Application, Installation, & Service Manual

ATA-Series
Reversing Central Air to Air Heat Pump

Two-Stage R410a
Model Sizes 25-75

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001999MAN-02

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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 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

ATA—75—HACW—P—1T—SDELF—xx

Series:
ATA = Air To Air heat pump

Nominal Size:
25 = 020 compressor
45 = 030 compressor
55 = 040 compressor
65 = 051 compressor
75 = 060 compressor

Functions:
H = Heating
AC = Active Cooling
W = domestic hot Water

Refrigerant:
P = R410a

Voltage Code:
1 = 230-1-60 VAC
2 = 208-3-60 VAC
4 = 460-3-60 VAC
6 = 220-1-50 VAC
7 = 380-3-50 VAC

Revision:
01, 02 etc.

Fan Outlet Orientation:
F = Field configurable

Fan Return Orientation:
L = Left return
R = Right return

Fan Motor:
E = ECM (variable speed)

Fan Type:
D = Direct drive

Air Coil:
S = standard
K = coated

Compressor:
S = 1 stage scroll
T = 2 stage scroll

ACE—75—P—1/6—KDE—xx

Series:
ACE = All weather Condenser / Evaporator
(air source outdoor unit)

Nominal Size:
25 = for AT_-25
45 = for AT_-45
55 = for AT_-55
65 = for AT_-65
75 = for AT_-75

Revision:
01, 02 etc.

Fan Motor:
E = ECM (Variable Speed)

Fan Type:
D = Direct Drive

Air Coil:
S = Standard
K = Coated

Voltage Code:
1/6 = 220~277-1-50/60

APPLICATION TABLE - INDOOR UNIT										
SIZE	FUNCTION	REFRIGERANT	VOLTAGE	COMPRESSOR	FAN/CASE	REVISIONS				
ATA-25	H A C W	P	1 2 4 6 7	T	S D E L F S D E R F	03				
ATA-45	H A C W	P	1 2 4 6 7	T	S D E L F S D E R F	03				
ATA-55	H A C W	P	1 2 4 6 7	T	S D E L F S D E R F	03				
ATA-65	H A C W	P	1 2 4 6 7	T	S D E L F S D E R F	03				
ATA-75	H A C W	P	1 2 4 7	T	S D E L F S D E R F	03				
			6	S						
This manual applies only to the models and revisions listed in this table.										

APPLICATION TABLE - OUTDOOR UNIT									
MODEL	REFRIGERANT	VOLTAGE	AIR COIL	BLOWER TYPE	BLOWER MOTOR	REVISIONS			
ACE-45	P	1/6	K	D	E	03	04		
ACE-55	P	1/6	K	D	E	03	04		
ACE-65	P	1/6	K	D	E	08			
ACE-75	P	1/6	K	D	E	08			
This manual applies only to the models and revisions listed in this table.									

APPLICATION TABLE - FIRMWARE AND PC APP			
Firmware	Version	Associated PC APP	Version
MGT GEN2 Bootload Firmware	V3.60+	MGT GEN2 PC APP	V2.00+

Maritime Geothermal Ltd. has a continuous improvement policy and reserves the right to modify specification data at any time without prior notice.

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ATA System Description

General Overview

The **ATA-Series** heat pump is a central air source heat pump that can heat or cool via a forced air duct system. The duct system can be zoned, but only to limited extent (see **Wiring** and **Ductwork** chapters).

Being an air source heat pump, the ATA does not require a ground loop, instead using an outdoor fan unit to exchange heat with the outdoor air. Unlike most air source outdoor units, this outdoor unit contains only an air coil, ECM hub motor fan, expansion valve (EEV), and outdoor temperature sensor. The remaining components, including the compressor and all electronics, are located in the indoor unit. This has several advantages: minimal installation and service work must be performed outdoors, most components are in the conditioned space for longevity, no electric compressor heater is required, and heating domestic hot water is possible (through a desuperheater circuit) since water lines are inside and will never freeze.

The air heating and cooling functions are controlled by a standard 3H/2C 24V room thermostat. Alternatively, BACnet can be used to control the heat pump and report operating data.

In additional to the main space heating/cooling functions, there is a double-wall desuperheater for pre-heating domestic hot water with ~5% of the heat pump's capacity. This function is only active when the heat pump is running for space heating or cooling purposes. An energy-efficient bronze head ECM circ pump for the desuperheater circuit is built in, along with a temperature control to turn the pump off when the DHW temperature reaches 140°F (60°C).

A two-stage scroll compressor is standard. The outdoor air coil is coated for corrosion protection. The cabinet is powder coated galvanized sheet metal. Control is overseen by the Nordic GEN2 programmable control board, which has many advanced features like laptop connectivity via the free PC App software, data logging & graphing, and real time readout from electronic temperature & pressure sensors.

1. Heating Mode

In heating mode, heat is extracted from the outdoor air and transferred to the air duct system. This causes the air coil to eventually frost up to the point that a defrost cycle is required; refer to the ***Defrost Operation*** section below. Refrigerant flow is controlled by the EEV located in the outdoor unit while the EEV in the indoor unit is fully open.

If the outdoor temperature is above 34°F(1°C), the outdoor unit fan starts and stops when the heat pump starts and stops. If the temperature is below 34°F(1°C), the outdoor fan will remain on at a very slow speed when the heat pump is off to minimize the chance of a fan freeze up, and to prevent snow from entering the unit. The outdoor fan will slowly ramp up to the required speed upon start.

Auxiliary Air Heat

An electric resistance plenum heater, placed inside the heat pump but ordered separately, is **required**. This is because the capacity of air source heat pumps fall as the outdoor temperature drops and the heating load increases. This output reduction can be seen in the performance charts later in this manual, and is common to all air source heat pumps. The plenum heater will be sized to satisfy all of the heat load if the outdoor temperature falls below the minimum for heat pump operation: -7°F (-22°C).

A second important function of the plenum heater is to provide heat to the indoor air steam during defrost mode (described below), to **avoid cold air blowing into the space**.

The room air thermostat controls when the plenum heater is activated, normally due to a drop in the room temperature. The heater is installed inside the indoor unit, unless the blower is installed in the side discharge position, in which case it is installed in the air discharge ductwork outside the heat pump.

Defrost Operation

The heat pump has an advanced defrost control algorithm, using outdoor temperature and suction pressure to determine when a defrost cycle should occur and how long it should be. Precise fan control allows the defrost heat to rise quickly and then be maintained at a setpoint for quick defrosting.

The outdoor unit has a unique physical arrangement for combatting the ice build up that is a common problem with air source heat pumps. The air coil is installed on a 15° angle and the area below the coil is open (no drip tray). The angle causes the melting frost/snow to run down the back of the coil to a single point of runoff rather than along the entire bottom side of the coil. It is not possible for runoff to remain between coil pipes and re-freeze between them, which a common cause of air coil failure in air source heat pumps.

2. Cooling Mode

In cooling mode, heat is extracted from the air duct system and rejected to the outdoor air. Refrigerant flow is controlled by the EEV located in the indoor unit while the EEV in the outdoor unit is fully open. There is no defrost cycle in cooling mode.

The outdoor fan is controlled based on the discharge pressure and will slowly ramp up to the required speed when the system starts. During operation, the fan speed will automatically adjust up or down to in order to maintain the discharge pressure setpoint value. Two stage units will drop down to the first stage to reduce the discharge pressure at very high outdoor temperatures.

Factory Options

Looking at the main service panel, the indoor unit can be ordered as a left or right hand air return from the factory. This must be specified at time of order as the physical construction of the two configurations is different.

* *See **Piping** chapter for an annotated copy of this diagram*

ATA Sizing

Air Source Heat Pumps

Since it is harder to extract heat from colder outdoor air, any air source heat pump will have its lowest heating capacity on cold days when building heat load is the highest. It is not generally possible to oversize an air source heat pump to cover 100% of the coldest day heat load, since this would mean excessive compressor short-cycling during moderate outdoor weather when heat pump capacity is much higher and heat load is much lower, and also poor dehumidification during cooling mode.

Therefore, it should be expected that ***any air source heat pump will need auxiliary heat on the coldest days.*** An air side plenum heater is **required**; see reasons in previous chapter.

Heat Pump Sizing

The table shows the size of home each air source heat

TABLE 1 - Heat Pump Size vs. Heated Area

Model	sq.ft.	m^2
25	**800**	***75***
45	**1,400**	***130***
55	**2,000**	***185***
65	**2,600**	***240***
75	**3,100**	***290***

This is an ***estimate*** of which unit size is required for a *typical* two-level home (main level and below grade basement) with R-20 walls, R-40 ceiling and average size and number of windows. The Heated Area is the area of the main level. The table accounts for a basement the same size as the heated area.

It is highly recommended that a heat loss/gain analysis be performed by a qualified person with software using the CSA F-280 or Manual J methods before selecting a heat pump size. The analysis will result in a heat load for the coldest day, which is influenced by, for example, the number of levels, the size of the windows, the orientation of the home, attached garage, bonus rooms, walk-out basement, and coldest outdoor temperature for the region.

In northern climates, a heat pump model size can be selected by matching the calculated heat load to the heat pump's heating capacity at an outdoor temperature of **35°F (1.7°C)** and an indoor water temperature of **105°F (40.5°C)** for concrete in-floor heating or **120°F (49°C)** for other heating types. These numbers can be found in the detailed performance tables in the **Model Specific Information** section later in this manual. This sizing will result in a good compromise between covering as much of the cold weather heat load as possible without utilizing backup heat, while minimizing excessive cycling (turning on and off frequently) during moderate outdoor temperatures.

It should be noted that sizing an air source heat pump is always a compromise between covering coldest-day heat load and minimizing cycling due to over-capacity in warm weather.

In cooling dominant climates, the heat pump should be similarly sized, by matching the calculated cooling load to the standard capacity rating at an outdoor temperature that matches the local maximum outdoor temperature. The difference here is that it is necessary to cover all of the cooling load, since there is no backup cooling.

Even in northern heating dominant climates, it should be ensured that 100% of the cooling load will be covered when sizing the heat pump.

Plenum Heater Sizing

The required plenum heater is available as an accessory in 5, 7, 10, 15 and 20kW sizes. Choose a size that covers **100% of the coldest day heat load**, according to the heat loss analysis mentioned in the last section. If that is not available, use the following recommendation:

TABLE 2 - Plenum Heater Sizing

Model	Plenum Heater Size (kW)	
	Recommended	Internally Possible
25	**7**	**5, 7, 10**
45	**10**	**5, 7, 10**
55	**10**	**5, 7, 10, 15, 20**
65	**15**	**5, 7, 10, 15, 20**
75	**20**	**5, 7, 10, 15, 20**

Two styles of plenum heater are available; the first is for internal installation (inside the indoor unit). Note limit for size 45 in above table.

The second has a wider element profile for installation outside the unit, in the ductwork. If field-installing the fan in the convertible side discharge position, this type of plenum heater will need to be used.

Installation Basics

Sample Bill of Materials - ATA Series

Although not exhaustive, following is a list of materials needed for a typical installation:

FROM MARITIME GEOTHERMAL
- ATA SERIES HEAT PUMP (L OR R RETURN) W/ACE OUTDOOR UNIT
- PLENUM HEATER __kW
- THERMOSTAT (WIFI OR STD)
- SHIELDED 18-8 WIRE FOR OUTDOOR UNIT

OPTIONAL FROM MARITIME GEOTHERMAL
- ANTI-VIBRATION PAD
- COMPRESSOR SOUND JACKET
- SECURE START
- ELECTROSTATIC (CLEANABLE) AIR FILTER

DUCTWORK
- OUTLET PLENUM ADAPTER W/ FLEXIBLE COLLAR
- RETURN AIR ADAPTER W/ FLEXIBLE COLLAR
- FIBREGLASS INSULATION (FOR NOISE, IF REQ'D)
- TRUNK DUCT W/ JOINERS (IF NOT EXISTING)
- 6" ROUND DUCT W/ADAPTERS (IF NOT EXISTING)
- ALUMINUM TAPE
- SHEET METAL SCREWS

DHW
- PREHEAT TANK, 40 OR 60 GAL
- ½" COPPER PIPE
- ½" FITTINGS, BALL VALVES, BOILER DRAINS, CV

ELECTRICAL
- HEAT PUMP SERVICE WIRE: 6-2 OR 8-2
- PLENUM HEATER SERVICE WIRE
- 14-2 OUTDOOR RATED WIRE W/ DISCONNECT SWITCH FOR OUTDOOR UNIT
- HEAT PUMP BREAKER
- PLENUM HEATER BREAKER
- THERMOSTAT WIRE 18-8
- THERMOSTAT WIRE 18-3 (PLENUM HEATER)
- FORK TERMINALS FOR TSTAT WIRE (10)
- CONDENSATE PUMP & HOSE (IF REQUIRED)

REFRIGERATION
- 1/2" & 7/8" (OR 3/8" & 3/4") ACR TUBING
- PIPE ISULATION
- EXTRA R410A REFRIGERANT FOR LINESETS >20 FT

- 2" STYROFOAM INSUL. (IF PAD NOT PURCHASED)

Unpacking the Unit

When the 2-piece 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.

Indoor Unit Placement

Ducted or forced air heat pumps should be centrally located in the home with respect to the conditioned space. This provides the best in economy and comfort and usually can be accomplished in harmony with the design of the home. A heating system cannot be expected to produce an even temperature throughout the building when it is located at one end of the structure and the heated or cooled air is transmitted with uninsulated metal ductwork.

If possible the front access panel and side access panel opposite the air return should remain clear of obstruction for a distance of **2 ft (0.7 m)** to facilitate servicing and general maintenance. No access is required on the back side. Ensure the unit is level to eliminate any possible condensate draining issues.

The heat pump comes equipped with 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. Be careful not to run piping in front of the filter rack access cover, since access is required in order to change the air filter.

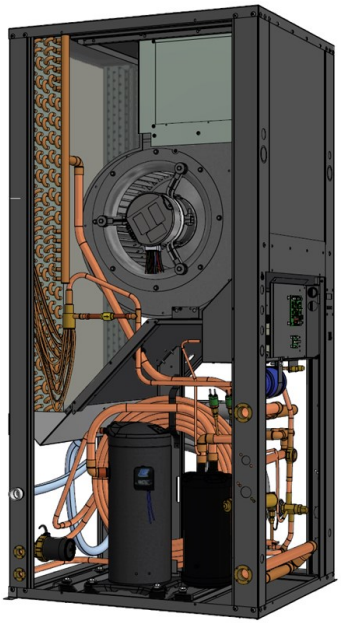
Raising the indoor unit off the floor a few inches is generally a good practice since this will prevent rusting of the bottom panel of the unit and deaden vibrations. An anti-vibration pad, available as an accessory, or a piece of 2" styrofoam should be placed under the unit.

Indoor Unit Air Outlet Orientation

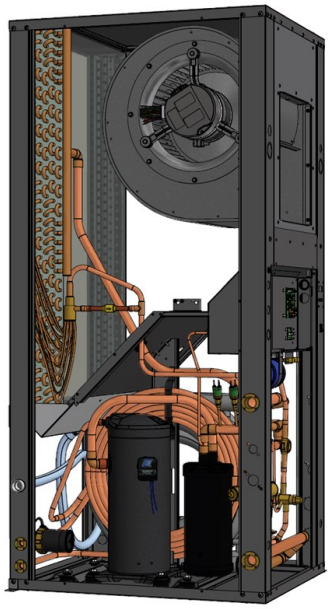
The indoor unit has a field configurable blower position, resulting in top or side air discharge. Its default location from the factory is in the top of the unit, providing a “ninety” in the airflow. It can easily be placed in the side of the unit for straight through airflow. Note that if this is done, plenum heater will need to be placed in ductwork outside unit.

To switch the location of the fan outlet:

1. Turn the power of to the unit.
2. Remove the screw that holds the side access panel in place and remove the access panel by pulling up on the handle and then outward from the bottom.
3. Disconnect the two wire harnesses and ground wire from the fan motor.
4. Repeat step 2 for the access panel with the fan mounted in it. Set the assembly on the floor.
5. Disconnect the plenum heater extension from the fan housing and from the access panel.
6. Mount the fan housing directly to the access panel.
7. Install the fan/panel in the new location and secure with the screw.
8. Reconnect both harnesses and ground wire.
9. Install the remaining access panel and secure with the remaining screw.



BLOWER IN TOP DISCHARGE POSITION (DEFAULT)



BLOWER IN SIDE DISCHARGE POSITION

Air Return Orientation

The heat pump can be ordered as left or right air return from the factory. This must be specified at time of order as the physical construction of the two configurations is different. Refer to the **Dimensions** section toward the end of this manual for physical dimensions of the units.

LEFT RETURN *RIGHT RETURN*

Plenum Heater Installation

Be sure to specify the type of installation anticipated, since the plenum heater models are different for internal or external (duct) installation.

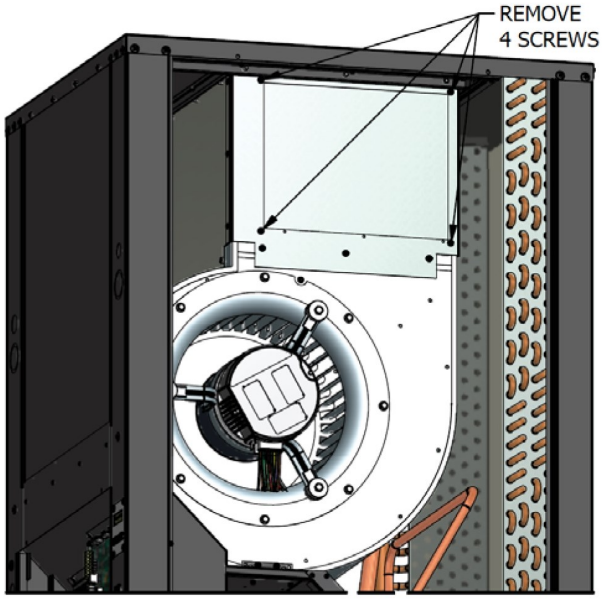
1. Blower in top discharge position: Plenum heater is mounted inside heat pump cabinet. See diagram on following page. Remove the screws from the cover plate, remove the cover plate, and place the plenum heater in the cutout. Slide it up and secure the bottom flange with three cover plate screws. Use the indicated knockouts on the heat pump cabinet for electrical connections.

When installation is complete, check the appropriate box of the label on the unit door to indicate which size heater was installed.

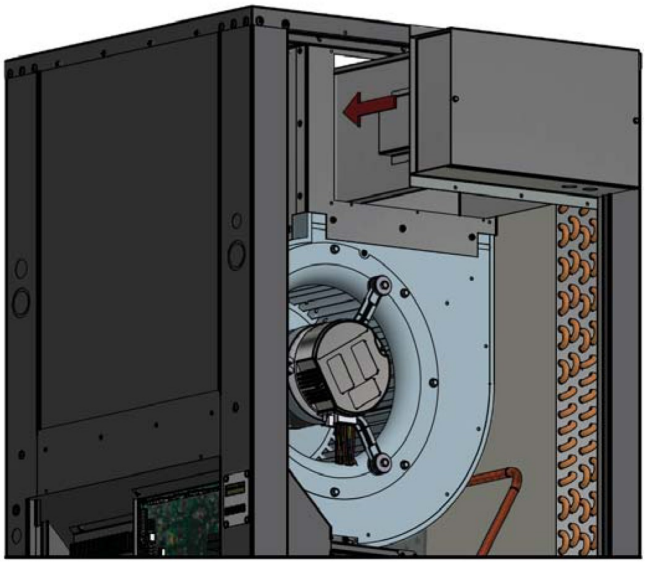
2. Blower in side discharge position: Plenum heater should be installed in the air discharge duct outside the heat pump cabinet in a manner that allows all of the airflow to pass through it to prevent any hot spots in the heater elements. Ensure that the plenum heater is mounted in an approved position as per its instructions.

Internal Plenum Heater Installation
R, TF, ATA, ATF, DX, DXTF Series

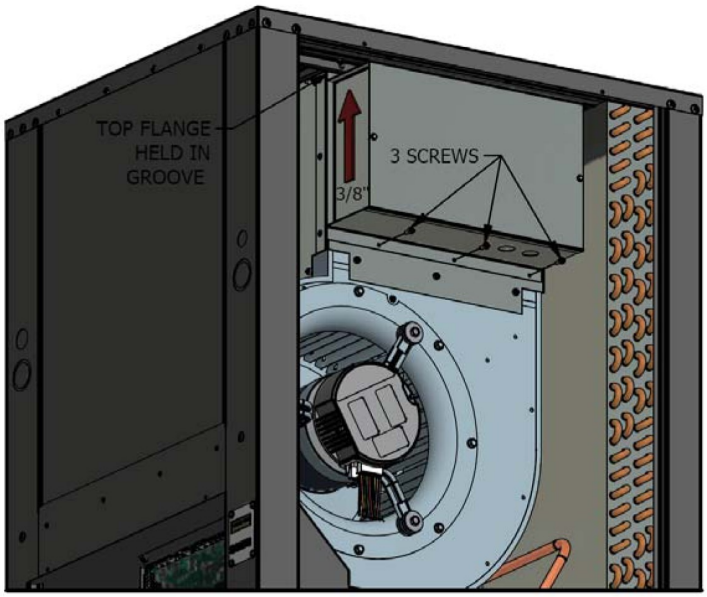
1. Remove four screws as shown, and remove blank panel.



2. Slide plenum heater into cutout until heater flange is flush with blower.



3. Slide plenum heater *UP* approximately 3/8". Top flange of heater is held in top groove of blower assembly and requires no fasteners. Install 3 screws through bottom flange of heater through pre-punched holes in heater and blower assembly.



01	Initial Release	Dan Rheault	Dan Rheault	9-Jan-2015
REV	ECO#	IMPL BY	APVD BY	DATE

Drawn By: Dan Rheault	Date: 9-Jan-2015	
Checked By: Dan Rheault	Date: 9-Jan-2015	
Eng. Approved By	Date	
Mfg. Approved By	Date	
Approved By	Date	

MARITIME GEOTHERMAL LTD.
P.O. Box 2555
170 Plantation Rd.
Petitcodiac, NB CANADA E4Z 6H4

Drawing Name: **Internal Plenum Heater Installation**

Size	Drawing Number	Revision	Sheet
LET	001915INF	01	1 / 1

Outdoor Unit Placement

The ACE unit must be placed outdoors, with the fan pointing away from the building.

Since there is no drip tray and defrost condensate will drip straight down under the unit, it should be mounted where **moisture or ice under the unit will not be considered to be unsightly**, as might be the case on a paved walkway to the front door for example. (Note that the lack of a drip tray is an intentional design feature that dramatically improves longevity of the outdoor heat exchanger.)

For ACE-65/75, there is a detachable cover for the piping and wiring which automatically places the unit **12 inches (30 cm)** away from the building, which is the recommended spacing. If necessary, the unit can be placed **8 inches (20 cm)** from the building: the cover can be shortened by cutting the tabs and removing one section. Be aware that if mounted at less than 12 inches from building, there is a risk of frost forming on the wall during defrost under certain conditions. Be sure there are no obstructions around the perimeter of the back, so that return airflow is unimpeded.

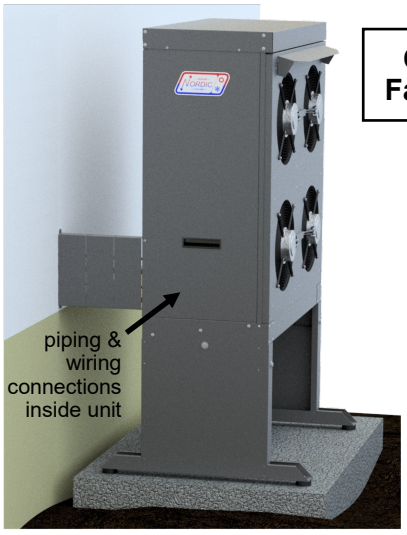
There should be little or no obstruction in the fan (front) direction for at least **10 ft (3 m)**, and preferably **16 ft (5 m)**, otherwise airflow and therefore overall performance will be reduced.

In addition, there should be at least **two feet (0.6 m)** of clearance on the electrical box and refrigeration piping side of the unit to facilitate servicing and general maintenance.

The outdoor unit **must be bolted or screwed down** to prevent a tipping hazard. See next section.

Note that **no field installed filter-dryer is required.**

IMPORTANT NOTE: The line set between the indoor and outdoor units must not exceed 70 ft (21 m) in length.



Outdoor Unit Fan Orientation

Outdoor Fan Speed Reduction

Should fan noise be a concern, for example if the outdoor unit is mounted near a frequently open window, the outdoor fan speed can be reduced (up to a maximum of 25%). This should only be done if necessary, since a small loss in efficiency will result.

The fan speed can be reduced via the LCD (see **LCD Interface & Menus** section) or PC App (see **PC Application** section).

Outdoor Unit Mounting Height

The outdoor unit must remain clear of snow and ice at all times. Good performance depends on good airflow, which of course cannot be achieved if the unit is buried in snow and re-frozen defrost condensate.

There are several ways to accomplish this. First, look up how much snowfall is expected in your area, either from local knowledge or weather data. The snowfall map included on next page can be used as a rough guide for Canada.

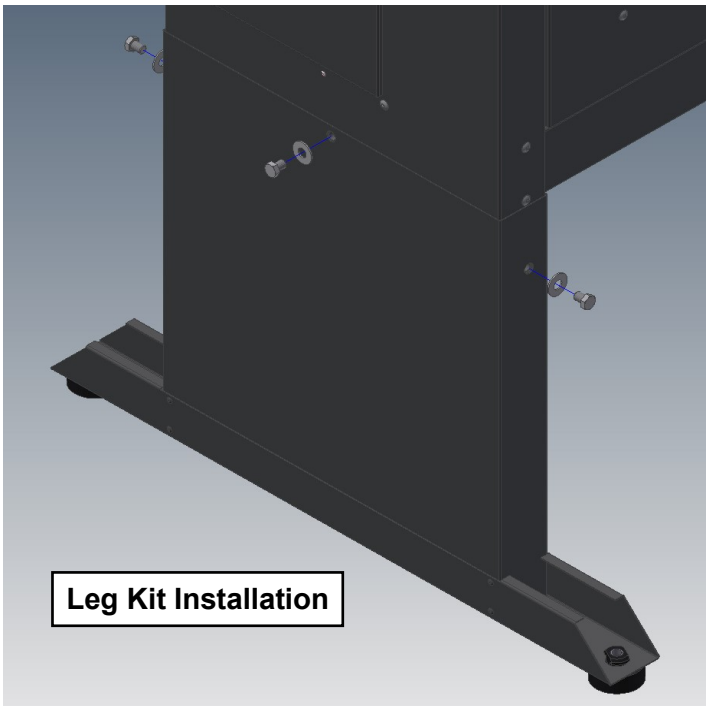
1. If there is less than ~4" (10 cm) of snow accumulation expected, the unit could be mounted directly on a concrete pad. This is **not recommended** in cold climates, since ongoing care would be required to ensure re-frozen condensate does not build up under unit.
2. The unit can be mounted on angle brackets attached to the side of a building. Be sure to adhere to the minimum clearance requirement of **8-12" (20-30 cm),** and use brackets designed for twice the unit weight.
3. Two leg kits which add either **15" (38 cm)** or **30" (76 cm)** of additional height are available as an accessory. For ATWC-65 and larger which use a larger outdoor unit, only the shorter leg kit is available.

To attach the legs:

ACE-25/45/55 - first remove the three bolts with flat washers that hold each foot plate in place. Leaving the foot plate in place on the inside of the cabinet panel, slide the leg over the outside of the panel and re-install the three bolts and flat washers.

ACE-65/75 -slide the leg over the outside of the two existing cabinet legs and affix with the kit's three SS bolts and flat washers.

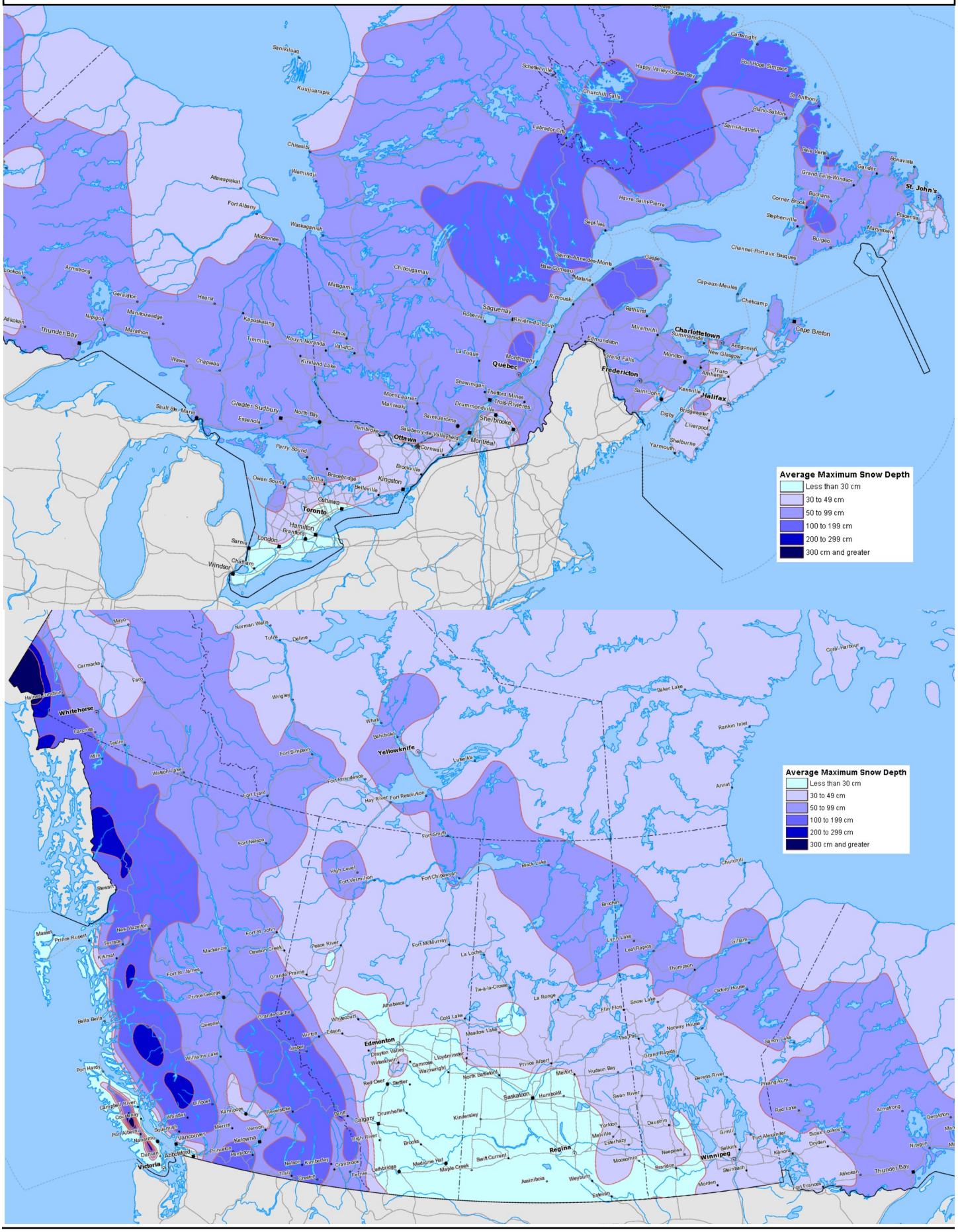
Whether or not a foot kit is used, be sure to mount the unit using the 4 rubber grommets included with the unit, to dampen any vibration. **The unit must be fastened to its mounting surface with four bolts through these grommets to prevent**



Leg Kit Installation

Average Maximum Snow Depth - Canada (1979-1997)

Source: Natural Resources Canada



Wiring

Indoor Unit Power Supply Connections

Power supply for the heat pump from the breaker panel is supplied to the indoor unit. The unit has a concentric 1.093" / 0.875" knockout for main power supply connection to the electrical box. There are also knockouts openings with plastic grommets for connections to plenum heater power supply, thermostat, and power and signal connections to the outdoor unit.

NOTE: Two separate power supplies are required, one for the heat pump and a second one for the plenum heater. Each must have its own supply wires and breaker.

A schematic diagram (SCH) and electrical box layout diagram (ELB) can be found on the electrical box cover of the unit as well as in the **Model Specific Information** section of this manual. The Electrical Tables in the **Model Specific Information** section contain information about the wire and breaker

IMPORTANT NOTE: A properly qualified electrician should be retained for all connections to the heat pump and associated controls. The connections to the unit MUST CONFORM TO LOCAL CODES.

IMPORTANT NOTE FOR 3-PHASE UNITS: If on startup compressor is noisy and not pumping, reverse L1 and L2 supply wires.

TABLE 3 - Power Supply Connections		
Line	**Description**	**Voltages**
L1	**Line 1**	**All**
L2	**Line 2**	**All**
L3	**Line 3**	**3-phase only**
N	**Neutral**	**460-3-60, 380-3-50**
GND	**Ground**	**All (connect to ground lug)**

TABLE 4 - Power Supply Connections (Plenum Heater)		
Line	**Description**	**Voltages**
L1	**Line 1**	**208/230-1-60**
L2	**Line 2**	**208/230-1-60**
GND	**Ground**	**208/230-1-60**
Contact factory for three phase plenum heater requirements.		

Control Transformer

The low voltage controls, including the control board, are powered by a 100VA class II transformer. 208/230-1-60 and 208-3-60 models have 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. All other voltage models have primary and secondary fuses for circuit protection.

TABLE 5 - Control Transformer	
Voltage	**Low Voltage Circuit Protection**
(1) 208/230-1-60	**Resettable breaker on transformer**
(2) 208-3-60	
(4) 460-3-60	**Primary / Secondary fuses**
(6) 220-1-50	
(7) 380-3-50	

IMPORTANT NOTE: For 208/230VAC-1-60 units, if connecting to 208VAC power supply move the red wire connected to the 240 terminal of the transformer to the 208 terminal.

Domestic Hot Water (Desuperheater)

The desuperheater function for domestic hot water heating is pre-wired and no field connections are necessary.

After the desuperheater is filled with water and purged of air, activate the built-in DHW circulator by connecting the brown wire with the blue insulated terminal to L1 of the compressor contactor as shown on the wiring diagram in the **Model Specific Information** section. **Ensure the power is off when connecting the wire.** Also, turn on the DHW ON/OFF switch.

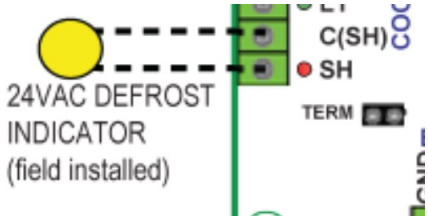
Disable Switch (field installed)

A switch to disable demand from the control system may be installed. On control board, jumper **COM_IN** to **GND**, and toggle **12VDC** to **IN_SPARE** to disable. See the main wiring diagram in the **Model Specific Information** section.

Defrost Indicator (field installed)

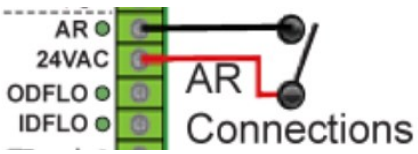
A 24VAC signal is available for an externally installed indicator, which is active when the heat pump is in defrost mode. This may be useful for the building operator or homeowner, to know when buffer tank is being cooled instead of heated.

The indicator may be installed between terminals **SH** and **C(SH)** at the lower left side of control board.



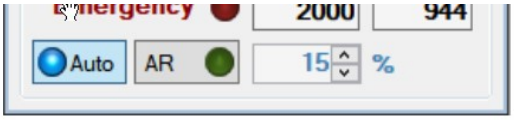
Airflow Reduction for Zoning

For zoning purposes, airflow may be reduced by a switch or dry contact using the connections on the right side of the control board. The dry contact may be from a relay and interconnected thermostats, or more commonly a zone controller.



The default reduction is 15%, but it may be adjusted from 5%-20% using the ***View-->Indoor Fan*** window in the PC App. See **PC Application** chapter. For airflow values including the reduction, see the **Indoor Airflow Data** table in the **Model Specific Information** chapter.

For more zoning advice, see **Ductwork** chapter.



Outdoor Unit: Power Connections

The ACE outdoor unit is powered from the indoor unit. The power supply for the ACE unit is 208 to 277VAC, 50/60Hz. The ATA and ACE units have matching terminal strips for these connections. Use a two conductor, minimum 14ga **outdoor rated cable** for this connection. Refer to diagram.

TABLE 6 - Outdoor Unit Power Supply Connections	
Line	**Description**
L1	**Supply line**
L2	**Supply line**
GND	**Ground**
Use a 2-conductor outdoor rated 14ga cable.	

IMPORTANT NOTE: Most codes require a disconnect switch visible and/or reachable from the outdoor unit to be installed in the power supply cable. If the switch has fuses or breakers they must be no more than 10A.

OUTDOOR DISCONNECT SWITCH IS A SAFETY DEVICE ONLY. *Turn off breaker to indoor unit before servicing to avoid costly damage to electronic control board.*

Outdoor Unit: Signal Connections

The speed of the fan and the heating mode expansion valve (EEV) in the outdoor unit are controlled by the control board in the indoor unit, and a temperature sensor is read. Therefore, communication wiring is required.

Connect the supplied 8 conductor **shielded outdoor rated cable** between the terminal strips in the indoor and outdoor units. **The shield ground wire is connected only to the indoor unit; do not connect the shield ground to the outdoor unit (there is no terminal for it).** Cut the shield ground wire short at the cable sheath in the outdoor unit.

TABLE 7 - Outdoor Unit Signal Connections	
Signal	**Description**
EEVR	**Electronic Expansion Valve (Red)**
EEVG	**Electronic Expansion Valve (Green)**
EEVW	**Electronic Expansion Valve (White)**
EEVB	**Electronic Expansion Valve (Black)**
TR	**Outdoor Temperature Sensor (Power)**
TG	**Outdoor Temperature Sensor (Signal)**
TB	**Outdoor Temperature Sensor (Ground)**
PWM+	**Outdoor Fan Control**
Shield GND*	**Shielded cable ground wire**
*** Connect only to the indoor unit. In the outdoor unit, leave this wire unconnected and cut it short at the cable sheath.**	

AVOID INSULATION NICKS ON INDIVIDUAL OUTDOOR UNIT SIGNAL WIRES

SLICE A LINE ALONG WIRE SHEATHING TOWARDS THE END, THEN PULL IT AWAY FROM THE WIRES BEFORE CUTTING OFF.

DO NOT CUT A CIRCLE WITH UTILITY KNIFE BEFORE SEPARATING SHEATHING FROM BUNDLED SIGNAL WIRES.

Thermostat & Plenum Heater Control Connections

A three-stage heating and two stage cooling heat pump configurable thermostat is required. The stages are S1 = stage 1 compressor, S2 = stage 2 compressor, and S3 = electric auxiliary (heating only). One can be purchased with the unit, or other heat pump compatible thermostats with the same number of stages can be used. The electrical box diagram on the electrical box cover provides a description of the signal connections, as does the table. Refer to diagram on a following page for the connections between the thermostat and the heat pump.

NOTE: A very few models may not be available in two-stage. Models numbers with a **T** in the Compressor designator are two-stage; models with an **S** are single stage (verify the model number against pages 2 and 3 of this manual). The **Y2** signal is not used for single stage units, and they only require a 2 stage heat 1 stage cool thermostat. The stages are S1 = compressor and S2 = electric auxiliary (heating only). If the selected thermostat has more stages than this, configure it for 2 and 1.

TABLE 8 - Thermostat Signal Description	
Signal	**Description**
C	**24VAC common (ground)**
R	**24VAC hot**
G	**Fan low speed (for air recirculation)**
Y1	**Heat pump stage 1**
Y2	**Heat pump stage 2 (not used for single stage units)**
W2	**Heating stage 3 (plenum heater)**
O	**Cooling mode (reversing valve)**
E	**Emergency heat (plenum heater)**
L	**Fault (24VAC output when fault condition)**
C_P	**Plenum heater dry contact (Connect to 'C' or 'l' in plenum heater)**
1	**Plenum heater stage 1 dry contact. (Connect to '1' in plenum heater)**
2	**Plenum heater stage 2 dry contact. (Connect to '2' in plenum heater)**
AR	**Airflow reduction:** connect AR to 24VAC at right side of control board with a dry contact to reduce the airflow for zoning.
24VAC	

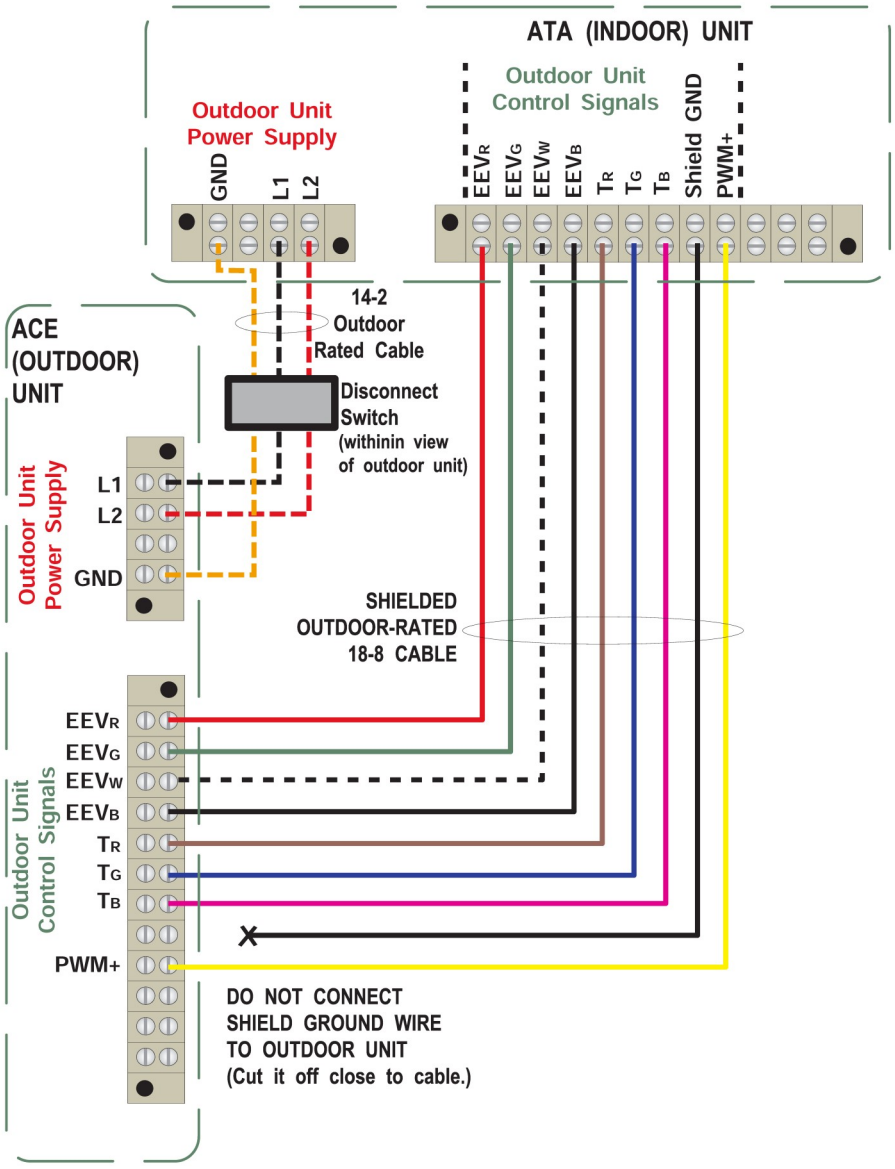
BACnet Connections

If using instead BACnet for external control of heating/cooling demand and/or monitoring of status, use a shielded twisted pair to the connector at the bottom left of control board. There is an optional termination jumper located above the connector.

See the **BACnet Interface** section for details.

TABLE 9 - BACnet Connections	
Line	**Description**
A	**Communication +**
B	**Communication -**
GND	**Ground**
Use a shielded twisted pair cable.	

Typical ATA Series Outdoor Unit Wiring



REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	Dan Rheault	Dan Rheault	10-Oct-2017

Drawn By	Dan Rheault	Date 10-Oct-2017
Checked By	Dan Rheault	Date 10-Oct-2017
Approved By	(ENG)	Date
Approved By	(MFG)	Date
Approved By		Date

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170 Plantation Rd.
Petitcodiac, NB
E4Z 6H4

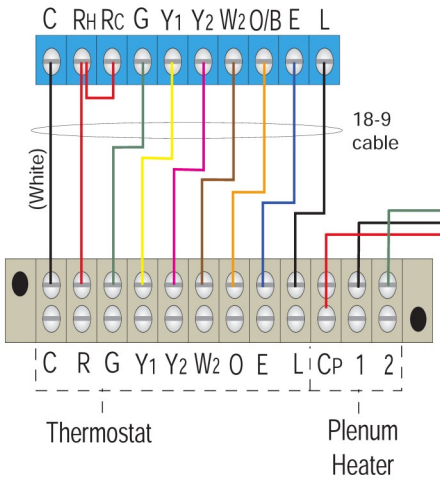
Drawing Name: Typical ATA Outdoor Unit Wiring

Size	Drawing Number	Drawing Rev	Sheet
A	002251CDG	01	1 of 1

Typical Thermostat Connections to GEN2 Control Board

Two-Stage Models (Compressor Stages = T)

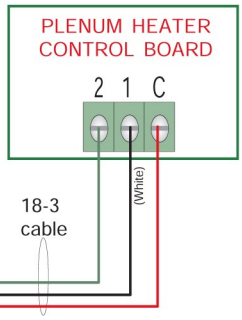
Typical 3 stage heat
2 stage cool
Heat Pump Thermostat



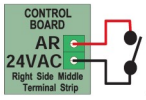
CONNECTION DESCRIPTION:

C	- 24VAC Common
R	- 24VAC Hot
G	- Fan
Y1	- Stage 1 Heat/Cool (Compressor)
Y2	- Stage 2 Heat/Cool (Compressor S2 solenoid coil)
W2	- Stage 3 Heat (Plenum Heater)
O	- Reversing Valve (Cooling)
E	- Emergency Heat
L	- Compressor Lock-out Light

NOTE: Configure O/B for energized in cooling.



