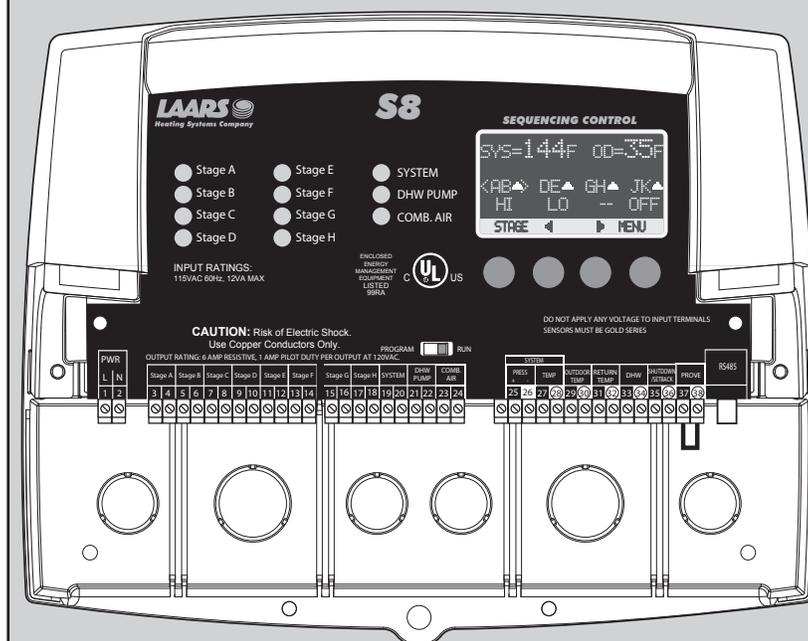# Laars Sequencing Controls

Sequencing
Model S8 and S8Ext

Output panel to Sequence
up to 24 individual
stages with lead-lag and
manual override capabilities

FOR YOUR SAFETY: This product must be installed and serviced by a professional service technician, qualified in hot water heater/boiler controls installation and maintenance. This manual is intended for anyone who will install, operate or maintain the control system. Before you begin installation and operation of this control, it is important that you thoroughly review this manual. Improper installation and operation could result in damage to equipment and possibly even personal injury. Laars Sequencing Controls are not intended for use as operation safety limit controls. Another control, that is intended and certified as a high limit control, must be in the water heater/boiler control circuit.
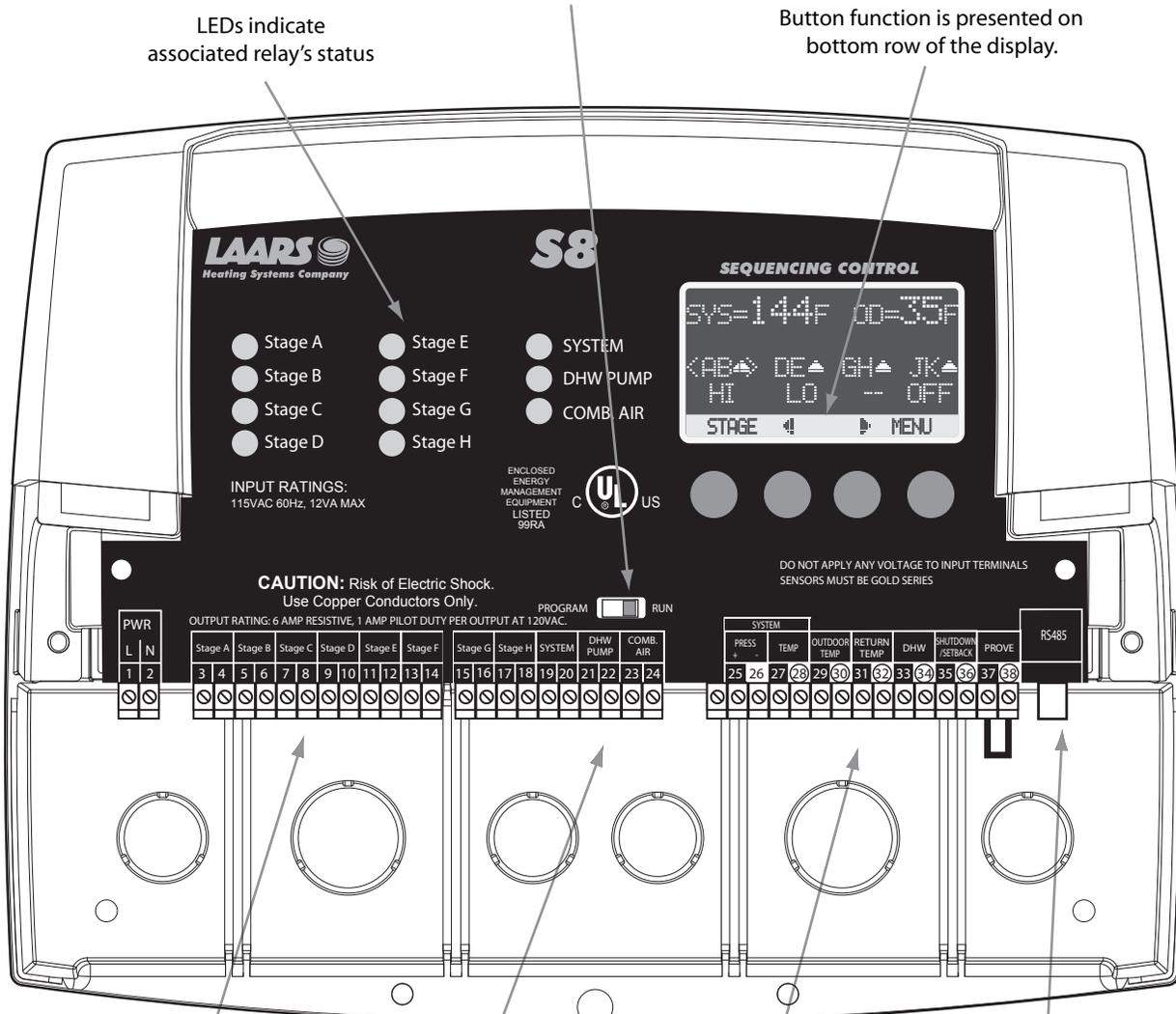
LAARS
Heating Systems Company
A subsidiary of **BRADFORD WHITE**®Corporation

Contents

S8 LAYOUT

Program Switch to restrict access to function changes. This Switch is covered with Enclosure Wiring Cover.

LEDs indicate associated relay's status

Button function is presented on bottom row of the display.

LAARS
Heating Systems Company

S8

SEQUENCING CONTROL

SYS=144F OD=35F

<AB◆ DE▲ GH▲ JK▲
HI LO -- OFF

STAGE ◀ ▶ MENU

Stage A Stage E SYSTEM
Stage B Stage F DHW PUMP
Stage C Stage G COMB. AIR
Stage D Stage H

INPUT RATINGS:
115VAC 60Hz, 12VA MAX

ENCLOSED ENERGY MANAGEMENT EQUIPMENT LISTED 99RA

C (UL) US

DO NOT APPLY ANY VOLTAGE TO INPUT TERMINALS SENSORS MUST BE GOLD SERIES

CAUTION: Risk of Electric Shock.
Use Copper Conductors Only.
OUTPUT RATING: 6 AMP RESISTIVE, 1 AMP PILOT DUTY PER OUTPUT AT 120VAC.

PROGRAM [ ] RUN

PWR		Stage A	Stage B	Stage C	Stage D	Stage E	Stage F		Stage G	Stage H	SYSTEM	DHW PUMP	COMB. AIR		SYSTEM PRESS +	TEMP	OUTDOOR TEMP	RETURN TEMP	DHW	SHUTDOWN /SETBACK	PROVE	RS485
L	N																					
1	2	3 4	5 6	7 8	9 10	11 12	13 14		15 16	17 18	19 20	21 22	23 24		25 26	27 28	29 30	31 32	33 34	35 36	37 38	

Output Relays to manage the stages.

When connecting Temperature Sensors, no Polarity is observed. Prove terminals must be connected for S8 to operate stages.

System Output controls pumps, valves, or other system components. DHW Pump and Comb. Air relays are controlled when configured.

Connect to Extension panels to add additional stages or connect to X-SIG Interface for external 4-20mA set point.

S8 OVERVIEW

SEQUENCES UP TO 8 STAGES WITH PUMPS OR VALVES.
The S8 is the perfect control whenever multiple boiler or chiller stages are required for hydronic heating or cooling applications. The S8 controls the stages and their pumps or valves to maintain a precise system set point.

PID OR OVER-SIZED-SYSTEM (OSS) LOGIC
The S8's control algorithm allows it to look at the rate of change in the system. If the load is changing quickly, the S8 can be set to OSS sequencing where it will react based on load changes. If the system fluctuations are minimal as in heating applications, the S8 will make slow and gradual output adjustments. Therefore, the S8 adapts to specific system requirements and minimizes fluctuations around the set point.

DIGITAL DISPLAY OF ALL SYSTEM SETTINGS
The S8's alphanumeric digital display names each system parameter in simple English and shows its precise value. The easy to follow menu system allows users to quickly make changes to any system setting without having to learn any specialized codes or keyboard commands.

AUTOMATIC ROTATION AMONG STAGES
Rotating the first stage to be activated on a call for output promotes even wear on each unit. The S8 has three modes of rotation: Manual, FOFO, or Time. The Time rotates the lead stage every selected time period from every hour to every 41 days.

OUTDOOR RESET WITH CUSTOMIZABLE CURVE
The S8 has a hydronic outdoor temperature reset function. This allows the S8 to change the set point based on outdoor temperature. Furthermore, a customizable outdoor reset curve has been incorporated for unique applications where standard reset ratios will not satisfy. In addition, the following settings have been added to help fine tune all reset operation; Offset, Minimum, and Maximum Targets and Night Setback Schedule or Setback using an External Signal.

STANDBY UNIT OPTION
Any of the S8 heating or cooling units can be configured as a Standby with an adjustable Standby delay. Assigning a specific unit to work in standby mode will remove it from the rotation. In this mode, the unit will be used for backup in large demand periods where the primary units will not suffice.

SYSTEM AND COMBUSTION AIR DAMPER OUTPUTS WITH PROVE INPUT
These outputs work with the control logic to operate a primary system pump and a combustion air damper. In addition, a System Prove input can be wired in to check the status of either of the components activated by the outputs before stages can be activated.

NORMAL OR PARALLEL (LO/LO/HI/HI) SEQUENCING
The S8 can sequence heating or cooling units as needed. For heating systems where higher efficiency is achieved using lower firing stages, the S8 offers the Parallel Sequencing option. It will sequence all the low firing stages first before bringing the rest of the stages on. For other types of heating and cooling units, using the Normal Sequencing option will bring the lower operating stage followed by the higher one of the lead unit. Then, will do the same with the lag unit.

MULTIPLE OR SINGLE STAGING
Unlike many boilers/water heaters where, to fire a multi-stage boiler both low and high stage relays must be energized, some of the available cooling units require that the operation of the higher stages turn off the lower operating stages. This can be achieved by selecting Single from the Startup Staging menu.

ADD UP TO 16 STAGES
As a stand-alone, the S8 is designed to control eight stages. However, it has the capability of expanding its control to two extension panels each with eight stages. Thus, the S8 can control a total of up to 24 stages.

MONITOR SYSTEM RETURN TEMPERATURE
Using a smart algorithm, the S8 can monitor boiler return temperature using an optional return sensor mounted on the return line. Then, sequence the boilers to raise above an adjustable Minimum Return.

### DHW PUMP CONTROL WITH MULTIPLE PRIORITY OPTIONS
Having a DHW input either as a dry contact to be used with an external aquastat or as a temperature sensor that can be ordered separately, the S8 can control a DHW pump using its built-in output relay. The user will have different priority options that varies based on the DHW piping design.

UNDERSTANDING OPERATION CONCEPT

The S8 has multiple operating modes that satisfy most hydronic systems. In heating, it can change the System Set Point based on outdoor temperature. Or, it can sequence stages to achieve an adjustable fixed Set Point in either heating or cooling.

In Outdoor Reset, the S8 controls a hot water heating system to provide a building with comfortable and even heat levels. The S8 varies the temperature of the circulating heating water in response to changes in the outdoor temperature. The heating water temperature is controlled through the sequencing of the stages.

The S8 also controls the system circulating pump with an adjustable Outdoor Cutoff. In heating, when the outdoor temperature is above Outdoor Cutoff, the pump is off and no heating water is circulated through the system. When the outdoor temperature drops below the Outdoor Cutoff, the system pump relay is activated and the heating water circulates through the system. The temperature of the heating water is controlled by the Reset Ratio, Water Offset, and changes with Outdoor temperature. In cooling applications, the outdoor cutoff turns off the cooling units and system pump when the outdoor temperature rises above the outdoor cutoff setting.

Reset Ratio Curves

Reset Ratio is Presented as
Outdoor Temp. : Water Temp. Ratio
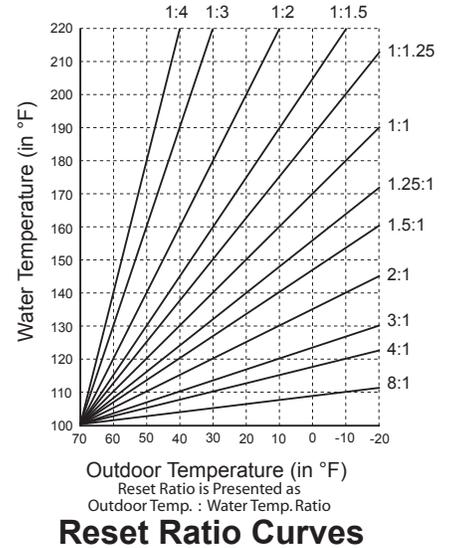
RESET RATIO/OUTDOOR RESET

When a building is being heated, heat escapes through the walls, doors, and windows to the colder outside air. The colder the outside temperature, the more heat escapes. If you can input heat into the building at the same rate that it is lost out of the building, then the building temperatures will remain constant. The Reset Ratio is an adjustment that lets you achieve this equilibrium between heat input and heat loss.

The starting point for most systems is the 1.00 (OD):1.00 (SYS) (Outdoor Temperature : Heating Water Temperature) ratio. This means that for every degree the outdoor temperature drops, the temperature of the heating water will increase one degree. The starting point of the curves is adjustable, but comes factory selected at 70°F Outdoor Temp. and 100°F Water Temp. For example with a 1.00 (OD):1.00 (SYS) ratio, if the outdoor temperature is 50°F, this means the temperature has fallen 20° from the starting point of 70°F. Therefore, the heating water temperature will increase 20° to 120°F.

With a 0° Offset, the ratio curves begin at 100° Water Temperature.

Each building has different heat loss characteristics. A very well insulated building will not lose much heat to the outside air, and may need a Reset Ratio of 2.00 (OD):1.00 (SYS) (Outdoor:Water). This means the outdoor temperature would have to drop 2 degrees to increase the water temperature 1 degree. On the other hand, a poorly insulated building with insufficient radiation may need a Reset Ratio of 1.00 (OD):2.00 (SYS). This means that for each degree the outdoor temperature dropped the water temperature will increase 2 degrees. The S8 has a full range of Reset Ratios to match any buildings heat loss characteristics.

With a -20° Offset, the ratio curves begin at 80° Water Temperature.

A heating curve that relies not only on Outdoor temperature but also on type of radiation will improve heat comfort. The following are suggested initial settings for different types of radiation based on average building insulation and heat loss. The contractor can fine tune these adjustments based on the specific building need.

With a +20° Offset, the ratio curves begin at 120° Water Temperature.

Type of Radiation in Building	Reset Ratio	Offset
Radiators (Steel & Cast Iron)	1.00 (OD) : 1.00 (SYS)	0˚F
Baseboard (Finned copper tube& Cast Iron)	1.00 (OD) : 1.00 (SYS)	0˚F
Radiant (High Mass/Concrete)	4.00 (OD) : 1.00 (SYS)	-10˚F
Radiant (Low Mass/Joists)	2.00 (OD) : 1.00 (SYS)	-10˚F
Fan Coils & Air Handlers	1.00 (OD) : 1.00 (SYS)	20˚F
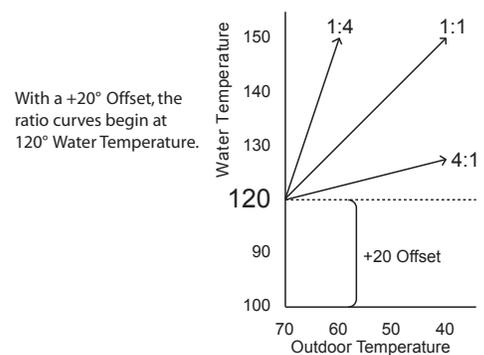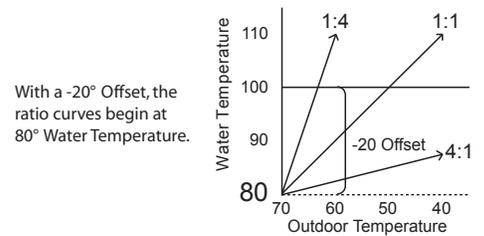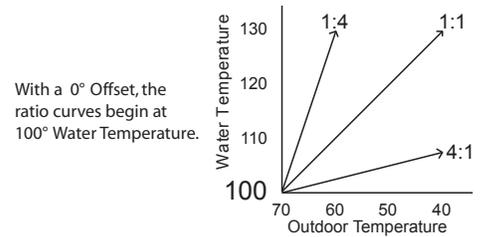
> ⚠ **WARNING**
> **When controlling a non condensing boiler, minimum boiler water temperature must be set to boiler manufacturer specifications. In that case, system temperature must not go below such temperature.**

MAKE SURE YOU HAVE THE RIGHT CONTROL

If you need the S8 to do additional tasks that either are not listed or do not know how to configure them, contact LAARS.

