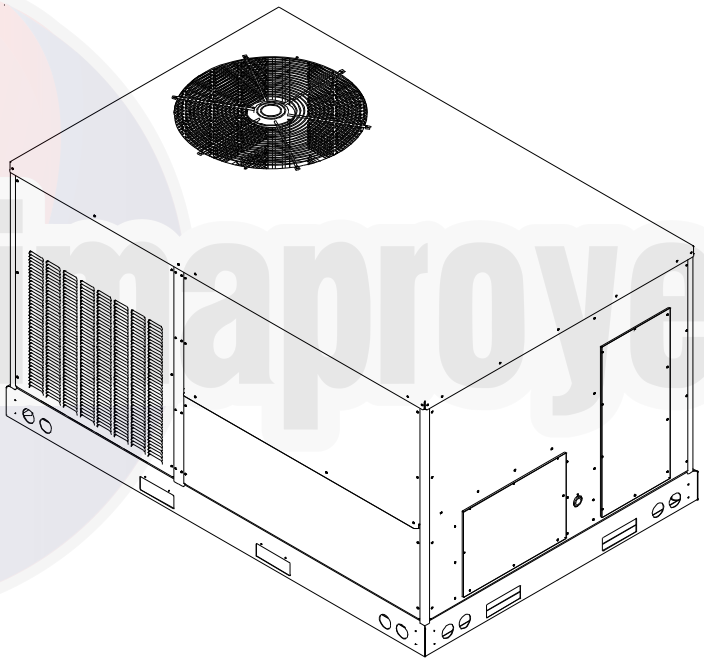
DAIKIN Service Instructions

DCC Cooling/DCH Heat Pumps
Commercial Package Units
with R-410A Refrigerant
4 - 6 Tons & Accessories

Not for installation in the United States or Canada. This unit is for export only.



COMMERCIAL GRADE

This manual is to be used by qualified, professionally trained HVAC technicians only. Daikin does not assume any responsibility for property damage or personal injury due to improper service procedures or services performed by an unqualified person.

RSDX6412006r1
November 2016

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IMPORTANT INFORMATION

Pride and workmanship go into every product to provide our customers with quality products. It is possible, however, that during its lifetime a product may require service. Products should be serviced only by a qualified service technician who is familiar with the safety procedures required in the repair and who is equipped with the proper tools, parts, testing instruments and the appropriate service manual. **REVIEW ALL SERVICE INFORMATION IN THE APPROPRIATE SERVICE MANUAL BEFORE BEGINNING REPAIRS.**

IMPORTANT NOTICES FOR CONSUMERS AND SERVICERS

RECOGNIZE SAFETY SYMBOLS, WORDS AND LABELS

WARNING

This unit should not be connected to, or used in conjunction with, any devices that are not design certified for use with this unit or have not been tested and approved by Daikin. Serious property damage or personal injury, reduced unit performance and/or hazardous conditions may result from the use of devices that have not been approved or certified by Daikin.

WARNING

ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE OR REPAIR (HEREINAFTER, "SERVICE") THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT. THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVICE THE EQUIPMENT. IMPROPER INSTALLATION, ADJUSTMENT, SERVICING OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

Do not store combustible materials or use gasoline or other flammable liquids or vapors in the vicinity of this appliance as property damage or personal injury could occur. Have your contractor point out and identify the various cut-off devices, switches, etc., that serves your comfort equipment.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

WARNING

The manufacturer will not be responsible for product or property damage, personal injury or death arising from improper installation, adjustment or servicing of this unit. If you incorrectly install, adjust or service this unit, you assume responsibility for any product or property damage, personal injury or death that may result.

To locate an authorized servicer, please consult your telephone book or the dealer from whom you purchased this product. For further assistance, please contact:

CONSUMER INFORMATION LINE - DAIKIN BRAND PRODUCTS
TOLL FREE 1-855-770-5678 (U.S. only)
email us at: customerservice@daikincomfort.com
fax us at: (713) 856-1821
(Not a technical assistance line for dealers.)

Outside the U.S., call 1-713-861-2500
(Not a technical assistance line for dealers.)
Your telephone company will bill you for the call.

IMPORTANT INFORMATION

SAFE REFRIGERANT HANDLING

While these items will not cover every conceivable situation, they should serve as a useful guide.

WARNING

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space.To avoid possible difficulty in breathing or death:

- **Never purge refrigerant into an enclosed room or space. By law, all refrigerants must be reclaimed.**
- **If an indoor leak is suspected, thoroughly ventilate the area before beginning work.**
- **Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact with refrigerant and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.**

WARNING

To avoid possible explosion:

- **Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.**
- **Never fill a cylinder more than 80% full of liquid refrigerant.**
- **Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.**
- **Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.**

WARNING

To avoid possible injury, explosion or death, practice safe handling of refrigerants.

WARNING

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

WARNING

To avoid possible explosion, use only returnable (not disposable) service cylinders when removing refrigerant from a system.

- **Ensure the cylinder is free of damage which could lead to a leak or explosion.**
- **Ensure the hydrostatic test date does not exceed 5 years.**
- **Ensure the pressure rating meets or exceeds 400 lbs.**

When in doubt, do not use cylinder.

WARNING

System contaminants, improper service procedure and/or physical abuse affecting hermetic compressor electrical terminals may cause dangerous system venting.

The successful development of hermetically sealed refrigeration compressors has completely sealed the compressor's moving parts and electric motor inside a common housing, minimizing refrigerant leaks and the hazards sometimes associated with moving belts, pulleys or couplings.

Fundamental to the design of hermetic compressors is a method whereby electrical current is transmitted to the compressor motor through terminal conductors which pass through the compressor housing wall. These terminals are sealed in a dielectric material which insulates them from the housing and maintains the pressure tight integrity of the hermetic compressor. The terminals and their dielectric embedment are strongly constructed, but are vulnerable to careless compressor installation or maintenance procedures and equally vulnerable to internal electrical short circuits caused by excessive system contaminants.

In either of these instances, an electrical short between the terminal and the compressor housing may result in the loss of integrity between the terminal and its dielectric embedment. This loss may cause the terminals to be expelled, thereby venting the vaporous and liquid contents of the compressor housing and system.

A venting compressor terminal normally presents no danger to anyone, providing the terminal protective cover is properly in place.

If, however, the terminal protective cover is not properly in place, a venting terminal may discharge a combination of

(a) hot lubricating oil and refrigerant

(b) flammable mixture (if system is contaminated with air)

in a stream of spray which may be dangerous to anyone in the vicinity. Death or serious bodily injury could occur.

Under no circumstances is a hermetic compressor to be electrically energized and/or operated without having the terminal protective cover properly in place.

See Service Section S-17 for proper servicing.

PRODUCT IDENTIFICATION

The model number is used for positive identification of component parts used in manufacturing. Please use this number when requesting service or parts information.

D	C	C	090	045	5	D	*	*	*	A	*
1	2	3	4, 5, 6	7, 8, 9	10	11	12	13	14	15	16

Brand

D Daikin

Configuration

C Standard Efficiency

Application

C Cooling
H Heat Pump

Nominal Gross Cooling Capacity

036	3 Tons	102	8½ Tons
048	4 Tons	120	10 Tons
060	5 Tons	180	15 Tons
072	6 Tons	240	20 Tons
090	7½ Tons		

Nominal Heating Capacity

Gas/Electric		A/C H/P	Factory-Installed Electric Heat		
180	180,000 BTU/h	XXX	No Heat	030	30 kW
300	300,000 BTU/h	016	15 kW	045	44 kW
350	350,000 BTU/h				

See product specifications for heat size(s) available for each capacity.

Voltage

1	208-230/1/60 (United States)	4	460/3/60 (United States)
3	208-230/3/60 (United States)	5	400/3/50 (Russia Daikin Brand)
6	400/3/60 (Saudi Arabia)	A	400/3/50 (Russia Goodman Brand)
B	400/3/50 (Kuwait)	E	400/3/50 (Argentina)

Supply Fan/Drive Type/Motors

B Belt Drive
D Direct Drive

Factory-Installed Options

X No Options

Factory-Installed Options

X Standard Aluminized Heat Exchanger
S Stainless Steel Gas Heat Exchanger

Factory-Installed Options

X No Options

Factory-Installed Options

X No Options

Major & Minor

Revision Levels

PRODUCT IDENTIFICATION

DCH***XXX**XXX

Daikin Commercial Multiposition Package Heat Pumps	
Models	**Description**
DCH[048-060]XXX6DXXXAA	Daikin Commercial Package Heat Pump, Multiposition heat pump units, 400V 3 Phase, 60 Hz Direct Drive. Initial release of Daikin branded models.
DCH072XXX6BXXXAA	Daikin Commercial Package Heat Pump, Multiposition heat pump units, 400V 3 Phase, 60 Hz Direct Drive. Initial release of Daikin branded models.
DCH048XXX6DXXXAD DCH060XXX6DXXXAC	Daikin Commercial Package Heat Pump, Multiposition heat pump units, 400V 3 Phase, 60 Hz Direct Drive with Phase Monitor.
DCH072XXX6BXXXAC	Daikin Commercial Package Heat Pump, Multiposition heat pump units, 400V 3 Phase, 60 Hz Direct Drive with Phase Monitor.

These units have R410A refrigerant

PRODUCT IDENTIFICATION

DCC***XXX**XXX

Daikin Commercial Multiposition Package Coolers	
Models	**Description**
DCC[048-060]XXX6DXXXAA	Daikin Commercial Package Cooler, Multiposition cooling, 400V 3 Phase, 60 Hz Direct Drive. Initial release of 4-5 Ton Daikin branded models.
DCC072XXX6BXXXAA	Daikin Commercial Package Cooler, Multiposition cooling, 400V 3 Phase, 60 Hz Direct Drive. Initial release of 4-5 Ton Daikin branded models.
DCC[048-060]XXXBDXXXAA	Daikin Commercial Package Cooler, Multiposition cooling, 400V 3 Phase, 60 Hz Direct Drive. Initial release of Daikin branded models with SASO level 2 regulations.
DCC[048-060]XXX6DXXXAC	Daikin Commercial Package Cooler, Multiposition cooling, 400V 3 Phase, 50 Hz Direct Drive with Phase Monitor.
DCC072XXX6BXXXAC	Daikin Commercial Package Cooler, Multiposition cooling, 400V 3 Phase, 50 Hz Direct Drive with Phase Monitor.

These units have R410A refrigerant

PRODUCT DESIGN

UNIT LOCATION

⚠ WARNING

TO PREVENT POSSIBLE EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH, THE FOLLOWING BULLET POINTS MUST BE OBSERVED WHEN INSTALLING THE UNIT.

IMPORTANT NOTE: Remove wood shipping rails prior to installation of the unit.

ALL INSTALLATIONS:

NOTE: Appliance is shipped from factory for vertical duct application.
Proper installation of the unit ensures trouble-free operation. Improper installation can result in problems ranging from noisy operation to property or equipment damages, dangerous conditions that could result in injury or personal property damage. Give this booklet to the user and explain it's provisions. The user should retain these instructions for future reference.

- For proper flame pattern within the heat exchanger and proper condensate drainage, the unit must be mounted level.
- The flue outlet must be at least 12 inches from any opening through which flue gases could enter a building, and at least three feet above any forced air inlet located within ten feet. The economizer/manual fresh air intake/ motorized fresh air intake and combustion air inlet mounted on the unit are not affected by this restriction.
- To avoid possible corrosion of the heat exchanger, do not locate the unit in an area where the outdoor air (i.e. combustion air for the unit) will be frequently contaminated by compounds containing chlorine or fluorine. Common sources of such compounds include swimming pool chemicals and chlorine bleaches, paint stripper, adhesives, paints, varnishes, sealers, waxes (which are not yet dried) and solvents used during construction and remodeling. Various commercial and industrial processes may also be sources of chlorine/fluorine compounds.
- To avoid possible illness or death of the building occupants, do NOT locate outside air intake device (economizer, manual fresh air intake, motorized fresh air intake) too close to an exhaust outlet, gas vent termination, or plumbing vent outlet. For specific distances required, consult local codes.
- Allow minimum clearances from the enclosure for fire protection, proper operation, and service access (see unit clearances). These clearances must be permanently maintained.
- The combustion air inlet and flue outlet on the unit must never be obstructed. If used, do not allow the economizer/manual fresh air damper/ motorized fresh air damper to become blocked by snow or debris. In some climates or locations, it may be necessary to elevate the unit to avoid these problems.
- When the unit is heating, the temperature of the return air entering the unit must be a minimum of 55° F.

GROUND LEVEL INSTALLATIONS ONLY:

- When the unit is installed on the ground adjacent to the building, a level concrete (or equal) base is recommended. Prepare a base that is 3" larger than the package unit footprint and a minimum of 3" thick.
- The base should also be located where no runoff of water from higher ground can collect in the unit.

ROOF TOP INSTALLATIONS ONLY:

- To avoid possible property damage or personal injury, the roof must have sufficient structural strength to carry the weight of the unit(s) and snow or water loads as required by local codes. Consult a structural engineer to determine the weight capabilities of the roof.
- The unit may be installed directly on wood floors or on Class A, Class B, or Class C roof covering material.
- To avoid possible personal injury, a safe, flat surface for service personnel should be provided.
- As indicated on the unit data plate, a minimum clearance of 36" to any combustible material is required on the furnace access side of the unit. All combustible materials must be kept out of this area.
- This 36" clearance must also be maintained to insure proper combustion air and flue gas flow. The combustion air intake and furnace flue discharge must not be blocked for any reason, including blockage by snow.
- Adequate clearances from the furnace flue discharge to any adjacent public walkways, adjacent buildings, building openings or openable windows must be maintained in accordance with the latest edition of the National Fuel Gas Code (ANSI Z223.1)
- Minimum horizontal clearance of 48" from the furnace flue discharge to any electric meters, gas meters, regulators and relief equipment is required.

UNIT PRECAUTIONS

- Do not stand or walk on the unit.
- Do not drill holes anywhere in panels or in the base frame of the unit except where indicated. Unit access panels provide structural support.
- Do not remove any access panels until unit has been installed on roof curb or field supplied structure.
- Do not roll unit across finished roof without prior approval of owner or architect.
- Do not skid or slide on any surface as this may damage unit base. The unit must be stored on a flat, level surface. Protect the condenser coil because it is easily damaged.

PRODUCT DESIGN

ROOF CURB INSTALLATIONS ONLY:

Curb installations must comply with local codes and should be done in accordance with the established guidelines of the National Roofing Contractors Association.

Proper unit installation requires that the roof curb be firmly and permanently attached to the roof structure. Check for adequate fastening method prior to setting the unit on the curb.

Full perimeter roof curbs are available from the factory and are shipped unassembled. Field assembly, squaring, leveling and mounting on the roof structure are the responsibility of the installing contractor. All required hardware necessary for the assembly of the sheet metal curb is included in the curb accessory.

⚠ WARNING

TO PREVENT POSSIBLE EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH, THE FOLLOWING BULLET POINTS MUST BE OBSERVED WHEN INSTALLING THE UNIT.

- Sufficient structural support must be determined prior to locating and mounting the curb and package unit.
- Ductwork must be constructed using industry guidelines. The duct work must be placed into the roof curb before mounting the package unit. Our full perimeter curbs include duct connection frames to be assembled with the curb. Cantilevered type curbs are not available from the factory.
- Curb insulation, cant strips, flashing and general roofing material are furnished by the contractor.

The curbs must be supported on parallel sides by roof members. The roof members must not penetrate supply and return duct opening areas as damage to the unit might occur.

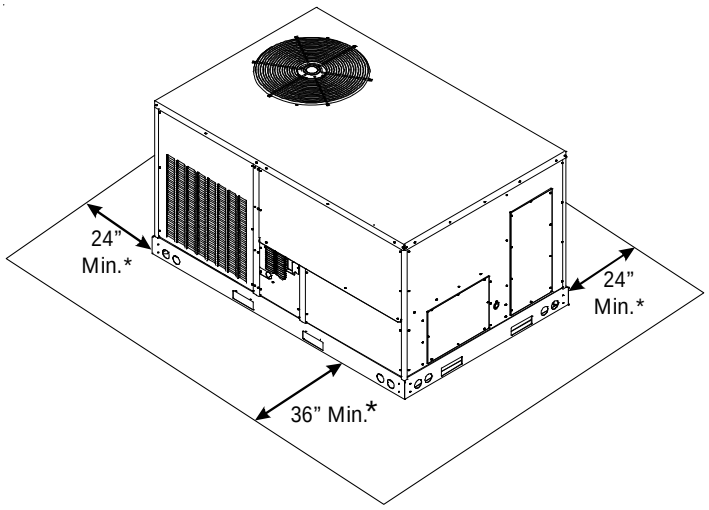
NOTE: The unit and curb accessories are designed to allow vertical duct installation before unit placement. Duct installation after unit placement is not recommended.

⚠ CAUTION

ALL CURBS LOOK SIMILAR. TO AVOID INCORRECT CURB POSITIONING, CHECK JOB PLANS CAREFULLY AND VERIFY MARKINGS ON CURB ASSEMBLY. INSTRUCTIONS MAY VARY IN CURB STYLES AND SUPERSEDES INFORMATION SHOWN.

See the manual shipped with the roof curb for assembly and installation instructions.

CLEARANCES



Unit Clearances

**In situations that have multiple units, a 48" minimum clearance is required between the condenser coils.*

Adequate clearance around the unit should be kept for safety, service, maintenance, and proper unit operation. A total clearance of 75" on the main control panel side of the unit is recommended to facilitate possible fan shaft, coil, electric heat and gas furnace removal. A clearance of 48" is recommended on all other sides of the unit to facilitate possible compressor removal, to allow service access and to insure proper ventilation and condenser airflow. The unit must not be installed beneath any obstruction. The unit should be installed remote from all building exhausts to inhibit ingestion of exhaust air into the unit fresh air intake.

PROTRUSION

Inspect curb to ensure that none of the utility services (electric) routed through the curb protrude above the curb.

ELECTRICAL WIRING

⚠ WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

PRODUCT DESIGN

⚠ WARNING

HIGH VOLTAGE!
TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DO NOT TAMPER WITH FACTORY WIRING. THE INTERNAL POWER AND CONTROL WIRING OF THESE UNITS ARE FACTORY-INSTALLED AND HAVE BEEN THOROUGHLY TESTED PRIOR TO SHIPMENT. CONTACT YOUR LOCAL REPRESENTATIVE IF ASSISTANCE IS REQUIRED.

⚠ CAUTION

TO PREVENT DAMAGE TO THE WIRING, PROTECT WIRING FROM SHARP EDGES. FOLLOW NATIONAL ELECTRICAL CODE AND ALL LOCAL CODES AND ORDINANCES. DO NOT ROUTE WIRES THROUGH REMOVABLE ACCESS PANELS.

⚠ CAUTION

CONDUIT AND FITTINGS MUST BE WEATHER-TIGHT TO PREVENT WATER ENTRY INTO THE BUILDING.

For unit protection, use a fuse or HACR circuit breaker that is in excess of the circuit ampacity, but less than or equal to the maximum overcurrent protection device. DO NOT EXCEED THE MAXIMUM OVERCURRENT DEVICE SIZE SHOWN ON UNIT DATA PLATE.

All line voltage connections must be made through weatherproof fittings. All exterior power supply and ground wiring must be in approved weatherproof conduit.

The main power supply wiring to the unit and low voltage wiring to accessory controls must be done in accordance with these instructions, the latest edition of the National Electrical Code (ANSI/NFPA 70), and all local codes and ordinances. All field wiring shall conform with the temperature limitations for Type T wire (63°F/35°C rise).

The unit is factory wired for the voltage shown on the unit's data plate. Refer to model nomenclature in Appendix B for voltage requirement for your unit.

NOTE: If supply voltage is 208V, lead on primary of transformer must be moved from the 230V to the 208V tap. Refer to wiring diagram on unit for details.

Main power wiring should be sized for the minimum wire ampacity shown on the unit's database. Size wires in accordance with the ampacity tables in Article 310 of the National Electrical Code. If long wires are required, it may be necessary to increase the wire size to prevent excessive voltage drop. Wires should be sized for a maximum of 3% voltage drop.

⚠ CAUTION

TO AVOID PROPERTY DAMAGE OR PERSONAL INJURY DUE TO FIRE, USE ONLY COPPER CONDUCTORS.

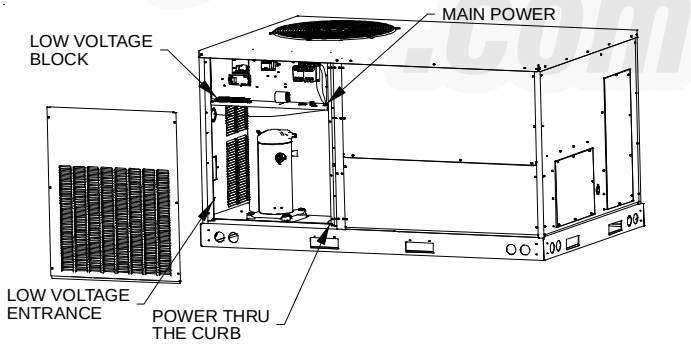
⚠ CAUTION

TO PREVENT IMPROPER AND DANGEROUS OPERATION DUE TO WIRING ERRORS, LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. VERIFY PROPER OPERATION AFTER SERVICING.

NOTE: A weather-tight disconnect switch, properly sized for the unit total load, must be field or factory installed. An external field supplied disconnect may be mounted on the exterior panel.

Ensure the data plate is not covered by the field-supplied disconnect switch.

- Some disconnect switches are not fused. Protect the power leads at the point of distribution in accordance with the unit data plate.
- The unit must be electrically grounded in accordance with local codes or, in the absence of local codes, with the latest edition of the National Electrical Code (ANSI-NFPA 70). A ground lug is provided for this purpose. Size grounding conductor in accordance with Table 250-95 of the National Electrical Code. Do not use the ground lug for connecting a neutral conductor.
- Connect power wiring to the compressor contactor closest to the entrance located within the main control box or to electrical power block, if equipped.



Power and Low Voltage Block Connections

⚠ WARNING

FAILURE OF UNIT DUE TO OPERATION ON IMPROPER LINE VOLTAGE OR WITH EXCESSIVE PHASE UNBALANCE CONSTITUTES PRODUCT ABUSE AND MAY CAUSE SEVERE DAMAGE TO THE UNIT ELECTRICAL COMPONENTS.

PRODUCT DESIGN

Areas Without Convenience Outlet

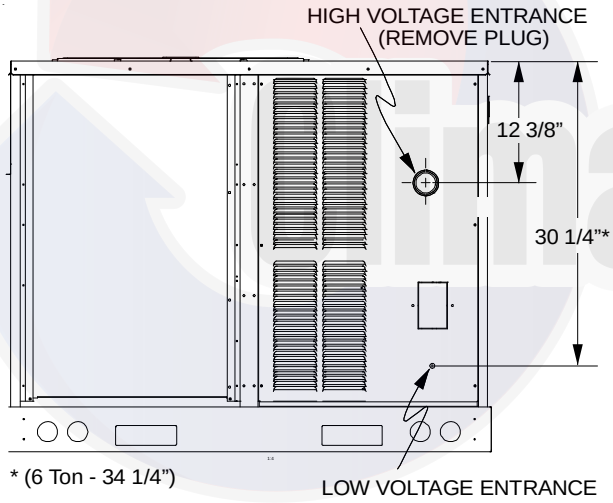
It is recommended that an independent 115V power source be brought to the vicinity of the roof top unit for portable lights and tools used by the service mechanic.

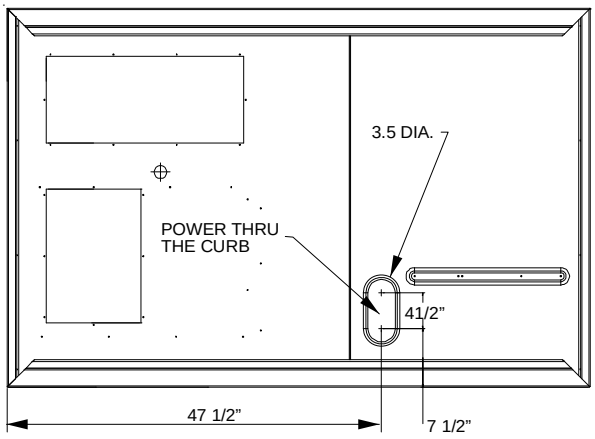
NOTE: Refer to local codes for requirements. These outlets can also be factory installed.

Units installed on Roof Tops

Main power and low voltage wiring may enter the unit through the condenser end of unit or through the roof curb. Install conduit connectors at the desired entrance locations. External connectors must be weatherproof. All holes in the unit base must be sealed (including those around conduit nuts) to prevent water leakage into building. All required conduit and fittings are to be field supplied.

Supply voltage to roof top unit must not vary by more than 10% of the value indicated on the unit data plate. Phase voltage unbalance must not exceed 2%. Contact your local power company for correction of improper voltage or phase unbalance.





Electrical Entrance and Thru Curb

Unit is equipped with a Low Voltage Terminal Block and has Single Point wiring to the contactor or power block, if equipped.

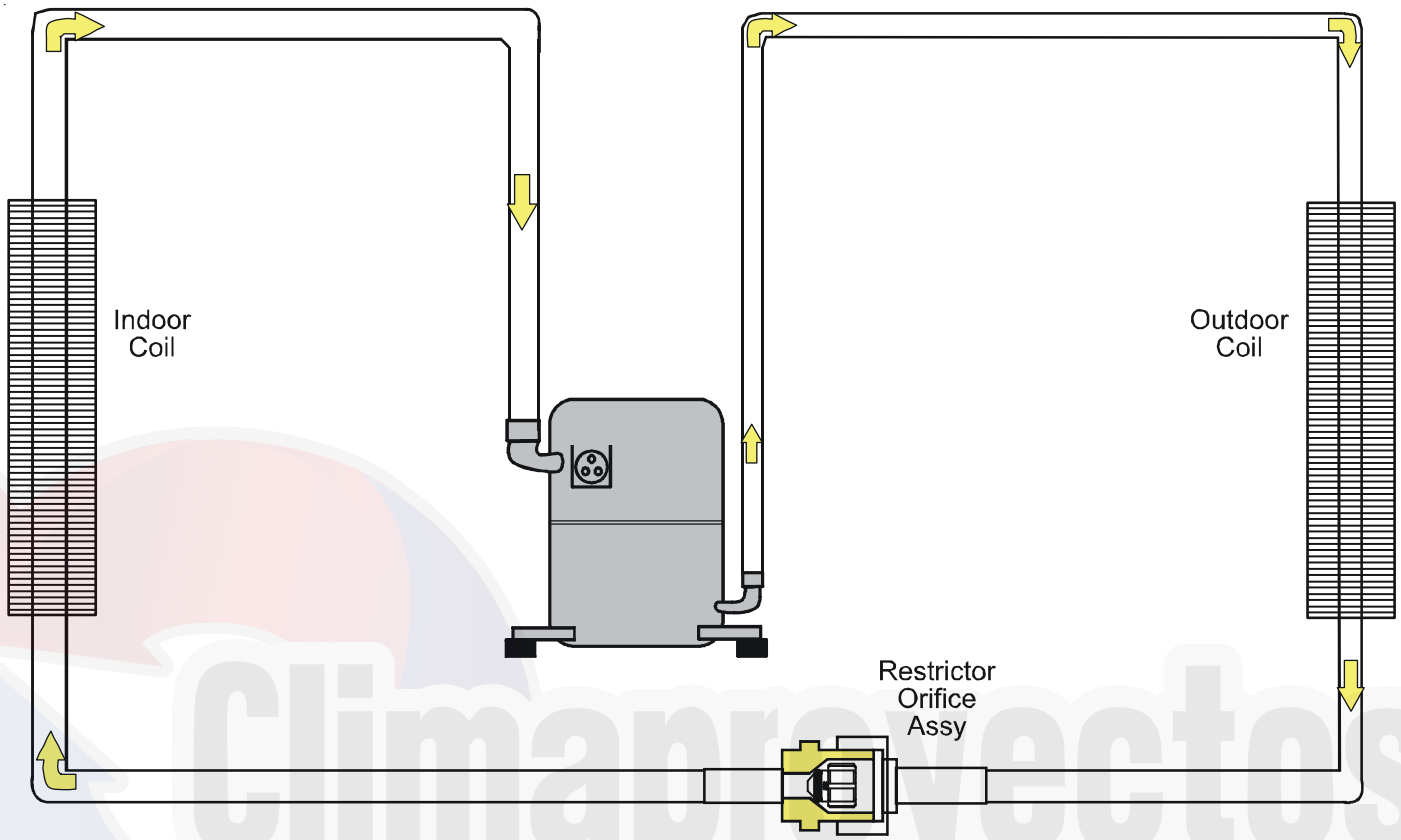
Low Voltage Control Wiring

1. A 24V thermostat must be installed for unit operation. It may be purchased with the unit or field -supplied. Thermostats may be programmable or electromechanical as required.
2. Locate thermostat or remote sensor in the conditioned space where it will sense average temperature. Do not locate the device where it may be directly exposed to supply air, sunlight or other sources of heat. Follow installation instructions packaged with the thermostat.
3. Use #18 AWG wire for 24V control wiring runs not exceeding 75 feet. Use #16 AWG wire for 24V control wiring runs not exceeding 125 feet. Use #14 AWG wire for 24V control wiring runs not exceeding 200 feet. Low voltage wiring may be National Electrical Code (NEC) Class 2 where permitted by local codes.
4. Route thermostat wires from sub-base terminals to the unit. Control wiring should enter through the condenser panel opening or through curb indicated in "Electrical Entrance" figure. Connect thermostat and any accessory wiring to low voltage terminal block TB1 in the main control box.

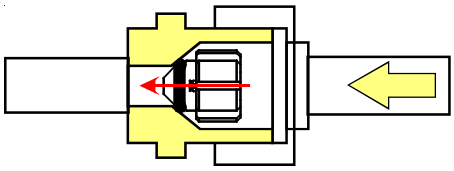
NOTE: Field-supplied conduit may need to be installed depending on unit/curb configuration. Use #18 AWG solid conductor wire whenever connecting thermostat wires to terminals on sub-base. DO NOT use larger than #18 AWG wire. A transition to #18 AWG wire may be required before entering thermostat sub-base.

NOTE: Refer to unit wiring diagrams for thermostat hookups.

Typical Package Cooling or Package Gas

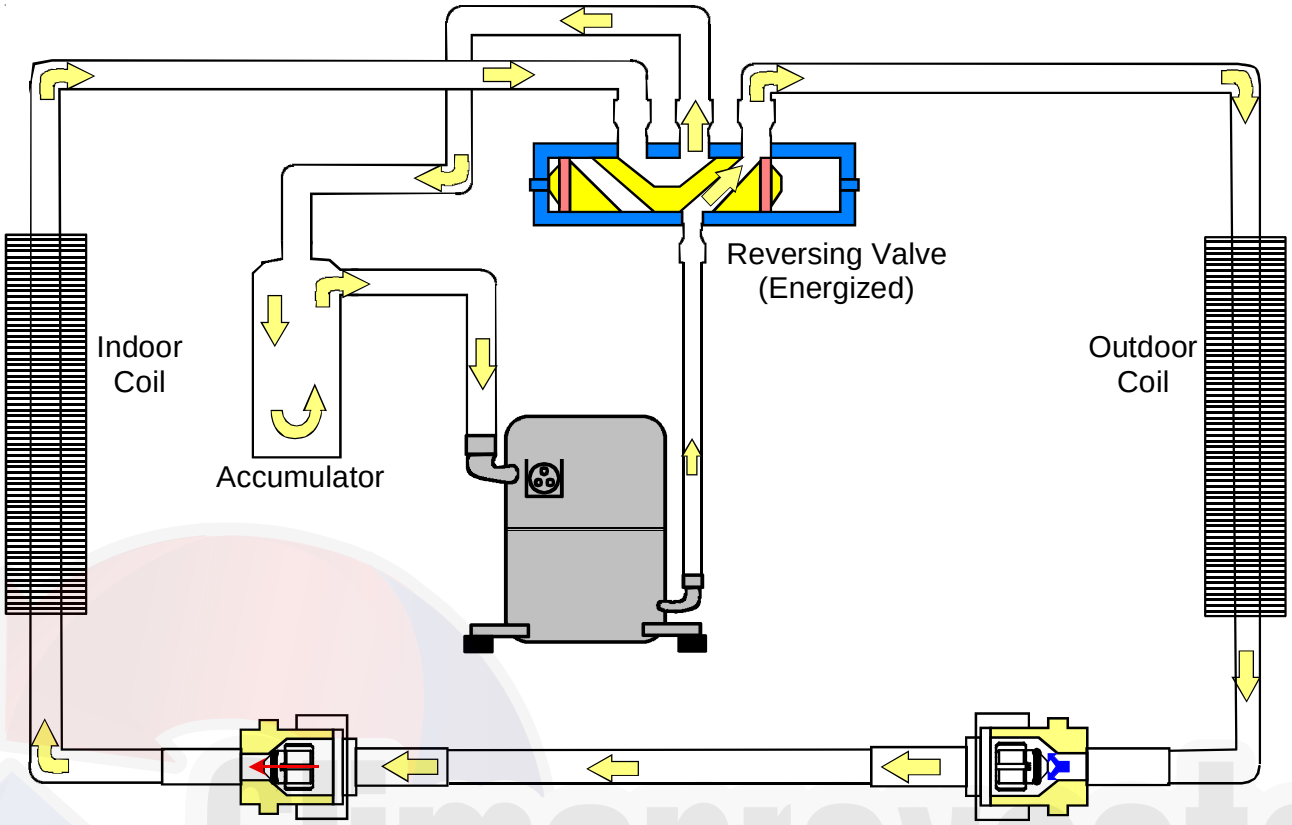


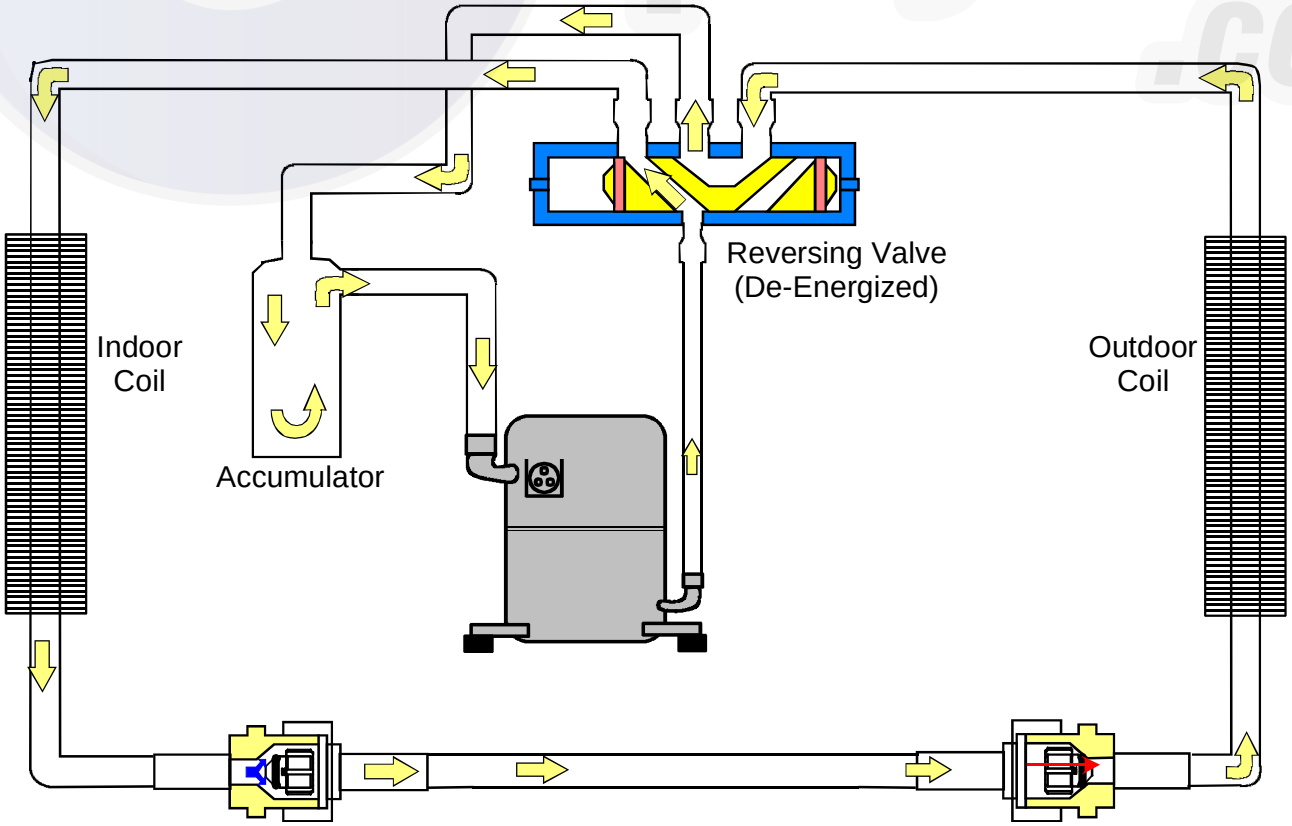
Restrictor Orifice Assembly in Cooling Operation



In the cooling mode the orifice is pushed into its seat forcing refrigerant to flow through the metered hole in the center of the orifice.

Typical Heat Pump System in Cooling





SYSTEM OPERATION

CIRCULATING AIR AND FILTERS

Ductwork

The supply duct from the unit through a wall may be installed without clearance. However, minimum unit clearances must be maintained (see "Clearances" section). The supply duct should be provided with an access panel large enough to inspect the air chamber downstream of the heat exchanger. A cover should be tightly attached to prevent air leaks.

Ductwork dimensions are shown in the roof curb installation manual.

If desired, supply and return duct connections to the unit may be made with flexible connections to reduce possible unit operating sound transmission.

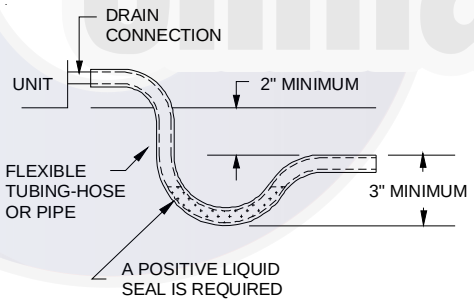
VENTING

NOTE: Venting is self-contained.

CONDENSATE DRAIN CONNECTION

Condensate Drain Connection

A 3/4" female NPT drain connection is supplied on the end of the unit and bottom of the drain pan for condensate piping. An external trap must be installed for proper condensate drainage.



Drain Connection

Install condensate drain trap as shown. Use 3/4" drain line and fittings or larger. Do not operate without trap.

Horizontal Drain

Drainage of condensate directly onto the roof may be acceptable; refer to local code. It is recommended that a small drip pad of either stone, mortar, wood or metal be provided to prevent any possible damage to the roof.

Cleaning

Due to the fact that drain pans in any air conditioning unit will have some moisture in them, algae and fungus will grow due to airborne bacteria and spores. Periodic cleaning is necessary to prevent this build-up from plugging the drain.

STARTUP, ADJUSTMENTS, AND CHECKS

⚠ WARNING

HIGH VOLTAGE!
To avoid personal injury or death due to electrical shock, bond the frame of this unit to the building electrical ground by use of the grounding terminal provided or other acceptable means. Disconnect all power before servicing or installing this unit.

⚠ CAUTION

To prevent property damage or personal injury, Do not start the unit until all necessary pre-checks and tests have been performed.

⚠ WARNING

MOVING MACHINERY HAZARD!
To prevent possible personal injury or death, disconnect power to the unit and padlock in the "OFF" position before servicng fans.

Contractor Responsibility

The installing contractor must be certain that:

- All supply and return air ductwork is in place, properly sealed, and corresponds with installation instructions.
- All thermostats are mounted and wired in accordance with installation instructions.
- All electric power, all gas, hot water or steam line connections, and the condensate drain installation have been made to each unit on the job. These main supply lines must be functional and capable of operating all units simultaneously.
- Requirements are met for venting and combustion air.
- Air filters are in place.
- Input rate and temperature rise are adjusted per rating plate.
- Return air temperature is maintained between 55°F (13°C) and 80°F (27°C).

Roof Curb Installation Check

Inspect the roof curb for correct installation. The unit and curb assembly should be level. Inspect the flashing of the roof mounting curb to the roof, especially at the corners, for good workmanship. Also check for leaks around gaskets. Note any deficiencies in a separate report and forward to the contractor.

SYSTEM OPERATION

Obstructions, Fan Clearance and Wiring

Remove any extraneous construction and shipping materials that may be found during this procedure. Rotate all fans manually to check for proper clearances and that they rotate freely. Check for bolts and screws that may have jarred loose during shipment to the job site. Retighten if necessary. Re-tighten all electrical connections.

Field Duct Connections

Verify that all duct connections are tight and that there is no air bypass between supply and return.

Filter Section Check

Remove filter section access panels and check that filters are properly installed. Note airflow arrows on filter frames.

AIR FLOW ADJUSTMENTS

When the final adjustments are complete, the current draw of the motor should be checked and compared to the full load current rating of the motor. The amperage must not exceed the service factor stamped on the motor nameplate. The total airflow must not be less than that required for operation of the electric heaters or the furnace.

If an economizer is installed, check the unit operating balance with the economizer at full outside air and at minimum outside air.

NOTE: Airflow setting below 350 CFM/Ton is not recommended, as evaporator freezing or poor unit performance is possible.

PSC Motor

Adjust the CFM for the unit by changing the speed tap of the indoor blower motor at the heat or cool tap on the control board connection with the one of the speed taps on “M1” or “M2” (Black-High Speed, Blue-Medium Speed, Red-Low Speed).

EEM Motor

Adjust the CFM for the unit by changing the position of the low voltage leads on the motor terminal block. Green is for Fan Only. Yellow is for Cooling and Heat Pump Heating.**NOTE:** If more than one lead is energized simultaneously, the motor will run at the higher speed.

Set Evaporator Fan Rpm

Actual RPM’s must be set and verified with a tachometer or strobe light. Refer to Appendices A and B for basic unit fan RPM. Refer also to “Airflow” section of this manual. With disconnect switch open, disconnect thermostat wires from terminals Y and W. This will prevent heating and mechanical cooling from coming on. Place a jumper wire across terminals R and G at TB1 terminal block. Close disconnect switch; evaporator fan motor will operate so RPM can be checked.

For gas heat units, the airflow must be adjusted so that the air temperature rise falls within the ranges given stated on Data Plate.

Evaporator Fan Rotation Check (Three Phase Models Only)

Check that fan rotates clockwise when viewed from the drive side of unit and in accordance with rotation arrow shown on blower housing. If it does not, reverse any two incoming power cables at Single Point Power Block. In this case, repeat bearing check.

Do not attempt to change load side wiring. Internal wiring assures all motors and compressors will rotate in correct direction once evaporator fan motor rotation check has been made.

Electrical Input Check

Make preliminary check of evaporator fan ampere draw and verify that motor nameplate amps are not exceeded. A final check of amp draw should be made upon completion of air balancing of the duct system.

BELT DRIVE MODELS ONLY

The drive on the supply fan is typically set in the middle of the RPM range. The drive motor sheave pitch diameter is field adjustable for the required airflow.

Upon completion of the air flow balancing, we recommend replacing the variable pitched motor sheave with a properly-sized fixed sheave. A matching fixed sheave will provide longer belt and bearing life and vibration free operation. Initially, it is best to have a variable pitched motor sheave for the purpose of airflow balancing, but once the balance has been achieved, fixed sheaves maintain alignment and minimize vibration more effectively. For direct drive units, move fan speed wire.

Bearing Check

Prior to energizing any fans, check and make sure that all setscrews are tight so that bearings are properly secured to shafts.

NORMAL SEQUENCE OF OPERATION

Cooling

Begin with power turned off at all disconnects.

1. Turn thermostat system switch to “Cool,” and fan switch to “Auto” and turn temperature setting as high as it will go.
2. Inspect all registers and set them to the normal open position.
3. Turn on the electrical supply at the disconnect.
4. Turn the fan switch to the “ON” position. The blower should operate after a 7 second delay.
5. Turn the fan switch to “Auto” position. The blower should stop after a 65 second delay.

6. Slowly lower the cooling temperature until the unit starts. The compressor, blower and fan should now be operating. Allow the unit to run 10 minutes, make sure cool air is being supplied by the unit.
7. Turn the temperature setting to the highest position, stopping the unit. The indoor blower will continue to run for 65 seconds.
8. Turn the thermostat system switch to "OFF" and disconnect all power when servicing the unit.

⚠ WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

HEAT PUMP

9. Check the cooling mode for the heat pump in the same manner as above. The reversing valve is energized when the thermostat is placed in the cooling position. A clicking sound should be noticeable from the reversing valve. By lowering the temperature setting to call for cooling, the contractor is energized. The compressor, blower and fan should then be running. After the cooling mode is checked out, turn the thermostat system switch to "OFF**".**
10. Turn the thermostat system switch to "HEAT" and fan switch to "AUTO**".**
11. Slowly raise the heating temperature setting. When the heating first stage makes contact, stop raising the temperature setting.. The compressor, blower and fan should now be running with the reversing valve in the de-energized (heating) position. After giving the unit time to settle out, make sure the unit is supplying heated air.
12. If the outdoor ambient is above 80°F, the unit may trip on its high pressure cut out when on heating. The compressor should stop. The heating cycle must be thoroughly checked, so postpone the test to another day when conditions are more suitable but-DO NOT FAIL TO TEST.

    If the outdoor ambient is low and the unit operates properly on the heating cycle, you may check the pressure cutout operation by blocking off the indoor return air until the unit trips.
13. If unit operates properly in the heating cycle, raise the temperature setting until the heating second stage makes contact. Supplemental resistance heat, if installed should now come on. Make sure it operates properly.

    NOTE: If outdoor thermostats are installed the outdoor ambient must be below the set point of these thermostats for the heaters to operate. It may be necessary to jumper these thermostats to check heater operation if outdoor ambient is mild.
14. For thermostats with emergency heat switch, return to step 11. The emergency heat switch is located at the bottom of the thermostat. Move the switch to emergency heat. The heat pump will stop, the blower will continue to run, all heaters will come on and the thermostat emergency heat light will come on.
15. If checking the unit in the wintertime, when the outdoor coil is cold enough to actuate the defrost control, observe at least one defrost cycle to make sure the unit defrosts completely.

HEAT PUMP OPERATION

COOLING CYCLE

When the heat pump is in the cooling cycle, it operates exactly as a Summer Air Conditioner unit. In this mode, all the charts and data for service that apply to summer air conditioning apply to the heat pump. Most apply on the heating cycle except that "condenser" becomes "evaporator", "evaporator" becomes "condenser", "cooling" becomes "heating".

HEATING CYCLE

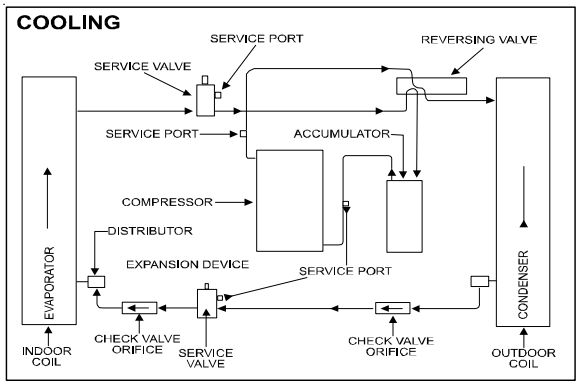
The heat pump operates in the heating cycle by redirecting refrigerant flow through the refrigerant circuit external to the compressor. This is accomplished with through the reversing valve. Hot discharge vapor from the compressor is directed to the indoor coil (evaporator on the cooling cycle) where the heat is removed, and the vapor condenses to liquid. It then goes through the expansion device to the outdoor coil (condenser on the cooling cycle) where the liquid is evaporated, and the vapor goes to the compressor.

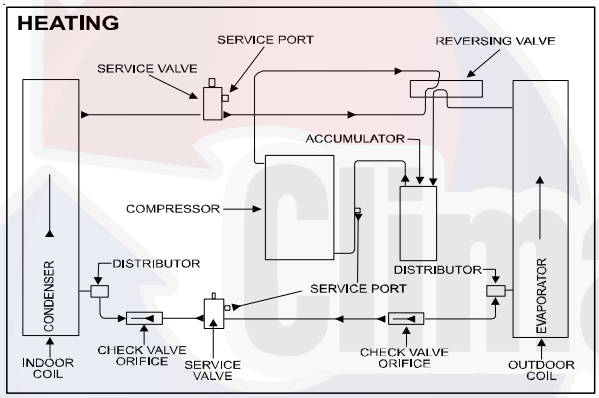
When the solenoid valve coil is operated either from heating to cooling or vice versa, the piston in the reversing valve to the low pressure (high pressure) reverse positions in the reversing valve.

The following figures show a schematic of a heat pump on the cooling cycle and the heating cycle. In addition to a reversing valve, a heat pump is equipped with an expansion device and check valve for the indoor coil, and similar equipment for the outdoor coil. It is also provided with a defrost control system.

The expansion devices are flowrator distributors and perform the same function on the heating cycle as on the cooling cycle. The flowrator distributors also act as check valves to allow for the reverse of refrigerant flow.

SYSTEM OPERATION





When the heat pump is on the heating cycle, the outdoor coil is functioning as an evaporator. The temperature of the refrigerant in the outdoor coil must be below the temperature of the outdoor air in order to extract heat from the air. Thus, the greater the difference in the outdoor temperature and the outdoor coil temperature, the greater the heating capacity of the heat pump. This phenomenon is a characteristic of a heat pump. It is a good practice to provide supplementary heat for all heat pump installations in areas where the temperature drops below 45° F. It is also a good practice to provide sufficient supplementary heat to handle the entire heating requirement should there be a component failure of the heat pump, such as a compressor, or refrigerant leak, etc.

Since the temperature of the refrigerant in the outdoor coil on the heating cycle is generally below freezing point, frost forms on the surfaces of the outdoor coil under certain weather conditions of temperature and relative humidity. Therefore, it is necessary to reverse the flow of the refrigerant to provide hot gas in the outdoor coil to melt the frost accumulation. This is accomplished by reversing the heat pump to the cooling cycle. At the same time, the outdoor fan stops to hasten the temperature rise of the outdoor coil and lessen the time required for defrosting. The indoor blower continues to run and the supplementary heaters are energized.

Defrost Control

During operation the power to the circuit board is controlled by a temperature sensor, which is clamped to a feeder tube entering the outdoor coil. Defrost timing periods of 30,60 and 90 minutes may be selected by connecting the circuit board jumper to 30, 60 and 90 respectively. Accumulation of time for the timing period selected starts when the sensor closes (approximately 31° F), and when the wall thermostat calls for heat. At the end of the timing period, the unit's defrost cycle will be initiated provided the sensor remains closed. When the sensor opens (approximately 75° F), the defrost cycle is terminated and the timing period is reset. If the defrost cycle is not terminated due to the sensor temperature, a ten minute override interrupts the unit's defrost period.

Refrigeration System Checks

Ensure the hold-down bolts on the compressor are secure and have not vibrated loose during shipment. Check that vibration grommets have been installed. Visually check all piping and clamps. The entire refrigeration system has been factory charged and tested, making it unnecessary to field charge. Factory charges are shown on the unit nameplate.

Final System Checks

1. Check to see if all supply and return air grilles are adjusted and the air distribution system is balanced for the best compromise between heating and cooling.
2. Check for air leaks in the ductwork. See Sections on **Air Flow Adjustments.**
3. Make sure the unit is free of "rattles", and the tubing in the unit is free from excessive vibration. Also make sure tubes or lines are not rubbing against each other or sheet metal surfaces or edges. If so, correct the trouble.
4. Set the thermostat at the appropriate setting for cooling and heating or automatic changeover for normal use.
5. Be sure the Owner is instructed on the unit operation, filter, servicing, correct thermostat operation, etc.

SCHEDULED MAINTENANCE

MAINTENANCE

⚠ WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

⚠ WARNING

TO PREVENT PERSONAL INJURY OR DEATH DUE TO IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE, REFER TO THIS MANUAL. FOR ADDITIONAL ASSISTANCE OR INFORMATION, CONSULT A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.

⚠ CAUTION

SHEET METAL PARTS, SCREWS, CLIPS AND SIMILAR ITEMS INHERENTLY HAVE SHARP EDGES, AND IT IS NECESSARY THAT THE INSTALLER AND SERVICE PERSONNEL EXERCISE CAUTION.

Preventive maintenance is the best way to avoid unnecessary expense and inconvenience. Have this system inspected at regular intervals by qualified service personnel, at least twice a year. Routine maintenance should cover the following items:

1. Tighten all belts, set screws, and wire connections.
2. Clean evaporator and condenser coils mechanically or with cold water, if necessary. Usually any fouling is only matted on the entering air face of the coil and can be removed by brushing.
3. Lubricate motor bearings.
4. Align or replace belts as needed.
5. Replace filters as needed (see below).
6. Check for blockage of condensate drain.
7. Check power and control voltages.
8. Check running amperage.
9. Check operating temperatures and pressures.
10. Check and adjust temperature and pressure controls.
11. Check and adjust damper linkages.
12. Check operation of all safety controls.
13. Examine gas furnaces (see below and the User's Information Manual).
14. Check condenser fans and tighten set screws.

FILTERS

⚠ CAUTION

TO PREVENT PROPERTY DAMAGE DUE TO FIRE AND LOSS OF EQUIPMENT EFFICIENCY OR EQUIPMENT DAMAGE DUE TO DUST AND LINT BUILD UP ON INTERNAL PARTS, NEVER OPERATE UNIT WITHOUT AN AIR FILTER INSTALLED IN THE RETURN AIR SYSTEM.

Every application may require a different frequency of replacement of dirty filters. Filters must be replaced at least every three (3) months during operating seasons.

Dirty filters are the most common cause of inadequate heating or cooling performance. Filter inspection should be made at least every two months; more often if necessary because of local conditions and usage.

Dirty throwaway filters should be discarded and replaced with a new, clean filter.

Disposable return air filters are supplied with this unit. See the unit Specification Sheet or the correct size and part number. To remove the filters, remove the filter access panel on return side of the unit.

CABINET FINISH MAINTENANCE

Use a fine grade automotive wax on the cabinet finish to maintain the finish's original high luster. This is especially important in installations with extended periods of direct sunlight.

CLEAN OUTSIDE COIL (QUALIFIED SERVICER ONLY)

The coil with the outside air flowing over it should be inspected annually and cleaned as frequently as necessary to keep the finned areas free of lint, hair and debris.

CONDENSER AND INDUCED DRAFT MOTORS

Bearings on the condenser fan motors and the combustion fan motor are permanently lubricated. No additional oiling is required.

LUBRICATION

The fan shaft bearings, the 1 to 2 HP supply fan motors, the condenser fan motors and compressors are permanently lubricated.

FUNCTIONAL PARTS

Refer to the unit Parts Catalog for a list of functional parts. Parts are available from your distributor.

