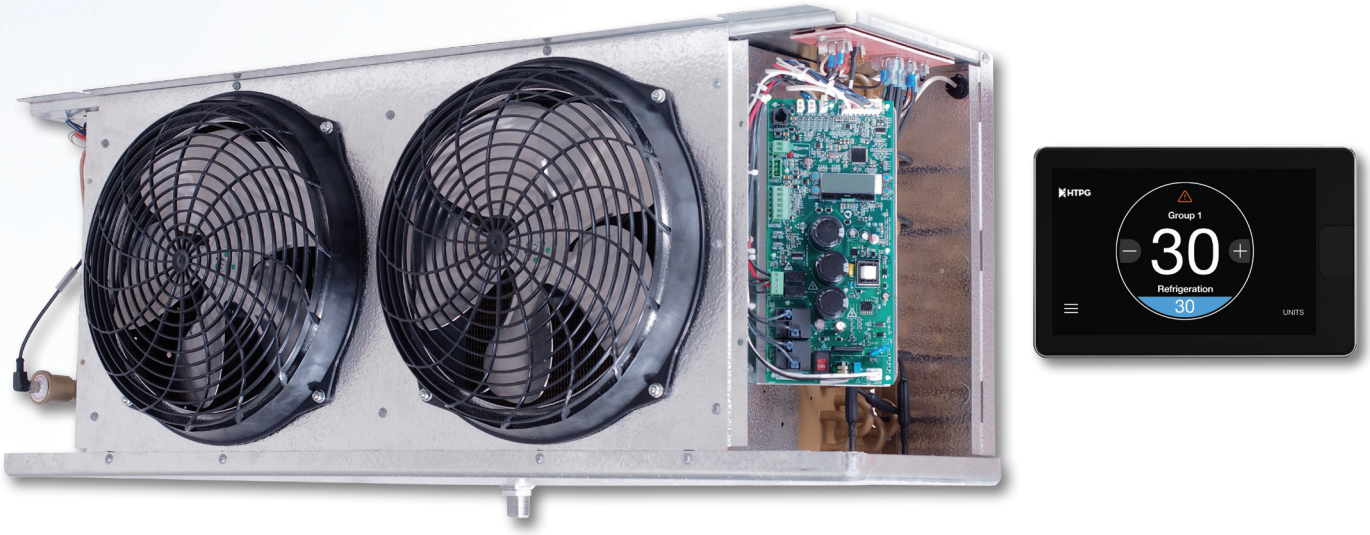
HTPG-EN-TG0821

EcoNet® Enabled Unit Coolers



Troubleshooting Guide

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3885 Crestwood Pkwy., Ste. 500 • Duluth, Georgia 30096
www.htpg.com • Phone: **800-288-9488,** 256-259-7400 • Fax: 256-259-7478

