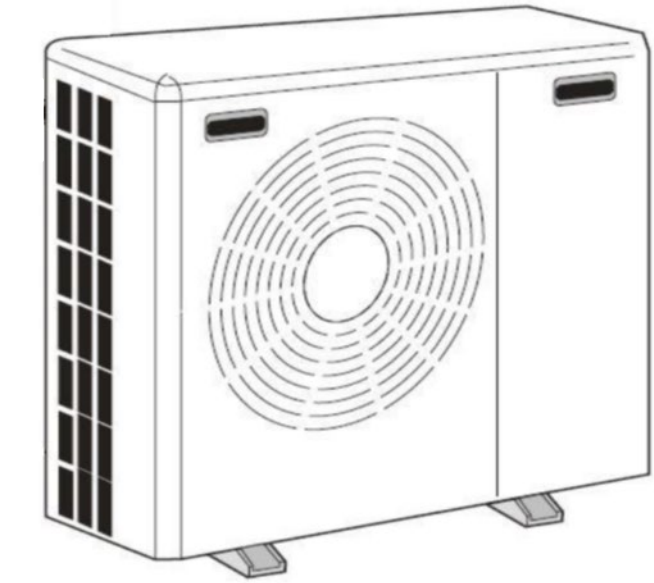
FC30 Install and Operation Manual

NOTE: This document is for the FC30 to be used with a cx35-1, cx50-2, cx65-1, cx75-1 with software version **V109.8 or newer**. If you have a cx35-1, cx50-2, cx65-1, cx75-1 with a lower software version you may need an update to use the features listed in this manual.



PLEASE REVIEW ENTIRE MANUAL BEFORE TRYING TO CONNECT THE CONTROLLER TO YOUR PHONE

Version 1

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IMPORTANT NOTE – MAKE SURE TO PROVIDE YOUR DESIGN DRAWING FOR APPROVAL BEFORE GETTING STARTED, INCLUDING DESIRED OPERATING TEMPERATURES.

Safety Precautions

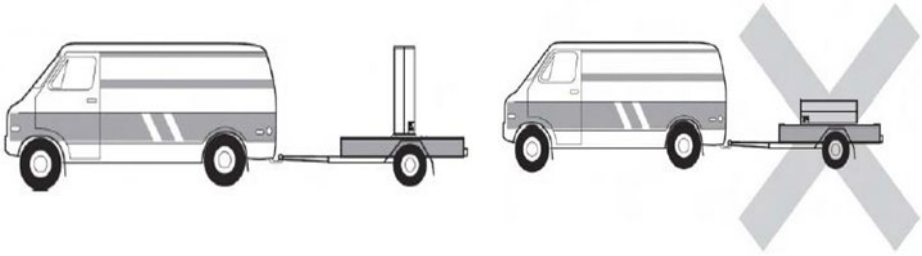
NOTE: It is required to read the Safety precautions in detail before operation. The precautions listed below are very important for safety, please follow all safety precautions.

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 at all times



IMPORTANT: Please refer to ALL of the appropriate documents for your system including V18 Manual, Tank Manual, etc. PLEASE SEE THE DOCUMENTS PAGE HERE https://www.chiltrix.com/documents/

Piping Diagram

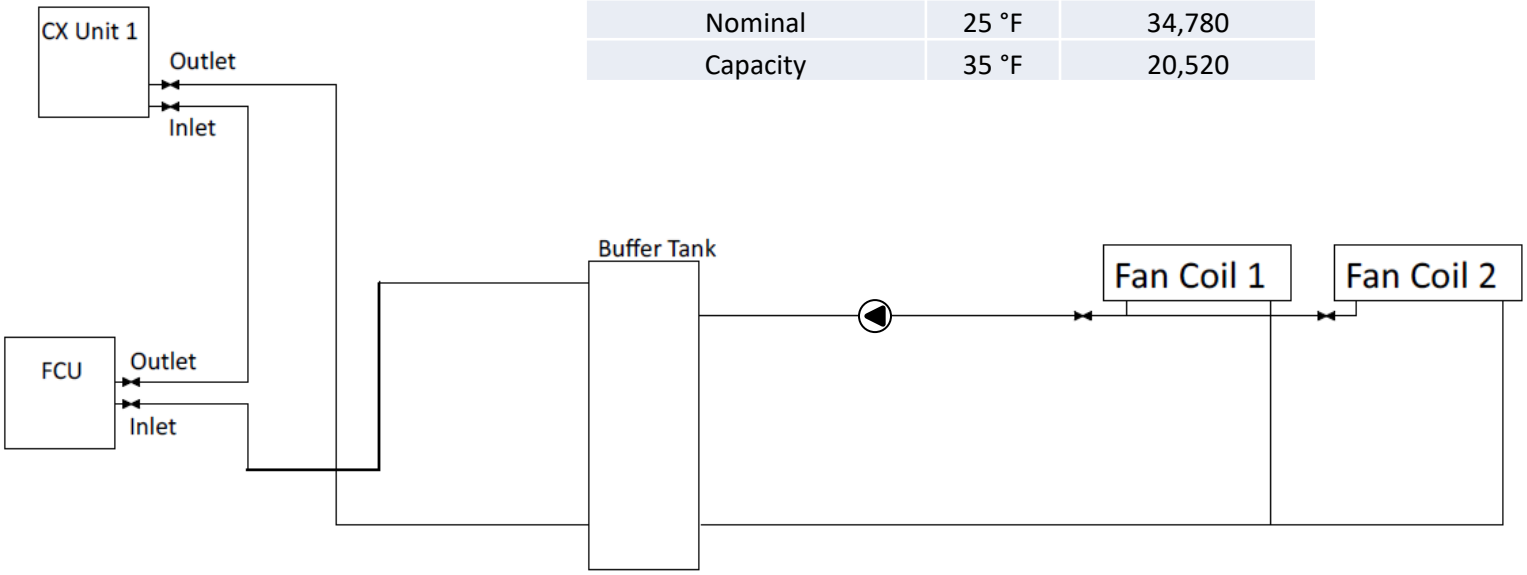
The FC30 (Free Cooling Unit) is designed with two goals in mind. Firstly, it allows critical indoor cooling requirements to be met even when outdoor ambient temperatures are too low for a high efficiency compressor to operate, for example, if outdoor ambient temperature drops below 5 F. Second, the FC30 allows reduced compressor operation (and energy savings) when outdoor temperatures are below 38F by working alongside the compressor and doing at least part of the cooling for free (taking some or all of the load off of the compressor) and producing energy efficiency values as high as EER 62 (COP 18) or higher. Depending on the cooling load, the compressor will be able to shut down entirely while cooling operation is continued when ambient outdoor temperatures drop to a low enough temperature.

The FC30 capacity chart explains the nominal cooling capacity of the FC30 at various outdoor temperatures and flow rates and assumes that up to a 50/50 mix of water and propylene glycol is used and the (variable speed, adjustable) FC30 fan is operating at full speed. The FC30 internal pump, working alongside the internal pump of the CX heat pump, can manage at least the listed nominal flow rate requirements in most piping designs supporting up to 2-tons. A compatible booster pump, controlled by the FC30, may be added if needed for higher capacity of >/= 4 tons and/or for use with higher head-loss piping arrangements.