SERVICING

COOLING ANALYSIS CHART

Complaint	No Cooling							Unsatisfactory Cooling					System Operating Pressures			Test Method Remedy	See Service Procedure Ref.
POSSIBLE CAUSE DOTS IN ANALYSIS GUIDE INDICATE "POSSIBLE CAUSE" SYMPTOM	System will not start	Compressor will not start - fan runs	Comp. and Cond. Fan will not start	Evaporator fan will not start	Condenser fan will not start	Compressor runs - goes off on overload	Compressor cycles on overload	System runs continuously - little cooling	Too cool and then too warm	Not cool enough on warm days	Certain areas too cool, others too warm	Compressor is noisy	Low suction pressure	High suction pressure	High head pressure		
Power Failure	●															Test Voltage	S-1
Blown Fuse	●		●	●												Inspect Fuse Size & Type	S-1
Unbalanced Power, 3PH		●				●	●									Test Voltage	S-1
Loose Connection	●			●		●										Inspect Connection - Tighten	S-2, S-3
Shorted or Broken Wires	●	●	●	●	●	●										Test Circuits With Ohmmeter	S-2, S-3
Open Fan Overload				●	●											Test Continuity of Overload	S-17A
Faulty Thermostat	●		●	●					●							Test Continuity of Thermostat & Wiring	S-3
Faulty Transformer	●		●													Check Control Circuit with Voltmeter	S-4
Shorted or Open Capacitor		●		●	●	●	●									Test Capacitor	S-15
Internal Compressor Overload Open		●														Test Continuity of Overload	S-17A
Shorted or Grounded Compressor		●				●										Test Motor Windings	S-17B
Compressor Stuck		●				●	●									Use Test Cord	S-17D
Faulty Compressor Contactor			●		●	●										Test Continuity of Coil & Contacts	S-7, S-8
Faulty Fan Relay				●												Test Continuity of Coil And Contacts	S-7
Open Control Circuit				●												Test Control Circuit with Voltmeter	S-4
Low Voltage		●				●	●									Test Voltage	S-1
Faulty Evap. Fan Motor				●									●			Repair or Replace	S-16
Shorted or Grounded Fan Motor					●										●	Test Motor Windings	S-16
Improper Cooling Anticipator							●		●							Check Resistance of Anticipator	S-3B
Shortage of Refrigerant							●	●					●			Test For Leaks, Add Refrigerant	S-101,103
Restricted Liquid Line							●	●					●		●	Remove Restriction, Replace Restricted Part	S-112
Dirty Air Filter								●		●	●		●			Inspect Filter-Clean or Replace	
Dirty Indoor Coil								●		●	●		●			Inspect Coil - Clean	
Insufficient air across Indoor Coil								●		●	●		●			Check Blower Speed and Rotation, Belt, Pulleys, Duct Static, Filter	S-200,205, 206, 207
Too much air across Indoor Coil														●		Reduce Blower Speed, Check Pulley Adjustment	S-205, 207
Overcharge of Refrigerant						●	●					●		●	●	Recover Part of Charge	S-113
Dirty Outdoor Coil						●	●	●		●					●	Inspect Coil - Clean	
Noncondensibles							●	●		●					●	Recover Charge, Evacuate, Recharge	S-114
Recirculation of Condensing Air							●	●		●					●	Remove Obstruction to Air Flow	
Infiltration of Outdoor Air								●		●	●					Check Windows, Doors, Vent Fans, Etc.	
Improperly Located Thermostat						●			●							Relocate Thermostat	
Air Flow Unbalanced									●		●					Readjust Air Volume Dampers	
System Undersized								●		●						Refigure Cooling Load	
Broken Internal Parts												●				Replace Compressor	S-115
Broken Valves								●				●		●		Test Compressor Efficiency	S-104
Inefficient Compressor								●						●		Test Compressor Efficiency	S-104
Expansion Device Restricted						●	●	●		●			●		●	Remove Restriction, Replace Expansion Device	111
Loose Hold-down Bolts												●				Tighten Bolts	
Flowrator Not Seating Properly								●						●		Check Flowrator & Seat or Replace Flowrator	S-111

● **Cooling Cycle**

SERVICING

Table of Contents

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

SERVICING

S-1 CHECKING VOLTAGE

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove doors, control panel cover, etc. from unit being tested.

With power ON:

WARNING

Line Voltage now present.

2. Using a voltmeter, measure the voltage across terminals L1 and L2 of the contactor for single phase units, and L3, for 3 phase units.
3. No reading - indicates open wiring, open fuse(s) no power or etc. from unit to fused disconnect service. Repair as needed.
4. With ample voltage at line voltage connectors, energize the unit.
5. Measure the voltage with the unit starting and operating, and determine the unit Locked Rotor Voltage.

   Locked Rotor Voltage is the actual voltage available at the compressor during starting, locked rotor, or a stalled condition. Measured voltage should be above minimum listed in chart below.

   To measure Locked Rotor Voltage attach a voltmeter to the run "R" and common "C" terminals of the compressor, or to the T_1 and T_2 terminals of the contactor. Start the unit and allow the compressor to run for several seconds, then shut down the unit. Immediately attempt to restart the unit while measuring the Locked Rotor Voltage.
6. Voltmeter should read within the voltage tabulation as shown. If the voltage falls below the minimum voltage, check the line wire size. Long runs of undersized wire can cause low voltage. If wire size is adequate, notify the local power company in regards to either low or high voltage.

Unit Supply Voltage		
Voltage	Min.	Max.
208/230	198	253
400	360	440
460	437	506
575	546	604

Three phase units require a balanced 3 phase power supply to operate. If the percentage of voltage imbalance exceeds 3% the unit must not be operated until the voltage condition is corrected.

$$\text{\% Voltage Imbalance} = \frac{\text{Max. Voltage Deviation From Average Voltage}}{\text{Average Voltage}} \times 100$$

To find the percentage of imbalance, measure the incoming power supply.

L1 - L2 = 240V
L1 - L3 = 232V
L2 - L3 = 238V
Total 710V

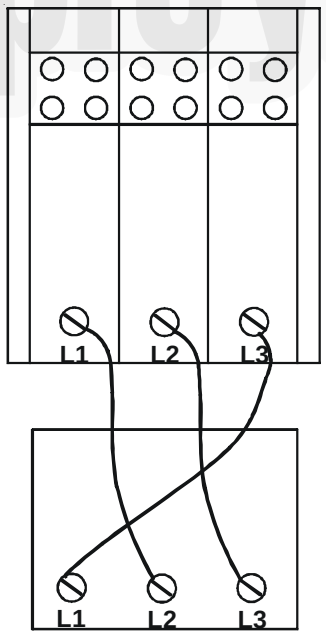
Avg. V = 710 / 3 = **236.7**

To find Max. deviation:
240 - 236.7 = +3.3
232 - 236.7 = **-4.7**
238 - 236.7 = +1.3

Max deviation was 4.7V

% Voltage Imbalance = 4.7 / 236.7 = **1.99%**

If the percentage of imbalance had exceeded 3%, it must be determined if the imbalance is in the incoming power supply or the equipment. To do this rotate the legs of the incoming power and retest voltage as shown below.



L1 - L2 = 240V
L1 - L3 = 227V
L2 - L3 = 238V

Rotate all 3 incoming legs as shown.

L1 - L2 = 227V
L1 - L3 = 238V
L2 - L3 = 240V

By the voltage readings we see that the imbalance rotated or traveled with the switching of the incoming legs. Therefore the imbalance lies within the incoming power supply.

If the imbalance had not changed then the problem would lie within the equipment. Check for current leakage, shorted motors, etc.

SERVICING

S-2 CHECKING WIRING

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Check wiring visually for signs of overheating, damaged insulation and loose connections.
2. Use an ohmmeter to check continuity of any suspected open wires.
3. If any wires must be replaced, replace with comparable gauge and insulation thickness.

S-3 CHECKING THERMOSTAT, WIRING, AND ANTICIPATOR

THERMOSTAT WIRE SIZING CHART	
LENGTH OF RUN	MIN. COPPER WIRE GAUGE (AWG)
25 feet	18
50 feet	16
75 feet	14
100 feet	14
125 feet	12
150 feet	12

S-3A THERMOSTAT AND WIRING

WARNING

Line Voltage now present.

With power ON, thermostat calling for cooling

1. Use a voltmeter to check for 24 volts at thermostat wires C and Y in the unit control panel.
2. No voltage indicates trouble in the thermostat or wiring.
3. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

Indoor Blower Motor

With power ON:

WARNING

Line Voltage now present.

1. Set fan selector switch at thermostat to "ON" position.
2. With voltmeter, check for 24 volts at wires C and G.
3. No voltage indicates the trouble is in the thermostat or wiring.
4. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

S-3B COOLING ANTICIPATOR

The cooling anticipator is a small heater (resistor) in the thermostat. During the "off" cycle, it heats the bimetal element helping the thermostat call for the next cooling cycle. This prevents the room temperature from rising too high before the system is restarted. A properly sized anticipator should maintain room temperature within 1 1/2 to 2 degree range.

The anticipator is supplied in the thermostat and is not to be replaced. If the anticipator should fail for any reason, the thermostat must be changed.

S-4 CHECKING TRANSFORMER AND CONTROL CIRCUIT

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

A step-down transformer (either 208-240, 460 or 575 volt primary to 24 volt secondary) is provided with each unit. This allows ample capacity for use with resistance heaters.

WARNING

Disconnect ALL power before servicing.

1. Remove control panel cover to gain access to transformer.

With power ON:

WARNING

Line Voltage now present.

2. Using a voltmeter, check voltage across secondary voltage side of transformer (R to C).
3. No voltage indicates faulty transformer, bad wiring, or bad splices.
4. Check transformer primary voltage at incoming line voltage connections and/or splices.

5 If line voltage available at primary voltage side of transformer and wiring and splices good, transformer is inoperative. Replace.

SERVICING

S-7 CHECKING CONTACTOR AND/OR RELAYS

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

The compressor contactor and other relay holding coils are wired into the low or line voltage circuits. When the control circuit is energized, the coil pulls in the normally open contacts or opens the normally closed contacts. When the coil is de-energized, springs return the contacts to their normal position.

NOTE*: Most single phase contactors break only one side of the line (L1), leaving 115 volts to ground present at most internal components.*

1. Remove the leads from the holding coil.
2. Using an ohmmeter, test across the coil terminals.

If the coil does not test continuous, replace the relay or contactor.

S-8 CHECKING CONTACTOR CONTACTS

SINGLE PHASE

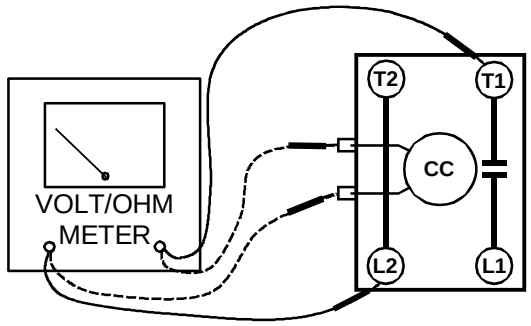
WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Disconnect the wire leads from the terminal (T) side of the contactor.
2. With power ON, energize the contactor.

WARNING

Line Voltage now present.



TESTING COMPRESSOR CONTACTOR (Single Phase)

3. Using a voltmeter, test across terminals.
   A. L1 - L2 - No voltage. Check breaker or fuses on main power supply.
   B. L2 - T1 - No voltage indicates CC1 contacts open.

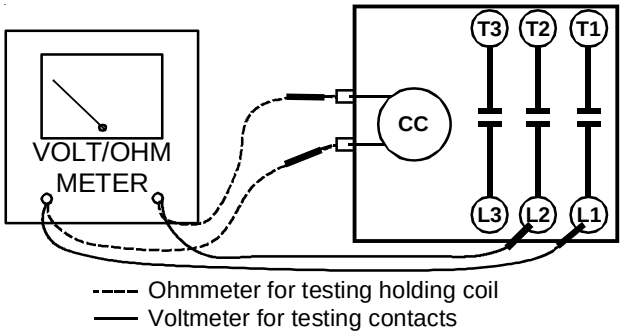
If a no voltage reading is obtained - replace the contactor.

THREE PHASE

Using a voltmeter, test across terminals.

A. L1-L2, L1-L3, and L2-L3 - If voltage is present, proceed to B. If voltage is not present, check breaker or fuses on main power supply..

B. T1-T2, T1-T3, and T2-T3 - If voltage readings are not the same as in "A", replace contactor.



TESTING COMPRESSOR CONTACTOR (ThreePhase)

SERVICING

S-9 CHECKING FAN RELAY CONTACTS

DCG:

The fan relays are incorporated into the control board. See section S-313 for checking control board for single phase gas models.

For 3 phase and belt drive models, the procedure for testing the fan relay contacts will be the same as checking the compressor contactor contacts (See section S-8).

DCC/DCH:
The **E**lectronic **B**lower **T**ime **D**elay **R**elay is used on PSC and belt driven models.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

Checking EBTDR High Voltage Contacts

1. With power off, remove wires from terminals NC, COM, and NO.
2. Using a VOM, check for resistance from NO to COM. Should read open. Next, check for resistance from NC to COM. Should read closed.
3. If not as above, replace EBTDR.

Checking EBTDR Contact Operation

With power on:

WARNING

Line Voltage now present.

1. Set the thermostat to the fan "on" position.
2. Check for 24 volts at the C and G terminals of the EBTDR.
3. If no voltage present, check fan circuit from thermostat. If 24 volts present, proceed to step 4.
4. Using a VOM, check for line voltage from the purple wire at the transformer (terminal 3 on 240 volt units, terminal 2 on 208 volt units) to terminal NO on the EBTDR. Should read line voltage. If no voltage present, check line voltage wiring in unit. If line voltage present, proceed to step 5.
5. Using a VOM, check for line voltage from the purple wire at the transformer (terminal 3 on 240 volt units, terminal 2 on 208 volt units) to the COM terminal on the EBTDR. Should read line voltage. If not as above, replace EBTDR.

PSC equipped, single phase model coolers and heat pumps have an isolation relay with a 240 volt holding coil in addition to the EBTDR.

WARNING

Disconnect ALL power before servicing.

Turn power off.

Testing relay holding coil

1. Remove the leads from the holding coil terminals 1 and 3.
2. Using an ohmmeter, test across the coil terminals 1 and 3. If the coil does not test continuous, replace the relay.

Testing relay contacts

WARNING

Disconnect ALL power before servicing.

Turn power off.

1. Using a VOM, test resistance across relay terminals 2 and 4. Should read open.
2. Turn power on.

WARNING

Line Voltage now present.

3. Apply 240 volts to coil terminals 1 and 3.
4. Using a VOM, check for 240 volts from terminals 3 and 1 of relay. Should read 240 volts. If voltage present, proceed to step 5.
5. Using a VOM, check for 240 volts from L1 at contactor to terminal 4 of relay. Should read 240 volts. Next check from L1 at contactor to terminal 2 of relay. Should read 240 volts.

If not as above, replace relay.

On the 5 ton units with the EEM motor, a standard fan relay is used.

WARNING

Disconnect ALL power before servicing.

Turn power off.

SERVICING

Testing relay holding coil

1. Remove the leads from the holding coil.
2. Using an ohmmeter, test across the coil terminals 1 and 3. If the coil does not test continuous, replace the relay.

Testing relay contacts

WARNING

Disconnect ALL power before servicing.

Turn power off.

1. Using a VOM, test resistance across relay terminals 2 and 4. Should read open.
2. Turn power on.

WARNING

Line Voltage now present.

3. Apply 24 volts to coil terminals 1 and 3.
4. Using a VOM, check for 24 volts from terminals 3 and 2 of relay. Should read 24 volts. If no voltage, check low voltage wiring from transformer to relay. If voltage present, proceed to step 5.
5. Using a VOM, check for 24 volts from terminals 3 and 4 of relay. Should read 24 volts.

If not as above, replace relay.

S-11 CHECKING LOSS OF CHARGE PROTECTOR

(Heat Pump Models)

The loss of charge protector senses the pressure in the liquid line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 22 PSIG. It will automatically cut-in (close) at approximately 50 PSIG.

Test for continuity using a VOM and if not as above, replace the control.

S-12 CHECKING HIGH PRESSURE CONTROL

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

The high pressure control senses the pressure in the discharge line. If abnormally high discharge pressures develop, the contacts of the control open, breaking the control circuit before the compressor motor overloads. This control is automatically reset.

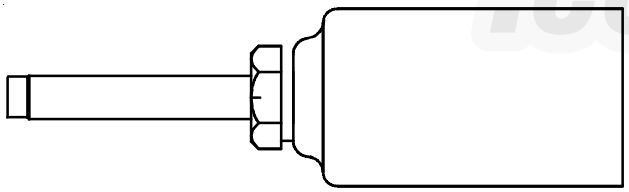
1. Using an ohmmeter, check across terminals of high pressure control, with wire removed. If not continuous, the contacts are open.
3. Attach a gauge to the access fitting on the liquid line.

With power ON:

WARNING

Line Voltage now present.

4. Start the system and place a piece of cardboard in front of the condenser coil, raising the condensing pressure.
5. Check pressure at which the high pressure control cuts-out.



If it cuts-out at 660 PSIG ± 10 PSIG, it is operating normally (See causes for high head pressure in Service Problem Analysis Guide). If it cuts out below this pressure range, replace the control. The control should reset at 420 PSIG ± 25 PSIG.

SERVICING

S-13 CHECKING LOW PRESSURE CONTROL

The low pressure control senses the pressure in the suction line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 22 PSIG ± 7 PSIG. It will automatically cut-in (close) at approximately 50 PSIG ± 7 PSIG.

Test for continuity using a VOM and if not as above, replace the control.

S-15 CHECKING CAPACITOR

CAPACITOR, RUN

A run capacitor is wired across the auxiliary and main windings of a single phase permanent split capacitor motor. The capacitors primary function is to reduce the line current while greatly improving the torque characteristics of a motor. This is accomplished by using the 90° phase relationship between the capacitor current and voltage in conjunction with the motor windings so that the motor will give two phase operation when connected to a single phase circuit. The capacitor also reduces the line current to the motor by improving the power factor.

CAPACITOR, START

SCROLL COMPRESSOR MODELS

Hard start components are not required on Scroll compressor equipped units due to a non-replaceable check valve located in the discharge line of the compressor. However hard start kits are available and may improve low voltage starting characteristics.

This check valve closes off high side pressure to the compressor after shut down allowing equalization through the scroll flanks. Equalization requires only about one or two seconds during which time the compressor may turn backwards.

Your unit comes with a 180-second anti-short cycle to prevent the compressor from starting and running backwards.

MODELS EQUIPPED WITH A HARD START DEVICE

A start capacitor is wired in parallel with the run capacitor to increase the starting torque. The start capacitor is of the electrolytic type, rather than metallized polypropylene as used in the run capacitor.

A switching device must be wired in series with the capacitor to remove it from the electrical circuit after the compressor starts to run. Not removing the start capacitor will overheat the capacitor and burn out the compressor windings.

These capacitors have a 15,000 ohm, 2 watt resistor wired across its terminals. The object of the resistor is to discharge the capacitor under certain operating conditions, rather than having it discharge across the closing of the contacts within the switching device such as the Start Relay, and to reduce the chance of shock to the servicer. See the Servicing Section for specific information concerning capacitors.

RELAY, START

A potential or voltage type relay is used to take the start capacitor out of the circuit once the motor comes up to speed. This type of relay is position sensitive. The normally closed contacts are wired in series with the start capacitor and the relay holding coil is wired parallel with the start winding. As the motor starts and comes up to speed, the increase in voltage across the start winding will energize the start relay holding coil and open the contacts to the start capacitor.

Two quick ways to test a capacitor are a resistance and a capacitance check.

S-15A RESISTANCE CHECK

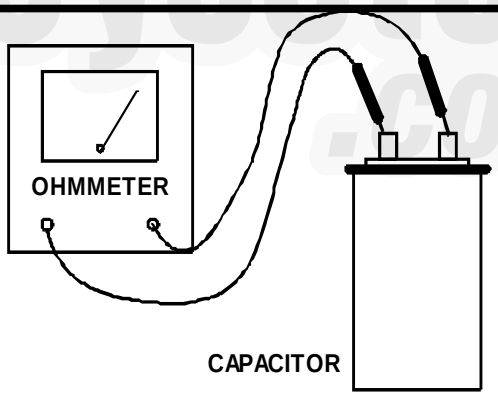
⚠ WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Discharge capacitor and remove wire leads.

⚠ WARNING

Discharge capacitor through a 20 to 30 OHM resistor before handling.



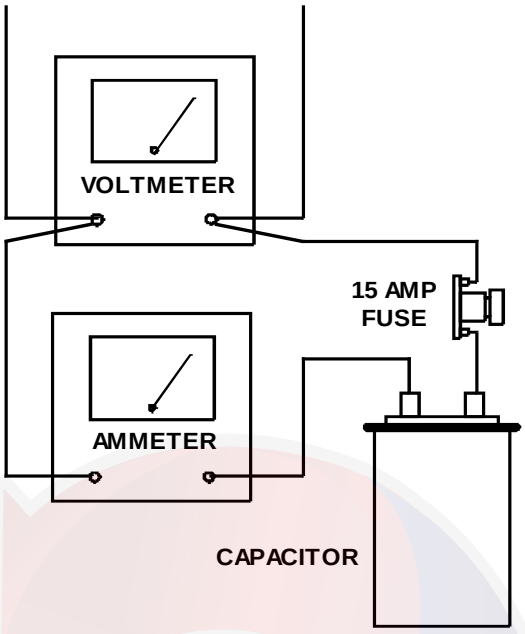
TESTING CAPACITOR RESISTANCE

2. Set an ohmmeter on its highest ohm scale and connect the leads to the capacitor -
   a. Good Condition - indicator swings to zero and slowly returns to infinity. (Start capacitor with bleed resistor will not return to infinity. It will still read the resistance of the resistor).
   b. Shorted - indicator swings to zero and stops there -replace.
   c. Open - no reading - replace. (Start capacitor would read resistor resistance.)

SERVICING

S-15B CAPACITANCE CHECK

Using a hookup as shown below, take the amperage and voltage readings and use them in the formula:



TESTING CAPACITANCE

WARNING

Discharge capacitor through a 20 to 30 OHM resistor before handling.

Capacitance (MFD) = $\frac{2650 \times \text{Amperage}}{\text{Voltage}}$

S-16 CHECKING MOTORS

S-16A CHECKING FAN AND BLOWER MOTOR WINDINGS (PSC MOTORS)

Applies only to units with PSC Motors

The auto reset fan motor overload is designed to protect the motor against high temperature and high amperage conditions by breaking the common circuit within the motor, similar to the compressor internal overload. However, heat generated within the motor is faster to dissipate than the compressor, allow at least 45 minutes for the overload to reset, then retest.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove the motor leads from its respective connection points and capacitor (if applicable).
2. Check the continuity between each of the motor leads.
3. Touch one probe of the ohmmeter to the motor frame (ground) and the other probe in turn to each lead.

If the windings do not test continuous or a reading is obtained from lead to ground, replace the motor.

S-16D CHECKING EEM (ENERGY EFFICIENT MOTOR) MOTORS

Applies only to units with EEM Motors

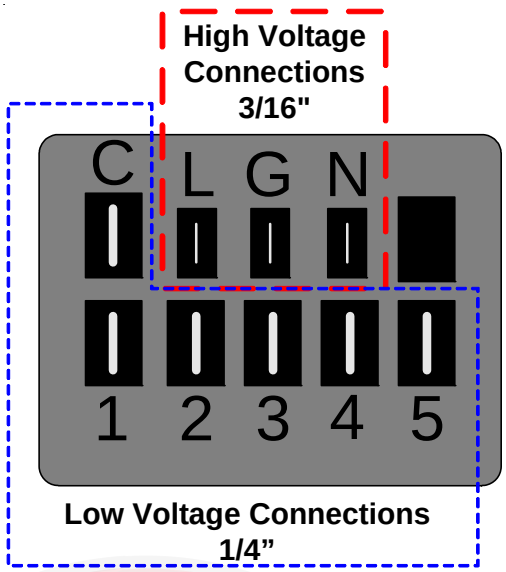
The EEM Motor is a one piece, fully encapsulated, 3 phase brushless DC (single phase AC input) motor with ball bearing construction. Unlike the ECM 2.3/2.5 motors, the EEM features an integral control module.

Note: The GE TECMate will not currently operate the GE EEM motor.

1. Using a voltmeter, check for 230 volts to the motor connections L and N. If 230 volts is present, proceed to step 2. If 230 volts is not present, check the line voltage circuit to the motor.
2. Using a voltmeter, check for 24 volts from terminal C to either terminal 1, 2, 3, 4, or 5, depending on which tap is being used, at the motor. If voltage present, proceed to step 3. If no voltage, check 24 volt circuit to motor.
3. If voltage was present in steps 1 and 2, the motor has failed and will need to be replaced.

Note: When replacing motor, ensure the belly band is between the vents on the motor and the wiring has the proper drip loop to prevent condensate from entering the motor.

SERVICING



EEM MOTOR CONNECTIONS

S-17 CHECKING COMPRESSOR WINDINGS

WARNING

Hermetic compressor electrical terminal venting can be dangerous. When insulating material which supports a hermetic compressor or electrical terminal suddenly disintegrates due to physical abuse or as a result of an electrical short between the terminal and the compressor housing, the terminal may be expelled, venting the vapor and liquid contents of the compressor housing and system.

If the compressor terminal PROTECTIVE COVER and gasket (if required) are not properly in place and secured, there is a remote possibility if a terminal vents, that the vaporous and liquid discharge can be ignited, spouting flames several feet, causing potentially severe or fatal injury to anyone in its path.

This discharge can be ignited external to the compressor if the terminal cover is not properly in place and if the discharge impinges on a sufficient heat source.

Ignition of the discharge can also occur at the venting terminal or inside the compressor, if there is sufficient contaminant air present in the system and an electrical arc occurs as the terminal vents.

Ignition cannot occur at the venting terminal without the presence of contaminant air, and cannot occur externally from the venting terminal without the presence of an external ignition source.

Therefore, proper evacuation of a hermetic system is essential at the time of manufacture and during servicing.

To reduce the possibility of external ignition, all open flame, electrical power, and other heat sources should be extinguished or turned off prior to servicing a system.

S-17A RESISTANCE TEST

Each compressor is equipped with an internal overload.

The line break internal overload senses both motor amperage and winding temperature. High motor temperature or amperage heats the disc causing it to open, breaking the common circuit within the compressor on single phase units.

Heat generated within the compressor shell, usually due to recycling of the motor, high amperage or insufficient gas to cool the motor, is slow to dissipate. Allow at least three to four hours for it to cool and reset, then retest.

WARNING

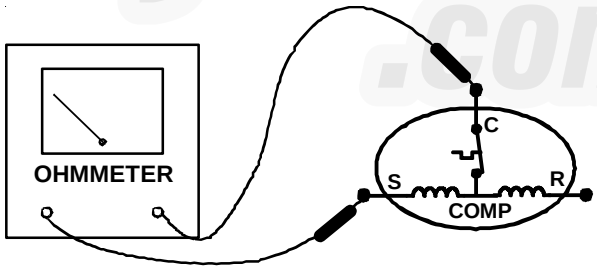
HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove the leads from the compressor terminals.

WARNING

See warnings S-17 before removing compressor terminal cover.

2. Using an ohmmeter, test continuity between terminals S-R, C-R, and C-S, on single phase units or terminals T1, T2 and T3, on 3 phase units.



TESTING COMPRESSOR WINDINGS

If either winding does not test continuous, replace the compressor.

NOTE: If an open compressor is indicated, allow ample time for the internal overload to reset before replacing compressor.

S-17B GROUND TEST

If fuse, circuit breaker, ground fault protective device, etc., has tripped, this is a strong indication that an electrical problem exists and must be found and corrected. The circuit protective device rating must be checked, and its maximum rating should coincide with that marked on the equipment nameplate.

SERVICING

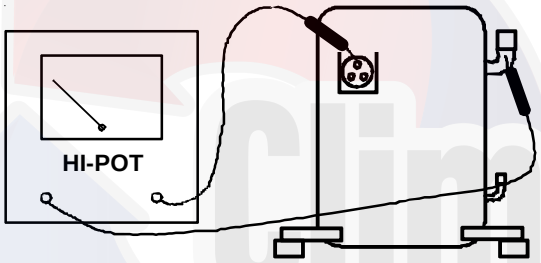
With the terminal protective cover in place, it is acceptable to replace the fuse or reset the circuit breaker ONE TIME ONLY to see if it was just a nuisance opening. If it opens again, DO NOT continue to reset.

WARNING

Disconnect ALL power before servicing.

Disconnect all power to unit, making sure that **all** power legs are open.

1. DO NOT remove protective terminal cover. Disconnect the three leads going to the compressor terminals at the nearest point to the compressor.
2. Identify the leads and using a Megger, Hi-Potential Ground Tester, or other suitable instrument which puts out a voltage between 300 and 1500 volts, check for a ground separately between each of the three leads and ground (such as an unpainted tube on the compressor). Do not use a low voltage output instrument such as a volt-ohmmeter.



COMPRESSOR GROUND TEST

3. If a ground is indicated, then carefully remove the compressor terminal protective cover and inspect for loose leads or insulation breaks in the lead wires.
4. If no visual problems indicated, carefully remove the leads at the compressor terminals.

WARNING

Damage can occur to the glass embedded terminals if the leads are not properly removed. This can result in terminal and hot oil discharging.

Carefully retest for ground, directly between compressor terminals and ground.

5. If ground is indicated, replace the compressor.

S-17D OPERATION TEST

If the voltage, capacitor, overload and motor winding test fail to show the cause for failure:

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove unit wiring from disconnect switch and wire a test cord to the disconnect switch.

NOTE: The wire size of the test cord must equal the line wire size and the fuse must be of the proper size and type.

2. With the protective terminal cover in place, use the three leads to the compressor terminals that were disconnected at the nearest point to the compressor and connect the common, start and run clips to the respective leads.
3. Connect good capacitors of the right MFD and voltage rating into the circuit as shown.
4. With power ON, close the switch.

WARNING

Line Voltage now present.

A. If the compressor starts and continues to run, the cause for failure is somewhere else in the system.

B. If the compressor fails to start - replace.

S-18 TESTING CRANKCASE HEATER (OPTIONAL ITEM)

Note: Not all compressors use crankcase heaters.
The crankcase heater must be energized a minimum of twenty-four (24) hours before the compressor is operated.

Crankcase heaters are used to prevent migration or accumulation of refrigerant in the compressor crankcase during the off cycles and prevents liquid slugging or oil pumping on start up. On some models, the crankcase heater is controlled by a crankcase heater thermostat that is wired in series with the crankcase heater.

A crankcase heater will not prevent compressor damage due to a floodback or over charge condition.

WARNING

Disconnect ALL power before servicing.

1. Disconnect the heater lead in wires.
2. Using an ohmmeter, check heater continuity - should test continuous. If not, replace.

SERVICING

S-18A CHECKING CRANKCASE HEATER THERMOSTAT

Note: Not all models with crankcase heaters will have a crankcase heater thermostat.

1. Install a thermocouple type temperature test lead on the discharge line adjacent to the crankcase heater thermostat.
2. Check the temperature at which the control closes its contacts by lowering the temperature of the control. The crankcase heater thermostat should close at 67°F ± 5°F.
3. Check the temperature at which the control opens its contacts by raising the temperature of the control. The crankcase heater thermostat should open at 85°F ± 5°F.
4. If not as above, replace control.

S-21 CHECKING REVERSING VALVE AND SOLENOID

Occasionally the reversing valve may stick in the heating or cooling position or in the mid-position.

When stuck in the mid-position, part of the discharge gas from the compressor is directed back to the suction side, resulting in excessively high suction pressure. An increase in the suction line temperature through the reversing valve can also be measured. Check operation of the valve by starting the system and switching the operation from COOLING to HEATING cycle.

If the valve fails to change its position, test the voltage (24V) at the valve coil terminals, while the system is on the COOLING cycle.

If no voltage is registered at the coil terminals, check the operation of the thermostat and the continuity of the connecting wiring from the "O" terminal of the thermostat to the unit.

If voltage is registered at the coil, tap the valve body lightly while switching the system from HEATING to COOLING, etc. If this fails to cause the valve to switch positions, remove the coil connector cap and test the continuity of the reversing valve solenoid coil. If the coil does not test continuous - replace it.

If the coil test continuous and 24 volts is present at the coil terminals, the valve is inoperative - replace it.

S-24 TESTING DEFROST CONTROL

To check the defrost control for proper sequencing, proceed as follows: With power ON; unit not running.

1. Jumper defrost thermostat by placing a jumper wire across the terminals "DFT" and "R" at defrost control board.
2. Connect jumper across test pins on defrost control board.
3. Set thermostat to call for heating. System should go into defrost within 21 seconds.
4. Immediately remove jumper from test pins.
5. Using VOM check for voltage across terminals "C & O". Meter should read 24 volts.
6. Using VOM check for voltage across fan terminals DF1 and DF2 on the board. You should read line voltage (208-230 VAC) indicating the relay is open in the defrost mode.
7. Using VOM check for voltage across "W2 & C" terminals on the board. You should read 24 volts.
8. If not as above, replace control board.
9. Set thermostat to off position and disconnect power before removing any jumpers or wires.

NOTE: Remove jumper across defrost thermostat before returning system to service.

S-25 TESTING DEFROST THERMOSTAT

1. Install a thermocouple type temperature test lead on the tube adjacent to the defrost control. Insulate the lead point of contact.
2. Check the temperature at which the control closes its contacts by lowering the temperature of the control. On 2 and 2.5 ton units, it should close at 34°F ± 5°F. On 3 thru 5 ton units, it should close at 31°F ± 3°F.
3. Check the temperature at which the control opens its contacts by raising the temperature of the control. On 2 and 2.5 ton units, it should open at 60°F ± 5°F. On 3 thru 5 ton units, it should open at 75°F ± 6°F.
4. If not as above, replace control.

TROUBLESHOOTING

THE FOLLOWING INFORMATION IS FOR USE BY QUALIFIED SERVICE AGENCY ONLY: OTHERS SHOULD NOT ATTEMPT TO SERVICE THIS EQUIPMENT.

Common Causes of Unsatisfactory Operation of Heat Pump on the Heating Cycle.

Inadequate Air Volume Through Indoor Coil

When a heat pump is in the heating cycle, the indoor coil is functioning as a condenser. The return air filter must always be clean, and sufficient air volume must pass through the indoor coil to prevent excessive discharge pressure, and high pressure cut out.

Outside Air into Return Duct

Do not introduce cold outside air into the return duct of a heat pump installation. For units with 2-speed motors, do not allow air entering the indoor coil to drop below 65° F. Air below this temperature will cause low discharge pressure, thus low suction pressure, and excessive defrost cycling resulting in low heating output. It may also cause false defrosting.

SERVICING

UNDERCHARGE

An undercharged heat pump on the heating cycle will cause low discharge pressure resulting in low suction pressure and frost accumulation on the outdoor coil.

POOR "TERMINATING" SENSOR CONTACT

The unit's defrost terminating sensor must make good thermal contact with the outdoor coil tubing. Poor contact may not terminate the unit's defrost cycle quickly enough to prevent the unit from cutting out on high discharge pressure.

MALFUNCTIONING REVERSING VALVE - THIS MAY BE DUE TO:

1. **Solenoid not energized** - In order to determine if the solenoid is energized, touch the nut that holds the solenoid cover in place with a screwdriver. If the nut magnetically holds the screwdriver, the solenoid is energized and the unit is in the cooling cycle.
2. **No voltage at unit's solenoid** - Check unit voltage. If no voltage, check wiring circuit.
3. **Valve will not shift**:
   - **a. Undercharged** - check for leaks;
   - **b. Valve Body Damaged** - Replace valve;
   - **c. Unit Properly Charged** - If it is on the heating cycle, raise the discharge pressure by restricting airflow through the indoor coil. If the valve does not shift, tap it **lightly** on both ends with a screwdriver handle. **DO NOT TAP THE VALVE BODY**. If the unit is on the cooling cycle, raise the discharge pressure by restricting airflow through the outdoor coil. If the valve does not shift after the above attempts, cut the unit off and wait until the discharge and suction pressure equalize, and repeat above steps. If the valve does not shift, replace it.

S-50 CHECKING HEATER LIMIT CONTROL(S)

(OPTIONAL ELECTRIC HEATERS)

Each individual heater element is protected with an automatic rest limit control connected in series with each element to prevent overheating of components in case of low airflow. This limit control will open its circuit at approximately 150°F. to 160°F and close at approximately 110°F.

WARNING

Disconnect ALL power before servicing.

1. Remove the wiring from the control terminals.
2. Using an ohmmeter test for continuity across the normally closed contacts. No reading indicates the control is open - replace if necessary. Make sure the limits are cool before testing.

IF FOUND OPEN - REPLACE - DO NOT WIRE AROUND.

S-100 REFRIGERATION REPAIR PRACTICE

DANGER

Always remove the refrigerant charge in a proper manner before applying heat to the system.

When repairing the refrigeration system:

WARNING

Disconnect ALL power before servicing.

1. Never open a system that is under vacuum. Air and moisture will be drawn in.
2. Plug or cap all openings.
3. Remove all burrs and clean the brazing surfaces of the tubing with sand cloth or paper. Brazing materials do not flow well on oxidized or oily surfaces.
4. Clean the inside of all new tubing to remove oils and pipe chips.
5. When brazing, sweep the tubing with dry nitrogen to prevent the formation of oxides on the inside surfaces.
6. Complete any repair by replacing the liquid line drier in the system, evacuate and charge.

BRAZING MATERIALS

Copper to Copper Joints - Sil-Fos used without flux (alloy of 15% silver, 80% copper, and 5% phosphorous). Recommended heat 1400°F.

Copper to Steel Joints - Silver Solder used without a flux (alloy of 30% silver, 38% copper, 32% zinc). Recommended heat - 1200°F.

S-101 LEAK TESTING

(NITROGEN OR NITROGEN-TRACED)

WARNING

To avoid the risk of fire or explosion, never use oxygen, high pressure air or flammable gases for leak testing of a refrigeration system.

SERVICING

WARNING

To avoid possible explosion, the line from the nitrogen cylinder must include a pressure regulator and a pressure relief valve. The pressure relief valve must be set to open at no more than 150 psig.

Pressure test the system using dry nitrogen and soapy water to locate leaks. If you wish to use a leak detector, charge the system to 10 psi using the appropriate refrigerant then use nitrogen to finish charging the system to working pressure, then apply the detector to suspect areas. If leaks are found, repair them. After repair, repeat the pressure test. If no leaks exist, proceed to system evacuation.

S-102 EVACUATION

WARNING

REFRIGERANT UNDER PRESSURE!
Failure to follow proper procedures may cause property damage, personal injury or death.

This is the most important part of the entire service procedure. The life and efficiency of the equipment is dependent upon the thoroughness exercised by the serviceman when evacuating air (non-condensables) and moisture from the system.

Air in a system causes high condensing temperature and pressure, resulting in increased power input and reduced performance.

Moisture chemically reacts with the refrigerant oil to form corrosive acids. These acids attack motor windings and parts, causing breakdown.

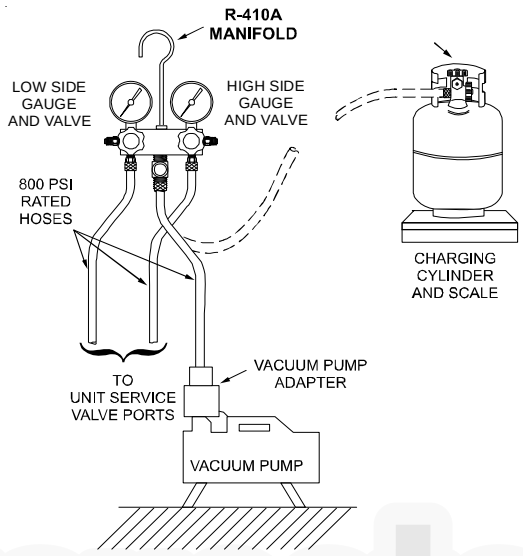
The equipment required to thoroughly evacuate the system is a high vacuum pump, capable of producing a vacuum equivalent to 25 microns absolute and a thermocouple vacuum gauge to give a true reading of the vacuum in the system

NOTE: Never use the system compressor as a vacuum pump or run when under a high vacuum. Motor damage could occur.

WARNING

Do not front seat the service valve(s) with the compressor open, with the suction line of the comprssor closed or severely restricted.

1. Connect the vacuum pump, vacuum tight manifold set with high vacuum hoses, thermocouple vacuum gauge and charging cylinder as shown.
2. Start the vacuum pump and open the shut off valve to the high vacuum gauge manifold only. After the compound gauge (low side) has dropped to approximately 29 inches of vacuum, open the valve to the vacuum thermocouple gauge. See that the vacuum pump will blank-off to a maximum of 25 microns. A high vacuum pump can only produce a good vacuum if its oil is non-contaminated.



EVACUATION

3. If the vacuum pump is working properly, close the valve to the vacuum thermocouple gauge and open the high and low side valves to the high vacuum manifold set. With the valve on the charging cylinder closed, open the manifold valve to the cylinder.
4. Evacuate the system to at least 29 inches gauge before opening valve to thermocouple vacuum gauge.
5. Continue to evacuate to a maximum of 250 microns. Close valve to vacuum pump and watch rate of rise. If vacuum does not rise above 1500 microns in three to five minutes, system can be considered properly evacuated.
6. If thermocouple vacuum gauge continues to rise and levels off at about 5000 microns, moisture and non-condensables are still present. If gauge continues to rise a leak is present. Repair and re-evacuate.
7. Close valve to thermocouple vacuum gauge and vacuum pump. Shut off pump and prepare to charge.

SERVICING

S-103 CHARGING

WARNING

REFRIGERANT UNDER PRESSURE!
*** Do not overcharge system with refrigerant.**
*** Do not operate unit in a vacuum or at negative pressure.**
Failure to follow proper procedures may cause property damage, personal injury or death.

CAUTION

Only use refrigerant certified to AHRI standards. Used refrigerant may cause compressor damage. Daikin is not responsible for damage or the need for repairs resulting from the use of unapproved refrigerant types or used or recycled refrigerant. Most portable machines cannot clean used refrigerant to meet AHRI standards.

CAUTION

Operating the compressor with the suction valve closed will cause serious compressor damage.

Charge the system with the exact amount of refrigerant.

Refer to the specification section or check the unit nameplates for the correct refrigerant charge.

An inaccurately charged system will cause future problems.

1. Using a quality set of charging scales, weigh the proper amount of refrigerant for the system. Allow liquid refrigerant only to enter the high side.
2. After the system will take all it will take, close the valve on the high side of the charging manifold.
3. Start the system and charge the balance of the refrigerant through the low side.

NOTE: R410A should be drawn out of the storage container or drum in liquid form due to its fractionation properties, but should be "Flashed" to its gas state before entering the system. There are commercially available restriction devices that fit into the system charging hose set to accomplish this. **DO NOT** charge liquid R410A into the compressor.

4. With the system still running, close the valve on the charging cylinder. At this time, you may still have some liquid refrigerant in the charging cylinder hose and will definitely have liquid in the liquid hose. Reseat the liquid line core. Slowly open the high side manifold valve and transfer the liquid refrigerant from the liquid line hose and charging cylinder hose into the suction service valve port. CAREFUL: Watch so that liquid refrigerant does not enter the compressor.

Final Charge Adjustment

The outdoor temperature must be 60°F or higher. Set the room thermostat to COOL, fan switch to AUTO, and set the temperature control well below room temperature.

After system has stabilized per startup instructions, compare the operating pressures and outdoor unit amp draw to the numbers listed in the spec sheet manual. If pressures and amp draw are too low, add charge. If pressures and amp draw are too high, remove charge. Check subcooling and superheat as detailed in the following section.

5. With the system still running, remove hose and reinstall both valve caps.
6. Check system for leaks.

Due to their design, Scroll compressors are inherently more tolerant of liquid refrigerant.

NOTE*: Even though the compressor section of a Scroll compressor is more tolerant of liquid refrigerant, continued floodback or flooded start conditions may wash oil from the bearing surfaces causing premature bearing failure.*S-104 CHECKING COMPRESSOR EFFICIENCY

The reason for compressor inefficiency is broken or damaged suction and/or discharge valves, or scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor.

The condition of the valves or scroll flanks is checked in the following manner.

1. Attach gauges to the high and low side of the system.
2. Start the system and run a Cooling Performance Test.

If the test shows-

⇒ Below normal high side pressure.

⇒ Above normal low side pressure.

⇒ Low temperature difference across coil.

⇒ Low amp draw at compressor.

-and the charge is correct. The compressor is faulty - replace the compressor.

SERVICING

S-104 CHECKING COMPRESSOR EFFICIENCY

The reason for compressor inefficiency is broken or damaged
scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor.

During the "OFF" cycle, the high side pressure bleeds to the low side through the fixed orifice restriction device. Check equalization time as follows:

1. Attach a gauge manifold to the suction and liquid line dill valves.
2. Start the system and allow the pressures to stabilize.
3. Stop the system and check the time it takes for the high and low pressure gauge readings to equalize.

If it takes more than seven (7) minutes to equalize, the restrictor device is inoperative. Replace, install a liquid line drier, evacuate and recharge.

S-106 OVERFEEDING

Overfeeding by the expansion valve results in high suction pressure, cold suction line, and possible liquid slugging of the compressor.

If these symptoms are observed:

1. Check for an overcharged unit by referring to the cooling performance charts in the spec sheet manual.
2. Check the operation of the power element in the valve.
3. Check for restricted or plugged equalizer tube.

S-108 SUPERHEAT

CHECKING SUPERHEAT

Refrigerant gas is considered superheated when its temperature is higher than the saturation temperature corresponding to its pressure. The degree of superheat equals the degrees of temperature increase above the saturation temperature at existing pressure. See Temperature - Pressure Chart .

CAUTION

To prevent personal injury, carefully connect and disconnect manifold gauge hoses. Escaping liquid refrigerant can cause burns. Do not vent refrigerant to atmosphere. Recover during system repair or final unit disposal.

1. Run system at least 10 minutes to allow pressure to stabilize.
2. Temporarily install thermometer on suction (large) line near compressor with adequate contact and insulate for best possible reading.
3. Refer to the superheat table provided for proper system superheat. Add charge to lower superheat or recover charge to raise superheat.

Superheat Formula = Suct. Line Temp. - Sat. Suct. Temp.

Ambient Condenser Inlet Temp (°F Drybulb)	Return Air Temp. (°F Drybulb)				
	65	70	75	80	85
100	---	---	---	10	10
95	---	---	10	10	10
90	---	---	12	15	18
85	---	10	13	17	20
80	---	10	15	21	26
75	10	13	17	25	29
70	10	17	20	28	32
65	13	19	26	32	35
60	17	25	30	33	37

SYSTEM SUPERHEAT

EXAMPLE:

a. Suction Pressure = 143
b. Corresponding Temp. °F. = 50
c. Thermometer on Suction Line = 59°F.

To obtain the degrees temperature of superheat, subtract 50.0 from 59.0°F.

The difference is 9° Superheat. The 9° Superheat would fall in the ± range of allowable superheat.

SERVICING

Pressure vs. Temperature Chart											
R-410A											
PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F
12	-37.7	114.0	37.8	216.0	74.3	318.0	100.2	420.0	120.7	522.0	137.6
14	-34.7	116.0	38.7	218.0	74.9	320.0	100.7	422.0	121.0	524.0	137.9
16	-32.0	118.0	39.5	220.0	75.5	322.0	101.1	424.0	121.4	526.0	138.3
18	-29.4	120.0	40.5	222.0	76.1	324.0	101.6	426.0	121.7	528.0	138.6
20	-36.9	122.0	41.3	224.0	76.7	326.0	102.0	428.0	122.1	530.0	138.9
22	-24.5	124.0	42.2	226.0	77.2	328.0	102.4	430.0	122.5	532.0	139.2
24	-22.2	126.0	43.0	228.0	77.8	330.0	102.9	432.0	122.8	534.0	139.5
26	-20.0	128.0	43.8	230.0	78.4	332.0	103.3	434.0	123.2	536.0	139.8
28	-17.9	130.0	44.7	232.0	78.9	334.0	103.7	436.0	123.5	538.0	140.1
30	-15.8	132.0	45.5	234.0	79.5	336.0	104.2	438.0	123.9	540.0	140.4
32	-13.8	134.0	46.3	236.0	80.0	338.0	104.6	440.0	124.2	544.0	141.0
34	-11.9	136.0	47.1	238.0	80.6	340.0	105.1	442.0	124.6	548.0	141.6
36	-10.1	138.0	47.9	240.0	81.1	342.0	105.4	444.0	124.9	552.0	142.1
38	-8.3	140.0	48.7	242.0	81.6	344.0	105.8	446.0	125.3	556.0	142.7
40	-6.5	142.0	49.5	244.0	82.2	346.0	106.3	448.0	125.6	560.0	143.3
42	-4.5	144.0	50.3	246.0	82.7	348.0	106.6	450.0	126.0	564.0	143.9
44	-3.2	146.0	51.1	248.0	83.3	350.0	107.1	452.0	126.3	568.0	144.5
46	-1.6	148.0	51.8	250.0	83.8	352.0	107.5	454.0	126.6	572.0	145.0
48	0.0	150.0	52.5	252.0	84.3	354.0	107.9	456.0	127.0	576.0	145.6
50	1.5	152.0	53.3	254.0	84.8	356.0	108.3	458.0	127.3	580.0	146.2
52	3.0	154.0	54.0	256.0	85.4	358.0	108.8	460.0	127.7	584.0	146.7
54	4.5	156.0	54.8	258.0	85.9	360.0	109.2	462.0	128.0	588.0	147.3
56	5.9	158.0	55.5	260.0	86.4	362.0	109.6	464.0	128.3	592.0	147.9
58	7.3	160.0	56.2	262.0	86.9	364.0	110.0	466.0	128.7	596.0	148.4
60	8.6	162.0	57.0	264.0	87.4	366.0	110.4	468.0	129.0	600.0	149.0
62	10.0	164.0	57.7	266.0	87.9	368.0	110.8	470.0	129.3	604.0	149.5
64	11.3	166.0	58.4	268.0	88.4	370.0	111.2	472.0	129.7	608.0	150.1
66	12.6	168.0	59.0	270.0	88.9	372.0	111.6	474.0	130.0	612.0	150.6
68	13.8	170.0	59.8	272.0	89.4	374.0	112.0	476.0	130.3	616.0	151.2
70	15.1	172.0	60.5	274.0	89.9	376.0	112.4	478.0	130.7	620.0	151.7
72	16.3	174.0	61.1	276.0	90.4	378.0	112.6	480.0	131.0	624.0	152.3
74	17.5	176.0	61.8	278.0	90.9	380.0	113.1	482.0	131.3	628.0	152.8
76	18.7	178.0	62.5	280.0	91.4	382.0	113.5	484.0	131.6	632.0	153.4
78	19.8	180.0	63.1	282.0	91.9	384.0	113.9	486.0	132.0	636.0	153.9
80	21.0	182.0	63.8	284.0	92.4	386.0	114.3	488.0	132.3	640.0	154.5
82	22.1	184.0	64.5	286.0	92.8	388.0	114.7	490.0	132.6	644.0	155.0
84	23.2	186.0	65.1	288.0	93.3	390.0	115.0	492.0	132.9	648.0	155.5
86	24.3	188.0	65.8	290.0	93.8	392.0	115.5	494.0	133.3	652.0	156.1
88	25.4	190.0	66.4	292.0	94.3	394.0	115.8	496.0	133.6	656.0	156.6
90	26.4	192.0	67.0	294.0	94.8	396.0	116.2	498.0	133.9	660.0	157.1
92	27.4	194.0	67.7	296.0	95.2	398.0	116.6	500.0	134.0	664.0	157.7
94	28.5	196.0	68.3	298.0	95.7	400.0	117.0	502.0	134.5	668.0	158.2
96	29.5	198.0	68.9	300.0	96.2	402.0	117.3	504.0	134.8	672.0	158.7
98	30.5	200.0	69.5	302.0	96.6	404.0	117.7	506.0	135.2	676.0	159.2
100	31.2	202.0	70.1	304.0	97.1	406.0	118.1	508.0	135.5	680.0	159.8
102	32.2	204.0	70.7	306.0	97.5	408.0	118.5	510.0	135.8	684.0	160.3
104	33.2	206.0	71.4	308.0	98.0	410.0	118.8	512.0	136.1	688.0	160.8
106	34.1	208.0	72.0	310.0	98.4	412.0	119.2	514.0	136.4	692.0	161.3
108	35.1	210.0	72.6	312.0	98.9	414.0	119.6	516.0	136.7	696.0	161.8
110	35.5	212.0	73.2	314.0	99.3	416.0	119.9	518.0	137.0		
112	36.9	214.0	73.8	316.0	99.7	418.0	120.3	520.0	137.3		

*Based on ALLIED SIGNAL Data

REQUIRED LIQUID LINE TEMPERATURE						
LIQUID PRESSURE AT ACCESS FITTING (PSIG)	REQUIRED SUBCOOLING TEMPERATURE (°F)					
	8	10	12	14	16	18
189	58	56	54	52	50	48
195	60	58	56	54	52	50
202	62	60	58	56	54	52
208	64	62	60	58	56	54
215	66	64	62	60	58	56
222	68	66	64	62	60	58
229	70	68	66	64	62	60
236	72	70	68	66	64	62
243	74	72	70	68	66	64
251	76	74	72	70	68	66
259	78	76	74	72	70	68
266	80	78	76	74	72	70
274	82	80	78	76	74	72
283	84	82	80	78	76	74
291	86	84	82	80	78	76
299	88	86	84	82	80	78
308	90	88	86	84	82	80
317	92	90	88	86	84	82
326	94	92	90	88	86	84
335	96	94	92	90	88	86
345	98	96	94	92	90	88
354	100	98	96	94	92	90
364	102	100	98	96	94	92
374	104	102	100	98	96	94
384	106	104	102	100	98	96
395	108	106	104	102	100	98
406	110	108	106	104	102	100
416	112	110	108	106	104	102
427	114	112	110	108	106	104
439	116	114	112	110	108	106
450	118	116	114	112	110	108
462	120	118	116	114	112	110
474	122	120	118	116	114	112
486	124	122	120	118	116	114
499	126	124	122	120	118	116
511	128	126	124	122	120	118

SERVICING

S-111 FIXED ORIFICE RESTRICTION DEVICES

The fixed orifice restriction device (flowrator) used in conjunction with the indoor coil is a predetermined bore (I.D.).

It is designed to control the rate of liquid refrigerant flow into an evaporator coil.

The amount of refrigerant that flows through the fixed orifice restriction device is regulated by the pressure difference between the high and low sides of the system.

In the cooling cycle when the outdoor air temperature rises, the high side condensing pressure rises. At the same time, the cooling load on the indoor coil increases, causing the low side pressure to rise, but at a slower rate.

Since the high side pressure rises faster when the temperature increases, more refrigerant flows to the evaporator, increasing the cooling capacity of the system.

When the outdoor temperature falls, the reverse takes place. The condensing pressure falls, and the cooling loads on the indoor coil decreases, causing less refrigerant flow.

If a restriction should become evident, proceed as follows:

1. Recover refrigerant charge.
2. Remove the orifice assembly and clean or replace.
3. Replace liquid line drier, evacuate and recharge.

CHECKING EQUALIZATION TIME

During the "OFF" cycle, the high side pressure bleeds to the low side through the fixed orifice restriction device. Check equalization time as follows:

1. Attach a gauge manifold to the suction and liquid line dill valves
2. Start the system and allow the pressures to stabilize.
3. Stop the system and check the time it takes for the high and low pressure gauge readings to equalize.

If it takes more than seven (7) minutes to equalize, the restriction device is inoperative. Replace, install a liquid line drier, evacuate and recharge.

S-112 CHECKING RESTRICTED LIQUID LINE

When the system is operating, the liquid line is warm to the touch. If the liquid line is restricted, a definite temperature drop will be noticed at the point of restriction. In severe cases, frost will form at the restriction and extend down the line in the direction of the flow.

Discharge and suction pressures will be low, giving the appearance of an undercharged unit. However, the unit will have normal to high subcooling.

Locate the restriction, replace the restricted part, replace drier, evacuate and recharge.

S-113 OVERCHARGE OF REFRIGERANT

An overcharge of refrigerant is normally indicated by an excessively high head pressure.

An evaporator coil, using an expansion valve metering device, will basically modulate and control a flooded evaporator and prevent liquid return to the compressor.

An evaporator coil, using a fixed orifice restrictor device (flowrator) metering device, could allow refrigerant to return to the compressor under extreme overcharge conditions.

Also with a fixed orifice restrictor device (flowrator) metering device, extreme cases of insufficient indoor air can cause icing of the indoor coil and liquid return to the compressor, but the head pressure would be lower.

There are other causes for high head pressure which may be found in the "Service Problem Analysis Guide."

If other causes check out normal, an overcharge or a system containing non-condensables would be indicated.

If this system is observed:

1. Start the system.
2. Remove and capture small quantities of refrigerant as from the suction line access fitting until the head pressure is reduced to normal.
3. Observe the system while running a cooling performance test. If a shortage of refrigerant is indicated, then the system contains non-condensables.

S-114 NON-CONDENSABLES

If non-condensables are suspected, shut down the system and allow the pressures to equalize. Wait at least 15 minutes. Compare the pressure to the temperature of the coldest coil since this is where most of the refrigerant will be. If the pressure indicates a higher temperature than that of the coil temperature, non-condensables are present.

Non-condensables are removed from the system by first removing the refrigerant charge, replacing and/or installing liquid line drier, evacuating and recharging.

S-115 COMPRESSOR BURNOUT

When a compressor burns out, high temperature develops causing the refrigerant, oil and motor insulation to decompose forming acids and sludge.

If a compressor is suspected of being burned-out, attach a refrigerant hose to the liquid line dill valve and properly remove and dispose of the refrigerant.

Now determine if a burn out has actually occurred. Confirm by analyzing an oil sample using a Sporlan Acid Test Kit, AK-3 or its equivalent.

Remove the compressor and obtain an oil sample from the suction stub. If the oil is not acidic, either a burnout has not occurred or the burnout is so mild that a complete clean-up is not necessary.

SERVICING

If acid level is unacceptable, the system must be cleaned by using the clean-up drier method.

CAUTION

Do not allow the sludge or oil to contact the skin. Severe burns may result.

