

Programming Guide

Central Processing Unit 1000
Version 1.38

The logo consists of the letters 'HBX' in a bold, black, sans-serif font. The letters are centered between two horizontal red bars. The top bar is above the 'H' and 'B', and the bottom bar is below the 'B' and 'X'.

HBX

CPU-1000

HBX Control Systems Inc.



Control Systems Inc.

HBX CPU-1000 HVAC Controller
Version 1.38



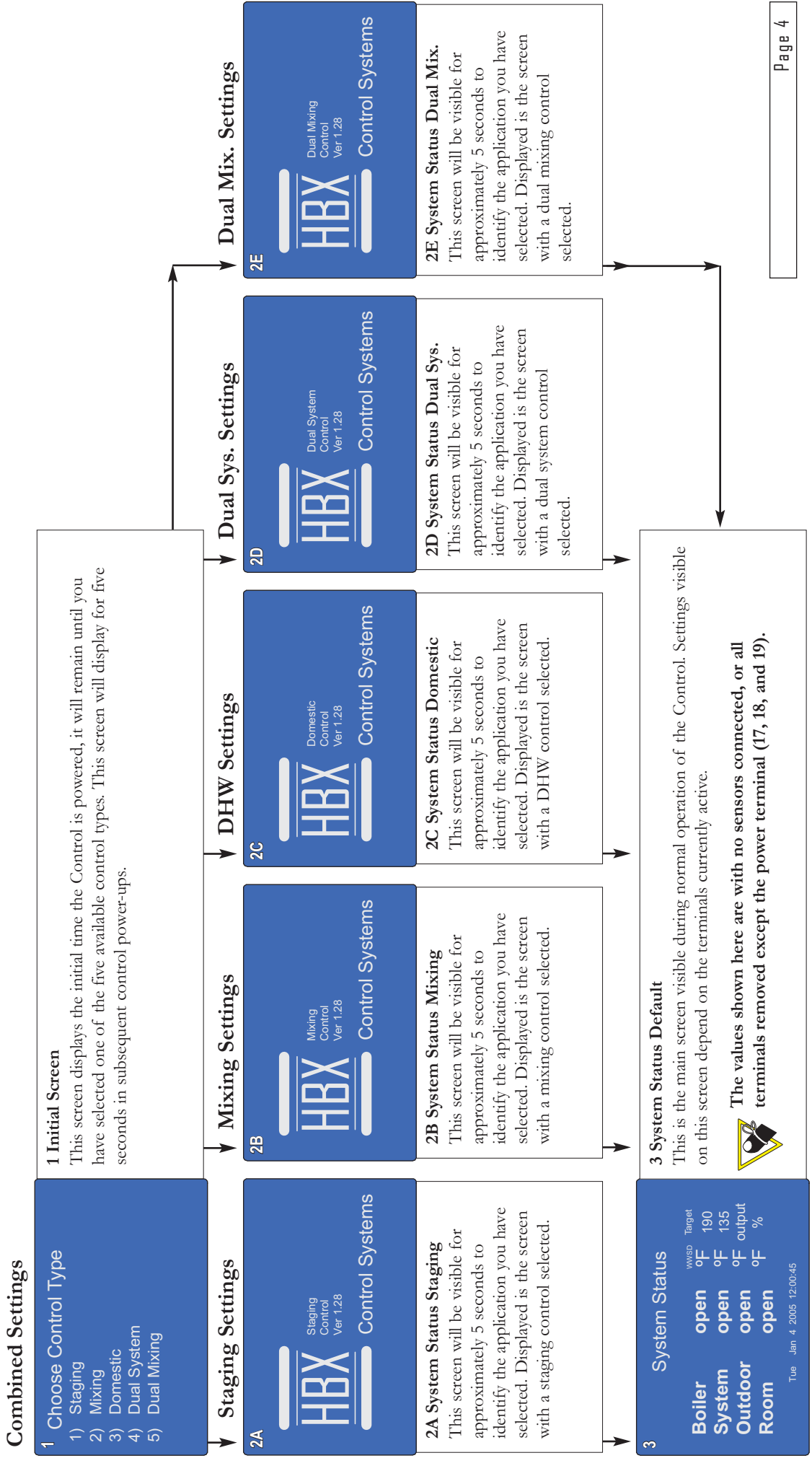
Control Systems Inc.

HBX CPU-1000 HVAC Controller
Version 1.38

NOTES:

NAVIGATING THE DISPLAY

The programming instructions are broken down into five columns to accommodate each control type. Steps in the first column are for “staging” control/common steps, the second column is applicable for “mixing” control steps, the third column pertains to the “DHW” control, the fourth step applies to the “dual system” control, and the last column is designated for the “dual mixing” control.



Staging Settings

4A	System Function	wwsd	Cycles
HT Sys Pump	OFF	236	720
Boiler	OFF	720	

4A System Function
You can toggle between main screens by pressing either the A or B button. For a staging control (with a single boiler selected) the screen will look like above (depending on current terminal activity).

Mixing Settings

4B	System Function	wwsd	Cycles
Boiler Pump	OFF	236	472
System Pump	OFF	472	720
Injection Boiler	OFF	720	236

4B System Function
You can toggle between main screens by pressing either the A or B button. For a mixing control (with a single boiler selected) the screen will look like above (depending on current terminal activity).

DHW Settings

4C	System Function	wwsd	Cycles
Boiler Pump 1	OFF	236	236
Boiler	OFF	720	
DHW Valve	OFF	236	

4C System Function
You can toggle between main screens by pressing either the A or B button. For a DHW control (with a single boiler selected) the screen will look like above (depending on current terminal activity).

Dual Sys. Settings

4D	System Function	CYCLES
HT Sys Pump	OFF	5
Boiler	OFF	68
DHW Boiler	OFF	0
DHW Valve	OFF	65535

4D System Function
You can toggle between main screens by pressing either the A or B button. For a dual system control the screen will look like above (depending on current terminal activity).

Dual Mix. Settings

4E	System Function	HTD	HD2	CYCLES
Boiler Pump1	ON	1		
System Pump1	OFF	0		
System Pump2	ON	1		
Injection	OFF	0		
Injection2	OFF	0		
Boiler	OFF	0		

4E System Function
You can toggle between main screens by pressing either the A or B button. For a dual mixing control the screen will look like above (depending on current terminal activity).

5 Programming

- 1) Control Options
- 2) System Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

5 Programming - Control Options

To access the Programming Menu, press the D button. To scroll to one of the 7 options, press the A button to move down the page or the B button to move up the page. Option two will vary depending on the specific control type that you have chosen.

6A Programming

- 1) Control Options
- 2) System Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

6A Programming - Control Options Enter
To enter the desired selection press the C button. For example, with line 1 flashing press button C to enter the Control Options screen.

6B Programming

- 1) Control Options
- 2) Mixing Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

6B Programming - Control Options Enter
To enter the desired selection press the C button. For example, with line 1 flashing press button C to enter the Control Options screen.

6C Programming

- 1) Control Options
- 2) Domestic Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

6C Programming - Control Options Enter
To enter the desired selection press the C button. For example, with line 1 flashing press button C to enter the Control Options screen.

6D Programming

- 1) Control Options
- 2) Dual Stage Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

6D Programming - Control Options Enter
To enter the desired selection press the C button. For example, with line 1 flashing press button C to enter the Control Options screen.

6E Programming

- 1) Control Options
- 2) Dual Mixing Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

6E Programming - Control Options Enter
To enter the desired selection press the C button. For example, with line 1 flashing press button C to enter the Control Options screen.

Combined Settings

7 Control Options

- 1) Display Options
- 2) Always HD? N
- 3) Use Room Therm? N
- 4) Mins and Maxs
- 5) Testing
- 6) Stage Run Times
- 7) Use Zone Module? N

7 Control Options Selections

- 1) Set up the display and clock
- 2) Program a permanent heat demand
- 3) Trigger the Control with a thermistor input via an Expansion Module
- 4) View temp values effecting each thermistor
- 5) Manually test each relay
- 6) View the running times of each boiler stage for all connected boilers
- 7) Option allowing you to add and use Zone Control Modules (under development)

8 Display Options

- 1) Change Time
- 2) Reset Cycles
- 3) Display in °F
- 4) D-lite Savings? N
- 5) Reset Run Times

8 Display Options

- 1) Set your date and time (MFG suggests to enter your clock setup now)
- 2) Reset the internal relay counter for pump and boiler cycles
- 3) Program and Display either °F or °C
- 4) Program the Control to allow for Daylight Savings time shifting
- 5) Clears stage accumulated hours counter

9 Display Options

- 1) Change Time
- 2) Reset Cycles
- 3) Display in °F
- 4) D-lite savings? N
- 5) Reset Run Times

9 Display Options: Change Time

It is recommended that you setup the correct time on your Control before configuring other options, as the real-time settings are effected by the "Change Time" feature.

9A Year 2000

9A Display Options: Change Time - Year

Select the appropriate year by pressing the "A" button to decrease and the "B" button to increase the year. Press the "C" button to proceed.

9B Month 00

9B Display Options: Change Time - Month

Select the appropriate month (1-12) by pressing the "A" button to decrease and the "B" button to increase the month. Press the "C" button to proceed.

Combined Settings

9C Day 00

9C Display Options: Change Time - Day

Select the appropriate day of the month (1-31) by pressing the “A” button to decrease and the “B” button to increase the day. Press the “C” button to proceed.

9D Weekday 1
(Sunday = 1)

9D Display Options: Change Time - Weekday

Select the appropriate day of the week (1-7) by pressing the “A” button to decrease and the “B” button to increase the day. Press the “C” button to proceed.



Sunday = 1.

9E Hour 00

9E Display Options: Change Time - Hour

Select the appropriate hour of the day (0-24) by pressing the “A” button to decrease and the “B” button to increase the hour. Press the “C” button to proceed.



Midnight = 0:00

9F Min 00

9F Display Options: Change Time - Minute

Select the appropriate minute of the hour (0-60) by pressing the “A” button to decrease and the “B” button to increase the minute. Press the “C” button to proceed.

10 Display Options

- 1) Change Time
- 2) **Reset Cycles**
- 3) Display in “F”
- 4) D-lite savings? N
- 5) Reset Run Times

10 Display Options: Reset Cycles

Pressing the “C” button with the “Reset Cycles” option selected will reset the internal relay counter for heat pumps and heat pump cycles. Heat pump and pump cycles are visible on the “System Function” screen.

Combined Settings

11 Display Options

- 1) Change Time
- 2) Reset Cycles
- 3) Display in °C**
- 4) D-lite savings? N
- 5) Reset Run Times

11 Display Options: Display in °F/°C

Pressing the “C” button with the “Display in °F/°C” option selected will allow you to program the Control and display in either °F or °C scales.

12 Display Options

- 1) Change Time
- 2) Reset Cycles
- 3) Display in °C
- 4) D-lite savings? Y**
- 5) Reset Run Times

12 Display Options: D-Lite Savings

Pressing the “C” button with the “D-Lite Savings” option selected will allow you to program the Control to allow for Daylight Savings time shifting.

13 Display Options

- 1) Change Time
- 2) Reset Cycles
- 3) Display in °C
- 4) D-lite savings? Y
- 5) Reset Run Times**

13 Display Options: Reset Run Times

Pressing the “C” button with the “Reset Run Times” option selected will clear the stage accumulated hours counter. To view the stage runtime, select the “Stage Run Times” option within the “Control Options” menu.

14 Control Options

- 1) Display Options
- 2) Always HD? N**
- 3) Use Room Therm? N
- 4) Mins and Maxs
- 5) Testing
- 6) Stage Run Times
- 7) Use Zone Module? N

14 Always Heat (Mixing) Demand/Use Room Therm

Option #2 allows you to set a permanent heat demand using the software program and does not require the use of an external signal. Eg. In a commercial staging control application.



15 Control Options

- 1) Display Options
- 2) Always HD? N
- 3) Use Room Therm? N**
- 4) Mins and Maxs
- 5) Testing
- 6) Stage Run Times
- 7) Use Zone Module? N

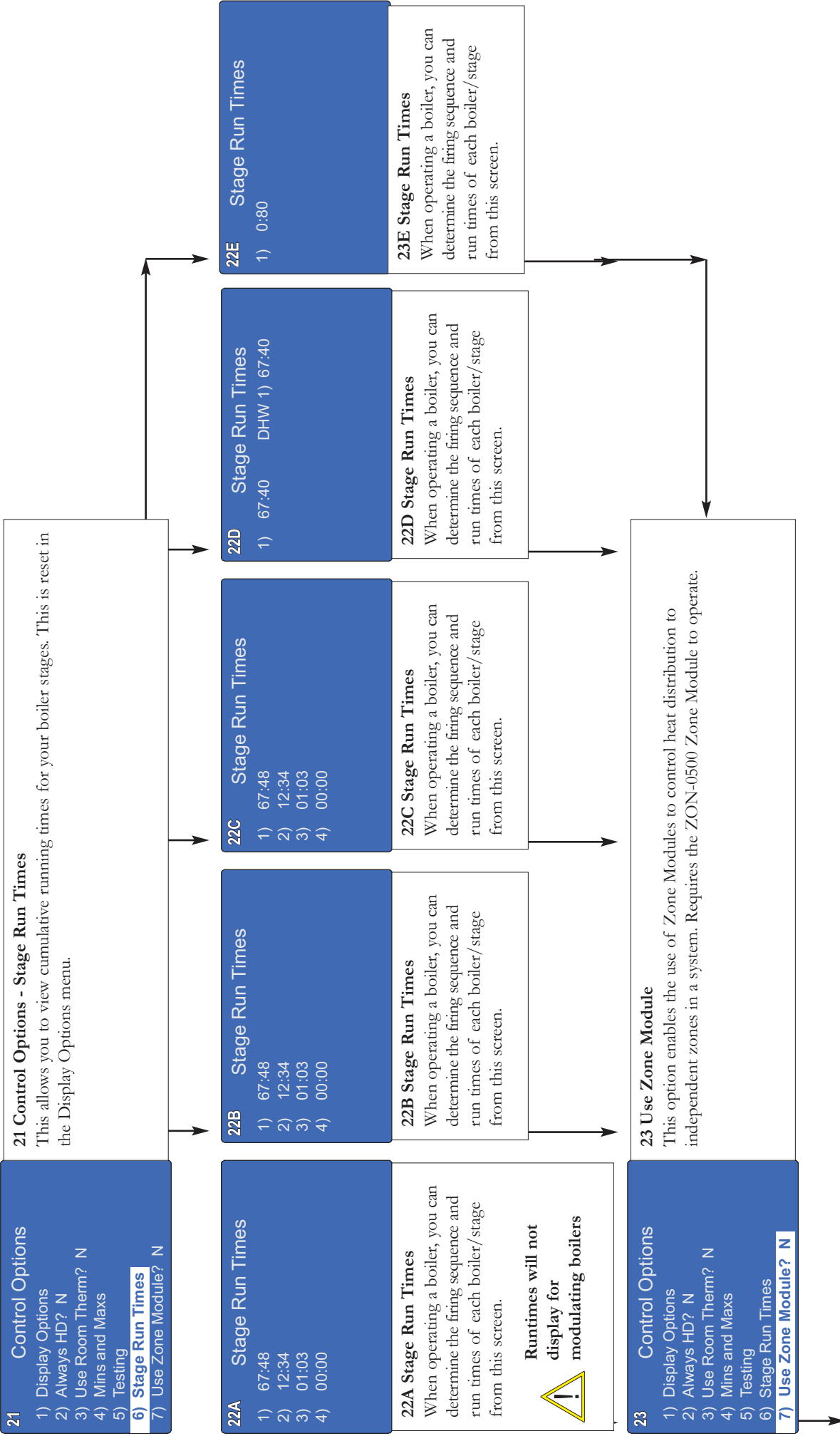
15 Use Room Therm

Option #3 requires the use of an Expansion Module (EXP-0100 or EXP-0300) for a fourth sensor value. Eg. When a room thermistor is selected to ‘Y’, the Control looks for a fourth thermistor.

