SCM2-1119
W30-WG0593

SPACE PAK HYDRONICS

MODEL SCM INSTALLATION, OPERATION & MAINTENANCE MANUAL

Air-To-Water
Reverse Cycle Heat Pumps
5 Ton

⚠WARNING **Qualified installer only —** This product must be installed only by a qualified service technician. The installation must be done using recognized industry practices, and in compliance with this manual and all applicable codes. Failure to comply could result in death, serious injury or substantial property damage.

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Intertek

NOTICE **For information not included in this manual, see the following:** This manual includes only basic information for installation, operation and maintenance of SpacePak air to water heat pumps. For more advanced applications and information not shown in this manual, contact SpacePak Technical Support for assistance and supplemental instructions. Call 413-564-5530 in Westfield, MA or visit our website at www.spacepak.com to send an e-mail or review technical literature.

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Section 1: READ BEFORE PROCEEDING

Hazard definitions

The following terms are used throughout this manual to bring attention to the presence of potential hazards or to important information concerning the product.

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, WILL result in death, serious injury or substantial property damage.

⚠ WARNING Indicates an imminently hazardous situation which, if not avoided, COULD result in death, serious injury or substantial property damage.

⚠ CAUTION Indicates an imminently hazardous situation which, if not avoided, MAY result in minor injury or property damage.

NOTICE Used to notify of special instructions on installation, operation or maintenance which are important to equipment, but not related to personal injury hazards.

Model SCM overview

The SpacePak Model SCM heat pump is a self contained reverse-cycle heat pump that provides a continuous supply of heated or chilled water for various purposes, such as: residential or small commercial building heating and cooling; and specialty applications, such as computer room cooling or industrial/agricultural conditioning and dehumidification.

Model SCM heat pumps are available in three- and five-ton nominal capacities. Both use the same general design and operating principals.

Each heat pump contains **TWO isolated refrigeration systems** of equal size to cool or heat the delivered water supply. The two systems can operate individually or in tandem to achieve 50% or 100% capacity. The major components of each system are:

- A hermetically sealed refrigeration compressor & motor.
- An outside coil to reject heat (in cooling) or absorb heat (in heating) from the surrounding ambient air.
- A fan and motor to force air over the outside coil.
- A shell-and-tube refrigerant-to-water heat exchanger to absorb heat (in cooling) or supply heat (in heating) to the delivered water flow.
- An electronic expansion valve to throttle the refrigerant flow in both heating and cooling modes of operation, responding to varying load on the system.
- A reversing valve (to select between heating and cooling operation).
- Sensors and safety circuits to monitor and protect the equipment from potentially damaging or dangerous operating conditions.

A single water circuit connects both internal heat exchangers, and contains sensors to measure entering and leaving water temperatures. A mechanical flow switch safety ensures continuous water flow while either of the two refrigerant systems is operating. All components are contained within a supporting structure and enclosure sufficient to allow stand-alone outdoor installation in all temperate climates.

All operation and protections are managed by a microprocessor controller which operates the individual systems, determines all operating parameters, and monitors the condition of each system. A simple interface communicates with the indoor air handler, heat exchanger, or other load.

⚠ WARNING Failure to comply with all of the guidelines BELOW could result in death, serious injury or substantial property damage.

Codes and electrical requirements

- This product must be installed in accordance with all applicable codes. Where instructions in this manual differ from specific local requirements, defer to the local codes.
- The electrical installation must also comply with the latest edition of: in the U. S. — National Electrical Code ANSI/NFPA No. 70; in Canada — CSA C22.1 Canadian Electrical Code Part 1. Wiring must be N.E.C. Class 1. Use only copper wire, rated for 120°F and sized for the load listed in this manual.
- **Electrical shock hazard** — Disconnect all electrical power before servicing the unit. Also, the unit must be grounded in accordance with the Electrical Code listed above.

Refrigerant

- The refrigeration system is factory charged with R410A refrigerant, and requires no additional service during installation. Any repair, diagnosis or maintenance service to the refrigeration system must be performed by a qualified technician. No alternate refrigerants, lubricants or additives are approved for this unit. Any use of alternate or non-approved materials in the refrigeration system may result in personal injury or equipment damage, and will void the manufacturer's warranty.

Liquid side

⚠ CAUTION **The fluid in the liquid side of the Model SCM must be an anti-freeze/water mix.**

- The antifreeze percentage must be at least 10%. Follow guidelines in this manual to find the required antifreeze mix for the application. Thoroughly flush the system before filling.
- The system must be supplied with a pump sized to provide the minimum flow rates specified in this manual. Pump selection must consider the pressure loss through the system and its components plus the pressure loss through the SCM's heat exchanger and internal components. The pump must be rated for use with chilled water/glycol mixture.
- Install a y-strainer at the liquid input of the heat pump as shown in this manual to prevent damage to the heat exchanger from sediment.
- **DO NOT use for potable water heating**. The single-wall heat exchanger is not suitable for the application.

Ambient limits

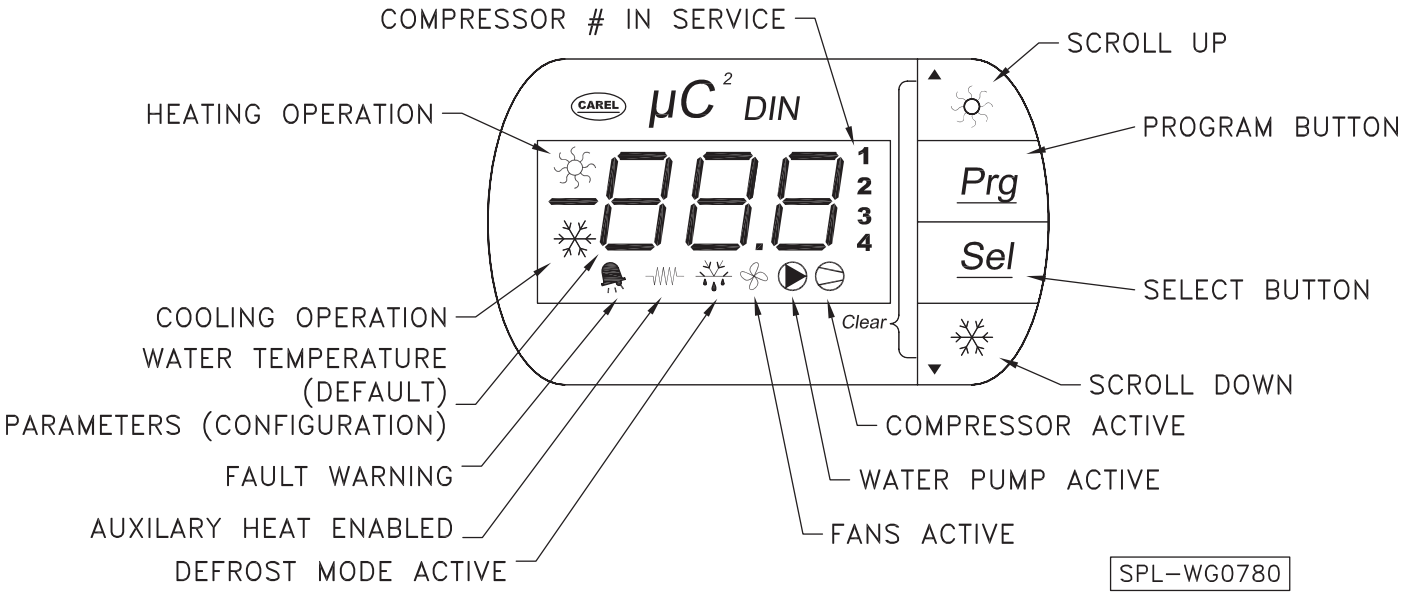
- See information in this manual for heating and cooling performance versus ambient temperature.
- For applications requiring cooling at outdoor temperatures below 55°F, contact SpacePak Technical Support for assistance.
- **DO NOT disconnect power in cold temperatures**. Power must be on to allow the anti-freeze cycle to operate.

SCM controller

- The SCM controller provides adjustability of various operating parameters to address specific applications. See Section 2 for detailed instructions to adjust these parameters.

Section 2: SCM Field Adjustable Parameters

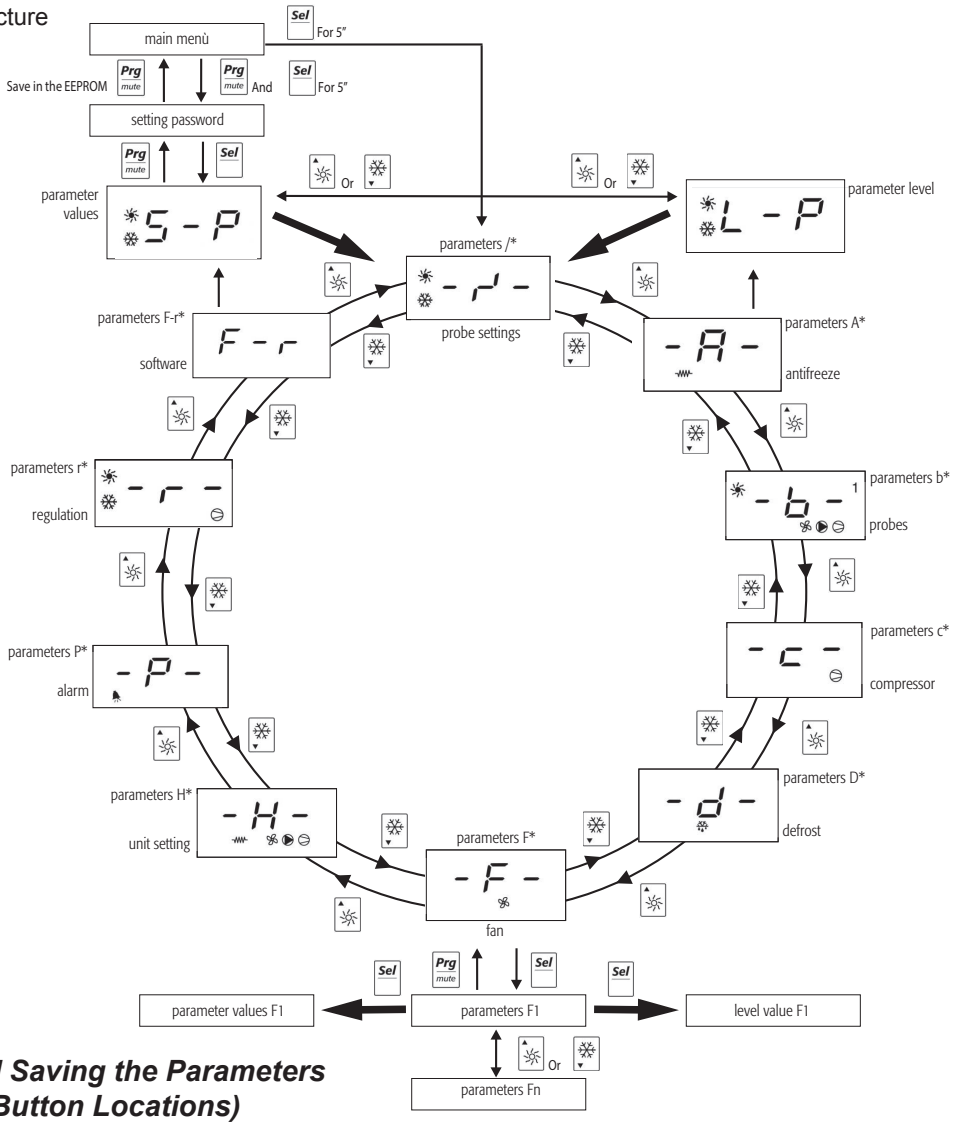
Figure 1



Keypad
The keypad is used to set the unit operating values (see Parameters/alarms – Keypad combinations).