INITIAL SETUP

Setting an Initial Program will ease the configuration of the S8 and will give the opportunity to utilize many of the energy saving features and give more comfortable heat when needed.

The program should consist of the following:

- Selecting the features that your system can utilize
- Installation: Install the Control, switches and sensors
- Setting the System Startup
- Setting the System Settings
- Setting the Stages
- Adjusting Reset Ratio and Water Offset (In Reset Mode Only)

SELECTING THE SYSTEM FEATURES

The S8 has been designed with Hydronic heating and cooling as the primary purpose. With this in mind, many of the S8 features can be utilized to ease, enhance and improve your system performance. Some of these features are listed in this section.

HEATING OR COOLING WITH MULTIPLE OR SINGLE OUTPUT AT A TIME
- The S8 is equipped to control multiple multi-stage boilers with or without pumps or valves for heating application. As well, it can be configured for cooling with multiple stage chillers.
- That, combined with the capability of energizing only a single stage of a multi-stage cooling unit when in high demand, makes the S8 versatile for many industries.

OUTDOOR RESET, SET POINT, OR EXTERNAL 4-20MA SET POINT
- The S8 can control the System Temperature either by adjusting the calculated temperature according to the Outdoor Temperature (Outdoor Reset) or by maintaining an adjustable Set Point. The Outdoor Reset option uses an Outdoor Sensor (supplied with the control) and achieves better fuel savings in addition to better comfort.
- Using an optional X-SIG Interface (CA004200), the S8 can receive an external 4-20mA Set Point through EMS system.

PID OR OSS CONTROL LOGIC
- The S8 PID can be used for applications where system reaction will require a long period to achieve or measure the results. However, OSS, can be used for applications where the load changes frequently and the sequencing must match the load and its immediate change.

NUMBER OF STAGES
- The S8 can be configured to control up to eight stages. It can control up to 24 stages using a maximum of two S8 Extension Panels each with eight stages.

STAGE PUMPS OR VALVES
- The S8 can control muliple stages in addition to unit pumps, valves.

CONTROL DHW PUMP AND COMBUSTION AIR DAMPER
- The control of the DHW is based on either a temperature sensor, can be purchased separately, on the DHW source or using a dry contact from an aquastat. The S8 provides multiple DHW Priority options to choose from based on the DHW piping. The Combustion Air Damper output can control the equipment while utilizing the Prove input to check the status on the Combustion Air Damper End Switch, System Pump Flow switch or any other checking devices before any stage is energized.

MONITOR BOILER RETURN
- The optional return line sensor, can be purchased separately, can be connected in heating applications to monitor and help protect the boilers from thermal shock and condensation caused by cool returns.

AUTOMATIC ROTATION AMONG BOILERS
- Rotating the lead unit to be activated on a call for output promotes even wear on all units. The S8 has three modes of rotation: Manual, First-On-First-Off, or Timed Rotation. This option automatically rotates units every selected time period from one hour to every 41(999 hours) days.

SETBACK OR DAY/NIGHT SCHEDULING
Two Setback modes are available for the S8:
- The Day/Night Scheduling provides an adjustable time-based schedule for the Setback.
- The Setback mode uses an external signal to switch the operation of the S8 in and out of setback mode.

INSTALLATION

Each of the S8 or S8EXT consists of three primary enclosure components.
- **The Enclosure Display Module:** contains the display, buttons, LEDs and electric wiring terminals. It has two screws to hold it to the base. A program configuration switch, used to adjust S8 settings, is placed above the terminals. This switch is enclosed with the enclosure wiring cover for security. Wiring terminals are of the plug-in type to ease installation and removal.
- **The Enclosure Base:** contains the holes to mount and hold the control against the wall or any flat surface. All other enclosure components mount on the base. The bottom section of the Enclosure Base contains the wiring chamber with knockouts on the bottom to easy installation.
- **The Enclosure Wiring Cover:** seals the wires from the external environment. It has two screws to hold it the base and a hole to secure a lock on the wiring enclosure. A plastic web that separates the wiring chamber into high and low volt sections has been provided.

MOUNTING THE ENCLOSURE
- Select a location near the equipment to be controlled.
- The surface should be flat, and be sufficiently wide and strong to hold the S8 or S8EXT.
- Keep the control away from extreme heat, cold, or humidity. Ambient operating temperature is from 20 to 120°F.
- Remove the Enclosure Wiring Cover from the control enclosure by removing the two bottom screws.
- Remove the Enclosure Display Module by removing the middle screws.
- Screw the Enclosure Base to the surface through the upper and lower mounting holes on the back of the enclosure.
- Replace the Enclosure Display Module and replace the middle screws.
- Do not replace the enclosure wiring cover until all wiring is done.
- When purchasing a padlock for the enclosure, the maximum shank diameter should not exceed ¼"

Enclosure Display Module

Enclosure Wiring Cover

Enclosure Base

Hole for optional
Padlock (not supplied)

Mounting Base

Display Mounting Screws   Wiring Cover Mounting Screws
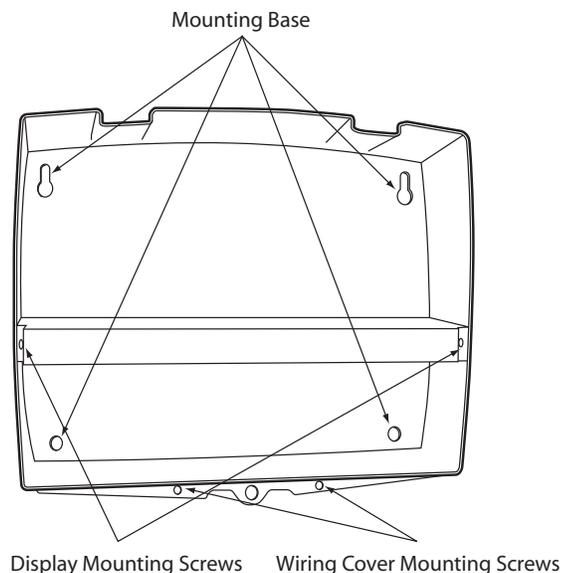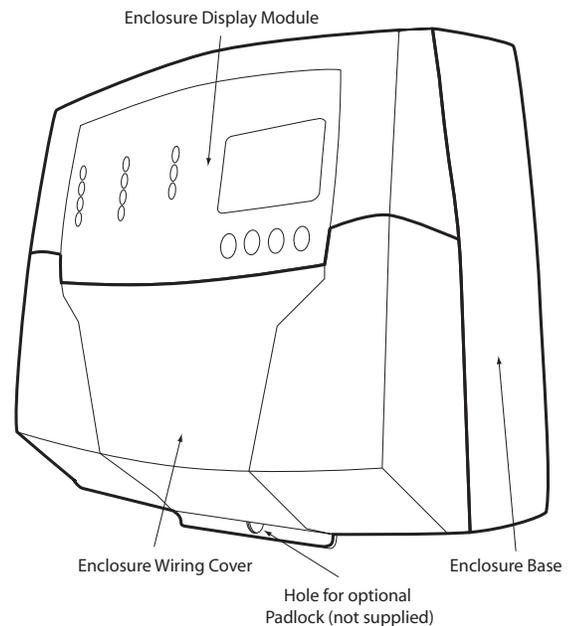
INSTALL THE SENSORS

SYSTEM SENSOR INSTALLATION

LOCATING THE SYSTEM SENSOR
*   Put the System sensor approximately 10' feet past the last heating/cooling unit on the common supply header but before any major takeoffs.
*   The sensor must be located where it sees the output of all the stages. If a unit is piped so that the sensor does not see its output, the S8 will not sequence the units correctly.
*   Only use a Standard Brass Tube sensor (CA002400 or equivalent).
*   The sensor wires can be extended up to 500' using a shielded 2-conductor cable (Belden #8760 or equivalent). Do not ground the shield at the sensor but at the panel using one of the terminals marked with an "O".
*   Do not run sensor wires in conduit with line voltage wiring.

IMMERSION HEATING SYSTEM SENSOR (HSS) INSTALLATION
*   Install a 3/8"ID immersion well (CA002500 or equivalent).
*   Insert the sensor probe of the supplied sensor into the well.

STRAP-ON HEATING SYSTEM SENSOR (HSS) INSTALLATION
*   Strap the sensor to the pipe using metal clamps. Do not over tighten the clamp.
*   Strap pipe insulation around the sensor and pipe.

Immersion Heating System Sensor

Strap-On Heating System Sensor
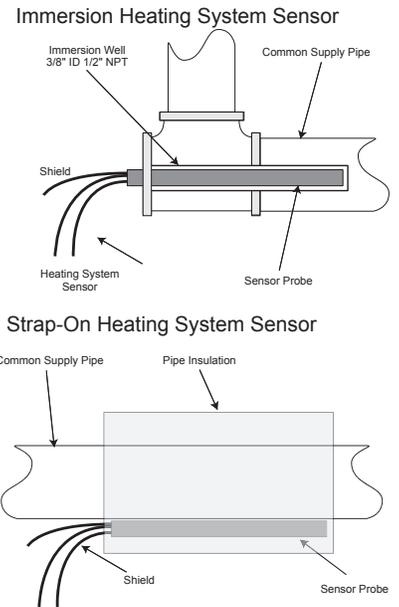
> **⚠ CAUTION**
>
> If the System Sensor can not sense the correct system water temperature being supplied to the building, the S8 will not provide comfortable heat/cool levels. Be sure that it is located on a main supply pipe which can not easily be isolated from the system.

OUTDOOR SENSOR INSTALLATION
*   Only use the Laars sensor included with the unit.
*   Locate the sensor in the shade on the north side of the building. The sensor should never be in direct sunlight.
*   Be sure the location is away from doors, windows, exhaust fans, vents, or other possible heat sources.
*   The sensor should be mounted approximately 10' feet above ground level.
*   Mount the sensor clip base to the outside of the building. Insert the sensor in the middle and snap close the clip on the sensor.
*   The sensor wires can be extended up to 500' using shielded 2-conductor cable. Do not ground the shield at the sensor but at the control using the terminal marked with an "O".
*   Do not run sensor wires in conduit with line voltage wiring.
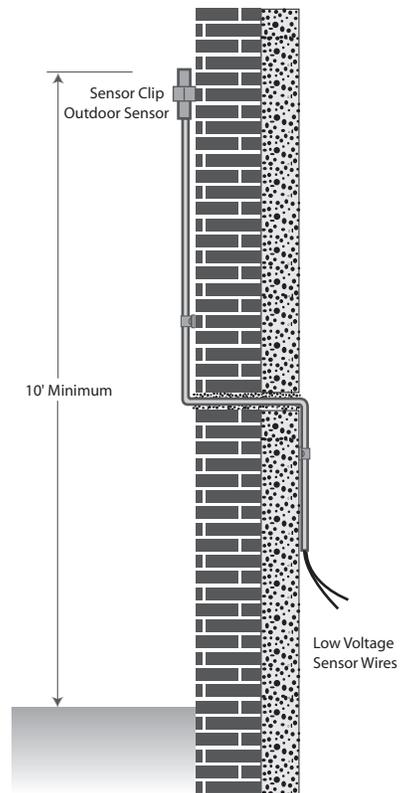
> **⚠ WARNING**
>
> **The S8 is an operating control only. All equipment must have all safety and limit controls required by code. It is the responsibility of the installer to verify that all the safety and limits are working properly before the S8 is installed.**

> **⚠ CAUTION**
>
> **Determining the proper location for the Outdoor Sensor is very important. The S8 will base its operation on the outdoor temperature information it receives from this location. If the sensor is in the sun, or covered with ice, its reading will be different from the actual Outdoor temperature (OD).**

WIRING

WIRING THE POWER (TERMINALS 1, 2)
- Bring the 120VAC 60Hz power wires through the bottom Knockout of the enclosure.
- Class 1 voltages must enter the enclosure through a different opening from any Class 2 voltage wiring.
- Connect the hot line to terminal marked L.
- Connect the neutral line to the terminal marked N.
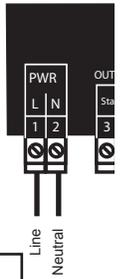
⚠ WARNING
Class 1 voltages must enter the enclosure through a different opening from any Class 2 voltage wiring. Laars recommends installing a surge suppressor on the power source to the S8.

⚠ WARNING
Connect the shield at the control terminal end and cut the shield wire at the sensor end.

WIRING THE SENSORS

SYSTEM TEMPERATURE SENSOR WIRING (TERMINALS 27, 28)
- A S8 must be connected to a temperature sensor located in the common header.
- The S8 is designed to be connected to a temperature sensor (CA002400 or equivalent) for immersion in a 3/8ID well (CA002500 or equivalent). Contact the factory for additional temperature sensor options.
- Temperature sensor wires can be extended up to 500' by splicing shielded 2-conductor cable (Belden #8760 or equivalent).
- Temperature sensors have no polarity. Connect the two wires from the sensor to the S8 terminals marked *SYSTEM TEMP 27, 28*.
- Connect the sensor shield to the circled terminal 28 with one of the sensor wires.
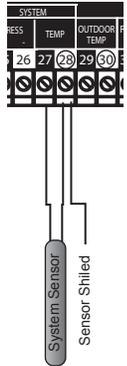
OUTDOOR SENSOR WIRING (TERMINALS 29, 30)
- When Outdoor Reset is selected, the S8 will vary the system Set Point based on outdoor temperature.
- Whether in Set Point or Outdoor Reset modes, the outdoor sensor can be used as an Outdoor Cutoff. In heating, the S8 will disable all Boilers when the outdoor temperature is above the adjustable Outdoor Cutoff temperature. However, in cooling it will disable the units when the outdoor temperature is below the Outdoor Cutoff. This feature will automatically be activated when an outdoor sensor is connected.
- For an outdoor sensor use a Laars outdoor sensor (CA002400 or equivalent).
- The sensor wires can be extended up to 500' using shielded 2-conductor cable (Belden #8760 or equivalent).
- Temperature sensors have no polarity. Connect the wires from the outdoor sensor to the S8 terminals marked *OUTDOOR TEMP - 29, 30*.
- Connect the shield to the circled terminal *30* with one of the sensor wires.
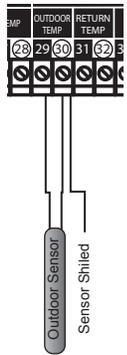
RETURN SENSOR WIRING (TERMINALS 31, 32) OPTIONAL (AVAILABLE IN HEATING ONLY)
- If the Return Sensor is connected, must be purchased separately, the S8 will recognize it and alternate its temperature on the display with the Target temperature. If the Return is below the Minimum Return, the S8 will sequence stages based on the Return Sensor, Minimum Return, Calculated Target, and the actual System Temperature.
- The Return on the S8 is designed to be connected to a temperature sensor that can be purchased separately (CA002400 or equivalent) for immersion in a 3/8ID well (CA002500 or equivalent).
- The sensor wires can be extended up to 500' using shielded 2-conductor cable (Belden #8760 or equivalent).
- Temperature sensors have no polarity. Connect the wires from the outdoor sensor to the S8 terminals marked *OUTDOOR TEMP - 31, 32*.
- Connect the shield to the circled terminal *32* with one of the sensor wires.
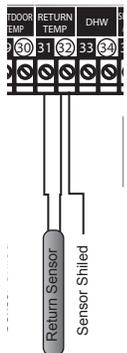
WIRING THE DOMESTIC HOT WATER (DHW) SENSOR (TERMINALS 33, 34)

- DHW can be used to raise system Set Point to 200°F or Maximum Target, whichever is lower. DHW Piping concept must be selected in the Startup Menu to determine the DHW Priority options.
- *DHW* Call terminals can be either a dry contact N.O. or a temperature sensor that can be purchased separately (CA002400 or equivalent) for immersion in a 3/8ID well (CA002500 or equivalent).
- If dry contact, wire an aquastat or other controls to provide closure on the *DHW* terminals.
- The sensor wires can be extended up to 500' using shielded 2-conductor cable (Belden #8760 or equivalent).
- Temperature sensors have no polarity. Connect the wires from the DHW sensor to the S8 terminals marked *DHW - 33, 34*.
- Connect the shield to the circled terminal *34* with one of the sensor wires.