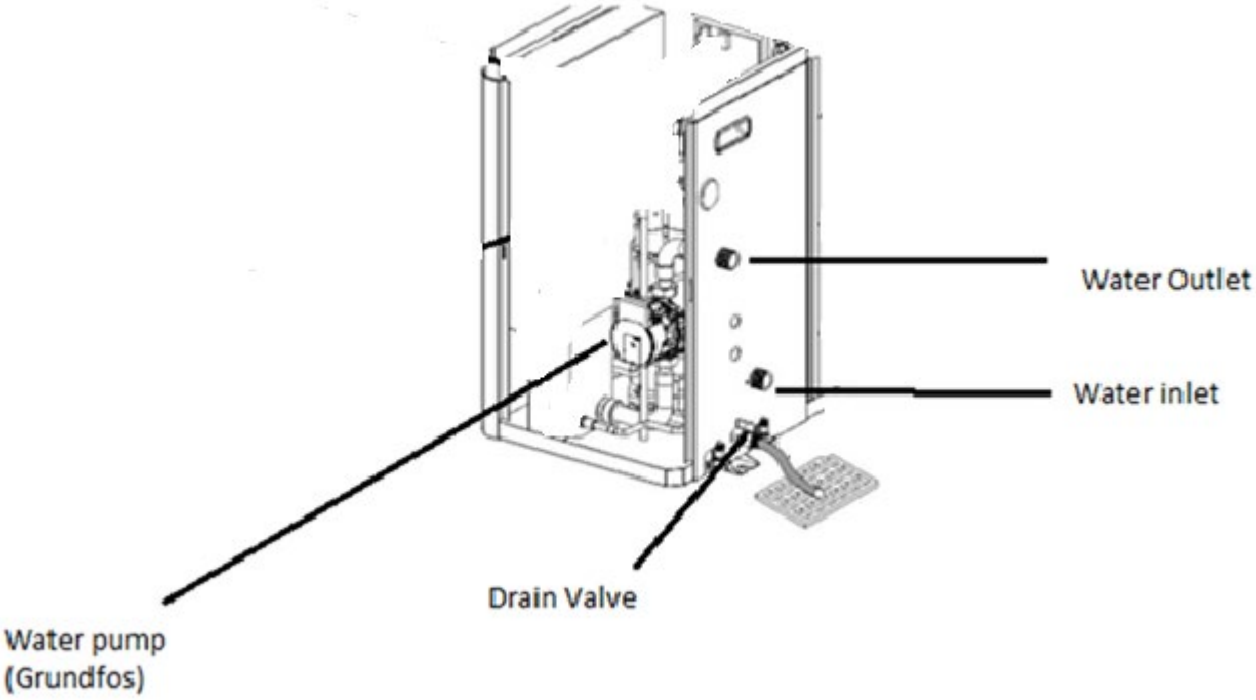
The FC30 unit sits in-series with the heat pump, but when not operating, the FC30 is bypassed. Water returning to the heat pump from the buffer tank is re-routed by a 3-way valve to first flow through the FC30 unit when the FC30 is activated. The FC30 pump and fan will start when the valve energizes. Activation rules/parameters are configurable as explained herein. Water flowing through the activated FC30 is pre-cooled or fully cooled (according to load and ambient temperature) before entering the heat pump. When water entering the heat pump has been (pre)cooled, the compressor will reduce its speed accordingly. If the water has been cooled enough by the FC30 to meet the target, the heat pump compressor will be off.

FC30 Free Cooling Unit		
Glycol 50%	Ambient	BTU/h
45 °F Outlet	0 °F	59,381
55 ° Inlet	10 °F	50,161
Nominal	25 °F	34,780
Capacity	35 °F	20,520

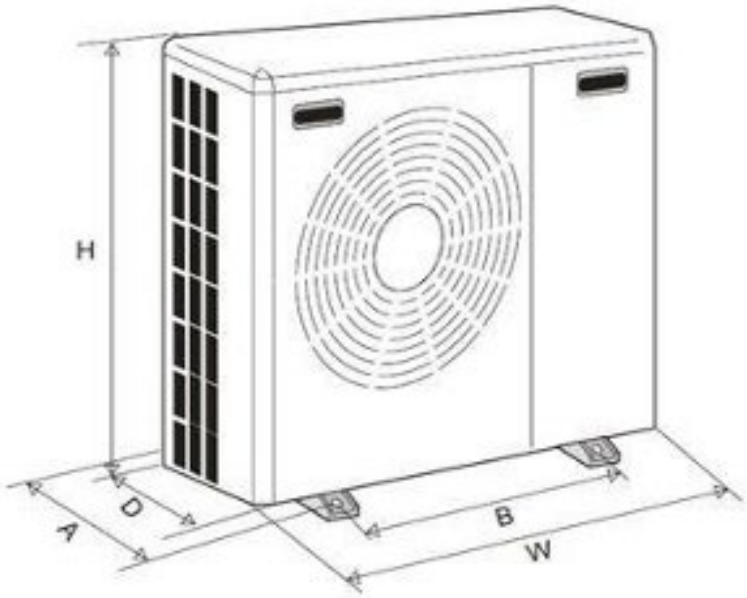
Option 1



FC30 Components/Dimensions



Unit Dimensions in Inches



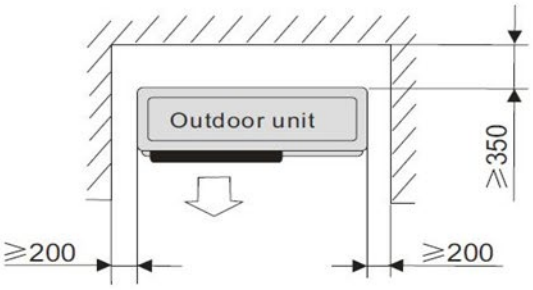
Dim	Inches
A	17.5”
B	32”
D	17”
H	40”
W	43”
D Inc Fan Shroud	18”

Chiltrix FC30 Installation

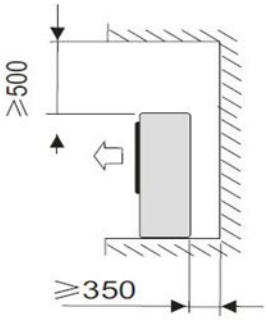
Installation position
Note: ***Installation must be carried out by professional personnel.***

The recommended mounting pad should be at least 1 ½" above ground level. If you are in an area where snow occurs, mount the unit high enough above grade to avoid blockage by drifting snow. You can consider a properly rated wall mount if desired.
Proper drainage is required at the heat pump unit to avoid flooding the outdoor unit with water or ice. Make sure condensate has a way to rapidly and completely drain away from the unit.
To install the unit on a balcony or on top of a building, the installation site must meet the allowable load bearing capacity of the building structure without affecting the structural safety. 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. The unit should not be installed in places accompanied with oil, inflammable gases; corrosive components e.g. sulfur compound, or high-frequency equipment.