Combined Settings

<p>16 Control Options</p> <ol style="list-style-type: none">1) Display Options2) Always HD? N3) Use Room Therm? N4) Mins and Maxs5) Testing6) Stage Run Times7) Use Zone Module? N	<p>16 Control Options - Mins and Maxs This allows you to view extreme temperatures that the thermistor has been subjected to. These values can be reset at any time.</p>				
<p>17 Mins and Maxs</p> <ol style="list-style-type: none">1) Thermistor 12) Thermistor 23) Thermistor 34) Thermistor 45) Thermistor 56) Thermistor 67) Reset All	<p>17 Mins and Maxs Allows you to look at up to six different thermistor min/max temperature extremes and reset back to zero. When formatting the Control, existing min/max values are reset. Selecting the 'Reset All' option clears the time and date stamps. To see updated Min/Max values return to the System Status screen to refresh the view.</p>				
<p>18 Thermistor 1</p> <table border="1"><tbody><tr><td>30/09/05 03HRS</td><td>Min Temp 89°F</td></tr><tr><td>24/09/05 16HRS</td><td>Max Temp 20 °F</td></tr></tbody></table>	30/09/05 03HRS	Min Temp 89°F	24/09/05 16HRS	Max Temp 20 °F	<p>18 Thermistor 1 Each min/max value also has a time and date stamp to show when the value was reached.</p> <p> This can serve as a valuable troubleshooting tool while diagnosing system problems.</p>
30/09/05 03HRS	Min Temp 89°F				
24/09/05 16HRS	Max Temp 20 °F				
<p>19 Control Options</p> <ol style="list-style-type: none">1) Display Options2) Always HD? N3) Use Room Therm? N4) Mins and Maxs5) Testing6) Stage Run Times7) Use Zone Module? N	<p>19 Control Options Testing This allows you to manually test/run each relay for up to 30 seconds.</p> <p> You can cycle the relay faster by pressing the C button, this skips the 30 second elapse time.</p>				
<p>20 Testing</p> <ol style="list-style-type: none">1) Relay # 12) Relay # 23) Relay # 34) Relay # 45) Relay # 56) Relay # 67) Relay # 7	<p>20 Testing Relays There are five relays on the main control box. Relays six and higher will be run with the corresponding Expansion Module connected. By continually pressing the 'A' button you can access extra screens showing Relays #8 and higher.</p>				

Combined Settings



Staging Settings

24A Programming

- 1) Control Options
- 2) System Options**
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

24A System Options
Access programming settings for a staging control through this selection.

Mixing Settings

24B Programming

- 1) Control Options
- 2) Mixing Options**
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

24B Mixing Options
Access programming settings for a mixing control through this selection.

DHW Settings

24C Programming

- 1) Control Options
- 2) Domestic Options**
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

24C Domestic Options
Access programming settings for a DHW control through this selection.

Dual Sys. Settings

24D Programming

- 1) Control Options
- 2) Dual Stage Options**
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

24D Dual Stage Options
Access programming settings for a dual system control through this selection.

Dual Mix. Settings

24E Programming

- 1) Control Options
- 2) Mixing Options**
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

24E Dual Mixing Options
Access programming settings for a dual mixing control through this selection.

25B Mixing Settings

- 1) Boiler Options**
- 2) Injection is PMlv

25B Boiler Options
Selection #1 will direct you to the System Options screen.

25C Domestic Setup

- 1) DHW Boiler Options**
- 2) Indirect Fire Tank

25C DHW Boiler Options
Selection #1 will direct you to the System Options screen.

25D Dual System Options

- DHW System Options
- 2) System Options**

25D Dual Sys. Boiler Options
Selection #2 will direct you to the System Options screen.

25E Domestic Setup

- 1) Boiler Options**
- 2) Injection is PMlv
- 3) Injection2 is PMlv

25E Dual Mix. Boiler Options
Selection #1 will direct you to the System Options screen.

26 System Options

- 1) Staging Options**
- Pump Options
- # of Stages 1
- Rotate Boilers? Y
- Mod Boiler Options
- Mod Prepurge On? N
- Use Flow Proof? N

26 System Options
These steps provide the necessary options to configure the boiler staging component in your system.

27 Staging Options - Hi/Lo Fire

- 1) Hi/Lo Fire? N**
- Fixed First? N
- Fixed Last? N
- Lo/Lo - Hi/Hi? N
- Boiler Diff'nital
- Min Boiler LagTime
- 4-Stage? N

27 Staging Options - Hi/Lo Fire
Enable the Hi/Lo Fire option if you are utilizing dual stage boilers with high and low output settings.

Combined Settings

<p>28 Staging Options</p> <ol style="list-style-type: none"> 1) Hi/Lo Fire? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo - Hi/Hi? N 5) Boiler Diff'nial 6) Min Boiler LagTime 7) 4-Stage? N 	<p>28 Staging Options - Fixed First Fixed First designates a boiler to function as the initial firing boiler, regardless of settings such as rotate boiler. This boiler will consistently be the first to fire when a heat demand is present.</p>
<p>29 Staging Options</p> <ol style="list-style-type: none"> 1) Hi/Lo Fire? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo - Hi/Hi? N 5) Boiler Diff'nial 6) Min Boiler LagTime 7) 4-Stage? N 	<p>29 Staging Options - Fixed Last Fixed Last designates a boiler to function as the last firing boiler, regardless of setting such as rotate boiler. This boiler will consistently be the last to fire when a heat demand is present.</p>
<p>30 Staging Options</p> <ol style="list-style-type: none"> 1) Hi/Lo Fire? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo - Hi/Hi? N 5) Boiler Diff'nial 6) Min Boiler LagTime 7) 4-Stage? N 	<p>30 Staging Options - Lo/Lo - Hi/Hi The Lo/Lo - Hi/Hi function of the Control instructs a heating system containing two dual stage boilers to engage the first stage of each boiler prior to igniting the second stage of either boiler. The Control will turn on the second stages of the boilers as the call for heat is required.</p>
<p>31 Staging Options</p> <ol style="list-style-type: none"> 1) Hi/Lo Fire? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo - Hi/Hi? N 5) Boiler Diff'nial 6) Min Boiler LagTime 7) 4-Stage? N 	<p>31 Staging Options - Boiler Differential The Boiler Differential option creates the margin for error above or below the target temperature. A higher boiler differential will allow for a greater discrepancy in target/actual temperature before there is a heat demand.  The boiler differential can only be manually set for single boiler applications.</p>
<p>32 Boiler Diff'nial</p> <p style="text-align: center; font-size: 2em; font-weight: bold;">AUTO</p> <p>NB. Single Stage Only</p>	<p>32 Staging Options - Boiler Differential This option allows the user to set the differential for a single boiler only. This will override automatic differential and PID control for the boiler.</p>

Combined Settings

33 Staging Options 1) Hi/Lo Fire? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo - Hi/Hi? N 5) Boiler Diff'nital 6) Min Boiler LagTime 7) 4-Stage? N	33 Staging Options - Minimum Boiler Lag Time The Minimum Boiler Lagtime enforces a minimum time period that must expire before a new boiler cycle may begin. This minimizes short cycling and functions to promote a more energy efficient system.
34 Boiler Min LagTime 20 mins	34 Staging Options - Minimum Boiler Lag Time Cont'd This screen allows you to set the desired time frame that must pass before consecutive boiler cycles may commence.
35 Staging Options 1) Hi/Lo Fire? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo - Hi/Hi? N 5) Boiler Diff'nital 6) Min Boiler LagTime 7) 4-Stage? N	35 4 Stage Boiler Choose this option when running a 4-stage boiler.
36 System Options 1) Staging Options 2) Pump Options 3) # of Stages 1 4) Rotate Boilers? Y 5) Mod Boiler Options 6) Mod Prepurge On? N 7) Use Flow Proof? N	36 Pump Options Access Pump Options to setup and differentiate between boiler pumps and system pumps with post purge features, etc.
37 Pump Options 1) 1 Pump/Boiler? N 2) Pump Sequencer? N 3) Pumps Always ON? N 4) Post Purge 30 Sec 5) Sequence Time 72H 6) Rotate Normal? Y 7) Use Flow Proof? N	37 Pump Options - 1 Pump/Boiler This feature asks you whether or not the boiler pumps are controlled by the boiler circuit. N = Boiler pumps controlled by boiler circuit Y = Boiler pumps controlled by CPU-1000 When selected 'Y' an automatic 30 sec post purge time is activated for the boiler pumps (Set on Option 4).

Combined Settings

- 38 Pump Options
- 1) Pump/Boiler? N
 - 2) **Pump Sequencer? N**
 - 3) Pumps Always ON? N
 - 4) Post Purge 30 Sec
 - 5) Sequence Time 72H
 - 6) Rotate Normal? Y
 - 7) Use Flow Proof? N

38 Pump Options - Pump Sequencer

If Pump Sequencing 'Y' is selected, the Control will alternate (sequence) 2 pumps connected to terminals 20-22 & 23-25 every 72 hours of run time. In addition the Control will exercise all pumps every 3 days, based on actual time.

This option is not valid for mixing controls.

- 39 Pump Options
- 1) Pump/Boiler? N
 - 2) Pump Sequencer? N
 - 3) **Pumps Always ON? N**
 - 4) Post Purge 30 Sec
 - 5) Sequence Time 72H
 - 6) Rotate Normal? Y
 - 7) Use Flow Proof? N

39 Pump Options - Pump Always On

Selection #3 gives you the option to run all of the pumps continuously regardless of a call for heat.



When selected 'Y' all pumps connected to the CPU will be permanently powered.

- 40 Pump Options
- 1) Pump/Boiler? N
 - 2) Pump Sequencer? N
 - 3) Pumps Always ON? N
 - 4) **Post Purge 30 Sec**
 - 5) Sequence Time 72H
 - 6) Rotate Normal? Y
 - 7) Use Flow Proof? N

40 Pump Options - Post Purge

Selection #4 gives you the ability to program a post purge cycle time which runs all pumps for a selectable duration (30-240 Secs) after the initial off-signal has been sent. Post purge does not effect the injection pumps.



This feature applies to both boiler pumps and system pumps.

- 41 Post Purge Time
30 Secs

41 Pump Options - Post Purge Time

This screen allows you to set the desired time frame for system and boiler pumps to run after a heat demand has been satisfied. This features process is to circulate tempered water into the loop which would otherwise be trapped in the boiler, causing energy waste.

- 42 Pump Options
- 1) Pump/Boiler? N
 - 2) Pump Sequencer? N
 - 3) Pumps Always ON? N
 - 4) Post Purge 30 Sec
 - 5) **Sequence Time 72H**
 - 6) Rotate Normal? Y
 - 7) Use Flow Proof? N

42 Pump Options - Sequence Time

Sequence Time is the number of hours that pass before the Control will rotate the active pump in an installation which contains 2 main system pumps.

Combined Settings

43 Sequence Time
72 hrs

43 Pump Options - Sequence Time Cont'd
Choose the amount of time you would like to pass before pumps are rotated.
This setting must be used in conjunction with pump sequencer.



44 Pump Options

44 Pump Options - Rotate Normal
This option allows the user to set the rotation of the pump sequencer pumps. 'Y' means the running pump will shut off first and the static pump will come on. 'N' means that the static pump will come on first followed by the active pump shutting down two seconds later.

1) Pump/Boiler? N
2) Pump Sequencer? N
3) Pumps Always ON? N
4) Post Purge 30 Sec
5) Sequence Time 72H
6) **Rotate Normal? Y**
7) Use Flow Proof? N

45 Rotate Normal

45 Pump Options - Rotate Normal Cont'd
This setting may help to alleviate hammering on check valves.




The 'N' setting may momentarily overpressure the system with both pumps running concurrently for two seconds.

1) Pump/Boiler? N
2) Pump Sequencer? N
3) Pumps Always ON? N
4) Post Purge 30 Sec
5) Sequence Time 72H
6) **Rotate Normal? N**
7) Use Flow Proof? N

46 Rotate Normal

46 Use Flow Proof
Selection #7 gives you the option to check flow through your pump(s), thus minimizing the possibility of damaging pump motors in "dry" conditions.



This feature is only active with the Staging and Dual System controls, and only when pump sequencing is activated.

1) Pump/Boiler? N
2) Pump Sequencer? N
3) Pumps Always ON? N
4) Post Purge 30 Sec
5) Sequence Time 72H
6) Rotate Normal? N
7) **Use Flow Proof? N**

47 System Function

47 System Function
The letters NF (no flow) are visible on the System Status screen to indicate a failure. The Control will automatically switch to the back-up pump.


	wvwsd	Cycles
HT Sys Pump 1	OFF	236
HT Sys Pump 2	NF	188
Boiler Pump 1	OFF	720
Boiler	OFF	720

