INSTALLATION OPERATION AND SERVICE MANUAL

GAS FIRED WALL HUNG & FLOOR MOUNT RESIDENTIAL COMMERCIAL STAINLESS STEEL BOILERS

DynaMax SERIES

HYDRONIC HEATING

Models; DMH081, 101, 151, 201, 251, 211, 261, 291, 391, 501, 601, 751

HOT WATER SUPPLY

Models; DMW082 ,102, 152, 202, 252, 212, 262, 292, 392, 502, 602, 752

COMBINATION HEATING/HOT WATER SUPPLY

Models; DMC083, 103, 153, 203, 253, 213, 263, 293, 393, 503, 603, 753

WARNING:

If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death

Do not store or use gasoline or other flammable vapours and 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 your building,
- Immediately call your gas supplier from a neighbour's phone. Follow the gas supplier's instructions,
- If you cannot reach your gas supplier, call the fire department.

Qualified installer, service agency or the gas supplier must perform installation and service.

To the Installer: After installation, these instructions must be given to the end user or left on or near the appliance.

To the End User: This booklet contains important information about this appliance. Retain for future reference.

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PART 1 GENERAL INFORMATION

1.1 INTRODUCTION

The **DynaMax** boiler is a fan assisted boiler based on a push through design which offers several venting options. Heat output is controlled by a one to one air/gas ratio control gas valve which provides seamless modulation. The boiler provides central heating, domestic hot water or combination heating with DHW priority at working pressure up to 160 PSI. It is designed for use with a fully pumped and pressurized water system. The boiler/water heater will automatically modulate to provide heat outputs from 100% down to approximately 20% of rated input.

The DynaMax utilizes a negative pressure gas valve. The operation of the fan will generate a negative pressure in the venturi, which draws in a matching amount of gas through the valve.

During operation the DynaMax maintains a steady state efficiency across the entire range of modulation. Air and gas are metered in precise proportion (1:1 Ratio) allowing combustion characteristics which determine efficiency to remain the same over the entire operating range.

The DynaMax is designed so that all of the sensible heating value and most of the latent heat is being transferred to the water.

1.2 SPECIAL INSTRUCTIONS TO OWNER

This manual supplies information for the installation, operation and servicing of the appliance. It is strongly recommended that this manual be reviewed completely before proceeding with an installation

CAUTION

It is important that all gas appliances are installed by a qualified installer/technician that is trained by Camus Hydronics. It is in your own interest and that of safety to ensure that all local codes, and all the following "NOTES" and "WARNINGS" are complied with.
Installing, servicing or adjusting this appliance should be performed only by a qualified installer/technician that is trained by Camus Hydronics. The serviceman must utilize a combustion analyzer with CO_2, CO, and draft gauge, to set the appliance according to Camus Hydronics' recommendations, prior to commissioning.

NOTE

RETAIN THIS MANUAL FOR FUTURE REFERENCE

1.3 CHECKING EQUIPMENT

Check for signs of shipping damage upon receiving equipment. Pay particular attention to parts accompanying the boiler, which may show signs of being hit or otherwise being mishandled. Verify total number of pieces shown on packing slip with those actually received. In case there is damage or a shortage, immediately notify carrier.

1.4 DISPLAY UNIT

The display unit will indicate status and will display selected temperature. Refer to Part 9 DynaMax Control Panel, which provides details to modes and error codes displayed on the appliance.

1.5 SEQUENCE OF OPERATION

1) The power switch is placed in the "ON" position.
2) Minimum 120 VAC 60Hz single phase (15A circuit) is supplied to the DynaMax Field Connection Board.
3) 120 VAC power is supplied to the DynaMax Controller which provides all setup and ignition control functions.
4) Access to settings is through the use of a LPT1/ USB cable using a laptop computer through the LPT1 port on the DynaMax Control Panel.
5) After the appliance water pump starts, flow is proven by the flow proving device. The normally open dry contacts in the low water cutoff (LWCO), if supplied, is to be wired in series with the normally open contacts of the flow proving device. (Refer to Figure 18, page 18 of this Manual)
6) Locate the probe type LWCO in the piping at least 3 feet above the boiler inlet/outlet connection. In all cases check with local codes.
7) Depending on the selected mode, the appliance operates as a master or slave configuration.
8) The DynaMax Controller initiates a start-up sequence once it receives a heat demand.
9) The DynaMax Controller energizes the on-board pump and starts to ramp up the voltage to the electrically commutated DC motor of the combustion fan.
10) The fan will run at Pre-Purge speed until the Pre-Purge timer is satisfied. Once this is complete the DynaMax Controller provides a signal to modulate down to ignition fan speed.
11) The DynaMax controller goes through internal safety checks and if this is satisfied the ignition sequence begins.
12) The DynaMax Controller supplies voltage to the air/gas ratio control valve. The air/gas ratio control valve senses the pressure across the venturi and supplies gas to pre-mix with air.
13) The igniter will continue to spark for 6 seconds, with the gas valve opened, and the fan running at ignition speed.
14) Spark Igniter lights the air/gas mixture. The DynaMax Controller looks for a minimum flame rectification signal of 1.25 µA DC from the flame sensor. If the signal is present the DynaMax Controller will allow the gas valve to remain open. The burner is now firing at starting input rate.
15) The boiler will modulate to the correct fan speed to meet the heat demand. The modulation rate is controlled via Pulse Width Modulation (PWM) signals provided by the DynaMax Controller.
16) The fan speed will slowly decrease as the heat request nears the heat demand. If the heat demand is sustained for a long duration of time the boiler will get to a point of steady-state and the fan will rotate at a constant speed.
17) When the heat demand is satisfied or is removed the burner will shut off and the fan speed will ramp up to the preset Post-Purge speed until the Post-Purge Timer is satisfied.
18) The boiler will then go into Standby as it awaits for the next heat demand.

Table 1: DynaMax Ignition Cycle (in LabVision)

	State						
	Standby	**Pre-Purge**	**Safety On**	**Safety Off**	**Ignit_0**	**Ignit_1**	**Burn**
Time	On	5sec after fan speed is within 300 RPM			2 sec	6 sec	Limited to 24 hrs Continuously[3]
Demand	0	No influence	No influence	No influence	No influence	No influence	> 0
Fan [RPM]	Off	Ignition Speed	Ignition Speed	Ignition Speed	Ignition Speed	Ignition Speed	Requested Power
Gas Valve	Closed	Closed	Closed	Closed	Closed	Open	Open
Spark	Off	Off	Off	Off	On	On4	Off
Ionisation	0	0	0	0	0[1]	Flame must be detected	Flame must be detected

Note:

1. If a flame signal is detected at the end of the pre-purge period a lockout will occur.
2. If at the end of the safety period (6 sec) no flame is detected the control will go to post-purge to remove the unburned gas. After this, a re-ignition attempt is started following the same cycle. The number of re-ignition attempts is limited to 2 after which a lockout occurs.
3. The burner can only be on continuously for a period of 24 hours. After this the burner is switched off and a restart sequence follows.
4. Sparking stops 2 seconds before the end of the ignition period to allow for ionisation detection.

1.5.2 Heat Transfer Process

1) Burner Input continues to increase until outlet water temperature reaches the Set Point temperature.
2) Burner Input may stabilize at a fixed rate where demand equals input.
3) Burner Input will decrease rate when outlet water temperature approaches temperature Set Point.

1.5.3 End of Sequence

1) Set Point temperature is satisfied.
2) Power to the gas valve is turned off.
3) Combustion Air Fan ramps to a stop over the factory preprogrammed time period.
4) Thermostat is now in standby mode waiting for the next "Call for Heat".

WARNING
To minimize the possibility of serious personal injury, fire or damage to your appliance, never violate the following safety rules.

DO NOT
Do not use this appliance if any part of it has been **under water**. The possible damage to a flooded appliance can be extensive and present numerous safety hazards. Any appliance that has been **under water** must be replaced

WHAT TO DO IF YOU SMELL GAS
Do not try to light any appliance. • Do not touch any electric switch: do not use any phone in your building. • Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. • If you cannot reach your gas supplier, call the fire department.

IMPORTANT
Consult and follow local Building and Fire Regulations and other Safety Codes that apply to this installation. Contact the local gas utility company to inspect and authorize all gas and flue connections.
Installation and service must be performed by a qualified technician/installer, and trained by Camus Hydronics.

WARNING
Should overheating occur or the gas supply fails to shut off, **DO NOT** turn off or disconnect the electrical supply to the pump. Shut off the gas supply at a location external to the appliance.

- Boilers and water heaters are heat producing appliances. To avoid damage or injury, do not store materials against the appliance or the vent-air inlet system. Use proper care to avoid unnecessary contact (especially children) with the appliance and vent-air inlet components.
- Never cover appliance, lean anything against it, store trash or debris near it, stand on it or in any way block the flow of fresh air to appliance.
- **UNDER NO CIRCUMSTANCES** may flammable materials such as gasoline or paint thinner be used or stored in the vicinity of this appliance, vent-air inlet system or any location from which fumes could reach the appliance or vent-air inlet system.
- A gas appliance that draws combustion air from the equipment room where it is installed must have a supply of fresh air circulating around it during burner operation for proper gas combustion and proper venting.

1.6 INSTALLATION CODES

The equipment shall be installed in accordance with those installation regulations enforced in the local area where the installation is to be made. These shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made. In the absence of such requirements, the installation shall conform to the latest edition or current as amended of the National Fuel Gas Code, ANSI Z223.1 and/or CAN/CGA-B149 Installation Code. All electrical wiring must be done in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with national electrical code, ANSI/NFPA70 and/or the Canadian electrical code part 1 CSA C22.1. Where required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, ASME CSD-1. All boilers must conform to the latest edition of the ASME Boiler and Pressure Vessel Code, Section II. Where required by the authority having jurisdiction, the installation must comply with the CSA International, CAN/CGA-B149 and/or local codes. This appliance meets the safe lighting performance criteria with the gas manifold and control assembly provided, as specified in the ANSI standards for gas-fired units, ANSI Z21.13.

1.7 WARRANTY

- Factory warranty (shipped with unit) does not apply to units improperly installed or improperly operated.
- Factory warranty shall apply only when the appliance is installed in accordance with local plumbing and building codes, ordinances and regulations, the printed instructions provided with it and good industry practices.
- Excessive **water hardness** causing a lime build-up in the stainless steel coils or tubes is not a fault of the appliance and is not covered by warranty. Consult the factory for recommendations for use in hard water areas. (See Water Treatment and Water Chemistry)
- Using or storing **corrosive chemicals** in the vicinity of this appliance can rapidly attack the stainless steel venting and heat exchanger coils and voids warranty.
- Damage caused by **freezing or dry firing** voids warranty.
- This appliance is not to be used for **temporary heating** of buildings under construction.
- The manufacturer shall **NOT** be held liable for any personal injury or property damage due to ice formation or the dislodging of ice from the vent system or the vent termination

1.8 REMOVAL OF EXISTING APPLIANCE

When an existing appliance is removed from a common venting system, the common venting system is likely to be too large for proper venting of the appliances remaining connected to it .At the time of removal of an existing appliance, the following steps must be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

- Seal any unused openings in the common venting system.
- Visually inspect the venting system for proper size and horizontal pitch and determine that there is no blockage, restriction, leakage, corrosion or other deficiency, which could cause an unsafe condition.
- Insofar as is practical, close all building doors and windows and all doors between the spaces in which the appliances remaining connected to the common venting system are located and other spaces of the building. If applicable turn on the clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
- Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so that appliance operates continuously.
- After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.
- Any improper operation of the common venting system should be corrected so that the installation conforms to the National Fuel Gas Code, ANSI Z223.1 and/or CAN/CGA B149, Installation Codes. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 of the National Fuel Gas Code, ANSI Z223.1 and /or CAN/CGA B149, Installation Codes.

Heat exchanger surfaces and vent piping should be checked every six months for deterioration and carbon deposits. Remove all soot or other obstructions from the chimney and flue, which might impede draft action. Replace any damaged or deteriorated parts of the venting system.

A qualified service technician should follow this procedure when inspecting and cleaning the heat exchanger and vent pipe.

1) Turn off electrical power and main manual gas shut-off and allow appliance to cool down.
2) Remove the vent pipe at connection to heat exchanger and check heat exchanger and vent for obstruction and clean as necessary.
3) Remove burner from appliance and carefully clean as required. Never brush or wipe the knitted metal fiber surface. Use a garden hose or gently wash under the tap. Vacuum out any deposits found in the heat exchanger.

CAUTION
Never use a pressure washer or compressed air to clean the burner.

4) Reinstall parts removed in steps 2 and 3. Be sure that vent pipe has proper pitch and is properly sealed. Replace any damaged gasket or refractory. Tighten fan flange mounting nuts to 3 ft-lb.
5) Restore electrical power and gas supply to appliance.
6) Place appliance in operation using lighting instructions provided.
7) Confirm proper operation of all safety devices
8) Check for gas leaks and proper vent operation.

NOTE
Experience has shown that improper installation or system design, rather than faulty equipment, is the cause of most operating problems

1.9 BOILER/FURNACE ROOM OPERATING CONDITION

- Due to low jacket losses from the appliance, temperatures in the vicinity of the boiler room may drop significantly; supplemental heat is required to maintain ambient temperature at minimum of 40ºF.

1.10 LOCATION OF UNIT

Install this appliance in a clean, dry location with adequate service clearance.

- Do not locate this appliance in an area where it will be subject to freezing unless precautions are taken. Radiant losses from the DynaMax are minimal and should not be relied on to keep the appliance room warm.
- The appliance should be located close to a floor drain in an area where leakage from the appliance or connections will not result in damage to the adjacent area or to lower floors in the structure, it is recommended that a suitable drain pan, adequately drained, be installed under the unit. Under no circumstances is the manufacturer to be held responsible for water damage in connection with this unit, or any of its components.
- If the appliance is installed above the level of the building's radiation system, a low water cut-off device must be installed in the appliance outlet at a minimum of 3 ft (1M) above the heat exchanger inlet/outlet connections. Some local codes require the installation of a low water cut-off on all systems
- When placing the appliance be aware that a minimum clearance of 24" must be provided at the front to allow easy access to the heat exchanger. DynaMax wall mount units do not require access through the sides and could be placed adjacent to each other with zero clearance. Floor mount units require access on the left side.
- The appliance must be installed so that the ignition system components are protected from water (dripping, spraying, etc.) during appliance operation and service (circulator replacement, control replacement, etc.)
- Appliances located in a residential garage and in adjacent spaces that open to the garage and are not part of the living space of a dwelling unit must be installed so that all burners and burner ignition devices have a minimum clearance of not less than 18" (46cm) above the floor. The appliance must be located or protected so that it is not subject to physical damage by a moving vehicle.
- **DO NOT** install this appliance in any location where gasoline or flammable vapors are likely to be present.
- Appliance must be installed on a level floor. Maintain required clearances from combustible surfaces.
- The appliance designed for indoor installation (Indoor Models) must be installed indoors where it is protected from exposure to wind, rain and weather.
- The appliance designed for outdoor installation (Outdoor Models) must be installed outdoors. For outdoor installations, always consider the use of a shelter such as a garden shed in lieu of direct exposure of the appliance to the elements. The additional protection afforded by the shelter will help to minimize nuisance problems with electrical connections and will allow easier servicing of the appliance under severe weather conditions.

1.11 CLEARANCE FROM COMBUSTIBLE MATERIAL

This appliance is suitable for alcove (a closet without a door) installation with minimum clearances to combustibles as follows:

Table 2: Wall Hung Clearance from Combustibles

Clearances from Combustibles		
	Wall Hung Model	**Floor Mount Model**
TOP:	0"	0"
SIDES:	0"	0"
REAR:	0"	12"
VENT (Vent Adapter):	1"	1"
VENT (PVC/CPVC):	0"	0"
FRONT:	OPEN	OPEN

Figure 1: Wall Hung Clearance from Combustibles

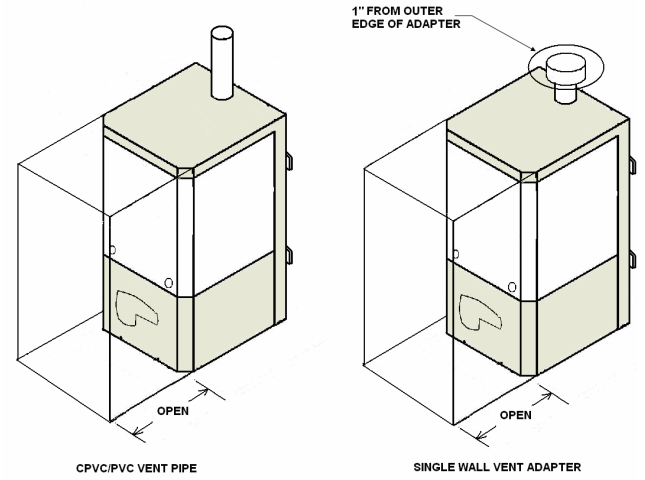
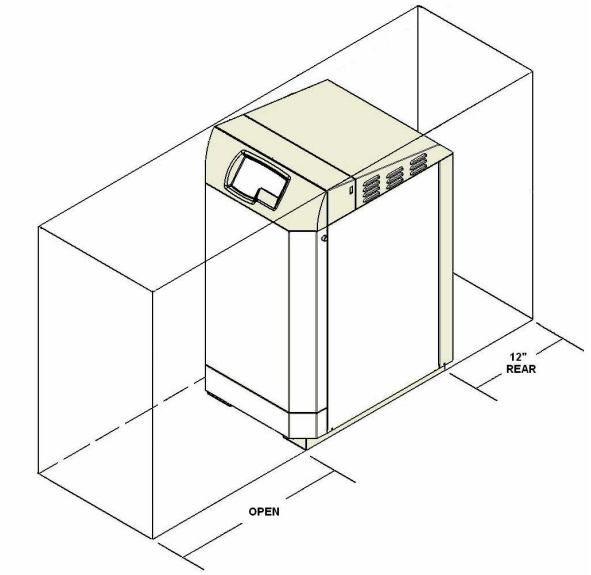


Figure 2: Floor Mount Clearance from Combustibles



NOTE
Clearances from combustible construction are noted on the appliance rating plate

Table 3: DynaMax Wall Hung Service Clearances

Input [BTU/hr]	Service Clearance, Inches (cm)				
	Front	Top	Right Side	Left Side	Rear
80,000	24” (61cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)
100,000	24” (61cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)
150,000	24” (61cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)
200,000	24” (61cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)
250,000	24” (61cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)	0” (0 cm)

Figure 3: DynaMax Wall Hung Model Dimensions

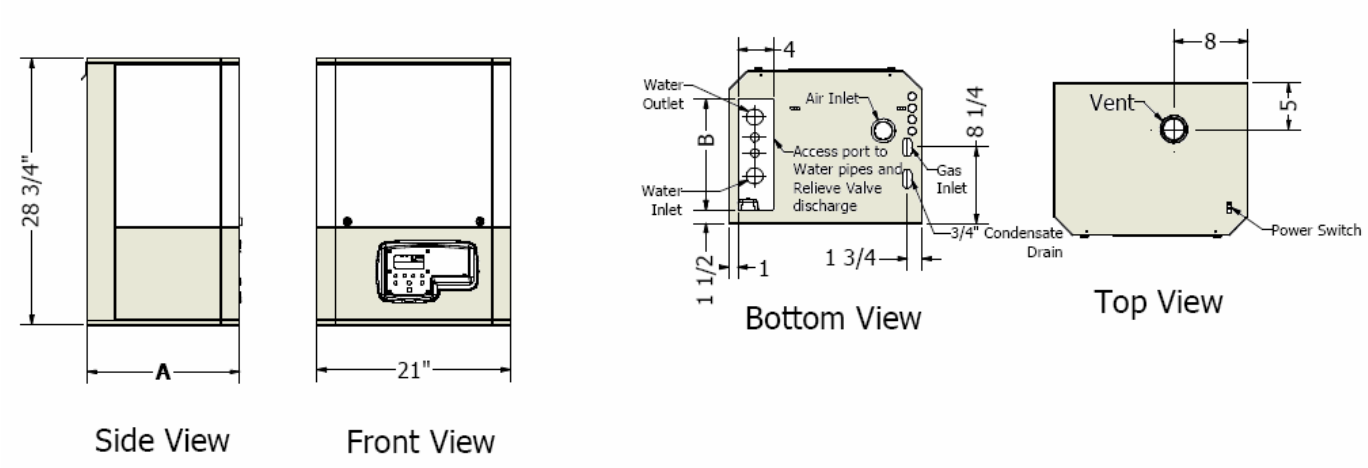


Table 4: Appliance Dimensions and Specifications

Input [BTU/hr]	Depth Dim. "A" [in.]	Dim. "B" [in.]	Equivalent Length of Vent & Air Intake Pipes at Recommended Diameter, [in.]			Water Conn [in.] NPT	Gas Conn. At Boiler [in.] NPT
			Over 25' and up to 100'	Over 15' and up to 25'	Up to 15'		
80,000	16 1/2	12	3	3	2	1	1/2
100,000	16 1/2	12	3	3	2	1	1/2
150,000	16 1/2	12	3	3	2	1	1/2
200,000	23 1/2	19	3	3	2	1	1/2
250,000	23 1/2	19	3	3	2	1 1/4	1/2

Maintain minimum specified clearances for adequate operation. All installations must allow sufficient space for servicing the vent connections, water pipe connections, circulating pump, bypass piping and other auxiliary equipment, as well as the appliance

Table 5: DynaMax Floor Mount Service Clearances

Input [BTU/hr]	Service Clearance, Inches (cm)				
	Front	Top	Right Side	Left Side	Rear
200,000	12” (31cm)	24” (61cm)	0” (0cm)	12” (31cm)	14” (36 cm)
250,000	12” (31cm)	24” (61cm)	0” (0cm)	12” (31cm)	14” (36 cm)
299,000	12” (31cm)	24” (61cm)	0” (0cm)	12” (31 cm)	14” (36cm)
399,000	12” (31cm)	24” (61cm)	0” (0cm)	12” (31 cm)	14” (36 cm)
500,000	12” (31cm)	24” (61cm)	0” (0cm)	12” (31 cm)	14” (36 cm)
600,000	12” (31cm)	24” (61cm)	0” (0cm)	12” (31 cm)	14” (36cm)
750,000	12” (31cm)	24” (61cm)	0” (0cm)	12” (31 cm)	14” (36 cm)

Figure 4: DynaMax Floor Mount Model Dimensions

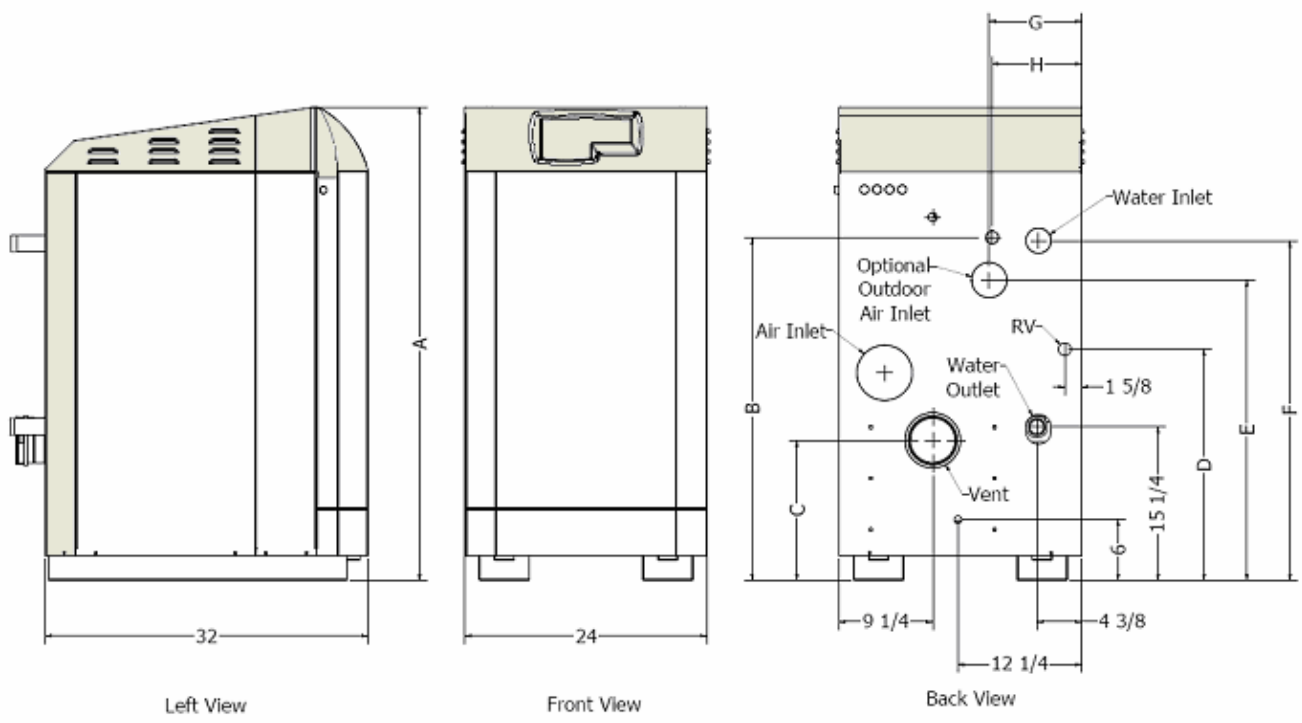


Table 6: Appliance Dimensions and Specifications

Model	Depth Dim. "A" [in.]	Dim. "B" [in.]	Equivalent Length of Vent & Air Intake Pipes at Recommended Diameter, [in.]			Water Conn [in.] NPT	Gas Conn. At Boiler [in.] NPT
			Over 25' and up to 100'	Over 15' and up to 25'	Up to 15'		
200,000	36	22 3/4	3	3	2	1	1/2
250,000	36	22 3/4	3	3	2	1 1/4	1/2
299,000	47 1/8	34 7/8	4	3	3	1 1/4	3/4
399,000	47 1/8	34 7/8	4	3	3	1 1/4	1
500,000	47 1/8	34 7/8	4	3	3	1 1/2	1
600,000	-	-	5	4*	4*	2	1
750,000	-	-	5	4*	4*	2	1

* Up to 40 equivalent feet.

Maintain minimum specified clearances for adequate operation. All installations must allow sufficient space for servicing the vent connections, water pipe connections, circulating pump, bypass piping and other auxiliary equipment, as well as the appliance

Figure 5: DynaMax Wall Hung Service Clearances

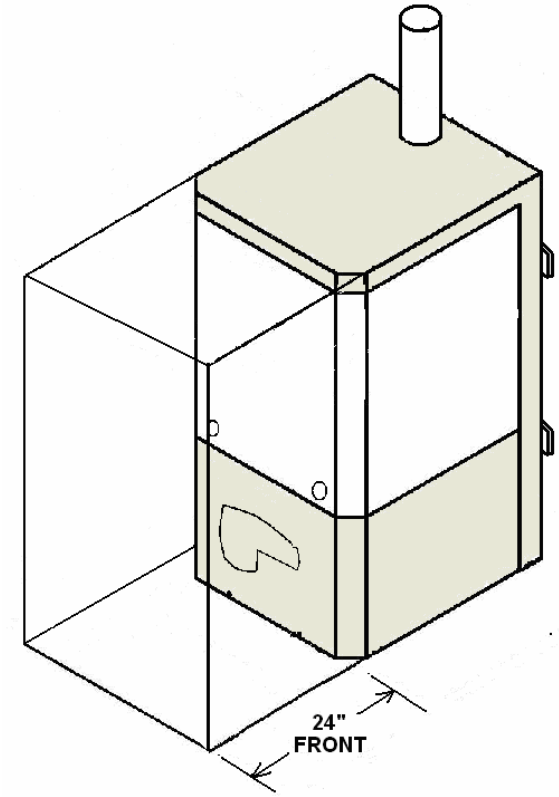
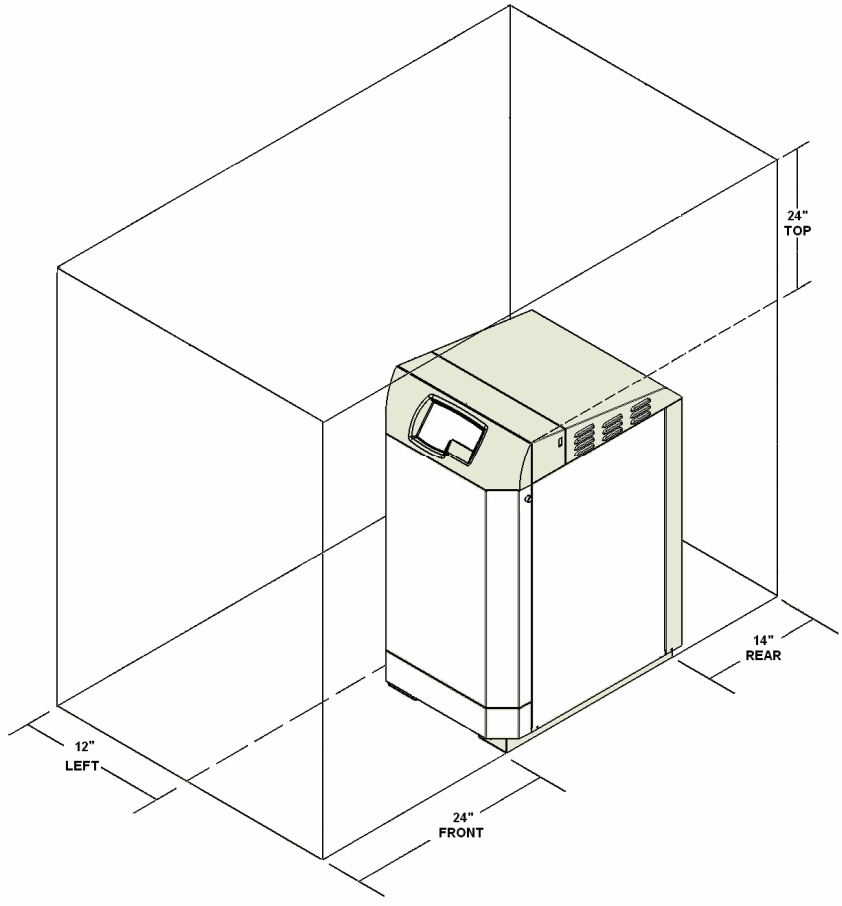


Figure 6: DynaMax Floor Mount Service Clearances



PART 2 AIR INLET AND VENTING

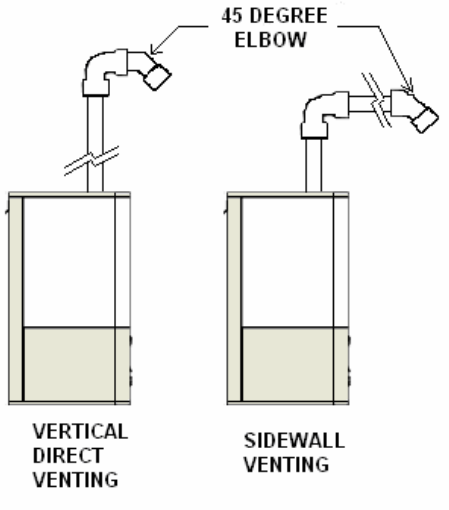
⚠ DANGER

It is extremely important to follow these venting instructions carefully. Failure to do so can cause severe personal injury, death or substantial property damage.

2.1 GENERAL VENTING GUIDE

- Single pipe vent with common air from room.

Figure 7: Vertical Venting Configuration



The DynaMax Wall Hung is a category IV condensing appliance, 97% efficient unit. The DynaMax Floor Mount is a category II condensing appliance, 97% efficient.

- The DynaMax may be vented with manufactured prefabricated UL/ ULC listed vents of AL29-4C or 316L stainless steel or with plastic vent certified to UL/ ULC S636, such as, IPEX System 636 CVPC or IPEX System 636 PVC or as permitted by local jurisdictions.
- The DynaMax boiler must be vented and supplied with combustion and ventilation air as described in this section. Ensure that the venting and combustion air supply complies with these instructions regarding the vent system, air system, and combustion air quality.
- Installations must be in accordance with Part 7, "Venting of Equipment", of the latest edition of the National Fuel Gas Code, ANSI Z223.1 for US installations or the latest edition of CAN/CGA Standard B149 Installation Code for Gas Burning Appliances and Equipment in Canada.
- The distance of the vent terminal from adjacent buildings, windows that open and building openings MUST comply with the latest edition of the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CAN/CGA Standard B149 Installation Code for Canadian Installations.
- Vent connection is made directly to the flue outlet opening on top of the unit for the wall mount unit and at the back of the unit for floor mount. The connection from the appliance vent to the stack must be made as direct as possible. The first 3 feet of vent from the appliance flue outlet must be readily accessible for visual inspection.
- Vent connectors serving appliances vented by natural draft shall not be connected into any portion of a mechanical draft system operating under positive pressure.
- Horizontal runs of vent pipe shall be securely supported (approximately every 4 feet) to prevent sagging and maintain a minimum upward slope of ¼" per foot from the appliance to the vent terminal.
- The weight of the venting system must not rest on the unit. Adequate support of the venting system must be provided in compliance with local codes and other applicable codes.
- All connections should be secured and sealed per the vent manufacturer's specifications. When a positive vent system is disconnected for any reason, the flue must be reassembled and resealed according to the vent manufacturer's instructions.
- Do not use an existing chimney as a raceway if another appliance or fireplace is vented through the chimney.
- Inspect completed vent and air supply piping thoroughly to ensure all connections are sealed and are in compliance with the instructions provided and satisfy requirements of all applicable codes.