NOTE: Daikin does **NOT** approve the flushing method using R-11 refrigerant.

Suction Line Drier Clean-Up Method

The POE oils used with R410A refrigerant is an excellent solvent. In the case of a burnout, the POE oils will remove any burnout residue left in the system. If not captured by the refrigerant filter, they will collect in the compressor or other system components, causing a failure of the replacement compressor and/or spread contaminants throughout the system, damaging additional components.

Use part number RF000127 suction line filter drier kit. This drier should be installed as close to the compressor suction fitting as possible. The filter must be accessible and be rechecked for a pressure drop after the system has operated for a time. It may be necessary to use new tubing and form as required.

NOTE: At least twelve (12) inches of the suction line immediately out of the compressor stub must be discarded due to burned residue and contaminates.

1. Remove the liquid line drier and expansion valve.
2. Purge all remaining components with dry nitrogen or carbon dioxide until clean.
3 Install new components **including** liquid line drier.
4. Braze all joints, leak test, evacuate, and recharge system.
5. Start up the unit and record the pressure drop across the drier.
6. Continue to run the system for a minimum of twelve (12) hours and recheck the pressure drop across the drier. Pressure drop should not exceed 6 PSIG.
7. Continue to run the system for several days, repeatedly checking pressure drop across the suction line drier. If the pressure drop never exceeds the 6 PSIG, the drier has trapped the contaminants. Remove the suction line drier from the system.
8. If the pressure drop becomes greater, then it must be replaced and steps 5 through 9 repeated until it does not exceed 6 PSIG.

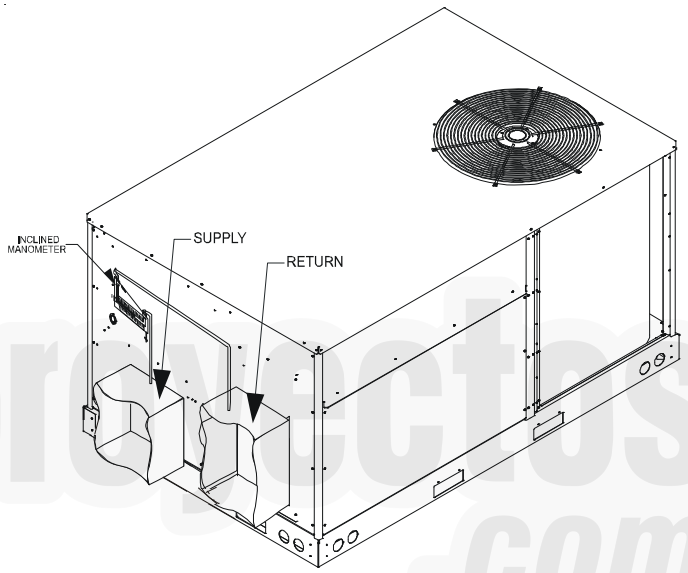
NOTICE: Regardless, the cause for burnout must be determined and corrected before the new compressor is started.

S-200 CHECKING EXTERNAL STATIC PRESSURE

The minimum and maximum allowable duct static pressure is found in the Spec Sheet Manual.

Too great of an external static pressure will result in insufficient air that can cause icing of the coil, whereas too much air can cause poor humidity control, and condensate to be pulled off the evaporator coil causing condensate leakage. Too much air can cause motor overloading and in many cases this constitutes a poorly designed system. To determine proper air movement, proceed as follows:

1. Using a draft gauge (inclined manometer) measure the static pressure of the return duct at the inlet of the unit, (Negative Pressure).



TOTAL EXTERNAL STATIC

2. Measure the static pressure of the supply duct, (Positive Pressure).
3. Add the two readings together.

NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired.

4. Consult proper table for quantity of air.

If the external static pressure exceeds the minimum or maximum allowable statics, check for closed dampers, dirty filters, undersized or poorly laid out ductwork.

SERVICING

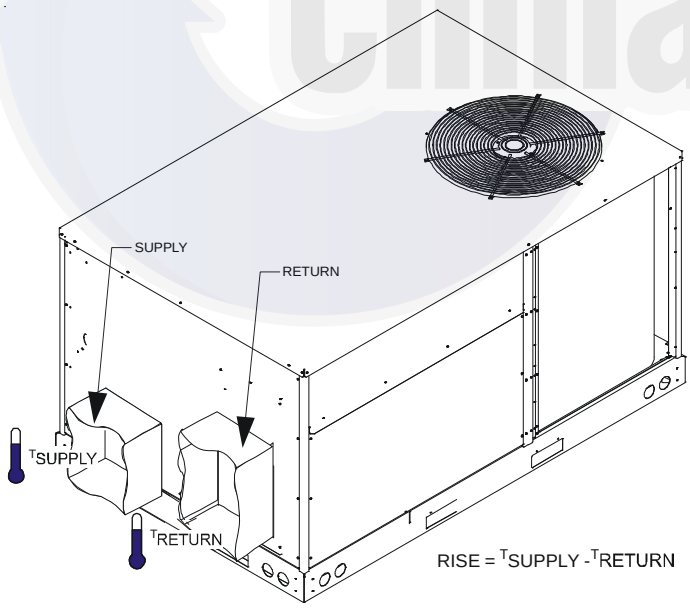
S-201 CHECKING TEMPERATURE RISE

Temperature rise is related to the BTUH output of the unit and the amount of air (CFM) circulated over the heat exchanger.

All units are designed for a given range of temperature increase. This is the temperature of the air leaving the unit minus the temperature of the air entering the unit.

The more air (CFM) being delivered through a given unit the less the rise will be; so the less air (CFM) being delivered, the greater the rise. The temperature rise should be adjusted in accordance to a given unit specifications and its external static pressure.

1. Check BTUH input to unit do not exceed input rating stamped on rating plate.
2. Take entering and leaving air temperatures.
3. Select the proper speed tap or dip switch setting for direct drive units.
4. For gas heat units, the airflow must be adjusted so that the air temperature rise falls within the ranges given stated on Data Plate by adjusting the variable pitch sheave on the motor (see Blower Performance section in appropriate Spec Sheet Manual for correct pulley adjustment).
5. Take motor amperage draw to determine that the motor is not overloaded during adjustments.



CHECKING TEMPERATURE RISE

S-205 CHECKING BELT TENSION

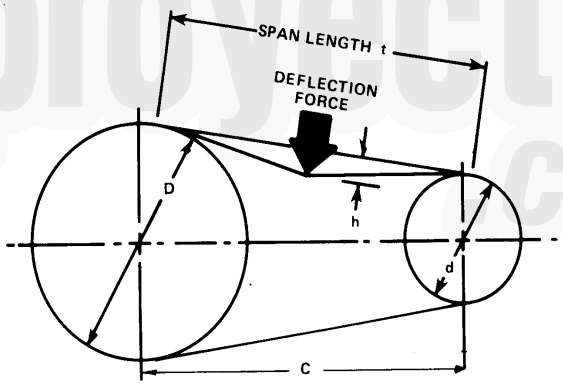
NOTE: Section on high static tables may require a field motor change.

BELT DRIVE MODELS ONLY

Tension and Alignment Adjustment

Check drive for adequate run-in belt tension. Correct belt tension is very important. A belt that is loose will have a substantially shorter life, and a belt that is too tight may cause premature motor and bearing failure. Correct belt tension on these units can be checked by measuring the force required to deflect the belt 1/8" at the midpoint of the span length (See DRIVE BELT TENSION ADJUSTMENT Figure). Belt tension force can be measured using a belt tension gauge, available through most belt manufacturers. The correct deflection force is 5 Ibs. for a new belt and 3.5 Ibs. for a belt that has been run in. New belt tension includes initial belt stretch.

When new V-belts are installed on a drive, the initial tension will drop rapidly during the first few hours. Check tension frequently during the first 24 hours of operation. Subsequent retensioning should fall between the minimum and maximum force. To determine the deflection distance from the normal position, use a straightedge or stretch a cord from sheave to sheave to use as a reference line. On multiple belt drives, an adjacent undeflected belt can be used as a reference.



*****Apply force to the center of the span.*

t = Span length, inches

C = Center distance, inches

D = Larger sheave diameter, inches

d = Smaller sheave diameter, inches

h = Deflection height, inches

SERVICING

DRIVE BELT TENSION ADJUSTMENT

3 - 6 TON MODELS

TYPE		SMALL SHEAVE DIAMETER (in)	DEFLECTION FORCE (lbs)		DEFLECTION (in)
BELT	DRIVE		USED	NEW	
AX	Standard	3.0 to 4.0	4.5 +/- 0.5	5.0 +/- 0.5	5/16 +/- 1/16

RECOMMENDED POUNDS OF FORCE PER BELT

S-206 INDOOR FAN ROTATION CHECK

Evaporator Fan Rotation Check (Three Phase Models Only)

Check that fan rotates counter-clockwise when viewed from the drive side of unit and in accordance with rotation arrow shown on blower housing. If it does not, reverse any two incoming power cables at Single Point Power Block. In this case, repeat bearing check.

Do not attempt to change load side wiring. Internal wiring assures all motors and compressors will rotate in correct direction once evaporator fan motor rotation check has been made.

S-207 MOTOR SHEAVE ADJUSTMENT

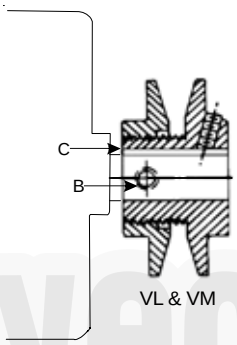
VL, VM, & 2VP VARIABLE PITCH KEY TYPE MOTOR SHEAVES

The driving and driven motor sheaves should be in alignment with each other and the shafts parallel.

VL & VM SHEAVES ADJUSTMENT

1. Loosen set screw “B” using a 5/32" Allen key.
2. Making half or full turns from closed position, adjust sheave pitch diameter for desired speed. DO NOT OPEN MORE THAN FIVE FULL TURNS.
3. Tighten set screw “B” securely over flat.
4. Carefully put on belts and adjust belt tension. DO NOT FORCE BELTS OVER GROOVES.
5. Ensure all keys are in place and the set screws tight before starting drive. Recheck set screws and belt tension after 24 hours service.

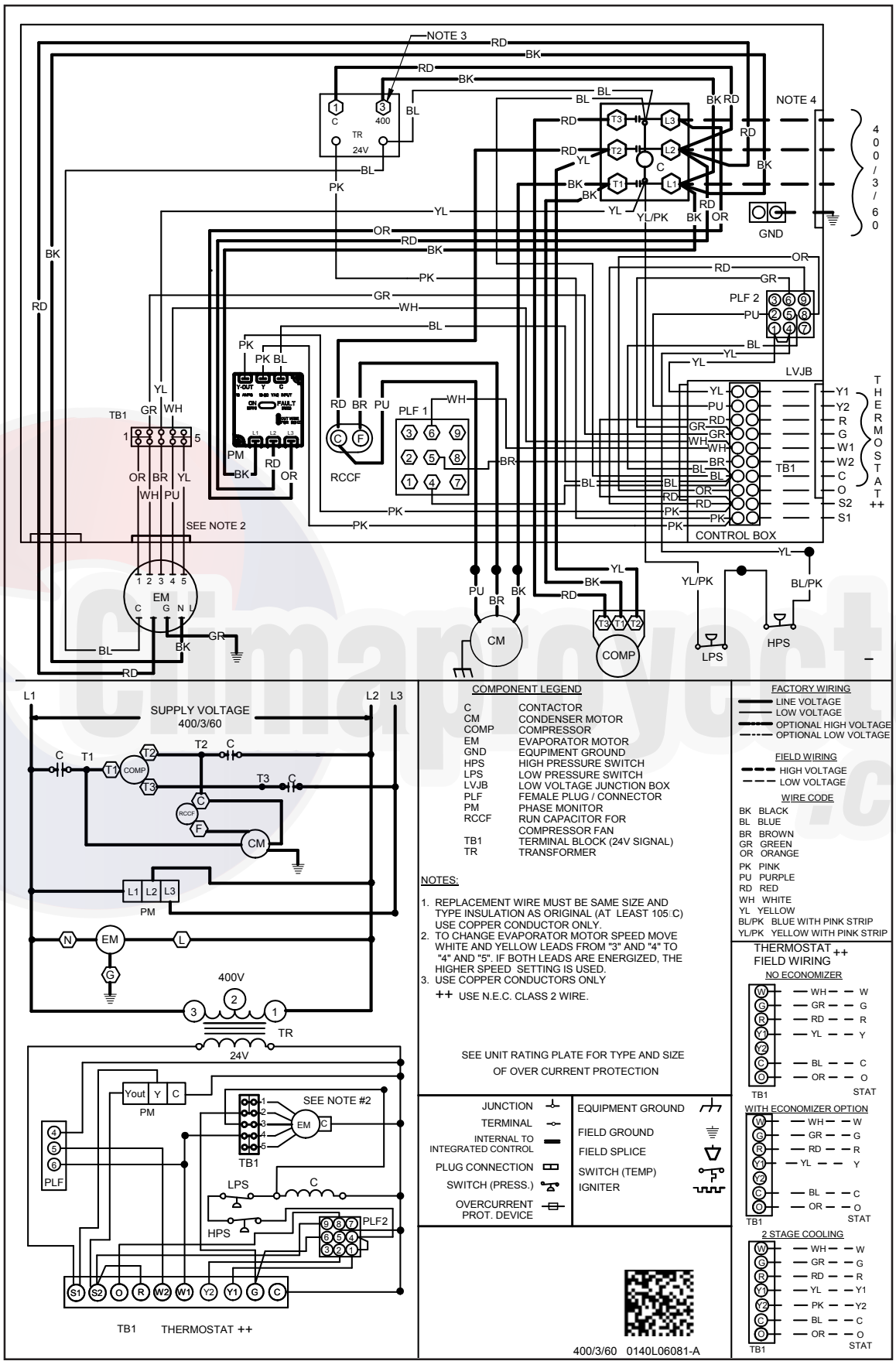
NOTE: Future adjustments should be made by loosening the belt tension and increasing or decreasing the pitch diameter of the sheave by half or full turns as required. Readjust belt tension before starting drive.



VL & VM

NOTE: Do **NOT** operate sheave with flange projecting beyond the hub end.

DCC COMMERCIAL
3-6 Ton Packaged Air Conditioner Unit
WIRING DIAGRAMS

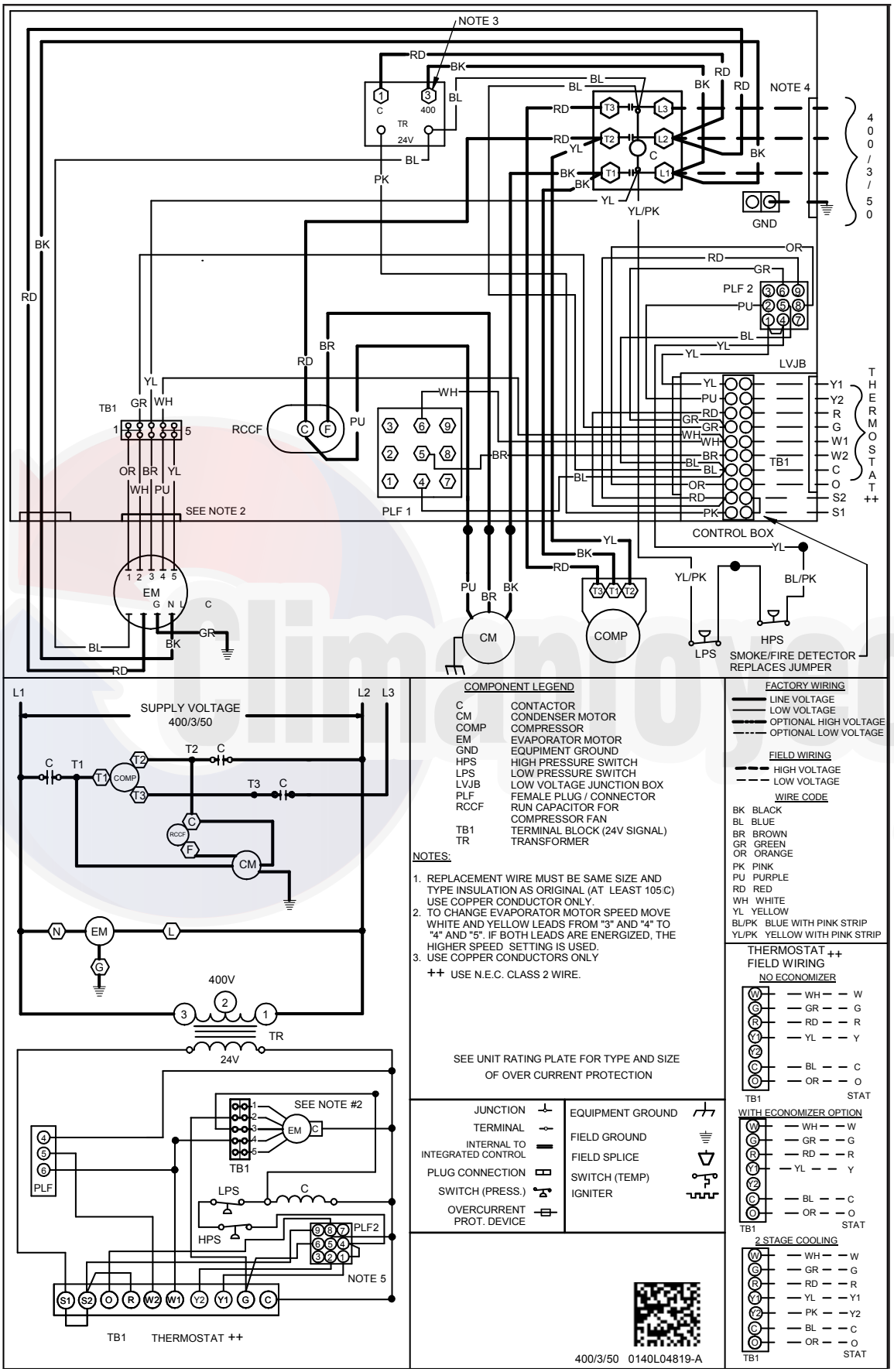


HIGH VOLTAGE! DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DCC048-060XXXBDXXXA*



COMPONENT LEGEND

C	CONTACTOR
CM	CONDENSER MOTOR
COMP	COMPRESSOR
EM	EVAPORATOR MOTOR
GND	EQUIPMENT GROUND
HPS	HIGH PRESSURE SWITCH
LPS	LOW PRESSURE SWITCH
LVJB	LOW VOLTAGE JUNCTION BOX
PLF	FEMALE PLUG / CONNECTOR
RCCF	RUN CAPACITOR FOR COMPRESSOR FAN
TB1	TERMINAL BLOCK (24V SIGNAL)
TR	TRANSFORMER

NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE INSULATION AS ORIGINAL (AT LEAST 105ºC) USE COPPER CONDUCTOR ONLY.
2. TO CHANGE EVAPORATOR MOTOR SPEED MOVE WHITE AND YELLOW LEADS FROM "3" AND "4" TO "4" AND "5". IF BOTH LEADS ARE ENERGIZED, THE HIGHER SPEED SETTING IS USED.
3. USE COPPER CONDUCTORS ONLY

++ USE N.E.C. CLASS 2 WIRE.

SEE UNIT RATING PLATE FOR TYPE AND SIZE OF OVER CURRENT PROTECTION

JUNCTION
TERMINAL
INTERNAL TO INTEGRATED CONTROL
PLUG CONNECTION
SWITCH (PRESS.)
OVERCURRENT PROT. DEVICE
EQUIPMENT GROUND
FIELD GROUND
FIELD SPLICE
SWITCH (TEMP)
IGNITER

FACTORY WIRING
LINE VOLTAGE
LOW VOLTAGE
OPTIONAL HIGH VOLTAGE
OPTIONAL LOW VOLTAGE

FIELD WIRING
HIGH VOLTAGE
LOW VOLTAGE

WIRE CODE

BK	BLACK
BL	BLUE
BR	BROWN
GR	GREEN
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
BL/PK	BLUE WITH PINK STRIP
YL/PK	YELLOW WITH PINK STRIP

THERMOSTAT ++ FIELD WIRING

NO ECONOMIZER

WITH ECONOMIZER OPTION

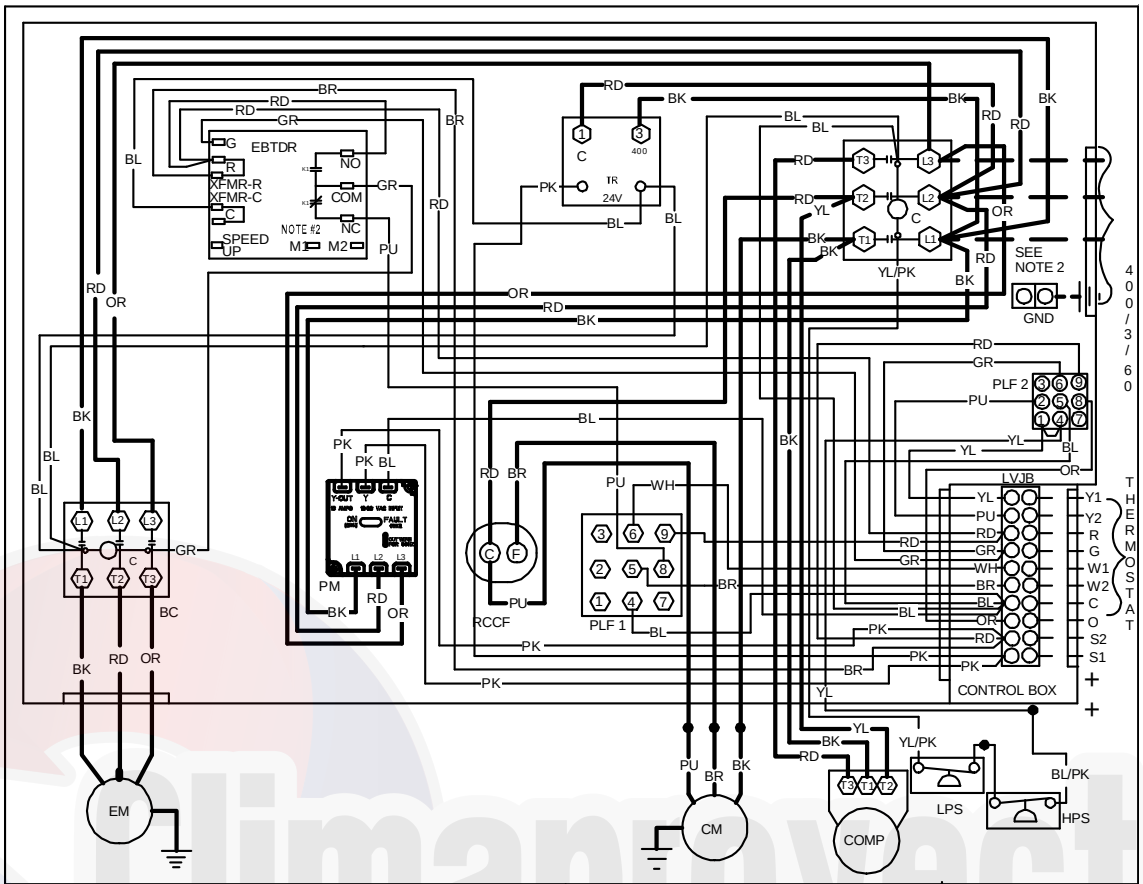
2 STAGE COOLING

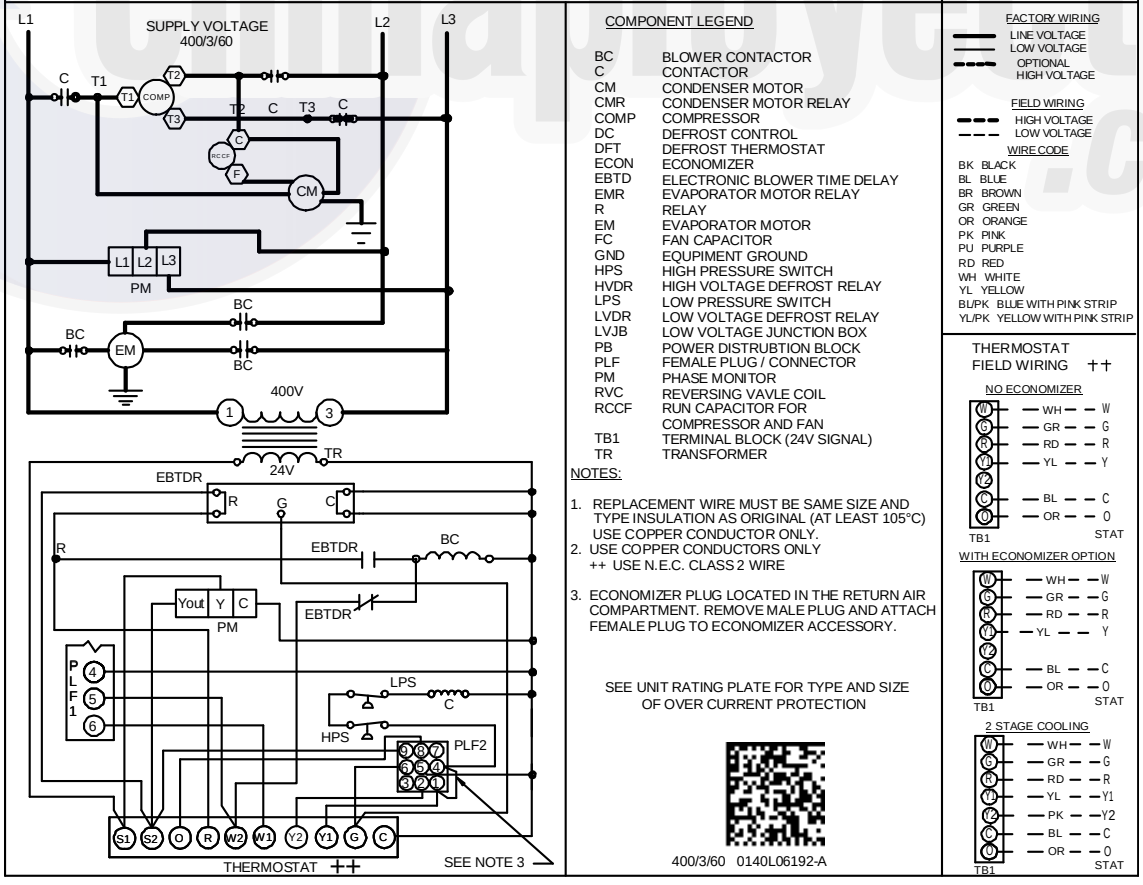
400/3/50 0140L04819-A

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.





COMPONENT LEGEND

BC	BLOWER CONTACTOR
C	CONTACTOR
CM	CONDENSER MOTOR
CMR	CONDENSER MOTOR RELAY
COMP	COMPRESSOR
DC	DEFROST CONTROL
DFT	DEFROST THERMOSTAT
ECON	ECONOMIZER
EBTD	ELECTRONIC BLOWER TIME DELAY
EMR	EVAPORATOR MOTOR RELAY
R	RELAY
EM	EVAPORATOR MOTOR
FC	FAN CAPACITOR
GND	EQUIPMENT GROUND
HPS	HIGH PRESSURE SWITCH
HVDR	HIGH VOLTAGE DEFROST RELAY
LPS	LOW PRESSURE SWITCH
LVDR	LOW VOLTAGE DEFROST RELAY
LVJB	LOW VOLTAGE JUNCTION BOX
PB	POWER DISTRUBTION BLOCK
PLF	FEMALE PLUG / CONNECTOR
PM	PHASE MONITOR
RVC	REVERSING VAVLE COIL
RCCF	RUN CAPACITOR FOR COMPRESSOR AND FAN
TB1	TERMINAL BLOCK (24V SIGNAL)
TR	TRANSFORMER

NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE INSULATION AS ORIGINAL (AT LEAST 105°C) USE COPPER CONDUCTOR ONLY.
2. USE COPPER CONDUCTORS ONLY
   ++ USE N.E.C. CLASS 2 WIRE
3. ECONOMIZER PLUG LOCATED IN THE RETURN AIR COMPARTMENT. REMOVE MALE PLUG AND ATTACH FEMALE PLUG TO ECONOMIZER ACCESSORY.

SEE UNIT RATING PLATE FOR TYPE AND SIZE OF OVER CURRENT PROTECTION

400/3/60 0140L06192-A

FACTORY WIRING
- LINE VOLTAGE
- LOW VOLTAGE
- OPTIONAL HIGH VOLTAGE

FIELD WIRING
- HIGH VOLTAGE
- LOW VOLTAGE

WIRE CODE

BK	BLACK
BL	BLUE
BR	BROWN
GR	GREEN
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
BL/PK	BLUE WITH PINK STRIP
YL/PK	YELLOW WITH PINK STRIP

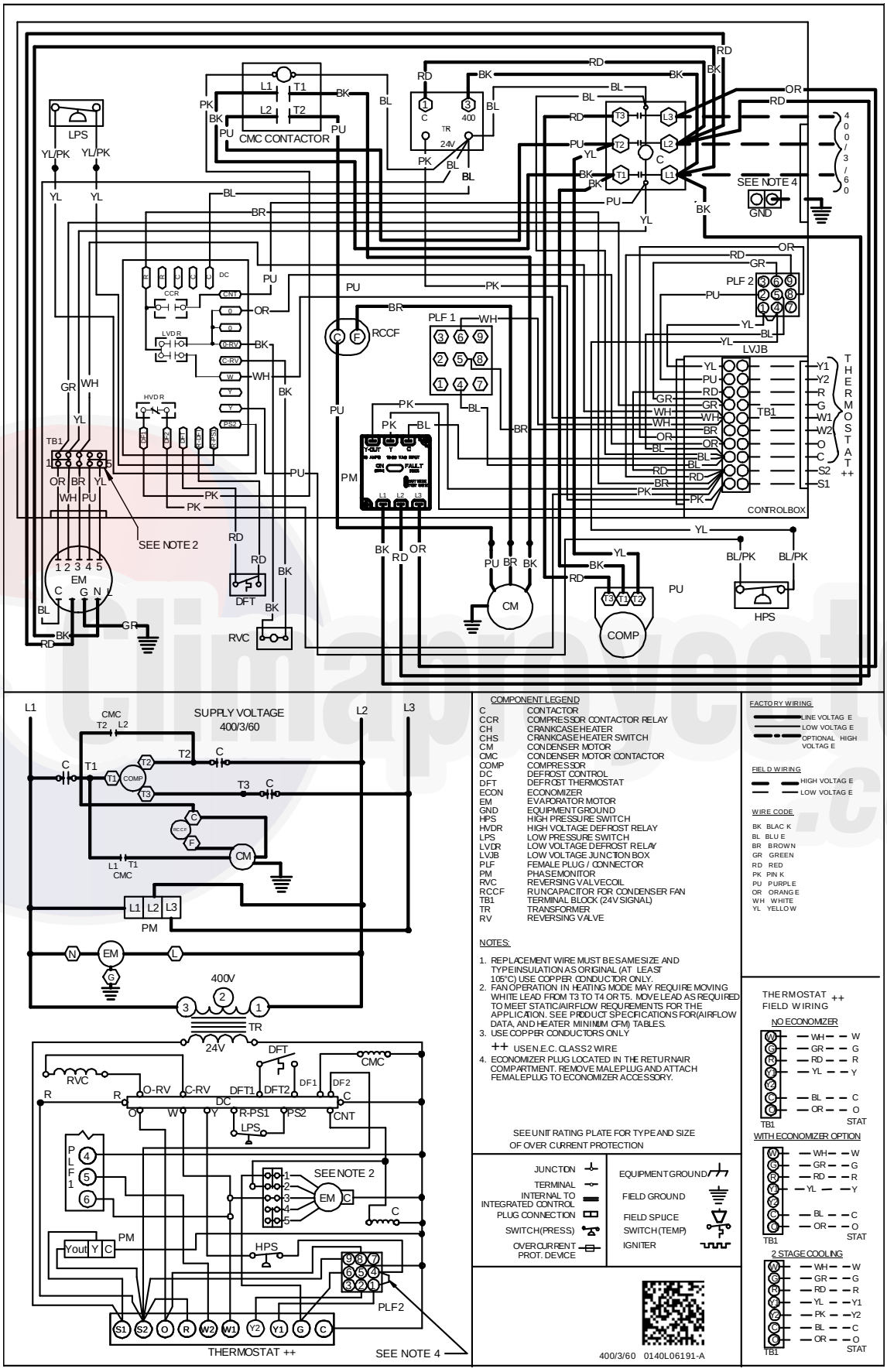
THERMOSTAT FIELD WIRING ++

HIGH VOLTAGE! DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

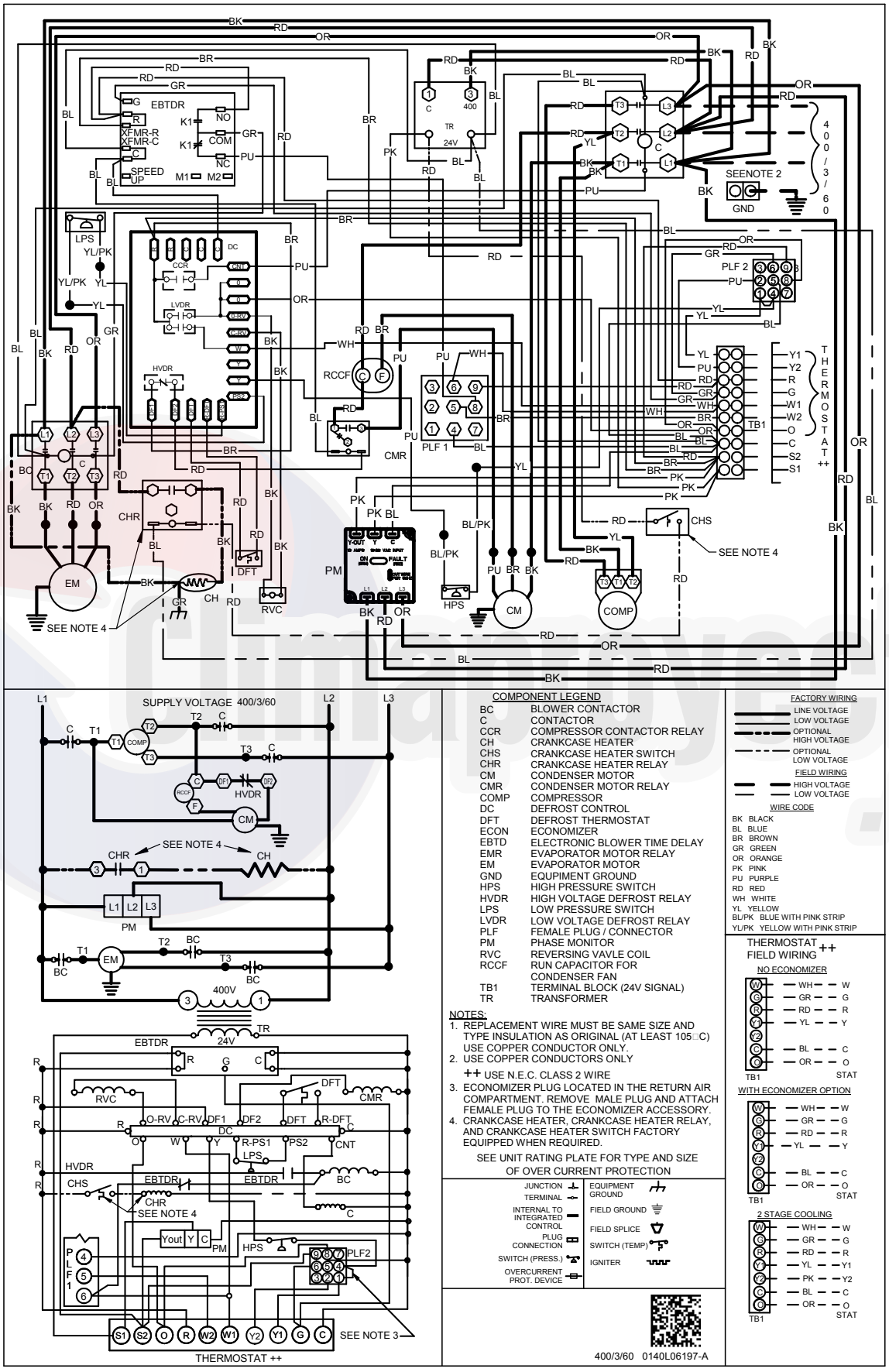
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DCH COMMERCIAL
3-6 Ton Packaged Heat Pump Unit
WIRING DIAGRAMS



Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DCH072XXX6BXXX**



COMPONENT LEGEND

BC	BLOWER CONTACTOR
C	CONTACTOR
CCR	COMPRESSOR CONTACTOR RELAY
CH	CRANKCASE HEATER
CHS	CRANKCASE HEATER SWITCH
CHR	CRANKCASE HEATER RELAY
CM	CONDENSER MOTOR
CMR	CONDENSER MOTOR RELAY
COMP	COMPRESSOR
DC	DEFROST CONTROL
DFT	DEFROST THERMOSTAT
ECON	ECONOMIZER
EBTD	ELECTRONIC BLOWER TIME DELAY
EMR	EVAPORATOR MOTOR RELAY
EM	EVAPORATOR MOTOR
GND	EQUIPMENT GROUND
HPS	HIGH PRESSURE SWITCH
HVDR	HIGH VOLTAGE DEFROST RELAY
LPS	LOW PRESSURE SWITCH
LVDR	LOW VOLTAGE DEFROST RELAY
PLF	FEMALE PLUG / CONNECTOR
PM	PHASE MONITOR
RVC	REVERSING VAVLE COIL
RCCF	RUN CAPACITOR FOR CONDENSER FAN
TB1	TERMINAL BLOCK (24V SIGNAL)
TR	TRANSFORMER

NOTES:
1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE INSULATION AS ORIGINAL (AT LEAST 105□C) USE COPPER CONDUCTOR ONLY.
2. USE COPPER CONDUCTORS ONLY
   ++ USE N.E.C. CLASS 2 WIRE
3. ECONOMIZER PLUG LOCATED IN THE RETURN AIR COMPARTMENT. REMOVE MALE PLUG AND ATTACH FEMALE PLUG TO THE ECONOMIZER ACCESSORY.
4. CRANKCASE HEATER, CRANKCASE HEATER RELAY, AND CRANKCASE HEATER SWITCH FACTORY EQUIPPED WHEN REQUIRED.

SEE UNIT RATING PLATE FOR TYPE AND SIZE OF OVER CURRENT PROTECTION

JUNCTION TERMINAL
INTERNAL TO INTEGRATED CONTROL
PLUG CONNECTION
SWITCH (PRESS.)
OVERCURRENT PROT. DEVICE
EQUIPMENT GROUND
FIELD GROUND
FIELD SPLICE
SWITCH (TEMP)
IGNITER

FACTORY WIRING
LINE VOLTAGE
LOW VOLTAGE
OPTIONAL HIGH VOLTAGE
OPTIONAL LOW VOLTAGE

FIELD WIRING
HIGH VOLTAGE
LOW VOLTAGE

WIRE CODE

BK	BLACK
BL	BLUE
BR	BROWN
GR	GREEN
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
BL/PK	BLUE WITH PINK STRIP
YL/PK	YELLOW WITH PINK STRIP

THERMOSTAT FIELD WIRING ++

NO ECONOMIZER

WITH ECONOMIZER OPTION

2 STAGE COOLING

WARNING

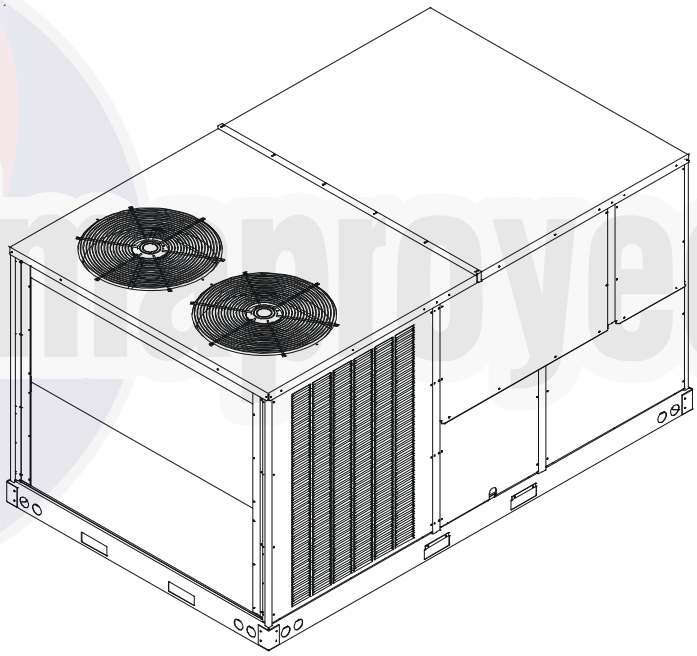
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DAIKIN Service Instructions

DCC Cooling/DCH Heat Pumps
Commercial Package Units
with R-410A Refrigerant
7.5 - 12.5 Tons & Accessories

Not for installation in the United States or Canada. This unit is for export only.



COMMERCIAL GRADE

This manual is to be used by qualified, professionally trained HVAC technicians only. Daikin does not assume any responsibility for property damage or personal injury due to improper service procedures or services performed by an unqualified person.

RSDX6412007r2
November 2016

TABLE OF CONTENTS

IMPORTANT INFORMATION

Pride and workmanship go into every product to provide our customers with quality products. It is possible, however, that during its lifetime a product may require service. Products should be serviced only by a qualified service technician who is familiar with the safety procedures required in the repair and who is equipped with the proper tools, parts, testing instruments and the appropriate service manual. **REVIEW ALL SERVICE INFORMATION IN THE APPROPRIATE SERVICE MANUAL BEFORE BEGINNING REPAIRS.**

IMPORTANT NOTICES FOR CONSUMERS AND SERVICERS

RECOGNIZE SAFETY SYMBOLS, WORDS AND LABELS

WARNING

This unit should not be connected to, or used in conjunction with, any devices that are not design certified for use with this unit or have not been tested and approved by the manufacturer. Serious property damage or personal injury, reduced unit performance and/or hazardous conditions may result from the use of devices that have not been approved or certified by the manufacturer.

WARNING

Only personnel that have been trained to install, adjust, service or repair (hereinafter, "service") the equipment specified in this manual should service the equipment. The manufacturer will not be responsible for any injury or property damage arising from improper service or service procedures. If you service this unit, you assume responsibility for any injury or property damage which may result. In addition, in jurisdictions that require one or more licenses to service the equipment specified in this manual, only licensed personnel should service the equipment. Improper installation, adjustment, servicing or repair of the equipment specified in this manual, or attempting to install, adjust, service or repair the equipment specified in this manual without proper training may result in product damage, property damage, personal injury or death.

WARNING

Do not store combustible materials or use gasoline or other flammable liquids or vapors in the vicinity of this appliance as property damage or personal injury could occur. Have your contractor point out and identify the various cut-off devices, switches, etc., that serves your comfort equipment.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

To locate an authorized servicer, please consult your telephone book or the dealer from whom you purchased this product. For further assistance, please contact:

CONSUMER INFORMATION LINE - DAIKIN BRAND PRODUCTS
TOLL FREE 1-855-770-5678 (U.S. only)
email us at: customerservice@daikincomfort.com
fax us at: (713) 856-1821
(Not a technical assistance line for dealers.)

Outside the U.S., call 1-713-861-2500
(Not a technical assistance line for dealers.)
Your telephone company will bill you for the call.

IMPORTANT INFORMATION

SAFE REFRIGERANT HANDLING

While these items will not cover every conceivable situation, they should serve as a useful guide.

WARNING

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space.To avoid possible difficulty in breathing or death:

- **Never purge refrigerant into an enclosed room or space. By law, all refrigerants must be reclaimed.**
- **If an indoor leak is suspected, thoroughly ventilate the area before beginning work.**
- **Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact with refrigerant and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.**

WARNING

To avoid possible explosion:

- **Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.**
- **Never fill a cylinder more than 80% full of liquid refrigerant.**
- **Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.**
- **Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.**

WARNING

To avoid possible injury, explosion or death, practice safe handling of refrigerants.

WARNING

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

WARNING

To avoid possible explosion, use only returnable (not disposable) service cylinders when removing refrigerant from a system.

- **Ensure the cylinder is free of damage which could lead to a leak or explosion.**
- **Ensure the hydrostatic test date does not exceed 5 years.**
- **Ensure the pressure rating meets or exceeds 400 lbs.**

When in doubt, do not use cylinder.

WARNING

System contaminants, improper service procedure and/or physical abuse affecting hermetic compressor electrical terminals may cause dangerous system venting.

The successful development of hermetically sealed refrigeration compressors has completely sealed the compressor's moving parts and electric motor inside a common housing, minimizing refrigerant leaks and the hazards sometimes associated with moving belts, pulleys or couplings.

Fundamental to the design of hermetic compressors is a method whereby electrical current is transmitted to the compressor motor through terminal conductors which pass through the compressor housing wall. These terminals are sealed in a dielectric material which insulates them from the housing and maintains the pressure tight integrity of the hermetic compressor. The terminals and their dielectric embedment are strongly constructed, but are vulnerable to careless compressor installation or maintenance procedures and equally vulnerable to internal electrical short circuits caused by excessive system contaminants.

In either of these instances, an electrical short between the terminal and the compressor housing may result in the loss of integrity between the terminal and its dielectric embedment. This loss may cause the terminals to be expelled, thereby venting the vaporous and liquid contents of the compressor housing and system.

A venting compressor terminal normally presents no danger to anyone, providing the terminal protective cover is properly in place.

If, however, the terminal protective cover is not properly in place, a venting terminal may discharge a combination of

(a) hot lubricating oil and refrigerant

(b) flammable mixture (if system is contaminated with air)

in a stream of spray which may be dangerous to anyone in the vicinity. Death or serious bodily injury could occur.

Under no circumstances is a hermetic compressor to be electrically energized and/or operated without having the terminal protective cover properly in place.

See Service Section S-17 for proper servicing.

PRODUCT IDENTIFICATION

The model and manufacturing number are used for positive identification of component parts used in manufacturing. Please use these numbers when requesting service or parts information.

D	C	C	090	045	5	D	*	*	*	A	*
1	2	3	4, 5, 6	7, 8, 9	10	11	12	13	14	15	16

Brand

D Daikin

Configuration

C Commercial Standard Efficiency

Application

C Cooling
H Heat Pump

Nominal Gross Cooling Capacity

036	3 Tons	102	8½ Tons
048	4 Tons	120	10 Tons
060	5 Tons	180	15 Tons
072	6 Tons	240	20 Tons
090	7½ Tons	300	25 Tons

Nominal Heating Capacity

Gas/Electric		A/C H/P	Factory-Installed Electric Heat		
180	180,000 BTU/h	XXX	No Heat	030	30 kW
300	300,000 BTU/h	016	15 kW	045	44 kW
350	350,000 BTU/h				

See product specifications for heat size(s) available for each capacity.

Voltage

1	208-230/1/60 (United States)	4	460/3/60 (United States)
3	208-230/3/60 (United States)	5	400/3/50 (Russia Daikin Brand)
6	400/3/60 (Saudi Arabia)	A	400/3/50 (Russia Goodman Brand)
B	400/3/50 (Kuwait)	E	400/3/50 (Argentina)

Supply Fan/Drive Type/Motors

B Belt Drive
D Direct Drive

Factory-Installed Options

X No Options
V Low-Leak Downflow Economizer[2]

[2] Please use part number DPE36722 / DPE36724 / DPE36727 if Power Exhaust is required

Factory-Installed Options

X Standard Aluminized Heat Exchanger
S Stainless Steel Heat Exchanger

Factory-Installed Options

X No Options

Revision Levels

Major & Minor

Factory- Installed Options

Note: Not all options available for all products.

- Economizers (Downflow): Based on air conditions, can provide outside air to cool the space.

PRODUCT IDENTIFICATION

DCH**XXX**XXX

Daikin Commercial Multiposition Package Heat Pumps	
Model #	**Description**
DCH[090-150]XXX6BXXXAA	Daikin Commercial Package Heat Pump, Multiposition heat pump units, 400V 3 Phase 60Hz. Belt Drive. Initial release of 7.5-12.5 Ton Daikin branded models.
DCH[090-120]XXX6BXXXAB	Daikin Commercial Package Heat Pump, Multiposition heat pump units, 400V 3 Phase 60Hz. Belt Drive with phase monitor
DCH150XXX6BXXXAD	Daikin Commercial Package Heat Pump, Multiposition heat pump units, 400V 3 Phase 60Hz. Belt Drive with phase monitor

These units have R410A refrigerant

PRODUCT IDENTIFICATION DCC***XXX**XXX

Daikin Commercial Multiposition Package Coolers	
Model #	**Description**
DCC[090-150]XXX6BXXXAA	Daikin Commercial Package Cooler, Multiposition cooling units, 400V 3 Phase 60 Hz. Belt Drive. Initial release of 7.5-12.5 Ton Daikin branded models.
DCC[090-150]XXX6BVXXAA	Daikin Commercial Package Cooler, Multiposition cooling units, 400V 3 Phase 60 Hz. Belt Drive. Factory installed options (Low-Leak Downflow Economizer)
DCC[090-120]XXX6BXXXAB	Daikin Commercial Package Cooler, Multiposition cooling units, 400V 3 Phase 60 Hz. Belt Drive with phase monitor
DCC150XXX6BXXXAB	Daikin Commercial Package Cooler, Multiposition cooling units, 400V 3 Phase 60 Hz. Belt Drive with phase monitor

These units have R410A refrigerant

PRODUCT DESIGN

UNIT LOCATION

⚠ WARNING

TO PREVENT POSSIBLE EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH, THE FOLLOWING BULLET POINTS MUST BE OBSERVED WHEN INSTALLING THE UNIT.

IMPORTANT NOTE: Remove wood shipping rails and metal shipping brace (if applicable) prior to installation of the unit on a roof curb.

ALL INSTALLATIONS:

NOTE: Appliance is shipped from factory for vertical duct application.
Proper installation of the unit ensures trouble-free operation. Improper installation can result in problems ranging from noisy operation to property or equipment damages, dangerous conditions that could result in injury or personal property damage. Give this booklet to the user and explain it's provisions. The user should retain these instructions for future reference.

- For proper flame pattern within the heat exchanger and proper condensate drainage, the unit must be mounted level.
- The flue outlet must be at least 12 inches from any opening through which flue gases could enter a building, and at least three feet above any forced air inlet located within ten feet. The economizer/manual fresh air intake/ motorized fresh air intake and combustion air inlet mounted on the unit are not affected by this restriction.
- To avoid possible corrosion of the heat exchanger, do not locate the unit in an area where the outdoor air (i.e. combustion air for the unit) will be frequently contaminated by compounds containing chlorine or fluorine. Common sources of such compounds include swimming pool chemicals and chlorine bleaches, paint stripper, adhesives, paints, varnishes, sealers, waxes (which are not yet dried) and solvents used during construction and remodeling. Various commercial and industrial processes may also be sources of chlorine/fluorine compounds.
- To avoid possible illness or death of the building occupants, do NOT locate outside air intake device (economizer, manual fresh air intake, motorized fresh air intake) too close to an exhaust outlet, gas vent termination, or plumbing vent outlet. For specific distances required, consult local codes.
- Allow minimum clearances from the enclosure for fire protection, proper operation, and service access (see unit clearances). These clearances must be permanently maintained.
- The combustion air inlet and flue outlet on the unit must never be obstructed. If used, do not allow the economizer/manual fresh air damper/ motorized fresh air damper to become blocked by snow or debris. In some climates or locations, it may be necessary to elevate the unit to avoid these problems.
- When the unit is heating, the temperature of the return air entering the unit must be between 50° F and 100° F.

GROUND LEVEL INSTALLATIONS ONLY:

- When the unit is installed on the ground adjacent to the building, a level concrete (or equal) base is recommended. Prepare a base that is 3" larger than the package unit footprint and a minimum of 3" thick.
- The base should also be located where no runoff of water from higher ground can collect in the unit.

ROOF TOP INSTALLATIONS ONLY:

- To avoid possible property damage or personal injury, the roof must have sufficient structural strength to carry the weight of the unit(s) and snow or water loads as required by local codes. Consult a structural engineer to determine the weight capabilities of the roof.
- The unit may be installed directly on wood floors or on Class A, Class B, or Class C roof covering material.
- To avoid possible personal injury, a safe, flat surface for service personnel should be provided.
- As indicated on the unit data plate, a minimum clearance of 36" to any combustible material is required on the furnace access side of the unit. All combustible materials must be kept out of this area.
- This 36" clearance must also be maintained to insure proper combustion air and flue gas flow. The combustion air intake and furnace flue discharge must not be blocked for any reason, including blockage by snow.
- Adequate clearances from the furnace flue discharge to any adjacent public walkways, adjacent buildings, building openings or openable windows must be maintained in accordance with the latest edition of the National Fuel Gas Code (ANSI Z223.1)
- Minimum horizontal clearance of 48" from the furnace flue discharge to any electric meters, gas meters, regulators and relief equipment is required.

UNIT PRECAUTIONS

- Do not stand or walk on the unit.
- Do not drill holes anywhere in panels or in the base frame of the unit except where indicated. Unit access panels provide structural support.
- Do not remove any access panels until unit has been installed on roof curb or field supplied structure.
- Do not roll unit across finished roof without prior approval of owner or architect.
- Do not skid or slide on any surface as this may damage unit base. The unit must be stored on a flat, level surface. Protect the condenser coil because it is easily damaged.

PRODUCT DESIGN

ROOF CURB INSTALLATIONS ONLY:

Curb installations must comply with local codes and should be done in accordance with the established guidelines of the National Roofing Contractors Association.

Proper unit installation requires that the roof curb be firmly and permanently attached to the roof structure. Check for adequate fastening method prior to setting the unit on the curb.

Full perimeter roof curbs are available from the factory and are shipped unassembled. Field assembly, squaring, leveling and mounting on the roof structure are the responsibility of the installing contractor. All required hardware necessary for the assembly of the sheet metal curb is included in the curb accessory.

⚠ WARNING

TO PREVENT POSSIBLE EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH, THE FOLLOWING BULLET POINTS MUST BE OBSERVED WHEN INSTALLING THE UNIT.

- Sufficient structural support must be determined prior to locating and mounting the curb and package unit.
- Ductwork must be constructed using industry guidelines. The duct work must be placed into the roof curb before mounting the package unit. Our full perimeter curbs include duct connection frames to be assembled with the curb. Cantilevered type curbs are not available from the factory.
- Curb insulation, cant strips, flashing and general roofing material are furnished by the contractor.

The curbs must be supported on parallel sides by roof members. The roof members must not penetrate supply and return duct opening areas as damage to the unit might occur.

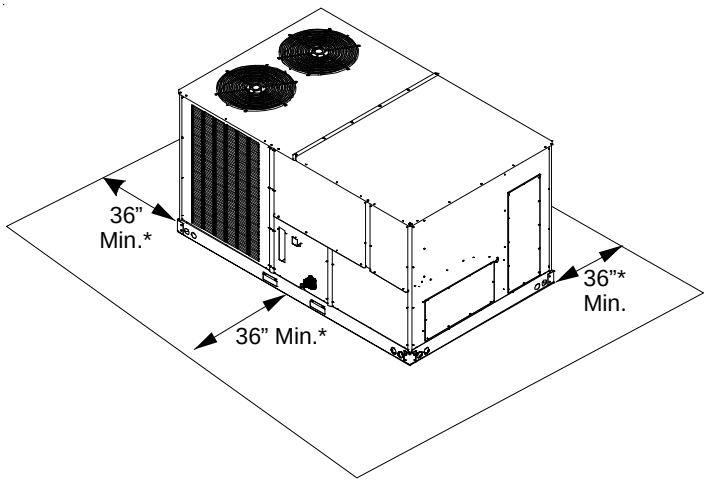
NOTE: The unit and curb accessories are designed to allow vertical duct installation before unit placement. Duct installation after unit placement is not recommended.

⚠ CAUTION

ALL CURBS LOOK SIMILAR. TO AVOID INCORRECT CURB POSITIONING, CHECK JOB PLANS CAREFULLY AND VERIFY MARKINGS ON CURB ASSEMBLY. INSTRUCTIONS MAY VARY IN CURB STYLES AND SUPERCEDE INFORMATION SHOWN.

See the manual shipped with the roof curb for assembly and installation instructions.

CLEARANCES



**In situations that have multiple units, a 48" minimum clearance is required between the condenser coils.*

UNIT CLEARANCES

Adequate clearance around the unit should be kept for safety, service, maintenance, and proper unit operation. A total clearance of 75" on the main control panel side of the unit is recommended to facilitate possible fan shaft, coil, electric heat and gas furnace removal. A clearance of 48" is recommended on all other sides of the unit to facilitate possible compressor removal, to allow service access and to insure proper ventilation and condenser airflow. The unit must not be installed beneath any obstruction. The unit should be installed remote from all building exhausts to inhibit ingestion of exhaust air into the unit fresh air intake.

