INSTALLATION GUIDE FOR POWERAIRE® QUAD
QUAD-FAN ASSIST

INTRODUCTION

Tate's PowerAire® Variable Speed Quad Fan Assist device provides the user with unparalleled local control and reliability of airflow to precisely meet individual rack cooling demands in areas of low or no static pressure without user intervention. Automatic control based on user a defined set point guarantees that each piece of IT hardware installed in the users rack is supplied with sufficient air volume at all times.

METHOD OF OPERATION

Tate's PowerAire® Quad Fan product is designed to work in conjunction with the DirectAire® Airflow Panels, to meet high airflow requirements and accurate air flow deliver to the rack face. The PowerAire® Quad Fan is designed to alleviate airflow issues in areas where little to no static pressure exists due to Underfloor restrictions, or insufficient floor heights. The PowerAire™ Quad Fan is designed to function on most finished floor heights of 6" or greater. Since IT loads are rarely stable on a rack to rack basis, the PowerAire® Quad Fan is designed to throttle the amount of air delivered to an individual rack based on its current inlet air temperatures. This guarantees sufficient air delivery to the rack, as hot air recirculation would occur in insufficient airflow delivery situations. This balancing act is managed by a high speed PID controller which monitors each temperature sensor in a multi loop temperature evaluation mode. Each of the three sensors installed at the rack face are polled for current temperature value, and then compared to each other. The probe having the highest value is then used as the control point. This control point is then used to determine the correct speed for the variable speed fan. The command signal is sent to the fan controller, which then changes the fan speed producing more or less air to pass through the DirectAire® or other airflow grate.

PLEASE HELP US IMPROVE THIS MANUAL

We would be very interested to hear any comments you might have on this installation manual. We are particularly interested in learning of omissions or subjects that are unclear. Please call, fax, or e-mail and direct your comments to Technical Service. Thank you very much for your assistance.

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INSTALLATION INSTRUCTIONS

1. Remove the PowerAire® unit from the factory packaging. Take care to check that each required separate component is in the shipping packaging as listed below, and figure 1 for details.

   A. 1 x PowerAire Quad Fan Assist Device
   B. 1 x Temperature Monitoring Probes
   C. Zip Ties for Temperature Probes
   D. 4 x Tool-less String Hangers
   E. 6' Power Cord (100-120V) (IEC C14 inlet) w/ Single Input universal 100-240VAC power supply

