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EcoNet® Enabled

Unit Coolers

Installation and Operations Manual

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EcoNet® Enabled Unit Coolers

Introduction

EcoNet® Enabled Unit Coolers are intelligent, electronically operated evaporators for walk-in coolers and freezers designed for easier installation and energy savings. Developed in conjunction with Rheem Manufacturing, it builds on the success, reliability and efficiency of the EcoNet technology and brings it to commercial refrigeration.

EcoNet Enabled Unit Coolers save energy in refrigeration systems through precise superheat and space temperature control, fan cycling, and controlling how often the system goes into defrost based on compressor runtime. It eliminates unnecessary defrosts, maximizes energy efficiency with less compressor runtime, reduces liability by eliminating icing issues, reduces fan speed to 50% during off cycle to save energy, and reduces temperature fluctuations by regulating defrosts for improved product quality. EcoNet Enabled Unit Coolers can be configured to work on a single or dual evaporator coil, and can be used with a condensing unit in single and multiple evaporator installations as a group.

EcoNet Board

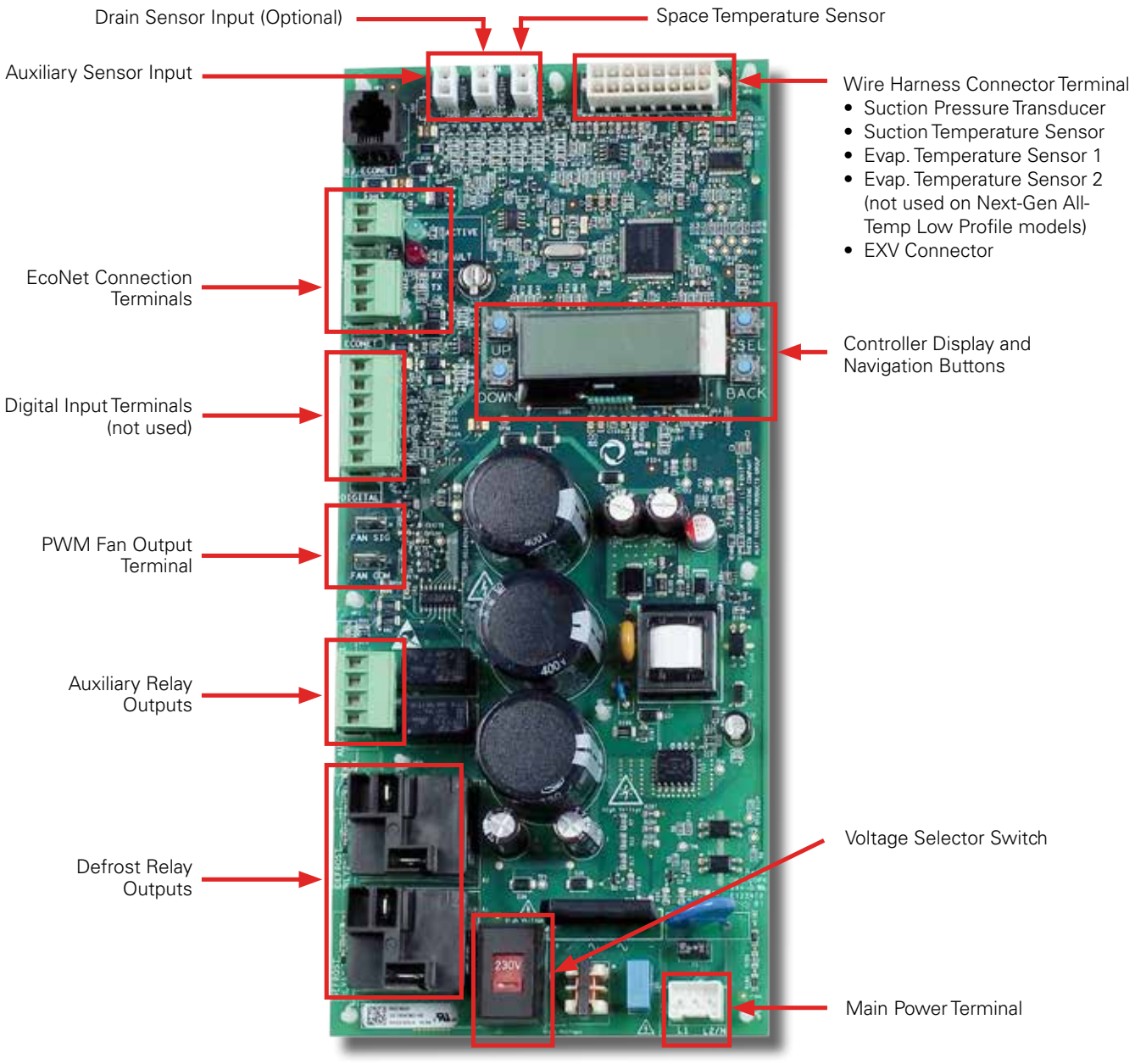


Figure 1-1

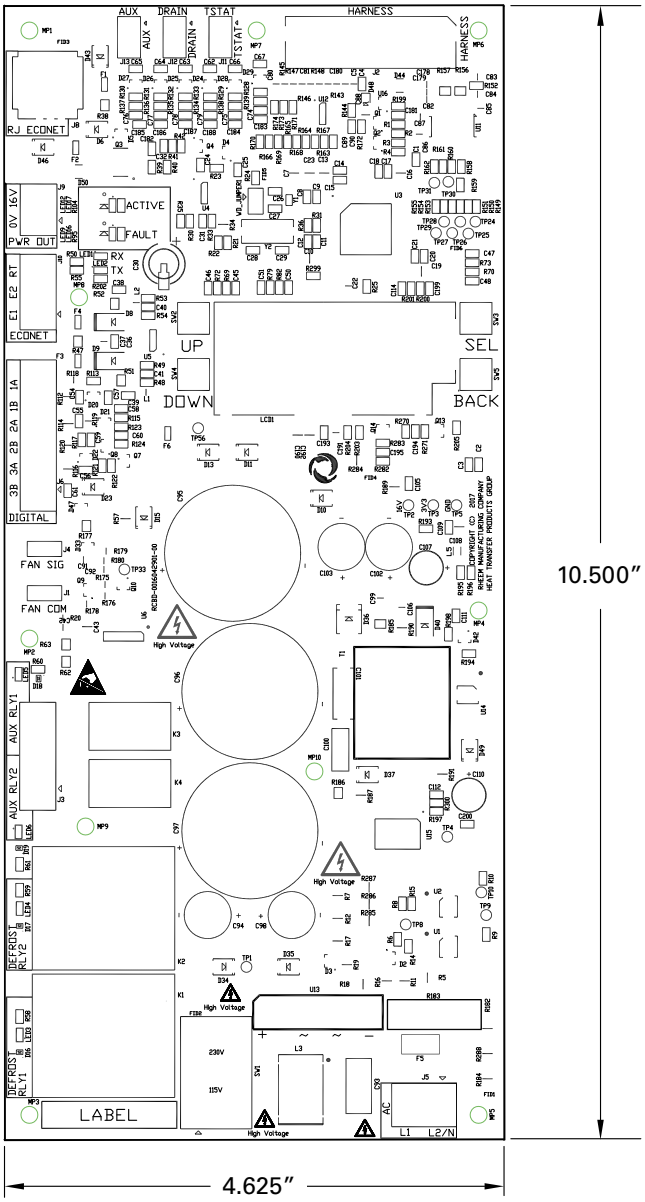


Figure 1-2

Safety Considerations

Failure to read and follow all instructions carefully before installing or operating this control and system could cause personal injury and/or property damage.

NOTE: All wiring must comply with national, local, and state codes.