Section 2: SCM Field Adjustable Parameters (continued)

Figure 2 Menu Structure



Programming and Saving the Parameters (See Figure 1 for Button Locations)

1. Press "**Prg**" and "**sel**" for 5 seconds;

2. the heating and cooling symbol and the figure "00" are displayed;

3. use "❄" and "❄" to set the password and confirm by pressing "**sel**";

4. use "❄" and "❄" to select the parameter menu (S-P) or levels (L-P) and then press "**sel**";

5. use "❄" and "❄" to select the parameter group and then press "**sel**";

6. use "❄" and "❄" to select the parameter and then press "**sel**";

7. after making the changes to the parameter, press "**sel**" to confirm or "**Prg**" to cancel the changes;

8. press "**Prg**" to return to the previous menu;

9. to save the modifications, press "**Prg**" repeatedly until reaching the main menu.

Note:
a. The parameters that have been modified without being confirmed using the "**sel**" button return to the previous value.
b. If no operations are performed on the keypad for 60 seconds, the controller exits the parameter modification menu by timeout and the changes are cancelled.
c. The appropriate passwords refered to in Step 2 can be found in the right-most column of the chart on the following page.

Section 2: SCM Field Adjustable Parameters (continued)

SCM Controller

The SCM controller allows the adjustment of heating & cooling setpoints, differentials, and defrosting parameters.

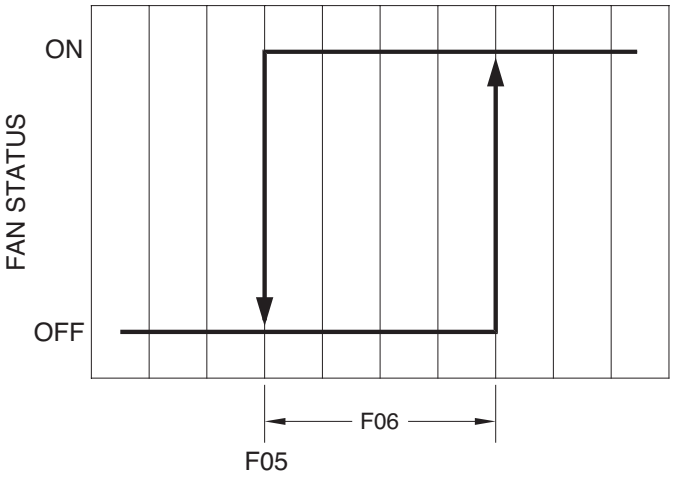
The following chart depicts the factory default values for the most commonly adjusted parameters.

Certain read only parameters are available to evaluate performance or troubleshoot faults. These are accessed through the same parameter menu and are listed below.

DISPLAY	DESCRIPTION	MIN	MAX	UOM	DEFAULT	MEANING	PASSWORD
A01	Low Temp Alarm	A07	A04	°F	34.0	Water temperature below which the Low Temp alarm A1 will activate	22
A02	Alarm differential	0.3	122.0	°F	4.0	Alarm A1 turns off at A01 + A02	22
A04	Aux heater setpoint	A01	r16	°F	36.0	Water temperature below which the pump and electric heater, if present, engage.	22
A05	Differential for aux heater	0.3	50.0	°F	5.0	Pump and heater turns off at A04+A05	22
A07	Antifreeze alarm set point limit	-40.0	176.0	°F	32.0	Minimum temperature that A01 can be set to	66
A08	Auxiliary heater set point in heating mode	A01	r15	°F	90.0	Water temperature below which the electric heater, if present, engages in heating mode	22
A09	Auxiliary heater differential in heating mode	0.3	50.0	°F	5.0	Electric heater turns off at A08 + A09 in heating.	22
b00	Default display value	0	10	Flag	0	b00 = 0 Displays return water temperature b00 = 01 displays supply water temperature	22
b01	Probe B1 reading	-	-	°F	-	Read only, real time return water temperature	00
b02	Probe B2 reading	-	-	°F	-	Read only, real time sys 1 HX leaving water temp	00
b03	Probe B3 reading	-	-	°F	-	Read only, real time Sys 1 OS coil surface temperature	00
b04	Probe B4 reading	-	-	°F	-	Read only, real time ambient air temperature	00
b05	Probe B5 reading			°F	-	Read only, real time supply water temperature	00
b06	Probe B6 reading			°F	-	Read only, real time sys 2 HX leaving water temp	00
b07	Probe B7 reading	-	-	°F	-	Read only, real time Sys 2 OS coil surface temperature	00
c10	Accumulated compressor #1 hours (System 1)	-	-	hrs x 100	-	Value x 100 is the accumulated compressor run time in hours	00
c12	Accumulated compressor #3 hours (System 2)			hrs x 100	-	Value x 100 is the accumulated compressor run time in hours	01
C15	Accumulated pump hours	-	-	hrs x 100	-	Value x 100 is the accumulated pump run time in hours	00
d01	Defrost cycle	0	1	Flag	0	Defrost feature currently disabled	22
d02	Defrost logic	0	2	Flag	0	Defrost on timed cycle	22
d03	Start defrosting temperature	0.0	d04	Bar	3.2	Coil temperature below which Defrost initiates	22
d04	End defrosting temperature	0.0	176.0	°F	45	End defrost temperature	22
d06	Min. duration of a defrosting cycle	0	150	Second	60	Minimum defrost duration even if all conditions are satisfied.	22
d07	Duration of a defrosting cycle	1	150	Minute	5	Time duration of a defrost cycle for one system.	22
d08	Time between defrost cycle	10	150	Minute	45	Run time between defrost cycle starts in one system	22
d09	Delay between two circuits	0	150	Minute	10	Minimum delay between start of defrost of one cuircuit to start of defrost of other circuit	22
d11	Immersion heaters on during defrost	0	1	Flag	1	Turns on electric immersion heater to offset heat loss during defrost cycle.	22
d16	Forced ventilation time at the end of the defrosting	0	360	Second	45	Duration of fan operation at full speed to clear water from coil	66
d17	Defrost with compressors OFF	0	80.0	°F	55.0	Temperature above which defrost occurs with fans only.	66
F02	Fan operating logic	0	2	Flag	1	0=Fans on whenever unit is on, 1=both fans on when either compressor is running, 2=both fans on when either compressor is running and coil temp is above threshold	66
F05	Temperature for fans off in cooling	-40.0		°F	75.0	Coil temperature below which fans turn off (if F02=2) (See Fig 1)	22
F06	Temperature differential to turn fans back on	0.0	50.0	°F	10.0	Fans turn back on at F05+F06 (if F02=2) (See Fig 1)	22
r01	Cooling set point	r13	r14	°F	42.0	Primary cooling setpoint (See Fig 3)	00
r02	Cooling differential	0.3	50.0	°F	8.0	Cooling differential/hysteresis	00
r03	Heating set point	r15	r16	°F	120.0	Primary heating setpoint (See Fig 5)	00
r04	Heating differential	0.3	50.0	°F	8.0	Heating differential/hysteresis	00
r13	Min. Cooling set point	-40.0	r14	°F	36.0	Minimum allowable cooling setpoint	22
r14	Max. Cooling set point	r13	176.0	°F	60.0	Maximum allowable cooling setpoint	22
r15	Min. Heating set point	-40	-40.0	°F	55.0	Minimum allowable Heating setpoint	22
r16	Max. Heating set point	r15	176.0	°F	125.0	Maximum allowable Heating setpoint	22
r17	Cooling compensation constant	-5.0	+5.0	°F	0.0	Slope of Outdoor reset curve, Deg water temp/Deg ambient temp. Cooling mode (See Fig 5)	22
r18	Maximum distance from the set point	0.3	20.0	°F	8.0	Maximum deviation from setpoint that can be achieved by outdoor reset (See Fig 5 & Fig 6)	22
r19	Start compensation temperature in cooling mode	-40.0	176.0	°F	85.0	Ambient air temp above which Outdoor Reset is active in Cooling (See Fig 5)	22
r20	Start compensation temperature in heating mode	-40.0	176.0	°F	30.0	Ambient air temp below which Outdoor Reset is active in Heating (See Fig 6)	22
r31	Heating compensation constant	-5.0	+5.0	°F	0.0	Slope of Outdoor reset curve, Deg water temp/Deg ambient temp. Heating mode (See Fig 6)	22

Section 2: SCM Field Adjustable Parameters (continued)

Figure 3 SCM Fan Speed Control, Cooling



If the fan control logic, parameter F02, is set to 02, the fans will shut off if the outside coil surface temperature (as read by sensors b03 & b07, whichever is greater) falls to the value established by parameter F05 (75°F, factory default) and remain off until the coil surface temperature rises above F05 plus F06 (75°F + 10°F=85°F, factory default) when the fans will turn on again.

Figure 4 SCM Outdoor Reset, Cooling

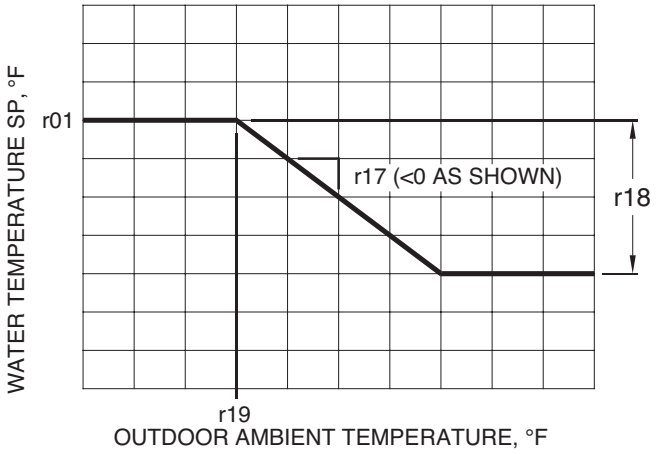
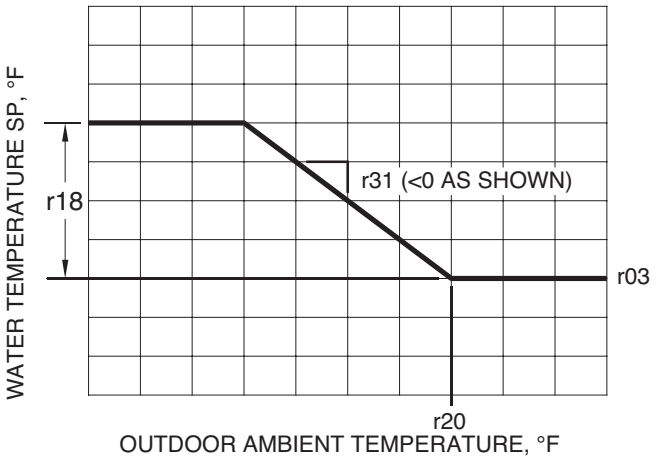


Figure 5 SCM Outdoor Reset, Heating



If the cooling compensation constant, parameter r17, is set to a value other than zero, the water temperature setpoint will be the value established by parameter r01, (42°F factory default) until the outdoor ambient temperature rises to the value of parameter r19 (85°F factory default). Then, as the outdoor temperature continues to increase, the water temperature setpoint will change (increase if r17 is greater than zero, decrease if r17 is less than zero) by the ratio of change in water temperature setpoint to change in ambient temp. For example, if r17 is set to a value of -.5, the setpoint will ***decrease*** by 0.5°F for every 1.0°F ***increase*** in outdoor ambient temperature. This will continue, until the difference between the new setpoint and the original setpoints matches the value established by parameter r18 (8.0°F factory default), So the final setpoint (42°F - 8°F=34°F factory default) will remain fixed even if the ambient temperature continues to rise.

