KIG - Coldrush Glycol Chiller Start Up Manual for 208/230 volt units (single and three phase)

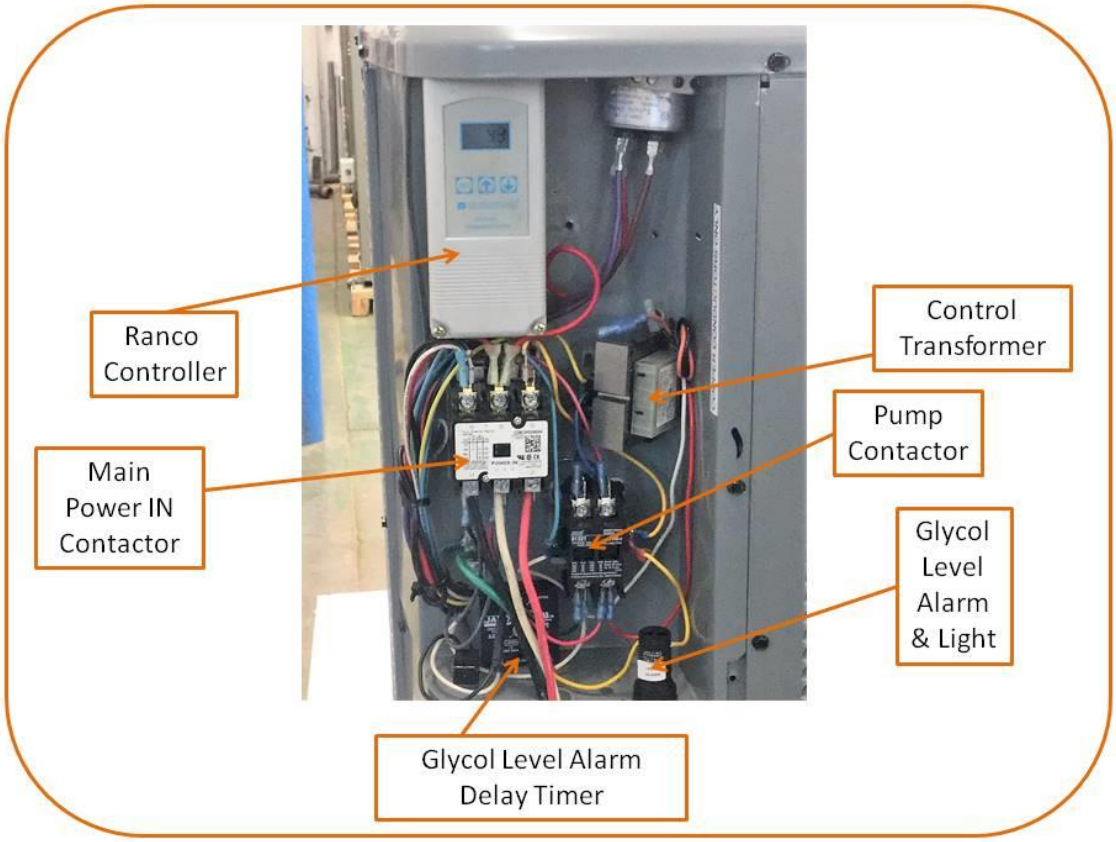
1. Placement: Ideally outdoors. On flat level surface. If indoors, or under a structure, about 6 ft or greater overhead clearance needed for proper upward air flow to avoid high pressure trips. The surface being level is very important as the chiller has a tank level alarm (red light & audible) which will go off if the tank is not completely full. Uneven surface can cause nuisance alarms.

2. Electrical: Electrician to bring appropriate power into main contactor in electrical cabinet where it's labeled "power in" . Tag on unit shows amps and max suggested fuse.

On 208/230 volt **single** phase units, phase rotation does not come into play for the compressor, the pump, or the fan.

