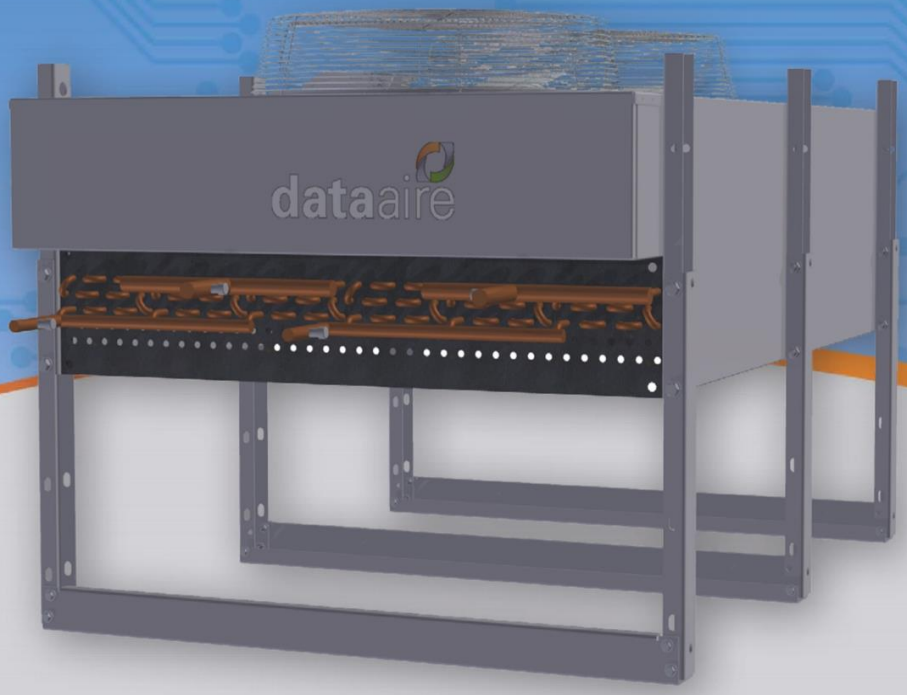
Air Cooled Condensers

Installation, Operation & Maintenance Manual



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dataaire
Precise by Design

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.

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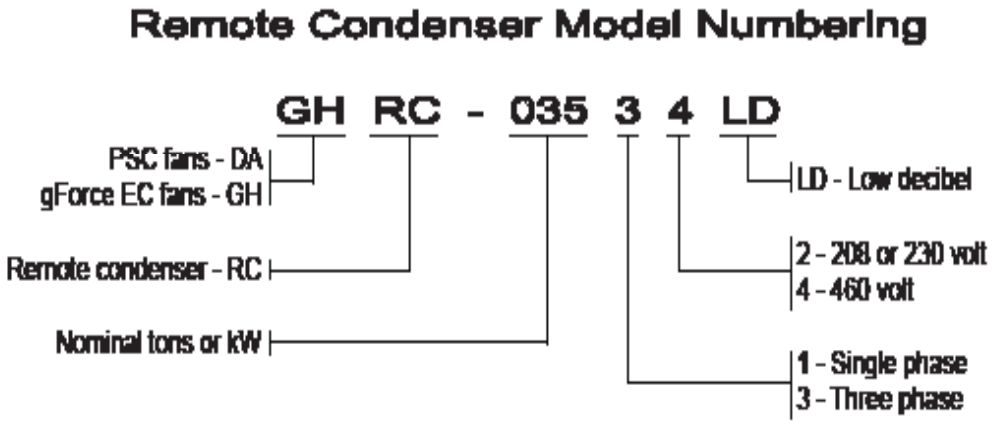
1.0 INTRODUCTION

The Data Aire air-cooled condenser is low-profile direct-drive propeller or axial fan-type heat exchanger unit suitable for mounting outdoors. It provides for the heat rejection of either one or two separate refrigeration circuits, matching heat rejection capacity varying with the outdoor ambient temperatures and with each corresponding compressors heat rejection requirements. Constructed with an aluminum cabinet and a copper-tube aluminum fin coil, the unit is quiet and corrosion resistant. The condenser is quickly and easily installed, because all internal wiring is completed at the factory with only electrical connections to be made at the job site. All electrical connections and controls are enclosed in an integral weatherproof electrical control section of the condenser.



1.1 Model Identification

1.2 Inspection

This Data Aire unit has been factory run tested and has passed a comprehensive inspection prior to packaging and shipment ensuring 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 remote control panels, disconnect switch handles or other items are packed inside the unit. Refer to the yellow shipping tag located on the door for details.

NOTE: Freight damage claims are the responsibility of the purchaser. Action to recover losses should be filed immediately. Please notify factory personnel of any claims.

1.3 Paperwork

Each Data Aire unit ships with a start-up sheet that should be completed during installation. Return the completed startup sheet to the factory to validate the warranty. Also included in the paperwork is a warranty/information packet that provides important wiring diagrams, specific component literature, warranty registration cards and other valuable paperwork including a copy of this Installation, Operation and Maintenance Manual (IOM). A yellow tag is attached to the outside panel to indicate articles that may have been packaged and shipped loose within the unit that are not factory mounted.

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.

WARNING: This equipment may contain substance that has been deemed harmful to public health and the environment. Venting of refrigerants to the atmosphere is illegal. Refrigerant recovery devices must be used when installing and/or servicing these types of products.

1.4 Storage

Data Aire equipment comes ready for immediate installation. However, 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 freezing temperatures, protected from damage by other equipment in storage, or transportation equipment. Avoid stacking and 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 the 25 PSIG) inert gas, such 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 damaged components, if required. All moving parts should be hand tested to ensure they are free and clear prior to start-up.

