

**Application Overview:** The Sage Zone Control Circulator Panel reduces installation time, increases system efficiency and is applicable to U.S. Boiler Company hot water boilers installed with multiple zone circulators. The panel evaluates individual zone heat demands and optimizes the modulation of U.S. Boiler-brand high-efficiency condensing boilers. ES2, ESC, Series 3, Series 2, MPO-IQ and V8H cast iron boilers benefit from advanced DHW features such as priority protection and, when an IQ Outdoor Reset Option Card is installed, whole home freeze protection and three heating temperature setpoints.

**Easier Installation:** The Sage Zone Control saves installation time and material. The zone panel connects to the boiler using only an included CAT 5 cable. End switches and ZR/ZC terminals that used to be wired to the boiler are available for other functions saving the cost and complexity of adding additional relays.

**Three Temperature System:** The Sage Zone Control supports the three temperature demands found in most contemporary, residential hydronic heating systems. "Central Heat" supports standard radiation heating and "Domestic" supports domestic hot water heating. A new "Auxiliary Heat" demand is a second heating demand that may be used to serve either low temperature radiation or warmer heat demands such as fan coils.

### HeatMatch™ Software used on Modulating Condensing (Mod-Con) Boilers:

The Sage Zone Control is the latest in home heating system innovation. Previous boilers simply received a "call for heat", measured water temperature (cold when starting), fired the boiler to 100%, then modulated back or cycled off. After receiving the "call for heat" the Sage2.2's patent pending HeatMatch Software uses zone expected heat rates to "size" the boiler to match active (turned on) zones, then measures water temperature and fires the boiler only as hard as required for the zones calling. The result is longer run times, dramatic reduction in boiler excessive cycling and higher operating efficiency.



Sage Zone Control Panel and U.S. Boiler Company products

**Fifth Zone:** Every U.S. Boiler control offers an extra domestic pump relay output that can be added to the four zones provided by the Sage Zone Control Circulator Panel. The communication link between the Sage2.2 and zone control panel ensures that priority is always taken care of.

