



5100 SERIES INSTALL GUIDE COMFORT PLUS HYDRONIC HEATING SYSTEMS

Models: 5120, 5130, & 5140

1 PERSONAL SAFETY INSTRUCTIONS

SAFETY ALERT SYMBOLS



Electrical



Mechanical



Fire



Hot
Surface



Heavy
Lifting



Explosion

SIGNAL WORDS

Carefully read and understand the instructions before you continue. Signal words that appear next to safety alert symbols are:

- **DANGER:** Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING:** Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION:** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

IMPORTANT

- The equipment described herein is intended for installation by a qualified technician in compliance with applicable local, state, and national codes and requirements.
- To ensure proper installation and operation of this product, completely read all instructions prior to attempting to assemble, install, operate, maintain or repair this product. Upon unpackaging of the system, inspect all parts for damage prior to installation and start-up.
- This appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities or lack of experience and knowledge, unless they have been given supervision and instruction on the safe use of the appliance and the hazards involved. Children shall not play with the appliance.
- Steffes strongly recommends that "Construction Heating Units" be used instead of the permanent heating system during the construction phase of a new home. Use of the permanent heating system during the construction phase may contaminate the duct system and/or internal areas of the heating system. This may cause poor indoor air quality issues and/or improper system operation once the home is completed. A suitable alternative heating system should be used during the construction phase.
- Disclaimer: In compiling this manual, Steffes has used its best judgment based upon information available, but disclaims any responsibility or liability for any errors or miscalculations contained herein, or any revisions hereof, or which result, in whole or in part, from the use of this manual or any revisions hereof.

After the heating system is installed, Steffes disclaims any responsibility or liability for mold/mildew growth and/or any damages caused by either. We strongly recommend that the user follow the moisture, mold and mildew prevention guidelines of the Environmental Protection Agency (EPA), available at <http://www.epa.gov>.

2 SAFETY PRECAUTIONS

1. Install all ceramic heat storage bricks before energizing the system. Failure to do so can result in equipment damage.
2. Install the pressure relief valve provided before operating the system.
3. Keep combustible materials away from this system. Storing explosive or flammable materials near this heating system can result in an explosion or fire.
4. Follow all placement and clearance requirements as specified in this Install Guide.
5. Make sure nothing is placed or stored on top of this system.
6. Disconnect power to all circuits before servicing as this system can be connected to more than one branch circuit.
7. Use caution when working around the system as inlet and outlet piping can be very hot.
8. Installation of and/or service to this system should be performed by a qualified technician in compliance with information contained herein and with national, state, and local codes and requirements.
9. A repeated message display of "CORE FAIL" indicates a need for service by a qualified technician.

WARNING



Risk of explosion. Can cause injury or death. Operating the system without the pressure relief valve installed can cause an explosion. Connect the pressure relief valve in a vertical, upright position with the supplied fittings. DO NOT modify this assembly. DO NOT cap, plug, or otherwise obstruct the outlet of the pressure relief valve.



Risk of fire. Can cause injury or death. Violation of the clearance requirements can cause improper operation of the equipment. Maintain the placement and clearance requirements specified.



Risk of personal injury. Plumbing and other surfaces can be hot. Use caution when working near the system.

3 SHIPPING AND PACKAGING

The Comfort Plus Hydronic should always be transported in an upright position to avoid damage to internal components and insulation materials. The information below describes the items shipped with each system:

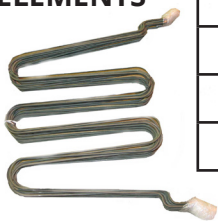


CAUTION

Risk of sharp edges. Can cause personal injury. Use caution when installing and/or servicing equipment.

1 INFORMATION PACKAGE

2 HEATING ELEMENTS



Model	Elements
5120	8
5130	12
5140	16

4 OUTDOOR TEMPERATURE SENSOR

(shipped inside the electrical panel)



5 JUNCTION BOX AND PRESSURE RELIEF VALVE

(shipped behind the exchanger access panel)



3 ELEMENT SCREW KIT AND LOW VOLTAGE BUSHING

(shipped inside the electrical panel)



6 CERAMIC BRICK

(shipped separately)



Model	Full Brick	Half Brick
5120	105	6
5130	150	12
5140	198	12

4 PLACEMENT AND CLEARANCE REQUIREMENTS

The physical dimensions (Figure 1) of the Comfort Plus Hydronic along with the clearances required (Figure 2) MUST be taken into consideration when choosing its location within a structure. The best installation location for this system is in a space requiring heat, so some amount of the heating requirements can be satisfied through static dissipation from the warm outer panels of the system. Standby heat dissipation of up to 2.5kW can be experienced in normal operation. Room air should be maintained at or below than 85°F/29°C.

If the Comfort Plus Hydronic is installed in an area where radiant heat coming from the system is undesired or where room temperatures may reach 85°F/29°C or greater, it is strongly recommended to install a Static Heat Recovery Unit or Air Handler.

In addition to the physical space requirements, the weight of the system must be taken into consideration when selecting the installation surface. A level concrete floor is the best installation surface, but most well supported surfaces are acceptable. If unsure of floor load capacity, consult a building contractor or architect.

NOTE: Special requirements need to be considered if placing the system in a garage or other area where combustible vapors may be present. Consult local, state, and national codes and regulations to ensure proper installation. An 18" stand (Order Item #1301585) is available to elevate the system.

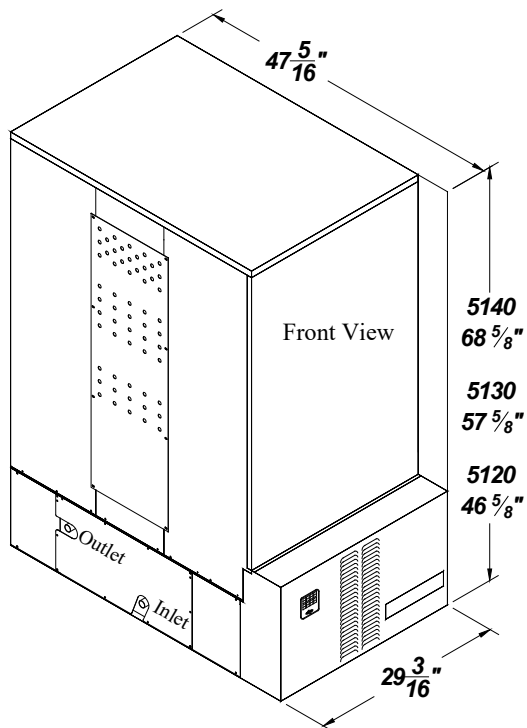


WARNING

Risk of fire. Can cause injury or death.

- Violation of the clearance requirements or failure to provide proper ventilation can cause improper operation of the system. Maintain the placement and clearance requirements as specified and provide ventilation as necessary.
- Moving the system after install may result in equipment damage. Do NOT move system from original installed location.

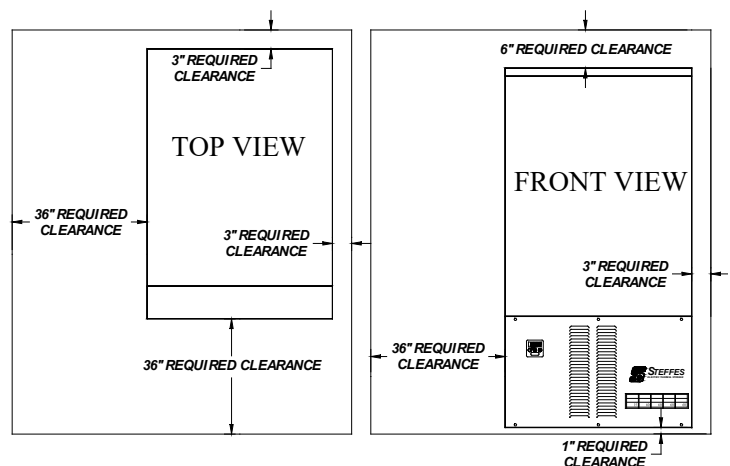
**FIGURE 1
DIMENSIONS**



MINIMUM CLEARANCE REQUIREMENTS

- Back and Right Side = 3 inches (from combustible material)
- Bottom = 1 inch clearance (from combustible material)
- Top = 6 inches (from combustible material)
- Front = 36 inches (for ease in servicing)
- Left Side = 36 inches (for ease in servicing)

**FIGURE 2
REQUIRED CLEARANCES**



NOTE: Minimum clearance requirements do NOT account for space needed for making electrical connections. If utilizing the Air Handler, additional space is required on the right hand side of the system.