#	Problem	Possible Cause	Remedy
1	EcoNet Controller does not turn on.	No power to controller	Ensure voltage selector switch is set to the proper setting (115V or 230V) and power harness is connected to controller board. Use a voltmeter to verify that proper voltage is present on terminal board (L1, L2) on evaporator.
		Controller board could be damaged.	Inspect controller board for visual signs of damage (discoloration, burn marks, broken components, etc.). If damaged, replace controller board. Make sure that new controller board has voltage selector switch to correct setting (115V or 230V) **before** applying power to the unit.
2	Controller turns on but display is missing lines or blank.	Controller board display is damaged.	Replace controller board.
3	One or more fans are not running.	No power to controller.	Ensure voltage selector switch is set to the proper setting (115V or 230V) and power harness is connected to controller board. Ensure power is connected to terminal board (L1, L2, GND) on evaporator.
		One or more fan wires are disconnected.	Verify fan wiring diagram on unit and ensure that fans are wired to controller: WHITE wire to L2, BLACK wire to Aux Relay 1 on controller board, RED wire to Aux Relay 2 on controller board. Verify wires from Aux Relays 1 and 2 are connected to L1 on terminal board. Verify each of the EC fan motors has all the wires connected (WHITE, BLACK & RED). Verify Aux Relay status: when Aux 1 Relay is ON, fans run at full speed; when Aux 1 and Aux 2 Relays are both ON, fans run at half speed. LED will turn ON next to each relay on controller board to indicate relay is active. User can also verify Aux Relay 1 and 2 status via display under ***Status →Outputs→Aux Relay #1/Aux Relay #2*** .
		Fan motor could be damaged.	Replace fan motor.
		Fan blades could be obstructed.	Verify fan blades and fan guards are free of obstruction.
4	None of the fans are running.	EcoNet controller could be manually disabled; System Enabled is set to NO in the controller settings.	On controller display, go to ***Settings →System Enabled*** and ensure it is set to YES.
		Evap Temp 1 temperature is not cold enough (on Single Coil units); Evap Temp 1 and Evap Temp 2 temperatures not cold enough (on Dual Coil units).	Controller is waiting on Evap Temp 1 (and Evap Temp 2 on Dual Coil units) to get cold enough before allowing fans to run. If unit is set to FREEZER, Evap Temp has to get below 35F for fans to run; if unit is set to COOLER, Evap Temp has to get below 55F for fans to run. Verify Aux Relay status: when Aux 1 Relay is ON, fans run at full speed; when Aux 1 and Aux 2 Relays are both ON, fans run at half speed. LED will turn ON next to each relay on controller board to indicate relay is active. User can also verify Aux Relay 1 and 2 status via display under ***Status→Outputs→Aux Relay #1/Aux Relay #2*** .
		If unit is set to Freezer, it could be defrosting.	Wait for defrost cycle to finish.
5	Fans run but never go to half speed.	Half speed fan wire (RED) could be disconnected/loose.	Verify fan wiring diagram on unit and ensure that RED wire is connected to Aux Relay 2 on controller, and connected to every fan motor. Verify wire from Aux Relay 2 is connected to L1 on terminal board. Fans should go to half speed when box temperature setpoint is satisfied. Verify Aux Relay 2 status via LED on controller next to the relay connectors, and via display under ***Status →Outputs→ Aux Relay #2*** .
		Unit has PSC fan motors installed.	Verify if the unit installed has PSC fan motors. PSC fan motors operate at full speed only or OFF. There will not be a wire connected to Aux Relay #2.
6	Fans run but never go to full speed.	Setpoint is satisfied	Verify Setpoint and Space Temp reading. If Space Temp is higher than Setpoint plus the Setpoint Control differential, allow the 2 minute minimum off time to finish for cooling to start again.
		Cooler is in the middle of a defrost cycle	If controller has software version HT-PG01-00-01-13 or earlier, and is configured as Cooler, the air defrost cycle will run the fans at half speed. More recent software versions will have the air defrost cycle run the fans at full speed. Allow the air defrost cycle to finish; if fans do not go to full speed when cooling starts again, proceed to next possible cause below.
		Evap Temp is not low enough.	When cooling is enabled (EXV is open), verify Evap Temp 1 (and also Evap Temp 2 on Center Mount units) gets cold enough (under 35F for Freezer, under 55F for Cooler). If Evap Temp reading is significantly higher (warm box, malfunctioning Evap Temp sensor), the fans will remain off initially, then run at 50% speed after an some time if the temperature still has not dropped.
		Aux Relays could be damaged	Verify that there is no visible damage or burn marks on the Aux Relays. Verify the status of each Aux Relay via the LED next to each one, via display under ***Status→Outputs→Aux Relay #1/Aux Relay #2.*** Relay operation for fan speed control is as follows: Aux Relay #1 ON = Full Speed; Aux Relays #1 & #2 ON = Half Speed; Aux Relays #1 & #2 OFF = Fans off. If damage on the Aux Relays is visible, replace controller.
		Fan motors could be malfunctioning	If Aux Relays do not look damaged, confirm that Aux Relay #2 is OFF (visually inspect LED is off, status on display indicates OFF). Power off unit and temporarily disconnect the red wire from Aux Relay #2. When unit is powered back on, verify fan speed when Aux Relay #1 turns on. If fan motors are still running at half speed, proceed to troubleshoot fan motors. Reconnect red wire when finished.
7	Unit is not cooling.	No power to controller.	Ensure voltage selector switch is set to the proper setting (115V or 230V) and power harness is connected to controller board. Ensure power is connected to terminal board (L1, L2, GND) on evaporator.
		Controller could be manually disabled; System Enabled is set to NO in the controller settings.	On controller display, go to ***Settings →System Enabled*** and ensure it is set to YES.
		Space Temp sensor is disconnected.	If the controller detects that the **Space Temp** sensor input is missing, it will attempt cooling operation in fixed intervals based on previously calculated runtime averages until the sensor is replaced. Also, while the sensor is disconnected, Space Temp will read "-60 °F" and a "***A103 Space Temp Thermistor Failure*** " alarm will be generated (viewed on the display under ***Service →Current Alarms***). Replace the Space Temp sensor as soon as possible to resume normal cooling operation based on the configured Setpoint. (Part no. 08219623)
		Controller could be enabled, but EXV is not opening.	Verify EXV is properly connected to wire harness and that none of the 4 prongs are bent or missing. Verify on wire harness connection at the controller that no wires have come loose from the connector. Verify that controller is commanding EXV to open by looking at the display under ***Status →EXV→ EXV Current Pos.*** To do a quick verification if the valve is working, a) disconnect power to the controller and listen for movement of the EXV (controller will force valve to close completely when power is disconnected), OR b) go to ***Settings →System Enable*** and set it to NO. Reconnect power to the controller, or set ***System Enable*** back to YES, and wait a couple of minutes to listen for EXV movement (valve should open if Space Temp Setpoint is not satisfied). See **Addendum A** on how to troubleshoot the EXV.
8	EXV is operating, but unit is still not cooling.	Verify if compressor is running.	Verify Suction Pressure reading on the display under ***Status →Sensors→Suction Pressure*** . If the system is charged properly, the Suction Pressure reading should start increasing as soon as the valve opens. Verify at the condensing unit if the compressor is running. Verify that power to the condensing unit is turned ON. Verify that the cut-in/cut-out pressure switches at the compressor are set properly for the refrigerant being used (refer to condensing unit installation manual).

