

POWER-fin®

User Manual

Models: 502, 752, 1002, 1302,
1501, 1701, and 2001
Up To 5:1 Turndown



⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

This appliance **MUST NOT** be installed in any location where gasoline or flammable vapors are likely to be present.

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.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

Save this manual for future reference.



Lochinvar®
High Efficiency Water Heaters, Boilers and Pool Heaters

Contents

Hazard definitions.....	2
Please read before proceeding	3
1.. Maintenance schedule.....	5
....	
Maintenance procedures	6
2.. Operating instructions.....	8
3.. SMART SYSTEM control module	9
Access modes	9
Saving parameters	9
Parameter table	10
Viewable and changeable control parameters.....	11
Status display screens	13
Revision Notes	Back Cover

Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

NOTICE indicates special instructions on installation, operation, or maintenance that are important but not related to personal injury or property damage.

Please read before proceeding

NOTICE

This is a gas appliance and should be installed by a licensed electrician and/or certified gas supplier. Service must be performed by a qualified service installer, service agency or the gas supplier.

⚠ WARNING

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

This appliance **MUST NOT** be installed in any location where gasoline or flammable vapors are likely to be present, unless the installation is such to eliminate the probable ignition of gasoline or flammable vapors.

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 neighbors phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

Warranty –

Factory warranty (shipped with unit) does not apply to units improperly installed or improperly operated.

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

1. Excessive water hardness causing a lime/scale build-up in the copper tube is not the fault of the equipment and is not covered under the manufacturer's warranty (see *Water Treatment and Water Chemistry in the Power-fin Installation and Operation Manual*).
2. Excessive pitting and erosion on the inside of the copper tube may be caused by too much water velocity through the tubes and is not covered by the manufacturer's warranty (see *Boiler Flow Rates and Temperature Rise for flow requirements in the Power-fin Installation and Operation Manual*).

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or additional information, consult a qualified installer, service agency or the gas supplier.

Checking equipment –

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

Do not use this appliance if any part 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.

⚠ Owner warning –

The information contained in this manual is intended for use by qualified professional installers, service technicians, or gas suppliers. **Consult your local expert for proper installation or service procedures.**

NOTICE

Consult and follow all local Building and Fire Regulations and other Safety Codes that apply to this installation. Consult a local gas utility company to authorize and inspect all gas and flue connections.

Your conventionally vented gas appliance must have a supply of fresh air circulating around it during burner operation for proper gas combustion and proper venting.

⚠ 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, turn off the manual gas control valve to the appliance at a location external to the appliance.

Prevention of freezing –

Heat exchangers and headers damaged by freezing are not covered by warranty.

See Section 7, *Startup - Freeze Protection* in the Power-fin Installation and Operation for more information.

Please read before proceeding

⚠ WARNING

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

1. Boilers and water heaters are heat producing appliances. To avoid damage or injury, do not store materials against the appliance or the vent-air intake system. Use proper care to avoid unnecessary contact (especially children) with the appliance and vent-air intake components.
2. Never cover your 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 your appliance.
3. UNDER NO CIRCUMSTANCES must flammable materials such as gasoline or paint thinner be used or stored in the vicinity of this appliance, vent-air intake system or any location from which fumes could reach the appliance or vent-air intake system.

Codes –

The equipment shall be installed in accordance with those installation regulations in force 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 of the National Fuel Gas Code, ANSI Z223.1. 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 conform to the latest edition of the ASME Boiler and Pressure Vessel Code, Section IV. Where required by the authority having jurisdiction, the installation must comply with the Canadian Gas Association Code, CAN/CGA-B149.1 and/or B149.2 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 Maintenance schedule