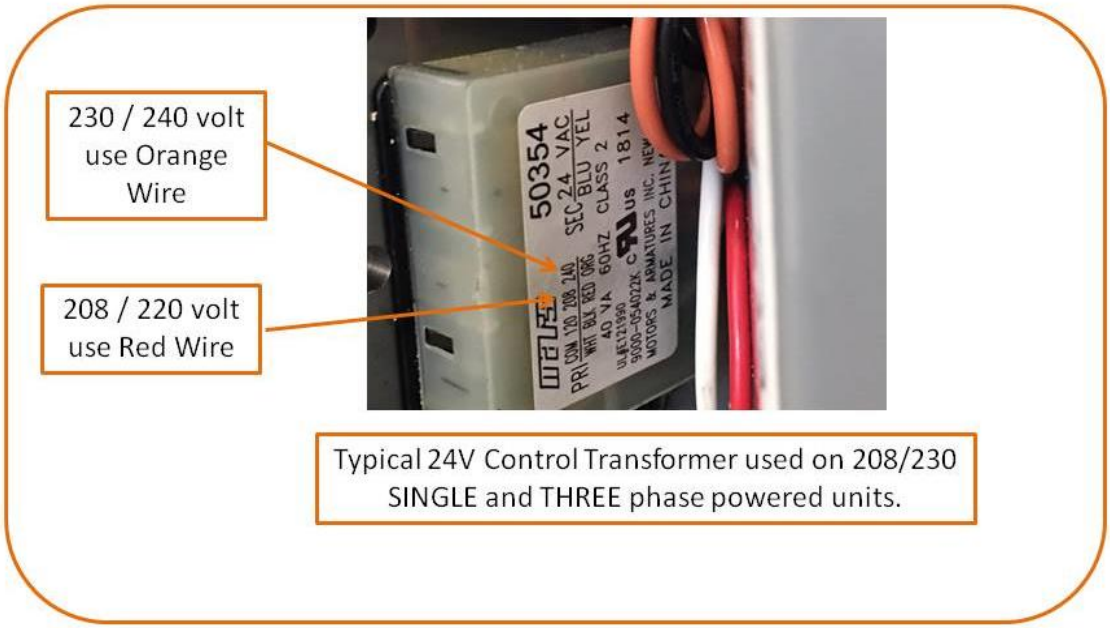
On 208/230 volt **THREE** phase units, phase rotation is VERY important for the 3 phase scroll compressor. Do not run the compressor backwards, even for a short period of time. Please note, that even on the 208/230 THREE phase units, the pump and fan are still SINGLE phase, so if the fan and/or pump are rotating correctly, it does NOT mean you have the phase rotation correctly. When the scroll compressor runs backwards, it makes an obvious louder noise than when running in the correct rotation. It is always advisable to have an HVAC technician present during start up, but if not available when you start unit for the first time, listen to the compressor for several seconds. Then, power down the unit at your main power disconnect. Confirm no voltage present with a meter, then swap any two of the three hot leads at the incoming power contactor at the chiller. Power up again and monitor the compressor noise. It should be obvious which power wiring configuration provides the correct rotation for the compressor.

For **DUAL** circuit units there is still just one incoming power, but it is in the lower cabinet behind access door, not in the upper condenser section(s).



There is a 24V Controller transformer in the cabinet. On the primary side, it has an orange wire for 230/240 volt power, or a red wire for 208/220 volt power (see label on transformer). You will see one of those 2 wires at the transformer will be capped. Depending on what voltage your facility has, you can swap the red for the orange, or vice versa to

better match the primary voltage. This will provide more accurate 24v power to the controls circuit, and in some cases prevent contactor chatter. The primary wire being used you will see gets it's power off the pump contactor.



Typical 24V Control Transformer used on 208/230 SINGLE and THREE phase powered units.

3. Power on / Compressor crankcase heater: Before powering up unit, tank must be filled with 45% Propylene Glycol solution to avoid freeze ups. This should be checked with a glycol refractometer. Much higher than 45% and heat transfer will suffer and refrigerant pressure drops may result. Lower than this, then at 25F glycol temps you may start developing ice in tank and causing problems with pump trying to pump slush. The chiller has a crankcase heater in/on the compressor. When the power is live to the chiller (but the chiller toggle switch "off") this heater still intentionally remains on to keep the refrigerant warm. The chiller toggle switch should never be put in the "on" position unless that heater has been on for 12 hours or more. This is very important in any climate, but more so in cooler climates. For the reasons above, you should not use your main disconnect at power panel to shut the chiller off, unless it's for very long durations. For example, if you turn your chiller off over the weekend (not typical, but some small operations do this), do so with the chillers on/off toggle.

