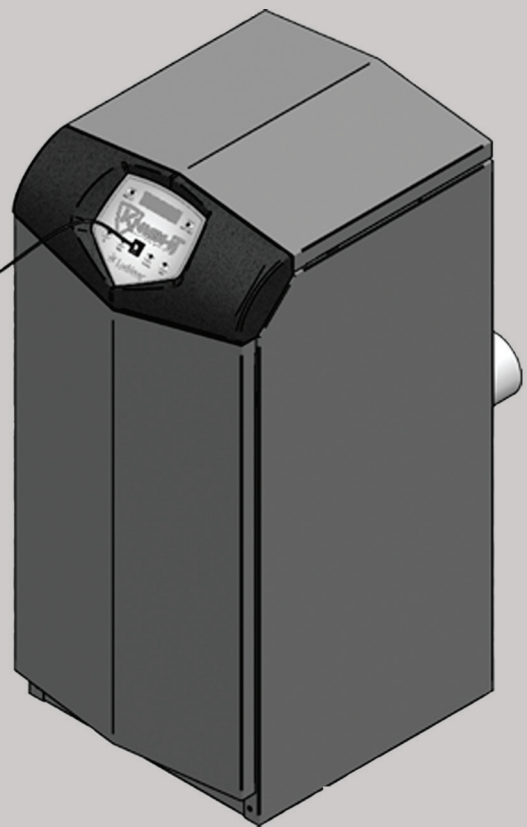




SMART SYSTEM

PC PROGRAM INSTRUCTIONS

Models: 80 - 500



⚠ WARNING

This manual must only be used by a qualified heating installer / service technician. Read all instructions, including this manual, the Knight Boiler Installation and Operation Manual, and the Knight Boiler Service Manual, before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death, or substantial property damage.



Lochinvar[®]
High Efficiency Water Heaters, Boilers and Pool Heaters

Save this manual for future reference.

Contents

Contents	2
1. Installation	3
Program Installation	3
Program Setup	3
Connect PC Cable	3
Starting the Program	3
2. SMART SYSTEM Status Screen	5
3. SMART SYSTEM Graphics Screen	7
4. SMART SYSTEM Fault History Screen	8
5. SMART SYSTEM Cascade Screen	9
6. Parameters	10
7. Notes	19

1 Installation

Program installation

To install the program on your PC:

1. Insert the CD-ROM into the CD drive on your computer.
2. Click on **START**, and then **RUN**.
3. Click on the Browse button, and select the CD drive.
4. Click on the file named **Setup.exe**, and then click on the **Open** button.
5. Now click the **OK** button. The setup program will start. Follow the prompts, and restart your computer when prompted to do so.

If you wish to have the PC program icon on your desktop, click on **START**, and then **Programs**. Right click on **SMART SYSTEM PC**. Place the cursor over **Send to >**, and then click on **Desktop**. The icon will appear on the Desktop Screen.

Program setup

The program needs to identify which ComPort is assigned to the serial port. Typically, it is COM1, so the program uses that as the default. If you need to change the default:

1. Start the program and click on the **Settings** tab along the top of the Main Screen window (FIG. 1).
2. Move the cursor over **Comport >** in the pull-down menu. A new menu appears with the Comport numbers.
3. Click on the appropriate name for the serial port on your computer.

The program displays temperatures in °F. If you wish to display temperatures in °C, click on the **Settings** tab along the top of the Main Screen window, and move the cursor over **Temperature >** in the pull-down menu. A new menu will appear, click on **Celsius**.

Connect PC cable

In order for the PC to communicate with the SMART SYSTEM, you must connect the 9-pin connector on the PC cable adapter module to the serial port connector on your PC. If your computer does not have a 9-pin serial port connector, you will need to attach a USB-to-serial port adapter to it, and connect the adapter module to the USB-to-serial port adapter. Insert one end of the coiled phone cable into the phone jack on the PC cable adapter. Remove the dust cover from the phone jack on the front display of the boiler, and insert the other end of the coiled phone cable into this phone jack.

CAUTION

DO NOT connect a phone line to the phone jack on the front display.

Starting the program

To start the program, double click on the icon (if you put it on your desktop), or click on **START**, then **Programs**, then **SMART SYSTEM PC**. See FIG. 1 on page 4.

1 Installation

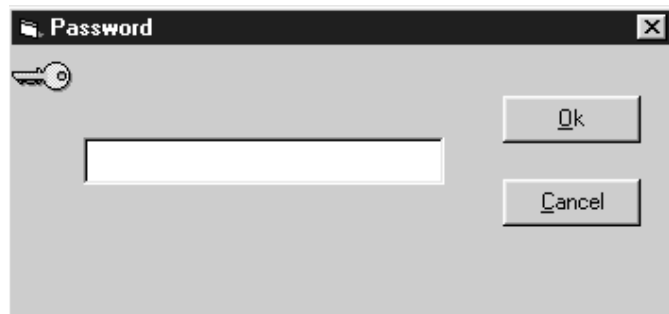
Figure 1_Main Screen



There are two access levels for this program. The user access level allows only certain settings to be changed. The installer access level allows more settings to be changed. The program defaults to the user level when started. You will notice that a lock symbol appears in the lower right-hand corner of the window. To move to the installer level, a password must be entered. This password is located on a label on the CD-ROM case. You may enter the password by clicking on the “key” button in the upper left-hand corner of the window. A window opens in which you can type in the password (see FIG. 2). Note that the password is case sensitive. Click on the **Ok** button, or press the **Enter** key. You will notice that the lock symbol at the lower right-hand corner of the window has changed into a key symbol.