#	Problem	Possible Cause	Remedy
9	Unit is cooling but Space Temp never reaches setpoint.	Door is open.	Close door to the box. Make sure door remains closed unless/until access to box is needed.
		System could be undercharged/leak present in the system.	Verify at controller display the current superheat and valve position; go to ***Status →Superheat/EXV Current Pos.*** If superheat is consistently high and valve is consistently running at or close to 100%, the system could be low on refrigerant. Verify if sight glass at condensing unit is clear. Verify suction pressure with a set of gauges. Recharge system as needed, verify if any leaks are present and fix as needed.
		Compressor could be shutting down intermittently.	Verify at condensing unit if compressor is shutting down intermittently. Troubleshoot condensing unit and verify if high head pressure, phase loss, etc.
10	Suction line at compressor is icing up excessively.	Verify that the correct refrigerant is selected.	Verify under the controller settings that the correct refrigerant is selected. On the display, go to ***Settings →Equipment→Refrigerant*** . An incorrect refrigerant setting will cause incorrect superheat calculation and the system will not operate properly.
		Suction Temp sensor disconnected (controller will alarm; red LED on controller will be blinking), or sensor could be malfunctioning/reading erratic value.	Verify if Suction Temp Thermistor alarm is active: on controller display go to ***Service →Current Alarms*** . Also verify Suction Temperature reading under ***Status→Sensors→Suction Temp*** ; if it is reading "-60 °F", the sensor is not making good contact or is missing. If Suction Temp sensor input is missing, the EXV will remain at a fixed position until sensor is replaced, and alarm ***"A100 Suction Temp Thermistor Failure"*** will be active. If sensor is reading a value other than -60 °F, verify that it is not an erratic value and that the reading reasonably corresponds to the conditions at the evaporator (for example, if sensor is reading 150 °F when the suction line at the evaporator is near freezing conditions). Replace Suction Temp Thermistor (part no. 08219637).
		Suction Pressure transducer disconnected (controller will alarm; red LED on controller will be blinking), or transducer could be malfunctioning.	Verify if Suction Pressure alarm is active: on controller display go to ***Service →Current Alarms*** . Also verify Suction Pressure reading under ***Status→Sensors→Suction Pressure*** ; if it is reading "-14.7 PSIG", the sensor is malfunctioning or is disconnected. If the controller detects that the pressure input is missing, alarm ***"A106 Suction Pressure Sensor Failure"*** will be active and the controller will attempt to calculate approximate superheat by using Evap Temp 1 reading instead of Saturated Suction Temp and continue metering the EXV, but the calculated superheat will not be as accurate. Replace Suction Pressure Transducer (part no. 08219621).
		Verify EXV is functioning properly, closing completely for pumpdown.	Verify harness connection to the EXV and to the controller board is secure. Set System Enable to NO, under ***Settings →System Enable*** in order to close the EXV and force a pumpdown. Confirm that the EXV can be heard moving as it closes. Confirm EXV position under ***Status→EXV→EXV Current Pos.*** is 0%. Verify that compressor pumps down and shuts off after a couple of minutes; Suction Pressure reading under ***Status→Sensors→Suction Pressure*** should decrease as the system pumps down. If the compressor is still running and does not turn off, the EXV may be malfunctioning and allowing some refrigerant to pass through even after being commanded by the controller to close. See **Addendum A** for more information on troubleshooting the EXV. Replace EXV if necessary.
11	Evaporator coil is icing up (Low Profile FREEZER, electric defrost)	Door is being left open.	Make sure door to the freezer is kept closed unless/until access to freezer is needed.
		Verify that heaters are working when controller goes into defrost.	Verify that when controller starts a defrost, the heaters are energized and operating properly. A manual defrost can be started by going on the display to ***Service →Defrost Control→Start a Defrost*** . Verify at the controller board that the LED's for the defrost relays turn ON and their status is ON on the display (***Status→Outptus→Defrost Relay #1/#2***). **If the unit is a Low Profile evaporator, make sure that Coil Type is set to "Single"** (go to ***Settings→Equipment*** and scroll down to verify these parameters), and that Evap Temp 1 sensor is connected and having a valid reading. If Evap Temp 1 sensor is disconnected, the controller will alarm (***"A101 Evaporator Temp Sensor Failure"***) and the Defrost Relays will not turn ON. If Coil Type is mistakenly set to Dual, the controller will alarm (***"A102 Evap Temp 2 Thermistor Failure"***) and the missing Evap Temp 2 sensor will prevent Defrost Relay #2 from turning on; this would keep the bottom heater and drain pan heater from turning on during a defrost and will cause ice build up on the bottom part of the coil. If both Defrost Relays are turning ON, verify with a meter that the heaters are drawing amps and are warming up; if they are not, verify the heater wiring with the wiring diagram at the evaporator. If the heaters are wired properly but still not heating, they may need to be replaced.
		Verify duration of defrost cycle/runtime between defrosts.	If the heaters are verified to be working properly, proceed to verify defrost cycle duration: on the controller display, go to ***Status →Defrost→Last Defr. Time*** . Also, force a defrost and wait for it to finish to take note of the duration. Low Profile Evaporators typically need between 20 to 30 minutes defrost duration to clear the ice. If the defrost cycle is too short, the Defrost Termination Temperature (***Def. Term. Temp***) and Runtime Until Defrost (***Def. Cmp. Run Time***) can be adjusted as needed in ***Settings→Equipment*** . Also, the pulsing on Defrost Relay #1 (top heater) can be disabled by setting ***Defrost Pulse Override*** to YES if needed. If the unit already has some ice built up in the coil, it may take several defrost cycles to clear the ice after the parameters mentioned above are adjusted.
12	Evaporator coil is icing up (Center Mount FREEZER, electric defrost).	Door is being left open.	Make sure door to the freezer is kept closed unless/until access to freezer is needed.
		Verify that heaters are working when controller goes into defrost.	Verify that when controller starts a defrost, the heaters are energized and operating properly. A manual defrost can be started by going on the display to ***Service →Defrost Control→Start a Defrost*** . Verify on the controller board that the LED's for the defrost relays turn ON and their status is ON on the display (***Status→Outptus→Defrost Relay #1/#2***). If the unit is a Center Mount evaporator, make sure that ***Coil Type*** is set to ***"Dual"*** and ***Defrost Pulse Override*** set to ***"YES"*** (go to ***Settings→Equipment*** and scroll down to verify these parameters), and that Evap Temp 1 and Evap Temp 2 sensors are connected and having a valid reading. If Evap Temp 1 sensor is disconnected, the controller will alarm (***"A101 Evaporator Temp Sensor Failure"***) and Defrost Relay #1 will not turn ON; if Evap Temp 2 sensor is disconnected, the controller wil alarm (***"A102 Evap Temp 2 Thermistor Failure"***) and Defrost Relay #2 will not turn ON. If the Defrost Relays are turning ON, verify with a meter that the heaters are drawing amps and are warming up; if they are not, verify the heater wiring with the wiring diagram at the evaporator. If the heaters are wired properly but still not heating, they may need to be replaced.
		Verify Evap Temp 1 and Evap Temp 2 sensor locations.	On Center Mount evaporators (***Coil Type = Dual***), both Evap Temp 1 (white wires) and Evap Temp 2 (blue wires) are used for defrost termination. During a defrost cycle, when Evap Temp 1 sensor reaches Defrost Termination Temp, the Defrost Relay #1 will turn off. Same for Evap Temp 2 with Defrost Relay #2; each side will terminate defrost independently. Verify with the wiring diagram on the unit that Evap Temp 1 sensor is located on the coil whose heaters are wired to Defrost Relay #1. Same goes for Evap Temp 2, it should be located on the coil whose heaters are wired to Defrost Relay #2.
		Verify Defrost Pulse Override is set to YES.	On Center Mount evaporators (***Coil Type = Dual***), make sure that Defrost Pulse Override is set to YES so Defrost Relay #1 does not pulse during a defrost cycle (go to ***Settings →Equipment→Def. Pulse Overr.*** and make sure it is set to YES).
		Verify duration of defrost cycle/runtime between defrosts.	If the heaters are verified to be working properly, proceed to verify defrost cycle duration: on the controller display, go to ***Status →Defrost→Last Defr. Time*** . Also, force a defrost and wait for it to finish to take note of the duration. Center Mount Evaporators typically need between 20 to 30 minutes defrost duration to clear the ice. If the defrost cycle is too short, the Defrost Termination Temperature (***Def. Term. Temp***)and Runtime Until Defrost (***Def. Cmp. Run Time***) can be adjusted as needed in ***Settings→Equipment*** . If the unit already has some ice built up in the coil, it may take several defrost cycles to clear the ice after the parameters mentioned above are adjusted.

