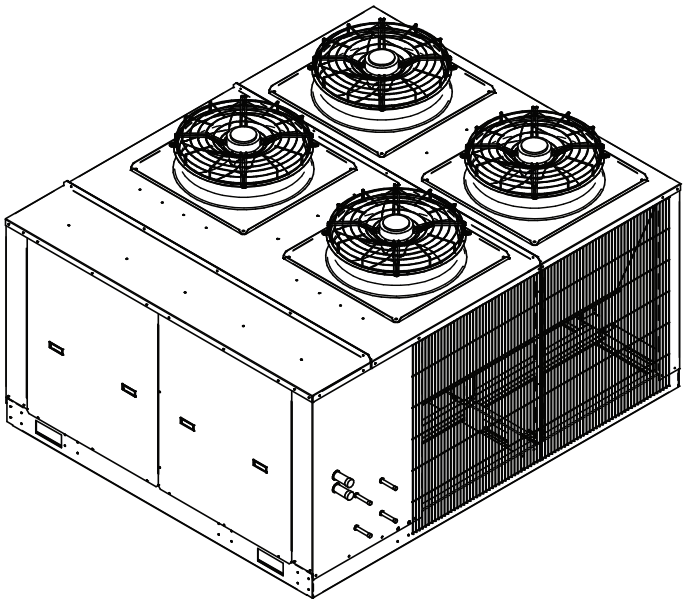
ADDISON®

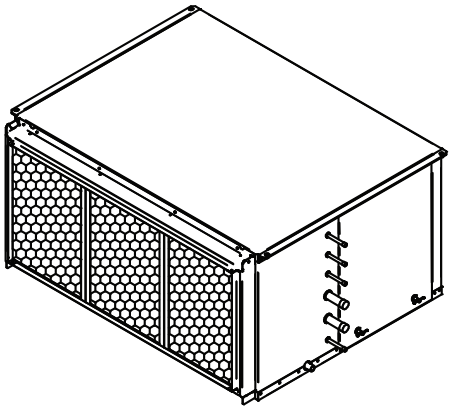
ADDISON® RC/FC Series



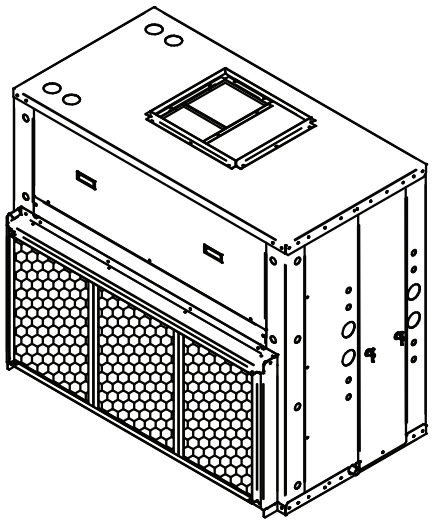
Split Condensing Section and Air Handling Unit

Installation, Operation, & Maintenance Manual

Part Number:
AD-IOM-RCFC-001
Rev.: 06 Feb 2019DS



RC/FC042
RC/FC048
RC/FC060
RC/FC072
RC/FC096
RC/FC120
RC/FC150
RC/FC180
RC/FC210
RC/FC240
RC/FC300
RC/FC360
RC/FC420



⚠ NOTICE

Installer:
Please take the time to read and understand the instructions contained inside this manual prior to any installation. The installer must give a copy of this manual to the unit owner.

Owner:
Keep this manual in a safe place in order to provide service technicians with necessary unit information.

NOT FOR RESIDENTIAL USE

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Table of Contents:

Table of Figures and Tables:

Figures:

Tables:

Section 1:
Safety Introduction and Labeling Guide:

Your Safety is Important to Us!

Please follow and understand the rules and the instructions contained herein carefully. Failure to do so could cause a malfunction of the HVAC equipment, resulting in injury, death and/or property damage.

Throughout this manual, and in specific places on the unit itself, the signal words **DANGER**, **WARNING** and **CAUTION** are used to identify levels of hazard seriousness. **NOTICE** will be used in areas where there is important information but not hazard related.

- **DANGER** – Immediate hazards which ***WILL*** result in severe personal injury or death.
- **WARNING** – Hazards or unsafe practices which ***COULD*** result in severe personal injury or death.
- **CAUTION** – Hazards or unsafe practices which ***COULD*** result in minor personal injury or product or property damage.
- **NOTICE** – Information to consider that might result in poor operation, or equipment damage/failure.

⚠ DANGER

DANGER labels will feature white text on a red background.

⚠ WARNING

WARNING labels will feature white text on an orange background.

⚠ CAUTION

CAUTION labels will feature white text on a yellow background.

⚠ NOTICE

NOTICE labels will feature white text on a black background.

⚠ WARNING

Improper installation, service, or maintenance can result in death, injury, or property damage. Read this installation, operation, and maintenance manual thoroughly before installing or servicing this equipment.

Installation must be done by a registered installer/ contractor qualified in the installation and service of HVAC equipment.

These instructions, local codes and ordinances and applicable standards that apply to piping, electrical wiring, ventilation, etc. must be thoroughly understood before proceeding with the installation.

Protective gear is to be worn during installation, operation and service in accordance to the Occupational Safety and Hazard Administration (OSHA). Gear must be in accordance to NFPA 70E, latest revision when working with electrical components. Thin sheet metal parts have sharp edges. To prevent injury, the use of work gloves is recommended.

This equipment must be applied and operated under the general concepts of reasonable use and installed using best building practices.

This equipment is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the equipment by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the equipment.

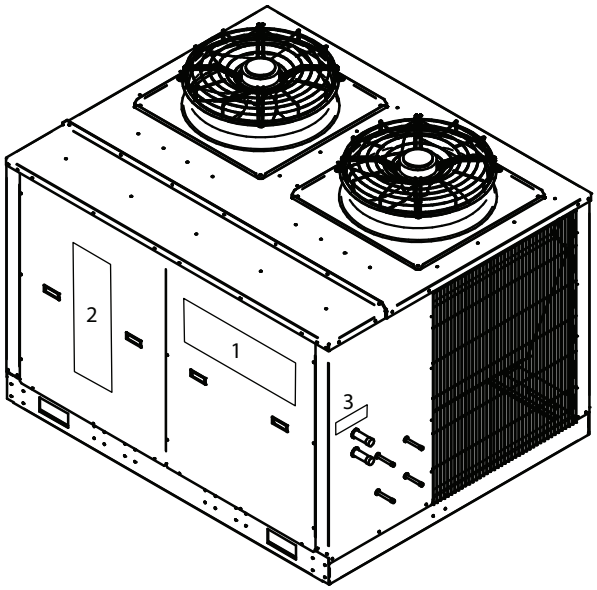
To obtain additional copies of the Installation, Operation and Maintenance Manual, please contact Addison.

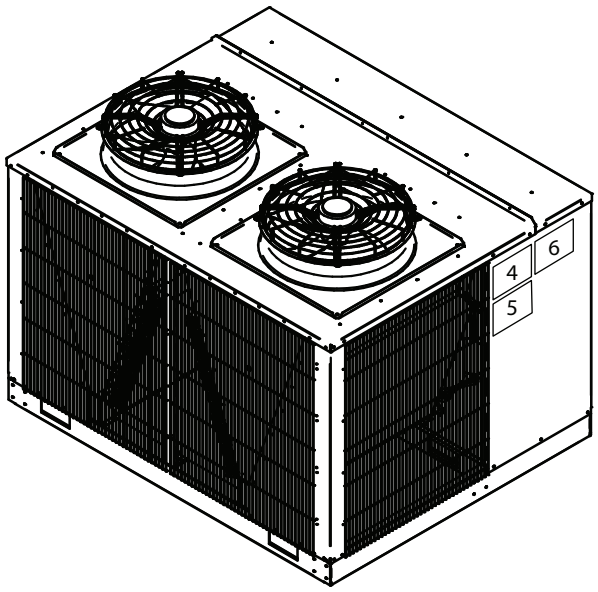
For detailed information regarding specifications, dimensional drawings, and weight information, contact your local ADDISON® manufacturer's representative.

Figure 1: Label Placement Drawing

⚠ NOTICE

California Proposition 65
In accordance with California Proposition 65 requirements, a warning label must be placed in a highly visible location on the outside of the equipment (i.e., near equipment's serial plate). See label placement drawings on Figure 1 for label location. Avoid placing label on areas with extreme heat, cold, corrosive chemicals or other elements. To order additional labels, please contact Addison.





Label	Part Number	Description	Notes
1	0527P-1286	Logo Decal	
2	91070001	Warning: Shock Hazard	
3	0527N-0441A	Warning: Nitrogen Under Pressure	
4	91070016	California Proposition 65	
5	91060003	Warning: R410-A Refrigerant	
6	N/A	Serial Data Plate	

Section 2:
Introduction and Pre-Installation:

2.1 - Description of Operation

The RC/FC Series is a split HVAC system that can operate within a broad range of ambient conditions and introduce ventilation air into a building at neutral conditions. It consists of matched refrigeration and air moving components (system controls, compressor[s], evaporator section, condensing section and fan[s]) designed to treat 100% outside air and/or recirculated air. This system has the ability to filter, cool, heat, and/or dehumidify air.

The unit may be provided with several different options and/or controls to meet various application requirements, including optional hot gas reheat, subcooling/reheat coil (not available on heat pump modes), supplemental heat (electric hot water or steam) and variable air volume delivery. Be sure to read this entire manual before installation and start-up.

2.2 Inspection and Setup

All units are leak-tested, pressure-tested, evacuated, and charged with nitrogen prior to shipment. Immediately upon receipt of the unit, check the electrical supply and characteristics of the unit and verify that they match the electrical supply available. Verify that the specifications on the unit rating plate match your order. Check the unit for any damage that may have occurred during shipment, including internal piping. ***If any damage is found, file a claim with the transporting agency. Do not refuse shipment.*** Check the installation location to ensure proper clearances. See Section 3.

Any small options (if so equipped) which do not come attached to the unit (i.e. sensors) will be found inside the condensing unit control enclosure.

If the unit must be temporarily stored (i.e. job site is not ready for installation of the unit), the unit should be set on 4" x 4" (10 cm x 10 cm) pieces of timber on level ground in a protected area. The unit should be covered to be protected from the environment. Indoor air handler sections cannot be stored outside.

⚠ WARNING

This unit contains HFC-(R410A), an azeotropic mixture of R-32 (Difluoromethane) and R-125 (Pentafluoroethane). DO NOT VENT HFC-(R410A) to the atmosphere. The U. S. Clean Air Act requires the recovery of any residual refrigerant. Do not use R-22 service equipment or components on R410A systems.

2.3 - Condensing Unit Nomenclature Example

Digit:	Description:	Feature:
1 - 2	Product Family	**RC** = Condensing Unit
3	Application	**O** = Dedicated Outdoor Air
		R = Recirculating
4	Operation Type	**A** = Air Cooled
		H = Air Source Heat Pump
5 - 7	Nominal Capacity	**042** = 3.5 Tons
		048 = 4.0 Tons
		060 = 5.0 Tons
		072 = 6.0 Tons
		096 = 8.0 Tons
		120 = 10.0 Tons
		150 = 12.5 Tons
		180 = 15.0 Tons
		210 = 17.5 Tons
		240 = 20.0 Tons
		300 = 25.0 Tons
		360 = 30.0 Tons
		420 = 35.0 Tons
8	Cabinet Size	**A** = A Cabinet
		B = B Cabinet
		C = C Cabinet
		D = D Cabinet
		E = E Cabinet
9	Controls	**A** = ALC, Standard Program, DOAS
		B = ALC, Standard Program, Recirculating
		C = ALC, Standard Program, DOAS with LON
		D = ALC, Standard Program, Recirculating with LON
		E = Controls by Others, Factory Mounted
		F = Terminal Strip, Controls Provided and Mounted by Others
		G = Remote Thermostat
		H = Compressor Lockout Thermostat
10	Voltage	**2** = 208/60/3
		3 = 230/60/3
		4 = 460/60/3
11	Vintage	**H** = Current

Note: See unit data plate for specific configuration and options.

2.4 - Air Handler Section Nomenclature Example

Digit:	Description:	Feature:
1 - 2	Product Family	**FC** = Air Handler
3	Application	**O** = Dedicated Outdoor Air
		R = Recirculating
4	Operation Type	**A** = Air Cooled
		H = Air Source Heat Pump
5 - 7	Nominal Capacity	**042** = 3.5 Tons
		048 = 4.0 Tons
		060 = 5.0 Tons
		072 = 6.0 Tons
		096 = 8.0 Tons
		120 = 10.0 Tons
		150 = 12.5 Tons
		180 = 15.0 Tons
		210 = 17.5 Tons
		240 = 20.0 Tons
		300 = 25.0 Tons
		360 = 30.0 Tons
		420 = 35.0 Tons
8	Cabinet Size	**A** = A Cabinet
		B = B Cabinet
		C = C Cabinet
		D = D Cabinet
		E = E Cabinet
9	Controls	**A** = ALC, Standard Program, DOAS
		B = ALC, Standard Program, Recirculating
		C = ALC, Standard Program, DOAS with LON
		D = ALC, Standard Program, Recirculating with LON
		E = Controls by Others, Factory Mounted
		F = Terminal Strip, Controls Provided and Mounted by Others
		G = Remote Thermostat
		H = Compressor Lockout Thermostat
10	Voltage	**2** = 208/60/3
		3 = 230/60/3
		4 = 460/60/3
11	Vintage	**H** = Current
12	Air Flow Orientation	**A** = Vertical Cabinet, Vertical Supply
		B = Horizontal Cabinet, Horizontal Supply

Note: See unit data plate for specific configuration and options.

Section 3:
Installer Responsibility:

The installer is responsible for the following:

- To install and commission the unit, as well as the electrical supplies, and chilled/hot water (if equiped), in accordance with applicable specifications and codes. Addison recommends the installer contact a local building inspector for guidance.
- To use the information given in a layout drawing and in the manual together with the cited codes and regulations to perform the installation.
- To furnish all needed materials not furnished as standard equipment, including all interconnecting refrigerant piping.
- To plan location of supports.
- To provide access to unit for servicing.
- To provide the owner with a copy of this Installation, Operation and Service Manual.
- To ensure there is adequate air circulation around the unit and to supply air for ventilation and distribution in accordance with local codes.
- To assemble or install any accessories or associated duct work using best building practices.
- To properly size supports and hanging materials.
- To verify that the unit is delivering design airflow by having an air balancing test performed.
- To have refrigerant technician certification per Section 608 of the US Environmental Protection Agency (EPA) Clean Air Act of 1990 or equivalent certification program.
- To have all required equipment to work on direct expansion and/or chilled water air conditioning system.
- Install any ship loose parts.

3.1 Corrosive Chemicals

Addison cannot be responsible for ensuring that all appropriate safety measures are undertaken prior to installation; this is entirely the responsibility of the installer. It is essential that the contractor, the subcontractor, or the owner identifies the presence of combustible materials, corrosive chemicals or halogenated hydrocarbons* anywhere in the premises.

⚠ CAUTION

PRODUCT DAMAGE HAZARD
Do not use equipment in area containing corrosive materials. Refer to appropriate Material Safety Data Sheets (MSDS). Failure to follow these instructions can result in product damage.

**** Halogenated Hydrocarbons** are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are frequently used in refrigerants, cleaning agents, solvents, etc. If these compounds enter the air supply of the burner, the life span of the unit components will be greatly reduced. An outside air supply must be provided to the burners whenever the presence of these compounds is suspected. Warranty will be invalid if the unit is exposed to halogenated hydrocarbons.*

3.2 Required Equipment and Materials

When lifting of the unit is required, the installing contractor is responsible for supplying or arranging for the appropriate lifting equipment so that the unit may be placed in a safe manner.

The qualified installing / service technician is responsible for having the appropriate equipment and materials for the safe installation and start-up of an unit. Tools and materials required to commission the unit include, but are not limited to, the following:

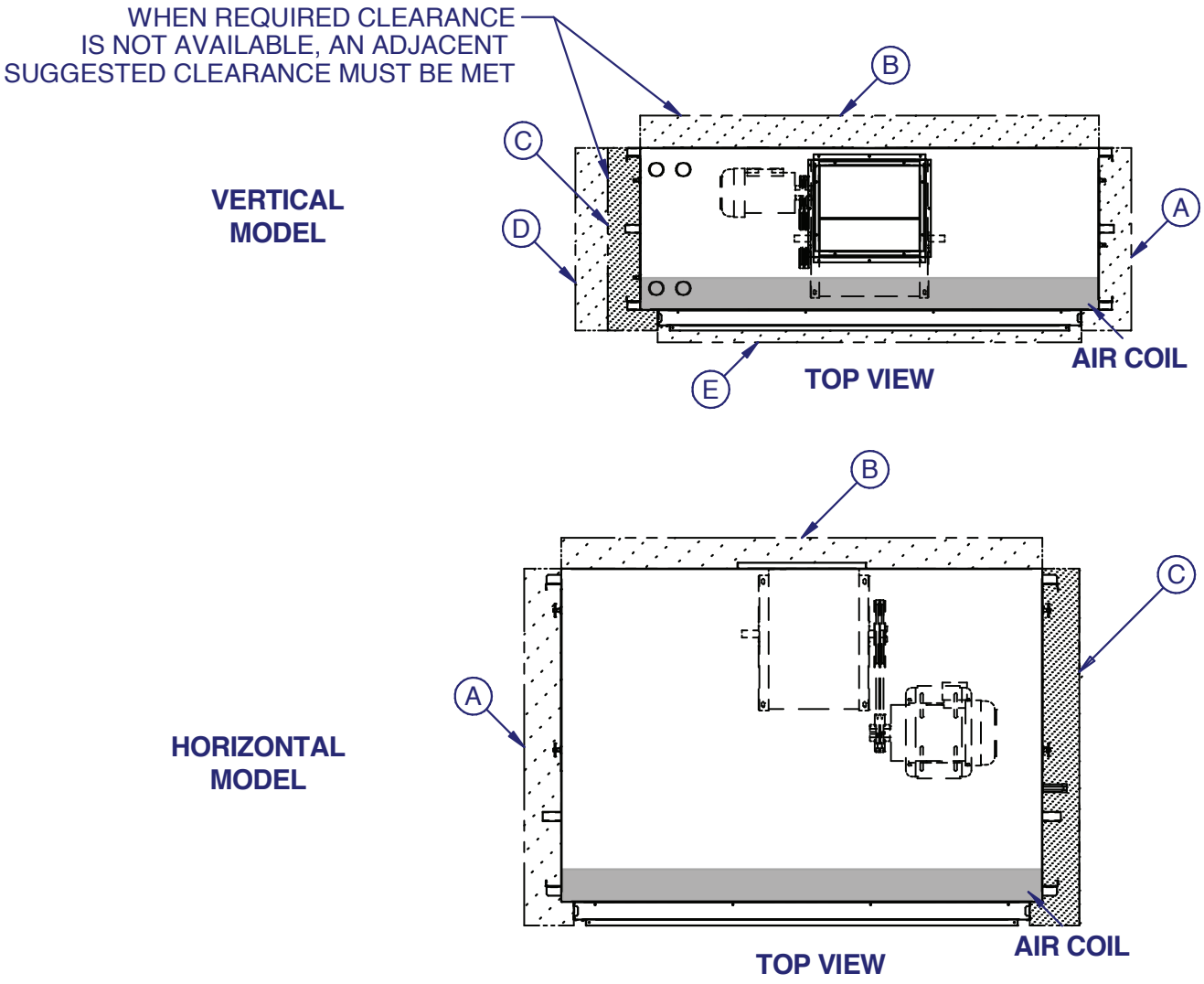
- Various screwdriver types and sizes
- Various wrench types and sizes
- Drill motor and various drill bits
- Voltmeter
- Clamp style ammeter
- Butyl caulk
- Gauges and accessories
- Direct expansion and/or chilled water gauges and accessories.
- Refrigerant
- Refrigerant oil

Section 4:
Critical Considerations:

4.1 Required Clearances

Clearances are the required distances that the unit must be away from objects and other units to allow service access and proper operation of the unit.

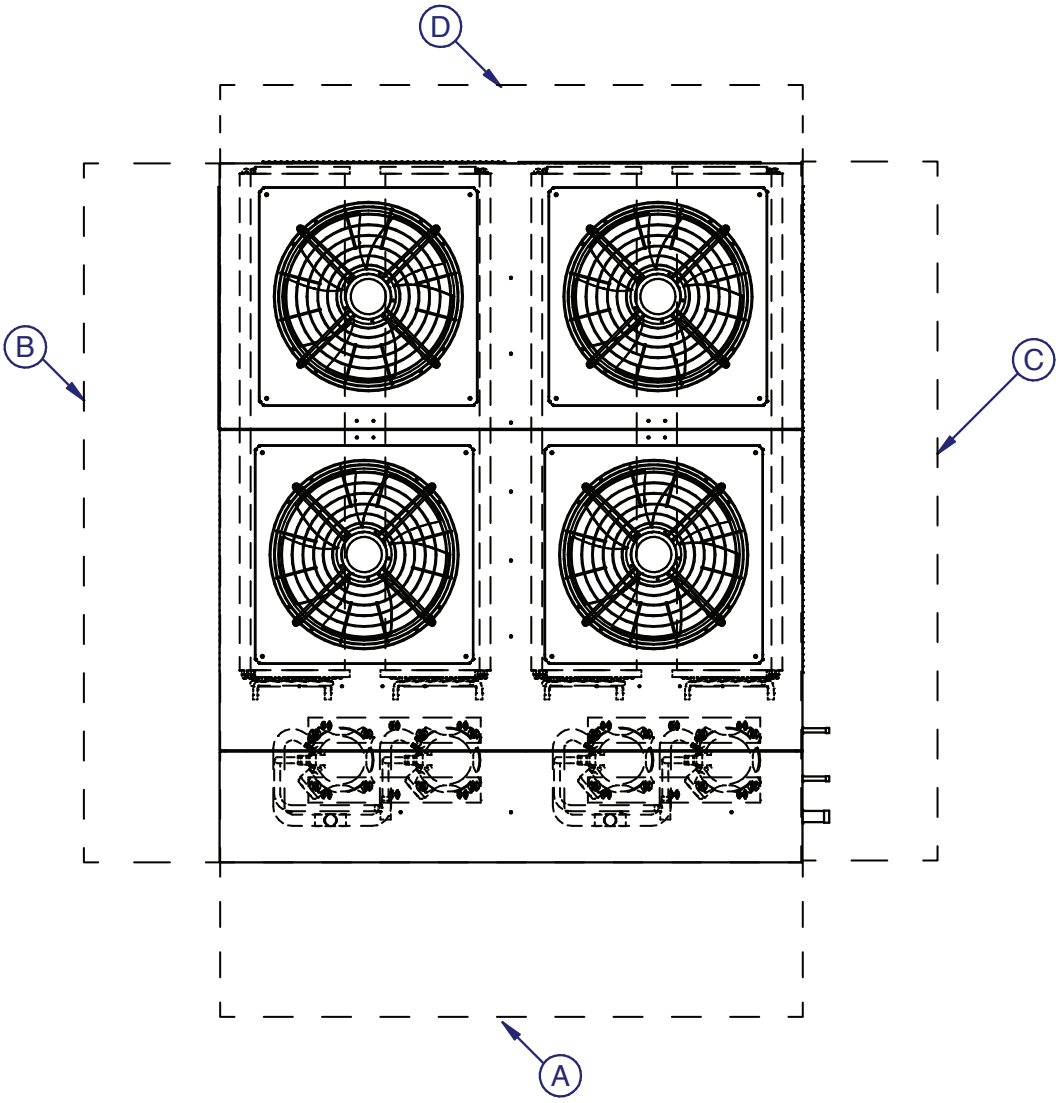
Figure 2: Air Handler Clearances



UNIT CLEARANCES				
AREA	DIM	DESCRIPTION	REQUIRED/SUGGESTED	NOTE
A	36”	BLOWER/COIL ACCESS	SUGGESTED	MINIMUM CLEARANCE FROM GROUNDED AND UNGROUNDED STRUCTURES.
B		BLOWER/MOTOR ACCESS		
C		BLOWER/MOTOR/BELT ACCESS	REQUIRED	
D	90”	COIL REMOVAL*	SUGGESTED	
E	36”	BLOWER ACCESS		
F	5”	TOP PAN REMOVAL		

NOTE: Horizontal units require vertical clearance over the unit sufficient to remove the air coil. Coil is mounted via clips that can be removed in an upwards direction.

Figure 3: Condensing Section Clearances



TOP VIEW

UNIT CLEARANCES				
AREA	DIM	DESCRIPTION	REQUIRED/SUGGESTED	NOTE
A	36”	COMPRESSOR & CONTROL	REQUIRED	MINIMUM CLEARANCE FROM GROUNDED AND UNGROUNDED STRUCTURES.
B		CONDENSING COIL		
C		CONDENSING COIL		
D	24”	AIR FLOW	SUGGESTED	
E	120”	VERTICAL CLEARANCE (NOT SHOWN)	REQUIRED	

4.1.1 Ventilation Clearances

In order to help ensure proper operation of an air-source constructed unit, a 24" (61.0 cm) clearance for ventilation must be maintained.

