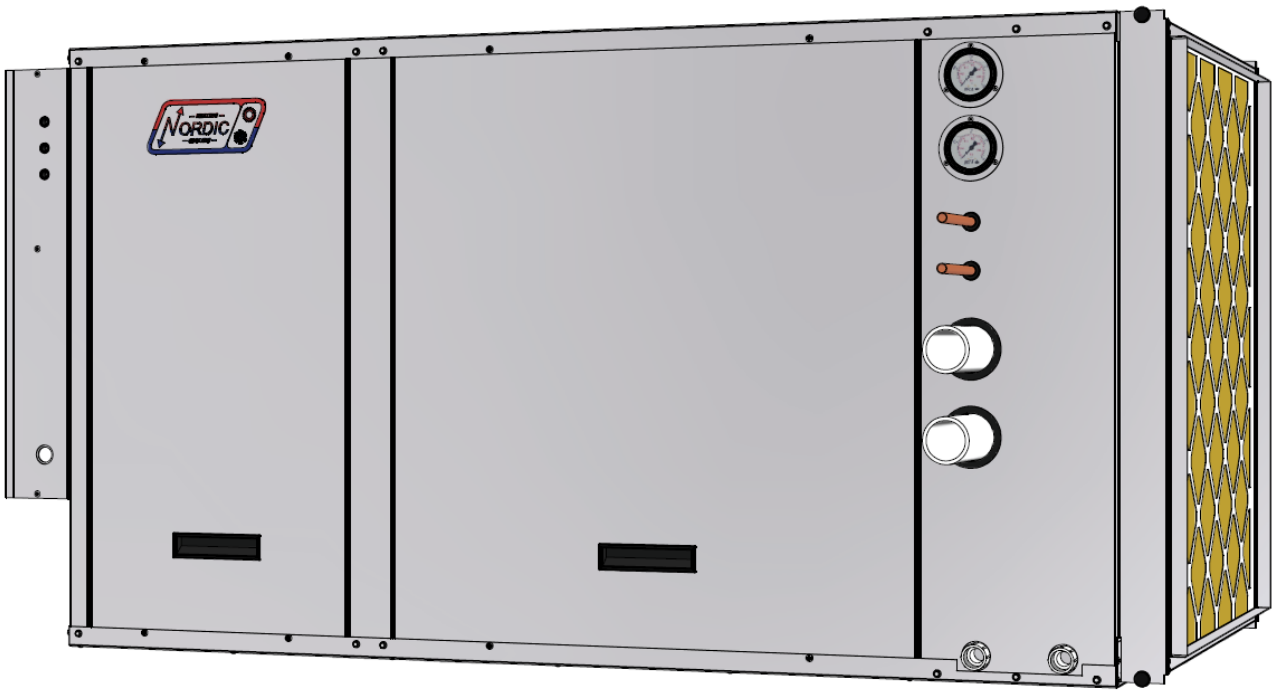
MARITIME GEOTHERMAL LTD.

Installation and Service Manual

PC-Series

Scroll R410a
Model Sizes 45-80

Heat Recovery Pool Conditioners



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SAFETY PRECAUTIONS

WARNING: **Ensure all access panels are in place and properly secured before applying power to the unit. Failure to do so may cause risk of electrical shock.**

WARNING: **Before performing service or maintenance on the heat pump system, ensure all power sources are DISCONNECTED. Electrical shock can cause serious personal injury or death.**

WARNING: **Heat pump systems contain refrigerant under high pressure and as such can be hazardous to work on. Only qualified service personnel should install, repair, or service the heat pump.**

CAUTION: **Safety glasses and work gloves should be worn at all times whenever a heat pump is serviced. A fire extinguisher and proper ventilation should be present whenever brazing is performed.**

CAUTION: **Venting refrigerant to atmosphere is illegal. A proper refrigerant recovery system must be employed whenever repairs require removal of refrigerant from the heat pump.**

MODEL NOMENCLATURE

PC—65—PG—1S—T—KDERS—xx

Series:
PC = Pool Conditioner

Nominal Size:
45 = 3 Ton
55 = 4 Ton
65 = 5 Ton
80 = 6 Ton

Refrigerant:
P = R410a

Refrigeration Gauges:
G = Yes

Voltage Code:
1 = 230-1-60 VAC
2 = 208-3-60 VAC
6 = 220-1-50 VAC
7 = 380-3-50 VAC

Compressor Stages*:
S = 1 Stage

Revision:
01, 02 etc.

Fan Discharge:
S = Side
T = Top (up)
D = Down

Fan Return:
R = Right Side

Fan Motor:
E = ECM (Variable Speed)

Fan Type:
D = Direct Drive

Air Coil:
K = Coated

Indoor Loop (Pool) Exchanger:
T = Titanium

APPLICATION TABLE											
SIZE	REFRIGERANT	REFRIGERANT GAUGES	VOLTAGE	STAGES	INDOOR COIL	FAN/CASE	REVISIONS				
45	P	G	1	S	T	KDERS	06				
			2	S		KDERT	06				
			6	S		KDERD	06				
			7	S			06				
55	P	G	1	S	T	KDERS	06				
			2	S		KDERT	06				
			6	S		KDERD	06				
			7	S			06				
65	P	G	1	S	T	KDERS	06				
			2	S		KDERT	06				
			6	S		KDERD	06				
			7	S			06				
80	P	G	1	S	T	KDERS	06				
			2	S		KDERT	06				
			6	S		KDERD	06				
			7	S			06				
This manual applies only to the models and revisions listed in this table											

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Installation Information

UNIT DESCRIPTION

The PC-Series unit is a high efficiency heat recovery unit with coated air coils, titanium exchanger and stainless steel case. The unit cools and dehumidifies the pool area and can reject the heat back into the airstream, into the pool, or to an optional external outdoor condenser unit.

An electrically commutated (ECM) fan with several speed options is standard. The motor has a soft start function for improved efficiency and reduced wear.

The unit contains R410a refrigerant, which is an environmentally friendly refrigerant. R410a is also a more efficient refrigerant than R22 or R407c.

The unit has several key features that are described in the specifications document for the particular heat pump. Please request a copy if desired or visit **www.nordicghp.com**

UNPACKING THE UNIT

When the heat pump reaches its destination it should be unpacked to determine if any damage has occurred during shipment. Any visible damage should be noted on the carrier's freight bill and a suitable claim filed at once.

The heat pump is well constructed and every effort has been made to ensure that it will arrive intact, however it is in the customer's best interest to examine the unit thoroughly when it arrives.

OPTIMUM PLACEMENT

The placement of a the unit has negligible effects on the operation of the system. The unit can be placed wherever it can most easily be connected to. Generally this is in the pool room or in the mechanical room in order to minimize piping distances. If ductwork is used then it is good practice to center the unit with respect to the ductwork when possible to facilitate air distribution.

If possible the access panels should remain clear of obstruction for a distance of **two feet** to facilitate servicing and general maintenance. Ensure the unit is level to eliminate any possible condensate drain issues.

Raising the heat pump off the floor a few inches is generally a good practice since this will prevent rusting of the bottom panel of the unit. We recommend that the heat pump be placed on a piece of 2" thick styrofoam. The styrofoam will smooth out any irregularities in the cement floor and deaden any compressor noise emitted from the bottom of the cabinet. The unit can also be suspended with a proper rack system able to bear a recommended **two times** the weight of the unit

The unit has an air-filter rack which can be installed with the removable end (where the filter is inserted) on either side to facilitate changing the filter.

WARNING: It is recommended that pool chemicals be stored away from the unit to prevent any premature corrosion problems. The should not be stored in the same room as the PC unit.

WARNING: Pool chemicals should be injected into the system downstream of the PC unit.

ELECTRICAL CONNECTIONS

The PC unit has a concentric 1.093" / 0.875" knockout for power supply connection to the electrical box. There are three 1/2" openings with plastic grommets (grommet hole is 3/8") in the upper section of the electrical box for connections to the external controls.

A schematic diagram and electrical box layout diagram (ELB) can be found inside the electrical box cover of the unit as well as in the Model Specific section of this manual. The Electrical Tables in the Model Specific section and the ELB diagram contain information about the size of wire for the connections, as well as the recommended breaker size. **A properly qualified electrician should be retained to make the connections to the heat pump and associated controls. The connections to the heat pump MUST CONFORM TO LOCAL CODES.**

CONTROL REQUIREMENTS

The PC-Series unit comes with the following controls:

- (2) Two stage aquastats
- (1) De-humidistat

One of the aquastats is used to control the pool room temperature and will be referred to as the **Air Aquastat** from now on. The other is used to control the pool temperature and will be referred to as the **Pool Aquastat**. If the A/C option (outdoor condenser unit) is installed then a third two-stage aquastat is required to control the air cooling mode. The electrical diagrams on the electrical box cover provide a description of the signal connections as does **TABLE 1**.

TABLE 1 - Control Signal Description

Signal	Description
C	24VAC Common (Ground)
R	24VAC Hot
Y	Heat Pump (Compressor and fan)
O	Air re-heat mode
F	Plenum Heater dry contact
F	Plenum Heater dry contact
C1*	24VAC Common (Ground) for cooling control
R1*	24VAC Hot for cooling control
O1*	Cooling Mode

* These signals are only required if the A/C option (outdoor condenser unit) is connected to the PC unit.

TABLE 2 shows typical settings for the each of the controls . These are the recommended settings. The setpoints may be adjusted as desired but there are a few rules that must be observed for proper system operation:

- Air Aquastat delta's should not be set larger than the values in the table.
- Pool Aquastat Stage 1setpoint should not be any more that 2°F below the Air Aquastat Stage 1 setpoint.
- Air Cooling Aquastat setpoints must be equal to (preferred) or higher than the Air Aquastat Stage 1 setpoint.
- Air Cooling Aquastat Stage 1 and Stage 2 setpoints and delta's must be set identical.

TABLE 2 - Typical PC Control Settings				
AIR AQUASTAT				
	Stage 1		Stage 2	
Item	°F	°C	°F	°C
Setpoint	82		79	
Delta	2		1	
Activation *	80		78	
AIR COOLING AQUASTAT (IF INSTALLED)				
	Stage 1 **		Stage 2**	
Item	°F	°C	°F	°C
Setpoint	82		82	
Delta	1		1	
Activation *	83		83	
POOL AQUASTAT				
	Stage 1		Stage 2 ***	
Item	°F	°C	°F	°C
Setpoint	80		80 (78)	
Delta	2		2 (1)	
Activation *	78		78 (77)	
DE-HUMIDISTAT				
Setpoint	55%			

*Activation is indirectly set by the Setpoint and Delta values
**Stage 1 and Stage 2 setpoint and Delta values must be identical for the Air Cooling Aquastat.
***** 80 and 2 if Priority Jumper is placed (must be identical to Stage 1 values)**

CONTROL MOUNTING LOCATIONS

The De-humidistat, Air Aquastat and Air Cooling Aquastat (if installed) should be mounted close to one another in the pool room, at a recommended height of 4ft to 5ft. They should be placed in a location that is away from any splashing to prevent accidental damage to them. They should not be placed directly in the path of any supply registers. Doing so can yield values that are not representative of the conditions of the room and can cause short-cycling. The probes of the aquastats can be neatly strapped up.

The Pool Aquastat can be mounted by itself or with the others. The probe should be placed in a dry-well in the Indoor IN line to the heat pump. If a dry well is not available then the probe can be strapped to the outside of the pipe, but ensure it is well insulated at least 6" at each end of it (**refer to 000145CDG-03**).

SYTEM OPERATION (PRIORITY JUMPER PLACED)

The primary purpose of the pool conditioner unit is to maintain proper humidity levels in the pool room. During this operation energy is removed from the air and can be rejected to either to the pool water, the pool room air, or optionally to an outdoor condenser unit. **TABLE 3** contains a truth table which indicates which modes are active based on the control signals. **Diagram A** and **Diagram B** contain flow charts that indicate the control sequence as well.

There are three methods in which the PC unit can be activated:

1) Call from the de-humidistat because the humidity level has risen above the desired setpoint
2) Call from the Pool Aquastat because the pool temperature has dropped below the desired setpoint.
3) Call from the Air Aquastat because the temperature in the room has dropped below the desired setpoint.

The modes of operation for each of these activation methods are described below.

1) UNIT ACTIVATED BY DE-HUMIDISTAT

A) Without A/C option: With no other controls active, RV#1 is active and the default rejection mode is air re-heat (**refer to 000353RCD**). In this mode the energy extracted from the dehumidification process is injected back into the pool room air along with the compressor and fan energy, for a net energy increase equal to the compressor and fan electrical consumption. In this mode the air is dehumidified and heated at the same time. This can lead to overheating the room in some cases if the pool room temperature is satisfied and the pool water is satisfied. If it is suspected that this may occur due to the climate of the region, then an outdoor condenser unit (A/C option) is recommended in order to reject the unwanted heat (**see A/C OPTION (OUTDOOR CONDENSER)**. The unit will shut off once the dehumidification setpoint has been reached.

If the pool water temperature drops down to the Pool Aquastat Stage 1 / Stage 2 (must be identical) activation point, the unit will override the air-reheat mode and pool heat mode is activated. The air-reheat mode will remain locked out until the Pool Aquastat Stage 1 / Stage 2 setpoint (must be identical) is reached. The plenum heater will still operate during this time if the pool room air temperature drops to the Air Aquastat Stage 2 activation point.

B) With A/C option: Operation of the system with the A/C option is the same as in section A except for when the pool room air temperature is above the Air Cool Aquastat activation points. This also implies that the pool room temperature is above the Air Aquastat Stage 1 setpoint (refer to controls) .

The Air Cool Aquastat engages both RV#1 and RV#2 to enable air cooling mode (**refer to 000354RCD**). If there is a call for dehumidification and the air temperature is above or equal to the Stage 1 activation point of the Air Cool Aquastat, the absorbed energy from the pool room air will be discarded outside via the outdoor condenser unit instead of being rejected into the air or pool. This allows the pool room to be de-humidified and cooled. The Air Cool Aquastat Stage 1 and Stage 2 setpoints must be identical and must be equal to or higher than the Air Aquastat Stage 1 setpoint. Once the Air Cool Aquastat setpoints have been reached the unit will revert back to air or pool water mode. Operation after this is identical to that described in section A.

2) UNIT ACTIVATED BY POOL AQUASTAT STAGE 1/2

In this scenario the de-humidistat is satisfied but the pool water temperature dropped to the Stage 1 activation point of the Pool Aquastat. The unit will operate in pool heat mode and begin dehumidifying / cooling the pool room and heating the pool water. If during this time the Stage 2 activation point of the Air Aquastat is reached, the plenum heater will engage to re-heat the air. The plenum heater operates independently of the PC unit and will remain on until Stage 2 setpoint is reached even if the PC unit cycles off. Note that if the PC unit does cycle

off during this time, the fan will remain on until Stage 2 setpoint has been reached and the plenum heater shuts off.

3) UNIT ACTIVATED BY AIR AQUASTAT STAGE 1

In this scenario the de-humidistat is satisfied and the Pool Aquastat is satisfied but the air temperature has dropped to the Stage 1 activation point of the Air Aquastat. The unit will start and operate in air-reheat heat mode and begin dehumidifying / re-heating the pool room. If during this time the Stage 2 activation point of the Air Aquastat is reached, the plenum heater will engage to help re-heat the air. The plenum heater operates independently of the PC unit and will remain on until Stage 2 setpoint is reached even if the PC unit cycles off.

TABLE 3 - PC Control System Operation Truth Table (Priority Jumper Placed)

CONTROLS*						SYSTEM OPERATION			
De-Humidistat	Air Aquastat		Pool Aquastat		Air Cool Aquastat	Plenum Heater	Air Re-Heat	Pool Water	Outdoor Condenser
STAGE 1	STAGE 1	STAGE 2	STAGE 1	STAGE 2	STAGE 1				
X							X		
X	X						X		
X	X	X				X	X		
X	X	X	X	X		X		X	
X			X	X				X	
X	X		X	X				X	
	X						X		
	X	X				X	X		
	X	X	X	X		X		X	
			X	X				X	
	X		X	X				X	
X					X				X
X	X**				X				X
X	X**	X**			X	X			X
X	X**	X**	X	X	X	X			X
X			X	X	X				X
X	X**		X	X	X				X
	X**				X				X
	X**	X**			X	X			
	X**	X**	X	X	X	X			X
			X	X	X				X
	X**		X	X	X				X

* Dehumidification occurs anytime the unit is operational.
**Ensure the cooling setpoint is equal to or higher than the heating setpoint to avoid these conditions. Ccooling has priority should these conditions occur, but the plenum heater will still activate anytime Air Aquastat Stage 2 is on.

DIAGRAM A - PC Control System Flow Chart Priority Jumper Placed (without A/C)

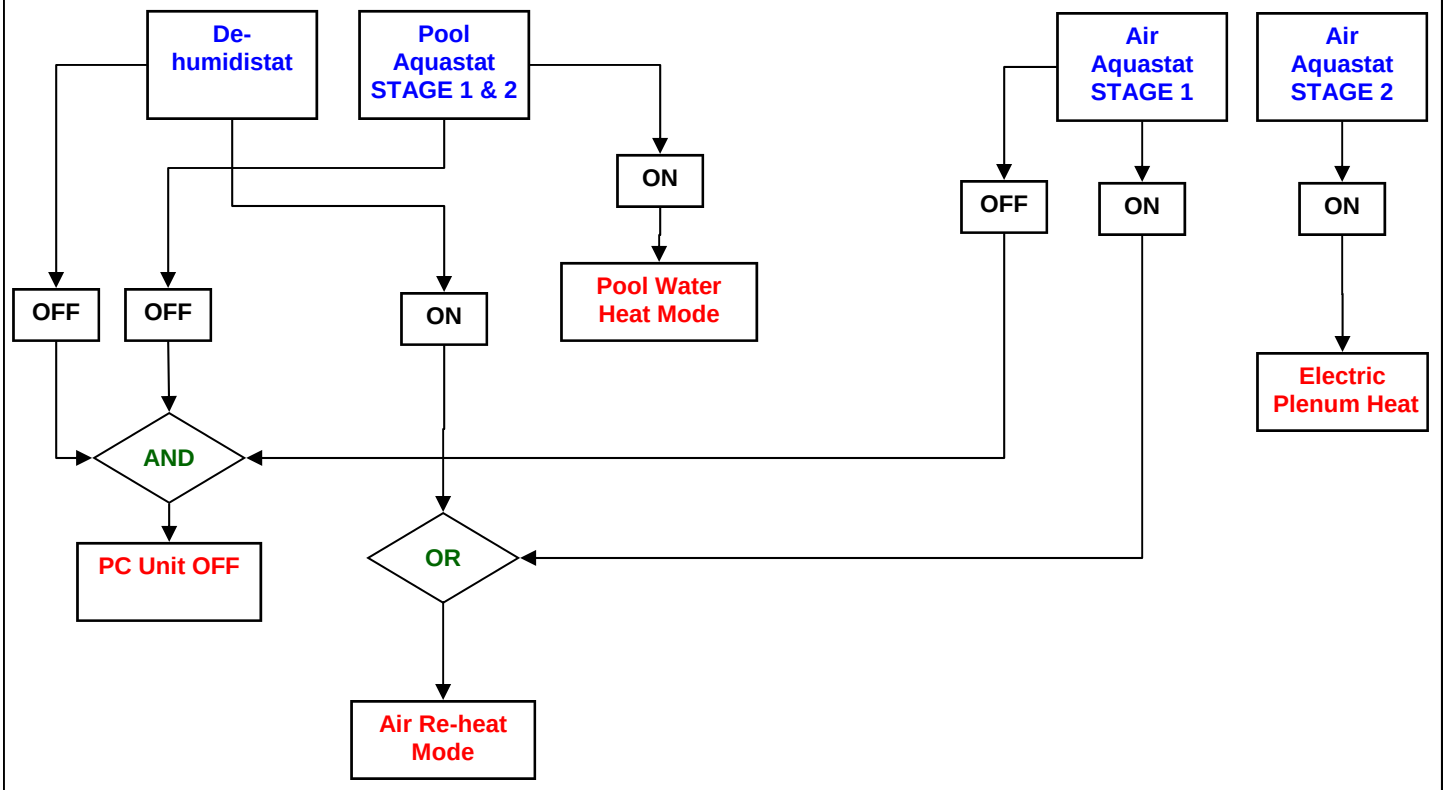
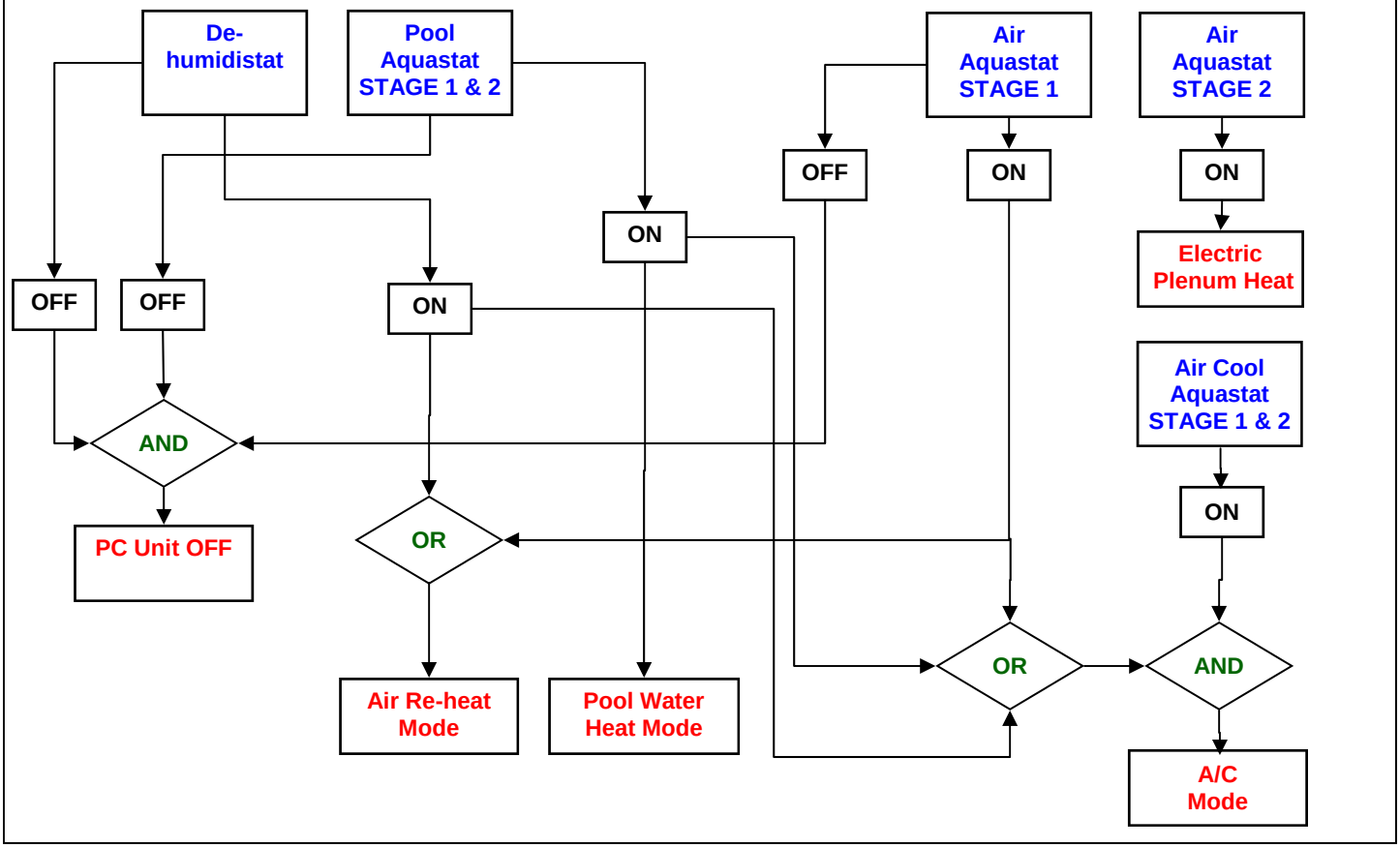


DIAGRAM B - PC Control System Flow Chart Priority Jumper Placed (with A/C)



SYTEM OPERATION
(PRIORITY JUMPER NOT PLACED)

The primary purpose of the pool conditioner unit is to maintain proper humidity levels in the pool room. During this operation energy is removed from the air and can be rejected to either to the pool water, the pool room air, or optionally to an outdoor condenser unit. **TABLE 4** contains a truth table which indicates which modes are active based on the control signals. **Diagram C** and **Diagram D** contain flow charts that indicate the control sequence as well.

