION	ENTRY	
INSTALLATION		**Default**	**Range**
ENGLISH	Set language	ENG	
CONTRAST	Adjust intensity of display	00	(-20) / (20)
DISPLAY SEL	Select additional display in standard operation	----	
SELEC-PROG	Heating circuit 1 or Heating circuit 2	01	(01 ÷ 02)
RETURN			
HOT WATER			
1-DHW	If the value is 1, the boiler switches on immediatly	00	(01 ÷ 02)
T-DHW 1	Hot water temperature setting in first enable time	140	(50 ÷ 158)
T-DHW 2	Hot water temperature setting in second enable time	140	(50 ÷ 158)
T-DHW 3	Hot water temperature setting in third enable time	140	(50 ÷ 158)
BOB VALUE	Operation without burner (solar or solid fuel integration)	0	(0 ÷ 126)
CIRCL-P-DHW	if the value is 01, the circulation pump runs when the hot water is enabled, but the circulation program is disabled.	0	(0 ÷ 1)
ANTILEGION	If the value is 01, every 20th time that heating takes place or once a week on Saturday at 1:00, the storage tank is heated up to 149° F	0	(0 ÷ 1)
RETURN			
HTG CIRCUIT 1/2			
MODE	When setting an alternative oparating mode this only applies to the assigned heating circuit	-----	
T-ROOM DES 1	Room temperature setting in first enable time	68	(41÷105)
T-ROOM DES 2	Room temperature setting in second enable time	68	(41÷105)
T-ROOM DES 3	Room temperature setting in third enable time	68	(41÷105)
T REDUCED	Required room temperature setting during night reduction	50	(41÷105)
T-ABSENCE	Required room temperature setting during holidays	59	(41÷105)
T-LIMIT DAY	Set the temperature value during heating time	66	(23 ÷104)
T-LIMIT N	Set the temperature value during reduction time	50	(23 ÷ 104)
HEATSLOPE	Set the Heatslope according to the installation	1,20	(0 ÷ 3)
ADAPTION	Only active if an FBR analogue room device is connected and an outdoor sensor	0	(0 ÷ 1)
OPTIM HEAT	Activates the function for automatically starting the unit	10	(0 ÷ 20)
ADAP ROOM-T	Room sensor adaptation	0	(-9 ÷ 9)
OPTIM HEAT	Heating optimisation	0	(00 ÷ 02)
MAX OPT-TIME	The start of heating is brought forward by no more than this time	2	(00 ÷ 03)
ECONO OPTI	Automatic reduction of burner disabling to the end of set heating time	0	(00 ÷ 02)
PC-ENABLE	Code number for enabling access to heating circuit data from a PC (0000= access is blocked)	0000	(0000÷9999)
SOLAR / MF			
RETURN	NOT USED		

NOTE: Some menus are visible only if the relevant sensor is wired.

5.8 Time Program Menu

The TIME PROGRAM menu contains the items shown below:

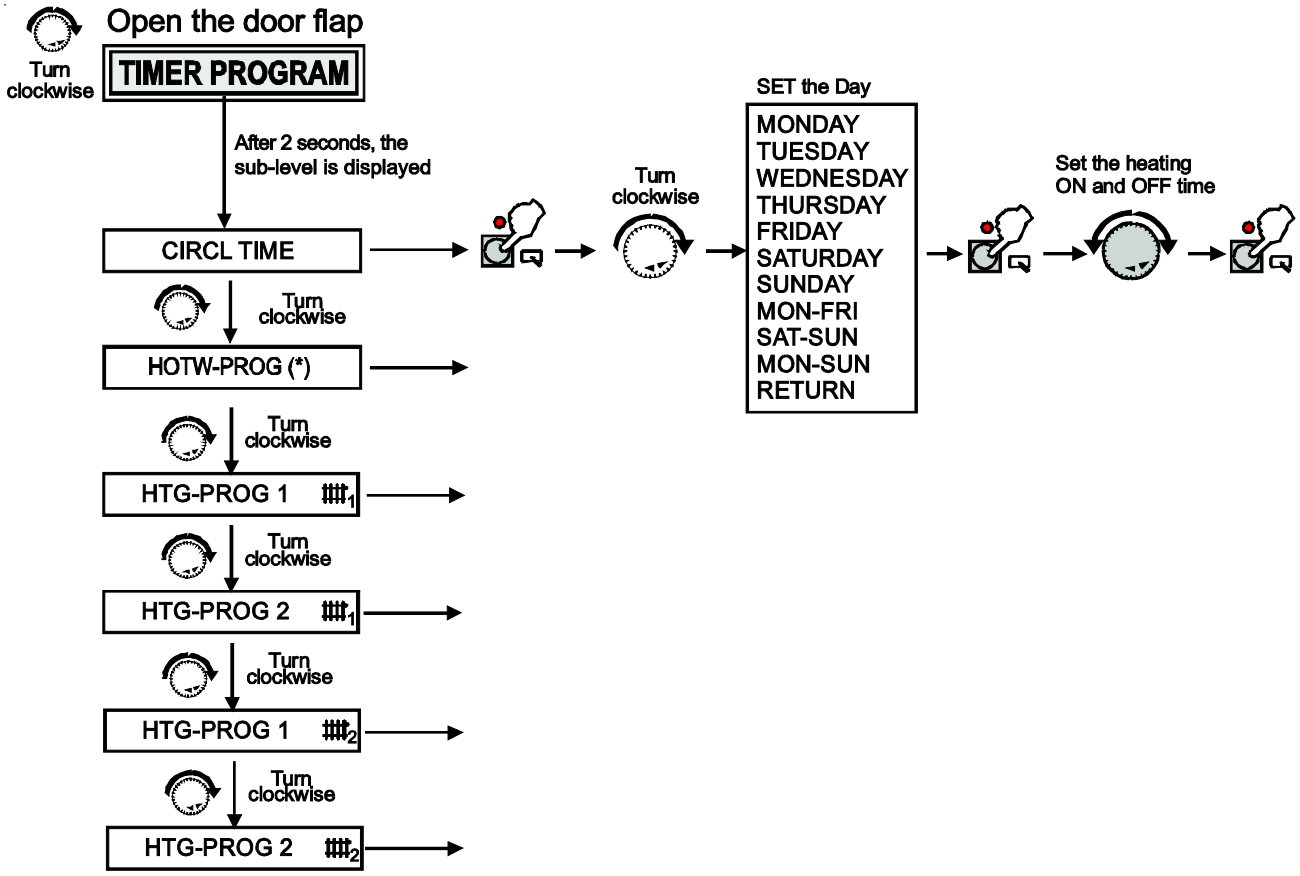


Figure 5-9: TIME PROGRAM Menu

Table 5-5: TIME PROGRAM Menu

LEVEL	DESCRIPTION
CIRCL TIME	Program for circulation pump
HOTW-PROG (*)	Program for hot water charging pump
HTG-PROG 1 1	1st Heating program for first controller heating circuit
HTG-PROG 2 1	2nd Heating program for first controller heating circuit
HTG-PROG 1 2	1st Heating program for second controller heating circuit
HTG-PROG 2 2	2nd Heating program for second controller heating circuit

(*) = Active only with parameter 1 x HW = 00

NOTE

By leaving the hour blank_ _ : _ _ the heating period is bypassed.

5.9 Expert Menu

The EXPERT menu contains the items shown below:

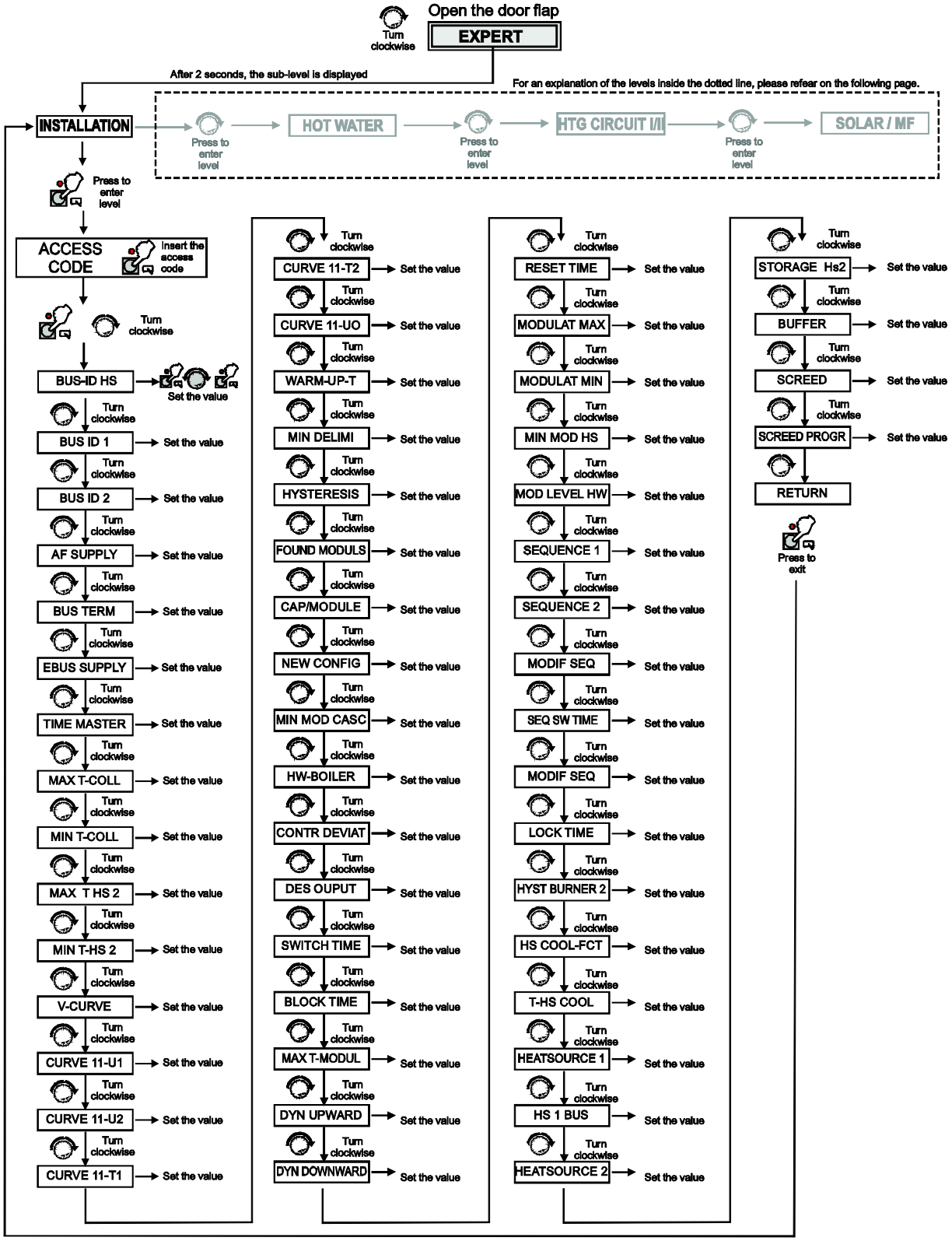


Figure 5-10: EXPERT Menu – 1 of 2

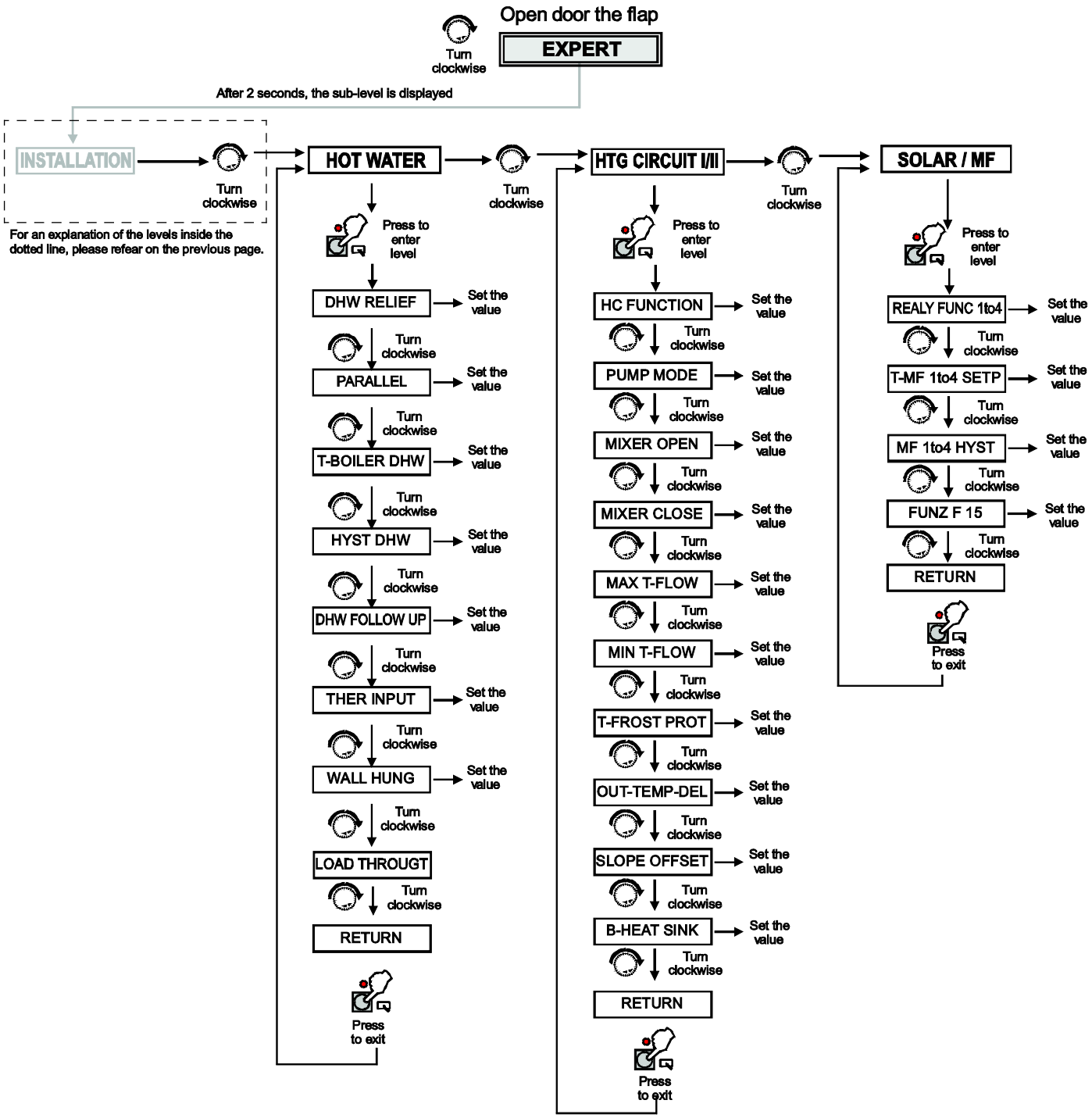


Figure 5-11: EXPERT Menu – 2 of 2

NOTE

The shaded items in the following table indicate those parameters that change according to the boiler type and whether used singly or in a cascaded configuration.

