INSTALLATION INSTRUCTIONS

AIR-COOLED CONDENSING UNITS

(-)ASL-JEC 18 SEER EQUIPPED WITH THE *COMFORT CONTROL²* *SYSTEM*™ AND FEATURING DUAL DRIVE COMPRESSORS IN SELECT MODELS

Comfort Control² System™

Featuring Industry Standard R-410A Refrigerant R-410A

RECOGNIZE THIS SYMBOL AS AN INDICATION OF IMPORTANT SAFETY INFORMATION!

⚠ WARNING

THESE INSTRUCTIONS ARE INTENDED AS AN AID TO QUALIFIED, LICENSED SERVICE PERSONNEL FOR PROPER INSTALLATION, ADJUSTMENT AND OPERATION OF THIS UNIT. READ THESE INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN IMPROPER INSTALLATION, ADJUSTMENT, SERVICE OR MAINTENANCE POSSIBLY RESULTING IN FIRE, ELECTRICAL SHOCK, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

ENERGY STAR

c UL us LISTED

Accredited by the RvA

ABS Quality Evaluations, Inc. Management System Certification

ANAB ACCREDITED

ISO 9001:2008

Certificate Number: 30164

DO NOT DESTROY THIS MANUAL

PLEASE READ CAREFULLY AND KEEP IN A SAFE PLACE FOR FUTURE REFERENCE BY A SERVICEMAN

[ ] INDICATES METRIC CONVERSIONS

92-101691-05-12
SUPERSEDES 92-101691-05-11

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1.0 SAFETY INFORMATION

⚠ WARNING

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⚠ WARNING

THE MANUFACTURER'S WARRANTY DOES NOT COVER ANY DAMAGE OR DEFECT TO THE AIR CONDITIONER CAUSED BY THE ATTACHMENT OR USE OF ANY COMPONENTS, ACCESSORIES OR DEVICES (OTHER THAN THOSE AUTHORIZED BY THE MANUFACTURER) INTO, ONTO OR IN CONJUNCTION WITH THE AIR CONDITIONER. YOU SHOULD BE AWARE THAT THE USE OF UNAUTHORIZED COMPONENTS, ACCESSORIES OR DEVICES MAY ADVERSELY AFFECT THE OPERATION OF THE AIR CONDITIONER AND MAY ALSO ENDANGER LIFE AND PROPERTY. THE MANUFACTURER DISCLAIMS ANY RESPONSIBILITY FOR SUCH LOSS OR INJURY RESULTING FROM THE USE OF SUCH UNAUTHORIZED COMPONENTS, ACCESSORIES OR DEVICES.

⚠ WARNING

DISCONNECT ALL POWER TO UNIT BEFORE STARTING MAINTENANCE. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

⚠ WARNING

DO NOT USE OXYGEN TO PURGE LINES OR PRESSURIZE SYSTEM FOR LEAK TEST. OXYGEN REACTS VIOLENTLY WITH OIL, WHICH CAN CAUSE AN EXPLOSION RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

⚠ WARNING

THE UNIT MUST BE PERMANENTLY GROUNDED. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

⚠ WARNING

TURN OFF ELECTRIC POWER AT THE FUSE BOX OR SERVICE PANEL BEFORE MAKING ANY ELECTRICAL CONNECTIONS.

ALSO, THE GROUND CONNECTION MUST BE COMPLETED BEFORE MAKING LINE VOLTAGE CONNECTIONS. FAILURE TO DO SO CAN RESULT IN ELECTRICAL SHOCK, SEVERE PERSONAL INJURY OR DEATH.

Continued on next page ➜

⚠ CAUTION

R-410A systems operate at higher pressures than R-22 systems. Do not use R-22 service equipment or components on R-410A equipment.

⚠ CAUTION

Only use evaporators approved for use on R-410A systems. Use of existing R-22 evaporators can introduce mineral oil to the R-410A refrigerant forming two different liquids and decreasing oil return to the compressor. This can result in compressor failure.

⚠ CAUTION

When coil is installed over a finished ceiling and/or living area, it is recommended that a secondary sheet metal condensate pan be constructed and installed under entire unit. Failure to do so can result in property damage.

⚠ CAUTION

THE COMPRESSOR HAS AN INTERNAL OVERLOAD PROTECTOR. UNDER SOME CONDITIONS, IT CAN TAKE UP TO 2 HOURS FOR THIS OVERLOAD TO RESET. MAKE SURE OVERLOAD HAS HAD TIME TO RESET BEFORE CONDEMNING THE COMPRESSOR.

⚠ CAUTION

UNIT MAY START SUDDENLY AND WITHOUT WARNING
Solid red light indicates a thermostat call for unit operation is present at the ICC control. ICC control will attempt to start unit after short cycle timer expires or when in Active Protection mode will attempt to restart unit prior to Lockout mode.

⚠ CAUTION

UNIT MAY START SUDDENLY AND WITHOUT WARNING
Solid red light indicates a thermostat call for unit operation is present at the ICC. ICC will attempt to start unit after short cycle timer expires or when in Active Protection mode will attempt to restart unit prior to Lockout mode.

⚠ CAUTION

THE TOP OF THE SCROLL COMPRESSOR SHELL IS HOT. TOUCHING THE COMPRESSOR TOP MAY RESULT IN SERIOUS PERSONAL INJURY.

⚠ CAUTION

R-410A PRESSURES ARE APPROXIMATELY 60% HIGHER THAN R-22 PRESSURES. USE APPROPRIATE CARE WHEN USING THIS REFRIGERANT. FAILURE TO EXERCISE CARE MAY RESULT IN EQUIPMENT DAMAGE, OR PERSONAL INJURY.

⚠ WARNING

THE MANUFACTURER'S WARRANTY DOES NOT COVER ANY DAMAGE OR DEFECT TO THE AIR CONDITIONER CAUSED BY THE ATTACHMENT OR USE OF ANY COMPONENTS. ACCESSORIES OR DEVICES (OTHER THAN THOSE AUTHORIZED BY THE MANUFACTURER) INTO, ONTO OR IN CONJUNCTION WITH THE AIR CONDITIONER. YOU SHOULD BE AWARE THAT THE USE OF UNAUTHORIZED COMPONENTS, ACCESSORIES OR DEVICES MAY ADVERSELY AFFECT THE OPERATION OF THE AIR CONDITIONER AND MAY ALSO ENDANGER LIFE AND PROPERTY. THE MANUFACTURER DISCLAIMS ANY RESPONSIBILITY FOR SUCH LOSS OR INJURY RESULTING FROM THE USE OF SUCH UNAUTHORIZED COMPONENTS, ACCESSORIES OR DEVICES.

MATCH ALL COMPONENTS:

- **OUTDOOR UNIT**
- **INDOOR COIL/METERING DEVICE**
- **INDOOR AIR HANDLER/FURNACE**
- **REFRIGERANT LINES**

2.0 GENERAL INFORMATION

The (-)ASL-series of condensing units are designed to operate using the *Comfort Control² System*™ or traditional 24VAC controls. These units are equipped with the *Comfort Control²*. Your installation must have these components to use *Comfort Control² System*™ :

- (-)ASL condensing unit equipped with the *Comfort Control² System*™
- An air handler or furnace equipped with the *Comfort Control² System*™
- A *Comfort Control²* thermostat

If your installation does not meet the above requirements, you must use traditional 24VAC controls.

This installation instruction manual contains complete instructions for installation and setup using *Comfort Control²* or conventional 24VAC controls. Please refer to the Engineering Specification Sheets for complete performance data, thermostat, and accessory listings.

The information contained in this manual has been prepared to assist in the proper installation, operation and maintenance of the air conditioning system. Improper installation, or installation not made in accordance with these instructions, can result in unsatisfactory operation and/or dangerous conditions (noise and component failure), and can cause the related warranty not to apply.

Read this manual and any instructions packaged with separate equipment required to make up the system prior to installation. Retain this manual for future reference.

To achieve optimum efficiency and capacity, the indoor cooling coils listed in the condensing unit specification sheet should be used.

2.1 CHECKING PRODUCT RECEIVED

Upon receiving unit, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company. Check condensing unit model number, electrical characteristics and accessories to determine if they are correct. Check system components (evaporator coil, condensing unit, evaporator blower, etc.) to make sure they are properly matched.

2.2 APPLICATION

Before specifying any air conditioning equipment, a survey of the structure and a heat gain calculation must be made. A heat gain calculation begins by measuring all external surfaces and openings that gain heat from the surrounding air and quantifying that heat gain. A heat gain calculation also calculates the extra heat load caused by sunlight and by humidity removal.

Air conditioning systems are sized on the cooling load calculation. There are two capacities that enable the equipment to provide comfort. The first is sensible capacity.

Sensible heat is the heat energy measured on the dry bulb thermometer as it is added or removed.

The second form of heat is called **latent** or **hidden heat.** This is heat held in the humidity in the air.

A properly-sized unit removes both forms of heat, producing a comfortable living space. An oversized system cycles on and off too quickly and does not properly remove humidity, producing an uncomfortable living space. Select the indoor and outdoor equipment combination based on the manufacturer's engineering data.

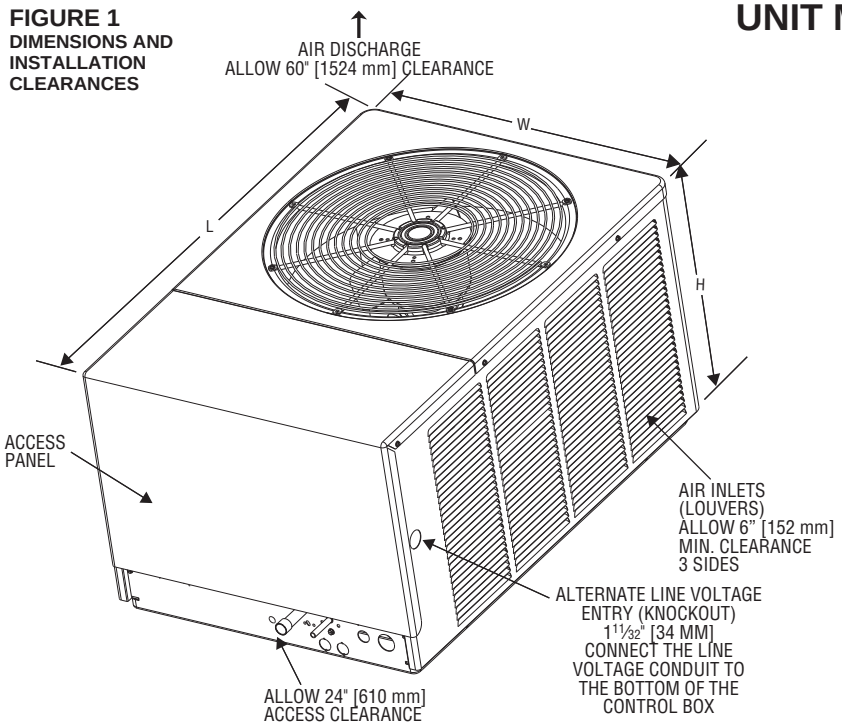
After the equipment combination has been selected, satisfying both sensible and latent conditioning requirements, the system must be properly installed. Only then can the unit provide the comfort the manufacturer intends.

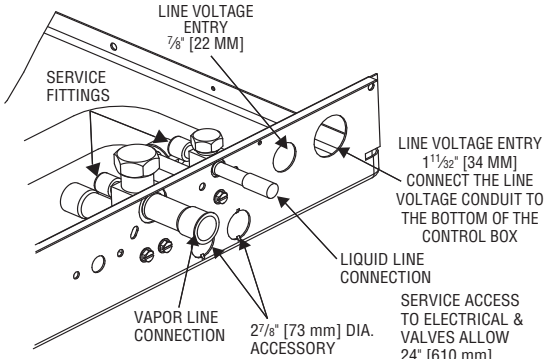
There are several factors that the installers must consider:

- Outdoor unit location
- System refrigerant charge
- Indoor unit blower speed
- System air balancing
- Proper equipment evacuation
- Indoor unit airflow
- Supply and return air duct design and sizing
- Diffuser and return air grille location and sizing

2.3 DIMENSIONS

FIGURE 1
DIMENSIONS AND INSTALLATION CLEARANCES





SERVICE ACCESS FOR 024 & 036 MODELS

Model Number RASL-	Height "H" (Inches) [mm]	Length "L" (Inches) [mm]	Width "W" (Inches) [mm]
024JEC/025JEC/036JEC/037JEC/ 039JEC/048JEC/060JEC	33 [838]	44⅜ [1127]	31½ [800]

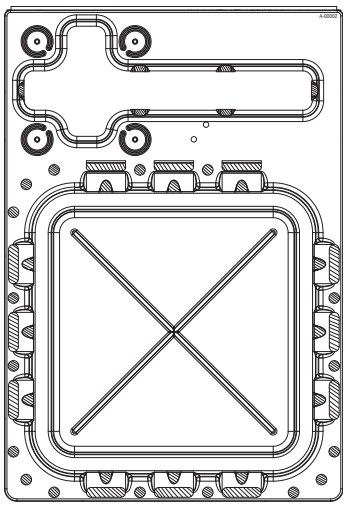
[ ] Designates Metric Conversions

UNIT MODEL NUMBER EXPLANATION

(-)ASL – 036 J E C

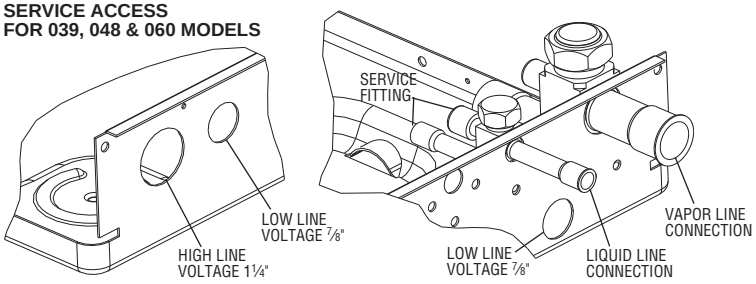
- EC = EQUIPPED WITH THE *COMFORT CONTROL² SYSTEM™*
- J - 208/230-1-60
- (NOMINAL CAPACITY)
  - 024/025 = 24000 BTU/HR
  - 036/037 = 36000 BTU/HR
  - 039 = 39000 BTU/HR
  - 048 = 48000 BTU/HR
  - 060 = 60000 BTU/HR
- L = DESIGN SERIES (R-410A)
- S = 18 SEER
- A = REMOTE CONDENSING UNIT
- TRADE NAME

BASE PAN



BOTTOM VIEW SHOWING DRAIN OPENINGS (\\\\\ SHADED AREAS).

SERVICE ACCESS FOR 039, 048 & 060 MODELS



2.4 ELECTRICAL & PHYSICAL DATA

TABLE 1
(-)ASL-JEC ELECTRICAL DATA

Model Number RASL-	ELECTRICAL							PHYSICAL					
	Phase Frequency (Hz) Voltage (Volts)	Compressor		Fan Motor Full Load Amperes (FLA)	Minimum Circuit Ampacity Amperes	Fuse or HACR Circuit Breaker		Outdoor Coil			Refrig. Per Circuit Oz. [g]	Weight	
		Rated Load Amperes (RLA)	Locked Rotor Amperes (LRA)			Minimum Amperes	Maximum Amperes	Face Area Sq. Ft. [m²]	No. Rows	CFM [L/s]		Net Lbs. [kg]	Shipping Lbs. [kg]
Rev. 4/20/2012													
024JEC	1-60-208/230	10.3/10.3	52	0.5	14/14	20/20	20/20	15.8 [1.47]	1	2500 [1180]	144 [4082]	250.5 [113.6]	263.5 [119.5]
024JEZ	1-60-208/230	10.3/10.3	52	0.5	14/14	20/20	20/20	15.8 [1.47]	1	2500 [1180]	144 [4082]	250.5 [113.6]	263.5 [119.5]
025JEC	1-60-208/230	11.7/11.7	58.3	2.8	18/18	25/25	25/25	15.8 [1.47]	1	2500 [1080]	138 [3912]	206 [93.4]	219 [99.3]
025JEZ	1-60-208/230	11.7/11.7	58.3	2.8	18/18	25/25	25/25	15.8 [1.47]	1	2500 [1080]	138 [3912]	206 [93.4]	219 [99.3]
036JEC	1-60-208/230	16.7/16.7	82	2.8	24/24	30/30	40/40	23.01 [2.14]	1	3400 [1604]	150 [4252]	301.5 [136.8]	314.5 [142.7]
036JEZ	1-60-208/230	16.7/16.7	82	2.8	24/24	30/30	40/40	23.01 [2.14]	1	3400 [1604]	150 [4252]	301.5 [136.8]	314.5 [142.7]
037JEC	1-60-208/230	15.3/15.3	83	2.8	22/22	30/30	35/35	23.01 [2.14]	1	3400 [1604]	186 [5273]	216 [98]	229 [103.9]
037JEZ	1-60-208/230	15.3/15.3	83	2.8	22/22	30/30	35/35	23.01 [2.14]	1	3400 [1604]	186 [5273]	216 [98]	229 [103.9]
039JEC	1-60-208/230	17.9/17.9	96	2.8	26/26	30/30	40/40	23 [2.14]	2	3500 [1652]	268 [7598]	332 [150.6]	345 [156.5]
048JEC	1-60-208/230	26.9/26.9	117	2.8	37/37	45/45	60/60	23 [2.14]	2	3500 [1652]	253 [7173]	335 [152]	348 [157.9]
060JEC	1-60-208/230	28.2/28.2	146	2.8	39/39	50/50	60/60	23 [2.14]	2	3500 [1652]	241 [6832]	333 [151.1]	346 [156.9]

2.5 PROPER INSTALLATION

Proper sizing and installation of this equipment is critical to achieve optimal performance. Use the information in this Installation Instruction Manual and reference the applicable Engineering Specification Sheet when installing this product.

