INSTALLATION INSTRUCTIONS FOR THE Unico System S.M.A.R.T. CONTROL BOARD (SCB)

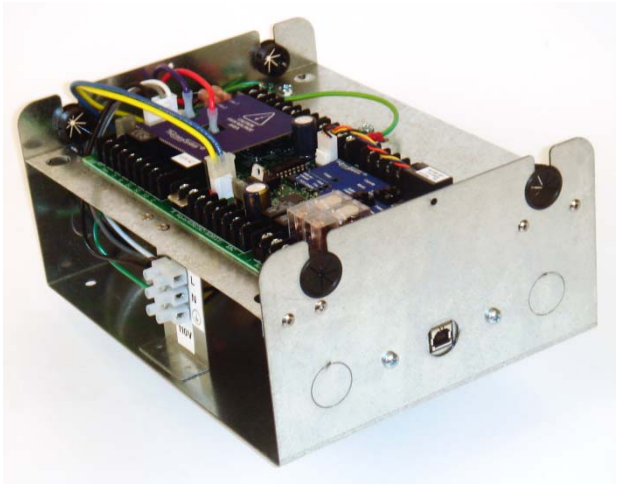


Figure 1. SMART circuit board in control box

General

The information on the following pages is to provide the installer the necessary information to properly install the Unico S.M.A.R.T. Control Board (SCB). The SCB control board is available as part of the blower assembly or as part of retrofit kit that includes the motor and blower wheel.

Part no.*	Description
U1218L1-ECx	Fan Coil Unit with SCB control, where 'x' is voltage
M2430BL1-ECx	Blower Module, 2430, with SCB and EC motor
M3642BL1-ECx	Blower Module, 3642, with SCB and EC motor
M4860BL1-CBx	Blower Module, 4860, with SCB and EC motor

'x' indicates voltage (1=120V, 2=240V)
There may be additional characters at the end for other options.

Upgrade Kits (for units made after 2003).
includes motor, wheel, and control box

A01543-K22	Upgrade Kit, EC2 (240V), 2430
A01543-K23	Upgrade Kit, EC2 (240V), 3642
A01543-K24	Upgrade Kit, EC2 (240V), 4860

Optional Accessories/Replacement Parts

A00175-G07	Control Box Assy with SCB, 240V
A00175-G10	Control Box Assy with SCB, 120V
A01426-002	Motor, EC, 1800 RPM, 1/2 hp
A01426-003	Motor, EC, 1800 RPM, 1 hp
A01469-G01	Control Board, S.M.A.R.T. (SCB)
A01470-G01	Control Board, Communications, (USB)
A01472-G01	Wire Harness, EC Motor, 240V
A01472-G02	Wire Harness, EC Motor, 120V
A01473-G01	Wire Harness, SCB/USB to ECM
A01474-G01	Wire Harness, SCB to USB
A01002-013	Fuse, Slow-blow, 2AG, 3A
A00057-G04	Transformer, 208/230V-24V, 50VA (for PCB)
A00057-G05	Transformer, 100/120V-24V, 50VA (for PCB)

*S.M.A.R.T. = Software Managed Air Rate and Temperature

Scope

The S.M.A.R.T. control board provides system control for Unico air handlers with EC motors. The control board comes with software and cable to connect to a personal computer (Windows XP or Vista operating system is required) which allows the user to set the precise airflow.

Features

Congratulations on your purchase on the finest and most versatile fan control on the market. This control board is only compatible with the Unico Electronically Commutative Motor (ECM). The control board comes standard with the following features.

Multiple configurations. Compatible with refrigerant-cooling (AC) systems; refrigerant-heating (heat-pump) systems; chilled water systems, including all UniChiller and UniChillerRC products, hot water systems, electric heat modules, and just about every practical combination of them.

Soft-start/Soft-stop. For the ultimate in quiet, the control board allows the motor to slowly ramp up to speed when it starts and slowly ramp down when it shuts off (total ramp time 45 seconds).

Ventilation Mode. The SCB is pre-configured to provide ventilation air at 50 percent of the high cool airflow rate.

Simplified Wiring. The control box was developed with the contractor in mind. All wiring terminals are clearly labeled and are designed for point-to-point wiring (one wire per terminal). In addition, we added a feature that allows you to make your terminal connects THEN slip the wire cable into the slotted

bushing. Never again, will you have to disconnect and re-wire the board because the cable was not pre-inserted through the bushings.

Accessories. The control board provides separate relays and contacts to energize a separate Electronic Air Cleaner (EAC) or UV light. We also provide a relay to energize a humidifier with a separate humidistat input for proper control. We even provide a feature to allow the humidistat to control the fan so that humidity can be added even if the fan is not already on. And, of course, the control is smart enough to sense when the system is trying to cool, so that humidity is not added if in cooling mode.

Designed for the Unico Electric Furnace. When using the Unico Electric Furnace with a heat pump, we prevent the third step of the electric heater from energizing at the same time as the heat pump. Previously, we required that a field installed relay or thermostat be installed to prevent this from occurring. The control box provides this feature, saving both time and costs. At the same time, the control board is designed for multiple stage thermostats to gradually turn on the electric heat after the heat pump; thereby, improving the efficiency of the heat pump while maintaining the greatest capacity.

Designed for the UniChillerRC. The control is designed to operate the Chiller from the thermostat. And, for multiple thermostat systems, the control boards can communicate, making one the "Leader" the others "Followers" for the best system control available. The board, then, knows whether the chiller is making hot or cold water and turns on the blower as appropriate.

Designed for Hot Water Heating systems. The control allows you to select whether the hot water heating is primary, secondary or emergency heat for single or multi-staged systems. Also, a timer function is included to operate the hot water pump when used with potable water 'combo' systems on a periodic basis; this prevents the water from becoming stagnant over time.

2-Speed condenser Compatibility. The SCB is pre-programmed to operate the blower at 75% of full speed during low stage operation for heating or cooling. This may be modified by using the ECM Config software.

Quality Design and Manufacture. The board itself is made from high quality electronic parts. The board includes a conformal coating to eliminate problems with humidity, moisture, and dust. It is resistant to high voltage discharges (lightening resistant, not lightening proof – which, of course, nothing is!). It is fully certified to UL standards and listed as part of the Unico Blower Module with ETL. Every board is fully tested.

Figure 2. SCB Control Box

Location and Mounting

Before installing the SCB, inspect thoroughly for shipping damages. Notify carrier immediately if there is any damage.

The control box can be installed in either one of two positions on the modular air handler (Figure 3). Choose the position that allows the best access. A three foot extension cable is available upon request for remotely mounting the control box (P/N: A01525).

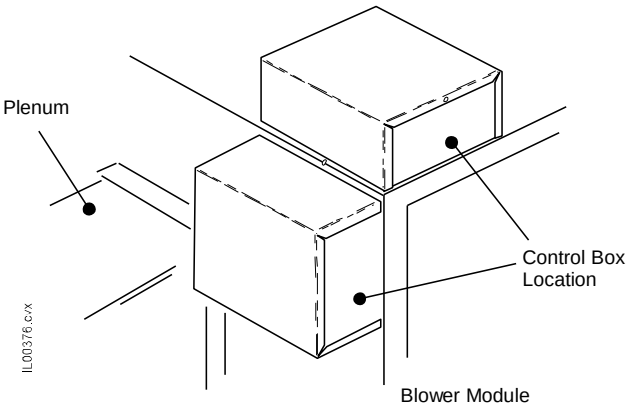


Figure 3. Control Box Mounting Locations.

CAUTION

The control box must be screwed to the air handler or remote mounted using the Unico extension cable to provide proper ground for the motor.

The knock-out on top/front of the air handler must be removed to allow the motor cable connector to extend into the air handler space.

WIRING

WARNING!

DISCONNECT ELECTRICAL SUPPLY BEFORE WIRING UNIT TO PREVENT INJURY OR DEATH FROM ELECTRICAL SHOCK.

All electrical wiring must comply with all local codes and ordinances. Use a separate power supply with appropriate amp fuse or breaker and wire gauge for the specified amperage.

CAUTION

Be sure that the input power voltage matches the control box to prevent damage to the equipment.

Once the control box is mounted to the cabinet, the motor can be connected from inside the air handler. Remove the appropriate air handler access panel. Connect the motor connector to the mating end of the control box, pushing firmly to be sure the connector is seated.

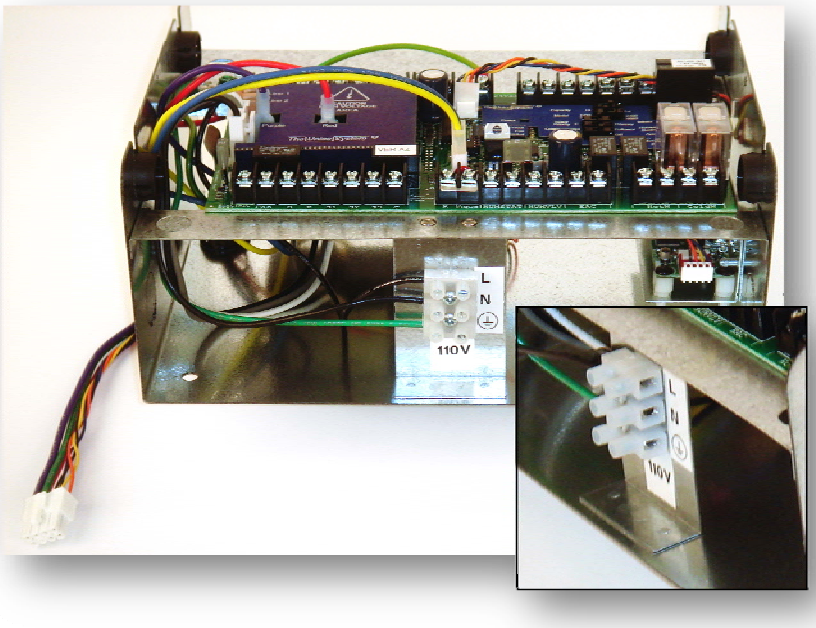
Connect the control wiring for the external devices such as the thermostat, condenser, and electric furnace to the SCB using the appropriate wiring diagrams as listed in Table 1.

There are several knockouts on the sides of the control box to bring power into. Use the most convenient one and connect line voltage and ground to the terminal block as shown in the Figure 4.

Table 1. Wiring Configurations

Cooling	Primary Heat	(Optional) Secondary Heat	(Optional) Emergency Heat	Use Elect. Diagram
—	—	—	—	1
A/C	—	—	—	1
A/C	Hot Water	—	Elect. Heat	1,4a,5
A/C	Elect. Heat	Elect. Heat	Hot Water	1,4b,5
Heat Pump	Heat Pump	—	—	2
Heat Pump	Heat Pump	Elect. Heat	Elect. Heat	2,6
Heat Pump	Heat Pump	Elect. Heat	Hot Water	2,4b,6
Heat Pump	Heat Pump	—	Hot Water	2,4b
Chiller	—	—	—	8
Chiller	Hot water	—	Elect. Heat	8,4a,5
Chiller	Elect. Heat	Elect. Heat	Hot Water	8,4b,5
Rev. Cycle	Rev. Cycle	—	—	9/10
Rev. Cycle	Rev. Cycle	—	Hot Water	9/10,4b
Rev. Cycle	Rev. Cycle	Elect. Heat	Elect. Heat	9/10,5
Rev. Cycle	Rev. Cycle	Elect. Heat	Hot Water	9/10,4b,5

Figure 4. Connect line power to L and N on terminal block



Switches

There are a number of function switches on the SCB (refer to diagram 1 for switch location). The switches have a small plastic stem that can easily be moved with your thumb. The description of each switch is listed below:

Voltage (208|230, default = 230 or 100|120, default = 120) Set the voltage switch to the most appropriate position. If the line voltage is between 220 and 250 (or 110 and 130), move the switch to the 230 (120) setting. If the line voltage is between 190 and 220 (100 and 110), then move the switch to the 208 (100) setting.

Humidistat Control (HIGH|LOW, default = HIGH) Allows a separate humidistat to control the fan operation under certain conditions. The control board has a humidifier relay which provides a set of dry contacts (HumVlv) which closes when the HumStat terminals have a 24 V signal.

If the unit is not in cooling or heating (when it is off) the HumStat will turn on the fan to the speed set by the switch. In the default condition (Humidistat Control=HIGH) the relay will energize the fan at the high-heat speed. If the Humidistat Control switch is moved to the LOW position, the fan will run at the ventilation value.

Potable Water (ON|OFF, default=OFF) For 'combo' systems, where potable water is circulated through the hot water heating coil, it is necessary to ensure that the water is never stagnant in the coil. The switch will activate a timer so that the HotW relay will energize a pump to circulate water once per day for 5 minutes regardless.

Air Cycle (ON|OFF, default=OFF) Used to periodically circulate air through the ducts to reduce the chance of moisture build up in the winter months. Fan will run on circulation speed for 5 minutes every 8 hours even if there is no thermostat demand for heat or cool or fan.