There are two methods in which the PC unit can be activated:

1) Call from the de-humidistat because the humidity level has risen above the desired setpoint
2) Call from the Pool Aquastat because the pool temperature has dropped below the desired setpoint

The modes of operation for each of these activation methods are described below.

1) UNIT ACTIVATED BY DE-HUMIDISTAT

A) Without A/C option: With no other controls active, the default rejection mode is pool water (**refer to 000352RCD**). In this mode the pool room air is dehumidified and cooled while the pool water is heated, regardless of whether or not there is a call from Stage 1of the Pool Aquastat. This can lead to overheating the pool in some cases if the pool room temperature is high enough. If it is suspected that this may occur due to the climate of the region, then an outdoor condenser unit (A/C option) is recommended in order to reject the unwanted heat (**see A/C OPTION (OUTDOOR CONDENSER)**.

If the pool room cools down enough to reach the Air Aquastat Stage 1 activation point (activation point = setpoint - delta), RV#1 is energized (**refer to 000353RCD**) and re-heat mode is activated. In this mode the energy extracted from the dehumidification process is injected back into the pool room air along with the compressor and fan energy, for a net energy increase equal to the compressor and fan electrical consumption. In this mode the air is dehumidified and heated at the same time.

If the pool room air temperature continues to drop and reaches The Air Aquastat Stage 2 activation point , the plenum heater will activate. The plenum heater operates independently of the PC unit and will remain on until Stage 2 setpoint is reached even if the PC unit cycles off. Note that if the PC unit does cycle off during this time, the fan will remain on until Stage 2 setpoint has been reached and the plenum heater shuts off.

If the pool water temperature drops down to the Pool Aquastat Stage 1 activation point, the unit will remain in air re-heat mode if Stage 1 of the Air Aquastat is still active. If the pool water temperature drops down to Pool Aquastat Stage 2 activation point, the air-reheat mode is locked out and pool heat mode is activated. The air-reheat mode will remain locked out until the Pool Aquastat Stage 2 setpoint is reached. The plenum heater will still operate during this time if the pool room air temperature drops to the Air Aquastat Stage 2 activation point.

B) With A/C option: Operation of the system with the A/C option is the same as in section A except for when the pool room air temperature is above the Air Cool Aquastat activation points. This also implies that the pool room temperature is above the Air Aquastat Stage 1 setpoint (refer to controls) .

The Air Cool Aquastat engages both RV#1 and RV#2 to enable air cooling mode (**refer to 000354RCD**). If there is a call for dehumidification and the air temperature is above or equal to the Stage 1 activation point of the Air Cool Aquastat, the absorbed energy from the pool room air will be discarded outside via the outdoor condenser unit instead of being rejected into the pool. This allows the pool room to be de-humidified and cooled without the risk of overheating the pool. The Air Cool Aquastat Stage 1 and Stage 2 setpoints must be identical and must be equal to or higher than the Air Aquastat Stage 1 setpoint. Once the Air Cool Aquastat setpoints have been reached the unit will revert back to pool water mode. Operation after this is the identical to that described in section A.

2) UNIT ACTIVATED BY POOL AQUASTAT STAGE 1

In this scenario the de-humidistat is satisfied but the pool water temperature dropped to the Stage 1 activation point of the Pool Aquastat. If no other controls are active then the unit will operate in pool heat mode and begin dehumidifying / cooling the pool room and heating the pool water. If during this time the Stage 1 activation point of the Air Aquastat is reached, air re-heat mode will begin. The unit will continue to switch back and forth between air re-heat and pool water heat modes until the Stage 1 setpoint of the Pool Aquastat is reached.

If the pool water temperature drops down to Pool Aquastat Stage 2 activation point, the air-reheat mode is locked out and pool heat mode is activated. The air-reheat mode will remain locked out until the Pool Aquastat Stage 2 setpoint is reached.

The plenum heater will still operate during this time if the pool room air temperature drops to the Air Aquastat Stage 2 activation point.

If the pool room air temperature continues to drop and reaches The Air Aquastat Stage 2 activation point , the plenum heater will activate. The plenum heater operates independently of the PC unit and will remain on until Stage 2 setpoint is reached even if the PC unit cycles off. Note that if the PC unit does cycle off during this time, the fan will remain on until Stage 2 setpoint has been reached and the plenum heater shuts off.

TABLE 4 - PC Control System Operation Truth Table (Priority Jumper Not Placed)

CONTROLS*						SYSTEM OPERATION			
De-Humidistat	Air Aquastat		Pool Aquastat		Air Cool Aquastat	Plenum Heater	Air Re-Heat	Pool Water	Outdoor Condenser
STAGE 1	STAGE 1	STAGE 2	STAGE 1	STAGE 2	STAGE 1				
X								X	
X	X						X		
X	X		X				X		
X	X	X				X	X		
X	X	X	X			X	X		
X	X	X	X	X		X		X	
X			X					X	
X			X	X				X	
X	X		X	X				X	
	X								
	X		X				X		
	X	X				X			
	X	X	X			X	X		
	X	X	X	X		X		X	
			X					X	
			X	X				X	
	X		X	X				X	
X					X				X
X	X**				X				X
X	X**		X		X				X
X	X**	X**			X	X			X
X	X**	X**	X		X	X			X
X	X**	X**	X	X	X	X			X
X			X		X				X
X			X	X	X				X
X	X**		X	X	X				X
X				X					X
	X**				X				
	X**		X		X				X
	X**	X**			X	X			
	X**	X**	X		X	X			X
	X**	X**	X	X	X	X			X
			X		X				X
			X	X	X				X
	X**		X	X	X				X

* Dehumidification occurs anytime the unit is operational.
**Ensure the cooling setpoint is equal to or higher than the heating setpoint to avoid these conditions. Ccooling has priority should these conditions occur, but the plenum heater will still activate anytime Air Aquastat Stage 2 is on.

DIAGRAM C - PC Control System Flow Chart Priority Jumper Not Placed (without A/C)

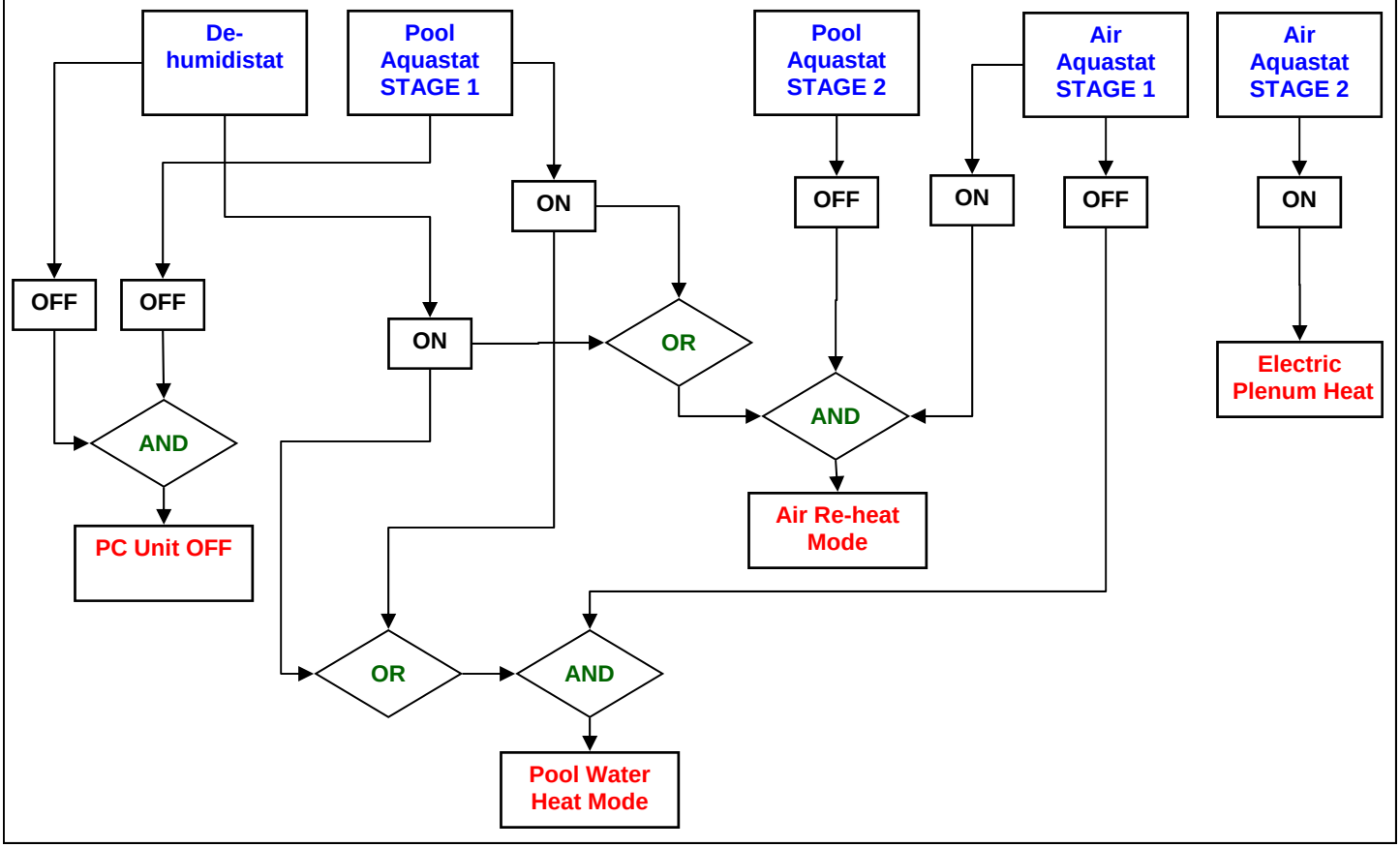
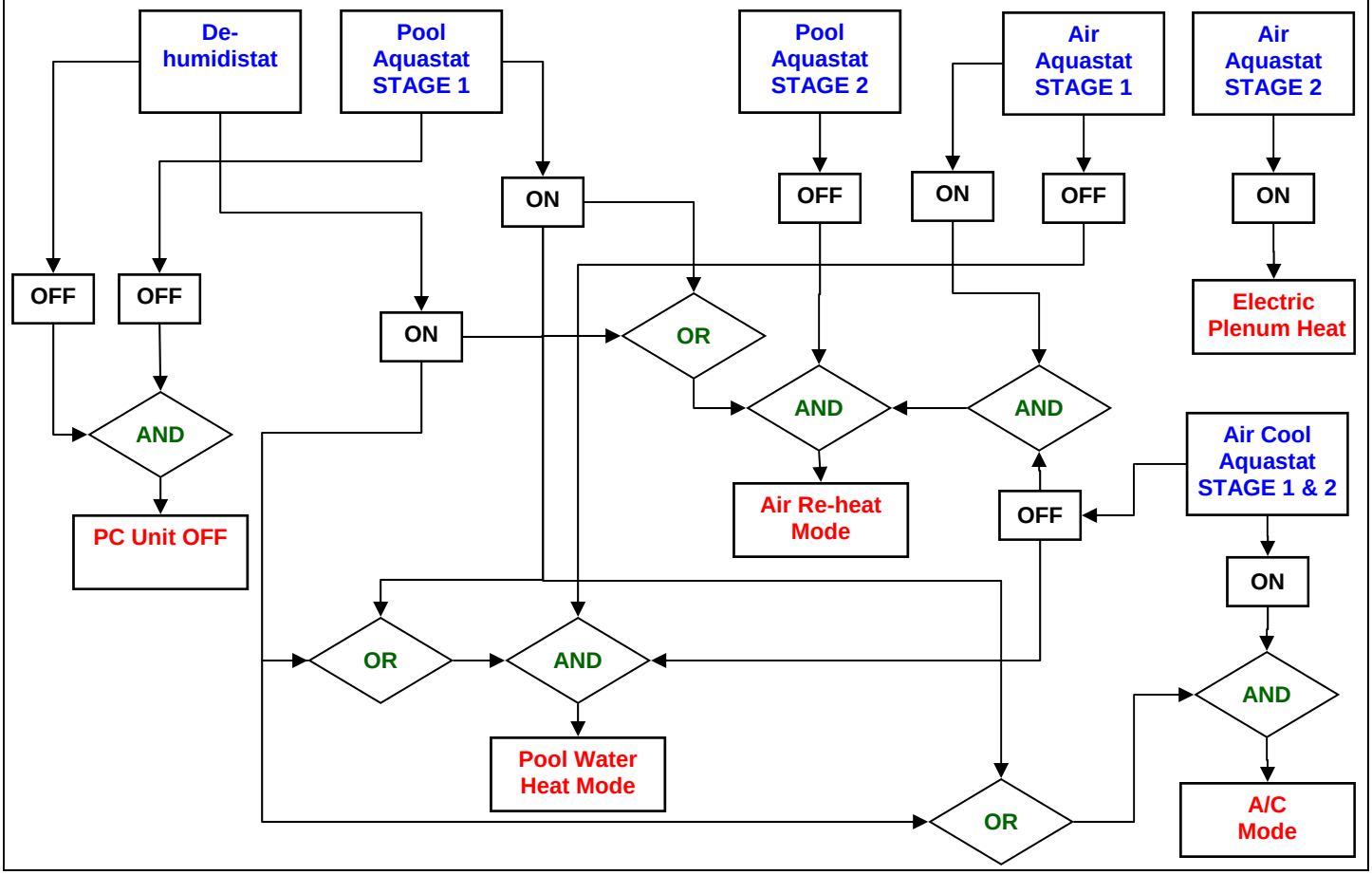


DIAGRAM D - PC Control System Flow Chart Priority Jumper Not Placed (with A/C)



FAN MOTOR

The unit is equipped with a direct drive ECM fan motor for maximum efficiency. The motor features a soft start which further improves efficiency by eliminating inrush current and provides a smooth, quiet ramp up to speed . The motor will maintain the programmed air flow up to the maximum external static value. Refer to the **APPENDIX B: ECM Fan Airflow Tables.**

The air flow can be set to four different levels by changing the position on the Air Flow board located in the electrical box. The four levels are indicated in **TABLE 5**. The actual air flow values can be found in **APPENDIX B**. Units are shipped with the **MED** position selected for nominal air flow.

TABLE 5 - Airflow Selections

Position	Airflow
LOW	-6%
MED	Nominal
HIGH	+6%
MAX	+12%

CONTROL TRANSFORMER

The low voltage controls are powered by a 75VA class II transformer. The transformer has a resettable breaker on the secondary side for circuit protection. Should the breaker trip, locate and correct the problem and then reset the breaker by pressing in on it.

SAFETY CONTROLS

The heat pump has two built in safety controls which are designed to protect the unit from situations which could damage it should the operation of the refrigeration circuit fall outside the allowable operating range.

A. Low Pressure Control

The low pressure control monitors the compressor suction pressure and will shut the compressor down if the refrigerant evaporating pressure becomes too low to prevent icing up the evaporator air coil.

There are some key reasons why this control would activate in response to the operating conditions of the unit :

1. Low or no airflow flow.
2. Low entering air temperature.
3. Dirty air coil due to poor filter maintenance.

B. High Pressure Control

The high pressure safety control monitors the compressor discharge pressure and will shut the compressor down if the condensing pressure becomes too high.

There some key reasons why this control would activate in response to the operating conditions of the unit depending on the mode of operation:

1. Low or no airflow (re-heat or A/C mode).
2. High return air temperature (re-heat or A/C mode).
3. Dirty air coil due to poor filter maintenance (re-heat or A/C mode).
4. Low or no flow through unit water condenser. (pool water mode)
5. Unit water condenser dirty or fouled (pool water mode).

The unit contains a control board that monitors the safety controls and operates the compressor accordingly. Refer to **APPENDIX A** for control board specifications. The low pressure control is connected to LP1 and LP2. The high pressure control is connected to HP1 and HP2.

The control board also has provisions for a flow switch. The flow switch is unused from the factory and a jumper wire is placed across the FLOW SWITCH terminals. If a flow switch is desired, the jumper can be removed and the two leads from the flow switch can be connected to the FLOW SWITCH terminals on the safety board. The flow switch is ignored for 30 seconds on compressor startup to allow time for flow to be established. The high and low pressure controls are monitored at all times. The compressor will not be able to start if either of them has a fault.

The control board has an on-board LED and a FAULT pin with a 24VAC output. An external indicator or relay can be connected across the FAULT pin and ground if external signaling is desired. Should a fault occur, the LED will flash the code of the fault condition while the safety control in question is open. The codes are shown in **TABLE 6.** The control board will lock out the compressor for five minutes when a fault occurs. Three retries per fault condition are allowed within a 60 minute period. If the fault condition occurs a fourth time the control board will permanently lock out the compressor and energize the FAULT pin. This can only be reset by powering down the unit. The LED will flash the fault code until the unit is reset.

TABLE 6 - Control Board Fault Codes

Fault	Code
High Pressure	1
Low Pressure	2
Flow (Not used)	3

If the control board enters permanent lockout mode there is a serious problem with the system and it must be rectified if the unit is to maintain good service.

POOL CIRCULATOR PUMP CONTROL

Anytime the PC unit is activated and operating in pool heat mode, there must be pool water flow through the Indoor (Pool) loop. If the pool circulator pump is a single stage unit and operates 24/7 then this is not an issue. If the pool pump is switched off and on, or is a two-stage or variable speed pump, then additional controls must be added to ensure the pool circulator pump is on and operating at full capacity whenever the PC unit is operating in pool heat mode.

A 24VAC control signal (**MAX 0.5A**) can be obtained to operate a dry contact, such as a contactor to supply power to the circulator pump, or a relay to make a low voltage signal. This can be accomplished with the addition of a SPDT relay (MARSII 92370 as an example) **CONTROL RELAY** and **DRY CONTACT** , either a second SPDT relay or a 24VAC contactor. A contactor could be used to provide a parallel high voltage power supply to a single stage pump or to power the second stage of a two-stage pump (depending on how the stages are controlled). AN SPDT relay could be used to make (or break) a signal to engage second stage on a two stage pump (depending on how the stages are controlled) or to switch setpoints on a variable speed pump.

Table 7 lists the connections required to set up the control circuit. The DRY CONTAC coil is energized whenever the PC unit is is pool heat mod (Y on, O off).

TABLE 7 - Pool Circulator Control Wiring			
WIRE FROM		WIRE TO	
ITEM	PIN	ITEM	PIN
PC unit	Y	Control Relay	C (pin 4)
PC unit	O	Control Relay	Coil (pin 3)
PC unit	C	Control Relay	Coil (pin 1)
PC unit	C	Dry Contact*	Coil-
Control Relay	NC (pin 5)	Dry Contact*	Coil+
* 24VAC coil high voltage contactor (115/230VAC) or low voltage SPDT relay (24VAC).			

A/C OPTION (OUTDOOR CONDENSER)

For installations that require cooling to maintain an appropriate pool room temperature, an outdoor condenser unit can be connected to the PC unit in order to reject the unwanted heat outdoors (or to another desired location) when the Air Aquastat and Pool Aquastat are satisfied. Without an outdoor condenser unit, the heat will be rejected to the pool even though the Pool Aqastat is satisfied, causing the pool to overheat.

The outdoor condenser unit does not require a TXV (nor should it have one). Only an air coil and fan are required. The condenser unit should be sized to match or exceed the rejection capacity of the unit to ensure proper operation (refer to **TABLE 16**).

The PC unit has external liquid and vapour ports on it for connection to an outdoor condenser unit. The vapour line is 7/8" OD and the liquid line is 3/8" OD. The PC unit must be pumped down to remove all refrigerant and then charged with nitrogen until a positive pressure is reached before the ends of the ports can be cut off and connected to. Connect the lines and silver solder the connections.

Maritime Geothermal Ltd. absolutely requires that dry nitrogen be bled through the system during all silver soldering procedures so that no oxidation occurs on the inside of the copper tubing. The service ports on the unit can be used to connect the nitrogen with a refrigeration manifold.

If necessary, a wet rag can be wrapped around the each of the ports to prevent melting the grommet when silver soldering. Ensure that no water enters any of the ports or tubing.

The Outdoor condenser unit will also require power and control connections. Refer the unit's manual for a description of these. Only one signal is required between the system controls and the condenser unit, which is used to activate the fan. This signal is the O1 signal of the PC unit. If the condenser unit has it's own controls and transformer, use a relay to isolate the signal. Another method would be to control a contactor placed in the power supply to the condenser unit.

A/C OPTION (COLD WATER)

As an alternate for installations that require cooling, a set of **motorized** 3-way valves can be place in the IN and OUT pool water lines connected to the unit (**refer to 001044CDG)**. Connect the IN valve common port to the PC IN port, the NO port to the supply from the pool and the NC port to a clean cold water source with it's own flow source, such as a well. It may also be necessary to install a regulating valve (ie gate valve, ball valve, dole valve) to restrict the flow to obtain the recommended discharge pressure of 350-400PSIG. Connect the OUT valve common port to the PC OUT port, the NO port to the return line to the pool and the NC port to a suitable drain.

The valves can be controlled by Stage 1 of an Air Cool Thermostat. When Stage 1 activates a signal is sent to the valves to energize them, disconnecting the pool circuit and connecting the cold water circuit. Additional wiring may be required to turn on the cold water pump system as well.

NOTE: The Priority Jumper must be removed for this setup.

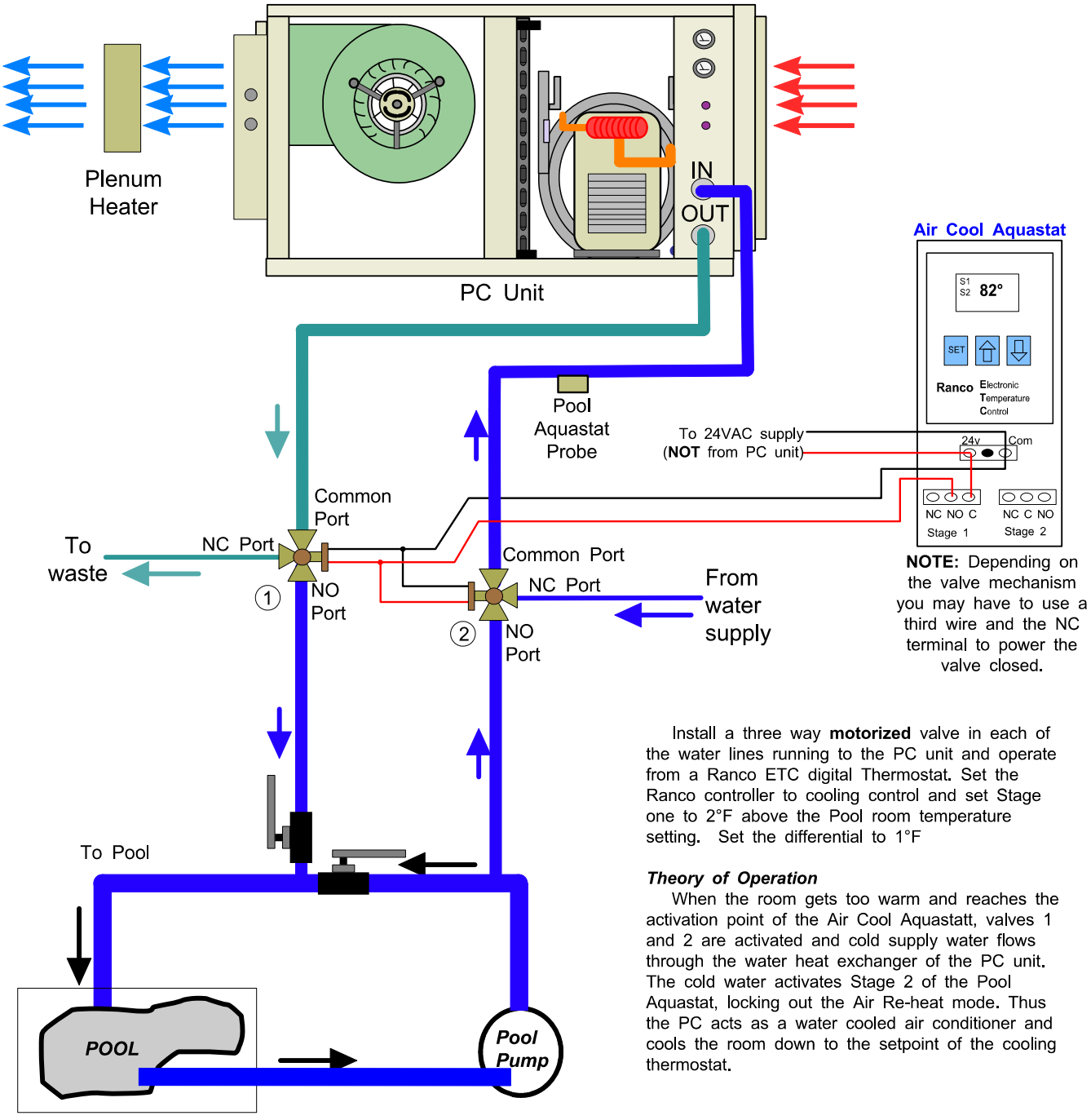
NOTE: the power for these controls must not come from the PC unit as it could overload the transformer. An external power supply is required..