Service technician (see the Power-fin Service Manual for instructions)		Owner maintenance (see the following pages for instructions)	
ANNUAL START-UP	General:		
	<ul style="list-style-type: none"> • Address reported problems • Inspect interior; clean and vacuum if necessary; • Inspect condensate system and flush with fresh water • Check for leaks (water, gas, flue, condensate) • Examine venting system • Check system water pressure/system piping/expansion tank • Check control settings • Check igniter • Check wiring and connections • Check flue gas passageways • Flame inspection (stable, uniform) • Inspect and clean the burner • Check manifold gas pressure • Perform start-up checkout and performance verification per Section 7 in the Power-fin Installation and Operation Manual. 	Daily	<ul style="list-style-type: none"> • Check appliance area • Check pressure/temperature gauge
	<p>If combustion or performance indicate need:</p> <ul style="list-style-type: none"> • Clean heat exchanger • Remove and clean burner using compressed air only • Clean the blower wheel 	Monthly	<ul style="list-style-type: none"> • Check vent piping • Check air piping • Check relief valve • Check condensate drain system
		Periodically	<ul style="list-style-type: none"> • Test low water cutoff (if used) • Reset button (low water cutoff)
		Every 6 months	<ul style="list-style-type: none"> • Check appliance piping (gas and water) for leaks • Operate relief valve
	End of season months	<ul style="list-style-type: none"> • Shut appliance down (unless boiler used for domestic hot water) 	



WARNING Follow the maintenance procedures given throughout this manual. Failure to perform the service and maintenance or follow the directions in this manual could result in damage to the appliance or system, resulting in severe personal injury, death, or substantial property damage.

1 Maintenance schedule

Maintenance procedures

Appliance must be serviced and maintained

⚠ WARNING

The appliance must be inspected and started annually at the beginning of the heating season by a qualified service technician. In addition, the maintenance and care of the pool heater designated on page 5 of this manual and explained on pages 6 and 7 must be performed to assure maximum appliance efficiency and reliability. Failure to service and maintain the appliance and system could result in equipment failure, causing possible severe personal injury, death, or substantial property damage.

NOTICE

The following information provides detailed instructions for completing the maintenance items listed in the maintenance schedule on page 5. In addition to this maintenance, the appliance must be serviced and started up at the beginning of each heating season by a qualified service technician.

Check appliance area

⚠ WARNING

To prevent potential of severe personal injury, death, or substantial property damage, eliminate all materials discussed below from the boiler/water heater vicinity and the vicinity of the boiler/water heater combustion air inlet. If contaminants are found:

Remove products immediately from the area. If they have been there for an extended period, call a qualified service technician to inspect the appliance for possible damage from acid corrosion.

If products cannot be removed, immediately call a qualified service technician to re-pipe vent and air piping and locate vent termination/air intake away from contaminated areas.

1. Combustible/flammable materials -- Do not store combustible materials, gasoline or any other flammable vapors or liquids near the appliance. Remove immediately if found.
2. Air contaminants -- Products containing chlorine or fluorine, if allowed to contaminate the appliance intake air, will cause acidic condensate in the appliance. This will cause significant damage to the appliance if allowed to continue.

Check vent piping

1. Visually inspect the flue gas vent piping for any signs of blockage, leakage, or deterioration of the piping. Notify your qualified service technician at once if you find any problems.

⚠ WARNING

Failure to inspect the vent system as noted above and have it repaired by a qualified service technician can result in vent system failure, causing severe personal injury or death.

Check pressure/temperature gauge

1. Make sure the pressure reading on the boiler pressure/temperature gauge does not exceed 24 PSI. Higher pressure may indicate a problem with the expansion tank.
2. Contact a qualified service technician if problem persists.

Check vent piping

1. Visually inspect the flue gas vent piping for any signs of blockage, leakage, or deterioration of the piping. Notify your qualified service technician at once if you find any problems.

⚠ WARNING

Failure to inspect the vent system as noted above and have it repaired by a qualified service technician can result in vent system failure, causing severe personal injury or death.

Check air piping

1. Visually inspect the air inlet elbow to be sure it is unobstructed. Inspect the entire length of air piping to ensure piping is intact and all joints are properly sealed.
2. Call your qualified service technician if you notice any problems.

Check relief valve

1. Inspect the appliance relief valve and the relief valve discharge pipe for signs of weeping or leakage.
2. If the relief valve often weeps, immediately contact your qualified service technician to inspect the appliance and system.

