Geothermal Programming Guide

Central Processing Unit 1000
Version 1.35
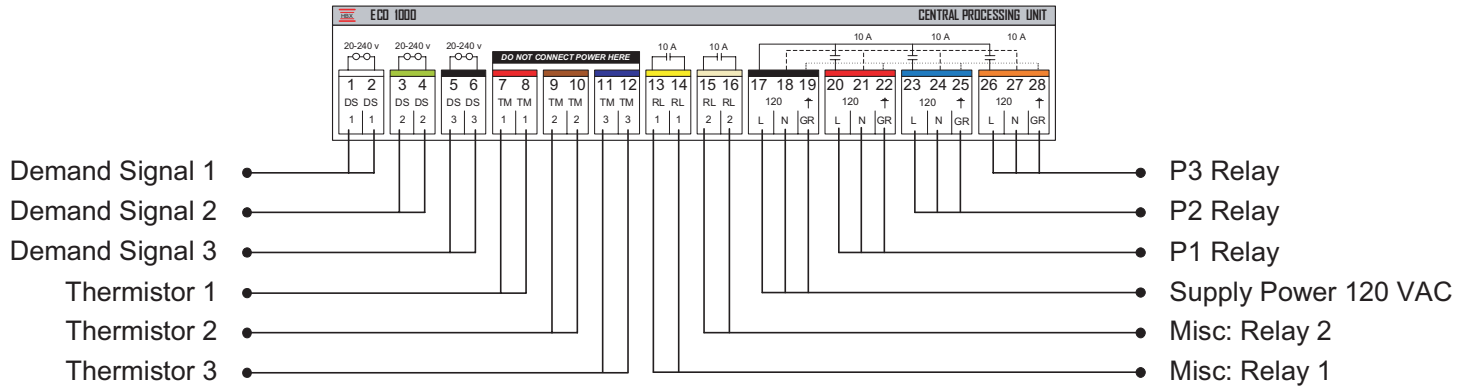
HBX

ECO-1000

HBX Control Systems Inc.

Terminal Designations for ECO-1000

Demand Signal 1 - This signal is only used in a geothermal application as a heat demand signal.

Demand Signal 2 - This signal is only used in a geothermal application as a cooling demand signal.

Demand Signal 3 - This signal is only used in a geothermal application, for a fault indicator.

Thermistor 1 - Tank Sensor

Thermistor 2 - GND loop or cold tank sensor for geothermal applications, solar sensor in solar applications.

Thermistor 3 - Outdoor Sensor / return sensor for solar.

P3 Relay - Used for a reversing valve in geothermal applications or as solar pump 2 in a solar system.

P2 Relay - Used as a geo-circulating pump in a geothermal application or as solar pump 1 in a solar system.

P1 Relay - Used as a geothermal circulating pump or tank 1 pump in a solar system.

Supply Power - the 3-wire 120VAC input to the control. Protected by a 30Amp breaker or fuse.

Misc Relay 1 - This relay is the default relay for bringing on the first geothermal stage, or the solar backup.

Misc: Relay 2 - This relay is the default relay for bringing on the 2nd geothermal stage or for a hi temp dump contact in a solar system.
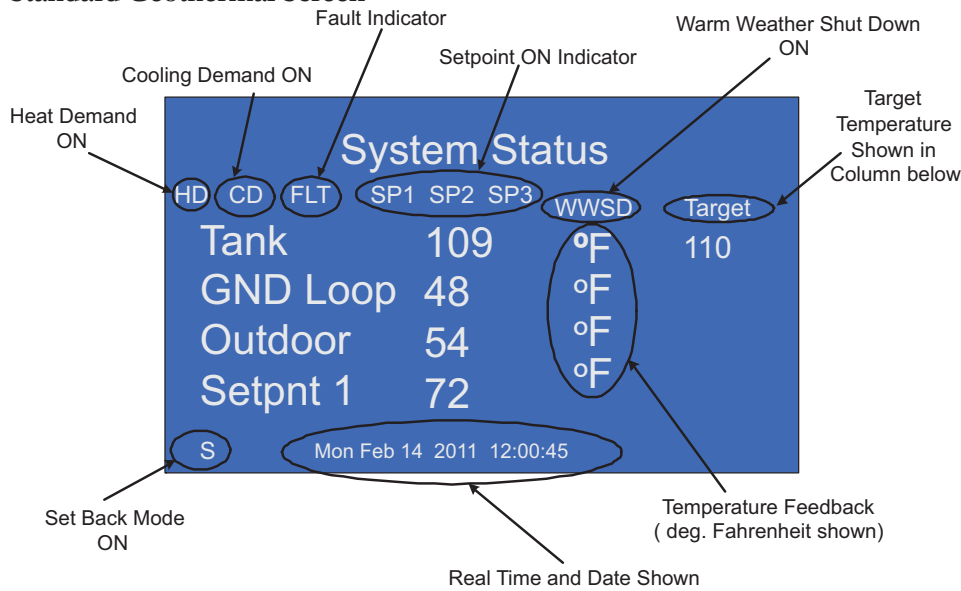
⚠ **Misc Relays 1&2 are Dry Contacts and rated for a max of 10Amps**

PROGRAMMING

DISPLAY FEATURES

The HBX display is a 128 x 64 pixel, back-lit graphic display on a blue background. In addition to displaying text and icons it has the ability to provide you with visual graphing capabilities. These graphing capabilities will allow you to get representative data and trending information of up to 2 independent feedback values.

Standard Geothermal Screen

Fault Indicator

Cooling Demand ON

Setpoint ON Indicator

Warm Weather Shut Down ON

Heat Demand ON

Target Temperature Shown in Column below

System Status

HD CD FLT   SP1 SP2 SP3   WWSD   Target

Tank   109   °F   110
GND Loop   48   °F
Outdoor   54   °F
Setpnt 1   72   °F

S   Mon Feb 14 2011 12:00:45

Set Back Mode ON

Temperature Feedback (deg. Fahrenheit shown)

Real Time and Date Shown

NAVIGATING THE CONTROL

The four large red buttons labeled "A", "B", "C", and "D" are used to make your way through the programming options within the Control.

Pressing the "A" or "B" button while viewing the initial "System Status" and "System Function" main screens will swap from screen to screen. Pressing the "D" button will take you to the "Programming Options" screen. Pressing the "D" button again will revert to the main system screens.
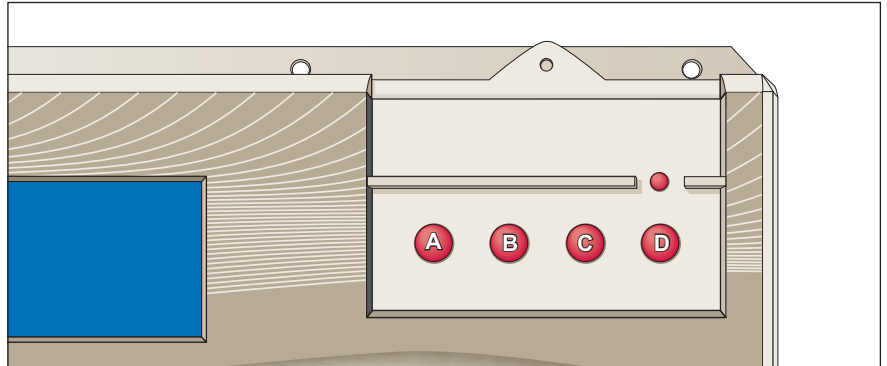
Once in the "Programming Options" menu you may move the selection indicator up and down by pressing the A and B buttons, pressing the "C" button will enter the selected option.

Pressing the "C" button on options with limited choices (ie. on/off, yes/no) will toggle the selection.

Pressing the "A" and "B" buttons on options with variable numerical choices (ie. temperature values, time settings) will increase and decrease the selected amount. Pressing the "C" button upon completion will forward you to the next step.

The "D" button can be used to revert to the previous menu.

Program Lock Feature

To minimize the potential for unauthorized tampering of your control after commissioning, you have the ability to limit/lock the programming menus.
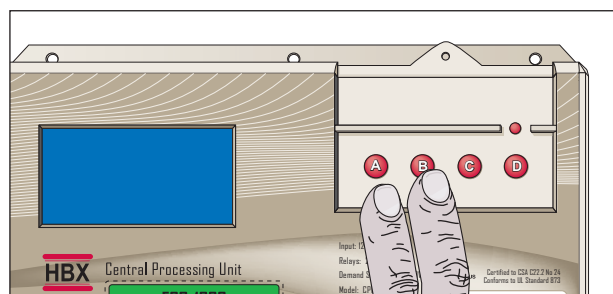
To lock the control, use two fingers to press and hold down the A and B buttons simultaneously for approximately 10 secs.