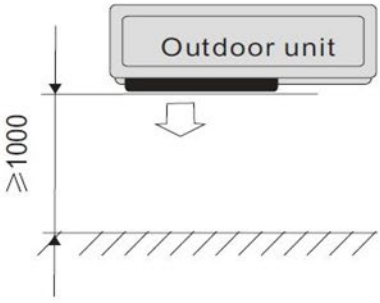
No obstacle in front of the unit



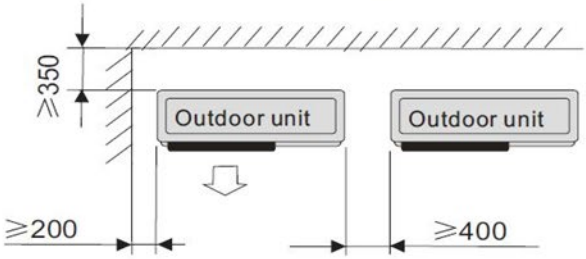
Obstacle above the unit



Obstacle in front of the unit

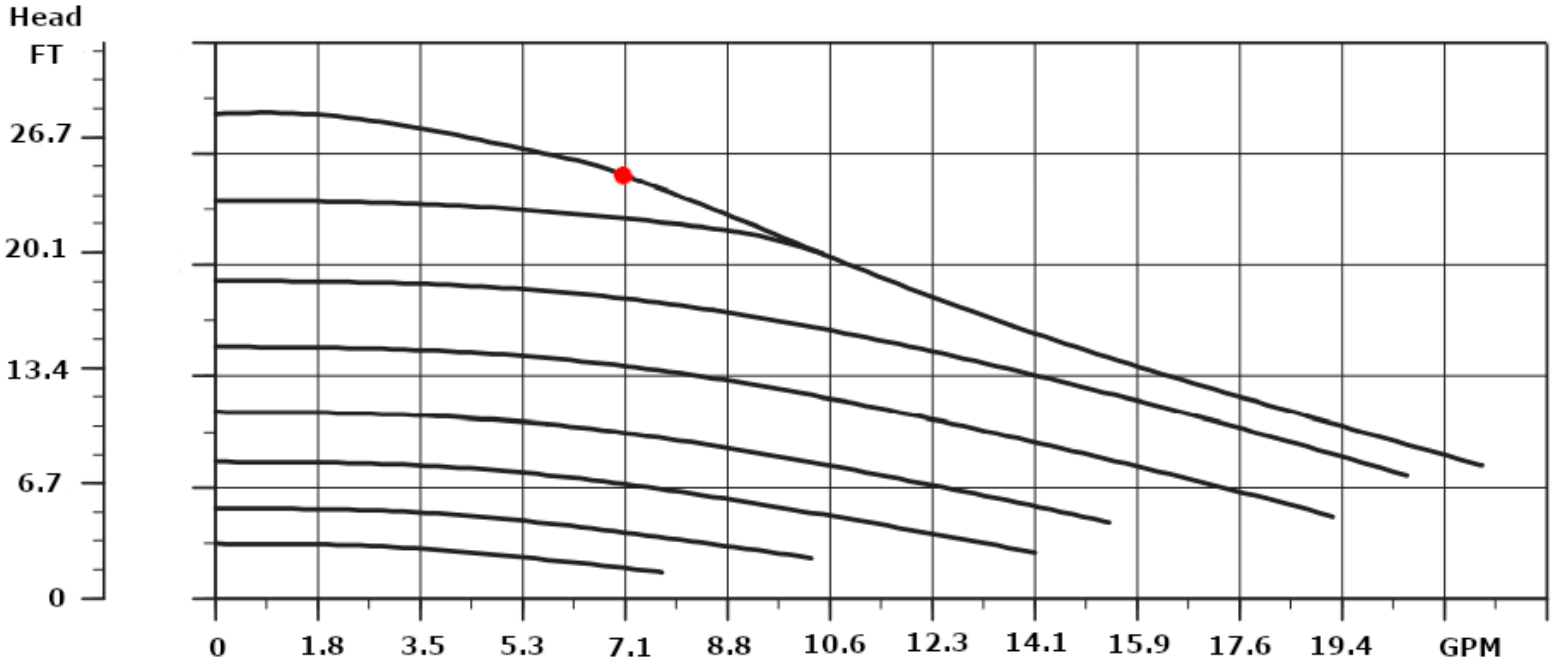


Several units in a row



More about Location:
You don't want it in a "pit" or enclosed area where air flow could be impaired or where fan output could introduced back into the fan inlet of the coil dropping performance.

GRUNDFOS UPMM 15/25-95 230V PWM



This is the Grundfos pump head curve for FC30 standard UPMM pump. This unit can also be ordered with a UPMXL pump for higher head or flow conditions, the installation will be the same for either.

Note, the FC30 itself has a cV of approximately 2.6, giving ~17.5ft of head at 7.1 GPM. This leaves about 6.3 ft of net head available when using the std. UPMM pump with the FC30. If you need more head or higher flow rates, the FC30 is also available with the UPMXL.

If your flow needs to be > 8.3 GPM you may need to upgrade to the UPMXL pump. When installing inline with a cx35/50/65/75, make sure to consider the internal pump and head loss of the heat pump to calculate along with this pump. In cases where flow is =/< 8.3 GPM, the FC30 with pump running will have a net-0 or positive effect on the head of the main heat pump head curve.. For example, a flow of 10GPM will produce a ~10 ft. of head loss net of the UPMM internal FC30 pump. **Note: These calculations do not include a glycol head loss factor. Your calculation must consider this when selecting a pump.** Multiply the ft. of head available according to the chart above (or by the UPMXL chart, as needed) by the factor below, based on the amount of glycol in your system.

Glycol %	Pump Head Derate Factor
0	1
10	.95
20	.91
30	,86
40	.79
50	.73
60	.68

Glycol

NEVER USE ETHYLENE GLYCOL. Ethylene Glycol is a poison. Propylene Glycol is a non-toxic anti-freeze also used in food, cosmetics, etc. and can safely be used**.**

Food-Grade Glycol is available at Home Depot and other retailers. You may also consider HSE Corn Glycol (Biodegradable Food-Grade Glycol made From Corn
https://www.hotspotenergy.com/corn-glycol/

Below is a Freeze Point Chart For Propylene Glycol Mixed w/ Water

Freezing Point								
Propylene Glycol Solution *(%)*	*by mass*	0	10	20	30	40	50	60
	by volume	0	10	19	29	40	50	60
Temperature	*°F*	32	26	18	7	-8	-29	-55
	°C	0	-3	-8	-14	-22	-34	-48

Is Glycol Required?

With a free cooling unit, Glycol is REQUIRED!

Note about cooling operation: the standard set point (AC Target) for cooling mode is 53F or 12c. This implies a leaving water temperature of 44F (7c) in steady-state operation. If you operate the unit at colder temperatures you should add propylene glycol to protect the heat exchanger. For example with a setting of 50F (implies a leaving temperature in steady state operation of 41F) you should have 10% glycol to protect the heat exchanger.

Required flow rate changes with the glycol %.

Note the "500" formula water factors are adjusted as follows (based on 2,3 tons capacity) based on 10F ΔT.

00% glycol use 500 24,000/500/10=4.8 GPM
10% glycol use 494 24,000/494/10=4.85 GPM
20% glycol use 488 24,000/488/10=4.91 GPM
30% glycol use 480 24,000/480/10=5.00 GPM
40% glycol use 463 24,000/463/10=5.18 GPM
50% glycol use 442 24,000/442/10=5.43 GPM

00% glycol use 500 36,000/500/10=7.42 GPM
10% glycol use 494 36,000/494/10=7.28 GPM
20% glycol use 488 36,000/488/10=7.37 GPM
30% glycol use 480 36,000/480/10=7.50 GPM
40% glycol use 463 36,000/463/10=7.77 GPM
50% glycol use 442 36,000/442/10=8.14 GPM

Example:
Based on load calculations a given system needs to deliver a maximum of 31,000 BTU with 30% glycol:
31,000/480/10=6.46 GPM
(BTU/water factor=required flow rate)

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, may occur. Do NOT use PVC piping.

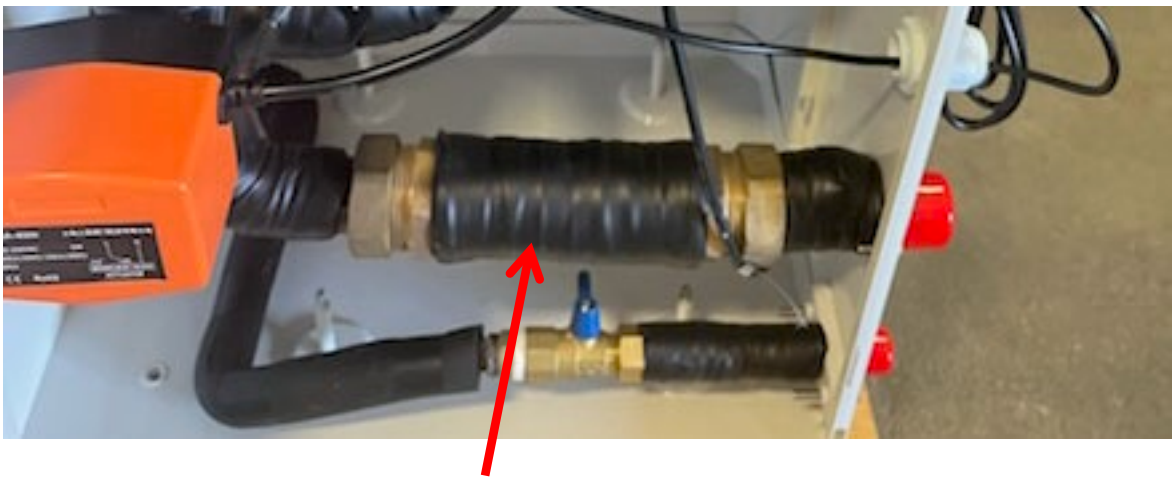
Use the required flow rate to calculate head based on the Head Flow Curve applicable to the pump(s) you are using.