Table 5-6: EXPERT Menu

LEVEL	DESCRIPTION	ENTRY	
INSTALLATION		**DEFAULT**	**RANGE**
BUS-ID HS	Boiler Bus address only for cascade of E8 controllers	----	(01 ÷ 08)
BUS ID 1	The heating circuits are sequentially numbered.....	01	(01 ÷ 15)
BUS ID 2	The heating circuits are sequentially numbered.....	--	(01 ÷ 15)
AF SUPPLY	Outdoor sensor power supply	01	(01 ÷ 15)
BUS TERM	Bus terminating resistor	01	(00 ÷ 01)
EBUS SUPPLY	Switching eBUS supply on/off in realtion to connected	01	(00 ÷ 01)
TIME MASTER	00 no time master; 01 controller is time master	00	(01 ÷ 01)
MAX T-COLL	Protects the HS from overheating	176°F	(86 ÷ 230)
MIN T-COLL	Decreased condensation build-up in HS with low heat requirement	50°F	(50 ÷ 176)
MAX T-HS2	Protects the HS from overheating	185°F	(86 ÷ 230)
MIN T-HS2	Decreased condensation build-up in HS with low heat requirement	104°F	(50 ÷ 176)
V-CURVE	Only for 0-10V input/output	11	(00 ÷ 11)
CURVE 11 - U1	Low voltage set	0 V	(0 V÷10 V)
CURVE 11 - U2	Higth voltage set	10 V	(0 V÷10 V)
CURVE 11 - T1	Low temperature level	68°F	(32 ÷ 248)
CURVE 11 - T2	High temperature level	185°F	(32 ÷ 248)
CURVE 11 - UA	Starting with this voltage level	2 V	(0 V÷10 V)
HYSTERESIS	Dyn. Switching hysteresys stage 1	9	(4Ra÷36Ra)
FOUND MODULS	Display of burners automatically reported via BUS	0	(0÷30 min)
CAP/MODULE	After restarting the controller searches the bus systems	----	(0÷1000)
NEW CONFIG	New bus configuration		(00 ÷ 01)
MIN MOD CASC	Min. modulation cascade	0	(00 ÷ 100)
HW-BOILER	Number of stages for HW operation	0	(00 ÷ 08)
CONTR DEVIAT	Header control variance		(00 ÷ 08)
DES OUPUT	Required system output [in %]		(0 ÷ 100)
BLOCK TIME	Currently remaining value		
MAX T-MODUL	Maximum temperature of the heat generator	185°F	(122 ÷ 230)
DYN UPWARD	Dynamic heat generator connection	100	(20 ÷ 500)
DYN DOWNWARD	Dynamic heat generator deactivation	80	(20 ÷ 500)
RESET TIME	Resetting time for I-Controller	180	(5 ÷ 500)

***Table 5-6: EXPERT Menu -** Continued*

LEVEL	DESCRIPTION	ENTRY	
INSTALLATION (Cont.)		**DEFAULT**	**RANGE**
IMODULAT MAX	If this modulation degree is exceeded, the next heat	35	(10 - 60)
MODULAT MIN	If values drop this modulation degree, the last heat	35	(10 - 60)
MIN MOD HS	Connection of the next heat generator	35	(0 - 60)
MOD LEVEL HW	Entry of the set modulation degree for the heat generators	80	(40 - 100)
SEQUENCE 1	Boiler sequence 1		12345678
SEQUENCE 2	Boiler sequence 2		87654321
SEQU CHANGE	Sequence change mode	06	(01 - 06)
SEQ SW TIME	Time to sequence change	200	(10 - 800)
LOCK TIME	Min. delay time after switching on or with switching HS	01	(00 - 30)
HYST BURNER2	Solid fuel integration: hysteresys for the charging pump	4	(3.6 – 36)Ra
HS COOL-FCT	Not used	0	(0 - 1)
T-HS COOL	Not used	176	(122 - 203)
HEATSOURCE 1	Primary heat generator type	06	(00 - 06)
HS 1 BUS	Connections for HS	02	(00 - 04)
HEATSOURCE 2	Secondary heat generator type	0	(00 - 05)
STORAGE HS 2	Heat accumulator for HS2	0	(00 - 03)
BUFFER	Heater buffer storage tank	0	(00 - 03)
SCREED	Activation of screed drying process	0	(00 - 01)
SCREED PROGR	Program setting		
RETURN			
HOT-WATER			
DHW RELIEF	The charging pump is not switched until.....	0	(00 - 01)
PARALLEL	Pump parallel running	0	(00 - 03)
T-BOILER DHW	Boiler temperature setting with hot water preparation	36	(00 - 90) Ra
HYST DHW	Hot water hysteresys	5	(9 - 54) Ra
DHW FOLLOWUP	Pump run-down time	0	(00 - 30)
THER INPUT	Storage tank with thermostat	0	(00 - 01)
WALL HUNG	Boiler temperature setting with hot water preparation	0	(00 - 01)
LOAD THROUGH	The charge through function can be activated by...	0	(00 - 01)
RETURN			

Table 5-6: EXPERT Menu - Continued

LEVEL	DESCRIPTION	ENTRY	
HTG CIRCUIT 1/2			
HC FUNCTION	Heating circuit function selection	0	(00 ÷ 04)
PUMP MODE	Pump operating mode	00	(00 ÷ 03)
MIXER OPEN	Open mixer dynamic	18	(5 ÷ 25)
MIXER CLOSE	Close mixer dynamic	12	(5 ÷ 25)
MAX T-FLOW	Max flow temperature setting	176	(68 ÷ 230)
MIN T-FLOW	Min flow temperature setting	10	(50 ÷ 230)
T-FROST PROT	Frost protection temperature	32	(5 ÷ 41)
OUT-TEMP-DEL	Ouside temperature delay	0	(0 ÷ 24)
SLOPE OFFSET	Heating slope distance	9	(0 ÷ 90)
B-HEAT SINK	Circuit enable	0	(00 ÷ 01)
RETURN			
SOLAR / MF			
RELAY FUNC 1 to 4	Function selection relay 1 to 4	0	(00 ÷ 26)
T-MF1 to 4 SETP	Switching temperature relay MF1 to 4	86	(86 ÷ 194)
MF 1 to 4 HYST	Hysteresys relay MF1 to 4	9	(4 ÷ 18)
FUNZ. F15	Sersor function F15	0	(00 ÷ 02)
RETURN			

NOTE

There is another sub-menu under the EXPERT menu called EXPERT HS. See section 3.35 – High Altitude Adjustment for details.

NOTE

Some menus are visible only if the relevant sensor is wired.

5.10 Other Possible Settings

5.10.1 **Settings for Heating Circuit 1/2**

5.10.1.1 Heating Adjustment With Constant Flow Temp

(Without Outer Sensor)

Offers the possibility to have a constant flow temperature on the selected heating circuit.

- INSTALLATION menu > HC FUNC "01"

5.10.1.2 Temperature Settings For Heating Circuits

(Only After Function Selection)

- USER menu ⇒ Heating circuit I / II ⇒ FLOW TEMP DAY
- USER menu ⇒ Heating circuit I / II ⇒ FLOW TEMP NIGHT

5.10.1.3 A Second DHW Storage Tank

(Only After Function Selection)
Offers the possibility to use one of the heating zones for the preparation of a second DHW storage tank.
EXPERT menu ⇒ Heating circuit I/II ⇒ HC FUNC. "03"

5.10.1.4 Temperature Setting For Second DHW Storage Tank

USER menu ⇒ Heating circuit / II ⇒ T- HW

5.10.1.5 Swimming Pool

Offers the possibility to use one of the heating zone for the heating of a swimming pool.
EXPERT menu ⇒ Heating circuit I/II ⇒ HC FUNC "02"

5.10.1.6 Swimming Pool Temperature Setting

(Only After Function Selection)
USER menu ⇒ Heating circuit I / II ⇒ T- POOL 1 / 2 / 3

5.10.1.7 Screed Dry Program (For Floor Heating Installation)

A program setting for drying the screed.
EXPERT menu ⇒ Installation ⇒ SCREED "01"

5.10.1.8 Temperature Setting For Screed Program

USER menu ⇒ Heating circuit I / II

5.10.1.9 Signal 0 – 10 V

Inlet of 0-10 V signal for slope control through an outer regulator (connect F15).
EXPERT menu ⇒ Solar/MF ⇒ FUNC. F15 "01"

5.10.1.10 Slope And Temperature Setting with 0 – 10 V Signal

See Table 5-7 for values.
EXPERT menu ⇒ Installation ⇒ TENS SLOPE (0 to 11)
EXPERT menu ⇒ Installation ⇒ SLOPE 11 – XX (freely settable)

Table 5-7: 0-10V Signal with Slope and Temperature

Curve	U1	U2	T1	T2	UA
0	2.0 V	10.0 V	32° F	194° F	2.0 V
1	2.5 V	0.3 V	100° F	176° F	5.0 V
2	2.5 V	0.3 V	100° F	167° F	5.0 V
3	2.5 V	0.3 V	100° F	113° F	5.0 V
4	4.0 V	0.1 V	68° F	185° F	5.0 V
5	4.0 V	0.1 V	68° F	167° F	5.0 V
6	4.0 V	0.1 V	68° F	131° F	5.0 V
7	4.0 V	0.1 V	68° F	189° F	5.0 V
8	4.0 V	0.1 V	68° F	189° F	5.0 V
9	4.0 V	0.1 V	68° F	163° F	5.0 V
10	4.0 V	0.1 V	68° F	127° F	5.0 V
11	4.0 V	0.1 V	68° F	194° F	5.0 V

5.10.2 **Setting of DHW Circuit**

5.10.2.1 Operation of Pumps In Parallel

Heating pump operation during DHW production.
EXPERT menu ⇒ Hot Water ⇒ F-PUMP PARAL “00,01,02,03”

5.10.2.2 Use of a DHW Storage Tank Thermostat (On/Off)

To use an ON - OFF thermostat instead of DHW sensor.
EXPERT menu ⇒ Hot Water ⇒ THER IMPUT “01”

5.10.2.3 Antilegion

Activation of an antilegion program.
EXPERT menu ⇒ Hot Water ⇒ ANTILEGION “01”

5.10.2.4 Setting for Solar Panel Use

Use a PT 1000 sensor as a solar panel sensor.
EXPERT menu ⇒ Solar/ MF ⇒ FUNC RELAY 4 “23”

5.11 ACCESS CODE SETTING

To set the access code, press the Programming button to enter the first parameter, use the data knob to select a number, and then press the Programming button to accept the value. Repeat this procedure for each code number position.

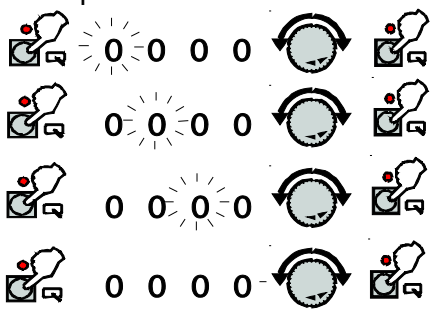


Figure 5-12: Setting the Access Code

CHAPTER 6: TROUBLESHOOTING

6.1 E8 Controller Error Codes

Fault codes are displayed in the upper right hand section of the E8 Controller display (see Figure-6-1). Use Table 6-1 (next page) to determine the fault message. There are codes for the following three different devices:

- **E8 Controller:** These are divided into four basic categories: PCB Element Faults, System Manager Faults, Communication Faults, and Internal Faults. These fault codes are shown in Table 6-2.
- **BCM (Boiler Control Module):** These fault codes are shown in Table 6-3.
- **BMM (Burner Management Module):** These fault codes are shown in Table 6-4.