WIRING THE SHUTDOWN (TERMINALS 35, 36)

- This feature will only be available when Day/Night Schedules are selected as the Setback Mode option from the Startup menu.
- This feature can be used whenever it is desirable to turn off the S8 stage outputs from a remote location or another controller (i.e. EMS input).
- When the Shutdown feature is enabled by closing a dry contact, all active stages will immediately turn off. The System and Comb. Air, and unit pumps' or valves' relays will remain energized for the Run-On delay period and then turn off.
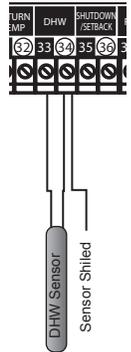- The Shutdown signal must be a dry contact only. No voltage can be placed across the *SHUTDOWN* terminals.
- Bring the two wires from the dry contact to the terminals marked *SHUTDOWN- 35,36*.
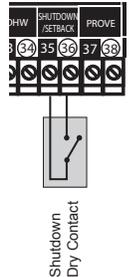
WIRING THE SETBACK (TERMINALS 35, 36)

- This feature can be used whenever it is desirable to switch the S8 to operate in Setback from a remote location (i.e. EMS input or external time clock). It will only be available when External Signal are selected as the Setback Mode option from the Startup menu.
- When the Setback is enabled by closing a dry contact, the Target will change by the Setback value. That is, in Heating, the Target will be reduced by the Setback value. On the other hand, in Cooling, the Setback will be added to the Target Set Point.
- The Setback signal must be a dry contact only. No voltage can be placed across the SETBACK terminals.
- Bring the two wires from the dry contact to the terminals marked *SETBACK- 35,36*.
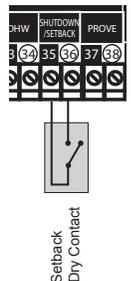
WIRING THE PROVE (TERMINALS 37, 38)

- The Prove feature is provided to check system component operation before energizing the stages. It can be used to check on the Combustion Air Damper by connecting it to the end switch of the damper. In this case, the Comb. Air Output option must be activated from the Startup Menu.
- If the Comb. Air Damper Output option was not activated, the PROVE input can be used to check on the System Output. A typical use of this feature is to check for system pump flow before energizing any stage.
- If the PROVE input is open on a call, the S8 will enable only the System Output. All stage outputs will be off when the PROVE input is open.
- A factory-installed jumper provides the System Prove signal. Do not remove the jumper unless it will be replaced by a System Prove signal.
- Bring the two wires from the dry contact to the terminals marked *PROVE - 37, 38*. No voltage can be placed across the *PROVE* terminals

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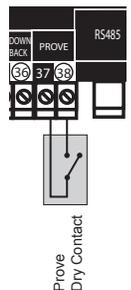
⚠ WARNING

The PROVE input cannot be used as a safety limit. All equipment must have its own certified limit and safety controls as required by local codes. No boiler stage will start unless Prove terminals are shorted. DO NOT remove the PROVE jumper supplied unless replacing it with a Prove signal.

WIRING THE SYSTEM OUTPUT (TERMINALS 19, 20)

System Output Operation in Set Point Mode

- In Heating, the SYS output relay will energize whenever the outdoor temperature drops below the Outdoor Cutoff or whenever a stage output is active. If no outdoor sensor is connected and the last boiler relay has de-energized, the SYS relay will remain energized for a period set by the Run-On.
- No stage outputs will be activated until the Prove input is shorted. If a Prove is not required, the factory-installed jumper should remain connected.

- In Cooling applications, the system relay will energize when the outdoor temperature is above the Outdoor Cutoff setting.
- A typical use of the SYS output is to activate a system pump starter. The pump can run whenever there is a call for heat/cool. When stages are no longer required, the pump will stay active for an adjustable Run-On delay.

System Output Operation in Reset Mode
- The SYS output relay will energize whenever the outdoor temperature is below the Outdoor Cutoff.
- The SYS will remain constantly energized while the outdoor temperature is below the Outdoor Cutoff.
- When the outdoor temperature rises 2°F above the Outdoor Cutoff, the SYS output will remain energized for the period set by the System Run-On.
- The SYS output has one Normally Open (N.O.) relay that acts as a dry contact only. It does not source any power.
- Class 1 voltages must enter the enclosure through a different opening from any Class 2 voltage wiring.

WIRING THE DHW PUMP (TERMINALS 21, 22)

The S8 can control the DHW Pump when the DHW Pump Output option is activated in the Startup Menu..
- The S8 will energize the DHW Pump whenever there is a call for DHW using a dry contact or when the DHW temp falls below the DHW Set Point and DHW Differential.
- The DHW Pump output is Normally Open (N.O.) dry contact only. It does not source any power.
- Class 1 voltages must enter the enclosure through a different opening from any Class 2 voltage wiring.
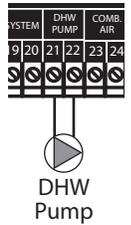
WIRING THE COMBUSTION AIR DAMPER (TERMINALS 23, 24)

The S8 can control the Combustion Air Damper when the Comb. Air Output option is activated in the Startup Menu.
- The S8 will energize the Combustion Air Damper relay whenever there is a call to energize any of the unit stages.
- The Comb. Air output has one Normally Open (N.O.) dry contact relay. It does not source any power.
- Class 1 voltages must enter the enclosure through a different opening from any Class 2 voltage wiring.
- In this scenario, the Prove input will be used to check on the Combustion Air Damper status.

Comb.
Air
Damper
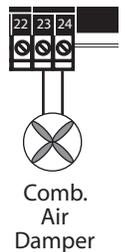
WIRING THE STAGES (TERMINALS 3 TO 17)

The S8 can be configured to operate the stages of the heating or cooling units. Moreover, it can be configured to operate the unit pumps or valves in addition to the unit stages.
- The N.O. contacts are dry contacts only. They do not source any voltage.
- Wire the N.O. relay contacts in series with the unit's limit circuit.
- Class 1 voltages must enter the enclosure through a different opening from any Class 2 voltage wiring.
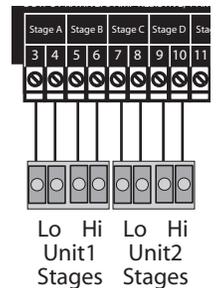
WIRING THE STAGE OUTPUTS
- Each Stage output (A through H) has one Normally Open (N.O.) relay contact.
- When wiring several multi-stage units, start with the lower stage of the first unit and wire it to Output A, followed by the higher stage of the same unit and wire it to Stage B.

WIRING THE PUMP OR VALVE OUTPUTS
- If the S8 is configured to operate Stage Pumps or Valves, then, wire them using the stage after the highest stage for that unit. That is, the low stage for the first unit must be connected to A and the higher stage of the same unit must be connected to Stage B. The Valve or Pump for the same unit must be connected to Stage C.

MENU SEQUENCE

STARTUP

```
SYS=168°F  OD=45°F
     TGT=172°F
ABC▾         <EFG▾>
─────         LO
BOILER          MENU
```

○ ○ ○ ○

```
─────  SETTINGS  ─────
▶ Season          Winter
  <Outdoor Rst> 135°F
  Set Point       140°F
  EMS Set Point135°F
  Min Return     110°F
  <System Settings>
  <Maintenance>
  <System Startup>
BACK    ▲    ▼   SELECT
```

MAINTENANCE

```
────  MAINTENANCE  ────
▶ Unit              °F
  Present Time12:30P
  <Sensor Trim>
  <Histories>
  <Configuration>
BACK    ▲    ▼   SELECT
```

```
S8 V1.00
Outdoor reset
Heating-BreakOnRise
Day/Night Schedule
DHW Parallel
BACK    ▲    ▼   SELECT
```

```
Sys=120°F       10:00AM



BACK    ◀    ▶    NEXT
```

```
─── SENSOR TRIM ────
▶ System Trim    +0°F
  Outdoor Trim   +0°F
  Return Trim    +0°F
  DHW Trim       +0°F
BACK    ▲    ▼   SELECT
```

```
─── ARE YOU SURE? ───
▶ No
  Yes
BACK    ▲    ▼    SAVE
```

> ⚠ **CAUTION**
>
> To be able to change the S8 settings
> the Program/Run Switch must be set to
> Program. The switch is located under
> the Enclosure Wiring Cover for security.
> The Enclosure Wiring Cover can be
> securely closed using a padlock.

```
─── SENSOR FAULT ───
▶ Stages On
  Stages Off
BACK    ▲    ▼    SAVE
```

```
─── CONTROL LOGIC──
▶ PID
  OSS
BACK    ▲    ▼    SAVE
```

```
────── SEQUENCE ──────
▶ Lo/Hi/Lo/Hi
  Lo/Lo/Hi/Hi
BACK    ▲    ▼    SAVE
```

```
────── STAGING ──────
▶ Multiple Outputs
  Single Output
BACK    ▲    ▼    SAVE
```

```
── TOTAL BOILERS ──
          8
[██                    ]
BACK    ▲    ▼    SAVE
```

```
── BOILER OUTPUT ──
▶ None
  Pump
  Valve
BACK    ▲    ▼    SAVE
```

```
─── BURNER TYPE ────
▶ On/Off
  2-Stage
  3-Stage
  4-Stage
BACK    ▲    ▼    SAVE
```

```
──── CONTROL MODE ───
  Outdoor Reset
▶ Set Point
  EMS 4-20mA
BACK    ▲    ▼    SAVE
```

```
──── DISPLAY UNIT ───
▶ °F
  °C
BACK    ▲    ▼    SAVE
```

EMS SET POINT

```
EMS 4mA SET POINT
       100°F
[███                  ]
BACK    ▲    ▼    SAVE
```

```
EMS 20mA SET POINT
       170°F
[██████              ]
BACK    ▲    ▼    SAVE
```

```
──── APPLICATION ───
▶ Heat-BreakOnRise
  Cool-MakeOnRise
BACK    ▲    ▼    SAVE
```

```
──── DHW PIPING ───
▶ Parallel
  Primary/Secondary
BACK    ▲    ▼    SAVE
```

```
──DHW PUMP OUTPUT──
▶ No
  Yes
BACK    ▲    ▼    SAVE
```

```
──COMB. AIR OUTPUT──
▶ No
  Yes
BACK    ▲    ▼    SAVE
```

```
─── SETBACK MODE ──
▶ Day/Night Schedule
  External Signal
BACK    ▲    ▼    SAVE
```

SET POINT

RESET RATIO

```
-- EMS  SET  POINT --
         140°F
BACK    ▲    ▼    SAVE
```

```
---- SEASON ---
▶ Winter
  Summer
BACK    ▲    ▼    SAVE
```

```
---- RESET  RATIO ---
Custom
  1(8.00°OD:1.00°SYS)
  2(4.00°OD:1.00°SYS)
  3(3.00°OD:1.00°SYS)
  4(2.00°OD:1.00°SYS)
  5(1.50°OD:1.00°SYS)
  6(1.25°OD:1.00°SYS)
▶ 7(1.00°OD:1.00°SYS)
  8(1.00°OD:1.25°SYS)
  9(1.00°OD:1.50°SYS)
  10(1.00°OD:2.00°SYS)
  11(1.00°OD:3.00°SYS)
  12(1.00°OD:4.00°SYS)
BACK    ▲    ▼    SAVE
```

```
----- SET  POINT -----
         140°F
[▮▮▮▮▮▮▮▮         ]
BACK    ▲    ▼    SAVE
```

```
-- OUTDOOR  RESET -
▶ Reset  Ratio      7
  Target  Offset +0°F
  Outdoor  Cutoff 65°F
  Min.Target     120°F
  Max.Target     120°F
BACK    ▲    ▼    SELECT
```

```
SYS=168°F  OD=45°F
     TGT=172°F
ABC▼        <EFG▼>
-----       LO
BOILER           MENU
```

```
---- MAX  TARGET ----
         240°F
[▮▮▮▮▮▮▮▮▮▮     ]
BACK    ▲    ▼    SAVE
```

```
-- SET  SYS  TEMP.1 -
         100°F
[▮▮▮▮▮          ]
BACK    ▲    ▼    SAVE
```

```
---- MIN  TARGET ----
         120°F
[▮▮▮▮           ]
BACK    ▲    ▼    SAVE
```

```
-- AT  OD  TEMP.1 ---
         70°F
[▮▮             ]
BACK    ▲    ▼    SAVE
```

```
------ SETTINGS ------
▶ Season       Winter
  <Outdoor  Rst>135°F
  Set  Point    140°F
  EMS  Set  Point135°F
  Min  Return   110°F
  <System  Settings>
  <Maintenance>
  <System  Startup>
BACK    ▲    ▼    SELECT
```

```
-- OUTDOOR  CUTOFF --
         70°F
[▮▮▮▮▮▮▮        ]
BACK    ▲    ▼    SAVE
```

```
-- SET  SYS  TEMP.2 -
         170°F
[▮▮▮▮▮▮▮        ]
BACK    ▲    ▼    SAVE
```

```
----- MIN  RETURN ----
         120°F
[▮▮▮▮           ]
BACK    ▲    ▼    SAVE
```

```
-- TARGET  OFFSET ---
         +0°F
[▮▮▮▮▮▮▮▮       ]
BACK    ▲    ▼    SAVE
```

```
-- AT  OD  TEMP.2 ---
         0°F
[▮              ]
BACK    ▲    ▼    SAVE
```

```
---- RETURN  LAG ----
         2min
[▮▮             ]
BACK    ▲    ▼    SAVE
```

DHW SETTINGS

```
DHW  PRIORITY  TIMER
         2min
[▮              ]
BACK    ▲    ▼    SAVE
```

```
- SYSTEM  SETTINGS -
▶ <Stage  Settings>
  <Setback  Schedule>
  <DHW  Settings>
  Setback        0°F
  Run-On        2min
  Pump  Exercise  Off
BACK    ▲    ▼    SELECT
```

```
-- DHW  SETTINGS ---
▶ DHW  Temp.     120°F
  DHW  Prior  Tmr60min
  DHW  Set  Point120°F
  DHW  Diff.      5°F
BACK    ▲    ▼    SELECT
```

```
-- DHW  SET  POINT --
         120°F
[▮▮▮▮▮▮▮        ]
BACK    ▲    ▼    SAVE
```

```
------- SETBACK ------
         0°F
[              ]
BACK    ▲    ▼    SAVE
```

```
--- PUMP  EXERCISE --
Off
On
BACK    ▲    ▼    SAVE
```

```
------- RUN-ON -------
         2min
[▮▮             ]
BACK    ▲    ▼    SAVE
```

```
DHW  DIFFERENTIAL
         10°F
[▮▮             ]
BACK    ▲    ▼    SAVE
```

STAGE SETTINGS

```
-  SYSTEM SETTINGS  -
▶<Stage Settings>
 <Setback Schedule>
 <DHW Settings>
 Setback          0°F
 Run-On          2min
 Pump Exercise    Off
 BACK    ▲    ▼   SELECT
```

```
-- STAGE SETTINGS --
▶Reaction Time 1min
 Purge Delay 0.0min
 Min Runtime    2min
 Standby Delay10min
 Last Stage Hold5°F
 Throttle        2°F
 <Lead Settings>
 BACK   ▲    ▼   SELECT
```

```
-- REACTION TIME --
        2min
[ ■■              ]
 BACK   ▲    ▼    SAVE
```

```
--- PURGE DELAY ----
        0.0min
[                  ]
 BACK   ▲    ▼    SAVE
```

```
- MINIMUM RUNTIME -
        2min
[ ■■              ]
 BACK   ▲    ▼    SAVE
```

```
----- SETTINGS ------
▶Season        Winter
 <Outdoor Rst>135°F
 Set Point     135°F
 EMS Set Point135°F
 Min Return    110°F
 <System Settings>
 <Maintenance>
 <System Startup>
 BACK   ▲    ▼   SELECT
```
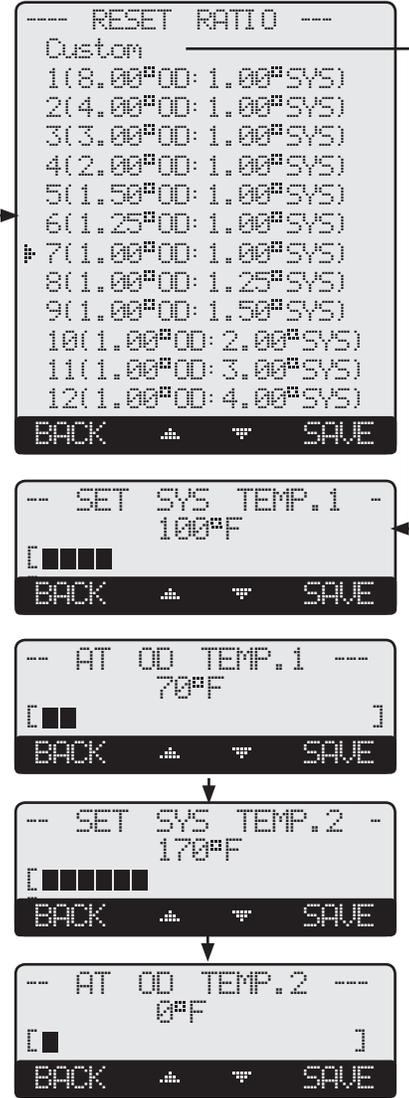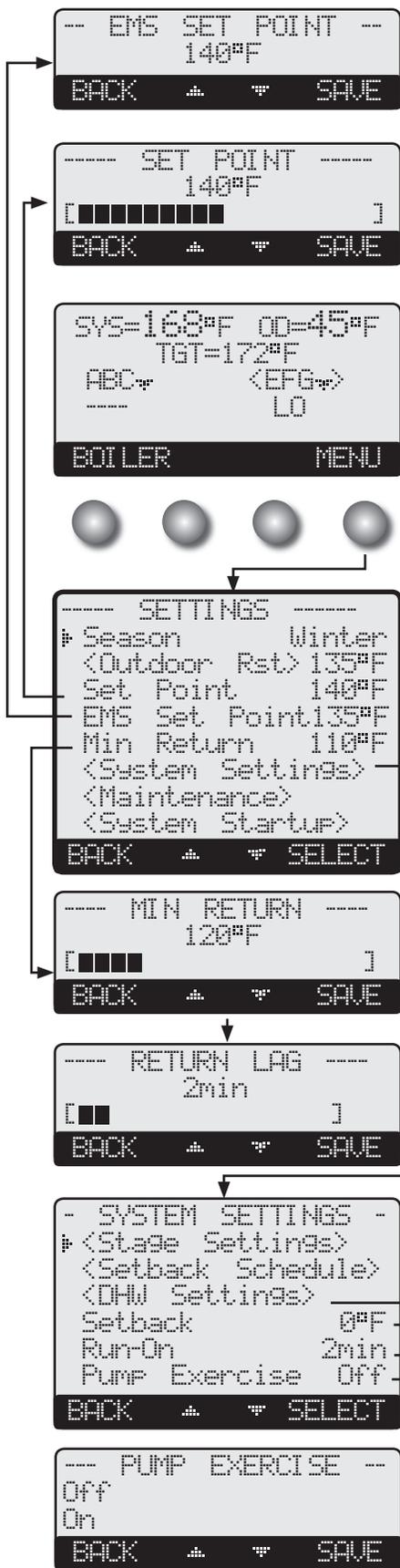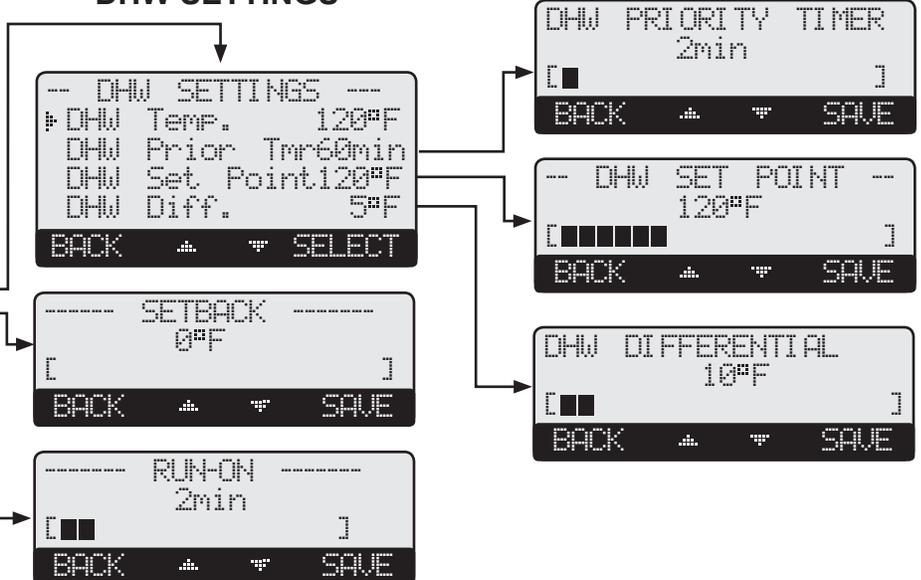
```
-- LEAD SETTINGS --
▶Lead Boiler     AB
 Rotate Mode   Time
 BACK   ▲    ▼   SELECT
```

```
-- STANDBY DELAY --
        10min
[■■■■■■            ]
 BACK   ▲    ▼    SAVE
```

```
-- LEAD ROTATION --
▶Time
 Manual
 FOFO
 BACK   ▲    ▼   SELECT
```

```
LAST STAGE HOLD
        0°F
[                  ]
 BACK   ▲    ▼    SAVE
```

```
AUTO ROTATE PERIOD
        24hrs
[■                 ]
 BACK   ▲    ▼    SAVE
```

```
-- LEAD BOILER --
▶AB
 CD
 BACK   ▲    ▼   SELECT
```

```
-- THROTTLE RANGE --
        2°F
[                  ]
 BACK   ▲    ▼    SAVE
```

