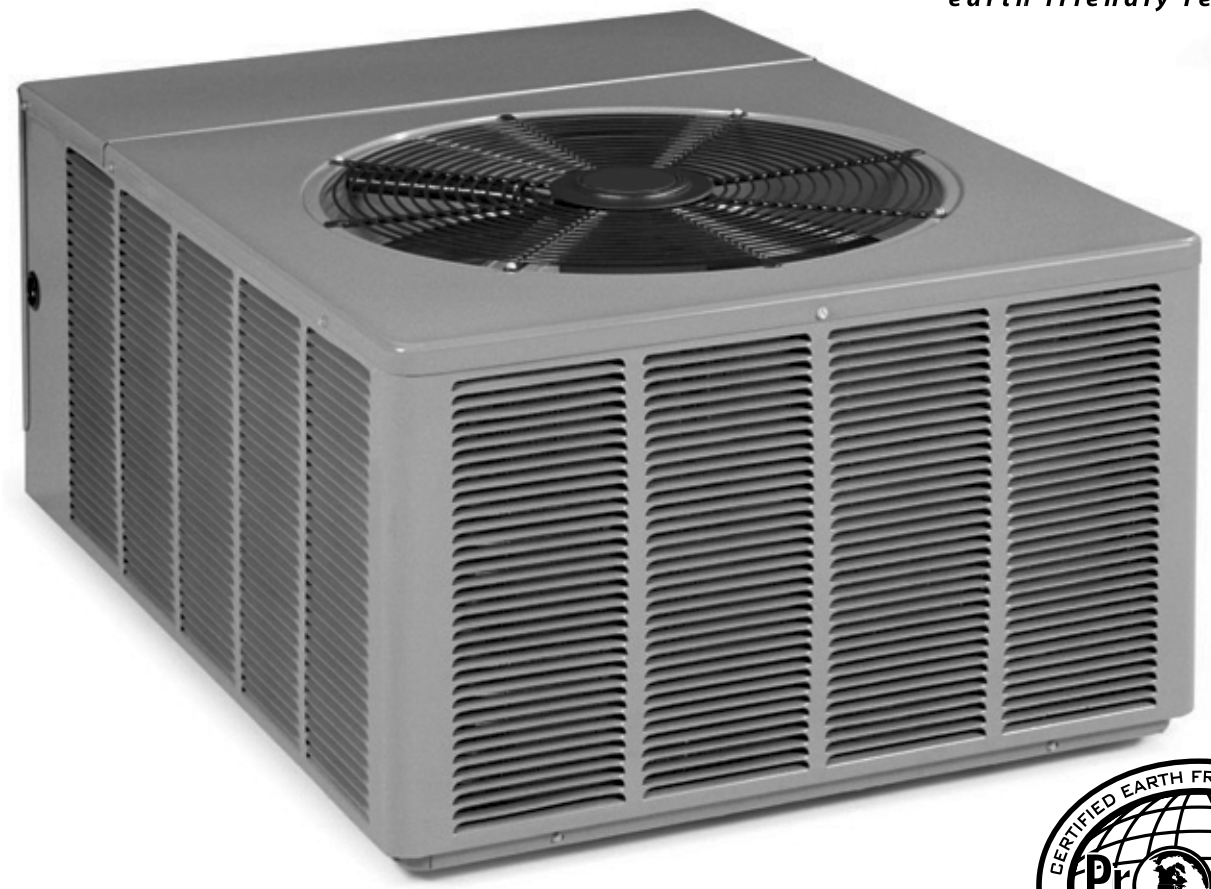
INSTALLATION INSTRUCTIONS

AIR-COOLED CONDENSING UNITS

(-)ARL AND (-)ASL MODEL SERIES

featuring R-410A
earth friendly refrigerant



CERTIFIED EARTH FRIENDLY PRODUCT
Pr zone
MEETS OR EXCEEDS WORLD ENVIRONMENTAL STANDARDS

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.

c UL us LISTED

ISO 9001:2000

DO NOT DESTROY THIS MANUAL
PLEASE READ CAREFULLY AND KEEP IN A SAFE PLACE FOR FUTURE REFERENCE BY A SERVICEMAN

[ ] INDICATES METRIC CONVERSIONS

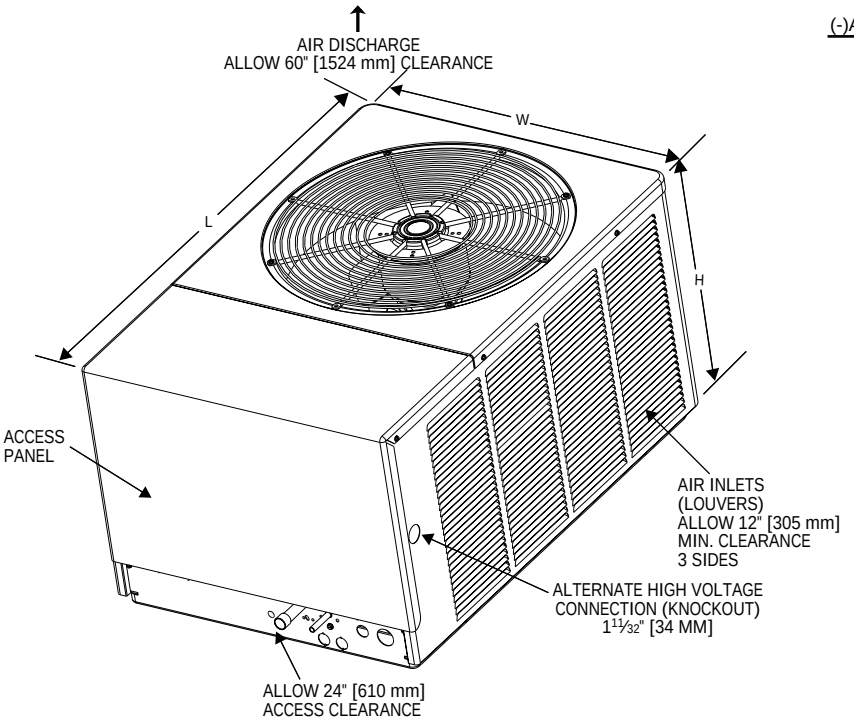
92-101691-01-02
SUPERSEDES 92-101691-01-01

TABLE OF CONTENTS

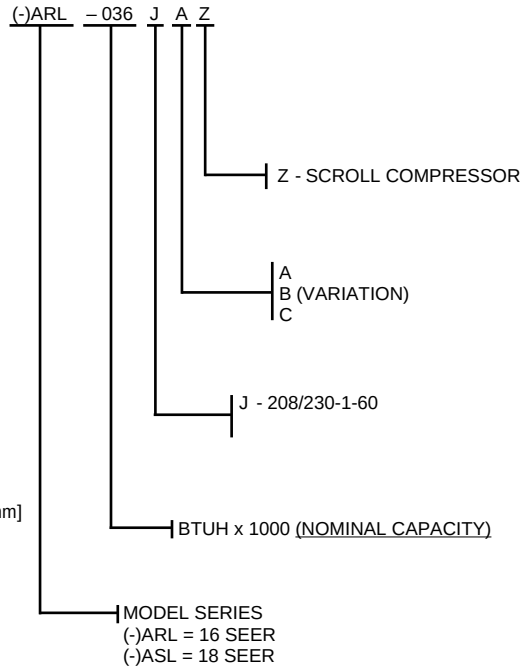
CHECKING PRODUCT RECEIVED

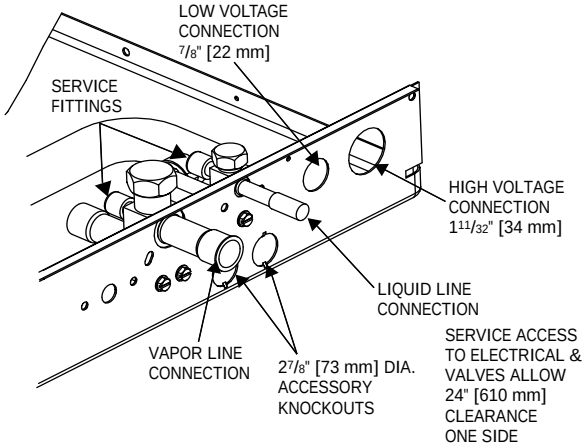
Upon receiving unit, inspect it for any shipping damage. Claims for damage, either apparent or concealed, should be filed immediately with the shipping company. Check condensing unit model number, electrical characteristics and accessories to determine if they are correct. Check system components (evaporator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