If r17 is set to zero, the water temperature setpoint will remain fixed at the value established by parameter r01 through the entire range of cooling operation.

If the heating compensation constant, parameter r31, is set to a value other than zero, the water temperature setpoint will be the value established by parameter r03, (120°F factory default) until the outdoor ambient temperature falls to the value of parameter r20 (30°F factory default). Then, as the outdoor temperature continues to fall, the water temperature setpoint will change (decrease if r31 is greater than zero, increase if r31 is less than zero) by the ratio of change in water temperature setpoint to change in ambient temp. For example, if r31 is set to a value of -.5, the setpoint will ***increase*** by 0.5°F for every 1.0°F ***decrease*** in outdoor ambient temperature. This will continue, until the difference between the new setpoint and the original setpoints matches the value established by parameter r18 (8.0°F factory default), So the final setpoint (120°F + 8°F=128°F factory default) will remain fixed even if the ambient temperature continues to fall.

If r31 is set to zero, the water temperature setpoint will remain fixed at the value established by parameter r03 through the entire range of heating operation.

Section 3: Specifications and Ratings

Figure 6 Model SCM rating data

Model	**SCM - 060**
Heating Capacity	52,200 BTUh (15.3 kW)
Heating COP	2.65
Cooling Capacity	48,000 BTUh (14.1 kW)
Voltage	230v/1ph/60Hz
Min Supply Temp	36°F (2.2°C)
Max Supply Temp	125°F (51.7°C)
Rated Water Flow	12 GPM (45.4 l/Min)
dP @ Rated Flow	24.2 ft (72.4 kPa/10.5 PSI)
Heating Current	25.6 amps
Cooling Current	24.8 amps
Noise Level	56 dB (A)
Compressor	Rotary x 2
Installed Weight	407 lbs (185 kg)

All heating data at 47°F ambient, 120°F supply.
All cooling data at 95°F ambient, 44°F supply.

Figure 7 Model SCM coding

Typical model	**S**	**C**	**M**	**0**	**6**	**0**	**A**	**4**
Position	1	2	3	4	5	6	7	8
Designation	Unit Type			Capacity			Series	Refrigerant type
Values	**SCM = SpacePak Heat Pump Module**			**060** = 5 ton nominal			**A = Series "A"**	**4 = R410A**

Examples	**SCM-060-A-4** = 5 ton nominal, series A, using R410A referigerant, SpacePak Heat Pump Module

Standard equipment

- Heat pump, including two refrigeration systems, factory-programmed controller, fans and all required internal components
- Powder-coated enclosure
- Auxiliary electric immersion heater (3 kW, 230V/1/60) — requires separate electrical power circuit, 15-amp minimum breaker

Additional components required

- Pump and piping by others
- Expansion tank, properly sized for system volume
- Buffer tank

Section 3: Specifications and Ratings (continued)

Heat Pump SCM060 Series

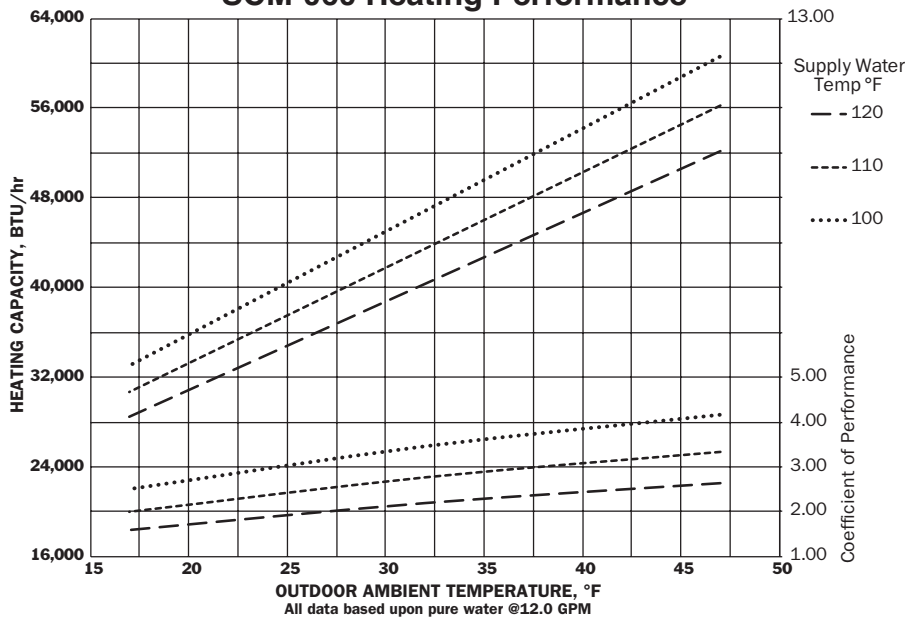
PERFORMANCE

SCM-060 Heating Operation / SCM-060 Cooling Operation

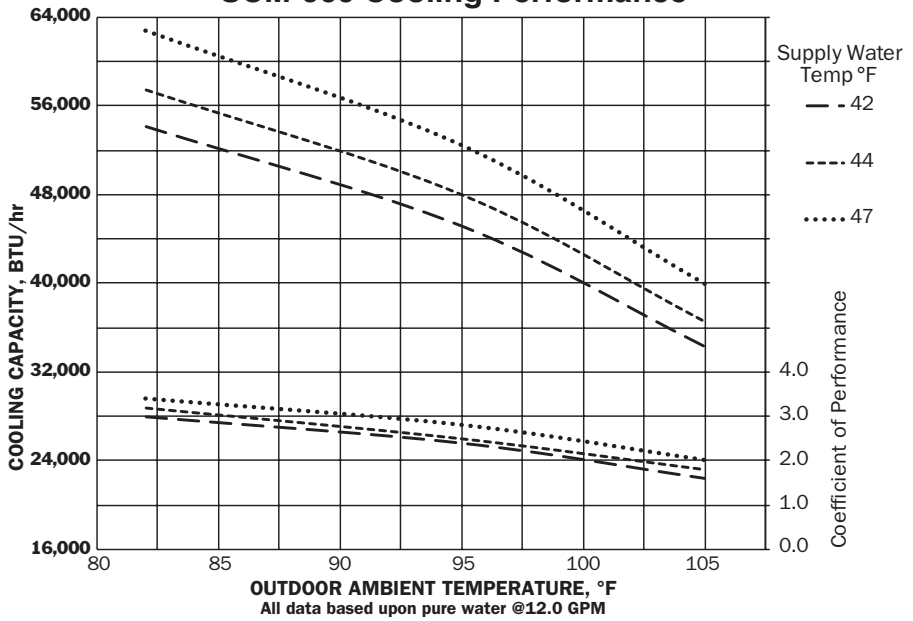
Supply Water Temp °F	Ambient Temp °F	Capacity BTU/hr	Water DP ft WC	Watts	COP	Supply Water Temp °F	Ambient Temp °F	Capacity BTU/hr	Water DP ft WC	Watts	COP
100	17	33,075	24.2	3,880	2.50	42	82	54,102	24.2	5,281	3.00
	32	46,828	24.2	3,970	3.45		95	45,163	24.2	5,510	2.40
	47	60,580	24.2	4,263	4.16		105	34,343	24.2	6,285	1.60
110	17	30,703	24.2	4,513	1.99	44	82	57,500	24.2	5,262	3.20
	32	43,468	24.2	4,618	2.76		95	48,000	24.2	5,622	2.50
	47	56,234	24.2	4,959	3.32		105	36,500	24.2	5,938	1.80
120	17	28,500	24.2	5,249	1.59	47	82	62,832	24.2	5,411	3.40
	32	40,350	24.2	5,371	2.20		95	52,451	24.2	5,485	2.80
	47	52,200	24.2	5,768	2.65		105	39,885	24.2	5,840	2.00

All data based upon pure water @ 12.0 GPM

SCM-060 Heating Performance

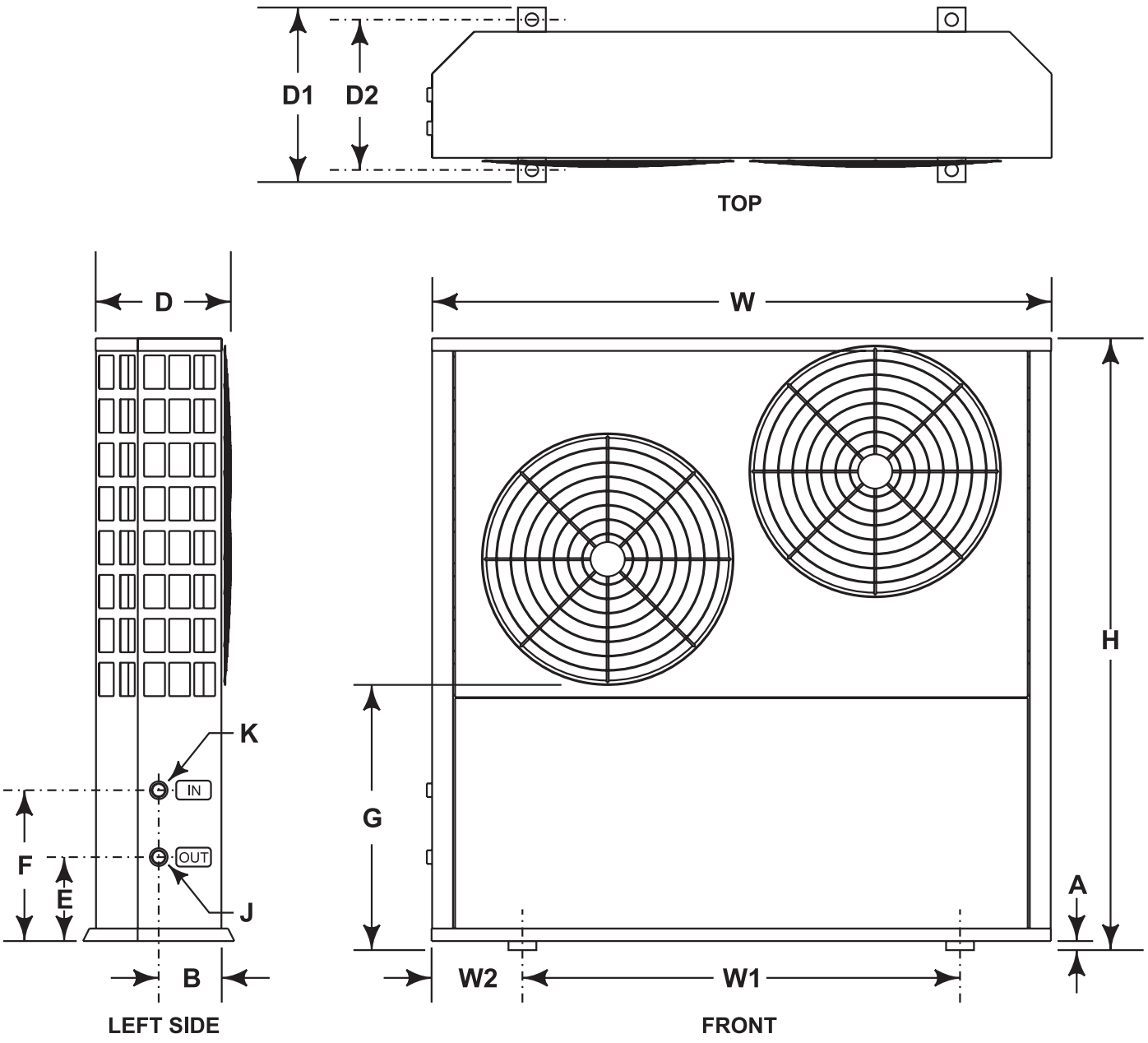


SCM-060 Cooling Performance



Section 4: Dimensions

Figure 8 Model SCM dimensions (ALL DIMENSIONS IN INCHES)



Model	A	B	D	D1	D2	E	F	G	H	J	K	W	W1	W2
	Leg height	Front to return	Cabinet depth	Mounting lug depth	Mounting lug centers	Bottom to return	Bottom to supply	Base to bottom edge of lower fan	Overall Height	Supply connection	Return connection	Overall width	Mounting lug centers	Lug center to edge
SCM-060	1	10	17 3/4	17 3/8	15 3/4	5 1/2	15 1/4	25	53	1" NPT	1" NPT	43 3/8	27 1/2	7 15/16

Section 5: Location & Mounting

⚠WARNING Failure to comply with all of the guidelines IN THE FOLLOWING could result in death, serious injury or substantial property damage.