WARNING: Disconnect power to the outdoor and indoor units before beginning installation.

- Only a trained service professional/contractor should use or interact with the control board.
- Never touch the control board surface directly to avoid static shock damage or exposure to high voltages.
- Before service, power to the unit should be disconnected per proper lockout procedures.
- After power is disconnected wait 10 minutes before touching the board for power stored to fully discharge.
- The control board has no user serviceable parts, do not try to repair.
- Do not wire the control board while powered.
- If the board becomes corroded replace immediately.
- Cleaning of the control board is not recommended.

System Installation

Evaporator

1. EcoNet Enabled Unit Coolers ship with the EcoNet controller installed and all sensors and relays wired. Prior to installation, you must verify that all sensors, defrost heaters and wire harnesses are securely connected to the controller board and terminal board.
2. Verify correct voltage from main power supply to evaporator unit. Set the Voltage Selector Switch (Figure 2-1) on the controller board to the correct voltage setting (115V/230V) before powering up the unit.

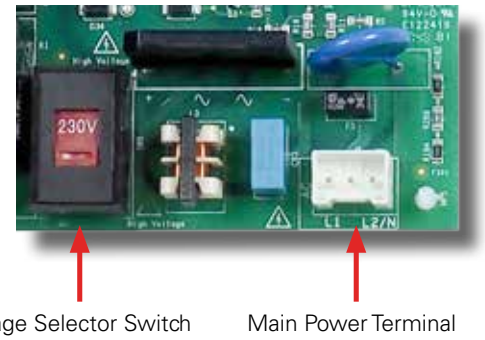


Figure 2-1

CAUTION: Having the Voltage Selector Switch set to incorrect voltage can damage the controller board when power is connected to it.

3. Connect main power to the evaporator unit at the L1/L2 and GND terminals on the terminal board as shown in the wiring diagram (Figures 2-2, 2-3).

