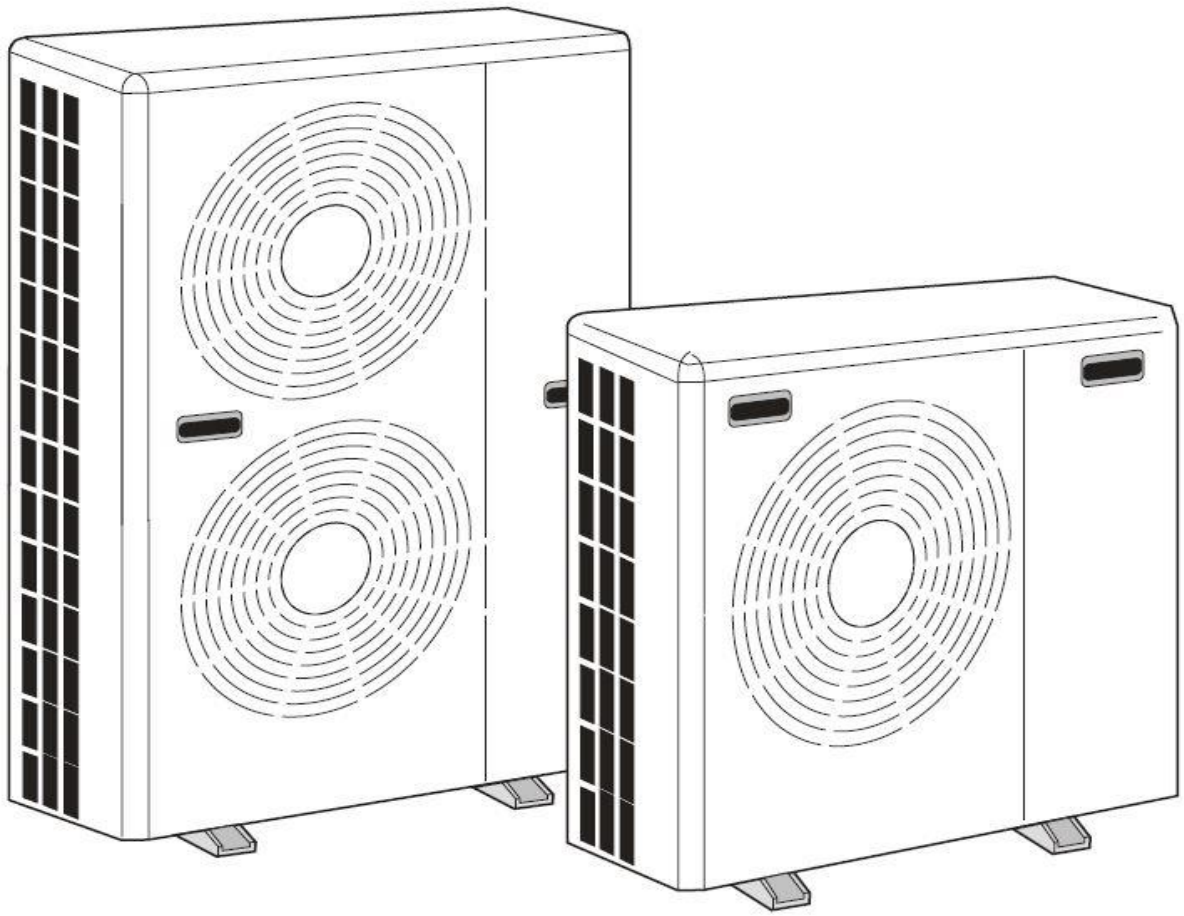
DC INVERTER

AIR TO WATER HEAT PUMP

AC series Heating & Cooling series CX30

Installation and Operation Manual



Version 1.7

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Safety Precautions

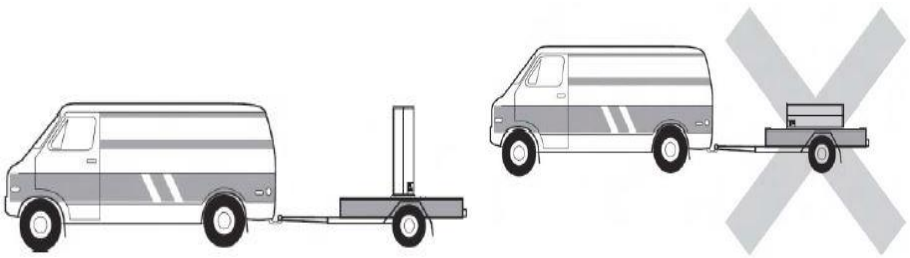
NOTE: It is required to read the Safety precautions in detail before operation. The precautions listed below are very important for safety, please follow all safety precautions.

General

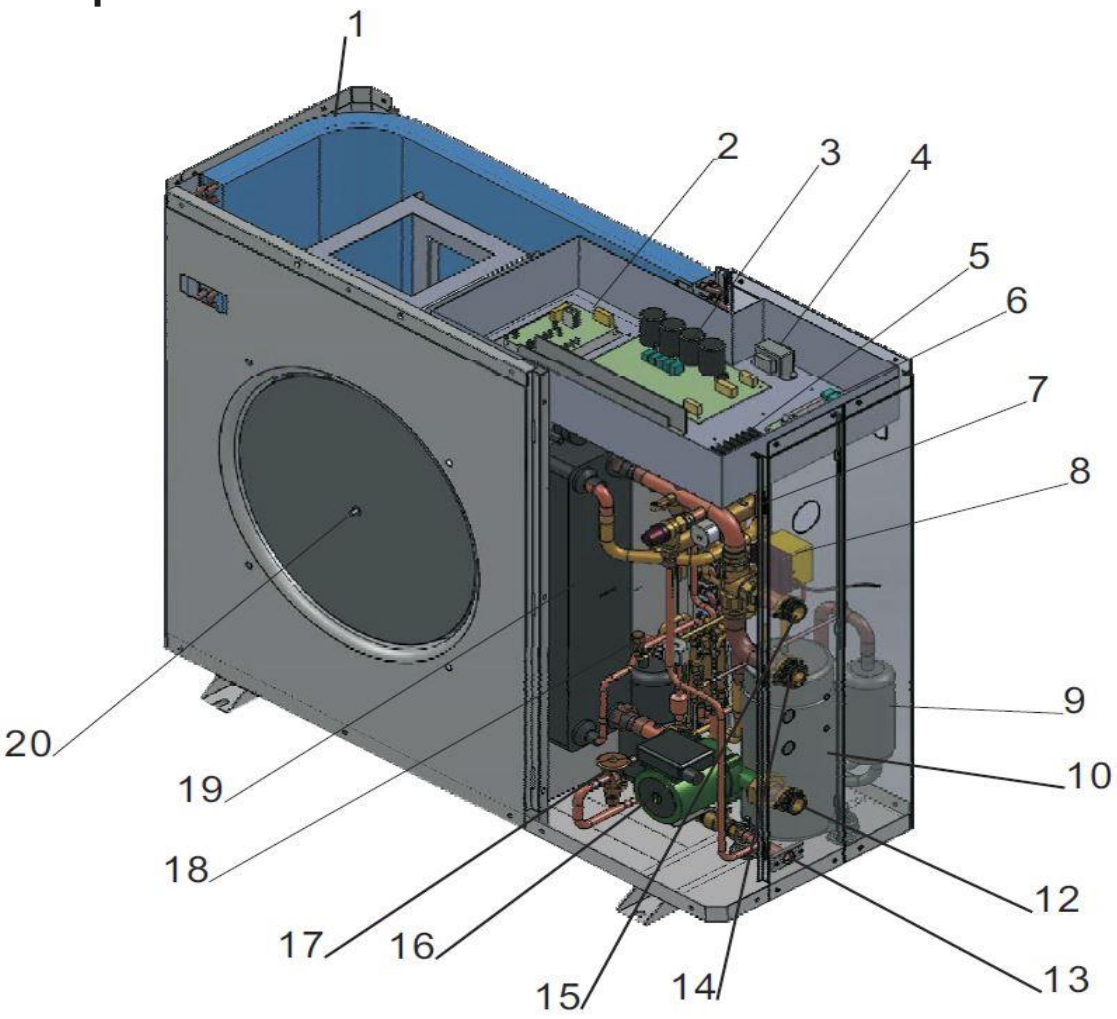
- Make sure that the ground wire in the building is securely connected to earth.
  Wiring tasks should be carried out by qualified electricians only, in addition, they should check the safety conditions of power utilization, for example, verify that the line capacity is adequate, and the power cable isn't damaged.
- Users must not install, repair or relocate the unit. Improper procedures might lead to accidents e.g. personal injury caused by fire, electrical shock or unit's falling off its base, and water leaking into the machine. Please contact a professional service department if problems arise.
- The unit shall not be installed at a spot with the potential hazard of leaking flammable gas. If gas is leaking near the machine, there might be the risk of explosion.
- Make sure that the foundation of the unit is stable. If the foundation is unstable, the outdoor unit may come loose from its base and cause injury.
- Make sure that the GFCI installed at the service panel is working properly to avoid shock or fires.
- If any abnormity occurs in the unit (such as a burning smell is noticed inside the unit), cut off the power supply immediately, and contact a professional service department.
- Please observe the follow items when cleaning the unit. Before cleaning, shut off the electric supply of the unit first to avoid injuries caused by the fan operation.
- Do not rinse the unit with water because the rinsed unit may cause electric shock.
- Make sure to shut off the electric supply before maintaining the unit.
- Please do not insert fingers or sticks into air outlet or air inlet.

Transporting and storage

- The machine must be transported and stored vertically.



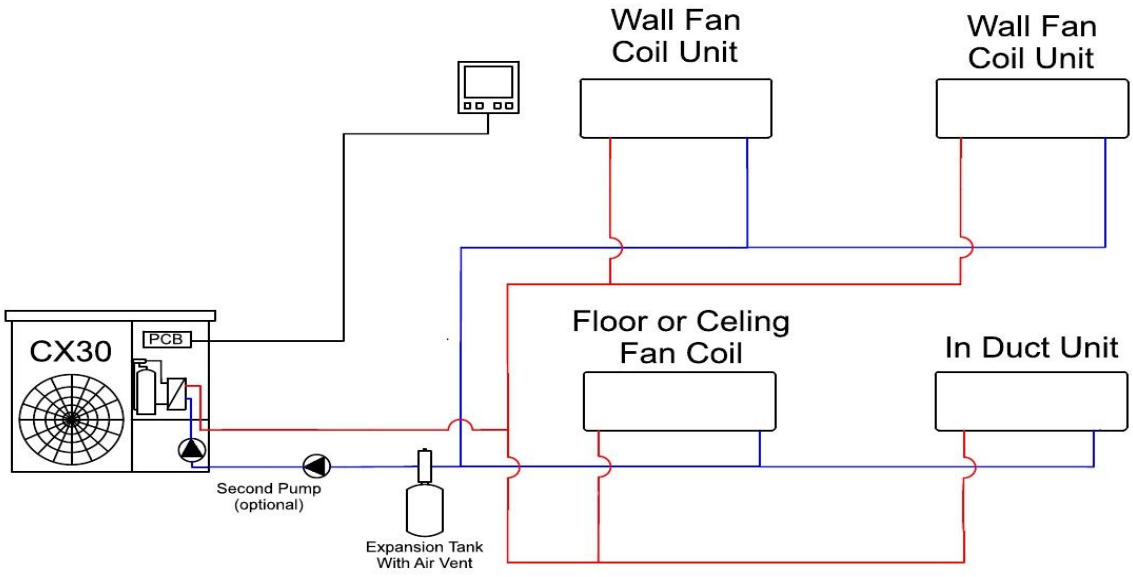
Components



Position	Component	Position	Component
1	Evaporator	12	Water inlet
2	IPM Module	13	Drain
3	Refrigeration control board	14	Water Outlet
4	Transformer	15	N/A
5	Terminal blocks	16	Water circulation pump
6	Water system control board	17	Thermal Expansion Valve
7	4 way valve	18	Service valves
8	N/A	19	Plate heat exchanger
9	Accumulator	20	Fan and fan motor
10	Compressor		

Hydronic Piping and Design Guide

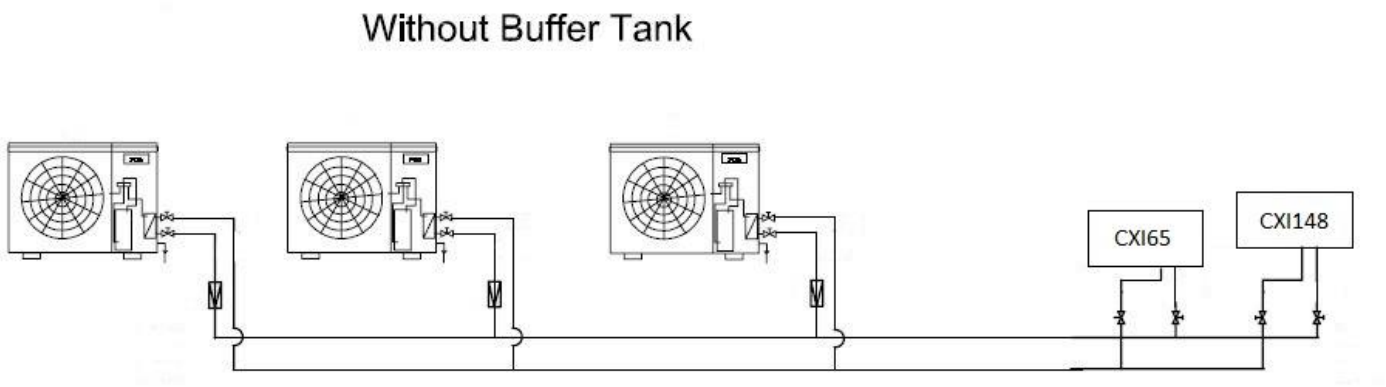
Installation Methods Heating and Cooling (Heating Shown)
Note: Primary Secondary Piping is NOT supported on this chiller.
A buffer tank must be used for floor heating.



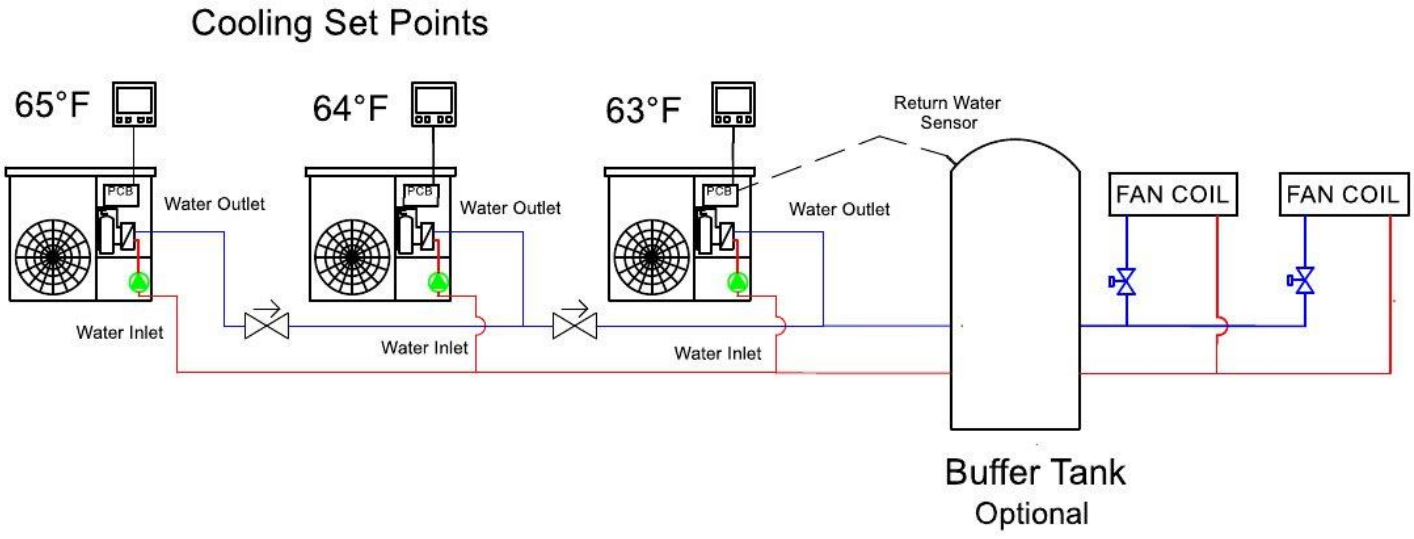
Installation Notes:

1. Minimum pipe size should be no less than 1”, CPVC or Oxygen Barrier PEX, reverse return piping is preferable to eliminate balancing valves or pressure regulators. The installer should calculate the pipe and fitting resistance to determine the head pressure. See the examples on the following pages, maximum water flow for the CX30 is 6 gpm, design flow is 4.8 gpm. If necessary, a second PWM pump may be added to the loop and controlled by the CX30. The second water pump connections can be found in the wiring diagram starting on page 19.
2. The loop example above is designed with wild coils. Water flows through the coil at all times, if there is a call for heating or cooling the FCU controls will turn the fan on. Optionally, a 2 way valve may be installed at the input tee to prevent any flow through the coil and the FCU will control it.
3. An air discharge valve should be installed at the top of the circulation system if possible for easy air discharge. As an alternative an automatic/manual air vent can be used inline before the pumps.
4. Flow meters with restrictor valves, Watts Flow Guard for example, may be used when reverse return piping is not an option.
5. Always install a water filter or wye strainer on the supply pipe to the chiller to prevent blockage of the heat exchanger.