5 INITIAL SETUP

1. Remove the Information Package from the outside of the shipping box and unpackage the Comfort Plus Hydronic heating system.
2. Move the system into its installation location. The system fits through a 30" doorway (minimum) without disassembling. If it is necessary to disassemble, refer to the disassembly instructions on page 19.
3. Once in place, adjust leveling legs on the bottom of the system to prevent rocking. If not placed properly the system may bend or twist during brick loading, making element and brick core temperature sensor installation difficult.
4. Remove the painted front panel of the brick storage cabinet. Detach by pulling the bottom of the panel forward and down.
5. Locate the element wiring harnesses and brick core temperature sensor(s) behind the front panel and disconnect from the shipping position. Carefully position to avoid damage during brick loading.
NOTE: Models 5130 and 5140 have two brick core temperature sensors.
6. Remove the galvanized front panel and set it aside.
7. Carefully lift the two insulation blankets, one at a time starting at the bottom, and drape them over the top of the system.
NOTE: Use face mask, gloves, and long sleeved garments when handling insulation materials in compliance with generally accepted safety practices.
8. Remove the front air channel and set aside.

IMPORTANT

To ensure proper operation, read and follow installation instructions carefully.

- DO NOT install the Comfort Plus Hydronic system on its shipping pallet.
- DO NOT extend the leveling legs more than one inch.
- DO use and follow generally accepted safety practices when handling insulation material.
- DO have equipment installed by a qualified technician in compliance with all applicable codes and regulations.

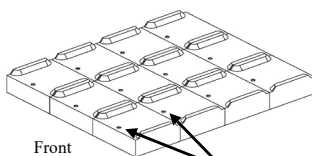
6 BRICK LOADING

Load the brick, one row at a time, using a left side, right side, center pattern. Start at the back of the brick core and work forward. Make sure the brick are placed so the grooved side is facing up and the ridges are on the left and right. See Figure 5.

BRICK INSTALLATION TIPS:

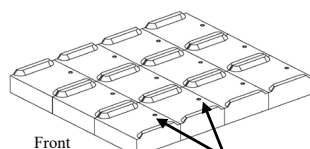
- Install bricks carefully to avoid damage to the insulation panels.
- Remove loose brick debris to prevent uneven stacking of brick, as this can make installation of the elements and the brick core temperature sensor(s) difficult.
- Brick rows MUST line up front to back and side to side.
- Half brick makes brick loading easier by evening out the stacks. Use HALF BRICK in the proper rows and positions as indicated in Figure 5.
- Alternate the direction of the brick's indicator in every other brick row. See Figures 3 and 4.
- All bricks in odd numbered rows (1, 3, 5, etc.) must have the indicator facing forward. See Figure 3.
- The bricks in even numbered rows must have the indicator facing back. See Figure 4.

FIGURE 3



i.e.: Rows 1, 3, 5, 7, 9, and 11 in 5140

FIGURE 4



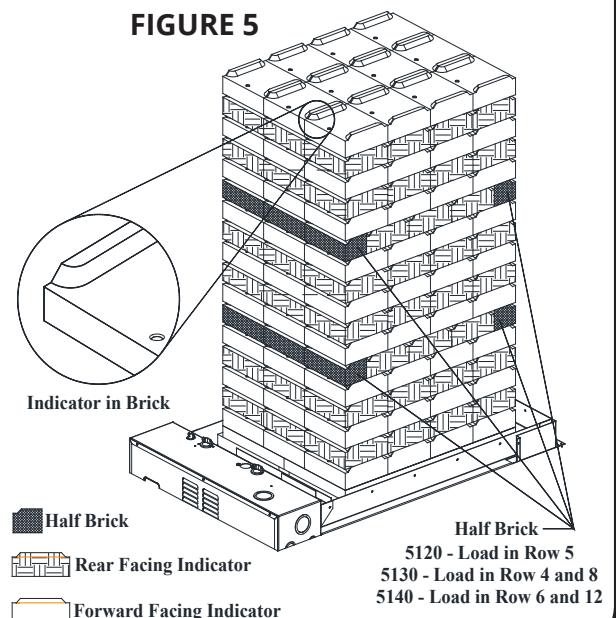
i.e.: Rows 2, 4, 6, 8, 10 and 12 in 5140



WARNING

Risk of fire. Can cause personal injury or death. DO NOT operate the system if damage to the insulation panel(s) on the inner sides of the brick core occurs.

FIGURE 5



7 HEATING ELEMENT AND AIR CHANNEL INSTALLATION

1. After all bricks are loaded, insert the heating elements between the brick layers, sliding them in until the element ends embed into the side cutouts of the brick cavity. Elements **MUST** be installed with the threaded screw tabs on the wire connection terminals pointing forward and down to ease the installation of the element-to-wiring harness. Note the required clearance (Figure 6).
2. Install the front air channel by placing the bottom in first, with the air deflectors (arrow shaped pieces) facing inward. Refer to the Air Channel Placement (Figure 7) for proper placement and installation of the front air channel.
3. Lower the insulation blankets back into position, one at a time. Carefully tuck the sides of this insulation into the edges, corners, and around the exposed portions of the heating elements to ensure maximum efficiency.
4. Reinstall the galvanized front panel by sliding the bottom of the panel inside the lower lip of the brick cavity and resting the top of the panel on the outside of the brick cavity. Secure it to the Comfort Plus Hydronic system using the screws that were originally removed.
5. Remove the painted front panel of the electrical compartment by removing the screws along the edges. Locate the installation hardware package that is shipped in this compartment.
6. Carefully route the element wiring harnesses and connect them to the heating elements, using the screws provided in the hardware package. Connections should be made with the screw heads up and the threads pointing down. Element screws should be tightened to 30 inch lbs. Refer to Figure 6 for proper positioning.

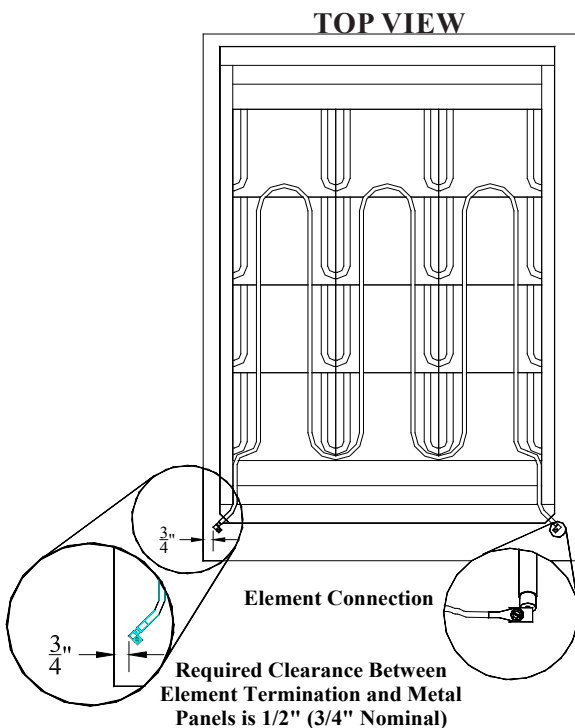


WARNING

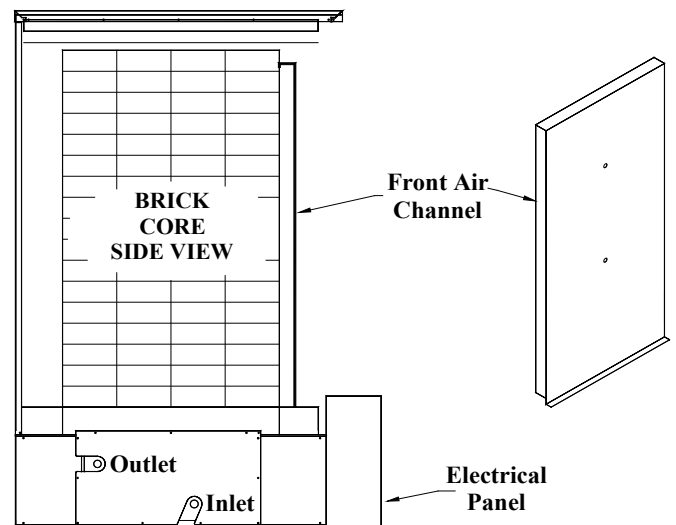
HAZARDOUS VOLTAGE: Risk of electric shock. Can cause injury or death.

