Air Cooled Condensing Unit

Installation, Operation & Maintenance Manual

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dataaire
Precise by Design

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INSTALLATION/OPERATION/MAINTENANCE MANUAL

DATA AIRE OUTDOOR CONDENSING UNITS

1.0 Installation

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

Whenever installing units, it should be determined what, if any, building changes are required for refrigeration piping, drain lines and electrical connections. Follow the submitted engineering dimensional data for proper equipment clearances.

1.1 Inspection

This equipment has been factory run-tested and 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 a remote control panels, disconnect switch handles and spare belts are packed inside the unit. Refer to the yellow shipping tag located on the electrical section panel.

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.

1.2 Description

Remote Outdoor Condensing Units (DRCU or GHCU) – The condensing unit contains a scroll compressor with crankcase heater and condenser coil. The condenser coil is constructed of copper tubes and aluminum fins. The condensing unit is constructed of tubular steel, sheet metal, and aluminum fan housing. Air discharge is vertical. The condenser fan motors are thermally protected. The standard unit uses a P-266 fan speed control on the lead condenser fan (nearest the header). This controls the high side pressure by varying speed of the motor to control the head pressure. Units with multiple fans will have fan speed control on the first fan, a pressure control on the second and ambient thermostats on consecutive fans. Field piping and wiring is required between the evaporator and condensing section. The condensing section requires its own power source and disconnect switch (subject to local code).

(There is an optional flooded head pressure control that is available for all units. This is primarily used in areas where the outdoor ambient can be below -20°F.)

1.3 Rigging

Outdoor condensing units should be moved to their mounting location using a crane or fork lift as applicable. Each fan section has 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. Under no circumstances should the coil headers or piping be used for lifting the unit. The unit should be kept in its shipping crate until it is ready to be set in place.

1.4 Locating the Condensing Unit

Consult local codes or ordinances for restrictions regarding location of unit.

Select a location for the unit where ice and snow will not fall from an overhang and damage the unit top or fan blade. Care must be exercised to maintain the clearance requirements.

See dimensional drawings for the following:

1. Location of refrigeration and electrical connections
2. Recommended clearances
3. Direction of condenser airflow
4. Mounting base dimensions

Place unit on level base strong enough to support the weight of the unit and resist effects of frost heaving, etc. Concrete lintels can be used if spaced to adequately support unit.

Allow air to circulate under unit. Channels are provided for this purpose or unit may be set in a bituminous mixture such as roofing tar to prevent base pan from rusting. Do not plug drain holes.

On rooftop applications, locate unit at least 6 inches above roof surface. Where possible, place the unit above a load-bearing wall. Arrange supporting members to adequately support unit and minimize transmission of vibration to building. Pre-cast concrete lintels, concrete blocks, treated timbers or steel beams can be used. Consult local code governing rooftop applications. In cold climates locate unit above expected snow levels.

Avoid locations where flowers, shrubs, etc. are in the pathway of condenser air intake or discharge air is impeded. Do not locate the condenser fan so that it will discharge air is against prevailing wind or a building structure.

Avoid locations where normal operating sounds may be objectionable (such as beneath windows, between structures or near doors). Should operation sounds be objectionable, consideration should be given to a shielding sound barrier.

Air cooled condensing units should be placed at a level that is higher than the indoor evaporator. Installation of the condensing unit more than 10 feet below the evaporator is not recommended. Excessive liquid line pressure drop can cause poor evaporator performance.

Piping must be supported within 18 inches of the inlet and outlet connections. The inlet connection is located on the top header on all remote heat exchangers and the outlet connection is located on the bottom header of all units.

1.5 Paperwork

Each Data Aire unit ships with start-up sheets that must 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 start-up service company to return the start-up sheets and warranty registration card to Data Aire for activation of the unit warranty. Failure to do so may cause delays in warranty related services and in some cases void the warranty.