1.5 Locating the remote heat exchanger

Remote air-cooled condensers (i.e., heat exchangers) should be located in secure areas where service is easily accessible. Areas where public access is available should be avoided. Avoid areas that contribute to ice and snow accumulation. The condenser may need to be elevated to ensure it is above the snow line in certain regions of the country. Condensers should be located in clean areas free from debris or foreign matter that could block the coil surface. Avoid areas of hot air or fume exhaust. Condensers should not be located near steam vents.

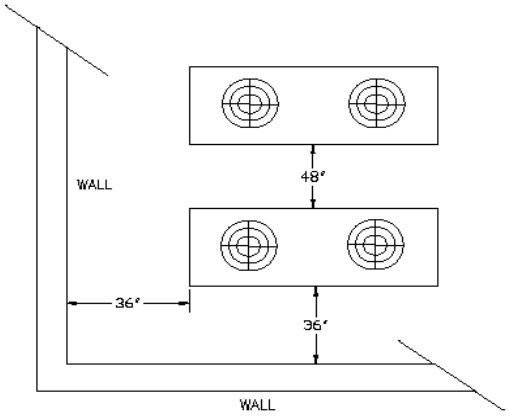


Figure 1

Condensers should not be closer than 36 inches from a wall or any obstruction. With proper clearance on all other sides units can be placed side by side. Additional units should be placed no closer than 48 inches apart, see Figure 1. Avoid air recirculation conditions that could be caused by walls, screening, etc. Do not connect ductwork to the coil inlet or fan outlet. Keep fan discharge away from building air intakes.

The remote heat exchanger must be located in an area that will ensure airflow into and out of the heat exchanger plus adequate service access clearance. Short circuiting of the airflow or the intake of warmer air from another unit will seriously degrade the performance of the air-cooled heat exchanger.

Do not locate the heat exchanger in a location that is bordered by tall obstructions (i.e. higher than 10 feet) on no more than two sides. See Figure 1 for minimum clearance from obstructions and between units. With proper clearance on all sides, two units can be placed side by side. Additional units should be placed at least 48 inches apart.

Noise factors should be considered when locating an air-cooled heat exchanger. Proximity to windows, walls and surrounding structures can cause objections by the occupants. An acoustical expert should be consulted when noise is of a particular concern.

Avoid installing units near occupied spaces, above or outside utility spaces and corridors whenever possible in order to reduce sound transmission and/or vibration to occupied spaces. Refrigerant piping should be flexible enough to prevent transmission noise or vibration from the unit. Isolation hangers should be used to prevent the transmission of vibration on all suspended (from the building) refrigerant lines.

Air-cooled condensers should be placed at a level that is higher than the indoor evaporator. It is not recommended to mount the condenser more than 10 feet below the evaporator. Excessive liquid line pressure drop can cause poor evaporator performance.

1.6 Leg Assembly

The legs must be unbolted from their collapsed shipping position and extended prior to placing the unit on its pad. Each leg extends down approximately 18” and reattaches using the same bolts.

NOTE: Failure to extend the legs will result in poor air distribution over the cooling coil resulting in significant capacity reduction and system failure.

Concrete pads are often used to provide support for the heat exchanger when set on the ground. Bolt holes in the bottom of each leg can be used to anchor the unit. Units mounted on the roof should be placed on rails designed to distribute the unit weight. Standard practices and local codes should be followed in either instance.

1.7 Rigging

Outdoor condensers should be moved to their mounting location (typically rooftop) using a crane or fork lift. Each fan section has heavy gage, steel leg supports with lifting holes at the top.

Do not lift with a choke sling around the unit. Spreader bars are recommended for lifting multiple fan units (See Figure 2). Under no circumstances should the coil headers or piping be used for lifting the unit. Ideally, the unit should be kept in its shipping crate until it is ready to be set in place.

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.

