



INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR AT SERIES AIR CONDITIONING UNITS



**Air Conditioners with Capacity of
4,000 through 12,000 Nominal BTU/HR**

115VAC & 208/230VAC Models





REVISION HISTORY

| REV* | DESCRIPTION | DATE |
|------|-----------------------------------|----------|
| A | Initial Release | 11/09/17 |
| B | Nomenclature Update | 12/08/17 |
| C | Schematic and Nomenclature Update | 02/08/18 |
| | | |

* A more recent revision may be available at www.voltairesys.com or the QR Code in the top right corner of every page.



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1. IMPORTANT INFORMATION TO REVIEW PRIOR TO INSTALLATION, OPERATION AND MAINTENANCE

- **READ THE ENTIRE MANUAL PRIOR TO INSTALLING AND MAINTAINING** the VoltAire Systems Air Conditioners. Do not install or perform maintenance on the air conditioner if you do not understand all of the instructions. Contact VoltAire Systems at (407) 378-7482 with any questions or concerns.
- The air conditioner should be fully inspected on initial delivery. Open the packaging completely at the time of initial delivery and verify there is no hidden or concealed damage. Shipping damage, including concealed damage, is not covered under warranty.
- **WARNING: IMPROPER INSTALLATION AND OPERATION MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.** The air conditioner shall only be installed and serviced by a certified professional in strict accordance with the requirements within this manual, in accordance with all local/state/federal codes, and per industry standards. Remove power from the unit during maintenance and installation, as line voltage may be dangerous, hazardous and lethal.
- In the event of a conflict, code requirements shall take precedence over the instructions provided within this manual. The installer shall be aware of all code requirements and shall comply fully.
- Use care when transporting and lifting the air conditioner. The unit should be maintained in the upright position at all times. If the unit has been mistakenly laid on its side stand the unit up and wait at least 24 hours before applying power.
- **WARNING: WEAR PROPER PERSONAL PROTECTION EQUIPMENT, INCLUDING BUT NOT LIMITED TO SAFETY GLASSES, GOGGLES, AND GLOVES. EDGES MAY BE SHARP.**
- A field provided time delay fuse or breaker must be provided by the installer with the power supply circuit serving the air conditioner. The installer shall size this fuse / breaker and wire in accordance with all applicable codes. Verify wire terminals and voltage prior to plugging into the Air Conditioner, otherwise you may damage the electrical components.
- These instructions should be retained by the owner and/or with the unit.



2. PARTS SHIPPED LOOSE AND TOOLS/MATERIALS PROVIDED BY THE INSTALLER

Materials shipped loose in addition to this manual are as follows:

a) Mounting gasket field kit

| UNIT | PART NUMBER |
|----------------------|-------------|
| AT04 AT06 | B6F0004LAA |
| AT08 AT08 AT12 | B6F0005LAA |

b) M6x25 Mounting Bolts

| UNIT | QUANTITY |
|----------------------|----------|
| AT04 AT06 | 10 |
| AT08 AT08 AT12 | 12 |

Required Tools and Materials provided by Installer

- a. Fuse and/or breaker
- b. Exterior rated silicone sealant
- c. M4 Torx tamper resistant screw driver
- d. M6 HEX head screw driver
- e. M6 nut driver/wrench
- f. Torque wrench
- g. Personal Protection Equipment (e.g. but not limited to safety goggles, gloves, etc.)
- h. Wire-Stripper

3. PRODUCT DESCRIPTION

VoltAire Systems AT Series Air Conditioning Units are designed for high efficiency and high performance heat management of electronic enclosures or equipment. This product is an active thermal management system with an internal refrigerant system and is designed for electronic environments. This product is designed to function in extreme temperatures ranging from 131°F (55 °C) to -40°F (-40°C).

Figure 1 shows the side of the AC unit and its intake and exhaust points for both the interior and exterior airflow path. Exterior air enters the unit at the bottom-front and discharges air through the condenser coil at the top-front of the unit. The interior air enters through the top-back of the unit and discharges conditioned air through the evaporator coil on the bottom-back of the unit. As an additional option, airflow on the interior/evaporator side can be actively heated with an electric element heater.

The units are designed and manufactured for exterior use and certified by UL per UL Type 3R standards such that they may be used on telecommunication cabinets requiring GR-487 compliance. The units are safety certified by UL per UL Standard 484, Special Purpose Air Conditioners. The refrigeration circuit uses R-134A refrigerant, a stable high temperature refrigerant with no o-zone depleting effect.

The unit is controlled with a control board that provides an easy to use interface to operate a Test Mode for startup and diagnosis, configure operating parameters for temperature and alarm set points, provide anti-short cycling, monitor operating pressure(s), provide visual alarms and diagnosis, and provides a HVAC trouble/temperature alarm dry contact output.

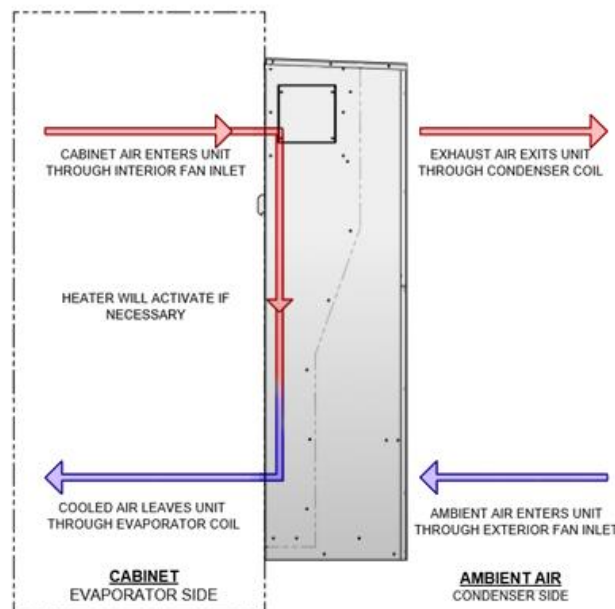


Figure 1 – Airflow
8K/10K/12K model shown, 4K and 6K functionally similar



4. GENERAL PRODUCT DATA

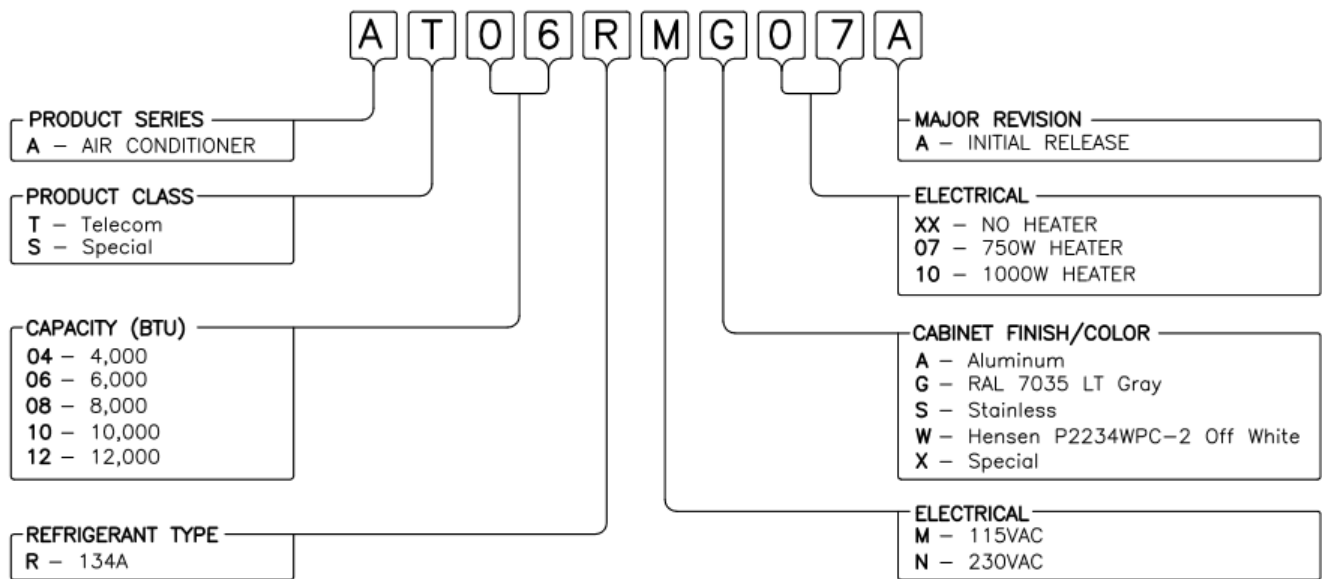


Figure 2 - Model Nomenclature

| MODEL NUMBER | NOMINAL CAPACITY ¹ (BTU/HR SENSIBLE) | RATED VOLTAGE (SGL Ø AC) | OPERATING LOAD (AMPS) | ELECTRIC SERVICE SIZE (AMPS) | WEIGHT (lbs.) | NOMINAL SIZE W x H x D (in.) |
|--------------|---|--------------------------|-----------------------|------------------------------|---------------|------------------------------|
| AT04RN | 4,000 | 208/230 | 2.5 | 15 | 72.7 | 17.1 x 29.6 x 12.9 |
| AT06RM | 6,000 | 115 | 4.8 | 15 | 74.7 | 17.1 x 29.6 x 12.9 |
| AT06RN | | 208/230 | 3.6 | 15 | 74.7 | |
| AT08RM | 8,000 | 115 | 9.7 | 15 | 91.3 | 16.3 x 43.6 x 12.0 |
| AT08RN | | 208/230 | 5.3 | 15 | 91.3 | |
| AT10RM | 10,000 | 115 | 12.1 | 15 | 94.6 | 16.3 x 43.6 x 12.0 |
| AT10RN | | 230 | 5.9 | 15 | 94.6 | |
| AT12RM | 12,000 | 115 | 13.4 | 20 | 96.9 | 16.3 x 43.6 x 12.0 |
| AT12RN | | 230 | 7.0 | 15 | 96.9 | |