EXHAUST FAN OPTION

As an alternate for installations that may only require minor cooling, an exhaust fan could be installed as part of the system to eliminate excess heat from the pool room. This exhaust fan would be temperature controlled (ie aquastat) and would operater whenever the pool room temperature rose above the activation value of the controller.

NOTE: The Priority Jumper must be placed for this setup.

Air Conditioning with a PC unit using (2) 3-way motorized valves and a local source of cold water



NOTE: Depending on the valve mechanism you may have to use a third wire and the NC terminal to power the valve closed.

Install a three way **motorized** valve in each of the water lines running to the PC unit and operate from a Ranco ETC digital Thermostat. Set the Ranco controller to cooling control and set Stage one to 2°F above the Pool room temperature setting. Set the differential to 1°F

Theory of Operation

When the room gets too warm and reaches the activation point of the Air Cool Aquastatt, valves 1 and 2 are activated and cold supply water flows through the water heat exchanger of the PC unit. The cold water activates Stage 2 of the Pool Aquastat, locking out the Air Re-heat mode. Thus the PC acts as a water cooled air conditioner and cools the room down to the setpoint of the cooling thermostat.

					Drawn By Chris Geddes	Date 25 MAY 09	MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4
					Checked By Chris Geddes	Date 25 MAY 09	Drawing Name: PC Unit Cold Water Cooling Connections
					Approved By (ENG) Chris Geddes	Date 25 MAY 09	
01	Initial Release	C. GEDDES	C. GEDDES	25 MAY 09	Approved By (MFG)	Date	Size: A; Drawing Number: 001045CDG; REV: 01; SHEET: 1 of 1
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date	

POOL SURFACE AREA

As the square footage of the pool increases the evaporation rate will increase proportionally. This is due to the increase in size of the surface water / air contact area. The depth, shape and total volume of the pool do not affect the evaporation rate.

PC UNIT SIZING

The amount of evaporation occurring in a residential pool application of a given size is governed mainly by the temperatures at which the air and water are maintained. It is common practice to keep the air temperature 2°F above the pool water temperature. The lower the air temperature is in comparison to the water temperature, the higher the evaporation rate. The evaporation rate of the pool increases when the following occur:

1) Pool water temperature increases
2) Activity level / wet floor area increases
3) Airflow across pool surface increases
4) Room air temperature decreases
5) Room relative humidity level decreases

1) Pool water temperature: The temperature of the pool water in relation to the air temperature is one of the most deciding factors in determining overall evaporation rate from the pool. As the room air temperature decreases in relation to the pool water, the evaporation rate will increase dramatically. The normal pool temperature range for private pool use is from 78° F. to 82° F. The air temperature should be preferably kept 1° to 2° F. above the water temperature for the most economical operation of the pool conditioner.

2) Activity level / wet floor area: During pool use, water will be drawn out of the pool by the action of swimmers leaving and re-entering the pool during normal activities. This water will accumulate on the floor surrounding the pool and will contribute to the overall surface exposed to the air for evaporation purposes. If the pool floor is heated then the evaporation rate will exceed that of the pool itself and this extra wetted area should be considered in sizing the pool conditioner.

3) Airflow across pool surface: Increased airflow across the surface area of the pool increases the evaporation rate. Ducting should de designed to minimize the airflow across the pool to reduce this effect. See the **Supply Duct Section** for more info.

4) Room air temperature: As mentioned in 1), the pool room temperature is normally kept slightly above the water temperature to minimize the amount of evaporation taking place.

5) Room relative humidity: The relative humidity setpoint for most pool areas is from 50% to 60%. Lowering the relative humidity setpoint will increase the evaporation rate from the pool thus causing the pool conditioner to run longer but may be necessary to prevent condensation on some glass surfaces during cold weather. Relative humidity should be set only low enough to prevent condensation from occurring on windows and doors.

TABLE 8 gives a step by step explanation of how to determine the evaporation rate of the pool. Once the Pool Evaporation Rate (ERp) has been calculated then the proper size unit can be selected from **TABLE 9 or 10** based on the Non-Active Humidity Level (RHna).

TABLE 9 or 10 also gives a general idea as to the size of pool that can be accommodated by each model size for a typical residential installation. This is just a guideline, the Pool Evaporation Rate (ERp) should be calculated as per **TABLE 8.**

TABLE 9 - Typical PC Unit Sizing Guide 60Hz*

	Airflow	Pool Surface Area	Moisture Removal 50%RH	Moisture Removal 60%RH
Model	CFM (L/s)	ft^2. (m^2)	Lbs(kg)/hr	Lbs(kg)/hr
45	1,200 (566)	**600 (56)**	**14 (6.4)**	**18 (8.2)**
55	1,500 (708)	**800 (74)**	**19 (8.6)**	**23 (10.4)**
65	1,900 (897)	**1,100 (93)**	**24 (10.9)**	**30 (13.6)**
80	2,100 (991)	**1,300 (111)**	**28 (12.7)**	**33 (15.0)**

*Residential application with Tp=80°F and Ta=82°F EWT=80F and EAT=82F

TABLE 8 - Step by Step Pool Evaporation Rate Calculation

Step	Action	Variable	Example	Unit
1	Select pool water temperature*	**Tp**	80	°F
2	Select pool room air temperature*	**Ta**	82	°F
3	Select Non-Active Humidity Level (50 or 60%)	**RHna**	50	%
4	Select the number of active hours	**Ha**	2	hours
5	Calculate the number of non-active hours = 24 - Ha	**Hna**	22	hours
6	Lookup the active Evaporation Rate Factor from **TABLE 12**	**ERFa**	0.036	Lbs/hr-ft^2
7	Lookup the non-active Evaporation Rate Factor from **TABLE 11** or **TABLE 12** (from Step 3).	**ERFna**	0.048	Lbs/hr-ft^2
8	Select the activity factor (see **TABLE 13**)	**Af**	0.5	
9	Calculate the Average Evaporation Rate Factor = (Ha * ERFa * AF + Hna x ERFna *0.5) / 24	**ERFavg**	0.0235	Lbs/hr-ft^2
10	Select Pool Surface Area	**Ap**	800	ft^2
11	Calculate Pool Evaporation Rate = Ap * ERFavg	**ERp**	18.8	Lbs/hr

*It is recommended that the air temperature be 2°F above the pool water temperature. The lower the air temperature in comparison to the water temperature, the higher the evaporation rate. Typical residential values are Tp = 80°F (27°C) and Ta = 82°F (28°C)

TABLE 10- Typical PC Unit Sizing Guide 50Hz*				
	Airflow	Pool Surface Area	Moisture Removal 50%RH	Moisture Removal 60%RH
Model	CFM (L/s)	ft^2. (m^2)	Lbs(kg)/hr	Lbs(kg)/hr
45	1,200 (566)	500 (46)	**13 (5.9)**	**15 (6.8)**
55	1,500 (708)	700 (65)	**16 (7.3)**	**20 (9.1)**
65	1,900 (897)	900 (84)	**21 (9.5)**	**26 (11.8)**
80	2,100 (991)	1,100 (102)	**24 (10.9)**	**29 (13.2)**

*Residential application with Tp=80°F and Ta=82°F
EWT=80F and EAT=82F

TABLE 11 - Evaporation Rate Chart (50% RH) – Lbs/Hr - ft^2											
		Air Temperature (Ta) °F										
		86	85	84	83	82	81	80	79	78	77	76
Pool Water Temperature (Tp) °F	78	0.034	0.036	0.038	0.038	0.040	0.042	0.044	0.046	0.048	0.050	0.052
	80	0.042	0.044	0.046	0.046	**0.048***	0.050	0.050	0.052	0.054	0.056	0.058
	82	0.048	0.050	0.052	0.052	0.054	0.056	0.058	0.060	0.062	0.064	0.066
	84	0.056	0.058	0.060	0.060	0.062	0.064	0.066	0.068	0.070	0.070	0.072
	86	0.062	0.066	0.068	0.068	0.070	0.072	0.074	0.076	0.076	0.078	0.080
	88	0.072	0.074	0.076	0.076	0.078	0.080	0.082	0.084	0.086	0.086	0.088
	90	0.080	0.082	0.084	0.084	0.086	0.088	0.090	0.092	0.094	0.096	0.098
	92	0.090	0.092	0.094	0.094	0.096	0.098	0.100	0.100	0.102	0.104	0.106
	94	0.098	0.102	0.104	0.104	0.106	0.108	0.108	0.110	0.112	0.114	0.116
	96	0.110	0.112	0.114	0.114	0.116	0.118	0.120	0.120	0.122	0.124	0.126
	98	0.120	0.122	0.124	0.124	0.126	0.128	0.130	0.132	0.134	0.136	0.138
	100	0.132	0.134	0.136	0.136	0.138	0.140	0.142	0.144	0.146	0.148	0.148
	102	0.144	0.146	0.148	0.148	0.150	0.152	0.154	0.156	0.158	0.158	0.160
	104	0.156	0.158	0.160	0.160	0.162	0.164	0.166	0.168	0.170	0.172	0.174

* Recommended setpoints value

TABLE 12 - Evaporation Rate Chart (60% RH) – Lbs/Hr - ft^2											
		Air Temperature (Ta) °F										
		86	85	84	83	82	81	80	79	78	77	76
Pool Water Temperature (Tp)°F	78	0.020	0.022	0.026	0.028	0.030	0.032	0.034	0.036	0.038	0.040	0.042
	80	0.026	0.030	0.032	0.034	**0.036***	0.038	0.040	0.044	0.046	0.048	0.050
	82	0.034	0.036	0.038	0.042	0.044	0.046	0.048	0.050	0.052	0.054	0.056
	84	0.040	0.044	0.046	0.048	0.050	0.054	0.056	0.058	0.060	0.062	0.064
	86	0.048	0.052	0.054	0.056	0.060	0.060	0.064	0.066	0.068	0.070	0.072
	88	0.058	0.060	0.062	0.064	0.066	0.070	0.072	0.074	0.076	0.078	0.080
	90	0.066	0.068	0.070	0.074	0.076	0.078	0.080	0.082	0.084	0.086	0.088
	92	0.074	0.078	0.080	0.082	0.084	0.088	0.090	0.092	0.094	0.096	0.098
	94	0.084	0.088	0.090	0.092	0.094	0.096	0.098	0.100	0.104	0.106	0.108
	96	0.094	0.098	0.100	0.102	0.104	0.106	0.110	0.112	0.114	0.116	0.118
	98	0.106	0.108	0.112	0.114	0.116	0.118	0.120	0.122	0.124	0.126	0.128
	100	0.118	0.120	0.122	0.124	0.128	0.130	0.132	0.134	0.136	0.138	0.140
	102	0.130	0.132	0.134	0.136	0.140	0.142	0.144	0.146	0.148	0.150	0.152
	104	0.142	0.144	0.146	0.150	0.152	0.154	0.156	0.158	0.160	0.162	0.164

* Recommended setpoints value

TABLE 13 – ACTIVITY FACTOR (AF)	
Value	**Application**
0.5	Residential
0.65	Fitness Club / Condiminium
0.65	Therapy / Aquafit / Elderly Swim
0.8	Hotel
0.8	School
1.0	Public Pool
1.0	Spas and Whirlpools

DUCT SYSTEMS - GENERAL

The duct system should be constructed of standard galvanized sheet metal, such as would be used for a typical residential heating system. All joints should be sealed with an approved duct sealant to ensure there are no leaks in the system.

A duct system capable of supplying the required air flow is of utmost importance. Maritime Geothermal Ltd. recommends that the static pressure be kept below 0.2 inches of water total. To mimimize the fan power required by the unit.

It is ***VERY IMPORTANT*** that all turns in both the supply trunks and the return trunks be made with ***TURNING RADII***. Air act like a fluid and, just like water, pressure drop is increased when air is forced to change direction rapidly around a sharp or irregular corner.

It is recommended that flexible collars be used to connect the main trunks to the heat pump. This helps prevent any vibrations from travelling down the ductwork. If a plenum heater is installed, the collar should be at least 12" away from the heater elements.

The first 5-10 feet of the main supply trunks may be insulated with acoustical duct insulation to further inhibit any noise from the unit from travelling down the ductwork. If a plenum heater is installed, insulation should not be placed within 12" of the heater elements. **Drawing 001032CDG** shows a typical installation.

SUPPLY DUCT SYSTEM

The care and attention devoted to setting up the air distribution system can make or break any indoor pool conditioning system. Important factors to consider are listed below:

1) Sufficient air must be moved within the pool enclosure to satisfy the requirements of both the occupants of the room and the heat pump system with maximum flow directed over the outside windows and doors and minimum flow directly over the exposed surface of the pool itself.

2) To prevent air stagnation and stratification the system must provide at least 4 to 8 room air changes per hour.

3) The PC unit supply air ductwork must be adequately sized to handle 1200 to 2100 cfm of air (depending on the model) with no more than .20" H_2O of external static pressure. **TABLE 15** has a duct sizing guide help in selecting adequate duct sizes.

4) An in-floor duct system is usually the most effective method of supplying air to the room (**refer to diagram C**). Distribution of the conditioned air will be most effective if the air is released from the floor and allowed to rise upwards over the glass surfaces. It is important to try and blanket the entire surface of glass windows and metal doors with a film of dry air from the pool conditioner to prevent accumulation of condensation at the corners or bottom of the glass. If a ceiling ducted system is chosen (**refer to diagram E**). then the supply air should be of sufficient velocity to ensure that air flows over the glass all the way down to the bottom of the window.

5) Linear supply grills should be placed near all glass areas exposed to outside temperatures for optimum operation.

6) Additional care should be taken to see that air flow is not directed across the pool surface since moisture loss from the pool water will be greatly increased under these conditions.

7) If a floor distribution system is not possible then ceiling ducts should be positioned to blow down over the exposed glassed areas of the room perimeter. It may be necessary to increase the airflow (refer to the **FAN MOTOR** section) to accommodate the more difficult job of forcing the air exiting the supply ducts down over the glass.

RETURN DUCT SYSTEM

The air inlet of the return duct system should ideally be placed 10 to 15 ft above the pool level. Placing this duct inlet in an elevated position will ensure that air movement travels in an upward fashion if it is introduced from the floor. An air flow pattern which causes minimum airflow across the pool surface should be constructed to minimize evaporation from the pool surface. (See duct diagram layout.) Large volumes of air travelling near the pool surface can also cause bathers to feel cool whenever they emerge from the water.

PLENUM HEATER (Optional)

For installations that do not already have a backup heat source such as electric baseboard, wood stove, propane etc, it is recommended that a plenum heater be installed. This provides two functions.

The first function of the plenum heater is to act as an auxiliary heat source for the pool room air. As such it will provide additional heat on extremely cold days when the pool requires all of the unit runtime, eliminating any discomfort to the homeowner.

The second function of the plenum heater is to provide emergency heat should a problem occur that causes the PC unit to be locked out on a safety control. The control system will automatically accomplish this function, allowing the plenum heater to function even if the PC unit is not operational (PC unit must still have power).

The plenum heater is powered separately from the heat pump. Only two sets of two control wires are needed to connect the plenum heater to the control system / PC unit. Refer to **000145CDG** in this manual or on the PC electrical box cover for instructions on how to connect the plenum heater control lines.

The plenum heater should be mounted in the supply duct in a manner that allows all of the airflow to pass through it to prevent any hot spots in the heater elements.

TABLE 14 shows the recommended size plenum heater, as well as the wire size and breaker size needed to provide power to the plenum heater.

TABLE 14 - Plenum Heater Sizing				
PC	Plenum Heater (230-1-60)			
Model	Size (kW)	Current (A)	Breaker (A)	Wire Size
45	15	62	100	#3
55	15	62	100	#3
65	20	84	125	#3
75	20	84	125	#3

CONDENSATE DRAIN

The unit comes equipped with a 7/8" OD copper pipe port labeled "Condensate Drain". This drain allows the condensate which forms during the air-conditioning cycle to be removed from the unit. The drain should be connected as per local codes. During high humidity weather, there could be as much as 25 gallons of water formed per day.

NOTE: The condensate drain operates by gravity, ensure the unit is mounted high enough to allow the condensate to flow without overflowing the internal drip tray located at the bottom of the unit.

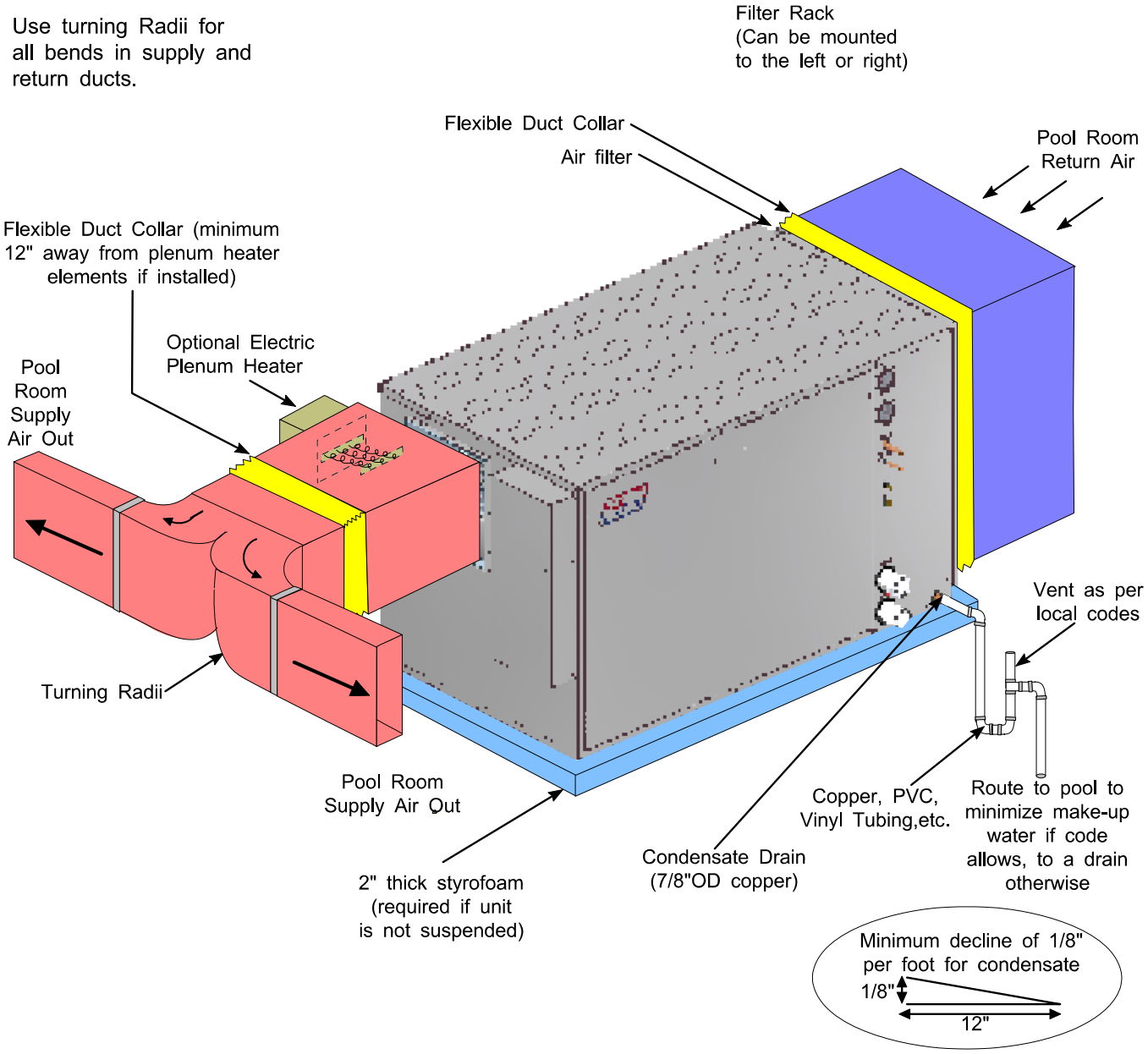
Care should be taken in the spring to ensure that this pipe is not plugged with dust that has collected during the winter causing the condensate to overflow into the bottom of the unit and onto the floor. **The condensate drain must be externally trapped.** It is recommended that it be piped into the pool via a separate line in order to reduce the amount of make-up water required for the pool.

Drawing 001032CDG shows a typical installation.

Typical Duct and Condensate Connections (PC Unit)

Ducts should be sized as per the Duct Sizing table in this manual

Use turning Radii for all bends in supply and return ducts.



Accoustic insulation may be used inside the supply ducts near the unit to dampen any air noise that may be present. Ensure there is no insulation within 12" of the plenum heater if installed.

REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	01 JUN 09

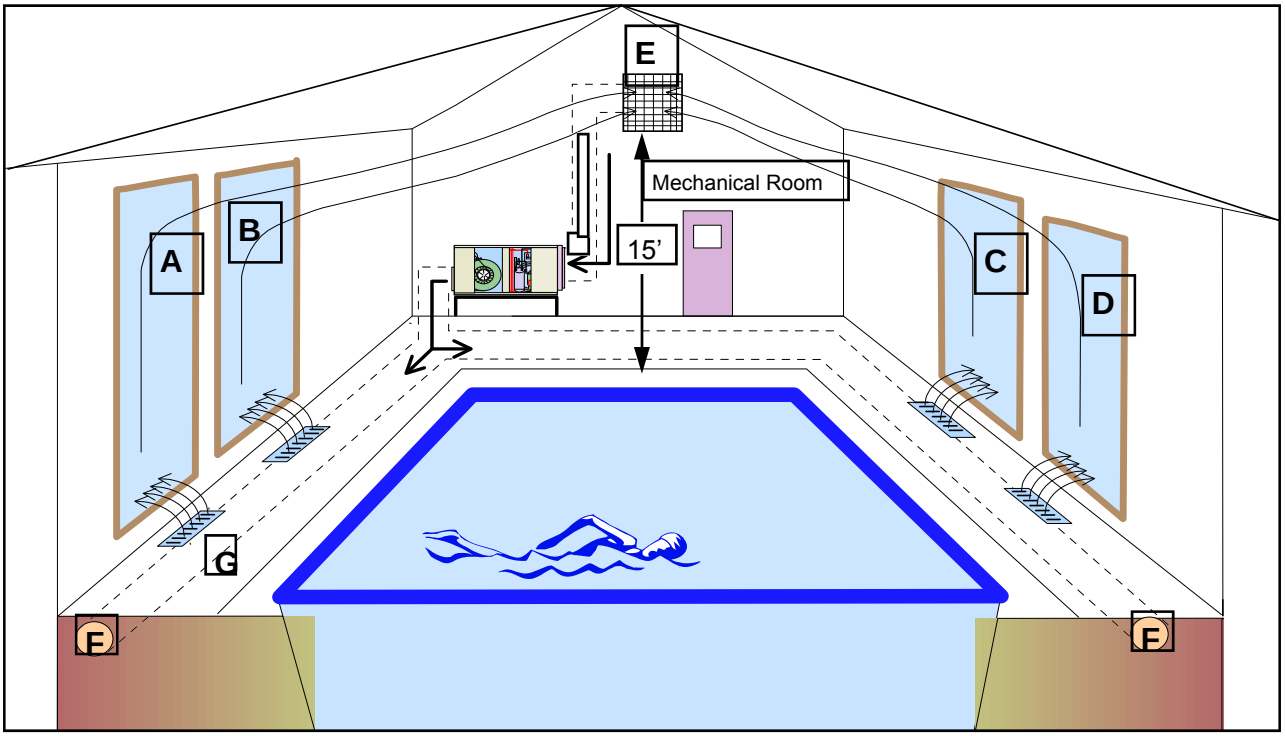
Drawn By	Chris Geddes	Date 01 JUN 09
Checked By	Chris Geddes	Date 01 JUN 09
Approved By (ENG)	Chris Geddes	Date 01 JUN 09
Approved By (MFG)		Date
Approved By		Date

MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: Typical Duct and Condensate Connections (PC unit)

Size	Drawing Number	REV	SHEET
A	001032CDG	01	1 of 1

DIAGRAM E - Floor Supply Ducts With Elevated Return

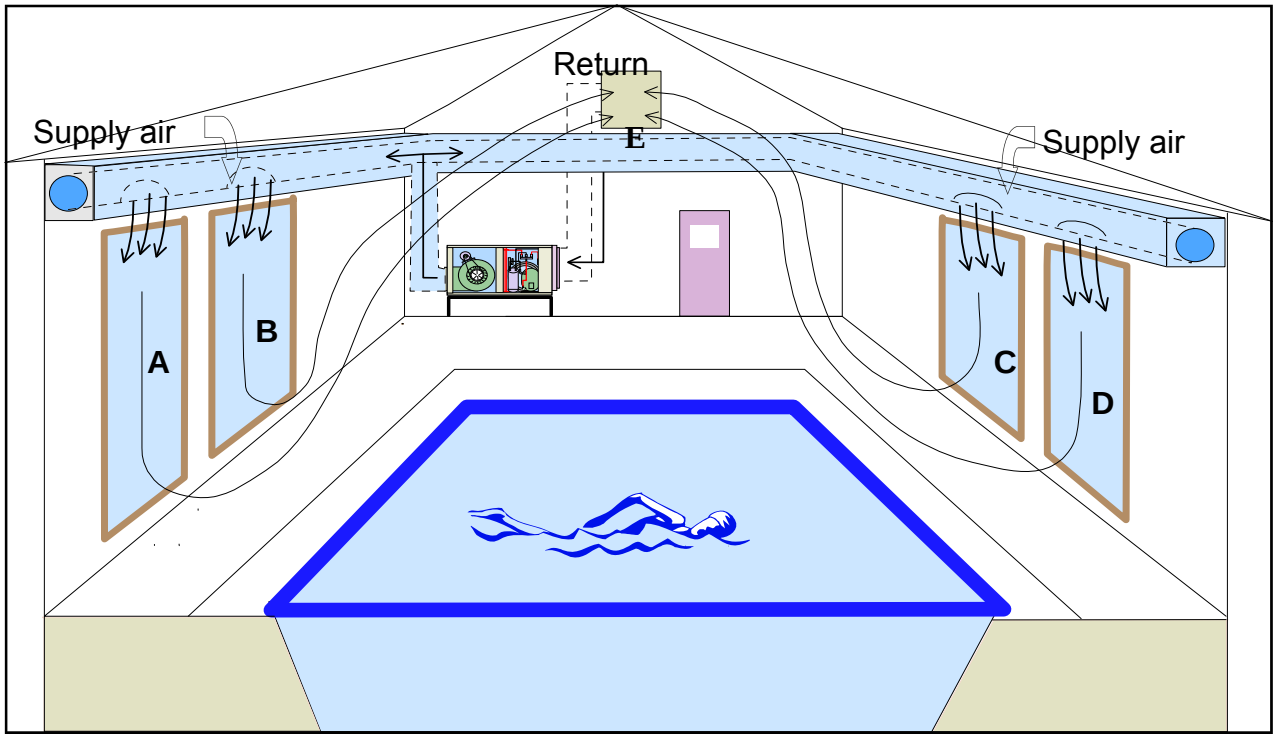


The diagram above shows a common technique for installing supply ducts in the pool room area. Dry air is directed upward over the windows **A**, **B**, **C** and **D** . As the air picks up moisture from the pool room it is drawn towards the return air grill **E** where it re-enters the pool conditioner. Air is released over the glass and drawn to the return air grill of the PC with as little travel as possible over the pool surface.

Supply ducts "**F**" are located below the concrete pool decking and insulated with waterproof closed cell or Styrofoam insulation so that the distribution air is relatively the same temperature throughout the entire length of the building.

Floor diffusers "**G**" should be placed close to the windows and be wide enough to direct air over the entire glass surface to ensure that no condensation occurs in corners or on the lower levels of the glass.

DIAGRAM F - Elevated Supply Ducts With Elevated Return



The diagram above shows another possible technique for installing supply ducts in the pool room area. Dry air is directed downward over the windows **A**, **B**, **C** and **D** . As the air picks up moisture from the pool room it is drawn towards the return air grill **E** where it renters the pool conditioner once more. In each case air is released over the glass and drawn to the return air grill of the PC with as little travel as possible over the pool surface.

TABLE 15 - Duct Sizing Guide (external static of 0.20”H2O)

Airflow (CFM)	Minimum Duct Area (sq.in)	Diameter (in)	Rectangular Equivalents (in)						Return Air Diameter (in)	Airflow (L/s)
37	20	5	2.25 x 10	3 x 8	3.5 x 6	4 x 5.5	5 x 5		5	17
63	20	5	2.25 x 10	3 x 8	3.5 x 6	4 x 5.5	5 x 5		6	30
100	28	6	3.25 x 10	4 x 8	5 x 6	5.5 x 5.5	6 x 6		7	47
152	38	7	3.25 x 14	4 x 11	5 x 8.5	6 x 7	6.5 x 6.5		8	72
212	50	8	4 x 15	5 x 12	6 x 10	7 x 8	8 x 8		9	100
226	50	8	4 x 15	5 x 12	6 x 10	7 x 8	8 x 8		10	107
277	64	9	5 x 15	6 x 12	7 x 10	8 x 9	8.5 x 8.5		10	131
304	64	9	5 x 15	6 x 12	7 x 10	8 x 9	8.5 x 8.5		12	143
393	79	10	6 x 15	7 x 13	8 x 11	9 x 10	9.5 x 9.5		12	185
411	113	12	7 x 18	8 x 16	9 x 14	10 x 12	11 x 11		12	194
655	113	12	7 x 18	8 x 16	9 x 14	10 x 12	11 x 11		14	309
680	154	14	8 x 22	9 x 19	10 x 17	11 x 15	12 x 14	13 x 13	14	321
995	154	14	8 x 22	9 x 19	10 x 17	11 x 15	12 x 14	13 x 13	16	470
1325	201	16	8 x 30	10 x 22	12 x 18	14 x 16	15 x 15		18	625
1450	201	16	8 x 30	10 x 22	12 x 18	14 x 16	15 x 15		20	684
1750	254	18	8 x 40	10 x 30	12 x 24	14 x 20	16 x 17	16.5 x 16.5	20	826
2000	254	18	8 x 40	10 x 30	12 x 24	14 x 20	16 x 17	16.5 x 16.5	22	944
2250	314	20	10 x 38	12 x 30	14 x 26	16 x 22	18 x 19	18.5 x 18.5	22	1062
2600	314	20	10 x 38	12 x 30	14 x 26	16 x 22	18 x 19	18.5 x 18.5	24	1227
2900	380	22	12 x 36	14 x 30	16 x 26	18 x 23	20 x 20		24	1369
3400	380	22	12 x 36	14 x 30	16 x 26	18 x 23	20 x 20		26	1605
3600	452	24	14 x 38	16 x 32	18 x 28	20 x 25	22 x 22		26	1699
4300	452	24	14 x 38	16 x 32	18 x 28	20 x 25	22 x 22		28	2029
5250	531	26	16 x 38	18 x 32	20 x 30	22 x 24	24 x 24		30	2478
6125	616	28	18 x 38	20 x 34	22 x 30	24 x 28	26 x 26		32	2891
6500	616	28	18 x 38	20 x 34	22 x 30	24 x 28	26 x 26		34	3068
7250	707	30	20 x 40	22 x 38	24 x 32	26 x 30	28 x 28		34	3422
7800	707	30	20 x 40	22 x 38	24 x 32	26 x 30	28 x 28		36	3681
8500	804	32	22 x 40	24 x 38	26 x 34	28 x 32	30 x 30		36	4012
9200	804	32	22 x 40	24 x 38	26 x 34	28 x 32	30 x 30		38	4342
9800	908	34	24 x 42	25 x 40	26 x 38	28 x 34	30 x 32	31 x 31	38	4625
10900	908	34	24 x 42	25 x 40	26 x 38	28 x 34	30 x 32	31 x 31	40	5144
			28 x 40	30 x 36	32 x 34	33 x 33				
			30 x 42	32 x 38	34 x 36	35 x 35				
			30 x 45	34 x 40	36 x 38	37 x 37				

Startup Procedure

The following steps describe how to perform the startup procedure of the pool conditioner.

The PC-Series R410a Startup Record located in this manual is used in conjunction with this startup procedure to provide a detailed record of the installation. A completed copy should be left on site, a copy kept on file by the installer and a copy should be sent to Maritime Geothermal Ltd.

Check the boxes or fill in the data as each step is completed. For data boxes, circle the appropriate units. Fill in the top section of all three copies, or one copy if photocopies can be made after the startup has been completed.

PRE-START INSPECTION

Ductwork:

1. Verify that all ductwork has been completed and is firmly attached to the unit. Verify that any dampers or diverters are properly set for operation of the unit.
2. Verify that all registers are open and clear of any objects that would restrict the airflow.
3. Verify that a new air filter is installed and the cover is secured.
4. Verify the condensate drain is connected, properly trapped, vented and free of debris.
5. Ensure the unit is sitting level to prevent overflow of the condensate drip tray.
6. If a plenum heater has been installed, verify that it is securely fastened to the ductwork.

Indoor Loop (Pool Loop):

1. Verify there are no leaks in the connections to the unit.
2. Verify that the bypass is set up and there flow as per 000145CDG.

Electrical:

1. **Ensure the power to the unit is off. Ensure the power to the plenum heater is off if equipped.**
2. Remove the electrical box cover.
3. Verify all high voltage connections. Ensure that there are no stray wire strands, all connections are tight and the ground wire is connected tightly to the ground connector for the unit and plenum heater.
4. Record the fuse / circuit breaker size and wire gauge for the unit. Record the fuse / circuit breaker size, wire gauge and size of the plenum heater if installed.
5. Set the de-humidistat to its highest setting.
6. Ensure all access panels are in place.

UNIT STARTUP

The unit is now ready to be started. The steps below outline the procedure for starting the unit and verifying proper operation of the unit. **It is recommended that safety glasses be worn during the following procedures.**

Preparation:

1. Turn the power on to the unit and verify that the Air Aquastat, Pool Aquastat and Air Cool Aquastat (if equipped) power up.
2. Adjust the Air Aquastat and Pool Aquastat to the following settings in the table below. There should be a 5 minute delay on power up, allowing enough time to enter the settings before the unit starts

Annumciator	Description	Pool Aquastat	Air Aquastat	Air Cool Aquastat
F or C	Temperature Scale	**F**	**F**	**F**
S1 (blinking)	Stage 1 Setpoint	**50**	**50**	**80**
DIF 1 (blinking)	Stage 1 Differential	**2**	**2**	**1**
C1/H1	Stage 1 Heating or Cooling Mode	**H**	**H**	**C**
S2 (blinking)	Stage 2 Setpoint	**50**	**50**	**80**
DIF 2 (blinking)	Stage 2 Differential	**1**	**2**	**1**
C2/H2	Stage 2 Heating or Cooling Mode	**H**	**H**	**C**

3. Lower the de-humidistat all the way. The unit should start within 5 minutes.
4. Measure the following voltages on the compressor contactor and record them on the startup sheet: L1-L2, L2-L3, L1-L3 (only L1-L2 for single phase units).

Pool Water Heating Mode:

1. Monitor the suction and discharge pressures on the gauges on the side front of the unit. Adjust the flow through the unit as per 000145CDG-03 until a discharge pressure of **350-400PSIG** is obtained.

2. The suction and pressure will depend on the room temperature, but it should be about **90-110PSIG** for a typical start-up. Record the value after 10 minutes of runtime.

3. Adjust the Air Aquastat Stage 1 setpoint to the desired pool room temperature or high enough to activate the stage if the room is already up to temperature. The unit should switch to Air Re-heat mode.

Air Re-heat Mode:

1. Check the refrigeration gauges on the unit. The suction and discharge pressures will depend on the room temperature, but they should be about **90-110PSIG** and **250-350PSIG** respectively for a typical start-up.
2. Monitor the refrigeration gauges while the unit runs. Record the following after 10 minutes of runtime:
    1. Suction pressure
    2. Discharge pressure
    3. Duct Return temperature (poke a small hole in the flex collar and insert probe in airstream)
    4. Duct Supply temperature (poke a small hole in the flex collar and insert probe in airstream)
    5. Duct Delta T (should be between **4-9°F, (2-5°C)**
    6. Compressor L1(C) current (black wire, place meter between electrical box and compressor)

Electric Plenum Heat (if installed):

1. Adjust the Air Aquastat Stage 2 value to 3F less that the desired pool room temperature or high enough to activate the stage if the room is already up to temperature.
2. Remove the electrical cover from the plenum heater. Place a current clamp meter around one of the supply wires. Turn on the power to the plenum heater. Verify that the current draw increase as each stage is activated. (10kW has 2 stages, 15kW has 3 stages and 20kW has 4 stages). Record the final current draw on the startup record.

Air Re-heat Lockout Verification:

1. Adjust the Pool Aquastat Stage 2 value to 2F less that the desired pool room temperature or high enough to activate the stage if the pool is already up to temperature. The unit should switch back to pool water heat mode but the electric plenum heater should remain on.

A/C Mode (If equipped):

1. Adjust the Stage 1 and Stage 2 setpoints low enough to activate the stages. The unit should switch to air conditioning mode and the outdoor condenser fan should start. Verify that the suction and discharge pressures are approximately **90-110PSIG** and **250-350PSIG.** Record the values after 10 minutes of runtime.

Final Inspection:

1. Turn the power off to the unit (and plenum heater if installed) and remove all test equipment.
2. Install the electrical box cover on the PC unit. Install the electrical cover on the plenum heater if applicable.
3. Do a final check for leaks in the indoor (pool) loop system and ensure the area is clean.
4. Turn the power on to the unit and the plenum heater if installed. Set the controls to the final values and record them on the startup record.

Startup Record:

1. The installer shall sign and date the Startup Record and have the homeowner sign as well. The installer shall leave the Startup Record with the homeowner, retain a copy for filing and send a copy to Maritime Geothermal Ltd. for warranty registration.

Post Startup Verification:

1. It is generally necessary to re-visit the site after a few days to verify that the system is operating properly as it may take some time to bring the pool up to temperature.
2. Force the unit to pool water heat mode (if it is not already in it) and verify the discharge pressure of the unit. Adjust the flow rate as per 000145CDG-03 to obtain a discharge pressure of **350-400PSIG** again if required.
3. If the pool is not close to the final temperature then anther visit and re-adjustment of the flow is recommended.

Startup Record —PC-Series Size 45-80 R410a

Installation Site		**Startup Date**	**Installer**									
City			**Company**									
Province			**Model**									
Country			**Serial #**									
Homeowner Name		**Homeowner Phone #**										

Check boxes unless asked to record data, circle units

PRE-START INSPECTION

Ductwork	Ductwork is completed, dampers/ diverters are adjusted											
	Registers are open and clear of objects											
	Air filter and end cap are installed											
	Condensate Drain is connected, trapped, vented and free of debris											
	Unit is sitting level											
	Plenum heater is securely fastened (if applicable)											
Indoor (Pool)	No leaks in the connections to the PC unit ports											
Loop	There is flow and bypass is setup as per drawing 000145CDG											
Electrical	High voltage connections are correct and securely fastened											
	Circuit breaker (or fuse) size and wire gauge for Heat Pump		A		Ga.							
	Circuit breaker (or fuse) size, wire gauge, and Plenum Heater size		A		Ga.		kW					
	Low voltage connections are correct and securely fastened											

STARTUP DATA

Preparation	Aquastats set at values listed in table											
	Voltage across L1 and L2, L1 and L3, L2 and L3											VAC
Pool Water	Flow set for a discharge pressure of 350-400PSIG											
Heating Mode	Suction pressure after 10 minutes of runtime				psig	kPa						
	Unit switches to Air-Reheat mode											
Air Re-Heat Mode	Suction Pressure / Discharge Pressure						psig	kPa				
(10 minutes)	Duct Return, Duct Supply, and Delta T		In		Out		°F	°C				
	Compressor L1 (black wire) current		A									
Plenum Heater	Current draw (all stages on)		A									
Air Re-heat Lock-out	Unit switches back to pool water heat mode											
A/C Mode	Suction and discharge after 10 minutes of runtime						psig	kPa				
Final Inspection	Electrical box cover installed on unit and plenum heater											
	Piping leak free, area is clean											
	De-humidistat setpoint		%RH									
	Pool Aquastat Settings (S1, DIF1, S2, DIF2)						°F	°C				
	Air Aquastat Settings (S1, DIF1, S2, DIF2)						°F	°C				
	Air Cool Aquastat Settings (S1, DIF1, S2, DIF2) (ensure identical)						°F	°C				

Date:		**Installer Signature:**		**Homeowner Signature:**	

A total of three copies are required, one for the homeowner, one for the installer and on to be sent to Maritime Geothermal Ltd.

GENERAL MAINTENANCE SCHEDULE		
Item	**Interval**	**Procedure**
Air Filter	6 months	Inspect for dirt. Replace if necessary.
Contactor	1 year	Inspect for pitted or burned points. Replace if necessary.
Condensate Drain	1 year	Inspect for clogs. Remove and clean if necessary.
Heat exchanger	As required*	Clean as per HEAT EXHCANGER FLUSING PROCEDURE below.
***Whenever system performance is reduced.**		

HEAT EXCHANGER FLUSHING PROCEDURE—INDOOR (POOL) LOOP	
STEP 1	Isolate the heat exchanger by closing the 3-way valves in the IN and OUT ports to the heat exchanger. This will block off the flow from the pool and provide connection points to flush through.
STEP 2	Blow out the heat exchanger into a clean 5 gallon bucket using compressed air.
STEP 3	If a purge cart is not available, use a 5 gallon plastic bucket, a circulator and some plastic piping to create a makeshift pump system. Connect a the inlet and outlet to the heat exchanger ports.*
STEP 4	Place 2 gallons of RYDLYME in the purge cart (or bucket). Circulate the fluid through the heat exchanger for at least 2 hours (3 recommended).
STEP 5	Disconnect the purge system dispose of the solution. RYDLYME is non-toxic and biodegradable and as such can be poured down a drain.
STEP 6	Connect fresh water and a drain to the heat exchanger ports and flush the exchanger for several minutes.
STEP 7	Return the plumbing to its original configuration and open the IN and OUT valves. Operate the system and check for improved performance.
***Depending on the plumbing, there should be either unions or boiler drains for to access the heat exchanger.	

Troubleshooting Guide

The following steps are for troubleshooting the geothermal heat pump. If the problem is with the domestic hot water or the plenum heater, proceed to those sections at the end of the troubleshooting guide. Repair procedures and reference refrigeration circuit diagrams can be found at the end of the troubleshooting guide.

STEP 1: Verify that the display is present on the thermostat. If it is not, proceed to POWER SUPPLY TROUBLE SHOOTING, otherwise proceed to STEP 2.

STEP 2: Remove the door and electrical box cover and check to see if there is a fault code on the control board. If there is, record the fault code. Turn the power off, wait 10 seconds and turn the power back on. Set the thermostat to call for heating or cooling, depending on what the reported problem was.

STEP 3: If a 24VAC signal does not appear across Y1 and C of the terminal strip within 6 minutes, proceed to the THERMOSTAT TROUBLESHOOTING section, otherwise proceed to STEP 4.

STEP 4: If a fault code appears once a signal is present at Y1 and the compressor does not attempt to start, proceed to the FAULT CODE TROUBLESHOOTING section, otherwise proceed to STEP 5.

STEP 5: If no fault codes appear and the compressor does not attempt to start, attempts to start but cannot, starts hard, or starts but does not sound normal, proceed to the COMPRESSOR TROUBLESHOOTING section, otherwise proceed to STEP 6.

STEP 6: If the compressor starts and sounds normal, this means the compressor is OK and the problem lies elsewhere. Proceed to the OPERATION TROUBLESHOOTING section.

NOTE: To speed up the troubleshooting process, the Test Jumper on the control board can be placed to the YES position to change the anti-short cycle timer to 5 seconds. **Be sure to set it back to NO when servicing is complete**.

POWER SUPPLY TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
No power to the heat pump	Disconnect switch open (if installed)	Verify disconnect switch is in the ON position.	Determine why the disconnect switch was opened, if all is OK close the switch.
	Fuse blown / Breaker Tripped.	At heat pump disconnect box, voltmeter shows 230VAC on the line side but not on the load side.	Reset breaker or replace fuse with proper size and type. (Time-delay type “D”)
No display on aquastats.	Transformer breaker tripped.	Breaker on transformer is sticking out.	Push breaker back in. If it trips again locate cause of short circuit and correct.
	Faulty transformer	Transformer breaker is not tripped, 230VAC is present across L1 and L3 of the compressor contactor but 24VAC is not present across R and C of the terminal strip.	Replace transformer.
	Faulty wiring between heat pump and aquastat.	24VAC is not present across 24V and COM of the aquastat.	Correct the wiring. (see 000145CDG)
	Faulty aquastat.	24VAC is present across 24V and COM of the aquastat but no display.	Replace aquastat.

CONTROLS TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
No Y signal to PC unit **(starts compressor)**	De-humidistat not active.	Adjust de-humidistat all the way down and verify PC unit starts.	Adjust de-humidistat to desired setpoint.
	Faulty wiring.	Verify 24VAC across C of the PC unit terminal strip and the terminal of the de-humidistat that is connected to R of the PC unit terminals strip.	Correct wiring if voltage not present.
	De-humidistat faulty.	Verify 24VAC across C of the PC unit terminal strip and the remaining de-humidistat terminal.	Replace de-humidistat if voltage not present.
	Faulty wiring.	Verify 24VAC across C and Y of the PC unit terminal strip.	Correct wiring if voltage not present.
	Pool Aquastat Stage 1 is not active.	Verify S1 is indicated on Pool Aquastat display.	Adjust Pool Aquastat Stage 1 setpoint.
	Faulty wiring.	Verify 24VAC across COM and Stage 1 C of Pool Aquastat.	Correct wiring if voltage not present.
	Pool Aquastat Stage 1 is faulty.	Verify 24VAC across COM and Stage 1 NO of Pool Aquastat.	Replace Pool Aquastat if voltage not present.
	Faulty wiring.	Verify 24VAC across C and Y of the PC unit terminal strip.	Correct wiring if voltage not present.
No O signal to PC unit **(activates Air Re-Heat mode)**	Air Aquastat Stage 1 is not active.	Verify S1 is indicated on Air Aquastat display.	Adjust Air Aquastat Stage 1 setpoint.
	Pool Aquastat Stage 2 is active.	Verify if S2 is indicated on the Pool Aquastat display.	No action, system is functioning properly.
	Faulty wiring.	Verify 24VAC across COM and Stage 1 C of the Air Aquastat.	Correct wiring if voltage not present.
	Air Aquastat Stage 1 is faulty.	Verify 24VAC across COM and Stage 1 NO of the Air Aquastat.	Replace Air Aquastat if voltage not present.
	Faulty wiring.	Verify 24VAC across COM and Stage 2 NC of the Pool Aquastat.	Correct wiring if voltage not present.
	Pool Aquastat Stage 2 or wiring is faulty.	Verify 24VAC across COM and Stage 2 C of the Pool Aquastat.	Replace Pool Aquastat.
	Faulty wiring.	Verify 24VAC across O and C of the terminal strip.	Correct wiring.
A/C Mode does not activate	Air Cool Aquastat Stage 1 and Stage 2 settings not set identical.	Verify settings.	Correct settings.
	Air Cool Aquastat Stage 1 and Stage 2 not active	Verify S1 and S2 are indicated on the Air Cool Aquastat display.	Adjust Air Cool Aquastat Stage 1 and Stage 2 setpoints.
	Faulty wiring.	Verify 24VAC across COM and Stage 1 C of the Air Cool Aquastat.	Correct wiring if voltage not present.
	Air Cool Aquastat Stage 1 or wiring is faulty.	Verify 24VAC across COM and Stage 1 NO of the Air Cool Aquastat.	Replace Air Cool Aquastat if voltage not present.
	Faulty wiring.	Verify 24VAC across C and O1 of the PC unit terminal strip.	Correct wiring if voltage not present.