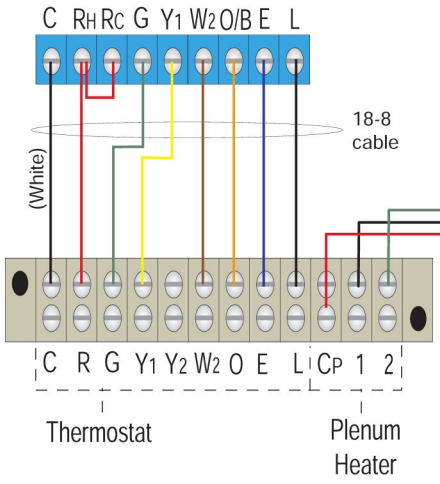
Note: If only using as single stage then only an 18-2 cable is required, place a jumper wire between 2 and 1 of the plenum heater terminals.



Note: Connect 24VAC amd AR together with a dry contact to invoke the airflow reduction function. Refer to the manual for more information.

Single-Stage Models (Compressor Stages = S)

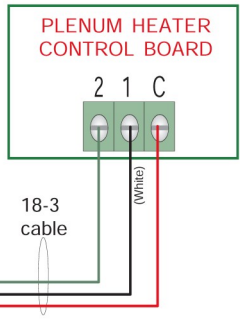
Typical 2 stage heat
1 stage cool
Heat Pump Thermostat



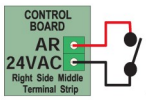
CONNECTION DESCRIPTION:

C	- 24VAC Common
R	- 24VAC Hot
G	- Fan
Y1	- Stage 1 Heat/Cool (Compressor)
W2	- Stage 3 Heat (Plenum Heater)
O	- Reversing Valve (Cooling)
E	- Emergency Heat
L	- Compressor Lock-out Light

NOTE: Configure O/B for energized in cooling.



Note: If only using as single stage then only an 18-2 cable is required, place a jumper wire between 2 and 1 of the plenum heater terminals.



Note: Connect 24VAC amd AR together with a dry contact to invoke the airflow reduction function. Refer to the manual for more information.

REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	21 APR 2016

Drawn By: Chris Geddes	Date: 21 APR 2016	
Checked By: Chris Geddes	Date: 21 APR 2016	
Approved By (ENG): Chris Geddes	Date: 21 APR 2016	
Approved By (MFG)	Date	
Approved By	Date	

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Drawing Name: Typical Thermostat Connections to GEN2 Control Board

Size	Drawing Number	Drawing Rev	SHEET
A	002071CDG	01	1 of 1

Piping

Domestic Hot Water (Desuperheater) Connections

The connections for the DHW circuit are 1/2" brass FPT fittings. They are marked DHW IN and DHW OUT.

A typical piping diagram for a pre-heat tank configuration can be found in document **000970PDG** at the end of this section. Be sure to note the position of the check valve and the direction of water flow. Other configurations are possible, and there may be multiple units tied together in larger buildings.

WARNING: USE ONLY COPPER LINES TO CONNECT THE DESUPERHEATER. TEMPERATURES CAN BE >200°F NEAR THE UNIT WITH DESUPERHEATER TURNED OFF, POTENTIALLY MELTING & RUPTURING PLASTIC PIPING.

Ensure the tank is filled with water and under pressure before activating the built-in DHW circulator as described below. First, slightly loosen the boiler drain on the DHW Out pipe to allow air to escape from the system. This step will make certain that the domestic hot water circulator in the unit is flooded with water when it is started.

CAUTION: the domestic hot water pump is water lubricated; damage will occur to the pump if it is run dry for even a short period of time.

Activate the built-in DHW circulator by connecting the brown wire with the blue insulated terminal to L1 of the compressor contactor. **Ensure the power is off when connecting the wire.** Once connected the DHW switch on the front of the unit may be used to enable/disable the domestic hot water circulator.

The DHW loop may have to be purged of air several times before good circulation is obtained. A temperature difference between the DHW In and DHW Out can be felt by hand when the circulator pump is operating properly.

For the pre-heat tank setup, the final tank should be set to **140°F (60°C),** which is required by most codes. The pre-heat tank does not require electric elements. This setup takes full advantage of the desuperheater as it is the sole heat provider to the pre-heat tank. The desuperheater remains active during the compressor runtime until the pre-heat tank has been completely heated by the desuperheater alone. This setup is more energy efficient than a single tank setup, and eliminates the possibility of reverse heating of the refrigerant gas under low condensing temperature operating conditions.

CAUTION: If two (2) shut-off valves are located on the domestic hot water ines as shown in the diagram, a pressure relief valve must be installed to prevent possible damage to the domestic hot water circulator pump should both valves be closed.

Note that connection and use of the desuperheater is optional, and there is no problem for the heat pump if desuperheater is left unconnected.

Condensate Drain

The unit comes equipped with one 3/4" female PVC socket drain connection. This drain allows the condensate which forms during the air conditioning cycle to be removed from the unit. The drain should be connected and vented as per local codes. During high humidity weather, there could be as much as 25 gallons of water formed per day.

The condensate drain is internally trapped and does not require an external trap. An external condensate pump may be installed if there is not sufficient slope to drain condensate under gravity to its destination.

To avoid overflow of the condensate pan, the drain line and trap should be inspected periodically to ensure they are not plugged with accumulated debris. There may be an alarm for condensate overflow, which will disable unit operation.

See **Ductwork** section for a diagram showing condensate drain connection.

Typical Piping Connections - ATA

See other diagrams and instructions in the manual for sizing and selection of equipment, and system design.

Many of the items illustrated in this diagram are available as accessories from Maritime Geothermal Ltd.. Other items are commonly available from plumbing or HVAC wholesalers.

01	Initial Rel.	Dan Rheault	Dan Rheault	14-Oct-2021
REV	ECO#	IMPL BY	APVD BY	DATE

Drawn By: Dan Rheault	Date: 14-Oct-2021
Checked By: Dan Rheault	Date: 14-Oct-2021
Eng. Approved By	Date
Mfg. Approved By	Date
Approved By	Date

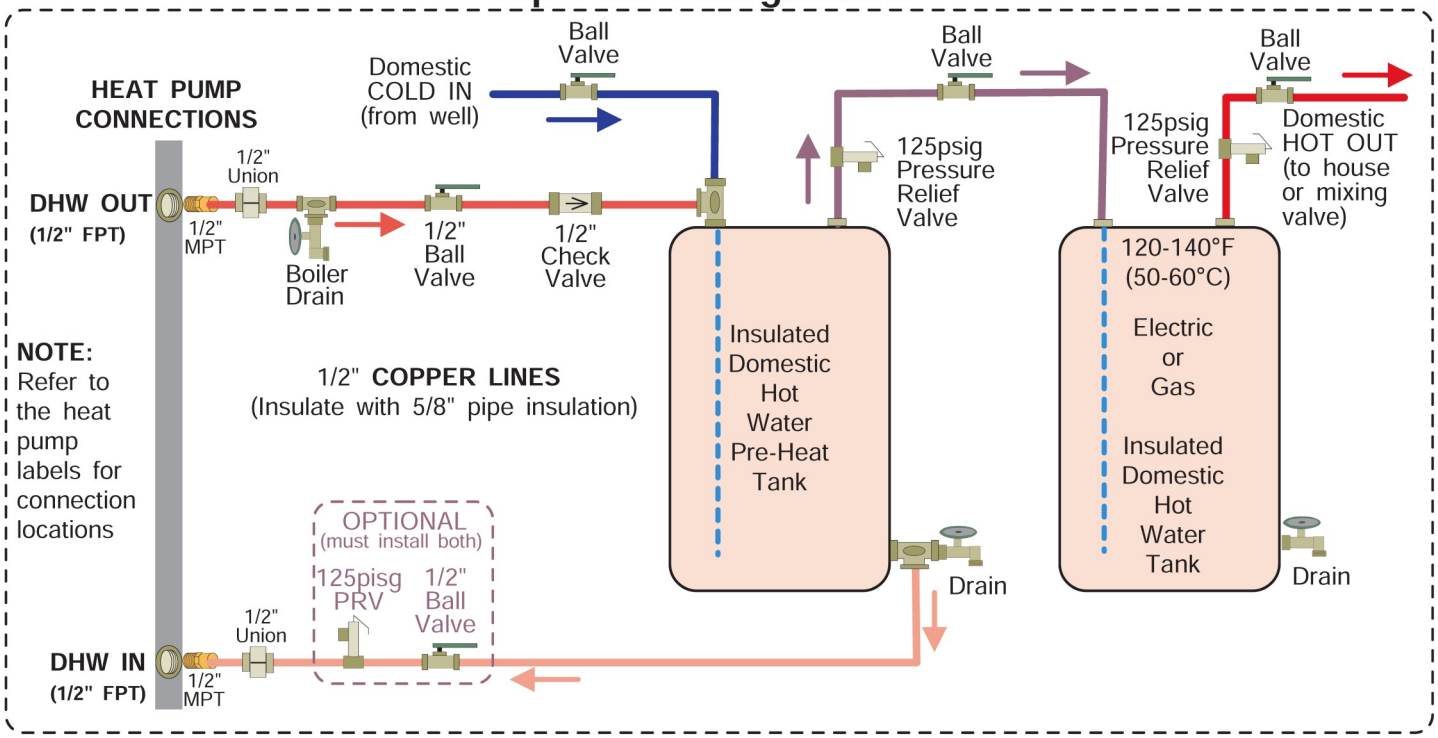
MARITIME GEOTHERMAL LTD.
P.O. Box 2555
170 Plantation Rd.
Petitcodiac, NB CANADA E4Z 6H4

Drawing Name: **Typical Piping Connections - ATA**

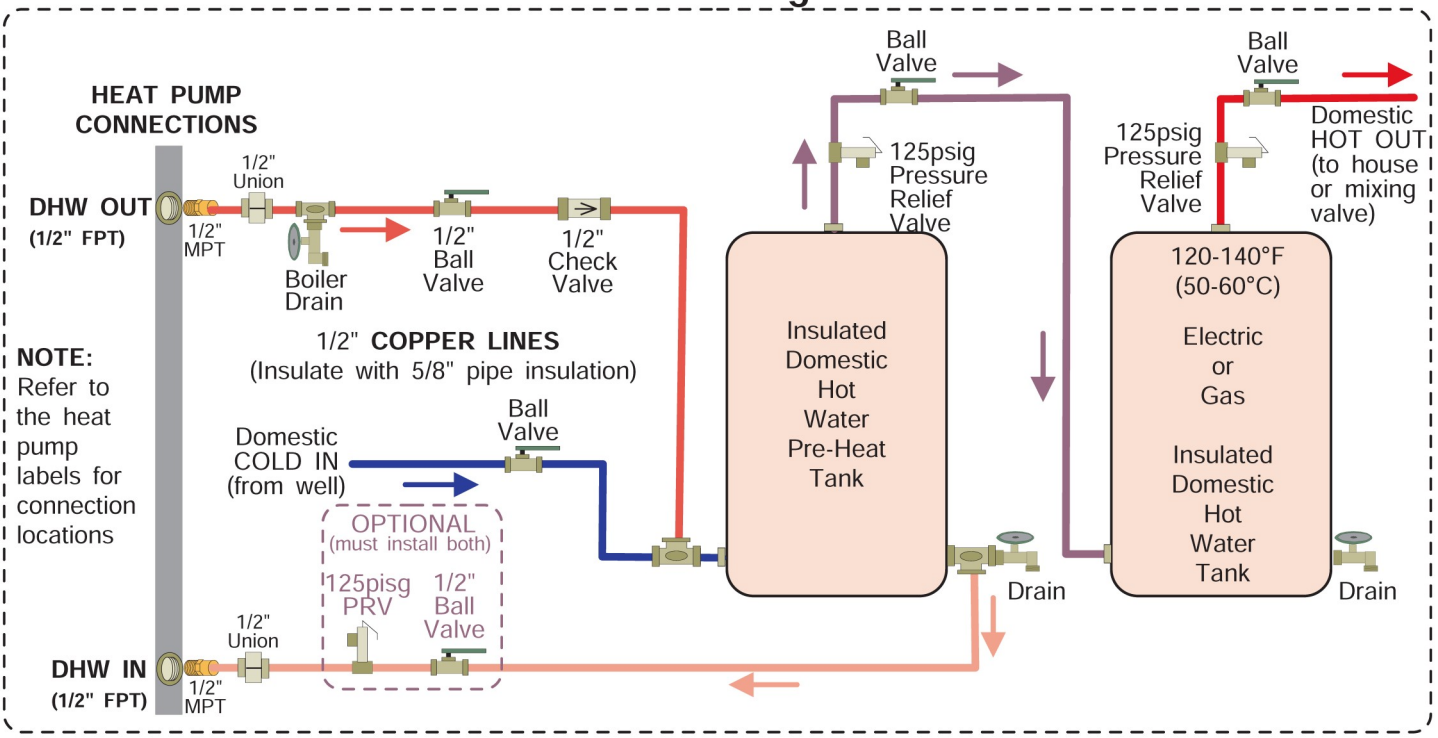
Size	Drawing Number	Revision	Sheet
LET	002547PDG	01	1 / 1

Desuperheater Connection to DHW Pre-Heat Tank

Top Port Configuration



Side Port Configuration



REV	ECO #	IMPL BY	APVD BY	DATE
01a	Re-titled	D. RHEAULT	D. RHEAULT	15 JAN 19
01	Initial Release	C. GEDDES	C. GEDDES	10 MAR 09

Drawn By: Chris Geddes	Date: 10 MAR 09	
Checked By: Chris Geddes	Date: 10 MAR 09	
Approved By (ENG): Chris Geddes	Date: 10 MAR 09	
Approved By (MFG):	Date:	
Approved By:	Date:	

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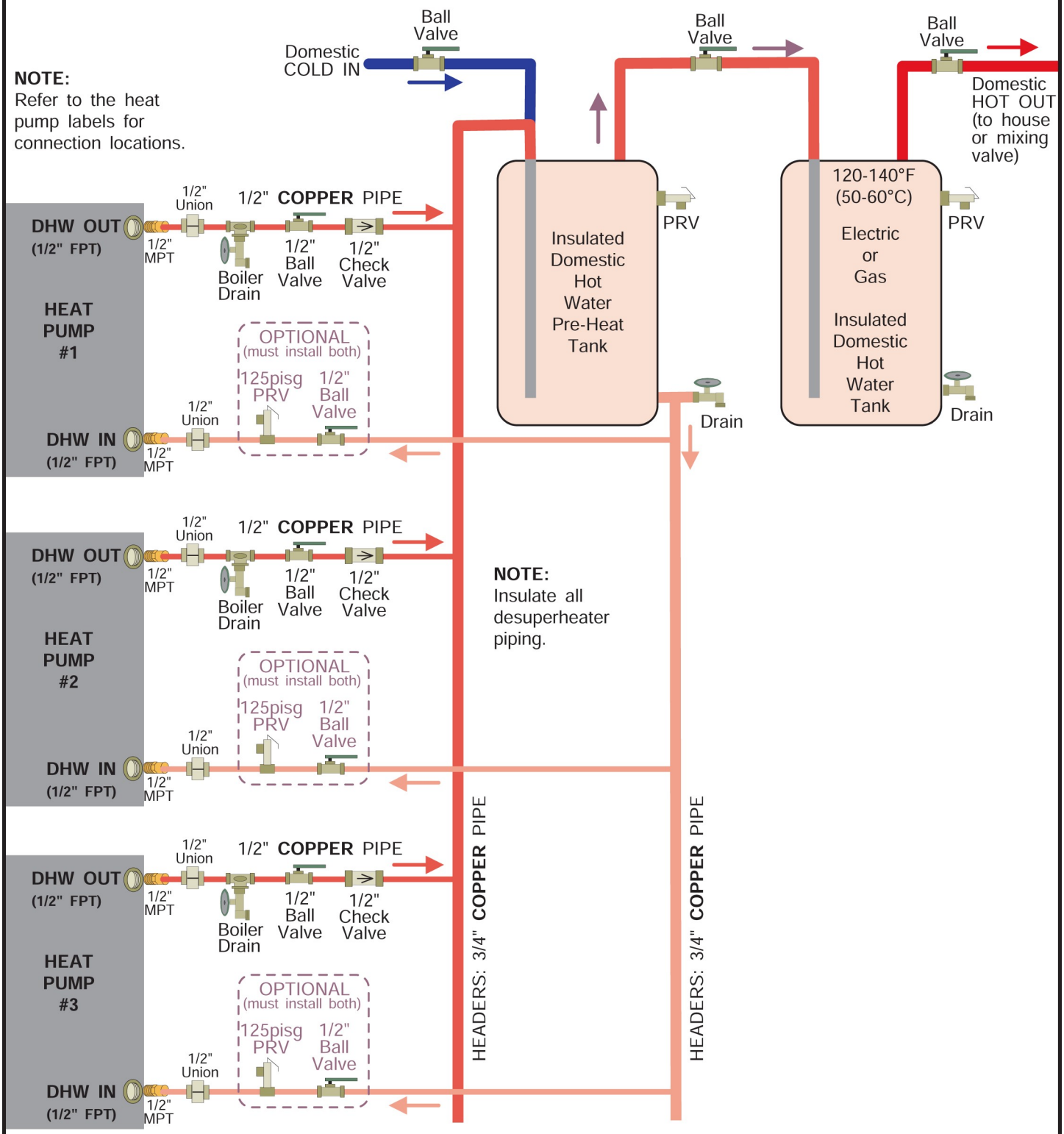
Drawing Name: Single Unit Connection to DHW Pre-Heat Tank (Brass FPT)

Size	Drawing Number	REV	SHEET
A	000970PDG	01a	1 of 1

Desuperheater Connection to DHW Pre-Heat Tank - Multiple Units



REV	ECO #	IMPL BY	APVD BY	DATE
01	Initial Release	D. RHEAULT	D. RHEAULT	24-Apr-2019

Drawn By Dan Rheault	Date	24-Apr-2019
Checked By Dan Rheault	Date	24-Apr-2019
Approved By (ENG) Dan Rheault	Date	24-Apr-2019
Approved By (MFG)	Date	
Approved By	Date	

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

Drawing Name: Multiple Unit Desuperheater Connection to DHW Pre-Heat Tank (Brass FPT)

Size	Drawing Number	REV	SHEET
A	002384PDG	01	1 of 1

Outdoor Unit Line Set

Line Set Interconnect Tubing

Once both the indoor and outdoor units have been mounted, the line set may be run between them. The line set consists of a liquid line and a vapour line.

The tubing used for this procedure must be ACR refrigeration tubing (cleaned & dehydrated). Every effort must be made to insure that the tubing does not become contaminated during installation. It is recommended that caps be placed on the open ends of tubing immediately after cuts are made and that these caps are only removed after all bends have been made and the pipe fixed in its permanent location ready to make the silver soldered joints. It is very important to keep a refrigeration system perfectly clean and dry. Removing the caps just prior to silver soldering or flaring will ensure minimum exposure to humidity in the atmosphere.

TABLE 10 - Line Set Sizing		
ATA-25/45	Vapour line O.D.	3/4”
	Liquid line O.D.	3/8”
ATA-55/65/75	Vapour line O.D.	7/8”
	Liquid line O.D.	1/2”

IMPORTANT NOTE: The line set between the indoor and outdoor units must not exceed 70 ft. (21 m) in length.

Indoor Unit Connections

The indoor unit connections for the interconnect line set are 3-way brass service valves with flare connections. After the line set is installed, the tubing can be vacuumed through the Schrader charging port on the 3-way valve, then the valve opened to let refrigerant contained in the indoor unit into the line set and outdoor unit.

The indoor unit comes pre-charged with enough refrigerant for a 20 ft. (6.1 m) line set. Longer line sets will require added charge; see next page.

Copper flare to solder adapters are included with the indoor unit, to remove the requirement to do an accurate flare in the field, especially on the larger 7/8” pipe. These are shipped along with the mounting feet for the outdoor unit and shielded 18-8 wire near the compressor in the indoor unit.

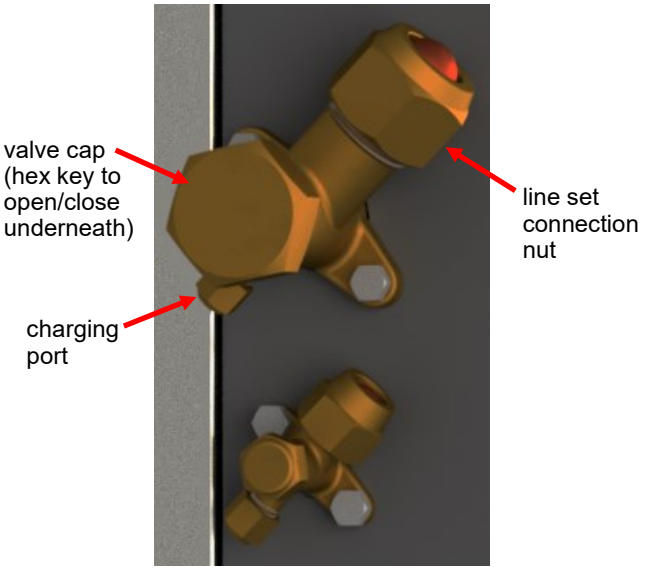


TABLE 11a - 3-way Service Valve Tooling				
Nominal Size	Line set connection nut wrench	Hex key to open/ close	Valve cap wrench	Charging port cap wrench
3/8”	22 mm *(7/8”)*	5 mm *(3/16”)*	19 mm *(3/4”)*	14 mm (9/16”)
1/2”	24 mm *(1”)*	5 mm *(3/16”)*	19 mm *(3/4”)*	14 mm (9/16”)
3/4”	32 mm *(1-3/8”)*	5 mm *(3/16”)*	30 mm *(1-1/4”)*	14 mm (9/16”)
7/8”	38 mm *(1-1/2”)*	8 mm *(5/16”)*	42 mm *(1-3/4”)*	14 mm (9/16”)

TABLE 11b - 3-way Service Valve Torques				
Nominal Size	Line set connection nut torque	Hex key torque	Valve cap torque	Charging port cap torque
3/8”	30-35 N.m *(22-26 ft.lb)*	5-7 N.m *(4-5 ft.lb)*	20-25 N.m *(15-18 ft.lb)*	10-12 N.m *(7-9 ft.lb)*
1/2”	40-45 N.m *(30-33 ft.lb)*	7-9 N.m *(5-7 ft.lb)*	25-30 N.m *(18-22 ft.lb)*	10-12 N.m *(7-9 ft.lb)*
3/4”	60-65 N.m *(44-48 ft.lb)*	11-13 N.m *(8-10 ft.lb)*	35-40 N.m *(26-29 ft.lb)*	10-12 N.m *(7-9 ft.lb)*
7/8”	110-120 N.m *(81-88 ft.lb)*	28-32 N.m *(21-24 ft.lb)*	47-53 N.m *(35-39 ft.lb)*	10-12 N.m *(7-9 ft.lb)*

Outdoor Unit Connections

The outdoor unit has capped off (soldered) pipes from the factory and is charged with 15 - 25 psig of nitrogen. Remove the side cover from the outdoor unit so that the piping is accessible. There is an illustration for a typical installation on a following page.

Oil Traps

If the line set has a vertical rise of over 20 ft (6 m), then an oil trap must be placed in the line set every 20 ft (6 m) of rise as shown in diagram.

Filter-Dryer

Note that **no field installed filter-dryer is required**, since one is included in the indoor unit.

Pipe Insulation

All line set piping between the indoor and outdoor units should be insulated with 3/8" thick closed cell pipe insulation to prevent condensation and dripping onto floors or walls during the heating season. It can be slid onto the capped tubing without having to slice it down the side for the most part. Ensure that any joints in in the line sets are accessible for leak testing.

Liquid and vapour ports and any remaining exposed tubing should be insulated with 3/8" thick closed cell pipe insulation once the silver soldering and pressure testing is complete. Ensure that all individual pieces of pipe insulation are glued to each other so there are no air gaps.

Silver Soldering Line Sets

All joints are to be silver soldered with 5% silver solder. **It is absolutely required 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.** Connect a set of refrigeration gauges to the service ports (Schrader ports) on the access valves of the indoor unit, the low side (blue hose) to the vapour line and the high side (red hose) to the liquid line. Connect the charge line (yellow hose) to a nitrogen source. Disconnect the high side (red) hose at the manifold so that nitrogen may flow freely though the line set. Adjust the nitrogen pressure through the low side (blue hose) so that it can be very lightly felt when a finger is placed on the disconnected high side (red) hose.

A wet rag may be wrapped around each of the outdoor unit ports to prevent melting the grommet when silver soldering; however this should may not be necessary for a skilled welder due to the distance from the grommet. Ensure that no water enters any of the ports or tubing.

Pressure Testing

Once all connections are complete, the system should be pressure tested to a final test pressure of **125 psig (860 kPa)** with dry nitrogen. Reconnect the high side (red) hose to the manifold and pressurize the line set. It is recommended to pressure test in stages, listening and inspecting for leaks along the way. For example, 10 psig (70 kPa) , 25 psig (170kPa), 75 psig (520kPa) and then finally 125PSIG (860kPa). Check all joints at the unit and any made in the interconnect tubing for leaks using soap suds, Spray Nine, etc. It is important not to bypass this step as vacuuming the system with a leak will be impossible and attempting to do so will introduce moisture into the system, making the vacuum process take much longer than if the leak had been found and repaired first. It is recommended that the system be left under pressure for a minimum of two hours to ensure there are no small leaks that were undetected.

Vacuuming the System

Remove the pressure from the system and connect the vacuum pump to the charge line (yellow hose) of the refrigeration manifold. Tighten all hose connections, open the valves on the manifold and start the vacuum pump.

Vacuum the system until the reading on an electronic vacuum gauge remains below 500 microns for a period of 5 minutes after the vacuum pump is shut off and the system sealed.

Charging the System

The indoor unit is pre-charged for line sets up to **20 ft** long. Once the system has been vacuumed, if extra refrigerant is required due to the length of the line set, it may be added before opening the access valves. Close off the charge valve on the refrigeration manifold set and disconnect the vacuum pump. Connect the charge (yellow) hose to the **liquid port** of a refrigerant tank and place the tank on a scale. Open the liquid valve of the refrigerant tank and then slightly loosen the charge (yellow) hose at the manifold until liquid comes out, then quickly re-tighten the hose. This will ensure that no air enters the system. Zero the scale and then add the amount of refrigerant calculated from the tables below.

Once the additional charge (if any) has been added, disconnect both hoses from the service ports of the access valves and place the caps back on them, tighten with a wrench.

Remove the caps from the access valves and open both valves with a hex key. Open the valves (counter-clockwise) until they stop turning. Replace the caps and tighten with a wrench.

The system is now ready for startup. Clean up the area, and install all access panels except the one which gives access to the electrical box. Proceed to the Startup Section of the manual before turning the power on to the unit.

TABLE 12 - Extra Charge for Model Sizes 25-45

Extra charge for line sets >20 ft (6 m)	1.1 oz per ft OR 0.10 kg per m		
Line set length (ft)	Extra Charge		
	(oz)	(lb)	(kg)
22	2	0.1	0.06
24	4	0.3	0.12
26	7	0.4	0.19
28	9	0.6	0.25
30	11	0.7	0.31
32	13	0.8	0.37
34	15	1.0	0.44
36	18	1.1	0.50
38	20	1.2	0.56
40	22	1.4	0.62
42	24	1.5	0.69
44	26	1.7	0.75
46	29	1.8	0.81
48	31	1.9	0.87
50	33	2.1	0.94
52	35	2.2	1.00
54	37	2.3	1.06
56	40	2.5	1.12
58	42	2.6	1.19
60	44	2.8	1.25
62	46	2.9	1.31
64	48	3.0	1.37
66	51	3.2	1.43
68	53	3.3	1.50
70	55	3.4	1.56

TABLE 13 - Extra Charge for Model Sizes 55-75

Extra charge for line sets >20 ft (6 m)	2.1 oz per ft OR 0.18 kg per m		
Line set length (ft)	Extra Charge		
	(oz)	(lb)	(kg)
22	4	0.3	0.12
24	8	0.5	0.24
26	13	0.8	0.36
28	17	1.1	0.48
30	21	1.3	0.60
32	25	1.6	0.71
34	29	1.8	0.83
36	34	2.1	0.95
38	38	2.4	1.07
40	42	2.6	1.19
42	46	2.9	1.31
44	50	3.2	1.43
46	55	3.4	1.55
48	59	3.7	1.67
50	63	3.9	1.79
52	67	4.2	1.91
54	71	4.5	2.02
56	76	4.7	2.14
58	80	5.0	2.26
60	84	5.3	2.38
62	88	5.5	2.50
64	92	5.8	2.62
66	97	6.0	2.74
68	101	6.3	2.86
70	105	6.6	2.98

Typical ATA/ATF to Outdoor Unit Line Set Connections

REV	ECO#	IMPL BY	APVD BY	DATE
02	000266	Dan Rheault	Dan Rheault	10-Feb-2020
01	Initial Rel.	Dan Rheault	Dan Rheault	6-Oct-2017

Drawn By	Dan Rheault	Date 6-Oct-2017
Checked By	Dan Rheault	Date 6-Oct-2017
Eng. Approved By		Date
Mfg. Approved By		Date
Approved By		Date

MARITIME GEOTHERMAL LTD.
P.O. Box 2555
170 Plantation Rd.
Petitcodiac, NB CANADA E4Z 6H4

Drawing Name: **Typical ATA/ATF to Outdoor Unit Line Set Connections**

Size	Drawing Number	Revision	Sheet
LET	002250CDG	02	1 / 1

Ductwork

Indoor Unit Blower Motor

The indoor unit is equipped with a direct drive ECM blower. The motor features a soft start function, and will maintain the programmed airflow up to the maximum external static value.

The airflow can be set in increments of 100cfm within an allowed range using the **Indoor Fan page** of the **PC App**. Airflow will be reduced with decreasing outdoor temperature, to avoid progressively cooler heated air being delivered as heat pump capacity decreases due to cold weather.

Zoning

Zoning can be done with heat pumps that have 2-stage compressors, but only to a limited extent. It is recommended that no zone be less than 1/3 the total area, to avoid problems of high airflow and noise through one zone or safety control trips due to capacity mismatch between heat pump and zones.

The airflow can be reduced by an adjustable amount between 5 and 20% (value set in **PC App**) by making a dry contact across **24VAC** and **AR** on the right side middle terminal strip of the control board, as show in **Wiring** chapter.

When only one zone of 50% or less is calling for heating or cooling, the compressor should be limited to **stage 1** operation by the zone controller by sending only a **Y1** (without Y2) control signal. Stage 1 corresponds to ~67% compressor capacity and ~80% airflow.

Refer to the **Indoor Airflow Data** in the **Model Specific Information** section for actual airflows with the various reduc-

Duct Systems - General

Ductwork layout for a heat pump will differ from traditional hot air furnace design in the number of leads and size of main trunks required. Air temperature leaving the heat pump is normally **95º-105ºF (35-40ºC)**, much cooler than that of a conventional fossil fuel furnace. To compensate for this, larger volumes of lower temperature air must be moved and consequently duct sizing must be able to accommodate the greater airflow without creating a high static pressure or high velocity at the floor diffusers.

A duct system capable of supplying the required airflow is of utmost importance. Maritime Geothermal Ltd. recommends that the external static pressure from the duct system be kept below 0.2 inches of water total. In some instances the number of floor diffusers will actually double when compared to the number that would be used for a hot air oil-fired furnace. Refer to following tables.

1. Generally allow **100 cfm** for each floor grill.
2. All leads to the grills should be 6" in diameter (28sq.in. each).
3. The main hot air trunks should be at least 75% of the cross sectional area of leads being fed at any given point.
4. Return air grills should have a minimum of the same total cross sectional area as the total of the supply grills.
5. The cross sectional area of the return trunks should equal the cross sectional area of the grills being handled at any given point along the trunk.

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.

Flexible collars should 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.

If desired, the first 5-10 feet of the main supply trunks can be insulated internally 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.

Duct Systems - Grill Layout

Most forced air heating systems in homes have the floor grills placed around the perimeter of the room. Supply grills should be placed under a window when possible to help prevent condensation on the window. Supply grill leads should be 6" in diameter (28 square inches each) to allow **100 cfm** of airflow.

In a typical new construction, there should be one supply grill for every 100 square feet of area in the room. When rooms require more than one grill, they should be placed in a manner that promotes even heat distribution, such as one at each end of the room. It is a good idea to place a damper in each grill supply or place adjustable grills so that any imbalances in the heat distribution can be corrected.

The total number of supply grills is based on the heat pump’s nominal airflow. The table shows the number of grills recommended per heat pump size.

TABLE 14 - Number of Air Grills

Model Size	# of Grills (@100 cfm)
25	8
45	12
55	15
65	19
75	21

Return grills should be mounted on the floor. At minimum they should be the same size as the supply grill, **it is highly recommended that they be 25% to 50% larger than the total supply.** They should be placed opposite the supply grills when possible to ensure distribution across the room. For rooms requiring more than one supply grill, it may be possible to use one larger return grill if it can be centrally positioned opposite of the supply grills, however it is preferred to have one return for each supply to optimize heat distribution across the room.

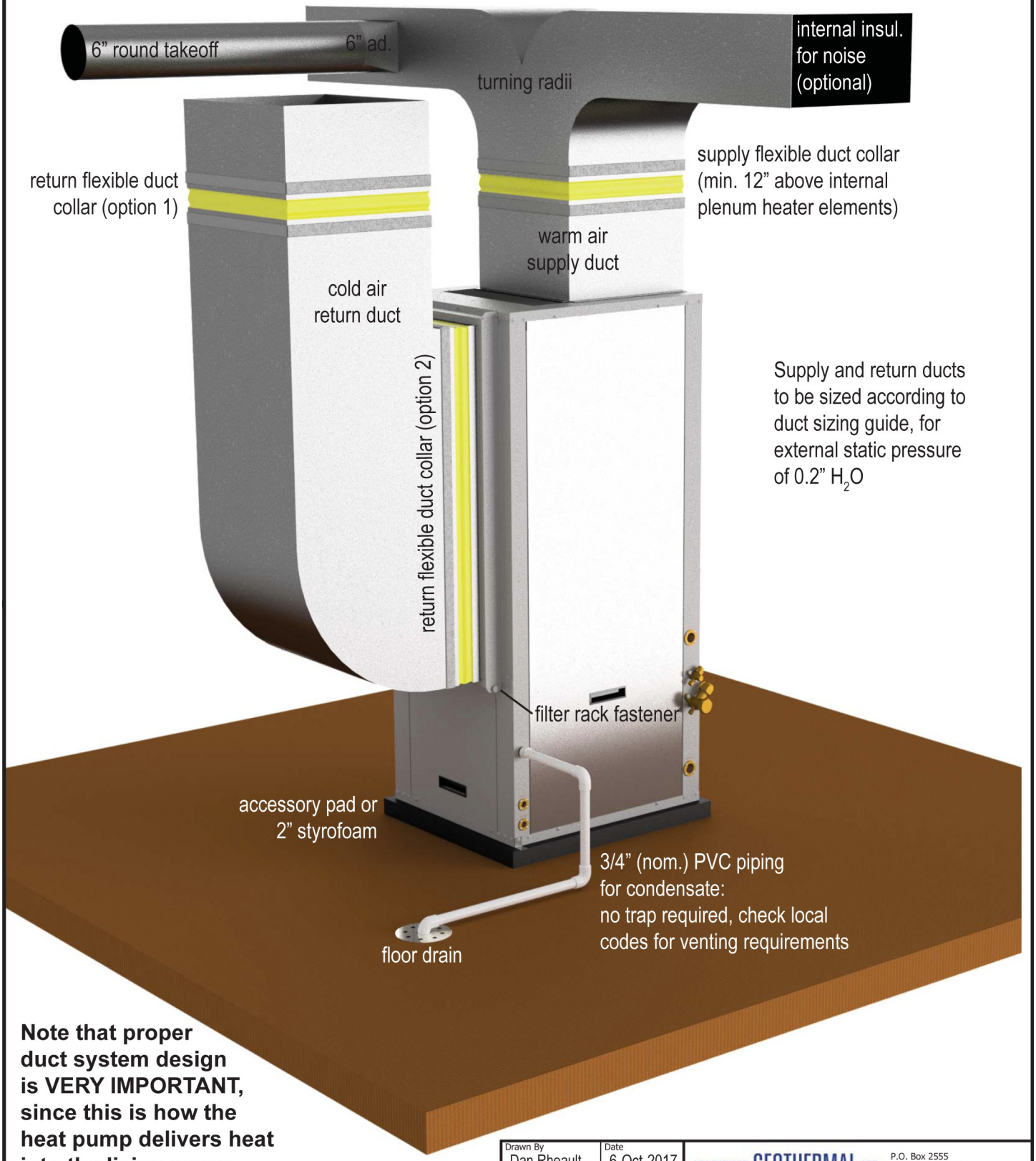
Thermostat Location

Most homes are a single ducted air zone with one thermostat. The thermostat should be centrally located within the home, typically on the main floor. It should be placed away from any supply grills, and should not be positioned directly above a return grill. Most installations have the thermostat located in a hallway, or on the inner wall of the living room. It should be noted that most homes do not have any supply ducts in the hallway. This can lead to a temperature lag at the thermostat if there is very little air movement in the hallway, causing the home to be warmer than indicated by the thermostat.

Plenum Heater

The plenum heater will be usually installed inside the heat pump, as described in the **Installation Basics** section. If the blower is installed in the side discharge position, the plenum heater will be installed in the discharge ductwork outside the unit, at least 12” away from any flexible duct collars. There is an accessory plenum heater with a wider cage profile available that is more suitable for duct installation.

Typical Duct & Condensate Connections - ATA/ATF Series



Note that proper duct system design is VERY IMPORTANT, since this is how the heat pump delivers heat into the living space.

REV	ECO#	IMPL BY	APVD BY	DATE
02	000266	Dan Rheault	Dan Rheault	10-Feb-2020
01	Initial Rel.	Dan Rheault	Dan Rheault	6-Oct-2017

Drawn By	Dan Rheault	Date	6-Oct-2017
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Eng. Approved By		Date	
Mfg. Approved By		Date	
Approved By		Date	

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P.O. Box 2555
170 Plantation Rd.
Petitcodiac, NB CANADA E4Z 6H4

Drawing Name: **Typical Duct & Condensate Connections - ATA/ATF Series**

Size	Drawing Number	Revision	Sheet
LET	002249PDG	02	1 / 1

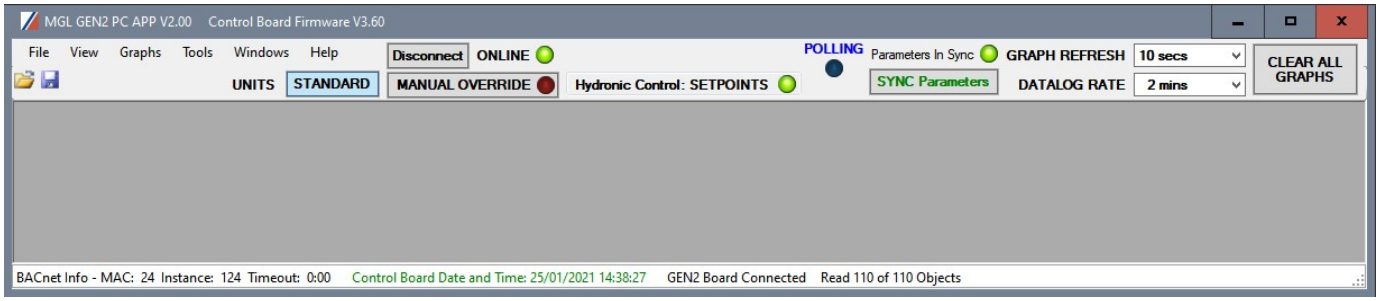
TABLE 15 - Duct Sizing Guide (external static of 0.20" H_2O)										
Airflow (cfm)	Minimum Duct Area (sq.in)	Diameter (in)	Rectangular Equivalents (in)						Return Air Diameter (in)	Airflow (L/s)
37	20	5	2.25 x 10	3 x 8	3.5 x 6	4 x 5.5	5 x 5		5	17
63	20	5	2.25 x 10	3 x 8	3.5 x 6	4 x 5.5	5 x 5		6	30
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				

PC Application (PC App)

NOTE: Before using the PC Application, refer to **Appendices B & C** for installation instructions for the PC Application and USB driver for the COM port. Both must be installed in order to run the PC App and communicate with the control board.

Connect a USB cable between the PC and the control board USB connector located at the bottom center of the board. Use the Windows Start menu to launch the PC App. You should see a screen similar to the one below. The revision of the PC APP is shown in the top left corner of the screen. Click the ***Connect*** button to begin communications with the control board.

Once connected, the menus and buttons will become accessible, the number of Objects available and Read should appear (they should be the same) and the Polling LED will begin to flash. The PC time and date will appear at the bottom left corner of the screen. Clicking on "Control Board Date and Time" will display the current control board date and time. If the date and time need to be adjusted, click on menu ***Tools—Set Date and Time***. The control board date and time will be set to that of the PC.



PC Application Menus

The following pages describe the PC APP's menus in detail. There are six menus: ***File, View, Graphs, Tools, Windows, Help***.

File Menu: This menu handles page arrangements. If one or multiple pages are open and arranged as desired for viewing, this page arrangement may be saved and re-used the next time the PC APP is used.

File-->Open: Opens a saved page arrangement.
File-->Save: Saves the current page arrangement under the current name.
File-->Save As: Save the current page arrangement under a new name.
File-->Exit: Exits the PC Application.

Windows Menu: This menu is used to arrange windows (pages), or to bring a particular window to the front.

Windows-->Cascade: Arranges windows one in front of the other each with a small right and down offset from the last.
Windows-->Tile Vertical: Arranges windows side by side, stretching them fully from top to bottom.
Windows-->Tile Horizontal: Arranges windows up and down, stretching them fully from left to right
Windows-->Close All: Closes all open windows.

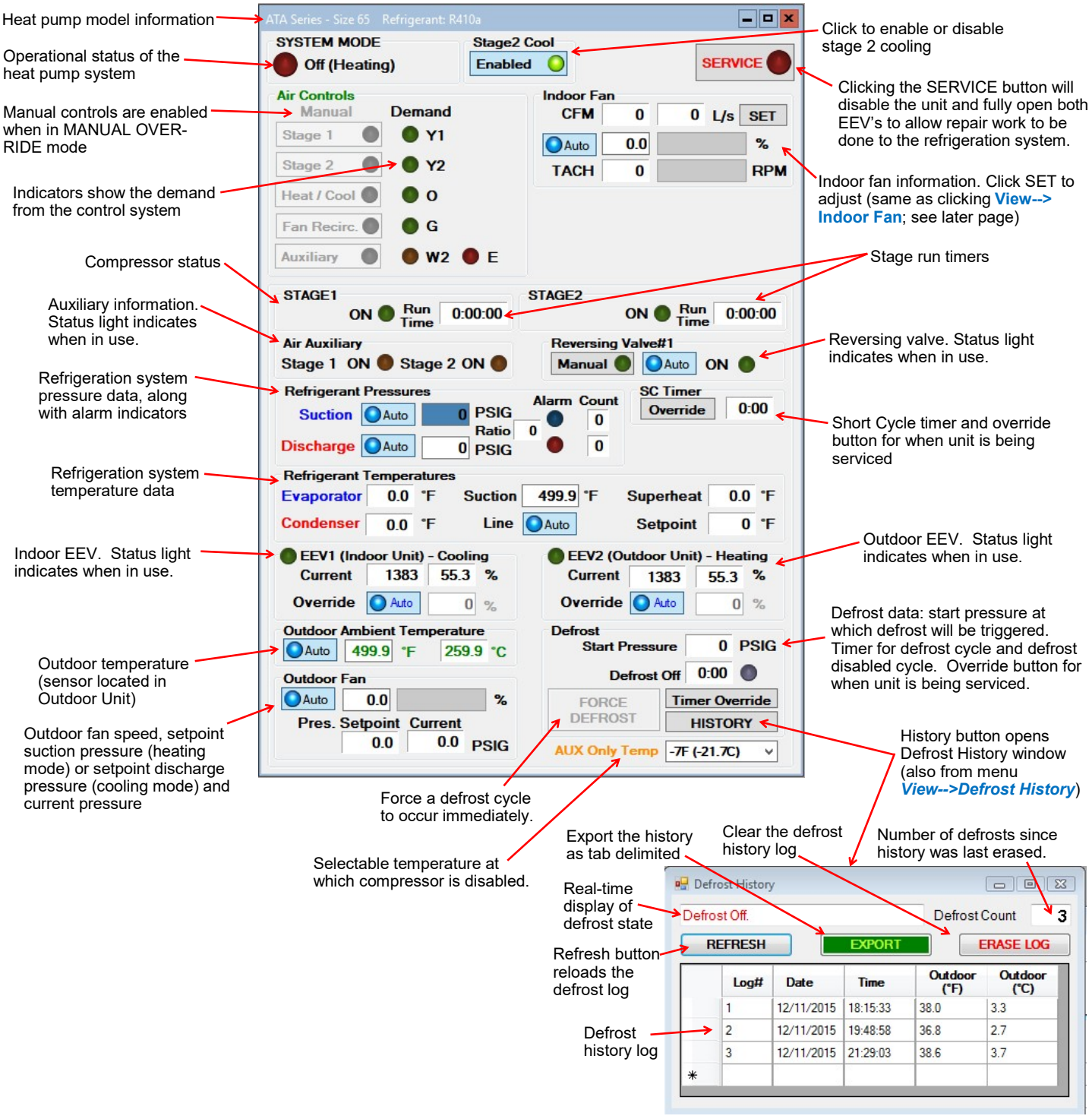
Help Menu: This shows information about the PC Application.

Help-->About: Displays the window shown to the right.

View Menu:

This menu handles all of the operational viewing screens. Clicking on the View submenus will open the page in the PC APP's frame. The next few pages of the manual show screenshots of each of the pages along with some descriptions of what is on each page.

View-->Control Panel: The main control panel window will open, shown below.



View-->Alarms, Limits and Faults

The alarms page has four tabs:

1. **ALARMS** - Current alarm status, alarm count, high and low refrigeration alarm cutout values, and short cycle timer.
2. **ALARMS LIST** - List of alarms that have occurred since the PC APP has been operating (this will be lost when the PC is disconnected from the control board.)
3. **LIMITS** - Limits in effect which prevent compressor operation but that do not cause an alarm.
4. **FAULTS** - List of board hardware faults.

View-->Alarms, Limits and Faults (ALARMS Tab):

NOTE: Greyed out Alarms in the PC APP are not applicable to the system setup and are not monitored by the control board.
NOTE: Refer to Alarms and Faults screenshot below to see which alarms have a count.