PROTRUSION

Inspect curb to ensure that none of the utility services (electric) routed through the curb protrude above the curb.

⚠ CAUTION

IF PROTRUSIONS EXIST, DO NOT ATTEMPT TO SET UNIT ON CURB. INFORMATION SHOWN.

ELECTRICAL WIRING

⚠ WARNING

HIGH VOLTAGE !

DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

PRODUCT DESIGN

⚠ WARNING

HIGH VOLTAGE !

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DO NOT TAMPER WITH FACTORY WIRING. THE INTERNAL POWER AND CONTROL WIRING OF THESE UNITS ARE FACTORY-INSTALLED AND HAVE BEEN THOROUGHLY TEST PRIOR TO SHIPMENT. CONTACT YOUR LOCAL REPRESENTATIVE IF ASSISTANCE IS REQUIRED.

⚠ CAUTION

TO PREVENT DAMAGE TO THE WIRING, PROTECT WIRING FROM SHARP EDGES. FOLLOW NATIONAL ELECTRICAL CODE AND ALL LOCAL CODES AND ORDINANCES. DO NOT ROUTE WIRES THROUGH REMOVABLE ACCESS PANELS.

⚠ CAUTION

CONDUIT AND FITTINGS MUST BE WEATHER-TIGHT TO PREVENT WATER ENTRY INTO THE BUILDING.

For unit protection, use a fuse or HACR circuit breaker that is in excess of the circuit ampacity, but less than or equal to the maximum overcurrent protection device. DO NOT EXCEED THE MAXIMUM OVERCURRENT DEVICE SIZE SHOWN ON UNIT DATA PLATE.

All line voltage connections must be made through weatherproof fittings. All exterior power supply and ground wiring must be in approved weatherproof conduit.

The main power supply wiring to the unit and low voltage wiring to accessory controls must be done in accordance with these instructions, the latest edition of the National Electrical Code (ANSI/NFPA 70), and all local codes and ordinances. All field wiring shall conform with the temperature limitations for Type T wire (63°F/35°C rise).

The main power supply shall be three-phase, three wire. The unit is factory wired for the voltage shown on the unit's data plate.

Main power wiring should be sized for the minimum wire ampacity shown on the unit's database. Size wires in accordance with the ampacity tables in Article 310 of the National Electrical Code. If long wires are required, it may be necessary to increase the wire size to prevent excessive voltage drop. Wires should be sized for a maximum of 3% voltage drop.

⚠ CAUTION

TO AVOID PROPERTY DAMAGE OR PERSONAL INJURY DUE TO FIRE, USE ONLY COPPER CONDUCTORS.

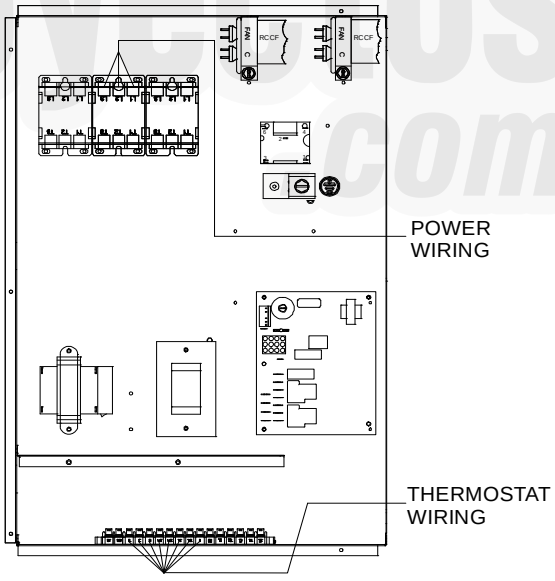
⚠ CAUTION

TO PREVENT IMPROPER AND DANGEROUS OPERATION DUE TO WIRING ERRORS, LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. VERIFY PROPER OPERATION AFTER SERVICING.

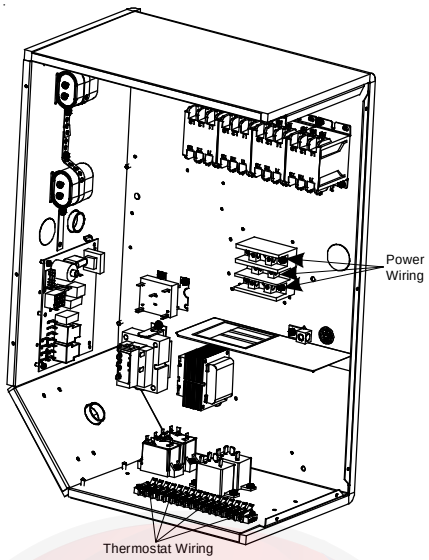
NOTE: A weather-tight disconnect switch, properly sized for the unit total load, must be field or factory installed. An external field supplied disconnect may be mounted on the exterior panel.

Ensure the data plate is not covered by the field-supplied disconnect switch.

- Some disconnect switches are not fused. Protect the power leads at the point of distribution in accordance with the unit data plate.
- The unit must be electrically grounded in accordance with local codes or, in the absence of local codes, with the latest edition of the National Electrical Code (ANSI-NFPA 70). A ground lug is provided for this purpose. Size grounding conductor in accordance with Table 250-95 of the National Electrical Code. Do not use the ground lug for connecting a neutral conductor.
- Connect power wiring to the middle contactor within the main control box or to electrical power block if equipped.



PRODUCT DESIGN



Power and Low Voltage Block Locations for 2 Speed Models

WARNING

FAILURE OF UNIT DUE TO OPERATION ON IMPROPER LINE VOLTAGE OR WITH EXCESSIVE PHASE UNBALANCE CONSTITUTES PRODUCT ABUSE AND MAY CAUSE SEVERE DAMAGE TO THE UNIT ELECTRICAL COMPONENTS.

AREAS WITHOUT CONVENIENCE OUTLET

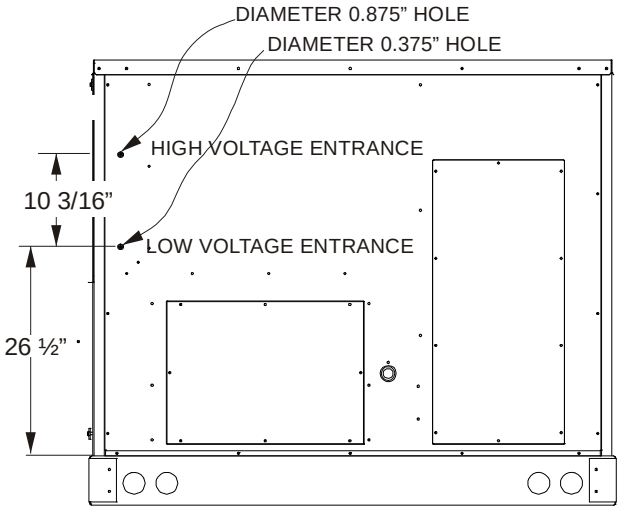
It is recommended that an independent 115V power source be brought to the vicinity of the roof top unit for portable lights and tools used by the service mechanic.

NOTE: Refer to local codes for requirements. These outlets can also be factory installed.

UNITS INSTALLED ON ROOF TOPS

Main power and low voltage wiring may enter the unit through the side or through the roof curb. Install conduit connectors at the desired entrance locations. External connectors must be weatherproof. All holes in the unit base must be sealed (including those around conduit nuts) to prevent water leakage into building. All required conduit and fittings are to be field supplied.

Supply voltage to roof top unit must not vary by more than 10% of the value indicated on the unit data plate. Phase voltage unbalance must not exceed 2%. Contact your local power company for correction of improper voltage or phase unbalance.



ELECTRICAL ENTRANCE LOCATIONS

Unit is equipped with a Low Voltage Terminal Block and has Single Point wiring to the contactor or power block if equipped.

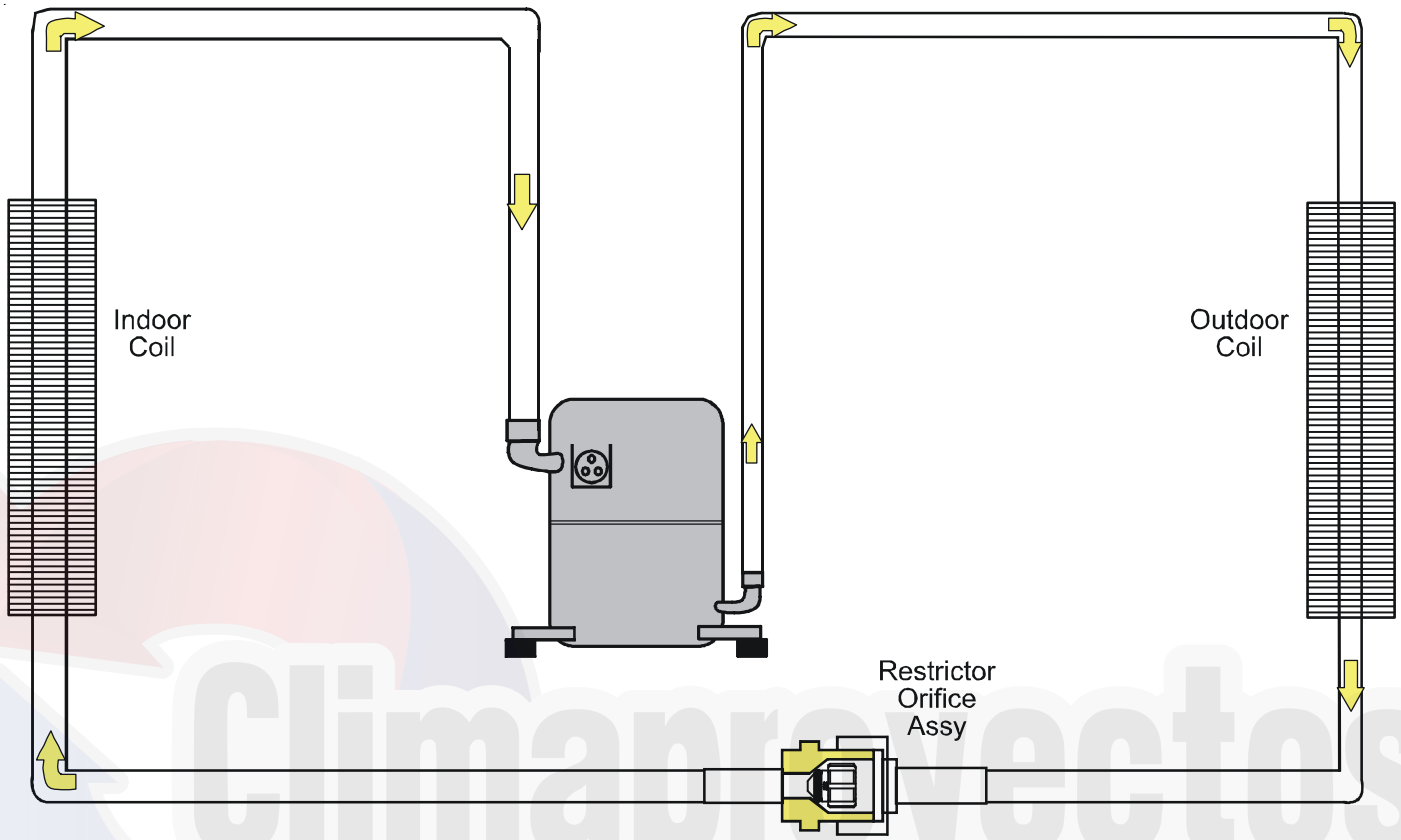
LOW VOLTAGE CONTROL WIRING

1. A 24V thermostat must be installed for unit operation. It may be purchased with the unit or field -supplied. Thermostats may be programmable or electromechanical as required.
2. Locate thermostat or remote sensor in the conditioned space where it will sense average temperature. Do not locate the device where it may be directly exposed to supply air, sunlight or other sources of heat. Follow installation instructions packaged with the thermostat.
3. Use #18 AWG wire for 24V control wiring runs not exceeding 75 feet. Use #16 AWG wire for 24V control wiring runs not exceeding 125 feet. Use #14 AWG wire for 24V control wiring runs not exceeding 200 feet. Low voltage wiring may be National Electrical Code (NEC) Class 2 where permitted by local codes.
4. Route thermostat wires from sub-base terminals to the unit. Control wiring should enter through the duct panel hole entrance locations or through the roof curb. Connect thermostat and any accessory wiring to low voltage terminal block TB1 in the main control box.

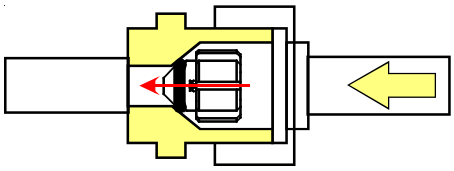
NOTE: Field-supplied conduit may need to be installed depending on unit/curb configuration. Use #18 AWG solid conductor wire whenever connecting thermostat wires to terminals on sub-base. DO NOT use larger than #18 AWG wire. A transition to #18 AWG wire may be required before entering thermostat sub-base.

NOTE: Refer to unit wiring diagrams for thermostat hookups.

Typical Package Cooling or Package Gas

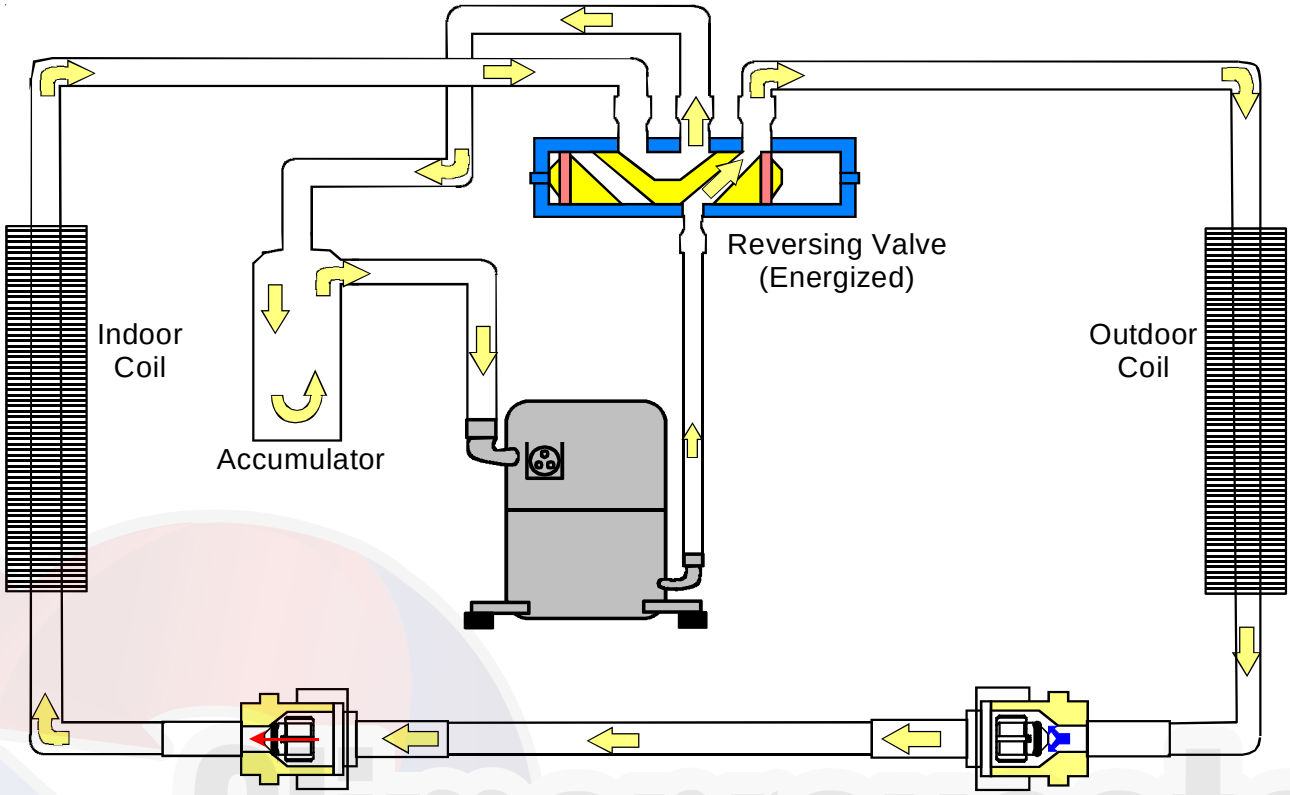


Restrictor Orifice Assembly in Cooling Operation

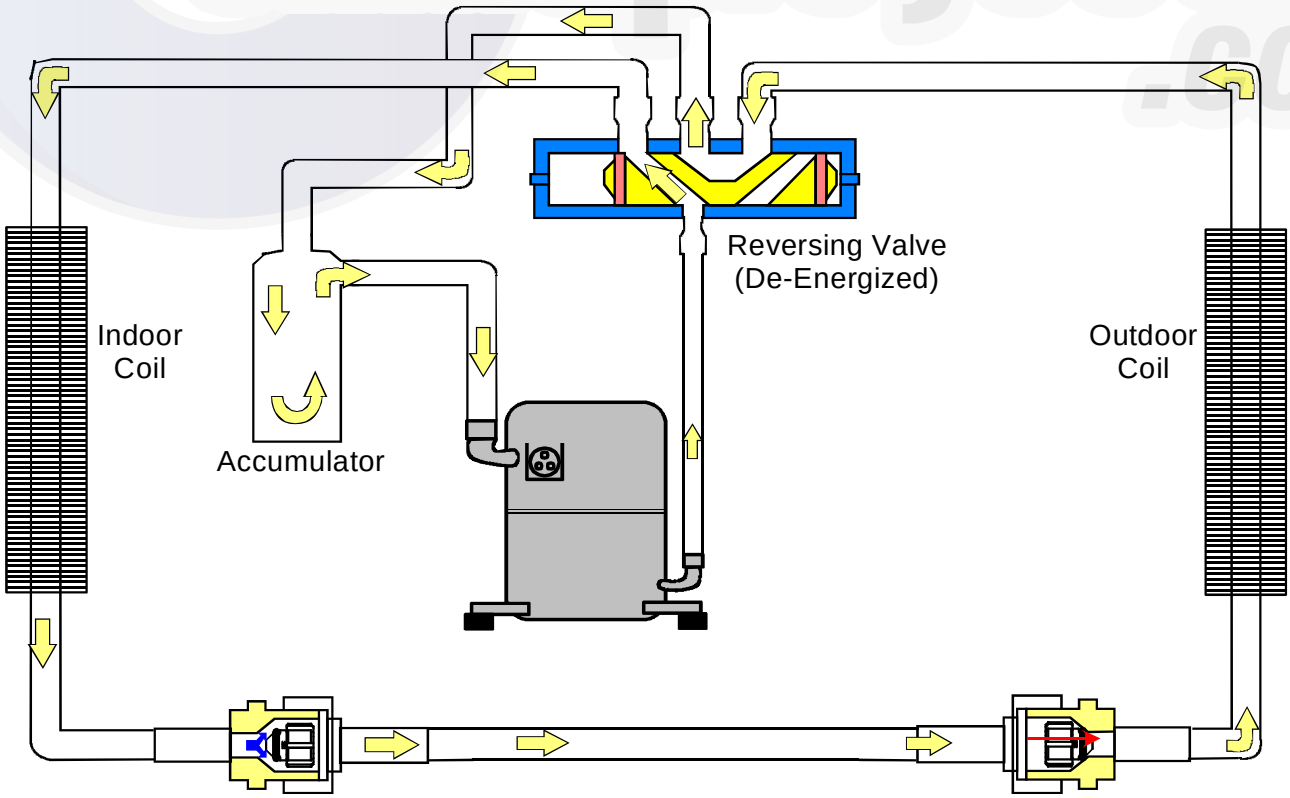


In the cooling mode the orifice is pushed into its seat forcing refrigerant to flow through the metered hole in the center of the orifice.

Typical Package Heat Pump



COOLING CYCLE



HEATING CYCLE

SYSTEM OPERATION

CIRCULATING AIR AND FILTERS

Ductwork

The supply duct should be provided with an access panel large enough to inspect the air chamber downstream of the heat exchanger. A cover should be tightly attached to prevent air leaks.

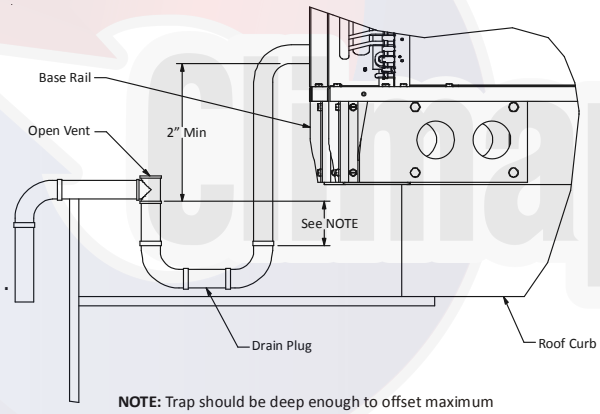
Ductwork dimensions are shown in the roof curb installation manual.

If desired, supply and return duct connections to the unit may be made with flexible connections to reduce possible unit operating sound transmission.

CONDENSATE DRAIN CONNECTION

Condensate Drain Connection

A 3/4" female NPT drain connection is supplied on the end of the unit and bottom of the drain pan for condensate piping. An external trap must be installed for proper condensate drainage



NOTE: Trap should be deep enough to offset maximum unit static difference. A minimum 4" trap is recommended.

Drain Connection

Install condensate drain trap as shown. Use 3/4" drain line and fittings or larger. Do not operate without trap.

Horizontal Drain

Drainage of condensate directly onto the roof may be acceptable; refer to local code. It is recommended that a small drip pad of either stone, mortar, wood or metal be provided to prevent any possible damage to the roof.

Cleaning

Due to the fact that drain pans in any air conditioning unit will have some moisture in them, algae and fungus will grow due to airborne bacteria and spores. Periodic cleaning is necessary to prevent this build-up from plugging the drain.

STARTUP, ADJUSTMENTS, AND CHECKS

⚠ WARNING

HIGH VOLTAGE!

To avoid personal injury or death due to electrical shock, bond the frame of this unit to the building electrical ground by use of the grounding terminal provided or other acceptable means. Disconnect all power before servicing or installing this unit.

⚠ CAUTION

To prevent property damage or personal injury, Do not start the unit until all necessary pre-checks and test have been performed.

⚠ WARNING

MOVING MACHINERY HAZARD!

To prevent possible personal injury or death, disconnect power to the unit and padlock in the "OFF" position before servicing fans.

Contractor Responsibility

The installing contractor must be certain that:

- All supply and return air ductwork is in place, properly sealed, and corresponds with installation instructions.
- All thermostats are mounted and wired in accordance with installation instructions.
- All electric power, all gas, hot water or steam line connections, and the condensate drain installation have been made to each unit on the job. These main supply lines must be functional and capable of operating all units simultaneously.
- Requirements are met for venting and combution air.
- Air filters are in place.
- Input rate and temperature rise are adjusted per rating plate.
- Return air temperature is maintained between 55°F (13°C) and 80°F (27°C).

Roof Curb Installation Check

Inspect the roof curb for correct installation. The unit and curb assembly should be level. Inspect the flashing of the roof mounting curb to the roof, especially at the corners, for good workmanship. Also check for leaks around gaskets. Note any deficiencies in a separate report and forward to the contractor.

SYSTEM OPERATION

Obstructions, Fan Clearance and Wiring

Remove any extraneous construction and shipping materials that may be found during this procedure. Rotate all fans manually to check for proper clearances and that they rotate freely. Check for bolts and screws that may have jarred loose during shipment to the job site. Retighten if necessary. Re-tighten all electrical connections.

Field Duct Connections

Verify that all duct connections are tight and that there is no air bypass between supply and return.

Filter Section Check

Remove filter section access panels and check that filters are properly installed. Note airflow arrows on filter frames.

AIR FLOW ADJUSTMENTS

When the final adjustments are complete, the current draw of the motor should be checked and compared to the full load current rating of the motor. The amperage must not exceed the service factor stamped on the motor nameplate. The total airflow must not be less than that required for operation of the electric heaters or the furnace.

If an economizer is installed, check the unit operating balance with the economizer at full outside air and at minimum outside air.

NOTE: Aiflow setting below 300 CFM /Ton is not recommended, as evaporator freezing or poor unit performance is possible.

Set Evaporator Fan Rpm

Actual RPM's must be set and verified with a tachometer or strobe light. With disconnect switch open, disconnect thermostat wires from terminals Y and W. This will prevent heating and mechanical cooling from coming on. Place a jumper wire across terminals R and G at TB1 terminal block. Close disconnect switch; evaporator fan motor will operate so RPM can be checked.

For gas heat units, the airflow must be adjusted so that the air temperature rise falls within the ranges given stated on Data Plate.

Evaporator Fan Rotation Check (Three Phase Models Only)

Check that fan rotates clockwise when viewed from the drive side of unit and in accordance with rotation arrow shown on blower housing. If it does not, reverse any two incoming power cables at Single Point Power Block. In this case, repeat bearing check.

Do not attempt to change load side wiring. Internal wiring assures all motors and compressors will rotate in correct direction once evaporator fan motor rotation check has been made.

Electrical Input Check

Make preliminary check of evaporator fan ampere draw and verify that motor nameplate amps are not exceeded. A final check of amp draw should be made upon completion of air balancing of the duct system .

BELT DRIVE MODELS ONLY

The drive on the supply fan is typically set in the middle of the RPM range. The drive motor sheave pitch diameter is field adjustable for the required airflow.

Upon completion of the air flow balancing, we recommend replacing the variable pitched motor sheave with a properly-sized fixed sheave. A matching fixed sheave will provide longer belt and bearing life and vibration free operation. Initially, it is best to have a variable pitched motor sheave for the purpose of airflow balancing, but once the balance has been achieved, fixed sheaves maintain alignment and minimize vibration more effectively. For direct drive units, move fan speed wire.

NORMAL SEQUENCE OF OPERATION

Cooling

Begin with power turned off at all disconnects.

1. Turn thermostat system switch to "Cool," and fan switch to "Auto" and turn temperature setting as high as it will go.
2. Inspect all registers and set them to the normal open position.
3. Turn on the electrical supply at the disconnect.
4. Turn the fan switch to the "ON" position. The blower should operate after a 7 second delay.
5. Turn the fan switch to "Auto" position. The blower should stop after a 65 second delay.
6. Slowly lower the cooling temperature until first stage COOL (LOW COOL) starts. The blower, both fans, and first stage compressor should now be operating. Allow the unit to run 10 minutes, make sure cool air is being supplied by the unit.
7. Lower the cooling temperature further until second stage COOL (HIGH COOL) starts. The blower, both fans, and both compressors should now be operating. Allow the unit to run 10 minutes, make sure cool air is being supplied by the unit.
8. Turn the temperature setting to the highest position, stopping the unit. The indoor blower will continue to run for 65 seconds.
9. Turn the thermostat system switch to "OFF" and disconnect all power when servicing the unit.

SYSTEM OPERATION

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

HEAT PUMP

10. Check the cooling mode for the heat pump in the same manner as above. The reversing valve is energized when the thermostat is placed in the cooling position. A clicking sound should be noticeable from the reversing valve. By lowering the temperature setting to call for cooling, the contractor is energized. The compressor, blower and fan should then be running. After the cooling mode is checked out, turn the thermostat system switch to "OFF**".**
11. Turn the thermostat system switch to "HEAT" and fan switch to "AUTO**".**
12. Slowly raise the heating temperature setting. When the heating first stage makes contact, stop raising the temperature setting.. The compressor, blower and fan should now be running with the reversing valve in the de-energized (heating) position. After giving the unit time to settle out, make sure the unit is supplying heated air.
13. If the outdoor ambient is above 80°F, the unit may trip on its high pressure cut out when on heating. The compressor should stop. The heating cycle must be thoroughly checked, so postpone the test to another day when conditions are more suitable but-DO NOT FAIL TO TEST.

    If the outdoor ambient is low and the unit operates properly on the heating cycle, you may check the pressure cutout operation by blocking off the indoor return air until the unit trips.
14. If unit operates properly in the heating cycle, raise the temperature setting until the heating second stage makes contact. Supplemental resistance heat, if installed should now come on. Make sure it operates properly.

    NOTE: If outdoor thermostats are installed the outdoor ambient must be below the set point of these thermostats for the heaters to operate. It may be necessary to jumper these thermostats to check heater operation if outdoor ambient is mild.
15. For thermostats with emergency heat switch, return to step 11. The emergency heat switch is located at the bottom of the thermostat. Move the switch to emergency heat. The heat pump will stop, the blower will continue to run, all heaters will come on and the thermostat emergency heat light will come on.
16. If checking the unit in the wintertime, when the outdoor coil is cold enough to actuate the defrost control, observe at least one defrost cycle to make sure the unit defrosts completely.

HEAT PUMP OPERATION

COOLING CYCLE

When the heat pump is in the cooling cycle, it operates exactly as a Summer Air Conditioner unit. In this mode, all the charts and data for service that apply to summer air conditioning apply to the heat pump. Most apply on the heating cycle except that "condenser" becomes "evaporator", "evaporator" becomes "condenser", "cooling" becomes "heating".

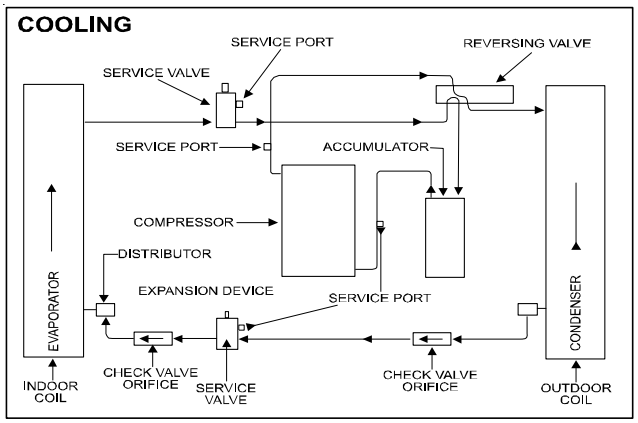
HEATING CYCLE

The heat pump operates in the heating cycle by redirecting refrigerant flow through the refrigerant circuit external to the compressor. This is accomplished with through the reversing valve. Hot discharge vapor from the compressor is directed to the indoor coil (evaporator on the cooling cycle) where the heat is removed, and the vapor condenses to liquid. It then goes through the expansion device to the outdoor coil (condenser on the cooling cycle) where the liquid is evaporated, and the vapor goes to the compressor.

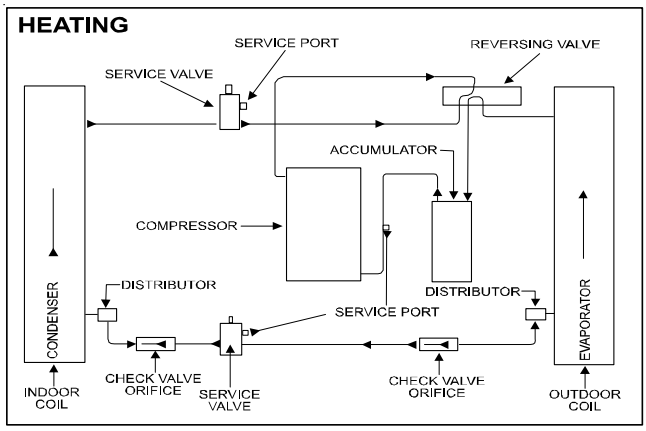
When the solenoid valve coil is operated either from heating to cooling or vice versa, the piston in the reversing valve to the low pressure (high pressure) reverse positions in the reversing valve.

The following figures show a schematic of a heat pump on the cooling cycle and the heating cycle. In addition to a reversing valve, a heat pump is equipped with an expansion device and check valve for the indoor coil, and similar equipment for the outdoor coil. It is also provided with a defrost control system.

The expansion devices are flowrator distributors and perform the same function on the heating cycle as on the cooling cycle. The flowrator distributors also act as check valves to allow for the reverse of refrigerant flow.



SYSTEM OPERATION



When the heat pump is on the heating cycle, the outdoor coil is functioning as an evaporator. The temperature of the refrigerant in the outdoor coil must be below the temperature of the outdoor air in order to extract heat from the air. Thus, the greater the difference in the outdoor temperature and the outdoor coil temperature, the greater the heating capacity of the heat pump. This phenomenon is a characteristic of a heat pump. It is a good practice to provide supplementary heat for all heat pump installations in areas where the temperature drops below 45° F. It is also a good practice to provide sufficient supplementary heat to handle the entire heating requirement should there be a component failure of the heat pump, such as a compressor, or refrigerant leak, etc.

Since the temperature of the refrigerant in the outdoor coil on the heating cycle is generally below freezing point, frost forms on the surfaces of the outdoor coil under certain weather conditions of temperature and relative humidity. Therefore, it is necessary to reverse the flow of the refrigerant to provide hot gas in the outdoor coil to melt the frost accumulation. This is accomplished by reversing the heat pump to the cooling cycle. At the same time, the outdoor fan stops to hasten the temperature rise of the outdoor coil and lessen the time required for defrosting. The indoor blower continues to run and the supplementary heaters are energized.

Defrost Control

NOTE: DCH models have one stage of mechanical heating. The defrost accumulation period will start when either first or second stage defrost thermostat closes. Defrost termination occurs when both thermostats open or the 10 minute cycle has completed.

During operation the power to the circuit board is controlled by a temperature sensor, which is clamped to a feeder tube entering the outdoor coil. Defrost timing periods of 30,60 and 90 minutes may be selected by connecting the circuit board jumper to 30, 60 and 90 respectively. Accumulation of time for the timing period selected starts when the sensor closes (approximately 31° F), and when the wall thermostat calls for heat. At the end of the timing period, the unit's defrost cycle will be initiated provided the sensor remains closed. When the sensor opens (approximately 75° F), the defrost cycle is terminated and the timing period is reset. If the defrost cycle is not terminated due to the sensor temperature, a ten minute override interrupts the unit's defrost period.

Refrigeration System Checks

Ensure the hold-down bolts on the compressor are secure and have not vibrated loose during shipment. Check that vibration grommets have been installed. Visually check all piping and clamps. The entire refrigeration system has been factory charged and tested, making it unnecessary to field charge. Factory charges are shown on the unit nameplate.

Final System Checks

1. Check to see if all supply and return air grilles are adjusted and the air distribution system is balanced for the best compromise between heating and cooling.
2. Check for air leaks in the ductwork. See Sections on **Air Flow Adjustments.**
3. Make sure the unit is free of "rattles", and the tubing in the unit is free from excessive vibration. Also make sure tubes or lines are not rubbing against each other or sheet metal surfaces or edges. If so, correct the trouble.
4. Set the thermostat at the appropriate setting for cooling and heating or automatic changeover for normal use.
5. Be sure the Owner is instructed on the unit operation, filter, servicing, correct thermostat operation, etc.

SCHEDULED MAINTENANCE

MAINTENANCE

⚠ WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

⚠ WARNING

TO PREVENT PERSONAL INJURY OR DEATH DUE TO IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE, REFER TO THIS MANUAL. FOR ADDITIONAL ASSISTANCE OR INFORMATION, CONSULT A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.

⚠ CAUTION

SHEET METAL PARTS, SCREWS, CLIPS AND SIMILAR ITEMS INHERENTLY HAVE SHARP EDGES, AND IT IS NECESSARY THAT THE INSTALLER AND SERVICE PERSONNEL EXERCISE CAUTION.

Preventive maintenance is the best way to avoid unnecessary expense and inconvenience. Have this system inspected at regular intervals by qualified service personnel, at least twice a year. Routine maintenance should cover the following items:

1. Tighten all belts, set screws, and wire connections.
2. Clean evaporator and condenser coils mechanically or with cold water, if necessary. Usually any fouling is only matted on the entering air face of the coil and can be removed by brushing.
3. Lubricate motor bearings.
4. Align or replace belts as needed.
5. Replace filters as needed (see below).
6. Check for blockage of condensate drain.
7. Check power and control voltages.
8. Check running amperage.
9. Check operating temperatures and pressures.
10. Check and adjust temperature and pressure controls.
11. Check and adjust damper linkages.
12. Check operation of all safety controls.
13. Examine gas furnaces (see below and the User's Information Manual).
14. Check condenser fans and tighten set screws.

FILTERS

⚠ CAUTION

TO PREVENT PROPERTY DAMAGE DUE TO FIRE AND LOSS OF EQUIPMENT EFFICIENCY OR EQUIPMENT DAMAGE DUE TO DUST AND LINT BUILD UP ON INTERNAL PARTS, NEVER OPERATE UNIT WITHOUT AN AIR FILTER INSTALLED IN THE RETURN AIR SYSTEM.

Every application may require a different frequency of replacement of dirty filters. Filters must be replaced at least every three (3) months during operating seasons.

Dirty filters are the most common cause of inadequate heating or cooling performance. Filter inspection should be made at least every two months; more often if necessary because of local conditions and usage.

Dirty throwaway filters should be discarded and replaced with a new, clean filter.

Disposable return air filters are supplied with this unit. See the unit Specification Sheet for the correct size and part number. To remove the filters, remove the filter access panel on return side of the unit.

CABINET FINISH MAINTENANCE

Use a fine grade automotive wax on the cabinet finish to maintain the finish's original high luster. This is especially important in installations with extended periods of direct sunlight.

CLEAN OUTSIDE COIL (QUALIFIED SERVICER ONLY)

The coil with the outside air flowing over it should be inspected annually and cleaned as frequently as necessary to keep the finned areas free of lint, hair and debris.

CONDENSER AND INDUCED DRAFT MOTORS

Bearings on the condenser fan motors and the combustion fan motor are permanently lubricated. No additional oiling is required.

LUBRICATION

The fan shaft bearings, the 1 to 2 HP supply fan motors, the condenser fan motors and compressors are permanently lubricated.

FUNCTIONAL PARTS

Refer to the unit Parts Catalog for a list of functional parts. Parts are available from your distributor.

COOLING ANALYSIS CHART

Complaint	No Cooling							Unsatisfactory Cooling					System Operating Pressures			Test Method Remedy	See Service Procedure Ref.
POSSIBLE CAUSE DOTS IN ANALYSIS GUIDE INDICATE "POSSIBLE CAUSE" SYMPTOM	System will not start	Compressor will not start - fan runs	Comp. and Cond. Fan will not start	Evaporator fan will not start	Condenser fan will not start	Compressor runs - goes off on overload	Compressor cycles on overload	System runs continuously - little cooling	Too cool and then too warm	Not cool enough on warm days	Certain areas too cool, others too warm	Compressor is noisy	Low suction pressure	High suction pressure	High head pressure		
Power Failure	●															Test Voltage	S-1
Blown Fuse	●		●	●												Inspect Fuse Size & Type	S-1
Unbalanced Power, 3PH		●				●	●									Test Voltage	S-1
Loose Connection	●			●		●										Inspect Connection - Tighten	S-2, S-3
Shorted or Broken Wires	●	●	●	●	●	●										Test Circuits With Ohmmeter	S-2, S-3
Open Fan Overload				●	●											Test Continuity of Overload	S-17A
Faulty Thermostat	●		●	●					●							Test Continuity of Thermostat & Wiring	S-3
Faulty Transformer	●		●													Check Control Circuit with Voltmeter	S-4
Shorted or Open Capacitor		●		●	●	●	●									Test Capacitor	S-15
Internal Compressor Overload Open		●														Test Continuity of Overload	S-17A
Shorted or Grounded Compressor		●				●										Test Motor Windings	S-17B
Compressor Stuck		●				●	●									Use Test Cord	S-17D
Faulty Compressor Contactor			●		●	●										Test Continuity of Coil & Contacts	S-7, S-8
Faulty Fan Relay				●												Test Continuity of Coil And Contacts	S-7
Open Control Circuit				●												Test Control Circuit with Voltmeter	S-4
Low Voltage		●				●	●									Test Voltage	S-1
Faulty Evap. Fan Motor				●									●			Repair or Replace	S-16
Shorted or Grounded Fan Motor					●										●	Test Motor Windings	S-16
Improper Cooling Anticipator							●		●							Check Resistance of Anticipator	S-3B
Shortage of Refrigerant							●	●					●			Test For Leaks, Add Refrigerant	S-101,103
Restricted Liquid Line							●	●					●		●	Remove Restriction, Replace Restricted Part	S-112
Dirty Air Filter								●		●	●		●			Inspect Filter-Clean or Replace	
Dirty Indoor Coil								●		●	●		●			Inspect Coil - Clean	
Insufficient air across Indoor Coil								●		●	●		●			Check Blower Speed and Rotation, Belt, Pulleys, Duct Static, Filter	S-200,205, 206, 207
Too much air across Indoor Coil														●		Reduce Blower Speed, Check Pulley Adjustment	S-205, 207
Overcharge of Refrigerant						●	●					●		●	●	Recover Part of Charge	S-113
Dirty Outdoor Coil						●	●	●		●					●	Inspect Coil - Clean	
Noncondensibles							●	●		●					●	Recover Charge, Evacuate, Recharge	S-114
Recirculation of Condensing Air							●	●		●					●	Remove Obstruction to Air Flow	
Infiltration of Outdoor Air								●		●	●					Check Windows, Doors, Vent Fans, Etc.	
Improperly Located Thermostat						●			●							Relocate Thermostat	
Air Flow Unbalanced									●		●					Readjust Air Volume Dampers	
System Undersized								●		●						Refigure Cooling Load	
Broken Internal Parts												●				Replace Compressor	S-115
Broken Valves								●				●		●		Test Compressor Efficiency	S-104
Inefficient Compressor								●						●		Test Compressor Efficiency	S-104
Expansion Device Restricted						●	●	●		●			●		●	Remove Restriction, Replace Expansion Device	111
Loose Hold-down Bolts												●				Tighten Bolts	
Flowrator Not Seating Properly								●						●		Check Flowrator & Seat or Replace Flowrator	S-111

● **Cooling Cycle**

SERVICING

Table of Contents

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

SERVICING

S-1 CHECKING VOLTAGE

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove doors, control panel cover, etc. from unit being tested.

With power ON:

WARNING

Line Voltage now present.

2. Using a voltmeter, measure the voltage across terminals L1 and L2 of the contactor for single phase units, and L3, for 3 phase units.
3. No reading - indicates open wiring, open fuse(s) no power or etc. from unit to fused disconnect service. Repair as needed.
4. With ample voltage at line voltage connectors, energize the unit.
5. Measure the voltage with the unit starting and operating, and determine the unit Locked Rotor Voltage.

   Locked Rotor Voltage is the actual voltage available at the compressor during starting, locked rotor, or a stalled condition. Measured voltage should be above minimum listed in chart below.

   To measure Locked Rotor Voltage attach a voltmeter to the run "R" and common "C" terminals of the compressor, or to the T_1 and T_2 terminals of the contactor. Start the unit and allow the compressor to run for several seconds, then shut down the unit. Immediately attempt to restart the unit while measuring the Locked Rotor Voltage.
6. Voltmeter should read within the voltage tabulation as shown. If the voltage falls below the minimum voltage, check the line wire size. Long runs of undersized wire can cause low voltage. If wire size is adequate, notify the local power company in regards to either low or high voltage.

Unit Supply Voltage		
Voltage	Min.	Max.
208/230	198	253
400	360	440
460	437	506
575	546	604

Three phase units require a balanced 3 phase power supply to operate. If the percentage of voltage imbalance exceeds 3% the unit must not be operated until the voltage condition is corrected.

$$\text{\% Voltage Imbalance} = \frac{\text{Max. Voltage Deviation From Average Voltage}}{\text{Average Voltage}} \times 100$$

To find the percentage of imbalance, measure the incoming power supply.

L1 - L2 = 240V
L1 - L3 = 232V
L2 - L3 = 238V
Total 710V

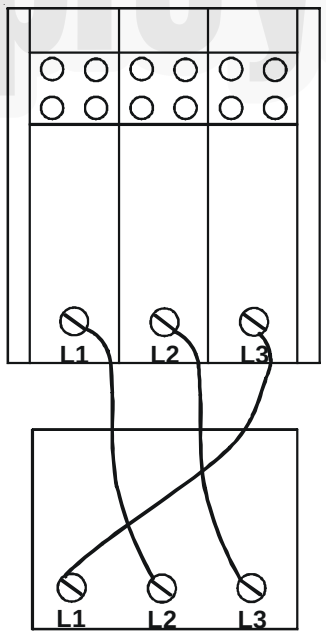
Avg. V = 710 / 3 = **236.7**

To find Max. deviation:
240 - 236.7 = +3.3
232 - 236.7 = **-4.7**
238 - 236.7 = +1.3

Max deviation was 4.7V

% Voltage Imbalance = 4.7 / 236.7 = **1.99%**

If the percentage of imbalance had exceeded 3%, it must be determined if the imbalance is in the incoming power supply or the equipment. To do this rotate the legs of the incoming power and retest voltage as shown below.



L1 - L2 = 240V
L1 - L3 = 227V
L2 - L3 = 238V

Rotate all 3 incoming legs as shown.

L1 - L2 = 227V
L1 - L3 = 238V
L2 - L3 = 240V

By the voltage readings we see that the imbalance rotated or traveled with the switching of the incoming legs. Therefore the imbalance lies within the incoming power supply.

If the imbalance had not changed then the problem would lie within the equipment. Check for current leakage, shorted motors, etc.

SERVICING

S-2 CHECKING WIRING

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Check wiring visually for signs of overheating, damaged insulation and loose connections.
2. Use an ohmmeter to check continuity of any suspected open wires.
3. If any wires must be replaced, replace with comparable gauge and insulation thickness.

S-3 CHECKING THERMOSTAT, WIRING, AND ANTICIPATOR

THERMOSTAT WIRE SIZING CHART	
LENGTH OF RUN	MIN. COPPER WIRE GAUGE (AWG)
25 feet	18
50 feet	16
75 feet	14
100 feet	14
125 feet	12
150 feet	12

S-3A THERMOSTAT AND WIRING

WARNING

Line Voltage now present.

With power ON, thermostat calling for cooling

1. Use a voltmeter to check for 24 volts at thermostat wires C and Y in the unit control panel.
2. No voltage indicates trouble in the thermostat or wiring.
3. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

Indoor Blower Motor

With power ON:

WARNING

Line Voltage now present.

1. Set fan selector switch at thermostat to "ON" position.
2. With voltmeter, check for 24 volts at wires C and G.
3. No voltage indicates the trouble is in the thermostat or wiring.
4. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

S-3B COOLING ANTICIPATOR

The cooling anticipator is a small heater (resistor) in the thermostat. During the "off" cycle, it heats the bimetal element helping the thermostat call for the next cooling cycle. This prevents the room temperature from rising too high before the system is restarted. A properly sized anticipator should maintain room temperature within 1 1/2 to 2 degree range.

The anticipator is supplied in the thermostat and is not to be replaced. If the anticipator should fail for any reason, the thermostat must be changed.

S-4 CHECKING TRANSFORMER AND CONTROL CIRCUIT

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

A step-down transformer (either 208-240, 460 or 575 volt primary to 24 volt secondary) is provided with each unit. This allows ample capacity for use with resistance heaters.

WARNING

Disconnect ALL power before servicing.

1. Remove control panel cover to gain access to transformer.

With power ON:

WARNING

Line Voltage now present.

2. Using a voltmeter, check voltage across secondary voltage side of transformer (R to C).
3. No voltage indicates faulty transformer, bad wiring, or bad splices.
4. Check transformer primary voltage at incoming line voltage connections and/or splices.

5 If line voltage available at primary voltage side of transformer and wiring and splices good, transformer is inoperative. Replace.

SERVICING

S-7 CHECKING CONTACTOR AND/OR RELAYS

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

The compressor contactor and other relay holding coils are wired into the low or line voltage circuits. When the control circuit is energized, the coil pulls in the normally open contacts or opens the normally closed contacts. When the coil is de-energized, springs return the contacts to their normal position.

NOTE: *Most single phase contactors break only one side of the line (L1), leaving 115 volts to ground present at most internal components.*

1. Remove the leads from the holding coil.
2. Using an ohmmeter, test across the coil terminals.

If the coil does not test continuous, replace the relay or contactor.

S-8 CHECKING CONTACTOR CONTACTS

SINGLE PHASE

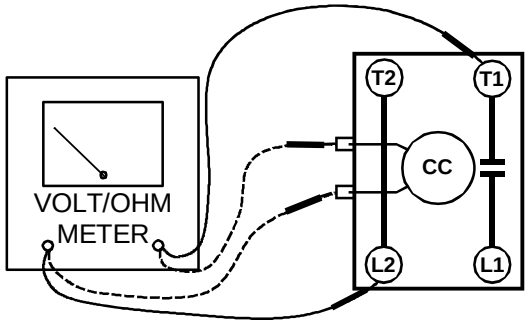
WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Disconnect the wire leads from the terminal (T) side of the contactor.
2. With power ON, energize the contactor.

WARNING

Line Voltage now present.



---- Ohmmeter for testing holding coil
—— Voltmeter for testing contacts

TESTING COMPRESSOR CONTACTOR
(Single Phase)

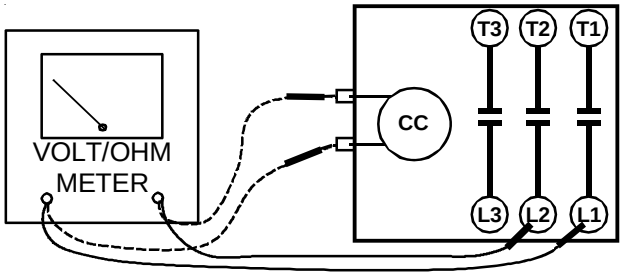
3. Using a voltmeter, test across terminals.
   A. L1 - L2 - No voltage. Check breaker or fuses on main power supply.
   B. L2 - T1 - No voltage indicates CC1 contacts open.

If a no voltage reading is obtained - replace the contactor.

THREE PHASE

Using a voltmeter, test across terminals.

A. L1-L2, L1-L3, and L2-L3 - If voltage is present, proceed to B. If voltage is not present, check breaker or fuses on main power supply..
B. T1-T2, T1-T3, and T2-T3 - If voltage readings are not the same as in "A", replace contactor.



---- Ohmmeter for testing holding coil
—— Voltmeter for testing contacts

TESTING COMPRESSOR CONTACTOR
(ThreePhase)

SERVICING

S-9 CHECKING FAN RELAY CONTACTS

DCG:

The fan relays are incorporated into the control board. See section S-313 for checking control board for single phase gas models.

For 3 phase and belt drive models, the procedure for testing the fan relay contacts will be the same as checking the compressor contactor contacts (See section S-8).

DCC/DCH:
The **E**lectronic **B**lower **T**ime **D**elay **R**elay is used on PSC and belt driven models.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

Checking EBTDR High Voltage Contacts

1. With power off, remove wires from terminals NC, COM, and NO.
2. Using a VOM, check for resistance from NO to COM. Should read open. Next, check for resistance from NC to COM. Should read closed.
3. If not as above, replace EBTDR.

Checking EBTDR Contact Operation

With power on:

WARNING

Line Voltage now present.

1. Set the thermostat to the fan "on" position.
2. Check for 24 volts at the C and G terminals of the EBTDR.
3. If no voltage present, check fan circuit from thermostat. If 24 volts present, proceed to step 4.
4. Using a VOM, check for line voltage from the purple wire at the transformer (terminal 3 on 240 volt units, terminal 2 on 208 volt units) to terminal NO on the EBTDR. Should read line voltage. If no voltage present, check line voltage wiring in unit. If line voltage present, proceed to step 5.
5. Using a VOM, check for line voltage from the purple wire at the transformer (terminal 3 on 240 volt units, terminal 2 on 208 volt units) to the COM terminal on the EBTDR. Should read line voltage. If not as above, replace EBTDR.

PSC equipped, single phase model coolers and heat pumps have an isolation relay with a 240 volt holding coil in addition to the EBTDR.

WARNING

Disconnect ALL power before servicing.

Turn power off.

Testing relay holding coil

1. Remove the leads from the holding coil terminals 1 and 3.
2. Using an ohmmeter, test across the coil terminals 1 and 3. If the coil does not test continuous, replace the relay.

Testing relay contacts

WARNING

Disconnect ALL power before servicing.

Turn power off.

1. Using a VOM, test resistance across relay terminals 2 and 4. Should read open.
2. Turn power on.

WARNING

Line Voltage now present.

3. Apply 240 volts to coil terminals 1 and 3.
4. Using a VOM, check for 240 volts from terminals 3 and 1 of relay. Should read 240 volts. In no voltage, check wiring from heater kit to relay. If voltage present, proceed to step 5.
5. Using a VOM, check for 240 volts from L1 at contactor to terminal 4 of relay. Should read 240 volts. Next check from L1 at contactor to terminal 2 of relay. Should read 240 volts.

If not as above, replace relay.

On the 5 ton units with the EEM motor, a standard fan relay is used.

WARNING

Disconnect ALL power before servicing.

Turn power off.

SERVICING

Testing relay holding coil

1. Remove the leads from the holding coil.
2. Using an ohmmeter, test across the coil terminals 1 and 3. If the coil does not test continuous, replace the relay.

Testing relay contacts

WARNING

Disconnect ALL power before servicing.

Turn power off.

1. Using a VOM, test resistance across relay terminals 2 and 4. Should read open.
2. Turn power on.

WARNING

Line Voltage now present.

3. Apply 24 volts to coil terminals 1 and 3.
4. Using a VOM, check for 24 volts from terminals 3 and 2 of relay. Should read 24 volts. If no voltage, check low voltage wiring from transformer to relay. If voltage present, proceed to step 5.
5. Using a VOM, check for 24 volts from terminals 3 and 4 of relay. Should read 24 volts.

If not as above, replace relay.

S-11 CHECKING LOSS OF CHARGE PROTECTOR

(Heat Pump Models)

The loss of charge protector senses the pressure in the liquid line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 22 PSIG. It will automatically cut-in (close) at approximately 50 PSIG.

Test for continuity using a VOM and if not as above, replace the control.

S-12 CHECKING HIGH PRESSURE CONTROL

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

The high pressure control senses the pressure in the discharge line. If abnormally high discharge pressures develop, the contacts of the control open, breaking the control circuit before the compressor motor overloads. This control is automatically reset.

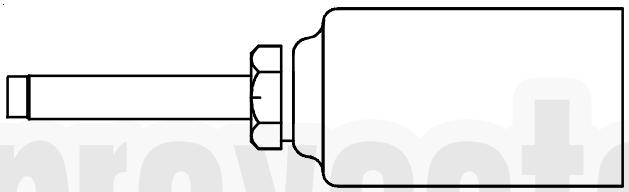
1. Using an ohmmeter, check across terminals of high pressure control, with wire removed. If not continuous, the contacts are open.
3. Attach a gauge to the access fitting on the liquid line.

With power ON:

WARNING

Line Voltage now present.

4. Start the system and place a piece of cardboard in front of the condenser coil, raising the condensing pressure.
5. Check pressure at which the high pressure control cuts-out.



If it cuts-out at 660 PSIG ± 10 PSIG, it is operating normally (See causes for high head pressure in Service Problem Analysis Guide). If it cuts out below this pressure range, replace the control. The control should reset at 420 PSIG ± 25 PSIG.

S-13 CHECKING LOW PRESSURE CONTROL

The low pressure control senses the pressure in the suction line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 22 PSIG ± 7 PSIG. It will automatically cut-in (close) at approximately 50 PSIG ± 7 PSIG.

Test for continuity using a VOM and if not as above, replace the control.

S-15 CHECKING CAPACITOR

CAPACITOR, RUN

A run capacitor is wired across the auxiliary and main windings of a single phase permanent split capacitor motor. The capacitors primary function is to reduce the line current while greatly improving the torque characteristics of a motor. This is accomplished by using the 90° phase relationship between the capacitor current and voltage in conjunction with the motor windings so that the motor will give two phase operation when connected to a single phase circuit. The capacitor also reduces the line current to the motor by improving the power factor.

SERVICING

CAPACITOR, START

SCROLL COMPRESSOR MODELS

Hard start components are not required on Scroll compressor equipped units due to a non-replaceable check valve located in the discharge line of the compressor. However hard start kits are available and may improve low voltage starting characteristics.

This check valve closes off high side pressure to the compressor after shut down allowing equalization through the scroll flanks. Equalization requires only about one or two seconds during which time the compressor may turn backwards.

Your unit comes with a 180-second anti-short cycle to prevent the compressor from starting and running backwards.

MODELS EQUIPPED WITH A HARD START DEVICE

A start capacitor is wired in parallel with the run capacitor to increase the starting torque. The start capacitor is of the electrolytic type, rather than metallized polypropylene as used in the run capacitor.

