ENERTECH
ENERGY + TECHNOLOGY

Installation, Operations, & Maintenance Manual

EAD MULTI-POSITION AIR HANDLERS

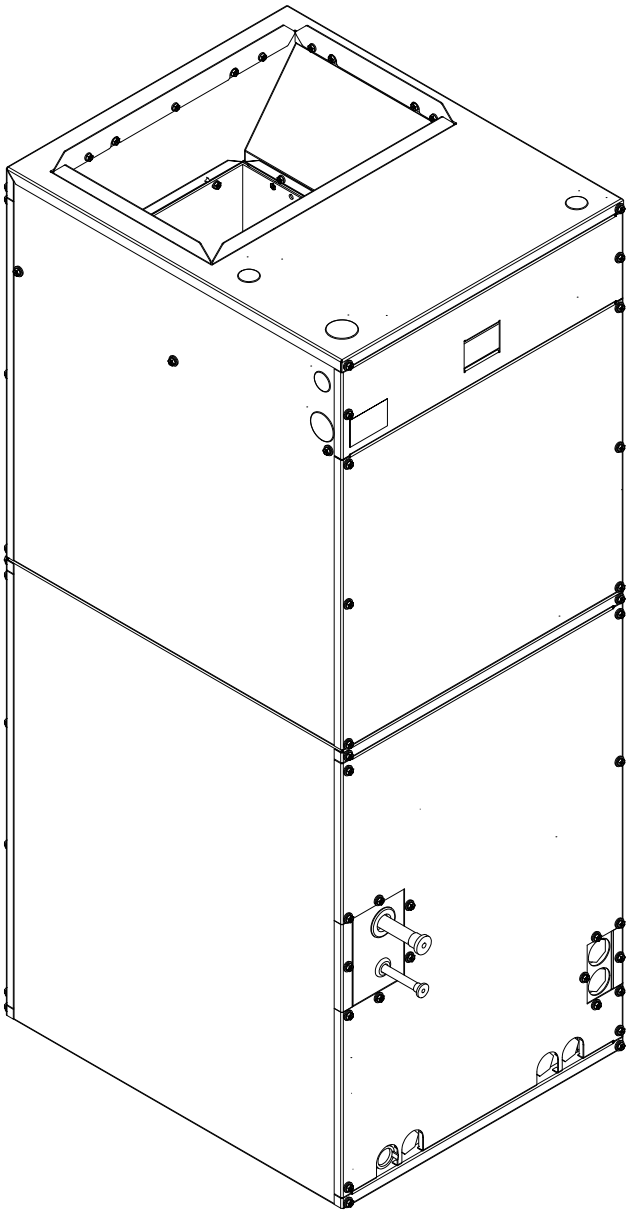

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Table of Contents

Section 1: Model Nomenclature
Nomenclature Decoder 4

Section 2: Introduction & Operational Considerations
Introduction 5
Inspection 5
Unit Protection 6
Pre-Installation Steps 6
Unit Placement 6
Condensation Drain Connection 7
Components 7
Transformer: Converts incoming (source) voltage to 24VAC. 7
Unit Orientation 7
EAD Refrigerant Piping 7
Duct Work 8
Consumer Instructions 8

Section 3: Unit Data
Dimensional Data - Models 018-024 10
Dimensional Data - Models 036-048 11
Dimensional Data - Models 060-072 12
EAD Electrical Data 13
AHA Electric Heater Electrical Data 13
ECM Fan Performance Data 14

Section 4: Controls
Thermostat Board Layout 15
Thermostat Board DIP Switch Selection 15
ECM Board Layout 15
ECM Motor Controller 15
Modes of Operation 15
Refrigerant Detection - System Response 16
Electrical Connections 17
Wiring Diagram 18

Section 5: General Unit Assembly
Disassembly 19
A2L Sensor Location 19
Assembly 20
Horizontal Applications 21

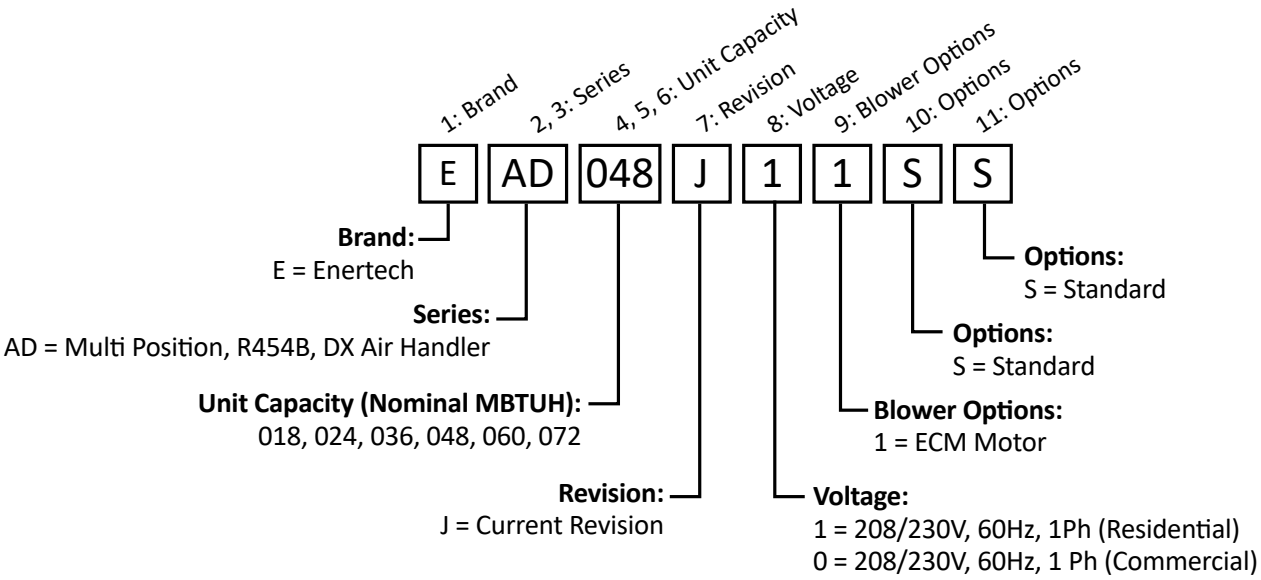
Section 6: Maintenance & Repair
ECM Board Troubleshooting: 27

Section 7: Decommissioning
A2L Recovery 30

Section 8: Revision Table
Revision Table 31

Section 1: Model Nomenclature

Nomenclature Decoder



Section 2: Introduction & Operational Considerations

Introduction

The EAD micro-channel air handlers are offered specifically for use with Enertech Global's water-to-air split compressor section. The water-to-air splits have been designed, tested, and certified with specific air handlers. Engineering and quality control is built into every unit. Good performance depends on proper application and correct installation. The information contained within this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.

Water-to-Air Split Certified Matches

Compressor Section	Air Handler Match
BS018	EAD018
BT024	EAD024
BT036	EAD036
BT048	EAD048
BT060	EAD060
BT072	EAD072

Note: In order to have an AHRI/Energy Star Certified product, the unit must be installed with its certified match.

Notices, Cautions, Warnings, & Dangers:

"NOTICE" Notification of installation, operation or maintenance information which is important, but which is NOT hazard-related.

"CAUTION" Indicates a potentially hazardous situation or an unsafe practice which, if not avoided, COULD result in minor or moderate injury or product or property damage.

"WARNING" Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.
"DANGER" Indicates an immediate hazardous situation which, if not avoided, WILL result in death or serious injury.

Introduction Notes:
Installation above 2000 meters will cause degradation of capacity and efficiency. Declared maximum altitude is 3500 meters.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure they do not play with the appliance.

⚠ WARNING ⚠
FAILURE TO FOLLOW THIS CAUTION MAY RESULT IN PERSONAL INJURY. USE CARE AND WEAR APPROPRIATE PROTECTIVE CLOTHING, SAFETY GLASSES AND PROTECTIVE GLOVES WHEN SERVICING UNIT AND HANDLING PARTS.

⚠ AVERTISSEMENT ⚠
LE NON-RESPECT DE CETTE MISE EN GARDE PEUT ENTRAÎNER DES BLESSURES. FAIRE PREUVE DE PRUDENCE ET PORTER DES VÊTEMENTS DE PROTECTION, DES LUNETTES DE SÉCURITÉ ET DES GANTS DE PROTECTION APPROPRIÉS LORS DE L'ENTRETIEN DE L'APPAREIL ET DE LA MANIPULATION DES PIÈCES.

Units rated at 208/230V are factory wired to 230V. To change to 208V, the red transformer wire (capped from factory) will need to be connected to the contactor at the connection point of the current orange wire. The orange wire will need to be capped off. Refer to wire diagrams for details.

Inspection

Upon receipt of any geothermal equipment, carefully check the shipment against the packing slip and the freight company bill of lading. Verify all units and packages have been received. Inspect the packaging of each package and each unit for damages. Ensure the carrier makes proper notation of all damages or shortage on all bill of lading papers. Concealed damage should be reported to the freight company within 5 days. If not filed within 5 days the freight company can deny all claims.

Note: Notify Enertech Global, LLC shipping department of damages within 5 days. It's the responsibility of the purchaser to file necessary claims with the freight company.

⚠ CAUTION ⚠
DO NOT OPERATE THE GEOTHERMAL HEAT PUMP UNIT DURING BUILDING CONSTRUCTION PHASE

⚠ MISE EN GARDE ⚠
NE PAS FAIRE FONCTIONNER LA THERMOPOMPE GÉOTHERMIQUE PENDANT LA PHASE DE CONSTRUCTION DU BÂTIMENT

⚠ WARNING ⚠
DO NOT USE MEANS TO ACCELERATE THE DEFROSTING PROCESS OR TO CLEAN, OTHER THAN THOSE RECOMMENDED BY THE MANUFACTURER.

THE APPLIANCE SHALL BE STORED IN A ROOM WITHOUT CONTINUOUSLY OPERATING IGNITION SOURCES. (FOR EXAMPLE: OPEN FLAMES, AN OPERATING GAS APPLIANCE OR AND OPERATING ELECTRIC HEATER)
BE AWARE THAT REFRIGERANTS MAY NOT CONTAIN AN ODOR.

⚠ AVERTISSEMENT ⚠
NE PAS RECOURIR À D'AUTRES MOYENS POUR ACCÉLÉRER LE PROCESSUS DE DÉGIVRAGE OU LE NETTOYAGE, À L'EXCEPTION DE CEUX RECOMMANDÉES PAR LE FABRICANT.

ENTREPOSER L'APPAREIL DANS UNE PIÈCE OÙ IL N'Y A AUCUNE SOURCE D'INFLAMMATION EN FONCTIONNEMENT CONTINU. (PAR EXEMPLE : FLAMMES NUES, APPAREIL À GAZ EN FONCTIONNEMENT OU APPAREIL DE CHAUFFAGE ÉLECTRIQUE EN FONCTIONNEMENT)
À NOTER QUE LES FRIGORIGÈNES PEUVENT NE PAS AVOIR D'ODEUR.

Un-packaging

Enertech units are mounted to wooden pallets for easy handling during shipment and installation. Units are protected during shipment with durable cardboard corner posts and top. Shrink wrap is covering the entire unit and attachment to the pallet.

Upon receipt of the unit, carefully remove the shrink wrap. Using a box cutter, slit the shrink wrap on the cardboard top and corner posts. Use caution to not damage the finished surface of the unit. Keep all cardboard or other packaging material for safe storage and transport to the job site prior to installation.

Remove the front service panel to locate technical documents (manuals, bulletins or instructions) and accessory items.

⚠ CAUTION ⚠

GEOTHERMAL EQUIPMENT IS DESIGNED FOR INDOOR INSTALLATION ONLY. DO NOT INSTALL OR STORE UNIT IN A CORROSIVE ENVIRONMENT OR IN A LOCATION WHERE TEMPERATURE AND HUMIDITY ARE SUBJECT TO EXTREMES. EQUIPMENT IS NOT CERTIFIED FOR OUTDOOR APPLICATIONS. SUCH INSTALLATION WILL VOID ALL WARRANTIES.

⚠ MISE EN GARDE ⚠

L'ÉQUIPEMENT GÉOTHERMIQUE EST CONÇU POUR UNE INSTALLATION À L'INTÉRIEUR SEULEMENT. NE PAS INSTALLER OU ENTREPOSER L'APPAREIL DANS UN ENVIRONNEMENT CORROSIF OU DANS UN ENDROIT OÙ IL SERAIT EXPOSÉ À UNE TEMPÉRATURE ET UNE HUMIDITÉ EXTRÊMES. L'ÉQUIPEMENT N'EST PAS CERTIFIÉ POUR UNE INSTALLATION À L'EXTÉRIEUR. UNE TELLE INSTALLATION ANNULERA TOUTES LES GARANTIES.

Unit Protection

Protect units from damage and contamination due to plastering (spraying), painting and all other foreign materials that may be used at the job site. Keep all units covered on the job site with either the original packaging or equivalent protective covering. Cap or recap unit connections and all piping until unit is installed. Precautions must be taken to avoid physical damage and contamination which may prevent proper start-up and may result in costly equipment repair.

Storage

Units should be stored inside in the original packaging in a clean, dry location. Units should be stored in an upright position at all times and should not be stacked unless specially noted on the packaging.