In addition, read and follow the additional ventilation clearance guidelines below:

- Do not locate the condensing unit under an overhang or near a wall/other equipment that will short circuit hot air to the coil intakes.
- Do not locate condensing unit within 10′ (3.0 m) of exhaust fans or flues.
- Do not locate the condensing unit within 48″ of another condensing unit to allow air recirculation.

4.2.1 Condensing Unit Placement Considerations

Locate the condensing unit as near as possible to the inside air handler section in order to keep connecting refrigerant tubing lengths to minimum and thus minimize loss of capacity due to long lines.

Select a location where external water drainage cannot collect around the condensing unit. Locate the unit so roof runoff water does not pour directly on the condensing unit. Provide gutter or other shielding at roof level. Where snowfall is anticipated, mount the unit so all intakes and discharges are above the maximum snow depth for the area.

When installed at ground level, the condensing unit should be mounted on a level concrete slab which should extend at least 2" (5.1 cm) beyond the unit on all sides. The top of the slab should be 2" (5.1 cm) above the ground level. The depth of the slab below the ground level and its structural design is governed by the type of soil and climatic conditions. The slab must not be in contact with any part of the building wall or foundation. The space between the slab and the building wall prevents the possibility of transmitting vibration to the building. When installing a condensing unit on the roof of a building, the structural members supporting the unit must be sufficiently strong for the weight of the unit and mounting rails.

In areas where there is a risk of hurricane force winds, properly sized “hurricane straps” should be used to secure the unit to the structure or slab it is installed on.

4.2.2 Air Handler Placement Considerations

When locating the air handlers, make sure there is sufficient free area to allow for adequate airflow to the filters. The air handler must be situated so that it can be serviced and the filters changed. Access panels are located on four sides of vertical units and two sides of horizontal units. However, consideration for the adjustments of the drive belt and motor are important when locating the units adjacent to walls or other units.

The cabinets of these units are well insulated. In most installations, this construction will prevent sweating on the outside of the unit. However, in cases where units are installed above ceilings which are over areas where high humidity conditions are prevalent, it is recommended that an insulated watertight pan with adequate drain connection be constructed and installed under the air handler. This separate drain pan should extend approximately 2″ beyond the unit on all sides to ensure collection of any condensate forming on the outside of the cabinet. When this additional pan is used, the unit must not be supported by the pan.

Air handlers are designed for a ducted supply application. Inlet air may be ducted as required.

4.3 Hardware

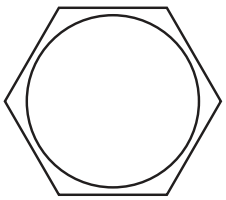
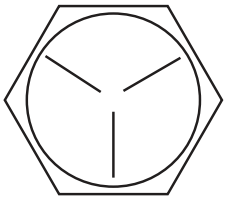
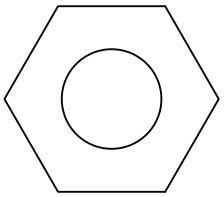
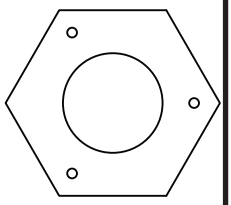
Unless otherwise specified, all hardware (except sheet metal screws) must be torqued to settings from Table 1.

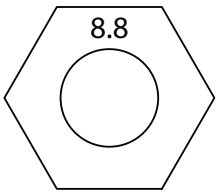
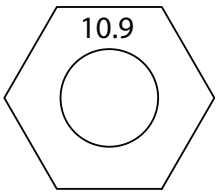
4.4 Ship-With Parts

Some options (if selected) may include parts that will require field installation. These parts are included loose with the shipment of the unit, inside the control panel.

- Motor starter – Starter may include phase monitor or VFD
- OA damper
- Over the blower electric heater are field-mounted at least 5" above the air handler discharge
- SAT/RH Duct Sensor
- DPT Duct Sensor

Table 1: Recommended Torque Settings

Bolt Head Grade Marking		
Nut Grade Marking		
Bolt Size:	**Grade 2:**	**Grade 5:**
10-24	27 in-Lb	42 in-Lb
1/4-20	65 in-Lb	101 in-Lb
5/16-18	11 ft-Lb	17 ft-Lb
3/8-16	19 fl-Lb	30 ft-Lb

Bolt Head Grade Marking		
Nut Grade Marking		
Bolt Size:	**Grade 2:**	**Grade 5:**
M5	6Nm	9Nm
M6	10Nm	15Nm
M8	25Nm	35Nm
M10	50Nm	75Nm
M12	85Nm	130Nm
M16	215Nm	315Nm

Section 5: National Standards and Applicable Codes:

5.1 Refrigerant Handling Practices

The handling, reclaiming, recovering and recycling of refrigerants as well as the equipment to be used and the procedures to be followed must comply with the national and local codes.

United States: Refer to Federal Clean Air Act - latest revision.
Canada: Refer to Canadian Environmental Protection Act - latest revision.

5.2 Installation Codes

Installations must be made in accordance with NFPA 90A - latest revision, Standard for the Installation of Air-Conditioning and Ventilation Systems.

5.3 Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes:

United States: Refer to Standard for Aircraft Hangars, NFPA 409 - latest revision.
Canada: Refer to Standard CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

5.4 Parking Structures and Repair Garages

Installation in garages must be in accordance with the following codes:

United States: Standard for Parking Structures NFPA 88A - latest revision or the Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A - latest revision.
Canada: Refer to CSA B149.1 - latest revision, Natural Gas and Propane Installation Code.

5.5 Electrical

Electrical connection to unit must be in accordance with the following codes:

United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances, and any special diagrams furnished.
Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

Section 6:
Lifting a Split Air Conditioning Unit:

The unit must be installed in compliance with all applicable codes. The qualified installer or service technician must use best building practices when installing the unit.

6.1 Moving/Lifting the Unit

6.1.1 Preparing to Move/Lift the Unit:

Prior to moving/lifting the unit, the following steps must be performed.

1. Remove all packaging or blockers.
2. Remove all packages that were shipped inside the unit.
3. Inspect the unit to:
   - Verify that there is no damage as a result of shipping.
   - Ensure that it is appropriately rated for the utilities available at the installation site.
   - Verify lifting holes located in the frame are intact, undamaged and secured to the air conditioning unit.
   - Ensure factory-installed hardware is torqued as specified.
4. Prepare the installation location to be ready to accept the unit.
5. Verify that the moving/lifting equipment can handle the unit's weight. Verify that forklift forks extend through the unit frame and that crane has required reach.

⚠ WARNING

CRUSH HAZARD
Use proper lifting equipment and practices. Failure to follow these instructions can result in death, injury, or property damage.

6.1.2 Moving the Unit with Forklift

Move the unit using forklift pockets, if provided. Insure that the forklift forks are evenly spaced, and go completely through both sides. Weight should be evenly balanced and centered with the forklift.

6.1.3 Lifting the Unit with Crane

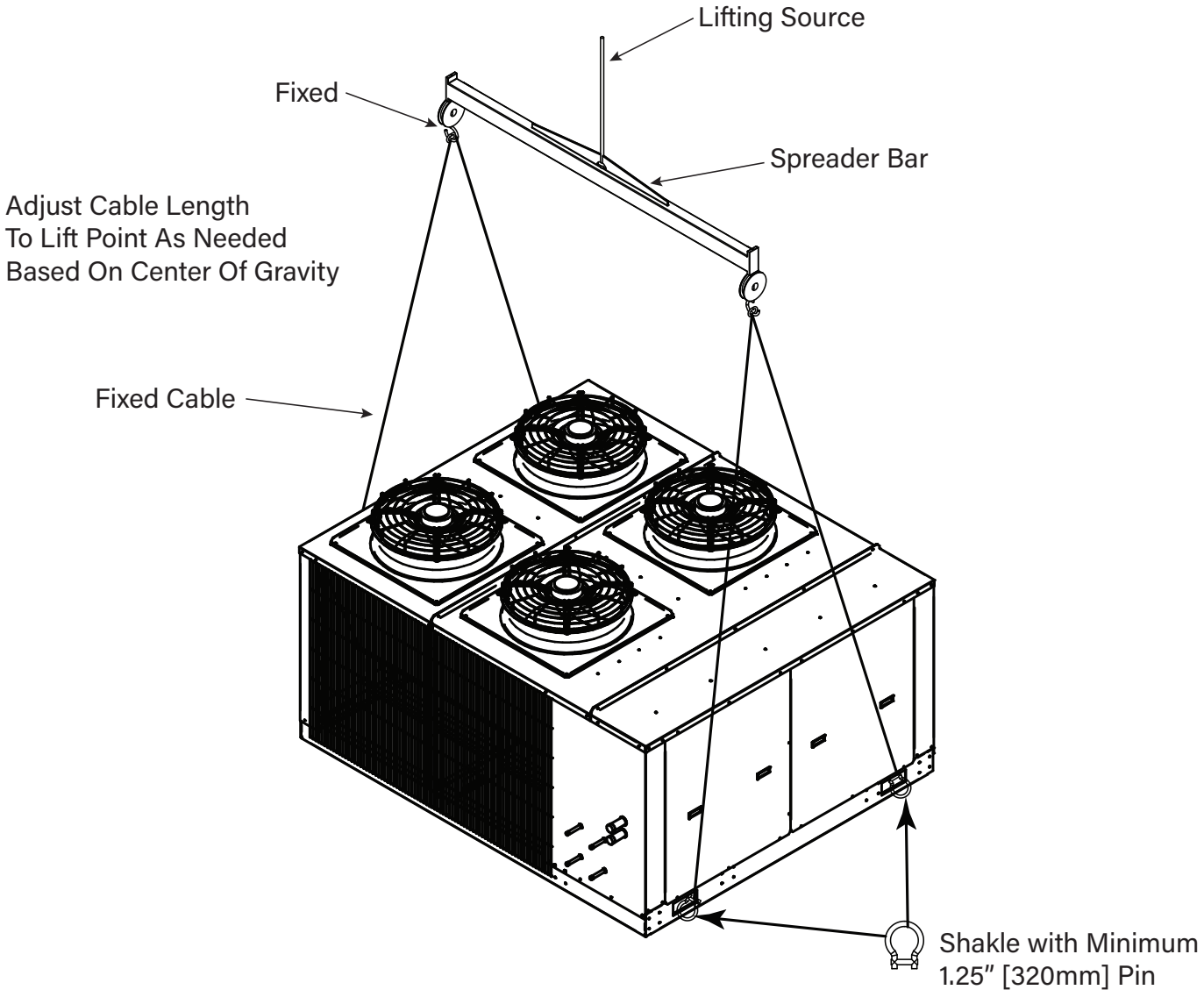
Lift the unit into place installing appropriate hardware (supplied by others) into all four lifting holes. Use spreader bars to ensure that the lifting cables clear the sides of the unit. See Figure 4. Test lift to 12" [30.5 cm] to check stability of rigging before completing the lift. Use caution as the load may be unbalanced. The unit must be kept level during the lift to prevent tipping, twisting or falling. If lifted improperly, product damage may occur.

Table 2: Unit Weights

FCRA/H	Base Weight	With Reheat or Subcooling	FCOA/H	Base Weight	With Reheat or Subcooling
042	255	285	042	140	160
048	255	285	048	210	230
060	255	285	060	255	285
072	255	285	072	255	285
096	405	445	096	405	445
120	485	525	120	485	525
150	740	790	150	740	790
180	790	840	180	790	840
210	790	840	210	790	840
240	815	865	240	815	865
300	815	865	300	815	865
360	935	995	360	935	995
420	1235	1335	420	1235	1335

RCRA/H & RCOA/H	Base
042	565
048	590
060	610
072	695
096	870
120	915
150	1335
180	1345
210	1400
240	1900
300	1945
360	2210
420	2330

Figure 4: Unit Lifting

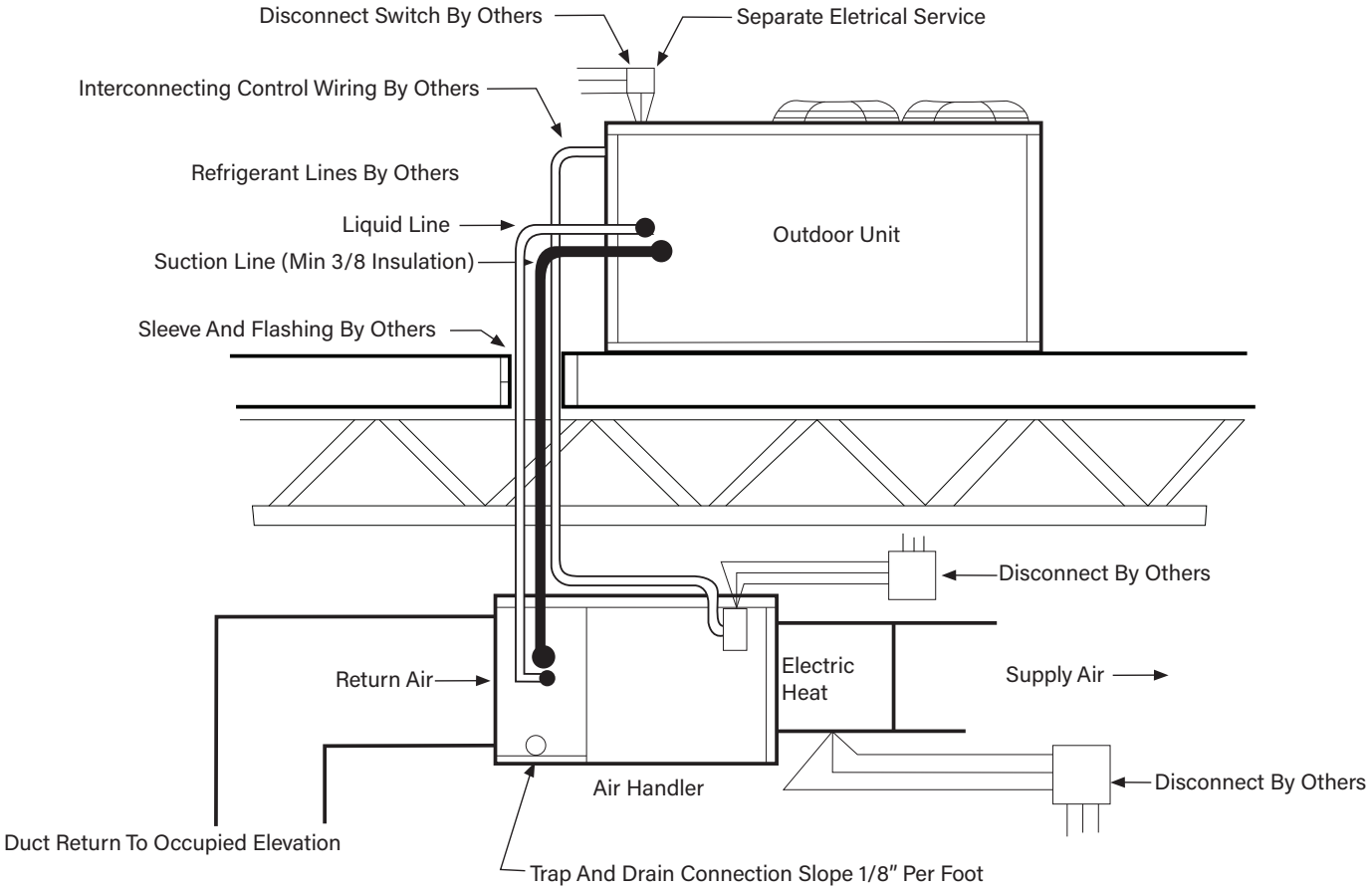


⚠ WARNING

CRUSH HAZARD
Use unit lifting points for rigging only. Failure to follow these instructions can result in death, injury, or property damage.

Section 7:
Unit Placement:

Figure 5: Unit Installation Example



Section 8:
Ductwork Consideration:

The unit has been designed to operate at the specific air volume and external static pressure that was ordered. This static pressure is generated by any additional components that are added to the unit (i.e. ductwork, etc). Additional static pressure beyond that ordered will affect the performance of the air conditioning unit and lessen the air volume that can be delivered.

Proper engineering methods need to be employed when calculating duct and component static pressure (i.e. 2009 ASHRAE Handbook - Fundamentals, Chapter 21).

The system ductwork must comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) or any other recognized standards.

It is recommended that flexible duct connections be incorporated into the ductwork design to prevent the transmission of any vibrations, either mechanical or harmonic.

As a general rule, all ducts should have a straight run of at least 3 hydraulic duct diameters immediately before and after the unit before adding any fittings, elbows, restrictions, etc.

Hydraulic duct diameter for round ducts (in inches):
Dh = d
Dh: hydraulic diameter
d: round duct inside diameter

Hydraulic duct diameter for rectangular ducts (in inches):
Dh = (2*H*W)/(H+W)
Dh: hydraulic diameter
H: rectangular duct inside height
W: rectangular duct inside width

The unit is not designed to support the weight of ductwork. Ductwork must be constructed in a fashion that is self-supporting.

Depending on the options ordered with the unit, flanges (either external or internal) may be provided to facilitate connection of ductwork. In cases where flanges are not provided, flat surfaces on the exterior skin of the unit are provided to facilitate connection of ductwork.

Neither the flanges nor exterior skin of the unit are capable of supporting the load of the ductwork. Ductwork support must come from the structure itself that the unit is servicing. Ductwork passing through unconditioned spaces must be insulated (including a vapor barrier) to prevent unnecessary energy losses and/or condensation.

8.1 Outside or Return Air Ductwork

Return air ductwork height and width must be no smaller than the unit return air opening height and width.

8.2 Discharge Ductwork

Discharge air ductwork height and width must be no smaller that the unit discharge air opening height and width.

Section 9:
Refrigeration Circuits and Piping:

9.1 Refrigerant

This unit utilizes R-410A, a refrigerant with a zero ozone depletion rating, and POE refrigerant oil. Equipment utilizing R-410A refrigerant operates at higher pressures than other typical refrigerants. System components have been sized and pressure switch settings have been adjusted for the system refrigerant flows and higher operating pressures.

The unit has a broad application range. For optimum performance and efficiency, it may be necessary to adjust the refrigerant charge to maintain desired subcooling and superheat at operating temperature extremes.

9.2 Components and Configurations

There are many different refrigeration circuit variations available. Depending on the configuration, the unit may include, but is not limited to, the following components:

- Accumulator
- Coil
  - Evaporator coil
  - Condenser coil
- Compressor
  - Standard scroll
  - Variable Speed Scroll
  - Digital scroll
- Filter drier
- Hot gas bypass valve
- Hot gas reheat components
  - Check valve
  - Coil
  - Solenoid valve (standard) or modulating bypass/ reheat valves (modulating)
- Oil separator
- Receiver
- Refrigerant pressure switches- high and low
  - Non-adjustable
- Switchable liquid sub-cooling components
  - Coil
  - Two solenoid valves
  - Check valve
- Thermal expansion valve (TXV)

⚠ WARNING

EXPLOSION HAZARD
System is shipped with a dry nitrogen charge under pressure, and must be relived before making any connections. Nitrogen is non-polluting and may be vented to the atmosphere.

⚠ WARNING

EXPLOSION HAZARD
System contains R-410A refrigerant. Operating pressures may exceed limits of R-22 service equipment. Use proper refrigerant handling practices, tools, and equipment. Failure to follow these instructions can result in death, injury, or property damage.

⚠ CAUTION

PRODUCT DAMAGE HAZARD
System contains R-410A refrigerant. Operating pressures may exceed limits of R-22 service equipment. Use only R-410A refrigerant and POE 3MAF compressor oil. Verify Failure to follow these instructions can result in equipment damage.

⚠ NOTICE

PRODUCT DAMAGE HAZARD
Verify compressor and refrigerant oil type of the system before installation. POE and PVE oil cannot be mixed, and will result in equipment damage.

See Figure 7 through Figure 13 for schematics of the most common refrigeration circuit configurations. All schematics illustrate a single-compressor, single-circuit, cooling-only system.

- For single-circuit systems with a tandem compressor, the pair of compressors are mounted on a common base that are used together on a single refrigeration circuit.
- For dual-circuit systems with two independent compressors, the circuitry and components are duplicated for the second circuit.
- For heat-pump systems, a reversing valve is included.

9.3 Lineset Piping Installation

Read these instructions completely before proceeding with piping.

Prepare to connect the two sections with clean dehydrated refrigeration grade tubing. Recommended line sizes can be found in Tables 3A-3F. In order to assure oil return a velocity of 1,000 FPM must be maintained.

Locations where copper tubing will be exposed to mechanical damage should be avoided. If it is necessary to use such locations, the tubing should be enclosed in rigid or flexible conduit.

Horizontal piping runs should be supported enough to prevent high binding stresses in the tubing. The weight of vertical piping may be either supported with riser clamps bearing on structural members of the building or by a platform at the bottom of the riser.

Supports should be strong enough to handle any load by thermal expansion or contraction of the pipe so that stresses will not be placed on the equipment to which the piping is connected.

The suction line and both hot gas reheat lines (if included) should be insulated with 5/8" minimum thickness closed cell foamed insulation, to prevent sweating or heat loss. All lines, except the liquid line, must be insulated. However, on installations where the liquid line is exposed to high ambient areas the liquid line must be insulated to prevent sub-cooling loss. Refrigerant lines run underground should be insulated with ¾" minimum thickness closed cell foamed insulation. Suction horizontal lines must be pitched toward the compressor unit, see Figure 6.

When the air handler is installed at a higher elevation than the compressor, provide a vertical loop in the suction line adjacent to the air handler to a point at least to the top of the evaporator coil. Do not insulate the refrigerant or condensate drain lines until all joints in these lines are leak tested.

For long vertical risers in both suction and discharge lines, additional traps are recommended for each full length of pipe (approximately 20 feet) to insure proper oil movement.

Purge holding charge from the condensing unit by opening both the high and low pressure gauge ports on the condensing unit and allow holding charge to bleed off to atmospheric pressure.

Drill a 1/16" bleed hole in the cap on the suction line fitting of the air handler (larger of the two fittings) and allow holding charge to reduce to atmospheric pressure.

Remove caps on the suction and liquid lines of the inside section by drilling a small hole in the caps and then apply heat to caps to remove. The caps are soldered to the fittings with soft solder.

Carefully clean the suction line and liquid line fittings on the outside and braze the refrigerant lines to these fittings. Leave gauge port open until all brazing is completed. Low pressure nitrogen purging is recommended while brazing.

9.4 Refrigerant Oil

All condensing units come pre-charged with a nominal amount of oil for use with R-410A. Check the unit data plate for the type of oil used in the system.

In split systems, additional oil must be added for refrigerant charges in excess of 20lbs per system. The installing contractor must add an additional ounce of oil for each additional 2lbs of refrigerant added to any system over 20lbs.

Tandem compressors add additional complexity and must be handled with great care being charged. The individual compressors are shipped with an initial oil charge as well as separate sight glasses and oil equalization tubes. During compressor assisted charging, it is important to use only the first stage compressor draw in the refrigerant. Since the tandem compressor has 2 oil pre-charges, the oil added calculation for excess refrigerant starts at 40lbs of R-410A. For tandem compressors, 7 ounces of oil must be added for every 10lbs of R-410A added to the system over 40lbs.

Oil can return to the crankcase for several minutes after the compressor stops. Oil will only flow and equalize between tandem compressors when both compressors are off. The compressor with the higher oil level will only pass surplus oil that is above the mid-point of the sight glass.

Units must have an oil level at, or above, the half-point of the sight glass after being off for a period of 5 minutes or longer, including both compressors in a tandem set.

⚠ CAUTION

PRODUCT DAMAGE HAZARD
Excessive oil within the system can cause potential issues with operation. The objective is to provide a proper system oil charge that is based on requirements.