A switching device must be wired in series with the capacitor to remove it from the electrical circuit after the compressor starts to run. Not removing the start capacitor will overheat the capacitor and burn out the compressor windings.

These capacitors have a 15,000 ohm, 2 watt resistor wired across its terminals. The object of the resistor is to discharge the capacitor under certain operating conditions, rather than having it discharge across the closing of the contacts within the switching device such as the Start Relay, and to reduce the chance of shock to the servicer. See the Servicing Section for specific information concerning capacitors.

RELAY, START

A potential or voltage type relay is used to take the start capacitor out of the circuit once the motor comes up to speed. This type of relay is position sensitive. The normally closed contacts are wired in series with the start capacitor and the relay holding coil is wired parallel with the start winding. As the motor starts and comes up to speed, the increase in voltage across the start winding will energize the start relay holding coil and open the contacts to the start capacitor.

Two quick ways to test a capacitor are a resistance and a capacitance check.

S-15A RESISTANCE CHECK

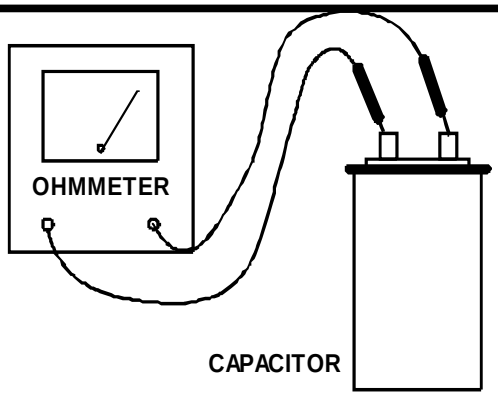
WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Discharge capacitor and remove wire leads.

WARNING

Discharge capacitor through a 20 to 30 OHM resistor before handling.

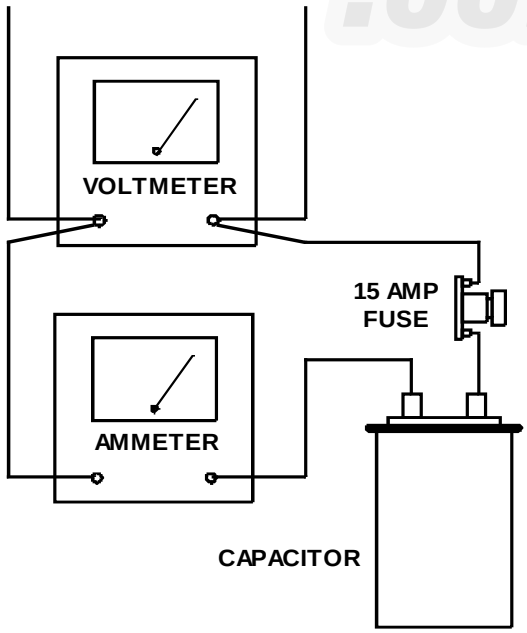


TESTING CAPACITOR RESISTANCE

2. Set an ohmmeter on its highest ohm scale and connect the leads to the capacitor -
   a. Good Condition - indicator swings to zero and slowly returns to infinity. (Start capacitor with bleed resistor will not return to infinity. It will still read the resistance of the resistor).
   b. Shorted - indicator swings to zero and stops there -replace.
   c. Open - no reading - replace. (Start capacitor would read resistor resistance.)

S-15B CAPACITANCE CHECK

Using a hookup as shown below, take the amperage and voltage readings and use them in the formula:



TESTING CAPACITANCE

SERVICING

WARNING

Discharge capacitor through a 20 to 30 OHM resistor before handling.

Capacitance (MFD) = $\frac{2650 \times Amperage}{Voltage}$

S-16 CHECKING MOTORS

S-16A CHECKING FAN AND BLOWER MOTOR WINDINGS (PSC MOTORS)

Applies only to units with PSC Motors

The auto reset fan motor overload is designed to protect the motor against high temperature and high amperage conditions by breaking the common circuit within the motor, similar to the compressor internal overload. However, heat generated within the motor is faster to dissipate than the compressor, allow at least 45 minutes for the overload to reset, then retest.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove the motor leads from its respective connection points and capacitor (if applicable).
2. Check the continuity between each of the motor leads.
3. Touch one probe of the ohmmeter to the motor frame (ground) and the other probe in turn to each lead.

If the windings do not test continuous or a reading is obtained from lead to ground, replace the motor.

S-17 CHECKING COMPRESSOR WINDINGS

WARNING

Hermetic compressor electrical terminal venting can be dangerous. When insulating material which supports a hermetic compressor or electrical terminal suddenly disintegrates due to physical abuse or as a result of an electrical short between the terminal and the compressor housing, the terminal may be expelled, venting the vapor and liquid contents of the compressor housing and system.

If the compressor terminal PROTECTIVE COVER and gasket (if required) are not properly in place and secured, there is a remote possibility if a terminal vents, that the vaporous and liquid discharge can be ignited, spouting flames several feet, causing potentially severe or fatal injury to anyone in its path.

This discharge can be ignited external to the compressor if the terminal cover is not properly in place and if the discharge impinges on a sufficient heat source.

Ignition of the discharge can also occur at the venting terminal or inside the compressor, if there is sufficient contaminant air present in the system and an electrical arc occurs as the terminal vents.

Ignition cannot occur at the venting terminal without the presence of contaminant air, and cannot occur externally from the venting terminal without the presence of an external ignition source.

Therefore, proper evacuation of a hermetic system is essential at the time of manufacture and during servicing.

To reduce the possibility of external ignition, all open flame, electrical power, and other heat sources should be extinguished or turned off prior to servicing a system.

S-17A RESISTANCE TEST

Each compressor is equipped with an internal overload.

The line break internal overload senses both motor amperage and winding temperature. High motor temperature or amperage heats the disc causing it to open, breaking the common circuit within the compressor on single phase units.

Heat generated within the compressor shell, usually due to recycling of the motor, high amperage or insufficient gas to cool the motor, is slow to dissipate. Allow at least three to four hours for it to cool and reset, then retest.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

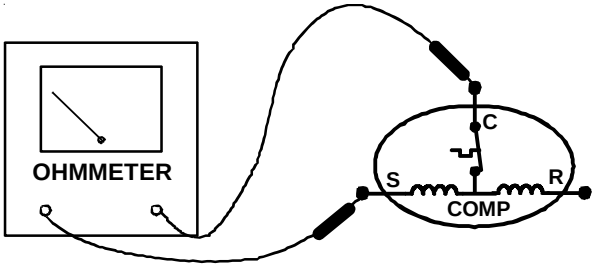
1. Remove the leads from the compressor terminals.

WARNING

See warnings S-17 before removing compressor terminal cover.

2. Using an ohmmeter, test continuity between terminals S-R, C-R, and C-S, on single phase units or terminals T1, T2 and T3, on 3 phase units.

SERVICING



TESTING COMPRESSOR WINDINGS

If either winding does not test continuous, replace the compressor.

NOTE: If an open compressor is indicated, allow ample time for the internal overload to reset before replacing compressor.

S-17B GROUND TEST

If fuse, circuit breaker, ground fault protective device, etc., has tripped, this is a strong indication that an electrical problem exists and must be found and corrected. The circuit protective device rating must be checked, and its maximum rating should coincide with that marked on the equipment nameplate.

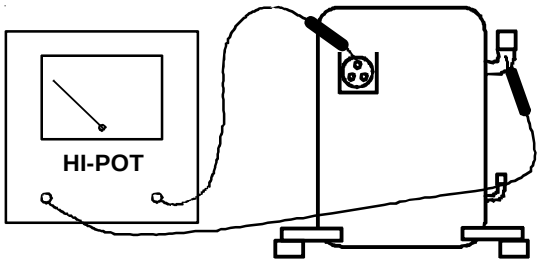
With the terminal protective cover in place, it is acceptable to replace the fuse or reset the circuit breaker ONE TIME ONLY to see if it was just a nuisance opening. If it opens again, DO NOT continue to reset.

WARNING

Disconnect ALL power before servicing.

Disconnect all power to unit, making sure that **all** power legs are open.

1. DO NOT remove protective terminal cover. Disconnect the three leads going to the compressor terminals at the nearest point to the compressor.
2. Identify the leads and using a Megger, Hi-Potential Ground Tester, or other suitable instrument which puts out a voltage between 300 and 1500 volts, check for a ground separately between each of the three leads and ground (such as an unpainted tube on the compressor). Do not use a low voltage output instrument such as a volt-ohmmeter.



COMPRESSOR GROUND TEST

3. If a ground is indicated, then carefully remove the compressor terminal protective cover and inspect for loose leads or insulation breaks in the lead wires.
4. If no visual problems indicated, carefully remove the leads at the compressor terminals.

WARNING

Damage can occur to the glass embedded terminals if the leads are not properly removed. This can result in terminal and hot oil discharging.

Carefully retest for ground, directly between compressor terminals and ground.

5. If ground is indicated, replace the compressor.

S-17D OPERATION TEST

If the voltage, capacitor, overload and motor winding test fail to show the cause for failure:

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove unit wiring from disconnect switch and wire a test cord to the disconnect switch.

NOTE: The wire size of the test cord must equal the line wire size and the fuse must be of the proper size and type.

2. With the protective terminal cover in place, use the three leads to the compressor terminals that were disconnected at the nearest point to the compressor and connect the common, start and run clips to the respective leads.
3. Connect good capacitors of the right MFD and voltage rating into the circuit as shown.
4. With power ON, close the switch.

WARNING

Line Voltage now present.

A. If the compressor starts and continues to run, the cause for failure is somewhere else in the system.

B. If the compressor fails to start - replace.

S-18 TESTING CRANKCASE HEATER (OPTIONAL ITEM)

Note: Not all compressors use crankcase heaters.
The crankcase heater must be energized a minimum of twenty-four (24) hours before the compressor is operated.

SERVICING

Crankcase heaters are used to prevent migration or accumulation of refrigerant in the compressor crankcase during the off cycles and prevents liquid slugging or oil pumping on start up. On some models, the crankcase heater is controlled by a crankcase heater thermostat that is wired in series with the crankcase heater.

A crankcase heater will not prevent compressor damage due to a floodback or over charge condition.

WARNING

Disconnect ALL power before servicing.

1. Disconnect the heater lead in wires.
2. Using an ohmmeter, check heater continuity - should test continuous. If not, replace.

S-18A CHECKING CRANKCASE HEATER THERMOSTAT

Note: Not all models with crankcase heaters will have a crankcase heater thermostat.

1. Install a thermocouple type temperature test lead on the discharge line adjacent to the crankcase heater thermostat.
2. Check the temperature at which the control closes its contacts by lowering the temperature of the control. The crankcase heater thermostat should close at 67°F ± 5°F.
3. Check the temperature at which the control opens its contacts by raising the temperature of the control. The crankcase heater thermostat should open at 85°F ± 5°F.
4. If not as above, replace control.

S-21 CHECKING REVERSING VALVE AND SOLENOID

Occasionally the reversing valve may stick in the heating or cooling position or in the mid-position.

When stuck in the mid-position, part of the discharge gas from the compressor is directed back to the suction side, resulting in excessively high suction pressure. An increase in the suction line temperature through the reversing valve can also be measured. Check operation of the valve by starting the system and switching the operation from COOLING to HEATING cycle.

If the valve fails to change its position, test the voltage (24V) at the valve coil terminals, while the system is on the COOLING cycle.

If no voltage is registered at the coil terminals, check the operation of the thermostat and the continuity of the connecting wiring from the "O" terminal of the thermostat to the unit.

If voltage is registered at the coil, tap the valve body lightly while switching the system from HEATING to COOLING, etc. If this fails to cause the valve to switch positions, remove the coil connector cap and test the continuity of the reversing valve solenoid coil. If the coil does not test continuous - replace it.

If the coil test continuous and 24 volts is present at the coil terminals, the valve is inoperative - replace it.

S-24 TESTING DEFROST CONTROL

To check the defrost control for proper sequencing, proceed as follows: With power ON; unit not running.

1. Jumper defrost thermostat by placing a jumper wire across the terminals "DFT" and "R" at defrost control board.
2. Connect jumper across test pins on defrost control board.
3. Set thermostat to call for heating. System should go into defrost within 21 seconds.
4. Immediately remove jumper from test pins.
5. Using VOM check for voltage across terminals "C & O". Meter should read 24 volts.
6. Using VOM check for voltage across fan terminals DF1 and DF2 on the board. You should read line voltage (208-230 VAC) indicating the relay is open in the defrost mode.
7. Using VOM check for voltage across "W2 & C" terminals on the board. You should read 24 volts.
8. If not as above, replace control board.
9. Set thermostat to off position and disconnect power before removing any jumpers or wires.

NOTE: Remove jumper across defrost thermostat before returning system to service.

S-25 TESTING DEFROST THERMOSTAT

1. Install a thermocouple type temperature test lead on the tube adjacent to the defrost control. Insulate the lead point of contact.
2. Check the temperature at which the control closes its contacts by lowering the temperature of the control. On 2 and 2.5 ton units, it should close at 34°F ± 5°F. On 3 thru 5 ton units, it should close at 31°F ± 3°F.
3. Check the temperature at which the control opens its contacts by raising the temperature of the control. On 2 and 2.5 ton units, it should open at 60°F ± 5°F. On 3 thru 5 ton units, it should open at 75°F ± 6°F.
4. If not as above, replace control.

SERVICING

TROUBLESHOOTING

THE FOLLOWING INFORMATION IS FOR USE BY QUALIFIED SERVICE AGENCY ONLY: OTHERS SHOULD NOT ATTEMPT TO SERVICE THIS EQUIPMENT.

Common Causes of Unsatisfactory Operation of Heat Pump on the Heating Cycle.

Inadequate Air Volume Through Indoor Coil

When a heat pump is in the heating cycle, the indoor coil is functioning as a condenser. The return air filter must always be clean, and sufficient air volume must pass through the indoor coil to prevent excessive discharge pressure, and high pressure cut out.

Outside Air into Return Duct

Do not introduce cold outside air into the return duct of a heat pump installation. For units with 2-speed motors, do not allow air entering the indoor coil to drop below 65° F. Air below this temperature will cause low discharge pressure, thus low suction pressure, and excessive defrost cycling resulting in low heating output. It may also cause false defrosting.

Undercharge

An undercharged heat pump on the heating cycle will cause low discharge pressure resulting in low suction pressure and frost accumulation on the outdoor coil.

Poor "Terminating" Sensor contact

The unit's defrost terminating sensor must make good thermal contact with the outdoor coil tubing. Poor contact may not terminate the unit's defrost cycle quickly enough to prevent the unit from cutting out on high discharge pressure.

Malfunctioning Reversing Valve - This may be due to:

1. **Solenoid not energized** - In order to determine if the solenoid is energized, touch the nut that holds the solenoid cover in place with a screwdriver. If the nut magnetically holds the screwdriver, the solenoid is energized and the unit is in the cooling cycle.
2. **No voltage at unit's solenoid** - Check unit voltage. If no voltage, check wiring circuit.
3. **Valve will not shift**:
   a. **Undercharged** - check for leaks;
   b. **Valve Body Damaged** - Replace valve;
   c. **Unit Properly Charged** - If it is on the heating cycle, raise the discharge pressure by restricting airflow through the indoor coil. If the valve does not shift, tap it **lightly** on both ends with a screwdriver handle. **DO NOT TAP THE VALVE BODY**. If the unit is on the cooling cycle, raise the discharge pressure by restricting airflow through the outdoor coil. If the valve does not shift after the above attempts, cut the unit off and wait until the discharge and suction pressure equalize, and repeat above steps. If the valve does not shift, replace it.

S-50 CHECKING HEATER LIMIT CONTROL(S)

(OPTIONAL ELECTRIC HEATERS)

Each individual heater element is protected with an automatic rest limit control connected in series with each element to prevent overheating of components in case of low airflow. This limit control will open its circuit at approximately 150°F. to 160°F and close at approximately 110°F.

WARNING

Disconnect ALL power before servicing.

1. Remove the wiring from the control terminals.
2. Using an ohmmeter test for continuity across the normally closed contacts. No reading indicates the control is open - replace if necessary. Make sure the limits are cool before testing.

IF FOUND OPEN - REPLACE - DO NOT WIRE AROUND.

S-52 CHECKING HEATER ELEMENTS

Optional electric heaters may be added, in the quantities shown in the spec sheet for each model unit, to provide electric resistance heating. Under no condition shall more heaters than the quantity shown be installed.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Disassemble and remove the heating element(s).
2. Visually inspect the heater assembly for any breaks in the wire or broken insulators.
3. Using an ohmmeter, test the element for continuity - no reading indicates the element is open. Replace as necessary.

To obtain the amount of subcooling subtract 109°F from 120°F.

The difference is 11° subcooling. See the specification sheet for the design subcooling range for your unit.

SERVICING

S-100 REFRIGERATION REPAIR PRACTICE

DANGER

Always remove the refrigerant charge in a proper manner before applying heat to the system.

When repairing the refrigeration system:

WARNING

Disconnect ALL power before servicing.

1. Never open a system that is under vacuum. Air and moisture will be drawn in.
2. Plug or cap all openings.
3. Remove all burrs and clean the brazing surfaces of the tubing with sand cloth or paper. Brazing materials do not flow well on oxidized or oily surfaces.
4. Clean the inside of all new tubing to remove oils and pipe chips.
5. When brazing, sweep the tubing with dry nitrogen to prevent the formation of oxides on the inside surfaces.
6. Complete any repair by replacing the liquid line drier in the system, evacuate and charge.

BRAZING MATERIALS

Copper to Copper Joints - Sil-Fos used without flux (alloy of 15% silver, 80% copper, and 5% phosphorous). Recommended heat 1400°F.

Copper to Steel Joints - Silver Solder used without a flux (alloy of 30% silver, 38% copper, 32% zinc). Recommended heat - 1200°F.

S-101 LEAK TESTING

(NITROGEN OR NITROGEN-TRACED)

WARNING

To avoid the risk of fire or explosion, never use oxygen, high pressure air or flammable gases for leak testing of a refrigeration system.

WARNING

To avoid possible explosion, the line from the nitrogen cylinder must include a pressure regulator and a pressure relief valve. The pressure relief valve must be set to open at no more than 150 psig.

Pressure test the system using dry nitrogen and soapy water to locate leaks. If you wish to use a leak detector, charge the system to 10 psi using the appropriate refrigerant then use nitrogen to finish charging the system to working pressure, then apply the detector to suspect areas. If leaks are found, repair them. After repair, repeat the pressure test. If no leaks exist, proceed to system evacuation.

S-102 EVACUATION

WARNING

REFRIGERANT UNDER PRESSURE!
Failure to follow proper procedures may cause property damage, personal injury or death.

This is the most important part of the entire service procedure. The life and efficiency of the equipment is dependent upon the thoroughness exercised by the serviceman when evacuating air (non-condensables) and moisture from the system.

Air in a system causes high condensing temperature and pressure, resulting in increased power input and reduced performance.

Moisture chemically reacts with the refrigerant oil to form corrosive acids. These acids attack motor windings and parts, causing breakdown.

The equipment required to thoroughly evacuate the system is a high vacuum pump, capable of producing a vacuum equivalent to 25 microns absolute and a thermocouple vacuum gauge to give a true reading of the vacuum in the system

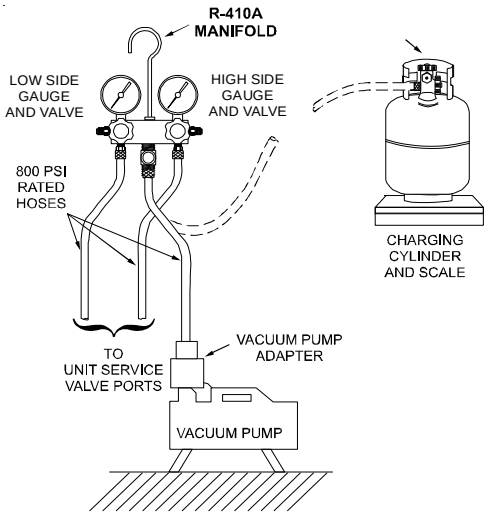
NOTE: Never use the system compressor as a vacuum pump or run when under a high vacuum. Motor damage could occur.

WARNING

Do not front seat the service valve(s) with the compressor open, with the suction line of the comprssor closed or severely restricted.

1. Connect the vacuum pump, vacuum tight manifold set with high vacuum hoses, thermocouple vacuum gauge and charging cylinder as shown.
2. Start the vacuum pump and open the shut off valve to the high vacuum gauge manifold only. After the compound gauge (low side) has dropped to approximately 29 inches of vacuum, open the valve to the vacuum thermocouple gauge. See that the vacuum pump will blank-off to a maximum of 25 microns. A high vacuum pump can only produce a good vacuum if its oil is non-contaminated.

SERVICING



EVACUATION

3. If the vacuum pump is working properly, close the valve to the vacuum thermocouple gauge and open the high and low side valves to the high vacuum manifold set. With the valve on the charging cylinder closed, open the manifold valve to the cylinder.
4. Evacuate the system to at least 29 inches gauge before opening valve to thermocouple vacuum gauge.
5. Continue to evacuate to a maximum of 250 microns. Close valve to vacuum pump and watch rate of rise. If vacuum does not rise above 1500 microns in three to five minutes, system can be considered properly evacuated.
6. If thermocouple vacuum gauge continues to rise and levels off at about 5000 microns, moisture and non-condensables are still present. If gauge continues to rise a leak is present. Repair and re-evacuate.
7. Close valve to thermocouple vacuum gauge and vacuum pump. Shut off pump and prepare to charge.

S-103 CHARGING

⚠ WARNING

REFRIGERANT UNDER PRESSURE!
*** Do not overcharge system with refrigerant.**
*** Do not operate unit in a vacuum or at negative pressure.**
Failure to follow proper procedures may cause property damage, personal injury or death.

⚠ CAUTION

Only use refrigerant certified to AHRI standards. Used refrigerant may cause compressor damage. The manufacturer is not responsible for damage or the need for repairs resulting from the use of unapproved refrigerant types or used or recycled refrigerant. Most portable machines cannot clean used refrigerant to meet AHRI standards.

⚠ CAUTION

Operating the compressor with the suction valve closed will cause serious compressor damage.

Charge the system with the exact amount of refrigerant.

Refer to the specification section or check the unit nameplates for the correct refrigerant charge.

An inaccurately charged system will cause future problems.

1. Using a quality set of charging scales, weigh the proper amount of refrigerant for the system. Allow liquid refrigerant only to enter the high side.
2. After the system will take all it will take, close the valve on the high side of the charging manifold.
3. Start the system and charge the balance of the refrigerant through the low side.

NOTE: R410A should be drawn out of the storage container or drum in liquid form due to its fractionation properties, but should be "Flashed" to its gas state before entering the system. There are commercially available restriction devices that fit into the system charging hose set to accomplish this. **DO NOT** charge liquid R410A into the compressor.

4. With the system still running, close the valve on the charging cylinder. At this time, you may still have some liquid refrigerant in the charging cylinder hose and will definitely have liquid in the liquid hose. Reseat the liquid line core. Slowly open the high side manifold valve and transfer the liquid refrigerant from the liquid line hose and charging cylinder hose into the suction service valve port. CAREFUL: Watch so that liquid refrigerant does not enter the compressor.

Final Charge Adjustment

The outdoor temperature must be 60°F or higher. Set the room thermostat to COOL, fan switch to AUTO, and set the temperature control well below room temperature.

After system has stabilized per startup instructions, compare the operating pressures and outdoor unit amp draw to the numbers listed in the spec sheet manual. If pressures and amp draw are too low, add charge. If pressures and amp draw are too high, remove charge. Check subcooling and superheat as detailed in the following section.

5. With the system still running, remove hose and reinstall both valve caps.
6. Check system for leaks.

Due to their design, Scroll compressors are inherently more tolerant of liquid refrigerant.

NOTE: *Even though the compressor section of a Scroll compressor is more tolerant of liquid refrigerant, continued floodback or flooded start conditions may wash oil from the bearing surfaces causing premature bearing failure.*S-104 CHECKING COMPRESSOR EFFICIENCY

SERVICING

The reason for compressor inefficiency is broken or damaged suction and/or discharge valves, or scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor.

The condition of the valves or scroll flanks is checked in the following manner.

1. Attach gauges to the high and low side of the system.
2. Start the system and run a Cooling Performance Test.

If the test shows-

⇒ Below normal high side pressure.

⇒ Above normal low side pressure.

⇒ Low temperature difference across coil.

⇒ Low amp draw at compressor.

-and the charge is correct. The compressor is faulty - replace the compressor.

S-104 CHECKING COMPRESSOR EFFICIENCY

The reason for compressor inefficiency is broken or damaged scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor.

During the "OFF" cycle, the high side pressure bleeds to the low side through the fixed orifice restriction device. Check equalization time as follows:

1. Attach a gauge manifold to the suction and liquid line dill valves.
2. Start the system and allow the pressures to stabilize.
3. Stop the system and check the time it takes for the high and low pressure gauge readings to equalize.

If it takes more than seven (7) minutes to equalize, the restrictor device is inoperative. Replace, install a liquid line drier, evacuate and recharge.

S-106 OVERFEEDING

Overfeeding by the expansion valve results in high suction pressure, cold suction line, and possible liquid slugging of the compressor.

If these symptoms are observed:

1. Check for an overcharged unit by referring to the cooling performance charts in the spec sheet manual.
2. Check the operation of the power element in the valve.
3. Check for restricted or plugged equalizer tube.

S-108 SUPERHEAT

CHECKING SUPERHEAT

Refrigerant gas is considered superheated when its temperature is higher than the saturation temperature corresponding to its pressure. The degree of superheat equals the degrees of temperature increase above the saturation temperature at existing pressure. See Temperature - Pressure Chart .

⚠ CAUTION

To prevent personal injury, carefully connect and disconnect manifold gauge hoses. Escaping liquid refrigerant can cause burns. Do not vent refrigerant to atmosphere. Recover during system repair or final unit disposal.

1. Run system at least 10 minutes to allow pressure to stabilize.
2. Temporarily install thermometer on suction (large) line near compressor with adequate contact and insulate for best possible reading.
3. Refer to the superheat table provided for proper system superheat. Add charge to lower superheat or recover charge to raise superheat.

Superheat Formula = Suct. Line Temp. - Sat. Suct. Temp.

Ambient Condenser Inlet Temp (°F Drybulb)	Return Air Temp. (°F Drybulb)				
	65	70	75	80	85
100	---	---	---	10	10
95	---	---	10	10	10
90	---	---	12	15	18
85	---	10	13	17	20
80	---	10	15	21	26
75	10	13	17	25	29
70	10	17	20	28	32
65	13	19	26	32	35
60	17	25	30	33	37

SYSTEM SUPERHEAT

EXAMPLE:

a. Suction Pressure = 143

b. Corresponding Temp. °F. = 50

c. Thermometer on Suction Line = 59°F.

To obtain the degrees temperature of superheat, subtract 50.0 from 59.0°F.

The difference is 9° Superheat. The 9° Superheat would fall in the ± range of allowable superheat.

S-111 FIXED ORIFICE RESTRICTION DEVICES

The fixed orifice restriction device (flowrator) used in conjunction with the indoor coil is a predetermined bore (I.D.).

It is designed to control the rate of liquid refrigerant flow into an evaporator coil.

The amount of refrigerant that flows through the fixed orifice restriction device is regulated by the pressure difference between the high and low sides of the system.

In the cooling cycle when the outdoor air temperature rises, the high side condensing pressure rises. At the same time, the cooling load on the indoor coil increases, causing the low side pressure to rise, but at a slower rate.

SERVICING

Pressure vs. Temperature Chart

R-410A

PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F
12	-37.7	114.0	37.8	216.0	74.3	318.0	100.2	420.0	120.7	522.0	137.6
14	-34.7	116.0	38.7	218.0	74.9	320.0	100.7	422.0	121.0	524.0	137.9
16	-32.0	118.0	39.5	220.0	75.5	322.0	101.1	424.0	121.4	526.0	138.3
18	-29.4	120.0	40.5	222.0	76.1	324.0	101.6	426.0	121.7	528.0	138.6
20	-36.9	122.0	41.3	224.0	76.7	326.0	102.0	428.0	122.1	530.0	138.9
22	-24.5	124.0	42.2	226.0	77.2	328.0	102.4	430.0	122.5	532.0	139.2
24	-22.2	126.0	43.0	228.0	77.8	330.0	102.9	432.0	122.8	534.0	139.5
26	-20.0	128.0	43.8	230.0	78.4	332.0	103.3	434.0	123.2	536.0	139.8
28	-17.9	130.0	44.7	232.0	78.9	334.0	103.7	436.0	123.5	538.0	140.1
30	-15.8	132.0	45.5	234.0	79.5	336.0	104.2	438.0	123.9	540.0	140.4
32	-13.8	134.0	46.3	236.0	80.0	338.0	104.6	440.0	124.2	544.0	141.0
34	-11.9	136.0	47.1	238.0	80.6	340.0	105.1	442.0	124.6	548.0	141.6
36	-10.1	138.0	47.9	240.0	81.1	342.0	105.4	444.0	124.9	552.0	142.1
38	-8.3	140.0	48.7	242.0	81.6	344.0	105.8	446.0	125.3	556.0	142.7
40	-6.5	142.0	49.5	244.0	82.2	346.0	106.3	448.0	125.6	560.0	143.3
42	-4.5	144.0	50.3	246.0	82.7	348.0	106.6	450.0	126.0	564.0	143.9
44	-3.2	146.0	51.1	248.0	83.3	350.0	107.1	452.0	126.3	568.0	144.5
46	-1.6	148.0	51.8	250.0	83.8	352.0	107.5	454.0	126.6	572.0	145.0
48	0.0	150.0	52.5	252.0	84.3	354.0	107.9	456.0	127.0	576.0	145.6
50	1.5	152.0	53.3	254.0	84.8	356.0	108.3	458.0	127.3	580.0	146.2
52	3.0	154.0	54.0	256.0	85.4	358.0	108.8	460.0	127.7	584.0	146.7
54	4.5	156.0	54.8	258.0	85.9	360.0	109.2	462.0	128.0	588.0	147.3
56	5.9	158.0	55.5	260.0	86.4	362.0	109.6	464.0	128.3	592.0	147.9
58	7.3	160.0	56.2	262.0	86.9	364.0	110.0	466.0	128.7	596.0	148.4
60	8.6	162.0	57.0	264.0	87.4	366.0	110.4	468.0	129.0	600.0	149.0
62	10.0	164.0	57.7	266.0	87.9	368.0	110.8	470.0	129.3	604.0	149.5
64	11.3	166.0	58.4	268.0	88.4	370.0	111.2	472.0	129.7	608.0	150.1
66	12.6	168.0	59.0	270.0	88.9	372.0	111.6	474.0	130.0	612.0	150.6
68	13.8	170.0	59.8	272.0	89.4	374.0	112.0	476.0	130.3	616.0	151.2
70	15.1	172.0	60.5	274.0	89.9	376.0	112.4	478.0	130.7	620.0	151.7
72	16.3	174.0	61.1	276.0	90.4	378.0	112.6	480.0	131.0	624.0	152.3
74	17.5	176.0	61.8	278.0	90.9	380.0	113.1	482.0	131.3	628.0	152.8
76	18.7	178.0	62.5	280.0	91.4	382.0	113.5	484.0	131.6	632.0	153.4
78	19.8	180.0	63.1	282.0	91.9	384.0	113.9	486.0	132.0	636.0	153.9
80	21.0	182.0	63.8	284.0	92.4	386.0	114.3	488.0	132.3	640.0	154.5
82	22.1	184.0	64.5	286.0	92.8	388.0	114.7	490.0	132.6	644.0	155.0
84	23.2	186.0	65.1	288.0	93.3	390.0	115.0	492.0	132.9	648.0	155.5
86	24.3	188.0	65.8	290.0	93.8	392.0	115.5	494.0	133.3	652.0	156.1
88	25.4	190.0	66.4	292.0	94.3	394.0	115.8	496.0	133.6	656.0	156.6
90	26.4	192.0	67.0	294.0	94.8	396.0	116.2	498.0	133.9	660.0	157.1
92	27.4	194.0	67.7	296.0	95.2	398.0	116.6	500.0	134.0	664.0	157.7
94	28.5	196.0	68.3	298.0	95.7	400.0	117.0	502.0	134.5	668.0	158.2
96	29.5	198.0	68.9	300.0	96.2	402.0	117.3	504.0	134.8	672.0	158.7
98	30.5	200.0	69.5	302.0	96.6	404.0	117.7	506.0	135.2	676.0	159.2
100	31.2	202.0	70.1	304.0	97.1	406.0	118.1	508.0	135.5	680.0	159.8
102	32.2	204.0	70.7	306.0	97.5	408.0	118.5	510.0	135.8	684.0	160.3
104	33.2	206.0	71.4	308.0	98.0	410.0	118.8	512.0	136.1	688.0	160.8
106	34.1	208.0	72.0	310.0	98.4	412.0	119.2	514.0	136.4	692.0	161.3
108	35.1	210.0	72.6	312.0	98.9	414.0	119.6	516.0	136.7	696.0	161.8
110	35.5	212.0	73.2	314.0	99.3	416.0	119.9	518.0	137.0		
112	36.9	214.0	73.8	316.0	99.7	418.0	120.3	520.0	137.3		

*Based on ALLIED SIGNAL Data

REQUIRED LIQUID LINE TEMPERATURE						
LIQUID PRESSURE AT ACCESS FITTING (PSIG)	REQUIRED SUBCOOLING TEMPERATURE (°F)					
	8	10	12	14	16	18
189	58	56	54	52	50	48
195	60	58	56	54	52	50
202	62	60	58	56	54	52
208	64	62	60	58	56	54
215	66	64	62	60	58	56
222	68	66	64	62	60	58
229	70	68	66	64	62	60
236	72	70	68	66	64	62
243	74	72	70	68	66	64
251	76	74	72	70	68	66
259	78	76	74	72	70	68
266	80	78	76	74	72	70
274	82	80	78	76	74	72
283	84	82	80	78	76	74
291	86	84	82	80	78	76
299	88	86	84	82	80	78
308	90	88	86	84	82	80
317	92	90	88	86	84	82
326	94	92	90	88	86	84
335	96	94	92	90	88	86
345	98	96	94	92	90	88
354	100	98	96	94	92	90
364	102	100	98	96	94	92
374	104	102	100	98	96	94
384	106	104	102	100	98	96
395	108	106	104	102	100	98
406	110	108	106	104	102	100
416	112	110	108	106	104	102
427	114	112	110	108	106	104
439	116	114	112	110	108	106
450	118	116	114	112	110	108
462	120	118	116	114	112	110
474	122	120	118	116	114	112
486	124	122	120	118	116	114
499	126	124	122	120	118	116
511	128	126	124	122	120	118

SERVICING

Since the high side pressure rises faster when the temperature increases, more refrigerant flows to the evaporator, increasing the cooling capacity of the system.

When the outdoor temperature falls, the reverse takes place. The condensing pressure falls, and the cooling loads on the indoor coil decreases, causing less refrigerant flow.

If a restriction should become evident, proceed as follows:

1. Recover refrigerant charge.
2. Remove the orifice assembly and clean or replace.
3. Replace liquid line drier, evacuate and recharge.

CHECKING EQUALIZATION TIME

During the "OFF" cycle, the high side pressure bleeds to the low side through the fixed orifice restriction device. Check equalization time as follows:

1. Attach a gauge manifold to the suction and liquid line dill valves
2. Start the system and allow the pressures to stabilize.
3. Stop the system and check the time it takes for the high and low pressure gauge readings to equalize.

If it takes more than seven (7) minutes to equalize, the restriction device is inoperative. Replace, install a liquid line drier, evacuate and recharge.

S-112 CHECKING RESTRICTED LIQUID LINE

When the system is operating, the liquid line is warm to the touch. If the liquid line is restricted, a definite temperature drop will be noticed at the point of restriction. In severe cases, frost will form at the restriction and extend down the line in the direction of the flow.

Discharge and suction pressures will be low, giving the appearance of an undercharged unit. However, the unit will have normal to high subcooling.

Locate the restriction, replace the restricted part, replace drier, evacuate and recharge.

S-113 OVERCHARGE OF REFRIGERANT

An overcharge of refrigerant is normally indicated by an excessively high head pressure.

An evaporator coil, using an expansion valve metering device, will basically modulate and control a flooded evaporator and prevent liquid return to the compressor.

An evaporator coil, using a fixed orifice restrictor device (flowrator) metering device, could allow refrigerant to return to the compressor under extreme overcharge conditions.

Also with a fixed orifice restrictor device (flowrator) metering device, extreme cases of insufficient indoor air can cause icing of the indoor coil and liquid return to the compressor, but the head pressure would be lower.

There are other causes for high head pressure which may be found in the "Service Problem Analysis Guide."

If other causes check out normal, an overcharge or a system containing non-condensables would be indicated.

If this system is observed:

1. Start the system.
2. Remove and capture small quantities of refrigerant as from the suction line access fitting until the head pressure is reduced to normal.
3. Observe the system while running a cooling performance test. If a shortage of refrigerant is indicated, then the system contains non-condensables.

S-114 NON-CONDENSABLES

If non-condensables are suspected, shut down the system and allow the pressures to equalize. Wait at least 15 minutes. Compare the pressure to the temperature of the coldest coil since this is where most of the refrigerant will be. If the pressure indicates a higher temperature than that of the coil temperature, non-condensables are present.

Non-condensables are removed from the system by first removing the refrigerant charge, replacing and/or installing liquid line drier, evacuating and recharging.

S-115 COMPRESSOR BURNOUT

When a compressor burns out, high temperature develops causing the refrigerant, oil and motor insulation to decompose forming acids and sludge.

If a compressor is suspected of being burned-out, attach a refrigerant hose to the liquid line dill valve and properly remove and dispose of the refrigerant.

Now determine if a burn out has actually occurred. Confirm by analyzing an oil sample using a Sporlan Acid Test Kit, AK-3 or its equivalent.

Remove the compressor and obtain an oil sample from the suction stub. If the oil is not acidic, either a burnout has not occurred or the burnout is so mild that a complete clean-up is not necessary.

If acid level is unacceptable, the system must be cleaned by using the clean-up drier method.

⚠ CAUTION

Do not allow the sludge or oil to contact the skin. Severe burns may result.

NOTE: Daikin does **NOT** approve the flushing method using R-11 refrigerant.

Suction Line Drier Clean-Up Method

The POE oils used with R410A refrigerant is an excellent solvent. In the case of a burnout, the POE oils will remove any burnout residue left in the system. If not captured by the refrigerant filter, they will collect in the compressor or other system components, causing a failure of the replacement compressor and/or spread contaminants throughout the system, damaging additional components.

SERVICING

Use part number RF000127 suction line filter drier kit. This drier should be installed as close to the compressor suction fitting as possible. The filter must be accessible and be rechecked for a pressure drop after the system has operated for a time. It may be necessary to use new tubing and form as required.

NOTE: At least twelve (12) inches of the suction line immediately out of the compressor stub must be discarded due to burned residue and contaminates.

1. Remove the liquid line drier and expansion valve.
2. Purge all remaining components with dry nitrogen or carbon dioxide until clean.
3 Install new components **including** liquid line drier.
4. Braze all joints, leak test, evacuate, and recharge system.
5. Start up the unit and record the pressure drop across the drier.
6. Continue to run the system for a minimum of twelve (12) hours and recheck the pressure drop across the drier. Pressure drop should not exceed 6 PSIG.
7. Continue to run the system for several days, repeatedly checking pressure drop across the suction line drier. If the pressure drop never exceeds the 6 PSIG, the drier has trapped the contaminants. Remove the suction line drier from the system.
8. If the pressure drop becomes greater, then it must be replaced and steps 5 through 9 repeated until it does not exceed 6 PSIG.

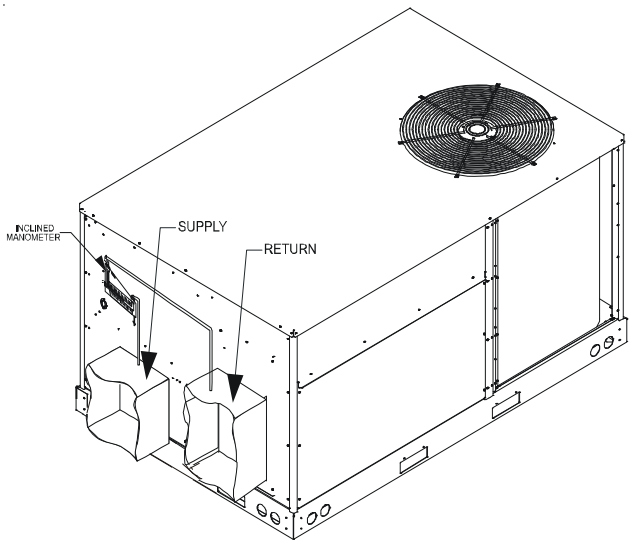
NOTICE: Regardless, the cause for burnout must be determined and corrected before the new compressor is started.

S-200 CHECKING EXTERNAL STATIC PRESSURE

The minimum and maximum allowable duct static pressure is found in the Spec Sheet Manual.

Too great of an external static pressure will result in insufficient air that can cause icing of the coil, whereas too much air can cause poor humidity control, and condensate to be pulled off the evaporator coil causing condensate leakage. Too much air can cause motor overloading and in many cases this constitutes a poorly designed system. To determine proper air movement, proceed as follows:

1. Using a draft gauge (inclined manometer) measure the static pressure of the return duct at the inlet of the unit, (Negative Pressure).



TOTAL EXTERNAL STATIC

2. Measure the static pressure of the supply duct, (Positive Pressure).
3. Add the two readings together.

NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired.

4. Consult proper table for quantity of air.

If the external static pressure exceeds the minimum or maximum allowable statics, check for closed dampers, dirty filters, undersized or poorly laid out ductwork.

S-201 CHECKING TEMPERATURE RISE

Temperature rise is related to the BTUH output of the unit and the amount of air (CFM) circulated over the heat exchanger.

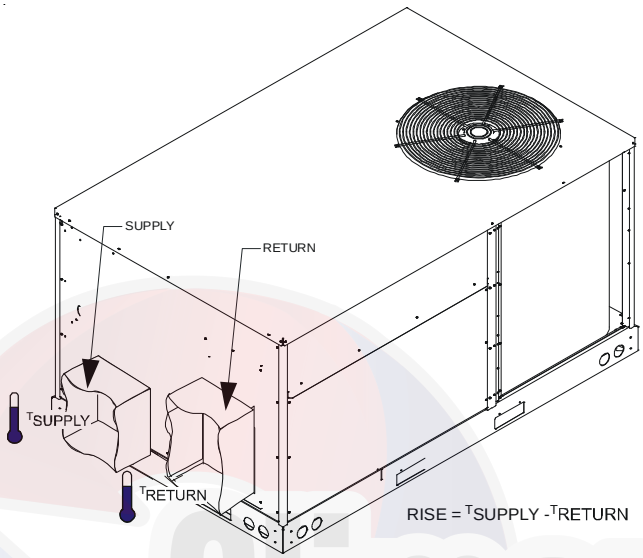
All units are designed for a given range of temperature increase. This is the temperature of the air leaving the unit minus the temperature of the air entering the unit.

The more air (CFM) being delivered through a given unit the less the rise will be; so the less air (CFM) being delivered, the greater the rise. The temperature rise should be adjusted in accordance to a given unit specifications and its external static pressure.

1. Check BTUH input to unit do not exceed input rating stamped on rating plate.
2. Take entering and leaving air temperatures.
3. Select the proper speed tap or dip switch setting for direct drive units.

SERVICING

4. For gas heat units, the airflow must be adjusted so that the air temperature rise falls within the ranges given stated on Data Plate by adjusting the variable pitch sheave on the motor (see Blower Performance section in appropriate Spec Sheet Manual for correct pulley adjustment).
5. Take motor amperage draw to determine that the motor is not overloaded during adjustments.



CHECKING TEMPERATURE RISE

S-205 CHECKING BELT TENSION

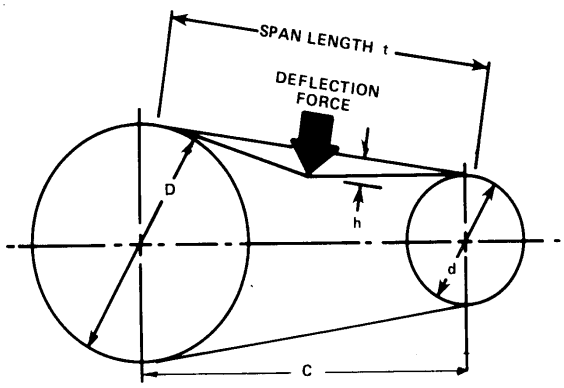
NOTE: Section on high static tables may require a field motor change.

BELT DRIVE MODELS ONLY

TENSION AND ALIGNMENT ADJUSTMENT

Check drive for adequate run-in belt tension. Correct belt tension is very important. A belt that is loose will have a substantially shorter life, and a belt that is too tight may cause premature motor and bearing failure. Correct belt tension on these units can be checked by measuring the force required to deflect the belt 1/8" at the midpoint of the span length (See DRIVE BELT TENSION ADJUSTMENT Figure). Belt tension force can be measured using a belt tension gauge, available through most belt manufacturers. The correct deflection force is 5 lbs. for a new belt and 3.5 lbs. for a belt that has been run in. New belt tension includes initial belt stretch.

When new V-belts are installed on a drive, the initial tension will drop rapidly during the first few hours. Check tension frequently during the first 24 hours of operation. Subsequent retensioning should fall between the minimum and maximum force. To determine the deflection distance from the normal position, use a straightedge or stretch a cord from sheave to sheave to use as a reference line. On multiple belt drives, an adjacent undeflected belt can be used as a reference.



Apply force to the center of the span.

t = Span length, inches

C = Center distance, inches

D = Larger sheave diameter, inches

d = Smaller sheave diameter, inches

h = Deflection height, inches

DRIVE BELT TENSION ADJUSTMENT

7.5 - 12.5 TON MODELS

MODEL	TYPE		SHEAVE DIAMETER (in)	DEFLECTION FORCE (lbs)		DEFLECTION (in)
	BELT	DRIVE		Used	New	
7.5 Ton	A, AX	Standard	2.6 to 3.6	3.75 +/- 0.5	4.0 +/- 0.5	9/32 +/- 1/16
8.5 Ton			2.6 to 3.6	3.75 +/- 0.5	4.0 +/- 0.5	9/32 +/- 1/16
10 Ton			3.0 to 4.0	3.75 +/- 0.5	4.0 +/- 0.5	9/32 +/- 1/16
12.5 Ton			2.6 to 3.6	3.75 +/- 0.5	4.0 +/- 0.5	9/32 +/- 1/16

RECOMMENDED POUNDS OF FORCE PER BELT

SERVICING

S-206 INDOOR FAN ROTATION CHECK

Evaporator Fan Rotation Check (Three Phase Models Only)

Check that fan rotates counter-clockwise when viewed from the drive side of unit and in accordance with rotation arrow shown on blower housing. If it does not, reverse any two incoming power cables at Single Point Power Block. In this case, repeat bearing check.

Do not attempt to change load side wiring. Internal wiring assures all motors and compressors will rotate in correct direction once evaporator fan motor rotation check has been made.

S-207 MOTOR SHEAVE ADJUSTMENT

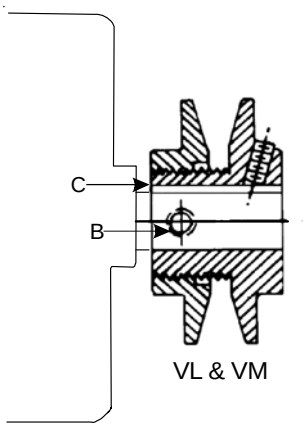
VL, VM & 2VP VARIABLE PITCH KEY TYPE MOTOR SHEAVES

The driving and driven motor sheaves should be in alignment with each other and the shafts parallel.

VL & VM SHEAVES ADJUSTMENT

1. Loosen set screw “B” using a 5/32" Allen key.
2. Making half or full turns from closed position, adjust sheave pitch diameter for desired speed. DO NOT OPEN MORE THAN SIX FULL TURNS.
3. Tighten set screw “B” securely over flat.
4. Carefully put on belts and adjust belt tension. DO NOT FORCE BELTS OVER GROOVES.
5. Ensure all keys are in place and the set screws tight before starting drive. Recheck set screws and belt tension after 24 hours service.

NOTE: Future adjustments should be made by loosening the belt tension and increasing or decreasing the pitch diameter of the sheave by half or full turns as required. Readjust belt tension before starting drive.



VL & VM

NOTE: Do not operate sheave with flange projecting beyond the hub end.

DAIKIN COMMERCIAL PACKAGE UNIT ACCESSORIES		
Accessory Number	***Description***	***Model Size***
**EHK*	Heater Kit	7.5-12.5 Ton
DDNECNJ90150B[1]	Downflow Jade Economizer All Fuels (MCCDANIEL METALS)	7.5-12.5 Ton
DDNECNJ90150NR[1]	Downflow Jade Economizer All Fuels (No Barometric Relief) (MCCDANIEL METALS)	7.5-12.5 Ton
1036610B[2]	Downflow Economizer (ROOFTOP SYSTEMS)	7.5-10 Ton
1036612B[2]	Downflow Economizer (ROOFTOP SYSTEMS)	12.5 Ton
DDNSQRD9020	Downflow Square to Round Adapter (20" Round)	7.5-12.5 Ton
DHZECNJ90150	Horizontal Jade Economizer All Fuels	7.5-12.5 Ton
DPE901502	Power Exhaust (208/230v)	7.5-12.5 Ton
DPE901504	Power Exhaust (460v)	7.5-12.5 Ton
DPE901507	Power Exhaust (575v)	7.5-12.5 Ton

** Complete listing of EHK kits listed on electrical data page in this manual.

[1] If this economizer is used for factory or field installed and power exhaust is also required, please use appropriate power exhaust: DPE901502, DPE901504, DPE901507.

[2] If this economizer is used for factory or field installed and power exhaust is also required, please contact RRS Rooftop Systems directly for more information and ordering accessories.

HEATER KITS

HEATER KITS	
Part Number	**Description**
EHK4-16	15 KW Electric Heat Kit, 480V Three Phase
EHK4-30	30 KW Electric Heat Kit, 480V Three Phase
EHK4-45	43 KW Electric Heat Kit, 480V Three Phase

MINIMUM AIRFLOW FOR ELECTRIC HEAT

Unit	HEATER KIT MODEL NUMBER	MINIMUM CFM
7.5 ton	EHK*-16	3000
	EHK*-30	3000
	EHK*-45	3000
10 ton	EHK* -16	3500
	EHK* -30	3500
	EHK* -45	4000

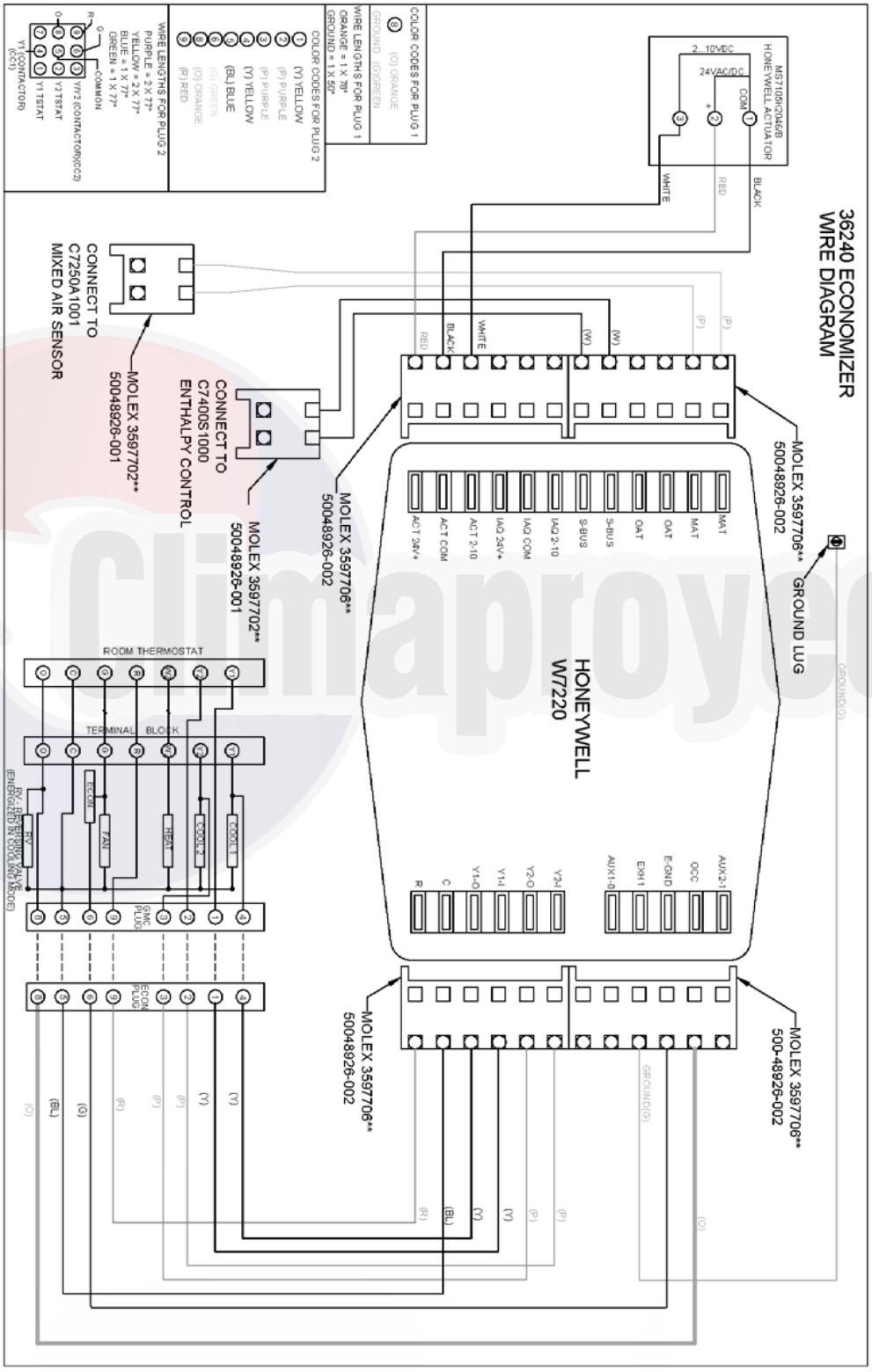
ATTENTION INSTALLING PERSONNEL

Use only the heater kit specified for each model as dictated by the table above.