   Not Pictured: The PowerAire® Quad is designed for optimum use with Tate's DirectAire® airflow panel ordered separately; other airflow panels may reduce the performance of the PowerAire® Quad.
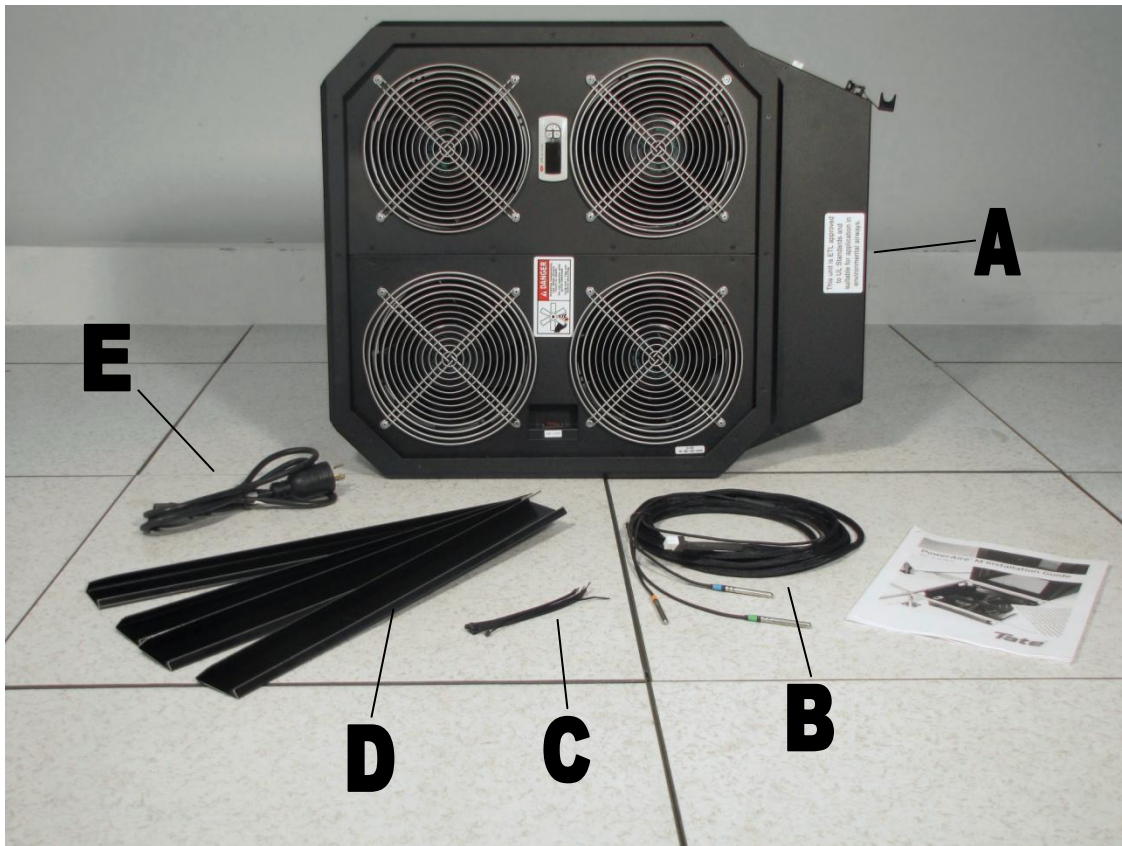

Figure 1 - Illustrated Parts List

2. Remove the existing airflow panel, and installed the four Tool Less Roll Formed Stringer Hangers into the stringer system. The hangers should be oriented with the larger angled bottom hook facing into the center of the removed panel. Simply orient the hanger at a 45 degree angle with the floor, sliding hanger's smaller angled hook surface into the gap in the roll formed stringer's bottom surface, and then allow the hanger to roll back perpendicular to the floor surface. Repeat this for all four sides of the panel. See figures 2-4 below.

Figure 2 –Position hanger parallel to the floor with short angled edge aligned to opening in roll form stringer

Figure 3 - Insert hanger into roll form opening and catch the top angle inside the stringer

Figure 4 - Release hanger and allow it to return perpendicular to the floor

3. A more flexible alternative method of attaching the unit to the raised floor understructure can also be realized by the use of the corner cable hangers. These cable hangers shown in figure 5 below, can allow unit to hang from the pedestal head in cases were non roll formed stringers are in use. It may be necessary to install a screw in the pedestal head on which to hook the unit for hanging.

Figure 5 - Alternative Corner Lock Hangers

Figure 6 – Power Outlet from Site Source

4. Each PowerAire® unit must be powered from the appropriate outlet. For 100-120V and 200-240V installations, a C14 power inlet is provided on the unit. The supply voltage of the unit will dictate the power cord supplied with the unit, which will be 6' feet in length, a list of the required power outlet is shown below in table 1. If the supplied cord does not meet the site requirements, a use supplied cord set may be used if it meets the voltage and amperage requirements of the power module. Figure 6 shows an example of a power feed to the unit.

Table 1 - Power Feed Requirements for Unit

PowerAire® Power Feed Requirements	
Voltage	Outlet Required
100 - 120V	NEMA 5-15R
200 - 240V	NEMA L6-15R

5. Pick up the PowerAire® unit using the inside lip around the inside perimeter of the PowerAire® unit. Be sure to orient the units extended shroud below the rack. Lower the PowerAire^{TM} unit at the edge that extends beyond the perimeter of the unit first so that this edge will be oriented beneath the rack see figure 7 through 9 below. Lock the lip of the unit into the hanger, the lower the opposite side into the waiting Tool Less hanger. Once this side is also resting in the hanger support, manipulated the unit so that each hanger on the alternate sides are also secure the unit into place.