1 Maintenance schedule *(continued)*

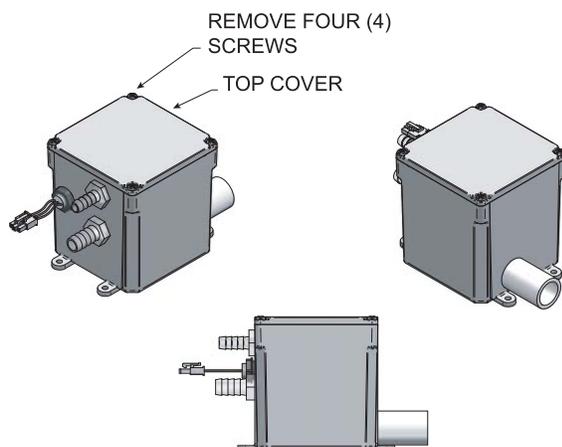
Inspect condensate system

1. Inspect the condensate drain line, condensate PVC fittings, and condensate trap on an annual basis.

Flush condensate trap with water

1. Remove the four (4) screws securing the top cover to the condensate trap and remove the cover (reference FIG. 1-1).
2. Locate the plastic ball inside the float tube. Verify there is nothing under the ball causing it to not seat properly.
3. If necessary, flush with fresh water until the water begins to pour out of the drain.
4. Replace the top cover on the condensate trap.
5. Replace the four (4) screws removed in Step 1.

Figure 1-1_ Condensate Trap



Test low water cutoff (if installed)

1. If the system is equipped with a low water cutoff, test the low water cutoff periodically during the heating season, following the low water cutoff manufacturer's instructions.

Reset button (low water cutoff)

1. Testing the low water cutoff shuts the unit off. Press the RESET button on the low water cutoff bracket to turn the unit back on.

Check appliance piping (gas and water)

1. Remove the appliance front access door and perform a gas leak inspection per steps 1 through 7 of the Operating Instructions on page 8. If gas odor or leak is detected, immediately shut down the appliance following the procedures on page 8. Call a qualified service technician.
2. Visually inspect for leaks around water piping. Also inspect the circulators, relief valve, and fittings. Immediately call a qualified service technician to repair any leaks.

⚠ WARNING

Have leaks fixed at once by a qualified service technician. Failure to comply could result in severe personal injury, death, or substantial property damage.

3. Replace the front access door.

Operate relief valve

1. Before proceeding, verify that the relief valve outlet has been piped to a safe place of discharge, avoiding any possibility of scalding from hot water.

⚠ WARNING

To avoid water damage or scalding due to valve operation, a metal discharge line must be connected to the relief valve outlet and run to a safe place of disposal. This discharge line must be installed by a qualified heating installer or service technician in accordance with the instructions in the Power-fin Installation and Operation Manual. The discharge line must be terminated so as to eliminate possibility of severe burns or property damage should the valve discharge.

2. Read the boiler pressure/temperature gauge to make sure the system is pressurized. Lift the relief valve top lever slightly, allowing water to relieve through the valve and discharge piping.
3. If water flows freely, release the lever and allow the valve to seat. Watch the end of the relief valve discharge pipe to ensure that the valve does not weep after the line has had time to drain. If the valve weeps, lift the seat again to attempt to clean the valve seat. If the valve continues to weep afterwards, contact your qualified service technician to inspect the valve and system.
4. If water does not flow from the valve when you lift the lever completely, the valve or discharge line may be blocked. Immediately shut down the appliance, following the operating instructions on page 8 of this manual. Call your qualified service technician to inspect the appliance and system.

Shut appliance down (unless boiler is used for Domestic Water)

1. Follow "To Turn Off Gas to Appliance" on page 8 of this manual.
2. Do not drain the system unless exposure to freezing temperatures will occur.
3. Do not drain the system if it is filled with an antifreeze solution.
4. DO NOT shut down appliances used for domestic water heating, they must operate year-round.

2 Operating instructions

FOR YOUR SAFETY READ BEFORE OPERATING

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

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

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.