Tue Jan 4 2005 12:00:45

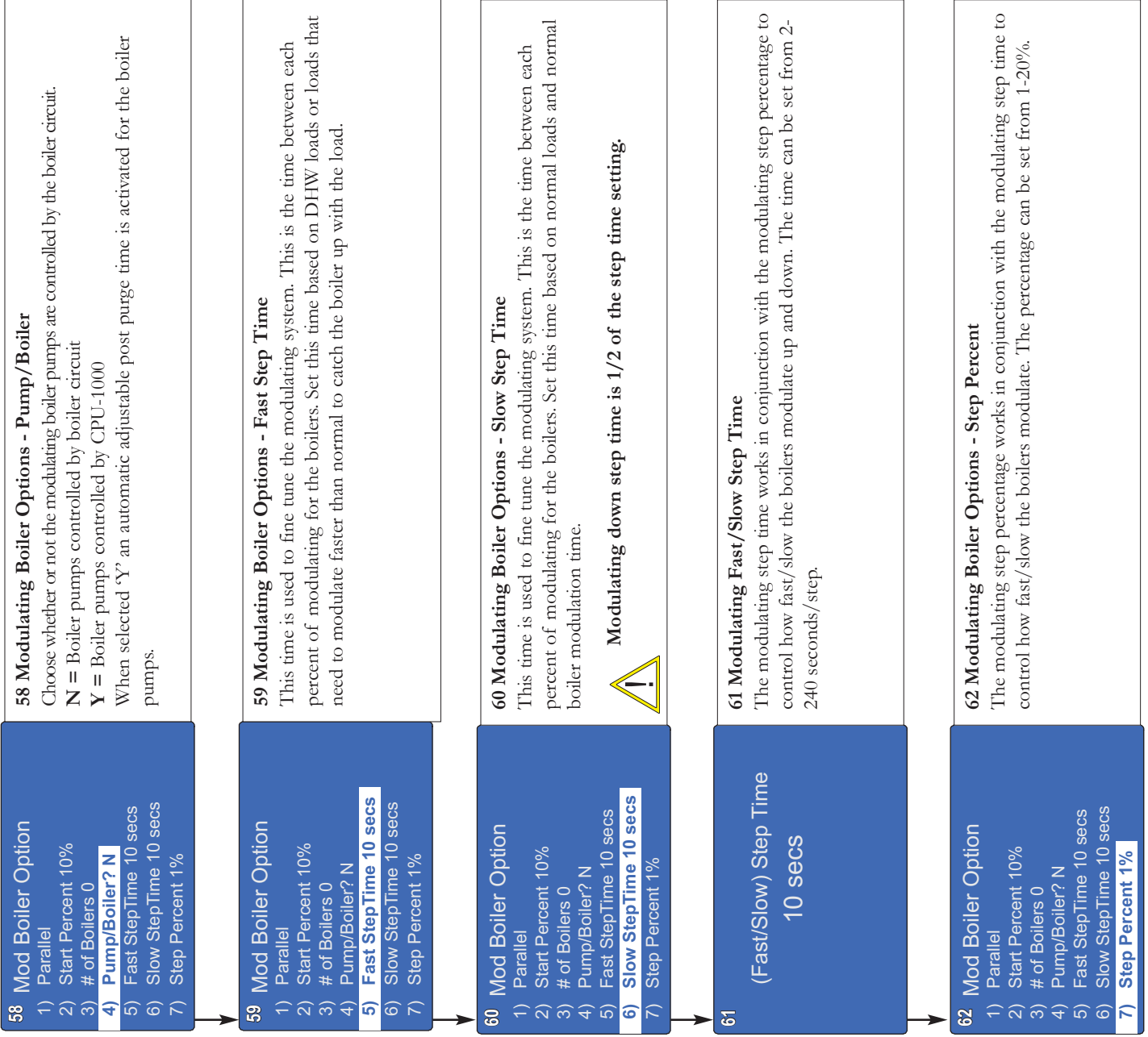
Combined Settings



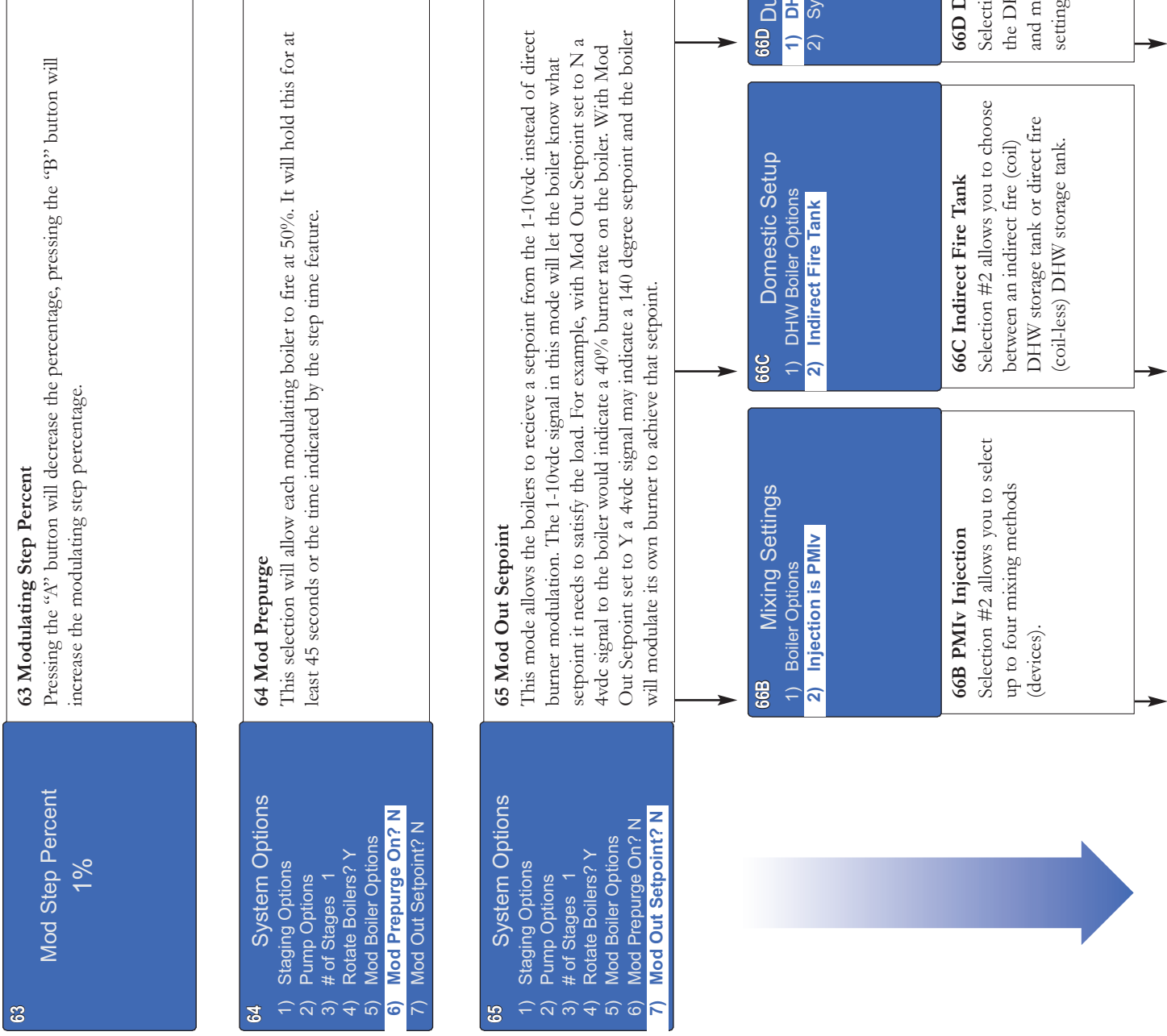
Combined Settings

<p>53 Mod Boiler Option</p> <ol style="list-style-type: none">1) Parallel2) Start Percent 10%3) # of Boilers 04) Pump/Boiler? N5) Fast StepTime 10 secs6) Slow StepTime 10 secs7) Step Percent 1%	<p>53 Modulating Boiler Options - Parallel Toggle between Series, Parallel and Progressive modes. See the “Modulating Theory and Types” section of this manual for a breakdown of modulating types.</p>
<p>54 Mod Boiler Option</p> <ol style="list-style-type: none">1) Parallel2) Start Percent 10%3) # of Boilers 04) Pump/Boiler? N5) Rotate Boilers? N6) Step Time 10 secs7) Step Percent 1%	<p>54 Modulating Boiler Options - Start Percent This value is the percentage of modulation that you would like each modulating boiler to begin firing at. This is also the lowest value that the modulating boiler will drop to before shutting off.</p> <p> If Mod Prepurge is set to 'Y' then the boiler will fire at 50%</p>
<p>55</p> <p>Mod Start Percent</p> <p>10%</p>	<p>55 Modulating Start Percent The modulating start percent must be between 10% and 100%. Press the “B” button to increase the amount and the “A” button to decrease the amount. When each boiler fires it will stay at the start percentage (Min Fire) for at least 45 seconds or if the step time is longer it will stay at min fire until the step time is reached.</p>
<p>56 Mod Boiler Option</p> <ol style="list-style-type: none">1) Parallel2) Start Percent 10%3) # of Boilers 04) Pump/Boiler? N5) Fast StepTime 10 secs6) Slow StepTime 10 secs7) Step Percent 1%	<p>56 Modulating Boiler Options - Number of Boilers This option allows you to designate the number of modulating boilers that are installed in your system (up to 5 modulating boilers).</p>
<p>57</p> <p># of Boilers</p> <p>0</p>	<p>57 Modulating Boiler Options - Number of Boilers Cont'd Increase or decrease the number of desired modulating boilers in this screen.</p>

Combined Settings



Combined Settings



Staging Settings

Mixing Settings

DHW Settings

Dual Sys. Settings

Dual Mix. Settings

67B Injection Type

- 1) PMI Valve
- 2) PMI Pump
- 3) Modulating
- 4) Floating Action

67B Injection Type
Select one of the following:

- 1) Valve
- 2) Pump
- 3) Modulating
- 4) Floating Action

68B Injection Type

- 1) PMI Valve
- 2) PMI Pump**
- 3) Modulating
- 4) Floating Action

68B PMI Pump
Some system configurations are not compatible with the PMIP (pump) injection mixing option. See next step.

69B Error

PMIP Injection can't be used with DHWP Injection set back to PMIV

Press B to Continue

69B PMIP Injection Error
You will receive an error when attempting to use PMIP injection with a DHW pump.

67D Domestic Options

- 1) DHW Boiler Options**
- 2) Indirect Fire Tank

67D DHW Boiler Options
Enter this section to designate staging options for the DHW side of a dual system.

68D DHW Boiler Options

- 1) Hi/Lo Fire? N**
- 2) # of Stages = 1

68D Hi/Lo Fire Boiler
This option allows you to enable a Hi/Lo fire boiler to service your DHW needs.

69D DHW Boiler Options

- 1) Hi/Lo Fire? N
- 2) # of Stages = 1**

69D # of Stages
Designate the total number of stages in your DHW system.

67E Injection Type

- 1) PMI Valve
- 2) PMI Pump
- 3) Modulating
- 4) Floating Action

67E Injection Type
Select one of the following:

- 1) Valve
- 2) Pump
- 3) Modulating (This option is only available for single mixing)
- 4) Floating Action

68E Injection Type

- 1) PMI Valve
- 2) PMI Pump**
- 3) Modulating
- 4) Floating Action

68E PMI Pump
Some system configurations are not compatible with the PMIP (pump) injection mixing option. See next step.

69E Error

PMIP Injection can't be used with DHWP Injection set back to PMIV

Press B to Continue

69E PMIP Injection Error
You will receive an error when attempting to use PMIP injection with a DHW pump.

Staging Settings

Mixing Settings

DHW Settings

Dual Sys. Settings

Dual Mix. Settings

70A Programming

- 1) Control Options
- 2) System Options
- 3) Change Designs**
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

70A Change Designs
Selection #3 guides you through the steps to adjust system design parameters; optimizing your systems performance.

70B Programming

- 1) Control Options
- 2) Mixing Options
- 3) Change Designs**
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

70B Change Designs
Selection #3 guides you through the steps to adjust system design parameters; optimizing your systems performance.

70C Programming

- 1) Control Options
- 2) Domestic Options
- 3) Change Designs**
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

70C Change Designs
Selection #3 guides you through the steps to adjust system design parameters; optimizing your systems performance.

70D Programming

- 1) Control Options
- 2) Dual System Options
- 3) Change Designs**
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

70D Change Designs
Selection #3 guides you through the steps to adjust system design parameters; optimizing your systems performance.

70E Programming

- 1) Control Options
- 2) Mixing Options
- 3) Change Designs**
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing

70E Change Designs
Selection #3 guides you through the steps to adjust system design parameters; optimizing your systems performance.

71 Change Designs

- 1) Manual
- 2) Factory Defaults
- 3) Format Control


71 Change Designs Options
A combination of manual and factory preprogrammed target temperatures can be accessed from here. These options also give you the ability to initialize the Control back to factory settings.

72 Change Designs

- 1) Manual**
- 2) Factory Defaults
- 3) Format Control

72 Change Designs Manual Design
Manual design allows you to customize each design temperature for your system.

73 Design Boiler Temp
190 °F

73 Design Boiler Temp
This screen allows you to set a design max boiler temperature.

The Control is not a safety limit for your boiler.

Combined Settings

74 Design System Temp

135 °F

74 Design System Temp

Design System Temp will allow you to provide the required heat for your radiant source, e.g. Fancoil supply temperature and/or protect floor coverings such as hardwood by limiting the temperature of the radiant floor. Design system temp contains a second value when used with dual mixing control.



This value is ignored on staging and DHW systems.

75 Design Room Temp

70 °F

75 Design Room Temp

This is the design temperature used in the heat curve calculation. Design room temp contains a second value when used with dual mixing controls.



May be used as a trigger point with an EXP Module and setting up “Use Room Therm” as shown in the “Control Options” screen. This value is ignored in DHW controls.

76 Design Outside Temp

-10 °F

76 Design Outside Temp

In North America ASHRAE have a recommended outside temperature rating for each city or region a heating control can work in. This takes into consideration some of the heat loss from your building. You can change your outside design temperature here to reflect your specific circumstances. Design outside temp contains a second value when used with dual mixing controls.



This is typically set for the coldest day of the year, and is ignored by strictly DHW systems.

77 Min Boiler Temp (Supply)

120 °F

77 Min Boiler Temp

This is an option that allows you to minimize boiler temp from condensing flue gases. This temp can be adjusted to run either a non-condensing boiler or condensing boiler. Setup as per the boiler manufacturers recommendation.



This value is ignored in strictly DHW systems.

78 Min System Temp

75 °F

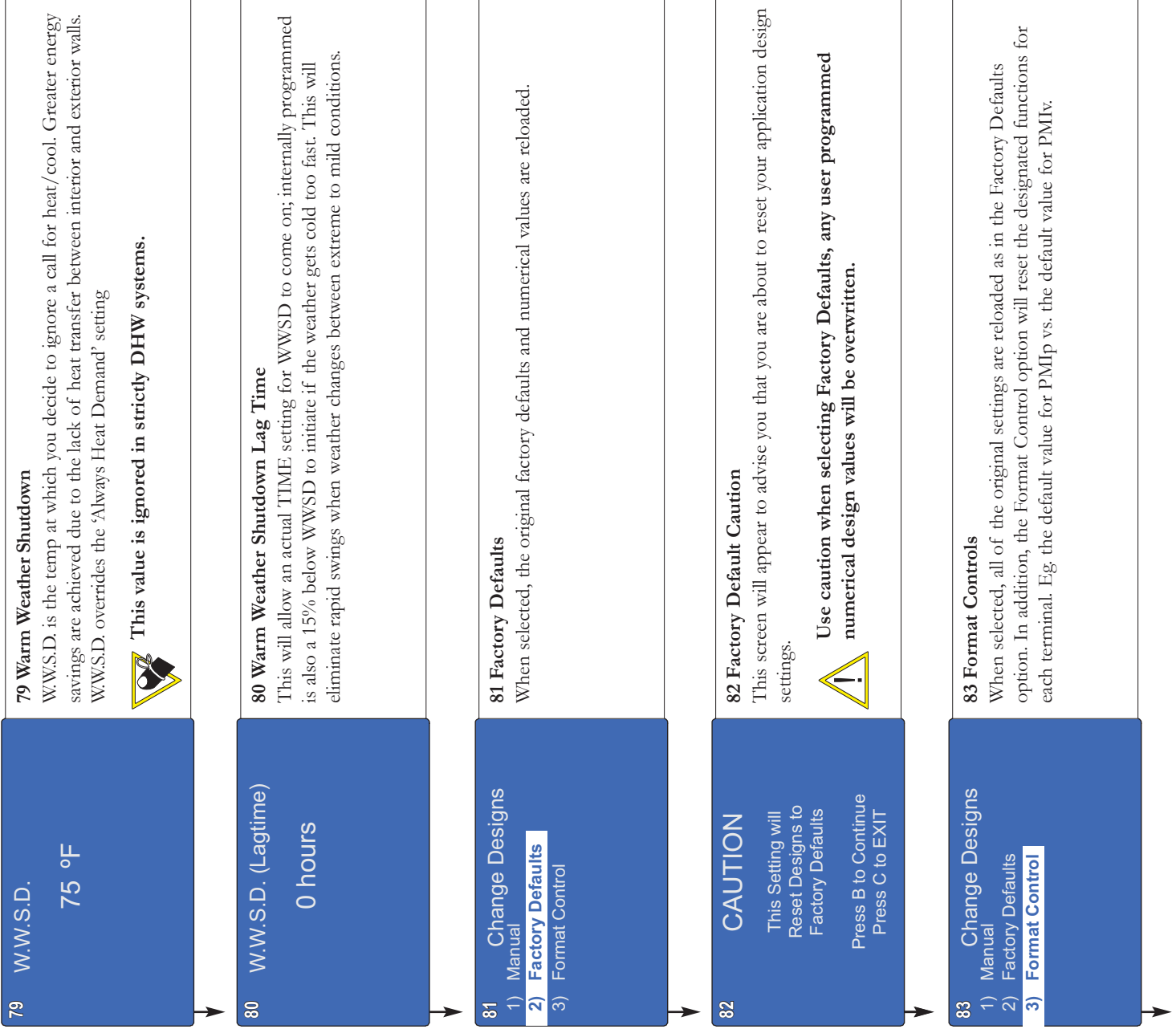
78 Min System Temp

Min System Temp is the lowest water temp in your mixed radiant loop. Min system temp contains a second value when used with dual mixing controls.