SCHEDULES

```
SETBACK SCHEDULE
▶Setback          0°F
 Present Time  ✳✳:✳✳
 Day Schdul  7:00Am
 Night Schdul7:00Pm
 BACK   ▲    ▼   SELECT
```

```
SYS=168°F  OD=45°F
     TGT=172°F
ABC▼          <EFG▼>
----           LO

 BOILER          MENU
```

STAGE MENU

```
-- NIGHT SCHEDULE --
      07:✳✳Pm
 BACK   ▲    ▼    SAVE
```

```
-- BOILER AB MODE -
▶Auto
 Standby
 Off
 On
 BACK   ▲    ▼    SAVE
```

```
-- DAY SCHEDULE ----
      07:✳✳Am
 BACK   ▲    ▼    SAVE
```

```
- SET PRESENT TIME
      ✳✳:✳✳
 BACK   ▲    ▼    SAVE
```

```
------ BOOST PERIOD---
        30min
[■■■■■             ]
 BACK   ▲    ▼    SAVE
```

```
----- BOILER AB -----
 Mode           Auto
 Runtime       58Hrs
 <Prev Boiler>
▶<Next Boiler>
 BACK   ▲    ▼    SAVE
```

```
------ SETBACK --------
        0°F
[                  ]
 BACK   ▲    ▼    SAVE
```

```
------- BOOST ----------
        0°F
[                  ]
 BACK   ▲    ▼    SAVE
```

```
BOILER AB RUNTIME
        58hrs
 BACK  ▼CLEAR▼    OK
```
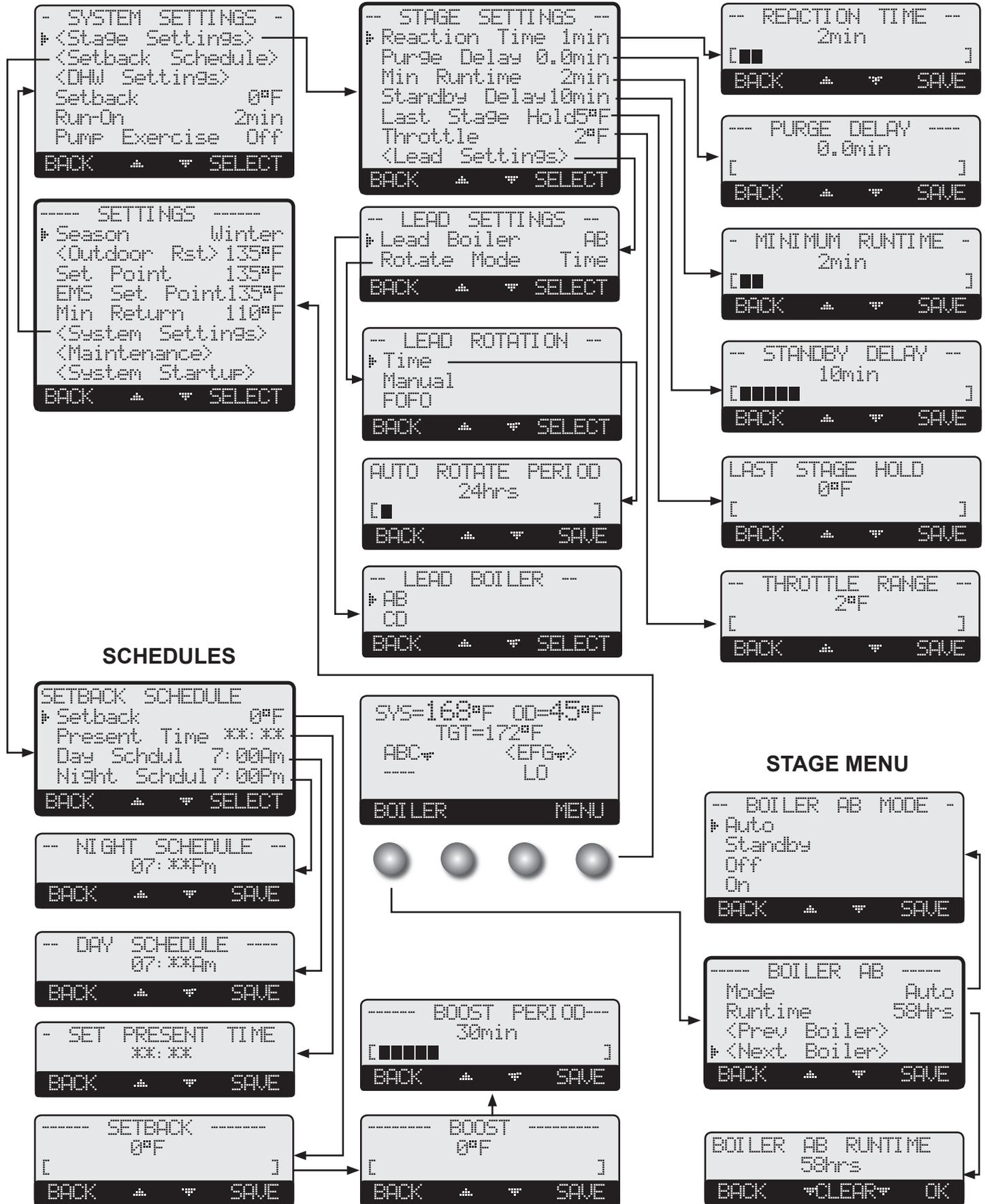
CONNECTING TO THE S8EXT PANELS AND XSIG INTERFACE

- The S8 is equipped with a 6-pin phone socket to connect to S8EXT panels or XSIG Interface.
- Only 6-wire phone cable provided must be used for proper operation.
- Each S8 Extension has two RS485 communication ports. Use one to connect to the S8. Use the other port to connect to the second extension or XSIG Interface.
- Additional compatible devices can utilize the second RS485 connection on the second S8 Extension. i.e. XSIG Interface (CA004200) to provide a 4-20mA set point signal to the S8.

SELECTING THE S8EXT PANEL LETTER

- The S8 is capable of communicating to two S8EXTs. However, each extension must be identified as either A or B using the switch on each extension to avoid having communication problem.
- Extension A (Switch is set to "A") will operate stages "I" through "P". While Extension B (Switch is set to "B") will operate stages "Q" through "X".
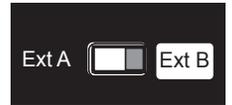
Connecting S8 to Two Extension Panels and XSIG Interface using RS485

S8

S8EXT A

6 Pin Phone Cable (provided with Extension)

S8EXT B

XSIG 4-20mA EMS Interface

4-20mA (+)
EMS Signal (-)

6 Pin Phone Cable (provided with XSIG Interface)
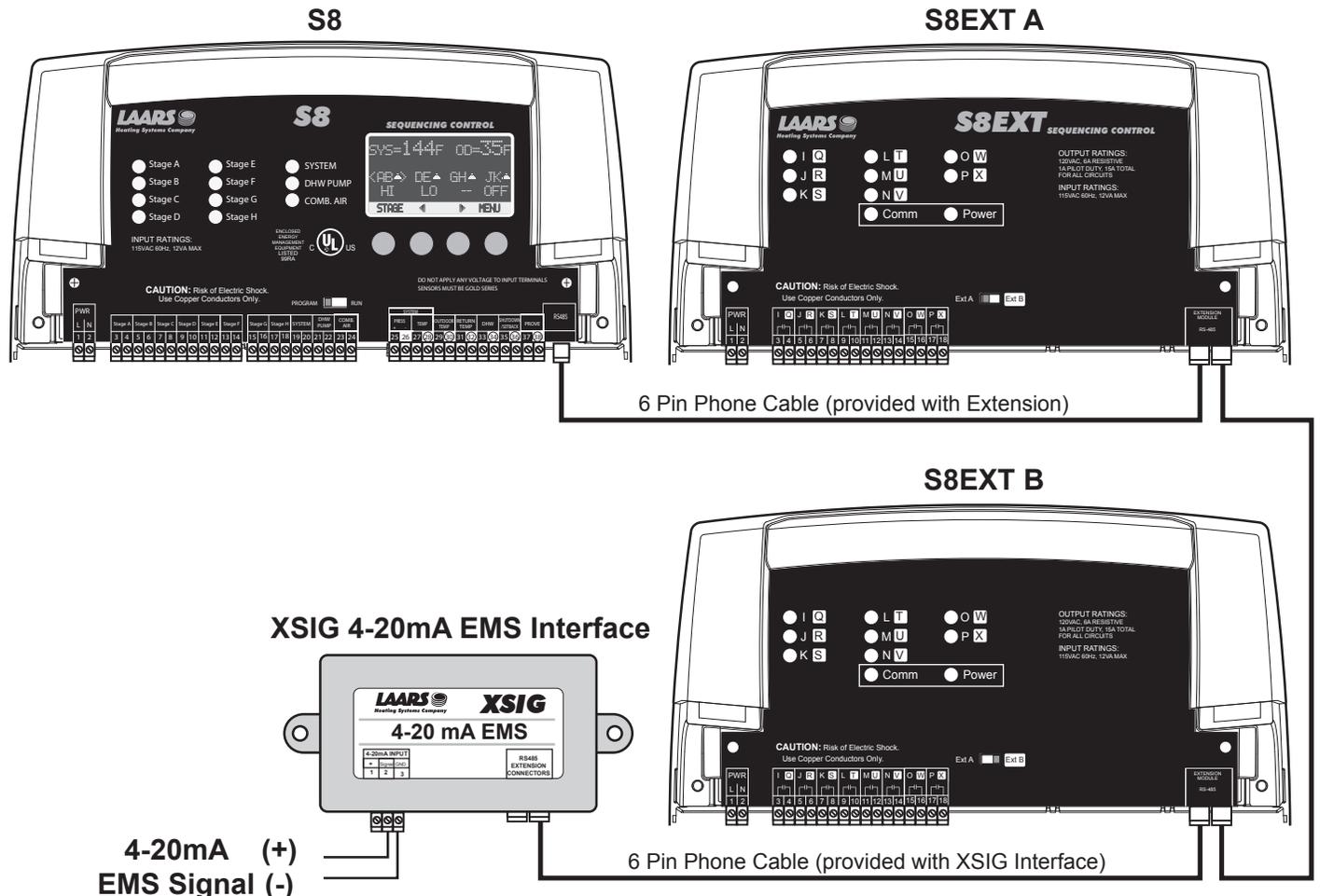
STARTUP SETTINGS

> ⚠ **CAUTION**
> A good practice after performing any Startup menu modifications is to check all operating settings and adjustments to match the new settings.

PROGRAM CHANGE SETTINGS

To be able to change the S8 settings the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security. The Enclosure Wiring Cover can be securely closed using a padlock.

`PROGRAM [ ▮ ] RUN`

STARTUP SEQUENCE

Button: *MENU/<System Startup>*

```
  ARE YOU SURE?
▶ No
  Yes
BACK    ⬍   ▼    SAVE
```

• When powered, the S8 performs a self-test on its components. After the self-test diagnostics have been successfully completed, the S8 will initialize the panel.
• On the first power up, the System Startup screen will appear after the initialization is complete. If it doesn't, the S8 has already been configured.
• The System Startup menu sets the main parameters like the type of sensor, the type of output whether heating or cooling, the sequencing mode, and many other parameters described in this section.
• Before entering the Startup menu, several warnings will alert you about the consequences of making Startup changes.

CONTROL MODE

Outdoor Reset, Set Point, EMS 4-20mA   **Default: Set Point**

Button: *MENU/<System Startup>/..../Control Mode*

```
--- CONTROL MODE ---
  Outdoor Reset
▶ Set Point
  EMS 4-20mA
BACK    ⬍   ▼    SAVE
```

• Outdoor Reset provides a variable set point based on outdoor temperature. Available for Heating applications only.
• Outdoor Reset mode requires the use of an outdoor sensor. DO NOT select Reset without an outdoor sensor.
• Set Point mode does not require an outdoor sensor. If an outdoor sensor is connected in Set Point mode it will be used only as an outdoor cutoff point. That is, to turn the stages, system, and Comb. Air relays off.
• The EMS 4-20mA allows the S8 to receive an external set point from an EMS/BMS system. This option requires the use of the XSIG Interface (CA004200).
• You must select the 4mA (min) and 20 mA (max) Set Points in the following screens.
• Connect the XSIG Interface to the S8's RS485 connection.

DISPLAY UNIT

ºF, ºC   **Default:ºF**

Button: *MENU/<System Startup>/..../Display Unit*

```
--- DISPLAY UNIT ---
▶ ºF
  ºC
BACK    ⬍   ▼    SAVE
```

• The S8 is designed to control boilers and chillers in hydronic environment where the temperature is the critical factor. It allows the user of displaying temperature information and settings in either ºF (Fahrenheit) or ºC (Celsius). Select the display unit that is best suited for your application.

SETTING THE 4MA AND 20MA SET POINTS (AVAILABLE IN 4-20MA EMS ONLY)

Default: Normal

Button: *MENU/<System Startup>/..../EMS 4mA Set Point/EMS 20mA Set Point*

```
EMS 4mA SET POINT
       100ºF
[▮▮▮            ]
BACK    ⬍   ▼    SAVE
```

• If EMS 4-20mA is selected from the Control Mode Menu as the temperature set point source, the user must purchase a Laars XSIG Interface (CA004200) to accept the 4-20mA signal and transmit it to the S8.
• In addition, the user will need to set the temperature range parameters. First, set the 4mA temperature, then the 20mA temperature.
• Any signal that is above or below the 4-20mA range will display the message "Shutdown by EMS" and all stages will de-energize. However, the System, Comb. Air, and Unit Pumps and Valves will continue for the Run-On delay period then de-energize.
• The control will calculate the temperature for the additional 1.9mA at each end of 4 - 20mA range.

```
EMS 20mA SET POINT
       170ºF
[▮▮▮▮▮▮         ]
BACK    ⬍   ▼    SAVE
```
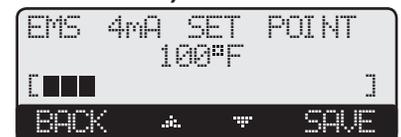
APPLICATION

Heating-BreakOnRise, Cooling-MakeOnRise　　　**Default: Heating-BreakOnRise**

Button: MENU/<System Startup>/..../Application

```
---- APPLICATION ----
▶ Heat-BreakOnRise
  Cool-MakeOnRise
BACK    ⏶    ⏷    SAVE
```

* The S8 offers two application modes, Heating and Cooling. In Heating, the S8 will sequence stages and when the system temperature is below the set point. In addition, the system relay will energize when the outdoor temperature is at or below the Outdoor Cutoff setting.
* In Cooling, the S8 will sequence stages and when the system temperature is above the set point. In addition, the system relay will energize when the outdoor temperature is at or above the Outdoor Cutoff setting.
* No Return Temperature monitoring or DHW options will be available in cooling applications.