FIGURE 1
DIMENSIONS AND INSTALLATION CLEARANCES

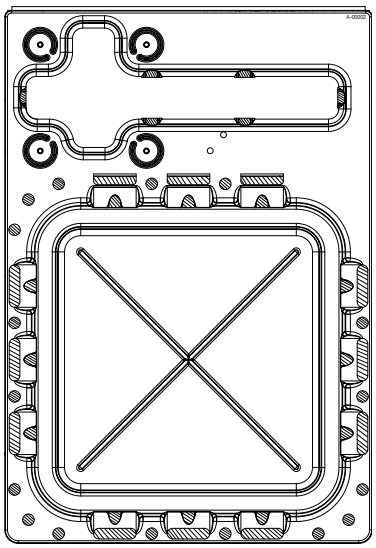


UNIT MODEL NUMBER EXPLANATION





BASE PAN



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

TABLE 1
(-)ARL AND (-)ASL ELECTRICAL DATA

Model Number	ELECTRICAL							PHYSICAL						DIMENSIONAL DATA		
	Phase Frequency (Hz) Voltage (Volts)	Compressor		Fan Motor (FLA)	Min. Circuit Ampacity Amperes	Fuse or HACR Circuit Breaker		Outdoor Coil			R-410a Oz. [g]	Weight		Height "H" (Inches)	Length "L" (Inches)	Width "W" (Inches)
		(RLA)	(LRA)			Min. Amperes	Max. Amperes	Face Area Sq. Ft. [m²]	No. Rows	CFM [L/s]		Net Lbs. [kg]	Shipping Lbs. [kg]			
(-)ARL-024JAZ	1-60-208/230	10.3/10.3	52	0.8	14/14	20/20	20/20	15.8 [1.47]	1	2285 [1078]	117 [3311]	190 [86.2]	200 [90.7]	23	44-3/8	31-1/2
(-)ARL-036JAZ	1-60-208/230	16.7/16.7	82	1.0	22/22	30/30	35/35	15.8 [1.47]	1	3900 [1841]	157 [4445]	236 [107]	246 [111.6]	33	44-3/8	31-1/2
(-)ARL-048JAZ	1-60-208/230	21.2/21.2	96	1.0	28/28	35/35	45/45	15.8 [1.47]	1	3900 [1841]	154 [4354]	236 [107]	246 [111.6]	33	44-3/8	31-1/2
(-)ARL-060JAZ	1-60-208/230	25.6/25.6	118	2.8	35/35	45/45	60/60	23.0 [2.14]	2	HS* 3500 [1652] LS* 2800 [1322]	224 [6350]	305 [138]	315 [143]	33	44-3/8	31-1/2
(-)ASL-036JAZ	1-60-208/230	16.7/16.7	82	2.8	24/24	30/30	40/40	23.0 [2.14]	1	HS* 3400 [1605] HS* 2800 [1322]	155 [4394]	236 [107]	246 [111.6]	33	44-3/8	31-1/2

*HS = high speed
*LS = low speed

⚠ 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**

GENERAL

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.

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 combinatin 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

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 on the cabinet 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.

LOCATING UNIT

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.

OPERATIONAL ISSUES

- **IMPORTANT:** Locate the condenser 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 manaufacturers' recommendations, local code recommendations and requirements will take presidence.
- Refrigerant piping and wiring should be properly sized and kept as short as possible to avoid capacity losses and increased operating costs.
- Locate the condenser 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:
  - Water pouring into the unit from the junction of rooflines, without protective guttering. Large volumes of water entering the condenser while in operation can impact fan blade or motor life.
- Refer to clearance recommendations on Page 3.
  - o 24" to the service panel access
  - o 60" above condenser fan discharge (unit top) to prevent recirculation
  - o 12" to condenser coil grille air inlets (per condenser).

FOR CONDENSERS WITH SPACE LIMITATIONS

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

Single Unit Applications: One condenser inlet air grille side may be reduced to no less than an 8-inch clearance. Clearances below 8 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 unit (2 or more condensers) air inlet grilles are placed side by side, a 12-inch per unit clearance is recommended, for a total of 24" between two units. When multiple condenser grille sides are aligned, a 4-inch per unit spacing can be used, for a total of 8 inches between multiple units. Two combined clearances below 8 inches will reduce capacity and efficiency. Do not reduce the 60-inch discharge, or 24-inch service, clearances.

CUSTOMER SATISFACTION ISSUES

- The condenser should be located away from the living, sleeping and recreational spaces of the owner and those spaces of 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.

  NOTE: Tubing installed in walls may cause noise issues.

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 condenser coil 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.

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

FACTORY-PREFERRED TIE-DOWN METHOD

FOR CONDENSING UNITS

IMPORTANT: These instructions are intended as a guide to securing equipment for wind-load ratings of "120 MPH sustained wind load" and "3-second, 150 MPH gust." While this procedure is not mandatory, the Manufacturer does recommend that equipment be properly secured in areas where high wind damage may occur.

STEP 1: Before installing, clear pad of any dirt or debris.
IMPORTANT: The pad must be constructed of industry-approved materials, and must be thick enough to accommodate the concrete fastener.

STEP 2: Center base pan on pad, ensuring it is level.

STEP 3: Using basepad as a guide, mark spots on concrete where 4 holes will be drilled (see Figure 2).

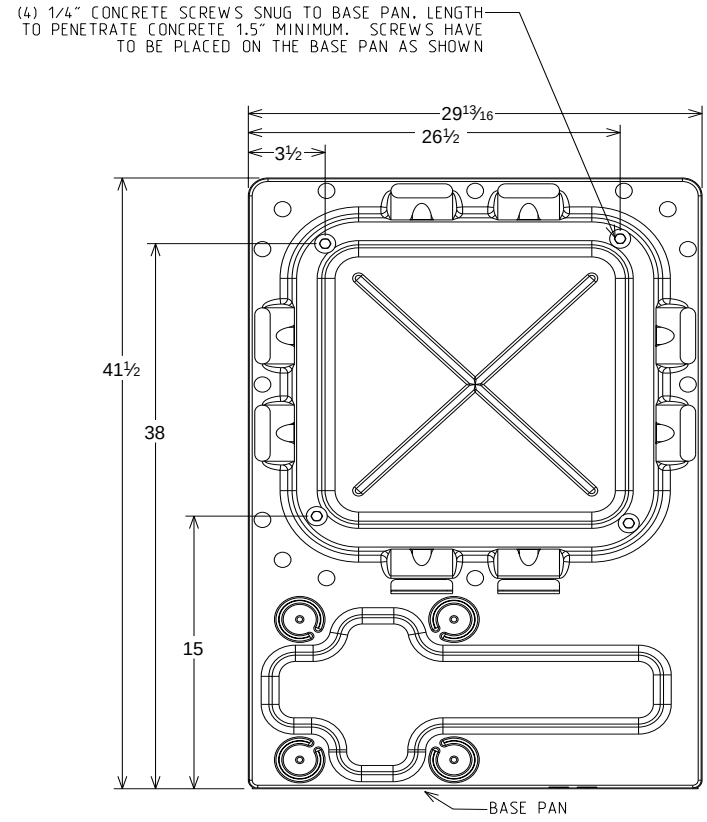
STEP 4: Drill four pilot holes in pad, ensuring that the hole is at least 1/4" deeper than the concrete screw being used.

STEP 5: Center basepan over pre-drilled holes and insert concrete screws.

STEP 6: Tighten concrete screws.
NOTE: Do not over-tighten the concrete screws. Doing so can weaken the integrity of the concrete screw and cause it to break.

STEP 7: Finish unit assembly per unit's installation instructions.