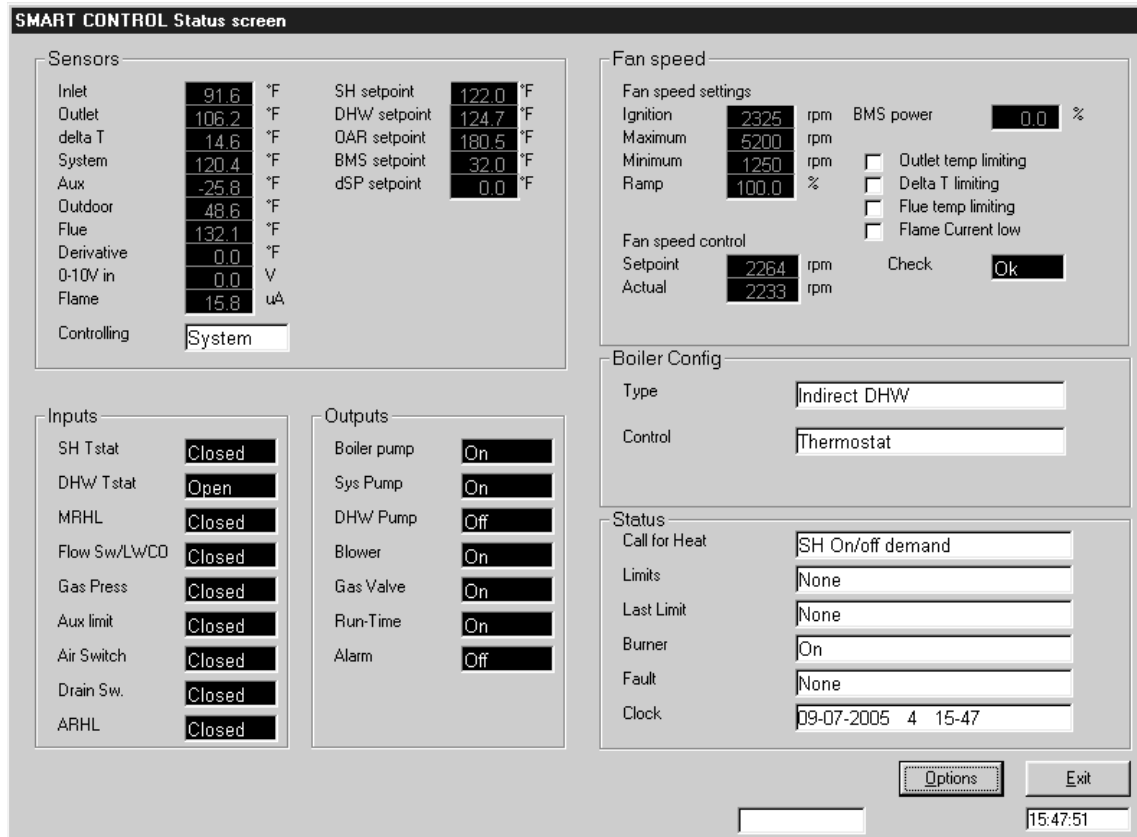
The fields along the bottom of the Main Screen window are as follows (FIG. 1): The left field shows the location of the program. The next field shows the status of the communication between the PC and the SMART SYSTEM. This will say “No connection” when the program is started. As soon as the program sends or receives data from the SMART SYSTEM, this field will show “Connected”. The right field shows the filename of the parameter file in the program’s memory.

Figure 2_Password Window



2 SMART SYSTEM Status screen

Figure 3 SMART SYSTEM Status Screen



To monitor and record the operation of the boiler, click on the **Status** tab along the top of the Main Screen window (FIG. 1). The SMART SYSTEM Status Screen will appear (see FIG. 3 above). The screen is divided into several sections.

The Sensors section displays the current temperatures seen by the Inlet, Outlet, System, Aux, Outdoor, and Flue sensors. The delta T across the heat exchanger, the voltage being applied to the 0-10Vdc input, and the flame current are also shown (FIG. 3). The controlling sensor is shown below the items mentioned above. The default controlling sensor is the Outlet sensor. If a System sensor is connected, the control will automatically use it as the controlling sensor. The SMART SYSTEM can be programmed to use the Inlet sensor if desired. When so programmed, the Outlet sensor will be displayed for the first 3 minutes after the burner lights, and then the Inlet sensor will be displayed. To the right of the sensor temperature readings are the various setpoints.

The SH setpoint is the setpoint the SMART SYSTEM uses during a space heating (SH) call for heat. Note that this setpoint will depend upon the outdoor temperature if the outdoor air sensor is connected. When the 0-10Vdc input is used, this setpoint will vary with the input voltage if it is used to control the setpoint.

The DHW setpoint is the setpoint used when an Aux. sensor is connected.

The OAR setpoint is the maximum temperature allowed when the outdoor temperature sensor is connected.

The BMS setpoint is the maximum temperature allowed when the 0-10Vdc input is used to control the rate of the boiler.

The dSP setpoint is used when the inlet sensor is programmed as the controlling sensor.

Below the Sensors section is the Inputs section (FIG. 3). This section displays the status of the Room Thermostat/Zone Control, DHW Thermostat, Manual Reset High Limit (optional), Flow Switch/Low Water Cutoff (optional), Gas Pressure Switch (optional), Aux Proving Switch (optional), Blocked Drain Switch, and Auto Reset High Limit Switch. An Air Switch is not used on this boiler and should always be indicated as Closed.

Next to the Inputs section is the Outputs section (FIG. 3). This section shows the status of the Boiler (secondary) pump, System (primary) Pump, DHW Pump, Blower, Gas Valve, Run-time Contacts, and Alarm Contacts.

2 SMART SYSTEM Status screen

At the top right of the window is the Fan Speed status information (FIG. 3). Included in the Fan Speed status are Min., Max., and Ignition fan speeds. If Ramp Delay is activated, the Ramp Delay limit is shown. The target and actual fan speeds are displayed, and if the actual speed is within acceptable limits. If the SMART SYSTEM is programmed to be controlled by a Building Management System (BMS), and programmed to have the BMS control the power from the boiler, then the percent of max. power is displayed. Finally, should certain temperatures or the flame current approach certain limits, the SMART SYSTEM will force the fan speed up or down accordingly to prevent exceeding those limits. When this happens, the box next to the corresponding sensor is checked.

Below the Fan Speed status is the Boiler Configuration. This indicates what application the SMART SYSTEM is programmed to be used in.

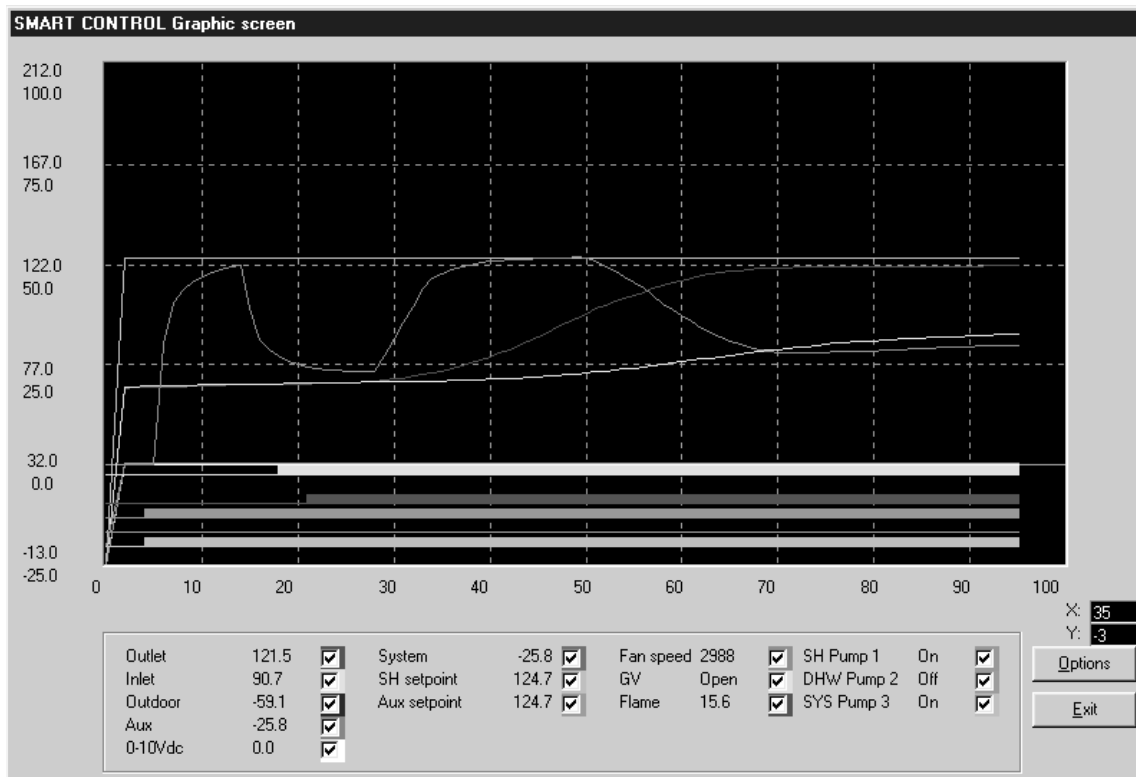
Finally, the General status of the boiler is shown. Included in the General status is the active call for heat (if any), the active limits (if any), the last active limit, the burner status, the last fault, and the date and time as stored in the SMART SYSTEM.