Figure 7 - PowerAire® Quad Unit Installed on hangers in correct orientation

Figures 8,9 - Installation of PowerAire® Quad Unit onto Tool Less Hangers

6. Plug in all temperature sensors into the labeled connection ports on the side of the unit. Route the temperature probes into the rack. This can typically be done by routing the probes through the cable entry hole serving the rack, or by drilling a new 0.5" hole at the front of the rack, through the panel directly below the rack. If a new hole is required, ensure that the hole is sealed after the temperature probes are completely routed, and that the holes edges are appropriately grommeted to decrease the risk of cable damage.

Figure 10 - Connection of temperature sensor tree

7. The placement of the sensors is at the user's discretion. The suggested location however would be along the perforated face of the rack door. The best method to accomplish this is to route the main trunk of the temperature sensor tree along the hinge side of the door, and then route the probes to the door surface, securing each probe to the inside surface of the door, while the door is completely open to ensure sufficient slack. Zip tie the cable trunk along the rack frame or where appropriate. Other alternatives for mounting the temperature sensors may include their installation along the frame of the rack or directly at the server inlets through various methods. In cases where racks are wider than a typical 24" panel, an individual rack may receive partial cooling from two panels. In these cases, simply double the sensor probes in these racks to allow for parallel operation of the PowerAire® units in question. The goal is to position the sensors in such a way that they are exposed to the continuous flow of intake air during normal IT operation. See figure 11 through 13 for routing examples. The PowerAire will determine fan speed based upon the highest temperature sensed, so it is not necessary to locate sensors in any particular order.
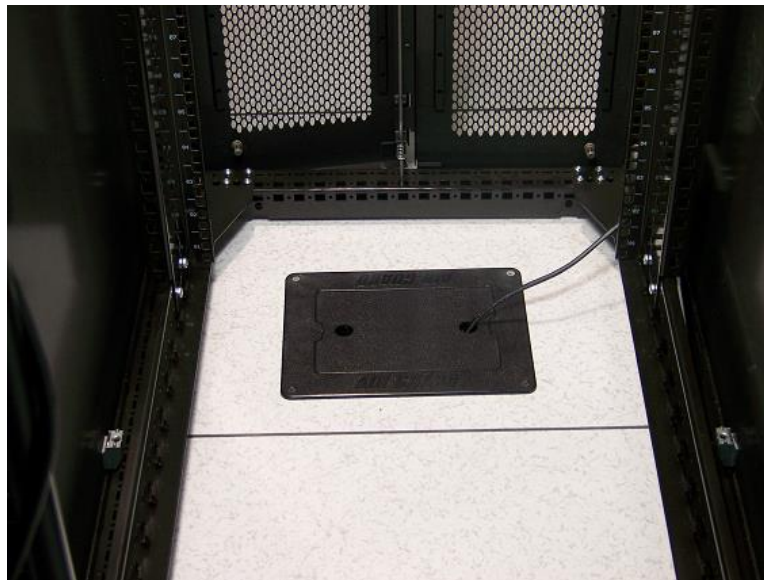

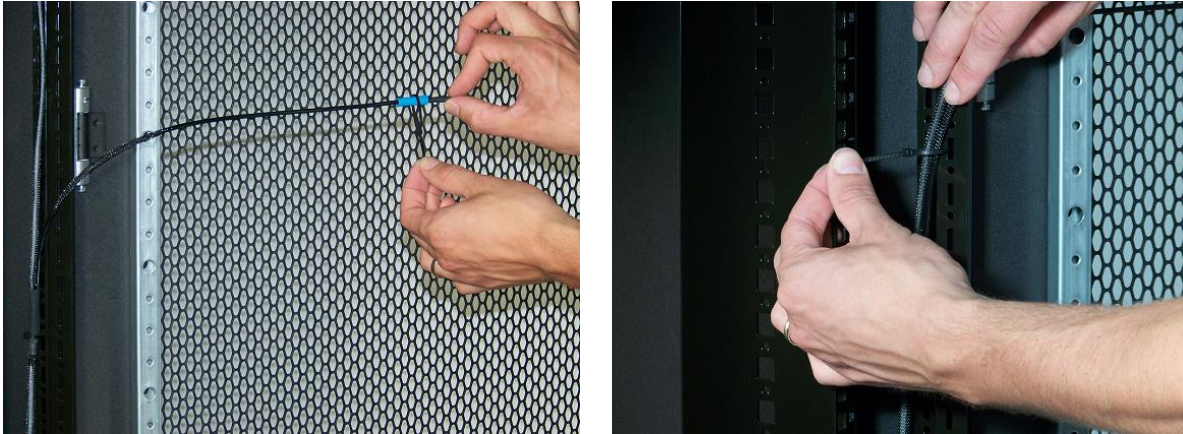Figure 11 - Routing temperature sensor tree through cable entry point