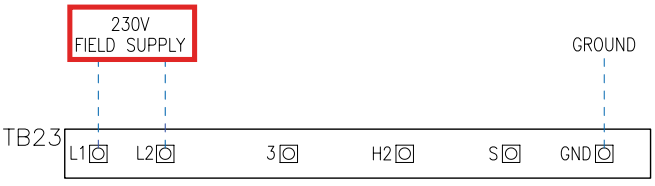


Figure 2-2

EcoNet® Enabled Unit Coolers

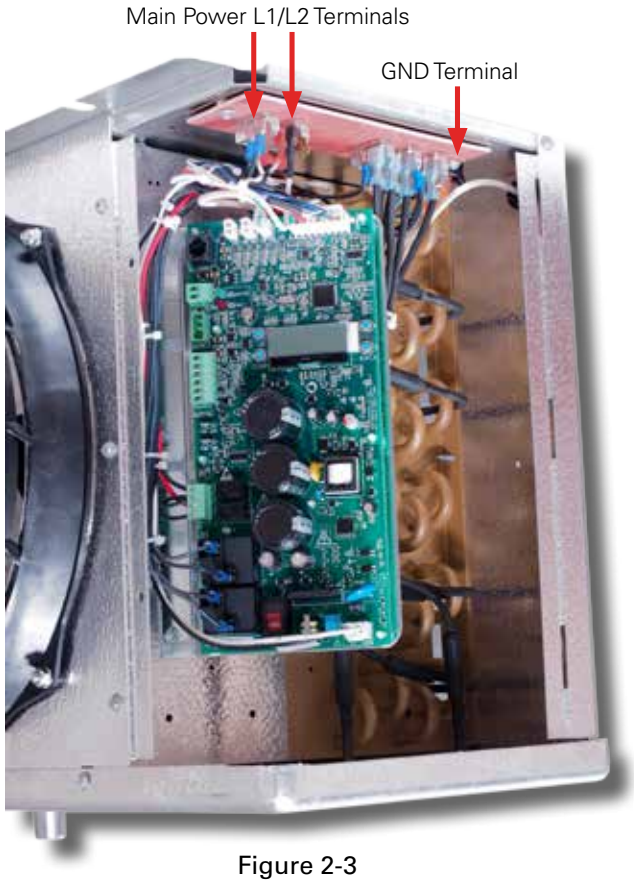


Figure 2-3

4. Prior to installation, please refer to factory label at evaporator unit for correct voltage and amp draw requirements to verify circuit breaker size where unit will be connected to.

Condensing Unit

1. If a defrost timer is installed on the condensing unit, make sure it is disconnected/disabled (all switches on time clock should be in the OFF position) (Figure 2-4). All defrost functions are performed by the controller board.

2. Please refer to factory label at condensing unit for correct voltage and amp draw requirements.

Figure 2-4

During System Installation

1. Refrigerant Line Brazing
   a. Cover EXV with wet rag to protect from excess heat from torch.
   b. Suction Temp Sensor must be removed from the suction line prior to brazing. The sensor must be reinstalled on the suction line (10 or 2 o'clock position) after brazing is completed and the tubing has been allowed to cool down. After suction temp sensor is installed, suction line should be insulated and the sensor should be covered with the insulation.
2. Purging Lines (pulling vacuum), two options:
   a. To purge lines on system with EXV closed, make sure that controller is off, and pull vacuum from both suction and discharge ports at the condensing unit.
   b. OR, to purge lines on system with EXV open, power up the controller and wait a couple of minutes for the controller to command the valve to open. Leave controller powered on while system evacuation is being done.
3. While charging the system with refrigerant, ensure that the EXV is open by powering up the controller and waiting a couple of minutes for the controller to command the EXV to open. With the controller powered on while the system is being charged, make sure to monitor the suction pressure, suction temperature, and superheat via the controller display and also via installer's gauges. Please refer to Display Status under the Startup/Commissioning section to show on the controller display the current suction temperature, suction pressure, EXV position and calculated superheat.

   NOTE: If there is a power loss at any time during normal system operation, the controller will close the EXV, forcing a pumpdown.
4. Power Supply
   a. Freezers require 230V for electric heaters; coolers can run on 115V or 230V. Please refer to factory label on evaporator unit for amp draw and voltage requirements for proper circuit sizing at the facility prior to installation.
   b. Set the Voltage Selector Switch on the controller board to the correct voltage setting (115V/230V) **before** connecting power to the controller. **CAUTION:** Having the voltage selector switch set to incorrect voltage can damage the controller board when power is connected to it.
   c. Connect main power to L1 and L2 on evaporator terminal board. Connect ground wire to GND on terminal board.

d. Refer to unit wiring diagram attached to cover panel.

e. If there is a power loss at any time during normal system operation, the controller will close the EXV, forcing a pumpdown. When power is restored, the controller will resume refrigeration operation.

f. To force the EXV closed while leaving the controller powered on, at the display go to *Settings→System Enabled→No*. This disables the system (fans off, EXV closed). To re-enable the system, go to the same display screen and set *System Enabled→Yes*. Please refer to the Setting Navigation Overview on page 6.

Start-Up/Commissioning

1. Local Display (Figure 3-1)

   a. Use the UP/DOWN/SEL/BACK buttons to navigate through the display.

   b. To change a parameter, navigate to it using the UP/DOWN buttons, press SEL until the value is flashing intermittently, use the UP/DOWN buttons to cycle through the selection, then press SEL again to confirm the selection.

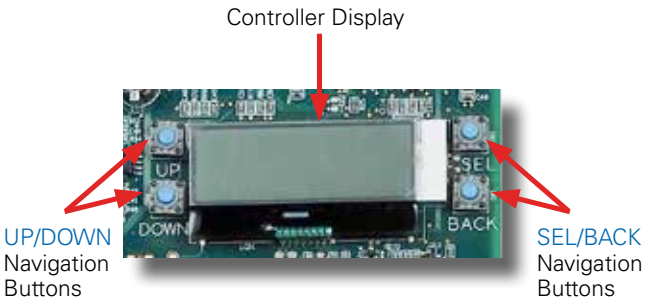
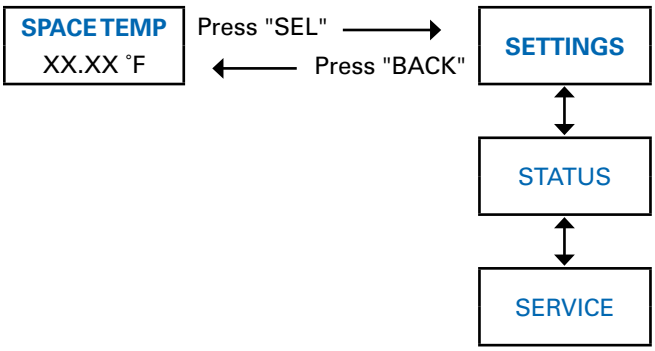