While in the SMART SYSTEM Status Screen, you can generate a log file of the readings as the boiler operates. Click on the **Options** button at the bottom right-hand corner of the screen (FIG. 3). Press the **LogFile** button and define a log file name and the directory you want it to be located in. Click **OK**. When you want to start logging data, click the **Log** button. The **Log** button will turn green to indicate that it is logging. You will also notice the filename at the top of the window, and will see the size increase as data is logged to the file. To stop logging, click on the **Options** button, then click on the **Log** button again. The **Log** button will turn back to gray to indicate that logging has stopped. If you desire to log data over an extended period of time, you may want to select a longer Log every time so the log file doesn't grow too large.

You can also produce a bitmap of the window. Click on the **Options** button, then the **Bitmap** button. A bitmap of the window will be saved into the C:/program files/SIT935pro/enconfls directory.

3 SMART SYSTEM Graphics screen

Figure 4 SMART SYSTEM Graphics Screen



The SMART SYSTEM Graphics Screen allows you to observe the changes in various readings while the boiler operates (see FIG. 4). By default, the Outlet Temperature, Inlet Temperature, System Temperature (if connected), Aux Sensor Temperature (if connected), Outdoor Temperature (if connected), 0-10Vdc input voltage, Space Heating setpoint, Aux setpoint, and fan speed are plotted. In addition, the status of the Gas Valve Output, Flame Current, and Pump Outputs are indicated by horizontal lines. When these readings are off, the line is thin; when on, the line is wide. Any of these readings can be removed from the graph by deselecting them at the bottom of the window. The current values of these readings are also displayed at the bottom of the window as depicted in FIG. 4.

The time scale and vertical (Y) scale can be changed by clicking on the **Options** button to get the Options window, and then the **Up** or **Down** buttons for the desired scale. Press the **Ok** button to close the Options window. The background color of the graphics screen can be changed by pressing the **Display** button on the Options window.

As with the SMART SYSTEM Status Screen, a log file can be generated to record the performance of the Knight boiler. Click on the **Options** button to open the Options window. Click on the **LogFile** button to create a file name and define the folder in which to put it in. Once a Log File is defined, click on the **Log** button to start logging the readings. The **Log** button will turn green to indicate that the program is logging, and the log file size will appear at the top of the Graphic Screen window. Note that the file size will increase as more readings are logged. Click on the **Log** button again to stop logging of the readings. The **Log** button will turn gray again to indicate that logging has stopped.

A bitmap can also be generated of the SMART SYSTEM Graphics Screen. Click on the **Options** button, and then the **Bitmap** button. A bitmap of the window will be saved into the C:/program files/SIT935pro/enconfls directory.

4 SMART SYSTEM Fault history screen

Figure 5_Fault History Screen

Encon Fault History

Control	BIC935	FLAA-P050901	
Parameters	B935-A02		Power on hours
Serial number	0528H1355		Hours SH < 50 %
Production date. (yymmdd)	050825		0 > 50%
Last service date. (yymmdd)	050902		Hours DHW
			Successful ignitions ...
			Failed ignitions

Code	total	
Flame out of sequence	0	0
MRHL	0	0
Air Sw stuck on	0	0
Fan speed Low	0	0
Fan speed High	0	0
Ignition failure	0	0
Flame failure	0	0
Air Switch	0	0
Outlet Sensor short	0	0
Outlet Sensor open	0	0
Inlet Sensor short	0	0
Inlet Sensor open	0	0
Flue Sensor short	0	0
Flue Sensor open	0	0
Aux Sensor short	0	0
Aux Sensor open	0	0
System Sensor short	0	0
System Sensor open	0	0

Last 10 faults	
1 -	No Error
2 -	No Error
3 -	No Error
4 -	No Error
5 -	No Error
6 -	No Error
7 -	No Error
8 -	No Error
9 -	No Error
10 -	No Error

Code		
WD	0	
GI1	0	
GI2	0	
APS	0	
Pro	0	
Fai	0	
Crc	0	
So4	0	
So3	0	
So2	0	
So1	0	

Last 10 blockings	
1 -	None
2 -	None
3 -	None
4 -	None
5 -	None
6 -	None
7 -	None
8 -	None
9 -	None
10 -	None

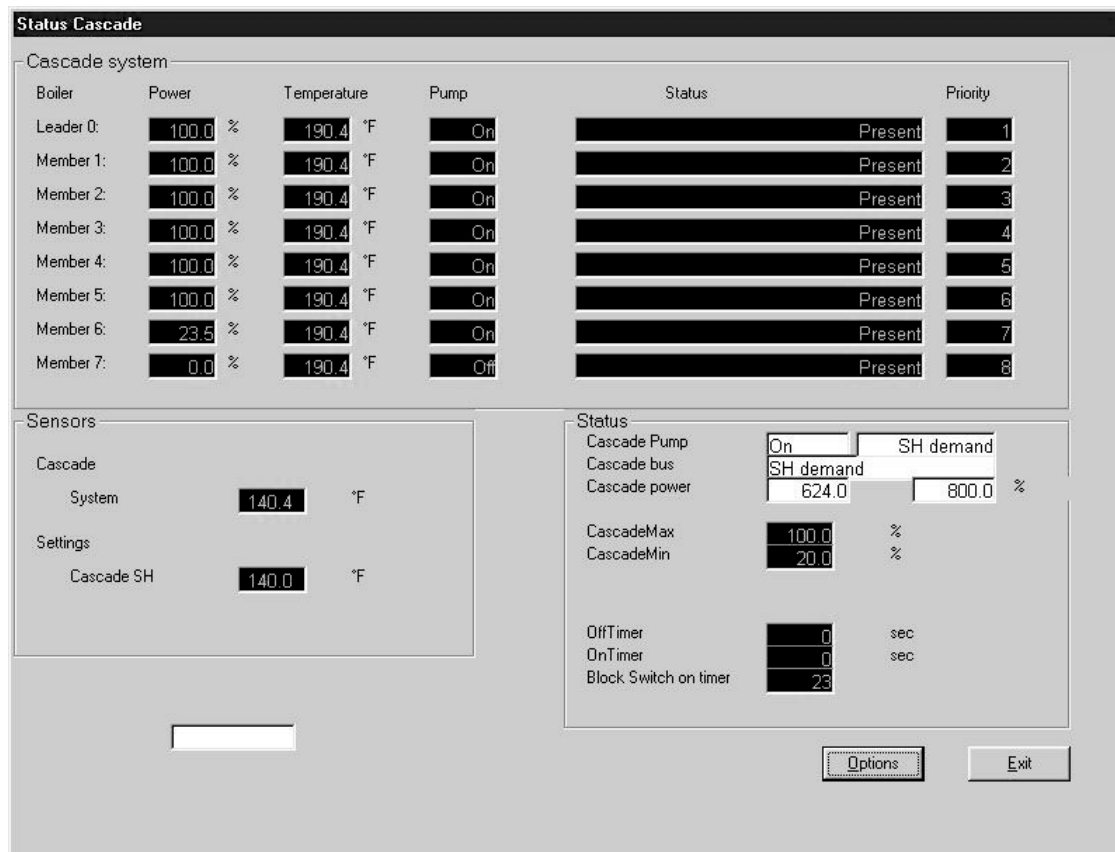
Bitmap
Print
Erase table
Read file
Save file
Exit