CONTROLS TROUBLESHOOTING (continued)			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
A/C Mode does not activate	Faulty wiring.	Verify 24VAC across COM and Stage 2 C of the Air Cool Aquastat.	Correct wiring if voltage not present.
	Air Cool Aquastat Stage 2 is faulty.	Verify 24VAC across COM and Stage 2 NO.	Replace Air Cool Aquastat if voltage not present.
	Faulty wiring.	Verify 24VAC acrosst C and O of PC unit terminal strip.	Correct wiring if voltage not present.
Plenum Heater does not activate	Air Aquastat Stage 2 not active.	Verify S2 is indicated on Air Aquastat display.	Adjust Air Aquastat Stage 2 setpoint.
	See Plenum Heater Troubleshooting section		

FAULT CODE TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Fault Code 1 (High Pressure Control)	Faulty High Pressure Control (open). * Must be a signal present on Y1 for this test. *HP pressures must be at static levels.	Verify if there is 24VAC across HP1 on the Control Board and C of the terminal strip, as well as HP2 and C.	Replace high pressure control if voltage is present on HP1 but not on HP2.
	Faulty Control Board	24VAC is present across HP1 and C1, and HP2 and C, but no voltage is present across CC on the Control Board and C.	Replace Control Board.
Fault Code 2 (Low Pressure Control)	Faulty Low pressure control (open). * Must be a signal present on Y1 for this test. *HP pressures must be at static levels.	Verify if there is 24VAC across LP1 on the Control Board and C of the terminal strip, as well as LP2 and C.	Replace high pressure control if voltage is present on LP1 but not on LP1.
	Faulty Control Board	24VAC is present across LP1 and C, and LP2 and C, but no voltage is present across CC on the Control Board and C.	Replace Control Board.
	Unit out of refrigerant.	Check static refrigeration pressure of the unit for a very low value.	Locate the leak and repair it. Spray nine, a sniffer and dye are common methods of locating a leak.
Fault Code 3 (Flow Switch)	Flow switch jumper removed or faulty.	Verify jumper is in place between pins marked FLOW SWITCH.	Place a jumper if missing.
	Flow switch faulty. (Only if installed)	Verify 24VAC is present between each flow switch pin on the Control Board and the C terminal of the terminal strip while there is flow through the unit.	Replace flow switch if signal is not present at both terminals on the Control Board.
	Faulty Control Board	24VAC is present across each FLOW SWITCH terminal and C, but not voltage is present across CC on the control board and C.	Replace Control Board.

COMPRESSOR TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Compressor will not start	Faulty Control Board.	Measuring from C on the terminal strip, verify there is voltage at Y, HP1, HP2, LP1, LP2, and both flow pins but no voltage present at CC.	If no voltage at Y then see Controls Troubleshooting, otherwise replace Control Board.
	Faulty run capacitor. (Single phase only)	Check value with capacitance meter. Should match label on capacitor. Compressor will hum while trying to start and then trip its overload.	Replace if faulty.
	Loose or faulty wiring.	Check all compressor wiring, including inside compressor electrical box.	Fix any loose connections. Replace any damaged wires.
	Faulty compressor contactor.	Voltage on line side with contactor held closed, but no voltage on one or both terminals on the load side. Points pitted or burned. Or, 24VAC across coil but contactor will not engage.	Replace contactor.
	Thermal overload on compressor tripped.	Ohmmeter shows reading when placed across R and S terminals and infinity between C & R or C & S. A valid resistance reading is present again after the compressor has cooled down.	Proceed to Operation Troubleshooting to determine the cause of the thermal overload trip.
	Burned out motor. (open winding)	Remove wires from compressor. Ohmmeter shows infinite resistance between any two terminals Note: Be sure compressor overload has had a chance to reset. If compressor is hot this may take several hours.	Replace the compressor.
	Burned out motor. (shorted windings)	Remove wires from compressor. Resistance between any two terminals is below the specified value.	Replace the compressor.
	Motor shorted to ground.	Remove wires from compressor. Check for infinite resistance between each terminal and ground.	If any terminal to ground is not infinite replace the compressor.
	Seized compressor due to locked or damaged mechanism.	Compressor attempts to start but trips its internal overload after a few seconds. (Run capacitor already verified)	Attempt to “rock” compressor free. If normal operation cannot be established, replace compressor.
Compressor starts hard	Start capacitor faulty. (Single phase only)	Check with capacitance meter. Check for black residue around blowout hole on top of capacitor.	Replace if faulty. Remove black residue in electrical box if any.
	Potential Relay faulty. (Single phase only)	Replace with new one and verify compressor starts properly.	Replace if faulty.
	Compressor is “tight” due to damaged mechanism.	Compressor attempts to start but trips its internal overload after a few seconds. Run capacitor has been verified already.	Attempt to “rock” compressor free. If normal operation cannot be established, replace compressor.

OPERATION TROUBLESHOOTING - AIR-REHEAT MODE			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Will not switch to Air-Reheat mode	Problem with controls	See Controls Troubleshooting section	
	Faulty reversing valve solenoid coil (RV#1)	Verify solenoid by removing it from the shaft while the unit is running. There should be a loud “whoosh” sound when it is removed.	Replace solenoid if faulty.
	Faulty reversing valve (RV#1).	A click can be heard when the coil is energized but the unit continues to heat instead of cool.	Replace reversing valve.
High Discharge Pressure	TXV adjusted too far closed.	Verify superheat. It should be between 8-12°F (3-6°C). Superheat will be high if TXV is closed too far.	Adjust TXV to obtain 8-12°F (3-6°C) superheat.
	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Filter-drier plugged	Feel each end of the filter- drier, it should be the same temperature. If there is a temperature difference then it is plugged. Also causes low suction pressure.	Replace filter-drier.
	Unit is overcharged. (Only possible if unit has been opened in the field and incorrectly charged).	High sub-cooling, low delta T across air coil.	Remove 1/2lb of refrigerant at a time and verify that the discharge pressure reduces.
Low Suction Pressure	Low or no airflow	See Fan Troubleshooting section	Correct the problem.
	Entering air temperature too cold.	Measure return air temperature. Should be above 60°F (15°C). Most likely will only occur during initial startup.	Use the plenum heater to heat the room up until the unit functions properly.
	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure. TXV may be frosting up.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Low refrigerant charge.	Entering liquid temperature, flow and entering air temperature are good but suction is low. Check static refrigeration pressure of the unit for a very low value.	Locate the leak and repair it. Spray nine, a sniffer and dye are common methods of locating a leak.
	Faulty compressor, not pumping.	Pressures change only slightly from static values when compressor is started.	Replace compressor.

OPERATION TROUBLESHOOTING - AIR RE-HEAT MODE (continued)			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
High Suction Pressure (may appear to not be pumping)	TXV adjusted too far open.	Verify superheat. It should be between 8-12°F (3-6°C). Superheat will be low if TXV is open too far.	Adjust TXV to obtain 8-12°F (3-6°C) superheat.
	TXV stuck open.	Adjusting the TXV does not affect the superheat or the suction pressure. Low super heat and discharge pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Leaking check valve between water condenser and receiver inlet.	Check valve is cold to the touch and does not warm up.	Replace check valve.
	Leaking check valve between outdoor condenser and receiver inlet. (if equipped)	Check valve is cold to the touch and does not warm up.	Replace check valve.
	Leaking reversing valve (RV#1 or RV#2).	Common suction line is warm, compressor is running hot.	Replace reversing valve.
	Faulty compressor, not pumping.	Pressures change only slightly from static values when compressor is started.	Replace compressor.
Compressor frosting up	See Low Suction Pressure in this section.		
TXV frosting up	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
Random low pressure trip (does not occur while on site)	Faulty compressor contactor.	Points pitted or burned. Contactor sometimes sticks causing the compressor to run without the fan, tripping the high pressure control.	Replace contactor.
	Intermittent fan.	See Fan Troubleshooting section.	Correct the problem.

OPERATION TROUBLESHOOTING - POOL WATER HEAT MODE			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
High Discharge pressure	Low or no Indoor (pool) flow.	Adjust the by-pass setup to obtain a discharge pressure of **350-400PSIG** as per **000145CDG-03**. Check for any restrictions in the lines.	Determine the cause of the flow restriction and correct it.
	Dirty or fouled coaxial heat exchanger.	Disconnect the water lines and check the inside of the pipes for scale deposits.	Have a qualified service technician backflush the coaxial exchanger.
	Unit is overcharged. (Only possible if unit has been opened in the field and incorrectly charged).	High sub-cooling, low delta T across water coil.	Remove 1/2lb of refrigerant at a time and verify that the discharge pressure reduces.

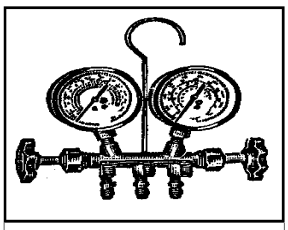
OPERATION TROUBLESHOOTING - POOL WATER HEAT MODE (continued)			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
High Suction Pressure (may appear to not be pumping)	TXV adjusted too far open.	Verify superheat. It should be between 8-12°F (3-6°C). Superheat will be low if TXV is open too far.	Adjust TXV to obtain 8-12°F (3-6°C) superheat.
	TXV stuck open.	Adjusting the TXV does not affect the superheat or the suction pressure. Low super heat and discharge pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Leaking check valve between air condenser and receiver inlet.	Check valve is cold to the touch and does not warm up.	Replace check valve.
	Leaking check valve between outdoor condenser and receiver inlet. (if equipped)	Check valve is cold to the touch and does not warm up.	Replace check valve.
	Leaking reversing valve (RV#1 or RV#2).	Common suction line is warm, compressor is running hot.	Replace reversing valve.
	Faulty compressor, not pumping.	Pressures change only slightly from static values when compressor is started.	Replace compressor.
Low Suction Pressure	Low or no airflow	See Fan Troubleshooting section. **Note:** low airflow will cause the air coil to ice up once the suction drops below **90PSIG**.	Correct the problem.
	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure. TXV may be frosting up.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Low or no refrigerant charge.	Entering air temperature and airflow are good but suction is low. Check static refrigeration pressure of unit for very low value.	Locate the leak and repair it. Spray nine, a sniffer and dye are common methods of locating a leak.
Compressor frosting up	See Low Suction Pressure in this section.		
TXV frosting up	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
Random Low Pressure trip (does not occur while there)	Faulty compressor contactor.	Points pitted or burned. Contactor sometimes sticks causing the compressor to run without the fan, tripping the low pressure control.	Replace contactor.
	Intermittent fan.	See Fan Troubleshooting section.	Correct the problem.

OPERATION TROUBLESHOOTING - AIR COOLING MODE (A/C)			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Will not switch to Air-Cooling mode	Problem with controls	See Controls Troubleshooting section	
	Faulty reversing valve solenoid coil (RV#2).	Verify solenoid by removing it from the shaft while the unit is running. There should be a loud “whoosh” sound when it is removed.	Replace solenoid if faulty.
	Faulty reversing valve.	A click can be heard when the coil is energized but the unit continues to heat instead of cool.	Replace reversing valve.
Pool Water Heat mode instead of Air Cooling mode	Problem with controls	See Controls Troubleshooting section	
	Faulty reversing valve solenoid coil (RV#1).	Verify solenoid by removing it from the shaft while the unit is running. There should be a loud “whoosh” sound when it is removed.	Replace solenoid if faulty.
	Faulty reversing valve.	A click can be heard when the coil is energized but the unit continues to heat instead of cool.	Replace reversing valve.
High Discharge pressure	Low or no Outdoor condenser unit airflow.	High delta T, fan appears to be visually or audibly slower than normal.	Refer to the outdoor condenser unit’s manual.
	Entering air temperature too hot.	Outdoor air temperature too hot.	Shut unit off until outdoor air is cooler.
	Dirty or fouled outdoor air coil.	Visually inpsect.	Clean as per instructions in the outdoor unit’s manual..
	Unit is overcharged. (Only possible if unit has been opened in the field and incorrectly charged).	High sub-cooling, low delta T across water coil.	Remove 1/2lb of refrigerant at a time and verify that the discharge pressure reduces.

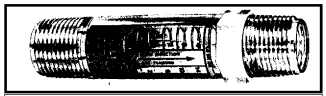
OPERATION TROUBLESHOOTING - AIR COOLING MODE (A/C) (continued)			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
High Suction Pressure (may appear to not be pumping)	TXV adjusted too far open.	Verify superheat. It should be between 8-12°F (3-6°C). Superheat will be low if TXV is open too far.	Adjust TXV to obtain 8-12°F (3-6°C) superheat.
	TXV stuck open.	Adjusting the TXV does not affect the superheat or the suction pressure. Low super heat and discharge pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Leaking check valve between water condenser and receiver inlet.	Check valve is cold to the touch and does not warm up.	Replace check valve.
	Leaking check valve between air condenser and receiver inlet.	Check valve is cold to the touch and does not warm up.	Replace check valve.
	Leaking reversing valve (RV#1 or RV#2).	Common suction line is warm, compressor is running hot.	Replace reversing valve.
	Faulty compressor, not pumping.	Pressures change only slightly from static values when compressor is started.	Replace compressor.
Low Suction Pressure	Low or no PC unit airflow.	See Fan Troubleshooting section. **Note:** low airflow will cause the air coil to ice up once the suction drops below **90PSIG**.	Correct the problem.
	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure. TXV may be frosting up.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
	Low or no refrigerant charge.	Entering air temperature and airflow are good but suction is low. Check static refrigeration pressure of unit for very low value.	Locate the leak and repair it. Spray nine, a sniffer and dye are common methods of locating a leak.
	Faulty compressor, not pumping.	Pressures change only slightly from static values when compressor is started.	Replace compressor.
Compressor frosting up	See Low Suction Pressure in this section.		
TXV frosting up	TXV stuck almost closed or partially blocked by foreign object.	Adjusting the TXV does not affect the superheat or the suction pressure.	Adjust the TXV all the way in and out a few times to loosen it. Replace TXV if this does not work.
Random Low Pressure trip (does not occur while there)	Faulty compressor contactor.	Points pitted or burned. Contactor sometimes sticks causing the compressor to run without the fan, tripping the low pressure control.	Replace contactor.
	Intermittent fan.	See Fan Troubleshooting section.	Correct the problem.
Random HighPressure trip (does not occur while there)	Faulty compressor contactor.	Points pitted or burned. Contactor sometimes sticks causing the compressor to run without the fan, tripping the low pressure control.	Replace contactor.
	Intermittent fan.	See Fan Troubleshooting section.	Correct the problem.

FAN TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Low Airflow	Dirty air filter	Inspect.	Replace.
	Dirty air coil.	Inspect.	Clean.
	Poor Ductwork	Measure delta T between supply and return ducts at the unit, it in heating mode, it should not be above 30F(17C).	The ECM fan will provide proper airflow up to 0.5 inH2o for 1/2HP motors and 0.7 inH2o for 1HP motors. The ductwork is poorly designed or greatly undersized if the fan motor cannot provide the required airflow.
	Air flow selected on Tap Board is too low.	Check selection on Air Flow Tap Board.	Select a higher setting.
Fan operating on wrong Stage speed	Fan Control Signal Harness is loose.	Verify that the connector is properly inserted into the fan motor. Gently tug on each wire to verify it is properly inserted into the connector.	Repair any loose connections.
	Faulty Control Signal Harness or faulty motor head.	Measure 24VAC between White (pin 3) and the following at the fan control signal harness (insert probes in connector where wire is inserted, do not unplug the connector): Circulation = Grey (pin 15) Stage 1 = Yellow (pin 6) Stage 2=Yellow/Black (pin14) Stage 3 = Violet (pin 2)	If proper signal isn't present, replace Fan Control Signal Harness. If proper signal is present, replace fan motor head.
Fan not operating or operating intermittently	Fan Control Signal Harness and/or Fan Power Harness is loose.	Verify that the connector is properly inserted into the fan motor. Gently tug on each wire to verify it is properly inserted into the connector.	Repair any loose connections.
	Faulty Control Signal Harness or; Faulty motor head.	Measure 24VAC between White (pin 3) and the following at the fan control signal harness (insert probes in connector where wire is inserted, do not unplug the connector): Circulation = Grey (pin 15) Stage 1 = Yellow (pin 6) Stage 2=Yellow/Black (pin14) Stage 3 = Violet (pin 2)	If proper signal isn't present, replace Fan Control Signal Harness. If proper signal is present, replace fan motor head.
	Fan Power Harness faulty or; Faulty motor.	Insert the tips of the voltmeter probes into the back of the connector at the fan to measure the voltage across the red and black wires, value should be 230VAC	Replace Power Harness if 230VAC is not present, replace motor if 230VAC is present

PLENUM HEATER TROUBLE SHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
No 230VAC across plenum heater L1 and L2	Disconnect switch open. (if installed)	Verify disconnect switch is in the ON position.	Determine why the disconnect switch was opened, if all is OK close the switch.
	Fuse blown / Breaker Tripped.	At plenum heater disconnect box (if installed), voltmeter shows voltage on the line side but not on the load side. Check if breaker is tripped.	Reset breaker or replace fuse at plenum heater disconnect box. Replace fuse with proper size and type. (Time-delay type “D”)
	Same “Line” to L1 and L2	Measuring L1 to ground and L2 to ground both yield 115VAC, but L1 to L2 yields 0VAC.	Correct wiring.
No 24VAC signal from C to ground at the plenum heater control connector	Plenum Heater transform-er is burned out.	Voltmeter does not show 24VAC across transformer secondary wind-ing.	Replace transformer.
	Plenum heater control board is faulty.	Transformer tested OK in previous step.	Replace control board.
No 24VAC signal from 1 to ground at the plenum heater control connector	Faulty wiring.	24VAC not present across C and ground at the plenum heater, but not across ground of the plenum heater and Air Aquastat Stage 1 NO	Correct wiring.
	Air Cool Aquastat Stage 2 is faulty.	Air Cool Aquastat Stage 2 is active. 24VAC present across plenum heat-er ground and Stage 2 C, but across plenum heater ground and Stage 2 NO.	Replace Air Aquastat.
	Faulty wiring.	Air Cool Aquastat Stage 2 is active. 24VAC present across plenum heat-er ground and Stage 2 NO, but across plenum heater ground I.	Correct wiring.
Thermal overload is tripped.	Fan not operating	See Fan Not Operating section	Correct problem. Reset thermal overload.
	Faulty overload	Reset thermal overload	Replace if faulty.

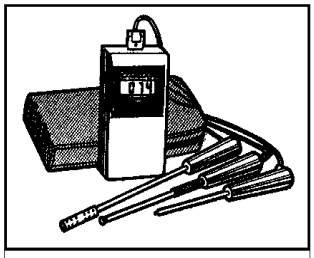


Refrigeration

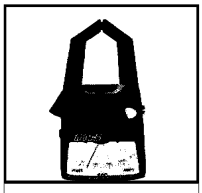


In-line Flowmeter

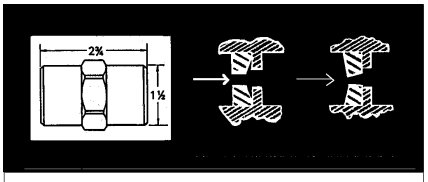
Trouble Shooting Tools



Digital



Multimeter - Voltmeter /



Dole flow control Valve

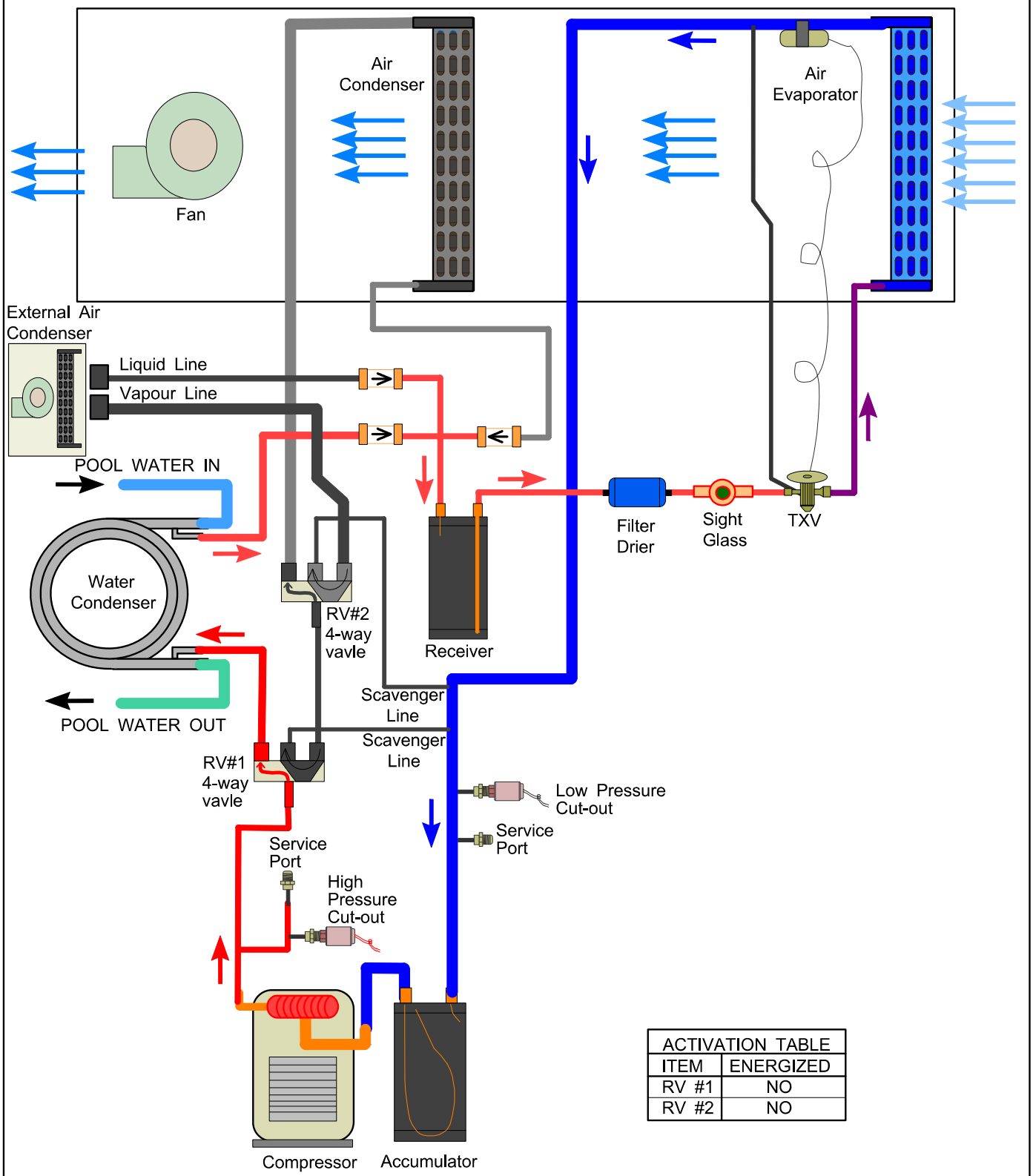
The Dole® flow control is a simple, self-cleaning device designed to deliver a constant volume of water from any outlet whether the pressure is 15 psig or as high as 125 psi. The controlling mechanism consists of a flexible orifice that varies its area inversely with pressure so that a constant flow is maintained.