NOTE
All vent pipes must be properly assembled and supported, and the exhaust must be pitched a minimum of 1/4 inch per foot back to the boiler. All components used to fabricate and assemble the vent system are to originate from the same supplier.

When determining equivalent inlet air and vent lengths of 3" diameter add 3 to 5 feet for each 90^{o} elbow and 2 to 3 feet for each 45^{o} elbow, depending on centerline radius of the elbow.
Example: 30 feet of CPVC pipe + (3 x 5 feet) 90^{o} elbows + (1 x 3 feet) 45^{o} elbow = 48 equivalent feet of piping for centerline radius of 1.5D, where D is the pipe diameter.

2.2 CATEGORY IV VENTING

A category IV appliance is individually vented through a dedicated vent.

The DynaMax Wall Hung boilers/ water heaters shall only be vented as a Category IV appliance. The DynaMax Floor Mount appliances may be vented as a Category II or IV appliance.

Both Wall Hung and Floor Mount appliances shall be vented using sealed positive vent suitable for a condensing appliance with the following venting options:

1) Sidewall or rooftop termination where both the vent and combustion air inlet air are in the same zone. The inlet and vent terminals are to be installed with a minimum 12" separation distance between centerline of inlet and centerline of exhaust. Refer to Fig. 8, 9, and 10 for sidewall termination and Fig. 11 for rooftop termination.
2) Sidewall termination with vent and combustion air inlet from separate zones.
3) Single Pipe thru wall or rooftop venting with combustion air inlet from the boiler room.

NOTE
Vent Option 3 not recommended for R-2000 homes or equivalent air tight construction.

2.2.1 Approved Venting Materials Category IV1)

1) PVC and CPVC (Chlorinated Polyvinyl Chloride) Schedule 40 or 80 approved to ULC S636.
2) Manufactured prefabricated UL/ULC listed vent of AL29-4C or 316L stainless steel. Use of 316L is limited to use in applications where there is no possibility of contaminants in the air such as refrigerants, chlorine etc.
3) PVC-DWV approved to comply with ANSI/ASTM D2665 (US Jurisdictions ONLY when permitted).
4) CPVC Schedule 40 approved to comply with ANSI/ASTM F441. (US Jurisdictions ONLY when permitted).

Table 7: Maximum Flue Temperature for Various Vent Materials

Vent Material	Maximum Flue Temperature [^{o}F]
PVC	149
CPVC	194
AL29-4C	300+, limited only by rating of seals
316L Stainless Steel	300+, limited only by rating of seals

Air Inlet (Supply Air or Fresh Air) Piping

- PVC
- CPVC (Chlorinated Polyvinyl Chloride)
- ABS (Acrylonitrile-Butadiene-Styrene)
- Single wall, Galvanized
- Single wall, Stainless steel
- Single wall, Aluminium

Single wall air inlet pipes are to be insulated 5 feet from the wall toward the interior of the building to minimize external sweating.

The following air intake options shall be utilized:

- Outside air sealed direct (vertical or horizontal)
- Outside air ducted to jacket flange
- Indoor Air

Table 8: Required Vent and Air Inlet Diameters

	Equivalent Length of Vent & Air Intake Pipes at Recommended Diameter		
Input [BTU/hr]	**Over 25' and up to 100'**	**Over 15' and up to 25'**	**Up to 15'**
80,000 – 250,000	3"	3"	2"
299,000	4"	3"	3"
399,000	4"	3"	3"
500,000	4"	3"	3"
600,000	5”	4”*	4”*
750,000	5”	4”*	4”*

* Up to 40 equivalent feet

2.3 CATEGORY II VENTING

A category II appliance may be combined into a common negative pressure venting system designed to ASHRAE requirements using a proven vent sizing program. Vent designs are to be certified by a qualified professional designer acceptable to the authority having jurisdiction.

The DynaMax Floor Mount boiler may be vented as a Category II appliance using sealed vent suitable for a condensing appliance.

2.3.1 Approved Venting Materials Category II

1) PVC and CPVC (Chlorinated Polyvinyl Choloride) Schedule 40 or 80 approved to ULC S636.
2) Manufactured prefabricated UL/ULC listed vent of AL29-4C or 316L stainless steel. Use of 316L is limited to use in where there is no possibility of contaminants in the air such as refrigerants, chlorine etc.
3) PVC-DWV approved to comply with ANSI/ASTM D2665 (US Jurisdictions ONLY when permitted).
4) CPVC Schedule 40 approved to comply with ANSI/ASTM F441. (US Jurisdictions ONLY when permitted).

Air Inlet (Supply Air or Fresh Air) Piping

- PVC
- CPVC (Chlorinated Polyvinyl Chloride)
- ABS (Acrylonitrile-Butadiene-Styrene)
- Single wall, Galvanized
- Single wall, Stainless steel
- Single wall, Aluminium

Single wall air inlet pipes are to be insulated 5 feet from the wall toward the interior of the building to minimize external sweating.

The following air intake options shall be utilized:

- Outside air sealed direct (vertical or horizontal)
- Outside air ducted to jacket flange
- Indoor Air

2.4 COMBINED COMBUSTION AIR INLET

Both the Category IV Wall Hung and Category II Floor Mount DynaMax appliances may be installed with a combined combustion air inlet.

The combined combustion air inlet pipe sizing can be calculated using the method shown below:

Equivalent pipe diameter = Sq Root $[(d_1)^2 + (d_2)^2 + (d_3)^2 + \ldots + (d_n)^2]$, where d_n = individual pipe diameter

- Example: Find the equivalent pipe diameter of three air inlet pipes, 3” (7.6cm), 3” (7.6cm) and 4” (10.2cm)

  Equivalent pipe diameter = Sq Root$[(3)^2 + (3)^2 + (4)^2]$ = Sq Root(34) = 5.8”, select 6” (15.3cm) equivalent diameter pipe.

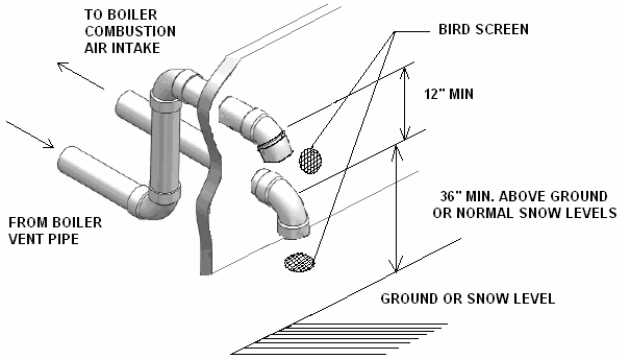
The air inlet point for multiple boiler air inlets must be provided with an exterior opening which has a free area equal to or greater than the total area of all air inlet pipes connected to the common air inlet. This exterior opening for combustion air must connect directly to the outdoors. The total length of the combined air inlet pipe must not exceed a maximum of 100 equivalent feet (30.5m). Deduct the restriction in an area provided by any screens, grills or louvers installed in the common air inlet point. Screens, grills or louvers installed in the common air inlet can reduce the free area of the opening from 25 to 75% based on the materials used. Calculate and compensate accordingly.

2.5 VENT TERMINATION AND AIR INLET CLEARANCES

2.5.1 Sidewall Venting

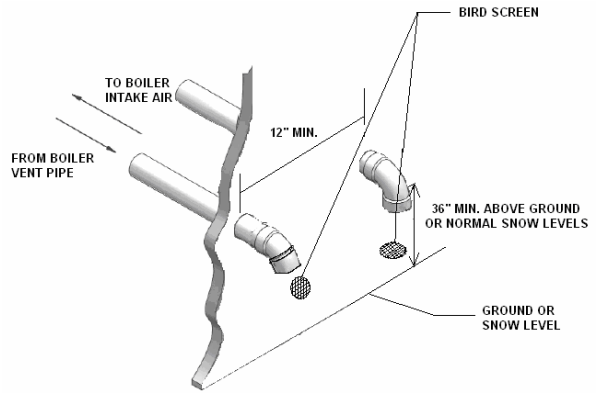
- The first 3 feet (1m) of vent from the appliance flue outlet must be readily accessible for inspection.

Figure 8: Vertical Configuration



* Always check local codes for minimum distance above ground or snow levels

Figure 9: Horizontal Configuration



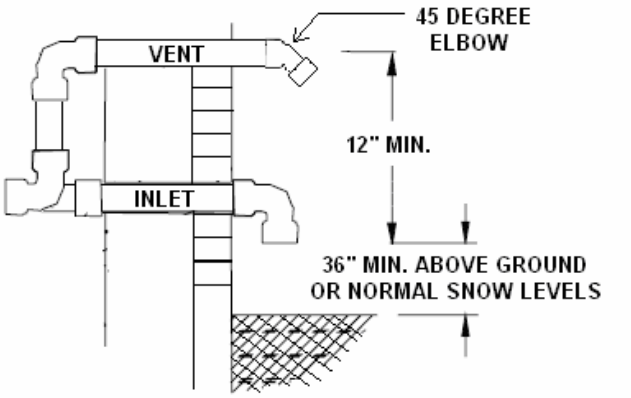
* Always check local codes for minimum distance above ground or snow levels

Location of Vent Termination

1) The total length of vent piping must not exceed the limits stated in Table 8.
2) The bottom of the vent terminal shall be located at least 3 feet (1m) above grade or above normal snow levels. In all cases the appliance shall be installed in accordance with local codes
3) The DynaMax can vent up to 100 equivalent feet. Elbows can range from 3 to 5 feet in equivalent length depending on the centerline radius. Vent sizes are 3" for Models 80 to 250 and 4" for Models 299 to 500 for equivalent vent lengths of up to 100'.
4) The vent outlet shall terminate at least 12" (0.30m) away from any forced air inlet. The vent must be at least 7 feet (2.15m) above grade when located adjacent to public walkways due to normal formation of water vapour in the combustion process.
5) The vent outlet MUST NOT terminate below a forced air inlet at any distance
6) The vent cannot terminate below grade. Position the vent termination where vapours will not damage walls or plants or may be otherwise objectionable.
7) The vent terminal shall not be installed closer than 3 feet (1m) from an inside corner of an L-shaped structure, window well, stairwell, alcove, courtyard or other recessed area as wind eddies could affect boiler performance or cause recirculation.
8) DO NOT terminate closer than 4 feet (1.25m) horizontally and vertically from any electric meter, gas meter, regulator, relief valve, or other equipment. In all cases local codes take precedence
9) Position terminations so they are not likely to be damaged by foreign objects, or exposed to a build-up of debris.
10) The vent piping must terminate in an elbow pointed outward or away from the air inlet.
11) Flue gas condensate can freeze on exterior walls or on the vent cap. Frozen condensate on the vent cap can result in a blocked flue condition. Keep the vent cap/terminal clear of snow, ice, leaves, debris etc. Some discolouration to exterior building surfaces is to be expected. Adjacent brick or masonry surfaces should be protected with a rust resistant sheet metal plate.
12) Perform regularly scheduled inspections to ensure that the vent terminal is unobstructed.

2.5.2 Sidewall Air Inlet

Figure 10: Sidewall Vent and Air Inlet Configuration



* Please check local codes for minimum distance above ground or snow levels

Location of a Sidewall Air Inlet Cap

1) The total length of piping for air inlet must not exceed the limits stated in Table 8.
2) The point of termination for the sidewall air inlet cap must be located a minimum of 12 inches (0.30m) away from the flue gas termination, but never above.
3) The air piping must terminate in a down-turned elbow to avoid recirculation of flue products into the inlet air stream.
4) DO NOT terminate closer than 4 feet (1.25m) horizontally and vertically from any electric meter, gas meter, regulator, relief valve, or other equipment. In all cases local codes take precedence
5) DO NOT terminate the air inlet in a window well, stairwell, alcove, courtyard or other recessed area as wind eddies could affect performance or cause recirculation.
6) The air inlet cannot terminate below grade.

7) Locate terminations so they are not likely to be damaged by foreign objects, or exposed to build-up of debris.
8) Perform regularly scheduled inspections to ensure that the air inlet terminal is unobstructed.

Termination and Fittings

1) Insert the bird screens into the air inlet and exhaust vent elbows that are provided with the boiler. Bird screens are 3" (DM80-250) and 4" (DM299-500).
2) The air inlet opening must be at least 12 inches (0.30m) away from (never above) the vent termination and at least 3 feet (1m) above grade or above normal maximum snow levels.

2.5.3 Vertical Direct Venting

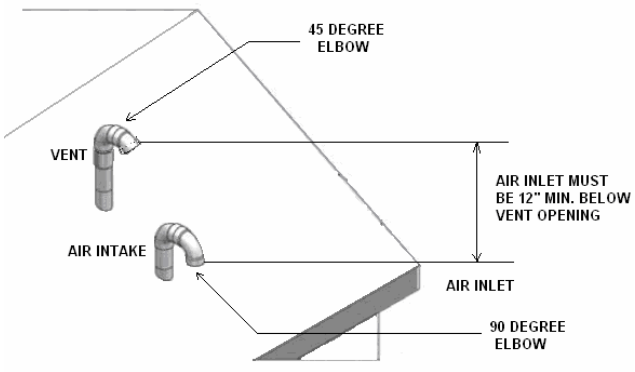
Location of Vent Termination

1) The total length of piping for venting must not exceed the limits stated in Table 8.
2) Insert the bird screen that is provided with the boiler into the vent termination opening. Bird screen sizes are 3" (DM80-250) and 4" (DM299-500).
3) The vent piping must terminate in a 90^{o} elbow if plastic piping is used or in an approved vent cap if using metal venting. The vent outlet must be at least 1 foot away and 1 foot above from the air inlet opening which must terminate in a double elbow facing downwards.
4) The vertical termination must be a minimum of 3 feet (1m) above the point of exit.
5) A vertical termination less than 10 feet (3.05m) from a parapet wall must be a minimum of 2 feet (0.61m) higher than the parapet wall.
6) DO NOT terminate closer than 4 feet (1.25m) horizontally and vertically from any electric meter, gas meter, regulator, relief valve, or other equipment. In all cases local codes take precedence.
7) Position the air inlet and vent terminations so they are not likely to be damaged by foreign objects, or exposed to build-up of debris.
8) Perform regularly scheduled inspections to ensure that the vent terminal is unobstructed.

Location of a Vertical Air Inlet Opening

1) The total length of piping for inlet air must not exceed the limits given in Table 8.
2) Insert the bird screen that is provided with the boiler into the air inlet elbow. Bird screen sizes are 3" (DM80-250) and 4" (DM299-500).
3) The air inlet consists of two 90^{o} elbows installed at the point of termination for the vertical air inlet pipe. A 90^{o} elbow and a 90^{o} street elbow may be used to make this assembly. If a straight piece of pipe is used between the two elbows, it should not exceed 6" (0.15m) in length. The air inlet opening must be at least 1 foot below the vent opening. The air piping must be no further than 2 feet (0.6m) from the center of the vent pipe. This arrangement avoids exhaust gases from re-circulating into the inlet air stream. Refer to Figure 10.
4) Air inlet must terminate at least 3 feet (1.0m) above the roof or normal snow levels and at least 1 foot (0.3m) below the vent termination.
5) Locate terminations so they are not likely to be damaged by foreign objects or exposed to build-up of debris.
6) Perform regularly scheduled inspections to ensure that the air inlet terminal is unobstructed.

Figure 11: Vertical Direct Venting Configuration



2.5.4 Length of Air Inlet Pipe

The maximum total length of the sidewall or vertical roof top combustion air inlet pipe as installed from the appliance to the air inlet cap must not exceed 100 equivalent feet (30.5m) in length. Subtract 3 to 5 feet (1 to 1.5m) of equivalent length depending on centerline radius for each 90^{o} elbow installed in the air inlet pipe system. Pressure drop in each 45^{o} elbow will be half as much, 2 to 3 feet (0.6 to 1.0m).

PART 3 GAS CONNECTION

Verify that the appliance is supplied with the type of gas specified on the rating plate. Consult factory for installations at high altitude.

3.1 GAS CONNECTION

- Safe operation of unit requires properly sized gas supply piping. See gas line sizing data.
- Gas pipe size may be larger than appliance connection.
- Installation of a union at the appliance gas line connection is required for ease of service and removal of the gas train.
- Install a manual main gas shutoff valve, outside of the appliance gas connection as require by local codes.
- A trap (drip leg) MUST be provided in the inlet gas connection to the appliance.
- Optional gas controls may require routing of bleeds and vents to the atmosphere, outside the building when required by local codes.

Table 9: Recommended Gas Pipe Size

Single Appliance Installation

(For distance from natural gas meter or propane second stage regulator)

Input	0-100 FT		101-200 FT		201-300 FT	
Btu/Hr, x1000	NAT.	L.P.	NAT.	L.P.	NAT.	L.P.
80	¾"	½"	¾"	½"	1"	¾"
100	¾"	½"	1"	¾"	1"	¾"
150	1"	¾"	1 ¼"	1"	1 ¼"	1"
200	1"	¾"	1 ¼"	1"	1 ¼"	1"
250	1 ¼"	1"	1 ¼"	1"	1 ½"	1 ¼"
299	1 ¼"	1"	1 ½"	1 ¼"	1 ½"	1 ¼"
399	1 ¼"	1"	1 ½"	1 ¼"	2"	1 ½"
500	1 ½"	1 ¼"	2"	1 ½"	2"	1 ½"
600	1 ½"	1 ¼"	2"	1 ½"	2"	1 ½"
750	2"	1 ½"	2"	1 ½"	2 ½"	2"

3.2 GAS PIPING

All gas connections must be made with pipe joint compound resistant to the action of liquefied petroleum and natural gas. All piping must comply with local codes and ordinances.

3.3 INSTALL PIPING

- The gas line should be sufficient to handle the total installed capacity. Verify pipe size with your gas supplier.
- Use approved piping as per code free from burrs.
- Install a manual main gas shutoff valve at the appliance gas inlet, outside of the appliance and before the gas valve.
- Run pipe to the Appliance gas inlet.
- Install a sediment trap in the supply line to the Appliance gas inlet.
- Apply a moderate amount of good quality pipe compound.
- For LP gas, consult your LP gas supplier for expert installation.

The appliance and its individual gas shut-off valve must be disconnected from the supply piping when pressure testing the gas supply piping at pressures above ½ PSI

Table 10: Gas Pressures at Inlet to Appliance

	PROPANE	NATURAL GAS
Minimum (inches W.C.)	11	3
Maximum (inches W.C.)	11	14

The gas supply line must be of adequate size to prevent undue pressure drop and must never be smaller than the size of the connection on the appliance. Sizing based on Table 4 or 6 is recommended, depending on model.
Before operating the appliance, the complete gas train and all connections must be tested using soap solution.

Verify that the appliance is supplied with the type of gas specified on the rating plate. Heating values of local natural gas are to be between 950 and 1010 Btu/ft^3. Consult factory if heating values are outside this range or if a gas with a mixture of constituents is being used.

3.4 CHECKING GAS SUPPLY PRESSURE

- Turn the main power switch to “OFF” position.
- Shut off gas supply at the manual gas cock in the gas piping to the appliance. If fuel supply is LP gas, shut off gas supply at the tank.
- Remove the 1/8" hex plug from the gas pressure test port located on the inlet gas supply connection at the rear of the appliance. Install a fitting in the inlet pressure tapping suitable to connect to a manometer or magnahelic gauge. Range of scale should be 0 to 14 inch W.C. or greater to check inlet pressure
- Turn on gas supply at the field installed manual gas cock; turn on LP gas at tank if required.
- Turn the power switch to “ON” position.
- Adjust the thermostat set point to call for heat.
- Observe the gas supply pressure as the burner fires at 100% of rated input. Supply pressure is to remain stable.
- Ensure inlet pressure is within specified range. Minimum and maximum gas supply pressures are specified in Table 10.
- If gas pressure is out of range, contact the gas utility, gas supplier, qualified installer or service agency to determine necessary steps to provide proper gas pressure to the control.
- If gas supply pressure is within normal range, proceed to remove gas manometer and replace pressure tap fittings in the gas piping to the appliance. Turn the power switch to “OFF” position.
- Turn on gas supply at the manual valve; turn on LP gas at tank if required.
- Turn the power switch to “ON” position.
- Adjust the thermostat temperature set point to the desired water temperature so the appliance will call for heat.
- Check appliance performance by cycling the system while you observe burner response. The burner should ignite promptly. Flame profile should be stable, see section 11.2, Visually Check Main Burner Flames. Turn system off and allow burner to cool, then cycle burner again to ensure proper ignition and flame characteristics.

IMPORTANT

Upon completion of initial installation or following any repair work on the gas system, leak test all gas connections with a soap solution while the main burner is firing. Immediately repair any leak found in the gas train or related components. DO NOT operate an appliance with a leak in the gas train, valves or related gas piping.

3.5 AIR/GAS RATIO VALVE

The main gas valve supplying gas to the burner on this appliance utilizes a servo pressure regulator providing a slow opening, fast closing safety shut off and air/gas ratio control for the gas combustion process. The valve is a 1:1 negative pressure gas valve. The valve performs the functions of a pressure regulator, safety shutoff, and air/gas ratio control. Full closing of the valve seat occurs in less than 0.8 seconds when the valve is de-energized. Operation of the gas valve in combination with the combustion air fan allows the burner input rate to vary from 20% to 100% based on temperature demand. The inlet gas supply pressure must be maintained within the specified minimum and maximum pressures.

The air/gas ratio is preset at the factory and adjustment is not usually required if gas supply pressure is maintained within the specified range.
There are no serviceable parts on the air/gas ratio valve control.

Figure 12: DynaMax 80 – 150 1:1 Air/Gas Ratio Control Valve

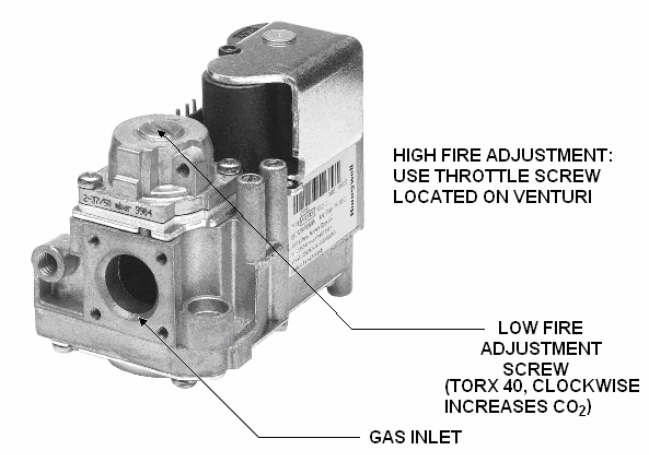


Figure 13: DynaMax 200 – 399 1:1 Air/Gas Ratio Control Valve

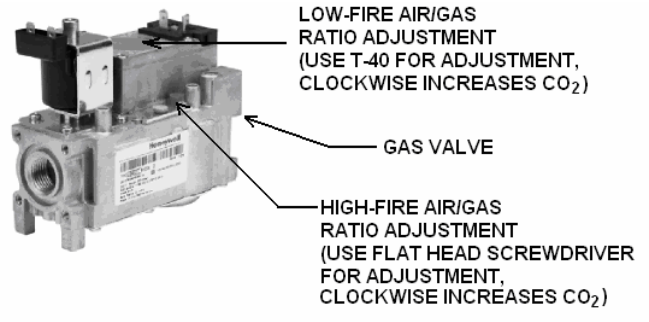
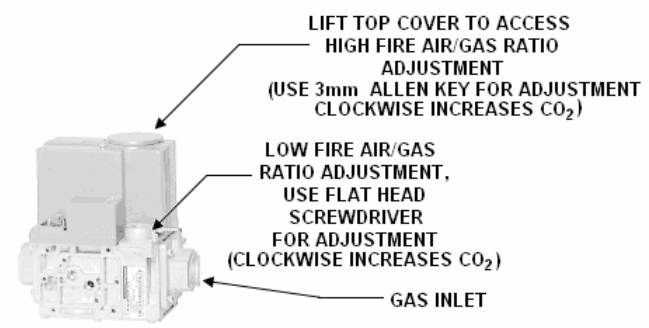


Figure 14: DynaMax 500 – 750 1:1 Air/Gas Ratio Control Valve



3.6 BURNER

Figure 15: DynaMax Burner

This appliance uses a single cylindrical burner installed horizontally into the cavity located in the center of the heat exchanger. There is a unique burner for each one of the DynaMax models.

Burners may NOT be interchanged between different Btu/hr input models. The burner consists of a round mounting flange welded to a ported stainless steel mixing tube. This stainless steel tube is covered with a close fitting, knitted stainless steel metal fiber alloy material that forms the burner outer surface. The burner is setup to operate in blue mode and infrared operating condition should be avoided. Infrared operation will occur only if air to gas adjustments is incorrect. If infrared operation is noted the cause must be corrected.

The burner should be removed for inspection and cleaning on an annual basis. An appliance installed in a dust or dirt contaminated environment will require inspection and cleaning on a more frequent schedule. The fan assisted combustion process may force airborne dust and dirt contaminants, contained in the combustion air, into the burner. With sustained operation, non-combustible contaminants may reduce burner surface area, reduce burner input or cause non-warrantable damage to the burner.

Airborne contaminants such as dust, dirt, concrete dust or dry wall dust can be drawn into the burner with the combustion air and block the burner surface area. **DO NOT** operate this appliance during construction.

The spark igniter and flame sensor are removable from the combustion chamber mounting door without removing the burner assembly.

Never use an open flame (match, lighter, etc.) to check gas connections.

PART 4 WATER CONNECTION

- Check all applicable local heating, plumbing and building safety codes before proceeding.
- If the appliance is installed above radiation level it must be provided with a low water cut-off device at the time of appliance installation (available from Camus). Some local codes require the installation of a low water cut-off on all systems.
- A pressure relief valve is supplied with each DynaMax. The relief valve must be mounted in a vertical position and piped to the floor in a manner acceptable to the enforcing authority.
- Be sure to provide unions and gate valves at inlet and outlet to the appliance so that it can be easily isolated for service.
- On combination heaters a flow setter valve at the appliance outlet facilitates setting of the desired outlet temperature at high fire. Refer to Section 12.9 Domestic Hot Water with Plate Heat Exchanger for more details
- This appliance is a low mass stainless steel tube design which provides for instant heat transfer. All appliances are supplied with an internal suitable specific pump mounted in place. When replacing the pump, replace with one of equal or better-performance.
- An air vent is supplied on the heat exchanger header to eliminate trapped air. Install venting devices at high points in the system as well to eliminate trapped air in the piping.
- Use suitable pipe hangers or floor stands to support the weight of all water and gas piping.
- The DynaMax must be installed so that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, control replacement, etc.)

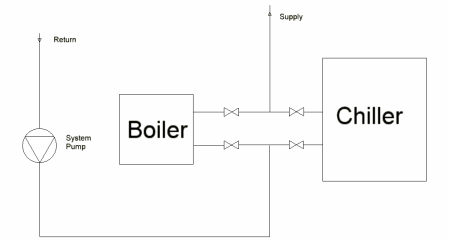
4.1 FREEZE PROTECTION OUTDOOR INSTALLATION

- Appliance installations are not recommended outdoors or in areas where danger of freezing exists unless precautions are taken. Maintaining a mixture of 70% water and 30% propylene glycol is the preferred method of freeze protection in hydronic systems. **DO NOT** exceed a mixture of 50/50. This mixture will protect the appliance to approximately -35ºF (-37ºC).
- For Outdoor installations a snow screen should be installed to prevent snow and ice accumulation around the appliance. Regular inspections should be made to ensure that air inlet and vent are free of snow and ice. Always consider the use of a shelter such as a garden shed in lieu of direct exposure of the appliance to the elements. The additional protection afforded by the shelter will help to minimize nuisance problems with electrical connections and will allow easier servicing of the appliance under severe weather conditions.

4.2 WARNING REGARDING CHILLED WATER SYSTEMS

When an appliance is connected to an air conditioning system where the same water is used for heating and cooling, the chiller must be piped in parallel with the appliance. Appropriate flow control valves; manual or motorized must be provided to prevent the chilled water from entering the appliance.

Figure 16: Chilled Water System



4.3 INLET AND OUTLET CONNECTIONS

- All water connections must meet American National Standard Pipe Threads (NPT).
- For ease of service, install unions on inlet and outlet of the appliance. The connection to the appliance marked “Inlet” on the header should be used for return from the system. The connection on the header marked “Outlet” is to be connected to the supply side of the system.

4.4 MINIMUM PIPE SIZE REQUIREMENTS

Minimum water pipe connections are as follows for DynaMax single unit installations. The equivalent number of straight feet of pipe for each valve and fitting in the connecting piping must be considered to properly arrive at the total equivalent feet of straight pipe in the field installed piping to the appliance. Consult factory if longer piping distances are required for a specific application. It is recommended to use copper piping for all system piping to reduce the possibility of the formation of deposits, which may result in heat exchanger starvation.

Table 11: Minimal System Pipe Size

Input, Btu/Hr	Water Size, NPT [in.]
80,000	1
100,000	1
150,000	1
200,000	1 1/4
250,000	1 1/4
299,000	1 1/2
399,000	2
500,000	2
600,000	2
750,000	2

4.5 HEAT EXCHANGER

This appliance uses precision formed stainless steel tubing to maximize the heat transfer process and achieve 97% steady-state efficiency. This heat exchanger is designed to withstand 160 PSIG working pressure.
A factory installed circulating pump ensures proper water flow during burner operation and creates enough velocity inside the stainless steel tubes and headers that prevents scaling.

4.6 LOW WATER TEMPERATURE SYSTEMS

In applications where the heating system requires supply water temperatures below 110℉, connections may be made directly to the DynaMax. At incoming temperatures of 80°F or lower the DynaMax achieves maximum efficiency. Inlet temperatures must not drop below 40°F to prevent freezing.

4.7 PIPING ARRANGEMENTS

The DynaMax boiler when configured as a hydronic heating boiler allows for 4 modes of operation. For more details on each of the operating modes refer to section 6.3 Central Heating Modes.

4.7.1 Field Supplied Components

1) **Boiler system piping**

   Boiler system piping MUST be sized according to Tables 4 and 6. Reducing the pipe size can restrict the flow rate through the boiler, causing boiler damage and will void the manufacturer's warranty.

2) **Isolation Valves**

   Use only full port ball valves. Failure to supply full port ball valves may result in reduced flow rate through the boiler, causing boiler damage and will void the manufacturer's warranty.

3) **Anti-Scald Mixing Valve**

   An anti-scaled mixing valve is recommended when DHW storage is above 120°F.

4) **Unions**

   Recommended for ease of serviceability.

5) **System Temperature Sensor**

   A system temperature sensor is to be installed in the main header at a point to detect controlled temperature and where it will not lead to short-cycling of the boiler.

An instantaneous water heater is designed to deliver hot water without the use of a storage tank. It is suitable for applications with variable load such as restaurants, condominiums, apartments and motels and typically used in conjunction with tempering valves to achieve temperature control.