#	Problem	Possible Cause	Remedy
13	Evaporator Coil is steaming excessively during a defrost; water droplets accumulating on the ceiling (Low Profile and Center Mount FREEZER units).	Defrost cycle is running too long.	Verify last defrost cycle duration under ***Status →Defrost→Last Defr. Time*** , and/or force a defrost manually and time it to verify duration. Low Profile and Center Mount evaporators should not defrost for longer than 30-35 minutes. Adjust Defrost Termination Temperature (***Def. Term. Temp***) down as needed, and also adjust the Maximum Defrost Time (***Def. Max Run Time***) down from the 60 minute default setting if needed.
14	EcoNet Controller generates alarm ***"A002 Drain Temp < Defrost Termination Temp."*** (Low Profile FREEZER only).	There may be ice on the drain pan after a defrost cycle ended; drain line could be blocked.	The Drain Temp sensor may be used on Low Profile Freezers as an additional early warning that ice is building up on the drain pan. To enable this function set **Drain Sensor?** to YES on ***Settings →Equipment*** , and make sure that a Drain Temp Sensor (part no. 08219623) is connected to the controller (DRAIN) and secured to the drain pan (carefully securing the sensor wire from touching the heaters). When a defrost cycle ends, if the Drain Temp does not reach Termination Temp, the controller will generate the ***"Drain Temp < Defrost Termination Temp."*** alarm. Verify that the drain pan heater is connected and working properly, and/or that the sensor is properly placed flat on the drain pan secured with the same nut that is holding the heater bracket. Verify that drain line is free of obstruction and heat tape is working properly to keep the line warm.
15	EcoNet Controller generates alarm "***A104 Drain Temp Thermistor Failure*** "	Drain Temp Sensor configured to YES under Settings and sensor is not connected.	If no Drain Temp sensor is installed, make sure Drain Temp sensor is configured to NO under ***Settings →Equipment→Drain Temp?*** . If a Drain Temp sensor is meant to be installed, make sure the sensor is reconnected or replaced (part no. 08219623)
16	EcoNet Controller generates alarm "***A105 Aux Temp Thermistor Failure*** "	Aux Temp Sensor is configured to YES under Settings and sensor is not connected.	Go to ***Settings →Equipment→Aux Temp?*** and make sure it is configured to NO. The Aux Temp sensor input is not used in the current software version.
17	EcoNet Controller generates notification ***"T001 Defrost Failure: Max Time Expired"***	Evaporator works on Air Defrost	Air Defrost units (set to **Cooler**) typically end defrost on maximum time, so in this scenario this notification would be nomal. If a shorter or longer defrost cycle is desired, the Max Defrost Time can be adjusted under ***Settings →Equipment→Def. Max Run Time*** (default is 60 minutes).
		Evaporator works on Electric Defrost	Electric Defrost units (set to **Freezer**) typically end defrost when the Evap Temp reading reaches Defrost Termination Temperature. If an Electric Defrost evaporator is ending defrost on maximum time instead, verify under ***Settings→Equipment→Def. Max Run Time*** is set to no less than 30 minutes (or is already at the default 60 minutes). If it is still terminating on max time, verify the Evap Temp sensor and electric heaters by referring to items 10 and 11 in this guide.
18	I have multiple evaporators in the same box working as a group, but one or more of them are not cooling/operating in sync.	EcoNet controller may not be addressed properly to work as part of the group.	Verify that each controller that is intended to work in the group is addressed properly. On each controller display, go to ***Settings →Equipment→Group-Member Cfg.*** to set the address. Group 1 Leader will be G1-L, Group 1 Follower #2 will be G1-2, Group 1 Follower #3 will be G1-3, etc. Same for Groups 2, 3 and 4. Each group will support a maximum of 6 evaporators (1 Leader + 5 Followers). Make sure that there are no conflicting addresses set between two or more controllers.
		EcoNet controller may not be wired properly to the rest of the group.	Verify that the communication wire used is at least **22 gauge, shielded**. Verify each of the 3 conductors are terminated at each board on E1, E2 and RT terminals and that polarity is maintained from board terminal to board terminal (a wire landed at E1 on the first board has to go to E1 on every other board on the daisy chain; same for E2 and RT). Verify that the shielding strands are connected at every splice and terminated at a ground point on one end of the daisy chain only.
		One or more controllers in the group may be manually disabled.	Verify on each controller in the group that **System Enable** is set to YES. Go to ***Settings →System Enable*** and verify that all the controllers in the group are set to YES.
		One controller may have a different software version from the other controllers in the group.	Verify software version at each controller on the display by navigating to ***Service →Software Version*** . Every controller in one Group must be running the same software version for the group function to operate properly. If you are having group sync issues and have one or more boards where the software version does not match the others, please call Customer Support.
19	Time stamp on the Alarm History is not accurate.	Time clock on controller may not have been set.	Go to ***Settings →Date and Time*** on each controller board display to set the controller time clock. If you have a Command Center Display wired to one or more controller boards, the time clock can be set there and it will be simultaneously broadcast to every controller connected.
		Time clock on controller may have been set at install, but a prolonged power loss may have reset it.	If the controller board remains powered off for more than a couple of days, the time clock will have to be reset. Go to ***Settings →Date and Time*** on each controller board display to set the controller time clock. If you have a Command Center Display wired to one or more controller boards, the time clock can be set there and it will be simultaneously broadcast to every controller connected.
20	Command Center Display screen is blank.	Make sure that Command Center Display is connected to a power supply.	If installing Command Center within 150 feet of the nearest EcoNet controller, make sure that the wires from the R and C terminals at the Command Center mounting bracket are securely connected to the 0V and 16V terminals at the controller. Make sure the controller is powered on. If Command Center is installed more than 150 feet away from nearest controller, make sure it is connected to a separate 24VAC or 24VDC power supply. Please refer to the Command Center wiring diagram on Page 13 of the EcoNet Installation Manual.
		Command Center Display could be damaged.	Inspect the Command Center Display for signs of damage (cracked screen, burn marks on the circuit board/mounting bracket, broken components). If damaged, replace the Command Center Display. Make sure that the Command Center is installed indoors, outside of the walk-in cooler/freezer, and that it does not get wet or dropped.