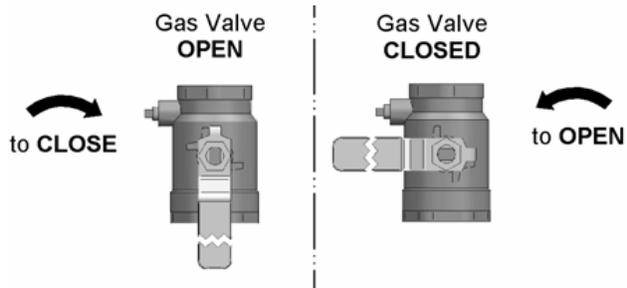
Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

If you cannot reach your gas supplier, call the fire department.

- C. Use only your hand to turn the gas control knob. Never use tools. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Turn gas shutoff valve located on rear of unit clockwise to close valve. Handle will be perpendicular to pipe. Do not force.
6. Wait five (5) minutes to clear out any gas. If you then smell gas, **STOP!** Follow "B" in the safety information above this label. If you don't smell gas, go to next step.
7. Turn gas shutoff valve counterclockwise to open valve. Handle will be parallel to pipe.
8. Turn on all electric power to appliance.
9. Set thermostat to desired setting.
10. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn gas shutoff valve located on rear of unit clockwise to close valve. Handle will be perpendicular to pipe. Do not force.
4. Install top cover.

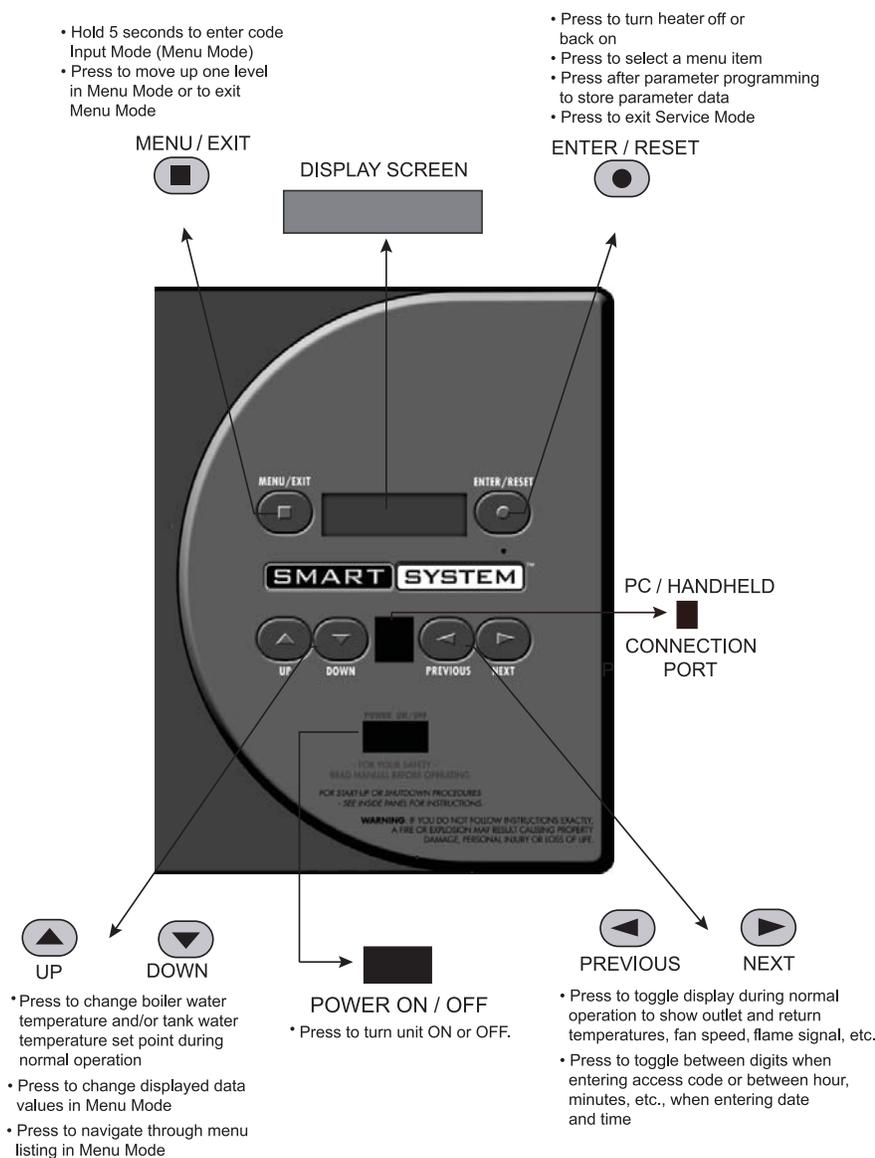
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3 SMART SYSTEM control module

SMART SYSTEM™ Power-fin control module

Use the control panel (FIG. 3-1) to set temperatures, operating conditions, and monitor appliance operation.

