Thermoelectric air conditioner installation and operation manual

FOR 1500 Btu MODEL #'S

AAC-145-T-E
AAC-145-4XT-E
AAC-145-T-E-HC
AAC-145-4XT-E-HC
AAC-145-XXXXX

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Version 1.0 Until 31st December 2008

General Information

1.1 Principles of Operation

In 1834 Jean Peltier discovered that by passing a current through two dissimilar conductors the junction of those materials will either absorb or release heat depending on the direction of the current flow.

Thirteen years earlier Thomas Seebeck had discovered that current would flow when you placed a temperature gradient across the junction of two dissimilar metals. These two discoveries were the basis of thermoelectrics.

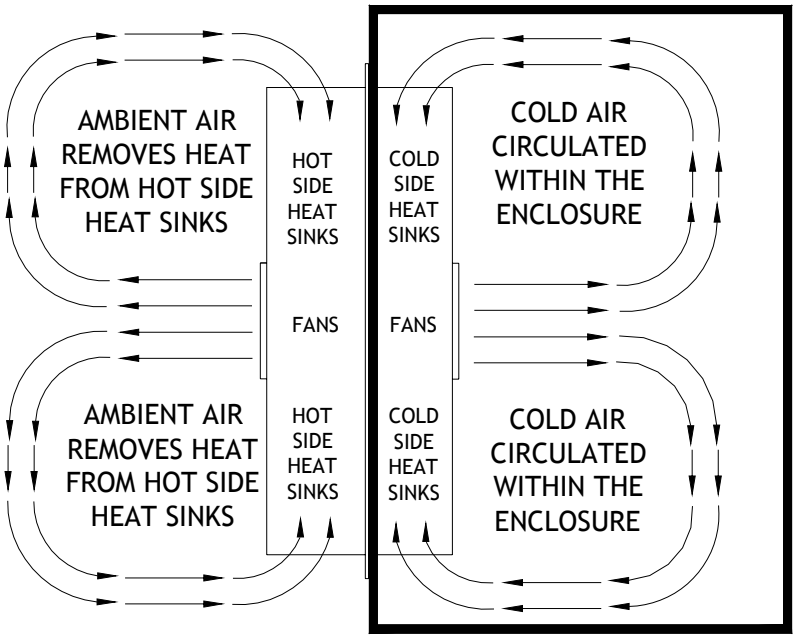
With the advent of modern semiconductors, thermoelectric devices became practical for real world applications and are now found in everything from consumer goods to spacecraft.

Your Thermoelectric Air Conditioner operates on this principle so there is no compressor and no expensive, ozone depleting CFC's.

These air conditioners use Thermoelectric "modules" sandwiched between high performance aluminium heat sinks, high CFM axial fans, and a patented electronic design to "pump" the heat from the inside of your enclosure to the outside, without exposing your delicate electronics to any outside air or contaminates.

See Figure 1.1. The supplied air conditioning unit uses only the highest quality components in our air conditioners and you can expect years of trouble free cooling from these solid-state devices. Every unit we sold is backed by a one year parts and labour warranty.

Figure 1.1



Installation

2.1 Choosing a location on your enclosure

When choosing a mounting location for your unit, be sure to keep the airflows of both the interior and exterior heat sink fans in mind. Adequate clearance between the fans/heat sinks and nearby surfaces is required for unrestricted airflows, which will ensure optimal performance and long, trouble free operation.

The general rule is to allow a minimum of two inches between the fans or heat sinks and any surface. Refer to figure 1.1 for an air flow diagram.

Other considerations in deciding on a mounting location include; allowing access to the thermostat (this will be inside the enclosure) if frequent adjustments are to be made; allowing access to the hot side heat sinks (this will be on the outside of the enclosure) for cleaning if the unit will be used in a harsh, dirty environment.

2.2 Orientation

Your AC unit can be mounted either vertically on the front, rear or side of your enclosure. It can also be mounted horizontally on the top of your enclosure. See Figure 2.1 and 2.2. on page 5.

Vertically mounted 1500 Btu units are always mounted with the exposed heat sink fins facing up and down, never left and right. (Fig. 2.1)

Vertical installations often require the use of a Condensate Drip Pan (part # DP-V) depending on a number of factors including internal enclosure temperatures and ambient temperatures, humidity levels, quality of enclosure seals, and frequency of enclosure opening.

We strongly recommend the use of a drip pan to protect the electronics from dripping condensate. (Fig. 2.1)

Mounting the air conditioning unit horizontally on the side of an enclosure, will cause condensate to drip in an uncontrolled manner. This could possibly damage electronic equipment within the enclosure. If horizontal orientation is the only possible configuration method, Please contact us to discuss a custom air conditioning solution from the manufacturer.

Horizontally mounted 1500 Btu units always require a factory-installed drip pan (part # DP-145H) to prevent dripping condensate from damaging electronic equipment. (Fig. 2.2)

In either orientation, issues regarding access should be considered and minimum clearances must be maintained as outlined in Section 2.1 of this manual.