#	Problem	Possible Cause	Remedy
21	Command Center Display turns on but is not communicating with any controllers.	Make sure that communication wires between Command Center Display and EcoNet controller are properly connected.	Make sure that communication wires from E1 and E2 terminals at the Command Center mounting bracket are securely connected at the E1 and E2 terminals respectively on the first controller board in the daisy chain. Make sure all controllers on the daisy chain network are powered on and properly addressed so the Command Center can find them. For Group Leaders and Followers, the address is set at each controller under ***Settings →Equipment→Group-Member Cfg.*** For standalone units on the daisy chain, the address is set at each controller under ***Settings→Equipment→Network Instance*** . Make sure that at least 22 gauge, shielded wire is used. Please refer to the EcoNet Installation Manual for how to daisy chain multiple controllers together with a Command Center Display.
22	Command Center Display turns on and is able to communicate with some controllers, but not with others on the daisy chain network.	Some Evaporator Controllers in the network bus may not be powered on.	Make sure that every evaporator controller in the daisy chain network is powered on.
		Possible conflict of addresses on the network.	Make sure all controllers on the daisy chain network are powered on and properly addressed so the Command Center can find them. Every EcoNet board on the daisy chain must have a unique address set. For Group Leaders and Followers, the address is set at each controller under ***Settings →Equipment→Group-Member Cfg.*** For standalone units on the daisy chain, the address is set at each controller under ***Settings→Equipment→Network Instance*** .
		Make sure that communication wires between Command Center Display and EcoNet controller are properly connected.	Make sure that communication wires from E1 and E2 terminals at the Command Center mounting bracket are securely connected at the E1 and E2 terminals respectively on the first controller board in the daisy chain. Make sure that the communication wire is securely connected to the E1, E2 and RT terminals between every controller board, and that the wires are not crossed from terminal to terminal. Make sure that at least **22 gauge, shielded wire** is used. Make sure that the shielding strands are tied together at every splice and tied to a ground point at one end of the daisy chain only. Make sure all controllers on the daisy chain network are powered on and properly addressed so the Command Center can find them. Please refer to wiring diagram the EcoNet Installation Manual for how to daisy chain multiple controllers together with a Command Center Display.