Pre-Installation Steps

Before you fully install the geothermal equipment, it is recommended you do the following:

1. Compare the model number on the unit nameplate with packing slip and ordering information to verify the correct unit has been shipped.
2. The installer must verify all applicable wiring, piping, and accessories are correct and on the job site. All wiring, line and low voltage, should comply with the manufacturer's recommendations, The National Electrical Code, and all local codes and ordinances.
3. Inspect all electrical connections and wires. Connections must be clean and tight at the terminals, and wires should not touch any sharp edges or copper pipe.
4. Verify all refrigerant tubing is free of dents and kinks. Refrigerant tubing should not be touching other unit components.
5. Before unit start-up, read all manuals and become familiar with unit components and operation. Thoroughly check the unit before operating.
6. For A-Coil installations, it is recommended the coil be sprayed with liquid detergent thoroughly and rinsed thoroughly before installation to ensure proper drainage of condensate from the coil fins, eliminate water blow off, and assure maximum coil performance. If not sprayed, approximately 50 hours of break in time is required to achieve the same results.

Equipment Installation

All units should be located in an indoor area were the ambient temperature will remain above 55°F and should be located in a way that piping and ductwork or other permanently installed fixtures do not have to be removed for servicing and filter replacement. For appliances containing more than **62.6oz** of mildly flammable refrigerant and installed in an unventilated area, the room area shall be sufficiently constructed or modified to not allow any refrigerant leak to stagnate and create a fire or explosion hazard.

Unit Placement

When installing a geothermal heating and cooling unit, there are items the installer should consider before placing the equipment.

- Make sure to provide enough clearance for service access. There needs to be enough space to service the control box, coil, blower, and electric elements (if equipped).
- The unit should be located in a way that piping and ductwork, or other permanently installed fixtures, do not have to be removed for servicing or filter replacement. These air handling units have a 0" minimum clearance to combustible materials rating from all cabinet surfaces.
- If an electric heater is installed, there is a 1" clearance on the supply plenum and duct. The unit should be installed with serviceability clearance of 30" from the front of the unit. The unit can be serviced entirely from the front, including replacing the filter. Be sure to route primary and secondary drain connections in a way that will not obstruct replacement of the filter. The unit is shipped from the factory arranged to be installed in a vertical up-flow, or horizontal right to left airflow position (standard). It can be field converted to a horizontal left to right airflow position or down-flow position.

Note: Installation above 2000 meters will cause degradation of capacity and efficiency. Declared maximum altitude is 3500 meters.

All air handling equipment should be placed on either a formed plastic air pad, or a high density, closed cell, polyethylene pad. Down-flow units should be placed on a non-combustible base. This helps eliminate vibration/noise transmission through the floor. The use of corner pads alone, is not recommended.

⚠ CAUTION ⚠

IF THE UNIT IS INSTALLED IN NON-CONDITIONED SPACE, SUCH AS AN ATTIC OR GARAGE, THE INSTALLER MUST PROVIDE A FULL SIZE AUXILIARY DRAIN PAN TO PREVENT DAMAGE FROM CONDENSATE RUN-OFF.

⚠ MISE EN GARDE ⚠

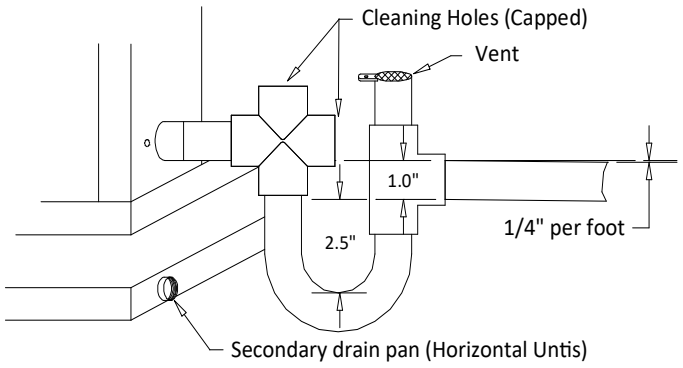
SI L'UNITÉ EST INSTALLÉE DANS UN ESPACE NON CONDITIONNÉ, TEL QU'UN GRENIER OU UN GARAGE, L'INSTALLATEUR DOIT FOURNIR UN BAC DE RÉCUPÉRATION AUXILIAIRE PLEINE GRANDEUR POUR ÉVITER LES DOMMAGES CAUSÉS PAR L'ÉCOULEMENT DES CONDENSATS.

⚠ WARNING ⚠

ONLY AUXILIARY DEVICES APPROVED BY ENERTECH GLOBAL SHALL BE INSTALLED IN CONNECTING DUCTWORK. REFER TO "SECTION 4" FOR APPROVED AUXILIARY HEATING KITS.

⚠ AVERTISSEMENT ⚠

SEULS LES DISPOSITIFS AUXILIAIRES APPROUVÉS PAR ENERTECH GLOBAL PEUVENT ÊTRE INSTALLÉS DANS LES SYSTÈMES DE GAINES CONNECTÉS. CONSULTER LA SECTION 4 POUR LES ENSEMBLES DE CHAUFFAGE AUXILIAIRE APPROUVÉS.



Electrical
All wiring, line and low voltage, should comply with the manufacturer's recommendations, The National Electrical Code, and all local codes and ordinances. The equipment main disconnect must be incorporated in the field wiring in accordance with NEC code.

Condensation Drain Connection
Connect the EZ-Trap to the 3/4" equipment condensate drain connection as shown below. The condensate line must be trapped a minimum of 1.0" as shown in the diagram. The condensate line should be pitched away from the unit a minimum of 1/4" per foot. The condensate line from the unit drain connection to the P-trap should be sloped downward. For more information on installing EZ-Trap, see installation sheet with the EZ-Trap kit. Always install the air vent after the trap.

Note: Connect drain through the trap to the condensation drain system in conformance to local plumbing codes.

Part Number	Description
ACDT1A	EZ-Trap 3/4" Kit
ACDT2A	EZ-Trap 1" Kit (3/4" MPT x 1" FPT adapter required)

Components
Transformer: Converts incoming (source) voltage to 24VAC.

Low Voltage Breaker: 3 Amp breaker attached directly to transformer, protects the transformer and low voltage circuit.

Low Voltage Fuse: 3 Amp fuse attached directly to ECM board, protects the transformer and low voltage circuit.

Thermostat Board: Provides connection to the thermostat or other accessories to the low voltage circuit on the thermostat board.

ECM Board: Operates the ECM blower motor and allows for airflow adjustment with DIP switches.

Note: If installing a 24V electronic air cleaner supplied by Enertech as an accessory, the air cleaner must connect to the 24V supply from R and C on the geothermal unit's thermostat terminal strip. In the event there is a leak or airflow falls too low, R and C will be de-energized.

Blower Motor (ECM): ECM (Electronically Commutated Motor) for variable fan speeds.

Electric Heater: Provides auxiliary heat during cold temperatures and provides electric backup if unit malfunctions.

Unit Orientation
EAD Series Air Handler
The air handler should be configured prior to installation. Begin with the unit in the vertical, upright position. Do not connect drains or refrigerant lines, until optimal orientation has been determined.

Up-Flow Application
In an up-flow installation the discharge outlet is at the top of the unit. Care should be taken to ensure the unit is level to permit proper condensate drainage. Normal up flow installation would typically be in a basement or closet.

If installed in a closet, the closet should have a platform framed in, with an opening on top of the platform for the air handler return air opening. Install return air ductwork from the platform to the conditioned space outside the closet. The platform must be at least 10" above the floor. Connect the supply air outlet to a warm air plenum. If installed in a basement, run supply and return ductwork in accordance with local codes.

Horizontal Application
Horizontal applications will normally be used in an attic or crawl space. This type of installation requires a return air duct be attached to the unit inlet. The opposite end of the return air duct is attached to a return air filter grille through the ceiling or wall. Remove the filter from the unit if the filter grille is used.

Down-Flow Application
Air handlers can be converted to a down flow application.

Note: If the unit is configured in the down-flow orientation or horizontal left to right configuration, it is recommended to trap the primary and secondary drain lines in order to prevent condensate from being sucked in to the blower.

EAD Refrigerant Piping
EAD air handlers require the installation of suction and liquid refrigerant lines (line set) from the unit to the compressor section.

Note: Please refer to the compressor section IOM for details on line set installation and line set size requirements.

These units are equipped with sweat copper adapters. The refrigerant lines should be brazed on with silver solder or a high temperature brazing alloy.

⚠ WARNING ⚠

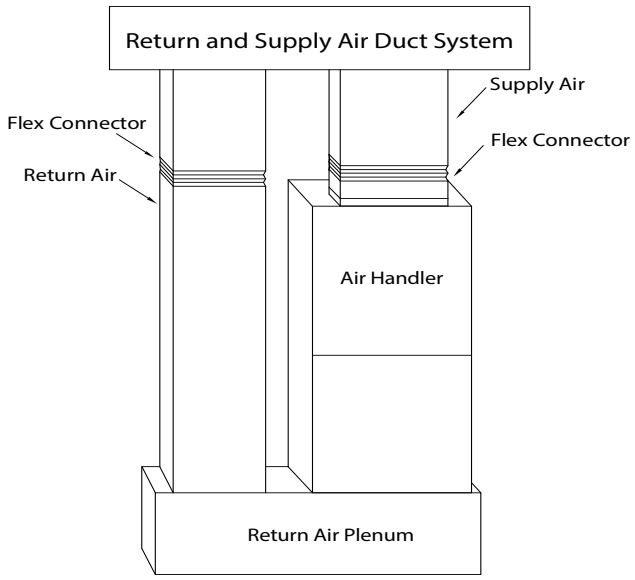
IF APPLIANCES, WHICH CONTAIN A2L REFRIGERANTS, ARE CONNECTED VIA AN AIR DUCT SYSTEM TO ONE OR MORE ROOMS, A ROOM WITH AN AREA LESS THAN THE MINIMUM AREA (SHOWN IN THE TABLE ABOVE) SHALL BE WITHOUT CONTINUOUSLY OPERATING OPEN FLAMES (E.G. AN OPERATING GAS APPLIANCE) OR OTHER POTENTIAL IGNITION SOURCES (FOR E.G. AN OPERATING ELECTRIC HEATER, HOT SURFACES). A FLAME PRODUCING DEVICE MAY BE INSTALLED IN THE SAME SPACE IF THE DEVICE IS PROVIDED WITH AN EFFECTIVE FLAME ARREST.

⚠ AVERTISSEMENT ⚠

SI DES APPAREILS CONTENANT DES FRIGORIGÈNES A2L SONT CONNECTÉS À UNE OU PLUSIEURS PIÈCES PAR UN SYSTÈME DE GAINES D'AIR, UNE PIÈCE DONT LA SUPERFICIE EST INFÉRIEURE AU MINIMUM (MONTRÉ DANS LE TABLEAU CI-HAUT) NE DOIT PAS AVOIR DE FLAMME NUE EN FONCTIONNEMENT CONTINU (P. EX. UN APPAREIL À GAZ EN FONCTIONNEMENT) OU D'AUTRES SOURCES D'INFLAMMATION POTENTIELLES (P. EX. UN APPAREIL DE CHAUFFAGE ÉLECTRIQUE EN FONCTIONNEMENT, DES SURFACES CHAUDES). UN DISPOSITIF DE PRODUCTION DE FLAMME PEUT ÊTRE INSTALLÉ DANS LE MÊME ESPACE SI L'APPAREIL EST MUNI D'UN ARRÊTE-FLAMME EFFICACE.

Section 2: Introduction & Operational Considerations

Typical Supply and Return Ductwork Connections:



Duct Work

All new ductwork shall be designed as outlined in Sheet Metal and Air Conditioning Contractors National Association (SMACNA) or Air Conditioning Contractors of America (ACCA) or American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) handbooks. All models do not have more than 2% air leakage.

All supply/return plenums should be isolated from the unit by a flexible connector (canvas) or equivalent to prevent transfer of vibration noise to the ductwork. The flex connector should be designed so as not to restrict airflow. Turning vanes should be used on any transition with airflow over 500 CFM. **All metal ductwork should be insulated** to prevent heat loss/gain, condensation and to absorb air noise. If the unit is being installed with existing ductwork, the ductwork must be designed to handle the air volume required by the unit being installed. When running a cooling or heating load on a building, size ductwork according to the building design load and heat pump CFM.

Industry Standard: When sizing ducts use 400 CFM per ton.

As a general rule, maximum recommended face velocity for a supply outlet used in a residential application is 750 FPM. Maximum recommended return grille velocity is 600 FPM. Refer to the maximum air velocities chart below and the CFM settings for the system. Systems with higher velocity, are likely to have noise problems.

In buildings where ceilings are 8 feet or more, at least 50 percent of the return air should be taken back to the heat pump from the ceiling or high sidewall location and not more than 50 percent from the floor or low sidewall location.

Maximum Air Velocities

Location	Supply	Return
Main Ducts	900 FPM	600 FPM
Branch Ducts	700 FPM	600 FPM
Grilles, Registers, Diffusers	750 FPM	600 FPM

False ceilings or drop ceilings may be used as a return air plenum if the refrigerant detection system is provided in the appliance and any external connections are also provided with a sensor immediately below the return air plenum duct joint.

Consumer Instructions

The contractor should instruct the consumer in proper operation, maintenance, filter replacements, thermostat and indicator lights. Also provide the consumer with the manufacturer's Owner's Manual for the equipment being installed.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure they do not play with the appliance.

Enertech Global D-I-Y Policy

Enertech Global's geothermal heat pumps and system installations may include electrical, refrigerant and/or water connections. Federal, state and local codes and regulations apply to various aspects of the installation. Improperly installed equipment can lead to equipment failure and health/safety concerns. For these reasons, only qualified technicians should install an Enertech Global built geothermal system.

Due to the importance of proper installation, Enertech Global does not sell equipment direct to homeowners. Internet websites and HVAC outlets may allow for purchases directly by homeowners and do-it-yourselfers, but Enertech Global offers no warranty on equipment purchased via the internet or installed by persons without proper training.