Rev. Valve (B|O, default = disabled). By default this switch is disabled unless the reversing valve jumper wire is cut. The board is factory setup for reversing valves that are energized in the cooling mode and require the O signal. If the reversing valve is energized on heating, the heat pump jumper wire (see next section) must be cut and this switch moved to the B position.

The UniChillerRC energizes the reversing valve in the heating mode so the switch must be set to 'B' and the heat pump jumper wire must be cut.

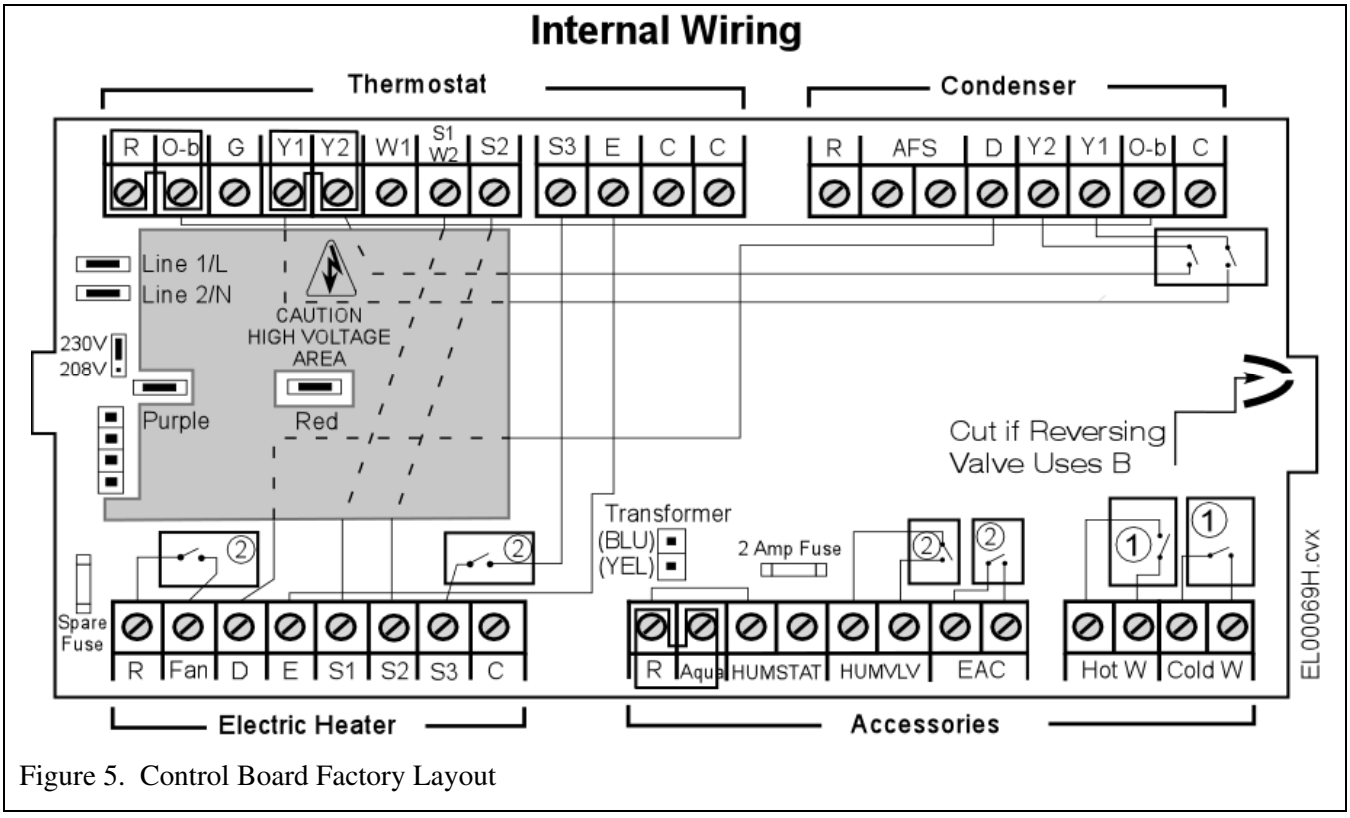


Figure 5. Control Board Factory Layout

CAUTION

To prevent the potential of coil frosting for 'cooling-only' systems, be sure the jumper across R and O-b is in place. If not, the AFS may not work properly. (Note: if the jumper wire is cut, make sure the reversing valve switch on the board is in the O position)

The reversing valve switch position along with the thermostat O-b input allows the control board to know when the unit is heating or cooling (or if the water is hot or cold) in accordance with the following logic diagram. For example, if the reversing valve switch is in the B position and 0-b is energized (O-b=1) the controller will think it is in heating.

Table 2. Water Temperature Logic

Switch position	O-b = 1	O-b = 0
Rev.Valve=B	HOT	COLD
Rev.Valve=O	COLD	HOT

** When o-b=1, the reversing valve is energized

Chiller (Leader|Follower, default=Leader). This switch controls the operation of both the chiller relay (ColdW) and the boiler relay (HotW). If the switch is in the 'leader' position, the relays will energize according to Table 3 and Table 4.

Table 3. ColdW relay and switch position

Chiller Switch	Thermostat Call			Boiler Switch	
	Y1/Y2	W1/W2	E	Primary	Emergency
Leader	✓	-	-	✓ or	✓
Follower	✓	-	-	✓ or	✓
	-	✓	-	-	✓

Table 4. HotW relay and switch position

Chiller Switch	Thermostat Call			Boiler Switch	
	Y1/Y2	W1/W2	E	Primary	Emergency
Leader	-	✓	-	✓	-
Leader or Follower	-	-	✓	-	✓

If the switch is in the 'follower' position, the relays will not energize unless the system is in the correct mode. In other words, if the system is in heating and the thermostat calls for cooling, the ColdW relay will not energize; however, the fan will still come on which will at least provide ventilation without heating the room when you need cooling.

Boiler Priority (Emerg|Primary, default = Primary). This switch controls when the boiler and chiller relays are energized. The functional chart is shown in table 3 and table 4. Refer to Diagram 3 for proper wiring.

Check CFM (Check CFM|Norm, default=Normal). This switch allows the user to check the operating airflow using the PCB Control LED located on the SCB. Each long flash represents 100 CFM while a short flash represents 50 CFM. A 1 second pause indicates the start of a new series of flashes. When the switch is in the Off position, the Check CFM is disabled.

Jumpers

There are several jumpers on the SCB that are provided to make the most common wiring applications easier. These must be removed for some applications. The description of each jumper is listed below:

R – Ob (thermostat block) jumper is required for all cooling-only systems. The board is preconfigured for heat-pump systems that energize the reversing valve in the cooling mode (i.e. require 'O'). The control senses the signal on the O-b terminal to determine whether it is in cooling or heating mode. Therefore, for cooling-only systems it is necessary to provide this jumper so the control knows it is in the cooling mode. For heat pump systems or UniChillerRC systems, this jumper must be removed.

Y2 – Y1 (thermostat block) jumper is used for the convenience of the installer when using a single-speed condenser. If the thermostat calls for cooling at the Y2 terminal the fan speed is high, whereas, at the Y1 terminal the fan speed is low. The jumper forces the fan to run on high during all cooling modes. Therefore, the jumper is in place to allow the installer the ability to use either terminal. For two-stage condensers, this jumper must be removed.

R – Aqua (accessories block) allows the HotW relay to function without an optional aquastat. If an aquastat is used, this jumper must be removed.

Heat Pump Jumper Wire (permanent jumper on board) disables the Reversing Valve switch so that it is permanently in the 'O' position. For systems that have a reversing valve that is energized in heating and requires a 'B' connection, cut the jumper with wire snips and move the Rev.Valve switch to 'B'. This wire jumper must be cut for proper UniChillerRC operation.

Terminal Block Description

The following tables describe in detail the function of each terminal on the control board.

Table 5. Thermostat Terminal Block Description

Inputs	**R**	Power out. 24V power signal.
	O-b	Reversing valve input from thermostat. Can be either O or B, depending on the requirements of the outdoor unit. For UniChillerRC the selection should be B.
	G	Fan input. Blower will operate at fan speed unless there is a call on Y1, Y2, W1, W2 or E. Refer to Table 10 for blower default settings.
	Y2	Cool input. Will energize blower on high and pass a signal to condenser Y2 terminal.
	Y1	Cool input. Will energize blower on low and pass a signal to condenser Y1 terminal.
	W1	Heat input (low stage). Electric heater will not turn on with this signal. Blower will operate at low speed heat,
	W2/S1	Heat input (high stage) Electric heater will energize if fan is at full speed (not ramping). Blower will operate at high speed, electric heater S1 terminal will be energized, and accessory relays (ColdW and HotW) will energize in accordance to Tables 3 and 4.
	W3/S2	Heat input (third stage heat). Electric heater S2 terminal will be energized. W signal must be present to energize the fan.
	S3	Heat input (third stage). Electric heater S3 terminal will be energized unless it is a heat pump (i.e. signal present at Y2 or Y1). W1 signal must be present to energize the fan.
	E	Emergency heat input. Will energize blower on high, send a signal to electric duct heater E terminal and energize the accessory relays (ColdW and HotW) per Tables 3 and 4.
	C	Common. Used to power the thermostat, if required.

Note: Factory ships with jumper across Y2 and Y1, and a jumper across R and O-b.
The Y2-Y1 jumper must be removed for two-speed condensers. The jumper is only a convenience so that either terminal may be used for single-speed condensers.
The R-Ob jumper must be removed for heat pump or UniChillerRC systems. The Rev.Valve switch must be set properly.

Table 6. Condenser Terminal Block Description

	R	Power out. 24V power signal.
Dry Contact Input (Rated 24VAC, 2 amp)	**AFS**	Terminals to connect the **A**nti-**F**rost **S**witch located on the coil. If the AFS is closed, the control will allow the condenser terminals to be energized. For chilled water cooling only, place a jumper between the AFS terminals (see Diagram 8). If the AFS switch opens, the condensers will stop although the indoor blower will continue to operate. The AFS will not affect operation of the condensers if in the heating mode. The AFS switch will open at 34°F±3°F (1°C±1.6°C) and close at 60°F±3°F (15.5°C±2.8°C). The AFS contacts are normally open and close when the R-Ob jumper is removed for heat pump application.
Input	**D**	Defrost input. Will send a signal to electric heater defrost terminal. The D signal also prevents nuisance trips from occurring if the outdoor unit control board energizes O-b during defrost.
Outputs	**Y1**	Cool output. Will energize single-speed condenser or the first-stage of a two-stage condenser.
	Y2	Cool output. Will energize the second-stage of a two-stage condenser.
	O-b	Reversing valve output. Can be either O or B, depending on the requirements of the outdoor unit. The UniChillerRC uses B.
	C	Common. Used to power the relays and controls in the condenser.