The pump should never be run dry, even for just a few seconds. This will cause damage to the pump seal. When first starting system up, keep in mind the chiller will be pumping somewhere in the neighborhood of 15 to 40 gpm (gallons per minute) out into your process or tanks. So it is a balance between power on (pump on) , then turn off, adding fluid, repeat until system is full.

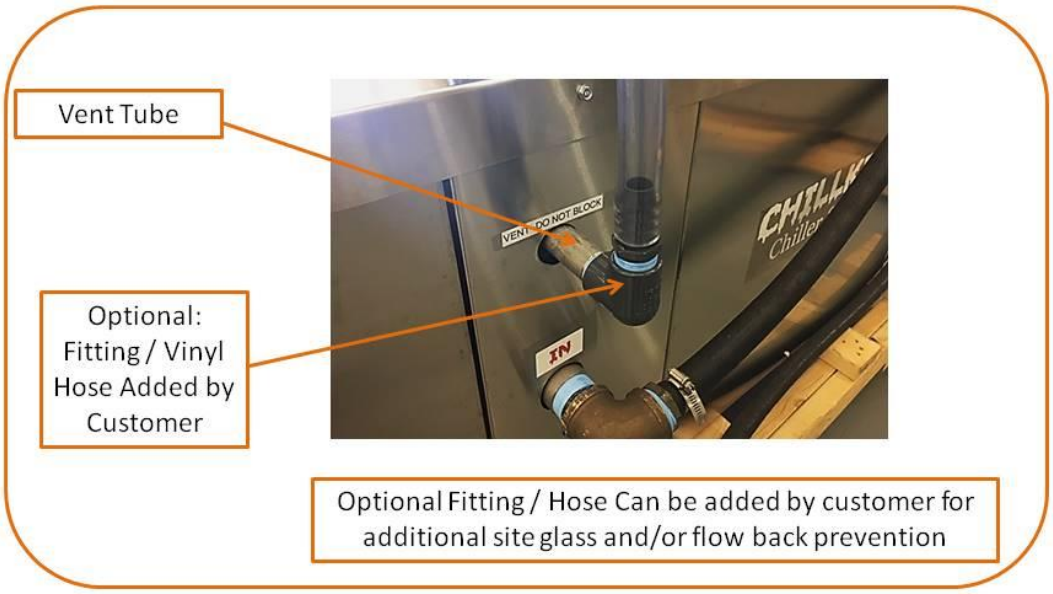
In some cases, customers may choose to test system with straight water first, before adding glycol, this is OK, but please do not operate chiller setpoint any colder than 48 degrees, or the water will start to freeze inside the tank {R410a refrigerant runs at about 20 degrees colder - approximately - than the chiller's fluid setpoint temperature}. Running with straight water does not eliminate the need or importance of the crankcase heater remaining on or 12 hours prior.

3a. Filling / tank / vent

You can fill the glycol tank through the vent using a pump / vinyl tube. Or, when you do your piping, have a "T" fitting on the return where you can pour fluid into as needed, then cap off/close when complete.

On 2019 and later Coldrush Chiller models, the internal glycol tank is sealed. Theoretically, based on laws of capillary action and other, in a sealed loop system with piping as described here, when the power is off there should not be any flow back into the tank due to glycol volume or pipes being at a higher location than the chiller. In practice, we find this

is not always the case. This may be due to pinhole leaks in the customers piping. If you see any flow back which causes glycol leaking out of the vent, install and clamp on a clear vinyl hose to the vent and arrange it vertical with the top being slightly higher than the higher point of your piping. This can act as a manual site glass also to compliment the built in glycol level alarm, which is nice.



In the chiller control enclosure, there is a bypass timer. It's black with a small red dial. This the delay timer to activate the glycol level alarm. It is there to prevent nuisance trips due to turbulence or waves inside the tank. During start up, put this to the lowest/quickest position. Afterwards, return it the position it was originally at.

4. Loop piping

We suggest copper but most folks in this size range don't go that route because of cost. Coolfit or ABS plastic is next best, but the coolfit especially is expensive, but super nice. ABS is nice, but not so readily available. Although technically not designed for glycol temps, most of our customers use schedule 80 PVC piping with glued connections where they can. For the drops to your tanks, they use PVC flex hose (which fit's into corresponding socket a pipe would), or other flex hose. The flex hose offers some give, and "flex" of course. Use 1" for your supply line and ideally ¾" for your drops to your tanks. If your tanks have dual jackets, use 1", then you can branch out to ¾ ".