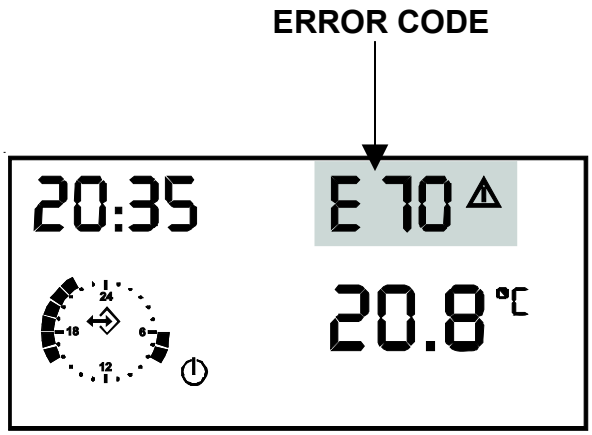


Figure 6-1: E8 Error Code Location

NOTE

When interpreting fault codes in the E8 display that refer to the E8 controller itself, the code number is directly referenced to a fault description in Table 6-2.

Displayed fault codes not listed in Table 6-2 refer to devices other than the E8 controller, such as the Boiler Management module (BMM) or Burner Controller Module (BCM). Use Table 6-1 (and the formula described below the table) to arrive at a fault number, which can be looked up in Tables 6-3 and 6-4 for the fault description.

In order to derive the error message from the code displayed in the E8 Controller display, use **Table 6-1** below to determine the working error code. To use the table, find the displayed number in the first column, identify the affected module from the second column, apply the formula from the third column, and identify the Error Table to reference from the fourth column.

Table 6-1: Determining the "Error Code" Reading from the E8 Controller Display

Observed Code	Observed Code	Code to Look Up in	Table
Code = 0	N/A	No Fault	-
Code between **1** and **255**	BMM #0 Fault	Look up code	6-4
Code between **256** and **511**	BMM #1 Fault	Subtract **256** from reading	6-4
Code between **512** and **767**	BMM #2 Fault	Subtract **512** from reading	6-4
Code between **768** and **1023**	BMM #3 Fault	Subtract **768** from reading	6-4
Code between **1024** and **1279**	BMM #4 Fault	Subtract **1024** from reading	6-4
Code between **1280** and **1535**	BMM #5 Fault	Subtract **1280** from reading	6-4
Code between **1536** and **1791**	BMM #6 Fault	Subtract **1536** from reading	6-4
Code between **1792** and **2047**	BMM #7 Fault	Subtract **1792** from reading	6-4
Code between **2048** and **65279**	N/A	Invalid Codes	-
Code above **65280**	BCM Fault	Subtract **65280** from reading	6-3

Example:

Based on the above, a code reading of "261" means the fault occurred on BMM #1. The fault code is (261 – 256 =) 5. An Error Code of 5 from the BMM Fault Codes table means "Flame Loss During Run".

6.1.1 E8 Controller Fault Codes

The table below lists the fault codes and fault descriptions associated with the E8 Controller.

Table 6-2: E8 Controller Fault Codes

FAULT CODE	FAULT DESCRIPTION
PCB Element Fault	
E 1	Intervention of the high limit thermostat (TL).
E 2	Insufficient gas pressure.
E 4	No flame detected during the ignition phase.
E 5	Loss of flame signal during boiler operation.
E 6	Over high water temperature detected by the heating sensor (SR) (>203°F).
E 10	Internal failure of the local control PCB (BMM).
E 11	Flame signal detected before the ignition cycle.
E 12	Local flow sensor failure SR1 first module.
E 14	Failure of the heating return sensor (SRR).
E 15	Difference between the global return heating temperature global sensor and the heating flow sensor greater than (>) 86 °F (rp +10).
E 16	Boiler body temperature very low: Ice forming risk
E 20	Flame signal detected after burner is OFF.
E 24	Modulating fan speed failure: failed to reach the correct speed within 30 seconds from starting of burner ignition cycle.
E 26	Modulating fan speed failure: failed to stop within 30 seconds from end of operation
E 28	Common chimney obstruction.
E29	Water inside chimney chamber.
E 30	Alteration of the operating parameters caused by EMC disturbances.
E 32	Mains supply voltage < 108 VAC.
E 40	Low system flow rate.
E 41	Presence of air in the pump (only with SensorLogic)
E 42	Pump blocked (only with SensorLogic)
E 43	Pump wire failure (only with SensorLogic)
System Manager Fault – Sensor Defective (break/short circuit)	
E 69	E8: F5 – Flow temperature sensor heating circuit 2.
E 70	E8: F11 – Flow temperature sensor heating circuit 1.
E 71	E8: F1 – Lower storage temperature sensor (Buffer).
E 72	E8: F3 – Higher storage temperature sensor (Buffer).
E 75	E8: F9 – Outer temperature sensor (AF).
E 76	E8: F6 – DHW storage temperature sensor (SPF).
E 78	E8: F8 – Boiler temperature sensor (KF).
E 80	E8: F2 – Room temperature sensor heating circuit 1.
E 83	E8: F15 – Room temperature sensor heating circuit 2.
E 135	E8: F12 – Lower DHW storage temperature sensor MF2.
E 136	E8: F13 – Boiler 2, Manifold 2 MF 3.
E 137	E8: F14 – Manifold 1, Multifunction 4.
E 138	E8: F15 – Room temperature Hc2.

***Table 6-2: E8 Controller Fault Codes** (Continued)*

FAULT CODE	FAULT DESCRIPTION
Communication Fault	
E 90	E8: BUS addresses 0 and 1. The BUS codes 0 and 1 cannot be used at the same time.
E 91	E8: BUS code occupied. The set BUS code is already used by another appliance.
E 99	E8: Internal failure.
E 200	Communication Error HS1
E 201	Communication Error HS1
E 202	Communication Error HS1
E 203	Communication Error HS1
E 204	Communication Error HS1
E 205	Communication Error HS1
E 206	Communication Error HS1
E 207	Communication Error HS1
Internal Fault	
E 81	E8: EEPROM fault. The invalid value has been replaced by the standard value.

6.1.2 BCM (Boiler Communications Module) Fault Codes

The table below lists the fault codes and troubleshooting tips associated with the BCM.

Table 6-3: BCM Fault Codes

CODE	DESCRIPTION	EFFECT	CORRECTION	RESET
E 17	Boiler pipe is frozen. Flow sensor temp. is 36°F or less.	Ignition is inhibited. Pump runs for 5 min at max speed.	Carefully defrost boiler.	AUTOMATIC - when Flow sensor is greater than 41°F.
E 18	Maximum Δ-temperature protection. Flow temperature - Return Temperature > Water Δ-Temp Protection + 50°F	All burners turned OFF and Pump ON at maximum speed.	Check the system installation.	AUTOMATIC - when Δ-temperature < Water Δ-Temp Protection.
E 19	High outlet temperature. Flow sensor temperature > 203°F.	All burners turned OFF and pump ON at maximum speed.	Check Flow Sensor or system pump.	AUTOMATIC - when Flow sensor < 176°F.
E 37	BCM: Internal fault			
E 38	Settings corrupted by electromagnetic interference.	Ignition is inhibited. Pump runs for 5 min at max speed.	Re-program the settings. Contact factory.	MANUAL - push reset switch or cycle power.
E 56	BCM: No remote control detected			
E 57	BCM: No BMM detected			
E 58	BCM: Sensor global flow detected.	Ignition is inhibited.	Close request input for manual operation.	MANUAL - push reset switch or cycle power.

6.1.3 **BMM (Burner Management Module) Fault Codes**

The table below lists the fault codes and troubleshooting tips associated with the BMM.

Table 6-4: BMM Fault Codes

CODE	DESCRIPTION	EFFECT	CORRECTION	RESET
E 1	High Limit (STB) Thermostat activated.	All burners turned OFF and pump ON at maximum speed.	Check flow sensor thermal connection to boiler.	MANUAL - push reset switch when temperature goes below limit.
E 2	Low gas pressure.	All burners turned OFF.	Check gas pressure or gas pressure switch.	AUTOMATIC - when gas pressure switch closes.
E 4	No flame detected at burner start.	Burner control lockout.	Check flame rod or combustion.	MANUAL - push reset switch or cycle power.
E 5	Flame loss during run.	Ignition retry.	Check combustion and wiring.	MANUAL - push reset switch or cycle power.
E 6	High outlet temperature. Flow sensor temperature > 203°F.	All burners turned OFF and pump ON at maximum speed.	Check flow sensor or system pump	AUTOMATIC - when Flow sensor < 176°F.
E 10	Internal failure.	Ignition is inhibited.	Contact factory for new BMM.	MANUAL - cycle the power.
E 11	Flame signal detected before ignition.	Ignition is inhibited.	Disconnect flame rod wire from BMM. If problem goes away, change flame rod and/or wire. If problem does not go away, change BMM.	MANUAL - push reset switch or cycle power.
E 12	Flow sensor fault.	All burners turned OFF.	Check flow sensor or wiring.	AUTOMATIC
E 13	Aux sensor fault.	The boiler will operate from the Flow sensor without the Aux sensor.	Check aux sensor or wiring.	AUTOMATIC

***Table 6-4: BMM Fault Codes** (Continued)*

CODE	DESCRIPTION	EFFECT	CORRECTION	RESET
E 14	Return sensor fault.	All burners turned OFF.	Check return sensor or wiring.	AUTOMATIC
E 15	Maximum Δ-temperature protection. Flow temperature - Return Temperature > Water Δ-Temp Protection + 50°F.	All burners turned OFF and Pump ON at maximum speed.	Check the system installation.	AUTOMATIC - when Δ-temperature < Water Δ-Temp Protection.
E 16	Boiler pipe is frozen. Flow sensor temperature is 36°F or less.	Ignition is inhibited. Pump runs for 5 min at max speed.	Carefully defrost boiler.	AUTOMATIC - when flow sensor is greater than 41°F.
E 20	Flame signal detected after burner is OFF.	Ignition is inhibited.	Disconnect gas valve wire from BMM. If failure goes away, check wiring or change BMM. If failure remains, check or change gas valve.	MANUAL - push reset switch or cycle power.
E 22	No air flow at burner after fan started for 30 seconds.	Ignition retry after 60 second delay and failure remains until a successful burner operation.	If fan is stopped, check supply voltage and fan wiring. If OK, try another fan. If still not working, change the BMM. If fan is ***not*** stopped, check the exhaust gas outlet for blockage. If OK, check the air pressure switch wiring. If still not working, try another air pressure switch. If still not working, change the BMM.	AUTOMATIC/MANUAL
E 23	The air pressure switch doesn't switch off.	Ignition is inhibited.	Disconnect the air proving switch. If problem goes away, install a new switch. If not, check the wiring. If wiring is OK, change BMM.	AUTOMATIC

***Table 6-4: BMM Fault Codes** (Continued)*

CODE	DESCRIPTION	EFFECT	CORRECTION	RESET
E 24	Fan speed out of control: It doesn't reach pre-purge speed within 30 seconds.	Ignition retry after 60 second delay and failure remains until we have a successful burner operation.	Check fan wiring.	AUTOMATIC/MANUAL
E 26	Fan speed out of control: It doesn't stop within 30 seconds after turned OFF.	Ignition is inhibited.	Check fan wiring.	AUTOMATIC
E 27	Air flow failure during ignition.	Restart pre-purge timer. The failure remains until we have a successful burner operation.	Check fan and wiring. Check air proving switch and wiring.	AUTOMATIC
E 30	Settings corrupted.	Ignition is inhibited. Pump runs for 5 min at max speed.	Re-program the settings. Contact factory.	MANUAL - cycle the power or send reset message.
E 32	Line voltage too low (<96 VAC).	Wait for proper line voltage (>102 VAC).	Check input voltage. Try another BMM.	AUTOMATIC
E 40	Low water flow. Low water flow switch activated.	Burners turned OFF.	Check water flow or check switch.	AUTOMATIC

CHAPTER 7: MAINTENANCE SCHEDULE

The boiler must receive regular, annual maintenance and cleaning in order to ensure reliable and efficient operation. Regular maintenance will prolong the life of the boiler. Refer to Table 7-1 for a suggested schedule of maintenance procedures.

Maintenance must be performed annually.

CAUTION!

To ensure the continued safe and efficient operation of the boiler it is highly recommended that it be checked at regular intervals and serviced when necessary, and that only original spare parts be used. Regular maintenance will prolong the life of the boiler.

WARNING!

If the boiler is not checked and serviced regularly it could cause damage to the equipment and/or harm to persons.

