**CONGRATULATIONS** ON THE SELECTION OF A DATA AIRE PRECISION ENVIRONMENTAL CONTROL SYSTEM. PROPER INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT WILL ENSURE YEARS OF OPTIMAL PERFORMANCE.

**NOTE:** This manual is intended to assist trained service personnel by providing necessary guidelines for this particular equipment. Service to Data Aire units should be done by qualified individuals with an adequate background in areas such as HVAC, electrical, plumbing and electronics, as applicable.

**WARNING:** Service performed by unauthorized or unqualified technicians may void manufacturers’ warranties and could result in property damage and/or personal injury.

Special care should be given to those areas where these symbols appear.

Data Aire, Inc. reserves the right to make design changes for the purpose of product improvement or to withdraw any design without notice.
# TABLE OF CONTENTS

## 1.0 INTRODUCTION
- **1.1 PRODUCT INFORMATION** ........................................................................................................... 7
- **1.2 MODEL IDENTIFICATION** .................................................................................................................. 7
- **1.3 INSPECTION** ........................................................................................................................................ 7
- **1.4 PAPERWORK** ...................................................................................................................................... 7
- **1.5 EQUIPMENT HANDLING** ................................................................................................................... 8
- **1.6 ROOM CONSIDERATIONS** .................................................................................................................. 8
- **1.7 STORAGE** .......................................................................................................................................... 8

## 2.0 INSTALLATION
- **2.1 INSTALLATION CHECKLIST** .................................................................................................................. 9
- **2.2 LOCATING THE UNIT** .......................................................................................................................... 9
- **2.3 ROW PLACEMENT** .................................................................................................................................. 9
- **2.4 IR UNIT PLACEMENT, SENSOR LOCATION AND REDUNDANCY GUIDE** ......................................... 10
  - **2.4.1 One Row – One IR Unit** .................................................................................................................. 10
  - **2.4.2 Two Rows – Two IR Units** .............................................................................................................. 10
  - **2.4.3 Redundancy** ...................................................................................................................................... 11
  - **2.4.4 One Row – Two IR Units** ................................................................................................................ 11
  - **2.4.5 Two Rows – Four IR Units** ............................................................................................................ 12
  - **2.4.6 Cold Aisle Containment** ................................................................................................................. 13
- **2.5 NUMBER OF RACKS / ROW LENGTH** ................................................................................................ 13
- **2.6 ADJUSTABLE DISCHARGE AIR DELIVERY** ....................................................................................... 13
  - **2.6.1 Right Side Only Discharge Air** ....................................................................................................... 14
  - **2.6.2 Left Side Only Discharge Air** .......................................................................................................... 14
  - **2.6.3 Both Left and Right Discharge Air** ................................................................................................. 14
  - **2.6.4 Front Only Discharge Air** .............................................................................................................. 15
- **2.7 PIPING** ............................................................................................................................................... 15
  - **2.7.1 Chilled Water (CW) Connections** .................................................................................................. 15
  - **2.7.2 Connection sizes, Chilled Water Units** ............................................................................................ 16
  - **2.7.3 Chilled Water Valve Ratings** ......................................................................................................... 16
  - **2.7.4 3-Way Chilled Water Valves** .......................................................................................................... 16
  - **2.7.5 2-Way Chilled Water Valves** .......................................................................................................... 16
- **2.8 DIRECT EXPANSION (DX) CONNECTIONS** ...................................................................................... 17
  - **2.8.1 Split Air Cooled Unit Piping** .......................................................................................................... 17
  - **2.8.2 Discharge Lines** ............................................................................................................................... 17
  - **2.8.3 Liquid Lines** ..................................................................................................................................... 18
  - **2.8.4 Suction Lines** .................................................................................................................................... 18
  - **2.8.5 Recommended Line Sizing** ............................................................................................................ 19
  - **2.8.6 Connection Sizes, Air Cooled Units** ............................................................................................... 20
  - **2.8.7 Connection Sizes, Condensers** ....................................................................................................... 20
  - **2.8.8 Field Piping, Remote Condenser/Condensing Unit Above Evaporator** ........................................... 21
  - **2.8.9 Field Piping, Remote Condenser/Condensing Unit Below Evaporator** ........................................... 21
  - **2.8.10 Connection Sizes, Condensing Units** ............................................................................................ 22
  - **2.8.11 Field Piping, Remote Condensing Unit** ........................................................................................ 22
  - **2.8.12 Water/Glycol Unit Piping** ............................................................................................................ 23
  - **2.8.13 Connection Sizes, Water/Glycol Cooled Units** ............................................................................. 23
  - **2.8.14 Connection Sizes, Fluid Coolers (Dry Coolers)** .......................................................................... 23
  - **2.8.15 Field Piping, Water/Glycol System** ............................................................................................. 24
- **2.9 CONDENSATE DRAIN PIPING** ........................................................................................................... 25
- **2.10 STEAM GENERATOR HUMIDIFIER PIPING (OPTIONAL)** ................................................................ 25
- **2.11 LEAK TESTING** .................................................................................................................................. 26
- **2.12 EVACUATION** .................................................................................................................................... 26
# ELECTRICAL CONNECTIONS

## 3.0 ELECTRICAL CONNECTIONS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>ELECTRICAL SERVICE</td>
<td>27</td>
</tr>
<tr>
<td>3.2</td>
<td>NAMEPLATE RATINGS</td>
<td>27</td>
</tr>
<tr>
<td>3.3</td>
<td>GROUNDING</td>
<td>27</td>
</tr>
<tr>
<td>3.4</td>
<td>VOLTAGE TOLERANCE</td>
<td>28</td>
</tr>
<tr>
<td>3.5</td>
<td>AUXILIARY CONTROL WIRING</td>
<td>28</td>
</tr>
<tr>
<td>3.6</td>
<td>REMOTE SHUTDOWN</td>
<td>29</td>
</tr>
<tr>
<td>3.7</td>
<td>REMOTE ALARM CONTACTS</td>
<td>29</td>
</tr>
<tr>
<td>3.8</td>
<td>CONDENSATE PUMPS</td>
<td>29</td>
</tr>
<tr>
<td>3.9</td>
<td>CONDENSATE PROBE</td>
<td>30</td>
</tr>
<tr>
<td>3.10</td>
<td>WATER SENSING CABLE (OPTIONAL)</td>
<td>30</td>
</tr>
<tr>
<td>3.11</td>
<td>RACK TEMPERATURE SENSORS</td>
<td>30</td>
</tr>
<tr>
<td>3.12</td>
<td>SENSOR LOCATION</td>
<td>30</td>
</tr>
<tr>
<td>3.13</td>
<td>MANUAL OVERRIDE SWITCHES</td>
<td>31</td>
</tr>
<tr>
<td>3.14</td>
<td>WIRING DIAGRAMS</td>
<td>31</td>
</tr>
</tbody>
</table>

# INSTALLATION OF REMOTE OUTDOOR HEAT EXCHANGER

## 4.0 INSTALLATION OF REMOTE OUTDOOR HEAT EXCHANGER

## 5.0 CHARGING

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>VOLTAGE PHASE CHECK</td>
<td>32</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Evaporator</td>
<td>32</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Secondary Heat Exchanger</td>
<td>32</td>
</tr>
<tr>
<td>5.2</td>
<td>AIR COOLED SYSTEMS</td>
<td>33</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Fan Speed Control System Charging (Units with Remote Outdoor Condenser)</td>
<td>33</td>
</tr>
<tr>
<td>5.3</td>
<td>FLOODED SYSTEM CHARGING</td>
<td>34</td>
</tr>
<tr>
<td>5.4</td>
<td>WATER/GYLCOOL COOLED SYSTEMS</td>
<td>35</td>
</tr>
<tr>
<td>5.4.1</td>
<td>Water/Glycol Cooled System Charging</td>
<td>35</td>
</tr>
<tr>
<td>5.4.2</td>
<td>Factory Charge for Water/Glycol Cooled Systems</td>
<td>36</td>
</tr>
<tr>
<td>5.5</td>
<td>REFRIGERANT HANDLING</td>
<td>36</td>
</tr>
<tr>
<td>5.6</td>
<td>IMPORTANT REFRIGERATION COMPONENTS</td>
<td>36</td>
</tr>
<tr>
<td>5.6.1</td>
<td>High Pressure Cutout Switch</td>
<td>36</td>
</tr>
<tr>
<td>5.6.2</td>
<td>Low Pressure Cutout Switch</td>
<td>36</td>
</tr>
<tr>
<td>5.6.3</td>
<td>Electronic Expansion Valve (EEV)</td>
<td>36</td>
</tr>
</tbody>
</table>

# GLYCOL SYSTEMS

## 6.0 GLYCOL SYSTEMS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>GLYCOL CONCENTRATION</td>
<td>37</td>
</tr>
<tr>
<td>6.1.1</td>
<td>GIWX or GIGX Internal (Fluid) Volume</td>
<td>37</td>
</tr>
<tr>
<td>6.1.2</td>
<td>Fluid Cooler Information</td>
<td>37</td>
</tr>
</tbody>
</table>

# CONTROLS

## 7.0 CONTROLS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>BUTTONS</td>
<td>38</td>
</tr>
<tr>
<td>7.2</td>
<td>POWERING THE UNIT ON/OFF</td>
<td>39</td>
</tr>
<tr>
<td>7.3</td>
<td>ACCESSING MENUS/PASSWORDS</td>
<td>39</td>
</tr>
<tr>
<td>7.4</td>
<td>CHANGING THE SERVICE LEVEL PASSWORD</td>
<td>40</td>
</tr>
<tr>
<td>7.5</td>
<td>ENTERING MENU SETTINGS</td>
<td>41</td>
</tr>
<tr>
<td>7.6</td>
<td>MENU A – ON/OFF</td>
<td>41</td>
</tr>
<tr>
<td>7.7</td>
<td>MENU B - SETPOINTS</td>
<td>42</td>
</tr>
<tr>
<td>7.8</td>
<td>MENU C – CLOCK/SCHEDULER</td>
<td>45</td>
</tr>
<tr>
<td>7.9</td>
<td>MENU D – INPUT/OUTPUT</td>
<td>45</td>
</tr>
<tr>
<td>7.10</td>
<td>MENU E – HISTORICAL DATA</td>
<td>45</td>
</tr>
<tr>
<td>7.11</td>
<td>MENU F – INFORMATION</td>
<td>48</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

1.1 Product Information
The direct expansion (DX) or chilled water (CW) gForce IR is a precision row based cooling unit. It is designed to be installed within high-density server racks that are placed in a hot aisle/cold aisle design. The air enters the unit from the rear (hot aisle) and is discharged from the front (cold aisle).

The unit provides cooling, reheat\(^1\), humidification\(^2\), dehumidification and air filtration.

The unit is provided with a Data Aire dap4™ microprocessor controller for precision control.

\(^1\) Electric reheat is optional

\(^2\) Steam generator humidifier is optional
1.3 Inspection
This equipment has gone through a comprehensive inspection prior to its packaging and shipment to ensure that it arrives in excellent condition. However, shipping damage can occur and a visual inspection of the outer crating immediately upon delivery should be performed.

Note any external damage or other transportation damage on the freight carrier’s forms. Inspect the unit itself for internal damage. A claim should be filed with the shipping company if the equipment is damaged or incomplete.

Loose items such as disconnect switch handles, spare filters, etc. may be packed inside the unit. Refer to the yellow shipping tag located on the unit door for details.

**WARNING:** Freight damage claims are the responsibility of the purchaser. Action to recover losses should be filed immediately. Please notify Data Aire of any claims.

1.4 Paperwork
Each Data Aire unit ships with start-up sheets that must be completed. The start-up sheets are enclosed in a packet with the unit. The packet includes the warranty certificate, wiring diagrams, specific component literature, warranty registration card and a copy of the unit’s Installation/Operation and Maintenance manual.

A manila tag is attached to the outside panel to indicate articles that have been packaged and shipped loose within the unit cabinet.

**NOTE:** It is the responsibility of the installing contractor to return the start-up sheet and warranty registration card to Data Aire for proper activation of the unit warranty. Failure to do so may cause delays and in some cases void the warranty.
1.5 Equipment Handling
Move the unit in its upright position to the installation site using the installed casters. It is recommended that the unit be protected from damage to the decorative doors during any storage or moving.

If necessary, use a pallet jack or fork lift to move the IR unit. Make sure the forks are spread to their widest allowable width for proper balance. Do not lift the unit any higher than 4 inches off the ground. If necessary to lift higher than the suggested 4 inches, exercise great care to ensure proper handling of the unit.

Personnel not involved with the lifting of the unit should keep a safe distance from the unit.

**WARNING:** Use care when moving. Improper handling could result in injury. Proper care should be taken when uncrating the unit. The packaging has wrapping bands with sharp edges that are under tension, crating has staples and splinters. Proper protective equipment should be worn by qualified personnel.

1.6 Room Considerations
Precision air conditioning equipment is designed to control spaces within close tolerances of temperature and humidity. However, the room must be built properly.

The room must be built with a proper vapor barrier. A film of polyethylene is often used on walls and ceilings. Floors must be painted with vapor seal paint. All doors to the controlled space should be equipped with weather seals to prevent the infiltration of non-neutral conditioned air from entering the space. Failure to provide a vapor barrier can compromise the ability to control space conditions.

Introduction of outside air into the controlled space should be minimized. Outside air in excess of 5% of the total circulated air volume can have a significant effect on the overall space conditions and result in poor space control. All outside air that is introduced should be conditioned to the required humidity and temperature parameters to maintain the room’s design conditions.

1.7 Storage
Your Data Aire equipment comes ready for immediate installation. In some instances it may be necessary to store the equipment for a period of time. If you must store the equipment it should be done in a dry area, out of the weather, protected from damage by other equipment in storage or transportation equipment, never stacked and avoid frequent relocation.

If equipment is stored for longer than 30 days special precautions must be taken to avoid coil damage. All coils should be charged and sealed with a low pressure (less than 25 PSIG) inert gas, such as nitrogen. This prevents contaminants from entering the coils. When the seal is broken at installation, the rush of escaping gas verifies the coil is still leak free. If coils are not charged and sealed, condensation mixes with air pollutants forming a weak acid and over time can cause pinhole leaks to develop in coil tubes.

When equipment is installed after storage, caution should be taken to inspect and replace, if required; any part that could have deteriorated due to storage. All moving parts, such as blowers and motors, should be hand tested to ensure they are free and clear prior to start-up. Finally, verify that all lubrication is fresh and full.
2.0 INSTALLATION

WARNING: There is no intent on the part of Data Aire, Inc. to define local codes and statutes which may supersede common trade practices. The manufacturer assumes no responsibility for their interpretation. Consult local building codes and the National Electrical Code for special installation requirements.