DHW PIPING (AVAILABLE WITH HEATING ONLY)

Parallel, Primary/Secondary　　　　　　　　　　**Default: Parallel**

Button: MENU/<System Startup>/..../DHW Piping

```
---- DHW PIPING ----
▶ Parallel
  Primary/Secondary
BACK    ⏶    ⏷    SAVE
```

* When Parallel is selected, the S8 will offer a DHW Priority Timer. The DHW Priority will only take place during heating periods.
* The Parallel option will allow the DHW Pump relay to energize while de-energizing the System relay when there is a DHW call during heating. However, during Summer, only the DHW Pump relay will energize on a DHW call.
* Selecting the Primary/Secondary option will energize the System relay with the DHW Pump relay whenever there is a call for DHW even during the Summer or when outdoor temperature is above the Outdoor Cutoff.

⚠ IMPORTANT

A DHW call can be initiated by either a dry contact or using a Laars Sensor (CA002400 or equivalent) for immersion in a 3/8ID well (CA002500 or equivalent). The use of a sensor will allow the adjustment of DHW Set Point and DHW Differential.

DHW PUMP OUTPUT

No, Yes　　　　　　　　　　　　　　　　**Default: No**

Button: MENU/<System Startup>/..../DHW Pump Output

```
--DHW PUMP OUTPUT--
▶ No
  Yes
BACK    ⏶    ⏷    SAVE
```

* The S8 can control the operation of the DHW Pump. This option allows the user to select if the S8 should be controlling the DHW Pump or not.

COMBUSTION AIR DAMPER OUTPUT

No, Yes　　　　　　　　　　　　　　　　**Default: No**

Button: MENU/<System Startup>/..../Comb. Air Output

```
- COMB. AIR OUTPUT-
▶ No
  Yes
BACK    ⏶    ⏷    SAVE
```

* The S8 can control the operation of the Combustion Air Damper. This option allows the user to select if the S8 should be controlling the Combustion Air Damper or not.
* If Yes is selected, the S8 will energize the Comb. Air relay whenever there is a call for a boiler and will use the Prove input to check on the status of the Combustion Air Damper. In a failure situation, the message "Wait for Comb. Prove" will display when there is a call for a boiler stage until Prove is Shorted.
* If Prove fails after boiler stages where energized, the stages will de-energize and the message "Comb. Prove Failure" will display until situation is rectified.
* If No is selected, the Prove input will be used to check System status instead of the Combustion Air Damper.

SETBACK MODE

Day/Night Schedules, External Signal　　　　**Default: Day/Night Schedules**

Button: MENU/<System Startup>/..../Setback Mode

```
--- SETBACK MODE --
▶ Day/Night Schedule
  External Signal
BACK    ⏶    ⏷    SAVE
```

* The S8 can either utilize its built-in day schedule or an external dry contact signal to switch to Setback.
* If Day/Night Schedules is selected, The Setback will follow the Day/Night Schedule and Shutdown/Setback input (terminals 35 and 36) will be used as Shutdown only.
* The External Signal will allow the Shutdown/Setback input (terminals 35 and 36) to work as an input for Setback. No Shutdown input will be available in this scenario.

BURNER TYPE
On/Off, 2-Stage, 3-Stage, 4-Stage   **Default: On/Off**
Button: MENU/<System Startup>/..../Burner Type
- The S8 can sequence from a single stage and up to four stages per heating or cooling unit.

```
--- BURNER TYPE ----
▶On/Off
 2-Stage
 3-Stage
 4-Stage
BACK    ▲    ▼    SAVE
```

BOILER OUTPUT
None, Pump, Valve   **Default: None**
Button: MENU/<System Startup>/..../Boiler Output
- When None is selected, the S8 will sequence multiple heating or cooling units without any additional unit pumps or valves.
- The Pump option allows the S8 to control the cooling or heating unit stages in addition to the unit pumps. The stage pump will run for the Run-On delay after the lower stage of that unit has de-energized.
- The Valve optional functions similar to the pump option except that when all stages are off and after Run-On delay has elapsed, the Lead unit's valve relay will remain energized to allow for pump flow across the system. The lead unit's valve will remain energized until the Outdoor temperature rises above the Outdoor Cutoff or when the Shutdown, or Summer is activated.

```
-- BOILER OUTPUT --
▶None
 Pump
 Valve
BACK    ▲    ▼    SAVE
```

TOTAL BOILERS
1 to 24   **Default: varies based on Burner Type and Boiler Output**
Button: MENU/<System Startup>/..../Boiler Output
- This option in combination with Burner Type and Boiler Output Startup options will determine the total number of outputs the S8 will need to control.
- If more stages are selected than the S8 and S8 Extension has, the extra stages will have CE as their status.

```
-- TOTAL BOILERS --
        8
[██              ]
BACK    ▲    ▼    SAVE
```
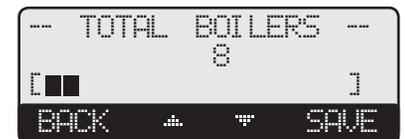
STAGING
Multiple Outputs, Single Output   **Default: Multiple Outputs**
Button: MENU/<System Startup>/..../Staging
- Most units will require that the higher output stages to be energized after the lower output stages. These units will need to select the Multiple Output option. That means, both Low and High Output stages must be energized for the unit to function.
- Some units require that when the higher output stages are required, the lower stages must de-energize. To operate these units, the user must select the Single Output option.

```
------ STAGING ------
▶Multiple Outputs
 Single Output
BACK    ▲    ▼    SAVE
```

SEQUENCE
Lo/Hi/Lo/Hi, Lo/Lo/Hi/Hi   **Default: Lo/Hi/Lo/Hi**
Button: MENU/<System Startup>/..../Sequencing
- Some units run more efficient when the lower stages are energized alone than with the higher stages. These types of units should select Lo/Lo/Hi/Hi. Then, the S8 will sequence the lower stages of all Automatic units before sequencing the higher stages.
- For
stage of the same unit. Then when more stages are needed, it will fire the lower stage of the lag unit followed by the higher stage of the lag unit.

```
------ SEQUENCE ------
▶Lo/Hi/Lo/Hi
 Lo/Lo/Hi/Hi
BACK    ▲    ▼    SAVE
```

CONTROL LOGIC
PID, OSS (Over-Sized-System)   **Default: PID**
Button: MENU/<System Startup>/..../Sequencing
- The PID option allows the S8 to sequence stages based on Reaction Time and Boiler Min Run Time. The PID relies on the rate of change in the System Temperature. The PID logarithmic calculations foresee changes and sequence stages based on those changes. It is the most efficient operation for most heating and cooling applications.

```
--- CONTROL LOGIC---
▶PID
 OSS
BACK    ▲    ▼    SAVE
```

- The Oversize option sequence stages based on how many Throttling ranges (differentials) is the system temperature away from the Target Temperature. In Heating and at one Throttling range below the Set Point, only one stage will be on. For each additional Throttling range below the Set Point, an additional stage will be activated. The last stage on will be allowed to exceed the Set Point by one Throttling range before turning off that stage. This helps to prevent the last stage from short cycling.

When PID is Selected, the following are the settings that directly affects this modes operation:
- Reaction Time   SELECT *Settings/System Settings/Stage Settings/Reaction Time*
- Purge Delay   SELECT *Settings/System Settings/Stage Settings/Purge Delay*
- Minimum Run Time   SELECT *Settings/System Settings/Stage Settings/Min Runtime*
- Standby Delay   SELECT *Settings/System Settings/Stage Settings/Standby Delay*
- Last Stage Hold   SELECT *Settings/System Settings/Stage Settings/Last Stage Hold*

When Oversize (OSS) is Selected, the following are the settings that directly affects this modes operation:
- Throttle   SELECT *Settings/System Settings/Stage Settings/Throttle*

SENSOR FAULT

Stages On, Stages Off   **Default: Stages On**

Button: MENU/<System Startup>/..../Sensor Fault

The Sensor Fault will determine the operating status of all output stages that are set to Auto when a sensor reads Short or Open.

```
--- SENSOR FAULT ---
▶ Stages On
  Stages Off
BACK    ⬝⬝   ▾     SAVE
```

RESET MODE
- When Stages-On is selected, the S8 will turn all unit stages On when the System reads Short or Open and Outdoor is below Outdoor Cutoff in heating or above Outdoor Cutoff in Cooling. When Outdoor reads Short or Open, the S8 will change the Target to me the Maximum Target.
- When Stages-Off is selected, the S8 will turn all stages Off when the System reads Short or Open. However, when the Outdoor reads Short or Open, the S8 will change the Target to me the Minimum Target.

SET POINT MODE
- When Stages-On is selected, the S8 will turn all stages On when the System sensor reads Short or Open.
- When Stages-Off is selected, the S8 will turn all stages Off when the System sensor reads Short or Open.
- The Outdoor Sensor Short or Open status will not affect the control operation in Set Point mode.

OPERATING SETTINGS

PROGRAM CHANGE SETTINGS

To be able to change the S8 settings the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security. The Enclosure Wiring Cover can be securely closed using a padlock.

PROGRAM ▭ RUN

SEASON

Winter, Summer   **Default: Winter**

Button: MENU/Season

- When in Summer, and in Heating Mode, the S8 will turn all boiler relays off. However, a DHW call will bring boilers back on if needed. The Message Display Line will display Summer. On ther other hand, in Cooling Mode, the S8 will turn all boiler relays off when it is in Winter setting. The Message Display Line will show Winter.
- When in Winter, the S8 will activate the Sys relay whenever the Outdoor temperature falls to or below the Outdoor Cutoff setting in heating applications. In addition, it will begin heating whenever the System temperature falls below the Set Point Temperature. The Message Display Line will not display any season information. However, in Cooling , all stages will be off and the Message Display Line will display Winter.
- When the season is over, it is a good practice to switch the S8 Season setting. This will allow DHW calls in heating to operate the boilers when needed.

> ⚠ **CAUTION**
> DO NOT turn power off to the S8 when in off-season or season is over. If you do so, the battery will run down and will have to be replaced. Instead switch to Summer or Winter.
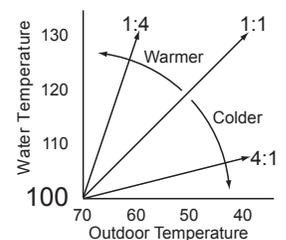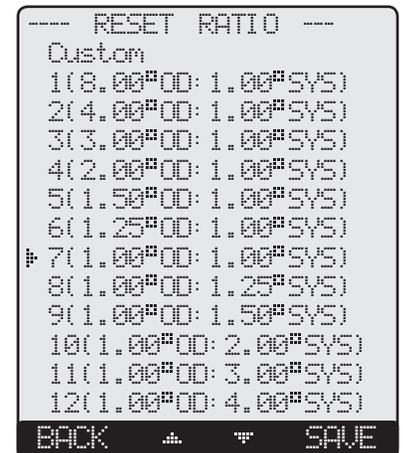
```
---- SEASON ----
▶Winter
 Summer
BACK    ▲    ▼    SAVE
```

RESET RATIO

Custom, 1(8.00ºOD : 1.00ºSys) to 12 (4.00ºOD : 1.00ºSys)Default: 1(1.00ºOD : 1.00ºSys)

Button: MENU/<Outdoor Reset>/Reset Ratio   **In Outdoor Reset Only**

- The Reset Ratio applies only to Heating applications.
- The Reset Ratio determines how the System water temperature will vary with Outside temperature. With any of the ratios, the colder it becomes outside, the hotter the temperature of the system water. (See Understanding Operation Concept on page 5)
- With a 1.00 (OD):4.00 (SYS) ratio, the System water temperature (SYS) will increase rapidly as the outside temperature falls, hitting the Maximum of 240°F at 35°F outside temperature. With a 4.00 (OD):1.00 (SYS) ratio, the System water temperature (SYS) will increase slowly as the outside temperature falls. Even at -30°F, the system water will only be 125°F, and at 22°F outside, the system water will be 112°F. Such a low Reset Ratio might be used with radiant floor heating applications.
- With most baseboard heating applications, a 1.00 (OD):1.00 (SYS) setting is a good place to start. With a 1.00 (OD):1.00 (SYS) ratio, for every degree the outside temperature falls, the system water temperature is increased one degree.
- If required: **Adjust the RESET RATIO in cold weather.** If the ambient building temperatures are too cold in cold weather, move the ratio to a higher selection. That is, if 1.00 (OD):1.00 (SYS) was initially selected, change the selection to 1.00 (OD):1.25 (SYS). If the building temperatures are too warm in cold weather, move the ratio to a lower selection. That is, if 1.00 (OD):1.00 (SYS) was initially selected, change the selection to 1.25 (OD):1.00 (SYS).

```
---- RESET RATIO ---
 Custom
 1(8.00"OD:1.00"SYS)
 2(4.00"OD:1.00"SYS)
 3(3.00"OD:1.00"SYS)
 4(2.00"OD:1.00"SYS)
 5(1.50"OD:1.00"SYS)
 6(1.25"OD:1.00"SYS)
▶7(1.00"OD:1.00"SYS)
 8(1.00"OD:1.25"SYS)
 9(1.00"OD:1.50"SYS)
 10(1.00"OD:2.00"SYS)
 11(1.00"OD:3.00"SYS)
 12(1.00"OD:4.00"SYS)
BACK    ▲    ▼    SAVE
```


CUSTOMIZED RESET RATIO

Button: MENU/<Outdoor Reset>/Reset Ratio/Custom

- F□
  can be used.
- The Custom Reset Ratio is only available when Custom is selected from the Reset Ratio menu option. It provides the user with the capability of assigning two points on the reset ratio diagram and use the line that connects those two points as the customized reset ratio curve. Each of the two points will need a specific System and Outdoor Temperature to identify it on the diagram.

- To Set the first point, specify Sys Temp 1, and OD Temp 1. Then, specify Sys Temp 2, and OD Temp 2, to set the second point on the curve. The two points can be anywhere on the line, not necessarily at the ends.
- The chart shows an example of a customized curve 6(OD):5(SYS) that does not exist in the standard curve options. If the outdoor temperature reaches 30ºF, the system target will be 145ºF.
- Remember that the Min Target and Max Target apply to all reset ratios including the customized reset ratio ones.

```
-- SET SYS TEMP.1 -
        120°F
[■■■■■          ]
BACK    ▲    ▼    SAVE
```

```
-- SET SYS TEMP.2 -
        170°F
[■■■■■■         ]
BACK    ▲    ▼    SAVE
```

```
-- AT OD TEMP.1 ---
        60°F
[■■             ]
BACK    ▲    ▼    SAVE
```

```
-- AT OD TEMP.2 ---
        0°F
[■              ]
BACK    ▲    ▼    SAVE
```


Custom Reset Ratio
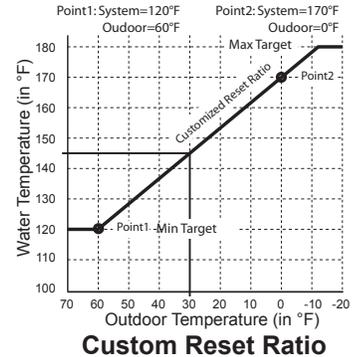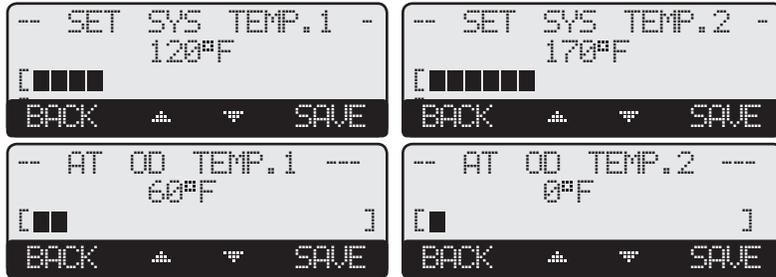
SET POINT (NOT ADJUSTABLE IN EMS MODE)

Adjustable -10ºF/-23ºC - 230ºF/110ºC   **Default: 140ºF/60ºC**
Button: MENU/Set Point   **In Set Point or EMS 4-20mA**

```
------ SET POINT ------
        70°F
[■■■■■■■■       ]
BACK    ▲    ▼    SAVE
```

- The Set point is the temperature value the S8 will use to control the system.
- The S8 will add, subtract, or hold the stages of the heating or cooling units to maintain the system temperature around the Set point.
- The system can be expected to fluctuate around the set point. The amount of fluctuation depends on the System Settings and Stage Settings.
- If an Outdoor Sensor was connected, pressing the SAVE button will switch to the Outdoor Cutoff setting option.
- If the EMS Mode was Enabled, the Set Point will be set by the EMS/BMS system and will be available to be only read.
- The range of Set Point in the EMS is set in the Startup menu at 4mA and 20mA.
- Any reading below the 2mA or above 22mA will indicate a "Shutdown by EMS" message on the Message Line.