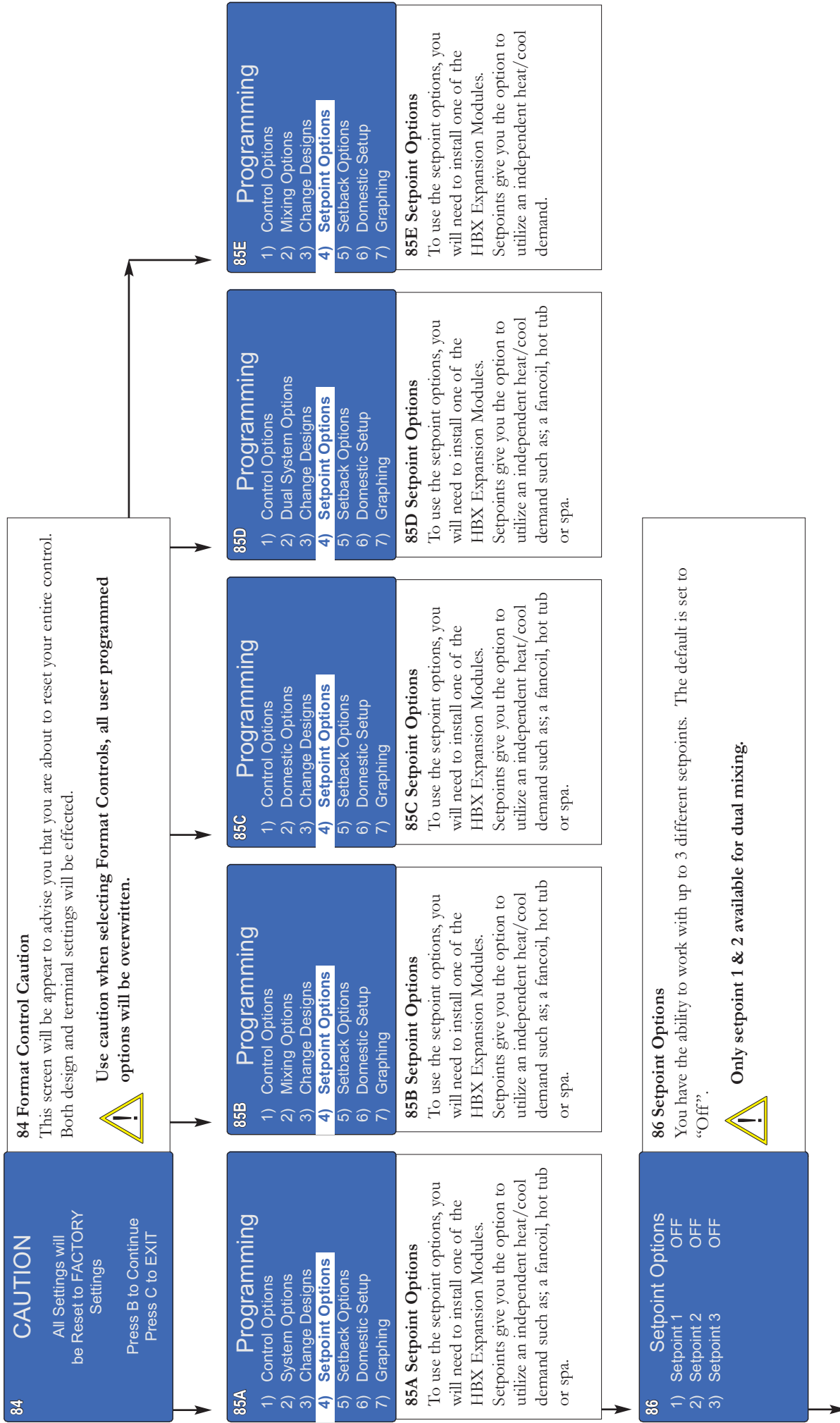


This value is ignored in staging and DHW systems.

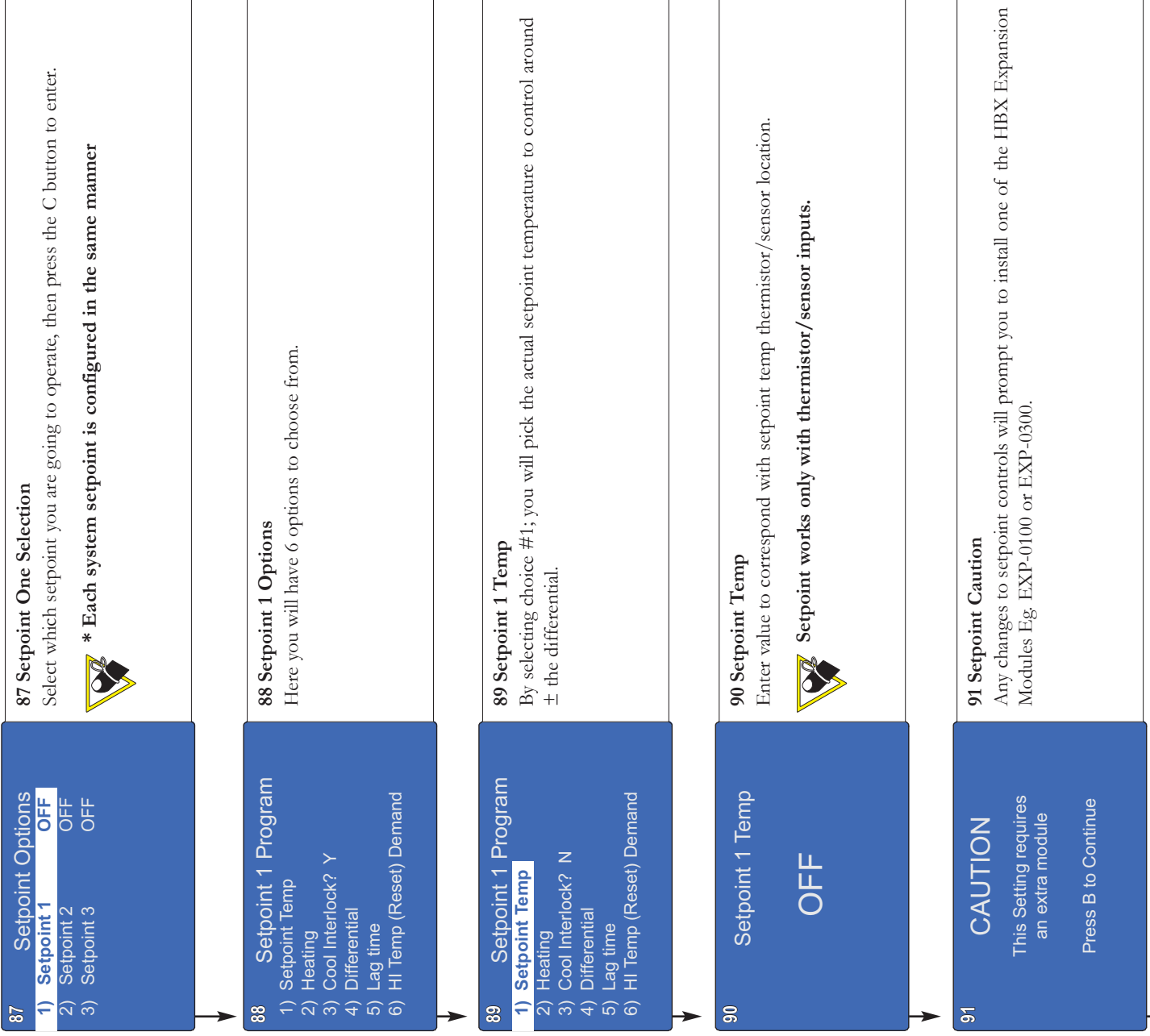
Combined Settings



Combined Settings



Combined Settings



Combined Settings

92 Setpoint 1 Program

- 1) Setpoint Temp
- 2) Cooling**
- 3) Cool Interlock? N
- 4) Differential
- 5) Lag time
- 6) HI Temp (Reset) Demand

92 Setpoint 1 Cooling

Choice #2 allows you to select either Heating or Cooling Mode. Press 'C' to toggle between choices, Eg. heating/cooling.

Heating - when the temperature drops below the setpoint the relays engage
Cooling - when the temperature rises above the setpoint the relays engage

93 Setpoint 1 Program

- 1) Setpoint Temp
- 2) Cooling
- 3) Cool Interlock? Y**
- 4) Differential
- 5) Lag time
- 6) HI Temp (Reset) Demand

93 Setpoint 1 Cool Interlock

If selected 'Y', this will allow cooling only and not a simultaneous heat demand. If selected 'N', then heating and cooling can be delivered to the same zone space. Eg. Tile floor warming and air conditioning.

94 Setpoint 1 Program

- 1) Setpoint Temp
- 2) Cooling
- 3) Cool Interlock? Y
- 4) Differential**
- 5) Lag time
- 6) HI Temp (Reset) Demand

94 Setpoint 1 Differential

Choice #4 (Differential) will allow you to set your margin of error in °F or °C around the setpoint temperature.

95 Setpoint 1 Differential

2 °F

95 Setpoint 1 Differential Value

Setpoint Differential Value is the temp value which the Control will turn on and off around the setpoint. In this example of 2°F with a setpoint of 68°F, the Control will turn on when the temp falls below 67°F and turn off when the temp rises above 69°F.

96 Setpoint 1 Program

- 1) Setpoint Temp
- 2) Heating
- 3) Cool Interlock? Y
- 4) Differential
- 5) Lag time**
- 6) HI Temp (Reset) Demand

96 Setpoint 1 Lag Time

Choice #5 is Lag Time. This allows you to set a minimum "Off Time" between a setpoint demand. This helps to establish a cycle time (length) between heat demands and reduce short cycling.

Combined Settings

97 Setpoint 1 LagTime
0 S

97 Setpoint 1 Lag Time Value
 You have a range of 0 to 600 seconds for lag time and it is adjustable in 5 second increments.

98 Setpoint 1 Program
 1) Setpoint Temp
 2) Heating
 3) Cool Interlock? Y
 4) Differential
 5) Lag time
6) HI Temp (Reset) Demand

98 Setpoint 1 Hi Temp (Reset) Demand
 The setpoint allows for a choice between a HI(Reset),HI(Max Boiler), LO or NO temp demand. A HI(Reset) temp demand will stage the boiler based on outdoor reset and only turn on the hi temp loop.A HI(Max Boiler) will only turn on the hi temp loop as well but it will raise the boiler setpoint to the maximum design temperature of the boiler. When a LO temp is selected the boiler output temperature will follow the outdoor reset curve for boiler and system. This will turn on both the boiler and system loop.

99A Programming
 1) Control Options
 2) System Options
 3) Change Designs
 4) Setpoint Options
5) Setback Options
 6) Domestic Setup
 7) Graphing

99B Programming
 1) Control Options
 2) Mixing Options
 3) Change Designs
 4) Setpoint Options
5) Setback Options
 6) Domestic Setup
 7) Graphing

99C Programming
 1) Control Options
 2) Domestic Options
 3) Change Designs
 4) Setpoint Options
5) Setback Options
 6) Domestic Setup
 7) Graphing

99D Programming
 1) Control Options
 2) Dual System Options
 3) Change Designs
 4) Setpoint Options
5) Setback Options
 6) Domestic Setup
 7) Graphing

99E Programming
 1) Control Options
 2) Mixing Options
 3) Change Designs
 4) Setpoint Options
5) Setback Options
 6) Domestic Setup
 7) Graphing

99A Setback Options
 Choice #5 in Programming will take you to the Setback Options.

99B Setback Options
 Choice #5 in Programming will take you to the Setback Options.

99C Setback Options
 Choice #5 in Programming will take you to the Setback Options.

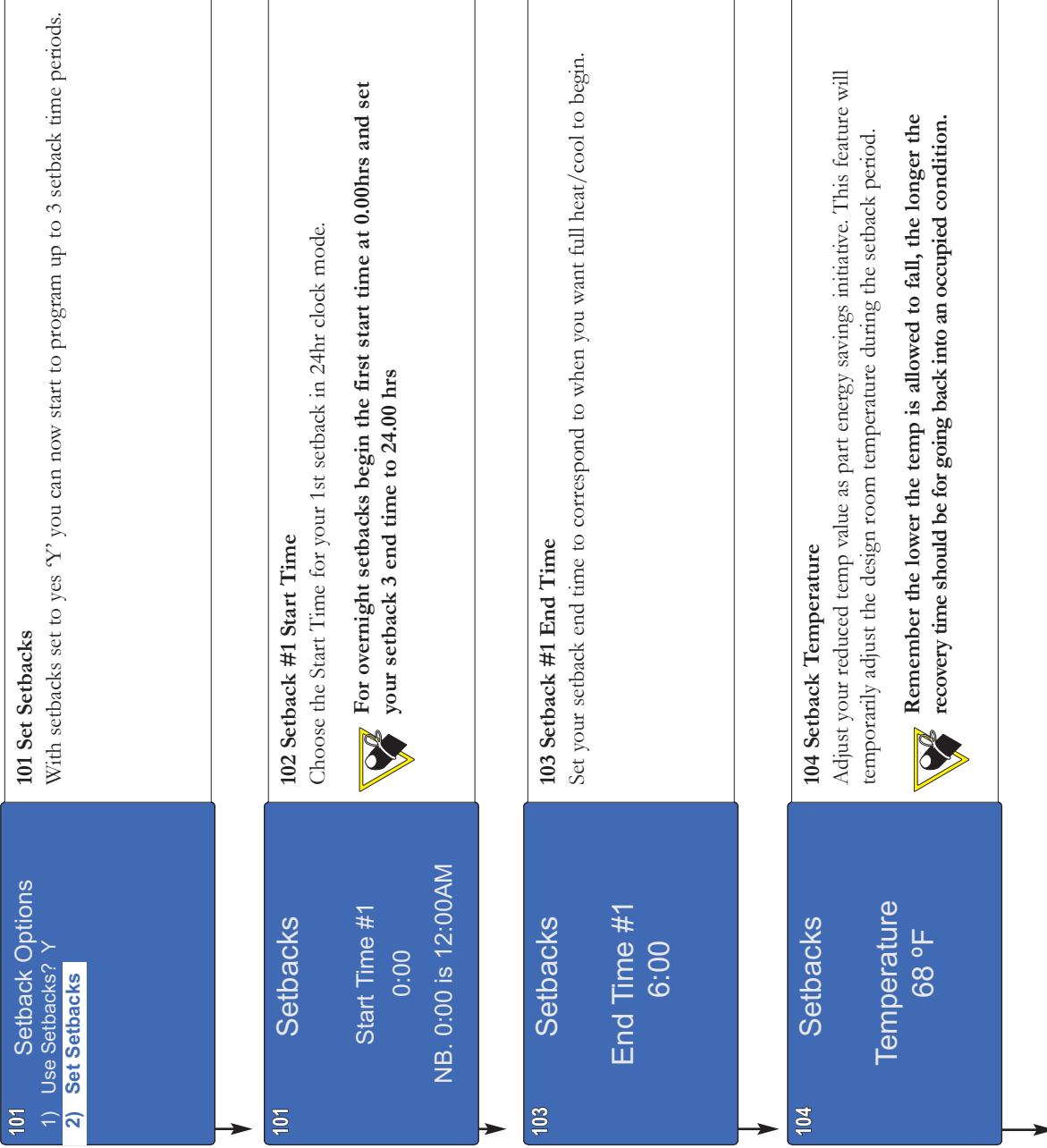
99D Setback Options
 Choice #5 in Programming will take you to the Setback Options.