Figure 12,13 - Temperature Sensor installation Securing Sensor Tree to Rack with Sufficient Slack for Door Operation

Control inputs.

8. Phoenix Port 1: Pins 1 and 2: For contact closure control of Quad Fan units a control switch loo should be provided via an alternate means than the provided equipment. This should be wired directly to the provided Phoenix type connector to the indicated connections.   When a closed contact is detected it will turn the unit off so a normally open contact closure is required to maintain the unit in the operating setting.

9. Phoenix Port 1: Pins 3 and 4: For remote alarm indication connect an external signaling device to pins 3 and 4. This is normally closed circuit which will open in the case of any alarm detected by the PowerAire.

10. Phoenix Port 2: Pins 1 and 2: For contact closure control of Quad Fan units a control switch loo should be provided via an alternate means than the provided equipment. This should be wired directly to the provided Phoenix type connector to the indicated connections.   When a closed contact is detected it will turn the unit off so a normally open contact closure is required to maintain the unit in the operating setting.

11. Phoenix Port 2: Pins 1, 2 and 3: All serial BACNET communication can be connect through this port without opening the housing of the unit.

12. Phoenix Port 2: Pins 4: Unused

Figure 14- Phoenix inputs

13. The unit can now be powered on by plugging it into (figure 15,16) the appropriate power outlet outline in table 1. Once power is applied, and the power switch is turn on, (figure 17) the unit will begin the startup procedure. This process is completed when the user display shows the current peak temperature.