Installation

Figure 2.1

Vertical installation of 1500 btu unit with DP-V vertical drip pan and drain tube

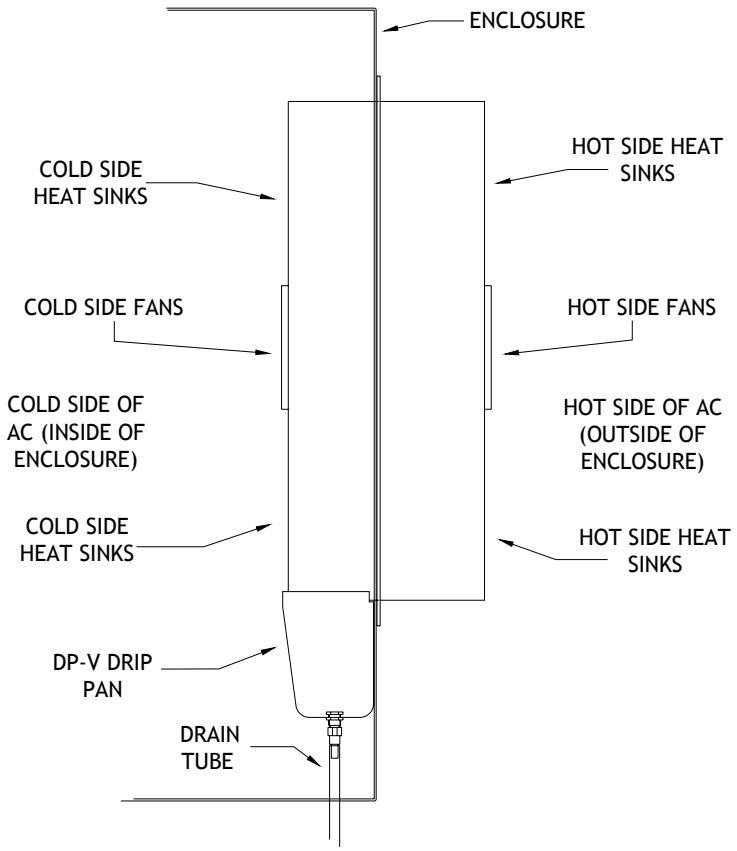
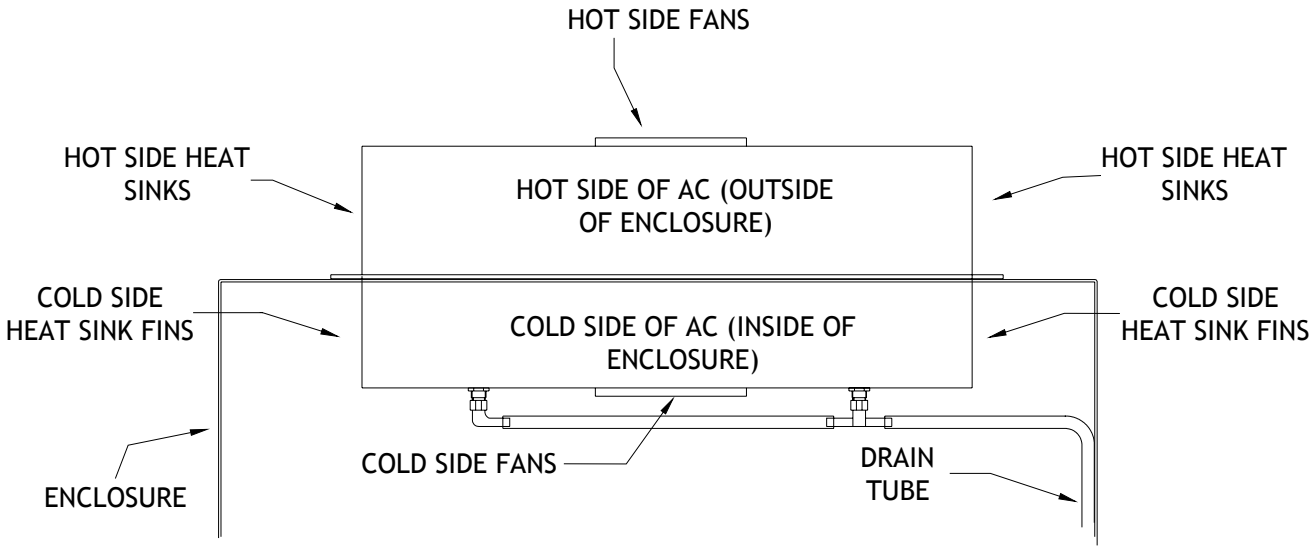


Figure 2.2

Horizontal installation of 1500 btu unit withinternally mounted DP-145H drip pan and drain tube



Installation

2.3 Preparing the enclosure

To mount the 1500 Btu unit you will need to cut an opening in your enclosure and drill mounting holes. A cut-out drawing (Fig. 2.3) on page 7 shows the cut-out size and hole locations. The instructions for installing the air conditioner are below.