ACCESSORIES WIRING DIAGRAMS

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



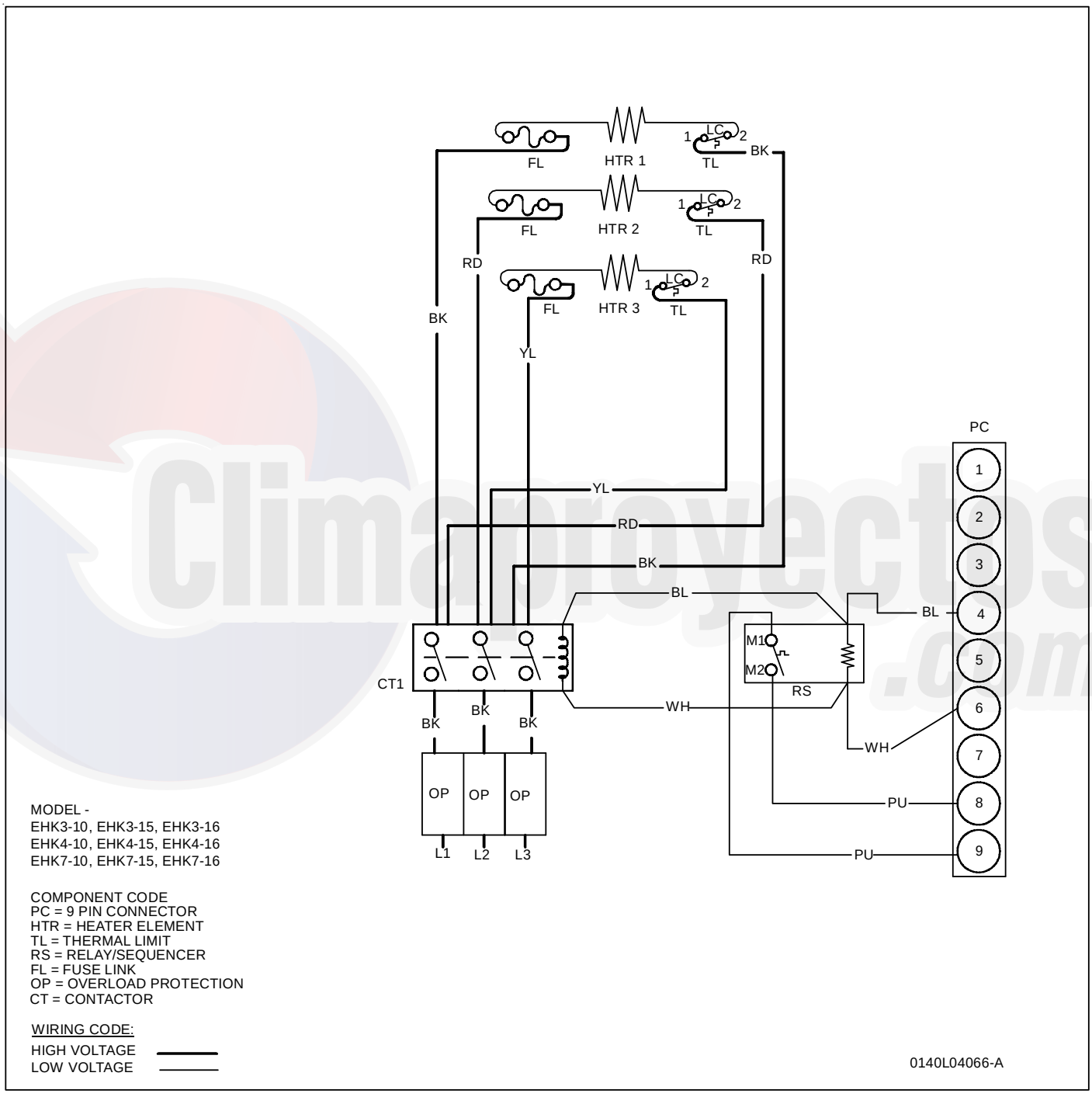
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

HEATER KIT WIRING DIAGRAMS

EHK4-16

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



MODEL -
EHK3-10, EHK3-15, EHK3-16
EHK4-10, EHK4-15, EHK4-16
EHK7-10, EHK7-15, EHK7-16

COMPONENT CODE
PC = 9 PIN CONNECTOR
HTR = HEATER ELEMENT
TL = THERMAL LIMIT
RS = RELAY/SEQUENCER
FL = FUSE LINK
OP = OVERLOAD PROTECTION
CT = CONTACTOR

WIRING CODE:
HIGH VOLTAGE ———
LOW VOLTAGE ———

0140L04066-A

EHK4 - 16 HEAT KIT - 10.42 KW (400V) KW

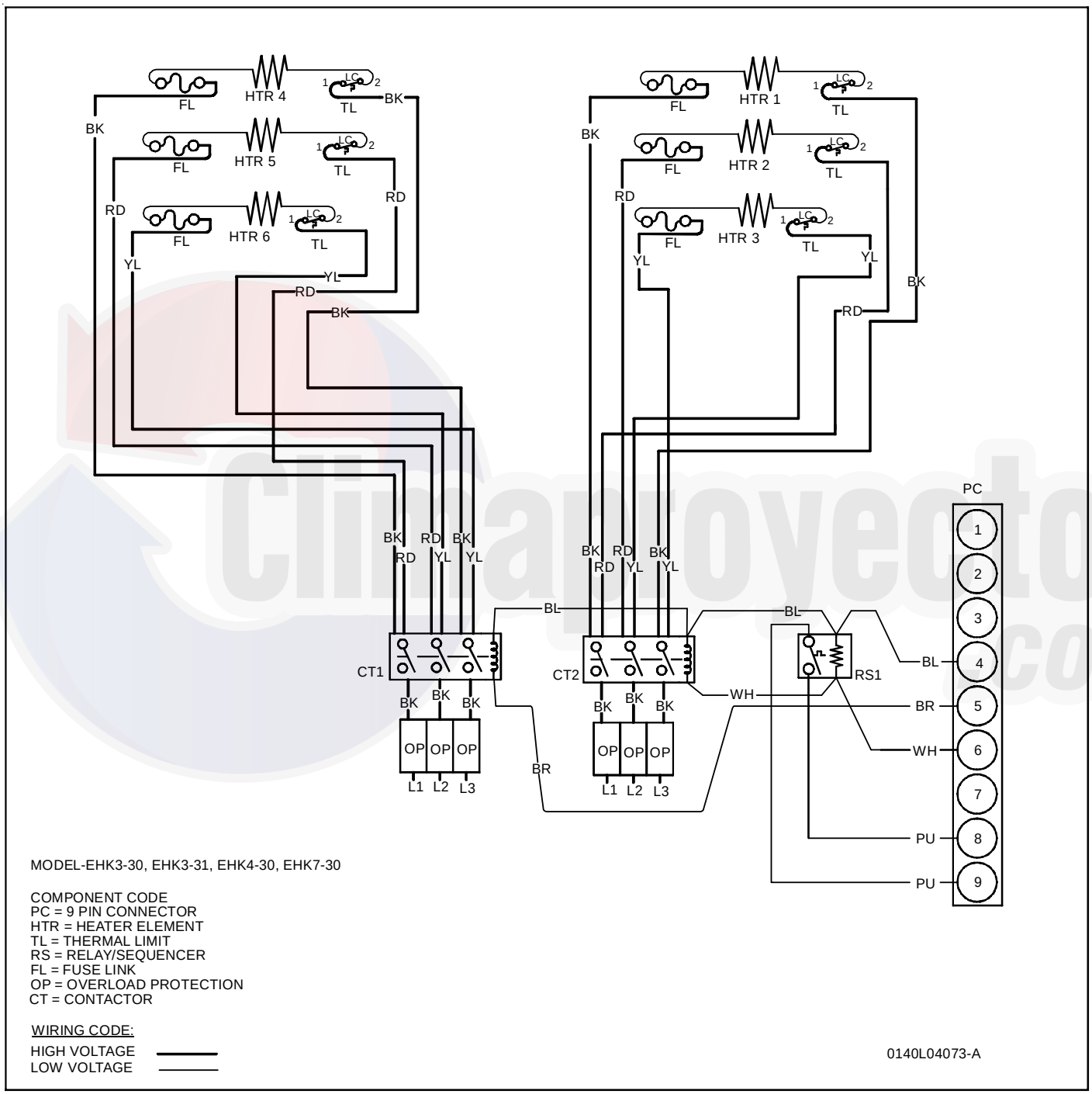
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

HEATER KIT WIRING DIAGRAMS

EHK4-30

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



MODEL-EHK3-30, EHK3-31, EHK4-30, EHK7-30

COMPONENT CODE
PC = 9 PIN CONNECTOR
HTR = HEATER ELEMENT
TL = THERMAL LIMIT
RS = RELAY/SEQUENCER
FL = FUSE LINK
OP = OVERLOAD PROTECTION
CT = CONTACTOR

WIRING CODE:
HIGH VOLTAGE ——
LOW VOLTAGE ——

0140L04073-A

EHK4 - 30 HEAT KIT - 20.76 KW (400V)

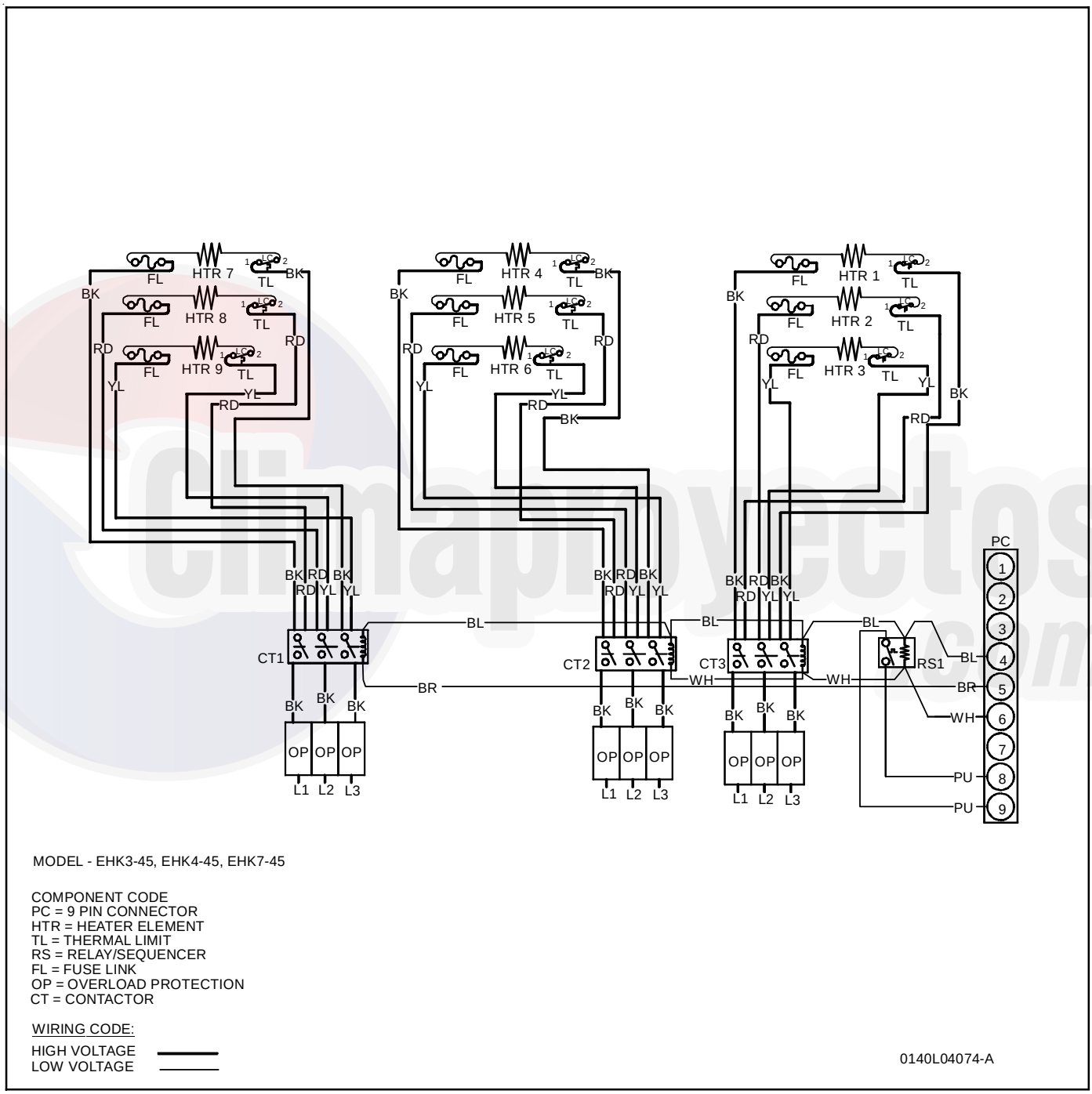
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

HEATER KIT WIRING DIAGRAMS

EHK4-45

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



MODEL - EHK3-45, EHK4-45, EHK7-45

COMPONENT CODE
PC = 9 PIN CONNECTOR
HTR = HEATER ELEMENT
TL = THERMAL LIMIT
RS = RELAY/SEQUENCER
FL = FUSE LINK
OP = OVERLOAD PROTECTION
CT = CONTACTOR

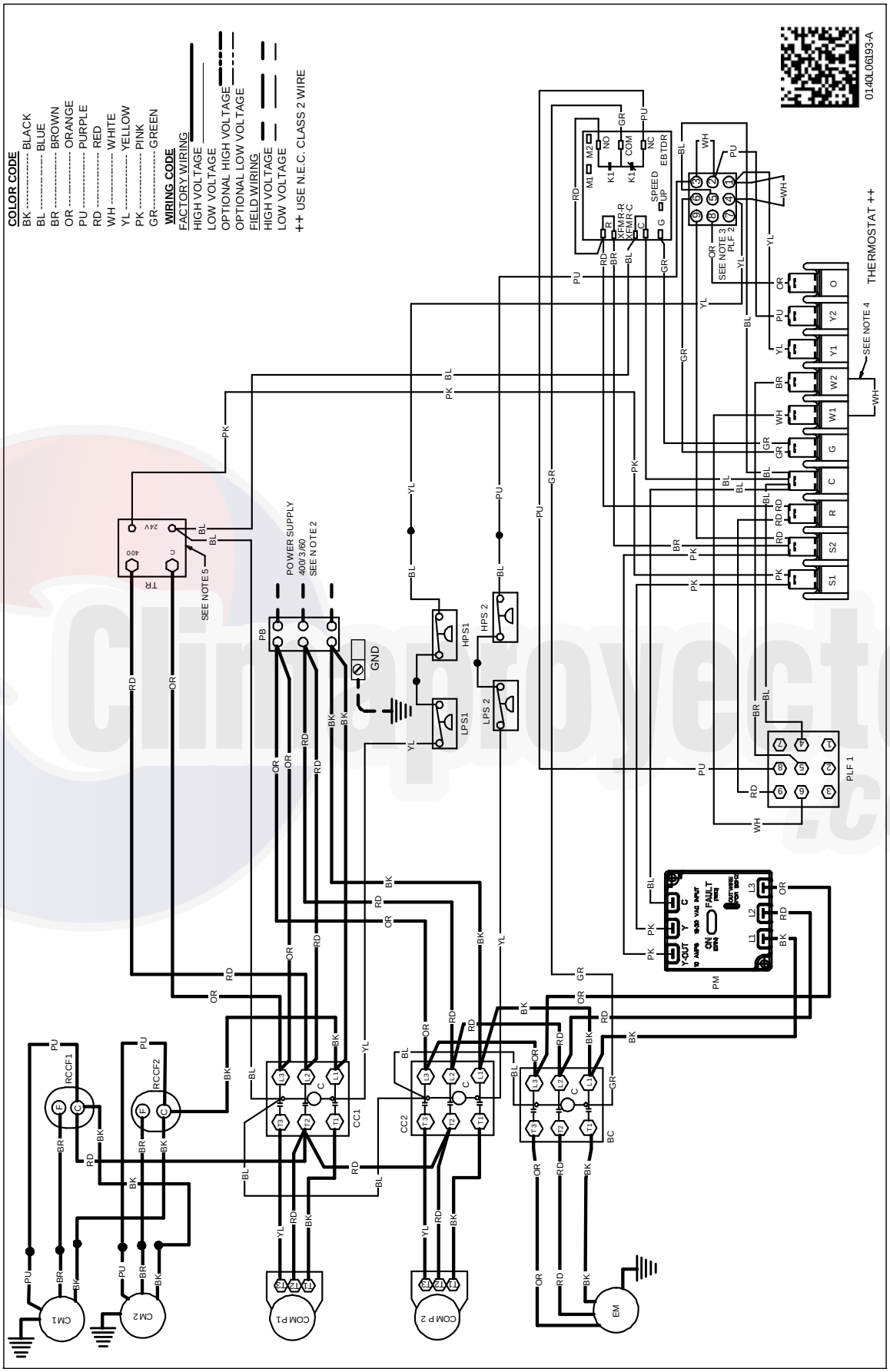
WIRING CODE:
HIGH VOLTAGE
LOW VOLTAGE

0140L04074-A

EHK4 - 45 HEAT KIT - 31.18 KW (400V)

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DCC COMMERCIAL
7.5-12.5 Ton Packaged Air Conditioner Unit
WIRING DIAGRAMS



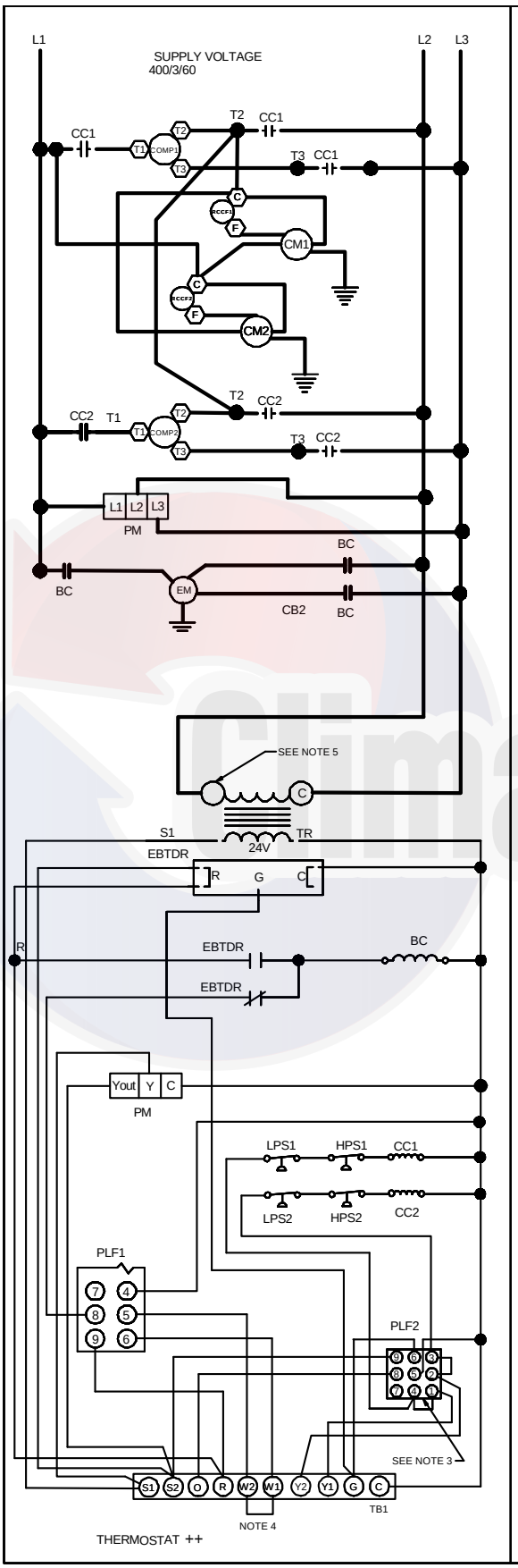
WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

UNIT WIRING DIAGRAMS

DCC090-150XXX6BXXX**



COMPONENT LEGEND

BC	BLOWER CONTACTOR
BR	BLOWER RELAY
CC	COMPRESSOR CONTACTOR
CB	CIRCUIT BREAKER
CCR	COMPRESSOR CONTACTOR RELAY
CM	CONDENSER MOTOR
CMR	CONDENSER MOTOR RELAY
COMP	COMPRESSOR
DC	DEFROST CONTROL
DFT	DEFROST THERMOSTAT
ECON	ECONOMIZER
EBTD	ELECTRONIC BLOWER TIME DELAY
EMR	EVAPORATOR MOTOR RELAY
R	RELAY
EM	EVAPORATOR MOTOR
FC	FAN CAPACITOR
GND	EQUPIMENT GROUND
HPS	HIGH PRESSURE SWITCH
HVDR	HIGH VOLTAGE DEFROST RELAY
LPS	LOW PRESSURE SWITCH
LVDR	LOW VOLTAGE DEFROST RELAY
PB	POWER DISTRUBTION BLOCK
PLF	FEMALE PLUG / CONNECTOR
PM	PHASE MONITOR
RVC	REVERSING VAVLE COIL
RCCF	RUN CAPACITOR FOR COMPRESSOR AND FAN
TB1	TERMINAL BLOCK (24V SIGNAL)
TR	TRANSFORMER

NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE INSULATION AS ORIGINAL (AT LEAST 105°C) USE COPPER CONDUCTOR ONLY.
2. USE COPPER CONDUCTORS ONLY ++ USE N.E.C. CLASS 2 WIRE
3. ECONOMIZER PLUG LOCATED IN THE RETURN AIR COMPARTMENT, REMOVE MALE PLUG, ATTACH FEMALE PLUG TO THE ECONOMIZER ACCESSORY.
4. FOR TWO STAGE OPERATION REMOVE W1 TO W2 WIRE JUMPER.
5. MOVE WIRE(S) TO APPROPRIATE INPUT VOLTAGE TERMINAL ON TRANSFORMER.

SEE UNIT RATING PLATE FOR TYPE AND SIZE OF OVER CURRENT PROTECTION

400/3/60 0140L06194-A

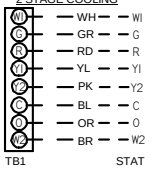
FACTORY WIRING
- LINE VOLTAGE
- LOW VOLTAGE
- OPTIONAL HIGH VOLTAGE

FIELD WIRING
- HIGH VOLTAGE
- LOW VOLTAGE

WIRE CODE

BK	BLACK
BL	BLUE
BR	BROWN
GR	GREEN
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
YL/PK	YELLOW WITH PINK STRIP
BU/PK	BLUE WITH PINK STRIP

THERMOSTAT FIELD WIRING ++



HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

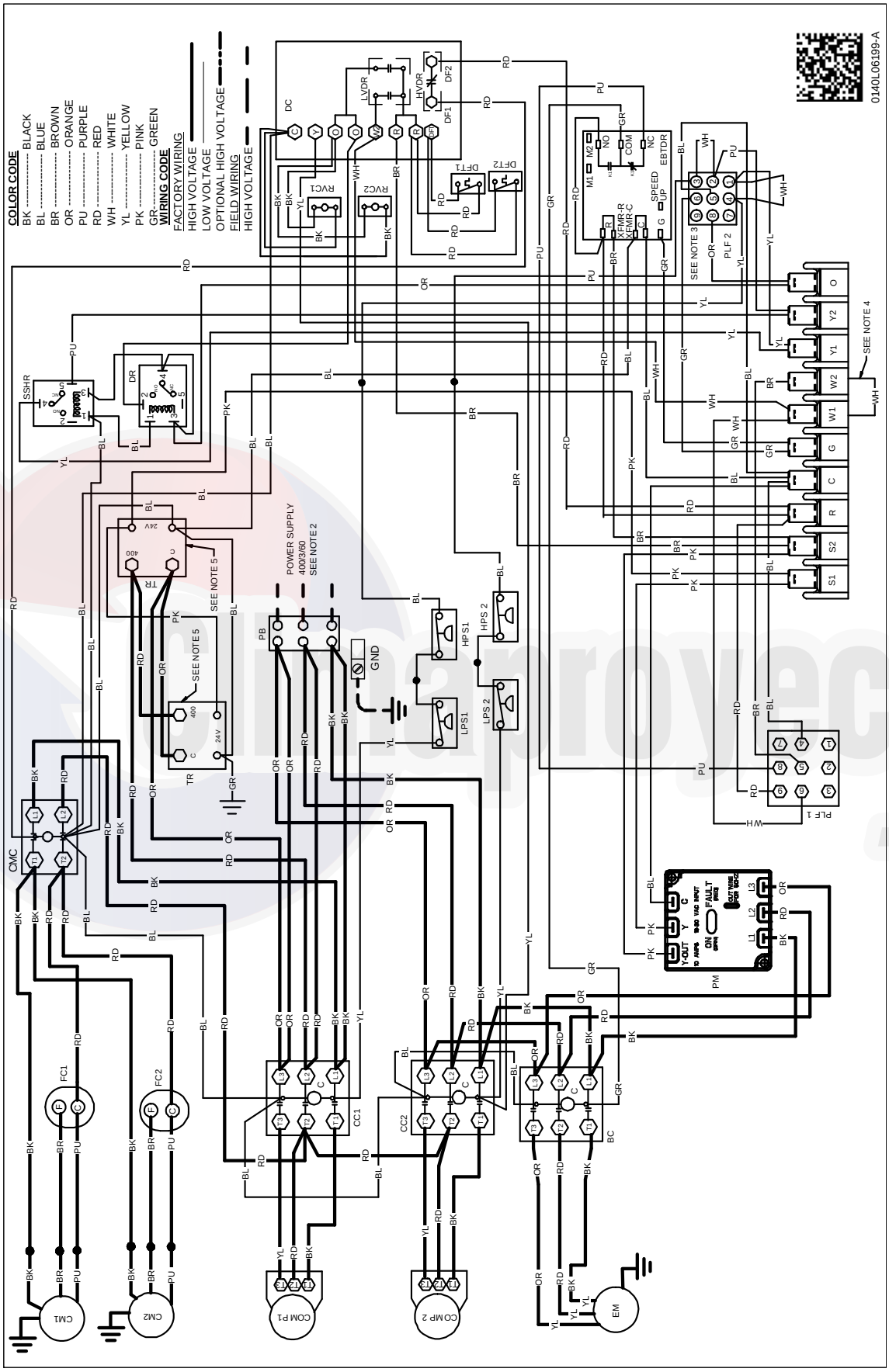
WARNING

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DCH COMMERCIAL
7.5-12.5 Ton Packaged Heat Pump Unit
WIRING DIAGRAMS

UNIT WIRING DIAGRAMS

DCH090-150XXX6BXXX**



WARNING

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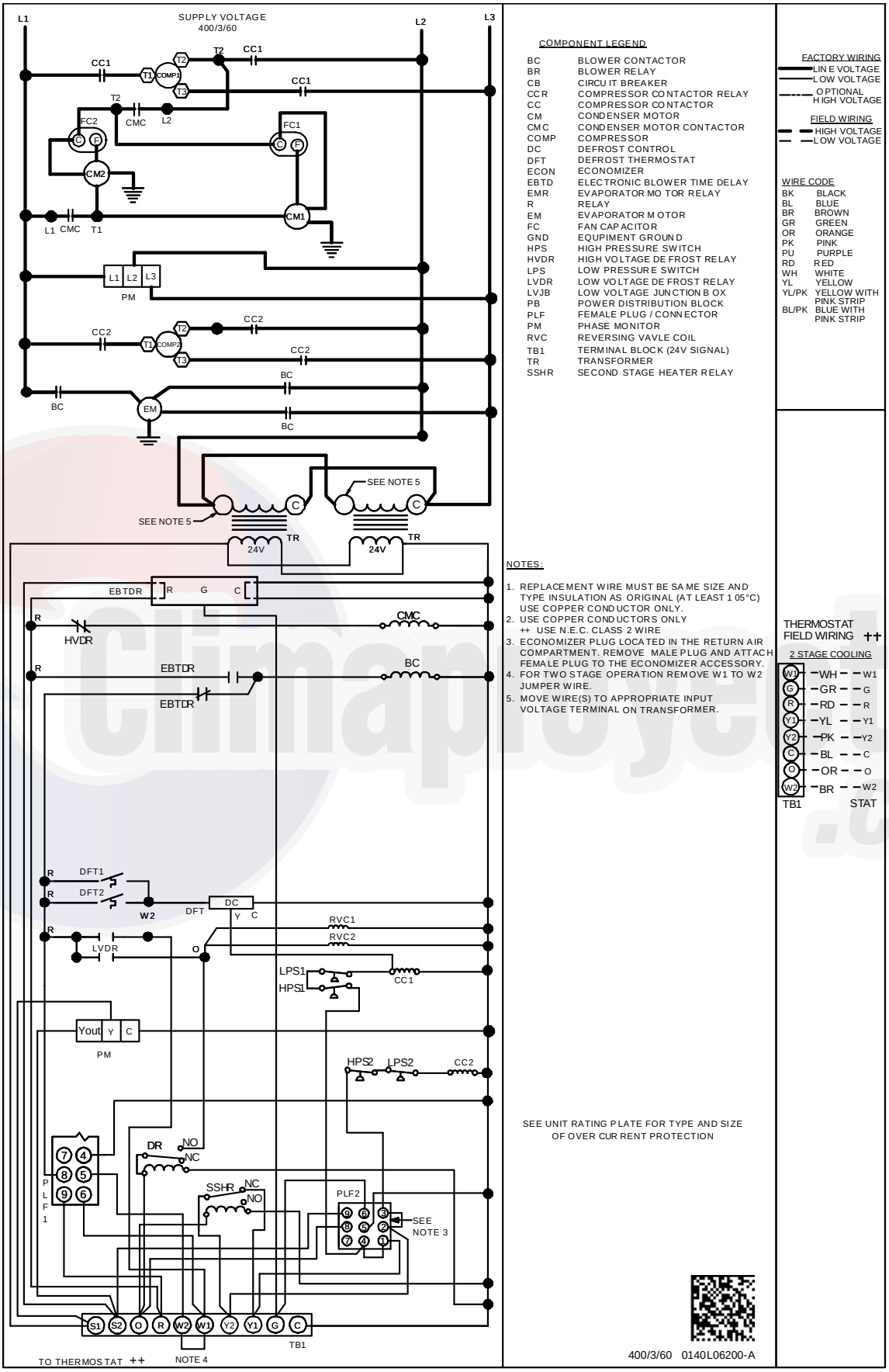
UNIT WIRING DIAGRAMS

DCH090-150XXX6BXXX**



COMPONENT LEGEND

BC	BLOWER CONTACTOR
BR	BLOWER RELAY
CB	CIRCUIT BREAKER
CCR	COMPRESSOR CONTACTOR RELAY
CC	COMPRESSOR CONTACTOR
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DFT	DEFROST THERMOSTAT
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EBTD	ELECTRONIC BLOWER TIME DELAY
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EM	EVAPORATOR MOTOR
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HPS	HIGH PRESSURE SWITCH
HVDR	HIGH VOLTAGE DEFROST RELAY
LPS	LOW PRESSURE SWITCH
LVDR	LOW VOLTAGE DEFROST RELAY
LVJB	LOW VOLTAGE JUNCTION BOX
PB	POWER DISTRIBUTION BLOCK
PLF	FEMALE PLUG / CONNECTOR
PM	PHASE MONITOR
RVC	REVERSING VAVLE COIL
TB1	TERMINAL BLOCK (24V SIGNAL)
TR	TRANSFORMER
SSHR	SECOND STAGE HEATER RELAY

FACTORY WIRING
- LINE VOLTAGE
- LOW VOLTAGE
- OPTIONAL HIGH VOLTAGE

FIELD WIRING
- HIGH VOLTAGE
- LOW VOLTAGE

WIRE CODE

BK	BLACK
BL	BLUE
BR	BROWN
GR	GREEN
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
YL/PK	YELLOW WITH PINK STRIP
BL/PK	BLUE WITH PINK STRIP

NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE INSULATION AS ORIGINAL (AT LEAST 105°C) USE COPPER CONDUCTOR ONLY.
2. USE COPPER CONDUCTORS ONLY
   ++ USE N.E.C. CLASS 2 WIRE
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5. MOVE WIRE(S) TO APPROPRIATE INPUT VOLTAGE TERMINAL ON TRANSFORMER.

SEE UNIT RATING PLATE FOR TYPE AND SIZE OF OVER CURRENT PROTECTION

THERMOSTAT FIELD WIRING ++

2 STAGE COOLING

400/3/60 0140L06200-A

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

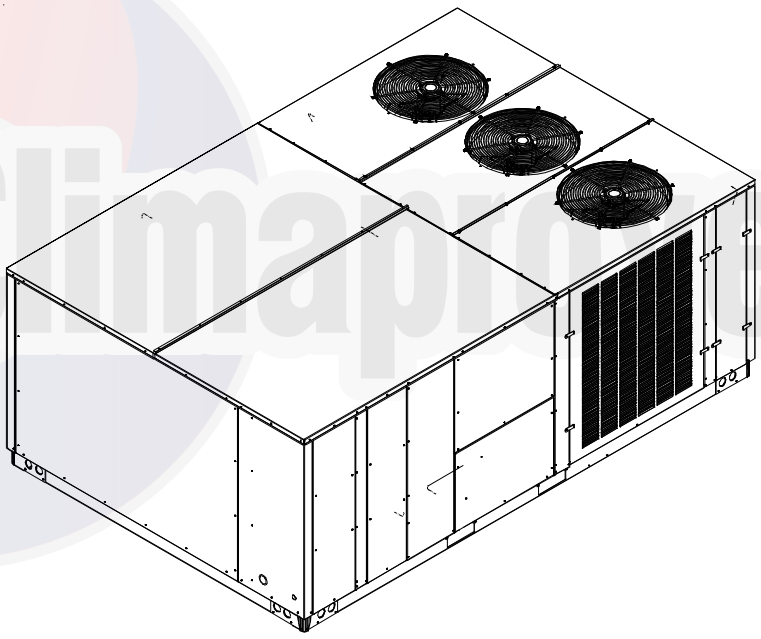
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DAIKIN Service Instructions

DCC Cooling
Commercial Package Units
with R-410A Refrigerant
15 - 25 Tons & Accessories

NOTE: *15 & 20 ton model shown in pictures.*
25 ton model has 2 fans.

Not for installation in the United States or Canada. This unit is for export only.



COMMERCIAL GRADE

This manual is to be used by qualified, professionally trained HVAC technicians only. Daikin does not assume any responsibility for property damage or personal injury due to improper service procedures or services performed by an unqualified person.

RSDX6412008r2
September 2016

TABLE OF CONTENTS

IMPORTANT INFORMATION

Pride and workmanship go into every product to provide our customers with quality products. It is possible, however, that during its lifetime a product may require service. Products should be serviced only by a qualified service technician who is familiar with the safety procedures required in the repair and who is equipped with the proper tools, parts, testing instruments and the appropriate service manual. **REVIEW ALL SERVICE INFORMATION IN THE APPROPRIATE SERVICE MANUAL BEFORE BEGINNING REPAIRS.**

IMPORTANT NOTICES FOR CONSUMERS AND SERVICERS

RECOGNIZE SAFETY SYMBOLS, WORDS AND LABELS

WARNING

This unit should not be connected to, or used in conjunction with, any devices that are not design certified for use with this unit or have not been tested and approved by Daikin. Serious property damage or personal injury, reduced unit performance and/or hazardous conditions may result from the use of devices that have not been approved or certified by the manufacturer.

WARNING

Only personnel that have been trained to install, adjust, service or repair (hereinafter, "service") the equipment specified in this manual should service the equipment. The manufacturer will not be responsible for any injury or property damage arising from improper service or service procedures. If you service this unit, you assume responsibility for any injury or property damage which may result. In addition, in jurisdictions that require one or more licenses to service the equipment specified in this manual, only licensed personnel should service the equipment. Improper installation, adjustment, servicing or repair of the equipment specified in this manual, or attempting to install, adjust, service or repair the equipment specified in this manual without proper training may result in product damage, property damage, personal injury or death.

WARNING

Do not store combustible materials or use gasoline or other flammable liquids or vapors in the vicinity of this appliance as property damage or personal injury could occur. Have your contractor point out and identify the various cut-off devices, switches, etc., that serves your comfort equipment.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

To locate an authorized servicer, please consult your telephone book or the dealer from whom you purchased this product. For further assistance, please contact:

CONSUMER INFORMATION LINE - DAIKIN BRAND PRODUCTS
TOLL FREE 1-855-770-5678 (U.S. only)
email us at: customerservice@daikincomfort.com
fax us at: (713) 856-1821
(Not a technical assistance line for dealers.)

Outside the U.S., call 1-713-861-2500
(Not a technical assistance line for dealers.)
Your telephone company will bill you for the call.

IMPORTANT INFORMATION

SAFE REFRIGERANT HANDLING

While these items will not cover every conceivable situation, they should serve as a useful guide.

WARNING

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space.To avoid possible difficulty in breathing or death:

- **Never purge refrigerant into an enclosed room or space. By law, all refrigerants must be reclaimed.**
- **If an indoor leak is suspected, thoroughly ventilate the area before beginning work.**
- **Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact with refrigerant and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.**

WARNING

To avoid possible explosion:

- **Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.**
- **Never fill a cylinder more than 80% full of liquid refrigerant.**
- **Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.**
- **Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.**

WARNING

To avoid possible injury, explosion or death, practice safe handling of refrigerants.

WARNING

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

WARNING

To avoid possible explosion, use only returnable (not disposable) service cylinders when removing refrigerant from a system.

- **Ensure the cylinder is free of damage which could lead to a leak or explosion.**
- **Ensure the hydrostatic test date does not exceed 5 years.**
- **Ensure the pressure rating meets or exceeds 400 lbs.**

When in doubt, do not use cylinder.

WARNING

System contaminants, improper service procedure and/or physical abuse affecting hermetic compressor electrical terminals may cause dangerous system venting.

The successful development of hermetically sealed refrigeration compressors has completely sealed the compressor's moving parts and electric motor inside a common housing, minimizing refrigerant leaks and the hazards sometimes associated with moving belts, pulleys or couplings.

Fundamental to the design of hermetic compressors is a method whereby electrical current is transmitted to the compressor motor through terminal conductors which pass through the compressor housing wall. These terminals are sealed in a dielectric material which insulates them from the housing and maintains the pressure tight integrity of the hermetic compressor. The terminals and their dielectric embedment are strongly constructed, but are vulnerable to careless compressor installation or maintenance procedures and equally vulnerable to internal electrical short circuits caused by excessive system contaminants.

In either of these instances, an electrical short between the terminal and the compressor housing may result in the loss of integrity between the terminal and its dielectric embedment. This loss may cause the terminals to be expelled, thereby venting the vaporous and liquid contents of the compressor housing and system.

A venting compressor terminal normally presents no danger to anyone, providing the terminal protective cover is properly in place.

If, however, the terminal protective cover is not properly in place, a venting terminal may discharge a combination of

(a) hot lubricating oil and refrigerant

(b) flammable mixture (if system is contaminated with air)

in a stream of spray which may be dangerous to anyone in the vicinity. Death or serious bodily injury could occur.

Under no circumstances is a hermetic compressor to be electrically energized and/or operated without having the terminal protective cover properly in place.

See Service Section S-17 for proper servicing.

PRODUCT IDENTIFICATION

The model number is used for positive identification of component parts used in manufacturing. Please use this number when requesting service or parts information.

D	C	C	090	045	5	D	*	*	*	A	*
1	2	3	4, 5, 6	7, 8, 9	10	11	12	13	14	15	16

Brand

D Daikin

Configuration

C Commercial Standard Efficiency

Application

C Cooling
H Heat Pump

Nominal Gross Cooling Capacity

036	3 Tons	102	8½ Tons
048	4 Tons	120	10 Tons
060	5 Tons	180	15 Tons
072	6 Tons	240	20 Tons
090	7½ Tons	300	25 Tons

Nominal Heating Capacity

Gas/Electric		A/C H/P	Factory-Installed Electric Heat		
180	180,000 BTU/h	XXX	No Heat	030	30 kW
300	300,000 BTU/h	016	15 kW	045	44 kW
350	350,000 BTU/h				

See product specifications for heat size(s) available for each capacity.

Revision Levels

Major & Minor

Factory-Installed Options

X No Options

Factory-Installed Options

X Standard Aluminized Heat Exchanger
S Stainless Steel Heat Exchanger

Factory-Installed Options

X No Options

Supply Fan/Drive Type/Motors

B Belt Drive
D Direct Drive

Voltage

1	208-230/1/60 (United States)	4	460/3/60 (United States)
3	208-230/3/60 (United States)	5	400/3/50 (Russia Daikin Brand)
6	400/3/60 (Saudi Arabia)	A	400/3/50 (Russia Goodman Brand)
B	400/3/50 (Kuwait)	E	400/3/50 (Argentina)

PRODUCT IDENTIFICATION

DCC***XXX**XXX

Daikin Commercial Package Coolers	
Model #	**Description**
DCC[180-300]XXX6BXXXAA	Daikin Commercial Package Cooler, R410A, 400V 3 Phase 60 Hz. Belt Drive. Initial release of 15-25 Ton Daikin branded models.
DCC[240-300]XXX6BXXXAB	Daikin Commercial Package Cooler, R410A, 400V 3 Phase 60 Hz. Belt Drive with phase monitor.
DCC180XXX6BXXXAC	Daikin Commercial Package Cooler, R410A, 400V 3 Phase 60 Hz. Belt Drive with phase monitor.

These units have R410A refrigerant

PRODUCT DESIGN

UNIT LOCATION

WARNING

TO PREVENT POSSIBLE EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH, THE FOLLOWING BULLET POINTS MUST BE OBSERVED WHEN INSTALLING THE UNIT.

ALL INSTALLATIONS:

IMPORTANT NOTE: *Unit should be energized 24 hours prior to compressor start up to ensure crankcase heater has sufficiently warmed the compressors. Compressor damage may occur if this step is not followed.*

NOTE: This appliance is a dedicated downflow design. Proper installation of the unit ensures trouble-free operation. Improper installation can result in problems ranging from noisy operation to property or equipment damages, dangerous conditions that could result in injury or personal property damage. Give this booklet to the user and explain it's provisions. The user should retain these instructions for future reference.

GROUND LEVEL INSTALLATIONS ONLY:

- When the unit is installed on the ground adjacent to the building, a level concrete (or equal) base is recommended. Prepare a base that is 3" larger than the package unit footprint and a minimum of 3" thick.
- The base should also be located where no runoff of water from higher ground can collect in the unit.

ROOF TOP INSTALLATIONS ONLY:

- To avoid possible property damage or personal injury, the roof must have sufficient structural strength to carry the weight of the unit(s) and snow or water loads as required by local codes. Consult a structural engineer to determine the weight capabilities of the roof.
- The unit may be installed directly on wood floors or on Class A, Class B, or Class C roof covering material.
- To avoid possible personal injury, a safe, flat surface for service personnel should be provided.

UNIT PRECAUTIONS

- Do not stand or walk on the unit.
- Do not drill holes anywhere in panels or in the base frame of the unit(except where indicated). Unit access panels provide structural support.
- Do not remove any access panels until unit has been installed on roof curb or field supplied structure.
- Do not roll unit across finished roof without prior approval of owner or architect.
- Do not skid or slide on any surface as this may damage unit base. The unit must be stored on a flat, level surface. Protect the condenser coil because it is easily damaged.

ROOF CURB INSTALLATIONS ONLY:

Curb installations must comply with local codes and should be done in accordance with the established guidelines of the National Roofing Contractors Association.

Proper unit installation requires that the roof curb be firmly and permanently attached to the roof structure. Check for adequate fastening method prior to setting the unit on the curb.

Full perimeter roof curbs are available from the factory and are shipped unassembled. Field assembly, squaring, leveling and mounting on the roof structure are the responsibility of the installing contractor. All required hardware necessary for the assembly of the sheet metal curb is included in the curb accessory.

WARNING

TO PREVENT POSSIBLE EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH, THE FOLLOWING BULLET POINTS MUST BE OBSERVED WHEN INSTALLING THE UNIT.

- Sufficient structural support must be determined prior to locating and mounting the curb and package unit.
- Ductwork must be constructed using industry guidelines. The duct work must be placed into the roof curb before mounting the package unit. Our full perimeter curbs include duct connection frames to be assembled with the curb. Cantilevered type curbs are not available from the factory.
- Curb insulation, cant strips, flashing and general roofing material are furnished by the contractor.

The curbs must be supported on parallel sides by roof members. The roof members must not penetrate supply and return duct opening areas as damage to the unit might occur.

NOTE: The unit and curb accessories are designed to allow vertical duct installation before unit placement. Duct installation after unit placement is not recommended.

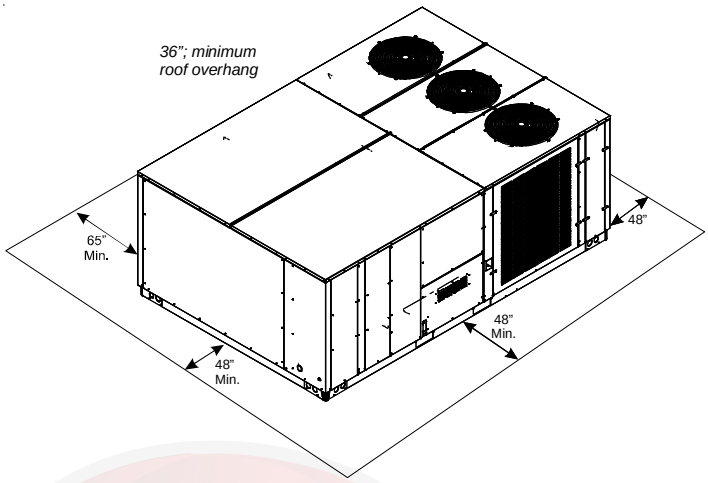
CAUTION

ALL CURBS LOOK SIMILAR. TO AVOID INCORRECT CURB POSITIONING, CHECK JOB PLANS CAREFULLY AND VERIFY MARKINGS ON CURB ASSEMBLY. INSTRUCTIONS MAY VARY IN CURB STYLES AND SUPERCEDE INFORMATION SHOWN.

See the manual shipped with the roof curb for assembly and installation instructions.

PRODUCT DESIGN

CLEARANCES



**In situations that have multiple units, a 48" minimum clearance is required between the condenser coils.*

UNIT CLEARANCES

Adequate clearance around the unit should be kept for safety, service, maintenance, and proper unit operation. A total clearance of 75" around this unit is recommended to facilitate possible blower assembly, shaft, wheel replacement, coil, heat exchanger, electric heat and gas furnace removal. This unit must not be installed beneath any obstruction. This unit should be installed remote from all building exhausts to inhibit ingestion of exhaust air into the unit's fresh air intake.

PROTRUSION

Inspect curb to ensure that none of the utility services (electric) routed through the curb protrude above the curb.

CAUTION

IF PROTRUSIONS EXIST, DO NOT ATTEMPT TO SET UNIT ON CURB. INFORMATION SHOWN.

ELECTRICAL WIRING

WARNING

HIGH VOLTAGE !

DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

HIGH VOLTAGE !

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DO NOT TAMPER WITH FACTORY WIRING. THE INTERNAL POWER AND CONTROL WIRING OF THESE UNITS ARE FACTORY-INSTALLED AND HAVE BEEN THOROUGHLY TESTED PRIOR TO SHIPMENT. CONTACT YOUR LOCAL REPRESENTATIVE IF ASSISTANCE IS REQUIRED.

CAUTION

TO PREVENT DAMAGE TO THE WIRING, PROTECT WIRING FROM SHARP EDGES. FOLLOW NATIONAL ELECTRICAL CODE AND ALL LOCAL CODES AND ORDINANCES. DO NOT ROUTE WIRES THROUGH REMOVABLE ACCESS PANELS.

CAUTION

CONDUIT AND FITTINGS MUST BE WEATHER-TIGHT TO PREVENT WATER ENTRY INTO THE BUILDING.

For unit protection, use a fuse or HACR circuit breaker that is in excess of the circuit ampacity, but less than or equal to the maximum overcurrent protection device. DO NOT EXCEED THE MAXIMUM OVERCURRENT DEVICE SIZE SHOWN ON UNIT DATA PLATE.

All line voltage connections must be made through weatherproof fittings. All exterior power supply and ground wiring must be in approved weatherproof conduit.

The main power supply wiring to the unit and low voltage wiring to accessory controls must be done in accordance with these instructions, the latest edition of the National Electrical Code (ANSI/NFPA 70), and all local codes and ordinances. All field wiring shall conform with the temperature limitations for Type T wire (63°F/35°C rise).

The main power supply shall be three-phase, three wire. The unit is factory wired for the voltage shown on the unit's data plate.

PRODUCT DESIGN

Main power wiring should be sized for the minimum wire ampacity shown on the unit's database. Size wires in accordance with the ampacity tables in Article 310 of the National Electrical Code. If long wires are required, it may be necessary to increase the wire size to prevent excessive voltage drop. Wires should be sized for a maximum of 3% voltage drop.

CAUTION

TO AVOID PROPERTY DAMAGE OR PERSONAL INJURY DUE TO FIRE, USE ONLY COPPER CONDUCTORS.

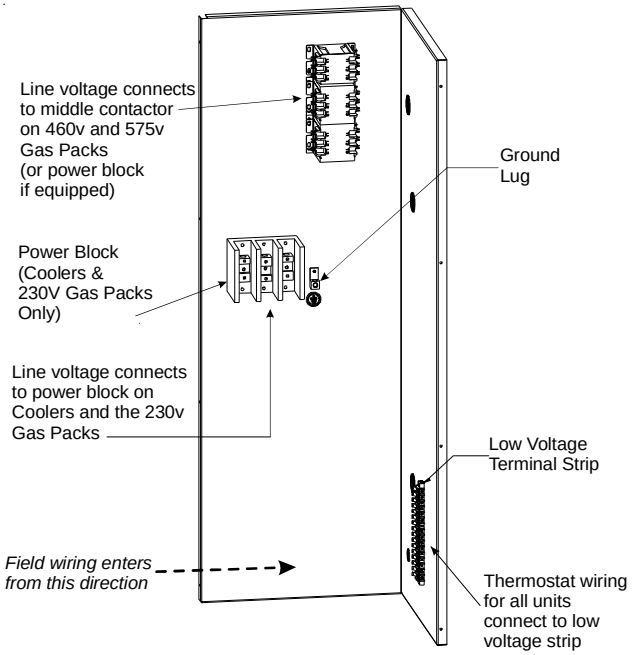
CAUTION

TO PREVENT IMPROPER AND DANGEROUS OPERATION DUE TO WIRING ERRORS, LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. VERIFY PROPER OPERATION AFTER SERVICING.

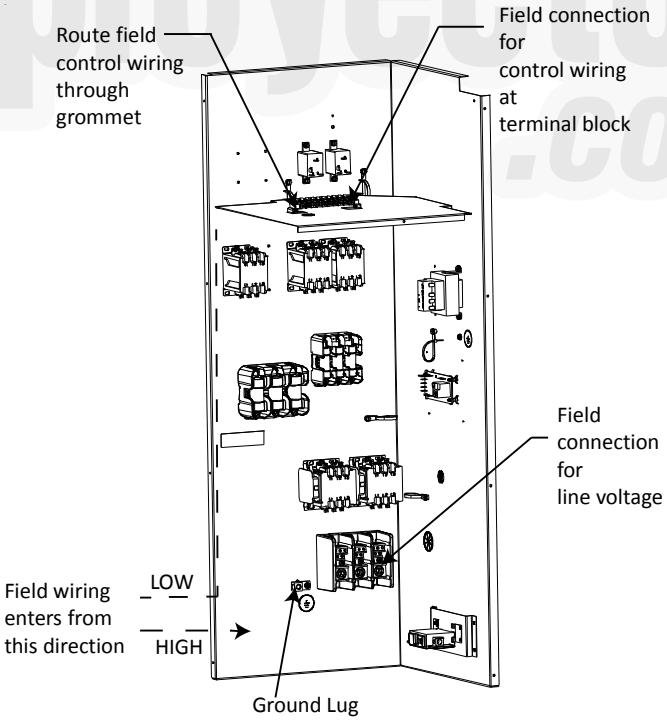
NOTE: A weather-tight disconnect switch, properly sized for the unit total load, must be field or factory installed. An external field supplied disconnect may be mounted on the exterior panel.

Ensure the data plate is not covered by the field-supplied disconnect switch.

- Some disconnect switches are not fused. Protect the power leads at the point of distribution in accordance with the unit data plate.
- The unit must be electrically grounded in accordance with local codes or, in the absence of local codes, with the latest edition of the National Electrical Code (ANSI-NFPA 70). A ground lug is provided for this purpose. Size grounding conductor in accordance with Table 250-95 of the National Electrical Code. Do not use the ground lug for connecting a neutral conductor.
- Connect power wiring to the electrical middle contactor within the main control box of power block, if equipped.



POWER AND LOW VOLTAGE BLOCK LOCATIONS



PRODUCT DESIGN

25 TON POWER AND LOW VOLTAGE BLOCK LOCATIONS

WARNING

FAILURE OF UNIT DUE TO OPERATION ON IMPROPER LINE VOLTAGE OR WITH EXCESSIVE PHASE UNBALANCE CONSTITUTES PRODUCT ABUSE MAY CAUSE SEVERE DAMAGE TO THE UNIT ELECTRICAL COMPONENTS.

Areas Without Convenience Outlet

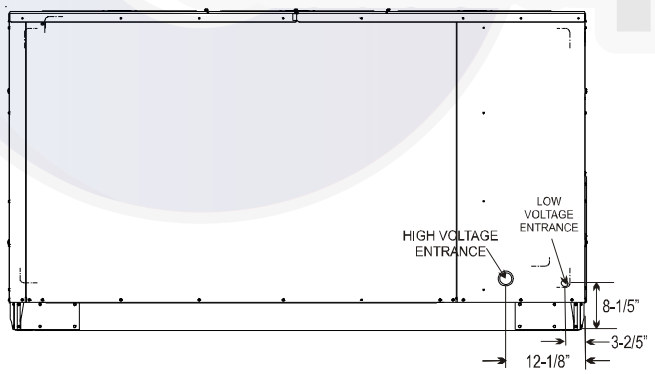
It is recommended that an independent 115V power source be brought to the vicinity of the roof top unit for portable lights and tools used by the service mechanic.

NOTE: Refer to local codes for requirements. These outlets can also be factory installed.

Units installed on Roof Tops

Main power and low voltage wiring may enter the unit through the side or through the roof curb. Install conduit connectors at the desired entrance locations. External connectors must be weatherproof. All holes in the unit base must be sealed (including those around conduit nuts) to prevent water leakage into building. All required conduit and fittings are to be field supplied.

Supply voltage to roof top unit must not vary by more than 10% of the value indicated on the unit data plate. Phase voltage unbalance must not exceed 2%. Contact your local power company for correction of improper voltage or phase unbalance.



ELECTRICAL ENTRANCE LOCATIONS

Unit is equipped with a Low Voltage Terminal Block and has Single Point wiring to the contactor.

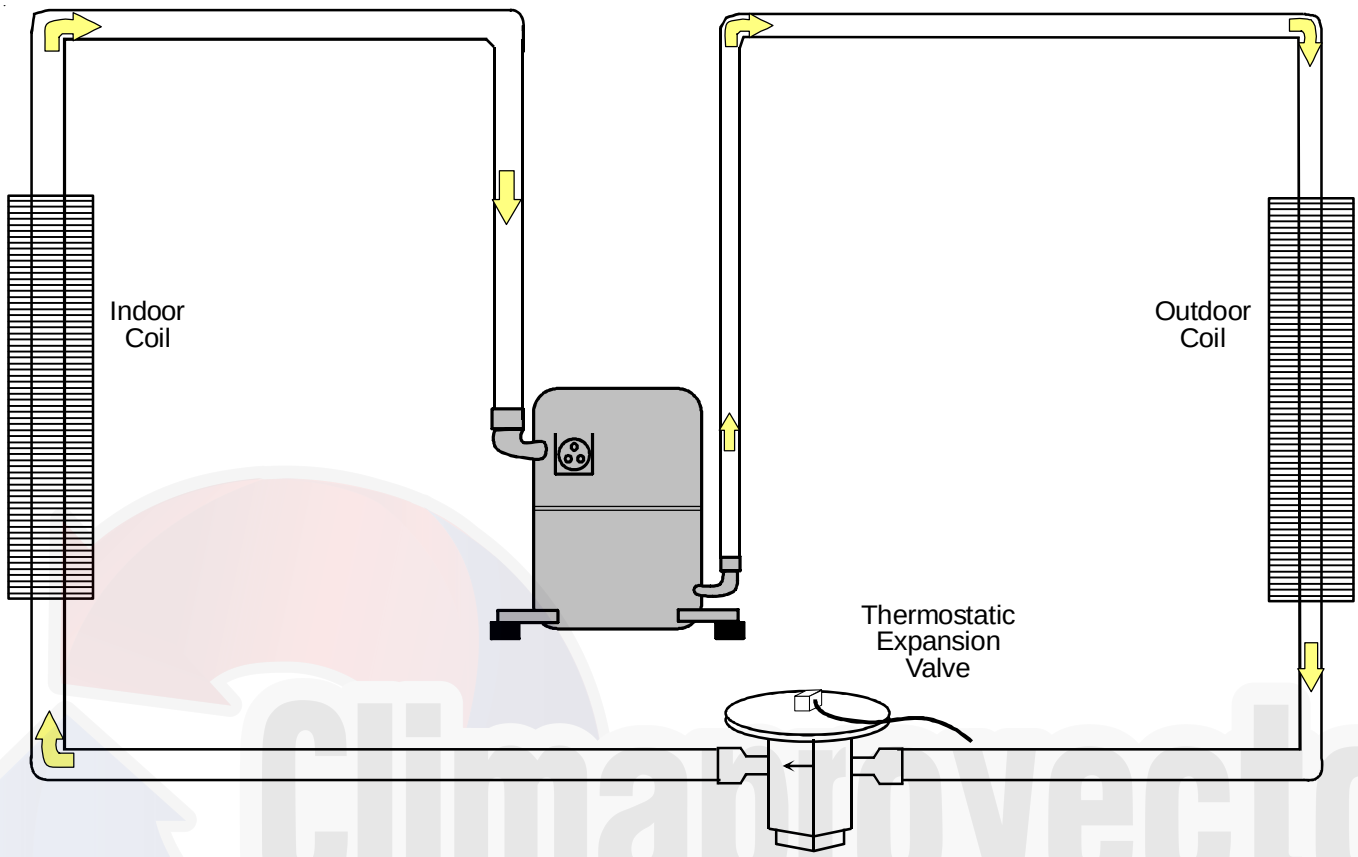
Low Voltage Control Wiring

1. A 24V thermostat must be installed for unit operation. It may be purchased with the unit or field -supplied. Thermostats may be programmable or electromechanical as required.
2. Locate thermostat or remote sensor in the conditioned space where it will sense average temperature. Do not locate the device where it may be directly exposed to supply air, sunlight or other sources of heat. Follow installation instructions packaged with the thermostat.
3. Use #18 AWG wire for 24V control wiring runs not exceeding 75 feet. Use #16 AWG wire for 24V control wiring runs not exceeding 125 feet. Use #14 AWG wire for 24V control wiring runs not exceeding 200 feet. Low voltage wiring may be National Electrical Code (NEC) Class 2 where permitted by local codes.
4. Route thermostat wires from sub-base terminals to the unit. Control wiring should enter through the duct panel (dimple marks entrance location). Connect thermostat and any accessory wiring to low voltage terminal block TB1 in the main control box.