IMPORTANT: This product has been designed and manufactured to meet ENERGY STAR® criteria for energy efficiency when matched with appropriate coil components. However, proper refrigerant charge and proper airflow are critical to achieve rated capacity and efficiency. Installation of this product should follow the manufacturer's refrigerant charging and airflow instructions. **Failure to confirm proper charge and airflow may reduce energy efficiency and shorten equipment life.**

3.0 LOCATING UNIT

3.1 Corrosive Environment

The metal parts of this unit may be subject to rust or deterioration if exposed to a corrosive environment. This oxidation could shorten the equipment's useful life. Corrosive elements include, but are not limited to, salt spray, fog or mist in seacoast areas, sulphur or chlorine from lawn watering systems, and various chemical contaminants from industries such as paper mills and petroleum refineries.

If the unit is to be installed in an area where contaminants are likely to be a problem, special attention should be given to the equipment location and exposure.

- Avoid having lawn sprinkler heads spray directly on the unit cabinet.
- In coastal areas, locate the unit on the side of the building away from the waterfront.
- Shielding provided by a fence or shrubs may give some protection, but cannot violate minimum airflow and service access clearances.
- Elevating the unit off its slab or base enough to allow air circulation will help avoid holding water against the basepan.

Regular maintenance will reduce the build-up of contaminants and help to protect the unit's finish.

⚠ WARNING

DISCONNECT ALL POWER TO UNIT BEFORE STARTING MAINTENANCE. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

- Frequent washing of the cabinet, fan blade and coil with fresh water will remove most of the salt or other contaminants that build up on the unit.
- Regular cleaning and waxing of the cabinet with a good automobile polish will provide some protection.
- A good liquid cleaner may be used several times a year to remove matter that will not wash off with water.

Several different types of protective coatings are offered in some areas. These coatings may provide some benefit, but the effectiveness of such coating materials cannot be verified by the equipment manufacturer.

3.2 CONDENSER LOCATION

Consult local and national building codes and ordinances for special installation requirements. Following location information will provide longer life and simplified servicing of the outdoor condenser.

NOTE: These units must be installed outdoors. No ductwork can be attached, or other modifications made, to the discharge grille. Modifications will affect performance or operation.

3.3 Operational Issues

- **IMPORTANT:** Locate the unit in a manner that will not prevent, impair or compromise the performance of other equipment horizontally installed in proximity to the unit. Maintain all required minimum distances to gas and electric meters, dryer vents, exhaust and inlet openings. In the absence of National Codes, or manufacturers' recommendations, local code recommendations and requirements will take precedence.
- Refrigerant piping and wiring should be properly sized and kept as short as possible to avoid capacity losses and increased operating costs.
- Locate the unit where water run off will not create a problem with the equipment. Position the unit away from the drip edge of the roof whenever possible. Units are weatherized, but can be affected by the following:
  - o Water pouring into the unit from the junction of rooflines, without protective guttering. Large volumes of water entering the heat pump while in operation can impact fan blade or motor life, and coil damage may occur to a heat pump if moisture cannot drain from the unit under freezing conditions.
  - o Freezing moisture, or sleeting conditions, can cause the cabinet to ice-over prematurely and prevent heat pump operation, requiring backup heat, which generally results in less economical operation.
- Closely follow clearance recommendations on Page 6.
  - o 24" to the service panel access
  - o 60" above heat pump fan discharge (unit top) to prevent recirculation
  - o 6" to heat pump coil grille air inlets

3.4 For Units With Space Limitations
FOR CONDENSERS WITH SPACE LIMITATIONS

In the event that a space limitation exists, we will permit the following clearances:

Single Unit Applications: Clearances below 6 inches will reduce unit capacity and efficiency. Do not reduce the 60-inch discharge, or the 24-inch service clearances.

Multiple Unit Applications: When multiple condenser grille sides are aligned, a 6-inch per unit clearance is recommended, for a total of 12" between two units. Two combined clearances below 12 inches will reduce capacity and efficiency. Do not reduce the 60-inch discharge, or 24-inch service, clearances.

3.5 Customer Satisfaction Issues

- The condensing unit should be located away from the living, sleeping and recreational spaces of the owner and those spaces on adjoining property.
- To prevent noise transmission, the mounting pad for the outdoor unit should not be connected to the structure, and should be located sufficient distance above grade to prevent ground water from entering the unit.

3.6 Unit Mounting

If elevating the condensing unit, either on a flat roof or on a slab, observe the following guidelines.

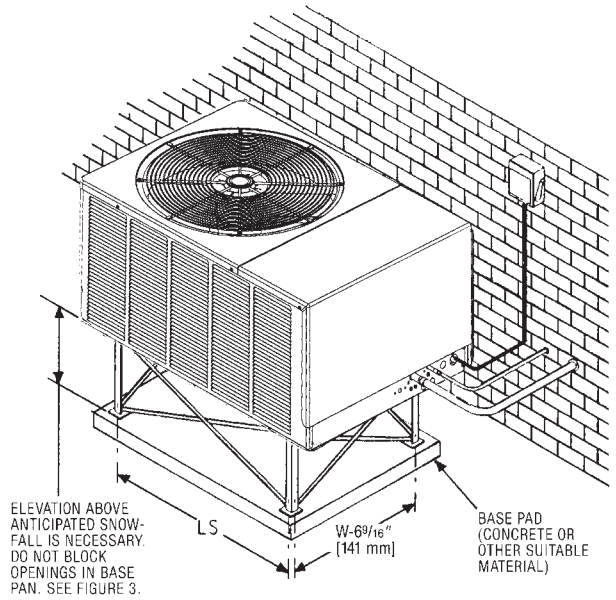
- The base pan provided elevates the heat pump 3/4" above the base pad.
- If elevating a unit on a flat roof, use 4" x 4" (or equivalent) stringers positioned to distribute unit weight evenly and prevent noise and vibration (see Figure 2).

  NOTE: Do not block drain openings shown in Figure 1.

3.7 Factory-Preferred Tie-Down Method for Outdoor Units

IMPORTANT: The Manufacturer approved/recommended method is a guide to securing equipment for wind and seismic loads. Other methods might provide the same result, but the Manufacturer method is the only one endorsed by Manufacturer for securing equipment where wind or earthquake damage can occur. Additional information is available in the PTS (Product Technical Support) section of the Manufacturer website Rheemote.net and can be found as a listing under each outdoor model. If you do not have access to this site, your Distributor can offer assistance.

FIGURE 2
RECOMMENDED ELEVATED INSTALLATION



4.0 REFRIGERANT CONNECTIONS

All units are factory charged with Refrigerant 410A. All models are supplied with service valves. Keep tube ends sealed until connection is to be made to prevent system contamination.

4.1 Tools Required For Installing & Servicing R-410A Models

Manifold Sets:
- **-Up to 800 PSIG High side**
- **-Up to 250 PSIG Low Side**
- **-550 PSIG Low Side Retard**

Manifold Hoses:
- **-Service Pressure Rating of 800 PSIG**

Recovery Cylinders:
- **-400 PSIG Pressure Rating**
- **-Dept. of Transportation 4BA400 or BW400**

⚠ CAUTION

R-410A systems operate at higher pressures than R-22 systems. Do not use R-22 service equipment or components on R-410A equipment.

IMPORTANT: The Rheem approved/recommended method is a guide to securing equipment for wind and seismic loads. Other methods might provide the same result, but the Rheem method is the only one endorsed by Rheem for securing equipment where wind or earthquake damage can occur. Additional information is available in the PTS (Product Technical Support) section of the Rheem website Rheemote.net and can be found as a listing under each outdoor model. If you do not have access to this site, your Distributor can offer assistance.

4.2 Specifications of R-410A:

Application: **R-410A is not a drop-in replacement for R-22;** equipment designs must accommodate its higher pressures. It cannot be retrofitted into R-22 heat pumps.

Physical Properties: R-410A has an atmospheric boiling point of -62.9°F and its saturation pressure at 77°F is 224.5 psig.

Composition: R-410A is an azeotropic mixture of 50% by weight difluoromethane (HFC-32) and 50% by weight pentafluoroethane (HFC-125).

Pressure: The pressure of R-410A is approximately 60% (1.6 times) greater than R-22. Recovery and recycle equipment, pumps, hoses and the like need to have design pressure ratings appropriate for R-410A. *Manifold sets need to range up to 800 psig high-side and 250 psig low-side with a 550 psig low-side retard. Hoses need to have a service pressure rating of 800 psig. Recovery cylinders need to have a 400 psig service pressure rating.* DOT 4BA400 or DOT BW400.

Combustibility: At pressures above 1 atmosphere, mixture of R-410A and air can become combustible. **R-410A and air should never be mixed in tanks or supply lines, or be allowed to accumulate in storage tanks. Leak checking should never be done with a mixture of R-410A and air.** Leak checking can be performed safely with nitrogen or a mixture of R-410A and nitrogen.

4.3 Quick Reference Guide For R-410A

- R-410A refrigerant operates at approximately 60% higher pressure (1.6 times) than R-22. Ensure that servicing equipment is designed to operate with R-410A.
- R-410A refrigerant cylinders are pink in color.
- R-410A, as with other HFC's is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- R-410A systems are to be charged with liquid refrigerants. Prior to March 1999, R-410A refrigerant cylinders had a dip tube. These cylinders should be kept upright for equipment charging. Post March 1999 cylinders do not have a dip tube and should be inverted to ensure liquid charging of the equipment.
- Do not install a suction line filter drier in the liquid line.
- A liquid line filter drier is standard on every unit. Only manufacturer approved liquid line filter driers can be used. These are Sporlan (CW083S) and Alco (80K083S) driers. These filter driers are rated for minimum working pressure of 600 psig.
- Desiccant (drying agent) must be compatible for POE oils and R-410A.

5.0 REPLACEMENT UNITS

To prevent failure of a new condensing unit, the existing evaporator tubing system must be correctly sized and cleaned or replaced. Care must be exercised that the expansion device is not plugged. For new and replacement units, a liquid line filter drier should be installed and refrigerant tubing should be properly sized. Test the oil for acid. If positive, a suction line filter drier is mandatory.

IMPORTANT: WHEN REPLACING AN R-22 UNIT WITH AN R-410A UNIT, EITHER REPLACE THE LINE SET OR ENSURE THAT THE EXISTING LINE SET IS THOROUGHLY CLEANED OF ANY OLD OIL OR DEBRIS.

6.0 INDOOR COIL

REFER TO INDOOR COIL MANUFACTURER'S INSTALLATION INSTRUCTIONS.

IMPORTANT: The manufacturer is not responsible for the performance and operation of a mismatched system, or for a match listed with another manufacturer's coil.
NOTE: All (-)ASL units must be installed with a TXV Evaporator.

> **⚠ CAUTION**
>
> Only use evaporators approved for use on R-410A systems. Use of existing R-22 evaporators can introduce mineral oil to the R-410A refrigerant forming two different liquids and decreasing oil return to the compressor. This can result in compressor failure.

The thermostatic expansion valve is specifically designed to operate with R-410A. **DO NOT use an R-22 TXV or evaporator. The existing evaporator must be replaced with the factory specified TXV evaporator specifically designed for R-410A.**

6.1 Location

Do not install the indoor coil in the return duct system of a gas or oil furnace. Provide a service inlet to the coil for inspection and cleaning. Keep the coil pitched toward the drain connection.

> **⚠ CAUTION**
>
> When coil is installed over a finished ceiling and/or living area, it is recommended that a secondary sheet metal condensate pan be constructed and installed under entire unit. Failure to do so can result in property damage.

7.0 INTERCONNECTING TUBING

7.1 Vapor and Liquid Lines

Keep all lines sealed until connection is made.

Make connections at the indoor coil first.

Refer to Line Size Information in Tables 3 and 4 for correct size and multipliers to be used to determine capacity for various vapor line diameters and lengths of run. The losses due to the lines being exposed to outdoor conditions are not included.

The factory refrigeration charge in the outdoor unit is sufficient for 15 feet of interconnecting lines. The factory refrigeration charge in the outdoor unit is sufficient for the unit and 15 feet of standard size interconnecting liquid and vapor lines. For different lengths, adjust the charge as indicated below.

1/4" ± .3 oz. per foot

5/16" ± .4 oz. per foot

3/8" ± .6 oz. per foot

1/2" ± 1.2 oz. per foot

TABLE 2
VAPOR LINE CAPACITY MULTIPLIER

(-)ASL Unit Vapor Line Connection Size (inches I.D.) [mm]		024/025	036/037	039	048	060
		3/4" [19.05] I.D. Sweat	3/4" [19.05] I.D. Sweat	3/4" [19.05] I.D. Sweat	3/4" [19.05] I.D. Sweat	7/8" [22.23] I.D. Sweat
Vapor Line Run Feet [m]		Vapor Line Diameter (inches O.D.) [mm]				
		5/8" [15.88] Optional	5/8" [15.88] Optional	5/8" [15.88] Optional	5/8" [15.88] Optional	3/4" [19.05] Optional
		3/4" [19.05] Standard	3/4" [19.05] Standard	3/4" [19.05] Standard	3/4" [19.05] Standard	7/8" [22.23] Standard
25' [7.62]	Opt. Std.	1.00 1.00	0.99 1.00	0.99 1.00	0.98 1.00	0.99 1.00
50' [15.24]	Opt. Std.	0.98 1.00	0.98 1.00	0.97 0.99	0.96 0.99	0.98 0.99
75' [22.86]	Opt. Std.	0.98 1.00	0.96 0.99	0.96 0.99	0.94 0.98	0.96 0.99
100' [30.48]	Opt. Std.	0.98 N/A	0.95 N/A	0.95 N/A	0.92 N/A	0.95 N/A
125' [38.10]	Opt. Std.	0.96 N/A	0.94 N/A	0.93 N/A	0.90 N/A	0.94 N/A
150' [45.72]	Opt. Std.	0.96 N/A	0.92 N/A	0.91 N/A	0.88 N/A	0.93 N/A

NOTES:
1. Do **NOT** exceed the limits in the liquid and suction line sizing charts.
2. Do **NOT** use 7/8 OD suction lines in 2, 3 or 4-ton applications.
3. Do **NOT** use 1-1/8 OD suction line in ANY application.
4. Line sets over 75 feet MUST use the optional suction line.

7.2 Maximum Length of Lines

The maximum length of interconnecting line is 150 feet. Always use the shortest length possible with a minimum number of bends. Additional compressor oil is not required for any length up to 150 feet.

NOTE: Excessively long refrigerant lines cause loss of equipment capacity.

7.3 Outdoor Unit Installed Above or Below Indoor Coil

Use the following guidelines when installing the unit:

1. Expansion Valve Coil:
   a. The vertical separation cannot exceed the value in Tables 3 and 4.
   b. No changes are required for expansion valve coils.
2. It is recommended to use the smallest liquid line size permitted to minimize the system charge.
3. Tables 3 and 4 may be used for sizing horizontal runs.

7.4 Tubing Installation

Observe the following when installing correctly sized type "L" refrigerant tubing between the condensing unit and evaporator coil:

- If a portion of the liquid line passes through a hot area where liquid refrigerant can be heated to form vapor, insulating the liquid line is required.
- Use clean, dehydrated, sealed refrigeration grade tubing.
- Always keep tubing sealed until tubing is in place and connections are to be made.
- Blow out the liquid and vapor lines with dry nitrogen before connecting to the outdoor unit and indoor coil. Any debris in the line set will end up plugging the expansion device.
- As an added precaution, a high quality filter drier is standard on R-410A units.
- Do not allow the vapor line and liquid line to be in contact with each other. This causes an undesirable heat transfer resulting in capacity loss and increased power consumption. The vapor line must be insulated.
- If tubing has been cut, make sure ends are deburred while holding in a position to prevent chips from falling into tubing. Burrs such as those caused by tubing cutters can affect performance dramatically, particularly on small liquid line sizes.