Install pressure gauges in your supply line. Ideally in two places.

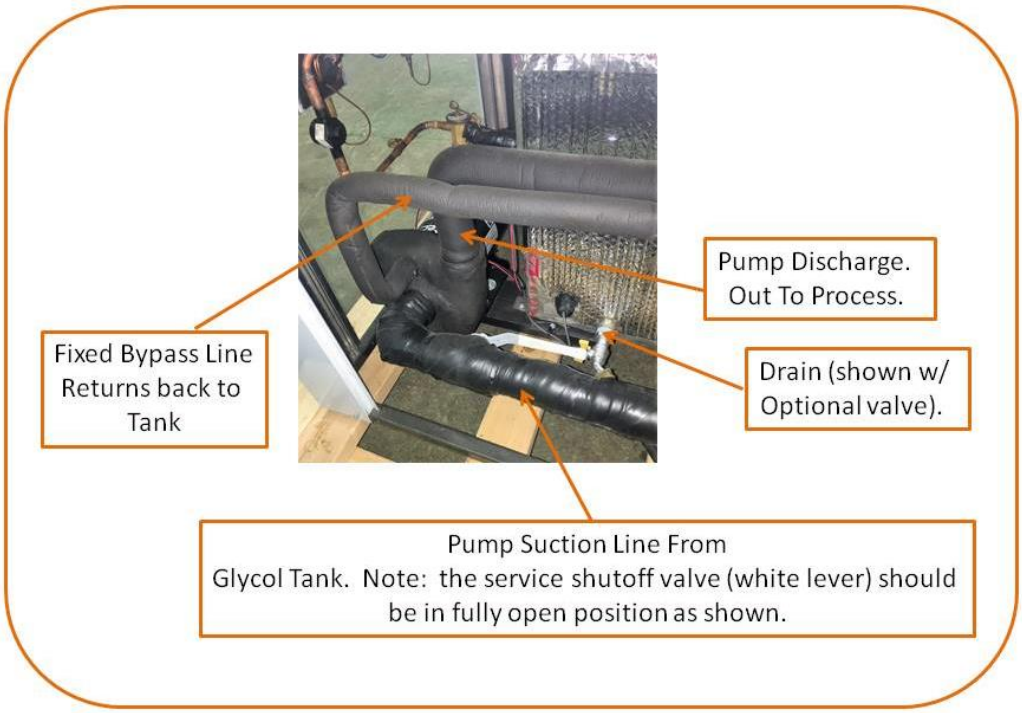
It is good and common practice to put shut off valves right at the supply and return to your chiller for service needs. Also, on the return, a Y -strainer with 20 mesh is advisable.

On the main return, go the next size up, 1.25". We want/like the return to be the next size up, because the chiller does not require any flow pressure on the return back to the glycol tank. That's a good thing. So by upsizing the return lines, you are eliminating/reducing any un-needed pressure requirements on the pump. Further, the design of the Chillking coil exchanger(s) in tank do not consume any pump head (pressure) either, like a plate exchanger. These two factors combined help to allow you to use the least pumping energy possible.

For the return, the first in - last out configuration is best.

5. Bypass

The ColdRush Chiller has a fixed internal glycol flow bypass. You do NOT and should NOT have a bypass valve in your piping where the supply meets the return. Supply line should just end (dead-headed) at the last tank it is feeding. If you have a bypass in your loop, it will cause the pump to pump too much, too fast, and cause overamping and the pump will shut down on thermal overload. To put this in perspective, when NONE of your processes are calling for cooling (their solenoids closed) there will be no flow in the supply line. This is by design.



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6. Pump Operation / Flow to tanks and/or your process

Our biggest start up issue and adjustment needed is for the glycol pump and back pressure in your supply line. Pumps like to see back pressure, if there is not enough back pressure/restriction in loop - as implied above, the pump will "spin" too fast and overamp and trip out on thermal overload. If new to pumps, it's opposite of what you would expect. WHEN THE CHILLER POWER IS ON, THE PUMP SHOULD RUN ALL THE TIME. If you observe the pump turns off, it has overamped and shut off on thermal overload. The chiller compressor and cooling will remain cooling in such a condition, so it is important to remedy this in a timely fashion.