2.1 Installation Checklist
As a precaution, review the following checklist to ensure proper operation:

- Check for any damage
- Check all wiring connections
- Filters are properly positioned in air intake

WARNING: When preparing the equipment, proper care should be taken when uncrating the unit. The packaging has wrapping bands with sharp edges that are under tension, crating has staples and splinters. Proper protective equipment should be worn by qualified personnel.
  - Remove the metal strapping bands
  - Remove the wooden crating
  - Remove the protective plastic covering

WARNING: Before removing from the packaging inspect the unit for any damage. Report any damage to the carrier and file a damage claim.

The unit is shipped with four zinc plated carbon steel ball casters to help move the unit once on the finished floor. Be sure the floor is clear of any debris or grit. The wheels are removable.

Leveling legs are shipped with the unit. The unit needs to be leveled with the leveling legs before piping and electrical wiring is installed.

2.2 Locating the Unit
When installing the gForce IR unit, sufficient space must be allowed for airflow clearance, wiring, plumbing, and service access. It is recommended that front and rear of the unit have a clearance of at least 24" to allow the doors to swing open and for servicing the unit.

The unit should be as close to the heat load as possible. This section provides examples of typical installations. For best performance observe the following guidelines:

- Create a defined hot and cold aisle.
- Eliminate gaps between server racks and utilize blanking plates.
- Install the rack temperature sensor(s) on the furthest rack(s) the gForce IR is serving.
- Walls or opposing racks can function to minimize the width of the hot and cold aisles.

2.3 Row Placement
The gForce IR cooler can be placed either at the end of a row or in between server racks. Locating an IR unit at the end of a row helps to isolate the end of the cold aisle from the surrounding space; protecting it from hot air wrapping around the sides of the aisle. The rack temperature sensor(s) monitor for hot air wrapping over the top of the racks.
When deploying multiple IR units it is recommended that units be installed at the end of rows with their diffusers set to direct cold supply air toward the server equipment. Depending on row length, heat density and airflow requirements, additional cooling units can be installed throughout the row with their diffusers set to direct supply air left, right or straight as it leaves the unit.

Cooling unit location within a row becomes less critical when deploying IR units in a containment strategy, but it is recommended that IR units be evenly spaced in each row. Using room barriers, such as walls can be very effective in simulating aisle containment.

2.4 IR Unit Placement, Sensor Location and Redundancy Guide

The following are general suggestions regarding unit placement within a row of server racks. There are many possibilities for IR unit placement in which the consulting engineer must take into account containment strategies, length of server rack rows, number of rows, location of the high heat loads, etc.

2.4.1 One Row – One IR Unit

The gForce IR unit shall be deployed at the end of the server rack row and the adjustable air delivery diffusers should be directed to move air towards the front of the server cabinets. The sensor location should be near the top of the server cabinet that is the furthest away from the IR.

![Hot Aisle](image1)

2.4.2 Two Rows – Two IR Units

The gForce IR units shall be deployed on opposite ends of the two server rack rows and the adjustable air delivery diffusers should be directed to move air towards the middle/center of the cold aisle. The sensor location should be near the top of the server cabinet that is the furthest away from each of the IR units.
2.4.3 Redundancy

The Zone Master option is required to have redundancy between IR units. This allows the IR units to either work together, rotate ON/OFF or work as a lead/lag setup for up to 16 IR units in a single zone.

2.4.4 One Row – Two IR Units

Redundancy in a single row can be configured by placing an IR unit at either end of the row of servers. The adjustable air delivery diffusers should be directed to move air towards the server racks in between.
2.4.5 Two Rows – Four IR Units

For dual row redundancy, place the IR units at the end of each row for a total of four (4) IR units. The adjustable air delivery diffusers should be directed to move air towards the server cabinets in the same row. Appropriate adjustments of the adjustable air delivery diffusers may need to be made in the field.
2.4.6 Cold Aisle Containment

It is recommended (but not necessary) to have a cold-aisle containment configuration when using IR units. Unit placement is not critical in a cold-aisle containment configuration since the aisle becomes pressurized and hot air cannot bypass around equipment. Units and the adjustable air delivery diffusers can be positioned where desired. In general, the sensor location should be near the top of the server cabinet that is the furthest away from the IR units.

2.5 Number of Racks / Row Length

The number of racks the gForce IR unit can condition is dependent upon the heat load and airflow requirements of the equipment. It is recommended to oversize the IR by approximately 20% to account for gaps where cold is lost through sever racks, obstructions (pillars, people, partially open rack doors) reducing air distribution efficiency, and error in estimating server equipment heat and airflow requirements. When deploying with cold aisle containment, the IR can be more closely matched to the server equipment needs.

Initially over-sizing the unit provides for future datacenter flexibility with nearly no energy consumption or footprint penalty. The intelligent dap4 control and variable system components allow the unit to minimize its operations without sacrificing environmental control. When the IR is significantly oversized, the cooling unit is able to effectively distribute air 6 to 7 racks away.

2.6 Adjustable Discharge Air Delivery

The gForce IR unit has field-adjustable air delivery diffusers located in the discharge air stream that direct the discharge airflow direction. Adjustments allow for right, left or straight ahead air discharge.
They can be quickly and easily reconfigured to redirect airflow. The configuration of the diffusers has been optimized to effectively distribute air to heat generating equipment in a wide variety of applications.

2.6.1 Right Side Only Discharge Air:

Adjust the vanes in the diffusers so that they both point to the right. Make certain that the vanes are closed or pinched together in the front.

2.6.2 Left Side Only Discharge Air:

Adjust the vanes in the diffusers so that they both point to the left. Make certain that the vanes are closed or pinched together in the front.

2.6.3 Both Left and Right Discharge Air:

Adjust the vanes in the diffusers so that the left hand side points to the left and the right hand side points to the right. Make certain that the vanes are closed or pinched together in the front.
2.6.4 Front Only Discharge Air:

Adjust the vanes in the diffusers so that both point straight ahead. Make certain that the vanes are closed or pinched together in the front.

2.7 Piping

The gForce IR units may be ordered with top or bottom connections. When piping, use copper tubing with appropriate supporting devices (supporting saddles, etc.). All field piping must be installed according to local codes.

2.7.1 Chilled Water (CW) Connections

Supply and return chilled water connections are sweat copper. The required field installed water pipe sizes may or may not be the same as the connection sizes at the unit. This will depend on the length of pipe and the calculated pressure drop of peripheral components.

Supply and return shutoff valves (field provided by others) are recommended to be installed within a few feet of the supply and return chilled water line connections of the unit. These valves allow ease of maintenance and isolate the unit for service. An in-line strainer (field provided by others) is also recommended. A fill valve with a hose bib connection should also be used on the supply or return lines at the unit to allow the unit to be drained.

Water temperature and worst-case room temperature and humidity conditions should be used to determine whether external piping should be insulated. Typical water temperature is 45° F which is usually cold enough to cause pipes to sweat.

Standard chilled water units have a 3-way chilled water valve. An option for a 2-way valve is also available. In either case the water connections to the unit should be made so there is a counter flow between the water and air. Field water pipe connections are labeled but the counter flow should also be verified before making field connections.

One of the most common problems in a chilled water system is the presence of air in the chilled water loop. Air vents must be installed in various high point locations in the piping system to purge the air. The gForce IR chilled water unit has an air vent installed at the top of the coil and can be accessed on the top left side.

In raised floor applications the piping must be installed so that it does not create any resistance to airflow. The piping should be positioned in a horizontal plane not stacked one above the other.

WARNING: With any fluid connection there is risk of leakage. Water leakage could result in property damage to mission critical equipment. Water leakage can result from improper installation and/or practices.
2.7.2 Connection sizes, Chilled Water Units

<table>
<thead>
<tr>
<th>Chilled Water Model</th>
<th>Water Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supply</td>
</tr>
<tr>
<td>GICW-060XX</td>
<td>1-1/2”</td>
</tr>
<tr>
<td>GICW-030XX</td>
<td>1-1/4”</td>
</tr>
</tbody>
</table>

2.7.3 Chilled Water Valve Ratings

The chilled water valves used on g-Force IR series use water valves that are rated at 400 psi operating pressure. The chart gives the valve size and $Cv^3$ rating on 3-way valves for all unit models. The same information plus maximum close off pressure for optional 2-way valves is also indicated.

2.7.4 3-Way Chilled Water Valves

<table>
<thead>
<tr>
<th>Evaporator Model</th>
<th>Valve Size</th>
<th>Valve $Cv$</th>
</tr>
</thead>
<tbody>
<tr>
<td>GICW-060XX</td>
<td>1-1/2”</td>
<td>18.7</td>
</tr>
<tr>
<td>GICW-030XX</td>
<td>1”</td>
<td>11.7</td>
</tr>
</tbody>
</table>

2.7.5 2-Way Chilled Water Valves

<table>
<thead>
<tr>
<th>Evaporator Model</th>
<th>Valve Size</th>
<th>Valve $CV$</th>
<th>Close-Off Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>GICW-060XX</td>
<td>1-1/2”</td>
<td>18.7</td>
<td>200 PSIG</td>
</tr>
<tr>
<td>GICW-030XX</td>
<td>1”</td>
<td>11.7</td>
<td>200 PSIG</td>
</tr>
</tbody>
</table>

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$Cv = \text{Flow coefficient or flow capacity rating of valve.}$
2.8 Direct Expansion (DX) Connections

2.8.1 Split Air Cooled Unit Piping

Refer to the attached line sizing chart in section 2.8.5 for a guideline for sizing refrigerant lines. The ultimate responsibility for line sizing selection is that of the installing contractor or the project engineer. Data Aire does not assume this responsibility. The chart covers distances up to 200 equivalent feet. For installations greater than this distance, consult ASHRAE or similar references.

**NOTE:** Standard piping practices must be used to ensure proper oil return and efficient operation. The interconnecting lines to the remote air cooled condenser or condensing unit must be installed by a qualified refrigeration mechanic.

2.8.2 Discharge Lines

Discharge lines, also called hot gas lines, should be trapped at the top (inverted) and bottom, as well as every 15 to 20 feet (4.6 to 6.1 m) of vertical rise. Discharge line check valves (field provided) are required on all installations, especially those where there are long pipe runs or cold climate.

For air-cooled units built after 3/14/2017, the discharge check valves are already included in the evaporator section and do not need to be installed external to the unit. For units built before this date, the check valves must be field supplied and installed externally to the evaporator section. If there is doubt as to whether or not the check valve is already included with the unit, look for it on the hot gas line exiting the unit (see example picture below). The externally installed check valve should be placed from six (6) to ten (10) feet (1.8 to 3.1 m) from the compressor.

Note: Picture is only intended to show an example of a common check valve. Picture may not represent your specific unit, check valve size, location or orientation
The check valve will prevent flow from the condenser to the compressor during the “off” cycle. Check valves should be installed no less than 6 to 10 feet (1.8 to 3.1 m) from the compressor. The discharge, suction and liquid lines need to be refrigerant grade copper and in accordance with local code. All refrigeration piping should be installed with high temperature brazed joints. When brazing, a supply of nitrogen gas needs to be fed through the refrigerant lines. Be sure to open the other end of the refrigerant line to allow the nitrogen to bleed off and not pressurize the piping. Prevailing good refrigeration practices should be employed for piping support, leak testing, dehydration and charging of the refrigerant circuits. During the installation the lines should be capped off and filled with dry nitrogen at the end of each day’s work or until the system is completed and sealed.

Data Aire recommends a silver/phosphorus/copper alloy with 5 to 15% silver to be used to braze the refrigerant line sets to the indoor and outdoor units. Nitrogen needs to be flowing through the lines to eliminate carbon deposit build-up of the joints. Carbon could contaminate the refrigerant and restrict the metering device. Piping must be supported within 18” of the inlet and outlet connections.

The discharge line pressure drop should not exceed 9 PSIG for R-410A. Recommended gas velocity for proper oil return is 1,000 FPM. Slope horizontal lines downward in the direction of refrigerant flow (1/2” for every 10 feet of line length). Discharge lines do not require insulation but due to the high temperatures of the refrigerant inside the line, the pipes may be insulated to protect against burns to individuals near or around the lines.

2.8.3. Liquid Lines

Liquid lines are determined by pressure drop and velocity. The liquid line pressure drop for R-410A should not exceed 9 PSIG. The recommended liquid velocity should be between 200 and 300 FPM. To avoid excessive liquid line pressure drop, the air cooled condenser should be located above or at the same level as the evaporator. Condenser installations more than 15 feet below the evaporator are not recommended. Insulation of liquid lines is not required but can be useful in preventing excessive sub-cooling or flashing on long exposed pipe runs.

2.8.4 Suction Lines

Some applications call for the compressor to be mounted as part of the condenser, more commonly referred to as a condensing unit. Such require field piping of liquid and suction lines. Suction lines are trapped similarly to discharge lines. Common practice for suction line selection and installation should be followed. Suction lines should always be insulated.
### 2.8.5 Recommended Line Sizing

#### Hot Gas Lines (Single Circuit Systems)

<table>
<thead>
<tr>
<th>Unit kW</th>
<th>50 (15.2 m)</th>
<th>100 ft (30.5 m)</th>
<th>150 ft (45.7 m)</th>
<th>200 ft (61.0 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HORIZ. &amp; VERTICAL DOWN</td>
<td>VERTICAL UP</td>
<td>HORIZ. &amp; VERTICAL DOWN</td>
<td>VERTICAL UP</td>
</tr>
<tr>
<td>22</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>35</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>1-1/8&quot;</td>
<td>7/8&quot;</td>
</tr>
</tbody>
</table>

#### Liquid Lines (Single Circuit Systems)

<table>
<thead>
<tr>
<th>Unit kW</th>
<th>50 (15.2 m)</th>
<th>100 ft (30.5 m)</th>
<th>150 ft (45.7 m)</th>
<th>200 ft (61.0 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HORIZ. &amp; VERTICAL DOWN</td>
<td>VERTICAL UP</td>
<td>HORIZ. &amp; VERTICAL DOWN</td>
<td>VERTICAL UP</td>
</tr>
<tr>
<td>10</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>20</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>22</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>35</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
</tr>
</tbody>
</table>

#### Suction Lines (Single Circuit Systems)

<table>
<thead>
<tr>
<th>Unit kW</th>
<th>50 (15.2 m)</th>
<th>100 ft (30.5 m)</th>
<th>150 ft (45.7 m)</th>
<th>200 ft (61.0 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HORIZ. &amp; VERTICAL DOWN</td>
<td>VERTICAL UP</td>
<td>HORIZ. &amp; VERTICAL DOWN</td>
<td>VERTICAL UP</td>
</tr>
<tr>
<td>10</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>20</td>
<td>1-1/8&quot;</td>
<td>1-1/8&quot;</td>
<td>1-1/8&quot;</td>
<td>1-3/8&quot;</td>
</tr>
</tbody>
</table>

**NOTE 1:** If equivalent piping length falls between two columns above, choose the longer equivalent length.

**NOTE 2:** If hot gas or suction line refrigerant flow is upward use, “VERTICAL UP”, if it is downward or horizontal, use “HORIZ. & VERTICAL DOWN”.
2.8.6 Connection Sizes, Air Cooled Units

<table>
<thead>
<tr>
<th>MODEL</th>
<th>HOT GAS LINE</th>
<th>LIQUID LINE</th>
<th>SUCTION LINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIAX-035XX</td>
<td>7/8”</td>
<td>7/8”</td>
<td>N/A</td>
</tr>
<tr>
<td>GIAX-022XX</td>
<td>5/8”</td>
<td>5/8”</td>
<td>N/A</td>
</tr>
<tr>
<td>GIAX-020XX</td>
<td>N/A</td>
<td>5/8”</td>
<td>1 3/8”</td>
</tr>
<tr>
<td>GIAX-010XX</td>
<td>N/A</td>
<td>1/2”</td>
<td>1 3/8”</td>
</tr>
</tbody>
</table>

**NOTE:** Units will have a liquid line and either a hot gas or suction line. Field connections at the indoor evaporator and remote condenser or condensing unit will not necessarily be the same as the field pipe size required. In some cases these sizes will vary significantly.