Table 7. Accessories Terminal Block Description

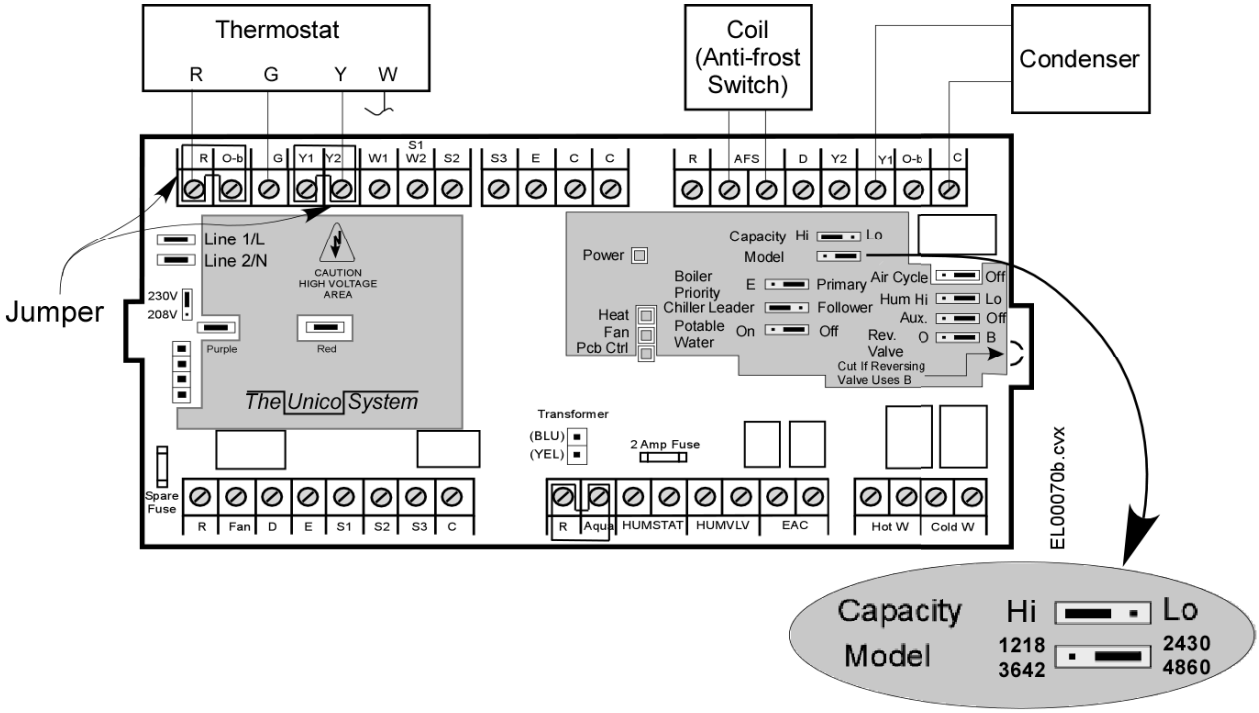
	R	Power out. 24V power signal.
Dry Contact Input	**Aqua**	Aquastat input. Allows the option of using an aqua-stat to reduce the time it takes for the air to become hot when heating. The fan will not energize until the aquastat is satisfied.
	HumStat	Humidistat input. The HumVlv contacts will close whenever the humidistat calls for humidity and the unit is not in cooling. The fan will come on if necessary.
Dry Contact Output (120VAC, 3 amp)	**HumVlv**	Used to turn on humidifier with a call from the Humstat.
	EAC	Used to energize an electronic air cleaner or UV-light option. Contacts close when fan is on high or low speed.
Dry Contact (250VAC, 5 Amps)	**HotW**	Used to energize either a boiler, valve, or pump. Contacts will close whenever there is a call for hot water heat (W1 or W2 if chiller switch = leader and boiler switch = primary, E if boiler switch = Emergency and aqua stat input is satisfied).
	ColdW	Used to energize a chiller, valve, or pump. Contacts will close whenever there is a call for chilled water cooling or UniChillerRC heating (Y1 or Y2 if chiller switch = leader, Y1 or Y2 if chiller switch = follower and in cooling, W1 or W2 if chiller switch = follower and in heating)
Note: Factory ships with jumper across R and Aqua. This jumper must be removed if an aquastat is used.		

Table 8. Electric Heater Terminal Block Description

Outputs	**R**	Power out. 24V power signal.
	Fan	Fan proving output, connected through a relay directly to G on the thermostat block. Once the motor reaches full speed, the relay closes sending a 24V signal to the electric heater to allow the heating elements to energize. The Unico Electric Furnace will not function unless this signal is present.
	D	Defrost input, direct connection to D on the condenser block. Will send a signal to electric Furnace defrost terminal.
	E	Emergency heat output, direct connection to E on the thermostat block. Will energize the electric Furnace elements.
	S1	Heat output, direct connection to W/W1 on the thermostat block. Blower will operate at high speed, electric Furnace S1 terminal will be energized, and accessory relays (HotW and ColdW) will energize in accordance to Tables 2 and 3.
	S2	Heat input (second stage), direct connection to W2 on the thermostat block. Electric Furnace S2 terminal will be energized. The electric Furnace requires that the S1 signal is present in order to energize second stage electric heat. The electric Furnace requires that the S1 signal is present in order to energize second stage electric heat.
	S3	Heat input (third stage), connected through a NC-relay directly to W3 on the terminal block. Relay is energized and contacts open whenever Y1 or Y2 is energized. This prevents the third stage of electric heating elements from energizing when the heat pump is operating. The electric heater requires that the S1 signal is present in order to energize third stage electric heat.
	C	Common. Used to power the relays in the electric heater.

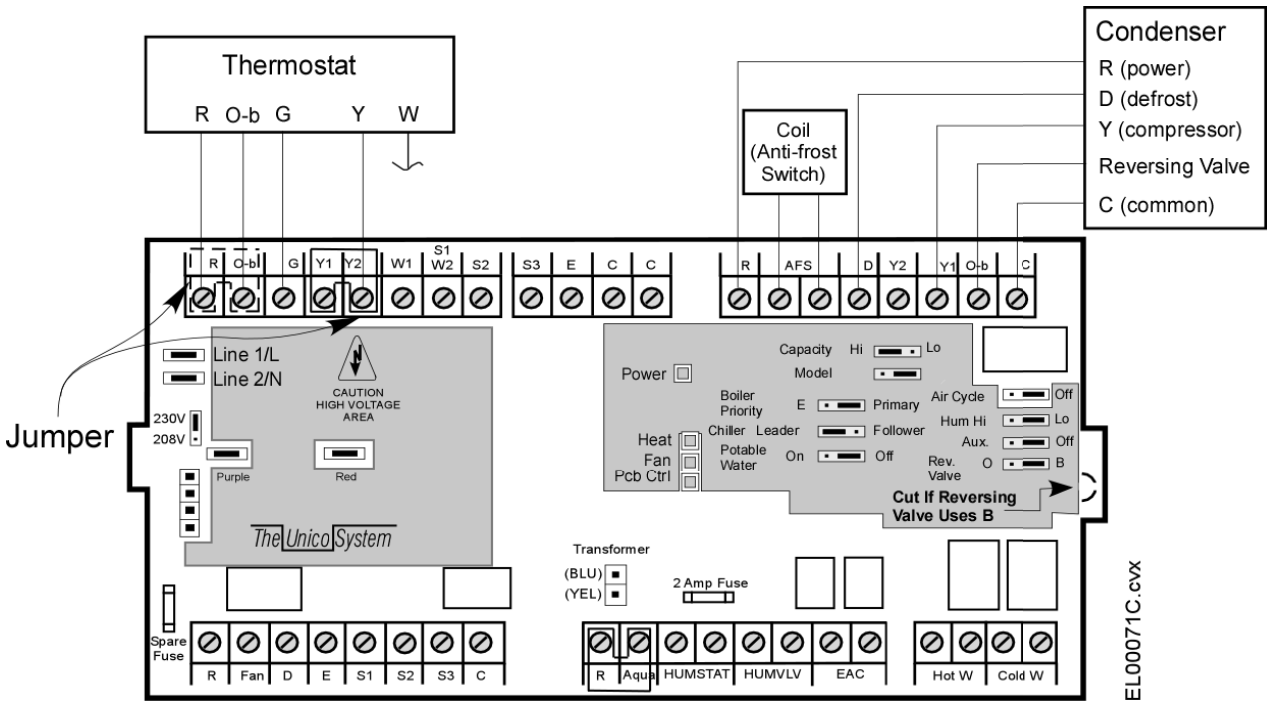
Wiring Configuration Diagrams

DIAGRAM 1. A/C ONLY



Be certain that the jumper is in place between R and O-b.

DIAGRAM 2. HEAT PUMP ONLY



Remove the jumper between R and O-b on the thermostat block.

If the reversing valve is energized in the heating mode (such as UniChillerRC), then cut the heat pump jumper wire with wire snips and be sure that the Reversing Valve switch is in the 'B' position and connect the 'B' thermostat terminal to the 'O-b' terminal on the board.

If the heat pump reversing valve requires power during cooling (i.e. requires the 'O' signal), it is not necessary to cut the reversing valve jumper wire. However, if the wire is cut, then move the switch to the 'O' position and connect the 'O' thermostat terminal to the 'O-b' terminal on the control board.

Note — most heat pumps use 'O'; the UniChillerRC uses 'B'.

Heat Pump (Alternate wiring to prevent feedback from outdoor unit)

Some of the new heat pumps have a feedback signal on the O terminal during defrost. This signal will inadvertently energize the anti-frost bypass relay. There are two methods which can be used to prevent this feedback signal. The easiest is to be sure to add the defrost wire shown in diagram 2. The other method is to install an isolation relay (not supplied) as shown in diagram 3.

Diagram 3. Using the isolation relay

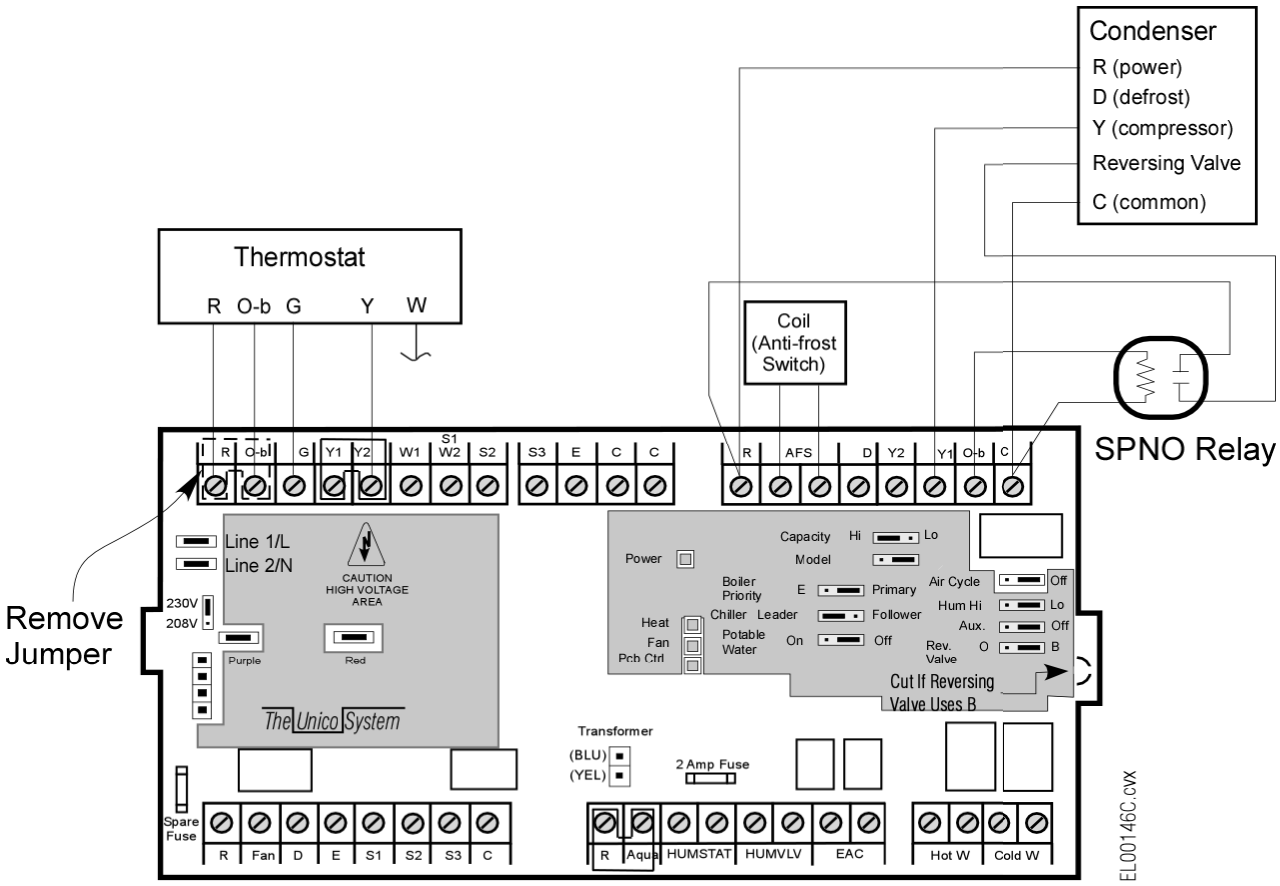
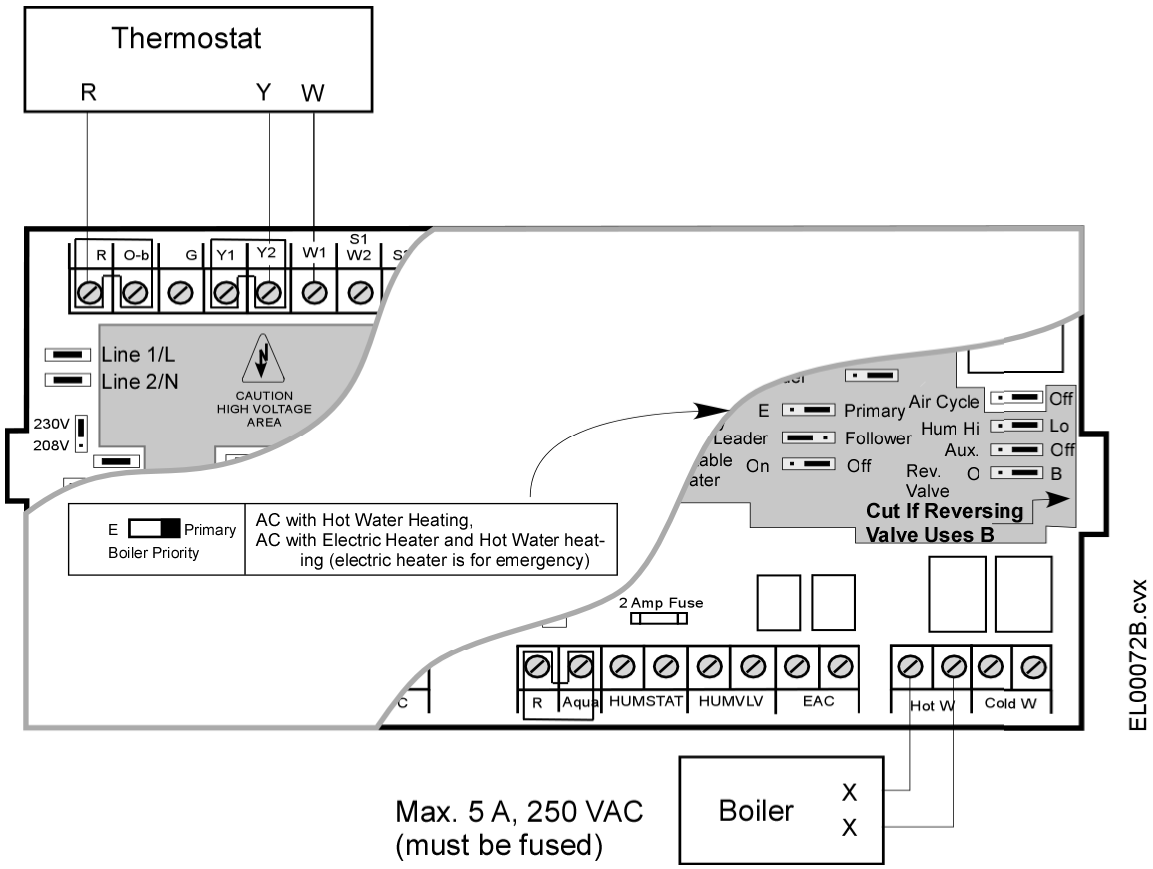