TABLE 3
(-)ASL LIQUID LINE SIZING

LIQUID LINE SIZE - OUTDOOR UNIT ABOVE INDOOR COIL								
R-410A System Capacity Model	Line Size Connection Size (Inch I.D.) [mm]	Line Size (Inch O.D.) [mm]	Liquid Line Size Outdoor Unit **Above** Indoor Coil (Cooling Only - Does not apply to Heat Pumps) Total **Equivalent** Length - Feet [m]					
			25 [7.62]	50 [15.24]	75 [22.86]	100 [30.48]	125 [45.72]	150 [45.72]
			Minimum Vertical Separation - Feet [m]					
-25	3/8" [9.53]	1/4" [6.35]	0	0	14 [4.27]	41 [12.50]	69 [21.03]	96 [29.26]
		5/16" [7.93]	0	0	0	0	0	0
		3/8" [9.52]*	0	0	0	0	0	0
-37	3/8" [9.53]	5/16" [7.93]	0	0	6 [1.83]	12 [3.66]	19 [5.79]	26 [7.93]
		3/8" [9.52]*	0	0	0	0	0	0
		1/2" [12.70]	0	0	0	0	0	0
-39	3/8" [9.53]	5/16" [7.93]*	0	0	0	0	13 [3.96]	27 [8.23]
		3/8" [9.52]	0	0	0	0	0	0
		1/2" [12.70]	0	0	0	0	0	0
-48	3/8" [9.53]	5/16" [7.93]*	0	0	0	23 [7.01]	45 [13.72]	68 [20.73]
		3/8" [9.52]	0	0	0	0	0	0
		1/2" [12.70]	0	0	0	0	0	0
-60	3/8" [9.53]	3/8" [9.52]*	0	0	0	0	0	0
		1/2" [12.70]	0	0	0	0	0	0

NOTES: N/A = Application Not Recommended
*Standard Line Size

LIQUID LINE SIZE - OUTDOOR UNIT BELOW INDOOR COIL								
R-410A System Capacity Model	Line Size Connection Size (Inch I.D.) [mm]	Line Size (Inch O.D.) [mm]	Liquid Line Size Outdoor Unit **Below** Indoor Coil (Cooling Only - Does not apply to Heat Pumps) Total **Equivalent** Length - Feet [m]					
			25 [7.62]	50 [15.24]	75 [22.86]	100 [30.48]	125 [45.72]	150 [45.72]
			Maximum Vertical Separation - Feet [m]					
-25	3/8" [9.53]	1/4" [6.35]	25 [7.93]	13 [3.96]	N/A	N/A	N/A	N/A
		5/16" [7.93]	25 [10.97]	32 [9.75]	29 [8.84]	26 [7.93]	23 [7.01]	20 [6.10]
		3/8" [9.52]*	25 [11.58]	37 [11.28]	35 [10.67]	34 [10.36]	33 [10.06]	32 [9.75]
-37	3/8" [9.53]	5/16" [7.93]	N/A	N/A	N/A	N/A	N/A	N/A
		3/8" [9.52]*	12 [3.66]	10 [3.05]	N/A	N/A	N/A	N/A
		1/2" [12.70]	14 [4.27]	13 [3.96]	13 [3.96]	12 [3.66]	12 [3.66]	11 [3.35]
-39	3/8" [9.53]	5/16" [7.93]*	16 [4.88]	11 [3.35]	N/A	N/A	N/A	N/A
		3/8" [9.52]	19 [5.79]	17 [5.18]	15 [4.57]	14 [4.27]	12 [3.66]	11 [3.35]
		1/2" [12.70]	20 [6.10]	20 [6.10]	19 [5.79]	19 [5.79]	19 [5.79]	18 [5.49]
-48	3/8" [9.53]	5/16" [7.93]*	25 [10.67]	23 [7.01]	N/A	N/A	N/A	N/A
		3/8" [9.52]	25 [11.89]	37 [11.28]	34 [10.36]	32 [9.75]	29 [8.84]	22 [6.71]
		1/2" [12.70]	25 [12.50]	41 [12.50]	40 [12.19]	40 [12.19]	39 [11.89]	39 [11.89]
-60	3/8" [9.53]	3/8" [9.52]*	25 [11.28]	34 [10.36]	30 [9.14]	23 [7.01]	13 [3.96]	N/A
		1/2" [12.70]	25 [12.19]	39 [11.89]	38 [11.58]	38 [11.58]	37 [11.28]	36 [10.97]

NOTES: N/A = Application Not Recommended
*Standard Line Size

TABLE 4
(-)ASL SUCTION LINE SIZING

SUCTION LINE SIZE - OUTDOOR UNIT ABOVE INDOOR COIL								
R-410A System Capacity Model	Line Size Connection Size (Inch I.D.) [mm]	Line Size (Inch O.D.) [mm]	Suction Line Size					
			Outdoor Unit **ABOVE** Indoor Coil (Cooling Only - Does not apply to Heat Pumps)					
			Total **Equivalent** Length - Feet [m]					
			25 [7.62]	50 [15.24]	75 [22.86]	100 [30.48]	125 [45.72]	150 [45.72]
-25	3/4" [19.05]	5/8" [15.88]	Same as Liquid Line Size Table					
		3/4" [19.05]*	NA					
		7/8" [22.23]	NA					
-37	3/4" [19.05]	5/8" [15.88]	Same as Liquid Line Size Table					
		3/4" [19.05]*	NA					
		7/8" [22.23]	NA					
-39	3/4" [19.05]	5/8" [15.88]	Same as Liquid Line Size Table					
		3/4" [19.05]*	NA					
		7/8" [22.23]	NA					
-48	7/8" [22.23]	5/8" [15.88]	Same as Liquid Line Size Table					
		3/4" [19.05]*	NA					
		7/8" [22.23]	NA					
-60	7/8" [22.23]	3/4" [19.05]	Same as Liquid Line Size Table					
		7/8" [22.23]*	NA					
		1-1/8" [28.58]	NA					

NOTES: Using suction line larger than shown in chart will result in poor oil return.
*Standard Line Size

SUCTION LINE SIZE - OUTDOOR UNIT BELOW INDOOR COIL								
R-410A System Capacity Model	Line Size Connection Size (Inch I.D.) [mm]	Line Size (Inch O.D.) [mm]	Suction Line Size					
			Outdoor Unit **BELOW** Indoor Coil (Cooling Only - Does not apply to Heat Pumps)					
			Total **Equivalent** Length - Feet [m]					
			25 [7.62]	50 [15.24]	75 [22.86]	100 [30.48]	125 [45.72]	150 [45.72]
-25	3/4" [19.05]	5/8" [15.88]	Same as Liquid Line Size Table			NA		
		3/4" [19.05]*	NA					
		7/8" [22.23]	NA					
-37	3/4" [19.05]	5/8" [15.88]	Same as Liquid Line Size Table					
		3/4" [19.05]*	Same as Liquid Line Size Table			NA		
		7/8" [22.23]	Same as Liquid Line Size Table			NA		
-39	3/4" [19.05]	5/8" [15.88]	Same as Liquid Line Size Table					
		3/4" [19.05]*	Same as Liquid Line Size Table			NA		
		7/8" [22.23]	NA					
-48	7/8" [22.23]	5/8" [15.88]	Same as Liquid Line Size Table					
		3/4" [19.05]*	Same as Liquid Line Size Table			NA		
		7/8" [22.23]	NA					
-60	7/8" [22.23]	3/4" [19.05]	Same as Liquid Line Size Table					
		7/8" [22.23]*	Same as Liquid Line Size Table			NA		
		1-1/8" [28.58]	NA					

NOTES: Using suction line larger than shown in chart will result in poor oil return.
*Standard Line Size

- For best operation, keep tubing run as short as possible with a minimum number of elbows or bends.
- Locations where the tubing will be exposed to mechanical damage should be avoided. If it is necessary to use such locations, the copper tubing should be housed to prevent damage.
- If tubing is to be run underground, it must be run in a sealed watertight chase.
- Use care in routing tubing and do not kink or twist. Use a good tubing bender on the vapor line to prevent kinking.
- Route the tubing using temporary hangers, then straighten the tubing and install permanent hangers. Line must be adequately supported.
- The vapor line must be insulated to prevent dripping (sweating) and prevent performance losses. Armaflex and Rubatex are satisfactory insulations for this purpose. Use 1/2” minimum insulation thickness, additional insulation may be required for long runs.
- Check Table 2 for the correct vapor line size. Check Table 3 for the correct liquid line size.

7.5 Tubing Connections

Indoor coils have only a holding charge of dry nitrogen. Keep all tube ends sealed until connections are to be made.

- Use type “L” copper refrigeration tubing. Braze the connections with the following alloys:
  - copper to copper - 5%
  - Silver alloy (no flux)
  - copper to steel or brass - 35%
  - silver alloy (with flux)
- Be certain both refrigerant shutoff valves at the outdoor unit are closed.
- Clean the inside of the fittings and outside of the tubing with steel wool or sand cloth before soldering. Always keep chips, steel wool, dirt, etc., out of the inside when cleaning.
- Assemble tubing part way into fitting. Apply flux all around the outside of the tubing and push tubing into stop. This procedure will keep the flux from getting inside the system.
- Remove the cap and schrader core from service port to protect seals from heat damage.
- Use an appropriate heatsink material around the copper stub and the service valves before applying heat.
- **IMPORTANT:** Do not braze any fitting with the TEV sensing bulb attached.
- Braze the tubing between the outdoor unit and indoor coil. Flow dry nitrogen into a service port and through the tubing while brazing.
- After brazing – use an appropriate heatsink material to cool the joint and remove any flux residue.
- The service valves are not backseating valves. To open the valves, remove the valve cap with an adjustable wrench. Insert a 3/16” or 5/16” hex wrench into the stem. Back out counterclockwise.
- Replace the valve cap finger tight then tighten an additional 1/2 hex flat for a metal-to-metal seal.

7.6 Leak Testing

- Pressurize line set and coil through service fittings with dry nitrogen to 150 PSIG maximum. Leak test all joints using liquid detergent. If a leak is found, recover pressure and repair.

⚠ WARNING

DO NOT USE OXYGEN TO PURGE LINES OR PRESSURIZE SYSTEM FOR LEAK TEST. OXYGEN REACTS VIOLENTLY WITH OIL, WHICH CAN CAUSE AN EXPLOSION RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

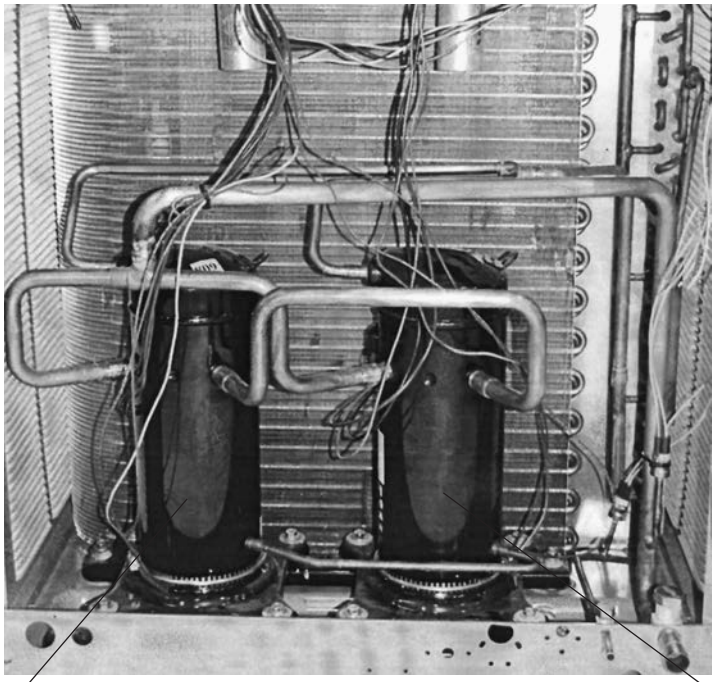
8.0 DUAL DRIVE COMPRESSORS

The -039, -048, & -060 condensing units contain two compressors to deliver maximum efficiency and comfort. The Dual Drive Compressors are sized to increase run times at first stage operation (partial capacity). When additional capacity is needed, a two stage thermostat energizes both compressors to deliver full rated capacity.

8.1 Compressor Identification

The individual compressors are identified as Compressor A and Compressor B. When facing the access panel, Compressor A is on the left and Compressor B is on the right. (See Figure 3.)

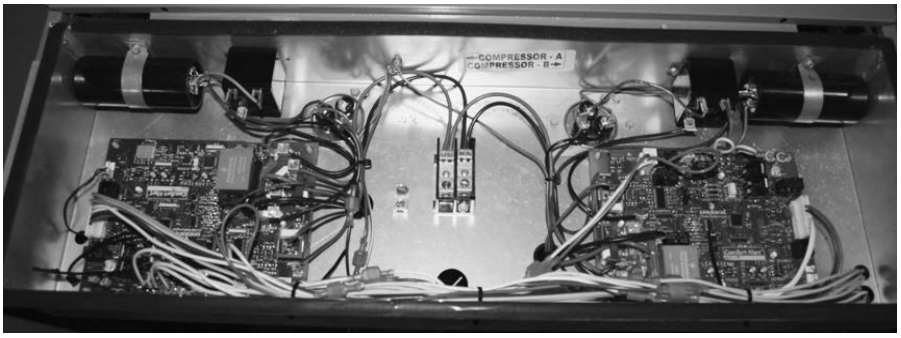
FIGURE 3
DUAL DRIVE COMPRESSORS



8.2 *Comfort Control² System™* Control Identification

The Dual Drive condensing units use one (1) serial communicating control per compressor. There is a label in the control box that identifies each control/compressor combination. When facing the access panel, Compressor A is controlled by the left-hand board and Compressor B is controlled by the right-hand board.

FIGURE 4



8.3 *Comfort Control² System™* Control Operation

A Dual Drive unit has two controls instead of a single control. The controls are the same as any residential communicating control except the secondary control dip-switches (SW5) should be in the off position. Therefore, the features such as fault recall and the operation of the test button are the same as any JEC control.

The two controls are identical and interchangeable, but the memory cards that attach to the controls are not interchangeable. This allows the controls to be swapped for troubleshooting if one of the controls is suspected of being defective. If the controls are swapped, it is important to keep the memory cards in the proper locations. Do not cut the tethers on the memory cards!

8.4 Lead/Lag

Tandem compressor ASL units now have a Lead/Lag functionality built into the control software. The purpose of Lead/Lag is to average the runtime of the compressors to give the homeowner the greatest compressor life possible. Upon receiving a first stage call, the primary compressor control (the control on the left as you face the control box) will alternate which compressor services the call. An example of Lead/Lag is: if compressor A is energized on one first stage call, compressor B would normally service the next first stage call.

9.0 COMPRESSOR CRANKCASE HEAT (CCH)

CCH is standard on these models due to refrigerant migration during the off cycle that can result in a noisy start up.

Crankcase Heater Operation:

Supplemental Crankcase heat is required to prevent refrigerant migration in systems with relatively high system refrigerant charges. Each Dual Drive compressor has its own crankcase heater.

The crankcase heater control is integrated into the *Comfort Control² System*™ and is designed for maximum energy savings.

Summary of operation:

- The crankcase heater is off whenever the compressor is running.
- Once the compressor turns off, the crankcase heater control (CCH) begins the two-hour timer countdown.
- If the compressor stays off for two hours, the CCH turns on the crankcase heater.

All heaters are located on the lower half of the compressor shell. Its purpose is to drive refrigerant from the compressor shell during long off cycles, thus preventing damage to the compressor during start-up.

At initial start-up or after extended shutdown periods, make sure the heater is energized for at least 12 hours before the compressor is started. (Disconnect switch on and wall thermostat off.)

10.0 HARD START COMPONENTS

Factory-installed start components are standard on all models.

11.0 HIGH AND LOW PRESSURE CONTROLS (HPC AND LPC)

These controls keep the compressor from operating in pressure ranges which can cause damage to the compressor. Both controls are in the low voltage control circuit.

High pressure control (HPC) is an automatic-reset which opens near 610 PSIG and closes near 420 PSIG.

The low pressure control (LPC) is an automatic-reset which opens near 50 PSIG and closes near 95 PSIG.

NOTE: HPC and LPC are monitored by the *Comfort Control² System*™. See Section 12.0.

⚠ CAUTION

THE COMPRESSOR HAS AN INTERNAL OVERLOAD PROTECTOR. UNDER SOME CONDITIONS, IT CAN TAKE UP TO 2 HOURS FOR THIS OVERLOAD TO RESET. MAKE SURE OVERLOAD HAS HAD TIME TO RESET BEFORE CONDEMNING THE COMPRESSOR.

11.1 Evacuation Procedure

Evacuation 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 and moisture from the system.

Air or nitrogen in the system causes high condensing temperatures and pressure, resulting in increased power input and non-verifiable performance.

Moisture chemically reacts with the refrigerant and oil to form corrosive hydrofluoric acid. This attacks motor windings and parts, causing breakdown.

- After the system has been leak-checked and proven sealed, connect the vacuum pump and evacuate system to 500 microns and hold 500 microns or less for at least 15 minutes. the vacuum pump must be connected to both the high and low sides of the system by connecting to the two pressure ports. Use the largest size connections available since restrictive service connections may lead to false readings because of pressure drop through the fittings.
- After adequate evacuation, open both service valves by removing both brass service valve caps with an adjustable wrench. Insert a 3/16" [5 mm] hex wrench into the stem and turn counterclockwise until the wrench stops.
- At this time gauges must be connected to the access fitting on the liquid line (small) service valve and the common suction port connected to the common suction line between the reversing valve and compressor to check and adjust charge.

IMPORTANT: Compressors (especially scroll type) should never be used to evacuate the air conditioning system because internal electrical arcing may result in a damaged or failed compressor. Never run a scroll compressor while the system is in a vacuum or compressor failure will occur.

FINAL LEAK TESTING

After the unit has been properly evacuated and service valves opened, a halogen leak detector should be used to detect leaks in the system. All piping within the heat pump, evaporator, and interconnecting tubing should be checked for leaks. If a leak is detected, the refrigerant should be recovered before repairing the leak. The Clean Air Act prohibits releasinig refrigerant into the atmosphere.

12.0 CONDENSING UNITS EQUIPPED WITH THE *COMFORT CONTROL² SYSTEM™*

Comfort Control² is the next generation of the Integrated Compressor Control (ICC) and is an integral part of the *Comfort Control² System*™ with the following features:

12.1 Control Description (see Figure 3)

Dual 7-Segment LED

- Displays status and diagnostic codes (See Status and Diagnostic Description)
- Displays diagnostic/fault recall (See Test Mode/Fault Recall)

RED LED (Y1)

- Y1 red LED (solid on) indicates Y1 call from thermostat is present

⚠ CAUTION

UNIT MAY START SUDDENLY AND WITHOUT WARNING
Solid red light indicates a thermostat call for unit operation is present at the ICC control. ICC control will attempt to start unit after short cycle timer expires or when in Active Protection mode will attempt to restart unit prior to Lockout mode.