¹ Capacity is nominal based upon free airflow without restrictions; Locating the air conditioner where airflow is restricted may reduce capacity; Nominal capacity is at exterior temperature of 131°F (55°C) and interior temperature of 131°F (55°C)

Table 1 – General Product Specifications

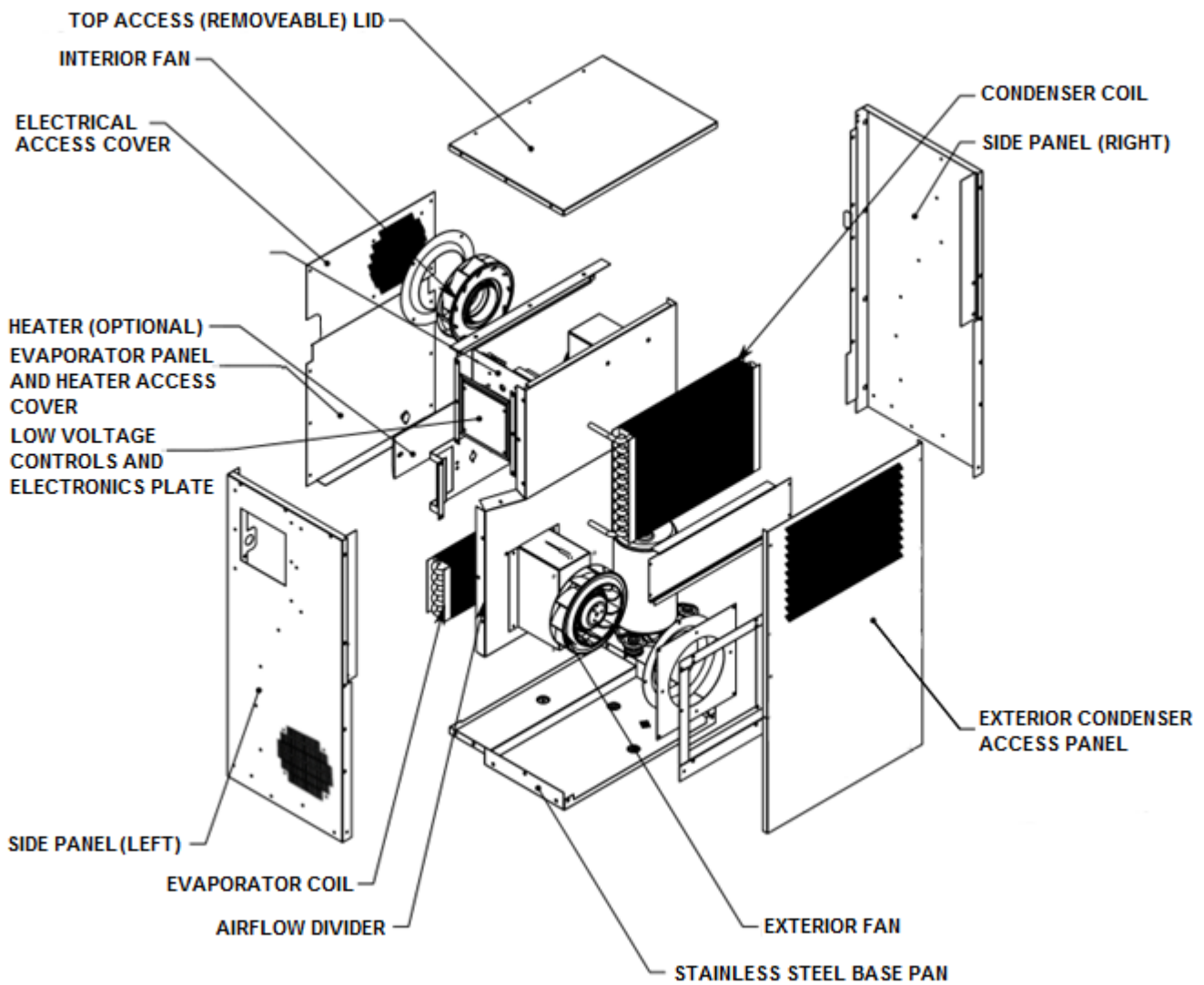


Figure 3 - 4K/6K AC Configuration

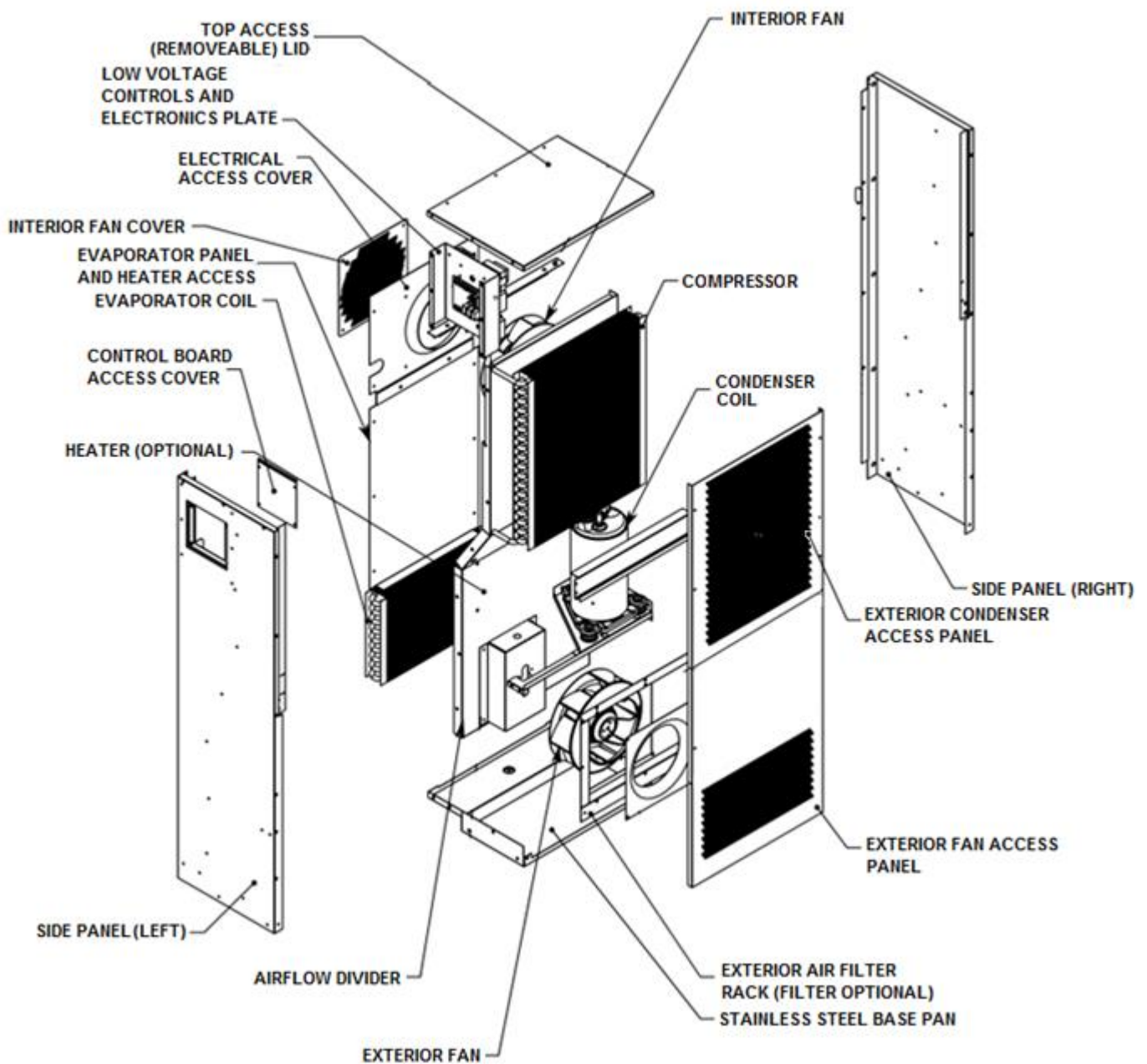


Figure 4 – 8K/10K/12K AC Configuration

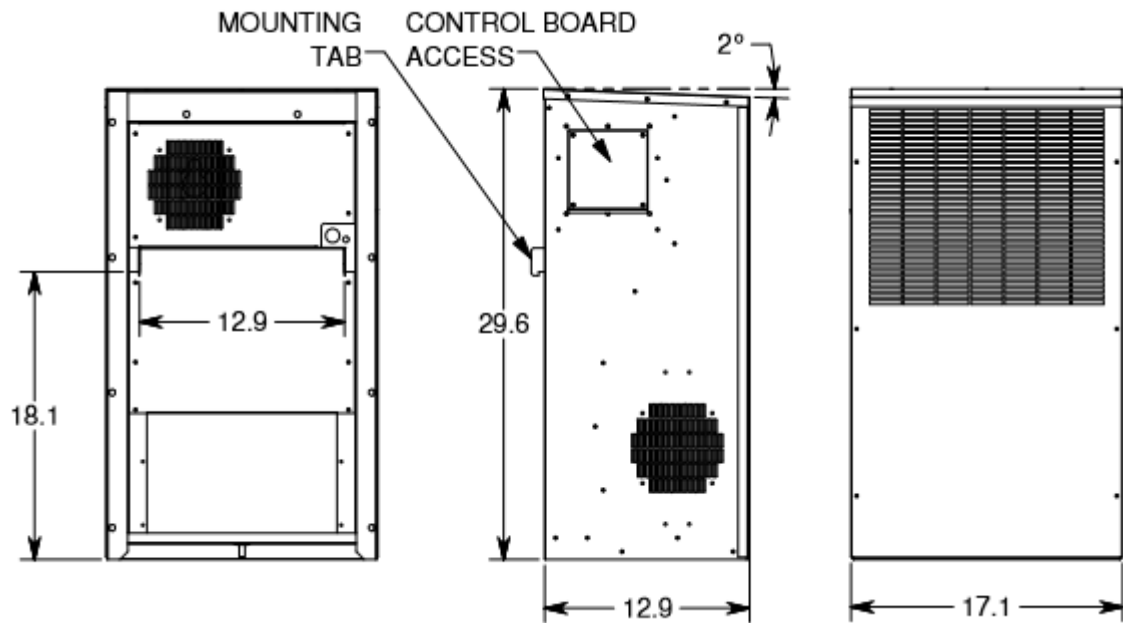


Figure 5 – 4K/6K AC Dimension Overview

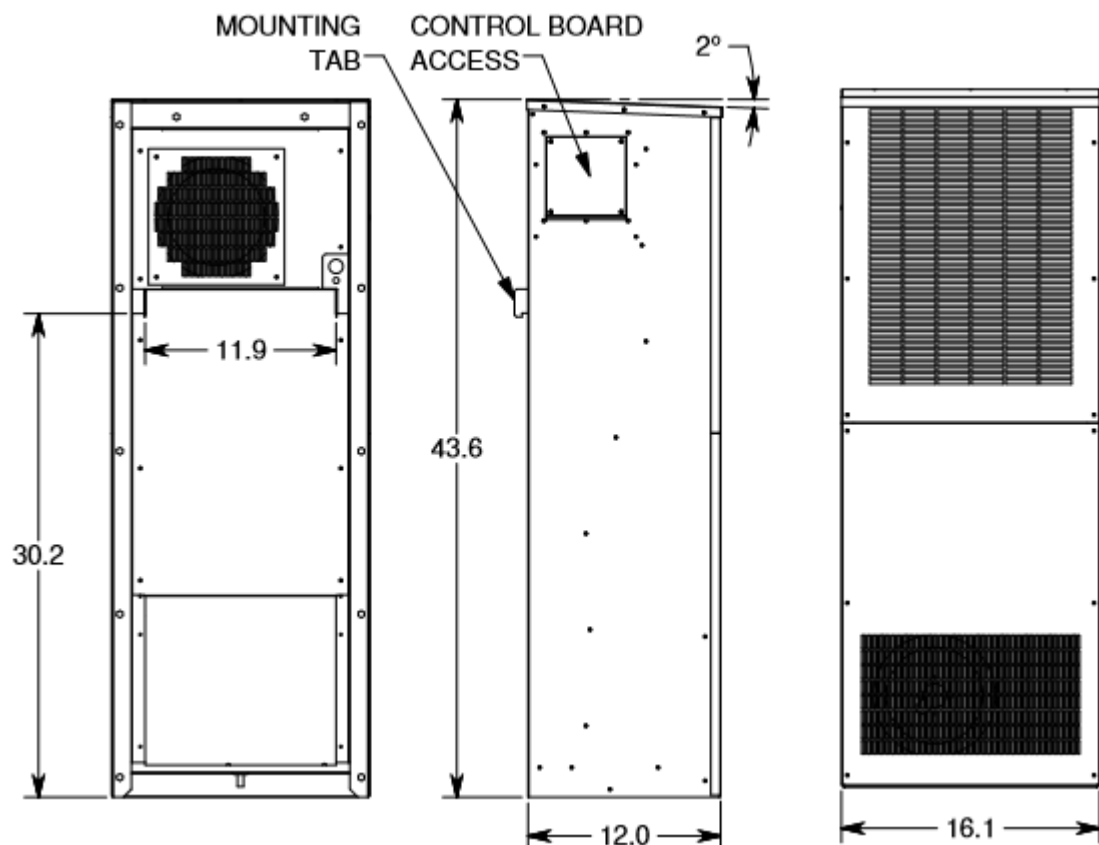


Figure 6 – 8K/10K/12K AC Dimension Overview



5. INSTALLATION INSTRUCTIONS

WARNING: REVIEW THIS MANUAL COMPLETELY PRIOR TO BEGINNING INSTALLATION, OR SERVICE. FAILURE TO DO SO MAY RESULT IN IMPROPER OPERATION, UNIT DAMAGE, AND/OR PERSONAL/BODILY HARM.

The unit may be installed on any flat vertical surface. Do not install the unit in a horizontal position and verify the unit is level. The unit should be located on a cabinet or equipment such that airflow is not restricted by obstructions of the interior or exterior airflow path, as obstruction of airflow will reduce capacity of the unit and may cause unit failure.

Using the cutout template shown below in Figure 7, prepare the wall for the interior intake and discharge openings and fastener locations. Clean the mounting surface to remove any dust, grease, and/or debris, including removing any metal burrs resulting from metal cutting.

