EcoKnight

Service Manual

Models:
EKW117
EKW190
EKW237
EKW295

Warning:
Read and fully understand this manual before attempting to work on this Water heater. It can cause personal injury and damage to the Water heater when you do not read the manual and/or do not obey the instructions.

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Article	Language	Version	Updated by
EcoKnight Service manual	English	Launch	SJA

PREFACE

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Lochinvar Ltd. reserves the right to modify specifications in this manual.

TRADEMARKS

Brand names in this manual are registered trademarks of their respective owners.

WARRANTY

Refer to the appendix Warranty within the water heat installation manual for the warranty provisions.

LIABILITY

Maintenance engineer

Lochinvar accepts no liability when the Appliance is not used correctly and requires the installation engineer to:

- Read this manual carefully and obey the instructions.
- Make sure that the entire Appliance installation complies with all applicable regulations.
- Make sure that the Appliance is tested before the installation is taken into use.
- Explain the correct use to the user.
- Notify the user when service and maintenance is required.
- Make sure that you hand over all applicable manuals.

Supplier

The appliance is designed in accordance with the applicable regulations. The Appliance is delivered with CE-marking and all necessary documentation in accordance with these regulations.

Lochinvar accepts no liability for claims from third parties when:

- The instructions for the correct installation of the Appliance are not followed.
- The instructions for the correct use of the Appliance are not followed.
- The Appliance has not been serviced as per the maintenance schedule.

For more information, refer to the General Terms of Sales. These are available on request, free of charge.

We believe that this manual provides you with an accurate and complete description of all relevant components. If you, nonetheless, find errors or inaccuracies in this manual, please inform Lochinvar. This helps us to further improve our documentation.

COMPLIANCE

To safely produce low temperature hot water, the design and construction of the appliance is in accordance with:

- UK and European Regulations 2016/426 on appliances burning gaseous fuels (GAR).
- UK and European Standard for Gas–fired boilers (BS EN15502).
- UK and European Eco-Design Directive.

Refer to the appendix Declaration of conformity (See Appendix).

REGULATIONS

It is law that all gas appliances are installed by a competent person, registered with a H.S.E. approved body, in accordance with The Gas Safety (Installation and Use) Regulations 1998. Failure to install appliances correctly could lead to prosecution. It is in your own interest, and that of safety, to ensure that this law is complied with. The installation of the equipment MUST be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, I.E.E. Regulations, and the bylaws of the local water undertaking.

In addition, the installation should follow the relevant guidance offered in the following documents. It is not practical to list all relevant information due to continuous changes, but emphasis is placed on the following documents, as failure to comply with the guidance given will almost certainly result in an unsatisfactory installation:

Institute of Gas Engineers and Managers (IGEM) Publications

CIBSE Guides

Clean Air Act

H.S.E Guidance

Note

Manufacturer's notes must not be taken in any way as overriding statutory obligations.

Contact information!

In the event of problems with your gas, electricity, or water supply connections or when you have any comments or questions, please contact your (energy/water) supplier.

ABOUT THIS MANUAL

SCOPE

This manual gives information about safe and correct use of the Appliance and how installation, maintenance and service activities must be done correctly. You must obey the instructions in this manual.

Caution

Read this manual carefully before you start servicing the appliance. It can cause personal injury and damage to the unit when you do not read the manual and/or do not obey the instructions.

The purpose of this manual is to:

- Describe the working principles and layout of the Appliance.
- Explain the safety devices.
- Highlight possible hazards.
- Describe the use of the Appliance.
- Describe the installation, service, and maintenance of the Appliance.

This manual has two parts:

A User part that describes the correct usage of the Appliance.

An Installation, Maintenance and Service part, that describes the correct installation and maintenance procedures.

TARGET GROUP

The information in this manual is only for the use of a qualified, competent service engineer:

This manual contains the following text styles/symbols for situations that may endanger users/engineers, cause damage to equipment or need special attention:

Note

A note gives more information on a topic.

Caution

Obey the caution instructions to prevent damage to the Appliance.

Warning

Obey the warning instructions to prevent danger of personal injury, and serious damage to the Appliance.

Hot surfaces:

The symbol indicates those components with a high surface temperature that could create a risk.

SAFETY GUIDELINES

When servicing the appliance/appliance

Warning:

Ensure the unit is disconnected from any electrical supply before performing maintenance to avoid electric shock

Ensure the unit has had sufficient time to cool to avoid severe burns and injury.

WHAT TO DO IF YOU SMELL GAS

Warning if you smell gas.

- **No naked flames, no smoking!**
- **Avoid causing sparks, do not switch on or off electrical equipment or lights.**
- **Open windows and doors.**
- **Shut off the main gas supply.**
- **Warn occupants and leave the building.**
- **After leaving the building alert the local gas supply company.**
- **Do not re-enter the building until it is safe to do so.**

Lochinvar Limited is not liable for any damage caused by inaccurately following these instructions. Only original parts may be used when carrying out any repair or service work.

This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

Installation Manual

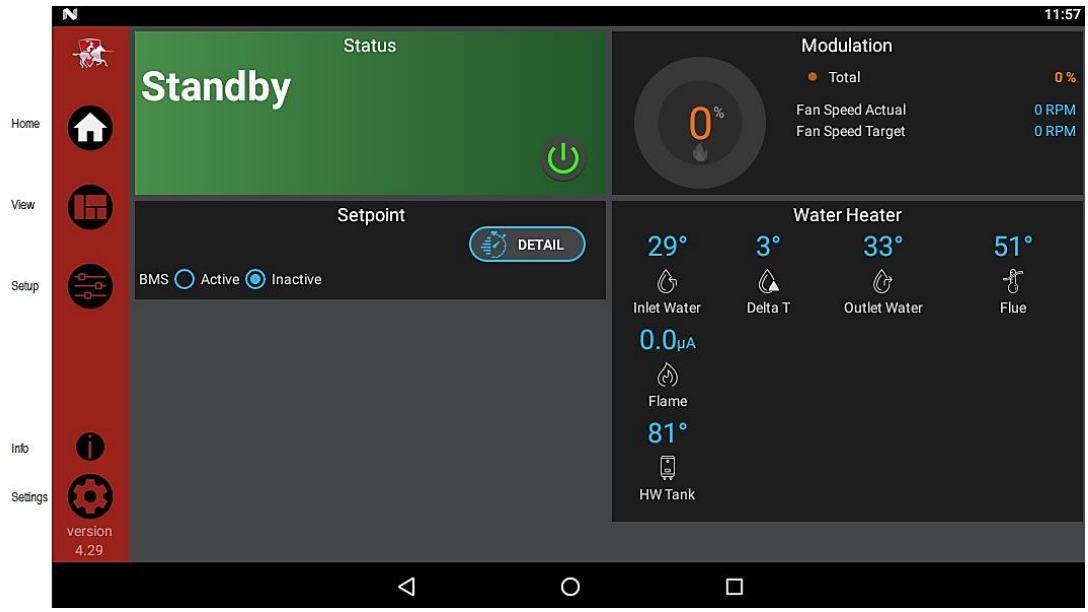
Refer to separate EcoKnight Installation Manual.

Scan the QR code to access the EcoKnight Installation Manual

CONTENTS

DISPLAY PANEL MENU ACCESS

FIGURE 1 SMARTOUCH CONTROL INTERFACE



The Status Section is located on the top left of the screen and displays how the unit is currently running (i.e., Off, Stand-by, locking, and Lockout) including current driving demand, the next Hot Water Setback scheduled, the reason for any blocking or lockout, and a power button.

The Demand Section is located on the bottom left of the screen and displays information about the targets and limits of the current demand being serviced.

The Modulation Section is located on the top right of the screen and displays the target modulation of the unit. This section also includes target and actual fan speeds.

The Sensor Section is located on the bottom right of the screen and displays both factory installed, and field installed sensor including Inlet Water Temperature, Delta T Water Temperature, Outlet Water Temperature, Flue Temperature, and HW Tank Temperature.

The Navigation Section is located down the left side of the screen. There are five (5) sections located below the Lochinvar icon: Home, View, Setup, Information (About), and Settings.

The Home Section is the screen shown in Figure 1. The View Section provides more detailed information including subsections for: History, Cascade, Graphing, and a complete list of current Sensor Values. The Setup Section has several screens to aid in setting up the appliance. The Setup Section includes screens for adjusting: Set Points, Pump Settings, Cascade, BMS, Ramp Delay, and Night Setback. The Information Section provides information about the hardware and software including the current software version of the interface, the version of the boiler control. The Setting Section enables several interface setup features including Time Setup, Temperature Unit Select and System Update.

GENERAL OPERATION

The appliance uses an advanced stainless steel heat exchanger and an electronic control module that allows fully condensing operation. The fan pulls in gas and air and pushes products of combustion out of the appliance through the heat exchanger and flue system. The control module regulates fan speed to control the units firing rate. The gas valve senses the amount of air flowing into the unit and allows only the right amount of gas to flow.

HOW THE CONTROL MODULE OPERATES

The Appliance control module receives input from the sensors. The control module activates and controls the fan and gas valve to regulate heat input and switches appliance, DHW, and system pumps on and off as needed. The user or installer should program the module to meet the system needs by adjusting control parameters. These parameters set operating temperatures and unit operating modes. The unit operation can be based on unit outlet water temperature, unit return water temperature or system supply temperature depending on the parameter setting.

SEQUENCE OF OPERATION

Table 1 shows the control module normal sequences of operation for heating and DHW operation. The combined operation sequence is for a typical application, programmed to provide DHW priority.

ADJUST SET POINT TEMPERATURE(S)

During normal operation, set point temperatures can be adjusted from the home screen by pressing the details button under setpoint on the screen (see Figure 1)

1. To change a set point, use the set point slider feature or alternatively the plus (+) and minus (-) buttons can be used.
2. Once the set point has been adjusted to the desired setting, press the door menu slider (top left) or the set-up button.
3. Press the APPLY CHANGES button on the top of the screen.

Note:

The APPLY CHANGES button must be pressed to complete programming of the controls. Failure to press the APPLY CHANGES button will result in an unprogrammed control. The door menu will become highlighted when there are changes that can be applied.

INSTALLER PASSWORD

Most parameters shown in this manual are only available after entering the installer password which is 5309.

TABLE 1 SEQUENCE OF OPERATION

Sequence of Operation	
1	Upon a call for heat, the control turns on the DHW pump.
2	The control confirms that the low water cutoff / flow switch contacts are closed and energizes the (optional) louvers.
3	The control confirms that the gas pressure switch, blocked drain switch, limits, louver proving switch (optional), and contacts close. The Pre-Purge cycle begins.
4	The control confirms the fan comes up to the desired speed.
5	Once the Pre-Purge cycle is complete, the control lowers the blower speeds, initiates sparking of the ignition electrode, and opens the gas valve.
6	After a short wait, the control stops sparking and checks for the presence of flame current through the flame sense electrode.
7	If the flame is not detected after the sparking ends, the control will perform a Post-purge, then start another pre-purge cycle and try to light the burner again. On the 190 and larger models, the control will lock out if this second attempt also fails. On the 117 model, the control will perform a total of 4 attempts before locking out. Once the control has locked the unit out, the RESET button will need to be pressed on the touch screen LCD.
8	If the control detects flame current, the control will hold the fan speed constant for a few seconds to allow the flame to stabilize, then begin modulating the firing rate to maintain the controlling sensor to the desired set point temperature
9	Once the DHW call for heat is satisfied, the control will turn off the gas valve and begin the Post-Purge cycle. Any pumps that are running will begin their respective Pump Delay cycles.
10	At the end of the Post-Purge cycle, the louver relay contacts will de-energize.
11	At the end of the Pump Delay cycle(s), the pump(s) will be turned off.

TABLE 2 PARAMETER TABLE

This table lists SMART TOUCH control module parameters and where to access them.