2.8.7 Connection Sizes, Condensers

<table>
<thead>
<tr>
<th>EVAPORATOR MODEL</th>
<th>CONDENSER MODEL</th>
<th>LIQUID CONNECTION</th>
<th>HOT GAS CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIAX-035XX</td>
<td>GHRC-053</td>
<td>7/8”</td>
<td>1-1/8”</td>
</tr>
<tr>
<td></td>
<td>GHRC-060</td>
<td>7/8”</td>
<td>1-3/8”</td>
</tr>
<tr>
<td></td>
<td>GHRC-074</td>
<td>7/8”</td>
<td>1-1/8”</td>
</tr>
<tr>
<td></td>
<td>GHRC-099</td>
<td>7/8”</td>
<td>1-3/8”</td>
</tr>
<tr>
<td></td>
<td>GHRC-155</td>
<td>1-1/8”</td>
<td>1-5/8”</td>
</tr>
<tr>
<td>GIAX-022XX</td>
<td>GHRC-025</td>
<td>7/8”</td>
<td>1-1/8”</td>
</tr>
<tr>
<td></td>
<td>GHRC-039</td>
<td>7/8”</td>
<td>1-1/8”</td>
</tr>
<tr>
<td></td>
<td>GHRC-053</td>
<td>7/8”</td>
<td>1-1/8”</td>
</tr>
<tr>
<td></td>
<td>GHRC-060</td>
<td>7/8”</td>
<td>1-3/8”</td>
</tr>
<tr>
<td></td>
<td>GHRC-099</td>
<td>7/8”</td>
<td>1-3/8”</td>
</tr>
</tbody>
</table>
2.8.8 Field Piping, Remote Condenser/Condensing Unit Above Evaporator

**NOTES:**
1. THIS IS THE RECOMMENDED PIPING. ALL PIPING TO BE PER LOCAL AND/OR STATE CODE.
2. CONDENSER TO BE NO MORE THAN 60 FEET ABOVE EVAPORATOR.
3. FOR UNITS BUILT AFTER APRIL 2017, THE CHECK VALVES ARE INCLUDED INTERNALLY IN THE EVAPORATOR SECTION.
4. SLOPE HORIZONTAL LINES DOWNWARD IN THE DIRECTION OF THE REFRIGERANT FLOW, 1/2" FOR EVERY 10 FEET OF LINE LENGTH.
5. INVERTED TRAP TO EXTEND 8" ABOVE THE BOTTOM OF THE CONDENSER COIL.

---

2.8.9 Field Piping, Remote Condenser/Condensing Unit Below Evaporator

**NOTES:**
1. THIS IS THE RECOMMENDED PIPING. ALL PIPING TO BE PER LOCAL AND/OR STATE CODE.
2. CONDENSER TO BE NO MORE THAN 15 FEET BELOW EVAPORATOR.
3. SLOPE HORIZONTAL LINES DOWNWARD IN THE DIRECTION OF THE REFRIGERANT FLOW, 1/2" FOR EVERY 10 FEET OF LINE LENGTH.
4. INVERTED TRAP NEEDED ON SUCTION LINE WHEN COMPRESSOR IS OUTDOORS ONLY.
2.8.10 Connection Sizes, Condensing Units

<table>
<thead>
<tr>
<th>EVAPORATOR MODEL</th>
<th>CONDENSING UNIT MODEL</th>
<th>LIQUID CONNECTION</th>
<th>SUCTION CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIAX-010XX</td>
<td>GHCU-011</td>
<td>1/2&quot;</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td></td>
<td>GHCU-018</td>
<td>1/2&quot;</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td></td>
<td>GHCU-018</td>
<td>1/2&quot;</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td></td>
<td>GHCU-025</td>
<td>7/8&quot;</td>
<td>1-1/8&quot;</td>
</tr>
<tr>
<td></td>
<td>GHCU-053</td>
<td>7/8&quot;</td>
<td>1-1/8&quot;</td>
</tr>
<tr>
<td>GIAX-020XX</td>
<td>GHCU-025</td>
<td>7/8&quot;</td>
<td>1-1/8&quot;</td>
</tr>
<tr>
<td></td>
<td>GHCU-025</td>
<td>7/8&quot;</td>
<td>1-1/8&quot;</td>
</tr>
<tr>
<td></td>
<td>GHCU-039</td>
<td>7/8&quot;</td>
<td>1-1/8&quot;</td>
</tr>
<tr>
<td></td>
<td>GHCU-053</td>
<td>7/8&quot;</td>
<td>1-1/8&quot;</td>
</tr>
<tr>
<td></td>
<td>GHCU-074</td>
<td>7/8&quot;</td>
<td>1-1/8&quot;</td>
</tr>
</tbody>
</table>

2.8.11 Field Piping, Remote Condensing Unit

**NOTES:**
1. ALL PIPING TO BE PER LOCAL AND OR STATE CODES.
2. VERTICAL DISTANCE BETWEEN UNITS NOT TO EXCEED 10 FEET MAXIMUM.
3. THIS IS SUGGESTED OR RECOMMENDED PIPING ONLY.
2.8.12 Water/Glycol Unit Piping

The required field installed condenser water pipe sizes may or may not be the same as the connection sizes at the evaporator section or fluid cooler (refer to Sections 2.8.11 and 2.8.12 for connection sizes). Water pipe sizes will depend on the length of pipe required and the calculated pressure drop of peripheral components.

Water cooled units may also be connected to building water or tower water sources. Pipe size will depend on length of run and the maximum water flow required.

Shut-off valves (field provided by others) should be installed within a few feet of the inlet and outlet connections of the evaporator to allow the unit to be isolated for service. Drain/fill valves should be located at the lowest point on the connected piping.

All water/glycol units are shipped with plate/fin heat exchangers as standard equipment. A strainer is shipped loose and is to be field installed in the supply line with shut-off valves (field provided by others) before and after the strainer. The strainers and water/glycol piping must be cleaned on a periodic basis.

All water pipes have a cap installed on the end of the pipe for pressure testing the system. These caps need to be removed before installing the water piping to the unit. Use a tube cutter for smaller pipes and a reciprocating saw with a metal cutting blade for larger pipe sizes or if there is a clearance problem. All connections need to be cleaned before connections are brazed together.

**NOTE:** One of the most common problems in a water/glycol system is the presence of air in the condenser loop. Air vents must be installed in various locations in the piping system to purge the air.

Water/Glycol system piping may include a centrifugal pump (or pumps for redundancy). Pumps must be primed before operating per the pump manufacturer’s guidelines.

2.8.13 Connection Sizes, Water/Glycol Cooled Units

<table>
<thead>
<tr>
<th>EVAPORATOR MODEL</th>
<th>WATER IN CONNECTION</th>
<th>WATER OUT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIWX-035XX</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
</tr>
<tr>
<td>GIGX-035XX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GIWX-022XX</td>
<td>1-1/4&quot;</td>
<td>1-1/4&quot;</td>
</tr>
<tr>
<td>GIGX-022XX</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.8.14 Connection Sizes, Fluid Coolers (Dry Coolers)

<table>
<thead>
<tr>
<th>EVAPORATOR MODEL</th>
<th>FLUID COOLER MODEL</th>
<th>WATER IN CONNECTION</th>
<th>WATER OUT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIWX-035XX</td>
<td>GHFC-060</td>
<td>2-1/8&quot;</td>
<td>2-1/8&quot;</td>
</tr>
<tr>
<td>GIGX-035XX</td>
<td>GHFC-074</td>
<td>2-1/8&quot;</td>
<td>2-1/8&quot;</td>
</tr>
<tr>
<td></td>
<td>GHFC-141</td>
<td>2-5/8&quot;</td>
<td>2-5/8&quot;</td>
</tr>
<tr>
<td>GIWX-022XX</td>
<td>GHFC-053</td>
<td>2-1/8&quot;</td>
<td>2-1/8&quot;</td>
</tr>
<tr>
<td>GIGX-022XX</td>
<td>GHFC-074</td>
<td>2-1/8&quot;</td>
<td>2-1/8&quot;</td>
</tr>
<tr>
<td></td>
<td>GHFC-130</td>
<td>2-5/8&quot;</td>
<td>2-5/8&quot;</td>
</tr>
</tbody>
</table>
NOTE to Installing Contractor: Condensation formation and frequent humidifier flushing are normal functions of this equipment. Proper drain connections must be made to ensure proper removal. Unit will require water connections for condensate removal and possibly for humidifier makeup water, condenser water, chilled water and/or hot water. Installation of units above equipment that could sustain water damage should be avoided.
2.9 Condensate Drain Piping
Every unit has a ¾” copper stub provided for condensate removal. A union is recommended at the field connection which will permit easy disconnection from the unit for cleaning.

**WARNING:** The condensate drain MUST be connected to an external drain line (provided by others) before unit start up.

Units with gravity drains require a P-trap to be installed for proper draining of the condensate water. The Inrow unit require a P-trap that is at least 7” deep due to the high static pressures developed by the fans in this unit.

Drain lines should be pitched downward not less than ¼” for every ten (10) feet of horizontal run. Do not reduce the size of the drain line. Do not expose the drain line to freezing temperatures.

Some installations have no convenient means of allowing a gravity drain. In these applications, a condensate pump can be used. Optional condensate pumps are factory mounted and wired. When the condensate pump is factory installed, a trap is built into the drain line to allow for proper drainage. Factory installed condensate pumps do not require a separate power source but do require a separate, external condensate drain line to an outside drain.

Condensate pumps shipped loose (or field provided by others) typically require a dedicated power source. Field pipe connections must be made to the pump discharge connection. A check valve must be installed to prevent short cycling. See also condensate pump electrical requirements in Section 3.8.

2.10 Steam Generator Humidifier Piping (Optional)
Steam generator humidifiers with disposable cylinders are optional. The humidifier make-up water should be brought to the humidifier through the field connection opening using ¼” copper tubing. A compression fitting is provided at the humidifier.

A shut-off valve should be provided outside the unit to allow disconnection for service. An in-line water pressure regulator should be (field provided by others) installed. Water pressure should be set between 20 and 50 PSIG.

The humidifier has a drain line at the bottom which is factory piped to the main condensate drain line. The dispersion tube also has a drain line. No additional field piping is required.
2.11 Leak Testing

**WARNING:** No installation is complete until the entire system has been thoroughly checked for leaks. This includes checking refrigerant tubing, flare fittings, pressure controls, Schrader fittings and compressor Rota-Lock service valves.

In addition to the refrigeration system, check all condenser water lines, humidifier makeup lines, condensate lines, condensate pumps, chilled water lines, centrifugal pumps, and fluid coolers as applicable.

With recent changes in the handling and recovery of refrigerant, it is not permissible to release refrigerant into the atmosphere. Many leak-test methods recommended in the past are no longer possible. Current standard practices must be used.

Pressurize system circuit to 150 PSIG (1034 kPa) by using dry nitrogen with a trace of refrigerant. Check the entire system for leaks with suitable leak finder, (per local code) including but limited to all braze joints, caps, fittings and flare nuts on both field and factory furnished components. After completion of leak testing, release test pressure and pull a vacuum on the system.

**WARNING:** Tightening of fittings and valves is the responsibility of the installing contractor.

**WARNING:** With any fluid connection there is risk of leakage. Water leakage could result in property damage to mission critical equipment. A water drain connection is required. Units with optional steam generator humidifiers will require an external potable water supply. Water leakage can result from improper installation and/or practices.

2.12 Evacuation

Evacuate the refrigerant lines, condenser coil and evaporator coil to 250 microns or lower (a micron gauge and 2-stage vacuum pump are required). Valve off and turn off the vacuum pump and wait for at least fifteen minutes to make sure the micron gauge reading does not go back up above 700 microns. If it does, re-start the vacuum pump and evacuate until the system reaches 250 microns. If the system still does not hold the pressure below 700 microns the system needs to be rechecked for leaks.

After the system has been satisfactorily evacuated the unit can be charged with refrigerant. Connect the pressure gauge manifold set to the high and low ports near the compressor, connect the charging line to the refrigerant tank and set it for liquid feed. Open the refrigerant tank valve and purge the line at the manifold, then open the high side valve on the manifold only, and allow the refrigerant to flow until the system pressure equalizes. At this point the system will have 75 to 80% of the total refrigerant charge. Start the fans and then the compressor checking the operating pressure and temperatures.

**WARNING:** DO NOT APPLY POWER TO THE COMPRESSOR WHEN IN A VACUUM.
3.0 ELECTRICAL CONNECTIONS

**WARNING:** The Data Aire cooling unit must be connected by a licensed and qualified electrician. Risk of electrical shock could result in injury or death. Disconnect all remote electrical power supplies prior to working on the unit.

**WARNING:** The 24” gForce IR has a plunger switch (kill switch) that inhibits the low voltage power and component power (fan motors, humidifier, reheat, compressor) when the front door is opened. It is located on the upper right hand side.

**NOTE:** The electrical section has two locking devices holding the front door closed that require a flat blade screwdriver to open.

**NOTE:** The 12” gForce IR have “hot swappable” fan power connections. To remove the fans simply unscrew the four holding screws and pull the fan out using the handle provided. The unit will remain powered and operate unless power to the unit is switched off.

**NOTE:** Disconnect switches are optional. The disconnect switch when turned OFF will de-energize the high voltage.

**WARNING:** Before proceeding with the electrical connections, make certain that the volts, hertz and phase correspond to that specified on the unit electrical nameplate. Use copper conductors only.