Piping Examples: Stacked Chillers

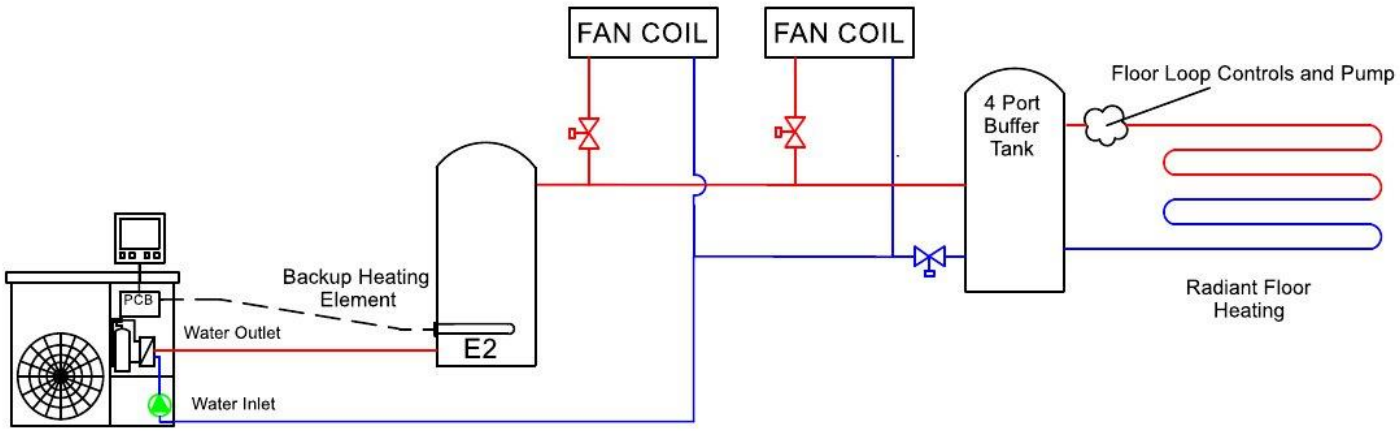


With a Buffer Tank and Second Non-PWM Pump



A buffer tank should be used when the loop volume is less than 10 gallons to keep the compressor from cycling.

Using a Buffer Tank



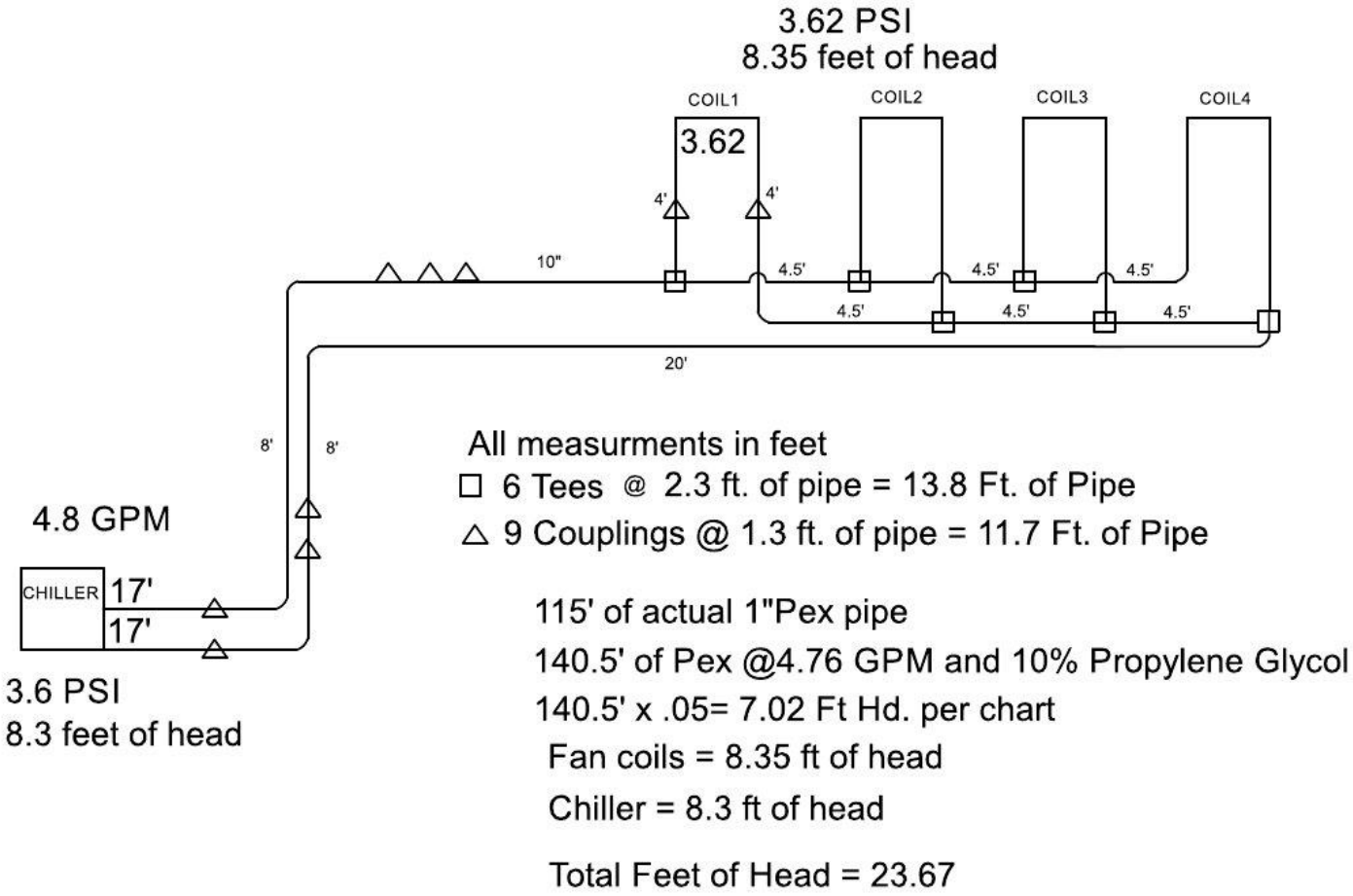
Primary / secondary piping is not supported, when connecting to a floor heating loop always use a buffer tank.

The pump in the buffer tank drawing is controlled by the customer's floor loop controls. To calculate the size of the buffer tank please use the following formula.
If the heat pump capacity is 8000 watts we use 8000/1.16/30 = 230 L/h. This means that an 8000W heat pump can increase 230 liters of 30°C water in one hour. 1.16 is the water transfer factor, and 30 is the temperature rise of the water.
4 is the heat pump hysteresis for water temperature change. It means after the compressor stops, the buffer tank can keep the returned water temperature change difference within heat pump hysteresis of 4c.
12 is 5 minutes (60/12 minutes). It means after the compressor stops, the buffer tank can keep the returned water temp change difference within heat pump hysteresis 4c for 5 minutes. This allows the compressor to stop for 5 minutes and save energy.

This formula is for the minimum size buffer tank. You can always add tank volume.

***Note – Cooling set points refer to the CX30 return water temperature, the system is managed by a 9F ΔT controller and is measured in C (5C). Default setting for cooling should be 12C, therefore the wired controller setting would be 17C. This will create a 54F leaving water temperature which is the standard setting.**

Example of head calculation



To calculate the head pressure for the correct water flow, the pipe length must be measured and all fittings counted. It is advisable to use flexible red oxygen barrier pex piping to avoid as many elbows as possible. All fittings have an equivalent length of pipe already calculated, available on the next page under PEX Fittings Pressure Drops. Add up the equivalent length of pipe for the fittings, 13.8’ + 11.7’ =25.5’. Then, add this to the actual pipe, 25.5’+115” = 140.5’ of 1” pipe. Once you know the total length of pipe, use a (1” PEX 10% Glycol, feet of head per 100 feet of tubing chart), to get the head for 1’ of pipe, at 40°F and 4.76 GPM. This comes to (.0500) feet of head per foot. 140.5 x .0500=7.02 ft. of head. Add up all head calculations, 7.02 + 2.3 + 8.35 + 8.3 = 23.67 ft. of head. Next we will look at the Wilo Pump curve on page 13. Maximum head at 4.76 GPM is 25 ft.

If using the CX30SE (Free Cooling option) the CX30SE’s pressure drop is 4.5 PSI when active.

Notes:

The example loop above has a volume of 4.5 gallons. The internal thermal expansion tank is 2 liters or .52 Gallons. An additional thermal expansion tank may be required for larger loops. There are many thermal expansion calculators on the internet, the following is an example. http://westank.com/calculator/
Minimum loop pressure is 14.5 psi, maximum pressure is 43.5 psi, and ideal pressure is 29 psi. The Lowest temperature is 44°F, the highest temperature is 131°F, the Initial pressure is 14.5 psi, and the final pressure is 29 psi.
An air scoop should be installed above the expansion tank to remove any air in the circulation loop.
Always install a water filter or wye strainer on the supply pipe to the chiller to prevent blockage of the heat exchanger.

Nominal size	OD	Wall thickness	ID	Voulme gal/100'
3/8"	0.500	0.070	0.350	0.50
1/2"	0.625	0.070	0.475	0.92
5/8"	0.750	0.083	0.574	1.34
3/4"	0.875	0.097	0.677	1.83
1"	1.125	0.125	0.863	3.03

PEX PIPE VOLUME

WYE STRAINER

PEX Fittings Pressure Drops

PEX Brass Crimp Fittings
Friction Loss - Equivalent Feet of PEX Tubing

Size	Coupling	Elbow	Tee Run	Tee Branch
3/8"	2.9	9.2	2.9	9.4
1/2"	2.0	9.4	2.2	10.4
3/4"	0.6	9.4	1.9	8.9
1"	1.3	10.0	2.3	11.0

Freeze protection

Vol% Propylene Glycol	Wt% Propylene Glycol	Freezing Point °F	Freezing Point °C	Burst Point °F	Burst Point °C
0	0	32	0.0	32	0.0
5	5.2	29	-1.7	27	-2.7
10	10.5	26	-3.3	22	-5.6
15	15.6	23	-5.0	18	-7.5
20	20.8	19	-7.2	11	-11.8
21	21.8	17	-8.3	9	-12.9
22	22.9	17	-8.3	7	-14.2
23	23.9	16	-8.9	4	-15.5
24	24.9	15	-9.4	2	-16.9
25	25.9	14	-10.1	-1	-18.4
26	27.0	13	-10.6	-4	-20.1
27	28.0	12	-11.1	-7	-21.8
28	29.0	10	-12.2	-10	-23.6
29	30.1	9	-12.8	-14	-25.5
30	31.1	8	-13.3	-18	-27.5
31	32.1	7	-13.9	-21	-29.6
32	33.1	5	-15.0	-24	-31.1
33	34.1	4	-15.6	-30	-34.4
34	35.1	2	-16.7	-38	-38.9
35	36.1	1	-17.2	-46	-43.3
36	37.2	-1	-18.3	-53	-47.2
37	38.2	-3	-19.4	-60	-51.1
38	39.2	-4	-20.0	-60	-51.1
39	40.2	-6	-21.1	-60	-51.1
40	41.2	-8	-22.2	-60	-51.1
41	42.2	-10	-23.3	-60	-51.1

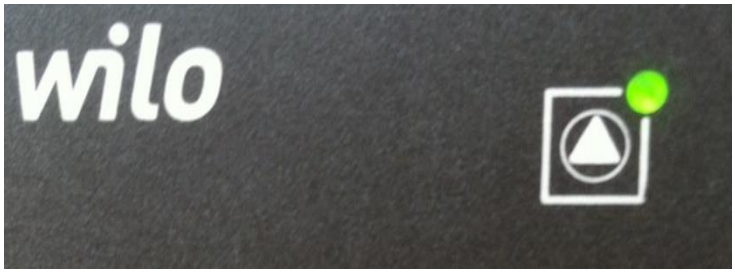
Vol% Propylene Glycol	Wt% Propylene Glycol	Freezing Point °F	Freezing Point °C	Burst Point °F	Burst Point °C
42	43.2	-12	-24.4	-60	-51.1
43	44.2	-14	-25.5	-60	-51.1
44	45.2	-16	-26.7	-60	-51.1
45	46.2	-18	-27.8	-60	-51.1
46	47.2	-21	-29.4	-60	-51.1
47	48.2	-23	-30.6	-60	-51.1
48	49.2	-26	-32.2	-60	-51.1
49	50.2	-28	-33.3	-60	-51.1
50	51.2	-31	-35.0	-60	-51.1

NOTE:

When using **CPVC piping** it is highly recommended that you do not exceed a 25% glycol to water ratio. Environmental Stress Cracking, also referred to as ESC, is a mechanism by which an organic chemical (possibly a weak solvent or even a non-solvent) achieves an extremely localized weakening at the surface of the material which permits propagation of a crack. Environmental stress cracking generally presents itself as a crack with glossy fracture surfaces that occur in regions of high mechanical stresses. ESC is dependent on both the presence of the chemical and a significant level of mechanical stress. Therefore, it may occur in some installations or certain parts of a system, while the system performs well in other areas. Many problems can, as a result, be avoided by proper design and installation. Potential ESC agents for CPVC include natural or synthetic ester oils, nonionic surfactants, alcohols and glycols.

Internal CX30 WILO Pump

LED	Meaning	Diagnostic	Cause	Remedy
On-Green	Pump in Operation	Pump is Running	Normal Operation	
Green Flashing	PWM Model	Pump in Standby	Normal Operation	
Blinks Red/Green	Pump is Functional but has stopped	Pump will restart after fault is cleared	Under Voltage < 160 vac	Check Power supply 195 vac – 253 vac
			Pump Over heating	
Blinks Red	Pump is not Functional	Pump Stopped	Pump will not start due to a permanent failure	Replace Pump
LED Off	No Power	No Voltage to Electronics	Pump Has no Power	Check Cable Connections
			Led is Damaged	Check if the Pump is Running
			Electronics are damaged	Replace Pump

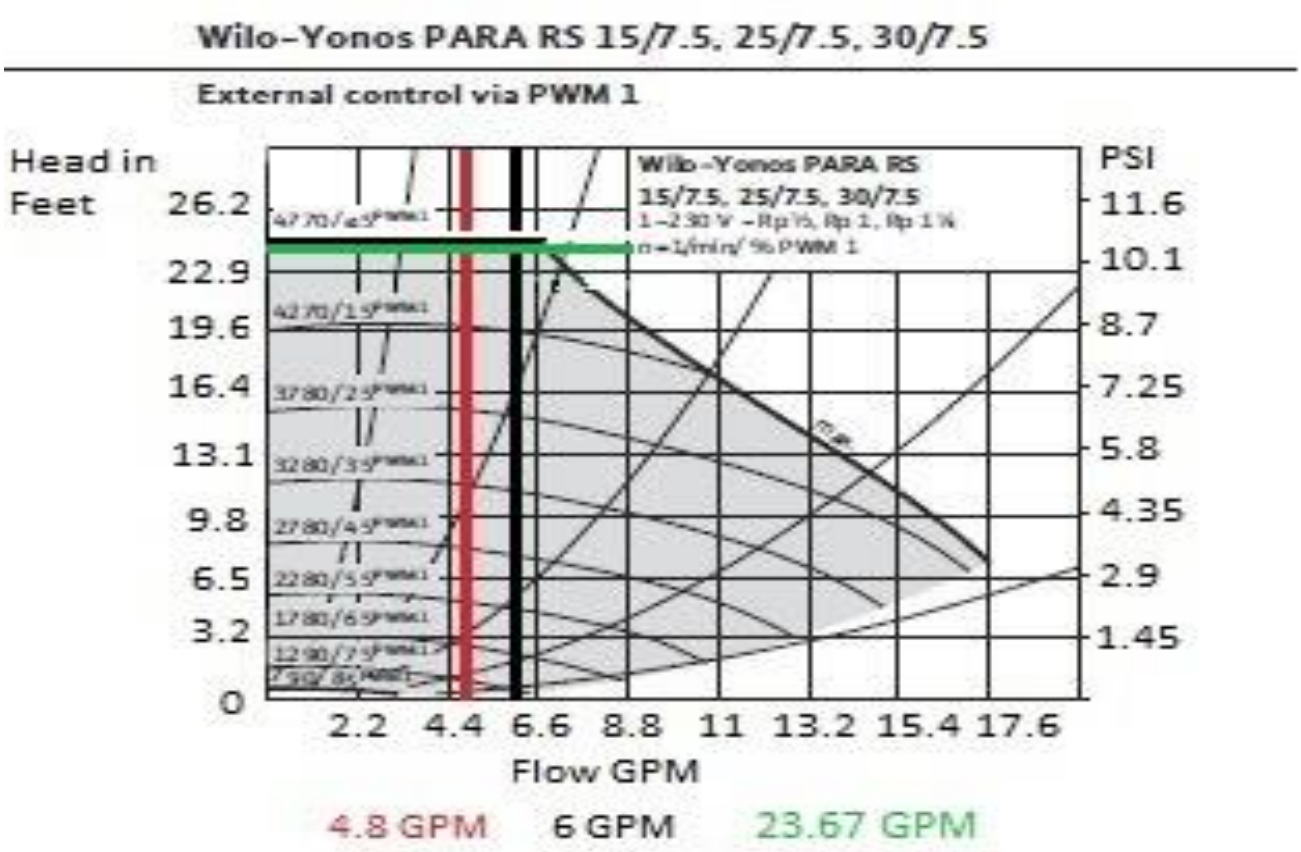


PWM pcb LED Error Codes (3 digit display)

Normally the 3 digit display shows the pump speed percentage in addition to temperatures and sensor errors.