Table 3a: Lineset Recommended Sizes

Indoor Unit Located Below Outdoor Unit						
Nominal Btu/h per refrigerant circuit	Equivalent length up to 25'			Equivalent length 26' to 50'		
	Size inches O.D.			Size inches O.D.		
	Suction(1)	Liquid	Hot gas reheat(4)	Suction(1)	Liquid	Hot gas reheat(4)
42,000	5/8 - 5/8	3/8	1/2	3/4 - 3/4	3/8	1/2
48,000	5/8 - 5/8	3/8	1/2	3/4 - 5/8	1/2	5/8
60,000	3/4 - 3/4	1/2	5/8	3/4 - 3/4	1/2	5/8
72,000	3/4 - 3/4	1/2	5/8	7/8 - 3/4	1/2	5/8
84,000	7/8 - 3/4	1/2	5/8	1-1/8 - 3/4	1/2	3/4
96,000	7/8 - 7/8	1/2	5/8	1-1/8 - 7/8	5/8	3/4
120,000	1-1/8 - 1-1/8	5/8	5/8	1-1/8 - 1-1/8	5/8	3/4
150,000	1-1/8 - 1-1/8	5/8	3/4	1-1/8 - 1-1/8	5/8	7/8
180,000	1-3/8 - 1-3/8	3/4	3/4	1-3/8 - 1-1/8	5/8	7/8
220,000	1-3/8 - 1-3/8	3/4	7/8	1-3/8 - 1-3/8	3/4	1-1/8
250,000	1-3/8 - 1-3/8	7/8	7/8	1-3/8 - 1-3/8	7/8	1-1/8
300,000	1-3/8 - 1-3/8	7/8	7/8	1-5/8 - 1-3/8	7/8	1-1/8
350,000	1-5/8 - 1-5/8	7/8	1-1/8	1-5/8 - 1-5/8	1-1/8	1-1/8
400,000	1-5/8 - 1-5/8	1-1/8	1-1/8	1-5/8 - 1-5/8	1-1/8	1-1/8
Nominal Btu/h per refrigerant circuit	Equivalent length 51' to 75'			Equivalent length 76' to 100'		
	Size inches O.D.			Size inches O.D.		
	Suction(1)	Liquid	Hot gas reheat(4)	Suction(1)	Liquid	Hot gas reheat(4)
42,000	3/4 - 3/4	3/8	1/2	7/8 - 3/4	3/8	5/8
48,000	3/4 - 5/8	1/2	5/8	7/8 - 5/8	1/2	5/8
60,000	7/8 - 3/4	1/2	5/8	7/8 - 3/4	1/2	3/4
72,000	7/8 - 3/4	1/2	3/4	7/8 - 3/4	1/2	3/4
84,000	1-1/8 -7/8	5/8	7/8	1-1/8 -7/8	5/8	3/4
96,000	1-1/8 -7/8	5/8	7/8	1-1/8 -7/8	5/8	3/4
120,000	1-1/8 -1-1/8	5/8	7/8	1-1/8 -1-1/8	5/8	7/8
150,000	1-1/8 -1-1/8	3/4	7/8	1-3/8 -1-1/8	3/4	7/8
180,000	1-3/8 -1-3/8	3/4	1-1/8	1-3/8 -1-3/8	3/4	1-1/8
220,000	1-3/8 -1-3/8	3/4	1-1/8	1-5/8 -1-3/8	3/4	1-1/8
250,000	1-3/8 - 1-3/8	3/4	1-1/8	1-3/8 -1-3/8	7/8	1-1/8
300,000	1-5/8 - 1-5/8	7/8	1-1/8	1-5/8 - 1-5/8	7/8	1-1/8
350,000	1-5/8 - 1-5/8	7/8	1-1/8	2-1/8 - 1-5/8	1-1/8	1-1/8
400,000	2-1/8 - 1-5/8	1-1/8	1-1/8	2-1/8 -1-5/8	1-1/8	1-1/8

(1) Maximum vertical lift = 60 feet with suction riser sized traps every 20 feet on the vertical line starting at the lowest point. First size is horizontal run; second size is for riser.
(4) Hot gas reheat, if ordered, requires one line per circuit. Pitch hot gas (discharge) lines in direction refrigerant flow - minimum 1/8" per foot.
Example for dual circuit unit: if total system capacity is 240,000 Btu/h, divide by 2 and use the line sizes for 120,000 Btu/h for each circuit. Follow industry standard refrigeration recommendations for piping. Suction (Vapor) and hot gas reheat lines must be insulated.

Table 3b: Lineset Recommended Sizes

Indoor Unit Located Below Outdoor Unit, Cont.						
Nominal Btu/h per refrigerant circuit	Equivalent length 100' to 125'			Equivalent length 126' to 150'		
	Size inches O.D.			Size inches O.D.		
	Suction(1)	Liquid	Hot gas reheat(4)	Suction(1)	Liquid	Hot gas reheat(4)
42,000	3/4 - 5/8	3/8	1/2	3/4 - 5/8	1/2	1/2
48,000	7/8 - 5/8	1/2	5/8	7/8 -3/4	1/2	5/8
60,000	7/8 - 3/4	1/2	5/8	7/8 - 3/4	1/2	5/8
72,000	7/8 - 3/4	1/2	5/8	7/8 - 3/4	1/2	5/8
84,000	1-1/8 - 7/8	5/8	3/4	1-1/8 - 7/8	5/8	3/4
96,000	1-1/8 - 7/8	5/8	3/4	1-1/8 - 7/8	5/8	3/4
120,000	1-1/8 -1-1/8	5/8	3/4	1-1/8 - 1-1/8	5/8	3/4
150,000	1-3/8 -1-1/8	5/8	7/8	1-1/8 - 1-3/8	3/4	7/8
180,000	1-3/8 - 1-1/8	3/4	7/8	1-3/8 - 1-1/8	3/4	1-1/8
220,000	1-3/8 - 1-3/8	3/4	1-1/8	1-3/8 - 1-3/8	3/4	1-1/8
250,000	1-3/8 -1-3/8	7/8	1-1/8	1-5/8 -1-3/8	7/8	1-1/8
300,000	1-5/8 - 1-3/8	7/8	1-1/8	1-5/8 - 1-3/8	7/8	1-1/8
350,000	1-5/8 - 1-5/8	1-1/8	1-1/8	1-5/8 - 1-5/8	1-1/8	1-1/8
400,000	1-5/8 - 1-5/8	1-1/8	1-3/8	2-1/8 -1-5/8	1-1/8	1-3/8

Nominal Btu/h per refrigerant circuit	Equivalent length 151' to 175'			Equivalent length 176' to 200'		
	Size inches O.D.			Size inches O.D.		
	Suction(1)	Liquid	Hot gas reheat(4)	Suction(1)	Liquid	Hot gas reheat(4)
42,000	3/4 - 5/8	1/2	1/2	3/4 - 5/8	1/2	5/8
48,000	7/8 - 3/4	1/2	5/8	7/8 - 3/4	1/2	5/8
60,000	7/8 - 3/4	1/2	5/8	7/8 - 3/4	1/2	5/8
72,000	1-1/8 - 3/4	1/2	5/8	1-1/8 - 3/4	5/8	5/8
84,000	1-1/8 -7/8	5/8	3/4	1-1/8 -7/8	5/8	3/4
96,000	1-1/8 -7/8	5/8	3/4	1-1/8 -7/8	5/8	3/4
120,000	1-1/8 -1-1/8	5/8	3/4	1-3/8 -1-1/8	5/8	3/4
150,000	1-3/8 -1-1/8	3/4	7/8	1-3/8 -1-1/8	3/4	7/8
180,000	1-3/8 -1-1/8	3/4	1-1/8	1-3/8 -1-1/8	3/4	1-1/8
220,000	1-3/8 -1-3/8	7/8	1-1/8	1-5/8 -1-3/8	7/8	1-1/8
250,000	1-5/8 -1-3/8	7/8	1-1/8	1-5/8 -1-3/8	7/8	1-1/8
300,000	1-5/8 - 1-3/8	7/8	1-1/8	1-5/8 - 1-3/8	7/8	1-1/8
350,000	1-5/8 - 1-5/8	1-1/8	1-1/8	1-5/8 - 1-5/8	1-1/8	1-1/8
400,000	2-1/8 -1-5/8	1-1/8	1-3/8	2-1/8 -1-5/8	1-1/8	1-3/8

(1) Maximum vertical lift = 60 feet with suction riser sized traps every 20 feet on the vertical line starting at the lowest point. First size is horizontal run; second size is for riser.
(4) Hot gas reheat, if ordered, requires one line per circuit. Pitch hot gas (discharge) lines in direction refrigerant flow - minimum 1/8" per foot.
Example for dual circuit unit: if total system capacity is 240,000 Btu/h, divide by 2 and use the line sizes for 120,000 Btu/h for each circuit. Follow industry standard refrigeration recommendations for piping. Suction (Vapor) and hot gas reheat lines must be insulated.

Table 3c: Lineset Recommended Sizes

Indoor Unit Located Level With, or Above Outdoor Unit						
Nominal Btu/h per refrigerant circuit	Equivalent length up to 25'			Equivalent length 26' to 50'		
	Size inches O.D.			Size inches O.D.		
	Suction(2)	Liquid(3)	Hot gas reheat(4)	Suction(2)	Liquid(3)	Hot gas reheat(4)
42,000	3/4	3/8	1/2	3/4	1/2	1/2
48,000	3/4	1/2	1/2	3/4	1/2	5/8
60,000	3/4	1/2	5/8	3/4	1/2	5/8
72,000	3/4	1/2	5/8	7/8	5/8	5/8
84,000	3/4	5/8	5/8	7/8	5/8	3/4
96,000	7/8	5/8	5/8	1-1/8	5/8	3/4
120,000	7/8	5/8	5/8	1-1/8	5/8	3/4
150,000	1-1/8	3/4	3/4	1-1/8	3/4	7/8
180,000	1-1/8	3/4	3/4	1-1/8	3/4	7/8
220,000	1-1/8	3/4	7/8	1-3/8	7/8	7/8
250,000	1-3/8	3/4	7/8	1-3/8	7/8	1-1/8
300,000	1-3/8	7/8	7/8	1-3/8	7/8	1-1/8
350,000	1-5/8	7/8	1-1/8	1-5/8	1-1/8	1-1/8
400,000	1-5/8	1-1/8	1-1/8	1-5/8	1-1/8	1-1/8

Nominal Btu/h per refrigerant circuit	Equivalent length 51' to 75'			Equivalent length 76' to 100'		
	Size inches O.D.			Size inches O.D.		
	Suction(2)	Liquid(3)	Hot gas reheat(4)	Suction(2)	Liquid(3)	Hot gas reheat(4)
42,000	3/4	1/2	1/2	7/8	1/2	5/8
48,000	7/8	1/2	5/8	7/8	1/2	5/8
60,000	7/8	5/8	5/8	1-1/8	1/2	3/4
72,000	7/8	5/8	3/4	1-1/8	5/8	3/4
84,000	1-1/8	5/8	7/8	1-1/8	5/8	7/8
96,000	1-1/8	5/8	7/8	1-1/8	5/8	7/8
120,000	1-1/8	3/4	7/8	1-1/8	7/8	7/8
150,000	1-1/8	3/4	7/8	1-3/8	3/4	7/8
180,000	1-3/8	3/4	1-1/8	1-3/8	3/4	1-1/8
220,000	1-3/8	3/4	1-1/8	1-3/8	7/8	1-1/8
250,000	1-3/8	1-1/8	1-1/8	1-5/8	7/8	1-1/8
300,000	1-5/8	1-1/8	1-1/8	1-5/8	1-1/8	1-1/8
350,000	1-5/8	1-1/8	1-1/8	1-5/8	1-1/8	1-1/8
400,000	1-5/8	1-1/8	1-1/8	1-5/8	1-1/8	1-1/8

(2) Loop piping to top of coil.
(3) Based on maximum vertical separation of 10 feet. Submit sketch for factory review if greater.
(4) Hot gas reheat, if ordered, requires one line per circuit. Pitch hot gas (discharge) lines in direction refrigerant flow - minimum 1/8" per foot.
Example for dual circuit unit: if total system capacity is 240,000 Btu/h, divide by 2 and use the line sizes for 120,000 Btu/h for each circuit. Follow industry standard refrigeration recommendations for piping. Suction (Vapor) and hot gas reheat lines must be insulated.

Table 3d: Lineset Recommended Sizes

Indoor Unit Located Level With, or Above Outdoor Unit						
Nominal Btu/h per refrigerant circuit	Equivalent length 100′ to 125′			Equivalent length 126′ to 150′		
	Size inches O.D.			Size inches O.D.		
	Suction(2)	Liquid(3)	Hot gas reheat(4)	Suction(2)	Liquid(3)	Hot gas reheat(4)
42,000	3/4	1/2	1/2	3/4	1/2	5/8
48,000	7/8	1/2	5/8	7/8	1/2	5/8
60,000	7/8	1/2	5/8	7/8	1/2	5/8
72,000	7/8	5/8	5/8	7/8	5/8	5/8
84,000	7/8	5/8	3/4	7/8	5/8	3/4
96,000	1-1/8	5/8	3/4	1-1/8	5/8	3/4
120,000	1-1/8	7/8	3/4	1-1/8	3/4	3/4
150,000	1-3/8	3/4	7/8	1-3/8	3/4	7/8
180,000	1-1/8	3/4	7/8	1-1/8	7/8	1-1/8
220,000	1-3/8	7/8	1-1/8	1-3/8	7/8	1-1/8
250,000	1-3/8	7/8	1-1/8	1-5/8	7/8	1-1/8
300,000	1-5/8	1-1/8	1-1/8	1-5/8	1-1/8	1-1/8
350,000	1-5/8	1-1/8	1-1/8	1-5/8	1-1/8	1-1/8
400,000	1-5/8	1-1/8	1-3/8	1-5/8	1-1/8	1-3/8
Nominal Btu/h per refrigerant circuit	Equivalent length 151′ to 175′			Equivalent length 176′ to 200′		
	Size inches O.D.			Size inches O.D.		
	Suction(2)	Liquid(3)	Hot gas reheat(4)	Suction(2)	Liquid(3)	Hot gas reheat(4)
42,000	3/4	1/2	1/2	3/4	1/2	1/2
48,000	7/8	1/2	5/8	7/8	1/2	5/8
60,000	7/8	1/2	5/8	7/8	5/8	5/8
72,000	7/8	5/8	5/8	7/8	3/4	5/8
84,000	1-1/8	5/8	3/4	1-1/8	5/8	3/4
96,000	1-1/8	5/8	3/4	1-1/8	3/4	3/4
120,000	1-1/8	3/4	3/4	1-1/8	3/4	3/4
150,000	1-3/8	3/4	7/8	1-3/8	7/8	7/8
180,000	1-3/8	7/8	1-1/8	1-3/8	7/8	1-1/8
220,000	1-5/8	7/8	1-1/8	1-5/8	7/8	1-1/8
250,000	1-5/8	7/8	1-1/8	1-5/8	7/8	1-1/8
300,000	1-5/8	1-1/8	1-1/8	1-5/8	1-1/8	1-1/8
350,000	1-5/8	1-1/8	1-1/8	1-5/8	1-1/8	1-1/8
400,000	1-5/8	1-1/8	1-3/8	1-5/8	1-1/8	1-3/8

(2) Loop piping to top of coil.
(3) Based on maximum vertical separation of 10 feet. Submit sketch for factory review if greater.
(4) Hot gas reheat, if ordered, requires one line per circuit. Pitch hot gas (discharge) lines in direction refrigerant flow - minimum 1/8" per foot.
Example for dual circuit unit: if total system capacity is 240,000 Btu/h, divide by 2 and use the line sizes for 120,000 Btu/h for each circuit. Follow industry standard refrigeration recommendations for piping. Suction (Vapor) and hot gas reheat lines must be insulated.

9.5 Hot Gas Reheat Lineset Piping Installation

Locate the hot gas reheat connection line(s) (factory installed) at the indoor unit. Locate the hot gas reheat circuit connection in the condensing unit. The hot gas reheat valve and solenoid is factory installed.

Size the piping between the evaporator and condenser for a minimum pressure drop. See Table 3 for recommended line size.

The piping should be free draining to the evaporator connection to ensure oil return to the compressor.

Connect the piping with clean, dehydrated refrigerant grade tubing. Use standard industry practices to install the refrigerant line.

9.6 Leak Testing and Evacuation

Charge system with R-410A trace gas and dry nitrogen. Pressurize to 150 PSIG.

Check inside unit, and interconnecting piping with suitable leak detector. Relieve testing charge and connect a good vacuum pump to the gauge connections.

Do not open any other valves at this time. Connect a micron gauge to the vacuum pump. A deep vacuum of at least 500 microns is required.

Wait 15 minutes, if there is no rise on the micron gauge the system is sealed.

Table 4: Equivalent Lengths of Fittings and Valves

Equivalent Length in Feet of Pipe for Valves and Fittings					
Tubing Size: O.D.	Short Radius Elbow	Long Radius Elbow	Tee Line	Tee Branch	Angle Valve
1/2	1.6	1.0	1.0	3.1	8.3
5/8	1.9	1.2	1.2	3.6	10.4
3/4	2.1	1.4	1.4	4.2	12.5
7/8	2.4	1.6	1.6	4.8	14.6
1-1/8	3.0	2.0	2.0	6.0	18.8
1-3/8	3.6	2.4	2.4	7.2	22.9
1-5/8	4.2	2.8	2.8	8.4	27.1
2-1/8	5.3	3.5	3.6	10.7	35.4

9.7 Additional Piping Considerations

9.7.1 Leaks

Leaks occur at incorrectly made joints. Very small scratches or particles of dirt in a joint can cause a refrigerant leak. The leak may be so small that it is difficult to detect on a Halide leak detector. Leaks can develop even years after the joint is made unless flux and solder specifically developed for refrigerant work are used. Any improper made joint will cause trouble in time, as it will eventually leak enough refrigerant to reduce capacity of the system.

9.7.2 Moisture

Moisture in the refrigeration system will combine with fluorine in the refrigerant and form hydrofluoric acid which will corrode and pit the system. Hydrofluoric acid also decomposes the compressor lubrication oil causing sludge. Great care should be exercised in keeping moisture out of the refrigeration system when installing tubing, because an extremely small amount can cause trouble. For this reason, except on large sizes, only refrigeration grade, seamless annealed, sealed copper tubing should be used. This tubing is available at refrigeration supply stores and has been dehydrated, cleaned inside and sealed at each end. Exposure of the inside of the tubing to the atmosphere must be kept to minimum. Do not use tubing that has been exposed.

9.7.3 Dirt

Dirt and metal chips must be kept out of the refrigeration system, since they will accumulate at strainers and clog them, restricting the flow of refrigerant.