3.1 Electrical Service
Check to be sure the service provided by the utility is sufficient to handle the additional load imposed by this equipment. Units with secondary heat exchangers will require a separate power source and field-provided, interconnecting control wires.

Remote condensers will typically require one power source. Glycol systems with fluid coolers and loose pump(s) typically require one power source for the fluid cooler and will require one additional source for a single pump or two additional sources for dual pumps. Systems where the pump(s) are mounted and piped integral to the fluid cooler will usually require a single power source.

3.2 Nameplate Ratings
Refer to the unit electrical nameplate for equipment electrical requirements. Minimum circuit ampacity (MCA) also known as wire sizing amps, will dictate the minimum required wire gauge. Maximum overcurrent protection (MOP) device amps will dictate the maximum circuit breaker or fuse size.

3.3 Grounding
The unit cabinet must have an uninterrupted true earth ground. An electrical ground wire of adequate size must be connected to the ground lug provided inside the main electrical box.
3.4 Voltage Tolerance
The supply voltage to the unit must be within tolerance; -5% to +10% for 208-230 voltage, +10% for 460 volts as indicated on the unit electrical nameplate. Phase to phase imbalance must not exceed 3%. The local utility company should be contacted for improper line voltage. Deviation from voltage ratings can cause premature failures and possibly void unit warranties.

WARNING: Check the wiring connections in the unit control panel to ensure they are tight. Screw terminals may become loose in transit. Tightening of wiring connections is the responsibility of the installing contractor.

3.5 Auxiliary Control Wiring
The interconnection of auxiliary control wiring for remote heat exchangers (condensers and fluid coolers) requires the connection of two (2) - 18-gauge wires for installations up to 150 feet (45 m) or 16-gauge wires for installations from 151 feet (46 m) up to 200 feet (61 m) from the electrical control box of the indoor evaporator to the electrical control box of the remote heat exchanger. Condensing units (i.e., where the compressor(s) are mounted in the remote heat exchanger) will typically require (4) or more wiring connection points and may require heavier gauge wire. In this case, the installing contractor must follow the applicable electrical codes to determine the required wire gauge.

Because of the wide variety of indoor evaporators and remote heat exchangers offer by Data Aire, the installing contractor must refer to the schematic which is provided inside the electrical control box of each unit, for the required auxiliary control wiring interconnection terminal points.

Examples:

Figure 1 - Typical Remote Heat Exchanger Interconnection Points

![Typical Remote Heat Exchanger Interconnection Points](image1)

Figure 2 - Typical Indoor Evaporator Interconnection Points

![Typical Indoor Evaporator Interconnection Points](image2)
3.6 Remote Shutdown

Every Data Aire unit has remote shutdown contacts. These are intended for a field supplied dry contact or switch to be wired across two terminals. When the contact or switch opens, the control circuit power is interrupted and the unit shuts down, including the control panel. The control circuit is 24 VAC and the field provided contact or switch should have a minimum rating of 10 amps. A minimum of 18 gauge wire needs to be used.

The remote shutdown contacts are on terminals number 1 and number 2 on the terminal block designated TB3. The unit will ship with a factory installed metal jumper that connects terminal number 1 to terminal number 2. Remove this clip prior to installing the field wires.

3.7 Remote Alarm Contacts

The dap4 microprocessor control panel provides four (4) remote alarm output contacts that can be field accessed. The contacts include a Normally Open (NO) or Normally Closed (NC) on Alarm, dry contact, intended to be used in a control circuit not exceeding 5 amps at 24 VAC.

These programmable output contacts will close on a failure and remain closed until the alarm is no longer present. The terminal designations for these alarm output contact pairs are:

<table>
<thead>
<tr>
<th>Remote Alarm Contacts Terminals</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB1</td>
<td></td>
</tr>
<tr>
<td># 11</td>
<td>Remote Alarm 1 (Common)</td>
</tr>
<tr>
<td># 12</td>
<td>Remote Alarm 1 (Normally Closed)</td>
</tr>
<tr>
<td># 13</td>
<td>Remote Alarm 1 (Normally Open)</td>
</tr>
<tr>
<td># 40</td>
<td>Remote Alarm 2 (Common)</td>
</tr>
<tr>
<td># 41</td>
<td>Remote Alarm 2 (Normally Closed)</td>
</tr>
<tr>
<td># 42</td>
<td>Remote Alarm 2 (Normally Open)</td>
</tr>
<tr>
<td># 43</td>
<td>Remote Alarm 3 (Common)</td>
</tr>
<tr>
<td># 44</td>
<td>Remote Alarm 3 (Normally Closed)</td>
</tr>
<tr>
<td># 45</td>
<td>Remote Alarm 3 (Normally Open)</td>
</tr>
<tr>
<td># 48</td>
<td>Remote Alarm 4 (Common)</td>
</tr>
<tr>
<td># 49</td>
<td>Remote Alarm 4 (Normally Closed)</td>
</tr>
<tr>
<td># 50</td>
<td>Remote Alarm 4 (Normally Open)</td>
</tr>
</tbody>
</table>

3.8 Condensate Pumps

A condensate pump is optional. Factory mounted pumps are pre-wired. While no outside power source is required, field piping is still a requirement.

**WARNING:** The condensate drain MUST be connected to an external drain line (provided by others) before unit start up. Without field piping condensate water will damage internal components.
Condensate pumps which ship loose normally require a separate source of power. Always check the pump power requirements before connecting power. Condensate pumps are available in various voltages.

Factory installed condensate pumps are wired to display a “High Condensate Water Level” alarm. The wiring for this must be done in the field on pumps that ship loose.

3.9 Condensate Probe
A condensate probe for sensing under floor water is included with this unit. The probe is in a plastic bag with approximately 15 feet of coiled wire. The probe is typically placed below the unit in a location where water is likely to accumulate. Secure the attached wires where necessary.

**WARNING:** Failure to remove from the plastic bag and uncoil the length of wire attached to the condensate probe can result in a nuisance water detected alarm. Remove/disconnect the probe if it is not to be used.

3.10 Water Sensing Cable (Optional)
Some units may be equipped with a water detection cable. The cable can sense moisture anywhere along its length. It is typically placed below the unit in a rectangular pattern that matches the perimeter of the unit. The cable is connected to the terminal board and ready for installation. Cable lengths will vary depending on the original order and specifications. Care should be taken when installing the cable. Be sure the cable is not touching metal and/or any debris under the raised floor.

3.11 Rack Temperature Sensors
The rack temperature sensors provide feedback to the cooling unit about the condition of the air entering the server racks. This information allows the gForce IR to ensure it is providing just enough cold air to each rack, virtually eliminating hotspots. Overcooling and excessive airflow are avoided, greatly reducing unnecessary energy consumption.

The unit is shipped with one (1) rack temperature sensor. Two (2) additional optional rack temperature sensors are available. The sensor is shipped with 20 feet of wire and can be mounted on the adjoining server racks (See paragraph 2.2).

In addition, there are discharge air (i.e., supply) and return air sensors pre-mounted and wired in the unit.

3.12 Sensor Location
For optimum performance the sensor or sensors may be installed in a variety of locations. Sensor location should be determined after the unit is operational. Recommended rack locations include:

- Sensor at the top of the server rack,
- In the highest density area of the rack,
- In the path of the entering airflow of the server rack,
- If there are fewer sensors than racks, place the sensor at the furthest rack(s). When dealing with some racks with higher densities, it might be useful to place sensor on every door,
- Reference section 2.4 for more details.
3.13 Manual Override Switches
For testing and during start-up each gForce IR unit is provided with manual override slide switches. There are seven slide switches. One for each of the following functions:

Water Valve, Fan Speed, Heat 1, Cool 2, Cool 1, Blower

![Manual Override Switches Diagram]

All automatic control is disabled but the safety switches remain functional. Simply slide the manual switches to energize the fan, compressor, humidification, reheat and other functions (as applicable).

The fan speed of the EC (Electronically Commutated) plug fan motor can be adjusted from 0 to 10 volts DC by adjusting the potentiometer at the left of the Fan Speed switch. The fan speed will increase 10% of the fan base speed for each one (1) volt adjustment (e.g., one (1) volt equals 10% speed). At ten (10) volts the motor is at full speed.

**WARNING:** Do not leave the unit in manual override. Slide the switches to the OFF position when completing testing and/or start-up. An alarm will be activated if units are left in the ON position.

3.14 Wiring Diagrams
Every Data Aire evaporator, condenser, condensing unit or fluid cooler comes with a wiring diagram. These diagrams are ladder type schematics intended for service personnel. The intent is to allow the technician to understand the wiring details associated with the electrical components and how they interface with the controls as well as peripheral equipment (including secondary heat exchangers).

The wiring diagram in the evaporator will indicate field interface terminals to the secondary heat exchanger. The internal wiring of the heat exchanger is found on a separate diagram which can be found on the inside cover of the heat exchanger electrical box. Both diagram types are also placed inside the shipping/warranty packet secured in the evaporator section.
4.0 INSTALLATION OF REMOTE OUTDOOR HEAT EXCHANGER

**NOTE:** Air cooled condenser and fluid coolers have individual Installation, Operation and Maintenance manuals which should be referred to for more complete details.

5.0 CHARGING

5.1 Voltage Phase Check

5.1.1 Evaporator

Prior to charging, the correct voltage phasing should be checked on the indoor evaporator. EC plug fans are not dependent on the input power phasing and will always operate in the proper direction.

For the GIXX-035XX and GIXX-022XX gForce IR model an out of phase compressor will not turn ON and the VFD will show an error message.

For the GIAX-020XX and GIAX-010XX gForce IR models, the easiest way to check the compressor rotation on the evaporator section is to momentarily energizing the compressor switch on the Manual Override Switch board located next to the microprocessor control module. Slide the Cool 1 switch to the ON position, observe the compressor operation for a short period of time then slide the switch back to the OFF position. An out of phase compressor will draw relatively low amps and both suction and discharge pressures will remain nearly equal. Reverse any two of the three line voltage wires at the line voltage field connection point to change the compressor rotation.

Although the scroll compressor is phase dependent, units shipped from the factory are run tested ensuring compressor rotation is consistent with the evaporator fan motor. However, a field change-out of the compressor may require checking proper phase.

5.1.2 Secondary Heat Exchanger

The secondary heat exchanger may be ordered as three phase but the individual fan motors are single phase and will only run in one direction. Check operation by placing a momentary jumper across low voltage terminals number 39 and number 40 which will energize the control circuit.

**NOTE:** Disconnect pumps on glycol systems unless already filled with water/glycol solution.

Fans may not run because the thermostat is above the current ambient or the number 1 fan on air cooled condensers with fan speed control has not reacted to the head pressure. On an R-410A system, the fan will not run until the head pressure is over 300 PSIG.
5.2 Air Cooled Systems

5.2.1 Fan Speed Control System Charging (Units with Remote Outdoor Condenser)

The standard outdoor air cooled condenser provided by Data Aire has fan speed control. The fan speed controller does not require field adjustment or programming.

After the refrigerant field piping is properly completed, connect the refrigerant drum to the low side and charge with vapor. Refer to Section 2.11 Leak Testing and Section 2.12 Evacuation prior to charging the system. For systems with R-410A, approximately 3 lbs. per nominal ton is required. For example, a model GIAX-035XX is a nominal 10 ton unit. Charge with about 30 lbs. of R-410A.

It is likely that more refrigerant will be required to complete the charging procedure for additional piping between the evaporator and the condenser. Make sure all hoses are properly purged. From a vacuum, feed liquid refrigerant into the high side of the system until the pressures equalizes. At this point there will be about 70-80% of the total charge in the system.

When charging a unit with a variable speed compressor, make sure to set the airflow of the unit to its full capacity. Start charging the unit with the compressor at its minimum frequency until the desired subcooling and superheat are met. Then slowly ramp the compressor up to its maximum frequency while slowly feeding the system more refrigerant. When the compressor is at its maximum frequency, make sure to maintain the required subcooling and superheat.

**NOTE:** The variable speed compressor has an integral crankcase heater. When the compressor is stopped, the VFD provides a DC current to the compressor motor to keep the oil warm.

**WARNING:** Before starting a compressor, the crankcase heater should be energized for a minimum of 12 hours to reduce the possibility of liquid slugging on start-up. Failure to energize the crankcase heater could result in compressor damage. If the system is charged from a vacuum, the pre-heating of the compressor is not necessary.

A quick and easy way to run the fans and compressor is by using the manual slide switches provided by the Manual Override Switch control board. Switch the fan and compressor manual switches to the ON position. All automatic control is disabled but safety switches will remain functional.

Start the evaporator fan and compressor and allow the system to stabilize to room temperature. Check the liquid line sight-glass to get a feel for the approximate charge. Bubbles in the sight-glass are not unusual at this point and can be caused by flashing from liquid line pressure drop, low sub-cooling or low charge. It is likely more refrigerant will be required to complete the charging procedure.

Adjust the refrigerant charge to a sub-cooling of 8 to 10° and the sight-glass has sparse bubbles. The unit should be allowed to stabilize for 15 to 20 minutes before meaningful measurements can be taken. After the system is allowed to stabilize, verification of a few key measurements should be noted. A properly charged system operating at typical parameters will have the following pressures:

<table>
<thead>
<tr>
<th>Units with R-410A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Head pressure</strong></td>
</tr>
<tr>
<td><strong>Suction pressure</strong></td>
</tr>
<tr>
<td><strong>Superheat</strong></td>
</tr>
<tr>
<td><strong>Sub-cooling</strong></td>
</tr>
</tbody>
</table>

---

4 The term subcooling refers to a liquid existing at a temperature below its normal saturation temperature. Subcooling is normally used so that when the cycling refrigerant reaches the thermostatic expansion valve, its totality is in its liquid form, thus, allowing the valve to work properly.

5 In refrigeration superheat is the amount of heat added to the refrigerant after it has changed from liquid state into a vapor state.
NOTE: Charging to a full liquid line sight-glass should never be the sole means of determining the correct refrigerant charge. Other parameters such as superheat, suction pressure, head pressure, sub-cooling and ambient temperature are also important. A system charged to a clear sight-glass is often overcharged.

5.3 Flooded System Charging

Flooded systems include an optional liquid receiver and head pressure control valve for use primarily in colder climates. When the ambient temperature falls during cold weather, the head pressure control valve will regulate the flow of refrigerant to ensure nearly constant receiver pressure. The receiver is partially flooded with liquid refrigerant in cold weather. In warm weather the extra refrigerant is stored in the receiver.

Flooded systems require more refrigerant than units with fan speed control. Connect the pressure gauge manifold set to the high and low ports near the compressor. Connect the charging line to the refrigerant tank and set it for liquid feed. Open the refrigerant tank valve and purge the line at the manifold. Open the high side valve on the manifold only and allow the refrigerant to flow until the system pressure equalizes. At this point the system will have 75 to 85% of the total refrigerant charge. Start the evaporator fans. Start the compressor and allow the system to stabilize to room temperature. Check the operating pressures and temperatures.