Table 7-1: Modulex EXT Maintenance Schedule

Maintenance Operation	Check Once a Year	Check Every 2 Years
Inspect for acceptable circulating and feed water quality and chemistry.	●	
Inspect gas assembly components.	●	
Inspect safety devices for water and gas.	●	
Inspect and clean the combustion chamber & burners.		●
Inspect and clean flame rod and ignitor.	●	
Inspect and clean the fan/blower.	●	
Check the operation of the fan/blower.		●
Check gas pressure and adjust if necessary.	●	
Inspect and clean the flue exhaust assembly.	●	
Check all water connections and valves.		●
Do combustion analysis and recalibrate if necessary.	●	
Check electrical and electronic components		●
Inspect condensate drain pipe and trap, clean if necessary.	●	
Check flow switch in the CSD-1 manifold for proper function.	●	

7.1 Instructions for Inspection and Maintenance

WARNING!

To ensure a long life of the boiler components and in order not to alter the conditions of an approved product, ONLY original AERCO spare parts may be used.

Before servicing, always carry out the following steps:

1. Disconnect the mains electrical supply to the boiler.
2. Separate the boiler from the electrical supply by means of a separating device with an open contact of at least 3 mm (for example, safety devices or power switches) and ensure that it cannot be accidentally connected to power.
3. Close the external ON-OFF gas valve installed upstream of the boiler.
4. If necessary, and in keeping with the type of work to be carried out, close any ON-OFF valves fitted on the C/H flow and return pipes, as well as the cold water inlet valve.
5. Remove the boiler front panel.
6. Perform the maintenance in keeping with official instructions and accepted standards and regulations.
7. After completing all the necessary maintenance work, always follow these steps:
   a) Open the C/H flow and return valves as well as the cold inlet valve (if previously closed).
   b) Purge and, if necessary, proceed with restoring the heating system's pressure until a pressure of 0.8 – 1.0 bar is reached.
   c) Open the external ON-OFF gas valve installed upstream of the boiler.
   d) Reconnect the appliance to the electrical supply and switch on the mains electrical supply.
   e) Test for correct operation, on the gas side and on the water side.
8. Replace the boiler front panel.

7.2 Periodic Examination Of Venting System

The inspection of the boiler and venting system should be performed every year and full maintenance should be done every two years. Please contact AERCO for further guidance on the frequency of maintenance and service requirements. Contact details can be found on the back page of this manual.

Verify that the air ventilation system, air intake and air intake pipes are unobstructed.

7.3 Proper Procedure For Cleaning Exhaust Flue

The flue exhaust system, including condensate evacuation, should be checked annually. Annual maintenance includes verifying that the flue manifold and exhaust vents are clean and unobstructed. It is necessary to inspect and clean the condensate drain pipe in particular.

7.3.1 Cleaning the Condensate Drain Line

In order to inspect and clean the condensate drain, do the following:

1. Refer to Figure 7-1, disconnect the pipe at location (A).
2. Check that no deposits have accumulated inside the drain. If there are any deposits, flush them out with clean water.
3. Reassemble the drain pipe in reverse order.

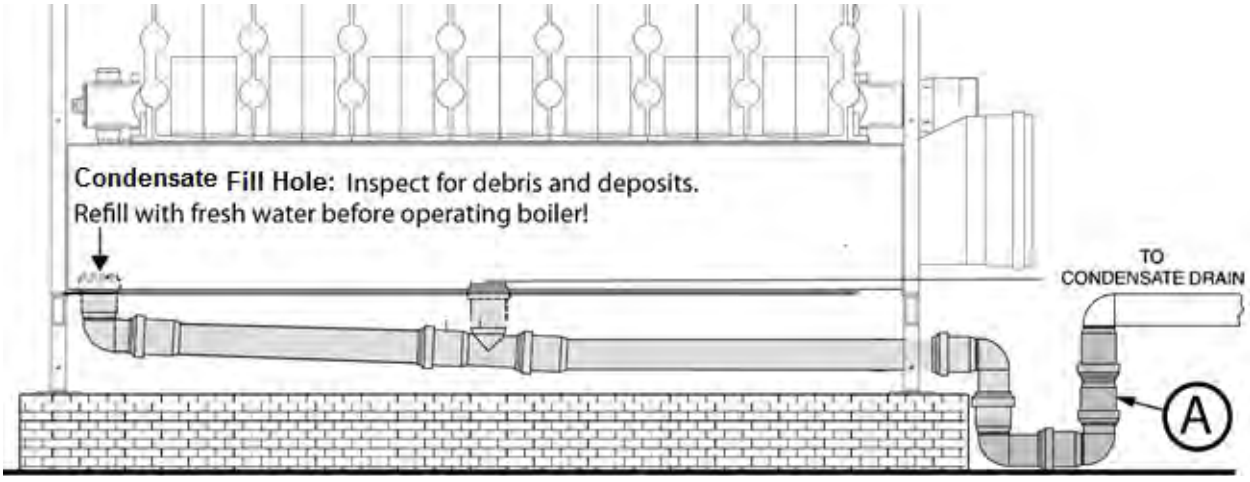


Figure 7-1: Condensate Drain Location

WARNING!

Before operating the boiler, it is absolutely necessary to verify that the condensate P-trap is filled with water. If the boiler is operated without the P-trap being properly filled, there is a danger of toxic combustion gases escaping from the unfilled condensate drain opening.

7.4 Checking CSD-1 Manifold Flow Switch

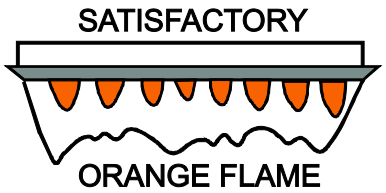
Check the function of the flow switch in the CSD-1 manifoild at the boiler hot water outlet. If it is not functioning, check the wiring to the terminal of the BMM module labeled “FL“ or replace with a new flow switch.

7.5 Visual Inspection Of The Flame

The burner must flame evenly over the entire surface when operating correctly. The flame must burn with a clear, ORANGE, stable flame. Check the flame through the flame observation port (Figure 7-2). The flame pattern should resemble the flame in the illustration below.

FLAME COLOR:

- YELLOW = CO2 HIGH NOT SATISFACTORY
- BLUE = CO2 LOW NOT SATISFACTORY
- ORANGE = OK SATISFACTORY



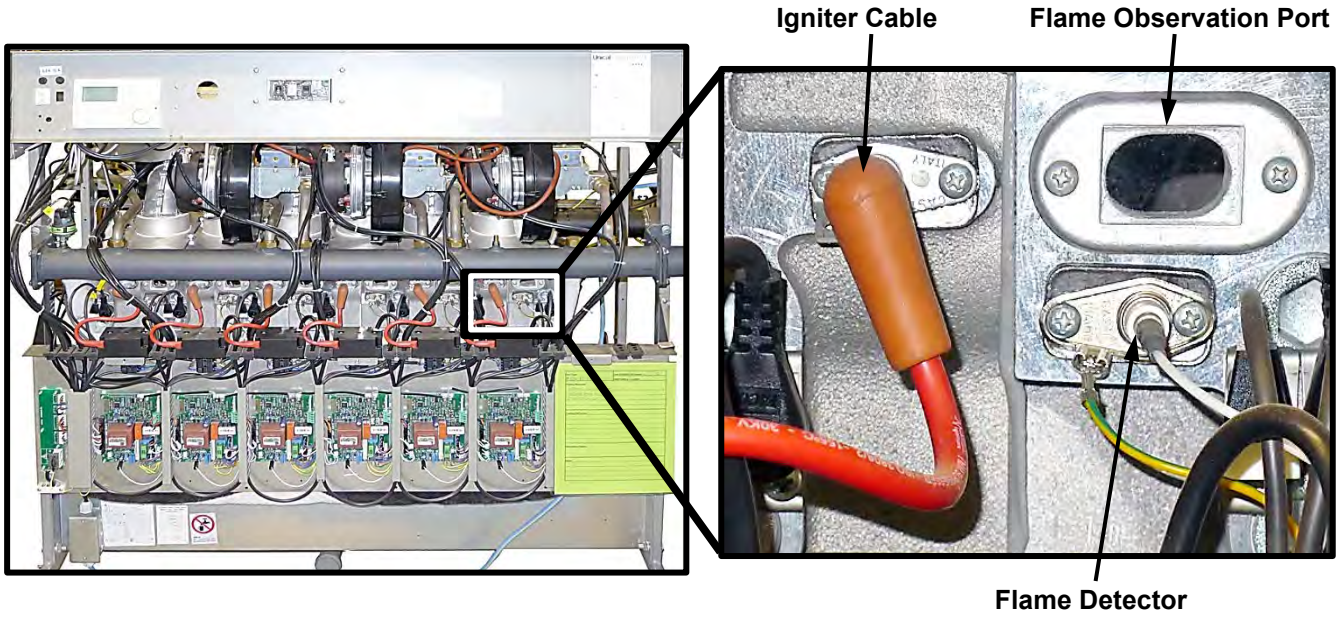


Figure 7-2: Boiler Flame Observation Port Location

7.6 Proper Reassembly and Resealing of the Vent-Air Intake System

After removing, inspecting, and possibly cleaning the flue pipes and air intake, replace the piping correctly. Refer to AERCO Venting Application Guide (GF-136-V) for information concerning Modulex venting requirements.

7.7 Pressure Switch Hoses And Connections

If pressure switch hoses need to be replaced, ensure that new hose lenghts are identical to the old hose lengths. If too long, there is an increased chance of condensation problems within the hoses. See

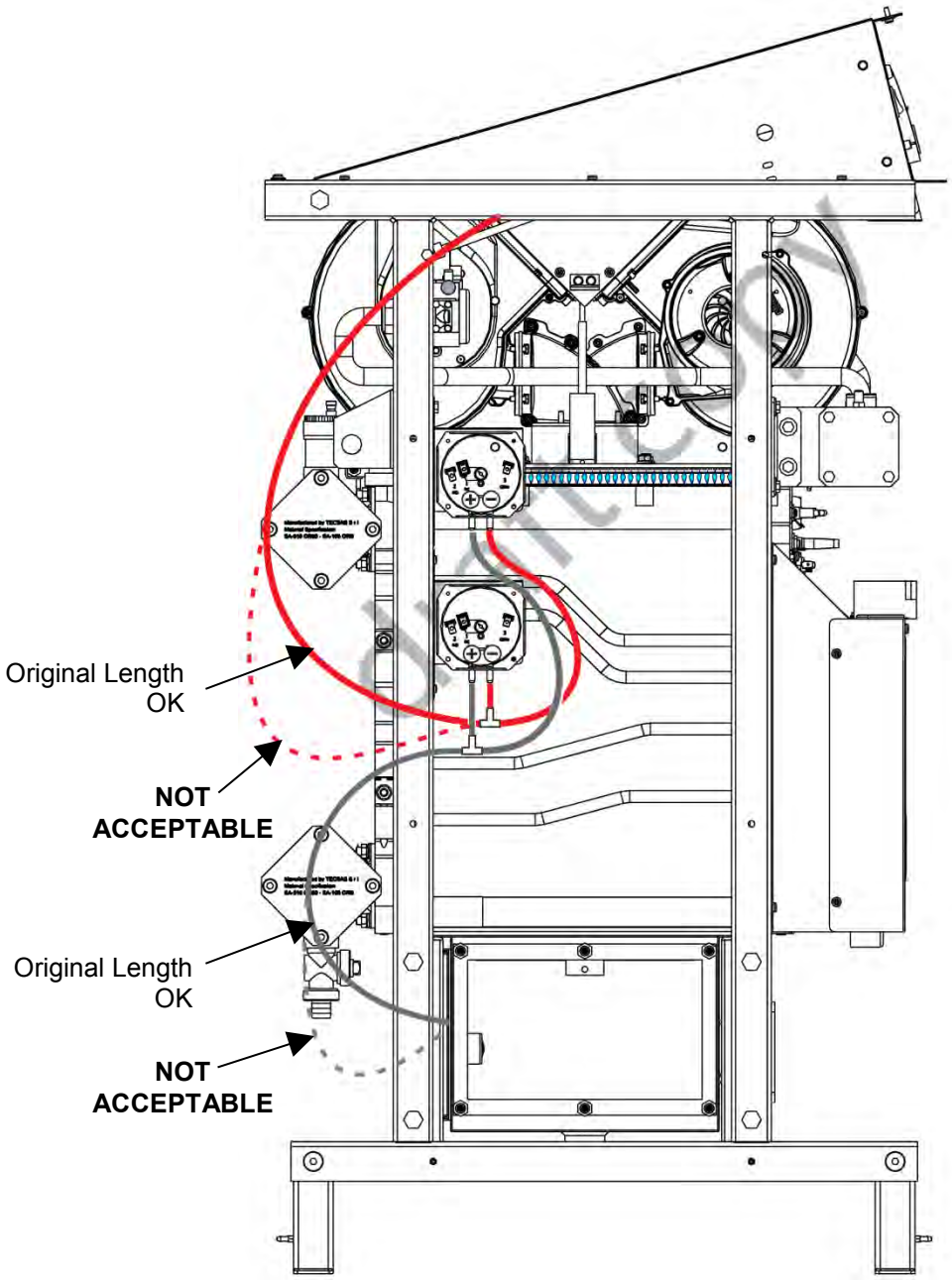


Figure 7-3: Pressure Hose Lengths

7.8 Burner / Heat Exchanger Cleaning Procedure

Dust and other particulate matter infiltrating into the combustion chamber over time will cause a decrease of heating efficiency and output due to the buildup of combusted by-products onto the thermally conductive surfaces. These surfaces must be cleaned from time to time in order to return the unit to its original specifications for thermal efficiency and heat output.