99E Setback Options
 Choice #5 in Programming will take you to the Setback Options.

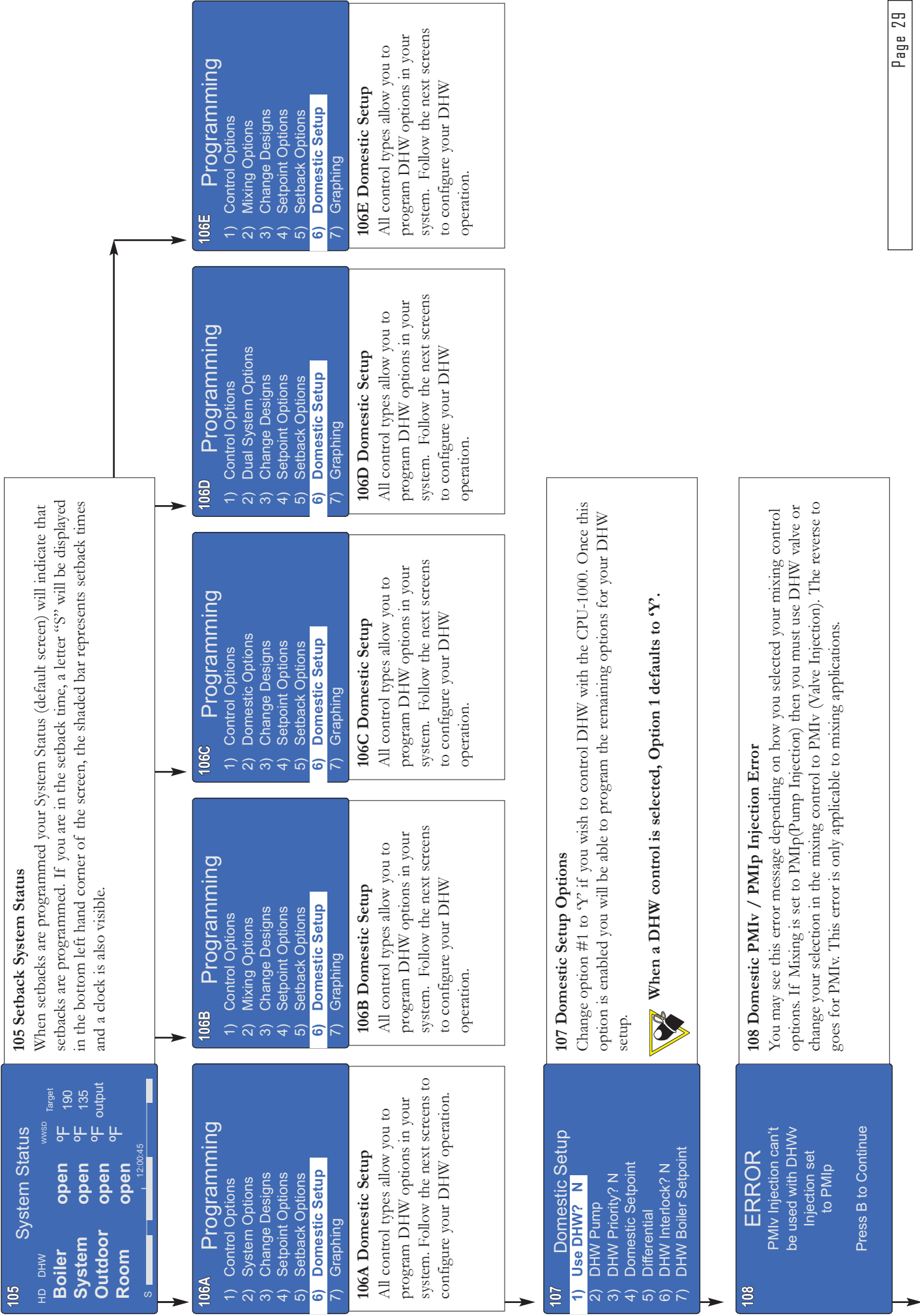
100 Setback Options
 1) Use Setbacks? N
 2) Set Setbacks

100 Setback Options
 These 2 choices will allow you to program a setback. A setback can be programmed to maximize energy usage during time frames where the building may be vacant.

Combined Settings



Combined Settings



Combined Settings

109 Domestic Setup

- 1) Use DHW? N
- 2) **DHW Pump**
- 3) DHW Priority? N
- 4) Domestic Setpoint
- 5) Differential
- 6) DHW Interlock? N
- 7) DHW Boiler Setpoint

109 Domestic Hot Water Pump / Valve

This option allows you to toggle between a pump and valve within a domestic hot water system.

110 Domestic Setup

- 1) Use DHW? N
- 2) DHW Pump
- 3) **DHW Priority? N**
- 4) Domestic Setpoint
- 5) Differential
- 6) DHW Interlock? N
- 7) DHW Boiler Setpoint

110 Domestic Setup

Selection #3 will allow the DHW demand to override the heating system for a max of 60 mins in order to satisfy the DHW demand. Once 60 mins has elapsed and there is still an unsatisfied heat demand, the Control will automatically switch back to accommodate the call for heat.

111 Domestic Setup

- 1) Use DHW? N
- 2) DHW Pump
- 3) DHW Priority? N
- 4) **Domestic Setpoint**
- 5) Differential
- 6) DHW Interlock? N
- 7) DHW Boiler Setpoint

111 Domestic Setpoint

Selection #4 allows you to select your DHW target temperature. Eg. 135°F.



Domestic setpoint will only operate from a thermistor input signal.

112 Domestic SetPoint 100 °F

112 Domestic Setpoint

Designate your systems Domestic Hot Water temperature in this step.

113 Domestic Setup

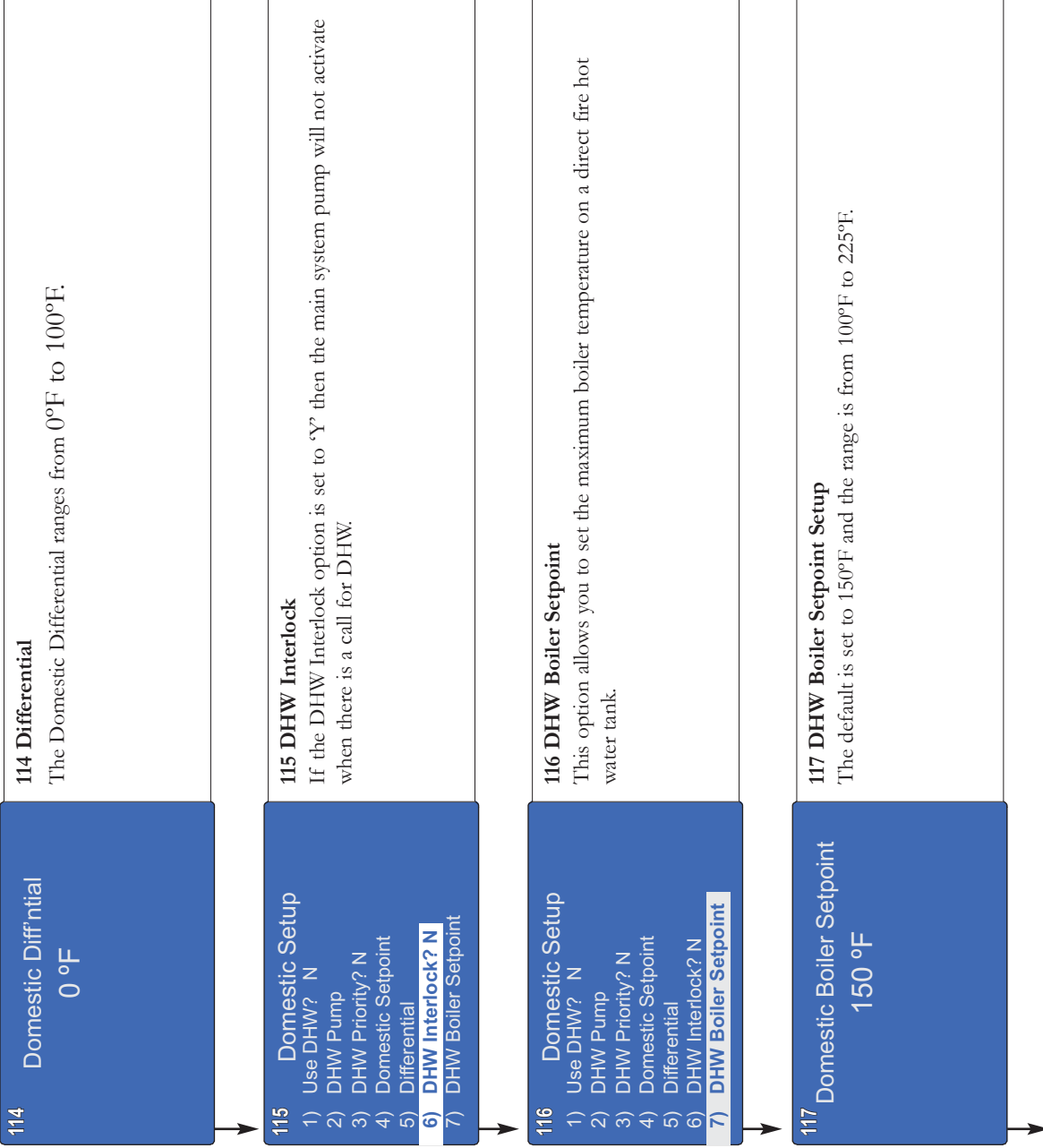
- 1) Use DHW? N
- 2) DHW Pump
- 3) DHW Priority? N
- 4) Domestic Setpoint
- 5) **Differential**
- 6) DHW Interlock? N
- 7) DHW Boiler Setpoint

113 Differential

Selection #5 allows you to program the error value, overshoot and undershoot of the target setpoint temperature.

In this example of 2°F with a setpoint of 68°F, the Control will turn on when the temp falls below 67°F and turn off when the temp rises above 69°F.

Combined Settings



Staging Settings

Mixing Settings

DHW Settings

Dual Sys. Settings

Dual Mix. Settings

118A Programming

- 1) Control Options
- 2) System Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing**

118A Graphing

The display allows you to get a visual impression of how your system is performing by selecting choice #7 in the programming menu.

118B Programming

- 1) Control Options
- 2) Mixing Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing**

118B Graphing

The display allows you to get a visual impression of how your system is performing by selecting choice #7 in the programming menu.

118C Programming

- 1) Control Options
- 2) Domestic Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing**

118C Graphing

The display allows you to get a visual impression of how your system is performing by selecting choice #7 in the programming menu.

118D Programming

- 1) Control Options
- 2) Dual System Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing**

118D Graphing

The display allows you to get a visual impression of how your system is performing by selecting choice #7 in the programming menu.

118E Programming

- 1) Control Options
- 2) Mixing Options
- 3) Change Designs
- 4) Setpoint Options
- 5) Setback Options
- 6) Domestic Setup
- 7) Graphing**

118E Graphing

The display allows you to get a visual impression of how your system is performing by selecting choice #7 in the programming menu.

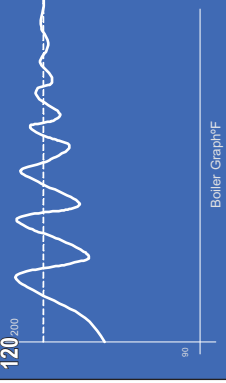
119 Programming

- 1) Boiler Graph
- 2) System Graph

119 Graphing Options

You have the option to look at either the Boiler Graph (Actual vs. Target) or System Graph (Actual vs. Target).

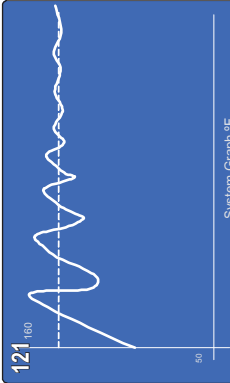
120



120 Boiler Graph

The Y and X axis are not adjustable. The dotted line represents the target temperature and the solid line represents the actual temperature. One full screen will display approx 10 mins of temperature data in 20 sec intervals.

121



121 System Graph

The Y and X axis are not adjustable. The dotted line represents the target temperature and the solid line represents the actual temperature. One full screen will display approx 10 mins of temperature data in 20 sec intervals.

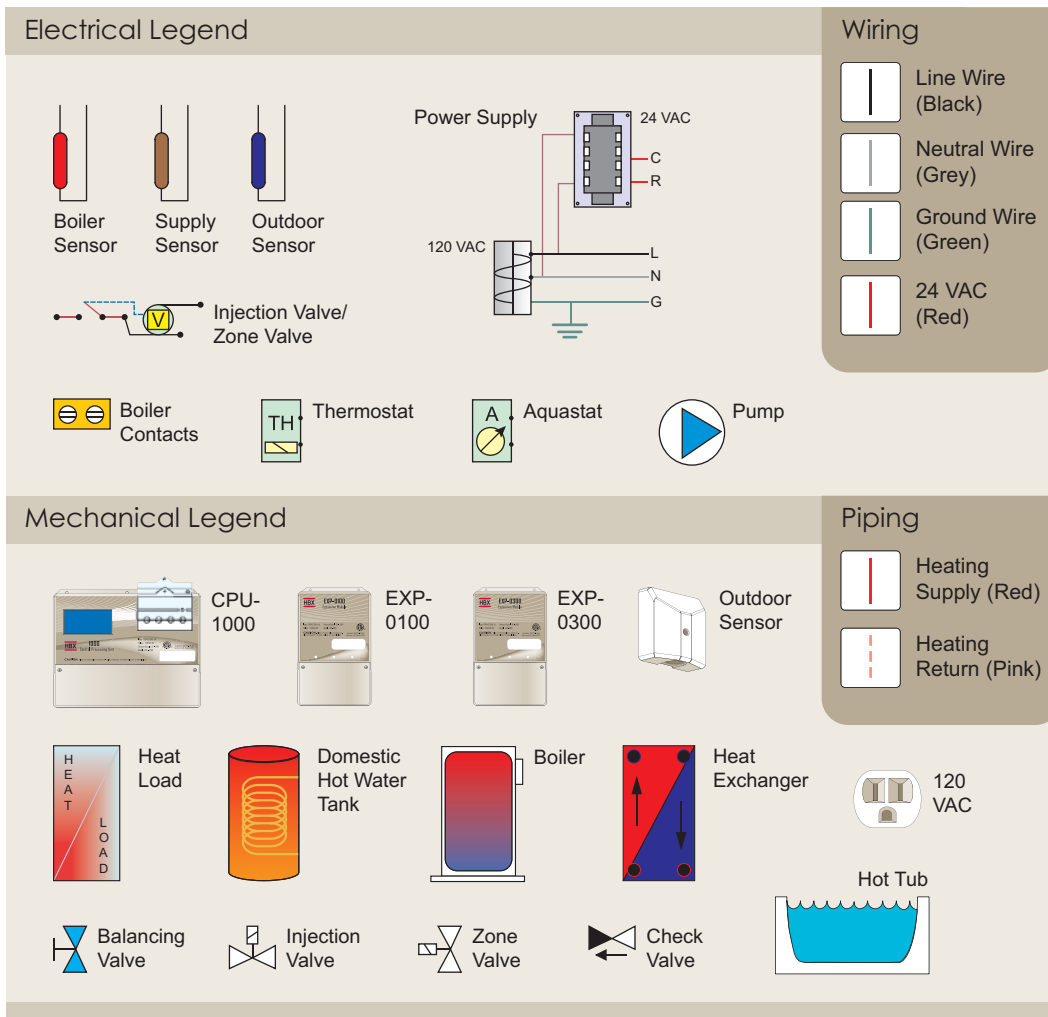
APPLICATION DRAWINGS

The following application drawings are intended to be a guide for a number of mechanical installations, and the corresponding electrical wiring schematic to control the applications. Please note the disclaimer below as to the accuracy, reliability and suitability of any particular installation the installer is attempting. The installer, as a professional, is ultimately responsible for their installation.

