

Installation Instructions

DIRECT DRIVE BLOWER

PH55/PYPA SERIES

SINGLE PACKAGE HEAT

PUMPS

ELECTRIC HEAT

(OPTIONAL)



TABLE OF CONTENTS

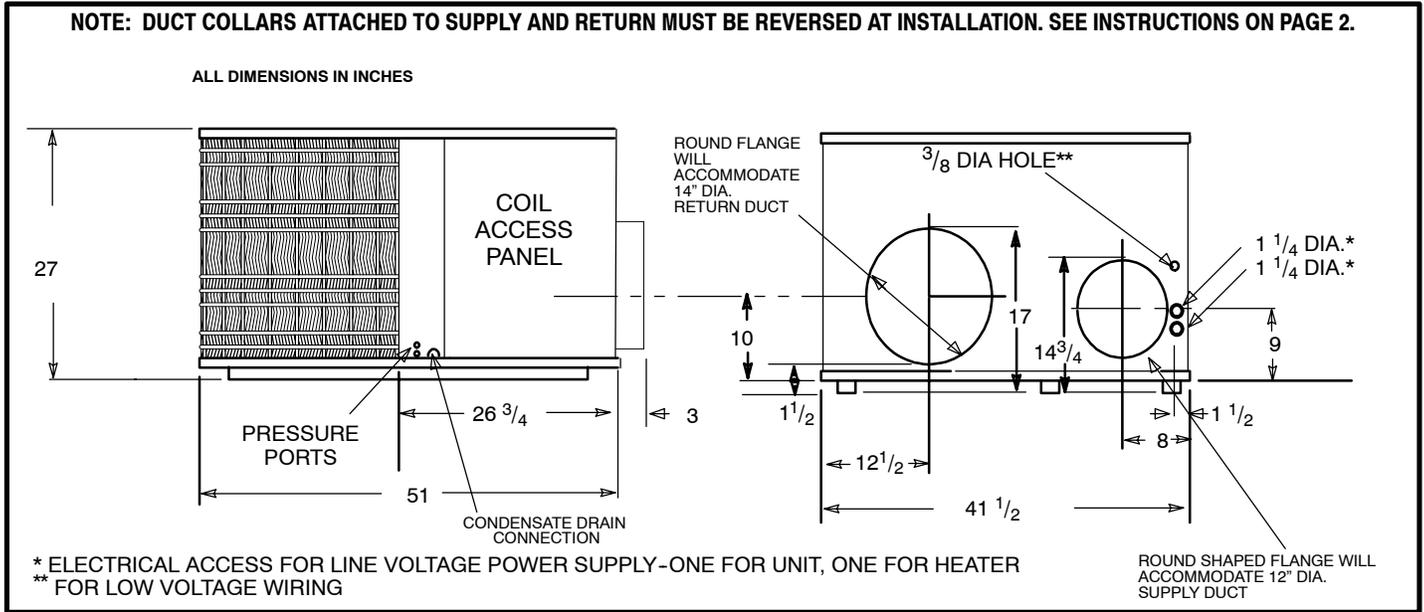
1. SAFETY LABELING AND SIGNAL WORDS	2	8. INSTALLING ELECTRIC HEAT ACCESSORY	10
2. UNIT DIMENSIONS	2	9. HEATER ELECTRICAL WIRING	11
3. SAFE INSTALLATION REQUIREMENTS	2	10. RAIN SHIELD INSTALLATION	15
4. LOCATING THE UNIT	2	11. AIR DISTRIBUTION SYSTEM	15
5. UNIT ELECTRICAL WIRING	4	12. START-UP PROCEDURES	15
6. WIRING DIAGRAMS	8	13. SEQUENCE OF OPERATION	17
7. ELECTRIC HEAT INSTALLATION GENERAL INFORMATION	10	14. OPERATION	18

1. Safety Labeling and Signal Words

Danger, Warning and Caution

The signal words **DANGER**, **WARNING** and **CAUTION** are used to identify levels of hazard seriousness. The signal word **DANGER** is only used on product labels to signify an immediate hazard. The signal words **WARNING** and **CAUTION** will be used on product labels and throughout this manual and other manuals that may apply to the product.

2. Dimensions



3. Safe Installation Requirements

WARNING

Installation or repairs made by unqualified persons can result in hazards to you and others. Installation **MUST** conform with local building codes or, in the absence of local codes, with the National Electrical Code NFPA70-1990 or current edition.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in unit malfunction, property damage, personal injury and/or death.

- Seal supply and return air ducts.
- Check to see that filters are installed correctly and are the proper type and size.

NOTE: It is the personal responsibility and obligation of the customer to contact a qualified installer to ensure that the installation is adequate and conforms to governing codes and ordinances.

CAUTION

Do NOT operate unit in a corrosive atmosphere containing chlorine, fluorine, or any other corrosive chemicals.

4. Locating The Unit

The unit is designed for outdoor installation only. Place the unit on a platform at ground level. The unit may be installed on a concrete slab of 48" (1219mm) x 48" (1219mm) dimensions. Cement blocks on a 3" sand footing will also work. The slab or blocks **SHOULD NOT** be in contact with any part of the structure. Check local codes covering zoning, noise, platforms, etc..

If practical avoid locating next to fresh air intakes, vent or bedroom windows. Noise may carry into the openings and disturb people inside.

Avoid installations under roof overhangs without gutturing. Water draining from the roof onto the unit could produce excessive noise, and may cause ice to build up on coil or fan.

Placement of the unit should be in a well drained area or the unit **MUST** be supported high enough so runoff will not enter the unit.

Do not locate unit where heat, lint or exhaust fumes will be discharged on unit (as from dryer vents.)

Clearances

Minimum clearances, as specified in **FIGURE 1**, **MUST** be maintained from adjacent structures to provide adequate air circulation and room for service personnel.

While minimum clearances are acceptable for safety reasons, they may not allow adequate air circulation around the unit for proper operation. Whenever possible, it is desirable to allow additional clearance, especially around the condenser inlet and discharge openings.

Do **NOT** install the unit in a recessed or confined area that will permit discharged air from the condenser to recirculate to the condenser inlet.

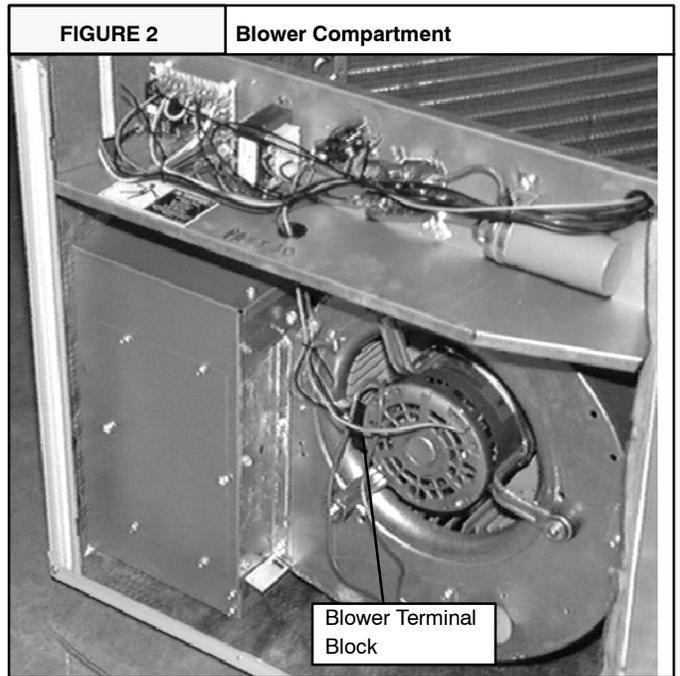
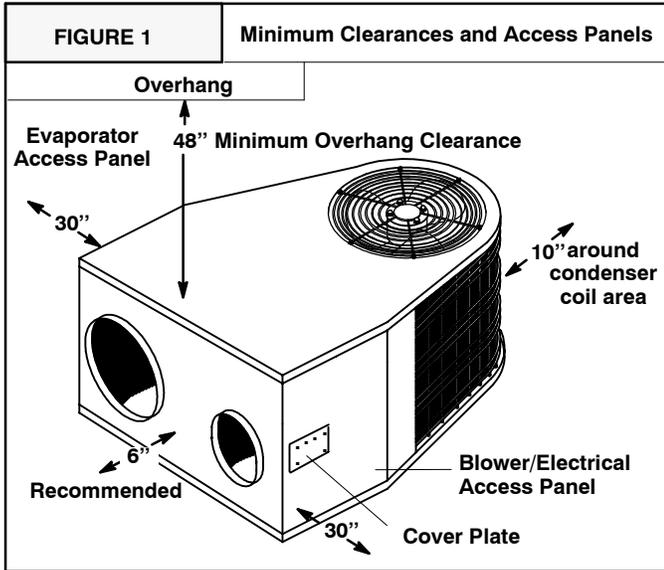
Minimum Clearances to Combustible Construction

SERVICE ACCESS CLEARANCES

Blower Access Panel Side	30" (762mm)
Electrical Access Panel Side	30" (762mm)

OPERATIONAL CLEARANCES

Combustible Base (Wood or Class A, B or C roof covering material)	0"
Supply and Return Air Ducts	0"
Duct Connection Side	0"
Clearance between Overhang and Top of Unit	48" (1219mm)
Clearance around Condenser Coil area to wall or shrubs	10"



Installing Duct Collars

Duct collars are supplied with the unit and are attached to the supply and return openings with the flanges to the inside and must be reversed before unit's installation.