Figure 6: Lineset Piping with the Air Handler Above the Condensing Unit

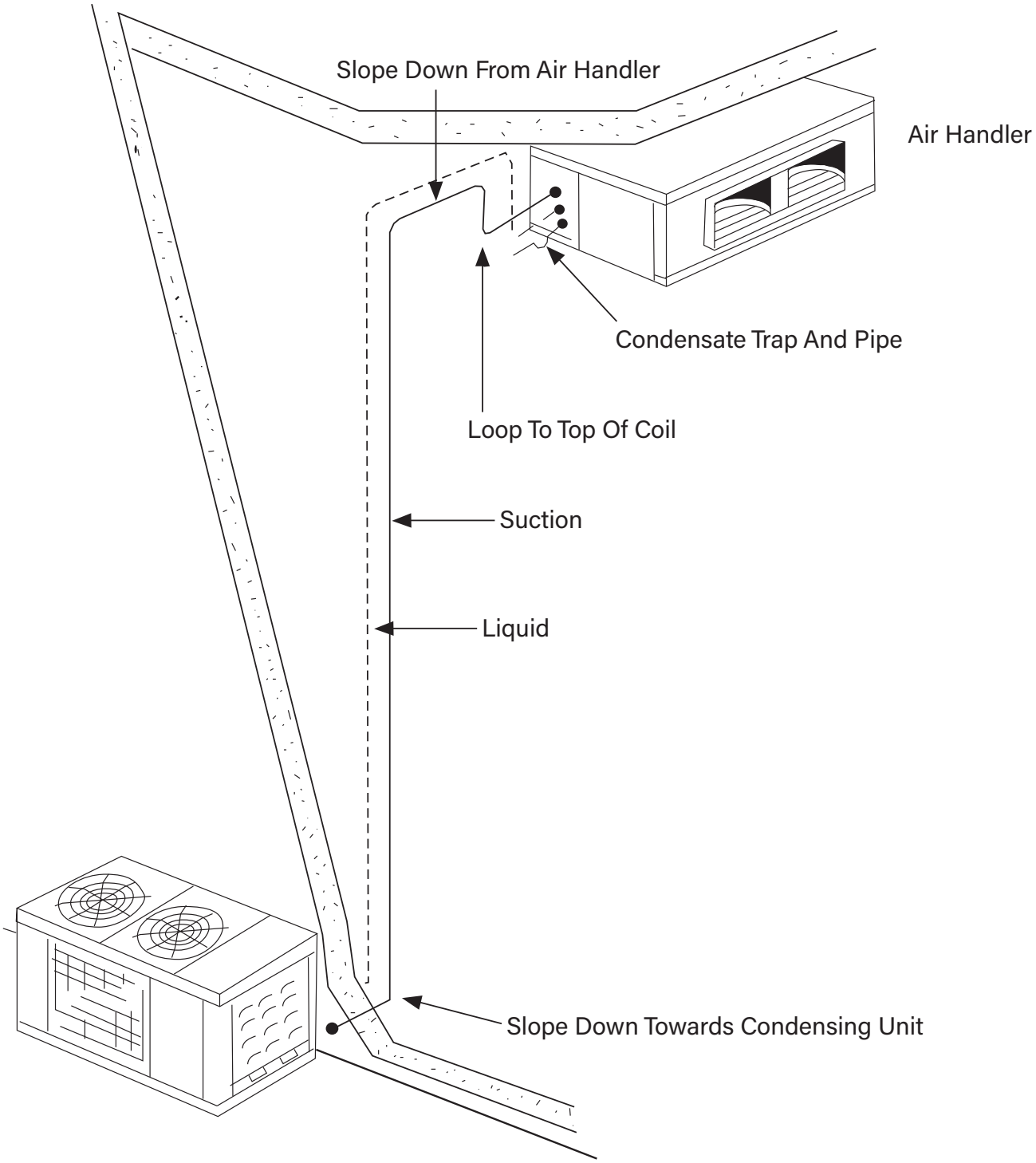


Figure 7: Lineset Piping with the Air Handler Below the Condensing Unit

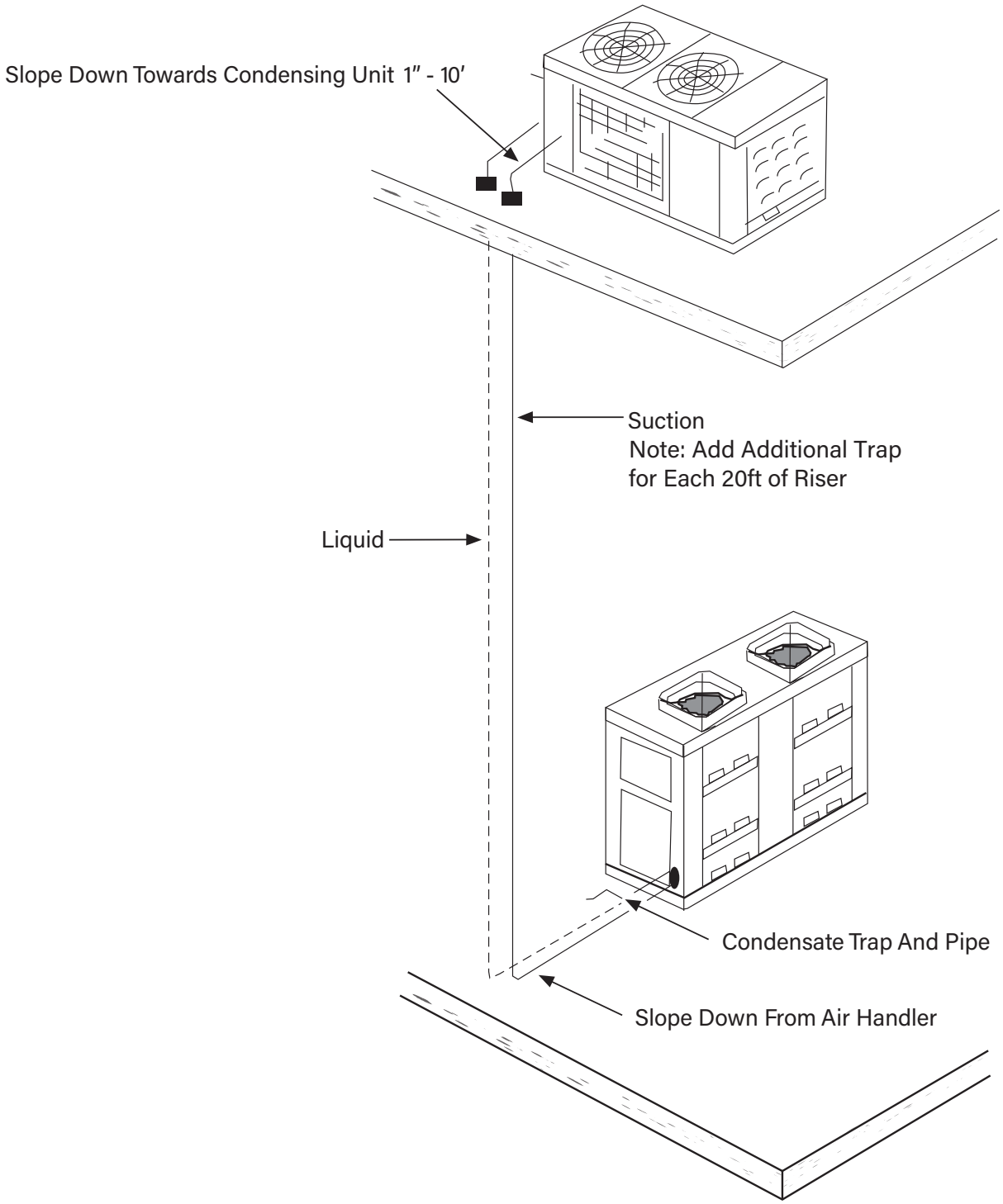


Figure 8: Circuit Diagram for Standard Compressor For Cooling Only

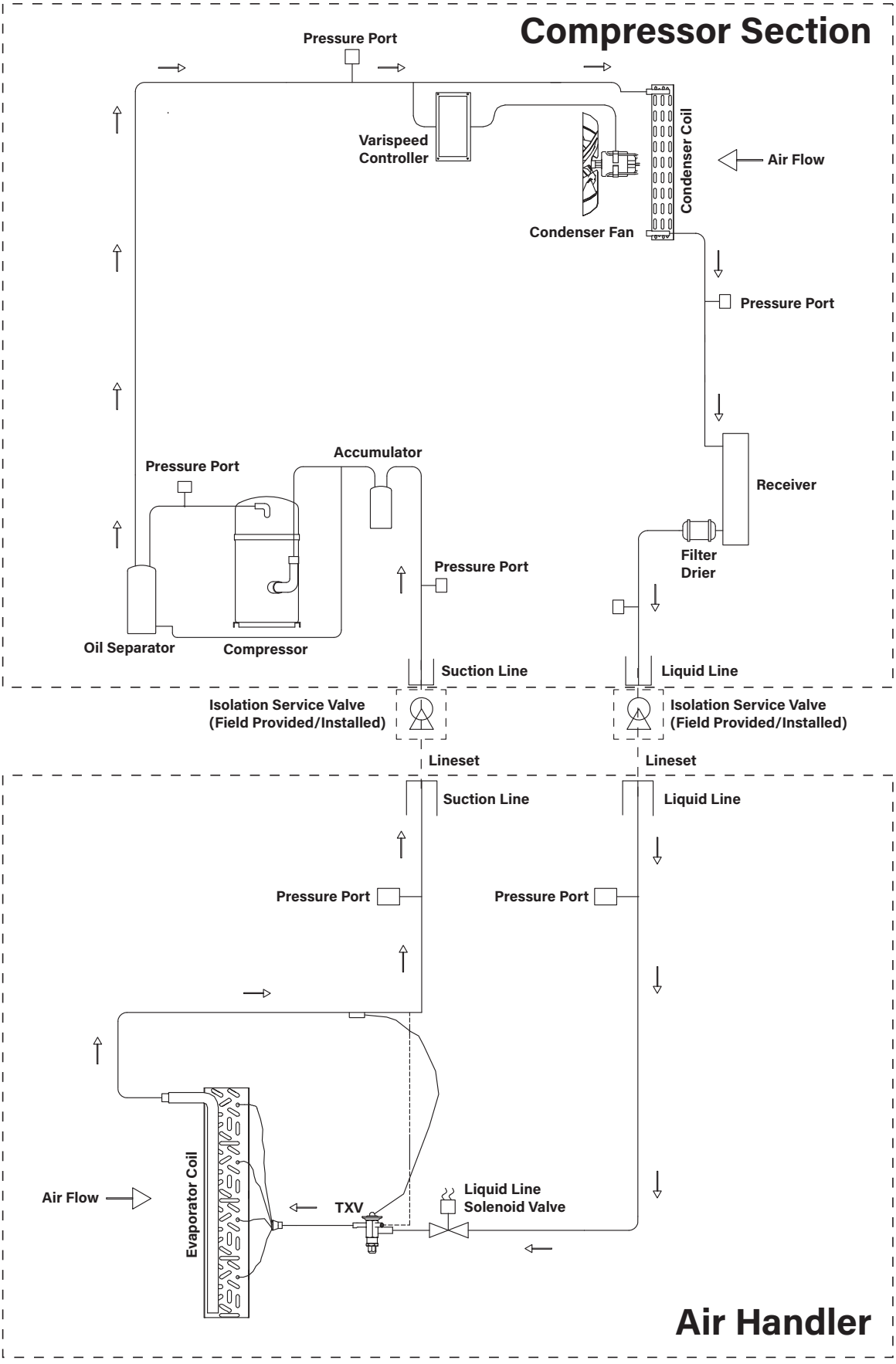


Figure 9: Circuit Diagram for Standard Compressor with Hot Gas Reheat

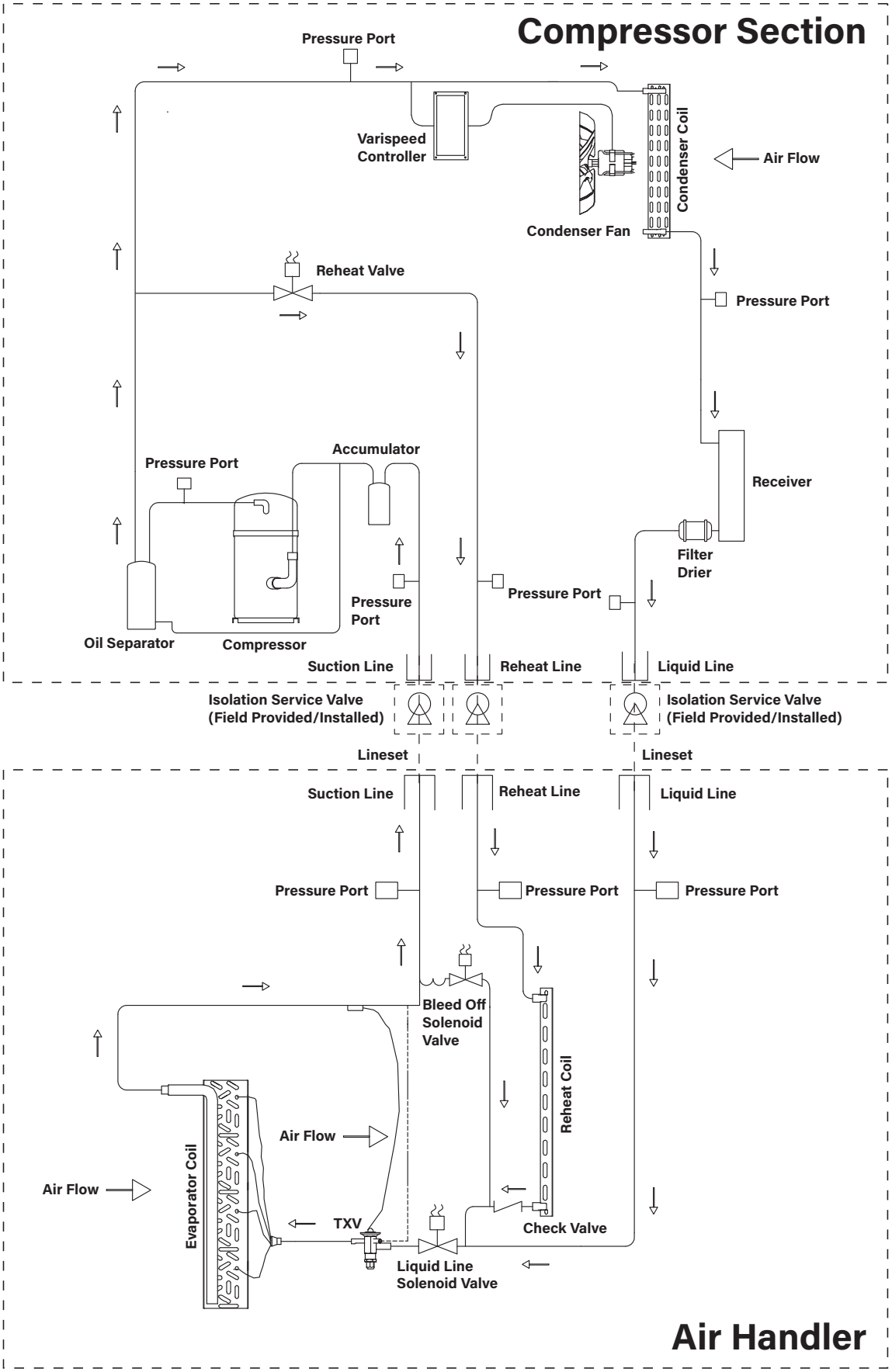


Figure 10: Circuit Diagram for Standard Compressor with Heat Pump Operation and Hot Gas Reheat

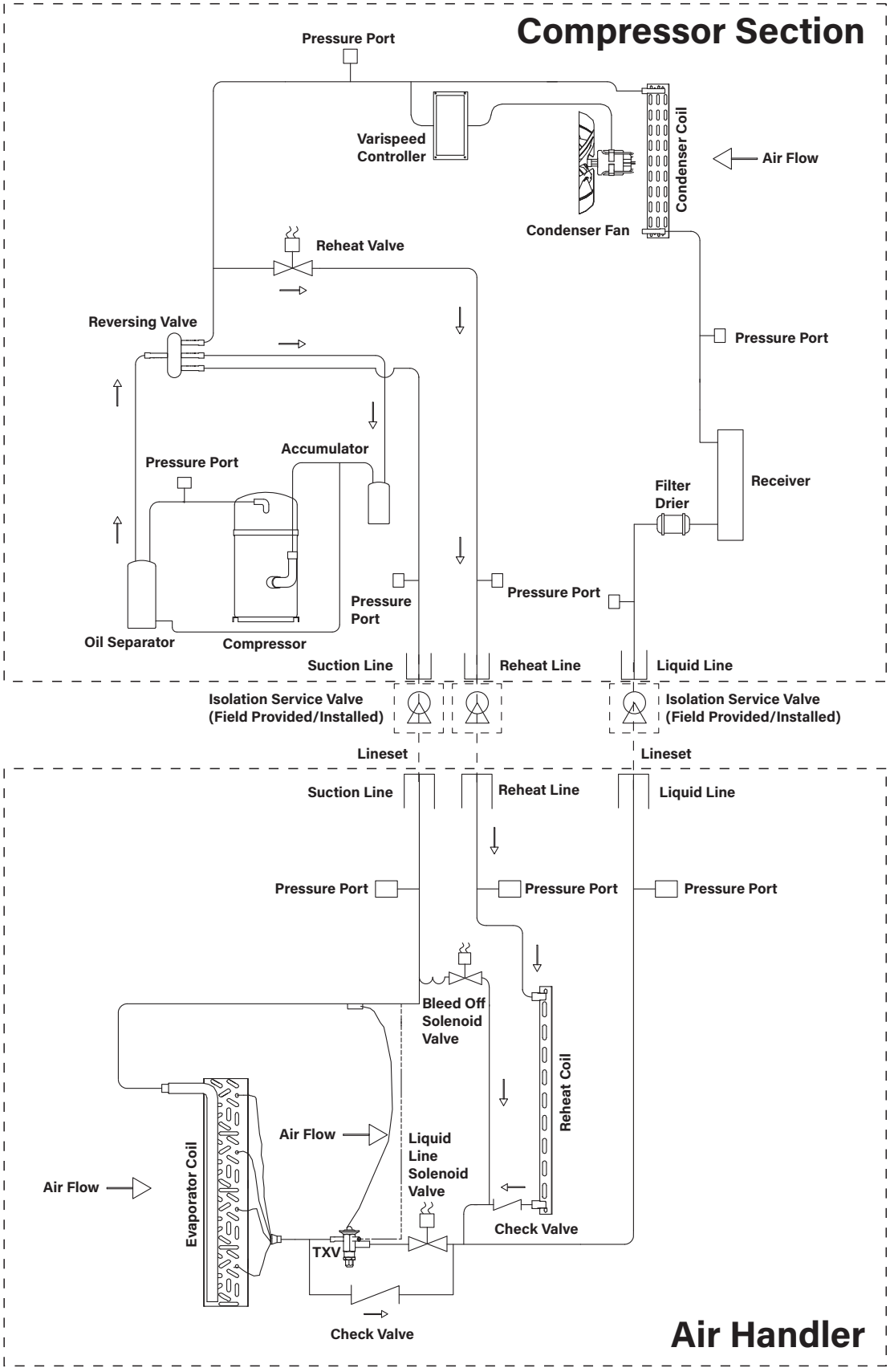
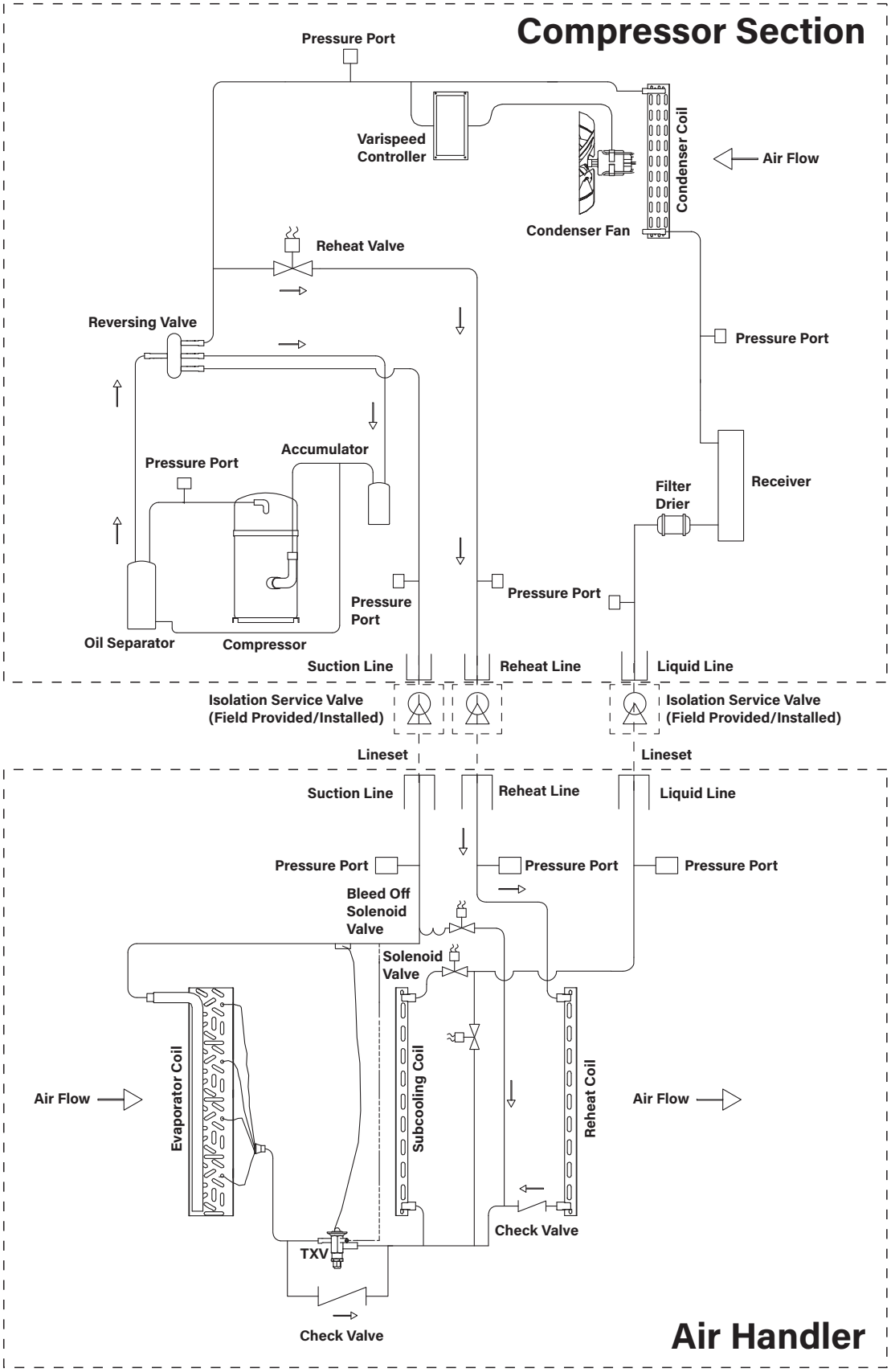


Figure 11: Circuit Diagram for Standard Compressor with Heat Pump Operation, Hot Gas Reheat, and Subcooling



Section 10: Unit Electrical:

Each unit is equipped with a wiring diagram (permanently attached behind clear view plastic on the inside of the control compartment door or on laminated sheets in an inside compartment) which will vary depending on the type of controls and options supplied. Check unit data plate for unit electrical data.

Note: Spark testing or shorting of the control wires by any means will render the transformers inoperative.

10.1 Wiring and Electrical Connections

All electrical wiring and connections, including electrical grounding, must comply with;

United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform also to local ordinances and any special diagrams furnished.

Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

Check rating plate on unit for supply voltage and current requirements.

If any of the original control wire supplied with the unit must be replaced, replace it with type THHN 221° F [105°C], 600 V, 16 gauge wire or equivalent. For all other wires, replace with the equivalent size and type of wire that was originally provided with the unit.

10.2 Disconnect

An external weather-tight disconnect switch properly sized for the unit total load is required for each unit. This disconnect can be supplied by the factory or supplied by others. Do not use the unit disconnect as a method of on/off control. Use the operating controller or thermostat to shut down the unit.

10.3 Current Draw

For current requirements of the unit, refer to the unit rating plate.

10.4 Wiring Connections

Power wiring should be connected to the main power terminal block located within the unit main control section. Power wiring connections on units with factory-mounted disconnects should be made at the line side of disconnect. Main power wiring should be sized for the minimum wire ampacity shown on the unit rating plate.

For your safety, make sure that the unit has been properly grounded at ground lug connection. Do not obstruct service panels or service areas with electrical gear.

⚠ DANGER

ELECTRICAL SHOCK HAZARD
Disconnect electric before service. More than one disconnect switch may be required to disconnect electric from equipment. Equipment must always be properly grounded.

10.5 Voltage Unbalance

The power supply should be checked against the unit nameplate characteristics. It must be within 10% of rated voltage and not more than 2% phase unbalance. The power supply cables must be sized to carry the minimum circuit ampacity listed on the nameplate.

Once it is established that supply voltage is within the utilization range; check and calculate if an unbalanced condition exists between phases. Calculate percent voltage unbalance as follows:

$$\text{Percent Voltage Unbalance} = 100 \times \frac{\text{Maximum Voltage Deviation From Average Voltage}}{\text{Average Voltage}}$$

For Example – With voltage of 220, 215 and 210 (Measure L1-L2, L1-L3, L2-L3)

Average voltage = 645 ÷ 3 = 215
Maximum voltage deviation from Average voltage = 220 – 215 = 5

$$\text{Percent Voltage Unbalance} = \frac{100 \times 5}{215} = \frac{500}{215} = 2.3\%$$

Percent voltage unbalance must not exceed (2%) two percent. Contact Power Company if phase unbalance exceeds 2%. A means of disconnecting power from the unit must be placed adjacent to the unit in accordance with national electrical code or local codes. Aluminum power wire is not recommended.

10.6 Low Voltage Wiring

For commercial equipment the following table lists the minimum size of 24-volt class 2 wire to be used.

Table 5: Low Voltage Wiring Lengths

Wire Size	Distance From Unit, or Longest Run
18 AWG	Maximum Run - 50 Feet
16 AWG	Maximum Run - 75 Feet
14 AWG	Maximum Run - 100 - 125 Feet
12 AWG	Maximum Run - 150 - 200 Feet

Figure 12: Example Electrical Wiring Diagram - Condensing Section

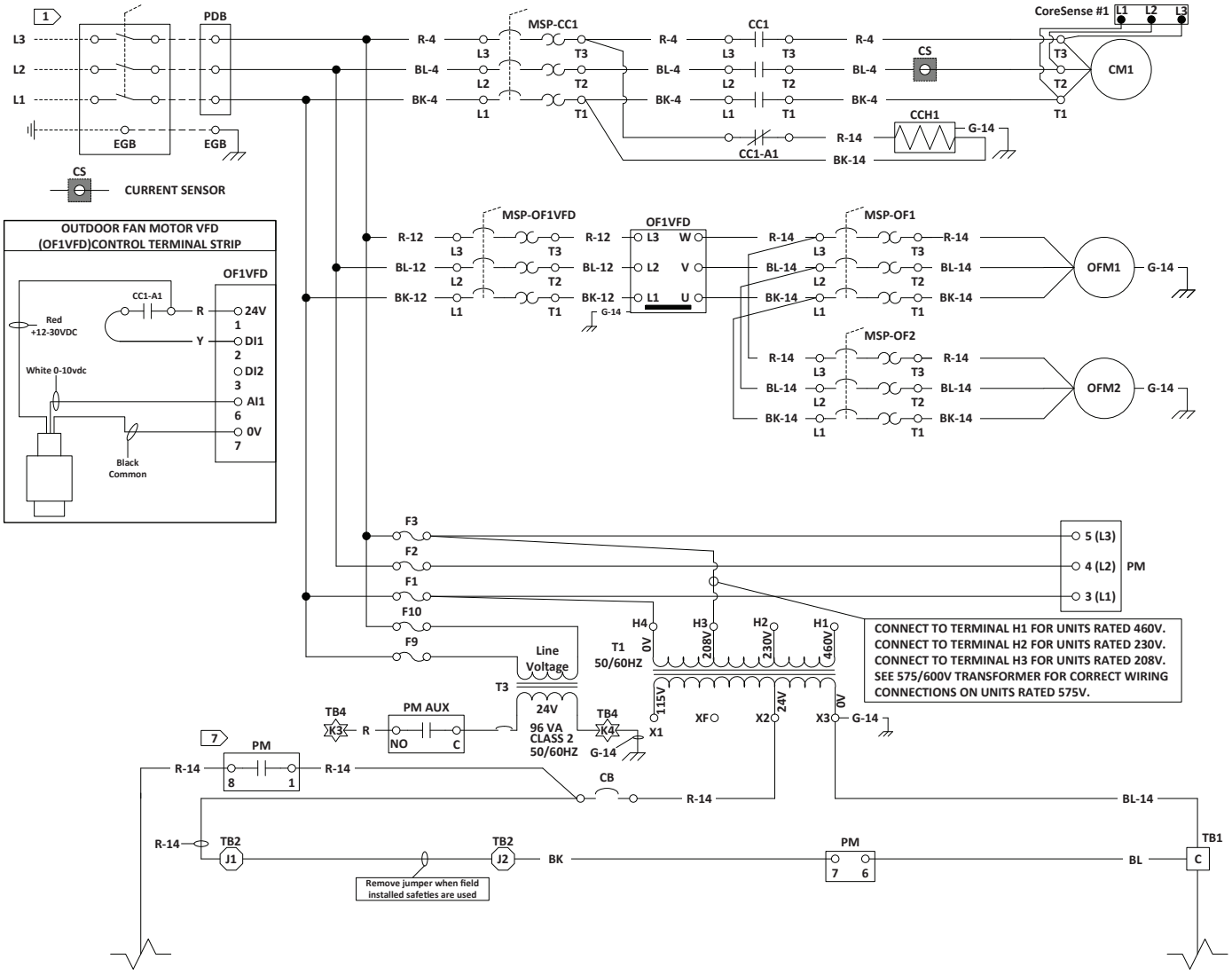


Figure 12: Example Electrical Wiring Diagram - Condensing Section, Cont.

