Installation and Operation Manual

HE

High Efficiency Heating System

Hotstart THERMAL MANAGEMENT

HS.HOTSTART.COM/HOTSTART-HEATPUMPS

Contents

DISCLAIMER: *This system has been designed and manufactured EXCLUSIVELY to heat diesel engine emergency generators. It is not authorized for any other use.*

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HE Heating System Indentification

1. **Air Discharge**
2. **Air Filter/Air Coil**
3. **Blower Motor and Condensate Pan Access**
4. **Three-way Toggle Switch**
5. **Run Hour Meter**
6. **Status Light**
7. **Electrical Knockouts**
8. **Electrical Controls**
9. **Water Outlet (hot)**
10. **Condensate**
11. **Water Inlet (cold)**

Site Pre-Requisites

- HE heat pump is approximately 22″ wide by 22″ deep by 45″ tall
- You will need at least 6″ clearance from the air filter to any wall
- If installing outdoors you will need a dog house shelter for the unit
- Unit is 208/230 volts single phase
- Condensate may be drained via gravity feed. If not the use of a Little Giant condensate pump Model VCMA10 208 volts may be used.
- Please keep unit off the floor via rubber isolation pads or condensing pad

Safety Precautions

- Turn power off to breaker for both engine heaters and HE heat pump.
- Close hydraulic coolant line ball valves to and from engine heaters
- Install hydraulic lines from HE to engine heater
- Install electrical conduit and wiring to and from HE heat pump.
- Once electrical and hydraulic installation is complete turn on ball valves and electrical power to unit

General Hydraulic Parts List (Not included)

HYDRAULIC PARTS – 1 ENGINE HEATER

HE-12 model heat pump:

- Flex Fab Silicone Heater Hose ¾" QTY: 30'
- Brass Hose Barbs ¾" x ½" (male)" QTY: 10
- Sleeved Constant Torque Hose Clamps QTY: 4
- Brass Hose Barb ½" x ½" (male) QTY: 1
- Rubber Isolation Pads QTY: 4
- Teflon Pipe Thread Sealant

HYDRAULIC PARTS – 1 ENGINE HEATER

HE-18 or HE-24 model heat pump:

- Flex Fab Silicone Heater Hose ¾" QTY: 30'
- Brass Hose Barbs ¾" x ¾" (male)" QTY: 4
- Sleeved Constant Torque Hose Clamps QTY: 4
- Brass Hose Barb ½" x ¾" (male) QTY: 1
- Rubber Isolation Pads QTY: 4
- Teflon Pipe Thread Sealant

HYDRAULIC PARTS – 2 ENGINE HEATERS

HE-12 model heat pump:

- Flex Fab Silicone Heater Hose ¾" QTY: 60'
- Brass Hose Barbs ¾" x ½" (male)" QTY: 10
- Sleeved Constant Torque Hose Clamps QTY: 10
- Brass Hose Barb ½" x ¾" (male) QTY: 1
- Rubber Isolation Pads QTY: 4
- Brass Tee ¾" QTY: 2
- Teflon Pipe Thread Sealant

HYDRAULIC PARTS – 2 ENGINE HEATERS

HE-18 or HE-24 model heat pumps:

- Flex Fab Silicone Heater Hose ¾" QTY: 60'
- Brass Hose Barbs ¾" x ¾" (male)" QTY: 10
- Sleeved Constant Torque Hose Clamps QTY: 10
- Brass Hose Barb ½" x ½" (male) QTY: 1
- Rubber Isolation Pads QTY: 4
- Brass Tee ¾" QTY: 2
- Teflon Pipe Thread Sealant

Tools Needed (Not included)

- Adjustable Cresent Wrench QTY: 2
- Nut Driver 5/16"
- Flat Head Screwdriver

Flex Fab Silicone Heater Hose ¾" (30' or 60' length)

Brass Barbs to Male Hose (¾" x ½"), (½" x ½"), (¾" x ¾")

Sleeved Constant Torque Hose Clamps

Rubber Isolation Pads

Brass Tee (¾")

Teflon Pipe Thread Sealant

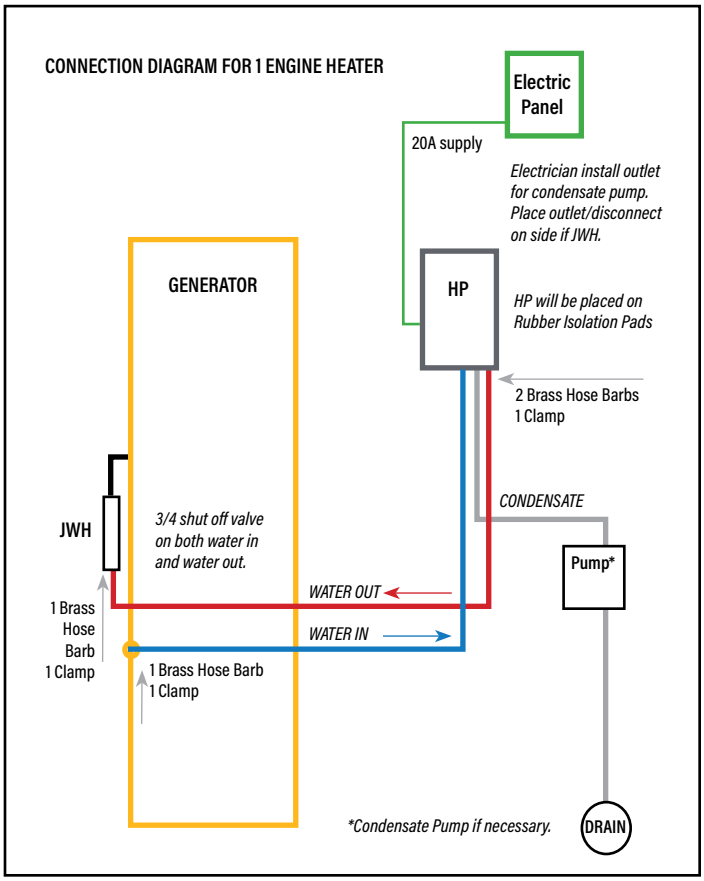
Tools: Crescent Wrench, Nut Driver & Screwdriver

Hydraulic Installation Procedure

HYDRAULIC INSTALLATION – 1 ENGINE HEATER

1. Remove inlet line from engine block to existing engine heater.
2. Install 3/4" hose barbs at HE Gen HP inlet, outlet and condensate (top outlet and bottom inlet fittings). Middle fitting is condensate. Use small amount of Teflon paste on male pipe threads. Do not over tighten hose barb fitting to HE Gen HP brass pipe fitting.
3. From engine block attach silicone heater hose and run to HE Gen HP inlet hose barb. Secure hose with hose clamps.
4. From HE outlet hose barb install silicone hose and hose clamp. Then run silicone hose to engine heater inlet.
5. Install ¾" male by ½" barb at the condensate fitting HE Gen HP (middle fitting that is plastic).
6. COMPLETE ELECTRICAL INSTALLATION (pg 6)
7. Do not open ball valves till electric installation has been completed. You should then open only the inlet ball valve. Turn on power to HE Gen HP. Once turned on, open the outlet ball valve to purge air from the heating system.
8. Normally 20 feet of silicone heater hose will be used, 4 qty ¾" hose barbs and 4 qty hose clamps are used.
9. Place plastic condenser pad under HE Gen HP along with rubber isolation pads to keep moisture off the bottom of the HE Gen HP.

A single engine heater system can be installed in about 1 to 3 hours.

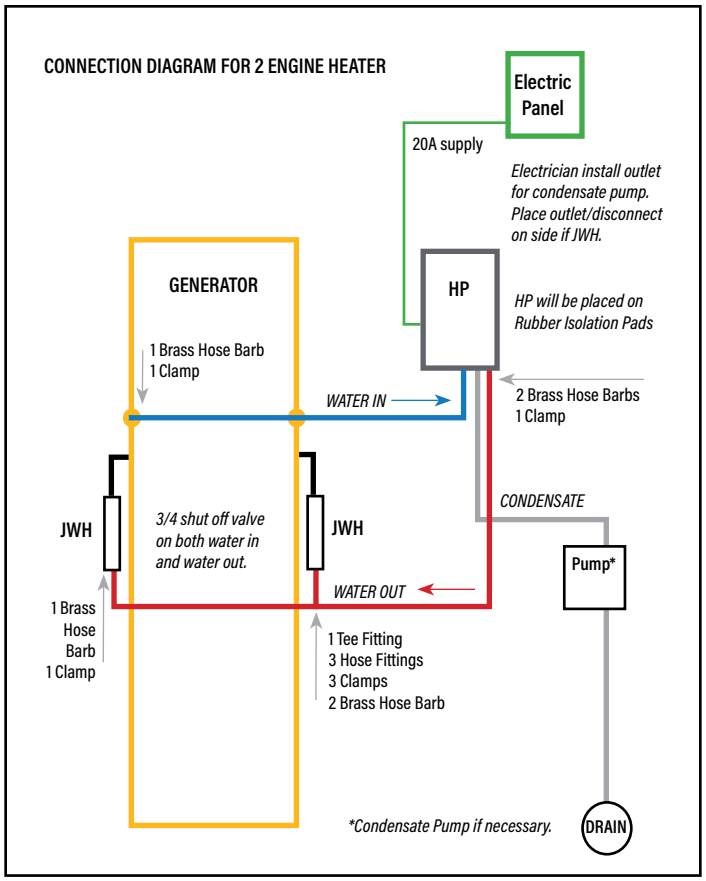


Hydraulic Installation Procedure

HYDRAULIC INSTALLATION – 2 ENGINE HEATERS

1. Follow instructions above. Start by removing the inlet lines to both engine heaters from the engine to the inlet of the engine heaters.
2. You will need two TEE fittings with ¾" hose barbs installed on all three fittings of the TEE. Small amount of Teflon paste is recommended on all male thread fittings.
3. The TEE fitting should be installed as close as possible to the engine and/or one of the engine heaters. You can run a single inlet and outlet silicone heater hose from the HE Gen HP to the TEE fittings.
4. From the TEE fitting, one fitting will be for your inlet and you will run silicone heater hose to both sides of the engine inlets. Then from the outlet TEE you will run silicone heater hose to both sides of the engine connecting to the engine heater inlet.
5. Install ¾" male by ½" barb at the condensate fitting HE Gen HP (middle fitting that is plastic).
6. COMPLETE ELECTRICAL INSTALLATION (pg 6)
7. Do not open ball valves till electric installation has been completed. You should then open only the inlet ball valves. Turn on power to HE Gen HP. Once turned on, open the outlet ball valve to purge air from the heating system.
8. The installation parts for 2 engine heaters will be 40 feet of silicone hose, 10 qty of ¾" hose barbs and 10 qty hose clamps (see pictures from list of materials).
9. Place plastic condenser pad under HE Gen HP along with rubber isolation pads to keep moisture off the bottom of the HE Gen HP.

A two engine heater system can be installed in about 2 to 5 hours.



Electrical Parts List

Liquid Tight Flex Conduit; length 20'

Liquid Tight Conduit Fittings Elbow (90°); QTY 2

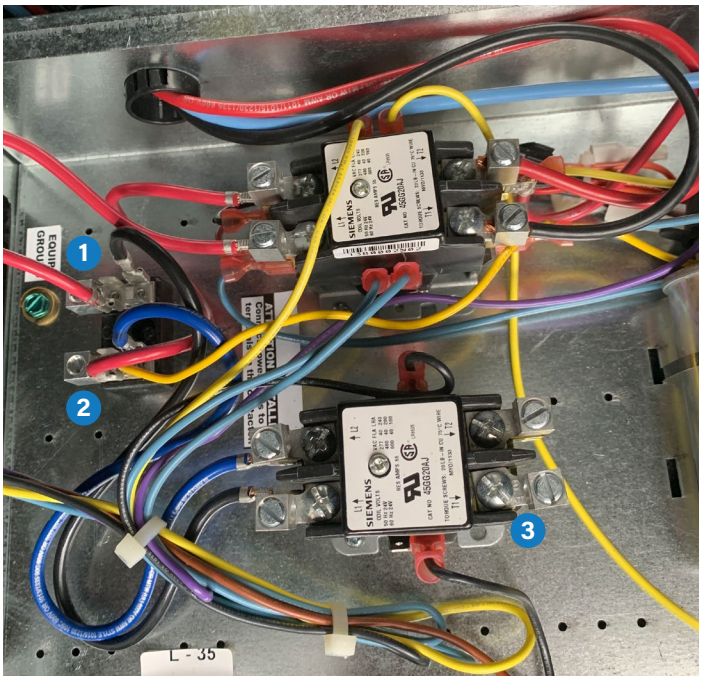
Wire 30' (2 hots and 1 ground)

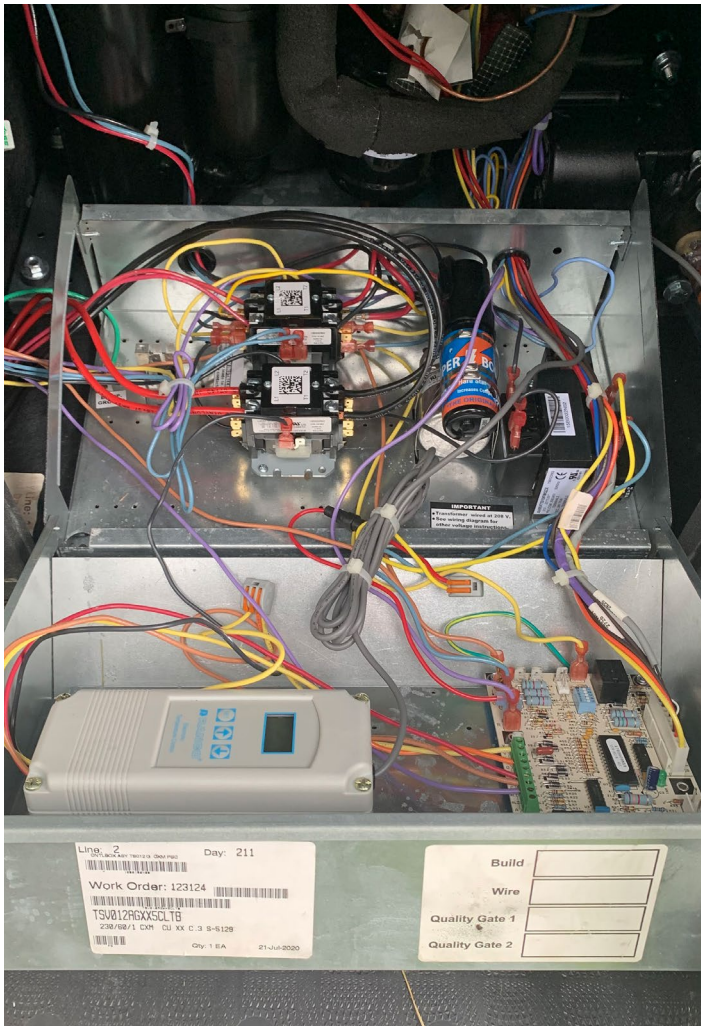
HE Heating System Electrical Installation

- HE heat pump has a 40 amp contactor to power the existing engine heater.
- Units are 208/230 volt single phase
- HE heat pump can be powered by a 20 amp service or by using existing engine heater that is 40 amps or less.
- Ranco two stage thermostat ensure an either/or operation where by only the HE heat pump can operate or the existing engine heaters – not both at the same time.
- 3 way toggle switch should be set to the bottom position "HP & Electric heat". Middle position is off (power still is on inside the HE heat pump) and up "Electric Heat" is engine heater only.

Electrical Indentification

1. L1
2. L2
3. EHC Engine Heater Contact
4. Ranco Temerature Control





Ranco Temperature Controls

Press the set button to adjust set points

S1: Heat Pump
S2: Engine Heater

HE Heating System Wire Diagram

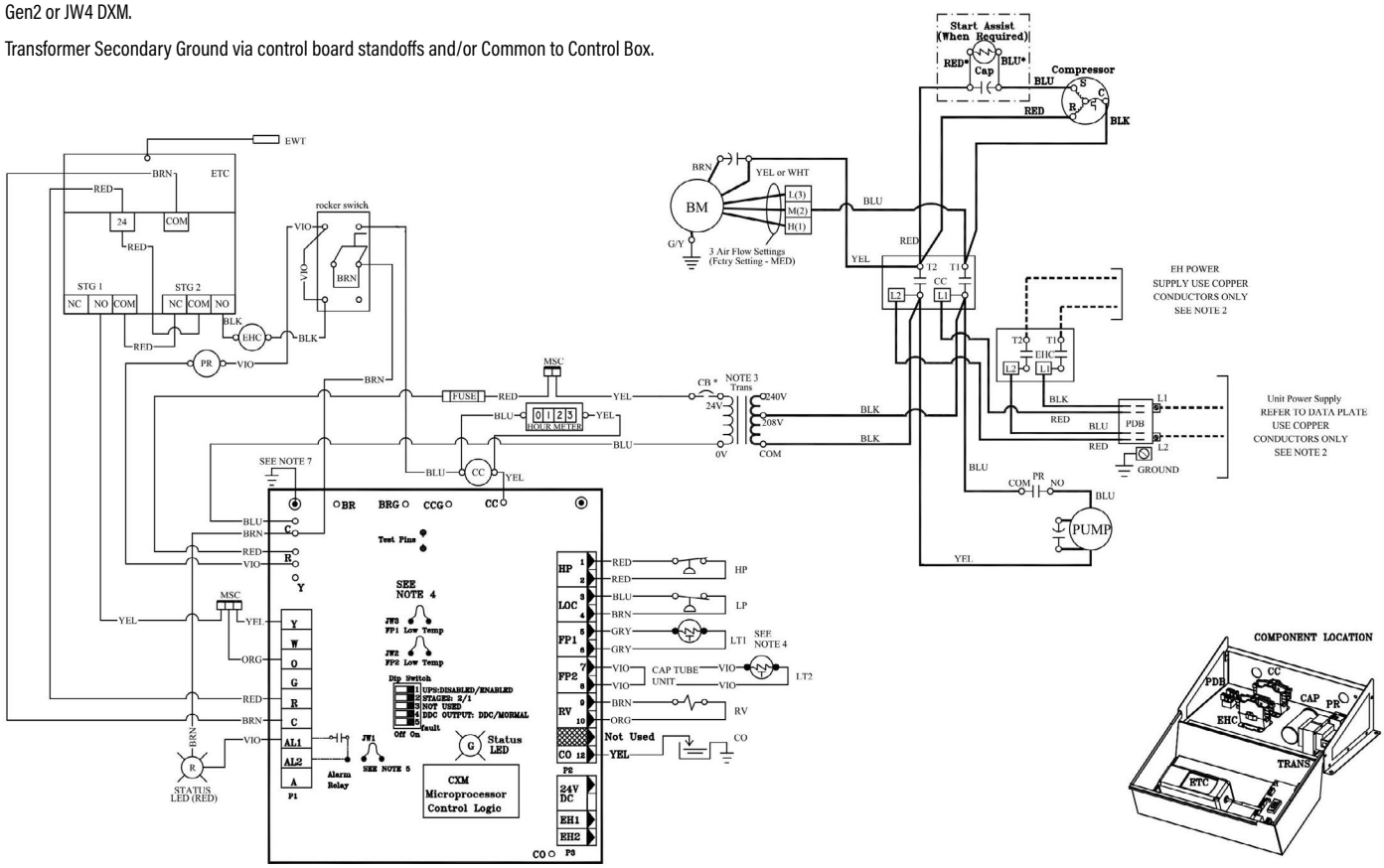
NOTES:

1. Compressor and Blower Motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes, low voltage wiring shall be Class 2 or equivalent.
3. Transformer wiring is voltage sensitive. Use layout corresponding to the unit voltage.
4. LTI provides low temperature protection for WATER. When using ANTI-FREEZE solutions, cut JW3 jumper.
5. Typical heat pump thermostat wiring shown. Refer to thermostat IOM for wiring to the unit. T-Stat wiring must be Class 1 and voltage rating equal to or greater than unit supply voltage.
6. 24V Alarm signal shown. For Dry Alarm contact between AL1 & AL2, cut JWI for CXM/DXM Gen2 or JW4 DXM.
7. Transformer Secondary Ground via control board standoffs and/or Common to Control Box.

