

V18 Installation and Operation Manual

Thank you for purchasing the worlds most advanced and efficient hydronic backup heating solution for air-to-water heat pumps. The V18 adds backup heat in the precise amount needed with variable & automatic real time control. For use with Chiltrix air-to-water heat pumps. Stand-alone version coming soon.

NOT For DHW backup, the V18 is for space heating backup only.

NOT for use with Chiltrix onboard dynamic outdoor reset control feature.

WARNING!

THIS PRODUCT USES HIGH VOLTAGE ELECTRICITY!

DO NOT OPEN OR SERVICE THIS DEVICE UNLESS POWER HAS BEEN DISCONNECTED

This product must be assembled and installed by a licensed electrician in a manner that conforms with all national and local electrical and safety codes. All high voltage electrical components meet UL requirements.

SERVICE OR REPAIR TO BE PERFORMED ONLY BY A LICENSED ELECTRICIAN

DO NOT DRY FIRE THIS DEVICE / INSTALL VERTICALLY

USE 208-240V 30a Circuit with GFCI Breaker.

Note special procedure for chilled water capable systems.

Read the entire manual before beginning installation.

Follow all instructions.



The V18 communicates with the Chiltrix air-to-water heat pump via MODBUS. The Chiltrix heat pump always understands the load as part of its capacity management program, as such, if a heating shortfall is detected, the quantity of such shortfall is known.

Real time monitoring and calculation allow the Chiltrix air-to-water heat pump to operate with the V18 such that only the needed amount of extra heat is added.

Power increments of adjustment as small as 27.5 watts are possible, as needed, for precise control.

Note, the 5.5 kW rating is for 240v line voltage and is equal to 18,760 BTU.

Actual max heating BTU is determined by your local line voltage.

Standard included element is rated for 240v, 5500w, and 18,760 BTU.

Voltage deratings for a 5500w element rated at 240v if used at a different voltage (Ohms Law):

230v= Up to 5051w (17,234 BTU)

220v= Up to 4621w (15,766 BTU)

208v= Up to 4131w (14,094 BTU)

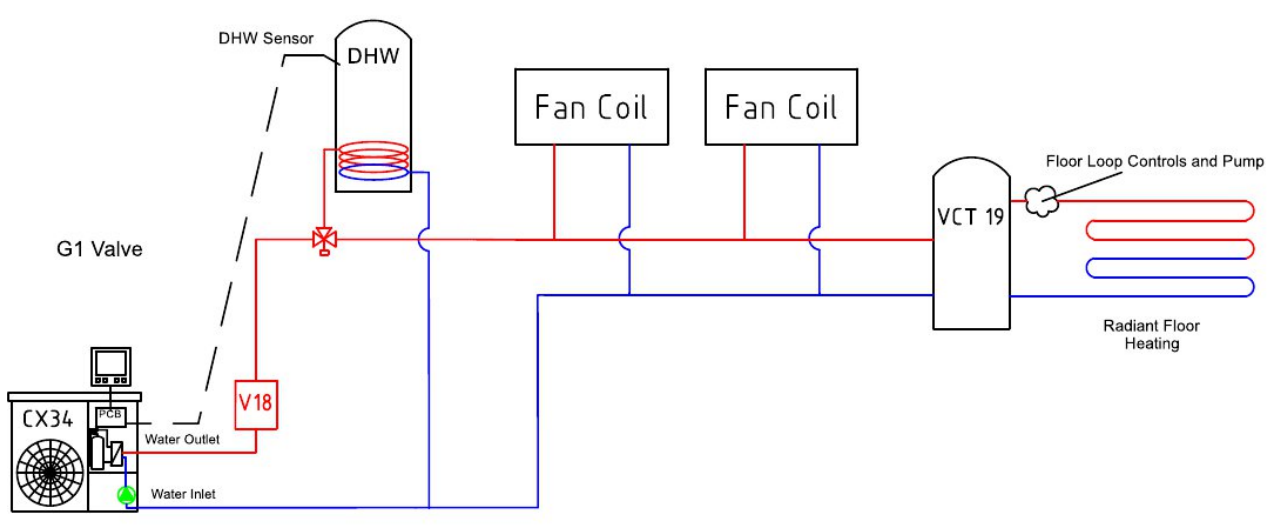
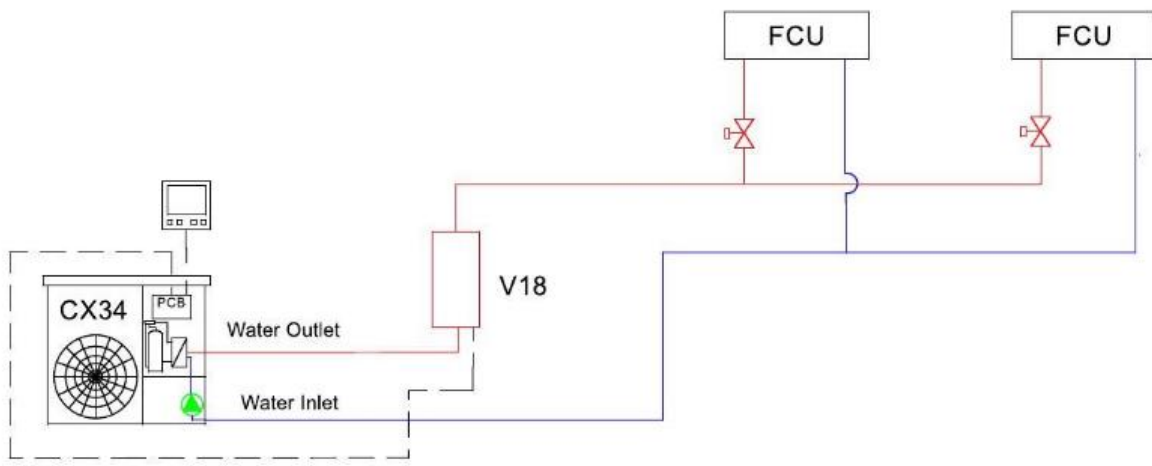


Shown above: V18 mounted on a painted plywood board with Uni-struts.

The pipe fittings are NPT 2" female, use a bushing or adapter to match it to your piping. Always use Teflon tape for any threaded pipe connection.

The above image shows an optional extension pipe which is generally not needed and is not included.