- **DO NOT** remove the electrical panel cover while system is energized.
- Position elements properly to avoid short circuiting them against metal surfaces.
- Protect element lead wires from front panel screws and any field installed screws to avoid short circuit.

**FIGURE 6
ELEMENT INSTALLATION**



**FIGURE 7
AIR CHANNEL PLACEMENT**



8 BRICK CORE TEMPERATURE SENSOR INSTALLATION

1. Remove the screw(s) around the brick core temperature sensor hole(s) in the galvanized front panel.

NOTE: Models 5130 and 5140 have an upper and a lower brick core temperature sensor.

2. Insert the brick core temperature sensor(s) through the hole(s) in the galvanized front panel. If installing a system with two sensors, the one marked upper sensor is installed in the upper position and the one marked lower sensor is installed in the lower position. Sensor(s) must pass through the blanket insulation and into the brick core. Holes are not pre-drilled through the insulation. Sensor(s) can aid in making a passageway by rotating the sensor(s) side-to-side while gently pushing inward.
3. Once the brick core sensor(s) is installed, put the screw(s) back into position in the galvanized front panel to hold the sensor(s) in position and provide the electrical ground.
4. Check the non-insulated element terminations to make sure they do not come within 1/2" of any surface area on the system.
5. Reinstall the painted front panel, using the previously removed screws.



CAUTION

Risk of improper operation. Proper installation of the brick core temperature sensor(s) is critical to the operation of the Comfort Plus Hydronic heating system. Read and follow installation instructions carefully.

9 LINE VOLTAGE ELECTRICAL CONNECTIONS

In standard configuration, the system is wired for connection to 240V, however, the element circuits can also be connected to 208V. A 208V connection derates the charging input of the system by 25%. If a system rated specifically for 208V is required, contact the factory. The controls circuit **MUST** be connected to 120V/240V or 120V/208V. If connecting to 120/208V, see page 17 for programming information.

The 60 amp breakers located in the electrical compartment feed the core charging (element) circuits. The 15 amp breaker feeds the controls, blowers, and pumps circuit. All systems are factory configured to be field connected to multiple line voltage circuits. If a single feed line voltage circuit is desired, an optional single feed kit is available from the factory.

To determine the correct wire size required for each circuit feeding the system, refer to the identification label (Figure 8) located on the lower left side of the system.

1. Route all line voltage wires through a knockout and into the electrical panel.
2. Make proper field wiring connections to the system's breakers. Refer to the Line Voltage Wiring Diagrams on the electrical panel cover for more information on these connections.



WARNING

HAZARDOUS VOLTAGE: Risk of electric shock. Can cause injury or death. System contains oversized protective earthing (grounding) terminal, which shall be properly connected.

- **Equipment must be installed by a qualified technician in compliance with all applicable local, state, and national codes and regulations.**
- **To ensure proper operation and safety, all line voltage circuits must be segregated from low voltage wiring in the Comfort Plus Hydronic.**
- **To reduce electro magnetic fields associated with electrical circuits and to avoid induced voltage on sensors and electronic devices, the circuit phases **MUST** be alternated as shown in Figure 9.**
- **DO NOT operate the Comfort Plus Hydronic heating system without the factory supplied junction box in place. Connections to the primary loop pump **MUST** be made inside the junction box. If installing the optional air handler, the air handler pump connections **MUST** also be made in the junction box.**
- **DO NOT energize the system until installation is complete.**

CONTINUED on PAGE 7

LINE VOLTAGE ELECTRICAL CONNECTIONS, CONT'D

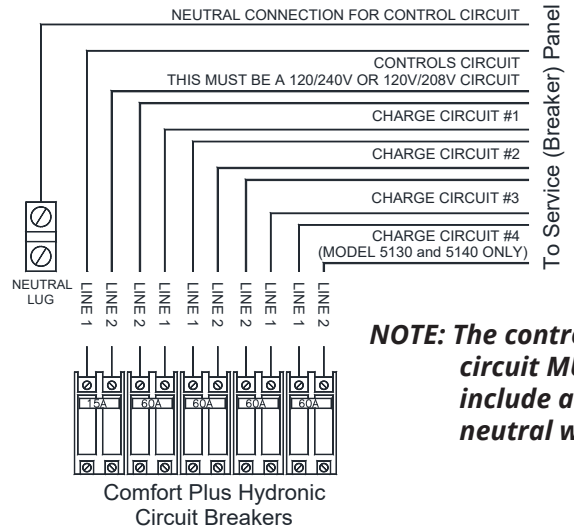
FIGURE 8
SAMPLE SYSTEM IDENTIFICATION LABEL

		Electric Central Heating Furnace 5P99			
Model	A	S/N	B	Option	D
Maximum Working Pressure	C		PSIG		
Maximum Discharge Water Temperature	E				
U.S. Patents – 5201024, 5086493		Canadian Patents – 2059158, 2060881			
Connections Required for Multi-Circuit Feed			Max Amps of Motors and Pumps		
Control Circuit	R	Volts	H	Amps	*Primary Pump Z
Min Circuit Ampacity	J	Amps	I	Hz	*Secondary Pump AC
Max Fuse Size	K	Amps			Core Blower AF
Charge Circuit #1	L	Volts	M	Watts	*House Blower AI
Charge Circuit #2	N	Volts	O	Watts	*Heat Recovery AL
Charge Circuit #3	P	Volts	Q	Watts	
Charge Circuit #4	R	Volts	S	Watts	
Connections Required for Single Circuit Feed			Clearance Requirements (5100 Series)		
Short-circuit current: 5kA rms symmetrical, 240V	T	Volts	U	Amps	V
Min Circuit Ampacity	X	Amps	W	Wires	
Max Fuse or Circuit Breaker Size	Y	Amps			

Allow three (3) inches from back and right side of system and six (6) inches from the top of system to combustibles. Allow thirty-six (36) inches front and left side panels to provide spacing for servicing. Allow one (1) inch bottom clearance to combustibles.

Label 1200504 Rev 2

FIGURE 9
CIRCUIT PHASING CONNECTIONS

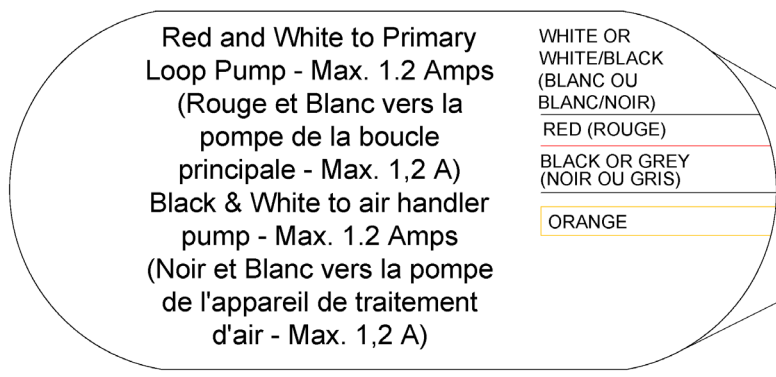


NOTE: The controls circuit MUST include a neutral wire.

JUNCTION BOX INSTALLATION

1. Attach the factory supplied junction box to the left side of the Comfort Plus Hydronic system as shown in Figure 16.
2. Make connections to the primary loop pump and air handler pump inside this junction box. The red and white wires connect to the primary loop pump and the black and white wires connect to the air handler pump. See Figure 10. The maximum connected amperage on either of these circuits is 1.2 amps.
3. Attach the junction box cover using the screws provided.

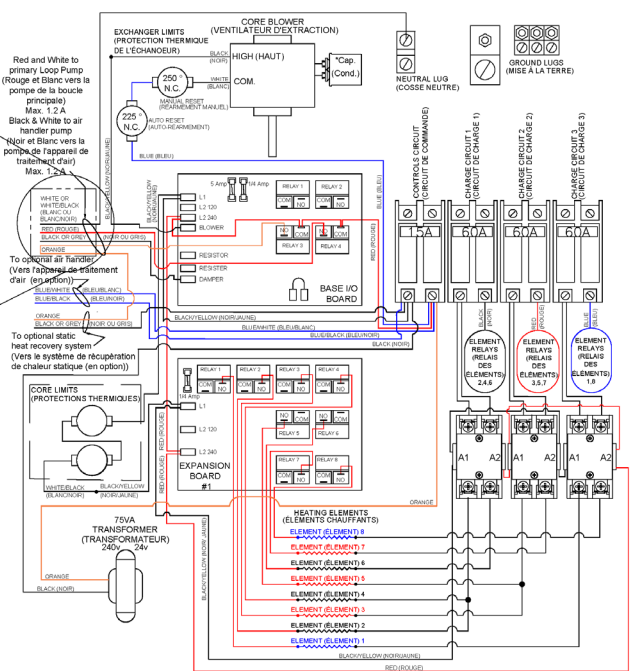
FIGURE 10
LINE VOLTAGE WIRING DIAGRAM



NOTE: If utilizing the optional air handler, the orange wire can be used with the white wire to power a secondary pump for hydronic zones.