Figure 3-1

2. Navigation Overview

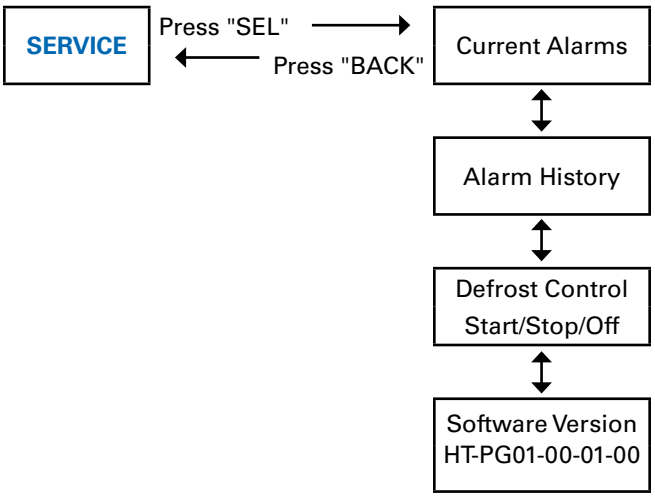
   a. Space Temp



   b. Settings Overview - see page 6

   c. Status Overview - see page 7

   d. Service



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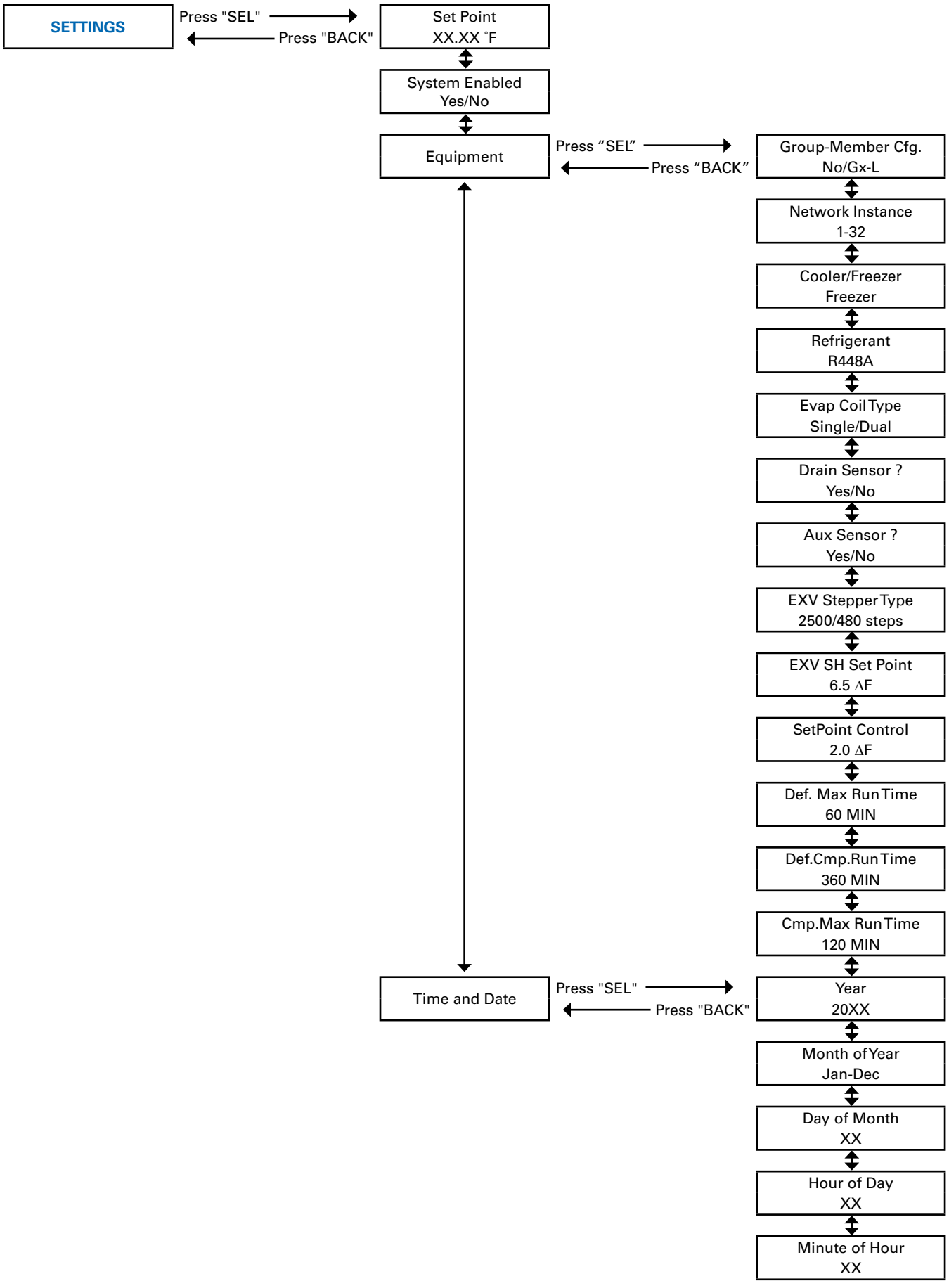
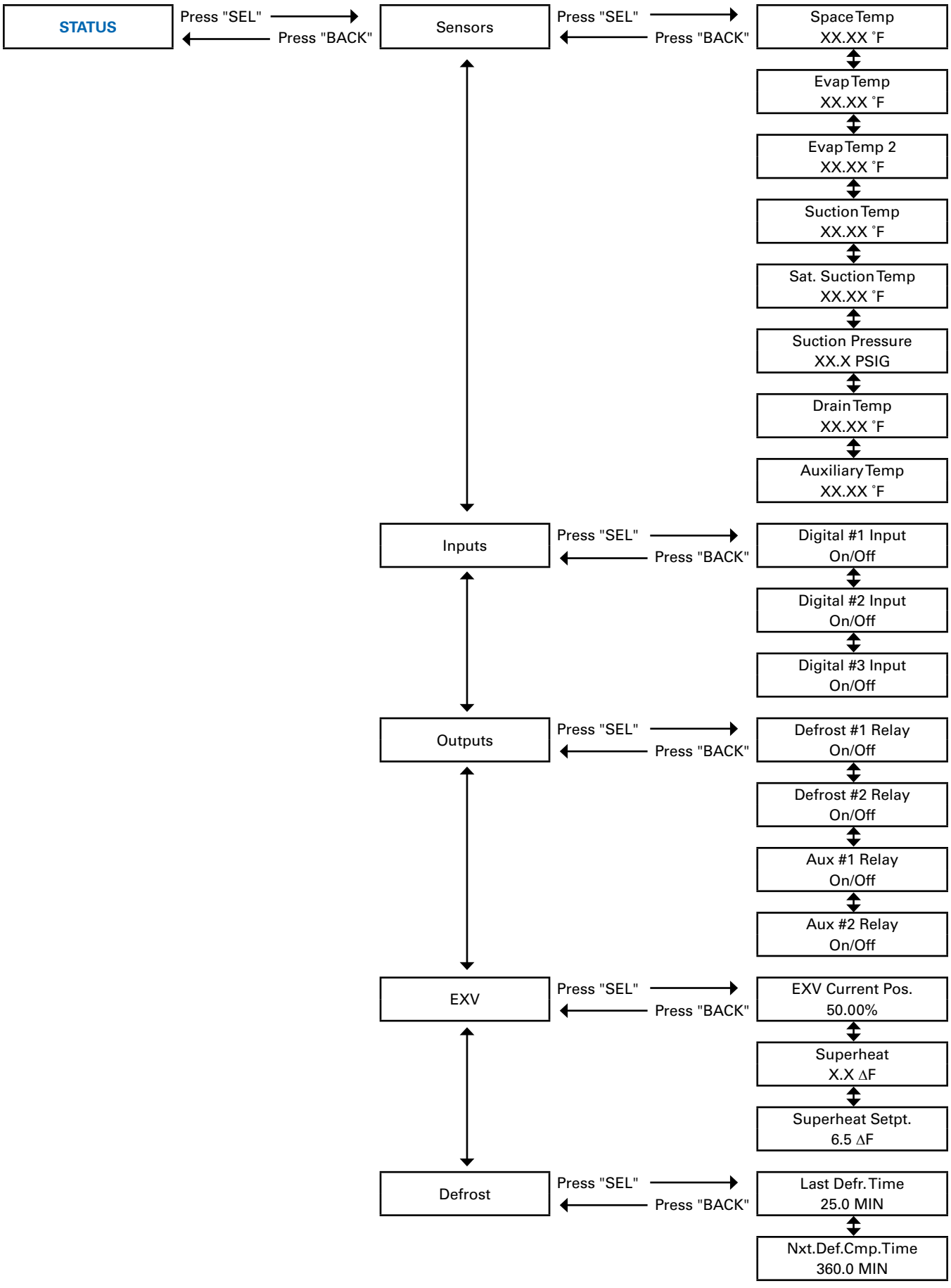
b. Settings Overview



c. Status Overview



EcoNet® Enabled Unit Coolers

3. Parameters List

Parameter	Range	Default
Setpoint	25°F to 60°F (Cooler); -40°F to 35°F (Freezer)	-10°F
Group Member Cfg	(See group member list)	No
Network Instance	1 to 32	1
Cooler/Freezer	Cooler or Freezer	Freezer
Refrigerant	(See supported refrigerants list)	R448A
Evap Coil Type	Single or Dual	Single
Drain Sensor?	Yes or No	No
Aux Sensor?	Yes or No	No
EXV Stepper Type	2500 or 480 steps	2500 steps (Sporlan)
EXV SH Setpoint	4.0dF to 20.0dF	6.5dF
Setpoint Control	0.5dF to 20.0dF	2.0dF
Def. Max Run Time	10 to 60 minutes	60 minutes
Def. Cmp. Run Time	0 to 900 minutes	360 minutes
Cmp. Max. Run Time	0 to 480 minutes	120 minutes