Alarms without a count: These alarms only occur one time at which point they immediately create a **Permanent Alarm**.

Alarms with a count: When an alarm occurs the compressor will stop, the alarm count will increase and the ***Short Cycle Timer*** will start. When the ***SC Timer*** expires the compressor will re-start. If no further alarms occur within ***Count Reduce Time***, the alarm count will be reduced by 1. If another alarm occurs within ***Count Reduce Time*** (see **Configuration Page**) the count will increase by 1. If alarms continue to occur, when the alarm count reaches the ***Maximum Count*** value a ***Permanent Alarm*** will occur.

Master Alarm: This alarm occurs when any permanent alarm occurs. It is used to simply indicate that there is an alarm.

Permanent Alarm: The compressor will be locked out until the ***Permanent Alarm*** is manually reset either by cycling the power or clicking on the ***RESET*** button

Low Pressure: A low pressure alarm occurs when the suction pressure drops to or below the ***Low Pressure Cutout*** value. The low pressure is checked just before a compressor start; if it is OK the compressor will start, otherwise an alarm will occur. When the compressor starts, low pressure alarm will be ignored for the number of seconds that ***Low Pressure Ignore*** is set to, after which the low pressure alarm will be re-enabled. This allows a dip in suction pressure below the cutout point during startup without causing a nuisance alarm.

High Pressure: A high pressure alarm occurs when the discharge pressure rises to or above the ***High Pressure Cutout*** Value.

Comp. Not Pumping: Discharge pressure is less than 30 psi higher than suction pressure after 1 minute run time. It indicates leaking reversing valve, manual high pressure control trip, bad contactor, or defective compressor.

Low Charge: This alarm occurs if the EEV has been at >99% for 20 minutes within first hour of a cycle.

LOC (Loss of Charge): This alarm occurs if both the low pressure and high pressure sensors are below 30 psig (207kPa).

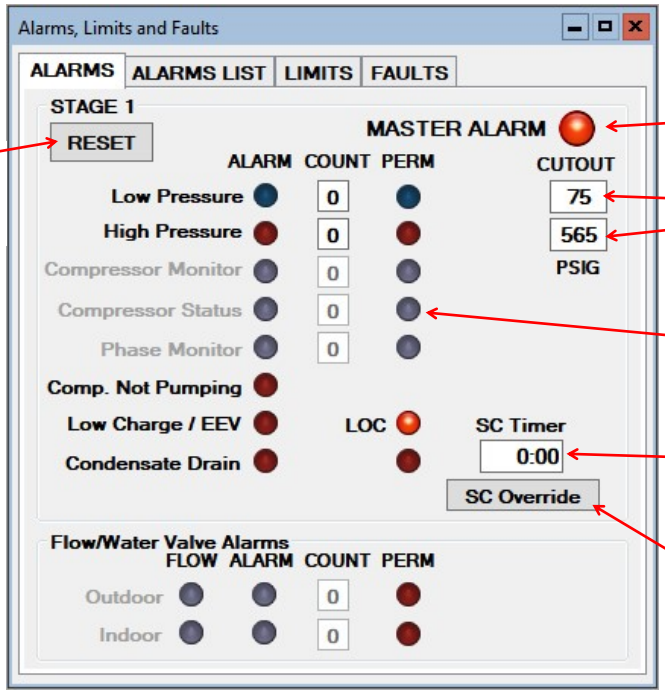
Condensate Drain: This alarm occurs if fluid level in the condensate tray rises to the level of the sensor (if equipped).

Multiple Defrosts: This alarm occurs if a second defrost occurs immediately after the defrost disabled timer expires from a previous defrost cycle. It indicates abnormally low suction pressure.

Go the Alarms Troubleshooting section of the Troubleshooting section of the manual to address alarm issues.

This button will erase all alarms and alarm counters, including a permanent alarm.

WARNING: Repeated resets can freeze and rupture heat exchangers, ruining the heat pump and voiding the warranty. The source of the alarm should be determined before resetting the unit if possible or during operation after a reset.



Master Alarm occurs when any alarm occurs.

Low Pressure cut out

High Pressure cut out

Greyed out alarms are not applicable to the system.

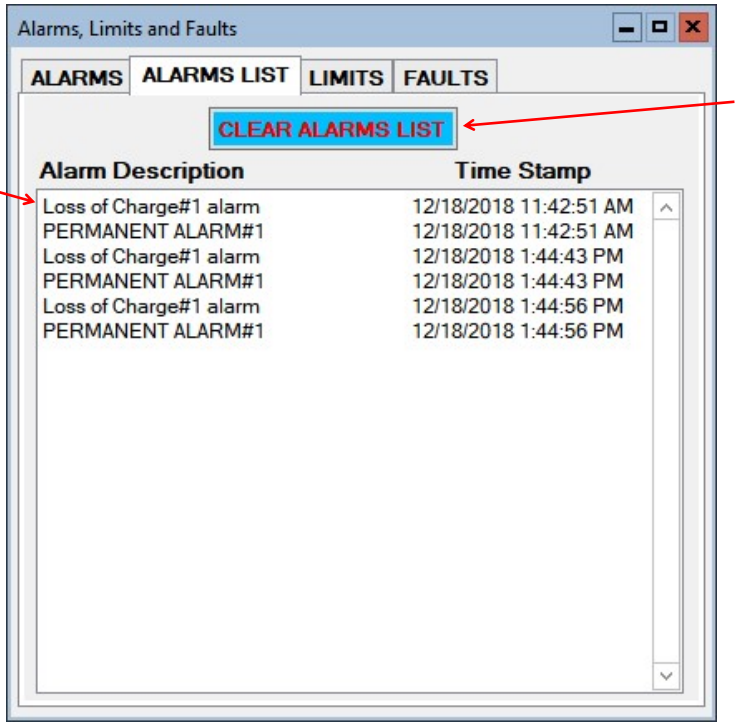
Short Cycle Timer counts down time until the next compressor start is allowed.

This button will reduce the short cycle timer value to 10 seconds.

View-->Alarms, Limits and Faults (ALARMS LIST Tab):

This tab show a history of alarms that have occurred since the PC APP was connected to the control board. This list will be lost when the PC APP is disconnected.

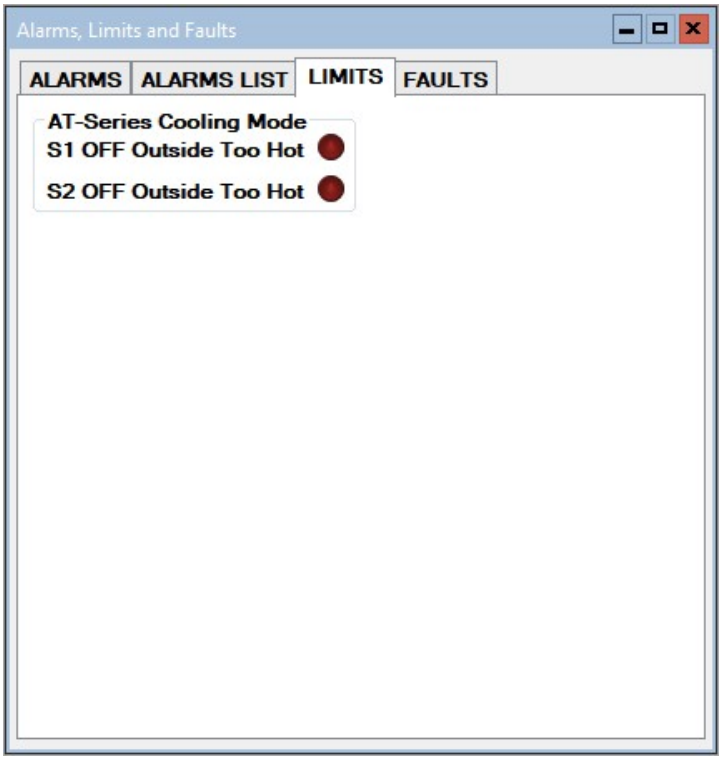
Each alarm that occurs while the PC APP is connected to the control board will appear here. The alarm type and a time stamp will be shown. The alarms list will be erased when the PC APP is disconnected from the control board.



This button will erase the alarm events in the Alarm List.

View-->Alarms, Limits and Faults (LIMITS Tab):

This tab shows temperatures that are out of limits but have not caused an alarm. With ATA series, these are only outdoor air temperatures.



View-->Alarms, Limits and Faults (FAULTS tab):

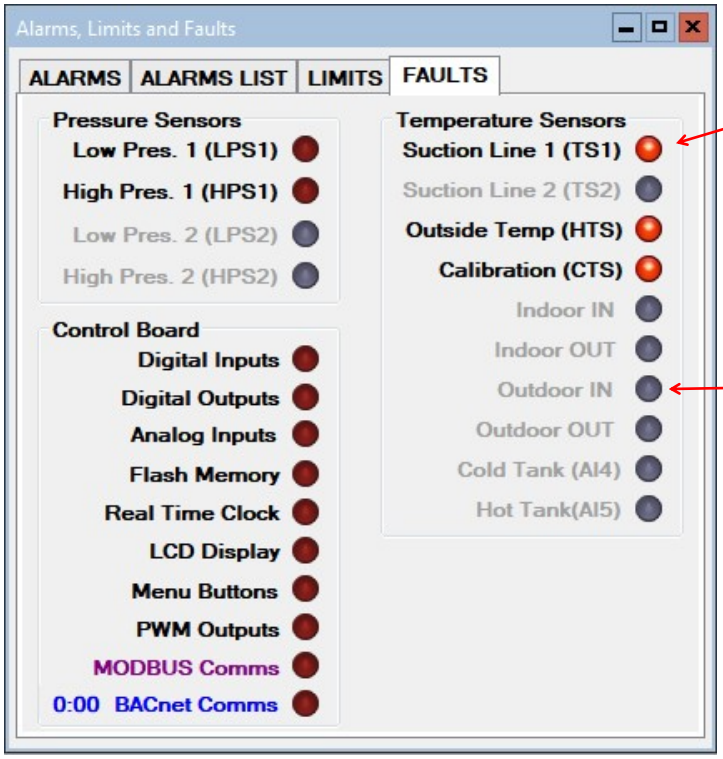
This tab shows hardware faults that could occur. If one of these faults occurs there may be a problem with the control board hardware, with LCD Display and buttons, or with a sensor.

If a fault occurs, some things to try:

- Turn the power to the heat pump off for 20 seconds and then back on again.
- Use the menu item ***Tools-->Reset to Factory Defaults***. If this clears the fault then the system configuration will have to be set up again.
- For LCD Display or Menu Button faults, turn off the power, disconnect and reconnect the cable between the LCD interface board and the control board, then turn the power back on again.

If the fault persists then there is most likely a hardware problem, and the sensor, control board, or LCD interface board will need to be replaced.

IMPORTANT NOTE: If the Indoor OUT (I_OUT) probe is faulty or disconnected, neither hydronic heating nor the auxiliary will operate if using Setpoint Control. They will continue to operate under Signals or BACnet control.

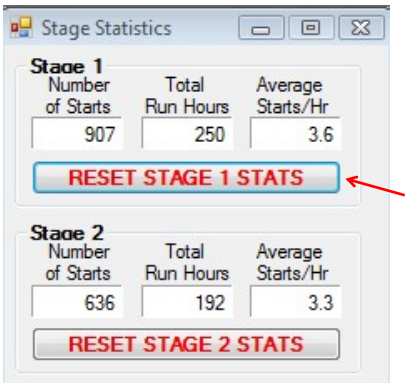


View-->Defrost History:

Same as clicking on HISTORY button in **Control Panel** window (see previous page).

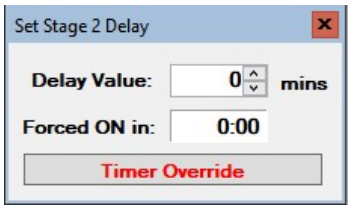
View-->Stage Stats:

The compressor information: number of starts, run hours and starts per hour.



View-->Set Stage 2 Delay:

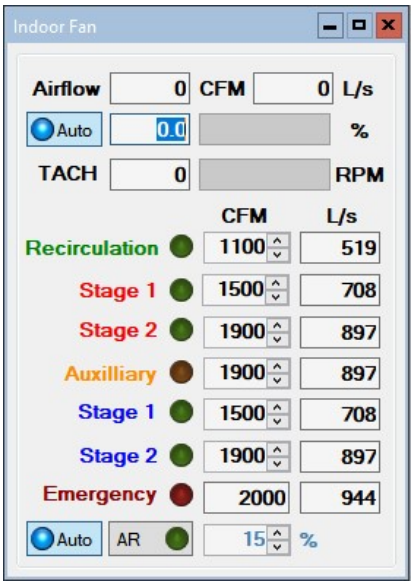
Sets the delay before stage 2 is engaged on a stage 1 demand. **Set to "0" for no stage 2 engaged on a stage-1-only demand from thermostat.**



View-->Indoor Fan

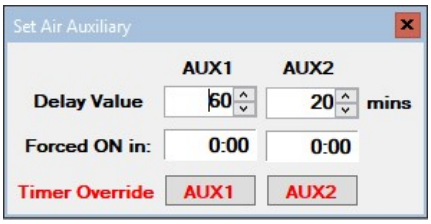
Shows the settings screen for the indoor fan/blower. Airflow may be adjusted up or down by the user within the allowed range. See **Indoor Airflow Data** section in the **Model Specific Information** chapter for airflow ranges.

NOTE: This screen may also be accessed from the SET button of the Indoor Fan section of the Control Panel screen.



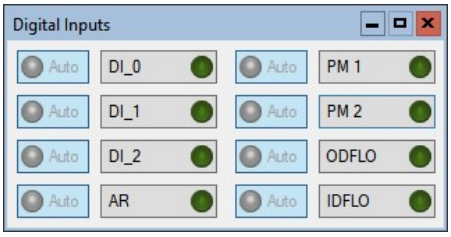
View-->Set Air Auxiliary Delays

Sets the delay before auxiliary air heat (plenum heater) is engaged on a stage 1 or stage 2 demand.
Set to "0" for no auxiliary heat engaged on a compressor-only demand from thermostat.



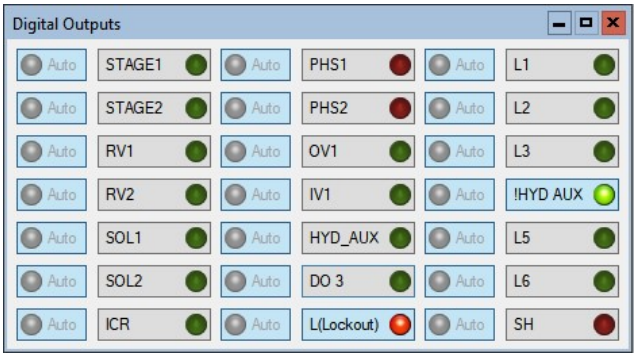
View-->Digital Inputs

Shows the digital inputs and their individual status (ON/OFF). They may be individually controlled when in Manual Override Mode in order to facilitate troubleshooting.



View-->Digital Outputs

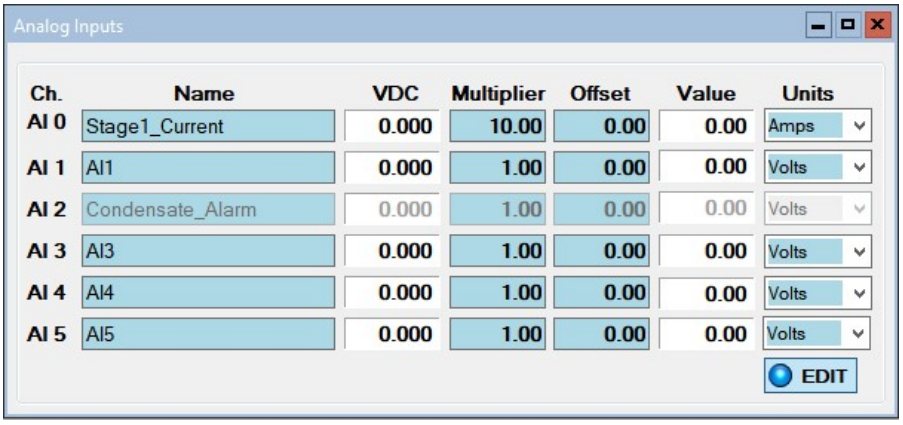
Shows the digital outputs and their individual status (ON/OFF). They may be individually controlled when in Manual Override Mode in order to facilitate troubleshooting.
.



View-->Analog Inputs

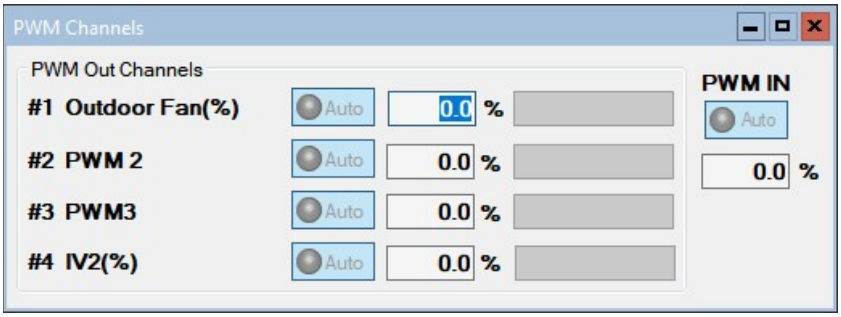
Shows the Analog inputs and their individual settings and values.

Click on the ***EDIT*** button to modify the blue boxes (button will now say ***SAVE***). For each channel a name may be selected (up to 16 characters), and the multiplier and Offset values may be set to accommodate the connected sensor scaling. Signals may be 4-20mA (channel jumper on board ON) or 0-10VDC (channel jumper on board OFF). A variety of units are also available for selection of common measurement types. Click on ***SAVE*** to save the changes. Values are kept even when power is removed from the unit.



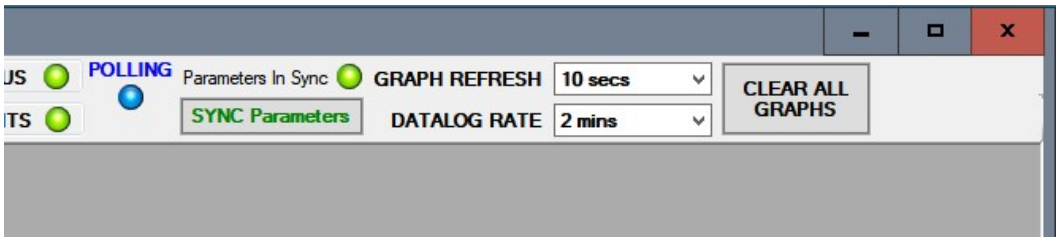
View-->PWM Channels

Shows the PWM channels and their individual status (0-100%). They may be individually controlled when in Manual Override Mode in order to facilitate troubleshooting.

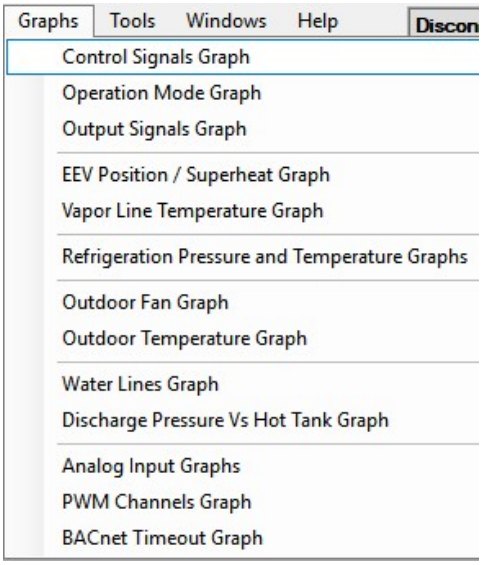


Graphs Menu:

This menu is a list of the available graphs. Graphs are real-time and show a time stamp of when the recording started as well as a current time which will show up if the graph is screen captured. Each graph has a CLEAR button which will erase the stored data and restart the graph. There is also a master CLEAR ALL GRAPHS button at the top right of the PC APP; this will clear all open graphs and re-start them all simultaneously to keep them in sync with each other. The refresh rate for the graphs is also located at the top right of the PC APP.



TIP: To screen print a graph and save it as a picture, hold down the Windows key and press Print Screen on the key-board. The image on the screen will be saved to the folder C:\Users\Username\Pictures\Screenshots.



ON/OFF status of the system control signals (demands)

ON/OFF status of heating and cooling modes

ON/OFF status of digital outputs

EEV position and resulting superheat

Suction temperature

Suction and discharge pressures, evaporating and condensing temperatures

Suction (heating) or discharge (cooling/defrost) pressure vs. outdoor fan speed

Suction (heating) or discharge (cooling/defrost) pressure vs. outdoor temperature

N/A for ATA series

N/A for ATA series

All analog input channels (0-10VDC or 4-20mA).

All PWM / 0-10VDC output channels and one PWM / 0-10VDC input channel.

For troubleshooting synchronization with 3rd party BACnet controllers.

An example of a typical graph screen. Items that are checked will be plotted, unchecked items will not. The graph screens show the time the graph started as well as the current time to time stamp the graph when screen printed.

Graph Name

CLEAR button erases all graph data

Check boxes to select which items are graphed

Current values

Primary Y axis on the left, secondary Y axis on the right.

X axis = Number of samples.

Elapsed time = Number of Samples **x** Refresh Rate.

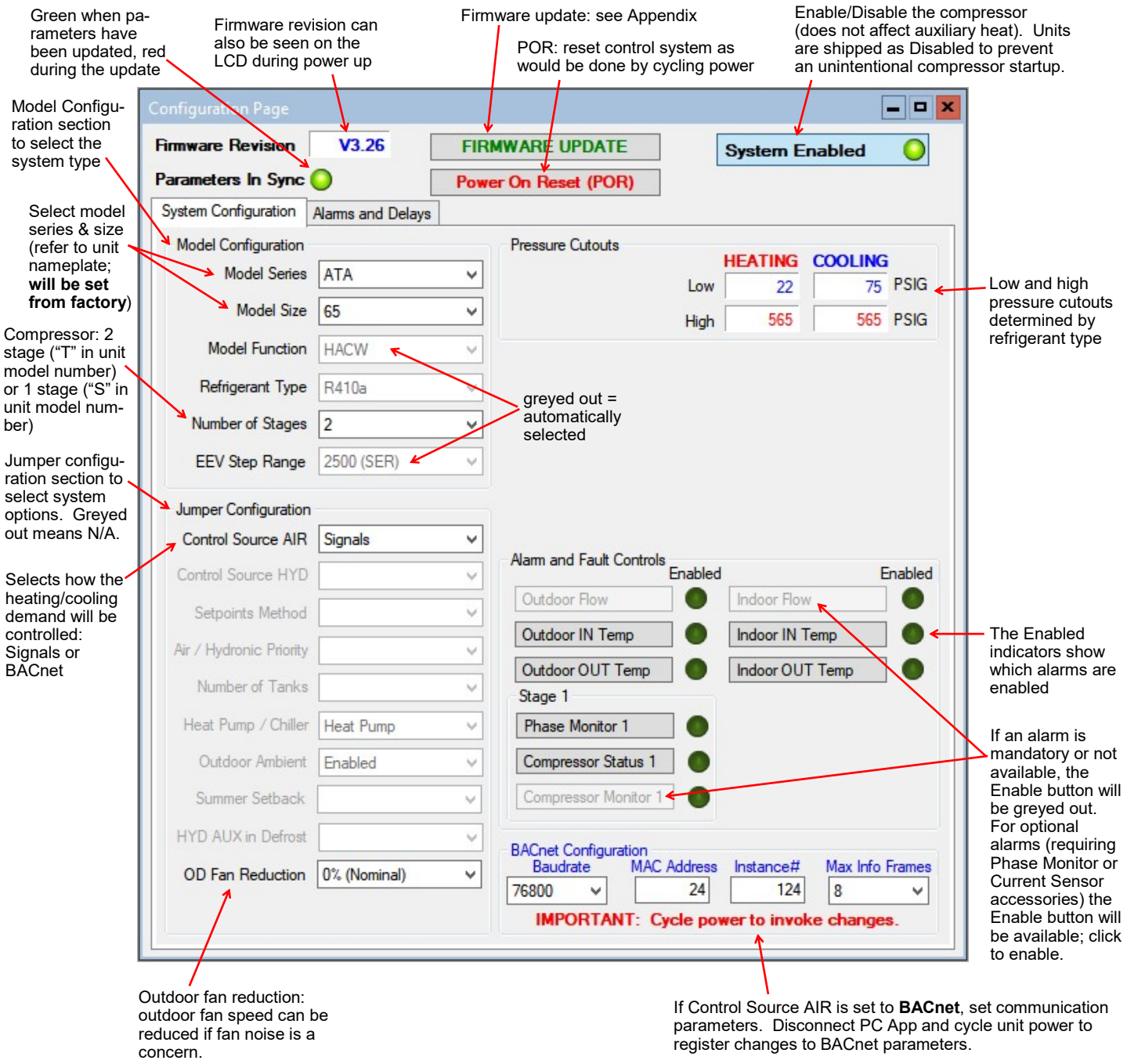
e.g. 20 samples **x** 1 second refresh = elapsed time of 20 seconds.

Tools Menu:

This is where various tools for system setup and monitoring are located.

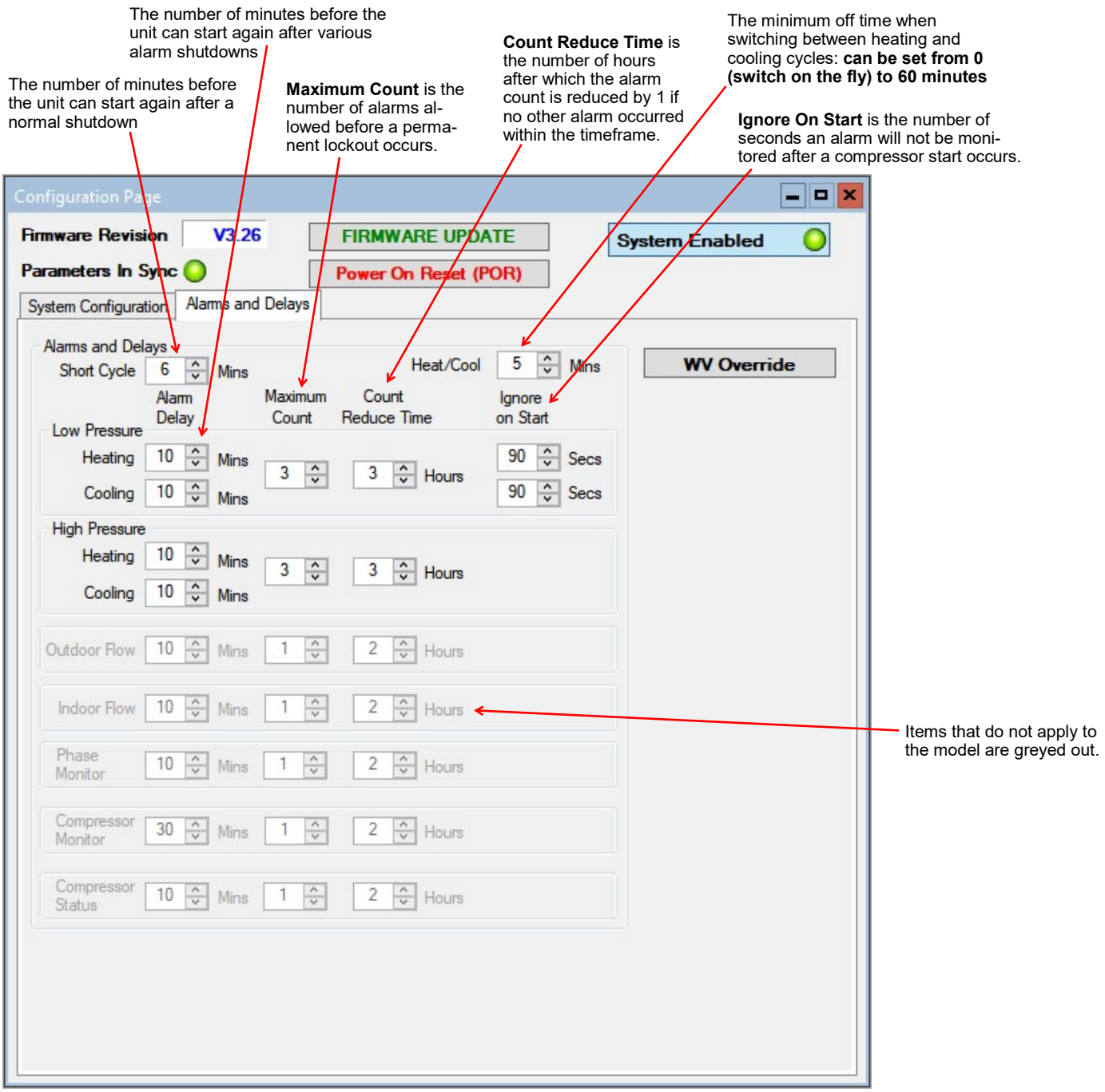
Tools-->Configuration (System Configuration tab):

This is where the system setup is done. ***Settings should only be changed by a person who has a good understanding of system operation***. Improper settings could cause the system to operate poorly or not at all.



Tools-->Configuration (Alarms and Delays tab):

Click on the UP/DOWN arrows to change the value, noting that values have both a low and high limit.

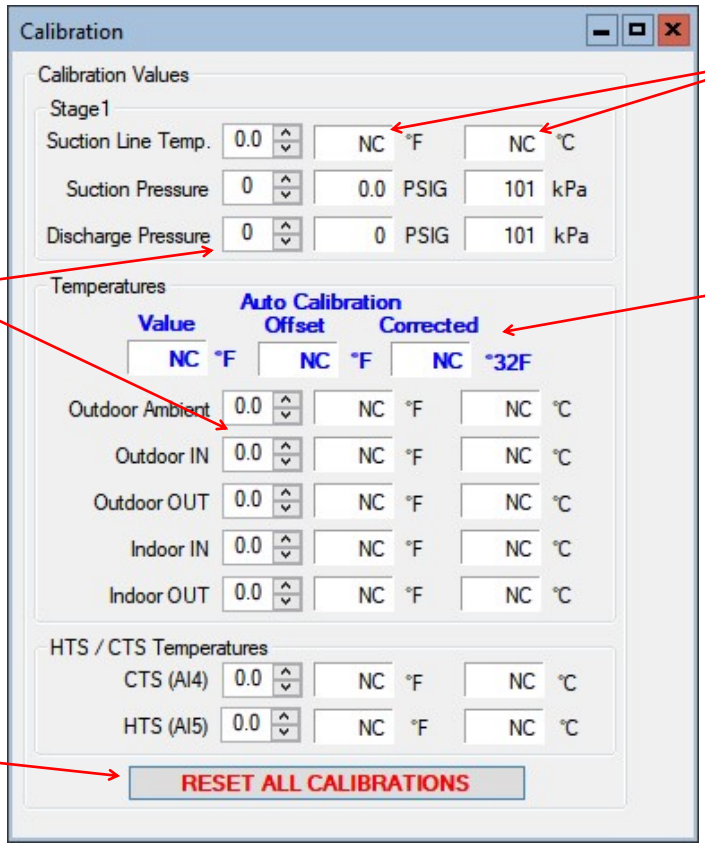


Tools-->Calibration:

Generally there is no need for calibration.

The suction and discharge pressures may be calibrated in increments of 1 psi if there is a discrepancy in the readings when compared to a known good reference.

Temperature sensors may be adjusted in increments of 0.1°F. There is an **AUTO CALIBRATION** routine in the program that continually calibrates the temperatures sensors against an on board reference resistor by applying an offset to the temperature sensors. Calibration adjustments made here are in addition to the Auto Calibration routine.



Current values in standard and metric.

Calibration adjustments

Temperature Auto Calibration information. The offset is applied to all temperature sensors. Calibration adjustments made to each sensor are in addition to the Auto Calibration values.

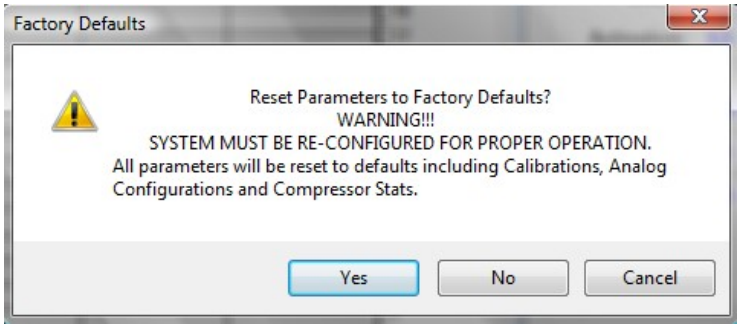
Click on the RESET ALL CALIBRATIONS button to clear all calibration data. A popup window will appear for confirmation.

Tools-->Reset to Factory Defaults:

This will reset all parameters to default values.

THE SYSTEM MUST BE RECONFIGURED AFTER A RESET IS PERFORMED.

A reset will default the system to a two stage ATW Series Size 65 with Signals as the control source. Calibrations, alarm delays, analog configurations, compressor statistics, and Setpoint Control values will be returned to defaults as well.



Tools-->Set Date and Time:

This will synchronize the date and time of the control board with the computer's date and time, and will be necessary for new units or units that have been powered off for several days or more.

The date and time of both the computer and the control board are shown in the status bar at the bottom of the PC App.

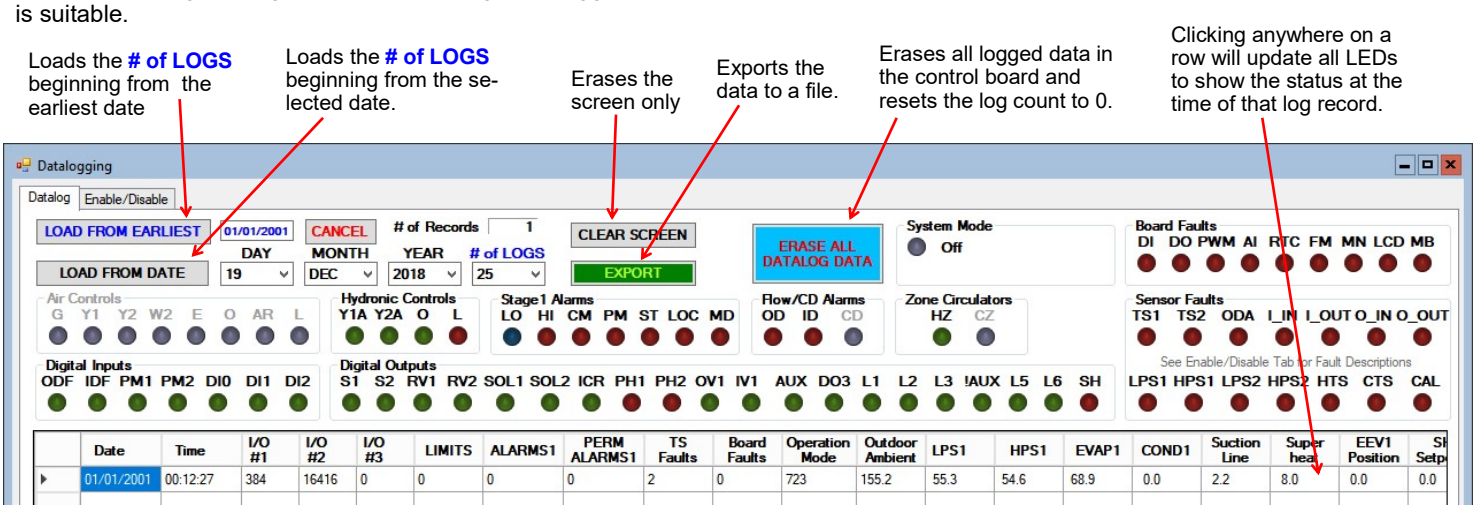
Tools-->Datalogging (Datalog tab):

A log will be automatically recorded at the following rates:

- SYSTEM DISABLED: every 10 minutes
- SYSTEM ENABLED: logging frequency set via the dropdown box at the top right of the PC App main window
- ALARM: logging frequency automatically set to 10 seconds, for 2 hours
- PERMANENT ALARM: every 10 minutes

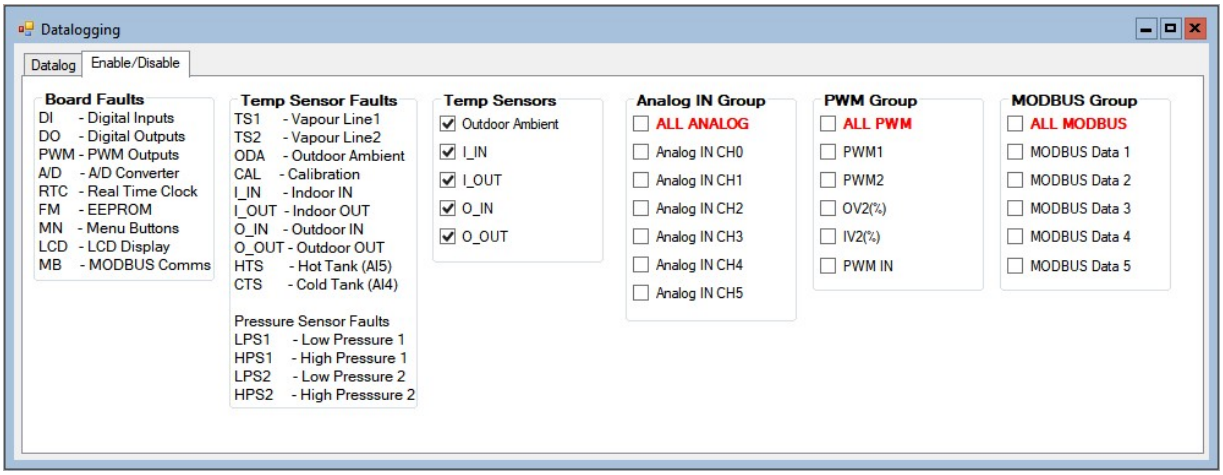
The maximum number of datalog records is 32,224, which will take 45 days to fill up at the default recording rate of 2 minutes.

Note that loading datalogs is time-consuming. It is suggested to leave the ***# of LOGS*** at **25** until it is shown that the start date selected is suitable.



Tools-->Datalogging (Enable/Disable tab):

Click on the checkboxes to customize which columns are shown/hidden in the datalog table.

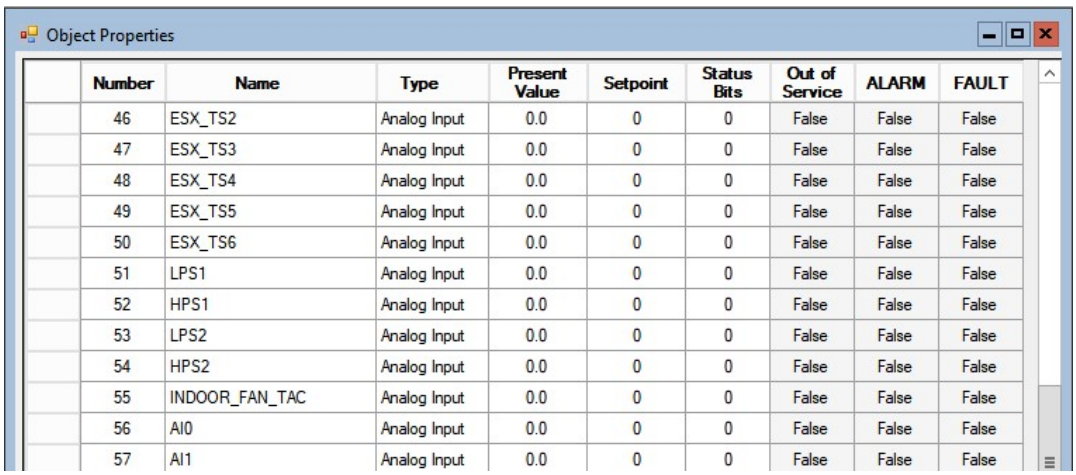


Tools-->MODBUS:

For future use.

Tools-->Objects:

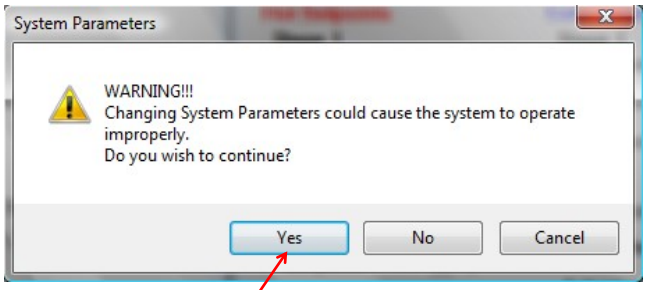
This is a window to display the runtime data, which is not stored when the power is turned off. No changes are possible.

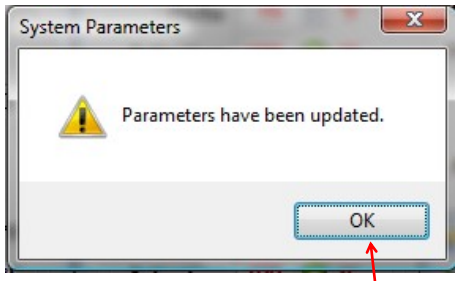


Tools-->Parameters:

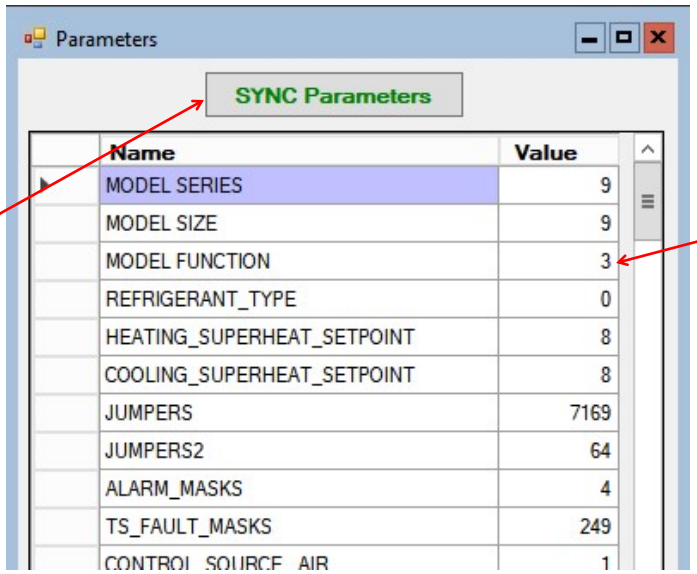
WARNING! The Parameters page is for advanced use only.
Changing parameter values can cause the system to stop functioning properly.

The parameters page shows all configurable memory spaces with their name and current value and allows them to be edited directly. To change a parameter value type in the new value and press ENTER.





Clicking on menu item ***Tools-->Parameters*** will display this warning. Click on **YES** to open the parameters page.

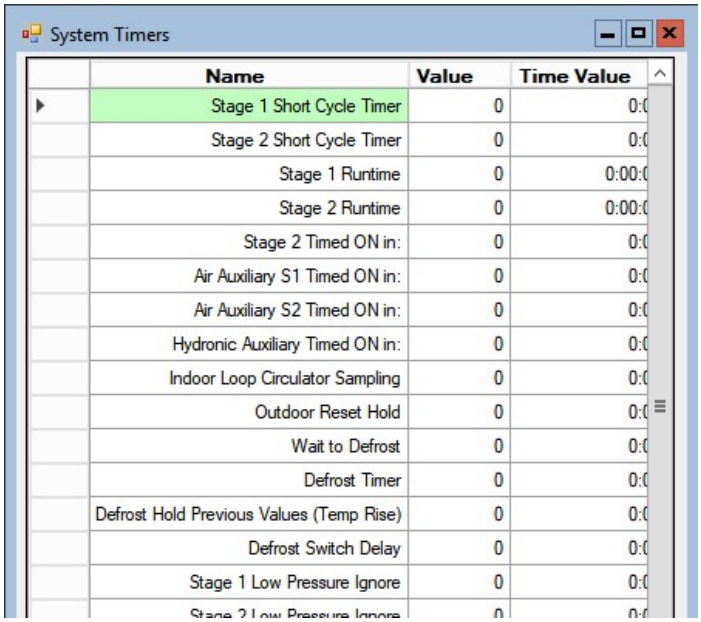


Click this button to reload the table with the values from the control board memory.

Type in the new value and press **ENTER**, the confirmation popup will appear, click on **OK**.

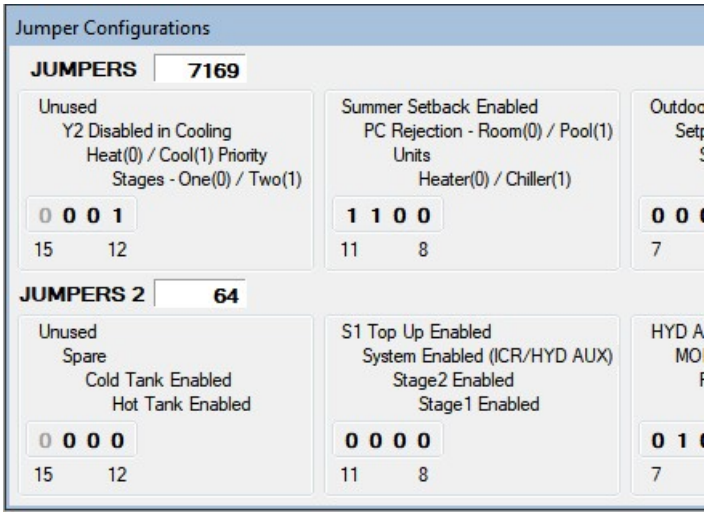
Tools-->SYSTEM TIMERS:

This page shows all internal timers by name along with their current values.