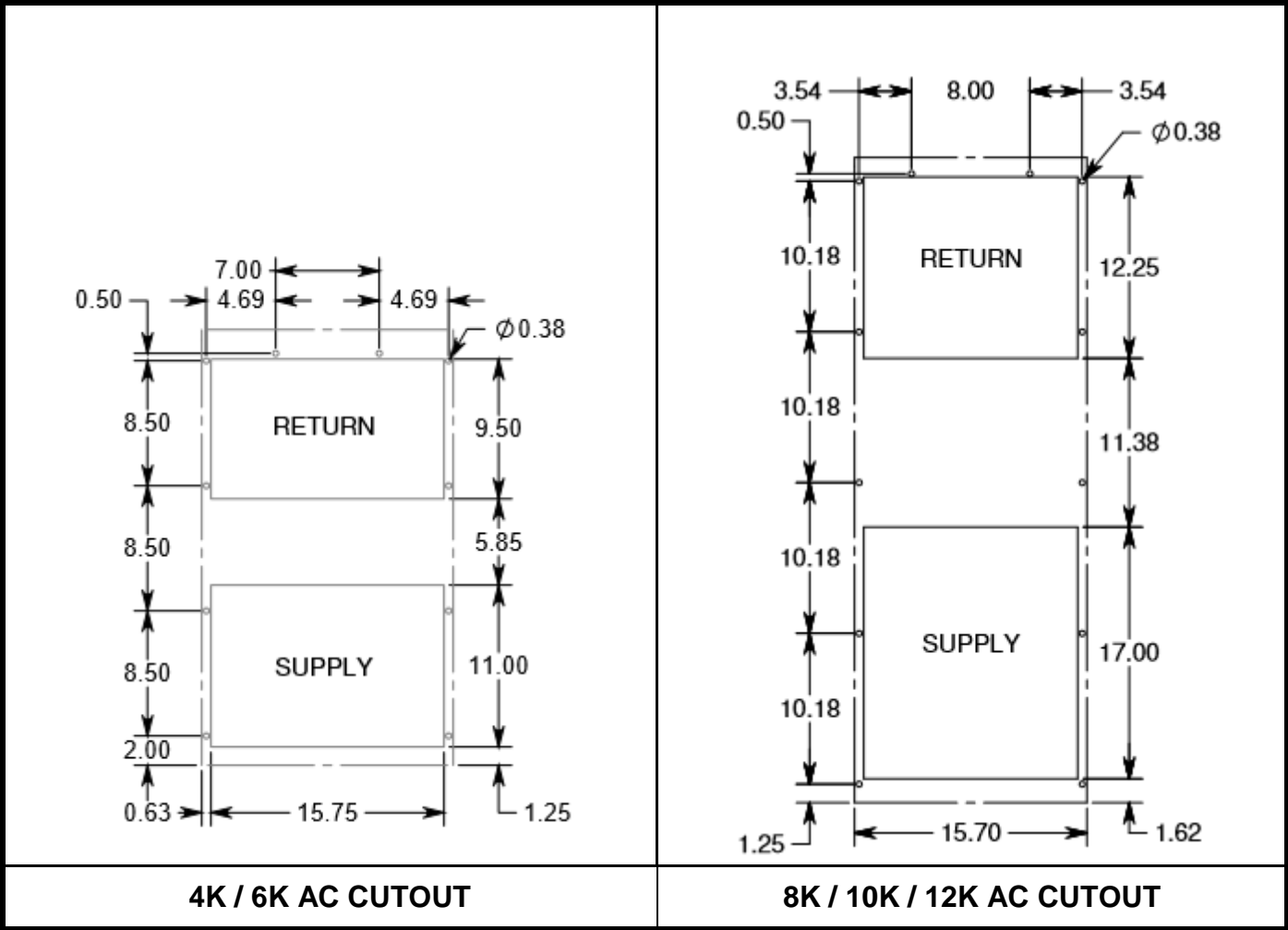


FIGURE 7 - AC CUTOUT DRAWINGS



The supplied gasket is compressed between the cabinet and the air conditioning unit to prevent external water from entering the cabinet through the supply and return openings as seen in Figure 8. Clean any dust or debris from the designated gasket area shown in Figure 9 to ensure that the gasket properly adheres to the unit. Using the provided gasket kit, place the gasket on the back of the AC Unit immediately abutting the mounting hole locations. The gasket should run across the width of the top of the unit, down both sides, with two cross pieces underneath the mounting hooks and the evaporator coil. Ensure there are no gaps in the gasket and verify the top has no gap to ensure proper protection of rain or water.

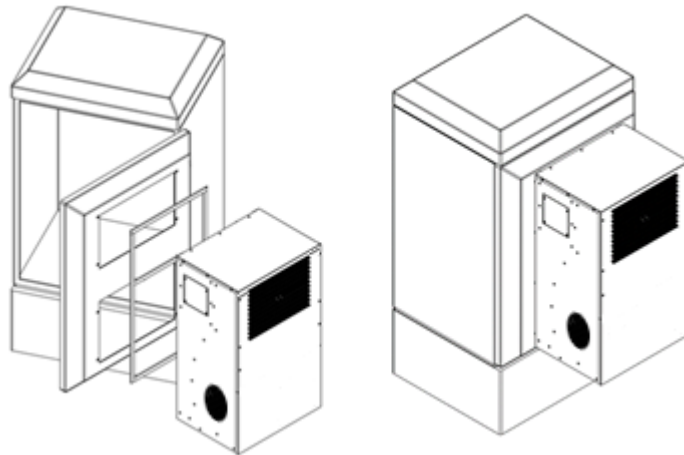


FIGURE 8 – Gasket Area

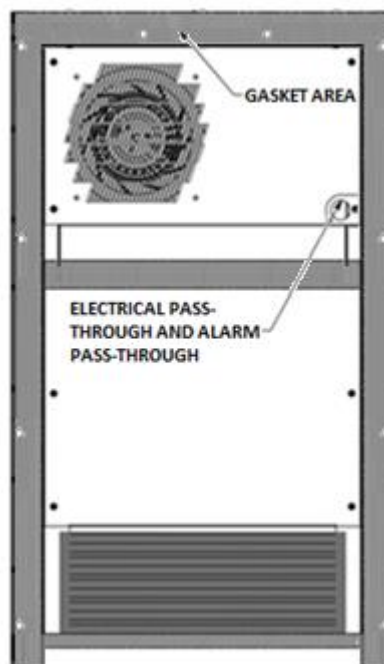


FIGURE 9 – Gasket Area



The unit is equipped with a set of mounting tabs to assist with temporary hanging during installation. These mounting tabs are shown in Figures 5 and 6. Utilize the mounting tabs to place the unit in the proper location at the base of the upper cutout. Install the M6x25 bolts (quantities vary by model) at each of the mounting locations. Install the M6 nuts and washers on the M6 studs. Tighten the M6 mounting bolts and nuts on the M6 studs to 50 in-lbs torque. Do not over tighten.

From the exterior, inspect the gasket to verify the gasket is tight and there are no visible leakage points. Using a field supplied sealant, seal around all four sides of the AC Unit. Note that the AC Unit is fully maintainable without removal from the cabinet/equipment. Therefore use a liberal amount of sealant. The unit is designed to be maintainable from the interior of the cabinet. However, access to all electrical components is also available from the top, if necessary. If top access is required for maintenance purposes, sealant may be removed along the top edge to gain access but new sealant shall be reapplied following the maintenance service.

The evaporator drain pan is provided with a 0.40" outside diameter drain. The drain is located on the positive side of the fan, therefore a trap is not required for positive drainage. If desired, this drain may be trapped by the installer using a field supplied hose or piping.

Install the field supplied fuse and/or breaker per all local/state/national codes, with electrical service rated per the size indicated in Table 1. Prior to starting the unit verify correct operating voltage, with operating voltage required to be within 10% of rated voltage. For nominal 208/230V units, the 24VAC transformer has two taps, 208V and 240V. The unit is shipped with the tapped at 240V, however adjust the transformer tap accordingly to the 208V tap if site voltage is lower than 220V. Failure to adjust the tap, if required, may result in improper operation.

Using the cord and plug provided with the unit, provide electric service to the unit with an electrical receptacle. Installation of the AC Unit is complete with the exception of testing the operation using the TEST Mode function of the controller.

6. CONTROLS AND OPERATION

IMPORTANT NOTE: INSTALLER AND MAINTENANCE PERSONNEL SHALL REVIEW THIS MANUAL THOROUGHLY PRIOR TO INSTALLATION, STARTUP AND MAINTENANCE. FAILURE TO DO SO MAY RESULT IN IMPROPER OPERATION, UNIT DAMAGE, AND/OR PERSONAL/BODILY HARM.

Control Board Functionality and Overview

The AT series air conditioner includes an electronic control board that provides monitoring of temperature and system operation with a simple and easy to use interface to allow the installer or maintenance technician to easily startup, operate and diagnose/troubleshoot the unit. As shown in Figure 9, the control board is easily accessible from the outside of the unit with a control board access panel on the left side of the unit. An instruction label is located on the rear of the control board access panel, seen in Figure 9, providing a brief description and operation of the user interface, with a more detailed explanation contained within this manual. The key features of the control board are shown in Figure 11.

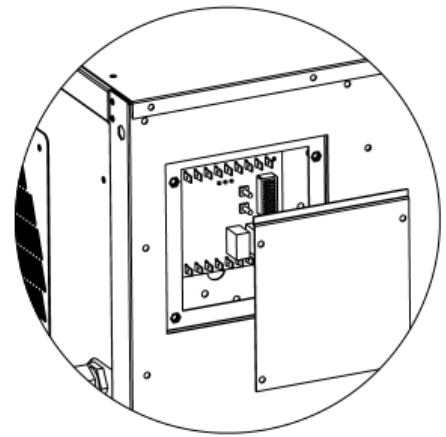


Figure 10 – Removable Side Panel

| ITEM NO. | DESCRIPTION |
|----------|--------------------------------------|
| 1 | High pressure sensor input |
| 2 | Low pressure sensor input |
| 3 | Remote temperature sensor input |
| 4 | High pressure status (HP) |
| 5 | Low pressure status (LP) |
| 6 | Alarm (ALR) |
| 7 | On board temperature sensor |
| 8 | Test button (TEST) |
| 9 | Temperature Display (TEMP) |
| 10 | Setpoint DIP Switches |
| 11 | 24VAC power terminals |
| 12 | Alarm (dry contacts NO/NC/COM*) |
| 13 | Heating Output |
| 14 | Fan output with Compressor Contactor |
| 15 | Compressor Contactor |