Tools and Materials Needed

- Pencil
- Scissors
- Tape measure
- Jigsaw or suitable alternative
- Electric drill
- # 29 drill bit
- # 8-32 tap and tap handle
- # 8-32 x 3/8" stainless machine screws, 10 screws for NEMA 12 installations, 20 screws for NEMA 4X installations (20 have been supplied)
- Twenty nylon washers for NEMA 4X installations (supplied)
- One neoprene gasket (supplied)

Cut the opening and drill mounting holes in the enclosure

1. Using the guidelines provided in the installation manual, choose an appropriate location for the air conditioner on your enclosure.
2. Layout the cut-out and hole pattern for the AC on the enclosure. Refer to Figure 2.3.
3. Before cutting or drilling check, that the location meets the clearance requirements as specified in the installation manual.
4. Using a pencil, centre punch or other method, mark the exact centre point of each mounting hole on the enclosure. You will use 10 holes for a NEMA 12 installation and all 20 holes for a NEMA 4X installation.
5. Use the jigsaw, to cut the opening in the enclosure.
6. Use the # 29 drill bit, to drill a hole at each of the marks you made earlier.
7. Use the 8-32 tap, to tap each of the holes you have drilled.

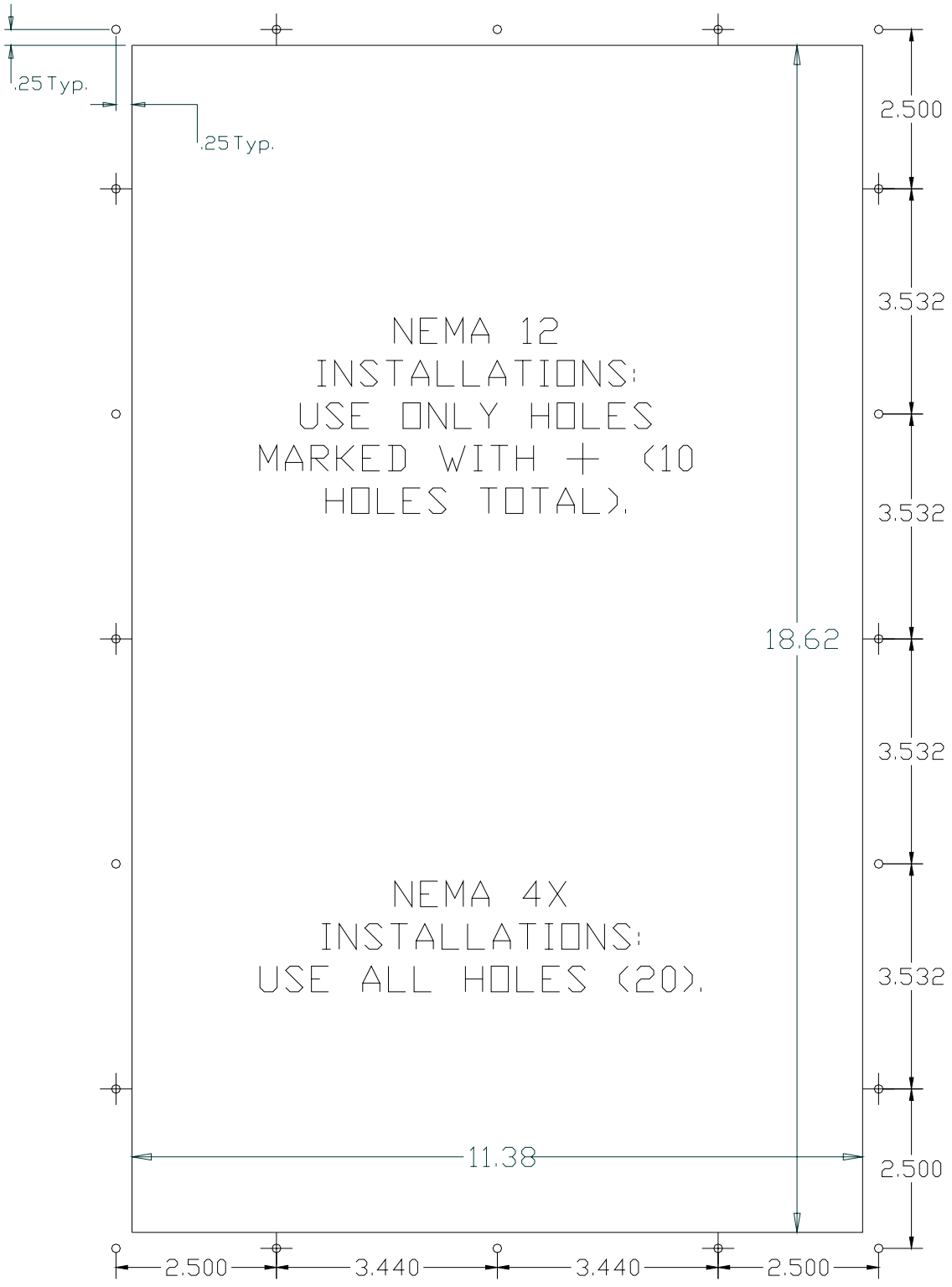
2.4 Installing the air conditioner

Install the air conditioner

1. Lay the air conditioner down with the cold side (side with the thermostat) facing up.
2. Take the supplied gasket and lay it down on the flange.
3. Take one of the supplied mounting screws and, from the under side of the flange, push it up through the top right mounting hole, and through the hole in the gasket.
   The gasket hole is undersized and will hold the screw in place. Repeat this on the top left mounting hole.
4. Set the AC unit in the hole you have cut in the enclosure, and using a screwdriver, carefully start the two screws you attached to the gasket to the tapped holes in the enclosure. Do not tighten these at this time.
5. Install the rest of the screws in the flange placing a nylon washer on each fastener and screw them into the tapped holes in the enclosure. Do not tighten them completely.
   a. If you have purchased a vertical drip pan, you will need to install the three long screws in the three centre holes in the bottom flange.
   b. If this is an indoor installation with no chance of exposure to water or other liquids, you can use 10 screws per the NEMA 12 pattern in Fig. 2.3.
   c. If this is a NEMA 4X installation (outdoors or chance of exposure to liquids) use all 20 screws provided.
6. Remove the two starter screws and place a nylon washer on each and reinstall.
7. Tighten all screws.

Installation

Figure 2.1



Installation

2.5 Install the drip pan

1. Two hose fittings are provided with the drip pan, a straight version and one at a right angle. Choose one and install it on the drip pan. Be sure if you use the right angle, fitting it is facing the desired direction prior to installing the drip pan.
2. There are three mounting holes in the drip pan, match these with the long mounting screws protruding into the enclosure at the bottom of the AC unit. Push the drip pan onto these screws.
3. Using the three 8-32 keps nuts provided, attach the drip pan to the air conditioner.
4. Attach the supplied PVC drain tube to the hose fitting on the drip pan. This tube should be routed to the bottom of the enclosure and fed through a 3/8" hole to the outside.
5. If you purchased a horizontal drip pan, it is installed at the factory and you will only need to install the hose fitting and PVC drain hose.

You must use the facto ry installed horizontal drip pan if you install the air conditioner horizontally (fig 2.2) On the to p of your enclosure. Failure to do so may allow condensate to drip in an uncontrolled manner caausing damage to your equipment