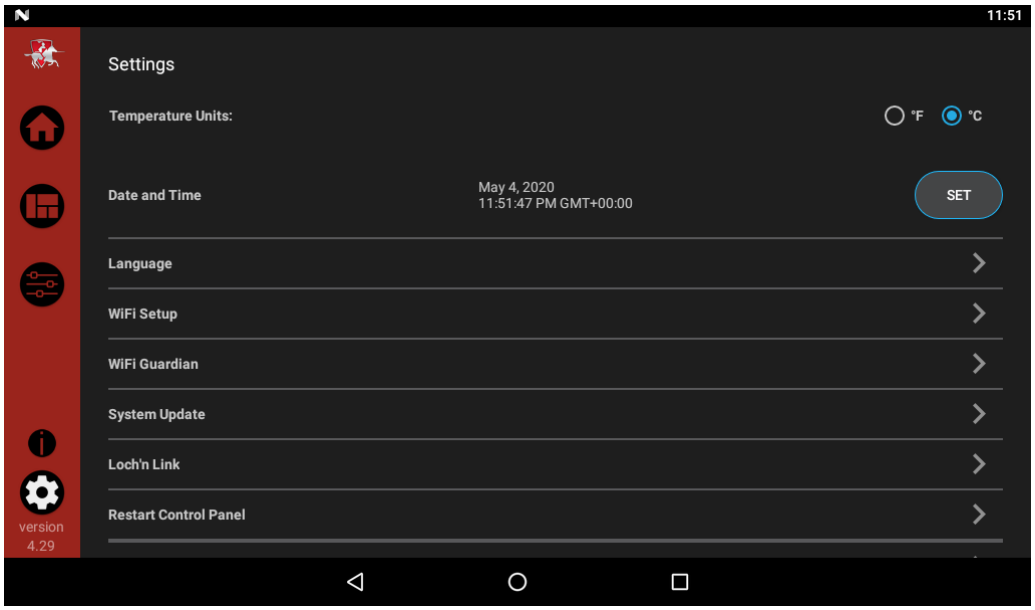
Menu	Description	User Access		Installer Access	
		Display	Modify	Display	Modify
General	Time and date	Yes	Yes	Yes	Yes
	Software version read only	No	No	Yes	No
	Temperature units (°C/°F)	Yes	Yes	Yes	Yes
	DHW Night set back offset	No	No	Yes	Yes
	DHW Night set back On Times	No	No	Yes	Yes
	DHW Night set back Off Times	No	No	Yes	Yes
	Display timeout	No	No	Yes	Yes
Data logging	Reset Log errors	No	No	Yes	Yes
Functions	Service mode delay	No	No	Yes	Yes
DHW Settings	Tank set point	Yes	Yes	Yes	Yes
	Tank setpoint offset	Yes	Yes	Yes	Yes
	Tank setpoint differential	No	No	Yes	Yes
	Tank minimum setpoint	No	No	Yes	Yes
	Tank maximum set point	No	No	Yes	Yes
Anti Cycling	Anti cycling time	No	No	Yes	Yes
	Anti cycling override differential	No	No	Yes	Yes
	Ramp delay	No	No	Yes	Yes
	Ramp setting	No	No	Yes	Yes

Table 2 continued

Menu	Description	User Access		Installer Access	
		Display	Modify	Display	Modify
Control Modes	BMS Tstat input	No	No	Yes	Yes
	BMS Tstat input	No	No	Yes	Yes
	ModBus	No	No	Yes	Yes
	ModBus T/O	No	No	Yes	Yes
	Cascade address	No	No	Yes	Yes
	Cascade type	No	No	Yes	Yes
	Max cascade set point	No	No	Yes	Yes
	Min on/off time	No	No	Yes	Yes
	Min next on time	No	No	Yes	Yes
	Water heater size	No	No	Yes	Yes
Circulation pumps	DHW pump delay	No	No	Yes	Yes
	DHW anti-seize delay	No	No	Yes	Yes
BMS	BMS type (power/set point)	No	No	Yes	Yes
	Volts at min	No	No	Yes	Yes
	Volts at max	No	No	Yes	Yes
	Rate at min volts	No	No	Yes	Yes
	Rate at max volts	No	No	Yes	Yes
	Set point at min volts	No	No	Yes	Yes
	Setpoint at max volts	No	No	Yes	Yes
	On volts	No	No	Yes	Yes
	Off differential volts	No	No	Yes	Yes
Service Notification	Service notification months	No	No	Yes	Yes
	Service notification running time	No	No	Yes	Yes
	Service notification Cycles	No	No	Yes	Yes
	Reset maintenance reminder	No	No	Yes	Yes
	Installer name and phone number	No	No	Yes	Yes

INITIAL SETUP

FIGURE 2 SMARTOUCH SETTINGS SCREEN



CLOCK AND DATE

The control uses an internal clock for the night setback feature and for logging events. For these features to work correctly, the clock must be set when the appliance is first installed or anytime the appliance has been powered off for more than 4 hours. The control can be configured to display temperature in either °C or °F.

HOW TO SET CLOCK AND DATE

Use the following procedure to set the clock:

1. Press the SETTINGS button under the Lochinvar Logo. (see figure 1)
2. Press the SET button across from the date and time.
3. Proceed to set the date and time.

Note:

Automatic Time Zone will only work if the unit is connected to a WIFI network

4. Temperature units and Wi-Fi may also be set here.
5. Press the Home, View, or back button to exit.

VIEWABLE AND CHANGEABLE CONTROL PARAMETERS

Note:

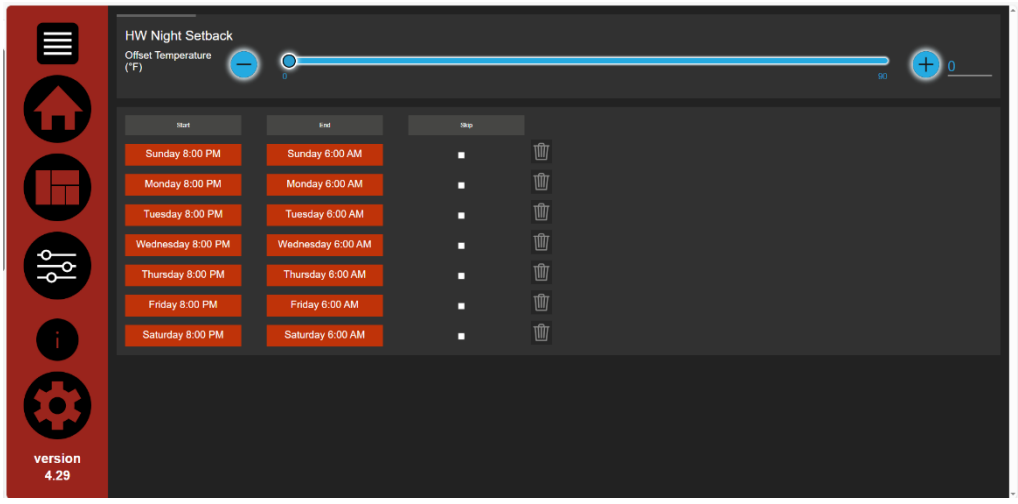
Before changing parameters, note the setting so that the unit can be returned to its original operating parameters

DHW NIGHT SETBACK ON & OFF TIMES

This is the time in which the Night Setback Offset becomes active. There are 7 start times and 7 stop times each for the DHW night setback feature. The DHW Night Setback On Times may be set to any time within a 7-day week. These settings are referred to as triggers. Multiple start or stop triggers may be set within a single day, if desired. When a start trigger and a stop trigger are set to the same time, the stop trigger has priority. The installer may adjust the DHW start triggers in the DHW Night Setback On Times parameter. This screen shows the start trigger number, the day of the week, and the time of day.

DOMESTIC HOT WATER (DHW) NIGHT SETBACK OFF TIMES

The stop triggers for the DHW night setback feature can be adjusted by accessing DHW Night Setback Off Times parameter.



DISPLAY TIMEOUT

This is the time in which the display remains illuminated. The range is 10 seconds to 10 minutes. The default setting is 3 minutes.

DATA LOGGING

RESET LOG ERRORS

The reset log errors function clears the last 10 errors log.

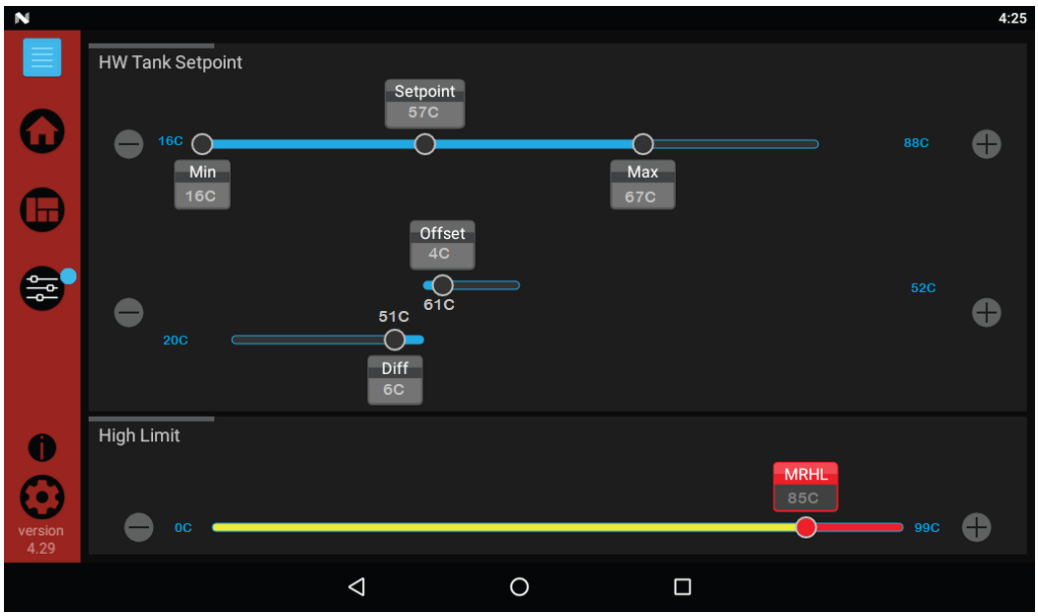
FUNCTIONS

SERVICE MODE DELAY

By accessing the Service Maintenance screen from the Settings menu, the control can be placed in Service Mode. This will override all other heat demands. The Service Mode allows the installer to set the unit to any firing rate for the purpose of combustion analysis. The delay sets the length of time the water heater will stay in the Service Mode if no keys have been pressed before going back to its original state. This parameter can only be changed by the installer by accessing the Service Mode Delay parameter. The time range of this parameter is 1 to 10 minutes. The default value is 10 minutes.

Temperature Settings

Figure 3 temperature set points



DHW Tank Set Point

By installing a tank sensor, the SMART TOUCH control can perform the tank thermostat function. The SMART TOUCH control automatically detects the presence of this sensor and generates a DHW call for heat when the tank temperature drops below the tank set point differential (Tank Set point Differential parameter) and finishes the call for heat when the tank temperature reaches tank set point + offset. This parameter can be changed by the installer by accessing the DHW Tank Set point parameter. The temperature range of this parameter tank minimum set point to tank maximum set point. The default value is 52°C.

Tank Set Point Offset

The tank set point offset measures how far the actual temperature must go above the set point before the call for heat ends (the water heater will turn off). This parameter can be changed by the installer by accessing the Tank Set Point Offset parameter.
The temperature range of this parameter is 0°C to 30°C. The default value is 6°C.

Tank Set Point Differential

When a tank sensor is installed, the tank temperature must drop this amount below the tank set point (DHW Tank Set point parameter) before the water heater turns back on. The installer can adjust this setting by accessing the Tank Set point Differential parameter. The minimum setting is 0°C, and the maximum is 22°C. The default setting is 3°C.

Tank Minimum Set Point

This setting controls the minimum tank set point for the tank temperature. The installer can adjust this by accessing the Tank Minimum Set point parameter. The minimum setting is 60°F (16°C) and the maximum setting is the maximum tank set point (Tank Maximum Set point parameter). The default value is 16°C.

Tank Maximum Set Point

This setting controls the maximum tank set point for the tank temperature. The installer can adjust this by accessing the Tank Maximum Set point parameter. The minimum setting is the minimum tank set point (Tank Minimum Set point parameter) and the maximum setting is 85°C. The default value is 60°C.

Anti-Cycling

Anti-Cycling Time

Once a DHW demand has been satisfied, a set amount of time must elapse before the control will respond to a new DHW demand. The control will block the new heat demand and anticycling will be shown in the display until the time has elapsed or the water temperature drops below the Anti-Cycling Override Differential parameter. This parameter can be changed by the installer by accessing the Anti-Cycling Time parameter. The time range for this parameter is 1 minute to 10 minutes. The default value is 1 minute.

Anti-Cycling Override Differential

The control will bypass the anti-cycling time if the inlet water temperature drops too much. The control will use the inlet water temperature the water heater was at when it shut off as the starting point. If the inlet temperature drops below the temperature parameter, the control will abort anti-cycling and allow the water heater to fire. This parameter can be changed by the installer by accessing the Anti-Cycling Override Differential parameter. The temperature range of this parameter is 0°C to 30°C. The default value is 6°C.

Ramp Delay (Enable / Disable)

This parameter allows the installer to enable or disable the DHW ramp delay. The default setting is disabled.

Ramp Settings

The SMART TOUCH control can be programmed to limit the firing rate for a fixed period at the start of a DHW demand. There are six (6) possible limits, each with their own time delay. The first limit applies as soon as the burner starts. Once its time delay expires, the second limit is applied, and its timer begins. The control steps through these limits until the 6th (sixth) limit expires. Note, however, that the 6th limit will also limit the rate for the rest of that heat demand. The installer can adjust the firing limits and time delays by accessing the Ramp Delay Screen. The screen will show the step number, the time delay for that step and the limit value corresponding with that step.