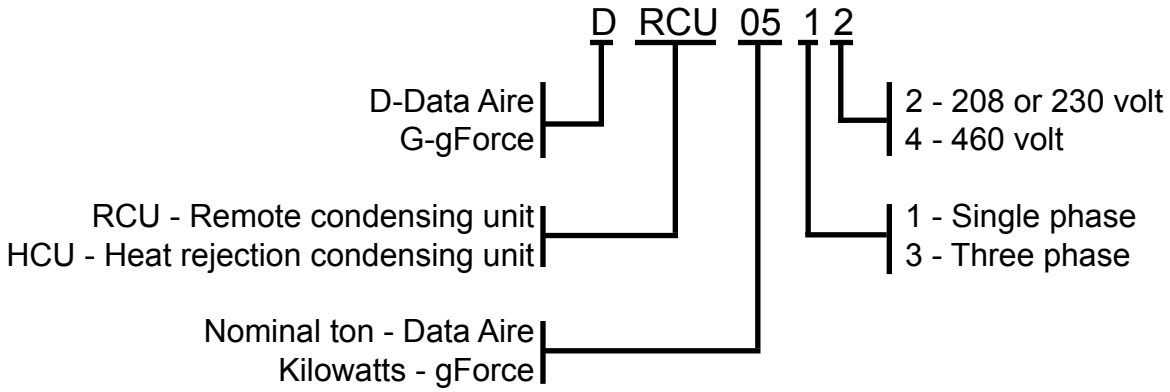
1.6 Storage

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 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, if required, rubber hoses and belts. 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.

1.7 Model Identification



2.0 Piping

2.1 Split Air Cooled Unit Piping

Refer to the attached line sizing chart on page 18 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.

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.

2.2 Refrigerant Lines

Both a suction and liquids line are required between the evaporator section and the condensing unit (DRCU or GHCU). Use copper tubing and insulate the suction line. Standard piping practice must be used to ensure proper oil return and efficient operation. The interconnecting lines to the remote condensing unit require installation by a qualified refrigeration mechanic.

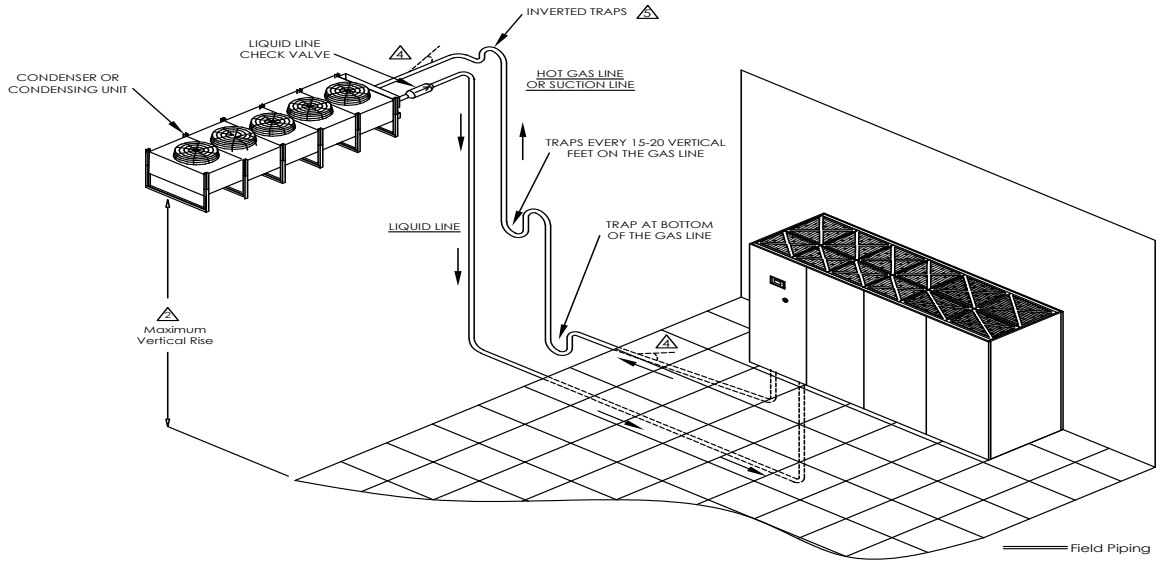
Refer to the line size refrigerant piping chart for a guideline for sizing refrigerant lines. The ultimate responsibility for line sizing is that of the installing contractor or project engineer. Data Aire does not assume this responsibility.