2.6 Apply power

Once the air conditioner is mounted, check the serial label and confirm the voltage required and then apply appropriate power as outlined below.

120 VAC units – plug into standard 120 volt grounded outlet.

220 – 240 VAC units – this unit will not have a plug on the end. Connect the wires to an appropriate power source using standard safe wiring methods as follows:

For US installations wire colours are as follows:
Black – line
White – line/neutral
Green – ground

For European installations the wire colours are as follows:
Brown – line
Blue – line/neutral
Green/yellow – ground

Amperage for 120 VAC unit is 6.3 amps
Amperage for 220 VAC unit is 4.6 amps

For other voltages, you will receive a separate wiring diagram showing the correct method of applying power.

If you purchased a Digital Temperature Controller with your AC unit, a separate wiring diagram will be provided, which will show the correct method of applying power to your particular air conditioner.

Upon applying power to the air conditioner, the fans on the cold side (inside the enclosure) will come on.

The hot side fans (outside the enclosure) may also run depending on where the thermostat is set.

The cold side fan always runs to circulate air within your enclosure thereby eliminating any "hot spots".

The hot side fans will only run when the air conditioner is cooling – they are "pumping" the heat from the inside of your enclosure to the outside air.

Operation

3.1 Thermostat set points and heating/cooling units

Setting the thermostat

Your air conditioner is equipped with an adjustable thermostat. The set point you choose should be based on the desired internal temperature of the enclosure. The air conditioner will run until the set point temperature is achieved within the enclosure at which point the hot side fans and the thermoelectric cooling modules will shut down. The cold side fan will continue to run, circulating the air to maintain a uniform temperature within the enclosure.

Heating and cooling units

If you purchased an HC unit (heating and cooling), the heater operation is controlled by a fixed-point thermostat. This thermostat is set to turn the heaters on when the temperature within the enclosure falls to approximately 7˚C (45˚F) and turn the heaters off when the temperature rises to approximately 13˚C (55˚F).

The cooling operation is controlled by the adjustable thermostat. To avoid having the heating and cooling on at the same time, do not set the cooling thermostat below 18˚C (65˚F).

3.2 Maintenance

The Thermoelectric Air Conditioners are virtually maintenance-free. The only time maintenance is required is when a unit is installed in an extremely dirty environment. In these cases, the hot side heat sinks (outside the enclosure) should be inspected regularly for a build-up of dust or dirt. If a build-up is present on the heat sink fins, it can be easily removed as follows:

1. Disconnect the power from the unit.
2. Dry dust/dirt can be removed using compressed air to blow out the heat sinks. Do not direct any high-pressure air at the fans.
3. NEMA 4X models of our air conditioners are designed to allow for water wash down of the hot side of the unit, which is outside of the enclosure (never the cold side, which is in the enclosure). A pressure washer can be used to carefully clean the hot side heat sink fins. Never direct high-pressure water at the fans or the joint formed by the mounting flange, gasket and enclosure. Never allow the cold side of your unit to get wet. Always check your serial label before proceeding with a water wash down.

Keeping the hot side heat sink fins free from any insulating build-up of dirt or dust will ensure long, trouble-free operation of your air conditioner.