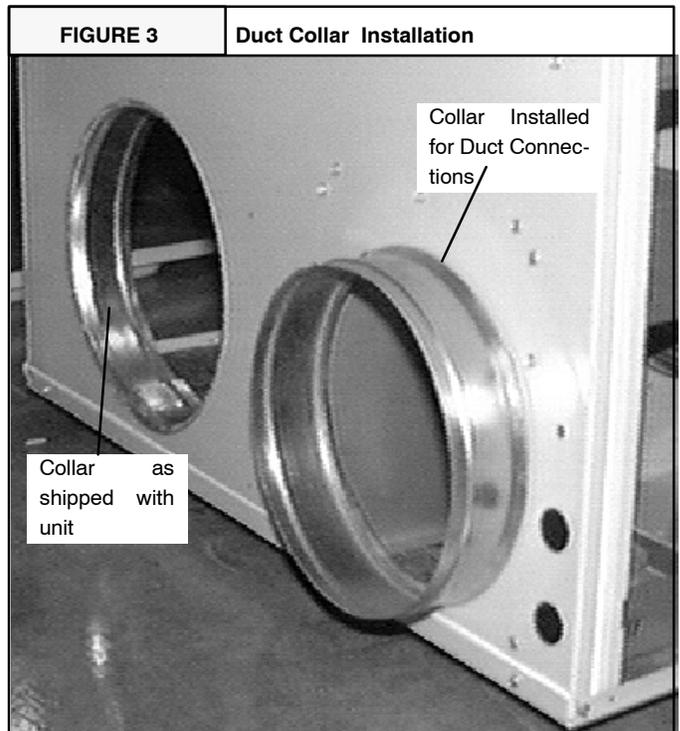
1. Remove the screws from the collars and reverse them so the flange is to the outside.
2. Make sure when pushing the collars into place that the "V" flange of the collars seats into the supply and return holes securely.
3. Re-install screw in each collar so it goes through both of the holes in the collar end. It does not matter how the ends of the collar overlap in order to accomplish this.

Installation

CAUTION

The unit must be installed with a slope no greater than $\frac{1}{8}$ " per foot (10mm per meter). For side to side leveling, the condensate drain side side **MUST** always be lower.

- The unit **MUST** be situated in such a way as to provide safe access for servicing.
- The platform may be made of either concrete or pressure treated wood and **MUST** be level and strong enough to support the unit's weight.
- Position platform separate from the building's foundation.
- Install in a well-drained area, with the top surface of the platform above grade level and above the average winter snow levels to prevent coil blockage.
- Platform **MUST** be high enough to allow for proper condensate drainage.

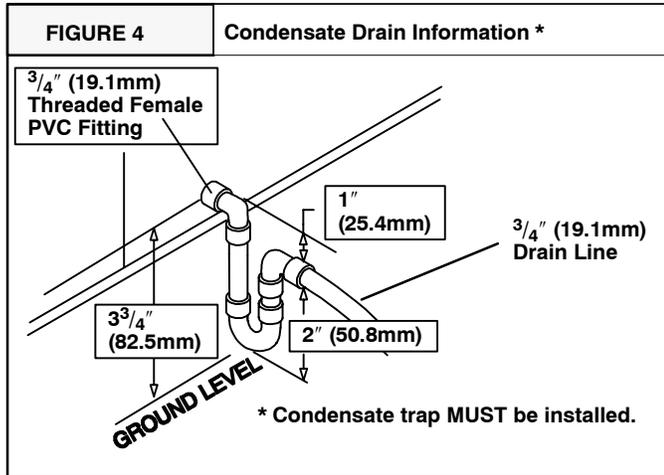


Condensate Drain

The condensate drain outlet is a $\frac{3}{4}$ " (19.1 mm) threaded female PVC connection located at the bottom of the unit to the left of the evaporator access panel.

The circulating blower and the condenser fan create a negative pressure on the condensate drain line that will prevent the condensate from draining properly without a trap. To combat this negative pressure, a field supplied condensate trap that will allow a standing column of water of at least 2" (50.8mm) **MUST** be installed. The outlet of the trap must be at least 1" below the unit drain connection. **Install the trap as near to the unit as possible for proper drainage.**

A $\frac{3}{4}$ " (19.1 mm) drain line **MUST** be installed if required by local codes or if location of unit requires it. Run the drain line to an open drain or other suitable disposal point.



5. Unit Electrical Wiring

WARNING

Electrical shock hazard.

Disconnect power at fuse box or service panel before making any electrical connections.

Unit **MUST be grounded to electrical service panel.**

Failure to follow this warning can result in property damage, personal injury, and/or death.

NOTE: All electrical work **MUST** conform with the requirements of local codes and ordinances and in the United States with National Electrical Code ANSI/NFPA 70-1990 (or current edition). Provide line voltage power supply from a separate fused circuit with a disconnect switch (when required) located within sight of the unit. Supply voltage, amperage, fuse and disconnect switch sizes **MUST** conform with local codes and ordinances.

Wiring **MUST** be protected from possible mechanical damage and **MUST NOT** interfere with removal of access panels, filters, etc.

All exposed line voltage connections **MUST** be made through liquid tight conduit to prevent water from entering the unit through the electrical access..

Ground Connections

A ground lug is installed on the control plate (or electric heat mounting plate) for the ground connection. Use a copper conductor of the appropriate size from the unit to a grounded connection in the electrical service panel or to a properly driven and electrically grounded ground rod. See warning on this page.

Line Voltage Wiring

Do **NOT** complete line voltage connections until unit is permanently grounded. All line voltage connections and the ground connection **MUST** be made with copper wire.

Connections for line voltage are made on the unit electrical control plate (see **FIGURE 6**). For access, remove the Blower/Electrical access panel.

Refer to applicable wiring diagram in *this Manual*. Complete the line service connections to the contactor 'L' terminals on the electrical control plate. Check all screw terminals to ensure they are tight.

NOTE: If an Electric Heat Accessory is installed, refer to the Electric Heat Accessory *section of this manual* to determine line voltage connections. The Electric Heat Accessory mounts inside the unit in the heater box. Field supplied line voltage wires for the Electric Heat Accessory (separate from the field supplied line voltage wires to the unit) connect to the appropriate circuit breaker (if used) in the Electric Heat Accessory.

Converting 230V Units to 208V

To convert 230V units to 208V:

1. Turn electric power **OFF**.
2. Remove the blower/electrical access panel.
3. Locate the 24V control transformer.
4. Remove wire from the terminal labeled "240V" on the 24V control transformer and reconnect it to the 208V terminal of the 24V control transformer.
5. Replace the electrical/compressor access panel.

Low Voltage Wiring

For access, remove the electrical control/blower access panel.

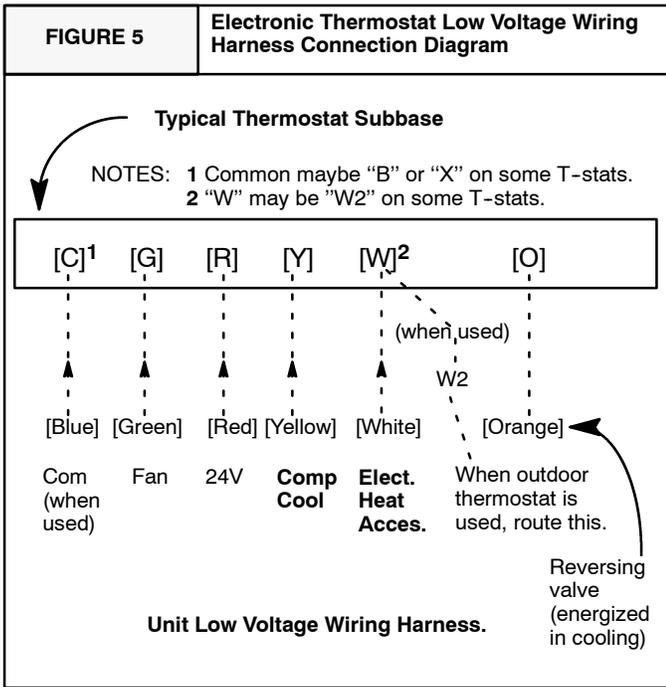
Refer to the connection wiring diagram for the applicable model and to the instructions included with the thermostat.

Route low voltage wires through the port located on the rear panel and up to the control box.

NOTE: If an Electric Heat Accessory is installed, see the Electric Heat Accessory *Installation Section of this manual* for low voltage connections.

Thermostat Connections

The location of the thermostat has an important effect on the operation of the unit. See the thermostat instructions for proper connection. See **FIGURE 5** for Low Voltage Wire Harness Connections



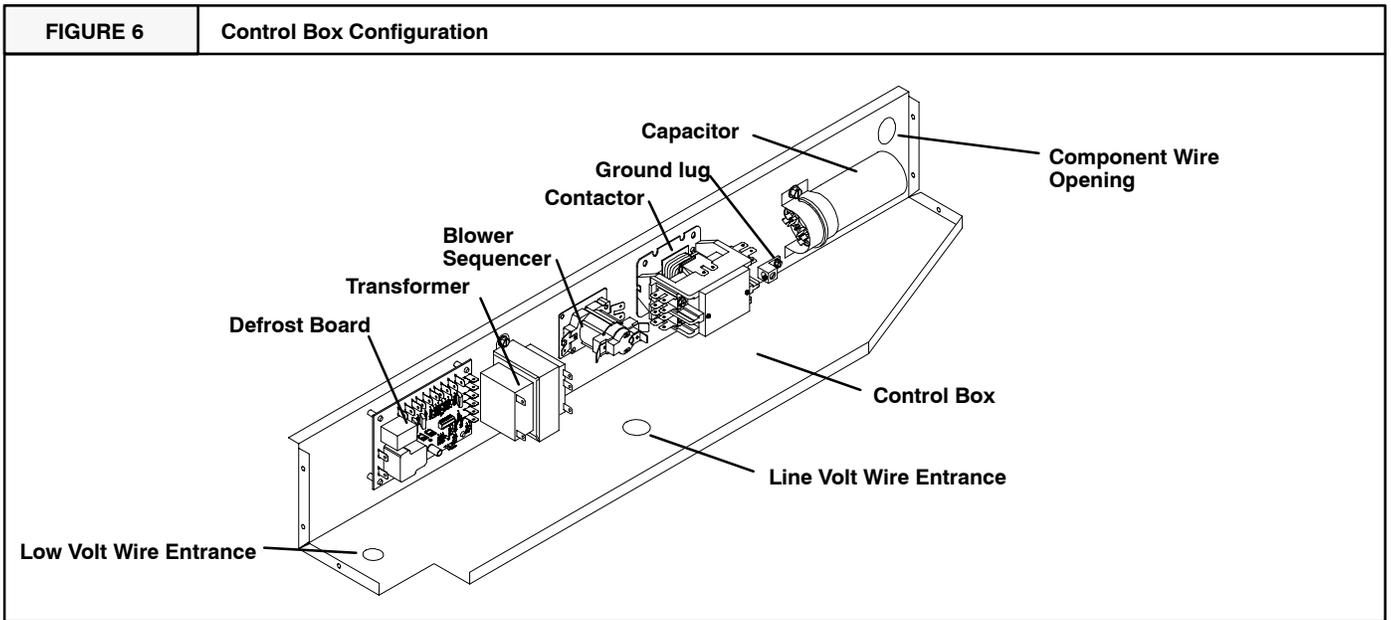
Field Installed Equipment

Wiring to be done in the field between the unit and other devices, or between separate devices which are field installed and located, **MUST NOT** exceed the temperature limitations for type T wire and **MUST** be installed according to the manufacturer's instructions for the devices.