FIGURE 2
SCREW LOCATIONS



REFRIGERANT CONNECTIONS

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

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.

SPECIFICATION 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 condensing units.

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.

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.
- R-410A, as with other HFC's is only compatible with POE oils.
- Vacuum pumps will not remove moisture from POE 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.
- Desiccant (drying agent) must be compatible for POE oils and R-410A.

EVAPORATOR COIL

REFER TO EVAPORATOR 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.

⚠ CAUTION

Only use evaporators rated and approved for use on (-)ARL R-410A systems.

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.**

LOCATION

Do not install the indoor evaporator 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.

INTERCONNECTING TUBING

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 through 5 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 25 feet of interconnecting lines. The factory refrigeration charge in the outdoor unit is sufficient for the unit and 25 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

OUTDOOR UNIT INSTALLED ABOVE INDOOR COIL

Keep the vertical separation between coils to a minimum. However, the vertical distance can be as great as 120 feet with the condensing unit ABOVE the indoor coil. Use the following guidelines when installing the unit:

NOTE: If exceeding these measurements, the system must be an engineered system.

OUTDOOR UNIT BELOW INDOOR COIL

Keep the vertical separation to a minimum. Use the following guidelines when installing the unit:

1. DO NOT exceed the vertical separations as indicated on Table 5.
2. Always use the smallest liquid line size permitted to minimize system charge.
3. Table 5 may be used for sizing horizontal runs.

Vertical separation is limited to the total line length as defined in the liquid line sizing charts.

Examples:

1. A 2-ton condensing unit with a 1/4" liquid line cannot exceed a total line length of 25 ft.
2. A 3-ton unit with a 5/16" liquid line cannot exceed a total line length of 125 ft.
3. A 4-ton unit with a 5/16" liquid line cannot exceed a total line length of 50 ft.

IMPORTANT: Do not exceed a total line length of 125 feet in all systems.

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.
- 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.
- 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 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 3 for the correct vapor line size. Check Tables 4 and 5 for the correct liquid line size.

TUBING CONNECTIONS

Indoor evaporator 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 brazing. 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.

TABLE 3
VAPOR LINE LENGTH SIZE AND CAPACITY MULTIPLIER

(-)ASL			036[2]		
(-)ARL		024[1]		048[3]	060[4]
Unit Vapor Line Connection Size		3/4" I.D. Sweat	7/8" I.D. Sweat	7/8" I.D. Sweat	7/8" I.D. Sweat
Vapor Line Run Feet		5/8" O.D. Optional	3/4" O.D. Optional	3/4" O.D. Optional	3/4" O.D. Optional
		3/4" O.D. Standard	7/8" O.D. Standard	7/8" O.D. Standard	7/8" O.D. Standard
		7/8" O.D. Optional		1-1/8" O.D. Optional	1-1/8" O.D. Optional
25'	Opt.	0.99	0.99	0.99	0.99
	Std.	1.00	1.00	1.00	1.00
	Opt.	1.01		1.01	1.01
50'	Opt.	0.98	0.98	0.98	0.98
	Std.	0.99	0.99	0.99	0.99
	Opt.	1.00		1.00	1.00
75'	Opt.	0.97	0.97	0.97	0.97
	Std.	0.97	0.98	0.98	0.98
	Opt.	0.99		0.99	0.99
100'	Opt.	0.95	0.96	0.95	0.95
	Std.	0.96	0.97	0.97	0.97
	Opt.	0.97		0.98	0.98

NOTES:
1. Do **NOT** use 7/8 OD suction lines in 2-ton applications where the outdoor unit is located above the indoor coil. Suction line may not have sufficient velocity for oil return.
2. Do **NOT** use 1-1/8 OD suction lines in 3-ton applications as they have insufficient velocity for oil return.
3. Do **NOT** use 1-1/8 OD suction lines in 4-ton applications where the outdoor unit is located above the indoor coil. Suction line may have insufficient velocity for oil return.
4. Do **NOT** use 1-1/8 OD suction lines in 5-ton applications where the outdoor unit is located above the indoor coil. Suction line may have insufficient velocity for oil return.

- 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.
  - Clamp the TXV bulb securely on the suction line at the 2 o'clock position with the strap provided in the parts bag.
  - Insulate the TXV sensing bulb and suction line with the provided pressure sensitive insulation (size 4" x 7") and secure with provided wire ties.
  - **NOTE: TXV SENSING BULB SHOULD BE LOCATED ON A HORIZONTAL SECTION OF SUCTION LINE, JUST OUTSIDE OF COIL BOX.**
- 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.

TABLE 4
ELBOW EQUIVALENT LENGTHS, FT.

Size	Short Radius (Inches)	Long Radius (Inches)
1/4	13/32	13/64
5/16	1/2	19/64
3/8	1/2	19/64
1/2	19/32	13/32
5/8	51/64	19/32
3/4	29/32	51/64
7/8	1	1
1-1/8	1-13/64	1-13/64
1-3/8	2-3/32	1-13-32
1-5/8	2-1/2	1-1/2

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.

TABLE 5
LIQUID LINE SIZE CHARTS

STANDARD REFRIGERANT CHARGE

LIQUID LINE SIZING CHART FOR (-)ARL- SERIES						
OUTDOOR UNIT **BELOW** INDOOR COIL						
Model	Line Size O.D. (Inch OD)	TOTAL LINE LENGTH - FEET				
		25	50	75	100	125
		VERTICAL SEPARATION - FEET				
024	**1/4***	14				
	5/16	23	18	13	8	3
	3/8	25	24	22	20	18
036	5/16	25	18	11		
	3/8*	25	27	24	21	18
048	5/16	19	5			
	3/8*	25	21	16	11	5
	1/2	25	30	29	29	28
060	5/16	25	35	17		
	3/8*	25	50	55	48	42
	1/2	25	50	71	69	68

***Standard Line Size**

NOTES: 1. **Example 1:** A 2-ton condensing unit with a total line length of 75 feet with a vertical separation of 15 feet requires a liquid line size of 3/8".
2. This chart may also be used to size horizontal runs. **Example 2:** A 3-ton condensing unit may have a total horizontal run of 100 feet if using a 3/8" liquid line.
3. If vertical separation exceeds this chart, use the extended line lengths chart.
4. Always use the smallest liquid line possible to minimum system charge.

EXTENDED LINE LENGTHS FOR USE WITH SUPPLEMENTAL REFRIGERANT CHARGE

LIQUID LINE SIZING CHART FOR (-)ARL- SERIES						
OUTDOOR UNIT **BELOW** INDOOR COIL						
Model	Line Size O.D. (Inch OD)	TOTAL LINE LENGTH - FEET				
		25	50	75	100	125
		VERTICAL SEPARATION - FEET				
024	**1/4***	25	21	8		
	5/16	25	39	33	28	23
	3/8	25	45	43	41	39
036	5/16	25	38	29	15	
	3/8*	25	48	45	41	38
048	5/16	25	26	12		
	3/8*	25	42	37	31	26
	1/2	25	50	51	50	49
060	5/16	25	45	27	9	
	3/8*	25	50	65	58	52
	1/2	25	50	75	79	78

***Standard Line Size**

IMPORTANT: Line sizing by this chart requires a supplemental refrigerant charge. Refer to charging chart on unit for proper charging with extended line sets.

NOTES: 1. **Example 1:** A 2-ton condensing unit with a total line length of 75 feet with a vertical separation of 15 feet requires a liquid line size of 5/16".
2. This chart may also be used to size horizontal runs. **Example 2:** A 3-ton condensing unit may have a total horizontal run of 100 feet if using a 5/16" liquid line.
3. The vertical separation indicated on this chart **CANNOT** be exceeded.
4. Always use the smallest liquid line possible to minimum system charge.

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 installing technician when evacuating air and moisture from the system.

Air 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 and hydrochloric acids. These attack 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. The vacuum pump must be connected to both the high and low sides of the system through adequate connections. Use the largest size connections available since restrictive service connections may lead to false readings because of pressure drop through the fittings.

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.