A quick and easy way to run the fans and compressor is by using the manual switches provided by the Manual Override Switch control board. Switch the fan and compressor manual switches to the ON position. All automatic control is disabled but safety switches will remain functional.

NOTE: The variable speed compressor has an integral crankcase heater. When the compressor is stopped, the VFD provides a DC current to the compressor motor to keep the oil warm.

WARNING: Before starting a compressor, the crankcase heater should be energized for a minimum of 12 hours to reduce the possibility of liquid slugging on start-up. Failure to energize the crankcase heater could result in compressor damage. If the system is charged from a vacuum, the pre-heating of the compressor is not necessary.

Start the compressor and allow the system to stabilize to room temperature. Check the liquid line sight-glass to get a feel for the approximate charge. Check the liquid line sight glass to get a feel for the approximate charge. Bubbles in the sight-glass are not unusual at this point and can be caused by flashing from liquid pressure drop, low sub-cooling or low charge. It is likely more refrigerant will be required to complete the charging procedure.

If the receiver (head) pressure is below 350 PSIG, block part of the condenser coil surface until the pressures rises to 350 PSIG or greater. During extremely cold weather all the condenser fans may have to be de-energized to maintain 350 PSIG.

Observe the sight-glass on the receiver. Add refrigerant through the suction line until the level of liquid in the receiver is approximately 1/3 from the bottom of the sight-glass (the leveling ball in the receiver will start to float). At this point the charging is correct. Observing the receiver sight-glass becomes difficult when they are remotely mounted near the condenser. The unit should be allowed to stabilize for several minutes before meaningful measurements can be taken.
After the system is allowed to stabilize, the superheat at the compressor suction line (reading from at least 6 inches from the compressor) should be 8 to 15°F. Units with remote condensing units (DRCU), the superheat should be 20 to 25°F at the compressor. Remove any block that may have been used on the condenser coil. If the ambient temperature while charging is below 70°F, some of the refrigerant will be backed up into the condenser coil causing the liquid level in the receiver to drop (this is normal).

**NOTE:** Charging to a full liquid line sight-glass should never be the sole means of determining the correct refrigerant charge. Other parameters such as superheat, suction pressure, head pressure, sub-cooling and ambient temperature are also important. A system charged to a clear sight-glass is often overcharged.

5.4 Water/Glycol Cooled Systems

5.4.1 Water/Glycol Cooled System Charging

All water/glycol cooled units are factory charged with refrigerant. The water regulating valve should be adjusted to maintain a discharge pressure between 340–390 PSIG for R-410A. Saturated suction pressure should be 100 PSIG or higher with R-410A. The superheat at the compressor suction line at least 6 inches away from compressor should be between 8-15°F.

Field charging water/glycol systems (if required) should be done by referring to the unit’s electrical nameplate. The factory charge is indicated on the nameplate. Although this value represents the original factory charge, it is still necessary to measure and note proper unit operation including superheat, head and suction pressure. Some adjustment to the refrigerant may be required.

Adjust the refrigerant charge until the sight-glass clears or has sparse bubbles. The unit should be allowed to stabilize for several minutes before meaningful measurements can be taken and the conditioned space should be at or near the temperature setpoint.

All water/glycol cooled units have a water regulating valve. A head pressure sensing transducer is connected to a Schrader fitting on the discharge line and water is regulated into the condenser coil. Standard condensers are plate fin type.

**NOTE:** The variable speed compressor has an integral crankcase heater. When the compressor is stopped, the VFD provides a DC current to the compressor motor to keep the oil warm.

**WARNING:** Before starting a compressor, the crankcase heater should be energized for a minimum of 12 hours to reduce the possibility of liquid slugging on start-up. Failure to energize the crankcase heater could result in compressor damage. If the system is charged from a vacuum, the pre-heating of the compressor is not necessary.

**NOTE:** Charging to a full liquid line sight-glass should never be the sole means of determining the correct refrigerant charge. Other parameters such as superheat, suction pressure, head pressure, sub-cooling and ambient temperature are also important. A system charged to a clear sight-glass is often overcharged.
5.4.2 Factory Charge for Water/Glycol Cooled Systems

<table>
<thead>
<tr>
<th>Evaporator Model</th>
<th>R-410A</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIWX-035XX</td>
<td>18 lbs.</td>
</tr>
<tr>
<td>GIGX-035XX</td>
<td></td>
</tr>
<tr>
<td>GIWX-022XX</td>
<td>16 lbs.</td>
</tr>
<tr>
<td>GIGX-022XX</td>
<td></td>
</tr>
</tbody>
</table>

5.5 Refrigerant Handling

The use of recovery/recycling is required by the US Environmental Protection Agency (EPA) regulations. Technicians who service and dispose of air conditioning and refrigeration equipment must recover the refrigerant instead of venting to the atmosphere.

Except for extremely small releases of refrigerant such as those that occur when disconnecting service hoses (diminutive release), a technician who knowing releases or vents refrigerant to the atmosphere is in violation of these regulations. Freon purchasers must be certified technicians and have a valid EPA certification card.

5.6 Important Refrigeration Components

5.6.1 High Pressure Cutout Switch

The refrigeration circuit is protected by a high head pressure cutout switch with a manual reset button. The switch is located near the compressor. The pressure rating for R-410A systems is 610 PSIG.

5.6.2 Low Pressure Cutout Switch

The refrigeration circuit includes a low pressure cutout switch with automatic reset. The switch is located near the compressor section. The pressure rating for R-410A systems is 50 PSIG.

5.6.3 Electronic Expansion Valve (EEV)

The refrigeration circuit includes an electronic expansion valve. It is used instead of the traditional Thermostatic Expansion Valve (TXV). The EEV maintains more stable system balance and is more energy efficient.
6.0 GLYCOL SYSTEMS

6.1 Glycol Concentration
The system must be filled with water and the appropriate amount of ethylene or propylene glycol to protect against winter freezing. To achieve the approximate glycol concentration, it is necessary to know the total system volume. The total system volume consists of the fluid cooler volume, the evaporator unit volume and the volume of the inter-connecting piping.

The following tables can be used for arriving at an approximate system volume. After installation, the glycol percentage should be checked. The glycol percentage should be checked at regular intervals to ensure against freeze protection.

6.1.1 GIWX or GIGX Internal (Fluid) Volume

<table>
<thead>
<tr>
<th>Evaporator Model</th>
<th>Volume (Gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GIWX-035XX</td>
<td>5.0</td>
</tr>
<tr>
<td>GIGX-035XX</td>
<td>5.0</td>
</tr>
<tr>
<td>GIWX-022XX</td>
<td>4.2</td>
</tr>
<tr>
<td>GIGX-022XX</td>
<td>4.2</td>
</tr>
</tbody>
</table>

6.1.2 Fluid Cooler Information
The information regarding fluid cooler internal volume and the volume of the inter-connecting piping can be found in the individual Fluid Cooler Installation, Operation and Maintenance manuals which should be referred to for more complete details.
Every gForce IR unit is shipped with a dap4™ microprocessor controller. The unit is shipped with factory default settings. The settings can be changed to meet the controlled space criteria. The dap4™ consists of two main components: the control module and the display panel. The control module is located in the unit’s electrical panel. The display panel is mounted on the front door. The two are connected by special telephone type cable6 harness. All data displayed on the display screen originates from the control module. The display panel has a backlit LCD (liquid crystal display). There are six keys on the face of the display panel to retrieve or enter settings.

Control Module

Display Module

6 Regular telephone cable will not operate. Factory supplied cable is required.
### 7.1 Buttons

<table>
<thead>
<tr>
<th>BUTTON</th>
<th>FUNCTION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| ![Alarm Icon] | Alarm | Allows viewing of active alarms  
Silences audible alarms  
Resets active alarms |
| ![Menu Icon] | Menu | Allows entry to Main Menu |
| ![Esc Icon] | Esc | Return to previous screen  
Hold 5 seconds to turn ON or OFF |
| ![UP Arrow Icon] | UP Arrow | Allows scrolling to previous screen  
Allows value changes (increase) |
| ![ENTER Icon] | ENTER | Allows entry to Menus  
Advances cursor |
| ![DOWN Arrow Icon] | DOWN Arrow | Returns to next screen  
Allows value changes (decrease) |

### 7.2 Powering the Unit ON/OFF

**WARNING:** Before powering the unit ON, check that power is available and proper connections have been completed.

**NOTE:** The unit is shipped with the control power in the OFF (OffbyKey) position.

Turn the disconnect switch to the ON position. The controller display keys and screen will illuminate and the processor will conduct a self-test (the screen will remain illuminated with no messages until the testing is complete). The self-test takes approximately 45 seconds. Once completed, the Main Menu screen will be displayed.

The Main Menu screen will display the unit type, date and time, and unit status. In addition, the screen will scroll and display the temperature, relative humidity and operating mode.

- The Unit Status will indicate the unit: “OffbyKEY”

The unit may be turned ON at any time by holding the ESC key for approximately 5 seconds. The display will continue to scroll and display messages. At the same time the unit status is changed to “Unit On”. Once powered there will be a 5 – 600 second start delay indicated by “Time Before Start: XXs”.

**NOTE:** The start time delay is programmable from 5 – 600 seconds (by accessing Menu J – Factory Settings). The factory default setting at shipment is 5 seconds.
For initial programming of setpoints, alarms, delays, etc. it is not necessary to have the unit ON. With the unit in the “OFFbyKey” mode, all settings are available to view and change (other than Menu J – Factory Settings and Menu L Configure Inputs/Outputs) if the proper password is entered.

Once the desired settings are complete, change the unit to ON by pushing and holding the ESC Key for approximately 5 seconds.

7.3 Accessing Menus/Passwords

To access any Menu, a numerical password is required.

To enter the menu and Sub-Menu screens, press the MENU key on the display panel. A password will be requested. The password is a four digit entry (including 0). Units are shipped from the factory with the password requirement bypassed to accommodate start-up and set-up. The display screen will have the following message:

The Service Level Password setting from the factory is: **0000**

The cursor will be flashing by the Security Access message at the top of the screen. Press the ENTER key to move the cursor. The cursor will flash at the first input (represented by a 0). Press the UP or DOWN keys to increase or decrease the value. Once the value is entered, press the ENTER key to move to the next input. Increase or decrease the value by pressing the UP or DOWN keys. Once the value is entered, press the ENTER key to move to the next input.

Once all four values have been entered, press the ENTER key. If the password is incorrect, the following message will appear: **Password Wrong!** The cursor will return to the first input value. Follow the same procedure to re-enter the password.

Once the correct password is entered and accepted, the Menus will display on the screen. Only those Menus allowed through the Service Password will be available. Use the UP or DOWN keys to scroll through the available. Use the UP or DOWN keys to scroll through the available Menus.
7.4 Changing the Service Level Password

The Service Level password can be changed by doing the following:

Enter the Main Menu by pressing the MENU key. You will be prompted to insert the Service Level password. Enter the current password.

- Press the MENU key. The screen will display the following display:

![SECURITY ACCESS]
Change Service Level
password (PWl): 0000

- Press the ENTER key. The cursor will highlight the first input. Change the input by pressing the UP or DOWN key. Once the selected number is displayed, press the ENTER key to move to the next input. Repeat the same steps for each input.

After the last input has been entered, press the MENU key to return to Main Menu. The new password is stored.

7.5 Entering Menu Settings

7.6 Menu A – ON/OFF

Menu A allows the unit power to be switched from ON to OFF and from OFF to ON (the Service level password is required).
Enter Menu A by pressing the MENU key. Use the UP or DOWN keys to scroll through the menus. Press the UP or DOWN key until “A. On/Off” is highlighted.

Press the ENTER key.

The following will appear on the display screen:

The cursor will be flashing at the upper left hand corner of the screen. Press the ENTER key. The cursor will move to the “Change to:  “SWITCH OFF”. Press either the UP of DOWN button to change the status. Press the ENTER key to save the setting.

- If selecting SWITCH OFF the STATUS will change to:  OFFbyKey. The unit will be OFF
- If selecting SWITCH ON the STATUS will change to:  UnitON. The unit will be ON

When switching from the SWITCH OFF selection to the SWITCH ON (and pressing the ENTER key), the following message will appear:  **Time Before Start:  XXs**

**NOTE:** The start time is a programmable time delay. It can be programmed from 5 to 600 seconds (see Menu J – Factory Settings).

Once the selection is made, to leave Menu A, press the MENU key. The Main Menu screen will continue to display other menus. To view any of these menus scroll to the desired menu. Press the ENTER key. If you choose to return to the main screen, press the Esc key.

**7.7 Menu B - Setpoints**

MENU B allows viewing and changing of Setpoints (Service Level password is required for entry)

Press the UP or DOWN key until “B. Setpoint” appears and is highlighted. Press the ENTER key.

Use the UP or DOWN key to scroll through the screens. Menu B has two screens.

The following screen will appear:
This is for the cooling temperature setpoint settings (to control the chilled water valve or compressor capacity):

**NOTE:**
The Temp Setpoint range is from 45.0°F to 105.0°F (factory setting is 72.0°F).
The Temp Deadband range is from 2.0°F to 5.0°F (factory setting is 2.0°F).
Superheat setpoint range is from 5.0°F to 15.0°F (factory setting is 6.0°F).

To change the values press the ENTER key to move the cursor to the desired input (Temp Setpoint). The cursor will flash next to the current entered value.

Press the UP or DOWN key to change the value. Once the value has been changed to the desired value, press the ENTER key. The cursor will move to the next input (Temp Deadband).

Change the value (if required) using the same procedure or press the ENTER key to return the cursor to the top of the screen (it will flash next to the title – Rack Temp Setpoints).

To see the next screen, press the DOWN key.

The following will appear if the fans are controlled based on Rack Temperature (values are for reference only):
This setpoint will control the fan motor modulation.

**NOTE:**
The Temp Setpoint range is from 45.0°F to 105.0°F (factory setting is 72.0°F).
The Temp Deadband range is from 2.0°F to 5.0°F (factory setting is 2.0°F).

To change the values press the ENTER key to move the cursor to the desired input (Temp Setpoint). The cursor will flash next to the current entered value.

Press the UP or DOWN key to change the value. Once the value has been changed to the desired value, press the ENTER key. The cursor will move to the next input (Temp Deadband).

Change the value (if required) using the same procedure or press the ENTER key to return the cursor to the top of the screen (it will flash next to the title – Rack Temp Setpoints).

To see the next screen, press the DOWN key.

The following will appear on the first Menu B screen (values are for reference only):

![Menu B Screen](image)

To see the next screen, press the DOWN key.