Final Electrical Check

Make a final wiring check to be sure system is correctly wired. Inspect field installed wiring and the routing to ensure that rubbing or chafing due to vibration will not occur.

NOTE: Wiring **MUST** be installed so it is protected from possible mechanical damage.

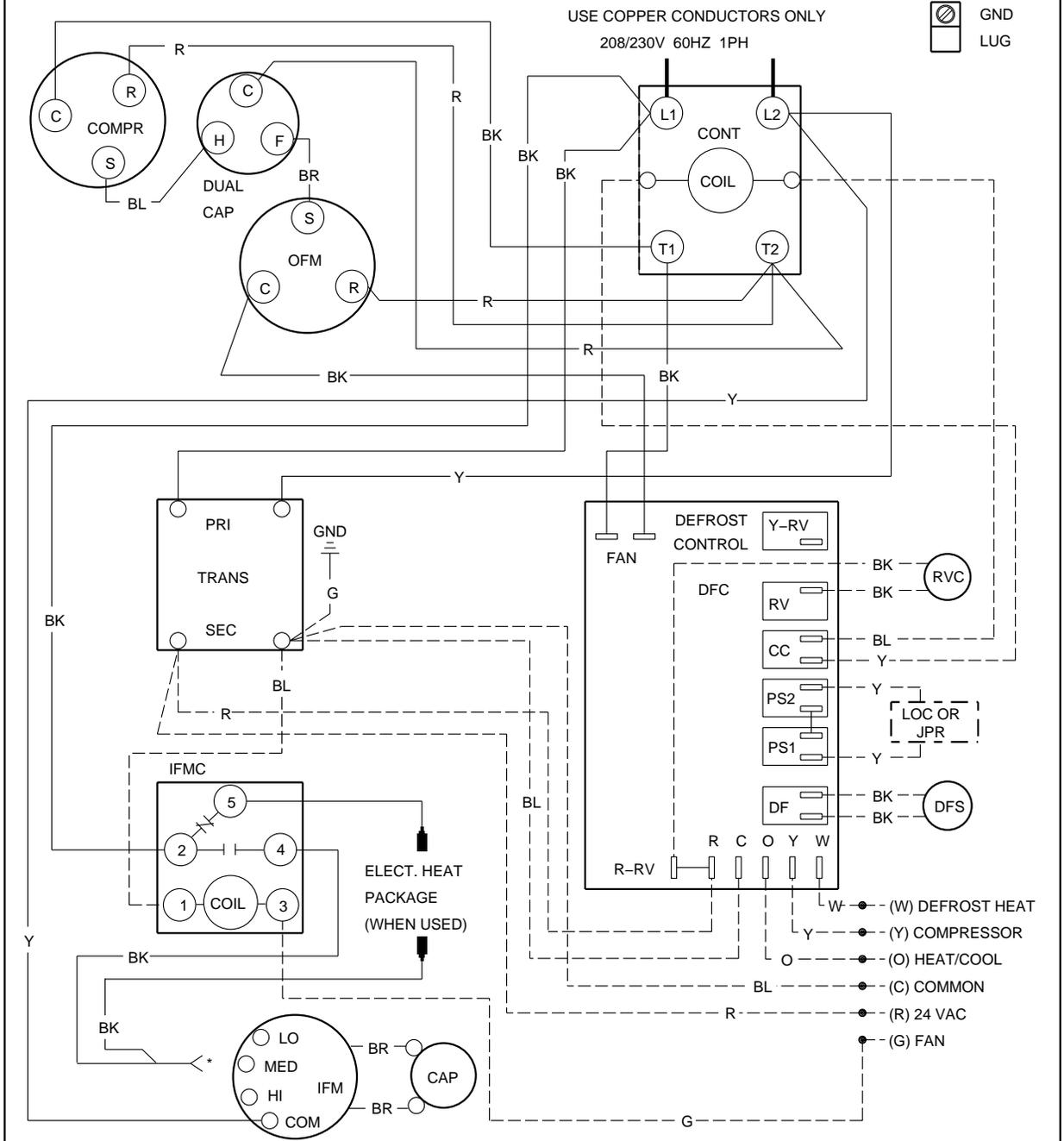


6. Wire Diagrams

2-3¹/₂ Ton Models

CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH TYPE AWM-105°C OR ITS EQUIVALENT.

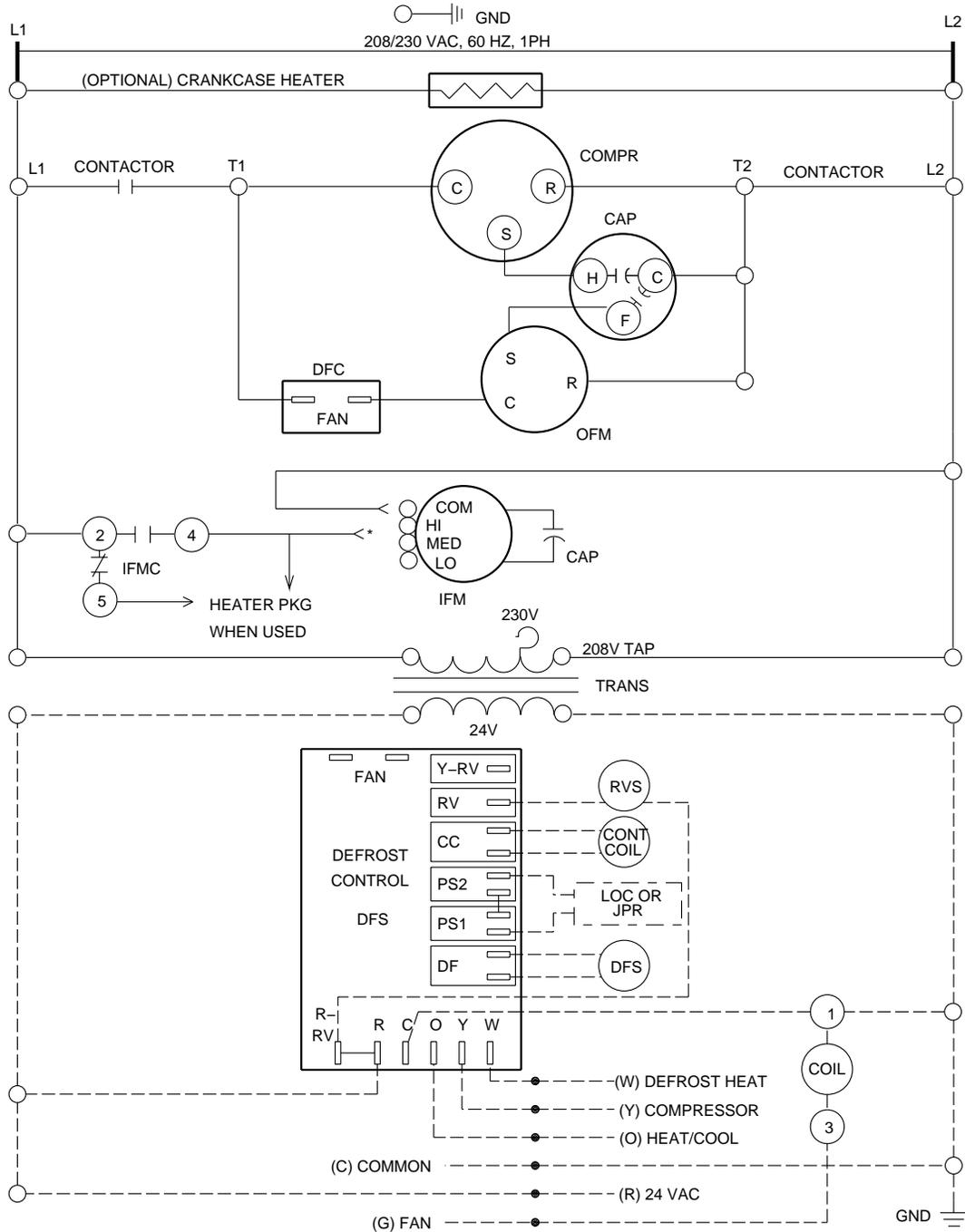
* SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT

Wire Diagrams (Cont'd...)

2-3¹/₂ Ton Models

LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



LEGEND

TRANS.....TRANSFORMER	GND.....GROUND	IFMC.....INDOOR FAN MOTOR CONTROL
COMPR.....COMPRESSOR	LOC.....LOSS OF CHARGE	IFM.....INDOOR FAN MOTOR
CAP.....CAPACITOR	PRESSURE SWITCH	RVS.....REVERSING VALVE SOLENOID
CONT.....CONTACTOR	DFS.....DEFROST SENSOR	OFM.....OUTDOOR FAN MOTOR
JPR.....JUMPER WIRE	DFC.....DEFROST CONTROL	TC.....TERMINAL CONNECTOR