Table 12: Flow and Pressure Drop at a Given Temperature Rise (Hydronic Heating)

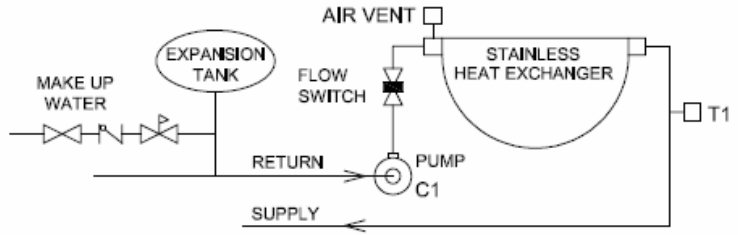
Input, Btu/Hr	30 ℉ (16.7 ℃) Temp Rise		35 ℉ (19.4 ℃) Temp Rise	
	USGPM (min. flow)	ΔP Ft.	USGPM. (min. flow)	ΔP Ft.
80,000	5.0	8.2	4.3	6.2
100,000	6.3	12.3	5.4	9.4
150,000	9.5	10.4	8.1	7.8
200,000	12.6	7.2	10.8	5.8
250,000	15.8	11.5	13.5	8.7
299,000	18.9	9.3	16.2	7.0
399,000	25.2	8.4	21.6	6.3
500,000	31.5	9.2	27.0	6.9
600,000	35.9	14.7	32.0	11.8
750,000	44.9	22.1	40.0	14.4

Table 13: Flow and Pressure Drop at a Given Temperature Rise (DHW)

Input, Btu/Hr	20 ℉ (11.1 ℃) Temp Rise	
	USGPM (min. flow)	ΔP Ft.
80,000	7.5	11.5
100,000	9.4	26.9
150,000	14.0	27.8
200,000	19.2	25.9
250,000	23.5	28.3
299,000	28.8	25.8
399,000	38.4	23.9
500,000	48.6	29.4
600,000	57.6	34.2
750,000	70.4	40.0

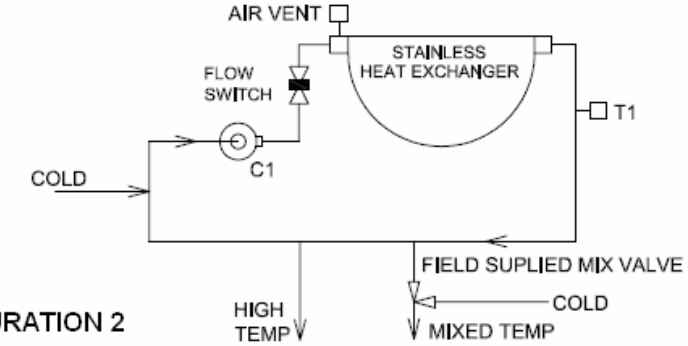
CH MODE = 0, 1, 2, 3
DHW MODE = 0

BOILER CONFIGURATION
Single or Multiple Heater



CONFIGURATION 1

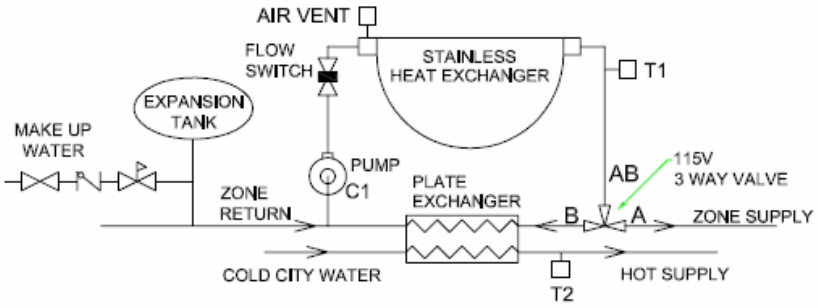
INSTANTANEOUS DIRECT DOMESTIC HOT WATER
Single or Multiple Heater



CONFIGURATION 2

CH MODE = 0, 1, 2, 3
DHW MODE = 4

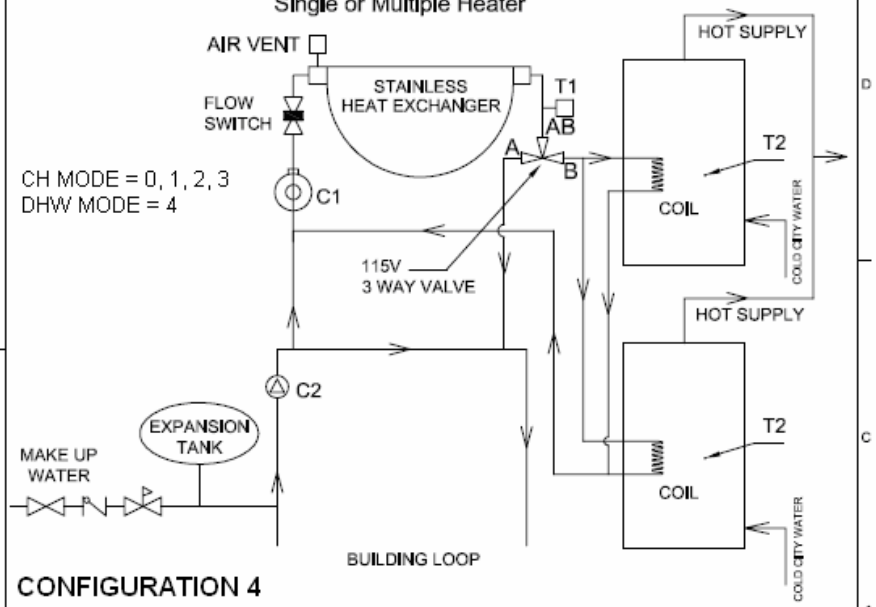
COMBO-BOILER CONFIGURATION
Single or Multiple Heater



CONFIGURATION 3

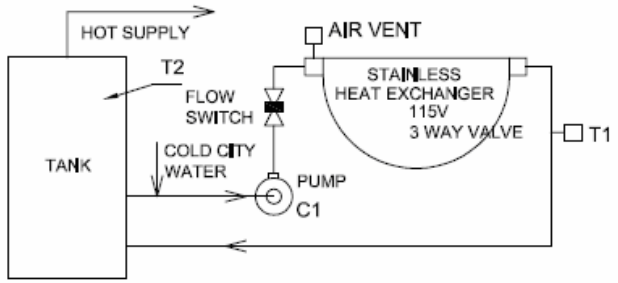
BOILER WITH INDIRECT TANK
Single or Multiple Heater

CH MODE = 0, 1, 2, 3
DHW MODE = 4



CONFIGURATION 4

DIRECT DOMESTIC HOT WATER HEATER WITH STORAGE TANK
Single or Multiple Heater



CONFIGURATION 5

CH MODE = 0
DHW MODE = 1, 2

DRAWN	MK	5/16/2007
CHECKED		
QA		
MFG		

CAMUS HYDRONICS LIMITED

TITLE: Piping Arrangements - DynaMax

SIZE	DWG NO	REV
C	93-0168	02

SCALE | SHEET 1 OF 1

4.8 FLOW PROVING DEVICE (wall mount models only)

Figure 17: Flow Proving Device

The flow proving device is designed to detect when flow is present. This is done by detecting the amount of current (amperes) that exists in the neutral wire from the pump. When the current becomes too low a flow switch error is displayed indicating a lack of water inside the boiler.

4.9 WATER FLOW SWITCH (shipped loose, floor mount models only)

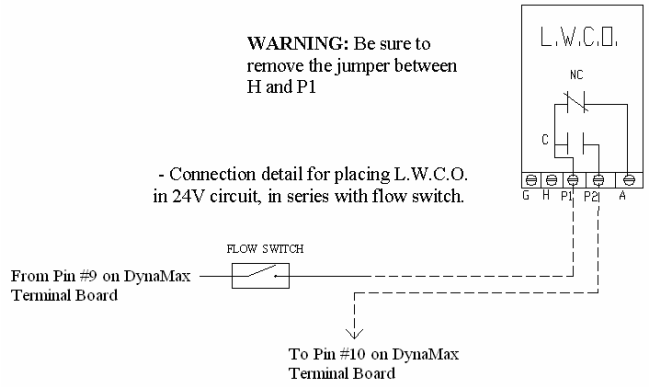
A water flow switch is shipped loose and is to be installed in the outlet piping on all heating boilers and hot water supply boilers. The flow switch is to be installed in a horizontal run of pipe in order to provide effective contact. The flow switch is to be wired into the DynaMax terminal board labelled 'Flow/LWCO'.

4.10 LOW WATER CUTOFF (If Equipped)

If this boiler is installed above radiation level, a low water cut-off device must be installed at the time of boiler installation. Some local codes require the installation of a low water cut-off on all systems. Electronic low water cut-offs are available as a factory supplied option on all models. Low water cut-offs should be tested every six months. The normally open switch contact of the low water cutoff is to be wired in series with the flow switch. This can be wired into the DynaMax terminal labelled 'Flow/LWCO'.

CAUTION
Remove jumper when connecting to 24 VAC circuit.

Figure 18: Low Water Cut Off Electrical Connections



4.11 RELIEF VALVE

This appliance is supplied with a relief valve sized in accordance with ASME Boiler and Pressure Vessel Code, Section IV ("Heating Boilers"). This component is shipped loose. The relief valve is to be installed in the vertical position and mounted in the outlet. No valve is to be placed between the relief valve, and the appliance. To prevent water damage, the discharge from the relief valve shall be piped to a suitable floor drain for disposal when relief occurs. No reducing couplings or other restrictions shall be installed in the discharge line. The discharge line shall allow complete drainage of the valve and line. Relief valves should be manually operated at least once a year.

CAUTION
Avoid contact with hot discharge water

4.12 DHW TUNING VALVE (combination models only)

A DHW tuning valve is provided with DynaMax combination models. In cases where flow control is not possible by the end user the DHW tuning valve is designed to act as a maximum flow controller. The tuning valve is designed to provide the correct amount of hot water for each particular DynaMax model and application. Refer to section 12.9 Domestic Hot Water with Plate Heat Exchanger for further details.

PART 5 ELECTRICAL & CONTROLS

⚠ DANGER

IT IS EXTREMELY IMPORTANT THAT THIS UNIT BE PROPERLY GROUNDED!

5.1 ELECTRICAL CONECTIONS

Minimum 120VAC 60Hz single phase (15A circuit) is required for the DynaMax models DM-080 through DM-750. The appliance, when installed, must be electrically grounded in accordance with the requirements of the authority having jurisdiction or in the absence of such requirements, with the latest edition of the National Electrical Code ANSI/NFPA No. 70. When the unit is installed in Canada, it must conform to the Canadian Electrical Code, C22.1, Part 1 and/or local Electrical Codes.

- All wiring between the appliance and field installed devices shall be made with wire having minimum 220ºF (105ºC) rating.
- Line voltage wire exterior to the appliance must be enclosed in approved conduit or approved metal clad cable.
- The pump must run continuously when appliance is being fired.
- To avoid serious damage, DO NOT ENERGIZE the appliance until the system is full of water. Ensure that all air is removed from the pump housing and piping before beginning initial operation. Serious damage may result if the appliance is operated without proper flow.
- Provide the appliance with proper overload protection.

5.2 HIGH LIMIT

A manual reset fail-safe high limit aqua-stat control is located at the back of the appliance and the control bulb is installed in a dry well in the heat exchanger outlet. The setting of this control limits maximum discharge water temperature to 210°F. The temperature of the outlet water in the heat exchanger must drop a minimum of 30℉ (16.7℃) belo w the setting of the high limit control before the reset function can be activated.

5.3 DYNAMAX CONTROLLER

This appliance uses a direct spark ignition control system. The operation of the DynaMax Controller for the direct spark igniter proves the presence of main flame using a flame sensor proof current (1.25µA). A status point alarm of Flame Fail will be displayed on the main panel if the boiler fails to light after three (3) ignition attempts.

Figure 19: DynaMax Controller

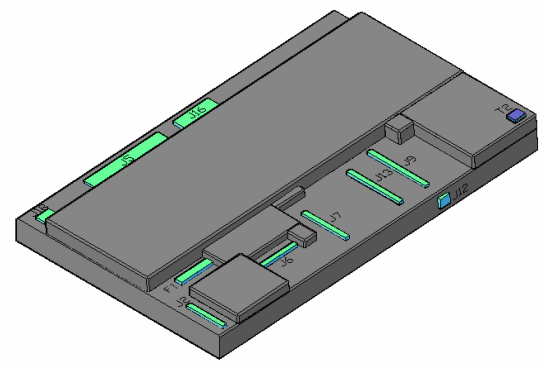


Table 14: Connector Description

Connector	Connector Description
J2	Provides 120V to the DynaMax Controller
J6	3-Way Diverter Valve
J7	On-Board Pump
J13	High-Limit, Gas Valve, Flame Sensor
J9	Fan Power, Fan Modulation
J5	Various Sensors
J16	Safety Switches
J12	Spark Return Signal
T2	Spark Igniter
F1	3.15A Fuse

5.3.1 SERVICE PARTS

The DynaMax Controller is not repairable. Any modification or repairs will invalidate the warranty and may create hazardous conditions that result in property damage, personal injury, fire, explosion and/or toxic gases. A faulty direct spark igniter **MUST** be replaced with a new factory part. **DO NOT** use general purpose field replacement parts. Each appliance has one DynaMax Controller, one direct spark igniter and one flame sensor. A list of recommended spare parts is available.

5.3.2 IGNITION MODULE LOCKOUT FUNCTIONS

The DynaMax Controller may lockout in either a hard lockout condition requiring pushing the reset button to recycle the control for a CSD1 requirement or a soft lockout condition. A typical hard lockout fault for the DynaMax Controller is a 3 trial ignition failure condition. Pushing the reset button on the control panel is the only way to reset the DynaMax Controller that is in a hard lockout condition. The reset button is active after the post purge cycle when there is a lockout condition as indicated by the LCD display. Turning the main power “OFF” and then “ON” or cycling the thermostat will not reset a hard lockout condition. Wait five seconds after turning on the main power before pushing the RESET button when the DynaMax Controller is in a hard lockout condition. Wait for the status LCD display to refresh indicating that the DynaMax Controller is ready before releasing the reset button.

The DynaMax Controller will go into a soft lockout condition, for example, if the supply sensor is disconnected, flow switch, LWCO or air switch are not made. If the fault is not corrected, the boiler will stay in the soft lockout state. Once the fault is corrected, the boiler will automatically return to normal operating state

5.4 ERROR TABLE

The following tables provide a description of all the possible errors with the DynaMax boiler. Errors can be divided into two groups. Soft lockout errors (will disappear when error is gone) and hard lockout errors (can only be reset by the RESET button). A soft lockout error will be indicated with an ‘E’ prior to the error number. A hard lockout lockout error will be indicated with an ‘A’ prior to error number.

When the control is in error the pump will be running. This is done to prevent the freezing of the central heating circuit when the boiler is in error during the winter period. For some non volatile lockouts the pump will not be running, see table below for more details.

5.4.1 Hard Lockout 'A' Codes

Table 15: Lockout Codes

'A' code	Error	Int nr.	Description
01	IGNIT_ERROR	1	Three unsuccessful ignition attempts in a row
02	TOO_MANY_FLAME_FAILURES	24	Three times flame lost during one demand
03	T_MAX_LOCK_ERROR	18	Overheat stat is open
04	GV_RELAY_ERROR	5	Problems with gas valve relay = internal hardware error (pump not running)
05	SAFETY_RELAY_ERROR	6	Problems with safety relay = internal hardware error (pump not running)
09	RAM_ERROR	9	Internal software error
09	FLAG_BYTE_INTEGRITY_ERROR	27	Internal software error
09	AD_HI_CPL_ERROR	28	Internal software error
09	AD_LO_CPL_ERROR	29	Internal software error
09	REGISTER_ERROR	30	Internal software error
10	E2PROM_ERROR	12	No communication with E2prom
12	WRONG_EEPROM_SIGNATURE	10	Contents of e2prom is not up-to-date
13	STATE_ERROR	13	Internal software error
14	ROM_ERROR	14	Internal software error
15	15MS_XRL_ERROR	16	Internal software error
16	20MS_XRL_ERROR	22	Internal software error
18	STACK_ERROR	19	Internal software error
19	FLAME_OUT_TOO_LATE_ERROR	20	Flame still present 10 sec. after closing the gas valve
20	FLAME_ERROR_1	21	Flame detected just before gas valve opened
32	41MS_ERROR	23	Internal software error
33	FAN_ERROR	8	Fan deviation more than 300 rpm longer than 1 minute (when fan speed > 4200 rpm this error is ignored)

To eliminate the hard lockout error,

1) Wait until the boiler has completed it's post-purge cycle, if applicable
2) Press and hold the 'RESET" button until the display reverts back to showing the supply temperature
3) Release the RESET button, the hard lockout has been cleared

5.4.2 Soft Lockout 'E' Codes

Table 16: Blocking Codes

'E' code	Error	Int nr.	Description
01	T_SUPPLY_OPEN	51	Supply sensor not connected
02	T_INLET_OPEN	52	Inlet sensor not connected
04	T_DHW_OPEN	55	DHW sensor not connected
11	T_SUPPLY_SHORTED	59	Supply sensor shorted
12	T_INLET_SHORTED	60	Inlet sensor shorted
13	T_STACK_SHORTED	65	Stack sensor shorted
14	T_DHW_SHORTED	63	DHW sensor shorted
19	E2PROM_READ_ERROR	0	Problems reading from or writing to e2prom
20	FLAME_ERROR_2	36	False flame detected
21	PHASE_ERROR	44	Phase and neutral of mains supply are reversed
22	WD_50HZ_ERROR	43	No earth connected or internal hardware error
23	NET_FREQ_ERROR	45	Mains frequency differs more than 2% from 60Hz
24	FAULTY_EARTH_ERROR	46	Earth connection is not ok
30	STACK_TEMP_ERROR	35	Stack sensor > setpoint + diff. See chapter
31	LOW_WATER_CUTOFF_ERROR	37	Water pressure is to low
32	INLET_TEMP_ERROR	40	Inlet temperature is above 90 degrees
42	WD_COMMUNICATION_ERROR	47	Internal hardware error
45	REFHI_TOO_LO_ERROR	31	Internal hardware error
46	REFHI_TOO_HI_ERROR	32	Internal hardware error
47	REFLO_TOO_LO_ERROR	33	Internal hardware error
48	REFLO_TOO_HI_ERROR	34	Internal hardware error
51	RESET_BUTTON_ERROR	66	Reset button pressed more than 7 times within one minute.
52	APPLIANCE_SELECTION_ERROR	48	Appliance selection code and resistor do not match. This is only checked at startup.

PART 6 CONTROL PANEL

6.1 *DYNAMAX CONTROLLER*

The appliance is provided with a operator interface panel at the front. On a DynaMax Wall Hung boiler the DynaMax Controller can be accessed by removing the upper stainless steel jacket and the lower black sheetmetal jacket which are each held on by two (2) screws. On a DynaMax Floor Mount boiler the DynaMax Controller can be accessed by carefully lifting off the black-coloured Top cover which is held on by four (4) snap lock fasteners.
The Boiler Temperature Controller (BTC) for this appliance is a proprietary Camus DynaMax Controller. It initiates the local call for heat and sets the target supply (appliance outlet) water temperature. This controller accommodates heating and domestic water control with multiple modes of operation which provide set point as well as reset control. It provides the following:

- Readings of inlet and outlet water temperatures, stack temperatures, domestic hot water temperature, flame current, status of heater operation, etc.
- Operation as an auto reset limit.
- Operation as a control for discharge water temperature.
- Optional tank mounted sensor used in conjunction with outlet sensor for domestic hot water.
- Adjustable target temperature
- Display of run hours for maintenance purposes. Counter displays run time up to 10,000 hours. Pressing the **RESET** button will reset the counter.
- Molex, Stocko and AMP connectors for ease of service.
- Error message display.

6.2 *SETTING THE DYNAMAX CONTROLLER*

Press the **MENU** button and then select the desired setting using the **PREVIOUS** and **NEXT** Buttons. When the desired setting is satisfied press the **ENTER** key and this will save the last setting. In normal operating mode the inlet temperature, outlet temperature, and ON hours can be viewed by pressing the **PREVIOUS** and **NEXT** key. After checking the settings allow the control to return to normal operation on its own.

6.3 *CENTRAL HEATING MODES*

Mode 0: Central Heating Without Outdoor Reset
In this mode no outdoor sensor is needed. If the room thermostat closes, the pump is switched on. If the supply temperature drops below the hysterese and central heating setpoint (ch_setpoint) temperature the burner is switched on. Burner power is PID regulated between (Supply temperature) T-supply and ch_setpoint. When supply temperature is above the ch_setpoint + hysterese the burner is switched off.

If the room thermostat opens the burner is switched off and the pump runs on for post pump (default: 30 sec).

Mode 1: Central Heating with Outdoor Reset and Thermostat Control

This mode will only function when an outdoor sensor is connected. The setpoint is calculated depending on the outdoor temperature and the burner will react on the room thermostat. The central heating setpoint is calculated as follows:

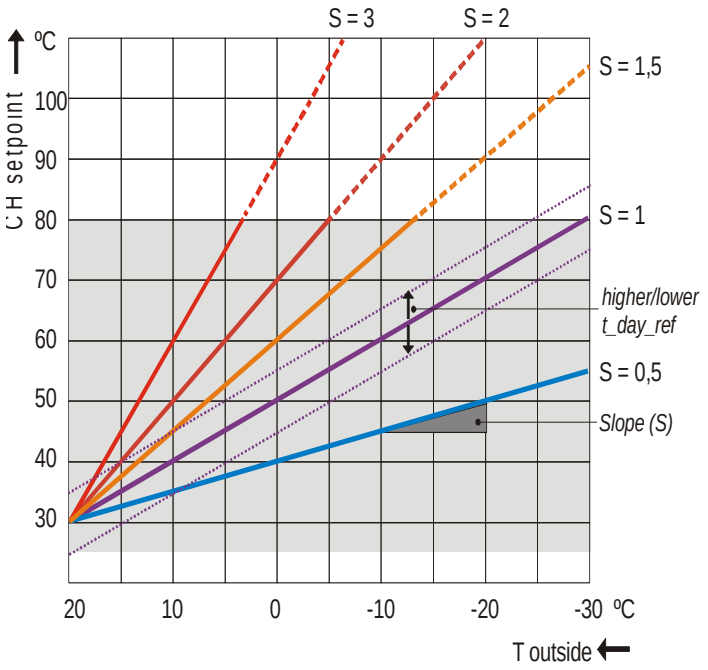
ch_setpoint = t_day_ref + [(20 – T_outdoor) * Slope]

t_day_ref is the reference temperature for central heating setpoint when T_outdoor is 68°F (20°C). T_day_ref is a user settable parameter.

The Slope can be set via the menu between 0.1 to 5.0 with steps of 0.1.

The calculated central heating setpoint is limited between 90°F (32°C) and 185°F (85°C).
The outdoor temperature used for the central heating setpoint calculation is measured once a minute and averaged with the previous measurement. This is done to avoid drastic changes to the boiler when outdoor temperature fluctuates rapidly.
Functionality remains the same as Mode 0 apart from the calculated setpoint.

Figure 20: Programmable Ch_setpoint curve



Mode 2: Central Heating with Outdoor Reset

An outdoor sensor must be connected for this mode to function properly. The central heating setpoint is calculated the same way as Mode 1. However, the demand does not depend on a room thermostat but instead on the outdoor temperature and the weather compensation setpoint. When the outdoor temperature is below this weather setpoint a central heating demand is created.

Overnight an input signal from a room thermostat (RT) can lower the ch_setpoint. When the RT input closes the ch_setpoint will also be lowered with t_night_reduction. Therefore, RT input does not directly influence central heating demand.

Mode 3: Central Heating with Constant Temperature Loop

No outdoor sensor is needed. The supply temperature is kept constantly at the setpoint temperature. The burner is controlled in a similar way as Mode 0. When the room thermostat contact closes the ch_setpoint will be decreased with t_night_reduction. The pump is always on in this condition.

6.4 DOMESTIC HOT WATER MODES

Mode 0: Disables Domestic Hot Water
No domestic hot water is available; therefore the DHW sensor is not supplied.

Mode 1: DHW Storage Tank with Temperature Sensor

The DHW temperature in the tank is measured with a storage tank sensor and set with parameter dhw_setpoint. When the DHW sensor drops below 'DHW_setpoint – dhw_hyst_down' the control detects a demand for the storage tank and activates the pump. If the DHW temperature continues to drop the ignition sequence will begin. When the burner is lit the load is PID-modulated so the supply is regulated towards DHW_setpoint. The burner will fire at steady-state or it shall shut off if the storage tank sensor is greater than 'DHW_setpoint + dhw_hyst_up'. The on-board pump will continue to circulate until the dhw_post_pump_ period timer is satisfied.

With this mode of operation a Pre-Heat function is implemented in the algorithm. If the storage tank sensor detects that the temperature is below DHW_*setpoint* – DHW_*store_hold_warm* the boiler will initiate the ignition sequence and the burner will fire at minimum fire until the storage tank sensor temperature is *satisfies DHW_setpoint* + *DHW_store_hyst_up*.

The anti-freeze monitor on each boiler will monitor the inlet water temperature and when it drops below 50^{o}F (10^{o}C) it will bring on the pump to prevent freezing of the heat exchanger.

Mode 2: DHW Storage Tank with Aguastat

When the aquastat closes the control detects a demand for the storage tank and starts the pump. Operation of Mode 2 is identical to the operation of Mode 1, but an aquastat replaces the use of a sensor in the storage tank. The Pre-Heat algorithm is not available in this mode of operation

Mode 4: Combination Boiler using Plate Heat Exchanger and DHW Temperature Sensor

In this configuration the boiler can be used for space heating and indirect domestic hot water. Camus supplies an on-board brazed plate heat exchanger, a pump and a 3-way diverter valve.

When a heat demand is detected the pump will run and the 3-way diverter valve switches over to the hydronic heating loop. The pump continues to run until the 'post pump CH period' is complete after cycling through a heat demand cycle. When there is no heat demand the pump will turn off Individually controlled zone pumps will draw hot water from the manifold and return from the zone to the manifold.

The temperature of the water leaving the plate heat exchanger is constantly monitored and when it drops below 'dhw_setpoint – dhw_hyst_down', the on-board pump activates to satisfy a demand for DHW and the 3-way diverter valve switches over to DHW demand. If a central heating demand is present when a DHW demand occurs, the heating demand will be interrupted resulting in domestic hot water priority. The 3-way valve shall switch over from hydronic heating to DHW demand and the boiler will continue to function in this state until DHW demand ends. If hydronic demand is still present after DHW demand ends the 3-way valve switches over to hydronic heating. This results in zero lag, as the burner does not restart when switching between hydronic heating and DHW demand.

Due to the use of a plate heat exchanger a Pre-Heat function is implemented in the algorithm. This ensures the plate is always warm and prevents the user from receiving an initial blast of cold water when they first turn on the tap. The Pre-Heat function is enabled after 2 minutes of burner shut off. If the DHW sensor detects that the temperature is below 'Pre Heat setpoint – pre heat hyst down' the boiler will initiate the ignition sequence and the burner will fire at minimum fire until the DHW sensor temperature is equal to the Pre Heat Setpoint. The Pre Heat function will only activate when a DHW demand is non-existant.

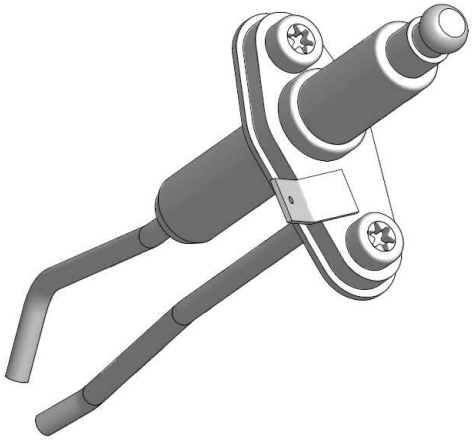
The anti-freeze monitor on each boiler will monitor the inlet water temperature and when it drops below 50^{o}F (10^{o}C) the pump will be activated to prevent the heat exchanger from freezing.

PART 7 COMPONENTS

7.1 DIRECT SPARK IGNITER

The direct spark igniter is inserted directly through the combustion chamber front door and held in place by two torx screws. Care must be taken when removing and/or installing the igniter. Always remove the igniter prior to removing the fan assembly for inspection of the burner and heat exchanger.

Figure 21: Direct Spark Igniter

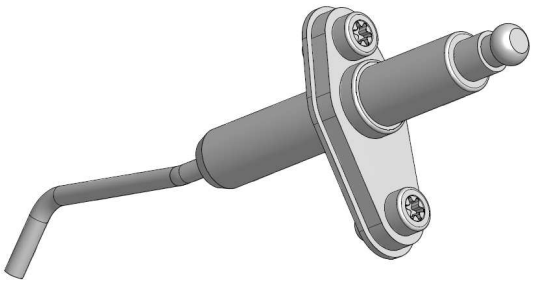


During a trial for ignition sequence a properly operating igniter will generate a continuous spark with a 3/16" spark gap. It is recommended to clean the direct spark igniter using steel wool as required. **DO NOT** use sandpaper or grit-cloth since this will contaminate the metal surface.

7.2 FLAME SENSOR

The flame sensor is inserted directly through the combustion chamber front door and is screwed into the combustion chamber front door. Care must be taken, when installing the flame sensor, to align it perpendicular to the fan flange and parallel to the burner tube and not to over tighten.

Figure 22: Flame Sensor



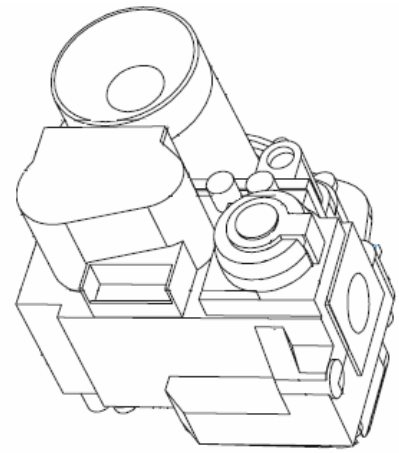
The ignition module relies on the flame sensor to provide a flame rectification signal. Oxide deposits, improper placement or damaged ceramic insulator will result in insufficient signal leading to ignition module lock out. For proper operation minimum 1.25 µA DC must be fed back to the module. Oxide deposit on the sensor rod must be removed with steel-wool. **DO NOT** use sand-paper since this will contaminate the metal surface.

7.3 COMBUSTION AIR FAN

DynaMax uses a modulating air fan to provide combustible air/gas mix to the burner and push the products of combustion through the heat exchanger and venting system. The fan assembly consists of a sealed housing and fan wheel constructed from spark resistant cast aluminium. The fan is operated by a fully enclosed 120 VAC, Single-Phase EC/DC electric motor. The fan housing and motor assembly is fully sealed and SHOULD NOT be field serviced. The power draw of the motor is proportional to the modulated gas input rate of the appliance.

7.4 GAS VALVE

Figure 23: Venturi and Gas Valve Arrangement



The Gas Valve supplied with the DynaMax boiler is a combined valve/venturi assembly. A servo pressure regulator is incorporated into the gas valve to provide stable gas supply. Pressure taps are provided to check inlet and outlet gas pressures. An internal fine mesh screen is incorporated in the inlet of the gas valve to prevent debris from entering the combustion chamber. Gas valves all factory set at low and high fire and modulates to maintain combustion characteristics across the full operating range.

7.5 OUTER JACKET

The outer jacket assembly is constructed from mirror finish stainless steel. This ensures a long life for the jacket assembly, with full integrity

PART 8 LABVISION SOFTWARE

NOTE
LabVision software is available on request from the factory and is not shipped with the boiler/ water heater.

To operate LabVision software a Laptop and LPT1/USB connection cable are needed.

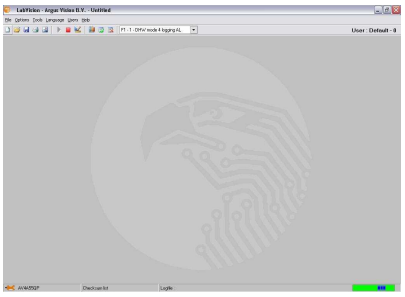
8.1 STARTING UP LAB VISION

Locate the file named LabVision.exe, the appearance of the icon is shown:

Figure 24: LabVision Icon

A startup screen will appear on screen:

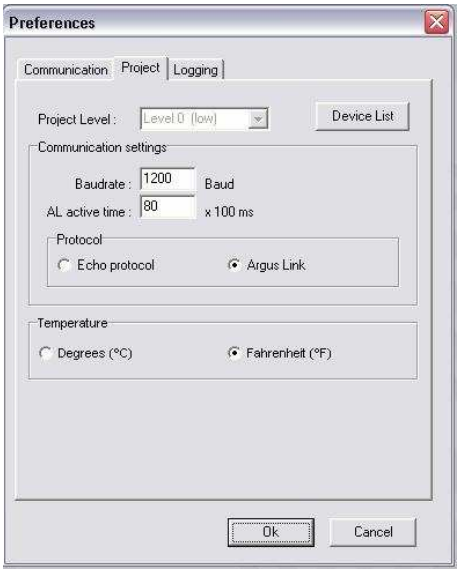
Figure 25: LabVision Startup Screen



When a connection between LabVision and the DynaMax boiler is established the blue status bar on the bottom-right will scroll from right-to-left and back again.
If a connection is not established between LabVision and the DynaMax boiler, a proper connection will need to be established before advancing to the next steps.

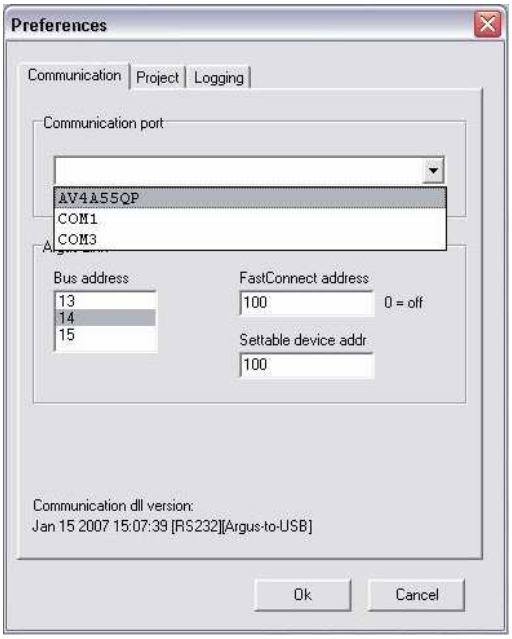
- Go to Options > Communication > Preferences
- A Preferences screen will pop up
- Under the Project Tab in the Protocol box select the Argus Link connection

Figure 26: Selecting Argus Link Protocol



- Click on the Communication Tab
- In the Communication Port pull down menu select the address of Argus Link USB port.
- Click [OK]
- Use the pull down menu to jump to the desired mode of operation.