The following will appear on the first Menu B screen (values are for reference only):

![Menu B Screen](image)
**NOTE:**

The Hum Setpoint range is from 25% to 70% (factory setting is 50%).
The Hum Deadband range is from 1% to 15% (factory setting is 2%).

Follow the same steps as detailed for Temperature Setpoints to make any desired changes.
To see the next screen, press the DOWN key.

The following will appear on the first Menu B screen (values are for reference only):

Disregard this Menu – it is not applicable to in-row cooling units.
Press the MENU key to return to the Main Menu

**7.8 Menu C – Clock/Scheduler**
Disregard this Menu – it is not applicable to in-row cooling units.

**7.9 Menu D – Input/Output**
This is a view only menu. The values are factory set and only if instructed by Data Aire Engineering or Technical Service personnel should these be changed.

**7.10 Menu E – Historical Data**
Menu allows viewing of alarms, component runtime hours and re-setting of runtimes. Alarms will be displayed by the alarm name and the time/date of occurrence. In addition, it will display the temperature and humidity at the time of the alarm.
The following will appear on the first Menu E screen (values are for reference only):

![Menu E screen](image)

Press ENTER once for the cursor to stay on the “à Scroll Up/Down?” line.

Press the UP or DOWN key to view additional alarms.

Press the ENTER key to return to the title line.

Press the DOWN key to Run Hours and Reset

The following will appear on the first Menu E screen (values are for reference only):

![Run Hours screen](image)

This screen (and the following two screens) gives you the option to reset the runtimes. Press the ENTER key to move the cursor over the No column. Press the UP or DOWN key to change the setting for No to Yes. When changing from No to Yes, the runtime will be erased to 0000.

Press the ENTER key to move the cursor. Follow the same procedure until all desired changes are made. Return the cursor to the title line (at the top of the screen) by pressing the ENTER key.

**NOTE:** This screen and the subsequent two screens will have information not applicable to in-row cooling units.
With the cursor flashing on the title, press the DOWN key to view the next screen.

The following will appear on the second Menu E screen (values are for reference only):

Press the ENTER key to move the cursor. Follow the same procedure until all desired changes are made. Return the cursor to the title line (at the top of the screen) by pressing the ENTER key.

With the cursor flashing on the title, press the DOWN key to view the next screen.

The following will appear on the third Menu E screen (values are for reference only):

Press the ENTER key to move the cursor. Follow the same procedure until all desired changes are made. Return the cursor to the title line (at the top of the screen) by pressing the ENTER key.

You also have the option to reset all runtimes (Screens 1 thru 3) by moving the cursor to “Reset All Runtimes”.

To exit Menu E, with the cursor on the title line, press the MENU key.

Advance to Menu F (Information) by pressing the DOWN key.
7.11 Menu F – Information
This is a view only menu. Menu entry requires a service password to enter.

There are three screens – two with information detailing the processor version and data. The third screen details unit information including model number, serial number and Data Aire job number.

To view the screens, press the DOWN key. The cursor will not move as this is a view only screen. When calling for technical assistance please have the serial number from the Unit Identification screen.

Press the Menu key to exit Menu F

7.12 Menu G – Network Config
This menu allows programming of available protocols. Menu entry requires a service password. This is a factory set menu dependent on whether optional communication cards were ordered.

The following will appear on the screen (values are for reference only):

![BMS Configuration screen](image)

**NOTE:** If N/A has been selected (no communication card ordered), this will be the only screen viewed. If a protocol has been selected, additional screens will appear as detailed.

The following protocols are available:

- MODBUS
- MODBUS EXT (future use)
- LON
- BACnet TCP/IP
- BACnet MSTP

The following screen will appear when MODBUS protocol is selected:
The following screen will appear when LON protocol selected:

The following screen will appear when BACnet TCP/IP protocol is selected:
The following screen will appear when BACnet MSTP protocol is selected:

Press the MENU key to exit Menu I
Press the ENTER key to advance to Menu H – Calibrate Sensors

7.13 Menu H – Calibrate Sensors
Menu H allows calibration of the installed unit sensors (if required). The service level password is required for entry.
Press the ENTER key
The following screens will be displayed (values are for reference only):
The following two displays only show when the IR DX is selected which uses an electronic expansion valve.

For all of the displays above, the cursor will flash by the Offset value. Press the UP or DOWN key to change the Offset value.

An independent calibrated meter should be used to verify the values before changing Offset.

Press the ENTER key. The cursor will advance to the title page. The Offset will be displayed and the Value will automatically change adding or subtracting the Offset.

With cursor on the title, Press the DOWN key to advance to the next screen.

Press the MENU key to exit Menu H – Calibrate Sensors

Press the ENTER to advance to Menu I – Manual Control

7.14 Menu I – Manual Control

Menu I allows manually running different unit components (the Service Level password is required). This menu should be used during service of the unit.

Press the ENTER key.

The following screen will be displayed (values are for reference only):
NOTE: The “Return to Auto” is programmable from 10 to 300 seconds. Once the set time has elapsed the functions will return to normal programmed operation (the default is 60 seconds).

Each component can be manually tested. Press the ENTER key to move the cursor to the selected component. To change from Auto (automatic) to Man (manual) press the DOWN key. To change from OFF to ON press the DOWN key.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

Each component can be manually tested. Press the ENTER key to move the cursor to the selected component. To change from Auto (automatic) to Man (manual) press the DOWN key. To change from OFF to ON press the DOWN key.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.
The following screen will be displayed (values are for reference only):

Each component can be manually tested. Press the ENTER key to move the cursor to the selected component. To change from Auto (automatic) to Man (manual) press the DOWN key. To change from OFF to ON press the DOWN key.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):
Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Screen Display](image)

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Screen Display](image)
Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Image of Analog Output 4]

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only): ⑦

![Image of Analog Output 5]

Press the ENTER key to return to the main Menu.

Press the DOWN key to advance to Menu J – Factory Settings

### 7.15 Menu J – Factory Settings

Menu J is for setting the control to the type equipment and options ordered. **This requires the Factory Level password and entry should be limited to Data Aire factory and service personnel.**

In the main menu screen press the UP or DOWN key until “J. Factory Settings” appears and is highlighted. Press the ENTER key.

The following will be displayed:

⑦ For IR DX only.
7.15.1 IR Chilled Water (CW) Settings

If the unit is shipped from factory as gForce IR CW, the first screen of Menu J will show the following.

**Model:** Must be “gForce IR CW” for the logic to work for IR CW units.

**Screen Flip Display:** Selectable from 3 – 99 seconds

**Temp Units:** Fahrenheit or Celsius

**Out Status:** Allow the unit status to be selectable between: Sys On, Reheat On, Comps On, Hum On or Dehum On

**Fan Type:** Plug Fan or Std On/Off, for gForce units, the fan type is always plug fan

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

**Fan Settings**
- CW Mode: Mod to Rack
- CW Speed: 85%
- DX Mode: Const Speed
- Modulation Min: 72%
- Modulation Max: 85%
Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Image of Compressor Settings screen]

Compressor Settings
Type: None
HP Lockout: None
Delay Btw Stages: 60s

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Image of Reheat Settings screen]

Reheat Settings
Reheat Stages: 1-Elect
Enable SCR Y4: No
Reheat Stages: There is only one stage maximum for GIAX units. There are 3 choices

- 1-Elect: Reheat only comes ON in dehumidification mode (factory default)
- One: Reheat comes on in dehumidification mode and when temperature goes below cooling setpoint minus deadband
- None: Reheat is not available. In this case, dehumidification will not be available.

Enable SCR Y4: Allows Enable/Disable of the SCR control to modulate the reheat. Optional SCR hardware is required.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Water Valve Settings](image1)

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Discharge Air PID](image2)
Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Humidity Settings](image1)

**Temp Sensors Used:** This is the number of rack mounted temperature sensors used. Maximum number is 3 sensors. Default value is 1. This sensor is used to control the fan speed, however, it only control the fan speed when the fan control is set to “Mod to Rack”. Otherwise, the sensor value is only for reference.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Rack Settings](image2)
The **Unit Identification** screen allows changing of the Model Number, Serial Number and the Job Number.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

The **Settings Management** screen allows changing of the language and reset controller settings.

Press the ENTER key to return to the Main Menu.

Press the DOWN key to advance to Menu K – Alarms and Limits
7.15.2 IR Direct Expansion (DX) Settings

If the unit is shipped from factory as gForce IR DX, the first screen of Menu J will show the following.

**Model:** Must be “gForce IR DX” for the logic to work for IR DX units.

**Screen Flip Display:** Selectable from 3 – 99 seconds

**Temp Units:** Fahrenheit or Celsius

**Out Status:** Allow the unit status to be selectable between: Sys On, Reheat On, Comps On, Hum On or Dehum On

**Fan Type:** Plug Fan or Std On/Off, for gForce units, the fan type is always plug fan

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

**12” High T Limit: Yes/No** Only enable this feature for GIAX-035 and GIAX-022 models. This allows the fan speeds to automatically reduce when Return Air is above 90°F.
**Ramp step rate:** The rate at which the fan will change its speed in any modulation mode. The default rate is 0.5% per second and ranges from 0.1% per second to 5% per second. It is recommended to keep the rate of change low to enhance system stability.

**DX Mode:** This is the fan control settings for the unit. There are 6 different modes:

- Const Speed: See section 8.2.1.6.
- BMS Speed: See section 8.2.1.5.
- Mod to Delta T: See section 8.2.1.2.
- Mod to Rack: See section 8.2.1.1.
- Mod to RetT: See section 8.2.1.4.
- Mod to Comp: See section 8.2.1.3.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

**Type:** There are two selections in this mode:

- On/Off Comp: This is used for 12” IRDX
- Variable Comp: This is used for 24” IRDX

**Mode:** This is only available when the type is “Variable Comp”

- Dis T-Variable: See section 8.2.2.2. (factory default)
- D T-Var Latent: see section 8.2.2.3.
- Ret T-Constant: See section 8.2.2.4.
- Ret T-Variable: See section 8.2.2.1.
**Min Run Time:** Determines the compressor minimum run time. This is only used to allow the compressor to stay on for a period of time after turning on to reach temperature setpoint. However, if there is any critical alarms, the compressor will shut down regardless of the minimum run time. Default setting is 8 minutes, adjustable from 1 to 10 minutes.

**HP Lockout:** Counts the number of compressor high head pressure alarms to lockout the compressor. Range is from 2 to 5 times per hour.

**Electronic Valve: One/Two/ None** Enable or disable the use of electronic expansion valve by selecting “One” or “None”. “Two” is for systems with dual compressors.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![PID Controller Screen](image)

**NOTE:** Any changes in this screen might result in system imbalance, only change this when if you are familiar with tuning a PID.

**Band:** Band has the same unit as the setpoint and is tunable in the dap4 controller. Increasing the band makes the system more stable and increases the steady state error. A good start for tuning the band is half of the setpoint. The default value is 40°F (4.44°C).

**Integration Time:** (Ti) Increasing Ti decreases the steady state error; but tends to make the system less stable and increase the overshoot. Therefore, the Band must increase in PI control and as a consequence the response speed will be slower. The default Ti is 50 seconds.

**Derivative Time:** (Td) Derivative is the speed at which the system reacts to a change in output. Increasing Td increases system stability, allowing the other two actions to be increased (with the respective benefits) while maintaining the same stability. Increasing the derivative time reduces the sensitivity to the output change. The default Td is 5 seconds.

**Output period:** Controller response time, default at 500ms.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.
The following screen will be displayed (values are for reference only):

Reheat Stages: There is only one stage maximum for GIAX units. There are 3 choices
  - 1-Elect: Reheat only comes ON in dehumidification mode (factory default)
  - One: Reheat comes on in dehumidification mode and when temperature goes below cooling setpoint minus deadband
  - None: Reheat is not available. In this case, dehumidification will not be available.

Enable SCR Y4: Allows Enable/Disable of the SCR control to modulate the reheat.

Optional SCR hardware is required.

Control: This shows the two different modes for humidity control:
  - Dew Point: Factory default when compressor is controlled by discharge air temperature
  - Relative Humidity: Default when compressor is controlled by return air temperature

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.
The following screen will be displayed (values are for reference only):

**Temp Sensors Used**: This is the number of rack mounted temperature sensors used. Maximum number is 3 sensors. Default value is 1. This sensor is used to control the fan speed, however, it only control the fan speed when the fan control is set to “Mod to Rack”. Otherwise, the sensor value is only for reference.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

**NOTE**: This screen only appears when the "Electronic Valve" is selected as “One” or “Two” in “Compressor Settings” screen.

**Super Heat**: The current value of refrigerant super heat

**Suction Temp**: The current value of refrigerant suction temperature

**Suction Pres**: The current value of refrigerant suction pressure

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.
The following screen will be displayed (values are for reference only):

![Image of Unit Identification screen]

The **Unit Identification** screen allows changing of the Model Number, Serial Number and the Job Number.

Move the cursor to the title block by pressing the ENTER key stepping through all the inputs. To return to the main Menu press the ESC key or to view the following screen press the DOWN key.

The following screen will be displayed (values are for reference only):

![Image of Settings Management screen]

The **Settings Management** screen allows changing of the language and reset controller settings.

Press the ENTER key to return to the Main Menu.

Press the DOWN key to advance to Menu K – Alarms and Limits.
7.16 Menu K – Alarms & Limits
Menu K is for the setting control alarms, limits, alarm enunciation mode, and to configure optional and custom alarms. Requires Service level password.

Press the DOWN key to advance to Menu K – Alarms and Limits

The following screen will be displayed (values are for reference only):

Press the ENTER key to move through the alarm/message inputs.
Press the UP or DOWN keys to change the alarm/message.

The following selections are available:

Audio Mode: None (factory setting)
Full On
Long Beep
Short Beep

Pwr-Up: Auto, No Alarm (factory setting)
Auto, With Alarm
Man, Clr Alarm

Maint Due Msg: None (factory setting)
1 – 1000 hours

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):
Press the ENTER key to move through the alarm/message inputs.

Press the UP or DOWN keys to change the alarm/message.

The following selections are available:

- **Comp Short Cycle:** Yes or No (Yes - factory setting)
- **Floor Water Alarm:** Alarm Only (factory setting)
- **Shutdown Unit**
- **Lockout Comps**
- **Reset Alarm Log:** Yes or No (No – factory setting)
- **Alarm Screen Contact:** No Contact Message (factory setting)
- **Service Company**
- **Maint Engineer**
- **Data Proc Mngr**
- **Custom Message** (factory installed)

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):
Press the ENTER key to move through the alarm/message inputs.
Press the UP or DOWN keys to change the alarm/message.