4. Parameter Definitions

a. **Setpoint**: This is the room setpoint for the walk-in box. If the controller is configured as a "Cooler", the available room setpoint range is 25°F to 60°F; if the controller is configured as a "Freezer", the available room setpoint range is -40°F to 35°F (See "d" Cooler/Freezer parameter).

b. **Group Member Cfg.**: This is to address the controller as part of a group if multiple evaporators will be wired together to cool the same space (See Group Operation section).

c. **Network Instance**: This is to address the controller to work as a standalone unit, but wired to other evaporators on the same communication bus with a Control Center Display (See Group Operation section).

d. **Cooler/Freezer**: Set the controller for the type of operation it will be used in. If set as "Freezer", the controller will use the defrost relays to activate the electric heaters in the evaporator, and allow a drain time at the end of the defrost cycle. If set as "Cooler", the unit will operate as air defrost (off-cycle).

e. **Refrigerant**: Set the refrigerant that will be used in the system from among the list of supported refrigerants.

Supported Refrigerants
R448A (Default)
R407A
R407C
R449A
R404A
R507A
R513A
R450A

f. **Evap Coil Type**: Set for the type of evaporator being used. "Single" applies to Low Profile evaporators. "Dual" applies to dual coil designs such as Ceiling Temp evaporators, where Evap Temp 2 sensor is used.

g. **Drain Sensor?**: Set to configure if drain temp sensor is installed.

h. **Aux Sensor?**: Not used.

i. **EXV Stepper Type**: Set to configure EXV type; 2500 steps or 480 steps. This should come preset from the factory and should not be changed.

j. **EXV SH Setpoint**: Set to configure desired superheat setpoint.

k. **Setpoint Control**: Set to configure desired hysteresis range for space temperature control. When the system is in Refrigeration mode, if the Space Temp Setpoint is -10°F with a default Setpoint control differential of 2.0 dF, the unit will continue to cool the space until the Space Temp is just under -10°F. At this point, the system will pump down and run the fans at half speed. When the Space Temp rises to around -8°F, Refrigeration mode will start back up: EXV will open and the fans will run at full speed until Setpoint is reached again or the unit goes into defrost.

l. **Def. Max Run Time**: Set to configure the maximum allowed defrost time.

m. **Def. Cmp. Run Time**: Set to configure the allowed compressor runtime before the unit goes into defrost.

n. **Cmp. Max Run Time**: Set to configure the allowed compressor runtime until Space Temperature Alarm is generated. If unit is actively cooling the space continuously for longer than this time period, an alarm will be generated to indicate that box has not achieved Setpoint.

5. Display Status
    a. Sensors
        1) Space Temp
        2) Evap Temp
        3) Evap Temp 2 (not applicable on Low Profile evaporators)
        4) Suction Temp
        5) Saturated Suction Temp (conversion based on refrigerant selection)
        6) Suction Pressure Gauge
        7) Drain Temp (optional; requires sensor installed and configured)
        8) Aux Temp (not used)
    b. Inputs
        1) Digital Inputs 1, 2 and 3 (not used)
    c. Outputs
        1) Defrost Relay 1 and 2
        2) Aux Relay 1 and 2
    d. EXV
        1) EXV current position
        2) Calculated superheat
        3) Current superheat Setpoint
6. Defrost
    a. Last defrost elapsed time
    b. Remaining runtime until next defrost
7. Service
    a. Current Alarms
        1) Use the UP/DOWN buttons on the display to cycle through the currently active alarms
    b. Alarm History
        1) Use the UP/DOWN buttons on the display to cycle through the alarm history list

        NOTE: In order for the Alarm History time stamp to be accurate, the Time and Date must be configured on the controller (See Settings Overview, page 6, under the Start-Up/Commissioning section).
    c. Defrost Control
        1) Use the UP/DOWN and SEL buttons to manually start/stop defrost cycle
    d. Software version (displays current software version)

Operational Overview

Refrigeration Mode

When powered up, the controller will go through an initial startup procedure driving the EXV closed to ensure the valve is properly seated. If the space temperature is higher than the Space Temp Setpoint, the controller will attempt to cool the space: After a couple of minutes the EXV will start opening and the controller will keep actively metering the valve to achieve its superheat Setpoint. The fans will start after a delay to ensure that the evaporator coil is cold enough.

During normal refrigeration mode, the fans will run at full speed, and the EXV will continuously modulate to maintain superheat. In order to prevent compressor short cycling, the active refrigeration mode will run for a minimum of 5 minutes.

When the space temperature drops below the Space Temp Setpoint, the EXV will close forcing a pumpdown, and the fans will cycle to half speed. In order to prevent compressor short cycling, this inactive mode will run for a minimum of 2 minutes.

When the space temperature rises 2 degrees above the Setpoint (can be adjusted via Setpoint Control parameter), the EXV will start metering again and then fans will cycle back to full speed.

NOTE: If there is a power loss, the controller will close the EXV to force a pumpdown. When power is restored, the controller will go through its initial startup before resuming refrigeration functions again.

Defrost Mode

The controller will automatically start defrost when the Def. Comp. Run Time has elapsed (default 360 minutes), or manually when set by the user on the display *Service→Defrost Control→Start Defrosting*.