HBX Controls hopes that these illustrations will assist you in gaining confidence to tackle a multitude of HVAC applications with our control and optional accessories.



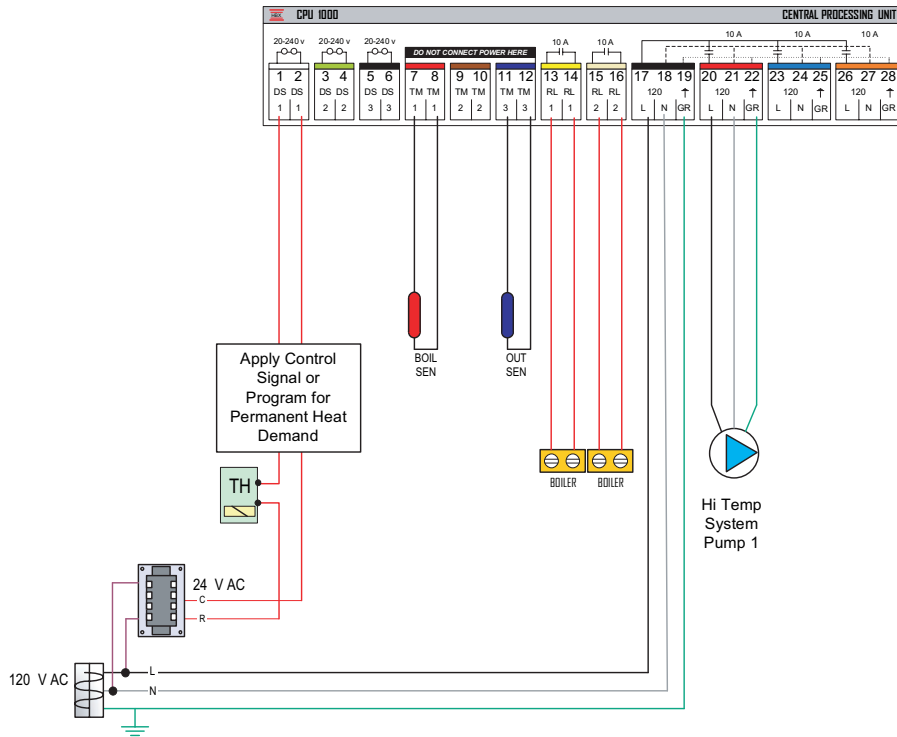
These are not engineered drawings and do not necessarily include all the components for an entire system. They are intended as representations of how the Control may be wired for a sample application. It is the responsibility of the installer to seek professional advice and/or install the system to meet all necessary codes for the jurisdiction of the actual installation.



STAGING CONTROL STG 1000-02

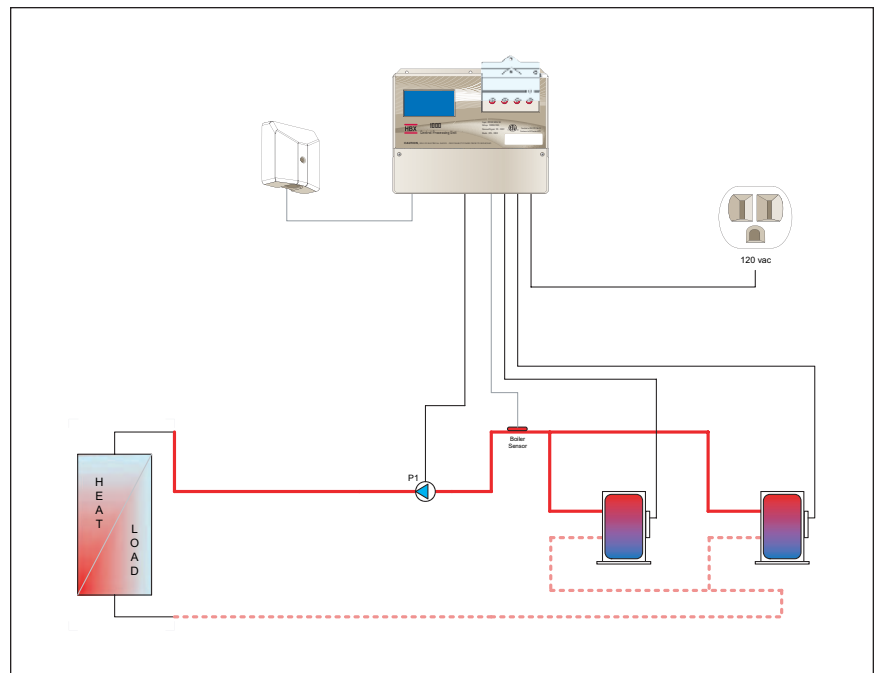
- 2 single stage boilers with 1 single Hi Temp system pump
- 1 boiler sensor on supply protecting the boiler, 1 outdoor sensor for outdoor reset control

ELECTRICAL



MECHANICAL

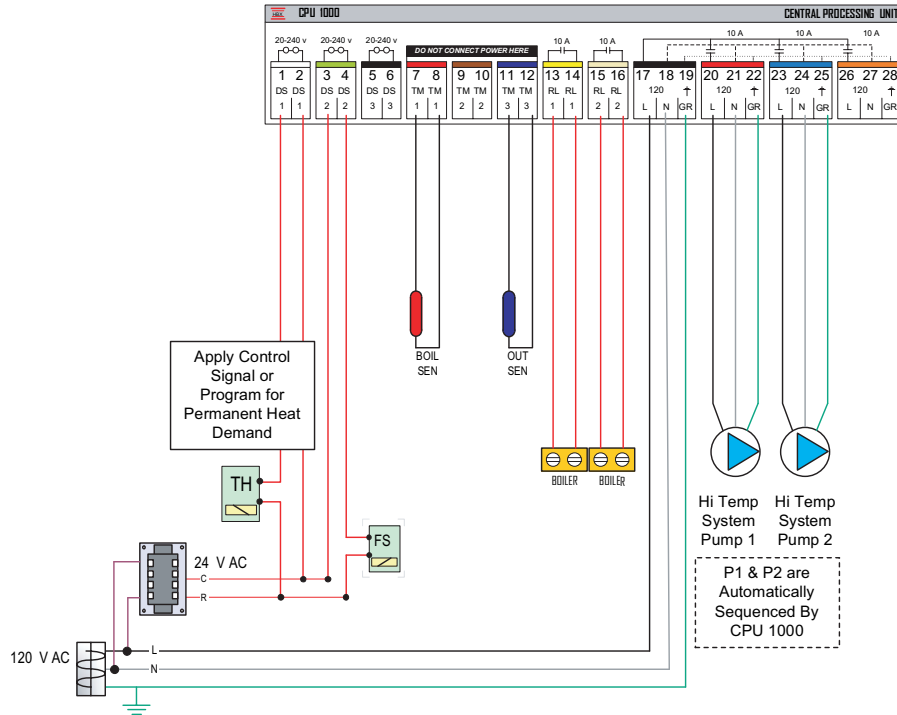
Pump Legend:
• P1 - System Pump



STAGING CONTROL STG 1000-03

- 2 single stage boilers with 2 sequenced Hi temp system pumps allowing the pumps to alternate, optional flow sensor shown
- 1 boiler sensor on supply protecting the boiler, 1 outdoor sensor for outdoor reset control

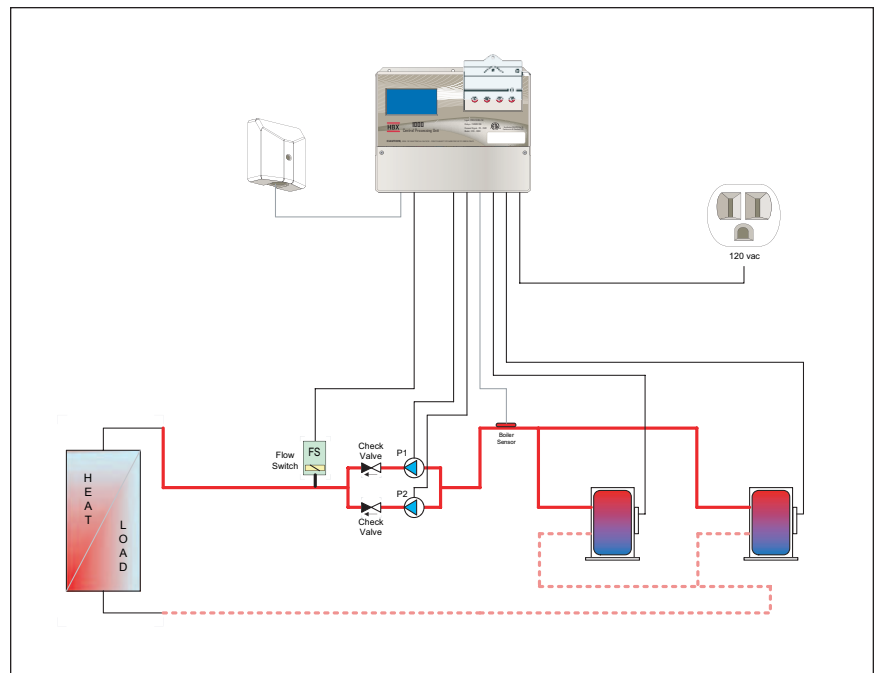
ELECTRICAL



MECHANICAL

Pump Legend:

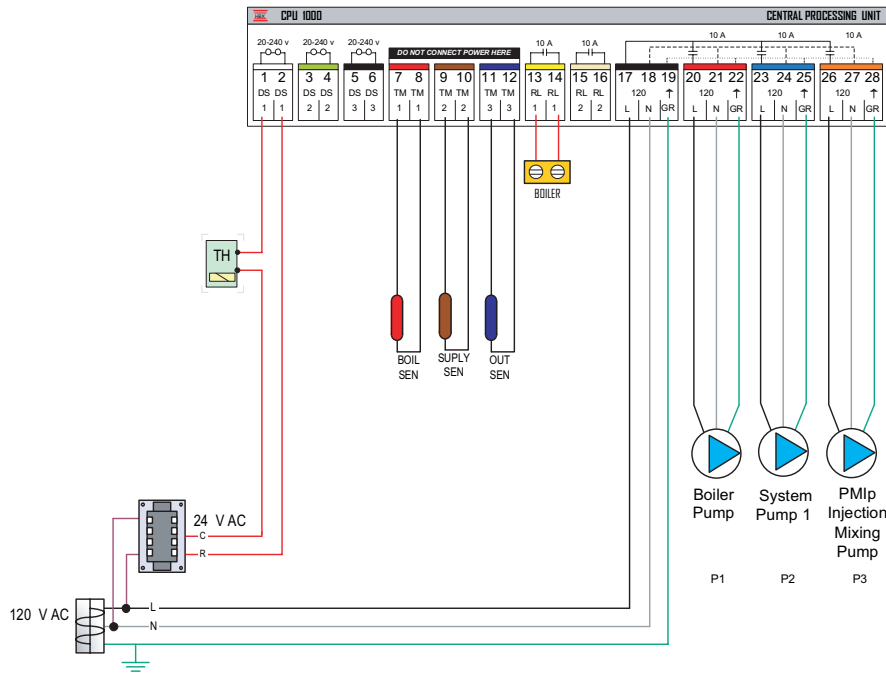
- P1 - System Pump 1
- P2 - System Pump 2



MIXING CONTROL MIX 1000-01

- Single stage mixing control using PMIp (Pump Injection)
- The Control is running the boiler pump, Lo temp system pump, and injection pump
- 1 boiler sensor on supply protecting the boiler, 1 system sensor measuring the mixed system temp, 1 outdoor sensor for outdoor reset control

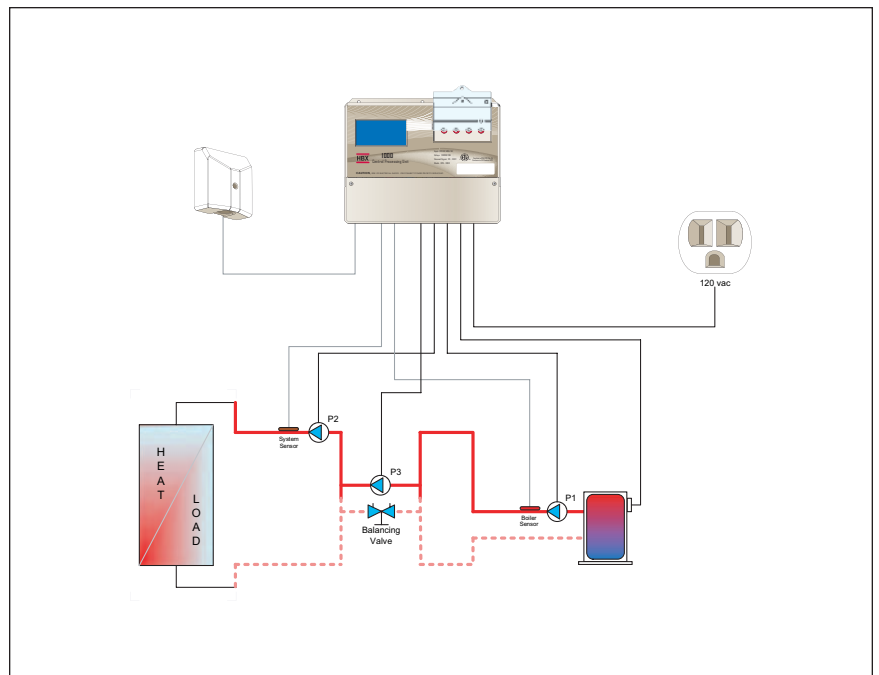
ELECTRICAL



MECHANICAL

Pump Legend:

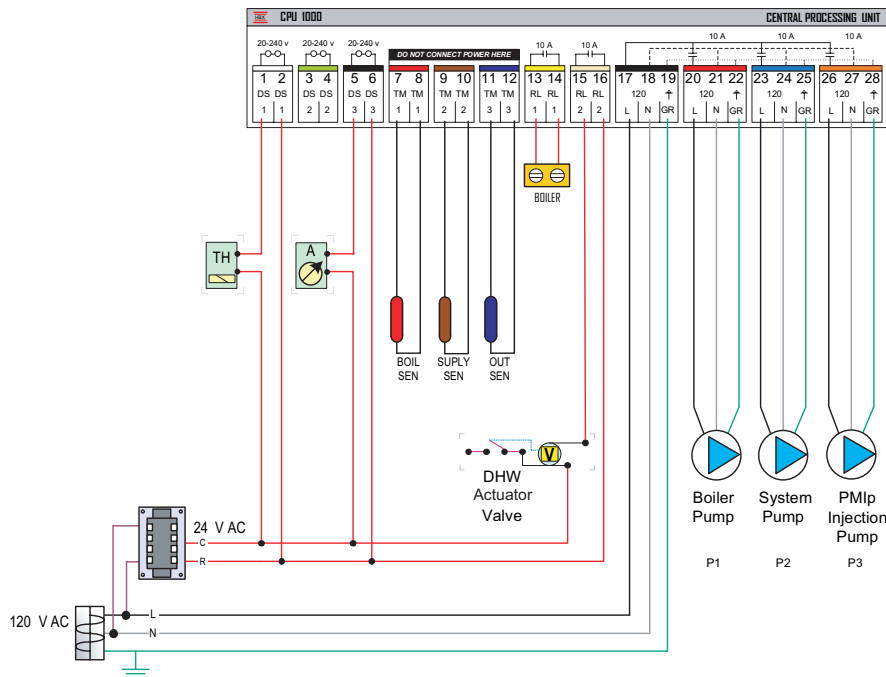
- P1 - Boiler Pump
- P2 - System Pump
- P3 - Injection Pump



MIXING CONTROL MIX 1000-10

- Single stage mixing control using PMIp(pump injection)
- Control is running the boiler pump Lo temp system pump, and injection pump
- Indirect DHW tank is supplied via an injection valve
- 1 boiler sensor on the supply protecting the boiler, 1 system sensor measuring the mixed system temp and 1 outdoor sensor for outdoor reset control

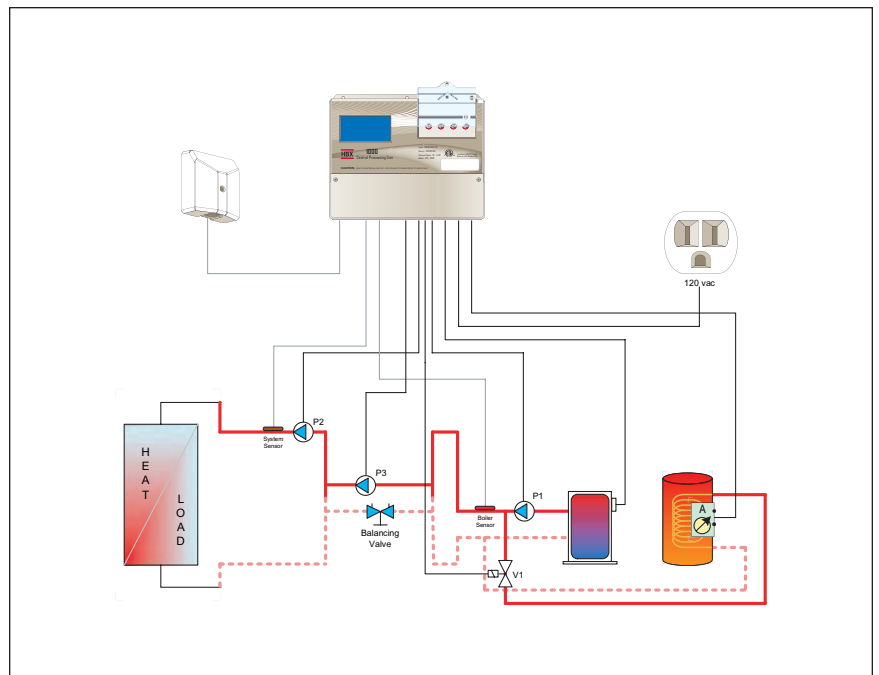
ELECTRICAL



MECHANICAL

Pump/Valve Legend:

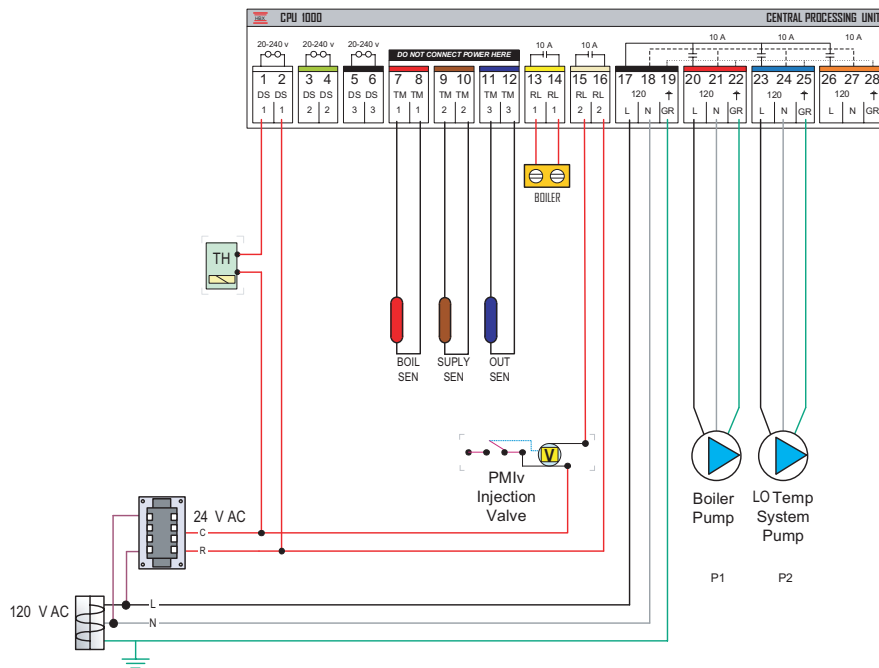
- P1 - Boiler Pump
- P2 - System Pump
- P3 - Injection Pump
- V1 - DHW Valve



MIXING CONTROL MIX 1000-02

- Single stage mixing control using PMIV (valve injection)
- Control is running the boiler pump and the Lo temp system pump
- 1 boiler sensor on the supply protecting the boiler, 1 system sensor measuring the mixed system temp, and 1 outdoor sensor for outdoor reset control

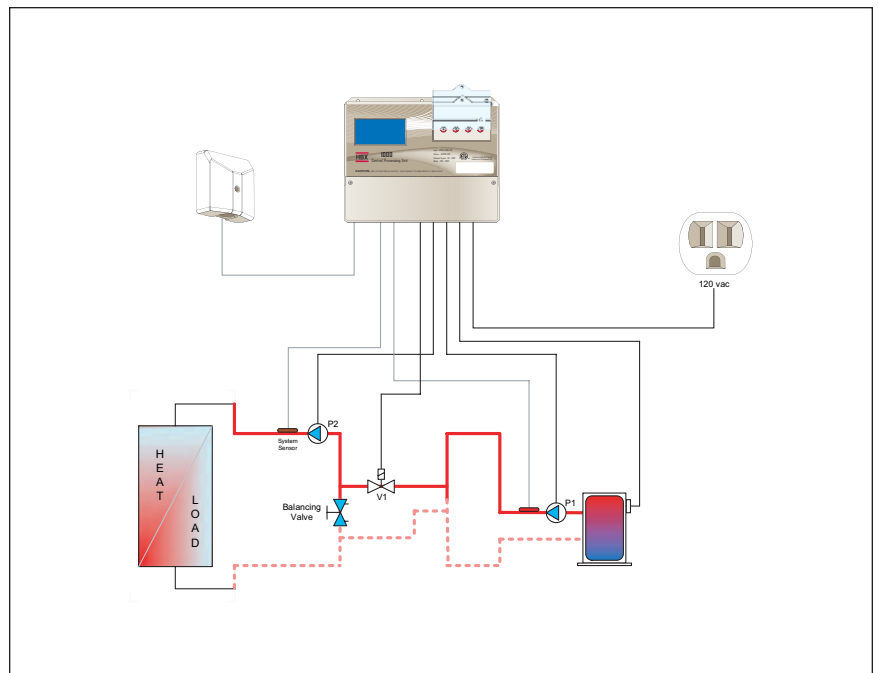
ELECTRICAL



MECHANICAL

Pump/Valve Legend:

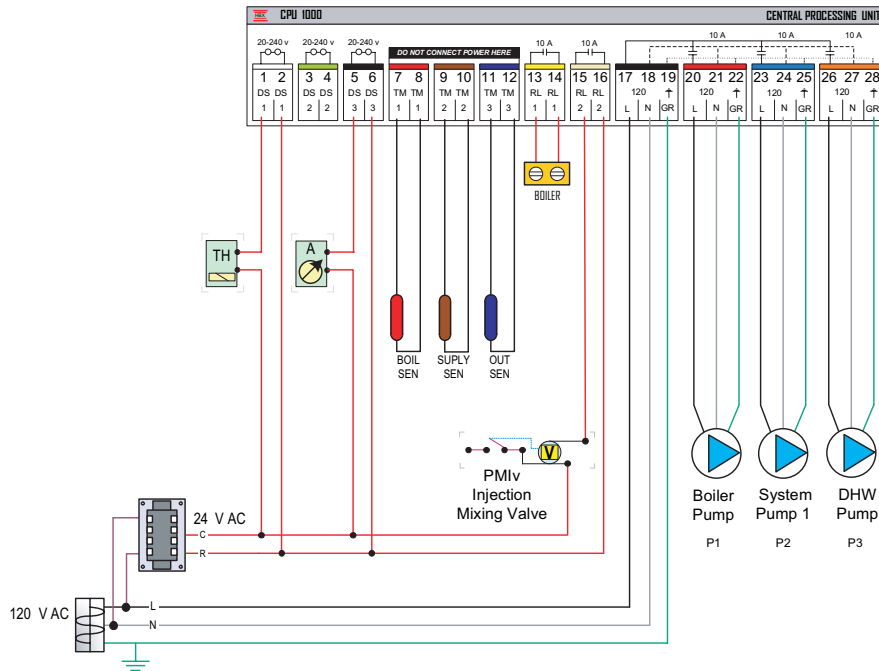
- P1 - Boiler Pump
- P2 - System Pump
- V1 - Injection Valve



MIXING CONTROL MIX 1000-11

- Single stage mixing control using PMIV (valve injection)
- Control is running the boiler pump and the Lo temp system pump
- Indirect DHW tank is supplied via a third pump
- 1 boiler sensor on the supply protecting the boiler, 1 system sensor measuring the mixed system temp, and 1 outdoor sensor for outdoor reset control

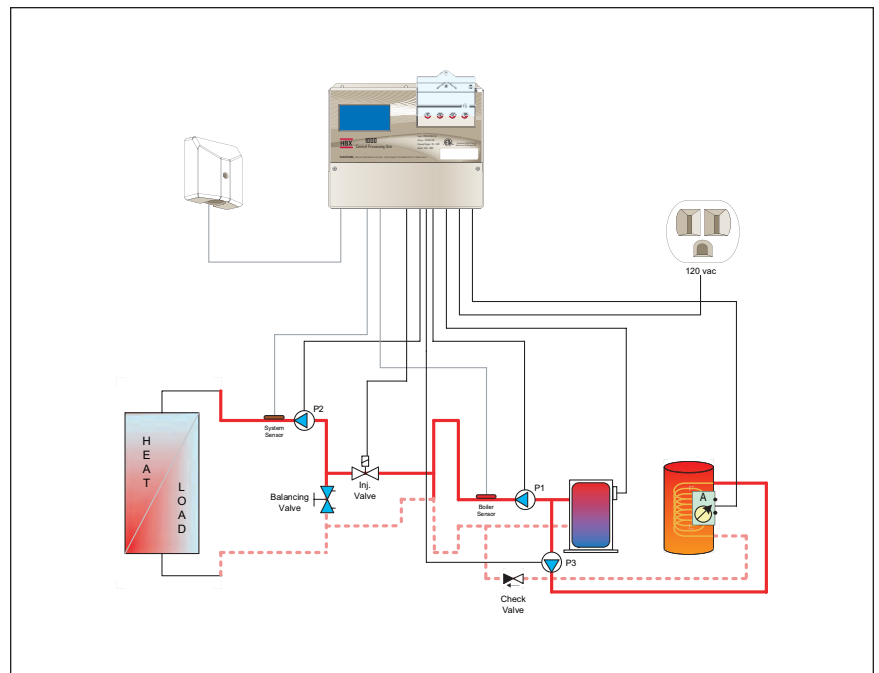
ELECTRICAL



MECHANICAL

Pump/Valve Legend:

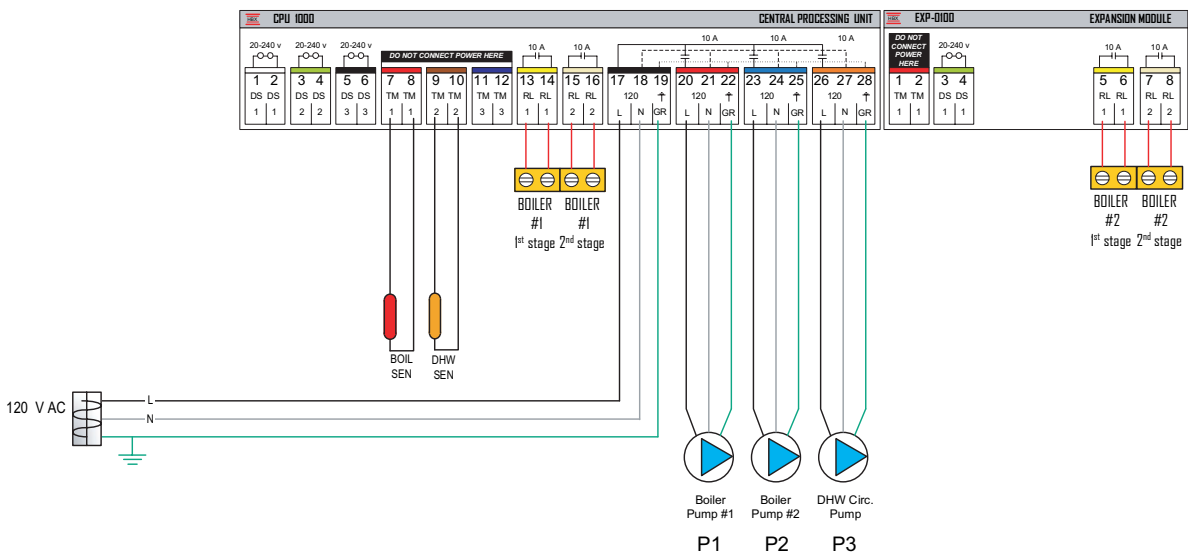
- P1 - Boiler Pump
- P2 - System Pump
- P3 - DHW Pump
- V1 - Injection Valve