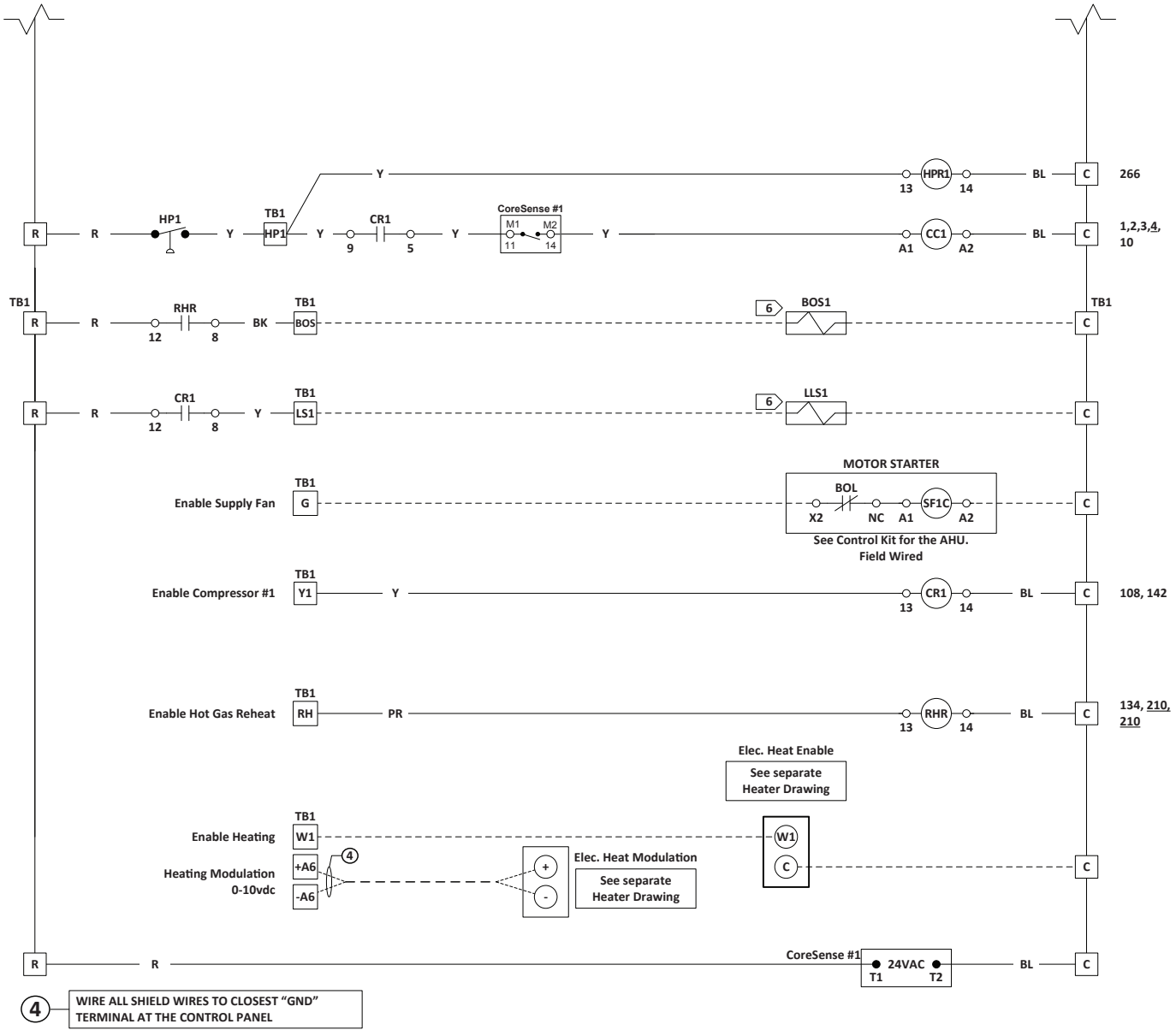
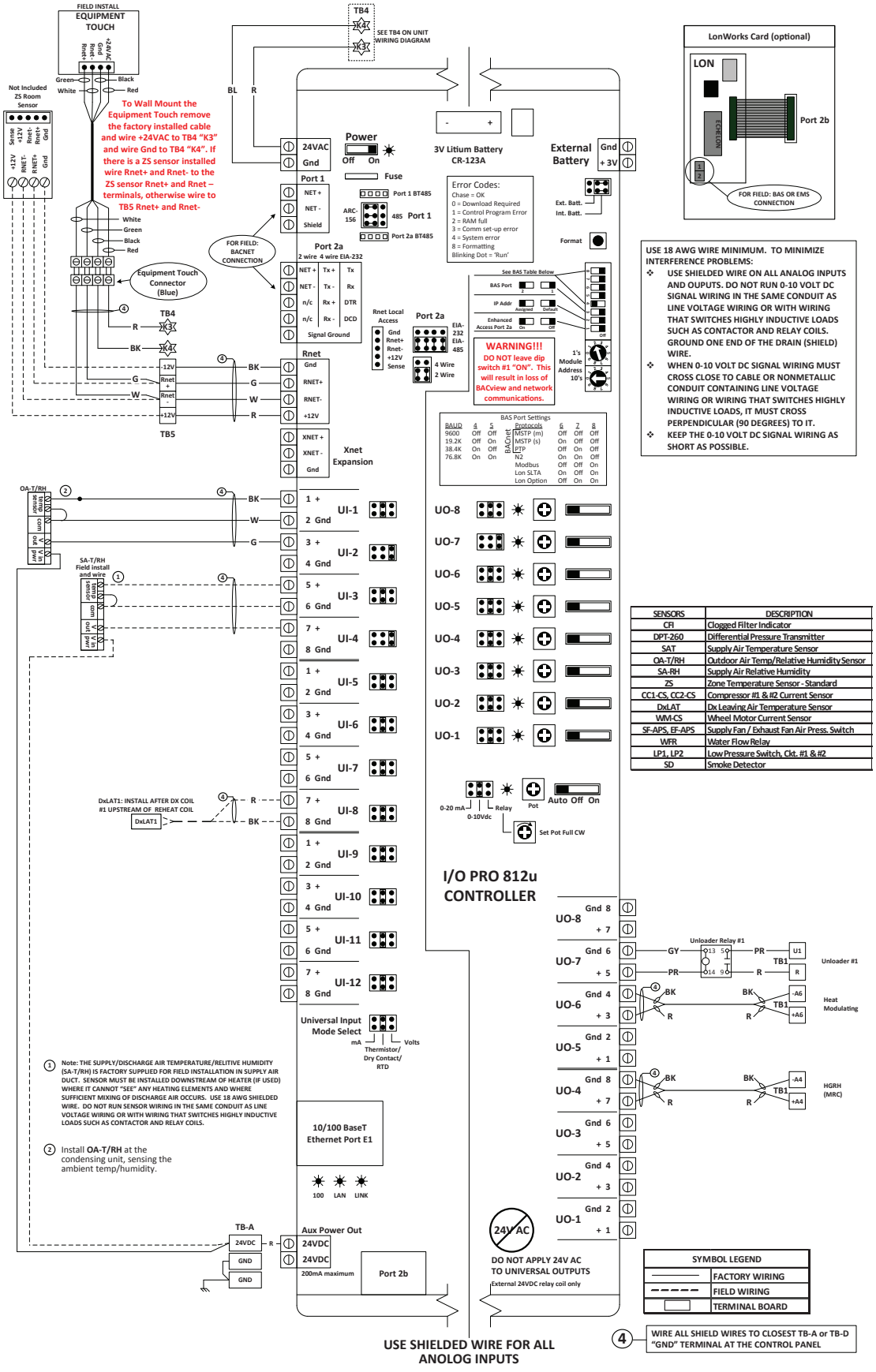


Figure 12: Example Electrical Wiring Diagram - Condensing Section, Cont.



SENSORS	DESCRIPTION
CFI	Clogged Filter Indicator
DPT-260	Differential Pressure Transmitter
SAT	Supply Air Temperature Sensor
OA-T/RH	Outdoor Air Temp/Relative Humidity Sensor
SA-RH	Supply Air Relative Humidity
ZS	Zone Temperature Sensor - Standard
CC1-CS, CC2-CS	Compressor #1 & #2 Current Sensor
DxLAT	Dx Leaving Air Temperature Sensor
WM-CS	Wheel Motor Current Sensor
SF-APS, EF-APS	Supply Fan / Exhaust Fan Air Press. Switch
WFR	Water Flow Relay
LP1, LP2	Low Pressure Switch, Ckt. #1 & #2
SD	Smoke Detector

Note: THE SUPPLY/DISCHARGE AIR TEMPERATURE/RELITIVE HUMIDITY (SA-T/RH) IS FACTORY SUPPLIED FOR FIELD INSTALLATION IN SUPPLY AIR DUCT. SENSOR MUST BE INSTALLED DOWNSTREAM OF HEATER (IF USED) WHERE IT CANNOT "SEE" ANY HEATING ELEMENTS AND WHERE SUFFICIENT MIXING OF DISCHARGE AIR OCCURS. USE 18 AWG SHIELDED WIRE. DO NOT RUN SENSOR WIRING IN THE SAME CONDUIT AS LINE VOLTAGE WIRING OR WITH WIRING THAT SWITCHES HIGHLY INDUCTIVE LOADS SUCH AS CONTACTOR AND RELAY COILS.

Install **OA-T/RH** at the condensing unit, sensing the ambient temp/humidity.

Figure 12: Example Electrical Wiring Diagram - Condensing Section, Cont.

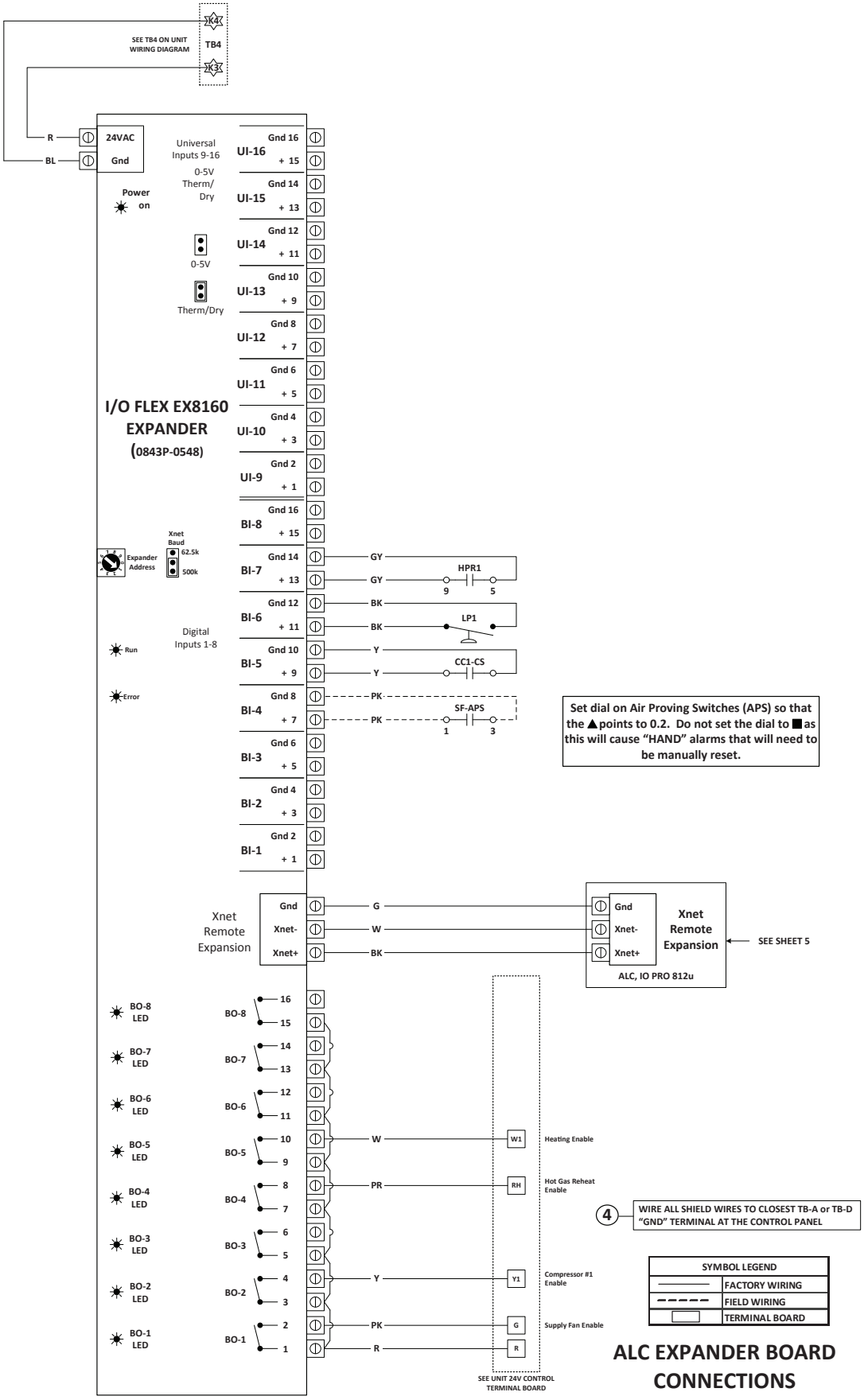


Figure 12: Example Electrical Wiring Diagram - Condensing Section, Cont.

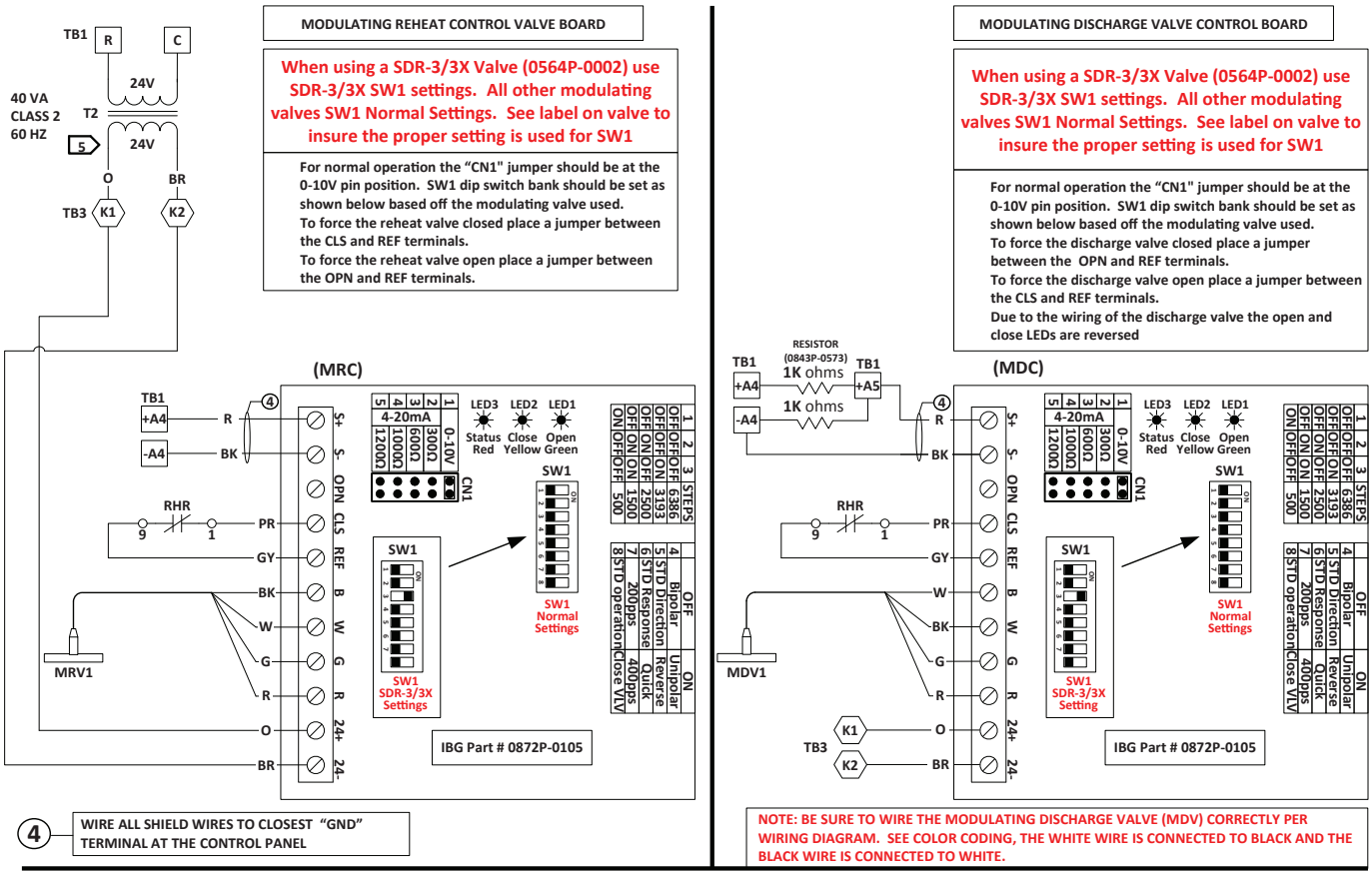
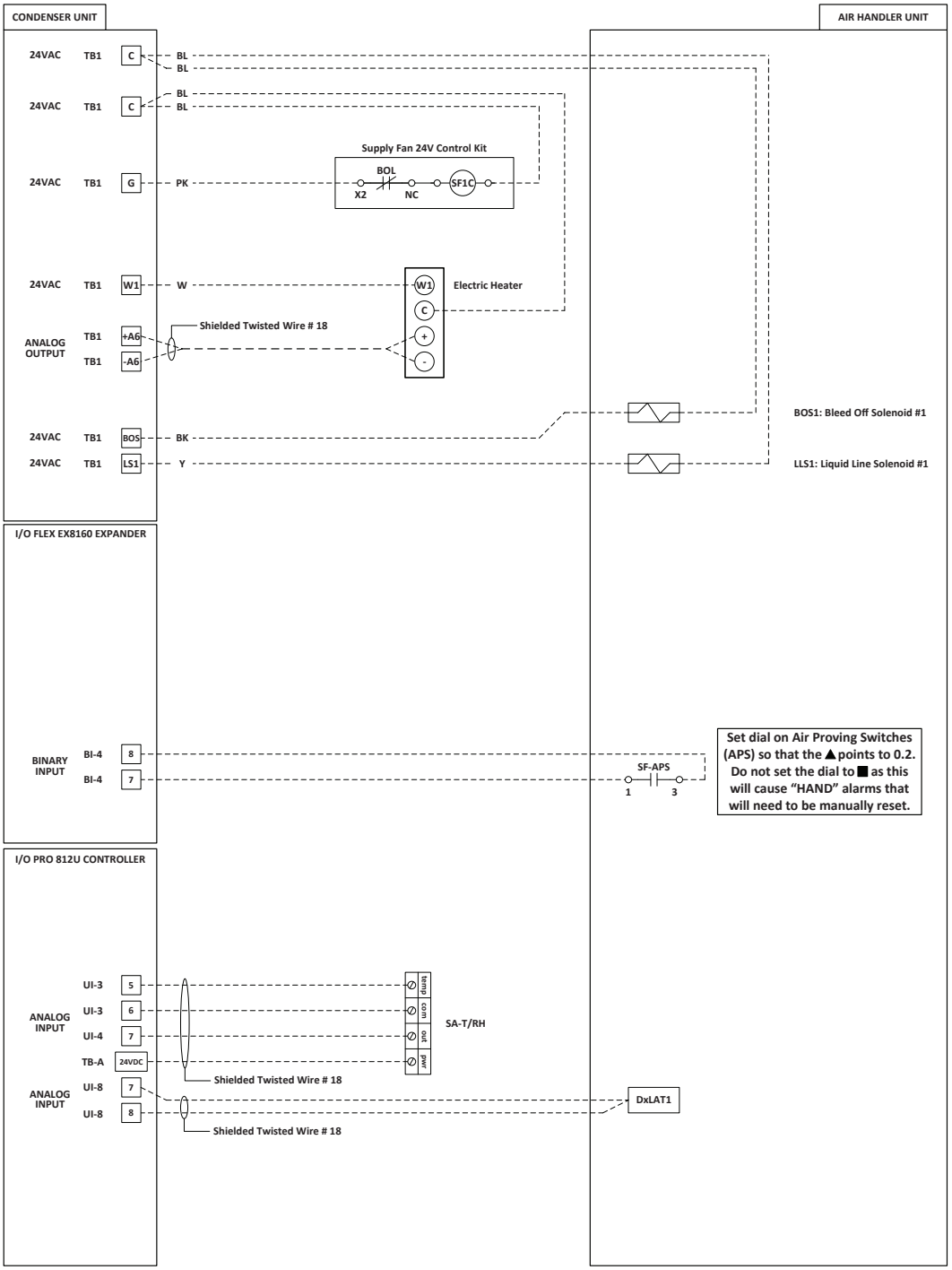


Figure 12: Example Electrical Wiring Diagram - Condensing Section, Cont.



For the BACview Keypad or RS/ZS Sensor (when used), Shielded Wire # 18 can go 500 ft run. All other Shielded Wire # 18 can go 1000 ft run.

USE 18 AWG WIRE MINIMUM. TO MINIMIZE INTERFERENCE PROBLEMS:

- USE SHIELDED WIRE ON ALL ANALOG INPUTS AND OUPUTS. DO NOT RUN 0-10 VOLT DC SIGNAL WIRING IN THE SAME CONDUIT AS LINE VOLTAGE WIRING OR WITH WIRING THAT SWITCHES HIGHLY INDUCTIVE LOADS SUCH AS CONTACTOR AND RELAY COILS. GROUND ONE END OF THE DRAIN (SHIELD) WIRE.
- WHEN 0-10 VOLT DC SIGNAL WIRING MUST CROSS CLOSE TO CABLE OR NONMETALLIC CONDUIT CONTAINING LINE VOLTAGE WIRING OR WIRING THAT SWITCHES HIGHLY INDUCTIVE LOADS, IT MUST CROSS PERPENDICULAR (90 DEGREES) TO IT.
- KEEP THE 0-10 VOLT DC SIGNAL WIRING AS SHORT AS POSSIBLE.

Low Voltage Wiring: For commercial equip.; minimum size of 24 volt class 2 wire.

Wire Size	Max. Run from Condensing Unit to AHU or Longest Run
18 AWG	50 Feet
16 AWG	75 Feet
14 AWG	100/125 Feet
12 AWG	150/200 Feet

SYMBOL LEGEND	
———	FACTORY WIRING
- - - - -	FIELD WIRING
▭	TERMINAL BOARD

WIRE COLOR LEGEND	
ABBREVIATION	COLOR
BK	BLACK
BL	BLUE
BR	BROWN
G	GREEN
O	ORANGE
PK	PINK
PR	PURPLE
R	RED
W	WHITE
Y	YELLOW

NOTE: NUMBER PLACED AFTER DASH FOLLOWING COLOR CODE INDICATES WIRE GAGE. EX. - BK-12 IS A BLACK, 12 AWG WIRE. NO NUMBER AFTER COLOR CODE INDICATES 18 AWG WIRE. EX. - BK IS A BLACK 18 AWG WIRE.

Figure 12: Example Electrical Wiring Diagram, Cont.

LEGEND - ITEMS INSIDE CONTROL PANEL			
ITEM	FUNCTIONAL DESIGNATION	LINE NUMBER	DESCRIPTION
104	CC1	110	Compressor Contactor no. 1
105	CC1-A1, CC1-A2	#	"CC1" Auxiliary Contact no. 1 and 2
107	MSP-CC1	1	Motor Starter Protection-"CC1"
108	CC2	123	Compressor Contactor no. 2
109	CC2-A1, CC2-A2	#	"CC2" Auxiliary Contact no. 1 and 2
111	MSP-CC2	11	Motor Starter Protection-"CC2"
118	EGB	4	Equipment Grounding Bar
119	F1, F2, F3	59, 60, 61	Fusing-See Fuse Table on this sheet
120	CB	71	Circuit Breaker-See Fuse Table on this sheet
122	MSP-OF1	22	Motor Starter Protection-Outdoor Fan no. 1
123	MSP-OF2	26	Motor Starter Protection-Outdoor Fan no. 2
126	OF1VFD	22, 25	Outdoor Fan Variable Frequency Drive no. 1
129	MDC1	214	Modulating Discharge-Line Controller no. 1
130	MRC1	202	Modulating Reheat Controller no. 1
131	PDB	1, 2, 3	Power Distribution Block
132	PM	59, 71	Power/Phase Monitor
133	RHR	156	Reheat Relay
135	T1	62, 67	Control Transformer no. 1
136	T2	200	Control Transformer no. 2
137	TB1	Sheet 2-5	Terminal Board no. 1
138	TB2	71	Terminal Board no. 2
139	TB3	204, 216	Terminal Board no. 3
140	TB-A	Sheet 5	Terminal Board no. -A
152	CR1	112	Compressor Relay no. 1
# SEE LINE NUMBER TO THE RIGHT OF CONTACTOR COIL ON WIRING DIAGRAM.			

FUSE TABLE						
FUSE NO.	CLASS	VAC	AMPS-208/230V	AMPS-460V	XFMR	TIME DELAY
F1, F3	CC	600	3	2	350VA	YES
	CC	600	2	1.5	250VA	YES
	CC	600	2	1.5	200VA	YES
	CC	600	1.5	3/4	150VA	YES
F2, F9, F10	CC	600	1	1	N/A	YES
CB	CC	600	16	16	350VA	YES
	CC	600	10	10	250VA	YES
	CC	600	10	10	200VA	YES
	CC	600	6	6	150VA	YES

1 FIELD POWER SUPPLY 208/230/460/575-3-60. MINIMUM CIRCUIT AMPACITY AND MAXIMUM SIZE AND TYPE OF BRANCH-CIRCUIT SHORT-CIRCUIT AND GROUND-FAULT PROTECTION PER UNIT RATING PLATE. PROVIDE DISCONNECTING MEANS AS REQUIRED.

2 TYPICAL MOTORS AND COMPRESSORS SHOWN. SEE CONNECTION DIAGRAM ON MOTOR OR COMPRESSOR FOR ACTUAL WIRING DETAIL.

LEGEND - ITEMS OUTSIDE CONTROL PANEL			
ITEM	FUNCTIONAL DESIGNATION	LINE NUMBER	DESCRIPTION
101	BOS1	132	Bleed-Off Solenoid no. 1
102	CCH1	4	Compressor Crankcase Heater No. 1
103	CM1	2	Compressor Motor No. 1
104	CM2	12	Compressor Motor No. 2
105	HP1	110	High Pressure Switch No. 1
106	LP1	265	Low Pressure Switch No. 1
107	LLS1	144	Liquid Line Solenoid no. 1
108	OFM1	23	Outdoor Fan Motor No. 1
109	OFM2	27	Outdoor Fan Motor No. 2
# SEE LINE NUMBER TO THE RIGHT OF CONTACTOR COIL ON WIRING DIAGRAM.			

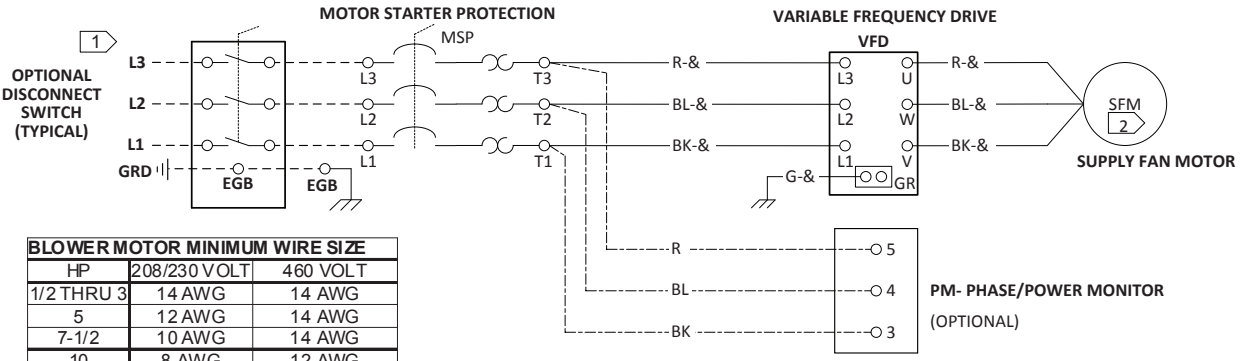
SYMBOL LEGEND			
	FACTORY WIRING		NORMALLY OPEN CONTACTS
	FIELD WIRING		NORMALLYCLOSED CONTACTS
	EARTH GROUND		IDENTIFIABLE TERMINAL
	CHASSIS (PANEL) GROUND		NON-IDENTIFIABLE TERMINAL, OTHER WIRE JUNCTIONS, INCLUDING SCHEMATIC
	COIL		

WIRE COLOR LEGEND	
ABBREVIATION	COLOR
BK	BLACK
BL	BLUE
BR	BROWN
G	GREEN
O	ORANGE
PK	PINK
PR	PURPLE
R	RED
W	WHITE
Y	YELLOW

NOTE: NUMBER PLACED AFTER DASH FOLLOWING COLOR CODE INDICATES WIRE GAGE. EX. - BK-12 IS A BLACK, 12 AWG WIRE. NO NUMBER AFTER COLOR CODE INDICATES 18 AWG WIRE. EX. - BK IS A BLACK 18 AWG WIRE.