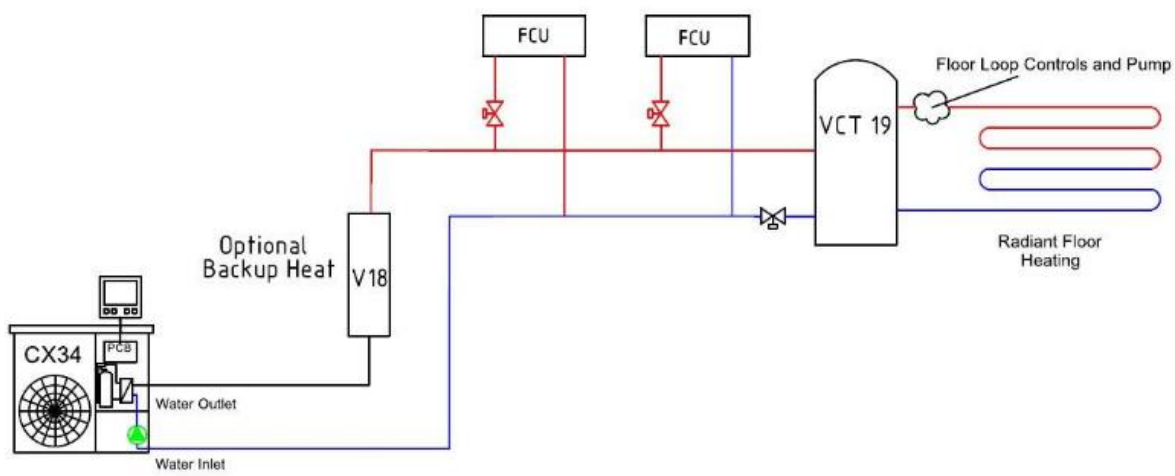
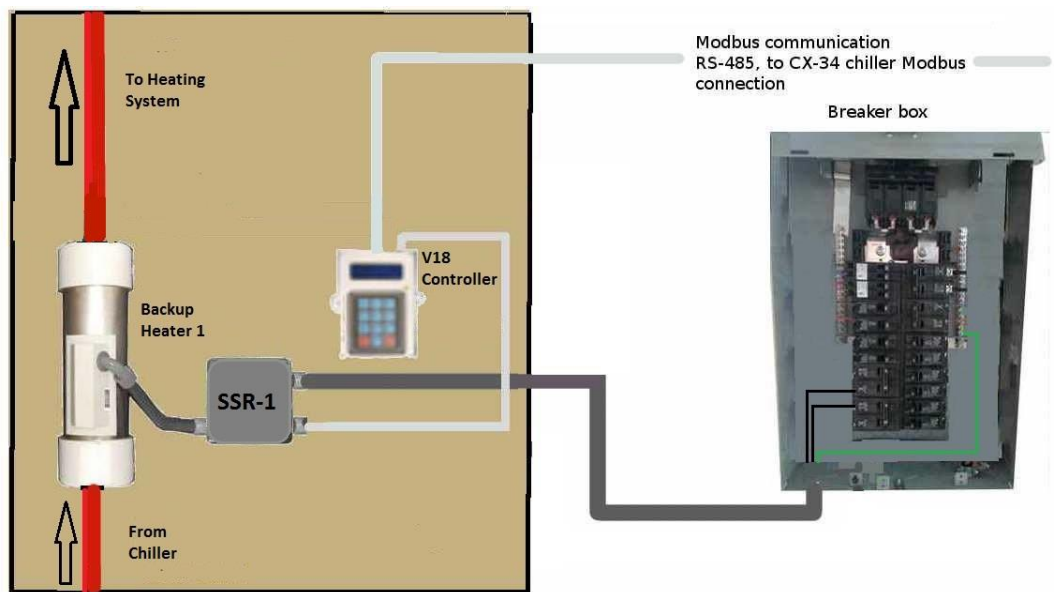
Example showing proper placement. Always installed *before* any loads, and *before* the DHW valve (if DHW is used in the system) or *before" and G3 valve (if used). See proper placement in the following examples.

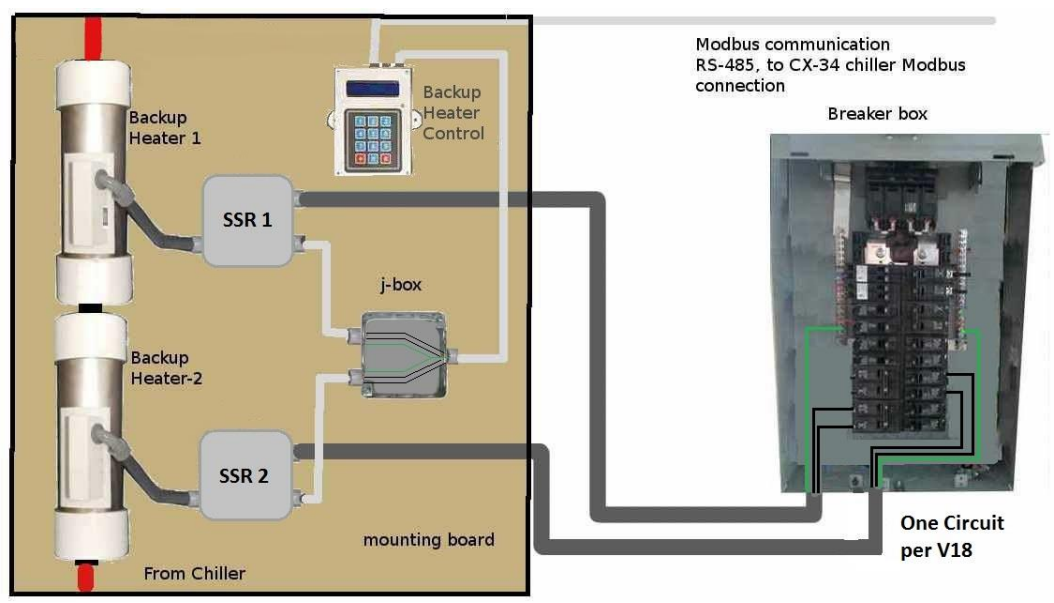


Installation

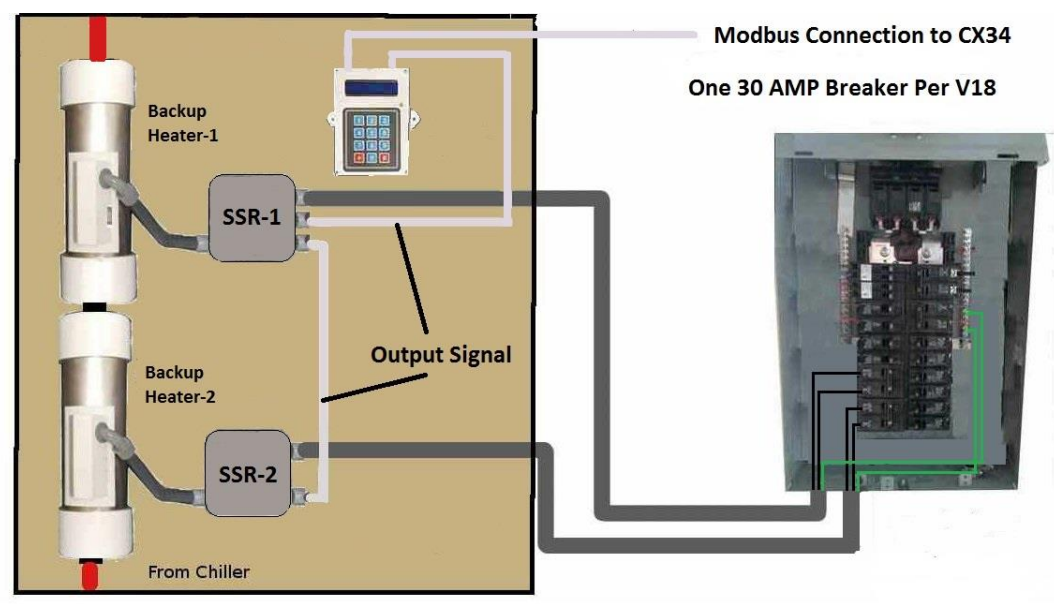
The in-line V18 Heater unit(s) must be installed indoors, in the main chiller loop between the Chiltrix outdoor unit(s) and any loads such as fan coils, air handler, or buffer tank. If DHW is used, the V18 would be before the G1 valve and before any loads. See drawings below. The V18 should be mounted on a board with the heating element mounted vertically. Mounting it horizontally could trap air bubbles that could cause flow or overheating problems.