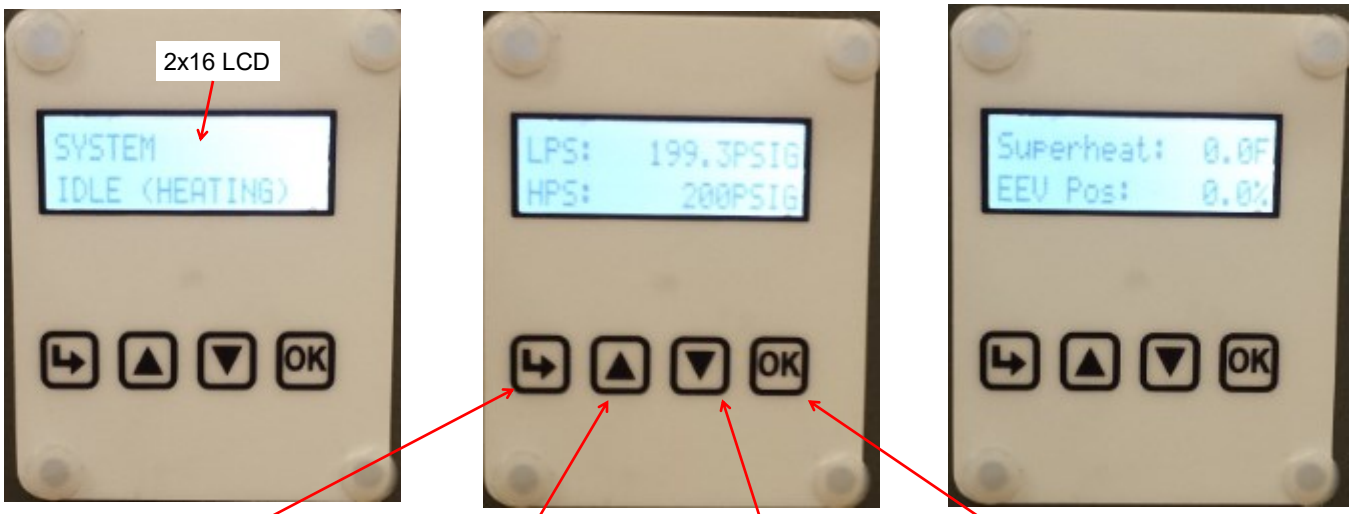
Tools-->Jumpers:

This page shows internal jumper configurations, for developers.



LCD Interface & Menus

These are examples of the unit status and operating data displayed when at the message display level (top level). Pressing ENTER will enter into the menu levels beginning with the Main Menu.



ENTER button:
Use this to push down to the next menu level. Also saves value if at parameter menu level.

UP button:
Use this to scroll up through the items available at a menu level.

DOWN button:
Use this to scroll down through the items available at a menu level.

OK/EXIT button:
Use this to come back up one menu level. Also saves value if at parameter menu level.

Main Menu: This table shows what is displayed based on each press of the ENTER button starting at the Main Menu level.

ENTER (From Main)	ENTER (First Press)	ENTER (Second Press)	ENTER (Third Press)	Description
System EN/DIS	***— Enable System?***	***— Disable***		Disable compressor, auxiliary and ICR.
		— Enable		Enable compressor, auxiliary and ICR.
Service Mode	***— Service Mode?***	***— No***		Do not enter Service Mode.
		— Yes		Enter into Service Mode.
EEV Control	***— EEV1 (Local)***	***— Auto/Manual***	***— Auto***	Puts EEV in Auto mode
			— Manual	Puts EEV in Manual mode
		— Manual Position	***— EEV Position (%)***	Sets EEV to manual position
	— EEV2 (Remote)	***— Auto/Manual***	***— Auto***	Puts EEV in Auto mode
			— Manual	Puts EEV in Manual mode
		— Manual Position	***— EEV Position (%)***	Sets EEV to manual position
Configuration	***— Control AIR***	***— BACnet***		BACnet control—see BACnet section
		— Signals		Hardwired Signal control
	— OD Fan Reduction	***— Reduction (%)***		Outdoor fan speed reduction in %.
	— Time Delays	***— Short Cycle***	***— Delay (min)***	Short-cycle timer delay in minutes
		— Heat/Cool	***— Delay (min)***	Heat / Cool timer delay in minutes
	— Units	***— Standard***		Standard units
		— Metric		Metric units
	— Set Time	***— Hours***	***— Hours value***	Set the system hours.
		— Minutes	***— Minutes value***	Set the system minutes.
	— Set Date	***— Day***	***— Day value***	Set the system day.
		— Month	***— Month value***	Set the system month.
		— Year	***— Year value***	Set the system year.
Calibration	***— Suction 1***	***— calibration adj.***		Calibration in 1PSI intervals.
	— Discharge 1	***— calibration adj.***		Calibration in 1PSI intervals.
	— Vapour Line 1	***— calibration adj.***		Calibration in 0.1°F intervals
	— Outdoor Ambient	***— calibration adj.***		Calibration in 0.1°F intervals

NOTE: Calibration is generally not required. All temperature sensors have an Auto Calibration feature.

BACnet Interface

The BACnet interface is an **MS/TP** connection via RS-485 twisted pair. BACnet **IP** is not available.
Recommended wire: 22-24 AWG single twisted pair, 100-120 Ohms impedance, 17pF/ft or lower capacitance, with braided or aluminum foil shield, such as Belden 9841 or 89841.

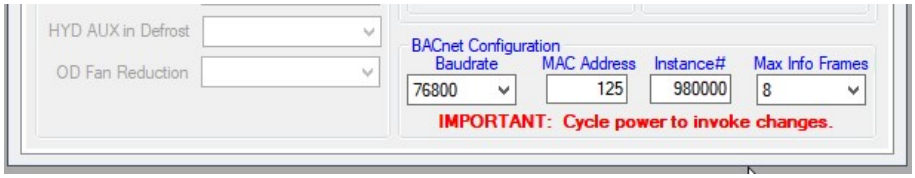
The connector on the control board is a three wire removable screw connector. The signals are as follows:
A: Communications line (+) (right pin)
B: Communications line (-) (middle pin)
C: Ground connection (left pin)

If connecting multiple units to one RS-485 connection point, connect the signal cable from the master building controller to the first unit. Connect the second unit to the first unit (in same connector), connect the third unit to the second unit, and so on until all units are connected (daisy-chain). Remove the TERM jumper (located just above the BACnet connector on control board) from all units except the last one. The shield ground should be connected only to the GND pin of the unit for single unit installations. For multiple units, the shield ground should only be connected to the GND pin of the last unit. The shield grounds for intermediate units should be connected together. The shield ground should be left unconnected at the building controller end for all cases.

Vendor: Maritime Geothermal Ltd.
Vendor ID: 260
Model Name: MGT GEN2 Control Board

The following parameters can be set via the PC App's *Configuration* Window:

1) **Baud rate**
   9600, 19200, 38400, or 76800
2) **MAC address**
   Maximum value is 125.
3) **Instance number**
   Maximum value is 4194303.



The BACnet parameter **Max_Master** has a fixed value of **127** in this device.

BACnet data is available regardless of the selected control method. In order to control the unit via the BACnet interface, set **Control Source** to ***BACnet*** either by using the PC App's *Configuration* window or the LCD menus.

TABLE 16 - BACnet OBJECTS - CONTROL SIGNALS (READ/WRITE)

Name	Data Type	ID	Property	Description
SYSTEM_O	Binary Value	BV2	Present Value	Switch to cooling mode. Inactive=HEATING, Active=COOLING
SYSTEM_Y1	Binary Value	BV3	Present Value	Demand for air heating or cooling (active is on)
SYSTEM_Y2	Binary Value	BV4	Present Value	Demand for stage 2 air heating or cooling (active is on)
SYSTEM_W2	Binary Value	BV5	Present Value	Demand for air auxiliary heat / plenum heater (active is on)
SYSTEM_G	Binary Value	BV6	Present Value	Demand for fan recirculation (active is on)
SYSTEM_AR	Binary Value	BV7	Present Value	Demand for airflow reduction (active is on)
BACnet_Units	Binary Value	BV9	Present Value	Select the units to use for the BACnet objects

TABLE 17 - BACnet OBJECTS - OPERATION MODE Description (Read Only)

Name	Data Type	ID	Present Value	Description
Operation Mode	Analog Value	**AV5**	0	Air heating
			1	Air cooling
			9	Air heating off
			10	Air cooling off
Note: Object is type Analog Value but value will always be an integer value.				

TABLE 18 - BACnet OBJECTS - LIMITS Description (Read Only)

Name	ID	BIT #	Decimal Value*	Bit Description
Limits (Present Value)	**AV6**	12	4,096	Stage 1 disabled - Outdoor Ambient too hot
		13	8,192	Stage 2 disabled - Outdoor Ambient too hot
Note: Limits object is type Analog Value but value is bit coded and may be decoded as such (integer value). Note * : Value is for a single alarm and reference only.				

Note: object names are subject to change without prior notice.

TABLE 19 - BACnet OBJECTS - DATA (Read Only)					
	Name	**ID**	**Property**	**Units**	**Description**
Type - Analog Input	AI0 (Comp1_Current)	AI0	Present Value	Amps	Compressor current draw (AI0) - requires accessory
	AI1 (Comp2_Current)	AI1	Present Value	User	User defined (0-5VDC or 4-20mA)
	AI2	AI2	Present Value	User	User defined (0-5VDC or 4-20mA)
	AI3	AI3	Present Value	User	User defined (0-5VDC or 4-20mA)
	AI4 (CTS)	AI4	Present Value	degF (degC)	User defined (0-5VDC or 4-20mA)
	AI5 (HTS)	AI5	Present Value	degF (degC)	User defined (0-5VDC or 4-20mA)
	LPS1	AI6	Present Value	PSIG (kPa)	Low pressure value (suction pressure)
	HPS1	AI7	Present Value	PSIG (kPa)	High pressure value (discharge pressure)
	EVAP1	AI8	Present Value	degF (degC)	Evaporating Temperature
	COND1	AI9	Present Value	degF (degC)	Condensing Temperature
	Suction Line 1	AI10	Present Value	degF (degC)	Suction line temperature
	Superheat 1	AI11	**Setpoint Value**	degF (degC)	Superheat
	EEV1 Position	AI12	Present Value	%	EEV1 position (% open)
	LPS2	AI13	Present Value	PSIG (kPa)	N/A
	HPS2	AI14	Present Value	PSIG (kPa)	N/A
	EVAP2	AI15	Present Value	degF (degC)	N/A
	COND2	AI16	**Setpoint Value**	degF (degC)	N/A
	Suction Line 2	AI17	Present Value	degF (degC)	N/A
	Superheat 2	AI18	**Setpoint Value**	degF (degC)	N/A
	EEV2 Position	AI19	Present Value	%	EEV2 position (% open)
	Outside Ambient	AI20	Present Value	degF (degC)	Outdoor Ambient temperature
	O_IN	AI21	Present Value	degF (degC)	N/A
	O_OUT	AI22	Present Value	degF (degC)	N/A
	I_IN	AI23	Present Value	degF (degC)	N/A
	I_OUT	AI24	Present Value	degF (degC)	N/A
Type - Analog Value	PWM_IN	AV0	Present Value	%	PWM input (from external source)
	PWM1 (OD Fan)	AV1	Present Value	%	Outdoor fan speed
	PWM2	AV2	Present Value	%	PWM output value (spare)
	PWM3 (OV2)	AV3	Present Value	%	PWM output value (spare)
	PWM4 (IV2)	AV4	Present Value	%	PWM output value (spare)
	Operation Mode	AV5	Present Value	N/A	Description of mode - see Operation Mode Description table
	Limits description	AV6	Present Value	N/A	Description of active limits - see Limits Description table
	Permanent Alarms 1	AV7	Present Value	N/A	Description of active alarms - see Alarm Descriptions table
	Permanent Alarms 2	AV8	Present Value	N/A	N/A
	Board Faults	AV9	Present Value	N/A	Description of active faults - see Fault Descriptions table
	Sensor Faults	AV10	Present Value	N/A	Description of active faults - see Fault Descriptions table
	Defrost Mode	AV11	Present Value	N/A	Descr. of defrost status - see Defrost Mode Description table
Type - Binary Output	STAGE1	BO0	Present Value	N/A	Compressor contactor
	STAGE2	BO1	Present Value	N/A	Compressor stage 2 solenoid
	ICR (Indoor Circ)	BO2	Present Value	N/A	N/A
	DO0 (OV1)	BO3	Present Value	N/A	N/A
	DO1 (IV1)	BO4	Present Value	N/A	N/A
	DO2 (HYD_AUX)	BO5	Present Value	N/A	N/A
	DO3 (AUX_ONLY)	BO6	Present Value	N/A	N/A
	PHS1	BO7	Present Value	N/A	Air plenum heater stage 1
	PHS2	BO8	Present Value	N/A	Air plenum heater stage 2
Type - Binary Value	CONTROLS	BV9	Present Value	N/A	Control Indicator, 0 = Local (manual override), 1 = Remote
	Outdoor Flow	BV10	Present Value	N/A	N/A
	Indoor Flow	BV11	Present Value	N/A	N/A
	Phase Monitor1	BV12	Present Value	N/A	Phase Monitor Stage 1 - requires accessory
	Phase Monitor2	BV13	Present Value	N/A	N/A
	Comp Monitor1	BV14	Present Value	N/A	N/A
	Comp Monitor2	BV15	Present Value	N/A	N/A

TABLE 20 - BACnet OBJECTS - DEFROST MODE Description (Read Only)				
Name	**Data Type**	**ID**	**Present Value**	**Description**
Defrost Mode	Analog Value	AV11	0	Off (normal heating operation)
			1	Waiting to re-check low pressure
			2	Entering Defrost Mode
			3	Waiting for EEV's
			4	Waiting for pressures to equalize
			5	Defrosting
			6	Completing Defrost Mode
			7	Exiting Defrost Mode
			8	Defrost disabled

Note: Object is type Analog Value but value will always be an integer value.
Note: Unit is in Defrost Mode when value is >= 2 and <= 7.

TABLE 21 - BACnet OBJECTS - ALARM Descriptions (Read Only)				
Name	**Data Type**	**ID**	**Description**	
AI0 (Comp1 Current)	Analog Input	AI0	Stage 1 Status alarm (Start / Stop Failure) - requires accessory	
AI1 (Comp2 Current)	Analog Input	AI1	N/A	
LPS1	Analog Input	AI6	Low pressure alarm	
HPS1	Analog Input	AI7	High pressure alarm	
LPS2	Analog Input	AI13	N/A	
HPS2	Analog Input	AI14	N/A	
Outdoor Flow	Binary Value	BV10	N/A	
Indoor Flow	Binary Value	BV11	N/A	
Phase Monitor1	Binary Value	BV12	Phase Monitor alarm - requires accessory	
Phase Monitor2	Binary Value	BV13	N/A	
Comp Monitor1	Binary Value	BV14	N/A	
Comp Monitor2	Binary Value	BV15	N/A	
Name	**ID**	**BIT #**	**Decimal Value***	**Bit Description**
Permanent Alarms 1 (Present Value)	**AV7**	0	1	Master permanent alarm (occurs when any alarm occurs)
		1	3	Low pressure heating mode alarm (suction pressure)
		2	5	Low pressure cooling mode alarm (suction pressure)
		3	9	High pressure heating mode alarm (discharge pressure)
		4	17	High pressure cooling mode alarm (discharge pressure)
		5	33	Loss of charge alarm
		6	65	Phase monitor alarm - requires accessory
		7	129	Compressor monitor alarm - N/A
		8	257	Status alarm - N/A
		14	16,385	N/A
		15*	32,769	N/A

Note: Permanent Alarm objects are type Analog Value but values are bit coded and may be decoded as such (integer value).
Note * : Value is for a single alarm and reference only. Value includes + 1 for Master Alarm

Note: object names are subject to change without prior notice.

TABLE 22 - BACnet OBJECTS - FAULT Descriptions (Read Only)				
Name	**Data Type**	**ID**	**Description**	
AI4 (Cold Tank)	Analog Input	AI0	N/A	
AI5 (Hot Tank)	Analog Input	AI1	N/A	
LPS1	Analog Input	AI6	Low pressure sensor faulty or disconnected	
HPS1	Analog Input	AI7	High pressure sensor faulty or disconnected	
LPS2	Analog Input	AI13	N/A	
HPS2	Analog Input	AI14	N/A	
Suction Line1	Analog Input	AI10	Suction line 1 temperature sensor faulty or disconnected.	
Suction Line2	Analog Input	AI17	N/A	
Outside Ambient	Analog Input	AI20	Outside temperature sensor faulty or disconnected	
O_IN	Analog Input	AI21	N/A	
O_OUT	Analog Input	AI22	N/A	
I_IN	Analog Input	AI23	N/A	
I_OUT	Analog Input	AI24	N/A	
Name	**ID**	**BIT #**	**Decimal Value***	**Bit Description**
Board Faults (Present Value)	**AV9**	0	1	Digital inputs
		1	2	Digital outputs
		2	4	PWM outputs
		3	8	Analog to digital conversion
		4	16	Real time clock
		5	32	EEPROM memory
		6	64	Menu buttons
		7	128	LCD interface
Sensor Faults (Present Value)	**AV10**	0	1	Suction line 1 temperature
		1	2	N/A
		2	4	Outdoor Ambient temperature
		3	8	Calibration temperature resistor plug
		4	16	N/A
		5	32	N/A
		6	64	N/A
		7	128	N/A
		8	256	N/A
		9	512	N/A

Note: Board and Sensor Fault objects are type Analog Value but values are bit coded and may be decoded as such (integer value).
Note * : Value is for a single fault and reference only.

Note: object names are subject to change without prior notice.

Startup Procedure

The ATA-Series Two-Stage 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.

Pre-Start Inspection

Outdoor Unit:

1. Ensure the system has been pressure tested, vacuumed to 500 microns and any extra charge required has been added.
2. Ensure both access valves have been fully opened and the caps have put been back on and tightened. Check the caps for leaks.
3. Ensure the outdoor unit is securely mounted in place.
4. Ensure the power and controls signals to the outdoor unit are properly connected, neat, and securely fastened.
5. Ensure fan outlet is clear of obstructions.

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 heat pump.
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 vented, and free of debris.
5. If a plenum heater has been installed, verify that it is securely fastened.

Domestic Hot Water:

1. Verify that all shutoff valves are fully open and there are no restrictions in the piping from the heat pump to the domestic hot water tank.
2. Verify that the entire system has been flooded and all the air has been purged as much as possible. Further purging may be required after the system has been operating for a while.
3. Verify that the brown wire with the insulated terminal is disconnected in the electrical box. Refer to the schematic diagram for more information.

Electrical:

1. **Ensure the power to the unit is off.**
2. 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.
3. Record the circuit breaker size and wire gauge for the heat pump.
4. Verify that the control connections to the unit are properly connected and all control signals are off, so that the unit will not start up when the power is turned on.
5. Verify that the circulator pumps are connected to the proper voltage terminals in the heat pump. Record the voltages of the circulator pumps.
6. Ensure all access panels except the one that provides access to the electrical box 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.**

IMPORTANT NOTE: The unit is shipped with the compressor DISABLED in order to prevent the unit from starting when the power is first turned on. Follow the instructions below in the Preparation section to enable the compressor.

The LCD interface will show the outdoor temperature, low (suction) pressure, high (discharge) pressure, superheat, and EEV position.

Preparation:

1. Turn the power on to the heat pump with air thermostat OFF. All LED's on the control board should turn on, the LCD interface should say "**MGT GEN2 VERx.xx**" on line 1 and "**Zeroing EEV's**" on line 2. You should be able to hear the EEV's moving (a clicking sound).
2. Measure the following voltages on the compressor contactor and record them on the startup sheet: L1-L2, L2-L3, L1-L3.
3. Connect a USB cable between the USB connector on the board and a laptop with the PC App installed (optional).
4. Enable the system either with the PC App's Configuration Page **System Enable/Disable** button or via the LCD Interface.

Heating Mode:

1. Set the air thermostat to heating mode and adjust the setpoint to activate stage 1 and stage 2. The fan should slowly ramp up to speed after the time delay of the thermostat expires (if applicable) and the compressor will start.
2. Check the PC APP or LCD interface. The suction and discharge pressures will depend on the air temperatures, but they should be about **90-110PSIG** and **260-360PSIG** respectively for a typical start-up.
3. Monitor the unit via the PC APP or LCD while the unit runs, and record the following after 10 minutes of run time:
    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 **22-32°F / 12-18°C** or less if it is very cold outside)
    6. Outdoor air temperature
    7. Compressor L1(C) current (black wire, place meter between electrical box and compressor)
4. Adjust the air thermostat setpoint to the desired room temperature and let the unit run through a cycle. Record the setpoint, suction, discharge pressures just before the unit shuts off.
5. For units with a desuperheater, turn the power off to the unit. Connect the brown wire with the blue insulated terminal to the compressor contactor as shown in the electrical box diagram. Turn the DHW switch in the unit post on. Turn the power to the unit on.
6. 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. Adjust the thermostat setpoint to **85°F (29°C)**. Verify that the current draw increase as each electric heat stage is activated. (10kW has 2 stages, 15kW has 3 stages and 20kW has 4 stages).
7. Verify the DHW IN and DHW OUT temperatures (if applicable) by hand **(caution: pipes get hot).** If the DHW OUT line does not become hotter than the DHW IN line the circulator is air locked. Bleed the air from the system and check the temperature differential again to ensure there is flow from the circulator.

Cooling Mode:

1. Set the thermostat to cooling mode and adjust the setpoint to activate stage 1 and stage 2.
2. Monitoring the unit via the PC APP or LCD Interface while the unit runs, record the following after 10 minutes of run time:
    1. Suction pressure
    2. Discharge pressure
    3. Duct Return temperature
    4. Duct Supply Out temperature
    5. Duct Delta T
    6. Outdoor air temperature
3. Adjust the thermostat setpoint to the desired room temperature if possible, otherwise set it just low enough to allow the unit to run (e.g. 1°F or 0.5°C less than room temperature) and let the unit run through a cycle. Record the thermostat setpoint, suction, and discharge pressures when the unit shuts off.

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 and the access panel on the heat pump. Install the service port caps securely to prevent refrigerant loss. Install the electrical cover on the plenum heater if applicable.
3. Do a final check for leaks/spills and ensure the area is clean.
4. Turn the power on to the unit and the plenum heater if installed. Set the thermostat to the final settings.

Startup Record:

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

Startup Record Sheet—ATA-Series Two-Stage R410a

Installation Site		**Startup Date**	**Installer**							
City			**Company**							
Province		**Check boxes unless asked to record data. Circle data units.**	**Model**							
Country			**Serial #**							
Homeowner Name		**Homeowner Phone #**								

PRE-START INSPECTION

Outdoor Unit	Unit is securely mounted at least 8” from building, fans facing out									
	Fan outlet is clear of obstructions									
Line Set	Line set length, extra charge added (only if needed)		ft.	m		lb	kg			
	System is pressure tested, vacuumed									
	All inter-connect piping is insulated and properly supported									
	Wiring is neat and securely fastened									
	Service valves are open and caps installed with torque wrench									
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, properly vented, & free of debris									
	Plenum heater is securely fastened (if applicable)									
Domestic Hot Water	All shut-off valves are open									
	Lines are full and purged									
	Desuperheater pump wire is disconnected									
Electrical	High voltage connections are correct and securely fastened									
	Circuit breaker size and wire gauge for heat pump		A		Ga.					
	Circuit breaker size, wire gauge, and size for Plenum Heater		A		Ga.		kW			
	Low voltage connections are correct and securely fastened									

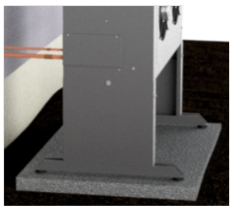
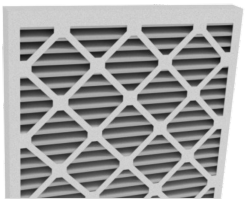
STARTUP DATA

Preparation	Voltage across L1 and L2, L1 and L3, L2 and L3									VAC
Heating Mode (10 minutes)	Suction Pressure / Discharge Pressure						psig	kPa		
	Duct Return, Duct Supply, and Delta T		In		Out		°F	°C		
	Outdoor Air Temperature		°F	°C						
	Compressor L1 (black wire) current		A							
	Air thermostat setpoint and discharge pressure at cycle end		°F	°C		psig	kPa			
	Domestic Hot Water functioning									
Cooling Mode (10 minutes)	Suction Pressure / Discharge Pressure					psig	kPa			
	Duct Return, Duct Supply, and Delta T		In		Out		°F	°C		
	Outdoor Air Temperature		°F	°C						
	Air thermostat setpoint and discharge pressure at cycle end		°F	°C		psig	kPa			

Date:		**Startup Personnel Signature:**	**Witness/Site Signature:**

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

Routine Maintenance

MAINTENANCE SCHEDULE			
Item		**Interval**	**Procedure**
Outdoor Unit		Weekly	Inspect for and clear away debris or leaves in air coil intake, and ice buildup under unit that is approaching air coil.
Indoor Air Filter		6 months	Inspect for dirt. Replace if necessary.
Compressor Contactor		1 year	Inspect for pitted or burned points. Replace if necessary.
Condensate Drain		1 year	Inspect for clogs. Clean if necessary.
LCD Interface or PC App		When heat pump problem is suspected	Check for alarms and faults (only necessary if alarms not reported through a BACnet system). Rectify problem if alarms found. See **Troubleshooting** chapter.

Troubleshooting Guide

WARNING: WHEN SERVICING THE OUTDOOR UNIT, BE SURE TO TURN OFF POWER TO THE INDOOR UNIT. The outdoor disconnect switch will not cut low voltage power, and damage to the control board will occur if the main heat pump breaker is not turned off during service.

The following steps are for troubleshooting the 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 later in this manual.

STEP 1: Verify that the LCD Interface is functioning . If it is not, proceed to POWER SUPPLY TROUBLE SHOOTING, otherwise proceed to STEP 2.

STEP 2: Record the alarm shown on the LCD Interface or use the PC APP Alarms page to determine the alarm type. Proceed to the ALARMS TROUBLESHOOTING section.

STEP 3: If there are no alarms and STAGE1 is showing ON (LCD Interface, PC APP or LED on control board) but the compressor is not operating, 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.

STEP 4: If the compressor starts and sounds normal, the compressor is most likely OK. Proceed to the OPERATION TROUBLESHOOTING section.

NOTE: To speed up the troubleshooting process, if using the PC Application, click on SC Override to reduce the short cycle timer to 10 seconds.

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 heartbeat on control board	Transformer breaker tripped (or fuse blown for those without breaker).	Breaker on transformer is sticking out (or fuse looks burnt).	Push breaker back in. If it trips again locate cause of short circuit and correct (or replace fuse) .
	Faulty transformer.	Transformer breaker is not tripped (or fuse not blown), 230VAC is present across L1 and L3 of the compressor contactor but 24VAC is not present across 24VAC and COM of the control board.	Replace transformer.
	Faulty Control Board.	24VAC is present across 24VAC and COM of the control board.	Replace the control board.
No display on air thermostat	No power from transformer.	See **No Heartbeat on control board**.	
	Faulty wiring between heat pump and thermostat.	24VAC is not present across R and C of the thermostat.	Correct the wiring.
	Faulty thermostat.	24VAC is present across R and C of the thermostat but thermostat has no display.	Replace thermostat .

ALARM TROUBLESHOOTING

Alarm/Fault	Description	Recommended Action
The data logging function of the GEN2 Control Board is a very useful tool for troubleshooting alarms. It provides a history of the unit operation up to and including the time at which the alarm(s) occurred. Note that some alarms require accessory components.		
Low Pressure	A low pressure alarm occurs when the suction pressure drops to or below the ***Low Pressure Cutout*** value. The low pressure is checked just before a compressor start; if it is OK the compressor will start, otherwise an alarm will occur. When the compressor starts, the low pressure alarm will be ignored for the number of seconds that ***Low Pressure Ignore*** is set to, after which the low pressure alarm will be re-enabled. This allows a dip in suction pressure below the cutout point during startup without causing a nuisance alarm.	Go to the Low Pressure section of the mode the unit was operating in at the time of the alarm. (In practice, low pressure in heating mode will result in a Multiple Defrosts alarm, since a defrost will occur before the unit trips on a low pressure alarm.)
High Pressure	A high pressure alarm occurs when the discharge pressure rises to or above the ***High Pressure Cutout*** value.	Go to the High Pressure section of the mode the unit was operating in at the time of the alarm.
Compressor Status (accessory)	This alarm occurs when there is a current draw on the compressor but no call for the compressor to be on (welded contactor) or when there is a call for the compressor to be on but there is no compressor current draw (manual high pressure control is open or contactor failure). Requires current sensor accessory.	Check contactor if compressor is staying on when it should be off. Go to Compressor section if compressor is not on when it should be. Also check for tripped manual high pressure control.
Comp. Not Pumping	Discharge pressure is less than 30 psi higher than suction pressure after 2 minutes run time. It indicates leaking reversing valve, compressor very hot and tripped on internal overload, manual high pressure control trip, bad contactor, or defective compressor.	Check for reversing valve not seated properly, tripped manual high pressure control, or a contactor or compressor problem.
Low Charge	EEV position has been above 99% for 20 minutes within the first hour of cycle.	Check system for refrigerant leak. Also check that EEV for proper operation (see **EEV Troubleshooting** section)
LOC (Loss of Charge)	This alarm occurs if the low pressure and/or high pressure sensors are below 30 psig (207 kPa).	Check system for refrigerant leak. Check for incorrect pressure sensor reading.
Condensate Drain	Water level in the condensate tray has risen to sensor level (if present), indicating condensate drain is blocked.	Check condensate drain.
Multiple Defrosts	This alarm occurs if a second defrost occurs immediately after the defrost disabled timer expires from a previous defrost cycle.	Go to **Low suction pressure** or **Outdoor temperature reading incorrect** in the **Operation Troubleshooting - Heating Mode** section.

FAULT TROUBLESHOOTING		
Alarm/Fault	**Description**	**Recommended Action**
Digital Inputs **Digital Outputs** **Analog Inputs** **MODBUS Comms** **PWM Outputs** **Real Time Clock**	A failure has occurred and the indicated section of the control board may no longer work properly.	Cycle the power a few times; if the fault persists replace the control board.
Flash Memory	A failure has occurred and stored data may be corrupt.	It may be possible to correct this by using the menu item ***Tools—Reset to Factory Defaults***. If this clears the fault then the system configuration will have to be set up again.
Menu Buttons	A failure has occurred and the control board may no longer respond to menu button key presses.	Try turning off the power, disconnecting and reconnecting the cable between the LCD Interface board and the Control Board, and then turning the power back on again. If this does not work then either the LDC Display board, the cable, or the driver section of the Control Board may be faulty.
LCD Interface	A failure has occurred and display may show erratic data, no data or may not turn on at all.	
BACnet Comms	BACnet communications experienced a timeout.	See below.
Pressure Sensors	The sensor is reading outside of the acceptable range. Check to ensure connector is on securely.	Replace the pressure sensor. If this does not rectify the problem, replace the control board.
Temperature Sensors	The sensor is reading outside of the acceptable range. Check to ensure connector is on securely.	Replace the temperature sensor. If this does not rectify the problem, replace the control board.

BACnet TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
BACnet communications not working properly **Or** **BACnet FAULT indication**	Selected baud rate does not match building control system.	Check baud rate of system.	Adjust BACnet parameters in the PC App's **Tools-->Configuration** window. **Cycle power to invoke any changes.**
	Selected MAC address and/or Instance # conflict with other devices on the network.	Check MAC address and Instance # in relation to other system devices.	
	BACnet wiring or termination problem.	Verify correct twisted pair wire and termination in the **BACnet Interface** chapter (earlier).	Correct wiring.
	Hardware problem on heat pump control board.	Remove BACnet connector from board as well as jumper from TERM (located just above the BACnet connector). Using a multimeter set to DC volts with negative probe on **B** and positive probe on **A**, confirm there is **+2.5VDC**.	Replace board if voltage not correct.

COMPRESSOR TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Compressor will not start	Faulty control board	No 24vac output on STAGE1 when compressor should be operating.	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 (particularly *high suction pressure* and *high discharge pressure*) 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.
Compressor stage 2 will not activate	Faulty stage 2 plug (solenoid coil is in plug).	Verify if 24VAC is present across Y2 and C of the terminal strip.	Replace module if signal is present. Check wiring if signal is not present.

OPERATION TROUBLESHOOTING - HEATING MODE			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Outdoor temperature reading is incorrect by a large amount	Outdoor EEV is mechanically faulty and causing electromagnetic interference	Verify EEV operation (EEV2) - see **EEV Troubleshooting** section	Replace outdoor EEV if faulty.
	Faulty outdoor temperature sensor	Outdoor EEV verified to be good, no loose connections in indoor to outdoor control wiring	Replace outdoor temperature sensor.
High or low suction or discharge pressure	Faulty sensor	Compare pressure sensor reading against a known reference such as a new refrigeration manifold set.	Check wiring, replace sensor. If problem persists, replace control board.
High discharge pressure	Low indoor unit airflow	See Indoor Fan Troubleshooting section	Correct the problem.
	Outdoor unit's EEV stuck almost closed or partially blocked by foreign object	Manually adjusting the outdoor EEV does not affect the superheat or the suction pressure. High superheat, low suction pressure.	Go to EEV troubleshooting section.
	Filter-dryer plugged	Feel each end of the filter-dryer; they should be the same temperature. If there is a temperature difference then it is plugged. Also causes low suction pressure.	Replace filter-dryer.
	Unit is overcharged	High subcooling, low air delta T.	Remove 1/2 lb of refrigerant at a time and verify that the discharge pressure reduces.
	Refrigerant contaminated with air or nitrogen	Possibility of procedural error during line set vacuuming and charging.	Replace refrigerant.
Low suction pressure	Entering indoor air temperature too cold (e.g. on startup, or if unit has been off for extended period)	Ensure entering air temperature is above the low limit indicated in the **Model Specific Information** section.	Reduce airflow temporarily until Indoor Out temperature has risen sufficiently. This can be done by partially blocking off the return duct.
	Low or no outdoor unit airflow	Visually check outdoor fan to see if it is operating.	Go to Outdoor Fan Troubleshooting section.
	TS1 temperature sensor not reading properly.	If the sensor is reading low it will cause the superheat to appear high, which causes the EEV to continually close.	Verify EEV position is low compared to normal. Check temperature sensor, replace if necessary.
	Filter-dryer plugged	Feel each end of the filter-dryer; they should be the same temperature. If there is a temperature difference then it is plugged. Also causes high discharge pressure.	Replace filter-dryer.
	Outdoor unit's EEV stuck almost closed or partially blocked by foreign object.	Manually adjusting the outdoor EEV does not affect the superheat or the suction pressure. High superheat and high discharge pressure.	Go to EEV troubleshooting section.
	Low refrigerant charge.	Superheat is high, outdoor EEV position is high.	Locate the leak and repair it. Spray Nine, a sniffer, and/or dye are common methods of locating a leak.

OPERATION TROUBLESHOOTING - HEATING MODE			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
High suction pressure (may appear to not be pumping)	Outdoor unit's EEV stuck open	Manually adjusting the outdoor EEV does not affect the superheat or the suction pressure. Low superheat and low discharge pressure.	Go to EEV troubleshooting section.
	Leaking reversing valve (can cause compressor to overheat and trip internal overload)	Reversing valve is the same temperature on both ends of body, common suction line is warm, compressor is running hot, low compressor discharge pressure.	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		
Outdoor unit EEV frosting up	Outdoor unit's EEV stuck almost closed or partially blocked by foreign object	Manually adjusting the outdoor EEV does not affect the superheat or the suction pressure. High superheat, low suction pressure.	Go to EEV troubleshooting section.
Random high pressure trip (may not occur while on site)	Faulty indoor fan	Go to Indoor Fan troubleshooting section.	Go to Indoor Fan troubleshooting section.
Random manual high pressure trip (may not occur while on site)	Faulty compressor contactor	Points pitted or burned. Contactor sometimes sticks causing the compressor to run when it should be off.	Replace contactor.

OPERATION TROUBLESHOOTING - DEFROST & COOLING MODES			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Heating instead of cooling	Thermostat or zone controller not set up properly	Verify that there is 24VAC across O and C of the terminal strip when calling for cooling.	Correct setup.
	Faulty reversing valve solenoid coil	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 unit airflow	Visually check fan to see if it is operating.	Go to Outdoor Fan Troubleshooting section.
	Filter-dryer plugged	Feel each end of the filter-dryer; they should be the same temperature. If there is a temperature difference then it is plugged. Also causes low suction pressure.	Replace filter-dryer.
	Unit is overcharged	High subcooling, low air delta T.	Remove 1/2 lb of refrigerant at a time and verify that the discharge pressure reduces.
	Refrigerant contaminated with air or nitrogen	Possibility of procedural error during line set vacuuming and charging.	Replace refrigerant.

OPERATION TROUBLESHOOTING - DEFROST & COOLING MODES			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
High suction pressure (may appear to not be pumping)	Indoor unit's EEV stuck open	Manually adjusting the indoor EEV does not affect the superheat or the suction pressure. Low superheat and low discharge pressure.	Go to EEV troubleshooting section.
	Leaking reversing valve (can cause compressor to overheat and trip internal overload)	Reversing valve is the same temperature on both ends of body, common suction line is warm, compressor is running hot, low compressor discharge pressure.	Replace reversing valve.
	Faulty compressor, not pumping	Pressures change only slightly from static values when compressor is started.	Replace compressor.
Low suction pressure	Low indoor unit airflow	See Indoor Fan Troubleshooting section. **Note:** low airflow will cause the air coil to ice up once the suction drops below **90PSIG**.	Correct the problem.
	Indoor unit's EEV stuck almost closed or partially blocked by foreign object	Manually adjusting the indoor EEV does not affect the superheat or the suction pressure. High superheat and high discharge pressure.	Go to EEV troubleshooting section.
	TS1 temperature sensor not reading properly	If the sensor is reading low it will cause the superheat to appear high, which causes the EEV to continually close.	Verify EEV position is low compared to normal. Check temperature sensor, replace if necessary.
	Filter-dryer plugged	Feel each end of the filter-dryer; they should be the same temperature. If there is a temperature difference then it is plugged. Also causes high discharge pressure.	Replace filter-dryer.
	Low refrigerant charge	Indoor airflow is good but suction is still low. Check static refrigeration pressure of unit for a 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		
Indoor unit's EEV frosting up	Indoor unit's EEV stuck almost closed or partially blocked by foreign object	Manually adjusting the indoor EEV does not affect the superheat or the suction pressure. High superheat and high discharge pressure.	Go to EEV troubleshooting section.
Random manual high pressure trip (may not occur while on site)	Faulty compressor contactor	Points pitted or burned. Contactor sometimes sticks causing the compressor to run when it should be off.	Replace contactor.
Outdoor temperature reading is incorrect by a large amount	Outdoor EEV is mechanically faulty and causing electromagnetic interference	Verify outdoor EEV operation (EEV2) - see **EEV Troubleshooting** section	Replace outdoor EEV if faulty.
	Faulty outdoor temperature sensor	Outdoor EEV verified to be good, no loose connections in indoor to outdoor control wiring	Replace outdoor temperature sensor.

INDOOR FAN/BLOWER TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Low indoor unit airflow	Dirty air filter	Inspect.	Replace.
	Dirty air coil	Inspect.	Clean.
	Poor ductwork	Measure delta T between supply and return ducts at the unit. In heating mode, it should not be above 30°F(17°C).	The ECM fan will provide proper airflow up to an external static backpressure of 0.5 inH_2O. The ductwork is poorly designed or greatly undersized if the fan motor cannot provide the required airflow.
	Airflow selected is too low	Check airflow settings on Indoor Fan page of the PC APP.	Select a higher setting.
	Airflow reduction is enabled	AR1 and AR2 are connected with a dry contact or jumper.	Airflow reduction may not be feasible with lower airflow selections. Increase settings until unit operates properly.
Indoor fan not operating at correct speeds	Wrong model size selected	Verify that the model size is correct on the Configuration Page of the PC APP.	Select the correct model size.
Indoor 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.
	Control board not configured properly	Verify that the model series is correct on the Configuration Page of the PC APP.	Correct the configuration. If the wrong series is selected there may be not be any fan output.
	Faulty control board outputs **Note: cycle the power once to see if the fan begins operating properly first**	Create a call for the fan from the thermostat or use a jumper R-G (24VAC on G terminal in heat pump). On the ECM Fan connector **on the left side of the control board:** 1) verify that there is 12 to 20VDC between pin G (grey wire) and pin C (white wire). 2) Verify that there is 2 to 6VDC between pin P (dark green wire) and pin C (white wire)	If there is no voltage present on either of the pins (G and P) replace the control board. Ensure control board model series is correct, see above.
	Faulty control signal harness or faulty motor head	Create a call for the fan from the thermostat or use a jumper R-G (24VAC on G terminal in heat pump). On the ECM Fan connector **at the fan motor:** 1) verify that there is 12 to 20VDC between pin G (grey wire) and pin C (white wire). 2) Verify that there is 2 to 6VDC between pin P (dark green wire) and pin C (white wire)	If proper signal isn't present, replace the fan control signal harness. If proper signal is present, replace fan motor.
	Faulty fan power harness 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.

OUTDOOR FAN TROUBLESHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Outdoor fan not operating or operating intermittently	Fan power connections	Check for 230VAC across L1 and L2 of the outdoor unit. Proceed to next step if voltage present.	If no voltage present, repair any loose connections.
	Faulty PWM output on GEN2 control board	Use manual mode of the PC APP to set the outdoor fan to 50%. Using a multimeter set to VDC, measure PWM1 to GND on the GEN2 control board in the indoor unit. It should be ~5VDC. Proceed to next step if voltage present.	If signal is not present the control board may be faulty. Try cycling the power and re-testing. If this does not correct the problem replace the control board.
	Fan PWM signal connections	Use manual mode of PC APP to set the outdoor fan to 50%. Using a multi-meter set to VDC, measure PWM+ to GND in the outdoor unit. It should be ~5VDC. Proceed to next step if voltage present.	If signal is not present, check connections of PWM wire and ground wire. Replace wiring if connections are good.
	Faulty fan motor	All of the above checks have been performed and everything is OK.	Replace fan motor.

DOMESTIC HOT WATER (DESUPERHEATER) TROUBLE SHOOTING			
Fault	**Possible Cause**	**Verification**	**Recommended Action**
Insufficient hot water (tank problem)	Thermostat on final hot water tank set too low. Should be set 120-140°F.	Visually inspect the setting.	Adjust the setting.
	Breaker tripped, or fuse blown in electrical supply to hot water tank	Check both line and load sides of fuses. If switch is open determine why (possible shorted element).	Correct problem, and replace blown fuse or reset breaker.
	Reset button tripped on hot water tank	Check voltage at elements with multimeter.	Push reset button.
Insufficient hot water preheat (heat pump problem)	DHW switch is turned off	Inspect switch, located on heat pump cabinet post.	Turn switch on.
	Brown wire with blue insulated terminal at compressor contactor not connected during installation	Inspect wire with insulated terminal as shown on electrical diagrams.	Connect wire as instructed on electrical box diagram and/or wiring schematic diagram.
	Circulator pump seized or motor failed	Use an amprobe to measure current draw.	Replace if faulty.
	Blockage or restriction in the water line or hot water heat exchanger	Check water flow and power to pump. Check water lines for obstructions.	Remove obstruction in water lines. Acid treat the domestic hot water coil.
	Faulty DHW cutout (failed open)	Check contact operation. Should close at 120°F and open at 140°F.	Replace DHW cutout if faulty.
	Heat pump not running enough hours to make sufficient hot water	Note the amount of time the heat pump runs in any given hour.	Temporarily turn up the tank thermostats until colder weather creates longer run cycles.
Water is too hot.	Faulty DHW cutout (failed closed)	Check contact operation. Should close at 120°F and open at 140°F.	Replace DHW cutout if faulty.
	Thermostat on hot water tank set too high. Should be set at 120°F to 140°F	Visually inspect the setting.	Adjust the setting.

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 W2 signal at heat pump terminal strip	No call for auxiliary or emergency heat from thermostat	Verify that the thermostat is indicating that auxiliary or emergency heat should be on.	Set thermostat to engage auxiliary or emergency heat. (Note that some thermostats require a jumper between auxiliary and emergency. Check the tstat manual.)
	Faulty thermostat	Thermostat doesn’t indicate a call for auxiliary or emergency when it should. Or indicates auxiliary or emergency but no 24VAC signal present across C and the auxiliary and/ or emergency pin at the thermostat.	Replace thermostat.
	Faulty thermostat wiring	24VAC signal is present across C and the auxiliary and/or emergency pin at the thermostat but no 24VAC signal is present across W2 and C at the heat pump terminal strip.	Correct wiring.
No 24VAC signal from C to ground at the plenum heater control board	Plenum heater transformer is burned out	Voltmeter does not show 24VAC across transformer secondary.	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 board (when a plenum heater demand is present)	Faulty wiring	24VAC present across C and ground at the plenum heater, but not across ground of the plenum heater and C_P of the heat pump terminal strip	Correct the wire which should run from heat pump C_P to plenum heater C.
		If above tested OK, 24VAC is present across ground of plenum heater and 1 of the heat pump terminal strip, but not across ground of plenum heater and 1 of the plenum heater.	Correct the wire which should run from heat pump terminal “1” to plenum heater terminal “1”.
Plenum heater thermal overload is tripped.	Indoor fan not operating	See Indoor Fan/Blower Troubleshooting section.	Correct problem. Reset thermal overload.
	Plenum heater is not positioned so that majority of airflow passes over elements (if installed in ductwork outside heat pump)	Plenum heater meant for internal heat pump installation is installed in a larger duct outside heat pump, or is positioned after duct elbow.	Reposition plenum heater, or obtain a plenum heater model with a wider element cage (contact Maritime Geothermal).
	Faulty overload	Reset thermal overload.	Replace if faulty.

EEV (Electronic Expansion Valve) TROUBLESHOOTING

Electronic expansion valves are a great advancement over TVX's, allowing more precise refrigerant control, but they do have a couple of limitations.

a) EEV's receive commands to open or close from the control board, but they don't send any feedback to the control board to confirm that command has been received and acted upon. If they aren't reliably acted upon (due to pulses missed due to a wiring issue or EEV being mechanically stuck), the actual valve opening position won't match what the control board thinks it is. In extreme cases, the resulting repeated commands can cause the *apparent* valve position to go to **15%** (minimum) or **100%**, when the valve is actually in between.

b) A restriction in the refrigeration circuit (particularly the liquid line, e.g. plugged filter-dryer) or shortage of refrigerant due to a leak can cause a similar issue. If the EEV opens to allow more refrigerant flow to lower the superheat but liquid refrigerant is not available at its inlet, the EEV will continue to open to attempt to let more refrigerant through and will work its way towards **100%** (full open). **High superheat** is also a symptom.

If there is low suction pressure and the EEV position is also low then the problem is generally not in the refrigeration system; check the water or airflow of the indoor or outdoor loop, whichever is currently the cold side (evaporator).