E1 is a Th1 sensor error, it is open or shorted.

E2 is a Th2 sensor error, it is open or shorted.



Pump Specifications
Voltage AC 1-230, 50-60 Hz
Power consumption 4-75 Watts
Speed 800-4770 RPM
Max Head 25 ft
Max Flow 15 GPM

Pipe Insulation

All loop piping must be insulated per local and national mechanical codes.
For design tips and a thickness calculator please visit http://www.armacell.us/knowledge-center/

Heat Pump Installation

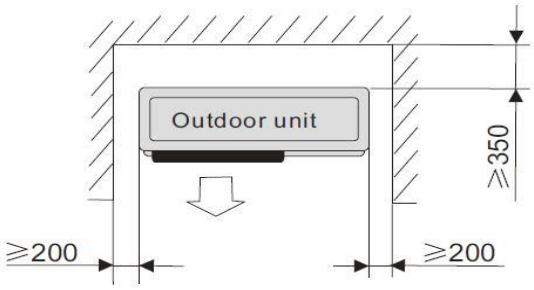
Installation position

Note: ***Installation must be carried out by professional personnel.***

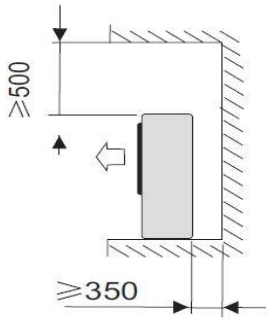
1. The recommended mounting pad should be 1" to 1 ½" above ground level.
2. A drainage path or other facilities should be arranged around the outdoor unit to avoid flooding the outdoor unit.
3. To install the unit on a balcony or on top of a building, the installation site must meet the allowable bearing capacity of the building structure without affecting the structural safety.
4. Ensure the unit is well ventilated; the direction of air exhaust should be kept away from the windows of neighboring buildings. Adequate service clearance should be kept around the unit.
5. The unit should not be installed in places accompanied with oil, inflammable gases; corrosive components e.g. sulfur compound, or high-frequency equipment.
6. The unit must be installed upon a reliable machine base or framework. Weight capacity of framework should be 3 times of the outdoor unit's body weight, and safeguard measures should be taken to avoid a malfunction of the fasteners.
7. The unit must have extra precautions taken when it is installed at sites with hurricane/ earthquake hazards. Consult the appropriate professional to determine the needed requirements
8. Midair or suspended installation should be avoided as much as possible, falling machines may result in personal injury and property damage.

Clearances (unit: mm) 200mm = 8” , 350mm =14 “, 400=16”, 500=20”,1000=40”

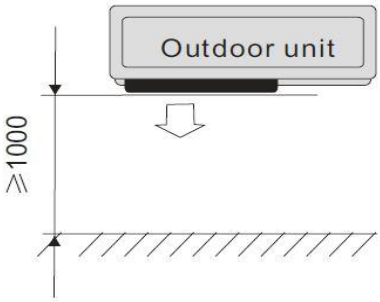
No obstacle in front of the unit



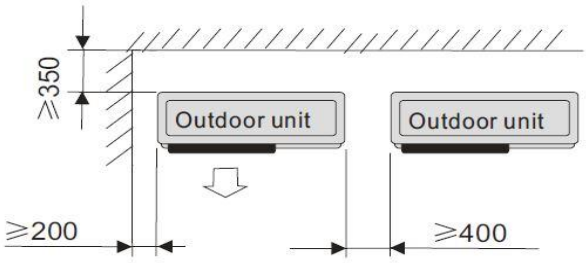
Obstacle above the unit



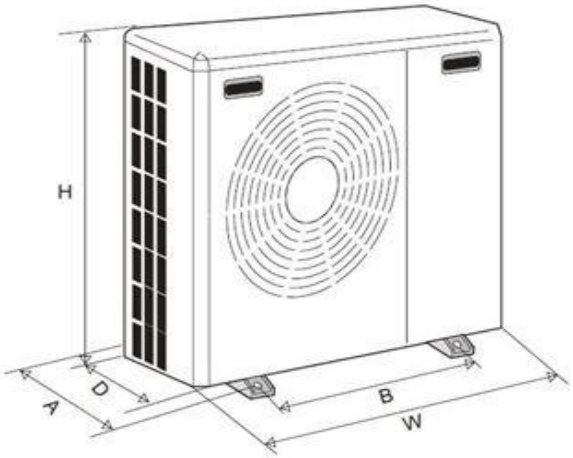
Obstacle in front of the unit



Several units in a row



Unit Dimensions in Inches



Model	CX30
W	43"
D	16"
H	31"
A	17"
B	32"

Electric connection

General

Note!

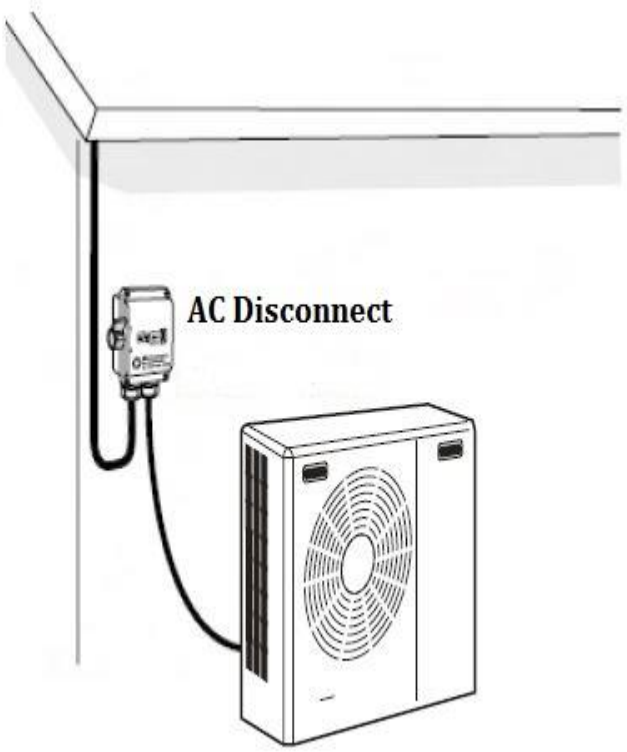
Electrical installation and service must be carried out under the supervision of a qualified electrician. Electrical installation and wiring must be carried out in accordance with the NEC.

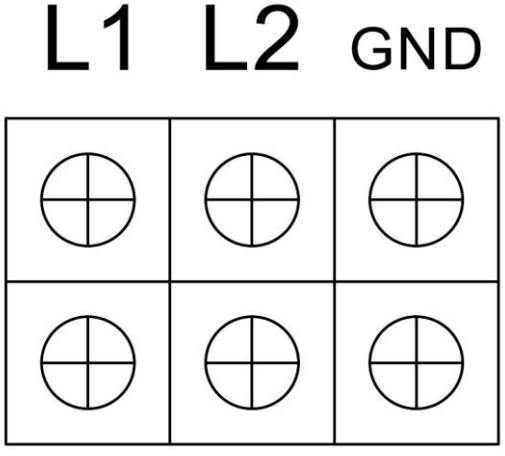
The heat pump must not be connected without the permission of the electricity supplier and must be connected under the supervision of a qualified electrician. Wires, spare parts and materials etc. must satisfy the relevant standards issued by the host country or region.

The heat pump does not include an AC disconnect or switch on the incoming electrical supply. The power supply cable must be connected to a circuit-breaker with at least a 3 mm breaking gap. Incoming supply must comply with the technical requirements, with a frame ground wire (neutral is not used), via a distribution box with breakers.

Voltage range is 208-240vac

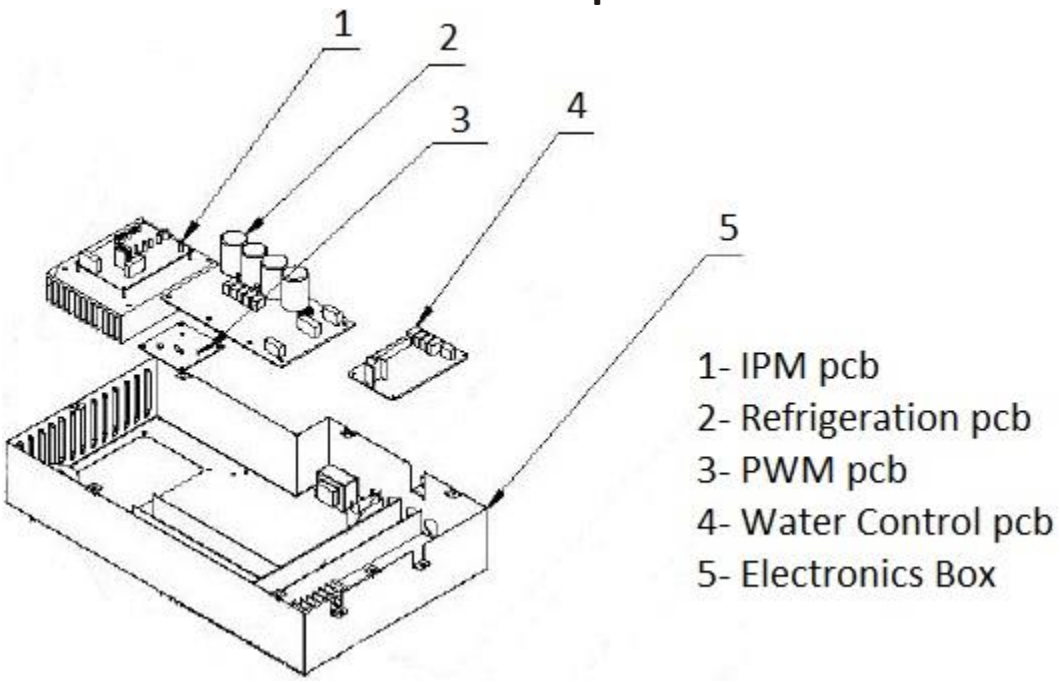
Maximum current draw is 13 amps, minimum wire size is 12 AWG, minimum breaker size is 20 AMP.