All refrigerant piping should be installed with high temperature brazed joints. Units should be installed with proper piping supports. Standard refrigeration practices should be followed for leak testing, evacuation and refrigerant charging of the refrigerant circuit. Care must be taken in isolating the refrigerant tubing from the building. Vibration isolation support is recommended.

2.3 Field Piping, Remote Condensing Unit Above Evaporator

NOTES:

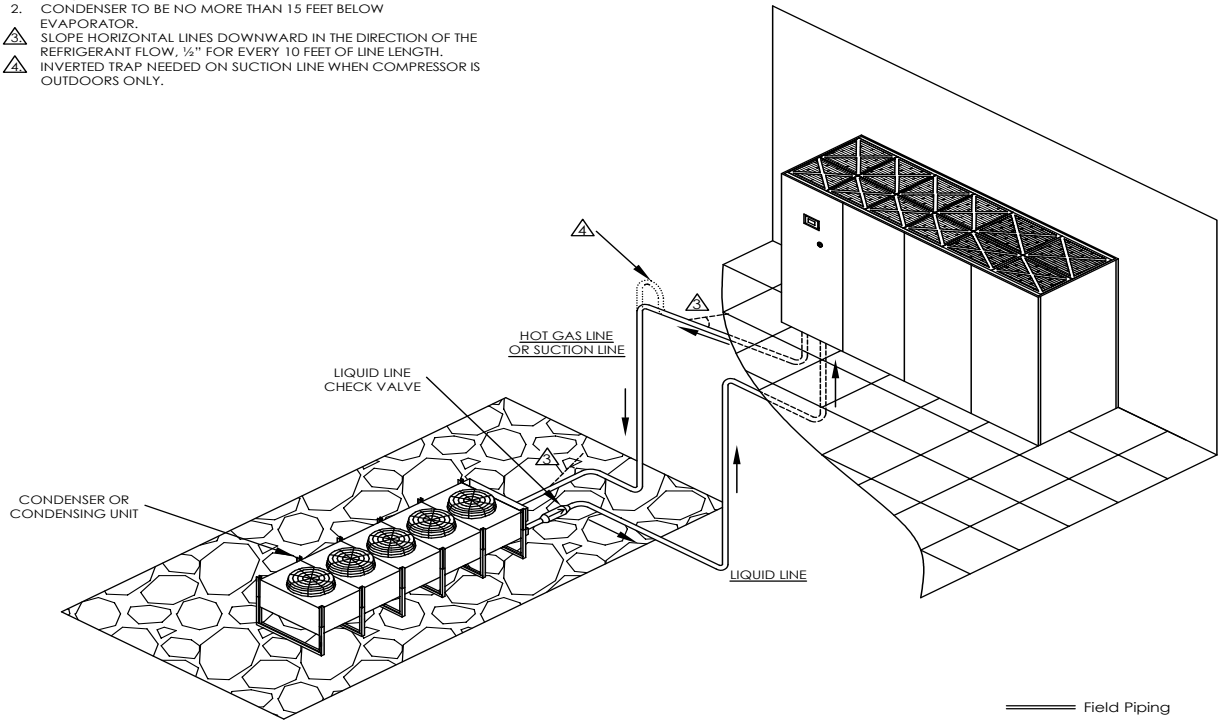
1. THIS IS THE RECOMMENDED PIPING. ALL PIPING TO BE PER LOCAL AND/OR STATE CODE.
2. CONDENSER TO BE NO MORE THAN 60 FEET ABOVE EVAPORATOR.
3. FOR UNITS BUILT AFTER APRIL 2017, THE CHECK VALVES ARE INCLUDED INTERNALLY IN THE EVAPORATOR SECTION.
4. SLOPE HORIZONTAL LINES DOWNWARD IN THE DIRECTION OF THE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



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



3.0 Electrical Connections

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 the service provided by the utility to ensure it is sufficient to handle the additional load imposed by this equipment. The condensing unit will require a separate power source and field provided, inter-connecting control wires to the evaporator section.