OUTDOOR CUTOFF TEMPERATURE

Adjustable Off, 20ºF/-7ºC - 100ºF/38ºC, On   **Default: 70ºF/21ºC**
Button: MENU/Set Point/Outdoor Cutoff   **in Set Point**
Button: MENU/<Outdoor Reset>/Outdoor Cutoff   **in Reset**

```
-- OUTDOOR CUTOFF --
        70°F
[■■■■■■         ]
BACK    ▲    ▼    SAVE
```

- In Outdoor Reset mode, Outdoor Cutoff will always exist. However, in Set Point mode, if the outdoor sensor is installed, the Outdoor Cutoff screen will automatically appear after the temperature Set Point has been selected.
- In Heating applications, when the outdoor temperature falls to the adjustable Outdoor Cutoff temperature, the S8 will control and sequence the boiler stages to hold the calculated temperature.
- When the outdoor temperature rises to the Outdoor Cutoff plus a 2°F differential, the S8 will turn all boilers off. The System relay and any other Pump or valve relays that were energized will remain energized for the Run-On delay.
- In Cooling applications, when the outdoor temperature rises to the adjustable Outdoor Cutoff temperature, the S8 will control and sequence the cooling unit stages to hold the calculated temperature.
- The Outdoor Cutoff can be set to ON or OFF. In the ON position, the System Relay will run regardless of the Outdoor temperature and the burner stages will be active to hold the calculated water temperature.
- In the OFF position, the system pump will always be off and all stages will be off as well.

TARGET OFFSET

Adjustable from 40ºF/22ºC - (-40ºF/-22ºC)   **Default: 0ºF/0ºC**
Button: MENU/<Outdoor Reset>/Offset   **in Outdoor Reset only**

```
-- TARGET OFFSET ---
        +0°F
[■■■■■■■■       ]
BACK    ▲    ▼    SAVE
```

- The Offset setting lets you adjust the starting points of the Reset Ratio curves. This means that, regardless of the Outdoor temperature, or the Reset Ratio that has been selected, when the Offset setting is changed, that change is directly added to or subtracted from the calculated temperature. For example, if the Set Point temperature was 130°F and the Offset was changed from 0° to 10° (an increase of 10°), then the Set Point temperature would increase to 140°F.

- The Offset setting does not change the ratio selection. For instance, with 1.00 (OD):1.00 (SYS) Reset Ratio, the System water temperature will always increase one degree for each degree change in the Outdoor temperature. What the Offset does is add or subtract a constant temperature value. (See Understanding Operation Concept on page 5)
- The Minimum and Maximum Target will take precedence over the Offset. That is, if the Max Target was set to 180°F and the Offset was set to 20°F. If the set point was 170°F, the new calculated set point based with the Offset will not exceed 180°F.
- If required: **Adjust the Water Offset in mild weather**. If the ambient building temperatures are too warm in the mild weather, decrease the Target Offset. If the ambient building temperatures are too cold in the mild weather, increase the Target Offset. The rule of thumb for baseboard radiation is to change the Offset 4°F for every 1°F you wish to change the building temperatures. In radiant heat applications, change the Offset 1°F or 2°F for every 1°F you wish to change the building temperature.

MINIMUM TARGET
Adjustable 70°F/21°C - 180°F/82°C   **Default: 120°F/49°C**
Button: MENU/<Outdoor Reset>/Min. Target   **in Outdoor Reset only**

```
----- MIN TARGET -----
          120°F
[■■■             ]
BACK   ⏶    ⏷    SAVE
```

- The Minimum Target must be set to the boiler manufacturer's specification. The S8 will calculate the Set Point based on the Outdoor temperature, the Reset Ratio, and the Offset value. The S8 will control all boilers to hold either the Set Point temperature, or the Minimum Target, whichever is higher.
- The Minimum Target must be at least 20°F lower than the Maximum Target (See next setting).

MAXIMUM TARGET
Adjustable 90°F/32°C - 240°F/116°C   **Default: 240°F/116°C**
Button: MENU/<Outdoor Reset>/Max. Target   **in Outdoor Reset only**

```
----- MAX TARGET -----
          240°F
[■■■■■■■■■   ]
BACK   ⏶    ⏷    SAVE
```

- This is the highest temperature heating water the S8 will circulate through the heating system.
- When using a radiation system, it should be set according to the tubing or floor manufacturer's specification.
- The Maximum Target must be at least 20°F higher than the Minimum Target (See previous setting)..

BOILER MINIMUM RETURN
Wh☐
monitoring the Target temperature (TGT), System temperature (SYS), Minimum Return, and actual return. (RTN). When the S8 predicts that a low return will occur, it will increase the Target automatically as an effort to increase the return temperature.

MINIMUM RETURN
Adjustable Off, 80°F/27°C - 140°F/60°C   **Default: 120°F/49°C**
Button: MENU/Min. Return   **in Heating only**

```
----- MIN RETURN -----
          120°F
[■■■■            ]
BACK   ⏶    ⏷    SAVE
```

- The Minimum Return is the critical temperature at which the return should be above. Normally, this setting is provided by the boiler manufacturer or the system engineer.
- The S8 will use that value as a guide. It will start to add additional stages if it foresees that the RTN temperature will drop below the Min. Return. During that period, it will display "Hold Return at 120°F" in the Display Message Line to indicate that the S8 is sequencing boilers to protect the return from dropping below the Minimum Return.
- Most condensing boilers will run more efficient with cooler return temperatures. In this case, select the Off option on the Minimum Return to allow the monitoring of the return on the display without sequencing the boiler stages.

RETURN LAG
Adjustable 0 - 30 minutes   **Default: 2 minutes**
Button: MENU/Min. Return/Return Lag   **in Heating only**

```
----- RETURN LAG -----
          2min
[■■              ]
BACK   ⏶    ⏷    SAVE
```

- The Return Lag is the time it takes for the system return to change after sequencing the stages.
- To get this time, start from a cold system. Calculate the amount of time it takes to get the return five degrees warmer from the start of the boiler. That should be your Return Lag.

SYSTEM SETTINGS

Button: MENU/<System Settings>

The System Settings menu provide access to adjusting and fine-tuning the system for enhanced comfort and better fuel savings.   The S8 behaves differently based on the selected Control Modes (see Startup Settings).

PROGRAM CHANGE SETTINGS

To be able to change the S8 settings the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security. The Enclosure Wiring Cover can be securely closed using a padlock.

STAGE SETTINGS

Button: MENU/<System Settings>/<Stage Settings>

REACTION TIME

Adjustable 1 - 10 minutes   **Default: 2 minutes**
Button: MENU/<System Settings>/<Stage Settings>/Reaction Time   **in PID Logic only**

- It is the amount of time it takes a single stage to affect the system.
- After the S8 turns on a stage trying to meet a set point, it will not turn on another stage until the reaction time has elapsed. Then, it will recalculate if a stage is need.
- To determine the optimum time, in a heating system start with a hot system. However, in a cooling system start with a cool system. Then, turn on a single stage and calculate how long it takes until the system begins to respond to that stage. That period should be set as the Reaction Time.

PURGE DELAY

Adjustable 0.0 - 10.0 minutes   **Default: 0.0 minutes**
Button: MENU/<System Settings>/<Stage Settings>/Purge Delay   **in PID Logic only**

- Most large units must go through a purge cycle before they are brought on line.
- When the S8 activates a unit (the lowest stage on a unit), it does not start to calculate its output until the Purge Delay is over. This allows the unit to fully come on line and to begin producing output.
- The Purge Delay helps to prevent short cycling of a newly activated units. Once the lowest unit stage is activated, it **MUST** run through the entire Purge Delay period.
- The minimum Purge Delay setting **MUST** be set to the time required by the units manufacturer specification.

MINIMUM RUNTIME

Adjustable 1 - 60 minutes   **Default: 2 minutes**
Button: MENU/<System Settings>/<Stage Settings>/Min Runtime   **in PID Logic only**

- This is the minimum amount of time any stage will run.
- For the lowest stage of a unit, the Minimum Runtime starts after the purge cycle.
- Initially, set the Min Runtime to half the Reaction Time.
- If System tends to overshoot, reduce the Min Runtime. If boilers tends to short cycle, increase Min Runtime.

STANDBY DELAY

Adjustable 1 - 60 minutes   **Default: 10 minutes**
Button: MENU/<System Settings>/<Stage Settings>/Standby Delay   **in PID Logic only**

- The Standby Delay Time only applies to units in Standby Mode.
- A Standby unit can only be activated after all the units in Auto Mode have run for the full Standby Time.

- Standby units are used for backup or extreme load conditions only. A Standby Stage can never be a Lead Stage
- The full Standby Delay Time must always elapse regardless of what happens to system temperature. Therefore, shorter Standby Times will result in smoother set point operation in extreme conditions. Longer Standby Times may prevent a Standby unit from starting if the other units can eventually meet the load, or if the load decreases.
- When setting Standby Time, remember that it will be added to the Reaction Time for the first stage on the first Standby unit. The following stages start time will rely on Pre-Purge and Reaction Time.

LAST STAGE HOLD

Adjustable 0°F/0°C - 30°F/17°C   **Default: 5°F/3°C**

Button: MENU/<System Settings>/<Stage Settings>/Last Stage Hold **in PID Logic only**

```
LAST  STAGE  HOLD
       0°F
[                    ]
BACK     ▲     ▼    SAVE
```

- The Last Stage Hold prevents short cycling of the Lead Stage during low load conditions where the system might have a load that is significantly less than the output of one stage. When the S8 brings on the Lead Stage, the Set Point is quickly exceeded, and the Lead Stage is turned off.
- To prolong the run time during this type of condition, use the Last Stage Hold setting.
- In heating, the S8 will allow the system temperature to exceed the Set Point by the number of degrees selected, before the Lead Stage is turned off. In cooling, the the S8 will allow the system temperature to rise above the Set Point by the number of degrees selected, before the Lead Stage is turned off.
- For example, with a Set Point of 160°F and a Last Stage Hold setting of 10°F, the Lead Stage boiler will remain on, at low fire, until the Set Point reaches 170°F then turn off.

THROTTLE RANGE

Adjustable 2°F/1°C - 20°F/11°C   **Default: 2°F/1°C**

Button: MENU/<System Settings>/<Stage Settings>/Throttle   **in OSS Logic only**

```
--- THROTTLE  RANGE ---
       2°F
[                    ]
BACK     ▲     ▼    SAVE
```

- The Throttling Range sets a temperature band around the Set Point that controls when stages will be turned on or off.
- For example, in the Oversize (OSS) heating mode, no stages will be activated until the temperature falls one full Throttling Range below the Set Point. A second stage will be activated when the temperature falls to two full Throttling Ranges below the Set Point, and so on, with one extra stage being turned on for every throttling below the Set Point the System temperature reaches.
- Stages will be turned off as the temperature rises toward the Set Point with one full throttling range as a differential.
- The last stage to be turned off will be allowed to exceed the Set Point by a full throttling range before it is turned off. This helps to prevent the last stage from short cycling when the load is low or when the stage is oversized.

Throttling Example in Heating Mode

Set Point = 180°F   **Throttling = 5°F**   **4 Boiler Stages, A, B, C, and D**

Temperature	Calculation	Falling Temperature		Rising Temperature	
		Stage Turned On	Stages On	Stage Turned Off	Stages On
185°F	180 + (1)THR	None	None	A	None
180°F	180 - (0)THR	None	None	None	A
175°F	180 - (1)THR	A	A	B	A
171 to 174°F	---	---	A	---	A,B
170°F	180 - (2)THR	B	A,B	C	A,B
166 to 169°F	---	---	A,B	---	A,B,C
165°F	180 - (3)THR	C	A,B,C	D	A,B,C
161 to 165°F	---	---	A,B,C	None	A,B,C,D
160°F	180 - (4)THR	D	A,B,C,D	None	A,B,C,D

LEAD SETTINGS

Button: MENU/<System Settings>/<Stage Settings>/<Lead Settings>

The lead menu is to help in setting the Lead unit and type of rotation appropreiate for the system.

```
--- LEAD SETTINGS ---
▶Lead Boiler      AB
 Rotate Mode     Time
BACK     ▲     ▼    SELECT
```

LEAD BOILER

Depending on the number of stages   **Default: The first set of stages**
Button: MENU/<System Settings>/<Stage Settings>/<Lead Setting>/Rotate Mode

No Pump or Valve stages

```
-- LEAD BOILER --



BACK    ⬆    ⬇   SELECT
```

- The Lead Unit's lowest stage will always be the first stage brought on when there is a call for output. As more output is needed, additional Stages are added.
- The Lead Unit is always shown on the main display in brackets.
- In a 2-Stage system (see Boiler Type in the Startup section), the display will show the two Lead Unit stages bracketed <AB>. In a 3-Stage system, the display will show the three Lead Unit stages bracketed <ABC>, and so on.
- If Pump or Valve is selected as the Boiler Output in the Startup menu, the Valve or Pump letter will be skipped from the number of stages. See example to the right. The missing stage C and F represent the Unit Valve or Pump.
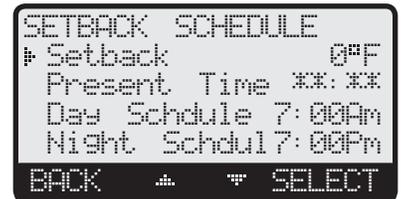- The Lead Unit can be rotated based on the Rotation Mode selected. (See next setting)

with Pump or Valve stages

```
-- LEAD BOILER --
▶ AB
  DE
BACK    ⬆    ⬇   SELECT
```
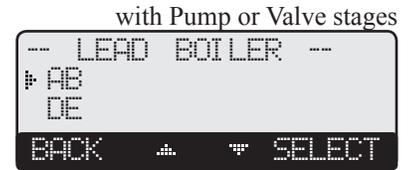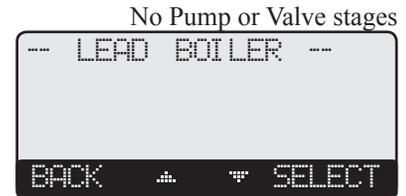
ROTATE MODE

Adjustable Time (1 hr to 999 hrs), Manual, FOFO   **Default: Time (24Hours)**
Button: MENU/<System Settings>/<Stage Settings>/<Lead Setting>/Rotate Mode

```
-- LEAD ROTATION --
▶ Time
  Manual
  FOFO
BACK    ⬆    ⬇   SELECT
```

- The Lead Unit is the first unit brought on when output is required.
- The Lead Unit can be rotated automatically, manually or based on First-On/First-Off (FOFO). The automatic rotation is recommended for most applications.
- The current Lead Unit is shown in brackets on the main display.
- Only units which are set to Auto Mode can be Lead. Therefore, not all the units may be available when manually selecting a new Lead Unit.
- If Time is selected, a second screen will allow the adjustment of the Auto Rotate Period If 24 Hours (default setting) was selected, the first rotation will take effect after 12 hours if the Time was not set. However, if the Time was set, the rotation will always take place at 2:00AM. The following rotations will take place every 24 hours thereafter.
- If First-On/First-Off (FOFO) is selected, the concept will follow this example; If A is the Lead, the starting sequence will be A, B, then C. When the de-energizing of the stages starts it will turn off A, B, Then C. Then stage D will be the new lead for the next load.

If Time Rotation is selected

```
AUTO ROTATE PERIOD
       24hrs
[■              ]
BACK    ⬆    ⬇    SAVE
```

```
SETBACK SCHEDULE
▶ Setback        0°F
  Present Time ✱✱:✱✱
  Day Schdule 7:00Am
  Night Schdul7:00Pm
BACK    ⬆    ⬇   SELECT
```

SETBACK SCHEDULE

Button: MENU/<System Settings>/<Stage Settings>/<Setback Schedule>
This menu provide the Day/Night Schedule as well as the Setback and Boost settings.

SETBACK

Adjustable 0°F/0°C to 80°F/44°C   **Default: 0°F/0°C**
Button: MENU/<System Settings>/<Setback Schedule>/Setback   **in Day/Night Schedule**
Button: MENU/<System Settings>/Setback   **in External Signal**

```
------- SETBACK -------
        0°F
[              ]
BACK    ⬆    ⬇    SAVE
```

- The Setback feature can be used to provide the S8 with a lower temperature Set Point in Heating or a higher Set Point in Cooling when less load is required.
- For example, if in heating the calculated temperature is 180°F and the Setback is 20°F, then when in Setback, the S8 will hold a Set Point of 160°F. The new Set Point will appear on the main display indicating this condition "Setback to 160°F".
- A typical use for Setback is to provide less system temperature in heating to a building during the night or on the weekends when building is not occupied, but heat is still required.
- After selecting a value in Setback, you'll be directed to the Boost menu.