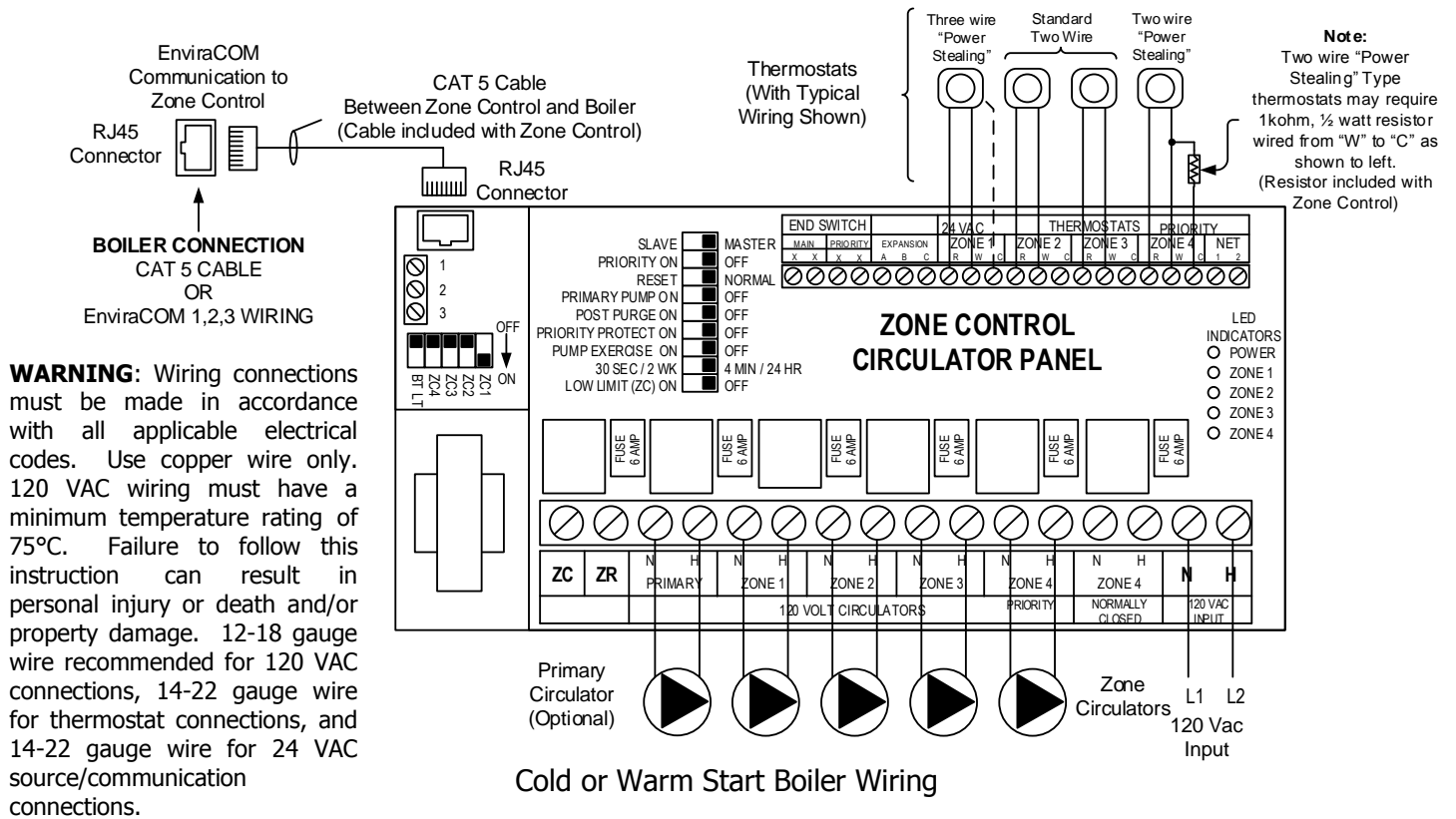
**Whole Home Freeze Protection:** When outside air temperature is below freezing and an individual zone has not opened for over an hour the zone and primary circulators are energized for a short period. Water is moved past the boiler supply sensor and the zone is warmed by circulating water from other parts of the house. This feature helps prevent individual zones from freezing due to thermostats being turned to low or mounted in a poor location.

### Additional features include:

- Selectable "Primary Circulator Run"
- Priority Protection
- Post Purge of DHW
- Circulator Exercise
- Front External Indicator Lights
- Sealed Relays & Fuse Protected
- Expandable to 4 Zoning Controls  
(16 zones with 4 zone controls)
- Universal Thermostat Compatibility
- 100% Factory Tested
- UL Approved



## Zone Control Wiring



**WARNING:** Wiring connections must be made in accordance with all applicable electrical codes. Use copper wire only. 120 VAC wiring must have a minimum temperature rating of 75°C. Failure to follow this instruction can result in personal injury or death and/or property damage. 12-18 gauge wire recommended for 120 VAC connections, 14-22 gauge wire for thermostat connections, and 14-22 gauge wire for 24 VAC source/communication connections.

### Thermostat Input (24 vac):

R	Hot side of transformer. Connect to R on thermostat.
W	Switched R signal from thermostat. Connect to W on thermostat.
C	Common side of transformer. Connect to COM on thermostat (optional).
NET, End Switches, Expansion	Not required