NOTE: When the unit is actively cooling the space (EXV is metering, fans running at full speed) the controller is counting runtime towards the next defrost. When the space temperature Setpoint is satisfied (EXV closes for pumpdown, fans running at half speed) the controller does not count this as runtime towards the next defrost.

When a defrost cycle starts, the EXV will close for pumpdown.

- If unit is set as "Freezer" the electric heaters will be energized via the defrost relays, and the fans will cycle off. Defrost will end when evaporator coil reaches termination temperature or when Max. Defrost Run Time has elapsed (whichever comes first). The unit will then begin a 5 minute drain time. After the drain time has elapsed, the unit will resume normal refrigeration operation: EXV opens and fans start after a short delay. If Drain Temp sensor is installed and configured, the controller will monitor the drain pan temperature and generate an alarm if the drain pan does not get warm enough during a defrost cycle.
- If unit is set as "Cooler" the fans will cycle to half speed. Defrost will end when evaporator coil reaches termination temperature or when Max. Defrost Run Time has elapsed (whichever comes first). After the defrost cycle ends, the unit will resume normal refrigeration operation: EXV opens and fans start after a short delay.

The remaining runtime until next defrost can be viewed on the display by selecting *Status→Defrost→Nxt. Def. Comp. Time.*

The elapsed time for the last defrost can be viewed on the display by selecting *Status→Defrost→Last Defr. Time.*

A defrost cycle can be stopped prematurely via the display if desired. At the display, select *Service→Defrost Control→Stop Defrosting*.

NOTE: If there is a power loss while the unit is in the middle of a defrost cycle, the controller will keep the EXV closed. When power is restored, the controller will go through its initial startup before resuming the defrost cycle. When the defrost cycle ends, the controller will resume refrigeration functions.

Test/Service Mode

If the user desires to temporarily disable the system without disconnecting power to the unit, at the controller display select *Settings→System Enabled→No.*

This function forces system pump down (EXV closes) and the fans turn off. The sensor inputs (temperatures, pressure, etc.) are still functional and can be viewed on the display.

To restart the system and enable cooling again, at the display select *Settings→System Enabled →Yes.*

Operational Limits

1. Voltage: 115V/230V
2. Operating Temp range: -40°F to 122°F
3. Operating Humidity range: 0% to 97% RH condensing
4. Groups/Leaders/Members: 32 devices max on daisy chain; 1000 ft. max length from first device to last device on daisy chain
5. Defrost Relay #1: 24A at 240VAC
6. Defrost Relay #2: 24A at 240VAC
7. Aux Relay #1: 3A at 120VAC
8. Aux Relay #2: 3A at 120VAC

Diagnostics

The following sensors are continuously monitored and an alarm is generated in case of failure. A red LED at the controller board will light up to indicate active alarms. The active alarm automatically clears once the sensor is repaired or replaced.

Currently active alarms can be viewed on the display by selecting *Service→Current Alarms.*

Any previously active alarms can be viewed in the display by selecting *Service→Alarm History*.

1. Space Temp
   a. On failure, Cooling ON and OFF periods are run based on previous cycle averages.
2. Evap Temp
   a. On failure, defrost cycle will run until max defrost time (60 minutes) has elapsed.
3. Evap Temp 2 (Not applicable on Low Profile Evaporators)
   a. Same as Evap Temp 1, but only if Evap Coil Type = Dual
4. Suction Temp
   a. On failure, EXV remains open at a fixed position. No superheat calculation is available.
5. Suction Pressure
   a. On failure, Evap Temp will be used with Suction Temp to obtain approximate superheat calculation. If Evap Temp sensor input has also failed, EXV to remain open at a fixed position.
6. Drain Temp (if applicable)

Group Operation

The EcoNet application supports multiple evaporator controllers to be connected together and work under a Leader/Follower setup. A maximum of 6 evaporators (1 Leader plus 5 Followers) can be configured on to a single group, and a maximum of 4 groups can be connected on to the same communication bus (see Figure 7-1).

When multiple controllers are addressed and connected to work as a group, the Leader of each group will command its followers when to cool the space, when to pump down, and when to start a defrost. Each group will work from a calculated average space temperature to determine if the space needs cooling. When a group is in active cooling mode, each evaporator in the group will meter its own EXV based on its individual superheat calculation. The Leader will keep track of the system runtime and command the Followers in its group to start a defrost cycle as necessary. When a defrost cycle ends, the Leader will command the Followers in its group to start cooling the space simultaneously after every member of the group has finished defrosting.

Each controller to be connected on the communication bus should be powered up and addressed individually before being connected to the other controllers in the daisy chain.

Group Member List	Description
G1-L	Group 1 Leader
G1-2	Group 1 Followers
G1-3	
G1-4	
G1-5	
G1-6	
G2-L	Group 2 Leader
G2-2	Group 2 Followers
G2-3	
G2-4	
G2-5	
G2-6	
G3-L	Group 3 Leader
G3-2	Group 3 Followers
G3-3	
G3-4	
G3-5	
G3-6	
G4-L	Group 4 Leader
G4-2	Group 4 Followers
G4-3	
G4-4	
G4-5	
G4-6	

Figure 7-1

To address each individual controller via the display select *Settings→Equipment→Group Member Cfg.*

In order to set up the communication bus, multiple controllers have to be wired together on a "daisy-chain" configuration. To "daisy chain" the units on the network, each unit should be connected to the EcoNet communication terminals (E1, E2, RT) as shown in Figure 7-2.