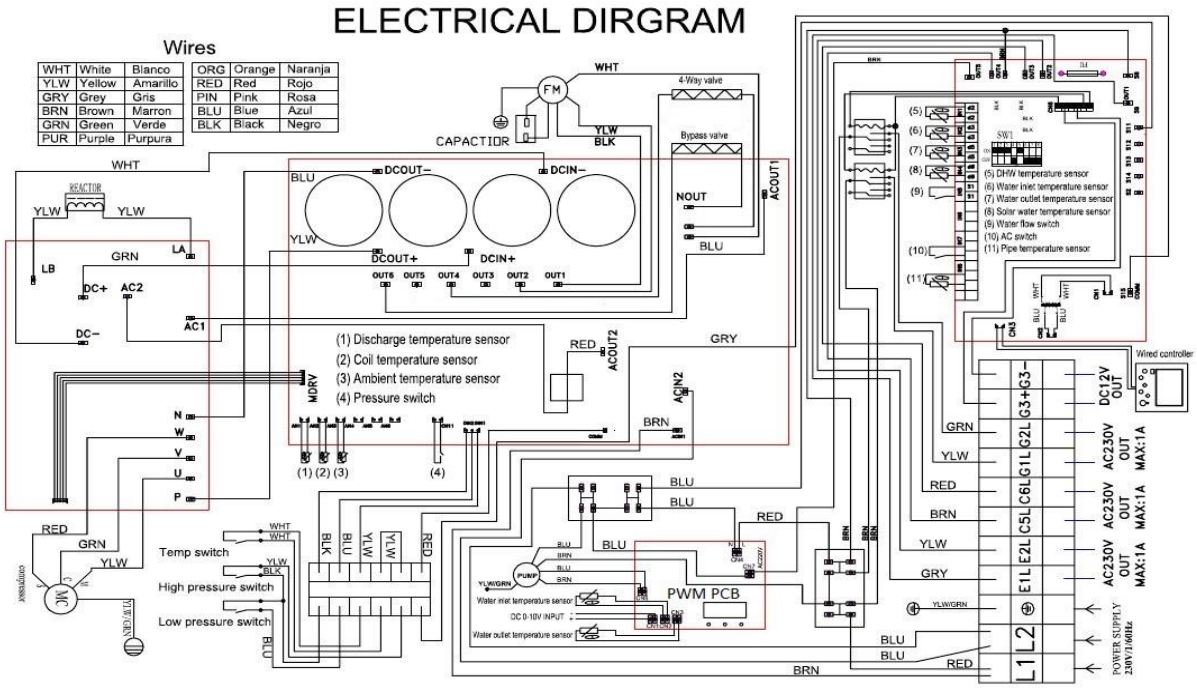


Main terminal block inside electronics box

Electric Connections and Component Locator

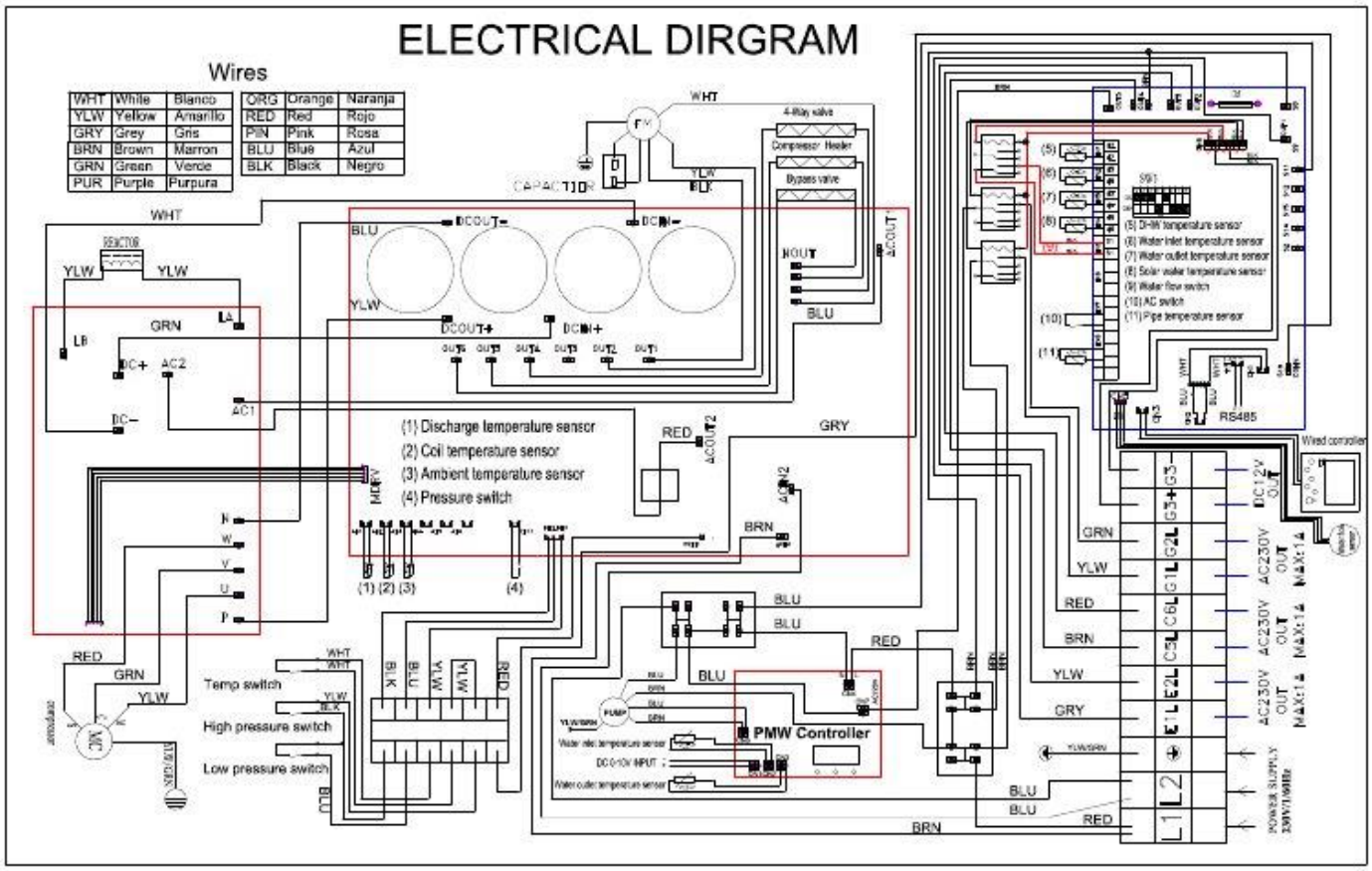


Using Internal PWM Pump



System layout with external flow switch

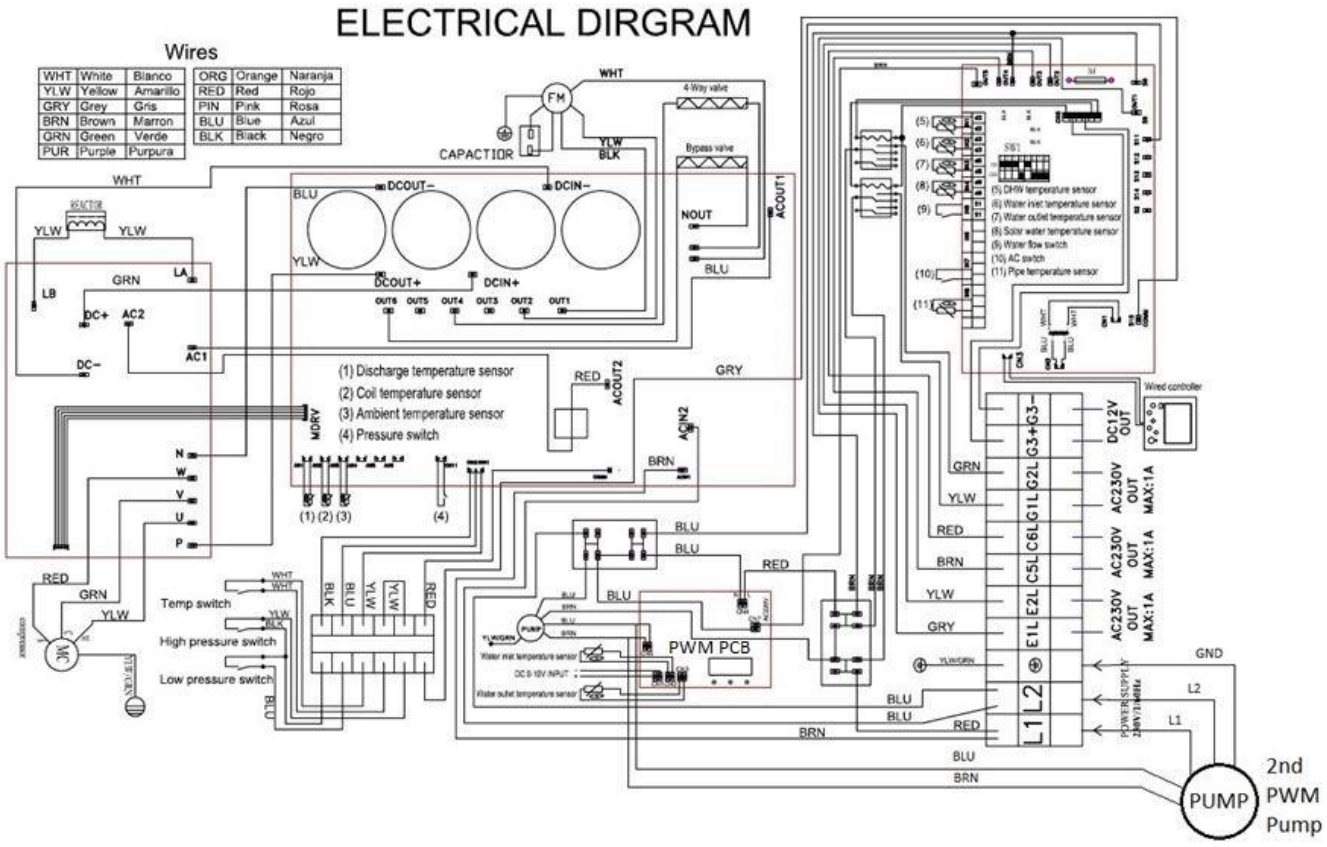
System Layout with internal flow switch and MODBUS



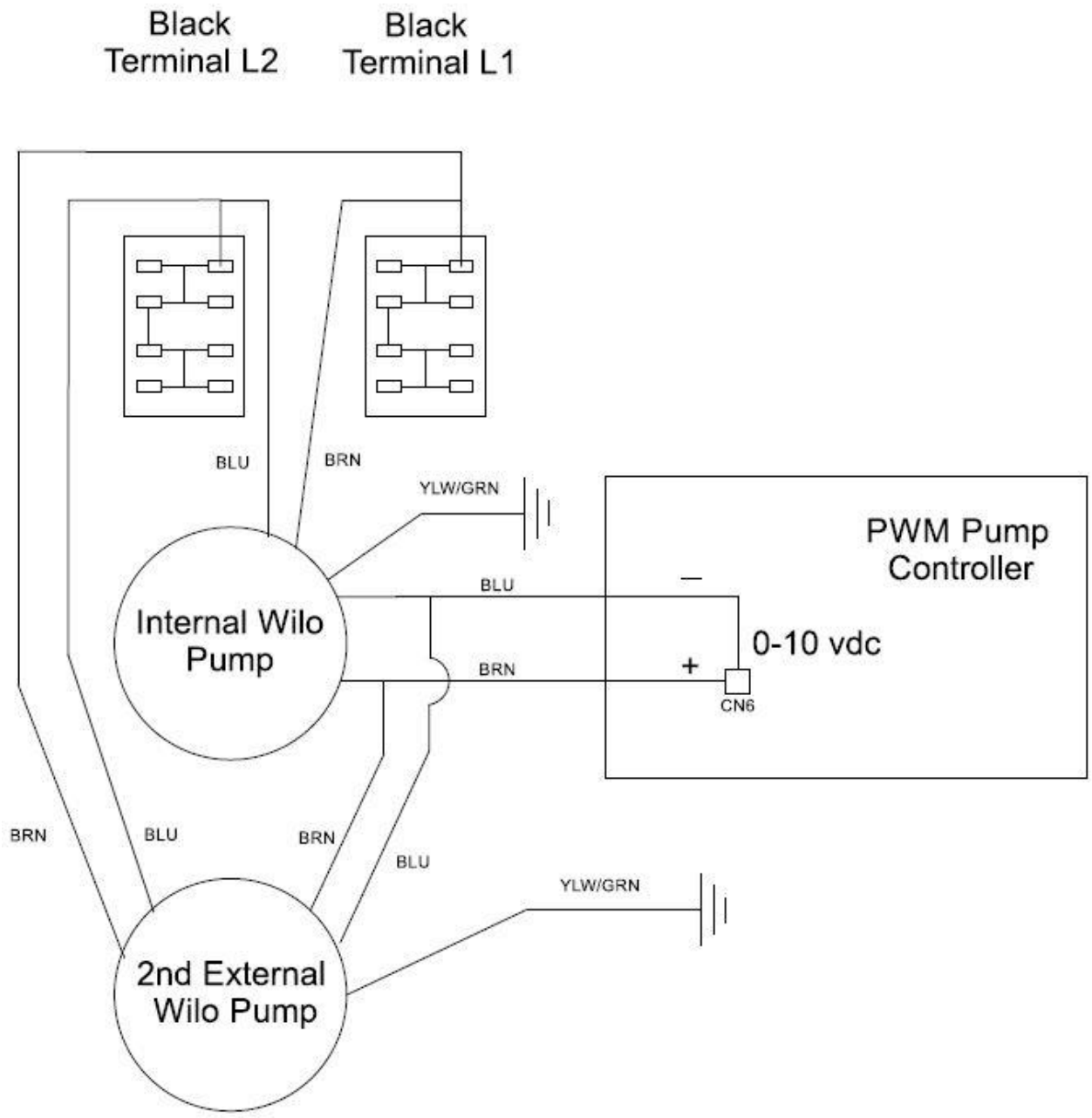
If the Wilo RS 25/7.5 PWM pump does not have the required pressure at the targeted flow rate, a second Wilo RS 25/7.5 may be added to increase the total pump pressure. This will double the head pressure at the targeted flow rate. Wiring details are on the following pages.

Contact us for more information on booster pumps.

Second PWM Pump Wiring

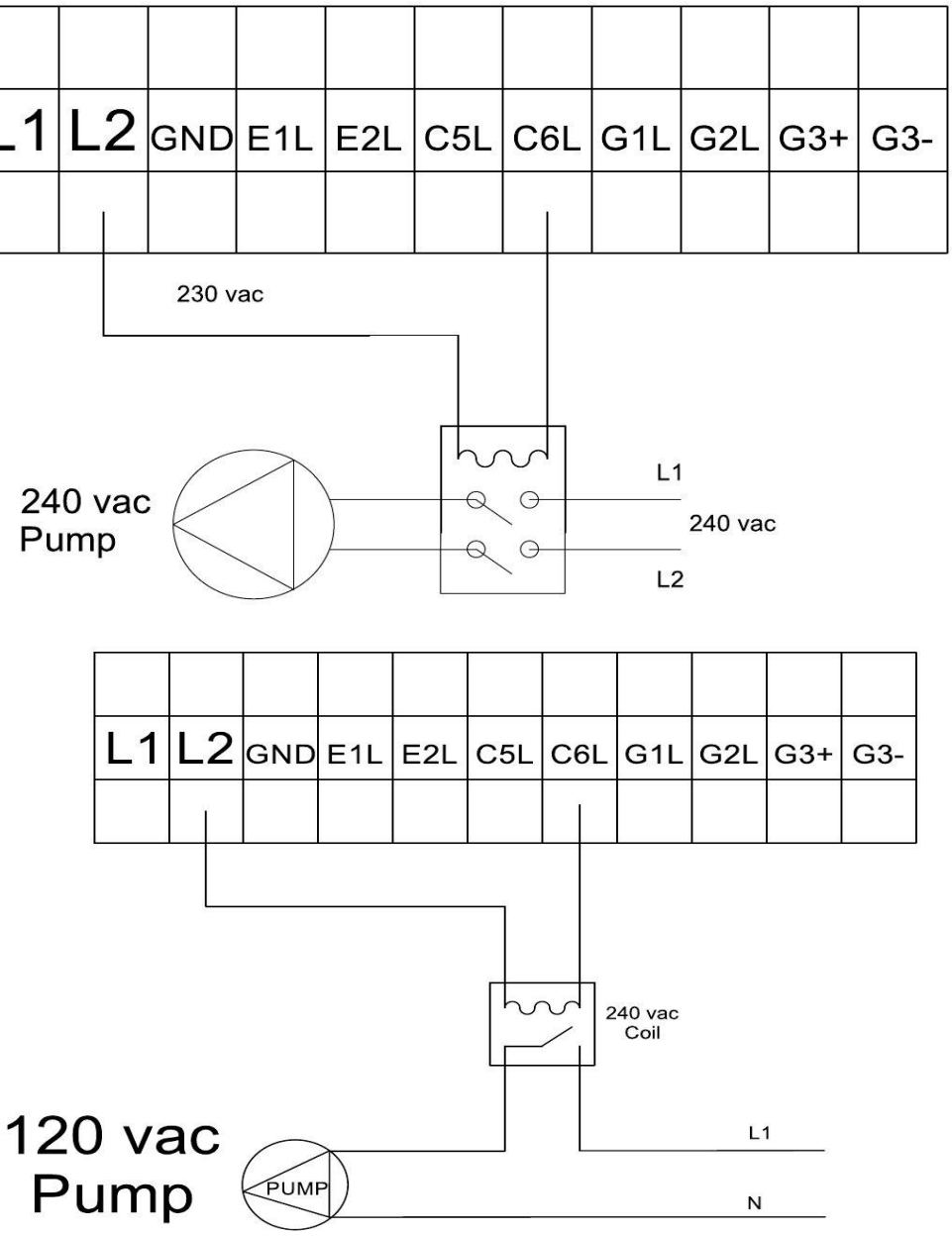


Use proper splicing connectors to connect the second PWM pump in parallel to the internal PWM pump.



When adding a second PWM pump (Wilo RS25/7.5), all wiring is done in parallel. Up to 4 PWM pumps can be wired to the PWM controller. They can be spliced into the wiring harness inside the refrigeration compartment.

When using a second NON-PWM water pump



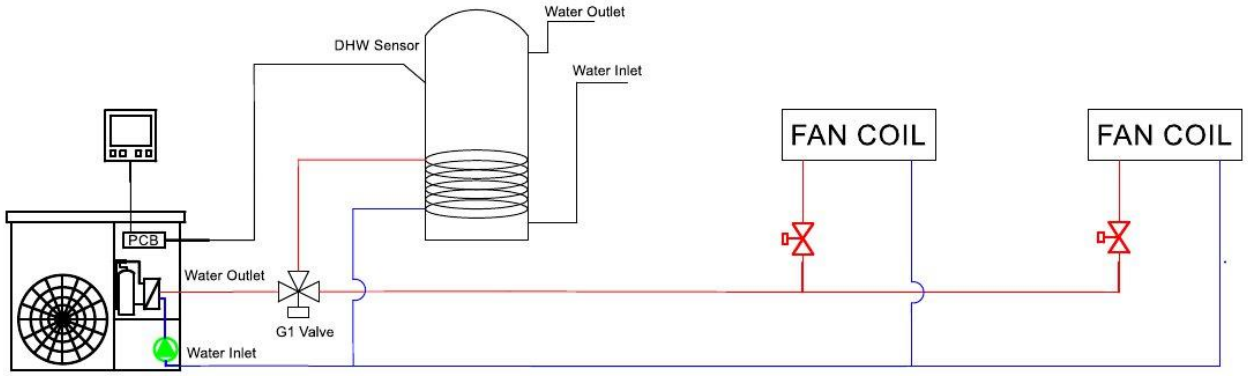
When using a second NON-PWM water pump, use terminals C6 and L2 for relay coil power only. Do not connect a pump directly to C6 and L2, always use a relay with a 240 vac coil. This pump will only run when the PWM pump is running.