* Alarm Dry Contact is rated at 2A @ 12VDC, 1A @ 30VDC, 3A @ 125VAC, 2A @ 250VAC

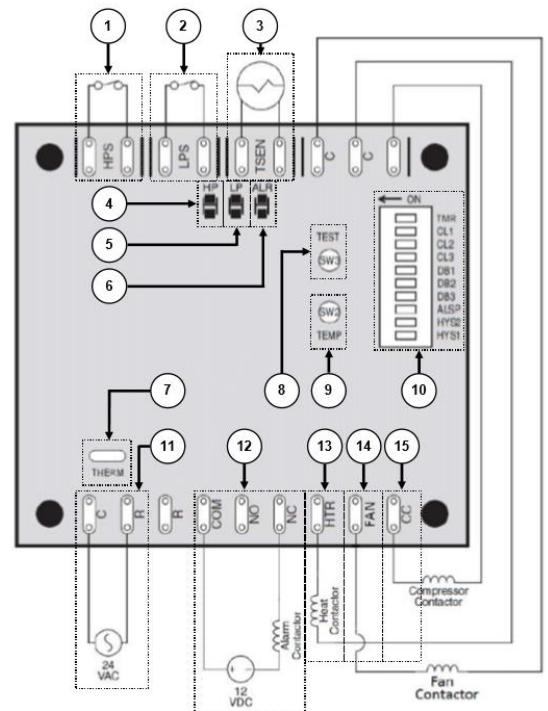


Figure 11 – Control Board Overview



The controller provides control of cooling and heating (if the optional heater is included) with auto-change over between heating and cooling mode. The board includes adjustable DIP switches to allow user configuration of desired temperature alarming, as well as providing testing and diagnosis functions. The board monitors temperature utilizing an onboard temperature sensor and remote sensor (installed as standard option), and the board temperature display function provides for temperature sensor reading verification for diagnostic purposes. The remote temperature sensor is connected to board and located within the interior cabinet section near the interior fan. The board uses the remote temperature sensor for all operations. The onboard sensor is provided as a backup only with no effect on operation if the remote sensor is attached and functioning properly. The remote temperature sensor is installed within the interior fan section of the unit, however the remote temperature sensor includes a 6' long lead wire and may be relocated outside of the unit, if deemed necessary by the installer or service technician. Be careful NOT to install the sensor in an area that is not properly conditioned by the unit (e.g. rear of cabinet obstructed by equipment resulting in insufficient airflow and conditioning), as that may result in the unit freezing and/or resulting in equipment damage.

In addition to monitoring temperature for alarming purposes, the controller utilizes an input from the high pressure switch and optional low pressure switch to monitor system operation. The pressure sensor(s) is provided to prevent permanent damage of the system due to system failure or lack of maintenance, as well as to provide a trouble alarm (LED status lights and alarm output). The pressure sensor monitoring and effect on sequence of operations is further discussed on Page 19.



The ten (10) DIP switches allow users to configure the controller for proper temperature and alarming. DIP switches are either ON (left position) or OFF (right position), as outlined below:

| DIP Switch | DESCRIPTION | ON (LEFT) | OFF (RIGHT) |
|------------|-----------------------------|---|-----------------|
| TMR | 5 MINUTE NO-TIMER MODE | NO-TIMER MODE ACTIVE | TIMER ACTIVE |
| CL1 | COOLING SETPOINT SWITCH 1 | SEE TABLE 3 FOR COOLING SETPOINTS | |
| CL2 | COOLING SETPOINT SWITCH 2 | | |
| CL3 | COOLING SETPOINT SWITCH 3 | | |
| DB1 | DEADBAND SWITCH 1 | SEE TABLE 5 FOR DEADBAND (HEATING SETPOINT = COOLING SETPOINT MINUS DEADBAND) | |
| DB2 | DEADBAND SWITCH 2 | | |
| DB3 | DEADBAND SWITCH 3 | | |
| ALSP | ALARM SETPOINT DIFFERENTIAL | 4° DIFFERENTIAL | 8° DIFFERENTIAL |
| HYS1 | COOLING HYSTERESIS SWITCH 1 | SEE TABLE 4 FOR HYSTERESIS SETTINGS | |
| HYS2 | COOLING HYSTERESIS SWITCH 2 | | |

NO-TIMER MODE

The NO-TIMER MODE allows an installer or maintenance technician to bypass all delays provided internal to the board (e.g. 5 min. anti-short cycling cooling delay). This switch may be used immediately after initial startup or cycling of power, or after the termination of a cooling or heating command. NO-TIMER MODE is active for 5 minutes after the NO-TIMER MODE is toggled from OFF to ON. During NO-TIMER MODE all timed delays will be ignored. However, to protect the compressor, a low or high pressure event will immediately terminate NO-TIMER MODE and the board will be locked out for cooling operation in order to protect the refrigeration circuit.

If the NO-TIMER MODE switch is left ON and power is cycled, the board will not permit a NO-TIMER MODE until after the switch is toggled OFF and back ON.



COOLING SEPOINT AND OPERATION

Cooling setpoint is based upon CL1/CL2/CL3 positions as shown below in Table 3. The board will energize cooling operation immediately upon the temperature sensor reading a temperature 1°F above the cooling setpoint, as long as the board is not in a cooling delay (5 minutes). The cooling operation will terminate when the temperature sensor reads a temperature equal to the setpoint less the hysteresis, with the hysteresis settings shown below in Table 4.

The hysteresis is the differential below the cooling setpoint when the unit will stops cooling operations. The Hysteresis is set per Table 4. As an example, if the cooling setpoint is 84° and the Hysteresis is set to 3°, the cooling operation will begin at 85° (Cooling Setpoint + 1°) and will terminate cooling operations at 81° (84° - 3°).

The cooling delay is used to prevent short cycling, which may cause premature unit failure. The 5 minute cooling delay is active upon initial startup, power cycling, and following the termination of the previous cooling operation. This delay may be temporarily bypassed, as discussed above with NO-TIMER MODE.

| COOLING SETPOINT | | | |
|-------------------------|-----|-----|----------|
| CL1 | CL2 | CL3 | SETPOINT |
| ON | ON | ON | 93 |
| ON | ON | OFF | 90 |
| ON | OFF | ON | 87 |
| ON | OFF | OFF | 84 |
| OFF | ON | ON | 81 |
| OFF | ON | OFF | 78 |
| OFF | OFF | ON | 75 |
| OFF | OFF | OFF | 72 |

Table 3 – Cooling Setpoint Settings



| COOLING HYSTERESIS | | |
|--------------------|------|------------|
| HYS1 | HYS2 | HYSTERESIS |
| ON | ON | 3 |
| ON | OFF | 6 |
| OFF | ON | 9 |
| OFF | OFF | 12 |

Table 4 – Offset From Cooling Setpoint Settings

HEATING SETPOINT AND OPERATION

Heating setpoint is set based upon the deadband DIP switch settings. Heating setpoint is equal to the cooling setpoint minus the deadband. The deadband DIP switch settings are identified below in Table 5. The board will energize heating operation immediately upon the temperature sensor reading a temperature 1°F below the heating setpoint (Cooling Setpoint minus Deadband), as long as the board is not in a 2 minute heating delay during initial startup or following the previous heating operation. Heating operation will stop when the temperature is 2°F above the heating setpoint.

The 2 minute heating delay is active upon initial startup, power cycling, and following the termination of the previous heating operation. This delay may be temporarily bypassed, as discussed above with NO-TIMER MODE.

| DEADBAND SETPOINT | | | |
|-------------------|-----|-----|----------|
| DB1 | DB2 | DB3 | DEADBAND |
| ON | ON | ON | 6 |
| ON | ON | OFF | 12 |
| ON | OFF | ON | 18 |
| ON | OFF | OFF | 24 |
| OFF | ON | ON | 30 |
| OFF | ON | OFF | 36 |
| OFF | OFF | ON | 42 |
| OFF | OFF | OFF | 48 |

Table 5 – Deadband Setpoint Settings



TEMPERATURE ALARM SETPOINT AND ALARM LED LIGHT STATUS

The temperature alarm setpoint operates for both cooling and heating, and is based upon the alarm differential from setpoint, with DIP switch settings below in Table 6 provided for alarm differential. For cooling, this alarm setpoint is the cooling setpoint plus the alarm differential. For heating the alarm setpoint is the heating setpoint less the alarm differential. A ten (10) minute delay is used to prevent nuisance temperature alarms. If the board measures a temperature above/below the temperature alarm setpoint for 10 minutes, the board will activate the alarm output as further discussed below.

| ALARM DIFFERENTIAL | |
|---------------------------|--|
| ALSP | Alarm Differential from Cooling/Heating Setpoint |
| ON | 4° |
| OFF | 8° |

Table 6 – Alarm Differential from Cooling Temperature Settings

As with the alarm output, the TEMP LED will be solid red during an active temperature alarm. The board will continue to operate with all functions for cooling and/or heating during a temperature alarm. If the temperature alarm clears, the alarm output will be deactivated and the TEMP LED will flash for a period of 100 hours. A subsequent temperature alarm, if any, will repeat the process with the same sequence. The active temperature alarm LED and alarm output may be cleared by cycling power to the unit.

HIGH/LOW PRESSURE OPERATIONS/MONITORING AND PRESSURE ALARM LIGHT STATUS

High pressure sensors are standard on all AT series air conditioners. Low pressure sensors are optional and if not included, a jumper will be placed on the board across the two low pressure input terminals to bypass the monitoring of low pressure.

The high pressure and low pressure switches are continuously monitored during an active cooling operation. If either pressure switch opens identifying either low or high pressure, the unit will immediately shut down for a soft lockout and the respective pressure LED (HP or LP) will flash. The unit will not start cooling operation if the high pressure switch is open during initial start or following a soft lockout. If the low pressure switch is open during initial start or following a soft lockout the unit will begin cooling operations for a two (2) minute low pressure bypass period, and if the low pressure switch remains open, the unit will terminate cooling operation.