START UP AND PERFORMANCE

Even though the unit is factory charged with Refrigerant-410A, the charge must be checked to the charge table attached to the service panel and adjusted, if required. Allow a minimum of 5 minutes running. Before analyzing charge, see the instructions on the unit service panel rating plate for marking the total charge.

CHECKING AIRFLOW

The air distribution system has the greatest effect. 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.

Air conditioning systems require a specified airflow. Each ton of cooling requires between 350 and 450 cubic feet of air per minute (CFM), or 400 CFM nominally.

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 airlow 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

$$CFM = \frac{\text{volts x amps x } 3.414}{1.08 \text{ x temp rise}}$$

Gas furnaces can use

$$CFM = \frac{\text{BTUH output}}{\Delta T \text{ x } 1.08}$$

An air velocity meter or airflow hood can give a more accurate reading of the system CFM's.

CHECKING REFRIGERANT CHARGE

Charge for all systems should be checked against the Charging Chart inside the access panel cover. Before using the chart, the indoor conditions must be within 2°F of desired comfort conditions and system must be run until operating conditions stabilize (15 min. to 30 min.)

⚠ CAUTION

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

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

Addition of R-410A will raise pressures (vapor, liquid and discharge) and lower vapor temperature.

If adding R-410A raises both vapor pressure and temperature, the unit is overcharged.

IMPORTANT: Use industry-approved charging methods to ensure proper system charge.

CHARGING BY LIQUID PRESSURE

Liquid pressure method is used for charging systems in the cooling mode when an expansion valve is used on the evaporator. The service port on the liquid service valve (small valve) is used for this purpose.

Read and record the outdoor ambient temperature entering the condensing unit, and the liquid line pressure at the service valve (the small valve). Locate the charging chart attached to the unit. The correct liquid line pressure will by found by finding the intersection of the unit model size and the outdoor ambient temperature. Adjust the liquid line pressure by either adding refrigerant to raise pressure or removing refrigerant to lower pressure.

CHARGING UNITS WITH R-410A REFRIGERANT

Checking the charge, or charging units using R-410A refrigerant, differs from those with R-22. The following procedures apply to units with R-410A refrigerant. These procedures require outdoor ambient temperature, liquid line pressure and indoor wet bulb temperature be used.

IMPORTANT: ONLY ADD LIQUID REFRIGERANT CHARGE INTO THE SUCTION LINE WITH R-410A UNITS. USE A COMMERCIAL METERING DEVICE TO ADD CHARGE INTO THE SUCTION LINE WITHOUT DAMAGE TO THE COMPRESSOR.

1. Read and record the outdoor ambient temperature entering the condensing unit.
2. Read and record the liquid line pressure at the small service valve.
3. Read and record the indoor ambient wet bulb temperature entering the indoor coil.
4. Use the appropriate charging chart to compare the actual liquid pressure to the correct pressure as listed on the chart.
5. R-410A charging charts are listed on the unit.

⚠ 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.

CHARGING BY WEIGHT

For a new installation, evacuation of interconnecting tubing and evaporator coil is adequate; otherwise, evacuate the entire system. Use the factory charge shown in Table 1 of these instructions or unit data plate. Note that charge value includes charge volume required for 25 ft. of standard size interconnecting liquid line. Calculate actual charge required with installed liquid line size and length using:

1/4" O.D. = 0.20 oz./ft.
5/16" O.D. = 0.3 oz./ft.
3/8" O.D. = 0.50 oz./ft.
1/2" O.D. = 1.0 oz./ft.

With an accurate scale (+/– 1 oz.) 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.

NOTE: When the total refrigerant charge volume exceeds 10 pounds, the manufacturer recommends installing a crankcase heater and start kit.

FINAL LEAK TESTING

After the unit has been properly evacuated and charged, a leak detector should be used to detect leaks in the system. All piping within the condensing unit, 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 releasing refrigerant into the atmosphere.

ELECTRICAL WIRING

⚠ 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.

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

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.

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 contactor 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.

IMPORTANT: DO NOT connect aluminum field wire to the contactor terminals.

TABLE 6
VOLTAGE RANGES (60 HZ)

Nameplate Voltage	Operating Voltage Range at Copeland Maximum Load Design Conditions for Compressors
208/230 (1 Phase)	197 - 253

GROUNDING

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

CONTROL WIRING

(See Figure 3)

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

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. Use Table 7 to size the 24 volt control wiring.

All field control wiring between the condensing unit and thermostat should be made in the furnace or air handler.

THERMOSTAT WIRING IN 16 SEER APPLICATIONS

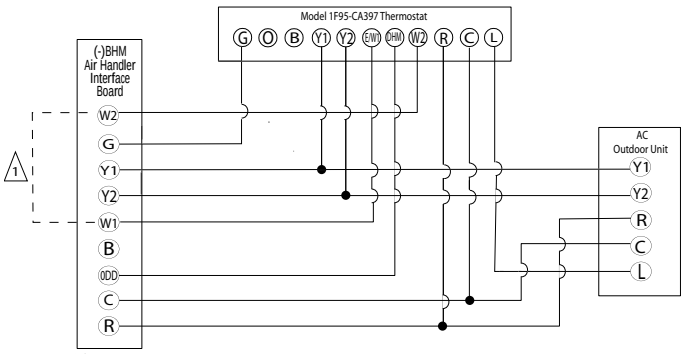
Figure 3 shows typical system wiring of 16 SEER condensing units with gas furnaces or air handlers. Reference Table 8 for an explanation of the control wiring symbols. Refer to the particular furnace or air handler installation instructions for additional system control wiring information.

NOTE: Refer to thermostat installation instructions for specific control wiring symbol explanations.

NOTE: 16 SEER applications (except the 2-ton system) require specific airflow across the indoor coil to maintain an acceptable latent/sensible cooling ratio. Refer to the indoor coil, furnace, or air handler installation instructions for additional information.

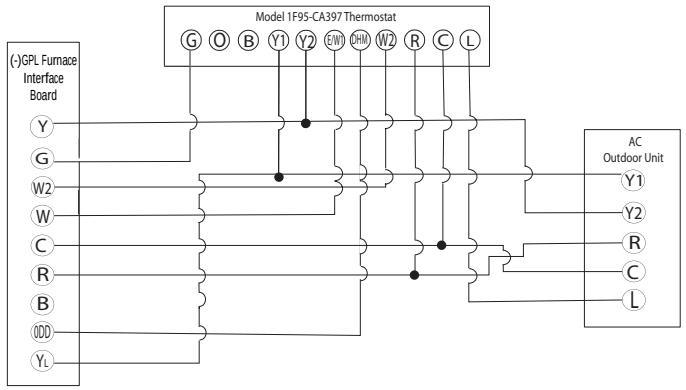
FIGURE 3
CONTROL WIRING FOR GAS OR ELECTRIC HEAT FOR USE WITH WHITE-RODGERS THERMOSTAT

Typical Control Wiring with White-Rodgers Thermostat



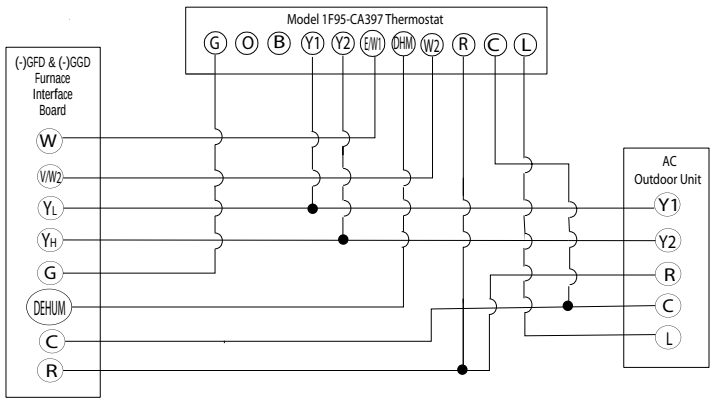
1 W1 & W2 may be jumpered to eliminate electric heat staging.
Note: Refer to Thermostat Installation Instructions for more information

Control Wiring for Gas Heat (-)GPL Furnace



Note: Refer to Thermostat Installation Instructions for more information

Control Wiring for Gas Heat (-)GFD & (-)GGD Furnace



Note: Refer to Thermostat Installation Instructions for more information

TABLE 7
FIELD WIRE SIZE FOR 24 VOLT THERMOSTAT CIRCUITS

Thermostat Load - Amps	SOLID COPPER WIRE - AWG.		
3.0	16	14	12
2.5	16	14	12
2.0	18	16	14
	50	100	150
	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.