### Boiler Connection (24 vac / source / communication):

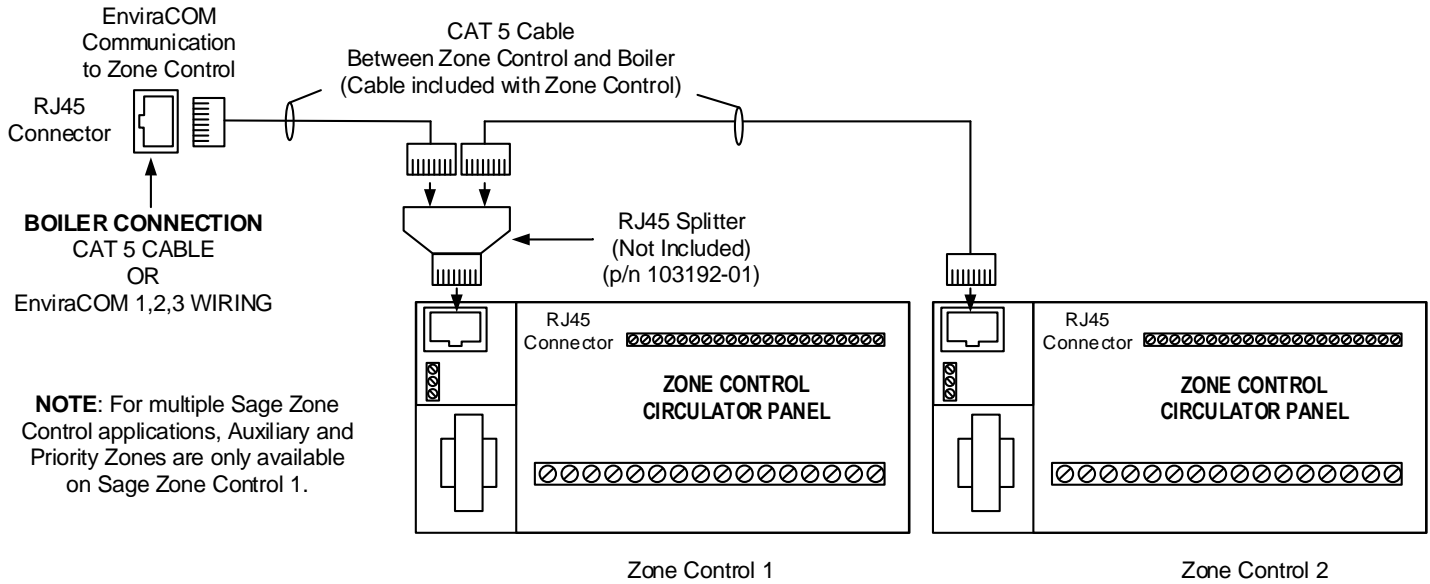
RJ45	Use Ethernet (Cat 5). Connect EnviraCOM to Alpine, K2, ES2, Series 3, MPO-IQ and other boilers with RJ45 ports.
1,2,3	Use 14-22 gauge wire. Connect EnviraCOM to Series 2, V8 and other boiler terminals.

### 120 VAC Connections (N is Neutral, H is Hot):

Power Input	Connect to 120 Volt AC power
Zone 4 Priority	Connect to Priority Zone Circulator (if enabled) or Zone 4 Circulator
Normally Closed	Normally closed terminals for the Priority Zone. Will deactivate on a Priority Zone call.
Zone 1-3	Connect to Zone Circulators
Primary	Connect to Primary Circulator (optional)
ZR/ZC	Not required

**External Diagnostics:** Externally visible lights show full functionality of the switching relay. The green light should always be on, indicating that power is connected. When the thermostat calls for heat, both the appropriate circulator and red indicating light are energized.