THE V18 MUST MOUNT VERTICALLY. DO NOT MOUNT HORIZONTALLY.





Two V18 inline heaters may be mounted together (series piping), note they are wired separately for power, each with a 30 GFCI circuit for main power. Control circuits are wired in parallel and one controller can manage up to 3x V18 units.



Wiring

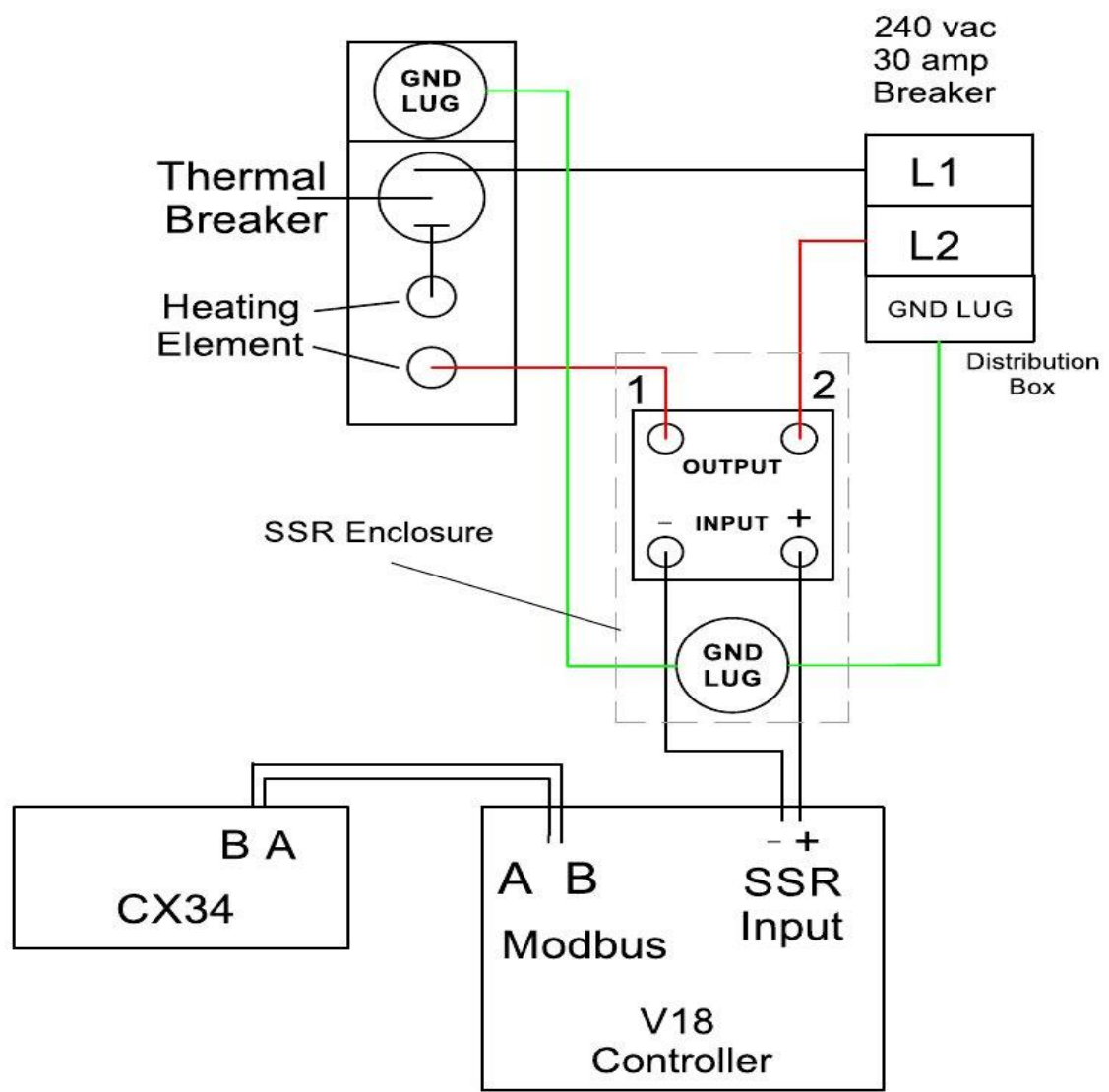
Power Wiring

Power to operate the Heating element in the In-line Heater(s) comes from a 2 pole 208 to 240 VAC GFCI circuit breaker, via an included Solid State Relay (SSR) used to provide real time control over the power level and manage the rate of addition of heat to the Chiltrix main loop.