TABLE 8
CONTROL WIRING SYMBOLS

Symbol	Function
R	24VAC
C	24VAC common
Y/Y1	First stage compressor①
Y^L	First stage compressor②
Y^H	Second stage compressor②
G	Fan
W	1st stage heating
W2	2nd stage heating
E	Emergency heat*
ODD	On-demand dehumidification①③
B*	Heat pump*

① (-)BHK, (-)BHL, (-)BHM & (-)BHN air handler applications
② (-)GFD & (-)GGD Furnace applications
③ (-)GLL & (-)GPL furnace applications
* Terminal is not used on condensing unit control wiring.

FIGURE 4
LED DESCRIPTION

FACTORY INSTALLED ACCESSORIES

COMPRESSOR SOUND WRAP

All (-)ARL and (-)ASL units are factory equipped with compressor sound wraps to reduce operating noise levels.

COMPRESSOR CRANKCASE HEATER (CCH)

The 5-ton (-)ARL is factory equipped with a crankcase heater. Refrigerant migration during the off cycle can result in a noisy start up. The crankcase heater minimizes refrigeration migration and helps reduce start up noise or bearing “wash out.”

The heater is located on the lower half of the compressor shell. Its purpose is to drive refrigerant from the compressor shell during low outdoor ambient conditions (below 75°F), thus preventing damage to the compressor during start-up. At initial start-up or after extended shutdown periods during low outdoor ambient conditons (below 75°F), make sure the heater is energized for at least 12 hours before the compressor is started. (Disconnect switch on and wall thermostat off.)

COMFORT ALERT™

The Comfort Alert™ diagnostics module is for troubleshooting air conditioning system failures. By monitoring and analyzing data from the compressor and the thermostat demand, the module can accurately detect the cause of electrical and system-related failures without any external sensors. A flashing LED indicator communicates the ALERT code and guides the service technician more quickly and accurately to the root cause of a problem.

POWER LED (Green): indicates voltage is present at the power connection of the module.

ALERT LED (Yellow): communicates an abnormal system condition through a unique flash code. The ALERT LED will flash a number of times consecutively, pause and then repeat the process. The number of consecutive flashes, defined as the Flash Code, correlates to a particular abnormal condition. Detailed descriptions of specific ALERT Flash Codes are shown in Figure 5.

TRIP LED (Red): indicates there is a demand signal from the thermostat but no current to the compressor is detected by the module. The TRIP LED typically indicates the compressor internal overload protector is open or may indicate missing high voltage supply power to the compressor.

INTERPRETING THE DIAGNOSTIC LEDS

When an abnormal system condition occurs, the Comfort Alert module displays the appropriate ALERT and/or TRIP LED. The yellow ALERT LED will flash a number of times consecutively, pause and then repeat the process. To identify a Flash Code number, count the number of consecutive flashes.

IMPORTANT: Every time the module powers up, the last ALERT Flash Code that occurred prior to shut down is displayed for one minute. The module will continue to display the flash code until the condition returns to normal or if 24VAC power is removed from the module.

CONTROL BOX COVER

The control box cover allows access to the Comfort Alert™ status LEDs. An abbreviated Comfort Alert™ diagnostic chart is provided on the control box cover.

TIME DELAY CONTROL (TDC)

The time delay (TDC) is in the low voltage control circuit. When the compressor shuts off due to a power failure or thermostat operation, this control keeps it off at least 5 minutes which allows the system pressure to equalize, thus not damaging the compressor or blower fuses on start-up.

HIGH PRESSURE CONTROL (HPC)

The high pressure control (HPC) keeps the compressor from operating in pressure ranges, which can cause damage to the compressor. This is an auto-reset control that opens near 450 PSIG and closes once the system pressure drops below 270 PSIG.

The high pressure control is wired in the 24VAC side of the control circuitry.

LOW PRESSURE CONTROL (LPC)

The low pressure control (LPC) keeps the compressor from operating in pressure ranges that can cause damage to the compressor. This is an auto-reset control that opens near 15 PSIG and closes once the system pressure rises above 40 PSIG.

The low pressure control is wired in the common side of the control circuitry.

THERMOSTAT USAGE WITH THE (-)ARL-/(-)ASL-SERIES OF CONDENSING UNITS

A two-stage cooling thermostat is required for proper unit operation.

In applications where additional latent removal (dehumidification) is required or desired, Rheem recommends the use of the White-Rodgers 90-Series thermostat (model 1F95-CA397). On-demand dehumidification is capable when combined with premium ECM indoor products. This thermostat provides the following functionality when connected to the (-)ARL/(-)ASL-series of condensing units.

- Humidity input to the indoor air handler or furnace via the “DHM” terminal on the thermostat. Refer to System wiring for proper connections.
- Compressor protection via the L terminal when the Comfort-Alert module on the condensing unit is connected to the L terminal on the thermostat.

FIGURE 5
WHITE-RODGERS 90-SERIES THERMOSTAT

FIGURE 6

COMFORT ALERT

The (-)ARL and (-)ASL condensing units are equipped with a Comfort Alert™ diagnostics module. By monitoring and analyzing data from the Copeland Scroll® compressor and the thermostat demand, the module can accurately detect the cause of electrical and system related failures without any external sensors. A flashing LED indicator communicates the ALERT code and guides the service technician more quickly and accurately to the root cause of a problem.

NOTE: The Comfort Alert™ module does not provide safety protection! The Comfort Alert module is a monitoring device and cannot control or shut down other devices unless used with the recommended White-Rodgers thermostat.

COMFORT ALERT WITH ACTIVE PROTECTION WHEN USED WITH WHITE-RODGERS THERMOSTAT 1F95-CA397

The Comfort Alert diagnostics module diagnoses system and electrical problems in the air conditioning outdoor system. Abnormal conditions are indicated by flashing ALERT codes on the yellow LED on the Comfort Alert module. The flash codes are transmitted to the thermostat when the ***L*** terminal on the Comfort Alert Module is connected to the ***L*** terminal on the thermostat. The White-Rodgers 1F95-CA397 thermostat displays a CHECK SYSTEM icon that flashes at the same rate as the yellow ALERT LED on the Comfort Alert module. Turn this feature ON to achieve protection, enabling the thermostat to identify certain fault codes when compressor damage is possible and react to those codes by turning the compressor off.

Comfort Alert™ Flash Codes
1 – Long Run Time
2 – System Pressure Trip
3 – Short Cycling
4 – Locked Rotor
5 – Open Circuit
6 – Open Start Circuit
7 – Open Run Circuit
8 – Welded Contactor
9 – Low Voltage

Active protection occurs under the following conditions:

1) Flash Code 2 - *System Pressure Trip*
   Condition: Four consecutive compressor protector trips occur where the average run time until trip is between 1 minute and 15 minutes
   Possible causes:
   Low suction pressure
   - Low pressure switch is open
   - Low system charge

   Blocked condenser coil
   Restricted condenser air flow

   Active Thermostat Reaction:
   The thermostat will cycle the system ON for 5 minutes and OFF for five minutes to verify system fault. If this ON/OFF cycling repeats for 30 ten-minute cycles, the thermostat concludes there is a system problem and implements a hard lockout.

2) Flash Code 3 - *Short Cycling*
   Condition: A pattern of short cycling emerges where the run time for the previous four cycles is less than three minutes each.
   Possible causes:
   High head pressure
   - High pressure switch is open
   - System overcharged
   - Non-condensables in system

   Faulty thermostat
   Intermittent contactor

   Active Thermostat Reaction:
   The thermostat will cycle the system ON for 5 minutes and OFF for five minutes to verify the system fault. If this ON/OFF cycling repeats for 30 ten-minute cycles, the thermostat concludes there is a system problem and implements a hard lockout.