5120 Line Voltage
Wiring Diagram 240/208 Volt

Use copper or aluminum conductors rated at 75°C or higher for field connections of this device.



10 LOW VOLTAGE ELECTRICAL CONNECTIONS - PEAK CONTROL

Steffes ETS heating equipment may be controlled by the Power Company via a peak control signal. This signal can be sent to the equipment using a Steffes Power Line Carrier control system, low voltage wiring, a Steffes Time Clock Module, or line voltage control. In applications utilizing automatic charge control, outdoor temperature information is required and can be received via an outdoor sensor or power line carrier control system.

IMPORTANT

**Low voltage wires
MUST never enter any
line voltage enclosure.**

The Comfort Plus Hydronic system is factory configured for low voltage peak control and is set to charge when the utility peak control switch closes. Refer to the Configuration Menu (Pages 15-17) for information on configuring the system for the application.

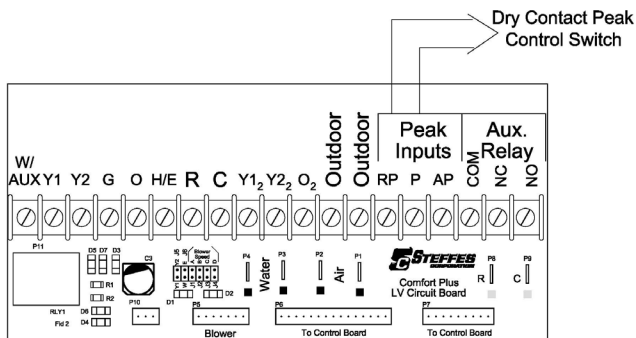
LOW VOLTAGE (HARD WIRED) PEAK CONTROL

Low voltage peak control is direct wired from the power company's peak control switch to the Comfort Plus. Field connections from the peak control switch are made to the low voltage terminal block through a low voltage knockout located on the left side of the electrical panel.

1. Route a low voltage circuit from the power company's load control or peak signaling device to the low voltage terminal block inside the electrical compartment through one of the low voltage wire knockouts. A black plastic bushing is provided.
2. Connect the field wiring to positions "RP" and "P". See Figure 11.

NOTE: To use the system to control other loads, refer to Auxiliary Load Control on page 15.

**FIGURE 11
PEAK CONTROL TERMINAL CONNECTIONS**



Low Voltage Terminal Block Coding

- RP = Peak Control Input Common
- P = Peak Control Input
- AP = Anticipated Peak (Pre-Peak) Control Input
- COM = Peak Control Output Common
- NC = Peak Control Output (Normally Closed)
- NO = Peak Control Output (Normally Open)

POWER LINE CARRIER (PLC) PEAK CONTROL

The Steffes Power Line Carrier (PLC) control has the ability to communicate with the heating system through the existing electrical circuits in the structure. If connecting to the Steffes PLC control, follow the installation instructions included with the PLC control.

In addition to providing peak control signals, the PLC control also provides outdoor temperature information for automatic charge control and anticipated peak utility control signals (if applicable).

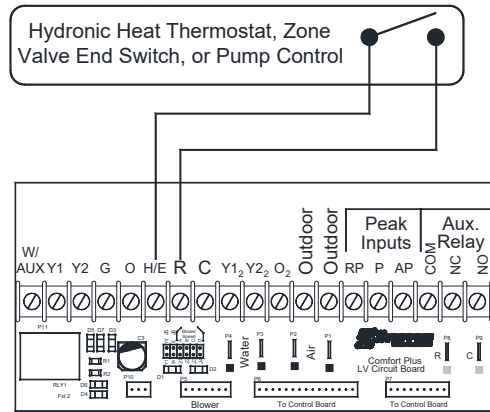
The PLC control is optional and must be ordered separately.

CONTINUED on PAGE 9

12 LOW VOLTAGE ELECTRICAL CONNECTIONS - ROOM THERMOSTAT

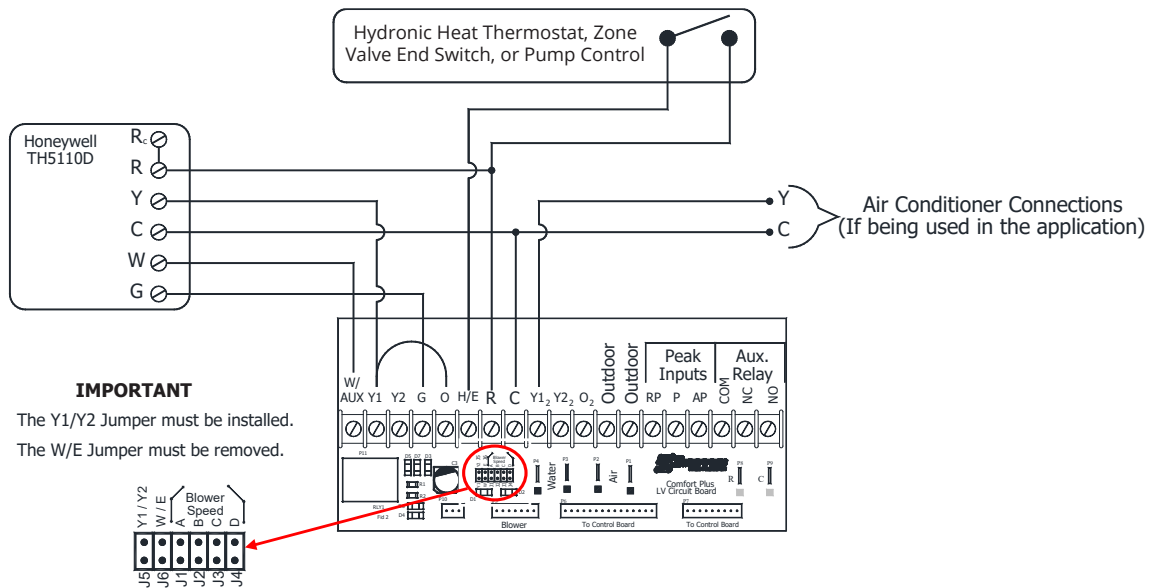
A low voltage (24VAC) room thermostat is required for room temperature control with the Comfort Plus Hydronic system. Steffes recommends using a digital thermostat. If utilizing a mechanical thermostat, a load resistor may be necessary due to the low current draw (.01 amps) on the heat call input circuit of the Comfort Plus system.

**FIGURE 12
LOW VOLTAGE CONNECTIONS
HYDRONIC HEATING SINGLE ZONE SYSTEM**



The Comfort Plus Hydronic system can be used in conjunction with an air conditioner or a heat pump. Refer to Figures 13-15, for more information on interfacing these systems with the Comfort Plus Hydronic. If multiple heat pumps are being interfaced, contact Steffes.