Ramp Delay Interval

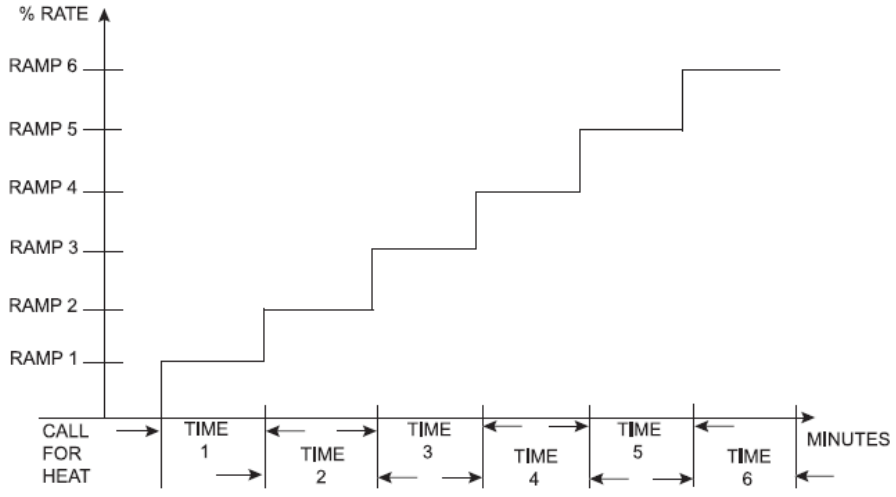


FIGURE 6 RAMP DELAY SCREEN

CONTROL MODES

BMS THERMOSTAT INPUT

When controlling the water heater through the 0 - 10V BMS input or through Modbus, the water heater can be enabled one of two ways. With the BMS Thermostat Input parameter set to ACTIVE, the water heater will be enabled by closing the tank thermostat input. When set to INACTIVE, the water heater will be enabled by the voltage level on the 0 - 10V input (in the case of 0 - 10V BMS control), or the 0 - 10V input value received through Modbus. The default value is INACTIVE.

BMS

The set point or modulation of the water heater may be controlled through the 0 - 10V BMS input or through Modbus. When the BMS parameter is set to INACTIVE, the 0 - 10V input will be ignored. When set to ACTIVE, the set point or modulation will be controlled by the voltage on the 0 - 10V input (in the case of 0 - 10V BMS control), or the 0 - 10V input value received through Modbus. The default value is INACTIVE.

MODBUS

When BMS is set to ACTIVE (see BMS) and the water heater is being controlled through Modbus, set Modbus parameter to ACTIVE. Otherwise, set the Modbus parameter to INACTIVE.

Note that the water heater can still be monitored by Modbus with this parameter set to INACTIVE. The default value is INACTIVE.

MODBUS T/O

The Modbus T/O is the amount of time the unit controls will wait to receive a communication string from the BMS controller before reverting to its own internal parameters. This parameter is adjustable by the installer by accessing the Modbus T/O parameter. The adjustment range of this parameter is 5 seconds to 2 minutes. The default value is 10 seconds.

CASCADE ADDRESS

The water heater designated as the Leader needs to be programmed with address 0. All the Member water heaters require addresses from 1 to 7, and the addresses must be different for each Member. The addresses can be in any order, regardless of the order in which the units are wired together.

This parameter is adjustable by the installer by accessing the Cascade Address parameter. The tank sensor must be connected to the Leader water heater. The default address is 1.

Cascade Type

There are two (2) options for the way a Cascade divides the load between its heaters. The first is Lead/Lag, designated as L/L in the menu. This method is used when it is desired to have the least amount of total flow through the water heaters.
This method will modulate the last two (2) water heaters. This provides for smooth transitions when a water heater turns on or off. When the last water heater reaches 100% and the calculated load is still increasing, it will start the next water heater at 20% and reduce the previous water heater to 80%, thus eliminating the sudden jump in total output of the Cascade. When the calculated load is decreasing and the last water heater gets down to 20% fire, it will hold it there and start lowering the firing rate on the next-to-last water heater. When the next-to-last water heater reaches 20%, it will turn the last water heater off and raise the rate of the next-to-last water heater to 40%, thus eliminating the sudden drop in total output of the Cascade.
The other Cascade divider method is Efficiency Optimization, designated as EFF in the menu. This method is used, as the name implies, when it is desired to have the most efficient system. When the first water heater reaches a certain rate (default = 90%), it lowers its rate to 45% and turns on the next water heater at 45%. The two (2) water heaters then modulate at the same rate. As the calculated load increases further and both water heaters ramp up to 90%, it lowers the rate of the first two (2) water heaters to 60% and brings the next water heater on at 60%. The three (3) water heaters then modulate together. As the calculated load decreases, the water heaters will reach a lower threshold (default = 30%), at which time the last water heater (the third in our example) will turn off and the Cascade will increase the rates of the remaining water heaters to provide the equivalent total output as before ((3 x 30%) / 2 = 45% in our example).
Efficiency optimization is automatically selected when heaters of different sizes are programmed into the Leader water heater.
(See Figure 9).

Maximum Cascade Set Point

This parameter determines the set point used by the individual water heaters in a Cascade. When a water heater is commanded to fire by the Leader water heater, it will attempt to achieve this temperature at its outlet. The Leader water heater will limit the modulation of the water heaters to hold the temperature at the tank sensor to the user set point. If any of the water heater outlet temperatures reach the maximum cascade set point, the water heater will then modulate down on its own to keep its outlet temperature within the maximum cascade set point. Therefore, this parameter can be used to limit the outlet temperatures of all the water heaters in a Cascade.
This parameter is adjustable by the installer by accessing the *Maximum Cascade Set Point* parameter**.** The temperature range of this parameter is 0°C to 88°C. The default maximum cascade set point is 85°C.

Minimum On/Off Time

To prevent units in a Cascade from short cycling, this parameter defines the minimum ON and OFF time for each unit. The installer can adjust this time by accessing the *Minimum On/Off Time* parameter. The minimum setting is 0 seconds, and the maximum setting is 10 minutes. The default is 30 seconds.

Minimum Next On Time

To reduce the risk of temperature overshoot with a Cascade, this parameter defines the minimum time delay from starting one unit until the next unit may be started. The installer can adjust this time delay by accessing the *Minimum Next on Time* parameter. The minimum setting is 0 minutes, and the maximum setting is 10 minutes. The default is 60 seconds.

FIGURE 7 CASCADE SETUP

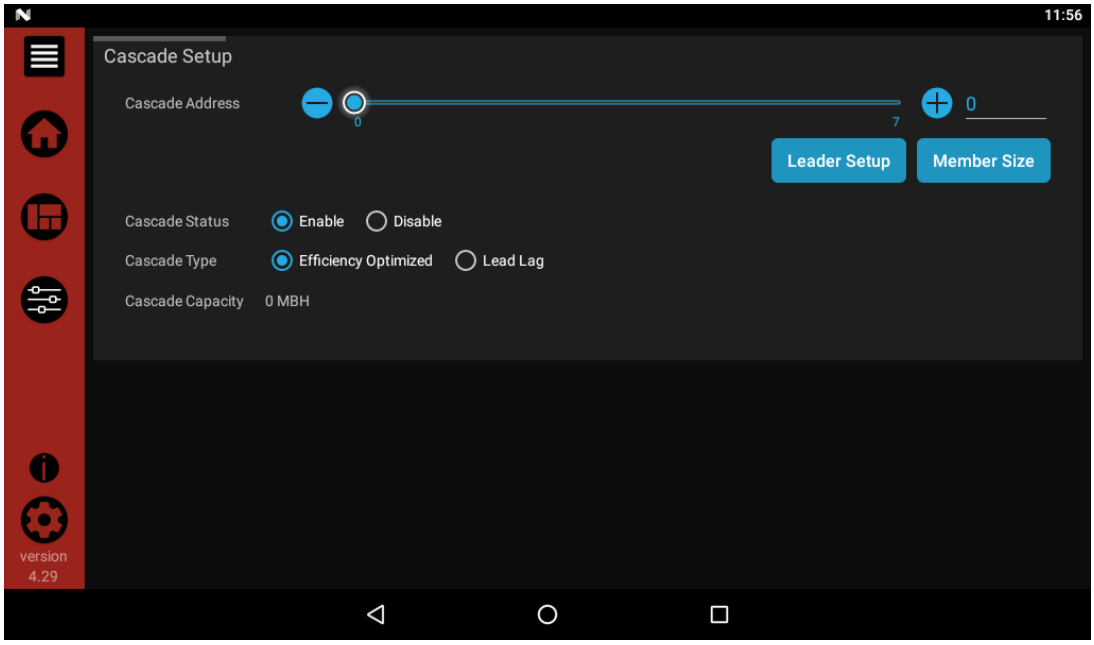


FIGURE 8 CASCADE LEADER SETUP

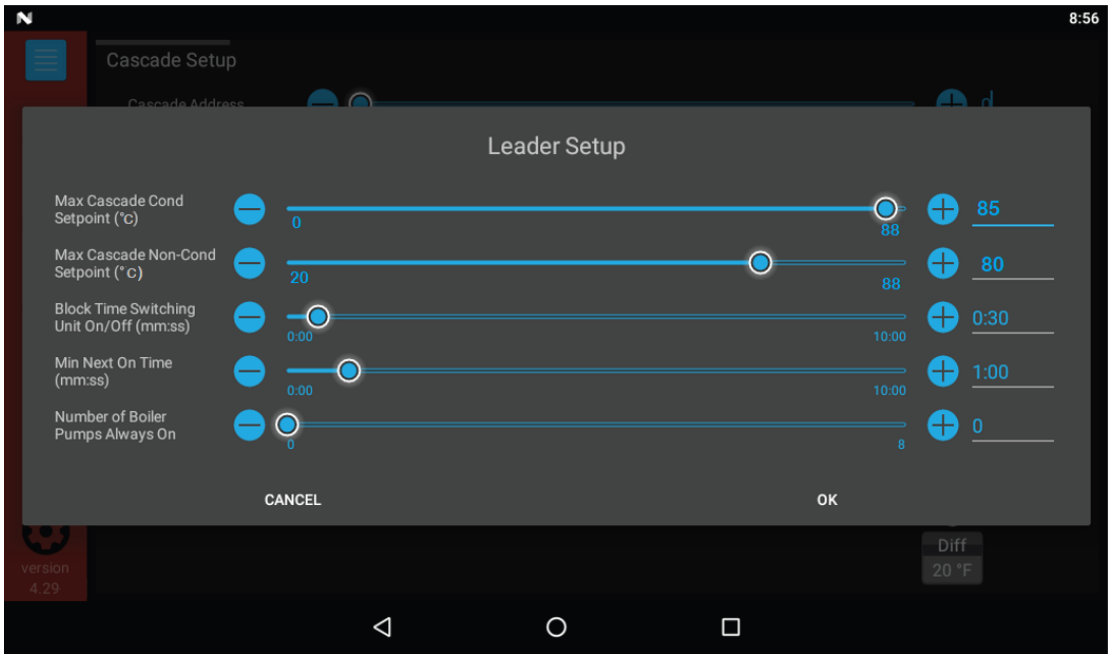
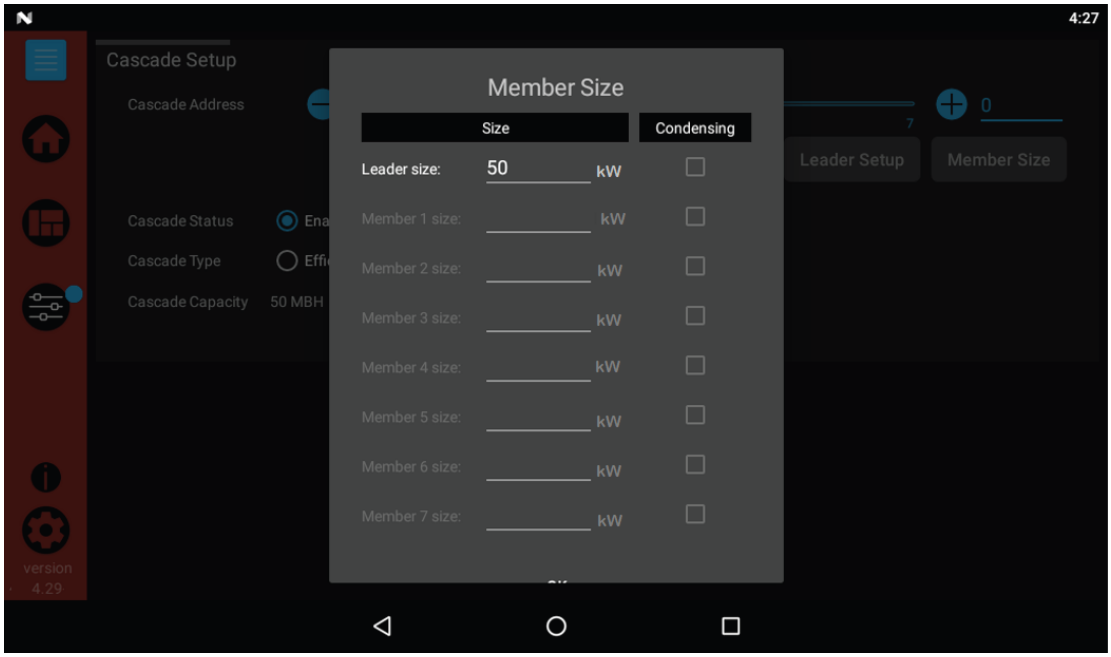


FIGURE 9 CASCADE MEMBER SETUP SCREEN



CIRCULATION PUMPS

DHW PUMP DELAY

The DHW pump delay parameter sets the length of time the DHW pump will run after a DHW demand has been satisfied. This parameter is adjustable by the installer by accessing the *DHW Pump Delay* parameter. The time range for this parameter is 10 seconds to 40 minutes. The default time is 1 minute.

DHW PUMP ANTI-SEIZE DELAY

If the water heater pump does not run for 24 hours, it will be turned on briefly to prevent it from seizing. The length of time it runs is determined by the *DHW Pump Anti-Seize Delay* parameter. The range of this setting is 0 seconds to 50 minutes. The default setting is 20 seconds.