Enertech Global has set forth this policy to ensure installations of Enertech Global geothermal systems are done safely and properly. The use of well-trained, qualified technicians helps ensure your system provides many years of comfort and savings.

⚠ WARNING ⚠

AUXILIARY DEVICES WHICH MAY BE A POTENTIAL IGNITION SOURCE SHALL NOT BE INSTALLED IN THE DUCT WORK. EXAMPLES OF SUCH POTENTIAL IGNITION SOURCE SHALL NOT BE INSTALLED IN THE DUCT WORK. EXAMPLES OF SUCH POTENTIAL IGNITION SOURCES ARE HOT SURFACES WITH A TEMPERATURE EXCEEDING 744F(396C) AND ELECTRIC SWITCHING DEVICES.

⚠ AVERTISSEMENT ⚠

LES DISPOSITIFS AUXILIAIRES POUVANT ÊTRE UNE SOURCE D'INFLAMMATION POTENTIELLE NE DOIVENT PAS ÊTRE INSTALLÉS DANS LES GAINES. DES EXEMPLES DE TELLES SOURCES D'INFLAMMATION POTENTIELLES NE DOIVENT PAS ÊTRE INSTALLÉS DANS LES GAINES. LES SURFACES CHAUDES DONT LA TEMPÉRATURE EST SUPÉRIEURE À 396 °C (744 °F) ET LES DISPOSITIFS DE COMMUTATION ÉLECTRIQUE EN SONT DES EXEMPLES.

Section 2: Introduction & Operational Considerations

A2L Installation Requirements

Systems cannot be installed in a residence with less than the Minimum Total Conditioned Space listed in the chart below. Conditioned space is considered the space served by supply and return duct registers and grilles. The altitude factor must be multiplied by the Minimum Total Condition Space based on the altitude of the installation site for final calculations.

If installing a 24V electronic air cleaner supplied by Enertech as an accessory, the air cleaner must get the 24V supply from R and C on the geothermal unit's thermostat terminal strip. In the event there is a leak or airflow falls too low, R and C will be de-energized.

Enertechnician

Enertech offers a free mobile service app that provides an easy to use calculator for A2L installations. The calculator helps to determine if the installation room and/or conditioned space meets the requirements for mitigation. A QR code can be found on page 29 to download the app.

AD Unit

Total Charge (oz./ kg)	Room Height(s)			
	7.2ft/ 2.2m	8.0ft/ 2.4m	10.0ft/ 3.0m	12.0ft/ 3.7m
	Minimum Total Conditioned Space (ft^2/ m^2) [4]			
62 / 1.77 or less	N/A- Mitigation Not Required			
64/ 1.81	60.1/ 5.6	54.1/ 5.0	43.3/ 4.0	36.1/ 3.4
72/ 2.04	67.6/ 6.3	60.9/ 5.7	48.7/ 4.5	40.6/ 3.8
80/ 2.27	75.2/ 7.0	67.6/ 6.3	54.1/ 5.0	45.1/ 4.2
88/ 2.49	82.7/ 7.7	74.4/ 6.9	59.5/ 5.5	49.6/ 4.6
96/ 2.72	90.2/ 8.4	81.2/ 7.5	64.9/ 6.0	54.1/ 5.0
104/ 2.95	97.7/ 9.1	87.9/ 8.2	70.4/ 6.5	58.6/ 5.4
112/ 3.18	105.2/ 9.8	94.7/ 8.8	75.8/ 7.0	63.1/ 5.9
120/ 3.40	112.7/ 10.5	101.5/ 9.4	81.2/ 7.5	67.6/ 6.3
more than 120/ 3.40	Not Allowed- Max Charge is 120 oz./ 3.40 kg			

Altitude Adjustment		
Altitude (H_{alt})		Adjustment
m	ft	Factor (AF)
0	0	1.00
200	656	1.00
400	1312	1.00
600	1969	1.00
800	2625	1.02
1000	3281	1.05
1200	3937	1.07
1400	4593	1.10
1600	5250	1.12
1800	5906	1.15
2000	6562	1.18
2200	7218	1.21
2400	7874	1.25
2600	8531	1.28
2800	9187	1.32
3000	9843	1.36
3200	10499	1.40

Notes:

1. Total charge includes BS/BT and AD total system charge.
2. Total conditioned spaces are spaces with return and discharge ducts (bathrooms, closets, etc.
3. Units cannot be installed in a residence with less than the above minimum total conditioned space.
4. Units cannot be installed in an unventilated area/room with less than the total conditioned space above if that area contains another appliance with a continuously operating open flame or other potential ignition source, per the Warning below. In the chart above room height is being used as release height.

⚠ WARNING ⚠

ONLY AUXILIARY DEVICES APPROVED BY ENERTECH GLOBAL SHALL BE INSTALLED IN CONNECTING DUCTWORK. REFER TO "SECTION 3" FOR APPROVED AUXILIARY HEATING KITS.

⚠ AVERTISSEMENT ⚠

SEULS LES DISPOSITIFS AUXILIAIRES APPROUVÉS PAR ENERTECH GLOBAL PEUVENT ÊTRE INSTALLÉS DANS LES SYSTÈMES DE GAINES CONNECTÉS. CONSULTER LA SECTION 3 POUR LES ENSEMBLES DE CHAUFFAGE AUXILIAIRE APPROUVÉS.

⚠ NOTICE ⚠

All zone dampers must open when the air handler unit detects a refrigerant leak and enters mitigation mode. Note that while the air handler unit is in mitigation mode the R field wiring terminals are de-energized.

⚠ WARNING ⚠

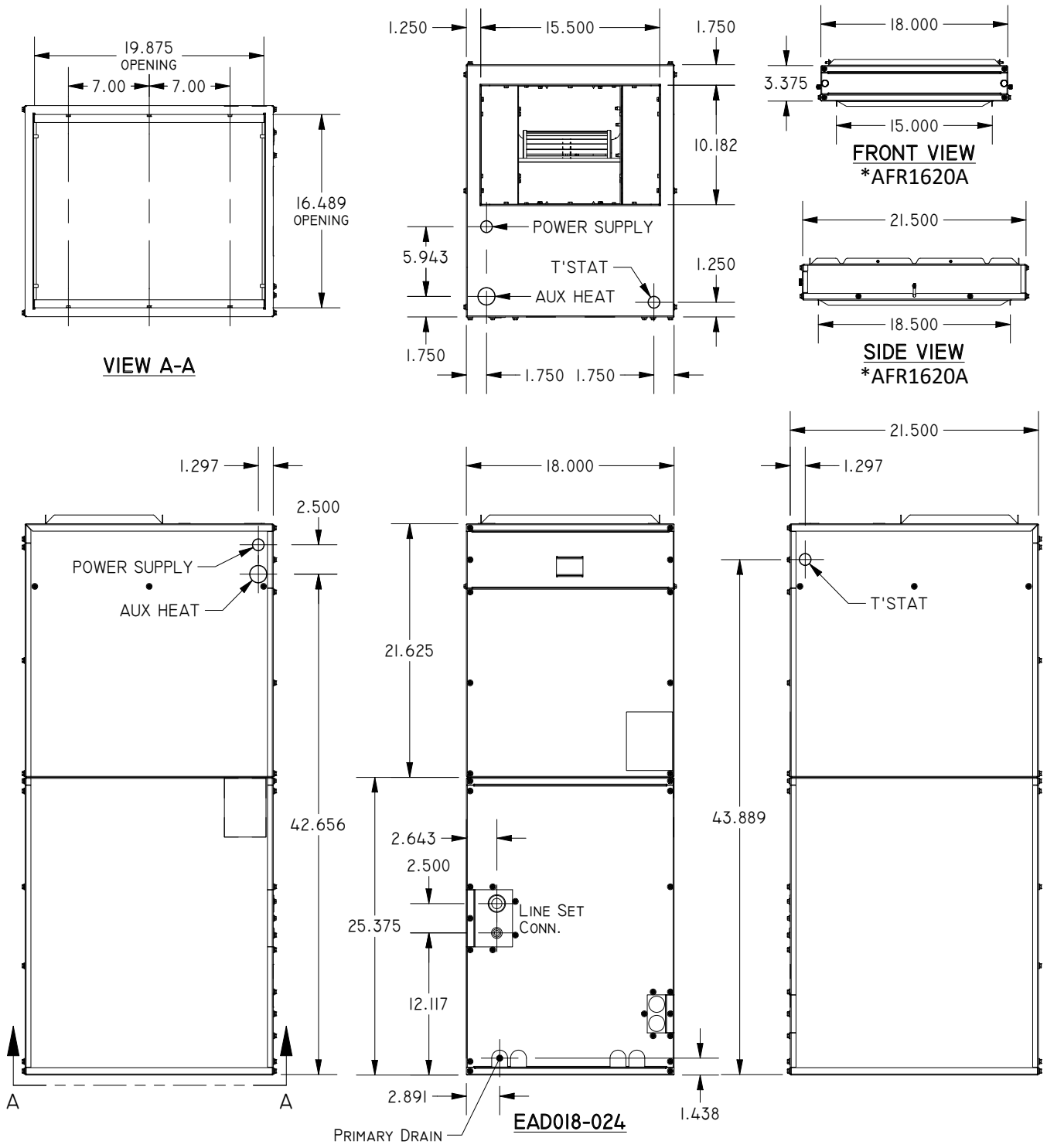
IF APPLIANCES, WHICH CONTAIN A2L REFRIGERANTS, ARE CONNECTED VIA AN AIR DUCT SYSTEM TO ONE OR MORE ROOMS, A ROOM WITH AN AREA LESS THAN THE MINIMUM AREA (SHOWN IN THE TABLE ABOVE) SHALL BE WITHOUT CONTINUOUSLY OPERATING OPEN FLAMES (E.G. AN OPERATING GAS APPLIANCE) OR OTHER POTENTIAL IGNITION SOURCES (FOR E.G. AN OPERATING ELECTRIC HEATER, HOT SURFACES). A FLAME PRODUCING DEVICE MAY BE INSTALLED IN THE SAME SPACE IF THE DEVICE IS PROVIDED WITH AN EFFECTIVE FLAME ARREST.

⚠ AVERTISSEMENT ⚠

SI DES APPAREILS CONTENANT DES FRIGORIGÈNES A2L SONT CONNECTÉS À UNE OU PLUSIEURS PIÈCES PAR UN SYSTÈME DE GAINES D'AIR, UNE PIÈCE DONT LA SUPERFICIE EST INFÉRIEURE AU MINIMUM (MONTRÉ DANS LE TABLEAU CI-HAUT) NE DOIT PAS AVOIR DE FLAMME NUE EN FONCTIONNEMENT CONTINU (P. EX. UN APPAREIL À GAZ EN FONCTIONNEMENT) OU D'AUTRES SOURCES D'INFLAMMATION POTENTIELLES (P. EX. UN APPAREIL DE CHAUFFAGE ÉLECTRIQUE EN FONCTIONNEMENT, DES SURFACES CHAUDES). UN DISPOSITIF DE PRODUCTION DE FLAMME PEUT ÊTRE INSTALLÉ DANS LE MÊME ESPACE SI L'APPAREIL EST MUNI D'UN ARRÊTE-FLAMME EFFICACE.