Chiltrix FC30 Installation

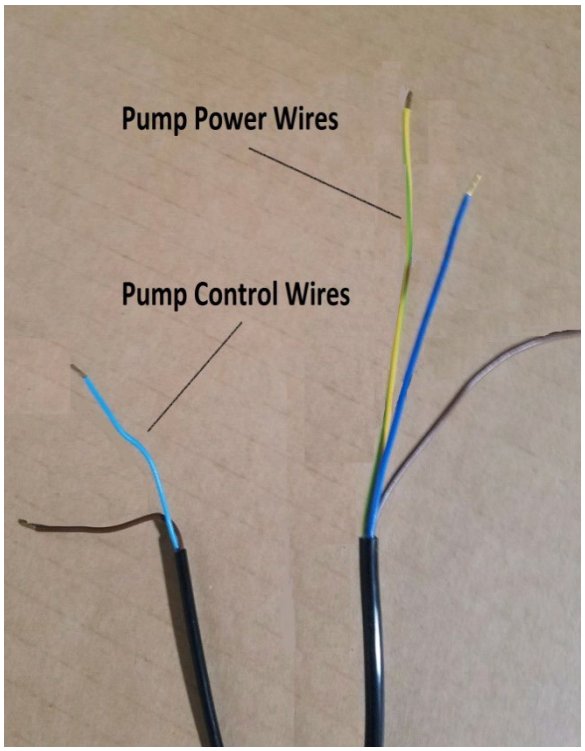
NOTE: The FC30 is shipped with the pump in a separate box attached to the top of the unit. Please follow the directions below to install the "C8" Grundfos internal pump.

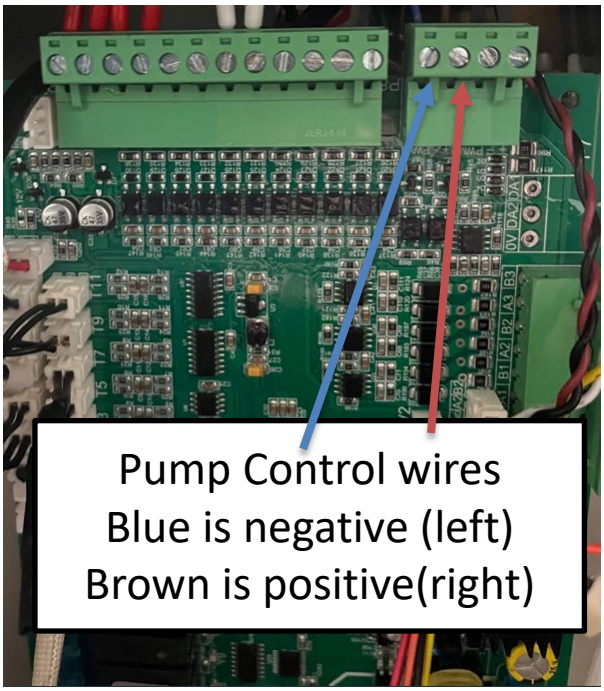
There is a factory installed spacer that is to be removed.

(Remove Top, Front, and Right Side Covers) DO NOT BEND OR STRESS THE PIPING, this may cause a broken joint or leak where it joins the coil. The pump will slide in between the pipes with the washers.

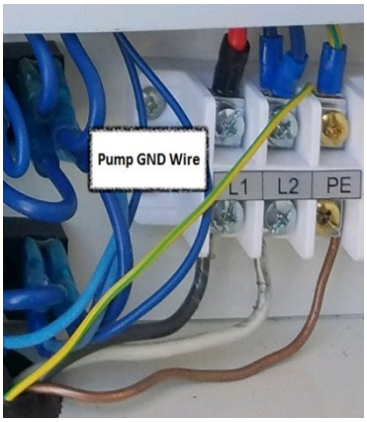


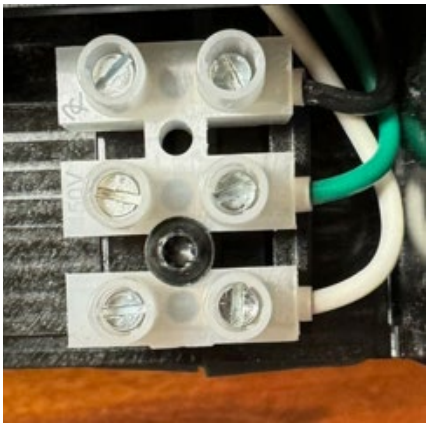
Remove this spacer to install the pump if needed.





The blue and brown pump **CONTROL WIRES** are connected to the (+ & -) on the Pump PWM terminal connector at the top of the main control pcb.





Color does not matter between C8L1 and L2 as long as Yellow and green go to GND/PE.

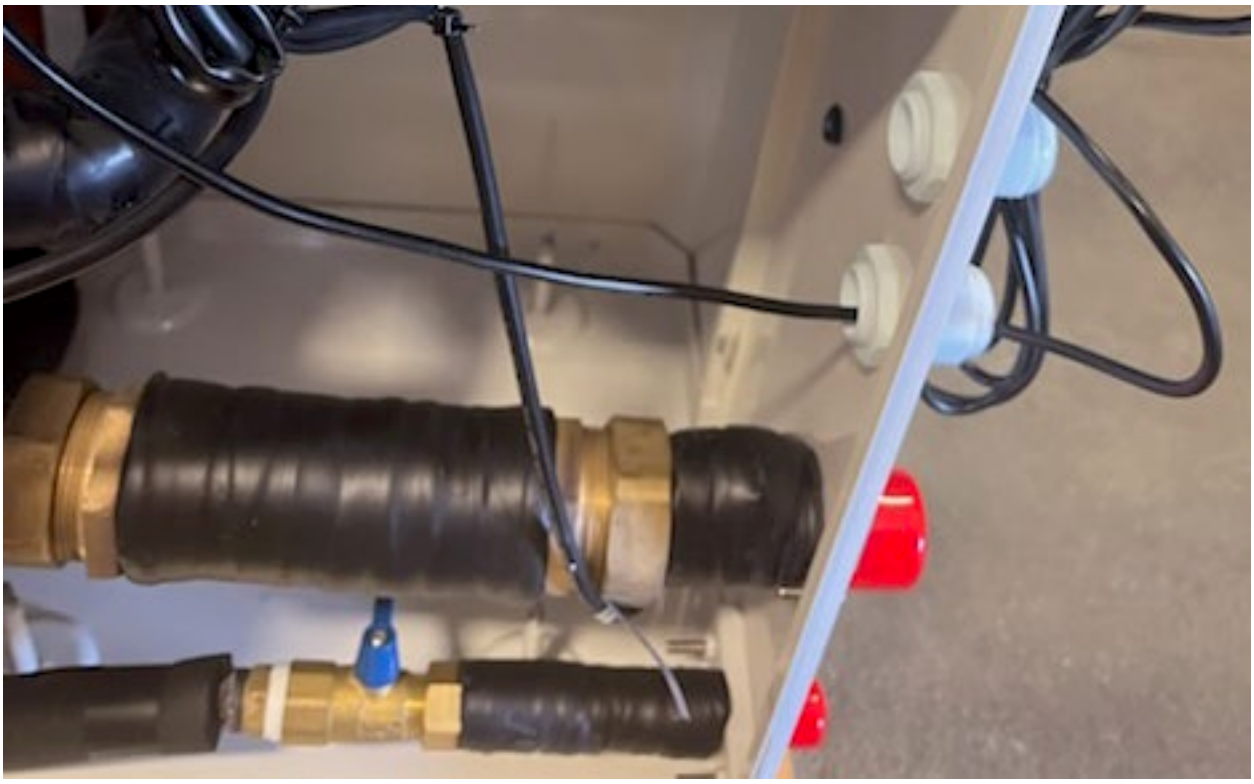
Note- If ordered, the FC30 UPMM pump ships with control cable and a plastic bag that includes the electrical box cover/screw and the gaskets. This pump does not ship with the power cable which is to be supplied by the installer. At pump, white and black connect to FCU C8L1 and L2, green yellow is frame ground. See Grundfos Pump Wiring supplement on the last page for more info.

FC30 Components

Ball Valve

Located in the unit, a ball valve is already installed internally.