Line Voltage Connector

- Line voltage is connected to control board at lug terminals L1 & L2
- Maximum wire size accepted is 6 AWG copper wire

- # 4 – 6 AWG 45 in/lbs
  # 8 AWG 40 in/lbs
  # 10 – 14 AWG 35 in/lbs
  (Check wire terminations annually)

Compressor Control (K2)

- Sealed single pole compressor relay switch with optical feedback feature (arc detection)

Thermostat Connector (E2)

- **R** – 24VAC from the indoor unit 24VAC transformer (40 VA minimum)
- **C** – 24VAC Common from the indoor unit 24VAC transformer
- 1-Data: System Communications Line 1
- 2-Data: System Communications Line 2

Low Volt Fuse

- If required replace with 3 A automotive ATC style blade fuse

Low Pressure Control (LPC Input)

- Low-pressure control is factory installed
- Low pressure control is an automatic resetting device

High Pressure Control (HPC Input)

- High-pressure control is factory installed
- High pressure control is an automatic resetting device

Ambient Temperature Sensor (included with all applications)

- Included with all applications

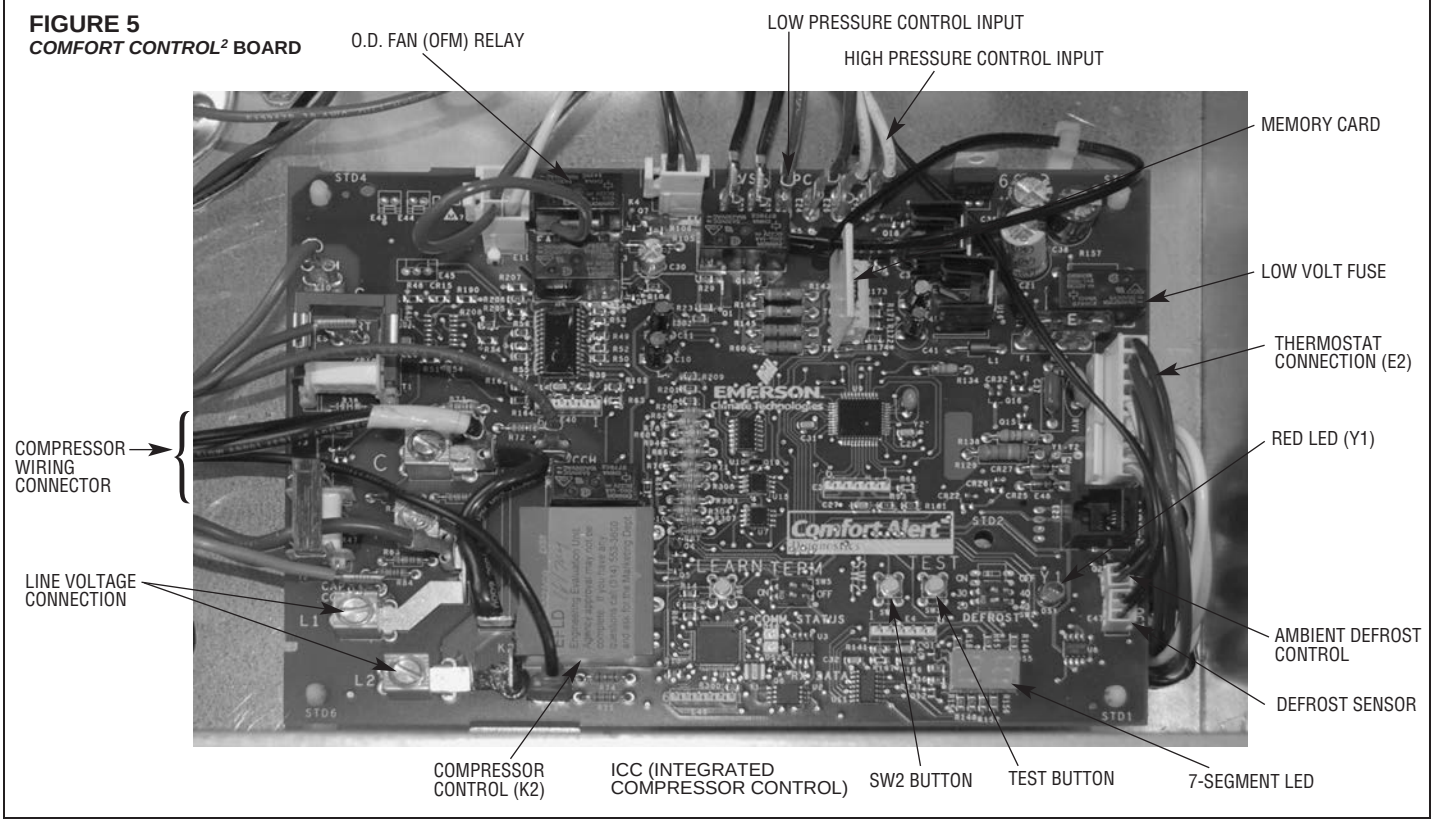
TEST and SW2 Buttons

- TEST and SW2 buttons used to enter Test and Fault Recall Mode

Memory Card

- The memory card stores all unit information.
- The unit information is called shared data.
- The shared data is all the information needed for proper unit operation.

FIGURE 5
***COMFORT CONTROL²* BOARD**



12.2 *Comfort Control² System™* Control Wiring

An HVAC system equipped with *Comfort Control² System*™ consists of:

- Heat pump or condensing unit equipped with *Comfort Control²*
- Air handler or furnace equipped with *Comfort Control²*
- *Comfort Control²* thermostat

The four 18AWG low voltage control wires must be installed from the thermostat to the indoor unit and from indoor unit to the outdoor unit. The wire length between the thermostat and indoor unit should not be greater than 100 feet. The wire length between the indoor unit and outdoor unit should not be greater than 125 feet.

IMPORTANT: If the installed system does not meet these requirements, the system must be wired using traditional control wiring, reference Section 12.7 Conventional 24VAC Thermostat Control Wiring.

Serial communications require four (4) control wires for unit operation:

R – 24VAC

C – 24VAC common

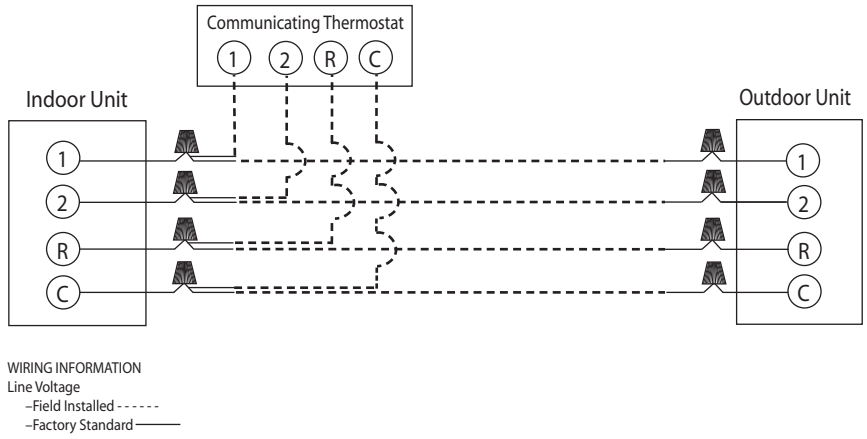
1 – Data wire 1

2 – Data wire 2

Note: *Comfort Control² System*™ requires 18 AWG thermostat wire.

Note: TERM dipswitches should be in ON position.

FIGURE 6
TYPICAL *COMFORT CONTROL² SYSTEM™* WIRING DIAGRAM



If the low voltage control wiring is run in conduit with the power supply, Class I insulation is required. Class II insulation is required if run separate. Low voltage wiring may be run through the insulated bushing provided in the 7/8 hole in the base panel, up to and attached to the pigtails from the bottom of the control box. Conduit can be run to the base panel if desired by removing the insulated bushing.

The serial communicating air handler or serial communicating furnace transformer is equipped with a 24 volt, 50 VA transformer for proper system operation. See the wiring diagram in Figure 4 for reference.

12.3 *Comfort Control² System™* Diagnostic Codes in Dual Drive Condensing Units

Comfort Control² System™ controls for both compressors are connected to the serial communicating network via Data Wire 1 and Data Wire 2. Each *Comfort Control² System*™ control board maintains separate fault history for the compressor it controls. Fault codes for both compressors can be retrieved using a service tool or via the installer menus.

12.4 *Comfort Control²* ICC Control Operation

Installation Verification

- 24V AC power on R&C must be present at the ICC for it to operate
- Line voltage must be present at the ICC for the compressor and the outdoor fan to operate
- The ICC displays a “0” for standby mode. Standby mode indicates line voltage and 24VAC are present at the ICC and there is not a command for unit operation from the serial communicating thermostat.

Zero (0) displayed
The unit is in standby

Command for Compressor Operation (Y1 LED)

- If a command for compressor operation is received by the ICC (first stage/second stage cooling or first stage/second stage heating), the red Y1 LED will illuminate.
- The ICC has an on/off fan delay of one (1) second for each stage of heating or cooling.
- The ICC ignores the low pressure control for the first 90 seconds of compressor operation.
- The dual 7-segment LED displays five (5) operational status codes.

1) First Stage Cooling Operation – When the ICC receives a command for first stage cooling operation, a lower case “c” is displayed on the dual 7-segment LEDs.

Lower case “c” indicates first stage cooling operation

2) Second Stage Cooling Operation – When the ICC receives a command for second stage cooling operation, an upper case “C” is displayed on the dual 7-segment LEDs.

Upper case “C” indicates second stage cooling operation

3-minute Anti-short Cycle Timer

- The ICC has a built in 3-minute time delay between compressor operations to protect the compressor against short cycling. The dual 7-segment LEDs will flash “c” or “C” while the short cycle timer is active and a command for unit operation is received.

Flashing lower case c
A command for first stage cooling has been received

Flashing upper case C
A command for second stage cooling has been received

- The 3-minute time delay can be bypassed when a command for compressor operation is present by pressing the TEST button for 1 second and releasing. The compressor will begin operation and the dual 7-segment will stop flashing.

30 Second Minimum Run Timer

- The ICC has a built in 30 second minimum unit run time. If a command for compressor operation is received by the ICC and the command is removed, the compressor will continue to operate for 30 seconds. The dual 7-segment LEDs will flash “c” or “C” while the minimum run timer is active.

1 Second Compressor/Fan Delay

- The ICC starts/stops the outdoor fan one (1) second after the start/stop of the compressor upon a command for compressor operation to minimize current inrush and/or voltage drop.

12.5 Active Compressor Protection Mode

- The ICC actively protects the compressor from harmful operation during a fault condition.
- When the ICC detects a condition that could damage the compressor, the ICC will enter active protection mode and lockout compressor operation
- The condition causing active protection must be resolved then the ICC can be reset to restart the system.
- There are five (5) active protection modes:

1) Low Pressure Control Lockout

- The ICC will display a flashing “L” followed by a flashing 21 when a low pressure control lockout occurs.
- The ICC addresses low pressure control faults differently depending on the mode of unit operation (cooling or heating mode).

Active Protection – Code L21 – Open low pressure control

Cooling Mode

- If the LPC opens three (3) times during the same command for cooling operation, the ICC will lockout the compressor to keep it from continuing to operate and flash a L” on the dual 7-segment LEDs followed by a “21”.

IMPORTANT: This mode of active protection must be manually reset.

2) High Pressure Control Lockout

- If the HPC opens three (3) times during the same command for unit operation, the ICC will lockout the compressor to keep it from continuing to operate and flash a L” on the dual 7-segment LEDs followed by a “29”.

Active Protection – Code L29 – Open high pressure control

IMPORTANT: This mode of active protection must be manually reset.

3) Locked Rotor

- The ICC will display a flashing “L” followed by a flashing “04” when a locked rotor condition occurs.

Active Protection – Code L4 – Locked rotor

If the ICC detects the compressor has run less than 15 seconds before the protector tripped for four (4) consecutive starts during the same command for unit operation, the ICC will lockout the compressor to keep it from continuing to operate and flash a “L” on the dual 7-segment LEDs followed by a “04”.

IMPORTANT: This mode of active protection must be manually reset.

4) Compressor Protector Trip

- If ICC detects a protector trip it will display a “P”. If protector doesn’t reset within 4 hours, the ICC display will change to “5”.

Compressor Protector – Code P – Protector Trip

5) Open Start Circuit Lockout

- The ICC will display a flashing “L” followed by a flashing “06” when an open start circuit condition occurs.

Active Protection – Code L6 – Compressor open start circuit

If the ICC lockouts L6 and L7 detect current in the run circuit without current present in the start circuit, the ICC will lockout the compressor to keep it from continuing to operate and flash a “L” on the dual 7-segment LEDs followed by a “06”.

IMPORTANT: This mode of active protection must be manually reset.

6) Open Run Circuit Lockout

- The ICC will display a flashing “L” followed by a flashing “07” when an open start circuit condition occurs.

Active Protection – Code L7 – Compressor open run circuit

If the ICC detects current in the start circuit without current present in the run circuit, , the ICC will lockout the compressor to keep it from continuing to operate and flash a “L” on the dual 7-segment LEDs followed by a “07”.

IMPORTANT: This mode of active protection must be manually reset.

Exiting Active Compressor Protection Lockout

Three are three methods to reset the ICC after an active protection lockout:

1) Cycle the line voltage to the unit
2) Cycle 24VAC to the ICC (remove the R or C connection to the ICC)
3) Push the TEST button down with an insulated probe for one (1) second and release

   Note: The ICC will attempt to start the unit when the TEST button is pressed and released

Note: The preferred method of resetting the ICC is to push the TEST button down for one (1) second.

12.6 Test and Fault Recall Modes

Test Mode (Test Button on the ICC)

- Enter TEST mode by pressing the TEST button with an insulated probe for one (1) second and release.
- The TEST mode causes the ICC to do the following
  1) Resets the ICC from active protection lockout mode
  2) Bypasses the 3-minute anti-short cycle timer
  3) Energizes the unit without a command for unit operation
- If the 3-minute anti-short cycle timer or 30 second minimum run timer is active (a flashing “c”, “C”, “h”, or “H” is displayed on the dual 7-segment LEDs) and a command for unit operation is present, TEST mode causes:
  1) A “t” to display momentarily on the dual 7-segment display

Lower case “t”

  2) The compressor will start and the outdoor fan will operate
  3) The display will change to a steady “c” or “C” to show the current command for unit operation.

  Note: If a command for unit operation is present at the end of TEST mode will cause the unit to continue to operate.
- If no command for unit operation is present, TEST mode causes
  1) A steady “t” appears on the dual 7-segment LEDs
  2) The compressor will start
  3) The compressor will turn off after 5-seconds.

  Note: Entering TEST mode without a command for unit operation will cause the compressor to run 5-seconds.

Fault Recall Mode (TEST and SW2 Buttons)

- Enter **FAULT RECALL** mode by pressing the **TEST** and **SW2** buttons at the same time with insulated probes for one (1) second and release.
- When entering and exiting FAULT RECALL mode the top and bottom segments of the dual 7-segment LEDs will illuminate.

Fault Recall Mode – the top and bottom segments on the right side are illuminated

- When entering **FAULT RECALL** mode, the ICC will automatically scroll through stored faults on the dual 7-segment LEDs.
- Each fault is displayed one time with the top right hand segment of the dual 7-segment display activated between faults.
- Each fault is displayed with the most recent fault displayed first.

- A maximum of six individual faults can be stored
- A maximum of three consecutive identical faults are stored.
- A “0” will be displayed with no faults are stored
- The ICC will automatically exit the **FAULT RECALL** mode after displaying stored faults

Clear Fault History (TEST and SW2 Buttons)

- Clear FAULT HISTORY by pressing both TEST and SW2 button for five (5) seconds with insulated probes and release.
- The top and bottom segments of the dual 7-segment LEDs flash to indicate the history has been cleared.

Fault history is cleared with the top and bottom LED segments flash

NOTE: The memory card for the system has specific shared data for this system. The memory card is attached to the control box with a tether. The tether has an identification tag that can be used to identify the memory card. For the system data faults d1 through d8 reference the label on the memory card tether.