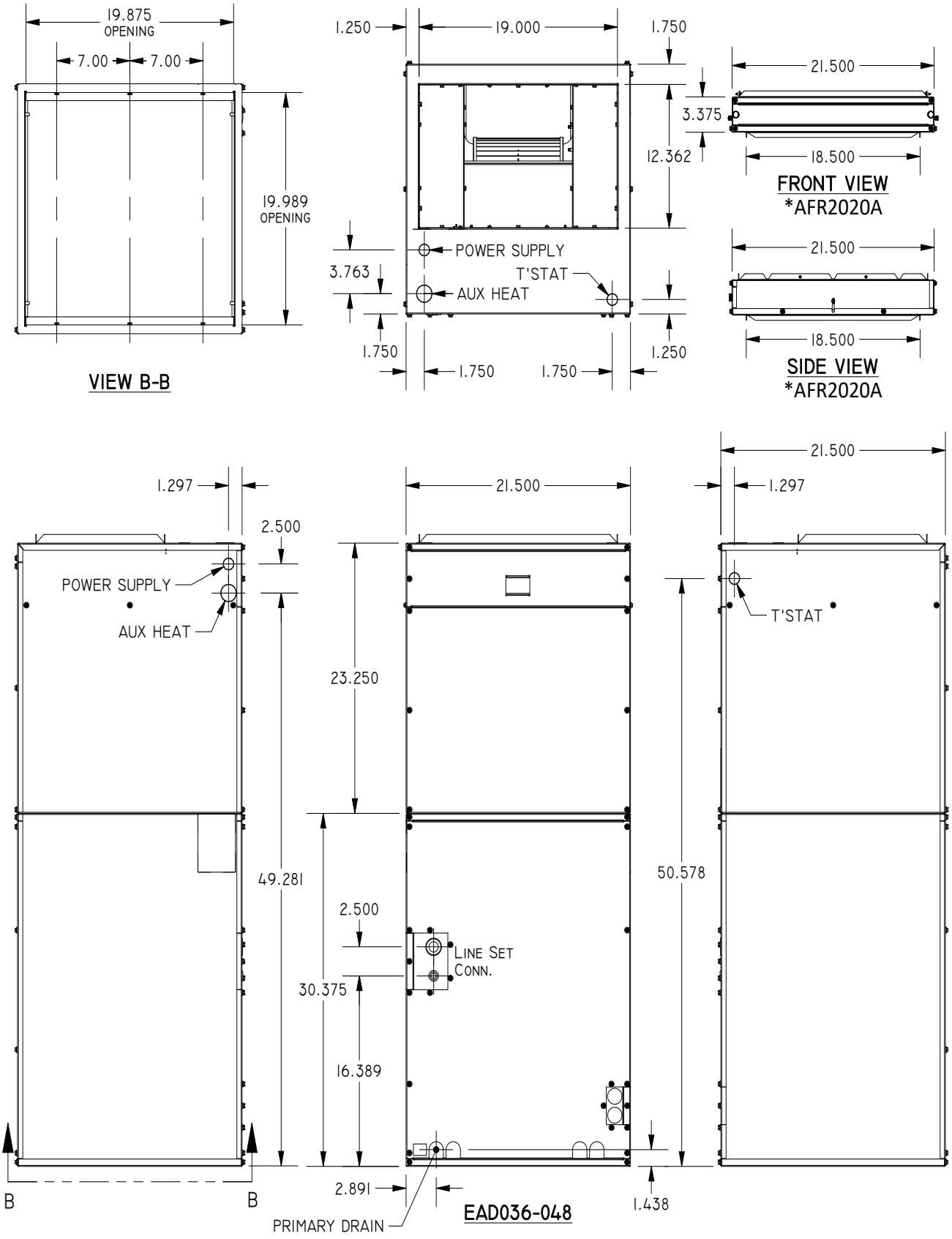
Section 3: Unit Data

Dimensional Data - Models 018-024

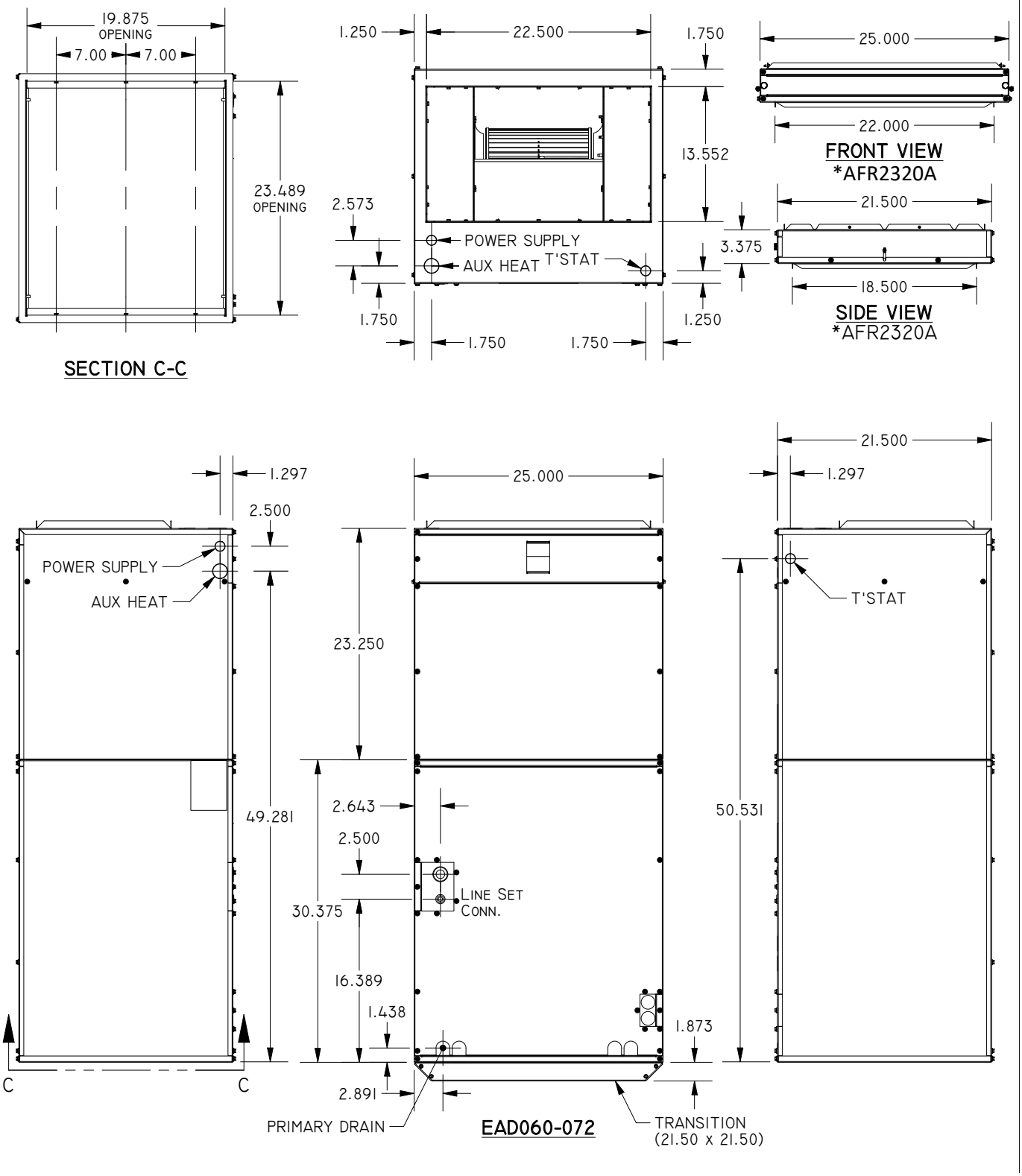


(EAD) Air Handler				
Model	Line Set Connections	Electrical Knockouts	EAD Unit Weight	*Accessory Filter Rack
018-024	3/8” - 5/8”	Sized for 1/2” or 1” Conduit	155 Lbs	AFR1620A
036	3/8” - 5/8”		190 Lbs	AFR2020A
048	3/8” - 3/4”			
060-072	3/8” - 7/8”		210 Lbs	AFR2320A

Dimensional Data - Models 036-048



Dimensional Data - Models 060-072



Section 3: Unit Data

EAD Electrical Data

Model	Voltage Code	60 Hz Power		Fan Motor FLA	Total Unit FLA	Min Circuit AMPS	Max Brkr HACR
		Volts	Phase				
EAD018	00/10	208/230	1	3.9/ 3.8	3.9/ 3.8	4.9/ 4.8	15/ 15
EAD024	00/10	208/230	1	3.9/ 3.8	3.9/ 3.8	4.9/ 4.8	15/ 15
EAD036	00/10	208/230	1	5.9/ 5.8	5.9/ 5.8	7.4/ 7.3	15/ 15
EAD048	00/10	208/230	1	5.9/ 5.8	5.9/ 5.8	7.4/ 7.3	15/ 15
EAD060	00/10	208/230	1	7.4/ 6.9	7.4/ 6.9	9.3/ 8.6	15/ 15
EAD072	00/10	208/230	1	7.4/ 6.9	7.4/ 6.9	9.3/ 8.6	15/ 15

Notes:
1. All line and low voltage wiring must adhere to the National Electrical Code and local codes, whichever is the most stringent.
2. In determining the correct supply wire size and maximum length, reference NFPA 70, Section 310. If the calculation is close to the maximum allowable ampacity of a particular wire size, use the next size up. This will ensure that no adverse effects occur, such as light dimming and/or shortened compressor life.
3. Min/Max Voltage: 208/230/60 = 187-252
4. Units rated at 208/230V are factory wired for 230V. To change to 208V, the red transformer wire (with wire nut) will need to be hooked to the power block in the position the current orange (230V) wire is. The orange wire will need to be capped off. Refer to wire diagram for details.

AHA Electric Heater Electrical Data

Technical Data 60Hz, Single Phase, w/ Circuit Breaker (*Single Point Connection)

Unit Model	Heater Model	Supply Circuit Number	Heat kW		Heater kW Per Circuit/ Stage		Heater FLA Total AMPS		Blower/ Motor FLA Total AMPS		Unit (Heater & Motor) FLA Total AMPS		MCA- Minimum Circuit Ampacity (Heater & Motor)		MOCP Maximum Overcurrent Protective Device (Heater & Motor)	
			208	240	208	240	208	240	208	230	208	230	208	230	208	230
AD018 AD/AH024	AHA051SB	Single	3.75	5			18.0	20.8	3.9	3.8	21.9	24.6	27.4	30.8	30	35
AD036 AD048	AHA051MB	Single	3.75	5			18.0	20.8	5.9	5.8	23.9	26.6	29.9	33.3	30	35
AD060 AD072	AHA051LB	Single	3.75	5			18.0	20.8	7.4	6.9	25.4	27.7	31.8	34.6	30	35
AD/AH036 AD/AH048	AHA101MB	Single	7.5	10	3.75	5	36.1	41.7	5.9	5.8	42.0	47.5	52.5	59.4	60	60
					3.75	5										
AD/AH060 AD072	AHA151LB*	Single	11.25	15	3.75	5	54.1	62.5	7.4	6.9	61.5	69.4	76.9	86.8	80	95
					7.50	10										

Technical Data (US Customers ONLY!!) 60Hz, Single Phase, w/ Circuit Breaker- (Single Point Connection Removed)

Unit Model	Heater Model	Supply Circuit Number	Heat kW		Heater kW Per Circuit/ Stage		Heater FLA Total AMPS		Blower/ Motor FLA Total AMPS		Unit (Heater & Motor) FLA Total AMPS		MCA- Minimum Circuit Ampacity		MOCP Maximum Overcurrent Protective Device (Heater & Motor)	
			208	240	208	240	208	240	208	230	208	230	208	230	208	230
AD/AH060 AD072	AHA151LB	L1/L2	11.25	15	3.75	5	18.0	20.8	7.4	6.9	25.4	27.7	31.8	34.6	30	35
		L3/L4			7.50	10	36.1	41.7			36.1	41.7	45.1	52.1	50	60

Note: Additional information regarding installation of AHA Electric Heaters can be found in Electric Heater IOM, 20D370-01NN.

Available Options		
Electric Heat Model	**Description**	**EAD Models**
AHA051SB	5kW, 208/230V, 60HZ, 1 Phase, with Circuit Breaker	018-024
*AHA051MB	5kW, 208/230V, 60HZ, 1 Phase, with Circuit Breaker	036-048
*AHA051LB	5kW, 208/230V, 60HZ, 1 Phase, with Circuit Breaker	060-072
AHA101MB	10kW, 208/230V, 60HZ, 1 Phase, with Circuit Breaker	036-048
AHA151LB	15kW, 208/230V, 60HZ, 1 Phase, with Circuit Breaker and Single Point Connection **Note:** Comes with single point connection jumper bar assembly factory installed.	060-072

***Note:** Ensure proper sizing to help combat any potential under-sizing issues.

Section 3: Unit Data

ECM Fan Performance Data

EAD Series ECM Fan Performance Data: One & Two-Stage Compressor Units

Model	Max ESP in. w.c.[2]	Program[3]	Heating Mode		Cooling Mode		Dehumidification Mode		Fan Only	AUX/EMG Heat[4]	DIP Switch Settings							
			1st	2nd	1st	2nd	1st	2nd			S1	S2	S3	S4	S5	S6	S7	S8
018	1.2	A		950		980		830	490	900	Off	Off	Off	Off	Off	Off	Off	Off
		B		**860**		**890**		**760**	**445**	**810**	**Off**	**Off**	**Off**	**On**	**Off**	**Off**	**Off**	**Off**
		C		740		770		650	385	675	On	Off	Off	Off	On	Off	Off	Off
		D		650		680		580	340	550	Off	On	On	Off	Off	On	Off	Off
024	1.1	A	750	950	770	980	650	830	490	900	Off	Off	Off	Off	Off	Off	Off	Off
		B	**720**	**860**	**730**	**890**	**620**	**760**	**445**	**810**	**Off**	**Off**	**Off**	**On**	**Off**	**Off**	**Off**	**Off**
		C	600	740	620	770	530	650	385	675	On	Off	Off	Off	On	Off	Off	Off
		D	500	650	500	680			340	550	Off	On	On	Off	Off	On	Off	Off
036	1.2	A	1300	1700	1150	1450	980	1230	725	1650	On	Off	Off	Off	On	Off	Off	Off
		B	**1120**	**1440**	**1000**	**1270**	**850**	**1080**	**635**	**1410**	**Off**	**On**	**Off**	**Off**	**Off**	**On**	**Off**	**Off**
		C	1000	1250	850	1100	720	940	550	1270	Off	On	Off	On	Off	On	Off	Off
		D	850	1050	700	950			475	1050	On	On	Off	Off	On	On	Off	Off
048	1.0	A	1500	1900	1300	1700	1110	1450	850	1925	Off	Off	On	Off	Off	Off	Off	Off
		B	**1400**	**1820**	**1230**	**1590**	**1050**	**1350**	**795**	**1750**	**Off**	**Off**	**Off**	**Off**	**Off**	**Off**	**Off**	**Off**
		C	1200	1550	1100	1400	940	1190	700	1575	Off	Off	Off	On	Off	Off	Off	Off
		D	1150	1450	1000	1300			650	1485	On	Off	Off	On	On	Off	Off	Off
060	1.2	A	1600	1900	1700	2000	1450	1700	1000	1900	Off	Off	Off	On	Off	Off	Off	Off
		B	**1480**	**1750**	**1540**	**1830**	**1310**	**1560**	**915**	**1705**	**Off**	**On**	**On**	**Off**	**Off**	**On**	**Off**	**Off**
		C	1300	1550	1400	1650			825	1550	Off	On	Off	Off	Off	On	Off	Off
		D	1200	1400	1250	1500			750	1395	Off	On	Off	On	Off	On	Off	Off
072	1.3	A	1850	2150	1900	2250	1620	1910	1125	2200	Off	Off	On	Off	Off	Off	Off	Off
		B	**1800**	**2100**	**1690**	**2000**	**1440**	**1700**	**1000**	**2110**	**On**	**Off**	**Off**	**Off**	**On**	**Off**	**Off**	**Off**
		C	1650	1950	1750	2050			1025	1900	On	Off	Off	On	On	Off	Off	Off
		D	1600	1850	1500	1800			900	1650	On	On	On	Off	On	On	Off	Off

Notes:

1. Program **B (Bold Type)** is factory settings and rated CFM. CFM is controlled within 5% up to the Max ESP.

2. Max ESP testing was done with dry coil.

3. Max ESP for AD018 through AD072 models with external electric heat is 0.8 in. w.c. Exceeding the Max ESP may result in nuisance trips of the electric heat. Thermal limits are rated at 100,000 cycles.