To unlock the control, use two fingers to press and hold down the C and D buttons simultaneously for approximately 10 secs.
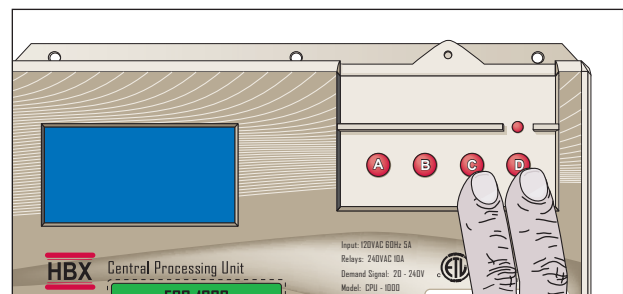
If the display flashes erratically, remove your fingers from the buttons and try again by pressing both buttons at the same time.

Lock Feature

Unlock Feature

1

Choose Control Type
1) Geothermal
2) Solar

1 Choose Control Type
The ECO-1000 can be configured as either a Geothermal or Solar specific hydronic control. This screen will only stay on the first time you power up the control. This screen will display for five seconds each time the control is started after you have selected the control type.

2A

Choose Control Type
1) GeoThermal
2) Solar

2A Geothermal Select
Selecting the geothermal option will setup the ECO-1000 to display all options applicable to a geothermal application.

3A

HBX   Geothermal
       Control
       Ver 1.26

Control Systems

3A Geothermal Status
This screen will be visible for approximately 5 seconds to identify the application you have selected.

4A   System Status

                              TARGET
Tank   open   °F 110
GNDLoop   open   °F
Outdoor   open   °F
Setpnt1   open   °F

          WED FEB 11 2009 11:07:02

4A Geo System Status
Temperatures visible depend on the settings currently active.

⚠ **The values shown here are with no sensors connected, or terminals removed**

5A   System Function

                              CYCLES
System Pump OFF °F 0
Heat Pump   OFF °F 0
Backup   OFF °F 0

5A Geo System Function
System function displays currently active pumps, heat pumps and cycles.
You can toggle between main screens by pressing either the "A" or "B" button.

---

6   System Status

                              Target
Extra   OFF   °F
Extra   OFF   °F

6 System Status Extra
The third system screen displays extra sensors if applicable in your system.

7A   Programming
1) Control Options
2) GeoThermal Options
3) Change Designs
4) Setpoint Options
5) Setback Options
6) Graphing

7A Programming Options
1) Control Options
2) Geothermal Option
3) Change Designs
4) Setpoint Options
5) Setback Options
6) Graphing

8A **Programming** 1) Control Options 2) GeoThermal Options 3) Change Designs 4) Setpoint Options 5) Setback Options 6) Graphing	**8A Control Options** The control options area contains options for changing the display, setting constant heat/cooling demands; testing/viewing activity and enabling zone control. To enter the desired selection, press the "C" button. For example, with line 1 flashing, press button "C" to enter the "Control Options screen".
9A **Control Options** 1) Display Options 2) Always HD? N 3) Always CD? N 4) Mins and Maxs 5) Testing 6) Stage Run Times 7) Use Zone Module? N	**9A Display Options: Menu** Display options allow you to: set your date and time; reset the internal relay counter for pump and heat pump cycles; program and display either °F or °C; program the Control to allow for Daylight Savings; access website information for HBX; and clear the stage accumulated hours counter.
10 **Display Options** 1) Change Time 2) Reset Cycles 3) Display in °F 4) D-lite savings? N 5) Contact HBX 6) Reset Run Times	**10 Display Options: Menu** Display options allow you to: set your date and time; reset the internal relay counter for pump and heat pump cycles; program and display either °F or °C; program the Control to allow for Daylight Savings; access website information for HBX; and clear the stage accumulated hours counter.
11 **Display Options** 1) Change Time 2) Reset Cycles 3) Display in °F 4) D-lite savings? N 5) Contact HBX 6) Reset Run Times	**11 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.
12 Year 2000	**12 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.
13 Month 00	**13 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.
14 Day 00	**14 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.

15 Weekday 1 (Sunday = 1)	**15 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**
16 Hour 00	**16 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**
17 Min 00	**17 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.
18 Display Options 1) Change Time 2) Reset Cycles 3) Display in °F 4) D-lite savings? N 5) Contact HBX 6) Reset Run Times	**18 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.
19 Display Options 1) Change Time 2) Reset Cycles 3) Display in °C 4) D-lite savings? N 5) Contact HBX 6) Reset Run Times	**19 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.
20 Display Options 1) Change Time 2) Reset Cycles 3) Display in °F 4) D-lite savings? Y 5) Contact HBX 6) Reset Run Times	**20 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.
21 Display Options 1) Change Time 2) Reset Cycles 3) Display in °F 4) D-lite savings? N 5) Contact HBX 6) Reset Run Times	**21 Display Options: Contact HBX** Pressing the "C" button with the "Contact HBX" option selected will display the manufacturer contact information and the units individual serial number.

22 HBX Control Systems Calgary, AB, Canada 1-403-720-0029 www.hbxcontrols.com ID Serial: xxxxxxxxxx Press B to Continue	**22 Display Options: Contact HBX Continued** Contact HBX Controls directly and display your Controls ID number

23 Display Options 1) Change Time 2) Reset Cycles 3) Display in °F 4) D-lite savings? N 5) Contact HBX 6) Reset Run Times	**23 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.

24A Control Options 1) Display Options 2) Always HD? Y 3) Always CD? N 4) Mins and Maxs 5) Testing 6) Stage Run Times 7) Use Zone Module? N	**24A Control Options: Always Heat Demand** Always HD allows you to set a permanent heat demand and does not require the use of an external signal. Eg. in a commercial heat pump application. ⚠ **W.W.S.D. will override the heat demand and shut off the heat pumps if not in cooling mode.**

25A Control Options 1) Display Options 2) Always HD? N 3) Always CD? Y 4) Mins and Maxs 5) Testing 6) Stage Run Times 7) Use Zone Module? N	**25A Control Opt.: Always Cooling Demand** Always CD allows you to set a permanent cooling demand and does not require the use of an external signal. Eg. in a commercial heat pump application. ⚠ **C.W.S.D. will override the heat demand and shut off the heat pumps if not in heating mode.**

26A Control Options 1) Display Options 2) Always HD? N 3) Always CD? N 4) Mins and Maxs 5) Testing 6) Stage Run Times 7) Use Zone Module? N	**26A 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.

27 Mins and Maxs 1) Thermistor 1 2) Thermistor 2 3) Thermistor 3 4) Thermistor 4 5) Thermistor 5 6) Thermistor 6 7) Reset All	**27 Mins and Maxs: Thermistors** Allows you to look at a maximum of six different thermistor min/max temperature extremes and reset back to zero. To see updated Min/Max values return to the System Status screen to refresh the view.

28 Thermistor 1 01/01/09 Min Temp 00HRS 223˚F 01/01/09 Max Temp 00HRS 223˚F	**28 Thermistor: Captured Data** Each thermistor has its highest and lowest temperatures stored, as well as the time that this temperature was reached and the period of time that it spent at this value.

Screen	Description
29 Mins and Maxs 1) Thermistor 1 2) Thermistor 2 3) Thermistor 3 4) Thermistor 4 5) Thermistor 5 6) Thermistor 6 7) Reset All	**29 Mins and Maxs: Reset All** When formatting the Control existing min/max values are reset. Selecting the "Reset All" option clears the time and date stamps.
30A Control Options 1) Display Options 2) Always HD? N 3) Always CD? N 4) Mins and Maxs 5) Testing 6) Stage Run Times 7) Use Zone Module? N	**30A Control Options: Testing** This allows you to manually test/run each relay for up to 30 seconds. ▽ **You can cycle the relay faster by pressing the "C" button, this skips the 30 second elapse time.**
31 Testing 1) Relay #1 2) Relay #2 3) Relay #3 4) Relay #4 5) Relay #5 6) Relay #6 7) Relay #7	**31 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.
32 16) Relay #16 17) Relay #17 18) PWM #1 19) PWM #2 20) PWM #3 21) PWM #4 22) PWM #5	**32 Testing: PWM** The third screen is displayed by pressing the "A" button on the last selection of the previous screen. PWM relays are accessible here.
33 Waiting for relays to turn off	**33 Testing: Relays Off** This screen informs you that the Control is reverting the relays to an off state.
34 Relay 1 is on	**34 Testing: Relay On** Pressing the "C" button on selected relays will activate the test sequence.
35A Control Options 1) Display Options 2) Always HD? Y 3) Always CD? N 4) Mins and Maxs 5) Testing 6) Stage Run Times 7) Use Zone Module? N	**35A Control Options: Stage Run Times** This allows you to view cumulative run times for your heat pump stages. This is reset in the "Display Options" menu.