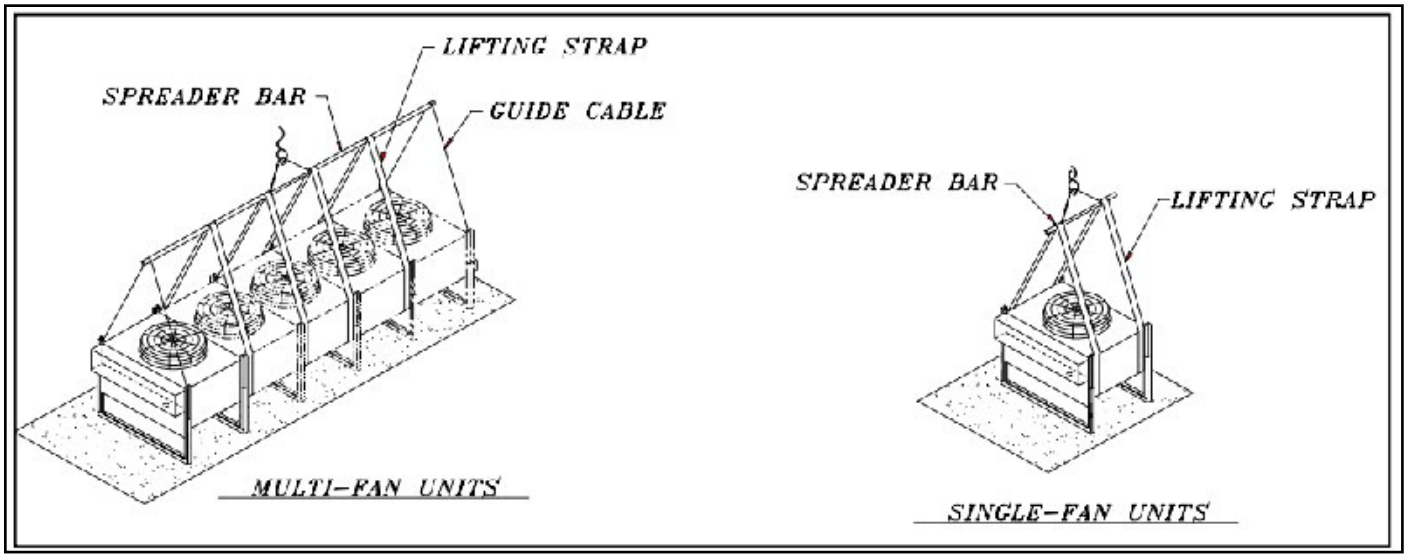


Figure 2

1.8 Installation

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

1.8.1 Installation Checklist

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

- Check for any damage
- Check all wiring connections

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.

Only qualified and experienced service technicians should perform installation and maintenance on this product. Equipment damage and personal injury can result from improper piping installation, leak checking and improper handling.

This equipment is designed to operate properly and produce rated capacities when installed in accordance with industry standards. Failure to meet the following conditions could result in voiding the warranty:

- System piping must be installed following industry standards for good piping practices
- System must be thoroughly leak checked before initial charging
- System power supply must meet voltage tolerance (see section 3.4)
- All controls and safety devices properly connected per wiring diagram
- Factory installed wiring must not be changed without written factory approval

Additionally, the refrigerant piping must comply with local code. After piping is completed all joints (and connections) should be leak tested.

2.0 Piping

Refer to the Line Size chart (7.0 LINE SIZES) for a guideline to sizing refrigerant lines. The ultimate responsibility for line size selection is that of the installing contractor or project engineer. Data Aire does not assume this responsibility. The chart covers distances up to 200 equivalent feet. For installations greater than this distance refer to ASHRAE or similar references.

Note: Standard piping practice must be used to ensure proper oil return and efficient operation. The interconnecting lines to the remote air-cooled condenser must be installed by a qualified refrigeration mechanic.

- Only use refrigerant grade copper tubing (ACR[1] preferred)
- Soft solder joints are not acceptable
- Purge dry nitrogen through the lines while brazing
- Do not leave dehydrated piping or components open to atmosphere any longer than is required

Welded or sweat joints should be used. Piping must be supported within 18 inches of the inlet and outlet connections on the units.

2.1 Discharge Lines

Discharge lines (also called hot gas lines) should be trapped at the top (inverted) and the bottom. In addition, a trap should be installed for every 15 to 20 feet of vertical rise. Discharge line check valves are highly recommended on all installations. Check valves should be installed 6 to 10 feet from the compressor. See Figure 3

Proper design will minimize refrigerant pressure drop and will maintain sufficient gas velocity to carry oil through the condenser. Discharge line pressure drop should not exceed 6 PSI. 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).

2.2 Liquid Lines

Liquid line size is determined by pressure drop and velocity. The liquid line pressure drop for R-407C should not exceed 5 PSI (35 kPa) or 9 PSI (62 kPa) for R-410A. The recommended liquid velocity should be between 200 and 300 FPM (1 to 1.5 m/sec). 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.

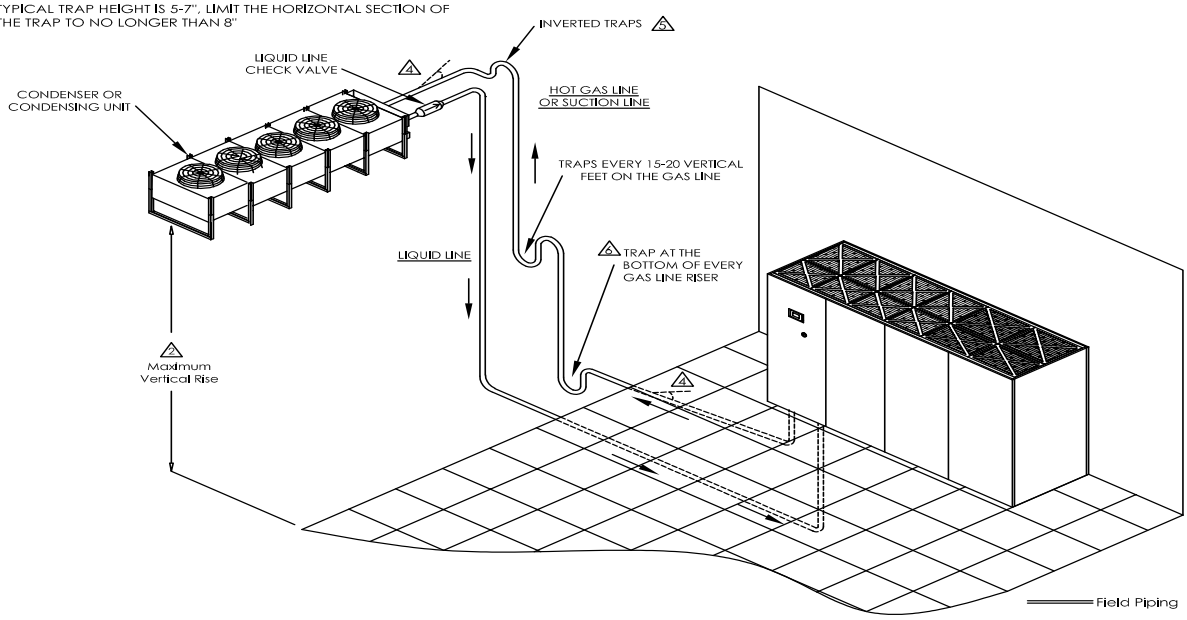
1 The American refrigeration industry uses different copper pipe call ACR (air conditioning and refrigeration field services) pipe, which is sized directly by its outside diameter (OD) and a type letter indicating wall thickness. ACR pipe is manufactured without processing oils that would be incompatible with the oils used to lubricate the compressors in the HVAC system