EAD Series Dehumidification Mode Options

DIP Switch		Mode	Operation
S9	**S10**		
ON	OFF	Normal	Dehumidification mode disabled (Normal Htg/Clg CFM)-- Factory setting.
OFF	ON	ODD	On Demand Dehumidification mode (humidistat input at terminal ODD)-- Humidistat required.
OFF	OFF	Constant Dehum	Constant Dehumidification mode (always uses dehum CFM for cooling and normal CFM for heating)--No humidistat required.
ON	ON	Not Used	Not an applicable selection.

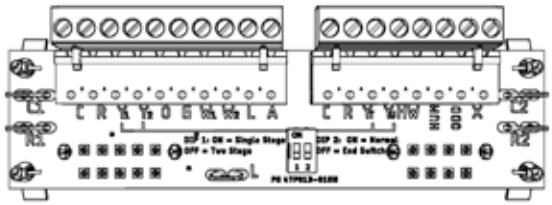
Notes:

1. To enter dehumidification mode, ODD input should be 0 VAC; for normal cooling CFM, ODD input should be 24 VAC.

2. Heating CFM is not affected by dehumidification mode. When in dehumidification mode, cooling CFM is 85% of normal CFM.

Section 4: Controls

Thermostat Board Layout



Thermostat Board DIP Switch Selection

The Enertech thermostat board is designed to eliminate jumpers and spade connectors and is equipped with two DIP switches for flexibility of applications.

Verify that the switches are set correctly prior to starting the unit with the following options:

DIP #1 - Single Speed or Two Stage

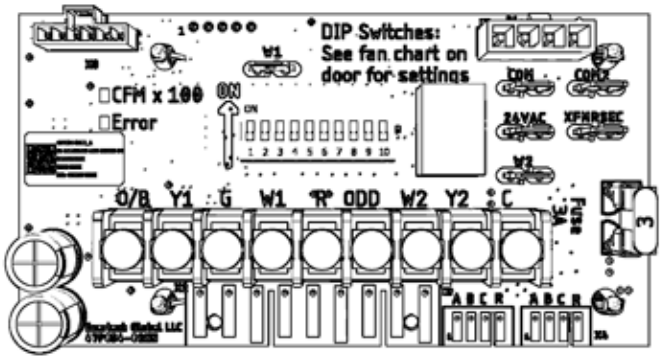
- ON = Single Stage (BS018)
- OFF = Two Stage *factory default (BT024-072)

Note: Setting this DIP switch ON connects Y1 to Y2 and provides full load capacity for single speed systems, or for two-stage systems that are used in single-stage mode (e.g. with a single stage buffer tank controller).

DIP #2 - Water Valve End Switch (terminals YT & YU)

- ON = No end switch (YT is jumpered to YU)
- OFF = Water valve has end switch (see wiring diagram)

ECM Board Layout



ECM Motor Controller

Fan Speed

The air handler units is equipped with a variable speed ECM motor. **See blower CFM chart for DIP switch settings.**

If a different speed is desired:

1. Shut OFF electrical power at the unit disconnect switch or service panel.
2. Remove blower access door, and confirm circuit breakers (if equipped with electric heat) are in the OFF position.
3. The speed can be changed for both heating and cooling modes.
4. DIP switches are provided to change blower CFM settings.

Airflow Monitor

An LED on the ECM fan control board flashes one time per 100 CFM when the unit's fan is operating to indicate airflow.

Modes of Operation

Heating 1st Stage (Y1, G)

The ECM fan immediately ramps up to 75% of 1st stage airflow (CFM) level (based on DIP switch settings), The ECM fan adjusts to 100% (of 1st stage operation) CFM level 90 seconds after the "Y1" input.

Heating 2nd Stage (Y1, Y2, G)

The ECM fan adjusts to 2nd stage airflow (CFM) level (based on DIP switch settings).

Heating 3rd Stage (Y1, Y2, W1, G)

The ECM fan remains at 100% of 2nd stage airflow (CFM) level (based on DIP switch settings), and the first stage of electric resistance heat is energized. Second stage of electric resistance heat (W2) is energized ten minutes after first stage electric resistance heat (W1) is energized. (W2 is only available with 10kW and 15kW electric heaters)

Emergency Heat (W1, G)

The fan is started immediately at 2nd stage airflow (CFM) level (based on DIP switch settings), and the electric resistance heat is energized. Second stage of electric heat (W2) is energized ten minutes after first stage electric heat (W1) is energized. (W2 is only available with 10kW and 15kW electric heaters).

Cooling 1st Stage (Y1, O, G)

Terminal "O" from the thermostat is energized for cooling operation. The ECM fan immediately ramps up to 75% of 1st stage airflow (CFM) level (based on DIP switch settings). The ECM fan adjusts to 100% (of 1st stage operation) CFM level 90 seconds after the "Y1" input.

Cooling 2nd Stage (Y1, Y2, O, G)

The ECM fan adjusts to 2nd stage airflow (CFM) level (based on DIP switch settings).

Dehumidification

The ECM fan control board includes two types of dehumidification modes, Constant Dehumidification mode, and On Demand Dehumidification (ODD). If the ECM control board is set to Constant Dehumidification mode, the ECM fan runs at normal airflow (CFM) in all heating stages, but all cooling operation will be 85% of the current stage airflow (CFM) level (based on DIP switch settings). The dehumidification mode lowers the airflow (CFM) through the evaporator coil, to improve latent (dehumidification) capacity. In ODD mode, a humidistat or a thermostat with a dehumidification output (output must be reverse logic -- i.e. it must operate like a humidistat) is connected to the ODD terminal. When the control receives a call for dehumidification, the fan runs at 85% of the current stage airflow (CFM) in the cooling mode. Otherwise, the airflow is at the normal airflow (CFM) level. The signal is ignored in the heating mode.

Fan Only

When the ECM control module receives a "G" call without a call for heating or cooling, the fan operates at 50% of the full load airflow (CFM) level (based on DIP switch settings).

Refrigerant Detection - System Response

A sensor will be mounted in the air handler. If the refrigerant sensors detect refrigerant concentration above 10% lower flammability limit (LFL), it will force the system into mitigation mode. In mitigation mode, the blower operates on high airflow and de-energizes the R terminal along with the controls in the compressor section, preventing the compressor from operating. The Error light on the ECM board will be the only light flashing during mitigation. This will continue until the refrigerant sensed is below 10% LFL and mitigation continues for 5 additional minutes.

Note: Refrigerant sensor shall only be replaced with manufacturer approved sensor.

⚠ NOTICE ⚠

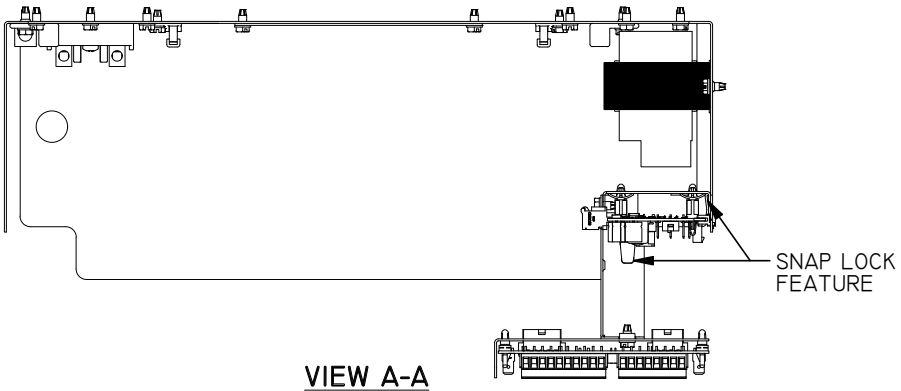
All zone dampers must open when the unit detects a refrigerant leak and enters mitigation mode. Note that while the unit is in mitigation mode the R field wiring terminals are de-energized.

Refrigerant Detection - Mitigation Testing

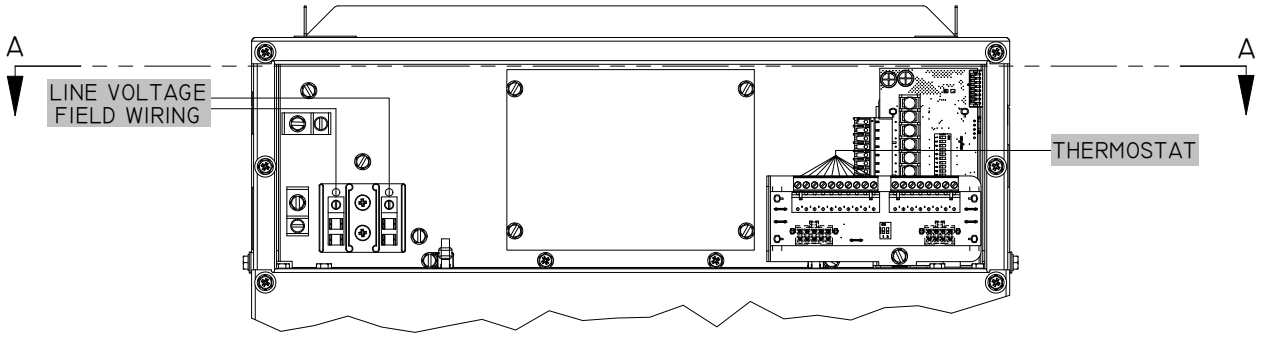
Provisions have been provided to test the mitigation mechanism. The center of the ECM control board has DIP switches for blower configuration. Turning DIP switches 9 and 10 to the ON position will force the system into mitigation mode. The expected operation is the blower operates on high airflow, compressor will de-energize, and other control boards will de-energize. To turn off the mitigation test, DIP switches 9 and 10 should be set back to settings based on the CFM table.

Note: Mitigation behavior continues for 5 full minutes after turning DIP switches off as required by the safety standard.