12.7 *COMFORT CONTROL² SYSTEM™* CONTROL WIRING AND CONVENTIONAL THERMOSTAT WIRING ICC DIAGNOSTIC CODES

ICC Diagnostic Codes

Descriptions of the ICC diagnostic codes are provided below:

Dual 7-Segment LEDs Display Code	Diagnostic Description	Status/Possible Cause – Troubleshooting Information
	0 – Standby No command for unit operation	Normal operation
	c - First Stage Cooling Unit has received a command for first stage cooling	Normal operation
 **FLASHING**	c - Anti-short cycle timer (3 minutes) or Minimum run timer (30 seconds) active	• The unit has received a command for first stage cooling during an active anti-short cycle timer or minimum run timer. • Wait until unit timer has expired or press the TEST button to defeat short cycle delay.
	C - Second Stage Cooling Unit has received a command for second stage cooling	Normal operation
 **FLASHING**	C - Anti-short cycle timer (3 minutes) or Minimum run timer (30 seconds) active	• The unit has received a command for second stage cooling during an active anti-short cycle timer or minimum run timer. • Wait unit timer has expired or press the TEST button to defeat short cycle delay.
	t - Test Mode	The ICC is in TEST mode
	P – Protector Trip A command for compressor operation is present but no current is measured to the compressor	• Motor protector open • Line voltage disconnected
	01 – Long Run Time (Compressor) The compressor has continuously run for more than 18 hours in the cooling mode.	• Low refrigerant charge • Air ducts have substantial leakage • Dirty indoor air filter • Dirty outdoor coil
	02 – High Side Fault Compressor limit has opened four (4) times within a call for operation	• Outdoor coil is dirty (cooling mode) • Outdoor fan is not running (cooling mode) • Dirty indoor coil or filter (heating mode) • Indoor blower is not running (heating mode) • Liquid line restriction • Excessive refrigerant charge
	03 – Short Cycling The ICC detects the run time for the past four (4) compressor cycles is less than three (3) minutes each.	• Check thermostat wire connections (R, C, 1, & 2) • Check thermostat location in zone (too close to discharge grill)
	L4 – Locked Rotor The ICC detects four (4) consecutive protector trips have occurred and the run time before each trip is less than 15 seconds	• Bad run capacitor • Low line voltage • Excessive refrigerant in compressor • Seized bearings in compressor

Dual 7-Segment LEDs Display Code	Diagnostic Description	Status/Possible Cause – Troubleshooting Information
	05 – Open circuit (Compressor will not Run) • The ICC has received a command for unit operation but no current is present in the start and run circuits • The ICC will attempt to restart the unit every five (5) minutes for four (4) attempts. After that, the ICC will attempt a restart every twenty (20) minutes for up to four (4) hours. • The ICC has had a protector trip for longer than 4 hours.	• Check for damaged, miswired, or wrong run capacitor • Check for broken wires, loose connectors, or miswired compressor • Check compressor windings for continuity • Check for open compressor internal protector • No retries, contactor remains closed (infinite retries)
	06 – Compressor Open Start Circuit The ICC detects current in the Run circuit but not in the Start circuit of the compressor	• Check for damaged, miswired, or wrong run capacitor • Check for broken wires, loose connectors, or miswired compressor • Check compressor windings for continuity
	06 – Compressor Open Start Circuit The ICC detects current in the Run circuit but not in the Start circuit of the compressor five times, 4 retries in one compressor call	• Check for damaged, miswired, or wrong run capacitor • Check for broken wires, loose connectors, or miswired compressor • Check compressor windings for continuity
	07 – Compressor Open Run Circuit The ICC detects current in the Start circuit but not in the Run circuit of the compressor	• Check for damaged, miswired, or wrong run capacitor • Check for broken wires, loose connectors, or miswired compressor • Check compressor windings for continuity
	07 – Compressor Open Run Circuit The ICC detects current in the Start circuit but not in the Run circuit of the compressor four (4) times in one compressor call (4 retries)	• Check for damaged, miswired, or wrong run capacitor • Check for broken wires, loose connectors, or miswired compressor • Check compressor windings for continuity
	09 – Low Secondary Volts The secondary voltage at R and C is below 18VAC	• Control transformer overloaded • Low line voltage
	21 – Low Pressure Control Open The ICC detects the LPC is open. Note: The low pressure control is ignored for the first 90 seconds of compressor operation	• Unit has low refrigerant charge • Indoor coil is frozen (cooling mode) • Dirty indoor coil or filter (cooling mode) • Indoor blower is not running (cooling mode) • Outdoor coil is frozen (heating mode) • Expansion valve is not operating correctly
 **FLASHING**	L21 – **<u>Active Protection</u>** Low Pressure Control Trip LPC has opened 3 times in the same cooling operation, the ICC has locked out the compressor to protect it. ICC alternately flashes L and 21	(see 21 above)
	27 – Low Line Voltage or No Line Voltage Fault	• Check incoming line voltage to the disconnect and unit • Check wiring connections

Dual 7-Segment LEDs Display Code	Diagnostic Description	Status/Possible Cause – Troubleshooting Information
	28 – High Line Voltage Fault	• Check line voltage
	29 – High Pressure Control Open The ICC detects the HPC is open	• Outdoor coil is dirty (cooling mode) • Outdoor fan is not running (cooling mode) • Dirty indoor coil or filter (heating mode) • Indoor blower is not running (heating mode) • Liquid line restriction • Excessive refrigerant charge
 **FLASHING**	L29 – **Active Protection** High Pressure Control Trip LPC has opened 3 times in the same cooling operation, the ICC has locked out the compressor to protect it. ICC alternately flashes L and 29	(see 29 above)
	30 – Fuse Open The ICC detects the on-board fuse is open	• The 3-amp fuse on the ICC is open. • Low voltage wiring at R and C is damaged or miswired.
	80 – Low Air Flow The ICC detects that the indoor unit is not providing the minimum airflow requirements.	• Misapplied/wrong indoor air mover – replace with properly sized unit.
	83 – Condenser Coil Temperature Fault The sensor detects an abnormally low or high coil temperature	• Replace the sensor • Check sensor is installed correctly on control
	84 – Outdoor Ambient Temperature Fault The sensor detects an abnormally low or high outdoor ambient temperature	• Check unit placement – If the outdoor unit is in a high temperature area, wait until the ambient temperature drops and check sensor reading. • Replace the sensor. • Check sensor is installed correctly on control
	93 – Internal Control Fault The control is not functioning properly.	• Check control for proper system operation. • Replace control
	d1 – No Shared Data	• Replace memory card with correct system information.
	d3 – Airflow CFM Mismatch The indoor air mover (air handler/furnace) cannot supply the required airflow for proper system operation	• Misapplied/wrong indoor air mover – replace with properly sized air handler/furnace.
	d4 – (Device) Memory Card Invalid for Device The data in the memory card inserted into the control board does not match the data in the control.	• Check memory card to ensure it matches device • Check if memory card is present
	d8 – Old Shared Data System data is obsolete	• If system will not operate, order new memory card to update system information.

12.8 Conventional 24VAC Thermostat Control Wiring

The (-)ASL series of heat pumps allow the installer to use conventional 24VAC control wiring and a conventional thermostat for proper unit operation.

IMPORTANT: The preferred method of unit installation and operation is by serial communications. Serial communications allow access to the fault history of the system. This diagnostic information is not available when the (-)ASL unit is using a conventional thermostat. Reference section 12.2 *Comfort Control*^{2} Control Wiring.

Thermostat control wiring requires a minimum of four (4) wires for proper unit operation:

R – 24VAC

C – 24VAC common

Y1 – First stage operation

Y2 – Second stage operation

Optional wiring:

L – ICC fault information

If the low voltage control wiring is run in conduit with the power supply, Class I insulation is required. Class II insulation is required if run separate. Low voltage wiring may be run through the insulated bushing provided in the 7/8 hole in the base panel, up to and attached to the pigtails from the bottom of the control box. Conduit can be run to the base panel if desired by removing the insulated bushing.

A thermostat and a 24-volt, 40VA minimum transformer are required for the control circuit of the condensing unit. The furnace or the air handler transformer may be used if sufficient. See the wiring diagram for reference. Use Table 5 to size the 24-volt control wirings.

L Terminal Output

- Flash 1 – Compressor running extremely long run cycle or low pressure
- Flash 2 – High pressure control trip
- Flash 3 – Unit short cycling
- Flash 4 – Locked rotor
- Flash 5 – Compressor will not run, open circuit
- Flash 6 – Open start circuit
- Flash 7 – Open run circuit
- Flash 8 – Control mis-operation
- Flash 9 – Low control voltage

TABLE 5
FIELD WIRE SIZE FOR 24 VOLT THERMOSTAT CIRCUITS

Thermostat Load - Amps	SOLID COPPER WIRE - AWG.					
3.0	16	14	12	10	10	10
2.5	16	14	12	12	10	10
2.0	18	16	14	12	12	10
	50	100	150	200	250	300
	Length of Run - Feet (1)					

(1) Wire length equals twice the run distance.

NOTE: Do not use control wiring smaller than No. 18 AWG between thermostat and outdoor unit.

12.9 Typical Non-Communicating Thermostat Wiring Diagrams

The following figures show the typical wiring diagrams with (-)HPN air handler and (-)ARL condensing unit. Cooling and heat pump airflows may need to be adjusted for homeowner comfort once the system is operational.

WIRE COLOR CODE			
BK – BLACK	G – GREEN	PR – PURPLE	Y – YELLOW
BR – BROWN	GY – GRAY	R – RED	
BL – BLUE	O – ORANGE	W – WHITE	

FIGURE 7
TYPICAL 2-STAGE THERMOSTAT: CONDENSING UNIT WITH ELECTRIC HEAT

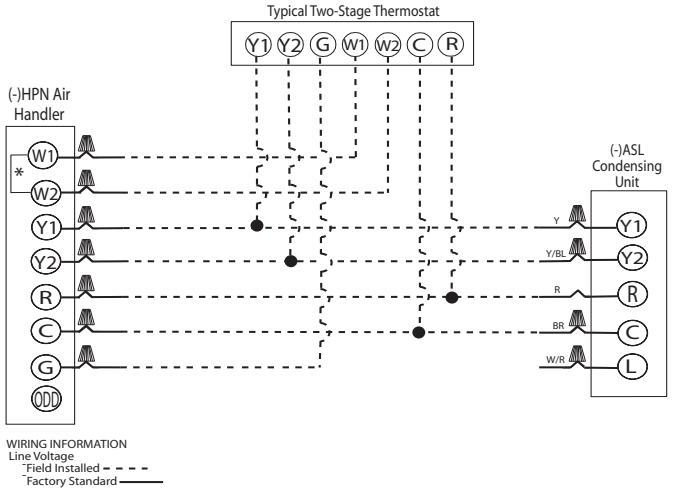
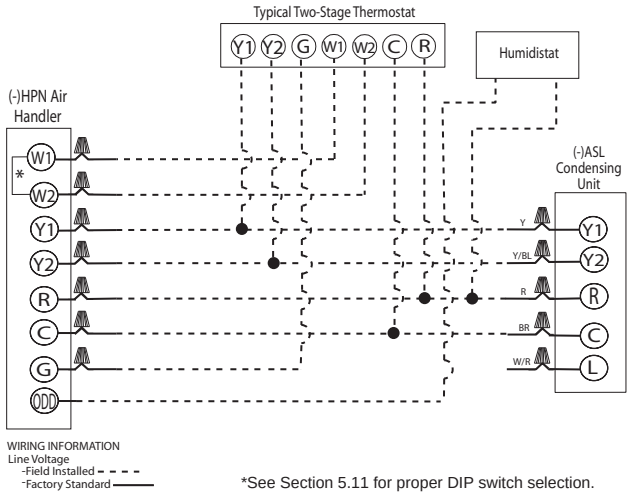


FIGURE 8
TYPICAL TWO-STAGE THERMOSTAT: CONDENSING UNIT WITH ELECTRIC HEAT USING A HUMIDISTAT FOR DEHUMIDIFICATION*.



*See Section 5.11 for proper DIP switch selection.

FIGURE 9
TYPICAL TWO-STAGE THERMOSTAT: CONDENSING UNIT WITH ELECTRIC HEAT USING A TWO-STAGE THERMOSTAT WITH DEHUMIDIFICATION*

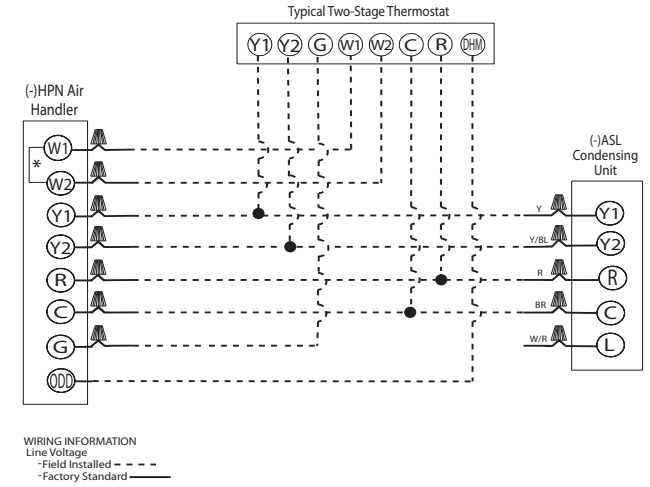
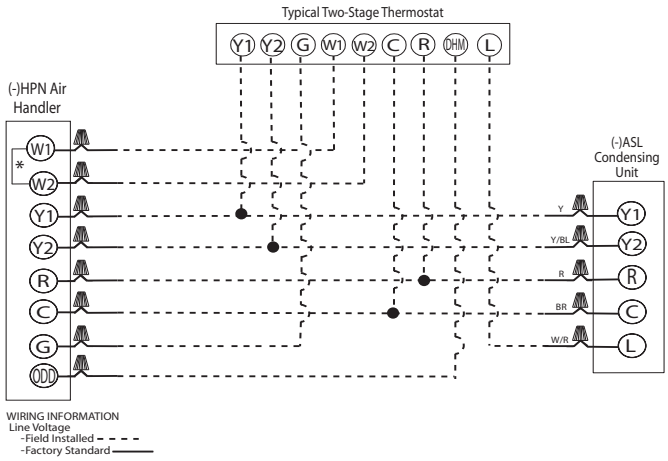


FIGURE 10
CONDENSING UNIT WITH ELECTRIC HEAT USING A TWO-STAGE THERMOSTAT WITH DEHUMIDIFICATION* AND A MALFUNCTION LIGHT



*If maximum outlet temperature rise is desired, it is recommended that W1 and W2 be jumpered together.

12.10 Diagnostic Codes in Dual Drive Condensing Units With Conventional Thermostat Wiring

Each *Comfort Control*^{2} *System*™ Control Board maintains separate fault history for the compressor it controls. Fault codes are accessible by two methods:

1. Using a service tool plugged directly into the compressor *Comfort Control*^{2} board.
2. Reading the codes directory off the dual 7-segment LEDs on the *Comfort Control*^{2} board.

12.11 ICC Control Operation with Conventional Thermostat Wiring

Installation Verification

- 24V AC power on R&C must be present at the ICC for it to operate
- Line voltage must be present at the ICC for the compressor and the outdoor fan to operate
- The ICC displays a “0” for standby mode. Standby mode indicates line voltage and 24VAC are present at the ICC and there is not a call for unit operation from the thermostat.

Zero (0) displayed
The unit is in standby

Call for Compressor Operation (Y1 LED)

- If a call for compressor operation is received by the ICC (first stage/second stage cooling or first stage/second stage heating), the red Y1 LED will illuminate.
- The ICC has an on/off fan delay of one (1) second for each stage of heating or cooling.
- The ICC ignores the lower pressure control for the first 90 seconds of compressor operation.
- On heat pumps, the ICC ignores the LPC during the defrost cycle.
- The dual 7-segment LED displays five (5) operational status codes:

1) First Stage Cooling Operation – When the ICC receives a call for first stage cooling operation, a lower case “c” is displayed on the dual 7-segment LEDs.

Lower case “c” indicates first stage cooling operation

2) Second Stage Cooling Operation – When the ICC receives a call for second stage cooling operation, an upper case “C” is displayed on the dual 7-segment LEDs.

Upper case “C” indicates second stage cooling operation

3-minute Anti-short Cycle Timer

- The ICC has a built in 3-minute time delay between compressor operations to protect the compressor against short cycling. The dual 7-segment LEDs will flash “c” or “C” while the short cycle timer is active and a call for unit operation is received.

Flashing lower case c
A call for first stage cooling has been received

Flashing upper case C
A call for second stage cooling has be received

- The 3-minute time delay can be bypassed when a call for compressor operation is present by pressing the TEST button for 1 second and releasing. The compressor will begin operation and the dual 7-segment will stop flashing.

30 Second Minimum Run Timer

- The ICC has a built in 30 second minimum unit run time. If a call for compressor operation is received by the ICC and the call is removed, the compressor will continue to operate for 30 seconds. The dual 7-segment LEDs will flash “c” or “C” while the minimum run timer is active.

1 Second Compressor/Fan Delay

- The ICC starts/stops the outdoor fan one (1) second after the start/stop of the compressor upon a call for compressor operation to minimize current inrush and/or voltage drop.

12.12 Active Compressor Protection Mode

- The ICC actively protects the compressor from harmful operation during a fault condition.
- When the ICC detects a condition that could damage the compressor, the ICC will enter active protection mode and lockout compressor operation
- The condition causing active protection must be resolved then the ICC can be reset to restart the system.
- There are five (5) active protection modes:

1) Low Pressure Control Lockout

- The ICC will display a flashing “L” followed by a flashing 21 when a low pressure control lockout occurs.
- The ICC addresses low pressure control faults differently depending on the mode of unit operation (cooling or heating mode).

Active Protection – Code L21 – Open low pressure control

Cooling Mode

- If the LPC opens three (3) times during the same call for cooling operation, the ICC will lockout the compressor to keep it from continuing to operate and flash a L” on the dual 7-segment LEDs followed by a “21”.

IMPORTANT: This mode of active protection must be manually reset.

2) High Pressure Control Lockout

- If the HPC opens three (3) times during the same call for unit operation, the ICC will lockout the compressor to keep it from continuing to operate and flash a L" on the dual 7-segment LEDs followed by a "29".

Active Protection – Code L29 – Open high pressure control

IMPORTANT: This mode of active protection must be manually reset.

3) Locked Rotor

- The ICC will display a flashing "L" followed by a flashing "04" when a locked rotor condition occurs.

Active Protection – Code L4 – Locked rotor

If the ICC detects the compressor has run less than 15 seconds before the protector tripped four (4) consecutive starts during the same call for unit operation, the ICC will lockout the compressor to keep it from continuing to operate and flash a "L" on the dual 7-segment LEDs followed by a "04".

IMPORTANT: This mode of active protection must be manually reset.

4) Open Start Circuit Lockout

- The ICC will display a flashing "L" followed by a flashing "06" when an open start circuit condition occurs.

Active Protection – Code L6 – Compressor open start circuit

If the ICC lockouts L6 and L6 detect current in the run circuit without current present in the start circuit, the ICC will lockout the compressor to keep it from continuing to operate and flash a "L" on the dual 7-segment LEDs followed by a "06".

IMPORTANT: This mode of active protection must be manually reset.

5) Open Run Circuit Lockout

- The ICC will display a flashing "L" followed by a flashing "07" when an open start circuit condition occurs.

Active Protection – Code L7 – Compressor open run circuit

If the ICC detects current in the start circuit without current present in the run circuit, , the ICC will lockout the compressor to keep it from continuing to operate and flash a “L” on the dual 7-segment LEDs followed by a “07”.

IMPORTANT: This mode of active protection must be manually reset.

Exiting Active Compressor Protection Lockout

Three are three methods to reset the ICC after an active protection lockout:

1) Cycle the line voltage to the unit
2) Cycle 24VAC to the ICC (remove the R or C connection to the ICC)
3) Push the TEST button down for one (1) second and release

Note: The ICC will attempt to start the unit when the TEST button is pressed and released

Note: The preferred method of resetting the ICC is to push the TEST button down for one (1) second.