DHW CONTROL DHW 1000-04

- Four stage boiler control for dedicated DHW
- 2 - Hi/Lo fire boilers supply hot water to 4 indirect DHW storage tanks
- Each boiler pump is controlled by the CPU-1000 in addition to the system pump
- 1 boiler sensor located on the upstream supply monitoring boiler output, 1 DHW sensor maintaining the DHW setpoint temp signal back to the control
- Boiler stages 3 and 4 are controlled by the EXP-0100 Expansion Module
- Boiler pumps can be set with a post-purge time

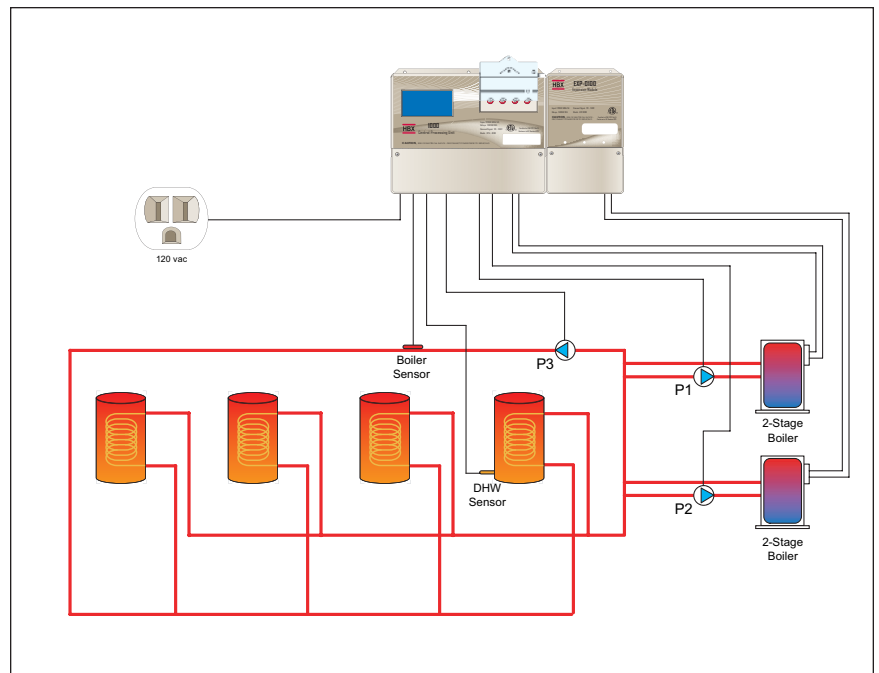
ELECTRICAL



MECHANICAL

Pump Legend:

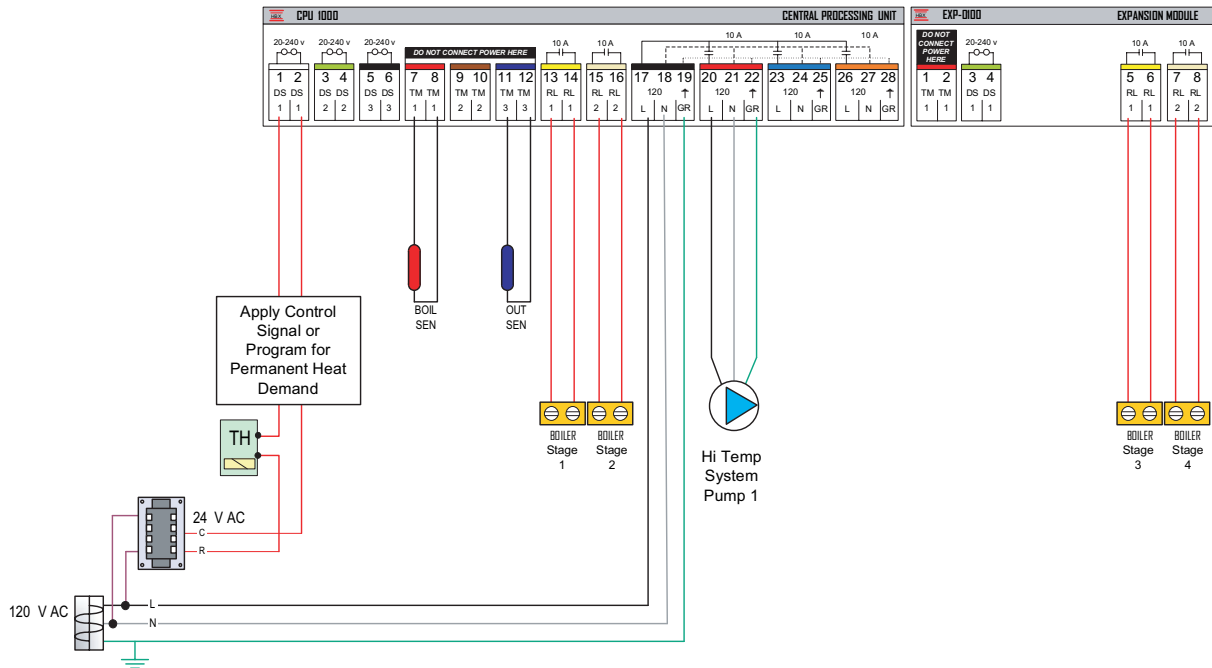
- P1 - Boiler Pump 1
- P2 - Boiler Pump 2
- P3 - DHW Circulator



STAGING CONTROL STG 1000-04

- 4 Single stage boilers with 1 individual Hi temp system pump
- 1 boiler sensor on supply protecting the boiler, 1 outdoor sensor for outdoor reset control
- Boilers (stages) 3 and 4 are staged on by use of 1 Expansion Module (EXP-0100)

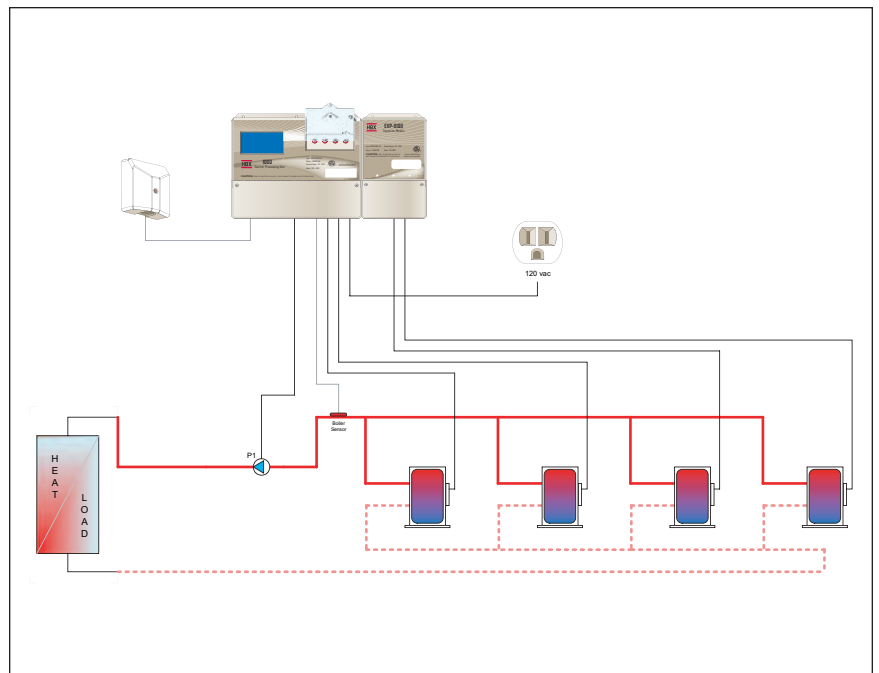
ELECTRICAL



MECHANICAL

Pump Legend:

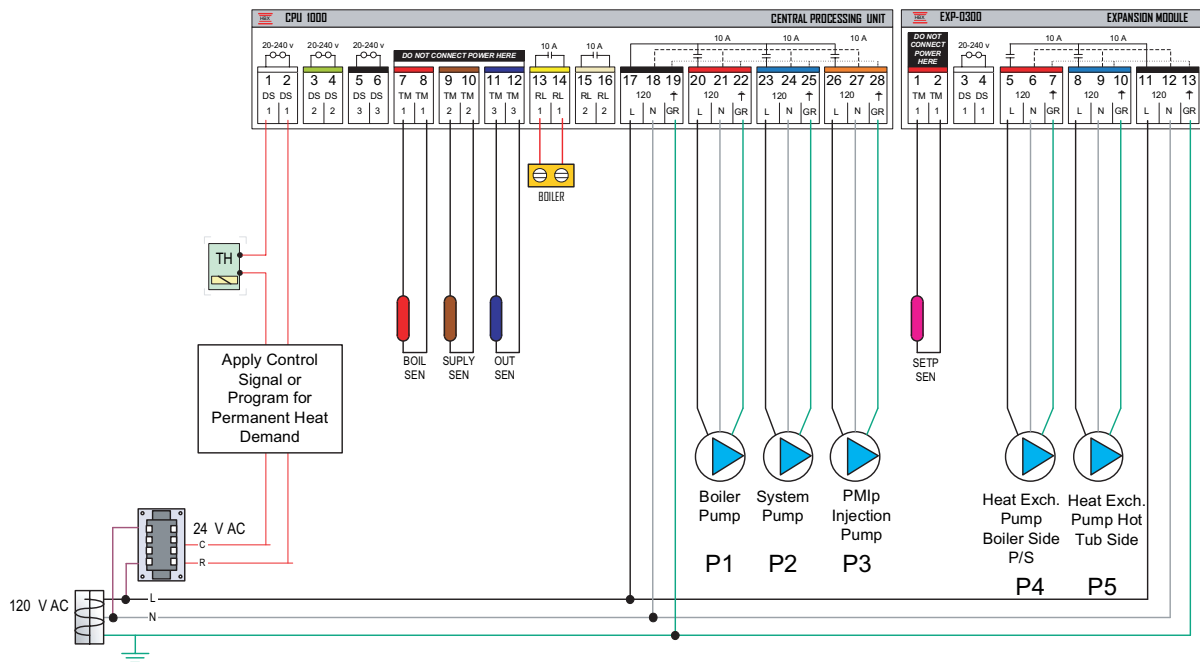
- P1 - System Pump



MIXING CONTROL MIX 1000-20

- Single stage mixing control running 1 mixed loop and 1 setpoint load via a plate heat exchanger
- Mixed injection using PMIp(pump injection), 1 boiler pump, and 1 Lo temp system pump
- Setpoint load for a hot tub requires the use of 1 EXP-0300 which also controls 2 pumps(P4 and P5) for both sides-- of the heat exchanger

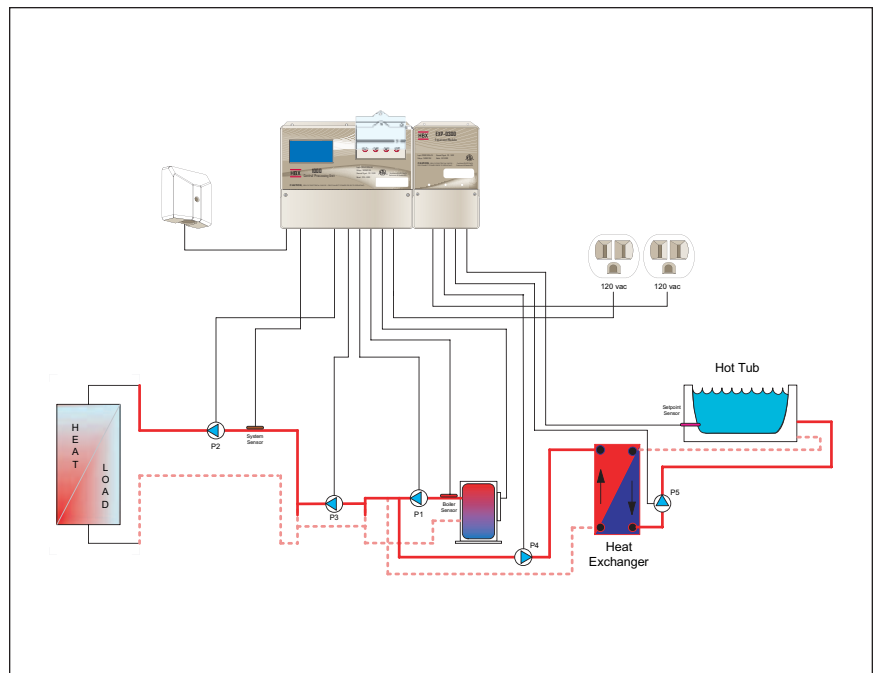
ELECTRICAL



MECHANICAL

Pump Legend:

- P1 - Boiler Pump
- P2 - System Pump
- P3 - Injection Pump
- P4 - Heat Exchanger Boiler Side
- P5 - Heat Exchanger Hot Tub Side





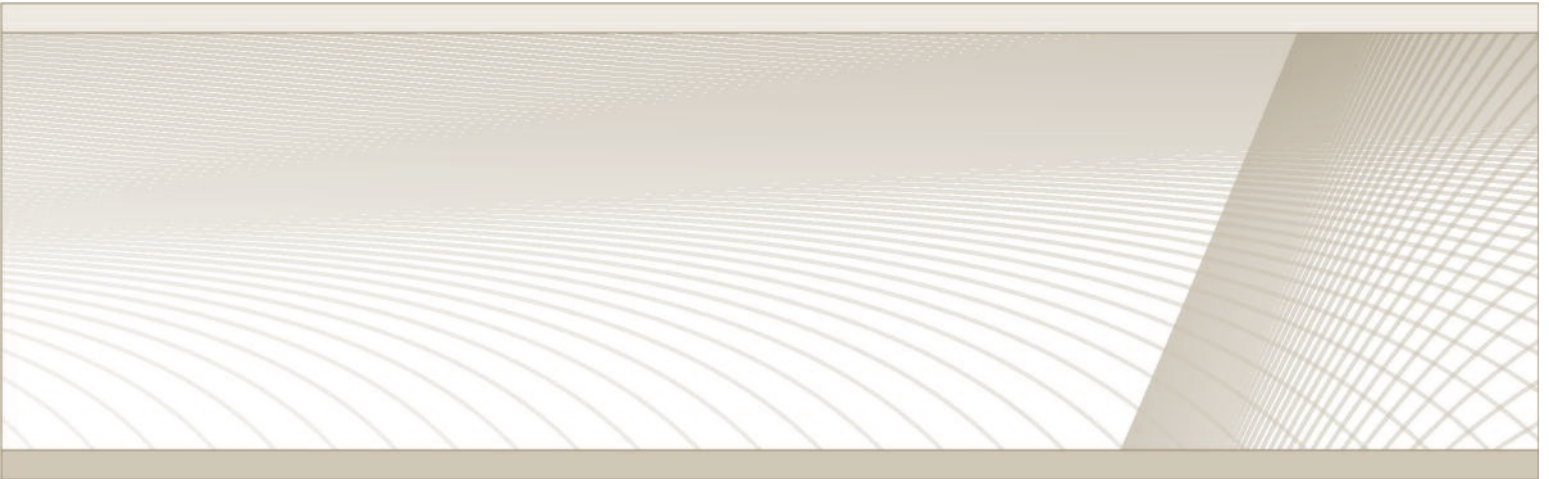
HBX

Control Systems Inc.

HBX CPU-1000 HVAC Controller
Version 1.38

Phone: +1 (403) 720-0029 Fax: +1 (403) 720-0054
Email: info@hbxcontrols.com Web: www.hbxcontrols.com

v3.7



HBX Control Systems Inc.
4516 - 112th Avenue SE
Calgary, AB T2C 2K2

© HBX Control Systems Inc. 2013