**FIGURE 13
STAND ALONE FURNACE APPLICATION CONNECTIONS SHOWN FOR SINGLE STAGE HEATING / SINGLE STAGE COOLING (UNCONTROLLED AIR CONDITIONING)**



Single Stage Heat / Single Stage Cool **			
Thermostat Stage	Thermostat Output	Heat Call Status on Digital Display *	Discharge Air Temperature Target
Hydronic	Varies	HC3	N/A
1	W	HC2	L049
Fan Only	G	HCF	N/A
Cool	Y/G	COOL	N/A
Contractor Use Only			

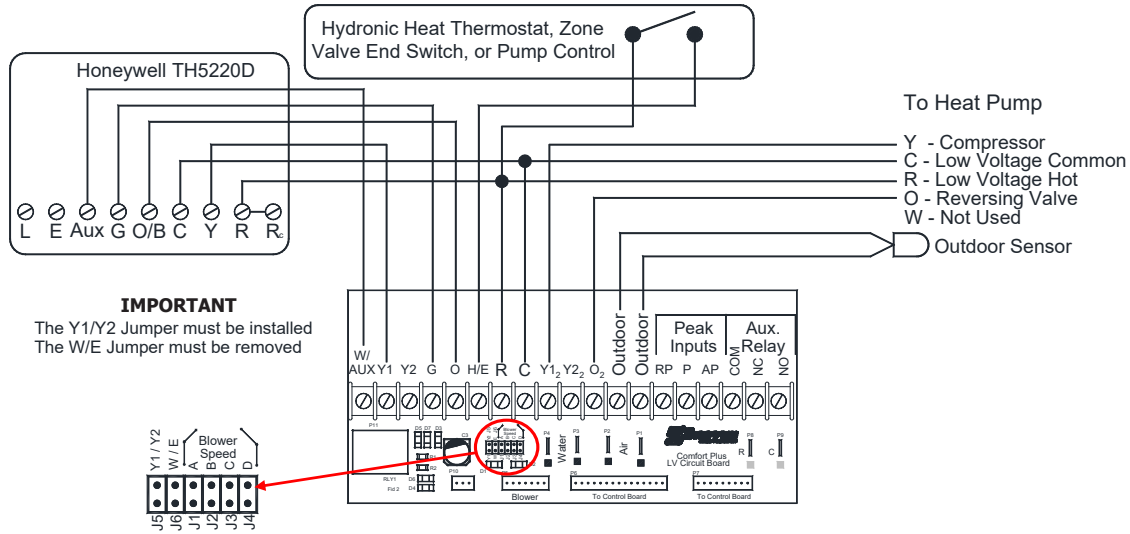
* If multiple inputs are active, system will display highest Heat Call values. "COOL" overrides all inputs and stops all heating operations.

** Thermostat must be programmed to energize reversing valve for cooling. If outdoor unit used for heating, see Configuration Menu on Pages 15-17.

CONTINUED on PAGE 9

LOW VOLTAGE ELECTRICAL CONNECTIONS - ROOM THERMOSTAT, CONT'D

FIGURE 14 SINGLE STAGE HEAT PUMP APPLICATION

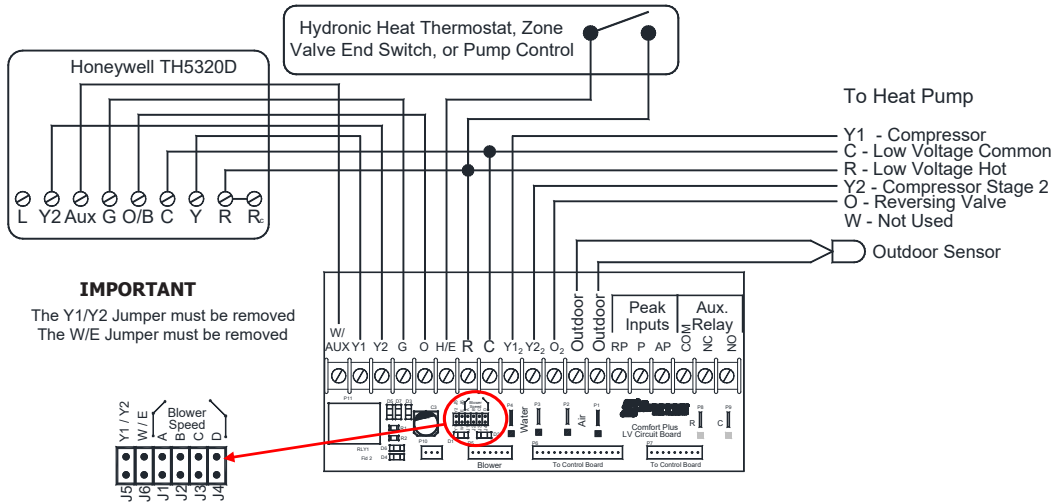


Single Stage Heat Pump with Auxiliary Heat / Single Stage Cool **						
Thermostat Stage	Thermostat Output	Heat Pump Stage	ECM Board Output to Heat Pump*	% of Selected CFM	Heat Call Status on Digital Display*	Discharge Air Temperature Target
1	Y/G	1	R/Y ₁	100%	HC1	L048/C010
Aux	Aux/Y/G	1	R/Y ₁	100%	HC2	L049
Fan	G	0	R	400 cfm	HCF	N/A
Cool	Y/G/O	1	R/Y ₁ /O ₂	100%	COOL	N/A
Hydronic	Varies	N/A	N/A	OFF	HC3	N/A

Contractor Use Only

* If multiple inputs are active, system will display highest Heat Call values. "COOL" overrides all inputs and stops all heating operations.
 ** Thermostat must be programmed to energize reversing valve for cooling. If outdoor unit used requires the reversing valve be energized for heating, see Configuration Menu on Pages 15-17.

FIGURE 15 TWO STAGE HEAT PUMP APPLICATION



Two Stage Heat Pump with Auxiliary Heat / Two Stage Cool ***						
Thermostat Stage	Thermostat Output	Heat Pump Stage	ECM Board Output to Heat Pump*	% of Selected CFM	Heat Call Status on Digital Display*	Discharge Air Temperature Target
1	Y/G	1	R/Y ₁	50% or 70%**	HC1	L048/C010
2	Y/Y2/G	2	R/Y ₁ /Y ₂	100%	HC1	L048/C010
3	Aux/Y/Y2/G	2	R/Y ₁ /Y ₂	100%	HC2	L049
Fan	G	0	R	400 cfm	HCF	N/A
Cool 1	Y/G/O	1	R/Y ₁ /O ₂	50% or 70%**	COOL	N/A
Cool 2	Y/Y2/G/O	2	R/Y ₁ /Y ₂ /O ₂	100%	COOL	N/A
Hydronic	Varies	N/A	N/A	OFF	HC3	N/A

Contractor Use Only

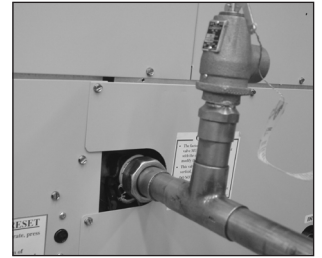
* If multiple inputs are active, system will display highest Heat Call values. "COOL" overrides all inputs and stops all heating operations.
 ** Systems built before 1/1/2011 are configured for 50% airflow in Stage 1. For more information, refer to Instruction #1200601-High Speed Stage 1 Relay Installation.
 *** Thermostat must be programmed to energize reversing valve for cooling. If outdoor unit used requires the reversing valve be energized for heating, see Configuration Menu on Pages 15-17.

13 PRESSURE RELIEF VALVE INSTALLATION

WARNING

Risk of explosion. Can cause injury or death. The factory supplied pressure relief valve MUST be connected to the system with the supplied fittings.

- **DO NOT modify this assembly.**
- **DO NOT cap, plug, or otherwise obstruct the outlet of the pressure relief valve.**
- **DO mount the pressure relief valve in a vertical, upright position.**
- **This pressure relief valve is sized to service the needs of the Comfort Plus Hydronic heating system. If multiple heating systems are being used, pressure relief valving for the other system MUST be provided separately.**



1. Remove the exchanger access panel and locate the pressure relief valve assembly.
2. Connect the pressure relief valve to the outlet water port on the left side of the Comfort Plus Hydronic. It is extremely important that the following conditions for installation of this part are met:

Available Pressure Relief Valves	Minimum BTU Rating	Maximum Operating Pressure	Order Item #
30 PSI	400,000	20 PSI	1100104
75 PSI	500,000	60 PSI	1100105
150 PSI	500,000	125 PSI	1100106

Note: 5100 Series Systems are shipped with 30 PSI pressure relief valves. If a different valve is required, order the item number listed.

- Ensure all connections, including the valve inlet are clean and free from any foreign material.
 - Use pipe compound sparingly, or tape on external threads only.
 - Mount the pressure relief valve in a vertical, upright position directly to the outlet water port of the system. Under no circumstances should there be a flow restriction or valve of any type between the safety relief valve and the pressure vessel.
3. Use schedule 40 pipe to install a discharge line for the pressure relief valve. This discharge line MUST:
 - Be connected from the valve outlet with no intervening valve and directed downward to a safe point of discharge.
 - Allow complete drainage of both the valve and the discharge line.
 - Be independently supported and securely anchored to avoid applied stress on the valve.
 - Be as short and straight as possible.
 - Terminate freely to atmosphere where any discharge is clearly visible and is at no risk of freezing.
 - Terminate with a plain end that is not threaded.
 - Be constructed of a material suitable for exposure to temperatures of 375°F/190°C or greater.
 - Be, over its entire length, of a pipe size equal to or greater than that of the valve outlet.