3.2 Nameplate Ratings

Refer to the unit electrical nameplate for equipment electrical requirements. Minimum circuit ampacity (MCA) will dictate the minimum required wiring wire gauge. Maximum over-current protection device amps will dictate the maximum circuit breaker or fuse size.

3.3 Grounding

The unit cabinet must have 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. Phase to phase imbalance must not exceed 3%. The local utility company should be contacted for correction of improper line voltage.

Deviation from voltage ratings can cause premature failures and possibly void unit warranties.

3.5 Field Supplied Wiring

A field supplied 3 to 7 wire control connection (24 VAC) is required between the evaporator and the condensing unit. All control wiring must be installed in accordance with the National Electrical Code (NEC) Class 1 circuit.

Refer to wiring diagram shipped with unit.

4.0 Refrigeration

4.1 Leak Testing

No installation is complete until the entire system has been thoroughly checked for leaks, both field and factory fittings. This includes all brazed joints, checking refrigerant tubing, flare fittings, pressure controls, Shraeder fittings and (optional) compressor rota-lock service valves.

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

Use proper recovery/recycling procedures as mandated by the U.S. Environmental Protection Agency (EPA) when handling refrigerant. It is not permissible to release or discharge refrigerant into the atmosphere. Many leak-test methods recommended and used in the past are no longer acceptable.

An acceptable method of leak testing air-cooled system does not involve refrigerant. This is done with a vacuum pump and a Micron Gage. The system needs to evacuate to 250 microns. When the system has reached 250 microns the gages are closed and the pump is disengaged. If the system is leak free it should be able to maintain a micron level of no more than 750 micron after 30 minutes. If the system does not hold the system will need to recheck and the leak(s) repaired before charging the system with refrigerant.

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

4.2 Evacuation

It is the utmost importance that proper system evacuation and leak detection procedures be employed. A minimum evacuation to 250 microns or lower is recommended. Good evacuation processes include frequent vacuum pump oil changes and larger diameter, short hose connections to both high and low sides of the system preferably using copper tubing or bronze braided hose. If the compressor has service valves, they should remain closed. A deep vacuum gauge capable of registering pressure in microns should be attached to the system for pressure readings. A shut-off valve between the gauge connection and vacuum pump should be provided to allow system pressure to be checked after evacuation. Do not turn off vacuum pump when connected to an evacuated system before closing the shut-off valve.

4.3 Voltage Phase Check

4.3.1 Evaporator – Prior to charging, the correct voltage phasing should be checked on the indoor evaporator. Check blower direction on the evaporator by momentarily energizing the fan motor. Reverse any two of the three line voltage wires at the line connection point to change the blower rotation.

4.3.2 Condensing Unit – Scroll compressors are phase dependent. Before operating the system the compressor rotation must be checked. To check the rotation, the power to the condensing unit must be turned on and with jumpers wires on the control circuit the compressor(s) are to “bumped”. The compressor will make a noise like chains being dragged across a metal

deck if it running backwards. If the compressor is rotating backwards reverse any of the two power leads entering the unit. An out-of-phase compressor will have relatively lower running amps and both the suction and discharge pressures will remain nearly equal.

A scroll compressor will be internally damage if left to run backwards for more than a few minutes

Do not apply power to the compressor when it is in a vacuum.

The condensing unit may be ordered in three phase but the individual motors are single phase and will only run in one direction

4.4 Charging

Before starting a compressor, the crankcase heaters should be energized for a minimum of 12 hours to reduce the possibility of liquid slugging on start-up. Failure to energize crankcase heaters could result in compressor damage.