The Fault History Screen provides historical data about the operation of the SMART SYSTEM. Click on the **Fault history** button along the top of the Main Screen window (FIG. 1), and then click on **Read from Control** in the pull-down menu. After uploading data from the SMART SYSTEM, a window will appear with the status of numerous counters and lists of the most recent events (see FIG. 5 above). Included are details of the control board serial number, software version, default parameters, production date, and last service date. The number of times various faults have occurred is also shown. The last 10 faults are listed, as well as the last 10 blockings (a blocking is an event that causes the burner to shut off). In addition, the number of hours the control has operated in various states is shown, as well as the number of successful and failed ignition attempts. Finally, a count of internal checks is shown.

Some of this information may be needed by a service technician to diagnose a problem, so provision is made to create a file in which to save this data. Click on **Save file**, and define a file name and the folder in which to save it in. A bitmap can also be saved by clicking on the **Bitmap** button at the bottom of the Fault History Screen (FIG. 5).

5 SMART SYSTEM Cascade screen

Figure 6_Cascade Screen



The Cascade Screen provides the status of the cascade system. The PC must be connected to the Leader (address 0) boiler. Click on the **Cascade** button along the top of the Main Screen window (FIG. 1).

The Cascade System area shows the power demand and setpoint, the boiler pump status, the boiler status, and the priority of each boiler in the cascade. If a system sensor is connected to the Leader boiler (recommended), the cascade control will send fixed setpoints of 190°F and power (% modulation) commands to all the boilers as required to maintain the system temperature at the setpoint. If a system sensor is not connected (NOT recommended), the Leader boiler will send the Cascade SH (Space Heating) setpoint and on/off commands to all of the boilers. The priority tells the order in which the boilers will be fired. This order changes every hour during the first day of operation, and every day thereafter.

The Sensors area displays the system sensor temperature, and the SH setpoint (see FIG. 6).

The Status area displays several important parameters. The Cascade Pump gives the status of the system pump output, and the type of heat demand (Space Heating or DHW). The Cascade power shows the power target for the cascade, and the total power available. This target power may not be the same as the total power shown in the Cascade System area, due to the various time delays described below. The Cascade Max and Cascade Min values show the maximum and minimum power available from each boiler. The Off Timer and On Timer are used to force each boiler to have a minimum off and on time, to prevent short cycling. The Block Switch on the timer is started whenever a boiler is commanded to start, and the next boiler is prevented from starting until this timer times out. This allows time for the system sensor to read the temperature change resulting from firing the last boiler, before starting the next boiler.

By clicking on the **Options** button, a log file can be defined, and logging can be started and stopped in the same way as with the Status and Graphics Screens previously described. A bitmap of the current screen can also be saved if desired.

6 Parameters

Parameter information screens

By accessing the Parameter Information Screens, the installer can view all of the SMART SYSTEM parameters. The installer can also change certain specific parameters to fine tune the operation of the boiler to the installation.

To access the parameter list, click on the **Parameters** button along the top of the Main Screen window (FIG. 7). Next click on **Retrieve Parameters from Controller** in the pull down menu (see FIG. 7). This will upload the current parameters in the SMART SYSTEM to the PC.

Once an adjustment has been made to a parameter, it must be programmed into the SMART SYSTEM. On the Parameter pull down menu, click on the **Program Parameters into Control** button. This will bring up another pull down menu. If a parameter was changed in just one set, select the set from the menu and click on it. If changes were made in multiple sets, select the **Store Parameter Set 0-4** from the menu and click on it. This will program the new parameters into the SMART SYSTEM.

While the programming is taking place, the SMART SYSTEM will go into a lockout mode. It will require that the **Enter/Reset** button on the display be pressed after the programming has been completed before the unit will be allowed to operate.

Figure 7_Parameters Pull-Down Menu Screen



Adjustable parameters are located in:

Set 1: System Setup

Set 2: Functional Data

Set 4: Menu Values

While many parameters are viewable in each set, only select parameters are adjustable. To make an adjustment to a parameter, select the parameter to be changed from the appropriate set. Click on the box next to the parameter and type in the value for the parameter.

6 Parameters *(continued)*

Changeable parameters

The following is a brief discussion of the changeable parameters, their default settings, the range of adjustment, and their location. The title for the parameters may differ slightly from the PC to the boiler display. To prevent confusion, the boiler display version will be listed in parenthesis.

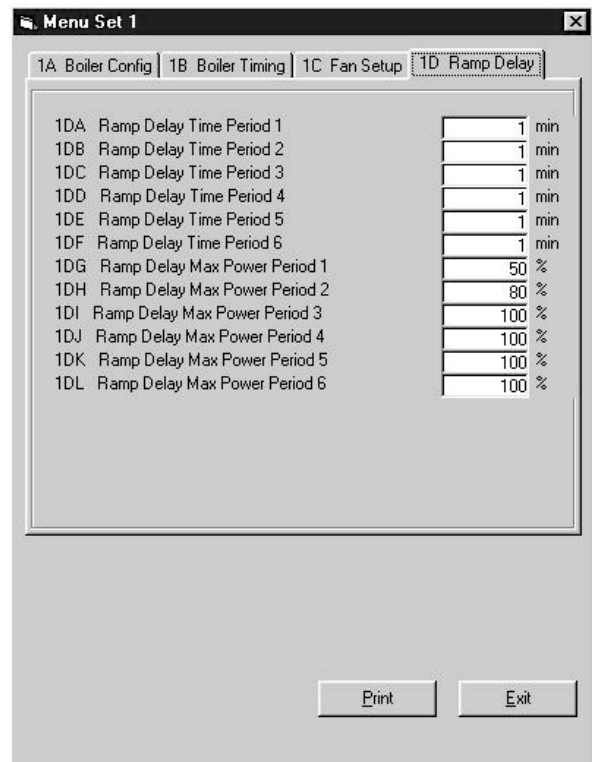
Set 1: System setup

Set 1 is accessed by clicking on **Parameters** at the top of the Main Screen window (FIG. 7), then on Set 1: Control Setup on the pull-down menu.