BMS

BMS Type

When programmed for BMS control through the 0 - 10V BMS input or through Modbus, the 0 - 10V signal can be interpreted as either a modulation command or a set point. When the *BMS Type* parameter is set to POWER, the 0 - 10V signal will control the modulation. When set to SETPOINT, the 0 - 10V signal will control the tank set point. The default setting is SETPOINT.

Volts at Minimum

When programmed for BMS control through the 0 - 10V BMS input or through Modbus, the *Volts at Minimum* parameter should be set to the minimum voltage signal sent to the SMART TOUCH control. The range of this parameter is 0.0V to the *Volts at Maximum* value. The default setting is 2.0V.

Volts at Maximum

When programmed for BMS control through the 0 - 10V BMS input or through Modbus, the *Volts at Maximum* parameter should be set to the maximum voltage signal sent to the SMART TOUCH control. The range of this parameter is the *Volts at Minimum* value to 10.0V. The default value is 10.0V.

Rate at Minimum Volts

When programmed for BMS control through the 0 - 10V BMS input or through Modbus and the BMS Type is programmed as POWER, the modulation percentage represented by the *Volts at Minimum* parameter is set by the *Rate at Minimum Volts* parameter. The minimum value is 0% and the maximum is the Rate at Maximum Volts setting. The default value is 20%.

Rate at Maximum Volts

When programmed for BMS control through the 0 - 10V BMS input or through Modbus and the BMS Type is programmed as POWER, the modulation percentage represented by the *Volts at Maximum* parameter is set by the *Rate at Maximum Volts* parameter. The minimum value is the *Rate at Minimum Volts.*

Set Point at Minimum Volts

When programmed for BMS control through the 0 - 10V BMS input or through Modbus and the BMS Type is programmed as SETPOINT, the set point represented by the *Volts at Minimum* parameter is set by the *Set Point at Maximum Volts* parameter. The minimum value is 0°C) and the maximum is the *Set Point at Maximum Volts* setting. The default value is 21°C.

Set Point at Maximum Volts

When programmed for BMS control through the 0 - 10V BMS input or through Modbus and the BMS Type is programmed as SETPOINT, the set point represented by the *Volts at Maximum* parameter is set by the *Set Point at Maximum Volts* parameter. The minimum value is the *Set Point at Minimum Volts* setting and the maximum is 88°C. The default value is 82°C.

On Volts

When programmed for BMS control through the 0 - 10V BMS input or through Modbus and the BMS Thermostat Input is set to INACTIVE, the *On Volts* parameter determines the 0 - 10V BMS input voltage at which the water heater is enabled. The minimum value is 0.5V and the maximum is 10.0V. The default value is 2.0V.

Off Differential Volts

When programmed for BMS control through the 0 - 10V BMS input or through Modbus and the BMS Thermostat Input is set to INACTIVE, the *Off Differential Volts* parameter determines how far below the *On Volts* setting the 0 - 10V BMS input voltage must be to disable the water heater. The minimum value is 0.2V and the maximum is the *On Volts* setting. The default value is 1.0V.

Service Notification

Service Notification in Months

When the water heater control determines that a scheduled service is due based on months of installation, the water heater display will alternate the standard water heater display text on the home screen with the message SERVICE DUE every 5 seconds. This parameter is adjustable by the installer by accessing the *Service Notification in Months* parameter. The time range for this parameter is 0 months to 100 months. The default time is 12 months. This feature has been disabled by the manufacturer. To enable this feature, update the Service Notification parameter to the desired time range.
This feature has been disabled by the manufacturer. To enable this feature, change the *Service Notification in Months* parameter to the desired time range.

Caution:

The unit should be inspected every 12months, the service reminder must not be set for more than this. The maintenance and care detailed within this manual must be performed to maximise the unit's efficiency and reliability. Failure to service and maintain the unit and system may result in equipment failure.

Figure 10 Service Notification Screen

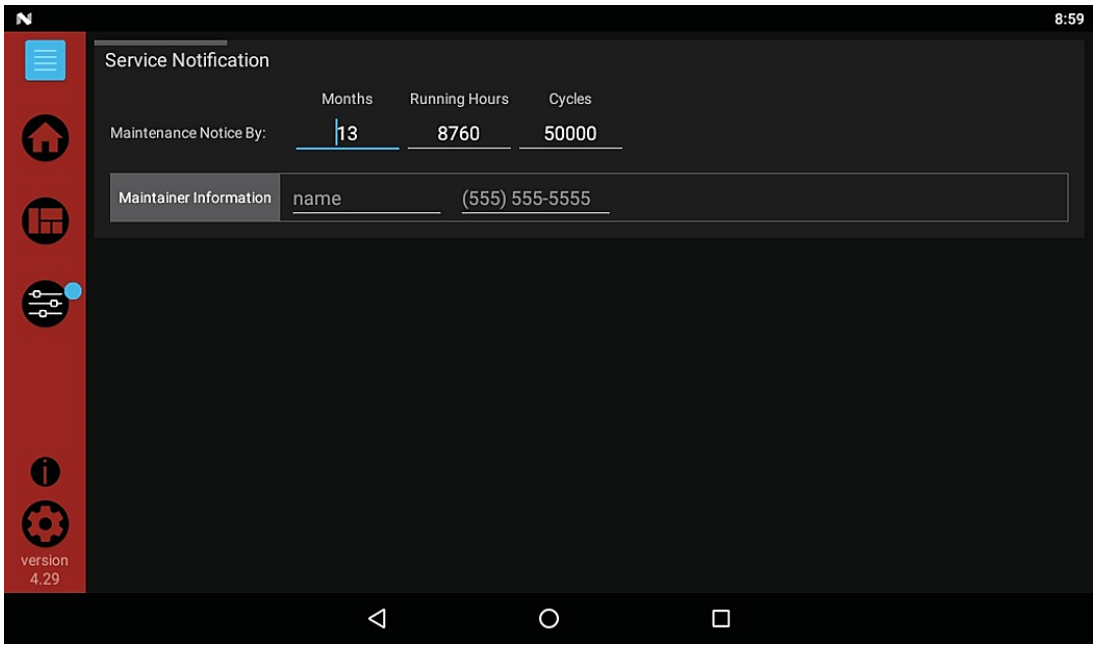


Table 3 Service Notification (This table lists control module parameters, use the sub-tab under the Setup tab to access them)
Maintenance Notice By: Months

Menu	Parameter Name (as shown on the LCD screen)	Min Value	Max Value	Default Value
	Maintenance Notice By: Months	0	36	12
	Maintenance Notice By: Running Hours	0	100,000	10,000
	Maintenance Notice By: Cycles	0	100,000	10,000
	Maintainer Information: Name	N/A	N/A	N/A
	Maintainer Information: Phone	N/A	N/A	N/A

When the appliance control determines that a scheduled service is due based on the months of installation, the appliance display will turn yellow, and a new status screen will appear informing the installer that maintenance is required.

Maintenance Notice By: Running Hours

When the appliance control determines that a scheduled service is due based on the hours of actual operation, the appliance display will turn yellow, and a new status screen will appear informing the installer that maintenance is required.

Maintenance Notice By: Cycles

When the appliance control determines that a scheduled service is due based on the number of appliance cycles, the appliance display will turn yellow, and a new status screen will appear informing the installer that maintenance is required.

Maintainer Information: Name and Phone Number

When a Maintenance Reminder timer or counter has expired, a Maintenance Reminder screen will appear on the display. By programming the installer's name and phone number, this information will appear on the Maintenance Reminder Screen at that time.

MAINTENANCE

Service and Maintenance Schedules

Table 4 service schedule

Service technician	
Daily	Check water heater area
Monthly	Check flue piping Check air piping Check air and vent termination Check relief valves Check condensate drain piping Check vents Check delta T Check operation of flow switch Check any strainer fitted Check operation of all pumps
Every 6 months	Check water heater piping Operate relief valves

Service technician	
ANNUAL INSPECTION	**General:** Address reported problems Inspect interior, clean, and vacuum if necessary Clean condensate trap and fill with fresh water Check for leaks, water gas, flue, condensate Verify flue and air lines are in good condition and sealed Check system water pressure, piping and expansion vessels Check control settings Check ignition and flame sense electrodes Check wiring and connections Perform startup check as per Commissioning section in the ICM instructions Flame inspection, stable and uniform Flame signal at least 10 microamps at high fire Clean heat exchanger if flue temperature is more than 12°C above return temperature Check Delta T Flush heat exchanger with descale fluid **If Required:** Clean heat exchanger Remove and clean burner using compressed air only Clean fan wheel

The above is for general guidance only, the unit may require an annual inspection more often based on running hours.

Warning:

Follow the service and maintenance procedures given throughout this manual and in literature shipped with the unit. Failure to perform the service and maintenance could result in damage to the unit, system and may result in serve personal injury, death, or substantial property damage.

Caution:

The unit should be inspected annually only by a qualified service technician. The maintenance and care detailed within this manual must be performed to maximise the unit's efficiency and reliability. Failure to service and maintain the unit and system may result in equipment failure.

Warning:

Electrical shock hazard – Turn off power to the unit before any service operation on the unit. Failure to turn off electrical power could result in electrical shock, causing severe personal injury or death.

Address reported problems

Inspect any problems reported by the owner and correct before proceeding.

Inspect unit area

Verify that the area is free of any combustible materials, petrol and other flammable vapours and liquids. Make sure the air intake area is free of any of the contaminants listed above. If any of these are present in the unit intake vicinity, they must be removed.

Inspect unit interior

Remove the front access cover and inspect the interior of the unit. There may be a need to vacuum any sediment from inside the unit and components. Remove any obstructions.

Clean condensate trap

Inspect the condensate drain line, condensate PVC fittings, and condensate trap.

Monthly inspection:

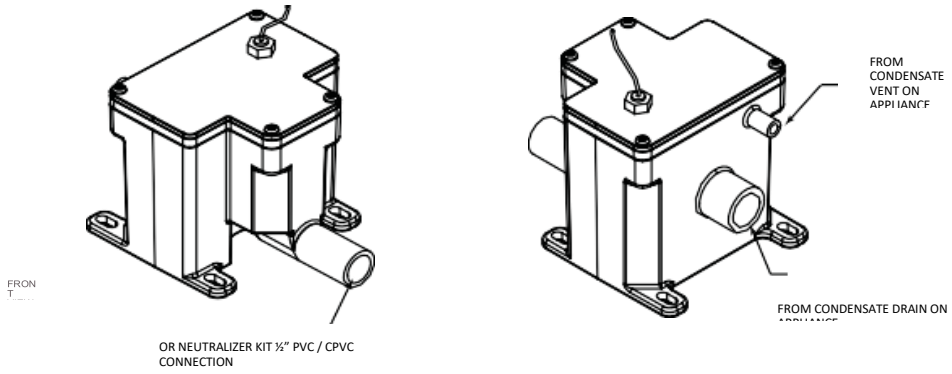
1. The condensate trap should be inspected monthly to ensure the trap is properly installed and connected to the condensate pipe under the unit.
2. The condensate line should be inspected monthly for obstructions, making sure it allows free flow for condensate to drain.
3. Inspect the neutralising kit (if installed) monthly to ensure the condensate is draining properly, and there is still an adequate amount of neutralizing agent available.

Annual cleaning:

1. The condensate trap should be cleaned at least once annually, or at the end of each heating season, by removing the bottom cap and cleaning out any sediment that exists.

2. The condensate trap is equipped with a ball that acts as a seal against harmful flue gases escaping in the case there is no condensate in the trap. If this ball is not present, flue gases may be able to pass through the trap when there is no condensate present, resulting in an unsafe environment. It is important to check and make sure the ball is still located in the trap, acting as a seal against the flue gases at least once annually and after every cleaning.
3. After the condensate trap is cleaned or serviced, it must be checked to ensure that it is installed and draining correctly.

FIGURE 11 CONDENSATE TRAP



Warning:
The condensate trap must be filled with water during all times of appliance operation to avoid flue gas emission from the condensate drain line. Failure to fill the trap could result in severe personal injury or death.

Check all piping for leaks

Eliminate all system or appliance leaks. Continual fresh makeup water will reduce appliance life. Minerals can build up in sections, reducing heat transfer, overheating heat exchanger, and causing heat exchanger failure. Leaking water may also cause severe property damage.

1. Inspect all water and gas piping and verify to be leak free.
2. Look for signs of leaking line and correct any problems found.
3. Check gas supply in line with the installation manual.

Flue system

1. Visually inspect the entire flue system for blockage, deterioration, or leakage. Repair any joints that show signs of leakage. Verify that air inlet pipe is connected and properly sealed.
2. Verify that appliance vent discharge and air intake are clean and free of obstructions.

Warning:

Failure to inspect for the above conditions and have them repaired can result in severe personal injury or death.

Check water system

1. Verify all system components are correctly installed and operational.
2. Check the cold fill pressure for the system. Verify it is correct (must be a minimum of 12 psi)
3. Watch the system pressure as the unit heats up (during testing) to ensure pressure does not rise too high. Excessive pressure rise indicates expansion vessel sizing or performance problems.
4. Inspect automatic air vents and air separators. Remove air vent caps and briefly press push valve to flush vent. Replace caps, make sure vents do not leak. Replace any leaking vents.
5. Carry out water side maintenance if required as per page 29.