2.3 Field Piping, Remote Condenser Above Evaporator

Figure 3

NOTES:

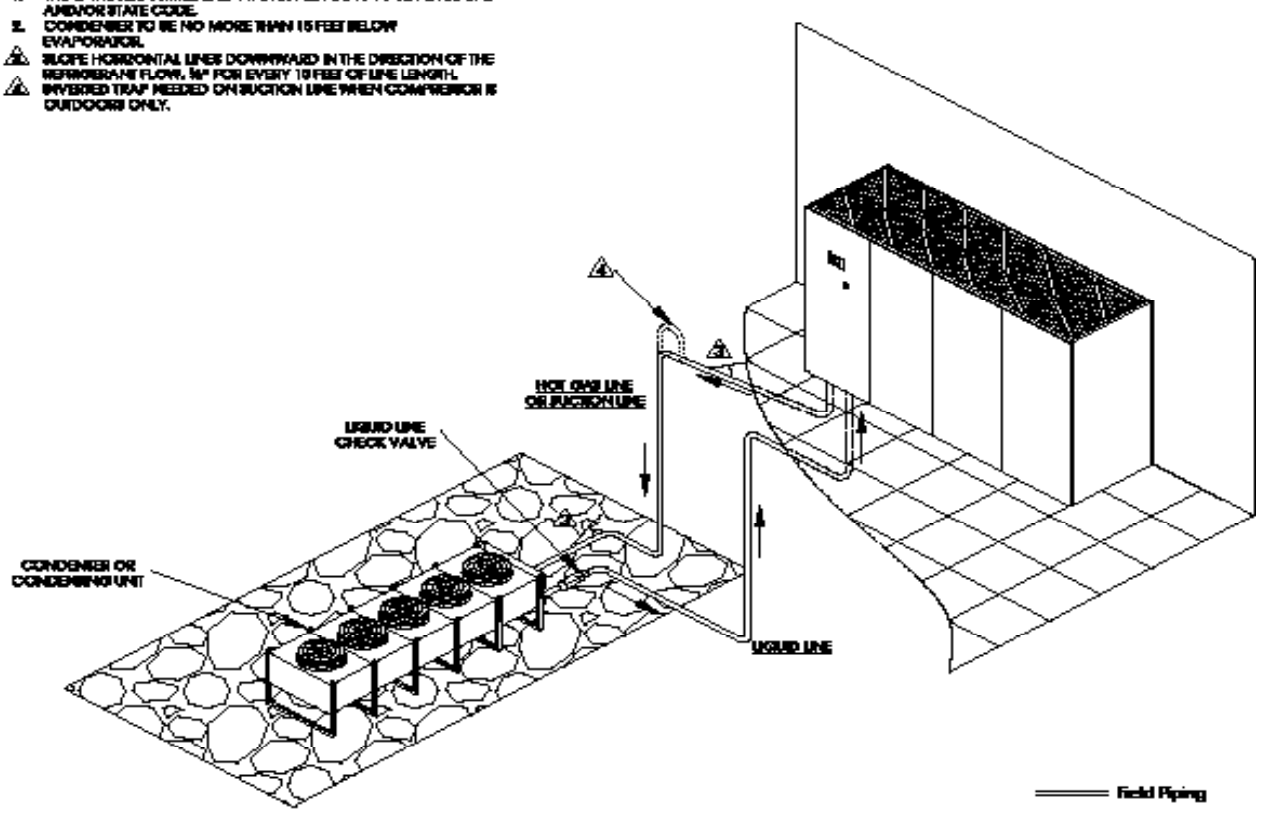
1. THIS IS THE RECOMMENDED PIPING. ALL PIPING TO BE PER LOCAL AND/OR STATE CODE.
2. CONDENSER TO BE NO MORE THAN 60 FEET ABOVE EVAPORATOR.
3. FOR UNITS BUILT AFTER APRIL 2017, THE CHECK VALVES ARE INCLUDED INTERNALLY IN THE EVAPORATOR SECTION.
4. SLOPE HORIZONTAL LINES DOWNWARD IN THE DIRECTION OF THE REFRIGERANT FLOW, ½" FOR EVERY 10 FEET OF LINE LENGTH.
5. INVERTED TRAP TO EXTEND 8" ABOVE THE BOTTOM OF THE CONDENSER COIL. ADDITIONALLY, INVERTED TRAPS ARE NEEDED AT THE TOP OF EVERY GAS LINE RISER.
6. TYPICAL TRAP HEIGHT IS 5-7", LIMIT THE HORIZONTAL SECTION OF THE TRAP TO NO LONGER THAN 8"



2.4 Field Piping, Remote Condenser 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, ½" FOR EVERY 10 FEET OF LINE LENGTH.
4. INVERTED TRAP NEEDED ON SUCTION LINE WHEN COMPRESSOR IS OUTDOORS ONLY.



Note: Field connections at the indoor evaporator section and remote condenser will not necessarily be the same as the field pipe size required. These could vary significantly.