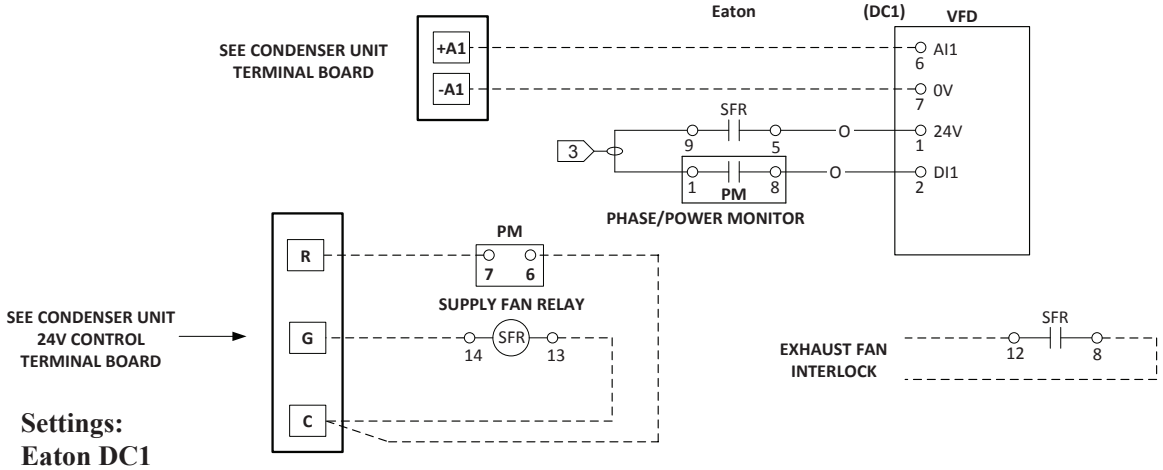
24 Volt Class 2 Minimum Wire Size	
Wire Size	Maxium Run
18 AWG	50 Feet
16 AWG	75 Feet
14 AWG	100/125 Feet
14 AWG	150/200 Feet

Figure 13a: VFD Control Kit Wiring



BLOWER MOTOR MINIMUM WIRE SIZE		
HP	208/230 VOLT	460 VOLT
1/2 THRU 3	14 AWG	14 AWG
5	12 AWG	14 AWG
7-1/2	10 AWG	14 AWG
10	8 AWG	12 AWG
15	6AWG	12AWG

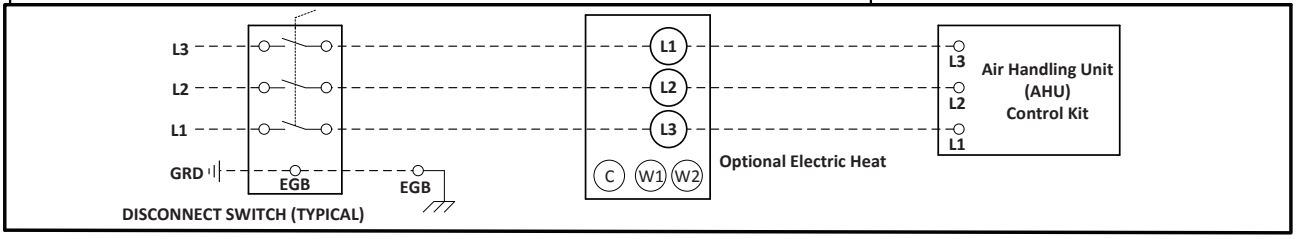
Use this wiring diagram when VFD (Variable Frequency Drive) is controlled by the ALC controller or Customer DDC controller. The Differential Pressure Transmitter should be wire directly to the ALC/DDC Controller. See condenser unit wiring diagram.



Settings:
Eaton DC1

Parameter	Setting		Parameter	Setting	
P-02	30	Minimum Speed	P-14	101	Password
P-03	30	Acceleration	P-15	4	DI Config Select
P-04	30	Deceleration	P-35	200.0%	AI1 Gain
P-05	0	Stop mode	P-39	50.0%	AI1 Offset
P-08	Set Per Name Plate	Motor Current	**All Other Setting Should be left at the default setting. Consult the DC1 Application Manual**		

TYPICAL WIRING DIAGRAM FOR SINGLE POINT POWER AIR HANDLING UNIT AND ELECTRIC HEATER



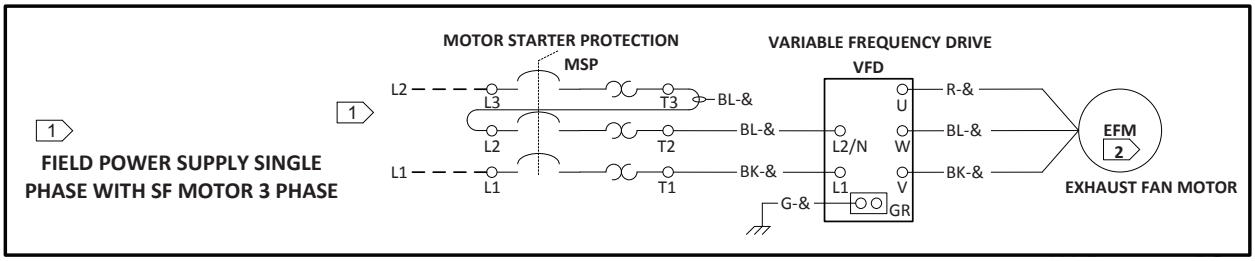
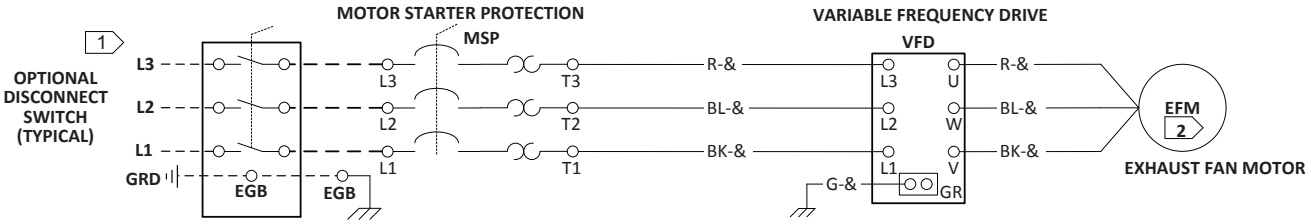
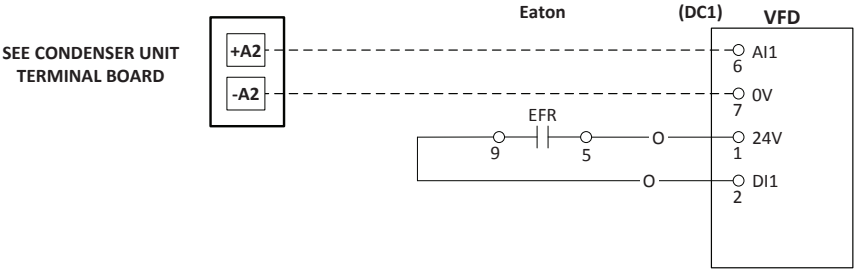


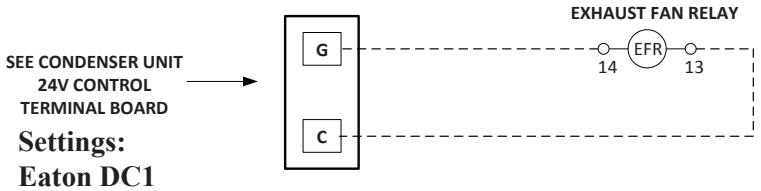
Figure 13b: VFD Control Kit Wiring



BLOWER MOTOR MINIMUM WIRE SIZE		
HP	208/230 VOLT	460 VOLT
1/2 THRU 3	14 AWG	14 AWG
5	12 AWG	14 AWG
7-1/2	10 AWG	14 AWG
10	8 AWG	12 AWG
15	6AWG	12AWG

Use this wiring diagram when VFD (Variable Frequency Drive) is controlled by the ALC controller or Customer DDC controller. The Differential Pressure Transmitter should be wire directly to the ALC/DDC Controller. See condenser unit wiring diagram.





Settings:

Eaton DC1

Parameter	Setting	
P-03	30	Acceleration
P-04	30	Deceleration
P-05	0	Stop mode
P-08	Set Per Name Plate	Motor Current
P-14	101	Password
P-15	4	DI Config Select

All Other Setting Should be left at the default setting. Consult the DC1 Application Manual

1 FIELD POWER SUPPLY 208/230/460-3-60. MINIMUM CIRCUIT AMPACITY AND MAXIMUM SIZE AND TYPE OF BRANCH-CIRCUIT SHORT-CIRCUIT AND GROUND-FAULT PROTECTION PER UNIT RATING PLATE. PROVIDE DISCONNECTING MEANS AS REQUIRED.

2 TYPICAL MOTOR SHOWN. SEE WIRING CONNECTION DIAGRAM ON MOTOR FOR ACTUAL WIRING DETAIL.

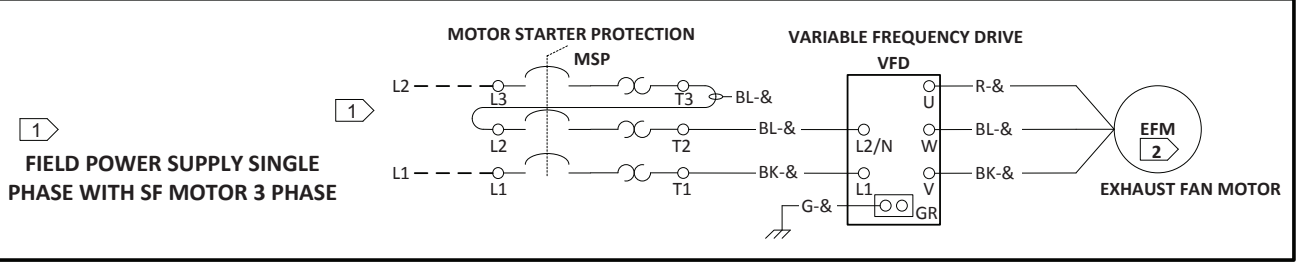


Figure 14a: Phase Monitor Data

Purpose

The purpose of the DPM is to monitor the line voltage supplying single and three phase systems, providing the opportunity to disconnect equipment if the voltages are outside of the selectable operational parameters.

Operation

If the voltages and rotation are within the selectable set-up parameters, the DPM will energize the internal relays, transferring the output contacts. If the voltages and/or rotation are outside any of the set-up parameters, the DPM internal relays will not energized.

If the line voltage does not meet all of the set-up parameters, the Default screen will toggle between the voltage screen showing the actual voltages and words describing the fault.

During transitions to relays energized or relays de-energized, the remaining time in seconds is displayed above the present relay condition ("ON" or "off").

General Operational Specifications

Line Voltages Monitored: 200 to 240VAC, 1Ø, 50/60Hz
200 to 600VAC, 3Ø, 50/60Hz

Faults:
- Overvoltage
- Undervoltage
- Phase Loss
- Phase Rotation
- Phase Imbalance
- Frequency Out of Range

Set-Up: Membrane Buttons & Digital Display
- Nominal Line Voltage
- Over/Undervoltage percentage (7% to 15%)
- Trip Time Delay (2 seconds to 10 seconds)
- Re-Start Time Delay (Manual Reset to 4 minutes)
- Phase Imbalance Percentage (3% to 10%)

Screens:
- Manufacture Name and Firmware Version
- Average Voltage, Frequency, Imbalance, Relay Status
- A-B, B-C & C-A Voltages, Relay Status
- Nominal Voltage Selection
  (Pay attention to 1Ø and 3Ø at the end of the voltages)
- Over/Undervoltage Percentage Selection
- Trip Time Delay
- Re-Start Time Delay
- Phase Imbalance Percentage Selection
- History with Last 4 Faults
- (Wraps back to Manufacture Name and Firmware Version)

Default Set-Up

The default set-up for the DPM as shipped from R-K Electronics is:

Line Voltage:	480VAC, 3Ø
Over & Undervoltage:	±5%
Trip Time Delay:	5 seconds
Re-Start Time Delay:	5 seconds
Phase Imbalance:	5%

Custom Set-Up

The DPM uses 4 membrane buttons to allow the customer to change the set-up criteria for their particular line voltage and preferred parameters. The following listings show the arrangement and selections available by moving through the menu choices. The membrane buttons allow for movement right or left with wrap around to selection criteria and up and down within a selection for specific parameters.

You can select the set-up parameters with only the supply voltage connected.

Example: From the Default screen (A-B, B-C & C-A voltages with relay status) pressing the right Arrow will take you to the line voltage selection parameters. If you want to change the nominal voltage to a different voltage, press the Up or Down arrows. Once you have the line voltage (and number of phases) that you want displayed on the screen:

1. Pressing either the Right or Left arrow will set the new line voltage parameter into memory and take you to the next screen, or
2. After 30 seconds of no action, the new voltage parameter will be set into memory and the screen will go back to the default screen.

Figure 14b: Phase Monitor Data

Example: If you want to change the Re-Start Delay to 3 minutes (default is 2 minutes) and you are on the Default screen:

1. Press the Right arrow until you get to the Re-Start Delay screen
2. Press the Up button until you have 3 Minutes on the screen
3. Pressing either the Right or Left arrow will set the new Re-Start Delay into memory and take you to the next screen, or
4. After 30 seconds of no action, the new Re-Start Delay will be set into memory and the screen will go back to the Default screen.

DPM with tabs
(cover shows DPM with blocks)

Screens

Manufacturer's Screen
R-K Electronics
DPM v0.0.00

Average Voltage Screen
VAvg Imb Hz
460 0 60 off

Default –
The Default screen shows the real time voltage detected on each of the 3 phases:
A-B B-C C-A
460 459 461 ON

Voltage Selection Screen (Vertical Format)
200, 1Ø; 208, 1Ø; 220, 1Ø; 230, 1Ø; 240, 1Ø;
200, 3Ø; 208, 3Ø; 220, 3Ø; 230, 3Ø; 240, 3Ø; 380, 3Ø; 415, 3Ø; 440, 3Ø;
460, 3Ø; 480, 3Ø; 575, 3Ø; 600, 3Ø;

Over/Undervolage Percentage Screen (Vertical Format)
7%, 8%, 9%, 10%, 11%, 12%, 13%, 14% & 15%

Trip Time Delay Screen (Vertical Format)
2S, 3S, 4S, 5S, 6S, 27S, 8S, 9S & 10S

Re-Start Time Delay Screen (Vertical Format)
Manual, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S,10S, 30S, 1M, 2M, 3M & 4M

Phase Imbalance Percentage Screen (Vertical Format)
3%, 4%, 5%, 6%, 7%, 8%, 9% & 10%

Fault Screen (Vertical Format)
"0" most recent fault, "1" previous fault, "2" third oldest fault & "3" fourth oldest fault

Fault words:

"Phase A Loss"	(There is no voltage sensed on 3-L1/S)
"Voltage Low"	(Average line voltage is less than selected Undervoltage percentage)
"Voltage High"	(Average line voltage is more than selected Overvoltage percentage)
"Imbalance"	(One Phase is lower than the average voltage by more than the Imbalance percentage)
"Phase Loss"	(One phase is more than 30% below the Line Voltage selection)
"Bad Rotation"	(The phase rotation sequence is reversed)
"Bad Freq"	Line frequency out of allowable range of 45 to 65Hz)

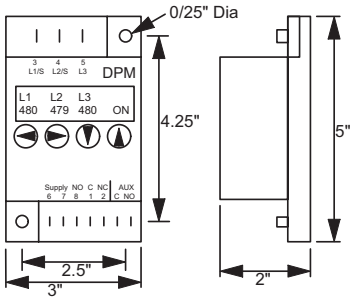
Figure 14c: Phase Monitor Data

Specifications

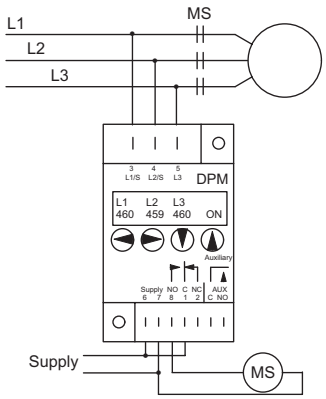
Supply Voltage:	24VAC, 120VAC or 208/240VAC, 1Ø	
Part Number:	*Tabs:*	*Pluggable Blocks*
12 VDC Supply:	DPM-12D-T	DPM-12D-B
24 VDC Supply:	DPM-24D-T	DPM-24D-B
24 VAC Supply:	DPM-24A-T	DPM-24A-B
120 VAC Supply:	DPM-120A-T	DPM-120A-B
240 VAC Supply:	DPM-240A-T	DPM-240A-B

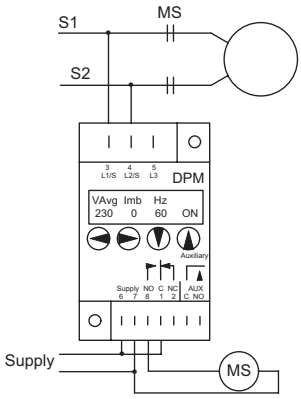
Display:	16 Character, 2 line; Back Lighting
Voltage Accuracy:	Approx ±1%
Buttons:	(4) Right & Left, Up & Down
Line Voltage Ranges:	200 to 240VAC, 1Ø 200 to 600VAC, 3Ø
Frequency Range:	45 to 65Hertz for all voltages
Over & Undervoltage:	8% to 15%
Phase Imbalance:	3% to 10%
Phase Loss:	≥30% low voltage in any one phase
Phase Rotation:	A-B-C
Re-Start Time Delay:	1 second to 4 minutes Manual Reset Option
Trip Time Delay:	1 second to 30 seconds
Output:	SPDT Contact, 10A @ 120VAC 1NO Contact, 6A @ 240VAC
Termination:	Tabs: Control Voltage: 0.187" Push-On tabs Three Phase Voltage: 0.250" Push-On tabs
Packaging:	Approx. 3"W x 5"L x 2"H Dust Cover and Epoxy Filled Base

Dimensions



Connections





Section 11:
Electric Heater Packages:

11.1 Principle of Operation

The electric heater is a self-contained duct heater comprised of:

- Power distribution
- Safety circuits
- Control circuit
- Heating elements

11.2 Operating and Safety Controls

Safety systems are required for proper performance of the electric heater. The electric heater shall not be permitted to operate with any safety system disabled. If a fault is found in any of the safety systems, then the system shall be repaired only by a contractor qualified in the installation and service of electric heating equipment, using only components that are sold and supplied by Addison.

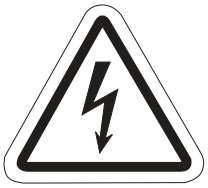
- Air Proving Switch: An air proving switch is provided as part of the control system to verify airflow across the elements. If sufficient airflow is not present, indicating lack of proper air movement through the elements, the switch opens shutting off the elements. The air proving switch has fixed settings and is not adjustable.
- Automatic Limit Switch: To prevent operation of the electric heater under low airflow conditions, the unit is equipped with a fixed temperature high limit switch mounted on the vestibule panel. This switch will shut off heater when the actual discharge air temperature exceeds the switch's setpoint. Reduced airflow may be caused by restrictions upstream or downstream of the circulating air blower, such as dirty or blocked filters or restriction of the air inlet or outlet to the unit.

11.3 Wiring

All electric wiring and connections, including electrical grounding, must comply with;

- United States: Refer to National Electric Code®, NFPA 70 - latest revision.
- Canada: Refer to Canadian Electric Code, CSA C22.1 Part 1 - latest revision.
- Check rating plate on unit for supply voltage and current requirements.
- If any of the original control wire supplied with the electric heater must be replaced, replace it with type THHN 221° F (105°C), 600 V, 16 gauge wire or equivalent.

⚠ DANGER



ELECTRICAL SHOCK HAZARD
Disconnect electric before service. More than one disconnect switch may be required to disconnect electric from equipment. Equipment must always be properly grounded.

SEVERE INJURY HAZARD
Do not enter equipment while in operation. Equipment may start automatically. Do not operate with access doors open. Installation, operation, and maintenance must be performed by a trained technician only.

Failure to follow these instructions can result in death, electrical shock, or injury.

⚠ WARNING

FIRE HAZARD
Keep all flammable objects, liquids, and vapors the minimum required clearances to combustibles away from equipment. Some objects will catch fire, or explode, when placed close to equipment.

BURN HAZARD
Allow equipment to cool before service. Internal components of equipment may still be hot after operation.

CUT/PINCH HAZARD
Wear protective gear during installation, operation, or maintenance. Edges are sharp.

Failure to follow these instructions can result in death, injury, or property damage.