The following selections are available:

- **No Water Flow Action:** Turn Compressors Off
- **Alarm Only (factory setting)**
- **Wtr Flow Alm Dly:** 5 to 190 seconds (5 - factory setting)
- **Air Flow Alm Dly:** 5 to 180 seconds (5 – factory setting)

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):

![Return Air Alarms Screen](image)

Press the ENTER key to move through the alarm/message inputs.
Press the UP or DOWN keys to change the alarm/message.

The following selections are available:

- **Firestat:** 100 – 150°F (factory setting is 100°F)
- **Hi Temp Alarm:** Yes or No (factory setting is Yes)
- **Set Point:** 70 - 120°F (factory setting is 80°F)
- **Lo Temp Alarm:** Yes or No (factory setting is Yes)
- **Set Point:** 55 - 75°F (factory setting is 60°F)

**NOTE:** If No is selected for the Hi or Low Temp, the setpoint will not be displayed.

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):
Press the ENTER key to move through the alarm/message inputs.

Press the UP or DOWN keys to change the alarm/message.

The following selections are available:

Hi Humidity Alarm: Yes or No (factory setting is Yes)
Set Point: 35 – 90% RH (factory setting is 60%)
Lo Humidity Alarm: Yes or No (factory setting is Yes)
Set Point: 10 – 65% RH (factory setting is 40%)

**NOTE:** If No is selected for the Hi or Low Humidity, the setpoint will not be displayed. Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):
Press the ENTER key to move through the alarm/message inputs.

Press the UP or DOWN keys to change the alarm/message.

The following selections are available:

<table>
<thead>
<tr>
<th>Alarm Number 1</th>
<th></th>
<th>Alarm Number 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SEE TAG INSIDE DOOR</td>
<td>CHECK HUMIDIFIER CYL</td>
<td>SEE TAG INSIDE DOOR</td>
<td>CHECK HUMIDIFIER CYL</td>
</tr>
<tr>
<td>REHEAT INHIBITED</td>
<td>FAN MOTOR OVERLOAD</td>
<td>REHEAT INHIBITED</td>
<td>FAN MOTOR OVERLOAD</td>
</tr>
<tr>
<td>HUMIDIFIER INHIBITED</td>
<td>CUSTOM MESSAGE</td>
<td>HUMIDIFIER INHIBITED</td>
<td>CUSTOM MESSAGE</td>
</tr>
<tr>
<td>REHEAT &amp; HUM INHIBIT</td>
<td>POWER A OPERATING</td>
<td>REHEAT &amp; HUM INHIBIT</td>
<td>POWER A OPERATING</td>
</tr>
<tr>
<td>UNIT IN STBY</td>
<td>POWER B OPERATING</td>
<td>UNIT IN STBY</td>
<td>POWER B OPERATING</td>
</tr>
<tr>
<td>UPS ON-CHK MAIN PWR</td>
<td>POWER A AVAILABLE</td>
<td>UPS ON-CHK MAIN PWR</td>
<td>POWER A AVAILABLE</td>
</tr>
<tr>
<td>STANDBY PUMP ON</td>
<td>POWER B AVAILABLE</td>
<td>STANDBY PUMP ON</td>
<td>POWER B AVAILABLE</td>
</tr>
</tbody>
</table>

**NOTE:** Some alarm messages require optional devices.

Press the ENTER key to move through the alarm/message inputs.
Press the UP or DOWN keys to change the alarm/message.
Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):
Press the ENTER key to move through the alarm/message inputs.

Press the UP or DOWN keys to change the alarm/message.

The following selections are available:

<table>
<thead>
<tr>
<th>Alarm Number 3</th>
<th>SEE TAG INSIDE DOOR</th>
<th>CHECK HUMIDIFIER CYL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REHEAT INHIBITED</td>
<td>FAN MOTOR OVERLOAD</td>
</tr>
<tr>
<td></td>
<td>HUMIDIFIER INHIBITED</td>
<td>CUSTOM MESSAGE</td>
</tr>
<tr>
<td></td>
<td>REHEAT &amp; HUM INHIBIT</td>
<td>POWER A OPERATING</td>
</tr>
<tr>
<td></td>
<td>UNIT IN STBY</td>
<td>POWER B OPERATING</td>
</tr>
<tr>
<td></td>
<td>UPS ON-CHK MAIN PWR</td>
<td>POWER A AVAILABLE</td>
</tr>
<tr>
<td></td>
<td>STANDBY PUMP ON</td>
<td>POWER B AVAILABLE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm Number 4</th>
<th>SEE TAG INSIDE DOOR</th>
<th>CHECK HUMIDIFIER CYL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>REHEAT INHIBITED</td>
<td>FAN MOTOR OVERLOAD</td>
</tr>
<tr>
<td></td>
<td>HUMIDIFIER INHIBITED</td>
<td>CUSTOM MESSAGE</td>
</tr>
<tr>
<td></td>
<td>REHEAT &amp; HUM INHIBIT</td>
<td>POWER A OPERATING</td>
</tr>
<tr>
<td></td>
<td>UNIT IN STBY</td>
<td>POWER B OPERATING</td>
</tr>
<tr>
<td></td>
<td>UPS ON-CHK MAIN PWR</td>
<td>POWER A AVAILABLE</td>
</tr>
<tr>
<td></td>
<td>STANDBY PUMP ON</td>
<td>POWER B AVAILABLE</td>
</tr>
</tbody>
</table>

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):

<table>
<thead>
<tr>
<th></th>
<th>Alarm Output Function 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alarm 1</td>
</tr>
<tr>
<td>CW Sensor</td>
<td>Yes or No</td>
</tr>
<tr>
<td>DA Sensor</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Fan Ovld</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Smoke</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Cond Wtr</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Firestat</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):

<table>
<thead>
<tr>
<th></th>
<th>Alarm Output Function 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alarm 1</td>
</tr>
<tr>
<td>C1 Hi Pr</td>
<td>Yes or No</td>
</tr>
<tr>
<td>C1 Low Pr</td>
<td>Yes or No</td>
</tr>
<tr>
<td>C2 Hi Pr</td>
<td>Yes or No</td>
</tr>
<tr>
<td>C2 Low Pr</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Short Cycl</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Maint Tmr</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>
Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):

<table>
<thead>
<tr>
<th>Alarm Output Function 3</th>
<th>Alarm 1</th>
<th>Alarm 2</th>
<th>Alarm 3</th>
<th>Alarm 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hi Humid</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Low Humid</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Humidifier</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>DA Low T</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>RA Low T</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>RA Hi Temp</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):

<table>
<thead>
<tr>
<th>Alarm Output Function 4</th>
<th>Alarm 1</th>
<th>Alarm 2</th>
<th>Alarm 3</th>
<th>Alarm 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Override</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Air Flow</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Wtr Flow</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Power Up</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Floor Wtr</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Hum Inhbt</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):

<table>
<thead>
<tr>
<th>Alarm Output Function 5</th>
<th>Alarm 1</th>
<th>Alarm 2</th>
<th>Alarm 3</th>
<th>Alarm 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Inhbt</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Filter</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Manl Ovrd</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>Hum Sensor</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>RA Sensor</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td>“See Tag”</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>
Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):

<table>
<thead>
<tr>
<th>Alarm Output Function 6</th>
<th>Alarm 1</th>
<th>Alarm 2</th>
<th>Alarm 3</th>
<th>Alarm 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit Stdby</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td><strong>UPS is On</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td><strong>Stby Pump</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td><strong>Hum Cyl</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td><strong>Cstm Msg 1</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td><strong>Cstm Msg 2</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>

Once the selections have been made, with the cursor on the title line, Press the DOWN key to advance to the next screen.

The following screen will be displayed (values are for reference only):

<table>
<thead>
<tr>
<th>Alarm Output Function 7</th>
<th>Alarm 1</th>
<th>Alarm 2</th>
<th>Alarm 3</th>
<th>Alarm 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cstm Msg 3</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td><strong>Cstm Msg 4</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td><strong>C1 Lockout</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
<tr>
<td><strong>C2 Lockout</strong></td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
<td>Yes or No</td>
</tr>
</tbody>
</table>

Once the selections have been made, with the cursor on the title line, Press the MENU key to return to the Main menu.

### 7.17 Menu L – Configure I/O

Menu L is for setting the control to the type equipment and options ordered. This requires the Factory Level password and entry should be limited to Data Aire factory and service personnel.

See the dap4™ Operation Manual for details – available on the Data Aire website (dataaire.com).

### 7.18 Zone Master

The gForce IR units with optional Zone Master control will be shipped with a supplemental manual detailing programming and individual screens on the dap4™ controller.
8.0 Control Logic

The following describes the implementation of the gForce IR logic with dap4™ controller.

8.1 Chilled Water Units

8.1.1 CW Valve Control

The chilled water valve for the gForce IR is the default to be controlled by discharge air temperature. In this mode the chilled water valve is modulating based on the control loop feedback PI (Proportional Integral loop).

In the dap4™ control Menu J – Factory Settings/Discharge Air PID screen, Band and Integration Time are seen. Band is the inverse of Proportional; the higher the band the slower the valve responds to a change in temperature. Integration Time is the same as the integral term. The higher the Integration Time, the closer the supply temperature will reach setpoint. However, if it is too high it could cause the system to be unstable.

8.1.2 Fan Control Logic

There are six different fan speed mode in CW IR logic:

- Fan Speed Modulation to Rack Temperature
- Fan Speed Modulation Proportional to Chilled Water Valve
- Fan Speed Modulation to Return Air (RA) Temperature
- Fan Speed Modulation for Constant Static Pressure Control
- Fan Speed Modulation based on BMS Command
- Constant Fan Speed

8.1.2.1 Fan Speed Modulation to Rack Temperature (Mod to Rack):

The gForce Chilled Water IR is factory programmed with Modulation to Rack Temperature “Mod to Rack” mode on the chilled water fan mode selection (Menu J – Factory Settings). “Mod to Rack” is the default control logic.

In this mode, the fans will be controlled based on the maximum rack temperature. A single sensor is standard. Two additional sensors are available as an option. If additional sensors are installed, the control logic will be based on the highest value.

The fan will operate on rack air SP (Setpoint) and DB (Deadband) as follows:

- When the Maximum Rack Temperature is increasing:

  If the Maximum Rack Temperature is greater than the Rack Temperature SP plus the (DB), the fans will start to ramp up from minimum allowable speed (56%).

  If the Maximum Rack Temperature is greater than or equal to Rack Temperature SP plus DB plus 1°F, the fans will run at maximum speed (100%).

- When the Maximum Rack Temperature is decreasing:

  If the Maximum Rack Temperature is less than the Rack Temperature SP plus 1°F, the fans will start to ramp down from allowable speed.

  If the Maximum Rack temperature is less than or equal to Rack Temperature SP, the fans will run at minimum speed (56%).

There are other selections available. These can be used to customize the unit to individual choices.
8.1.2.2 Fan Speed Modulation Proportional to Chilled Water Valve:

The CW Valve Action is an optional setting in which the chilled water valve opens and closes, and the fan speed modulates proportionally based on the CW valve action.

8.1.2.3 Fan Speed Modulation to Return Air (RA) Temperature (Mod to RetT):

The dap4™ controller is set for fan speed control based on Return Air (RA) temperature. As the RA temperature rises, the fan will start at the minimum speed and increase by 10% for every 0.1 degree F above RA Temp setpoint plus RA Temp deadband. This feature is only available on CW equipment and requires an optional return air temperature sensor.

8.1.2.4 Fan Speed Modulation for Constant Static Pressure Control:

An optional setting in which the fan proportionally increases or decreases the speed to maintain a constant static pressure set-point in the controlled space. This feature requires an optional differential pressure transmitter to measure and control the static pressure of the controlled space.

8.1.2.5 Fan Speed Modulation Based on BMS (BMS) Command:

An optional setting in which the fan speed is completely controlled by the BMS. The dap4™ controller will change (normally increase) the fan speed during humidification and dehumidification cycles but other than these cycles, the BMS controls the fan speed.

8.1.2.6 Constant Fan Speed (Const Speed):

In this mode, the fan speed can be set at the required speed and remains fixed at that speed. Field adjustment is available via the front display panel and can be manually adjusted.

8.2 Direct Expansion Units

The control logic for the gForce DX IR unit is similar to the control logic for a chilled water IR unit in which the fans are controlled by Rack Temperature and Cooling function (variable capacity compressor) is controlled by Supply Temperature via PID loop as the default setting.
8.2.1 Fan Control Logic

There are six different fan speed mode in DX IR logic:
- Fan Speed Modulation to Rack Temperature
- Fan Speed Modulation based on Delta-T
- Fan Speed Modulation Proportional to Cooling Demand
- Fan Speed Modulation to Return Air (RA) Temperature
- Fan Speed Modulation based on BMS Command
- Constant Fan Speed

8.2.1.1 Fan Speed Modulation to Rack Temperature (Mod to Rack):

This fan mode logic is identical to Chilled Water’s mod to rack logic 8.1.2.1. The fan modulates to rack temperature to control DX fan speed.

8.2.1.2 Fan Speed Modulation Based on Delta-T (Mod to DeltaT):

In this mode, the fan speed modulates to maintain a constant delta-T across the unit. The delta-T is calculated as the Return Air (RA) temperature minus the Discharge Air (DA) temperature. A PID loop is used to control the fan speed. As the delta-T increases, the fan speed runs slower. The delta-T setpoint ranges from 10°F to 40°F (-12.2°C to 4.4°C). If the delta-T decreases lower than 5°F, then the fans run at minimum speed until the delta-T increase to more than 5°F.

8.2.1.3 Fan Speed Modulation Proportional to Cooling Demand (Mod to Comp):

Proportional fan speed control is based on the cooling demand. The fan speed ranges from 80% to 100% of fans total capacity and a minimum fan speed is as low as 70% of the maximum fan speed. When the fans start, they operate at the minimum fan speed. As the compressor modulates from minimum to maximum speed, the fan speed will modulate proportionally to the compressor VFD between the minimum fan speed setpoint to the maximum fan speed setpoint. The fans will operate at the maximum fan speed when reheat or humidification is required.

8.2.1.4 Fan Speed Modulation to Return Air (RA) Temperature (Mod to RetT):

This fan mode logic is identical to the Chilled Water “Mod to Ret Air” logic 8.1.2.3. The fans modulate based on return temperature to control DX fan speed.

8.2.1.5 Fan Speed Modulation based on BMS (BMS) Command:

In this mode, the controller allows the BMS to change the constant fan speed mode of the fans from 70% to 100%. The fans will run at a constant speed in this mode. When the fans start, they will operate at the front panel’s programmed constant fan speed then it will modulate to the BMS programmed fan speed when a network communication with a BMS is established.