A five (5) minute soft lockout period follows a termination of cooling operation due to a pressure switch opening. During a soft lockout the board will not energize cooling operation. Upon the termination of the soft lockout period the board will attempt to restart the cooling operation and repeat the process. If the board experiences three (3) pressure soft lockouts within a 90 minute period the board will provide an alarm output and enter a hard lockout. A hard lockout will not permit cooling operation and a may only be cleared by cycling power to the unit.

Important Note: The pressure switches are NOT monitored during the 5 minute cooling delay. The NO-TIMER MODE may be used to bypass the 5 minute delay to quickly determine if a switch is open. However be advised that the board will immediately process a hard lockout with a single pressure switch failure while in NO-TIMER MODE. This diagnostic process allows quick verification of pressure switch status while protecting the compressor against repeated starts.

The LED lights for high pressure (HP) and low pressure (LP) provide a visual indication of status. A solid light indicates an active hard lockout of the respective switch whereas a flashing light reflects a soft lockout had occurred within the previous 100 hours. Cycling power to the unit will reset the LED lights.

TEMPERATURE DISPLAY MODE

The Temperature Display (TEMP) button may be pressed for at least 1 second at any time to display the current temperature at the active temperature sensor, with the TEMP LED used to flash display the current temperature in degrees F. During temperature display any active LEDs reflecting HP/LP/TEMP alarm status will be temporarily suppressed. Following a 1.5 second delay, TEMP LED will flash with a long period flash reflecting the current temperature's 10's place digit (one long flash for every 10 degrees), and after another short delay, the LED will begin short flashes representing the 1's place digit (One short flash for every 1 degree). If the High-Pressure Alarm LED is solid red during the temperature display sequence, then the resulting temperature is negative. Upon completion of the displayed temperature, the HP/LP/TEMP LED Alarm status will return to their pre-Temperature Display alarm state, if any.

Temperature Display Example:

Seven (7) Long Period Flash: $7 \times 10 = 70$

Three (3) Short Period Flash: $3 \times 1 = 3$

Temperature Read at Sensor = $70 + 3 = 73^{\circ}\text{F}$



TEST MODE

The Test Mode is available to allow the installer or service technician to test operation of each component of the system. To enter test mode, press the TEST button for at least 1 second to begin the following test sequence.

Test Sequence:

From 0-60 seconds: Cooling Operation

From 61-90 seconds: Heating Operation (if optional heater is installed)

From 91-100 seconds: Low-Pressure Alarm LED is on

From 101-110 seconds: High-Pressure Alarm LED is on

From 111-120 seconds: High/Low Temperature Alarm LED is on

From 91-120 seconds: Alarm Output is Energized

Important Note: The outdoor condenser fan will begin operation once the high pressure equals the +/- 200 psi cut-in pressure of the low ambient control pressure switch. Subject to testing in extreme/low temperature conditions (e.g. below 0°F), the outdoor condenser fan may not energize during the 60 second Cooling Operation test period. In these extreme conditions the cooling operation will need to be tested using a standard cooling operation, with the technician having available the NO-TIMER MODE to bypass the 5 minute delay.

ALARM OUTPUT

Dry contacts rated at 2A @ 12VDC/1A @ 30VDC/3A @ 125VAC/2A @ 250VAC are provided to allow connection to an alarm monitoring system. The output is designed to be fail safe, such that the alarm output relay is energized when no alarm is present thus providing an alarm output in the event that the board loses power. As referenced above, the alarm output is active for a high or low temperature event (following a 10 minute delay) and/or for a hard lockout of a pressure switch.

FAN OPERATION

The internal fan is energized only when the control board provides a command for cooling or heating. If the user prefers continuous fan operation, the line voltage fan blue wire from the fan to the fan relay may be relocated to the continuous power side of the compressor contactor. This continuous interior fan adjustment is noted on the wiring diagram. Disconnect power to the unit prior to making this wiring change.



7. ELECTRICAL WIRING DIAGRAM

The following table can be used to identify components on the electrical schematic.

| Electrical Schematic Key | | | |
|----------------------------|----------------------------------|---------------|-----------------------|
| Main Electrical Components | | Control Board | |
| CR1 | Contactor and Distribution Block | HPS | High Pressure Control |
| R1 | Relay 1 (Heater) | LPS | Low Pressure Control |
| R2 | Relay 2 (Interior Fan) | TESN | Temperature Sensor |
| T1 | 24VAC Transformer | C | Common |
| TS-1 | Thermal Protection Disc 1 | R | 24VAC |
| TS-2 | Thermal Protection Disc 2 | COM | Common |
| Hard Start Relay | | NO | Normally Open |
| High Pressure Switch | | NC | Normally Closed |
| Low Pressure Switch | | HTR | Heating Component |
| Low Ambient Control | | FAN | Cooling Component |
| | | CC | Compressor Contactor |

Table 7 – Electrical Schematic Key

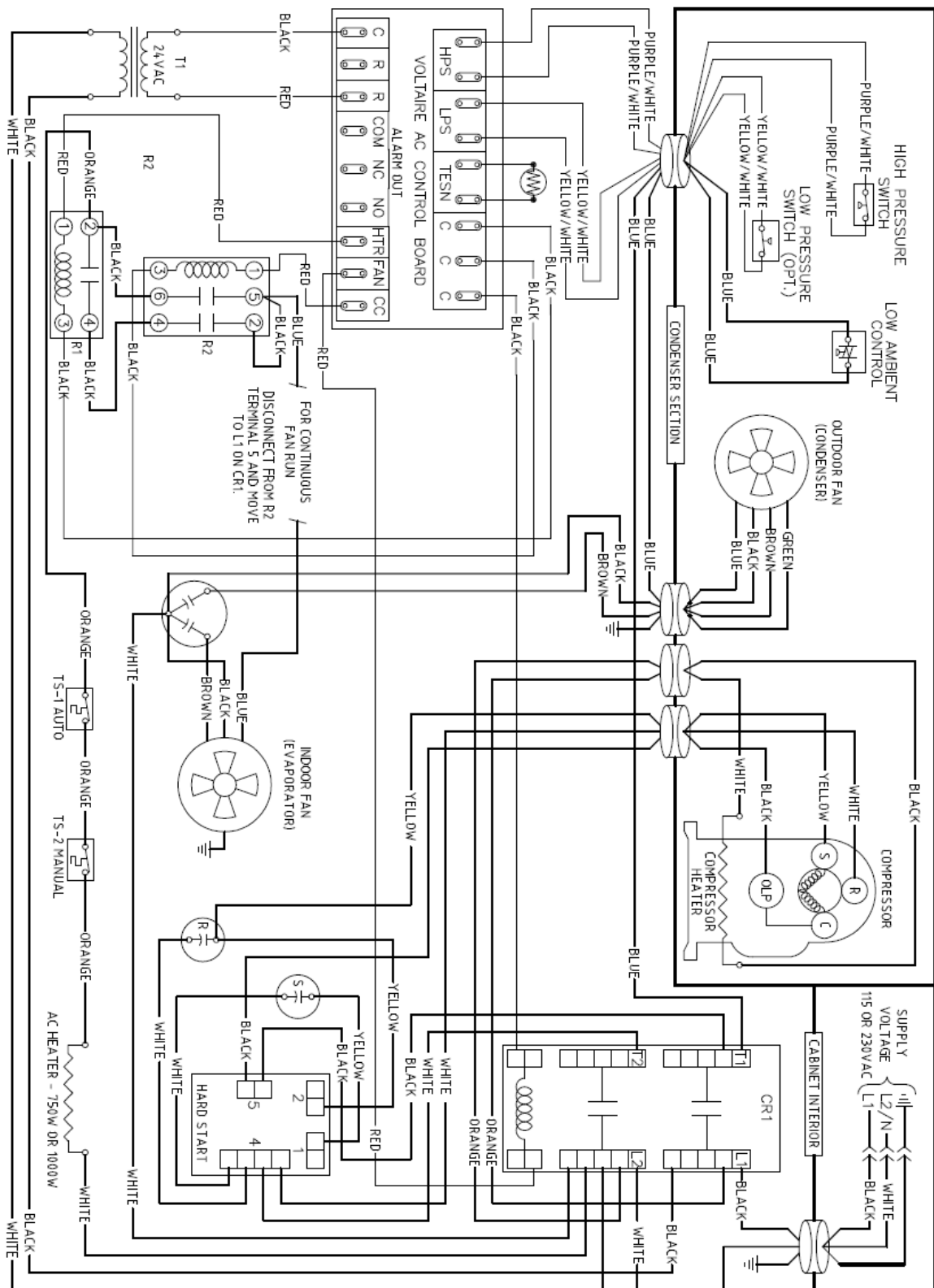


Figure 12 – Electrical Wiring Diagram with Hard Start





8. RECOMMENDED / PREVENTATIVE MAINTENANCE

Although the VoltAire Systems Air Conditioners are designed to require minimal maintenance, it is recommended that the units be inspected periodically for proper operation. The frequency of maintenance is a function of the site conditions, such that dirtier sites may require more frequent maintenance to clean coils and/or filters. The following items can be reviewed during other routine maintenance of the cabinet/equipment:

- Verify operation of the interior and exterior fans. Use the control board test button to verify operation of the compressor, heater and fans.
- Verify that the unit is sealed properly. The field sealing of the unit to the cabinet/equipment should be inspected to ensure proper sealing.
- Interior/evaporator and Exterior/condenser coil should be cleaned using a commercial available non-acidic HVAC coil cleaner.
- Clean the exterior/condenser filter (optional item), if applicable

Table 7 can be used to assist in timing service / maintenance.

| Maintenance Schedule | | | | | |
|----------------------|--|-----------------------------|--------------|--------|---------|
| | Maintenance Item | Quarterly / Semiannually | Semiannually | Yearly | 5 Years |
| 1 | Check for filter blockage (If Applicable) | ✓* | | | |
| 2 | Condenser Coil Cleaning (Remove debris / blockages) | ✓* | | | |
| 3 | Functionality Check (Check if unit is reaching capacity) | | ✓ | | |
| 4 | Fan rotation Check (Verify fans spin without issues) | | | ✓ | |
| 5 | Evaporator Coil Cleaning (Remove debris / blockages) | | | ✓ | |
| 6 | Cabinet Cleaning / Corrosion Check | | | ✓ | |
| 7 | Condensate Drain Pipe (Clean and clear any blockage) | | | ✓ | |

*Time may vary based on location conditions of installed unit. Monthly may be necessary for extraordinarily dirty sites

Table 8 – Maintenance Schedule



9. TROUBLESHOOTING GUIDE

WARNING: ELECTRICAL SHOCK HAZARD. DISCONNECT POWER FOR SERVICING. FAILURE TO DO SO COULD RESULT IN ELECTRICAL SHOCK OR DEATH.

CAUTION: ELECTRICAL AND REFRIGERATION SERVICE AND TROUBLESHOOTING SHOULD ONLY BE CONDUCTED BY CERTIFIED HVAC TECHNICIANS. TECHNICIANS SHALL FOLLOW ALL INDUSTRY STANDARDS FOR SAFETY. THE COMPONENTS IN THE UNIT ARE STANDARD INDUSTRY COMPONENTS, AND TOGETHER WITH THE INFORMATION PROVIDED WITHIN THIS MANUAL, THE TECHNICIAN SHALL USE STANDARD ELECTRICAL AND REFRIGERATION TROUBLESHOOTING, DIAGNOSIS AND REPAIR PROCEDURES. PLEASE NOTE THAT UNIT MAY CONTAIN CUT HAZARDS/SHARP EDGES AND GLOVES SHALL BE USED TO AVOID SHARP EDGES AND INJURY.

IMPORTANT: REVIEW THE MANUAL IN ITS ENTIRETY PRIOR TO SERVICING OR MAINTAINING THE EQUIPMENT.

| PROBLEM | POTENTIAL CAUSE | SOLUTION |
|---|--|---|
| Unit or components not powering on | No or improper supply voltage | Check power source voltage (shall be within +/- 10% of unit rating) and verify electrical connections at all terminals. Verify transformer voltage tap is set properly at either 208V or 240V and adjust as necessary as described within this manual. |
| | Control board not working | Remove power from the unit and check/verify all terminals are fully connected at control board, transformer, relays, contactor, and capacitors. Verify 24V supply power across control board R and C terminal on control board. Use Test Mode to verify proper operation of each component as described within this manual. |
| Unit not reaching cooling capacity or satisfying heat load in cabinet | Dirty condenser or evaporator coil or exterior filter (optional feature) | Remove blockage by cleaning condenser/evaporator coil thoroughly with commercially available coil cleaner. Acidic based coil cleaner shall <u>NOT</u> be used. Clean exterior filter, if applicable. |
| | Bent fins on coil | Use coil comb to straighten out fins. |
| | Loss of refrigerant | Locate leak, repair or replace components, and recharge unit to initial specified charge specification by removing all charge, pumping down refrigerant circuit to remove moisture, and weighing charge in with new R134A refrigerant. |
| | Verify free and clear airflow at both coils | Verify that airflow is not blocked or obstructed at evaporator and condenser coils. Adjust or divert air, and/or relocate equipment in cabinet that is obstructing airflow. |
| | Refrigeration metering device malfunction | TXV or capillary tube may be restricted or malfunctioning. See loss of refrigerant above then verify pressure and / or temperature drop and replace if malfunctioning. |
| | Unit undersized for load | Check heat load of cabinet and verify proper unit sizing. |



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| Evaporator/indo or coil ice buildup | Insufficient heat load | Reduce control board Hysteresis (HYS) to cycle compressor off more quickly and/or increase cooling set point to reduce run time. Unit possibly oversized and may need to be replaced with lower capacity unit. |
| | Insufficient interior airflow due to dirty evaporator coil | Remove blockage by cleaning evaporator coil thoroughly with commercially available coil cleaner. Acidic based coil cleaner shall <u>NOT</u> be used. |
| | Unit may be low on refrigerant | Locate leak and repair, and/or replace components, and recharge unit to initial specified charge specification by removing all charge, pumping down refrigerant circuit to remove moisture, and weighing charge in with new R134A refrigerant. |
| Fan failure | Bad capacitor | Check capacitance of capacitor and replace capacitor if operating outside of specified range. |
| | Verify operation of low ambient/head pressure control pressure switch | Condenser fan is powered through a head pressure control relay that closes at approx. 200psi and opens at approx. 110psi. Verify switch is closed at normal operating pressures. Replace switch if permanently open. |
| Compressor fails to run after startup or unit is operating with low and/or high pressure or compressor drawing abnormally high amps. | Bad run/start capacitor | Check capacitance of capacitors and replace capacitor(s) if operating outside of specified range. |
| | High pressure switch operation | Switch should be closed with standard operating pressure (or below). Replace bad switch. |
| | Low pressure switch operation (optional feature) | Switch should be closed with standard operating pressure (or above). Note that control board bypasses switch for 2 minutes after compressor start. Replace bad switch. |
| | Bad contactor | Verify voltage at contactor and replace contactor if not operating properly. |
| | Restricted liquid line filter drier | Verify proper pressure drop across liquid line filter drier, and replace if necessary. |
| | Start relay failure | Verify proper start relay operation and replace as necessary. |
| | Bad thermal overload switch | Replace overload switch. |
| Tripper breaker and/or fuse (both field supplied) | Undersized breaker/fuse | Replace with properly sized breaker/fuse and/or wire. |
| | Short in system | Locate and eliminate short. |
| | Unit drawing high amps on startup. | Check compressor windings and compressor startup components. |
| Water in enclosure | Evaporator drain clogged | Remove blockage and clean drain pipe. |
| | Enclosure not sealed | Properly seal off enclosure to prevent humidity entering unit. |
| | Mounting gasket damaged | Replace mounting gasket or replace sealant around unit. |

FOR ADDITIONAL TECHNICAL SUPPORT, PLEASE CONTACT VOLTAIRE SYSTEMS AT (407) 378-7482.



10. SPARE PARTS

| AIR CONDITIONER MODEL NO(S). | PART NO. | PART DESCRIPTION |
|---------------------------------|------------|-------------------------------------|
| CONTROL PANEL SPARE PARTS | | |
| All Units | B4B0001JAA | AC Control Board |
| All Units | Y4R0001XXA | Relay, 24VAC SPNO, 12FLA |
| All Units | Y4R0002XXA | Relay, 24VAC 1NO/1NC, 12FLA |
| AT**RM | Y4T0003VAA | 115VAC 24VAC, 20VA, Transformer |
| AT**RN | Y4T0004XXA | 208/240VAC 24VAC, 20VA, Transformer |
| AT06RM | Y4R0005XXA | Relay, Start Relay, 35A 2AH |
| AT06RN | Y4R0006XXA | Relay, Start Relay, 35A 2AI |
| AT08RM | Y4R0007XXA | Relay, Start Relay, 35A 3AI |
| AT10RM | Y4R0008XXA | Relay, Start Relay, 35A 4AH |
| AT08RN | Y4R0009XXA | Relay, Start Relay, 35A 9AG |
| HEATER SPARE PARTS | | |
| AT**RM07* | B1H0001XXA | MICA Strip Heater, 115V, 750W |
| AT**RN07* | B1H0002XXA | MICA Strip Heater, 230V, 750W |
| AT**RN10* | B1H0003XXA | MICA Strip Heater, 230V, 1000W |
| All Units | Y4S0003SEA | Auto Disc Thermostat |
| All Units | Y4S0004SEA | Manual Disc Thermostat |
| MISC. SPARE PARTS | | |
| All Units | B4R0001WSA | HP Pressure Switch |
| All Units | B4R0002WSA | LAC Pressure Switch |
| All 115V Units | B1H0007TTA | Compressor Heater, 115V 30W |
| All 230V Units | B1H0008TTA | Compressor Heater, 230V 30W |
| COMPRESSORS | | |
| AT04RN | B2B0001LGA | Rotary Compressor, 230V, 4K, R134 |
| AT06RM | B2A0001TKA | Rotary Compressor, 115V, 6K, R134 |
| AT06RN | B2B0002TKA | Rotary Compressor, 230V, 6K, R134 |
| AT08RM | B2A0002TKA | Rotary Compressor, 115V, 8K, R134 |
| AT08RN | B2B0003TKA | Rotary Compressor, 230V, 8K, R134 |
| AT10RM | B2A0003TKA | Rotary Compressor, 115V, 10K, R134 |