## Multiple Zone Control Wiring



**RJ45 Connection Diagram (2 panels shown, typical for up to 4 panels)**

## Zone Control Settings

	<table border="0"> <tr><td>SLAVE</td><td><input checked="" type="checkbox"/></td><td>MASTER</td></tr> <tr><td>PRIORITY ON</td><td><input checked="" type="checkbox"/></td><td>OFF</td></tr> <tr><td>RESET</td><td><input checked="" type="checkbox"/></td><td>NORMAL</td></tr> <tr><td>PRIMARY PUMP ON</td><td><input checked="" type="checkbox"/></td><td>OFF</td></tr> <tr><td>POST PURGE ON</td><td><input checked="" type="checkbox"/></td><td>OFF</td></tr> <tr><td>PRIORITY PROTECT ON</td><td><input checked="" type="checkbox"/></td><td>OFF</td></tr> <tr><td>PUMP EXERCISE ON</td><td><input checked="" type="checkbox"/></td><td>OFF</td></tr> <tr><td>30 SEC / 2 WK</td><td><input checked="" type="checkbox"/></td><td>4 MIN / 24 HR</td></tr> <tr><td>LOWLIMIT (ZC) ON</td><td><input checked="" type="checkbox"/></td><td>OFF</td></tr> </table>	SLAVE	<input checked="" type="checkbox"/>	MASTER	PRIORITY ON	<input checked="" type="checkbox"/>	OFF	RESET	<input checked="" type="checkbox"/>	NORMAL	PRIMARY PUMP ON	<input checked="" type="checkbox"/>	OFF	POST PURGE ON	<input checked="" type="checkbox"/>	OFF	PRIORITY PROTECT ON	<input checked="" type="checkbox"/>	OFF	PUMP EXERCISE ON	<input checked="" type="checkbox"/>	OFF	30 SEC / 2 WK	<input checked="" type="checkbox"/>	4 MIN / 24 HR	LOWLIMIT (ZC) ON	<input checked="" type="checkbox"/>	OFF	<p><b>Factory Default Settings:</b></p> <p>The zone panel is shipped ready to communicate to the boiler control. Zone Panel switches are set for the panel to be connected to four (4) Central Heat Zones.</p>
SLAVE	<input checked="" type="checkbox"/>	MASTER																											
PRIORITY ON	<input checked="" type="checkbox"/>	OFF																											
RESET	<input checked="" type="checkbox"/>	NORMAL																											
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LOWLIMIT (ZC) ON	<input checked="" type="checkbox"/>	OFF																											
<p>Switches Located on Zone Panel</p> <p><b>Factory Default (As Shipped) Settings</b></p>																													

**Operation:** When any thermostat calls for heat, the appropriate circulator is energized and the appropriate heat demand is sent to the boiler control.

### Adjusting Zone Panel Switches:

Factory Setting	Range / Choices	Switch and Description
Master	Master, Slave	<p><b>Slave / Master</b></p> <p>Master Zone panel is set to communicate with boiler control.</p> <p>Slave Expansion panels must be set "Slave".</p>
Off	Off, On	<p><b>Priority</b></p> <p>When the priority is set to ON and the priority zone is energized, all other zones are de-energized until priority zone is satisfied. When priority is set OFF all zones will operate independently.</p> <p>Off Zone 4 is a Central Heat Zone, all zones operate independently.</p> <p>On Zone 4 is a Priority Zone and Zones 1, 2 and 3 are de-energized during priority.</p>