DIAGRAM 4a. AC or Chilled Water with Primary Hot Water Heating option (boiler operation)



For proper boiler operation, select the appropriate Boiler Priority as shown. If an aquastat is used, refer to Diagram 4d. In boiler operation, the SCB provides a set of dry contacts to turn the boiler on (Hot W will close with signal on 'W'). The boiler is required to turn on any pumps or valves in the system.

Please note that the Hot Water relay is rated for 5 amps at 250 VAC. For complete protection, be sure wiring to relay is externally fused.

DIAGRAM 4b. AC, Chilled Water, or Heat Pump with Emergency Hot Water Heating option

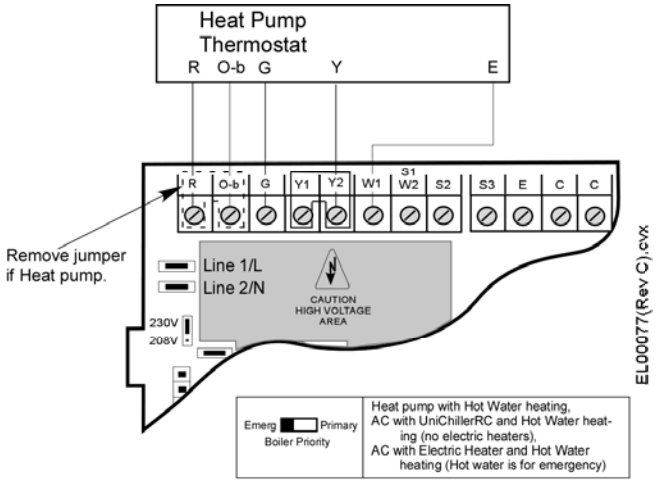
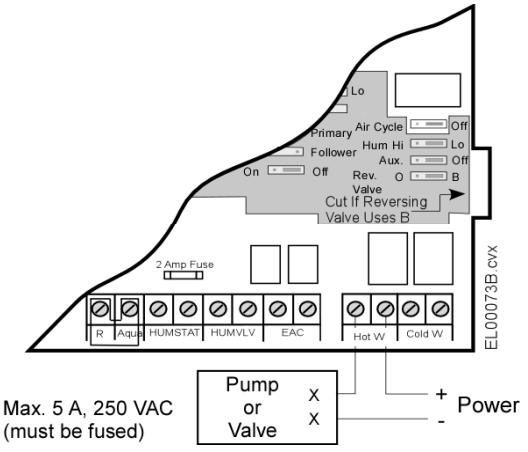


DIAGRAM 4c. Hot Water Heating option (pump or valve operation)



If desired, the valve can have an end switch to power on the pump or boiler separately. If an aquastat is used, refer to Diagram 4d.

DIAGRAM 4d. Aquastat Option

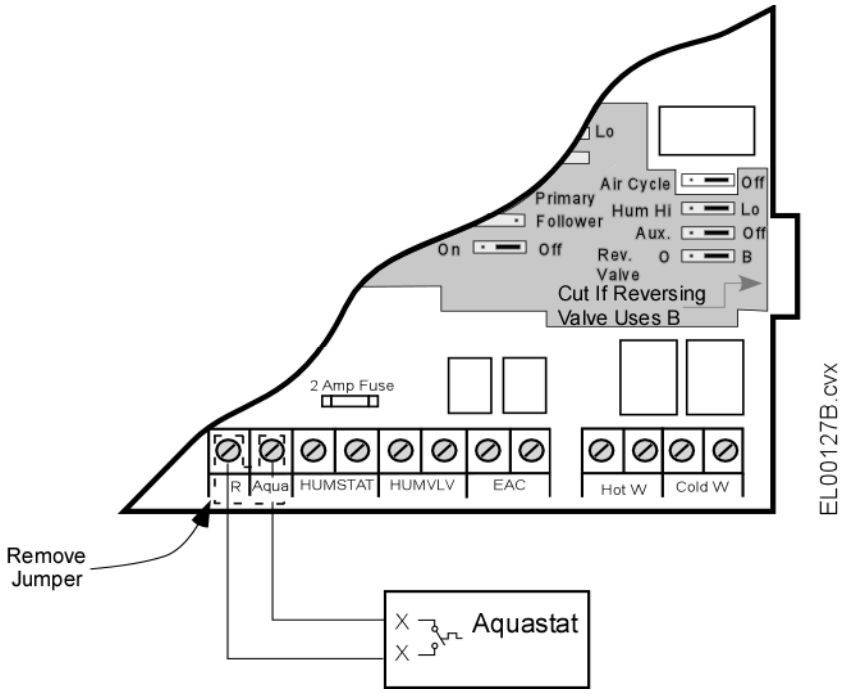
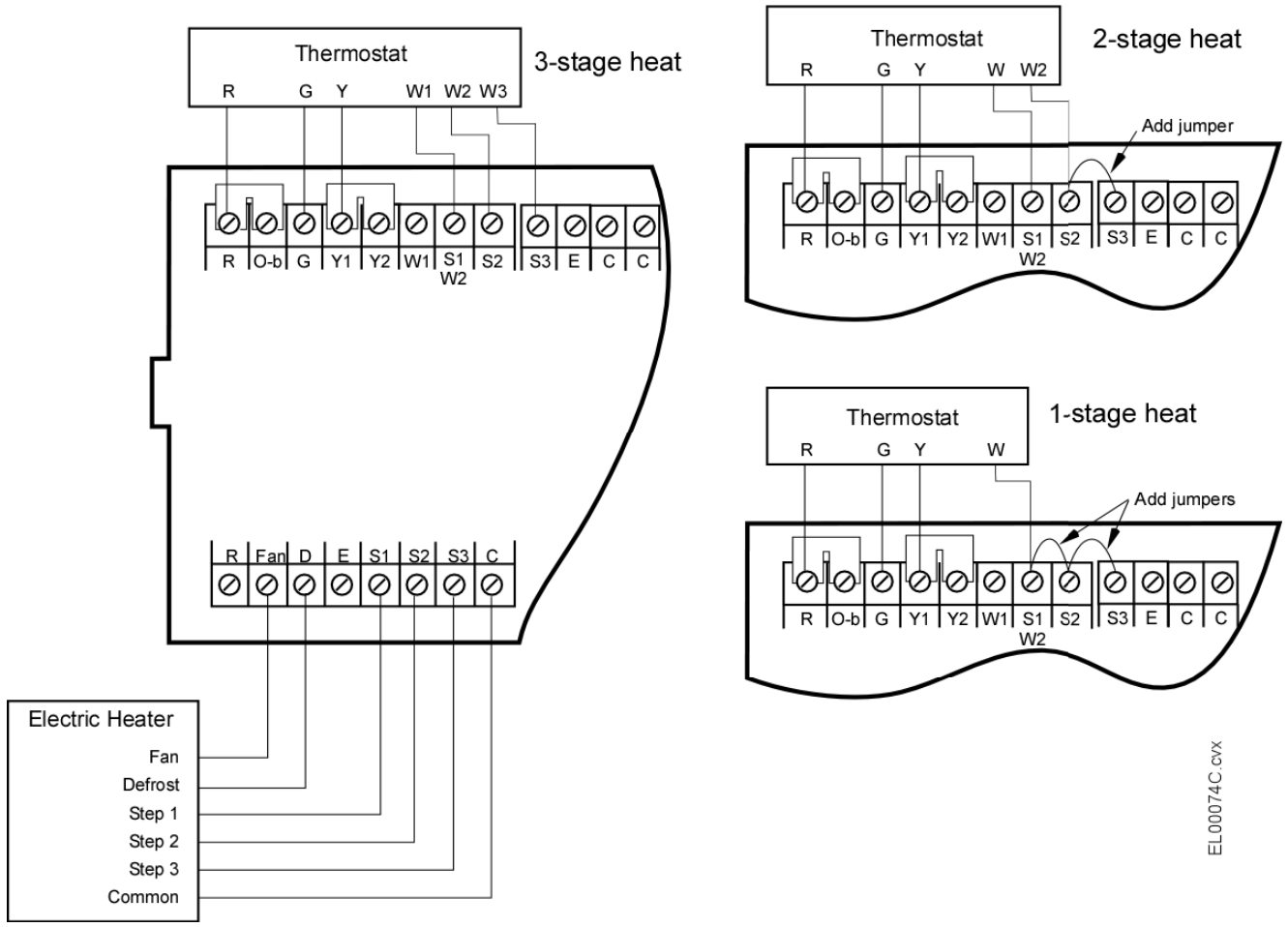
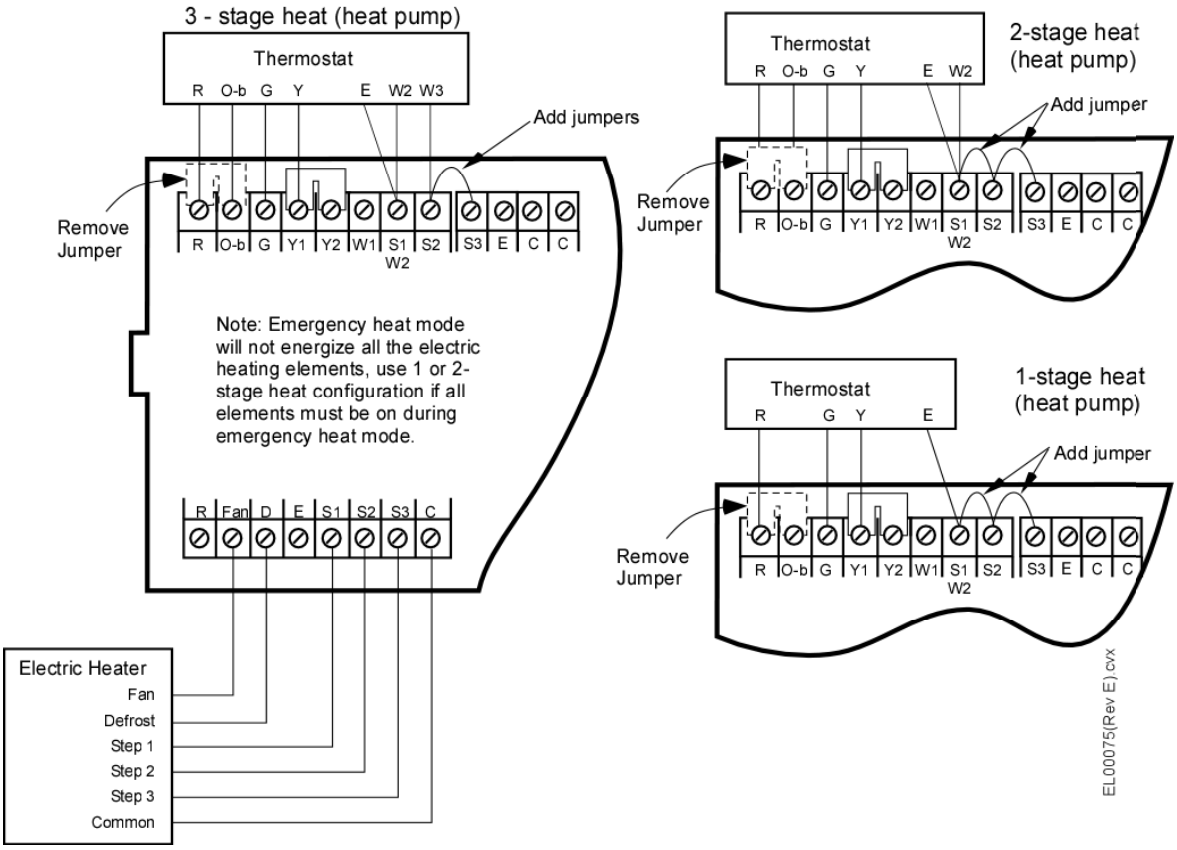


DIAGRAM 5. AC with ELECTRIC HEAT



Refer to Diagram 1 to wire outdoor condenser unit.