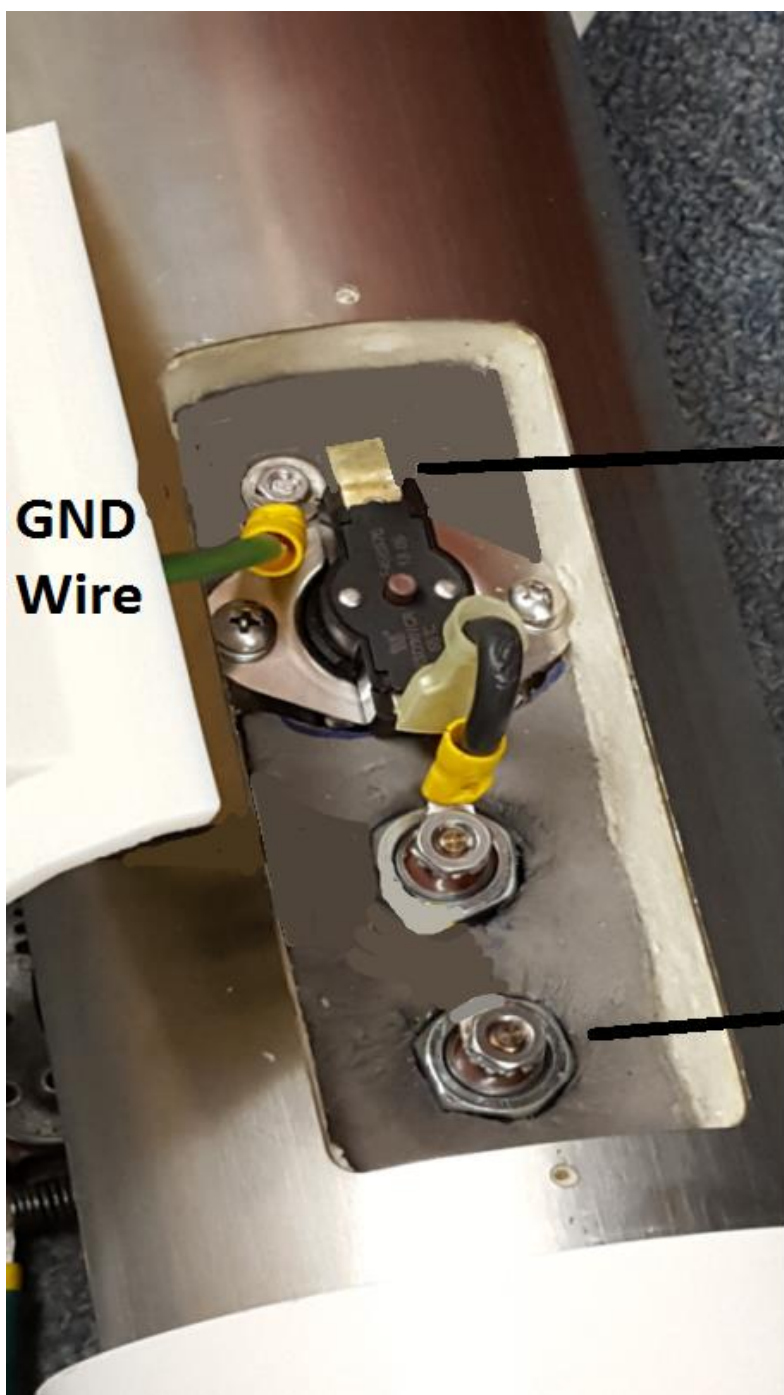
The power from one circuit breaker pole (L1) passes through the relay box and connects directly to the in-line heater's thermal interrupt device.

Power from the other circuit breaker pole(L2) is connected to the SSR and its conductor is connected to the Relay's terminal #2. The Relay's terminal #1 is connected to the in-line heater's heating element. See below.

MAKE SURE GROUNDING IS DONE PROPERLY!



Assembly of this system and all connections to the buildings electrical power system should be performed by a qualified licensed electrician according to local and national electric codes.



CHILLED WATER

IMPORTANT NOTE*

If the V18 will be installed in a system that performs cooling operation at times, make sure to thoroughly seal around the white ABS cover and inside the Liquidtight conduit with silicone as a minimum precaution.

The requirement is to prevent air from entering the V18 inside the white ABS cover and contacting the cold pipe or components which could cause condensation to form and accumulate inside the unit.

For higher humidity locations you may also consider filling the entire cavity (but not cover the reset button) with an electronics-grade RTV silicone potting material rated for this type of application.

When using a potting material, use it only per-code and according to the materials instructions, make sure to allow the material to fully cure before attaching the cover.

Make sure power is disconnected before and during this operation.

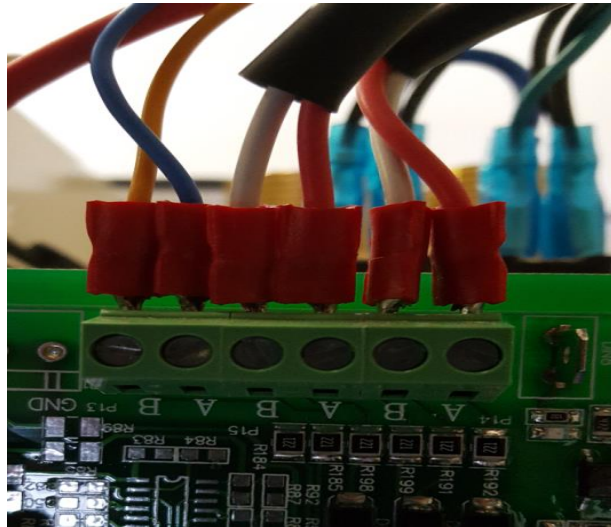
Control Wiring

Output Cable

Control wiring from the V18 controller to the SSR(s) consists of a cable sub-assembly with ring terminals at one end and a 1/8" stereo plug at the other. The plug is inserted into the 1/8" receptacle on the top right of the controller, connect the wire end with the ring terminals to terminal #3 (+) red wire and terminal #4 (-) black wire on the solid state relay (SSR). If more than one in-line heater/SSR arrangement is used then a jumper cable sub assemble is used. It consists of a cable with ring terminals at both ends, connecting the red to terminal #3 (+) and black (-) to terminal #4. A junction box could also be used for this purpose (see illustrations on page 6) .



Jumper cable, one for each additional V18



CX34 Modbus connection above

Modbus Cable

The Modbus cable used for the V18 backup heater has a 1/8" stereo plug on the end that is plugged into the port on the heater controller labeled "Modbus". Connect the white conductor to the CX-34's Modbus "B" terminal, and the green conductor to the "A" terminal on the main logic pcb inside the CX34.

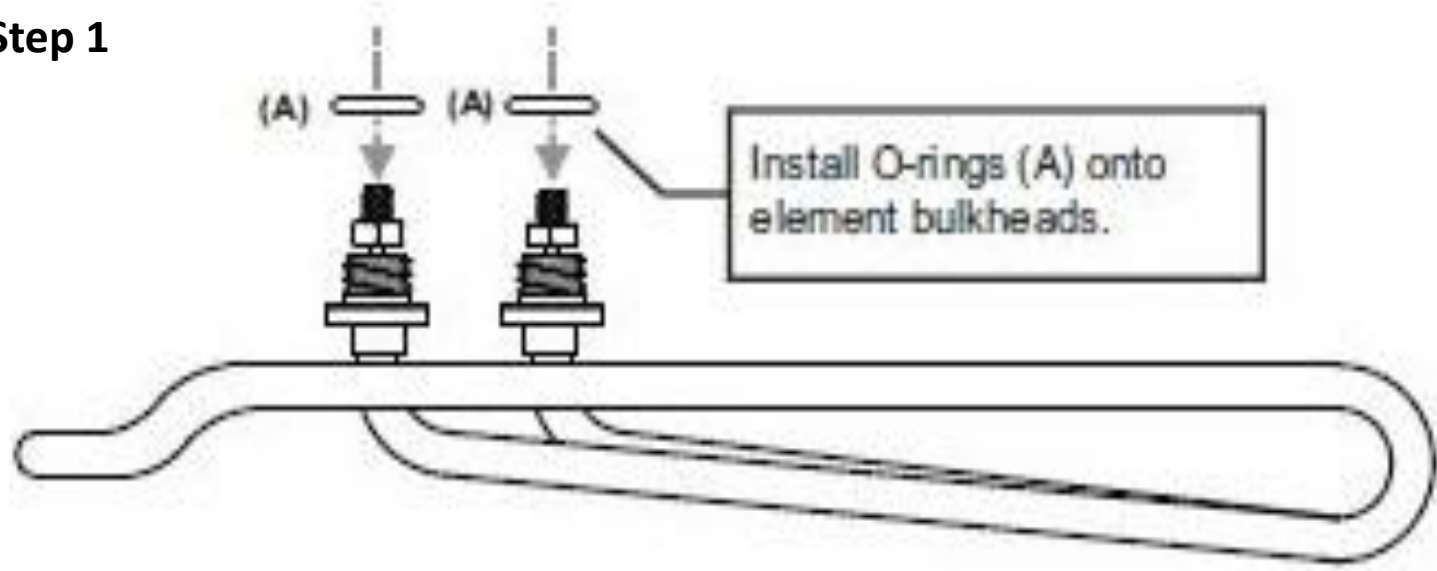
Note that other devices may be plugged into the Chiltrix "A&B" terminals, a pigtail may be necessary to connect all Modbus wires. The other end of the cable has a 1/8" stereo plug which is inserted into V18 Controller in the top left receptacle.