12.13 Test and Fault Recall Modes

Test Mode (Test Button on the ICC)

- Enter TEST mode by pressing the TEST button with an insulated probe for one (1) second and release.
- The TEST mode causes the ICC to do the following
  1) Resets the ICC from any active protection lockout mode
  2) Resets the 3-minute anti-short cycle timer
  3) Energizes the unit without a call for unit operation
- If the 3-minute anti-short cycle timer or 30 second minimum run timer is active (a flashing “c” or “C” is displayed on the dual 7-segment LEDs) and a call for unit operation is present, TEST mode causes:
  1) A “t” to display momentarily on the dual 7-segment display

Lower case “t”

  2) The compressor will start
  3) The display will change to a steady “c” or “C” to show the current call for unit operation.

  Note: If a call for unit operation is present at the end of TEST mode will cause the unit to continue to operate.
- If no call for unit operation is present, TEST mode causes
  1) A steady “t” appears on the dual 7-segment LEDs
  2) The compressor will start
  3) The compressor will turn off after 5-seconds.

  Note: Entering TEST mode without a call for unit operation will cause the compressor to run 5-seconds.

Fault Recall Mode (TEST and SW2 Buttons)

- Enter **FAULT RECALL** mode by pressing the **TEST** and **SW2** buttons at the same time with insulated probes for one (1) second and release.
- When entering and exiting FAULT RECALL mode the top and bottom segments of the dual 7-segment LEDs will illuminate.

Fault Recall Mode – the top and bottom segments on the right-hand are illuminated

- When entering **FAULT RECALL** mode, the ICC will automatically scroll through stored faults on the dual 7-segment LEDs.
- Each fault is displayed one time with the top right-hand segment of the dual 7-segment display activated between faults.
- Each fault is displayed with the most recent fault displayed first.
- A maximum of six individual faults can be stored
- A maximum of three consecutive identical faults are stored.
- A “0” will be displayed with no faults are stored
- The ICC will automatically exit the **FAULT RECALL** mode after displaying stored faults

IMPORTANT: The ICC stores the previous two weeks of history faults. The complete stored fault history cannot be displayed using a conventional thermostat.

Clear Fault History (TEST and SW2 Buttons)

- Clear FAULT HISTORY by pressing both TEST and SW2 button for five (5) seconds with insulated probes and release.
- The top and bottom segments of the dual 7-segment LEDs flash to indicate the history has been cleared.

Fault history is cleared with the top and bottom LED segments flash

13.0 ELECTRICAL WIRING

Field wiring must comply with the National Electric Code (C.E.C. in Canada) and any applicable local code.

13.1 Power Wiring

It is important that proper electrical power from a commercial utility is available at the condensing unit contactor. Voltage ranges for operation are shown in Table 6.

Install a branch circuit disconnect within sight of the unit and of adequate size to handle the starting current (see Table 1).

Power wiring must be run in a rain-tight conduit. Conduit must be run through the connector panel below the access cover (see Figure 1) and attached to the bottom of the control box.

Connect power wiring to line voltage lug located in outdoor condensing unit electrical box. (See wiring diagram attached to unit access panel.)

Check all electrical connections, including factory wiring within the unit and make sure all connections are tight.

DO NOT connect aluminum field wire to the contactor terminals.

TABLE 6
VOLTAGE RANGES (60 HZ)

Model Number	Nameplate Voltage	Operating Voltage Range (VAC)
024/025/036/ 037/039/048/060	208/230 (1 Phase)	187 - 253

13.2 Grounding

A grounding lug is provided near the contactor for a ground wire.

⚠ WARNING

THE UNIT MUST BE PERMANENTLY GROUNDED. FAILURE TO DO SO CAN CAUSE ELECTRICAL SHOCK RESULTING IN SEVERE PERSONAL INJURY OR DEATH.

13.3 Control Wiring

If the low voltage control wiring is run in conduit with the power supply, Class I insulation is required. Class II insulation is required if run separate. Low voltage wiring may be run through the insulated bushing provided in the 7/8 hole in the base panel, up to and attached to the pigtails from the bottom of the control box. Conduit can be run to the base panel if desired by removing the insulated bushing.

A thermostat and a 24 volt, 40 VA minimum transformer are required for the control circuit of the condensing unit. The furnace or the air handler transformer may be used if sufficient. See the wiring diagram for reference. Use Table 5 to size the 24 volt control wiring.

Verify the connectors on data lines 1 & 2 are plugged together. The connectors are located on the inside of the control box in front of the ground lug.

14.0 START-UP – CHECKING AIRFLOW

The air distribution system has the greatest effect on airflow. The duct system is totally controlled by the contractor. For this reason, the contractor should use only industry-recognized procedures. The correct air quantity is critical to air conditioning systems. Proper operation, efficiency, compressor life, and humidity control depend on the correct balance between indoor load and outdoor unit capacity. Excessive indoor airflow increases the possibility of high humidity problems. Low indoor airflow reduces total capacity and causes coil icing. Serious harm can be done to the compressor by low airflow, such as that caused by refrigerant flooding. Each ton of cooling requires between 375 and 450 cubic feet of air per minute (CFM). See the manufacturer's spec sheet for rated airflow for the system being installed. Duct design and construction should be carefully done. System performance can be lowered dramatically through bad planning or workmanship. Air supply diffusers must be selected and located carefully. They must be sized and positioned to deliver treated air along the perimeter of the space. If they are too small for their intended airflow, they become noisy. If they are not located properly, they cause drafts. Return air grilles must be properly sized to carry air back to the blower. If they are too small, they also cause noise. The installers should balance the air distribution system to ensure proper quiet airflow to all rooms in the home. This ensures a comfortable living space.

These simple mathematical formulas can be used to determine the CFM in a residential or light commercial system. Electric resistance heaters can use:

$$CFM = \frac{volts \times amps \times 3.413}{SHC \times temp\ rise}$$

Gas furnaces can use:

$$CFM = \frac{Output\ Capacity\ in\ BTUH^*}{SHC\ x\ temp\ rise}$$

*Refer to furnace data plate for furnace output capacity. SHC = Sensible Heat Constant (see table below), an air velocity meter or airflow hood can give a more accurate reading of the system CFM. The measurement for temperature rise should be performed at the indoor coil inlet and near the outlet, but out of direct line of sight of the heater element or heat exchanger. For best results, measure air temperature at multiple points and average the measurements to obtain coil inlet and outlet temperatures.

Altitude (feet)	SENSIBLE HEAT CONSTANT (SHC)	ALTITUDE (FEET)	SENSIBLE HEAT CONSTANT (SHC)
Sea Level	1.08	6000	0.87
500	1.07	7000	0.84
1000	1.05	8000	0.81
2000	1.01	9000	0.78
3000	0.97	10000	0.75
4000	0.94	15000	0.61
5000	0.90	20000	0.50

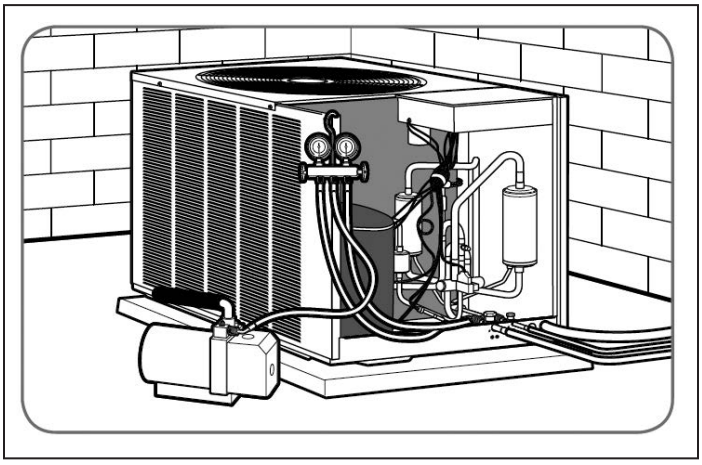
15.0 EVACUATION AND LEAK TESTING

15.1 EVACUATION PROCEDURE

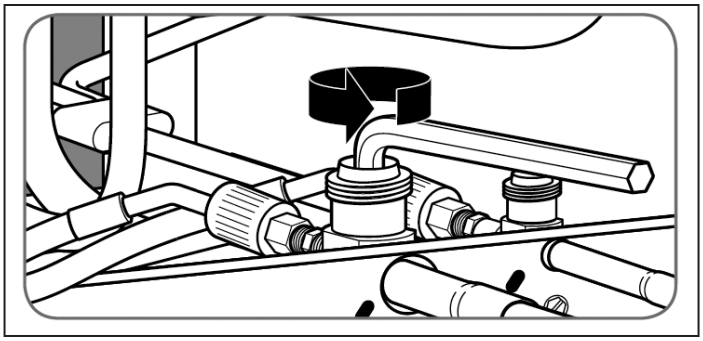
Evacuation is the most important part of the entire service procedure. The life and efficiency of the equipment is dependent upon the thoroughness exercised by the serviceman when evacuating air and moisture from the system.

Air or nitrogen in the system causes high condensing temperatures and pressure, resulting in increased power input and non-verifiable performance.

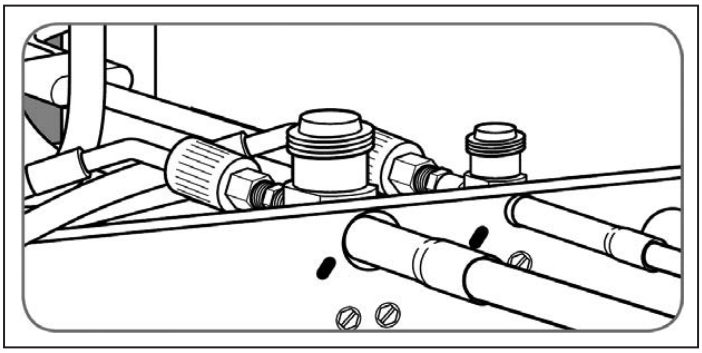
Moisture chemically reacts with the refrigerant and oil to form corrosive hydrofluoric acid. This attacks motor windings and parts, causing breakdown.



- After the system has been leak-checked and proven sealed, connect the vacuum pump and evacuate system to 500 microns and hold 500 microns or less for at least 15 minutes. The vacuum pump must be connected to both the high and low sides of the system by connecting to the two pressure ports. Use the largest size connections available since restrictive service connections may lead to false readings because of pressure drop through the fittings.



- After adequate evacuation, open both service valves by removing both brass service valve caps with an adjustable wrench. Insert a 3/16” [5 mm] or 5/16” [8 mm] hex wrench into the stem and turn counterclockwise until the wrench stops.



- At this time gauges must be connected to the access fitting on the liquid line (small) service valve and the common suction port connected to the common suction line between the reversing valve and compressor to check and adjust charge.

IMPORTANT: Compressors (especially scroll type) should never be used to evacuate the air conditioning system because internal electrical arcing may result in a damaged or failed compressor. Never run a scroll compressor while the system is in a vacuum or compressor failure will occur.

15.2 FINAL LEAK TESTING

After the unit has been properly evacuated and service valves opened, a halogen leak detector should be used to detect leaks in the system. If a leak is detected, the refrigerant should be recovered before repairing the leak. The Clean Air Act prohibits releasing refrigerant into the atmosphere.

16.0 CHECKING REFRIGERANT CHARGE

Charge for all systems should be checked against the Charging Chart inside the access panel cover.

⚠ WARNING

The top of the scroll compressor shell is hot. Touching the compressor top may result in serious personal injury.

IMPORTANT: Use factory-approved charging method as outlined on the next 4 pages to ensure proper system charge.

⚠ NOTICE

The optimum refrigerant charge for any outdoor unit matched with a CFL/CFM/H*L indoor coil/air handler is affected by the application. Therefore, charging data has been developed to assist the field technician in optimizing the charge for all mounting configurations (UF – Upflow, DF – downflow, LH – Left Hand Discharge, and RH – Right Hand Discharge). Refer to the charging chart inside the access panel cover on the unit and choose the appropriate column for the specific application being installed or serviced. New installations utilizing either a CFL/CFM indoor coil installed on a gas furnace or an H*L air handler in the downflow or horizontal right hand discharge may require removal of refrigerant since the factory charge could result in an overcharge condition.

16.1 CHARGING UNITS WITH R-410A REFRIGERANT

⚠ CAUTION

R-410A pressures are approximately 60% higher (1.6 times) than R-22 pressures. Use appropriate care when using this refrigerant. Failure to exercise care may result in equipment damage or personal injury.

Charge for all systems should be checked against the Charging Chart inside the access panel cover.

IMPORTANT: Do not operate the compressor without charge in the system.

Addition of R-410A will raise high-side pressures (liquid, and discharge).

⚠ NOTICE

System maintenance is to be performed by a qualified and certified technician.

The following method is used for charging systems in the cooling and heating mode. All steps listed should be performed to insure proper charge has been set. For measuring pressures, the service valve port on the liquid valve (small valve) and the service port on the suction line between the reversing valve and compressor are to be used.

CONFIRM ID AIR FLOW & COILS ARE CLEAN

Confirm adequate Indoor supply air flow prior to starting the system. See the Technical Specification sheet for rated air flow for each ID/OD unit match. Air filter(s) and coils (indoor & outdoor) are to be clean and free of frost prior to starting the system. Supply Air flow must be between 375 and 450 cfm per rated cooling ton prior to adjusting system charge. If a humidification system is installed disengage it from operating prior to charge adjustment. Refer to the “Checking Airflow” section of this manual for further instruction.

⚠ NOTICE

Verify system components are matched according to the outdoor unit Specification Sheet.

16.2 MEASUREMENT DEVICE SETUP

Step 1. With an R410A gauge set, attach the high pressure hose to the access fitting on the liquid line (small) service valve at the OD unit.

Step 2. Attach the low pressure hose to the common suction port connected to the common suction line between the reversing valve and compressor.

Step 3. Attach a temperature probe within 6” outside of the unit on the copper liquid line (small line). For more accurate measurements clean the copper line prior to measurement and use a calibrated clamp on temperature probe or an insulated surface thermocouple.

16.3 CHARGING BY WEIGHT

⚠ NOTICE

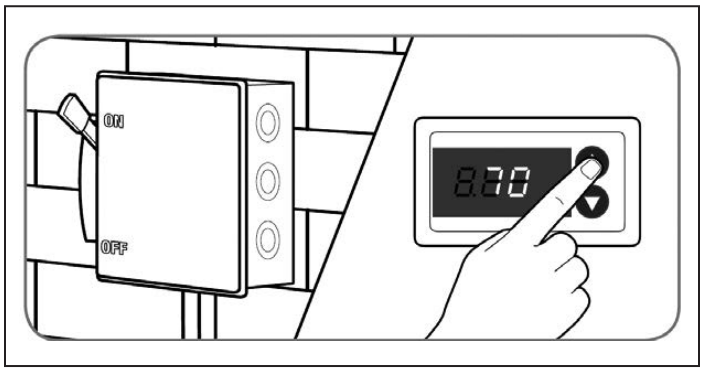
ADJUST THE SYSTEM CHARGE BY WEIGHT FOR THE STRAIGHT LENGTH OF THE REFRIGERANT LINE SET.

For a new installation, evacuation of interconnecting tubing and indoor coil is adequate; otherwise, evacuate the entire system. Use the factory charge shown in *"Electrical and Physical Data"* on page 6 of these instructions or on the unit data plate. Note that the charge value includes charge required for 15 ft. [4.6 m] of standard-size inter-connecting liquid line without a filter drier. Calculate actual charge required with installed liquid line size and length using:

1/4" [6.4 mm] O.D. = .3 oz./ft. [8.5 g/.30 m]
5/16" [7.9 mm] O.D. = .4 oz./ft. [11.3 g/.30 m]
3/8" [9.5 mm] O.D. = .6 oz./ft. [17.0 g/.30 m]
1/2" [12.7 mm] O.D. = 1.2 oz./ft. [34.0 g/.30 m]
Add 6 oz. for field-installed filter drier.

With an accurate scale (+/– 1 oz. [28.3 g]) or volumetric charging device, adjust charge difference between that shown on the unit data plate and that calculated for the new system installation. If the entire system has been evacuated, add the total calculated charge.

IMPORTANT: Charging by weight is not always accurate since the application can affect the optimum refrigerant charge. Charging by weight is considered a starting point ONLY. Always check the charge by using the charging chart and adjust as necessary. CHARGING BY LIQUID SUB-COOLING MUST BE USED FOR FINAL CHARGE ADJUSTMENT.



With thermostat in the "Off" position, turn the power on to the furnace or air handler and the heat pump. Start the heat pump and the furnace or air handler with the thermostat. Verify that the outdoor unit is operating in **second stage** and the indoor air mover is delivering the **second-stage** airflow for the system size.

16.4 GROSS CHARGING BY PRESSURES

Step 1. Following air flow verification and charge weigh in, run the unit for a minimum of 15 minutes prior to noting pressures and temperature.

IMPORTANT: Indoor conditions as measured at the indoor coil must be within 2°F of the following during gross charge (pressure) evaluation:

Cooling Mode: 80°F Dry Bulb

⚠ NOTICE

If the Indoor temperature is above or below this range, run the system to bring the temperature down or run the electric heat/furnace to bring the temperature within this range. System pressure values provided in the Charge Chart for outdoor dry bulbs corresponding to conditions outside of ranges listed below, are provided as reference ONLY.

Step 2. Note the Outdoor Dry Bulb Temperature, ODDB°F = _____°F. Unit charging is recommended under the following outdoor conditions ONLY:

Cooling Mode ONLY: 55°F outdoor dry bulb and above

Step 3. Locate and note the design pressures. The correct liquid and vapor pressures are found at the intersection of the Installed system and the outdoor ambient temperature on the Charging Chart located on the inside of the control box cover of the outdoor unit.