NOTICE The installation must comply with all applicable local codes.

Prepare the unit

- Inspect the unit for shipping damage. DO NOT use if there is a risk that the damage could affect unit operation.
- Make sure all required components are available.
- Install optional immersion heater, if used. See instructions provided with the heater.

Location

- DO NOT locate where the unit could be sprayed by sprinklers.
- DO NOT locate near swimming pools, spas or any location that could cause chlorine or other contaminant to enter the unit.
- DO NOT locate where water run-off from adjacent structures could impinge on the unit.
- Maintain the clearances shown in Figure 10.
- LOW AMBIENT conditions — Contact SpacePak Technical Support to obtain low ambient adjustment instructions if cooling operation below 55°F is required.
- CORROSIVE ENVIRONMENTS — Do not install the unit in an area subject to sea air or other potential corrosive contaminants.
- INDOOR INSTALLATION — If the unit is installed inside a building, the building must be equipped with air openings sufficient to ensure free discharge of heated (or cooled) air generated by the heat pump. All clearances must be maintained to ensure free air flow into and out of the enclosure. Make sure no other equipment located in the space will be affected by the unit's air flow.

Handling

- See Figure 9.
- Place padding at pressure points to prevent damage to the enclosure.
- Use caution when handling. The unit is heavy and could cause severe injury or damage if dropped or handled incorrectly.

Figure 9 Handling with cables

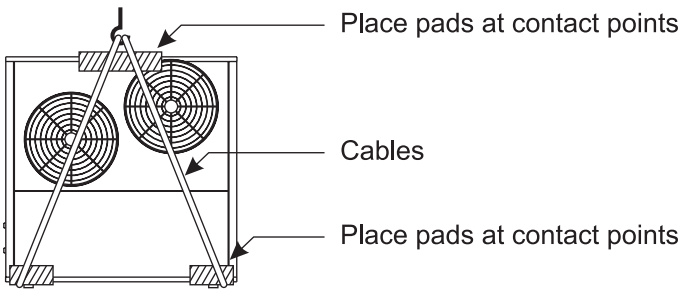
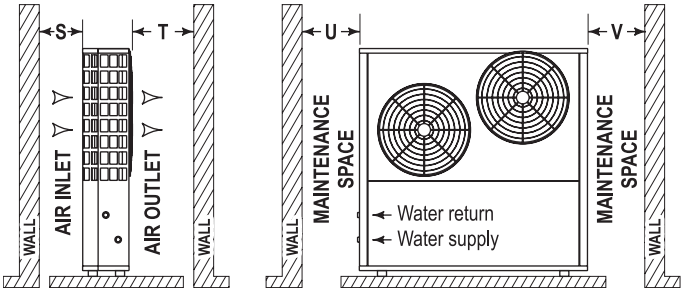


Figure 10 Maintain clearances below



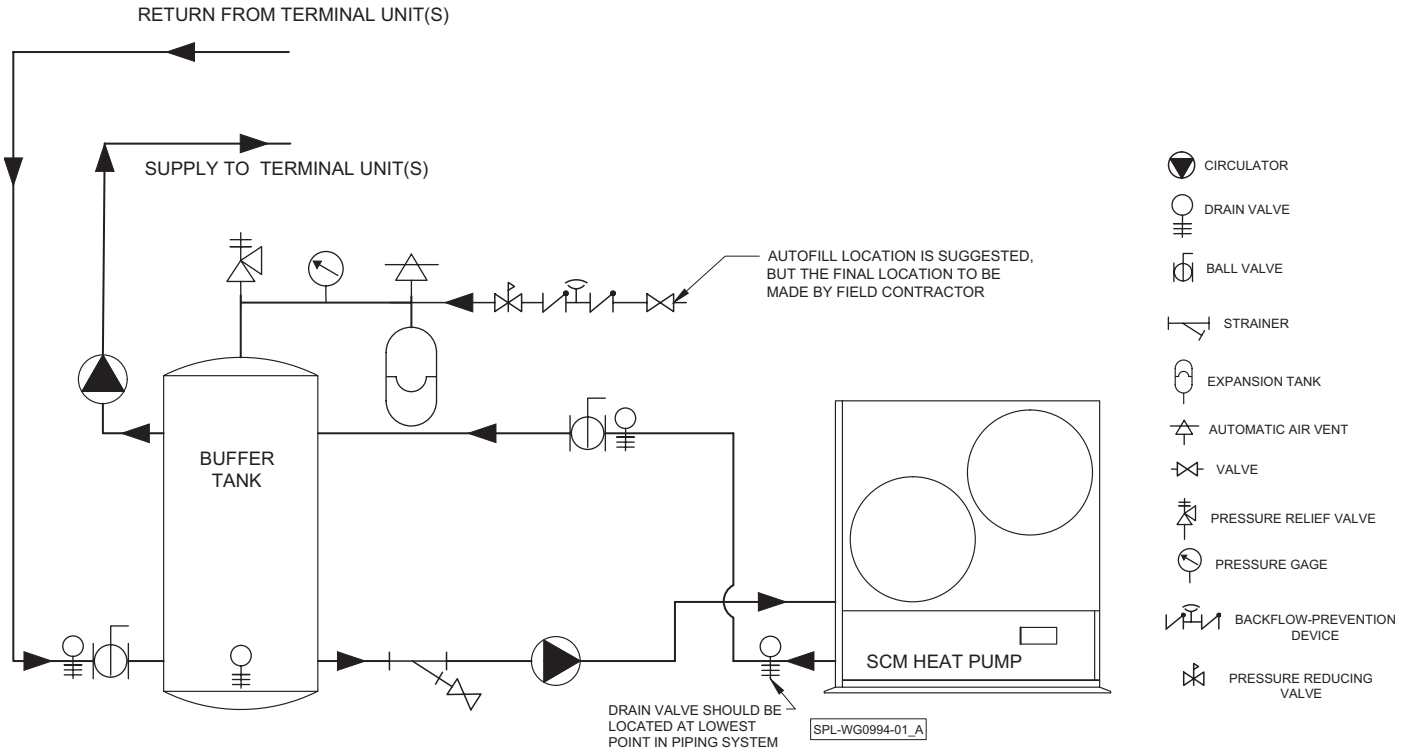
Minimum clearances (inches)			
S	**T**	**U**	**V**
20	59	40	20

Mounting pad

- The SpacePak heat pump must be mounted on a level, corrosion and weather-resistant mounting surface, preferably concrete. The structural support must be suitable for the operating weight of the unit and attached components, its mounting pad, snow loading and any other expected loads.
- The mounting pad must not be attached directly to a structure where noise transmission can occur.
- Vibration isolators supplied with the heat pump may be installed when desired to reduce transmitted vibration.
- The unit must be bolted securely to the pad. Where required by local jurisdiction, the mounting must also be analyzed for seismic loading capability.
- The mounting must ensure that there will be no debris accumulation which might block air flow through the enclosure openings. ***The lower edge of the lower fan opening must be above the typical snow line, including allowance for drifting***.
- There must be no accumulation of water that could reach the bottom of the unit's enclosure.

Section 6: Recommended Piping Diagram

Figure 11 SpacePak heat pump with single air handler (See Section 7 for instructions)



Section 7: Glycol/Water System

Figure 12 SCM Glycol Concentrations (10% Minimum, 50% Maximum)

Ethylene Glycol %	10	20	30	40	50
Min. Ambient Temp for Operation	23°F/-5°C	14°F/-10°C	2°F/-17°C	-13°F/-25°C	-36°F/-38°C
SpacePak Capacity Multiplier	0.98	0.96	0.93	0.91	0.89
Pressure Drop Multiplier (Cooling)	1.06	1.12	1.16	1.25	1.36
Pressure Drop Multiplier (Heating)	1.06	1.12	1.16	1.22	1.28
Minimum Expansion Volume / System Volume					
Heating and Cooling (Gallons)	1 gallon expansion per 15 gallons system volume				
Heating only, HP only (Gallons)	1 gallon expansion per 20 gallons system volume				
Heating Only, with Boiler (Gallons)	1 gallon expansion per 15 gallons system volume				
Propylene Glycol %	10	20	30	40	50
Min. Ambient Temp for Operation	26°F/-3°C	18°F/-8°C	8°F/-13°C	-7°F/-22°C	-29°F/-34°C
SpacePak Capacity Multiplier	0.99	0.98	0.96	0.93	0.88
Pressure Drop Multiplier (Cooling)	1.10	1.20	1.34	1.5	1.65
Pressure Drop Multiplier (Heating)	1.10	1.20	1.34	1.46	1.5
Minimum Expansion Volume / System Volume					
Heating and Cooling	1 gallon expansion per 15 gallons system volume				
Heating only, HP only	1 gallon expansion per 20 gallons system volume				
Heating only, with Boiler	1 gallon expansion per 15 gallons system volume				

Figure 13

Piping Pressure Losses*

	Pressure Drop, Ft water/100Ft			
Flow rate GPM	**1"**	**1-1/4"**	**1-1/2"**	**2"**
Pex Pipe				
10	13.4	5.2	2.4	0.6
11	15.9	6.2	2.8	0.7
12	18.5	7.2	3.2	0.9
14	24.4	9.4	4.2	1.2
Copper Pipe (Type L)				
10	7.1	2.6	1.1	0.3
11	8.4	3.1	1.3	0.3
12	9.9	3.6	1.5	0.4
14	13.2	4.8	2	0.5

*Remember to check the CV rating of your fittings and valves to make sure your getting the correct flow through the equipment.

Glycol/Water System Design

Each SCM Heat Pump has a recommended flow that should be maintained during all times of operation. For the SCM-060, the recommended flow is 12 GPM, at which the head loss is 24.2 ft. WC, 10.4 PSI or 72 kPa. These head loss values are based upon pure water, see Figure 12 for multipliers to correct for various concentrations of anti-freeze solution.

Note: these are the recommended flow values. Should the flow drop significantly below this value, the heat pump will shut down and display the code FL on the display. This is not an indication of a fault in the heat pump, but rather points to insufficient pump or plumbing capacity, or air trapped within the system.

System Volume and Expansion Volume

To ensure smooth temperature control and minimize cycling of refrigeration system, all installations must have total circulating volumes equal to or greater than 7-1/2 gallons per nominal ton of the unit performance (The greater of either heating or cooling produced). In other words, in the case of a four ton heat pump the minimum total system volume is 4x7-1/2=30 gallons. Multiple heat pump installations that are operating in a staged configuration follow the same rule, so that only a single heat pump tonnage needs to be considered. Additionally, the system requires an expansion volume (air) to compensate for the change in volume of the glycol mixture as it heats and cools, see Figure 12 for expansion volume.

A typical multiple heat pump installation may actually have a volume far greater than the minimum required, and it is this entire volume that must be considered when sizing the expansion tank.