## Zone Control Settings (continued)

### Adjusting Zone Panel Switches:

Factory Setting	Range / Choices	Switch and Description
Normal	Reset Normal	<b>Reset</b> The Reset switch is not used. The outdoor reset functionality is included in the Sage2.2 Controller and may be added to boilers equipped with IQ Control Systems by applying the IQ Outdoor Reset Option Card.
Off	Off, On	<b>Primary Pump</b> When Primary Pump is set to OFF, the primary circulator output will energize when any zone calls for heat, except the priority zone. When Primary Pump is set to ON, the primary circulator output will energize when any zone calls for heat. Off Primary pump is not energized for Priority Zone demand On Primary pump is energized for Priority Zone demand.
Off	Off, On	<b>Post Purge</b> When Post Purge is set to ON, the priority zone output will stay energized for 2 minutes after its thermostat or Aquastat is satisfied, but not operate the boiler. The post purge is only active when there is no other zone call for heat active. Off Priority zone is e-energized when priority demand is satisfied. On Priority zone is held energized for 2 minutes after demand is satisfied provided no other zones are active.
Off	Off, On	<b>Priority Protection</b> When the Priority Protection is set to ON, and if the priority zone calls continuously for more than one hour, power is returned to all the other zones, allowing each zone to function independently. Once the priority zone is satisfied, the timer is reset and the priority zone is again allowed to have priority for up to one hour starting from when it calls next. Off Priority zone retains priority when calls continuously. On Priority is removed after the priority zone calls continuously for more than an hour.
Off	Off, On	<b>Pump Exercise</b> When the Pump Exercise is set to ON, a timer cycles connected circulators at the selected time interval. The time interval can be set for the circulators to run for either 30 seconds every 2 weeks or for 4 minutes every 24 hours. Off Pumps are not energized periodically according to exercise interval. On Pumps run periodically according to interval.
4 min/24hr	30sec/2wk 4 min/24hr	<b>Exercise Interval</b> 4 min/24 hr Pumps are energized for 4 minutes each 24 hour period. 30 sec/2 wk Pumps are energized for 30 seconds each 2 week period.
Off	Off, On	<b>Low Limit (ZC)</b> Low Limit switch is not used. Warm start boiler Aquastats use EnviraCOM communication to ensure circulators are energized only when boiler temperature is above low limit setpoint.
ZC1=On ZC2=Off ZC3=Off ZC4=Off	On, Off	<b>Zone Control</b> ZC1 = On Zone control is set to No. 1 and may be set to be master zone control. ZC2 = On Zone control is set to No. 2 and may only be a slave zone control. ZC3 = On Zone control is set to No. 3 and may only be a slave zone control. ZC4 = On Zone control is set to No. 4 and may only be a slave zone control.
BT	BT, LT	<b>BT/LT</b> The Master Panel's Zone 3 may be selected to send Central Heat or Auxiliary Heat demands to the boiler control. The Sage2.2 and IQ Outdoor Reset Card respond to these demands with appropriate independent setpoints and reset curves. Zone 1 and 2 are always Central Heat demands. BT Central Heat demand is selected for Zone 3. LT Auxiliary Heat demand is selected for Zone 3.

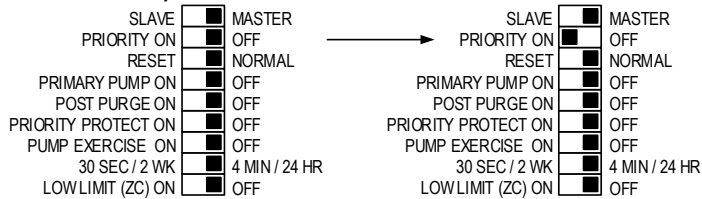
## Setting Zone Panel to use Zone 4 as Priority Zone On with Sage2.2

The boiler and zone controls are factory set to provide for Zone 4 to be a Central Heat demand. To change from Central Heat to Priority (Domestic Hot Water) Demand perform the following:

### Step 1

Set Zone Control Priority Switch to Domestic Hot Water Priority:

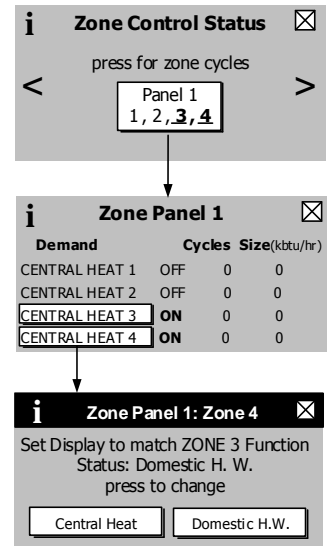
1. Set Priority switch to ON:
2. Set Priority Protection switch to ON if desired.