BM4 Blower motor factory wired to Medium speed. For Low speed remove BLU wire from Medium tap and connect to Low Speed Tap. For High speed remove BLU wire from existing Speed Tap and remove BRN jumper wire from High Speed Tap. Connect BLU wire to High Speed Tap. Tape off Unconnected end of BRN jumper.

HWG3 WSTAT is supplied with unit and must be wired in series with the hot leg to the pump. WSTAT is rated for voltage up to 277V.

SAC1 Use start assist capacitor only on unit size 006-012.



LEGEND:

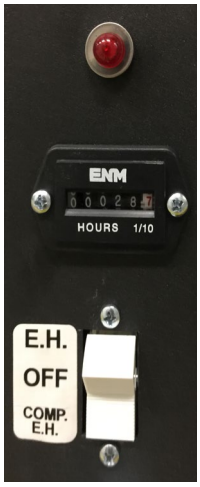
Factory Low voltage Wiring	LED	ACO	Automatic Change Over	EHC	Electronic Heat Contactor	MS	Manual Starter
Factory Line voltage Wiring	Low Pressure Switch	AL	Alarm Relay Contacts	ES	End Switch	MSC	Multi-Splice Connector
Field Low voltage Wiring	Mate-N-Lock	ATS	Air Temperature Sensor	ETC	Electronic Temperature Control	MWV	Motorized Water Valve
Field Line voltage Wiring	Multi-Splice Connector	BM	Blower Motor	EWT	Entering Water Temp Sensor	NLL	Night Low Limit Switch
Printed Circuit Trace	Optional	BMC	Blower Motor Capacitor	FSR	Fan Speed Relay	PDB	Power Ditribution Block
Optional Wiring	Overload	BR	Blower Relay/Blower Contactor	FSS	Fan Speed Switch	POT	Potentionmeter
Optional Block	Relay contacts - NC	CAP	Capacitor	HP	High Pressure Switch	P1	Field Wiring Terminal Block
Capacitor	Relay contacts - NO	CB	Circuit Breaker	HPWS	High Pressure Water Switch	PR	Pump Relay
Circuit Breaker	Relay/Contactor Coil	CC	Compressor Contactor	HR	Heating Relay	RAS	Return Air Sensor
Condensate Pan	Solenoid Coil	CDT	Compressor Discharge Temperature	JW	Jumper Wire	RVS	Reversing Valve Solenoid
Control Board Jumper	Splice Cap	CO	Condensate Overflow Sensor	LAT	Leaving Air Temperature	SAC	Start Assist Capacitor
FUSE	Temperature Switch	CR	Compressor Relay	LOR	Lock Out Relay	SAS	Supply Air Sensor
Ground	Themistor	CRC	Compressor Run Capacitor	LP	Low Pressure Switch	TB	Terminal Block
High Pressure Switch	Wire Nut	CS	Current Sensor	LT1	Sensor, low temp protection, water coil	TRANS	Transformer
		DHW	Domestic Hot Water	LT2	Sensor, low temp protection, air coil	UMT	Unit Mounted Thermostat
		DM	Damper Motor	LWT	Leaving Water Temp Sensor	VFD	Variable Frequency Drive
		DTS	Discharge Temperature Switch	MCO	Manual Change Over	VSP	Variable Speed Pump
		EEV	Electronic Expansion Valve	MOD	Modulating Water Valve	WSTAT	Water Stat

Sequence of Operations

This sequence of operation is for information purposes only. Once the heat pump has been set up there should be no further action required by the customer related to operational function or changing of any set points.

The heat pump system requires approximately 40-70% operation in order to maintain the designed temperatures, vs the typical engine heater operation of 50-100%. The system will automatically shut off if outside air temperature drops to approximately 40 °F (5 °C), or supply voltage drops to 197V or over 250V. In either condition, the engine heater will automatically resume operation based on the control of the dual stage thermostat. As soon as either of those conditions are corrected, the heat pump will resume operation and continue unless the above conditions persist.

There is a three-way switch on the unit for bypass, off, and dual mode. The dual mode Comp/EH mode is the down position and the only operating mode unless troubleshooting the heat pump is required. The green status light will advise of a fault code and a steady green advises that the heat pump is operating to specification. A flashing green indicates a fault has occurred. Neither up nor down is the off position. The up position is for engine heater only mode.



HE 3-Way Toggle Switch Operation

EH: Engine Heater On

OFF: Both systems off

COMP/EH: HE Heat Pump On
Heat Pump primary heat source with Engine Heaters as back up

HE Heating System Operation & Maintenance

The Hotstart HE Heating System provides energy savings while providing a redundant heating source for the engine. Hydraulic tubing is routed in series through the existing engine heater(s), making the heat pump the primary heating source. This is controlled by a dual stage thermostat, which insures the system operates with redundancy. Should the heat pump ever fail to maintain a minimum temperature of 94 °F (34 °C), the engine heater(s) will engage and raise the coolant temperature until the heat pump can safely maintain the targeted temperature range.

Operating instructions:

Heat pump switch should be left in the “Comp & EH” mode so that the heat pump is the primary heat source and engine heater is set as back-up (photo#31).

To check heat pump operation remove front panel. The light on the control board should be a steady green. A flashing green light indicates failure.

In a case of heat pump failure, turn switch to “EH” (engine heater) position. If there is a fast or slow flash refer to manual for troubleshooting guide.

Middle position on the switch turns both heaters off. Do not select unless specific maintenance is required. When finished, return the system to “Comp & EH” mode.

Thermostat:

Press “set” button to scroll settings

S1 = Heat Pump, S2 = Engine Heater(s)

Settings: F or C: set to “F” (Fahrenheit)

S1: 100 °F (40 °C), Diff 5 °F, H1 or C1 (H1 for heat)

S2: 95 °F, Diff 5 °F, H2 or C2 (H2 for heat)

Other Notes:

- Heat pump and engine heaters will not be running simultaneously.
- HE heat pump does not have a defrost cycle - it shuts off when air temperature is below 40 °F (5 °C).
- Thermostat senses when generator is running, preventing heat pump operation.
- HE heat pump has copper piping that allows it to withstand high coolant temperatures when generator runs.
- Do not use gauges on compressor unless absolutely needed.

Maintenance:

- HE heat pump requires bi-annual maintenance, as detailed in “Planned Maintenance”

Planned Maintenance

Our maintenance plan makes it easy to keep your HE ASHP running at its best, ensuring it gets the recommended scheduled maintenance.

Recommended scheduled maintenance every 6 months:

1. Replace air filter every 6 months (every 3 months if dirty)
2. Record temperature on thermostat every 6 months
3. Brush, vacuum, or light pressure water pump sprayer to clean coils if needed
4. Check compressor amp. draw every 6 months
5. Record hours run every 6 months

Once on site, the above procedure should take no more than 15 minutes to perform. Be sure to record all the results on the log sheet and set your next maintenance schedule for 6 months ahead.

HE Functional Specifications

Specifications

Heat Pump Model HE-12

Heating Capacity	19,800 BTU/Hr*
Cooling Capacity	15,200 BTU/Hr*
Voltage	208/230 phase I
Circuit Ampacity	10 AMP
Amps	5
Power Consumption	1.4 KW/Hr
EER	14.0
COP	4.1*
Dimensions (DxWxH)	22″ x 17″ x 43″
Weight	160lbs

Heat Pump Model HE-18

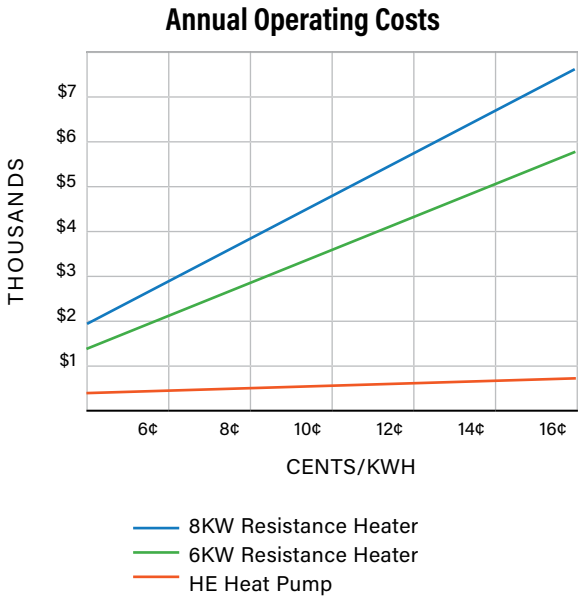
Heating Capacity	23,000 BTU/Hr*
Cooling Capacity	18,600 BTU/Hr*
Voltage	208/230 phase I
Circuit Ampacity	15 AMP
Amps	7.5
Power Consumption	2.1 KW/Hr
EER	11.6
COP	3.4*
Dimensions (DxWxH)	22″ x 25″ x 48″
Weight	200lbs

Heat Pump Model HE-24

Heating Capacity	30,000 BTU/Hr*
Cooling Capacity	25,000 BTU/Hr*
Voltage	208/230 phase I
Circuit Ampacity	15 AMP
Amps	12.2
Power Consumption	2.5 KW/Hr
EER	12.9
COP	3.8*
Dimensions (DxWxH)	25.6″ x 22.4″ x 48.5″
Weight	250lbs

*90 °F entering air and 100 °F entering water

HE Heat Pump vs Resistance Heaters



HE Heat Pump 60% run time and resistance heaters at 70% run time.

How it works

Heat Pump technology takes available heat out of the air and transfers it efficiently to the engine coolant system by using refrigerant under pressure.

Hotstart THERMAL MANAGEMENT

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INSTALLATION DATA
ETC TWO STAGE ELECTRONIC TEMPERATURE CONTROL

The Ranco® ETC is a microprocessor based family of electronic temperature controls, designed to provide on/off control for commercial heating, cooling, air conditioning and refrigeration. The ETC is equipped with a liquid crystal display (LCD) that provides a constant readout of the sensed temperature, and a touch keypad that allows the user to easily and accurately select the setpoint temperature, differential and heating/cooling mode of the operation. Models are available that operate on either line voltage (120/208/240V AC) or low voltage (24V AC).

APPLICATIONS

With its wide temperature setpoint range and selectable heating or cooling modes, the ETC can be used for a wide variety of applications including multiple compressor control, two stage heating, ventilation control, automatic changeover, condenser fan cycling, space and return air temperature control, water cooled condensers and control with alarm function.

FEATURES

- Wide setpoint temperature range (-30°F to 220°F) and differential adjustment (1°F to 30°F)
- Simple keypad programming of setpoint temperature, differential and cooling/heating modes
- Two individually programmable stages for heating and/or cooling
- LCD display readout of sensor temperature, control settings, relay status and onboard diagnostics
- LED (Light Emitting Diode) backlight to improve visibility of the display in low light ambient applications.
- IP67 rated (water and dust resistant) thermistor-based probe to remotely monitor temperature
- The sensor probe can be retrofitted in the field by the use of factory installed interconnect
- Remote temperature sensing up to 400 feet
- Two SPDT output relays
- User-selectable Fahrenheit/Celsius scales
- Lockout switch to prevent tampering by unauthorized personnel
- Choice of line voltage and low voltage models available
- Optional 0 to 10 volt analog output available for remote temperature indication
- Anti-short Cycle Compressor Delay for cooling applications

SPECIFICATIONS

Input Voltage	120 or 208/240V AC (24V AC optional), 50/60 Hz
Temperature Range	-30°F to 220°F
Differential Range	1°F to 30°F
Switch Action	SPDT
Sensor	Thermistor, 1.94 in. long x 0.25 in. diameter with 8 ft. cable, IP67 rated
Power Consumption	120/208/240V AC: 100 milliamps 24V AC: 2-6V AC

Relay Electrical Ratings

	120V	208/240V
NO Contact		
Full-load amps	9.8 Amps	4.9 Amps
Locked rotor amps	58.8 Amps	29.4 Amps
Resistive amps	9.8 Amps	4.9 Amps
Horsepower	1/2 HP	1/2 HP
NC Contact		
Full-load amps	5.8 Amps	2.9 Amps
Locked rotor amps	34.8 Amps	17.4 Amps
Resistive amps	5.8 Amps	2.9 Amps
Horsepower	1/4 HP	1/4 HP

Pilot Duty: 125 VA at 120/208/240 VAC	
Control Ambient Temperature	
Operating	-20°F to 140°F (-29°C to 60°C)
Storage	-40°F to 176°F (-40°C to 80°C)
Ambient Humidity	0 to 95%, RH, Non-condensing
0 to 10V Output Impedance	1 K
Enclosure	NEMA 1, Plastic
Agency Approvals	UL Listed, File E94419, Guide XAPX CSA Certified, File LR68340, Class 4813 02

ETC ORDERING INFORMATION

Uni-Line Numbers	OEM Numbers	Input Voltage	No. of Stages	0 - 10 V Output
ETC-211000-000	ETC-211020-000	120/240	2	No
ETC-211100-000	ETC-211120-000	120/240	2	Yes
ETC-212000-000	ETC-212020-000	24	2	No
ETC-212100-000	ETC-212120-000	24	2	Yes

OPERATION

Liquid Crystal Display (LCD)

The LCD display provides a constant readout of the sensor temperature and indicates if either of the two output relays is energized. When the **S1** annunciator is constantly illuminated during operation, the Stage 1 relay is energized. Likewise, when the **S2** annunciator is constantly illuminated during operation, the Stage 2 relay is energized. The display is also used with the keypad to allow the user to adjust the setpoint temperatures, differentials and heating/cooling modes for each stage.

Backlight

When any mode key is pressed, the backlight is activated and the ETC is in control mode. Press the SET key to begin program mode.

Control Setup

The temperature setpoint refers to the temperature at which the normally open (NO) contacts of the output relay will open. Determine the loads to be controlled and the operating modes required for each stage, cooling or heating.

- When the cooling mode is chosen, the differential is above the setpoint. The relay will de-energize as the temperature falls to the setpoint.
- Anti-short Cycle Compressor Delay for cooling. After a relay de-energizes, the ETC will prevent the relay from turning on until a configurable time has occurred to protect compressor.
- When the heating mode is chosen, the differential is below the setpoint. The relay will de-energize as the temperature rises to the setpoint.

The ETC two stage control can be set up for two stages of heating, two stages of cooling or one stage cooling plus one stage heating. Refer to Figures 1, 2 and 3 for a visual representations of different control setups.

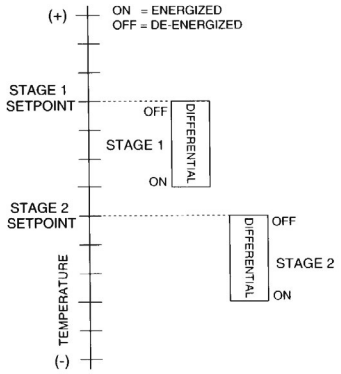


Figure 1: Two Stage Heating Example

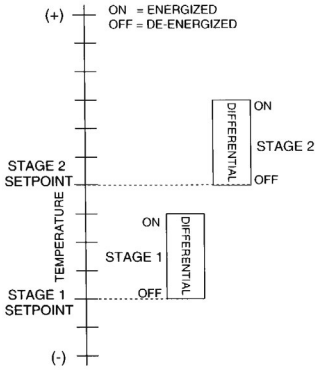


Figure 2: Two Stage Cooling Example

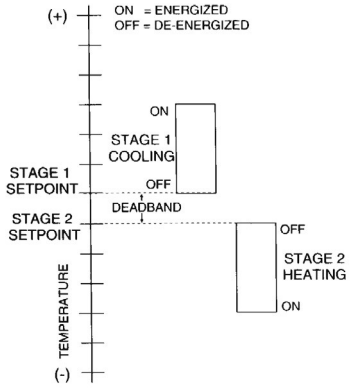


Figure 3: One Stage Cooling and One Stage Heating Example

Programming Steps and Display Mode

The ETC two stage can be programmed in seven simple steps using the LCD display and the three keys on the face of the control.

Step 1 To start programming, press the **SET** key once to access the Fahrenheit/Celsius mode. The display will show the current status, either **F** for degrees Fahrenheit or **C** for degrees Celsius. Then press either the up ⬆ or down ⬇ arrow key to toggle between the **F** or **C** designation.

Stage 1

Step 2 Press the **SET** key again to access the stage 1 setpoint. The LCD will display the current setpoint and the **S1** annunciator will be blinking on and off to indicate that the control is in the setpoint mode. Then press either the up ⬆ key to increase or the down ⬇ key to decrease the setpoint to the desired temperature.

Step 3 Press the **SET** key again to access the stage 1 differential. The LCD will display the current differential and the **DIF 1** annunciator will be blinking on and off to indicate that the control is in the differential mode. Then press either the up ⬆ key to increase or the down ⬇ key to decrease the differential to the desired setting.

Step 4 Press the **SET** key again to access the stage 1 cooling or heating mode. The LCD will display the current mode, either **C1** for cooling or **H1** for heating. Then press either the up ⬆ or down ⬇ key to toggle between the **C1** or **H1** designation.

Step 5 Press the **SET** key again to access the Anti-short Cycle Compressor Delay when in Cooling Mode. Press the up ⬆ or down ⬇ keys to set the delay from 1 to 20 minutes. Press **SET** key again to finish the programming.

Stage 2

Step 6 Press the **SET** key again to access the stage 2 setpoint. The LCD will display the current setpoint and the **S2** annunciator will be blinking on and off to indicate that the control is in the setpoint mode. Then press either the up ⬆ key to increase or the down ⬇ key to decrease the setpoint to the desired temperature.

Step 7 Press the **SET** key again to access the stage 2 differential. The LCD will display the current differential and the **DIF 2** annunciator will be blinking on and off to indicate that the control is in the differential mode. Then press either the up ⬆ key to increase or the down ⬇ key to decrease the differential to the desired setting.

Step 8 Press the **SET** key again to access the stage 2 cooling or heating mode. The LCD will display the current mode, either **C2** for cooling or **H2** for heating. Then press either the up ⬆ or down ⬇ key to toggle between the **C2** or H2 designation. Press the **SET** key once more and programming is complete.