Note that the nominal expansion tank volume is not the same as the expansion volume. If the actual air volume is not published, consider it to be no more than half the nominal volume.

As an example, a four ton nominal heat pump, used for both heating and cooling, requires a minimum of thirty gallons of circulated system volume. A 40 gallon buffer tank is selected for best operation. When the system installation is complete, the total liquid volume of plumbing, air handlers, and heat pump is 45 gallons. (Note the expansion tank, no matter how large, is not considered circulated volume) This requires an ***acceptance volume*** of 3 gallons. If the acceptance volume is not specified, assume it is 50% of the total volume. Therefore, this system would require an expansion tank of 3 gallons acceptance volume, or six gallons nominal full volume.

Air Separator

Locate at least one high efficiency air separator as shown in the piping to remove any air from the system.

Glycol / Water Mixture

⚠WARNING The water system must contain a mixture of inhibited glycol and water with thermal protection sufficient for the coldest expected temperature for the installation. The inhibitor level can degrade over time, and may need to be adjusted periodically. The inhibitor is essential to prevent the glycol from accelerating corrosion of metal components in the system. The glycol and inhibitor levels must be checked regularly (no less than once annually).

⚠CAUTION The minimum allowable concentration of glycol is 10% by volume in all installations.

⚠CAUTION Automotive glycol is not suitable for use in the LAHP system. Over time it may leave deposits which will degrade the performance and damage pumps or other devices in the system. Use only ethylene glycol or propylene glycol mixtures specifically labeled for boiler or HVAC use.

Section 7: Glycol/Water System (continued)

Glycol/Water System Installation

Obtain all components specified in Figure 11. Make sure all components and piping comply with applicable local codes.

DO NOT use galvanized pipe anywhere in the system. Galvanizing will react with the glycol and can cause glycol degradation and sludge in the system.

- Confirm charge of expansion tank is 12-15 PSIG (with no water or pressure in the system).
- Install the system piping. DO NOT connect the SpacePak unit to the system piping until the system has been cleaned as required below.

The SCM must NOT be connected to the system during this process.

1. Connect a hose from a fresh water supply to the system fill hose bib. Note the drain port can be used for this purpose. The hose bib purge/drain valve should be located low in the system and close to the SCM return connection.
2. Open the high point purge valve, (not shown in illustration, as it may be inside the air handler) while slowly filling the system. Close the valve when air is removed from the system and water begins to flow out of the valve.
3. Fill the system with fresh water and run water until the system has been thoroughly flushed clean.

Automatic Fill – When an automatic fill system is installed, the cooling fluid (Glycol/water) must be inspected at least every 3 months, or whenever a leak is detected to ensure the proper glycol concentration is maintained.

Pressure Test The System

1. Add water to the system as needed to raise the pressure to 25 PSIG (verify that all system components are suitable for this pressure). Verify that the pressure remains constant for at least one hour. Locate and correct any leaks.
2. After successfully testing, drain the system and remove the fresh water hose.

Insulate The Piping

1. After testing and draining the system, apply pipe insulation. Fill system with glycol/water mixture. Calculate the system volume.
2. See Figure 12, for required glycol concentration for the minimum expected outside temperature.
3. Obtain the required volume inhibited glycol/water solution premixed or mix in a clean container. (The glycol must contain an inhibitor to prevent metal corrosion.)
4. Pump the glycol/water solution into the system, allowing air to escape through the purge valve(s).
5. After filling the system, sample the system fluid and verify glycol and inhibitor percentages, following instructions provided with the glycol.

The electrical loads given in Figure 1, allow for a pump load of no more than 5 amps at 110 VAC (2.5 amps at 230 VAC). If the pump load exceeds this, provide a separate power source to the pump. DO NOT feed power to the pump from the SpacePak air handler panel.

- Provide a separate power source and overcurrent protection for the immersion heater. Refer to the Figures 18 and 19 of this manual for detailed wiring.

SCM Control Wiring Connection

The SpacePak SCM requires a dry contact (relay) signal to enable and select between heating and cooling modes. They will not operate on the 24V signals from typical thermostats or air handlers. Connecting 24V to either of these points will result in erratic operation and may cause significant component damage.

- Connect single zone systems to heat pump as shown in Figure 16.
- Connect multiple zone system to heat pump using SpacePak SSIC Control Module and instructions included with it. Refer to manual supplied with SSIC Control Module for connection and operational details.
- See Figure 19, for heat pump electrical ladder diagram. Section 9: Electrical Diagrams.

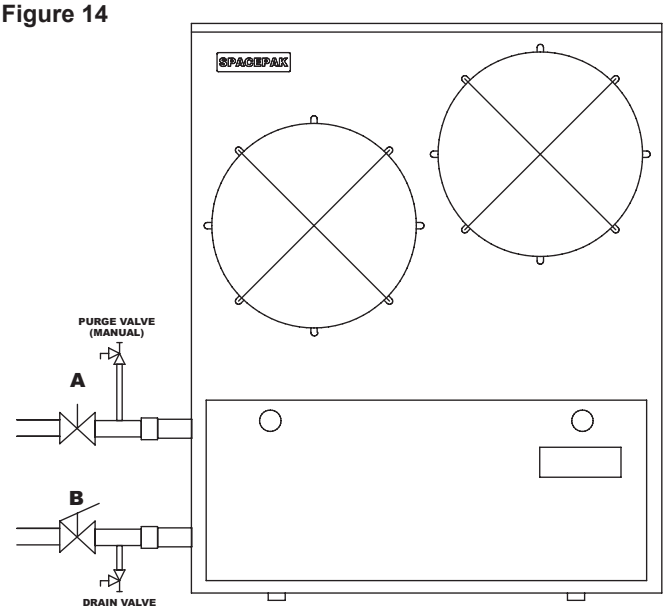
Low Ambient Temperature Cooling Operation

If cooling operation is desired in a year-round application, or any time outdoor temperatures are expected to be consistently below 55˚F, the fan operation should be modified in order to ensure proper operating conditions within the refrigeration system. Refer to Section 2, Fig. 3, for instructions.

Note once implemented, this will cause the fans to start and stop periodically during operation. This is normal behavior during cooler outdoor temperatures and should not be a concern.

Section 8: Start-up and Test

Figure 14



See the above illustration; note this is not intended to include all components in the system, just the minimum to properly purge air from the heat pump.

1. With the heat pump isolated and dry, valves A & B closed, charge the "system"(that is, all the plumbing not shown), and remove as much air as possible through the air separator.
2. Apply a static pressure to the system, with all pumps off, of 15-25 PSI.
3. Very gradually open the lower ball valve, B, to allow water under pressure to begin to fill the heat pump from the bottom.
4. Crack the manual vent valve until you hear air escaping.
5. Allow the water to continue to fill the heat pump, displacing air. This should go very slowly, and could take a minute or more.
6. When all the air has been displaced and a steady stream of water is flowing out of the vent valve, fully open ball valve B.
7. Open ball valve A, a small amount of air might escape the vent valve from the heat pump supply line.
8. When all the air has escaped, close the vent valve.

Note, this procedure fills the heat pumps in the opposite direction of normal flow, so it **must** be done when *all pumps are off*.

BEFORE starting the unit

⚠WARNING **Electrical shock hazard** — Disconnect all electrical power before proceeding with the following.

1. Verify that the system and all components have been installed in accordance with this manual and all applicable codes and instructions.
2. Inspect the SpacePak heat pump and all other system components. All components should be in good condition and operational.
3. Inspect the water piping for any signs of leakage.

⚠WARNING Repair all system leaks. Leakage will cause pressure to drop, preventing the heat pump from operating. Leaks also allow introduction of excess make-up water, whether filled automatically or manually.

4. Check system pressure. The pressure should be at least 15 PSIG with heat pump not in operation.
5. Check all wiring connections to ensure terminal connections are tight and all wiring is in place.

Start the SpacePak heat pump

Start in cooling mode.

1. Apply power to the unit
2. The display (Figure 1) should show the start sequence — uC2, then 2.0, then the current water temperature. No other symbol should appear.
3. When the display shows only temperature, lower the thermostat setpoint below the current room temperature.
4. This begins a call for cooling, and the pump symbol will begin to flash.
5. After 1 to 2 minutes, the pump symbol will change to constant display, and the pump will begin circulating.
6. Assuming the water is outside of the cooling temperature range (above 42°) the refrigeration system will initiate and the 1, or 3, or both numerals will begin flashing.
7. After 1 to 2 minutes, the 1, or 3, or both numerals will change to constant, the compressor symbol will turn on and one or both compressors will start.
8. Observe for any alarms, errors, or faulty operation (noises, vibration, etc)
9. When operation is deemed satisfactory, raise the thermostat set-point or turn it off.
10. The pump will run for approximately two minutes after the compressor shutdown.

Start in heating mode.

1. When the pump has stopped, change the thermostat to Heating (if applicable) and raise the set point above current room temperature.
2. This initiates a call in Heating mode. The pump symbol will begin flashing.
3. After 1 to 2 minutes, the pump symbol will change to constant display, and the pump will begin circulating.
4. Assuming the water is outside of the heating temperature range (below 120°) the refrigeration system will initiate and the 1, or 3, or both numerals will begin flashing.
5. After 1 to 2 minutes, the 1, or 3, or both numerals will change to constant, the compressor symbol will turn on and one or both compressors will start.
6. Observe for any alarms, errors, or faulty operation (noises, vibration, etc).

Section 8: Start-up and Test (continued)

Anti-freeze cycle

1. Should the water temperature drop to 34°F during periods of non-use, the pump will start and the antifreeze heater (if connected) will energize and continue to operate until the temperature reaches 38°F.
2. If the water temperature continues to fall and reaches 33°F, the Alarm symbol and Fault Code AL will be displayed, and the unit will automatically start in heating mode. It will continue to run until the water temperature reaches 38°F.
3. NOTE: This provides the maximum level of protection in all cases, but may use energy unnecessarily when a suitable concentration of glycol anti-freeze is installed. When freeze protection is sufficient, these value can be adjusted to lower temperatures. Contact technical support for guidance in re-configuring these parameters, however it must be understood that the installer is responsible for ensuring sufficient freeze protection to the lowest temperature allowed.

24-Hour follow-up

Approximately 24 hours after start-up and testing, return to the installation to verify proper operation. Perform the following checks.

1. Check system pressure. Add additional glycol/water mixture if needed to restore pressure. (Pressure can drop as air is removed from the system by the air vents.)
2. Sample the glycol/water mixture in the system. Verify inhibitor and glycol levels.
3. Inspect the piping and components to ensure there are no leaks. Repair any leaks immediately.
4. Close the isolation valves on either side of the y-strainer at the SpacePak heat pump return connection. Remove the screen and inspect for sediment. Clean if necessary.
   - If the strainer has become clogged with sediment, determine whether the system needs to be drained, cleaned and re-filled. Excessive sediment accumulation in the strainer will reduce flow and cause the unit to shut down.
5. Cycle the system on heating and cooling. Verify that all components operate correctly.

Electric Heat

The SCM series heat pumps are equipped with integral 3 kW electric heater elements contained within the water circuit. These are powered by a 230VAC input (separate from the heat pump power) and must have individual protection, (minimum 15A)

The heater function is managed by the Carel µC2 controller, and it provides three different functions, all of which are adjustable via the Display Keypad.

A. Freeze protection: When the heat pump is in standby, it monitors the temperature of the water circuit. If the temperature falls below the value of parameter A04, the controller will start the circulator, and send a call for the heaters to energize. The heaters are powered through a Time Delay Relay (TDR), to ensure flow is established before the heaters come on. Parameter A05 is a differential value, such that the heaters will shut off when the temperature reaches A04 + A05.