2.5 Condenser Connection Sizes

CONDENSER CONNECTION SIZES – Single Circuit					
Standard Fans	**Discharge (Hot Gas) Line**	**Liquid Line**	**EC Fans**	**Discharge (Hot Gas) Line**	**Liquid Line**
DARC 03	1/2”	1/2”	GHRC 011	1/2”	1/2”
DARC 05	1/2”	1/2”	GHRC 018	1/2”	1/2”
DARC 07	1-1/8”	7/8”	GHRC 025	1-1/8”	7/8”
DARC 09	1-1/8”	7/8”	GHRC 032	1-1/8”	7/8”
DARC 11	1-1/8”	7/8”	GHRC 039	1-1/8”	7/8”
DARC 15	1-1/8”	7/8”	GHRC 053	1-1/8”	7/8”
DARC 17	1-3/8”	7/8”	GHRC 060	1-3/8”	7/8”
DARC 21	1-3/8”	7/8”	GHRC 074	1-3/8”	7/8”

CONDENSER CONNECTION SIZES – Dual Circuit					
Standard Fans	Discharge (Hot Gas) Line	Liquid Line	EC Fan(s)	Discharge (Hot Gas) Line	Liquid Line
DARC 07	1-1/8”	7/8”	GHRC 025	1-1/8”	7/8”
DARC 09	1-1/8”	7/8”	GHRC 032	1-1/8”	7/8”
DARC 11	1-1/8”	7/8”	GHRC 039	1-1/8”	7/8”
DARC 15	1-1/8”	7/8”	GHRC 053	1-1/8”	7/8”
DARC 17	1-3/8”	7/8”	GHRC 060	1-3/8”	7/8”
DARC 21	1-3/8”	7/8”	GHRC 074	1-3/8”	7/8”
DARC 24	1-3/8”	7/8”	GHRC 084	1-3/8”	7/8”
DARC 28	1-3/8”	7/8”	GHRC 099	1-3/8”	7/8”
DARC 30	1-3/8”	7/8”	GHRC 106	1-3/8”	7/8”
DARC 37	1-5/8”	1-1/8”	GHRC 130	1-5/8”	1-1/8”
DARC 40	1-5/8”	1-1/8”	GHRC 141	1-5/8”	1-1/8”
DARC 44	1-5/8”	1-1/8”	GHRC 155	1-5/8”	1-1/8”
DARC 50	1-5/8”	1-1/8”	GHRC 176	1-5/8”	1-1/8”
DARC 57 (DW)[2]	1-3/8”	7/8”	GHRC 201	1-3/8”	7/8”
DARC 61 (DW)[2]	1-3/8”	7/8”	GHRC 215	1-3/8”	7/8”
DARC 75 (DW)[2]	1-5/8”	1-1/8”	GHRC 264	1-5/8”	1-1/8”
DARC 80 (DW)[2]	1-5/8”	1-1/8”	GHRC 281	1-5/8”	1-1/8”
DARC 88 (DW)[2]	1-5/8”	1-1/8”	GHRC 310	1-5/8”	1-1/8”
DARC 100 (DW)[2]	1-5/8”	1-1/8”	GHRC 352	1-5/8”	1-1/8”