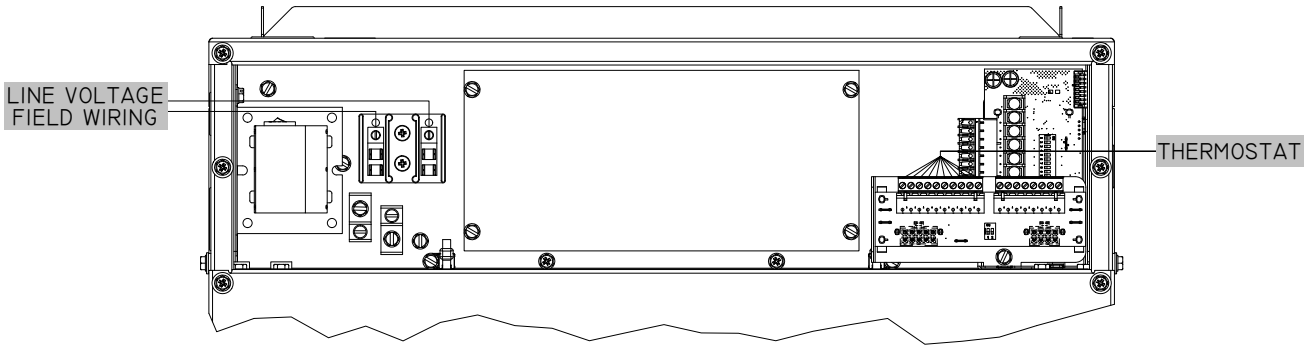
Electrical Connections



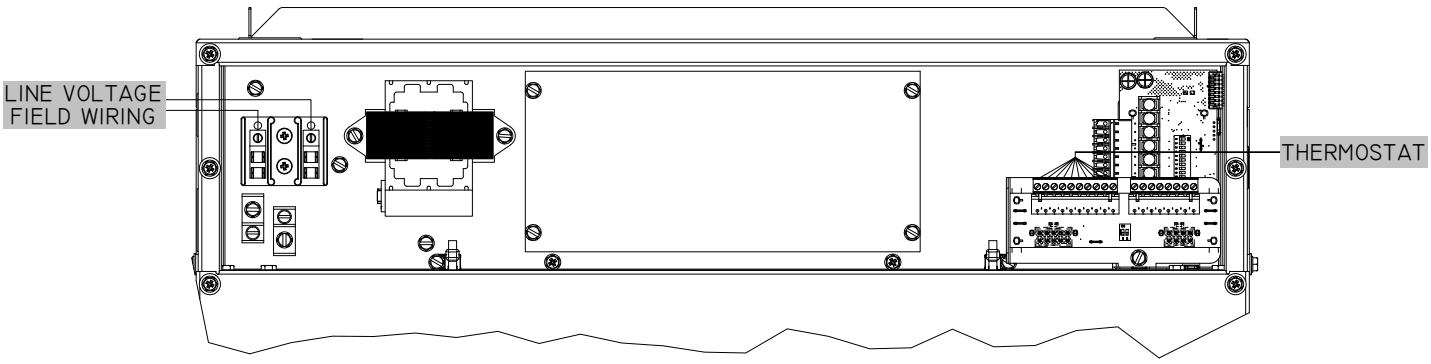
VIEW A-A
EAD018-024



EAD018-024



EAD036-048



EAD060-072

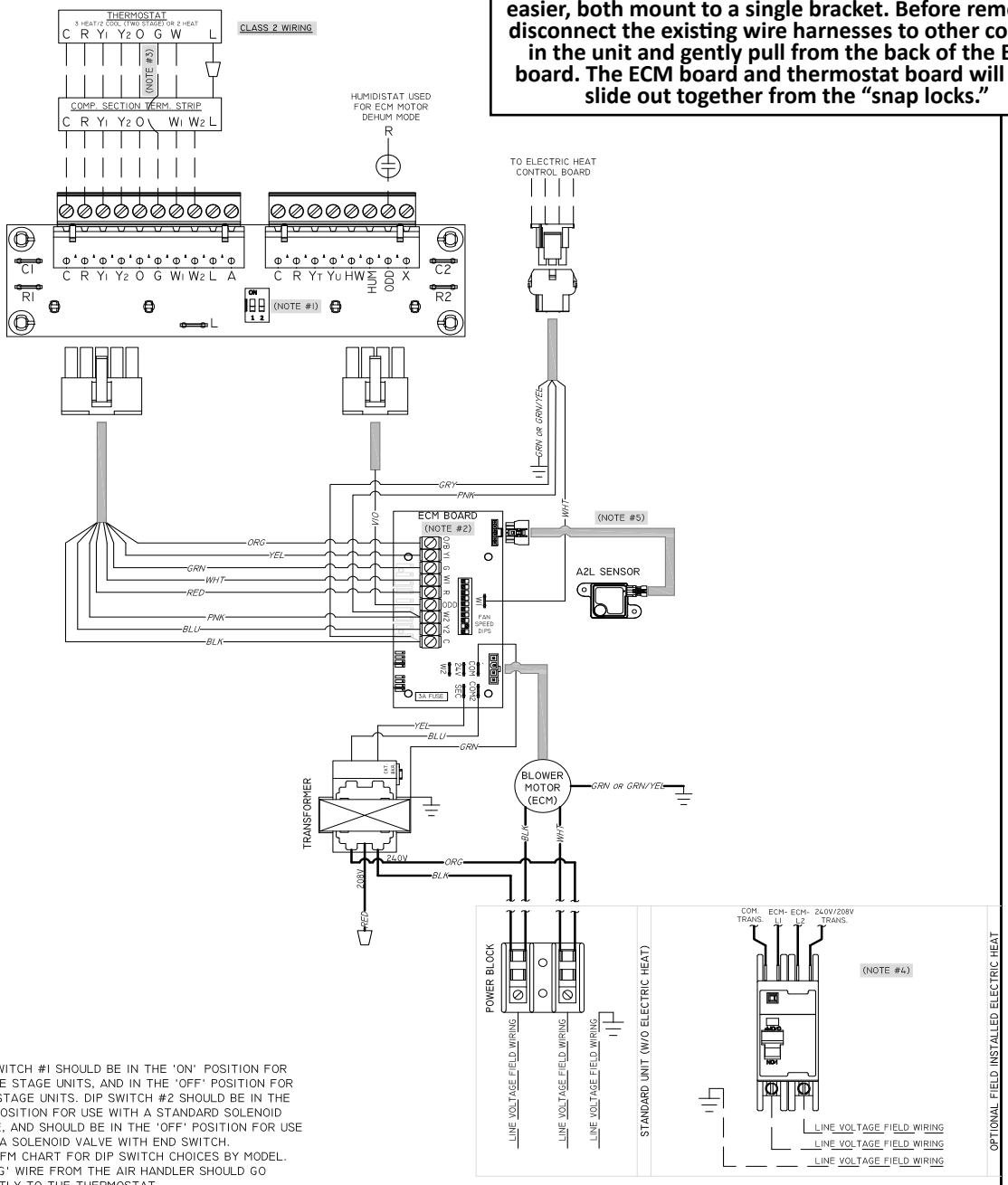
Wiring Diagram

AIR HANDLER, ECM, 208/230V, 60Hz, RESIDENTIAL & COMMERCIAL AD/AH SERIES

The "G" wire from the Air Handler should go directly to the thermostat.

NOTICE

To make servicing the ECM board and thermostat board easier, both mount to a single bracket. Before removing, disconnect the existing wire harnesses to other controls in the unit and gently pull from the back of the ECM board. The ECM board and thermostat board will pop/ slide out together from the "snap locks."



NOTES:

1. DIP SWITCH #1 SHOULD BE IN THE 'ON' POSITION FOR SINGLE STAGE UNITS, AND IN THE 'OFF' POSITION FOR TWO STAGE UNITS. DIP SWITCH #2 SHOULD BE IN THE 'ON' POSITION FOR USE WITH A STANDARD SOLENOID VALVE, AND SHOULD BE IN THE 'OFF' POSITION FOR USE WITH A SOLENOID VALVE WITH END SWITCH.
2. SEE CFM CHART FOR DIP SWITCH CHOICES BY MODEL.
3. THE 'G' WIRE FROM THE AIR HANDLER SHOULD GO DIRECTLY TO THE THERMOSTAT.
4. IF INSTALLING AHA REV. B ELECTRIC HEAT MODELS, THE BLOWER AND TRANSFORMER WIRES MAY BE MOVED OVER TO THE LOAD SIDE OF THE APPROPRIATE CIRCUIT BREAKER AND THE POWER BLOCK MAY BE REMOVED. SEE HEATER IOM FOR INSTALLATION DETAILS.
5. REQUIRED FACTORY INSTALLED A2L SENSOR KIT FOR UNITS THAT CONTAIN MORE THAN 62 OZ. OF CHARGE. REFER TO IOM FOR DETAILS.

26W349-01NN

ENERTECH
GLOBAL, LLC
2506 S. ELM ST.
GREENVILLE, IL 62246

Section 5: General Unit Assembly

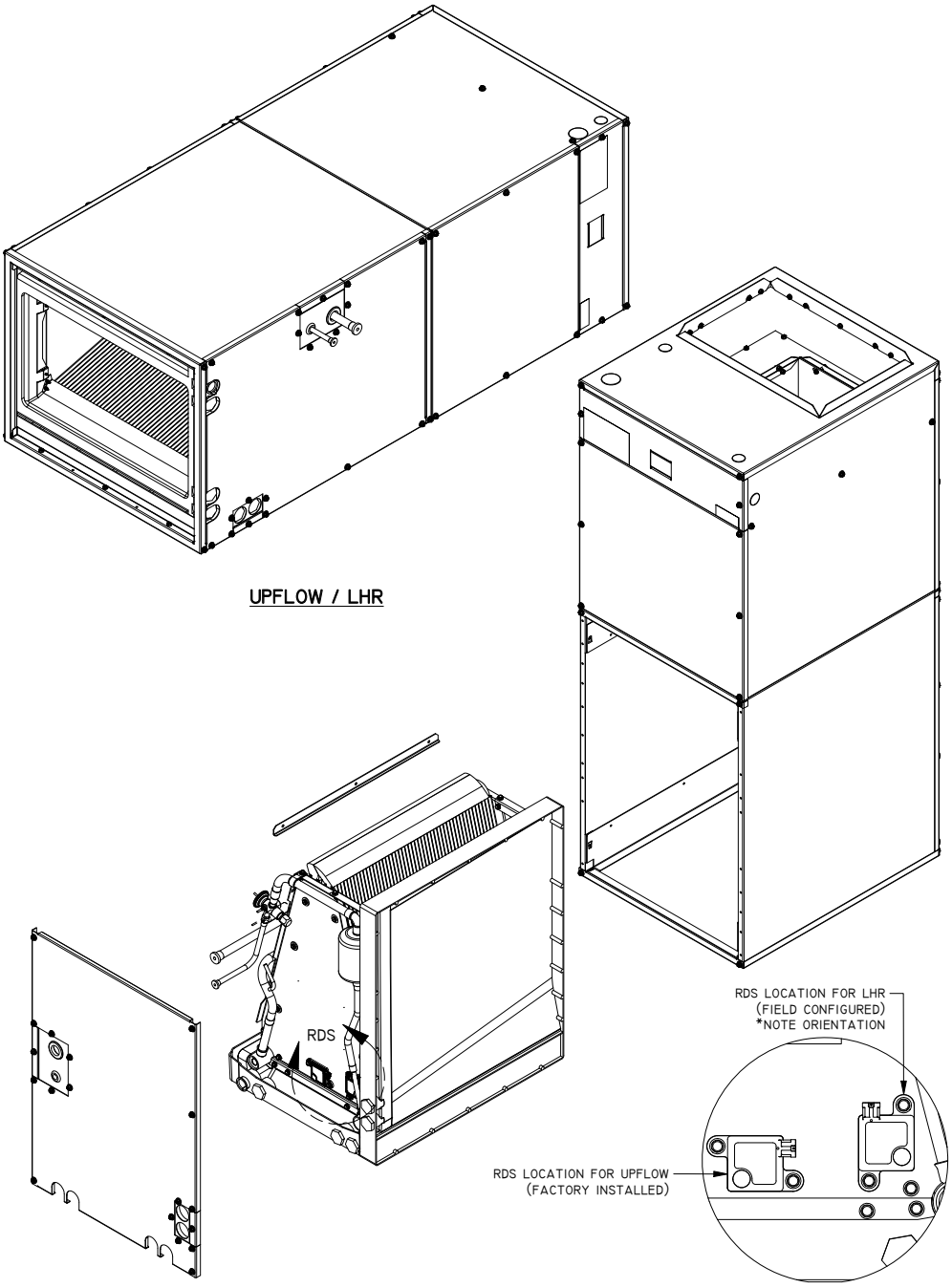
Disassembly

1. Remove the evaporator coil door panel. Set the door and screws aside, as they will be re-used.
2. Remove the evaporator coil assembly with the drain pan, by sliding it out of the front of the unit.
3. Remove the (3) screws securing the drain pan rail. Set the rail and screws aside, as they will be re-used.

A2L Sensor Location

A refrigerant detection sensor will come factory installed within the air handler. In it's factory installed location, it will serve Upflow and Downflow orientations. If installing the air handler in either a right-hand return or left-hand return orientation (horizontal), the sensor must be moved to the the open mounting location as shown by Figures 1 & 2. Ensure that the orientation of the sensor matches the diagrams below.

Figure 1

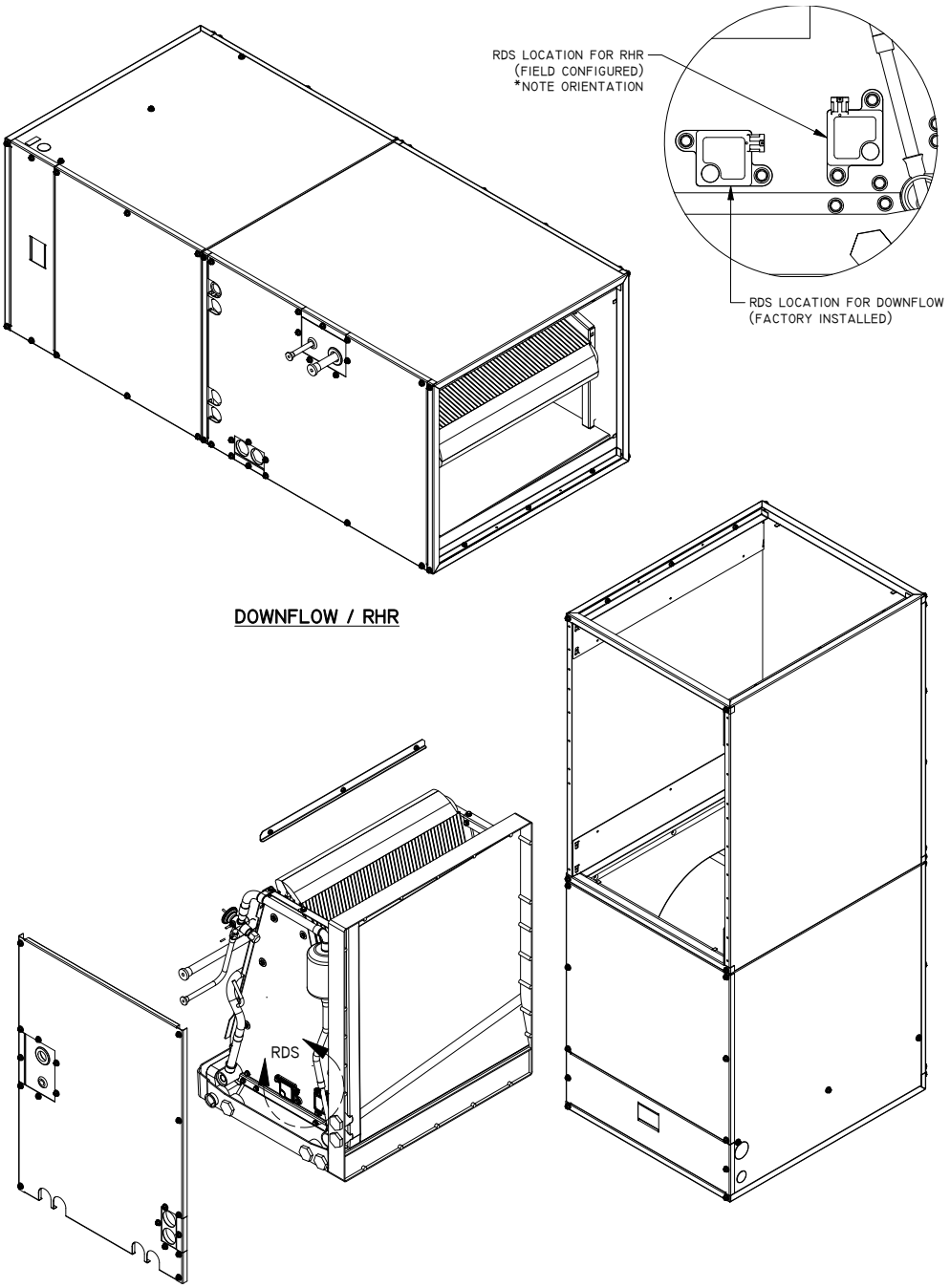


Section 5: General Unit Assembly

Assembly

4. Invert the air handler 180°, and reinstall the drain pan rail just above the blower. Use the (3) screws that were taken out in Step #3.
5. Slide the evaporator assembly back into the coils section. Evaporator must be installed so it is configured in the “A” position.
6. Re-install the evaporator door panel using parts from Step #1.