Step 9 Press the **SET** key again to access the Anti-short Cycle Compressor Delay when in Cooling Mode. Press the up ⬆ or down ⬇ keys to set the delay from 1 to 20 minutes. Press **SET** key again to finish the programming.

Refer to Page 3 for an illustrated guide to programming the ETC.

NOTE: The ETC will automatically end programming if no keys are depressed for a period of thirty seconds. Any settings that have been input to the control will be accepted at that point.

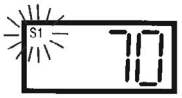
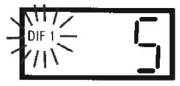
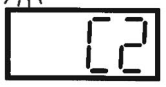
All control settings are retained in non-volatile memory if power to ETC is interrupted for any reason. Re-programming is not necessary after power outages or disconnects unless different control settings are required.

Lockout Switch

The ETC is provided with a lockout switch to prevent tampering by unauthorized personnel. When placed in the **LOCK** position, the keypad is disabled and no changes to the settings can be made. When placed in the **UNLOCK** position, the keypad will function normally.

To access the lockout switch, disconnect the power supply and open the control. The switch is located on the inside cover about 2 inches above the bottom. (see Figure 4). To disable the keypad, slide the switch to the left **LOCK** position. To enable the keypad, slide the switch to the right **UNLOCK** position. All ETC controls are shipped with this switch in the **UNLOCK** position.

Program Mode Displays

Step	Annunciator	Description	Display
1	**F** or **C**	Fahrenheit or Celsius Scale	
2	**S1** (blinking)	Stage 1 Setpoint Temperature	
3	**DIF 1** (blinking)	Stage 1 Differential Temperature	
4	**C1/H1**	Stage 1 Cooling or Heating Mode	
5	**D1**	Cooling Delay Set to 1-20 Minutes	
6	**S2** (blinking)	Stage 2 Setpoint Temperature	
7	**DIF 2** (blinking)	Stage 2 Differential Temperature	
8	**C2/H2**	Stage 2 Cooling or Heating Mode	
9	**D2**	Cooling Delay Set to 1-20 Minutes	

TROUBLESHOOTING ERROR MESSAGES

Display Messages

E1 Appears when either the up ⬆ or down ⬇ key is pressed when not in the programming mode.
To correct: If the **E1** message appears even when no keys are being pressed, replace the control.

E2 Appears if the control settings are not properly stored in memory.
To correct: Check all settings and correct if necessary.

EP Appears when the probe is open, shorted or sensing a temperature that is out of range.
To correct: Check to see if the sensed temperature is out of range. If not, check for probe damage by comparing it to a known ambient temperature between -30°F and 220°F. Replace the probe if necessary.

EE Appears if the EEPROM data has been corrupted.
To correct: This condition cannot be field repaired. Replace the control.

CL Appears if calibration mode has been entered.
To correct: Remove power to the control for at least five seconds. Reapply power. If the **CL** message still appears, replace the control.

Normal Operating Mode

Probe Temperature	**°F**
Relay 1 ON	**S1**
Relay 2 ON	**S2**

*Note Cd alternates with temperature and relay

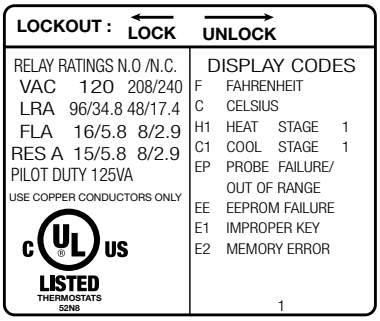


Figure 4: Lockout Switch

INSTALLATION INSTRUCTIONS

WARNING

Electrical Shock Hazard - Turn off power at the main power source before installing the ETC control. DO NOT restore electrical power to the unit until the ETC control is properly installed and cover assembled.

Fire Hazard - DO NOT locate the ETC control in an explosive atmosphere as a fire could result due to possible spark generation in the control.

All ETC Controls are designed as temperature controls and are not used as temperature limit controls.

Where failure or malfunction of the ETC control could cause personal injury or property damage, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn or protect against failure or malfunction of the ETC control must be installed.

INSTRUCTIONS CONCERNANT L'INSTALLATION

AVERTISSEMENT

Risque de choc électrique - Couper le courant à la source d'alimentation principale avant d'installer le contrôleur ETC. NE PAS rétablir l'alimentation électrique de l'appareil avant que le contrôleur ETC ne soit correctement installé et que le couvercle ne soit assemblé.

Risque d'incendie - Ne pas placer le contrôleur ETC dans une atmosphère explosive car un incendie pourrait être déclenché par d'éventuelles étincelles survenant dans le contrôleur.

Toutes les commandes de l'ETC sont conçues pour contrôler la température et ne sont pas utilisées comme témoins des limites de température.

Si une défaillance du contrôleur ETC peut causer des blessures ou des dommages matériels, d'autres dispositifs (contrôles des limites ou de la sécurité) ou des systèmes (d'alarme ou de surveillance) destinés à prévenir ou à protéger contre une défaillance ou un dysfonctionnement du contrôleur ETC, doivent être installés.

CAUTION

Read all of the information in these instructions before installing or operating the ETC control.

The schematic drawings and other information included in these installation instructions are for the purpose of illustration and general reference only.

ETC controls are not to be located in areas of significant moisture, dirt or dust as use of the control in such environment may cause personal injury or property damage and is likely to shorten the control life.

It is the responsibility of the installer and the user to assure that the application and use of the ETC control is in compliance with all applicable federal, state, and local laws, regulations and ordinances, including, without any limitation, all requirements imposed under the National Electric Code and any applicable building codes.

PRÉCAUTIONS

Lire toutes les informations contenues dans ces instructions avant d'installer ou d'utiliser le contrôleur ETC.

Les schémas et toutes les autres informations figurant dans ces instructions d'installation sont indiqués à des fins d'illustration et de référence générale seulement.

Les contrôleurs ETC ne doivent pas être placés dans des zones ayant un taux d'humidité élevé, de la saleté ou de la poussière, car l'utilisation du contrôleur dans de tels environnements peut engendrer des blessures ou des dommages matériels et est susceptible de raccourcir la durée de vie du contrôleur.

Il est de la responsabilité de l'installateur et de l'utilisateur de s'assurer que l'installation et l'utilisation du contrôleur ETC soit faites en conformité avec tous les règlements, lois, et ordonnances fédéraux, provinciaux, et locaux, y compris, sans y être limité, toutes les exigences imposées par la National Electric Code ainsi que tous les codes du bâtiment, en vigueur.

CONTROL MOUNTING

Mount the ETC to a wall or any flat surface using a combination of any two or more of the slotted holes located on the back of the control case. The control's components are not position sensitive, but should be mounted so that they can be easily wired and adjusted. Avoid excessive conditions of moisture, dirt, dust and corrosive atmosphere. The ETC has provisions for 1/2 inch conduit connections. The conduit hub should be secured to the conduit before securing the hub to the plastic housing of the control. When using the conduit entry in the rear of the case, a standard plug should be inserted into the conduit hole in the bottom. Caution should be exercised not to damage the control circuit board or wiring when installing a conduit connector.

ANTI-SHORT CYCLE COMPRESSOR DELAY

When the unit is configured for cooling and there is a call for cooling, the relay will not activate until the Anti-short Cycle Compressor Delay is satisfied. During an Anti-short Cycle Compressor Delay, the temperature will alternate with Cd to indicate the Relay On is delayed.

If Relay 1 is in Anti-short Cycle Compressor Delay, the temperature will alternate with aCd or S1 icon. If Relay 2 is in Anti-short Cycle Compressor Delay mode, the temperature will alternate with a Cd or S2 icon.

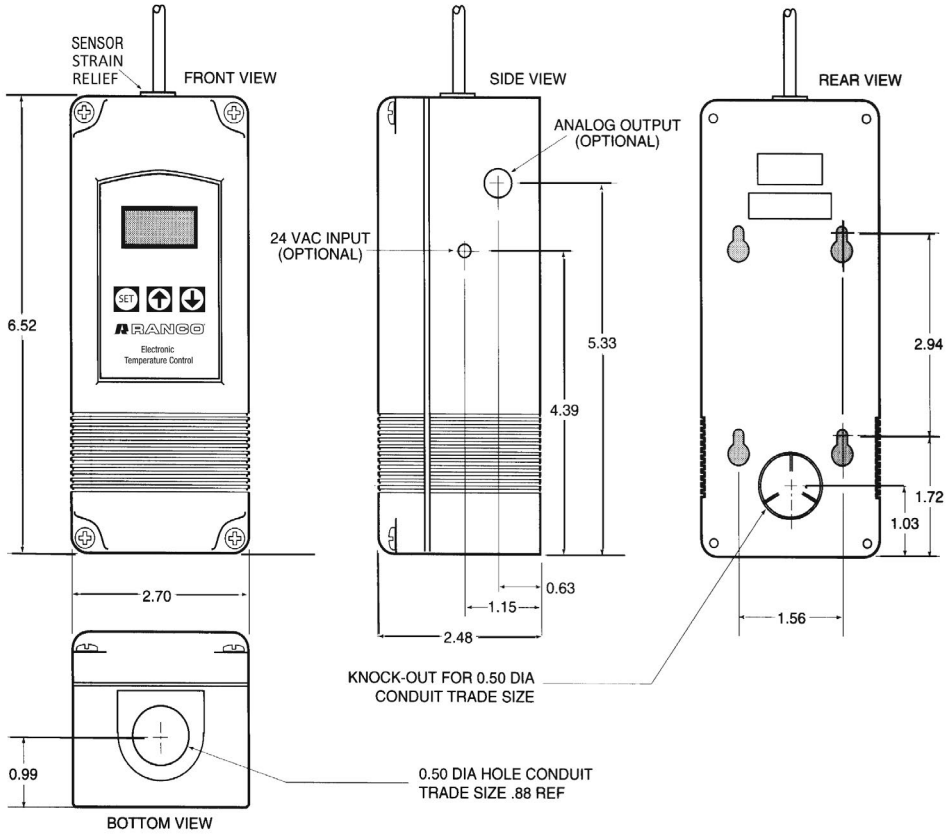


Figure 5: Dimensions (Inches)

CONTROL WIRING

General

- All wiring should conform to the National Electric Code and local regulations.
- The total electrical load must not exceed the maximum rating of the control (see Specifications).
- Use copper conductors only.
- Electrical leads should not be taut; allow slack for temperature change and vibration.

Input and Output Wiring

For typical wiring diagrams, refer to Figures 6 and 7. All connections are made to the power (lower) circuit board. When using the 24V AC powered models, the 24V AC input lines must enter through the sidewall of the case. Refer to Figure 5 for location of the entry hole.

Analog Output

ETC models are available with an optional 0 to 10 volt analog output. This signal is a linear representation of the sensor temperature with 0 volts = -30°F and 10 volts = 220°F. See figure 8 for wiring information and Figure 5 for location of the entry hole. The reference for this output is designated by the "-" symbol on the wiring diagram. The output signal is designated by the "+" symbol.

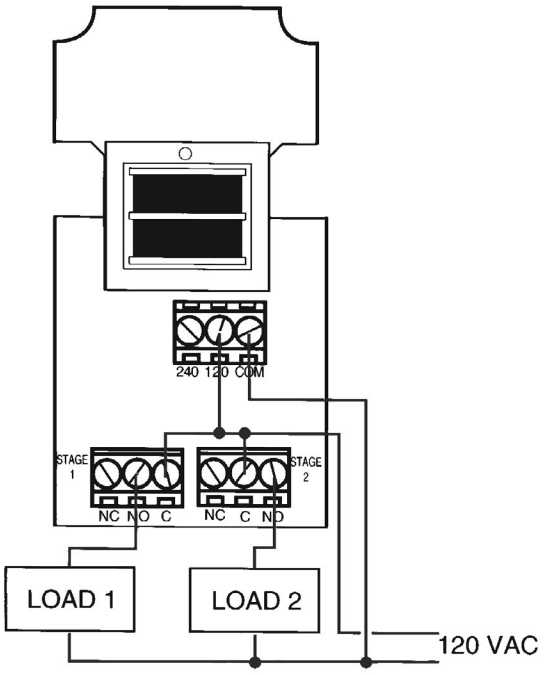


Figure 6: Typical Voltage Wiring Diagram.

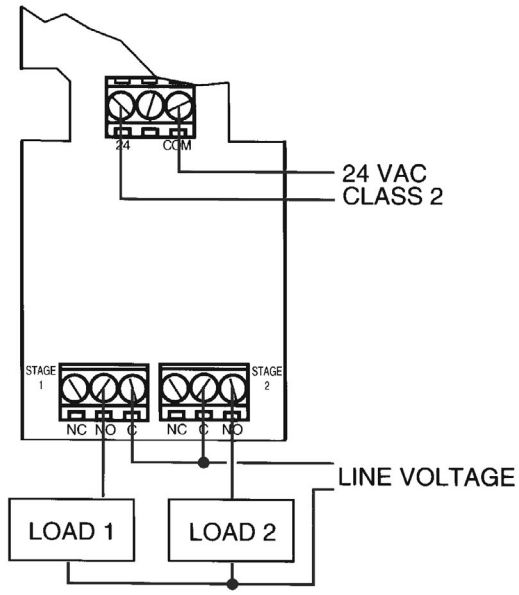


Figure 7: Typical Wiring Diagram for 24 VAC Power Input and Line Voltage Switching.

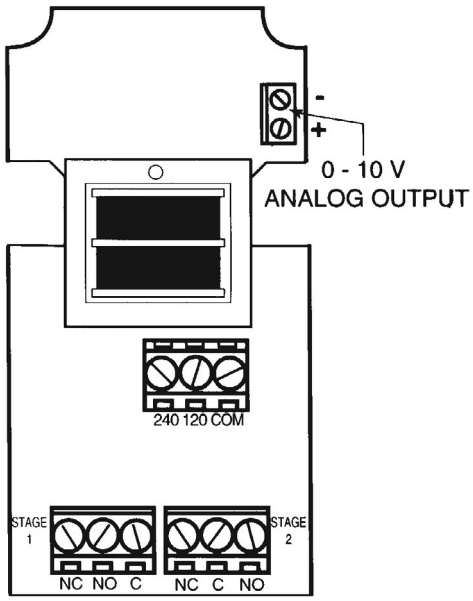


Figure 8: 0-10 V Analog Output Located on Power (Lower) Circuit Board

FIELD REPAIRS

Field calibrating or repairs to the ETC control must not be attempted. Sensors and replacement controls are available through Ranco wholesalers.

SENSOR MOUNTING

For space sensing, mount the sensor where it will be unaffected by heat/cool discharge or radiated heat sources. Spot sensing requires the sensor to be in good contact with the surface being sensed. The sensor can be inserted in a bulb well for immersion sensing.

EXTENDING SENSOR

CAUTION: Sensor wiring splices may be made external from the control.

CAUTION: Disconnect power to control before wiring to avoid possible electrical shock or damage to the controller.

Additional cable can be spliced to the sensor cable to increase the length beyond the standard 8 feet. It can be extended up to 400 feet. The cable should be at least 22 AWG or larger to keep additional resistance to a minimum.

All splices and wire lengths added to the sensor cable should be made according to acceptable wiring practices and should conform to the National Electrical Code and local regulations. Use copper conductors only. Shielded cable is not required. The sensor is not polarity sensitive.

Checkout Procedure

1. Before applying power, make sure installation and wiring connections are correct.
2. Apply power to the control and observe one or more cycles of operation.
3. If performance indicates a problem, check sensor resistance to determine if sensor or control is at fault.
4. To check sensor resistance, disconnect sensor and measure the resistance across the leads while measuring temperature at the sensor.

SENSOR REPLACEMENT

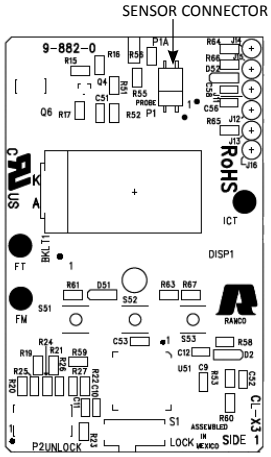


Figure 9: Sensor replacement on Display (Upper) Circuit Board.

Sensor Replacement

ETC models are available with Quick Connect Sensor feature that allows for easy sensor replacement due to damage or wear. To access the sensor connector, disconnect the power supply and open the control. Remove single screw located in the center of the Display Upper Circuit Board and carefully remove Display Board Circuit. Remove Sensor Strain Relief to allow sensor to be removed from unit. See Figure 5 for location of sensor strain relief. The sensor connection is made at the P1 Connector on the Display Upper Circuit Board. See figure 9 for connection information.

Replacement Sensor - Order
Uni-Line Number 1309007-044
(OEM Number 1309007-048)

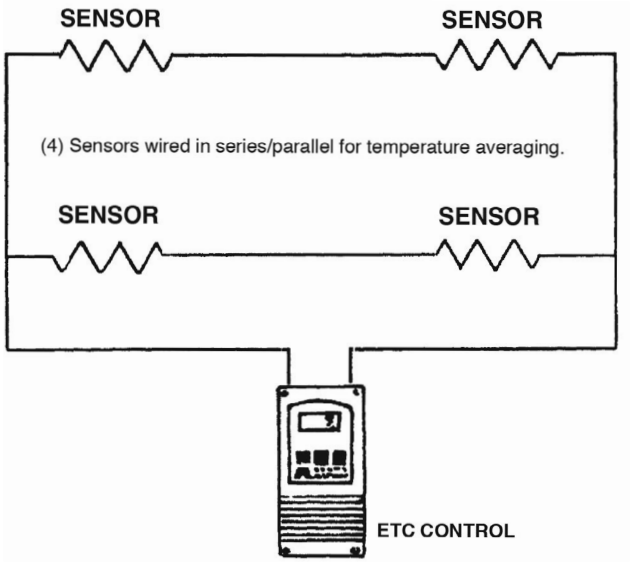


Figure 10

SPECIFICATIONS

The sensor is a negative temperature coefficient (NTC) thermistor sensor. The sensor resistance decreases with temperature increase. It is .25 x 1.94 long with 8 feet #22 AWG cable. The thermistor has a reference resistance of 30,000 ohms at 77°F (25°C).

Deg. C.	Deg. F.	RES. Nom.
-40	-40	1,010,000
-30	-22	531,000
-20	-4	291,200
-10	14	166,000
0	32	97,960
10	50	59,700
20	68	37,470
25	77	30,000
30	86	24,170
40	104	15,980
50	122	10,810
60	140	7,464
70	158	5,200
80	176	3,774
90	194	2,753
100	212	2,036
110	230	1,531

Figure 11:
Resistance vs Temperature
Sensor including 8 foot cable.

Customer Service Telephone 1.800.304.6563
Customer Service Facsimile 1.800.426.0804
HVACCustomerService@robertshaw.com

For Technical Service
Telephone 1.800.445.8299
TechnicalService@robertshaw.com

02/18 –352-00008-00 Rev C

Little GIANT

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Oklahoma City, OK 73157-2010
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www.LittleGiantPump.com
CustomerService-WTS@fele.com

VCMA-10
VCMA-15
VCMA-20

EN INTRODUCTION

Your Little Giant condensate pump is designed as an automatic condensate removal pump for water dripping off an air conditioner evaporative coil. The pump is controlled by a float/switch mechanism which turns the pump on when approximately 2-1/4" of water collects in the tank, and automatically switches off when the tank drains to approximately 1-1/4".