3) Flash Code 4 - *Locked Rotor*
   Condition: The compressor internal overload trips where the average run

time is less than 15 seconds.
Possible causes:
- Bad run capacitor
- Low line voltage
- Excessive liquid refrigerant in compressor
- Compressor bearings are seized
- Faulty hard start components

Active Thermostat Reaction:
- The thermostat implements a hard lockout once this error is sensed.

4) Flash Code 6 - *Open Start Circuit*
Condition: Current is detected in the run circuit but not in the start circuit.
Possible causes:
- Bad run capacitor
- Open circuit in compressor start wiring or connections.
- Compressor start winding is damaged

Active thermostat reaction:
- The thermostat implements a hard lockout after 3 hours.

5) Flash Code 7 - *Open Run Circuit*
Condition: Open circuit in compressor run wiring or connections.
Compressor run winding is damaged.

Active Thermostat Reaction:
- The thermostat implements a hard lockout after 3 hours.

RESETTING THE WHITE-RODGERS THERMOSTAT AFTER A HARD LOCKOUT

The White-Rodgers thermostat will automatically reset after a hard lockout once the Comfort Alert trouble code has been cleared.

FIGURE 7
COMFORT ALERT DIAGNOSTICS TROUBLESHOOTING CHART

Status LED	Status LED Description	Status LED Troubleshooting Information
Green "POWER"	Module has power	Supply voltage is present at module terminals
Red "TRIP"	Thermostat demand signal Y1 is present, but the compressor is not running	1. Compressor internal protector is open • Check for high head pressure • Check compressor supply voltage 2. Outdoor unit power disconnect is open 3. Compressor circuit breaker or fuse(s) is open 4. Broken wire or connector is not making contact 5. Low pressure switch open 6. Compressor contactor has failed open
Yellow "ALERT" Flash Code 1	**Run Time Over 18 Hours** Compressor is running extremely long run cycles	1. Low refrigerant charge 2. Evaporator blower is not running • Check blower relay coil and contacts • Check blower motor capacitor • Check blower motor for failure or blockage • Check evaporator blower wiring and connectors • Check indoor blower interface board • Check thermostat wiring for open circuit 3. Evaporator coil is frozen • Check for low suction pressure • Check for excessively low thermostat setting • Check evaporator airflow (coil blockages or return air filter) • Check ductwork or registers for blockage 4. Faulty metering device • Check TXV bulb installation (size, location and contact) • Check if TXV is stuck closed or defective 5. Evaporator coil is dirty 6. Liquid line restriction (filter drier blocked if present in system) 7. Thermostat is malfunctioning • Check thermostat sub-base or wiring for short circuit • Check thermostat installation (location, level)
Yellow "ALERT" Flash Code 2	**System Pressure Trip** Discharge pressure out of limits or compressor overloaded	1. Condenser coil poor air circulation (dirty, blocked, damaged) 2. Condenser fan is not running • Check fan capacitor • Check fan wiring and connectors • Check fan motor for failure or blockage 3. Return air duct has substantial leakage

Flash Code number corresponds to a number of LED flashes, followed by a pause and then repeated. TRIP and ALERT LEDs flashing at same time means control circuit voltage is too low for operation.

FIGURE 7
COMFORT ALERT DIAGNOSTICS TROUBLESHOOTING CHART – CONTINUED

Status LED	Status LED Description	Status LED Troubleshooting Information
Yellow "ALERT" Flash Code 3	**Short Cycling** Compressor is running only briefly	1. High head pressure • Check high pressure switch if present in system • Check if system is overcharged with refrigerant • Check for non-condensable in system 3. Thermostat demand signal is intermittent 3. Time delay relay defective
Yellow "ALERT" Flash Code 4	**Locked Rotor**	1. Run capacitor has failed 2. Low line voltage (contact utility if voltage at disconnect is low) • Check wiring connections 3. Excessive liquid refrigerant in compressor 4. Compressor bearings are seized • Measure compressor oil level 5. Faulty-start assist
Yellow "ALERT" Flash Code 5	**Open Circuit**	1. Outdoor unit power disconnect is open 2. Compressor circuit breaker or fuse(s) is open 3. Compressor contactor has failed open • Check compressor contactor wiring and connectors • Check for compressor contactor failure (burned, pitted or open) • Check wiring and connectors between supply and compressor • Check for low pilot voltage at compressor contactor coil 4. High pressure switch is open 5. Open circuit in compressor supply wiring or connections 6. Unusually long compressor protector reset time due to extreme ambient temperature 7. Compressor windings are damaged • Check compressor motor winding resistance
Yellow "ALERT" Flash Code 6	**Open Start Circuit** Current only in run circuit	1. Run capacitor has failed 2. Open circuit in compressor start wiring or connections • Check wiring and connectors between supply and the compressor "S" terminal 3. Compressor start winding is damaged • Check compressor motor winding resistance
Yellow "ALERT" Flash Code 7	**Open Run Circuit** Current only in start circuit	1. Open circuit in compressor run wiring or connections • Check wiring and connectors between suply and the compressor "R" terminal 2. Compressor run winding is damaged • Check compressor motor winding resistance
Yellow "ALERT" Flash Code 8	**Welded Contactor** Compressor always runs	1. Compressor contactor has failed closed 2. Thermostat demand signal not connected to module
Yellow "ALERT" Flash Code 9	**Low Voltage** Control circuit < 17VAC	1. Control circuit transformer is overloaded 2. Low line voltage (contact utility if voltage at disconnect is low) • Check wiring connections

Flash Code number corresponds to a number of LED flashes, followed by a pause and then repeated. TRIP and ALERT LEDs flashing at same time means control circuit voltage is too low for operation.

FIELD INSTALLED ACCESSORIES

COMPRESSOR CRANKCASE HEATER (CCH)

While scroll compressors usually do not require crankcase heaters, there are instances when a heater should be added. Refrigerant migration during the off cycle can result in a noisy start up. Add a crankcase heater to minimize refrigeration migration, and to help eliminate any start up noise or bearing “wash out.”

NOTE: A crankcase heater should be installed if: the charge of the system exceeds 10 pounds.

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.)

IMPORTANT: (-)ARL and (-)ASL unit sound wraps are not compatible with field installed crankcase heaters. Sound wraps must be removed unless the unit was factory equipped with a crankcase heater.

LOW AMBIENT CONTROL (LAC)

This component senses compressor head pressure and shuts the condenser fan off when the head pressure drops to approximately 175 PSIG. This allows the unit to build a sufficient head pressure at lower ambient temperatures in order to maintain system balance and obtain improved capacity. Low ambient control should be used on all equipment operated below 55°F ambient.

SERVICE

SINGLE-POLE COMPRESSOR CONTACTOR (CC)