NOTE: You can install an external valve if needed. Or install a drain onto the threads external of the unit.



Electrical Connection

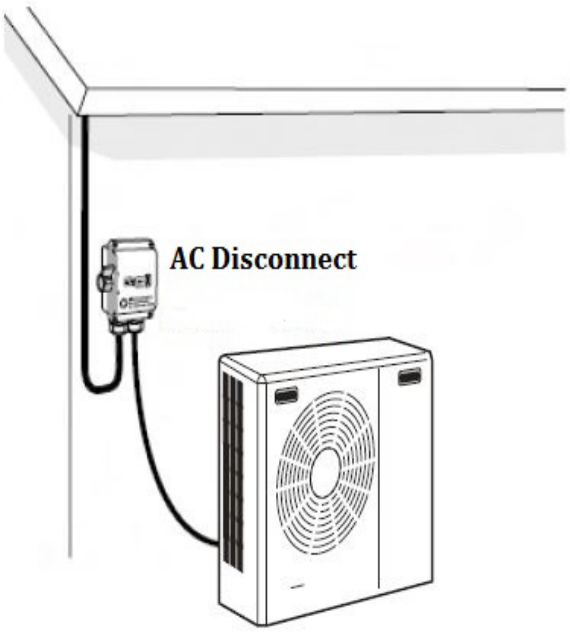
General

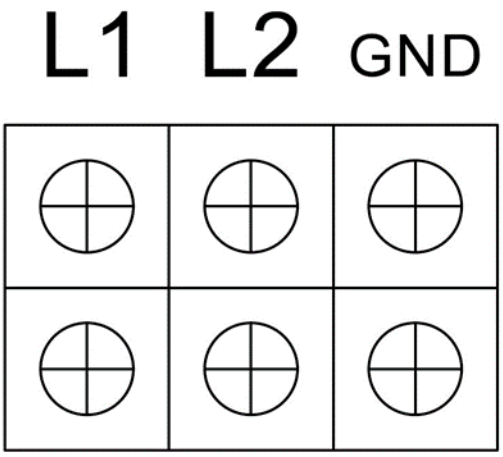
Note!

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 be connected under the supervision of a qualified electrician. Wires, spare parts and materials etc. must satisfy the relevant standards and codes issued by the host country or region.
The heat pump does not include an AC disconnect or switch on the incoming electrical supply which will be required. 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. **Allowed Voltage range is 208-240vac. Minimum wire size must be suitable to your code and meet NEC requirements, breaker size is 10 AMP, for the FCU.**

It is the responsibility of the customer to provide clean power, 208-245v 1P 60Hz without power surges. It is advisable to add surge suppression with transient voltage protection to the circuit powering the heat pump. Clamping voltage of the device should be less than 400v.



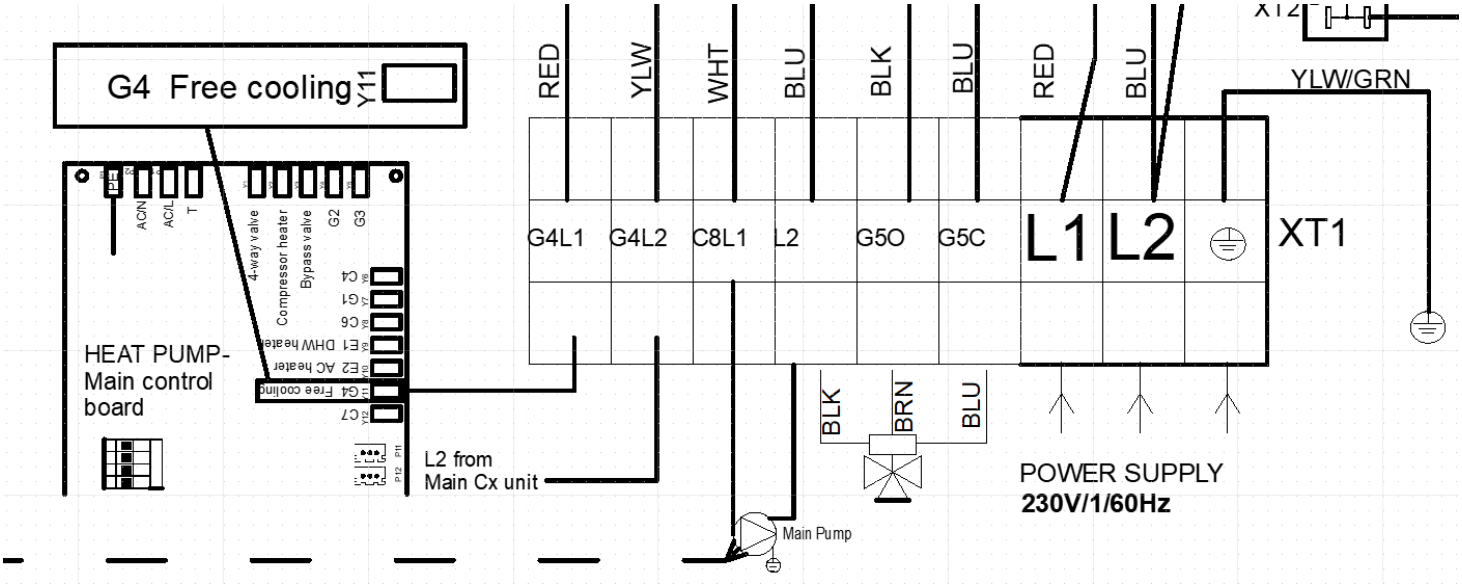


Main terminal block inside electronics box

Example MOV transient voltage suppressor
https://www.mouser.com/_/?Keyword=V300LA40AP

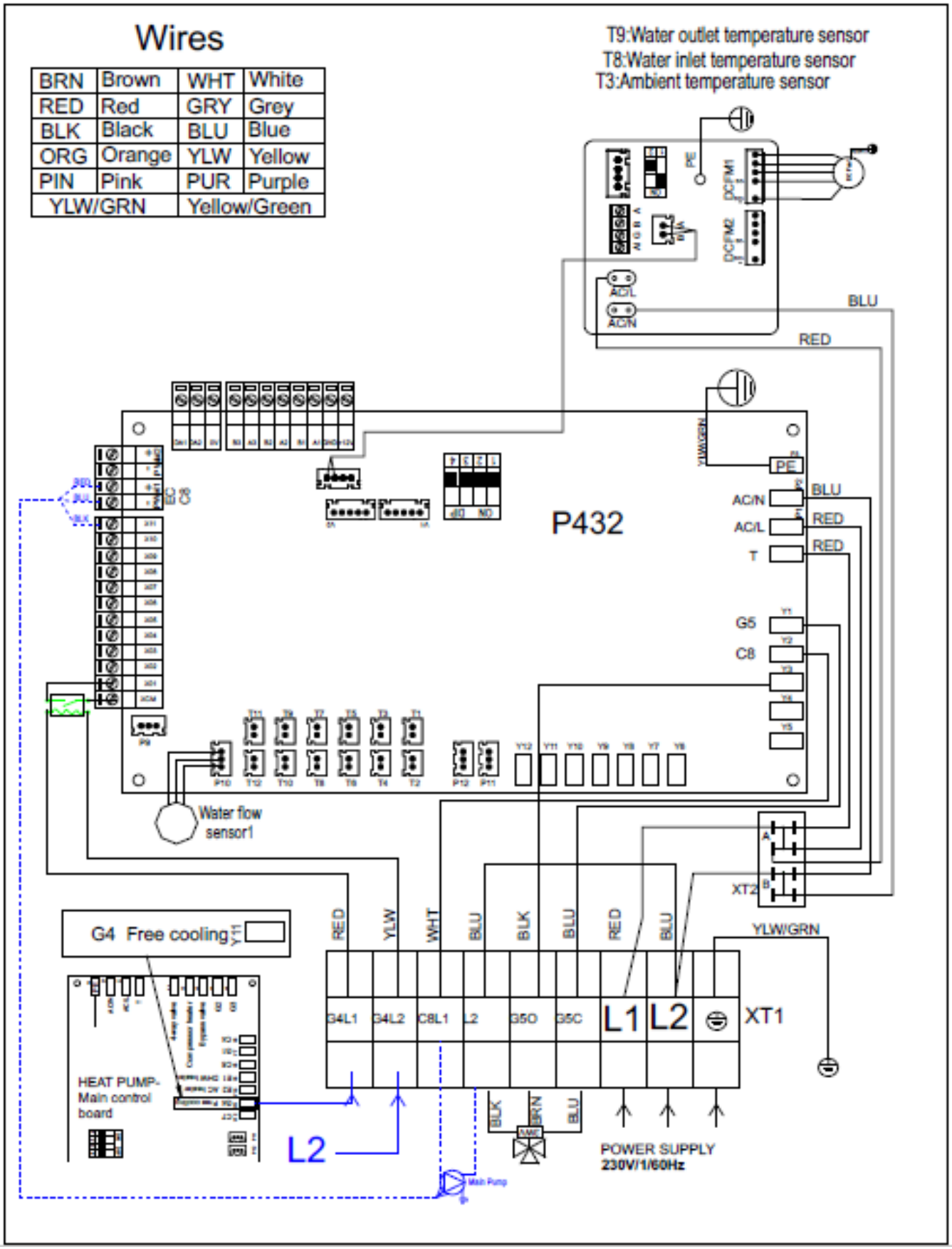
Electrical Connection Continued
Connecting the Main CX unit to the FC30