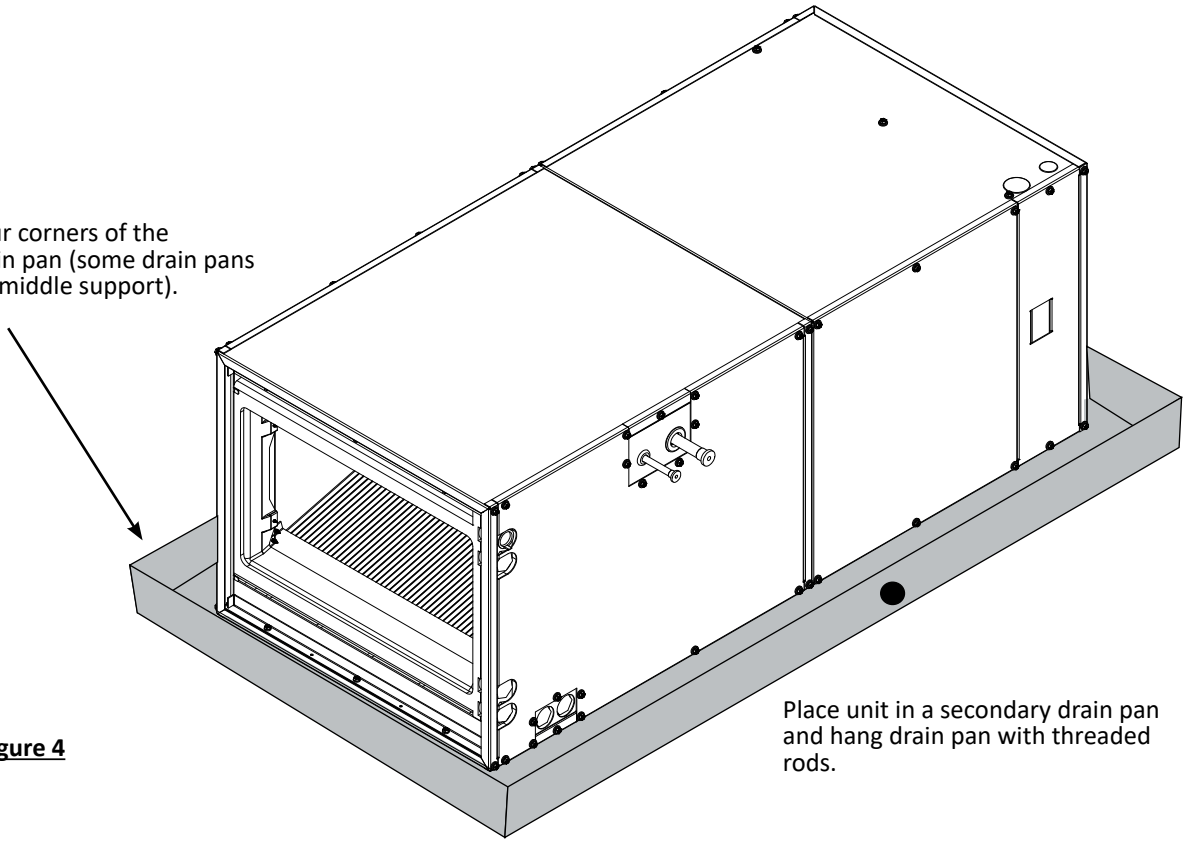
Figure 2



Horizontal Applications
Require support from three sets of threaded rods (Figure 3) or the air handler may be suspended via a secondary drain pan (Figure 4). Local code will determine secondary drain pan requirements.

Figure 3

Support all four corners of the secondary drain pan (some drain pans may require a middle support).



Place unit in a secondary drain pan and hang drain pan with threaded rods.

Figure 4

A2L Servicing Requirements

Technicians must be qualified for the work being performed. The use of A2L refrigerants requires careful consideration to the safety of the technician and others in the vicinity. Examples of service activities requiring increased qualifications include breaking into the refrigerant circuit, opening of sealed components, opening of ventilated enclosures. As such, it is recommended to have the EPA 608 Type I & II cetification from an accredited institution.

Note: This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, unless servicing.

⚠ WARNING ⚠

DO NOT USE MEANS TO ACCELERATE THE DEFROSTING PROCESS OR TO CLEAN, OTHER THAN THOSE RECOMMENDED BY THE MANUFACTURER.

THE APPLIANCE SHALL BE STORED IN A ROOM WITHOUT CONTINUOUSLY OPERATING IGNITION SOURCES. (FOR EXAMPLE: OPEN FLAMES, AN OPERATING GAS APPLIANCE OR AND OPERATING ELECTRIC HEATER)

DO NOT PIERCE OR BURN
BE AWARE THAT REFRIGERANTS MAY NOT CONTAIN AN ODOR.

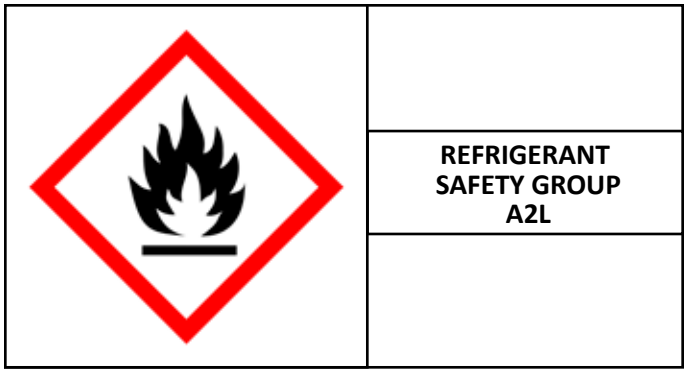
⚠ AVERTISSEMENT ⚠

NE PAS RECOURIR À D'AUTRES MOYENS POUR ACCÉLÉRER LE PROCESSUS DE DÉGIVRAGE OU LE NETTOYAGE, À L'EXCEPTION DE CEUX RECOMMANDÉES PAR LE FABRICANT.
ENTREPOSER L'APPAREIL DANS UNE PIÈCE OÙ IL N'Y A AUCUNE SOURCE D'INFLAMMATION
EN FONCTIONNEMENT CONTINU. (PAR EXEMPLE : FLAMMES NUES, APPAREIL À GAZ EN FONCTIONNEMENT OU APPAREIL DE CHAUFFAGE ÉLECTRIQUE EN FONCTIONNEMENT)

NE PAS PERCER NI BRÛLER.
À NOTER QUE LES FRIGORIGÈNES PEUVENT NE PAS AVOIR D'ODEUR.

Safety Checks

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure the risk of ignition is minimized. For repair to the refrigerating system, work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed. No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner leading to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, during repairing, removing, disposal and any other times which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure no flammable hazards or ignition risks are present. Smoking is bad for your health and the health of those around you. "No smoking" signs shall be displayed.



Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed. Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

The area shall be checked with a refrigerant detector compatible for detection of A2L refrigerants, prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

Leak Checks

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors - These may be used to detect refrigerant leaks. For electronic detectors used for flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free-area.) Ensure the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed.

Leak detection fluids - These are suitable for use with most refrigerants, but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Leak detection fluid examples:

- bubble method
- fluorescent method agents.

If a leak is suspected, all naked flames shall be removed or extinguished.

If leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Recovery of refrigerant shall be carried out according to the Decommissioning section of this manual.

Refrigeration Components
Where refrigeration components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturers technical department for assistance. The following checks apply to installations using flammable refrigerants:

- The ventilation machinery and outlets are operating adequately and are not obstructed;
- The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- Marking to the equipment continues to be visible and legible. Illegible marking and signs shall be corrected.
- Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being corroded.

Electrical Components
Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists compromising the technicians safety, no electrical supply shall be connected to the circuit until the fault is satisfactorily repaired. Initial safety checks shall include:

- Discharging of the capacitors with main power verified to be de-energized. Discharging shall be done in a safe manner to avoid a possibility of sparking. Use insulated clips and a 5 W 20 kohm resistor to short across the capacitor terminals. Verify voltage drops to 0V.
- Ensure no live electrical components and wiring are exposed while charging, recovering, or purging the system.
- Check for the presence of continuity to earth bonding.

Check to make sure cabling will not be subject to wear, corrosion, excessive pressure, excessive vibration, sharp edges or any other adverse environmental conditions. During the check take into account effects of aging or continual vibration from sources such as compressors or fans. Sealed electrical components and intrinsically safe components shall be replaced and shall not be repaired.

Removal/Evacuation
When breaking into the refrigerant circuit to make repairs, or for any other purpose, conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- safely remove refrigerant following location and national regulations

1. evacuate
2. purge the circuit with inert gas (optional for A2L)
3. evacuate (optional for A2L)
4. continuously flush or purge with inert gas when using flame to open circuit
5. open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging the refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Charging
In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure cross contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimize the amount of refrigerant in each hose.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Refrigeration system must be earth grounded prior to charging the system with refrigerant.
- Label the total charge on the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigeration system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas (inert nitrogen). The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site. See the proper procedures under the leak checks section in this section of the manual.

⚠ CAUTION ⚠
ALWAYS USE DRY NITROGEN WHEN BRAZING.

⚠ MISE EN GARDE ⚠
UTILISEZ TOUJOURS DE L'AZOTE SEC LORS DU BRASAGE.

⚠ CAUTION ⚠
DO NOT PIERCE OR BURN.
BEFORE DRILLING OR DRIVING ANY SCREWS INTO CABINET, CHECK TO BE SURE THE SCREW WILL NOT HIT ANY INTERNAL PARTS OR REFRIGERANT LINES.

⚠ MISE EN GARDE ⚠
NE PAS PERCER NI BRÛLER.
AVANT DE PERCER OU DE VISSER À TRAVERS L'ARMOIRE, S'ASSURER QUE LA VIS N'ENTRERA EN CONTACT AVEC AUCUNE PIÈCE INTERNE NI AUCUNE CONDUITE DE FLUIDE FRIGORIGÈNE.

Refrigeration Troubleshooting Table								
Condition	Mode	Discharge Pressure	Suction Pressure	Superheat	Subcooling	Air TD	Water TD	Compressor Amps
Under Charge	Heat	Low	Low	High	Low	Low	Low	Low
	Cool	Low	Low	High	Low	Low	Low	Low
Over Charge	Heat	High	High/Normal	Normal	High	High	Normal	High
	Cool	High	High/Normal	Normal	High	Normal	High	High
Low Air Flow	Heat	High	High/Normal	Normal	High/Normal	High	Low	High
	Cool	Low	Low/Normal	Low	Normal	High	Low	High/Normal
Low Source Water Flow	Heat	Low	Low/Normal	Low	Normal	High	Low	High/Normal
	Cool	High	High/Normal	Normal	High/Normal	High	Low	High
Low Load Water Flow	Heat	High	High/Normal	Normal	High/Normal	High	Low	High
	Cool	Low	Low/Normal	Low	Normal	High	Low	High/Normal
Restricted TXV	Heat	High	Low	High	High	Low	Low	Low
	Cool	High	Low	High	High	Low	Low	Low
TXV Stuck Open	Heat	Low	High/Normal	Low	Low	Low	Low	High
	Cool	Low	High/Normal	Low	Low	Low	Low	High
Inadequate Compression	Heat	Low	High	High/Normal	Low/Normal	Low	Low	Low
	Cool	Low	High	High/Normal	Low/Normal	Low	Low	Low

Troubleshooting Tips	
A: UNIT WILL NOT START IN EITHER CYCLE	
Thermostat	Set thermostat on heating and highest temperature setting. Unit should run. Set thermostat on cooling and lowest temperature setting. Unit should run. Set fan to On position. Fan should run. If unit does not run in any position, disconnect wires at heat pump terminal block and jump R, G, Y. Unit should run in heating. If unit runs, replace thermostat with correct thermostat only.
Loose or Broken Wires	Tighten or replace wires.
Blown Fuse	Check fuse size, replace fuse or reset circuit breaker. Check low voltage circuit breaker.
Tripped Circuit Breakers	Check fuse size, replace fuse or reset circuit breaker.
Low Voltage Circuit	Check 24 volt transformer. If burned out or less than 24 volt, replace. Before replacing, verify tap setting and correct if necessary.
B: BLOWER RUNS BUT COMPRESSOR WILL NOT START (COMPRESSOR OVERLOAD, BAD CAPACITOR, HP FAULT)	
Logic Board	Check if status light is on and logic board is working properly. Check fault lights. See LED Identification chart in Controls Section.
Defective Sensors	Check status/fault lights. Sensor is out of normal range for resistance values, open, or shorted. Compare sensor resistance values with the charted resistance in Controls Section.
Defective Capacitor	Check capacitor. If defective, replace.
Failed Compressor	See charts M and N for compressor diagnostic. If compressor still doesn't run, replace it.