The Little Giant unit you have purchased is of the highest quality workmanship and material. It has been engineered to give you long and reliable service.

Little Giant pumps are carefully packaged, inspected and tested to ensure safe operation and delivery. When you receive your pump, examine it carefully to determine that there are no broken or damaged parts that may have occurred during shipment. If damage has occurred, make notation and notify the firm that you purchased the pump from. They will assist you in replacement or repair, if required.

READ INSTRUCTIONS CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THE LITTLE GIANT PUMP. KNOW THE PUMP APPLICATION, LIMITATIONS AND POTENTIAL HAZARDS. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE. INSTALLATION AND CONNECTIONS ARE TO BE MADE BY A QUALIFIED PERSON.

SAFETY GUIDELINES

⚠WARNING⚠

DO NOT USE TO PUMP FLAMMABLE OR EXPLOSIVE FLUIDS SUCH AS GASOLINE, FUEL OIL, KEROSENE, ETC. DO NOT USE IN EXPLOSIVE ATMOSPHERES. PUMP SHOULD BE USED WITH LIQUIDS COMPATIBLE WITH PUMP COMPONENT MATERIALS.

DO NOT HANDLE PUMP WITH WET HANDS OR WHEN STANDING ON A WET OR DAMP SURFACE, OR IN WATER.THIS PUMP IS SUPPLIED WITH A GROUNDING CONDUCTOR AND/OR GROUNDING TYPE ATTACHMENT PLUG. TO REDUCE THE RISK OF ELECTRICAL SHOCK, BE CERTAIN THAT IT IS CONNECTED TO A PROPERLY GROUNDED GROUNDING TYPE RECEPTACLE.

IN ANY INSTALLATIONS WHERE PROPERTY DAMAGE AND/OR PERSONAL INJURY MIGHT RESULT FROM AN INOPERATIVE OR LEAKING PUMP DUE TO POWER OUTAGES, DISCHARGE LINE BLOCKAGE, OR ANY OTHER REASON, A BACKUP SYSTEM(S) AND/OR ALARM SHOULD BE USED.

SUPPORT PUMP AND PIPING WHEN ASSEMBLING AND WHEN INSTALLED. FAILURE TO DO SO MAY CAUSE PIPING TO BREAK, PUMP TO FAIL, MOTOR BEARING FAILURES, ETC.

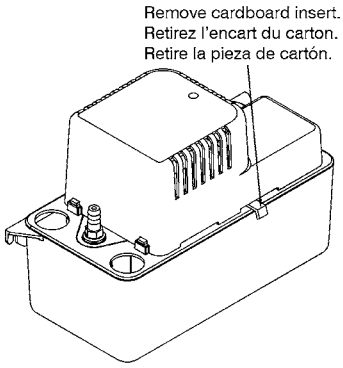


Figure 1

INSTALLATION

1. Before installing pump, allow air conditioner to cycle several times, collecting condensate in a separate container to help flush any residual oils that may remain in the system.
2. Carefully unpack the pump. Remove the cardboard packing from the motor cover air slots. Carefully slide the packing away from the pump. This packing is used to prevent switch movement during shipment (Figure 1).
3. Mounting the pump: the tank has two slots provided to mount the unit. The slots are located on the ends of the tank (Figure 5). The unit should be mounted either on the side of the air conditioner unit or nearby wall. Pump must be level and the inlet must be below the coil drain. Conduit fittings are not compatible with the plastic pump housing.
4. The pump should not be installed in a manner that will subject it to splashing or spraying.
5. This pump is not intended for use inside air plenums.

ELECTRICAL CONNECTIONS

⚠WARNING⚠

1. Shut off electrical power at fuse box before making any connections. All wiring must comply with local codes.
2. Line voltage: Connect power cord to line voltage specified on motor and nameplate. Power cord must be connected to a constant source of power (not a fan or other device that runs intermittently). If power cord does not have a plug, wiring is as follows: green (or green/yellow)—ground. Black (or brown)—line. White (or blue)—neutral.
3. Safety switch: The safety overflow switch should be connected to a class II low voltage circuit. To control a thermostatic circuit the COM and NO connections from the safety switch are to be wired in series with the low voltage thermostat circuit to shut down the heating/AC circuit. The COM and NC switch contacts may be used to actuate a low voltage alarm circuit (connected in series) if the heating/cooling system can not be disrupted. The safety switch comes from the factory with leads connected to the COM and NO switch terminals. Typical hook-up of "NC" circuits would be (Figures 2 & 3).
4. If fused plug is used on 230V units, a 1.0 amp fuse is recommended.

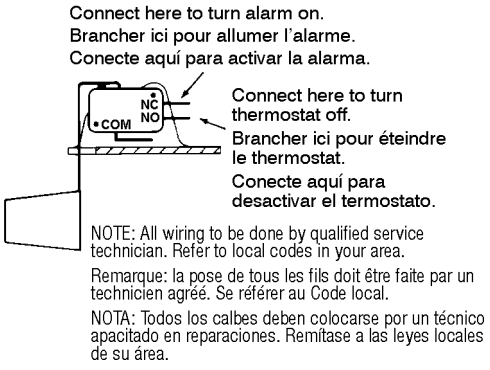


Figure 2

Figure 3

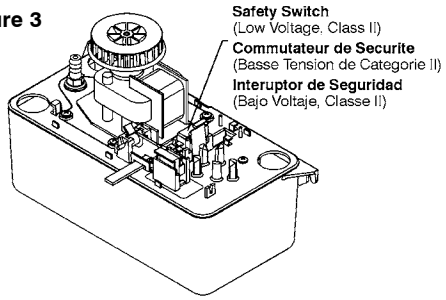
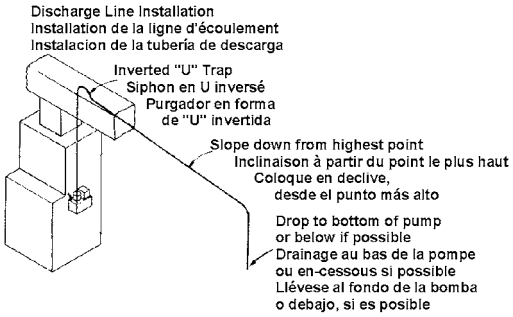


Figure 4



PIPING

1. Run flexible tubing or pipe from evaporator drain into one of the three pump inlets. Be sure inlet piping is sloped downward to allow gravity flow (Figure 4). Extend the inlet piping into the tank from 1 to 3 inches to ensure that it will not interfere with proper float operation. Be sure that the inlet piping is cut at an angle where it enters the tank.
2. The outlet piping should be flexible tubing secured with a hose clamp (not provided) or pipe (3/8 inch I.D. maximum to prevent excessive flow back to unit). From condensate unit, extend discharge piping straight up as high as necessary. Do not extend this line above the head/GPH of the particular model being installed. From this high point, slope discharge line down slightly to a point above drain area; then turn down and extend to a point below or approximately level with the bottom of the condensate unit. This will give a siphoning effect which will improve efficiency of the condensate unit and will, in most cases, eliminate the need for a check valve (Figure 5). If it is not possible to slope discharge line down, make an inverted "U" trap directly above the pump at the highest point.

SERVICE INSTRUCTIONS

⚠WARNING⚠

1. Make certain that the unit is disconnected from the power source before attempting to service or remove any component!
2. Be sure the floats move freely. Clean as necessary (Figure 6).
3. Clean the tank with warm water and mild soap.
4. Check the inlet and outlet piping. Clean as necessary. Be sure there are no kinks in the line that would inhibit flow.

TESTING

1. Turn on power.
2. Remove motor/tank cover assembly and hold level.
3. Test motor switch by raising motor switch float with finger (Figure 6). Motor should turn on just before float contacts cover.
4. Test safety switch by raising safety switch float with finger. Safety switch should activate before float contacts cover.
5. Replace motor/tank cover assembly on tank.

Figure 5

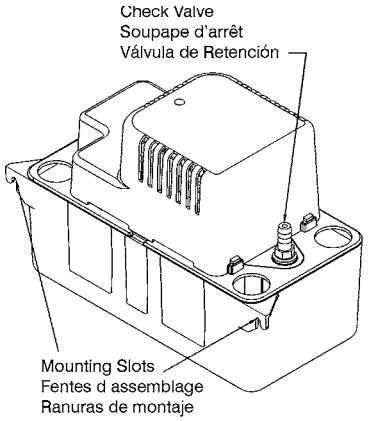
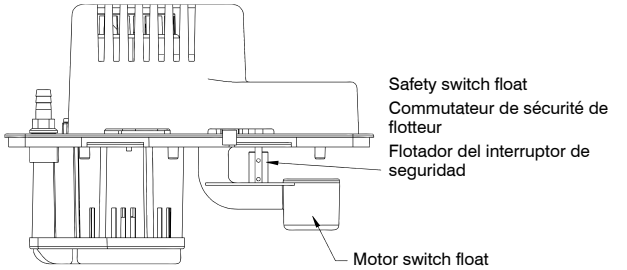


Figure 6



This pump is suitable for gas furnace condensate applications. Caution must be taken to ensure acidity of condensate does not increase below the average pH of 3.4 (to prevent localized pocket of acid that acts like a battery causing pitting) by routinely cleaning or flushing tank with fresh water.

FR INTRODUCTION

Votre pompe a condensats Little Giant est concue comme une unite automatique d'evacuation des condensats. Elle evacue l'eau condensee egouttant de la volute de l'evaporateur d'un systeme de climatisation. La pomp est actionee par un mechisme flotteur/ interrupteur lequel entraine le demarrage dela pompe oorsque environ 2 po 1/4 d'eau s'accumule dans le reservoir. La pompe s'arrete automatiquement lorsqu'il ne reste plus qu'environ 1 po 1/4 d'eau.

Votre nouvelle pompe Little Giant a été fabriquée avec les meilleurs matériaux et avec le plus grand soin. Elle a été conçue pour foncionner bien et longtemps.

Les pompes Little Giant sont soigneusement emballées, et testées pour assurer une livraison et un fonctionnement sans problèmes. Lorsque vous recevez votre pompe, examinez-la attentivement pour vous assurer qu il n y a pas eu de pièce cassée ou endommagée pendant l acheminement. S il y a eu des dégats, prenez-en note et signalez-le au magasin où vous avez acheté la pompe. Ils vous aideront pour le remplacement ou la réparation, si nécessaire. Cette pompe est conçue pour pomper de l eau. NE POMPEZ PAS de produit chimique, de solvant, d eau salée, ou de liquides épais tels que des huiles ou de la graisse.

BIEN LIRE LES INSTRUCTIONS AVANT D'INSTALLER, DE FAIRE FONCTIONNER OU D'ENTRETENIR LA POMPE LITTLE GIANT. IL FAUT CONNAÎTRE L'APPLICATION, LES LIMITES ET LES DANGERS POTENTIELS DE LA POMPE. PROTÉGEZ-VOUS ET LES AUTRES EN RESPECTANT TOUTES LES NORMES DE SÉCURITÉ. LE NON-RESPECT DES INSTRUCTIONS PEUT CAUSER DES ATTEINTES AUX PERSONNES OU À LA PROPRIÉTÉ! GARDER LE PRÉSENT

DOCUMENT POUR REFERENCE ULTERIEURE.L´INSTALLATION ET LES BRANCHEMENTS DOIVENT ÊTRE EFFECTUÉS PAR DES PROFESSIONNELS.

DIRECTIVES DE SECURITE

⚠AVERTISSEMENT⚠

NE PAS UTILISER POUR POMPER DES LIQUIDES EXPLOSIFS OU INFLAMMABLES (ESSENCE, HUILE, KÉROSÈNE, ETC.) NE PAS UTILISER DANS UN ENVIRONNEMENT PROPICE AUX EXPLOSIONS. UTILISER AVEC DES LIQUIDES COMPATIBLES AVEC LES MATÉRIAUX DE LA POMPE.

NE PAS MANIPULER LA PUMPE LES MAINS HUMIDES, LES PIEDS POSES SURE UNE SURFACE MOUILLEE OU HUMIDE, OU LES PIEDS DANS L'EAU.

VOTRE POMPE VIENT AVEC UN FIL DE MISE A LA TERRE ET/OU UNE PRISE A TROIS BRANCHES. AFIN DE RÉDUIRE LE RUSQUE DE CHOC ÉLECTRIQUE, S'ASSURER QUE LA POMPE EST BRANCHÉE A UNE PRISE CORRECTEMENT MISE A LA TERRE.

L'UTILISATION D'UN OU DE PLUSIEURS SYSTÈMES AUXILIAIRES ET/OU D'UN SYSTÈME D'ALARME EST RECOMMANDÉE POUR TOUTE INSTALLATION POTENTIELLEMENT DANGEREUSE (FUITE OU DÉFECTUOSITÉ CAUSÉES PAR UNE COUPURE DE COURANT, UN BLOCAGE DU CIRCUIT DE REFOULEMENT OU POUR TOUTE AUTRE RAISON) POUR LES PERSONNES OU LA PROPRIËTË.

IMMOBILISER LA POMPE ET LES TUYAUX LORS DE L'INSTALLATION ET DE L'UTILISATION AFIN D'ËVITER TOUT RISQUE DE DOMMAGES AUX TUYAUX. À LA POMPE AUX ROULEMENTS À BILLE DU MOTEUR, ETC.

INSTALLATION

1. Avant d'installer la pompe, laisser le climatiseur effectuer quelques cycles pour collecter le condensat dans un contenant séparé afin de faciliter l'évacuation des huiles résiduelles qui pourraient rester dans le système.
2. Déballer la pompe avec précaution en faisant gliser l'emballage. Enlever l'emballage de carton des fetes d'aération qui se trouvent sur le courvercle du moteur. Cet emballage est destiné à éviter le mouvement des commutateurs pendant le transport (Figure 1).
3. Montage-Deux fentes situées à l'extrémité du couvercle de réservoir, permettent le montage. Celui-ci doit être fait prés d'un climatiseur ou d'un mur (Figure 5). La pompe doit étre à niveau et l'arrivée doit se trouver sous le serpentin d'écoulement. Son carter en plastique n'est pas compatible avec la tuyauterie.
4. Éviter d'installer la pompe où elle pourrait être claboussée ou arrosée.
5. Cette pompe n'a pas été conçue pour l'intérieur de chambres de répartition d'air.

CONNEXIONS ELECTRIQUES

⚠AVERTISSEMENT⚠

1. Avant de faire les connexions, couper le courant électrique à fusibles et s'assurer que tous les fils sont conformes au Code local de l'électricité.
2. Ligne de tension : Le câble électrique doit être connecté à la ligne de tension comme spécifié sur le moteur et sur la plaque de constructeur. La connexion doit être faite à une source constante et non à une source intermittente comme un ventilateur. Si le câble électrique n'est pas équipé d'une prise, les fils se présentent de la façon suivante: vert (ou vert et jaune) à la terre—noir (ou marron) ligne de tension—blanc (ou bleu)-neutre.
3. Disjoncteur : Le disjoncteur de débordement doit être connecté à un circuit à basse tension de catégorie II. Pour commander un circuit thermostatique, les connexions COM et NO de l'interrupteur de sécurité doivent être branchées en série avec le circuit basse tension du thermostat; il est alors possible de couper le système de chauffage/climatisation. Si une telle coupure n'est pas désirée, les contacts COM and NO peuvent aussi être utilisés pour activer une alarme de faible tension (branchée en série). L'interrupteur de sécurité a été réglé en usine avec des fils raccordés aux bornes COM et NO. L'assemblage typique de circuits 'NC' serait (Figures 2 & 3).
4. Si une prise avec fusible est utilisée sous une tension de 230 V, l'utilisation d'un fusible de 1 ampère est recommandée.

TUYAUTERIE

1. Courant flexible tubage ou pipe dès evaporator drain into 1 de la 3 pompe inlets. Pour permettre un bon écoulement, s'assurer que le tuyau d'admission est bien dirigée vers le bas (Figure 4). Introduire le tuyau d'entrée de 1 à 3 pouces (de 2,5 à 7,5 cm) à l'intérieur du réservoir afin de s'assurer qu'il ne nuise pas au fonctionnement du flotteur. Vérifier que le tuyau d'entrée est coupé en angle à son entrée dans le réservoir.
2. Le tuyau de sortie, s'il est flexible, doit être fixé avec une pince à tuyaux (non comprise). S'il est rigide, il ne doit pas dépasser 3/8 po (0,5 cm) de D.I., afin d'éviter un reflux excessif vers la pompe. Á partir de l'unité d'extraction, étirer verticalement le tuyau d'écoulement jusqu'à la bonne hauteur. Ne pas l'étirer au dessus de la tête/GPH du modèle installé. De ce point haut, incliner légèrement le tuyau d'écoulement vers un point situé au-dessus de lieu d'écoulement; rabattre et étirer jusqu'à un point situé en-doussous ou à peu près au même niveau que le bas du système de condensation ce qui donnera un effet de siphon qui en augmentera l'efficacité et éliminera pratiquement l'installation d'une soupape d'arrêt (Figure 5). S'il n'est pas possible d'incliner le tuyau d'écoulement, faire un branchement en U inversé, à un point situé le plus haut au-dessus de la pompe.

DIRECTIVES D'ENTRETIEN

⚠AVERTISSEMENT⚠

1. Votre pompe demandera très peu d'entretien. Si, pour une raison quelconque, elle ne peut pas fonctionner, suivez les instructions ci- dessous!
2. Veillez à ce que les flotteurs bougent librement. Nettoyez-les au besoin (Figure 6).
3. Nettoyez le réservoir à l'eau tiède et au savon.
4. Vérifiez la tuyauterie d'alimentation et de sortie. Nettoyez-la au besoin. Assurez-vous que les tuyaux ne présentent aucun tortillement pouvant influer sur le débit.

VÉRIFICATION

1. Mettre la pompe en marche.
2. Enlever le couvercle qui couvre l'ensemble moteur, réservoir et le supporter de niveau.
3. Tester le commutateur de moteur en levant le commutateur de moteur du flotteur avec le doigt (Figure 6). Le moteur doit se mettre en marche avant que le flotteur ne touche le couvercle.
4. Tester la sécurité du commutateur en levant le commutateur de sécurité de flotteur avec le doigt. Le commutateur de sécurité doit se mettre en marche avant que le flotteur ne touche le couvercle.
5. Replacer le couvercle sur l'ensemble.

Cette pompe convient aux applications des condensats de radiateurs á gaz. Certaines précautions doivent être prises pour éviter que l'acidité du condensat ne descende en dessous du pH moyen de 3,4 ce qui causerait la formation lacalisée d'une poche d'acidité qui fonctionnerait comme une batterie et causerait de la corrosion. Il est recommandé de nettoyer ou de rincer périodiquement le réservoir à l'eau claire.

ES INTRODUCCIÓN

Su bomba de condensacion Little Giant esta disenada como una bomba de remocion de condenscion automatica para remover agua que gotea de las bobinas evaporantes de una unidad de aire acondicionado. La bombs esta controlada por un mecanismo flotador/interruptor que activa la bomba aproximadamente cuando 2-1/4" de agua so junta en el tanque, y se apaga automaticamente cuando elnnivel del agua baja a aprozimadamente 1-1/4".