Figure 27 : Selecting Communication Port



The three blue status bars located at the bottom-right of the screen will move left-to-right and back again. This confirms that a successful connection has been established between LabVision and the DynaMax boiler.

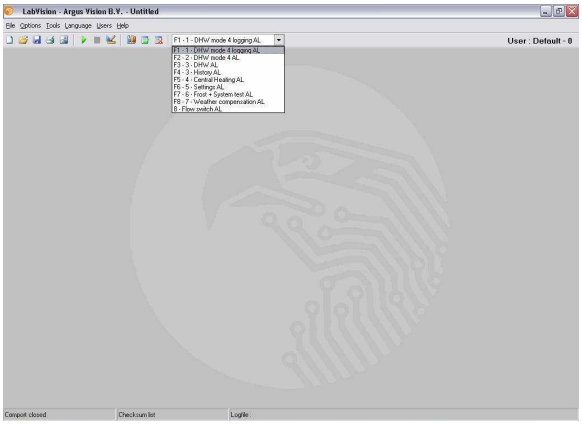
USB connector address is shown in the bottom-left.

NOTE
Do not make any other parameter or setting changes other than those stated in the manual as they will have a detrimental effect to the DynaMax Boiler.

8.2 ADJUSTING FAN SPEEDS

Use the pull down menu to access DynaMax settings:

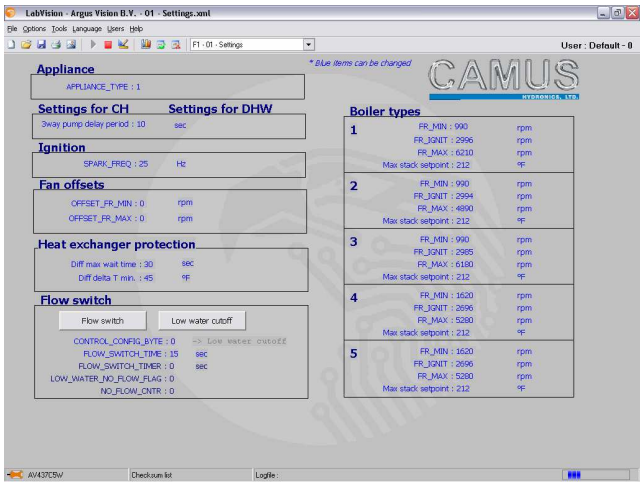
Figure 28: Pull Down Menu



To adjust ignition fan speeds. Use the pull down menu or the function keys on the keyboard, select Settings. This will bring up the Settings screen.

Parameters shown in blue text can be adjusted. To change a blue coloured parameter, place the cursor on top a parameter and double-click. This will bring up a window to enter the desired values of operation.

Figure 29: Settings Screen



- The Appliance name is listed under Appliance Type
- Fan speeds are listed which corresponds to the appliance address, listed below:

Table 17: Appliance Type Designations

Appliance Type	DynaMax Model
0	80
1	100
2	150
3	200
4	210
5	250
6	260
7	299
8	399
9	500
10	600
11	750

NOTE
Only change the fan speed settings with the associated boiler, as only this will have an effect on boiler performance.

8.3 LABVISION CENTRAL HEATING

Use the pull down menu and select Central Heating to adjust parameters in Central Heating. Before any parameters can be adjusted the blue status bar must track left-to-right and back again. Refer to Section 8.1 to resolve connection issues.

Figure 30: Central Heating Screen

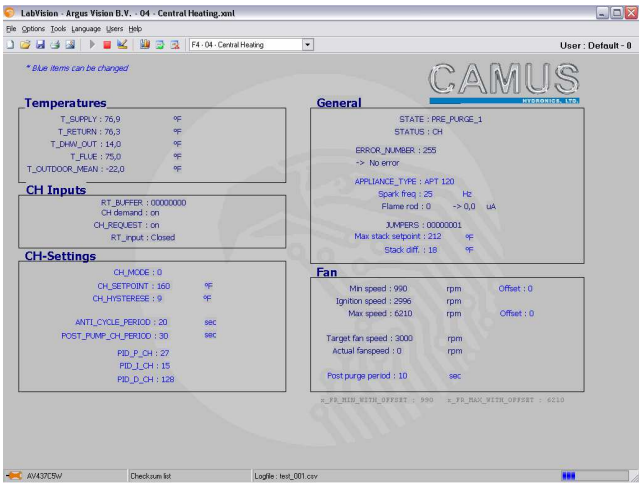
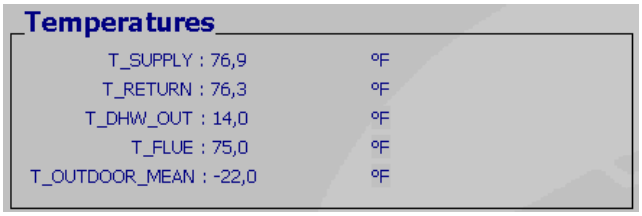


Figure 31: Central Heating Temperature Screen



Real-time temperatures are updated on screen, this includes:

- Outlet/Supply Temperature (T_SUPPLY)
- Inlet/Return Temperature (T_RETURN)
- Stack/Flue Temperature (T_FLUE)
- Outside Temperature (T_OUTDOOR_MEAN)
- DHW Supply Temperature (T_DHW_OUT)

The CH demand switches between on/off depending on whether or not there is a demand for central heating. The other parameters are designed for internal control purposes.

Figure 32: Central Heating Input Screen

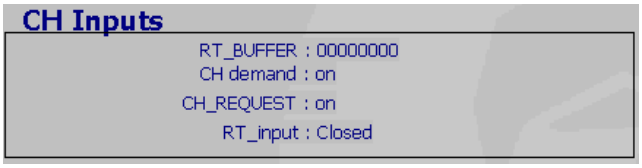
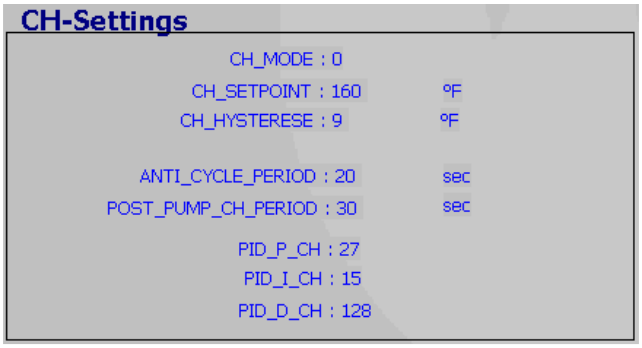


Table 18: CH Input Screen Parameters

Parameter	Parameter Description
CH demand	Displays the state of the room thermostat. When 'on' is shown the thermostat is closed, when 'off' is shown the thermostat is open.
CH_REQUEST	Displays the response of the boiler. 'on' is displayed when the boiler is responding to the CH_demand, and 'off' is displayed when a CH_demand does not exist.

8.3.1 Central Heating Mode, Installer Level

Figure 33: Central Heating Mode Settings



The following parameters can be adjusted:

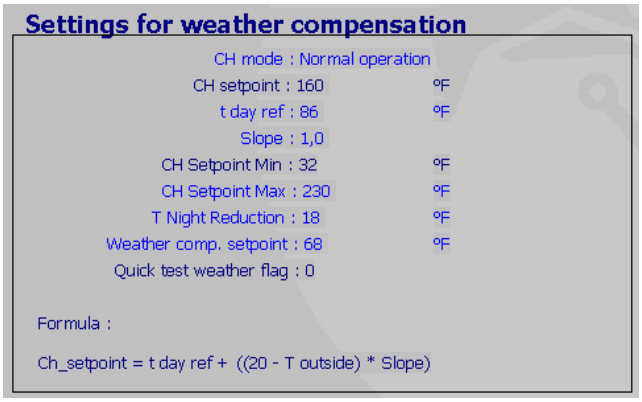
Table 19: CH Mode = 0 Parameters

Parameter	Parameter Description
CH_Setpoint	**CH Mode = 0, 1, 2, 3** To provide a target setpoint for the heating system. (Default: 160°F)
CH_Hysterese	**CH Mode = 0, 1, 2, 3** To provide a modulation rate above and below CH_setpoint. For example, if the value is 10°F and the setpoint is 160°F, the boiler will begin to modulate at 155°F and shut off at 165°F. (Default: 9°F)

To change a blue coloured parameter, place the cursor on top of a parameter and double-click. This will bring up a window to enter the desired values. Take note of the minimum and maximum values that can be entered, as the values entered MUST be within this range.
The Anti_Cycle_Period is designed to prevent the boiler from short-cycling. The preset time must be satisfied before the boiler will start up. Post_Pump_CH_Period determines the time the on-board pump continues to circulate after the burner has shut off and completed its post-purge cycle.

8.3.2 Central Heating Mode = 1, 2, 3 Installer Level

Figure 34: Central Heating Mode = 1, 2, 3 Settings



The following parameters can be adjusted:

Table 20: CH Mode = 1 Parameters

Parameter	Parameter Description
t_day_ref	**CH Mode 1, 2** To determine the outdoor reset temperature. The control uses the following algorithm to adjust the CH_setpoint accordingly: CH_Setpoint = t_day_ref + [(20-T_Outdoor) * Slope (Default: 68°F)
Slope	**CH Mode 1, 2** To determine the outdoor reset temperature. See t_day_ref to understand how Slope affects CH_Setpoint. (Default: 1.0)
T_night_reduction	**CH Mode 2** If setting an alternate temperature for night time usage is desired. This parameter is only engaged when the external clock is satisfied. (Default: 50°F)
Weather_setpoint	**CH Mode 2** When the outdoor temperature is below the preset Weather_setpoint a CH demand is created. Therefore, the CH demand is not dependent on Room Temperature input. (Default: 68°F)

To change a blue coloured parameter, place the cursor over a parameter and double-click. This will bring up a window to enter the desired values of operation. Take note of the minimum and maximum values that can be entered, as the values entered MUST be within this range.

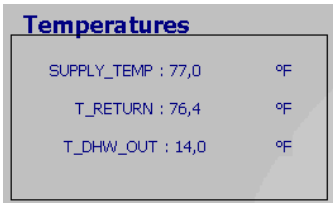
8.4 LABVISION DOMESTIC HOT WATER

Use the pull down menu and select DHW Mode 4 to adjust parameters. Before the parameters can be adjusted the blue status bar must track left-to-right and back again. Refer to Section 8.1 to resolve connection issues.

Real-time temperatures are tracked by LabVision and are displayed on the screen. The temperatures tracked are:

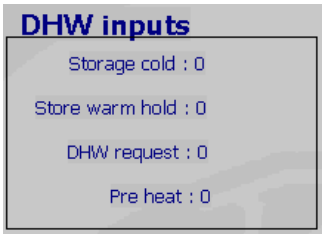
- Outlet/Supply Temperature (T_SUPPLY)
- Inlet/Return Temperature (T_RETURN)
- DHW Supply Temperature (T_DHW_OUT)

Figure 35: DHW Temperature Screen



The DHW section of the screen displays the request that the DynaMax boiler is responding to. The values for the 4 parameters: Storage cold, Tap flow, DHW request, and Pre heat vary from 0 (off) and 1 (on). This information is also listed under the General section as well.

Figure 36: DHW Inputs



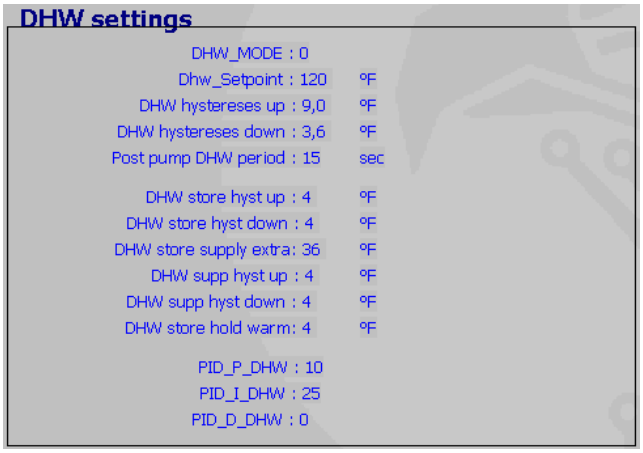
The Pre heat and Tap flow screens are designed to keep the DynaMax operating at its optimum setting, and therefore these parameters will be preset and cannot be changed.

8.4.1 DHW Mode = 0, Installer Level

No parameter changes can be made in this mode as this mode is used for a DynaMax Heating boiler.

8.4.2 DHW Mode = 1, 2 Installer Level

Figure 37: DHW Mode = 1, 2 Settings



The following parameters can be adjusted:

Table 21: DHW Mode = 1, 2 Parameters

Parameter	Parameter Description
Dhw_Setpoint	To provide a target setpoint for the storage tank. (Default: 135^{O}F)
DHW store hyst up	To detect the start of a storage tank demand. (Default: 4^{o}F)
DHW store hyst down	To detect the end of a storage tank demand(Default: 4^{o}F)
DHW store supply extra	Additional increase in the setpoint temperature above Dhw_Setpoint (Default: 36^{o}F)
DHW supp hyst up	To provide a modulation rate above Dhw_setpoint(Default: 4^{o}F)
DHW supp hyst down	Supply temperature below Dhw_Setpoint to start ignition sequence. (Default: 4^{o}F)
DHW store hold warm	When the storage tank temperature drops below this value the boiler will fire at minimum fire. This functionality is only activated when the boiler is in Standby mode. (Default: 120^{o}F)

To change a blue coloured parameter, place the cursor over a parameter and double-click. This will bring up a window to enter the desired values of operation. Take note of the minimum and maximum values that can be entered, as the values entered MUST be within this range

8.4.3 DHW Mode = 4, Installer Level

This mode can **ONLY** be accessed on a DynaMax Combination model using a plate type heat exchanger. Use the pull down menu and select DHW Mode 4 to adjust parameters. Before parameters can be adjusted the blue status bar must track left-to-right and back again. Refer to Section 8.1 to resolve connection issues.

Figure 38: DHW Mode = 4 Screen

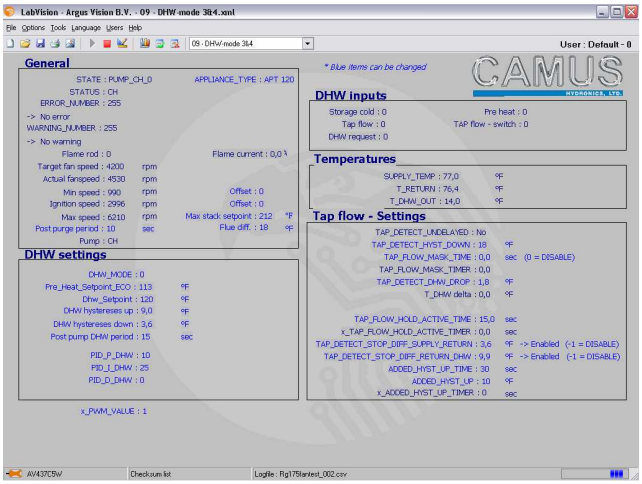
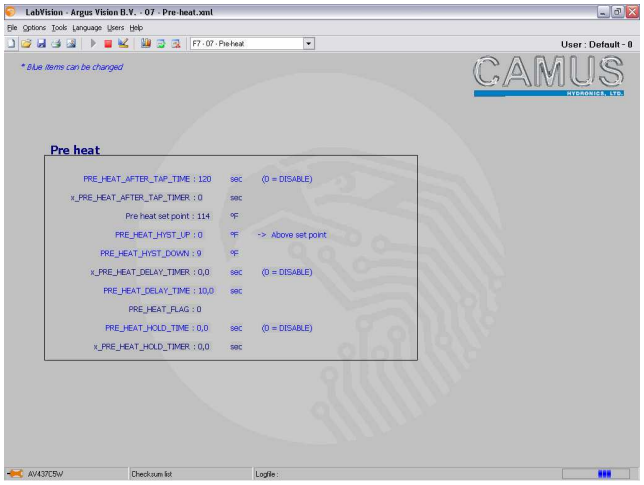


Table 22: DHW Mode = 4 Parameters

Parameter	Parameter Description
DHW_Setpoint	To provide a target setpoint for DHW. (Default: 120°F)
DHW hystereses up	To provide modulation rate above DHW setpoint. (Default: 9°F)
DHW hystereses down	To provide modulation rate below DHW setpoint. (Default: 4°F)
Pre Heat Setpoint	When the plate heat exchanger outlet/supply temperature drops below this value the boiler will fire at minimum fire. This functionality is only activated when the boiler is in Standby mode. (Default: 110°F)
Pre Heat hyst_up	To provide modulation rate above Pre-heat setpoint for the plate heat exchanger during pre-heat. (Default: 0°F)
Pre Heat hyst_down	To detect the start of the pre-heat sequence below Pre Heat Setpoint. (Default: 9°F)

Figure 39: DHW Mode = 4 Pre heat and Tap flow Screen



The General screen provides access to the state of the boiler at any point in time. The State displays the operation of the DynaMax boiler. This parameter ranges from STANDBY, PRE_PURGE, SAFETY_ON, SAFETY_OFF, IGNIT_0, IGNIT_1, and BURN. The complete breakdown of the ignition sequence is listed in Table 43. Status displays that the boiler is in CH, PRE_HEAT or TAP mode.

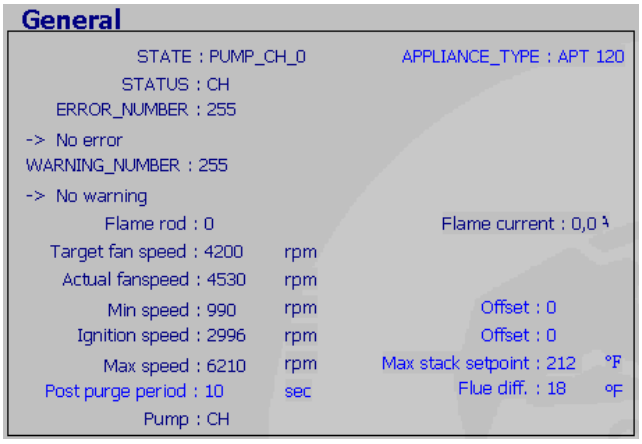
Table 23: Status Readouts

Parameter	Parameter Description
PRE HEAT	Keeps the plate heat exchanger warm. This is accomplished by firing the boiler at minimum fire. This process repeats itself with a 2 minute gap in between firing if the plate has not reached Pre Heat Setpoint.
TAP	When there is a domestic demand and the burner will fire until DHW_Setpoint is satisfied.

DHW Priority

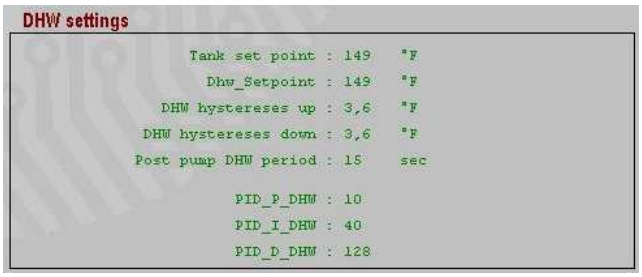
When both a CH demand and DHW demand exist simultaneously, DHW will always have priority. When DHW demand ends the boiler will check the Outlet Temperature sensor or System Sensor and Room Thermostat switch to determine if CH demand exists.
Flame rod current in µA can be observed. Fan speeds cannot be altered here, instead they are varied under the Settings screen. This is covered in Section 8.2 of this manual The Maximum Stack Setpoint Temperature and the Flue Diff. Temperature cannot be changed to preserve reliable and efficient performance.

Figure 40: DHW Mode = 4 General Screen



To change a blue coloured parameter, place the cursor over a parameter and double-click. This will bring up a window to enter the desired values of operation. Take note of the minimum and maximum values that can be entered, as the values entered MUST be within this range

Figure 41: DHW Mode = 4 Settings



8.5 LABVISION CASCADE

When connected in a cascade setup the Master boiler can control up to 7 slave boilers (ie. a total of 8 boilers) from the control panel of the Master Boiler. All diagnostic, control operation can be performed on the Master boiler, which can then relay the relevant information to the slave boilers. Therefore a direct connection to the Master Boiler and LabVision is required for communication using LabVision.

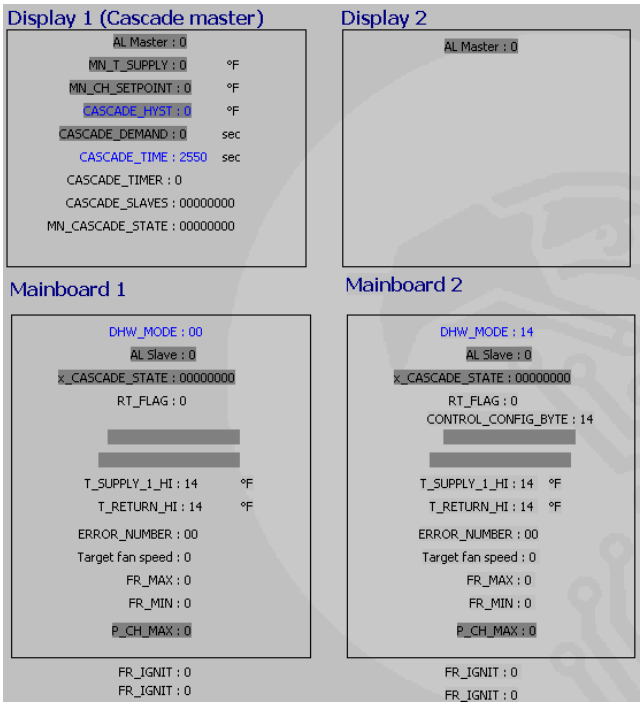
When the master boiler detects a heat demand for CH this boiler will start and uses it own parameters for CH demand. If after cascade_delay_time the system temperature is still below the setpoint the next boiler will start.

When the master temperature (T_system) plus cascade_hyst is greater than the setpoint a boiler will be stopped. If after a period of cascade_delay_time this situation is still present the next boiler is switched off.

In a situation where there is an installation of more than 8 DynaMax boilers in the Cascade system, a Zone Master can be ordered with the system. This Zone Master functions in the same way as the DynaMax Controller controlling the Cascade function and can support up to 64 DynaMax boilers.

Refer to section 12.14 Cascade Setup to install a Cascade system setup.

Figure 42: Cascade Screen



The following parameters can be adjusted:

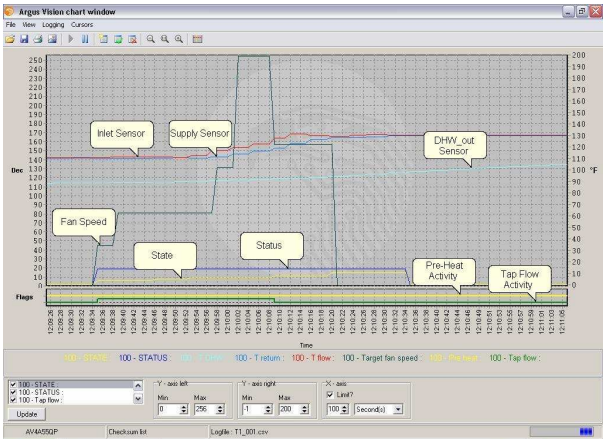
Table 24: Cascade Parameters

Parameter	Parameter Description
CASCADE_HYST	This parameter is entered to provide a modulation rate above and below the setpoint. This value must be smaller than the CH_Hysterese.(Default: 9^{0}F)
CASCADE_DELAY_TIME	This parameter is entered to implement a delay time between the startup of one boiler to the next. This timer starts when a flame signal is detected from the first boiler.(Default: 120 sec)

8.6 DATA LOGGING

LabVision software also comes equipped with data logging capability which has the ability to track return/supply, DHW temperatures, actual and target fan speed, state and status in a graph as the boiler is operating. This is a beneficial feature as it improves the ability to troubleshoot and diagnose issues in the field.

Figure 43: Data Logging Screen



To select the parameters that need to be viewed or recorded, a Parameter Selection Box on the bottom left-side of the screen contains all the parameters that LabVision can track. To view or record the parameter that is required, click the check box beside each parameter. When finished selecting the parameters required, click on Update and this will refresh the logging screen.

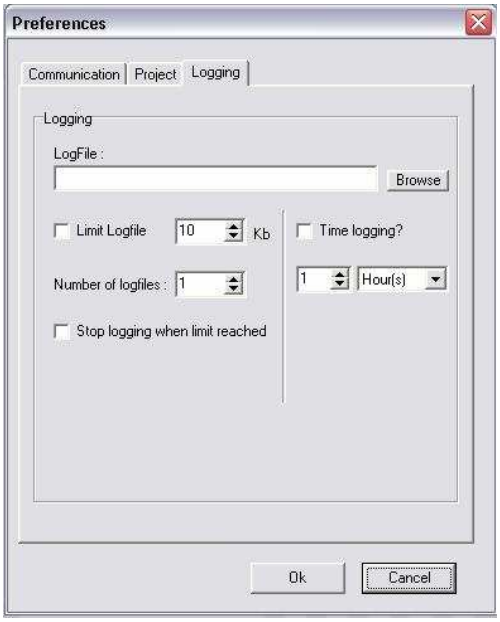
Figure 44: Parameter Selection Box

To adjust the viewing area, this can be done by adjusting the margins for the left y-axis, right y-axis and the timeframe with which to view.

Figure 45: Adjust Viewing Area

To record the data that is shown on screen, go to the Toolbar and click on Logging > Start Logging. A window will pop up on screen asking for a file name for the log file to be captured. DO NOT change the file type, as LabVision must record the log file as .Csv. As soon as file name is confirmed by clicking on 'Open', LabVision begins capturing the data immediately.
Also notice that the status bar has changed from blue to red. This demonstrates that LabVision is recording to the log file specified. The amount of data collected can be limited to a certain size inside LabVision. When a maximum memory limit is set, this results in over-writing previously written data in the same log. Therefore it captures the most recent amount of data. To prevent this from occurring this feature can be turned off by clicking on Options > Options > Logging tab and uncheck the parameter 'Limit Logfile'. With this feature disabled the log file will be dependent on time as opposed to memory size.

Figure 46: Unlimited Log File Size



When logging is complete click on Logging > Stop Logging. Notice that the status bar has changed from red to blue. This informs that Logging is complete.
To view a log file, Camus recommends using Microsoft® Excel.

8.6.1 Procedure for Viewing Log Files in Microsoft® Excel

1) Open Microsoft® Excel
2) Use a new spreadsheet, if Microsoft® Excel fails to load a new spreadsheet. Click on File > New..
3) Data > Import External Data > Import Data..
4) A window appears titled 'Select Data Source'
5) Identify the log file that was created and double-click it
6) A new window will pop up titled 'Text Import Wizard'. Select Delimited. Click Next.
7) Place a checkmark beside 'Tab' and 'Semi-Colon' from the checkboxes provided. Click Next.
8) In the 'Column data format' section of the window, ensure that 'General' is selected. Click Finish.
9) An 'Import Data' window will appear and check to see that 'Existing Worksheet' is selected and the text box reads: '=Sheet1!$A$1' or '=$A$1'. This allows the data to start to importing the data at cell 'A1' of the spreadsheet.
10) Click OK.
11) The log file will appear on the spreadsheet.

8.6.2 Analysis of Microsoft® Excel Log File

The log file parameters are divided into columns with a reference to the time of data collection on each row. The Status and State parameters are identified by numbers and these can be translated into a description, listed below.

Table 25: Description of State and Status Parameters

State		Status	
#	Description	#	Description
0	RESET_0	0	STANDBY
1	RESET_1	10	ALARM
2	STANDBY_0	14	BLOCK
3	SAFETY_ON	15	FROST_PROTECT
4	SAFETY_OFF	16	CH
5	PRE_PURGE	17	RESET_STATE
6	PRE_PURGE_1	18	STORAGE
7	IGNIT_0	19	TAP
8	IGNIT_1	20	PRE_HEAT
9	BURN_0		
10	POST_PURGE_0		
11	POST_PURGE_1		
12	PUMP_CH_0		
13	PUMP_CH_1		
14	PUMP_HW_0		
15	PUMP_HW_1		
16	ALARM_1		
17	ERROR_CHECK		
18	BURNER_BOOT		
19	CLEAR_E2PROM_ERROR		
20	STORE_BLOCK_ERROR		
21	WAIT_A_SECOND		

8.7 Error History

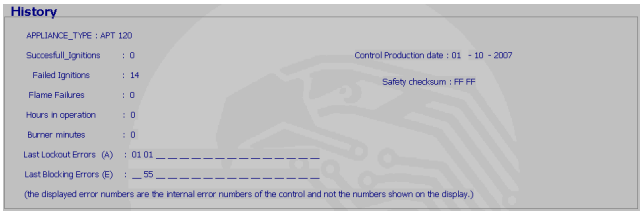
LabVision has the ability to record past blocking (E) and lockout (A) errors. To access this feature use the pull down menu and select History.

Figure 47: Error History

The blocking and lockout errors are separated into their own respective rows and are identified by their respective error codes. This assists with diagnostic and service work as the behaviour of the boiler can be tracked.

This screen also provides information of the number of Successful Ignitions, Failed Ignitions and Flame failures due to a lost flame signal.

Figure 48: History and Diagnostic Information



Due to a large number of error codes that can be presented, LabVision comes complete with a feature in which to provide a description of each error code. Double click on the phrase ‘Enter error number here for description’ and a window will appear allowing the installer to identify the error.

Figure 49: Error Query

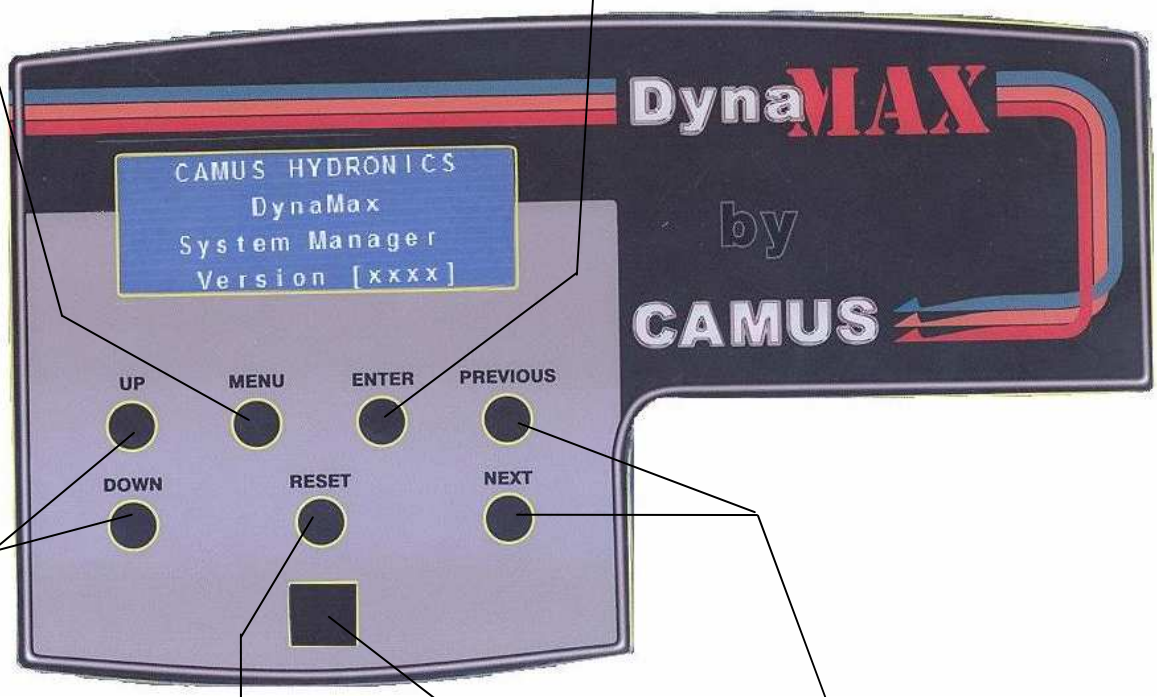
PART 9 DYNAMAX CONTROL PANEL

MENU

- Press to enter Main Menu. This provides access to System Monitor, Settings, Programs and Errors

ENTER

- Press to ENTER to confirm selection or to confirm a parameter change



UP

DOWN

- Press to change boiler parameter values (Setpoint Temperature, Date & Time)

RESET

- Press to reset a lockout error. This shown on the display as A##*

* Where # denotes a digit from 0 – 9.