BOOST

Adjustable 0°F/0°C to 80°F/44°C   **Default: 0°F/0°C**
Button: MENU/<System Settings>/Setback/Boost

```
--------- BOOST ---------
        0°F
[              ]
BACK    ⬆    ⬇    SAVE
```

- This features allows a building to either warm up or cool down quickly after a Setback period to bring the building to the desired temperature faster.
- The Boost temperature will be the number of degrees to be added in Heating or subtracted in Cooling from the Calculated Target Temperature.
- Using the previous example, if the Target was 180°F and the Setback was 20°F and the Boost was 10°F for 30 minutes, after the setback period, the Boost will change the target to 190°F for a period of 30 minutes. The new Set Point will appear on the main display indicating this condition "Boost to 190°F".

BOOST PERIOD

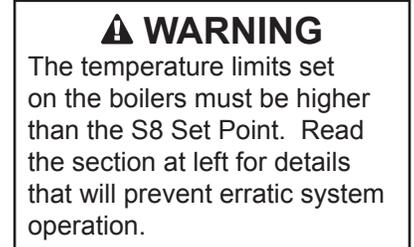**Adjustable 0 to 120 minutes**   **Default: 30 minutes**

Button: MENU/<System Settings>/Setback/Boost/Boost Period

```
------ BOOST PERIOD---
         30min
[ ■■■■■              ]
BACK    ▲    ▼    SAVE
```

- This will determine the amount of Boost the system will receive.
- If External Signal was selected as the Setback Mode, the Boost will start when the switch from Setback to normal operation takes place and will continue for the full Boost Period. An example would be if the Boost Period was set to 30 minutes and the shorting of the Setback terminals has ended at 7:00Am, the Boost will start at 7:00Am and will terminate at 7:30Am where the control will resume normal operation.
- If Day/Night Schedule was seleceted as the Setback Mode, the Boost will start a full Boost Period prior to the switch from Night Setback to Day normal operation. If the Day was set to start at 7:00Am, the Boost Period was set to 30 minutes, the Boost will start at 6:30Am and terminate at 7:00Am.

Avoiding Conflicting Boiler Limits

- The temperature limits set on the boilers MUST be set considerably higher than the S8's Set Point for the reasons detailed below.
- The S8 sensor is located in a common header some distance from the boilers.
- As the temperature rises in the header and before reaching the sensor location, energy is dissipated. Therefore, the temperature in the header could be lower than that registered by boiler sensors.
- In addition to the normal drop experienced between the boiler's temperature and that read by the S8 sensor, the Last Stage Hold setting must be accounted for. The boiler limit must be set above the Set Point PLUS the Last Stage Hold PLUS the normal drop experienced in the piping.
- Using the previous example of a 10°F Last Stage Hold with a 160°F Set Point, the boilers' limits must be set enough over 170°F to prevent the boilers' internal limits being reached. In this situation, the boiler high limit should be set at approximately 180°F to prevent the difference in boiler temperature vs. header temperature causing erratic operation.

> **⚠ WARNING**
>
> The temperature limits set on the boilers must be higher than the S8 Set Point. Read the section at left for details that will prevent erratic system operation.

DAY/NIGHT SCHEDULES

Button: MENU/<System Settings>/<Setback Schedule>/Day Schedules

```
-- DAY SCHEDULE ----
      07:**Am
BACK    ▲    ▼    SAVE
```

```
-- NIGHT SCHEDULE --
      10:**Pm
BACK    ▲    ▼    SAVE
```

- The S8 has two levels of heat or cool. The Day level is used when a building is occupied and people are active.
- The Night (Setback) level is used when a building is not occupied, or when people are sleeping. This setting reduces the calculated temperature in Heating and increase it in Cooling by the Setback setting. In Heating, if the Day calculated water temperature was 150°F and the Setback was 20°F, the Night Schedule will run at (150°F - 20°F) = 130°F.
- If the Boost feature is being used, it uses the Day Schedule as a Boost ending point. That is, if the Day Schedule is set to start at 6:00AM, the Boost was set to 10ºF, and the Boost Period was 30 minutes, the Boost will start at 5:30AM. The S8 will then raise the calculated water temperature by the Boost amount. Using the previous example, at 5:30AM the S8 will raise the calculated water to 160°F (150°F + 10°F) until 6:00AM.

SET PRESENT TIME

Button: MENU/<System Settings>/<Setback Schedule>/Present Time
Button: MENU/<Maintenance>/Present Time

```
- SET PRESENT TIME
      **:**
BACK    ▲    ▼    SAVE
```

- The Time is used for Day/Night Schedule and History graph.
- Adjust the time by selecting Time from the menu and then scrolling through the hours followed by the minutes. If hours are to be set to PM, scroll through the AM hours to reach the PM hours.

> **⚠ CAUTION**
>
> Remember that the battery is the backup for the Time. If no power is supplied to the S8 and there was no battery or battery had no power, time values will be lost and will need to be reset.

DHW SETTINGS

Button: MENU/<System Settings>/<DHW Settings>

```
-- DHW SETTINGS --
▶ DHW Temp.        120°F
  DHW Prior Tmr   60min
  DHW Set Point   120°F
  DHW Diff.          5°F
BACK    ⊥    ▼    SELECT
```

- A DHW call can be initiated by shorting the DHW input terminals, 33 and 34. In addition, using a Laars temperature sensor on the same terminals instead of a dry contact input will add the DHW Set Point and Differential control capability.
- In addition to raising the Target to either 200ºF or the Maximum Target on a DHW call, which ever is lower, the S8 provides three levels of DHW pump operation. The first is when Primary/Secondary is selected as the DHW Piping from the Startup Menu. This option will provide no DHW Priority. Furthermore, if there was a DHW call during the Summer or when the outdoor temperature is above the Outdoor Cutoff, both the DHW Pump and the System relays will energize. Upon the termination of the DHW call, the DHW Pump relay will de-energize leaving the System relay energized for the Run-On delay.
- The other two DHW options are available when Parallel is selected as the DHW Piping from the Startup Menu. These two options will not allow the System relay to energize in the Summer or when the outdoor temperature is above the Outdoor Cutoff on a DHW call.
- In Winter, if the DHW Priority Timer was set to NO, a DHW call will keep the System relay energized in addition to energizing the DHW Pump relay. Upon termination of the DHW call, the DHW Pump relay will de-energize leaving the System relay on.
- In Winter, if the DHW Priority Timer was set to a value other than NO, a DHW call will de-energize the System relay and energize the DHW Pump relay. This will remain for the period of the DHW Priority Timer setting or until the DHW call terminates, whichever is sooner. If the DHW call was still active after the DHW Priority Timer elapses, the System relay will energize for the remaining of the DHW call period.
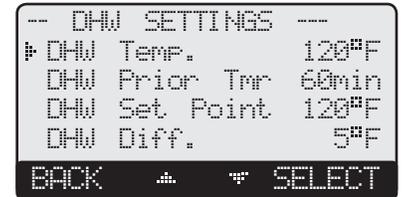
DHW PRIORITY TIMER (AVAILABLE WITH PARALLEL DHW PIPING)

Adjustable NO, 1 to 120 minutes   **Default: NO**

Button: MENU/<System Settings>/<DHW Settings>/DHW Prior. Timer   **in Parallel**

```
DHW PRIORITY TIMER
       2min
[ ■                    ]
BACK    ⊥    ▼    SAVE
```

- The DHW Priority Timer provides the user with the capability of selecting the DHW Priority period. If NO was selected, both DHW Pump and System relay will be energized on a DHW call whenever the control is set to Winter and the Outdoor temperature is below or at the Outdoor Cutoff.
- In Summer, a DHW call will energize only the DHW Pump relay leaving the System relay de-energized.
- If the DHW Priority Timer was set to a value other than NO, a DHW call in the Winter when the Outdoor temperature is below the Outdoor Cutoff will cause the System relay to de-energize and the DHW Pump relay to energize for the period of the DHW Priority Timer or until the DHW call expertise, whichever happens sooner. If the DHW call did not expire within the Priority period, then the System relay will energize.
- If there was a DHW call during Summer or when the Outdoor temperature is above the Outdoor Cutoff, only the DHW Pump relay will energize.

DHW SET POINT (REQUIRES AN OPTIONAL DHW TEMPERATURE SENSOR)

Adjustable 100°F/38°C to 200°F/93°C   **Default: 160°F/71°C**

Button: MENU/<System Settings>/<DHW Settings>/DHW Set Point

```
-- DHW SET POINT --
       160°F
[ ■■■■■■             ]
BACK    ⊥    ▼    SAVE
```

- This is the desired DHW temperature setting at which the DHW Pump relay will de-energize when reached.
- The S8 can accept a DHW call in two ways. An aquastat can provide a dry contact closure to terminals 33 and 34 is the first option.
- The second option will be connecting a Laars temperature sensor (CA002400 or equivalent) for immersion in a 3/8ID well (CA002500 or equivalent) will offer the capability of adjusting the DHW Set Point and Differential through he S8 easy to follow menu. In addition to being able to view and log DHW temperature history.

DHW DIFFERENTIAL

Adjustable 5°F/3°C to 80°F/44°C   **Default: 10°F/6°C**

Button: MENU/<System Settings>/<DHW Settings>/DHW Diff.

```
DHW DIFFERENTIAL
       10°F
[ ■■                 ]
BACK    ⊥    ▼    SAVE
```

- This represents the number of degrees the DHW temperature can drop from the DHW Set Point before a DHW call can be recognized and the DHW Pump relay energized.
- Larger Differential will result in larger fluctuation in DHW temperature. However, small Differential will have a tighter control over the DHW temperature but might result in boilers coming on frequently for short periods to satisfy the DHW Set Point and Differential settings.

PUMP, VALVE, AND COMBUSTION AIR DAMPER OPERATION

- The S8 controls multiple relays each controlling different types of equipment. In addition to the control of the boilers or cooling units, it can control, the primary system pump, unit pumps or valves, a DHW pump, and a combustion air damper. The operation of those relays depends on the Startup and System Settings.

RUN-ON

Adjustable 0 to 60 minutes   **Default: 2 minutes**

Button: MENU/<System Settings>/Run-On

- The Run-On applies to all pumps, valves and dampers. It is the additional time a pump, valve or a combustion air damper will run after the output unit relays has de-energized. For pumps and valves it is used to dissipate the excess energy from the heating or cooling system into the building. For a combustion air damper, it brings in enough fresh air for the next boiler fire up.
- The Run-On time should be set based on the size and type of the equipment. A boiler with low water content and high horsepower will need a longer Run-On than a boiler with the same horsepower but has more water content.

```
-------- RUN-ON --------
        2min
[██                     ]
BACK    ⬑     ⬎     SAVE
```

PUMP EXERCISE

Adjustable Off, On   **Default: Off**

Button: MENU/<System Settings>/Pump Exercise

- The S8 provides an option to exercise pumps for 10 seconds when not used for seven days. This option reduces pumps' impellers locking during the off-season period.

```
--- PUMP EXERCISE --
▷ Off
  On
BACK    ⬑     ⬎     SAVE
```

MAINTENANCE

Button: MENU/<Maintenance>

The Maintenance menu gives access to sensor and outputs trimming. In addition, you'll have access to view the Startup configuration settings as well as sensor histories

```
---- MAINTENANCE ----
▷ Unit            °F
  Present  Time12:30P
  <Sensor  Trim>
  <Histories>
  <Configuration>
BACK    ⬑     ⬎   SELECT
```

> ⚠ **CAUTION**
>
> To be able to change the S8 settings the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security. The Enclosure Wiring Cover can be securely closed using a padlock.

SYSTEM & OUTDOOR SENSOR TRIM

Adjustable -20°F/-11°C to +20°F/+11°C   **Default: 0°F**

Button: MENU/<Maintenance>/System Trim
Button: MENU/<Maintenance>/Outdoor Trim
Button: MENU/<Maintenance>/Return Trim
*Button: MENU/<Maintenance>/DHW Trim*

- The Laars thermistor type sensors are very accurate, and normally require no calibration. However, sometimes it may be desirable to make small adjustments to the displayed value.
- Do not use the Trim setting to make the Outdoor temperature sensor match the reported on the radio or TV. Outdoor temperature can vary widely over a broadcast range.

```
--- SENSOR  TRIM ----
▷ System  Trim    +0°F
  Outdoor  Trim   +0°F
  Return  Trim    +0°F
  DHW  Trim       +0°F
BACK    ⬑     ⬎   SELECT
```

HISTORY

Button: MENU/<Histories>

The S8 provides users with a graphical history of the System, Outdoor, DHW, and Return temperatures for the previous 24 hours. The temperatures are sampled every 12 minutes. That is, readings of temperatures are recorded and stored every 12 minutes for the last 24 hours.

```
Sys=120°F      10:00AM


BACK    ◁     ▷    NEXT
```
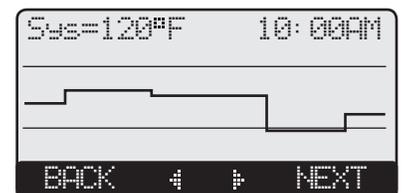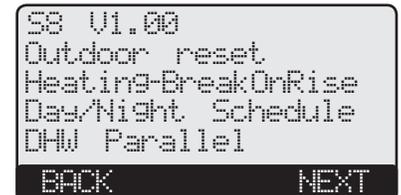
- To view the values of specific time period, use the two middle buttons to scroll to that time and read the upper left temperature.
- The first screen will be the System Temperature History. By clicking on the Next button, you'll be able to view the Outdoor Temperature History, then, the Return History followed by the DHW History.

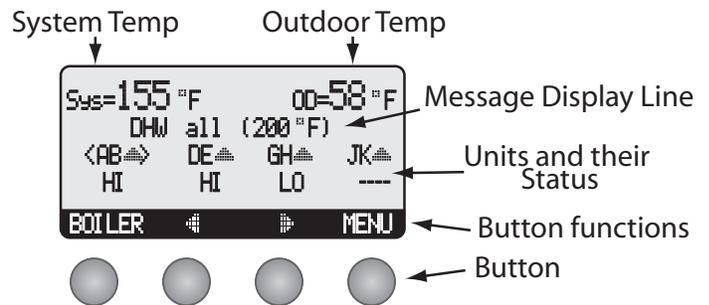## CONFIGURATION

Button: *MENU/<Maintenance>/<Configuration>*
- This menu option provides a consolidated view of the Startup settings.
- Additional settings will be available by selecting the NEXT option.

```
S8 V1.00
Outdoor reset
Heating-BreakOnRise
Day/Night  Schedule
DHW  Parallel
BACK              NEXT
```

```
8 X On/Off
PID,Fault Stgs Off


BACK              NEXT
```

DISPLAY

The S8 display layout provides a variety of information that gives an immediate picture of the operation status. The display shows four heating or cooling units at a time. The two middle buttons scrolls the screen to view additional boilers. Moreover, all the information is brightly displayed. It can be viewed in brightly or dimly lit rooms.
- The buttons' functionality changes based on the screen and menu level. The buttons' functionality is displayed on a dark background on the screen bottom line.
- Horizontal arrows are to scroll through the available stages.
- Vertical arrows are to scroll through the menu functions when in menus or to change values of settings when in its specific screen.

System Temp   Outdoor Temp

```
Sys=155°F          OD=58°F
       DHW  all (200°F)
  <AB⇑>   DE⬆   GH⬆   JK⬆
    HI      HI    LO    ----
 BOILER  ◄      ►    MENU
```

Message Display Line
Units and their Status
Button functions
Button

DISPLAY OUTPUT STATUS

The S8 unit sequencing status gives immediate access to each unit status. The following list show all possible boiler status:
- <AB>   Two-Stage unit and Unit AB is the Lead in sequencing. (Brackets indicate Lead Stage).
- ---   Unit is de-energized. The unit Mode is set to Auto.
- STB   Unit is set to be a Standby Unit.
- HI   Unit highest stage is active. The unit Mode is set to either Auto or Standby.
- MED   Unit Middle stage is active. Available in Three-stage units only. The unit Mode is set to either Auto or Standby.
- MHI   Unit Middle High stage is active. Available in Four-stage units only. The unit Mode is set to either Auto or Standby.
- MLO   Unit Middle Low stage is active. Available in Four-stage units only The unit Mode is set to either Auto or Standby.
- LO   Unit Lowest stage is active. The unit Mode is set to either Auto or Standby.
- ON   All Unit Stages are set to ON.
- OFF   All Unit Stages are set to OFF or unit does not exist.
- C/E   Unit on Extension panel is not communicating back to the S8..
- ⬝⬝⬝   Unit Pumps are being controlled by the S8.
- ⬝⬝⬝   Unit Valves are being controlled by the S8.

DISPLAY MESSAGES

The S8 normal display layout reserved the second line for message indications. The following is a list of the most common Message Display Line information:
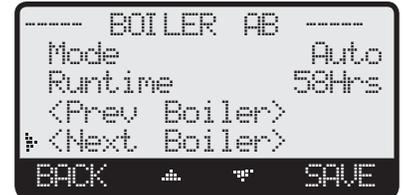- Summer   The control is set to Summer. No heat is active.
- Winter   The control is set to Winter. No cooling is active.
- Outdoor Cutoff   The Outdoor temperature is above the Outdoor Cutoff in heating or below it in cooling.
- Shutdown Active   The Shutdown Terminals are Shorted. No heating or cooling units will be active.
- Shutdown by EMS   The EMS is below 2mA or above 22mA
- DHW Call (171°F)   There is a DHW (Domestic Hot Water) call. The S8 will Raise system Set Point to the indicated temperature. DHW increases calculated temperature to 200°F or Max Water Temperature, whichever is lower.