Figure 15- Connecting power to the unit
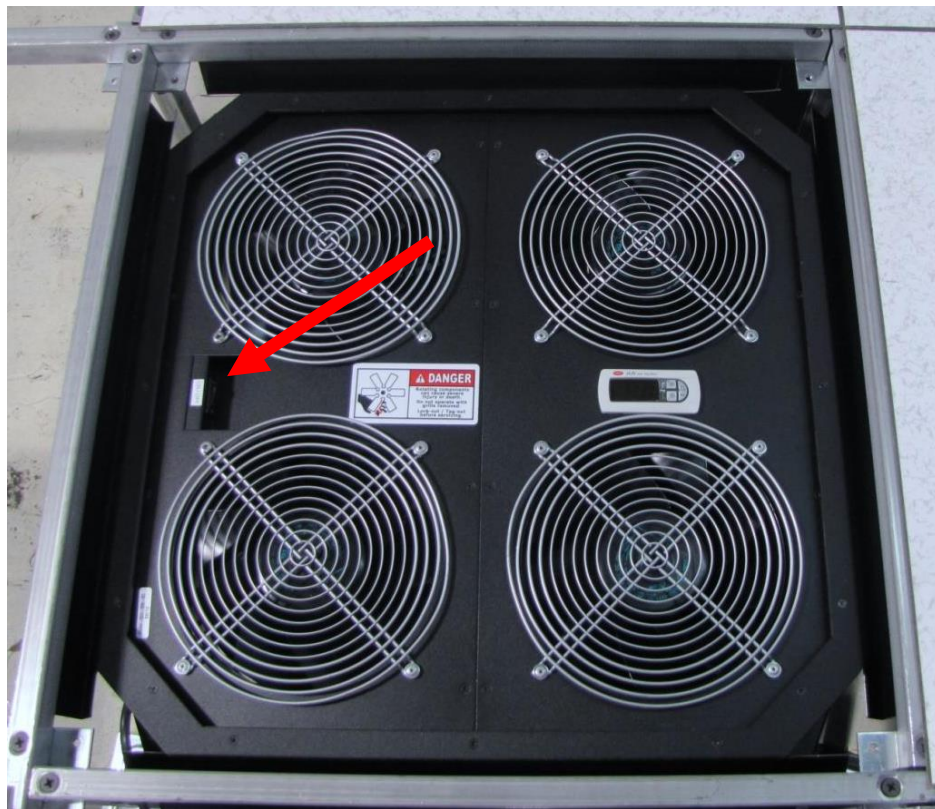

Figure 16 - Plugging the power cord into the unit

Figure 17 – Location of Power Switch

14. Setting the number of sensors.
    A. The user must now set the total number of sensors installed. If only the single point temperature sensor included with the PowerAire Quad is utilized, no settings must be adjusted.
    B. However, if more than 1 sensor is installed, complete the following steps:

        i. Hold down the up and down arrows until the display begins to flash.
        ii. Press the "set" key until the display flashes the number of sensors variable is shown and begins flashing
        iii. Press the up and down arrows to set the correct number of sensors connected
        iv. Hold down the set key for 5 seconds until the display stops flashing and current temperature is shown again

15. Adjusting Minimum and Maximum Fan Settings
    A. By default the fan is set to a minimum fan speed of 30% and a maximum fan speed of 65%. To adjust these thresholds the user should complete the following steps:

        i. Hold down the up and down arrows until the display begins to flash.
        ii. Press the "set" key until the display shows "min", and then blinks with a value of 0.30
        iii. Press the up and down arrows to set the minimum value
        iv. Hold down the set key for 5 seconds until the display stops flashing and current temperature is shown again
        v. Hold down the up and down arrows until the display begins to flash.
        vi. Press the "set" key until the display shows "max", and then blinks with a value of 0.30
        vii. Press the up and down arrows to set the maximum value
        viii. Hold down the set key for 5 seconds until the display stops flashing and current temperature is shown again