4.4.1 General Recommendations - A quick and easy way to run the compressor is using the manual switch on the unit's microprocessor. Switch the compressor manual switch to the ON position. All automatic control is disabled but safety switches will remain functional.

The refrigerant charge for the system will vary depending on the size of the system, the piping length and size. As a general rule the refrigerant charge can be estimated within 10 to 15%. There a several factors that is to be considered. First the type of refrigerant, the nominal tonnage of the circuit being charged and the size and length of the line set.

The type of refrigerant will affect the amount of refrigerant used in the system. R-407c is less dense than R-410a. A system using R-407c will need about 2.5 pounds of refrigerant per nominal ton plus the line set. R-410a will require about 3 pounds of refrigerant per nominal ton plus the line set.

Various refrigerant manufactures have charts of the weight of the refrigerant in a given size pipe. Please refer to these charts for the refrigerant weight-in for the line set.

If a receiver is being used in a system for low ambient head pressure control, additional refrigerant will be required. See below for the approximate receiver capacities:

Nominal Tons	R-407c	R-410a
1 - 6	31 Pounds	36 Pounds
7.5 – 13	53 Pounds	62 Pounds
15	80 Pounds	94 Pounds

Receiver refrigerant weights are in addition to the normal guide lines above stated above.

Caution: The refrigerant weights are not exact and are only to be used as guild lines for the total refrigerant charge. These recommendations have a 15% variance and should be used accordingly.

Both R-407c and R-410a are refrigerant blends. Blends must always need to be added to the system in liquid form. This will require metering of the refrigerant when added to the low side of the system to prevent compressor damage.

4.5 Air Cooled Systems

Fan Speed Control System Charging

The standard air cooled condenser provided with Data Aire equipment has fan speed control on the lead motor (nearest the header).

To start the charging procedure make sure all hoses are properly purged of air or other non-condensable. From a deep vacuum feed liquid refrigerant into the high side of the system only until the pressure equalizes. At this point there will be approximately 70-80% of the total charge in the system. If the system is being charged from a vacuum, the pre-heating of the compressor is not necessary.

Start the system and allow the system to stabilize to room temperature. Bubbles in the sight glass are not unusual. It is likely that more refrigerant will be required to complete the charging procedure. There will be flashing and/or bubbles in the sight glass when the system is properly charged.

The system should be allowed to stabilize for 15 to 20 minutes before meaningful measurements can be taken. Adjust the refrigerant charge until the sub-cooling is between 8-10°F. After the system is allowed to stabilize, verification of a few key measurements should be noted. The discharge pressure with R-410a should be between 340 - 415 PSIG and the sub-cooling should be between 8 - 10°F depending on ambient conditions. Units with R-407c the discharge pressure should be between 240 -295 PSIG. Suction pressure should be 100 PSIG or greater with R-410a and 52 PSIG or greater with R-407c. Measure the superheat at the compressor suction line at least 6 inches away from the compressor. The superheat should be between 20 to 25°F degrees measured 6 inches from the suction service valve on the compressor.

Note: Charging to a full liquid line sight glass should never be the 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.

Caution: **The P-266 is pre-programmed by Data Aire for your system – DO NOT MAKE ANY ADJUSTMENTS TO THE P-266 FAN SPEED CONTROL. The warranty for the unit will be voided if adjusted in the field`**

4.6 Flooded System Charging

Flooded type systems are supplied with liquid receiver and head pressure control valve. When the ambient temperature falls during cold weather, the head pressure control valve will regulate the flow of refrigerant to ensure nearly constant minimum receiver pressure. The condenser is partially flooded with liquid refrigerant in cold weather to maintain the proper head pressure. In warm weather the extra refrigerant is stored in the receiver.

Flooded systems require more refrigerant than fan speed control systems. With the system in a deep vacuum, connect the pressure gauge manifold set to the receiver liquid port and at the compressor suction service valve or port. Connect the charging line to the refrigerant tank and set for liquid feed. Open the refrigerant tank valve and purge the line of air or other non-condensable. 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 75-85% of the total refrigerant charge. Start the evaporator motor. Start the compressor and check the operating pressures and temperatures.