Table 6: FCRA/H Air Handler Standard Electric Heaters

Air Handler Model	Heater kW Available 208/60/3
042 - 060	3.8 - 18.8
072 - 120	7.5 - 30.0
150 - 240	11.3 - 45.0
300 - 420	15.0 - 52.5

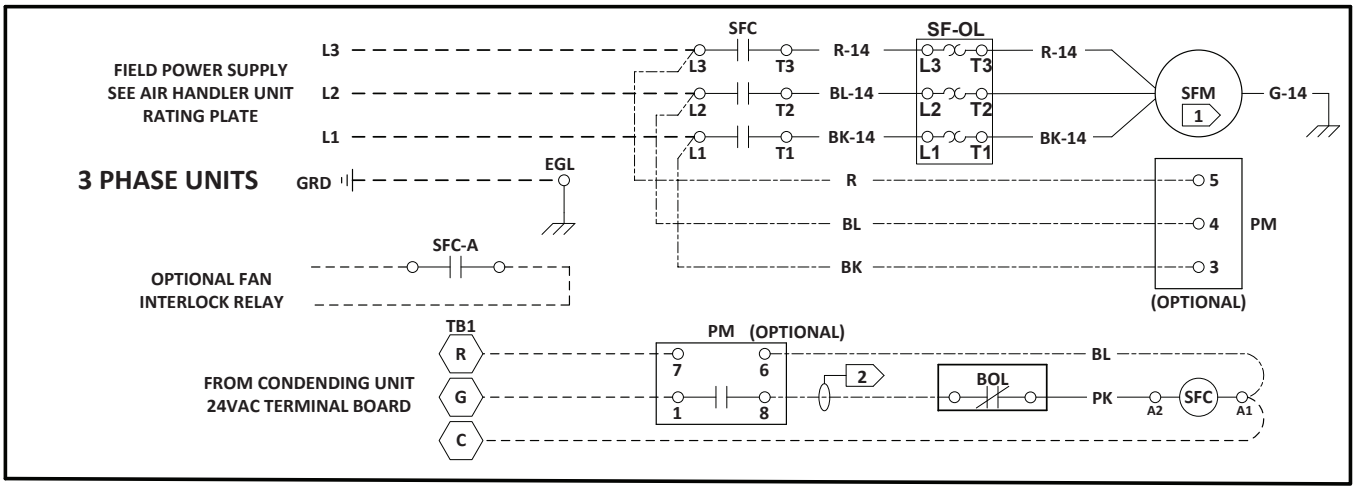
Air Handler Model	Heater kW Available 230/60/3 460/60/3
042 - 060	5.0 - 25.0
072 - 120	10.0 - 40.0
150 - 240	10.0 - 50.0
300 - 420	15.0 - 70.0

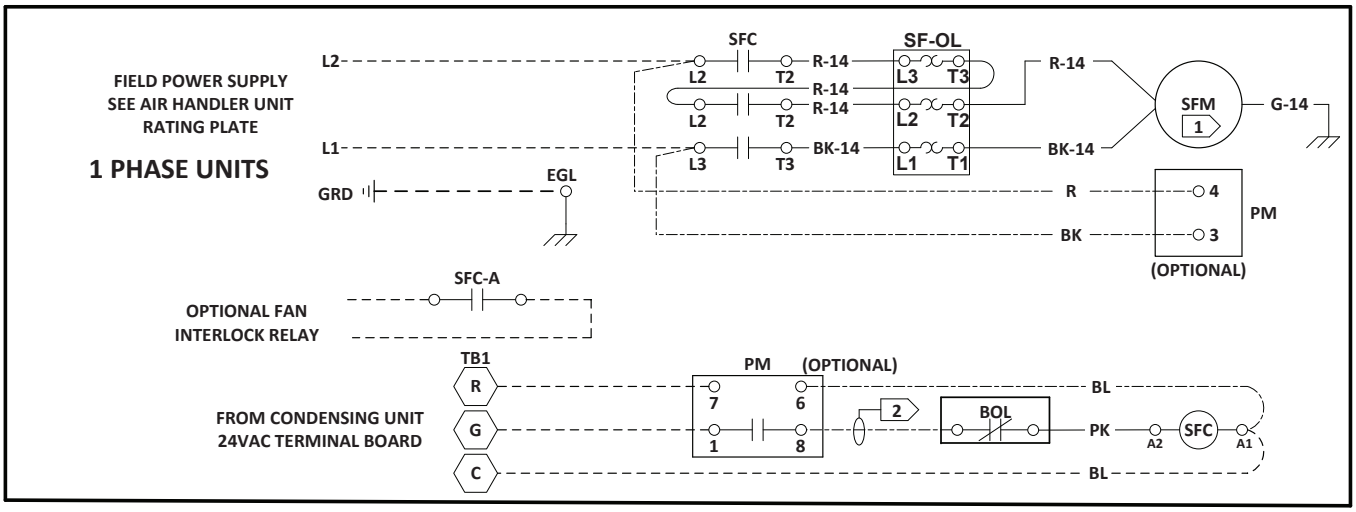
Table 7: FCOA/H Air Handler Standard Electric Heaters

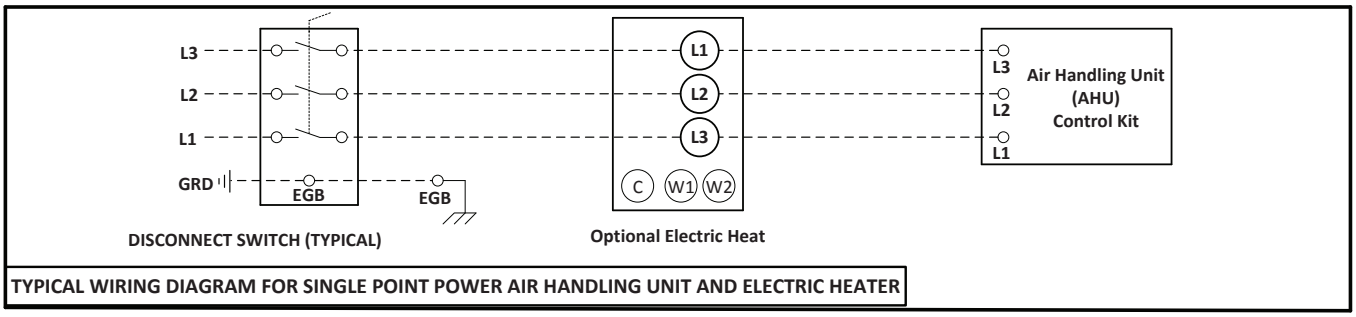
Air Handler Model	Heater kW Available 208/60/3
042 - 060	3.8 - 18.8
072 - 120	7.5 - 30.0
150 - 240	11.3 - 45.0
300 - 420	15.0 - 52.5

Air Handler Model	Heater kW Available 230/60/3 460/60/3
042 - 060	5.0 - 20.0
072 - 120	7.5 - 30.0
150 - 240	10.0 - 50.0
300 - 420	15.0 - 60.0

Figure 15: Typical Air Handler Wiring Diagram







TYPICAL WIRING DIAGRAM FOR SINGLE POINT POWER AIR HANDLING UNIT AND ELECTRIC HEATER

1 TYPICAL MOTOR SHOWN; SEE CONNECTION DIAGRAM ON MOTOR FOR ACTUAL WIRING DETAIL.

2 THIS WIRE CONNECTS DIRECTLY TO TERMINAL G OF "TB1" WHEN OPTIONAL POWER MONITOR IS NOT USED.

LEGEND	
FUNCTIONAL DESIGNATION	DESCRIPTION
SFC	SUPPLY FAN CONTACTOR
SFC-A	"SFC"- AUXILIARY CONTACT
SFM	SUPPLY FAN MOTOR
EGL	EQUIPMENT GROUNDING LUG
PM	POWER MONITOR
SF-OL	SUPPLY FAN OVERLOAD RELAY
TB	TERMINAL BOARD

SYMBOL LEGEND
FACTORY WIRING
FIELD WIRING
FACTORY WIRING
EARTH GROUND
CHASSIS (PANEL) GROUND
NORMALLY OPEN CONTACT
NORMALLY CLOSE CONTACT

Section 12:
Sequence of Operation:

12.1 Unit Configuration

Based on the unit's application, the unit may be configured in any number styles to achieve the described functionality. Refer to the unit's model number to see which configuration the unit was supplied with.

12.2 Controls Options

Unit may be controlled in one of the following ways:

- Factory-mounted ALC controls (by factory)
- Factory-mounted DDC controls (by others)
- Factory-mounted terminal strip for field-mounted
- Factory-mounted terminal strip for electromechanical controls (by factory or by others)

Unit Nomenclature Control Options:

A = ALC, Standard Program, DOAS
B = ALC, Standard Program, Recirculating
C = ALC, Standard Program, DOAS with LON
D = ALC, Standard Program, Recirculating with LON
E = Controls by Others, Factory Mounted
F = Terminal Strip, Controls Provided and Mounted by Others
G = Remote Thermostat
H = Compressor Lockout Thermostat

12.2.1 Factory-Mounted ALC Controls (by factory)

The ALC control option consists of a factory programmed controller and a series of factory-wired sensors. The controller can operate in a 100% stand alone mode with the use of a hand-held display. It can also connect to a building automation system (BMS) using one of four compatible protocols (BACnet®, LonWorks with the optional Echelon card, Modbus, N2). The point mapping to these protocols can be pre-set, so that the protocol and baud rates desired can be easily field-selected without the need for additional downloads or technician assistance. Depending on the options ordered, remote sensors may be installed and wired to the controller.

12.2.2 Factory-Mounted DDC Controls (by others)

Field-supplied DDC controls are mounted by the factory per the customer's specifications.

12.2.3 Factory-Mounted Terminal Strip for Field-Mounted DDC Controls (by others)

Field-supplied DDC controls can be connected to the factory-mounted and factory-wired terminal strip.

⚠ DANGER

ELECTRICAL SHOCK HAZARD
Disconnect electric before service. More than one disconnect switch may be required to disconnect electric from equipment. Equipment must always be properly grounded.

12.2.4 Factory-Mounted Terminal Strip for Remote Thermostat (by factory or by others)

A factory-supplied or field-supplied thermostat can be connected to the factory-mounted and factory wired terminal. The 24V factory-supplied thermostat has the following capabilities:

- Up to 4 heat/2 cool with humidity control - for heat pump
- Up to 3 heat/2 cool with humidity control - for straight cool

The thermostat features a 45-90 °F [7-32 °C] temperature control range with a +/- 1 °F [0.5 °C] accuracy and are capable of connecting to optional factory-supplied remote indoor air and outdoor air temperature sensors.

Figure 16: Equipment Touch Display

12.3 Basic Sequence of Operation

All sequence of operation information for units controlled with ALC controls is available in the ALC Sequence of Operation documents that can be requested from your manufacturer's Addison representative for each specific job.

- Sequence of operation information specifically for the operation of the electric heater modules within the above referenced document.

For sequence of operation information for units controlled with field-supplied DDC controls (whether factory-mounted or field-mounted), consult the DDC controls manufacturer and/or installer.

12.4 Accessory Controls Options

Accessory controls options include, but are not limited to:

- **Carbon Dioxide Detector:** This option provides a room-mounted carbon dioxide detector for initiating additional outdoor ventilation.
- **Clogged Filter Indicator:** This section provides a differential pressure switch and status indication.
- **Exhaust Fan Interlock:** This option provides an interlock between an exhaust fan and the unit.
- **Firestat:** This option de-energizes the unit when the stat, mounted in the return air section, senses return air above 135 °F (57.2 °C). The firestat must be manually reset.
- **Freezestat:** This option shuts down the unit when the discharge temperature falls below the controller's setpoint.
- **Service Receptacle:** This option provides a 115V service receptacle with 15A breaker. It is mounted in a 2" x 4" (51cm x 10.2cm) enclosure. It can be field-wired or factory-wired (outdoor condensing section only).
- **Smoke Detector:** This option provides an ionization type supply air smoke detector which shuts off the unit if smoke is detected.

Section 13:
Start-Up Procedure:

Installation Code and Quarterly Inspections:

All installation and service of ADDISON® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Addison and conform to all requirements set forth in the ADDISON® manuals and all applicable governmental authorities pertaining to the installation, service operation and labeling of the equipment.

To help facilitate optimum performance and safety, Addison recommends that a qualified contractor conduct, at a minimum, quarterly inspections of your ADDISON® equipment and perform service where necessary, using only replacement parts sold and supplied by Addison.

Check installation site to ensure all codes and engineering specifications are correct. This section of the manual is intended to be used as an instructional guide to the commissioning of the unit. Fill out the attached start up sheet (located at the back of the manual) as each step of the procedure is performed. This procedure should be completed by the commissioning contractor and returned to Addison.

13.1 Tools & Supplies Required

1. 5/16" Allen Key to Unlock Unit Doors
2. Equipment Touch
3. Refrigeration Manifold Gages
4. Refrigeration Wrench
5. Multimeter
6. Temperature Sensors
7. Clamp-On Temperature Probe
8. Socket Wrenches
9. Small Flat Heat Screwdriver
10. Refrigerant Oil
11. R-410A Refrigerant

⚠ DANGER

ELECTRICAL SHOCK HAZARD
Disconnect electric before service. More than one disconnect switch may be required to disconnect electric from equipment. Equipment must always be properly grounded.

SEVERE INJURY HAZARD
Do not enter equipment while in operation. Equipment may start automatically. Do not operate with access doors open. Installation, operation, and maintenance must be performed by a trained technician only.

Failure to follow these instructions can result in death, electrical shock, or injury.

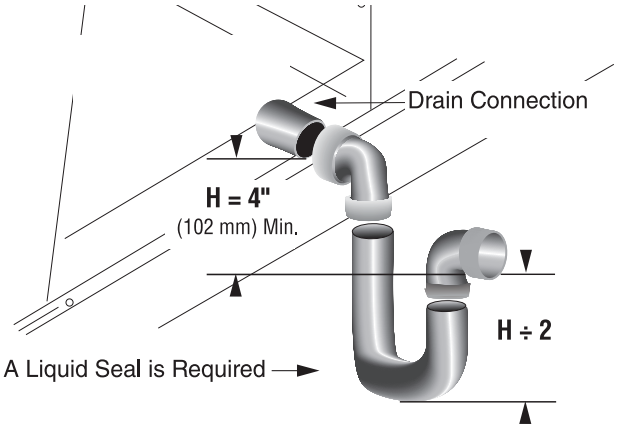
⚠ WARNING

BURN HAZARD
Allow equipment to cool before service. Internal components of equipment may still be hot after operation.

FALLING HAZARD
Use proper safety equipment and practices to avoid falling. Do not use any part of the equipment as a support.

Failure to follow these instructions can result in death, injury, or property damage.

Figure 17: P-Trap Configuration



13.2 Pre-Start Checks

13.2.1 Ductwork and Electrical Connections

Ensure that the following ductwork and electrical connections have been made:

- Ductwork: Supply and return air connections.
- Electrical: Line voltage power, control voltage power and remote sensor connections.

13.2.2 Condensate Drain

Units are provided with condensate drain connection(s). Do not operate unit unless a P-Trap is constructed and attached to drain connection. See Figure 15. Unit must be level or slightly inclined towards drain. Drain should pitch down and away from the unit. P-Trap pipe diameter should be the same as the drain connection diameter. Units with high internal and external static pressure drops will require a deeper trap. Prime the trap before operating the unit.

13.2.3 Supply Fans

1. Make sure electrical power is isolated.
2. Check power settings for voltage and verify that they correspond with the data on the motor plate.
3. Check that the motor is grounded (earthed).
4. Check that all electrical leads are sufficiently insulated.
5. Check that all electrical and system connections are properly made and tightened.
6. Check that all nuts, bolts and setscrews are tightened.
7. Check that the blower wheel and drive assembly turns freely without rubbing.
8. Check that belt drives are tightened, properly aligned and tensioned.
9. Bump the motor.
10. Check rotation.

13.2.4 Compressors

With the supply fan operational, prepare for compressor operation.

1. Verify that the crankcase heaters are operating. These should operate for at least 24 hours before starting the compressors. Crankcase heaters must be operating during off cycles to prevent liquid refrigerant from migrating to the compressor crankcase.

13.2.5 Hot Water Heating Coils (Optional)

1. Check all plumbing to the hot water heating coil is complete and free of leaks.
2. Check that all air has been eliminated from the water loop and coil.
3. Check that flow rates match the nominal GPM listed in the table below.

Pre-Start Checklist:

- ☐ Documentation to properly start the unit including the sequence of operation, and a copy of the work order listing complete unit configuration.
- ☐ Pre-Start visual check of the unit, and a copy of the unit start up form to document the operation and performance of the unit.
- ☐ Unit checked for debris.
- ☐ Gages placed on each circuit to make sure the circuit has a refrigerant charge before circuit is enabled for operation.
- ☐ Supply power (line voltage) is connected to the unit, and is correct.
- ☐ Phase monitor is set up correctly.
- ☐ All ductwork is connected to the unit.
- ☐ All condensate piping is connected to the unit.
- ☐ All refrigerant lineset piping is connected to the unit.
- ☐ All control wiring is connected to the unit.
- ☐ Filed installed parts (if applicable) that shipped lose are installed.
- ☐ Electrical connections are tight.
- ☐ Overloads are adjusted.
- ☐ Fan wheel(s) rotate freely.
- ☐ O/A dampers (if applicable) move freely.
- ☐ Safety switches are adjusted properly.
- ☐ Verify any field installed safeties (I.E. Fire (SD) or Condensate Overflow (COS)) are on the correct ALC board terminal location, and/or jumpers are installed correctly.
- ☐ Crankcase heater has been on for at least 24 hours at a minimum.
- ☐ 80% of the calculated unit charge should be charged into the system before starting compressor.

Notes:

1. Start-up technician will need to fill out the Start-Up Form with date of start-up and all information.
2. Start-up technician will need to verify the sequence of operation for the order.
3. Return trip may be necessary to check cooling or heating operation based on the outdoor air temperature at the time of start-up.
4. Subcooling and superheat readings must be taken with the reheat circuit disabled, and in the cooling mode.
5. Digital compressors must be operated at 100%.
6. Supply fan will need to run at 50Hz at a minimum.
7. Subcooling circuit (if applicable) must be energized and open.

Table 8: Hot Water Heating Coil Flow Rate and Pressure Drop

Air Handler Model	Cabinet	Nominal GPM (Water Only)	Pressure Drop (FT, H2O)
042 - 072	A	5.0	1.72
096 - 120	B	10.0	5.96
150 - 210	C	16.0	2.10
240 - 360	D	25.0	3.20
420	E	40.0	5.80

Table 9: Superheat and Subcooling - 100% OA

Ambient Air Temperature	95°F	85°F	75°F	65°F	55°F	45°F
Subcooling	10° - 12°F		8° - 10°F		In Heating Mode	
	No Reheat					
Subcooling	10 - 12°F		8°F - 12°F		In Heating Mode	
	With Reheat					
Superheat	8°F - 15°F		6°F - 15°F		In Heating Mode	

Note: Subcooling and superheat readings must be taken with the reheat circuit disabled and in the cooling mode.

Table 10: Superheat and Subcooling - Recirculating

Ambient Air Temperature	95°F	85°F	75°F	65°F	55°F	45°F
Subcooling	10° - 12°F		8° - 10°F		6°F - 10°F	
Superheat	8°F - 15°F		6°F - 15°F		6°F - 10°F	

Note: Subcooling and superheat readings must be taken with the reheat circuit disabled and in the cooling mode.

Table 11: Superheat and Subcooling - Heat Pump

Ambient Air Temperature	95°F	85°F	75°F	65°F	55°F	45°F
Subcooling	8° - 12°F		8° - 10°F		In Heating Mode	
Superheat	6°F - 15°F				In Heating Mode	

Note: Subcooling and superheat readings must be taken with the reheat circuit disabled and in the cooling mode.

Table 12: Refrigerant Temperature-Pressure Chart (PSIG)

Temp °F	R-22	R-134A	R-410A	Temp °C
-40	0.6	14.8(“Hg)	10.8	-40
-38	1.4	13.9(“Hg)	12.1	-39
-36	2.2	12.9(“Hg)	13.4	-38
-34	3.1	12.0(“Hg)	14.8	-37
-32	4.0	10.9(“Hg)	16.3	-36
-30	4.9	9.8(“Hg)	17.8	-34
-28	5.9	8.7(“Hg)	19.4	-33
-26	6.9	7.5(“Hg)	21.0	-32
-24	8.0	6.3(“Hg)	22.7	-31
-22	9.1	5.0(“Hg)	24.5	-30
-20	10.2	3.7(“Hg)	26.3	-29
-18	11.4	2.3(“Hg)	28.2	-28
-16	12.6	0.8(“Hg)	30.2	-27
-14	13.9	0.3	32.2	-26
-12	15.2	1.1	34.3	-24
-10	16.5	1.9	36.5	-23
-8	17.9	2.8	38.7	-22
-6	19.4	3.6	41.0	-21
-4	20.9	4.6	43.4	-20
-2	22.4	5.5	45.9	-19
0.0	24.0	6.5	48.4	-18
2.0	25.7	7.5	51.1	-17
4.0	27.4	8.5	53.8	-16
6.0	29.1	9.6	56.6	-14
8.0	31.0	10.8	59.5	-13
10.0	32.8	11.9	62.4	-12
12.0	34.8	13.1	65.5	-11
14.0	36.8	14.4	68.6	-10
16.0	38.8	15.7	71.9	-9
18.0	40.9	17.0	75.2	-8
20.0	43.1	18.4	78.7	-7
22.0	45.3	19.9	82.2	-6
24.0	47.6	21.3	85.8	-4
26.0	50.0	22.9	89.6	-3
28.0	52.4	24.5	93.4	-2
30.0	55.0	26.1	97.4	-1
32.0	57.5	27.8	101.4	0.0
34.0	60.2	29.5	105.6	1.0
36.0	62.9	31.3	109.9	2.0
38.0	65.7	33.1	114.3	3.0
40.0	68.6	35.0	118.8	4.0
42.0	71.5	37.0	123.4	6.0
44.0	74.5	39.0	128.2	7.0
46.0	77.6	41.1	133.0	8.0
48.0	80.8	43.2	138.0	9.0
50.0	84.1	45.4	143.2	10.0
52.0	87.4	47.7	148.4	11.0
54.0	90.8	50.0	153.8	12.0
56.0	94.4	52.4	159.3	13.0
58.0	98.0	54.9	164.9	14.0
60.0	101.6	57.4	170.7	16.0
62.0	105.4	60.0	176.6	17.0
64.0	109.3	62.7	182.7	18.0
66.0	113.2	65.4	188.9	19.0
68.0	117.3	68.2	195.3	20.0
70.0	121.4	71.1	201.8	21.0
72.0	125.7	74.1	208.4	22.0
74.0	130.0	77.1	215.2	23.0
76.0	134.5	80.2	222.2	24.0
78.0	139.0	83.4	229.3	26.0
80.0	143.6	86.7	236.5	27.0
82.0	148.4	90.0	244.0	28.0
84.0	153.2	93.5	251.6	29.0
86.0	158.2	97.0	259.3	30.0
88.0	163.2	100.6	267.3	31.0
90.0	168.4	104.3	275.4	32.0
92.0	173.7	108.1	283.6	33.0
94.0	179.1	112.0	292.1	34.0
96.0	184.6	115.9	300.7	36.0
98.0	190.2	120.0	309.5	37.0
100.0	195.9	124.2	318.5	38.0
102.0	201.8	128.4	327.7	39.0
104.0	207.7	132.7	337.1	40.0
106.0	213.8	137.2	346.7	41.0
108.0	220.0	141.7	356.5	42.0
110.0	226.4	146.4	366.4	43.0
112.0	232.8	151.1	376.6	44.0
114.0	239.4	156.0	387.0	46.0
116.0	246.1	160.9	397.6	47.0
118.0	253.0	166.0	408.4	48.0
120.0	260.0	171.2	419.4	49.0
122.0	267.1	176.5	430.7	50.0
124.0	274.3	181.8	442.1	51.0
126.0	281.7	187.4	453.8	52.0
128.0	289.2	193.0	465.8	53.0
130.0	296.9	198.7	477.9	54.0
132.0	304.7	204.6	490.3	56.0
134.0	312.6	210.6	503.0	57.0
136.0	320.7	216.7	515.9	58.0
138.0	329.0	222.9	529.1	59.0
140.0	337.4	229.2	542.5	60.0
142.0	345.9	235.7	556.2	61.0
144.0	354.6	242.3	570.2	62.0
146.0	363.5	249.0	584.5	63.0
148.0	372.5	255.9	599.0	64.0
150.0	381.7	262.9	613.9	66.0

Section 14
Start-Up Form:

Field start-up should be performed by a qualified technician.

The technician is responsible for assuring that all of the items on the unit start-up checklist are properly installed and operating. Upon completion, a copy of the form should be returned to Addison, using the contact information listed.

Installation Code and Quarterly Inspections:

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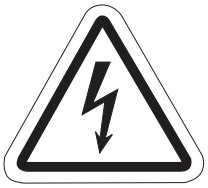
To help facilitate optimum performance and safety, Addison recommends that a qualified contractor conduct, at a minimum, quarterly inspections of your ADDISON® equipment and perform service where necessary, using only replacement parts sold and supplied by Addison.

Further Information:

Applications engineering and detailed guidance on systems design, installation and equipment performance is available through ADDISON® representatives. Please contact us for any further information you may require, including the Installation, Operation and Service Manual.

This product is not for residential use. This document is intended to assist licensed professionals in the exercise of their professional judgment.

⚠ DANGER



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⚠ WARNING

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System contains R-410A refrigerant. Operating pressures may exceed limits of R-22 service equipment. Use proper refrigerant handling practices, tools, and equipment. Failure to follow these instructions can result in death, injury, or property damage.

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START-UP FORM: RC/FC Series

Split System Unit

DEDICATED OUTDOOR AIR SPECIALISTS

7050 Overland Road
Orlando, FL 32810
Tel.: 407-292-4400 · Fax: 407-290-1329
www.addison-hvac.com

Technician Name: _____

Start-Up Date: _____

Part Number:
ADFMRCST
Rev.: 06 June 2018DS

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GENERAL INFORMATION

Customer Name:

Address:

City/State/Zip:

Phone/Fax:

Project Name:

Contractor Name:

Unit Model #:

Unit Serial #:

Unit Tag #:

Start-Up Date:

APPLICATION INFORMATION

Outdoor Air Temp (°F or °C): db wb

Return Air Temp (°F or °C): db wb

Supply Air Temp (°F or °C): db wb

Outdoor Fan Temp (°F or °C): db wb

Design CFM:

Design Duct ESP:

UNIT INFORMATION

Unit Electrical:

Volts: Hertz: Phase:

Amperage:

Supply Voltage:

L1-L2: L2-L3: L1-L3:

Unit Controls:

Manufacturer:

Installed By:

Description & Operation:

Lineset Information:

Overall Length:

Service Valves Installed?:

Suction Line Size:

Discharge Line Size:

Supply Fan Motor:

Make:

Catalog#:

Voltage: AMPS:

FR#:

HP: RPM:

Quantity:

UNIT INFORMATION

Condenser Fan Motor:

Make: | Catalog#:

Voltage: | AMPS: | FR#:

HP: | RPM: | Quantity:

Unit Compressors:

Manufacturer:

Model Number: | Serial Number:

Model Number: | Serial Number:

Model Number: | Serial Number:

Model Number: | Serial Number:

Unit Air Filters:

Pre-Filters: | Quantity:

Final Filters: | Quantity:

Other: | Quantity:

PRE-START CHECK

Shipping Blocks Removed:

Unit Supply Voltage Correct:

Unit Checked for Debris:

Electrical Wiring Correct:

Vibration Isolators Adjusted:

Phase Monitor Checked:

Electrical Connections Tight:

Overloads Adjusted:

Set Screws Tight:

Fan(s) Wheels/Blades Turn Freely:

Crankcase Heater On:

Smoke Detector Checked:

Unit Condition:

START-UP CHECK

Supply Motor AMPS: L1 L2 L3 RPM

OA Damper Operation: Actuator:

Return Damper Operation: Actuator:

HEATING CHECK

Heating Type: Hot Water: Electric: kW:

Control Valve:

Heat Stages:

Unit Safeties Operate Properly:

Electric Heat AMPS: L1 L2 L3

Comments:

COOLING CHECK

Refrigerant Type: Charge: Number of Circuits:

Unit Safeties Operate Properly: Fans Run & Cycle Properly:

Comments:

COOLING CHECK

Compressor Circuit #1:

Suction Pressure: _____ **Suction Temp:** _____ **Saturation Temp:** _____

Discharge Pressure: _____ **Discharge Temp:** _____ **Saturation Temp:** _____

Liquid Pressure: _____ **Liquid Temp:** _____

Superheat: _____ *To Calculate Superheat: Convert suction pressure to saturation temperature, then subtract the suction line temperature.*

Subcooling: _____ *To Calculate Subcooling: Convert liquid line pressure to condensing temperature, then subtract the liquid line temperature.*

Compressor 1 AMPS: _____ **L1** _____ **L2** _____ **L3** _____ **RLA**

Compressor 2 AMPS: _____ **L1** _____ **L2** _____ **L3** _____ **RLA**

Compressor Circuit #2:

Suction Pressure: _____ **Suction Temp:** _____ **Saturation Temp:** _____

Discharge Pressure: _____ **Discharge Temp:** _____ **Saturation Temp:** _____

Liquid Pressure: _____ **Liquid Temp:** _____

Superheat: _____ *To Calculate Superheat: Convert suction pressure to saturation temperature, then subtract the suction line temperature.*

Subcooling: _____ *To Calculate Subcooling: Convert liquid line pressure to condensing temperature, then subtract the liquid line temperature.*

Compressor 1 AMPS: _____ **L1** _____ **L2** _____ **L3** _____ **RLA**

Compressor 2 AMPS: _____ **L1** _____ **L2** _____ **L3** _____ **RLA**

Condenser Fans:

Condenser Fan 1 AMPS: _____ **L1** _____ **L2** _____ **L3**

Condenser Fan 2 AMPS: _____ **L1** _____ **L2** _____ **L3**

Condenser Fan 3 AMPS: _____ **L1** _____ **L2** _____ **L3**

Condenser Fan 4 AMPS: _____ **L1** _____ **L2** _____ **L3**

Condenser Fan 5 AMPS: _____ **L1** _____ **L2** _____ **L3**

Condenser Fan 6 AMPS: _____ **L1** _____ **L2** _____ **L3**

Unloading Switch:

Cut In: _____

Cut Out: _____

Hot Gas Bypass/Hot Gas Reheat:

Hot Gas Bypass # of Stages: _____ **Setpoint:** _____ **1:** _____ **2:** _____ **3:** _____ **4:**

Hot Gas Reheat # of Stages: _____ **Setpoint:** _____ **1:** _____ **2:**

Comments:

Owner's Representative: _____

Signature: _____

Section 15:
Unit Maintenance:

Prior to any maintenance or service to the unit, shut off, lockout and tagout the electrical disconnect and fuel valve (if applicable) that supplies the unit in accordance with OSHA regulations and, if the unit includes electric or gas heat, allow ample time for the unit to cool. After maintenance is performed or the unit is serviced, the unit shall be re-commissioned per the start-up procedure as outlined in Section 13.