### Step 2

Set Sage2.2 Zone Panel 1 Status Screen to Count Domestic Hot Water (DHW):

1. Press "Status" button from boiler control "Home" screen
2. Press "left arrow" button to view "Zone Control Status" screen.
3. Press "Panel 1" button.
4. Press "Central Heat 4" button to view "Zone Panel 1: Zone 4" screen
5. Press "Domestic H.W." button to set display status, cycles and size to DHW.
6. Press  to return to status screens.
7. Enter Adjustment mode to adjust DHW parameter settings if desired.



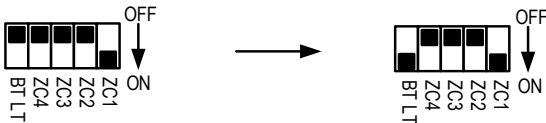
## Setting Zone Control to use Zone 3 for Auxiliary Heat with Sage2.2

Auxiliary Heat is a second heating demand that may be used to serve either low temperature radiation or warmer heat demands such as fan coils. When both Central Heat and Auxiliary Heat demand types are active at the Central Heat is higher priority unless Auxiliary Heat is selected to be higher priority.

The boiler and zone controls are factory set to provide for Zone 3 to be a Central Heat demand. To change from Central Heat to Auxiliary Heat Demand perform the following:

### Step 1

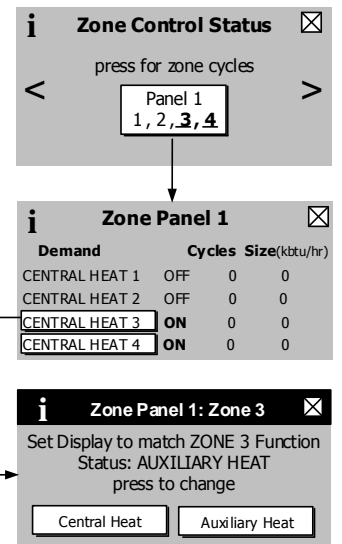
Set Zone Control BT/LT switch to LT:



### Step 2

Set Sage2.2 Zone Panel 1 Status Screen to Count Auxiliary Heat cycles:

1. Press "Status" button from boiler control "Home" screen
2. Press "left arrow" button to view "Zone Control Status" screen.
3. Press "Panel 1" button.
4. Press "Central Heat 3" button to view "Zone Panel 1: Zone 3" screen
5. Press Auxiliary Heat button to set display status, cycles and size to Auxiliary Heat.
6. Press  to return to status screens.
7. Enter Adjustment Mode to modify Auxiliary Heat parameter settings if desired.

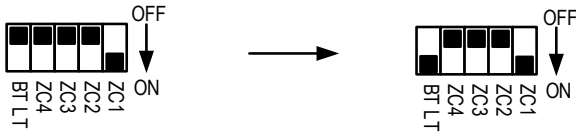


## Set Zone Control to use Auxiliary Heat with IQ Outdoor Reset Option Card

The boiler and zone controls are factory set to provide for Zone 3 to be a Central Heat demand. When Zone 3 is set to Auxiliary Heat the IQ Control System has two separate setpoints and outdoor reset curves. When both demand types are active at the higher temperature demand request has priority. "Zone 2" settings may be set higher or lower than "Zone 1" settings. To change from Central Heat to Auxiliary Heat perform the following:

### Step 1

Set Zone Control BT/LT switch to LT:



### Step 2

Adjust IQ Reset Card Auxiliary Heat Settings:

#### Selecting IQ Option Card

To access an IQ Option Card:

1. Press the "I" key. The display will go from "DCLP" to [ 1, [ 2 and . . . (when cards are installed) to provide access to each of the card slots and the card plugged into that slot.
2. Press either the Up ↑ or Down ↓ keys when the display shows the card number where the reset card is installed. For example, if the reset card is installed in slot one, press the Up ↑ or Down ↓ keys when "[ 1" is displayed.