NOTE: Field-supplied conduit may need to be installed depending on unit/curb configuration. Use #18 AWG solid conductor wire whenever connecting thermostat wires to terminals on sub-base. DO NOT use larger than #18 AWG wire. A transition to #18 AWG wire may be required before entering thermostat sub-base.

NOTE: Refer to unit wiring diagrams for thermostat hookups.

Typical Package Cooling or Package Gas



Either a thermostatic expansion valve or restrictor orifice assembly may be used depending on model, refer to the parts catalog for the model being serviced.

SYSTEM OPERATION

CIRCULATING AIR AND FILTERS

Ductwork

The supply duct should be provided with an access panel large enough to inspect the air chamber downstream of the heat exchanger. A cover should be tightly attached to prevent air leaks.

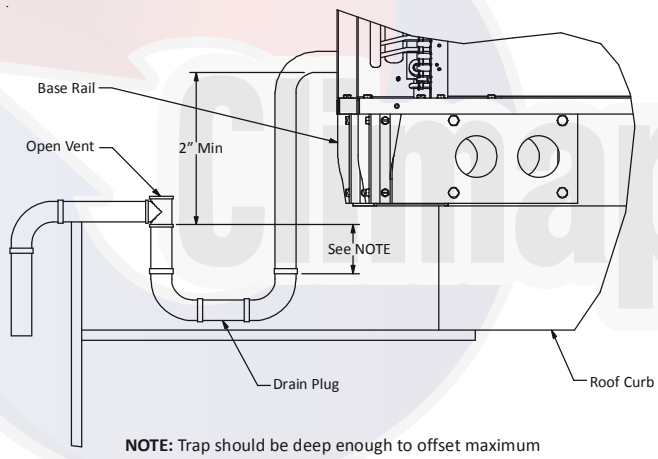
Ductwork dimensions are shown in the roof curb installation manual.

If desired, supply and return duct connections to the unit may be made with flexible connections to reduce possible unit operating sound transmission.

CONDENSATE DRAIN CONNECTION

Condensate Drain Connection

A 1" female NPT drain connection is supplied on the side of the unit and a 1" male NPT on the bottom of the drain pan for condensate piping. An external trap must be installed for proper condensate drainage.



NOTE: Trap should be deep enough to offset maximum unit static difference. A minimum 4" trap is recommended.

Drain Connection

Install condensate drain trap as shown. Use 1" drain line and fittings or larger. Do not operate without trap.

Horizontal Drain

Drainage of condensate directly onto the roof may be acceptable; refer to local code. It is recommended that a small drip pad of either stone, mortar, wood or metal be provided to prevent any possible damage to the roof.

Cleaning

Due to the fact that drain pans in any air conditioning unit will have some moisture in them, algae and fungus will grow due to airborne bacteria and spores. Periodic cleaning is necessary to prevent this build-up from plugging the drain.

STARTUP, ADJUSTMENTS, AND CHECKS

⚠ WARNING

HIGH VOLTAGE!

To avoid personal injury or death due to electrical shock, bond the frame of this unit to the building electrical ground by use of the grounding terminal provided or other acceptable means. Disconnect all power before servicing or installing this unit.

⚠ CAUTION

To prevent property damage or personal injury, Do not start the unit until all necessary pre-checks and test have been performed.

⚠ WARNING

MOVING MACHINERY HAZARD!

To prevent possible personal injury or death, disconnect power to the unit and padlock in the "OFF" position before servicing fans.

Contractor Responsibility

The installing contractor must be certain that:

- All supply and return air ductwork is in place, properly sealed, and corresponds with installation instructions.
- All thermostats are mounted and wired in accordance with installation instructions.
- All electric power, all gas, hot water or steam line connections, and the condensate drain installation have been made to each unit on the job. These main supply lines must be functional and capable of operating all units simultaneously.
- Requirements are met for venting and combution air.
- Air filters are in place.
- Input rate and temperature rise are adjusted per rating plate.
- Return air temperature is maintained between 55°F (13°C) and 80°F (27°C).

Roof Curb Installation Check

Inspect the roof curb for correct installation. The unit and curb assembly should be level. Inspect the flashing of the roof mounting curb to the roof, especially at the corners, for good

workmanship. Also check for leaks around gaskets. Note any deficiencies in a separate report and forward to the contractor.

Obstructions, Fan Clearance and Wiring

Remove any extraneous construction and shipping materials that may be found during this procedure. Rotate all fans manually to check for proper clearances and that they rotate freely. Check for bolts and screws that may have jarred loose during shipment to the job site. Retighten if necessary. Re-tighten all electrical connections.

Field Duct Connections

Verify that all duct connections are tight and that there is no air bypass between supply and return.

Filter Section Check

Remove filter section access panels and check that filters are properly installed. Note airflow arrows on filter frames.

AIR FLOW ADJUSTMENTS

When the final adjustments are complete, the current draw of the motor should be checked and compared to the full load current rating of the motor. The amperage must not exceed the service factor stamped on the motor nameplate. The total airflow must not be less than that required for operation of the electric heaters or the furnace.

If an economizer is installed, check the unit operating balance with the economizer at full outside air and at minimum outside air.

NOTE: Airflow setting below 300 CFM/Ton is not recommended, as evaporator freezing or poor unit performance is possible.Start-up Procedure and Checklist for 2 Speed Models.

Set Evaporator Fan Rpm

Actual RPM's must be set and verified with a tachometer or strobe light. With disconnect switch open, disconnect thermostat wires from terminals Y and W. This will prevent heating and mechanical cooling from coming on. Place a jumper wire across terminals R and G at TB1 terminal block. Close disconnect switch; evaporator fan motor will operate so RPM can be checked.

For gas heat units, the airflow must be adjusted so that the air temperature rise falls within the ranges given stated on Data Plate.

Electrical Input Check

Make preliminary check of evaporator fan ampere draw and verify that motor nameplate amps are not exceeded. A final check of amp draw should be made upon completion of air balancing of the duct system.

BELT DRIVE MODELS ONLY

The drive on the supply fan is typically set in the middle of the RPM range. The drive motor sheave pitch diameter is field adjustable for the required airflow.

Upon completion of the air flow balancing, we recommend replacing the variable pitched motor sheave with a properly-sized fixed sheave. A matching fixed sheave will provide longer belt and bearing life and vibration free operation. Initially, it is best to have a variable pitched motor sheave for the purpose of airflow balancing, but once the balance has been achieved, fixed sheaves maintain alignment and minimize vibration more effectively. For direct drive units, move fan speed wire.

Bearing Check

Prior to energizing any fans, check and make sure that all setscrews are tight si that bearings are properly secured to shafts.

⚠ WARNING

TO AVOID PROPERTY DAMAGE, PERSONAL INJURY OR DEATH DUE TO FIRE OR EXPLOSION, A QUALIFIED SERVICER MUST INVESTIGATE THE REASON FOR THE ROLLOUT PROTECTION DEVICE TO OPEN BEFORE MANUALLY RESETTING THE ROLLOUT PROTECTION DEVICE.

NORMAL SEQUENCE OF OPERATION

Cooling

Begin with power turned off at all disconnects.

1. Turn thermostat system switch to "Cool," and fan switch to "Auto" and turn temperature setting as high as it will go.
2. Inspect all registers and set them to the normal open position.
3. Turn on the electrical supply at the disconnect.
4. Turn the fan switch to the "ON" position. The blower should operate after a 7-second delay.
5. Turn the fan switch to "Auto" position. The blower should stop after a 65 second delay.
6. Slowly lower the cooling temperature until first stage COOL (LOW COOL) starts. The blower, both fans, and first stage compressor should now be operating. Allow the unit to run 10 minutes, make sure cool air is being supplied by the unit.
7. Lower the cooling temperature further until second stage

SYSTEM OPERATION

COOL (HIGH COOL) starts. The blower, both fans, and both compressors should now be operating. Allow the unit to run 10 minutes, make sure cool air is being supplied by the unit.

8. Turn the temperature setting to the highest position, stopping the unit. The indoor blower will continue to run for 65 seconds.

9. Turn the thermostat system switch to "OFF" and disconnect all power when servicing the unit.

⚠ WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

REFRIGERATION CHECK

The unit is equipped with a thermal expansion valve as a metering device.

Ensure the hold-down bolts on the compressor are secure and have not vibrated loose during shipment. Check that vibration grommets have been installed. Visually check all piping for damage and leaks; repair if necessary. The entire system has been factory charged and tested, making it unnecessary to field charge. Factory charges are shown on the unit's nameplate. To confirm charge levels or, if a leak occurs and charge needs to be added to the system, it is recommended to evacuate the system and recharge refrigerate to unit nameplate specifications. This unit has been rated in the cooling mode at the AHRI rated conditions of: Indoor (80° db / 67° wb) and outdoor (95° db). While operating at this condition, the subcooling should range from 12° to 15° F for each refrigeration circuit, for 15 and 20 ton models. Sucooling for 25 ton models should be from 16° to 19° F for circuit 1, and from 12° to 15° F for circuit 2.

FINAL SYSTEM CHECKS

1. Check to see if all supply and return air grilles are adjusted and the air distribution system is balanced for the best compromise between heating and cooling.
2. Check for air leaks in the ductwork. See Sections on **Air Flow Adjustments.**
3. Make sure the unit is free of "rattles", and the tubing in the unit is free from excessive vibration. Also make sure tubes or lines are not rubbing against each other or sheet metal surfaces or edges. If so, correct the trouble.
4. Set the thermostat at the appropriate setting for cooling and heating or automatic change over for normal use.
5. Be sure the Owner is instructed on the unit operation, filter, servicing, correct thermostat operation, etc.

SCHEDULED MAINTENANCE

MAINTENANCE

WARNING

HIGH VOLTAGE !

DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

TO PREVENT PERSONAL INJURY OR DEATH DUE TO IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE OR MAINTENANCE, REFER TO THIS MANUAL. FOR ADDITIONAL ASSISTANCE OR INFORMATION, CONSULT A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.

CAUTION

SHEET METAL PARTS, SCREWS, CLIPS AND SIMILAR ITEMS INHERENTLY HAVE SHARP EDGES, AND IT IS NECESSARY THAT THE INSTALLER AND SERVICE PERSONNEL EXERCISE CAUTION.

Preventive maintenance is the best way to avoid unnecessary expense and inconvenience. Have this system inspected at regular intervals by qualified service personnel, at least twice a year. Routine maintenance should cover the following items:

1. Tighten all belts, set screws, and wire connections.
2. Clean evaporator and condenser coils mechanically or with cold water, if necessary. Usually any fouling is only matted on the entering air face of the coil and can be removed by brushing.
3. Lubricate motor bearings.
4. Align or replace belts as needed.
5. Replace filters as needed (see below).
6. Check for blockage of condensate drain.
7. Check power and control voltages.
8. Check running amperage.
9. Check operating temperatures and pressures.
10. Check and adjust temperature and pressure controls.
11. Check and adjust damper linkages.
12. Check operation of all safety controls.
13. Examine gas furnaces (see below and the User's Information Manual).
14. Check condenser fans and tighten set screws.

FILTERS

CAUTION

TO PREVENT PROPERTY DAMAGE DUE TO FIRE AND LOSS OF EQUIPMENT EFFICIENCY OR EQUIPMENT DAMAGE DUE TO DUST AND LINT BUILD UP ON INTERNAL PARTS, NEVER OPERATE UNIT WITHOUT AN AIR FILTER INSTALLED IN THE RETURN AIR SYSTEM.

Every application may require a different frequency of replacement of dirty filters. Filters must be replaced at least every three (3) months during operating seasons.

Dirty filters are the most common cause of inadequate heating or cooling performance. Filter inspection should be made at least every two months; more often if necessary because of local conditions and usage.

Dirty throwaway filters should be discarded and replaced with a new, clean filter.

Disposable return air filters are supplied with this unit. See the unit Specification Sheet for the correct size and part number. To remove the filters, remove the filter access panel on return side of the unit.

CABINET FINISH MAINTENANCE

Use a fine grade automotive wax on the cabinet finish to maintain the finish's original high luster. This is especially important in installations with extended periods of direct sunlight.

CONDENSER AND INDUCED DRAFT MOTORS

Bearings on the condenser fan motors and the combustion fan motor are permanently lubricated. No additional oiling is required.

LUBRICATION

The fan shaft bearings and the supply fan motor have grease fittings that should be lubricated during normal maintenance checks.

CLEAN OUTSIDE COIL (QUALIFIED SERVICER ONLY)

The coil with the outside air flowing over it should be inspected annually and cleaned as frequently as necessary to keep the finned areas free of lint, hair and debris.

FUNCTIONAL PARTS

Refer to the unit Parts Catalog for a list of functional parts. Parts are available from your distributor.

COOLING ANALYSIS CHART

Complaint	No Cooling							Unsatisfactory Cooling					System Operating Pressures			Test Method Remedy	See Service Procedure Ref.
POSSIBLE CAUSE DOTS IN ANALYSIS GUIDE INDICATE "POSSIBLE CAUSE" SYMPTOM	System will not start	Compressor will not start - fan runs	Comp. and Cond. Fan will not start	Evaporator fan will not start	Condenser fan will not start	Compressor runs - goes off on overload	Compressor cycles on overload	System runs continuously - little cooling	Too cool and then too warm	Not cool enough on warm days	Certain areas too cool, others too warm	Compressor is noisy	Low suction pressure	High suction pressure	High head pressure		
Power Failure	●															Test Voltage	S-1
Blown Fuse	●		●	●												Inspect Fuse Size & Type	S-1
Unbalanced Power, 3PH		●				●	●									Test Voltage	S-1
Loose Connection	●			●		●										Inspect Connection - Tighten	S-2, S-3
Shorted or Broken Wires	●	●	●	●	●	●										Test Circuits With Ohmmeter	S-2, S-3
Open Fan Overload				●	●											Test Continuity of Overload	S-17A
Faulty Thermostat	●		●	●					●							Test Continuity of Thermostat & Wiring	S-3
Faulty Transformer	●		●													Check Control Circuit with Voltmeter	S-4
Shorted or Open Capacitor		●		●	●	●	●									Test Capacitor	S-15
Internal Compressor Overload Open		●														Test Continuity of Overload	S-17A
Shorted or Grounded Compressor		●				●										Test Motor Windings	S-17B
Compressor Stuck		●				●	●									Use Test Cord	S-17D
Faulty Compressor Contactor			●		●	●										Test Continuity of Coil & Contacts	S-7, S-8
Faulty Fan Relay				●												Test Continuity of Coil And Contacts	S-7
Open Control Circuit				●												Test Control Circuit with Voltmeter	S-4
Low Voltage		●				●	●									Test Voltage	S-1
Faulty Evap. Fan Motor				●									●			Repair or Replace	S-16
Shorted or Grounded Fan Motor					●										●	Test Motor Windings	S-16
Improper Cooling Anticipator							●		●							Check Resistance of Anticipator	S-3B
Shortage of Refrigerant							●	●					●			Test For Leaks, Add Refrigerant	S-101,103
Restricted Liquid Line							●	●					●		●	Remove Restriction, Replace Restricted Part	S-112
Dirty Air Filter								●		●	●		●			Inspect Filter-Clean or Replace	
Dirty Indoor Coil								●		●	●		●			Inspect Coil - Clean	
Insufficient air across Indoor Coil								●		●	●		●			Check Blower Speed and Rotation, Belt, Pulleys, Duct Static, Filter	S-200,205, 206, 207
Too much air across Indoor Coil														●		Reduce Blower Speed, Check Pulley Adjustment	S-205, 207
Overcharge of Refrigerant						●	●					●		●	●	Recover Part of Charge	S-113
Dirty Outdoor Coil						●	●	●		●					●	Inspect Coil - Clean	
Noncondensibles							●	●		●					●	Recover Charge, Evacuate, Recharge	S-114
Recirculation of Condensing Air							●	●		●					●	Remove Obstruction to Air Flow	
Infiltration of Outdoor Air								●		●	●					Check Windows, Doors, Vent Fans, Etc.	
Improperly Located Thermostat						●			●							Relocate Thermostat	
Air Flow Unbalanced									●		●					Readjust Air Volume Dampers	
System Undersized								●		●						Refigure Cooling Load	
Broken Internal Parts												●				Replace Compressor	S-115
Broken Valves								●				●		●		Test Compressor Efficiency	S-104
Inefficient Compressor								●						●		Test Compressor Efficiency	S-104
Expansion Device Restricted						●	●	●		●			●		●	Remove Restriction, Replace Expansion Device	111
Loose Hold-down Bolts												●				Tighten Bolts	
Flowrator Not Seating Properly								●						●		Check Flowrator & Seat or Replace Flowrator	S-111

● **Cooling Cycle**

SERVICING

Table of Contents

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

SERVICING

S-1 CHECKING VOLTAGE

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove doors, control panel cover, etc. from unit being tested.

With power ON:

WARNING

Line Voltage now present.

2. Using a voltmeter, measure the voltage across terminals L1 and L2 of the contactor for single phase units, and L3, for 3 phase units.
3. No reading - indicates open wiring, open fuse(s) no power or etc. from unit to fused disconnect service. Repair as needed.
4. With ample voltage at line voltage connectors, energize the unit.
5. Measure the voltage with the unit starting and operating, and determine the unit Locked Rotor Voltage.

   Locked Rotor Voltage is the actual voltage available at the compressor during starting, locked rotor, or a stalled condition. Measured voltage should be above minimum listed in chart below.

   To measure Locked Rotor Voltage attach a voltmeter to the run "R" and common "C" terminals of the compressor, or to the T_1 and T_2 terminals of the contactor. Start the unit and allow the compressor to run for several seconds, then shut down the unit. Immediately attempt to restart the unit while measuring the Locked Rotor Voltage.
6. Voltmeter should read within the voltage tabulation as shown. If the voltage falls below the minimum voltage, check the line wire size. Long runs of undersized wire can cause low voltage. If wire size is adequate, notify the local power company in regards to either low or high voltage.

Unit Supply Voltage		
Voltage	Min.	Max.
208/230	198	253
400	360	404
460	437	506
575	546	604

Three phase units require a balanced 3 phase power supply to operate. If the percentage of voltage imbalance exceeds 3% the unit must not be operated until the voltage condition is corrected.

$$\text{\% Voltage Imbalance} = \frac{\text{Max. Voltage Deviation From Average Voltage}}{\text{Average Voltage}} \times 100$$

To find the percentage of imbalance, measure the incoming power supply.

L1 - L2 = 240V
L1 - L3 = 232V
L2 - L3 = 238V
Total 710V

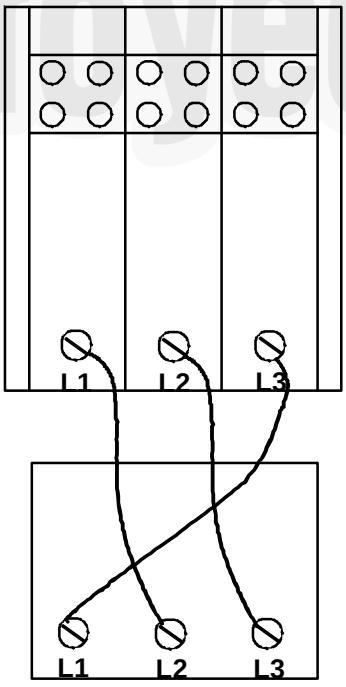
Avg. V = 710 / 3 = **236.7**

To find Max. deviation:
240 - 236.7 = +3.3
232 - 236.7 = **-4.7**
238 - 236.7 = +1.3

Max deviation was 4.7V

% Voltage Imbalance = 4.7 / 236.7 = **1.99%**

If the percentage of imbalance had exceeded 3%, it must be determined if the imbalance is in the incoming power supply or the equipment. To do this rotate the legs of the incoming power and retest voltage as shown below.



L1 - L2 = 240V
L1 - L3 = 227V
L2 - L3 = 238V

Rotate all 3 incoming legs as shown.

L1 - L2 = 227V
L1 - L3 = 238V
L2 - L3 = 240V

By the voltage readings we see that the imbalance rotated or traveled with the switching of the incoming legs. Therefore the imbalance lies within the incoming power supply.

If the imbalance had not changed then the problem would lie within the equipment. Check for current leakage, shorted motors, etc.

SERVICING

S-2 CHECKING WIRING

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Check wiring visually for signs of overheating, damaged insulation and loose connections.
2. Use an ohmmeter to check continuity of any suspected open wires.
3. If any wires must be replaced, replace with comparable gauge and insulation thickness.

S-3 CHECKING THERMOSTAT, WIRING, AND ANTICIPATOR

THERMOSTAT WIRE SIZING CHART	
LENGTH OF RUN	MIN. COPPER WIRE GAUGE (AWG)
25 feet	18
50 feet	16
75 feet	14
100 feet	14
125 feet	12
150 feet	12

S-3A THERMOSTAT AND WIRING

WARNING

Line Voltage now present.

With power ON, thermostat calling for cooling

1. Use a voltmeter to check for 24 volts at thermostat wires C and Y in the unit control panel.
2. No voltage indicates trouble in the thermostat or wiring.
3. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

Indoor Blower Motor

With power ON:

WARNING

Line Voltage now present.

1. Set fan selector switch at thermostat to "ON" position.
2. With voltmeter, check for 24 volts at wires C and G.
3. No voltage indicates the trouble is in the thermostat or wiring.
4. Check the continuity of the thermostat and wiring. Repair or replace as necessary.

S-3B COOLING ANTICIPATOR

The cooling anticipator is a small heater (resistor) in the thermostat. During the "off" cycle, it heats the bimetal element helping the thermostat call for the next cooling cycle. This prevents the room temperature from rising too high before the system is restarted. A properly sized anticipator should maintain room temperature within 1 1/2 to 2 degree range.

The anticipator is supplied in the thermostat and is not to be replaced. If the anticipator should fail for any reason, the thermostat must be changed.

S-4 CHECKING TRANSFORMER AND CONTROL CIRCUIT

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

A step-down transformer (either 208-240, 460 or 575 volt primary to 24 volt secondary) is provided with each unit. This allows ample capacity for use with resistance heaters.

WARNING

Disconnect ALL power before servicing.

1. Remove control panel cover to gain access to transformer.

With power ON:

WARNING

Line Voltage now present.

2. Using a voltmeter, check voltage across secondary voltage side of transformer (R to C).
3. No voltage indicates faulty transformer, bad wiring, or bad splices.
4. Check transformer primary voltage at incoming line voltage connections and/or splices.
5 If line voltage available at primary voltage side of transformer and wiring and splices good, transformer is inoperative. Replace.

SERVICING

S-7 CHECKING CONTACTOR AND/OR RELAYS

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

The compressor contactor and other relay holding coils are wired into the low or line voltage circuits. When the control circuit is energized, the coil pulls in the normally open contacts or opens the normally closed contacts. When the coil is de-energized, springs return the contacts to their normal position.

NOTE*: Most single phase contactors break only one side of the line (L1), leaving 115 volts to ground present at most internal components.*

1. Remove the leads from the holding coil.
2. Using an ohmmeter, test across the coil terminals.

If the coil does not test continuous, replace the relay or contactor.

S-8 CHECKING CONTACTOR CONTACTS

WARNING

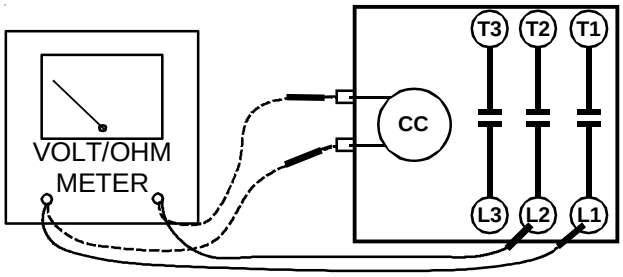
HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Disconnect the wire leads from the terminal (T) side of the contactor.
2. With power ON, energize the contactor.

WARNING

Line Voltage now present.

3. Using a voltmeter, test across terminals.
   A. L1-L2, L1-L3, and L2-L3 - If voltage is present, proceed to B. If voltage is not present, check breaker or fuses on main power supply..
   B. T1-T2, T1-T3, and T2-T3 - If voltage readings are not the same as in "A", replace contactor.



TESTING COMPRESSOR CONTACTOR (ThreePhase)

S-9 CHECKING FAN RELAY CONTACTS

DCG:

The fan relays are incorporated into the control board. See section S-313 for checking control board for single phase gas models.

For 3 phase and belt drive models, the procedure for testing the fan relay contacts will be the same as checking the compressor contactor contacts (See section S-8).

DCC:

The **E**lectronic **B**lower **T**ime **D**elay **R**elay is used on PSC and belt driven models.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

Checking EBTDR High Voltage Contacts

1. With power off, remove wires from terminals NC, COM, and NO.
2. Using a VOM, check for resistance from NO to COM. Should read open. Next, check for resistance from NC to COM. Should read closed.
3. If not as above, replace EBTDR.

SERVICING

Checking EBTDR Contact Operation

With power on:

WARNING
Line Voltage now present.

1. Set the thermostat to the fan "on" position.
2. Check for 24 volts at the C and G terminals of the EBTDR.
3. If no voltage present, check fan circuit from thermostat. If 24 volts present, proceed to step 4.
4. Using A VOM check for 24 volts between the NO terminal on the on the EBTDR and C on the EBTDR board. If voltage is present go to step 5.
5. With a call for continuous fan from the thermostat using a VOM check for 24 volts between the COM terminal EBTDR and C on the EBTDR board. If voltage is present go to step 6 if not replace the EBTDR.
6. Using a VOM check for 24 volts between the green wire connection and the blue wire connect ion at the Blower contactor. If 24 volts is present Replace the contactor.

WARNING
Disconnect ALL power before servicing.

Turn power off.

Testing relay holding coil

1. Remove the leads from the holding coil terminals 1 and 3.
2. Using an ohmmeter, test across the coil terminals 1 and 3. If the coil does not test continuous, replace the relay.

Testing relay contacts

WARNING
Disconnect ALL power before servicing.

Turn power off.

1. Using a VOM, test resistance across relay terminals 2 and 4. Should read open.
2. Turn power on.

WARNING
Line Voltage now present.

3. Apply 240 volts to coil terminals 1 and 3.
4. Using a VOM, check for 240 volts from terminals 3 and 1 of relay. Should read 240 volts. In no voltage, check wiring from heater kit to relay. If voltage present, proceed to step 5.
5. Using a VOM, check for 240 volts from L1 at contactor to terminal 4 of relay. Should read 240 volts. Next check from L1 at contactor to terminal 2 of relay. Should read 240 volts.

If not as above, replace relay.

WARNING
Disconnect ALL power before servicing.

Turn power off.

Testing relay holding coil

1. Remove the leads from the holding coil.
2. Using an ohmmeter, test across the coil terminals 1 and 3. If the coil does not test continuous, replace the relay.

Testing relay contacts

WARNING
Disconnect ALL power before servicing.

Turn power off.

1. Using a VOM, test resistance across relay terminals 2 and 4. Should read open.
2. Turn power on.

WARNING
Line Voltage now present.

3. Apply 24 volts to coil terminals 1 and 3.
4. Using a VOM, check for 24 volts from terminals 3 and 2 of relay. Should read 24 volts. If no voltage, check low voltage wiring from transformer to relay. If voltage present, proceed to step 5.
5. Using a VOM, check for 24 volts from terminals 3 and 4 of relay. Should read 24 volts.

If not as above, replace relay.

SERVICING

S-11 CHECKING LOSS OF CHARGE PROTECTOR

(Heat Pump Models)

The loss of charge protector senses the pressure in the liquid line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 22 PSIG. It will automatically cut-in (close) at approximately 50 PSIG.

Test for continuity using a VOM and if not as above, replace the control.

S-12 CHECKING HIGH PRESSURE CONTROL

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

The high pressure control senses the pressure in the discharge line. If abnormally high discharge pressures develop, the contacts of the control open, breaking the control circuit before the compressor motor overloads. This control is automatically reset.

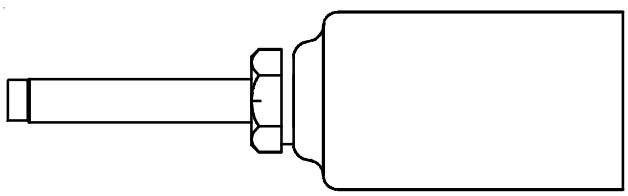
1. Using an ohmmeter, check across terminals of high pressure control, with wire removed. If not continuous, the contacts are open.
3. Attach a gauge to the access fitting on the liquid line.

With power ON:

WARNING

Line Voltage now present.

4. Start the system and place a piece of cardboard in front of the condenser coil, raising the condensing pressure.
5. Check pressure at which the high pressure control cuts-out.



If it cuts-out at 660 PSIG ± 10 PSIG, it is operating normally (See causes for high head pressure in Service Problem Analysis Guide). If it cuts out below this pressure range, replace the control. The control should reset at 420 PSIG ± 25 PSIG.

S-13 CHECKING LOW PRESSURE CONTROL

The low pressure control senses the pressure in the suction line and will open its contacts on a drop in pressure. The low pressure control will automatically reset itself with a rise in pressure.

The low pressure control is designed to cut-out (open) at approximately 22 PSIG ± 7 PSIG. It will automatically cut-in (close) at approximately 50 PSIG ± 7 PSIG.

Test for continuity using a VOM and if not as above, replace the control.

S-15 CHECKING CAPACITOR

CAPACITOR, RUN

A run capacitor is wired across the auxiliary and main windings of a single phase permanent split capacitor motor. The capacitors primary function is to reduce the line current while greatly improving the torque characteristics of a motor. This is accomplished by using the 90° phase relationship between the capacitor current and voltage in conjunction with the motor windings so that the motor will give two phase operation when connected to a single phase circuit. The capacitor also reduces the line current to the motor by improving the power factor.

CAPACITOR, START

SCROLL COMPRESSOR MODELS

Hard start components are not required on Scroll compressor equipped units due to a non-replaceable check valve located in the discharge line of the compressor. However hard start kits are available and may improve low voltage starting characteristics.

This check valve closes off high side pressure to the compressor after shut down allowing equalization through the scroll flanks. Equalization requires only about one or two seconds during which time the compressor may turn backwards.

Your unit comes with a 180-second anti-short cycle to prevent the compressor from starting and running backwards.

MODELS EQUIPPED WITH A HARD START DEVICE

A start capacitor is wired in parallel with the run capacitor to increase the starting torque. The start capacitor is of the electrolytic type, rather than metallized polypropylene as used in the run capacitor.

A switching device must be wired in series with the capacitor to remove it from the electrical circuit after the compressor starts to run. Not removing the start capacitor will overheat the capacitor and burn out the compressor windings.

SERVICING

These capacitors have a 15,000 ohm, 2 watt resistor wired across its terminals. The object of the resistor is to discharge the capacitor under certain operating conditions, rather than having it discharge across the closing of the contacts within the switching device such as the Start Relay, and to reduce the chance of shock to the servicer. See the Servicing Section for specific information concerning capacitors.

RELAY, START

A potential or voltage type relay is used to take the start capacitor out of the circuit once the motor comes up to speed. This type of relay is position sensitive. The normally closed contacts are wired in series with the start capacitor and the relay holding coil is wired parallel with the start winding. As the motor starts and comes up to speed, the increase in voltage across the start winding will energize the start relay holding coil and open the contacts to the start capacitor.

Two quick ways to test a capacitor are a resistance and a capacitance check.

S-15A RESISTANCE CHECK

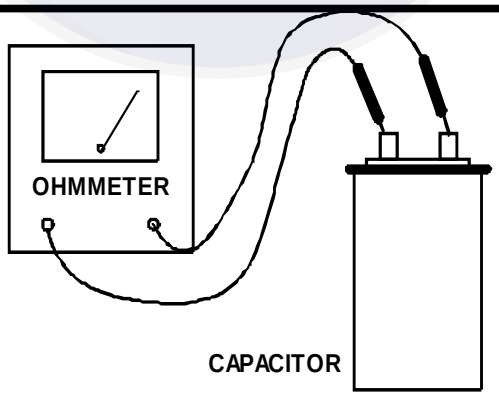
WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Discharge capacitor and remove wire leads.

WARNING

Discharge capacitor through a 20 to 30 OHM resistor before handling.

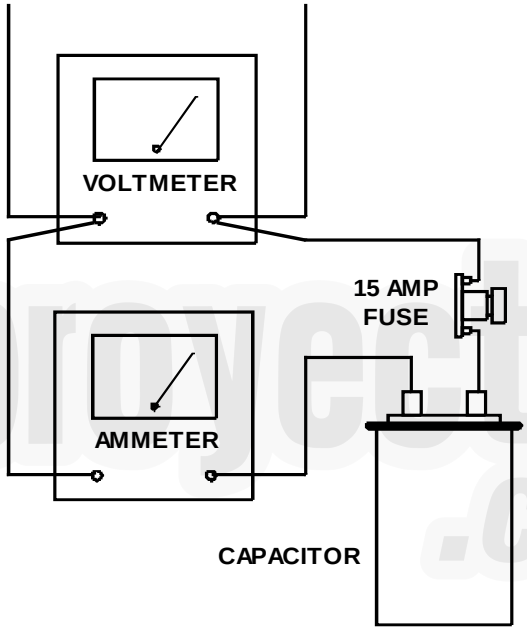


TESTING CAPACITOR RESISTANCE

2. Set an ohmmeter on its highest ohm scale and connect the leads to the capacitor -
   a. Good Condition - indicator swings to zero and slowly returns to infinity. (Start capacitor with bleed resistor will not return to infinity. It will still read the resistance of the resistor).
   b. Shorted - indicator swings to zero and stops there -replace.
   c. Open - no reading - replace. (Start capacitor would read resistor resistance.)

S-15B CAPACITANCE CHECK

Using a hookup as shown below, take the amperage and voltage readings and use them in the formula:



TESTING CAPACITANCE

WARNING

Discharge capacitor through a 20 to 30 OHM resistor before handling.

$$\text{Capacitance (MFD)} = \frac{2650 \times \text{Amperage}}{\text{Voltage}}$$

SERVICING

S-16 CHECKING MOTORS

S-16A CHECKING FAN MOTOR WINDINGS (PSC MOTORS)

Applies only to the condenser fan motors

The auto reset fan motor overload is designed to protect the motor against high temperature and high amperage conditions by breaking the common circuit within the motor, similar to the compressor internal overload. However, heat generated within the motor is faster to dissipate than the compressor, allow at least 45 minutes for the overload to reset, then retest.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove the motor leads from its respective connection points and capacitor (if applicable).
2. Check the continuity between each of the motor leads.
3. Touch one probe of the ohmmeter to the motor frame (ground) and the other probe in turn to each lead.

If the windings do not test continuous or a reading is obtained from lead to ground, replace the motor.

S-17 CHECKING COMPRESSOR WINDINGS

WARNING

Hermetic compressor electrical terminal venting can be dangerous. When insulating material which supports a hermetic compressor or electrical terminal suddenly disintegrates due to physical abuse or as a result of an electrical short between the terminal and the compressor housing, the terminal may be expelled, venting the vapor and liquid contents of the compressor housing and system.

If the compressor terminal PROTECTIVE COVER and gasket (if required) are not properly in place and secured, there is a remote possibility if a terminal vents, that the vaporous and liquid discharge can be ignited, spouting flames several feet, causing potentially severe or fatal injury to anyone in its path.

This discharge can be ignited external to the compressor if the terminal cover is not properly in place and if the discharge impinges on a sufficient heat source.

Ignition of the discharge can also occur at the venting terminal or inside the compressor, if there is sufficient contaminant air present in the system and an electrical arc occurs as the terminal vents.

Ignition cannot occur at the venting terminal without the presence of contaminant air, and cannot occur externally from the venting terminal without the presence of an external ignition source.

Therefore, proper evacuation of a hermetic system is essential at the time of manufacture and during servicing.

To reduce the possibility of external ignition, all open flame, electrical power, and other heat sources should be extinguished or turned off prior to servicing a system.

S-17A RESISTANCE TEST

Each compressor is equipped with an internal overload.

The line break internal overload senses both motor amperage and winding temperature. High motor temperature or amperage heats the disc causing it to open, breaking the common circuit within the compressor on single phase units.

Heat generated within the compressor shell, usually due to recycling of the motor, high amperage or insufficient gas to cool the motor, is slow to dissipate. Allow at least three to four hours for it to cool and reset, then retest.

WARNING

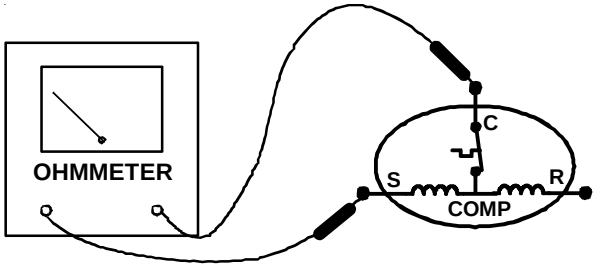
HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove the leads from the compressor terminals.

WARNING

See warnings S-17 before removing compressor terminal cover.

2. Using an ohmmeter, test continuity between terminals S-R, C-R, and C-S, on single phase units or terminals T1, T2 and T3, on 3 phase units.



TESTING COMPRESSOR WINDINGS

If either winding does not test continuous, replace the compressor.

NOTE: If an open compressor is indicated, allow ample time for the internal overload to reset before replacing compressor.

SERVICING

S-17B GROUND TEST

If fuse, circuit breaker, ground fault protective device, etc., has tripped, this is a strong indication that an electrical problem exists and must be found and corrected. The circuit protective device rating must be checked, and its maximum rating should coincide with that marked on the equipment nameplate.

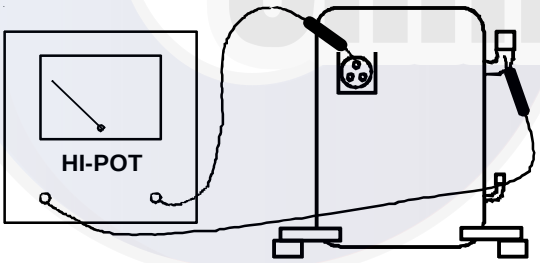
With the terminal protective cover in place, it is acceptable to replace the fuse or reset the circuit breaker ONE TIME ONLY to see if it was just a nuisance opening. If it opens again, DO NOT continue to reset.

WARNING

Disconnect ALL power before servicing.

Disconnect all power to unit, making sure that **all** power legs are open.

1. DO NOT remove protective terminal cover. Disconnect the three leads going to the compressor terminals at the nearest point to the compressor.
2. Identify the leads and using a Megger, Hi-Potential Ground Tester, or other suitable instrument which puts out a voltage between 300 and 1500 volts, check for a ground separately between each of the three leads and ground (such as an unpainted tube on the compressor). Do not use a low voltage output instrument such as a volt-ohmmeter.



COMPRESSOR GROUND TEST

3. If a ground is indicated, then carefully remove the compressor terminal protective cover and inspect for loose leads or insulation breaks in the lead wires.
4. If no visual problems indicated, carefully remove the leads at the compressor terminals.

WARNING

Damage can occur to the glass embedded terminals if the leads are not properly removed. This can result in terminal and hot oil discharging.

Carefully retest for ground, directly between compressor terminals and ground.

5. If ground is indicated, replace the compressor.

S-17D OPERATION TEST

If the voltage, capacitor, overload and motor winding test fail to show the cause for failure:

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Remove unit wiring from disconnect switch and wire a test cord to the disconnect switch.

NOTE: The wire size of the test cord must equal the line wire size and the fuse must be of the proper size and type.

2. With the protective terminal cover in place, use the three leads to the compressor terminals that were disconnected at the nearest point to the compressor and connect the common, start and run clips to the respective leads.
3. Connect good capacitors of the right MFD and voltage rating into the circuit as shown.
4. With power ON, close the switch.

WARNING

Line Voltage now present.

A. If the compressor starts and continues to run, the cause for failure is somewhere else in the system.

B. If the compressor fails to start - replace.

S-18 TESTING CRANKCASE HEATER (OPTIONAL ITEM)

Note: Not all compressors use crankcase heaters.

The crankcase heater must be energized a minimum of four (4) hours before the condensing unit is operated.

Crankcase heaters are used to prevent migration or accumulation of refrigerant in the compressor crankcase during the off cycles and prevents liquid slugging or oil pumping on start up.

A crankcase heater will not prevent compressor damage due to a floodback or over charge condition.

WARNING

Disconnect ALL power before servicing.

1. Disconnect the heater lead in wires.
2. Using an ohmmeter, check heater continuity - should test continuous. If not, replace.

SERVICING

S-50 CHECKING HEATER LIMIT CONTROL(S)

(OPTIONAL ELECTRIC HEATERS)

Each individual heater element is protected with an automatic rest limit control connected in series with each element to prevent overheating of components in case of low airflow. This limit control will open its circuit at approximately 150°F. to 160°F and close at approximately 110°F.

WARNING

Disconnect ALL power before servicing.

1. Remove the wiring from the control terminals.
2. Using an ohmmeter test for continuity across the normally closed contacts. No reading indicates the control is open - replace if necessary. Make sure the limits are cool before testing.

IF FOUND OPEN - REPLACE - DO NOT WIRE AROUND.

S-52 CHECKING HEATER ELEMENTS

Optional electric heaters may be added, in the quantities shown in the spec sheet for each model unit, to provide electric resistance heating. Under no condition shall more heaters than the quantity shown be installed.

WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing or installing this unit. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death.

1. Disassemble and remove the heating element(s).
2. Visually inspect the heater assembly for any breaks in the wire or broken insulators.
3. Using an ohmmeter, test the element for continuity - no reading indicates the element is open. Replace as necessary.

S-100 REFRIGERATION REPAIR PRACTICE

DANGER

Always remove the refrigerant charge in a proper manner before applying heat to the system.

When repairing the refrigeration system:

WARNING

Disconnect ALL power before servicing.

1. Never open a system that is under vacuum. Air and moisture will be drawn in.
2. Plug or cap all openings.
3. Remove all burrs and clean the brazing surfaces of the tubing with sand cloth or paper. Brazing materials do not flow well on oxidized or oily surfaces.
4. Clean the inside of all new tubing to remove oils and pipe chips.
5. When brazing, sweep the tubing with dry nitrogen to prevent the formation of oxides on the inside surfaces.
6. Complete any repair by replacing the liquid line drier in the system, evacuate and charge.

BRAZING MATERIALS

Copper to Copper Joints - Sil-Fos used without flux (alloy of 15% silver, 80% copper, and 5% phosphorous). Recommended heat 1400°F.

Copper to Steel Joints - Silver Solder used without a flux (alloy of 30% silver, 38% copper, 32% zinc). Recommended heat - 1200°F.

S-101 LEAK TESTING (NITROGEN OR NITROGEN-TRACED)

WARNING

To avoid the risk of fire or explosion, never use oxygen, high pressure air or flammable gases for leak testing of a refrigeration system.

WARNING

To avoid possible explosion, the line from the nitrogen cylinder must include a pressure regulator and a pressure relief valve. The pressure relief valve must be set to open at no more than 150 psig.

Pressure test the system using dry nitrogen and soapy water to locate leaks. If you wish to use a leak detector, charge the system to 10 psi using the appropriate refrigerant then use nitrogen to finish charging the system to working pressure, then apply the detector to suspect areas. If leaks are found, repair them. After repair, repeat the pressure test. If no leaks exist, proceed to system evacuation.

SERVICING

S-102 EVACUATION

WARNING

REFRIGERANT UNDER PRESSURE!
Failure to follow proper procedures may cause property damage, personal injury or death.

This is the most important part of the entire service procedure. The life and efficiency of the equipment is dependent upon the thoroughness exercised by the serviceman when evacuating air (non-condensables) and moisture from the system.

Air in a system causes high condensing temperature and pressure, resulting in increased power input and reduced performance.

Moisture chemically reacts with the refrigerant oil to form corrosive acids. These acids attack motor windings and parts, causing breakdown.

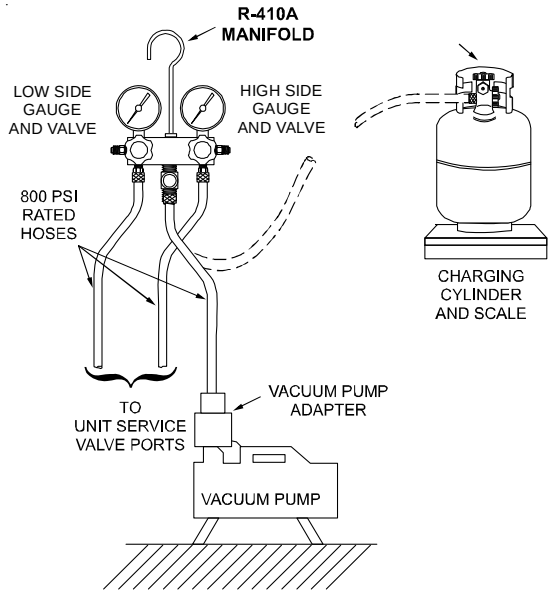
The equipment required to thoroughly evacuate the system is a high vacuum pump, capable of producing a vacuum equivalent to 25 microns absolute and a thermocouple vacuum gauge to give a true reading of the vacuum in the system

NOTE: Never use the system compressor as a vacuum pump or run when under a high vacuum. Motor damage could occur.

WARNING

Do not front seat the service valve(s) with the compressor open, with the suction line of the comprssor closed or severely restricted.

1. Connect the vacuum pump, vacuum tight manifold set with high vacuum hoses, thermocouple vacuum gauge and charging cylinder as shown.
2. Start the vacuum pump and open the shut off valve to the high vacuum gauge manifold only. After the compound gauge (low side) has dropped to approximately 29 inches of vacuum, open the valve to the vacuum thermocouple gauge. See that the vacuum pump will blank-off to a maximum of 25 microns. A high vacuum pump can only produce a good vacuum if its oil is non-contaminated.



EVACUATION

3. If the vacuum pump is working properly, close the valve to the vacuum thermocouple gauge and open the high and low side valves to the high vacuum manifold set. With the valve on the charging cylinder closed, open the manifold valve to the cylinder.
4. Evacuate the system to at least 29 inches gauge before opening valve to thermocouple vacuum gauge.
5. Continue to evacuate to a maximum of 250 microns. Close valve to vacuum pump and watch rate of rise. If vacuum does not rise above 1500 microns in three to five minutes, system can be considered properly evacuated.
6. If thermocouple vacuum gauge continues to rise and levels off at about 5000 microns, moisture and non-condensables are still present. If gauge continues to rise a leak is present. Repair and re-evacuate.
7. Close valve to thermocouple vacuum gauge and vacuum pump. Shut off pump and prepare to charge.

S-103 CHARGING

WARNING

REFRIGERANT UNDER PRESSURE!
*** Do not overcharge system with refrigerant.**
*** Do not operate unit in a vacuum or at negative pressure.**
Failure to follow proper procedures may cause property damage, personal injury or death.

SERVICING

CAUTION

Only use refrigerant certified to AHRI standards. Used refrigerant may cause compressor damage. Daikin is not responsible for damage or the need for repairs resulting from the use of unapproved refrigerant types or used or recycled refrigerant. Most portable machines cannot clean used refrigerant to meet AHRI standards.

CAUTION

Operating the compressor with the suction valve closed will cause serious compressor damage.

Charge the system with the exact amount of refrigerant.

Refer to the specification section or check the unit nameplates for the correct refrigerant charge.

An inaccurately charged system will cause future problems.

1. Using a quality set of charging scales, weigh the proper amount of refrigerant for the system. Allow liquid refrigerant only to enter the high side.
2. After the system will take all it will take, close the valve on the high side of the charging manifold.
3. Start the system and charge the balance of the refrigerant through the low side.

NOTE: R410A should be drawn out of the storage container or drum in liquid form due to its fractionation properties, but should be "Flashed" to its gas state before entering the system. There are commercially available restriction devices that fit into the system charging hose set to accomplish this. **DO NOT** charge liquid R410A into the compressor.

4. With the system still running, close the valve on the charging cylinder. At this time, you may still have some liquid refrigerant in the charging cylinder hose and will definitely have liquid in the liquid hose. Reseat the liquid line core. Slowly open the high side manifold valve and transfer the liquid refrigerant from the liquid line hose and charging cylinder hose into the suction service valve port. CAREFUL: Watch so that liquid refrigerant does not enter the compressor.

Final Charge Adjustment

The outdoor temperature must be 60°F or higher. Set the room thermostat to COOL, fan switch to AUTO, and set the temperature control well below room temperature.

After system has stabilized per startup instructions, compare the operating pressures and outdoor unit amp draw to the numbers listed in the spec sheet manual. If pressures and amp draw are too low, add charge. If pressures and amp draw are too high, remove charge. Check subcooling and superheat as detailed in the following section.

5. With the system still running, remove hose and reinstall both valve caps.
6. Check system for leaks.

Due to their design, Scroll compressors are inherently more tolerant of liquid refrigerant.

NOTE*: Even though the compressor section of a Scroll compressor is more tolerant of liquid refrigerant, continued floodback or flooded start conditions may wash oil from the bearing surfaces causing premature bearing failure.*S-104 CHECKING COMPRESSOR EFFICIENCY

The reason for compressor inefficiency is broken or damaged suction and/or discharge valves, or scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor.

The condition of the valves or scroll flanks is checked in the following manner.

1. Attach gauges to the high and low side of the system.
2. Start the system and run a Cooling Performance Test.

If the test shows-

⇒ Below normal high side pressure.

⇒ Above normal low side pressure.

⇒ Low temperature difference across coil.

⇒ Low amp draw at compressor.

-and the charge is correct. The compressor is faulty - replace the compressor.

S-104 CHECKING COMPRESSOR EFFICIENCY

The reason for compressor inefficiency is broken or damaged scroll flanks on Scroll compressors, reducing the ability of the compressor to pump refrigerant vapor.

During the "OFF" cycle, the high side pressure bleeds to the low side through the fixed orifice restriction device. Check equalization time as follows:

1. Attach a gauge manifold to the suction and liquid line dill valves.
2. Start the system and allow the pressures to stabilize.
3. Stop the system and check the time it takes for the high and low pressure gauge readings to equalize.

If it takes more than seven (7) minutes to equalize, the restrictor device is inoperative. Replace, install a liquid line drier, evacuate and recharge.

S-106 OVERFEEDING

Overfeeding by the expansion valve results in high suction pressure, cold suction line, and possible liquid slugging of the compressor.

If these symptoms are observed:

1. Check for an overcharged unit by referring to the cooling performance charts in the spec sheet manual.
2. Check the operation of the power element in the valve as explained in S-110 Checking Expansion Valve Operation.
3. Check for restricted or plugged equalizer tube.

SERVICING

S-109 CHECKING SUBCOOLING

Refrigerant liquid is considered subcooled when its temperature is lower than the saturation temperature corresponding to its pressure. The degree of subcooling equals the degrees of temperature decrease below the saturation temperature at the existing pressure.

1. Attach an accurate thermometer or preferably a thermocouple type temperature tester to the liquid line close to the pressure switch.
2. Install a high side pressure gauge on the high side (liquid) service valve at the front of the unit.
3. Record the gauge pressure and the temperature of the line.
4. Compare the hi-pressure reading to the "Required Liquid Line Temperature" chart on the preceding page. Find the hi-pressure value on the left column. Follow that line right to the column under the design subcooling value. Where the two intersect is the required liquid line temperature.

   Alternately you can convert the liquid line pressure gauge reading to temperature by finding the gauge reading in Temperature - Pressure Chart and reading to the left, find the temperature in the °F. Column.
5. The difference between the thermometer reading and pressure to temperature conversion is the amount of subcooling.

Add charge to raise subcooling. Recover charge to lower subcooling.

Subcooling Formula = Sat. Liquid Temp. - Liquid Line Temp.

EXAMPLE:

a. Liquid Line Pressure = 417
b. Corresponding Temp. °F. = 120°
c. Thermometer on Liquid line = 109°F.

To obtain the amount of subcooling, subtract 109°F from 120°F.

The difference is 11° subcooling. See the specification sheet for the design subcooling range for your unit.

See R410A Pressure vs. Temperature chart.

S-110 CHECKING EXPANSION VALVE OPERATION

1. Remove the remote bulb of the expansion valve from the suction line.
2. Start the system and cool the bulb in a container of ice water, closing the valve. As you cool the bulb, the suction pressure should fall and the suction temperature will rise.
3. Next warm the bulb in your hand. As you warm the bulb, the suction pressure should rise and the suction temperature will fall.
4. If a temperature or pressure change is noticed, the expansion valve is operating. If no change is noticed, the valve is restricted, the power element is faulty, or the equalizer tube is plugged.
5. Capture the charge, replace the valve and drier, evacuate and recharge.

S-112 CHECKING RESTRICTED LIQUID LINE

When the system is operating, the liquid line is warm to the touch. If the liquid line is restricted, a definite temperature drop will be noticed at the point of restriction. In severe cases, frost will form at the restriction and extend down the line in the direction of the flow.

Discharge and suction pressures will be low, giving the appearance of an undercharged unit. However, the unit will have normal to high subcooling.

Locate the restriction, replace the restricted part, replace drier, evacuate and recharge.

S-113 OVERCHARGE OF REFRIGERANT

An overcharge of refrigerant is normally indicated by an excessively high head pressure.

An evaporator coil, using an expansion valve metering device, will basically modulate and control a flooded evaporator and prevent liquid refrigerant return to the compressor.

An evaporator coil, using a fixed orifice restrictor device (flowrator) metering device, could allow liquid refrigerant to return to the compressor under extreme overcharge conditions.

Also with a fixed orifice restrictor device (flowrator) metering device, extreme cases of insufficient indoor air can cause icing of the indoor coil and liquid refrigerant return to the compressor, but the head pressure would be lower.

There are other causes for high head pressure which may be found in the "Service Problem Analysis Guide."

If other causes check out normal, an overcharge or a system containing non-condensables would be indicated.

If this system is observed:

1. Start the system.
2. Remove and capture small quantities of refrigerant as from the suction line access fitting until the head pressure is reduced to normal.
3. Observe the system while running a cooling performance test. If a shortage of refrigerant is indicated, then the system contains non-condensables.

S-114 NON-CONDENSABLES

If non-condensables are suspected, shut down the system and allow the pressures to equalize. Wait at least 15 minutes. Compare the pressure to the temperature of the coldest coil since this is where most of the refrigerant will be. If the pressure indicates a higher temperature than that of the coil temperature, non-condensables are present.

Non-condensables are removed from the system by first removing the refrigerant charge, replacing and/or installing liquid line drier, evacuating and recharging.