- PC LPT1 Connection Port

PREVIOUS

NEXT

- Press to change boiler parameter values (Setpoint Temperature, Date & Time)

9.1 INTRODUCTION TO THE DYNAMAX CONTROL PANEL

For times when a notebook computer is not available, a service technician will still be able to perform all the functions described in LabVision, except for the logging aspect.

The menu structure for the DynaMax Control Panel was designed to be intuitive and easy to use for a first time user. To maintain the DynaMax boiler at its correct settings three levels of security is provided. User, Installer and Factory with an increasing amount of parameters that can be adjusted with each higher level of access. This is done to provide an easy means of communication for the end user and a more indepth approach for factory and installers when installing and troubleshooting.

Figure 50: DynaMax Control Panel Layout

Table 26: DynaMax Control Panel Key Functions

KEY	KEY DESCRIPTION
MENU	The MENU display is shown when pressed.
RESET	Only used during a lockout error situation
ENTER	Confirms selection of a parameter or parameter value
PREVIOUS	Scroll backward through the parameter structure
NEXT	Scroll forward through the parameter structure
UP	Increase a parameter value
DOWN	Decrease a parameter value

Levels of Access

Three access levels to simplify the use of the boiler.

User – Access to general boiler and display settings and will allow adjustments to the central heating and domestic hot water setpoint.

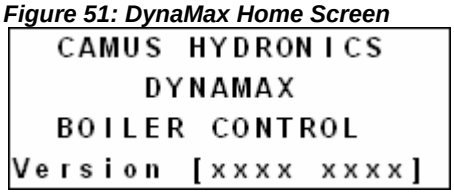
Installer –Access to all user parameters and allows for changes to additional boiler parameters to allow for ease of startup and serviceability.

Camus – Full access to DynaMax parameters and is only open to Camus personnel.

Startup Display

Upon startup of the DynaMax boiler the DynaMax Control Panel startup display is shown. This display is shown for 5 seconds upon startup. The Version # relates to the version of software uploaded onto the boiler control.

Figure 51: DynaMax Home Screen



The display panel then defaults to the next screen which provides System, Boiler and Hot Water temperature. For a DynaMax heater that does not have domestic hot water capability the status will display OFF.
A temperature readout of supply temperatures from the boiler will be displayed. If the DynaMax is a water heater or a combination unit it will also display the Hot Water temperature.

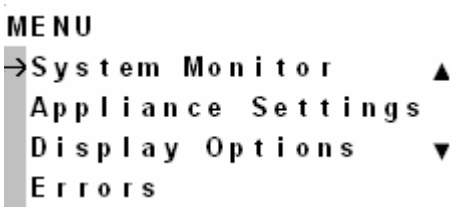
Figure 52: Temperature and Status

Table 27: Temperature and Status Display Readout

	DISPLAY READOUT	DESCRIPTION
System	ON	Heat Request
	OFF	No Heat Request
	DHW	DHW Request
	ERR	Lockout/ Blocking Error
	NC	No Communication
Boiler	ON	Burner On, Responding to CH Demand
	OFF	Burner Off
Hot Water	ON	Burner On, Responding to DHW Demand
	OFF	Burner Off

9.2 MENU SCREEN

Figure 53: Menu Display



From TEMPERATURE AND STATUS display;

1) Press **[MENU]** button.

System Monitor
Monitor Central Heating and DHW settings, if equipped. System Monitor will be open to all levels of access.

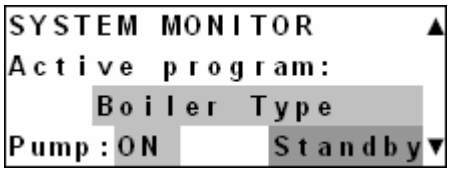
Display Options
Changes to Languages, Date and Time, and Units of measurement. The default setting is English, Fahrenheit and Imperial. 'Display Options' will be open to all levels of access.

Appliance Settings
Changes boiler characteristics. The User level will have access to the first screen inside Appliance Settings which allows for changes in Central Heating setpoint. A 4-digit personal identification number (PIN) needs to be entered before moving further into the controller. If an incorrect PIN# is entered this will result in an error displayed on screen.

Errors
Displays the lockout or error code along with a description of the error.

9.3 SYSTEM MONITOR DISPLAY

Figure 54: System Monitor



From MENU display;

1) Use **[NEXT]** to select 'System Monitor'
2) Press **[ENTER]**

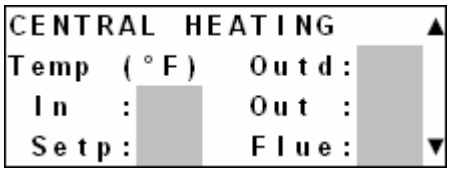
Table 28: System Monitor Display Readout

	DISPLAY READOUT	DESCRIPTION
Active Program	MASTER	Boiler is designated as a Master boiler in the cascade setup
	SLAVE	Boiler is designated as a Slave boiler in the cascade setup
PUMP	ON	Pump is active
	OFF	Pump is inactive (idle)
STATUS	Standby	Heating and DHW Request (if equipped) is satisfied
	##%	Boiler is firing at the rate indicated

When no action is detected for 30 seconds, the screen will default back to the Temperature and Status Display.

Central Heating Display

Figure 55: Central Heating



From SYSTEM MONITOR display;

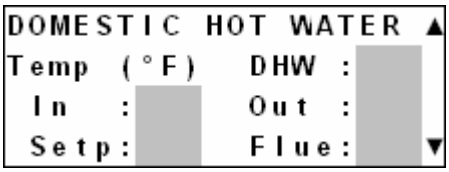
2) Use **[NEXT]** to view CENTRAL HEATING display.

Table 29: Central Heating Readout

	DISPLAY READOUT	DESCRIPTION
CENTRAL HEATING	Outd	Outdoor Temperature (if equipped)
	In	Return/Inlet Temperature to Boiler
	Out	Supply/Outlet Temperature to Boiler
	Setp	Central Heating Setpoint
	Flue	Flue Temperature

Domestic Hot Water Display

Figure 56: Domestic Hot Water



From CENTRAL HEATING display;

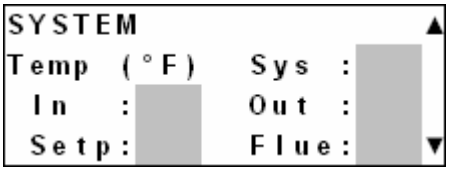
3) Use **[NEXT]** to view DOMESTIC HOT WATER display.

Table 30: Domestic Hot Water Readout

	DISPLAY READOUT	DESCRIPTION
DOMESTIC HOT WATER	DHW	DHW Temperature
	In	Return/Inlet Temperature to Boiler
	Out	Supply/Outlet Temperature to Boiler
	Setp	Central Heating Setpoint
	Flue	Flue Temperature

System Display

Figure 57: System



From DOMESTIC HOT WATER display;

1) Use **[NEXT]** to view SYSTEM display

Table 31: System Display Readout

	DISPLAY READOUT	DESCRIPTION
SYSTEM	Sys	System Temperature of Primary Loop
	In	Return/Inlet Temperature to Boiler
	Out	Supply/Outlet Temperature to Boiler
	Setp	Central Heating Setpoint
	Flue	Flue Temperature

Run Time Display

Figure 58: Run Time

From SYSTEM display;

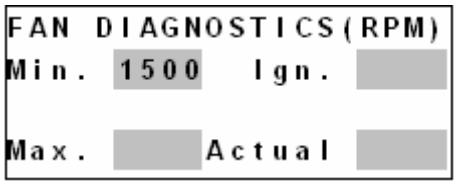
1) Use **[NEXT]** to view RUN TIME display

Table 32: Run Time Display Readout

	DISPLAY READOUT	DESCRIPTION
RUN TIME	Total Run Time Since Installation	Monitors the amount of operational time since the DynaMax was installed. The timer starts counting as soon as it receives a flame signal to the time the flame signal disappears

Fan Diagnostics Display

Figure 59: Fan Diagnostics



From RUN TIME display;

1) Use **[NEXT]** to view FAN DIAGNOSTIC display.

Table 33: Fan Diagnostic Display Readout

	DISPLAY READOUT	DESCRIPTION
FAN DIAGNOSTICS (RPM)	Min.	Programmed Minimum Fan Speed
	Max.	Programmed Maximum Fan Speed
	Ign.	Programmed Ignition Fan Speed
	Actual	Actual Fan Speed updated in real-time

To move back to the previous screen at anytime, press the **[PREVIOUS]** button.

Display Options Display

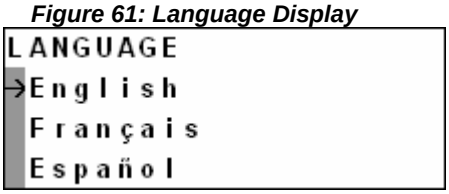
Figure 60: Display Options Display

From MENU display;

1) Use **[PREVIOUS]/[NEXT]** button to select 'Display Options'.
2) Press **ENTER**

Language Display

Figure 61: Language Display



1) Use **[UP]/[DOWN]** buttons to select preferred language.
2) Press **[ENTER]** to confirm.

Date and Time Display

Figure 62: Date and Time Display

From LANGUAGE display;

1) Use **[NEXT]** to view DATE AND TIME display
2) Use **[UP]/[DOWN]** and the cursor arrow will point to either the Day, Date or Time
3) Press **[ENTER]** to change a parameter. The parameter will begin to flash
4) Use **[UP]/[DOWN]** to change parameter value.
5) Press **[ENTER]** to confirm.

Units Display

Figure 63: Units Display

From DATE AND TIME display;

1) Use **[NEXT]** to view UNITS display
2) Use **[UP]/[DOWN]** to select the desired unit of measurement
3) Press **[ENTER]** to confirm.

To move back to the previous screen at anytime, press the **[PREVIOUS]** button. When no action is detected for 30 seconds, the screen will default back to the Temperature and Status Display.

9.4 CENTRAL HEATING DISPLAY

Figure 64: Programs Screen

From MENU display;

1) Use **[PREVIOUS]/[NEXT]** button to select 'Central Heating'
2) Press **[ENTER]**

Figure 65: Central Heating Setpoint

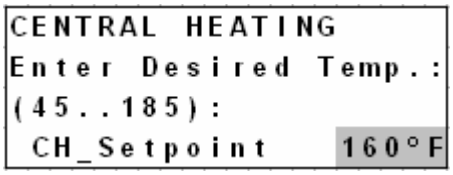


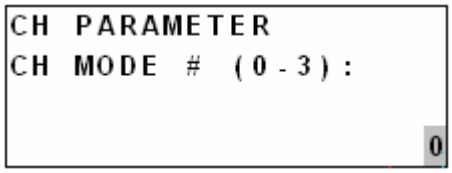
Figure 66: Installer Access

From CENTRAL HEATING display;

1) Use [**NEXT]** to enter INSTALLER ACCESS display
2) Use **[UP/DOWN]** to enter desired PIN #.
3) Press **[ENTER]** to confirm.

The correct PIN # must be entered in order to gain access to additional parameters.

Figure 67: Central Heating Mode Selection

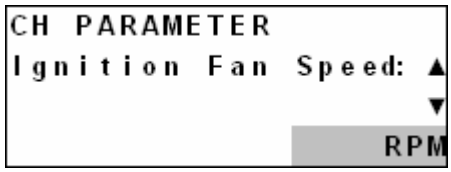


From INSTALLER ACCESS display;

1) Use **[UP]/[DOWN]** to select mode of operation. A full description of each mode is available in 6.3 The following parameters can be selected from the installer level.
2) Press **[ENTER]** to confirm.

Ignition Fan Speed Display

Figure 68: Ignition Fan Speed



From CH PARAMETER > Minimum Fan Speed display;

1) Use **[NEXT]** to enter Ignition Fan Speed setting.
2) Use **[UP/DOWN]** to select desired ignition fan speed
3) Press **[ENTER]** to confirm

The Ignition Fan Speed must be between the minimum fan speed and maximum fan speed.

Central Heating Mode = 0, 1, 2, 3 Installer Level Parameters

The following parameters can be scrolled through using the **[NEXT]** button. When no action is detected for 30 seconds the display will revert back to the Temperature and Status display.

Table 34: Central Heating Parameters

	MODE SELECTION	DISPLAY READOUT	DESCRIPTION
CENTRAL HEATING	0,1,2,3	CH_Setpoint	To provide a target setpoint for the heating system. (Default: 160^{O}F)
		CH_Hysterse	To provide modulation rate above and below CH_setpoint. For example, if the value is 10^{o}F and the setpoint is 160^{o}F, the boiler will begin to modulate at 155^{o}F and shut off at 165^{o}F. (Default: 9^{O}F)
	1,2	T_day_ref	To determine the outdoor reset temperature. The control uses the following algorithm to adjust the CH_setpoint: CH_Setpoint = T_day_ref + [(20-T_Outdoor) * Slope]. (Default: 68^{o}F)
		Slope	To determine the outdoor reset temperature. See T_day_ref to understand how Slope affects CH_Setpoint. (Default: 1.0)
	2	T_night_reduction	Temperature for night time usage This parameter is only engaged when the external clock is satisfied. (Default: 50^{O}F).
		Weather_setpoint	When the outdoor temperature is below the preset Weather_setpoint a CH demand is created. Therefore, the CH demand is not dependent on Room Temperature input. (Default: 68^{o}F)

9.5 DOMESTIC HOT WATER DISPLAY

Figure 69: Program Selection

From MENU display;

1) Use **[PREVIOUS]/[NEXT]** to select 'Domestic Hot Water'
2) Press **[ENTER]**

Figure 70: Domestic Hot Water Setpoint

3) Use **[UP]/[DOWN]** to select DHW Setpoint.
4) Press **[ENTER]**

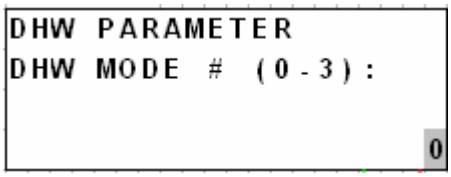
Figure 71: Installer Access

From DOMESTIC HOT WATER display;

5) Use **[NEXT]** to enter INSTALLER ACCESS display
6) Use **[UP]/[DOWN]** to enter desired PIN #.
7) Press **[ENTER]** to confirm

The correct PIN # must be entered in order to gain access to additional parameters.

Figure 72: Domestic Hot Water Mode



From INSTALLER ACCESS display;

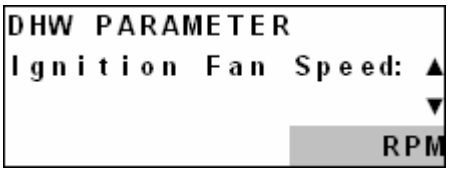
8) Use **[UP]/[DOWN]** to select mode of operation. A full description of each mode is available in 6.3. The following parameters can be selected from the installer level.
9) Press **[ENTER]** to confirm.

NOTE
DHW Mode = 0, is ONLY used when Central Heating is selected. 'DHW Functionality Disabled' is shown on screen.

Regardless of which DHW mode is selected. A number of common screens will first be shown.

Ignition Fan Speed

Figure 73: Ignition Fan Speed



From DHW PARAMETER > Minimum Fan Speed;

1) Use **[NEXT]** to enter Ignition Fan Speed setting.
2) Use **[UP]/[DOWN]** to select desired ignition fan speed
3) Press **[ENTER]** to confirm

The Ignition Fan Speed must be between the minimum fan speed and maximum fan speed.

Domestic Hot Water Mode = 0, 1, 2, 3, 4 Installer Level Parameters

The following parameters can be scrolled through using the **[NEXT]** button.

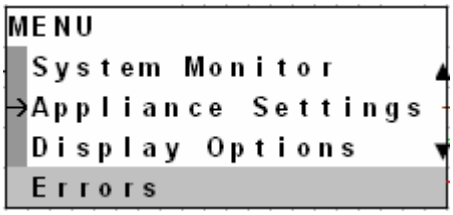
Table 35: Domestic Hot Water Parameters

	MODE SELECTION	DISPLAY READOUT	DESCRIPTION
DOMESTIC HOT WATER	1,2,3,4	DHW_Setpoint	To provide a target setpoint for the storage tank. (Mode 1,2 Default: 135^{O}F, Mode 3,4 Default:120^{o}F)
		DHW_hyst_up	To provide modulation rate above the DHW_setpoint. (Default: 9^{o}F)
		DHW_hyst_down	To provide modulation rate below the DHW_setpoint. (Default: 4^{o}F)
	3, 4	Pre-Heat Setpoint	During a DHW request, the user will not be subjected to a stream of cold water when the tap is first turned on. This also creates a buffer zone for the boiler to fire up and modulate. (Default: 110^{o}F)
		Pre-Heat hyst_up	To provide modulation rate above Pre-heat setpoint for the plate heat exchanger during pre-heat. (Default: 0^{o}F)
		Pre-Heat hyst_down	To provide modulation rate below Pre-heat setpoint for the plate heat exchanger during pre-heat. (Default: 9^{O}F)

9.6 CASCADE CONTROL

From MENU display.

Figure 74: Menu Display

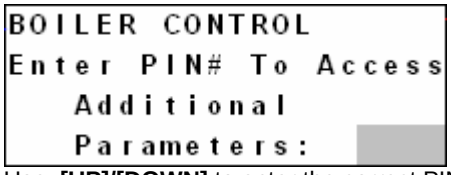


1) Use **[PREVIOUS]/[NEXT]** to select 'Appliance Settings'
2) Press **[ENTER]**

Figure 75: Selecting Cascade Control

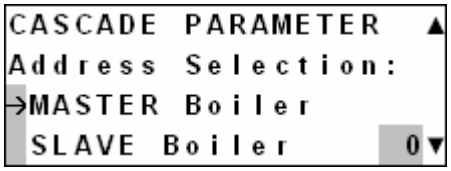
3) Use **[PREVIOUS]/[NEXT]** to select 'Cascade Control'
4) Press **[ENTER]**

Figure 76: Enter PIN#



5) Use **[UP]/[DOWN]** to enter the correct PIN#.
6) Press **[ENTER]**.

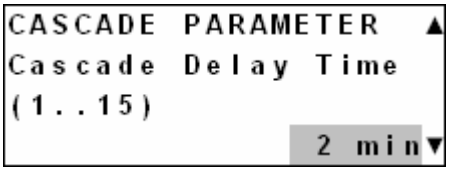
Figure 77: Cascade Address Selection



7) Use **[UP]/[DOWN]** to select the option of a 'MASTER Boiler' or 'SLAVE Boiler'.
8) Press **[ENTER]** to confirm.
9) If 'SLAVE Boiler' is selected assign it an address of '2' if this is the boiler immediately after the 'MASTER Boiler. Assign a number of '3' if it is the third boiler in the system. Continue this until all boilers have been assigned an address. Use **[UP]/[DOWN]** to select the correct address
10) Press **[ENTER]** to confirm.

NOTE
1) For a standalone boiler the Address Location is '0'. 2) In a Cascade Setup the Master boiler MUST have the Address Location '1'. Slave boilers MUST have Address Location greater than '1', as that is reserved for the Master boiler.

Figure 78: Cascade Delay Time



11) Use **[NEXT]** to enter Cascade Delay Time.
12) Use **[UP]/[DOWN]** to select delay time. (Default: 2 minutes)
13) Press **[ENTER]** to confirm.

Figure 79: Cascade Hysterese

14) Use **[NEXT]** to enter Cascade Hysterese.
15) Use **[UP]/[DOWN]** to select delay time. (Default: 5°F)

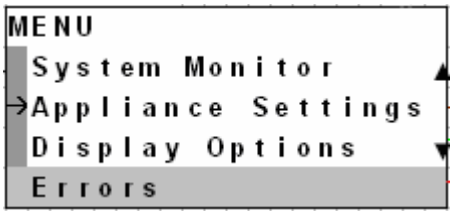
NOTE
Cascade Hysterese must be a smaller value than CH_Hysterese in order for the cascade system to function.

16) Press **[ENTER]** to confirm.

9.6 BOILER CONTROL

From MENU display

Figure 80: Menu Display



1) Use **[PREVIOUS]/[NEXT]** to select 'Appliance Settings'
2) Press **[ENTER]**

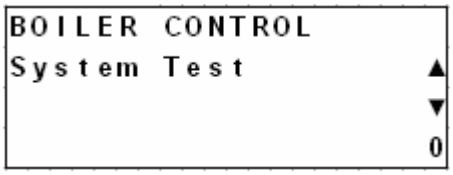
Figure 81: Selecting Boiler Control

3) Use **[PREVIOUS]/[NEXT]** to select 'Cascade Control'
4) Press **[ENTER]**

Figure 82: Enter PIN#

5) Use **[UP]/[DOWN]** to enter the correct PIN#.
6) Press **[ENTER]**.

Figure 83: Boiler Control



The following parameters can be scrolled through using the **[NEXT]** button.

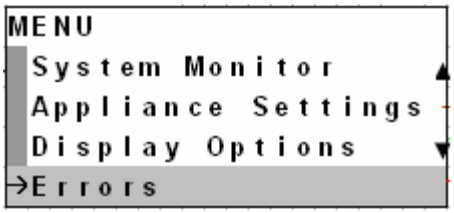
Table 36: System Test Parameters

	DISPLAY READOUT	DESCRIPTION
SYSTEM TEST	0	System Test Off
	L	Low Power Operation
	I	Ignition Power Operation
	H	Maximum Power Operation

9.7 ERROR SCREEN

From MENU display.

Figure 84: Menu Display



1) Use **[PREVIOUS]/[NEXT]** to select 'Errors'
2) Press **[ENTER]**.

Errors are divided into lockout (A ##) and blocking (E ##) errors. A full description of lockout and blocking errors is detailed in 5.4. If there is more than one error present the display will alternate through the errors. When no errors are present the display will display 'None'.

Figure 85: Error Screen

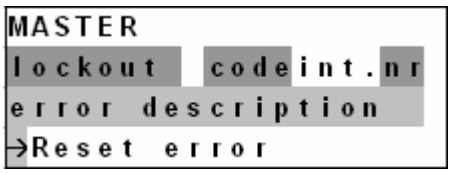
3) Use **[NEXT]** to enter error detail screen.

NOTE
A Lockout Code and Internal Number are generated in the event of an error. The Internal Number is used by the DynaMax Controller to identify an error.

4) To reset a Lockout error. Press and hold **[RESET]** until the error description line reads 'None'

The following screen can only be accessed when an error is present. This screen provides more details about the error that has occurred.

Figure 86: Detailed Error Screen



MASTER

Either MASTER or SLAVE # (# is the slave # assigned to the boiler) is displayed during an error situation

lockout

This will display 'Blocking' or 'Lockout' depending on the error

code

This will display the error code in the form of A ## (Lockout code, Table 5.4.1) or E ## (Blocking error, Table 5.4.2)

nr

This will display the internal error number that the DynaMax Controller uses to identify the error. The Internal Number can be used interchangeably for Lockout error codes and Blocking error codes.

error description

The error description block shall display the error in text. The description is identical to Table 15 and Table 16 under section 5.4.

Reset error

If a lockout error occurs (A ##) pressing **RESET** shall reset the error. For example, this can occur if the burner has failed to ignite after three consecutive trials.

PART 10 TROUBLESHOOTING

Table 37: Troubleshooting Table

COMPONENT	FAILURE MODE	ANALYSIS
Incoming Power	• Two wires interchanged, E21	• No effect on safety • Live and Neutral wires are interchanged.
Transformer Tripped	• The 24Volts and 120 Volts wired are interchanged	• Transformer immediately burns out, replace transformer • Fuse on DynaMax Controller blows, replace 3.15A fuse located at F1 on DynaMax Controller.
Pump Fails to Circulate	• Wiring Issue	• Check that wires are correctly wired from the DynaMax Controller to the pump delay relay. • Check that 115V is delivered to pump coil.
	• Faulty Pump on a wet rotor pump	• Pump impeller may be stuck. Use a flat head screwdriver on face of pump to turn impeller manually • Replace Pump
	• Air in the piping system	• Purge all air from the piping system
	• Internal Fault on DynaMax Controller	• Replace DynaMax Controller
Relief Valve	• System pressure exceeds relief valve setting	• Replace the standard relief valve with a higher rated valve up to the maximum pressure of the heat exchanger. • Improperly sized expansion tank.
Flow Proving Device/ LWCO	• Flow Proving Device/ LWCO contacts are open	• Verify LED's on current sensing transformer during a heat demand (wall hung) • Check flow switch paddle (floor mount) • Verify for closed valves or obstructions in boiler piping • Verify that all air has been purged from the system • Verify that wiring is correct
	• Blown Fuse	• Replace 3.15A Fuse located at F1 on DynaMax Controller. • **DO NOT** use alternates as it may damage the DynaMax Controller

SYMPTOM	FAILURE MODE	ANALYSIS
Flame Failure (Pressing the manual RESET on the DynaMax Control Panel will be required to restart the ignition sequqnce)	• The boiler has failed to ignite the burner after 3 unsuccessful attempts	• Verify that all air has been purged from gas line • Inspect spark electrode and related wiring for damage and connection errors • Verify that the ignition fan speed is set to 3000 RPM through fan diagnostics screen. • Verify that boiler is properly grounded • Verify incoming gas supply pressure and that it coincides with Table 10. • Verify that the vent/ air inlet piping (if equipped) are correctly installed and obstructions are not present. • Verify 120 VAC and 24 VAC is being supplied to the gas valve transformer from the DynaMax Controller during ignition. Check wiring from DynaMax Controller, Gas Valve Transformer and Gas Valve Relay. If a signal cannot be detected, the DynaMax Controller needs to be replaced • If 24 VAC is present, check the outlet of the valve to ensure that gas is flowing. With a manometer connected to the outlet pressure tap of the gas valve a negative pressure should be present during pre-purge. When the valve is energized a change in pressure should occur, if no change is detected the gas valve has failed to open or it is passing insufficient amount of gas. If this is an initial startup increase the low fire gas setting by ¼ turn clockwise. • Inspect flame sensor and associated wiring. Replace if necessary • Inspect the burner. Refer to Burner Maintenenace in section 11.7 • Replace the DynaMax Controller
Flame Disappears During a Run Cycle (Pressing the manual RESET on the DynaMax Control Panel will be required to restart the ignition sequence)	• The DynaMax boiler was running and flame signal suddenly disappeared. This condition occurred 3 times.	• Verify that minimum fan speed is greater than 2500 RPM • Verify that all air has been purged from gas line • Inspect spark electrode and related wiring for damage and connection errors. • Verify that boiler is properly grounded • Verify incoming gas supply pressure and that it coincides with Table 10. • Verify that the gas line connections to the boiler are adequate • Verify that the vent/ air inlet piping (if equipped) are correctly installed and obstructions are not present • Verify 120 VAC is being supplied to the transformer from the DynaMax Controller during ignition. If a signal cannot be detected, the DynaMax Controller needs to be replaced • Verify that 120 VAC and 24 VAC is being supplied to the gas valve during ignition. If a signal cannot be detected, the transformer needs to be replaced • Inspect flame sensor and associated wiring. Replace if necessary • Inspect the burner. Refer to Burner Maintenance in section 11.7 • Replace the DynaMax Controller if necessary

SYMPTOM	FAILURE MODE	ANALYSIS
Noisy Operation	• Supply Gas Issue	• Refer to Part 3 Gas Connection in this manual. • Natural Gas Pressure should read between 3" w.c. and 14" w.c. • L.P. Gas Pressure should be at 11" w.c.
	• Air/Gas Mixture Issue	• Refer to Gas Valve Adjustment Procedure in section 10.2 of this manual for the proper combustion setting.
	• Air Inlet and/or Vent configuration	• Refer to Part 2 Air Inlet and Venting
	• Dirty/ Damaged Burner	• Refer to Burner Maintenance in section 11.7 of this manual for the burner removal and inspection procedure. Clean or replace the burner, if required.
	• Air in the piping system	• Purge all air from the piping system
	• Incorrect Igniter Gap	• Check that spark gap is 3/16"
Auto Reset High Limit Trips	• The supply/ outlet temperature has exceeded the setpoint temperature specified.	• Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the boiler is piped properly. Refer to Piping Diagrams in Section 13 of this manual. • Verify that 120VAC is being supplied to the boiler pump on a call for heat. If voltage cannot be detected check wiring. • Verify that the pump is circulating when 120VAC is detected. If not, pump impeller may be stuck. Use a flat head screwdriver on face of pump to turn impeller manually • If 120VAC is present during a call for heat, but the pump still does not circulate, replace the pump. • Replace the main DynaMax Controller if necessary
Manual Reset High Limit Trips (Pressing the manual RESET on the DynaMax Control Panel will be required to restart the ignition sequence)	• A03 appears on boiler display. • Manual Reset Safety High Lmit tripped, supply/outlet temperature in excess of 210^{o}F	• Verify that the capillary tube is broken. If this is the case, replace Manual Reset High Limit • Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the boiler is piped properly. Refer to Piping Diagrams in Section 13 of this manual. • Verify that 120 VAC is being supplied to the boiler pump on a call for heat. If voltage cannot be detected check wiring. • Verify that the pump is circulating when 120 VAC is supplied. If so, pump impeller may be stuck. Use a flat head screwdriver on face of pump to turn impeller manually. • If 120 VAC is present during a call for heat, but the pump still does not circulate, replace pump.
Fan Speed Too Low	• Actual fan RPM is 30% slower than target fan speed.	• Verify wiring connections at the fan and DynaMax Controller. • Replace the fan • Replace the DynaMax Controller.
Fan Speed Too High	• Actual fan RPM is 30% faster than what is required.	• Vent/ Air Inlet Lengths exceed the maximum allowed equivalent lengths. Refer to Air Inlet and Venting Section in Part 2 of this manual. • Verify that there are no obstructions in the vent/ air inlet pipes or at terminations • Verify wiring connections at the fan and DynaMax Controller. • Replace the fan • Replace the DynaMax Controller.

SYMPTOM	FAILURE MODE	ANALYSIS
Temperature Overshoot	• Stack temperature has exceeded the limit set on the boiler.	• Measure the resistance of the flue sensor at room temperature, it should be approximately 10kΩ.
	• The supply/outlet temperature has exceeded the setpoint temperature specified.	• Verify that the system is full of water and that all air has been properly purged from the system • Verify that the boiler is piped properly. Refer to Piping Diagrams in Section 13 of this manual • Verify that 120 VAC is being supplied to the boiler pump on a call for heat. If voltage cannot be detected check wiring • Verify that the pump is circulating when 120 VAC is supplied. If so, pump impeller may be stuck. Use a flat head screwdriver on face of pump to turn impeller manually • If 120 VAC is present during a call for heat, but the pump still does not circulate, replace the pump. • Replace the DynaMax Controller, if necessary.
Sensor Not Connected	• E01 shown on display. Supply/ Outlet sensor • E02 shown on display. Return/ Inlet sensor • E03 shown on display. Flue sensor • E04 shown on display. DHW-Out sensor	• Verify that the sensors are connected • Verify that they are wired correctly. • Measure the resistance of the sensors, 10kΩ sensors. • Replace the sensor if necessary
Sensor Shorted	• E11 shown on display. Supply/ Outlet sensor • E12 shown on display. Return/Inlet sensor • E13 shown on display. Flue sensor • E14 shown on display. DHW-out sensor	• Verify that the sensors are connected • Verify that they are wired correctly. • Measure the resistance of the sensors, 10kΩ sensors. • Replace the sensor if necessary
Fan Not Turning	• A33 shown on display. Fan refuses to rotate	• Check fan power wires • Fan signal wires are interchanged • Minimum fan speed must be greater than 1500 RPM
Reset Button Error	• E51	• Reset button pressed more than 7 times in one minute
Air Switch	• Blocked flue error	• Air Switch wire(s) is/are loose • Air Switch is set too tight, reduce sensitivity by turning screw ¼ turn counter-clockwise.
Flame Detection is out of Sync	• Flame detection is present when no visible signs of a flame exist	• Verify supply voltage for proper polarity. • Check external wiring for voltage feedback • Check internal wiring for proper connections • Check the flame sensor and verify that it is clean • Replace DynaMax Controller
Blank Display Screen	• Blank display screen	• Replace fuse with factory 3.15A fuse. • **DO NOT** use alternates as it may damage the DynaMax Controller

10.1 SETTING THE CORRECT COMBUSTION

1) Switch the main power off to the boiler by placing the toggle switch in the 'OFF' position

2) Switch the main power on to the boiler and adjust setpoint so that boiler begins ignition sequence.

3) Observe the boiler as it goes through its startup cycle and operates at high fire. This cycle is detailed on Table 41 in section 12.14 Ignition Cycle.

4) Insert the combustion measurement probe into the stack when high fire operation is observed. Check to see that fan is running at maximum fan speed using the Control Panel.

5) The combustion values should reside in the range listed in Table 38. If combustion values are not within this range refer to Section 10.2 Gas Valve Adjustment Procedure to correct this issue.