Figure 3-1_ Control Panel



Access modes

User

The user can adjust the space heating target temperature and the tank target temperature (if a tank sensor is used) by using the UP and DOWN buttons (FIG. 3-1) at any time during normal operation. By entering the USER code (0704), the user can also change temperature units, time and date, and night setback settings. In User Mode, the following parameters can be viewed but not changed:

- Boiler outlet water target temperature in DHW Mode
- Appliance model number
- Software version
- Total operating hours
- Total cycles

Installer

Most parameters are available only to the installer, accessible only by entering the installer access code, see the Power-fin Service Manual.

Saving parameters (reference the Parameter Table in the Power-fin Service Manual)

To save parameters and exit programming:

Press the ENTER/RESET button, then the MENU/EXIT button 3 times.

To keep parameter settings only for a current operating cycle:

Press the MENU/EXIT button 3 times after making all desired parameter changes.

To enter a parameter and continue programming:

Press the MENU/EXIT button 1 time to return to the parameter listings; press again to return to the menu listings. Remember to press the ENTER/RESET button when finished programming in order to save the changes made.

See the Power-fin Service Manual for a detailed description of parameters and access modes.

3 SMART SYSTEM control module

Parameter table

Table 3A This table lists SMART SYSTEM control module parameters and where to access them

	MENU	SUB ITEM	DESCRIPTION	SEE PAGE	USER ACCESS		INSTALLER ACCESS	
					DISPLAY	MODIFY	DISPLAY	MODIFY
GENERAL	A	1	Heater Model	11	Yes	No	Yes	No
		2	User Code	11	Yes	Yes	Yes	Yes
		3	Date and Time	11	Yes	Yes	Yes	Yes
		4	Software Version	11	Yes	No	Yes	No
		5	Temperature Units	11	Yes	Yes	Yes	Yes
		6	Night Setback Temperature	11	Yes	Yes	Yes	Yes
		7	Night Setback Times	11	Yes	Yes	Yes	Yes
TEMPERATURE SETTING	B	1	SH Set Point User	11	Yes	Yes	Yes	Yes
DATA LOGGING	C	1	Hours Running SH	11	Yes	No	Yes	No
		2	Hours Running DHW	11	Yes	No	Yes	No
		3	Ignition Attempts	11	Yes	No	Yes	No
		4	Show Last 10 Errors	11	Yes	No	Yes	No
DHW SETTINGS	E	1	DHW Tank Set Point	12	Yes	Yes	Yes	Yes
		2	DHW Boiler Set Point	12	Yes	Yes	Yes	Yes
		3	SH/DHW Switching Time	12	Yes	Yes	Yes	Yes
OUTDOOR AIR RESET	F	5	Outdoor Air Shutdown	12	Yes	Yes	Yes	Yes
		6	Outdoor Air Shutdown Differential	12	Yes	Yes	Yes	Yes
		8	Boost Temperature	12	Yes	Yes	Yes	Yes
		9	Boost Time	12	Yes	Yes	Yes	Yes

3 SMART SYSTEM control module *(continued)*

Viewable and changeable control parameters

CAUTION

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

A: General

Heater model

The control will display “LOCHINVAR” as the model number because the same control is used on several models. This will be displayed when parameter **A1** has been accessed. This parameter is not changeable.

User code

The User Code allows the user to access and change a limited number of control parameters. The access code can be changed by the user or the installer to a code of their choosing. To change the code, parameter **A2** must be accessed. The default code is 0704. The code can be changed one digit at a time by using the arrow keys on the display.