PUMP DOWN PROCEDURE	
STEP 1	Connect the refrigerant recovery unit to the heat pump service ports via a refrigeration charging manifold and to a recovery tank as per the instructions in the recovery unit manual. **If there was a compressor burn out, the refrigerant cannot be reused and must be disposed of according to local codes.**
STEP 2	All water coil heat exchangers must either have full flow or be completely drained of fluid before recovery begins. Failure to do so can freeze and rupture the heat exchanger, voiding its warranty. (Note that this does not apply to double wall domestic hot water exchangers (desuperheater coils)
STEP 3	Ensure all hose connections are properly purged of air. Start the refrigerant recovery as per the instructions in the recovery unit manual.
STEP 4	Allow the recovery unit suction pressure to reach a vacuum. Once achieved, close the charging manifold valves. Shut down, purge and disconnect the recovery unit as per the instructions in its manual. Ensure the recovery tank valve is closed before disconnecting the hose to it.
STEP 5	Connect a nitrogen tank to the charging manifold and add nitrogen to the heat pump until a positive pressure of 5-10PSIG is reached. This prevents air from being sucked into the unit by the vacuum when the hoses are disconnected.
STEP 6	The heat pump is now ready for repairs. Always ensure nitrogen is flowing through the system during any soldering procedures to prevent soot buildup inside the pipes. Maritime Geothermal Ltd. recommends replacing the liquid line filter-drier anytime the refrigeration system has been exposed to the atmosphere.

VACUUM AND CHARGING PROCEDURE	
STEP 1	After completion of repairs and nitrogen pressure testing, the refrigeration circuit is ready for vacuuming.
STEP 2	Release the refrigerant circuit pressure and connect the vacuum pump to the charging manifold. Start the vacuum pump and open the charging manifold valves. Vacuum until the vacuum gauge remains at less than 500 microns for at least 1 minute with the vacuum pump valve closed.
STEP 3	Close the charging manifold valves then shut off and disconnect the vacuum pump. Place a refrigerant tank with the proper refrigerant on a scale and connect it to the charging manifold. Purge the hose to the tank.
STEP 4	Weigh in the appropriate amount of refrigerant through the low pressure (suction) service port. Refer to the label on the unit or **TABLE 16 - Refrigerant Charge Chart** for the proper charge amount.
STEP 5	If the unit will not accept the entire charge, the remainder can be added through the low pressure service port after the unit has been restarted.

REPLACMENT PROCEDURE FOR A COMPRESSOR BURN-OUT	
STEP 1	Pump down the unit as per the Pump Down Procedure above.
STEP 2	Replace the compressor. Replace the liquid line filter-drier.
STEP 3	Vacuum the unit until it remains under 500 microns for several minutes with the vacuum pump valve closed.
STEP 4	Charge the unit and operate it for continuously for 2 hours. Pump down the unit and replace the filter-drier. Vacuum the unit until it remains under 500 microns for several minutes with the vacuum pump valve closed.
STEP 5	Charge the unit (refrigerant can be re-used) and operate it for 2-3 days. Pump down the unit and replace the filter-drier.
STEP 6	Charge the unit (refrigerant can be re-used) and operate it for 2 weeks. Pump down the unit and replace the filter-drier.
STEP 7	Charge the unit a final time. Unit should now be clean and repeated future burn-outs can be avoided.

PC-SERIES REFIGRATION CIRCUIT - POOL HEAT MODE



ACTIVATION TABLE	
ITEM	ENERGIZED
RV #1	NO
RV #2	NO

REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	09 JAN 07

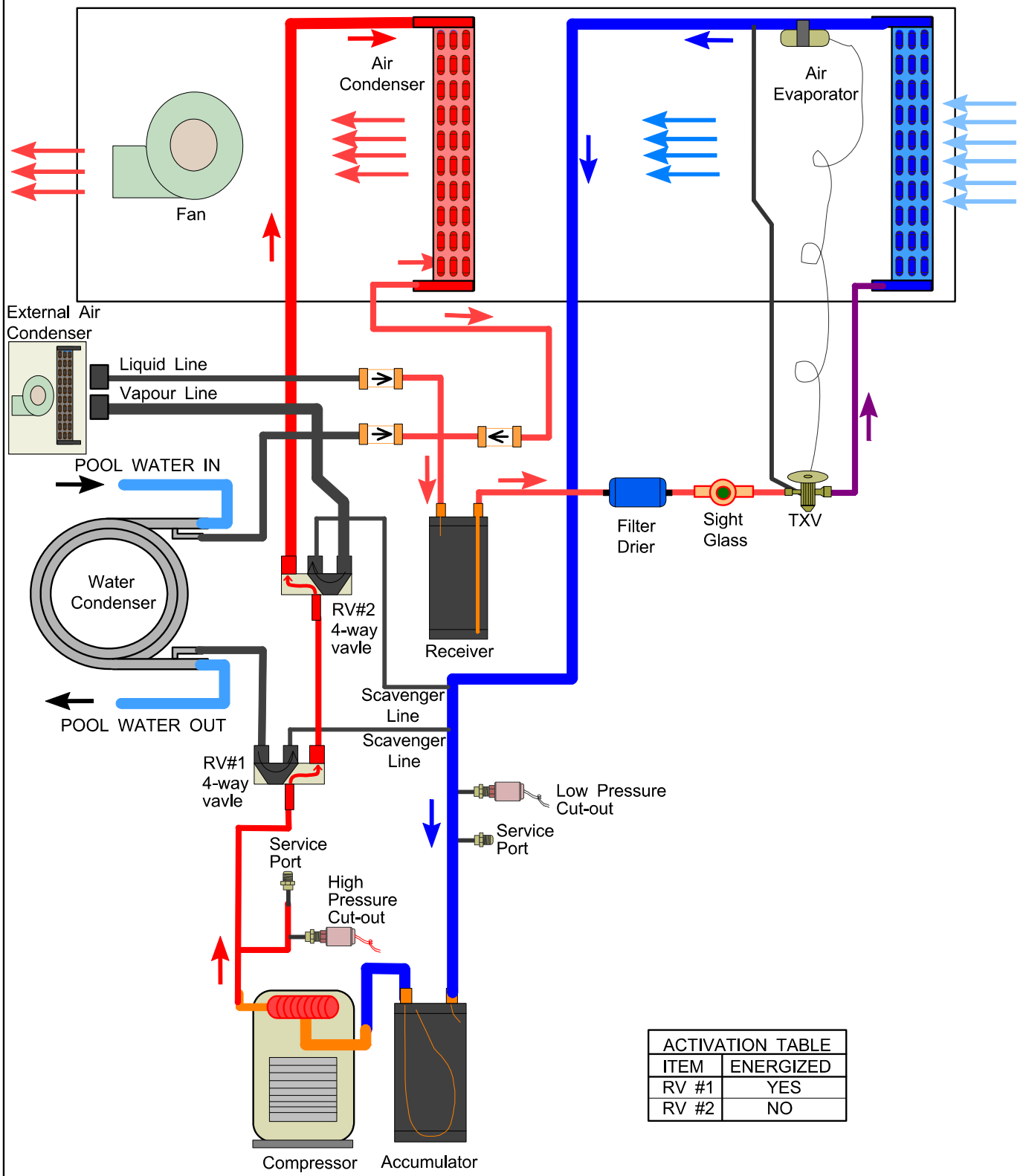
Drawn By: Chris Geddes		Date: 09 JAN 07
Checked By: Chris Geddes		Date: 09 JAN 07
Approved By: Chris Geddes	(ENG)	Date: 09 JAN 07
Approved By	(MFG)	Date
Approved By		Date

MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: PC-Series Refrigeration Circuit Diagram - Pool Heat Mode

Size	Drawing Number	REV	SHEET
A	000352RCD	01	1 of 1

PC-SERIES REFIGRATION CIRCUIT - AIR RE-HEATING MODE



ACTIVATION TABLE	
ITEM	ENERGIZED
RV #1	YES
RV #2	NO

REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	09 JAN 07

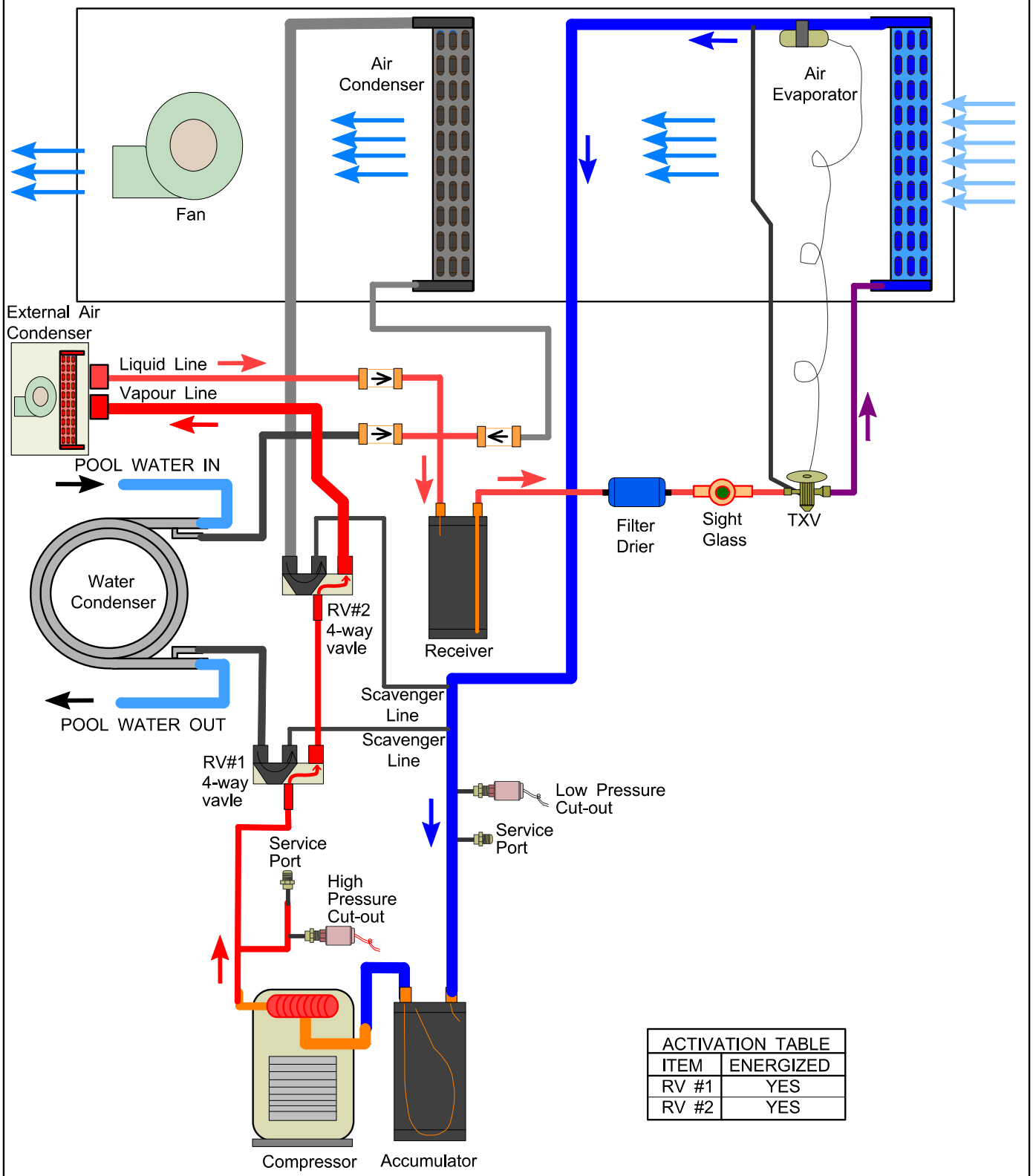
Drawn By	Chris Geddes	Date 09 JAN 07
Checked By	Chris Geddes	Date 09 JAN 07
Approved By (ENG)	Chris Geddes	Date 09 JAN 07
Approved By (MFG)		Date
Approved By		Date

MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: PC-Series Refrigeration Circuit Diagram - Air Re-Heating Mode

Size	Drawing Number	REV	SHEET
A	000353RCD	01	1 of 1

PC-SERIES REFIGRATION CIRCUIT - AIR COOLING MODE



ACTIVATION TABLE	
ITEM	ENERGIZED
RV #1	YES
RV #2	YES

REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	09 JAN 07

Drawn By: Chris Geddes	Date: 09 JAN 07	
Checked By: Chris Geddes	Date: 09 JAN 07	
Approved By (ENG): Chris Geddes	Date: 09 JAN 07	
Approved By (MFG):	Date:	
Approved By:	Date:	

MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: PC-Series Refrigeration Circuit Diagram - Air Cooling Mode

Size	Drawing Number	REV	SHEET
A	000354RCD	01	1 of 1

Model Specific Information

This section provides general information particular to each model. For complete specifications please see the specifications document for the desired model.

REFRIGERANT CHARGE CHART

Table 16 - Refrigerant - R410a

SIZE	Lbs.	kg
45	9.0	4.1
55	10.0	4.5
65	11.0	5.0
80	12.0	5.4
System contains POE oil.		

SHIPPING INFORMATION

Table 17 - Shipping Information

MODEL	WEIGHT	DIMENSIONS in (cm)		
	Lbs. (kg)	L	W	H
45	TBD	67 (170)	39 (99)	40 (102)
55	TBD	67 (170)	39 (99)	40 (102)
65	TBD	67 (170)	39 (99)	40 (102)
80	TBD	67 (170)	39 (99)	40 (102)

CAPACITY RATINGS

The tables below depict the results of standard capacity rating tests done at the temperatures indicated in the table.

TABLE 18 - PC Unit Capacity Ratings 60Hz

	Indoor (Pool) Flow			Indoor (Pool) Pressure Drop	Airflow	Input Energy	Capacity	Moisture Removal 50%RH	Moisture Removal 60%RH	Typical Pool Surface Area
Model	IGPM	USGPM	L/s	PSIG (kPa)	CFM (L/s)	Watts	BTU/Hr (kW)	Lbs(kg)/hr	Lbs(kg)/hr	ft^2. (m^2)
45	17.5	21	1.32	1.5 (10.3)	1,200 (566)	2,020	46,000 (13.4)	14 (6.4)	18 (8.2)	600 (56)
55	23.3	28	1.77	2.2 (15.2)	1,500 (708)	3,000	64,200 (18.8)	19 (8.6)	23 (10.4)	800 (74)
65	29.1	35	2.21	2.8 (19.3)	1,900 (897)	4,045	77,000 (22.7)	24 (10.9)	30 (13.6)	1,100 (93)
80	35.0	42	2.65	3.5 (24.1)	2,400 (1133)	5,785	103,300 (30.3)	28 (12.7)	33 (15.0)	1,300 (111)
*EWT (Tp)=80°F (26.7°C) and EAT (Ta)=82°F (27.8°C)										

TABLE 19 - PC Unit Capacity Ratings 50Hz

	Indoor (Pool) Flow			Indoor (Pool) Pressure Drop	Airflow	Input Energy	Capacity	Moisture Removal 50%RH	Moisture Removal 60%RH	Typical Pool Surface Area
Model	IGPM	USGPM	L/s	PSIG (kPa)	CFM (L/s)	Watts	BTU/Hr (kW)	Lbs(kg)/hr	Lbs(kg)/hr	ft^2. (m^2)
45	17.5	21	1.32	1.5 (10.3)	1,200 (566)	1,690	37,700 (11.0)	13 (5.9)	15 (6.8)	500 (46)
55	23.3	28	1.77	2.2 (15.2)	1,500 (708)	2,585	54,100 (15.8)	16 (7.3)	20 (9.1)	700 (65)
65	29.1	35	2.21	2.8 (19.3)	1,900 (897)	3,450	64,000 (18.8)	21 (9.5)	26 (11.8)	900 (84)
80	35.0	42	2.65	3.5 (24.1)	2,400 (1133)	5,050	88,000 (25.8)	24 (10.9)	29 (13.2)	1,100 (102)
*EWT (Tp)=80°F (26.7°C) and EAT (Ta)=82°F (27.8°C)										

Table 20 - PC Unit Electrical Information (230-1-60)							
Model	Compressor		Fan	FLA	MCA	Max Fuse/ Breaker	Wire Size
	RLA	LRA	RLA	Amps	Amps	Amps	ga
45	18.6	79	3.5	22.3	27.0	40	#8-2
55	24.3	117	4.0	28.5	34.6	50	#6-2
65	29.3	134	5.5	35.0	42.3	60	#6-2
80	35.7	148	6.5	42.4	51.3	60	#6-2

Table 21 - PC Unit Electrical Information (208-3-60)							
Model	Compressor		Fan	FLA	MCA	Max Fuse/ Breaker	Wire Size
	RLA	LRA	RLA	Amps	Amps	Amps	ga
45	11.6	73	3.5	15.3	18.2	30	#10-3
55	15.3	83	4.0	19.5	23.3	40	#8-3
65	17.4	110	5.5	23.1	27.5	50	#8-3
80	25.0	149	6.5	31.7	38.0	50	#8-3

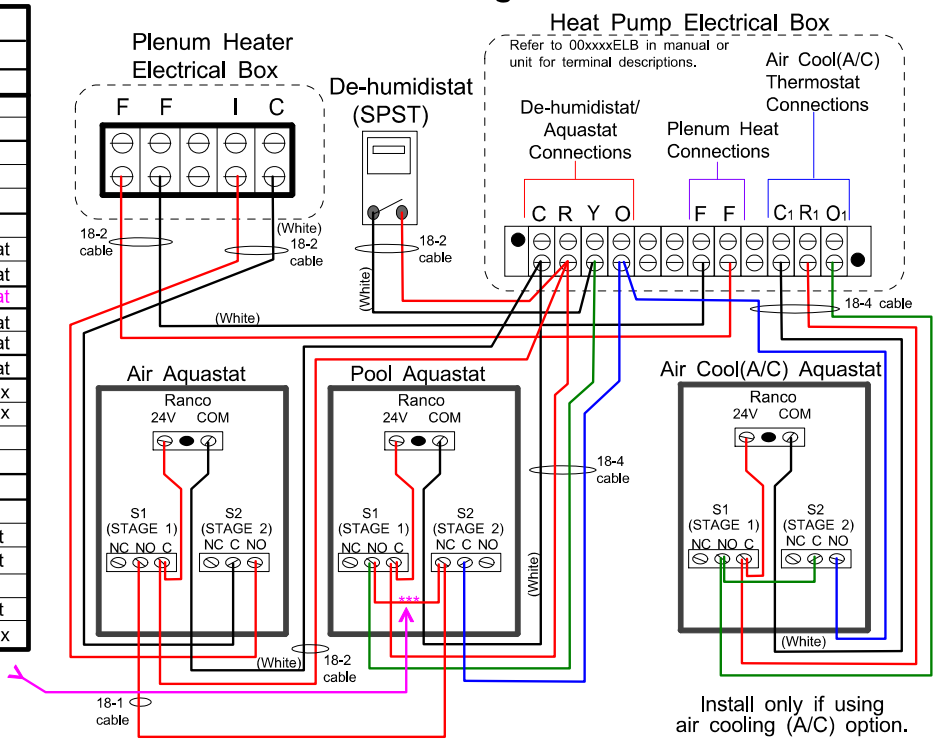
Table 22 - PC Unit Electrical Information (220-1-50)							
Model	Compressor		Fan	FLA	MCA	Max Fuse/ Breaker	Wire Size
	RLA	LRA	RLA	Amps	Amps	Amps	ga
45	15.0	67	3.5	18.7	22.5	30	#10-2
55	17.7	98	4.0	21.9	26.3	40	#8-2
65	22.5	128	5.5	28.2	33.8	50	#8-2
80	32.9	176	6.5	39.6	47.8	60	#6-2

Table 23 - PC Unit Electrical Information (380-3-50)							
Model	Compressor		Fan	FLA	MCA	Max Fuse/ Breaker	Wire Size
	RLA	LRA	RLA	Amps	Amps	Amps	ga
45	6.1	38	3.5	9.8	11.3	15	#14-3
55	6.8	43	4.0	11.0	12.7	20	#12-3
65	8.6	52	5.5	14.3	16.5	30	#10-3
80	10.9	6462	6.5	17.6	20.3	30	#10-3

PC-Series Controls Connection Diagram

CONTROLS CONNECTIONS			
FROM		TO	
Term	Location	Term	Location
Y	HP Electrical Box	Wire	De-humidistat
R	HP Electrical Box	Wire	De-humidistat
C	HP Electrical Box	COM	Air Aquastat
R	HP Electrical Box	C	S1 Air Aquastat
C	S1 Air Aquastat	24V	Air Aquastat
C	HP Electrical Box	COM	Pool Aquastat
R	HP Electrical Box	C	S1 Pool Aquastat
C	S1 Pool Aquastat	24V	S1 Pool Aquastat
NO***	S1 Pool Aquastat	NC***	S2 Pool Aquastat
Y	HP Electrical Box	NO	S1 Pool Aquastat
O	HP Electrical Box	C	S2 Pool Aquastat
NO	S1 Air Aquastat	NC	S2 Pool Aquastat
F	Plenum Heater	F	HP Electrical Box
F	Plenum Heater	F	HP Electrical Box
I	Plenum Heater	NO	S2 Air Aquastat
1	Plenum Heater	C	S2 Air Aquastat
Applications with Air Cooling Option (A/C)			
C_1	HP Electrical Box	COM	A/C Aquastat
O_1	HP Electrical Box	NO	S1 A/C Aquastat
R_1	HP Electrical Box	C	S1 A/C Aquastat
C	S1 A/C Aquastat	24V	A/C Aquastat
NO	S1 A/C Aquastat	C	S2 A/C Aquastat
NO	S2 A/C Aquastat	O	HP Electrical Box

*** PRIORITY JUMPER. Place if air re-heat mode is to be default (typically placed).



Mode Description

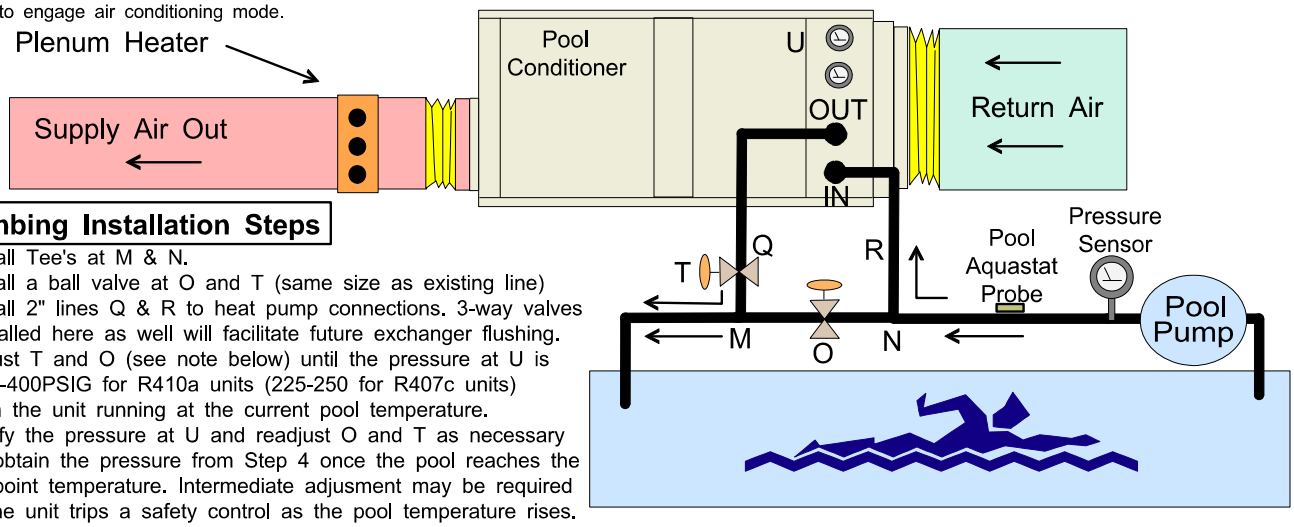
The PC series heat pump primary function is pool room dehumidification which is controlled by the de-humidistat. It has three modes in which it may reject the absorbed energy from the air: re-heat mode (pool room air), pool water mode, or air cooling mode (outdoor condenser). The unit may also be activated by the Pool Aquastat as well.