CAUTION

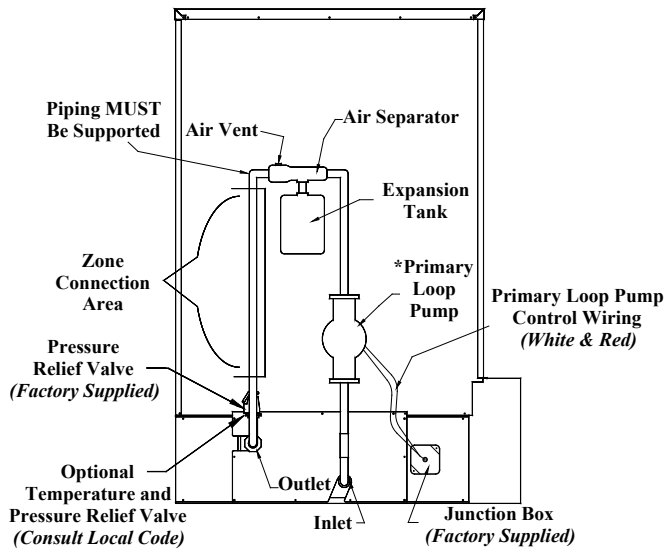
Risk of discharged hot water and/or steam. Can cause personal injury or property damage. During operation, the pressure relief valve may discharge large amounts of steam and/or hot water. To reduce the potential for bodily injury or property damage, install a discharge line.

14 PLUMBING

The heating system **MUST** be plumbed with a **primary loop and secondary (zone) loops**. The primary loop needs to consist of a minimum of 10' of 1" pipe and requires its own pump (circulator). The secondary (zone) loops require additional pump(s) to operate effectively. Refer to Typical Primary Loop (Figure 16) and the Typical System Plumbing Diagrams (Figures 17 and 18) for installation information.

The primary loop serves to regulate heat transfer from the system's heat exchanger. The primary loop pump must be powered by the red and white pump control wires as shown in Figure 17-18.

**FIGURE 16
TYPICAL PRIMARY LOOP**



PRESSURE DROP THROUGH HEAT EXCHANGER	
STATIC PRESSURE (Feet Water Column) Based on 80 degree entry water temperature with a 50% glycol mix.	.1 ft @ 2 GPM
	.2 ft @ 4 GPM
	.4 ft @ 6 GPM
	.7 ft @ 8 GPM
	1.1 ft @ 10 GPM

HEAT EXCHANGER SPECIFICATIONS	
Capacity	1.2 Gallons
Maximum Flow	10 GPM
Tubing Material	Copper
Maximum Outlet Water Set Temperature	185°F/85°C

PUMP SPECIFICATIONS

- Steffes recommends a Taco 007 or equivalent single speed 115VAC pump for the primary pump.
- Air Handler pump should NOT be a split phase pump.
- Air Handler pump should NOT have any type of auxiliary control built into or onto the pump.



CAUTION

- **FREEZE PROTECTION:** Risk of frozen pipes. Can cause property damage. Hydronic heating system freeze-ups **WILL** cause extensive damage to the entire heating system and/or property. It is the responsibility of the installer to provide protection against freezing.
- **PIPING SUPPORT:** Risk of exchanger damage. Can cause property damage or personal injury. **DO NOT** use the exchanger as support for piping. Support brackets should be in place to ensure proper operation of the system and to keep pressure off the inlet and outlet piping.
- It is the responsibility of the installer to prevent involuntary flow of water to the air handler. Not doing so may cause limit tripping and/or decrease heat pump efficiency. Use of a check valve, zone valve, or other device may help prevent involuntary flow.

CONTINUED on PAGE 14

PLUMBING, CONT'D

FIGURE 17
TYPICAL SYSTEM PLUMBING , SINGLE TEMPERATURE ZONES

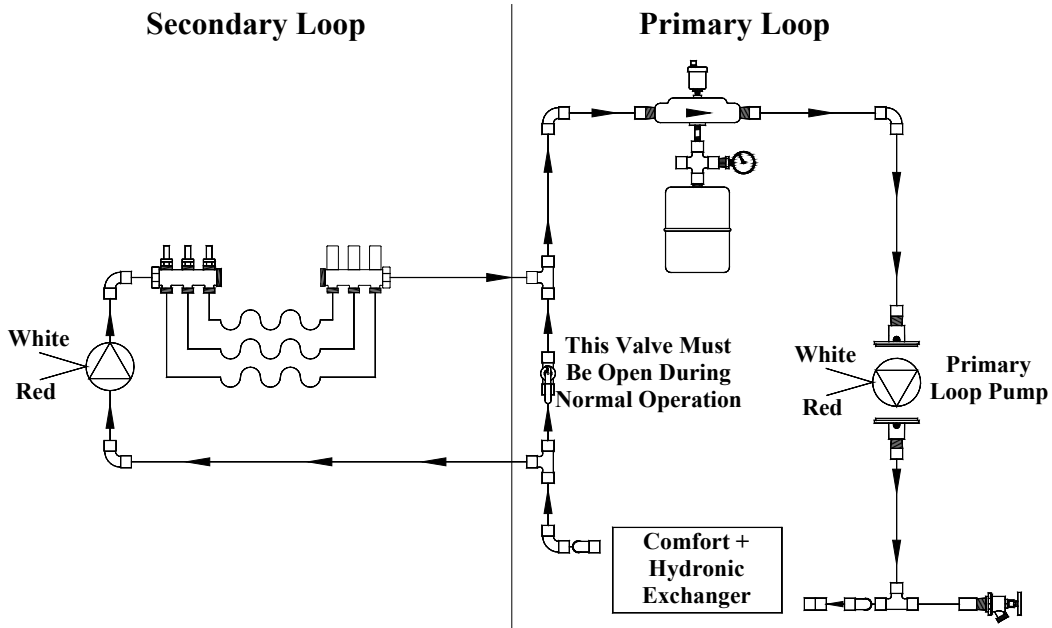
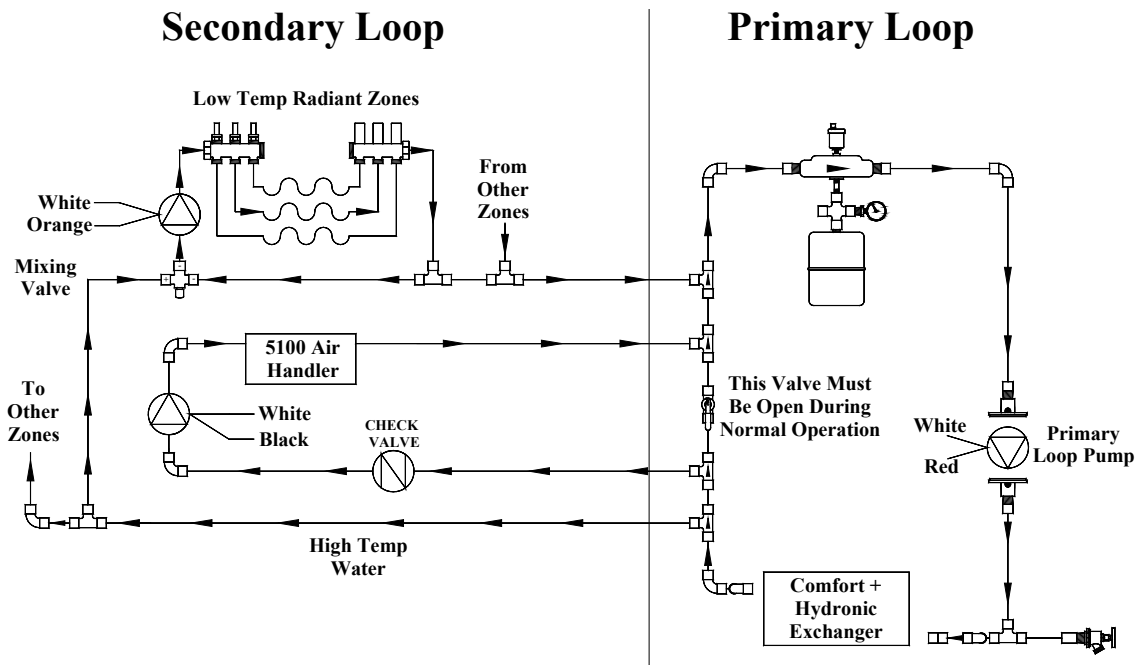