SERVICING

Pressure vs. Temperature Chart

R-410A

PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG	°F
12	-37.7	114.0	37.8	216.0	74.3	318.0	100.2	420.0	120.7	522.0	137.6
14	-34.7	116.0	38.7	218.0	74.9	320.0	100.7	422.0	121.0	524.0	137.9
16	-32.0	118.0	39.5	220.0	75.5	322.0	101.1	424.0	121.4	526.0	138.3
18	-29.4	120.0	40.5	222.0	76.1	324.0	101.6	426.0	121.7	528.0	138.6
20	-36.9	122.0	41.3	224.0	76.7	326.0	102.0	428.0	122.1	530.0	138.9
22	-24.5	124.0	42.2	226.0	77.2	328.0	102.4	430.0	122.5	532.0	139.2
24	-22.2	126.0	43.0	228.0	77.8	330.0	102.9	432.0	122.8	534.0	139.5
26	-20.0	128.0	43.8	230.0	78.4	332.0	103.3	434.0	123.2	536.0	139.8
28	-17.9	130.0	44.7	232.0	78.9	334.0	103.7	436.0	123.5	538.0	140.1
30	-15.8	132.0	45.5	234.0	79.5	336.0	104.2	438.0	123.9	540.0	140.4
32	-13.8	134.0	46.3	236.0	80.0	338.0	104.6	440.0	124.2	544.0	141.0
34	-11.9	136.0	47.1	238.0	80.6	340.0	105.1	442.0	124.6	548.0	141.6
36	-10.1	138.0	47.9	240.0	81.1	342.0	105.4	444.0	124.9	552.0	142.1
38	-8.3	140.0	48.7	242.0	81.6	344.0	105.8	446.0	125.3	556.0	142.7
40	-6.5	142.0	49.5	244.0	82.2	346.0	106.3	448.0	125.6	560.0	143.3
42	-4.5	144.0	50.3	246.0	82.7	348.0	106.6	450.0	126.0	564.0	143.9
44	-3.2	146.0	51.1	248.0	83.3	350.0	107.1	452.0	126.3	568.0	144.5
46	-1.6	148.0	51.8	250.0	83.8	352.0	107.5	454.0	126.6	572.0	145.0
48	0.0	150.0	52.5	252.0	84.3	354.0	107.9	456.0	127.0	576.0	145.6
50	1.5	152.0	53.3	254.0	84.8	356.0	108.3	458.0	127.3	580.0	146.2
52	3.0	154.0	54.0	256.0	85.4	358.0	108.8	460.0	127.7	584.0	146.7
54	4.5	156.0	54.8	258.0	85.9	360.0	109.2	462.0	128.0	588.0	147.3
56	5.9	158.0	55.5	260.0	86.4	362.0	109.6	464.0	128.3	592.0	147.9
58	7.3	160.0	56.2	262.0	86.9	364.0	110.0	466.0	128.7	596.0	148.4
60	8.6	162.0	57.0	264.0	87.4	366.0	110.4	468.0	129.0	600.0	149.0
62	10.0	164.0	57.7	266.0	87.9	368.0	110.8	470.0	129.3	604.0	149.5
64	11.3	166.0	58.4	268.0	88.4	370.0	111.2	472.0	129.7	608.0	150.1
66	12.6	168.0	59.0	270.0	88.9	372.0	111.6	474.0	130.0	612.0	150.6
68	13.8	170.0	59.8	272.0	89.4	374.0	112.0	476.0	130.3	616.0	151.2
70	15.1	172.0	60.5	274.0	89.9	376.0	112.4	478.0	130.7	620.0	151.7
72	16.3	174.0	61.1	276.0	90.4	378.0	112.6	480.0	131.0	624.0	152.3
74	17.5	176.0	61.8	278.0	90.9	380.0	113.1	482.0	131.3	628.0	152.8
76	18.7	178.0	62.5	280.0	91.4	382.0	113.5	484.0	131.6	632.0	153.4
78	19.8	180.0	63.1	282.0	91.9	384.0	113.9	486.0	132.0	636.0	153.9
80	21.0	182.0	63.8	284.0	92.4	386.0	114.3	488.0	132.3	640.0	154.5
82	22.1	184.0	64.5	286.0	92.8	388.0	114.7	490.0	132.6	644.0	155.0
84	23.2	186.0	65.1	288.0	93.3	390.0	115.0	492.0	132.9	648.0	155.5
86	24.3	188.0	65.8	290.0	93.8	392.0	115.5	494.0	133.3	652.0	156.1
88	25.4	190.0	66.4	292.0	94.3	394.0	115.8	496.0	133.6	656.0	156.6
90	26.4	192.0	67.0	294.0	94.8	396.0	116.2	498.0	133.9	660.0	157.1
92	27.4	194.0	67.7	296.0	95.2	398.0	116.6	500.0	134.0	664.0	157.7
94	28.5	196.0	68.3	298.0	95.7	400.0	117.0	502.0	134.5	668.0	158.2
96	29.5	198.0	68.9	300.0	96.2	402.0	117.3	504.0	134.8	672.0	158.7
98	30.5	200.0	69.5	302.0	96.6	404.0	117.7	506.0	135.2	676.0	159.2
100	31.2	202.0	70.1	304.0	97.1	406.0	118.1	508.0	135.5	680.0	159.8
102	32.2	204.0	70.7	306.0	97.5	408.0	118.5	510.0	135.8	684.0	160.3
104	33.2	206.0	71.4	308.0	98.0	410.0	118.8	512.0	136.1	688.0	160.8
106	34.1	208.0	72.0	310.0	98.4	412.0	119.2	514.0	136.4	692.0	161.3
108	35.1	210.0	72.6	312.0	98.9	414.0	119.6	516.0	136.7	696.0	161.8
110	35.5	212.0	73.2	314.0	99.3	416.0	119.9	518.0	137.0		
112	36.9	214.0	73.8	316.0	99.7	418.0	120.3	520.0	137.3		

*Based on ALLIED SIGNAL Data

REQUIRED LIQUID LINE TEMPERATURE						
LIQUID PRESSURE AT ACCESS FITTING (PSIG)	REQUIRED SUBCOOLING TEMPERATURE (°F)					
	8	10	12	14	16	18
189	58	56	54	52	50	48
195	60	58	56	54	52	50
202	62	60	58	56	54	52
208	64	62	60	58	56	54
215	66	64	62	60	58	56
222	68	66	64	62	60	58
229	70	68	66	64	62	60
236	72	70	68	66	64	62
243	74	72	70	68	66	64
251	76	74	72	70	68	66
259	78	76	74	72	70	68
266	80	78	76	74	72	70
274	82	80	78	76	74	72
283	84	82	80	78	76	74
291	86	84	82	80	78	76
299	88	86	84	82	80	78
308	90	88	86	84	82	80
317	92	90	88	86	84	82
326	94	92	90	88	86	84
335	96	94	92	90	88	86
345	98	96	94	92	90	88
354	100	98	96	94	92	90
364	102	100	98	96	94	92
374	104	102	100	98	96	94
384	106	104	102	100	98	96
395	108	106	104	102	100	98
406	110	108	106	104	102	100
416	112	110	108	106	104	102
427	114	112	110	108	106	104
439	116	114	112	110	108	106
450	118	116	114	112	110	108
462	120	118	116	114	112	110
474	122	120	118	116	114	112
486	124	122	120	118	116	114
499	126	124	122	120	118	116
511	128	126	124	122	120	118

SERVICING

S-115 COMPRESSOR BURNOUT

When a compressor burns out, high temperature develops causing the refrigerant, oil and motor insulation to decompose forming acids and sludge.

If a compressor is suspected of being burned-out, attach a refrigerant hose to the liquid line dill valve and properly remove and dispose of the refrigerant.

Now determine if a burn out has actually occurred. Confirm by analyzing an oil sample using a Sporlan Acid Test Kit, AK-3 or its equivalent.

Remove the compressor and obtain an oil sample from the suction stub. If the oil is not acidic, either a burnout has not occurred or the burnout is so mild that a complete clean-up is not necessary.

If acid level is unacceptable, the system must be cleaned by using the clean-up drier method.

CAUTION

Do not allow the sludge or oil to contact the skin. Severe burns may result.

NOTE: Daikin does **NOT** approve the flushing method using R-11 refrigerant.

Suction Line Drier Clean-Up Method

The POE oils used with R410A refrigerant is an excellent solvent. In the case of a burnout, the POE oils will remove any burnout residue left in the system. If not captured by the refrigerant filter, they will collect in the compressor or other system components, causing a failure of the replacement compressor and/or spread contaminants throughout the system, damaging additional components.

Use part number RF000127 suction line filter drier kit. This drier should be installed as close to the compressor suction fitting as possible. The filter must be accessible and be rechecked for a pressure drop after the system has operated for a time. It may be necessary to use new tubing and form as required.

NOTE: At least twelve (12) inches of the suction line immediately out of the compressor stub must be discarded due to burned residue and contaminates.

1. Remove the liquid line drier and expansion valve.
2. Purge all remaining components with dry nitrogen or carbon dioxide until clean.
3 Install new components **including** liquid line drier.
4. Braze all joints, leak test, evacuate, and recharge system.
5. Start up the unit and record the pressure drop across the drier.
6. Continue to run the system for a minimum of twelve (12) hours and recheck the pressure drop across the drier. Pressure drop should not exceed 6 PSIG.
7. Continue to run the system for several days, repeatedly checking pressure drop across the suction line drier. If the pressure drop never exceeds the 6 PSIG, the drier has trapped the contaminants. Remove the suction line drier from the system.
8. If the pressure drop becomes greater, then it must be replaced and steps 5 through 9 repeated until it does not exceed 6 PSIG.

NOTICE: Regardless, the cause for burnout must be determined and corrected before the new compressor is started.

S-200 CHECKING EXTERNAL STATIC PRESSURE

The minimum and maximum allowable duct static pressure is found in the Specification Sheet Manual.

Too great of an external static pressure will result in insufficient air that can cause icing of the coil, whereas too much air can cause poor humidity control, and condensate to be pulled off the evaporator coil causing condensate leakage. Too much air can cause motor overloading and in many cases this constitutes a poorly designed system. To determine proper air movement, proceed as follows:

1. Using a draft gauge (inclined manometer) measure the static pressure of the return duct at the inlet of the unit, (Negative Pressure).
2. Measure the static pressure of the supply duct, (Positive Pressure).
3. Add the two readings together.

NOTE: Both readings may be taken simultaneously and read directly on the manometer if so desired.

4. Consult proper table for quantity of air.

S-205 CHECKING BELT TENSION

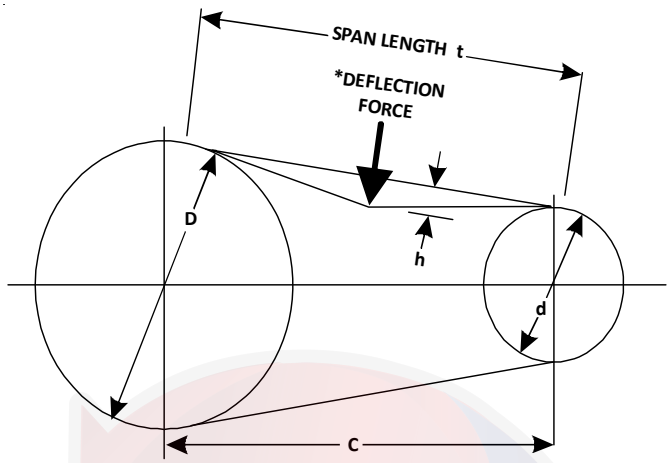
NOTE: Section on high static tables may require a field motor change.

BELT DRIVE

TENSION AND ALIGNMENT ADJUSTMENT

Check drive for adequate run-in belt tension. Correct belt tension is very important. A belt that is loose will have a substantially shorter life, and a belt that is too tight may cause premature motor and bearing failure. Correct belt tension on these units can be checked by measuring the force required to deflect the belt 1/8" at the midpoint of the span length (Figure 21). Belt tension force can be measured using a belt tension checker, available through most belt manufacturers. The correct deflection force is 5 Ibs. for a new belt and 3.5 Ibs. for a belt that has been run in. New belt tension includes initial belt stretch. When new V-belts are installed on a drive the initial tension will drop rapidly during the first few hours. Check tension frequently during the first 24 hours of operation. Subsequent retensioning should fall

between the minimum and maximum force. To determine the deflection distance from the normal position, use a straight-edge or stretch a cord from sheave to sheave to use as a reference line. On multiple belt drives, an adjacent undeflected belt can be used as a reference.



Apply force to the center of the span.

t = Span length, inches

C = Center distance, inches

D = Larger sheave diameter, inches

d = Smaller sheave diameter, inches

h = Deflection height, inches

DRIVE BELT TENSION ADJUSTMENT

15&20 TON MODELS

MODEL	TYPE		SHEAVE DIAMETER (in)	DEFLECTION FORCE (lbs)		DEFLECTION (in)
	BELT	DRIVE		Used	New	
15 Ton	B, BA	Standard	4.3 to 5.5	5.5 ± .5	8.2 ± .5	1/4 ± 1/16
20 Ton 25 Ton	B, BA	Standard	4.3 to 5.5	5.5 ± .5	8.2 ± .5	1/4 ± 1/16

RECOMMENDED POUNDS OF FORCE PER BELT

S-206 INDOOR FAN ROTATION CHECK

Evaporator Fan Rotation Check (Three Phase Models Only)

Check that fan rotates clockwise when viewed from the drive side of unit and in accordance with rotation arrow shown on blower housing. If it does not, reverse any two incoming power cables at Single Point Power Block. In this case, repeat bearing check.

Do not attempt to change load side wiring. Internal wiring assures all motors and compressors will rotate in correct direction once evaporator fan motor rotation check has been made.

S-207 MOTOR SHEAVE ADJUSTMENTS

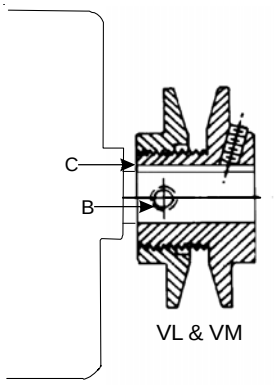
VL, VM & 2VP VARIABLE PITCH KEY TYPE MOTOR SHEAVES

The driving and driven motor sheaves should be in alignment with each other and the shafts parallel.

VL & VM SHEAVES ADJUSTMENT

1. Loosen set screw “B” using a 5/32" Allen key.
2. Making half or full turns from closed position, adjust sheave pitch diameter for desired speed. DO NOT OPEN MORE THAN SIX FULL TURNS.
3. Tighten set screw “B” securely over flat.
4. Carefully put on belts and adjust belt tension. DO NOT FORCE BELTS OVER GROOVES.
5. Ensure all keys are in place and the set screws tight before starting drive. Recheck set screws and belt tension after 24 hours service.

NOTE: Future adjustments should be made by loosening the belt tension and increasing or decreasing the pitch diameter of the sheave by half or full turns as required. Readjust belt tension before starting drive.



VL & VM

NOTE: Do not operate sheave with flange projecting beyond the hub end.

DAIKIN COMMERCIAL PACKAGE UNIT ACCESSORIES		
Accessory Number	***Description***	***Model Size***
**EHK*	Heater Kit	15-25 Ton

** Complete listing of EHK kits listed on electrical data page in DCC manuals

HEATER KITS

UNIT	HEATER KIT MODEL NUMBER	MINIMUM CFM Downshot
15 TON	EHK4-31	5250
	EHK4-46	5250
	EHK4-60	5250
20 TON	EHK4-31	7000
	EHK4-46	7000
25 TON	EHK4-60	7000
	EHK4-75	7000

ATTENTION INSTALLING PERSONNEL

Use only the heater kit specified for each model as dictated by the table above.

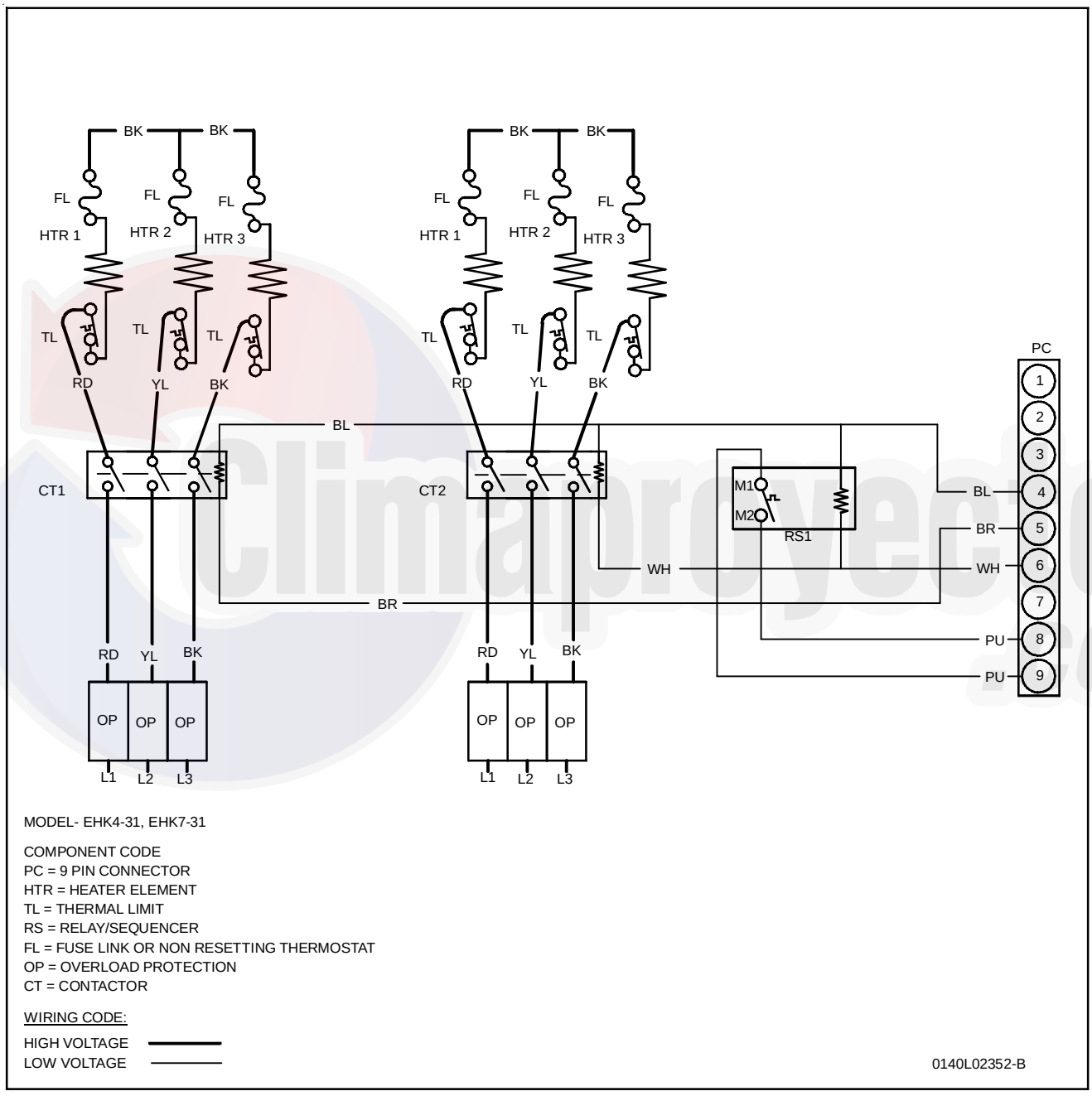
When using electric heat kit, use of the single point kit installed in the unit is required to meet UL requirements

HEATER KIT WIRING DIAGRAMS

EHK4-31

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



MODEL- EHK4-31, EHK7-31

COMPONENT CODE
PC = 9 PIN CONNECTOR
HTR = HEATER ELEMENT
TL = THERMAL LIMIT
RS = RELAY/SEQUENCER
FL = FUSE LINK OR NON RESETTING THERMOSTAT
OP = OVERLOAD PROTECTION
CT = CONTACTOR

WIRING CODE:

HIGH VOLTAGE ——————
LOW VOLTAGE ——————

0140L02352-B

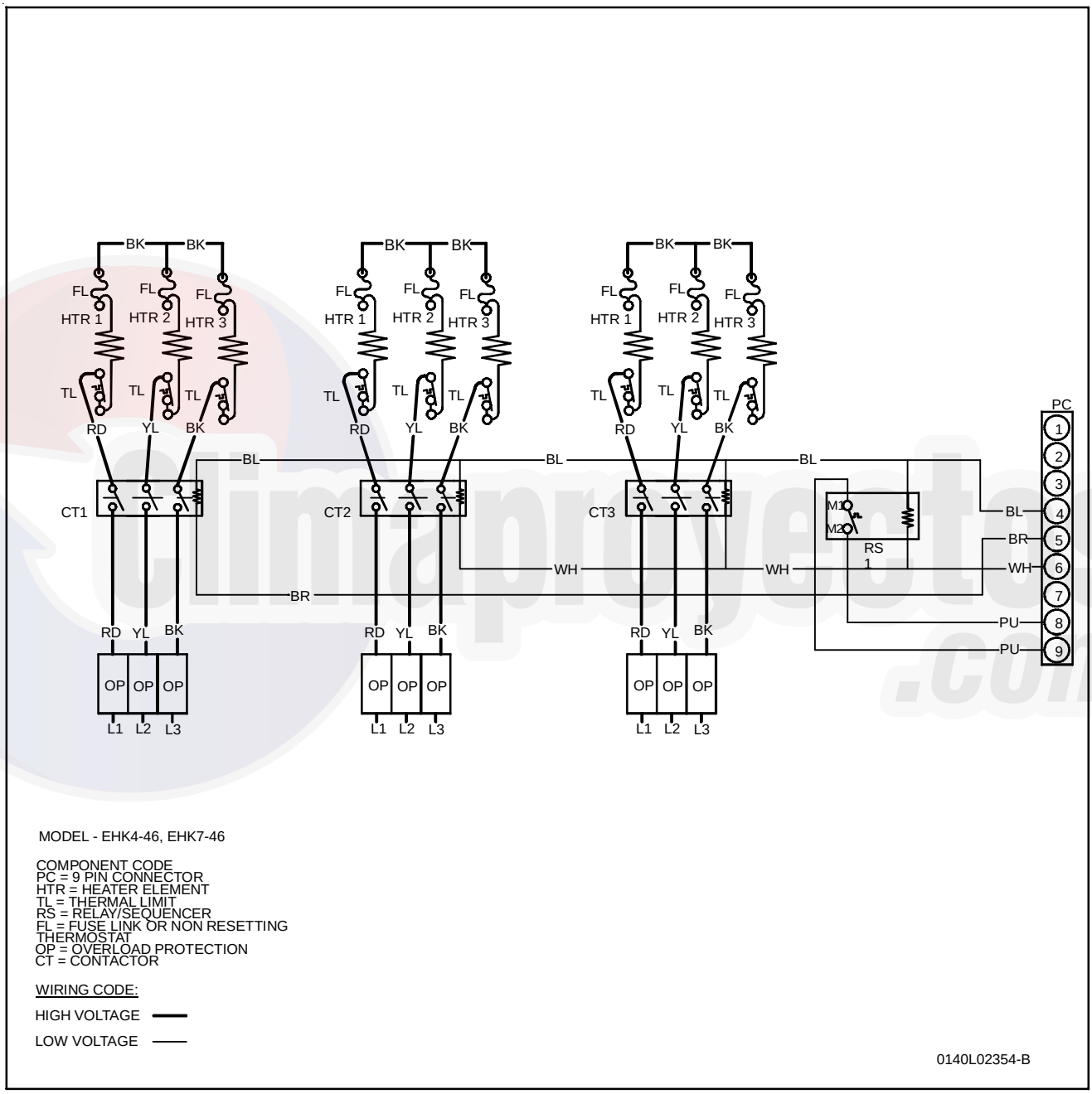
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

HEATER KIT WIRING DIAGRAMS

EHK4-46

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



MODEL - EHK4-46, EHK7-46

COMPONENT CODE
PC = 9 PIN CONNECTOR
HTR = HEATER ELEMENT
TL = THERMAL LIMIT
RS = RELAY/SEQUENCER
FL = FUSE LINK OR NON RESETTING THERMOSTAT
OP = OVERLOAD PROTECTION
CT = CONTACTOR

WIRING CODE:

HIGH VOLTAGE ——

LOW VOLTAGE ——

0140L02354-B

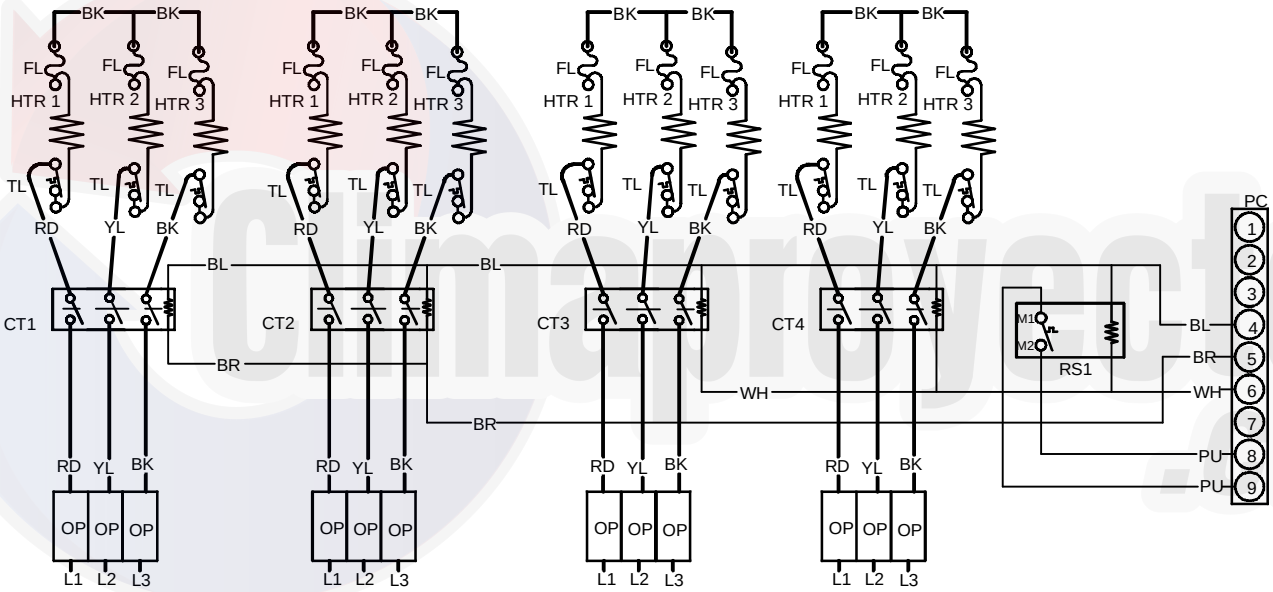
Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

HEATER KIT WIRING DIAGRAMS

EHK4-60

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



MODEL - EHK4-60, EHK7-60

COMPONENT CODE
PC = 9 PIN CONNECTOR
HTR = HEATER ELEMENT
TL = THERMAL LIMIT
RS = RELAY/SEQUENCER
FL = FUSE LINK OR NONRESETTING THERMOSTAT
OP = OVERLOAD PROTECTION
CT = CONTACTOR

WIRING CODE:

HIGH VOLTAGE ———
LOW VOLTAGE ———

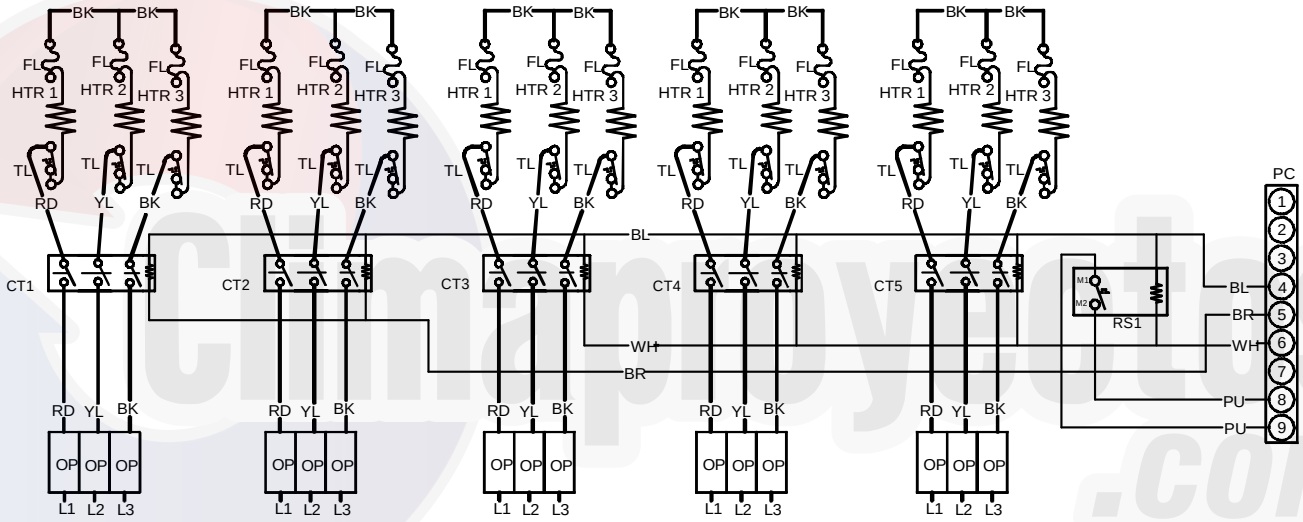
0140L02356-B

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

HEATER KIT WIRING DIAGRAMS

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



MODEL - EHK4-75, EHK7-75

COMPONENT CODE
PC = 9 PIN CONNECTOR
HTR = HEATER ELEMENT
TL = THERMAL LIMIT
RS = RELAY/SEQUENCER
FL = FUSE LINK OR NONRESETTING THERMOSTAT
OP = OVERLOAD PROTECTION
CT = CONTACTOR

WIRING CODE:

HIGH VOLTAGE ——————
LOW VOLTAGE ——————

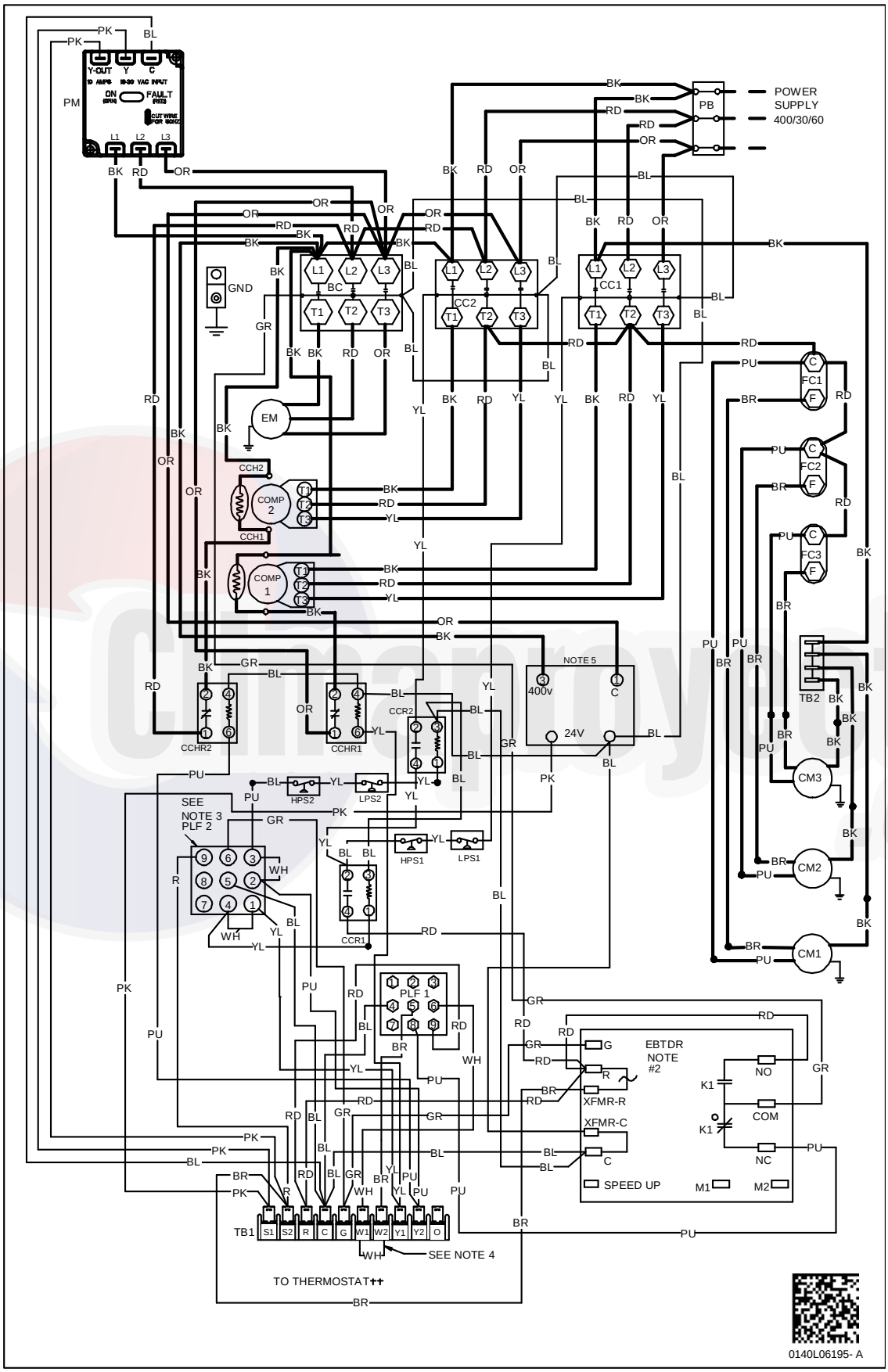
0140L02358-B

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

DCC COMMERCIAL
15 - 25 Ton Packaged Air Conditioner Unit
WIRING DIAGRAMS

UNIT WIRING DIAGRAMS

DCC180XXX6BXXX**



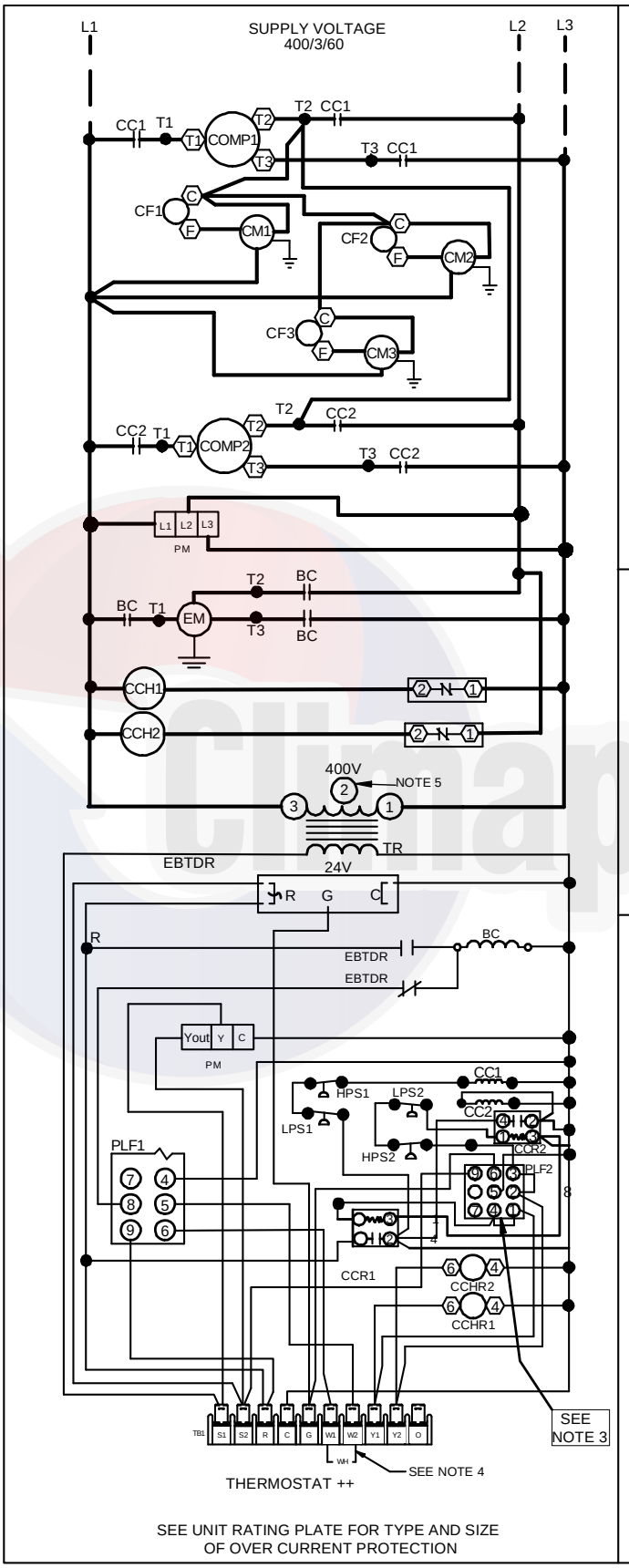
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

UNIT WIRING DIAGRAMS

DCC180XXX6BXXX**



SEE UNIT RATING PLATE FOR TYPE AND SIZE OF OVER CURRENT PROTECTION

COMPONENT LEGEND

BC	BLOWER CONTACTOR
CC	COMPRESSOR CONTACTOR
CCH	CRANK CASE HEATER
CCHR	CRANK CASE HEATER RELAY
CCR	COMPRESSOR CONTACTOR RELAY
CM	CONDENSER MOTOR
CMR	CONDENSER MOTOR RELAY
COMP	COMPRESSOR
ECON	ECONOMIZER
EBTD	ELECTRONIC BLOWER TIME DELAY
EMR	EVAPORATOR MOTOR RELAY
R	RELAY
EM	EVAPORATOR MOTOR
FC	FAN CAPACITOR
GND	EQUIPMENT GROUND
HPS	HIGH PRESSURE SWITCH
LPS	LOW PRESSURE SWITCH
PB	POWER DISTRUBTION BLOCK
PLF	FEMALE PLUG / CONNECTOR
PM	PHASE MONITOR
TB1	TERMINAL BLOCK (24V SIGNAL)
TB2	TERMINAL BLOCK (L1)
TR	TRANSFORMER

NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE INSULATION AS ORIGINAL (AT LEAST 105°C) USE COPPER CONDUCTOR ONLY.
2. USE COPPER CONDUCTORS ONLY ++ USE N.E.C. CLASS 2 WIRE
3. ECONOMIZER PLUG LOCATED IN THE RETURN AIR COMPARTMENT, REMOVE MALE PLUG, ATTACH FEMALE PLUG TO THE ECONOMIZER ACCESSORY.
4. FOR TWO STAGE OPERATION REMOVE W1 TO W2 WIRE JUMPER.

FACTORY WIRING

LINE VOLTAGE
LOW VOLTAGE
OPTIONAL HIGH VOLTAGE

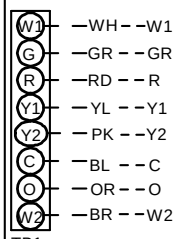
FACTORY WIRING

HIGH VOLATGE
LOW VOLATGE

WIRE CODE

BK	BLACK
BL	BLUE
BR	BROWN
GR	GREEN
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
YL/PK	YELLOW WITH PINK STRIP
BL/PK	BLUE WITH PINK STRIP

THERMOSTAT ++
FIELD WIRING
2 STAGE COOLING



0140L06196-A

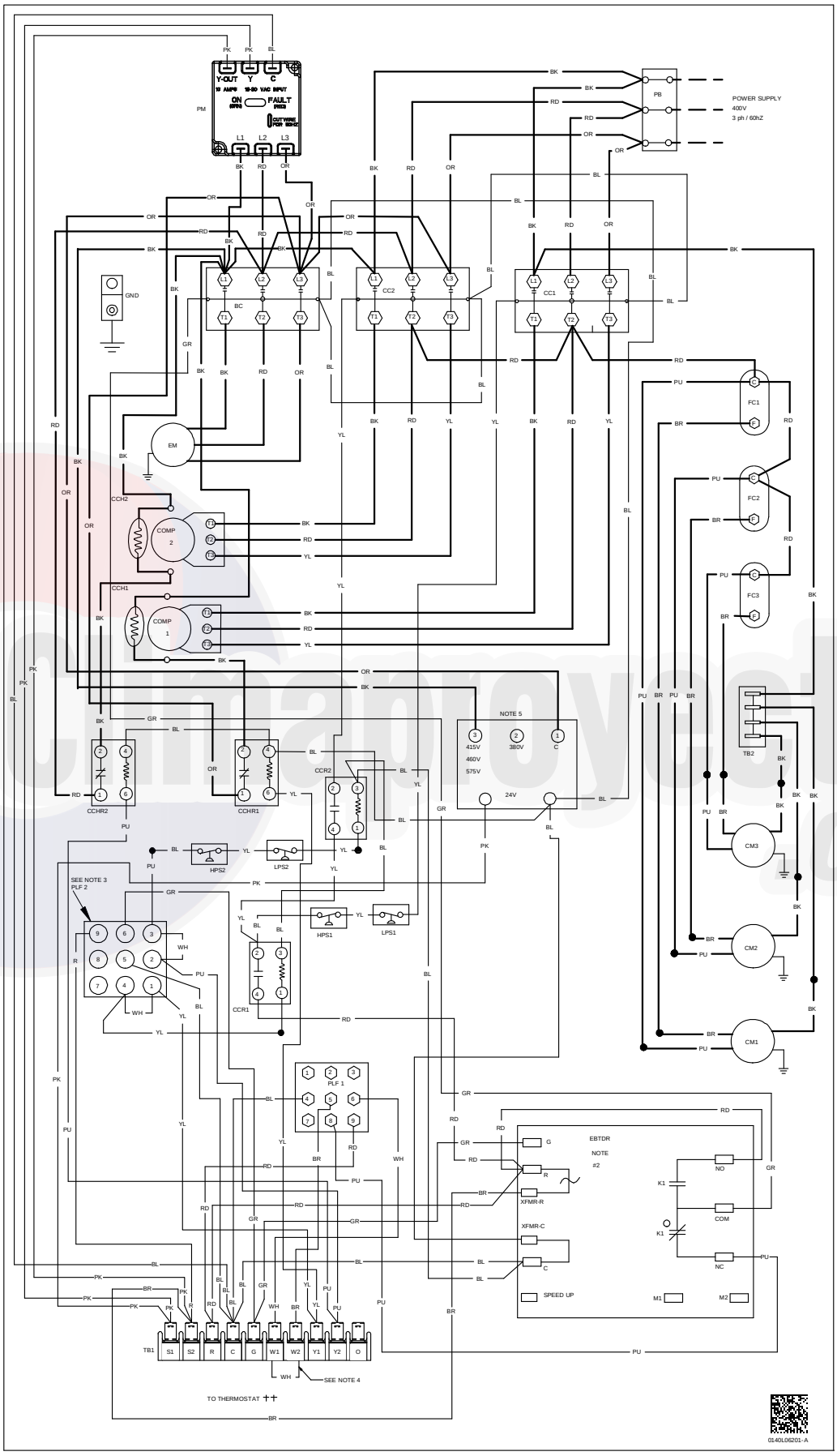
HIGH VOLTAGE! DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

UNIT WIRING DIAGRAMS

DCC240XXX6BXXX**



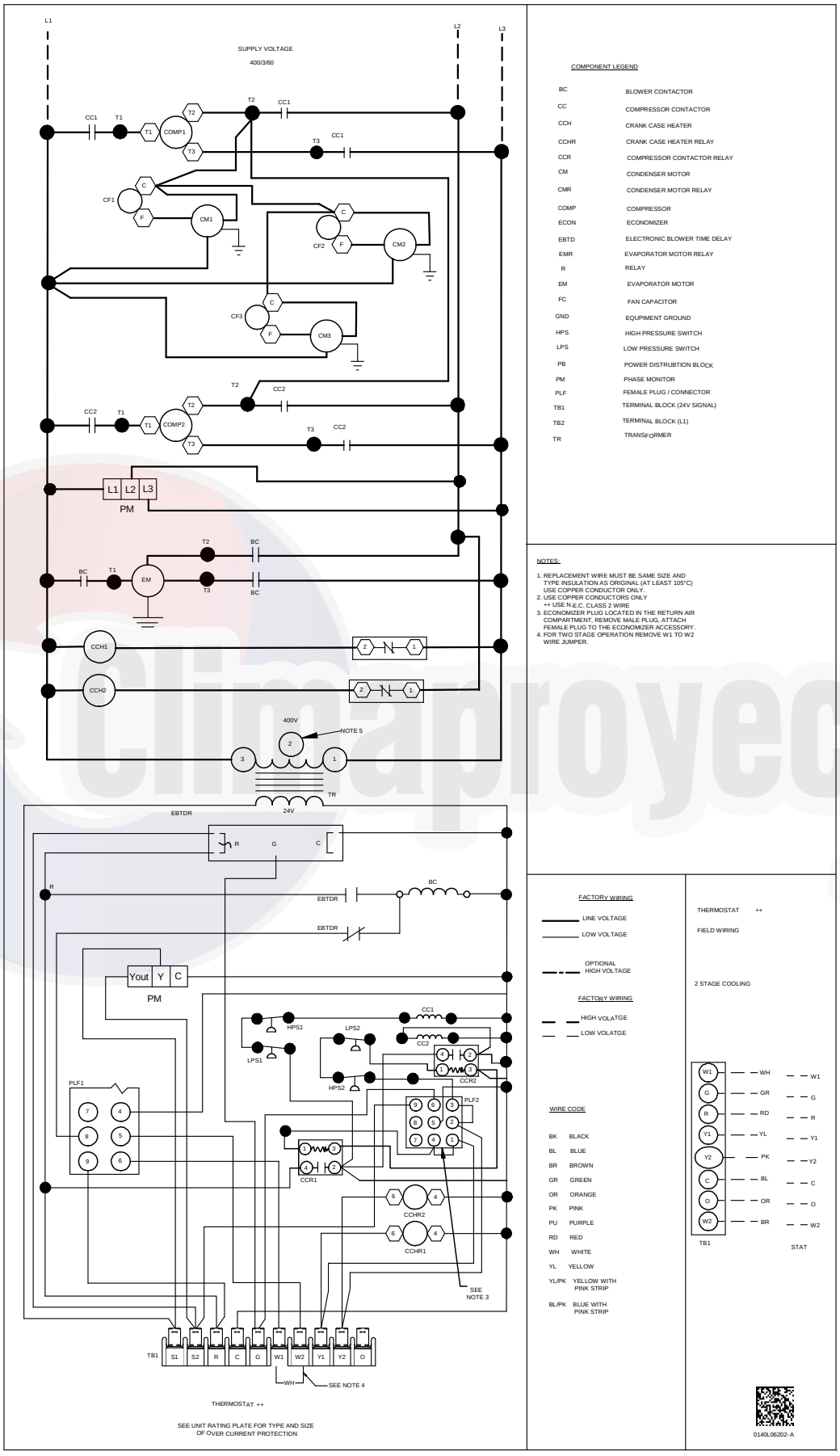
HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

UNIT WIRING DIAGRAMS

DCC240XXX6BXXX**



COMPONENT LEGEND

BC	BLOWER CONTACTOR
CC	COMPRESSOR CONTACTOR
CCH	CRANK CASE HEATER
CCHR	CRANK CASE HEATER RELAY
CCR	COMPRESSOR CONTACTOR RELAY
CM	CONDENSER MOTOR
CMR	CONDENSER MOTOR RELAY
COMP	COMPRESSOR
ECON	ECONOMIZER
EBTD	ELECTRONIC BLOWER TIME DELAY
EMR	EVAPORATOR MOTOR RELAY
R	RELAY
EM	EVAPORATOR MOTOR
FC	FAN CAPACITOR
GND	EQUIPMENT GROUND
HPS	HIGH PRESSURE SWITCH
LPS	LOW PRESSURE SWITCH
PB	POWER DISTRUBTION BLOCK
PM	PHASE MONITOR
PLF	FEMALE PLUG / CONNECTOR
TB1	TERMINAL BLOCK (24V SIGNAL)
TB2	TERMINAL BLOCK (L1)
TR	TRANSFORMER

NOTES:

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE INSULATION AS ORIGINAL (AT LEAST 105°C) USE COPPER CONDUCTOR ONLY.
2. USE COPPER CONDUCTORS ONLY ++ USE N.E.C. CLASS 2 WIRE
3. ECONOMIZER PLUG LOCATED IN THE RETURN AIR COMPARTMENT, REMOVE MALE PLUG, ATTACH FEMALE PLUG TO THE ECONOMIZER ACCESSORY.
4. FOR TWO STAGE OPERATION REMOVE W1 TO W2 WIRE JUMPER.

FACTORY WIRING

LINE VOLTAGE

LOW VOLTAGE

OPTIONAL HIGH VOLTAGE

FACTORY WIRING

HIGH VOLATGE

LOW VOLATGE

WIRE CODE

BK	BLACK
BL	BLUE
BR	BROWN
GR	GREEN
OR	ORANGE
PK	PINK
PU	PURPLE
RD	RED
WH	WHITE
YL	YELLOW
YL/PK	YELLOW WITH PINK STRIP
BL/PK	BLUE WITH PINK STRIP

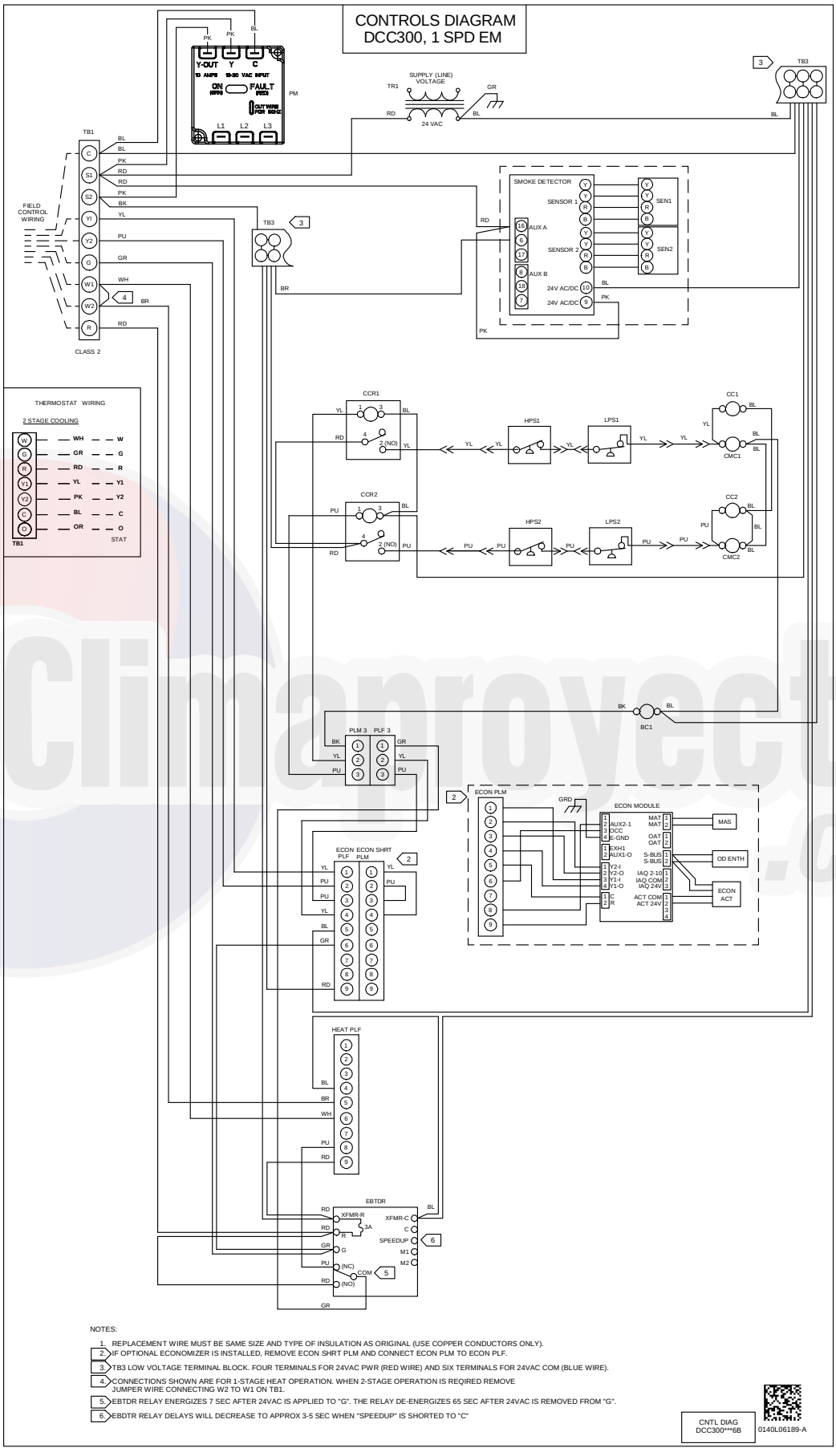
THERMOSTAT ++

FIELD WIRING

2 STAGE COOLING

0140L06202- A

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.



HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

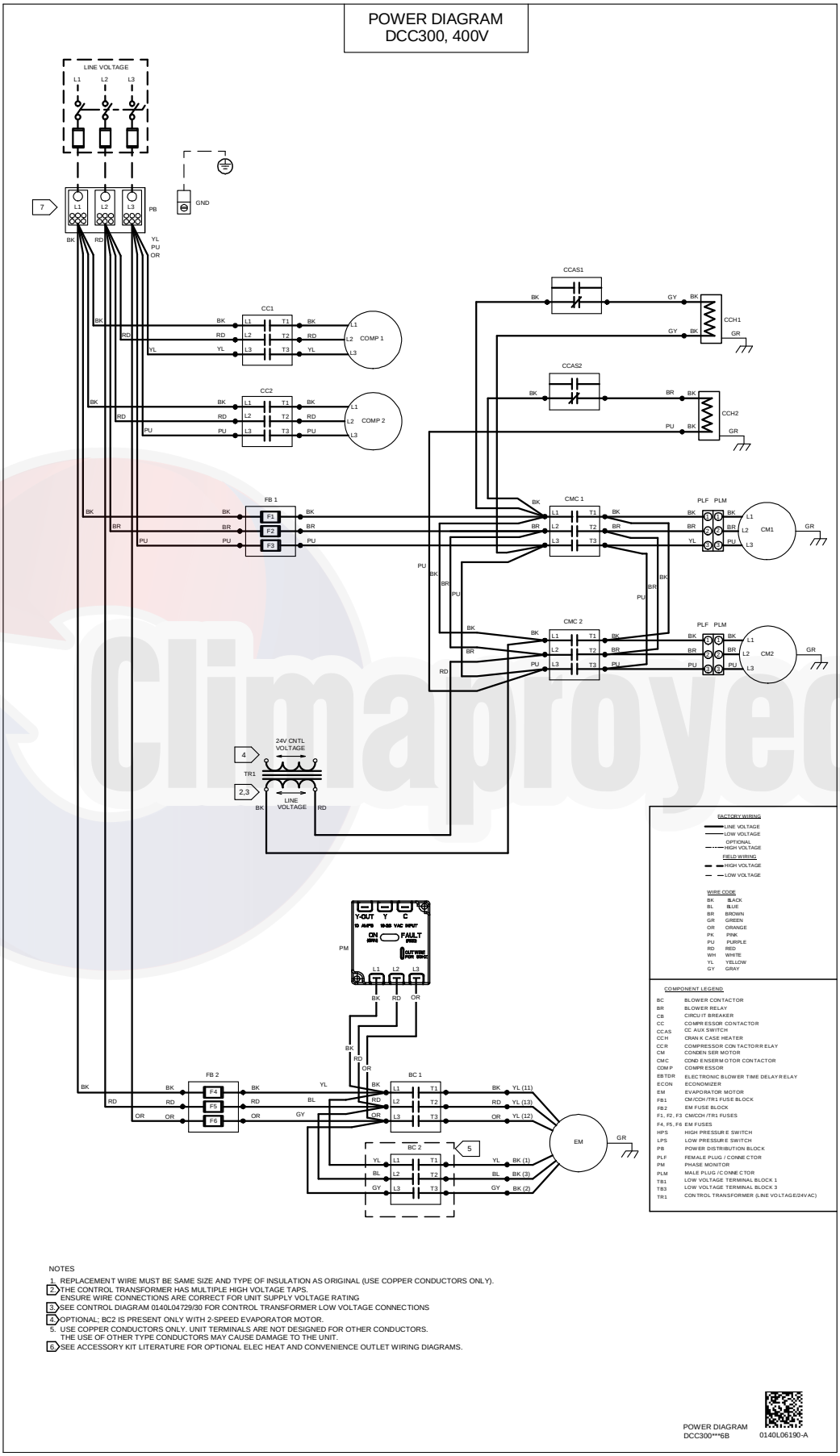
WARNING

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.

UNIT WIRING DIAGRAMS

DCC300XXX6BXXX**

POWER DIAGRAM
DCC300, 400V



NOTES

1. REPLACEMENT WIRE MUST BE SAME SIZE AND TYPE OF INSULATION AS ORIGINAL (USE COPPER CONDUCTORS ONLY).
2. THE CONTROL TRANSFORMER HAS MULTIPLE HIGH VOLTAGE TAPS. ENSURE WIRE CONNECTIONS ARE CORRECT FOR UNIT SUPPLY VOLTAGE RATING
3. SEE CONTROL DIAGRAM 0140L04729/30 FOR CONTROL TRANSFORMER LOW VOLTAGE CONNECTIONS
4. OPTIONAL; BC2 IS PRESENT ONLY WITH 2-SPEED EVAPORATOR MOTOR.
5. USE COPPER CONDUCTORS ONLY. UNIT TERMINALS ARE NOT DESIGNED FOR OTHER CONDUCTORS. THE USE OF OTHER TYPE CONDUCTORS MAY CAUSE DAMAGE TO THE UNIT.
6. SEE ACCESSORY KIT LITERATURE FOR OPTIONAL ELEC HEAT AND CONVENIENCE OUTLET WIRING DIAGRAMS.

POWER DIAGRAM
DCC300***6B

0140L06190-A

WARNING

HIGH VOLTAGE!
DISCONNECT ALL POWER BEFORE SERVICING OR INSTALLING THIS UNIT. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

Wiring is subject to change. Always refer to the wiring diagram on the unit for the most up-to-date wiring.