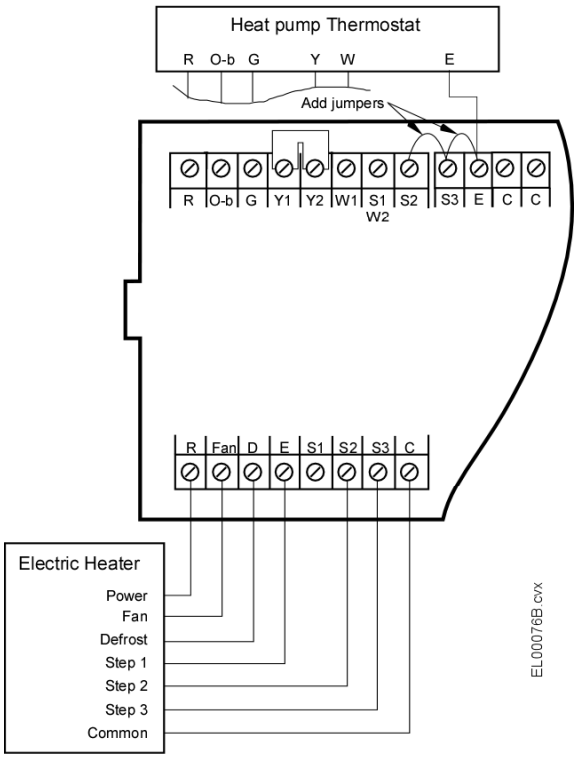
DIAGRAM 6. Heat Pump with Emergency Heat



Refer to Diagram 2 to wire outdoor heat pump and for instructions for setting the reversing valve O-b switch.

For 2 or 3-stage heating, if hot water coil is used for emergency heat, then do not connect the thermostat E to W2 and refer to Diagram 4b.

DIAGRAM 7. Emergency-Only Electric Heater



Diagrams 8 through 10 demonstrate how to wire a UniChiller system with the SCB. Diagram 8 is the simplest design, where there is only one UniChiller and one air handler. Diagrams 9a through 9b are for systems with one UniChiller and multiple air handlers. Diagram 10 shows the wiring needed for backup electric or hot water heat (refer to diagrams 9a and 9b to wire the UniChiller). All of these schematics are "intermittent" pump operation which means the UniChiller pumps will not come on unless there is a call for heating or cooling from at least one air handler. This is more efficient than running the UniChiller pumps constantly although it may take a few minutes for the water to reach its set point.

For a one air handler system (diagram 8), the air handler is considered the leader. For this system, it is easiest to connect the air handler directly to the UniChiller using only one transformer. For multiple air handler systems (diagrams 9 and 10), only one air handler is the leader; all others are followers. Also, you must use isolation relays to prevent the overloading of the low voltage transformers.

Sequence of operation: The UniChillerRC water pump is energized whenever either air handler is calling for cooling or heating (intermittent pump operation). The follower air handler will not close the ColdW contacts if the water is the wrong temperature. For example, if the follower's thermostat calls for cooling and the UniChiller is set for hot water ('B' is energized), then the ColdW relay will not close and only the fan will come on to provide air circulation. Set the Boiler Priority on the follower unit to "Emergency"; otherwise the HotW relay will close instead of the ColdW relay.

Configuring the SCB: (1) Remove the jumper between R and O-b on the thermostat terminals and move it to the AFS terminals; (2) cut the reversing valve jumper wire to enable the O-b reversing valve switch; (3) move the reversing valve switch to the 'B' position; (4) move the lead air handler chiller switch to the 'Leader' position; (5) move the follower air handler chiller switch to the 'Follow' position; (6) for the single air handler system, disconnect the transformer inside of UniChiller; and (7) connect all wiring as shown.

Diagram 8 – One air handler with one UniChiller

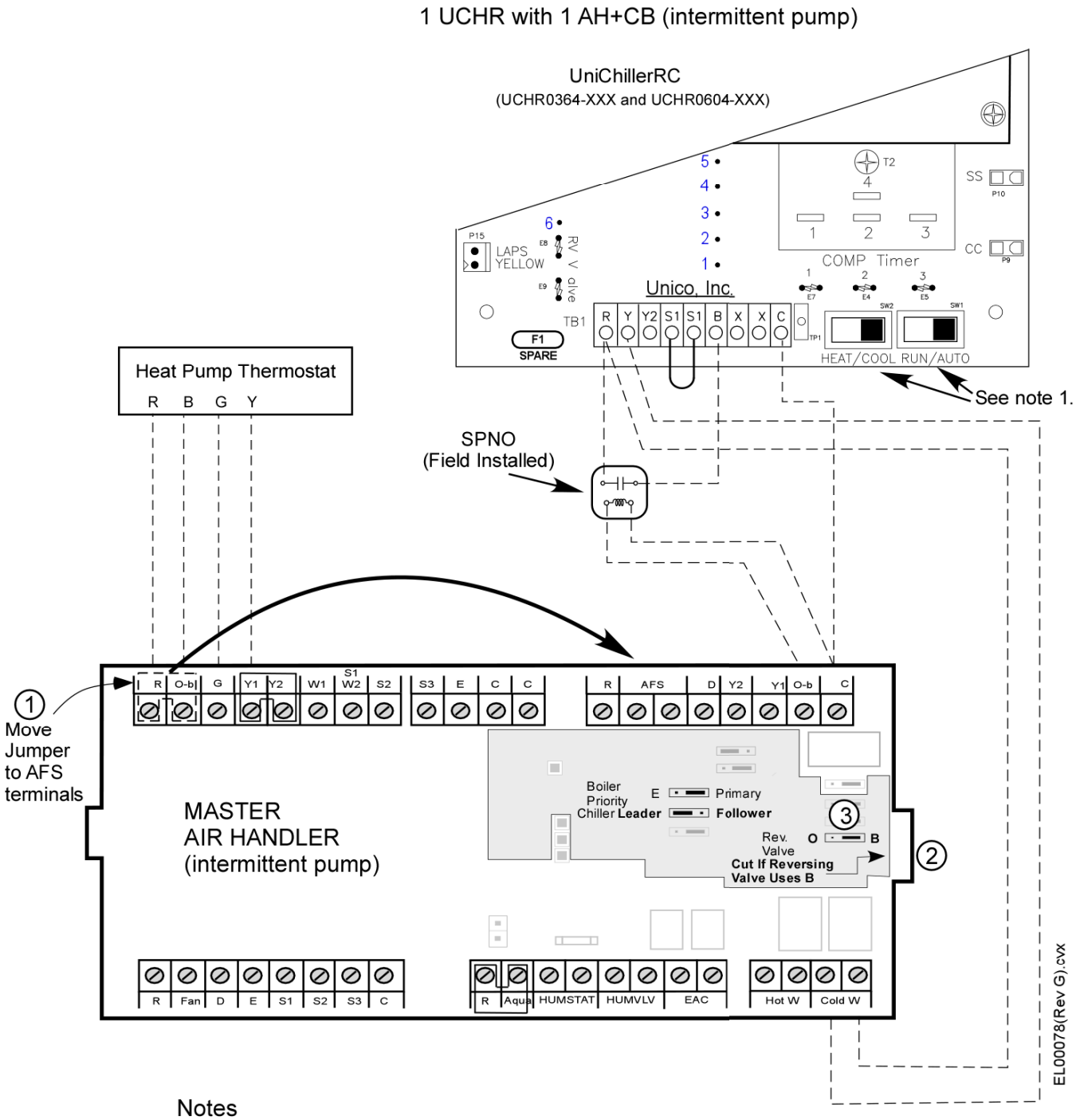
Diagram 9a – Multiple air handlers with one UniChiller, using zone valves (primary piping)

Diagram 9b – Multiple air handlers with one UniChiller, using zone pumps (primary-secondary piping)

Diagram 10 – Multiple air handlers with one UniChiller and backup electric or hot water heat

For multiple UniChillers, use a stage control as shown in the UniChiller instructions.

DIAGRAM 8. Single UniChillerRC with One Air Handler (Intermittent Pump)



Notes

1. Set Heat/Cool switch to Cool and the Run/Auto switch to Auto to have the Thermostat control the function of the board.