36 Stage Run Times 1) 0:00	**36 Stage Run Times** This screen will display staging runtimes in a geothermal system, and the backup system runtime in a solar installation. Press the "D" button to exit

37A   Control Options
 	
  1) Display Options
  2) Always HD? Y
  3) Always CD? N
  4) Mins and Maxs
  5) Testing
  6) Stage Run Times
  7) Use Zone Module? Y
	37A Control Options: Use Zone Module
	This option enables the use of the HBX ZON-0500 zone control to control heating/cooling distribution to independent zones in a system.

38A   Programming
 	
  1) Control Options
  2) GeoThermal Options
  3) Change Designs
  4) Setpoint Options
  5) Setback Options
  6) Graphing
	38A Geothermal Options
	The geothermal options menu provides settings specific to your geothermal installation.

39A   GeoThermal options
 	
  1) Heat Pmp Options
  2) Geo Settings
  3) Fault Settings
  4) Backup Settings
  5) Heating Priority? N
	39A Geo Options: Heat Pump
	The heat pump menu allows you to customize the settings for your systems heat pumps.

40A   GeoThermal Options
 	
  1) Staging Options
  2) Pump Options
  3) # of Stages 1
  4) Rotate Heat Pmps? Y
  5) Rotate Cycles
	40A Geo Options: Staging
	These steps provide the necessary options to configure the heat pump staging components of your system.

41A   Staging Options
 	
  1) 2 Stage HPump? Y
  2) Fixed First? N
  3) Fixed Last? N
  4) Lo/Lo -Hi/Hi? N
  5) Min ON LagTime
  6) Max OFF LagTime
	41A Staging: 2 Stage HP
	Enable the 2 stage heat pump option if you are utilizing dual stage heat pumps or heat pumps with 2 compressors per unit.

42A   Staging Options
 	
  1) 2 Stage HPump? N
  2) Fixed First? Y
  3) Fixed Last? N
  4) Lo/Lo -Hi/Hi? N
  5) Min ON LagTime
  6) Max OFF LagTime
	42A Staging: Fixed First
	Fixed first designates a heat pump to function as the initial firing device, regardless of settings such as rotate heat pump. This will consistently be the first to fire when a heat demand is present.

43A Staging Options	**43A Staging: Fixed Last**
1) 2 Stage HPump? N 2) Fixed First? N 3) Fixed Last? Y 4) Lo/Lo -Hi/Hi? N 5) Min ON LagTime 6) Max OFF LagTime	Fixed last designates a heat pump to function as the last firing device, regardless of setting such as rotate heat pump. This will consistently be the last to fire when a heat demand is present.

44A Staging Options	**44A Staging: LoLo/HiHi**
1) 2 Stage HPump? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo -Hi/Hi? Y 5) Min ON LagTime 6) Max OFF LagTime	The "Lo/Lo - Hi/Hi" function instructs a system containing a pair of 2 stage heat pumps to engage the first stage of each prior to igniting the second stage of either heat pump. The "2 Stage HPump" option must be set to "Y" and two or more stages must be present.

45A Staging Options	**45A Staging: Min HP Lagtime**
1) 2 Stage HPump? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo -Hi/Hi? Y 5) Min ON LagTime 6) Max OFF LagTime	Use this setting to set the minimum time between heat pump stages staging on.

46A Min ON LagTime 1 mins	**46A Min HP Lagtime**
	Set this value to be the minimum amount of time between heat pump stages turning on. 1 minute is the minimum.

47A Staging Options	**47A Staging: Max Off Lagtime**
1) 2 Stage HPump? N 2) Fixed First? N 3) Fixed Last? N 4) Lo/Lo -Hi/Hi? Y 5) Min ON LagTime 6) Max OFF LagTime	Set this value to be the maximum time between heat pump stages turning off.

48A Max OFF LagTime 60 Secs	**48A Max Off Lagtime**
	Set this time to be the maximum time desired between heat pump stages turning off. This can be set as low as 1 second.

49A GeoThermal Options	**49A Geo Options: Pumps**
1) Staging Options 2) Pump Options 3) # of Stages 1 4) Rotate Heat Pmps? Y 5) Rotate Cycles	Access pump options to setup and differentiate between heat pump circulators and system pumps with post purge features.

50A Pump Options 1) 1 Pump/HeatP? N 2) Pumps Always ON? N 3) Post Purge 1 Sec 4) Use Tank Pumps? N 5) AIR/Zone Pumps? N	**50A Pumps: 1 Pump/HP** N = Heat pump circulators controlled by heat pump circuit Y = Heat pump circulators controlled by ECO-1000 When selected 'Y' the post purge time is activated for the pumps in the system.
51A Pump Options 1) 1 Pump/HeatP? N 2) Pumps Always ON? N 3) Post Purge 1 Sec 4) Use Tank Pumps? N 5) AIR/Zone Pumps? N	**51A Pumps: Pump Always On** Gives you the option to run all of the pumps continuously, regardless of a call for heat. ⚠ **All connected pumps will be permanently on.**
52A CAUTION This Setting will Turn all pumps on in the System Press B to Continue	**52A Pumps Always On: Caution** All connected pumps will be permanently on.
53A Pump Options 1) 1 Pump/HeatP? N 2) Pumps Always ON? N 3) Post Purge 1 Sec 4) Use Tank Pumps? N 5) AIR/Zone Pumps? N	**53A Pumps: Post Purge** Program a post purge cycle which runs all pumps for a selectable duration (1-240 Secs) after the initial off-signal has been sent.
54A Post Purge Time 1 Secs	**54A Post Purge Time** Set the time for 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 heat pump, causing energy waste.
55A Pump Options 1) 1 Pump/HeatP? N 2) Pumps Always ON? N 3) Post Purge 1 Sec 4) Use Tank Pumps? Y 5) AIR/Zone Pumps? N	**55A Use Tank Pumps** This setting is used when you wish to utilize individual system pumps for two separate temperatures. Each system pump will run only when there is a demand for its respective temperature, and 1 or more heat pumps are running. ⚠ **These pumps are usually between the heat pump and the tank.**
56A Pump Options 1) 1 Pump/HeatP? N 2) Pumps Always ON? N 3) Post Purge 1 Sec 4) Use Tank Pumps? Y 5) AIR/Zone Pumps? N	**56A AIR/Zone Pumps** This setting is used when you wish to utilize Fan-Coils and Floor Radiant pumps. P1 (Fan-Coil Pump), will come on when an HD or CD is given directly on the control and P2 (Zone Pump), will come on only when an HD comes from zone control. Also with these pumps, the temperature in the tank must be within 10 differential of the target before it can come on for the protection of the zone.
57A GeoThermal Options 1) Staging Options 2) Pump Options 3) # of Stages 1 4) Rotate Heat Pmps? Y 5) Rotate Cycles	**57A Geo Options: # of Stages** Set the number of heating/cooling stages in the system.

58A Number of Stages 1 NB. HI/LO = 2 Stages	**58A # of Stages** The number of stages available ranges from 1-14. For systems with 3 or more stages, EXP-0100 modules are required. ⚠️ **Do not include a backup source as a stage, see Backup Settings.**
59A CAUTION This Setting requires EXP-0100 modules Press B To Continue	**59A # of Stages Caution** This screen will display to remind you that if you have 3 or more stages that you require the adequate number of EXP-0100 modules attached.
60A GeoThermal Options 1) Staging Options 2) Pump Options 3) # of Stages 1 4) Rotate Heat Pmps? N 5) Rotate Cycles	**60A Geo Options: Rotate HP** Gives you the ability to rotate the heat pump sequence for lead/lag and effectively accomplish equal run time per heat pump. Rotation is executed every 48 hours (running hours).
61A GeoThermal Options 1) Staging Options 2) Pump Options 3) # of Stages 1 4) Rotate Heat Pmps? N 5) Rotate Cycles	**61A Geo Options: Rotate Cycles** This feature allows you to rotate the heat pumps according to the number of cycles you have set.
62A Rotation Cycles 2	**62A Rotate Cycles** Set the number of cycles at which you would like to rotate the heat pumps.
63A GeoThermal options 1) Heat Pmp Options 2) Geo Settings 3) Fault Settings 4) Backup Settings 5) Heating Priority? N	**63A Geo Options: Settings** This setting allows for the setup of the geothermal setpoints and system setup.
64A GeoThermal Settings 1) Dual Tank System? Y 2) Hot Tank Setpoint 3) Cold Tank Setpoint 4) Cold Differential 5) Hot Differential 6) Min Loop Temp 7) Use Rev/3way Vlv? N	**64A Dual Tank System** Set this option to "Y" if you are using a two tank system, one heating and one cooling. Can also be used in a dual heat system. If "N" is selected, the tank will function as a hot storage tank when the outdoor temperature is below the WWSD value and it will act as a cold storage tank when the outdoor temp is above the WWSD value.