16. The user should now set the desired supply air temperature that should not be exceeded at the IT rack intake. The menu of the controller is accessed as follows.
    A. Pressing the large button labeled SEL will allow the user to scroll through the current temperature values recorded as t1, t2, and t3. Each value will be displayed in sequence with pressing of the SEL button. Figure 18 below shows these steps.
    B. After the temperature values are displayed, pressing SEL again will show the current set point value indicated by SP. (Figure 18)
    C. Pressing the SEL button again will light the PRG buttons, and allow the user to adjust the set point as desired. Pressing either button once will adjust the set point 0.1F, holding the button for approximately 1 seconds will quickly adjust the set point in 1.0F increments.
    D. Pressing the SEL button again after the desired SP is entered will store the value and then display the current command fan speed the controller has sent to the fan. The fan will adjust to this value in time as the fan follows the command position.
    E. Pressing the SEL button again will return the user to main screen which displays the current peak temperature value recorded from the temperature sensor tree. Figure 18 shows this procedure.
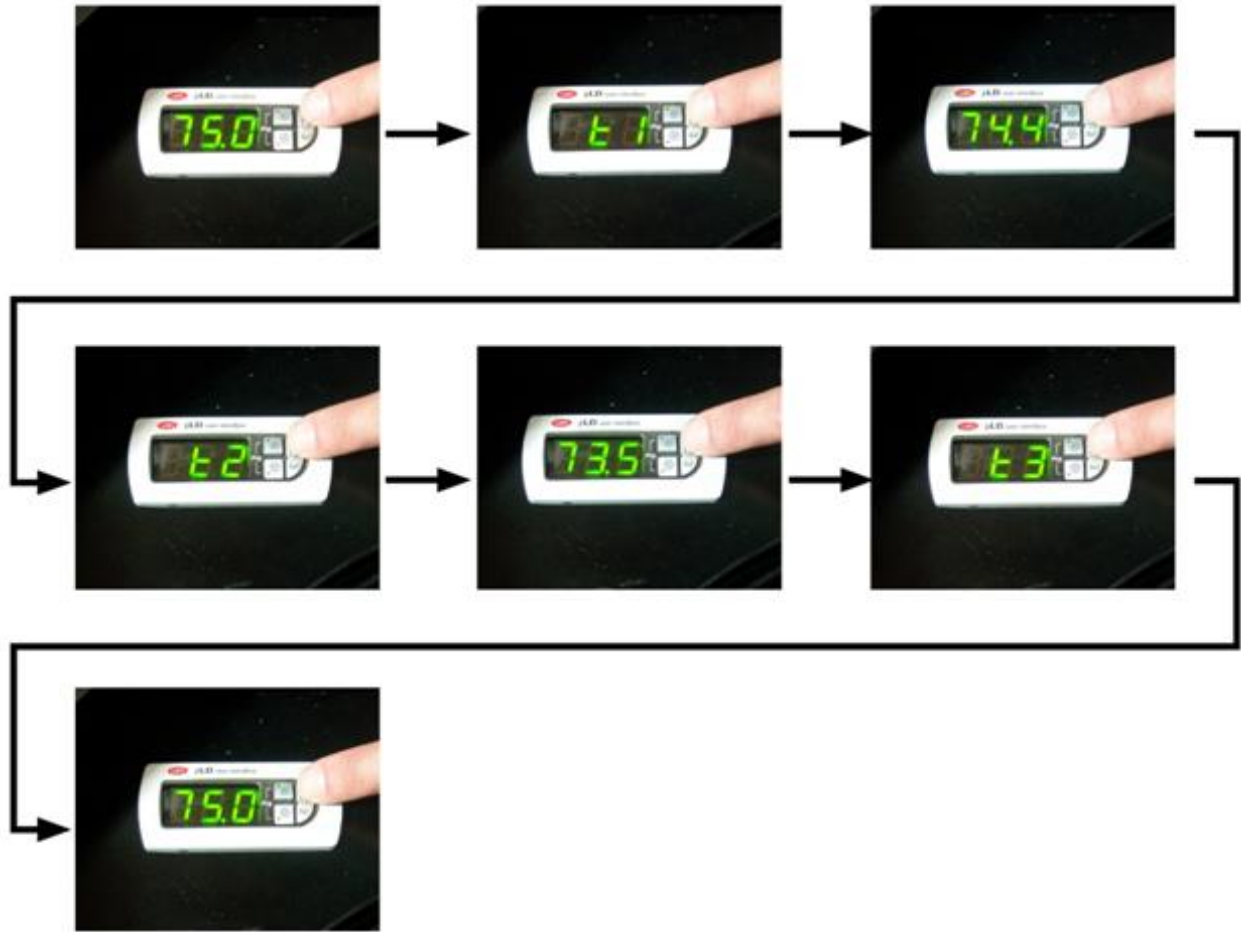
Figure 18 - Scrolling Through Temperature Values