Tests to determine if an EEV is working

- Sound test: turn the power to the heat pump off and back on again. Or manually set the EEV to 25% and wait for it to stop, then set the EEV to "–1%". Both actions will cause the EEV to overdrive closed. You should hear the valve clicking and then the clicking should change and get louder when the valve reaches 0%. If there is no sound, then it is likely that the EEV is faulty or stuck.
- Using the PC APP, put the system in manual override mode. Manually adjust the EEV position by at least 25% either up or down and check to see that the suction pressure, discharge pressure and superheat react to the change. If there is no reaction, then it is likely that the EEV is faulty or stuck.
- Set the EEV back to AUTO and then turn the heating or cooling demand off (but leave power on). Once the demand is off, if the EEV is working then the discharge pressure should remain significantly higher than the suction pressure, i.e. the system will not equalize (since EEV's are closed when there is no demand). If the system does equalize it is likely that the EEV is not working and is partially open.

There are 3 possible causes for EEV problems: the control board is not working properly, the wire/cable is faulty, or the EEV is faulty.

The EEV can be checked electrically:

- RED to GREEN 75ohms
- WHITE to BLACK 75ohms

If this test fails, EEV is bad and should be replaced, but if it passes it still may be mechanically defective.

Check with a new EEV:

A further check that can be performed is to connect a new EEV and cable to the control board and visually check the EEV so see if it opens and closes by setting the position to 0 and 100% If the new EEV works then the EEV in the unit or the cable needs to be replaced.

1) Connect a test EEV and test cable to the control board.
2) Set the EEV position to 0%.
3) Set the EEV position to 100% and then listen for clicking and watch to see if the pintle in the EEV moves open.
4) Set the EEV position to 0% and then listen for clicking and watch to see if the pintle in the EEV moves closed.
5) If the EEV does not move in one or both directions then the control board must be replaced.
6) If the test EEV moves in both directions then then either the cable or the EEV in the unit is faulty.
7) Disconnect the test EEV from the test cable and connect it to the cable in the unit.
8) Repeat steps 2 to 4.
9) If the test EEV moves in both directions then the EEV in the unit is faulty and must be replaced.
10) If the test EEV does not move in one or both directions then the cable must be replaced.

Repair Procedures

WARNING: WHEN SERVICING THE OUTDOOR UNIT, BE SURE TO TURN OFF POWER TO THE INDOOR UNIT. The outdoor disconnect switch will not cut low voltage power, and damage to the control board will occur if the main heat pump breaker is not turned off during service.

Pumpdown Procedure

1. Place the unit in SERVICE mode via the PC App or LCD interface; this will open the EEVs. Then **TURN OFF POWER** to indoor unit (which powers outdoor unit), as per above warning.
2. Connect the refrigerant recovery unit to the heat pump's internal service ports via a refrigeration charging manifold and to a recovery tank as per the instructions in the recovery unit manual. Plan to dispose of refrigerant if there was a compressor burnout.
3. Ensure all hose connections are properly purged of air. Start the refrigerant recovery as per the instructions in the recovery unit manual.
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.
5. Connect a nitrogen tank to the charging manifold and add nitrogen to the heat pump until a positive gauge pressure of 5-10 psig is reached. This prevents air from being sucked into the unit by the vacuum when the hoses are disconnected.

The heat pump is now ready for repairs.

General Repair Procedure

1. Perform repairs to system.
   - Always ensure nitrogen is flowing through the system at the lowest flow rate that can be felt at the discharge during any brazing procedures to prevent soot buildup inside the pipes.
   - It is recommended to replace the liquid line filter-dryer any time the refrigeration system has been exposed to the atmosphere.
   - Place a wet rag around any valves being installed, as almost all valve types have non-metallic seats or seals that will be damaged by excessive heat, and aim the torch flame away from the valve body. Solder only one joint at a time and cool joints down in between.
2. Pressure test the system with nitrogen. It is recommended to check for leaks using leak detection spray, Spray Nine, or soapy water. Check at 10, 25, 50 and 100 psig. Allow the system to sit at 100 psig for at least an hour, then re-check. With a laptop connected, the **PC App** may be used to graph the nitrogen pressure (**Graphs** menu--> **Refrigeration Pressure and Temperature Graphs**) to make any downward trend due to a leak apparent. Be aware that changing room temperature can also cause upward or downward trends in nitrogen pressure.

Vacuuming & Charging Procedure

After completion of repairs and nitrogen pressure testing, the refrigeration circuit is ready for vacuuming.

1. Release the nitrogen 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.
2. 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.
3. Weigh in the appropriate amount **and type** of refrigerant through the low pressure (suction) service port. Refer to the nameplate label on the unit for the proper refrigerant type and charge amount.
4. 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.

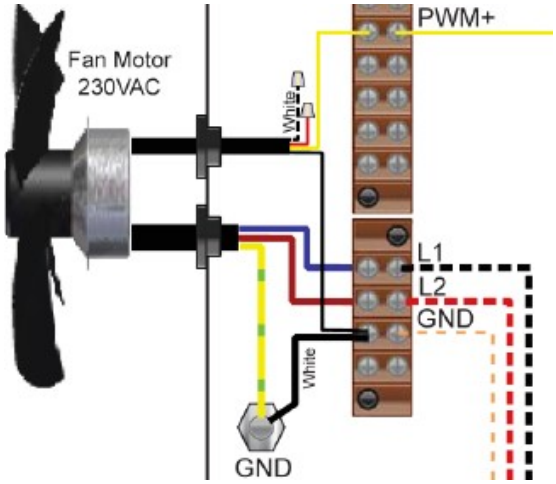
Compressor Replacement Procedure

1. Pump down the unit as per the Pumpdown Procedure above. **If there was a compressor burn out (motor failure), the refrigerant cannot be reused and must be disposed of according to local codes**.
2. Disconnect piping.
3. Replace the compressor. Replace the liquid line filter-dryer. Always ensure nitrogen is flowing through the system at the lowest flow rate that can be felt at the discharge during any brazing procedures to prevent soot buildup inside the pipes.
4. Vacuum the unit as per above procedure.
5. If there was a compressor burnout:
   - ***a)*** Charge the unit with **new** refrigerant and operate it for continuously for 2 hours. Pump down the unit and replace the filter-dryer. Vacuum the unit as per above procedure.
   - ***b)*** Charge the unit (refrigerant can be re-used) and operate it for 2-3 days. Perform an acid test. If it fails, pump down the unit and replace the filter-dryer.
   - ***c)*** Charge the unit (refrigerant can be re-used) and operate it for 2 weeks. Perform and acid test. If it fails, pump down the unit and replace the filter-dryer.
5. Charge the unit a final time. Unit should now be clean and repeated future burn-outs can be avoided.

Outdoor Fan Replacement Procedure

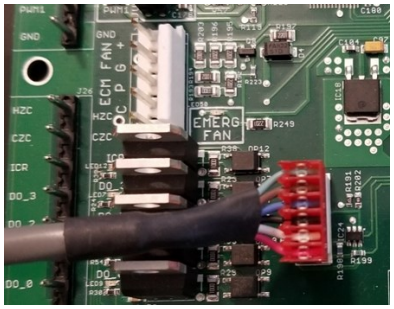
1. Turn of the power to the Indoor Unit. This will ensure that power and control signals are off in the outdoor unit.
2. Remove the two screws that hold the electrical box cover in place and remove the cover.
3. Remove the two bolts that secure the front cover in place.
4. Loosen the four bolts that hold the fan guard in place.
5. Swing the front cover open.

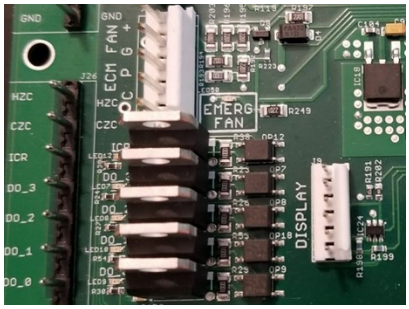
6. For the fan signal cable: remove the **YELLOW** wire from the **PWM** terminal and remove the **BLACK** wire from the **GND** terminal.
7. For the fan power cable: remove the **BLUE** wire from **L1**, the **RED** wire from **L2** and the **YELLOW/GREEN** wire from **GND**.
8. Pull the cables out of the electrical box, noting the path for installation of the new fan. Cut wire ties if necessary.
9. Remove the four fan guard bolts and remove the fan and guard as one.
10. Installation is the reverse of removal.



Control Board Replacement Procedure

1. Turn the power off to the unit.
2. Take a picture of the control board and connectors for reference. The picture in **Appendix A** may also be helpful.
3. Carefully remove all green terminal strips on the left side, the right side and the bottom of the control board. They pull straight off the board, with no need to disconnect wires from their screw terminals. You may need to wiggle them from both ends for the 8 pin ones.
4. Remove the red six pin display board connector from the left side of the control board (marked DISPLAY on the board).





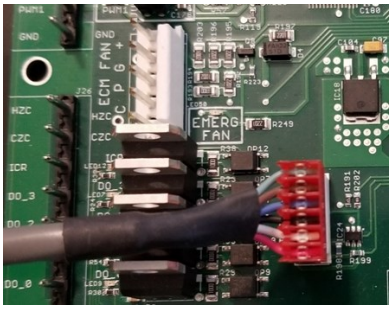
5. Remove all connectors from the top of the control board. Each connector (or wire) should be marked already from the factory, e.g. HPS1, LP1, TS1, etc.. This matches the marking on the control board.
6. The control board is held in place at its four corners. Squeeze each standoff by hand or with needle nose pliers if necessary and carefully pull the corner of the board off of the standoff.
7. Once the control board has been removed, if there are any other standoffs left (they have the bottom snap cut off) remove them as well.
8. Carefully remove the new control board from the static bag it was shipped in. Place any cut off standoffs from the old board into the same locations on the new board.
9. Align the control board with the four corner standoffs in the electrical box then push on each corner until they snap in place.
10. Connect the top connectors to the control board. Refer to the **Step 2** picture if necessary for proper locations.

    Note that the connector with the resistor (no cable) goes on **CTS**.
    Note that the connector to the left of **CTS** is marked **HTS** on older boards, and **ODTS** on newer boards.

11. Check each of the connectors from Step 10 to ensure they are properly aligned and that no pins are showing.
12. Connect the green terminal strips to the left side, right side and bottom of the control board. Refer to the **Step 2** picture if necessary for locations.
13. Turn the power on to the heat pump. Ensure the LCD Interface comes on. Note the firmware version. After EEV zeroing and Random Start countdown the display should begin alternating data.
14. If the replacement control board was pre-configured for this unit at the factory then the system is ready for operation. If it was not then use the PC App corresponding to the unit's firmware version to configure the unit. Refer to the **Tools -> Configuration** menu in the **PC APP** section.

LCD Interface (Display) Board Replacement Procedure

1. Turn the power off to the unit.
2. Remove the display board cable connector from the control board.



3. Using a sharp utility knife with a long blade, slice each of the display board standoff heads off, taking care to not damage the lexan cover.

4. Pull the display board from the unit.
5. Remove the display board cable connector from the back of the display board.
6. Place a new display board standoff into each of the four holes in the cabinet.
7. Remove the new display board from the static bag it was shipped in.
8. Connect one end of the display board cable to the back of the display board. Ensure the connector is properly aligned and that no pins are showing.
9. Place the display board in position and align the four standoffs into the four holes of the board.
10. Push on each corner of the board until each standoff snaps in place, while pushing on the front of the standoff to keep it from popping out of the cabinet hole.
11. Connect the other end of the display board cable to the control board, ensuring the connector is aligned properly and that no pins are showing.
12. Turn the power on to the unit and verify the display works.
13. Once the display begins to scroll data, test each of the buttons to ensure they work. Push the Arrow button to enter the Main Menu, then use the Up and Down to move through the list, then push the OK button to exit again. If any of the buttons seem hard to press, repeat Step 10 and then test the buttons again.

Model Specific Information

Table 23 - Shipping Information - Indoor Unit

MODEL	WEIGHT lb. (kg)	DIMENSIONS in (cm)		
		L	W	H
ATA-25	360 (163)	38 (97)	30 (76)	65 (165)
ATA-45	375 (170)	38 (97)	30 (76)	65 (165)
ATA-55	440 (200)	38 (97)	30 (76)	65 (165)
ATA-65	470 (213)	38 (97)	30 (76)	65 (165)
ATA-75	505 (229)	38 (97)	30 (76)	65 (165)

Table 24 - Shipping Information - Outdoor Unit

MODEL	WEIGHT lb. (kg)	DIMENSIONS in (cm)		
		L	W	H
ATA-25	230 (104)	36 (91)	70 (178)	45 (114)
ATA-45	230 (104)	36 (91)	70 (178)	45 (114)
ATA-55	230 (104)	36 (91)	70 (178)	45 (114)
ATA-65	295 (134)	36 (91)	70 (178)	56 (142)
ATA-75	295 (134)	36 (91)	70 (178)	56 (142)

Table 25 - Refrigerant Charge

MODEL	lb	*kg*	Refrigerant	Oil Type
ATA-25	7.5	*3.4*	R410a	POE
ATA-45	7.5	*3.4*	R410a	POE
ATA-55	11.0	*5.0*	R410a	POE
ATA-65	12.0	*5.5*	R410a	POE
ATA-75	13.0	*5.9*	R410a	POE

- Oil capacity is marked on the compressor label.
- **Refrigerant charge is subject to revision;** actual charge is indicated on the unit nameplate.

Table 26 - Operating Temperature Limits

Loop	Mode	Parameter	(°F)	*(°C)*	Note
Indoor	Heating	Minimum EAT	60	*15*	
	Heating	Maximum EAT	100	*38*	
	Cooling	Minimum EAT	50	*10*	
	Cooling	Maximum EAT	100	*38*	
Outdoor	Heating	Minimum EAT	-7	*-22*	Compressor automatically stops below this outdoor temperature.
	Cooling	Maximum EAT	120	*49*	Compressor automatically stops above this outdoor temperature.

Table 27 - Outdoor Unit Sound Levels (dBA)*

MODEL	1 ft distance		3 ft distance		5 ft distance		10 ft distance	
	Front	Side	Front	Sides	Front	Sides	Front	Sides
ATA-25	68.0	61.1	66.4	59.7	63.5	57.4	59.3	56.7
ATA-45	68.0	61.1	66.4	59.7	63.5	57.4	59.3	56.7
ATA-55	72.4	66.8	71.1	64.8	68.0	62.9	64.6	61.1
ATA-65	70.3	62.9	65.9	60.5	62.2	58.1	56.6	54.0
ATA-75	71.7	66.8	68.7	63.7	65.7	61.2	60.0	57.1

* At maximum fan speed. This occurs in heating mode, or in cooling mode with outdoor greater than ~27°C.

Table 28 - Indoor Unit Sound (dBA)*

MODEL	1 ft distance	3 ft distance
ATA-25	58.0	56.2
ATA-45	58.4	56.6
ATA-55	60.7	59.8
ATA-65	61.4	59.7
ATA-75	65.5	64.8

* With all doors installed.

Standard Capacity Ratings

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Standard CSA C656 (ARI 210-240).

Table 29 - Standard Capacity Ratings - Heating																60 Hz
Indoor Air 70°F (21°C) db / 60°F (15.6°C) wb				H12 - Outdoor Air 47°F (8.3°C)				H22 - Outdoor Air 35°F (1.7°C)				H32- Outdoor Air 17°F (-8.3°C)				
Model	Indoor Airflow		Stage	Input Energy	Capacity		COP_H	Input Energy	Capacity		COP_H	Input Energy	Capacity		COP_H	
	cfm	*L/s*		Watts	Btu/hr	*kW*	W/W	Watts	Btu/hr	*kW*	W/W	Watts	Btu/hr	*kW*	W/W	
25	800	*378*	2	1,520	19,900	*5.8*	3.84	1,485	16,800	*4.9*	3.32	1,395	13,100	*3.8*	2.74	
45	1200	*566*	2	2,290	30,100	*8.8*	3.85	2,240	25,500	*7.5*	3.34	2,100	19,600	*5.8*	2.74	
55	1500	*708*	2	3,110	40,700	*11.9*	3.83	3,030	34,400	*10.1*	3.33	2,760	25,700	*7.5*	2.72	
65	1900	*897*	2	3,955	51,800	*15.2*	3.84	3,810	43,200	*12.7*	3.32	3,560	32,800	*9.6*	2.70	
75	2100	*991*	2	4,550	59,400	*17.4*	3.83	4,485	50,700	*14.9*	3.31	4,295	39,000	*11.4*	2.66	

Table 30 - Standard Capacity Ratings - Cooling													60 Hz
Indoor Air 80°F (26.7°C) DB / 67°F (19.°C) WB / 50% RH				B2 - Outdoor Air 82°F (27.8°C)					A2 - Outdoor Air 95°F (35°C)				
Model	Indoor Airflow		Stage	Input Energy	Capacity		EER	COP_C	Input Energy	Capacity		EER	COP_C
	cfm	*L/s*		Watts	Btu/hr	*kW*	Btu/W-hr	W/W	Watts	Btu/hr	*kW*	Btu/W-hr	W/W
25	800	*378*	2	1,510	22,400	*6.6*	14.9	4.35	1,740	20,600	*6.0*	11.9	3.47
45	1200	*566*	2	2,235	34,100	*10.0*	15.2	4.47	2,605	31,400	*9.2*	12.1	3.53
55	1500	*708*	2	2,925	44,000	*12.9*	15.0	4.41	3,410	40,600	*11.9*	11.9	3.49
65	1900	*897*	2	3,725	55,400	*16.2*	14.9	4.36	4,310	51,200	*15.0*	11.9	3.48
75	2100	*991*	2	4,385	64,600	*18.9*	14.7	4.31	5,010	59,200	*17.4*	11.8	3.46

Air Heating/Cooling Performance

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ATA-25-HACW-P-1T *R410a, 60 Hz, ZPS20K5E-PFV*

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Cond. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Heating (Btu/hr)	COP_H
HEATING	**-5°F**	-16	4,310	5.7	75	1,431	**70°F**	92	800	82	12	**9,192**	**1.88**
	5°F	-8	6,083	6.0	75	1,390		96	800	84	14	**10,826**	**2.28**
	15°F	0	7,873	6.3	75	1,397		100	800	86	16	**12,641**	**2.65**
	25°F	8	9,681	6.6	75	1,438		104	800	88	18	**14,590**	**2.97**
	35°F	16	11,769	6.9	75	1,486		108	800	91	21	**16,842**	**3.32**
	45°F	25	14,092	7.2	75	1,522		112	800	94	24	**19,288**	**3.71**
	55°F	32	16,505	7.6	75	1,572		116	800	97	27	**21,871**	**4.08**
	65°F	40	18,938	7.9	75	1,635		120	800	101	31	**24,517**	**4.39**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Evap. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Latent (Btu/hr)	Sensible (Btu/hr)	Cooling (Btu/hr)	EER
COOLING	**50°F**	62	30,669	3.7	70	1,147	**80°F**	46	800	57	23	8,049	18,514	**26,563**	**23.2**
	60°F	72	29,705	4.4	70	1,227		47	800	58	22	7,674	17,653	**25,327**	**20.6**
	70°F	83	28,844	5.1	70	1,347		47	800	59	21	7,289	16,767	**24,056**	**17.9**
	80°F	93	27,906	5.7	70	1,475		47	800	60	20	6,872	15,807	**22,679**	**15.4**
	90°F	104	27,081	6.5	70	1,641		48	800	61	19	6,362	14,916	**21,278**	**13.0**
	100°F	114	26,185	7.3	70	1,814		48	800	63	17	5,917	13,873	**19,791**	**10.9**
	110°F	125	25,358	8.4	70	2,027		49	800	64	16	5,454	12,786	**18,239**	**9.0**
	120°F	136	24,587	9.8	70	2,264		49	800	65	15	4,981	11,677	**16,658**	**7.4**

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	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (W)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Cond. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Heating (W)	COP_H
HEATING	**-21°C**	-26.6	1,263	5.7	75	1,431	**21°C**	33.3	378	27.5	6.4	**2,693**	**1.88**
	-15°C	-22.2	1,782	6.0	75	1,390		35.6	378	28.6	7.5	**3,172**	**2.28**
	-9°C	-17.8	2,307	6.3	75	1,397		37.8	378	29.9	8.8	**3,704**	**2.65**
	-4°C	-13.5	2,837	6.6	75	1,438		40.0	378	31.2	10.1	**4,275**	**2.97**
	2°C	-8.9	3,448	6.9	75	1,486		42.2	378	32.8	11.7	**4,935**	**3.32**
	7°C	-4.0	4,129	7.2	75	1,522		44.4	378	34.5	13.4	**5,651**	**3.71**
	13°C	0.2	4,836	7.6	75	1,572		46.7	378	36.3	15.2	**6,408**	**4.08**
	18°C	4.5	5,549	7.9	75	1,635		48.9	378	38.1	17.0	**7,183**	**4.39**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (W)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Evap. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Latent (W)	Sensible (W)	Cooling (W)	COP_C
COOLING	**10°C**	16.7	8,986	3.7	70	1,147	**27°C**	7.8	378	13.8	12.9	2,358	5,425	**7,783**	**6.79**
	16°C	22.2	8,704	4.4	70	1,227		8.1	378	14.4	12.3	2,249	5,172	**7,421**	**6.05**
	21°C	28.3	8,451	5.1	70	1,347		8.3	378	15.0	11.6	2,136	4,913	**7,048**	**5.23**
	27°C	33.9	8,176	5.7	70	1,475		8.5	378	15.7	11.0	2,013	4,632	**6,645**	**4.50**
	32°C	40.0	7,935	6.5	70	1,641		8.7	378	16.3	10.4	1,864	4,370	**6,234**	**3.80**
	38°C	45.6	7,672	7.3	70	1,814		8.9	378	17.0	9.6	1,734	4,065	**5,799**	**3.20**
	43°C	51.7	7,430	8.4	70	2,027		9.2	378	17.8	8.9	1,598	3,746	**5,344**	**2.64**
	49°C	57.8	7,204	9.8	70	2,264		9.4	378	18.6	8.1	1,459	3,421	**4,881**	**2.16**

Air Heating/Cooling Performance

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ATA-45-HACW-P-1T *R410a, 60 Hz, ZPS30K5E-PFV*

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	**EAT**	Cond. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	**Heating** (Btu/hr)	**COP_H**
HEATING	**-5°F**	-16	6,563	8.3	175	2,109	**70°F**	92	1,200	82	12	**13,763**	**1.91**
	5°F	-8	9,208	8.7	175	2,073		96	1,200	84	14	**16,282**	**2.30**
	15°F	0	11,862	9.2	175	2,097		100	1,200	86	16	**19,018**	**2.66**
	25°F	8	14,780	9.7	175	2,164		104	1,200	89	19	**22,167**	**3.00**
	35°F	16	17,901	10.2	175	2,241		108	1,200	91	21	**25,548**	**3.34**
	45°F	25	21,314	10.7	175	2,293		112	1,200	94	24	**29,141**	**3.72**
	55°F	32	24,824	11.2	175	2,365		116	1,200	97	27	**32,894**	**4.08**
	65°F	40	28,562	11.7	175	2,454		120	1,200	101	31	**36,936**	**4.41**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	**EAT**	Evap. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Latent (Btu/hr)	Sensible (Btu/hr)	**Cooling** (Btu/hr)	**EER**
COOLING	**50°F**	61	47,054	6.4	170	1,739	**80°F**	46	1,200	56	24	12,370	28,455	**40,825**	**23.5**
	60°F	71	45,268	6.8	170	1,852		47	1,200	58	23	11,712	26,941	**38,653**	**20.9**
	70°F	82	43,764	7.5	170	2,018		47	1,200	59	21	11,085	25,499	**36,583**	**18.1**
	80°F	92	42,248	8.3	170	2,191		47	1,200	60	20	10,446	24,030	**34,476**	**15.7**
	90°F	103	41,028	9.4	170	2,456		48	1,200	61	19	9,679	22,691	**32,370**	**13.2**
	100°F	113	39,667	10.6	170	2,703		48	1,200	62	18	9,020	21,147	**30,167**	**11.2**
	110°F	124	38,322	12.2	170	2,993		49	1,200	64	16	8,322	19,510	**27,832**	**9.3**
	120°F	135	36,960	14.1	170	3,319		49	1,200	65	15	7,581	17,774	**25,356**	**7.6**

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	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (W)	Compressor Current (A)	Fan (W)	Input Power (W)	**EAT**	Cond. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	**Heating** (W)	**COP_H**
HEATING	**-21°C**	-26.7	1,923	8.3	175	2,109	**21°C**	33.3	566	27.5	6.4	**4,032**	**1.91**
	-15°C	-22.2	2,698	8.7	175	2,073		35.6	566	28.6	7.5	**4,770**	**2.30**
	-9°C	-17.8	3,475	9.2	175	2,097		37.8	566	29.9	8.8	**5,572**	**2.66**
	-4°C	-13.4	4,331	9.7	175	2,164		40.0	566	31.4	10.3	**6,495**	**3.00**
	2°C	-8.8	5,245	10.2	175	2,241		42.2	566	32.9	11.8	**7,486**	**3.34**
	7°C	-3.9	6,245	10.7	175	2,293		44.4	566	34.6	13.5	**8,538**	**3.72**
	13°C	0.2	7,273	11.2	175	2,365		46.7	566	36.3	15.2	**9,638**	**4.08**
	18°C	4.6	8,368	11.7	175	2,454		48.9	566	38.2	17.1	**10,822**	**4.41**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (W)	Compressor Current (A)	Fan (W)	Input Power (W)	**EAT**	Evap. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Latent (W)	Sensible (W)	**Cooling** (W)	**COP_C**
COOLING	**10°C**	16.1	13,787	6.4	170	1,739	**27°C**	7.9	566	13.5	13.2	3,624	8,337	**11,962**	**6.88**
	16°C	21.7	13,263	6.8	170	1,852		8.1	566	14.2	12.5	3,432	7,894	**11,325**	**6.11**
	21°C	27.8	12,823	7.5	170	2,018		8.3	566	14.9	11.8	3,248	7,471	**10,719**	**5.31**
	27°C	33.3	12,379	8.3	170	2,191		8.6	566	15.5	11.1	3,061	7,041	**10,101**	**4.61**
	32°C	39.4	12,021	9.4	170	2,456		8.8	566	16.2	10.5	2,836	6,649	**9,484**	**3.86**
	38°C	45.0	11,622	10.6	170	2,703		9.0	566	16.9	9.8	2,643	6,196	**8,839**	**3.27**
	43°C	51.1	11,228	12.2	170	2,993		9.2	566	17.6	9.0	2,438	5,716	**8,155**	**2.72**
	49°C	57.2	10,829	14.1	170	3,319		9.4	566	18.4	8.2	2,221	5,208	**7,429**	**2.24**

Air Heating/Cooling Performance

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ATA-55-HACW-P-1T *R410a, 60 Hz, ZPS40K5E-PFV*

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Cond. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Heating (Btu/hr)	COP_H
HEATING	**-5°F**	-17	7,655	12.1	185	2,552	**70°F**	91	1,500	81	11	**16,367**	**1.88**
	5°F	-8	11,495	12.6	185	2,651		95	1,500	84	14	**20,542**	**2.27**
	15°F	0	15,352	13.1	185	2,765		99	1,500	87	17	**24,789**	**2.63**
	25°F	8	19,493	13.7	185	2,891		103	1,500	90	20	**29,359**	**2.98**
	35°F	17	23,987	14.3	185	3,028		107	1,500	93	23	**34,321**	**3.32**
	45°F	25	29,148	14.9	185	3,114		111	1,500	97	27	**39,777**	**3.74**
	55°F	33	34,697	15.5	185	3,241		115	1,500	101	31	**45,758**	**4.14**
	65°F	41	40,532	16.1	185	3,368		119	1,500	105	35	**52,027**	**4.53**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Evap. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Latent (Btu/hr)	Sensible (Btu/hr)	Cooling (Btu/hr)	EER
COOLING	**50°F**	62	58,709	8.7	195	2,164	**80°F**	46	1,500	56	24	15,432	35,499	**50,931**	**23.5**
	60°F	72	57,478	9.4	195	2,367		46	1,500	57	23	14,849	34,157	**49,006**	**20.7**
	70°F	83	56,122	10.5	195	2,613		46	1,500	58	22	14,184	32,627	**46,811**	**17.9**
	80°F	93	54,638	11.8	195	2,853		47	1,500	59	21	13,486	31,022	**44,508**	**15.6**
	90°F	104	53,224	13.4	195	3,194		47	1,500	60	20	12,535	29,388	**41,923**	**13.1**
	100°F	114	51,622	15.0	195	3,538		48	1,500	62	18	11,705	27,442	**39,146**	**11.1**
	110°F	125	50,123	17.2	195	3,968		48	1,500	63	17	10,818	25,362	**36,180**	**9.1**
	120°F	135	48,394	19.4	195	4,383		48	1,500	65	15	9,878	23,159	**33,037**	**7.5**

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	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (W)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Cond. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Heating (W)	COP_H
HEATING	**-21°C**	-26.9	2,243	12.1	185	2,552	**21°C**	32.8	708	27.2	6.1	**4,795**	**1.88**
	-15°C	-22.3	3,368	12.6	185	2,651		35.0	708	28.7	7.6	**6,019**	**2.27**
	-9°C	-17.8	4,498	13.1	185	2,765		37.2	708	30.3	9.2	**7,263**	**2.63**
	-4°C	-13.3	5,711	13.7	185	2,891		39.4	708	32.0	10.9	**8,602**	**2.98**
	2°C	-8.6	7,028	14.3	185	3,028		41.7	708	33.8	12.7	**10,056**	**3.32**
	7°C	-3.9	8,540	14.9	185	3,114		43.9	708	35.8	14.7	**11,654**	**3.74**
	13°C	0.7	10,166	15.5	185	3,241		46.1	708	38.1	16.9	**13,407**	**4.14**
	18°C	4.9	11,876	16.1	185	3,368		48.3	708	40.4	19.3	**15,244**	**4.53**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (W)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Evap. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Latent (W)	Sensible (W)	Cooling (W)	COP_C
COOLING	**10°C**	16.7	17,202	8.7	195	2,164	**27°C**	7.6	708	13.5	13.1	4,522	10,401	**14,923**	**6.90**
	16°C	22.2	16,841	9.4	195	2,367		7.8	708	14.0	12.7	4,351	10,008	**14,359**	**6.07**
	21°C	28.3	16,444	10.5	195	2,613		8.0	708	14.6	12.1	4,156	9,560	**13,715**	**5.25**
	27°C	33.9	16,009	11.8	195	2,853		8.2	708	15.2	11.5	3,951	9,089	**13,041**	**4.57**
	32°C	40.0	15,594	13.4	195	3,194		8.4	708	15.8	10.9	3,673	8,611	**12,283**	**3.85**
	38°C	45.6	15,125	15.0	195	3,538		8.7	708	16.5	10.2	3,429	8,040	**11,470**	**3.24**
	43°C	51.7	14,686	17.2	195	3,968		8.9	708	17.3	9.4	3,170	7,431	**10,601**	**2.67**
	49°C	57.2	14,179	19.4	195	4,383		9.1	708	18.1	8.6	2,894	6,785	**9,680**	**2.21**

Air Heating/Cooling Performance

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ATA-65-HACW-P-1T *R410a, 60 Hz, ZPS51K5E-PFV*

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Cond. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Heating (Btu/hr)	COP_H
HEATING	**-5°F**	-17	10,119	15.3	300	3,456	**70°F**	91	1,900	82	12	**21,916**	**1.86**
	5°F	-8	14,899	15.6	300	3,467		95	1,900	84	14	**26,734**	**2.26**
	15°F	0	19,721	16.2	300	3,563		99	1,900	87	17	**31,882**	**2.62**
	25°F	8	24,813	16.8	300	3,681		103	1,900	90	20	**37,378**	**2.97**
	35°F	17	30,197	17.5	300	3,812		107	1,900	93	23	**43,209**	**3.32**
	45°F	25	36,696	18.3	300	3,953		111	1,900	96	26	**50,188**	**3.72**
	55°F	34	43,231	19.1	300	4,122		115	1,900	100	30	**57,299**	**4.07**
	65°F	42	49,827	20.0	300	4,300		119	1,900	104	34	**64,503**	**4.40**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Evap. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Latent (Btu/hr)	Sensible (Btu/hr)	Cooling (Btu/hr)	EER
COOLING	**50°F**	62	75,605	11.5	325	2,827	**80°F**	46	1,900	56	24	19,831	45,618	**65,449**	**23.2**
	60°F	72	73,150	12.3	325	3,038		46	1,900	57	23	18,869	43,404	**62,272**	**20.5**
	70°F	83	71,046	13.5	325	3,339		46	1,900	58	22	17,920	41,222	**59,142**	**17.7**
	80°F	93	68,938	14.9	325	3,640		47	1,900	60	21	16,970	39,037	**56,008**	**15.4**
	90°F	104	67,066	16.8	325	4,050		47	1,900	61	20	15,773	36,980	**52,753**	**13.0**
	100°F	114	65,053	18.8	325	4,469		48	1,900	62	18	14,743	34,566	**49,309**	**11.0**
	110°F	125	63,253	21.4	325	5,009		48	1,900	63	17	13,654	32,011	**45,664**	**9.1**
	120°F	135	61,121	24.1	325	5,549		48	1,900	65	15	12,465	29,225	**41,690**	**7.5**

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	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (W)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Cond. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Heating (W)	COP_H
HEATING	**-21°C**	-26.9	2,965	15.3	300	3,456	**21°C**	32.8	900	27.5	6.4	**6,421**	**1.86**
	-15°C	-22.3	4,365	15.6	300	3,467		35.0	900	28.9	7.8	**7,833**	**2.26**
	-9°C	-17.8	5,778	16.2	300	3,563		37.2	900	30.4	9.3	**9,341**	**2.62**
	-4°C	-13.3	7,270	16.8	300	3,681		39.4	900	32.0	10.9	**10,952**	**2.97**
	2°C	-8.6	8,848	17.5	300	3,812		41.7	900	33.7	12.6	**12,660**	**3.32**
	7°C	-3.9	10,752	18.3	300	3,953		43.9	900	35.8	14.7	**14,705**	**3.72**
	13°C	0.9	12,666	19.1	300	4,122		46.1	900	37.9	16.8	**16,788**	**4.07**
	18°C	5.3	14,599	20.0	300	4,300		48.3	900	40.0	18.9	**18,899**	**4.40**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (W)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT	Evap. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Latent (W)	Sensible (W)	Cooling (W)	COP_C
COOLING	**10°C**	16.7	22,152	11.5	325	2,827	**27°C**	7.6	900	13.3	13.3	5,810	13,366	**19,176**	**6.78**
	16°C	22.2	21,433	12.3	325	3,038		7.8	900	14.0	12.7	5,528	12,717	**18,246**	**6.01**
	21°C	28.3	20,816	13.5	325	3,339		8.0	900	14.6	12.1	5,251	12,078	**17,328**	**5.19**
	27°C	33.9	20,199	14.9	325	3,640		8.2	900	15.3	11.4	4,972	11,438	**16,410**	**4.51**
	32°C	40.0	19,650	16.8	325	4,050		8.4	900	15.9	10.8	4,622	10,835	**15,457**	**3.82**
	38°C	45.6	19,060	18.8	325	4,469		8.7	900	16.6	10.1	4,320	10,128	**14,447**	**3.23**
	43°C	51.7	18,533	21.4	325	5,009		8.9	900	17.3	9.4	4,000	9,379	**13,379**	**2.67**
	49°C	57.2	17,908	24.1	325	5,549		9.1	900	18.1	8.5	3,652	8,563	**12,215**	**2.20**

Air Heating/Cooling Performance

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ATA-75-HACW-P-1T *R410a, 60 Hz, ZPS60K5E-PFV*

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	**EAT**	Cond. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	**Heating** (Btu/hr)	**COP_H**
HEATING	**-5°F**	-17	12,161	18.6	410	4,028	**70°F**	92	2,100	82	12	**25,910**	**1.88**
	5°F	-8	17,560	19.4	410	4,159		96	2,100	85	15	**31,754**	**2.24**
	15°F	0	23,143	20.2	410	4,293		100	2,100	88	18	**37,797**	**2.58**
	25°F	8	29,197	21.1	410	4,387		104	2,100	91	21	**44,171**	**2.95**
	35°F	17	35,401	21.9	410	4,486		108	2,100	94	24	**50,710**	**3.31**
	45°F	25	42,073	22.8	410	4,552		112	2,100	97	27	**57,608**	**3.71**
	55°F	34	48,649	23.7	410	4,657		116	2,100	101	31	**64,544**	**4.06**
	65°F	42	55,597	24.6	410	4,807		120	2,100	104	34	**72,005**	**4.39**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	**EAT**	Evap. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Latent (Btu/hr)	Sensible (Btu/hr)	**Cooling** (Btu/hr)	**EER**
COOLING	**50°F**	63	88,261	14.0	450	3,311	**80°F**	46	2,100	55	25	23,167	53,291	**76,458**	**23.1**
	60°F	73	85,697	15.5	450	3,593		46	2,100	56	24	22,098	50,834	**72,932**	**20.3**
	70°F	83	83,316	17.0	450	3,984		46	2,100	57	23	20,973	48,244	**69,217**	**17.4**
	80°F	93	80,444	18.7	450	4,290		47	2,100	58	22	19,786	45,514	**65,300**	**15.2**
	90°F	104	77,778	20.8	450	4,733		47	2,100	60	20	18,261	42,813	**61,074**	**12.9**
	100°F	114	74,910	23.0	450	5,194		47	2,100	61	19	16,933	39,699	**56,632**	**10.9**
	110°F	124	72,324	25.6	450	5,801		47	2,100	63	17	15,541	36,435	**51,976**	**9.0**
	120°F	134	69,726	28.6	450	6,447		47	2,100	64	16	14,105	33,068	**47,173**	**7.3**

METRIC

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air)*						
	Outdoor Air Temperature	Evaporating Temperature	Heat Absorbed (W)	Compressor Current (A)	Fan (W)	Input Power (W)	**EAT**	Cond. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	**Heating** (W)	**COP_H**
HEATING	**-21°C**	-27.1	3,563	18.6	410	4,028	**21°C**	33.3	990	28.0	6.9	**7,592**	**1.88**
	-15°C	-22.4	5,145	19.4	410	4,159		35.6	990	29.5	8.4	**9,304**	**2.24**
	-9°C	-17.8	6,781	20.2	410	4,293		37.8	990	31.1	10.0	**11,074**	**2.58**
	-4°C	-13.2	8,555	21.1	410	4,387		40.0	990	32.8	11.7	**12,942**	**2.95**
	2°C	-8.6	10,372	21.9	410	4,486		42.2	990	34.5	13.4	**14,858**	**3.31**
	7°C	-3.8	12,327	22.8	410	4,552		44.4	990	36.4	15.2	**16,879**	**3.71**
	13°C	0.9	14,254	23.7	410	4,657		46.7	990	38.2	17.1	**18,911**	**4.06**
	18°C	5.8	16,290	24.6	410	4,807		48.9	990	40.2	19.0	**21,097**	**4.39**

	OUTDOOR LOOP *(Air)*			ELECTRICAL			INDOOR LOOP *(Air @ 50% RH)*								
	Outdoor Air Temperature	Condensing Temperature	Heat Rejected (W)	Compressor Current (A)	Fan (W)	Input Power (W)	**EAT**	Evap. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Latent (W)	Sensible (W)	**Cooling** (W)	**COP_C**
COOLING	**10°C**	17.2	25,860	14.0	450	3,311	**27°C**	7.8	990	12.6	14.1	6.788	15,614	**22,402**	**6.77**
	16°C	22.8	25,109	15.5	450	3,593		7.9	990	13.2	13.4	6,475	14,894	**21,369**	**5.95**
	21°C	28.3	24,411	17.0	450	3,984		8.0	990	13.9	12.8	6,145	14,135	**20,280**	**5.09**
	27°C	33.9	23,570	18.7	450	4,290		8.1	990	14.6	12.0	5,797	13,336	**19,133**	**4.46**
	32°C	40.0	22,789	20.8	450	4,733		8.2	990	15.3	11.3	5,350	12,544	**17,895**	**3.78**
	38°C	45.6	21,948	23.0	450	5,194		8.3	990	16.2	10.5	4,961	11,632	**16,593**	**3.19**
	43°C	51.1	21,191	25.6	450	5,801		8.4	990	17.0	9.6	4,553	10,675	**15,229**	**2.63**
	49°C	56.7	20,430	28.6	450	6,447		8.6	990	17.9	8.7	4,133	9,689	**13,822**	**2.14**

Electrical Specifications

TABLE 31 - ATA-Series Electrical Specifications ** equipped with K6E compressors where available*

	Code	Power Supply			Compressor		Indoor Fan	Outdoor Unit	FLA	MCA	Max. Breaker	Min. Wire
		V-ø-Hz	MIN	MAX	RLA	LRA	Max A	Max A	Amps	Amps	Amps	ga
ATA-25	1	208/230-1-60	187	253	10.9	63	2.5	1.6	15.8	18.5	30	#10-2
	2	208-3-60	187	229	6.5	55	2.5	1.6	11.4	13.0	20	#12-3
	4	460-3-60	414	506	3.5	28	2.5	1.6	8.4	9.3	15	#14-4
	6	220-1-50	187	253	9.2	52	2.5	1.6	14.1	16.4	20	#12-2
	7	380-3-50	342	418	3.2	27	2.5	1.6	8.1	8.9	15	#14-4
ATA-45	1	208/230-1-60	187	253	14.1	84	3.5	1.6	20.0	23.5	30	#10-2
	2	208-3-60	187	229	9.6	74	3.5	1.6	15.5	17.9	30	#10-3
	4	460-3-60	414	506	5.1	37	3.5	1.6	11.0	12.3	15	#14-4
	6	220-1-50	187	253	12.4	67	3.5	1.6	18.3	21.4	30	#10-2
	7	380-3-50	342	418	4.9	37	3.5	1.6	10.8	12.0	15	#14-4
ATA-55	1	208/230-1-60	187	253	20.4	122	4.0	1.6	26.8	31.9	50	#8-2
	2	208-3-60	187	229	14.0	83	4.0	1.6	20.4	23.9	30	#10-3
	4	460-3-60	414	506	6.4	41	4.0	1.6	12.8	14.4	20	#12-4
	6	220-1-50	187	253	15.5	100	4.0	1.6	21.9	25.8	40	#8-2
	7	380-3-50	342	418	6.1	43	4.0	1.6	12.5	14.0	20	#12-4
ATA-65	1	208/230-1-60	187	253	22.8	147	5.5	3.0	32.1	37.8	60	#6-2
	2	208-3-60	187	229	16.5	110	5.5	3.0	25.8	29.9	40	#8-3
	4	460-3-60	414	506	7.2	52	5.5	3.0	15.1	16.9	20	#12-4
	6	220-1-50	187	253	21.5	126	5.5	3.0	30.8	36.2	50	#8-2
	7	380-3-50	342	418	6.9	52	5.5	3.0	16.2	17.9	20	#12-4
ATA-75	1	208/230-1-60	187	253	27.6	190	6.5	3.0	37.9	44.8	60	#6-2
	2	208-3-60	187	229	18.6	149	6.5	3.0	28.9	33.6	50	#8-3
	4	460-3-60	414	506	9.0	61	6.5	3.0	17.9	20.2	30	#10-4
	6	220-1-50	187	253	28.2	155	6.5	3.0	38.5	45.6	60	#6-2
	7	380-3-50	342	418	7.7	59	6.5	3.0	18.0	19.9	30	#10-4

TABLE 32 - Plenum Heater Electrical Specifications

Nominal (kW)	(230-1-60)					(208-1-60)					(220-1-50)				
	Actual (kW)	FLA (A)	MCA (A)	Breaker (A)	Wire Size	Actual (kW)	FLA (A)	MCA (A)	Breaker (A)	Wire Size	Actual (kW)	FLA (A)	MCA (A)	Breaker (A)	Wire Size
5	5	20.8	26.0	30	#10	3.8	18.1	22.6	30	#10	4.2	19.1	19.1	30	#10
7	7	29.2	36.5	40	#8	5.3	25.3	31.6	40	#8	5.9	26.7	26.7	40	#6
10	10	41.7	52.1	60	#6	7.5	36.1	45.1	50	#6	8.4	38.1	38.1	50	#6
15	15	62.5	78.1	80	#4	11.3	54.2	67.7	80	#4	12.6	57.2	57.2	80	#3
20	20	83.3	104.2	100	#3	15.0	72.2	90.3	100	#3	16.8	76.3	76.3	100	#3

Indoor Airflow Data

TABLE 33 - Indoor Airflow Range for STAGE 2 (Full Load)

Model Size	Nominal		Range		Airflow Reduction - 20%		Airflow Reduction - 15%		Airflow Reduction - 10%		Airflow Reduction - 5%	
	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*
25	750	*350*	600-900	*280-425*	600	*280*	640	*300*	680	*320*	710	*340*
45	1150	*540*	900-1400	*430-660*	920	*430*	980	*460*	1040	*490*	1090	*520*
55	1500	*710*	1200-1800	*570-850*	1200	*570*	1280	*600*	1350	*640*	1430	*670*
65	1900	*900*	1500-2300	*710-1090*	1520	*720*	1620	*760*	1710	*810*	1810	*850*
75	2200	*1040*	1750-2500	*830-1180*	1760	*830*	1870	*880*	1980	*940*	2090	*990*

TABLE 34 - Indoor Airflow Range for STAGE 1 (Part Load)

Model Size	Nominal		Range		Airflow Reduction - 20%		Airflow Reduction - 15%		Airflow Reduction - 10%		Airflow Reduction - 5%	
	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*
25	600	*280*	500-700	*240-330*	480	*230*	510	*240*	540	*250*	570	*270*
45	900	*430*	700-1100	*330-520*	720	*340*	770	*360*	810	*380*	860	*400*
55	1200	*570*	950-1450	*450-680*	960	*450*	1020	*480*	1080	*510*	1140	*540*
65	1500	*710*	1200-1800	*570-850*	1200	*570*	1280	*600*	1350	*640*	1430	*670*
75	1750	*830*	1400-2100	*660-990*	1400	*660*	1490	*700*	1580	*740*	1660	*790*

TABLE 35 - Indoor Airflow Range for STAGE 3 (Auxiliary)

Model Size	Nominal		Range		Airflow Reduction - 20%		Airflow Reduction - 15%		Airflow Reduction - 10%		Airflow Reduction - 5%	
	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*
25	750	*350*	600-900	*280-425*	600	*280*	640	*300*	680	*320*	710	*340*
45	1150	*540*	900-1400	*430-660*	920	*430*	980	*460*	1040	*490*	1090	*520*
55	1500	*710*	1200-1800	*570-850*	1200	*570*	1280	*600*	1350	*640*	1430	*670*
65	1900	*900*	1700-2300	*800-1090*	1520	*720*	1620	*760*	1710	*810*	1810	*850*
75	2200	*1040*	2000-2500	*940-1180*	1760	*830*	1870	*880*	1980	*940*	2090	*990*

TABLE 36 - Indoor Airflow Range for Fan Recirculation

Model Size	Nominal		Range		Airflow Reduction - 20%		Airflow Reduction - 15%		Airflow Reduction - 10%		Airflow Reduction - 5%	
	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*	cfm	*L/s*
25	425	*201*	325-525	*153-248*	340	*160*	360	*170*	380	*180*	400	*190*
45	650	*310*	500-800	*240-380*	520	*250*	550	*260*	590	*280*	620	*290*
55	850	*400*	700-1000	*330-470*	680	*320*	720	*340*	770	*360*	810	*380*
65	1100	*520*	900-1300	*430-610*	880	*420*	940	*440*	990	*470*	1050	*490*
75	1250	*590*	1000-1500	*470-710*	1000	*470*	1060	*500*	1130	*530*	1190	*560*

TABLE 37 - Indoor Airflow Range for Emergency Heat

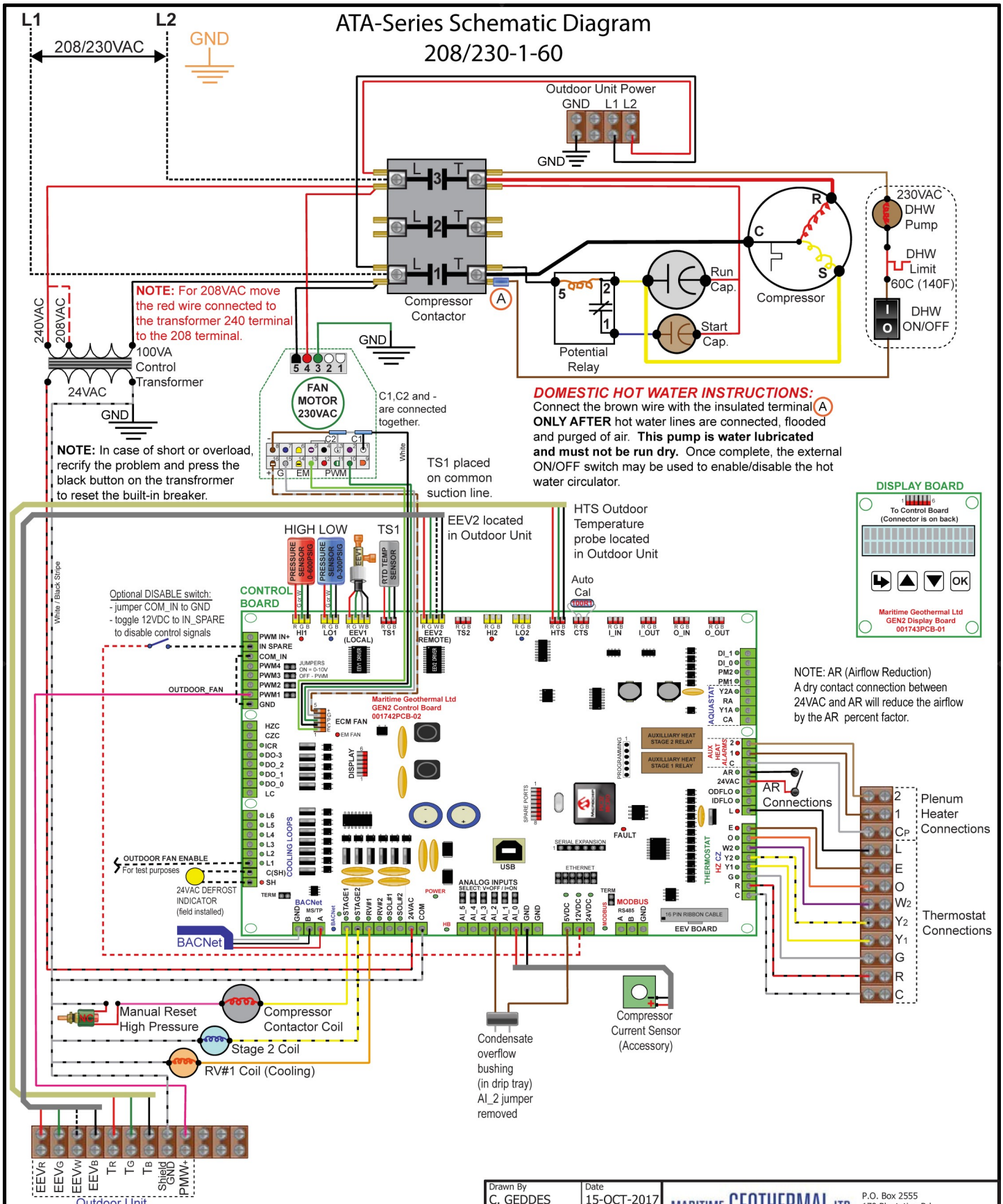
Model Size	cfm	*L/s*
25/45	1200	*566*
55/65/75	2000	*940*

Maximum external static pressure:
0.50in H_2O

To obtain the AR airflow values, use a dry contact to connect AR to 24VAC on the right side of control board.
Airflow reduction % is set through PC App.