On the main cx unit, there is a male spade connector labeled Y11. Y11 is what engages or disengaged the FC30 unit. You must run a wire from Y11 on the main unit and L2 on the main unit to the FC30 and connect Y11 to G4L1, and connect L2 to G4L2.



Main terminal block inside outdoor unit

Wiring Schematic



System filling with Propylene Glycol and water

At or near the Fc30 or the cx unit a flush/fill valve assembly must be installed. This can be made with three ball valves and a couple hose fittings. If you don't already have a fill kit for use with solar thermal, hydronic, or chiller systems, you can easily create one with the following Bill of materials: All Pex fittings are available at www.supplyhouse.com

2 ea. Pex 1" x ¾" Tee SKU: H051175LF Brand: Rifeng

1 ea. Pex 1" Ball Valve SKU: H081000LF Brand: Rifeng

2 ea.Pex ¾ Ball Valve SKU: H080750LF Brand: Rifeng

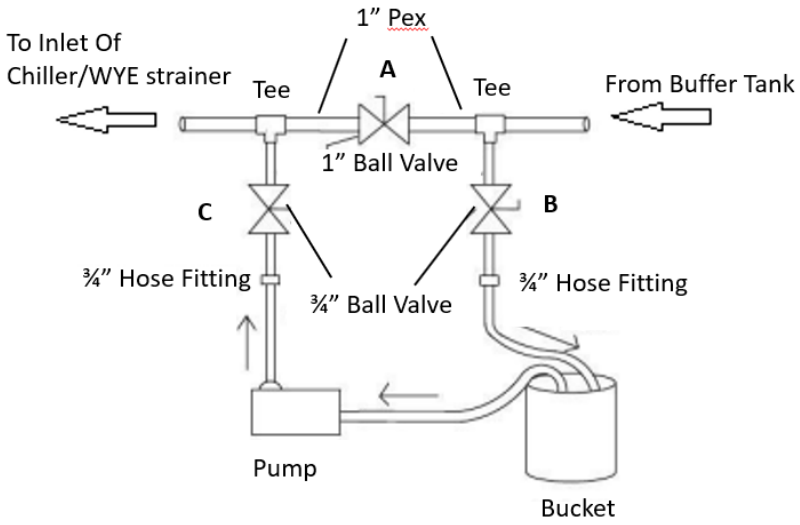
2 ea. ¾" Hose Fitting SKU: G20103 Brand: Jones Stephens

2 ea. Pex ¾" x ¾" NPT Female Adaptor SKU: H040750LF Brand: Rifeng

10' of Garden Hose Home Depot

5 Gallon Bucket Home Depot

High Head Fill Pump Grainger



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". Using a third hose, connect it to valve "B", and leave the open end in the glycol bucket. Close the middle ball valve "A". Close the middle ball valve "A". The pump should be pumping toward the FC30 or the Cx chiller. Open and close valve "A" a few times to remove trapped air.

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 FC30 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 20-30 psi.

See more info on Isolation valves used with the flush fill system here
https://www.chiltrix.com/documents/Charging-Fill-Kit.pdf

Parameter Settings CX Heat Pump Main Unit

Use the heap pump HMI controller for these settings. The main CX unit will be controlling the FC30 outdoor unit. In order to turn on free cooling the parameters must be set:

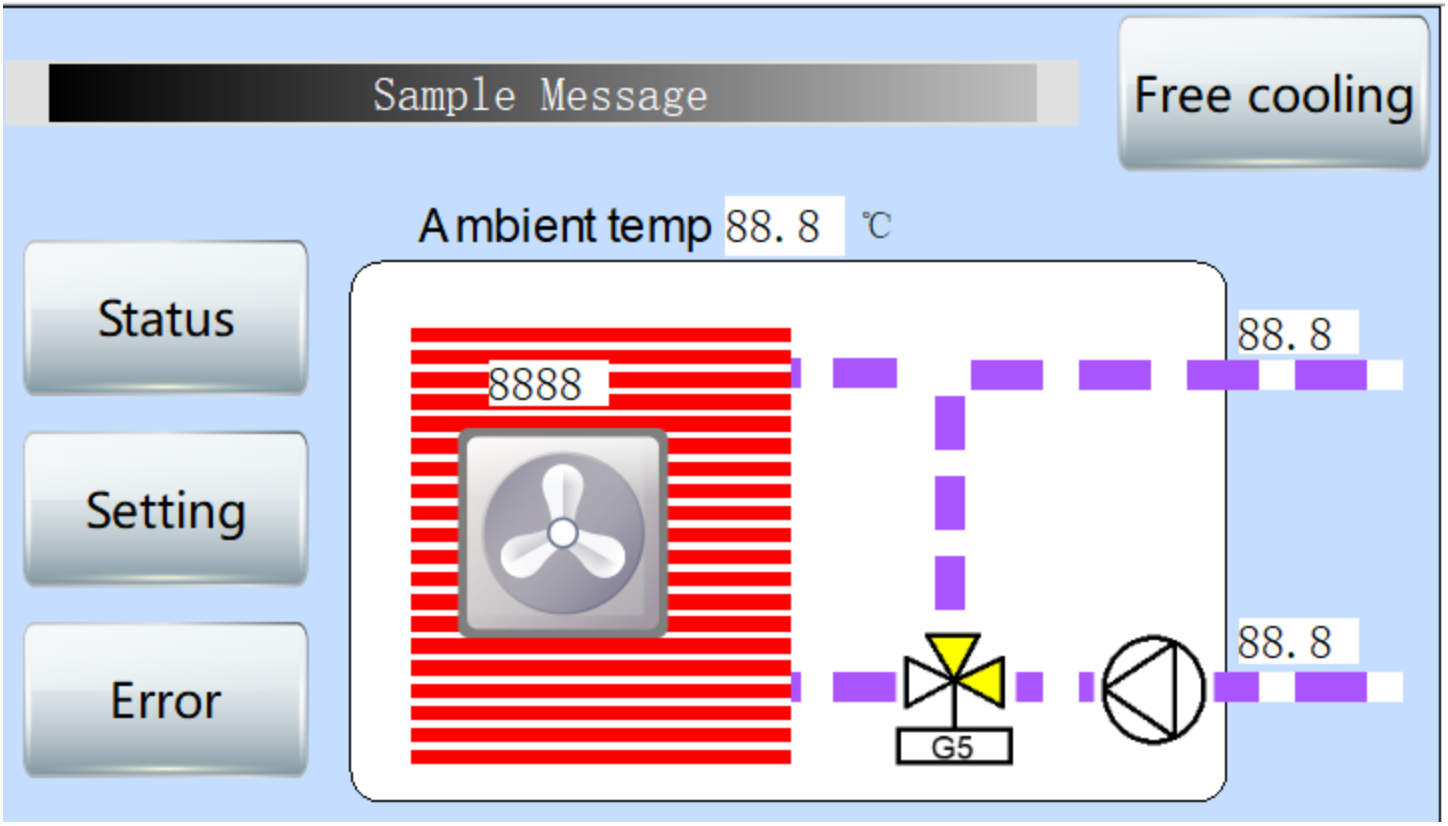
P06- this is to allow or not allow free cooling
P68- this is the ambient temp at which free cooling will be activated Allowed to work when there is a call).
P69- this is the temperature difference once free cooling starts that the compressor stops, and only free cooling is active.