Ramp delay settings

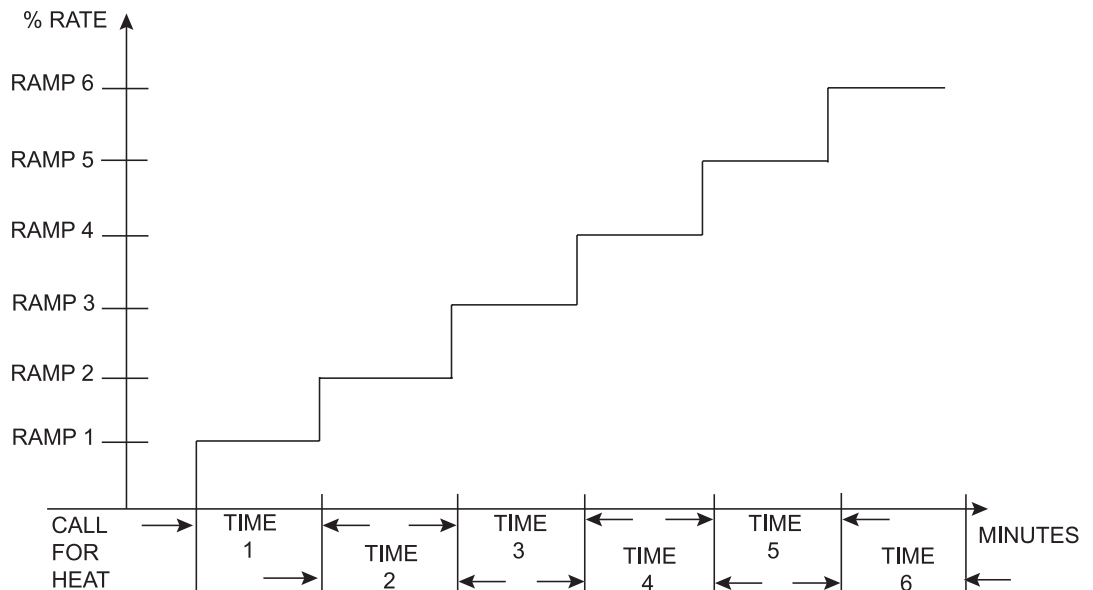
When active, the ramp delay limits the boiler firing rate when a SH cycle has started. There are 6 limiting steps used to limit temperature overshoot and short cycles (see FIG. 8). This feature can be turned on or off depending on the installation. The default condition for this feature is disabled. It should only be needed when the flow through the heat exchanger is very low, or the flow in the primary loop can be less than the flow in the secondary loop. The time for each of the 6 ramp delays as well as the power level for each of the 6 ramp delays are adjustable. The time range for each ramp delay is adjustable from 1 minute to 40 minutes with the total of all 6 ramp delays not to exceed 109 minutes. The default time for each ramp delay is 1 minute. This process can also work in reverse when the boiler shuts off. After shutting off, the max firing rate will be limited to the ramp 6 limit for the period 6 time delay, then to the ramp 5 limit for the period 5 time delay, and so forth. This step down feature overrides the step up feature until the ramp up limit becomes higher than the ramp down limit. To access the Ramp Delay settings, click on the tab labeled 1D Ramp Delay (see FIG. 8).

Figure 8_Parameter Set 1D



The power range for each ramp delay is adjustable from 0 to 100. The defaults for each ramp delay is ramp delay 1= 50%, ramp delay 2=80%, ramp delay 3=100%, ramp delay 4=100%, ramp delay 5=100%, ramp delay 6=100% (FIG. 9). The locations for these parameters are 1DG through 1DL. See parameter 4FE (page 17 of this manual) to enable or disable the ramp delay feature.

Figure 9_Ramp Delay Interval



6 Parameters

Set 2: Functional Data

Set 2 is accessed by clicking on **Parameters** at the top of the Main Screen window, then clicking on **Set 2: Functional Data** on the pull-down menu (FIG. 7, page 10).

Building Management System (BMS) control

Parameters **2BJ** through **2BO** sets the configuration for the control when a 0-10Vdc BMS has been connected to the unit and has been selected in parameter **4CA** as the control input. If BMS has been selected as the control input, then parameter **4CB** selects how the control responds to the 0-10Vdc signal. This can be based on either temperature or power level. Parameters **2BJ** and **2BK** will set the temperature range if temperature has been selected. Parameters **2BL** through **2BO** will set the power levels if power control has been selected. To access the BMS parameters, click on the tab labeled **2B General Settings** (see FIG. 10 below).

BMS setpoint corresponding with 0V

If temperature has been selected, the control must identify the minimum temperature 0V relates to. This can be changed by accessing parameter **2BJ**. The temperature range for this parameter is 32°F-190°F. The default value is 70°F.

BMS setpoint corresponding with 10V

If temperature has been selected, the control must identify the maximum temperature 10Vdc relates to. This can be changed by accessing parameter **2BK**. The temperature range for this parameter is 32°F-190°F. The default value is 180°F.

BMS power at min voltage (2BN)

If power has been selected, the control must identify the minimum power level to be used. This can be changed by accessing parameter **2BL**. The range for this parameter is 20% to 100%. The default value is 20%.

BMS power at max voltage (2BO)

If power has been selected, the control must identify the maximum power level to be used. This can be changed by accessing parameter **2BM**. The range for this parameter is 20% to 100%. The default value is 100%.

BMS voltage at min power (2BL)

If power has been selected, the control must identify the lowest voltage signal to be used. The control will relate this signal to what the minimum power level will be. This can be changed by accessing parameter **2BN**. The range for this parameter is 0 to 10. The default value is 1.

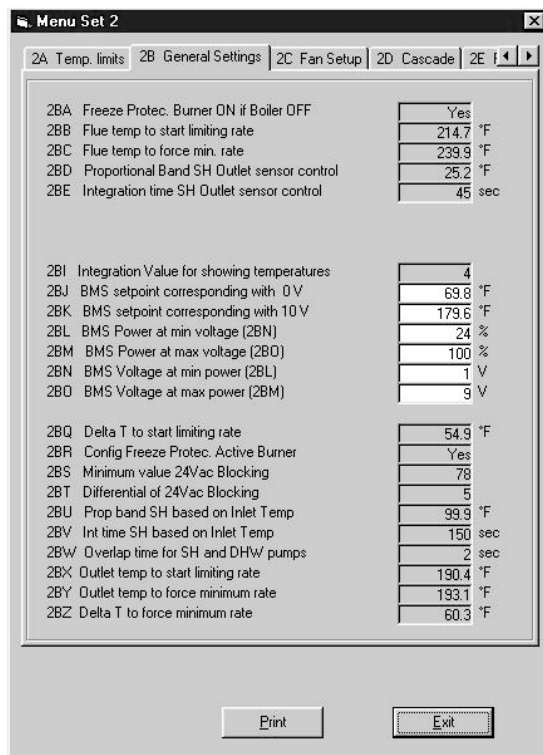
BMS voltage at max power (2BM)

If power has been selected, the control must identify the highest voltage signal that will be used. The control will relate this signal to what the maximum power level will be. This can be changed by accessing parameter **2BO**. The range for this parameter is 0 to 10. The default value is 9.