7. Valving for drops to tanks.

Your drops to your tanks should have a valve. Preferably a globe valve which is better for regulating flow and produces a bigger pressure drop. Gate or ball valves can be used, but will sacrifice a bit of flow for the given pressure drop. Then you will have your on/off solenoid connected to your tank temperature controller.

8. Dialing system flow in - matching to pump flow.

The key do dialing in your glycol loop Is MAINTAINING SUFFICIENT SUPPLY HEADER PRESSURE UNDER WORST CASE CONDITION - MEANING WHEN ALL YOUR TANKS ARE CALLING FOR COOLING. When all your tanks are calling for cooling, this represents the maximum flow through the system. Start by having all your valves to your tanks 90% closed (allowing very little flow). Under this condition with solenoids all open and calling for cooling, monitor your supply head pressure. Depending on your pump, this could be in the 30 psi and higher range. At this point it is imperative to check the amp draw on the pump. Your pump motor has an ID tag on which will show amp ratings for 115v and 230 volt. The smaller of the amp ratings is for your pump (the higher the volts, the lower the amps). Measure the amps on the glycol pump in the chiller with a good clamp or forks style meter (with clamp on one of the two exposed wires coming from pump - either the black or red wire) and make sure the amps are below nameplate amps on the pump motor.

Open up the valves going to your tanks as needed - and if allowed - based on above parameters as long as pump stays in it's amp range limit.

Limiting flow through the jackets is key. Too much flow, and a tank will use an unfair share of cooling capacity on a properly sized system. You don't want flow that will allow you to cold crash any quicker than you need. The rate of cooling in your tank will not be linear. It's like ½ of a bell curve. It will start very slow (because there is no agitator or flow inside of your fv or brite of course) so takes some time to see that first degree drop.. and towards the end, rate of cooling slows down drastically too because the Delta T (temp differential) between the glycol and beer is much smaller at that point. Not much actual flow is needed through the jackets to be able to crash the tank in 24 hours, or maintain temp.

9. Temperature Setpoint & Differential - Ranco Controller

Run your system at the highest temperature and differential you can, without sacrificing your product/process. An example is 28F setpoint with a differential of 4F. The chiller cooling will shut down at 28F and turn back on at 32F. The larger the differential, the lower the amount of starts and stops on the compressor. You want to minimize the amounts of starts and starts to optimize compressor life. The differential setting combined with the glycol tank and loop volume acting as a buffer or "thermal flywheel", all aid in this. The lowest approved setpoint for the ColdRush Chiller is 25F. For **DUAL** circuit systems you will have two setpoints on the controller. Still have both at the same setpoint, but set on with a differential about 2 degrees higher than the other. So if compressor 1 can not keep up, when it drifts 2 degrees higher, the 2nd compressor will kick in. Switch those parameters back and forth a few times a year to balance compressor hours.

10. Pressure Switches / Fan Cycling.

The chiller comes with 3 adjustable refrigerant pressure switches (per circuit). The low pressure switch, the high pressure switch, and the fan cycling. The low and high pressure are set at the factory and for the units safety and protection. The fan switch is based off of pressure, and activates the condenser fan as needed. The fan does NOT have

to be on at the same time as the compressor. This feature is what achieves the low ambient capability of the unit - allowing it to operate in colder climates outdoors.

some supplier notes:

- Schedule 80 and flex pipe on line sources… :

https://pvcpipesupplies.com/pvc-valves/ball-valves/pvc-true-union-ball-valves

https://pvcpipesupplies.com/pvc-fittings/schedule-80-pvc-fittings/schedule-80-pvc-male-adapters

https://pvcpipesupplies.com/pvc-fittings/schedule-80-pvc-fittings/schedule-80-pvc-tees

https://www.amazon.com/HydroMaxx-Flexible-Tubing-Gardens-Gorilla/dp/B003XS0LY6

https://flexpvc.com/cart/agora.cgi?product=3_Flex_PVC_Pipe_1_inch

- Fyi for solenoid valves and controls for your fv's and brites, many folks us GW Kent…

https://www.gwkent.com/ranco-tank-temperature-controller.html

https://www.gwkent.com/controlling-monitoring/solenoid-valves.html

https://www.gwkent.com/controlling-monitoring/pressure-gauges.html