CAUTION: Ensure that the refrigerant flow is not interrupted during the charging process. Make sure that there is enough refrigerant on hand to meet the system requirements.

If the receiver (head) pressure is below 350 PSIG with R-410a, block part of the condenser coil surface until the pressure rises to 350 PSIG or higher. If the receiver (head) pressure is below 230 PSIG with R-407c, block part of the condenser coil surface until the pressure rises to 230 PSIG or higher. During extremely cold weather all the condenser fan have to be de-energized to maintain head pressure during the charging process. Add refrigerant to the system until the ball in the sight glass on the receiver is at the 1/3 level from the bottom.

After the system is allowed to stabilize, the superheat at the compressor suction line (measured from a least 6 inches from the compressor) should be 20-25°F. Remove any blocks that may have been used on the condenser coil. If the ambient temperature is below 70°F, some of the refrigerant will be backed up in 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.

4.7 System Check for Overcharging

Since good system reliability depends on proper refrigerant charge, it is very important that the system is thoroughly checked for superheat and oil temperature AFTER the unit is stabilized as shown above. A final check should be made after the room is turned on and the unit is fully loaded.

4.8 Sequence of Operation

When the evaporator control “calls for cooling”, contacts close energizing the contractor holding coil through pressure switches with a 24-volt external power source. At the same time, the condenser fan motor is energized.

5.0 Maintenance

The plumbing and electrical compartments contain high voltage components and wiring. When servicing any type of equipment care must be taken. Unit has hazardous electrical voltage. Line side of factory disconnect remains energized when disconnect is in “OFF” position. Access should be limited to authorized personnel only.

5.1 Electrical Panel

The electrical panel should be inspected all terminal connections need to be retightened semi-annually.

5.2 Fuses

Drops in voltage can create brief periods of high amp draw causing fuses to blow. Always replace fuses with equivalent type and rating with regard to amperage, voltage and speed. Compressor and motors are inductive loads that require time delay fuses.

5.3 Refrigeration System

As a preventive measure the refrigeration system should be inspected for wear and proper function. Inspect all refrigerant lines for signs of oil leaks. Refrigerant lines should be checked for proper support. Refrigerant lines should not be allowed to vibrate against other refrigerant lines, floors, walls, ceilings or the unit’s frame to avoid noise transmission. The refrigerant lines should be checked at least once a year.

Suction and discharge pressures will vary with load conditions. Suction pressure should be 52 PSIG or greater with R-407c and 100 PSIG or greater with R-410a. Discharge pressures will range from 240 to 295 PSIG with R-407c and 340 to 415 PSIG with R-410a. All units have a factory installed high pressure switch(s) that will shutdown the unit if it reaches its cut-out setting. The switch has a manual reset button.

Condenser coils should be checked for and cleared of any debris. It may be necessary to wash the coil using environmentally safe solutions. Look for any bent or damaged coil fins and repair where required. A clean coil will ensure unrestricted airflow, proper discharge pressures and cooling capacity.

5.4 Important Refrigeration Components

5.4.1 Expansion Valve - Each refrigerant circuit has an adjustable thermo expansion valve (TXV). These are factory adjusted to their normal rating. Any field adjustment should be to “fine tune” a system that has stabilized and already has acceptable operating parameters. Adjusting a TXV to produce large swings in superheat is not recommended.

5.4.2 High Pressure Cutout Switch - Each refrigerant circuit is protected by a high pressure cutout switch with manual reset button. The switch is typically located in the evaporator near the compressor.

The high pressure rating for R-410a is 575 PSIG.

The high pressure rating for R-407c is 450 PSIG.

5.4.3 Low Pressure Cutout Switch - Each refrigerant circuit has a low pressure cutout switch with automatic reset. The switch is located near the compressor.

The low pressure for R-410a is 50 PSIG.

The low pressure rating for R-407c is 28 PSIG.