ASSEMBLING COMPONENTS

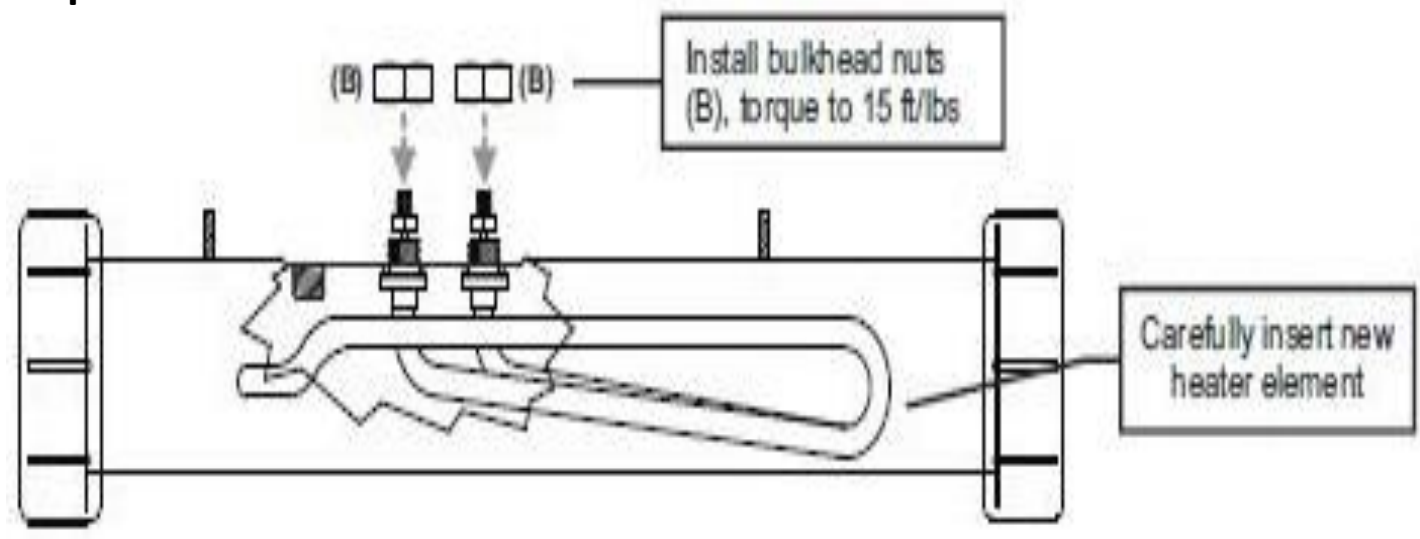
HEATER ELEMENT REPLACEMENT INSTRUCTIONS

CAUTION – During assembly/installation or after removing an element for replacement, assure that all inner and outer sealing surfaces are clean and free of debris prior to installing the new o-rings and element or leaks may occur.

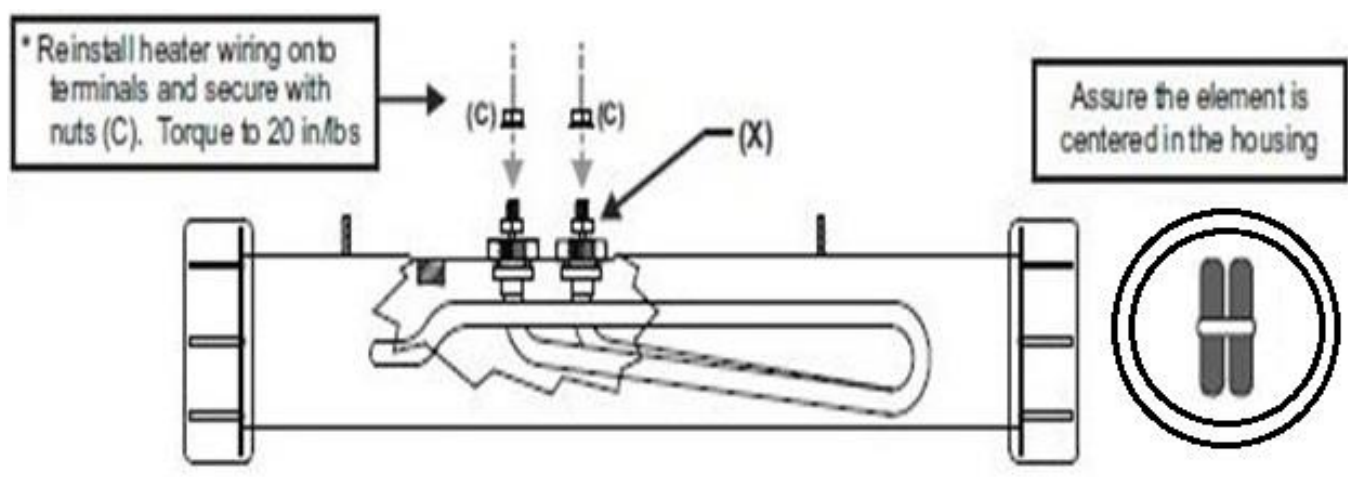
Step 1



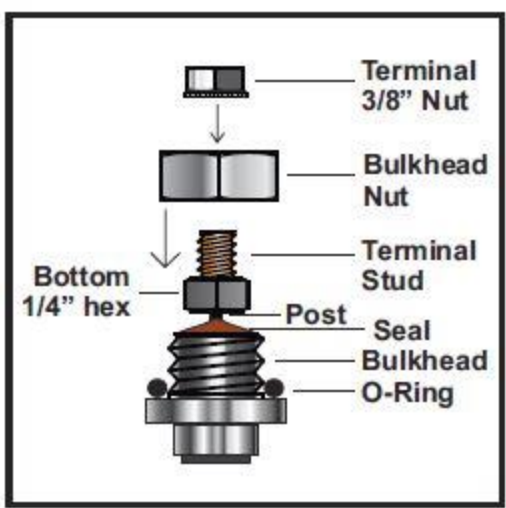
Step 2



Step 3



WARNING: Hold the Bottom Hex (x) with a 1/4" open end wrench when tightening the Terminal Nut to prevent rotation and damage to the epoxy end seal.