B. Heat boost: When the heat pump is operating in heating mode, the Carel controller will call for the heater to be energized when the water temperature falls below the value of parameter A08, again controlled by the TDR. Parameter A09 is a differential value, such that the heaters will shut off when the temperature reaches A08 + A09.

C. Defrost operation: When enabled, via parameter d11 being set to a value of 01, the controller will call for the heater to energize, after the TDR duration, whenever the defrost cycle is active.

Time Delay Relay

In all instances, the heaters receive power only after a time interval, controlled by the TDR. See Figure 15. The TDR can be adjusted to provide a delay from .01 second, to 100 hours. This is accomplished by two dials on the face of the components. The lower dial establishes the range, in increments of 0.1 second, 1 second, 6 seconds, 60 seconds, 0.1 hour, 1 hour, and 10 hours. The upper dial is the multiplier, and increased the range from 1 to 10 times. The factory default is 10 minutes as shown in the figure; the range is 60 seconds, and the multiplier is 10. This may be excessively long for most applications, and may be adjusted to a shorter interval, especially if it is primarily used for defrost operation.

When the TDR receives a signal from the controller, the Coil LED will begin to flash, and continue for the duration of the time delay. Once the delay has expired, the Coil LED will change to solid, and the Contact LED will illuminate also. When the signal is removed from the TDR, the contact will open immediately.

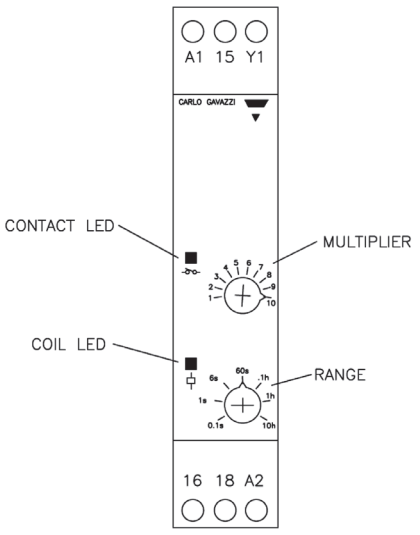
Protection

The heater circuit must first prove water flow before energizing the heaters, and maintain a circuit through an overtemp protection device (located within the heater element) which opens at 201°F. Should either of these conditions fail, the heaters will immediately de-energize.

Heater Capacity

The internal circuit and switching is sufficiently robust to carry the load of the 3kW internal heater, or the (2) 3kW heaters within the available BT-H series buffer tanks, but it cannot power all three heaters. Therefore, the internal heater must be disconnected from power when connecting buffer tank heaters.

Figure 15



Section 9: Electrical Connections

⚠WARNING The electrical installation must comply with the latest edition of: in the U.S. — National Electrical Code ANSI/NFPA No. 70; in Canada — CSA C22.1 Canadian Electrical Code Part 1. Wiring must be N.E.C. Class 1. Use only copper wire, rated for 120°F and sized for the load listed in this manual.

⚠WARNING **Electrical shock hazard** — Disconnect all electrical power before servicing the unit. Also, the unit must be grounded in accordance with the Electrical Code listed above.

Overcurrent protection & wire sizing

- Protect each circuit with a breaker or fuse rated for the load given in Figure 1.

NOTICE The electrical loads given in Figure 1, page 3 allow for a pump load of no more than 5 amps at 110 VAC (2.5 amps at 230 VAC). If the pump load exceeds this, provide a separate power source to the pump. DO NOT feed power to the pump from the SpacePak air handler panel.

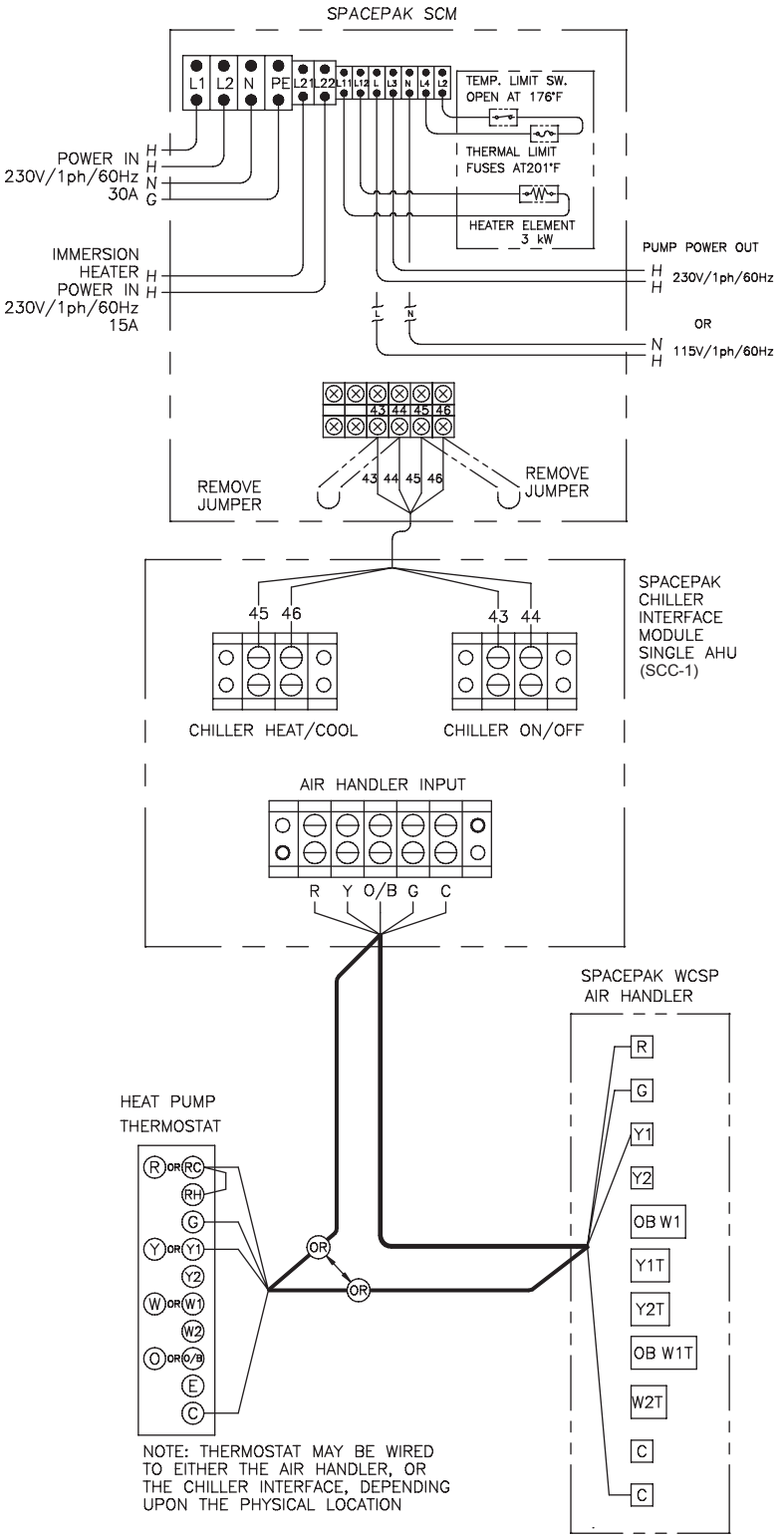
- Provide a separate power source and overcurrent protection for the immersion heater. Refer to the Figures 18 and 19 of this manual for detailed wiring.

SpacePak heat pump wiring

⚠CAUTION The SpacePak SCM heat pumps require a *dry contact* (relay) signal to enable and select between heating and cooling modes. They will not operate on the 24V signals from typical thermostats or air handlers. Connecting 24V to either of these points will result in erratic operation and may cause significant component damage.

- Connect **single** air handler to heat pump as shown in Figure 16.
- Connect **multiple** air handlers to heat pump via SpacePak heat pump Interface Module as shown in Figure 17.
- See Figure 19, for heat pump electrical ladder diagram.

Figure 16 SpacePak Heat Pump field wiring — SINGLE air handler (See Figure 19 for ladder wiring diagram)

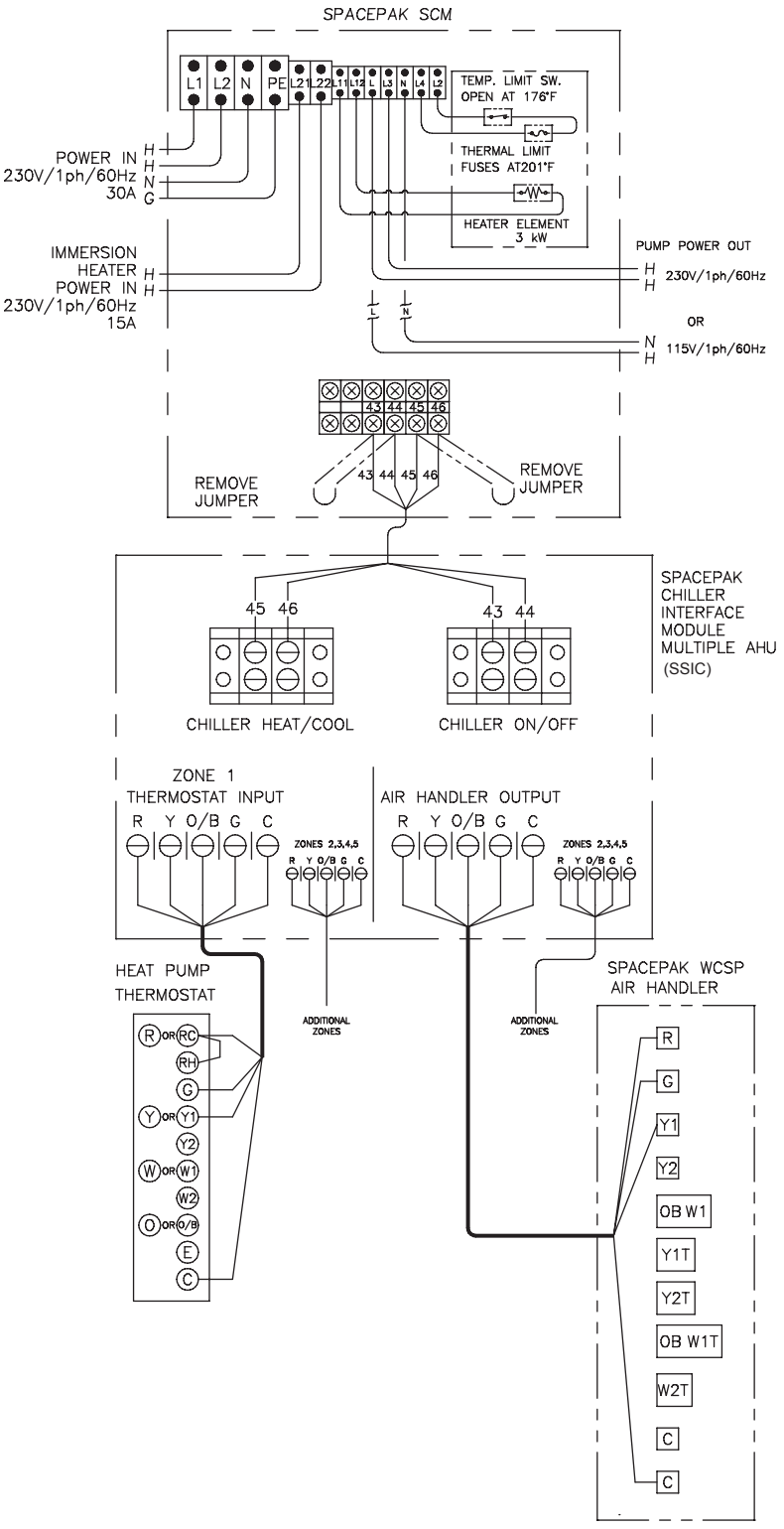


Section 9: Electrical Connections (continued)