For detailed cleaning instructions, see section 7.11.

NOTE

A reduction of the input can be caused by the obstruction of the vent or air intake.

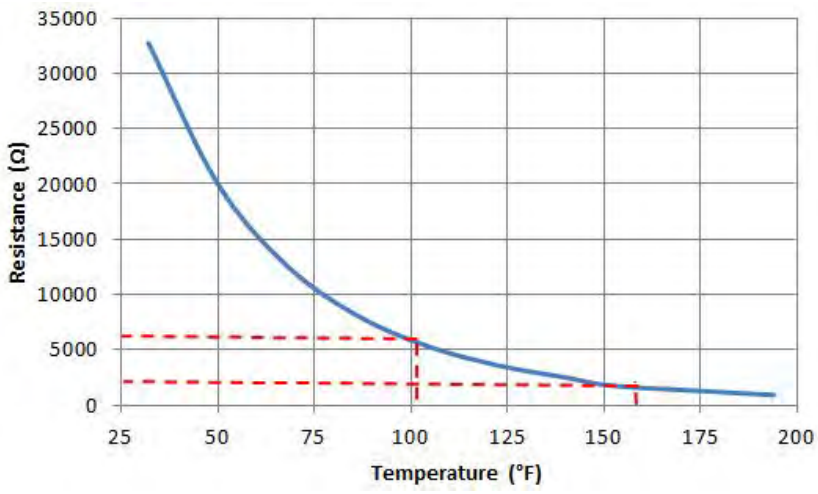
Before cleaning the boiler body sections, check the boiler input and the O_2 percentage (see section 3.33).

7.9 Heat and Return Sensor Resistance Values

Nominal resistance differences at a given temperature ratio (°C) between the primary and return heating sensors should be checked periodically by measuring the electrical resistance (ohms) between the two sensors with a voltmeter. Use the chart below to determine the correct resistance values at the given temperature ratios.

Table 7-2: Table of Resistance Values for Primary and Return Heat Sensors

°F	°C	Resistance (Ω)
32°	0°	32,755
50°	10°	20,003
68°	20°	12,571
86°	30°	8,112
104°	40°	5,363
122°	50°	3,627
140°	60°	2,504
152°	70°	1,762
176°	80°	1,263
194°	90°	920



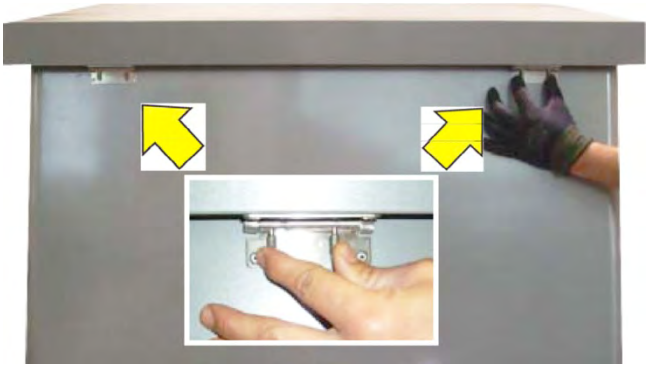
Example: At 104 °F (40°C), the nominal resistance is 5,363 Ohm. At 194 °F (90°C), the nominal resistance is 920 Ohm

7.10 Unit Disassembly

To disassemble the unit for maintenance, do the following:

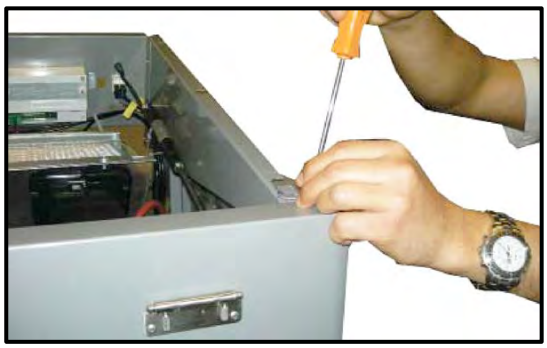
Disassembling the EXT Boiler for Maintenance

1. Switch OFF external electrical power and CLOSE the gas supply valve upstream from the boiler, and ensure it is completely closed.
2. Unlatch and raise the top lid (Figure 7-4).
3. Remove screws from top of unit holding the rear and side panels in place (Figure 7-5). Remove panels by tilting away from unit, then lifting up and out (Figure 7-6). Note, the front and rear panels must be removed before the side panels can be removed.



NOTE
Commercial units have a special latch kit to hold up the top plate, Unical part number 00362418

Figure 7-4: Unlatch Top Lid (Step 2)



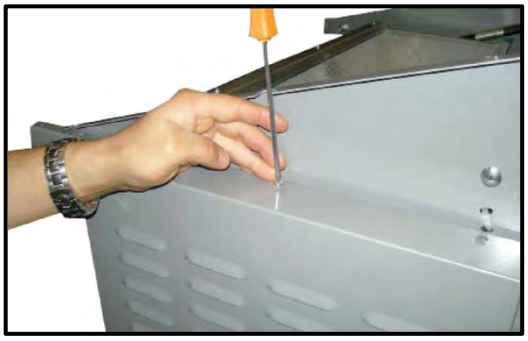


Figure 7-5: Remove Screws at Edges and Remove Side and Rear Panels (Step 3)

Figure 7-6: Remove Panels (Step 3)

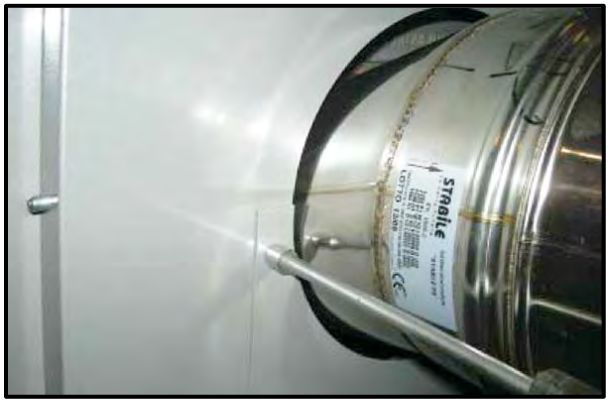


Figure 7-7: Remove Flue Assembly (Step 4)

Disassembling the Boiler for Maintenance – Continued

4. Remove screws from around exhaust outlet opening and remove flue assembly from unit (Figures 7-7 & 7-8).

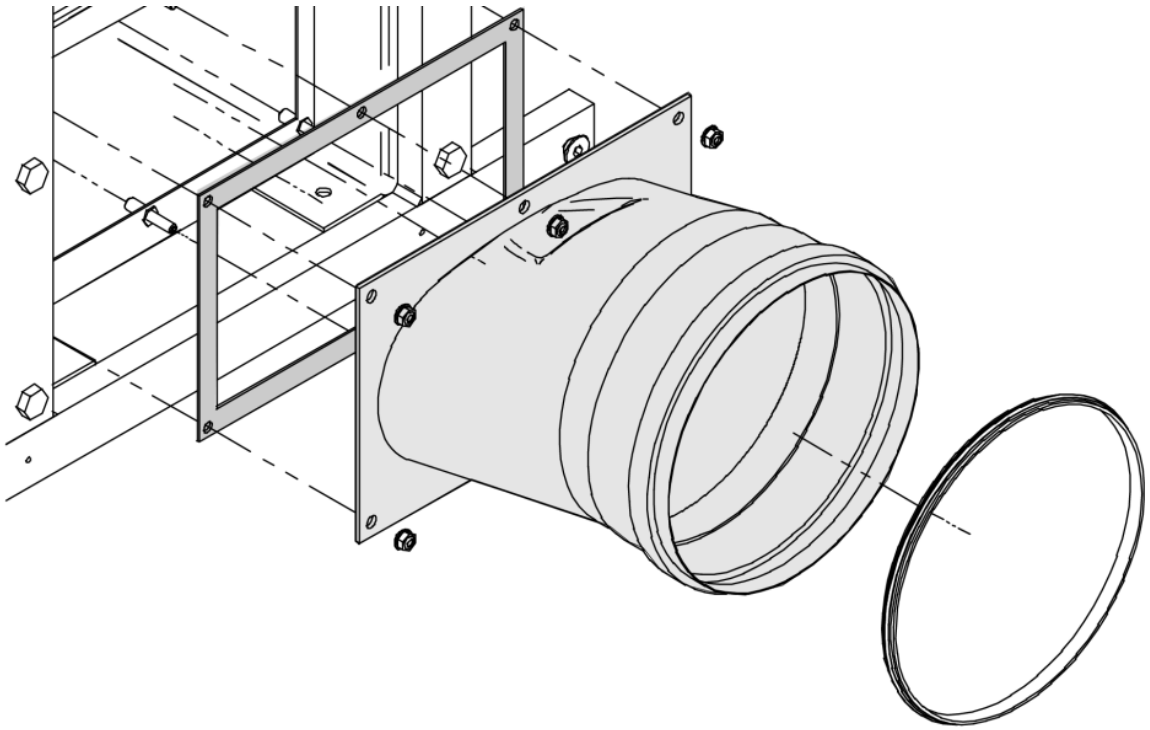


Figure 7-8: Flue Removal (Step 4)

5. On each side of the air intake manifold, unlatch spring clips holding it in place (Figure 7-9).

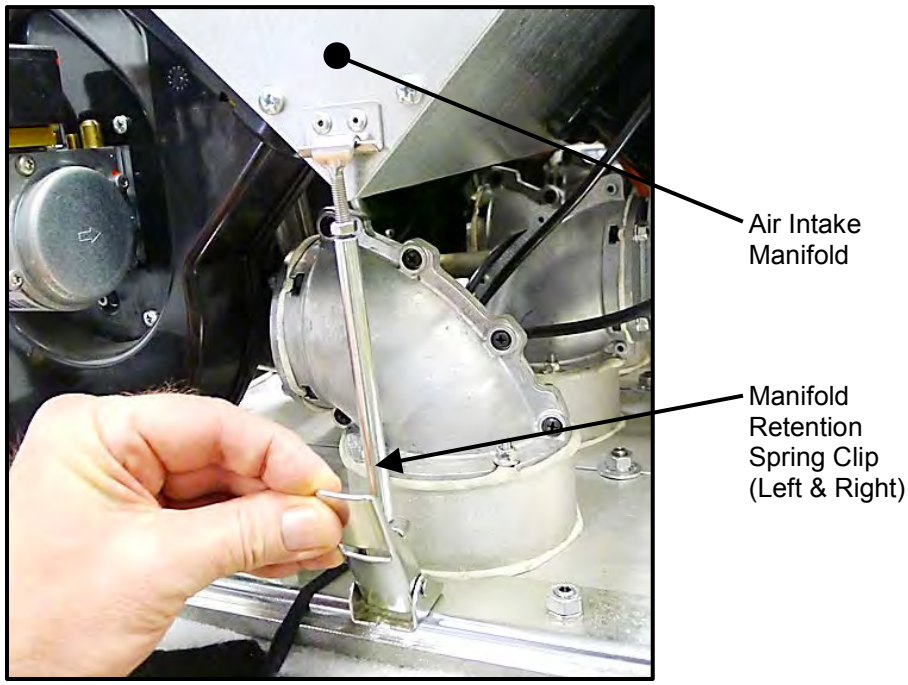


Figure 7-9: Unlatch Spring Clips from Left and Right Side of Manifold (Step 5)

Disassembling the Boiler for Maintenance – Continued

6. Remove the red hoses (quantity depends on model) from bottom side of manifold (Figure 7-10), then lift entire manifold from the unit.