Special pump delay functions

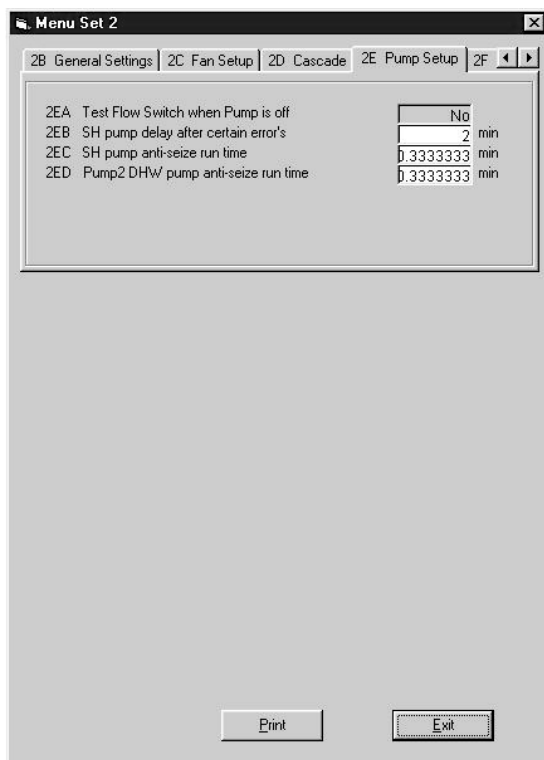
The parameters for special pump delay functions are accessed by clicking on the tab labeled **2E Pump Setup** (see FIG. 11, page 13).

Figure 10_Parameter Set 2B



6 Parameters *(continued)*

Figure 11_Parameter Set 2E



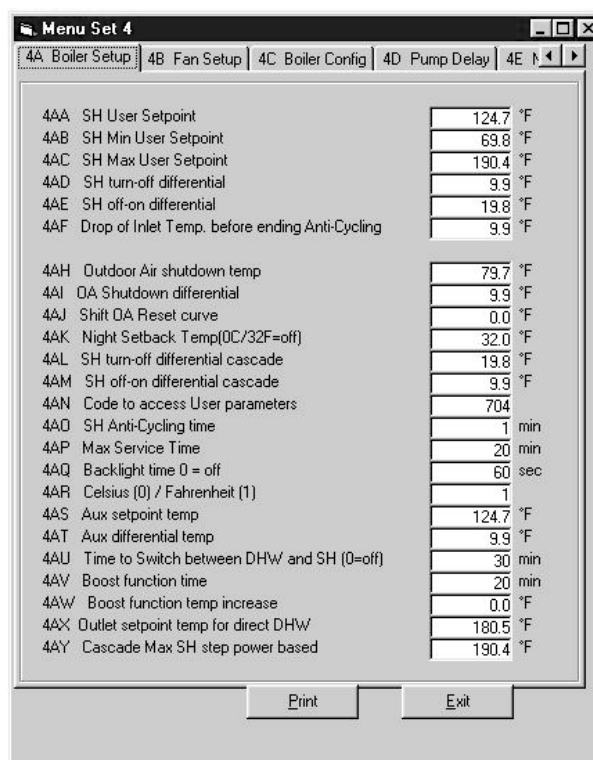
Parameter **2EB** sets the pump delay time for the boiler pump after an over-temperature condition. This time is adjustable from 0 minutes to 40 minutes. The default time is 2 minutes.

To prevent jamming, if the boiler pump or DHW pump have not been active in a 24 hour period, the SMART SYSTEM will activate the appropriate pump for a programmed time. The boiler pump time can be changed by accessing parameter **2EC**. This time is adjustable from 0 minutes to 40 minutes. The default time is 20 seconds. The DHW pump time can be changed by accessing parameter **2ED**. This time is adjustable from 0 minutes to 40 minutes. The default time is 20 seconds.

Set 4: Menu values

Set 4 contains parameters that can be accessed from the boiler display. The parameters in this set control the basic operation of the boiler. To access these parameters, click on **Parameters** at the top of the Main Screen window (FIG. 7, page 10), then click on **Set 4: Menu Values** on the pull-down menu (FIG. 12).

Figure 12_Parameter Set 4A



Space Heating (SH) user setpoint (SH setpoint)

The SH User Setpoint sets the water temperature setpoint for fixed operation or the maximum temperature setpoint when the outdoor air sensor is used. This parameter can be changed by accessing parameter **4AA**. The temperature range of this parameter is 50°F to 190°F. The default value is 125°F.

SH min user setpoint (minimum SH setpoint)

The SH Minimum User Setpoint sets the minimum water temperature setpoint that can be used for space heating operation. The user or installer will not be able to program the control with a lower SH setpoint. This parameter can be changed by accessing parameter **4AB**. The temperature range of this parameter is 0°F to 190°F. The default value is 70°F.

SH max user setpoint (maximum SH setpoint)

The SH Maximum User Setpoint sets the maximum water temperature setpoint that can be used for space heating. The user or installer will not be able to program the control with a higher SH setpoint. This parameter can be changed by accessing parameter **4AC**. The temperature range of this parameter is 0°F to 190°F. The default value is 190°F.

6 Parameters

SH turn-off differential (Offset SH)

The SH Turn-off Differential sets how many degrees above setpoint the temperature has to go before the boiler will shut off. This parameter can be changed by accessing parameter **4AD**. The temperature range of this parameter is 0°F to 86°F. The default value is 10°F.

SH off-on differential (Differential SH)

The SH Off-on Differential sets how many degrees below the turn-off temperature the temperature has to go before the boiler will turn on. This parameter can be changed by accessing parameter **4AE**. The temperature range of this parameter is 0°F to 86°F. The default value is 20°F.

Drop of inlet temp before ending anti-cycling (Return Temperature Differential for Ending Anti-cycling)

The control will bypass the anti-cycling time if the inlet water temperature drops too much. The control will use the inlet water temperature when it shuts off as the starting point. If the temperature drops this amount below the starting temperature, the control will abort anti-cycling and allow the boiler to fire. This parameter can be changed by accessing parameter **4AF**. The temperature range of this parameter is 0°F to 86°F. The default value is 10°F.

Outdoor air shutdown temp (Outdoor Air Shutdown)

When the outdoor air temperature rises above this point, the control will inhibit all SH demands (DHW demands will still be active). This parameter can be changed by accessing parameter **4AH**. The temperature range of this parameter is 0°F to 120°F. The default value is 80°F.

OA shutdown differential (Outdoor Air Shutdown Differential)

This is the number of degrees below parameter **4AH** the outdoor air temperature must go before the boiler will again respond to an SH demand. This parameter can be changed by accessing parameter **4AI**. The temperature range of this parameter is 0°F to 90°F. The default value is 10°F.

Shift OA reset curve (Shift Air Reset)

The Shift Heat Curve shifts the actual setpoint above or below the calculated setpoint by the number of degrees in this parameter. This parameter can be changed by accessing parameter **4AJ**. The temperature range of this parameter is -27°F to 27°F. The default value is 0°F. This feature will be active if this parameter is set to anything other than 0°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 setpoint for space heating. This parameter can be changed by accessing parameter **4AK**. The temperature range for this parameter is 32°F to 140°F. With a setting of 32°F the feature is turned off. The default value will be 32°F.