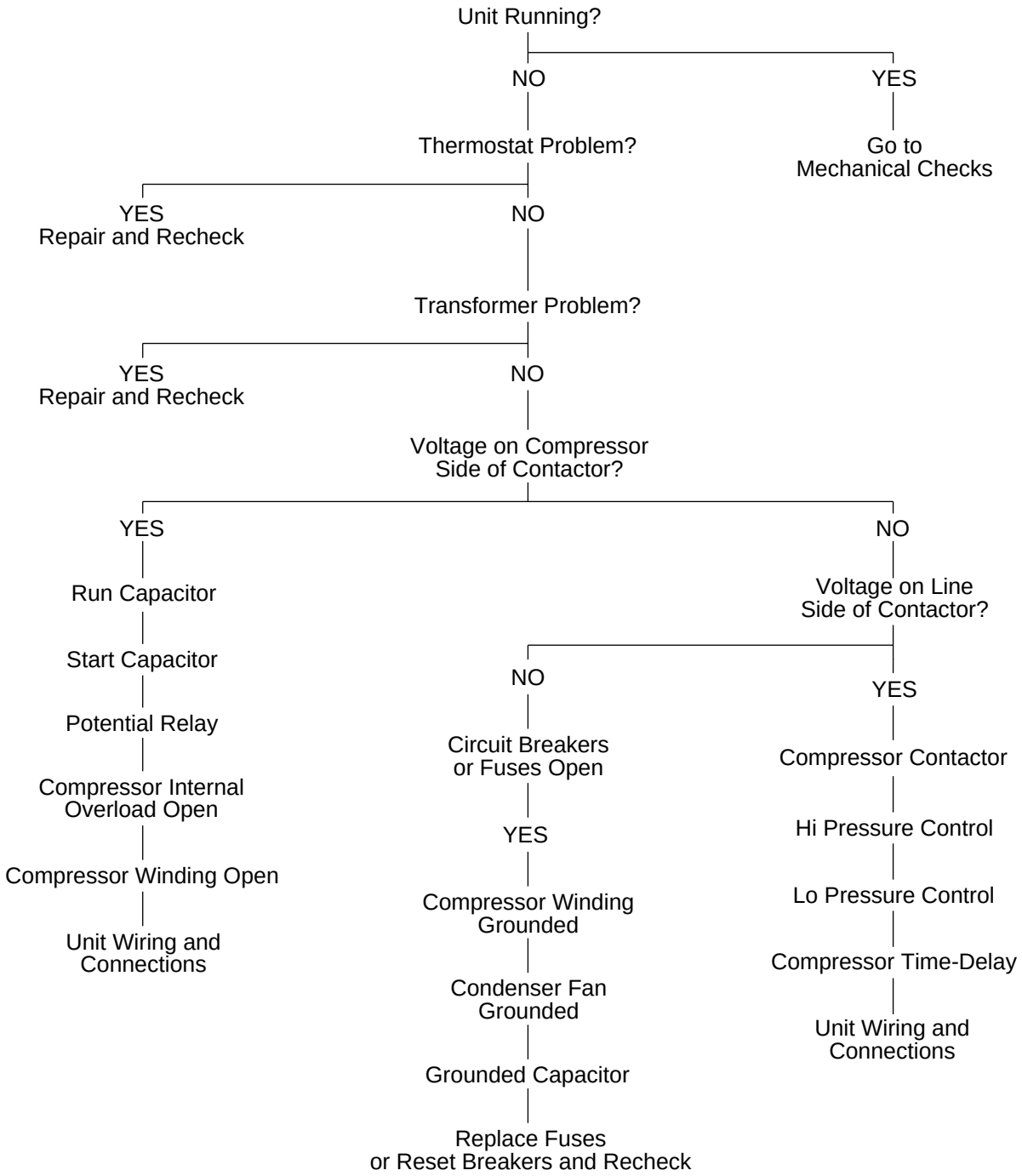
Single-pole contactors are used on all standard single phase units up through 5 tons. Caution must be exercised when servicing as only one leg of the power supply is broken with the contactor.

TROUBLE SHOOTING

In diagnosing common faults in the air conditioning system, it is useful to present the logical pattern of thought that is used by experienced technicians. The charts which follow are not intended to be an answer to all problems, but only to guide your thinking as you attempt to decide on your course of action. Through a series of yes and no answers, you will follow the logical path to a likely conclusion.

Use these charts as you would a road map, if you are a beginning technician. As you gain experience, you will learn where to establish the shortcuts. Remember that the chart will help clarify the logical path to the problem.

ELECTRICAL CHECKS FLOW CHART



MECHANICAL CHECKS FLOW CHART

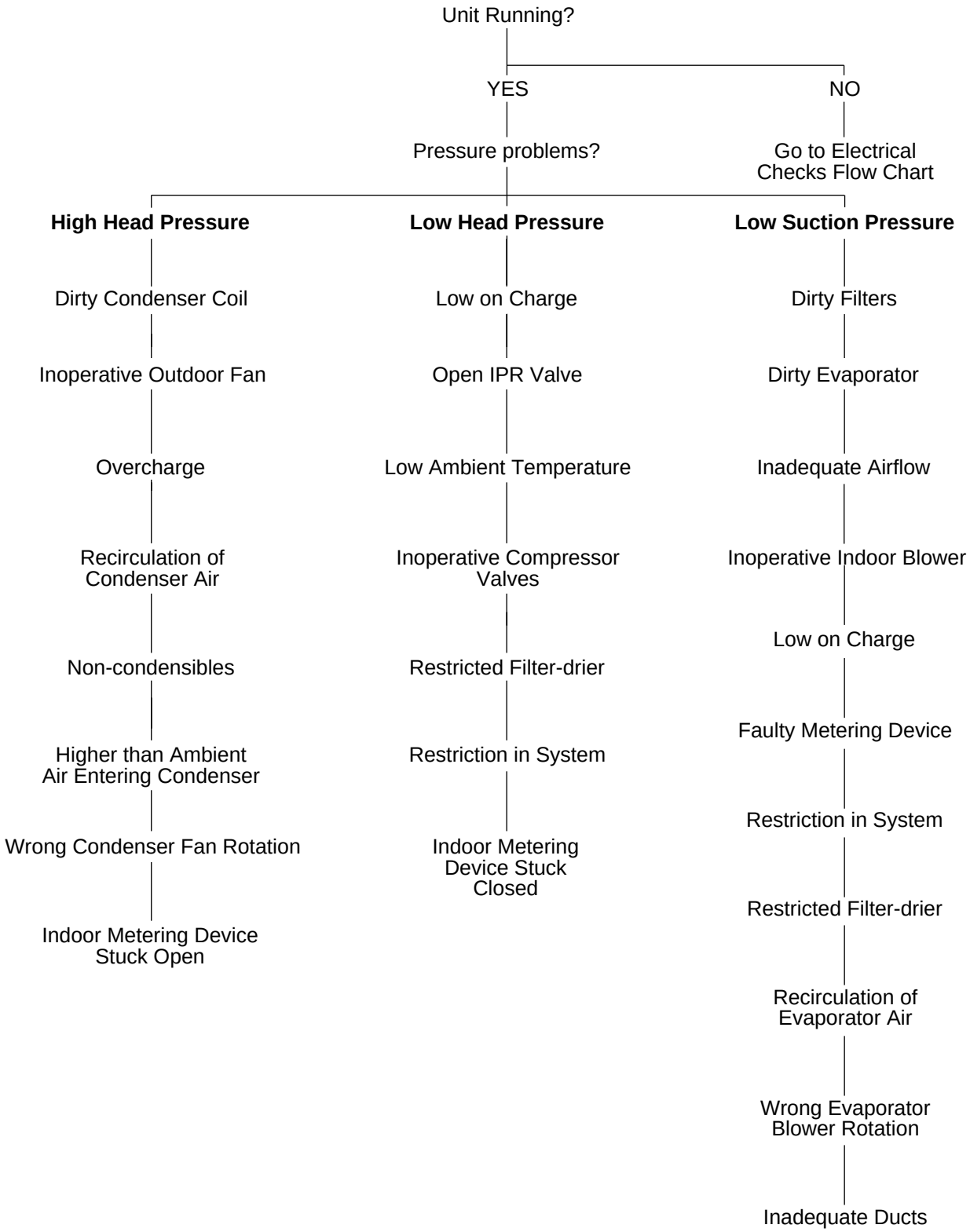


TABLE 9
TEMPERATURE PRESSURE CHART

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

SYSTEM CHARGE TROUBLESHOOTING

SUPERHEAT CALCULATION

1. Measure the suction pressure at the suction line service valve.
2. Convert the suction pressure to saturated temperature. See Table 9.
3. Measure the temperature of the suction line at the suction line service valve.
4. Compare the temperature of the suction line to the saturated temperature.
5. The difference between saturated temperature and suctin line temperature is the superheat. Superheat normal range 9° to 16°.

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 5° to 14°.