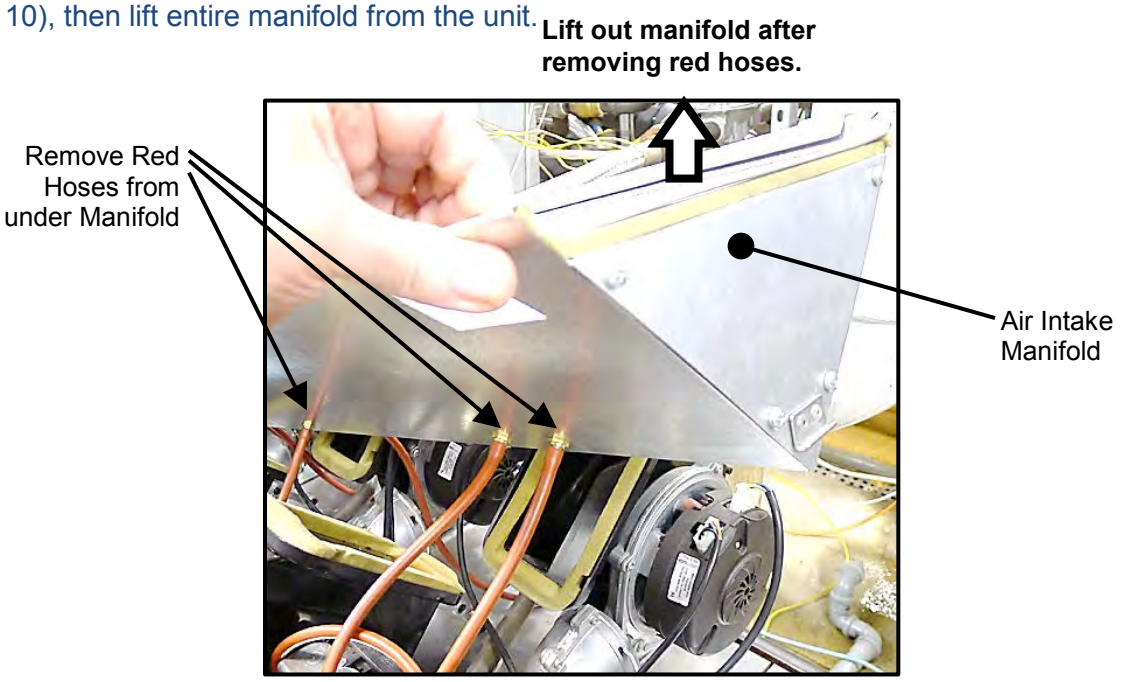


Figure 7-10: Removing Red Hoses and Manifold from Unit (Step 6)

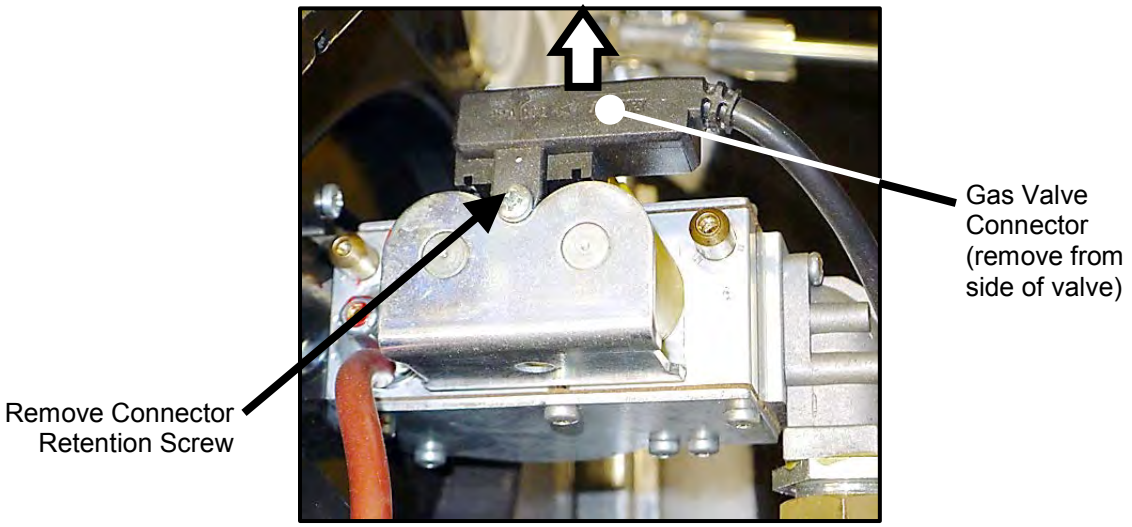


Figure 7-11: Removing Gas Valve Connector from All Gas Valves (Step 7)

7. On each gas valve, unscrew the Gas Valve Connector with a Phillips head screwdriver. Remove connector (Figure 7-11) from the side of each gas valve.

Disassembling the Boiler for Maintenance – Continued

8. On each fan, remove each (of two) Fan Connectors (Figure 4-10)

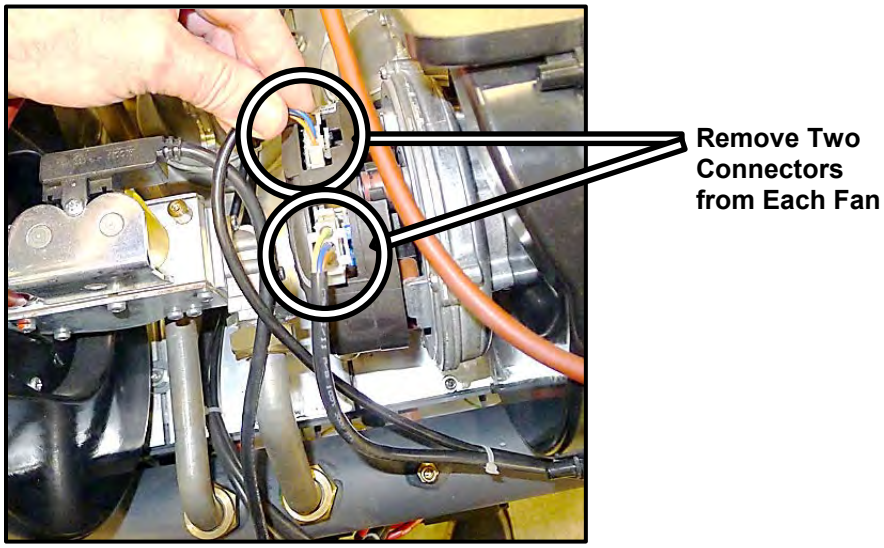


Figure 7-12: Removing Both Fan Connectors from All Fans (Step 8)

9. Burner maintenance may be performed on all burner modules simultaneously or on each one separately, as described in a) and b) below:

   a) **All Modules:** Use a 13mm wrench to remove all "**A**" and "**C**" nuts (surrounded by horizontal dotted lines in Figure 7-11, below). Leave the "**B**" screws affixed so all burner plates may be lifted together. Then complete the remainder of the instructions in this section.

   b) **Separate Modules:** Use a 13mm wrench to remove only the "**A**" and "**C**" nuts on either side of the module in question (vertical dotted lines in figure 7-12), then remove the "**B**" Phillips screw at the end of the burner module. You can then skip the remaining steps in this section and continue with section 11 - Cleaning the Burner Module and Combustion Chamber.

10. To access individual burner modules, refer to Figures 7-13 and 7-14 and, using a standard Phillips head screwdriver, remove the "**C**" screws of each burner module to be accessed. These are the screws that are located at each *end* of each burner plate (2 per plate).

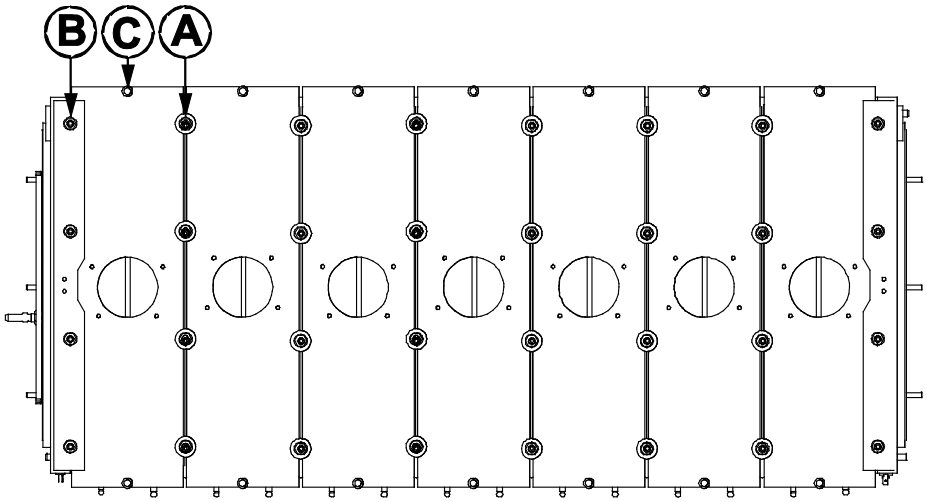


Figure 7-13: Removal of Burner Plate Hardware (Steps 9, 10, 11)

Disassembling the Boiler for Maintenance – Continued

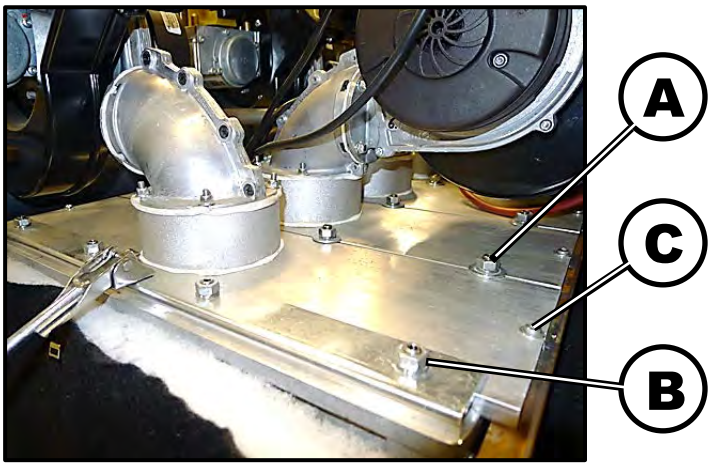


Figure 7-14: Removal of Burner Plate Hardware (Steps 9, 10, 11)

11. Refer to Figure 7-15 and remove the two bolts (white arrows) at each end of the gas collection tube that mount it to the boiler chassis.

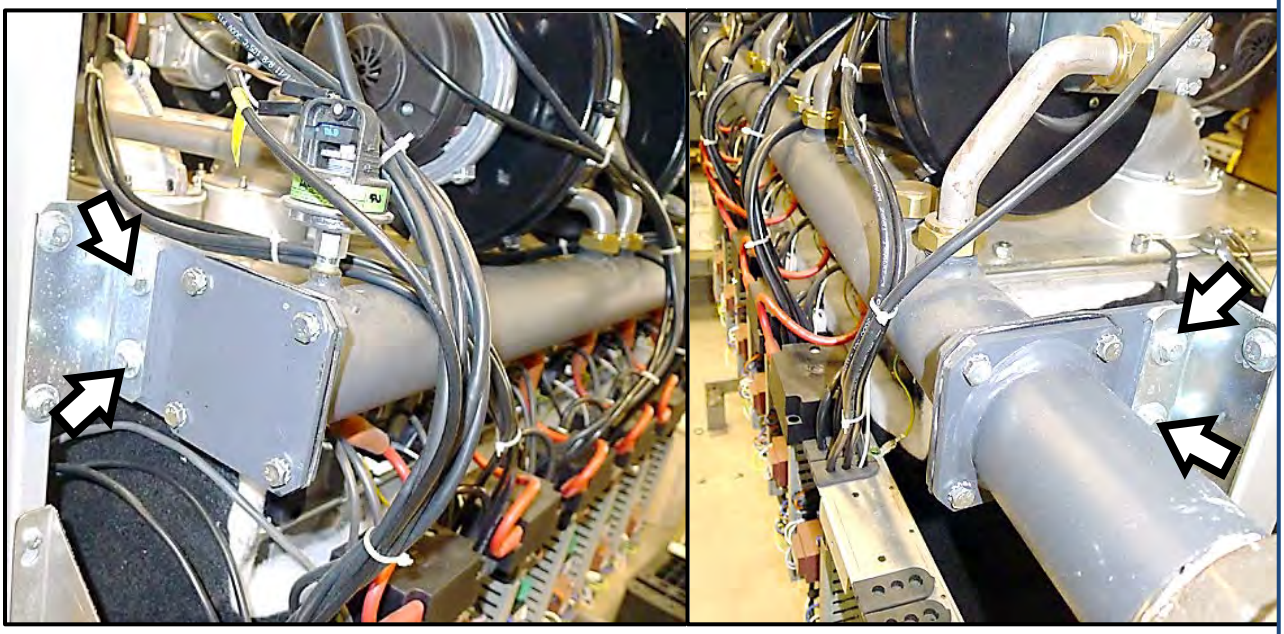


Figure 7-15: Uninstall Gas Collector Tube from Boiler Chassis (Step 12)

Disassembling the Boiler for Maintenance – Continued

12. Refer to Figure 7-16 and, using a 10mm socket wrench, remove the four bolts/nuts (white arrows) to separate the Gas Collector Tube Flange from the gas supply piping.

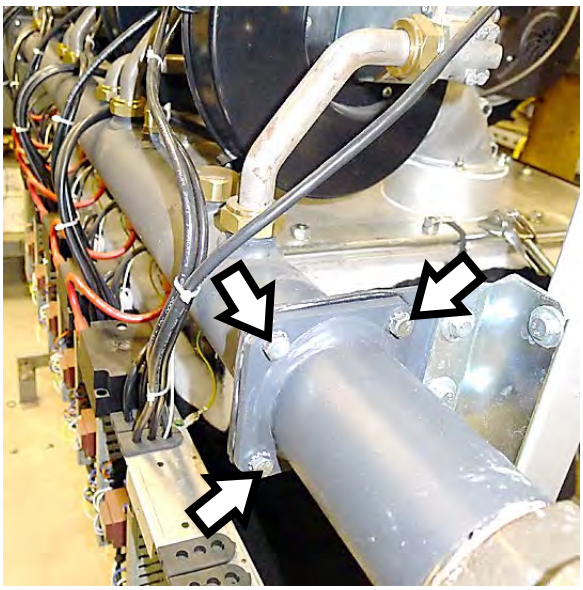


Figure 7-16: Uninstall Gas Collector Flange from Gas Supply Piping (Step 13)

13. Refer to Figure 7-17 for location of burner assembly lifting screws. There is one at each end. Elevate the burner assembly slightly until screw is lined up with the tab hole, then unscrew the lift screw until it extends into the hole. Do this at both ends.