Code to access user parameters (User Code)

This code allows the user to access and change a limited number of control parameters via the display. To change the code, parameter **4AN** must be accessed. The default code is 0704 (July 4th).

SH anti-cycling time (Anti-Cycling Time)

Once a SH demand has been satisfied, a set amount of time must elapse before the control will respond to a new SH demand. This helps prevent short cycling of the boiler. The control will inhibit the new heat demand and “Anti-cycling” will be shown on the display, until either this time has elapsed or the water temperature drops below parameter **4AF**. This parameter can be changed by accessing parameter **4AO**. The time range for this parameter is 0 minutes to 40 minutes. The default value is 1 minute.

Max service time (Service Mode Delay)

By pressing the pin button on the front of the display for 5 seconds, the control will be placed in service mode. This will override all other heat demands. The service mode allows the installer to set the unit to a fixed firing rate for the purpose of combustion analysis. The delay sets the length of time the boiler will stay in the service mode if no keys have been pressed before going back to its original state. This parameter can be changed by accessing parameter **4AP**. The time range of this parameter is 0 minutes to 40 minutes. The default value is 20 minutes.

Backlight time

This feature sets the amount of time the backlight will stay on after a button has been pressed on the display. This parameter can be changed by accessing parameter **4AQ**. The time range of this parameter is 0 seconds to 255 seconds. A setting of 0 will turn the backlight feature off and a setting of 255 will leave the backlight on continuously. The default time is 60 seconds.

6 Parameters *(continued)*

Celsius/Fahrenheit (Unit °C or °F)

The control can be configured to display temperatures in either °C or °F. This parameter can be changed by accessing parameter **4AR**. For °C set the parameter to 0. For °F set the parameter to 1. The default is °F.

Time to switch between DHW and SH (SH/DHW Switching Time)

This feature sets the length of time the control will stay in DHW mode when a 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 to DHW mode. This will continue back and forth until one of the demands has been satisfied. This parameter can be changed by accessing parameter **4AU**. The time range of this parameter is 10 minutes to 240 minutes. The default value is 30 minutes.

Boost function time (Boost Time)

This function will only work if the outdoor air sensor is connected. The Boost Function Time sets the amount of time that must elapse during an SH demand before the water temperature setpoint will be increased. This parameter can be changed by accessing parameter **4AV**. The time range for this parameter is 1 minute to 60 minutes. The default value is 20 minutes.

Boost function temp increase (Boost Temperature)

This function will only work if the outdoor air sensor is connected. If a SH demand lasts longer than the programmed time setting in parameter **4AV**, and there have been no DHW demands, the control will increase the water temperature setpoint by the amount in this parameter. If the SH demand continues through another time period, the setpoint will be increased again. This will continue until either the SH demand ends, a maximum of 20 increases has occurred, or the maximum user setpoint has been reached. Once the SH demand has been satisfied the setpoint will revert back to its calculated setting. The boost temperature can be changed by accessing parameter **4AW**. The temperature range of this parameter is 0°F to 45°F. The default value is 0°F. This feature will be active if this parameter is set to anything other than 0°F.

Outlet setpoint temp for direct DHW (DHW Boiler Setpoint)

When a DHW call for heat becomes active, the control will control the firing rate of the boiler in order to maintain the outlet water temperature at this setpoint. This parameter can be changed by accessing parameter **4AX**. The temperature range of this parameter is 50°F to 190°F. The default value is 180°F.

On the tabs at the top of the window (FIG. 13), click on the tab labeled **4C Boiler Config** to set the parameters that enable BMS operation and determine the controlling sensor (see FIG. 13 below).

Figure 13 Parameter Set 4C

Parameter	Description	Value
4CA	Config SH Control (2=Cas/4=BMS/6=Rem On/Off)	6
4CB	BMS (2=Temp/ Other=Power)	0
4CC	Config Cascade (0=Leader/1-7=Member)	1
4CD	Priority Change Cascade (Don't Change)	1
4CE	Boiler Status (0 = Boiler Off)	1
4CH	Controlling sensor (2=outlet 4=inlet)	2
4CI	Inlet control time delay	3 min

Buttons: Print, Exit

Config SH control (SH Control)

The Config SH Control parameter selects the method used to control the modulation of the boiler. This parameter can be changed by accessing parameter **4CA**. The allowable values are 2 for cascade control, 4 for 0-10Vdc BMS control, or 6 for operation based on user setpoint and the temperature of the selected controlling sensor. If 2 is selected for cascade control, additional parameters will have to be adjusted. If 4 is selected for 0-10Vdc BMS control, additional parameters may need to be adjusted.

BMS

If BMS has been selected in parameter **4CA**, the control must know how to use the 0-10Vdc signal. This can be either temperature based or power based. This parameter can be changed by accessing parameter **4CB**. The allowable values for this parameter are "0" for power or "2" for temperature. The default value is 0. Parameters **2BJ** through **2BO** may need to be adjusted.

Cascade

If Cascade has been selected in parameter **4CA**, each boiler in the cascade must be given a unique address. This address can

6 Parameters

be changed by accessing parameter 4CC. The Leader boiler (to which the thermostat/zone control, system sensor, and system pump (if controlled by the boiler) are connected) must be set to address 0. All the Member boilers must be given an address from 1 to 7. The range of this parameter is 0 to 7. The default value is 1.

Cascade Max SH step power based (SH setpoint)

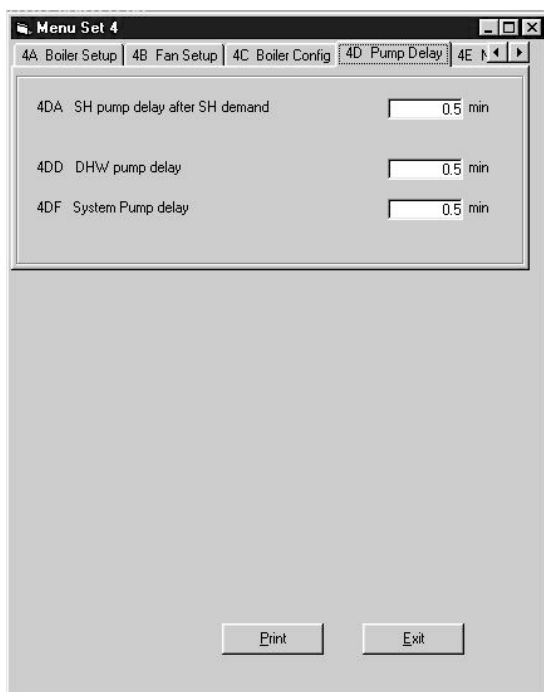
When the control is programmed as a Cascade Leader (address 0), the cascade control will modulate the boilers in order to maintain the system sensor temperature at this setpoint. This parameter can be changed by accessing parameter 4AY. The temperature range of this parameter is 32°F to 212°F. The default value is 125°F.