Mode Priority: Priority Jumper not placed

The de-humidistat starts the unit in pool heat mode. Stage 1 of the Air Aquastat will switch the unit to air re-heat mode. Stage 2 of the Air Aquastat will engage the plenum heater. Stage 1 of the Pool Aquastat will start the unit (if not running), mode re-mains air re-heat. Stage 2 of the Pool Aquastat will override air-reheat mode and select pool heat mode. Optional AC will override both pool and air re-heat modes to engage air conditioning mode.

Mode Priority Priority Jumper placed (typical)

The de-humidistat starts the unit in air re-heat mode. Stage 1 of the Air Aquastat will start the unit (if not running), mode remains air re-heat. Stage 2 of the Air Aquastat will engage the plenum heater. Stage 1 and 2 of the Pool Aquastat will start the unit (if not running), override air re-heat mode and switch to pool heat mode. Optional AC will override both pool and air re-heat modes to engage air conditioning mode.



Plumbing Installation Steps

1. Install Tee's at M & N.
2. Install a ball valve at O and T (same size as existing line)
3. Install 2" lines Q & R to heat pump connections. 3-way valves installed here as well will facilitate future exchanger flushing.
4. Adjust T and O (see note below) until the pressure at U is 350-400PSIG for R410a units (225-250 for R407c units) with the unit running at the current pool temperature.
5. Verify the pressure at U and readjust O and T as necessary to obtain the pressure from Step 4 once the pool reaches the setpoint temperature. Intermediate adjusment may be required if the unit trips a safety control as the pool temperature rises.

NOTE: Reduce the flow through the unit to increase the pressure at U. Start with T and O fully open. If there is too much flow through the unit, (U is low) adjust T until the pressure at U is within range. If there is not enough flow (U is high), adjust O until the pressure at U is within range.

REV	ECO #	IMPL BY	APVD BY	DATE
03	000187	C. GEDDES	C. GEDDES	20 OCT 11
02	000143	C. GEDDES	C. GEDDES	25 MAY 09
01	Initial Release	C. GEDDES	C. GEDDES	15 FEB 06

Drawn By	Chris Geddes	Date 15 FEB 06
Checked By	Chris Geddes	Date 15 FEB 06
Approved By (ENG)	Chris Geddes	Date 15 FEB 06
Approved By (MFG)		Date
Approved By		Date

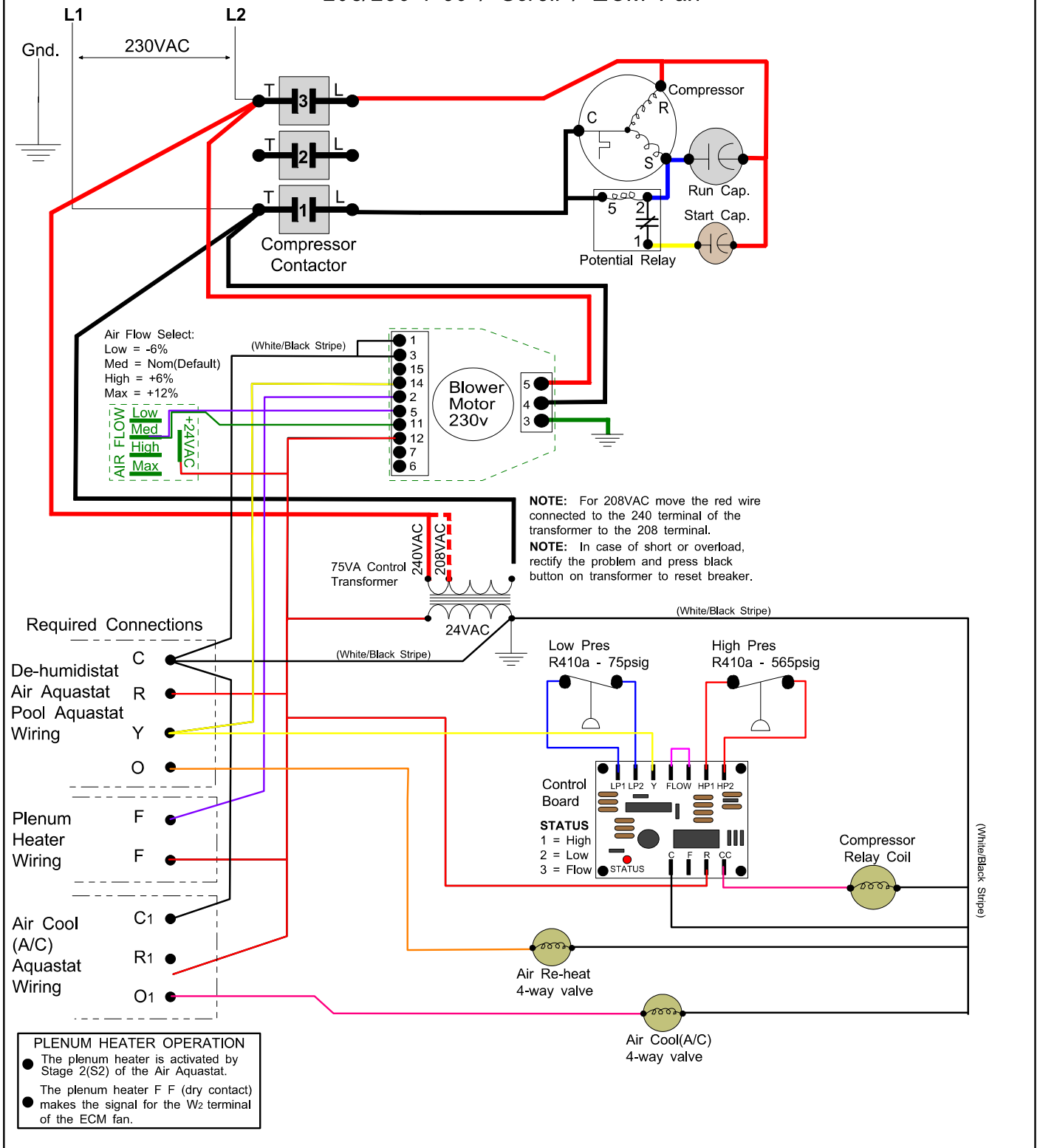
MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4

Drawing Name: PC-Series Controls Connection Diagram for ECM Fan

Size	Drawing Number	REV	SHEET
A	000145CDG	03	1 of 1

PC-Series Schematic Diagram

208/230-1-60 / Scroll / ECM Fan



REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	20 OCT 11

Drawn By: Chris Geddes	Date: 28 FEB 11	
Checked By: Chris Geddes	Date: 28 FEB 11	
Approved By (ENG): Chris Geddes	Date: 28 FEB 11	
Approved By (MFG):	Date:	
Approved By:	Date:	

MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: PC-**-**-1S-T-*DE** Schematic Diagram

Size	Drawing Number	REV	SHEET
A	001423SCH	01	1 of 1

PC-Series Electrical Box Diagram

208/230-1-60 / Scroll / ECM Fan

Low Voltage Wiring (24VAC)

Refer to 000145CDG-02 for more detail

De-humidistat Wiring

Use and 18-2 conductor cable to connect the Heat Pump to the De-humidistat.
R - 24VAC Hot
Y - Compressor / ECM Fan

Air Aquastat Wiring

Use and 18-2 conductor cable to connect the Heat Pump to the Air Aquastat.
C - 24VAC Common
R - 24VAC Hot
Use and 18-2 conductor cable to connect Stage 1(S1) NO to Pool Aquastat Stage 1(S1) NC and Stage 2(S2) NC

Pool Aquastat Wiring

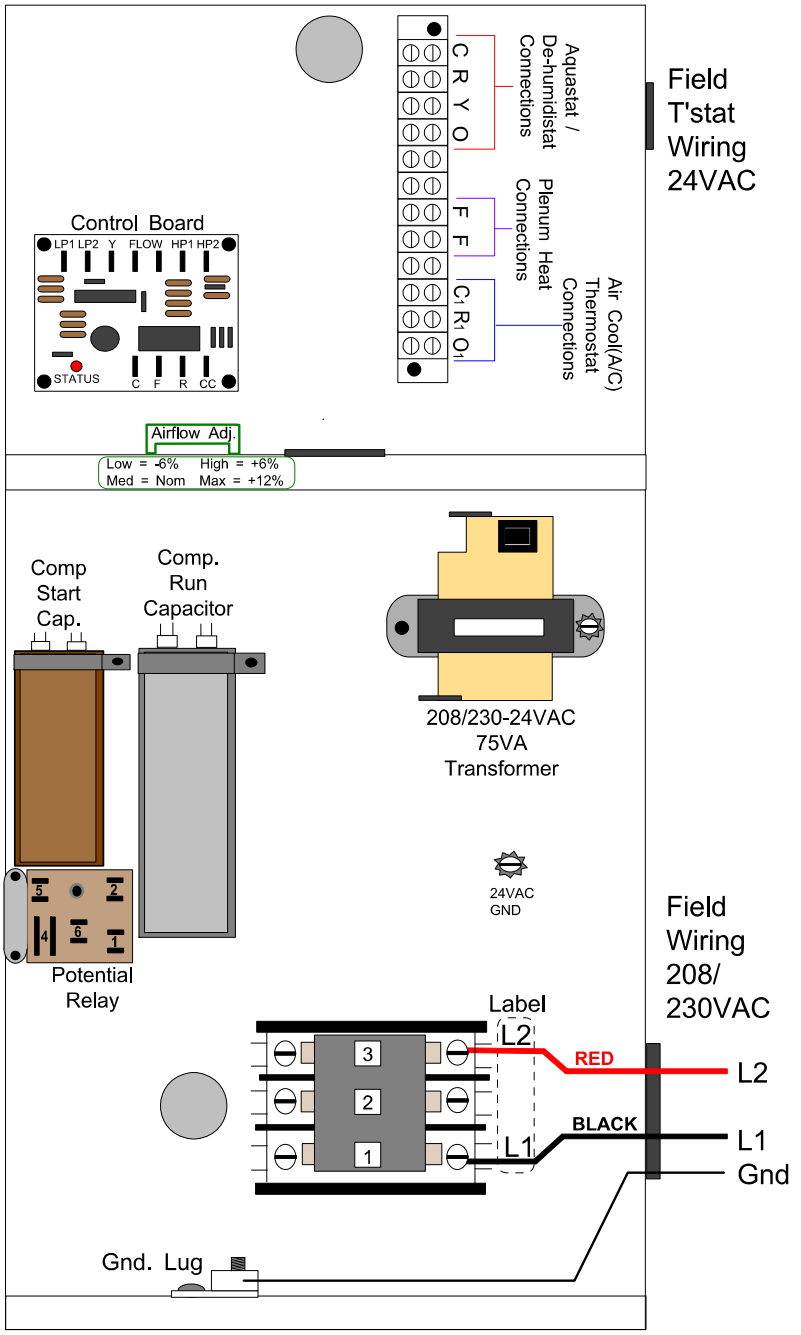
Use and 18-4 conductor cable to connect the Heat Pump to the Pool Aquastat.
C - 24VAC Common
R - 24VAC Hot
Y - Compressor / ECM Fan
O - Air Reheat (4-way Valve)

Air Cool(A/C) Aquastat Wiring

Use an 18-3 conductor cable to connect the Heat Pump to the Air Cool thermostat::
C_1 - 24VAC Common
R_1 - 24VAC Hot
O_1 - Air Conditioning (4-way valve)

Plenum Heater Wiring

Use an 18-2 conductor cable to connect Heat Pump [F F] to Plenum Heater [F F] Use an 18-2 conductor cable to connect Air Aquastat Stage 2(S2) NO and C to Plenum Heater [C 1] (or [I 1])



208/230VAC CONNECTIONS		
Wire	**Colour**	**Contactor (Label)**
Line 2	Red	L2
Line 1	Black	L1
Connect "Gnd" to Gnd. Lug		

Heat Pump Electrical Service Requirements
208/230VAC Single Phase 60Hz (208/230-1-60)

Model Size	Min. Circuit Ampacity	Min. Wire Gauge	TD Fuse or Breaker
45	27	8-2	40
55	35	6-2	50
65	42	6-2	60
80	51	6-2	60

IMPORTANT NOTE FOR 208-1-60 POWER
Ensure red wire is connected to the 208 terminal on the transformer instead of the 230V terminal.

REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	20 OCT 11

Drawn By: Chris Geddes		Date: 28 FEB 11
Checked By: Chris Geddes		Date: 28 FEB 11
Approved By: Chris Geddes	(ENG)	Date: 28 FEB 11
Approved By	(MFG)	Date
Approved By		Date

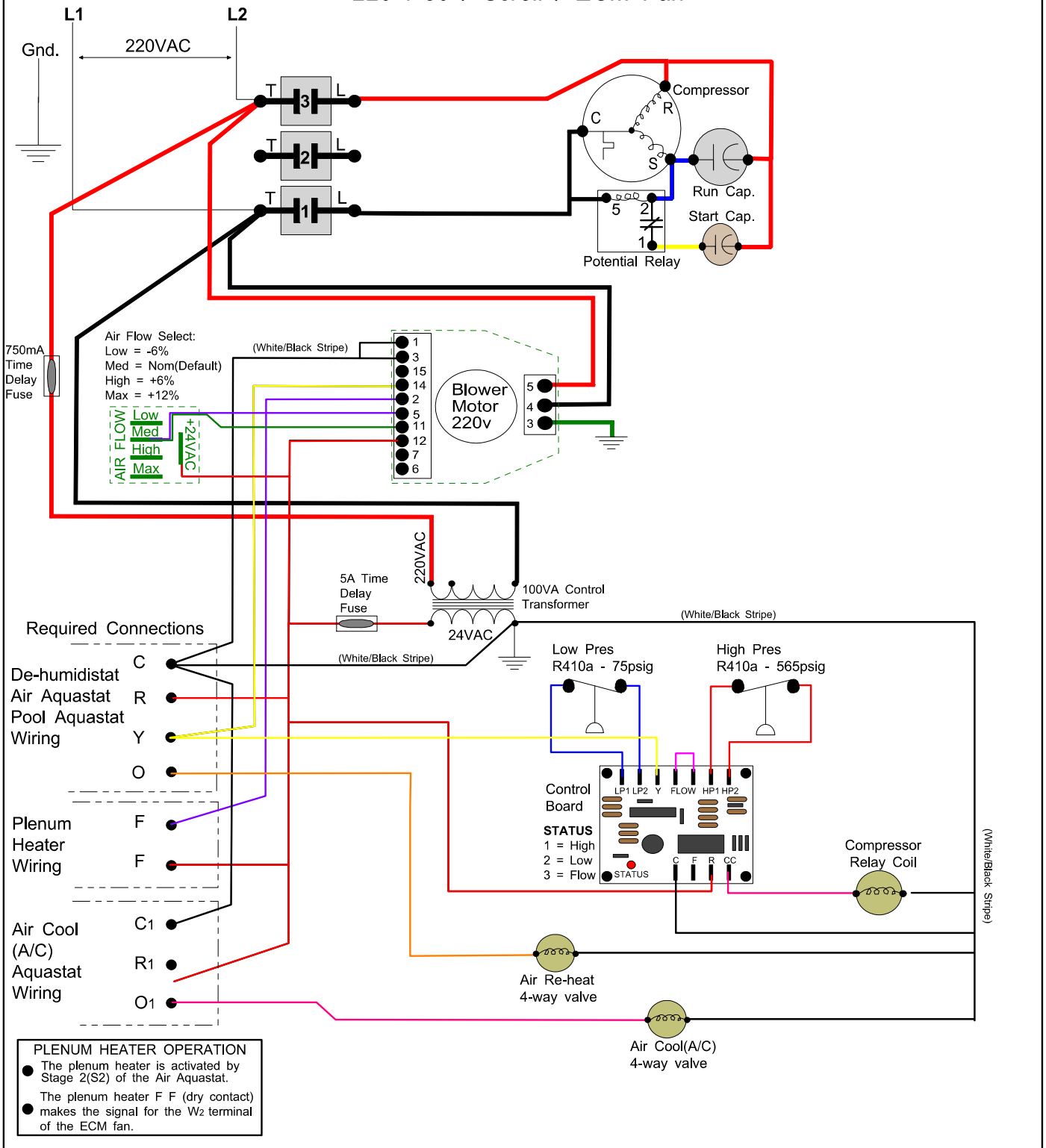
MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: PC-**-**-1S-T-*DE** Electrical Box Diagram

Size	Drawing Number	REV	SHEET
A	001424ELB	01	1 of 1

PC-Series Schematic Diagram

220-1-50 / Scroll / ECM Fan



PLENUM HEATER OPERATION

- The plenum heater is activated by Stage 2(S2) of the Air Aquastat.
- The plenum heater F F (dry contact) makes the signal for the W2 terminal of the ECM fan.

REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	20 OCT 11

Drawn By: Chris Geddes	Date: 28 FEB 11	
Checked By: Chris Geddes	Date: 28 FEB 11	
Approved By (ENG): Chris Geddes	Date: 28 FEB 11	
Approved By (MFG):	Date:	
Approved By:	Date:	

MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: PC-**-**-6S-T-*DE** Schematic Diagram

Size	Drawing Number	REV	SHEET
A	001425SCH	01	1 of 1

PC-Series Electrical Box Diagram

220-1-50 / Scroll / ECM Fan

Low Voltage Wiring (24VAC)

Refer to 000145CDG-02 for more detail

De-humidistat Wiring

Use and 18-2 conductor cable to connect the Heat Pump to the De-humidistat.
R - 24VAC Hot
Y - Compressor / ECM Fan

Air Aquastat Wiring

Use and 18-2 conductor cable to connect the Heat Pump to the Air Aquastat.
C - 24VAC Common
R - 24VAC Hot
Use and 18-2 conductor cable to connect Stage 1(S1) NO to Pool Aquastat Stage 1(S1) NC and Stage 2(S2) NC

Pool Aquastat Wiring

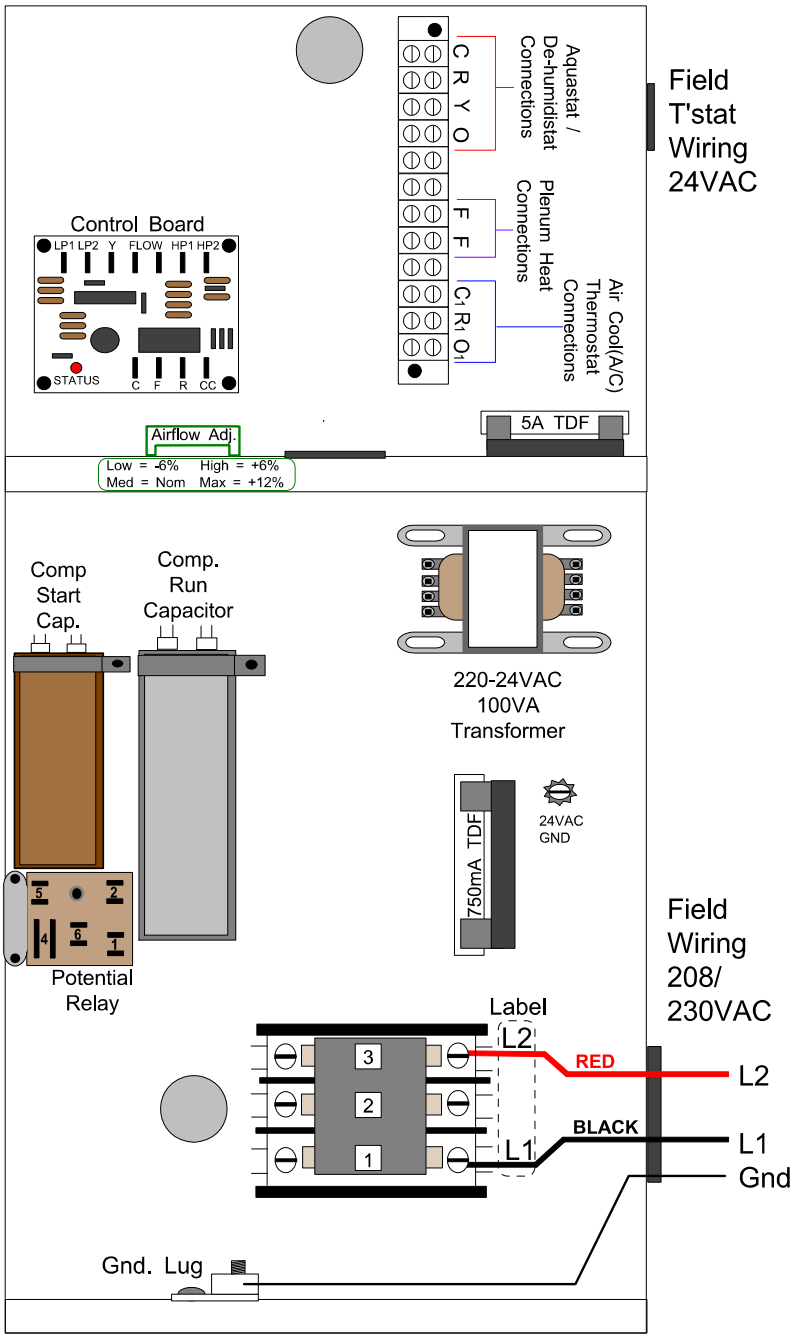
Use and 18-4 conductor cable to connect the Heat Pump to the Pool Aquastat.
C - 24VAC Common
R - 24VAC Hot
Y - Compressor / ECM Fan
O - Air Reheat (4-way Valve)

Air Cool(A/C) Aquastat Wiring

Use an 18-3 conductor cable to connect the Heat Pump to the Air Cool thermostat::
C_1 - 24VAC Common
R_1 - 24VAC Hot
O_1 - Air Conditioning (4-way valve)

Plenum Heater Wiring

Use an 18-2 conductor cable to connect Heat Pump [F F] to Plenum Heater [F F] Use an 18-2 conductor cable to connect Air Aquastat Stage 2(S2) NO and C to Plenum Heater [C 1] (or [I 1])



220VAC CONNECTIONS		
Wire	**Colour**	**Contactor (Label)**
Line 2	Red	L2
Line 1	Black	L1
Connect "Gnd" to Gnd. Lug		

Heat Pump Electrical Service Requirements
220VAC Single Phase 50Hz (220-1-50)

Model Size	Min. Circuit Ampacity	Min. Wire Gauge	TD Fuse or Breaker
45	23	10-2	30
55	26	8-2	40
65	34	8-2	50
80	48	6-2	60