Low Pressure Switch	Low refrigerant charge. Check for pressure. Check for leaks.
C: BLOWER RUNS BUT COMPRESSOR SHORT CYCLES OR DOES NOT RUN	
Wiring	Loose or broken wires. Tighten or replace wires. See A: Unit will not start in either cycle.
Blown Fuse	Check fuse size. Check unit nameplate for correct sizing. Replace fuse or reset circuit breaker.
Check low voltage circuit breaker.	Temporarily bypass flow switch for a couple seconds. If compressor runs properly, check switch. If defective, replace. If switch is not defective, check for air in loop system. Make sure loop system is properly purged. Verify flow rate before changing switch.
Defective Sensors	Check status/fault lights. Sensor is out of normal range for resistance values, open, or shorted. Compare sensor resistance values with the charted resistance in Controls Section.
Water Flow (Source Heat Exchanger Freeze Fault)	Check status/fault lights. To check water flow remove the FS jumper (see Controls Section for location) and jumper the two FS terminals (located between blue and violet wires on the right side of the board) together to complete the flow switch circuit. Determine if the required water pressure drop is present. If required pressure drop is present, check the resistance of T4 source sensor (15°F=41.39kΩ; 30°F=28.61kΩ) and temperature of the refrigerant line between the source heat exchanger and TXV.
High or Low Pressure Switches	If heat pump is out on high or low-pressure cutout (lockout), check for faulty switches by jumping the high and low-pressure switches individually. If defective replace. Check airflow, filters, water flow, refrigerant pressures, and ambient temperature. WARNING: Only allow compressor to run for a couple of seconds with the high pressure switch jumped.
Defective Logic Board Relay	Jump R to Y directly on lockout board. Check for 24V at Y. If no operation and no faults occur, replace lockout board.
Hot Gas Temperature>220°F	Check status/fault lights. Check hot gas/discharge line temperature with a thermocouple type thermometer. WARNING: Let the unit remain off for several minutes and touch the thermocouple to the discharge line to check if it is cooled enough to strap/tape a thermocouple to it. Check the discharge line temperature during the next operation cycle to compare the temperature to the lockout temperature of 220°F. Check water/air flow. If water/air flow is present, check the refrigerant pressures.
Condensate Overflow (CO)	Check status/fault lights. Check sensors for contact with water, debris, or a loose sensor touching metal. Clean sensors if contacting debris. Flush drain lines if the drain pan is full. If no debris is present and drain pan is empty, remove violet wire from CO terminal on lockout board (lower right). If CO lockout occurs with violet wire removed replace the lockout board.
Over/Under Voltage	Make sure secondary/low voltage is between 20V and 29V. Check the transformer's primary connections for the correct voltage (Orange & Black = 230V; Red & Black = 208V). Correct any possible voltage drops in the main voltage.
Load Heat Exchanger Frozen	Check status/fault lights. Check for reduced air flow due to dirty filter, obstructions, or poor blower performance. Check T1 sensor for the proper resistance (30°F = 28.61kΩ).
D: UNIT RUNNING NORMAL, BUT SPACE TEMPERATURE IS UNSTABLE	
Thermostat	Thermostat is getting a draft of cold or warm air. Make sure that the wall or hole used to run thermostat wire from the ceiling or basement is sealed, so no draft can come to the thermostat. Faulty Thermostat (Replace).

E: NOISY BLOWER AND LOW AIR FLOW	
Noisy Blower	Blower wheel contacting housing—Readjust, Foreign material inside housing—Clean housing. Loose duct work—Secure properly.
Low air flow	Check speed setting, check nameplate or data manual for proper speed, and correct speed setting. Check for dirty air filter—Clean or replace; obstruction in system—Visually check. Balancing dampers closed, registers closed, leaks in ductwork. Repair. Ductwork too small. Resize ductwork.
F: NO WATER FLOW	
Pump Module	Make sure Pump Module is connected to the control box relay (check all electrical connections). For non-pressurized systems, check water level in Pump Module. If full of water, check pump. Close valve on the pump flanges and loosen pump. Take off pump and see if there is an obstruction in the pump. If pump is defective, replace. For pressurized systems, check loop pressure. Repressurize if necessary. May require re-flushing if there is air in the loop.
Solenoid valve	Make sure solenoid valve is connected. Check solenoid. If defective, replace.

G: IN HEATING OR COOLING MODE, UNIT OUTPUT IS LOW	
Water	Water flow & temperature insufficient.
Airflow	Check speed setting, check nameplate or data manual for proper speed, and correct speed setting. Check for dirty air filter—Clean or replace. Restricted or leaky ductwork. Repair.
Refrigerant charge	Refrigerant charge low, causing inefficient operation. Make adjustments only after airflow and water flow are checked.
Reversing valve	Defective reversing valve can create bypass of refrigerant to suction side of compressor. Switch reversing valve to heating and cooling mode rapidly. If problem is not resolved, replace valve. Wrap the valve with a wet cloth and direct the heat away from the valve. Excessive heat can damage the valve. Always use dry nitrogen when brazing. Replace filter/drier any time the circuit is opened.
Heat pump will not cool but will heat. Heat pump will not heat but will cool.	Reversing valve does not shift. Check reversing valve wiring. If wired wrong, correct wiring. If reversing valve is stuck, replace valve. Wrap the valve with a wet cloth and direct the heat away from the valve. Excessive heat can damage the valve. Always use dry nitrogen when brazing. Replace filter/drier any time the circuit is opened.
Water heat exchanger	Check for high-pressure drop, or low temperature drop across the coil. It could be scaled. If scaled, clean with condenser coil cleaner.
System undersized	Recalculate conditioning load.
H: WATER HEAT EXCHANGER FREEZES IN HEATING MODE	
Water flow	Low water flow. Increase flow. See F. No water flow.
Flow Switch	Check switch. If defective, replace.
I: EXCESSIVE HEAD PRESSURE IN COOLING MODE	
Inadequate water flow	Low water flow, increase flow.
J: EXCESSIVE HEAD PRESSURE IN HEATING MODE	
Low air flow	See E: Noisy blower and low air flow.
K: AIR COIL FREEZES OVER IN COOLING MODE	
Air flow	See E: Noisy blower and low air flow.
Blower motor	Motor not running or running too slow. Motor tripping off on overload. Check for overheated blower motor and tripped overload. Replace motor if defective.
Panels	Panels not in place.
Low air flow	See E: Noisy blower and low air flow.
L: WATER DRIPPING FROM UNIT	
Unit not level	Level unit.
Condensation drain line plugged	Unplug condensation line.
Water sucking off the air coil in cooling mode	Too much airflow. Duct work not completely installed. If duct work is not completely installed, finish duct work. Check static pressure and compare with air flow chart in spec manual under specific models section. If ductwork is completely installed it may be necessary to reduce CFM.
Water sucking out of the drain pan	Install an EZ-Trap or P-Trap on the drain outlet so blower cannot suck air back through the drain outlet.

ECM Board Troubleshooting:

ECM Board LED Code Chart

LED State Name	Green LED Behavior	Red LED Behavior	Causes Mitigation Mode*	Notes
Off/Not Programmed	OFF	OFF	NO	**Solution:** Check 24vac power and 3 amp fuse, Replace ECM Board if fuse and Power are good.
In Bootloader	Rapidly Flashing	OFF	NO	**Solution:** Power Cycle. If stuck in this mode, Replace ECM Board
Running, No Blower Configuration	Ping-Pong	Ping-Pong	NO	**Solution:** Power Cycle. If Stuck in this mode Replace ECM Board
Running, Mitigation Enabled	Flashes 5 Times	OFF	NO	**Solution:** Everything is Operating Correctly. This only happens at start up as a general indication it is a mitigation enabled board.
Running, Telling Blower Not to Run	ON	OFF	NO	**Solution:** Everything is Operating Correctly
Running, Asking The Motor to Run	Flashing once per 100 CFM demand	OFF	NO	**Solution:** Everything is Operating Correctly
Error Modes (If the ECM board is mitigation enabled, power to all controls will be shut off and the blower will be told to run at max speed) (Some exceptions apply as stated in the Notes column)				
Mitigation Sensor Error	ON	Flashing 1 x Every 3 Sec.	YES	**Solution**: Check harness connection on ECM board and Mitigation Sensor(s). If a Fault is active on the lockout board, diagnose accordingly. Leaks may still be present without a Low Pressure or Freeze fault active.
Blower Communication Error	ON	Flashing 2 x Every 3 Sec.	YES	**Solution:** With Power Off, Check both Blower Motor Communication and high voltage Harnesses(s). Turn on power, Confirm high voltage at blower motor harnness.(Do not unplug High voltage with Power On) If good, Replace Motor.
Locked Rotor Error	ON	Flashing 4 x Every 3 Sec.	YES	**Solution**: Check Blower Motor High voltage. Check funcitonality of ECM board. With power off, Check if blower wheel spins freely. If not, Replace Blower Motor.
Lost Rotor Error	ON	Flashing 7 x Every 3 Sec.	YES	**Solution**: Check Blower Motor High voltage. Check funcitonality of ECM board. With power off, Check if blower wheel spins freely and is still attacehd to motor shaft. If not, Replace Blower Motor.
Over Current Error	ON	Flashing 8 x Every 3 Sec.	YES	**Solution**: Check Blower Motor High voltage. Be sure filters are clean and all registers are open. Check Duct Static Pressure. Reference E.S.P limits per unit in Installation Manaul. Check Duct Zoning operation if Applicable. If good, Replace Blower Motor.
Over Voltage Error	ON	Flashing 9 x Every 3 Sec.	YES	**Solution**: Check Blower Motor AC High voltage. If Good, Replace Blower Motor.
Under Voltage Error	ON	Flashing 10 x Every 3 Sec.	YES	**Solution**: Check Blower Motor High voltage. If Good, Replace Blower Motor.
Over Temperature Error	ON	Flashing 11 x Every 3 Sec.	YES	**Solution**: Check High voltage. Be sure filters are clean and all registers are open. Check Duct Static Pressure. Reference E.S.P limits per unit in Installation Manaul. Check Duct Zoning operation if Applicable. Check Blower Motor High voltage. If Good, Replace Blower Motor.Trip Point >97C , Reset <80C

***Applies to units above M1 Charge level**

Error Modes (If the ECM board is mitigation enabled, power to all controls will be shut off and the blower will be told to run at max speed) (Some exceptions apply as stated in the Notes column)				
LED State Name	**Green LED Behavior**	**Red LED Behavior**	**Causes Mitigation Mode***	**Notes**
Torque Limit Error	ON	Flashing 13 x Every 3 sec.	YES	**Solution:** Be sure filters are clean and all registers are open. Check Duct Static Pressure. Reference E.S.P limits per unit in Installation Manaul. Check Duct Zoning operation if Applicable.
Undesired Parameter Error	Flashing once per 100 CFM demand	Flashing 14 x Every 3 sec.	NO	**Solution:** Power Cycle. Check Low Voltage Harness connections. Check function of ECM board. Call Tech Support for further assistance.
Incomplete Parameters Error	Flashing once per 100 CFM demand	Flashing 3 x Every 3 Sec.	NO	**Solution:** Power Cycle. Check Low Voltage Harness connections. Check function of ECM board. Call Tech Support for further assistance.
Power Limit Error	Flashing once per 100 CFM demand	Flashing 5 x Every 3 Sec.	NO	**Solution:** Check high voltage Power. Be sure filters are clean and all registers are open. Check Duct Static Pressure. Reference E.S.P tables per unit in Installation Manaul. Check Duct Zoning operation if Applicable.
Temperature Limit Error	Flashing once per 100 CFM demand	Flashing 6 x Every 3 Sec.	NO	**Solution:** Check high voltage Power. Be sure filters are clean and all registers are open. Check Duct Static Pressure. Reference E.S.P limits per unit in Installation Manaul. Check Duct Zoning operation if Applicable.
Speed Limit Error	Flashing once per 100 CFM demand	Flashing 12 x Every 3 Sec.	NO	**Solution:** Be sure filters are clean and all registers are open. Check Duct Static Pressure. Reference E.S.P limits per unit in Installation Manaul. Check Duct Zoning operation if Applicable.
***Applies to units above M1 Charge level**				

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Section 7: Decommissioning

A2L Recovery

Before carrying out this procedure, it is essential for the technician to be completely familiar with the equipment and all its detail. It is recommended good practice to recover all refrigerants safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. Ensure safe electrical power is available for recovery equipment before the task is commenced. Complete these steps:

A. Become familiar with the equipment and its operation.

B. Isolate system electrically.

C. Before attempting the procedure, ensure that:
   - Mechanical handling equipment is available, if required, for handling refrigerant cylinders;
   - All personal protective equipment is available and being used correctly;
   - The recovery process is supervised at all times by a competent person;
   - Recovery equipment and cylinders must conform to the appropriate standards for mildly flammable, A2L refrigerants.

D. Make sure the cylinder is situated on the scales before recovery takes place.

E. Start the recovery machine and operate in accordance with instructions.

F. Pump down refrigerant system, if possible.

G. If a vacuum is not possible, make a manifold connection to allow refrigerant to be removed from all sections of the system.

H. Do not overfill cylinders (no more than 80% volume liquid charge).

I. Do not exceed the maximum working pressure of the cylinder, even temporarily.

J. When the cylinders have been filled correctly and the process completed, make sure the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

K. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Equipment shall be labeled stating it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure labels on the equipment state the equipment contains flammable refrigerant.
When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice for all refrigerants to be removed safely.

When transferring refrigerant into cylinders ensure only appropriate refrigerant recovery cylinders are employed. Ensure the correct number of cylinders for holding the total system charge are available. All cylinders to be used are designated for the recovered refrigerant and labeled for refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment at hand and shall be suitable for the recovery of the mildly flammable, A2L refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure it has been evacuated to an acceptable level to make certain flammable refrigerant does not remain within the lubricant. The compressor body shall **not** be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Removal and Disposal

All geothermal units removed from service should have all components, oils, antifreeze and refrigerants properly disposed of according to local and national environmental recycling codes, regulations, standards and rules.

Revision Table

Date	Description of Revision	Page
10JULY2024	Document created	All

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