If the reheat or humidifier is required, the maximum fan speed setting is used. If reheat or humidifier is required while the fan speed is commanded by the BMS to a value that is lower than the maximum fan speed, the fan speed will automatically increase to the maximum speed. The fan speed will revert to the BMS programmed fan speed when reheat or humidification is no longer needed.
8.2.1.6 Constant Fan Speed (Const Speed):

In this mode, the fan speed can be set at the required speed and remains fixed at that speed. Field adjustment is available via the front display panel and can be manually adjusted via the “Constant Fan Speed” menu. This value is adjustable from 70% to 100%, which results in an analog output of 7 VDC to 10 VDC. In this mode, the fans will start and operate at this constant design fan speed all the time.

8.2.2 Compressor

The DX IR is equipped with the following compressors based on cabinet width and capacity:

- 12” cabinet width (10 & 20 kW) = (1) Fixed Speed Compressor
- 24” cabinet width (22 & 35 kW) = (1) Variable Speed Compressor

The units with a variable speed compressor can be controlled in three (3) methods:

- Return Air (RA) Temperature Control
- Discharge Air (DA) Temperature Control
- Discharge Air (DA) Temperature Control with Latent Control
- Constant Speed Control

8.2.2.1 Return Air (RA) Temperature Control (Ret T-Variable):

When cooling is required, the compressor will turn ON and starts to modulate. If the return air temperature is rising and greater than or equal to RA setpoint plus RA deadband, then the compressor will run at minimum speed (56%). As the RA temperature continues to rise, the compressor speed is increased by 10% for every 0.1°F up to 100% compressor speed (factory default).

If the return air temperature is decreasing and less than RA setpoint plus 10°F, then the compressor will run at maximum speed (100%). As the RA temperature decreases the compressor speed will decrease by 10% for every 0.1°F until minimum speed (56%) is reached.

8.2.2.2 Discharge Air Temperature (DA) Control (Dis T-Variable):

When this mode is chosen, the compressor turns ON when the discharge air temperature is above setpoint plus deadband and a PID loop is used to control the compressor speed based on DA temperature. When the DA temperature is below setpoint minus deadband, the compressor is turned OFF.

The PID logic uses only the P and I functions. The default values are:

- Band = 58.0
- Integration Time = 110 seconds

8.2.2.3 Discharge Air Temperature (DA) Control with Latent (Dis T-Var Latent):

The compressor speed is controlled by Discharge Air (DA) temperature with the addition that the temperature setpoint can be automatically raised to prevent water carry-over from the cooling coil.

8.2.2.4 Constant Speed Control (Ret T-Constant):

When the return air temperature is above setpoint plus deadband, the compressor will turn ON and run at the Constant Compressor Speed setpoint. The Constant Compressor Speed is field adjustment via the front display panel and can be manually adjusted via the “Constant Compressor Speed” menu. The constant compressor speed range is between 1800 and 5400 RPM.
9.0 REGULAR MAINTENANCE ITEMS

9.1 Air Filters
The unit is equipped with deep pleated 2 inch filters rated MERV 8 following ASHRAE 52.2 (30% by ASHRAE 52.1), located within the cabinet and accessible from the rear of the unit (facing the hot aisle). A filter clog alarm is included. There is a hinged access door for easy access. The filters are easily removed for maintenance.

<table>
<thead>
<tr>
<th>Filter Sizes (MERV 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GICW-060XX</td>
</tr>
<tr>
<td>20” x 25” x 2”</td>
</tr>
<tr>
<td>GICW-030XX</td>
</tr>
<tr>
<td>16” x 20” x 2”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>GIXX-035XX</td>
</tr>
<tr>
<td>20” x 25” x 2”</td>
</tr>
<tr>
<td>GIXX-022XX</td>
</tr>
<tr>
<td>20” x 25” x 2”</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>GIXX-020XX</td>
</tr>
<tr>
<td>20” x 20” x 2”</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Air filters should be checked on a regular basis and changed when they become dirty. This will ensure efficient operation of the unit. Spare air filters should be kept in stock as these tend to be a frequently replaced maintenance item. Air filters may require changing as often as monthly dependent on room or space conditions. New installations with construction dust will quickly clog filters requiring new filters.

The dap4™ control panel monitors the air filters status. A dirty filter alarm will be enunciated on the controls display screen. Although the unit may display a dirty filter alarm, this should not be relied on as the only determinant for replacing air filters. A misadjusted air filter differential pressure switch may not give a proper indication of a clogged filter.

To check the air filter pressure differential pressure switch for proper adjustment, temporarily cover approximately 75% of the return air opening using heavy cardboard or similar material. The alarm should energize when 75% of the air is blocked, simulating dirty filters. If the alarm energizes prematurely or does not energize at all, the pressure switch should be adjusted. All side panels must remain closed when determining if an adjustment is necessary.

**WARNING:** Air filters that require changing can restrict airflow and create problems such as coil icing or poor air distribution.

9.2 Fuses
Fuses may occasionally require changing especially with installations where the voltage is not consistent. Drops in voltage can create brief periods of high amp draw, causing fuses to blow. Always replace fuses with those of the equivalent rating with regard to: 1) amperage, 2) voltage, and 3) speed. For instance motors are inductive loads which require time delay fuses. Electric reheat and humidifiers are resistive loads requiring fast acting fuses.

9.3 Electric Reheat (Optional)
The reheat elements are of the nichrome wire type and are installed on each fan inlet. The elements are set up in a single stage so that they function together. When there is a call for reheat or an alarm, all elements will react together. The reheat is capable of maintaining room dry bulb conditions when the system is calling for dehumidification. Each element includes two safety switches to protect the system from overheating:
• Auto-resetting switch (Cuts out at 110°F and Cuts in at 90°F)
• Single-blow switch (165°F) – MUST BE REPLACED IF TRIPPED

Heating elements do not normally require maintenance. However, they may accumulate a film of dust or dirt when unused for extended periods of time. When energized, the burning debris can create smoke or an unpleasant odor. To help avoid a problem, periodic cleaning is recommended.

9.4 Humidifier Canisters (Optional)
The optional steam generator type humidifier does not require maintenance other than to replace the canister as required. The frequency of change will depend on usage and water type. A set of the humidifier manufacturer’s instructions is included with the paperwork placed inside the unit when it ships.

9.5 Refrigerant Filter Drier
Factory installed refrigerant filter driers do not normally require maintenance. When replacing compressors or other repairs that open the refrigeration system to atmosphere, it is advisable to replace the filter drier. The equivalent type and size should be used.

9.6 Plug Fans
Maintenance is not required on EC motor/plug fan modules. The motors are sealed, have maintenance free ball bearings and permanent lubrication. The only acceptable service is replacement.

9.6.1 Electronically Commutated Motors
Electronically Commutated (EC) motors with “plug fans” are standard on all gForce IR units.

NOTE: The plug fan modules are powered by high voltage input line power (i.e. 208-230V/3PH/60HZ or 460V/3PH/60HZ).

EC motors have built in protective features that include the following:
• Over-Temperature protection of the (motor) electronics,
• Over-Temperature protection of the motor,
• Locked rotor protection,
• Phase failure protection,
• Under voltage detection,
• Short circuit protection.

If any of the conditions exist, the motor stops electronically and an alarm (FAN FAILURE) will be indicated on the unit’s controller screen. The remaining motors will increase in speed trying to maintain the units CFM (airflow).

The motor will not start-up automatically. To reset, the power supply must be switched to OFF for a minimum of twenty (20) seconds.

If for any reason the rotor is blocked, the motor will electronically switch off. Before looking for blockage make certain to remove power from the unit. Once the blockage is cleared the motor will automatically restart when powered on.

If there is an alarm condition indicated as “NO AIRFLOW”, all active functions (cooling, heating and humidification will stop until the alarm is cleared.
EC motors have an under voltage protection. If the power supply voltage falls below 150 VAC/3Ø (for 230 volt motors) 290 VAC/3Ø (for 460 motors) for a minimum of five (5) seconds, the motor will automatically switch off and an alarm condition (NO AIRFLOW) will be energized and displayed. If the power supply voltage returns to the correct values, the motor will automatically restart.

Note: The unit’s control panel (dap4™) has a time delay before the NO AIRFLOW alarm is energized. It is adjustable from 5 to 180 seconds (in 5 second increments). On site where a voltage problem is known to exist, the delay can be adjusted to eliminate “nuisance” alarms until the problem is corrected.

9.6.2 TESTING

To test the plug fan modules in manual mode, wire a 9 volt battery across the plug fan control signal (see schematic for wiring details). Be certain to disconnect both terminals (+ and -) from the analog output. This will enable the fan control signal at approximately 90%. The fans will spin at near full speed if the contactors are enabled.
10.0 CONTACT DATA AIRE

Address: Data Aire, Inc.
230 West BlueRidge Avenue
Orange, CA 92865

Telephone: 714-921-6000
800-347-AIRE (2473) Toll Free

E-mail: Service@dataaire.com
Engineering@dataaire.com
Sales@dataaire.com

Fax: 714-921-6010 Main
714-921-6011 Engineering
714-921-6022 Parts Sales

Web Site: www.dataaire.com

Job/Unit Information:

Data Aire Job Number: ________________________________

Evaporator Serial Number: ________________________________

Evaporator Model Number: ________________________________

Condenser/Fluid Cooler Serial Number: ______________________

Condenser/Fluid Cooler Model Number: _____________________

Date installed: _______ / _____ / 20 _____

Installing Contractor ______________________
## MAINTENANCE/INSPECTION CHECKLIST

<table>
<thead>
<tr>
<th>MAINTENANCE/INSPECTION CHECKLIST (Quarterly)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaporator Model No.:</td>
</tr>
<tr>
<td>Technician:</td>
</tr>
<tr>
<td>Temperature/Humidity set at</td>
</tr>
<tr>
<td>Air Filters</td>
</tr>
<tr>
<td>___ Inspect and replace (if required)</td>
</tr>
<tr>
<td>___ Inspect grille area and ensure unrestricted</td>
</tr>
<tr>
<td>Electrical Section</td>
</tr>
<tr>
<td>___ Inspect fuses</td>
</tr>
<tr>
<td>___ Inspect/tighten all wire connections</td>
</tr>
<tr>
<td>___ Inspect contactor operation</td>
</tr>
<tr>
<td>___ Check operation sequence</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>EC Plug Fan Section:</td>
</tr>
<tr>
<td>___ Check plug fan wheel movement to be free and clear of any debris</td>
</tr>
<tr>
<td>___ Check motor voltage</td>
</tr>
<tr>
<td>Fan number 1  L1 ____ V  L2 ____ V  L3 ____ V  L1 ____ A  L2 ____ A  L3 ____ A</td>
</tr>
<tr>
<td>Fan number 2  L1 ____ V  L2 ____ V  L3 ____ V  L1 ____ A  L2 ____ A  L3 ____ A</td>
</tr>
<tr>
<td>Fan number 3  L1 ____ V  L2 ____ V  L3 ____ V  L1 ____ A  L2 ____ A  L3 ____ A</td>
</tr>
<tr>
<td>Fan number 4  L1 ____ V  L2 ____ V  L3 ____ V  L1 ____ A  L2 ____ A  L3 ____ A</td>
</tr>
<tr>
<td>Fan number 5  L1 ____ V  L2 ____ V  L3 ____ V  L1 ____ A  L2 ____ A  L3 ____ A</td>
</tr>
<tr>
<td>Fan number 6  L1 ____ V  L2 ____ V  L3 ____ V  L1 ____ A  L2 ____ A  L3 ____ A</td>
</tr>
<tr>
<td>___ Check fan wheel speed (RPM)</td>
</tr>
<tr>
<td>Fan 1_____   Fan 2_____   Fan 3_____   Fan 4_____   Fan 5_____   Fan 6_____</td>
</tr>
<tr>
<td>Humidifier (Steam Generator) is equipped</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td>___ Inspect drain valve/trap/drain line</td>
</tr>
<tr>
<td>___ Check for leaks (make-up water/hoses)</td>
</tr>
<tr>
<td>___ Check humidifier canister (replace if needed)</td>
</tr>
<tr>
<td>___ Check and clean fill strainer</td>
</tr>
<tr>
<td>___ Check operation</td>
</tr>
<tr>
<td>___ Record humidifier amp draw L1 L2 L3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>___ Inspect element (and clean if required)</td>
</tr>
<tr>
<td>___ Check wiring</td>
</tr>
<tr>
<td>___ Record amps _____ A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Refrigeration Piping</th>
</tr>
</thead>
<tbody>
<tr>
<td>___ Check for lines (leaks/lines secure)</td>
</tr>
<tr>
<td>___ Check capillary lines</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condensers (Water-Cooled)</th>
</tr>
</thead>
<tbody>
<tr>
<td>___ Check for leaks</td>
</tr>
<tr>
<td>___ Entering/leaving water temperatures</td>
</tr>
</tbody>
</table>
## MAINTENANCE/INSPECTION CHECKLIST (Quarterly)

<table>
<thead>
<tr>
<th>Compressor</th>
<th>Condensate Pan and Pump (if equipped)</th>
<th>Air Cooled Condenser (if applicable)</th>
<th>Dry Cooler (if applicable)</th>
<th>Glycol Pump (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>___ Check for oil leaks</td>
<td>___ Check for leaks</td>
<td>___ Inspect coil/clean if required</td>
<td>___ Inspect coil/clean if required</td>
<td>___ Glycol leaks (pump area)</td>
</tr>
<tr>
<td>___ Check compressor mounting</td>
<td>___ Check for debris</td>
<td>___ Inspect motor/motor mounts</td>
<td>___ Inspect motor/motor mounts</td>
<td>___ Pump operation</td>
</tr>
<tr>
<td>___ Inspect wire connection</td>
<td>___ Inspect/check float operation</td>
<td>___ Inspect fan blade(s)</td>
<td>___ Inspect fan blade(s)</td>
<td>___ Auto air vent clean of mineral deposits</td>
</tr>
<tr>
<td>___ Record suction pressure ___ PSIG</td>
<td>___ Record discharge pressure ___ PSIG</td>
<td>___ Check wiring</td>
<td>___ Check wiring</td>
<td></td>
</tr>
<tr>
<td>___ Record discharge pressure ___ PSIG</td>
<td>___ Record superheat ___ °F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ Record superheat ___ °F</td>
<td>___ Record sub-cooling ___ °F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ Check high pressure cut-out ___ PSIG</td>
<td>___ Check low pressure cut-in ___ PSIG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ Check low pressure cut-out ___ PSIG</td>
<td>___ Check low pressure cut-out ___ PSIG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ Record compressor amp draw L1 L2 L3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MAINTENANCE/INSPECTION CHECKLIST (Quarterly)

Equipment Runtimes

- Blower
- Compressor
- Condenser
- Reheat (if equipped)
- Humidifier (if equipped)
- Dehumidification

_______ Reset all to zero runtimes
_______ hrs
_______ hrs
_______ hrs
_______ hrs
_______ hrs
_______ hrs