TABLE 38 - Indoor Airflow Reduction for Outdoor Temperature

Outdoor Temperature		Airflow Reduction	Airflow
> 45°F	*> 7°C*	0%	100%
30 to 45°F	*-1 to 7°C*	-5%	95%
25 to 30°F	*-4 to -1°C*	-10%	90%
20 to 25°F	*-7 to -4°C*	-15%	85%
15 to 20°F	*-9 to -7°C*	-20%	80%
10 to 15°F	*-12 to -9°C*	-25%	75%
5 to 10°F	*-15 to -12°C*	-30%	70%
0 to 5°F	*-18 to -15°C*	-35%	65%
< 0°F	*< -18°C*	-40%	60%



03	000292	D. RHEAULT	D. RHEAULT	15-OCT-2021
02	-	D. RHEAULT	D. RHEAULT	10-FEB-2020
01	Initial Release	C. GEDDES	C. GEDDES	15-OCT-2017
REV	ECO#	IMPL BY	APVD BY	DATE

Drawn By	C. GEDDES	Date	15-OCT-2017
Checked By	C. GEDDES	Date	15-OCT-2017
Eng. Approved By	C. GEDDES	Date	15-OCT-2017
Mfg. Approved By		Date	
Approved By		Date	

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Petitcodiac, NB CANADA E4Z 6H4

Drawing Name
ATA-**-HACW-P-1*-SDE*F
Schematic Diagram

Size	Drawing Number	Drawing Rev	Sheet
LET	001971SCH	03	1 / 1

ATA-Series Electrical Box Diagram
208/230VAC Single Phase 60Hz

SYSTEM CONTROL DESCRIPTION

Sytem Control by BACNet or External Control Signals		
BACNet Object	External	Activation
SYSTEM_G	G	Fan Recirculation Mode
SYSTEM_Y1	Y1	Compressor Stage 1 (Air)
SYSTEM_Y2	Y2	Compressor Stage 2 (Air)
SYSTEM_W2	W2	Auxiliary Heat (Air)
SYSTEM_O	O	Air Heating (OFF) / Air Cooling (ON)

BACNet INTERFACE CONNECTIONS (MS/TP RS-485)

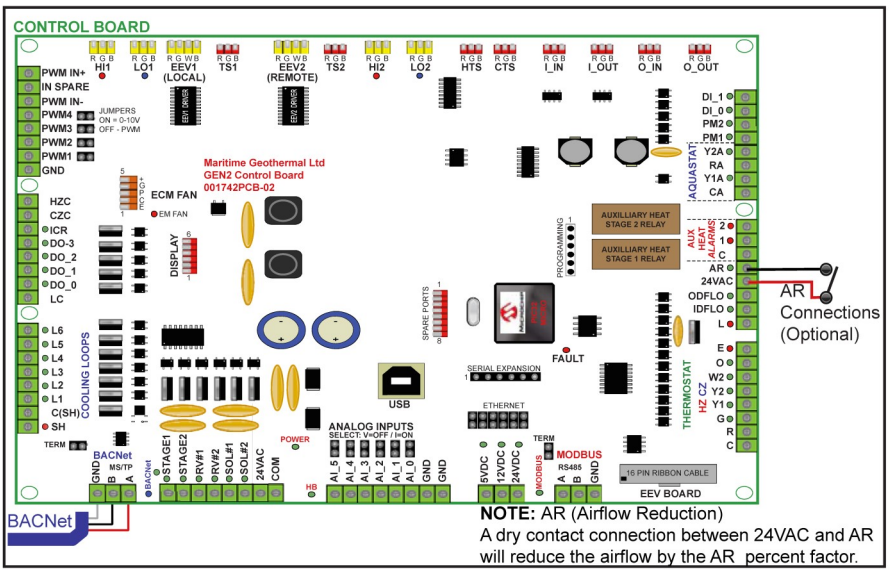
Use twisted pair shielded, conductor cable to connect the BACNet connections to the control board connector.
A - Communication (+)
B - Communication (-)
GND - Ground

OUTDOOR UNIT SIGNAL CONNECTIONS (24VAC)

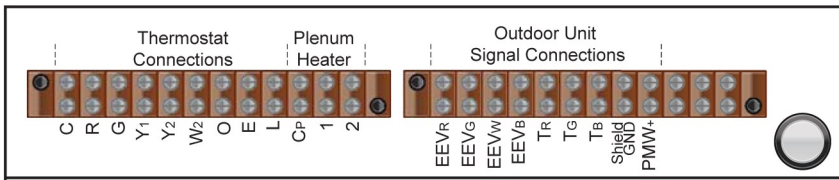
Use an 18-8 shielded cable to connect the Outdoor Unit Signal Connections to the matching Outdoor Unit Signal Connections in the heat pump electrical box. Connect the shield ground to the Shield Ground terminal.

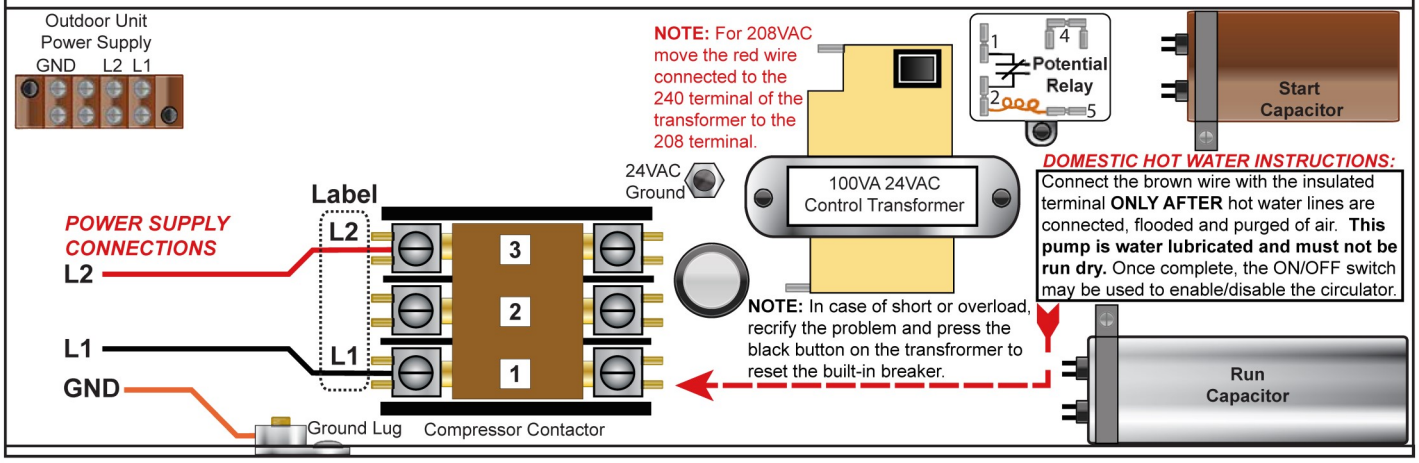
OUTDOOR UNIT POWER CONNECTIONS (230VAC)

Use a minimum of #14-2 outdoor rated cabling to connect the power supply of the outdoor unit to the matching terminals of the outdoor power supply terminal strip in the electrical box of the heat pump.



NOTE: AR (Airflow Reduction)
A dry contact connection between 24VAC and AR will reduce the airflow by the AR percent factor.





EXTERNAL AIR CONTROL CONNECTIONS (24VAC)

Use an 18 gauge thermostat wire to connect the thermostat to the heat pump terminal strip:

C - 24VAC Common
R - 24VAC Hot
G - Fan Recirculation Mode
Y1 - Compressor Stage1
Y2 - Compressor Stage2 (Two stage models only)
W2 - Auxiliary Heat (Air)
E - Emergency Heat (Air)
O - Cooling Mode (Active) - Heating Mode (Inactive)
L - Lockout indicator (24VAC when lockout occurs)

A dry contact connection between R and any external control connection (G, Y1, Y2, W2, E or O) will activate the external control signal input to the control board.

PLENUM HEATER CONTROL (24VAC)

Use an 18 gauge thermostat wire to connect the plenum heater to the heat pump terminal strip:

CP - 24VAC Common
1 - electric heat stage 1
2 - electric heat stage 2

208/230VAC CONNECTIONS		
Wire	Colour	Contactor (Label)
Line 2	Red	L2
Line 1	Black	L1
Connect "GND" to ground lug		

REV	ECO#	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	15-OCT-2017

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Eng. Approved By: C. GEDDES	Date: 15-OCT-2017	
Mfg. Approved By	Date	
Approved By	Date	

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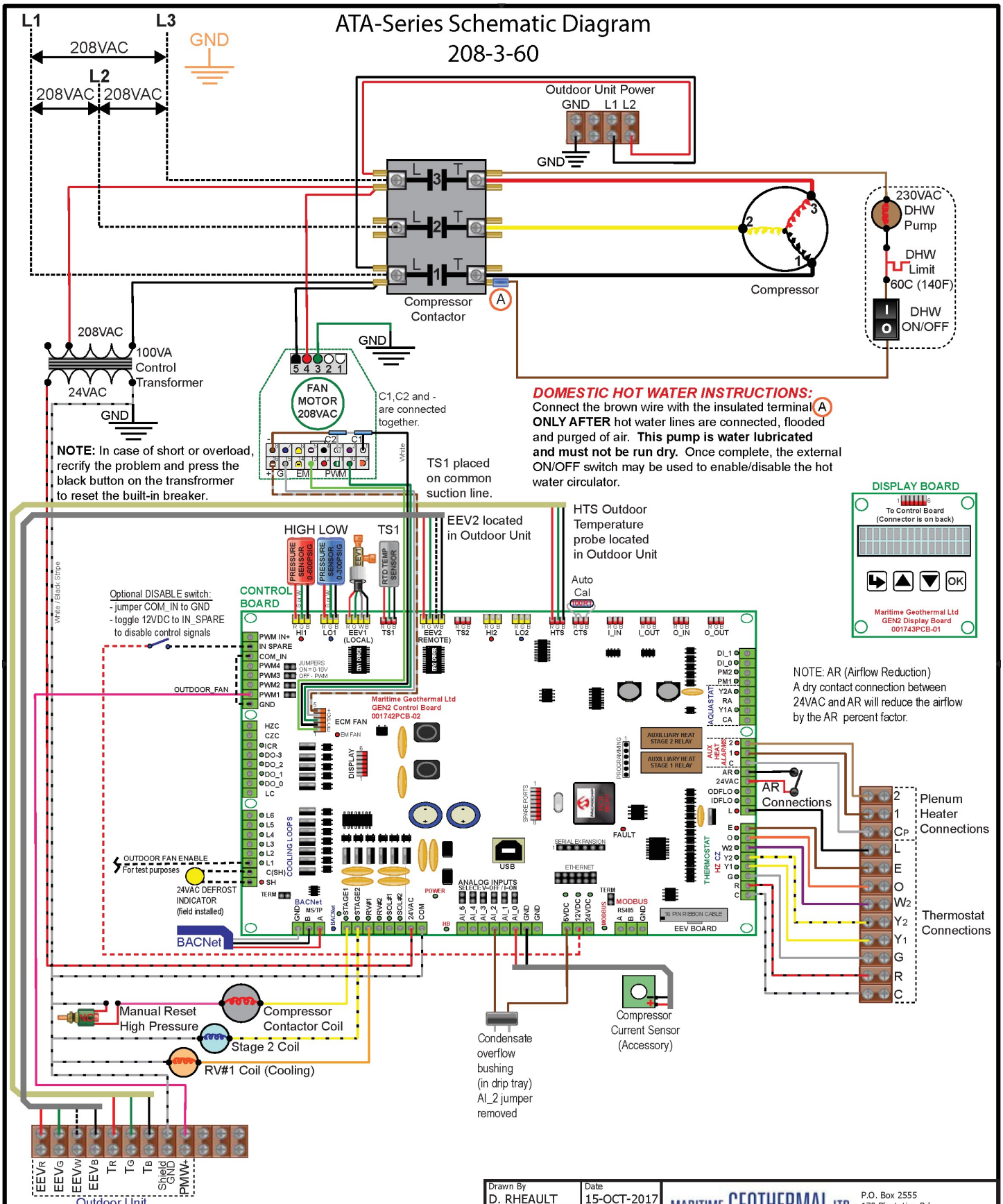
Drawing Name: ATA-**-HACW-P-1*-SDE*F Electrical Box Diagram

Size	Drawing Number	Drawing Rev	Sheet
LET	001972ELB	01	1 / 1

ATA-Series Schematic Diagram
208-3-60



REV	ECO#	IMPL BY	APVD BY	DATE
04	000296	D. RHEAULT	D. RHEAULT	1-JAN-2022
03	000292	D. RHEAULT	D. RHEAULT	15-OCT-2021
02	-	D. RHEAULT	D. RHEAULT	10-FEB-2020
01	Initial Release	D. RHEAULT	D. RHEAULT	15-OCT-2017

Drawn By	D. RHEAULT	Date 15-OCT-2017
Checked By	D. RHEAULT	Date 15-OCT-2017
Eng. Approved By	D. RHEAULT	Date 15-OCT-2017
Mfg. Approved By		Date
Approved By		Date

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Drawing Name: ATA-**-HACW-P-2*-SDE*F Schematic Diagram

Size	Drawing Number	Drawing Rev	Sheet
LET	001973SCH	04	1 / 1

ATA-Series Electrical Box Diagram
208VAC Three Phase 60Hz

SYSTEM CONTROL DESCRIPTION

Sytem Control by BACNet or External Control Signals		
BACNet Object	**External**	**Activation**
SYSTEM_G	G	Fan Recirculation Mode
SYSTEM_Y1	Y1	Compressor Stage 1 (Air)
SYSTEM_Y2	Y2	Compressor Stage 2 (Air)
SYSTEM_W2	W2	Auxiliary Heat (Air)
SYSTEM_O	O	Air Heating (OFF) / Air Cooling (ON)

BACNet INTERFACE CONNECTIONS (MS/TP RS-485)

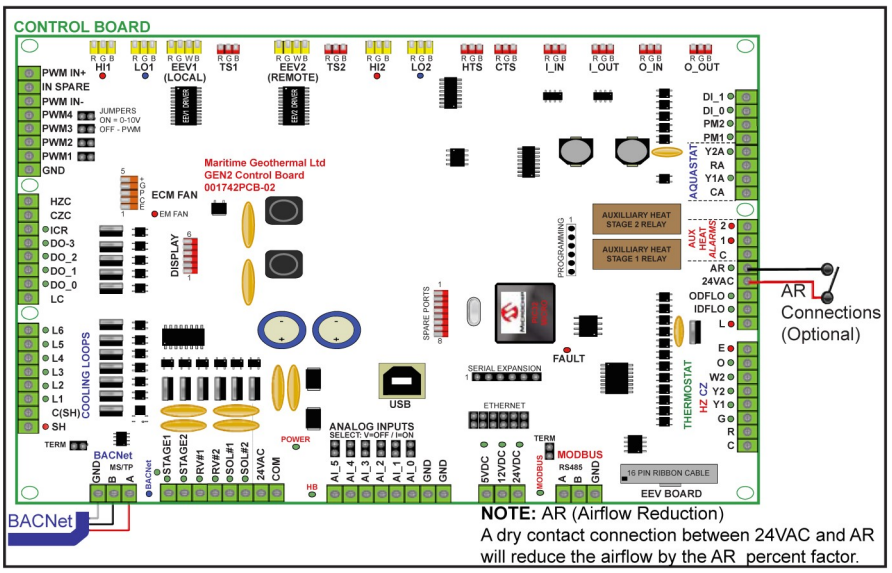
Use twisted pair shielded, conductor cable to connect the BACNet connections to the control board connector.
A - Communication (+)
B - Communication (-)
GND - Ground

OUTDOOR UNIT SIGNAL CONNECTIONS (24VAC)

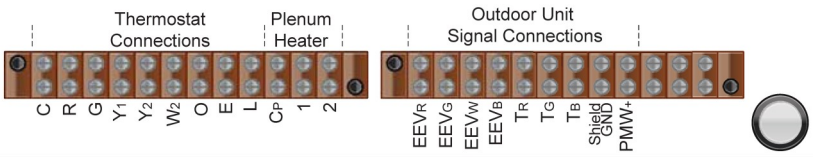
Use an 18-8 shielded cable to connect the Outdoor Unit Signal Connections to the matching Outdoor Unit Signal Connections in the heat pump electrical box. Connect the shield ground to the Shield Ground terminal.

OUTDOOR UNIT POWER CONNECTIONS (230VAC)

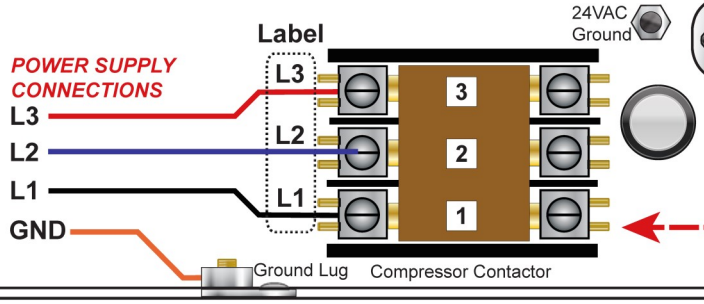
Use a minimum of #14-2 outdoor rated cabling to connect the power supply of the outdoor unit to the matching terminals of the outdoor power supply terminal strip in the electrical box of the heat pump.

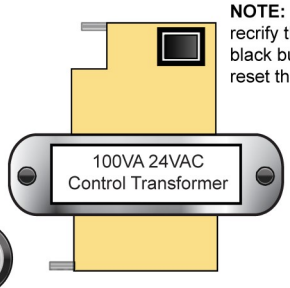


NOTE: AR (Airflow Reduction)
A dry contact connection between 24VAC and AR will reduce the airflow by the AR percent factor.



IMPORTANT NOTE FOR 3 PHASE POWER
If on initial startup the compressor is noisy and not pumping, reverse L1 and L2 supply wires.





NOTE: In case of short or overload, recrify the problem and press the black button on the transfrormer to reset the built-in breaker.

DOMESTIC HOT WATER INSTRUCTIONS:

Connect the brown wire with the insulated terminal **ONLY AFTER** hot water lines are connected, flooded and purged of air. **This pump is water lubricated and must not be run dry.** Once complete, the ON/OFF switch may be used to enable/disable the circulator.

EXTERNAL AIR CONTROL CONNECTIONS (24VAC)

Use an 18 gauge thermostat wire to connect the thermostat to the heat pump terminal strip:

C - 24VAC Common
R - 24VAC Hot
G - Fan Recirculation Mode
Y1 - Compressor Stage1
Y2 - Compressor Stage2 (Two stage models only)
W2 - Auxiliary Heat (Air)
E - Emergency Heat (Air)
O - Cooling Mode (Active) - Heating Mode (Inactive)
L - Lockout indicator (24VAC when lockout occurs)

A dry contact connection between R and any external control connection (G, Y1, Y2, W2, E or O) will activate the external control signal input to the control board.

PLENUM HEATER CONTROL (24VAC)

Use an 18 gauge thermostat wire to connect the plenum heater to the heat pump terminal strip:

CP - 24VAC Common
1 - electric heat stage 1
2 - electric heat stage 2

208VAC CONNECTIONS		
Wire	**Colour**	**Contactor (Label)**
Line 3	Red	L3
Line 2	Blue	L2
Line 1	Black	L1
Connect "GND" to ground lug		

REV	ECO#	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	15-OCT-2017

Drawn By C. GEDDES	Date 15-OCT-2017	
Checked By C. GEDDES	Date 15-OCT-2017	
Eng. Approved By C. GEDDES	Date 15-OCT-2017	
Mfg. Approved By	Date	
Approved By	Date	

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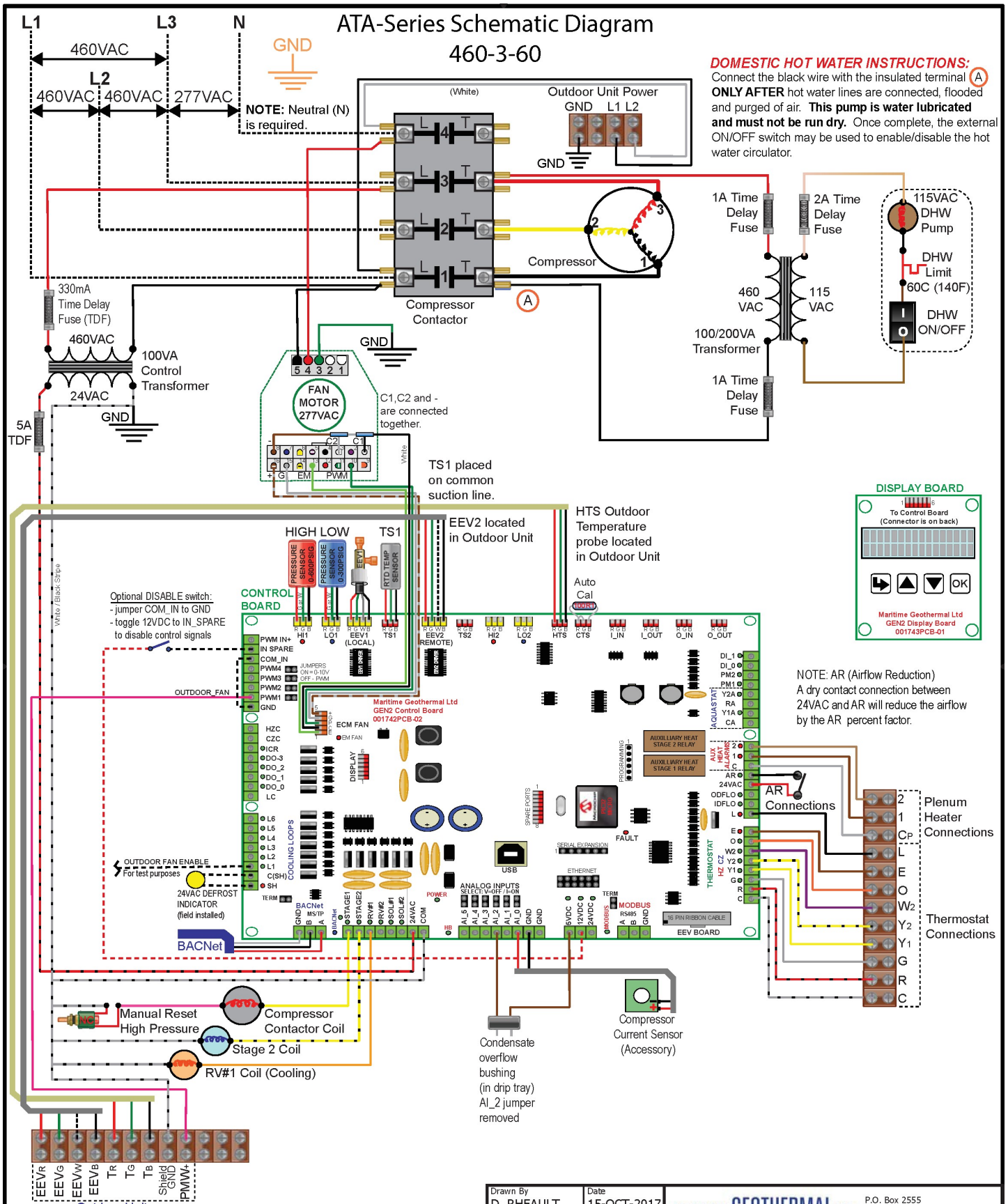
Drawing Name
ATA-**-HACW-P-2*-SDE*F
Electrical Box Diagram

Size	Drawing Number	Drawing Rev	Sheet
LET	001974ELB	01	1 / 1



REV	ECO#	IMPL BY	APVD BY	DATE
04	000296	D. RHEAULT	D. RHEAULT	1-JAN-2022
03	000292	D. RHEAULT	D. RHEAULT	15-OCT-2021
02	-	D. RHEAULT	D. RHEAULT	10-FEB-2020
01	Initial Release	D. RHEAULT	D. RHEAULT	15-OCT-2017

Drawn By D. RHEAULT	Date 15-OCT-2017	
Checked By D. RHEAULT	Date 15-OCT-2017	
Eng. Approved By D. RHEAULT	Date 15-OCT-2017	
Mfg. Approved By	Date	
Approved By	Date	

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Drawing Name
ATA-**-HACW-P-4*-SDE*F
Schematic Diagram

Size	Drawing Number	Drawing Rev	Sheet
LET	001975SCH	04	1 / 1

ATA-Series Electrical Box Diagram
460VAC Three Phase 60Hz

SYSTEM CONTROL DESCRIPTION

Sytem Control by BACNet or External Control Signals		
BACNet Object	**External**	**Activation**
SYSTEM_G	G	Fan Recirculation Mode
SYSTEM_Y1	Y1	Compressor Stage 1 (Air)
SYSTEM_Y2	Y2	Compressor Stage 2 (Air)
SYSTEM_W2	W2	Auxiliary Heat (Air)
SYSTEM_O	O	Air Heating (OFF) / Air Cooling (ON)

BACNet INTERFACE CONNECTIONS (MS/TP RS-485)

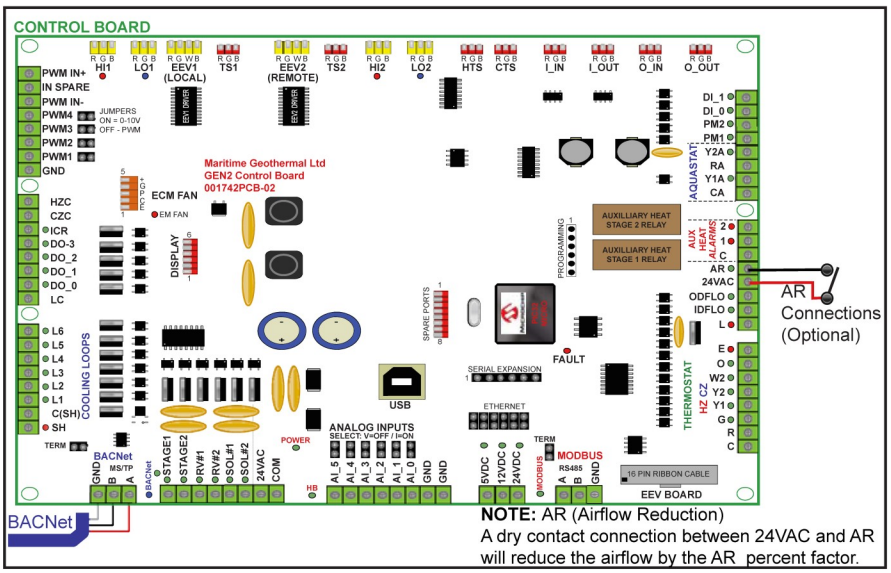
Use twisted pair shielded, conductor cable to connect the BACNet connections to the control board connector.
A - Communication (+)
B - Communication (-)
GND - Ground

OUTDOOR UNIT SIGNAL CONNECTIONS (24VAC)

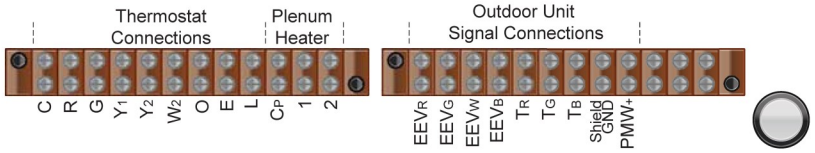
Use an 18-8 shielded cable to connect the Outdoor Unit Signal Connections to the matching Outdoor Unit Signal Connections in the heat pump electrical box. Connect the shield ground to the Shield Ground terminal.

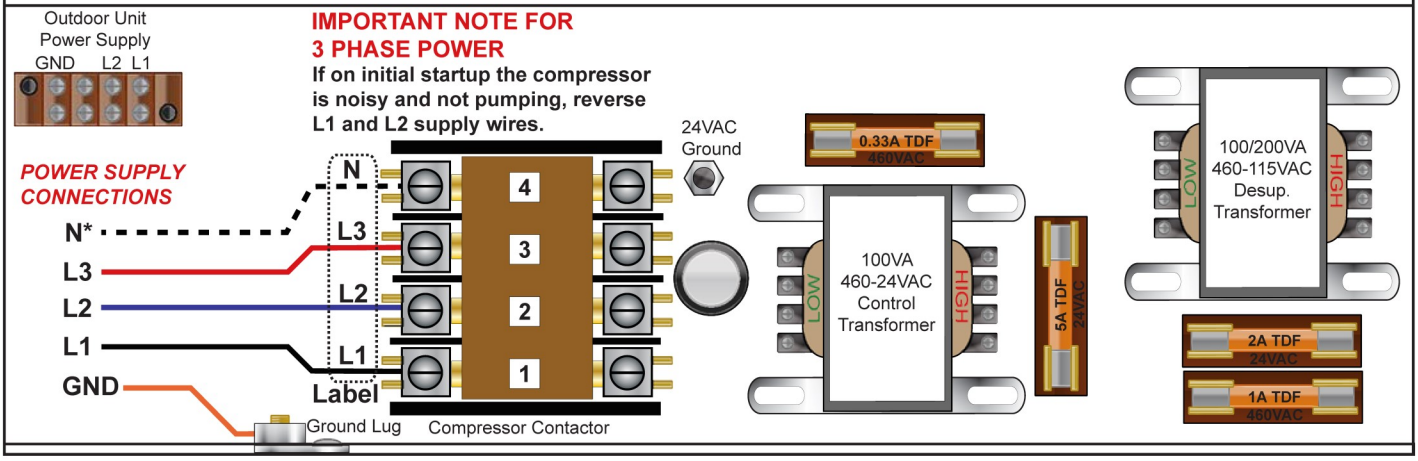
OUTDOOR UNIT POWER CONNECTIONS (230VAC)

Use a minimum of #14-2 outdoor rated cabling to connect the power supply of the outdoor unit to the matching terminals of the outdoor power supply terminal strip in the electrical box of the heat pump.



NOTE: AR (Airflow Reduction)
A dry contact connection between 24VAC and AR will reduce the airflow by the AR percent factor.





EXTERNAL AIR CONTROL CONNECTIONS (24VAC)

Use an 18 gauge thermostat wire to connect the thermostat to the heat pump terminal strip:

C - 24VAC Common
R - 24VAC Hot
G - Fan Recirculation Mode
Y1 - Compressor Stage1
Y2 - Compressor Stage2 (Two stage models only)
W2 - Auxiliary Heat (Air)
E - Emergency Heat (Air)
O - Cooling Mode (Active) - Heating Mode (Inactive)
L - Lockout indicator (24VAC when lockout occurs)

A dry contact connection between R and any external control connection (G, Y1, Y2, W2, E or O) will activate the external control signal input to the control board.

PLENUM HEATER CONTROL (24VAC)

Use an 18 gauge thermostat wire to connect the plenum heater to the heat pump terminal strip:

CP - 24VAC Common
1 - electric heat stage 1
2 - electric heat stage 2

460/277VAC CONNECTIONS		
Wire	**Colour**	**Contactor (Label)**
Neutral*	White	N*
Line 3	Red	L3
Line 2	Blue	L2
Line 1	Black	L1
Connect "GND" to ground lug		

*NOTE: Neutral (N) is required for heat pump operation.

REV	ECO#	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	15-OCT-2017

Drawn By: C. GEDDES	Date: 15-OCT-2017	
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Eng. Approved By: C. GEDDES	Date: 15-OCT-2017	
Mfg. Approved By	Date	
Approved By	Date	

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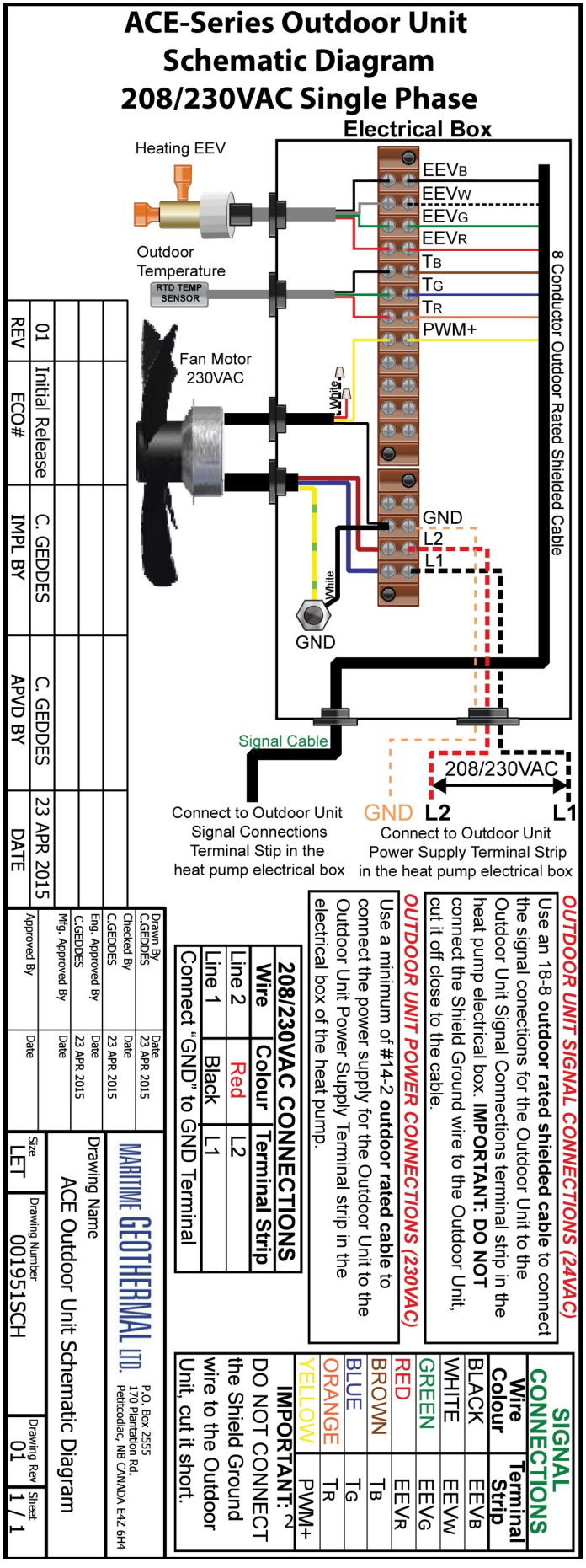
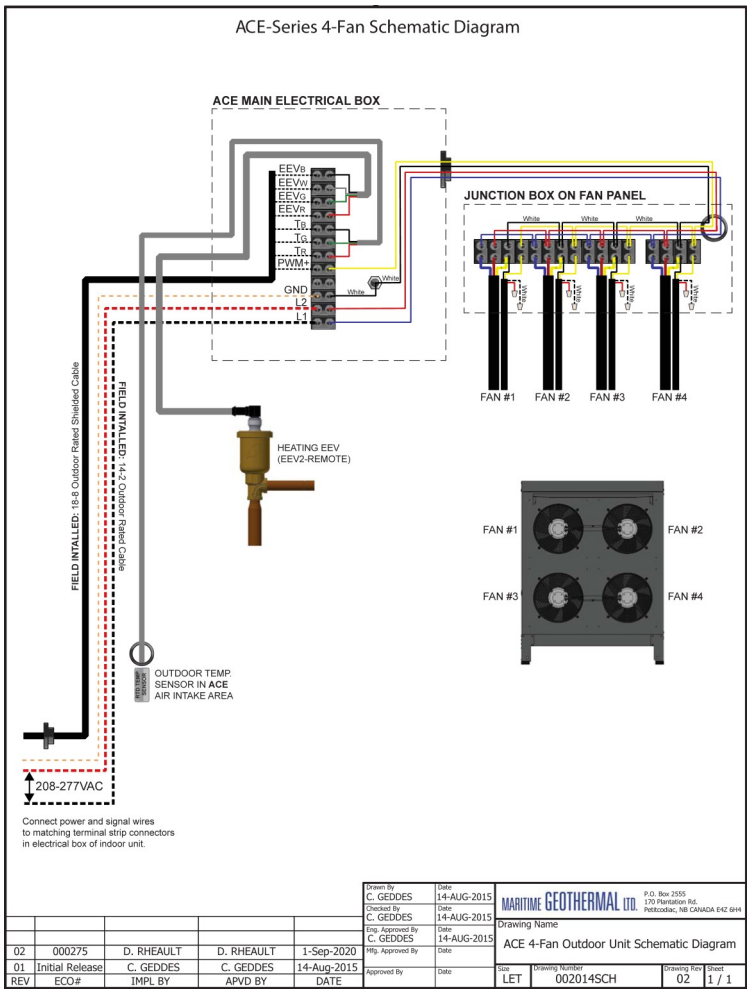
Drawing Name: ATA-**-HACW-P-4*-SDE*F Electrical Box Diagram

Size	Drawing Number	Drawing Rev	Sheet
LET	001976ELB	01	1 / 1

ACE-25/45/55 Wiring Diagram

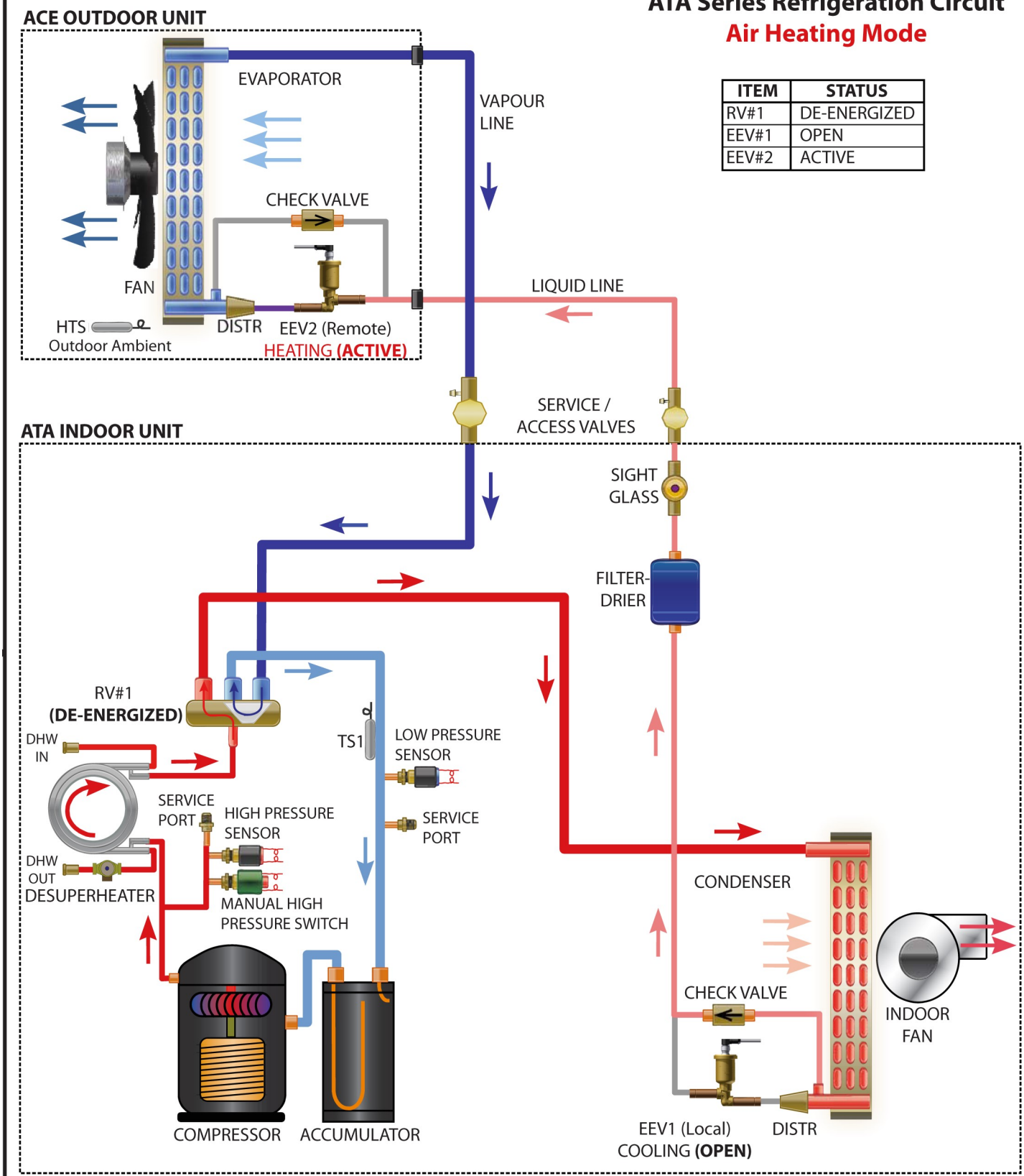


ACE-65/75 Wiring Diagram



ATA Series Refrigeration Circuit
Air Heating Mode

ITEM	STATUS
RV#1	DE-ENERGIZED
EEV#1	OPEN
EEV#2	ACTIVE



REV	ECO#	IMPL BY	APVD BY	DATE
01	Initial Release	C. GEDDES	C. GEDDES	16 JUL 2014

Drawn By C.GEDDES	Date 16 JUL 2014	
Checked By C.GEDDES	Date 16 JUL 2014	
Eng. Approved By C.GEDDES	Date 16 JUL 2014	
Mfg. Approved By	Date	
Approved By	Date	