La unidad Little Giant que usted ha adquirido posee la más alta calidad de fabricación y materiales. Ha sido diseñada para brindarle una larga vida de servicio sin problemas.

Las bombas Little Giant se envasan cuidadosamente, registradas y probadaspara asegurar la entrega y operación segura. Cuando usted recibe su bomba,examina lo cuidadosamente para determinar que no hay roto o dañado partes que pueden haber ocurrido durante el embarque. Si el daño ha ocurrido, hechoanotación y notificado la firma que usted compró la bomba desde. Ellos ayudarán usted en el reemplazo o la reparación, si requirió.

LEA DETENIDAMENTE LAS INSTRUCCIONES ANTES DE INTENTAR INSTALAR OPERAR O DAR MANTENIMIENTO A LA BOMBA LITTLE GIANT. CONOZCA LAS LIMITACIONES, APLICACIONES Y LOS PELIGROS POTENCIALES DE LA BOMBA. PROTEJASE A SI MISMO Y A LOS DEMAS CUMPLIENDO TODAS LAS RECOMENDACIONES DE SEGURIDAD.

¡EL INCUMPLIMIENTO DE LAS INSTRUCCIONES PODRIA RESULTAR EN LESIONES PERSONALES Y/O DAÑOS MATERIALES! CONSERVE LAS INSTRUCCIONES PARA REFERENCIAS FUTURAS.

LA INSTALACIÓN Y LAS CONEXIONES DEBEN SER HECHAS POR UNA PERSONA CALIFICADA.

NORMAS DE SEGURIDAD

¡ADVERTENCIA¡

NO USE LA UNIDAD PARA BOMBEAR LIQUIDOS INFLAMABLES NI EXPLOSIVOS TALES COMO GASOLINA, FUELOIL, QUEROSENO, ETC. NO USE LA UNIDAD EN AMBIENTES EXPLOSIVOS. LA BOMBA SE DEBE USAR CON LIQUIDOS COMPATIBLES CON LOS MATERIALES DE LOS COMPONENTE DE LA BOMBA.

NO MANIPULE LA BOMBA CON LAS MANOS MOJADAS, NI MIENTRAS SE ENCUENTRE EN UNA SUPERFICIE MOJADAS, NI MIENTRAS SE ENCUENTRE EN UNA SUPERFICIE MOJADA O HUIMEDA O ENTRE EL AGUA.

ESTA BOMBA SE SUMINISTRA CON UN CONDUCTOR A TIERRA Y/O UN ENCHUFE DE CONEXION DE TIPO DE CONEXION A TIERRA. PARA REDUCIR EL RIESGO DE DESCARGA ELECTRICA ASEGURESE DE CONECTAR LA UNIDAD A UN RECEPTACULO DEL TIPO POLARIZADO Y ADECUADAMENTE CONECTADO A TIERRA.

EN CUALQUIER INSTALACION DONDE PUEDAN OCURRIR DAÑOS MATERIALES Y/O LESIONES PERSONALES QUE RESULTEN DEL FUNCIONAMIENTO INADECUADO O DE FUGAS EN LA BOMBA A CAUSA DE FALLOS EN LA ALIMENTACION ELECTRICA, BLOQUEO DE LA LINEA DE LA DESCARGA, O CUALQUIER OTRA RAZON, SE DEBERA USAR UNO O VARIOS SISTEMAS DE RESPALDO Y/O ALARMAS.

IAPOYE LA BOMBA Y LA TUBERIA DURANTE EL ENSAMBLADO DE LA UNIDAD Y AL COMPLETAR LA INSTALACION. EL NO HACERLO ASI PUEDE CAUSAR LA RUPTURA DE LA TUBERIA, EL FALLO DE LA BOMBA, EL FALLO DE LOS COJINETES DEL MOTOR, ETC.

INSTALACION

1. Antes de instalar la bomba, permita que el aire acondicionado realice varios ciclos, recolectando la condensación en un contenedor separado para ayudar a vaciar cualquier aceite residual que pueda permanecer en el sistema.
2. Desempaque la bomba cuidadosamente. Quite el embalaje de cartón de los orificios de ventilación de la cubierta del motor. Retire el embalaje de la bomba, haciéndolo deslizar cuidadosamente. Este embalaje se usa para evitar el movimiento de los interruptores durante el transporte (Figura 1).
3. Montaje de la bomba: el tanque tiene dos ranuras, destinadas a montar la unidad. Las ranuras se encuentran situadas en el extremo de la cubierta del tanque (Figura 5). La unidad deberá montarse al lado de la unidad del acondicionador de aire o en una pared cercana a ella. La bomba deberá estar nivelada y la toma deberá encontrarse debajo de la bobina de drenaje. Los accesorios de tubo aislador no son compatibles con la caja plástica de la bomba.
4. La bomba no debería instalarse de tal forma que quede expuesta a salpicaduras o rociaduras.
5. Esta bomba no está preparada para usar dentro de la cámara impelente de aire.

CONEXIONES ELECTRICAS

¡ADVERTENCIA¡

1. Desconecte la corriente eléctrica en la caja de fusibles, antes de hacer cualquier conexión. El tendido de cables debe ajustarse totalmente a la legislación local.
2. Voltaje de la línea: conecte el cable eléctrico a una línea del voltaje especificado en el motor y en la placa del constructor. El cable eléctrico debe estar conectado a una fuente constante de electricidad (no un ventilador u otro dispositivo que funcione de manera intermitente). Si el cable eléctrico carece de enchufe, los cables son los siguientes: verde (o verde y amarillo)—a tierra; negro (o marrón)—circuito; blanco (o azul)—neutro.
3. Interruptor de seguridad: el interruptor de seguridad de exceso sobre la capacidad, debe encontrase conectado a un circuito de bajo voltaje de la clase II. Para controlar un circuito termostático, las conexiones COM y NO del interruptor de seguridad tienen que ser conectadas en serie con el circuito del termostato de bajo voltaje, para que apague el sistema de calefacción/aire acondicionado. Los contactos COM y NC del interruptor pueden usarse para activar un circuito de bajo voltaje de alarma (conectado en serie), si el sistema de calefacción/aire acondicionado no puede ser interrumpido. El interruptor de seguridad se suministra desde la fábrica con los cables conectados a los bornes COM y NO del interruptor. El prototipo de la conexión de los circuitos abiertos, sería (Figuras 2 & 3).
4. Si se utiliza un enchufe con fusible en unidades a 230 V, se recomienda el uso de un fusible de 1,0 amperio.

TUBERIA

1. Corra flexible tubería o pipe desde evaporator alcantarilla into 1 de el 3 bomba inlets. Cerciórese de que la tubería de la toma se encuentre en declive, para permitir el flujo por gravedad (Figura 4).
2. La tubería de descarga debe ser una tubería flexible o tubos de un diámetro interno máximo de 3/18 de pulgada, para evitar un reflujo excesivo a la unidad. Desde la unidad de agua de condensación, extienda la tubería directamente hacia arriba, a la altura que sea necesaria. No tienda esta tubería por encima

de la cabeza/GPH del modelo específico que se este instalando. Desde esta altura, coloque la tubería de descarga en declive ligero, hasta un punto por encima del área de drenaje. Luego, vuélvala hacia abajo y tiéndala hasta un punto que se encuentre aproximadamente al mismo nivel del fondo de la unidad de agua de condensación o por debajo de éste. Esto producirá un efecto de sifón, que incrementará la eficiencia de la unidad de agua de condensación, y en la mayoría de los casos eliminará la necesidad de una válvula de retención (Figura 5). Si no es posible colocar en declive la tubería de descarga, haga un purgador en forma de "U" invertida, directamente sobre la bomba, en el punto más alto.

INSTRUCCIONES DE SERVICIO

⚠ ¡ADVERTENCIA! ⚠

1. ¡Asegurese de que la unidad este desconectada de la fuenta de alimentacion electrica antes de intentar prestar servicio a la unidad o quitar cualquier componente de ella!
2. Asegúrese de que el flotador se mueva libremente. Limpie cuando sea necesario (Figura 6).
3. Limpie el tanque con agua caliente y con un jabón suave.
4. Verifique la tubería de entrada y salida. Limpie cuando sea necesario. Asegúrese de que no haya torceduras en la línea que puedan detener el paso del líquido.

COMPROBACION

1. Conecte la electricidad.
2. Quite el conjunto del motor y la cubierta del tanque y consérvelo nivelado.
3. Pruebe el interruptor del motor, levantando su flotador con el dedo (Figura 6). El motor deberá activarse, antes de que el flotador entre en contacto con la cubierta.
4. Pruebe el interruptor de seguridad, levantando su flotador con el dedo. El interruptor de seguridad deberá activarse, antes de que el flotador entre en contacto con la cubierta.
5. Vuelva a colocar sobre el tanque el conjunto de la cubierta del motor y la cubierta del tanque.

La bomba es adecuada para el uso en aguas de condensación de hornos de gas. Debe tenerse cuidado de verificar que la acidez del agua de condensación no aumente por debajo del nivel de acidez promedio de 3,4 (para evitar una bolsa de ácido) que actuaría como una pila, causando una corrosión localizada) limpiando o enjuagando rutinaria mente el tanque con agua limpia.

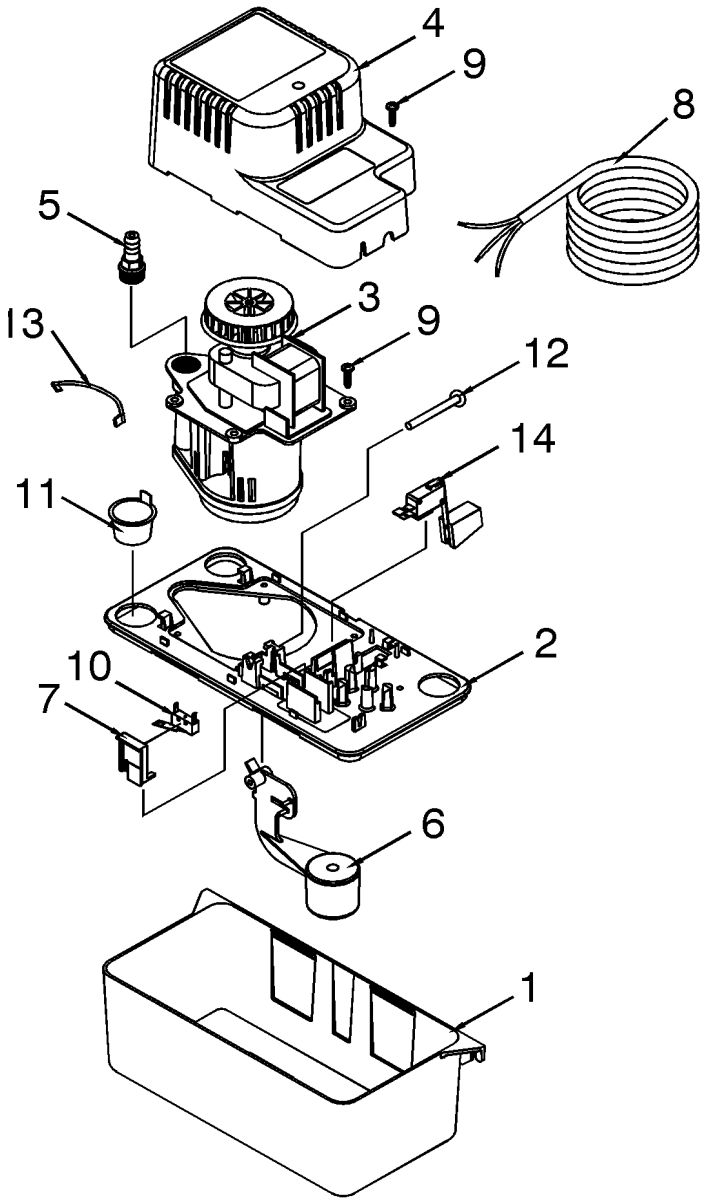


Figure 7

ITEM NO. REPERE ARTÍCULO	P/N	DESCRIPTION • DESCRIPTION • DESCRIPCIÓN	554481 VCMA-10	554401 VCMA-15UL	554405 VCMA-15ULS	554415 VCMA-15ULST	554411 VCMA-15ULT	554421 VCMA-20UL	554451 VCMA-20UL	554425 VCMA-20ULS	554455 VCMA-20ULS	554435 VCMA-20ULST	554461 VCMA-20ULST	554431 VCMA-20ULT	554471 VCMA-20S	554472 VCMA-20ST	554473 VCMA-20S
1	154401	Tank, Black, ABS • Réservoir, Noir, ABS • Tanque, Negra, ABS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	154411	Tank, Cover, ABS • Couvercle, Réservoir, ABS • Cubierta Del Tanque, ABS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	154491	Volute/Motor Assy. • Ensemble Volute/Moteur • Ensamblaje Voluta/Motor, 115V, 60Hz	--	1	1	1	1	--	--	--	--	--	--	--	--	--	--
	154492	Volute/Motor Assy. • Ensemble Volute/Moteur • Ensamblaje Voluta/Motor, 115V, 60Hz	--	--	--	--	--	1	--	1	--	1	--	1	--	--	--
	154493	Volute/Motor Assy. • Ensemble Volute/Moteur • Ensamblaje Voluta/Motor, 230V, 50/60Hz	--	--	--	--	--	--	1	--	1	--	1	--	1	1	1
	154494	Volute/Motor Assy. • Ensemble Volute/Moteur • Ensamblaje Voluta/Motor, 230V, 50Hz	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4	154421	Motor, Cover, ABS, Natural • Couvercle, Carter De Moteur, ABS, Naturel • Cubierta, Caja Del Motor, ABS, Natural	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	154708	Check Valve, 1/4" I.D. Tubing • Soupape D'arrêt, 1/4" I.D. Tube • Válvula De Retención, Tuberia de I.D. 1/4"	1	--	--	--	--	--	--	--	--	--	--	--	1	--	1
	154715	Check Valve, 3/8" I.D. Tubing • Soupape D'arrêt, 3/8" I.D. Tube • Válvula De Retención, Tuberia de I.D. 3/8"	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	154452	Float Arm • Bras Du Flotteur • Brazo Del Flotante	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	154471	Switch Holder, ABS, Natural • Support De L'interrupteur, ABS, Naturel • Portador De Interruptor, ABS, Natural	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	951604	Wiring Harness Assy., 115V, 6' With Terminals • Montage Faisceau De Câbles, 6 Pieds (15 Cm) Avec Bornes • Conjunto De Colector De Cables, 6 Pies Con Bornes	--	1	1	1	1	1	--	1	--	1	--	1	--	--	--
	951606	Wiring Harness Assy., 230V, 6' With Terminals • Montage Faisceau De Câbles, 6 Pieds (1.8m) Avec Bornes • Conjunto De Colector De Cables, 6 Pies Con Bornes	--	--	--	--	--	--	1	--	1	--	1	--	--	--	--
	951089	Wiring Harness Assy., 230V, 6' With Terminals • Montage Faisceau De Câbles, 6 Pieds (1.8m) Avec Bornes • Conjunto De Colector De Cables, 6 Pies Con Bornes	1	--	--	--	--	--	--	--	--	--	--	--	1	1	--
	951088	Wiring Harness Assy., 230V, 3m With Terminals Ho5vv-F • Montage Faisceau De Câbles, 3m Avec Bornes • Conjunto De Colector De Cables, 3 Metros Con Bornes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
9	902414	Tapping Screw • Vis Taraudée • Tornillo, Rosca Macho, 8-18 x 5/8"	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
10	950337	Switch • Commutateur • Interruptor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	929602	Drain Hole Plug • Bouchon, Orifice D'écoulement • Tapón Agujero De Desagüe	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	154455	Float Pivot Pin • Axe De Pivotement Du Flotteur • Pasador De Pivote De Flotante	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	951941	Lead Wire Assy. • Assemblage Fils Plumbés • Conjunto De Hilos Conductores	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	154465	Safety Switch Assy. • Montage Interrupteur De Sécurité • Conjunto De Interruptor De Seguridad	--	--	1	1	--	--	--	1	1	1	1	--	1	1	1
15	944302	Tubing (not shown) • Tube (non illustré) • Tuberia, 3/8" x 1/2" x 20' (no se muestra)	--	--	--	1	1	--	--	--	--	1	1	1	--	1	--

Table 1

LIMITED WARRANTY

Your product is guaranteed to be in perfect condition when it leaves our factory. It is warranted against defective materials and workmanship for a period of 12 months from date of purchase by the user.

Any product that should fail for either of the above two reasons and is still within the warranty period will be repaired or replaced at the option of Little Giant as the sole remedy of buyer. For our customers in the CONTINENTAL UNITED STATES: Please return the defective unit, postage paid, to the factory at 301 North MacArthur Blvd., Oklahoma City, OK 73127-6616. All defective product returned under warranty will be fully inspected to determine the cause of failure before warranty is approved.

For our customers located elsewhere; it is not economical, due to duties and freight, to return the pump to the factory for inspection. Please return the defective unit to any authorized distributor or dealer with a brief written explanation of the problem. If there are no apparent signs of customer abuse, unit will be repaired or replaced. If dispute arises over replacement of the pump, the distributor or dealer is to segregate such items and hold for inspection by a representative of Franklin Electric Co., Inc. or notify factory with details of the problem for factory disposition and settlement of warranty claim.

DISCLAIMER: THE FOREGOING WARRANTY IS AN EXCLUSIVE WARRANTY IN LIEU OF ANY OTHER EXPRESS WARRANTIES. ANY IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) TO THE EXTENT EITHER APPLIES TO A PUMP SHALL BE LIMITED IN DURATION TO THE PERIODS OF THE EXPRESS WARRANTIES GIVEN ABOVE.

Warranty will be **VOID** if any of the following conditions are found:

1. Sealed motor housing opened.
2. Product connected to voltage other than indicated on nameplate.
3. Cord cut off to a length less than three feet.
4. Pump allowed to operate dry (fluid supply cut off).
5. Pump used to circulate anything other than water.
6. Product abuse by customer.

Any oral statements about the product made by the seller, the manufacturer, the representatives or any other parties, do not constitute warranties, shall not be relied upon by the user and are not part of the contract for sale. Seller's and manufacturer's only obligation, and buyer's only remedy, shall be the replacement and/or repair by the manufacturer of the product as described above. NEITHER SELLER NOR THE MANUFACTURER SHALL BE LIABLE FOR ANY INJURY, LOSS OR DAMAGE, DIRECT, INCIDENTAL OR CONSEQUENTIAL (INCLUDING, BUT NOT LIMITED TO INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS), ARISING OUT OF THE USE OR THE INABILITY TO USE THE PRODUCT AND THE USER AGREES THAT NO OTHER REMEDY SHALL BE AVAILABLE TO IT. Before using, the user shall determine the suitability of the product for the intended use, and user assumes all risk and liability whatsoever in connection therewith.

Some states and countries do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and country to country.

The National Electric Code (in the USA) and similar codes in other countries require a Ground Fault Circuit Interrupter (GFCI) to be installed in the branch circuit supplying fountain equipment rated above 15 volts. 115 volt GFCI's (with various cord lengths) are in stock, and we recommend each pump be used with a GFCI.