G1 Valve

DHW and AC / Heating

G1: DHW/AC / Heating Valve

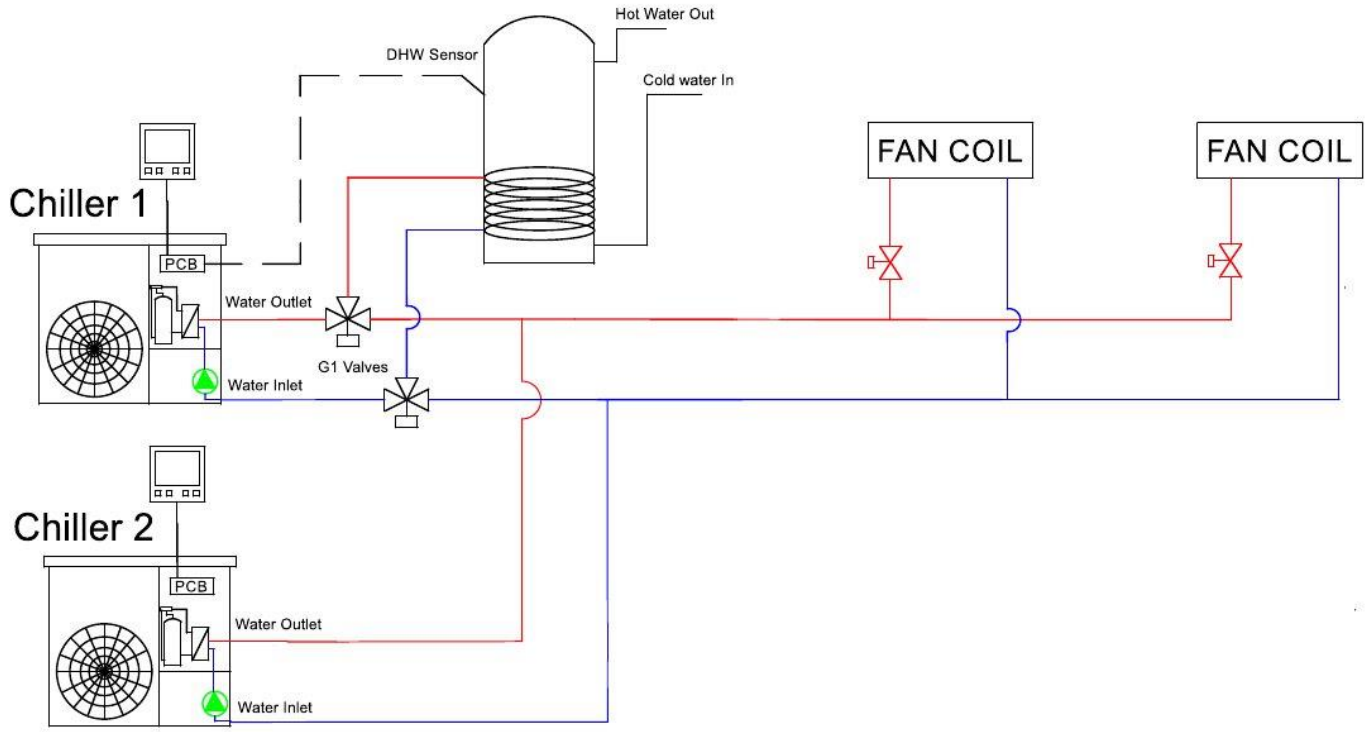
In DHW mode, the G1 valve is powered off. In AC mode, G1 is powered on.
Function Selection Switch: SW1 must be set for SW1-5 OFF to activate G1, SW1-5 ON to deactivate. SW1-6 “OFF”, DHW is activated, SW1-6 ON DHW is deactivated. The main power must be cycled off then on for switch settings to take effect. Parameter 09 will show the switch status.



DHW target setting temperature is the tank water temperature measured with the DHW sensor, not the inlet water temperature. If the target temperature is 122°F, refer to page 37 to set the DHW temp, and the differential is 2°c, it means, when the DHW tank reaches 122°F, the compressor will stop. When the DHW tank temperature is lower than 119°F, the compressor will start.
Parameter 11 is to avoid high pressure protection, P1 errors, during DHW heating. Some older tanks use a short coil inside the tank, if the heat pump is connected to the short coil, the heat pump capacity may be too high creating too much heat and triggering the high pressure protection switch. If this happens, parameter 11 may be changed to adjust the compressor frequency lower. The adjusted number is decided by the installer when testing the DHW function. If you don't use DHW, no changes to parameter 11 are necessary.

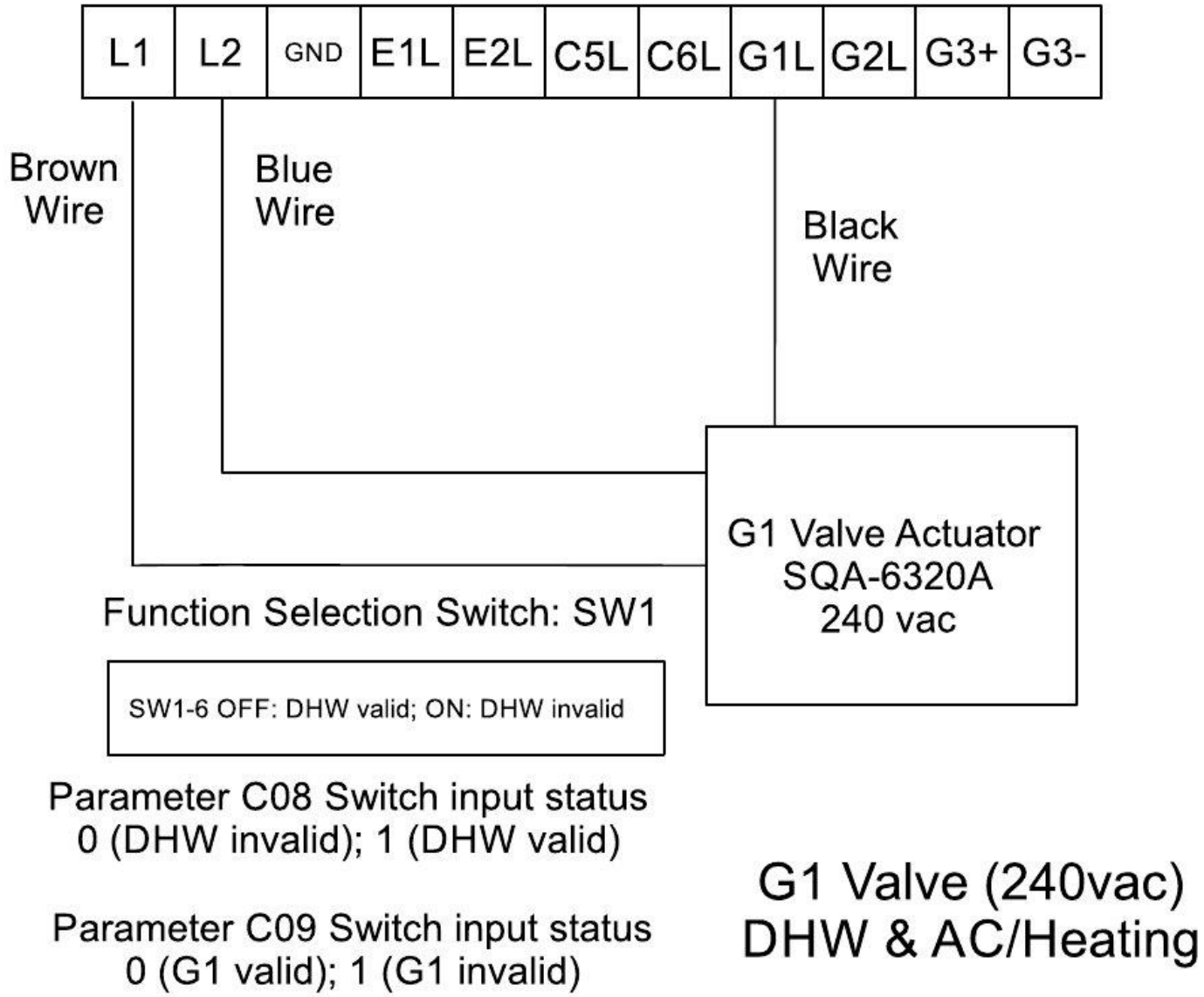
G1 Valve

DHW and AC / Heating with two chillers in Parallel

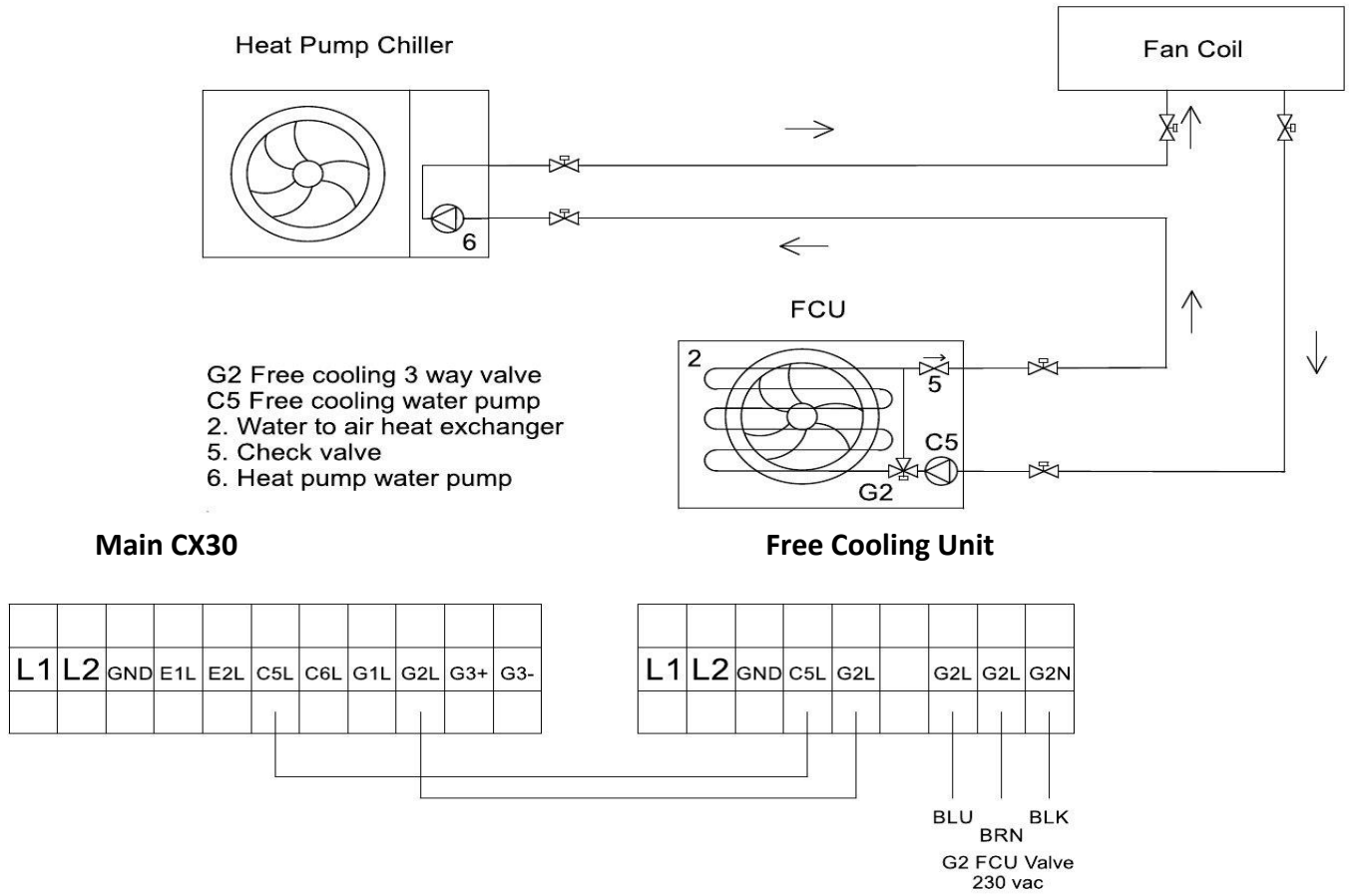


Please remember to set dipswitch 1-6 to the off position for DHW, page 44. The power must be cycled after changing the switch settings.

G1 Valve Wiring and Parameters

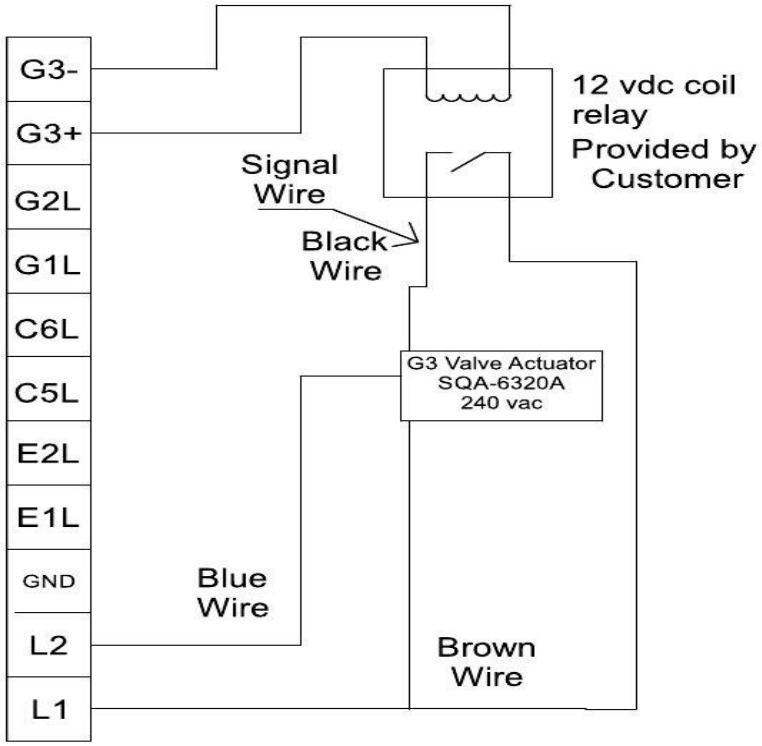


G2 Valve Wiring “Free Cooling “ CX30SE Model



G2 Valve and C5 cooling water pump are preinstalled in the CX30SE. To enable the free cooling function dipswitch SW1-5 must be set to ON. The main CX30 C5 port is connected to the Free Cooling Units C5 port, the CX30 G2 is connected to the FCU 3-way valve G2 port. Parameters P29 and P31 have a factory default of 5°C, differential = 2°C. P29 must be changed to 3°C, and P31 must remain 5°C. The unit will operate as follows: When outdoor temperatures drop below 38F, the CX30SE glycol-water loop is automatically extended through the water-to-air heat exchanger to harvest outdoor cold ambient conditions to pre-cool the glycol-water loop so that the CX30 variable speed compressor can drop to a very slow speed and consume less power. At and below 28F, the CX30SE server room chiller will turn off the compressor entirely and still be able to maintain its rated cooling capacity using only the variable speed pump and fan motors.

G3 Valve: Seasonal Switch Valve or Solar Preheat Valve



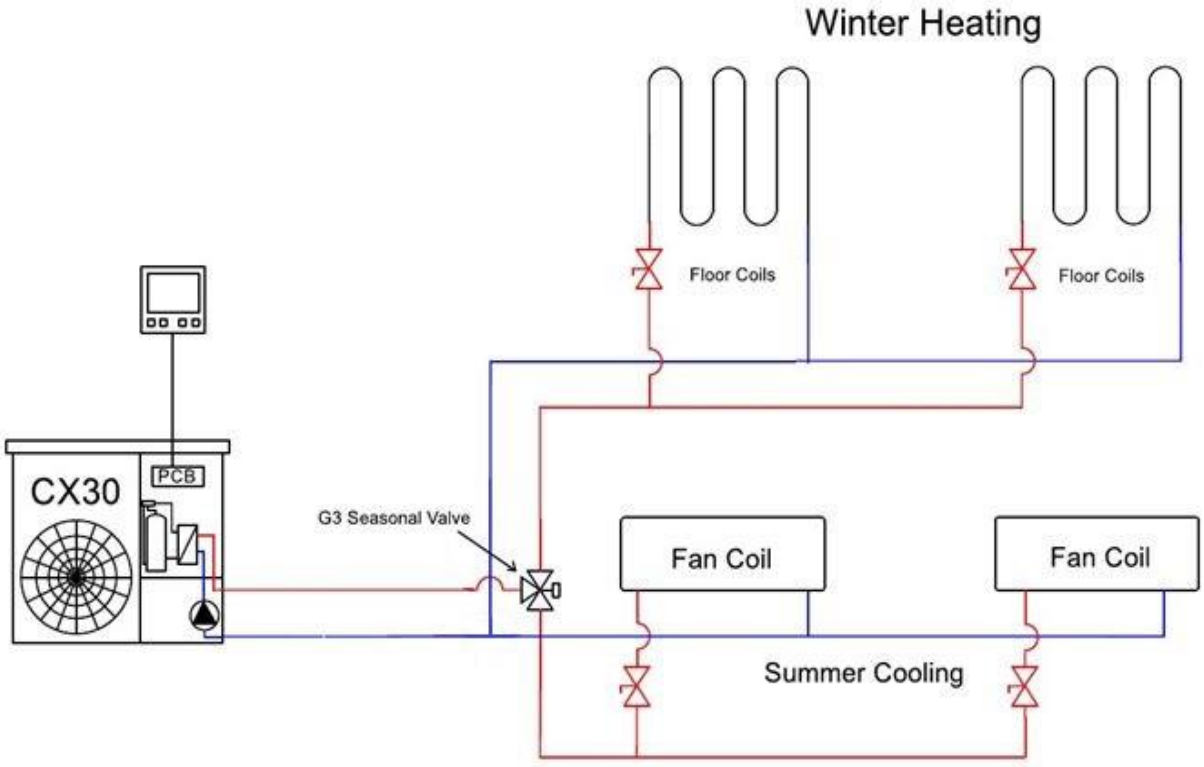
When Parameter 14 is 0, G3 is configured as a seasonal switch
When Parameter 14 is 1, G3 is configured as a solar preheat valve

The G3 port can be used to control a seasonal switch valve. The seasonal switch valve is used to isolate the floor coils from the fan coils when switching over from heating to cooling. The seasonal switch valve is controlled by parameter 14. When parameter 14 is 0, the valve is configured as a seasonal Switch.