6.0 Paperwork

Each Data Aire unit ships with a packet that includes start-up sheets, warranty information, wiring diagrams, specific component literature and a copy of the Installation/Operation/Maintenance manual.

A yellow tag is attached to the outside of the exterior panel to indicate which articles may have been packaged and shipped loose within the cabinet.
It is the responsibility of the installing contractor to return the start-up sheets to Data Aire for proper activation of the unit's warranty. Failure to do so may cause delays and in some cases void the warranty.

7.0 Superheat and Suction Pressure Troubleshooting Guide

7.1 Low Suction Pressure and High Superheat

- Moisture, dirt or wax
- High superheat adjustment
- Gas charge condensation
- Dead thermostatic element charge
- Wrong thermostatic charge
- Evaporator pressure drop – no external equalizer
- External equalizer location
- Restricted or capped external equalizer
- Low refrigerant charge
- Liquid line vapor
- Low pressure drop across valve

7.2 High Suction Pressure – Low Superheat

- TEV seat leak
- Low superheat adjustment
- Bulb installation
  - Poor thermal contact
  - Warm location
- Wrong thermostatic charge
- Bad compressor – low capacity
- Moisture, dirt or wax
- Incorrectly located external equalizer

7.3 Low Suction Pressure – Low Superheat

- Low load
  - Not enough air
  - Dirty air filters
  - Coil icing
- Poor air distribution
- Poor refrigerant distribution
- Improper compressor/evaporator balance

8.0 System Troubleshooting Guide

Problem	Possible Cause	Possible Corrective Steps
Compressor will not run	Main switch open	Close switch
Compressor will not run	Fuse blown	Check electrical circuits and motor winding for shorts or grounds. Investigate for possible overloading. Replace fuse after fault is corrected
Compressor will not run	Thermal overloads tripped	Overloads are automatically reset. Check unit closely when unit comes back on line
Compressor will not run	Defective contractor or coil	Repair or replace
Compressor will not run	System shutdown by safety devices	Determine type and cause of shutdown and correct before resetting safety switch
Compressor will not run	No cooling required	None. Wait until unit calls for cooling
Compressor will not run	Liquid line solenoid will not open	Repair or replace coil
Compressor will not run	Motor electrical trouble	Check motor for open windings, short circuit or burn out
Compressor will not run	Loose wiring	Check all wire junctions. Tighten all terminal screws.
Compressor noisy and/or vibrating	Flooding of refrigerant into crankcase	Check setting of expansion valve(s)
Compressor noisy and/or vibrating	Improper support on suction or liquid line	Relocate. Remove or add hangers
Compressor noisy and/or vibrating	Worn compressor	Replace
Compressor noisy and/or vibrating	Scroll compressor rotation reversed	Rewire for phase change
High discharge pressure	Non-condensables in system	Remove non-condensables
High discharge pressure	System overcharged with refrigerant	Reclaim excess refrigerant
High discharge pressure	Discharge shut-off valve partially closed	Open valve
High discharge pressure	Condenser fan not running	Check electrical circuit
High discharge pressure	Dirty condenser coil	Clean
Low discharge pressure	Faulty condenser temperature regulation	Check condenser control operation
Low discharge pressure	Suction valve partially closed	Open valve

Problem	Possible Cause	Possible Corrective Steps
Low discharge pressure	Insufficient refrigerant charge in system	Check for leaks. Repair and add refrigerant
Low discharge pressure	Flooded head pressure control	Check setting and operation
High suction pressure	Excessive load	Reduce load or add additional units
High suction pressure	Expansion valve overfeeding	Check remote bulb. Adjust superheat
Low suction pressure	Lack of refrigerant	Check for leaks. Repair and add refrigerant
Low suction pressure	Evaporator dirty or iced	Clean
Low suction pressure	Clogged liquid line filter-drier	Reclaim refrigerant and replace filter-drier
Low suction pressure	Thermal expansion valve malfunctioning	Check or reset for proper superheat
Compressor loses oil	Lack of refrigerant	Check for leaks. Repair and add refrigerant
Compressor loses oil	Refrigerant flood back	Maintain proper superheat at compressor
Compressor loses oil	Improper piping or traps	Correct piping