GARANTIE LIMITÉE

La présente garantit que votre pompe est en parfaite condition à sa sortie de l'usine. La pompe est garantie contre tout défaut de matériau ou de fabrication pendant une période de 12 mois à partir de la date d'achat initial.

Tout produit encore garanti qui serait défectueux pour l'une des deux raisons susmentionnées sera réparé ou remplacé à la discrétion du Little Giant. L'acheteur n'aura pas d'autre recours. Pour nos clients aux ÉTATS-UNIS (territoire continental seulement) : Veuillez retourner l'article défectueux suffisamment affranchi à l'usine à l'adresse suivante 301 North MacArthur Blvd., Oklahoma City, OK 73127-6616. Tous les produits garantis retournés feront l'objet d'une inspection détaillée afin de déterminer si la défectuosité est couverte par la garantie. Pour les clients à l'extérieur des États-Unis : étant donné les frais de douane et de transport, il n'est pas économique de retourner la pompe à l'usine pour inspection. Expédier la pompe ainsi qu'une brève description du problème à tout distributeur ou détaillant autorisé. Si elle ne présente aucun signe apparent d'une mauvaise utilisation, elle sera remplacée ou réparée. S'il y a conflit sur la nécessité de remplacer la pompe, le distributeur ou le détaillant devra garder celle-ci et, soit la fera inspecter par un représentant du le Fabricant, soit avisera l'usine du problème afin de connaître la décision de celle-ci et le règlement de la réclamation.

DÉNÉGATION : LA GARANTIE ÉNONCÉE DANS LES PRÉSENTES EST EXCLUSIVE ET REMPLACE TOUTE AUTRE GARANTIE EXPRESSE OU IMPLICITE; CELA COMPORTE, MAIS NON EXCLUSIVEMENT, TOUTE GARANTIE IMPLICITE

D'APTITUDE À LA COMMERCIALISATION OU D'APTITUDE PARTICULIERE, POUVANT S'APPLIQUER À UNE POMPE LITTLE GIANT. DE PLUS, ELLE NE S'APPLIQUE QUE DURANT LA PÉRIODE DE COUVERTURE PRÉCISÉE CI-DEVANT.

La présente garantie sera **ANNULÉE** si :

1. Le boîtier scellé du moteur a été ouvert;
2. Le branchement à une tension autre que celle indiquée sur la plaque du fabricant a été effectué;
3. Le fil d'alimentation a été coupé à une longueur inférieure à 0,91 m (trois pieds);
4. La pompe a tourné à vide (l'alimentation en liquide a été coupée);
5. La pompe a été utilisée pour faire circuler des liquides autres que de l'eau;
6. La pompe a été mal utilisée.

Toute déclaration sur la pompe faite oralement par le vendeur, le fabricant, le représentant ou par toute autre partie ne constitue pas une garantie et, par conséquent, ne peut servir à l'utilisateur. De plus, une telle déclaration ne peut, en aucun cas, faire partie du contrat de vente. L'unique obligation du vendeur et du fabricant, et l'unique recours de l'acheteur, est le remplacement ou la réparation de la pompe selon les modalités décrites précédemment. NI LE VENDEUR NI LE FABRICANT NE PEUVENT ÊTRE TENUS RESPONSABLES DE TOUTE BLESSURE, TOUTE PERTE, OU TOUT DOMMAGE DIRECT, INDIRECT OU ACCESSOIRE (INCLUANT, MAIS NON EXCLUSIVEMENT, LES VENTES OU PROFITS PERDUS, LES ATTEINTES AUX PERSONNES OU À LA PROPRIÉTÉ OU TOUTE AUTRE PERTE INDIRECTE OU ACCESSOIRE) RÉSULTANT DE L'UTILISATION OU DE L'INCAPACITÉ D'UTILISATION DE LA POMPE, ET L'ACHETEUR CONVIENT QU'IL NE DISPOSE D'AUCUN AUTRE RECOURS. L'acheteur doit s'assurer que la pompe convient à l'usage projeté; il assume aussi tout risque et toute responsabilité relativement à cet usage.

Certaines juridictions ne permettent pas la limitation de la durée d'une garantie ou l'exclusion ou la limitation de responsabilité pour des dommages indirects ou accessoires. Par conséquent, il est possible que la limitation ou l'exclusion indiquée précédemment puisse ne pas être applicable. Cette garantie vous donne des droits particuliers et peut-être d'autres, dépendamment des juridictions en vigueur.

Le code national de l'électricité et autres codes semblables d'autres pays exigent l'installation d'un interrupteur avec mise à la terre (GFI) sur le circuit d'alimentation de la fontaine pour toute installation dont la tension est supérieure à 15 volts. Nous offrons de tels interrupteurs (avec différentes longueurs de fil) et nous recommandons que chaque pompe soit reliée à un interrupteur de ce type.

GARANTIA LIMITADA

El producto que Little Giant le ofrece está garantizado a estar en perfectas condiciones al momento de salir de la fábrica. El producto está garantizado contra materiales y fabricación defectuosa por un período de 12 meses desde la fecha en la cual fue comprada por el usuario.

Cualquier producto que falle por alguna de las dos razones anteriores y que esté dentro del período de garantía será reparado o reemplazado a opción de Little Giant y éste será el único remedio del comprador. Para nuestros clientes en los ESTADOS UNIDOS CONTINENTALES: Por favor, devolver la unidad defectuosa, con el porte pagado, a la fábrica en 301 North MacArthur Blvd., Oklahoma City, OK 73127-6616. Todo producto defectuoso devuelto bajo la garantía será cuidadosamente inspeccionado para determinar la causa de la falla antes de aprobar la garantía. Para nuestros clientes ubicados en otros lugares; no es económico devolver la bomba a la fábrica para que ésta sea inspeccionada, debido a los impuestos y al flete.

Por favor, devuelva la unidad defectuosa a cualquier distribuidor o vendedor autorizado con una breve explicación por escrito del problema. Si no existen señas aparentes de abuso por parte del cliente, la unidad será reemplazada o reparada. Si se produce una disputa sobre el reemplazo de la bomba, el distribuidor o vendedor debe separar los artículos y retenerlos para que sean inspeccionados por un representante de Franklin Electric Co., Inc. o avisarle a la fábrica de los detalles del problema para que la fábrica disponga de las acciones necesarias y resuelva el reclamo de la garantía.

DESAUTORIZACION: LA GARANTIA ANTERIOR ES UNA GARANTIA EXCLUSIVA EN LUGAR DE CUALQUIER OTRA GARANTIA EXPRESA. CUALQUIER GARANTIA IMPLICADA (INCLUYENDO PERO NO LIMITADO A CUALQUIER GARANTIA IMPLICADA DE COMERCIALIZACION O APTITUD PARA PROPOSITO PARTICULAR) EN LA MEDIDA EN QUE SE PUEDA APLICAR A UNA BOMBA, QUEDARA LIMITADA EN DURACION A LOS PERIODOS DE GARANTIAS PROPORCIONADOS ANTERIORMENTE.

La garantía será declarada NULA si se encuentran cualesquiera de las siguientes condiciones:

1. El alojamiento sellado del motor abierto.
2. El producto conectado a un voltaje que no es el indicado en la placa principal.
3. El cable cortado a menos de tres pies (0,91 m.).
4. Se permitió que la bomba opere en seco (envío de fluido cortado).
5. La bomba empleada para hacer circular cualquier otra sustancia que no sea agua.
6. Abuso del producto por parte del cliente.

Cualquier declaración oral acerca del producto hecha por el vendedor, fabricante, representantes o cualquiera de las partes, no constituyen garantías, el usuario no debe confiarse de ellas, y no forman parte del contrato de compra-venta. La única obligación del vendedor y del fabricante y el único remedio para el comprador, será la reposición y/o reparación del producto por parte del fabricante bajo las condiciones descritas anteriormente.

NI EL VENDEDOR NI EL FABRICANTE SE HACEN RESPONSABLES DE NINGUNA LESION, PERDIDA O DAÑO, DIRECTO, INCIDENTAL O CONSECUENTE (INCLUYENDO, PERO SIN LIMITARSE A, DAÑOS INCIDENTALES O CONSECUENTES DEBIDO A GANANCIAS PERDIDAS, VENTAS PERDIDAS, DAÑOS A PERSONAS O PROPIEDADES O CUALQUIER OTRA PERDIDA INCIDENTAL O CONSECUENTE), QUE RESULTE DEL USO O DE LA IMPOSIBILIDAD DEL USO DEL PRODUCTO, Y EL COMPRADOR ACUERDA QUE NO EXISTE OTRO REMEDIO DISPONIBLE PARA EL. Antes de usar, el usuario debe determinar si el producto se adapta al uso deseado, y el usuario asume todos los riesgos y responsabilidades en relación a ello.

Algunos estados y países no permiten limitaciones sobre la duración de una garantía implícita o la exclusión o limitación de daños incidentales o consecuentes, de manera que las limitaciones o exclusiones anteriores podrían no tener aplicación en su caso. Esta garantía le da derechos legales específicos, y usted podría disponer también de otros derechos que varían de un estado a otro y de un país a otro.

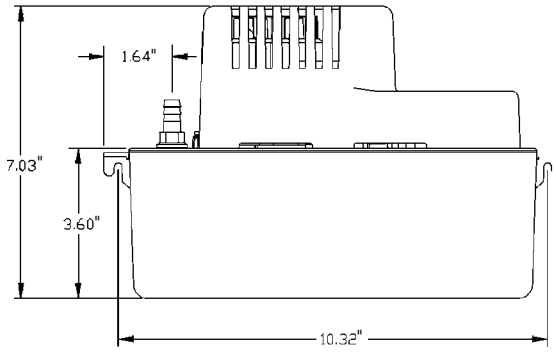
El Código Eléctrico Nacional (en los Estados Unidos) y códigos similares en otros países requieren un Interruptor de circuito de falla de conexión a tierra (GFCI) para ser instalado en el circuito secundario que suministra equipo de fuente calibrado por encima de 15 voltios. En el almacén se encuentran GFCI de 115 voltios (con varias longitudes de cable), y recomendamos que cada bomba sea usada con un GFCI.

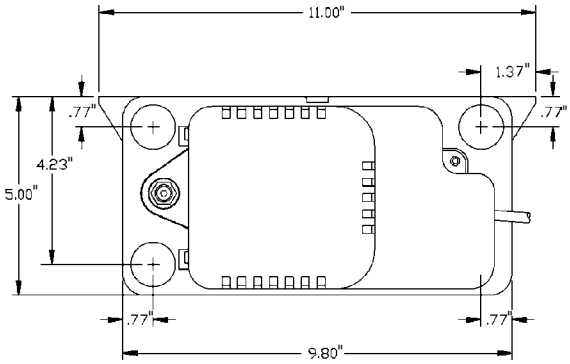
For parts or repair, please contact 1.888.572.9933
For technical assistance, please contact 1.888.956.0000
Pour des parties ou la réparation,
entrez s'il vous plaît en contact 1.888.572.9933
Pour l'aide technique, entrez s'il vous plaît en contact 1.888.956.0000
Para partes o la reparación,
por favor póngase en contacto 1.888.572.9933
Para la ayuda técnica, por favor póngase en contacto 1.888.956.0000

www.LittleGiantPump.com
CustomerService-WTS@fele.com

Form 998086 - 07/22/2009

Engineering Data





Specifications

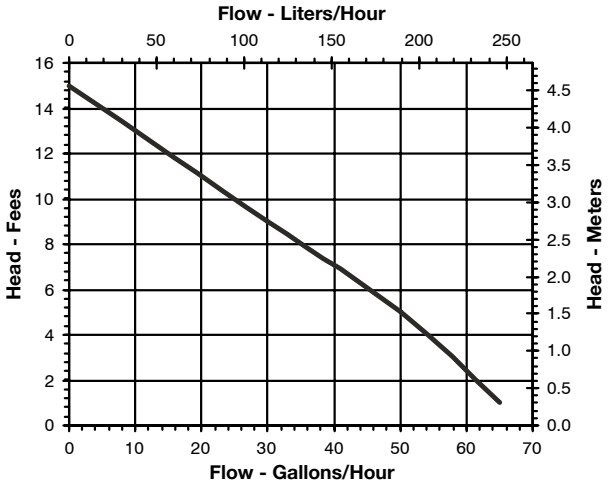
Item No.	Model No.	Discharge Size	HP	Volts	Hertz	Amps	Watts	Performance (GPH@Head)				Shutoff		Cord Length (ft)	Weight (lbs)
								1'	5'	10'	20'	Ft	PSI		
554401	VCMA-15UL	3/8" OD Barbed	1/50	115	60	1	60	65	50	25	0	15	6.5	6	4.40
554411	VCMA-15ULT	3/8" OD Barbed	1/50	115	60	1	60	65	50	25	0	15	6.5	6	5.80
554405	VCMA-15ULS	3/8" OD Barbed	1/50	115	60	1	60	65	50	25	0	15	6.5	6	4.40
554415	VCMA-15ULST	3/8" OD Barbed	1/50	115	60	1	60	65	50	25	0	15	6.5	6	5.80

NOTE: GPH is through check valve.

Replacement Parts

Item	Part Number
Tank	154401
Cover, motor	154421
Float arm	154452
Switch holder	154471
Switch	950337
Check valve	154715

Performance Data



Franklin Electric

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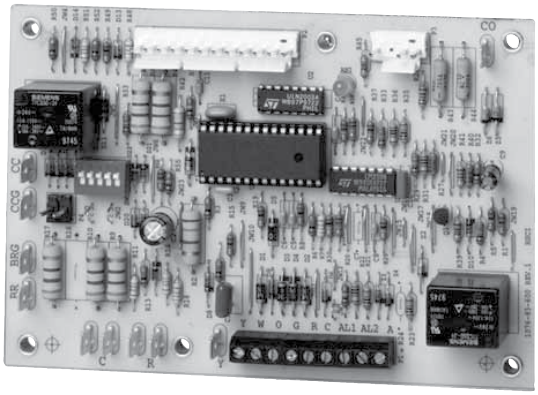
Oklahoma City, OK 73157-2010
Phone: 1.800.701.7894
Fax: 1.800.678.7867
www.LittleGiantPump.com

Form 995124 – 08/12

CXM CONTROLS



CXM Digital

Heat Pump Controller

Application, Operation & Maintenance

97B0003N12
Rev.: March 30, 2017

CXM Unit Control

Rev.: March 30, 2017

CXM Electronic Heat Pump Control

CXM Overview
The CXM electronic control is a microprocessor based heat pump controller that is simple to use, yet provides all the necessary features to improve the operation and safety of water source heat pumps.

CXM Controller Part Number:
17B0001N01 CXM Control Board

General Operating Parameters

The following are general operating parameters for the CXM control:
- Operating Environment: -40°F to 176°F and up to 95% relative humidity, non-condensing.
- Storage Environment: -40°F to 185°F and up to 95% relative humidity, non-condensing.

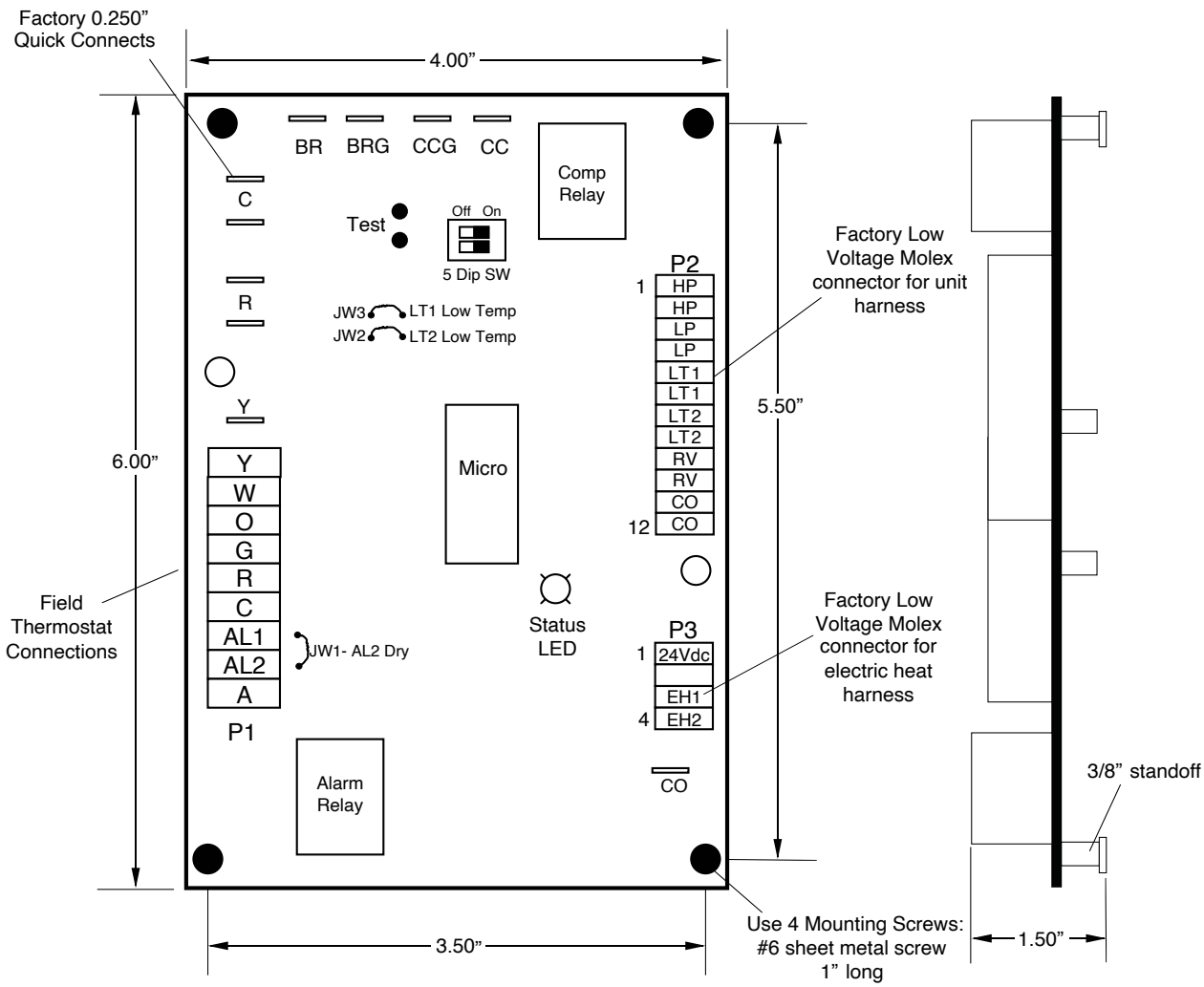
Power Requirements:
- CXM only power draw -
- Normally 5 VA draw at 24VAC.
- Maximum 9 VA draw at 24VAC.
- A dedicated 24VAC, 50-60Hz, 1Ph, 40VA transformer minimum is required for typical WSHP application.

Relay Contact Ratings
The following relays are mounted on the CXM control:
- Compressor Relay: 40VA at 24VAC.
- Alarm Relay: 28VA at 24VAC.