Only NEMA 4X units, with model numbers beginning with "AAC-145-4XT, are designed for hot side of the air conditioner (outside the enclosure) to tolerate exposure to water.

NEMA 12 units, with model #'s with "AAC-145-T", are not designed to be exposed to water and should never be washed down.

Never expose the cold side of any air conditioner (inside the enclosure) to water.

If you have any questions about any aspect of your air conditioner, please contact CP who will be happy to help.

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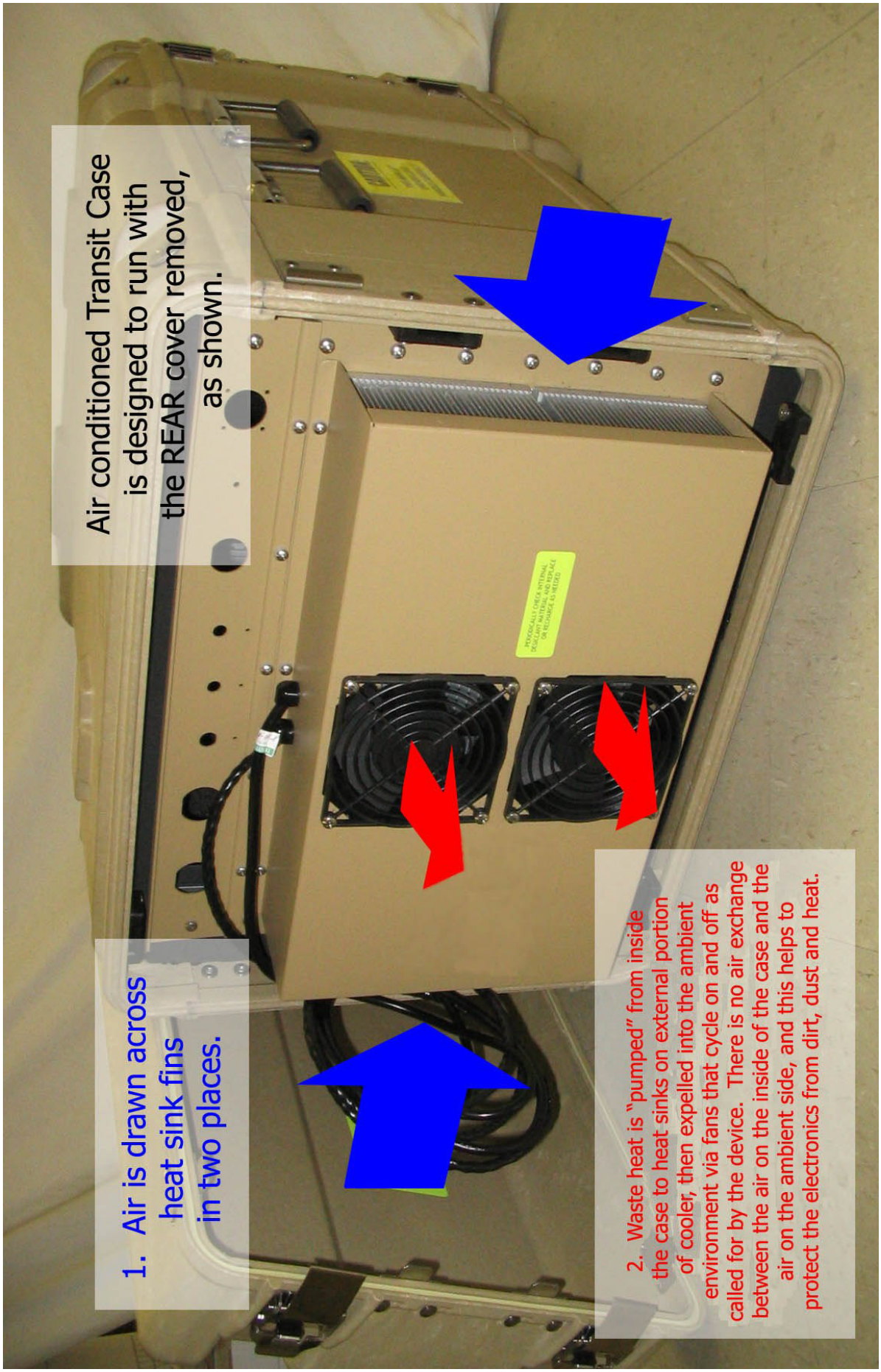
Diagrams