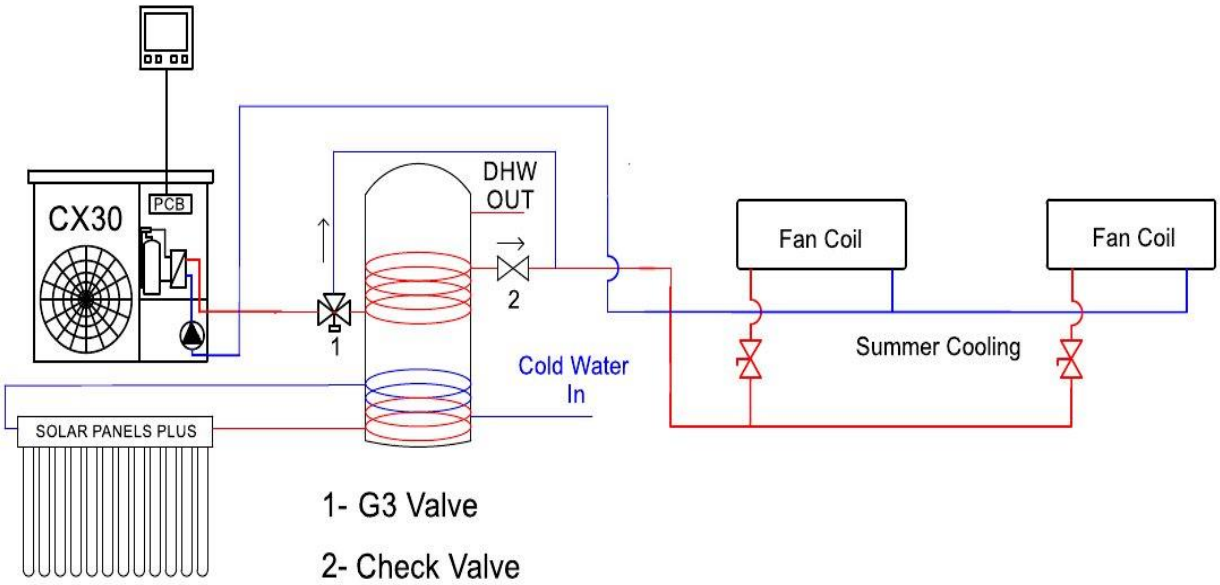
When parameter 14 is 1, the valve is configured as a solar pre-heat valve. The CX30 compares the solar tank temp and AC returned temp. When the solar tank temp – AC returned temp is ≥ 5 ℃ , the 3-way valve G3 will be on; when solar water tank temperature minus the air conditioning returned temperature is less than 2°C, G3 will be off.

G3 VALVE

Seasonal Switch Valve

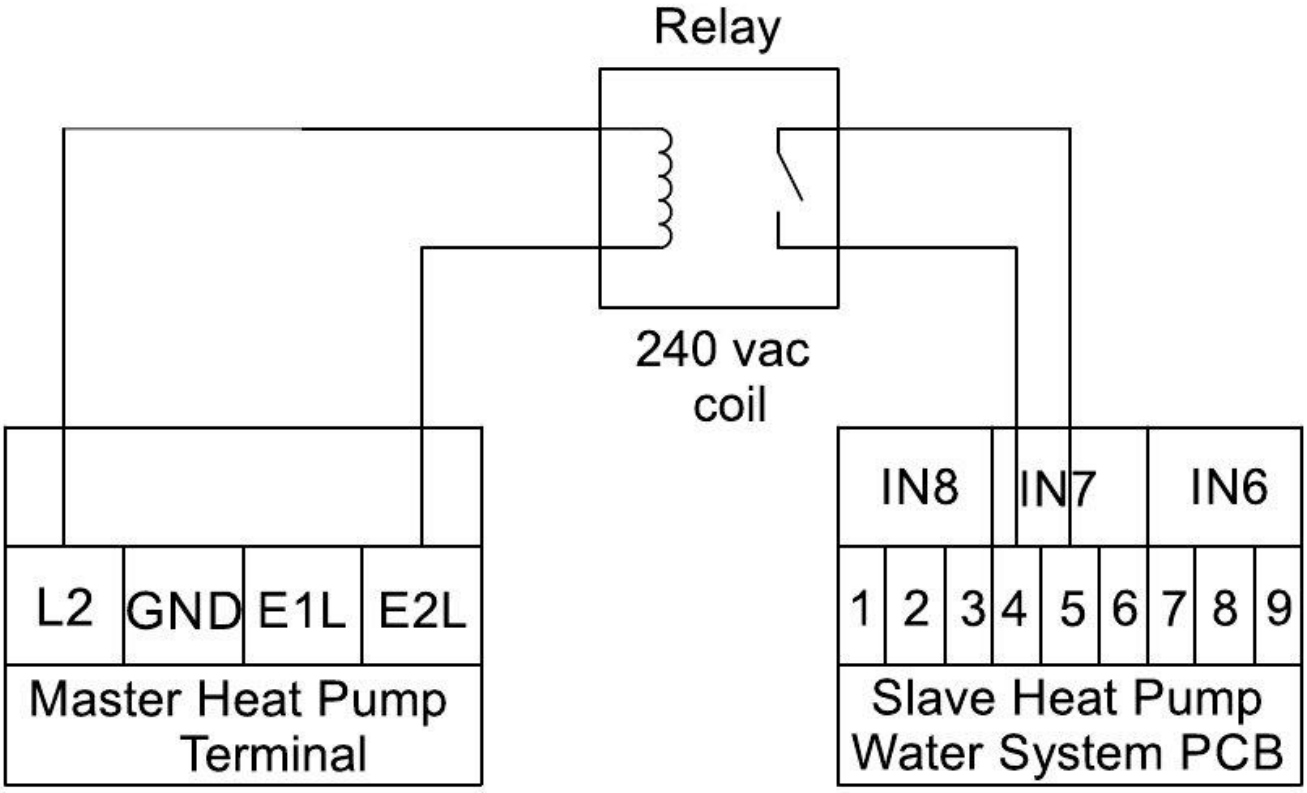


Solar Preheat Valve



Master – Slave Wiring

Heating Mode Only

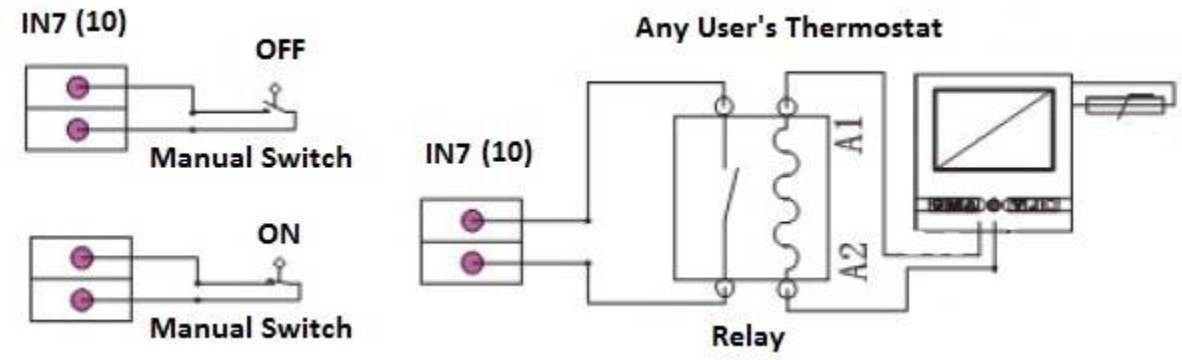


When using the master –slave configuration, the heater control port of the master unit is connected to the AC 2nd switch port of the slave unit through a customer supplied relay. This port is activated when the master unit cannot reach the target temperature within 15 minutes. The slave unit must be turned on and heating mode must be selected. There is no limit to the number of slaves that can be used.

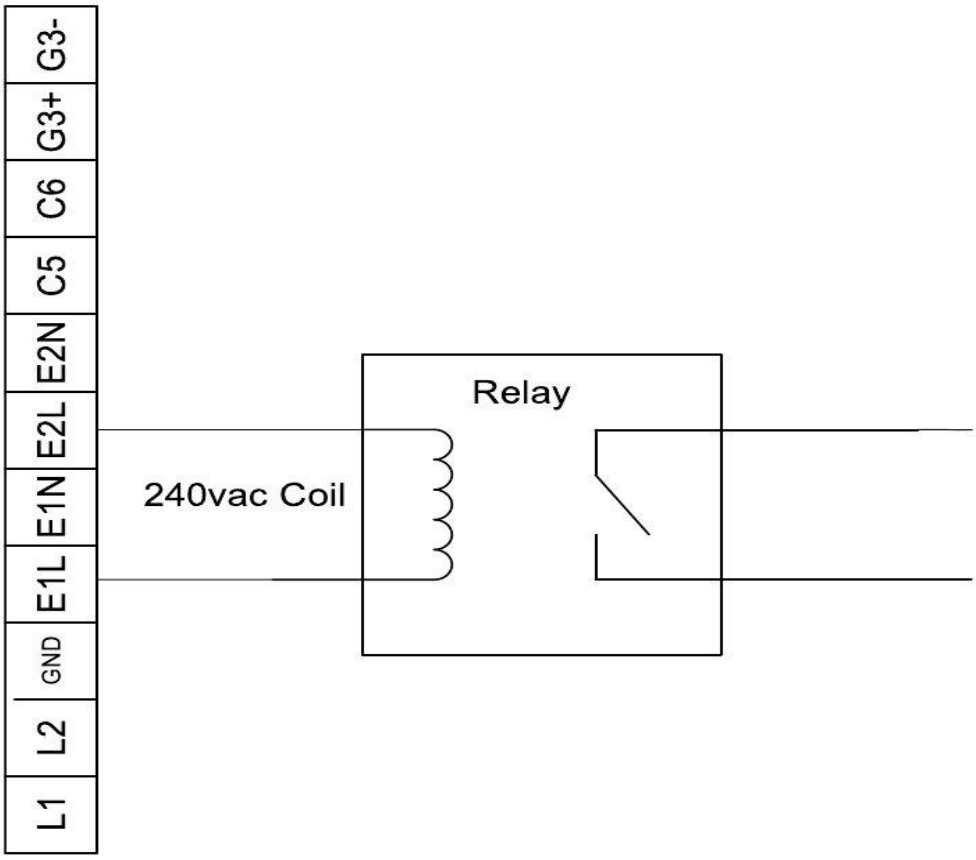
2nd AC Switch Function

The 2nd switch function enables our heat pump to be controlled by any additional user's thermostat or remote switch for convenient control. Function: When the 2nd switch is off, the heat pump AC mode will enter standby mode no matter whether the AC water temp reaches its target or not. When 2nd switch is on, the heat pump will run according to set temp.

Connection: The manual switch or user's thermostat is to connected to Water Control PCB IN7 as shown in the wiring diagram below. When the 2nd switch is off, the lock icon will appear on the wired controller.



Second Heat Source or Assistant Electric Heater



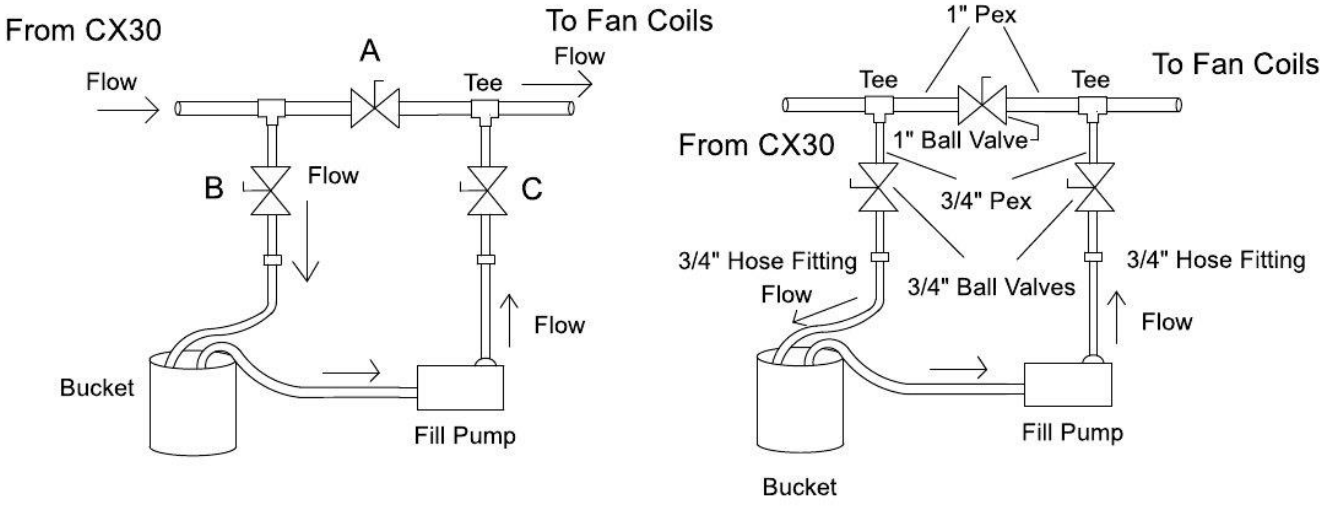
Parameter 27, 28 usage If you set parameter 27 to "0", E2 is the assistant electric heater control port, if you set parameter 27 to 1, E2 will be 2nd heat source control port. If the E2 port is the assistant electric heater control port, it is controlled by parameter 10. If air temp < Parameter 10, E2 will be active. But it will not start at once, if the compressor cannot reach target temp within 15 minutes, it will energize the relay coil at E1& E2. The compressor will work together with E2. If E2 is 2nd heat source control port, it is controlled by parameter 28. When air temp is lower than parameter 28 (default -15c), E2 will be energized and the compressor will stop. Only the 2nd heat source is working with E2. You can connect the electric boiler on/off signal to E2. E2 only provides an "on/off" signal. You can connect your own controls, it's max current is 1 amp. You must add a relay to protect the heat pump PCB, so if there are any problems from the electric boiler, it will not damage the heat pump PCB. If your winter is not too cold (above -15c), you can use E2 as an assistant electric heater. If your winter is too cold, (lower than -18c~-20c), the compressor will work too hard, so you should set E2 as 2nd heat source port to protect the heat pump.

System filling with Propylene Glycol and water

At or near the chiller a flush/fill valve assembly must be installed. This can be made with three ball valves and a couple hose fittings. See example below.

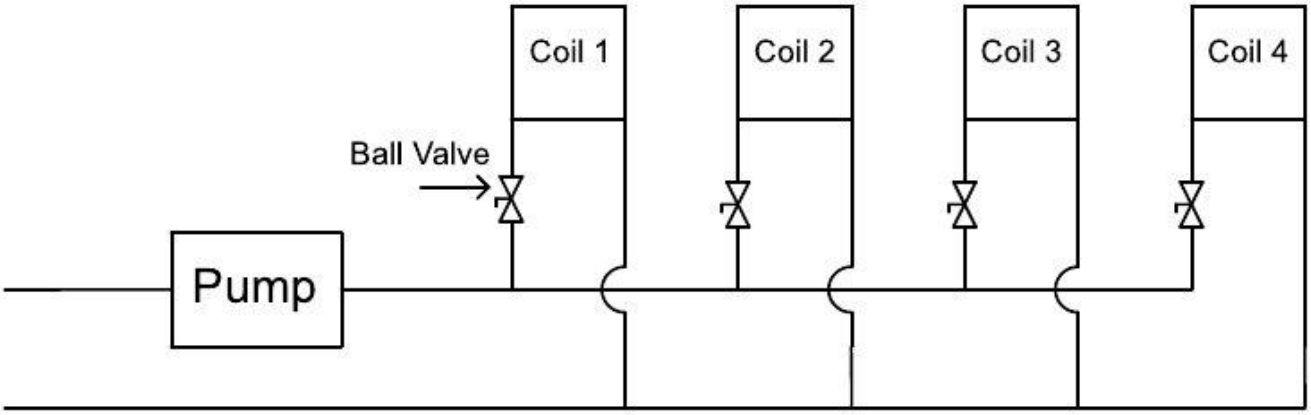
Bill Of Materials

2 ea. 1" x 3/4" tee
1 ea. 1" Ball Valve
2 ea. 3/4" Ball Valve
2 ea. 3/4" Hose Fittings
10' of Garden Hose
5 Gallon Bucket
High Head Fill Pump



Pre-mix the propylene glycol in a container large enough to hold the loop volume plus a few gallons. Using a filling pump and 3 hoses, place one hose in the glycol container and connect it to the suction side of the pump. Connect the second hose to the pump discharge and the other end to valve “C” that is closest to the fan coils. Using a third hose, connect it to valve ”B”, closest to the chiller and leave the open end in the glycol bucket. Close the middle ball valve “A”. The pump should be pumping away from the CX30 chiller. Run the pump until there are no more air bubbles coming out of the loop. After all air is expelled from the loop, close valve “B” and then open valve “A” with the pump running. When the pressure gage on the CX30 shows at least 30 psi close valve “C” and turn off the pump. Minimum loop pressure is 14.5 psi, maximum pressure is 43.5 psi, and ideal pressure is 30 psi.