Grounding
The control board is grounded through two of the metal standoffs.
Field connection ratings for the CXM control:
'A' terminal: 20VA at 24VAC.

Product Specification Features
- Anti-short cycle protection
- High and low pressure cutouts
- Water coil low temperature cut-out
- Air coil low temperature cut-out
- Random start
- Unit Performance Sentinel
- Over/under voltage protection
- Diagnostic LED
- Reset lockout at unit or disconnect
- Intelligent reset
- Condensate overflow sensor
- Test Mode
- Electric heat outputs
- Accessory water valve connection

CXM Physical Dimensions & Layout



CXM Controls

Field Selectable Inputs

Test Mode - Test Mode allows the service personnel to check the operation of the control in a timely manner. By momentarily shorting the test terminals, the CXM control enters a 20 minute Test Mode period in which all time delays are sped up 15 times. Upon entering Test Mode, the Status LED will flash a code representing the last fault. For diagnostic ease at the thermostat, the Alarm Relay will also cycle during Test Mode. The Alarm Relay will cycle on and off similar to the status LED to indicate a code representing the last fault, at the thermostat.

Note: Code 1 indicates there is no fault in memory; stated differently, the control has not faulted since the last power-down to power-up sequence.

Test Mode can be exited by shorting the test terminals for 3 seconds.Test Mode can also be entered and exited by cycling the G input, 3 times within a 60 second time period.
During Test Mode, the control monitors to see if the LT1 and LT2 thermistors are in the appropriate place. If the control is in Test Mode, the control will lockout with Code 9 after 30 seconds if:
the compressor is On in Cooling Mode and the LT1 sensor is colder than the LT2 sensor, or,
the compressor is On in Heating Mode and the LT2 sensor is colder than the LT1 sensor.

Table 1: LED & Alarm Relay Operations

Description of Operation	LED	Alarm
Normal Mode	ON	Open
Normal Mode w/UPS Warning	ON	Cycle (Closed 5 seconds, Open 25 seconds)
CXM is non-functional	OFF	Open
Fault Retry	Slow Flash	Open
Lockout	Fast Flash	Closed
Over/Under Voltage Shutdown	Slow Flash	Open (Closed after 15 Minutes)
Test Mode - No Fault in Memory	Flashing Code 1	Cycling Code 1
Test Mode - HP Fault in Memory	Flashing Code 2	Cycling Code 2
Test Mode - LP Fault in Memory	Flashing Code 3	Cycling Code 3
Test Mode - LT1 Fault in Memory	Flashing Code 4	Cycling Code 4
Test Mode - LT2 Fault in Memory	Flashing Code 5	Cycling Code 5
Test Mode - CO Fault in Memory	Flashing Code 6	Cycling Code 6
Test Mode - Over/Under Shutdown in Memory	Flashing Code 7	Cycling Code 7
Test Mode - UPS in Memory	Flashing Code 8	Cycling Code 8
Test Mode - Swapped Thermistor	Flashing Code 9	Cycling Code 9

Special Notes and Examples:
- Slow Flash = 1 flash every 2 seconds
- Fast Flash = 2 flashes every 1 second
- Flash code 2 = 2 quick flashes, 10 sec. pause, 2 quick flashes, 10 sec. pause, etc.
- On pulse 1/3 sec.; off pulse 1/3 sec.

Retry Mode - If the control is attempting a retry of a fault, the status LED will slow flash (slow flash = one flash every 2 seconds) to indicate the control is in process of retrying.

Note: In the following field configuration options, jumper wires should be clipped ONLY when power is removed from the CXM control.

Water Coil Low Temperature Cut-Out Limit Setting - Jumper 3 (JW3-LT1 Low Temp) provides field selection of temperature limit setting for LT1 to be 30°F or 10°F.

Not Clipped = 30°F. Clipped = 10°F.

Air Coil Low Temperature Cut-Out Limit Setting - Jumper 2 (JW2-LT2 Low Temp) provides field selection of temperature limit setting for LT2 to be 30°F or 10°F.

Not Clipped = 30°F. Clipped = 10°F.

Alarm Relay Setting - Jumper 1 (JW1-AL2 Dry) provides field selection of Alarm Relay terminal AL2 to be jumpered to 24VAC or to be dry (no connection).
Not Clipped = AL2 connected to R. Clipped = AL2 dry contacts (no connection).

DIP Switches

Note: In the following field configuration options, DIP switches should only be moved when power is removed from the CXM control, to ensure proper operation.

DIP Switch 1: Unit Performance Sentinel Disable - provides field selection to disable the UPS feature.
On = Enabled. Off = Disabled.

DIP Switch 2: Stage 2 Selection - provides selection of whether the compressor has an on delay. If set to stage 2, the compressor will have a 3 second delay before energizing. Also, if set for stage 2, the Alarm Relay will NOT cycle during Test Mode.
On = Stage 1. Off = Stage 2

DIP Switch 3: - Not Used.

DIP Switch 4: DDC Output at EH2 - provides selection for DDC operation. If set to DDC Output at EH2, the EH2 terminal will continuously output the last fault code of the controller. If set to EH2 Normal, then the EH2 will operate as standard electric heat output.

On = EH2 Normal. Off = DDC Output at EH2.

NOTE: Some CXM controls only have a 2 position DIP switch package. If this is the case, then this option can be selected by clipping the jumper which is in position 4 of SW1:

Jumper not clipped = EH2 Normal. Jumper clipped = DDC Output at EH2.

DIP Switch 5: Factory Setting - Normal position is ON. Do not change selection unless instructed to do so by the Factory.

Safety Features
The following safety features are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

Anti-Short Cycle Protection - The control features a 5 minute anti-short cycle protection for the compressor. **Note: The 5 minute anti-short cycle also occurs at power up**.

Random Start - The control features a 5-80 second random start upon power up.

Extended Compressor Operation Monitoring - If the compressor relay has been on for 4 continuous hours, then the control will automatically turn off the compressor relay and wait the short cycle protection time. All appropriate safeties including the LP will be monitored during the off time. If all operation is normal, and if the compressor demand is still present, the control will turn the compressor back on.

Fault Retry - In Fault Retry Mode, the Status LED begins slow flashing to signal that the control is trying to recover from a fault input. The CXM control will stage off the outputs and then "try again" to satisfy the thermostat "Y" input call. Once the thermostat input calls are satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat "Y" input call, then the control will go into Lockout Mode. The last fault causing the lockout will be stored in memory and can be viewed by going into Test Mode.
Note: LT1 and LT2 faults are factory set for for one try, so there will be no "retries" for LT1 and LT2 faults. The control will only try one time for these faults.

Lockout - In Lockout Mode, the Status LED will begin fast flashing. The compressor relay is turned off immediately.

⚠ CAUTION! ⚠

CAUTION! Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

Lockout Mode can be soft reset via the thermostat "Y" input or can be hard reset via the disconnect. The last fault causing the lockout will be stored in memory and can be viewed by going into Test Mode.

Lockout with Emergency Heat - While in Lockout Mode, if W becomes active, then Emergency Heat Mode will occur.

High Pressure Switch - When the high pressure switch opens due to high refrigerant pressures, the compressor relay is de-energized immediately since the high pressure switch is in series with the compressor contactor coil. The High Pressure Fault recognition is immediate as well.

High Pressure Lockout Code = 2
Example: 2 quick flashes, 10 sec. pause, 2 quick flashes, 10 sec. pause, etc.

Low Pressure Switch - The low pressure switch must be open and remain open for 30 continuous seconds during ON cycle to be recognized as a Low Pressure fault. If the low pressure switch is open for 30 seconds prior to compressor power up it will be considered a low pressure (loss of charge) fault. The low pressure switch input is bypassed for the initial 120 seconds of a compressor run cycle.

Low Pressure Lockout Code = 3

Water Coil Low Temperature Cut-Out Limit (LT1) - The control will recognize an LT1 fault, during a compressor run cycle if:

a) the thermistor temperature is below the selected low temperature protection limit setting, and,
b) the thermistor temperature is rising (getting warmer) at a rate LESS than 2°F per 30 second time period. The LT1 input is bypassed for the initial 120 seconds of a compressor run cycle.

LT1 Lockout Code = 4

Air Coil Low Temperature Cut-Out Limit (LT2) - The control will recognize an LT2 fault, during a compressor run cycle if:

a) the thermistor temperature is below the selected low temperature protection limit setting, AND
b) the thermistor temperature is rising (getting warmer) at a rate LESS than 2F per 30 second time period.

The LT2 input is bypassed for the initial 120 seconds of a compressor run cycle.

LT2 Lockout Code = 5

Condensate Overflow - The Condensate Overflow sensor must sense overflow levels for 30 continuous seconds to be recognized as a CO fault. Condensate Overflow will be monitored during compressor run cycle.

CO Lockout Code = 6

Over/Under Voltage Shutdown - An Over/Under Voltage condition exists when the control voltage is outside the range of 18VAC to 31.5VAC. Over/Under Voltage Shutdown is self resetting in that if the voltage comes back within range of 18.5VAC to 31VAC for at least 0.5 seconds, then normal operation is restored. This is not considered a fault or lockout. If the CXM is in Over/Under Voltage Shutdown for 15 minutes, the Alarm Relay will close.

Over/Under Voltage Shutdown Code = 7

Unit Performance Sentinel - UPS (patent pending) - The UPS feature warns when the heat pump is operating inefficiently. A UPS condition exists when:

a) in Heating Mode with compressor energized, if LT2 is greater than 125°F for 30 continuous seconds, or
b) in Cooling Mode with compressor energized, if LT1 is greater than 125°F for 30 continuous seconds, OR LT2 is less than 40°F for 30 continuous seconds.

If a UPS condition occurs, the control will immediately go to UPS warning. The status LED will remain on as if the control is in Normal Mode. (see "LED and Alarm Relay Operation Table"). Outputs of the control, excluding LED and Alarm Relay, will NOT be affected by UPS. The UPS condition cannot occur during a compressor off cycle. During UPS warning, the Alarm Relay will cycle on and off. The cycle rate will be On for 5 seconds, Off for 25 seconds, On for 5 seconds, Off for 25 seconds, etc.

Unit Performance Sentinel Warning Code = 8

Swapped LT1/LT2 Thermistors - During Test Mode, the control monitors to see if the LT1 and LT2 thermistors are in the appropriate place. If the control is in Test Mode, the control will lockout, with Code 9, after 30 seconds if:

a) the compressor is On in Cooling Mode and the LT1 sensor is colder than the LT2 sensor. Or,
b) the compressor is On in Heating Mode and the LT2 sensor is colder than the LT1 sensor.

Swapped LT1/LT2 Thermistor Code = 9.

Diagnostic Features - The Status LED on the CXM control advises the serviceman of the current status of the CXM control. The status LED can display either the current CXM Mode or the last fault memory if in Test Mode. See Table 1 for a complete listing of codes. If the fault type is "Primary" (HP, LP, LT1, LT2, or CO) then the fault type will always be retained in memory (Primary faults will overwrite Secondary faults). If the fault type is "Secondary" (Over/Under Voltage, UPS or Swapped LT1/LT2) then the fault type will only be retained if there are no "Primary" faults in memory. The Secondary fault types will not "overwrite" the Primary fault memory.

Unit Operation Description

PowerUp - The unit will not operate until all the inputs and safety controls are checked for normal conditions. **Note: The compressor will have a 5 minute anti-short cycle delay at power-up.**

Standby - In Standby Mode, Y and W inputs are not active. Inputs O and G may be active. Compressor will be off.

Cooling - To enter Cooling Mode, Y and O become active. The first time after power-up that there is a call for compressor, the compressor will follow a 5 to 80 second random start delay. There will also be a 5 minute compressor anti-short cycle protection time as well. After the random start delay and the anti-short cycle delay, the compressor relay is energized. On all subsequent compressor calls, the random start delay is omitted.

Heating Stage 1 - To enter Heating Stage 1 Mode, Y becomes active. The first time after power-up that there is a call for compressor, the compressor will follow a 5 to 80 second random start delay. There will also be a 5 minute compressor anti-short cycle protection time as well. After the random start delay and the anti-short cycle delay, the compressor relay is energized. On all subsequent compressor calls, the random start delay is omitted.

Heating Stage 2 - To enter Heating Stage 2 Mode, W becomes active (Y already active). The G input must be active or the W input is ignored. The compressor relay remains on. EH1 is turned on immediately. With continuing Heating Stage 2 demand, EH2 will turn on after 10 minutes. The EH2 will not turn on (or will turn off if already on) if LT1 temperature is greater than 45°F and LT2 is greater than 110°F.

Emergency Heat - In Emergency Heat Mode, W becomes active while Y is not active. The G input must be active or the W input is ignored. EH1 is turned on immediately. With continuing Emergency Heat demand, EH2 will turn on after 5 minutes. The LT1 and LT2 temperatures do not effect emergency heat operation.

Table 1a: Fault Description Table

Fault	Fault LED Code	Fault Condition
No Fault in Memory	1	There has been no fault detected since the last power down/power up sequence
High Pressure Switch	2	HP Open Instantly
Low Pressure Switch or LOC	3	LP open for 30 continuous seconds before or during a call (bypassed for first 120 seconds)
Low Temperature Cut-Out Coax - LT1	4	LT1 below Temp limit for 30 continuous seconds (bypassed for first 120 seconds of operation)
Low Temperature Cut-Out Aircoil - LT2	5	LT2 below Temp limit for 30 continuous seconds (bypassed for first 120 seconds of operation)
Condensate Overflow	6	Sense overflow (grounded) for 30 continuous seconds
Over/Under Voltage Shutdown	7 (Autoreset)	“R” power supply is <18VAC or >31.5VAC
UPS Warning	8	Unit Performance Warning signal has occurred
Swapped LT1/LT2	9	LT1 and LT2 are in reversed positions

CXM Unit Control

Rev.: March 30, 2017

Engineering Guide Specifications

The following engineering guide specifications for the CXM control should be a part of all product submittals.

CXM Control

A microprocessor-based compressor controller (CXM) shall be provided to monitor and control unit operation. The control shall provide compressor and electric heater sequencing, high and low pressure monitoring, field selectable water and air coil low temperature cut-out sensing, condensate overflow sensing, over/under voltage monitoring, and unit performance sentinel. The control shall also provide for water valve connection, a Test Mode, short cycle protection, random start-up, as well as fault LED, fault memory, and intelligent fault retry. The control shall employ a quick attach harness assembly for low voltage connections to the CXM control board to aid in troubleshooting or replacement. An integral terminal block with screw terminals shall be provided on the CXM control for all field low voltage connections.

CXM Service & Application Notes

CXM Sensors

Pressure Switches
All pressure switches are designed to be normally closed during normal operating conditions, and to open upon fault.

Condensate Sensor
The Condensate Sensor input will fault upon sensing impedance less than 100,000 Ohms for 30 continuous seconds. The recommended design uses a single wire terminated with a male 1/4" quick connect located in the drain pan at desired trip level. Upon a high condensate level the water will short between the air coil and the quick connect producing a resistance less than 100,000 Ohms. Since condensate is free of impurities, it has no conductivity. Only the impurities from the drain pan and coil dust or dirt create the conductance. A second ground wire with appropriate terminal to the drain pan can be used with the control to replace the air coil ground path. The Condensate Sensor can also essentially be any open contact that closes upon a fault condition.

Thermistor Temperature Sensors
The thermistor is available in the following configurations shown in Table 2. The thermistor is an NTC (negative temperature coefficient) type. The sensor has a 1% tolerance and follows the Table 2 and Chart 2 shown. Table 4 shows the nominal resistance at any given temperature and can be used for field service reference. The sensor will use a minimum of 24 awg wire and be epoxy embedded in the beryllium copper clip.

Table 2: 1% Sensor Calibration Points

Temp (°F)	Minimum Resistance (Ohm)	Maximum Resistance (Ohm)	Nominal Resistance (Ohm)
78.5	9523	9715	9619
77.5	9650	9843	9746
76.5	10035	10236	10135
75.5	10282	10489	10385
33.5	30975	31598	31285
32.5	31871	32512	32190
31.5	32653	33310	32980
30.5	33728	34406	34065
1.5	80624	82244	81430
0.5	83327	85002	84160
0.0	84564	86264	85410

Chart 1: Thermistor Nominal Resistance

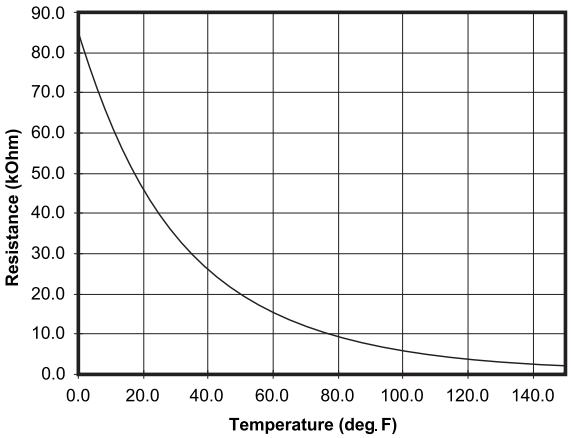


Table 3: Replacement Thermistor LT1, LT2 Part Numbers

Thermistor Type	Tube OD	Lead Length (in.)			
		36	48	96	192
LT1 (Gray)	3/8, 1/2	17B0027N06	N/A	17B0027N04	N/A
	5/8, 7/8	N/A	N/A	17B0026N01	N/A
LT2 (Violet)	3/8, 1/2	N/A	17B0026N02	N/A	17B0005N05
	5/8, 7/8	N/A	N/A	N/A	17B0026N02

Table 4: Nominal Resistance at Various Temperatures

Temp (ºC)	Temp (ºF)	Resistance (kOhm)	Temp (ºC)	Temp (ºF)	Resistance (kOhm)
-17.8	0.0	85.34	55	131.0	2.99
-17.5	0.5	84.00	56	132.8	2.88
-16.9	1.5	81.38	57	134.6	2.77
-12	10.4	61.70	58	136.4	2.67
-11	12.2	58.40	59	138.2	2.58
-10	14.0	55.30	60	140.0	2.49
-9	15.8	52.38	61	141.8	2.40
-8	17.6	49.64	62	143.6	2.32
-7	19.4	47.05	63	145.4	2.23
-6	21.2	44.61	64	147.2	2.16
-5	23.0	42.32	65	149.0	2.08
-4	24.8	40.15	66	150.8	2.01
-3	26.6	38.11	67	152.6	1.94
-2	28.4	36.18	68	154.4	1.88
-1	30.2	34.37	69	156.2	1.81
0	32.0	32.65	70	158.0	1.75
1	33.8	31.03	71	159.8	1.69
2	35.6	29.50	72	161.6	1.64
3	37.4	28.05	73	163.4	1.58
4	39.2	26.69	74	165.2	1.53
5	41.0	25.39	75	167.0	1.48
6	42.8	24.17	76	168.8	1.43
7	44.6	23.02	77	170.6	1.39
8	46.4	21.92	78	172.4	1.34
9	48.2	20.88	79	174.2	1.30
10	50.0	19.90	80	176.0	1.26
11	51.8	18.97	81	177.8	1.22
12	53.6	18.09	82	179.6	1.18
13	55.4	17.26	83	181.4	1.14
14	57.2	16.46	84	183.2	1.10
15	59.0	15.71	85	185.0	1.07
16	60.8	15.00	86	186.8	1.04
17	62.6	14.32	87	188.6	1.01
18	64.4	13.68	88	190.4	0.97
19	66.2	13.07	89	192.2	0.94
20	68.0	12.49	90	194.0	0.92
21	69.8	11.94	91	195.8	0.89
22	71.6	11.42	92	197.6	0.86
23	73.4	10.92	93	199.4	0.84
24	75.2	10.45	94	201.2	0.81
25	77.0	10.00	95	203.0	0.79
26	78.8	9.57	96	204.8	0.76
27	80.6	9.16	97	206.6	0.74
28	82.4	8.78	98	208.4	0.72
29	84.2	8.41	99	210.2	0.70
30	86.0	8.06	100	212.0	0.68
31	87.8	7.72	101	213.8	0.66
32	89.6	7.40	102	215.6	0.64
33	91.4	7.10	103	217.4	0.62
34	93.2	6.81	104	219.2	0.60
35	95.0	6.53	105	221.0	0.59
36	96.8	6.27	106	222.8	0.57
37	98.6	6.01	107	224.6	0.55
38	100.4	5.77	108	226.4	0.54
39	102.2	5.54	109	228.2	0.52
40	104.0	5.33	110	230.0	0.51
41	105.8	5.12	111	231.8	0.50
42	107.6	4.92	112	233.6	0.48
43	109.4	4.72	113	235.4	0.47
44	111.2	4.54	114	237.2	0.46
45	113.0	4.37	115	239.0	0.44
46	114.8	4.20	116	240.8	0.43
47	116.6	4.04	117	242.6	0.42
48	118.4	3.89	118	244.4	0.41
49	120.2	3.74	119	246.2	0.40
50	122.0	3.60	120	248.0	0.39
51	123.8	3.47	121	249.8	0.38
52	125.6	3.34	122	251.6	0.37
53	127.4	3.22	123	253.4	0.36
54	129.2	3.10			

CXM Thermostat Details

Thermostat Compatibility - Most all heat pump thermostats can be used with the CXM control. However Heat/Cool stats are NOT compatible with the CXM.