Example: p06=0 valid, P68=3*C, P69= 5*C

In this example when the ambient temp reaches 3*C and below, the free cooling unit will be active. Once the ambient temp reaches -2*C (P68-P69) the compressor will be able to stop running and allow only free cooling to be running. The main unit will still show all the temperatures and show in cooling mode.

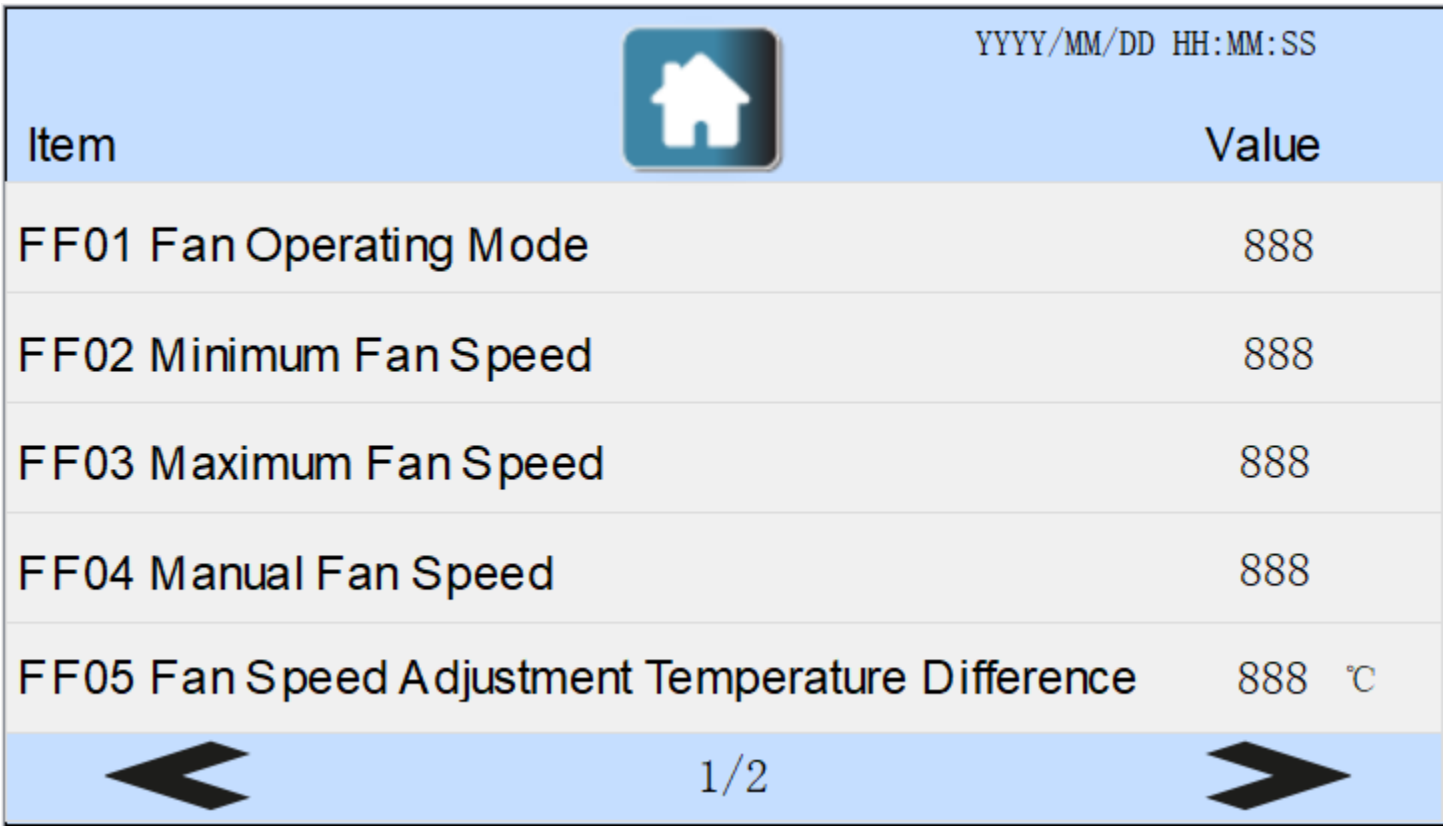
FC30 Unit Screen

The screen below shows the operational status of the FC30. The unit is controlled via the main heat pump unit so no operational on/off settings are required to be enabled on the main screen, it is strictly for display purposes only.
The “sample message” bar will be where errors accumulate.



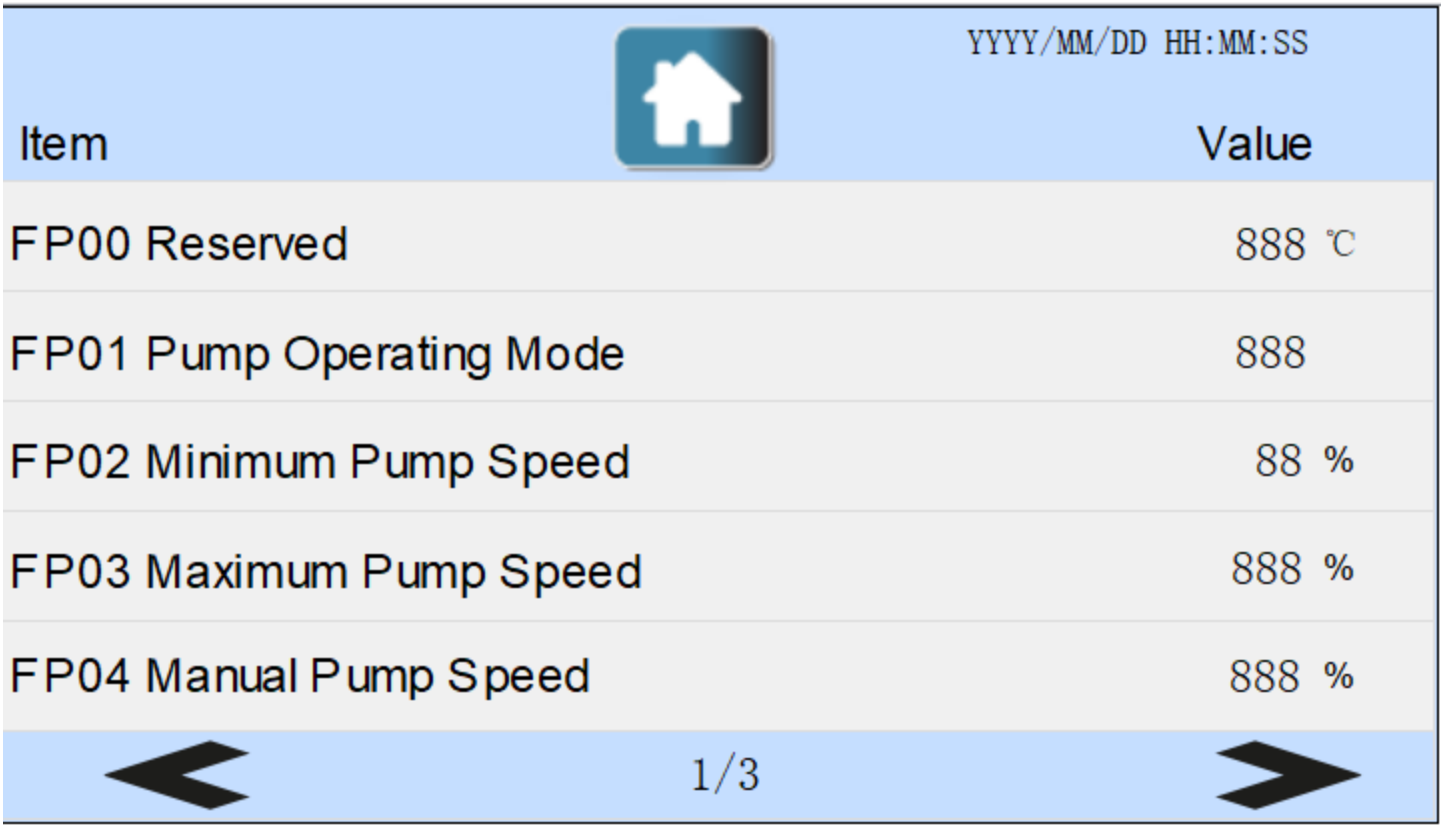
F Parameters

The F parameters are mainly for controlling fan speed. These are preset and only special circumstances will determine if these need to be changed. Do not change these without contacting the Chiltrix support department. Defaults are show on the parameter page.