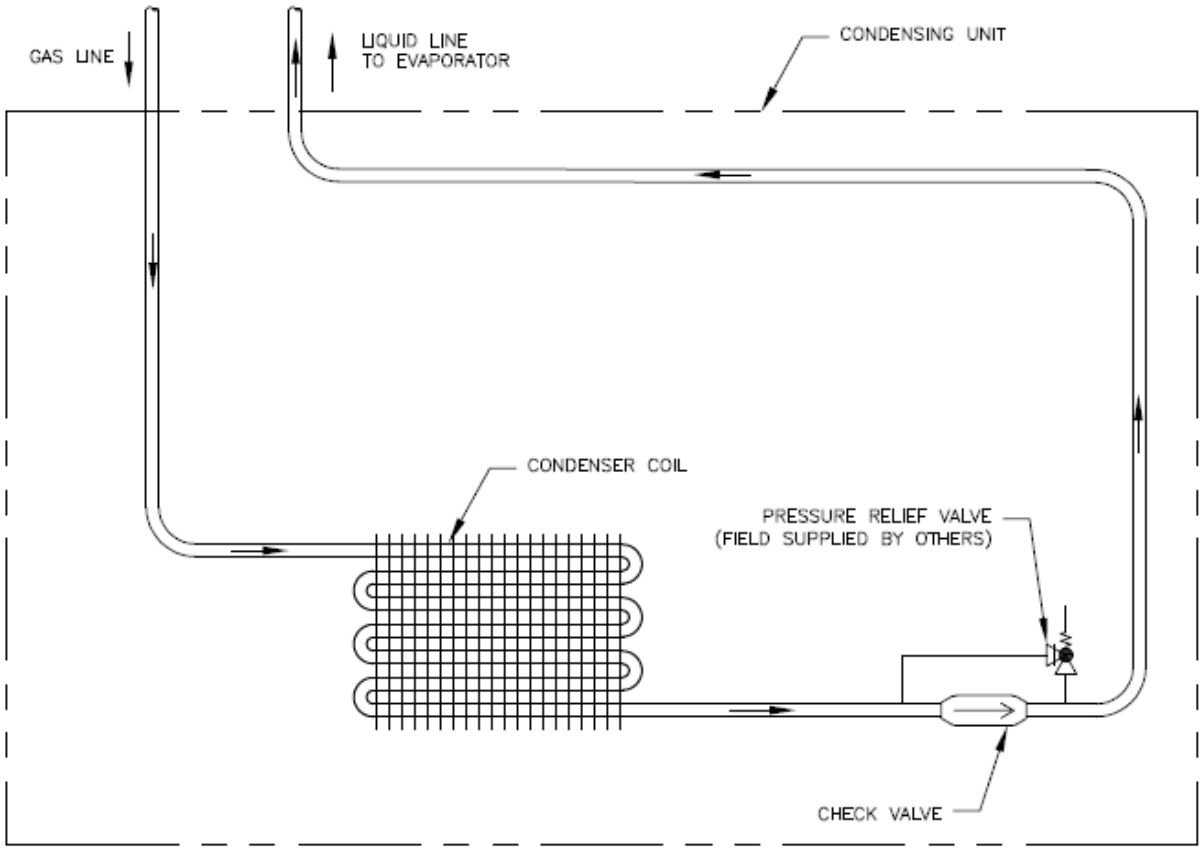
2 DW - double wide condenser

2.6 Field Installation of Relief Valve(s) on Condenser Liquid Lines

Data Aire condensers and condensing units include a check valve on the liquid line of each circuit on air-cooled systems. Most air-cooled systems will have long enough line length where any pressure increase in the liquid line, when the unit is in standby mode, is not a critical issue. On shorter liquid line lengths there is a need for a relief valve to relieve this potential pressure build-up.

Field piping lengths for air-cooled systems are often not known by Data Aire for most projects, therefore it is required that the installing contractor review the liquid line length between the condenser and evaporator sections and determine if they need to supply and install a relief valve on the liquid line to prevent excessive pressure build up in the liquid line. It is Data Aire' recommendation that if the liquid line length is less than 25 feet long, then a relief valve must be provided and installed in the field by the installing contractor.

Relief valve are available from Data Aire from our Parts department or can be sourced from a local refrigeration supply house. It is the responsibility of the installing contactor to follow all the relief valve manufacturer installation recommendations when applying these valves.



2.7 Leak Testing

NOTE: With any connection there is risk of leakage. Leakage could result in damage. Leakage can be a result from improper installation and/or practices.

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

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 the system circuit(s) to 150 PSIG (1034 kPa) using dry nitrogen with a trace of refrigerant. Check the entire system for leaks with a suitable leak finder (per local code) including but not 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.

NOTE: Tightening of fitting and valves is the responsibility of the installing contractor.

2.8 Evacuation

Evacuate the refrigerant lines, condenser coil evaporator coil to 300 microns or lower (micron gauge and 2-stage vacuum pump are required). Valve off and turn OFF the vacuum pump and wait at least 20 minutes to make sure the micron gauge reading does not go back above 500 microns. If it does, restart the vacuum pump and evacuate until the system reaches 300 microns. If the system still does not hold the vacuum below 500 microns the system needs to be rechecked for leaks.

NOTE: Do not apply power to the compressor (i.e., run the compressor) when under 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.

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.

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 Phase

The air-cooled condenser 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 field terminals #39 and #40 (refer to unit electrical wiring diagram). This energizes the control circuit. If the fans do not run:

- The head pressure has not exceeded the require discharge pressure. The first fan (with fan speed control) reacts to head pressure
- Multiple fan units also have a pressure control on the second motor

3.6 Auxiliary Control Wiring

Auxiliary control wiring for secondary heat exchangers (i.e., condensers) is accomplished by connecting two 18 gauge wires from the electrical box of the indoor evaporator to the electrical box of the remote heat exchanger. Follow the wiring diagrams for each of these pieces of equipment.
On most evaporator sections the interface connections will be on terminals #46 and #47. On older units with the DAP-II controller, the terminals are #42 and #43. On most remote heat exchangers the terminals will be #39 and #40.

All control wiring on Data Aire equipment is 24 VAC or less. Refer to the wiring diagrams.

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.

3.7 Wiring Diagrams

Every Data Aire condenser 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 CHARGING

4.1 Fan Speed Control/Fan Cycling

Data Aire air-cooled condensers (DARC) is equipped with the latest upgrade to control the high side pressure of the refrigeration system. The Fan Speed Control (FSC) is a single-phase condenser fan speed controller that is compact, weather-resistant, and durable speed control for single-phase, permanent-split capacitor (PSC) motors used in a wide variety of low-ambient refrigeration and air conditioning condenser applications. The FSC is designed to allow additional features and application flexibility.

On single fan condensers this is the only means of fan speed control. Multiple fan condensers are provided with fan speed control on the first motor (nearest the header) and ON/OFF operation for all other motors. The FSC is pre-programmed at the factory and there is no need to adjust the unit in the field. The first fan will cycle with the head pressure of the unit.

Refrigerant	Starting Pressure	Full Speed Pressure
R-410a	320 PSIG	400 PSIG
R-407c	220 PSIG	285 PSIG

When the condenser load exceeds the output capacity of the first fan (controlled by the FSC), the second fan will turn ON to full speed and the first fan will modulate, as required to maintain the head pressure of the unit. This allows the condenser load to be modulated by the cooling effect of two fans instead of just one.

4.2 Ambient Sensing Thermostats

On condensers with more than two fans, the additional motors (subsequent to the first and second motors) are cycled by means of ambient temperature sensing thermostats. These thermostats have a capillary tube with remote sensing bulb. They function best with the sensing bulb is mounted below the coil, away from exposure to direct sun light and the bulb in the vertical position. An instruction set comes as part of a mounting kit that includes a sheet metal bracket, mounting clamps and TEK screws. This includes directions for field mounting and adjustment. The ambient sensing thermostats are adjusted to maintain a desired head pressure range shown below:

Refrigerant	Head Pressure
R-410a	340 to 400 PSIG
R-407c	230 to 285 PSIG

4.2.1 Typical Ambient Thermostats Factory Settings

AMBIENT THERMOSTATS FACTORY SETTINGS					
Number of Fans	Motor Number 1	Motor Number 2	Motor Number 3	Motor Number 4	Motor Number 5
1	FSC	N/A	N/A	N/A	N/A
2	FSC	Pressure Control	N/A	N/A	N/A
3	FSC	Pressure Control	50°F	N/A	N/A
4	FSC	Pressure Control	75°F	50°F	N/A
5	FSC	Pressure Control	85°F	75°F	50°F

As the ambient air temperature decreases the capacity of the condenser increases. The capacity increase is directly proportional to the temperature difference (TD) between the condensing tem-

perature and the ambient air temperature entering the condenser coil. Air-cooled condensers are required to operate over a wide range of ambient air temperatures. Provisions must be made to maintain the overall system balance. Air-cooled condensers tend to run at low head pressure when operating in low ambient condition. Low head pressure can cause poor expansion valve operation and poor system performance.