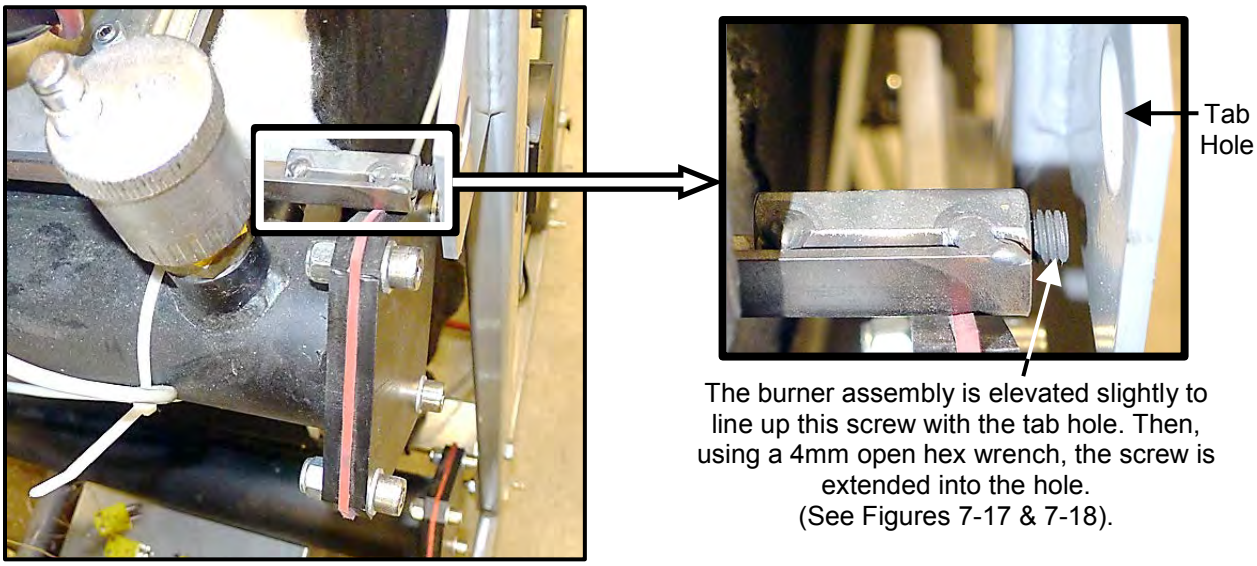


Figure 7-17: Location of Burner Assembly Lifting Screw (Step 14)

Disassembling the Boiler for Maintenance – Continued

Figure 7-18: Unscrewing Lift Screw into Tab Hole (Step 14)

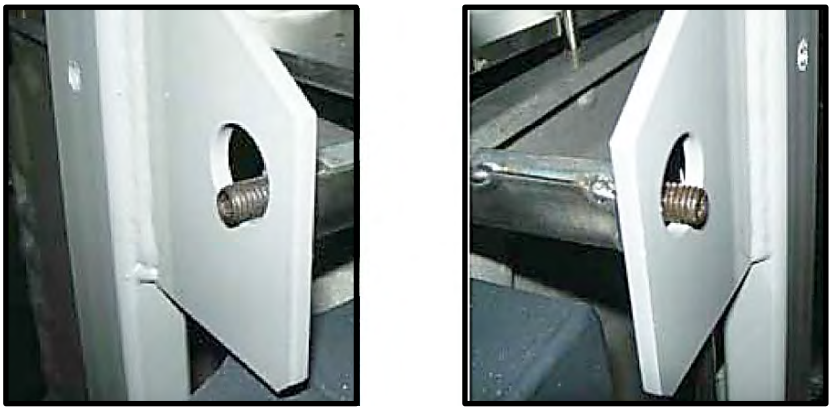


Figure 7-19: Lift Screws Extended into Tab Holes, Left and Right Sides (Step 14)

14. Refer to Figure 7-20, then lift up the front of the burner assembly and raise up until the two lift pins can be inserted (Figure 7-22) at the left and right sides in order to hold up the burner assembly.

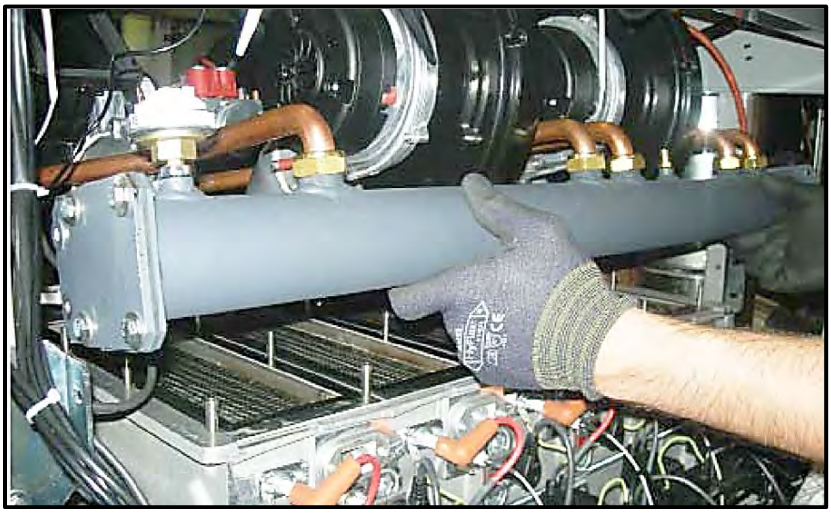


Figure 7-20: Lifting Burner Assembly from Front (Step 15)

Disassembling the Boiler for Maintenance – Continued

NOTE

The check valve (1 in Figure 7-21) should at this time be checked to ensure that it moves freely and closes properly.

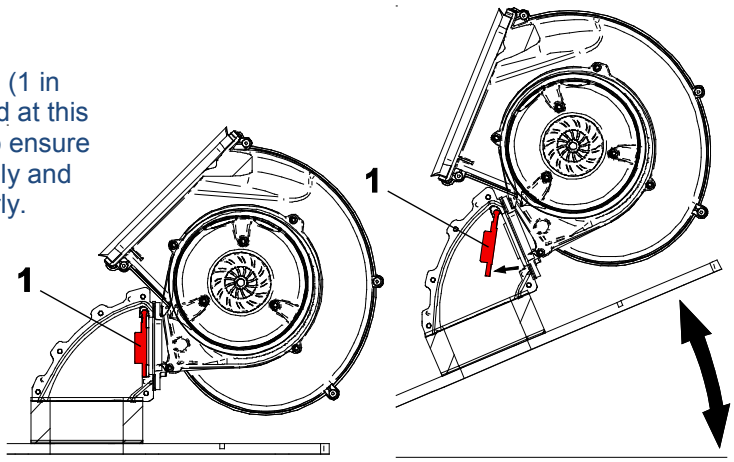


Figure 7-21 Lifting Burner Assembly and Location of Check Valve (Step 1)

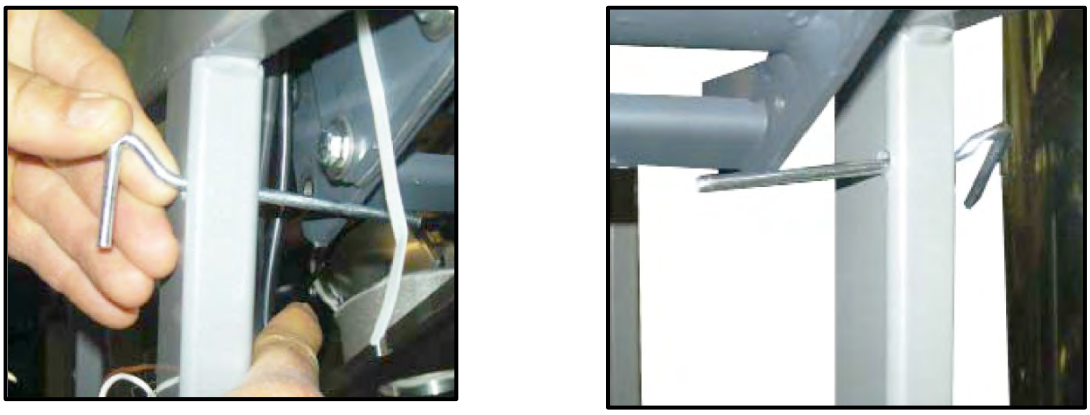


Figure 7-22: Lift Pins Inserted into Lift Holes, Left and Right Sides (Step 15)

7.11 Cleaning the Burner Module and Combustion Chamber

After lifting up the burner assembly, the individual burner modules are now exposed and may be cleaned. Follow the instructions to clean the burner modules.

Cleaning the Burner Modules

Figure 7-23: Burner Modules Exposed for Cleaning

Cleaning the Burner Modules – Continued

1. Carefully lift each burner module from its position. Remove both the module and the gasket. Discard the used gasket, as each one will be replaced at reassembly.

WARNING!

The burner gaskets *MUST* be replaced at every cleaning.

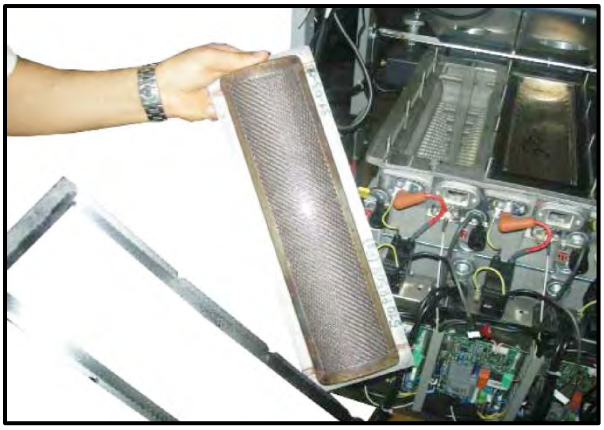


Figure 7-23: Removing Individual Burner Module and Gasket (Step 1)

2. Use only compressed air to clean the burners by blowing into the "side flame" side of the burner mesh. See Figure 7-24.

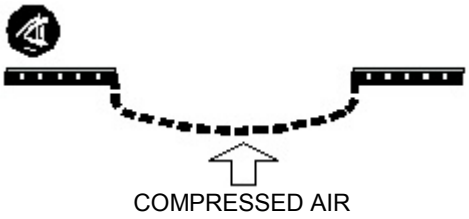


Figure 7-24: Burner Module Profile Compressed Air Orientation (Step 17)

3. Visually inspect burner mesh and the spot welds at the L profile (where the mesh is welded to the frame) for integrity. If welds are compromised or the burner mesh is damaged, the burner module should be replaced.
4. Once all the burner modules are removed, wash the combustion chamber underneath with water. Avoid getting the electrical harnesses and components wet.
5. During this operation, inspect to the condensate drain pipe to determine if it is free of obstructions; wash water should drain freely from the condensate drain pipe.
6. Blow the combustion chamber with compressed air and attempt to remove any dirt clogging the aluminum pins of the combustion chamber wall. If any buildup is found on the heat exchanger, particularly on the lower heat exchanger pins, remove it with a stiff plastic brush.
7. Once the washing of the aluminum sections is finished, make sure the condensate drain and trap are free of obstructions. Clean them if necessary.
8. Inspect the flue exhaust section, including the exhaust piping.

7.12 Reassembly of the Burner Modules

Follow the instructions to reassemble the burner modules:

Reassembling the Burner Modules

1. After the cleaning of the boiler combustion chamber and/or the burners, reposition the burners in their proper positions.
2. Position the new graphite gaskets onto each burner module and ensure proper positioning.

Proceed with reassembly, performing whichever disassembly operation was chosen (all or

WARNING!

The burner gaskets *MUST* be replaced at every cleaning.

3. individual method) in reverse order. For individual burner module reassembly (only) skip **steps a-d** proceed directly to **step e**.
    a) Lower burner assembly
    b) Remove left and right lift pins at front and lift screws at rear.
    c) Reinstall gas supply pipe to gas collector flange (4 bolts).
    d) Reinstall gas collector tube ends onto boiler frame (2 screws per end).
    e) Reinstall bolts “A,” “B” and “C” screws to secure burner assembly to boiler body.

NOTE

Tighten the burner bolts with a torque of **13 Nm**.

    f) Reassemble red hoses to the air intake manifold, place manifold onto the blowers, then reattach tension spring clip to left and right ends of manifold.
    g) Proceed to section 7.13 for final procedures before returning boiler to service.

7.13 Final Procedures After Maintenance

Before returning the boiler to service, the following procedures must be performed:

Final Procedures after Maintenance

1. Before lighting the boiler make sure the condensate drain pipe has been filled with water (Figure 7-1).
2. Ensure the seal between the gas supply pipe and the gas collection tube flange are tight. To do this, open the external gas valve and bubble check for leaks using a soap solution.
3. When a single burner is ignited, check immediately to ensure that the gas valve and the relevant premixing chamber are operating correctly.
4. Perform the combustion gas analysis and check all parameters (section 3.33).
5. Make sure that all the pressure test nipples, previously opened, have been closed.

7.14 Maintenance Kit Part Number

To order the MODULEX annual and 24-Month Fireside Inspection maintenance kits, contact AERCO International and use P/N 58086-TAB, replacing the "TAB" with the appropriate suffix as determined in Tables 7-3 and 7-4.