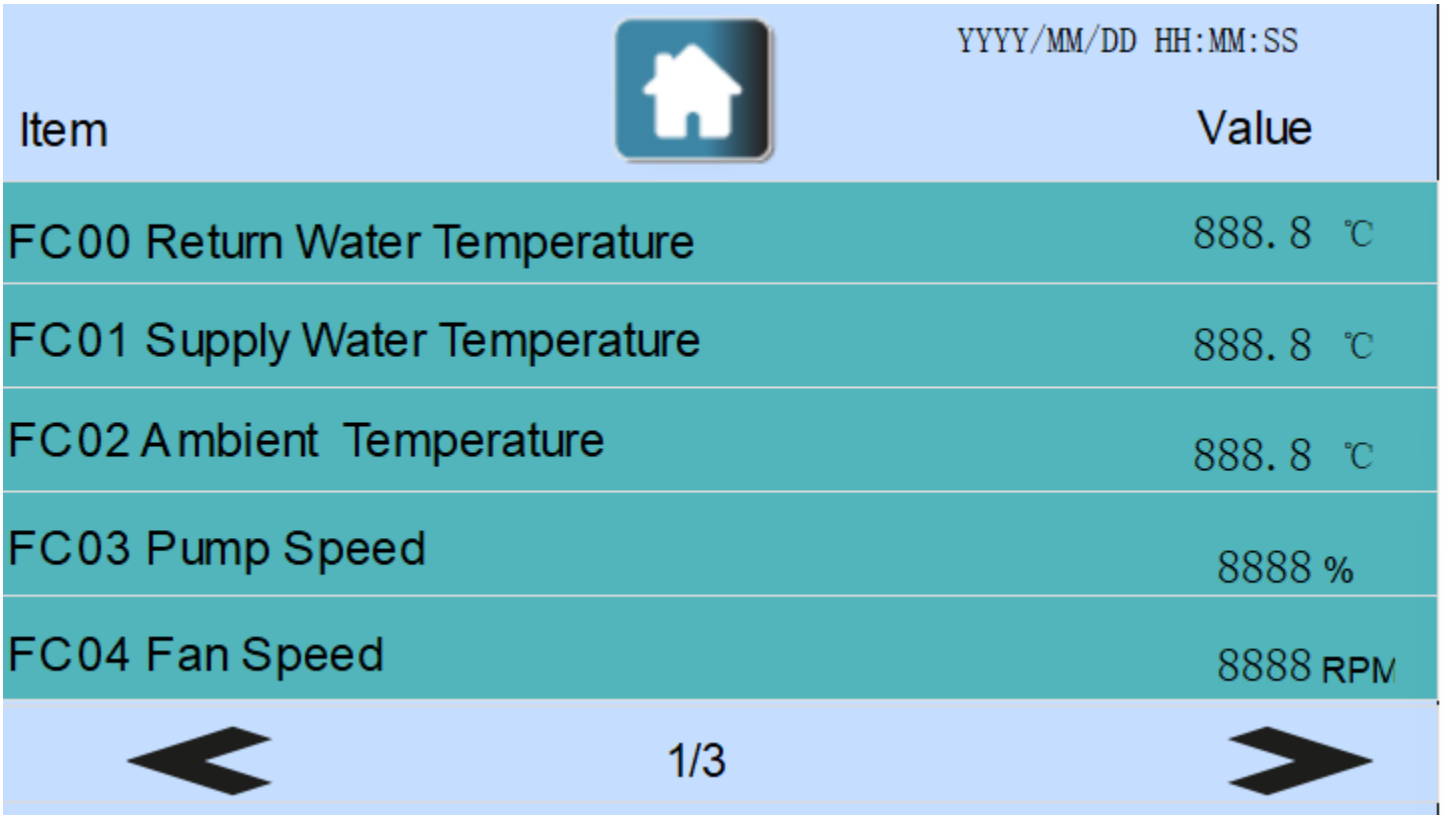
P Parameters

The P parameters are mainly for controlling pump speed. These are preset and only special circumstances will determine if these need to be changed. Do not change these without contacting the Chiltrix support department. Defaults are show on the parameter page.



C Parameters (status)

The C parameters are for status.



F/P Parameters

Parameter Number/Description	Description/Range	Default
FP00	Reserved for future use	
FP01 Pump Operating Mode	0=Manual, 1=Auto	1
FP02 Minimum Pump Speed	20~80%，	30
FP03 Maximum Pump Speed	50~100%	100
FP04 Manual Pump Speed (0-100%,)	0~100%	100
FP05 Pump Speed Adjustment Temperature	2~15℃	5
FP06 Water Flow Protection Selection	0-2 (not used) 0: No Protection 1: Flow Meter Protection 2: Pump Feedback Protection	0
FP07 Flow Meter Selection	0: Water Flow Switch 1: YFG1 Water Flow Switch	1
FP08 Pump Flow Meter Selection	0~10 (not used)	0
FP09 Minimum Water Flow	6~50	10
FP10 Pump Speed Adjustment Interval	2~120S	10
FP11	Reserved for future use	
FP12	Reserved for future use	
FP13	Reserved for future use	
FP14	Reserved for future use	
FF01 Fan Operating Mode	0=Manual, 1=Auto	1
FF02 Minimum Fan Speed	200~600rpm	400
FF03 Maximum Fan Speed	500~900rpm	900
FF04 Manual Fan Speed	200~900rpm	900
FF05 Fan Speed Adjustment Temperature Difference	3~16 Outlet temp vs ambient temp delta T	5
FF06	Reserved for future use	
FF07	Reserved for future use	
FF08	Reserved for future use	
FF09	Reserved for future use	
FF10 Restore Default	0-1	0
Auto Run Parameters	Reserved for future use	

C Parameters

Parameter Number/Description	Description/Range
FC00 Return Water Temperature	-40-140*C
FC01 Supply Water Temperature	-40-140*C
FC02 Ambient Temperature	-40-140*C
FC03 Pump Speed	0-100
FC04 Fan Speed	0-900
FC05 Water Flow Meter Feedback (Reserved)	Reserved for future use
FC06 Water Flow (Pump Feedback, for Reference Only)	Reserved for future use
FC07 G4 Input Status	0-1
FC08 G5 Output Status	0-1
FC09 C8 Output Status	0-1
FC10 DIP Switch Feedback Bit	xxxx

Error Codes

Error Number	Description
E1	Ambient/Environmental temperature sensor fault
E2	Environmental temperature sensor fault
E3	Outlet water temperature sensor fault
E4	Fan driver communication fault with main board
E5	DC fan fault
E6	EC water pump fault
E7	Reserved for future use Heat pump communication fault with FCU
E8	Water flow fault
E9	Reserved for future use DC fan 2 fault

Some Grundfos pumps will ship with a power cable already attached. Some models you will need to run your own power wire. Wire from the chiller terminal block to the pump should be at least 20 Gauge or larger. The pump draws very low amps. You should also install ferrule crimps on the pump side wires and fork or eyelet connectors on the terminal block side.

Below is a schematic of how to run the power wires from the outdoor logic board to the pump. You will also need to run the control wires as stated earlier. Gnd is common to the ground coming into the unit and chassis ground.