#### Entering Adjustment Mode

The Outdoor Reset IQ Option Card is factory programmed to include basic outdoor air reset functionality. To view or adjust these settings:

1. Press and hold the Up ↑ or Down ↓ and "I" keys simultaneously for three (3) seconds while the display is in the reset card View Mode. While holding the buttons the display will change to an Adjustment mode label signifying to the user that installer mode has been entered. This procedure is intended to discourage unauthorized or accidental changes to parameter settings.
2. After entering Adjustment Mode, Press the "I" key to view the item to be adjusted.
3. Press the Up ↑ or Down ↓ keys to adjust the displayed setpoint to the desired value. Zone 2 parameters are used for Auxiliary Heat demand.

#### Note

*Hb2, Lb2, Ho2 AND Lo2* Are only used when the zone panel is connected to the system and has a "low temperature" heat demand. A "low temperature" heat demand is available at zone panel zone 3 when "BT/LT" dip switch is set to "LT". Refer to "wiring" section for dip switch location.



## Outdoor Air Reset

### View Mode

St	Setpoint Temperature
ot	Outside Temperature
bAc	Back to Operating Mode
Err	Error (see Error Numbers)

### Error Numbers

53	Sensor Failure
89	Communication Error
156	Outdoor Low Battery

### Adjustment Mode

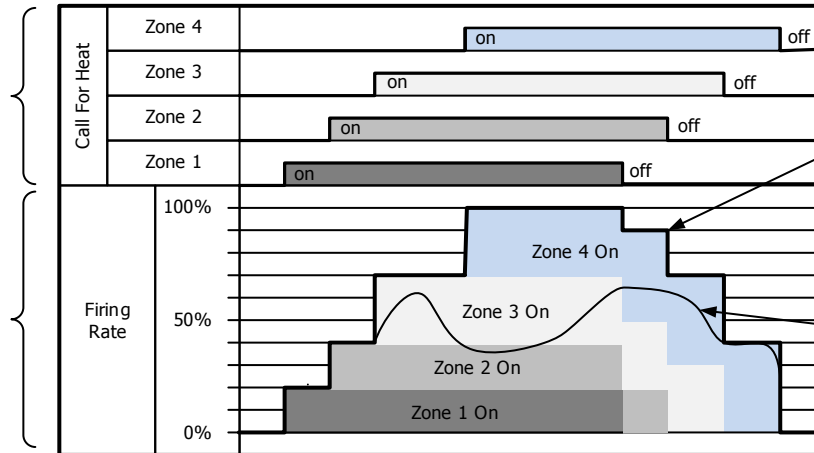
dS_	DHW Setpoint
Pt_	DHW Priority Time
Pr_	Primary Pump Run
tB_	Boost Time
SS_	T-stat Setback Setpoint
Hb_	High Boiler Temp. Zone 1
Lb_	Low Boiler Temp. Zone 1
Ho_	High Outdoor Temp.
Lo_	Low Outdoor Temp.
Lt_	Min. Boiler Water Temp.
Hb2	High Boiler Temp. Zone 2
Lb2	Low Boiler Temp. Zone 2
Ho2	High Outdoor Temp. Zone 2
Lo2	Low Outdoor Temp. Zone 2
F-C	Set to F or C Mode
bAc	Back to View Mode

## Adjusting Zone Expected Heat Rate with Sage2.2 HeatMatch Software

The Control is shipped with defaults that will provide improved operation. Adjustment is only required to optimize setup. The expected heat rate adjustment is used to better match boiler output to the home heating needs. After receiving a "call for heat" the Control first uses the expected heat rate value to set a maximum heat rate. The maximum heat rate is the highest heat rate that the boiler can fire to at that moment. The maximum heat rate is the summation of the expected heat rates for the active (turned on) zones. After establishing the maximum heat rate the Control then measures water temperature and fires the boiler only as hard as required for the heat demand.

Example "call for heat" durations for a four zone house.

Maximum heat rate limits firing rate and prevents the Control from firing to 100% in response to a smaller zone demands.



### Maximum Heat Rate:

Automatically adjusted by the Control based on the size and number of zones calling for heat.