65A	GeoThermal Settings	**65A Settings: Hot Tank Setpoint**
	1) Dual Tank System? N	This setting is used to set the desired temperature in the hot tank when there is a heat
	2) Hot Tank Setpoint	demand present.
	3) Cold Tank Setpoint	
	4) Cold Differential	
	5) Hot Differential	
	6) Min Loop Temp	
	7) Use Rev/3way Vlv? N	

66A	Hot Tank Setpoint 110°F	**66A Hot Tank Setpoint** This is the setpoint for the hot tank. Set to the desired temperature for the hot tank. To use outdoor reset on the hot tank, scroll the value down (press the "A" button) until the screen value reads "Outdoor Reset". Following this the design temperatures must be set in the "Change Designs" section of the control.

67A	GeoThermal Settings	**67A Settings: Cold Tank Setpoint**
	1) Dual Tank System? N	Choose this selection to setup a cold tank if the system is responsible for cooling demands.
	2) Hot Tank Setpoint	This is the cooling setpoint regardless if cooling is done in a separate tank or not.
	3) Cold Tank Setpoint	
	4) Cold Differential	
	5) Hot Differential	
	6) Min Loop Temp	
	7) Use Rev/3way Vlv? N	

68A	Cold Tank Setpoint 50°F	**68A Cold Tank Setpoint** If this setting is above 84ºF, screens 9A, 67A, 68A, and 69A will change to reflect a 2 hot tank system. This option will set your cold tank setpoint if below 84ºF and your second hot tank setpoint if set above 84ºF.

69A	GeoThermal Settings	**69A Settings: Hot Tank 2 Setpoint**
	1) Dual Tank System? N	This option also functions as the Hot Tank 2 Setpoint. Choose this option when setting the
	2) Hot Tank Setpoint	temperature for the second tank.
	3) Hot Tank 2 Setpoint	
	4) Hot 2 Differential	
	5) Hot Differential	
	6) Min Loop Temp	
	7) Use Rev/3way Vlv? N	

⚠️ **Must be over 84ºF to function as a hot tank setpoint.**

9A	Control Options	68A	Hot Tank 2 Setpoint	69A	GeoThermal Settings	70A	Hot 2 Differential
	1) Display Options		142°F		1) Dual Tank System? N		4°F
	2) Always HD? N				2) Hot Tank Setpoint		
	3) Always HD2? N				3) Hot Tank 2 Setpoint		
	4) Mins and Maxs				4) Hot 2 Differential		
	5) Testing				5) Hot Differential		
	6) Stage Run Times				6) Min Loop Temp		
	7) Use Zone Module? N				7) Use Rev/3way Vlv? N		

69A	GeoThermal Settings	**69A Settings: Cold Differential**
	1) Dual Tank System? N	Choose this option to set the cooling differential.
	2) Hot Tank Setpoint	⚠️ **When in 2 Hot tank mode, this option will set the second hot tank differential.**
	3) Cold Tank Setpoint	
	4) Cold Differential	
	5) Hot Differential	
	6) Min Loop Temp	
	7) Use Rev/3way Vlv? N	

70A Cold Differential 4°F	**70A Cold Differential** Set this temperature to be the desired cold tank differential. A differential of 4°F will allow for 2 degrees above and/or 2 degrees below the desired temperature before a demand is present.

71A GeoThermal Settings 1) Dual Tank System? N 2) Hot Tank Setpoint 3) Cold Tank Setpoint 4) Cold Differential 5) Hot Differential 6) Min Loop Temp 7) Use Rev/3way Vlv? N	**71A Settings: Hot Differential** Choose this section to set the heating differential.

72A Hot Differential 4°F	**72A Hot Differential** Set this temperature to be the desired hot tank differential. A differential of 4°F will allow for 2 degrees above and/or 2 degrees below the desired temperature before a demand is present.

73A GeoThermal Settings 1) Dual Tank System? N 2) Hot Tank Setpoint 3) Cold Tank Setpoint 4) Cold Differential 5) Hot Differential 6) Min Loop Temp 7) Use Rev/3way Vlv? N	**73A Settings: Min Loop Temperature** If a GND loop sensor is used on a single tank unit, then use this setting to set the minimum loop temperature.

74A Min Loop Temperature 33°F	**74A Min Loop Temperature** Set this to the minimum GND loop temperature you desire in your system. This will depend on the percentage of glycol in your system, as well as environmental and system factors.

75A GeoThermal Settings 1) Dual Tank System? N 2) Hot Tank Setpoint 3) Cold Tank Setpoint 4) Cold Differential 5) Hot Differential 6) Min Loop Temp 7) Use Rev/3way Vlv? Y	**75A Settings: Use Rev/3 Way Valve** Set this option if you are controlling the reversing valve or 3-way valves to go from heating to cooling.

76A GeoThermal options 1) Heat Pmp Options 2) Geo Settings 3) Fault Settings 4) Backup Settings 5) Heating Priority? N	**76A Geo Options: Fault Settings** This option allows you to view and manage the heat pump faults.

77A Fault Settings 1) Use Fault? Y 2) Reset Fault 3) Num of Faults = 0 4) Last Fault Time 00/00 2009 00:00	**77A Fault Settings: Use Fault** Set this to "Y" if you would like to record and see fault conditions. **To use this section you must hook-up faults from the heat pump to pins 5 and 6 on the ECO-1000.**
78A Fault Settings 1) Use Fault? N 2) Reset Fault 3) Num of Faults = 0 4) Last Fault Time 00/00 2009 00:00	**78A Fault Settings: Reset Fault** Set this to clear the most recent fault condition.
79A Fault Settings 1) Use Fault? N 2) Reset Fault 3) Num of Faults = 0 4) Last Fault Time 00/00 2009 00:00	**79A Fault Settings: Number of Faults** Line three displays the cumulative number of faults that have occurred.
80A Fault Settings 1) Use Fault? N 2) Reset Fault 3) Num of Faults = 0 4) Last Fault Time 00/00 2009 00:00	**80A Fault Settings: Last Fault** Line four indicates the time and date of the last fault.
81A GeoThermal options 1) Heat Pmp Options 2) Geo Settings 3) Fault Settings 4) Backup Settings 5) Heating Priority? N	**81A Geo Options: Use Backup** HBX Control Systems Inc. has changed the backup on time. The Geothermal backup will now activate at 2 times the "Minimum On Time". The "Minimum On Time" is set within the GEOTHERMAL OPTIONS/HEAT PUMP OPTIONS/ STAGING OPTIONS. This feature allows the system to attempt to use the heat pumps for a longer duration before bringing on the backup.
82A Backup Settings 1) Use Backup? Y 2) Use Backup Temp 3) Bckup Only Out Temp 4) Bckup Only Tnk Temp	**82A Backup Settings: Use Backup** Set this option to "Y" if you are using a backup to accompany your heat pumps.
83A Backup Settings 1) Use Backup? N 2) Use Backup Temp 3) Bckup Only Out Temp 4) Bckup Only Tnk Temp	**83A Use Backup Temp** Set this value to the outdoor temperature that you wish the backup to be enabled. Any outdoor value below this temperature will allow the backup to turn on when called for.