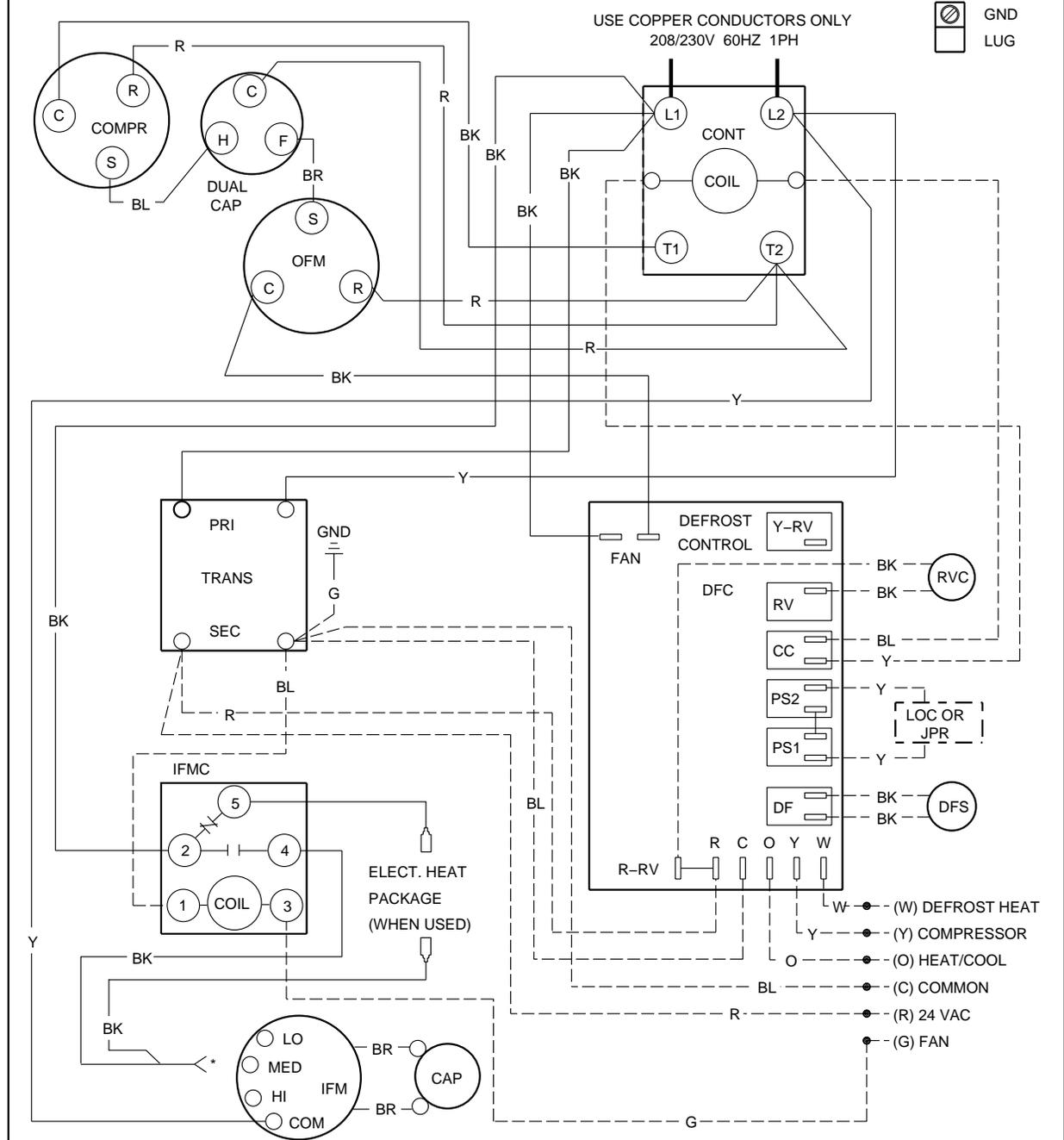
1081362

Wire Diagrams (Cont'd...)

4 & 5 Ton Model

CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH TYPE AWM-105°C OR ITS EQUIVALENT.

* SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT

—	LINE VOLTAGE FACTORY	COLOR CODE :	BLACK BK	GREEN G	WHITE W
—	LINE VOLTAGE FIELD		BLUE BL	ORANGE O	YELLOW Y
- - -	LOW VOLTAGE FACTORY		BROWN BR	RED R	
- - -	LOW VOLTAGE FIELD		GRAY GY	VIOLET V	

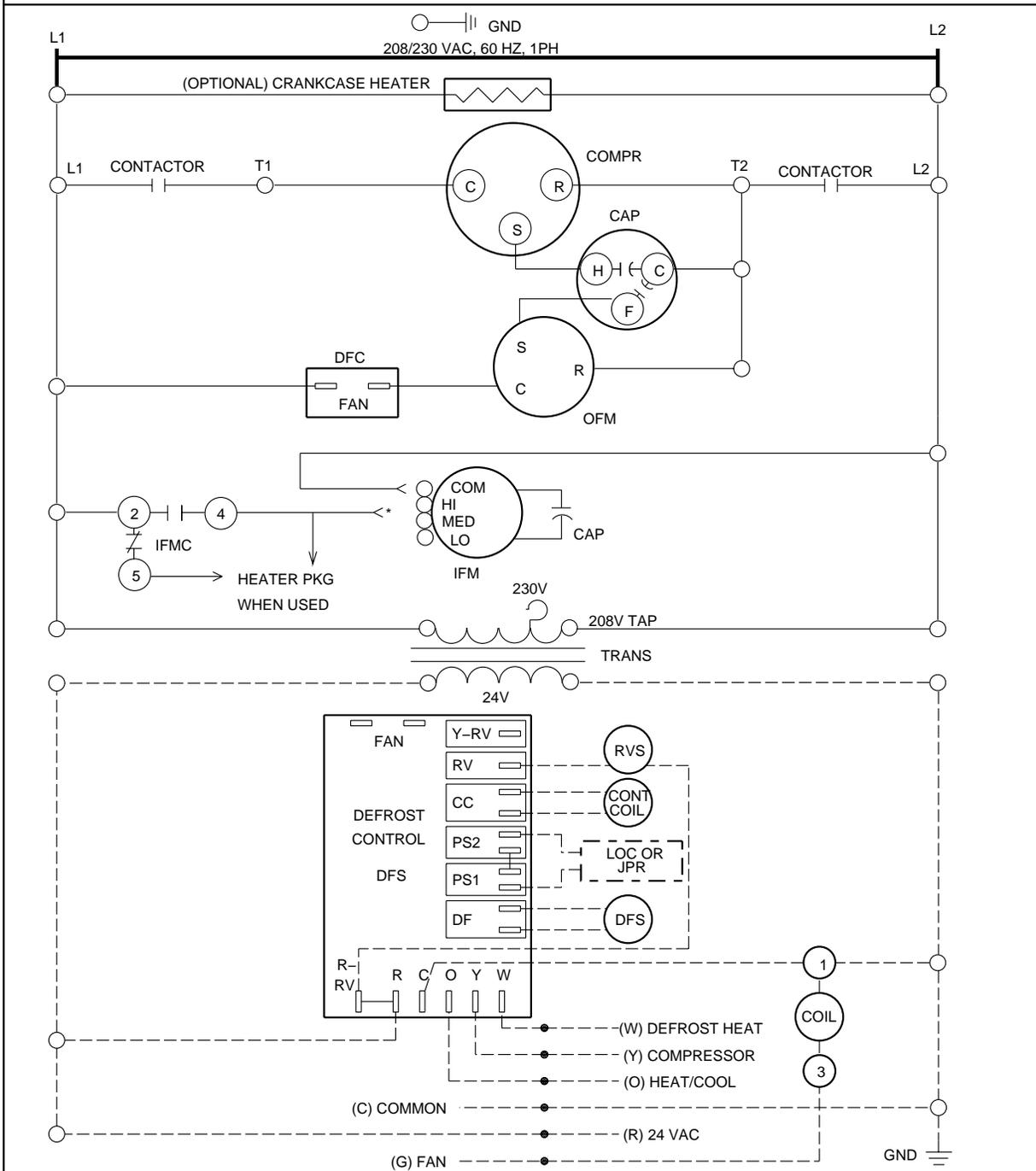
1081364

Wire Diagrams (Cont'd...)

4 & 5 Ton Model

LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



LEGEND

- | | | |
|-----------------------|-------------------------|-----------------------------------|
| TRANS.....TRANSFORMER | GND.....GROUND | IFMC.....INDOOR FAN MOTOR CONTROL |
| COMPR.....COMPRESSOR | LOC.....LOSS OF CHARGE | IFM.....INDOOR FAN MOTOR |
| CAP.....CAPACITOR | PRESSURE SWITCH | RVS.....REVERSING VALVE SOLENOID |
| CONT.....CONTACTOR | DFS.....DEFROST SENSOR | OFM.....OUTDOOR FAN MOTOR |
| JPR.....JUMPER WIRE | DFC.....DEFROST CONTROL | TC.....TERMINAL CONNECTOR |

1081364

7. Electric Heat Installation General Information

General Information

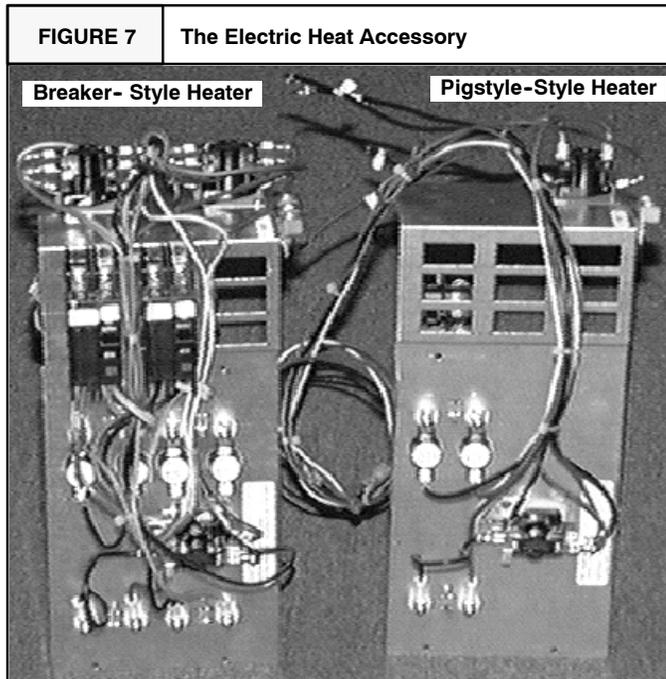
WARNING

Installation or repairs made by unqualified persons can result in hazards to you and others. Installation must conform with local building codes or, in the absence of local codes, with National Electrical Code ANSI/NFPA 70-1990 or current edition.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures, equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in malfunction, property damage, personal injury, and/or death.

When an electric heat accessory is installed, two separate field power supplies **MUST** be provided - **one or more** for the electric heat accessory and **one** for the unit.



8. Installing Electric Heat Accessory

WARNING

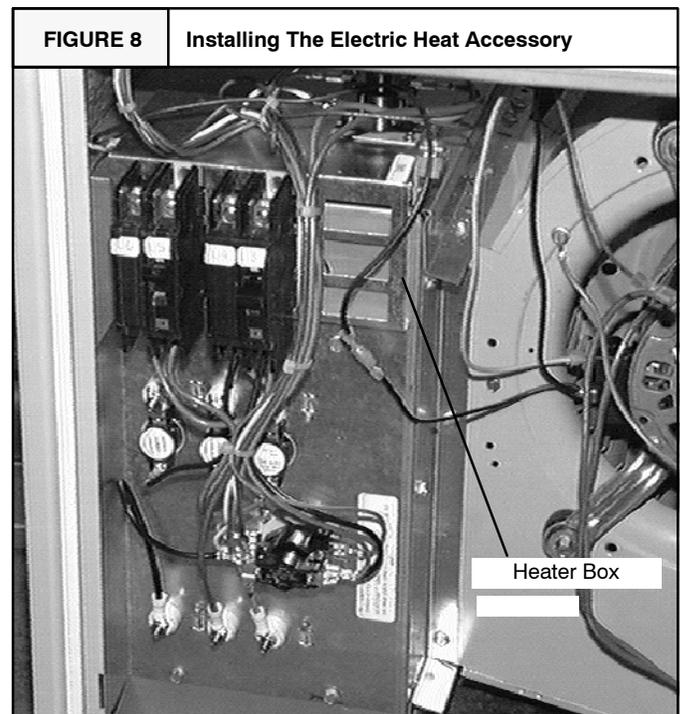
Electrical shock hazard.