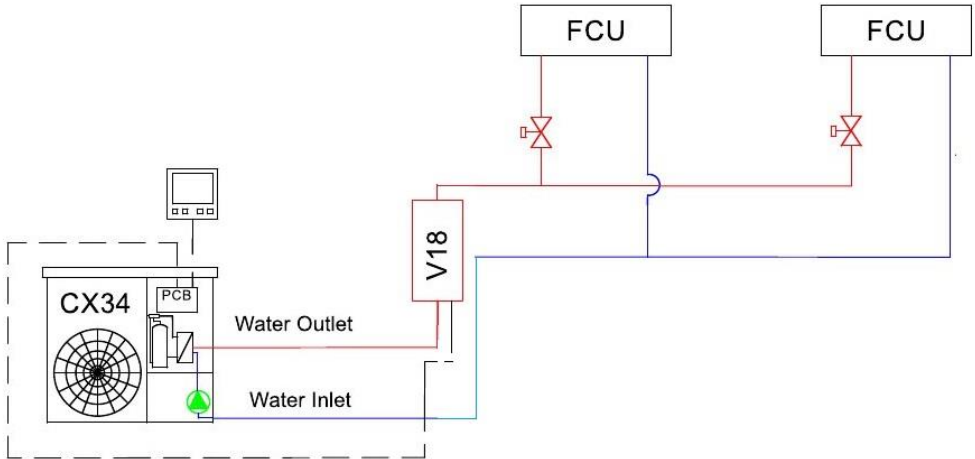
- PARTS INCLUDED**
- (A) - 60-0022 - O-Ring (2ea)
 - (B) - 01-0010 - Nut, 1/2"x 20 (2ea)
 - (C) - 01-0035 - Nut, K-Lock #10-32 (2ea)

- TORQUE SETTINGS**
- 3/4" Bulkhead Nuts = 15 ft/lbs
 - 3/8" Terminal Nuts = 20 in/lbs

Note, if you replace an element, make sure to change the V18 controller parameters #10 (and #12) as needed, to the correct volt/watts ratings. If you are using 2 or 3 heaters with the same V18 controller **the elements may be of different watts ratings as long as they are rated at the same voltage.** Use the total watts of all elements that are connected to the same controller. For parameter #10. The standard element is 5500w. A max 6000w element can be used.

Plumbing

The in-line V18 Heater unit(s) are installed in-doors, in the main chiller loop between the CX-34 outdoor unit(s) and Load (building's Hydronic system), as near to the CX-34 chiller as practical. See illustration below.



The inline heater units have 2" NTP female connections at either end. Install 2" NTP pipe nipple(s) to connect two heater units together in series. Install 2" NTP bushings or adapter fittings to match up to the plumbing.

Use Teflon tape on all threaded fittings to prevent leaks. Once the heater units are installed, pressurize your loop and check for any leaks. Flush fill, and pressurize the loop according to the Chiltrix Installation and Operations Manual.



Programming the V18 Controller

Note: Ensure that the circuit breaker is off until program setup is complete

Ensure that the all circuit breakers feeding the in-line heater unit(s) are off at this point. Plug in the wall transformer power pack and plug the power connector into its socket on the right side of the controller. The controller will go through a quick boot phase indicating that the system has not yet been set up.

It will recommend that "*" is pressed to go into setup mode. Pressing "*" at any time during operation will put the system in this mode.

The unit will display the quantity of watts that are available to the system based on the default settings. The settings on the operational display show the current temperatures and other parameters as they become available.

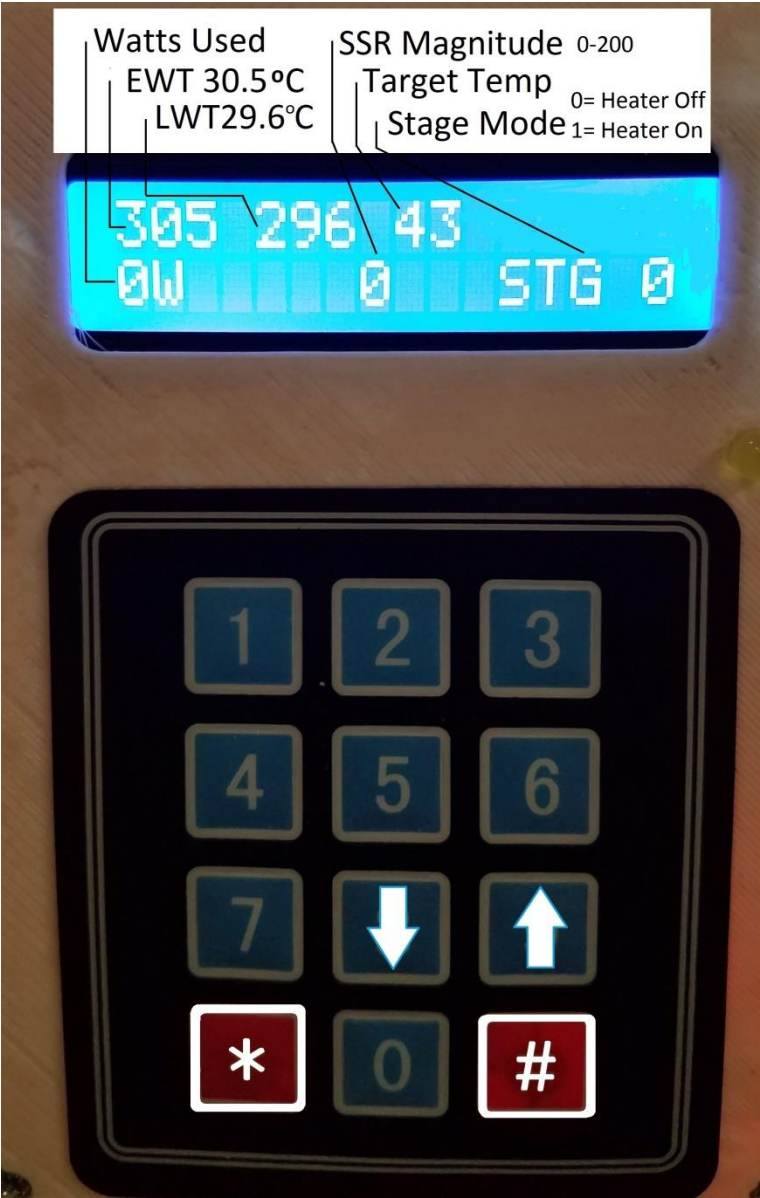
Controller setup

The V18 LV controller is designed to work in Modbus Master Mode when the unit operates with a standalone CX-34 chiller without a Psychrologix controller. If the installation has multiple standalone chillers, then multiple V18 LV controllers are needed, one for each chiller.