Date and time

The control uses an internal clock for the night setback feature and for logging of events. For these features to work correctly, the clock must be set when the unit is first installed or any time the unit has been powered off for more than 30 days. To set the clock, parameter **A3** must be accessed. The date and time are displayed as “YY:MM:DD W hh:mm”. YY = year, MM = month, DD = date, W = day (1 = Monday, 2 = Tuesday, etc.), hh = hour (24 hour time; 2:00 PM = 14:00), mm = minutes.

NOTICE

The internal clock does not adjust for Daylight Savings Time and therefore, will require a manual adjustment.

Software version

The software version allows the user to view the software version in use by the control. This software controls the operation of the unit. When a new software version becomes available, the existing control can be replaced with a new control to update the software.

Temperature units

The control can be configured to display temperature in either °C or °F. This parameter can be changed by the user or the installer by accessing parameter **A5**. The default is °F.

Night setback temperature

Once the internal clock has been set correctly, the night setback feature can be used to program a lower water temperature set point for space heating or tank. This parameter can be changed by the user or the installer by accessing parameter **A6**. The temperature range for this parameter is 32°F (0°C) to 140°F (60°C). The feature is turned off with a setting of 32.0°F (0°C). The default value is 32.0°F (0°C).

Night setback times

If parameter **B6** is set to anything other than 32.0°F (0°C), the night setback feature becomes active. This will require start and stop times to be programmed for the days that reduced temperatures are required. These times can be changed by the user or the installer by accessing parameter **A7**. Each day of the week (Monday through Sunday) will have an on and off time.

Example: Monday ON: 22:30, Tuesday OFF: 6:45. If you wish to skip a day and have no night setback, leave the on and off times the same. The default times for each day will be 08:00 (OFF) and 18:00 (ON).

B: Temperature settings (boiler only)

SH Set point user

The SH set point user sets the water temperature set point for fixed operation or the maximum temperature set point when the outdoor air sensor is used. This parameter can be changed by the user or the installer by accessing parameter **B1**. The temperature range of this parameter is 60°F (15°C) to 230°F (110°C). The default value is 120°F (49°C).

C: Data logging

Hours running SH

The hours running SH parameter shows the total number of hours the unit has been in the SH firing position. This parameter can be viewed by the user and the installer by accessing parameter **C1**.

Hours running DHW

The hours running DHW parameter shows the total number of hours the unit has been in the DHW firing position. This parameter can be viewed by the user and the installer by accessing parameter **C2**.

Ignition attempts

The ignition attempts parameter shows the total number of times the unit has attempted to fire. This parameter can be viewed by the user and the installer by accessing parameter **C3**.

Show last 10 errors

The control will log the 10 most current errors with the date and time the error occurred. This parameter can be viewed by the user and the installer by accessing parameter **C4**.

3 SMART SYSTEM control module

E: DHW settings

DHW tank set point

When a temperature sensor is installed in the DHW tank, the DHW tank set point sets the target temperature of the water in the tank. The user or installer can adjust this set point by accessing parameter **E1**. The temperature range of this parameter is 60°F (15°C) to 190°F (88°C). The default value is 120°F (49°C).

DHW boiler set point (boiler only)

When a DHW call for heat becomes active, the control will use the DHW boiler set point to determine the firing rate of the unit based on the actual outlet water temperature. This parameter can be changed by the installer by accessing parameter **E2**. The temperature range of this parameter is 60°F (15°C) to 200°F (93°C). The default value is 180°F (82°C).

SH/DHW switching time (boiler only)

The SH/DHW switching time parameter sets the length of time the control will stay in DHW Mode when a space heating (SH) call has been received. After this time period has expired the control will revert to SH Mode. If a DHW call is still active the timer will reset. After the time period has expired the control will revert back to DHW Mode. This will continue until one of the demands has been satisfied. This parameter can be changed by the installer by accessing parameter **E3**. The time range of this parameter is 10 minutes to 240 minutes. The default value is 30 minutes.

F: Outdoor air reset (boiler only)

Outdoor air shutdown

When the outdoor temperature rises above this point, the control will block all SH demands (DHW demands will still be active). This parameter can be changed by the user or the installer by accessing parameter **F5**. The temperature range of this parameter is 0°F (-18°C) to 120°F (49°C). The default value is 80°F (27°C).