Table 38: Combustion Values for High Fire

	Natural Gas		Propane	
	CO_2	CO	CO_2	CO
Max. Fire	8.5% - 9.0%	<100 PPM	9.5% - 10.0%	<100 PPM
Min. Fire	7.5% - 8.0%	<100 PPM	9.0% - 9.5%	<100 PPM

7) When the combustion values are satisfied record these values as Camus requires these for warranty purposes.

8) Remove the combustion measurement device and switch the main power off to the boiler by placing the toggle switch in the 'OFF' position.

9) Replace the flue temperature sensor back to its proper location.

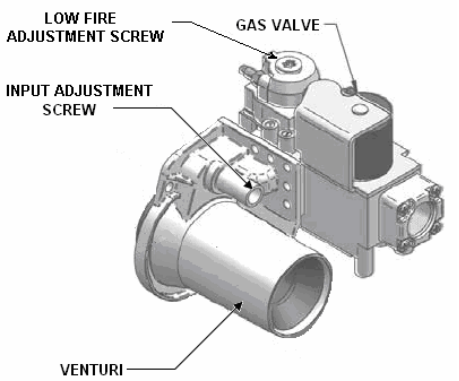
10.2 GAS VALVE ADJUSTMENT PROCEDURE

If adjustment of the gas valve is required use the following procedure.

In order to perform adjustments to the gas valve the DynaMax must be firing before proceeding.

DM 080 – 150

Figure 87: Venturi & Gas Valve Assembly



<u>To adjust the high-fire setting</u>

Use the DynaMax Control Panel

Press the **[MENU]** button > select Appliance Settings and press **[ENTER]** > select Boiler Control and press **[ENTER]** > Enter the correct Installer passcode.

Select 'H' for high power. The DynaMax should respond immediately and fire at maximum fan speed.

Locate the input adjustment screw on the side of the venturi. Using a flat head screwdriver turn the screw clockwise to decrease CO_2 levels and counter-clockwise to increase CO_2 levels. Turn the screw 1/4 turn in either way for each adjustment to keep track of the adjustments. After adjusting the screw wait a moment for the combustion levels to stabilize before attempting to make any further adjustments. Continue this procedure until combustion levels are satisfied.

On the DynaMax Control Panel select 'O' to return to normal operation.

<u>To adjust the low fire setting</u>

Use the DynaMax Control Panel

Press the **[MENU]** button > select Appliance Settings and press **[ENTER]** > select Boiler Control and press **[ENTER]** > Enter the correct Installer passcode.

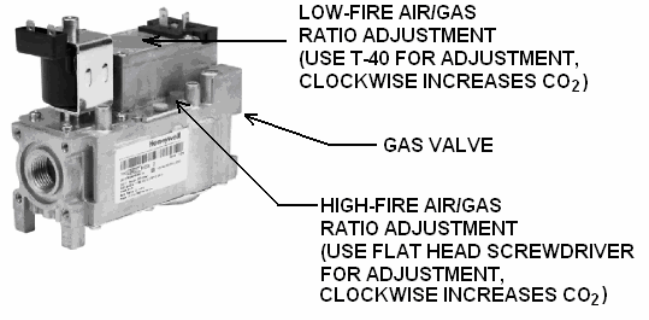
Select 'L' for low power.

The DynaMax should respond immediately and fire at minimum fan speed. When this is achieved locate the low fire adjustment screw as illustrated in Figure 86. This screw is covered with a cap, which can be removed using a Torx 40 screwdriver. With the screw cap removed using a Torx 40 screwdriver rotate clockwise to increase CO_2 levels and counter-clockwise to decrease CO_2 levels. When the correct combustion values are achieved replace the screw cap back on to the gas valve.

On the DynaMax Control Panel select '0' to return to normal operation.

DM 200 – 399

Figure 88: DM 200 – 399 Gas Valve



To adjust the high-fire setting

Use the DynaMax Control Panel

Press the **[MENU]** button > select Appliance Settings and press **[ENTER]** > select Boiler Control and press **[ENTER]** > Enter the correct Installer passcode.

Select 'H' for high power. The DynaMax should respond immediately and fire at maximum fan speed.

Locate the high-fire adjustment screw on the top side of the gas valve. The screw can be identified by a red cylinder casing around the screw. Using a thin flat head screwdriver turn the screw clockwise to increase CO_2 levels and counter-clockwise to decrease CO_2 levels. Turn the screw 1/4 turn in either way for each adjustment to keep track of the adjustments. After adjusting the screw wait a moment for the combustion levels to stabilize before attempting to make any further adjustments. Continue this procedure until combustion levels are satisfied.

On the DynaMax Control Panel select 'O' to return to normal operation.

To adjust the low fire setting

Use the DynaMax Control Panel

Press the **[MENU]** button > select Appliance Settings and press **[ENTER]** > select Boiler Control and press **[ENTER]** > Enter the correct Installer passcode.

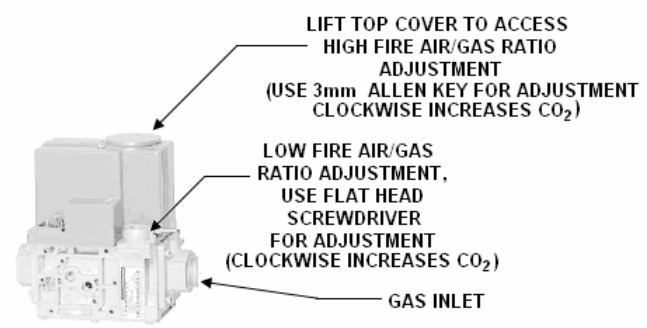
Select 'L' for low power.

The DynaMax should respond immediately and fire at 1500 RPM. When this is achieved locate the low fire adjustment screw as illustrated in Figure 88. Using a flat screwdriver rotate clockwise to increase CO_2 levels and counter-clockwise to decrease CO_2 levels. When the correct combustion values are achieved replace the screw cap back on to the gas valve.

On the DynaMax Control Panel select 'O' to return to normal operation.

DM 500 – 750

Figure 89: DM 500 - 750 Gas Valve



To adjust the high-fire setting

Use the DynaMax Control Panel

Press the **[MENU]** button > select Appliance Settings and press **[ENTER]** > select Boiler Control and press **[ENTER]** > Enter the correct Installer passcode.

Select 'H' for high power. The DynaMax should respond immediately and fire at maximum fan speed.

Locate the input adjustment screw on the top side of the gas valve. Using a flat head screwdriver turn the screw clockwise to increase CO_2 levels and counter-clockwise to decrease CO_2 levels. Turn the screw 1/4 turn in either way for each adjustment to keep track of the adjustments. After adjusting the screw wait a moment for the combustion levels to stabilize before attempting to make any further adjustments. Continue this procedure until combustion levels are satisfied.

On the DynaMax Control Panel select 'O' to return to normal operation.

To adjust the low fire setting

Use the DynaMax Control Panel

Press the [**MENU]** button > select Appliance Settings and press **[ENTER]** > select Boiler Control and press **[ENTER]** > Enter the correct Installer passcode.

Select 'L' for low power.

The DynaMax should respond immediately and fire at 1500 RPM. When this is achieved locate the low fire adjustment screw as illustrated in Figure 89. Using a flat screwdriver rotate clockwise to increase CO_2 levels and counter-clockwise to decrease CO_2 levels. When the correct combustion values are achieved replace the screw cap back on to the gas valve.

On the DynaMax Control Panel select 'O' to return to normal operation.

PART 11 MAINTENANCE

CAUTION

It is important that all gas appliances be serviced by a qualified technician trained by Camus Hydronics. It is in your own interest and that of safety to ensure that all local codes, and all the "NOTES" and "WARNINGS" in this manual are complied with. To service or adjust this appliance, it is imperative that the serviceman utilize a combustion analyzer to read CO_2 and CO according to Camus Hydronics recommendations.

Listed below are items that must be checked to ensure safe reliable operations. Verify proper operation after servicing.

11.1 EXAMINE THE VENTING SYSTEM

Examine the venting system at least once a year. Check more often in the first year to determine inspection interval. Check all joints and pipe connections for tightness, corrosion or deterioration. Flush the condensate drain hose with water to clean. Clean screens in the venting air inlet system as required. Have the entire system, including the venting system, periodically inspected by a qualified service agency.

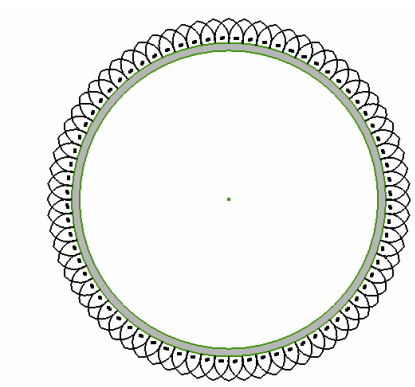
11.2 VISUALLY CHECK MAIN BURNER FLAMES

At each start up after long shutdown periods or at least every six months. A burner view port is located on the combustion chamber front door.

CAUTION

The area around the burner view port is hot and direct contact could result in burns

Figure 90: Normal Burner Flame Profile (short dense and blue)

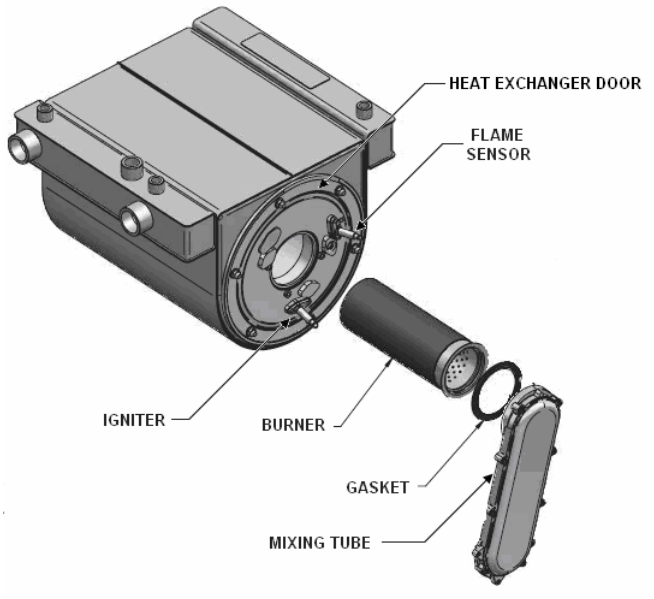


- **Normal Flame**: A normal flame at 100% of burner input is blue, with a well defined flame and no flame lifting.
- **Yellow Tip**: Yellow tipping can be caused by blockage or partial obstruction of air flow to the burner.
- **Yellow Flames**: Yellow flames can be caused by blockage of primary air flow to the burner or excessive gas input. This condition **MUST** be corrected immediately.

If improper flame is observed, examine the venting system; ensure proper gas supply and adequate supply of combustion and ventilation air.

11.3 CLEANING BOILER HEAT EXCHANGER

Figure 91: Heat Exchanger & Burner Assembly



1) Shut down boiler:
   a) Turn the main power off to the boiler
   b) Shut off gas supply at the main manual valve in the gas piping of the main appliance
   c) DO NOT drain the boiler unless it will be exposed to freezing temperatures. If using antifreeze prevention fluid in the heat exchanger, **DO NOT** drain.
2) Allow time for the boiler to cool to room temperature if it has been firing.
3) Remove both the stainless steel upper jacket and the lower sheetmetal jacket.
4) Remove igniter and flame sensor electrodes. If necessary, clean with steel wool. **DO NOT** use sandpaper.
5) Remove the fan/ mixing tube assembly from the heat exchanger door.
6) Remove burner.
7) Examine burner and clean if required as per 11.7.1.
8) Examine heat exchanger surfaces to determine if cleaning is required. If cleaning is required remove the (6) nuts fastening the heat exchanger flange from the heat exchanger.
9) Use a vacuum cleaner to remove any debris that has collected on the heat exchanger surfaces. **DO NOT** use any type of solvent.
10) Finish cleaning by wiping down the boiler heating surfaces with a clean, damp cloth.
11) Re-install the heat exchanger door by evenly torquing down the (6) nuts to 3 ft-lbs, burner, igniter and flame sensor, and fan/ mixing tube assembly. Fasten the nuts back to the heat exchanger assembly.
12) Re-connect the fan assembly to the boiler mixing tube.

NOTE

All gaskets on disassembled components must be replaced with new gaskets/sealant on re-assembly, if required. Gasket kits are available from the factory

CAUTION

When the vent system is disconnected for any reason it must be reassembled and resealed according to vent manufacturer's instruction

11.4 CONDENSATE TREATMENT

Condensate occurs when the products of combustion are cooled below their dew point in the heat transfer process. The liquid condensate formed from this high efficiency heat transfer process is mildly acidic. The condensate will typically have a pH ranging from 4.0 to 5.0 as it is discharged from the condensate drain of the appliance. The condensate collection box where the condensate is collected is constructed of a non-corrosive plastic. All materials external to the appliance in contact with the condensate must be corrosion resistant. Condensate must be able to flow freely from the appliance. All condensate flow is accomplished by gravity requiring a minimum downward slope of 1/4" per foot (21mm/m) to ensure proper flow to a suitable drain. A neutralizer box is mounted inside each DynaMax. All condensate piping and connections must be easily accessible for routine maintenance and inspection. Use solid piping when running condensate line across the floor. Check neutralized pH level regularly or as required by local jurisdiction. Replace neutralizer medium as required.

11.4.1 Condensate Volume

There are several factors affecting amount of condensation created by the appliance, however for rough approximation use.
Condensation Volume, US Gallon/Hr = Input, MBH/1000 x 5.0
Many codes will require the acidic condensate to be neutralized before it can be placed in a drain system. A neutralizer to control the pH of the liquid discharged to a drain system is provided with every DynaMax boiler. The neutralizer consists of an industrial grade, non-corrosive plastic reservoir for collection of the condensate. The condensate collects in the reservoir where it is in direct contact with calcium carbonate neutralizer medium. As the reservoir fills, it provides an extended residence time to neutralize the condensate. Residency time in the neurtalizer reservoir allows time for the pH to be raised. Prime the neutralizer reservoir with 1 litre of water.

As the condensate migrates through the reservoir in typical applications the pH is controlled to a range of 5.5 to 6.0 before exiting the system. Always check with local codes for specific requirements.

11.5 IGNITER AND FLAME SENSOR ELECTRODES

The direct spark igniter is to be checked at every service interval. Clean the direct spark igniter as required to maintain peak ignition efficiency.

1) Turn off main electrical power to the appliance.
2) Turn off main manual gas shutoff to the appliance.
3) Locate the direct spark igniter and flame sensor.
4) Disconnect the power lead to the direct spark igniter and flame sensor
5) Loosen and remove the two (2) torx screws that hold the igniter and flame sensor to the heat exchanger flange.
6) Pull the igniter horizontally out of the heat exchanger flange. Use care, do not hit or break the igniter leads.
7) Remove any debris that has accumulated on the electrodes using steel wool. If the electrodes cannot be cleaned to their original appearance, replacements are needed. Do not use sand-paper since this will contaminate the surface.
8) Check that the igniter and flame sensor gaskets are still in good condition (no tears or seams). If the gaskets are in good condition the electrodes can be re-installed back to the heat exchanger flange.
9) Check that the igniter gap is 3/16".

11.6 CHECK IGNITER GROUND WIRING

1) Inspect boiler ground wire from the heat exchanger flange to J12 of the electrical DynaMax Controller. Check boiler ground wire continuity.
2) Verify that all wiring is in good condition and is securely anchored.

11.7 BURNER MAINTENANCE

The burner should be removed for inspection and cleaning on an annual basis. An appliance installed in a dust or dirt contaminated environment will require inspection and cleaning on a more frequent schedule. The fan assisted combustion process may force airborne dust and dirt contaminants, contained in the combustion air, into the burner. With sustained operation, non-combustible contaminants may reduce burner port area, reduce burner input or cause non-warrantable damage to the burner. Never operate this appliance during construction.

Airborne contaminants such as dust, dirt, concrete dust or dry wall dust can be drawn into the burner with the combustion air and block the burner port area.

11.7.1 Burner Removal and Cleaning

Access to the burner will require the following steps:

- Turn off main electrical power to the appliance.
- Turn off main manual gas shutoff to the appliance
- Remove the front cover.
- Disconnect the gas supply connection to the fan inlet.
- Disconnect the fan motor power wires at the harness.

- Remove the direct spark igniter and the flame sensor.
- Remove the three (3) T-25 screws holding the front burner flange in place to gain access to the burner.
- The burner can now be pulled horizontally out of the heat exchanger cavity.
- Use care to prevent damage to the knitted metal fiber of the burner surface.
- Wash the burner with water, such as a garden hose. Never wipe or brush the surface of the burner.
- For optimal results immerse the burner port area in a solution of dishwashing detergent and hot water. **DO NOT** use chlorine based solvents or cleaning agents on the burner. Allow the burner to remain in the solution for a short period of time to remove, dust, dirt and oil or grease laden contaminants.
- Rinse the burner thoroughly with clean water to remove any residue from the detergent cleaner
- The burner should be air dried after removal from the cleaning solution and rinsing.
- Check all gaskets and replace as necessary. Gaskets affected by heat will not reseal properly and must be replaced.
- Replace the burner in the reverse order that it was removed.

NOTE

When the combustion air fan is removed for any reason, the inlet to the burner must be covered to prevent further foreign objects from falling into the burner. Always look inside the burner to check for dents. Do not place a burner back into operation if the inner distribution screen has been dented during the service operation, call the factory for recommendations. Use care when removing and handling the burner, Sharp objects or impact may damage or tear the metal fiber surface rendering the burner unfit for service.

11.8 COMBUSTION AND VENTILATION AIR

Check frequently to be sure that the flow of combustion air to the appliance is not obstructed unless air is piped directly to the heater. Combustion air must be provided to the mechanical room with openings sized per the requirements of the current B149 or National Fuel Gas Code. The DynaMax is setup to allow outdoor combustion air to be connected directly to the appliance.

11.9 CONTROL CIRCUIT VOLTAGE

This appliance uses a transformer to supply a low voltage control circuit. The voltage on the secondary side should be 24 to 28VAC when measured with a voltmeter. A secondary voltage of 21VAC or less supplied to 24VAC components may cause operational problems.

11.10 COMBUSTIBLE MATERIALS

CAUTION

Keep appliance clear from combustible materials; do not store **GASOLINE** and other flammable vapors and liquids in the proximity of the appliance.

11.11 FREEZE PROTECTION FOR INDOOR & OUTDOOR INSTALLATIONS

Installations are not recommended in areas where the danger of freezing exists. Proper freeze protection must be provided for appliances installed outdoors, in unheated mechanical rooms or where temperatures may drop to the freezing point or lower. If freeze protection is not provided for the system, a low ambient temperature alarm is recommended for the mechanical room. Damage to the appliance by freezing is non-warrantable.

- **Location** - Heating boilers, hot water supply boilers or water heaters must be located in a room having a temperature of at least 40ºF (5ºC).
- **Caution** - A mechanical room operating under a negative pressure may experience a downdraft in the flue of an appliance that is not firing. The cold outside air may be pulled down the flue and freeze a heat exchanger. This condition must be corrected to provide adequate freeze protection.
- Freeze protection for the appliance using an indirect coil can be provided by using hydronic system antifreeze. Follow the manufacturer's instructions. **DO NOT** use undiluted or automotive type antifreeze.
- **Shut-down and draining** - If for any reason, the unit is to be shut off in a space where danger of freezing exists, the following precautionary measures must be taken:
  - o Shut off gas supply.
  - o Shut off water supply.
  - o Shut off electrical supply.
  - o Drain the main exchanger and the brazed plate heat exchanger, if supplied, completely.
  - o Ensure that the pump and connecting piping are fully drained.

11.12 FREEZE PROTECTION FOR A HEATING BOILER SYSTEM (Optional)

- Use only properly diluted inhibited glycol antifreeze designed for hydronic systems. Camus recommends using a 30/70 mixture of glycol antifreeze to water. **DO NOT** exceed a mixture of 50/50.
- Follow the instructions from the antifreeze manufacturer. Quantity of antifreeze required is based on total system volume including expansion tank volume.
- Antifreeze is denser than water and changes the viscosity of the system. The addition of antifreeze will decrease heat transfer and increase frictional loss in the boiler and related piping. Where antifreeze has been used, to maintain the temperature rise across the appliance confirm that the recommended GPM for pure water has been increased by 15% and the head loss by 20%.
- Local codes require a back flow preventer or actual disconnect from city water supply when antifreeze is added to the system.
- When filling or topping-up the system with water mixed with the antifreeze always used distilled or RO (reverse osmosis) water. This will prevent the reaction of the water with antifreeze which can create sludge.

PART 12 INSTALLATIONS

WARNING
Before starting the boiler, smell near the floor and around the boiler for any gas odours or any unusual odour. Remove the stainless steel jacket and smell the interior of the boiler. If there is any sign of a gas leak, do not proceed with startup. Repair all the leaks before attempting to start the boiler.

WARNING
Propane boilers ONLY – Your local propane supplier adds an odorant to the propane gas to allow for propane gas leak detection. In some cases, the added odorant can fade and the gas may not give off any noticeable odour. Before startup have the local propane supplier check for the correct odorant level in the gas.

12.1 CHECKING THE INSTALLATION

- Inspect the connections for water, gas and electricity.
- Inlet gas pressure must be a minimum of 3" W.C. for natural gas and 11" W.C. for propane.
- With the boiler off, open the main gas supply valve and vent the trapped air from the piping leading to the boiler. Confirm that all gas connections to the heater are tight and that there are no missing test plugs.

Refer to Section 10.1 Setting the Correct Combustion of the manual for recommendations on setting combustion characteristics

12.2 CHECKING THE CONSTRUCTION

- Check the boiler wiring to see that it agrees with the wiring diagram supplied.
- Confirm that all terminal strips and field connections are identified.
- Confirm that the DynaMax Controller control is set in the proper mode. In remote mode an external controller determines the set point and the stage contacts on the DynaMax Controller are always closed. Auto reset limits are fixed in all Modes.
- With the boiler running, check for flue gas leaks along the inner cabinet joints and around the flue outlet.
- Repair any leaks prior to proceeding to the next step.
- At the factory, adjustments were made to achieve proper input and acceptable burner performance at full input and at minimum input.

12.3 HEATING BOILER INSTALLATIONS

Before beginning the installation, consult local codes for specific plumbing requirements. The installation should have unions and valves at the inlet and outlet of the appliance so it can be isolated for service. An air separation device must be supplied in the installation piping to eliminate trapped air in the system. Locate a system air vent at the highest point in the system. The system must also have a properly sized expansion tank installed. Typically, an air charged diaphragm-type expansion tank is used. The expansion tank must be installed close to the boiler and on the suction side of the system pump (appliance Inlet) to ensure proper operation. Caution: This appliance should not be operated at less than 12 PSIG cold. Pressure will rise when hot. Expansion tank sizing will determine the pressure when the system is hot. Do not operate the system at less than 18-20 PSIG when hot. Water piping must be supported by suitable hangers or floor stands, NOT by the appliance. Pipe systems will be subject to considerable expansion and contraction. Pipe supports could allow the pipe to slide resulting in noise transmitted into the system. Padding is recommended. The boiler pressure relief valve must be piped to a suitable floor drain. See Section 4.11.

12.4 INSPECT & RECHARGE CONDENSATE COLLECTION/NEUTRALIZING RESERVOIR

1) Inspect the condensate reservoir in the DynaMax, making sure the collection box is intact.
2) Remove screw holding lid on to condensate collection box. Remove lid from the condensate collection box
3) Examine neutralizer medium and refill as necessary with fresh medium
4) Fill with fresh water until the water begins to flow out of drain
5) Re-install the lid and hold-down screw on the condensate collection box.

WARNING
The condensate collection box must be filled with water to prevent flue gas emissions from escaping during boiler operation.

CAUTION
A leak in a boiler "System" will cause the fill system to introduce fresh water constantly, which may cause the tubes to accumulate a line/scale build up. Lime/scale buildup leading to heat exchanger failure is **NOT** covered by warranty.

12.5 WATER CONNECTIONS

Pipe size must be in accordance with Tables 4 or 6 (depending on model) and, between supply and return lines, must not exceed 50 feet of equivalent length. Any reduction in recommended pipe size may decrease flow resulting in high temperature rise across the heat exchanger, boiler noise, flashing to steam and non-warrantable heat exchanger damage.

12.6 PIPING LENGTHS

The appliance circulator provides the water flow from the primary boiler piping, through the boiler and back to the primary system. Pipe diameter and length are critical to ensure proper flow through the boiler.
The secondary loop piping to and from the appliance must have a fully ported ball valve installed in both the supply and return side piping and will be used for isolation only. *The ball valves must be the same diameter as the installed piping*. If flow control is required, other means of flow control such as globe valve or flow setter should be used.

12.7 SUMMARY

a) Typical Boiler Installations

General Plumbing Rules

1) Check all local codes.
2) For serviceability, always install unions.
3) Always pipe pressure relief valve to an open drain.
4) Locate system air vents at highest point of system.
5) Expansion tank must be installed near the boiler and on the suction side of the system pump.
6) Support all water piping.
7) Place drip pan underneath boiler. (if required)

b) Placing the Boiler in Operation

Pre-Start Check List

1) Review the location of the boiler, clearances from combustible surfaces and available service clearances.
2) Review Part 2 Venting. Ensure that all vent components are fabricated from the correct category of materials with adequate clearance from combustibles.
3) Fill the condensate collector with fresh water until water begins to pour out the drain.
4) Ensure that the boiler condensate drain and all vent system condensate drains are properly routed to an acceptable floor drain.
5) Review the vent termination point for proper location and clearances.
6) If a separate combustion air pipe is used, ensure that it is properly sized, sealed and terminated.
7) Review the water piping from the boiler to the system. The boiler must be installed in a primary/ secondary piping system. Review the diameter and equivalent length of the installed piping to and from the boiler to ensure proper flow.
8) Ensure that a properly sized system pump is installed with an expansion tank.
9) Check system pressure. Ensure a minimum of 18-20 PSIG with the system hot and not more than 90% of the rated pressure of the relief valve.
10) Review the installed gas piping from the meter to the boiler. Ensure that the gas pipe, meter and any regulators are adequately sized.
11) Review the field wiring and electrical service for the boiler controls. Ensure that the electrical service(s) is adequately sized.

Boiler Set-Up

1) Ensure that the boiler and piping system are full of water. Bleed all air from the pump housing and secondary loop.
2) Check system for any water leaks.
3) Check system for installation of glycol or water treatment where required. Where glycol has been used to maintain the temperature rise across the appliance confirm that the recommended flow for pure water has been increased by 15% and the head loss by 20%.

Boiler Operational Checks

1) Turn the boiler main power switch to the “ON” position.
2) Verify operation of the text display on the front panel.
3) Program the adjustable points.
4) Push the reset button if a lockout error is displayed.
5) Install a manometer on the gas supply to the boiler and verify minimum gas supply pressure as the burner fires at 100% of rated input.
6) Verify operation of safeties as necessary (low water cut-off, high limit, gas pressure, etc.).

Boiler Operation

1) Appliance should begin the start-up process for the sequence of operation.
2) The boiler will fire at 50% of rated input on initial start-up and adjust input as required to meet system demand.
3) Based on system demand, the appliance will modulate accordingly.
4) As system demand is satisfied, the burner will fire at minimum fire for the given demand and the boiler will cycle off when the demand ceases or is interrupted. When this occurs the combustion air fan will decelerate at a pre-programmed rate before the appliance shuts down.

12.8 DOMESTIC HOT WATER WITH STORAGE TANK

Hot water heaters are designed for installation with a storage tank. The piping between the tank and heater and the control of water velocity, as explained below, are important for correct operation of your hot water heater.

12.9 DOMESTIC HOT WATER WITH PLATE HEAT EXCHANGER

The piping between the plate heat exchanger in the DynaMax boiler and to an outlet tap is important for correct operation of the plate heat exchanger. The following procedure should be followed for setting the domestic hot water tuning valve:

1) There is a temperature tuning valve inside the Dynamax jacket on the domestic hot water outlet from plate exchanger . This valve can be set for field conditions .
2) First identify the highest domestic hot water load . For example in some cases it may be the bath tub and in some cases it may be the clothes washer.
3) Allow the Dynamax to fire up and reach full fire under maximum hot water load demand conditions .
4) Observe the outlet water temperature and close the tuning valve gradually as outlet temperature starts to drop . Allow the system to reach equilibrium between adjustments to the tuning valve .
5) Once the tuning valve is properly set , outlet temperatures will never drop below desired minimum temperature.
6) Seal stem of tuning valve with silicone to prevent unauthorized tampering .

12.10 TEMPERATURE RISE AT FULL FIRING RATE

1) The pump must run continuously when the burner is firing.
2) With the pump running and the burner in the water heater or hot water supply boiler in the off cycle, the Return/Inlet temperature and Supply/Outlet temperature readings on the DynaMax Control Panel should read approximately the same temperatures.
3) Turn the hot water heater on and allow time for the temperature to stabilize. Check the temperature rise when the burner is firing at 100% of rated input.
4) Compare the temperature rise on the Control Panel with the required temperature rise at the required flow rate on Tables 39 and 40.
5) Should adjustment be needed, proceed as follows:
6) The DynaMax uses stainless steel heat exchanger tubes which are not sensitive to higher water velocity. If temperature rise is lower than anticipated it is not necessary to reduce flow.

If the temperature rise is too high, the water velocity is too low. Adjust as follows:

1) Check for flow restrictions. Check for debris in strainers
2) Check diameter and equivalent length of the piping between the storage tank and hot water heater.
3) Be sure all valves are open between the hot water heater and the storage tank. Ensure that all ball valves are fully ported.
4) Check the pump to be sure it is running properly and that the pump motor is running in the proper direction.
5) Be sure the pipes between the hot water heater and storage tank are not more than a total of 50 equivalent feet between supply and return lines. If maximum equivalent length for the specified pipe diameter is exceeded, larger diameter pipe may have to be installed to achieve correct flow and temperature rise.
6) Common manifold piping for multiple unit installations will require larger minimum pipe sizes and tank circulating tapping to ensure proper flow.

The required temperature rise and the recommended pump size are based on the heating of potable water with a hardness of 7.5 to 17.0 grains per gallon and a total dissolved solids not exceeding 300 PPM. Consult the factory when heating potable water exceeding these specifications. Water with a hardness of less than 5 grains per gallon will usually have a low pH which can be aggressive and corrosive causing non-warrantable damage to the heater, pump and associated piping. Refer to Tables 39 and 40 for reference.

Table 39: Temperature Rise Across Heat Exchanger (Hydronic Heating)

MODEL [BTU/hr]	TEMPERATURE RISE ACROSS HEAT EXCHANGER			
	30°F (16.7°C)		35°F (19.4°F)	
	USGPM	ΔP-Ft.	USGPM	ΔP-Ft.
80,000	5.0	8.2	4.3	6.2
100,000	6.3	12.3	5.4	9.4
150,000	9.5	10.4	8.1	7.8
200,000	12.6	7.2	10.8	5.8
250,000	15.8	11.5	13.5	8.7
299,000	18.9	9.3	16.2	7.0
399,000	25.2	8.4	21.6	6.3
500,000	31.5	9.2	27.0	6.9
600,000	35.9	14.7	32.0	11.8
750,000	44.9	22.1	40.0	14.4

Table 40: Temperature Rise Across Heat Exchanger (DHW)

MODEL [BTU/hr]	TEMPERATURE RISE ACROSS HEAT EXCHANGER	
	20°F (11.1°C)	
	USGPM	ΔP-Ft.
80,000	7.5	11.5
100,000	9.4	26.9
150,000	14.0	27.8
200,000	19.2	25.9
250,000	23.5	28.3
299,000	28.8	25.8
399,000	38.4	23.9
500,000	48.6	29.4
600,000	57.6	34.2
750,000	70.4	40.0

CAUTION
Temperature rise cannot be adjusted when the burner is firing at less than 100% of input rate.

CAUTION
Adequate care **MUST** be taken to prevent potential scald injury when storing water at 140℉ (60℃) and hotte r.

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 appliance

12.11 SETTING THE CORRECT COMBUSTION

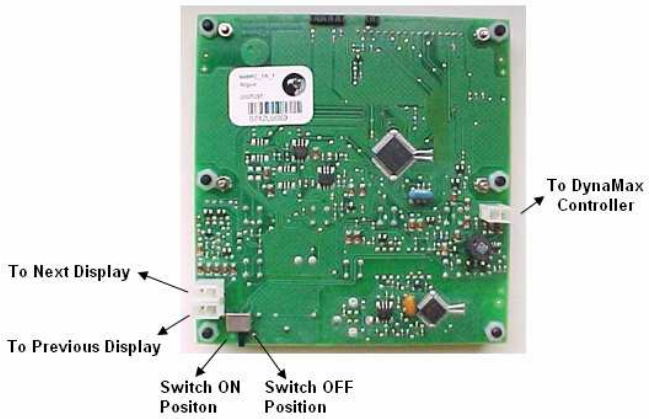
Refer to Section 10.1 Setting the Correct Combustion.