Shut OFF electric power at unit disconnect and/or service panel before beginning the following procedures.

Failure to follow this warning can result in property damage, personal injury, and/or death.

1. Shut OFF electric power at unit disconnect switch or service panel.
2. Remove the blower access panel from unit.
NOTE: Installation of field wiring and conduit for heaters to the unit prior to installing the heater will simplify wiring of heaters.
3. From inside the blower compartment, remove the six screws on the heater cover plate and save the screws. Discard the heater cover plate.

The screws will be used later to mount the electric heat accessory and its cover.
4. Remove the cardboard wrapper from the heater's elements.
5. Insert the heater into the heater/blower box. Exercise caution to prevent damage to heater elements.
6. Secure heater to heater/blower box with four of the six screws removed in **Step 3**.



9. Heater Electrical Wiring

WARNING

Electrical shock hazard.

Shut OFF electric power at unit disconnect or service panel before making any electrical connections.

Unit **MUST** be grounded before making line voltage connections. Do NOT fuse ground or neutral conductors.

Failure to follow this warning can result in property damage, personal injury, and/or death.

NOTE: All electrical work **MUST** conform with the requirements of local codes and ordinances and in the United States with National Electrical Code ANSI/NFPA70-1990 or current edition. Provide line voltage power supply from a separate protected circuit with a disconnect switch (when required) located within sight of the unit. Supply voltage, amperage, fuse and disconnect switch sizes **MUST** conform with all technical specifications in this manual and on the unit rating plate and local codes.

Wiring **MUST** be protected from possible mechanical damage and **MUST NOT** interfere with removal of access panels, filters, etc.

All exposed wiring or connections **MUST** be made with weatherproof cable or wire unless installed in conduit.

All line voltage connections and the ground connection **MUST** be made with copper wire.

The power supply wiring **MUST** have overcurrent protection. This can be either fuses or circuit breakers. The maximum size for the overcurrent protection is shown in the column labeled "Max. Fuse or NEC HACR Breaker (Amps)" in the Electrical Data Table in **FIGURE 10** or on the unit rating plate.

Grounding

Permanently ground the electric heat accessory in accordance with local codes and ordinances and in the United States with National Electrical Code ANSI/NFPA70-1990 or current edition. Use a copper conductor of the appropriate size from the electric heat accessory to the ground lug on the circuit breaker panel as shown in **FIGURE 9**.

Adjusting Thermostat Anticipator

Set the heat anticipator of the thermostat to the proper value. See instructions provided with the thermostat before making this adjustment.

Model Number	Anticipator Setting
AMMK05AHB/A	.18
AMMK07AHB/A	.36
AMMK10AHB/A	.36
AMMK15AHB/A	.36
AMMK20AHB/A	.54

Limit Controls

The limit controls are mounted on the face of the heater and are wired into the supply wires to each element. If there is not enough air flow through the heater, the limit will open and break the power circuit. The limit will reset when the electric accessory cools down.

Time Delay Operation

The heater elements are switched **ON** and **OFF** through one or more controls which operate through the low voltage thermostat circuit.

These controls consist of a number of time delays depending on the specific heater model. An electric heat accessory has 1, 2 or 3 of these controls. The first time delay is activated when the thermostat contacts close. Approximately 1 to 20 seconds later the indoor blower and the first heater bank are energized. Approximately 70 seconds after the first heater bank is energized the remaining time delays and heater banks are energized.

Staging

Some electric utilities require staging on electric heaters larger than 6 kilowatts. Therefore, the heater elements are turned on in 5 or 10 kW increments under control of the sequencers.

If staging based on heat loss or demand is required, the use of accessory outdoor thermostats is recommended. The heat sequencer wiring is designed to be staged by breaking the 24V "Common" Leg (normally brown or gray). Outdoor thermostats available through your wholesale supplier allow the control of two or four stages of electrical heat.

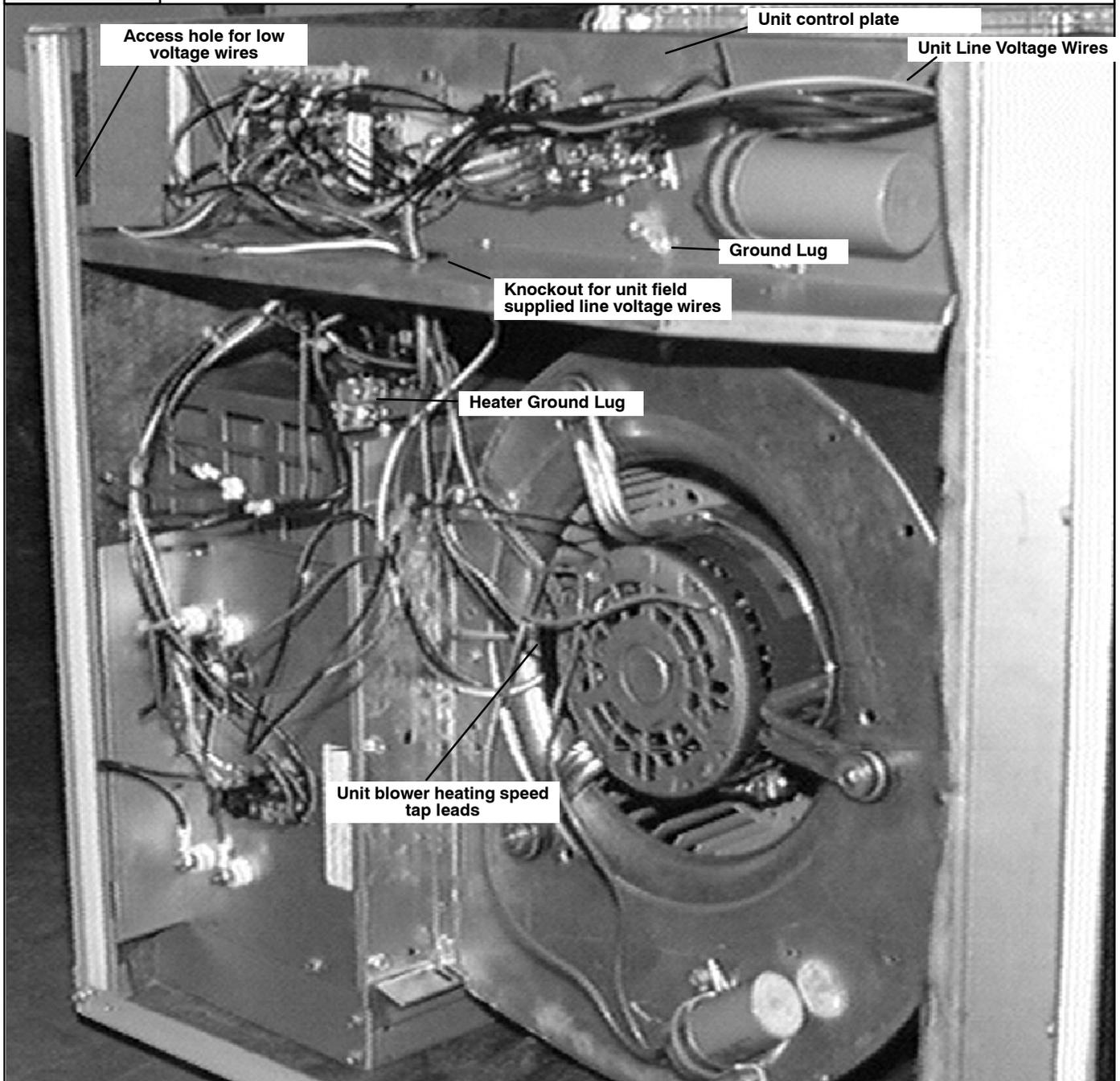
Some indoor electronic thermostats may provide for multiple stage of electric heat. When this type thermostat is used, it may be necessary to break the 24V "Hot" leg of the sequencer (as fed from the "W" circuit at the thermostat). This will require field modification of the control wiring and should only be done by an experienced controls technician/or electrician.

Installing Wiring

1. Shut **OFF** electric power at unit disconnect or service panel.
2. Install the appropriate field supplied conduit fitting into the heater knockout located in the rear panel of the unit. The wiring entrance hole is sized for 1" conduit.

FIGURE 9

Typical Wiring Installation (Breaker Style Heater Shown-Pigtail style also available)



3. Connect field installed copper ground wire(s) to the ground lug(s) on the heater mounting plate. On models with more than one circuit, a separate copper ground wire **MUST** be connected to a separate ground lug for *each* circuit.

4. Route the field supplied line voltage wires for the heater to the line side of the electric heat accessory's circuit breaker(s) or high voltage wiring harness. Leave approximately 8" of excess wire so the breaker or wiring harness may be moved to service. Make line voltage connections to L3-L6 as appropriate. NOTE: If heaters without breakers are used, route field wires to inside of unit and attach to heater wires tagged L3-L6 as appropriate using supplied wire nuts.

5. Connect the black wire with terminal from the heater wire harness to the loose black wire at the unit blower.
NOTE: Check **FIGURE 11** for heater/speed combinations that are unacceptable.

6. Connect the red wire with terminal in the heater wire harness to the loose red wire from the unit sequencer.

7. Connect the white wire from the heater wire harness to the white wire from the thermostat at the field supplied low volt wire harness in the control box.

8. Connect the grey and brown wires from the heater wire harness to the blue wire from the unit 24V common. NOTE: If outdoor thermostats are used for staging electric heat, connect the grey and brown wires according to the thermostat instructions. See "Staging" in *Electrical Wiring* Section of this Manual.

After completing installation of the heater, install the breaker rain shield on the blower access panel according to the following instructions on page 13. If using a pigtail style heater, proceed to Start-Up Procedures for Auxiliary Electric Strip Heat on page 14.