84A Use Backup Temp 40°F	**84A Use Backup Temp** Set this temperature to the value you wish the backup to be enabled at (based on outdoor air temperature), if you want the backup feature to be on constantly, ensure that this value is set to "Off". This option will work in unison with the "Minimum On Time Feature".
85A Backup Settings 1) Use Backup? N 2) Use Backup Temp 3) Bckup Only Out Temp 4) Bckup Only Tnk Temp	**85A Backup Only Out Temp** Geothermal heat pumps can become inefficient when outdoor temperatures become to cold. This option allows you to set a temperature at which the backup will run at all times in favour of the heat pump, the heat pump will not run until the outside temperature rises above this setting.
86A Backup Only Out Temp OFF	**86A Backup Only Out Temp** Set this value to be the temperature at which you wish the backup to constantly override the heat pump, based on outdoor temperature.
87A Backup Settings 1) Use Backup? N 2) Use Backup Temp 3) Bckup Only Out Temp 4) Bckup Only Tnk Temp	**87A Backup Only Tank Temp** This feature is used when you would like a hotter temperature in your hot tank. This will turn the heat pumps off if the temperature in the hot tank goes above this setting. This will make sure that the heat pumps do not go into error.
88A Backup Only Tnk Temp 110°F	**88A Backup Only Tank Temp** Set this to the maximum tank temperature for the heat pumps to run at. Once this temperature has been exceeded, only the backup will heat the tank to the target temperature. To function properly, this temperature should be set lower than the hot tank target temperature.
89A GeoThermal options 1) Heat Pmp Options 2) Geo Settings 3) Fault Settings 4) Backup Settings 5) Heating Priority? Y	**89A Heating Priority** **Single Tank:** If set to Y, and there is a heat demand and cooling demand simultaneously, the control will disregard the call that is not priority until the priority demand is satisfied **Dual Tank:** If set to Y, and there is a heat demand and cooling demand simultaneously, the control will satisfy the priority tank before switching to the non priority tank **Two Hot Tanks:** If set to Y, and there is a heat demand, the control will prioritize the first hot tank, not the second hot tank
90A Programming 1) Control Options 2) GeoThermal Options 3) Change Designs 4) Setpoint Options 5) Setback Options 6) Graphing	**90A Change Designs** Change designs guides you through the steps to adjust system design parameters, optimizing your systems performance.

91   Change Designs
   1) Manual
   2) Format Control
	91 Change Designs: Manual
	Manual design allows you to customize each design temperature for your system. The design temperature for outdoor reset will only work if hot tank setpoint is set to use outdoor reset.

92 Design System Temp 110°F	**92 Change Designs: Design System 1 Temp** Design system temp will allow you to provide the required heat for your radiant source, this is set to be the maximum temperature required in the hot tank. ▼ **To use outdoor reset, "Hot Tank Setpoint" must be set to use outdoor reset.**

93 Design Room Temp 70°F	**93 Change Designs Design Room 1 Temp** This is the design temperature used in the heat curve calculation.

94 Design Outside Temp 6°F	**94 Change Designs: Design Outside 1 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. Typical design temperatures are shown at the back of the General Installation Guide

95 Min System Temp 75°F	**95 Change Designs: Min System Temp** Minimum system temp is the lowest water temperature you would like in the hot tank. This setting will supersede the outdoor reset calculation.

96 W.W.S.D. 75°F	**96 Change Designs: Warm Weather Shutdown** W.W.S.D. is the temp at which you decide to ignore a call for heat. This is an energy saving feature. W.W.S.D. overrides the "Always Heat Demand" setting.

97 C.W.S.D. OFF	**97 Change Designs: Cold Weather Shutdown** C.W.S.D. is the temp at which you decide to ignore a call for cooling. This is an energy saving feature. C.W.S.D. overrides the "Always Cooling Demand" setting. ▼ **For single buffer tank systems utilizing permanent heat/ cool demands the C.W.S.D. must be set higher than W.W.S.D.**

98 Programming 1) Manual 2) Format Control	**98 Change Designs: Format Control** When selected, all of the original settings are reloaded as in the "Factory Defaults" option. In addition, the "Format Control" option will reset the designated functions for each terminal.

99 CAUTION All Settings will be RESET to FACTORY Settings Press B to Continue Press C to EXIT	**99 Format Control: Caution** This screen is your final opportunity to avoid formatting the options within the Control.

100A Programming 1) Control Options 2) GeoThermal Options 3) Change Designs 4) Setpoint Options 5) Setback Options 6) Graphing	**100A Setpoint Options** Setpoints give you the option to utilize an independent heat/cool demand such as a fancoil, DHW pre-heat tank, hot tub, pool or spa. HBX Expansion Modules are required to run setpoints.

101 Setpoint Options 1) Setpoint 1 OFF 2) Setpoint 2 OFF 3) Setpoint 3 OFF 4) Merge Setpoints? N	**101 Setpoint Options: Setpoints** You have the ability to work with up to 3 different setpoints. The default is set to "Off". Select which setpoint you are going to operate, then press the "C" button to enter. Each system setpoint is configured in the same manner.

102 Setpoint 1 Program 1) Setpoint Temp 2) Heating 3) Cool Interlock? N 4) Differential 5) Lag Time 6) Demand Temp	**102 Setpoint Options: Setpoint Temperature** By selecting choice #1, you will pick the actual setpoint temperature to control around ± the differential.

103 Setpoint 1 Temp OFF	**103 Setpoint Options: Setpoint Temperature** Enter value to correspond with setpoint temp thermistor/sensor location. ⚠️ **Setpoint works only with thermistor/sensor inputs.**

104 CAUTION This Setting requires An Extra module Press B To Continue	**104 Setpoint Options: Setpoint Expansion Caution** Any changes to setpoint controls will prompt you to install one of the HBX Expansion Modules Eg. EXP-0100 or EXP-0300.

105 Setpoint 1 Program 1) Setpoint Temp 2) Cooling 3) Cool Interlock? N 4) Differential 5) Lag Time 6) Demand Temp	**105 Setpoint Options: Heating / 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
106 Setpoint 1 Program 1) Setpoint Temp 2) Heating 3) Cool Interlock? Y 4) Differential 5) Lag Time 6) Demand Temp	**106 Setpoint Options: 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.
107 Setpoint 1 Program 1) Setpoint Temp 2) Heating 3) Cool Interlock? N 4) Differential 5) Lag Time 6) Demand Temp	**107 Setpoint Options: Differential** Choice #4 "Differential" will allow you to set your margin for error in °F or °C around the setpoint temperature.
108 Setpoint 1 Diff'ntial 2°F	**108 Setpoint Differential** 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.
109 Setpoint 1 Program 1) Setpoint Temp 2) Heating 3) Cool Interlock? N 4) Differential 5) Lag Time 6) Demand Temp	**109 Setpoint Options: Lag Time** Choice #5 is "Lag Time". This allows you to set a minimum off time between setpoint demands. This helps to establish a cycle length between heat demands and reduce short cycling.
110 Setpoint 1 LagTime 0 S	**110 Setpoint Lag Time** You have a range of 0 to 600 seconds for lag time, and is adjustable in 5 second increments.
111 Setpoint 1 Program 1) Setpoint Temp 2) Heating 3) Cool Interlock? N 4) Differential 5) Lag Time 6) Demand Temp	**111 Setpoint Options: Demand Temperature** Set this option to the desired tank temperature when the setpoint engages. This option can be set to "No Demand", or from 1-200°F. ▽ **This setting will be set to "No demand" on a solar control.**

112 Setpoint Demand Temp No Demand	**112 Setpoint Demand Temperature** When set to "NO Demand", there is no internal call from the Expansion Module to the ECO-1000 for heating or cooling.

113 Setpoint Options 1) Setpoint 1 ON 2) Setpoint 2 OFF 3) Setpoint 3 OFF 4) Merge Setpoints? Y	**113 Setpoint Options: Merge Setpoints** "Merge Setpoints" is set to "Y" if you wish to have setpoints 1 and 2 output to the same Expansion Module. This would be used to effectively save space, increasing the number of heat pumps that the Control can manage.

114 CAUTION Can't Merge Setpoints Not enough modules for thermistors Press B To Continue	**114 Merge Setpoints** You must have more than two modules attached to the control to merge the setpoints. There must also be an even number of heat pumps in the system.

115 Programming 1) Control Options 2) GeoThermal Options 3) Change Designs 4) Setpoint Options 5) Setback Options 6) Graphing	**115 Setback Options** Choice #5 in programming will take you to the "Setback Options". Setbacks are pre-programmed time periods that lower the target temperature in a building to coincide with sleeping hours or vacancy.

116 Setback Options 1) Use Setbacks? Y 2) Set Setbacks	**116 Setbacks: Enable Setbacks** The first option allows you to enable setbacks, press the "C" button to turn setbacks on. Each of the three setbacks is setup in the same manner.