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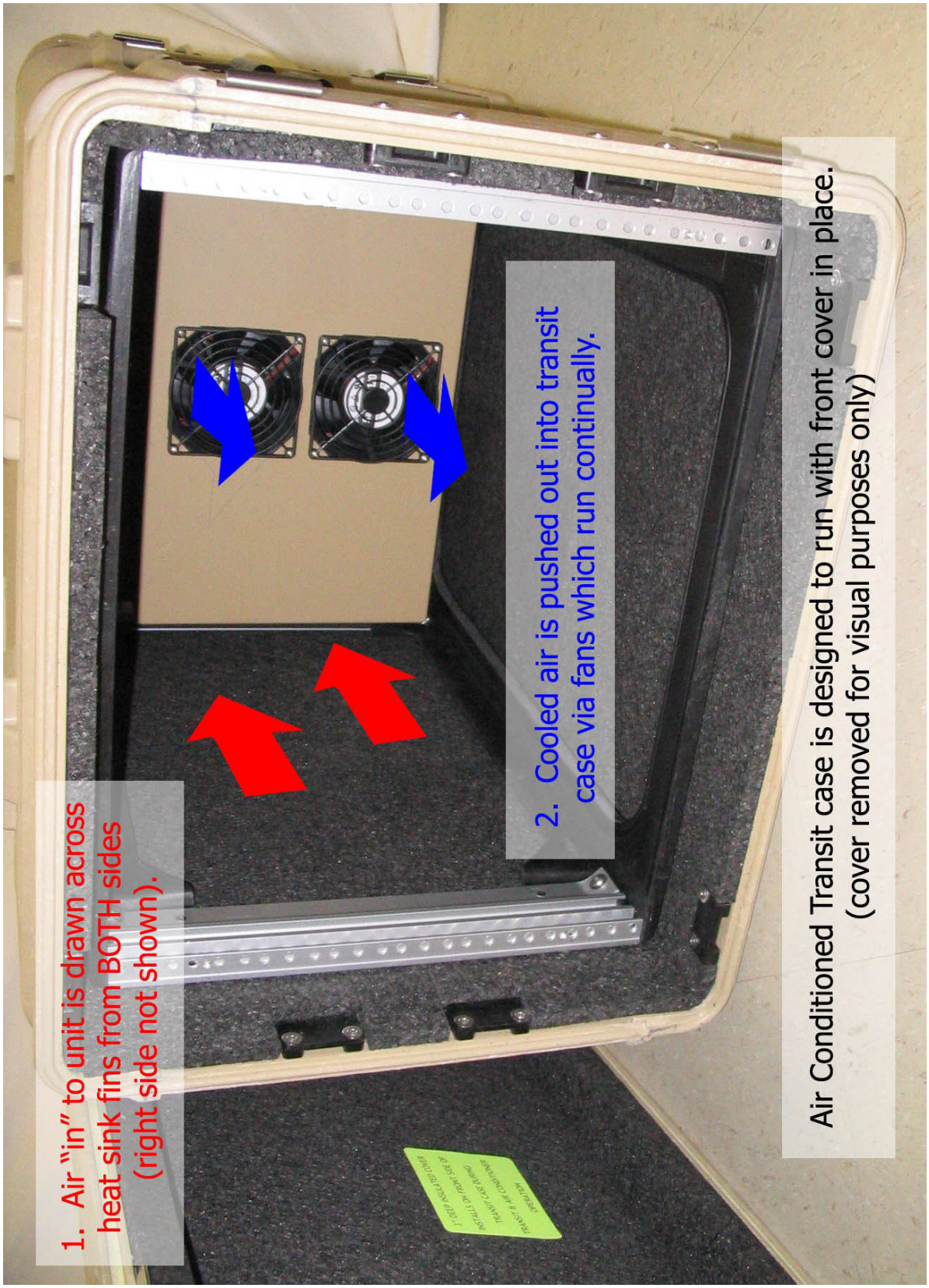

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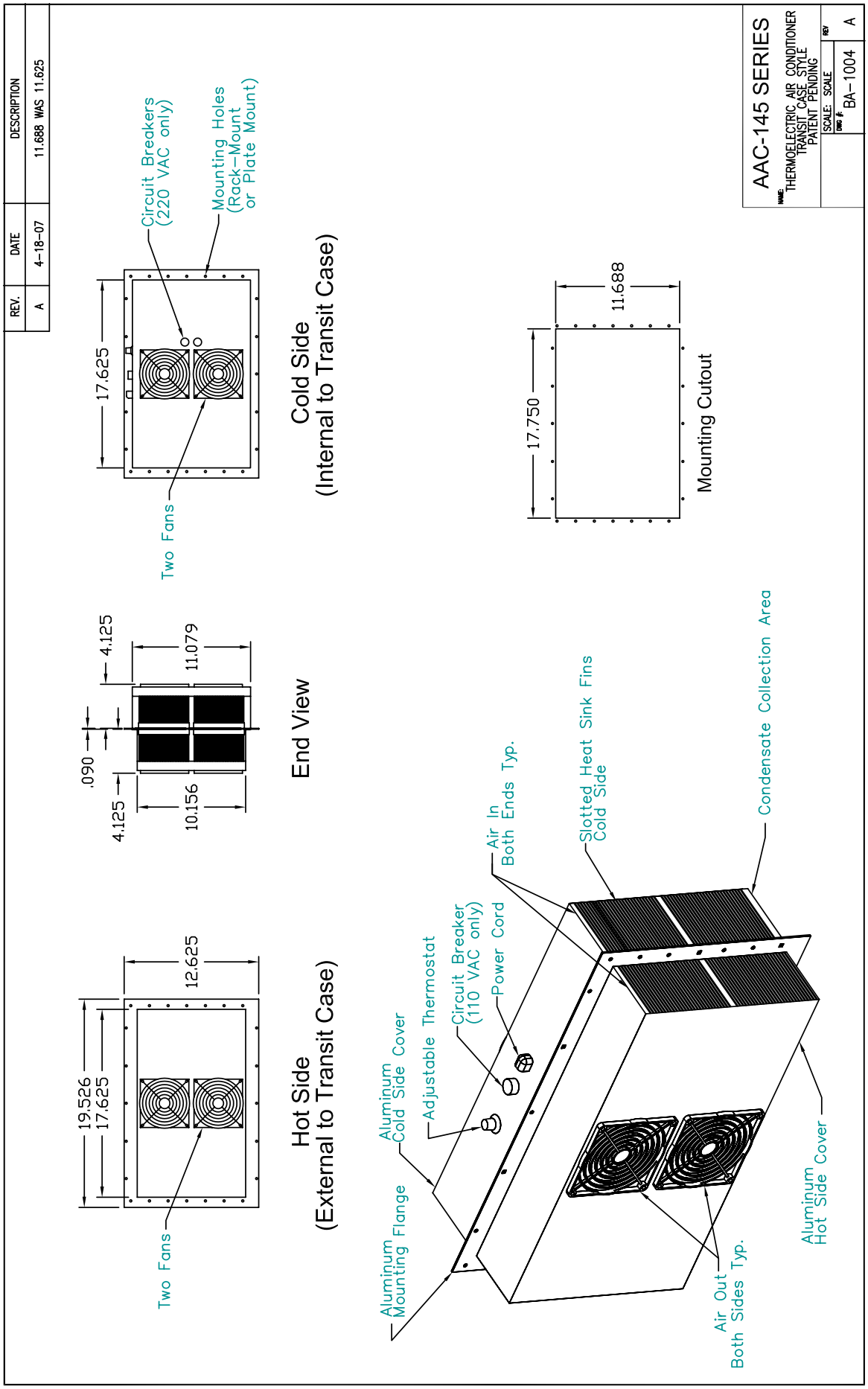
Diagrams