Purging Air from the Fan Coils



Close the input valve to each fan coil except the first coil (1). Turn the pump on and run it, when the bubbles stop coming out of the discharge hose turn on the ball valve on coil (2), wait for the bubbles to stop, then do the same for coil number (3), then (4). All CX Chillers have a flow switch installed in the loop. Air in the system may cause a flow switch alarm; the controller will display a P5 or P6 error code.

All CXI fan coils have an air purge screw near the water inlet port, always purge the fan coils before starting the chiller.

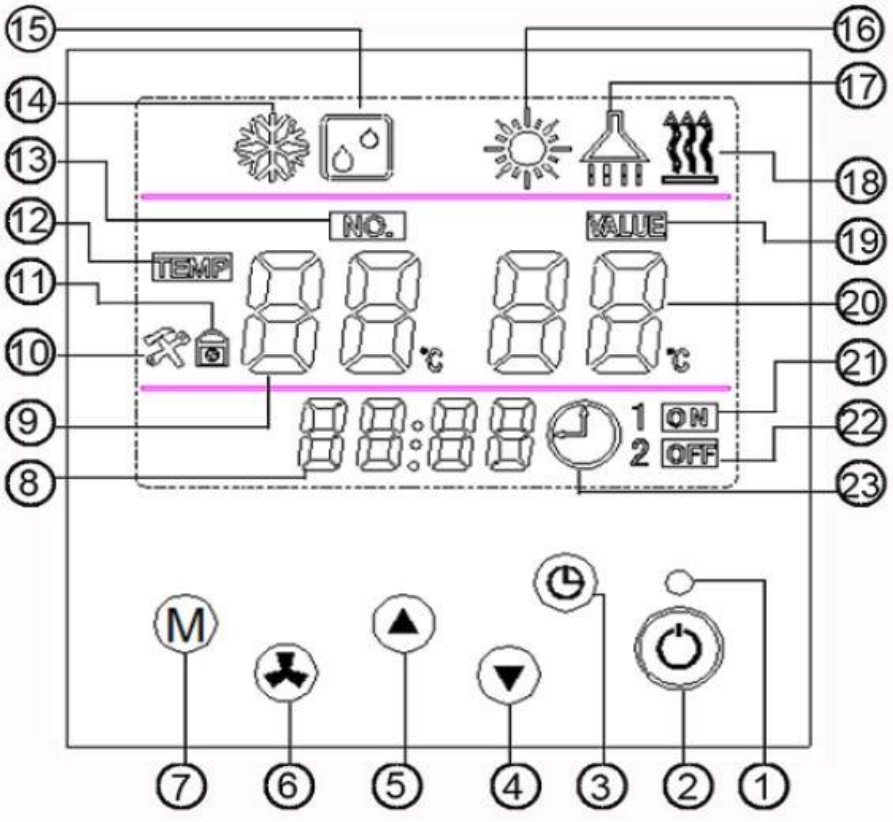
The CX30 chiller also has a bleeder valve with a ¼" clear tube attached to it located near the brazed plate heat exchanger.

Proper and even flow through each fan coil is critical for both heating and cooling. This can be done with balance valves or ball valves installed at each fan coil supply or return pipe. Set each fan coil to the same temperature and fan speed. Using an accurate digital thermometer adjust each ball valve until the coil return temperatures are even. This must be done in heating mode so proper flow can be verified to protect the heat exchanger from freezing up in cooling mode.

If a fan coil is powered on but the fan isn't running, there is a good possibility that there is air trapped in that particular part of the loop.

WIRED CONTROL PANEL

The control panel contains a LCD and 6 operational keys (as show below). It retains its memory when powered off and can be used as a timer.



No.	Icon meaning	No.	Icon meaning	No.	Icon meaning
1	Green = Power on Orange = Compressor on Red = System Error	9	Returned AC Temp.	17	DHW
2	On / Off	10	Maintain icon	18	Water/ground source display
3	Clock Button	11	Lock icon	19	Parameter icon
4	Down Button	12	Temperature icon (Reserved)	20	Ambient Temp
5	Up Button	13	Parameter number icon	21	Timer on icon
6	Fan Button	14	AC Cooling icon	22	Timer off icon
7	Mode Button	15	N/A	23	Clock Icon
8	Clock display	16	AC heating icon		

1. Key functions

(1) Three-colored indicator light: Green when in standby, Orange when the compressor is on, Red when there is an error code displayed. For more details, please check the fault code sheet at the back of this manual.
(2) Key “on/off”: power on/ power off.
(3) Key “down”: adjust the clock or set the time.
(4) Key “down”: it’s a combined key to decrease the numerical value. Continuous pressing causes a continuous decrease. Short pressing increases the value by one.
(5) Key “up”: it’s a combined key also, but just the opposite of the down key. Continuous pressing causes a continuous increase. Short pressing increases the value by one.
(6) Key “confirm”: confirms previous operations.
(7) Key “mode”: operational mode’s switch, it’s also a combined key.

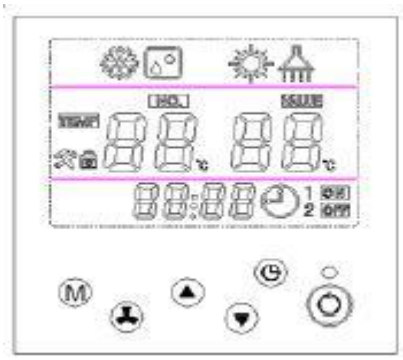
2. Icon Meaning

UNIT OPERATION

1. **Turning the unit on and off**
   To start the unit, press and hold the On/Off key for one second.
   To stop the unit, press and hold the On/Off key for one second.
2. **Mode Switch (2 modes Cooling or heating)**
   Under mode “standby or on”, press the M key repeatedly to cycle through the icons.
   AC cooling -> heating ->
   When a mode is selected, press the button to confirm, the icon will be lit solid, the heat pump mode will be as selected.
3. **Changing the Cooling/Heating parameter setting procedure**
   A. When in the “on” mode, the unit will operate in accordance with the factory default temperature or last modified temperature.
   B. Modification method for heating or cooling.
   In the on mode, press key M key once. The current mode symbol will be displayed.

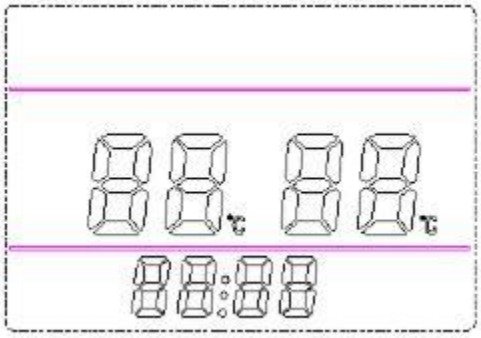
Displays for the different modes

(1) Air source heat pumps icons.

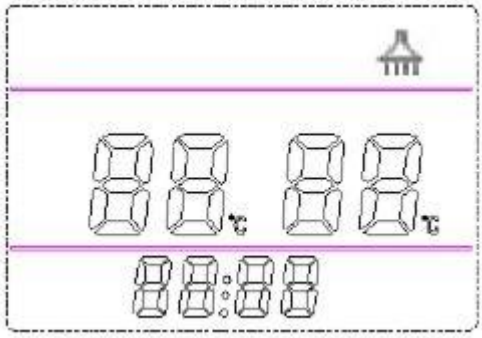


(3) Powered off display

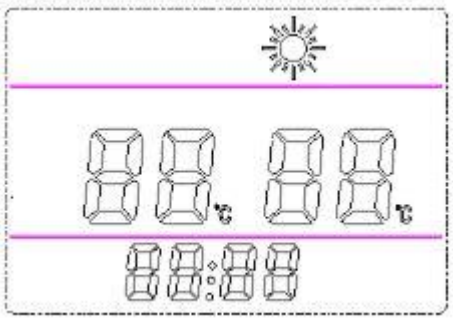
If it has a timer on/off setting, there is a timer icon to indicate it.



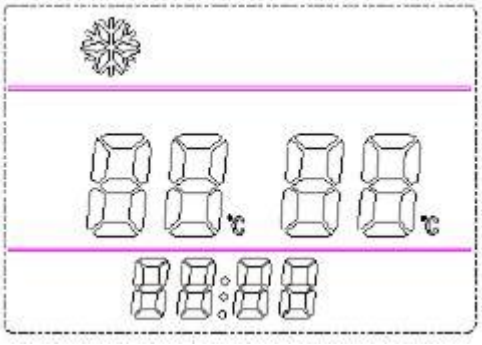
Timer display



DHW display



AC heating display



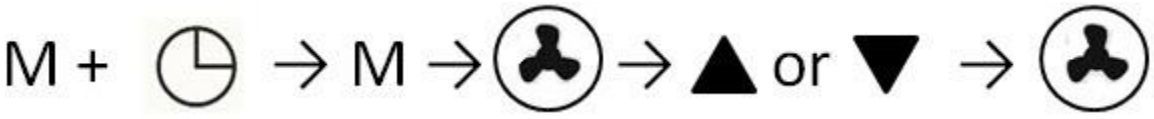
cooling display

INITIAL TEMPERATURE SETTINGS

***Note – Cooling set points refer to the CX30 outlet temperature, however, the system is managed by a 9°F ΔT controller and is measured in C (5°C). Default setting for cooling should be 12°C, therefore the controller returned temp would be set to 17°C. This will create a 54°F leaving water temperature which is the correct setting. The same applies to the heating setting. The default setting for heating should be 40°C, therefore the returned temp would be set to 35°C, this will create a 95°F leaving water temperature which is the correct setting.**

Detailed settings as follows:

N0.	Meaning	Selected temperature range	Recommended controller temperature setting	Operation for modifying settings
1	AC cooling returned water temp	10°C ~ 25°C	12-17°C	M+ → M → → ▲ or ▼ →
2	AC heating returned water temp	10°C ~ 55°C	35-40°C	M+ → M → → ▲ or ▼ →
3	DHW temp	10°C ~ 50°C	50°C	M+ → M → → ▲ or ▼ →



UNIT OPERATION

Time adjustment

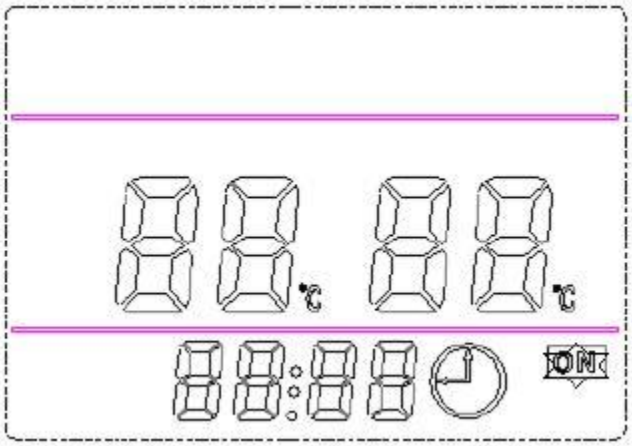
Press the key, time “hour” value will flash, then press ▲ or ▼, the value will increase or decrease. Press and hold either key and the value will cause a continuous increase or decrease. Press the to confirm settings and exit the time mode.

5. Timer setting

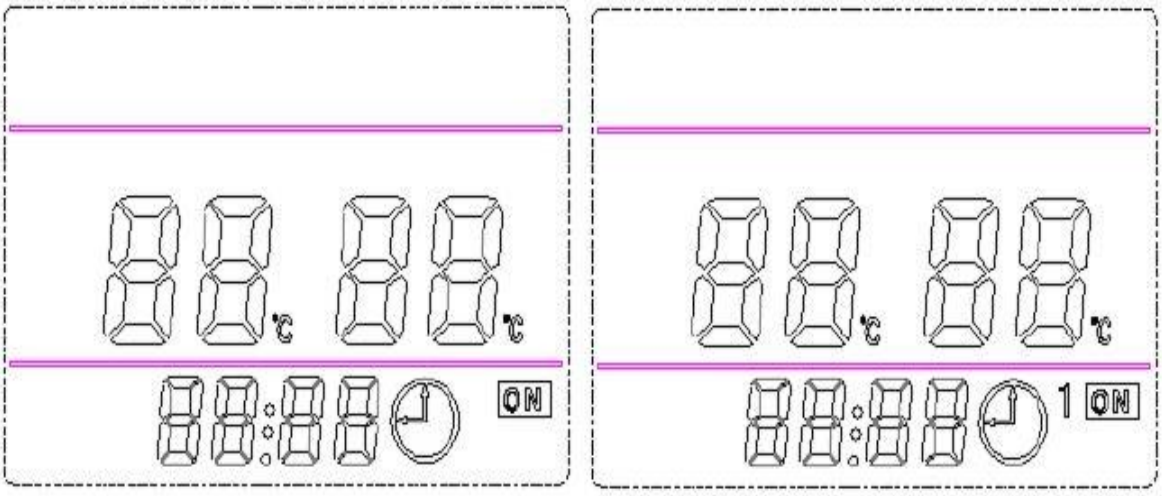
You can set one time to start and one time to turn off. You can select cycling the on /off settings or just turn on and follow the set point.

A. Setting the time “on” method:

1. Press for 3 seconds to set the time, you will see ON flash as show below.



2. Press the ▲ or ▼ key to modify the time, then, press the key to confirm. This setting is only valid for one time. If you want to cycle the time please press the after setting the time, then press the key to confirm.

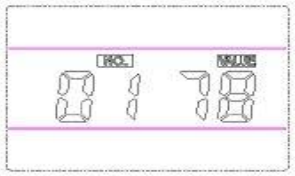


B. Timing off method is the same method as timing on.

C. Press the for 3 seconds to enter timing mode, press to cancel the time setting.

Parameter Checking and Setting

Please press the M+▲ key for 3 seconds and enter parameter setting mode as show below.



In this example “01” is the parameter code, and “78” is the parameter value. Use the key to move from NO. to VALUE. After changing parameters, press the to save the changes.

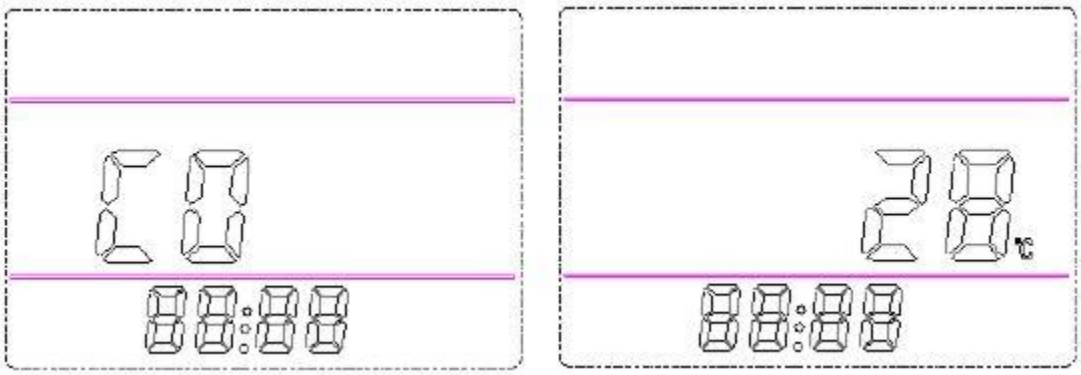
NO	Name	Range/Meaning	Default	Status
00	power down auto restart	0=no recovery, 1=recovery	1	Check/Set
01	DHW water temp. return differential	2~15℃, minus differential	2℃	Check/Set
02	air conditioning return differential	2~15℃, minus differential	2℃	Check/Set
03	Copper pipe temp to start defrost	-20~5℃	0℃	Check/Set
06	defrost exit temperature	10~35℃	30℃	Check/Set
07	Max defrost duration time	15~99 mins	15	Check/Set
08	defrost interval time between 2 defrosts	15~99 mins	35	Check/Set
09	air temp to start DHW electrical heater	-20~20℃	0℃	Check/Set
10	air temp. to start AC electrical heater	-20~20℃	0℃	Check/Set
11	DHW compressor frequency limit	2~10 = 20hz~100hz	10	Check/Set
12	Compressor discharge air protection temp	A0~C7 = (100~127℃)	B0	Check/Set
13	Defrost interval time multiply rate	0: No defrost 1~4: Parameter 08*1~4	1	Check/Set
14	G3 function parameter	0：G3 is seasonal switch valve 1：G3 is solar pre-heat valve	0	Check/Set
26	Chiller water pump running mode C4 And C6	0: not stop, 1: stop when reach target temp, 2: run 1 minute, stopping every 15 minutes	0	Check/Set
27	2nd heat source control validation	0, 1 (0: 2nd heat source control disable; 1: control enable)	0	Check/Set
28	Air temp to start 2nd heat source	-15 ~ 10℃	-15℃	Check/Set

29	Air temp to start Free cooling + compressor cooling (SW1-2 must be set to ON to valid this parameter)	-16℃～20℃ (differential 2°C)	3℃	Check/Set
31	Air temp differential on parameter 29 to start Full free cooling (SW1-2 must be set to ON to valid this parameter)	3℃～15℃ If the air temp is lower than P29-P31, start full free cooling	5℃	Check/Set
32	Lowest starting water flow volume, Variable speed pump only.	6~60L/min	6	Check/Set
33	Working Mode	1~4	0= cooling 1= Heating 2= DHW 3= Cooling + DHW 4=Heating + DHW	

UNIT OPERATION

Machine operational status "Checking Only"

Press both M and ▼ for 3 seconds to enter machine status mode, see table below.