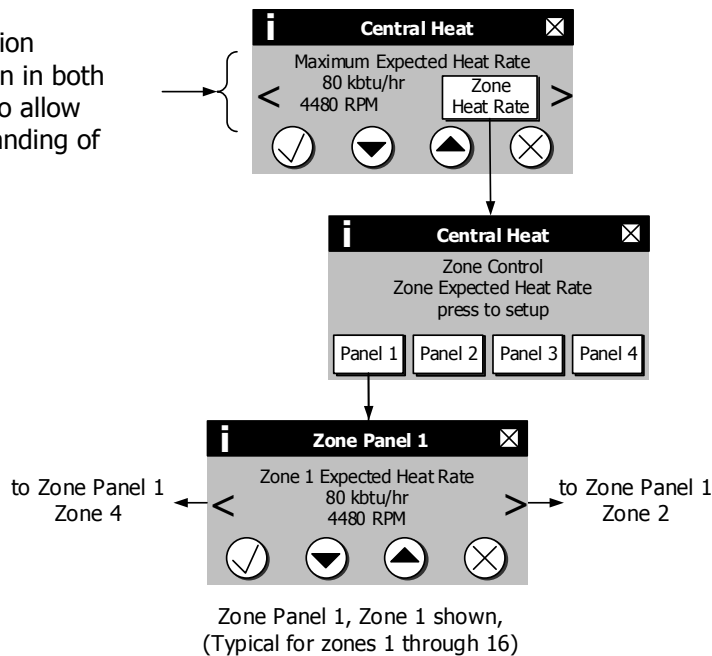
### Actual Heat Rate:

Boiler is free to modulate based on temperature from minimum to maximum heat rate.

Set Sage2.2 Expected Heat Rates:

1. Press "Adjust" button from boiler control "Home" screen
2. Enter password and Press "Save" and then "Adjust" button.
3. Press "Modulation" button.
4. Press "right arrow" button to view "Central Heat Maximum Expected Heat Rate Screen" screen.
5. Press "Zone Heat Rate" button.
6. Select a zone panel to adjust and Press "Panel" button.
7. Adjust individual zone expected heat rate.
8. Press  to return to status screens.

Maximum modulation numbers are shown in both RPM and kbtu/hr to allow for easier understanding of boiler heat rate.



The sum of Zone Expected Heat Rates plus DHW Maximum Expected Heat Rate (if DHW is active) is used to calculate the active maximum modulation rate.

## Specifications

Number of Zones	Input Voltage	Combined Load	Type 1 Enclosure Dimensions
4 with Priority	120/60/1 VAC	20 amps	10¾" wide --- 7" high --- 2¾" deep

- UL listed, file E160793, (model SR504-EXP-S5-4).
- All circulator relay connections (incl. ZC/ZR) rated 1/3 HP (6 FLA, 36 Locked Rotor Amps - LRA) at 120 VAC.
- End switch connections are rated 24 VAC, 1 amp.
- All thermostat connections supply a 24 VAC class 2 output.
- Boiler/EnviraCOM 123 connections supply a 24 VAC class 2 output.

### Requirements:

- Intelligent Oil Boiler Control: Models manufactured since September 1, 2012 (i.e. 2012 compliant).
- Intelligent Hydronic Control: Models manufactured since September 1, 2012 (i.e. 2012 compliant).
- IQ Outdoor Reset Card: Version 14 or newer.
- Sage2.2 Controller: Version 3219.4716 or newer and LCD Display GT02r07 or newer.

### Ordering Information:

Part Number	Description
104590-01	Sage Zone Control Circulator Panel
105648-01	IQ Outdoor Air Reset IQ Option Card Kit for use with IQ Option Panel. Kit includes the outdoor air temperature sensor and instructions.
103192-01	RJ45 Splitter for use with expansion panels. Connect two standard Ethernet cables into the same zone panel.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC. Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



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