17. Once the value has been set, and all programming completed. Reinstall the DirectAire® or other panel above the PowerAire® unit and proceed to the next unit. It is best to work right to left due to the connector layout on the PowerAire® unit. Each subsequent unit can fully access connector points on its neighboring unit, allowing for easier access to power connections.
18. The PowerAire® will now run automatically, increasing and decreasing fan speed as the temperature values change based on changing IT equipment conditions. The unit is meant to function as a hot spot reduction device, pulling air into areas with little or no static pressure due to underfloor restrictions, and insufficient floor heights. Best practices dictate that underfloor plenum spaces should have all unnecessary restrictions removed from beneath the floor, but often site conditions make this difficult or not cost effective.
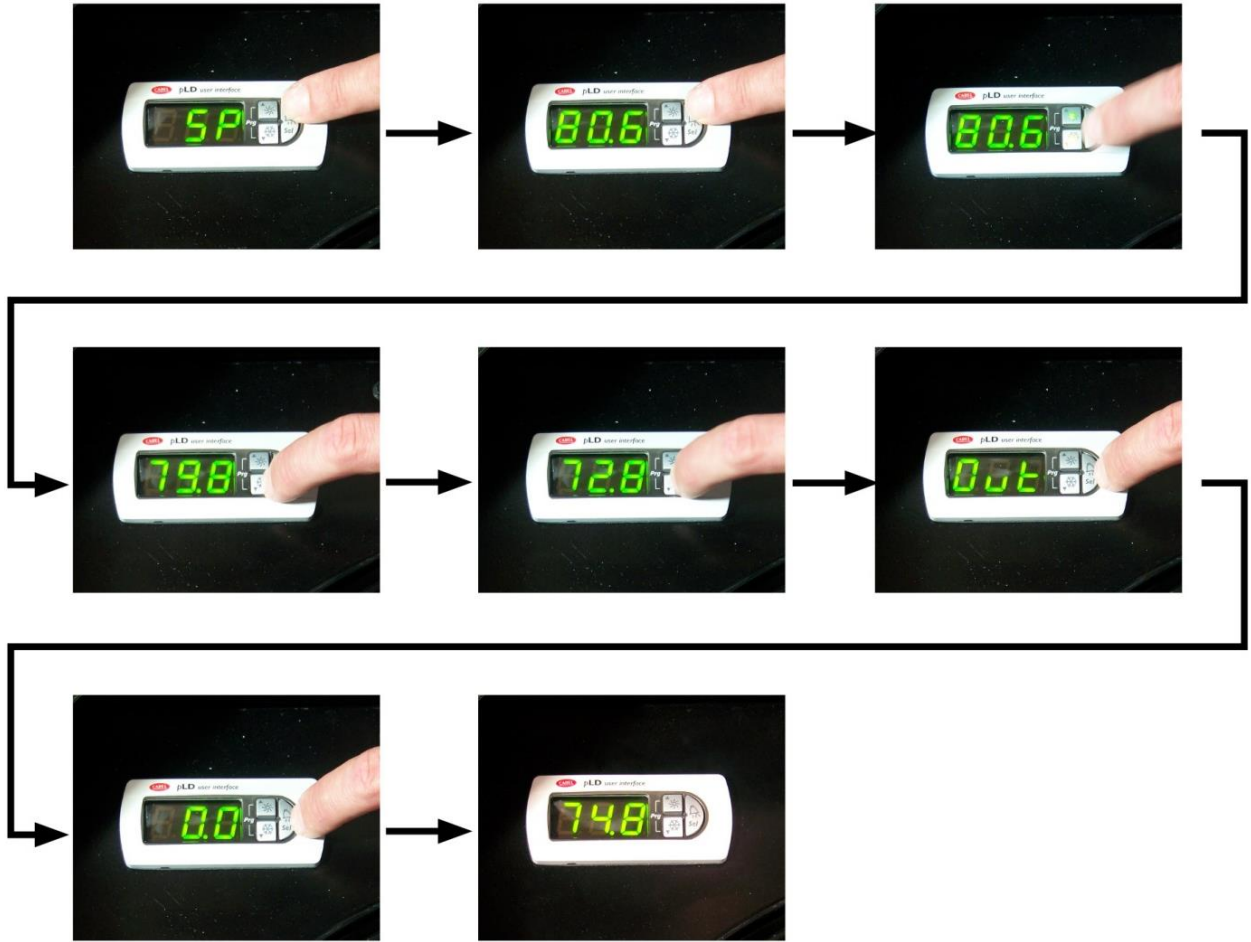
Figure 19 - Programming Set point for Control

Figure 20 - Installation of DirectAire® Panel

Figure 21 - Typical Operation

19. The PowerAire® units are completely maintenance free. The temperature display will continue to show the current peak temperature during normal operation. Power failure, or control failure will result in a 0% fan speed although air may still flow from the panel due to the effect of underfloor air pressure alone. After a power interruption event, the PowerAire® unit will reenter the last operation condition when power is restored.