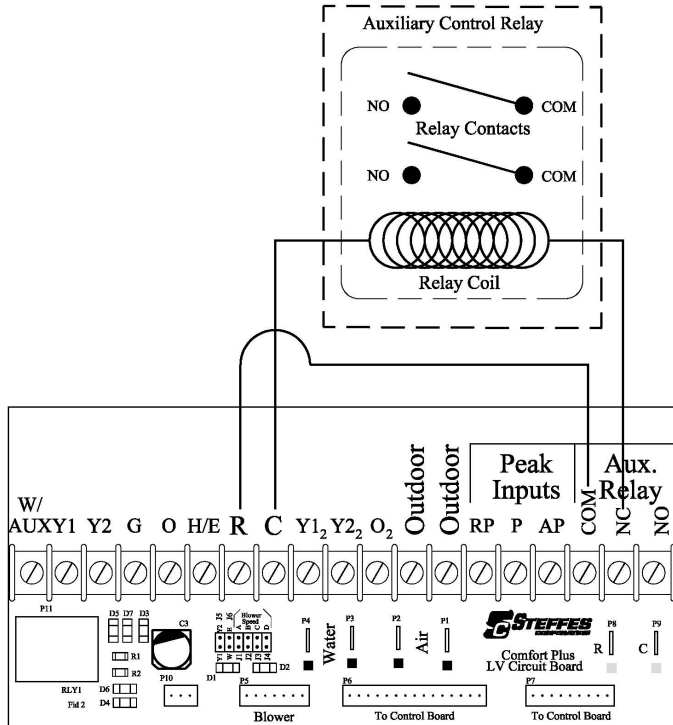
FIGURE 18
TYPICAL SYSTEM PLUMBING (SHOWN WITH STEFFES AIR HANDLER)



15 AUXILIARY LOAD CONTROL

The heating system can be used to provide control signals to other loads in the application. To do so, connect low voltage control wires to the "COM" and "NC" or the "COM" and "NO" positions of the low voltage circuit board in the electrical compartment (Figure 19). These contacts are rated for 30 volts, 3 amps maximum.

**FIGURE 19
TYPICAL AUXILIARY LOAD CONTROL**



IMPORTANT

Maximum external load should not exceed 60 VA on the system's class II transformer.

NOTE: During off-peak (charge) periods, the contact is closed between "COM" and "NC".

16 CONFIGURATION MENU

The Steffes Comfort Plus Hydronic heating system has a Configuration Menu, which allows the system to be customized to the power company and consumer's needs. This menu can be accessed on start-up and allows low voltage configuration settings to be easily adjusted.

To access the Configuration Menu:

1. Energize the system. Access to the Configuration Menu is allowed for the first two (2) minutes of operation. If the system has been energized for more than two (2) minutes, the 15 amp circuit breaker must be powered off and back on to gain access to this menu.
2. Press and release the **M** button until the faceplate displays "CONF".
3. Press the up arrow once and the faceplate will display "C000". The faceplate will flash between "C000" and the corresponding configuration value.
4. If necessary, edit the configuration value by pressing and holding the **M** button while using the up or the down arrow button to change the value.
5. Once the value is correct, release the buttons and press the up arrow button to go to the next configuration (C001, C002, etc.)
6. Repeat steps 4 through 5 until all configuration settings have been adjusted to the desired values.
7. Once configured, use the down arrow to leave the Configuration Menu.

IMPORTANT

If access to the Configuration Menu times out, the 15 amp circuit breaker must be powered off and back on to re-enter the menu.

CONTINUED on PAGE 16

CONFIGURATION MENU, CONT'D

In most applications only a few, if any, configuration changes will be necessary. The following is a description of the configuration settings and their function:

Configuration Number	Method of Peak Control								
	Power Line Carrier (PLC) Peak Control	Low Voltage Direct Wire Peak Control				Time Clock Module Peak Control		Line Voltage Peak Control	
		Peak Switch Closed for Charging		Peak Switch Open for Charging					
		Outdoor Sensor **	No Outdoor Sensor	Outdoor Sensor	No Outdoor Sensor	Outdoor Sensor	No Outdoor Sensor	Outdoor Sensor	No Outdoor Sensor
C000	5	5	6	5	6	5	6	5	6
C001	50°F	50°F				50°F		50°F	
C002	10°F	10°F				10°F		10°F	
C003	Match to the Channel Selected at PLC	0				0		0	
C004	8	9	8	9	8	13	12	9	8
C005	0	1		0		0		0	
C006	2	2				2		2	
C007	30	30				30		30	
C008	5°F	5°F				5°F		5°F	
C009	5°F	5°F				5°F		5°F	
C010	90°F	90°F				90°F		90°F	
C011	APPLICATION DEPENDENT *								
C012	APPLICATION DEPENDENT *								
C013 - C021	N/A	N/A				Refer to the Time Clock Installation Instructions		N/A	

* Risk of high temperature water. Can cause property damage. Improper water temperature settings can result in damage to the floor covering. Verify the maximum and minimum water temperatures (C011 and C012) are appropriate for the application.

** Factory Default is Low Voltage Direct Wire Peak Control Closed for Charging with Outdoor Sensor.

- C000 Off-Peak Method of Charge Control** - Sets the method of brick core charging to be used during off-peak (charge) periods. System is configured for automatic charge control which is a value of five (5).
- C001 Start Brick Core Charge Set Point** - If utilizing automatic charge control as set in C000, this value indicates the outdoor temperature at which the system will start charging.
- C002 Full Brick Core Charge Set Point** - If utilizing automatic charge control as set in C000, this value indicates the outdoor temperature at which the system will target a full core charge.
- C003 Power Line Carrier (PLC) Channel Selection** - If using PLC communication, this setting must match the channel setting in the Steffes PLC control. A value of zero indicates power line carrier communication is disabled.
- C004 Optional Controls Configuration**
- | Value | Configuration Description |
|-------|---|
| 8 | No Outdoor Sensor/No Time Clock Module |
| 9 | Outdoor Sensor/No Time Clock Module |
| 12 | No Outdoor Sensor/Time Clock Module (unlocks C013-C021) |
| 13 | Outdoor Sensor/Time Clock Module (unlocks C013-C021) |
- C005 Control Switch Configuration** - If utilizing power line carrier control, the Steffes Time Clock Module, line voltage peak control, or if the utility control switch opens for charging this value should be zero (0). For all other applications, this value should be one (1).

CONTINUED on PAGE 17

CONFIGURATION MENU, CONT'D

C006 Output Control Configuration - Configures the output controls of the Comfort Plus Hydronic system. To determine the value, check the options desired from the list below. Then, add the numbers from the "Value" column and enter the sum into this location. If not used in conjunction with a heat pump or air conditioner, the value in this location should be set to two (2).

Value	Option Selected
2	All Comfort Plus Hydronic Systems (5100 Series)
8	Enables compressor control if there is a "COOL" call during a peak (control) time.
32	If a peak (control) period and a cooling call, the compressor will turn off and on in 20 minute intervals (off 20 minutes, on 20 minutes, off 20 minutes, etc.).
128	Interfaces Comfort Plus Hydronic with a heat pump that has a reversing valve which is energized for heating.

C007 Charge Factor - This configuration should be set to a value of 30.

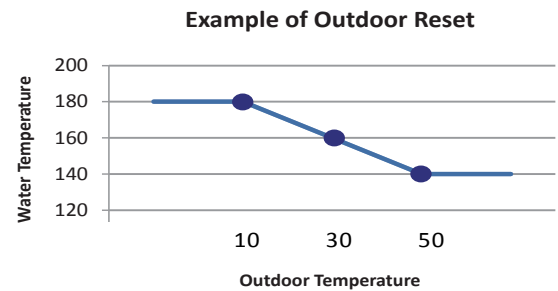
NOTE: *C008 and C009 configurations are only applicable if the Comfort Plus Hydronic system is being used in conjunction with a heat pump.*

C008 Heat Pump Compressor Outdoor Lock-Out Temperature for Off-Peak or Anticipated Peak Modes - Indicates the outdoor temperature at which the heat pump's compressor is locked out and not allowed to operate during an off-peak or anticipated peak period.

C009 Heat Pump Compressor Outdoor Lock-Out Temperature for On-Peak Mode - Indicates the outdoor temperature at which the heat pump's compressor is locked out and not allowed to operate during an on-peak period.

C010 Minimum Discharge Air Temperature - Sets the minimum discharge air temperature the system targets during a Stage 1 heat call if using an air handler.