9.0 Recommended Line Sizing for Air Cooled Split Systems

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

10.0 Preventive Maintenance

10.1 Quarterly Maintenance

- Do a visual inspection of the unit
  - Check for signs of oil on interconnecting piping and condenser coil
  - Inspect solder joints, building penetrations and pipe supports
  - Check any suspect areas with an electronic leak detector and add refrigerant after repairing any leaks
  - Check compressor sight-glass (if available) for proper oil level
  - Check condenser coil and clean any dirt or debris (as required)
  - Check for excessive noise or vibration making corrective steps as required
  - Inspect wiring for signs of wear. Repair or replace as needed
  - Check and tighten any flare connections

10.2 Semi-Annual Maintenance

- Repeat quarterly inspection
  - Clean condenser coil and fan blades. Use a brush, pressurized water and a commercially available (environmentally friendly) foam coil cleaner. Do not use an acid based cleaner. Follow the directions as stated by the manufacturer. Rinse completely
- Check condenser fan operation
  - Check fan rotation ensuring they rotate freely and quietly
  - Check all fan blades set screws and tighten as required
  - Check all fan blades for cracks, stress fractures or wear. Replace as required
  - Check all condenser fan motors
    - Make certain all motors are secured properly
      Replace any fan motor that not rotate properly or makes excessive noise
      Inspect
- Inspect electrical wiring and electrical components
  - Ensure that all electrical and ground connections are secure and tightened as required
  - Check compressor contractor. Look for discoloration and pitting. Replace if required
  - Checker compressor crankcase heater (measure amp draw)
  - Check operation of all timers, relays, pressure and safety control
  - Inspect electrical cabinet and remove any debris (birds, rats, etc.)
- Check refrigeration cycle
  - Check suction and discharge pressures
  - Check pressures across filter-driers
  - Verify superheat is within manufacturers stated values
  - Check pressure and safety control settings and verify their operation

10.3 Annual Maintenance

- Repeat quarterly and semi-annual checks
  - Pay attention to all brazed fittings and solder joints
  - Re-insulate where required
  - Clean any corroded area

Temperature Pressure Chart

Temperature (°F)	R-22	R-407c	R-410a
26	50.0	43.6	89.7
27	51.2	44.7	91.6
28	52.4	45.9	93.5
29	53.7	47.1	95.5
30	54.9	48.4	97.5
31	56.2	49.6	99.5
32	57.5	50.9	101.6
33	58.8	52.1	103.6
34	60.2	53.4	105.7
35	61.5	54.8	107.9
36	62.9	53.2	110.0
37	64.3	57.5	112.2
38	65.7	58.9	114.4
39	67.1	60.3	116.7
40	68.6	61.7	118.9
41	70.0	63.1	121.2
42	71.5	64.6	123.6
43	73	66.1	125.9
44	74.5	67.6	128.3
45	76.1	69.1	130.7
46	77.6	70.6	133.2
47	79.2	72.2	135.6
48	80.8	73.8	138.2
49	82.4	75.1	140.7
50	84.1	77.1	143.3
55	92.6	106.0	156.6
60	101.6	116.2	170.7
65	111.3	127.0	185.7
70	121.5	138.5	201.5
75	132.2	150.6	218.2
80	143.7	163.5	235.9
85	115.7	177.0	254.6
90	168.4	191.3	274.3
95	181.9	206.4	295.0
100	196.0	222.3	316.9
105	210.8	239.0	339.9
110	226.4	256.5	364.1
115	242.8	274.9	389.6
120	260.0	294.2	416.4
125	278.1	314.5	444.5
130	297.0	335.7	474.0
135	316.7	357.8	505.0
140	337.4	380.9	537.6
145	359.1	405.1	571.7
150	381.7	430.3	607.6

Air Cooled Condensing Unit

Installation, Operation & Maintenance Manual

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