FIGURE 10 Accessory Electric Heater Electrical Data

HEATER MODEL	Used With	Supply Voltage	KW Rating	Nominal Heating BTUH	Supply Circuit No.	Heater Amps	Minimum Circuit Ampacity	Maximum Overcurrent Protective Device (Amps)
AMMK05AHA AMMK05AHB	2-5 TON	240-1-60	4.8	16,382	L3 - L4	20.0	25.0	30
		208-1-60	3.6	12,287	L3 - L4	17.3	21.6	25
AMMK07AHA AMMK07AHB	2-5 TON	240-1-60	7.5	25,598	L3-L4	31.2	39.1	45
		208-1-60	5.6	19,113	L3-L4	26.9	33.6	40
AMMK10AHA AMMK10AHB	2-5 TON	240-1-60	9.6	32,765	L3 - L4	40.0	50.0	60
		208-1-60	7.2	24,574	L5 - L6	34.6	43.3	50
AMMK15AHB	2 1/2-5 TON	240-1-60	14.4	49,147	L3 - L4	40.0	50.0	60
			L5 - L6	20.0	25.0	30		
		208-1-60	10.8	36,860	L3 - L4	34.6	43.3	50
			L5 - L6	17.3	21.6	25		
AMMK20AHB	2 1/2-5 TON	240-1-60	19.2	65,530	L3 - L4	40.0	50.0	60
			L5 - L6	40.0	50.0	60		
		208-1-60	14.4	49,147	L3 - L4	34.6	43.3	50
			L5 - L6	34.6	43.3	50		

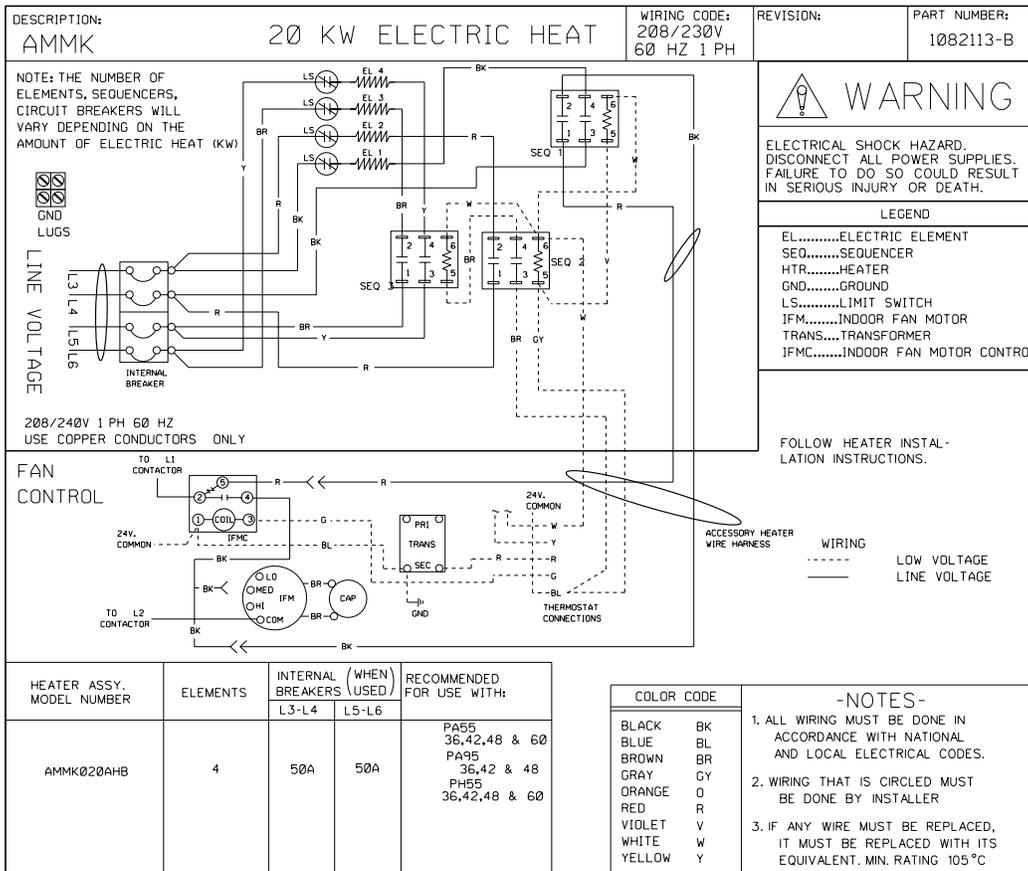
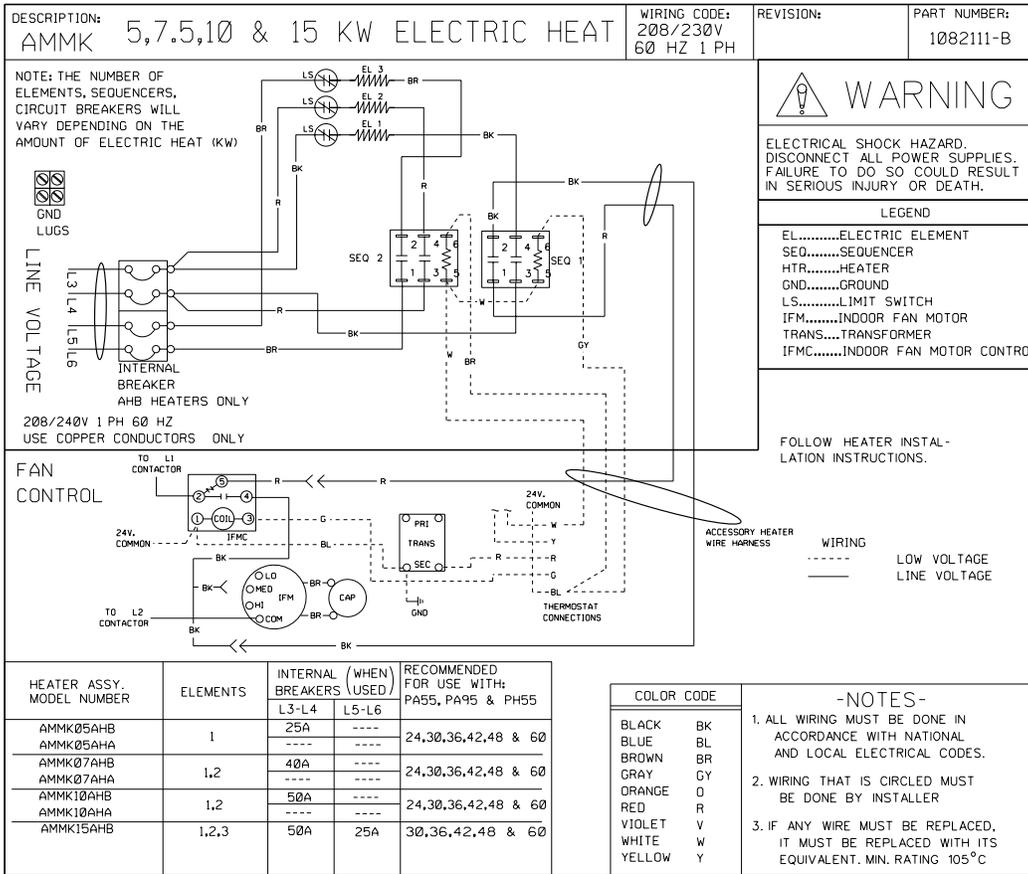
FIGURE 11 Accessory Electric Heater Heating Data

Heater Model	Use With	Supply Voltage	KW Rating	Total Heating BTUH	*Temperature Rise °F @ CFM (Electric Heat Only)								
					600	800	1000	1200	1400	1600	1800	2000	2200
AMMK05AHA AMMK05AHB	2-5 TON	240-1-60	4.8	16,832	25.3	19.0	15.2	12.6	10.8	9.5	8.4	7.6	---
		208-1-60	3.6	12,287	19.0	14.2	11.4	9.5	8.1	7.1	6.3	5.7	---
AMMK07AHA AMMK07AHB	2-5 TON	240-1-60	7.5	25,598	39.5	29.6	23.7	19.8	16.9	14.8	13.2	11.9	10.8
		208-1-60	5.6	19,113	29.5	22.1	17.7	14.7	12.6	11.1	9.8	8.8	8.0
AMMK10AHA AMMK10AHB	2-5 TON	240-1-60	9.6	32,765	50.6	37.9	30.3	25.3	21.7	19.0	16.9	15.2	13.8
		208-1-60	7.2	24,574	37.9	28.4	22.8	19.0	16.3	14.2	12.6	11.4	10.3
AMMK15AHB *	2 1/2-5 TON	240-1-60	14.4	49,147	---	56.9	45.5	37.9	32.5	28.4	25.3	22.8	20.7
		208-1-60	10.8	36,860	56.9	42.7	34.1	28.4	24.4	21.3	19.0	17.1	15.5
AMMK20AHB **	2 1/2-5 TON	240-1-60	19.2	65,530	---	---	---	50.6	43.3	37.9	33.7	30.3	27.6
		208-1-60	14.4	49,147	---	56.9	45.5	37.9	32.5	28.4	25.3	22.8	20.7

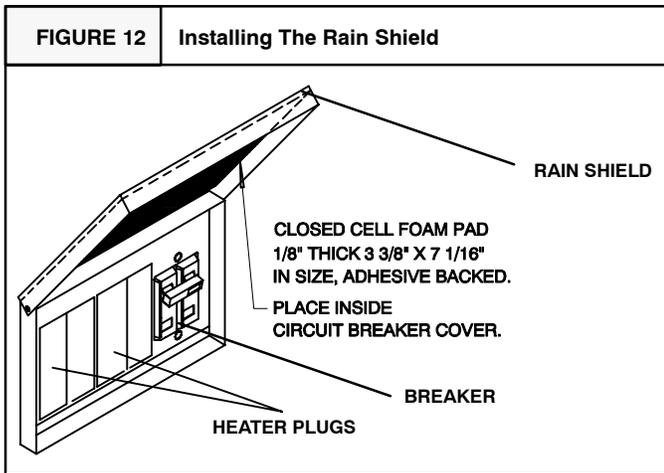
* 15 KW HEATER NOT TO BE OPERATED ON LOW TAP FOR 2 1/2 TON A/C AND HP.