DIAGRAM 9a. One UniChillerRCs with One or more Air Handlers with Zone Valves

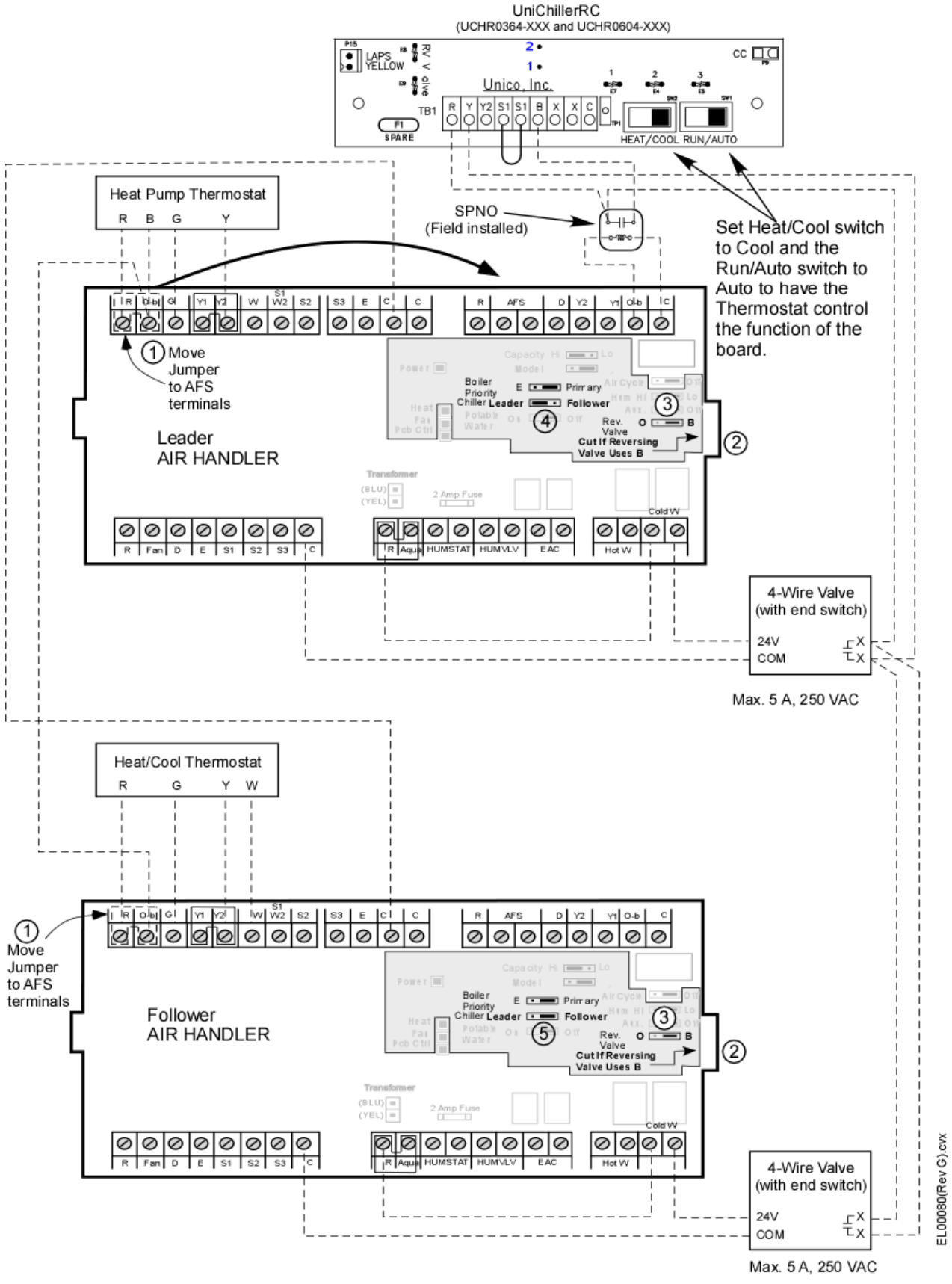


DIAGRAM 9b. One UniChillerRC with One or more Air Handlers with Zone Pumps

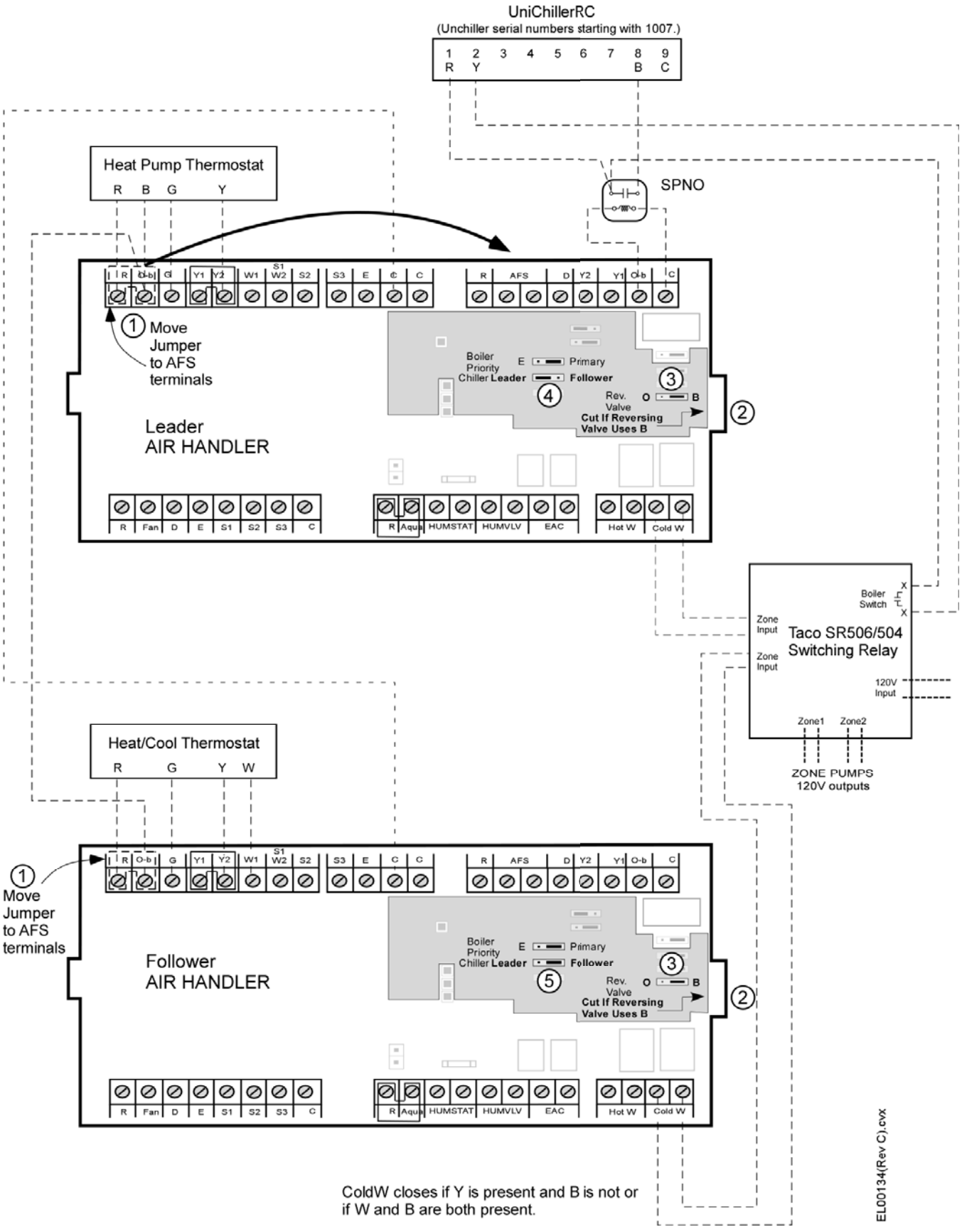
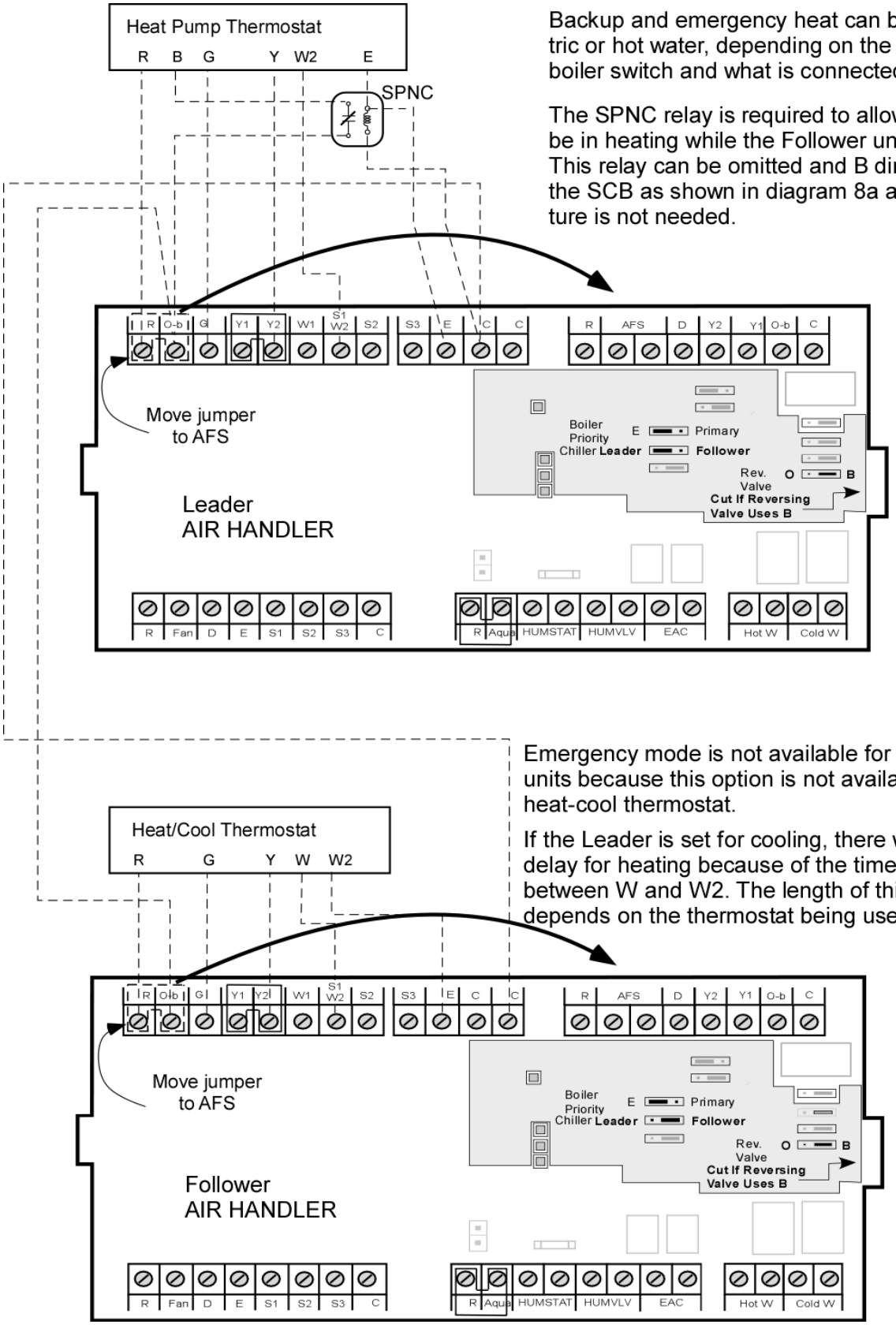


DIAGRAM 10. One UniChillerRC with One or more Air Handlers with Backup or Second Stage Heat



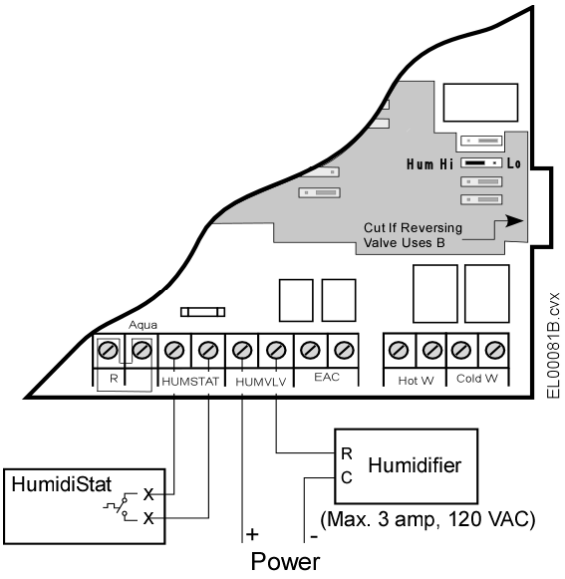
Backup and emergency heat can be either electric or hot water, depending on the position of the boiler switch and what is connected.

The SPNC relay is required to allow the Leader to be in heating while the Follower units are cooling. This relay can be omitted and B directly wired to the SCB as shown in diagram 8a and 8b if this feature is not needed.

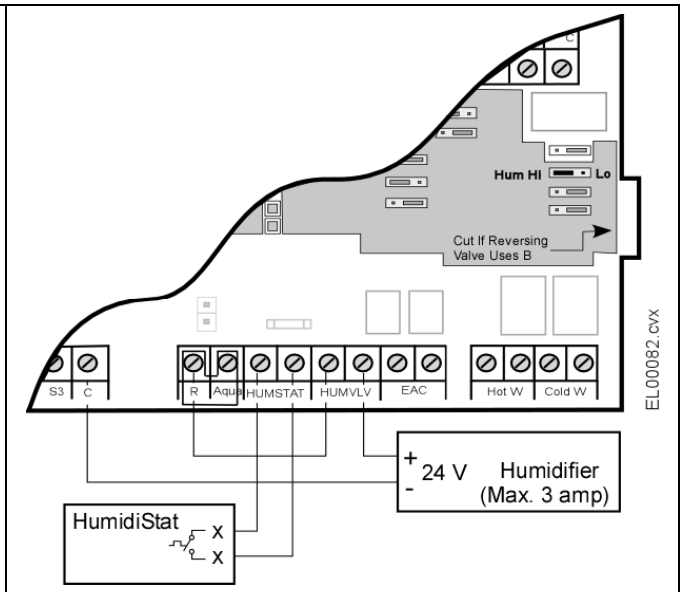
Emergency mode is not available for the Follower units because this option is not available with a heat-cool thermostat.

If the Leader is set for cooling, there will be a delay for heating because of the time delay between W and W2. The length of this time depends on the thermostat being used.

DIAGRAM 11. HUMIDITY SYSTEM



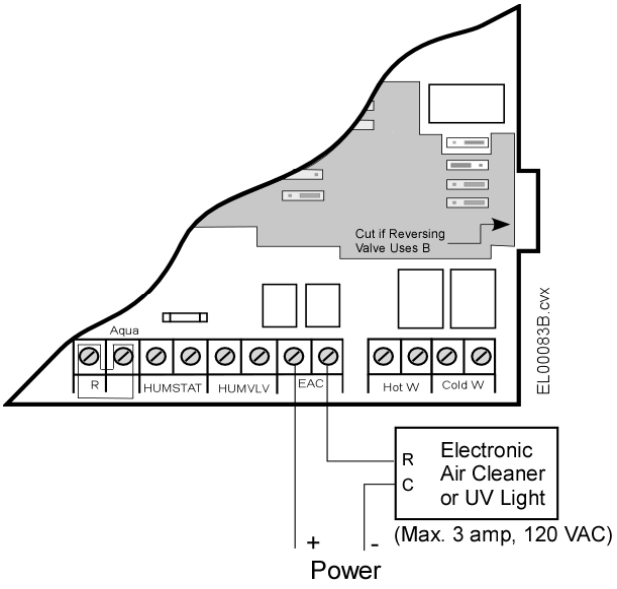
(for line voltage power humidifier or humidifier valve)



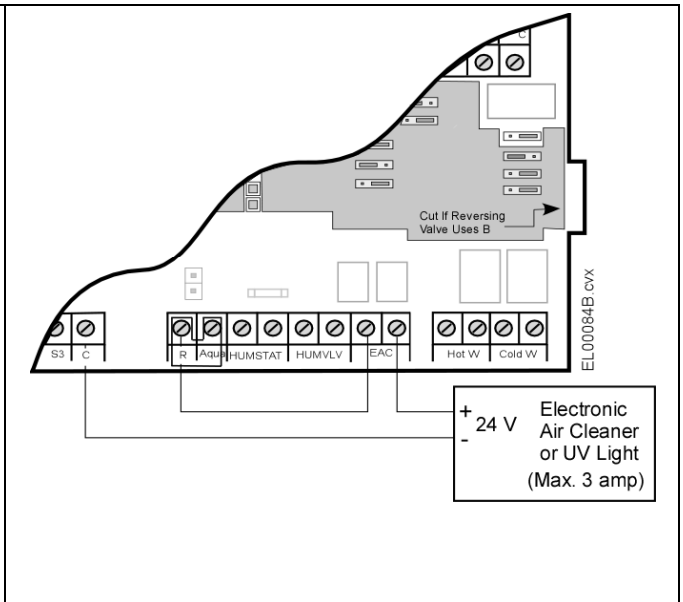
(for 24 V power humidifier or humidifier valve)

Set Humidity Control switch to proper position. The 'HI' position will energize the high fan speed in response to a call for humidity from the humidistat unless the fan is already in high. The Humidity Valve relay will than close and turns on the humidifier. If the switch is in the 'LOW' position, then the ventilation fan will energize and the Humidity Valve relay will close and turn on the humidifier.