TABLE 10
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 Condenser	High	High	Low	Low	High
Low Outside Ambient Temperature	Low	Low	High	High	Low
Inefficient Compressor	Low	High	High	High	Low
TXV Sensing Bulb Charge Lost	Low	Low	High	High	Low
Poorly Insulated Sensing Bulb	High	High	Low	Low	High

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
Compressor runs, ECM outdoor fan doesn't	• 24VAC signal not present at yellow fan wire • Common signal not present at blue fan wire	• Check for correct thermostat connections • Verify blue fan wire is connected to the common side

FIGURE 8
(-)ARL-024, (-)ARL-036, (-)ARL-048 WIRING DIAGRAM

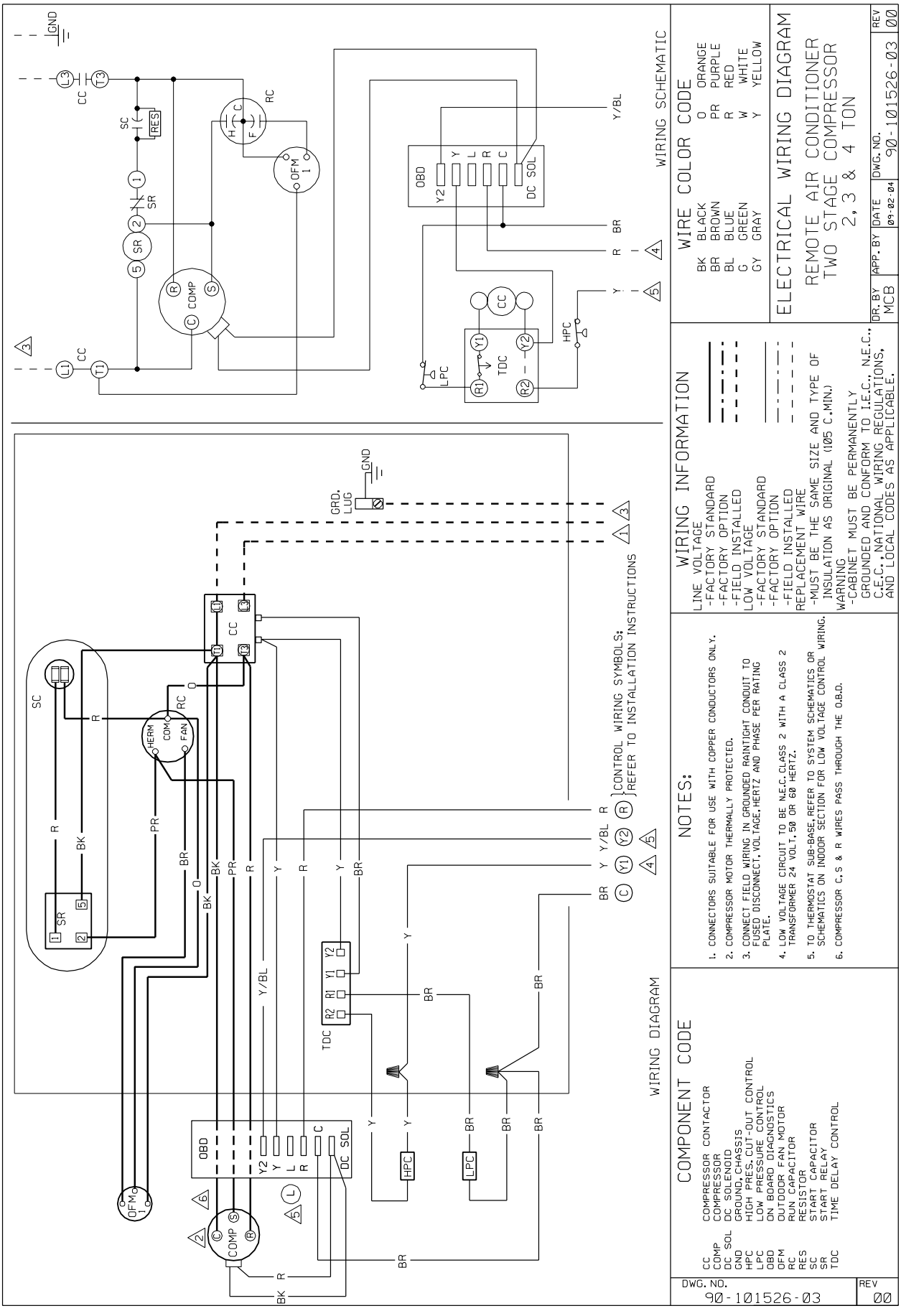


FIGURE 9
(-)ASL-036 WIRING DIAGRAM

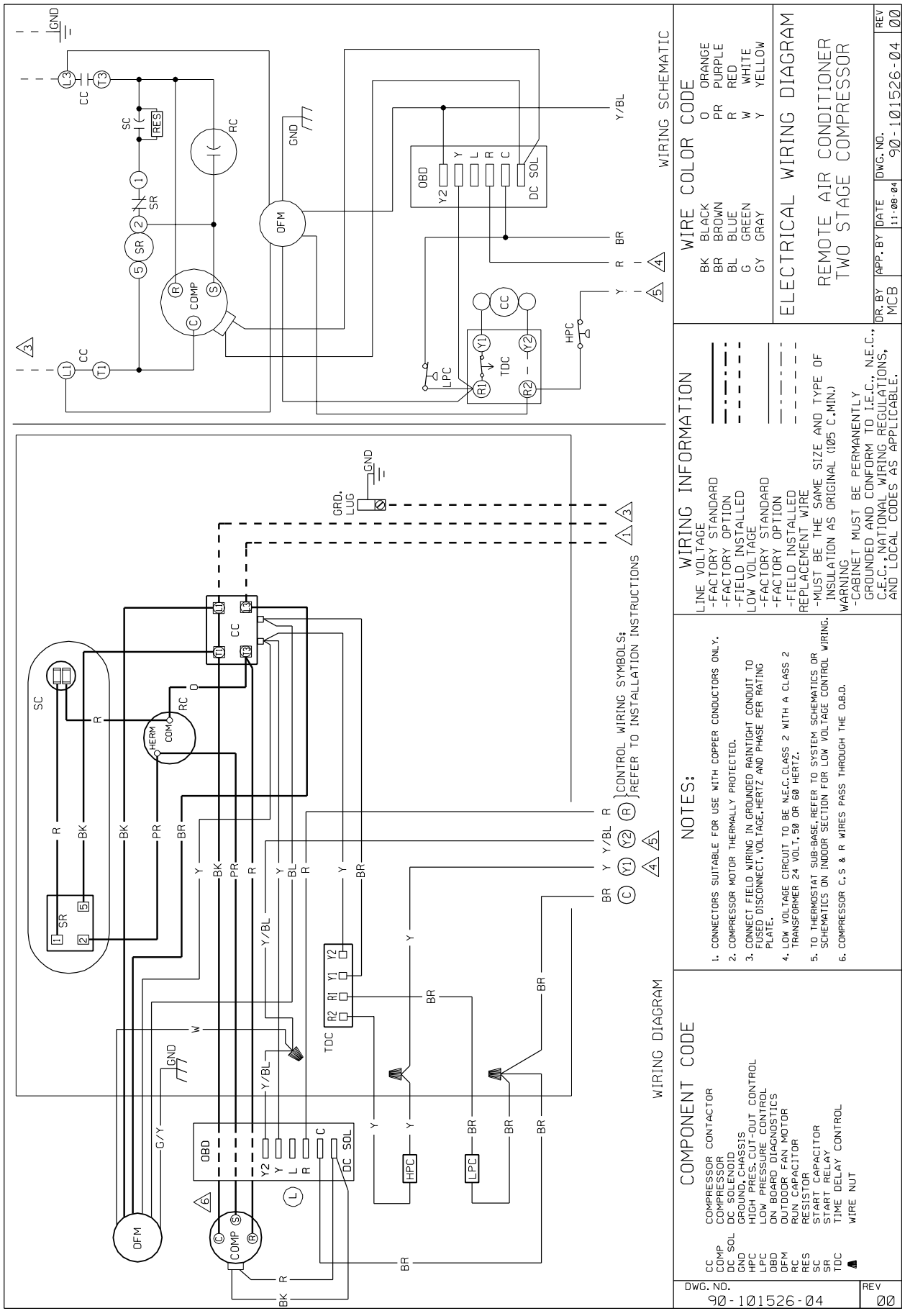


FIGURE 10
(-)ARL-060 WIRING DIAGRAM