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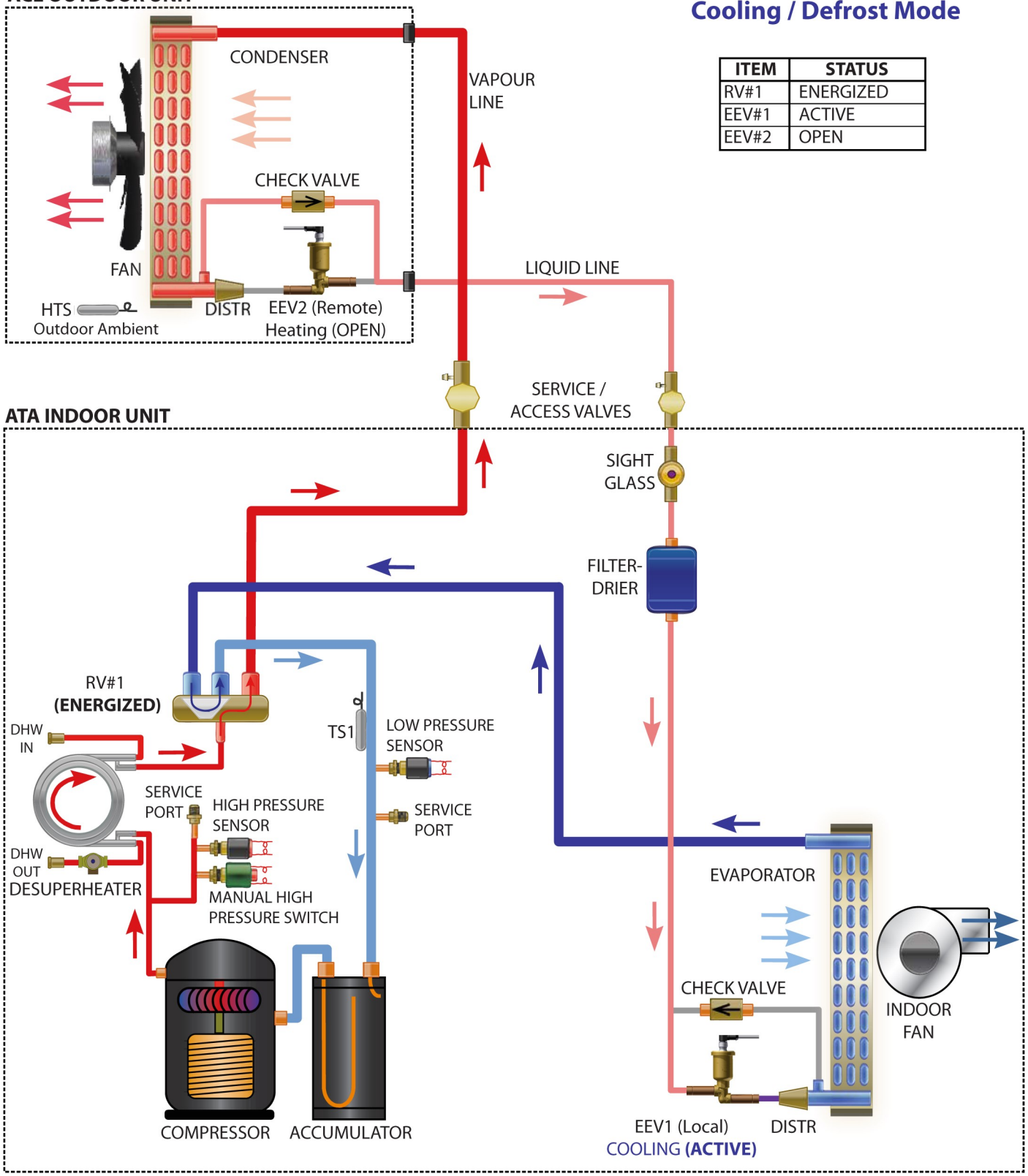
Drawing Name: ATA-Series Refrigeration Circuit Heating Mode

Size	Drawing Number	Drawing Revision	Sheet
LET	001842RCD	01	1 / 1

ATA Series Refrigeration Circuit
Cooling / Defrost Mode

ITEM	STATUS
RV#1	ENERGIZED
EEV#1	ACTIVE
EEV#2	OPEN



01	Initial Release	C. GEDDES	C. GEDDES	16 JUL 2014
REV	ECO#	IMPL BY	APVD BY	DATE

Drawn By C.GEDDES	Date 16 JUL 2014
Checked By C.GEDDES	Date 16 JUL 2014
Eng. Approved By C.GEDDES	Date 16 JUL 2014
Mfg. Approved By	Date
Approved By	Date

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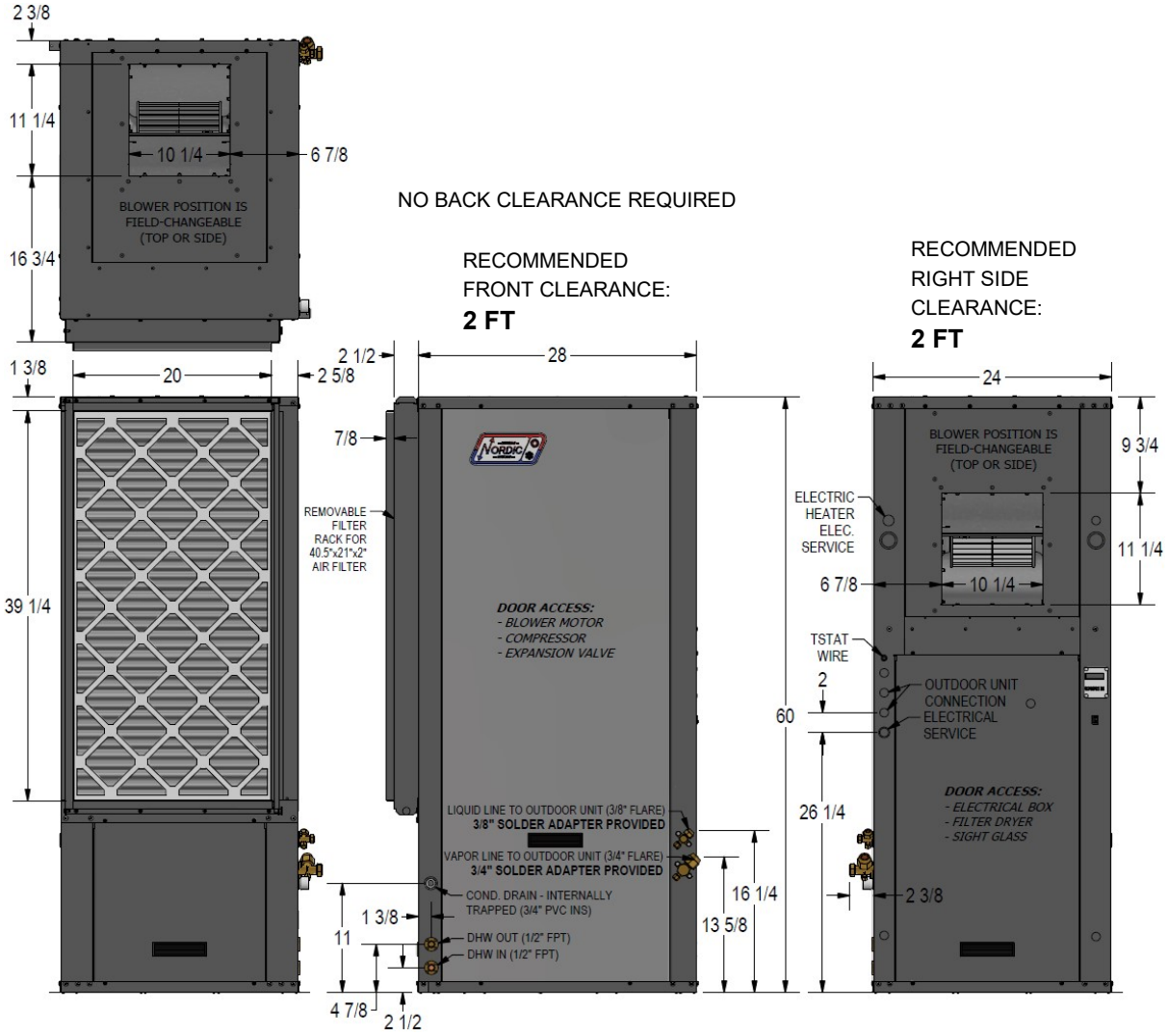
Drawing Name: ATA-Series Refrigeration Circuit Cooling / Defrost Mode

Size	Drawing Number	Drawing Revision	Sheet
LET	001843RCD	01	1 / 1

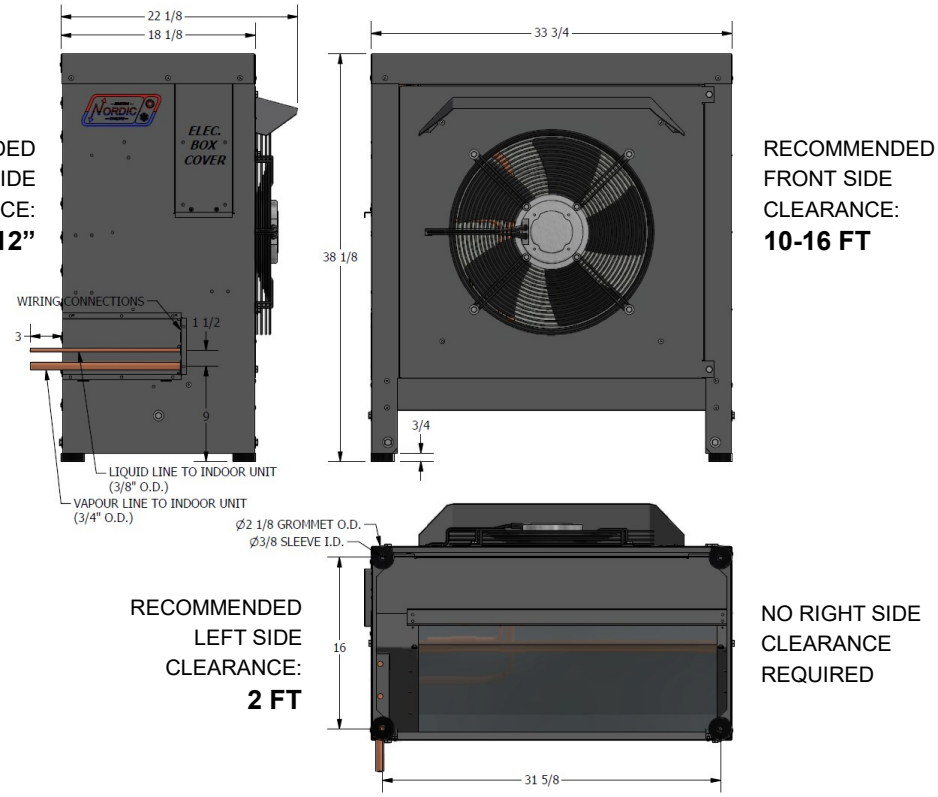
Dimensions: ATA-25/45 (with Left Return Indoor Unit)

All dimensions in inches

INDOOR UNIT



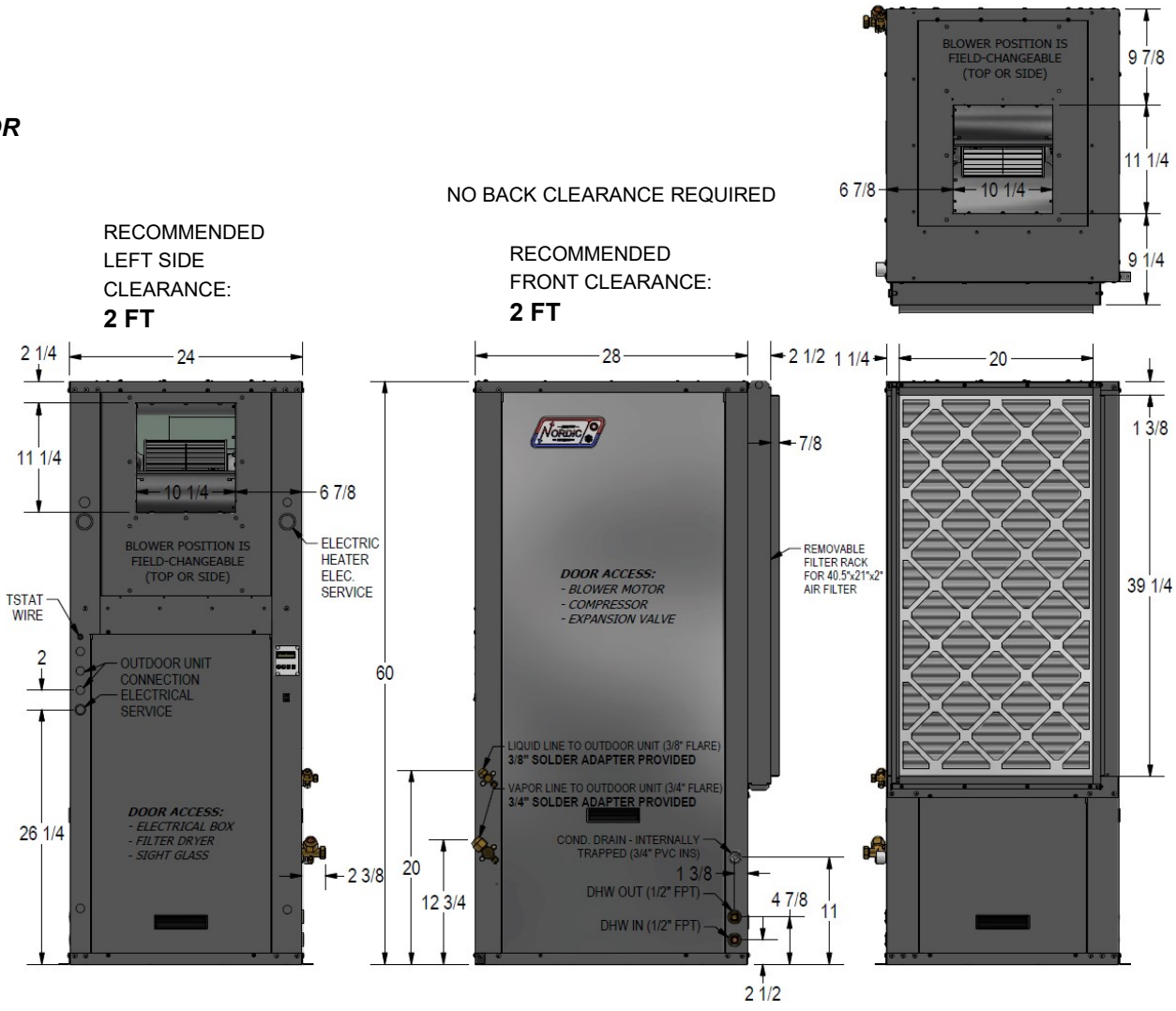
OUTDOOR UNIT



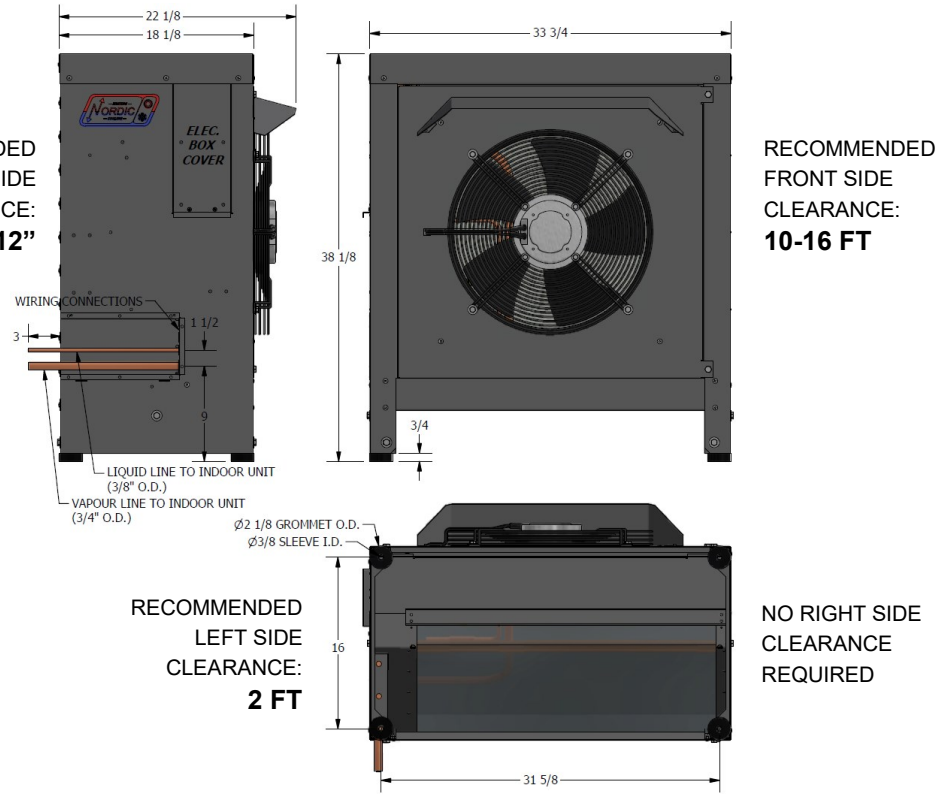
Dimensions: ATA-25/45 (with Right Return Indoor Unit)

All dimensions in inches

INDOOR UNIT



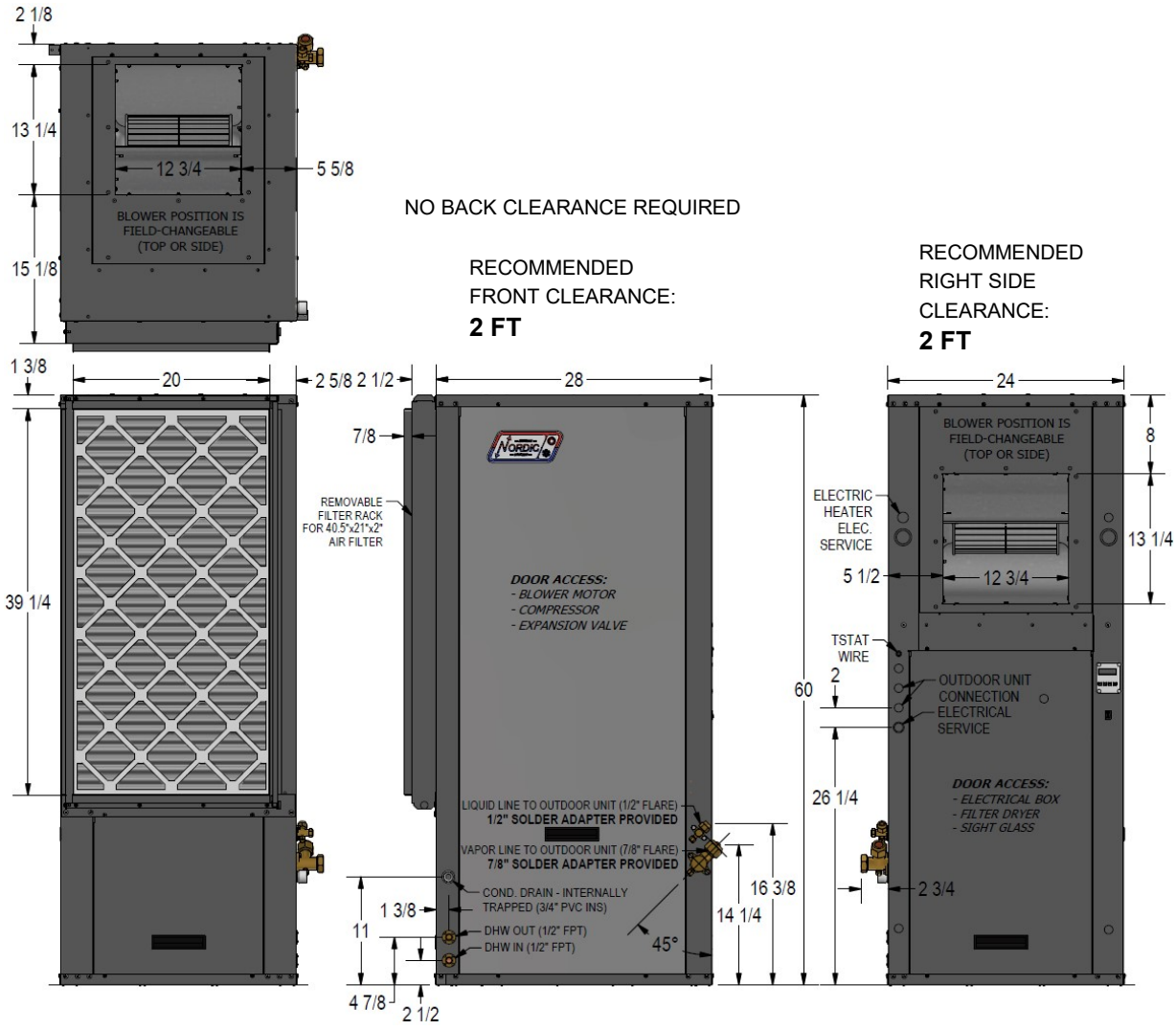
OUTDOOR UNIT



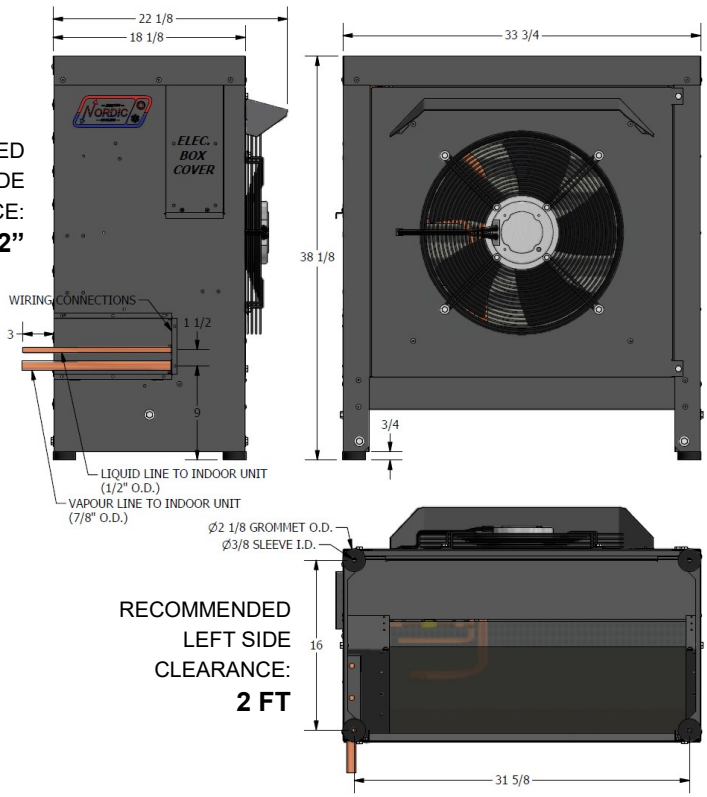
Dimensions: ATA-55 (with Left Return Indoor Unit)

All dimensions in inches

INDOOR UNIT



OUTDOOR UNIT



RECOMMENDED BACK SIDE CLEARANCE: **12”**

RECOMMENDED FRONT SIDE CLEARANCE: **10-16 FT**

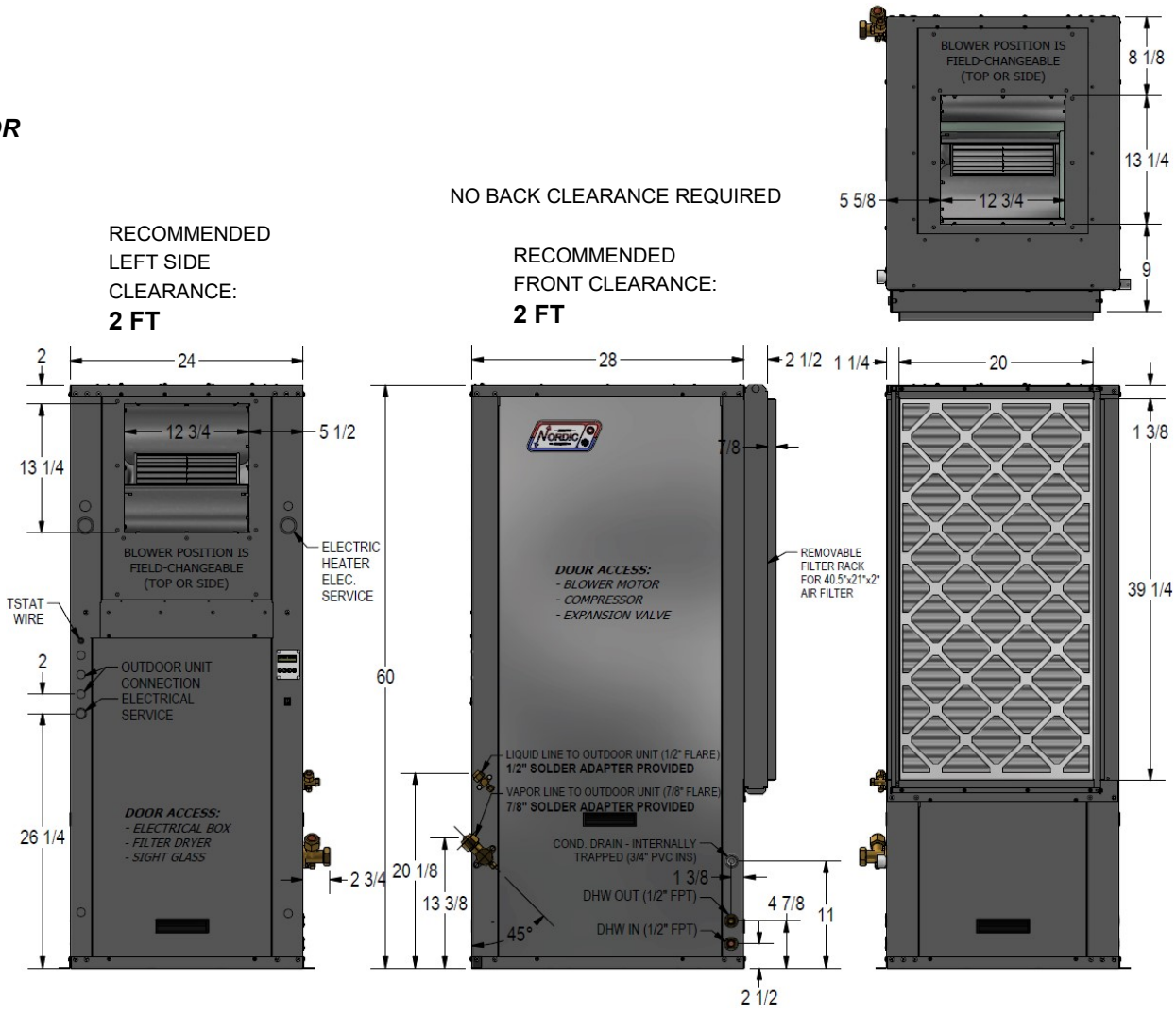
RECOMMENDED LEFT SIDE CLEARANCE: **2 FT**

NO RIGHT SIDE CLEARANCE REQUIRED

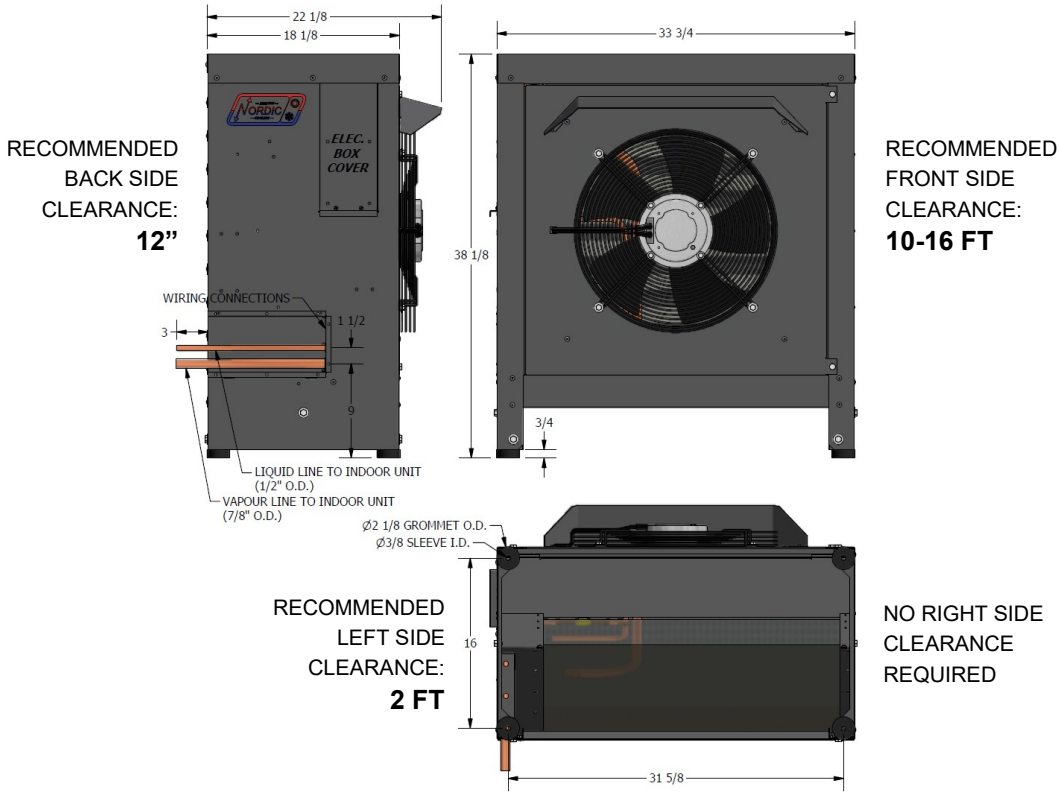
Dimensions: ATA-55 (with Right Return Indoor Unit)

All dimensions in inches

INDOOR UNIT



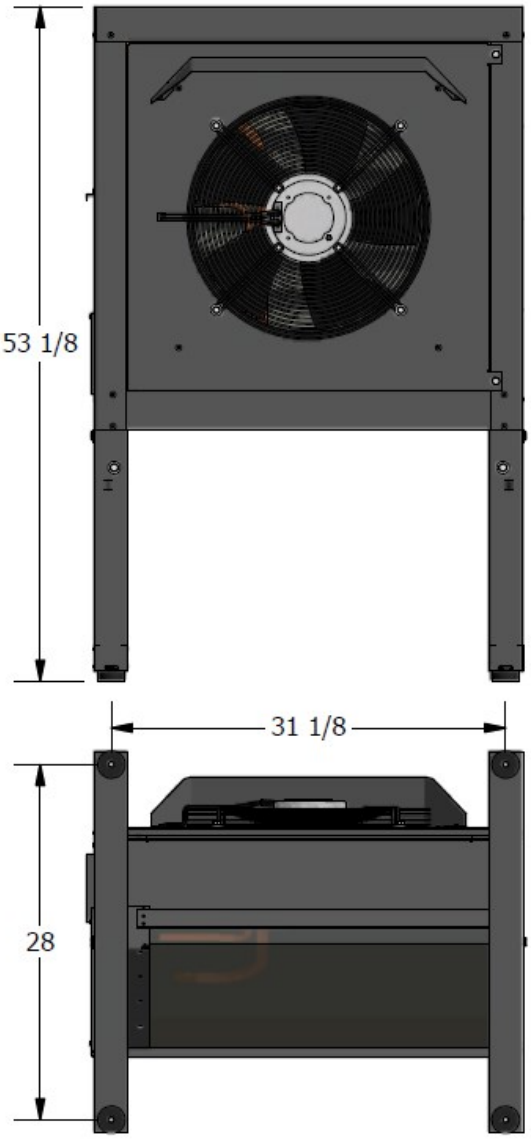
OUTDOOR UNIT



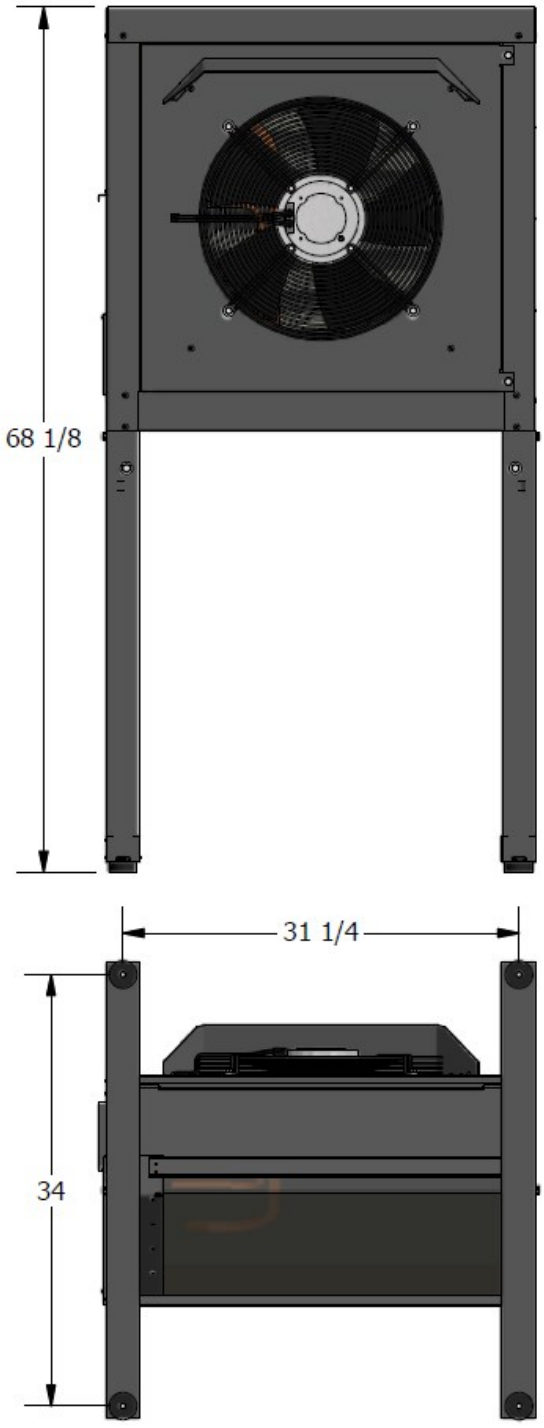
Dimensions: ATA-25/45/55 (Leg Kit for Outdoor Unit)

All dimensions in inches

WITH LEG KIT



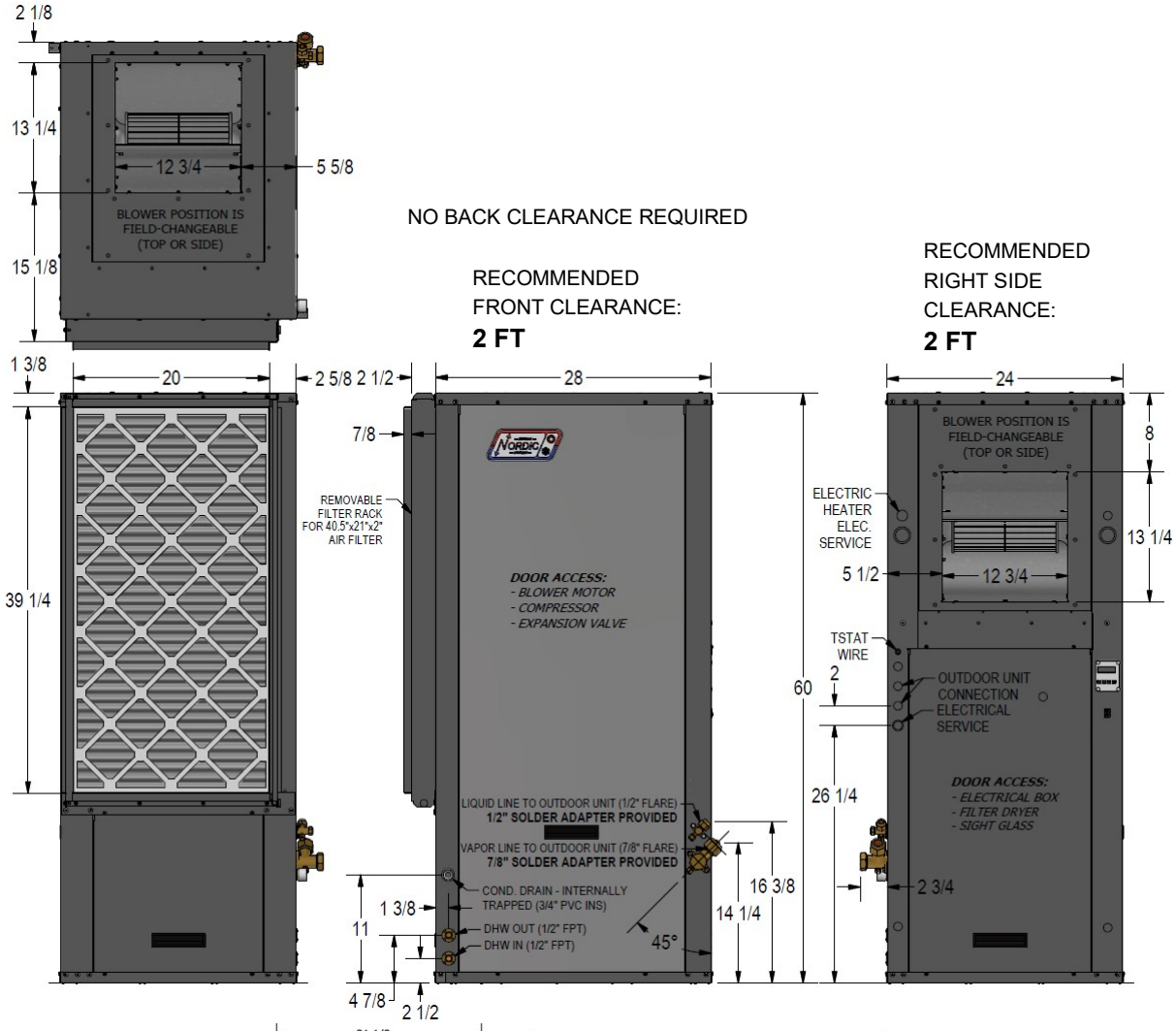
WITH TALL LEG KIT



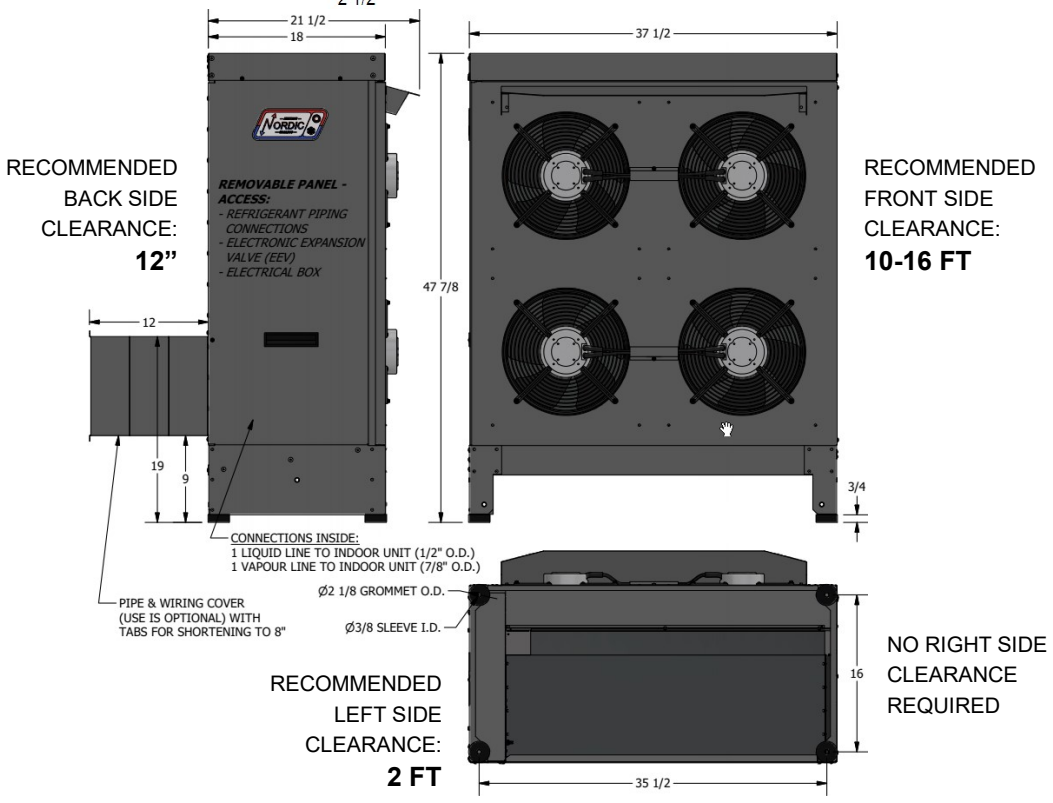
Dimensions: ATA-65/75 (with Left Return Indoor Unit)

All dimensions in inches

INDOOR UNIT



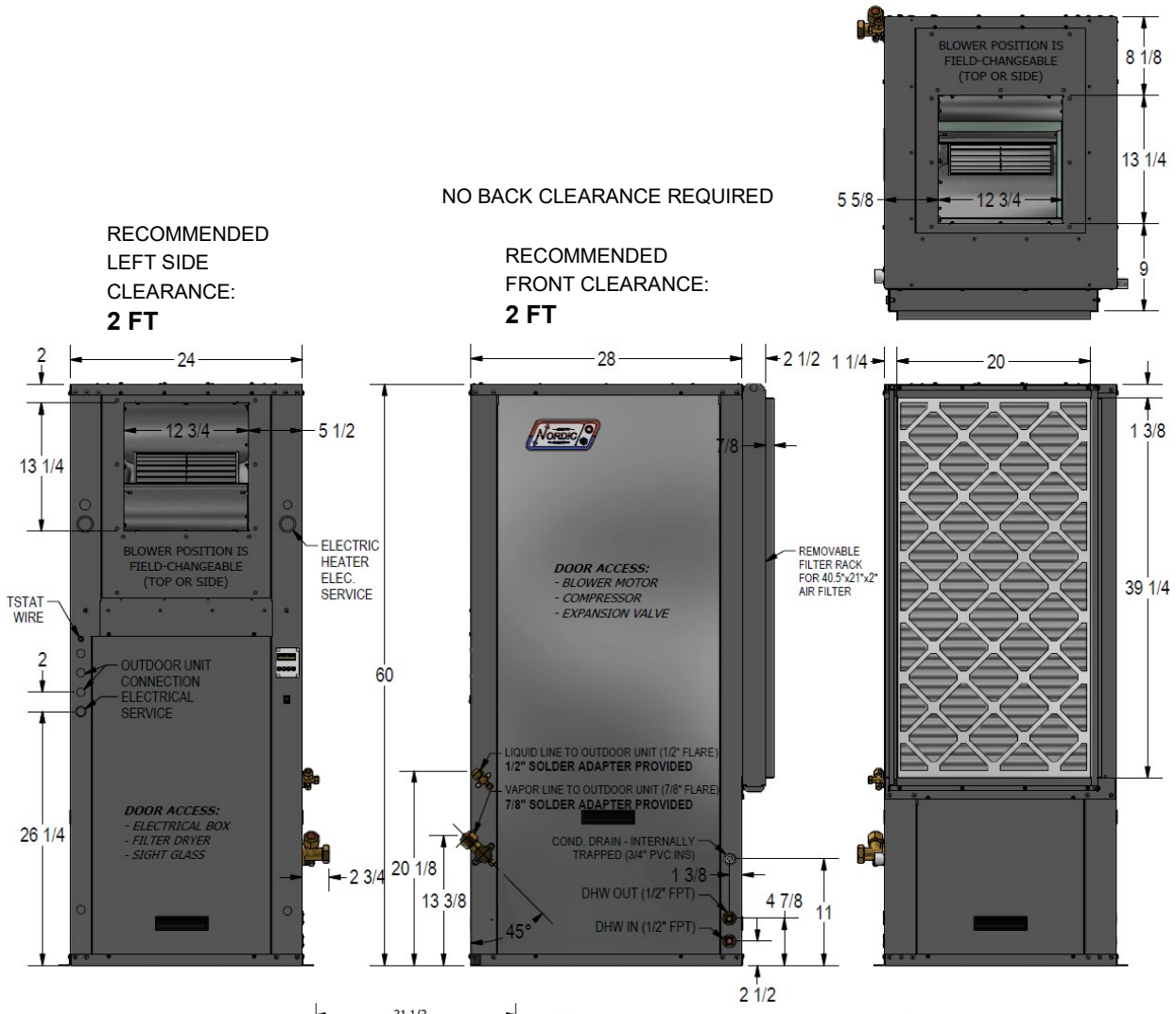
OUTDOOR UNIT



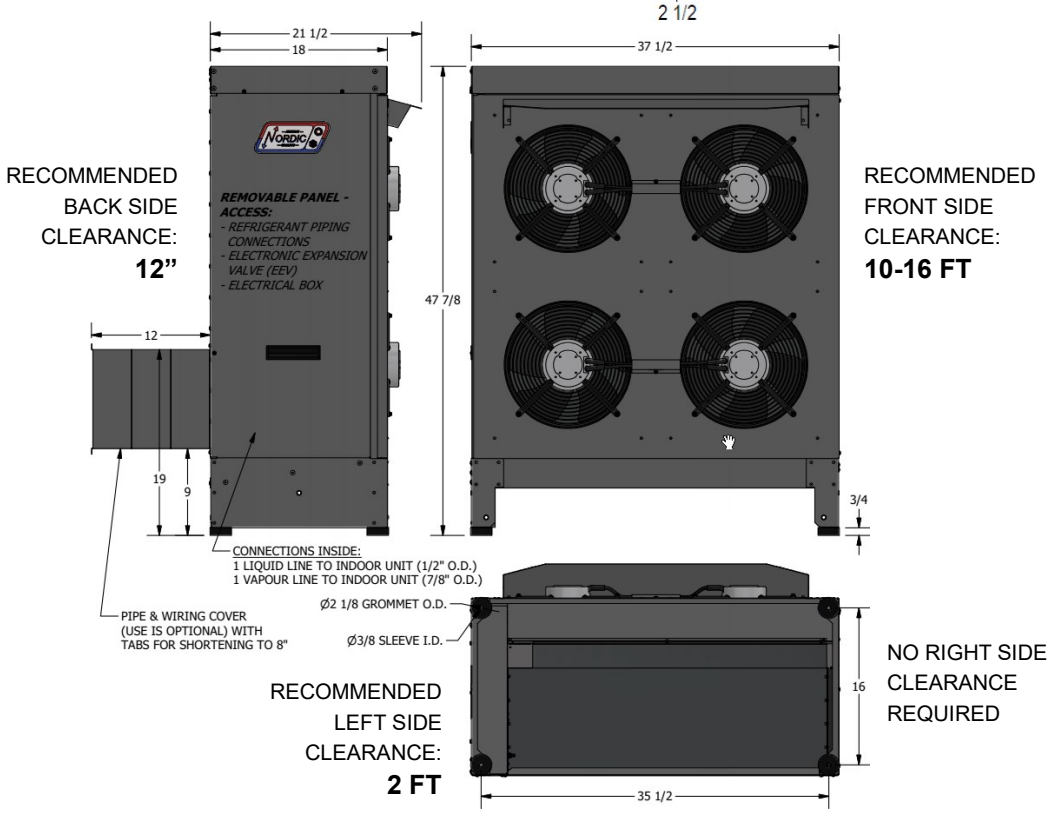
Dimensions: ATA-65/75 (with Right Return Indoor Unit)