DIAGRAM 12. Electronic Air Cleaner (EAC), Recovery Ventilator (ERV or HRV), or UV light connection



(for line voltage EAC or UV light)

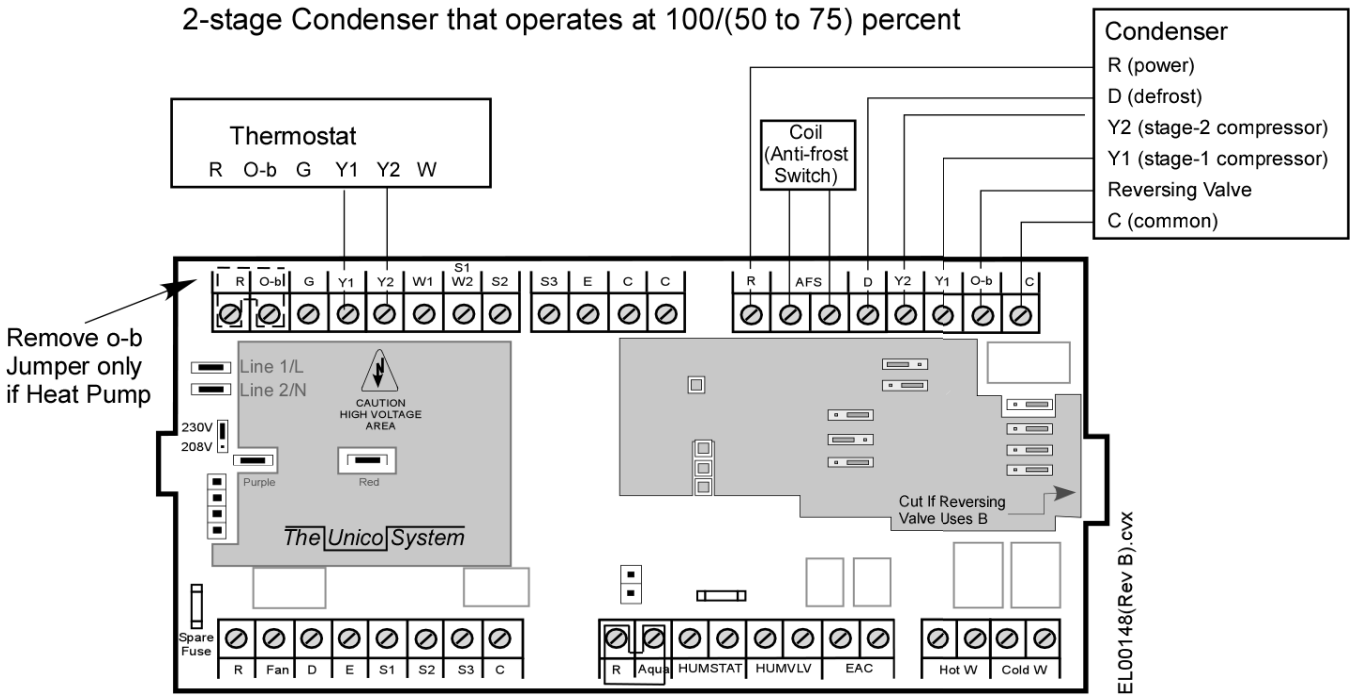


(for 24 V power EAC or UV light)

Diagram 12 shows how to connect an ERV, HRV, or EAC to turn on when the blower is on. Call Unico customer service for instructions if the ERV needs to operate on a predetermined time schedule.

DIAGRAM 13. Two-Stage (100/75) Condensers and Heat Pumps

Two-stage condensers and heat pumps operate between 100/75 and 100/50 capacity. To account for the variation in the second stage, Unico designed a feature into the SCB that allows the low speed (Y1) to match that of the outdoor unit. By default, Y1 will run at 75% of the Y2 setting. However, if the second stage of the condenser is something other than 75 percent, the SCB can be configured to match that of the outdoor unit via a simple change using lap top connection. For more information on how to make this change refer to page 19-21 (Programming the SCB).



External Wiring of SCB

The SCB connects to the EC motor using a combination of three different wiring harnesses. Each wiring harness uses either a quick disconnect or Molex plug for ease of termination.

Table 9. Wiring Harness Description

#	P/N	Description
1	A01473-001	"SCB Harness" -Connects to SCB and USB Board, Supplies power and communication to the Motor Harness.
2	A01474-001	"Data Cable" -Links SCB to USB board
3	A01472-001	"Motor Harness"- Connects directly to the Motor (**230V applications**).
4	A01472-002	"Motor Harness"- Connects directly to the Motor (**110V applications**).

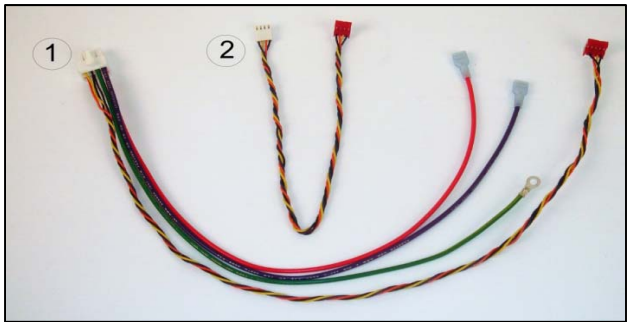


Figure 4. SCB Harness and Data Cable

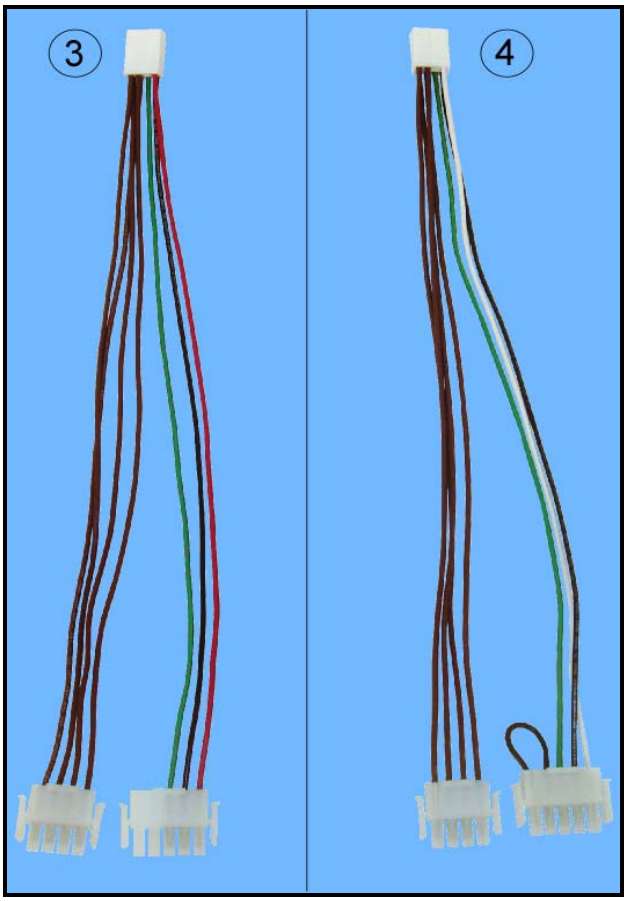


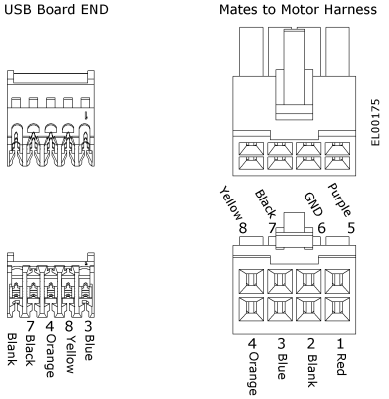
Figure 5. 230V Motor Harness **Figure 6. 110V Motor Harness**

Wiring Harness Pin Positions

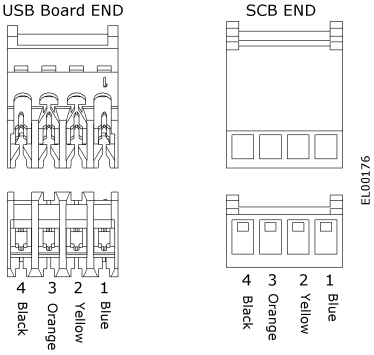
WARNING

Using the -002 (110V) Motor Harness at a supply voltage of 230V will damage the motor.

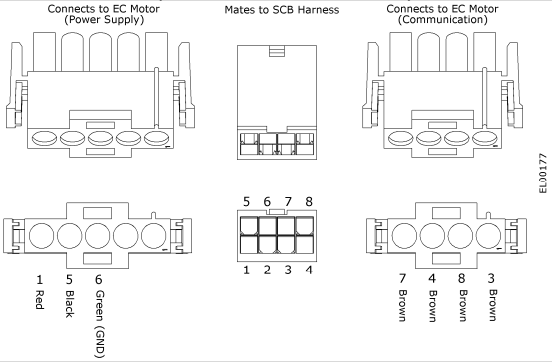
(1) A01473-001 (SCB Harness)



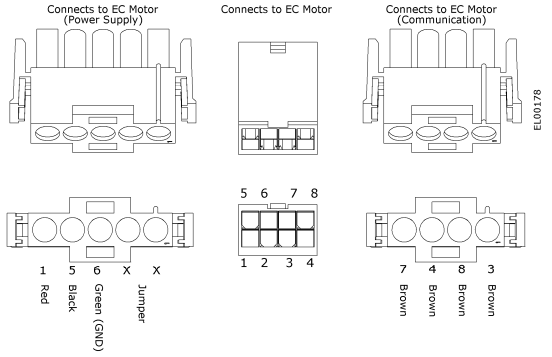
(2) A01474-001 (Data Cable)



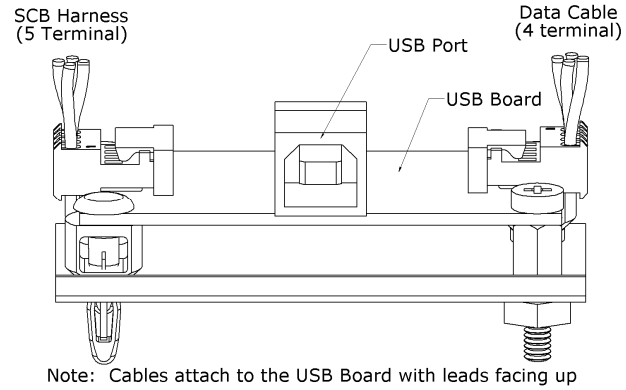
(3) A01472-001 (230V Motor Harness)



(4) A01472-002 (110V Motor Harness)



Cable Connection to the USB Board



Programming the SCB (ECM Config Software)

The SCB has a two different settings that are selectable using the 'capacity' switch on the board (see fig. 6). This will set the high-cool airflow per table 10 below. All other modes of operation are based on a percentage of the high-cool and are shown in Table 11.

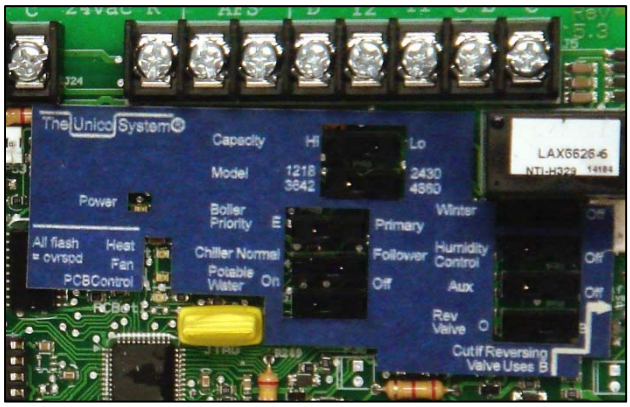


Figure 6. Model and airflow capacity selection switches

Table 10. High-Cool (Y2) Airflow defaults, CFM (L/s)

Model	Capacity Switch setting	
	Low	High
1218	300 (142)	400 (189)
2430	500 (236)	625 (294)
3642	750 (354)	875 (413)
4860	1000 (472)	1250 (590)

Table 11. Airflow defaults (for all modes)

Mode	Percentage (of high cool airflow)
Fan Recirculation (G)	50
Low Cool (Y1)	75
Low Heat (W1)	75
High Heat (W2)	100
Emergency Heat (E)	100

These settings are based on design airflow requirements for refrigerant cooling coils and should be sufficient for most applications. However, if you want to modify them, they can be individually modified via a computer linked to the USB port on the side of the control box (figure 7) using the Unico ECM Config software.