Multiple air handler applications

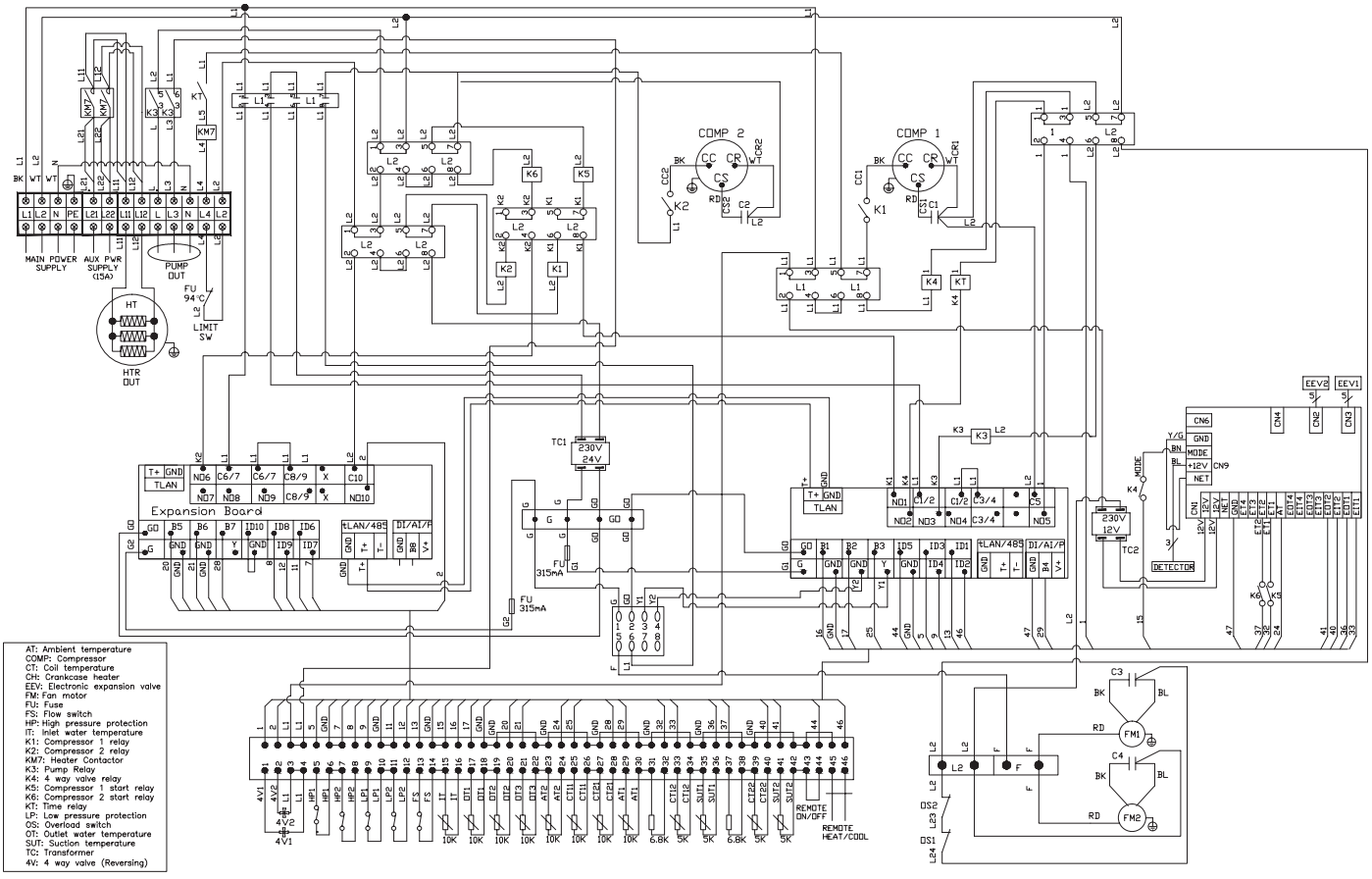
- For multiple air handler applications, provide a zone valve or pump to control water the flow to the air handler.
  - When the zone thermostat activates the SCM, the valve will be activated by the SpacePak air handler.
  - The total zone control load must not exceed 20 VA at 24 VAC. If a larger valve or zone pump is used, it must be switched by a power relay controlled from the 24 VAC output of the air handler.
- Refer to manual supplied with SSIC module for connection and operational details.

Figure 17 SpacePak Heat Pump field wiring — Multiple air handlers (see Figure 19 for ladder wiring diagram)



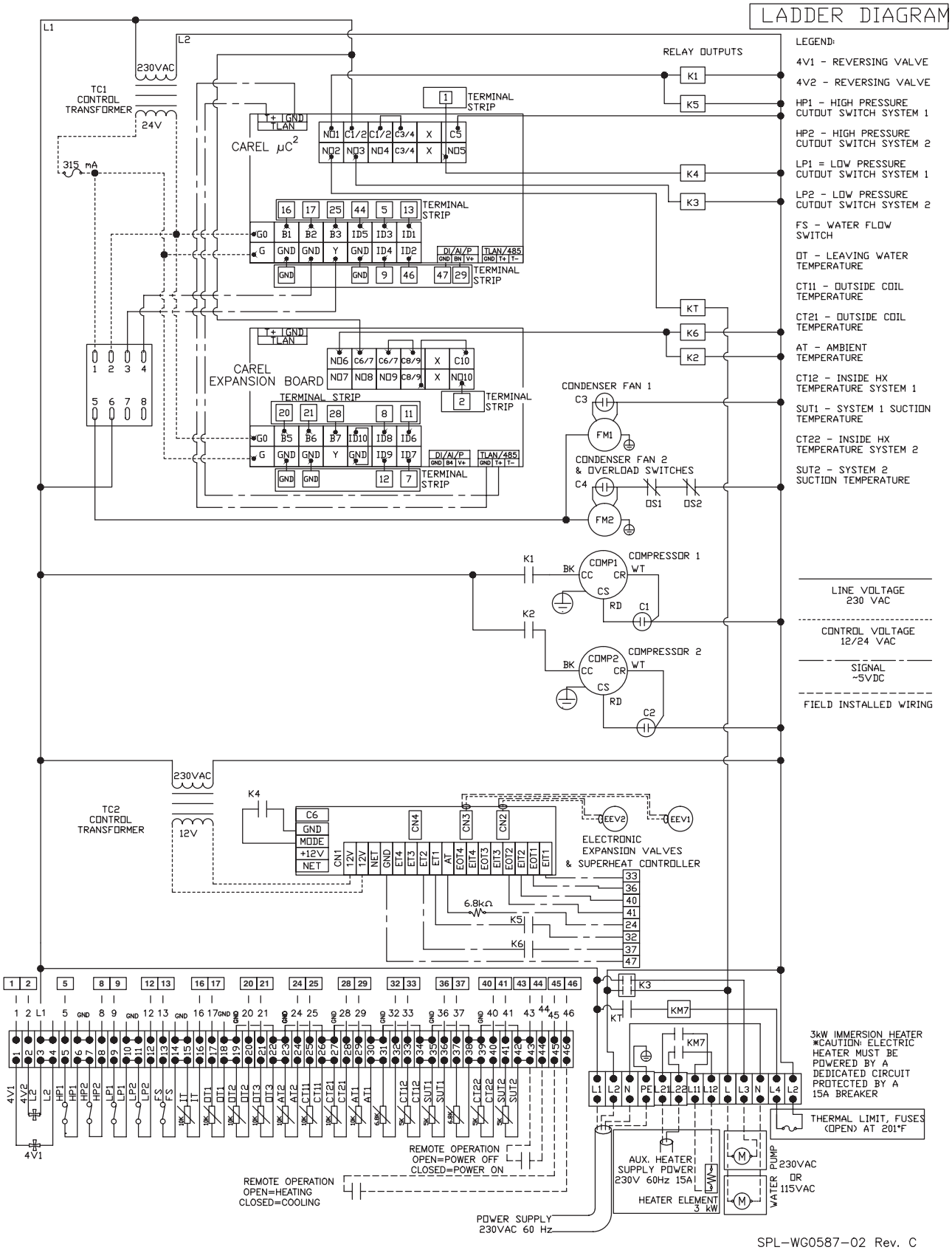
Section 9: Electrical Connections (continued)

Figure 18 SpacePak Heat Pump — Pictoral wiring diagram



Section 6: Electrical Connections (continued)

Figure 19 SpacePak Heat Pump electrical ladder diagram



Section 10: Troubleshooting

Figure 20 Troubleshooting suggestions

Condition	Possible Causes	Verification	Solution
Unit will not start	Incorrect power supply	Check power supply	Supply correct power
	Loose or broken wires	Check wiring	Repair or replace wiring
	Circuit breaker interrupted	Check for short	
Compressor running - insufficient cooling/ heating	Insufficient pipe insulation	Check insulation	Add/repair insulation
	Dirty coil	Check coil	Clean Coil
	Low water flow	Look for alarm symbol and FL fault code	Clean strainer screen
			Clear blockage
			Remove air in piping
			Verify operation/condition of water pump
High compressor discharge pressure in cooling	Dirty coil	Check coil	Clean Coil
High compressor discharge pressure in heating	Low water flow	Measure water flow through heat exchanger	Flow should be a minimum of 10 GPM for SCM060 or 8 GPM for SCM036
Low compressor suction pressure in cooling	Insufficient/no water flow	Look for alarm symbol and FL fault code	Clean strainer screen
			Clear blockage
			Remove air in piping
			Verify operation/condition of water pump
	Cooling operation in low ambient	Confirm outdoor ambient is lower than typical for cooling operation, e.g. <55°	If low ambient cooling is desired, refer to Section 7.
Compressor will not run	Power supply failure		Supply correct power
	Failed compressor contactor		Replace contactor
	Loose power cable	Check power cable	Tighten power cable
	Compressor limit exceeded	Check for compressor symbols 1 and/or 3. If symbol is displayed but compressor is inactive, thermal overload has been tripped.	This will reset, however root cause must be determined
	Incorrect return water temperature setting	Check return water temperature setting	Adjust return water temperature setting
	Low glycol/water flow	Look for alarm symbol and FL fault code	Clean strainer screen
			Clear blockage
			Remove air in piping
Noisy compressor	Liquid returning to compressor		Replace compressor
	Compressor failure		
Fan will not run	Fan relay failure		Replace fan relay
	Fan motor failure		Replace fan motor
Compressor runs - no heating/cooling	No refrigerant charge	Check for leaks	Add appropriate refrigerant
	Damaged heat exchanger	Check for glycol/water leaks and/or refrigerant leaks	Replace heat exchanger
	Compressor failure		Replace compressor
Low outlet glycol/water temperature in cooling	Improper temperature control setting	Check cooling temperature setpoint and differential	Contact Technical Support for instructions to reset cooling setpoints
	No load/rapid temperature drop	Ensure compressors are allowed to run a minimum of three minutes before reaching desired temperature	Verify cooling fuction when there is sufficient heat load to allow continuous operation.