Outdoor air shutdown differential

The outdoor air shutdown differential parameter is the number of degrees below parameter F5 the outdoor air temperature must go before the unit will respond to a SH demand. This parameter can be changed by the user or the installer by accessing parameter **F6**. The temperature range of this parameter is 0°F (0°C) to 90°F (50°C). The default value is 10°F (5°C).

Boost temperature

If a SH demand lasts longer than the programmed time delay setting (F9) and there have been no DHW demands, the control will increase the water temperature set point by the amount in this parameter. If the SH demand continues through another time period, the set point will be increased again. This will continue until either the SH demand ends, a maximum of 20 increases has occurred, or the maximum set point has been reached. Once the SH demand has been satisfied the set point will revert back to its calculated setting. The boost temperature can be changed by the installer by accessing parameter **F8**. The temperature range of this parameter is 0°F (0°C) to 45°F (25°C). The default value is 0°F (0°C). This feature will be active if this parameter is set to anything other than 0°F (0°C).

Boost time

The boost time parameter sets the amount of time that must elapse with a SH demand before the water temperature set point will be increased. This parameter can be changed by the installer by accessing parameter **F9**. The time range for this parameter is 1 minute to 60 minutes. The default value is 20 minutes.

3 SMART SYSTEM control module *(continued)*

Status display screens

Status Display Screens		
By using the Previous/Next (◀, ▶) arrow keys on the SMART SYSTEM display panel, you can navigate through the nine (9) display screens. Each screen will contain two (2) viewable items. The following is a description of the individual items and what they can display:		
Screen	Display shows:	Description
#1	HTR: OFF	The unit has been turned OFF by the Enter/Reset button on the SMART SYSTEM display panel.
	Standby	The unit has not received a call for heat from a remote thermostat nor has it received a call for heat from a DHW thermostat.
	Set Point Met	The unit has met the water temperature set point, but is still receiving a call for heat from either a remote thermostat or a DHW thermostat.
	Prepurge	The unit has initiated the prepurge and HSI warm-up periods on a call for heat.
	Ignition	The unit has begun a trial for ignition.
	SH***% Rate DHW***% Rate	The unit has fired and is running at the displayed percentage.
	Postpurge	The call for heat has been satisfied and the unit runs the fan for an additional post purge period to clear the combustion chamber and vent system of residual flue products.
	Service	The unit has been placed in a temporary mode that will allow the unit to fire for the purpose of combustion analysis.
	OUT: ***F(***)	When the outlet sensor has been selected as the control sensor (default), the control will display the outlet temperature as well as the set point in parenthesis.
	***F	If the outlet sensor has not been selected as the control sensor or a system supply sensor is connected, only the outlet temperature will be displayed.
	Open	The control does not detect the outlet sensor.
Shorted	The outlet sensor wires or the sensor itself has become shorted.	
Press the Next ▶ arrow key on the SMART SYSTEM display to access Screen #2.		
#2	IN: ***F	If the inlet sensor has not been selected as the control sensor or a system return sensor is installed, only the inlet temperature will be displayed.
	F ()	When the inlet sensor has been selected as the control sensor, the control will display the inlet temperature as well as the set point in parenthesis.
	Open	The control does not detect the inlet sensor.
	Shorted	The inlet sensor wires or the sensor itself has become shorted.
	RISE: ***F	The difference between the inlet temperature and the outlet temperature.
Press the Next ▶ arrow key on the SMART SYSTEM display to access Screen #3.		