117 Setback Options 1) Use Setbacks? Y 2) Set Setbacks	**117 Setbacks: Set Setbacks** "Set Setbacks" 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.

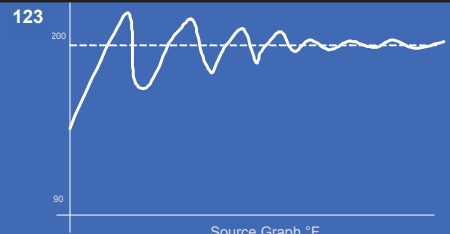|	
118 Setbacks Start Time #1 0:00 NB. 0:00 is 12:00AM	**118 Setbacks: Start Time** Choose the time that you would like the temperature reduction to begin.

119 **Setbacks**	**119 Setbacks: End Time**
End Time #1	Choose the time that you would like the temperature reduction to commence.
0:00	
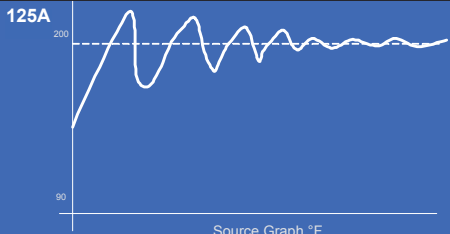
120 **Setbacks**	**120 Setbacks: Temperature**
Temperature	Choose the temperature that you would like the setback to drop to.
0%	

121 **Programming** 1) Control Options 2) GeoThermal Options 3) Change Designs 4) Setpoint Options 5) Setback Options 6) Graphing	**121 Graphing** The display allows you to get a visual impression of how your system is performing.

122 **Graphing** 1) Load Graph 2) Source Graph	**122 Graphing: Load Graph** You have the option to look at the "Load Graph" (Actual vs. Target).

123 Graphing: Load Graph Continued
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 10 sec intervals.

124 **Graphing** 1) Load Graph 2) Source Graph	**124 Graphing: Source Graph** You have the option to look at the "Source Graph" (Actual vs. Target).

125A Graphing: Source Graph Continued
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 10 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.**
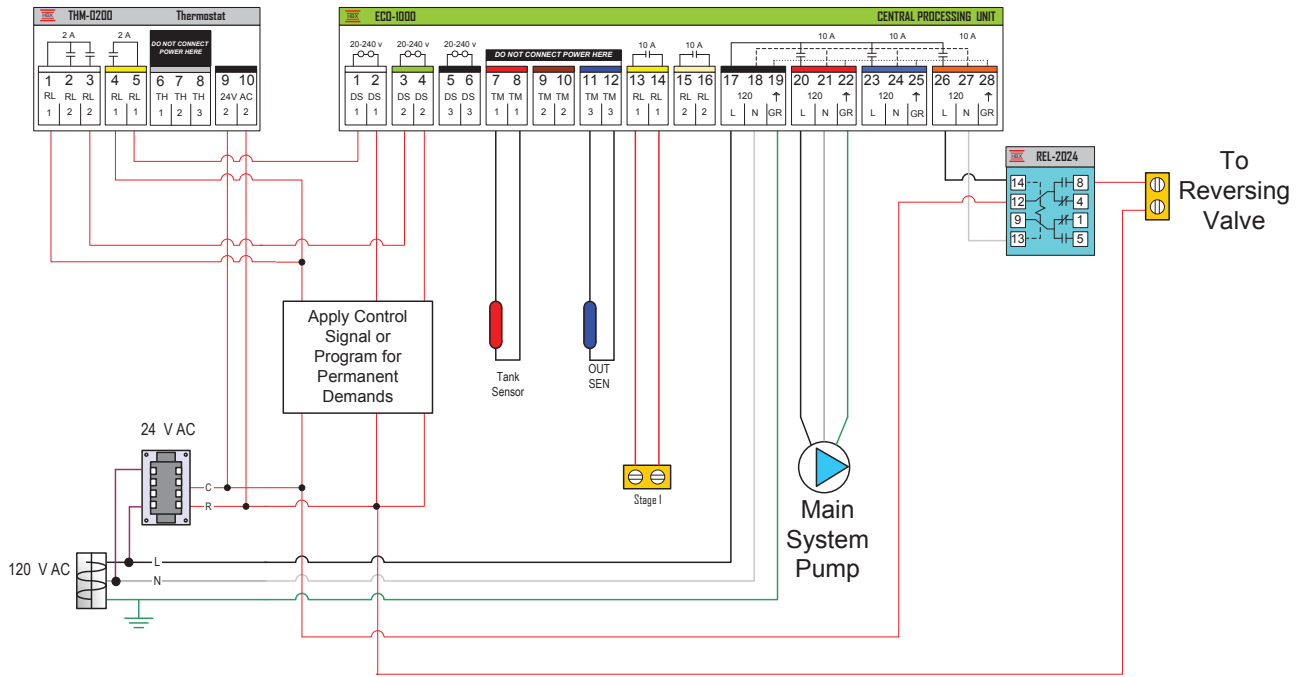

Electrical Legend

Tank Sensor | Supply Sensor | Outdoor Sensor

Heat Pump Contacts

Power Supply — 24 VAC — C, R
120 VAC — L, N, G

Thermostat (TH) | Aquastat (A) | Pump

Wiring

Line Wire (Black)
Neutral Wire (Grey)
Ground Wire (Green)
24 VAC (Red)

Mechanical Legend

ECO-1000 | EXP-0100 | EXP-0300 | Outdoor Sensor

Heat Load | Domestic Hot Water Tank | Boiler | Heat Exchanger | Heat Pump | 120 VAC

Balancing Valve | Injection Valve | Zone Valve | Check Valve | 3 Way Valve | Hot Tub

Piping

Heating Supply (Red)
Heating Return (Pink)