- Use minimum 24AWG shielded twisted pair cable with shunt capacitance of 16 pF per foot and 100 ohm impedance.
- Ensure that communication wiring polarity is consistent on all controllers being wired together.
- A maximum of 32 devices can be daisy chained together on a single communication bus.
- Maximum wiring length of communication bus from first device to last device is 1,000 feet.
- The controllers can be wired in any order.

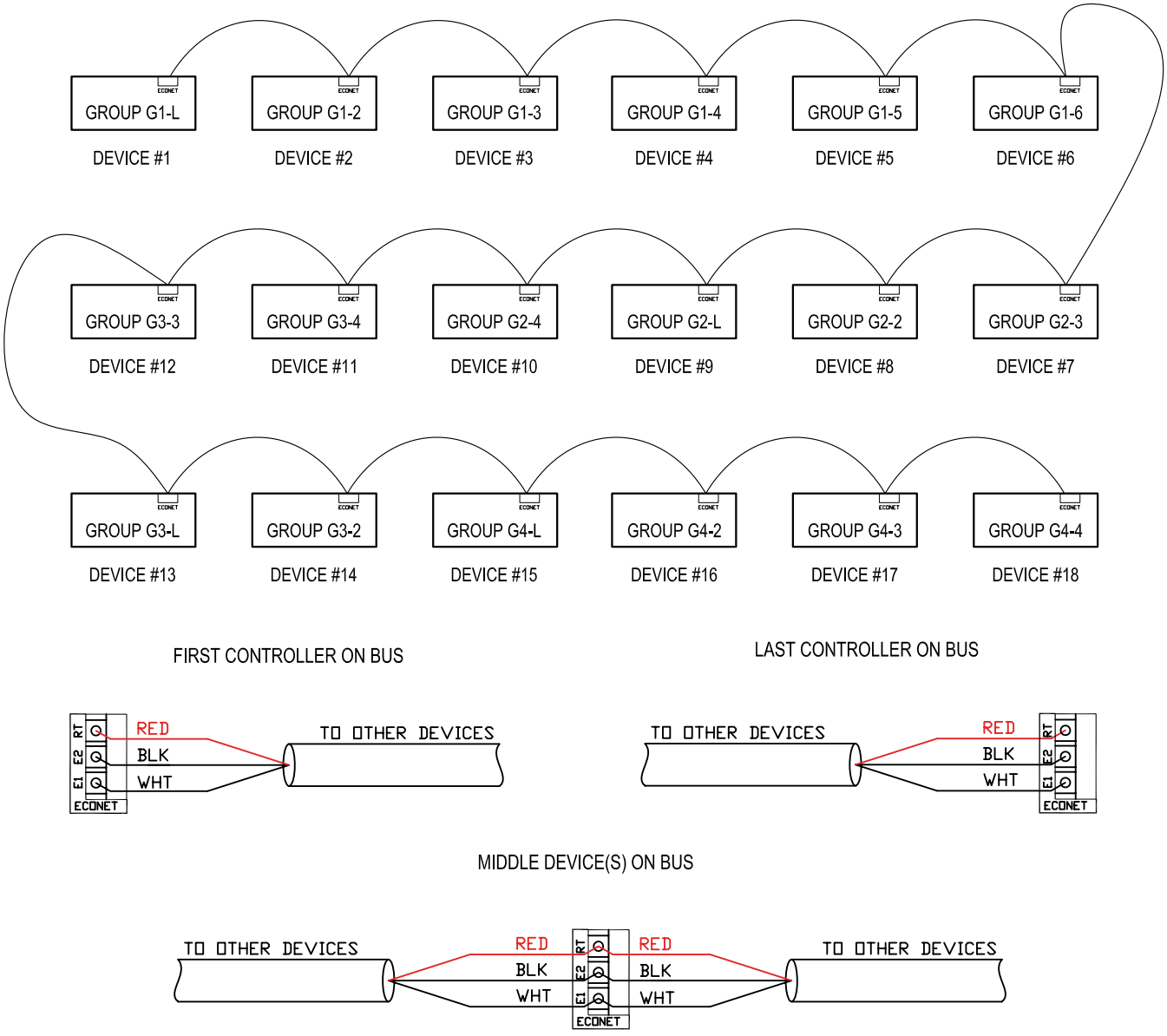
Figure 7-2 on page 12 shows a typical wiring configuration that can be achieved with multiple controllers.

Replacement Parts and Part Numbers

1. Control Boards (08219624)
2. Sensors
   a. Space/Drain Temp (08219623)
   b. Evap Temp (08219636)
   c. Suction Temp (08219637)
   d. Suction Pressure (08219621)
3. Wire Harness
   a. 63" Controller wire harness, SER valve (0821963501)
   b. 96" Controller wire harness, SER valve (0821963502)
   c. 126" Controller wire harness, SER valve (0821963503)
4. Controller Power Harness (08219638)

For help with replacement parts, call or e-mail our Parts Department at: (800) 288-9488, (256) 259-7400 or parts@htpgusa.com.

Typical Wiring Configuration with Multiple Controllers



NOTES

1. 1,000 feet maximum bus wire from first device to last device.
2. 32 maximum number of devices connected to same bus.

Figure 7-2

Due to continuing product development, specifications are subject to change without notice.