3 SMART SYSTEM control module

Status Display Screens (cont'd)		
By using the Previous/Next (◀, ▶) arrow keys on the SMART SYSTEM display panel, you can navigate through the nine (9) display screens. Each screen will contain two (2) viewable items. The following is a description of the individual items and what they can display:		
Screen	Display shows:	Description
#3	SYS: ***F	If the system supply sensor has not been selected as the control sensor, only the system temperature will be displayed.
	F ()	When the system supply sensor has been selected as the control sensor, the control will display the system temperature as well as the set point in parenthesis.
	Open	The control does not detect the system supply sensor.
	Shorted	The system supply sensor wires or the sensor itself has become shorted.
	OUTDOOR: ***F	The control will display the outdoor air temperature as sensed by the outdoor air sensor.
	Open	The control does not detect the outdoor air sensor.
	Shorted	The outdoor air sensor wires or the sensor itself has become grounded.
Press the Next ▶ arrow key on the SMART SYSTEM display to access Screen #4.		
#4	SYSRT: ***	The control will display the system return temperature if the system return sensor is connected. If not connected, the display will skip this screen and display screen #5.
	VALVE: ***%	The control will display the position of the 3-way valve; 100% indicates that no outlet water is being bypassed into the inlet.
Press the Next ▶ arrow key on the SMART SYSTEM display to access Screen #5.		
#5	FLUE: ***F	The control will display the flue temperature.
	Open	The control does not detect the flue sensor.
	Shorted	The flue sensor wires or the sensor itself has become shorted.
	AUX: ***F	The control will display the temperature.
	Open	The control does not detect the auxiliary sensor.
	Shorted	The auxiliary sensor wires or the sensor itself has become shorted.
Press the Next ▶ arrow key on the SMART SYSTEM display to access Screen #6.		
#6	FAN SPD: ***RPM	The control will display the actual fan motor RPM.
	FLAME SIG: **. *uA	The control will display the flame signal in dc microamps.
Press the Next ▶ arrow key on the SMART SYSTEM display to access Screen #7.		

3 SMART SYSTEM control module *(continued)*

Status Display Screens *(cont'd)*

By using the Previous/Next (◀, ▶) arrow keys on the SMART SYSTEM display panel, you can navigate through the nine (9) display screens. Each screen will contain two (2) viewable items. The following is a description of the individual items and what they can display:

Screen	Display shows:	Description
#7	SH CFH: OFF	The control has not received a call for heat from a SH remote thermostat.
	ON	The control has received a call for heat from a SH remote thermostat.
	DHW CFH: OFF	The control has not received a call for heat from a tank sensor or tank thermostat.
	ON	The control has received a call for heat from a tank sensor or tank thermostat.

Press the Next ▶ arrow key on the SMART SYSTEM display to access Screen #8.

#8	DHW PUMP: OFF	The control has not received a DHW call for heat and has not powered the DHW pump.
	ON	The control has received a DHW call for heat and has powered the DHW pump.
	Delay	The DHW call for heat has been satisfied and the DHW pump is running for a fixed time to remove any residual heat.
	0-10V IN: **.VDC	The control will display a 0-10 VDC signal received from a Building Management System (BMS) connected to the unit.

Press the Next ▶ arrow key on the SMART SYSTEM display to access Screen #9.

#9	SYS PUMP: OFF	The control has not received a call for heat from a remote thermostat and has not powered the system pump.
	ON	The control has received a call for heat from a remote thermostat and has powered the system pump.
	Delay	The system call for heat has been satisfied and the system pump is running for a fixed time to remove any residual heat.
	BLR PUMP: OFF	The control has either not received a call for heat from a remote thermostat, a remote thermostat is not connected to the unit and the water temperature has not dropped below the temperature set point of the control to initiate a call for heat, or the control has received a DHW call for heat from a DHW thermostat.
	ON	The control has received a call for heat from a remote thermostat or a remote thermostat is not connected and the water temperature has dropped below the temperature set point of the control to initiate a call for heat.
	Delay	The call for heat has been satisfied and the boiler pump is running for a fixed time to remove any residual heat.

Press the Next ▶ arrow key on the SMART SYSTEM display to roll back to Screen #1. At any point if you wish to access an earlier screen, press the Previous ◀ arrow key on the SMART SYSTEM display.

Revision Notes: *Revision B (PBX-PFX-USER-Rev B) reflects the addition of Models 502 - 1302 to the manual*

Revision C (ECO C06058) reflects the removal of heat exchanger cleaning information in "Maintenance and annual startup" section on page 5.

Revision D (ECO C12077) reflects the update of ignition timing information on page 13.