Check expansion vessel

Expansion vessels provide space for water to move in and out as the system water expands due to temperature increase or contracts as the water cools.

Check appliance relief valve

1. Inspect the relief valve and lift the lever to verify flow. Before operating any relief valve, ensure that it is pipped with its discharge in a safe area to avoid severe scald potential.
2. After following the above warning directions, if the relief valve weeps or will not seat properly, replace the relief valve. Ensure that the reason for relief valve weeping is the valve and not over-pressurization of the system due to expansion vessel issues.

Inspect ignition and flame sense electrodes

1. Remove the ignition and flame sense electrodes from the unit heat exchanger access cover.
2. Inspect the ignition/flame sense electrode and replace if necessary. We recommend these are changed as part of the annual service or more regular if required.

Check ignition ground wiring

1. Inspect unit ground wire from the heat exchanger access cover to ground terminal strip.
2. Verify all wiring is in good condition and securely attached.
3. Check ground continuity of wiring using continuity meter.
4. Replace ground wiring if any faults or damage is found.

Check all appliance wiring

1. Inspect all unit wiring, making sure wires are in good condition and securely attached.

Check control settings

1. Set the smart touch control module display to parameter mode and check all settings. Adjust settings if necessary.
2. Check settings of external limits controls (if any) and adjust if necessary.

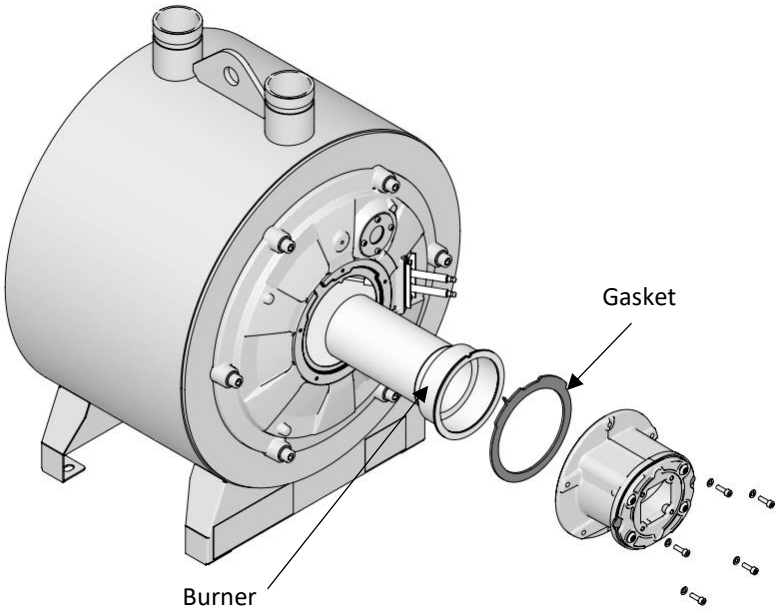
Perform start-up and checks

1. Start the unit and perform check and tests specified in the startup section in the installation manual.
2. Verify cold fill pressure is correct and that operating pressure does not go too high.

Check burner flame

1. Inspect the flame through the observation window.
2. If the flame is unsatisfactory at either high fire or low fire, turn off the unit and allow to cool down. Remove the burner and clean it thoroughly using a vacuum cleaner or compressed air. Do not use compressed air to clean the burner if preformed inside a building.
3. Remove the burner as shown in Figure 12 below.
4. When replacing the burner, ensure gasket is in good condition and positioned correctly.

Figure 12 removing door



Check flame signal

1. At high fire the flame signal shown on the display should be at least 10 microamps.
2. A lower flame signal may indicate a fouled or damaged flame sense electrode. Cleaning of the electrode may improve this. If the ground wiring is in good condition, and ground continuity is satisfactory, then the electrode will need replacing.
3. See Table 7 for further procedures for dealing with low flame signal.

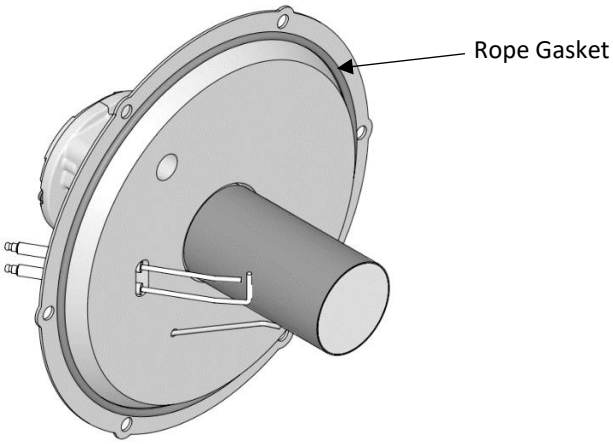
CLEANING HEAT EXCHANGER

1. Shut down the unit.
2. Allow time for the unit to cool to room temperature if the unit has been firing.
3. Remove the nuts securing the heat exchanger access cover to the heat exchanger and set aside.
4. Remove the heat exchanger access cover, burner, and gas/air arm assembly.
5. Remove the condensate hose from the heat exchanger end. Connect a ¾" diameter hose to a drain pan. Cover the refractory in the back of the combustion chamber of the heat exchanger.
6. Use a vacuum cleaner to remove any accumulation on the unit heating surface. Do not use any solvent.
7. Brush the heat exchanger while dry using a nylon bristle brush. **DO NOT** use a metal brush. Re-vacuum the heat exchanger.
8. Finish cleaning using a clean cloth dampened with warm water. Rince our any debris.
9. Allow the heat exchanger to thoroughly dry.
10. Remove the cover from the refractory at the back of the combustion chamber of the heat exchanger and reassemble.
11. Close isolation valve on the piping to isolate the unit from the system. Attach a hose to the unit drain and flush thoroughly with clean water by using purging valves to allow water to flow through the water make-up line to unit.
12. Perform start-up and check out procedures in the check flame and combustion.
13. Replace the access cover and restore unit to operation.

Warning:

The unit contains ceramic fibre materials. Use care when handling these materials. Failure to comply could result in severe personal injury.

FIGURE 13 ROPE GASKET – HEAT EXCHANGER DOOR



Note:

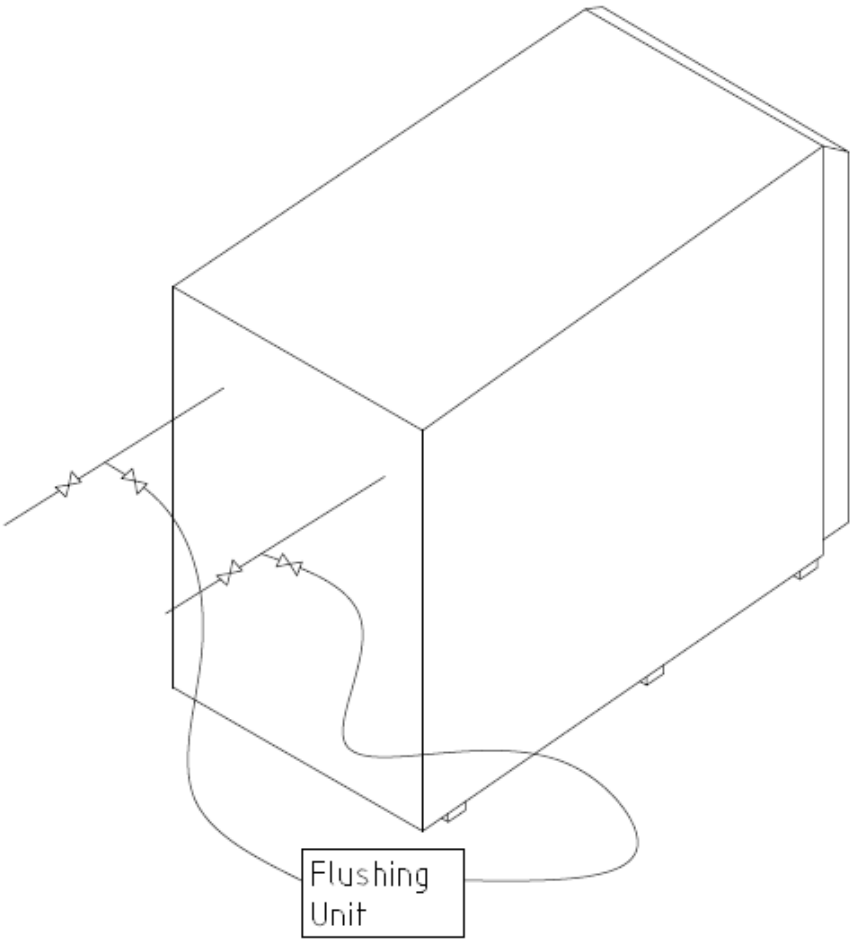
The rope gasket is intended for sealing combustion. If damaged DO NOT reuse, the rope gasket must be replaced. Contact Lochinvar for a replacement.

WATERSIDE MAINTENANCE

If the water hardness is above 100ppm CaCO3 then the heat exchanger should be flushed with a descale fluid at least every 12 months. This may be more often depending on water quality and how hard the water heater is working, contact Lochinvar TSG for assistance.

Procedure:

1. Turn off the water heater.
2. Isolate the water heater from the DHW system as shown below.
3. Attached a flushing unit to the water heater and flush using a suitable descale fluid as per the instructions.
4. Flush the heat exchanger with clean water to ensure no descale is left behind.
5. Remove the flushing unit.
6. Turn the isolating valves back on
7. Turn on the water heater and recommission.



TROUBLESHOOTING

Warning:

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Always disconnect power to the unit before servicing. Failure to comply could result in severe personal injury, death, or property damage.

BEFORE TROUBLESHOOTING

1. Have the following items: Voltmeter that can check 230 VAC, 24 VAC, and 12 VDC, continuity checker, contact thermometer.
2. Make sure the thermostat is calling for heat and contacts are closed. Check for 24 VAC between thermostat wire nuts and ground.
3. Make sure all external limit controls are installed and operating.

CHECK THE FOLLOWING

1. Wire connectors to control module are securely plugged in at the module and originating control.
2. Gas pressures: Maximum 34mbar with no flow (lockup) or with unit on. Minimum: 10mbar with gas flowing (verify during unit start up.

CHECK CONTROL MODULE FUSES

1. Always check control module fuses before replacing control module or any major components (fan, etc). If one of these fuses is blown, it can prevent the control module or other components from operating.
2. Turn off the power to the unit at the external line switch.
3. Remove top access cover.
4. Remove the control module cover.
5. Inspect fuses F1, F2, and F3.
6. The unit is shipped with three spares fuses in a plastic bag attached to the control module cover.
7. If necessary, replace open fuse (F3 is 80 amps, F2 is 3.15 amps and F1 is 5 amps)
8. Fuses F1, F2, and F3 are all slow blow fuses.

Warning:

Do not jumper fuse or replace with any fuse except as specified. Failure to comply could result in severe personal injury, death, or substantial property damage.

1. Install control module cover and top access cover after fuse inspection.
2. Restore the power to the unit at the external line switch and verify unit operation after completing the unit service.

FIGURE 14 POSITION OF FUSES ON BOARD

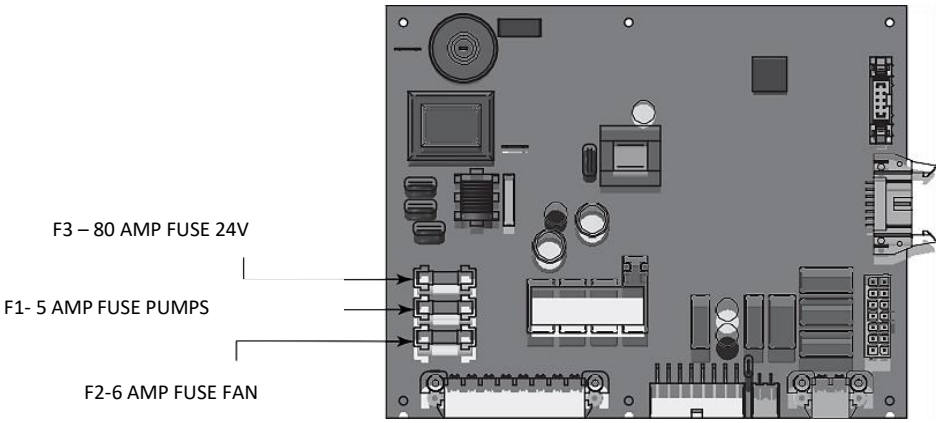


TABLE 5 TROUBLESHOOTING CHART

FAULT	CAUSE	CORRECTIVE ACTION
No Display	No 230 VAC supplied to unit.	• Check external line switch, fuse, or breaker. • Check position of ON/OFF switch. Turn switch to the ON position. • Check 230 vac through the ON/OFF switch. • Check wiring harness connection between display board and main control board. Connect harness at both points.
	No voltage through the switch.	• Replace switch.
	Bad display board.	• Replace board.
	Bad main control board.	• Replace the main control board.
	Blown fuse.	• Replace fuse F3 on the main control board, see Figure 14 of this manual.
No Burner Operation	Main control board temperature set point satisfied.	• Review temperature setting.
	Remote thermostat satisfied.	• Review remote thermostat setting.
	Unit locked out on fault.	• Consult display for specific fault. Refer to fault descriptions on page 37 of this manual for corrective actions.
	Unit in Shutdown Mode.	• Take unit out of Shutdown Mode.
	Ramp delay active.	• Check ramp delay parameter settings. Optional PC software required. • Turn ramp delay feature off. See page 15 of this manual for instructions on how to turn this feature off.
Unit Does Not Modulate Above 50%	Water heater controlled by BMS.	• Check BMS parameter settings. Optional PC software required.
	Flue sensor open.	• Verify that the flue sensor is in the flue outlet. • Check wiring connections at the flue sensor. • Check the resistance of the flue sensor and compare to Table 3-2D on page 35 of this manual.