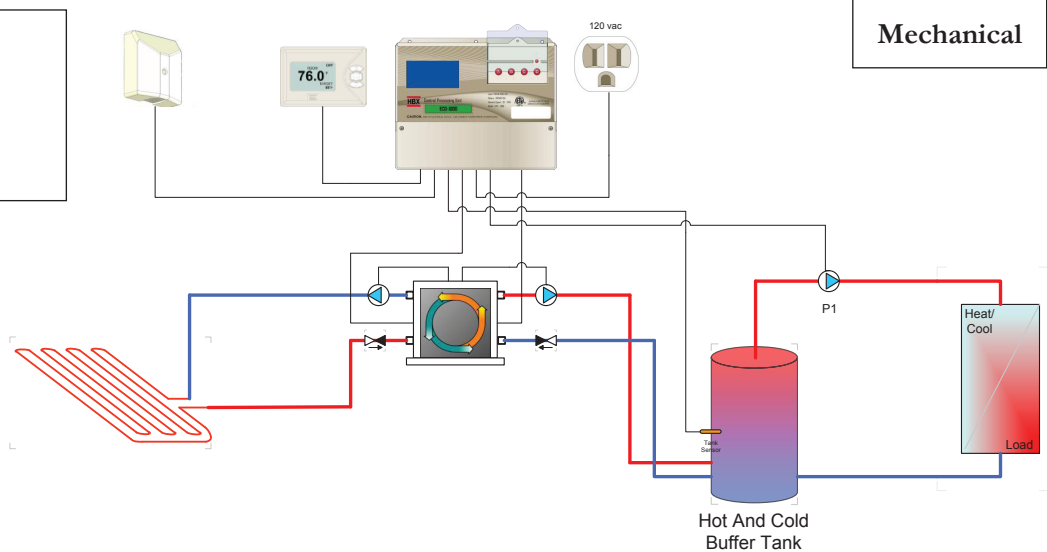Application Drawings

Comfort Control Innovation

GEOTHERMAL CONTROL GEO 1000-01

• Single stage geothermal system using outdoor reset, single buffer tank
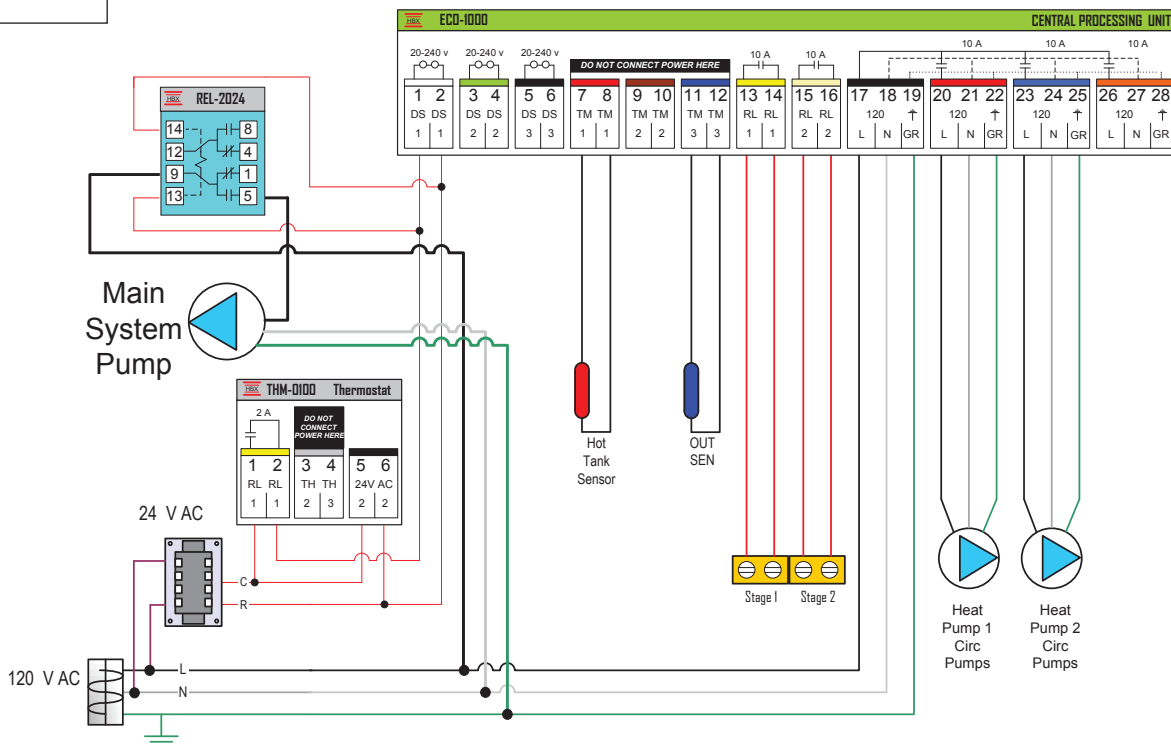• Control running main system pump

Electrical

Mechanical

Pump Legend:
• P1 - System Pump

Hot And Cold
Buffer Tank

GEOTHERMAL CONTROL GEO 1000-02

- Two Stage geothermal with control running GND loop and load side circulating pumps.
- Heating only system.

Electrical

ECO-1000   **CENTRAL PROCESSING UNIT**

Main System Pump

REL-2024

THM-0100 Thermostat

24 V AC

120 V AC

Hot Tank Sensor

OUT SEN

Stage 1   Stage 2

Heat Pump 1 Circ Pumps

Heat Pump 2 Circ Pumps

Mechanical

Pump Legend:
- P1 - System Pump
- P2 - Heat Pump 1 Circ Pump
- P3 - Heat Pump 2 Circ Pump

120 vac

Heat Demand Turns System Pump On

P1

P2   P2

P3   P3

Buffer Tank

Heat

Load
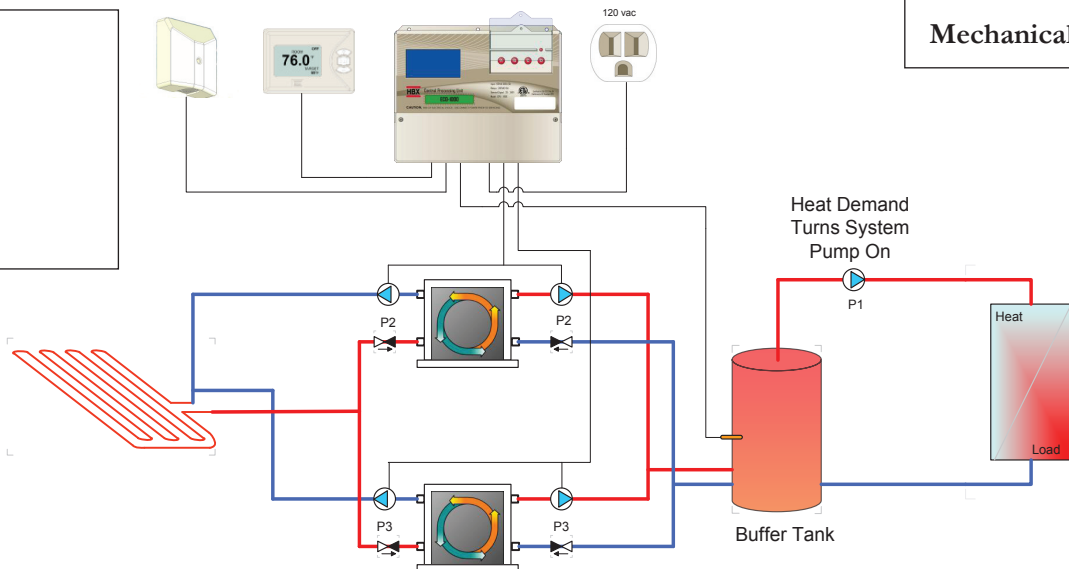
GEOTHERMAL CONTROL GEO 1000-03

- Three stage geothermal with control running GND loop pump, diverter and reversing valves
- Separate cold and hot tank
- Boiler backup

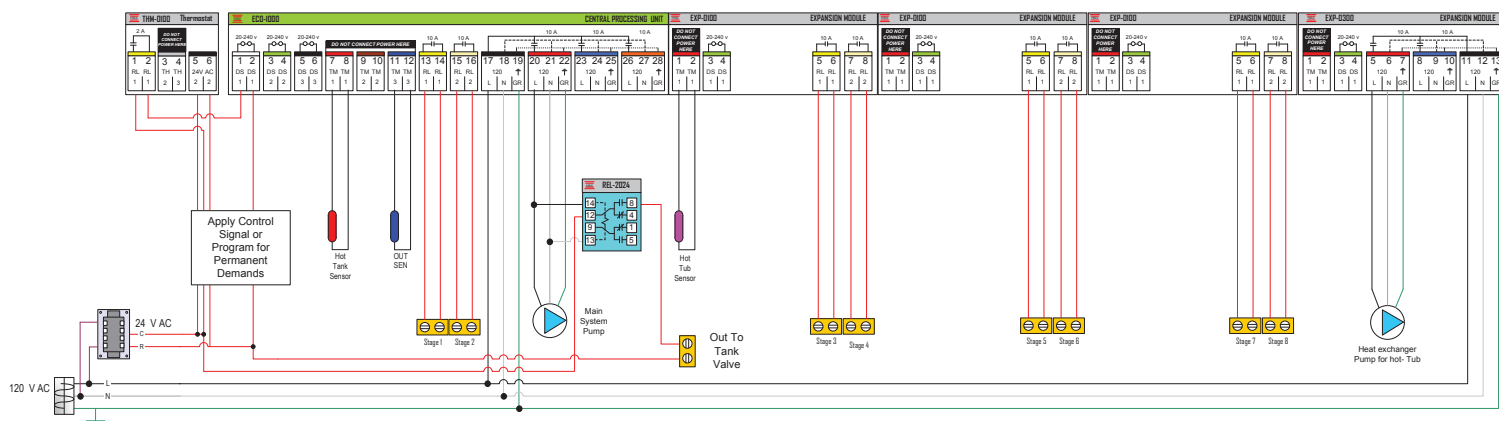**Electrical**
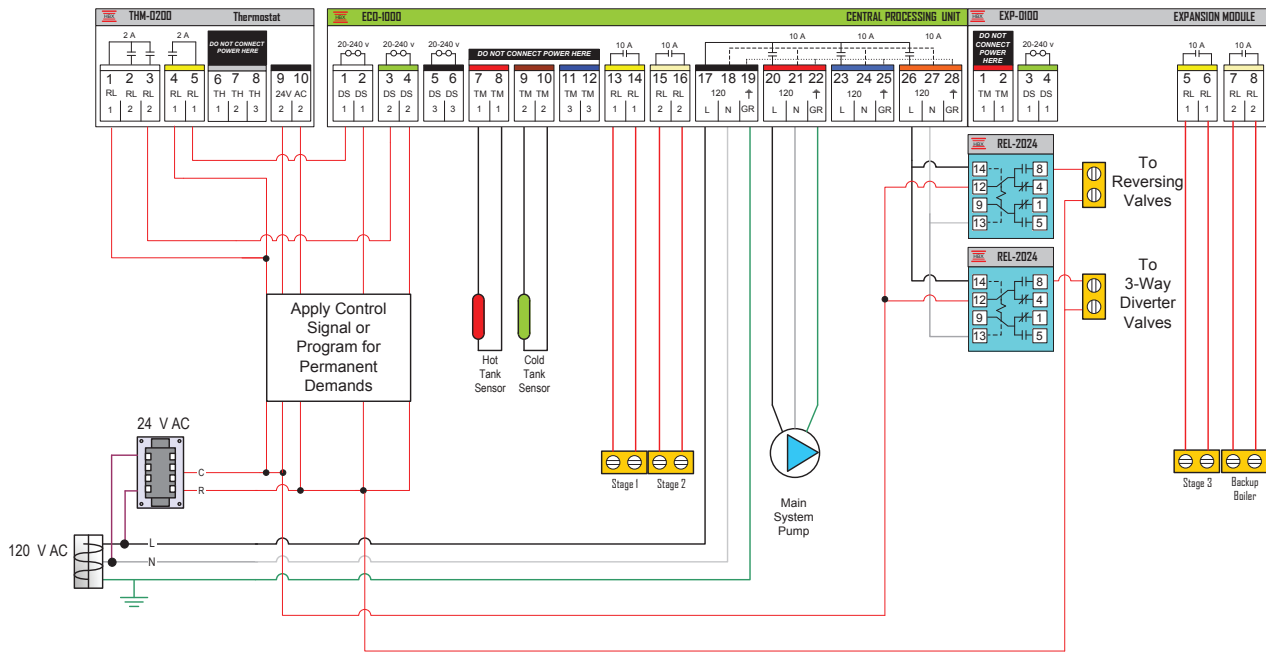
Mechanical