** 20 KW HEATER NOT TO BE OPERATED ON LOW OR MEDIUM LOW TAP FOR 3 AND 3 1/2 A/C AND HP.

Wire Diagrams - Electric Heat Accessory



10. Rain Shield Installation



1. Remove all screws from the cover plate on Blower/Electrical Access Panel.
2. Install adhesive backed gasket on Blower/Electrical Access Panel.
3. Install lower frame of rain shield with 4 screws.
4. Install rain shield hinged cover with 4 screws.
5. Install circuit breaker filler plates (2 each per unused breaker slot.)
6. Re-install Blower/Electrical Access Panel.

NOTE: VERIFY ALL APPROPRIATE SEALS ARE IN PLACE. SEE FIGURE 12.

11. Air Distribution System

For airflow data (blower performance data, blower speed tap settings, etc.) see the *Technical Data Sheet* attached to the unit.

Ductwork

NOTE: The total heat gain of the structure to be conditioned as expressed in total Btu/hr should be calculated by manufacturer's method or in accordance with "A.S.H.R.A.E. Guide" or "Manual J - Load Calculations" published by the Air Conditioning Contractors of America. The total heat gain calculated should be equal to or less than the cooling capacity output based on D.O.E. test procedures, steady state efficiency times input.

Ductwork, supply registers, and return air grilles **MUST** be designed and sized to handle the unit's cooling air volume requirements. If the unit is

connected to an existing system, the ductwork **MUST** be checked to make sure it is adequate. Extra runs or larger duct sizes may have to be installed.

Maximum recommended velocity in trunk ducts is 1000 feet per minute (5.08m/s). Velocity in branches should not exceed 800 feet per minute (4.06m/s). Refer to the *Technical Data Label on the unit* for unit air volume requirements and system sizing recommendations.

NOTE: Ductwork sizing affects temperature rise and cooling temperature differential. Be sure to properly size ductwork to the capacity and airflow characteristics of your unit. Failure to do so can affect limit controls, compressors, motors, and other components and will lead to premature failure of components. This will also adversely affect day to day unit performance.

Flexible Duct Kits are available from your supplier to effect proper sizing and installation to **Mobile Homes and other standard construction..**

Refer to unit rating plate for proper Electric Heat Accessory sizing and see the *Temperature Rise Check* section in the Electric Heat Accessory *Installation Section* of this manual.

Ductwork Insulation

It is recommended that ductwork installed outdoors have a minimum of 2" (51 mm) of fiberglass insulation and be covered by a weatherproof vapor barrier that is protected against damage. Caulking and flashings, or other means adequate to provide a permanent weather seal, must be used.

It is recommended that ductwork installed in attics or other areas exposed to outdoor temperatures have a minimum of 2" (51mm) fiberglass insulation and have an indoor type vapor barrier.

Ductwork Connections

The use of flexible, **non-combustible** connectors between main trunk ducts and supply and return air plenums is recommended to minimize vibration transmission .

NOTE: Connect supply and return air plenums to unit in a manner that will allow the top of the unit to be removed without removing plenums. Plenums **MUST** be individually sealed to unit casing. Ducts **MUST** be terminated inside structure.

Filters

All return air **MUST** pass through a field supplied filter before entering the unit. If used, an electronic air cleaner **MUST** be installed in the *return* air ductwork. Minimum recommended filter areas are listed in **FIGURE 13** and are based on a velocity of 300 ft/min (1.2m/s) for disposable filters and 500 ft/min (2.54m/s) for washable high velocity filters.

CAUTION

Do NOT operate the unit without all filters in place.

FIGURE 13		Recommended Filter Sizes	
NOTE: Some filters are marked with an arrow to indicate the proper direction of air flow through the filter. The air flow direction will be towards the blower motor. Make sure filter is installed correctly.			
Nominal Tons Air Conditioning	Nominal Air Flow Cubic Feet per Minute	Recommended Filter Sizes Sq. In. Surface Area/Nominal Size	
		Disposable Filters	Cleanable Filters
2	700-900	400 or 20 x 25	246 or 15 x 20
2 1/2	900-1100	487 or 20 x 30	301 or 14 x 25
3	1100-1300	576 or 14 x 25 (2Req.)	356 or 16 x 25
3 1/2	1300-1500	665 or 16 x 25 (2Req.)	411 or 20 x25
4	1500-1700	753 or 20 x 25 (2 Req.)	466 or 20 x 25
5	1900-2100	960 or 20 x 30 (2 Req.)	575 or 24 x 25

12. Start-up Procedures

WARNING

Electrical shock hazard.

Use extreme care during all of the following checks and procedures.

Make sure electric power is turned OFF as instructed in appropriate steps.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Circulating Air Blower

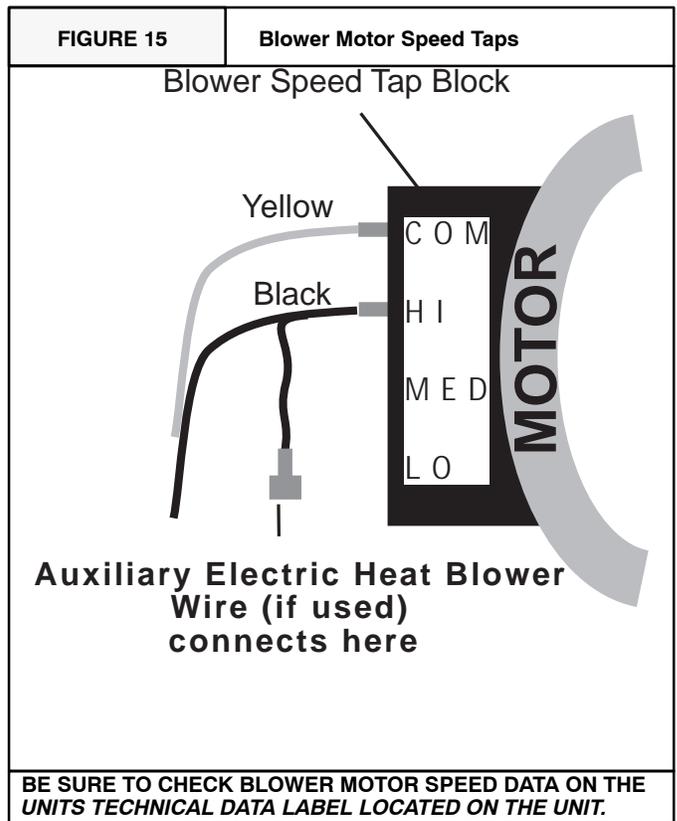
Determining Blower Speed

1. Turn electric power OFF.
2. From the system design, determine the total external static pressure (ESP) for the supply ducts, return ducts and registers, diffusers, grilles, dampers, heaters and filters.
3. To your system ESP determined in **Step 2**, add 0.05 In. W.C. for a wet coil.
4. From the system design, determine the desired cooling airflow in cubic feet per minute (CFM).
5. Locate the unit's Blower Performance Data table on the tech data label for the unit's voltage. (The tech data sheet is attached to the evaporator access panel on the unit.) From the table, determine the speed tap required to achieve the desired airflow.
6. See next section, *Speed Taps*, to set the blower motor speed terminal block (speed taps) to the cooling speed determined in the previous steps.

Speed Taps

After determining the required CFM and speed tap data from the tech data sheet, follow the steps below to change speeds if necessary.

FIGURE 14	Blower Speed Tap Settings
10 SEER 2 TON	MED
10 SEER 2 ¹ / ₂ TON	MED
10 SEER 3 TON	LOW
10 SEER 3 ¹ / ₂ TON	MED HI
10 SEER 4 TON	LOW
10 SEER 5 TON	HI



NOTE: On Heat Pumps Electric heater blower wire must be attached to the same speed tap required for cooling/heat pump operation. **See FIGURE 11 notes.** The **yellow** lead **MUST** always be connected to the speed tap block at the common quick connect terminal. The terminal is identified as **COM**.

Refer to **FIGURE 15** and the appropriate unit wiring diagram included in this manual. Wire the black wire to the required speed tap terminal to achieve required airflow determined in **Step 5**.

Cooling, Heating (Heat Pump) and Auxiliary Electric Strip Heat

NOTE: The cooling, heat pump and strip heat airflows are all on the same speed tap. The refrigerant system requires the same specific CFM for proper operation in the cooling and the heat pump mode. For this reason, cooling and heating airflow must be the same. **DO NOT SPLIT OUT INTO A COOLING SPEED AND HEATING SPEED.** If auxiliary electric heat is installed, the auxiliary electric heat blower speed wire must be connected to the black wire insulated quick connect terminal.

Check Before Starting

1. Check that the blower motor speed terminal block is set to the proper cooling speed. Refer to the unit wiring diagram and the various airflow tables in this manual.
2. Check to see that clean, properly sized field supplied air filters are installed in the return air duct.
3. Inspect the inside of the unit to be sure that all wires are in place and all tools, etc. are removed.
4. Replace all service access panels.

Check the unit's operation as outlined in the following instructions. If any unusual sparking, odors or noises are encountered, shut **OFF** electric power immediately. Recheck for wiring errors, or obstructions in or near blower motors.

Circulating Air Blower

1. Be sure electric power is **OFF**.
2. Set thermostat Heat-Cool selector to **OFF**.
3. Set thermostat fan switch to **AUTO**.
4. Turn electric power **ON**. Nothing should start running.
5. Set thermostat fan switch to **ON**. The circulating air blower should come **ON** after a 30 second delay.
6. Reset thermostat fan switch to **AUTO**. The circulating air blower should go **OFF** after a 30 second delay. Nothing should be running.

Cooling

1. Be sure that electric power is **OFF**.
2. Set thermostat Heat-Cool select to **COOL**.
3. Adjust thermostat setting to below room temperature.
4. Turn electric power **ON**. During power application check the following:
 - a. Contactor - Contacts closing
 - b. Compressor - **ON**
 - c. Condenser fan motor - **ON**
 - d. Circulating air blower - **ON** (after delay)
5. Switch the thermostat to **OFF**, check the following:
 - a. Contactor contacts opening.
 - b. Compressor - **OFF**
 - c. Condenser fan motor - **OFF**
 - d. Circulating blower - **OFF** (after delay)
6. Turn electric power **OFF**

Auxiliary Heating

NOTE: Repeat circulating air blower procedure above if Auxiliary Electric Heat is being installed after unit has been installed and checked out.

Temperature Rise Check

Temperature rise is the difference between the supply and return air temperatures. The temperature rise should be $\pm 2^{\circ}\text{F}$ (1.1°C) of the temperature rise shown in **FIGURE 11**.