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Addendum A

Verifying EcoNet Controller EXV Operation (Sporlan SER Valve)

1. On the controller display, navigate to ***Settings→Equipment→EXV Stepper Type*** and verify that it is set to ***2500 steps***, corresponding to Sporlan SER valves.
2. Connect a set of gauges on the suction line to verify suction pressure.
3. If the system is running (no defrost active), go to ***Settings→System Enable*** and set it to ***No***. This will cause the controller to command the EXV to close and pump down the system. If standing close enough to the evaporator, listen for the characteristic noise of the EXV as it is closing. The noise/vibration from the valve is confirmation that the controller is applying current to the stepper motor in the valve. If the valve is confirmed to make noise, go to Step 5. If driving the valve again is needed to confirm valve noise, set ***System Enable*** back to ***Yes*** and wait the two-minute minimum OFF time to finish so the controller can command the valve to open (open the freezer door if needed to warm the box slightly). After confirming the controller is attempting to open the valve, set ***System Enable*** back to ***No*** to force the valve to close again. (Alternatively, disconnecting and re-connecting power to the controller will cause it to drive the valve closed as part of initial startup of the controller.)
4. If the valve does not make any noise:
    a. Verify connection to the valve is secure, and that the 4 pins on the valve are not bent.
    b. Verify that the wiring harness is not damaged, or that any pins have not come loose from the connector on the control board.
    c. Refer to *Verifying Controller Signal to EXV* section below to determine if the controller output to the valve is being energized.
5. On the controller display, navigate to ***Status→EXV*** to verify the ***EXV Current Pos***. This is the valve position currently being commanded by the controller. After setting ***System Enable*** to ***No***, the ***EXV Current Pos.*** will display 0% (the controller is commanding the EXV to be at 0%).
6. Verify on the pressure gauges that the suction pressure decreases, and the compressor turns off after pump down. Verify that while the ***EXV Current Pos.*** is 0%, the suction pressure on the gauges does not increase steadily. A slight momentary bump of the compressor to pump down any remaining refrigerant that is still boiling off and slightly increasing pressure on the suction line is normal, followed immediately by the compressor turning back off.
7. If suction pressure keeps significantly increasing and causing the compressor to keep constantly running while ***EXV Current Pos.*** is at 0%, it is possible the valve is leaking or not working properly. Proceed to verify the EXV (See attached document from Sporlan: *Installation & Servicing Instructions for Sporlan SER Valves*).