Liquid Pressure: = _____psig; Vapor Pressure = _____psig

⚠ NOTICE

The refrigerant pressures provided are for gross charge check ONLY. These pressure values are typical, but may vary due to application. Evaporator (indoor coil in cooling mode) load will cause pressures to deviate. Notice that all systems have unique pressure curves. The variation in the slope and value is determined by the component selection for that indoor/outdoor matched system. The variation from system to system seen in the table is normal. The values listed are for the applicable indoor coil match ONLY!

Step 4. If the measured liquid pressure is below the listed requirement for the given outdoor and indoor conditions, add charge. If the measured liquid pressure is above the listed requirement for the given Outdoor and Indoor conditions remove charge.

16.5 FINAL CHARGE BY SUB-COOLING

Step 1. After gross charging note the designed Sub-Cool value. The correct sub-cooling value is found at the intersection of the Installed system and the outdoor ambient temperature on the Charging Chart located on the inside of the control box cover of the outdoor unit.

SC° from Charging Chart = _____°F.

IMPORTANT: Indoor conditions as measured at the indoor coil are required to be between 70°F and 80°F dry bulb for fine tune unit charge adjustment. Unit charging is recommended under the following outdoor conditions ONLY:

Cooling Mode ONLY: 55°F outdoor dry bulb and above

⚠ NOTICE

If the Indoor temperature is above or below the recommended range, run the system to bring the temperature down or run the electric heat/furnace to bring the temperature up. System sub-cooling values provided in the Charge Chart for outdoor dry bulbs corresponding to conditions outside of the above range, are provided as reference ONLY.

Step 2. Note the measured Liquid Pressure, Pliq = _____psig, as measured from the liquid (small) service valve. Use the pressure temperature chart below to note the corresponding saturation temperature for R410A at the measured liquid pressure.

Liquid Saturation Temperature, SAT°F= _____°F.

Step 3. Note the liquid line temperature, Liq° = _____°F, as measured from a temperature probe located within 6” outside of the unit on the copper liquid line (small line). It is recommended to use a calibrated clamp on temperature probe or an insulated surface thermocouple.

Step 4. Subtract the liquid line temperature (Step 3) from the saturation temperature (Step 2) to calculate Sub-Cooling. SAT°F_____ - Liq°_____ = SC°_____

TABLE 7

SATURATION TEMP (Deg. F)	R-410A PSIG	SATURATION TEMP (Deg. F)	R-410A PSIG	SATURATION TEMP (Deg. F)	R-410A PSIG	SATURATION TEMP (Deg. F)	R-410A PSIG
-150	-	-30	17.9	35	107.5	100	317.4
-140	-	-25	22	40	118.5	105	340.6
-130	-	-20	26.4	45	130.2	110	365.1
-120	-	-15	31.3	50	142.7	115	390.9
-110	-	-10	36.5	55	156.0	120	418.0
-100	-	-5	42.2	60	170.1	125	446.5
-90	-	0	48.4	65	185.1	130	476.5
-80	-	5	55.1	70	201.0	135	508.0
-70	-	10	62.4	75	217.8	140	541.2
-60	0.4	15	70.2	80	235.6	145	576.0
-50	5.1	20	78.5	85	254.5	150	612.8
-40	10.9	25	87.5	90	274.3		
-35	14.2	30	97.2	95	295.3		

Step 5. Adjust Charge to obtain the specified sub-cooling value. If the measured sub-cool is below the listed requirement for the given outdoor and indoor conditions, add charge. If the measured sub-cool is above the listed requirement for the given outdoor and indoor conditions remove charge.

⚠ NOTICE

Systems should not be fine tune charged below 40°F outdoor dry bulb.

IMPORTANT: Excessive use of elbows in the refrigerant line set can produce excessive pressure drop. Follow industry best practices for installation. Installation and commissioning of this equipment is to be preformed by trained and qualified HVAC professionals. For technical assistance contact your Distributor Service Coordinator.

16.6 FINISHING UP INSTALLATION

- Disconnect pressure gauges from pressure ports; then replace the pressure port caps and tighten adequately to seal caps. **Do not over tighten.**
- Replace the service valve caps finger-tight and then tighten with an open-end wrench adequately to seal caps. **Do not over tighten.**
- Replace control box cover and service panel and install screws to secure service panel.
- Restore power to unit at disconnect if required.
- Configure indoor thermostat per the thermostat installation instructions and set thermostat to desired mode and temperature.

17.0 ACCESSORIES

17.1 Remote Outdoor Temperature Kit (Part No. 47-102709-03)

This is a kit that has a longer remote sensor that can be installed away from the outdoor unit for better thermostat temperature display.

17.2 RXME-A02 Communicating 2 Wire Kit

This kit will allow the outdoor unit to communicate to the system with only 2 wires.

18.0 TROUBLESHOOTING

IMPORTANT: The JEC series units with the ICC (Integrated Compressor Control) provide status and diagnostic information that greatly enhances the ability to quickly diagnose system faults. Use the following troubleshooting guides as another tool in system diagnostics.

NOTE: In diagnosing common faults in the cooling system, develop a logical thought pattern as used by experienced technicians. The charts which follow are not intended to be an answer to all problems but only to guide the technician's troubleshooting. Through a series of yes and no answers, follow the logical path to a likely conclusion.

A novice technician should use these charts like a road map. Remember that the chart should clarify a logical path to the solution.

18.1 *Comfort Control² System™* System Initial Startup

Connect the system.

There are four wires that need to be connected to each unit.

R 24 VAC
C 24 VAC common
1 Communications
2 Communications

Thermostat		Air Handler Furnace Indoor		Air Conditioner Heat Pump Outdoor
R	– – – – – – – – – – – – – – – – – –	R	– – – – – – – – – – – – –	R
1	– – – – – – – – – – – – – – – – – –	1	– – – – – – – – – – – – –	1
2	– – – – – – – – – – – – – – – – – –	2	– – – – – – – – – – – – –	2
C	– – – – – – – – – – – – – – – – – –	C	– – – – – – – – – – – – –	C

These wires need to be connected to each device thermostat, indoor air handler and outdoor unit (heat pump or AC). Verify the connectors on data lines 1 & 2 are plugged together. The connectors are located on the inside of the control box in front of ground lug.

If the communications wires (1 & 2) are crossed at any point the green LED (D52) will always be on. If this happens check the wires at each point to ensure they are not reversed.

Once all devices are connected, turn on the line and low voltage to the system. When all devices are powered the thermostat should detect the indoor and outdoor units within 60 seconds. The air handler and the primary control in the outdoor units have a set of bias dipswitches set at a factory default to the ON position. The secondary control dipswitches are defaulted off. DO NOT CHANGE DIP SWITCHES.

Once the system is powered the airflow settings will be configured for all devices. The outdoor unit will send information to configure indoor airflow. If the indoor unit is incapable of supplying the required airflow a d3 fault will be displayed on the thermostat and outdoor unit.

All devices have a LEARN button. This button is for future use and has no function at this time.

IMPORTANT: DO NOT USE A PHONE CORD TO CONNECT INDOOR AND OUTDOOR UNITS. THIS WILL DAMAGE THE CONTROLS.

IMPORTANT: DO NOT CONNECT THE SYSTEM TO A PHONE LINE. THIS WILL DAMAGE THE CONTROLS.

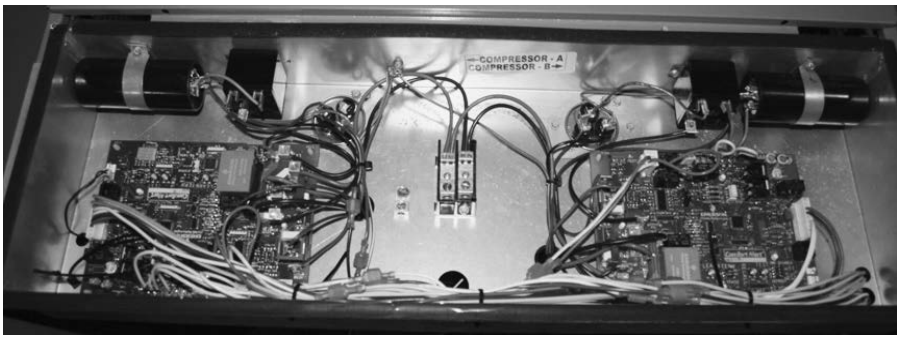
ADVANCED SETTINGS

All adjustments for airflow are made at the thermostat at this time. Items that can be changed are Airflow trim adjustment, Dehumidification Setpoint and mode of operation. The thermostat also has a wide range of fault and history information. The following tables show all of the available options by unit type. To go down into a menu, press Install Config. To move back up, press the Menu button. See the Thermostat Installation Instructions for additional information.

18.2 REPLACEMENT OF *COMFORT CONTROL² SYSTEM™* CONTROL BOARD

Each control board in the *Comfort Control² System™* needs information specific to the unit the control is installed in. This information is called shared data because it is distributed (shared) on the HVAC network. The shared data for a unit contains information that allows the unit to operate correctly.

FIGURE 11



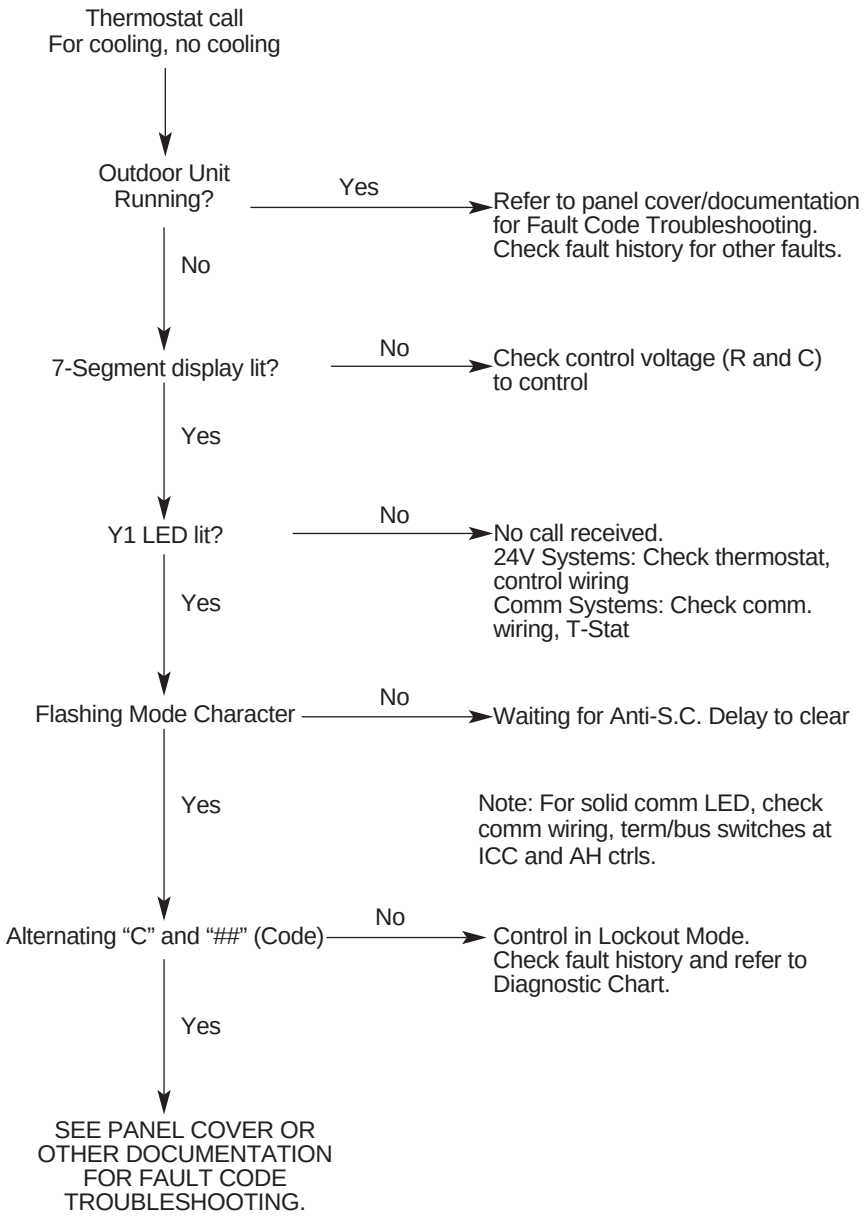
When a control board requires replacement, it is important that the replacement board gets the shared data from the old control. The primary way the replacement control gets this information is by the memory card that should be installed on the old control. Remove the memory card from the old control, but leave it attached to the unit by the plastic tether, replace the control and reinstall the memory card on the new control. If for some reason, the memory card has been damaged or is missing, the shared data from the network (air handler) will be used by the control. The network shared data is considered a back up for a lost or missing memory card. Never remove the memory card from the unit or cut the tether of the memory card as it is the most effective way to transfer the shared data. If the memory card is damaged or missing a new memory card can be ordered from Pro Stock. The unit will operate without the memory card, but a D4 error will be displayed on the seven segment displays.

The memory card from a different unit should never be used.

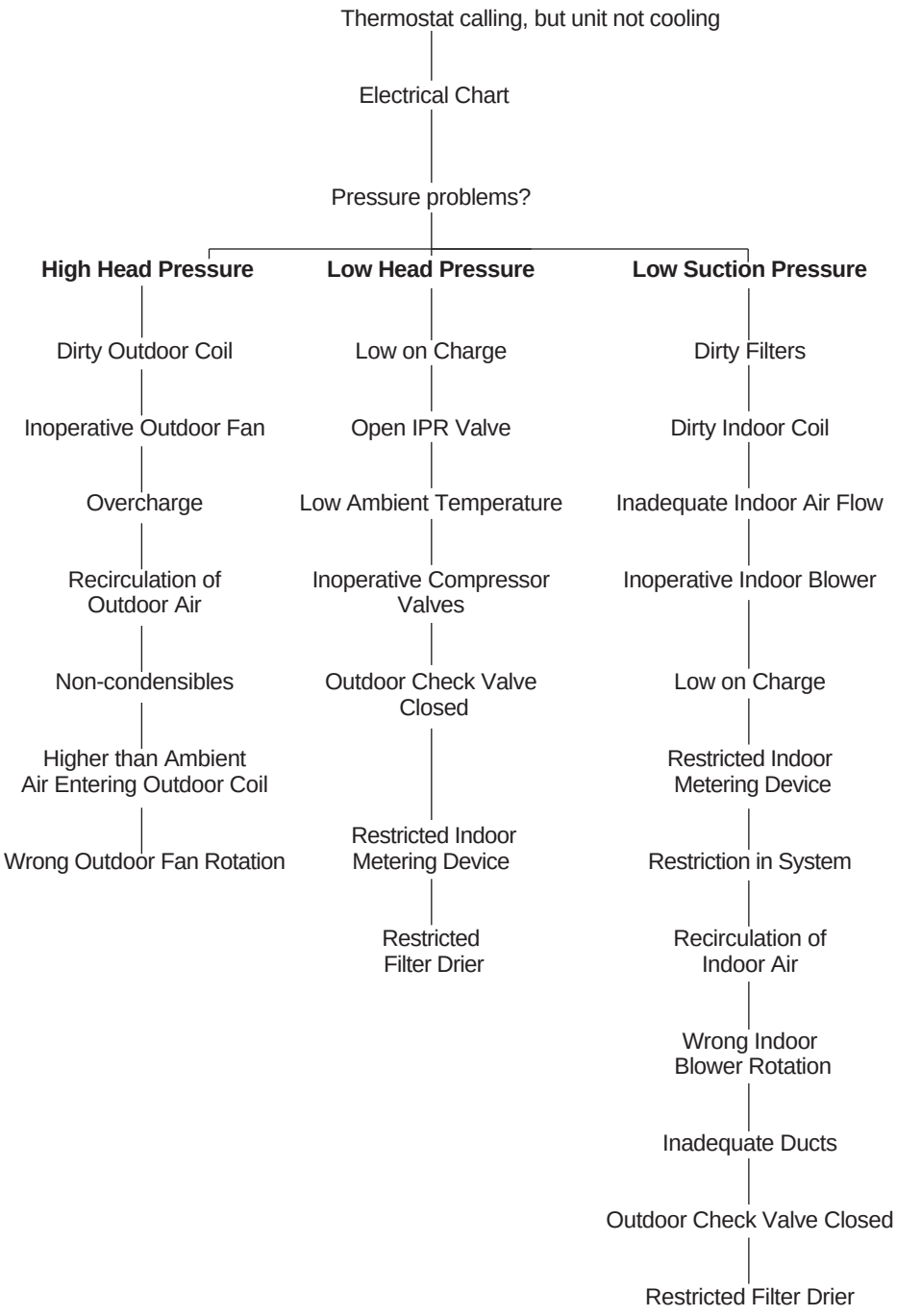
The memory cards on the primary and secondary controls of a fully communicating tandem system are different and not interchangeable.

The dipswitches (SW5) should be turned off if the secondary (Compressor B) is replaced. If the primary control (Compressor A) is replaced, the SW5 switches should be in the on position.