12.12 CASCADE SETUP

The DynaMax can be placed into a multiple boiler system in a cascade setup. In such a cascade configuration all boilers should be connected with an additional connection between the master DynaMax boiler and the slave DynaMax boiler

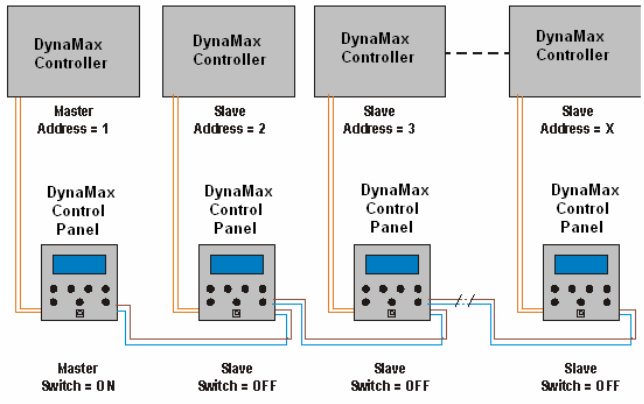
12.12.1 Programming the Cascade Setup

Figure 92: Rear view of DynaMax Controller



To setup a multiple boiler system the wiring setup is shown in Figure 96. The DynaMax Control Panel has 3 Molex Minifit Jr connections on the rear. Use the DynaMax Control Panel Power connector to connect to the DynaMax controller and use the double connector to link to the other displays.

Figure 93: Wiring of Cascade Setup



The boiler addresses for each boiler must be set individually, therefore DO NOT electrically connect the boilers together during the setup process.

Procedure to Setup a Cascade System (Master Boiler)

- Using the DynaMax Control Panel access the Cascade Control screen.
- MENU > Appliance Settings > Cascade Control
- Enter the Installer Password to gain access to the Cascade Control parameters
- For a Master boiler, select address location 1 and press **STORE**. Check to see on the DynaMax Control Panel that the Switch is placed in the ON position as shown in Figure 95.
- Now the Master boiler has been programmed.

Procedure to Setup a Cascade System (Slave Boiler)

- Go to the next boiler in the Cascade system and using the DynaMax Control Panel access the Cascade Control screen.
- MENU > Appliance Settings > Cascade Control
- Enter the Installer Password to gain access to the Cascade Control parameters
- Address location 1 has already been reserved for the Master boiler, the slave boiler will need to be programmed with the next available address location. Press **STORE** when desired address is shown.
- A switch located on the back of the DynaMax Control panel must be placed into the OFF position for all Slave boilers as shown in Figure 95.
- Now the Slave boiler has been programmed.
- Continue this process until all DynaMax boilers in the cascade system are programmed.

When all boilers have been programmed electrically connect the boilers together.

	DISPLAY READOUT	DESCRIPTION
CASCADE CONTROL	Cascade Delay Time	Delay time for switching on/off next boiler with ch_setpoint is not satisfied
	Cascade Hysteresis	Hysteresis to start or stop the next slave boiler(s). Start slave boiler condition: T_supply < CH_Setpoint - Casade Hysteresis. Stop slave boiler condition: T_supply > CH_Setpoint + Cascade Hysteresis

12.13 APPLIANCE

- Remove manometers and tighten test port screws.
- Fill out start up report for each heater. Be sure to record all settings and readings. Retain a copy of report for future reference.
- Start up is now complete and heater may be placed into service.

12.14 IGNITION CYCLE

The ignition cycle is shown in the table below. The values are the default factory settings.

Table 41: DynaMax Ignition Cycle

State →	Standby	Pre Purge	Safety ON	Safety OFF[6]	Ignit_0	Ignit_1	Burn	Post Purge_0	Post Purge_1
Time	0s	5s after fan speed is within 600rpm			2 sec	6 sec	Limited to 24 hours continuously[3]	Max. 10 sec	10 sec.
Demand	0	No influence	No influence	No influence	No influence	No influence	> 0	No influence	No influence
Fan	Off	Ignition speed	Ignition speed	Ignition speed	Ignition speed	Ignition speed	Requested power	Ignition speed	Ignition speed
Gasvalve	Closed	Closed	Closed	Closed	Closed	Open	Open	Closed	Closed
Spark	Off	Off	Off	Off	On	On[4]	Off	Off	Off
Ionisation	0	0	0	0	0[1]	Flame must be detected[2]	Flame must be detected	No flame must be detected[5]	0

Note:

1. If a flame signal is detected at the end of the pre-sprak period (Ignit_0) then a lockout will occur.
2. If at the end of the safety period (6 sec) no flame is detected the control will go to post-purge to remove the unburned gas. After this a re-ignition attempt is started following the same cycle. The number of re-ignition attempts is limited to 2 after which a lockout occurs.
3. The burner can only be on continuously for a period of 24 hours. After this the burner is switched off and a restart sequence follows.
4. Sparking stops 2 seconds before the end of the Ignit_1 period to allow for ionisation detection when measuring ionisation through the spark plug.
5. If after post_purge_0 time (max. 10 sec.) still flame is detected lockout follows
6. Safety ON/OFF in this state the correct working of the safety relay is proved.

If the ignition cycle is started it will continue until completion, even if the demand is removed.

PART 13 PIPING DIAGRAMS

Figure 94: Single Boiler Hydronic Heating Zoned Piping Arrangement

This piping arrangement is designed for:

Central Heating Mode: 0, 1, 2, or 3

DHW Mode: 0

Boiler Address: 100

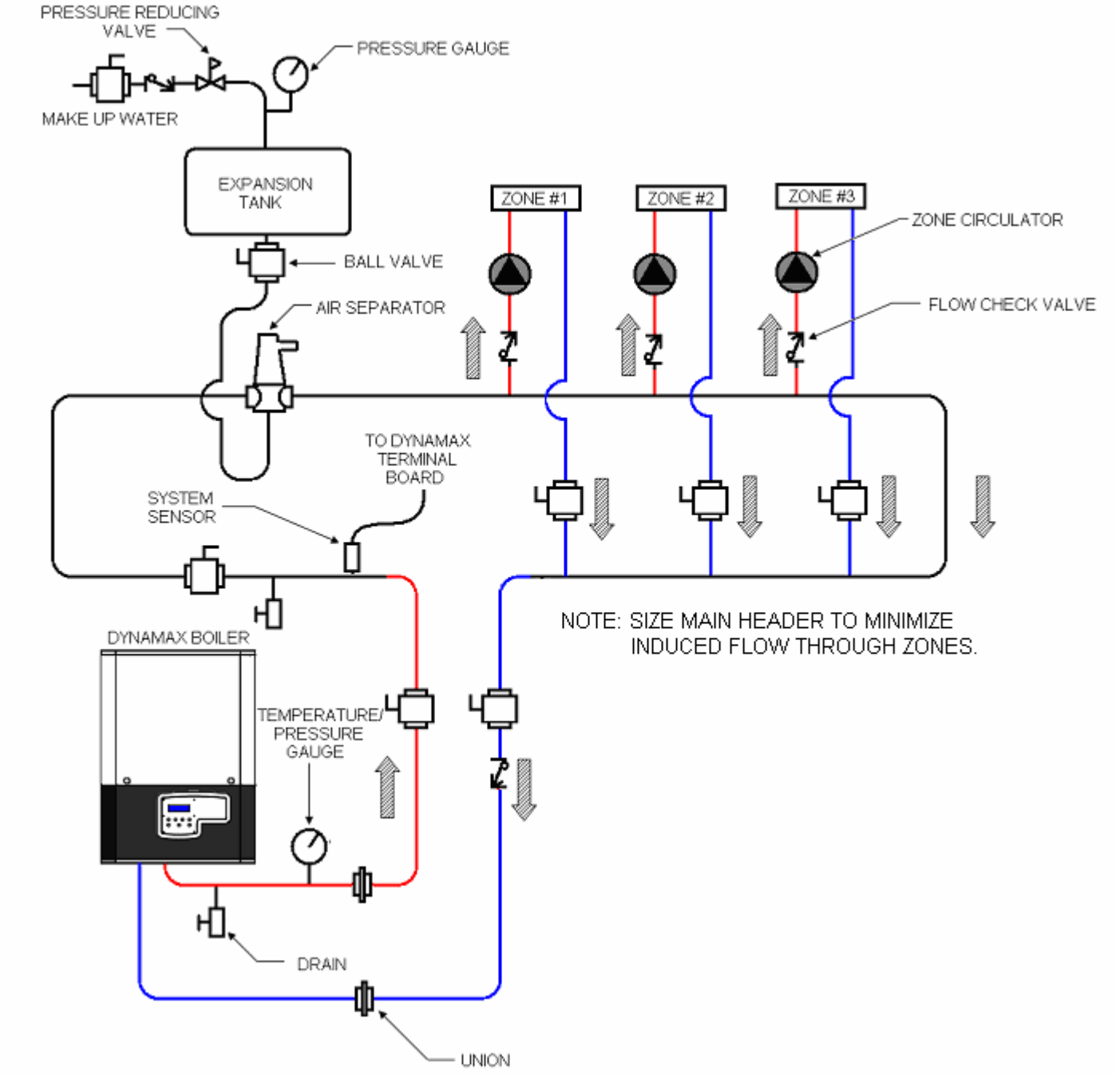


Figure 95: Single Combination Boiler Zoned Piping Arrangement

Central Heating Mode: 0, 1, 2, or 3

DHW Mode: 3, or 4

Boiler Address: Boiler Address = 100

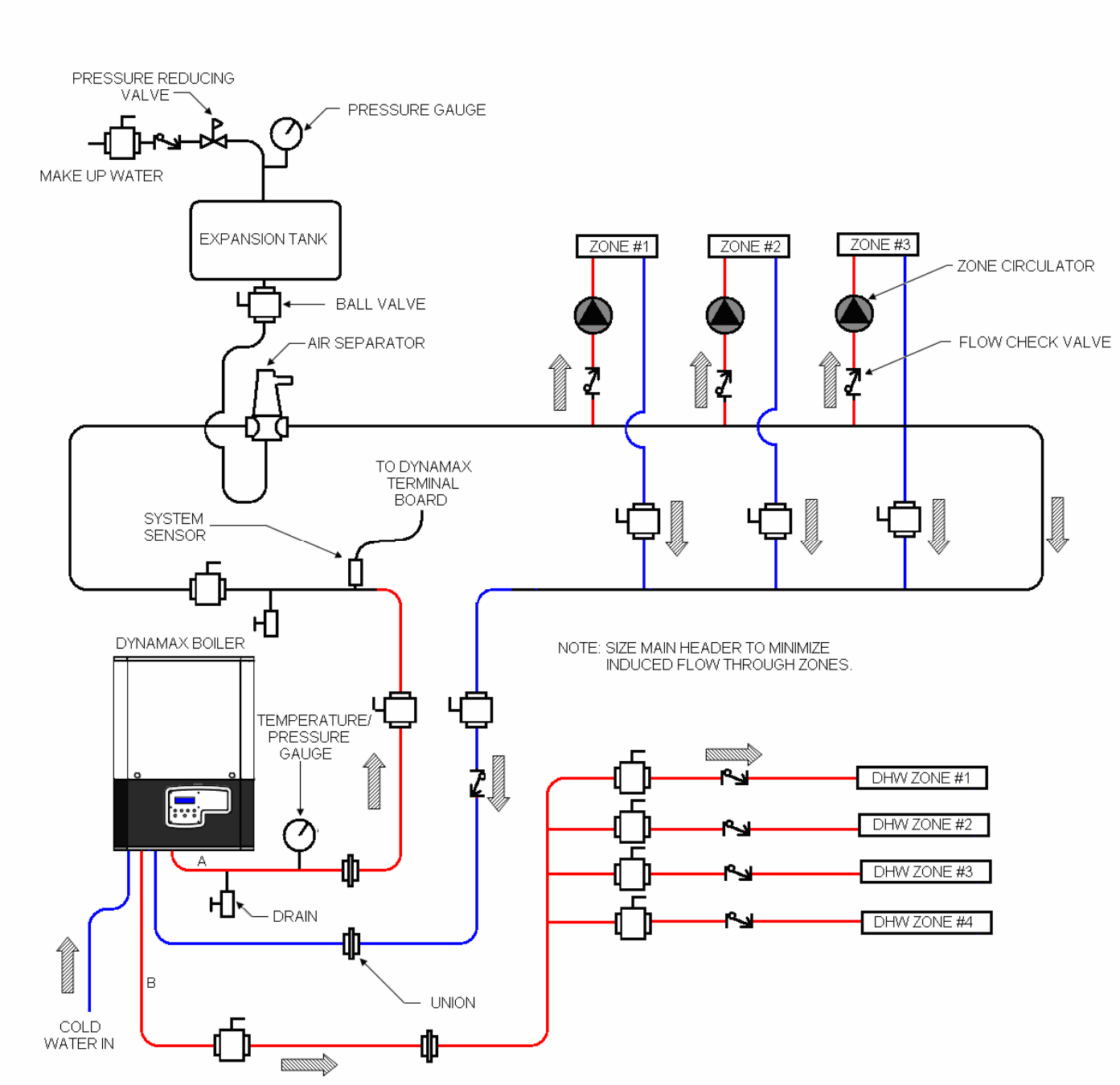


Figure 96: Single Boiler Hydronic Heating & Indirect Storage Tank Zoned Piping Arrangement

Central Heating Mode: 0, 1, 2, or 3

DHW Mode: 1, or 2

Boiler Address: Boiler Address = 100

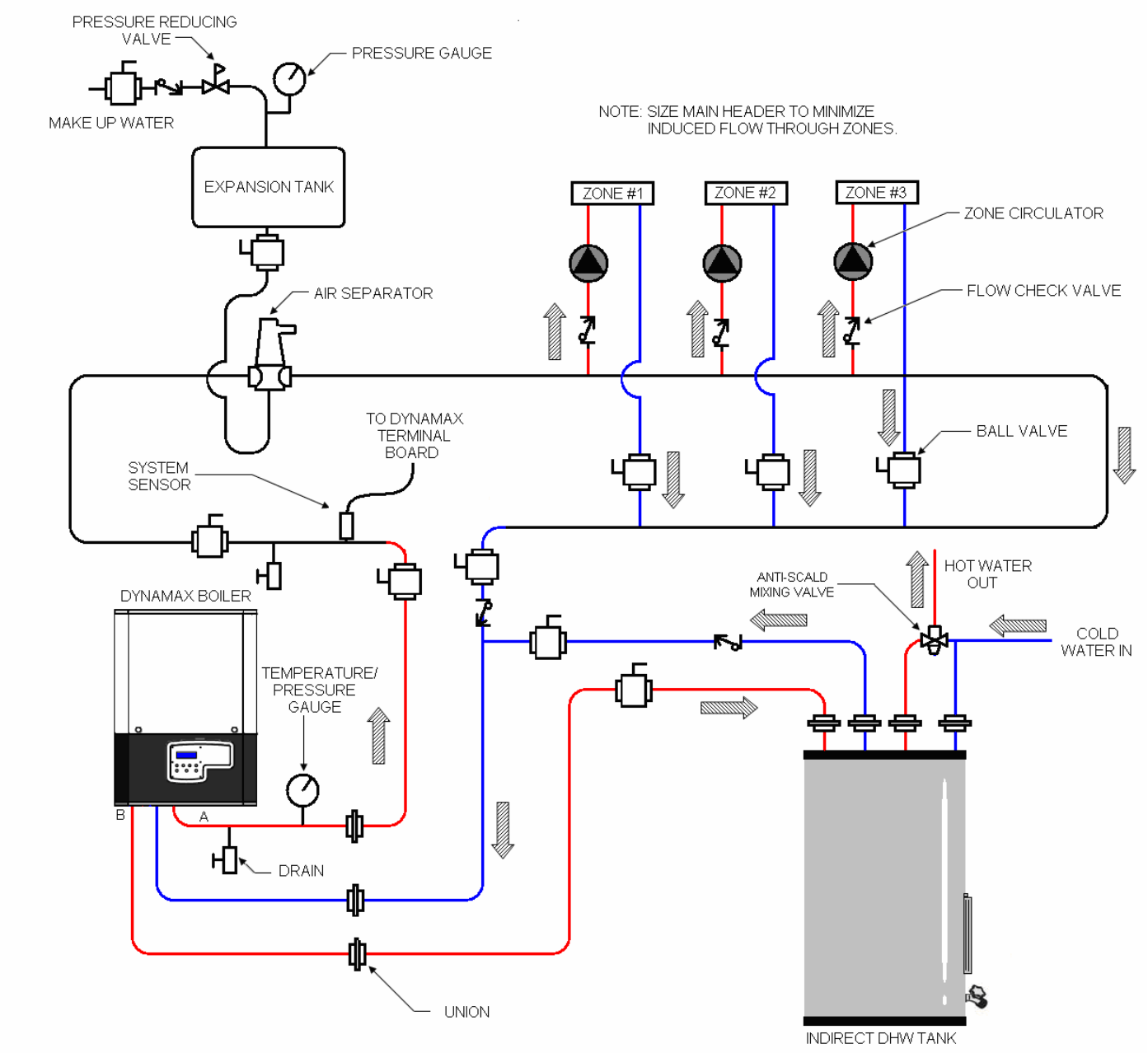


Figure 97: Single Boiler Hydronic Heating & Indirect Storage Tank Non-Zoned Piping Arrangement

Central Heating Mode: 0, 1, 2, or 3

DHW Mode: 1or 2

Boiler Address: Boiler Address = 100

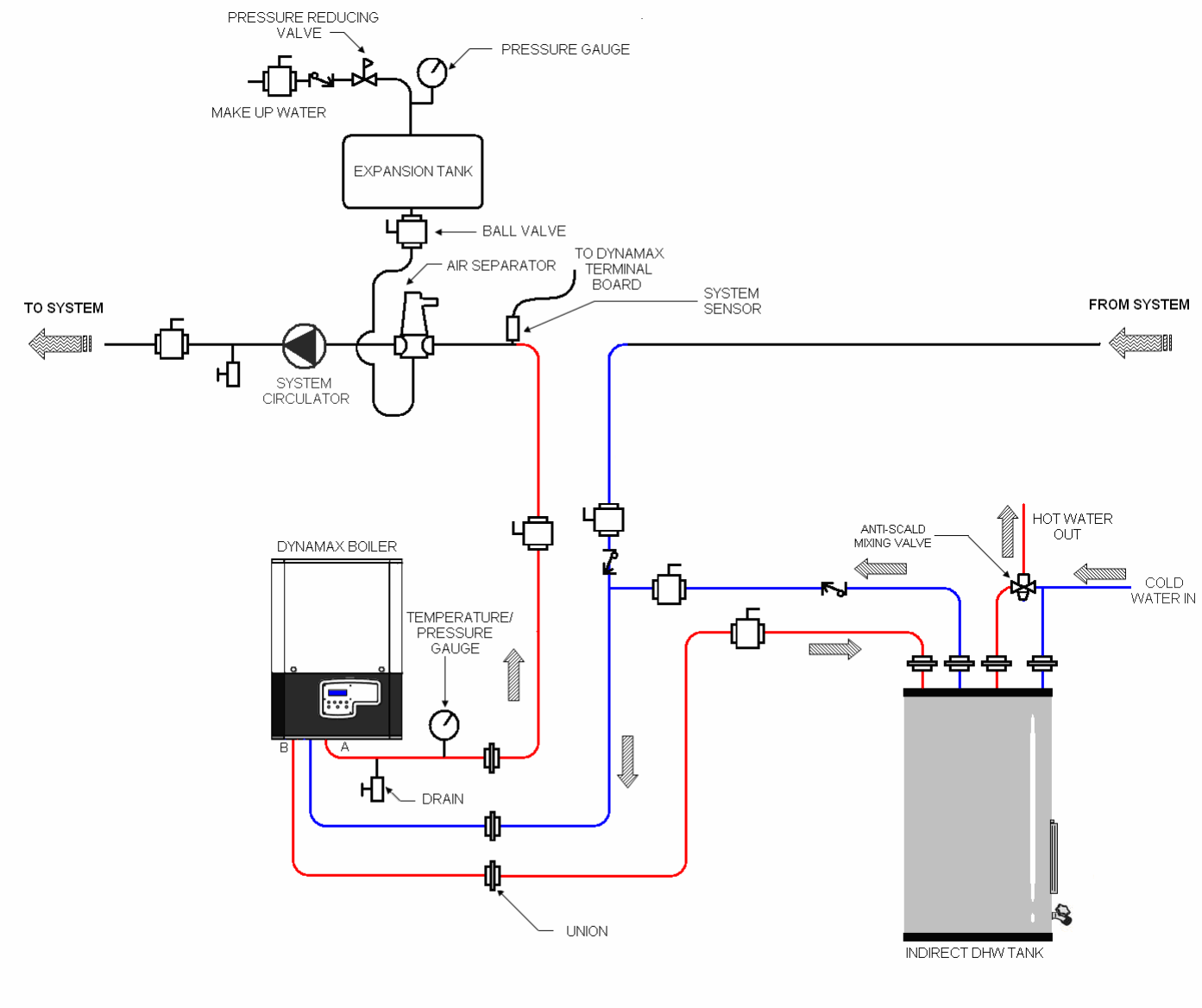


Figure 98: Single Boiler Hydronic Heating & Direct Storage Tank Zoned Piping Arrangement

Central Heating Mode: 0

DHW Mode: 1 or 2

Boiler Address: Boiler Address = 100

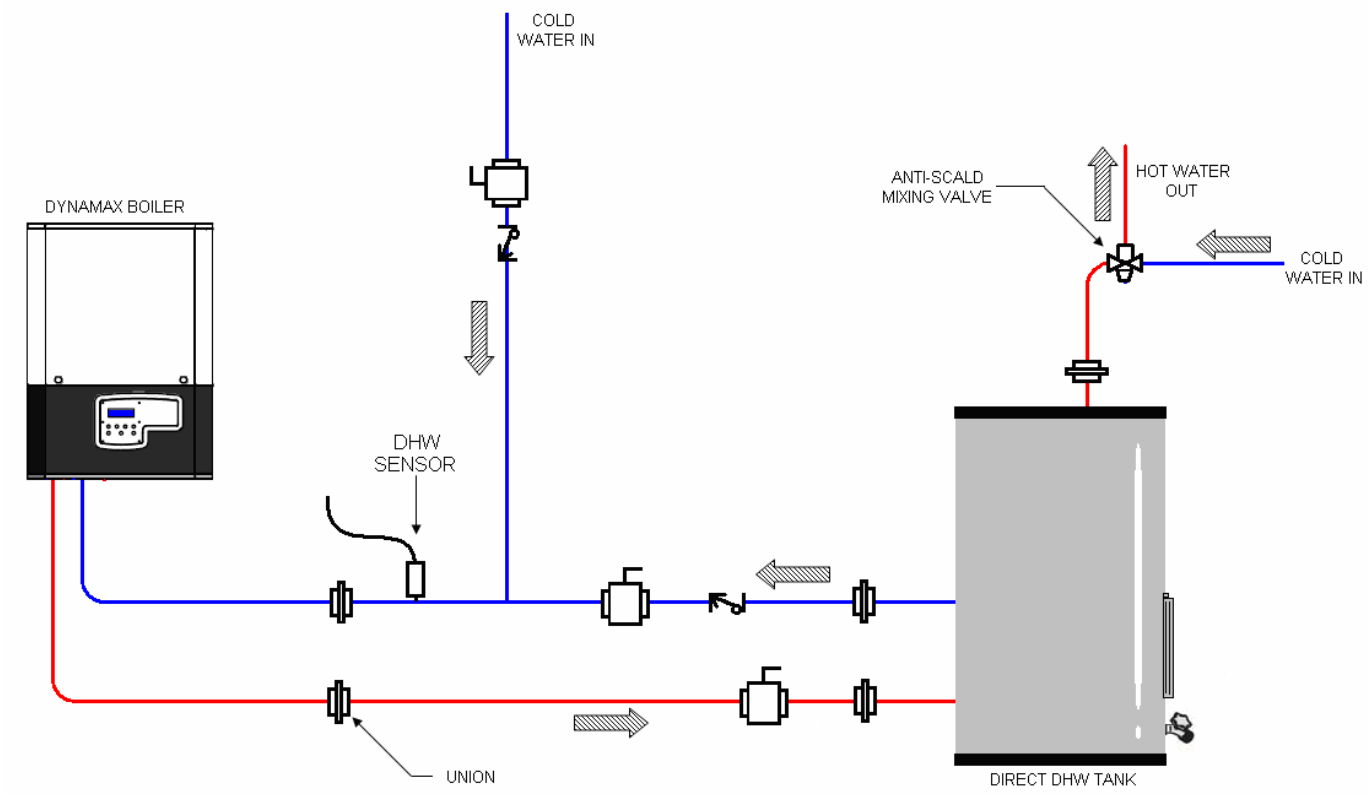
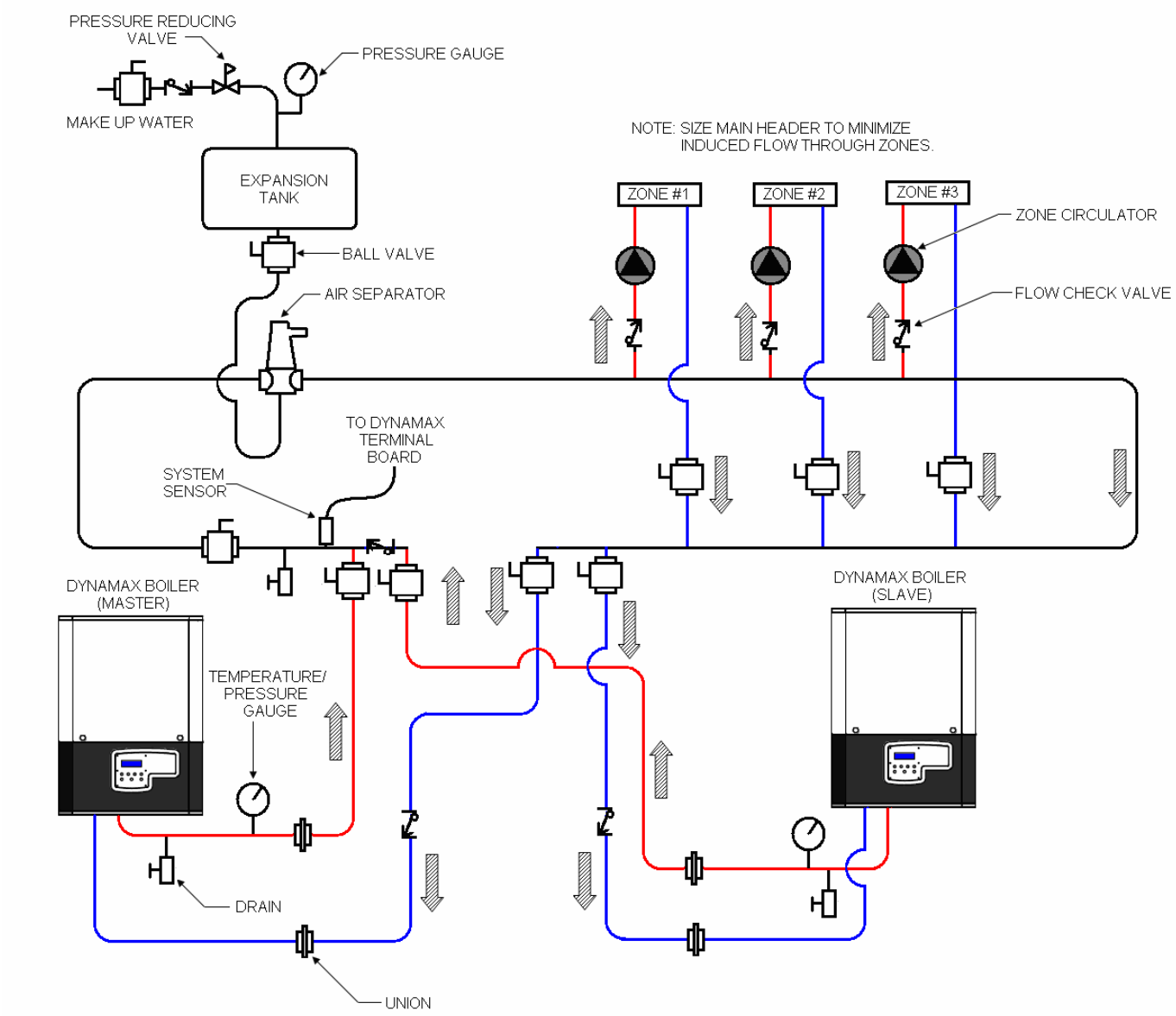