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|--|----------------------------|---|
| AT10RN | B2B0004TKA | Rotary Compressor, 230V, 10K, R134 |
| AT12RM | B2A0004TKA | Rotary Compressor, 115V, 12K, R134 |
| AT12RN | B2B0005TKA | Rotary Compressor, 230V, 12K, R134 |
| COMPRESSOR CAPACITORS | | |
| AT06RN | C4G0001XXA | Start Capacitor, 72-88MFD 330V |
| AT08RM | C4G0003XXA | Start Capacitor, 97MFD +/- 10% |
| AT06RM | C4G0004XXA | Start Capacitor, 119MFD +/- 10% |
| AT12RM | C4G0005XXA | Start Capacitor, 176MFD +15% / -0% |
| AT06RN | C4G0006XXA | Run Capacitor, 15MFD 370V |
| AT10RN | C4G0007XXA | Run Capacitor, 25MFD 370V |
| AT12RM | C4G0008XXA | Run Capacitor, 35MFD 240V |
| AT04RN | C4G0014XXA | Run Capacitor, 12.5MFD 370V |
| FANS / RUN CAPACITORS | | |
| AT06RM (Int. & Ext.) AT08RM (Int. Only) | C3A0002RBA / C4G0013XXA | Centrifugal Fan, 192mm, 115V / 8MFD Run Capacitor |
| AT04RN (Int. & Ext.) AT06RN (Int. & Ext.) AT08RN (Int. Only) | C3B0021RBA / C4G0009XXA | Centrifugal Fan, 192mm, 230V / 2MFD Run Capacitor |
| AT08RM (Ext. Only) AT10RM (Int. Only) AT12RM (Int. Only) | C3A0003RBA / C4G0013XXA | Centrifugal Fan, 220mm, 115V / 8MFD Run Capacitor |
| AT08RN (Ext. Only) AT10RN (Int. Only) AT12RN (Int. Only) | C3B0022RBA / C4G0010XXA | Centrifugal Fan, 220mm, 230V / 3MFD Run Capacitor |
| AT10RM (Ext. Only) AT12RM (Ext. Only) | C3A0004RBA / C4G0015XXA | Centrifugal Fan, 225mm, 115V / 18MFD Run Capacitor |
| AT10RN (Ext. Only) AT12RN (Ext. Only) | C3B0023RBA / C4G0011XXA | Centrifugal Fan, 225mm, 230V / 4MFD Run Capacitor |
| COILS | | |
| AT04 | B1B0001CCA | Condenser Coil, 4K |
| AT06 | B1B0002CCA | Condenser Coil, 6K |
| AT08 | B1B0003CCA | Condenser Coil, 8K |
| AT10 AT12 | B1B0004CCA | Condenser Coil, 10K/12K |
| AT04 | B1B0005CCA | Evaporator Coil, 4K |
| AT06 | B1B0006CCA | Evaporator Coil, 6K |



| | | |
|----------------------|------------|-----------------------------|
| AT08 | B1B0007CCA | Evaporator Coil, 8K |
| AT10 | B1B0008CCA | Evaporator Coil, 10K |
| AT12 | B1B0009CCA | Evaporator Coil, 12K |
| TXV / FILTER DRIERS | | |
| AT08 | B1V0003DFA | TXV 8K Expansion Valve |
| AT10 AT12 | B1V0004DFA | TXV 10K/12K Expansion Valve |
| AT04 AT06 | B1V0006DFA | Filter Drier, 4K/6K |
| AT08 AT10 AT12 | B1V0007DFA | Filter Drier, 8K/10K/12K |



11. WARRANTY

VOLTAIRE SYSTEMS THERMAL UNITS LIMITED WARRANTY AND LIMITATIONS OF LIABILITY

**(Applies to All Heat Exchangers, Pressurization Units,
Fan Units, and Air Conditioners)**

The VoltAire Systems, LLC ("VoltAire") Non-Transferable Limited Warranty ("Limited Warranty") is applicable for 12 months following the shipment of the product to the original purchaser ("Purchaser") defined as the "Warranty Period". VoltAire warrants to the original purchaser during the Warranty Period that all materials and workmanship are free of defects of quality and operation that would impair the usefulness of the original air conditioner, fan unit, or heat exchanger (collectively herein referred to as "Product") during the Warranty Period. This Limited Warranty is for all components of the Product, except filters, when installed and operated under the following conditions:

- A. In strict accordance with the Product's Installation and Operation Manual, as may be revised from time to time with the latest version available at www.voltairesys.com.
- B. Maximum voltage variation no greater than plus or minus 10% of nameplate nominal rating.
- C. Maximum frequency variation no greater than plus or minus 3 Hz. of nameplate nominal rating.
- D. Must not exceed minimum and maximum stated temperatures on the nameplate.
- E. Not to exceed (BTU/Hr.) rating, including any heat sink, as indicated on the nameplate.
- F. Installed per all local, State and Federal Codes
- G. The unit must not be restarted for a period of five (5) minutes after intentional or accidental shut-off of a compressor. (This does not apply to heat exchangers or pressurization units.)

The Limited Warranty is void and not applicable if:

- A. The Product is installed improperly
- B. The Product is not maintained properly, including prolonged operation with dirty filters or coils.
- C. The Product is modified, abused and/or tampered
- D. The Product is applied in an incorrect manner, including operation within a corrosive atmosphere (including but not limited to coastal applications)
- E. The Product is used with the incorrect refrigerant (air conditioners only)
- F. The Product is damaged and/or inoperable due to accidents or events beyond the reasonable control of VoltAire and Acts of God
- G. The Product is repaired with parts not provided by VoltAire
- H. The Product is installed and operated outside the United States, Mexico, and/or Canada.

Damage during freight is not included with this Limited Warranty. The Purchaser must insure the Product is installed by a competent, professional, qualified contractor, following all local, state, and national codes and industry standards. The Purchaser must provide adequate maintenance (e.g. filter changes, coil cleanings).

The Limited Warranty covers the Product only during the Warranty period, and the Limited Warranty does not include any labor, freight, and/or consequential damages or loss. Upon Notification by the Purchaser, VoltAire solely reserves the right to either:

- Ship replacement parts to the Purchaser for the Purchaser's infield replacement of the part. Infield replacement will require the Purchaser to provide a purchase order to VoltAire for the standard cost of the part and after infield replacement return the original part to VoltAire with



freight cost by Purchaser. Within fourteen (14) days of receipt of the returned part VoltAire will review and analyze the returned part. If the part is found to be defective by VoltAire a credit will be issued to the customer. Parts returned to VoltAire and found not to be defective will result in no credit applied to Purchaser's account and the Purchaser will be required to pay for the replacement part.

- Or request the return of the Product for evaluation. Return of the Product must be preceded by the issuance of a VoltAire Return Merchandise Authorization (RMA). The RMA will require that shipping costs be paid by the Purchaser to return the Product to VoltAire. Within fourteen (14) days of receipt of the returned Product VoltAire will review and analyze the Product. If the Product is determined by VoltAire to be defective, VoltAire may repair or replace the Product, and will ship the Product to the Purchaser for the Purchaser's installation in the field with no labor costs reimbursed by VoltAire. If the Product is determined by VoltAire to NOT be defective, the Purchaser will be notified and a Purchase Order must be issued in the amount required for the Product to be Packaged and returned to the Purchaser.

DISCLAIMERS AND LIMITATIONS OF LIABILITY:

THIS LIMITED WARRANTY CONSTITUTES THE ENTIRE WARRANTY FOR THE VOLTAIRE PRODUCT AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING ANY WARRANTY OR MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

VOLTAIRE IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE WHATSOEVER, INCLUDING, BUT NOT LIMITED TO, LOST PROFITS, ATTORNEYS FEES, AND LOSS OF USE DAMAGES.

VOLTAIRE EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS, OR REPRESENTATIVES IN RESPECT TO THE MANUFACTURE OR SUPPLY OF GOODS, INCLUDING THE PRODUCT, OR THE PROVISION OF SERVICES RELATING TO THE GOODS, INCLUDING THE PRODUCT.

This Limited Warranty, Disclaimer, and Limitation of Liability shall supersede any Terms of Purchase provided by the Purchaser at the time of the Purchase, and the Limitation of Liability shall survive from the date of the Purchase to the date of discontinued use. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation of consequential damages may not apply.