All dimensions in inches

INDOOR UNIT



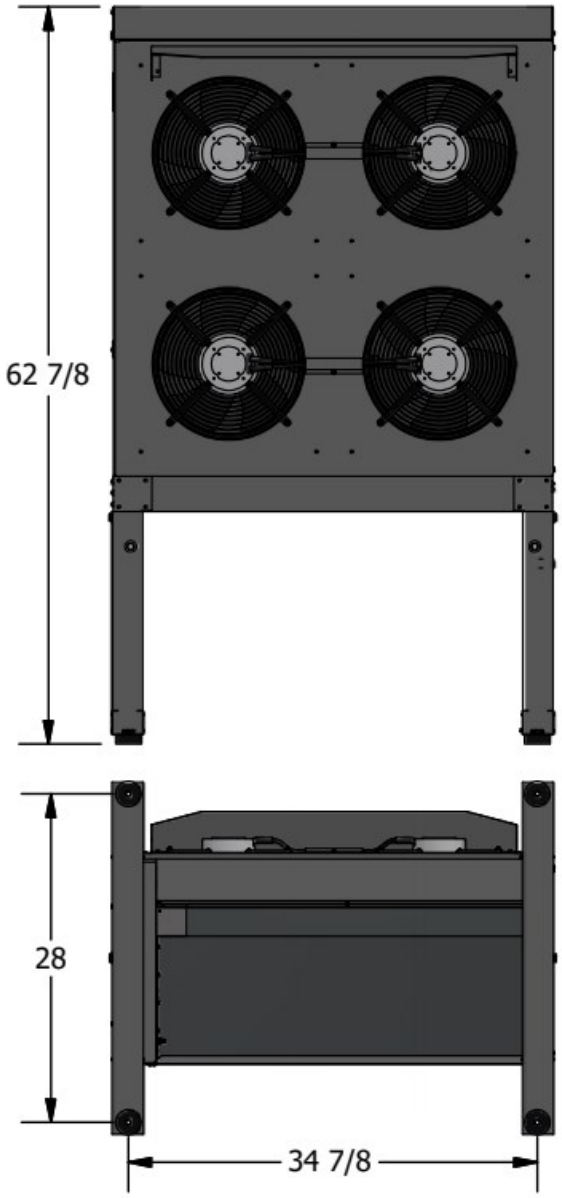
OUTDOOR UNIT



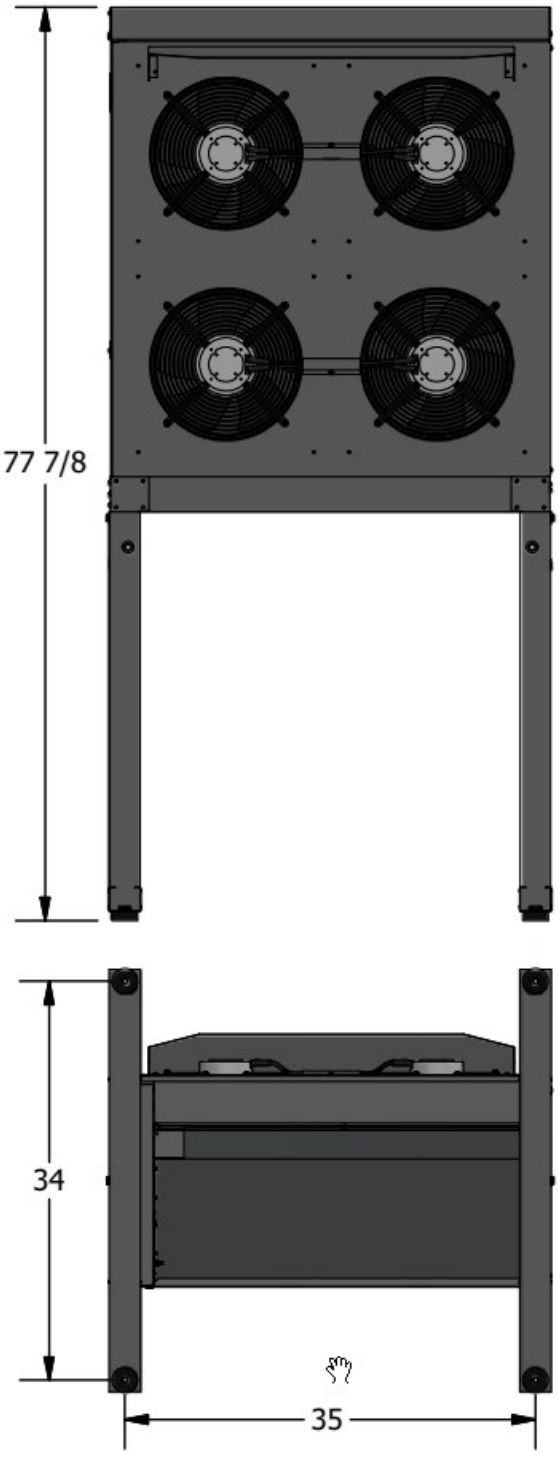
Dimensions: ATA-65/75 (Leg Kit for Outdoor Unit)

All dimensions in inches

WITH LEG KIT

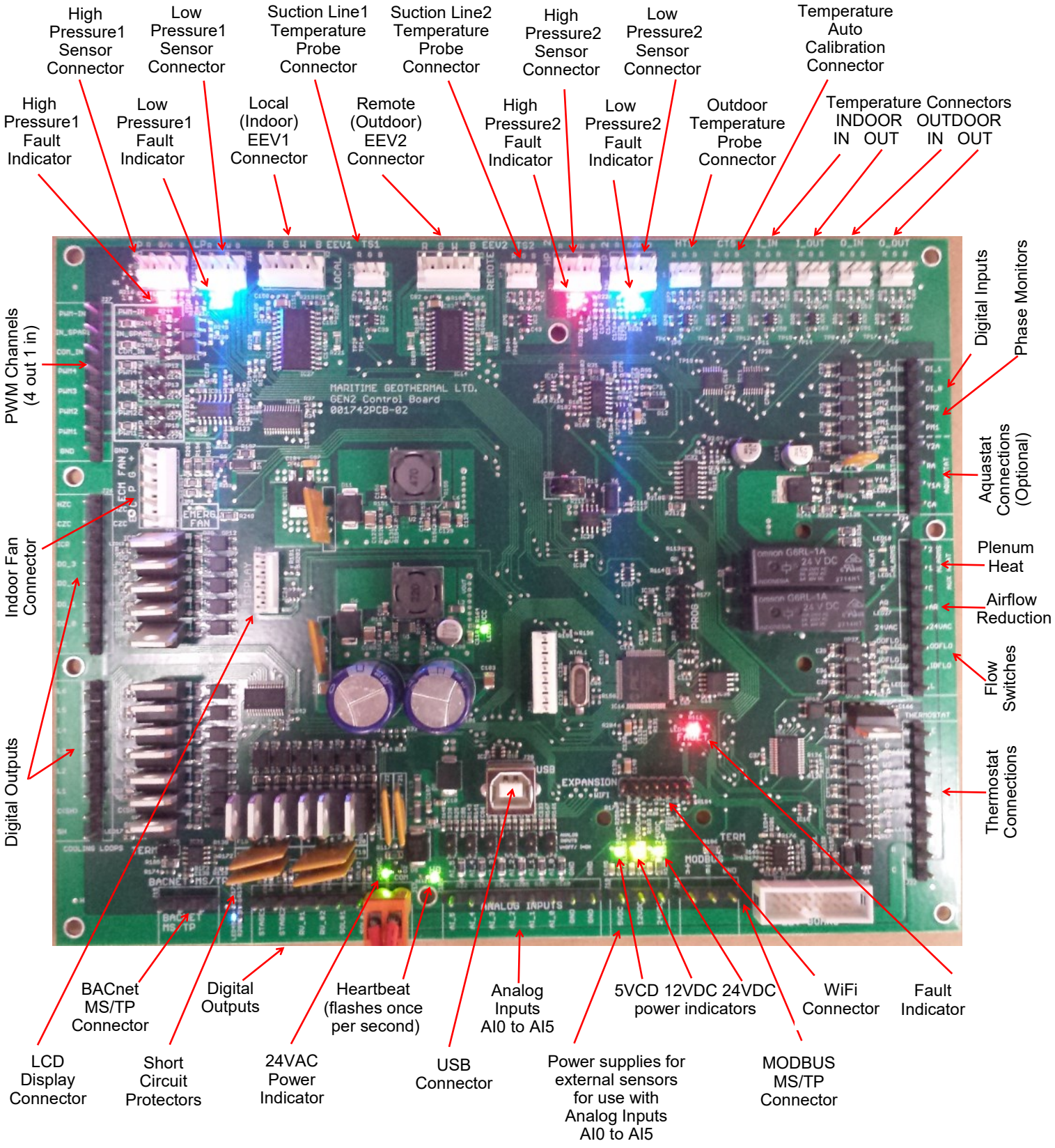


WITH TALL LEG KIT



Appendix A: Gen2 Control Board Description

The picture below shows the locations of the connectors and LED indicators of the control board. The control board offers many features such as short circuit protection on all digital outputs, Real Time Clock with super capacitor for backup power, WiFi capability, relay outputs for plenum heater control (if equipped), USB port, PIC32 microcontroller, etc.



The tables describe the connections starting with the top of the board and working around the board counter clock-wise.

TABLE A1 - Control Board Connector Descriptions (Top)		
Name	**Description**	
HPS1/HI1	High Pressure Sensor 1	Mounted in indoor unit, measures discharge pressure.
LPS1/LO1	Low Pressure Sensor 1	Mounted in indoor unit, measures suction pressure.
EEV1	Local EEV	Mounted in indoor unit, used in cooling mode.
TS1	Suction Line Temperature 1	Mounted to common suction line inside unit.
EEV2	Remote EEV	Mounted in outdoor unit, used in heating mode.
TS2	Suction Line Temperature 2	Unused.
HPS2/HI2	High Pressure Sensor 2	Unused.
LPS2/LO2	Low Pressure Sensor 2	Unused.
HTS/ODTS	Outdoor Temperature	Temperature sensor, mounted in outdoor unit.
CTS	Auto Calibration	Resistor in connector for auto-calibration reference (32°F—0°C).
I_IN	Indoor Loop IN	Unused.
I_OUT	Indoor Loop OUT	Unused.
O_IN	Outdoor Loop IN	Unused.
O_OUT	Outdoor Loop OUT	Unused.

TABLE A2 - Control Board Connector Descriptions (Left Side)		
Name	**Description**	
PWM_IN	Signal for PWM IN	Unused.
IN_SPARE	Spare digital input	Switch or dry contact from 12VDC to disable unit (also COM_IN to GND).
COM_IN	Common for PWM IN	Jumper to GND for disable functionality.
PWM4	PWM / 0-10VDC output	Unused.
PWM3	PWM / 0-10VDC output	Unused.
PWM2	PWM / 0-10VDC output	Unused.
PWM1	PWM / 0-10VDC output	Outdoor Fan PWM control signal.
GND	Ground	Jumper to COM_IN for disable functionality.
HZC	Hot Zone Circulator	Unused.
CZC	Cold Zone Circulator	Unused.
ICR	Internal Circulator Relay	Unused.
DO_3	AUX_ONLY	Unused.
DO_2	HYD_AUX	Unused.
DO_1	Digital output	Unused.
DO_0	Digital output	Unused.
LC	Loop common (ground)	Ground.
L6	Loop6	Unused.
L5	Loop5	Unused.
L4	NOT_HYD_AUX	Unused.
L3	TWO_TANK_3_WAY	Unused.
L2	Loop2	Unused.
L1	Loop1	ON when outdoor fan is operating.
C(SH)	Soaker Hose common	Ground for SH pin.
SH	Soaker Hose	Defrost indicator: ON when unit in defrost mode.

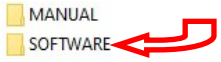
TABLE A3 - Control Board Connector Descriptions (Bottom)		
Name	**Description**	
GND	BACnet MS/TP	Ground for shield if required.
B	BACnet MS/TP	RS-485.
A	BACnet MS/TP	RS-485.
STAGE1	Compressor Stage 1	Starts / stops the compressor.
STAGE2	Compressor Stage 2	Turns the compressor Stage 2 solenoid on/off.
RV_#1	Reversing Valve#1	Off in heating mode, on in cooling mode.
RV_#2	Reversing Valve#2	Unused.
SOL#1	Solenoid#1	Unused.
SOL#2	Solenoid#2	Unused.
24VAC	Power supply for board	24VAC power for control board.
COM	Power supply for board	GND for control board.
AI_5	Analog In Channel 5	0 to 5VDC or 4-20mA user settable with board jumper.
AI_4	Analog In Channel 4	0 to 5VDC or 4-20mA user settable with board jumper.
AI_3	Analog In Channel 3	0 to 5VDC or 4-20mA user settable with board jumper.
AI_2	Analog In Channel 2	0 to 5VDC or 4-20mA user settable with board jumper.
AI_1	Analog In Channel 1	0 to 5VDC or 4-20mA user settable with board jumper.
AI_0	Analog In Channel 0	Optional compressor current sensor.
GND	Ground pin	Ground for analog sensors.
GND	Ground pin	Ground for analog sensors.
5VDC	Power for analog sensors	Provides 5VDC regulated power supply for sensors.
12VDC	Power for analog sensors	Provides 12VDC regulated power supply for sensors.
24VDC	Power for analog sensors	Provides 24VDC unregulated power supply for sensors.
A	MODBUS	RS-485.
B	MODBUS	RS-485.
GND	MODBUS	Ground for shield if required.

TABLE A4 - Control Board Connector Descriptions (Right Side)		
Signal	**Description**	
DI_1	Digital Input1	Unused.
DI_0	Digital Input0	Unused.
PM2	Phase Monitor2	Unused.
PM1	Phase Monitor1	Accessory for 3 phase models.
Y2A	Aquastat Stage2	Unused.
RA	Aquastat Power (24VAC)	Unused.
Y1A	Aquastat Stage1	Unused.
CA	Aquastat Power (Ground)	Unused.
2	Plenum Heat Stage2	Dry contact output to activate plenum heater stage 1.
1	Plenum Heat Stage1	Dry contact output to activate plenum heater stage 1.
C	Plenum Heat Common	Common terminal for plenum heater dry contacts.
AR	Airflow Reductions	Digital input to reduce airflow for zoning applications.
24VAC	Power	Power to external dry contact for AR terminal.
ODFLO	Outdoor Flow Switch	Unused.
IDFLO	Indoor Flow Swtich	Unused.
L	Thermostat Lockout Indicator	24VAC to external trouble indicator.
E	Thermostat Emergency Heat	24VAC input from external dry contact (air thermostat); activates plenum heater.
O	Thermostat Heat/Cool	24VAC input from external dry contact (air thermostat); activates cooling mode.
W2	Thermostat Auxiliary Heat	24VAC input from external dry contact (air thermostat); activates plenum heater.
Y2	Thermostat Stage2	24VAC input from external dry contact (air thermostat); activates compressor stg. 2.
Y1	Thermostat Stage1	24VAC input from external dry contact (air thermostat); starts compressor.
G	Thermostat Fan	24VAC input from external dry contact (air thermostat); activates fan recirculation.
R	Thermostat Power (24VAC)	24VAC to air thermostat.
C	Thermostat Power (Ground)	24VAC ground for powering air thermostat.

Appendix B - USB Driver Installation

The first step in connecting a Windows laptop computer to the control board is to install the USB driver. Any version of Windows from XP and onwards should be compatible, but Windows 10 (as found on any recent laptop computer) is recommended.

The easiest way to install the USB driver is from the **USB drive included with the unit**. Insert the USB stick into a Windows computer, and open a File Explorer window to view its contents:

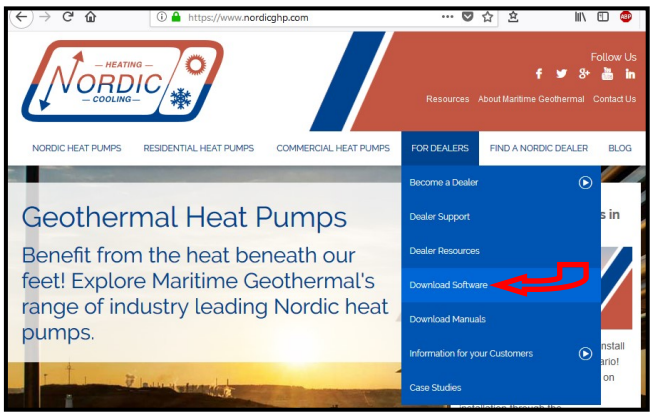


Double click on the SOFTWARE folder to show its contents:

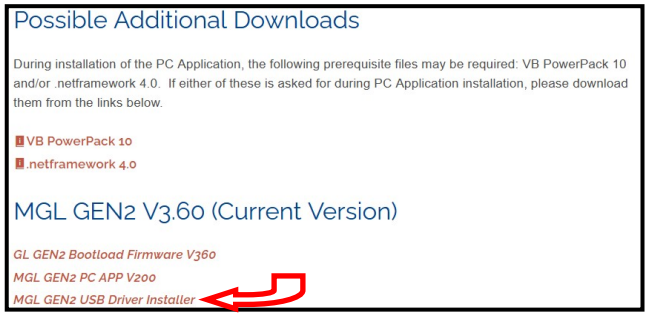
Double click on **Step 1** to install the USB driver, clicking "allow" or "yes" as required.

If the USB stick drive is not available, the same file can be **downloaded from the web page**.

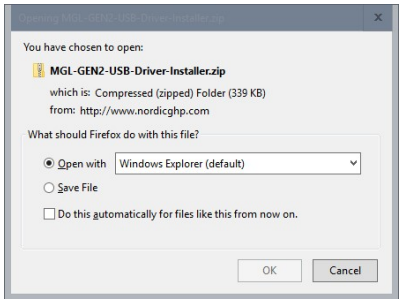
1. Go to www.nordicghp.com, Download Software page:



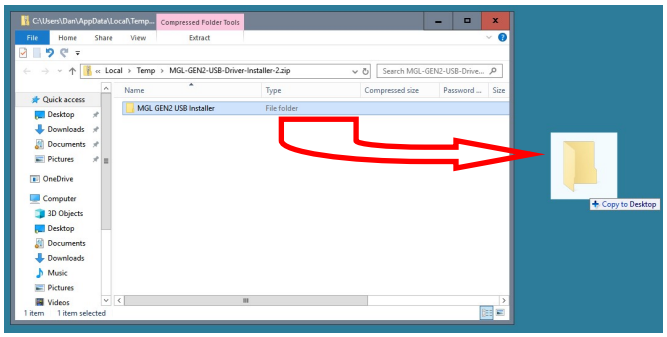
2. Click on **MGL GEN2 USB Driver Installer** to download it:



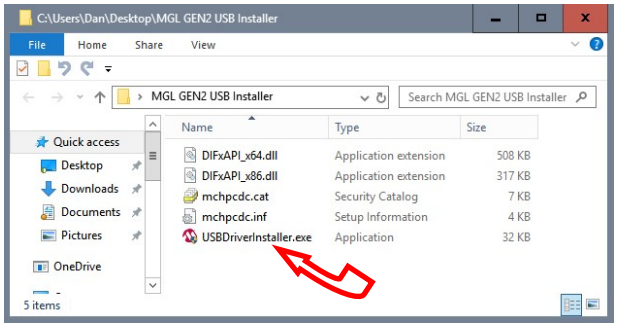
3. Choose "Open with Windows Explorer", and hit "OK":



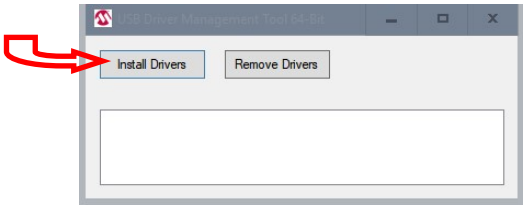
4. In the window that is displayed, click and hold down the mouse button on the folder name, and drag to your desktop:



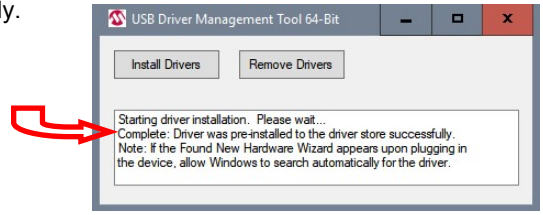
5. Double click on the folder you just dragged onto the desktop, then double click on the "USBDriverInstaller" file:



6. In the next window, click on "Install Drivers":



7. You will see a message indicating the driver was installed successfully.

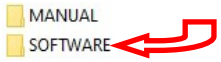


8. You are now ready to install the PC App.

Appendix C - PC App Installation

The PC App allows detailed interfacing with the control board using a Windows laptop computer. Any Windows from XP and onwards should be compatible, but Windows 10 (as found on any recent laptop computer) is recommended. First, install the USB driver as per the previous appendix.

The easiest way to install the Pc App is from the **USB drive included with the unit**. Insert the USB stick into a Windows computer, and open a File Explorer window to view its contents:

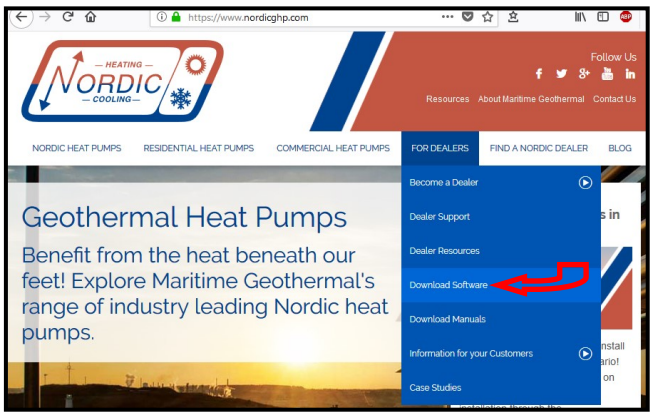


Double click on the SOFTWARE folder to show its contents:

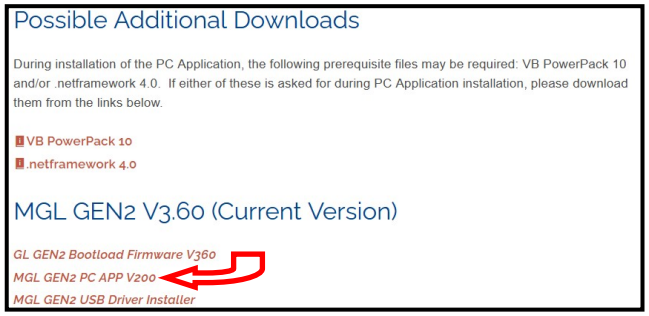
Double click on **Step 2** and follow the prompts, clicking “allow” or “yes” as required. If you get a warning that .NET framework is required, go back and double click on step **z**, then try **Step 2** again.

If the USB stick drive is not available, the same file can be **downloaded from the web page**.

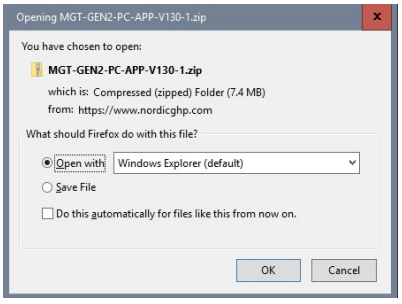
1. Go to www.nordicghp.com, Download Software page:



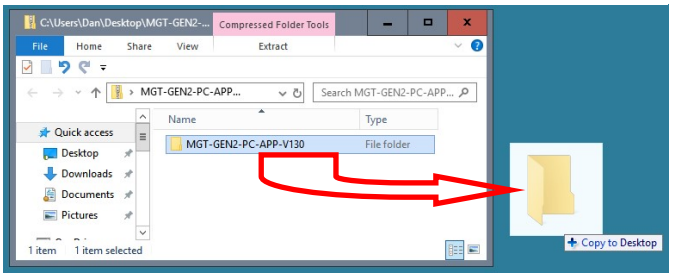
2. Click on **MGL GEN2 PC APP V2__** to download it:



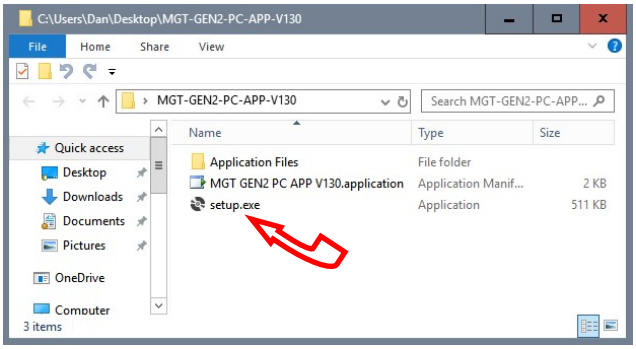
3. Choose “Open with Windows Explorer”, and hit “OK”:



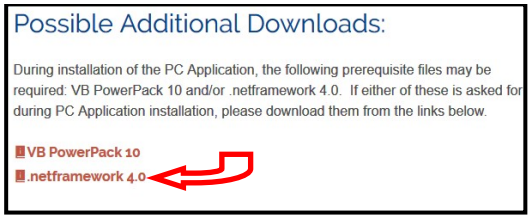
4. In the window that is displayed, click and hold down the mouse button on the folder name, and drag to your desktop:



5. Double click on the folder you just dragged onto the desktop, then double click on the “setup” file:



6. Click “Yes”, “Run”, “Install”, or similar on any warning windows which pop up. If an error message is encountered regarding .NET framework, exit the installation and use the link on the Download Software page to install the missing item:



Then go back to step 5.

7. The PC App will open when it is finished installing. You are now ready to connect a USB cord between the laptop computer and GEN2 control board, and connect.

Appendix D: Updating Firmware

METHOD 1: Updating Firmware Using PC App

This method can be used when updating post-2017 control boards with bootloader version 2.0. This method will not work for older control boards with bootloader version 1.0 (approx. unit serial numbers -17 and lower); for those, see **METHOD 2**. Note that **METHOD 2** will work for all control boards.

The firmware comes as a .ZIP file named:
MGL GEN2 Bootload Firmware Vxxx.zip
where xxx is the version reference, e.g. 360 (version 3.60).
This file can be downloaded from **www.nordicghp.com**, menu *For Dealers --> Download Software*.

1. Download the file to your PC. When prompted, "Open" the zip file. If the zip file is *Saved* instead of *Opened*, find it in the web browser's Downloads list or at the bottom of browser window and click on it to open. In the window that comes up, drag the folder containing the required files onto your desktop so that it can be found easily, e.g.:

   \Desktop\MGL GEN2 Bootload Firmware V360

   Also be sure the latest PC App version is installed, which is listed alongside the firmware on the web page. If needed, install a new version as per those instructions, and uninstall older PC App versions to avoid their accidental use (which can corrupt control board parameters).

2. In that folder on the Desktop, there will be three files:

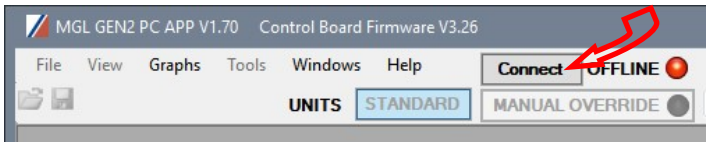
MGL_GEN2_V360.production.hex	(firmware file)
PIC32UBL.exe	(the programmer)
USB Bootloader Instructions.pdf	(these instructions)

   Note that on most computers, the file extensions (.exe, .pdf) will be hidden.

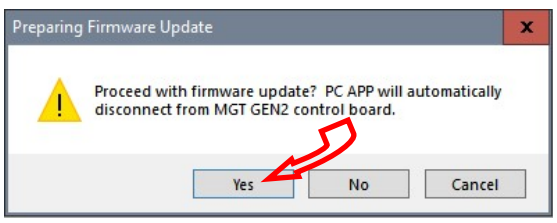
3. Connect a USB (printer) cable between computer and control board.

4. Launch the PC App version that matches the firmware (e.g. PC App 2.00 for firmware V3.60). After it is installed, the PC App can be started using the entry found under the "M" section in the Windows **START** menu, which is accessed using the 4-rectangles icon normally found at the bottom left corner of the computer screen.

5. In the PC App, click on the **Connect** button to connect to the

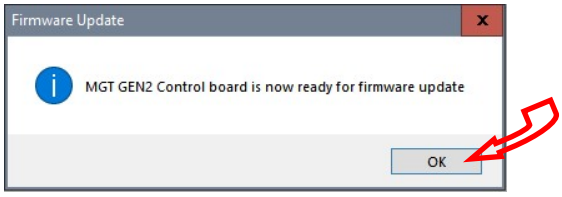


6. Go to menu **Tools --> Update Firmware**. The following message box will appear:



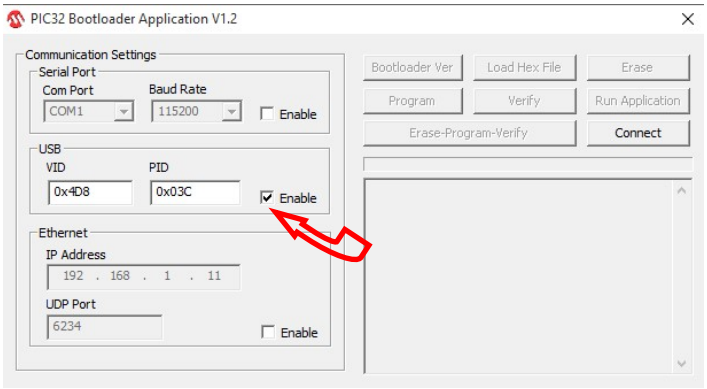
7. Click on **YES**. The following message box will appear:

8. Click on **OK**. After a minute, the following message box will appear:

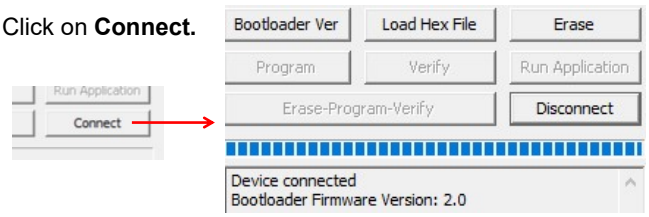


9. Click on **OK**. The control board is now in bootloader mode and is ready to be programmed.

10. Double click on the downloaded file PIC32UBL.exe to run it. In the window that opens, click on the USB **Enable** check box.

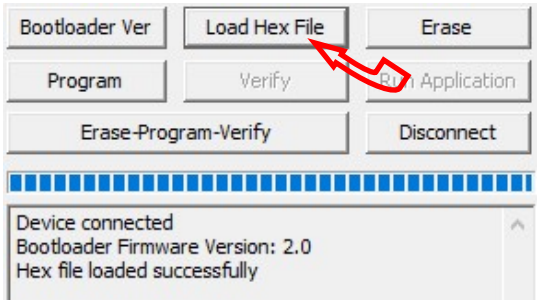


11. Click on **Connect.**

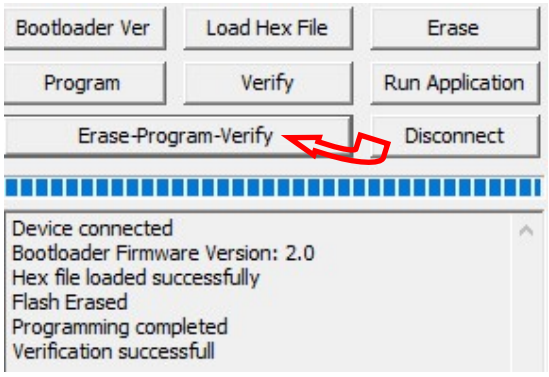


*If device fails to connect and an error message is displayed, the board's bootloader may be older than v2.0. It will be necessary to instead update the firmware via jumper pins (**METHOD 2**), as per the next section.*

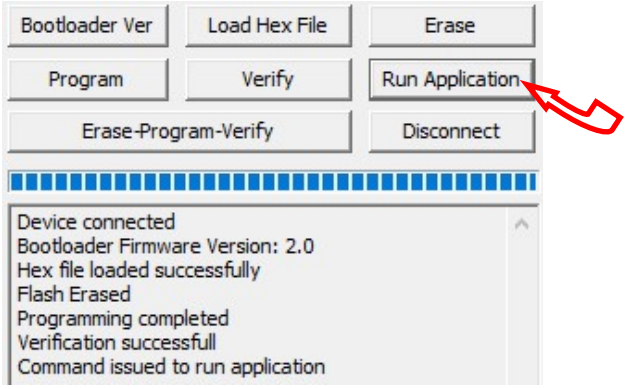
12. Click on **Load Hex File**. Select the M*GL_GEN2_V360.production.hex* (or higher version number) file, which is in the folder you created on the Desktop.



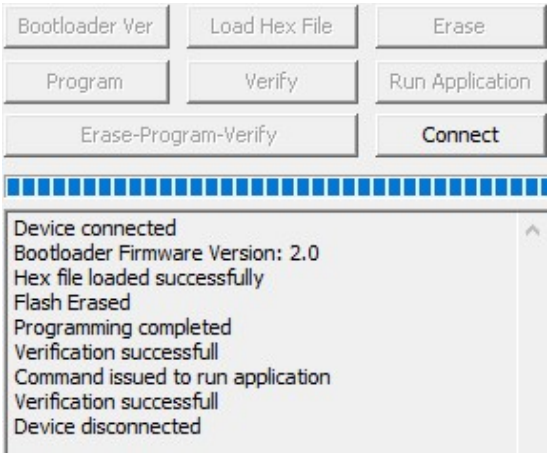
13. Click on **Erase—Program—Verify.** Programming…. Wait while status bar shows progress. The messages should read as below when finished:



11. "Programming completed. Verification successful." Click on **Run Application.** This will take the control board out of bootloader mode and back into normal operational mode, so that the PC App can connect again.



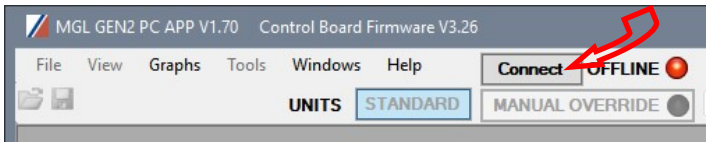
15. **Wait until the programmer disconnects itself.** The messages should read as follows:



16. Close the PIC32 program.

17. **WAIT APPROXIMATELY 10 SECONDS.** This gives the control board time to reset, initialize and re-connect to the PC USB port.

18. Go back to the PC APP and click on the **Connect** button. Verify that the firmware version, shown in the title bar after connection, has been updated. Perform any configuration needed.



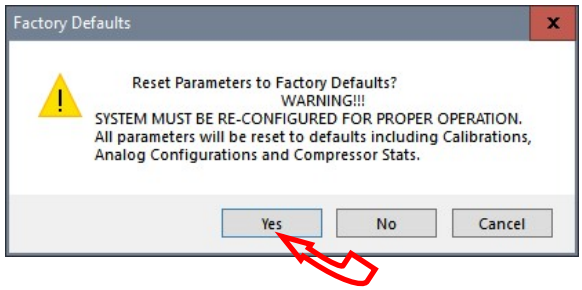
NOTE: Updating the firmware does not affect the configuration settings.

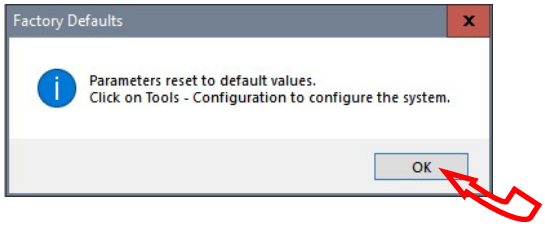
Reset to Defaults?

When updating from **firmware V3.58 or earlier**, the following steps must be taken after the update as there are significant differences in the internal parameters used to operate the system. These steps may also be performed for troubleshooting, when the control system is not acting as it should.

Note that if the firmware on a heat pumps is 2.45 or earlier, chances are that it will have an older bootloader version that requires the use of **METHOD 2** to update the firmware (see following page).

1. With PC App connected, go to menu **Tools --> Configuration** and note all settings. They will need to be re-set later.
2. Go to menu **Tools --> Reset To Factory Defaults.** Click **YES** in the pop up window, and OK in the next window.





3. Go back to menu **Tools --> Configuration**. Re-select the Model Series <u>even if it already indicates the proper series,</u> as clicking on it will load the parameters for that series.
4. Select the Model Size and make any other changes that apply to the particular system setup such as number of stages, control method, etc.

METHOD 2: Updating Firmware Using Jumper Pins

This method should be used when updating older control boards that have bootloader version 1.0, or where the PC App has trouble connecting to older firmware. This method will work for all control boards and can be used on all units.

The firmware comes as a .ZIP file named:
MGL GEN2 Bootload Firmware Vxxx.zip
where xxx is the version reference, e.g. 360 (version 3.60). This file can be downloaded from **www.nordicghp.com**, menu *For Dealers --> Download Software.*

1. Download the file to your PC. When prompted, "Open" the zip file. If the zip file is *Saved* instead of *Opened*, find it in the web browser's Downloads list or at the bottom of browser window and click on it to open. In the window that comes up, drag the folder containing the required files onto your desktop so that it can be found easily, e.g.:

   \Desktop\MGL GEN2 Bootload Firmware V360

2. In that folder on the Desktop, there will be three files:

MGL_GEN2_V360.production.hex	(firmware file)
PIC32UBL.exe	(the programmer)
USB Bootloader Instructions.pdf	(these instructions)

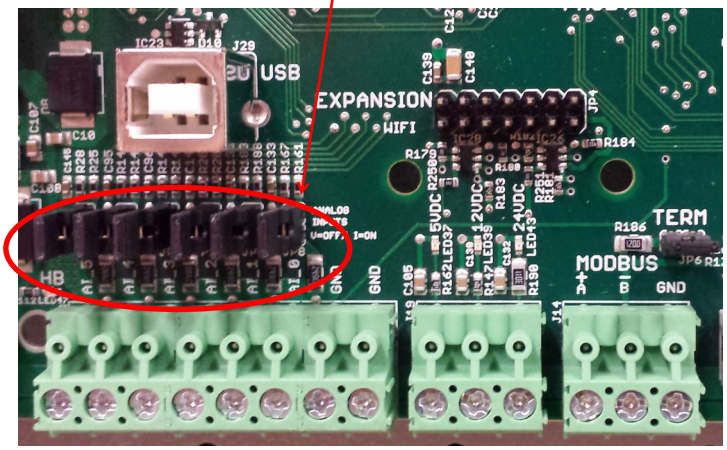
   Note that on most computers, the file extensions (.exe, .pdf) will be hidden.

3. Connect a USB (printer) cable between computer and control board.

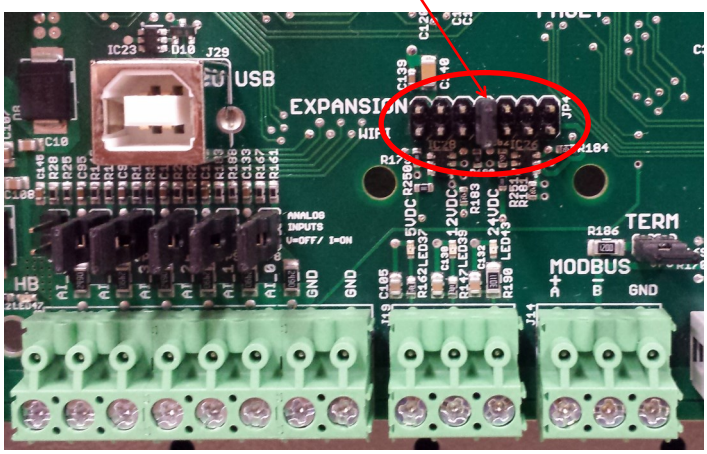
4. Turn power off to the heat pump.

5. Remove one of the black pin jumpers from just below the USB connector on the board and place in on the center pin pair of the EXPANSION header as shown below.

Borrow any one of these jumpers (however many are present)

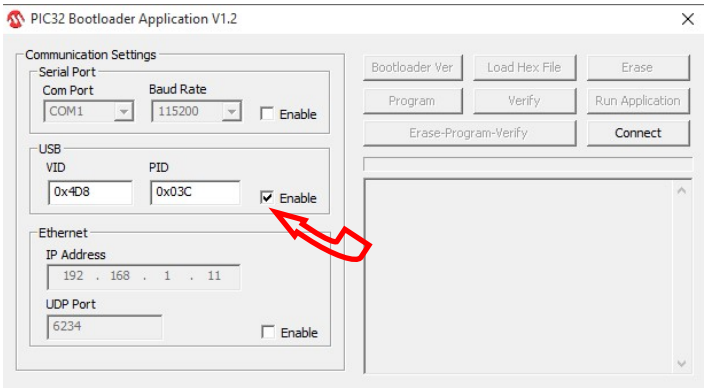


Place jumper here

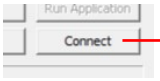


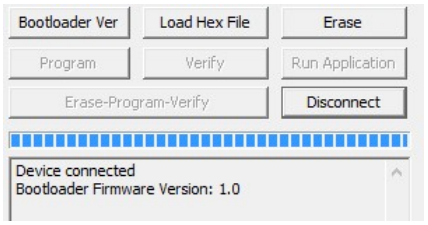
6. Turn the power back on. The control board is now in boot loader mode and is ready to be programmed.

7. Double click on the downloaded PIC32UBL.exe to run it. In the window that opens, click on the USB **Enable** check box.

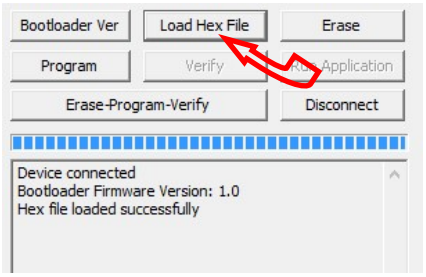


8. Click on **Connect.**



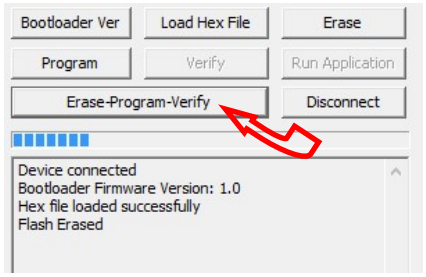


9. Click on **Load Hex File**. Select the *MGL_GEN2_V360.production.hex* (or higher version number) file, which is in the folder you created on the Desktop.



10. Click on **Erase—Program—Verify**

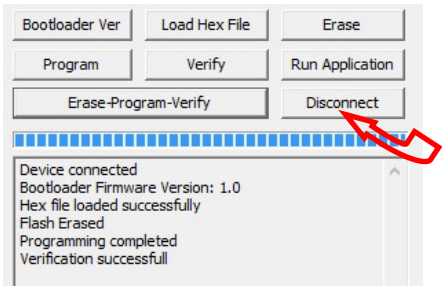
Programming…



11. "Programming completed. Verification successful." Click on **Disconnect** and close the program.

12. Turn power off to the heat pump again.

13. Move the jumper back to where it was taken from.



14. Turn the power back on. Check that the LCD Display shows e.g. **MGL GEN2 V3.60** on the top line during power up.

LIMITED RESIDENTIAL WARRANTY

MARITIME GEOTHERMAL LTD. warrants that the heat pumps manufactured by it shall be free from defects in materials and workmanship for a period of (5) FIVE YEARS after the date of installation or for a period of (5) FIVE YEARS AND (60) SIXTY DAYS after the date of shipment, whichever occurs first. In addition MARITIME GEOTHERMAL LTD. warrants that the compressor shall be free of defects in materials and workmanship for an additional period of (2) TWO YEARS from said date.

MARITIME GEOTHERMAL LTD. shall, at its option repair or replace any part or parts covered by this warranty which shall be returned to MARITIME GEOTHERMAL LTD., transportation charges prepaid, which, upon examination proves to be defective in materials or workmanship. Replacement or repaired parts and components are warranted only for the remaining portion of the original warranty period.

This warranty is subject to the following conditions:

1. The NORDIC® heat pump must be properly installed and maintained in accordance with MARITIME GEOTHERMAL LTD.'s installation and maintenance instructions.
2. The installer must complete the "**Installation Data Sheet**", have it endorsed by the owner and return it to Maritime Geothermal Ltd. within 21 days of installation of the unit.
3. It is the responsibility of the building or general contractor to supply temporary heat to the structure prior to occupancy. These heat pumps are designed to provide heat only to the completely finished and insulated structure. Start-up of the unit shall not be scheduled prior to completion of construction and final duct installation for validation of this warranty.

If the heat pump, manufactured by MARITIME GEOTHERMAL LTD., fails to conform to this warranty, MARITIME GEOTHERMAL LTD.'s sole and exclusive liability shall be, at its option, to repair or replace any part or component which is returned by the customer during the applicable warranty period set forth above, provided that (1) MARITIME GEOTHERMAL LTD. is promptly notified in writing upon discovery by the customer that such part or component fails to conform to this warranty. (2) The customer returns such part or component to MARITIME GEOTHERMAL LTD., transportation charges prepaid, within (30) thirty days of failure, and (3) MARITIME GEOTHERMAL LTD.'s examination of such component shall disclose to its satisfaction that such part or component fails to meet this warranty and the alleged defects were not caused by accident, misuse, neglect, alteration, improper installation, repair or improper testing.