In a single chiller setup, or a multi chiller setup with a common heating and cooling loop, a Psychrologix Controller must be used and the V18 LV controller must be setup in Slave Mode.

Likewise, a single Chiltrix unit setup, if using the Psychrologix controller, the V18 will also require setup as Slave Mode.

A Modbus data network cannot have more than one Master. See parameter number 4 in the parameter chart on page 15.



Pressing the * key will put the controller in setup mode.

Use the up/down, 8 or 9 keys to select the parameter to be changed.

Press * to open the parameter, the parameter will flash.

Use the up or down keys to change the parameter value, then press the * key to save the value.

The controller will reboot after each parameter change and the main screen will appear.

If the controller does not reboot after all the parameter changes, de-energize the controller by unplugging its power supply, then re-power the unit after 5 seconds to reboot.

In Master mode, data population happens pretty quickly, less than a minute, in slave mode, the Psychrologix controller Auto-finds the V18 controller; this could take up to 5 minutes.



Setup Parameter Menu Items

Number	Description	Units	Default
1	Targ Trig offset	Degrees ° C	3
2	Target Setback	Degrees ° C	3
3	Ambient Air trig	Degrees ° C	12
4	Slave 1 Master 2	Mode	0 See note 1 below
5	Multiplier		100 x .01
6	Stage1 Delay	Min	3
7	LWT2 OffSet	Degrees ° C	N/A
8	System Exit Time	Min	5
9	Water Factor	WF	448 (Must use table below)
10	Heater Rating (Total)	X 100 Watts	55
11	Measured Line Voltage	VAC	240 (Must Measure)
12	Rated Voltage	VAC	240 (Read from Element)

When installing a single V18 with the original element, the only parameters that have to be changed from default are #4, #9, and #11. #4 must be setup to “Mode 1” SLAVE or “Mode 2” MASTER. Mode “0” forces system to be at least minimally setup before it will operate the backup element. We suggest to not ever change parameters 1-3 or 5-8 unless directed to do so by the Chiltrix technical support dept. When using 2-3x V18s heaters with a single V18 controller, #10 must be set to the TOTAL watts rating of all elements. If using replacement element(s), note that all elements must have the same voltage rating.

Percentage of Propylene Glycol	Water Factor
0	500
5	495
10	490
15	485
20	480
25	473
30	467
35	457
40	447
45	436
50	425

Note 1 (Regarding parameter 4 above)

This is the mode of the unit. Its default “0” indicates the setup has yet to be initiated.

“1” sets the controller in slave mode to work with the Psychrologix controller and other CX-34 chillers. “2” or greater puts the unit in master mode allowing it to operate independently.



Notes Re: Controllers

When the V18 is active, any changes to temperature parameters entered via the standard controller or via the Psychrologix controller (including outdoor reset) will be ignored.

Outdoor Reset function, if used in the Psychrologix controller, must be set at to least 1 degree higher ambient trigger than what is set as the V18 parameter 3 (outdoor air trigger).

If using the CX34 onboard dynamic outdoor heat reset control function, see the addendum: **Bulletin Regarding V18 Operation in conjunction with the cX-34's Built-in Reset Function.**

For any changes needed to loop temperature or to change the DHW status (on/off) please disable V18 controller until this change has been made from the other controller.

Multiple V18s

When using multiple V18s, parameter #10 rated watts should be entered as the total of all elements. Both (all) elements must be the of same rated voltage.



V18 Installer Testing

In order to test the V-18 after first installed (after communication with Chiltrix heat pump has been established) the following steps are used. The objective is to force the backup heater to switch on briefly, and in a shorter than nominal time.

1. Run the chiller in cooling mode, if needed, until the returning fluid temperature (EWT) is below 21c (72F).
2. Put the chiller in standby.
3. Disconnect Psychrologix controller (if installed).
4. On V-18 controller, reset the following setup as follows:
 - a) #1 Target Trigger Offset to "0"
 - b) #3 Ambient Air Temp to 30
 - c) #4 Mode to Master "2"
 - d) #6 Stage Delay to 1 min
 - e) #8 System Exit Time to 1 min
4. Disconnect power from V-18 controller and re-energize to accept settings changes.
5. If a "clamp on" Ammeter is available, it should be installed on one of the legs feeding the heating element, from the breaker panel is fine. If an ammeter is not available and the location of the V-18 is very quiet, sound emanating from the V-18 (a slight hissing) may be heard from the V18 indicating that it is operating. The Ammeter should read around 20 amps with the element energized (when a standard 5500w element).
6. Start the chiller in heating mode with the EWT target temp at 45°C
7. As the chiller starts, permissive errors, as seen on the right top of the V-18 controllers LCD screen, begin to clear, "off", "W0", "Hamb" etc. as water begins to flow and mode signals change, with the EWT Lower than the Target Temp, you will see a count down from 60 in blocks of about 7 or 8 seconds. Once this times out to zero, the blue LED on the controller, and the red LED on the Solid State Relay should turn on, and Stage indicate "1" with a Magnitude of 200 should be displayed.
8. Did it work? At this same time as the Magnitude changes to 200 the Clamp on ammeter should show a load of around 20-25 amps. If no ammeter is used, the V18 should make a soft hissing sound (similar to the sound a pot of water makes just prior to reaching a boil).within a few seconds.
9. If the expected amps (or sound) is not detected, refer to the troubleshooting section or call Chiltrix technical support at 757-410-8640 ext. 112
10. With the test complete, disconnect power to the V18 controller, set the Chiltrix heat pump to its correct operational settings, reconnect power to the V18 controller and reset the V18 settings as explained in this manual.



Troubleshooting

The backup heater is off by default. Activation can only occur under certain strict conditions and only if backup heat is needed. There are 4 levels of safety.

- The GFCI breaker will trip if there is a ground fault. This protects the system in the event of a short circuit or loose wire in the power wiring.
- An internal thermal circuit breaker will trip if the heater exceeds 150°F . Reset for this control is manual. See below.
- There are a number of permissive factors that will inhibit the firing of the SSR. There must be minimal fluid flow, the CX-34 unit(s) must be on (not in standby) and in a heating mode, the ambient outside temperature must be below a set point, there can be no errors posted from any connected Chillers, and there can be no MODBUS communications errors.
- The backup heater control relies on data from the CX-34 chiller(s). This data is critical for control and safety functions. Any loss of communication is detected within one second and a communication error is posted to the LCD screen, and output, as noted above, is halted.

The following indicate a communications error:

If the controller is in Master Mode, and indicates “Communication Error (100, 20, or 120)” then the controller is unable to confirm commands sent to the CX-34. If the controller is in Slave Mode and indicates “Communication Error (3)” then the controller is not able to receive data from the attached Psychrologix controller. The usual cause of these errors is shorted or disconnected Modbus wires, incorrect Modbus wire termination (wrong terminals , or “A” + “B” reversed) or incorrect Modbus address on the CX-34(s).

Note that the Psychrologix controller can take up to 5 min to detect the V-18 back up heater controller, and could produce “Communication Error (3)” until this times out.