18.3 Electrical Checks Flow Chart



18.4 Cooling Mechanical Checks Flow Chart



18.5 General Trouble Shooting Chart

⚠ WARNING

DISCONNECT ALL POWER TO UNIT BEFORE SERVICING. CONTACTOR MAY BREAK ONLY ONE SIDE. FAILURE TO SHUT OFF POWER CAN CAUSE ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

SYMPTOM	POSSIBLE CAUSE	REMEDY
Unit will not run	• Power off or loose electrical connection • Thermostat out of calibration-set too high • Defective contactor • Blown fuses / tripped breaker • Transformer defective • High pressure control open (if provided)	• Check for correct voltage at contactor in condensing unit • Reset • Check for 24 volts at contactor coil - replace if contacts are open • Replace fuses / reset breaker • Check wiring-replace transformer • Reset-also see high head pressure remedy-The high pressure control opens at 450 PSIG
Outdoor fan runs, compressor doesn't	• Run or start capacitor defective • Start relay defective • Loose connection • Compressor stuck, grounded or open motor winding, open internal overload. • Low voltage condition	• Replace • Replace • Check for correct voltage at compressor - check & tighten all connections • Wait at least 2 hours for overload to reset. If still open, replace the compressor. • Add start kit components
Insufficient cooling	• Improperly sized unit • Improper indoor airflow • Incorrect refrigerant charge • Air, non-condensibles or moisture in system	• Recalculate load • Check - should be approximately 400 CFM per ton. • Charge per procedure attached to unit service panel • Recover refrigerant, evacuate & recharge, add filter drier
Compressor short cycles	• Incorrect voltage • Defective overload protector • Refrigerant undercharge	• At compressor terminals, voltage must be ± 10% of nameplate marking when unit is operating. • Replace - check for correct voltage • Add refrigerant
Registers sweat	• Low indoor airflow	• Increase speed of blower or reduce restriction - replace air filter
High head-low vapor pressures	• Restriction in liquid line, expansion device or filter drier • Flowcheck piston size too small • Incorrect capillary tubes	• Remove or replace defective component • Change to correct size piston • Change coil assembly
High head-high or normal vapor pressure - Cooling mode	• Dirty outdoor coil • Refrigerant overcharge • Outdoor fan not running • Air or non-condensibles in system	• Clean coil • Correct system charge • Repair or replace • Recover refrigerant, evacuate & recharge
Low head-high vapor pressures	• Flowcheck piston size too large • Defective Compressor valves • Incorrect capillary tubes	• Change to correct size piston • Replace compressor • Replace coil assembly
Low vapor - cool compressor - iced indoor coil	• Low indoor airflow • Operating below 65°F outdoors • Moisture in system	• Increase speed of blower or reduce restriction - replace air filter • Add Low Ambient Kit • Recover refrigerant - evacuate & recharge - add filter drier
High vapor pressure	• Excessive load • Defective compressor	• Recheck load calculation • Replace
Fluctuating head & vapor pressures	• TXV hunting • Air or non-condensibles in system	• Check TXV bulb clamp - check air distribution on coil - replace TXV • Recover refrigerant, evacuate & recharge
Gurgle or pulsing noise at expansion device or liquid line	• Air or non-condensibles in system	• Recover refrigerant, evacuate & recharge
Unit will not run	• Miswiring of communications (communication light on continuously)	• Check communication wiring

18.6 Service Analyzer Charts

COMPRESSOR OVERHEATING		
SYMPTOMS	**POSSIBLE CAUSE**	**CHECK/REMEDIES**
High superheat	Low charge	Check system charge
	Faulty metering device	Restricted cap tube, TEV (TXV)
		Power element superheat adjustment
		Foreign matter stopping flow
	High internal load	Hot air (attic) entering return
		Heat source on; mis-wired or faulty control
	Restriction in liquid line	Drier plugged
		Line kinked
	Low head pressure	Low charge
		Operating in low ambient temperatures
	Suction or liquid line subjected to high heat source	Hot attic
		Hot water line
Low voltage	Loose wire connections	Check wiring
	Power company problem, transformer	Have problem corrected before diagnosis continues
	Undersized wire feeding unit	Correct and complete diagnosis
High voltage	Power company problem	Have problem corrected
High head pressure	Overcharge	Check system charge
	Dirty heat pump coil	Clean coil
	Faulty or wrong size heat pump fan motor	Replace fan motor
	Faulty fan blade or wrong rotation	Replace fan blade
		Replace with correct rotation motor
	Recirculation of air	Correct installation
	Additional Heat Source	Check for dryer vent near unit
		Check for recirculation from other equipment
	Non-condensibles	Recover refrigerant, Evacuate and recharge system
	Equipment not matched	Correct mis-match
Short cycling of compressor	Faulty pressure control	Replace pressure control
	Loose wiring	Check unit wiring
	Thermostat	Located in supply air stream
		Differential setting too close
		Customer misuse
	TEV	Internal foreign matter
		Power element failure
		Valve too small
		Distributor tube/tubes restricted
	Capillary tube	Restricted with foreign matter
		Kinked
		I.D. reduced from previous compressor failure

SYMPTOMS	POSSIBLE CAUSE	CHECK OR REMEDIES
Short cycling of compressor (cont.)	Low charge	Check system charge
	Low evaporator air flow	Dirty coil
		Dirty filter
		Duct too small or restricted
	Faulty run capacitor	Replace
	Faulty internal overload	Replace compressor
Faulty Compressor Valves	Fast equalization/ Low pressure difference	Replace compressor and examine system to locate reason
ELECTRICAL		
SYMPTOMS	**POSSIBLE CAUSE**	**CHECK OR REMEDIES**
Voltage present on load side of compressor contactor and compressor won't run	Compressor start components	Check start capacitor
		Check potential relay
	Run capacitor	Check with ohmmeter
	Internal overload	Allow time to reset
	Compressor windings	Check for correct ohms
Voltage present on line side of pressor contactor only	Thermostat	Check for control voltage to com-contactor coil
	Compressor control circuit	High pressure switch
		Low pressure switch
		Ambient thermostat
		Solid state protection control or internal thermal sensors
		Compressor timed off/on control or interlock
No voltage on line side of compressor contactor	Blown fuses or tripped circuit breaker	Check for short in wiring or unit
	Improper wiring	Re-check wiring diagram
Improper voltage	High voltage	Wrong unit
		Power supply problem
	Low voltage	Wrong unit
		Power supply problem
		Wiring undersized
		Loose connections
	Single Phasing (3 phase)	Check incoming power and fusing
CONTAMINATION		
SYMPTOMS	**POSSIBLE CAUSE**	**CHECK OR REMEDIES**
Moisture	Poor evacuation on installation or during service	In each case, the cure is the same. Recover refrigerant. Add filter drier, evacuate and re-charge
High head pressure	Non-condensibles air	
Unusual head and suction readings	Wrong refrigerant	
Foreign Matter- copper filings	Copper tubing cuttings	
Copper oxide	Dirty copper piping	
Welding scale	Nitrogen not used	
Soldering flux	Adding flux before seating copper part way	
Excess soft solder	Wrong solder material	

LOSS OF LUBRICATION		
SYMPTOMS	**POSSIBLE CAUSE**	**CHECK OR REMEDIES**
Compressor failures	Line tubing too long	Add oil to the recommended level
	Line tubing too large	Reduce pipe size to improve oil return
Low suction pressure	Low charge	Check system charge
	Refrigerant leaks	Repair and recharge
Cold, Noisy compressor - Slugging	Dilution of Oil with Refrigerant	Observe piping guidelines
Noisy compressor	Migration	Check crankcase heater
Cold, sweating compressor	Flooding	Check system charge
Low Load	Reduced air flow	Dirty filter
		Dirty coil
		Wrong duct size
		Restricted duct
	Thermostat setting	Advise customer
Short cycling of compressor	Faulty pressure control	Replace control
	Loose wiring	Check all control wires
	Thermostat	In supply air stream, out of calibration,
		Customer misuse

FLOODED STARTS		
SYMPTOMS	**POSSIBLE CAUSES**	**CHECK OR REMEDIES**
Liquid in the compressor shell	Faulty or missing crankcase heater	Replace crankcase heater
Too much liquid in system	Incorrect piping	Check Piping guidelines
	Overcharge	Check and adjust charge

SLUGGING		
SYMPTOMS	**POSSIBLE CAUSES**	**CHECK OR REMEDIES**
On start up	Incorrect piping	Review pipe size guidelines
TEV hunting when running	Oversized TEV	Check TEV application

FLOODING		
SYMPTOMS	**POSSIBLE CAUSES**	**CHECK OR REMEDIES**
Poor system control using a TEV	Loose sensing bulb	Secure the bulb and insulate
	Bulb in wrong location	Relocate bulb
	Wrong size TEV	Use correct replacement
	Improper superheat setting	Adjust, if possible; Replace, if not
Poor system control using capillary tubes	Overcharge	Check system charge
	High head pressures	Dirty heat pump
		Restricted air flow
		Recirculation of air
	Evaporator air flow too low	Adjust air flow to 400 CFM/Ton

THERMOSTATIC EXPANSION VALVES

SYMPTOMS	POSSIBLE CAUSE	CHECK OR REMEDIES
High Superheat, Low Suction Pressure	Moisture freezing and blocking valve	Recover charge, install filter-drier, evacuate system, recharge
	Dirt or foreign material blocking valve	Recover charge, install filter-drier, evacuate system, recharge
	Low refrigerant charge	Correct the charge
	Vapor bubbles in liquid line	Remove restriction in liquid line Correct the refrigerant charge
		Remove non-condensible gases
		Size liquid line correctly
	Misapplication of internally equalized valve	Use correct TEV
	Plugged external equalizer line	Remove external equalizer line restriction
	Undersized TEV	Replace with correct valve
	Loss of charge from power head sensing bulb	Replace power head or complete TEV
	Charge migration from sensing bulb to power head (Warm power head with warm, wet cloth. Does valve operate correctly now?)	Ensure TEV is warmer than sensing bulb
	Improper superheat adjustment (Only applicable to TEV with adjustable superheat settings)	Adjust superheat setting counter-clockwise
Valve feeds too much refrigerant, with low superheat and higher than mal suction pressure	Moisture causing valve to stick open.	Recover refrigerant, replace filter-drier, evacuate system and then nor-recharge
	Dirt or foreign material causing valve to stick open	Recover refrigerant, replace filter-drier, evacuate system and recharge
	TEV seat leak (A gurgling or hissing sound is heard AT THE TEV during the off cycle, if this is the cause.) NOT APPLICABLE TO BLEED PORT VALVES.	Replace the TEV
	Oversized TEV	Install correct TEV
	Incorrect sensing bulb location	Install bulb with two mounting straps, in 2:00 or 4:00 position on suction line, with insulation
	Low superheat adjustment (only applicable to TEV with adjustable superheat setting)	Turn superheat adjustment clockwise
	Incorrectly installed, or restricted external equalizer line	Remove restriction, or relocate external equalizer
Compressor flood back upon start up	Refrigerant drainage from flooded evaporator	Install trap riser to the top of the evaporator coil
	Compressor in cold location	Install crankcase heater on compressor
	Any of the causes listed under Symptoms of Problem #2	Any of the solutions listed under Solutions of Problem #2

THERMOSTATIC EXPANSION VALVES

SYMPTOMS	POSSIBLE CAUSE	CHECK OR REMEDIES
Superheat is low to normal with low suction pressure	Unequal evaporator circuit loading	Ensure air flow is equally distributed through evaporator
		Check for blocked distributor tubes
	Low load or airflow entering evaporator coil	Ensure blower is moving proper air CFM
		Remove/Correct any air flow restriction
Superheat and suction pressure fluctuate (valve is hunting)	Expansion valve is oversized	Install correct TEV
	Sensing bulb is affected by liquid refrigerant or refrigerant oil flowing through suction line	Relocate sensing bulb in another position around the circumference of the suction line
	Unequal refrigerant flow through evaporator circuits	Ensure sensing bulb is located properly
		Check for blocked distributor tubes
	Improper superheat adjustment (only possible with TEV having superheat adjustment)	Replace TEV or adjust superheat
	Moisture freezing and partially blocking TEV	Recover refrigerant, change filter-drier, evacuate system and recharge
Valve does not regulate at all	External equalizer line not connected or line plugged	Connect equalizer line in proper location, or remove any blockage
	Sensing bulb lost its operating charge	Replace TEV
	Valve body damaged during soldering or by improper installation	Replace TEV

TABLE 8
TEMPERATURE PRESSURE CHART

TEMP (Deg. F)	R-410A PSIG
-150	—
-140	—
-130	—
-120	—
-110	—
-100	—
-90	—
-80	—
-70	—
-60	0.4
-50	5.1
-40	10.9
-35	14.2
-30	17.9
-25	22.0
-20	26.4
-15	31.3
-10	36.5
-5	42.2
0	48.4
5	55.1
10	62.4
15	70.2
20	78.5
25	87.5
30	97.2
35	107.5
40	118.5
45	130.2
50	142.7
55	156.0
60	170.1
65	185.1
70	201.0
75	217.8
80	235.6
85	254.5
90	274.3
95	295.3
100	317.4
105	340.6
110	365.1
115	390.9
120	418.0
125	446.5
130	476.5
135	508.0
140	541.2
145	576.0
150	612.8

18.7 Subcooling Calculation

1. Measure the liquid pressure at the liquid line service valve.
2. Convert the liquid line pressure to saturated temperature. See Table 9.
3. Measure the liquid line temperature at the liquid line service valve.
4. Compare the liquid line temperature to the saturated temperature.
5. The difference between saturated temperature and liquid line temperature is the subcooling. Subcooling normal range 9° to 12°.

TABLE 9
AIR CONDITIONING SYSTEM TROUBLESHOOTING TIPS

AIR CONDITIONING SYSTEM TROUBLESHOOTING TIPS					
SYSTEM PROBLEM	INDICATORS				
	DISCHARGE PRESSURE	SUCTION PRESSURE	SUPERHEAT	SUBCOOLING	COMPRESSOR AMPS
Overcharge	High	High	Low	High	High
Undercharge	Low	Low	High	Low	Low
Liquid Restriction (Drier)	Low	Low	High	High	Low
Low Evaporator Airflow	Low	Low	Low	Low	Low
Dirty Heat Pump	High	High	Low	Low	High
Low Outside Ambient Temperature	Low	Low	High	High	Low
Inefficient Compressor	Low	High	High	High	Low
TXV Feeler Bulb Charge Lost	Low	Low	High	High	Low
Poorly Insulated Sensing Bulb	High	High	Low	Low	High

19.0 WIRING DIAGRAMS

FIGURE 12

WIRING DIAGRAM FOR (-)ASL-024JEC/-025JEC/-036JEC & -03JEC

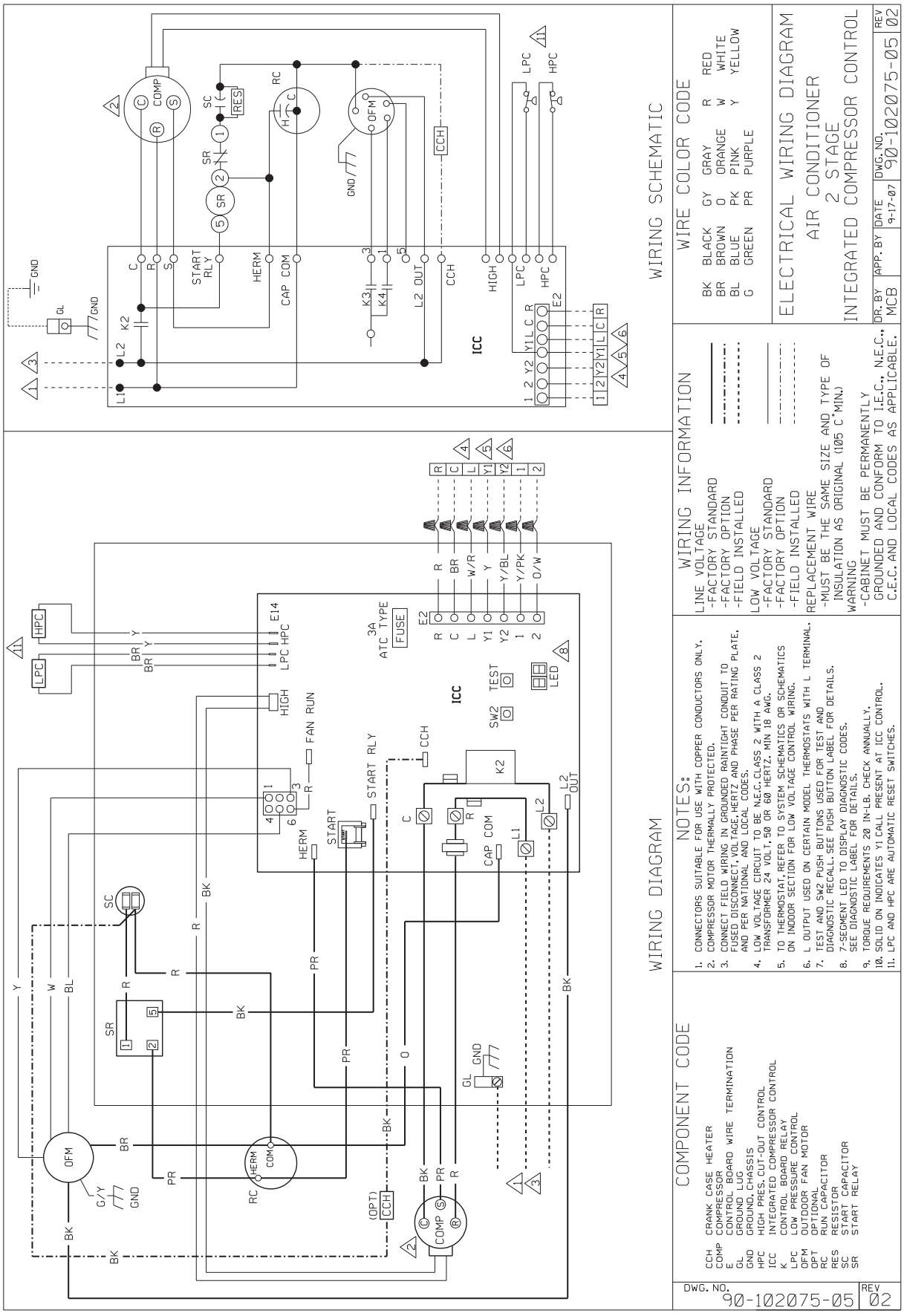


FIGURE 13

WIRING DIAGRAM FOR (-)ASL-039JEC, 048JEC, & 060JEC (DUAL DRIVE)