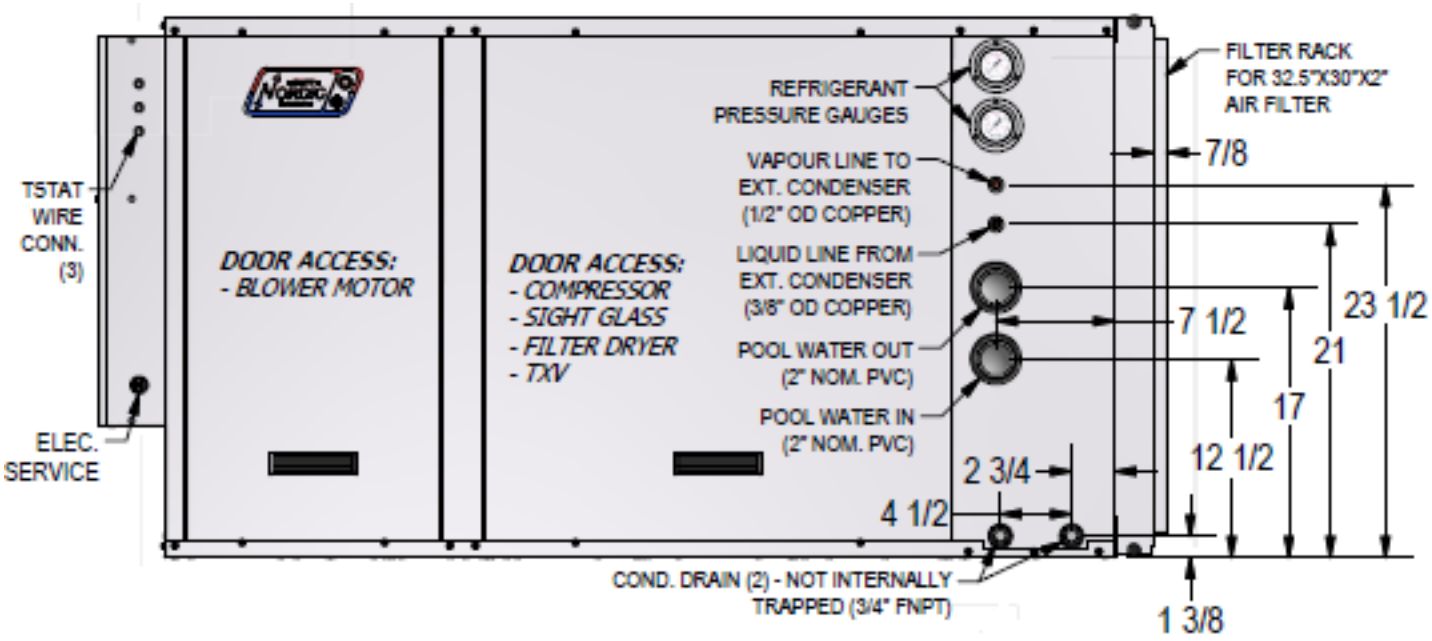
REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	20 OCT 11

Drawn By Chris Geddes		Date 28 FEB 11
Checked By Chris Geddes		Date 28 FEB 11
Approved By Chris Geddes	(ENG)	Date 28 FEB 11
Approved By	(MFG)	Date
Approved By		Date

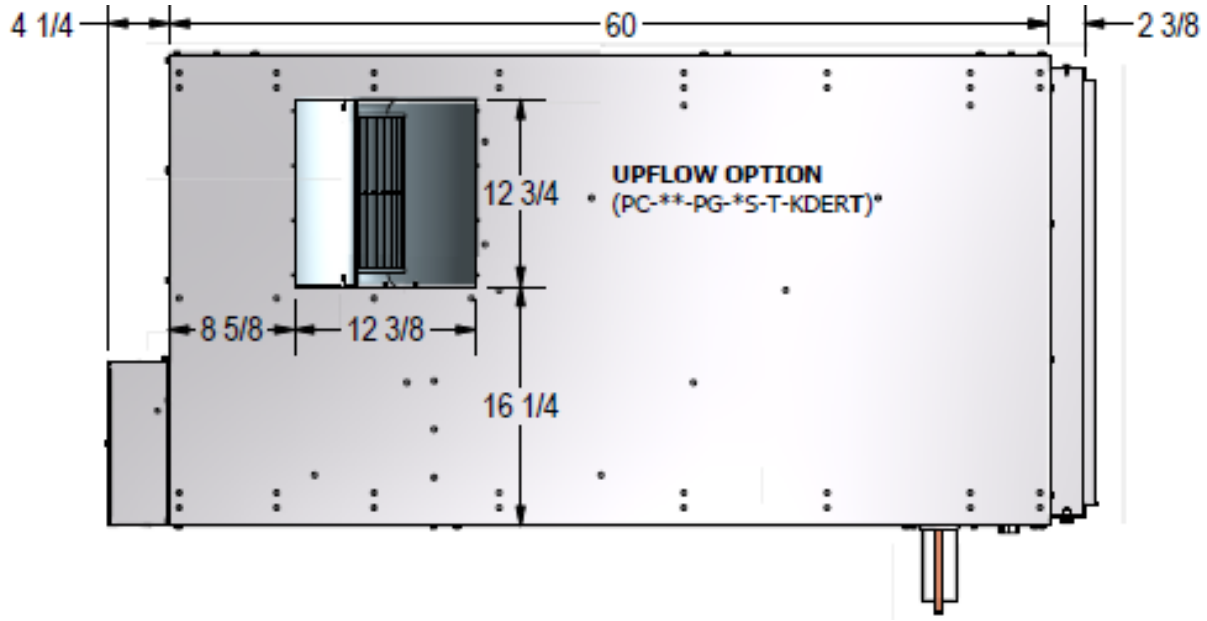
MARITIME GEOTHERMAL LTD.
170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

Drawing Name: PC-**-**-6S-T-*DE** Electrical Box Diagram

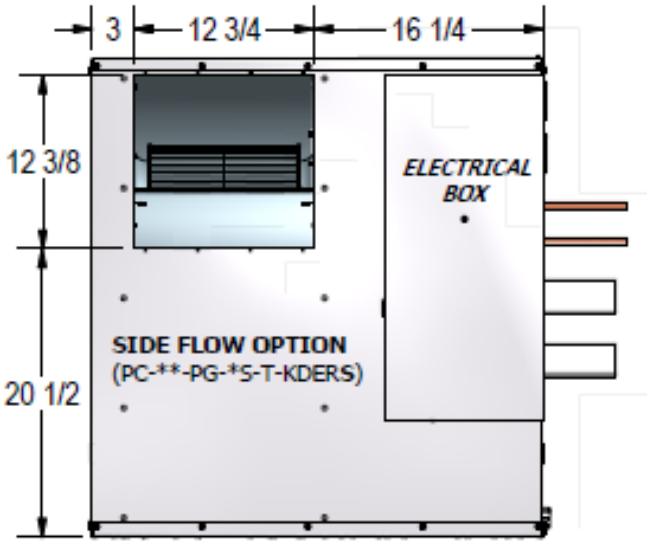
Size	Drawing Number	REV	SHEET
A	001426ELB	01	1 of 1



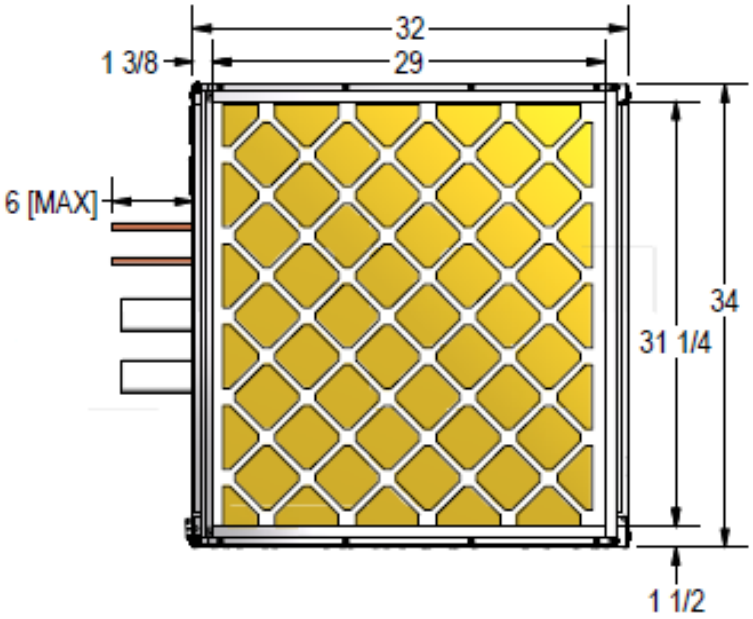
Front View



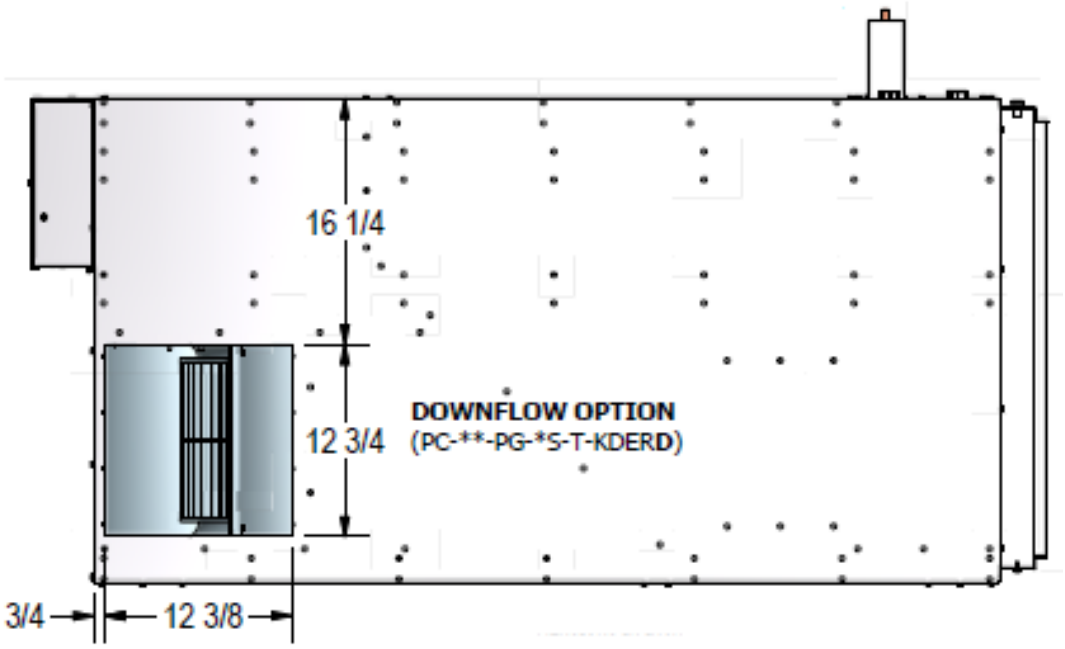
Top View



Left View



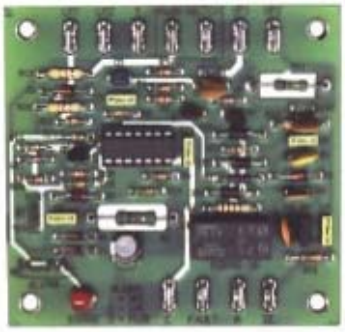
Right View



Bottom View

Lockout Protection Module

- **Anti-short cycle/lockout control**
- **Pressure/flow switch monitoring**
- **Alarm output during lockout**
- **5-minute anti-short cycle delay (5-second test mode)**
- **LED fault codes for lockout status**
- **Test mode for reduced test time**
- **Conformally coated for moisture protection**



Mode of Operation

The control will begin the 5-minute time delay upon a Y call from the thermosat. After the time delay expires, the compressor contactor will be energized as long as the high and low pressure switches are closed. If either switch is open after the delay expires, the compressor will not energize. If either switch opens while the compressor is energized, it will de-energize immediately and begin the anti-short cycle delay. The compressor will not be allowed to turn on again until the anti-short cycle delay expires and both pressure switches are closed. The flow switch will have a 30-second bypass timer in which the control will ignore an open flow switch for the first 30 seconds. If the flow switch remains open after the 30-second bypass timer expires, the unit will de-energize the compressor and begin the anti-short cycle delay. If the control experiences three high pressure, low pressure, or flow switch faults in a 60-minute period, it will lockout the compressor and energize the fault output. A manual reset of power will be required to reset the lockout condition.

The control has a status LED to indicate which type of fault or lockout has occurred. If a high pressure fault or lockout occurs, the status LED will blink once. If a low pressure fault or lockout occurs, the status LED will blink twice. If a flow switch fault occurs, the status LED will blink three times.

Specifications

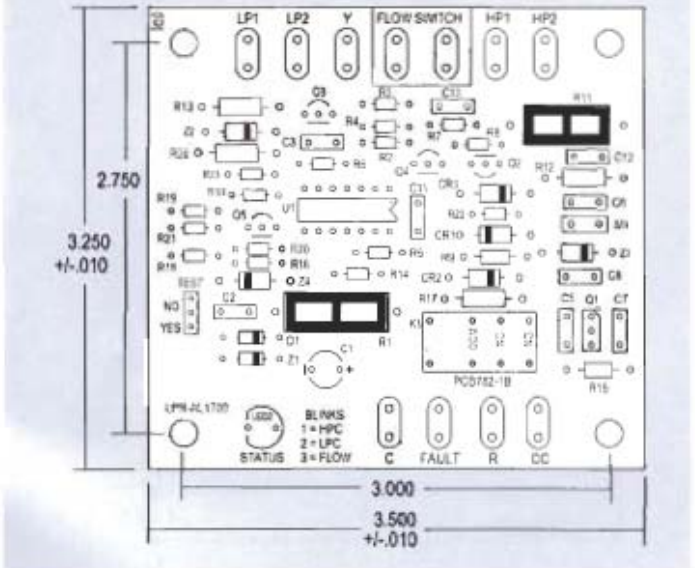
Input
- **Voltage:** 18 to 30 VAC
- **Frequency:** 50 to 60 Hz

Output
- **CC**
  - **Type:** Solid state (Triac)
  - **Rating:** 1 amp @ 30 VAC
- **Fault**
  - **Type:** Relay (SPDT) N.O.
  - **Rating:** 1 amp @ 30 VAC

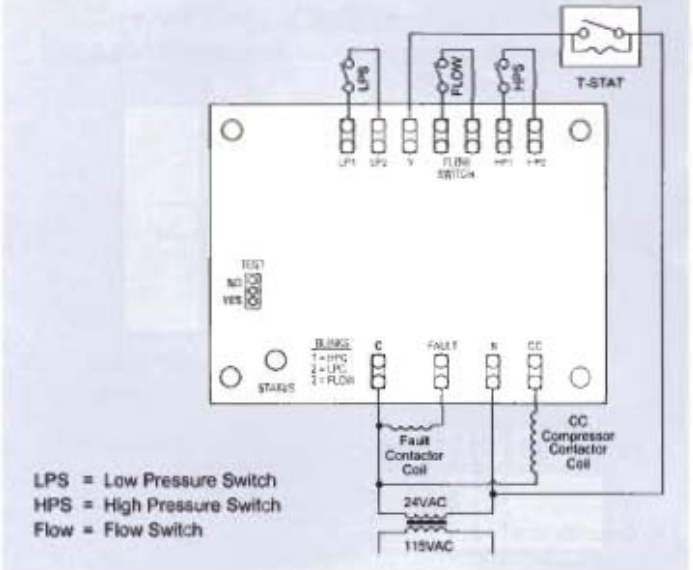
Time Delay
- **Anti-short cycle time:** 5-minutes fixed ±20% (5-second test mode)

Mechanical
- **Board dimensions:** 3.5" x 3.25" x 1"
- **Mounting:** Surface mount using (4) #6 or #8 screws

Dimensions



Wiring Diagram



APPENDIX B - ECM Fan Airflow Tables

NOMINAL AIRFLOW SETTING (MED)		
Model	Full	
	CFM	L/s
45	1200	566
55	1500	708
65	1900	897
80	2400	1133

-6% AIRFLOW SETTING (LOW)		
Model	Full	
	CFM	L/s
45	1128	532
55	1410	665
65	1786	843
80	2256	1065

+6% AIRFLOW SETTING (LOW)		
Model	Full	
	CFM	L/s
45	1272	600
55	1590	750
65	2014	951
80	2544	1201

+12% AIRFLOW SETTING (LOW)		
Model	Full	
	CFM	L/s
45	1344	634
55	1680	793
65	2128	1004
80	2688	1269

NOTES: Unit sizes 45 and 55 nominal value up to 0.50 inH2o, sizes 65, and 80 up to 0.70inH2o
*REDUCED airflow values do not apply to PC series units

APPENDIX C - RANCO Aquastat Instructions

The Ranco® ETC is a microprocessor-based electronic temperature control designed to handle the OFF/ON functions of the PC unit. The ETC is equipped with an LCD display which provides a constant readout of the sensed temperature and a touch keypad that allows the user to easily and accurately select the setpoint temperatures and differentials for the first and second stages of operation.

Programming Steps and Display
Step 1– To start programming, press the **SET** key once to access the Fahrenheit/Celsius mode. The display will show the current temperature scale, F for degrees Fahrenheit or C for degrees Celsius. Press either the **UP** arrow or **DOWN** arrow key to toggle between the F or C designation. For closer regulation of your PC temperatures we recommend you program in the Fahrenheit mode.

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. Press either the **UP** arrow key to increase or the **DOWN** arrow 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. Press either the **UP** arrow key to increase or the **DOWN** arrow key to decrease the differential to the desired setting.

Step4– 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. Press the **UP** or **DOWN** key to toggle between the **C1** or **H1** designation.

STAGE 2
Step 5– 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. Press either the **UP** arrow key to increase or the **DOWN** arrow key to decrease the setpoint to the desired temperature.

Step 6– 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. Press either the **UP** arrow key to increase or the **DOWN** arrow key to decrease the differential to the desired setting.

Step 7– 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. Press the **UP** or **DOWN** key to toggle between the **C2** or **H2** designation.

NOTE: For PC units the mode for both stages of the Air Aquastat and the Pool Aquastat is set to the H* designation. If the A/C option is added to the system, the mode for both of its stages are is set to C*

NOTE: The Ranco® ETC will automatically end programming if no keys are depressed for a period of 30 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.

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LIMITED EXPRESS WARRANTY

It is expressly understood that unless a statement is specifically identified as a warranty, statements made by Maritime Geothermal Ltd., a corporation registered in New Brunswick, Canada, ("MG") or its representatives, relating to MG's products, whether oral, written or contained in any sales literature, catalogue or agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely MG's opinion or commendation of MG's products.
EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF MG'S PRODUCTS. MG MAKES NO WARRANTY AGAINST LATENT DEFECTS. MG MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.

LIMITED EXPRESS RESIDENTIAL WARRANTY - PARTS
MG warrants its Residential Class 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) Air conditioning, heating and/or heat pump units built or sold by MG ("MG Units") for five (5) years from the Warranty Inception Date (as defined below).
(2) Thermostats, auxiliary electric heaters and geothermal pumping modules built or sold by MG, when installed with MG Units, for five (5) years from the Warranty Inception Date (as defined below).
(3) Sealed refrigerant circuit components of MG Units (which components only include the compressor, refrigerant to air/water heat exchangers, reversing valve body and refrigerant metering device) for ten (5) years from the Warranty Inception Date (as defined below).
(4) Other accessories and parts built or sold by MG, when installed and purchased with MG Units, for five (5) years from the date of shipment from MG.
(5) Other accessories, when purchased separately, for (1) year from the date of shipment from MG.

The "Warranty Inception Date" shall be the date of original unit installation, as per the date on the installation Startup Record or six (6) months from date of unit shipment from MG, whichever comes first.

To make a claim under this warranty, parts must be returned to MG in Petitcodiac, New Brunswick, freight prepaid, no later than ninety (90) days after the date of the failure of the part. If MG determines the part to be defective and within MG's Limited Express Residential Warranty, MG shall, when such part has been either replaced or repaired, return such to a factory recognized distributor, dealer or service organization, freight prepaid. The warranty on any part repaired or replaced under warranty expires at the end of the original warranty period.

LIMITED EXPRESS RESIDENTIAL WARRANTY - LABOUR
This Limited Express Residential Labour Warranty shall cover the **labour** incurred by MG authorized service personnel in connection with the installation of a new or repaired warranty part that is covered by this Limited Express Residential Warranty only to the extent specifically set forth in the current **labour** allowance schedule "A" provided by MG's Warranty Department and only as follows:
(1) MG Units for two (2) years from the Warranty Inception Date.
(2) Thermostats, auxiliary electric heaters and geothermal pump modules built or sold by MG, when installed with MG Units, for two (2) years from the Warranty Inception Date.
(3) Sealed refrigerant circuit components of MG Units (which components only include the compressor, refrigerant to air/water heat exchangers, reversing valve body and refrigerant metering device) for five (5) years from the Warranty Inception Date.

Labour costs are not covered by this Limited Express Residential Warranty to the extent they **exceed** the amount allowed under said allowance schedule, they are not specifically provided for in said allowance schedule, they are not the result of work performed by MG authorized service personnel, they are incurred in connection with a part not covered by this Limited Express Residential Warranty, or they are incurred more than the time periods set forth in this paragraph after the Warranty Inception Date.
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 MG, 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 MG, or to the owner's seller or installing contractor, is in default.
(6) Products subjected to improper or inadequate installation, maintenance, repair, wiring or voltage conditions.
(7) Products subjected to accident, misuse, negligence, abuse, fire, flood, lightning, unauthorized alteration, misapplication, contaminated or corrosive liquid or air supply, operation at abnormal air or liquid temperatures or flow rates, or opening of the refrigerant circuit by unqualified personnel.
(8) Mold, fungus or bacteria damage
(9) Corrosion or abrasion of the product.
(10) Products supplied by others.
(11) Products which have been operated in a manner contrary to MG's printed instructions.
(12) Products which have insufficient performance as a result of improper system design or improper application, installation, or use of MG's products.
(13) Electricity or fuel, or any increases or unrealized savings in same, for any reason whatsoever.

Except for the limited **labour** allowance coverage set forth above, MG is not responsible for:
(1) The costs of fluids, refrigerant or system components **supplied by others**, or associated **labour** to repair or replace the same, which is incurred as a result of a defective part covered by MG's Limited Residential Warranty.
(2) The costs of **labour**, refrigerant, materials or service incurred in diagnosis and removal of the defective part, or in obtaining and replacing the new or repaired part.
(3) Transportation costs of the defective part from the installation site to MG, or of the return of that part if not covered by MG's Limited Express Residential Warranty.
(4) The costs of normal maintenance.

This Limited Express Residential Warranty applies to MG Residential Class products manufactured on or after February 15, 2010. MG'S LIABILITY UNDER THE TERMS OF THIS LIMITED WARRANTY SHALL APPLY ONLY TO THE MG UNITS REGISTERED WITH MG THAT BEARS THE MODEL AND SERIAL NUMBERS STATED ON THE INSTALLATION START UP RECORD, AND MG SHALL NOT, IN ANY EVENT, BE LIABLE UNDER THE TERMS OF THIS LIMITED WARRANTY UNLESS THIS INSTALLATION START UP RECORD HAS BEEN ENDORSED BY OWNER & DEALER/INSTALLER AND RECIEVED BY MG LIMITED WITHIN 90 DAYS OF START UP.

Limitation: This Limited Express Residential Warranty is given in lieu of all other warranties. If, not withstanding the disclaimers contained herein, it is determined that other warranties exist, any such express warranty, including without imitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Residential Warranty.

LIMITATION OF REMEDIES In the event of a breach of the Limited Express Residential Warranty, MG will only be obligated at MG'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 MG's factory in Petitcodiac, New Brunswick of each defect, mal-function or other failure, and a reasonable number of attempts by MG to correct the defect, malfunction or other failure, and the remedy fails of its essential purpose, MG shall refund the purchase price paid to MG in exchange for the return of the sold good(s). Said refund shall be the maximum liability of MG. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR PURCHASER AGAINST MG FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR MG'S NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY MG shall have no liability for any damages if MG'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 labour, acts of God or any other reason beyond the sole control of MG. **MG 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 MG's NEGLIGENCE OR AS STRICT LIABILITY.**

OBTAINING WARRANTY PERFORMANCE Normally, the dealer or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any MG recognized distributor, dealer or service organization. If assistance is required in obtaining warranty performance, write or call: Maritime Geothermal Ltd • Customer Service • PO Box 2555 • Petitcodiac, New Brunswick E4Z 6H4 • (506) 756□8135 • or e-mail to info@nordicghp.com 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 MG Installation, Installation and Service Manual for operating and maintenance instructions.

An extended warranty option is also available. Please contact Maritime Geothermal Ltd. via the contact information in the previous paragraph for more information.