CHECKING TEMPERATURE SENSORS

The unit temperature sensors (inlet water, outlet water, system water, flue, and outdoor air) are all resistance type devices. The following tables show the correct values for the sensors at various temperatures. Use an ohm meter to read the resistance of the sensor at a known temperature. If the resistance of the sensor does not closely match its corresponding table, replace the sensor.
It is important to note that the flue and outlet water sensors have two temperature sensing devices in one housing. These devices are designated as S1a/S1b, outlet sensor and S3a/S3b, flue sensor. Please reference the wiring diagram in the installation manual for the correct terminal location.

Temperature °C	Resistance Ω	Temperature °C	Resistance Ω
10	18,780	70	1,990
20	12,263	80	1,458
30	8,194	90	1,084
40	5,592	100	817
50	3,893		
60	2,760		

S1a				S1b			
(Wire Color - R/BK and Y)				(Wire Color - G and Y)			
Temperature °C	Resistance Ω	Temperature °C	Resistance Ω	Temperature °C	Resistance Ω	Temperature °C	Resistance Ω
10	19,553	70	2,004	10	40,030	70	3,478
20	12,690	80	1,464	20	25,030	80	2,492
30	8,406	90	1,084	30	16,090	90	1,816
40	5,715	100	816	40	10,610	100	1,344
50	3,958			50	7,166		
60	2,786			60	4,943		

S3a				S3b			
(Wire Colour - W/B and Y)				(Wire Colour - PR and Y)			
Temperature °C	Resistance Ω	Temperature °C	Resistance Ω	Temperature °C	Resistance Ω	Temperature °C	Resistance Ω
10	40,030	70	3,478	10	258,500	70	16,870
20	25,030	80	2,492	20	125,500	80	12,000
30	16,090	90	1,816	30	80,220	90	8,674
40	10,610	100	1,344	40	52,590	100	6,369
50	7,166			50	35,270		
60	4,943			60	24,160		

TABLE 6 TROUBLESHOOTING – NOISY SYSTEM

FAULT	CAUSE	CORRECTIVE ACTION
Noisy Operation	Supply gas problem. Natural gas pressures should be between 17.5 and 20mbar	• Refer to the Gas Connections section of the Installation and Operation Manual for detailed information concerning the gas supply.
	Gas/air mixture problem.	• Clean burner and heat exchanger. • Refer to the Gas Valve Adjustment Procedure on in this manual for the proper gas valve setting. Verify that the vent/air intake lengths do not exceed the maximum listed in the General Venting section of the Installation and Operation Manual.
	Dirty/damaged burner.	• Refer to this manual for the burner removal and inspection procedure. Clean or replace the burner as necessary.
	Low water flow through the heat exchanger.	• Refer to the pipework section of the Installation and Operation Manual for minimum flow rates. Verify that the pump is running and at the correct speed.
	Air in the piping system.	• Properly purge all air from the piping system.
	Low system water pressure.	• Verify system pressure is a minimum of 0.8bar.
No Pump Operation	Blown fuse.	• Replace fuse F1 on the control board, see Figure 14 of this manual. **Note:** Make sure pump amperage does not exceed 1.8 amps.
	Faulty pump.	• Replace pump.
	Internal fault on control board.	• Replace main control board.
No Fan Operation	Internal fault on control board.	• Replace control board. • Check wiring connections
	Faulty fan.	• Replace fan.
Relief Valve Opening	System setting pressure exceeds relief valve setting	• Lower the system pressure below the rating of the relief valve or replace the standard relief valve with a higher rated valve up to the maximum pressure of the heat exchanger. • Faulty or improperly sized expansion vessel.

TABLE 7 TROUBLESHOOTING – FAULT MESSAGES DISPLAY ON UNIT INTERFACE

FAULT	DESCRIPTION	CORRECTIVE ACTION
Gas Pressure SW (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	- Either the optional manual reset low gas pressure switch, or the optional manual reset high gas pressure switch tripped.	• Reset the pressure switches. • Measure the supply gas pressure to determine cause of failure. Natural gas pressures should be between 17.5 and 20mbar • Refer to the Gas Connections section of the Installation and Operation Manual for detailed information concerning the gas supply. • Correct the supply gas pressure if necessary. • Check for a loose or misplaced jumper if pressure switches are not installed.
	- The gas pressure switch contacts on the Low Voltage Connection Board are open.	• Check for a loose or misplaced jumper on the Low Voltage Connection Board. • Check for the addition of a device wired across the gas pressure switch terminals on the Low Voltage Connection Board.
Flow Switch/ LWCO (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	- Either the optional flow switch or the optional low water cutoff is not making.	• Check water heater pump operation on a call for heat. • Check for closed valves or obstructions in the boiler piping. • Verify system is full of water and all air has been purged from the system. • Check for loose or misplaced jumpers if flow switch or LWCO is not installed.
	- Blown fuse.	• Replace fuse F3 on the control board, see page 33 of this manual.
Blocked Drain SW (will require a manual reset once condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The blocked drain switch has detected excessive condensate build up inside the unit.	• Check condensate tube from unit to floor drain for proper installation and obstructions. • Inspect condensate trap for blockage. Clean if necessary. • Check for loose wiring connection at wire harness plug. • Bad blocked drain switch. Replace switch.

Table 7 Troubleshooting – Continued from previous page.

FAULT	DESCRIPTION	CORRECTIVE ACTION
Air pressure switch open (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Air pressure switch contacts are open	• Check the wiring connections to switch. Wires should be connected to the common and normally closed terminals. • Air intake lengths exceed the maximum allowed lengths. Check flue guidance in ICM instructions. • Check for obstruction or blockage in the air intake pipes or at terminations • Check reference hoses connected to the air pressure switch for blockage or obstruction. • Inspect the burner. Reference this manual for removal and cleaning procedures. Replace if necessary. • Inspect the heat exchanger. Reference this cleaning procedures. Replace if necessary. Replace if necessary. • Faulty air pressure switch. Replace switch
Anti-cycling	The main control board has received a call for heat too quickly after the previous call for heat has ended.	• The control board will release the call for heat after a set time. • The control board will release the call for heat if the outlet temperature drops too quickly.
Flame failure	The unit has failed to prove main burner ignition after four (4) attempts (EKW117) or two (2) attempts (EKW190-EKW295).	• Inspect spark electrode and associated wiring for damage and connection. Reference this manual for removal and cleaning procedures. Replace if necessary. • Check for proper electrical grounding of the unit. • Check incoming supply gas pressure. Natural gas pressure should be between 17.5 and 20mbar.

Table 7 Troubleshooting – Continued from previous page.

FAULT	DESCRIPTION	CORRECTIVE ACTION
No Flame, (will require a manual reset once the fault has been corrected) press the reset button on the SMART TOUCH display to reset.	The unit was running and lost the flame signal. This condition occurred four (4) straight times.	• Check wiring harness connection at the gas valve and at the main control board. • Inspect spark electrode and associated wiring for damage and connection. Reference this manual for removal and cleaning procedures. Replace if necessary. • Check for proper electrical grounding of unit. • Check incoming supply gas pressure. Natural gas pressures should be between 17-20mbar. Refer to the Gas Connections section of the Installation and Operation Manual for detailed information concerning the gas supply. • Verify that the plastic hose from the gas valve to the air inlet is connected and is not damaged. • Verify that the vent/air intake pipes are installed correctly and there are no obstructions. • Check for 24 VAC to the gas valve at the 2-pin connection on the side of the main control board during the ignition attempt. If no voltage is present, replace the main control board. • If 24 VAC is present at the main control board, check the wiring between the main control board and the gas valve. Replace the wiring if necessary. • If 24 VAC is present, check the outlet of the valve to ensure the valve is flowing gas. With a manometer connected to the outlet tap of the gas valve, when the unit is in the prep urge period, there should be a negative pressure present. When the valve is negative pressure present. When the valve is pressure change does not occur, the gas valve is not opening. Replace the gas valve. • Inspect flame sensor and associated wiring. Reference this manual for removal and cleaning procedures. Replace if necessary. • Inspect the burner. Reference this manual for removal and cleaning procedures. Replace if necessary. • Replace the main control board.
Flame Sequence (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The flame detector circuit is seeing a flame signal while no flame is present.	• Check supply voltage for proper polarity. • Check external wiring for voltage feedback. • Check the flame rod and make sure it is clean. • Check the internal wiring for bad connections. • Replace main control board.

Table 7 Troubleshooting – Continued from previous page.

FAULT	DESCRIPTION	CORRECTIVE ACTION
Flame Sequence (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The flame detector circuit is seeing a flame signal while no flame is present.	• Check supply voltage for proper polarity. • Check external wiring for voltage feedback. • Check the flame rod and make sure it is clean. • Check the internal wiring for bad connections. • Replace main control board.
Auto reset high limit	The outlet water temperature has exceeded the setting of the automatic 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 water heater is piped correctly between water heater and buffer vessel. Refer to the Installation and Operation Manual for the proper piping methods for the water heater. • Check 230 vac to water heater pump motor on a call for heat. If voltage is not present, check wiring back to the main control board. • Replace the main control board if necessary. • If 230 vac is present on a call for heat and the water heater pump is not operating, replace the pump. • If the system pump is a variable speed pump, ensure that the system flow is not less than the water heater flow. • If operating on something other than an outlet sensor, check temperature setting of the main control board. • If the manual reset high limit has tripped, check setting of the device. • Check resistance of water sensors and compare to Table B of this manual. Replace sensor if necessary. • Replace high limit.

Table 7 Troubleshooting – Continued from previous page.

FAULT	DESCRIPTION	CORRECTIVE ACTION
Manual Reset High Limit (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The outlet water temperature has exceeded the fixed setting of the 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 water heater is piped correctly between water heater and buffer vessel. Refer to the Installation and Operation Manual for the proper piping methods for the water heater. • Check 230 VAC to water heater pump motor on a call for heat. If voltage is not present, check wiring back to the main control board. • Replace the main control board if necessary. • If 230 VAC is present on a call for heat and the water heater pump is not operating, replace the pump. • If the manual reset high limit has tripped, check setting of the device. • Check resistance of water sensors and compare to page 34 of this manual. Replace sensor if necessary. • Replace high limit.
Fan Low OR Fan Speed Low (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The actual fan RPM is 30% lower than what is being called for.	• Vent/air intake lengths exceed the maximum allowed lengths. Refer to the General Venting section of the Water Heater Installation and Operation Manual for proper lengths. • Check for obstruction or blockage in the vent/air intake pipes or at terminations. • Check the wiring connections at the fan and at the main control board. • Replace the fan. • Replace the main control board.
	Blown fuse	• Replace fuse F4 on the control board, see page 32 of this manual.
Fan High OR Fan Speed High (will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	The actual fan RPM is 30% higher than what is being called for	• Vent/air intake lengths exceed the maximum allowed lengths. Refer to the General Venting section of the Water Heater Installation and Operation Manual for proper lengths. • Check for obstruction or blockage in the vent/air intake pipes or at terminations. • Check the wiring connections at the fan and at the main control board. • Replace the fan. • Replace the main control board.
Sensor open (Will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Either the inlet water or outlet water temperature sensor has been disconnected.	• Check the sensors and their associated wiring. Repair or replace the sensor or wiring if damaged. • Measure the resistance of the sensors and compare the resistance to the tables of this manual. • Replace the sensor if necessary.

Table 7 Troubleshooting – Continued from previous page.

FAULT	DESCRIPTION	CORRECTIVE ACTION
Sensor Shorted (Will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	Either the inlet water or outlet water temperature sensor has been shorted.	Check the sensors and their associated wiring. Repair or replace the sensor or wiring if damaged. • Measure the resistance of the sensors and compare the resistance to the tables on page 34 of this manual • Replace the sensor if necessary
Louver Proving (Will require a manual reset once the condition has been corrected. Press the RESET button on the SMART TOUCH display to reset.)	An optional remote proving switch is not making.	• Check function of remote devices. • Check for loose or misplaced jumper if auxiliary proving switch is not installed.
Flue Temp High	The stack temperature has exceeded the set parameters for the water heater.	• Inspect the heat exchanger. Reference this manual for the procedure on how to clean the flue side of the heat exchanger. • Inspect the flue sensor and associated wiring. Measure the resistance of the flue sensor and compare to Table 3D of this manual. Replace the sensor if necessary. • Verify that the vent/air intake pipes are properly installed and that there are no obstructions. • Replace the main control board.
	Scaling has reduced water flow.	• Descaling may be required.
Delta T High	The temperature rise across the heat exchanger has exceeded the set parameters. for the water heater.	• Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the water heater is piped properly between the water heater and buffer vessel. Refer to the System Piping section of the Water Heater Installation and Operation Manual for the proper piping methods for the water heater. • Check for 230 VAC to the water heater pump motor on a call for heat. If voltage is not present, check the wiring back to the main control board. Replace the main control board if necessary. • If 230 VAC is present on a call for heat and the water heater pump is not operating, replace the pump. • Verify that the water heater pump is set to the proper speed or that the pump is the proper size. Reference the System Piping section of the Water Heater Installation and Operation Manual for water heater pump specifications.