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Table 13: Maintenance Guidelines

<table>
<tr><th colspan="3">15.1 General</th></tr>
<tr><td>Quarterly</td><td colspan="2">Follow the entire start-up procedure at this time and check settings (controls, operating temperatures, operating pressures, power and control voltages) and operation.</td></tr>
<tr><th colspan="3">15.2 Unit Exterior</th></tr>
<tr><td>Cabinet Exterior</td><td colspan="2">After installation, touch up scratches. Periodic painting should be done thereafter as required. The caulk should be inspected annually. Re-apply caulk as needed to maintain integrity.</td></tr>
<tr><td>Unit Location</td><td colspan="2">Verify that no flammable objects, liquids or vapors are present near the unit. If unit includes gas furnace, clearances to combustibles around the vent must be adhered to.
Do not hang anything from or place anything on the unit.
Keep the area around the unit free of all objects.</td></tr>
<tr><th colspan="3">15.3 Belt-Drive Supply Fans</th></tr>
<tr><td rowspan="5">Motors</td><td colspan="2">Inspection:
1. Inspect motor every 3 months. Keep the motor clean and vent openings clear.</td></tr>
<tr><td colspan="2">Lubrication:
1. Motors with grease fittings must be lubricated based on the table below.
2. A high grade ball or roller bearing grease must be used. Recommended grease for standard service is Mobil Polyrex™ EM. Other compatible greases include ChevronTexaco Polystar®, ChevronTexaco Rykon® Premium 2, Pennzoil® Pen 2 Lube and ChevronTexaco SRI.
3. Motors without grease fittings are sealed for life and do not require relubrication.</td></tr>
<tr><td colspan="2">Motor Lubrication Intervals
<table>
<tr><th>NEMA Frame Size (Motor HP)</th><th>Rated at 1800 RPM (Hours)</th></tr>
<tr><td>Up to 210 (3 - 5)</td><td>6,000</td></tr>
<tr><td>Over 210 to 280 (7.5 - 20)</td><td>4,750</td></tr>
<tr><td>Over 280 to 360 (25 - 50)</td><td>3,700</td></tr>
</table></td></tr>
<tr><td colspan="2">Instructions for Lubricating:
Before greasing, be sure fittings are clean and free from dirt. Remove grease relief plug or plate and, using a low-pressure grease gun, pump in the required grease. Do not over-grease. Relubrication intervals are specified in the table above. After relubricating, allow motor to run for 10 minutes before replacing relief hardware.

NOTE: In general, it is not recommended to mix greases of different brands. The mixing of different types of thickeners may destroy the composition and physical properties of the grease. In the event that a different grease is required by the end user, the following steps can be taken. Using the instructions for lubrications, open grease outlet and purge the system as much as possible of the old or unwanted grease. Repeat this same operation after one week of service. Consult Addison or the motor manufacturer for further recommendations on grease compatibility.</td></tr>
<tr><th colspan="3">15.4 Condensing Fans</th></tr>
<tr><td>Assemblies</td><td colspan="2">Manually rotate to ensure free movement. Check that all fan mounting hardware is tight. Check motor bearings for wear.</td></tr>
<tr><th colspan="3">15.5 Refrigeration Circuit Components</th></tr>
<tr><td>Evaporator Coil</td><td colspan="2">Check for dirt and bent fins. Clean with water from blower side towards filter side.</td></tr>
<tr><td>Condenser Coil</td><td colspan="2">Check for dirt and bent fins. Clean by brushing off with broom.</td></tr>
<tr><td>Compressors</td><td colspan="2">Compressors are factory-supplied with a charge of oil and should not require additional maintenance.</td></tr>
</table>

Table 13: Maintenance Guidelines, Cont.

15.6 Condensate Drain Pan and Drain	
Assembly	Check for blockages. Clean as necessary with mixture of 1/2 cup [0.1 L] bleach and 1 gallon [1.9 L] warm water if signs of mold or algae are present.
15.7 Dampers	
Dampers	Check and clean blades.
Damper Motor/Linkages	Verify that all damper linkages move freely. Lubricate if necessary.
15.8 Electric Heater Wiring and Wiring Connections	
Assembly	Check all wiring connections. Tighten as necessary.
	Check internal wiring. Replace as necessary with type THHN 221°F (105°C), 600V, 16 gauge wire or equivalent.
Control Panel	Check heater control panel for dust/dirt and moisture. Clean as necessary.
Heating Elements	Check heating elements for dust/dirt build-up and/or broken elements. Replace elements and /or clean elements with low pressure air as necessary.
	Check element male/female chassis insulators for breaks and/or cracks. Replace as necessary.
	Check element support frame insulators. Replace missing or broken insulators as necessary.
15.9 Filters	
Assemblies	Filters should be checked for dirt restriction on a monthly basis (or as required). Replace filters with filters of equal specification when they appear dirty.

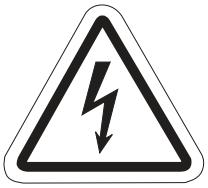
Section 16:
Replacement Parts:

Before ordering replacement parts, please contact factory to make sure that the replacement parts are the direct replacement for your specific unit.

Replacement parts used in units with the harsh environment coating option must be coated before being installed.

Only genuine ADDISON replacement parts should be used.

⚠ DANGER



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⚠ WARNING

EXPLOSION HAZARD

FIRE HAZARD

CARBON MONOXIDE HAZARD

Section 17: Troubleshooting:

The following tables outline typical unit troubleshooting techniques for each section of the system.

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Table 14.1: Supply Fan

Problem	Probable Cause	Solution
Blower Motor Does Not Run	Damper limit switch not closed or inoperative	Repair or replace switch
	Motor thermal overloads tripped	For tripped condition-reset
	Fuses blown or missing	Replace
	External power source lacking	Have incoming power lines checked
	Motor inoperative	Repair or replace
Blower Motor Runs, But Fans Do Not Supply Enough Make-Up Air	Intake filters dirty	Replace or clean
	Obstruction in intake	Check dampers for proper operation Clear all intake passages of obstructions
	Fan wheel loose on shaft	Reposition and tighten
	Access doors and panels not closed	Close
	Excessive discharge resistance from: Dirty filters in discharge External dampers	Clean filters and/or readjust dampers
Excessive Fan Noise	Fan bearing	Replace
	Fan wheel loose on shaft	Reposition and re-tighten
	Fan wheel rubbing	Loosen setscrews reposition cone and tighten
	Fan wheel dirty	Clean
	Loose duct	Tighten or reinforce
	Foreign article in fan or duct	Remove

Table 14.2: Compressor

Problem	Probable Cause	Solution
Compressor Will Not Start	Power off, loose electrical connections or fuse open	Check disconnect switch, fuses and wiring
	Compressor contactor not closing	Check voltage to contactor coil, transformer slave relay, thermostat
	Internal compressor thermal overload open	If compressor is hot, allow 2 hours to cool – see below
	Compressor defective	Check compressor for electrical failure Compressor may be seized, check for LRA
	High or low pressure switch open or defective	Check calibration of high or low pressure switch
	Oil pressure control open or defective	Check oil failure control – see below
Compressor Starts But Cuts Out On Low Pressure Switch	Low on refrigerant	Check sightglass and check pressures
	Airflow restricted	Check for dirty evaporator coil, dirty filters, dampers closed, iced evaporator, VFD settings, check motor amps, duct design
	Restriction in liquid line	Check head pressure, check and adjust TXV if not functioning properly, check pressure drop across filter drier
	Defective low pressure switch	Check calibration of switch
Compressor Starts But Cuts Out On High Pressure Switch	Refrigerant overcharged	Check pressures, charge by subcooling
	Condensing unit fan control has incorrect setting	Check calibration of the low ambient control
	Fan motor defective	Check fan motor
	Condensing unit coil inlet obstructed or dirty	Check coil and inlet clearances and for possible air re-circulation
	Air or non-condensables in system	Compare liquid refrigerant pressure with the saturated pressure If the presence of air or non-condensables is suspected, the refrigerant must be reclaimed through a service port The system must then be re-evacuated to 250-500 microns and recharged The filter-drier should also be replaced be charging
	Defective high pressure switch	Replace switch
	Restriction in discharge or liquid line	Check discharge and liquid line pressures, check TXV

Table 14.2: Compressor, Cont.

Problem	Probable Cause	Solution
Compressor Cuts Out On Thermal Overload	Low voltage	Check incoming voltage leg-to-leg All three legs must be within 10% of the required voltage and the leg-to-three-leg average voltage variation must be less than 2% on each leg
	Sustained high discharge pressure	Check running amperage and conditions described under high discharge pressure
	High suction and discharge pressures	Check TXV setting, check for air in system
	Defective compressor overload	Allow compressor to cool for two hours if compressor is hot, recheck for open circuit
	Defective run capacitor	Check run capacitor for compressor and fan motor
	Improper refrigerant charge	Check subcooling
	Bearings or pistons too tight	Check for low oil level
	Allow time for compressor to cool	Check dome temperature of compressor
Noisy Compressor	Scroll compressors are rotation sensitive	Reverse wiring at disconnect switch may require blower be rechecked for rotation
	Refrigerant overcharged	Check pressures and subcooling
	Excess or insufficient oil in compressor crankcase	Check oil level on hermetic compressors, check total equivalent feet of piping, add oil as recommended
	Liquid floodback	Check TXV setting, refrigerant overcharge refrigerant circuit problem
	Tubing rattle	Dampen by taping or clamping, bend tubing away from contact where possible
	Compressor defective	Replace compressor

Table 14.3: Refrigeration Circuit

Problem	Probable Cause	Solution
Noisy Operation	Air noise	Check ductwork Air Velocity too high
	Chattering contactor	Check for adequate control voltage, check for shorts or breaks, check thermostat, check contactor points
	Tubing rattle	Dampen by taping or clamping, bend tubing away from contact where possible
High Suction Pressure	Excessive load on evaporator coil	Check for high entering wet bulb temperature Check for excessive airflow
	Broken compressor valves Scroll compressors do not have valves	Scroll compressors should not be pumped down below 5 PSI
	Compressor is unloaded	Recalibrate unloader pressure switch
	Leaking check valve	Check temperature across check valve
	Expansion valve not secured to suction line or TXV defective	Check the TXV, ensure bulb is insulated
High Discharge Pressure	TXV setting	Check TXV setting and calibrate superheat
	Air inlet to condensing unit dirty or obstructed	Check for proper clearances and possible air recirculation
	Condensing unit fan, motor defective	Check condensing unit fan motor and run capacitor
	Condensing unit fan control has incorrect setting	Check calibration of low ambient head pressure control
Suction Pressure Too Low	Refrigerant undercharge	Check pressures and subcooling
	Blower running backwards	Interchange any two wires connected to motor
	Defective or improperly adjusted expansion valve	Check superheat and adjust TXV
	Dirty filter	Check filter and evaporator coil
	Too little airflow or low entering air temperature	Check airflow and entering air wet bulb conditions
	Restriction in suction or liquid line	Check refrigerant circuit for restriction
Head Pressure Too Low	Insufficient refrigerant charge	Check subcooling, check for leak
	Defective or improperly adjusted expansion valve	Check superheat and adjust TXV
	Low suction pressure	See above – suction pressure too low
	Condensing unit fan control setting	Check calibration of low ambient control
	Compressor defective	See above – high suction pressure
Liquid Line Too Hot	Refrigerant undercharged	See above – high discharge pressure
	High discharge pressure	Restriction upstream at point of frosting
Suction Line Frosting	Insufficient evaporator airflow	Check airflow, check fan VFD, closed dampers
	Restriction in suction or liquid line	Restriction upstream at point of frosting
	Malfunctioning or defective expansion valve	Check bulb of TXV

Table 14.3: Refrigeration Circuit, Cont.

Problem	Probable Cause	Solution
Compressor Short Cycles	Thermostat location or malfunction	Check thermostat, check heat anticipator setting
	Improper refrigerant charge	Check subcooling, verify superheat
	Defective high or low pressure control	Check high or low pressure switch
	Cycling on internal overload	Possible tight bearings – see above
	Defective expansion valve	Check TXV and superheat
	Poor air distribution	Check ductwork for recirculation
	High discharge pressure	See above – high discharge pressure
	Leaking discharge valves in compressor	See above – high suction pressure
Running Cycle Too Long Or Unit Operates Continuously	Refrigerant undercharged	Check subcooling
	Dirty filter or evaporator coil	Check filter, coil and airflow
	Dirty or clogged condensing unit coil	Check coil and airflow
	Air or other non-condensables in system	Check equalized high side pressure with equivalent outdoor temperature
	Defective compressor	See above – high suction pressure
	Restriction in suction and liquid line	Check for restrictions in refrigerant circuit
	Control contacts stuck	Check thermostat, shorts in wiring, slave relay compressor contactor
Supply Air Temperature Too High	Refrigerant undercharge or leak in system	Check subcooling and check for leaks
	Evaporator plugged with dirt or ice	Check evaporator, airflow and filter
	Improperly adjusted or defective expansion valve	Check superheat and adjust TXV, check bulb
	Defective compressor	Check compressor for proper operation
	High discharge pressure	See above- high discharge pressure
	Airflow is too high	Check external static pressure
Supply Air Temperature Too Low	Airflow is too low	Check evaporator coil, filter, check for closed dampers, grills, drive for loose parts, belts, misalignment, check external static pressure
	Return air temperature too low	Check entering air wet bulb conditions
Blower Motor Not Running	Improper wiring	Check wiring diagram
	Defective motor	Check motor controller
	Defective thermostat or control circuit	Check “R” and “G” Circuit
	Motor off on overload protector	Allow motor to cool, check amperage

Table 14.4: Variable Speed Head Pressure Control

Problem	Probable Cause	Solution
No Fan Operation	No 24V control voltage	Check for 24 VAC at control
	No input pressure to control	Check alignment of capillary fitting Schrader valve depressor must depress Schrader valve enough to allow pressure into capillary
	Bad fan motor	Disconnect power, when P266 is used, place a jumper from L1 to M1 and connect power, if fan does not start, motor is bad and should be replaced
	Pressure transducer problem	Disconnect 6 pin connector from right side of control, place a jumper wire between third pin from the top and bottom pin on the control (not the cable) If fan goes to full speed, check for input pressure If it has been determined there is adequate pressure, the transducer is bad and the control must be replaced
Fan Stops When Pressure Reached The High End Of The Operating Range	Control is not wired correctly	See wiring diagrams
No Fan Modulation (On-Off Operation)	Control is not wired correctly	See wiring diagrams
Fan Starts At Full Speed	Control is not wired correctly	See wiring diagrams
Erratic Fan Operation	Control is not wired correctly	See wiring diagrams
	Dirty or blocked condensing unit coil	Clean condensing unit coil
Erratic Pressure Control	Defective regulator	Replace defective part
	Dirt causing regulator to bind	Disassemble regulator and clean internal parts Install strainer
	Power source to hot gas solenoid or operation of the solenoid is intermittent	Determine if problem is caused by supply voltage, solenoid or excessive MOPD, make changes necessary to correct problem
Regulator Leakage	Dirt in regulator causing seat to remain open	Clean regulator Install strainer
	Worn or eroded seating surface on regulator	Replace defective part
Regulator Hunting (Chattering) With Large Fluctuations In Controlled Pressures	Regulator is oversized	Contact Addison for correctly sized regulator
	Regulator and liquid injection thermovalve have control interaction	Increase superheat setting, dampen bulb response by repositioning
	Regulator and cylinder unloaders have control interaction	Increase differential between the controls by lowering the regulator's setpoint

Table 14.4: Variable Speed Head Pressure Control, Cont.

Problem	Probable Cause	Solution
Regulator Will Not Provide Pressure Control	Regulator seat is restricted	Locate and remove stoppage, install strainer
	Pressure adjusting stem is set at a point so high that suction pressure never reaches the setpoint	Re-adjust the regulator
	Strainer clogged at the regulator inlet	Locate and remove stoppage
	MOPD exceeded across the solenoid or loss of source voltage	Replace solenoid or troubleshoot the electrical problem
	Solenoid coil burned out	Replace coil
	Wrong type of distributor for hot gas bypass to the evaporator	Install proper venture-flo type distributor for low pressure drop
Regulator Fails To Close	Dirt under seat of regulator	Locate and remove stoppage, install strainer or filter drier
	Diaphragm failure (leakage around the adjusting stem)	Replace defective parts
	Pressure adjusting stem is set at a point so high that suction never reaches the setpoint	Re-adjust the regulator
	Blocked external equalizer passage	Locate and remove stoppage, install strainer
	Worn or eroded regulator seat	Replace defective part

Table 14.5: Electric Heater

Problem	Probable Cause	Solution
No Heat	No call for heat	Check that the controls are set to call for heating
	No power and control voltage to heater	Check that heater has power and control voltage
	Faulty component	Check components with continuity meter, replace as necessary
Not Enough Heat	Faulty component	Check ampere draw is reasonably close to that on the heater data plate If more than 10% short, begin testing individual components, replace as necessary
	Heat anticipator current draw too low, causing short cycling	Check current draw
Heater Cycling on Automatic Limit	Improper airflow	Check for obstructions to return air, loose or broken fan belt and clogged filters and/or evaporator coils
	Faulty temperature limit switch	Test and, if necessary, replace
Open Secondary Protective Device	Stuck contactor	Check contactor
Contactor Chatter	Improper wiring	Check wiring
	Insufficient transformer capacity	Check transformer
Element Failure	Corroded hardware and/or loose connections	Check hardware

Section 18
Addison Warranty:

The following is the Limited Warranty provided by Addison (a trade name of Addison HVAC LLC, herein "Seller") to any customer (herein "Buyer") for any goods and services (a "deliverable"):

1. 1. Limited Warranty. Seller provides such warranty as set forth in any instruction manual provided with the deliverable, or if there is no such warranty or instruction manual, Seller warrants to Buyer that such deliverable will be free from defects in material and workmanship (in either case the "Limited Warranty"). Except as expressly set forth in this section or specifically authorized by an executive officer of Seller in writing, the Limited Warranty is not transferable or assignable and any such transfer or assignment is void. If Buyer is authorized by Seller to be a reseller of deliverables that are goods or an installing contractor, the Limited Warranty may be passed through to Buyer's customer, but Buyer shall not alter the Limited Warranty in any way. Notwithstanding the foregoing, if Buyer re-brands Seller's deliverable or Seller, at Buyer's request, brands the deliverable with a mark not owned by Seller, the Limited Warranty may not be transferred or assigned, and all claims under the Limited Warranty shall be made directly by Buyer to Seller and not by any customer of Buyer.

   The Limited Warranty does not cover service trips, service calls, costs of removing and reinstalling components and other labor charges or the cost of shipment of replacement parts. The Limited Warranty excludes damages due to (i) failure to install, operate or maintain deliverables as directed in any instruction manual provided or under applicable law or regulation, (ii) misuse, abuse, neglect or modification of a deliverable or any controls, in any way, (iii) improper service, use of replacement parts or accessories that are not specified by Seller, (iv) improper installation, or any relocation of a deliverable after initial installation, (v) incorrect supply, accident, fire, flood, acts of God or other casualty, (vi) use of a deliverable other than its intended purpose and normal usage, (vii) use of a deliverable in a corrosive atmosphere or any atmosphere containing contaminants, (viii) shipment of a deliverable (all claims must be filed with carrier), (ix) use of a deliverable in the vicinity of combustible or explosive materials, (x) any defect in a deliverable arising from a drawing, design, or specification supplied by or on behalf of Buyer, (xi) failure of parts, components, services or hook-ups not supplied by Seller, (xii) incompatibility with items not supplied by Seller, (xiii) a deliverable not properly installed by a qualified contractor experienced in installing the deliverable, (xiv) inadequate air for combustion, (xv) improper or rapid cycling of the compressor. No warranty coverage is applicable if Buyer cannot prove original purchase date and required annual maintenance history, the data plate and/or serial number on any deliverable is removed, defaced, modified or altered in any way, or Seller is not permitted to inspect the damaged deliverable.

   Wear items or consumables such as belts, filters, coolant, refrigerant, etc. are not included under the Limited Warranty. The Limited Warranty does not cover the equipment and materials not manufactured by Seller; the warranty for those items shall be limited to only such warranty as that furnished by the manufacturer thereof as may properly be assigned to Buyer.

   No person other than an executive officer of Seller has authority to change or extend the terms of the Limited Warranty, and Buyer confirms that no other warranty terms have been extended by Seller or are applicable to the deliverables. Change or extensions to the terms of the Limited Warranty are binding only if confirmed in writing by Seller's duly authorized executive officer.

2. Limitation on Warranties/Damages. Any claim under the Limited Warranty set forth in section 1 must be made within the following time periods or such claim is waived: (a) for compressors, the claim must be made within sixty (60) months from the date of purchase by Buyer; (b) for replacement parts, the claim must be made within the latter of twelve (12) months from the date of shipment by Seller or any Limited Warranty period remaining on the deliverable with which the replacement part is used or is intended to be used; (c) for all other deliverables, the claim must be made within twelve (12) months from the date of start-up or eighteen (18) months from the date of shipment by Seller, whichever occurs first. For all deliverables (other than replacement parts) that require installation and start-up, the otherwise applicable warranty period shall be extended by an additional four (4) months if (i) the installation and start-up is performed by a contractor on Seller's current list of contractors who have successfully completed Seller's current installation course for that deliverable and (ii) full details of the installation and start-up are provided to Seller at or prior to the time any warranty claim is made.

Except as set forth in these terms, Seller makes no representation or warranty of any type, express or implied, including any warranty of merchantability, warranty of fitness for a particular purpose or warranty of non-infringement or warranty arising from any course of dealing, course of performance or usage of trade.

Seller will not under any circumstances, be liable for any special, indirect, punitive or consequential damages (even if Seller has been notified of the possibility of such damages) resulting from or related to a product including, without limitation, any loss of profits, or loss of opportunity. Some jurisdictions do not allow limitations on warranties or damages, so this limitation or exclusion may not apply to Buyer

3. Remedy. **Seller's sole obligation and Buyer's exclusive remedy with respect to any deliverable, whether arising in contract, tort (including negligence), strict liability, breach of warranty or otherwise, is limited to Seller, at its discretion, replacing or repairing the defective deliverable, providing replacement parts or issuing Buyer a credit equal to the price paid to Seller for such defective deliverable, and in no event will Seller's liability exceed the amounts actually received by Seller for any deliverable.**

   This exclusive remedy shall not be deemed to have failed its essential purpose so long as Seller is willing and able to repair or replace a defective deliverable or parts thereof or, also at Seller's option, to refund the price received by Seller for the defective deliverable, within a reasonable time after Buyer demonstrates that a defect exists in accordance with the terms and limitations of the Limited Warranty.

If you have questions, contact your installing professional. Should you need replacement parts or have additional questions, call or write:

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