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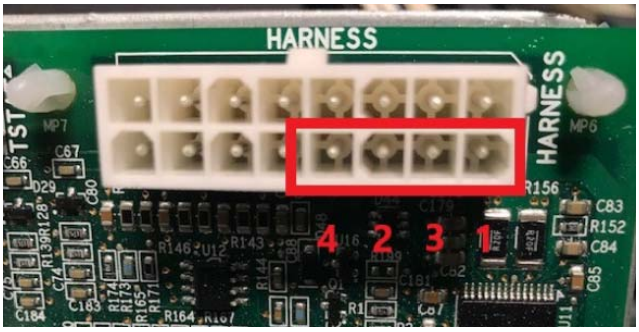
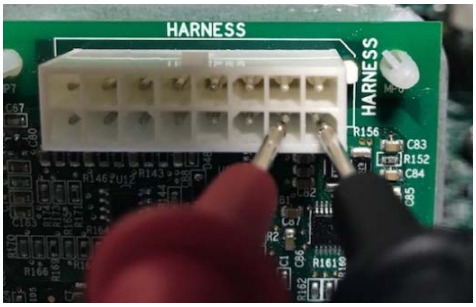
Verifying Controller Signal to EXV

1. If the system is running (no defrost active), go to ***Settings→System Enable*** and set it to ***No*** to force a pump down. Disconnect power to the condensing unit, and the evaporator.
2. **With no power applied to the evaporator terminal block**, safely disconnect the wire harness connector from the controller to expose the 4 pins that connect to the EXV cable, as shown in the picture below.



3. Reconnect power to the evaporator only to turn the controller back on.
4. Using a voltmeter, place the test leads between pins 1 & 3, and pins 2 & 4 as shown in the pictures below. Set the meter to measure DC volts.



5. On the controller display, set ***System Enable*** back to ***Yes*** and wait 1 to 2 minutes for the controller to enable cooling (open freezer door if needed to warm up the box slightly so the controller can attempt to signal the valve open).
6. With the meter test leads touching pins 1 and 3, when the controller signals that the output to the valve reached the desired position (between 35% and 65%, visible via ***Status→EXV***), the meter should read approximately 12 to 16 Volts DC for a few seconds, then read approx. zero volts. Set ***System Enable*** back to ***No*** to have the controller send the signal to close. Again, with the meter test leads touching pins 1 and 3, watch the voltmeter for the momentary bump in DC volts (12 to 16 VDC) when the signal to the valve reaches its final position (0%, visible via ***Status→EXV***) then back to near zero volts.
7. Repeat Step 5 again with meter leads touching pins 2 and 4. Repeat the test several times with both pairs of pins if needed to confirm if the controller is functioning properly or not. If the momentary DC voltage jump is detected with the meter following the preceding steps, the controller is working properly. Proceed to troubleshoot the wire harness and the EXV.
8. If no voltage is detected at any point in time after following steps 3 thru 6, replace the controller board.

Step Motor Expansion Valves

Types SER-B, C, & D

Installation and Servicing Instructions

Operation

The Sporlan SER valve series are step motor operated electric expansion valves. Step motors are designed to provide discrete segments of angular motion, or rotation, in response to an electronically generated signal. The advantages of step motors in valve applications are high resolution, repeatability and reliability with low hysteresis. Feedback loops are not required, simplifying controller design and circuitry.

The step motor used in the SER valves is a 12-volt DC, two-phase, bi-polar, permanent magnet rotor type. Motor rotation is converted to linear motion by the use of a lead screw and threaded drive coupling. Forward motion of the motor extends the drive coupling and pin, which moves the valve to the closed position. Backward rotation of the motor retracts the drive coupling and pin modulating the valve in the opening direction. Full forward or backward travel, while the valve is assembled, is limited by the valve seat in the closed position or an upper stop in the open direction. A slight clicking or "ratcheting" sound may be heard at either of these two positions and does no harm to the valve or drive mechanism.