Table 7 Troubleshooting – Continued from previous page.

FAULT	DESCRIPTION	CORRECTIVE ACTION
Outlet Temp High	Outlet water temperature has exceeded the maximum outlet water temperature.	• Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the water heater is piped properly between the water heater and buffer vessel. Refer to the System Piping section of the Water Heater Installation and Operation Manual for the proper piping methods for the water heater. • Check for 230 VAC to the water heater pump motor on a call for heat. If voltage is not present, check wiring back to the main control board. Replace the main control board if necessary. • If 230 VAC is present on a call for heat and the water heater pump is not operating, replace the pump. • Replace the main control board.
Rem Ctrl Flt	External control is cycling too often.	Check set point of the external control. • Check the wiring between the external control and the unit. • Replace the control
Service Blk	While the unit is in Service Mode, the outlet temperature has exceeded 85°C	Establish a heating load to remove the heat from the water heater loop. • Verify that the system is full of water and that all air has been properly purged from the system. • Verify that the water heater is piped properly between the water heater and buffer vessel. Refer to the System Piping section of the Water Heater Installation and Operation Manual for the proper piping methods for the water heater. • Check 230 VAC to the water heater pump motor on a call for heat. If voltage is not present, check the wiring back to the main control board. Replace the main control board if necessary. • If 230 VAC is present on a call for heat and the water heater pump is not operating, replace the pump. • Verify that the water heater pump is set to the proper speed or that the water heater pump is the proper size. Reference the System Piping section of the Water Heater Installation and Operation Manual for water heater pump specifications.
Low 24 VAC	230 VAC input to the main control board has dropped below 26 VAC.	• Check 230 VAC supply to the transformer. • Check wiring connections at the low voltage terminal strip. • Check the wire size/length to remote devices. • Replace the transformer.

Table 7 Troubleshooting – Continued from previous page.

FAULT	DESCRIPTION	CORRECTIVE ACTION
Watch Dog Error	The main control board has detected an internal fault.	• Replace the main control board.
Write EEProm	The main control board has detected an internal fault.	• Replace the main control board.
CRC Parameters	The main control board has detected an internal fault.	• Replace the main control board.
No Error Stored	The main control board has detected an internal fault.	• Replace the main control board.
Fatal Error Parameters	The main control board has detected an internal fault.	• Restore the default parameters. • Replace the main control board. • Replace the display board.

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CHECK FLAME AND COMBUSTION

1. Turn the main power off to the unit by placing the “On/Off switch in the off position.
2. Remove the flue temperature sensor from the flue pipe connection. Combustion measurements will made at this point.
3. Turn the main power to the unit by placing the “On/Off” switch in the ON position.
4. Navigate to the setup screen from the home screen by pressing the SETUP button along the left side of the screen. Enter the installer password. (5309)
5. Select the service maintenance screen. The tabs will scroll (up and down) to reveal more options. See this manual for more detailed information.
6. Insert the probe from a combustion analyser into the hole left by the removal of the flue temperature sensor.
7. Once the appliance has modulated up to full fire, measure the combustion. The values should be in range listed in the table below. The CO levels shall be less than 150 ppm for a properly installed unit.
8. Once the combustion analysis is complete, test the safety shut off device by turning the manual shut off valve to the off position and ensuring that the unit shuts down and registers an alarm. Turn the manual shut off switch to the on position and reset the control.
9. Turn the main power off to the unit and replace the flue temperature sensor into the flue pipe connection.
10. Place the appliance back into normal operation.

You must replace the flue gas temperature sensor to prevent flue gas spillage into the room. Failure to comply could result in severe personal injury, death, or substantial property damage.

TABLE 8 CO2-O2 FIGURES

Natural Gas	
CO2	**O2**
8.4%-9.4%	**4.8%-6.5%**

TABLE 9 TROUBLESHOOTING CHART – COMBUSTION LEVELS

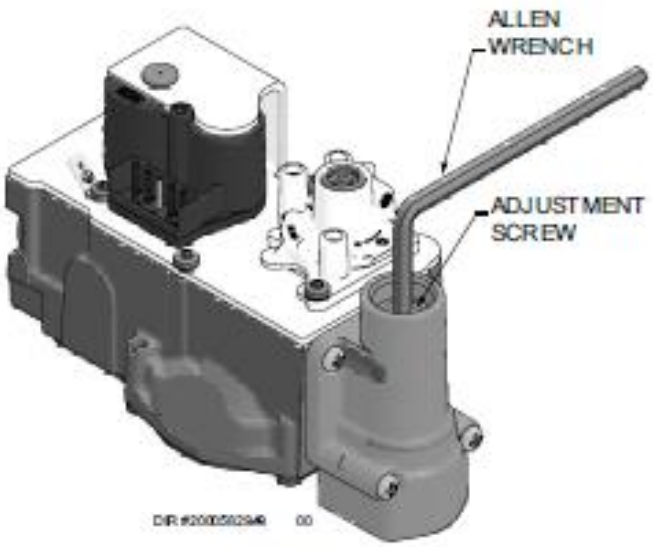
FAULT	CORRECTIVE ACTION
Flue/air intake length or obstruction	• Refer to the General Flue section of the Water Heater Installation and Operation Manual for the proper flue and air intake methods for the water heater. • Check for obstructions at the vent/air intake terminals.
Gas Supply Pressure	Refer to the Gas Connections section of the Water Heater Installation and Operation Manual for information on the gas supply for the water heater.
Dirty/Damaged Burner	• Refer to this manual for burner removal and cleaning procedures. • Replace burner if necessary
Gas Valve Adjustment	• Refer to this manual for the gas valve adjustment procedure.

GAS VALVE ADJUSTMENT PROCEDURE

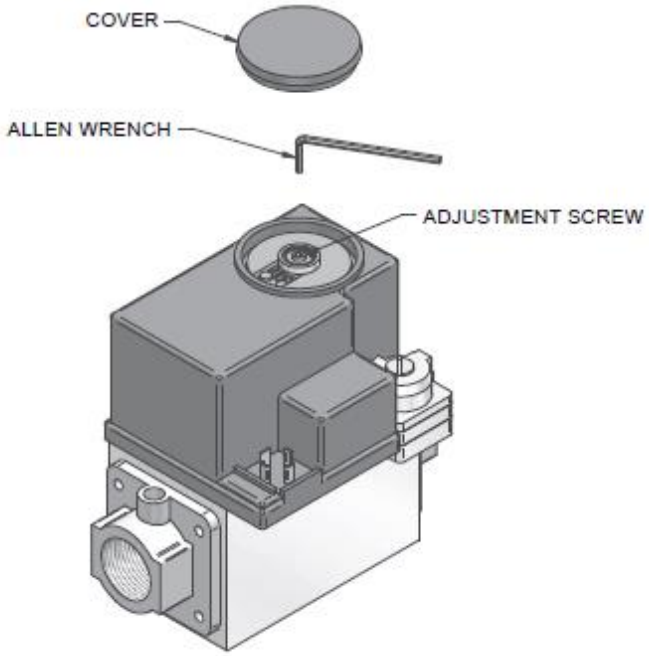
1. **For EKW117:** Remove the front panel from the unit.
   For EKW190, 235, 295: Remove the top access cover from the unit.
2. **For EKW190, 235, 295:** Remove the cover on top of the gas valve.
3. Use a combustion analyser to verify CO2 is within the range listed in table 16. If not, adjust the screw counterclockwise incrementally to raise CO2 and clockwise to lower CO2.
4. Replace the gas valve cover and access covers.
5. Replace the front access panel removed in step 1 and resume operation.