Diagrams

1500 BTU Thermoelectric Air Conditioner, "Hot Side" (ambient side) shown.

Diagrams



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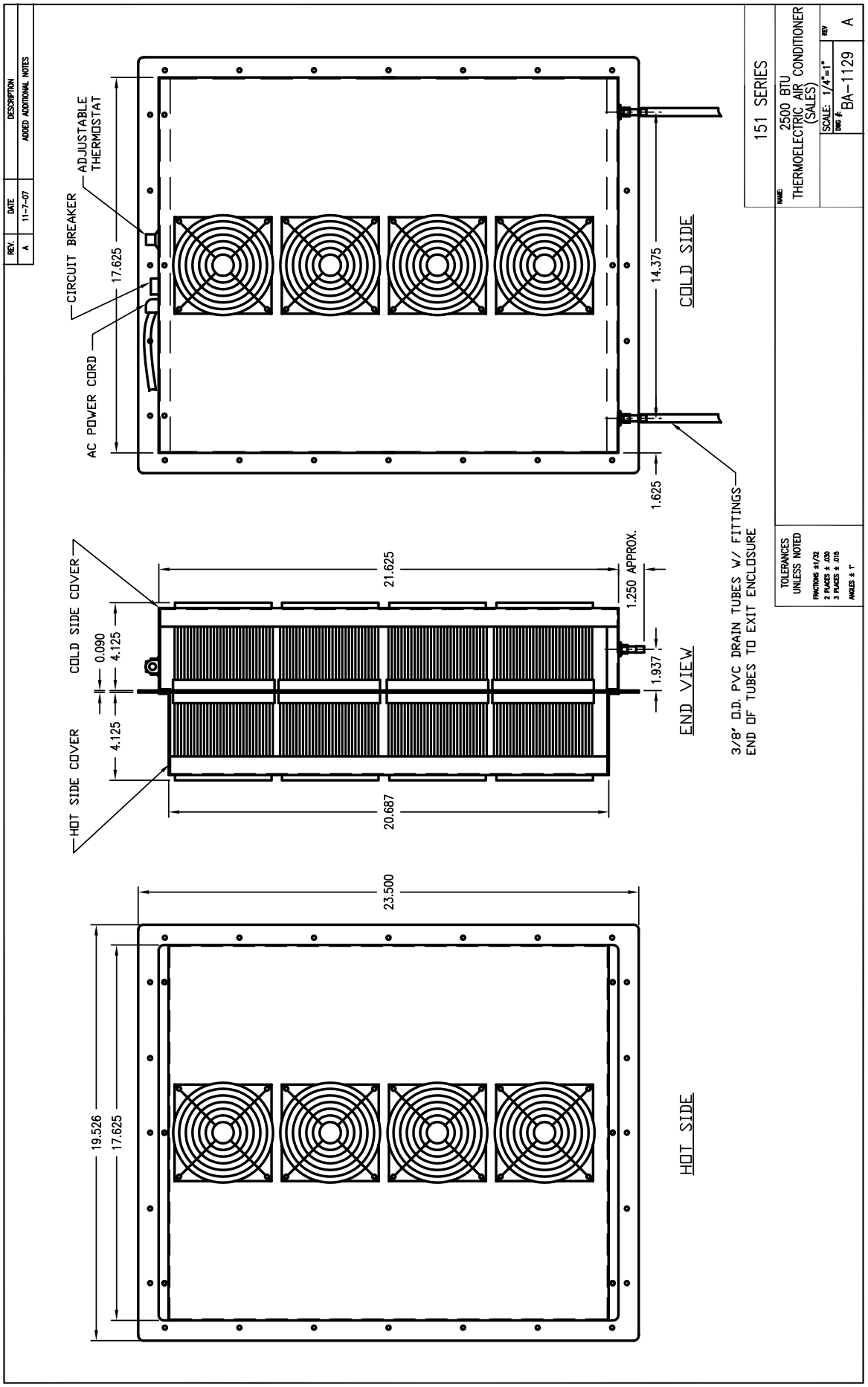