4.3 Charging with Fan Speed Control

As previously noted, the standard Data Aire air-cooled condenser (DARC) comes equipped with fan speed control on the lead motor (motor number 1, nearest the header). After field refrigerant piping is properly completed, connect a refrigerant drum to the low side of the system and charge with vapor (refer to Section 2.5 Leak Testing and Section 2.6 Evacuation prior to charging the system). Connect the refrigerant drum to the high side and charge with liquid. Charge with approximately 2.55 pounds per nominal ton. Make sure all hoses are properly purged.

NOTE: Before starting the compressor(s) the crankcase 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.

Use the manual override switches (evaporator motor and compressor) on the unit mounted controllers (dap4, DAP-III or DAP-II) to switch the units to the ON position (all automatic control will be disabled but safety switches will remain functional).

Start the evaporator fan and then the compressor. 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. It is more likely that more refrigerant will be required to complete the charging procedure.

Adjust the refrigerant charge until the system measures 8 to 10°F of sub-cooling . For system with Electronic Expansion Valves (EEV), the superheat setpoint defaulted is 6°F and should be between 5 to 10°F. Units with dual refrigerant circuits should have both compressors energized. The unit should be allowed to stabilize for at least 20 minutes before meaningful measurements can be recorded.

After the system is allowed to stabilize, a few key measurements should be noted. The superheat should be measured at the compressor suction line, at least 6 inches away from the compressor.

KEY MEASUREMENTS				
Refrigerant	Discharge Head Pressure[5]	Sub-Cooling[6] (depending on ambient conditions)	Suction Pressure[7]	Superheat[8]
R-410a	340 to 415 PSIG	8 to 10°F	104 PSIG or greater	8 to 15°F
R-410a With Electronic Expansion Valves	340 to 415 PSIG	8 to 10°F	104 PSIG	5 to 10°F
R-407c	245 to 285 PSIG	8 to 10°F	52 PSIG or greater	8 to 15°F

5 Discharge pressure (also called high side pressure or head pressure) is the pressure generated on the output side of a gas compressor in a refrigeration of air conditioning system. The discharge pressure is affected by several factors: size and speed of the condenser fan, condition and cleanliness of the condenser coil, and the size of the discharge line.

6 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, it is totally in liquid form, thus, allowing the valve to work properly.

7 In refrigeration and air conditioning systems, the suction pressure (also called the low-side pressure) is the intake pressure generated by the system compressor while operating.

8 In refrigeration superheat is the amount of heat added to the refrigerant after it has changed from liquid to 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 air temperature are also important. A system charged to a full sight-glass is often overcharged.

4.3.1 R-410a – Charging/Installation Work Procedures

The basic installation work procedures are the same as R-407c refrigerant. Since the working pressure is 1.6 times higher than the conventional refrigerant, some of the piping, installation and tools are special.

Special Service Equipment

- High pressure manifold gauge set
- High pressure recovery machine
- High pressure recovery tank (DOT 4BA400 or ABW400)

NOTE: R-410a and R-407c use Polyolester oil (POE) oil that is prone to absorbing moisture. The system should never be left open to the atmosphere.

4.4 Flooded Systems

Flooded systems are units having refrigerant circuits with optional liquid receiver and head pressure control (recommended for low ambient conditions). 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 condenser is partially flooded with liquid refrigerant in cold weather. In warm weather the extra refrigerant is stored in the receiver.

Data Aire units with optional receivers are either provided within the evaporator section (depending on the unit size) or shipped loose for field installation. The receiver includes heaters and thermostat. A thermostat monitors temperature in the receiver and prevent overheating (overheating of receivers may cause the soft plug to blow and loss of refrigerant charge).

4.4.1 Charging Flooded Systems

Flooded systems require more refrigerant than condensers with fan speed control. With the unit under a vacuum, add liquid refrigerant directly into the receiver. Make sure all hoses are properly purged.

Use the manual override switches (evaporator motor and compressor) on the unit mounted controllers (dap4, DAP-III or DAP-II) to switch the units to the ON position (all automatic control will be disabled but safety switches will remain functional).
Hook up charging gauges to the suction line. If the receiver (head) pressure is below the pressure shown in the chart below for the required refrigerant, block part of the condenser coil surface until the pressure rises to the specified pressure or higher. During extremely cold weather all the condenser fans may have to be de-energized to maintain the desired receiver (head) pressure.

Refrigerant	Receiver (Head) Pressure
R-410a	342 PSIG
R-407c	242 PSIG 10

Observe the sight-glass on the receiver. Add refrigerant liquid through the suction line until the level of liquid in the receiver is approximately 1/3 from the bottom of the sight-glass which is about 80%

full. The sight-glass on outdoor receivers will be difficult to observe however, this step is required for proper charging.

WARNING: When adding refrigerant through the suction line it is imperative that the refrigerant is meter carefully to the compressor. Charging a liquid into the suction line too rapidly can cause damage to the compressor.

Units with dual refrigerant circuits should have both compressors running. The unit should be allowed to stabilize for 20 minutes before meaningful measurements can be recorded.