FIGURE 15 GAS VALVE ADJUSTMENT

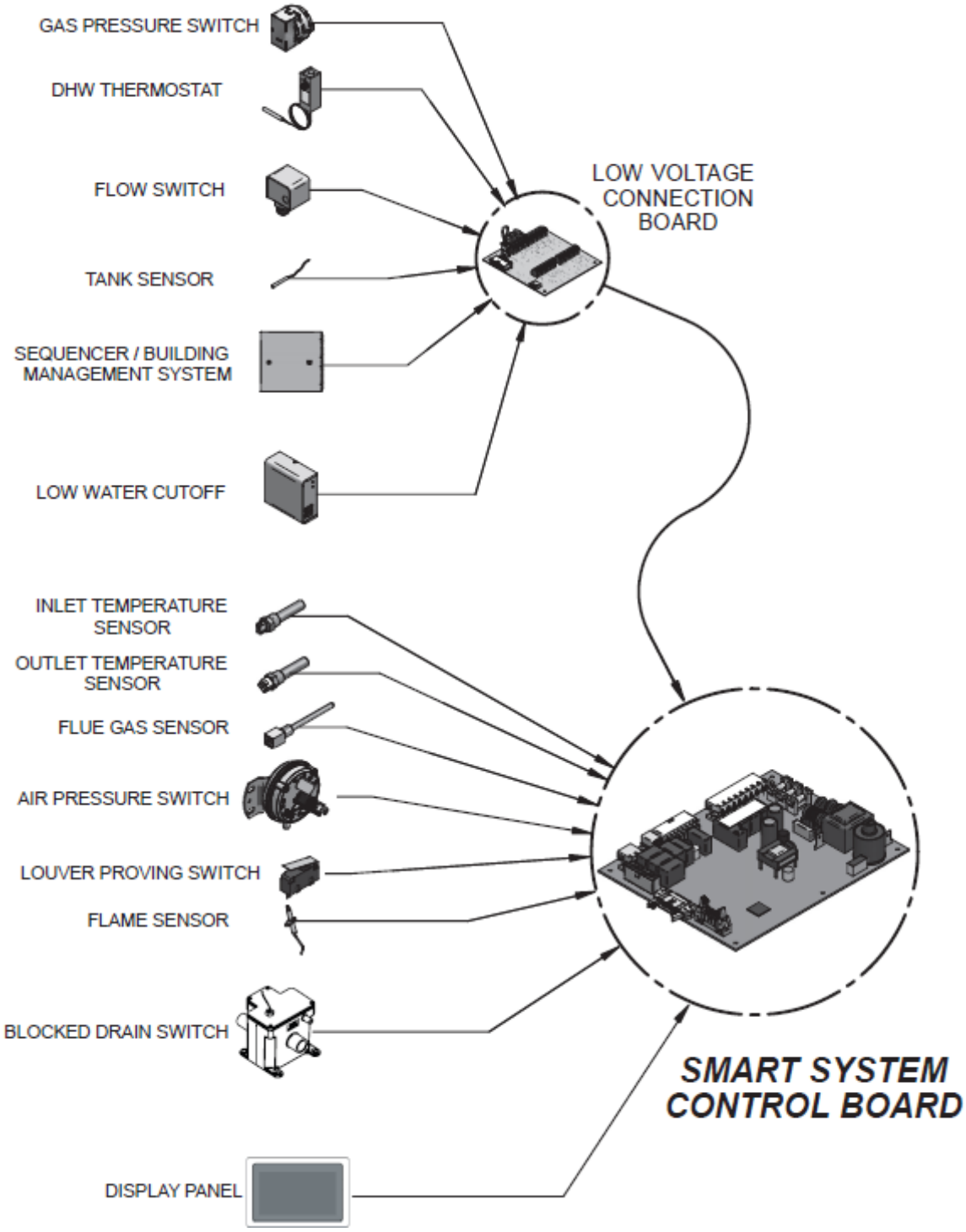
Gas valve adjustment – EKW117



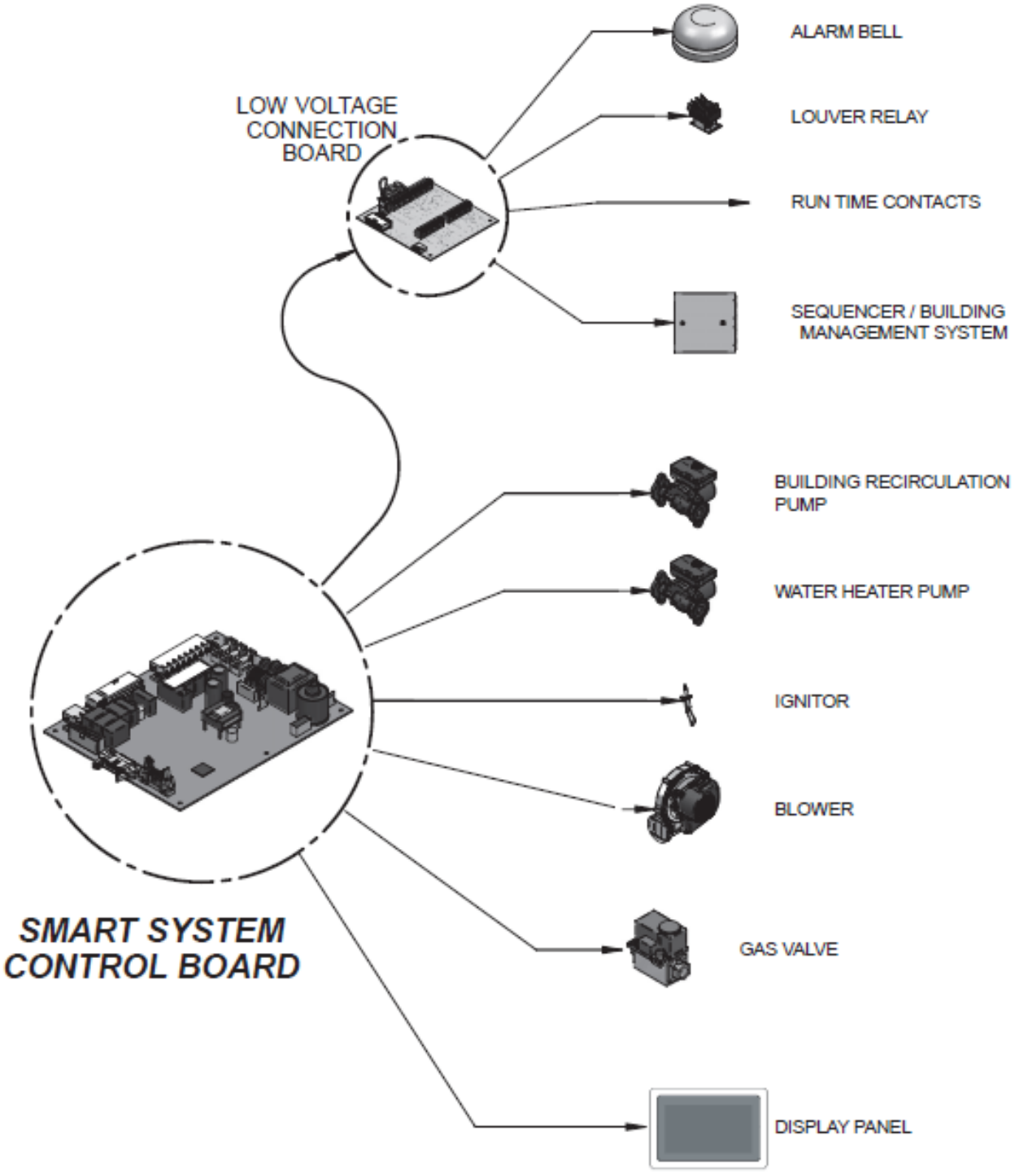
Gas valve adjustment – EKW190, 235, 295



APPENDIX 1 CONTROL INPUTS



APPENDIX 2 CONTROL OUTPUTS

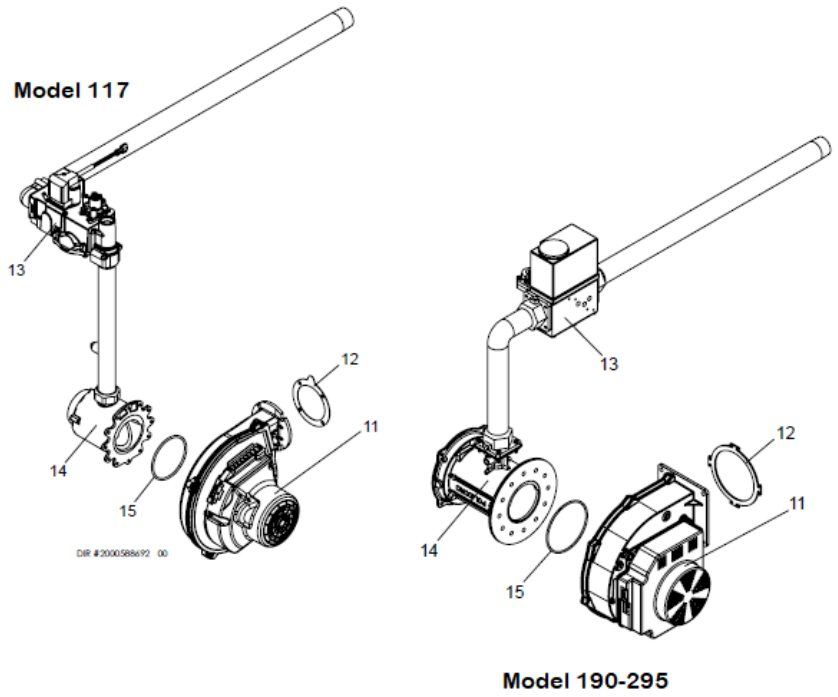


APPENDIX 3 SPARE PARTS FINDER

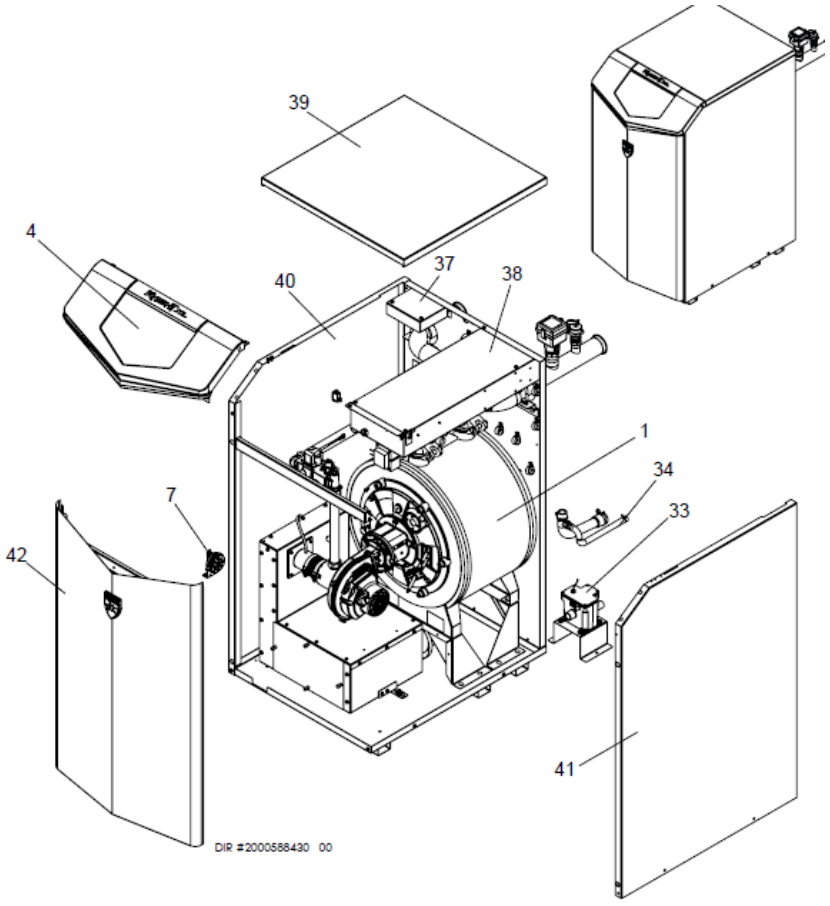
Item No	Description of item	Item Comments	EKW117CE	EKW190CE	EKW235CE	EKW295CE
1	Heat Exchanger		LL100330273	LL100330275	LL100330276	LL100330277
2	Low Voltage Connection Board	Prior Serial #2148	LL100208459			
2	Low Voltage Connection Board	Beg Serial #2148	LL100351933			
3	Main Control Board		LL100330278	LL100334033	LL100334034	LL100334035
4	Display Assembly		LL100330279			
5	Sensor Inlet		LL100208563			
6	Sensor Outlet		LL100208558			
-	Sensor Flue C/W Grommet		LL100330186			
7	Air Pressure Switch		PRS20016	-	LL100335692	-
8	Power On/Off Switch		LL100208242			
9	Pump Relay		LL100208509			
10	Transformer		LL100288473			
11	Fan	C/W Gasket	LL100330187	LL100330188	LL100330188	LL100330189
12	Fan Gasket		LL100208101	LL100330190	LL100330190	LL100330191
13	Gas Valve		LL100330192	LL100172015	LL100330193	LL100330193
14	Venturi	C/W Gasket	LL100330194	LL100330196	LL100330197	LL100330199
15	Venturi Gasket		LL100208761	LL100233705	LL100233705	LL100233698
-	Gas Valve O-Ring		LL100288880	-	-	-
-	G-Nut Gasket		LL100288899	-	-	-
-	Gas Valve Gasket		-	LL100208105	LL100208105	LL100208105
16	Ignitor	C/W Gasket & Screws	LL100297132			
17	Ignitor Gasket		LL100297133			
18	Flame Sensor	C/W Gasket & Screws	LL100330200			
19	Flame Sensor Gasket		LL100330341			
20	Sight Glass		LL100330201			
21	Sight Glass Gasket		LL100297136			
22	Door Rope Gasket		LL100330202			
23	Intake Manifold Hex Inlet		LL100330209	LL100330203	LL100330203	LL100330204
24	Intake Manifold Gasket		LL100330206	LL100330207	LL100330207	LL100330208
25	Burner	C/W Gasket	LL100330210	LL100330212	LL100330213	LL100330214
26	Burner Gasket		LL100330215			
27	Burner Door		LL100330216			
28	Insulation Deflector		LL100330218			
29	Insulation Burner Door		LL100330217			
-	Flue Outlet Gasket		LL100330219	LL100330220	LL100330220	LL100330220
-	Flue Clamp Ring		LL100330314	LL100330315	LL100330315	LL100330315
30	Inlet Water Pipe		LL100330223	LL100330223	LL100330223	LL100330224
31	Outlet Water Pipe		LL100330225	LL100330227	LL100330229	LL100330230
32	Water Pipe Coupling		LL100330232			
33	Condensate Trap Assembly		LL100330233			
34	Condensate Trap Hose		LL100330234			
-	Outdoor Sensor		LL100208834			
-	Spark Ignitor Harness		LL100330235			
-	Flame Sensor Harness		LL100208622			
-	Electrode Ground Harness		LL100330236			
-	Communication Cable Harness		LL100330237			
-	Air Filter		LL100233577			
-	Compression Latch		-	-	-	LL100302180
37	Junction Box Cover		LL100335983			
38	Control Cover		LL100335985			
39	Top casing		LL100330328	LL100330329	LL100330329	LL100330330
40	Side casing	Left hand side	LL100330331	LL100330332	LL100330332	LL100330336
41	Side casing	Right hand side	LL100330337	LL100330333	LL100330333	LL100330334
42	Front casing		LL100330335			

Use in conjunction with drawings on the following pages .

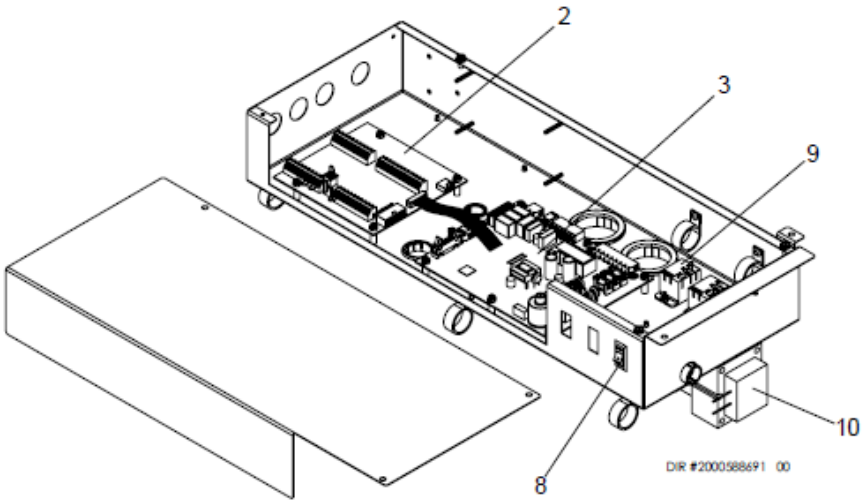
Gas valve and combustion train



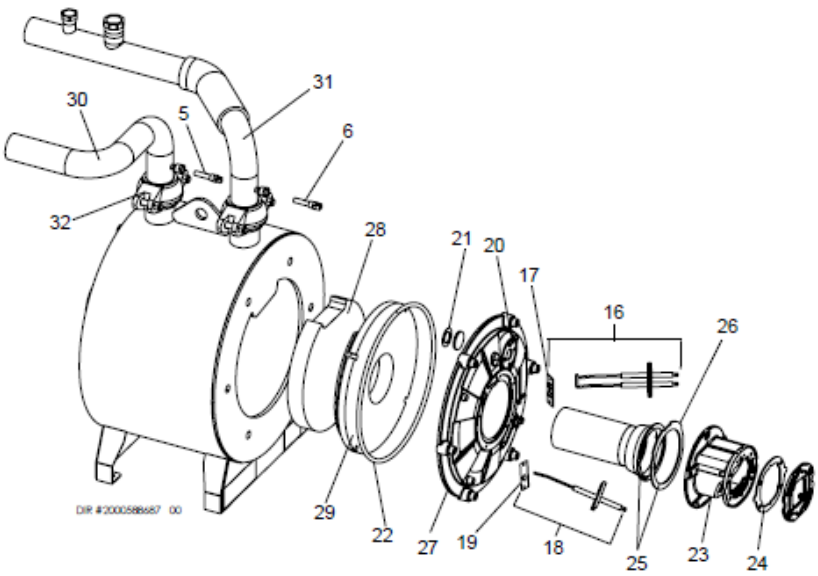
Casings and externally sited items



Control boards



Heat exchanger and burner



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