Pump Legend:
- P1 - GND Loop Pump
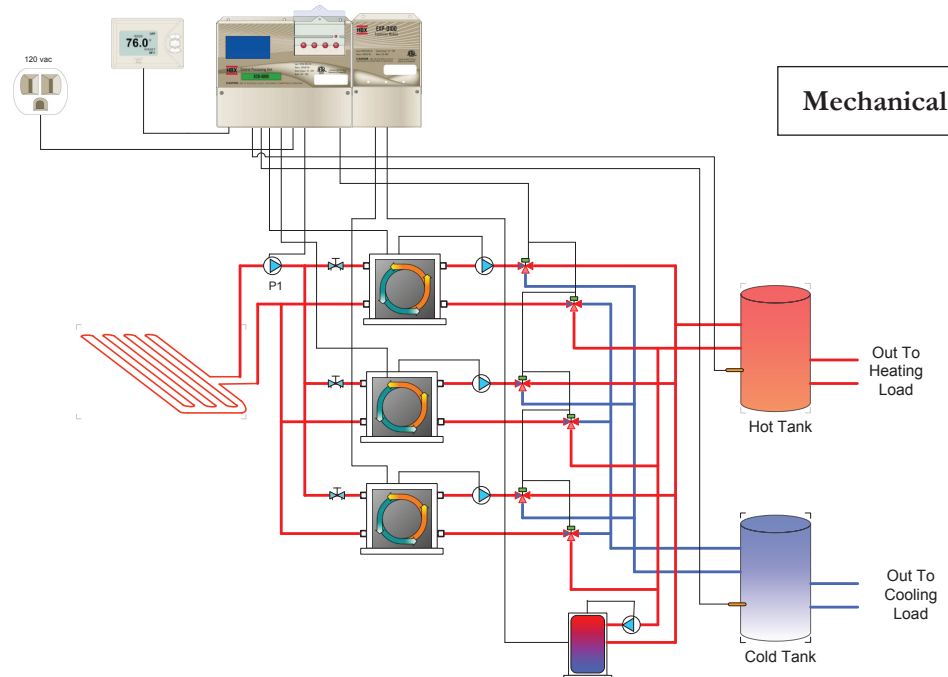
GEOTHERMAL CONTROL GEO 1000-04

- Eight stage geothermal with control using outdoor reset
- Control running main system pump
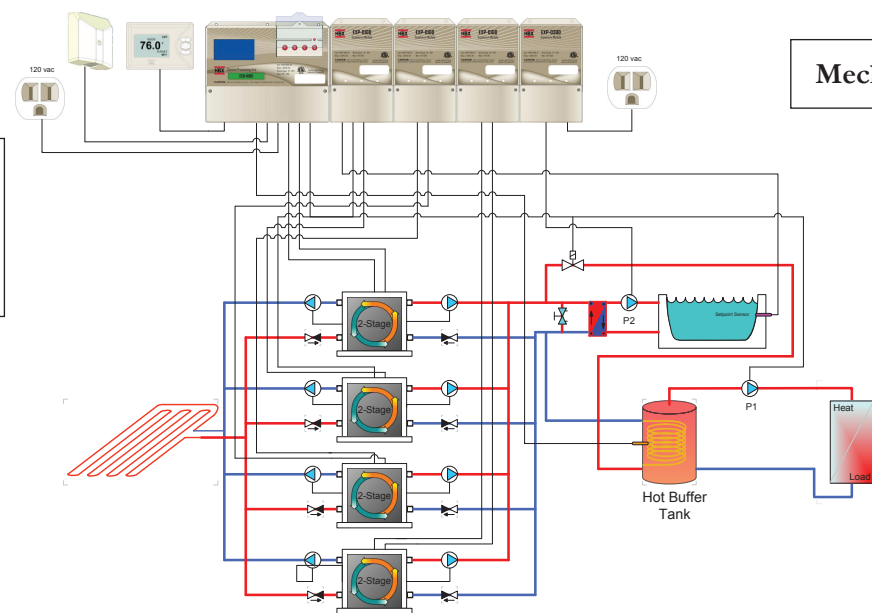- Setpoint running hot tub
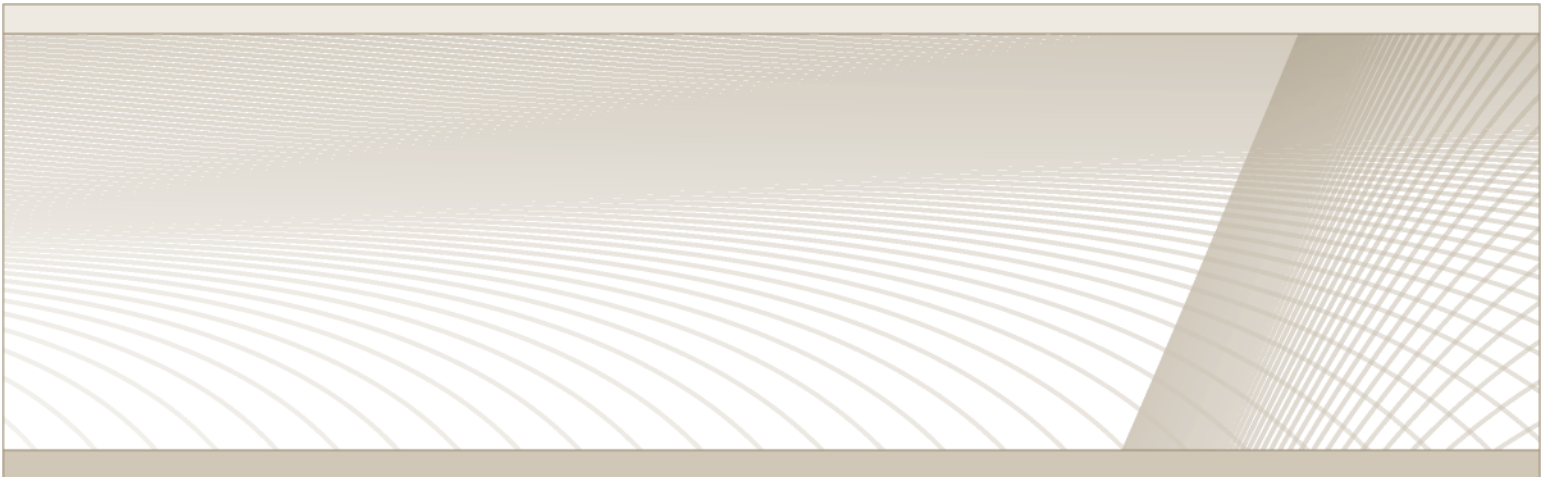- Single tank, heating only system

Electrical

Mechanical

Pump Legend:
- P1 - System Pump
- P2 - Heat Exchanger Pump