"C0" is the parameter number, "28" is the parameter value. The parameter values can't be changed.

Notes for above parameters:

System parameter reset: press controller key for 5 seconds. After one beep, all system parameters are reset. CX30 needs to be re-powered again to refresh parameter changes.

Use of Parameter 14, G3 3-way valve Function parameter:

(1) When parameter 14 is 1, the CX30 compares the solar tank temp and AC returned temp. When the solar tank temp – AC returned temp is ≥ 5℃ , the 3-way valve G3 will be on; when solar water tank temperature minus the air conditioning returned temperature is less than 2°C, G3 will be off.

(2) When parameter 14 is 0, G3 is a seasonal switching valve. When the system runs in heating mode, G3 is ON. When the system runs in cooling mode, G3 is off.

Parameter 03, 06, 07, 08, 13 are for defrost settings.

The defrost function watches parameter 03, it triggers the defrost cycle when the copper pipe temp is below that, it runs until it reaches parameter 06 or times out on parameter 07. It won't check again until the time set in parameter 08 is reached, or parameter 08 multiplied by parameter 13s time has elapsed.

Use of Parameter 26: AC water pump working mode

If you're not using an AC buffer tank, Parameter 26 must be set to 0, the AC water pump will work continuously to keep the AC loop water temp always the same in the loop. If using an AC buffer tank, for the application to stop the AC water pump when it reaches the target temp, please make the following changes.

(1) Set parameter 26 to 1. You must move the AC inlet water temp sensor (6) IN2 into the buffer tank. (refer to the wiring diagram), page 6.

(2) If adding an AC buffer tank and a second water pump, the second pump will be controlled by a room thermostat or the fan coil control PCB. The (internal) heat pump side water pump is controlled by heat pump C4.

(3) You must use a glycol mixture suitable for your environment and not pure water at both sides of the buffer tank.

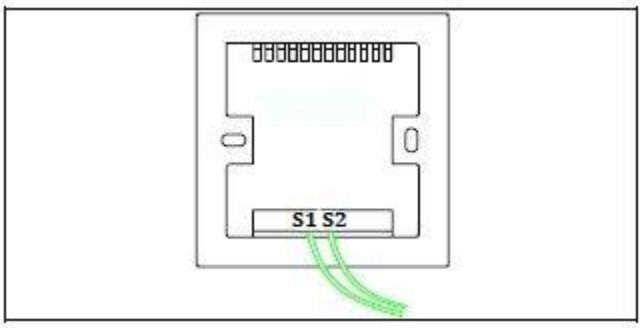
Parameter Checking Only

Press M + ▼ for 3 seconds to search and check parameters.

No.	Name	Range/meaning	Status
C0	Outdoor pipe temp. (AIN2)	0 ~ 97℃	check
C01	Compressor exhaust gas temp. (AIN1)	inverter: 0 ~ 97℃ (0: disconnected; 1: connected)	check
C02	Ambient temp. (AIN3)	-30 ~ 97℃	check
C03	Outlet water temp. (IN3)	0 ~ 97℃	check
C04	DHW pipe temp. (IN7)	0~97℃	check
C05	Solar pipe water temp. (IN6)	0 ~ 97℃	check
C06	Switch input status	0; Cooling Invalid 1; Cooling Valid	check
C07	Switch input status	0; Heating Invalid 1; Heating Valid	check
C08	Switch input status	0; DHW Invalid 1; DHW valid	
C09	Switch input status	0 (G1 valid); 1 (G1 invalid)	check
C10	High pressure switch status	0: (ON); 1 (OFF)	check
C11	Mid pressure switch status	0: (ON); 1 (OFF)	check
C12	Low pressure switch status	0: (ON); 1 (OFF)	check
C13	Inside water flow switch	0: (ON); 1 (OFF)	check
C14	Outside water flow switch	0: (ON); 1 (OFF)	check
C15	Over current protection switch	0: (ON); 1 (OFF)	check
C16	Defrost	1: ON ; 0 (NO)	check
C17	AC antifreeze	1: ON ; 0 (NO)	check
C18	System antifreeze	1: ON ; 0 (NO)	check
C19	Compressor running frequency	0 ~ 100	check
C20	Outdoor fan motor	1: ON; 0:OFF	check
C21	Crankcase heater	1: ON; 0:OFF	check
C22	4-way valve	1: ON Heating; 0:OFF Cooling	check
C23	Bypass valve	1: ON; 0:OFF	check
C24	Solenoid valve 1 **G2**	1: ON; 0:OFF	check
C25	Solenoid valve 2 **G1**	1: ON; 0:OFF	check
C26	Solenoid valve 3 **G3**	1: ON; 0:OFF	check
C27	Electrical heater 1	1: ON; 0:OFF	check

C28	Electrical heater 2	1: ON; 0:OFF	check
C29	C4 water pump	1: ON; 0:OFF	check
C30	C5 water pump	1: ON; 0:OFF	check
C31	C6 water pump	1: ON; 0:OFF	check
C32	Functional parameter	0-99 (accumulated days from last sterilization)	check
C33	Cooling target temp.		check
C34	Heating target temp.		check
C35	Reserved		
C36	Reserved		
C37	Outdoor unit module temp.	0 ~ 97℃	check
C38	Outdoor unit returned air temp.	0 ~ 97℃	check
C39	Internal pipe temp.	0 ~ 97℃	check
C40	Expansion valve open degree	0 ~ 97℃	
C41	Water source inlet temp(AIN4)	0 ~ 97℃	
C42	Water source outlet temp(AIN5)	0 ~ 97℃	
C43	Solar water tank temp(IN4)	0 ~ 97℃	
C44	Inner pipe temp(IN8)	0 ~ 97℃	
C45	Actual water flow volume	0 ~ 60 L/min Divide by 10 for L/min	

Wired Communications Controller (2 wire)



The communication cable from the wired controller is plugged into the water control pcb and comes with a 16’ extension located in the cable bundle in the refrigeration compartment. It can also be extended to 300’ using 24 AWG wire or larger.

Function Selection Switch: SW1

This switch is on the Water System PCB. Unit must be **power cycled** if switch settings are changed.

Switch	Description	Default
SW1-8	OFF: cooling valid	OFF
SW1-7	OFF: heating valid	OFF
SW1-6	OFF: DHW valid; ON: DHW invalid	ON
SW1-5	OFF: G2 invalid; ON: G2 valid	ON
SW1-4	OFF: inverter outdoor model	OFF
SW1-3	Reserved	ON
SW1-2	OFF: C5 is used for solar heating water pump On: C5 is used for free cooling water pump	ON
SW1-1	ON: air source	ON

ERROR CODES

When the machine has an error, the control will show "P" or "E" at the AC temp location and show the error code at the DHW temp location, press key ▼ to search more error codes that may have happened at the same time. Please see table below for error code meaning.

Error code list

Error Code	Error Meaning	Outdoor Led2	Possible Error Reason	Error Solution
E1	Compressor discharge gas high temp. protection	Flash's 10 times	1. Refrigerant low 2. throttling device problem 3. Water flow volume is too low	1. Check the refrigerant pressure and check if there is leakage. 2. Check the thermostatic expansion valve. 3. Check the water flow volume and if the water pump is too small or is blocked.
E2	Outdoor air temp sensor fault	Flash's 3 times	Sensor open circuit or short circuit	1. Reconnect the sensor 2. Measure the sensor resistance at different temperatures, if it is out of range change the sensor.
E3	Pipe temp or returned air temp sensor fault	Flash's 6 times	Sensor open circuit or short circuit	1. Reconnect the sensor 2. Measure the sensor resistance at different temperatures, if it is out of range change the sensor.
E4	AC returned water temp. sensor fault	No flash	Sensor open circuit or short circuit stop compressor in AC	1. Reconnect the sensor 2. Measure the sensor resistance at different temperatures, if it is out of range change the sensor.
E5	AC output water temp. sensor fault	No flash	Sensor open circuit or short circuit stop compressor in AC	1. Reconnect the sensor Measure the sensor resistance at different temperatures, if it is out of range change the sensor.

E6	Hot water temp. sensor fault	No flash	Sensor open circuit or short circuit stop compressor at DHW	Reconnect the sensor Measure the sensor resistance at different temperatures, if it is out of range change the sensor.
E7	Solar water temp. sensor fault	No flash	Sensor open circuit or is shorted.	1. Reconnect the sensor 2. Measure the sensor resistance at different temperatures, if it is out of range change the sensor.
FB/ E8	Outdoor coil high temp protection	Flash's 15 times	Outdoor unit heat exchange not good	1. Check if the outdoor is too near the wall. 2. Check if the fan is blowing. 3. Check if the coil temp sensor has an error.
E9	AC antifreeze twice	No flash	Inlet or Outlet water temp is lower than 39.2°F, AC antifreeze 2 times within 90 minutes.	Check inlet and outlet water temp sensors, they may be loose.
EA	DHW antifreeze twice	No flash	DHW tank water temp is lower than 41°F, antifreeze 2 times within 60 minutes.	Check DHW tank temp sensor is mounted at a warm location on DHW tank top
Eb	Indoor refrigerant pipe temp sensor error	No flash		1. Reconnect the sensor 2. Measure the sensor resistance at different temperatures, if it is out of range change the sensor.
F1	Voltage protection	Flash's 1 time	Voltage too high or too low, (after voltage becomes normal, 165~265VAC, unit will auto restart).	Check if the electricity supply is ok, wires are not loose.

F2	Rating module PFC error	Flash	IPM module (PFC) connection wire loose or IPM module defective.	1. Check if there is any burn marks on IPM PCB.
F3	Compressor stopped abnormally	Flash	Power supply error, electromagnetic interference, Outdoor PCB error or bad compressor.	1. Shut off the power supply wait for 3 minutes then reconnect the power. 2. Check that all wire connections are not loose.
F4	Outdoor IPM module radiator sensor fault	Flash's 5 times	IPM module temp sensor error.	Reconnect or change the sensor.
F5	Outdoor unit current sensor fault	Flash's 8 times	Running Current sensor fault or loose wires.	Reconnect or change the sensor.
F6	IPM or module control board fault	Flash's 14 times	1. Communication wire between IPM module and outdoor PCB. 2. IPM Module is burned or IPM has no power from the AC contactor. 3. Outdoor PCB Communication port error.	4. Check if the IPM module (PFC) connection wire with outdoor PCB is not loose. 5. Check if there is any burn marks on IPM. 6. Check the AC connection at the IPM. 7. Check if the outdoor PCB has an error.
F7	Compressor fail to start	Flash	Decided by Outdoor unit	Check the wire connections, Refrigeration PCB and compressor.
F8	Outdoor unit overcurrent	Flash's 11 times	Compressor working current too high	1. Check the compressor wire connections. 2. Disconnect the power supply and reconnect it after 3 minutes. 3. Check if the refrigerant volume is correct 4. Open the heat expansion valve 360~180°

F9	Exhausted gas temp. sensor fault	Flash's 7 times		1. Reconnect the sensor. 2. Measure the sensor resistance at different temperatures, if it is out of range, change the sensor.
FA	Outdoor module overheat, over-current	Flash's 5 times	IPM temperature too high, compressor current too high.	1. Disconnect the power supply and reconnect it after 3 minutes. 2. Check if the IPM connection wires are not loose or IPM is burned.

P1	high pressure protection	Flash's 2 times	1. High pressure switch loose or faulty. 2. There is air inside the water circuit. 3. Water flow volume is too low, water pump is too small or faulty. 4. Throttling device (expansion valve) problem. 5. There is air inside the refrigerant system or refrigerant volume is too high.	1. If the error displays before the compressor starts, it means high pressure switch error. Please reconnect high pressure switch or change the switch. If the error displays when water temp is about 104°F, please check if the high pressure switch or mid pressure switch is misconnected by mistake. Refer to the wiring diagram. 2. Clean and purge the air from the water circuit. 3. Clean the Water circuit filter or add a bigger water pump if water flow is not enough. 4. Open the thermostatic expansion valve 360~180°, 5. Measure the refrigerant pressure, re-vacuum the system and recharge the refrigerant.

P2	Low pressure protection	Flash's 9 times	1. Low pressure switch loose or faulty. 2. Throttling device (expansion valve) problem 3. Heat expansion valve needs to be preheated. 4. Refrigerant low (leaks)	1. If the error displays before the compressor starts, it means low pressure switch error. Please reconnect the low pressure switch or change it. 2. Open the thermostatic expansion valve 360~180°. 3. Disconnect the power for 3 minutes, connect power again and turn on the unit. Repeat this 2 or 3 times to preheat the expansion valve. 4. Check for refrigerant leakage.
P5	outdoor unit water flow fault	No flash	1. Low water flow. 2. Water flow switch fault.	1. Clean the water filter, check water pump flow. 2. Check and reconnect water flow switch.
P6	outdoor unit (water source side) water flow fault	Flash's 17 times	1. Water source side water flow too small. 2. Water flow switch fault.	1. Clean the water filter, check water pump flow. Test the water flow switch.
P7	phase loss	Flash	Power connection fault	Reconnect power supply wires
P8		Flash	Power connection fault	Reconnect power supply wires
P9		Flash	Power supply connection fault or communication between refrigeration pcb and water control pcb.	1. Check the power supply wire connection and wires between IPM pcb and the Refrigeration pcb. 2. Check the water control PCB for loose connections.

Commissioning and Test Run "In Heating Mode Only"

Preparation

After finishing the installation tasks, please check the items below:

1. Check the Function Selection switch settings on the water control PCB, refer to page 44.
2. Check if the power cable is securely connected and the screws are tight.
3. Is the ambient temperature displayed in the two right most digits of the wired controller?
4. Verify that all the shut off valves and manual valves are open. Insulate all water supply and return pipes. Test only in **heating mode** to verify proper water flow.

Water or Glycol Filling (See page 31) A 10% minimum glycol mixture is required to protect the unit from freezing. Refer to the chart on page 10.

1. With a hose and filling pump connected to the CX30 water system, and all air exhaust valves open in the water system, fill the water loop with water and glycol mixture. Keep the air exhaust valves open until there is a continuous flow of water and glycol mixture coming out of the air exhaust valve. Then close the air exhaust valves. See page 32 and 33 for more details.
2. Discharge the air from both domestic hot water system and air conditioning water system. CXI fan coils have a bleeder valve located near the inlet and outlet ports. The CX30 has a bleeder tube attached to the Brazed plate heat exchanger.

To avoid freezing the heat pump when the air temperature drops below 32F in winter, you must use an appropriate glycol and water mixture just in case the electricity is cut off. We recommend biodegradable non-toxic SPP Corn Glycol, any Propylene Glycol (PG) can be used.

Running a Test

Apply power to the CX30 and select **heating mode** using the wired controller. The internal pump should start running at 100% and slowly ramp down. There is a 3 digit display on the PWM PCB that shows the percentage of pump speed. There are also 3 switches, sw1, sw2, and sw3. Pressing sw2 once displays a 0, twice displays return water temp, pressing it a third time displays leaving water temp. Return and leaving water temperature should be within 6-7 degrees. If more than 6-7 degrees there is not enough flow in the system and you will get P5 and P1 errors. Call tech support if any error codes are displayed on the wired controller.

Chiltrix tech support hours of operation, M-F, 9 am-6 pm EST, 757-410-8640 x119

MOST IMPORTANT!

1. Always maintain electricity connection with heat pump to enable the antifreeze function.
2. Initial test should be done in **heating mode**. Make sure it is not in cooling mode during first operation or running a test until you make sure the air conditioning circulation pump is working properly and water is flowing smoothly.