Section 10: Troubleshooting (continued)

Figure 21 Troubleshooting suggestions *(continued)*

Condition	Possible Causes	Verification	Solution
Low outlet glycol/water temperature in heating	Dirty coil, damaged or improperly operating fans	Visually inspect coil condition and fan operation	Clean coil, repair fan blade or motor as necessary.
	Extremely low ambient temperature	Heating performance falls considerable as temperatures drop below 20-25°F	Install supplemental heating for extreme low ambient conditions.
Low glycol/water flow	Damaged or blocked plumbing or air handler	Check for blockage and/or air in piping, check operation/condition of water pump	Clean strainer screen
			Clear blockage
			Remove air in piping
	Defective or improper pump	Verify pump operation/condition. Measure water flow through the heat exchanger	Replace or re-size pump to obtain a minimum of 10 GPM for SCM060

Figure 22 Fault codes

Alarm Display	Alarm Type	Reset Logic	Compessor Response	Pump Response	Fans Response	Heater Response
A1	Freeze warning, system 1	Automatic	Stop	None	Stop	Enable
A2	Freeze warning, system 2	Automatic	Stop	None	Stop	Enable
Aht	High water temp at startup	Automatic	Stop	None	Stop	None
dF1	Defrost error, cycle time exceeded	Automatic	None	None	None	None
E1	Return water temp sensor fail	Automatic	Stop	None	Stop	Stop
E2	System 1 HX temp sensor fail	Automatic	Stop	None	Stop	Stop
E3	System 1 OS coil temp sensor fail	Automatic	None	None	None	None
E4	Ambient air temp sensor fail	Automatic	Stop	None	Stop	None
E5	Supply water temp sensor fail	Automatic	Stop	None	Stop	None
E6	System 2 HX temp sensor fail	Automatic	Stop	None	Stop	Stop
E7	System 2 OS coil temp sensor fail	Automatic	Stop	None	Stop	None
ESP	Lost com. with expansion module	Automatic	Stop	Stop	Stop	Stop
FL	Water system low flow	Automatic	Stop	Stop	Stop	Stop
Hc1	Service hours notification	Automatic	None	None	None	None
HP1	Sys 1 refrigerant High Pressure fault	Auto x3, then Manual	Stop	None	Run 60 sec	None
HP2	Sys 2 refrigerant High Pressure fault	Auto x3, then Manual	Stop	None	Run 60 sec	None
Ht	High water temp	Automatic	None	None	None	None
LHt	Low Water temp at startup	Automatic	Stop	None	Stop	None
LP1	Sys 1 refrigerant Low Pressure fault	Auto x3, then Manual	Stop	None	Run 60 sec	None
LP2	Sys 2 refrigerant Low Pressure fault	Auto x3, then Manual	Stop	None	Run 60 sec	None

Section 11: Annual Maintenance

Perform Annual Inspection

Glycol/water mixture

⚠WARNING The water system must contain a mixture of inhibited glycol and water with thermal protection sufficient for the coldest expected temperature for the installation. The inhibitor level can degrade over time, and may need to be adjusted periodically. The inhibitor is essential to prevent the glycol from accelerating corrosion of metal components in the system. The glycol and inhibitor levels must be checked regularly (no less than once annually).

⚠CAUTION The minimum allowable concentration of glycol is 10% by volume in all installations.

⚠CAUTION Automotive glycol is not suitable for use in the heat pump system. Over time it may leave deposits which will degrade heat pump performance and damage pumps or other devices in the system.

Use only ethylene glycol or propylene clycol mixtures specifically labeled for boiler or hvac use.

1. At least once annually, sample the system fluid to verify that the glycol concentrations meets the minimum value given in Figure 12. Also test the inhibitor concentration. Add glycol and inhibitor as needed to return the system to the correct concentrations.
2. Perform any and all other tests as recommended by the anti-freeze manufacturer's instructions in order to ensure optimal performance and maintain warranty protection on all installed components.

Check operating pressure

1. Check the glycol/water system pressure. Operating pressure should be between 15 and 25 PSIG. Adjust fluid volume if needed to restore pressure.
2. If pressure is low, check system for evidence of leaks. Repair all leaks immediately.

Perform annual inspection

⚠WARNING **Electrical shock hazard** — Disconnect all electrical power before proceeding with the following.

1. At least once annually, perform a complete inspection of the system, including at least the following.
2. Inspect the SCM for signs of dirt or debris accumulation. Remove any debris and notify the building owner that the unit must be kept clean and unobstructed.
3. Inspect glycol/water system piping and components. Repair or replace any defective components. Repair all leaks immediately.
4. Close the isolation valves on either side of the y-strainer at the SpacePak heat pump return connection. Remove the screen and inspect for sediment. Clean if necessary.
   - If the strainer has become clogged with sediment, determine whether the system needs to be drained, cleaned and re-filled. Excessive sediment accumulation in the strainer will reduce flow and cause the unit to shut down.
5. Inspect all wiring and wiring connections. Tighten connections if needed. Correct any problems found.
6. Check the fuses or breakers to ensure they are correctly sized and properly installed.
7. Clean the SCM heat exchangers and air openings.
8. Cycle the system on heating and cooling. Verify that all components operate correctly.

Preparing the SCM for shut down

⚠WARNING DO NOT turn off power to the SCM heat pump in the winter or any time when there is a possibility of freezing. Power must be ON for the automatic anti-freeze operation to occur. See information below for preparing the unit for shut down.

1. When the water temperature drops below 34°F during periods of non-use, the pump will start and the antifreeze heater (optional, when installed) will energize and continue to operate until the temperature reaches 38°F.
2. If SCM must be turned off or left idle during periods when freezing is possible, one of the following must be done:
   a. Verify that sufficient glycol solution is present to protect against most extreme anticipate conditions
   b. — OR — Drain heat pump and external piping completely

To restart after shutdown

1. If unit was drained, refill.
2. Follow start up procedure from Section 8.

Section 12: Replacement Parts

Figure 23 Replacement parts

PART NUMBER	DESCRIPTION
45R20000-360006	Compressor Contactor
45R2000-3136	Fan Motor Controller
45R2000-3137	Carel Expansion Board, MCH
45460-WG1046-01	Programmed Controller, SCM
45R2000-3501	Fan Motor Capacitor
45R2000-3603	Pressure Switch, Low Limit
45R2000-3606	Flow Switch
45R2000-3619	Relay, Circulator
45R20000-370011	Transformer, 12V
45R2001-3605	Pressure Switch, High Limit
45R2001-3608	Pressure Switch, Fan Control
45R20000-140456	EEV, SCM036
45R20000-140449	EEV, SCM060
45R2004-1437	Reversing Valve
45R20000-330124	Fan Motor
45R3500-2701	Fan Blade
45R20000-110097	Compressor, SCM060
45R20000-110068	Compressor, SCM036
45R2000-3504	Compressor Capacitor, SCM060
45R2000-3505	Compressor Capacitor, SCM036
45R35018-120010	Tube in Shell Heat Exchanger SCM060
45R35018-120012	Tube in Shell Heat Exchanger SCM036
45R35036-120011	Finned Tube Heat Exchanger SCM060, Left
45R35036-120012	Finned Tube Heat Exchanger SCM060, Right
45R40000-120006	Finned Tube Heat Exchanger SCM036, Left
45R40000-120007	Finned Tube Heat Exchanger SCM036, Right
45460-WG1061-02	Replacement Heater Kit
45R2000-3242	Temperature Sensor, 5K NTC
45R2001-2255	Clear Plastic Access Window
45W55-WG0609-01	Temperature Sensor, 10K NTC
45R3536-2115	Fan Guard - SCM Series

Heat Pump Start Up Instructions

Job Name:_____

Job Address:_____

Contact Phone:_____

Model #:_____ Serial

#:_____ Start Up Performed

By:_____Date:_____

After powering up the unit, the following steps must be followed:

START UP IN COOLING MODE

____ Display start sequence will read uC2, then 2.0, then the current water temperature

- If only temperature is displayed, lower the thermostat setpoint below the current room temperature

____ The COOLING OPERATION symbol* will appear and the pump symbol will begin to flash as a call for cooling is made *See Figure 1

____ After 1-2 minutes pump symbol will remain constant

____ Once water is outside the cooling temperature range (above 46°F; setpoint of 42°F plus 1/2 differential per factory default) the refrigeration system initiates and the 1, 3, or both numerals will begin flashing

____ After 1-2 minutes the 1, 3, or both numerals will remain constant, the compressor symbol will come on and one or both compressors will start

____ Observe for any alarms, errors, or faulty operation (noise, vibration etc)

____ When satisfactory operation has been confirmed, raise the indoor thermostat setpoint to remove the call for cooling. If one or both compressors have been running less than two minutes, they will complete a two minute run time before shutting down.

____ Pump will run for approximately 2 minutes after final compressor shutdown

START UP IN HEATING MODE

____ Once pump has stopped, change the thermostat to Heating (if applicable) and raise the set point above the current room temperature.

____ The HEATING OPERATION symbol* will appear and the pump symbol will being to flash as a call for heat is made *See Figure 1

____ After 1-2 minutes pump symbol will remain constant

____ Once water is outside the cooling temperature range (below 115°F; setpoint of 120°F minus 1/2 differential per factory default) the refrigeration system initiates and the 1, 3, or both numerals will begin flashing

____ After 1-2 minutes the 1, 3, or both numerals will remain constant, the compressor symbol will come on and one or both compressors will start

____ Observe for any alarms, errors, or faulty operation (noise, vibration etc)

____ When satisfactory operation has been confirmed, lower the indoor thermostat setpoint to remove the call for heating. If one or both compressors have been running less than two minutes, they will complete a two minute run time before shutting dlown.

____ Pump will run for approximately two minutes after final compressor shutdown.

24 HOUR FOLLOW UP

24 Hours after start up the following checks should be performed:

____ Check System Pressure (add glycol/water mixture if needed to restore pressure)

____ Sample and verify glycol/water mixture

____ Inspect all piping and components for leaks

____ Close isolation valves on either side of the y-strainer at the heat pump return connection

____ Remove the screen and inspect for sediment, clean if necessary

- If the strainer is clogged determine if system needs to be drained and re-filled. Excessive sediment buildup will cause reduced flow and the system will shut down

____ Cycle the system in both heating and cooling

____ Verify that all components operate correctly

Section 13: LIMITED WARRANTY

Air to Water Reverse Cycle Heat Pump

The “Manufacturer” warrants to the original owner at the original installation site that the Air to Water Reverse Cycle Heat Pump (the “Product”) will be free from defects in material or workmanship for a period not to exceed one (1) year (parts) or two (2) years (compressor) from the startup. If upon examination by the Manufacturer the Product is shown to have a defect in material or workmanship during the warranty period, the Manufacturer will repair or replace, at its option, that part of the Product which is shown to be defective.

This limited warranty does not apply:

a) if the Product has been subjected to misuse or neglect, has been accidentally or intentionally damaged, has not been installed, maintained or operated in accordance with the furnished written instructions, or has been altered or modified in any way.

b) to any expenses, including labor or material, incurred during removal or reinstallation of the defective Product or parts thereof.

c) to any workmanship of the installer of the Product.

This limited warranty is conditional upon:

a) shipment, to the Manufacturer, of that part of the Product thought to be defective. Goods can only be returned with prior written approval from the Manufacturer. All returns must be freight prepaid.

b) determination, in the reasonable opinion of the Manufacturer, that there exists a defect in material or workmanship.

Repair or replacement of any part under this Limited Warranty shall not extend the duration of the warranty with respect to such repaired or replaced part beyond the stated warranty period.

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, AND ALL SUCH OTHER WARRANTIES, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS LIMITED WARRANTY. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE IN ANY WAY FOR ANY CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OF ANY NATURE WHATSOEVER, OR FOR ANY AMOUNTS IN EXCESS OF THE SELLING PRICE OF THE PRODUCT OR ANY PARTS THEREOF FOUND TO BE DEFECTIVE. THIS LIMITED WARRANTY GIVES THE ORIGINAL OWNER OF THE PRODUCT SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY BY EACH JURISDICTION.

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