After the system is allowed to stabilize, the superheat at the compressor suction line (at least 6 inches away from the compressor) should be 8 to 15°F. For system with electronic expansion valves, the superheat setpoint is defaulted at 6°F and should be between 5 to 10°F. Remove the block from the condenser coil. If the ambient air temperature while charging is below 60°F, some of the refrigerant will be backed up in the condenser coil, causing the liquid level in the receiver to drop.

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 air temperature are also important. A system charged to a full sight-glass is often overcharged.

4.5 Refrigerant Handling

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

Except for extremely small releases of refrigerant such as what occurs when disconnecting service hoses (diminutive release), a technician who knowingly releases or vents refrigerant to the atmosphere is in violation of this regulation. Freon purchases must be made by certified technicians and have a valid EPA certification card.

4.6 Condenser with EC Motor Axial Fan(s) (Option)

Data Aire air-cooled condensers (GHRC) provided with optional axial Electronically Commutated (EC) fan(s) provide variable speed control based on head pressure. The EC motor has all the required components to run at variable speeds.
The control system in a GHRC condenser allows all fans to modulate, as required, to maintain the proper head pressure of the unit.

4.6.1 EC Motor Speed Adjustments

The EC motor varies its speed linearly based on a 0-10V input signal from the head pressure transducers. The fans are scaled per the following table:

Refrigerant Pressure Settings (PSIG)		
Refrigerant	Cut-in 100^{O} F	Full Speed
R-410a	319	370
R-407c	226	270

5.0 WARRANTY

NOTE: See separate warranty certificate and registration card that is supplied with each unit as part of the paperwork package.

6.0 PREVENTIVE MAINTENANCE

The operating life of the condenser can be extended by following a simple preventive maintenance schedule. This schedule will reduce the possibility of failure of components and unnecessary malfunction of the system. Although the service technicians must be thoroughly familiar with the special design features of this equipment before attempting any service or repair, an experienced technician can perform certain simple maintenance functions to ensure normal, trouble-free operation.

6.1 Maintenance Functions

Monthly	Inspect condenser for obstruction to the inlet air side of the coil. Inspect the motor/fan blade assemblies to ensure the bearings are free and the motor mounts and fan(s) are secure.
Seasonally	Inspect electrical components for loose wire connections. Inspect contactor contacts for pitting. Inspect fan motor(s). In the winter, do not allow snow to accumulate or build-up around the sides or underneath the coil.
Bi-annually	Clean the condenser coil of all debris that could restrict air flow.
Annually	Check all refrigerant lines and connections for leaks or any sign of oil.

6.2 Electronically Commutated (EC) Fan Troubleshooting

Refer to the EC fan manufacturer's Operating Instructions for detailed instructions, critical safety information and troubleshooting instructions for this product.

6.3 Coil Cleaning

Keeping the outdoor coils clean is an important factor in maintaining peak efficiency, reliability and long life of the equipment. It is much easier to keep up on frequent cleanings rather than wait until heavy build up has occurred which may create head pressure problems with the evaporator units.

6.3.1 When to Clean

Normal conditions typically dictate cleaning twice a year, spring and fall. On-site or area conditions such as cottonwood trees, construction, etc., can increase cleaning frequency. On your standard monthly preventive maintenance schedule, a visual inspection of the coil is recommended to monitor conditions.

6.3.2 What to Use

The best overall coil cleaner to use is plain water. If the coil has been maintained and cleaned at regular intervals, water is sufficient to remove dirt and debris from the fins. Heavy build up on the exterior of the fins can be removed with a brush. Water pressure from a garden hose and sprayer usually works well.

WARNING: If a pressure washer is used, make sure the equipment is set to a lower pressure setting and that the nozzle is set to the fan spray, not stream. Otherwise, damage to the fins could result.

If a chemical cleaner is required, a non-acidic type cleaner is recommended.

WARNING: Acid-type cleaners can be aggressive to the coil fins as well as surrounding areas. Many sites do not allow the use of acidic cleaners for environmental reasons.

6.3.3 How to Clean

The absolute best way to clean coils is from the inside out. This requires disconnecting the power supply before working on the unit. The fan guards and fan blades must be removed to gain access to the coil surface. The sprayer can then be worked across the coil using the water/cleaning solution, pushing the dirt and debris out the bottom of the coil. Although this does extend the time involved, the results are well worth it. This method should be used at least once a year. Spraying the coil from the outside repeatedly can push a majority of the dirt to the inner section of the fins and continue to restrict air flow.

Keep in mind you may not have the luxury of shutting the unit(s) down for an extended time. A prescheduled shutdown with the operator may be in order.

WARNING: If you are using a chemical cleaner along with the spraying process, follow recommended manufacturer instructions and be sure to rinse the coil thoroughly. Any residue left on the coil can act as a magnet to dirt.

Reinstall and secure the fan blades and fan guards after the cleaning is finished. Last, reconnect the power supply to the unit.

7.0 LINE SIZES

Please refer to evaporator Installation, Operation, & Maintenance Manuals for recommended line sizing for air-cooled split systems – up to 200 equivalent feet

8.0 CONTACT DATA AIRE

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Orange, CA 92865

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800-347-AIRE (2473) Toll Free

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

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

Web Site: http://www.dataaire.com

Job/Unit Information: _____

Data Aire Job Number: _____

Evaporator Serial Number: _____

Evaporator Model Number: _____

Condenser Serial Number: _____

Condenser Model Number: _____

Installing Contractor: _____

Date installed: _____ / _____ / 20_____

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Air Cooled Condensers

Installation, Operation & Maintenance Manual

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