Air Conditioner Sizing Guide

Enclosures and Thermoelectric Cooling Systems for Every Environment

Please complete, then Fax to +44 (0)20 8568 1141 CP Cases will review & make recommendation as to the proper size of air conditioner for your application. If questions call +44 (0)20 8568 1881 or Email info@cpcases.com

COMPANY _____ **DATE** _____
CONTACT PERSON _____ **TITLE** _____
ADDRESS _____

_____

_____

COUNTRY _____ **POST CODE** _____
PHONE _____ **FAX** _____ **EMAIL** _____

TEMPRATURE SPECIFICATION (Please specifiy ˚C or ˚F)

1. Maximum Ambient Temprature (outside existing enclosure) _____
2. Maximum Allowable Internal Temprature _____
3. Delta T (Difference between internal and ambient temprature) _____
4. Internal Heat Load Estimate (watts) _____

If #4 is unknown: A) External temprature immediately outside existing enclosure _____
B) Temprature inside existing enclosure _____

ENCLOSURE SPECIFICATIONS
HEIGHT _____ **x WEIGHT** _____ **x DEPTH** _____

(Check all that apply)

NEMA STANDARD:
___NEMA 12 (indoor)
___NEMA 4 (indoor/outdoor)
___NEMA 4X (__Stainless __Alum. __FRP)
___Non NEMA

LOCATION:
___ Indoors
___ Outdoors
___ Full (or partial) sun exposure
___ Full shade (no direct sun)

MOUNTING:
___ Free-standing
___ Wall-mounted
___ Pole-mounted

GENERAL
Geographic area of use _____
Is enclosure vented _____ Does enclosure have a fan_____ Size _____in., CFM_____
Color of enclosure_____ Is enclosure insulated _____ If so, how thick _____ in. If not, could it be_____
Qty of front doors _____ Qty of rear doors _____ Does enclosure have a window_____ How large _____in. X _____ in.

AIR CONDITIONER: (check all that apply)

MOUNTING:
___ Vertical, right side
___ Vertical, left side
___ Vertical, front door
___ Vertical, rear
___ Horizontal, roof

___ Through-mount (approx. 3 ½" protrusion into enclosure)
___ Flush-mount (no protrusion intto enclosure)

VOLTAGE:
____ 120 VAC
____ 220 VAC
____ DC (please specify)

ADDITIONAL DETAILS (Please include sketch and/or photos if availible)

_____
_____
_____
_____
_____
_____

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Thermoelectric vs. Traditonal

While most traditional refrigeration systems use designs based on compressors and refrigerants, more and more applications are turning to thermoelectric cooling as an alternative to traditional refrigeration technology.

While thermoelectric cooling isn't viable for every refrigeration, thermoelectric modules can significantly outperform traditional refrigerant-based cooling systems in certain applications.

Why Use Thermoelectrics Instead of Traditional Refrigerant-Based Systems

- Solid state design
  - No moving parts
  - Integrated chip design
  - No hazardous gases
  - Silent operation
- Cooling/heating mode options
  - Fully reversible with switch in polarity
  - Supports rapid temperature cycling
- Localized Cooling
  - Spot cooling for components or medical applications
  - Perfect for temperature calibration in precision detection systems
  - Efficient condensation of atmospheric water vapor
- Compact and lightweight
  - Low profile
  - Sizes to match your component footprint
  - No bulky compressor units
  - Perfect for benchtop applications
- Precise temperature stability
  - Tolerances of better than +/- 0.1°C
  - Accurate and reproducible ramp and dwell times
- Rapid response times
  - Instantaneous temperature change
  - Reduced power consumption
- Low DC voltage designs
- Dehumidification
- High reliability
  - 100,000 hours + MTBF

Primary attributes of thermoelectric air conditioners:

1. Highly reliable, long life-span
2. Low maintenance
3. No air exchange between outside (ambient) and inside
4. Operating environment up to 60°C (140°F)
5. Indoor or outdoor use, vertical or horizontal installation
6. Compact and lightweight
7. 200-2500 Btu range
8. Cooling and heating models available
9. No filters to change or clean
10. No compressor, evaporator, condenser
11. No refrigerants, CFC's or other chemicals
12. No copper tubing or liquid lines
13. Solid state design (no moving components other than fans)
14. High tech product, AC & DC power choices
15. Perfect for cooling computers & other electronics
16. No performance loss when low input voltage (brown-outs)

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