Figure 99: Multiple Boiler Hydronic Heating Zoned Piping Arrangement

Central Heating Mode: 0, 1, 2, 3

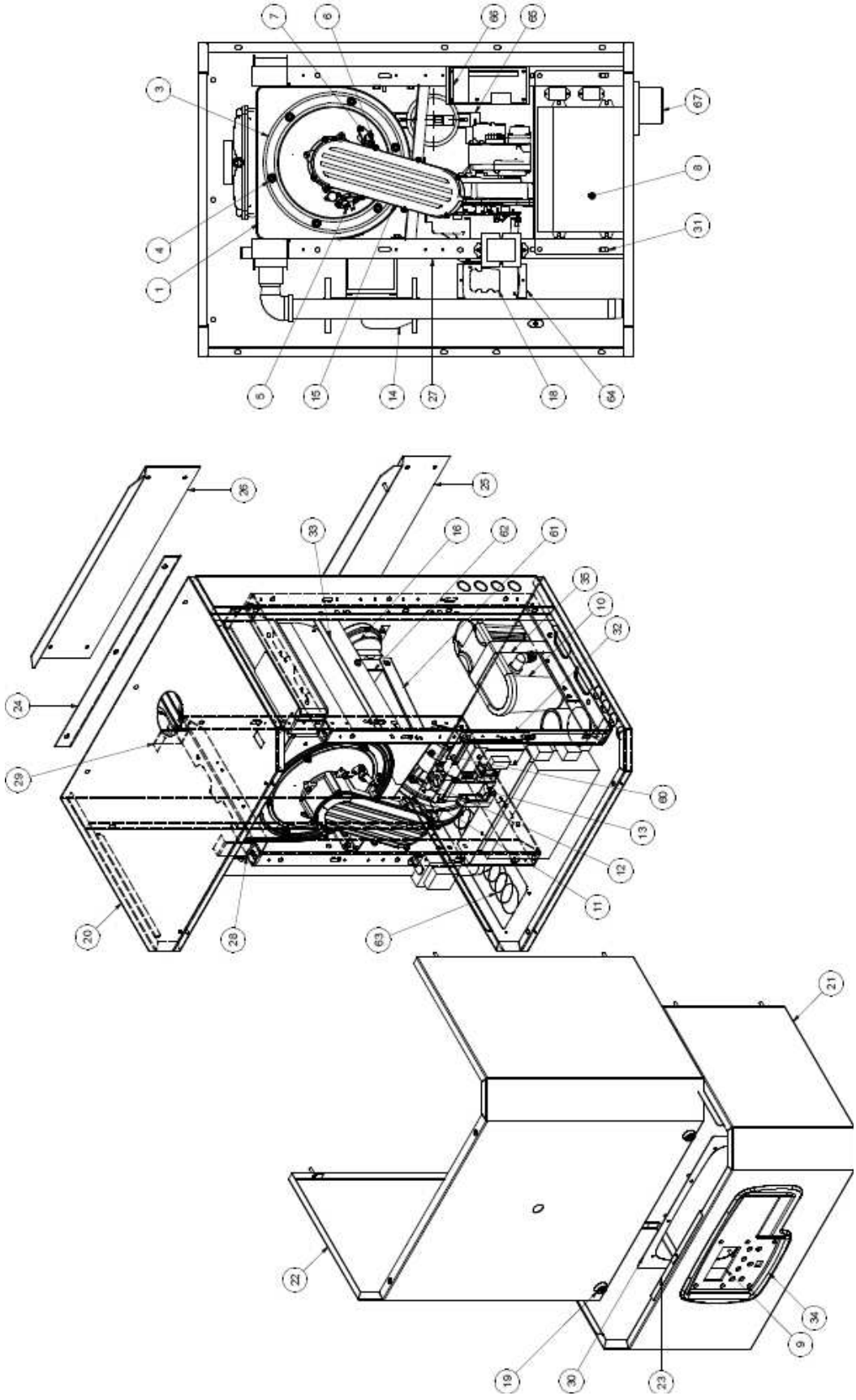
DHW Mode: 0

Boiler Address: Master Boiler Address = 101
Slave Boiler Address = 102

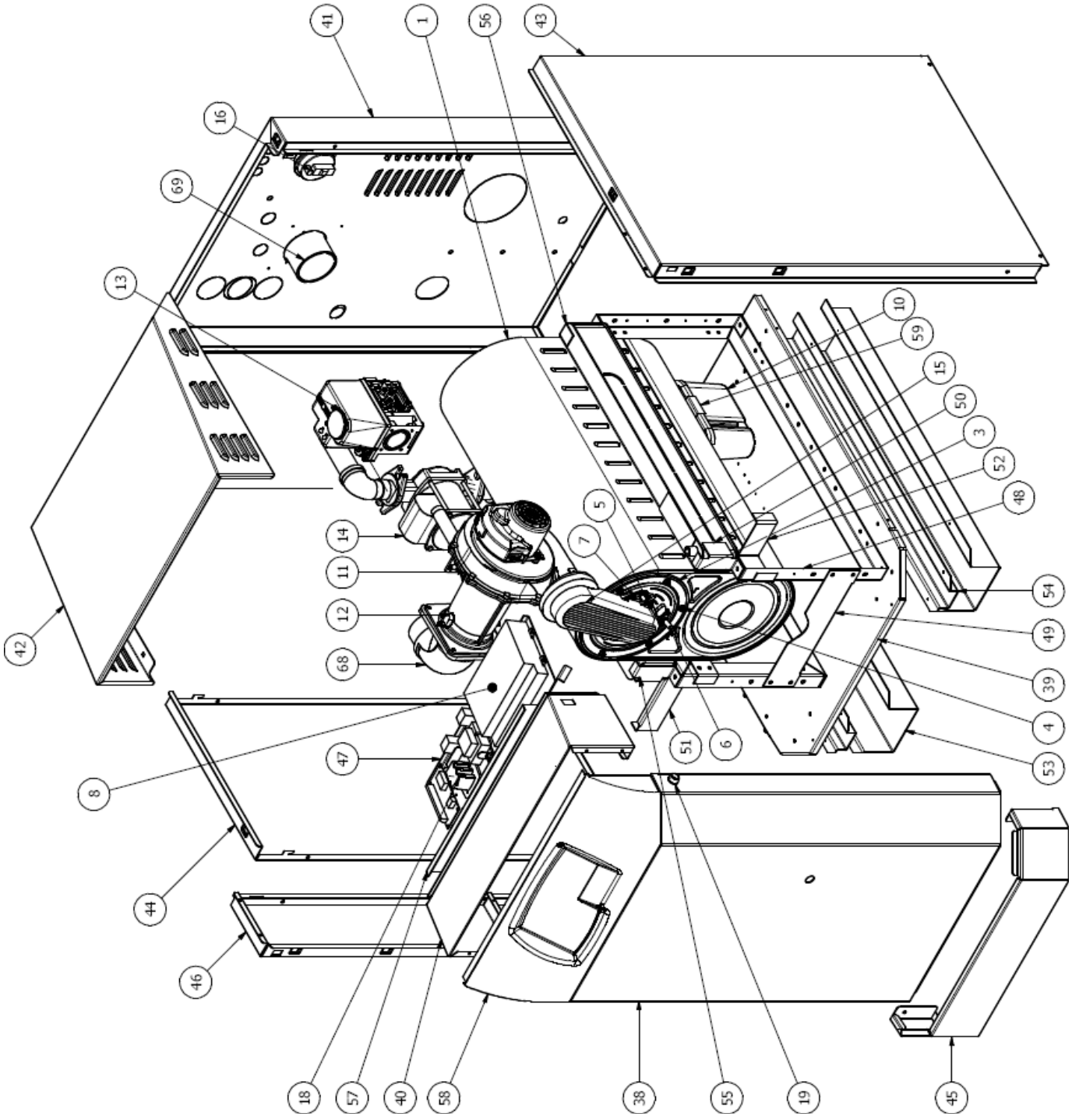


PART 14 EXPLODED VIEW & PARTS LIST

DYNAMAX WALL HUNG



DYNAMAX FLOOR MOUNT



Ref #	Name of Part	Part ID	DynaMax Models												
			ALL	80	100	150	200	210	250	260	299	399	500	600	750
1	Heat Exchanger	4 + 1 Wall		X	X										
		5 + 2 Wall				X									
		8 + 4 Wall					X		X						
		8 + 4 Floor						X		X					
		10 + 6 Floor									X				
		15 + 8 Floor										X			
		18 + 10 Floor											X		
		24 +11 Floor												X	
		24 + 12 Floor													X
2	Burner	80,000 BTU		X											
		100,000 BTU			X										
		150,000 BTU				X									
		200,000 BTU					X	X							
		250,000 BTU							X	X					
		299,000 BTU									X				
		399,000 BTU										X			
		500,000 BTU											X		
		600,000 BTU												X	
		750,000 BTU													X
3	Heat Exchanger Flange	GM20-65-028-01		X	X	X									
		GM20-65-033-01					X	X	X	X	X	X	X		
4	Heat Exchanger Flange Nuts	GM10-05-012	X												
5	Igniter	GM10-35-108	X												
6	Flame Sensor	GM10-35-109	X												
7	Igniter/Flame Sensor Screws	GM10-05-020	X												
8	DynaMax Controller	848MN	X												
9	DynaMax Control Panel	848RC	X												
10	DynaMax Condensate Neutralizer Box	15-6010	X												
11	Combustion Fan	55667.11221		X	X										
		55667.21120				X									
		55667.01970					X								
		55667.21080						X	X	X					
		55667.21200									X	X			
		55667.14002											X		
		G1G 170												X	X
12	Venturi	459000-444-003		X	X										
		459000-444-001				X									
		459000-446-051					X	X	X	X					
		45900450-010									X				
		45900450-020										X			
		VMU300A1046											X	X	X

Ref #	Name of Part	Part ID	DynaMax Models												
			ALL	80	100	150	200	210	250	260	299	399	500	600	750
13	Gas Valve	VK8115 V1036		X	X	X	X	X	X	X					
		VR8615VB1044/B									X	X			
		V8730V1015											X	X	X
14	Pump (Non E-Series)	Astro 30		X	X										
		Astro 50				X	X	X							
		S25		X	X										
		S35				X	X	X	X	X	X	X	X		
		PL30							X	X	X				
		PL36										X	X	X	
		PL45													X
	Pump (E-Series)	E7									X				
		E8		X	X	X	X	X	X	X					
		E9										X	X		
		E11				X	X	X							
		E12									X	X			
		E16										X	X	X	X
		E33												X	X
	Pump (H-Series)	H54											X		
		H66												X	
		H67													X
15	Mixing Chamber	GM20-70-011		X	X	X									
		GM20-70-020-01					X	X	X	X	X	X			
16	Air Pressure Switch	8021205256	X												
17	3-Way Valve (Combination Models ONLY)	VC4011ZZ02/E		X	X	X	X	X	X	X	X	X	X	X	X
18	High Limit	TCL 110A	X												
19	¼ Turn Lock	Wall Hung	X												
		Floor Mount	X												
20	DynaMax Wall Mount Back Panel	14-5402		X	X	X									
21	DynaMax Wall Mount Front Bottom Wrap	14-5403		X	X	X									
22	DynaMax Wall Mount Front Upper Wrap	14-5404		X	X	X									
23	DynaMax Wall Mount Restrain	14-5405		X	X	X	X		X						
24	DynaMax Wall Mount Mounting Bracket	14-5406		X	X	X	X		X						
25	DynaMax Wall Mount Wall Lower Bracket	14-5407		X	X	X	X		X						
26	DynaMax Wall Mount Wall Top Bracket	14-5408		X	X	X	X		X						

Ref #	Name of Part	Part ID	DynaMax Models											
			ALL	80	100	150	200	210	250	260	299	399	500	600	750
27	DynaMax Wall Mount Support Frame Assembly	14-5409		X	X	X									
28	DynaMax Wall Mount Bracket Front	14-5410		X	X	X	X		X						
29	DynaMax Wall Mount Rear Bracket	14-5411		X	X	X	X		X						
30	DynaMax Wall Mount Bezel Stiffener Plate	14-5412		X	X	X	X		X						
31	DynaMax Wall Mount Controller Plate	14-5413		X	X	X	X		X						
32	DynaMax Wall Mount Electrical Conduit Plate	14-5415		X	X	X	X		X						
33	DynaMax Wall Mount Electrical Strip Plate	14-5416		X	X	X	X		X						
34	DynaMax Wall Mount Plastic Bezel	15-6001-A		X	X	X	X		X						
35	DynaMax Wall Mount Bracket for Neutralizer Box	14-5419		X	X	X	X		X						
36	Air Inlet/ Vent Adapter	FSA-HEX03		X	X	X	X	X	X	X	X	X			
37	Plate Heat Exchanger (Combination Models ONLY)	LB31-20X		X	X	X									
		LB31-40X					X	X	X	X	X	X	X	X	X
38	DynaMax Floor Front Panel	14-5501									X	X	X		
39	DynaMax Floor Base Panel	14-5502						X		X	X	X	X		
40	DynaMax Floor Top Cover Front	14-5503						X		X	X	X	X		
41	DynaMax Floor Back Panel	14-5504									X	X	X		
42	DynaMax Floor Top Cover Back	14-5505						X		X	X	X	X		
43	DynaMax Floor Side Panel Right	14-5506									X	X	X		
44	DynaMax Floor Side Panel Left	14-5507									X	X	X	X	X

Ref #	Name of Part	Part ID	DynaMax Models												
			ALL	80	100	150	200	210	250	260	299	399	500	600	750
45	DynaMax Floor Front Panel Bottom	14-5508						X		X	X	X	X	X	X
46	Dynamax Floor Side Panel Left Front	14-5509									X	X	X	X	X
47	DynaMax Floor Control Panel Plate	14-5510						X		X	X	X	X	X	X
48	DynaMax Floor HX Support Frame	14-5511									X	X	X	X	X
49	DynaMax Floor Support Plate	14-5512						X		X	X	X	X	X	X
50	DynaMax Floor Bracket Right	14-5513									X	X	X	X	X
51	DynaMax Floor Stand Off Left	14-5514									X	X	X	X	X
52	DynaMax Floor Stand Off Right	14-5515						X		X	X	X	X	X	X
53	DynaMax Floor Support Leg	14-5516						X		X	X	X	X	X	X
54	DynaMax Floor Stiffner under Leg	14-5517						X		X	X	X	X	X	X
55	DynaMax Floor Bracket Left	14-5518									X	X	X	X	X
56	DynaMax Floor Rear Bracket	14-5520									X	X	X	X	X
57	DynaMax Floor Mount Top Cover Assembly	14-5521									X	X	X	X	X
58	DynaMax Floor Mount Dashboard	15-6002-A						X		X	X	X	X	X	X
59	DynaMax Floor Mount Bracket for Neutralizer Box	14-5525									X	X	X	X	X
60	Rubber Bushing	33-0101		X	X	X	X	X	X	X					
61	DynaMax Wall Mount Condensate Pan	14-5414		X	X	X	X		X						
62	DynaMax Wall Mount Condensate Pan Brace	14-5417		X	X	X	X		X						
63	Cover Plate	14-5421		X	X	X	X		X						
64	Standoff	14-5423		X	X	X	X		X						
65	Standoff	14-5422	X												

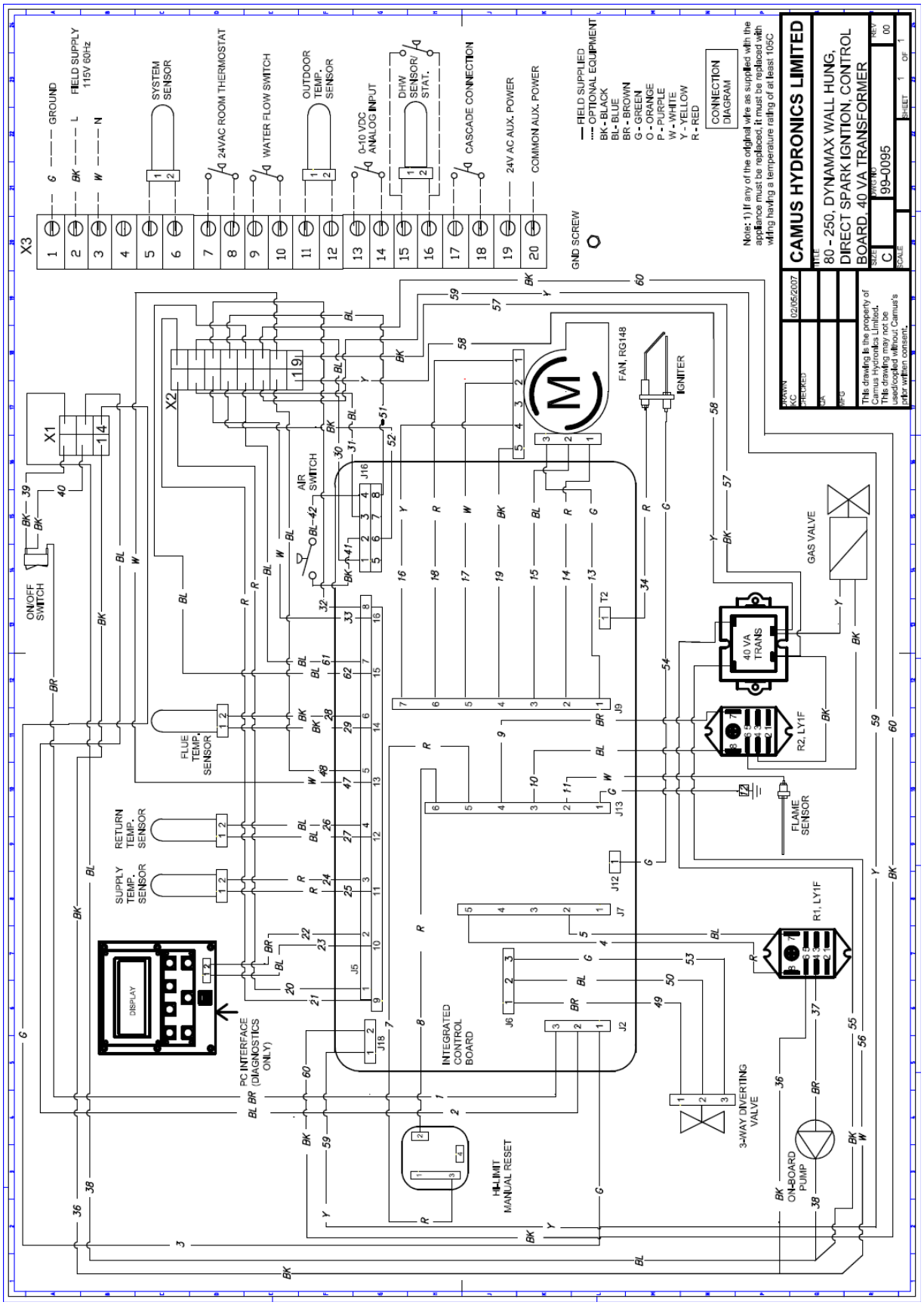
Ref #	Name of Part	Part ID	DynaMax Models												
			ALL	80	100	150	200	210	250	260	299	399	500	600	750
66	Electrical Strip Plate Protector	14-5420	X												
67	DynaMax Wall Mount Air Intake Adapter	44-0008		X	X	X	X		X						
68	DynaMax Floor Mount Plastic Flange with 3" Street Elbow	44-0009											X	X	X
69	DynaMax Floor Mount Air Intake Adapter	44-0010											X	X	X
70	Igniter Gasket	GM10-25-018	X												
71	Flame Sensor Gasket	GM10-25-004	X												
72	Burner Refractory	GM10-25-098-01		X	X	X									
		GM10-25-107					X	X	X	X	X	X	X		
73	Automatic Air Vent	FV-4M1	X												
74	DynaMax Terminal Board	TB-001.001	X												
75	On/Off Switch	W51A152A	X												
76	40VA Transformer	HCT-01E0BB06	X												
77	Supply/Return Sensor	TSD00AS	X												
78	Flue Sensor	TSD20A1	X												
79	Sensor Wire (DMH/DMW: 3, DMC: 4)	CABLE HARNESS	X												
80	DHW Sensor (Clip-on, Combination Models ONLY)	TSC 0AS0	X												
81	Burner Gasket	GM10-25-074-09		X	X	X	X	X	X	X	X	X			
82	Gas Valve Elbow	45900400-132/B		X	X	X	X	X	X	X					
		45900400-144/B									X	X			
83	Gas Valve Wire Harness	45900441-015B		X	X	X									
		45900429-007B					X	X	X	X	X	X			
84	Relief Valve	10-407-05		X	X	X	X	X	X	X					
		10-604-10									X	X	X		
85	Wiring Harness	77-0004		X	X	X	X		X						
		77-0006						X		X	X	X	X		
86	Flow Sensing Device (Current Transformer)	RIBXGA		X	X	X	X		X						
87	1/2" Firing Valve	USA0509101T		X	X	X	X		X						

Ref #	Name of Part	Part ID	DynaMax Models											
			ALL	80	100	150	200	210	250	260	299	399	500	600	750
88	DynaMax Fan Discharge Orifice	14-0377		X	X	X	X	X	X	X					
89	Expandable Air Inlet Adapter w/o Pressure Test Point	14-0378		X	X	X	X		X						
90	Expandable Air Inlet Adapter	14-0379		X	X	X	X		X						
91	Flex Pipe	2" Diameter		X	X	X	X	X	X	X	X	X			
		3" Diameter											X	X	X
92	Flexible Stainless Steel Pipe 1" X 11"	66-0075	X												
93	Flexible Stainless Steel Pipe 1/2" X 11"	66-0073	X												
94	Manual Shutoff Valve Kit	50002653-001													
95	Rear Vent Adapter	GM10-15-991-01						X		X					
		GM10-15-992-01									X	X	X		
96	Metal Latch	6521-00-0551-YT						X		X	X	X	X	X	X
97	Strike	7800-02						X		X	X	X	X	X	X

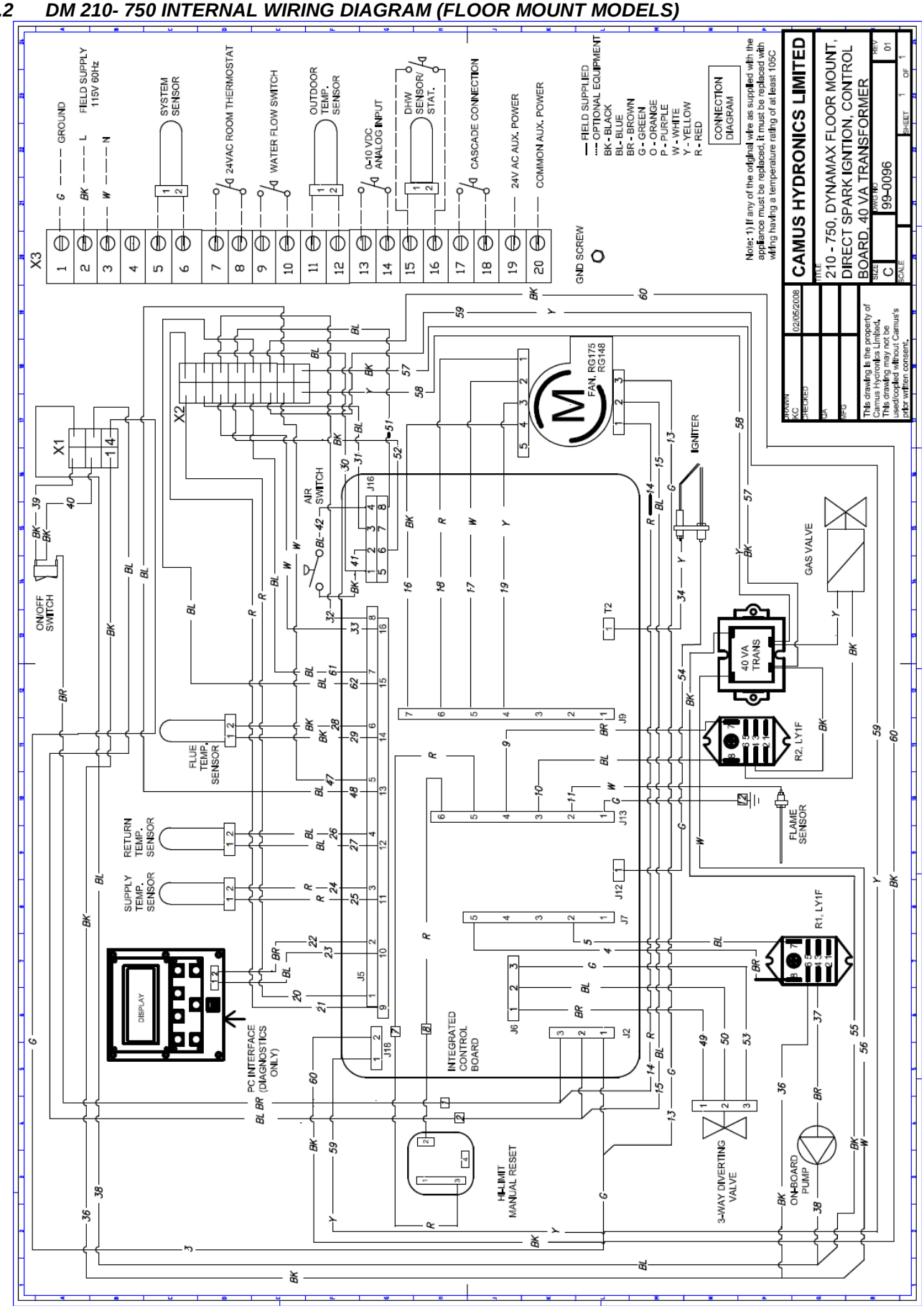
Not shown in Exploded View

PART 15 ELECTRICAL DIAGRAMS

15.1 DM 80- 250 INTERNAL WIRING DIAGRAM (WALL HUNG MODELS)



15.2 DM 210- 750 INTERNAL WIRING DIAGRAM (FLOOR MOUNT MODELS)



15.3 FIELD WIRING

15.3.1 System Sensor

The temperature of the primary return can be controlled by installing a system sensor. The DynaMax Controller automatically detects the use of this sensor and controls the burner modulation rate accordingly to maintain the system supply temperature to the set point.

15.3.2 Boiler Management System

An external controller can be connected to control the modulation rate of the burner, set point temperatures along with other user accessible parameters. To gain access to this function connect the 0-10Vdc terminals on the terminal board to the 0-10Vdc terminal on the boiler management system.

To allow for proper functionality ensure that the '+' terminal is connected to the '+' terminal on the terminal board and the '-' terminal is connected to the '-' terminal on the terminal board.

15.3.3 Cascade Setup

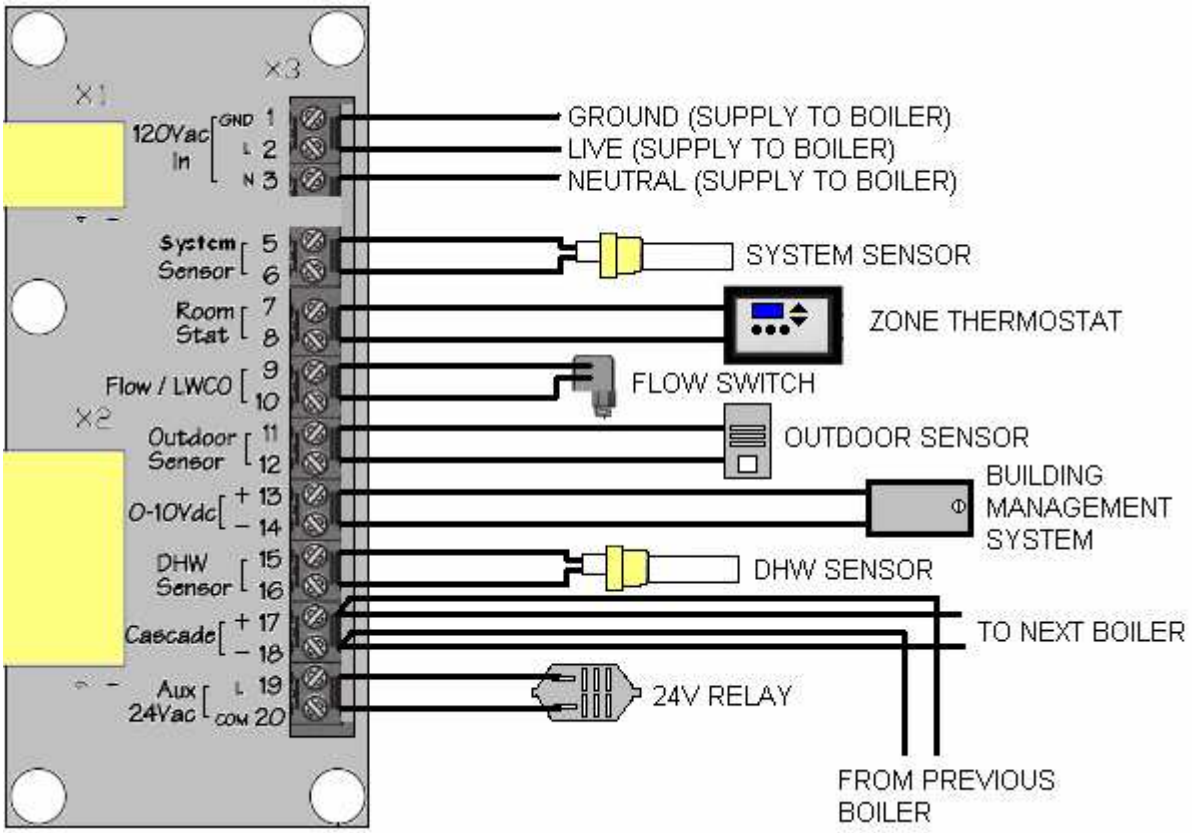
To setup a cascade system a Master boiler must be chosen, and the other boilers connected to it in this system are designated as Slaves.

Connect the system sensor and outdoor sensor (if equipped) to the Master boiler. The Master boiler will use the water temperature in the primary loop to control the operation of the cascade setup. The location of the system sensor should be installed downstream of all the zones in the primary loop. The system sensor is wired into the DynaMax Terminal board as shown in the diagram below.

If outdoor reset is desired, the outdoor sensor needs to be connected to the Outdoor Sensor location on the DynaMax Terminal Board. When the outdoor sensor is connected to the Master boiler, the DynaMax Controller will recognize this automatically and the Master will calculate the water temperature setpoint based on the Ch_Setpoint Curve (Figure 15). If the outdoor sensor is not connected to the Master boiler the DynaMax Controller will maintain a fixed water temperature that is programmed into the control.

If a Zone Thermostat is available, it needs to be connected to the Room Thermostat terminals on the DynaMax Terminal Board. If the boiler is required to run continuously a jumper cable can be placed between the '+' and '-' contacts, this will then force a call for heat on the cascade setup.

Communication between the Master and Slave boilers is accomplished by a running shielded 2-wire cable. Connect one end of the wires to Master 'Cascade +' and the other end to Slave 'Cascade +' on the DynaMax Terminal Board. Setup the other wire in the same manner with one end of the wires to Master 'Cascade -' and the other end to Slave 'Cascade –' on the DynaMax Terminal Board. If more than 2 boilers are connected in a cascade fashion, daisy chain the wiring from the second boiler on the Cascade DynaMax Terminal Board to the third boiler on the Cascade DynaMax Terminal Board. Do the same for the third, the fourth etc. Keep the wires short to minimize the chance of interference signals.



15.4 DETAILED CONNECTOR DESCRIPTION

Connector	Pin #	Connector Description
J2		Provides 120VAC to the DynaMax Controller
	1	Earth/ Ground
	2	120VAC Neutral
	3	120VAC Live
J6		3-Way Diverter Valve
	1	DHW 120VAC Live
	2	CH 120VAC Live
	3	120VAC Neutral
J7		On-Board Pump
	1	Not Used
	2	Pump 120VAC Neutral
	3	Not Used
	4	Not Used
	5	Pump 120VAC Live
J13		High-Limit, Gas Valve, Flame Sensor
	1	120VAC Ground
	2	Flame Sensor
	3	Gas Valve 120VAC Neutral
	4	Gas Valve 120VAC Live
	5	High-Limit Safety
	6	
J9		Fan Power, Fan Modulation
	1	Fan 120VAC Earth/ Ground
	2	Fan 120VAC Live
	3	Fan 120VAC Neutral
	4	Fan Signal +
	5	Fan Hall Effect Signal
	6	Fan Pulse Width Modulation (PWM) Signal
	7	Fan Signal -
J16		Various Sensors
	1	Flow Switch
	2	Air Switch
	3	Flow Switch
	4	Air Switch
	5	Not Used
	6	0-10VDC Analog Input
	7	Not Used
	8	0-10VDC Analog Input

Connector	Pin #	Connector Description
J5		Various Sensors
	1	Room Thermostat, 24VAC
	2	Control Panel, +
	3	Supply/Outlet Sensor
	4	Return/Inlet Sensor
	5	DHW Sensor/ Tank Stat
	6	Flue/Stack Sensor
	7	System Sensor
	8	Outdoor Sensor
	9	Room Thermostat, 24VAC
	10	Control Panel, -
	11	Supply/Outlet Sensor
	12	Return/Inlet Sensor
	13	DHW Sensor/ Tank Stat
	14	Flue/Stack Sensor
	15	System Sensor
	16	Outdoor Sensor
J12		Spark Return Signal
T2		Spark Igniter
F1		3.15A Fuse

CONDENSING BOILER LIMITED WARRANTY

Camus Hydronics Limited ("Camus") extends the following LIMITED WARRANTY to the owner of this appliance, provided that the product has been installed and operated in accordance with the Installation Manual provided with the equipment. Camus will furnish a replacement for, or at Camus option repair, any part that within the period specified below, shall fail in normal use and service at its original installation location due to any defect in workmanship, material or design. The repaired or replacement part will be warranted for only the unexpired portion of the original warranty.

THIS LIMITED WARRANTY DOES NOT COVER

1. Failure to properly install, operate or maintain the equipment in accordance with Camus' manual
2. Abuse, alteration, accident, fire, flood, foundation problems and the like
3. Sediment or lime build-up, freezing, or other conditions causing inadequate water circulation
4. Pitting and erosion caused by high water velocity;
5. Failure of connected systems devices, such as pump or controller
6. Use of non-factory authorized accessories or other components in conjunction with the system;
7. Failing to eliminate air from, or replenish water in, the connected water system
8. Chemical contamination of combustion air or use of chemical additives to water
9. Production of noise, odours, discolouration or rusty water
10. Damage to surroundings or property caused by leakage or malfunction
11. All labour costs associated with the replacement and/or repair of the unit
12. Any failed component of the hydronic system not manufactured as part of the boiler.

HEAT EXCHANGER

If within TWELVE years after initial installation of the appliance, a heat exchanger shall prove upon examination by Camus to be defective in material, thermal shock, leakage or workmanship, Camus will exchange or repair such part or portion on the following pro rated limited warranty

Years into Warranty	% of List Price
8	30
9	40
10	50
11	60
12	70

This term is reduced to SIX years if the appliance is used for other than hydronic space heating. Heat Exchanger shall be warranted for (20) years from date of installation against "Thermal Shock" (excluded, however, if caused by appliance operation at large changes exceeding 150ºF between the water temperature at inlet and appliance temperature.

BURNER

If within FIVE years after initial installation of the appliance a burner shall prove upon examination by Camus to be defective in material or workmanship, Camus will exchange or repair such part or portion.

ANY OTHER PART

If any other part fails within one (1) year after installation, or eighteen (18) months from date of factory shipment based on

Camus' records, whichever comes first. Camus will furnish a replacement or repair that part. Replacement parts will be shipped f.o.b. our factory.

DURATION OF LIMITED WARRANTY

Any limited warranty, including the warranty of mechantability imposed on the sale of the boiler under the laws of the state or province of sale are limited in duration to one year from date of original installation.

STATE LAW & LIMITED WARRANTY

Some states or provinces do not allow:
a) Limitations on how long an implied warranty lasts
b) Limitations on incidental or consequential damages.
The listed limitations may or may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which may vary from state to state and province to province.

CONDITIONS

We will not:
a) Repair or replace any boiler, or part, subject to conditions outlined in 'This Limited Warranty Does Not Cover'
b) Reimburse any costs associated with repair and/or replacement
c) Replace and/or reparir any boiler without complete model number/serial number
d) Replace any boiler without prior receipt of actual rating plate from the appliance.

HOW TO MAKE A CLAIM

Any claim under this warranty shall be made directly to Camus Hydronics Limited Canadian Head Office

SERVICE LABOR RESPONSIBILITY

Camus shall not be responsible for any labour expenses to service, repair or replace the components supplied. Such costs are the responsibility of the owner.

DISCLAIMERS

Camus shall not be responsible for any water damage. Provisions should be made that in the event of a water/appliance or fitting leak, the resulting flow of water will not cause damage to its surroundings.

Name of Owner			
Name of Dealer			
Address			
Model No.			
Serial #:			
Date of Installation:		Date of Initial Operation:	

6226 Netherhart Road, Mississauga, Ontario, L5T 1B7, CANADA

CAMUS Hydronics is a manufacturer of replacement parts for most copper finned water heaters and heating boilers as well as a supplier of specialty HVAC products. Our service line is open 24 hours, 7 days a week!

The CAMUS CERTIFIED! Seal assures you that Reliability, Efficiency & serviceability are built into every single unit! For more information on our innovative products from CAMUS Hydronics Limited, call 905-696-7800 today.

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