Controlling sensor

This parameter selects which sensor the control will use to regulate the boiler firing rate. This parameter is adjustable by accessing parameter 4CH. The selections are “2” for outlet sensor, which will regulate the firing rate based on the outlet water temperature from the boiler, or “4” for inlet sensor which will regulate the firing rate based on the inlet water temperature to the boiler. If the outlet sensor is selected, and the optional system sensor has been connected, the control will regulate the firing rate based on system sensor temperature. The default sensor is the outlet sensor. The inlet sensor may not be used if the control configuration is set to cascade.

On the tabs at the top of the window, click on the tab labeled **4D Pump Delay** to set the delay time for the boiler, system, and DHW pumps (see FIG. 14 below).

Figure 14_Parameter Set 4D



SH pump delay after SH demand (Pump Delay SH Pump)

This feature sets the length of time the boiler pump will run after a SH demand has been satisfied. This parameter is adjustable by accessing parameter 4DA.

The time range for this parameter is 0 minutes to 40 minutes. The default time is 30 seconds.

DHW pump delay (Pump Delay DHW Pump)

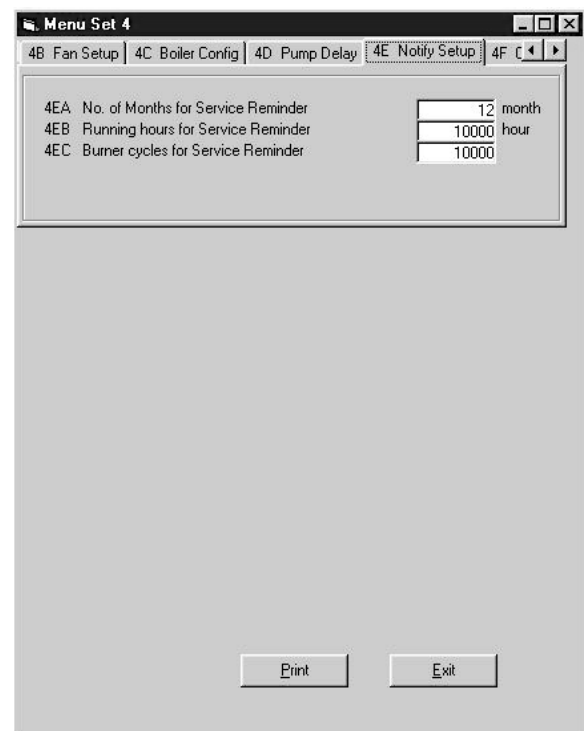
This feature sets the length of time that the DHW pump (if connected) will run after a DHW demand has been satisfied. This parameter is adjustable by accessing parameter 4DB. The time range for this parameter is 0 minutes to 40 minutes. The default time is 30 seconds.

System pump delay (Pump Delay System Pump)

This feature sets the length of time the system pump (if connected) will run after a SH demand has been satisfied. This parameter is adjustable by accessing parameter 4DC. The time range for this parameter is 0 minutes to 40 minutes. The default time is 30 seconds.

To set the parameters for Service Notification, click on the tab labeled **4E Notify Setup** (see FIG. 15 below).

Figure 15_Parameter Set 4E



6 Parameters *(continued)*

No. of months for service reminder (Service Notification in Months)

When the boiler control determines that a scheduled service is due based on days of installation, the boiler display will alternate the standard boiler display text with the message SERVICE DUE every 5 seconds. This parameter is adjustable by accessing parameter 4EA. The time range for this parameter is 0 months to 36 months. The default time is 12 months.

Running hours for service reminder (Service Notification Running Hours)

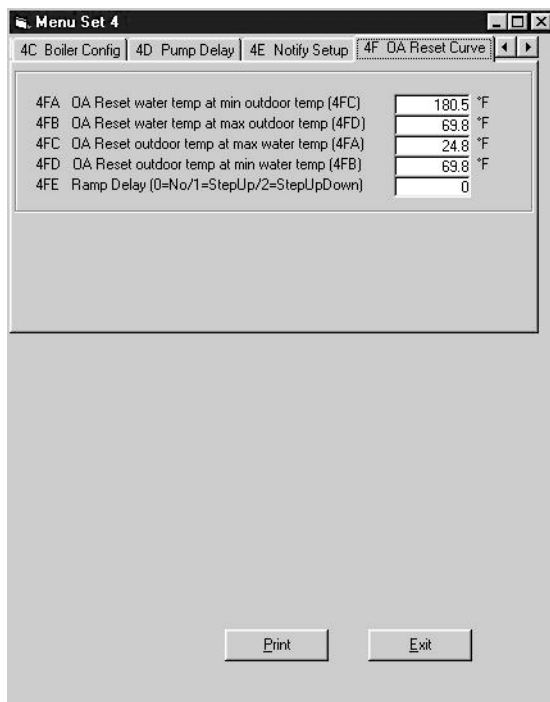
When the boiler control determines that a scheduled service is due based on the hours of actual operation, the boiler display will alternate the standard boiler display text with the message SERVICE DUE every 5 seconds. This parameter is adjustable by accessing parameter 4EB. The time range for this parameter is 0 hours to 100,000 hours. The default time is 10,000 hours.

Burner cycles for service reminder (Service Notification Boiler Cycles)

When the boiler control determines that a scheduled service is due based on the number of boiler cycles, the boiler display will alternate the standard boiler display text with the message SERVICE DUE every 5 seconds. This parameter is adjustable by accessing parameter 4EC. The range for this parameter is 0 cycles to 100,000 cycles. The default is 10,000 cycles.

To adjust the Outdoor Air Reset curve, click on the tab labeled 4F OA Reset Curve (see FIG. 16 below).

Figure 16_Parameter Set 4F



OA reset water temp at min outdoor temp (4FC) (Maximum SH Setpoint)

When the outdoor air temperature drops to or below its minimum setting (4FC), the water temperature setpoint will be at this value. However, if the SH user setpoint (4AA) is lower, it will override this setting. This parameter can be changed by accessing parameter 4FA. The temperature range of this parameter is 0°F to 190°F. The default value is 180°F (FIG. 17).

OA reset water temp at max outdoor temp (4FD) (Minimum SH Setpoint)

When the outdoor air temperature rises to or above its maximum setting (4FD), the water temperature setpoint will be at this value. This parameter can be changed by accessing parameter 4FB. The temperature range of this parameter is 0°F to 190°F. The default value is 70°F (FIG. 17).

OA reset outdoor temp at max water temp (4FA) (Minimum Air Temperature)

When the outdoor air temperature drops to or below this point, the water temperature setpoint will be at its maximum setting (if not overridden by the SH user setpoint). This parameter can be changed by accessing parameter 4FC. The temperature range of this parameter is -30°F to 90°F. The default value is 25°F (FIG. 17).

OA reset outdoor temp at min water temp (4FB) (Maximum Air Temperature)

When the outdoor air temperature rises to or above this point, the water temperature will be at its minimum setpoint. This parameter can be changed by accessing parameter 4FD. The temperature range of this parameter is -30°F to 90°F. The default value is 70°F (FIG. 17).

Ramp delay

This parameter configures the ramp delay feature from off to on. This parameter can be changed by accessing parameter 4FE (FIG. 16). The control range of this parameter is 0 = Off, 1 = Ramp Up Only, and 2 = Ramp Up and Ramp Down. The default is 0.

6 Parameters

Figure 17_Outdoor Air Reset Curve