Figure 7. Location of USB (computer) port

Reset. At anytime, it is possible to reset the airflow settings to the factory default. This will erase any custom settings created with the software therefore only do this if you do not have a computer connected and are unsure if the airflow has been modified.

To reset the airflow to the default, change the postion of either the airflow capacity switch or the model switch. Then turn off the power to the SCB and then turn it on. The board will check the switch position each time it is first powered on. If the positions have been changed since the last time the board was on, the internal airflow values will be reset to the factory default.

Changing the postion of these switches when the unit is powered on or while it is off will have no effect unless the positions are different at the time it is turned on compared to the last time it was turned on.

Compatibility. The ECM Config software requires Windows XP, XP Pro, or Vista. The software also requires .NET version 3.5. A software installation CD ships with the SCB control box. Upon installation it will search your oporating system for the correct .NET framework and automatically install it if its not found. There is a known issue with .NET version 4.0 so you may need to downgrade.

Installing ECM Config software. The control ships with a software CD or you can download the software at www.unicosystem.com (Products | S.M.A.R.T board). If using the CD, simply insert and follow the instructions. If the installer does not automatically begin then go the the Start button, select RUN and type "*drive*://ECMconfi.msi".

If you have an older version of the software, you will first need to uninstall the older version.

Connecting your computer. After the software is installed, connect your computer to the control box using the USB cable (Type A/B) included with the control box. Start the program and apply power the control box. Your computer should immediately recognize the device and the software will indicate that it is connected.

Main Screen

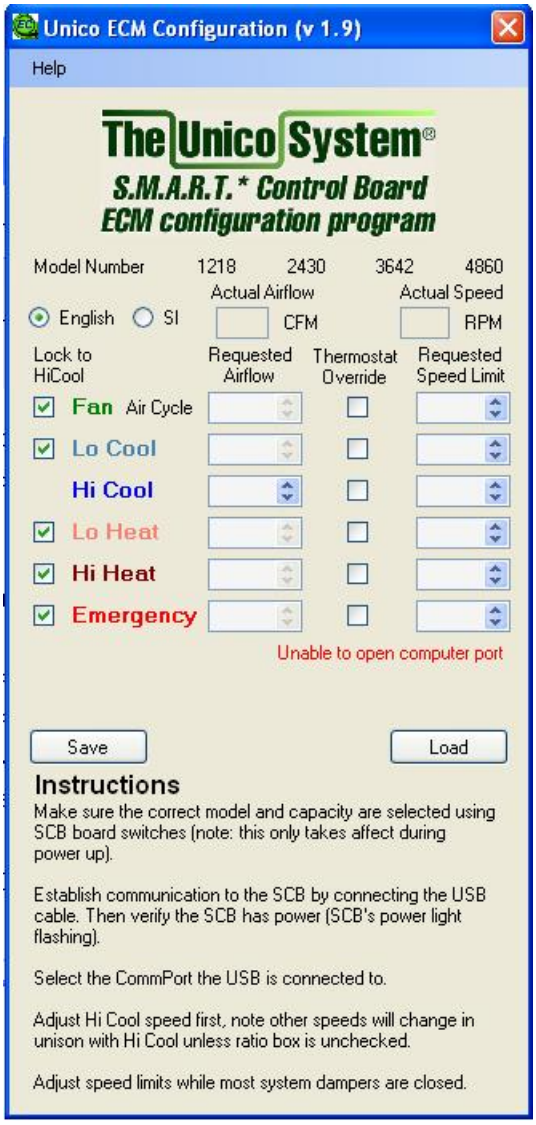


Figure 8. ECM Config. Main Menu

Messages

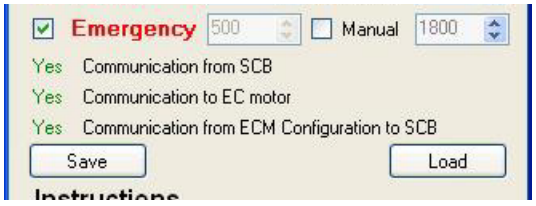


Figure 9. Communication Messages

The program checks for proper communication between your computer and the SCB, your computer and the EC motor, and between the SCB to the EC motor. If the links are good and properly communicating the program will indicate this as shown with a 'yes'. If there is a problem, you will see a 'no' with a brief explanation. The most likely problem is no power to the SCB or motor, or a bad cable.

Model Number

Figure 10. Model Selection

The model number of the unit is highlighted in the program. If the model number is incorrect, you simply change the position of the model number switch on the SCB. After changing the position of the switch, you must turn the power off then on again to the SCB in order for the board to remember the new setting. This action will also erase any customized settings so be sure to move the switch prior to changing the default airflow.

Unit of measure

Figure 11. Display Units

The program can easily be switched between English (CFM) and SI metric (m^3/s).

Actual airflow

Figure 12. Real Time Actual CFM

The program queries the motor for the airflow being requested by the SCB. The motor will ramp to this value so the output airflow of the blower may be delayed by a few seconds. This is obvious by observing that the RPM is changing.

Actual speed

Figure 13. Real Time Motor Speed

The program queries the motor for the motor speed in revolutions per minute. This value is exact and will fluctuate somewhat as the motor attempts to hold the airflow constant.

Lock to HiCool

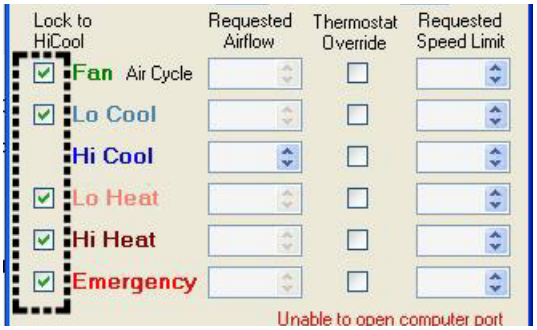


Figure 14. Lock to Percent

The airflow will be locked to the high cool (Y2) mode at the default percentage shown in table 11. To change the airflow in these modes, you must uncheck this box before changing the requested airflow.

Air cycle indicator

Figure 15. Air Cycle mode

If the air cycle switch is in the 'on' position, the program will display the words 'air cycle'. If the air cycle mode is active, then the Fan mode (G) will be highlighted yellow and the PCB control light on the board will be flashing.

Requested airflow

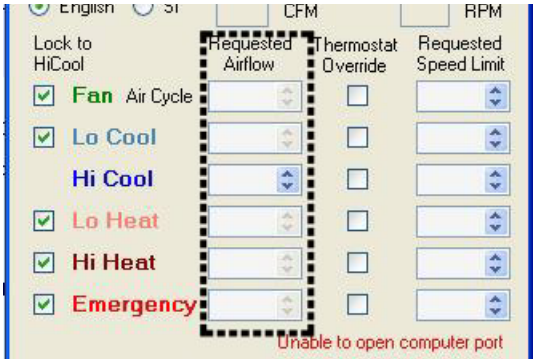


Figure 16. Requested Airflow

To modify the airflow for any mode, you can enter the airflow with the number pad or use the 'up/down' arrows to change incrementally. Any changes are saved to the SCB memory immediately. The program will not allow you to enter a value outside the minimum and maximum as shown in Table 12.

Table 12. Airflow range, CFM (L/s)

Model	Minimum	Maximum
1218	100 (47)	500 (236)
2430	200 (95)	750 (353)
3642	300 (142)	1200 (566)
4860	400 (189)	1500 (707)

Thermostat override

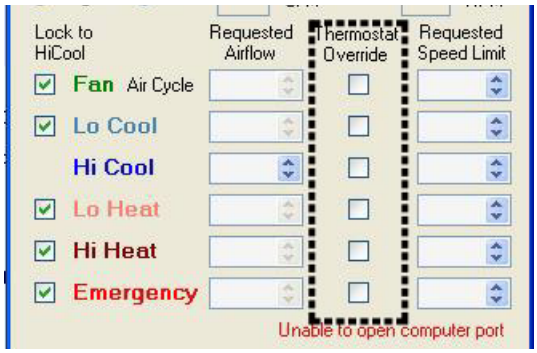


Figure 17. Thermostat Simulation

The thermostat override is for troubleshooting the system. These settings will not be retained in the SCB once the computer is disconnected. To simulate the operation of the thermostat simply click on the check box for the mode of operation you are troubleshooting. This will activate the blower and relays on the SCB; it will not turn on the condensing unit.

Save/load buttons

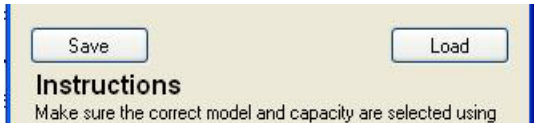


Figure 18. Save/Load functions

To save the current airflow settings to your computer, select the 'Save' button. You will be prompted to enter a file name and a location. This is a useful feature if you want to have a record how you set the unit or if you want to duplicate it in another unit. The 'Load' button will retrieve any saved settings. Again, it will prompt you for the file name and location. It is unnecessary to press 'Save' to store the airflow settings into the SCB memory. This is automatic.

Description of LEDs (light emitting diodes)

The SCB is equipped with several features that allow you to perform a quick trouble shoot without any additional equipment. There are four LED's (Power, Heat, Fan, and PCBctl) that will indicate what state the controller is in (refer to table 13).

Table 13. LED Chart

LED	Condition	Indication
Power (green)	Flashing	Board is functioning properly. If not flashing, remove and reapply power to air handler.
	Solid	24V is present, but unit not functioning properly.
Heat (red)	Off	System is not in heating mode.
	Solid	System is in the heating mode.
	Flashing	No communication to the motor. Check cables and power to motor.
Fan (green)	Off	(Electric heat mode only). Fan has not reached full speed or is off.
	Solid	Fan has reached full speed and will allow electric heater to come on.
PCBctl (red) Normal Mode	Off	Normal operation
	Flashing	Air Cycle mode, or in the Potable Water mode.
	Solid	Fan is at max RPM and is unable to achieve the programmed airflow. This normally indicates a restrictive duct system unless it is zoned system where the user has changed the maximum RPM.
PCBctl (red) Check CFM Mode	Long flash	100 CFM (only when Aux switch is in CFM Check position)
	Short flash	50 CFM (only when Aux switch is in CFM Check position)

TROUBLE SHOOTING

Default Airflow seems too High/Low

Check that the **Model switch** on the SCB is in the correct position. If not, select the appropriate model and cycle the power.

NOTE

IF THE MODEL SWITCH IS SET FOR 1218, THE BLOWER WILL SPIN COUNTER CLOCKWISE. IF THE MODEL SWITCH IS SET FOR 2430 THE BLOWER WILL SPIN CLOCKWISE.

Check the air flow against the default setting listed in table 10. The Aux switch activates the Check CFM function. When selected, the PCB Ctrl LED will flash the actual delivered CFM. A long flash indicates 100 cfm and a short flash indicates 50 cfm (example: 7 long flashes followed by a short flash indicate an actual airflow of 750 cfm).

Fan does not run

"Power" LED off? SCB is not receiving power. The SCB LED's are activated by 24V. Check to make sure the transformer is getting 230V or 110V and then check to make sure the output of the transformer is delivering 24V (Common problem is a loose connection).

"Power" LED on but not flashing? SCB has power but processor is not executing. Disconnect power, wait 10 seconds, reconnect power.

Is the thermostat energizing G, W or Y? Check if 24Vac exists from C to G, W, Y1, Y2, or E. If no voltage exists on any of these, check connection between SCB and the thermostat. Check connection at the thermostat or replace the thermostat.

If 24vAC does exist on G, W, or Y check the Heat LED on the SCB. Flashing indicates the motor has lost communication. Inspect the connections between the control box and the motor. Disconnect and reseat the motor connector. Check that the motor is free to turn.

Fan runs without demand from thermostat

Is PCBctl LED lit? This is normal. The fan is running because of a built-in turn-off delay, or the winter switch is activated, or "Humidity always" is selected and the humidistat is demanding water.

Is "Power" LED flashing? If not, the processor has stopped executing, remove and reapply power.

Heat pump compressor runs in heat mode but does not run for air conditioning.

AFS (automatic frost switch) input is open. The AFS terminals must be connected to a frost switch.

Heat pump compressor runs but is cooling when it should be heating or heating when it should be cooling.

Is the "Reversing Valve" switch set properly? (If the outdoor reversing valve requires 24vac for heating, then the Reversing Valve switch should be switched to "B" and the jumper wire must be cut.

3rd stage electric heat (S3) does not energize

Is the thermostat demanding heat pump operation? This is normal. The third stage is disabled during heat pump operation.