- Holding Return at 110˚F   The Return sensor is reading less than the Minimum Return. S8 is trying to raise return to 110˚F.
- Holding Until 150˚F   The Lead boiler is in Last Stage Hold. This example shows that the lead stage will turn off when system temperature reaches 150˚F.
- Waiting for Comb. Prove   The System or Combustion Air Damper relay is ON and the prove terminals are open before the lead boiler relay can energize.
- SYS Prove Failure   After boilers have run for a while, Prove signal was opened. The boiler relays will de-energize. However, the System relay will remain energized.

STAGE SETTINGS
Button: BOILER/
- In most installations, all active unit adjustments are the same, but each can be configured differently if desired.
- When the BOILER or C.UNIT button is depressed, the Unit A Settings menu will be shown.
- Make all the appropriate settings for Unit A (See below).
- Then select the Next Stage option from the menu to bring up the Boiler B Settings menu and make all the settings. Continue until all boilers have been set.
- If a S8EXT is connected to the S8, scrolling through stages using the Next and Prev Stage menu options will scroll through the S8EXT stages as well.

```
----- BOILER  AB -----
Mode              Auto
Runtime          58Hrs
<Prev  Boiler>
▶<Next  Boiler>
BACK    ⌁    ⌄     SAVE
```

```
PROGRAM  ▮   RUN
```

> ### ⚠ CAUTION
> To be able to change the S8 settings, the Program/Run Switch must be set to Program. The switch is located under the Enclosure Wiring Cover for security. The Enclosure Wiring Cover can be securely closed using a padlock.

MODE
Auto, Standby, Off, On   **Default: Auto**
Button: BOILER/Mode

```
-- BOILER  AB MODE -
▶Auto
 Standby
 Off
 On
BACK    ⌁    ⌄     SAVE
```

- The S8 only controls any unit set to Auto or (after a delay) those set to Standby. None of the other settings is recommended for output units connected to active units.
- Any output without an active unit connected must be set to Off.
- The following list describes the MODE options:

Auto -   The S8 will control the unit's operation to maintain the desired Set Point. Only units set to Auto can be Lead.

Standby   Standby units can only be activated when all units in Auto have been at HI for an adjustable Standby delay period. Standby is generally used when you want a specific unit to be available in extreme load conditions. Note that a Standby unit Cannot be a Lead unit. Standby Time is only available in PID mode.

Off   Any output unit A through D not connected to a physical unit should be set to Off. The Off Mode can also be used to disable units that are being serviced. The number of units and their stages are selected in the Startup menu.

On   The On Mode should only be used when testing a unit. The On Mode overrides the PROVE input. Once set to On the unit will immediately start all of its stages.

RUNTIME
Clear
Button: BOILER/RunTime

```
BOILER  AB RUNTIME
         58hrs
BACK   ⌄CLEAR⌄    OK
```

- The RunTime provides an accumulative hourly run for the selected unit.
- The RunTime for a specific unit can be reset to zero by pressing the middle two buttons.

TROUBLESHOOTING

TEMPERATURE INPUTS
Display shows Sensor OPEN
Check the sensor is connected and the wires are continuous to the S8. Finally follow the procedure for Incorrect Temperature Display.

Display shows Sensor SHORT
The S8 sees a short across the input terminals. Remove the wires from the sensor terminals. The display should change to read OPEN. If it doesn't, the S8 may be damaged.

Display shows an Incorrect Temperature Display
Remove the wires from sensor terminals. The display should change to read OPEN. If it doesn't, the S8 may be damaged. Take an ohm reading across the detached sensor wires. The ohm reading should correspond to the side chart. If it doesn't, the sensor may be damaged.

Return Sensor does not Display Temperature
Check the sensor is connected and the wires are continuous to the S8. Finally follow the procedure for Incorrect temperature display.

CONTROL OPERATION
Too Much Heat
Check if the control has any of the following:
- **Domestic Hot Water call** - The S8 will raise the temperature of the system to either 200°F or Maximum Target on a DHW call.
- **Reset Ratio and Offset** - If excessive heat occurs only in certain weather conditions, adjust the Reset Ratio and Offset (See Understanding Operating Concept). If excessive heat occurs year round, reduce the Offset.
- **Unit Mode Settings** - The S8 will only sequence boilers their mode is set to Auto or Standby. Check to see if any boiler stage is set to On.
- **Control Settings** - The Last Stage Hold will allow only the Lead boiler to stay on for an additional number of degrees. If the setting is too high, and only the Lead boiler is on, the system can over heat. Reduce the Last Stage Hold setting.

Too Little Heat
Check if the control has any of the following:
- **Reset Ratio and Offset** - If reduced heat occurs only in certain weather conditions, adjust the Reset Ratio and Offset (See Understanding Operating Concept). If reduced heat occurs year round, increase the Offset.
- **Setback and Day/Night Schedule** - If reduced heat occurs only during specific hours, check the Day/Night Schedule and the Setback, **Boost, and B**oost **Period** values. Either reduce the Setback or Boost settings or change the Day and Night Schedules.
- **Boiler Mode Settings** - The S8 will only modulate boilers their mode is set to Auto or Standby. Check if any boiler stage is set to Off or Standby.

Units are Short-Cycling
- **Minimum Runtime** - Increase the Minimum Runtime only if all units tend to short-cycle.
- **Last Stage Hold** - Increase the Last Stage Hold only if the lead unit tends to short-cycle.

System is Overshooting or Undershooting
- **Reaction Time and Minimum Runtime** - If the system is overshooting or undershooting, adjust Minimum Runtime or the Reaction Time. That depends on if the stages are brought on fast and were not allowed to turn off until the Minimum Runtime elapsed. Or, the stages were brought on slowly, however, were allowed to turn off quickly.
- **PID vs OSS** - If the application the system is used on requires fast response that the normal PID mode cannot provide, try using the OSS mode and adjust its parameters according to the system requirements.

Temperature Sensor Chart

TEMPERATURE (in Degrees °F)	Value (in Ohms)
-30	117720
-20	82823
-10	59076
0	42683
10	31215
20	23089
25	19939
30	17264
35	14985
40	13040
45	11374
50	9944
55	8714
60	7653
70	5941
80	4649
90	3667
100	2914
110	2332
120	1879
130	1524
140	1243
150	1021
160	842
170	699
180	583
190	489
200	412
210	349
220	297
230	253
240	217
250	187

MULTIPLE BOILERS WITH PUMPS
PIPING DIAGRAM
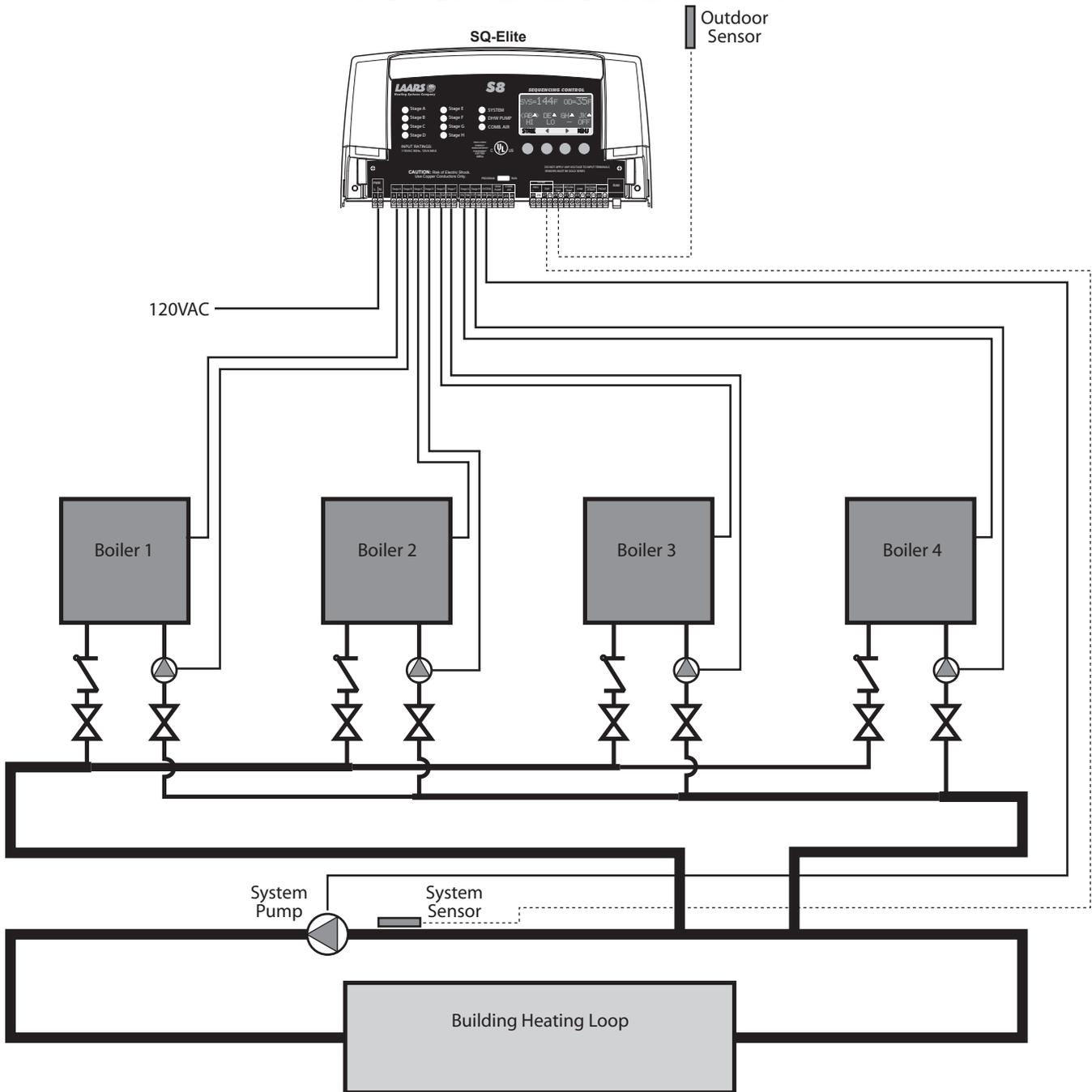
System:

The S8 sequencing 4 single-stage boilers and their boiler pumps. The boilers are piped in Reverse Return on the primary loop. The System output is controlling the System Pump.

Laars Heating Systems is aware that each installation is unique. Thus, Laars Heating Systems is not responsible for any installation related to any electrical or plumbing diagram generated by Laars Heating Systems. The provided illustrations are to demonstrate Laars Heating Systems's control operating concept only.

MULTIPLE BOILERS
WIRING DIAGRAM
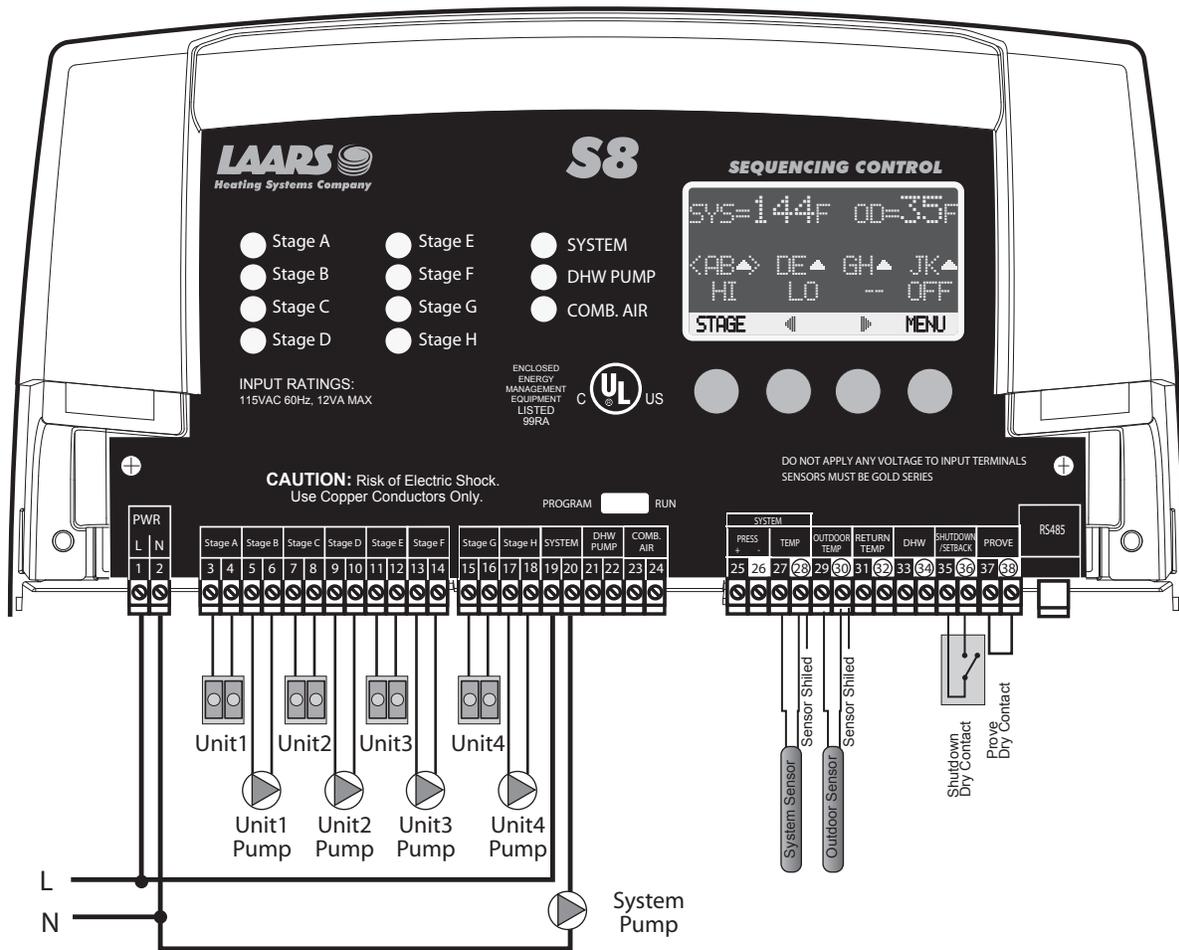
SPECIFICATIONS:

Voltage Input: . . . . 120 VAC 60 Hz
Power Consumption: . . . . 12 VA Max
Operating Temperature: . . . . 20°F/-7°C to 120°F/49°C
Operating Humidity: . . . . 20% to 80%
Dimensions: . . . . 11"W x 9" H x 3 ¾
Weight: . . . . 2.5 pounds

S8 Specifications:

Lead Stage Rotation: . . . . Time (1 to 999 Hours (41 days)), Manual, First-On/First-Off
S8 Outputs and LEDs: . . . . 11 N.O. S.P.S.T (8 Stages, 1 System, 1 DHW Pump, 1 Combustion Air)
S8 Inputs: . . . . 1 Sys(Temp), 1 Outdoor, Return Temp, DHW Temp, Ext Setback/Shutdown, Prove
Stage Modes: . . . . Auto, Standby, Off, On
Standby Time (PID only): . . 1 to 60 minutes
Output Relay Ratings: . . . . 2 Amp inductive at 120 VAC 60 Hz
Add-On S8EXT Panels: . . . . up two S8EXT Panels using RS485
Temperature Display: . . Fahrenheit or Celsius.
Display: . . . . Graphical Alphanumeric (7 rows x 21 char. each)
Temperature Sensor Ranges: . . . . -35°F/-37°C to 250°F/121°C
Outdoor Cutoff Range: . . . . 20°F/-7°C to 100°F/38°C, ON and OFF
Set Point: . . . . -10°F/-23°C to 230°F/110°C
External Set Point: . . . . -10°F/-23°C to 240°F/116°C using XSIG Interface (optional)
Reset Ratio Range (Outdoor Reset Only): . . . . . . (8:1) to (1:4) (Outdoor : System Water), and Custom Reset Ratio
Offset Adjustment (Outdoor Reset Only): . . . . -40°F/-22°C to plus 40°F/22°C
Minimum Target (Outdoor Reset Only): . . . . 70°F/21°C to 170°F/77°C
Maximum Target (Outdoor Reset Only): . . . . 90°F/32°C to 240°F/116°C
Reaction Time (PID only): . . . . 1 to 10 minutes
Minimum Run-Time (PID only): . . . . 1 to 60 minutes
Purge Delay (PID only): . . 0.0 to 10.0 minutes
Last Stage Hold (PID only): . . . . 0°F/0°C to 30°F/17°C
Throttle Range (OSS only): . . . . 2°F/1°C to 20°F/11°C
Domestic Hot Water Priority Options: . . . . . .Parallel Piping with Priority or without Priority and Primary Secondary
Pump Run-On: . . . . 0 to 60 minutes
Pump Exercise: . . . . Yes or No
Schedules: . . . . .1 Day and 1 Night (Setback) settings per day
Night Setback: . . . . . 0°F/0°C to 80°F/44°C
Power Backup: . . . . . . .Lithium coin battery, 100 days minimum 5 year replacement (Maintains Clock in power outages).
External Inputs: . . . . Shutdown Input, and Prove Input. (Dry Contacts Only)
Season: . . . . Winter and Summer.

S8EXT Specifications:

Extension Numbering: . Toggle Switch A or B
LED: . . . 1 Power (Dual Color Green (A)/Red (B)), 1 Communication, 8 Stage Output relays (Dual Color Green (A)/Red (B))
Stage Outputs: . . . . 8 N.O. S.P.S.T.
Output Relay Ratings: . . . . 2 Amp inductive at 120 VAC 60 Hz
Connection to S8 and another S8EXT: . . . . Two RS485