The valve will operate only when connected to a properly designed controller. The controller must supply the necessary square wave step signal at 12 volts DC and 200 PPS for the valve to control properly. Various Sporlan and third party controllers are available for use with the valve. Questions of suitability of a specific controller should be directed to the Sporlan Division, Parker Hannifin, Attn.: Product Manager — EEVs. Control algorithms for the valve include a initialization sequence that will first over-drive the valve in the closing direction. This is to assure that the valve is completely shut and to establish the "zero" open position. The controller then keeps track of the valve's position for normal operation. During this initialization phase, a light clicking sound may be heard, which will serve as proof of the valve's operation and closure.

Table 1

Valve Model	Cable Torque	Maximum Cable Length	Motor Phase Resistance (at 72°F)	Number of Steps	Maximum Internal Temperature During Install
SER-B SER-C SER-D	10-14 in.-lb.	40 feet	100 Ohms ±10%	2500	250°F

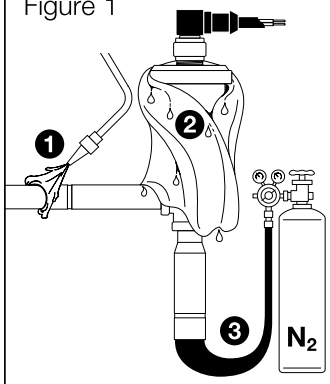
All valves are tight seating and uniquely characterized by pin and port combinations for exceptional control of refrigerant flow. The seats require no service and are not replaceable.

Installation

The Sporlan SER valve series are electronically controlled Step Motor Expansion Valves, and are installed before the distributor and evaporator just as one would install a Thermostatic Expansion Valve. The valves are bi-flow capable. Location should be planned to provide cable serviceability and to allow controller installation within the maximum cable length of forty feet. The valve may be installed in the refrigerated space and may be mounted in any position. For flexibility, the cable can be removed from the valve and re-positioned in any four configurations. See Table 1 for cable torque. Cable routing should avoid any sharp edges or other sources of potential physical damage such as defrost heaters and fan blades. For neatness and protection, the cable may be fastened to the suction or liquid lines with nylon wire ties.

The SER has copper connections and any solder or brazing alloy may be used to install the valve. The torch flame should be directed

Figure 1



1. Use proper torch tip, point away from valve.
2. Wrap valve body with wet rag.
3. Purge with inert gas, flow hot gas away from valve.

away from the motor housing and cable. See Figure 1. In order to maintain IP-67 rating on the cable interface, it is NOT recommended to remove cable during installation. If the cable is removed, take precaution to ensure water does NOT flow down into motor contact pins. Cable must be retightened to the specifications shown in Table 1. Care must be taken to assure that the cable is not damaged either directly from the flame, or indirectly from contact with hot piping. The valve is shipped in the open position to prevent heat being conducted into the motor, but it is strongly suggested that the valve body be wrapped with a wet cloth during the soldering operation. Valve internals **must not experience maximum temperature,** as shown in Table 1, during install. Inlet strainers are supplied optionally, and if used, should be oriented in the proper direction as shown on the strainer package. The valve should be completely installed before connecting to the controller and applying power. The wiring is color-coded and the controller manufacturer should be consulted for the proper attachment to the controller.

Field Servicing Instructions

1. If the valve fails to operate properly, obtain a digital multimeter and measure motor resistance. Resistance between the black and white leads or between the red and green leads should be as shown in Table 1. Note: Resistance values in the table are at 72°F. Using the same digital multimeter, measure resistance across black and red lead, or any lead and valve housing; resistance should be greater than 1 Mohm. If the resistance is less, the valve should be replaced.

2. If you have access to a SMA test instrument, operation of the valve may be proven. Connect the motor leads to the proper color-coded connector on the SMA. Set the rate to 200 PPS and toggle in the "OPEN" direction. After approximately 15 seconds, the driver should be fully retracted and a light clicking or "ratcheting" sound may be heard, this is normal to the valves and proves operation of the motor. If the SMA is toggled in the "CLOSE" position, after approximately 15 seconds the driver should be fully extended and a light clicking or "ratcheting" may be heard.

3. If the motor responds to step 2 above, the valve itself should be checked for obstruction. Check for contaminants in the port or strainer, if used.

4. If the port and strainer are clear and the motor operates as in step 2 above, the valve is considered operational and the problem lies in the controller or power supply. The manufacturer of these components should be contacted for further assistance.

Valve Replacement

The entire valve may be replaced if desired. The old valve may be unbrazed or cut out of the piping. If cut out, use a tubing or pipe cutter and not a saw. When installing the new valve any convenient brazing alloy and method may be used. The body and motor assembly should be wrapped with a wet cloth to prevent damage.

Cable can be removed while brazing. If not, extra care should be taken to prevent damage to the motor cable, either directly from the torch, or indirectly from contact with a hot surface. Refer to Installation section.

Sporlan Division, Parker Hannifin Corporation
206 Lange Drive, Washington, MO 63090 USA
phone 636 239 1111 • fax 636 239 9130
www.sporlan.com