Annual Maintenance Kits contain a flame detector and igniter, while the 24-Month Fireside Inspection Kits contain flame detector, igniter, and burner gaskets.

Table 7-3: MLX Annual Maintenance Kit (58086-TAB)

P/N Suffix	DESCRIPTION
-01	**EXT-321**, ANNUAL MAINTENANCE KIT
-02	**EXT-481**, ANNUAL MAINTENANCE KIT
-03	**EXT -641** OR **EXT-1530**, ANNUAL MAINTENANCE KIT
-04	**EXT -802** OR **EXT-1912**, ANNUAL MAINTENANCE KIT
-05	**EXT -962** OR **EXT-2295**, ANNUAL MAINTENANCE KIT
-06	**EXT -1123** OR **EXT-2677**, ANNUAL MAINTENANCE KIT
-11	**EXT -3060**, ANNUAL MAINTENANCE KIT

Table 7-4: MLX 24-Month Fireside Inspection Maintenance Kit (58086-TAB)

P/N Suffix	DESCRIPTION
-12	**EXT -321**, 24 MONTH FIRESIDE INSPECTION KIT
-13	**EXT -481**, 24 MONTH FIRESIDE INSPECTION KIT
-14	**EXT -641**, 24 MONTH FIRESIDE INSPECTION KIT
-15	**EXT -802**, 24 MONTH FIRESIDE INSPECTION KIT
-16	**EXT -962**, 24 MONTH FIRESIDE INSPECTION KIT
-17	**EXT -1123**, 24 MONTH FIRESIDE INSPECTION KIT
-18	**EXT -1530**, 24 MONTH FIRESIDE INSPECTION KIT
-19	**EXT -1912**, 24 MONTH FIRESIDE INSPECTION KIT
-20	**EXT -2295**, 24 MONTH FIRESIDE INSPECTION KIT
-21	**EXT -2677**, 24 MONTH FIRESIDE INSPECTION KIT
-22	**EXT -3060**, 24 MONTH FIRESIDE INSPECTION KIT

7.15 Accessory Kit Part Numbers

The following Modulex EXT Accessory Kits are available:

- **58081**, for Modulex EXT models: 321, 481, 641
- **58082**, for Modulex EXT models: 802, 962, 1123

The contents of each are listed in the table below:

Table 7-5: MLX Accessory Kits 58081 & 58082

				Included in Kit	
Item #	**Qty.**	**Part No.**	**Description**	**58081**	**58082**
1	1	123675-2	GAUGE, PRESSURE/TEMP	✓	✓
2	1	49051	4” EXHAUST CONN. PART FOR PVC	✓	
3	1	49050	6” EXHAUST CONN. PART FOR PVC		✓
4	2	59039	6” WORK DRIVE HOSE CLAMP	✓	✓
5	1	93087	1-1/2 X 1-1/4 PVC RED.CLAMP	✓	✓
6	1	64105	FLOW SWITCH	✓	✓

CHAPTER 8: SPARE PARTS DRAWING AND LISTS

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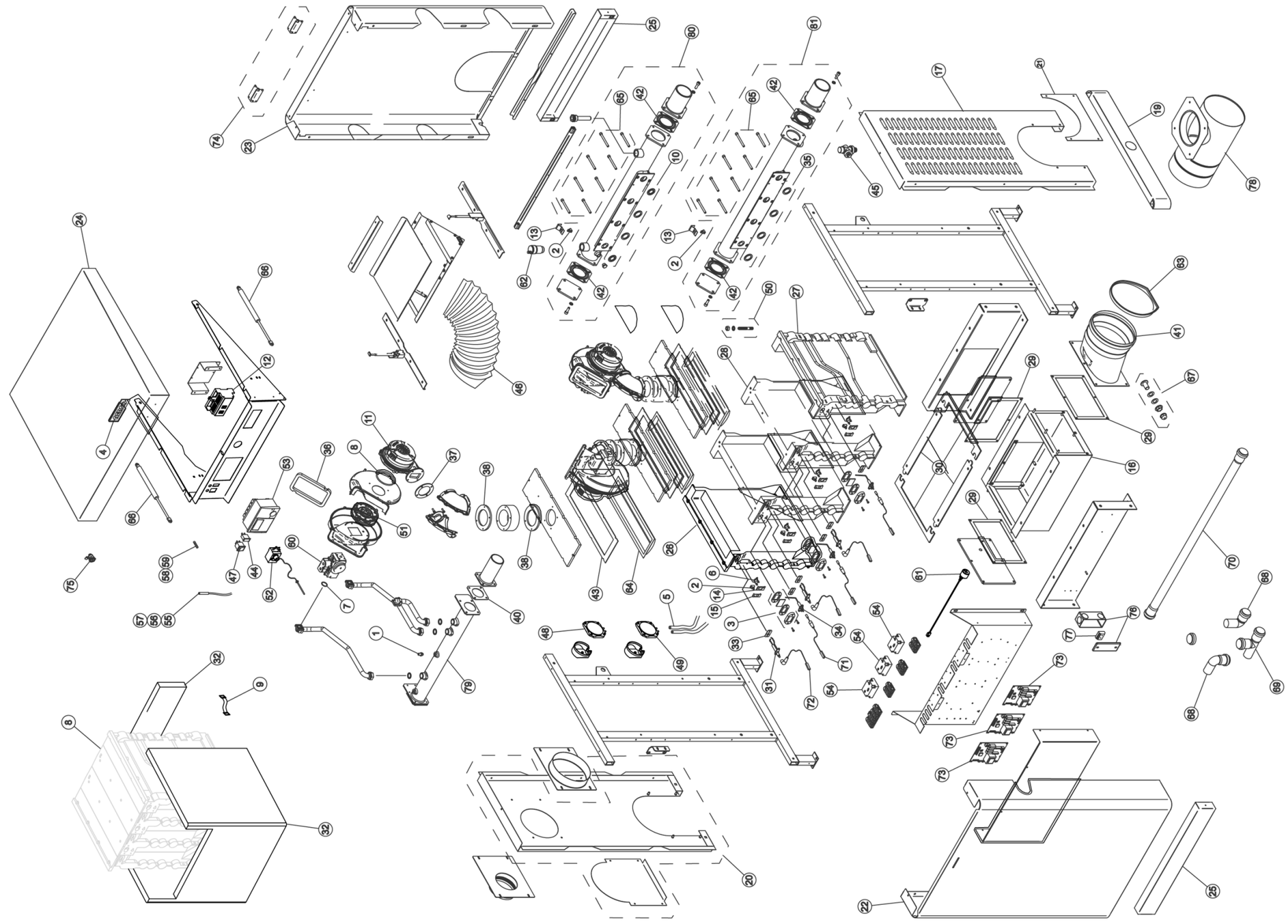

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Modulex EXT Parts List (Models EXT 321, 481, 641, 802, 962, & 1123)

No.	Part No.	Description
1	95000020	Outlet pressure G1/8"
2	95000021	Heating Sensor 3/4" T7335D1016 10K
3	95000467	Observation Port, Combustion Chamber
4	95362314	AERCO plate
5	95000657	Silicone tube 4 X 8
6	95262953	High Water Temperature Switch
7	95000709	Gasket OR 22,22 X 2,62
8	95263765	Gasket OR 3,0 X 63
9	95000845	Spring clips
10	95000846	Diaphragms Flow Manifold
11	95263075	Blower
12	95000962	BCM Control Unit
13	95211352	Heating Sensor Bracket
14	95211357	Safety Thermostat Bracket
15	95211358	Heating Sensor Bracket
16	95213277	Boiler Sump Assembly, EXT 321
	95213280	Boiler Sump Assembly, EXT 481
	95213284	Boiler Sump Assembly, EXT 641
	95213287	Boiler Sump Assembly, EXT 802
	95213291	Boiler Sump Assembly, EXT 962
	95213294	Boiler Sump Assembly, EXT 1123
17	95213301	Right Side Panel
18	95213953	Left Side Panel
19	95213303	RH lateral Panel
20	95213304	LH lateral Panel
21	95213305	Locking plate flue MODULEX EXT
22	95213307	Casing Front Panel, EXT 321 & EXT 481
	95213320	Casing Front Panel, EXT 641 & EXT 802
	95213323	Casing Front Panel, EXT 962 & EXT 1123
23	95213686	Casing Rear Panel, EXT 321 & EXT 481
	95213687	Casing Rear Panel, EXT 641 & EXT 802
	95213688	Casing Rear Panel, EXT 962 & EXT 1123
24	95213309	Casing Top Panel, EXT 321 & EXT 481
	95213318	Casing Top Panel, EXT 641 & EXT 802
	95213327	Casing Top Panel, EXT 962 & EXT 1123
25	95213315	Front/Rear Panel, EXT 321 & EXT 481
	95213321	Front/Rear Panel, EXT 641 & EXT 802
	95213325	Front/Rear Panel, EXT 962 & EXT 1123
26	95000930	Burner Chamber, End Section LH

No.	Part No.	Description
27	95000931	Burner Chamber, End Section RH
28	95000932	Burner Chamber, Centre Section
29	95250612	Sealing Gasket-Flue box Outlet
30	95250618	Gasket - H/E-Flue Box, EXT 321
	95250619	Gasket - H/E-Flue Box, EXT 481
	95250620	Gasket - H/E-Flue Box, EXT 641
	95250621	Gasket - H/E-Flue Box, EXT 802
	95250622	Gasket - H/E-Flue Box, EXT 962
	95250623	Gasket - H/E-Flue Box, EXT 1123
31	95250624	Igniter
32	95250847	Boiler Body Insulation, EXT 321
	95250848	Boiler Body Insulation, EXT 481
	95250849	Boiler Body Insulation, EXT 641
	95250850	Boiler Body Insulation, EXT 802
32	95250851	Boiler Body Insulation, EXT 962
	95250852	Boiler Body Insulation, EXT 1123
33	95251210	Graphite Electrode Gasket
34	95251274	Flame Detector
35	95251529	Return Manifold Gasket
36	95251587	Fan Blower Manifold Gasket
37	95251588	Fan NRG118 Gasket
38	95251592	Silicone Gasket
39	95251851	Sheath Bulbs
40	95251607	Gas Manifold Gasket
41	95251611	Flue Terminal D.200
42	95251841	Water Manifold Gasket
43	95261173	Burner Gasket
44	95263570	Signal Light
45	95261357	Boiler Drain Cock G 3/4"
46	95263452	Suction Hose
47	95261558	Main Switch
48	95263756	Air Pressure Switch 43/40 pa
49	95263767	Air Pressure Switch 280/245 pa
50	95262011	Screw + Washer + Nut kit (12 pcs)
51	95262129	Mixer DUNGS SW12 - RG130 - nozzle D.7
52	95262137	Thermostat 90-110°
53	95262207	E8 - System Manager
54	95263579	Ignition Transformer
55	95262208	External Sensor E8 - System Manager
56	95262209	Mixed Flow Sensor E8 - System Manager
57	95262211	Tank Sensor E8 - System Manager

No.	Part No.	Description
58	95262220	10A Fuse
59	95262221	6,3A Fuse
60	95263074	Gas Valve
61	95262565	Level Sensor
62	95262579	Automatic Air Vent G3/4"
63	95262765	D.200 EPDM Gasket
64	95263419	Mesh Burner
65	95262925	Screw UNI 5931 M8X110
66	95262926	Gas Spring
67	95262932	Gas Cap Inspection
68	95310512	Drain Elbow HTB DN40
69	95310513	Drain TEE HTEA DN 40/40
70	95310515	Drain Pipe 1M LG. DN 40
71	95611085	Flame Detector Cable
72	95611593	Igniter Cable
73	95000963	Electronic Board
74	95262930	Hinge Casing
75	95262931	Casing Top Panel lock
76	95000721	Junction Box
77	95261720	Terminal Strip
78	95251877	Flanged Flue Outlet Terminal
79	95372088	Gas Inlet Header Modulex 2/3 Elements, EXT 321 & EXT 481
	95372089	Gas Inlet Header Modulex 4/5 Elements, EXT 641 & EXT 802
	95372090	Gas Inlet Header Modulex 6/7 Elements, EXT 962 & EXT 1123
80	95372093	Flow Header, 2 Elements, EXT 321
	95372094	Flow Header, 3 Elements, EXT 481
	95372095	Flow Header, 4 Elements, EXT 641
	95372096	Flow Header, 5 Elements, EXT 802
80	95372097	Flow Header, 6 Elements, EXT 962
	95372098	Flow Header, 7 Elements, EXT 1123
81	95372099	Return Header, 2 Elements, EXT 321
	95372100	Return Header, 3 Elements, EXT 481
	95372101	Return Header, 4 Elements, EXT 641
	95372102	Return Header, 5 Elements, EXT 802
	95372103	Return Header, 6 Elements, EXT 962
	95372104	Return Header, 7 Elements, EXT 1123

Change Log:

Date	Description	Changed By
12/01/2014	Rev E: Applied final changes per A.M. Reformatted per current design standards. Misc. corrections and improvements.	Curtis Harvey
07/13/2015	Rev F: **DIR 195**: Warranty pages removed. Warranty information for all Modulex units is now included in a new stand-alone document, All Modulex Limited Warranty, posted on the AERCO web site. Clarified maintenance schedule, added information on heat exchanger cleaning to Chapter 7.	Chris Blair