Anticipation Leakage Current - Maximum leakage current for "Y" is 50 mA and for "W" is 20mA. Triacs can be used if leakage current is less than above. Thermostats with anticipators can be used if anticipation current is less than that specified above.

Thermostat Signals

- "Y" and "W" have a 1 second recognition time when being activated or being removed.
- "O" and "G" are direct pass through signals but are monitored by the micro processor.
- "R" and "C" are from the transformer.
- "AL1" and "AL2" originate from the Alarm Relay.
- "A" is paralleled with the compressor output for use with well water solenoid valves.
- The "Y" 1/4" quick connect is a connection point to the "Y" input terminal P1 for factory use. This "Y" terminal can be used to drive panel mounted relays such as the loop pump relay.

Safety Listing

The CXM control is listed under the UL Standard for limit controls and is CE listed under EN50081-1 and EN61000-3.

Troubleshooting Information

General - CXM board troubleshooting in general is best summarized as simply verifying inputs and outputs. After this process has been verified, confidence in board operation is confirmed and the trouble must be elsewhere. Below are some general guidelines required for developing training materials and procedures when applying the CXM Control.

CXM Field Inputs - All inputs are 24VAC from the thermostat and can be verified using a Volt meter between C and Y, G, O, W. See the I/O reference table (table 5).

Sensor Inputs - All sensor inputs are 'paired wires' connecting each component with the board. Therefore continuity on pressure switches can be checked at the board connector.

The thermistor resistance should be measured with the connector removed so that only the impedance of the thermistor is measured. If desired this reading can be compared to the chart shown in the thermistor section of this manual based upon the actual temperature of the thermistor clip. An ice bath can be used to check calibration of a thermistor if needed.

CXM Outputs - The compressor relay is 24VAC and can be verified using a voltmeter. The fan signal is passed through the board to the external fan relay. The alarm relay can either be 24VAC as shipped or dry contacts (measure continuity during fault) for use with DDC by clipping the J1 jumper. Electric heat outputs are 24VDC and require a voltmeter set for DC to verify operation. When troubleshooting, measure from 24VDC terminal to EH1 or EH2 terminals. See the I/O reference table.

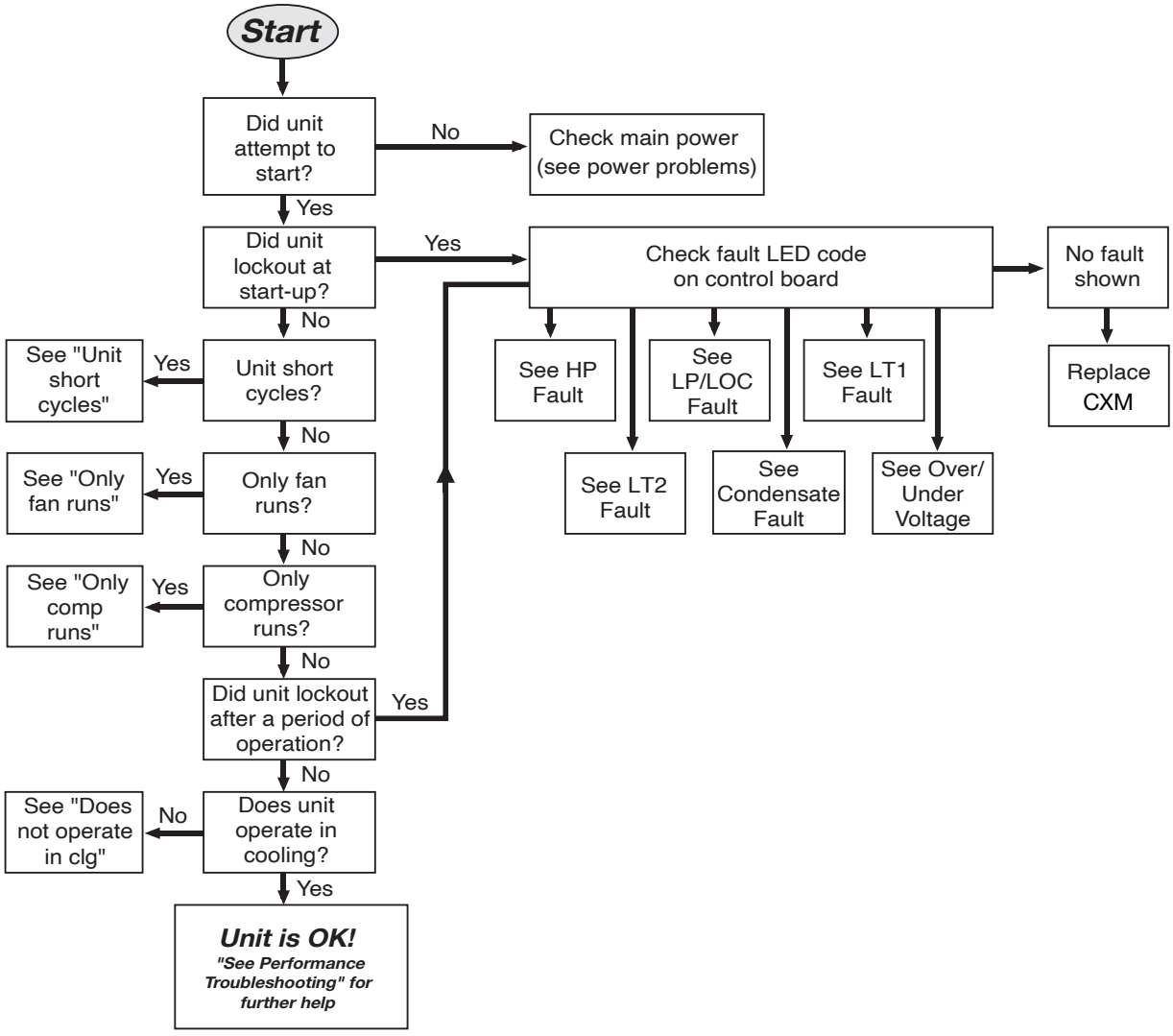
Test Mode - Test Mode can be entered for 20 minutes by shorting the test pins. For diagnostic ease at the thermostat, the alarm relay will also cycle during Test Mode. The alarm relay will cycle on and off similar to the fault LED to indicate a code representing the last fault, at the thermostat. Test Mode can also be entered and exited by cycling the G input, 3 times within a 60 second time period.

Table 5: CXM Input/Output Reference Table

Connection	Input or Output	Description
R	-	24 VAC
C	-	24 VAC (grounded common)
Y	I	Connect to thermostat - Y output call for compressor
W	I	Connect to thermostat - W output call for Htg2 or Emerg Ht
O	I	Connect to thermostat - 0 output call for reversing valve with cooling
G	I	Connect to thermostat - G output call for fan
AL1	O	Connect to thermostat fault light - 24VAC or dry alarm
AL2	O	Alarm Relay 24VAC or dry
A	O	Output for water solenoid valve - paralleled with compressor contactor coil
BR	O	Connection for blower relay-direct connect from G
BRG	O	Blower relay common connection
CC	O	Connection for compressor contactor
CCG	O	Compressor contactor common connection
HP	I	High Pressure Switch input terminals
LP	I	Low Pressure Switch input terminals
LT1	I	Water Coil Low Temperature Thermistor Input
LT2	I	Air Coil Low Temperature Thermistor Input
RV	O	Reversing Valve Output Terminals - direct connect from "O"
CO	I	Condensate overflow input terminals
24VDC	O	24 VDC supply to electric heat module
W1	O	Output terminal for stage 1 electric heat
W2	O	Output terminal for stage 2 electric heat

Troubleshooting Chart

Use the following troubleshooting flow chart to find appropriate troubleshooting strategies on the following pages for the CXM control and most water source heat pump applications.



Functional Troubleshooting

⚠ CAUTION! ⚠

CAUTION! Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

Fault	Htg	Clg	Possible Cause	Solution
Green Status LED Off	X	X	Main power problems	Check line voltage circuit breaker and disconnect.
				Check for line voltage between L1 and L2 on the contactor.
				Check for 24VAC between R and C on CXM/DXM'
				Check primary/secondary voltage on transformer.
HP Fault Code 2 **High Pressure**		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow adjust to proper flow rate.
		X	Water Temperature out of range in cooling	Bring water temp within design parameters.
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Dirty Air Coil- construction dust etc.
				Too high of external static. Check static vs blower table.
	X		Air temperature out of range in heating	Bring return air temp within design parameters.
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table.
	X	X	Bad HP Switch	Check switch continuity and operation. Replace.
LP/LOC Fault Code 3 **Low Pressure / Loss of Charge**	X	X	Insufficient charge	Check for refrigerant leaks
	X		Compressor pump down at start-up	Check charge and start-up water flow.
LT1 Fault Code 4 **Water coil low temperature limit**	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace..
				Check water flow adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper temperature limit setting (30°F vs 10°F [-1°C vs -2°C])	Clip JW3 jumper for antifreeze (10°F [-12°C]) use.
	X		Water Temperature out of range	Bring water temp within design parameters.
	X	X	Bad thermistor	Check temp and impedance correlation per chart
LT2 Fault Code 5 **Air coil low temperature limit**		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs blower table.
		X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters.
		X	Improper temperature limit setting (30°F vs 10°F [-1°C vs -12°C])	Normal airside applications will require 30°F [-1°C] only.
	X	X	Bad thermistor	Check temp and impedance correlation per chart.
Condensate Fault Code 6	X	X	Blocked drain	Check for blockage and clean drain.
	X	X	Improper trap	Check trap dimensions and location ahead of vent.
		X	Poor drainage	Check for piping slope away from unit.
				Check slope of unit toward outlet.
				Poor venting. Check vent location.
		X	Moisture on sensor	Check for moisture shorting to air coil.
	X	X	Plugged air filter	Replace air filter.
	x	X	Restricted Return Air Flow	Find and eliminate restriction. Increase return duct and/or grille size.
Over/Under Voltage Code 7 **(Auto resetting)**	X	X	Under Voltage	Check power supply and 24VAC voltage before and during operation.
				Check power supply wire size.
				Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer tap for correct power supply voltage.
	X	X	Over Voltage	Check power supply voltage and 24VAC before and during operation.
				Check 24VAC and unit transformer tap for correct power supply voltage.
Unit Performance Sentinel Code 8	X		Heating mode LT2>125°F [52°C]	Check for poor air flow or overcharged unit.
		X	Cooling Mode LT1>125°F [52°C] OR LT2< 40ºF [4ºC])	Check for poor water flow, or air flow.
Swapped Thermistor Code 9	X	X	LT1 and LT2 swapped	Reverse position of thermistors
No Fault Code Shown	X	X	No compressor operation	See "Only Fan Operates".
	X	X	Compressor overload	Check and replace if necessary.
	X	X	Control board	Reset power and check operation.

Performance Troubleshooting

Performance Troubleshooting	Htg	Clg	Possible Cause	Solution
Insufficient capacity/ Not cooling or heating	X	X	Dirty filter	Replace or clean.
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs. blower table.
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present.
	X	X	Low refrigerant charge	Check superheat and subcooling per chart.
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
		X	Defective reversing valve	Perform RV touch test.
	X	X	Thermostat improperly located	Check location and for air drafts behind stat.
	X	X	Unit undersized	Recheck loads & sizing. Check sensible clg. load and heat pump capacity.
	X	X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Inlet water too hot or too cold	Check load, loop sizing, loop backfill, ground moisture.
High Head Pressure	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow. Adjust to proper flow rate.
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture.
	X		Air temperature out of range in heating	Bring return air temperature within design parameters.
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Unit overcharged	Check superheat and subcooling. Re-weigh in charge.
	X	X	Non-condensables in system	Vacuum system and re-weigh in charge.
	X	X	Restricted metering device.	Check superheat and subcooling per chart. Replace.
Low Suction Pressure	X		Reduced water flow in heating.	Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace.
				Check water flow. Adjust to proper flow rate.
	X		Water temperature out of range.	Bring water temperature within design parameters.
		X	Reduced air flow in cooling.	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Air temperature out of range	Too much cold vent air? Bring entering air temperature within design parameters.
	X	X	Insufficient charge	Check for refrigerant leaks.
Low Discharge Air Temperature in Heating	X		Too high of air flow	Check fan motor speed selection and air flow chart.
	X		Poor performance	See 'Insufficient Capacity'
High humidity		X	Too high of air flow	Check fan motor speed selection and airflow chart.
		X	Unit oversized	Recheck loads & sizing. Check sensible clg load and heat pump capacity.

Tranquility® Compact High Capacity (TC_L) Series

Rev.: October 3, 2019

Warranty

CLIMATEMASTER
Geothermal Heat Pump Systems

CLIMATE MASTER, INC.

LIMITED EXPRESS WARRANTY/ LIMITATION OF REMEDIES AND LIABILITY

It is expressly understood that unless a statement is specifically identified as a warranty, statements made by Climate Master, Inc., a Delaware corporation, ("CM") or its representatives, relating to CM's products, whether oral, written or contained in any sales literature, catalog or any other agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely CM's opinion or commendation of CM's products.

EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF CM'S PRODUCTS. CM MAKES NO WARRANTY AGAINST LATENT DEFECTS. CM MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.

GRANT OF LIMITED EXPRESS WARRANTY

CM warrants CM products purchased and retained in the United States of America and Canada to be free from defects in material and workmanship under normal use and maintenance as follows: (1) All complete air conditioning, heating and/or heat pump units built or sold by CM for twelve (12) months from date of unit start up or eighteen (18) months from date of shipment (from factory), whichever comes first; (2) Repair and replacement parts, which are not supplied under warranty, for ninety (90) days from date of shipment (from factory). All parts must be returned to CM's factory in Oklahoma City, Oklahoma, freight prepaid, no later than sixty (60) days after the date of the failure of the part; if CM determines the part to be defective and within CM's Limited Express Warranty, CM shall, when such part has been either replaced or repaired, return such to a factory recognized dealer, contractor or service organization, F.O.B. CM's factory, Oklahoma City, Oklahoma, freight prepaid. The warranty on any parts repaired or replaced under warranty expires at the end of the original warranty period.

This warranty does not cover and does not apply to: (1) Air filters, fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) Any portion or component of any system that is not supplied by CM, regardless of the cause of the failure of such portion or component; (4) Products on which the unit identification tags or labels have been removed or defaced; (5) Products on which payment to CM is or has been in default; (6) Products which have defects or damage which result from improper installation, wiring, electrical imbalance characteristics or maintenance, or are caused by accident, misuse or abuse, fire, flood, alteration or misapplication of the product; (7) Products which have defects or damage which result from a contaminated or corrosive air or liquid supply, operation at abnormal temperatures, or unauthorized opening of refrigerant circuit; (8) Mold, fungus or bacteria damages; (9) Products subjected to corrosion or abrasion; (10) Products manufactured or supplied by others; (11) Products which have been subjected to misuse, negligence or accidents; (12) Products which have been operated in a manner contrary to CM's printed instructions; or (13) Products which have defects, damage or insufficient performance as a result of insufficient or incorrect system design or the improper application of CM's products.

CM is not responsible for: (1) The costs of any fluids, refrigerant or other system components, or associated labor to repair or replace the same, which is incurred as a result of a defective part covered by CM's Limited Express Warranty; (2) The costs of labor, refrigerant, materials or service incurred in removal of the defective part, or in obtaining and replacing the new or repaired part; or, (3) Transportation costs of the defective part from the installation site to CM or of the return of any part not covered by CM's Limited Express Warranty.

Limitation: This Limited Express Warranty is given in lieu of all other warranties. If, notwithstanding the disclaimers contained herein, it is determined that other warranties exist, any such warranties, including without limitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Warranty.

LIMITATION OF REMEDIES

In the event of a breach of the Limited Express Warranty, CM will only be obligated at CM's option to repair the failed part or unit or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to CM's factory in Oklahoma City, Oklahoma of each defect, malfunction or other failure and a reasonable number of attempts by CM to correct the defect, malfunction or other failure and the remedy fails of its essential purpose, CM shall refund the purchase price paid to CM in exchange for the return of the sold good(s). Said refund shall be the maximum liability of CM. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR THEIR PURCHASER AGAINST CM FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR CM'S NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY

CM shall have no liability for any damages if CM's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any war, civil unrest, government restrictions or restraints, strikes or work stoppages, fire, flood, accident, shortages of transportation, fuel, material, or labor, acts of God or any other reason beyond the sole control of CM. **CM EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR CM's NEGLIGENCE OR AS STRICT LIABILITY.**

OBTAINING WARRANTY PERFORMANCE

Normally, the contractor or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any CM recognized dealer, contractor or service organization. If assistance is required in obtaining warranty performance, write or call:

Climate Master, Inc. • Customer Service • 7300 S.W. 44th Street • Oklahoma City, Oklahoma 73179 (405) 745-6000

NOTE: Some states or Canadian provinces do not allow limitations on how long an implied warranty lasts, or the limitation or exclusions of consequential or incidental damages, so the foregoing exclusions and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and from Canadian province to Canadian province.

Please refer to the CM Installation, Operation and Maintenance Manual for operating and maintenance instructions.

Rev.: 11/09

LC083