NOTE: *C011 and C012 configurations must be set for the hottest temperature zone in the installation. C011 is the highest temperature the system will target and C012 is the lowest temperature the system will target during a heat call. Outdoor reset is done using these two temperatures. (See graph.)*



C011 Maximum Outlet Water Temperature - The value set indicates the maximum outlet water temperature to be targeted. The targeted outlet water temperature is affected by the values in C001 and C002. For example, if the value in C001 = 50; C002 = 10; C011 = 180; C012 = 140, then at an outdoor temperature of 30°F/1°C, the targeted outlet water temperature would be 160°F/71°C.

C012 Minimum Outlet Water Temperature - The value set indicates the minimum outlet water temperature to be targeted. The targeted outlet water temperature is affected by the values in C001 and C002. For example, if the value in C001 = 50; C002 = 10; C011 = 180; C012 = 140, then at an outdoor temperature of 30°F/1°C, the targeted outlet water temperature would be 160°F/71°C.

C013-C021 Time Clock Module Configuration - These configuration settings are used to configure the peak control times when utilizing the optional Steffes Time Clock Module. Refer to the installation and configuration instructions included with the module for more information.

NOTE: 208V SYSTEMS ONLY: *In standard configuration, Steffes heaters are dual rated for 240V and 208V power connections. The heaters are factory configured for 240V. If the control circuit is operating on 208V power, the value in Location 28 (L028) must be changed to 5.*



CAUTION

Risk of high temperature water. Can cause property damage. Improper water temperature settings can result in damage to the floor covering. Make sure the maximum and minimum water temperatures are appropriate for the application.

17 INSTALLER'S FINAL CHECK-OUT PROCEDURE



WARNING



HAZARDOUS VOLTAGE: Risk of electric shock. Can cause injury or death. System may be connected to more than one branch circuit. Disconnect power to all circuits before servicing. Equipment must be serviced by a qualified technician.

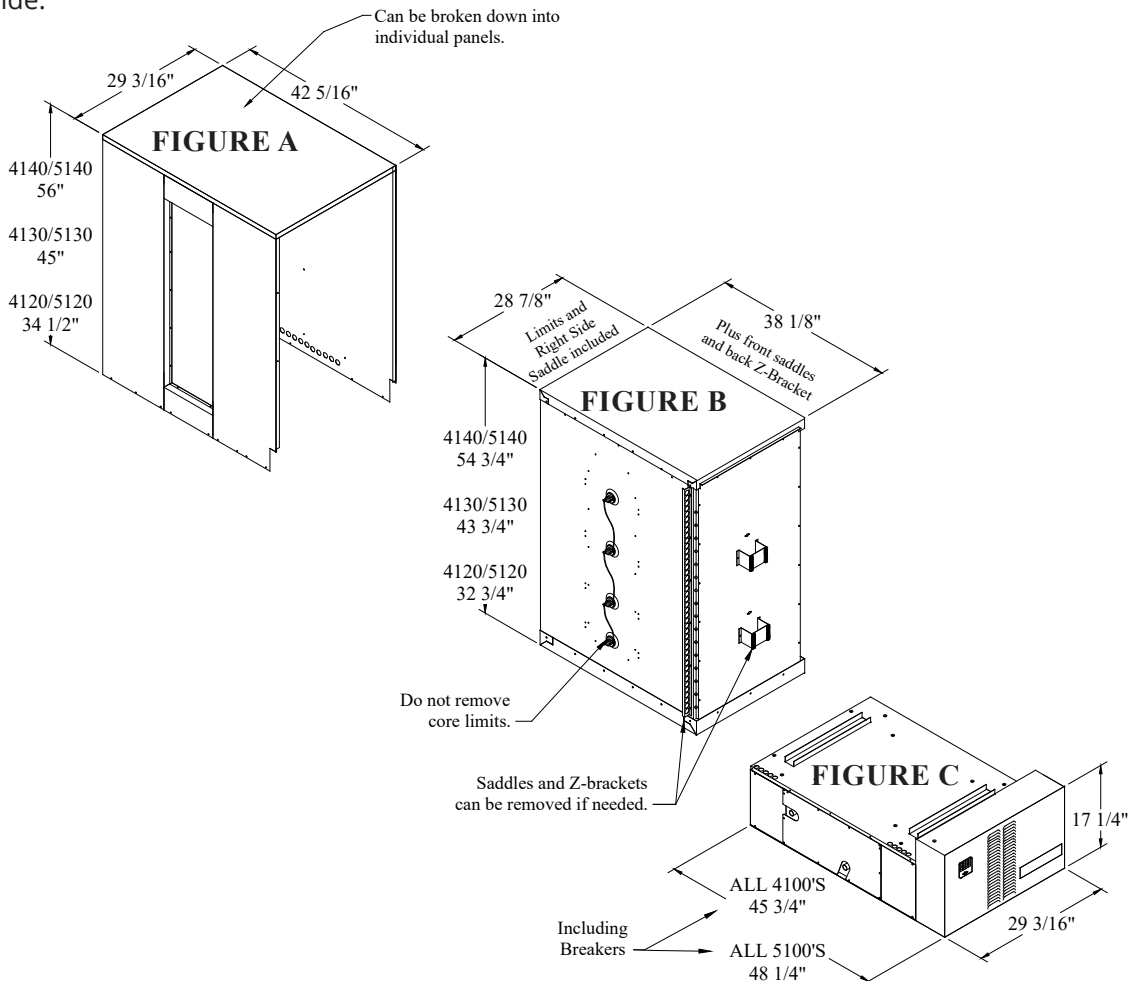
1. Verify that the water pressure is correct for the application. The water pressure of the heating system should be between 12 and 20 psig.
2. Verify the operating mode displayed on the control panel corresponds with the power company's peak control signal.
3. Press the up arrow one time and verify that the outdoor temperature information displayed on the control panel is approximately the same as the current outdoor temperature.
4. Initiate a heat call from each room thermostat (one at a time) and verify that the heating system recognizes the appropriate heat call. In applications utilizing the air handler, verify that the air handler and/or heat pump operates appropriately.

5. If utilizing the air handler, initiate a cooling call from the room thermostat and verify that the heating system recognizes the "COOL" call. Verify that the air handler, heat pump, and/or air conditioner operates appropriately.
6. With the system in an off-peak (charge) mode, initiate the charge control override. Once initiated, the target level of the heating system should be 100 percent, the control panel should display "tL: F", and all of the heating elements should be energized. With an amp meter, verify that the amperage of the system is correct for the installation. Refer to the system identification label on the heating system for information regarding the proper amperage.
7. Cancel the charge control override and verify that all elements in the system de-energize.
8. Verify that all hydronic heating zones are operating as intended.
9. Verify, once again, that the "Operating Mode" displayed on the control panel corresponds with the power company's peak control signal.
10. In applications utilizing the Steffes Power Line Carrier control system, complete the Installer's Final Checkout procedure provided with that device.
11. Give the customer the User's Guide and Warranty Registration Card. The registration card must be submitted to ensure warranty coverage.

18 DISASSEMBLING THE COMFORT PLUS HYDRONIC SYSTEM

1. Remove the painted front panel of the brick storage cabinet. Detach by pulling the bottom of the panel forward and down.
2. Remove the limit zone cover.
3. Remove the screws around the perimeter of the limit zone and around the bottom of the left side, right side, and back upper panels.
4. There are two white/black wires which route from the limit zone through a knockout. These wires route into the electrical panel through a romex connector. Loosen the romex connector.
5. Remove the electrical panel cover and locate the point where the white/black wires connect to the black/yellow wires. Disconnect the white/black wires and route them up through the romex connector.
6. Remove the one to two screws in the center of the upper right side panel.
7. From the back of the system, lift and remove the painted panels. (See Figure A.)
8. Locate the brick core temperature sensor(s) behind the front panel and disconnect them from their shipping position. Carefully lay the sensor(s) aside to avoid damaging them.
9. Carefully rock the brick core (Figure B) to one side and lift top portion up and off the base (Figure C.)
10. Move the heating system into the desired location, reassemble, and continue with the installation instructions in this install guide.

WARNING	
 	<p>HEAVY OBJECT</p> <p>Can cause muscle strain or back injury. Use assistance to lift or move this equipment.</p> <p>Use lifting aids and proper lifting techniques when lifting or moving this equipment.</p> <p>Keep all body parts and other objects clear of the system when lifting or moving.</p>



Thank you for purchasing Steffes ETS heating equipment. We welcome your comments relating to the Comfort Plus and this guide. Enjoy your new purchase!

3050 Hwy 22 North • Dickinson, ND 58601-9413 USA • www.steffes.com



DOCUMENT #1206115 Rev 1