20. The PowerAire® unit can affect the air flow that is delivered to other nearby panels if insufficient air delivery is widespread in the data center environment. The installer should verify after installation that sufficient air volume is reaching IT hardware in the vicinity of the PowerAire® installation location. Failure to do this may result in a reduction of airflow in neighboring panels, and should be avoided.

21. **WARNING: The fan unit can start and stop at any time during normal operation, be sure to switch power off at the unit if accessing the PowerAire unit. See figure 22 below**

Figure 22 - WARNING - Ensure power is switched off before accessing unit

16. Figure 23 and 24 below show an overview of the wiring diagram and installation of each of the PowerAire Quad units.
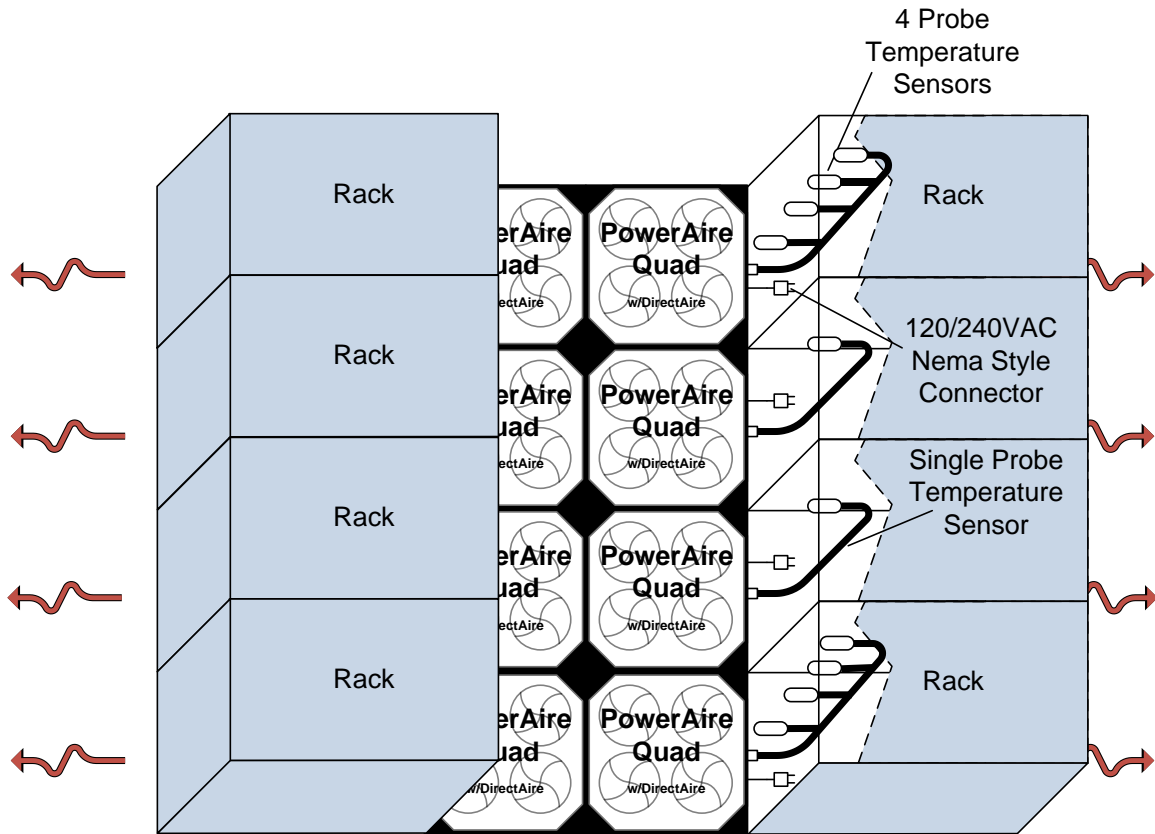
Note: PowerAire® Quad shown within the interior portion of an aisle.

Figure 23 – PowerAire® Quad installation wiring diagram