Visual indicators: AFTER DISCONNECTING AC POWER, Remove the cover from the gang box exposing the Solid State Relay. If the units are receiving a firing signal, the LED on the controller front, and the red LED on the SSR(s) will be lit. If the LEDs are lit, then power will be sent to the units when the circuit breaker is on.

As noted, the second-level safety feature we have included is a safety switch, a UL-Listed bi-metal thermal overload switch that opens and breaks the element power connection in case of temperature rising above 150°F. It is attached to the heater barrel interior wall.

Troubleshooting (cont'd)

The V-18 controller monitors system conditions via the CX-34 directly (Master mode) via a connected Psychrologix controller (Slave mode).

Activation of the backup heater is indicated by a change in stage from "0" to "1". While in backup heater mode (stage 1) the system heating element(s) indicate firing with flashing of the blue LED on the controller and red LED on the individual Solid State Relays (SSRs). Before the system can go into backup heating, certain conditions have to be met and maintained for operation in order to ensure safety and proper performance, as follows:

No Errors may be active on any system. If there are multiple chillers, then any error on any chiller error will shut down the backup process. There must be water flow as indicated by the CX-34. Ambient temperature must be below the controller set point. The default for this set point is 12°C (53.6°F) but this can be adjusted to as low as -20 °C to 30°C (or as high as 50°C under certain test conditions. The LWT2 sensor (if installed at the exit of the heater unit) must be less than 60°C (140°F). (Generally this sensor is not used). There cannot be any communication errors. System must be running (not stand-by or "off")
Mode not in Cooling, Mode not in DHW only, Mode not in Cooling with DHW

Provided that all the above conditions are met the system will begin testing for activation conditions (Stage 1). The system will look to see if the EWT is unable to meet its target (minus an adjustable off set "defaulted to 3°C) within a pre-determined time (default 3 mins). For example: if the target heating is set for 40°C yet the system can only maintain an EWT of 36°C or less (Target minus 3°C Default) for more than the Default 3 minutes, then the system will go into stage "1" and lock into this Mode until the system's "Exit Conditions" are met or until if any of the above permissives are violated.

While in stage "1", the system will calculate the degree of BTU "Short Fall" required to make up the difference between what the Cx34 can produce and what the load requires. Based on this running calculation, the controller will fire the heating element(s) to the required magnitude. If the heating load demand is reduced, the magnitude will reduce as low as zero. After a preset time (default 5 min) with the magnitude at zero the system will shift back to Stage "0" and all system and functions return to pre-activation conditions.

Manual Reset

If the heater unit rises to an unsafe temperature the thermal overload switch will stop power to the units element.

To access the reset switch, **FIRST, POWER MUST BE DISCONNECTED.** Remove the white ABS cover to access the reset button. Assuming the temperature is below 130 °F, depressing the reset button will reset the V18.

Note, a tripped thermal safety switch most likely indicates a problem that should be corrected before resetting.

A short circuited Solid State Relay is a possible cause of a tripped safety switch. If this is suspected, turn off the circuit breakers feeding power to the backup heater. Disconnect the SSR from the output signal connection by pulling the 1/8" plug from the output jack on the controller. Have a licensed Electrician check the SSR before turning the circuit breakers back on.

If the backup unit stops working, first check the Chiltrix standard controller for any error codes. Check for loose wires, as a communications error will also stop the backup heater. See troubleshooting section. Make sure nothing is blocking flow through the heater.

Contact Chiltrix technical support with any questions at 757 410 8640 ext. 112.

DO NOT REMOVE WHITE COVER UNLESS POWER HAS BEEN DISCONNECTED.

DO NOT RECONNECT POWER UNTIL THE COVER HAS BEEN REPLACED.



NOTICE

Bulletin Regarding V18 Installed With CX34 Systems Used For Cooling

CHILLED WATER

IMPORTANT NOTE*

If the V18 will be installed in a system that performs cooling operation at times, make sure to thoroughly seal around the white ABS cover and inside the Liquidtight conduit with silicone as a minimum precaution.

Make sure power is disconnected before and during this operation.

The requirement is to prevent air from entering the V18 inside the white ABS cover and contacting the cold pipe or components which could cause condensation to form and accumulate inside the unit.

For high humidity locations you may also consider filling the entire cavity (but not cover the reset button) with an electronics-grade silicone potting material rated for this type of application. Example: GC 19-160 or similar. (gcelectronics.com)

Make sure power is disconnected before and during this operation.

When using a silicone potting material, use it only per-code and according to the material manufacturers instructions and make sure to allow the material to fully cure before attaching the cover. Do not cover the reset button with silicone.

Do not connect power until the material has fully cured and white cover has been replaced.



NOTICE

Bulletin Regarding V18 Operation After A Power Failure

In the event of a power failure or interruption that affects both the CX34 and the V18 controller at the same time, a power failure should cause no issues.

If the CX34 loses power and the V18 controller does not lose power, the following applies.

This bulletin applies only if the CX34 is in heating mode at the time of CX34 power loss.

If power is interrupted to the CX34, and not to the V18 controller, such as if the circuit breaker serving the CX34 is opened, or tripped, then please disconnect and restore power to the V18 controller to reset it after CX34 power has been restored.

If there is a power interruption that affects the CX34 and does NOT affect the Circuit powering the V18 heater controller, it is possible that this will cause the V18 to fail to properly modulate temperature and may result in reduced efficiency or error.

We suggest to make sure the V18 controller is powered from the same power source or breaker panel as the CX34 and to make sure that either both, or neither, the CX34 and V18 are connected to a backup power source. Any time you open the CX34 circuit breaker, you may the also open the breaker that serves the V18 controller power supply.

Any time that you will reset the CX34 by opening the circuit breaker, first place the CX34 in standby mode so as to avoid the above mentioned.

NOTICE

Bulletin Regarding V18 Operation When Used With CX34 Onboard (Built-in) Dynamic Outdoor Reset

The CX-34's Onboard (built-in) Reset function is very useful and offers better performance than the single-point reset offered by the Psychrologix controller outdoor reset function. Onboard dynamic outdoor reset changes the Entering Water Target temperature on a user-defined curve as ambient temperature changes. To compensate for the variable, adjustments can be made to the V18 controller as follows:

Number	Description	Units	Default	New Settings for Reset Function
1	Target Trigger offset	°C	3	3
2	Target Setback	°C	3	0
3	Ambient Air Trigger	°C	12	12
4	Slave 1 Master 2	Mode	0 See note 1	See note 1
5	Multiplier		100 x .01	same
6	Stage1 Delay	min	3	1
7	LWT2 OffSet	°C	5	2
8	System Exit Time	min	5	1
9	Water Factor	WF	448 must use WF table	same
10	Heater power Rating	x 100 Watts	55	same
11	Measured Line Voltage	VAC	240	as measured
12	Element Rated Voltage	VAC	240	same

Note 1 : set to 1 for slave if used with a Psychrologix controller , or 2 for Master, to operate independently.