NOTE: The temperature rise can be adjusted by changing the heating speed tap at the unit's blower terminal block. Refer to the unit's *Installation Instructions* for airflow information.

A temperature rise greater than 60°F (33.3°C) is not recommended. (This applies to electric heat only).

1. To check the temperature rise through the unit, place thermometers in the supply and return air ducts as close to the unit as possible.
2. Open **ALL** registers and duct dampers.
3. Set thermostat Heat-Cool selector to **HEAT**.

4. Set the thermostat temperature setting as high as it will go.

5. Turn electric power **ON**.

6. Operate unit **AT LEAST** 5 minutes, then check temperature rise.

NOTE: The maximum outlet air temperature for all models is 200°F (93.35°C). Maximum temperature rise for electric heat is 60°F (33.35°C)

If temperature rise is excessive, verify proper airflow through the unit. If temperature rise is inadequate, check for proper electrical supply to the heater and verify correct airflow.

7. Set thermostat to normal temperature setting.

8. Turn electric power **OFF**.

9. Change blower speed tap if 60°F (33.3°C) Temperature Rise was exceeded and repeat.

10. Be sure to seal all holes in ducts if any were created during this process.

Defrost Control Time Interval Adjustment

WARNING

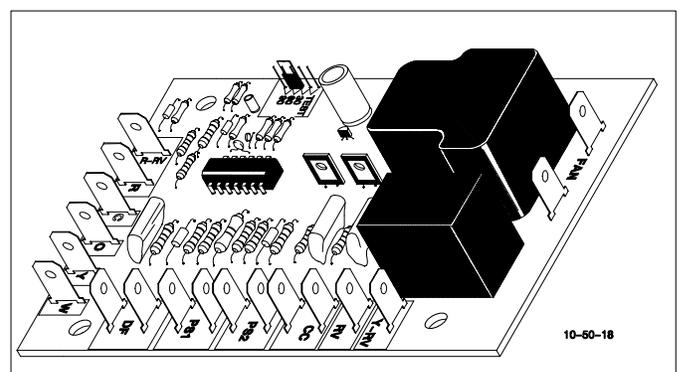
Electrical shock hazard.

Turn OFF electric power supply at disconnect switch or service panel before removing any access or service panel from unit.

Failure to follow this warning can result in property damage, personal injury, and/or death.

To adjust defrost interval:

1. Turn off all power to Heat Pump.
2. Remove control box cover.
3. Locate electronic defrost control board.
4. The Defrost Control Board has a jumper plug that can be set at 30, 60, 90 or TEST. Remove the plug and insert on the appropriate 2 pins indicated by \rangle on the board.



13. Sequence of Operation

NOTE: If power to the unit has been interrupted, there will be a 3 minute delay before the compressor starts.

Cooling Mode: Energized (R,G,Y, O) De-energized (N/A)

(a) When high and low voltage have been applied to unit for more than 3 minutes:

(1)On a call for cooling.....:

The compressor and condenser fan will energize. The evaporator blower motor will have a delay on and will energize after 30 seconds.

(2)When the cooling setpoint has been satisfied.....:

The compressor and condenser fan will de-energize immediately. The evaporator blower motor will have a delay off and will de-energize after 30 seconds.

**Heat Mode (Heat Pump Only): Energized (R,G,Y)
De-energized (O)**

(a) When high and low voltage have been applied to unit for more than 3 minutes:

(1) On a call for heating.....:

The compressor and condenser fan will energize (there will be a 3 minute delay on 4 Ton model with anti-cycle timer). The evaporator blower motor will have a delay on and will energize after 30 seconds. The delay on for the compressor and the condenser fan can be by-passed by jumpering the test pins on the defrost control board .

(2) When the heating setpoint has been satisfied.....:

The compressor and condenser fan will de-energize immediately. The evaporator blower motor will have a delay off and will de-energize after 30 seconds.

Defrost Mode:Energized (R,G,Y) De-energized (O) Defrost Sensor Closed

(1) On a call for defrost.....

When the defrost sensor closes in the heating mode,there is a 30, 60 or 90 minute delay before the defrost mode begins. This delay is selected by the position of a jumper on the defrost board

In normal defrost mode, the following sequence will occur after the set delay:

1. Condenser fan off.
2. Reversing valve energized to cooling and auxillary electric heat ("W" circuit) is energized.
3. After defrost sensor opens or a maximum of 10 minutes; the condenser fan is energized immediately. After a 10-12 second delay the reversing valve is then de-energized to the heat mode. Electric strip heat is also de-energized except as required by thermostat.

To check out the defrost mode, place jumper across the two tabs marked "DF". This simulates the defrost sensor closing. The delay can be by-passed by jumpering the test pins on the defrost control board (this reduces the delay from 30 minutes to 7 seconds, from 60 minutes to 14 seconds and from 90 minutes to 21 seconds). In the defrost mode the reversing valve will energize and the condenser fan will de-energize.

NOTE: If the jumper on the defrost delay selection is left in the "TEST" mode, the board will default to 90 min. delay until power is off.

(2) When defrost has been completed.....

This condition will be maintained until the defrost sensor opens or until the defrost mode operates for 10 minutes (or 2 seconds if test pins are jumpered), whichever comes first.

Adding Accessories

Low/High Pressure Controls

This unit is equipped with extra low and high pressure ports located inside the unit panel where the external high and low pressure ports are installed. This allows for installation of high and low pressure controls or low ambient controls.

14. Operation

Scroll Anti-Cycle Timer (Where Applicable)

Single phase units with scroll compressors may be equipped with an anti-cycle device which delays the start of the compressor in the event of a power interruption. This equalizes pressure throughout the system and prevents possible reverse rotation of the scroll compressor. Later production scroll compressors are equipped with an anti-reverse device to prevent the compressor from running backwards, so an anti-cycle timer is not needed on these models.

CAUTION

Do NOT operate unit on cooling when the outdoor temperature is below 60°F. This is necessary to prevent possible damage to the compressor.

Loss of Charge Pressure Switch

Scroll compressor bearing units are equipped with a low pressure switch on the liquid line (high side) which has been installed to prevent system damage due to a loss of charge. The switch will open and de-energize the contactor if the high side pressure drops below the set point of the switch.

INTERNATIONAL COMFORT PRODUCTS
LIMITED WARRANTY CERTIFICATE
For Cooling & Heating Products

SAVE THIS CERTIFICATE. It gives you specific legal rights, and you may also have other rights which may vary from state to state and province to province.

If your unit needs servicing, contact a qualified dealer or qualified service technician of your choice. When requesting service, please have the model and serial number from each unit in your heating and/or cooling system readily available. If your dealer needs assistance, the distributor is available to provide support and we, in turn, support its efforts.

Fill in the installation date and model and serial numbers of the unit in the space provided below and retain this Limited Warranty for your files.

GENERAL TERMS

Subject to the conditions and limitations stated herein, during the term of this Limited Warranty, we will provide a replacement for any functional component part (as defined below) of your unit found to be defective in materials or workmanship. The term of this Limited Warranty is five years from installation on Residential Products and one year from installation on Commercial Products. Except as otherwise stated in the "Additional Terms" section, this Limited Warranty covers only the original purchaser and subsequent transferees, and only while the unit remains at the site of the original installation (except for mobile home installations), and only if the unit is installed inside the continental United States, Puerto Rico, Alaska, Hawaii or Canada. In addition, the Limited Warranty applies only if the unit is installed and operated in accordance with the printed instructions accompanying the unit, and in compliance with all applicable installation and building codes and good trade practices. As used in this Limited Warranty, "installation" means the original installation of the unit.

THERE ARE EXCEPTIONS to this Limited Warranty as described on the reverse side of this page. All replacement parts will be warranted for the unused portion of the warranty coverage period on the unit. The part to be replaced must be returned by the dealer to a distributor that sells products for International Comfort Products, in exchange for the replacement part. In lieu of providing a replacement part, we may, at our sole option, refund to you an amount equal to the distributor's component purchase price from us, or provide to you a credit equal to that amount to be applied toward the purchase of any new unit that we distribute. If a credit for a new unit is given in lieu of a replacement part, the rating plate from the unit being replaced must be submitted on a warranty claim, and your dealer must make the unit being replaced available to our distributor for disposition. As a condition to warranty coverage, the unit must receive yearly maintenance, as described in the owner's manual, by a dealer. Satisfactory proof of yearly service by a dealer may be required.

"Functional component parts" include only the following: blower motor, unit-mounted sensors & timers, condenser motor, evaporator coil, condenser coil, condenser fan, capacitor, transformer, single-phase strip heat elements, expansion device, reversing valve, solenoid valve, service valve, electronic and electro-mechanical control board, ignitor, ignition module, draft inducer assembly, burner pilot, gas valve, limit control, pressure switch, relays and contactors, blower wheel, interlock switch, crosslighter, pilot shield, gas & oil burners, oil pump assembly, accumulators and factory installed driers and strainers.

This Limited Warranty **DOES NOT COVER** any labor, material, refractory chambers, oil nozzles, refrigerant, refrigerant inspection and refrigerant reclaiming, freight and/or handling charges associated with any repair or replacement and such charges will be your responsibility.

To establish the installation date for any purpose under this Limited Warranty, you must retain the original records that can establish the installation date of your unit. If you do not provide such documents the start date of the term of this Limited Warranty will be based upon the date of unit manufacture, plus thirty (30) days. In establishing that the required yearly service has occurred, you must furnish proof of yearly service by a qualified service technician.

This Limited Warranty does not cover: (a) failure or damages caused by accident, abuse, negligence, misuse, riot, fire, flood, or Acts of God (b) damages caused by operating the unit where there is a corrosive atmosphere containing chlorine, fluorine, or any other damaging chemicals (other than those found in a normal residential environment) (c) damages caused by an unauthorized alteration or repair of the unit affecting its stability or performance (d) damages caused by improper matching or application of the unit or the unit's components (e) damages caused by failing to provide proper maintenance and service to the unit in accordance with this Limited Warranty Certificate and the printed instructions originally provided with the unit (f) any expenses incurred for erecting, disconnecting, or dismantling the unit (g) parts or supplies used in connection with service or maintenance, such as refrigerant, refractory chambers, oil nozzles, filters, or belts (h) damage, repairs, inoperation or inefficiency resulting from faulty installation or application (i) electricity or fuel costs or any increase in electricity or fuel cost whatsoever including additional or unusual use of supplemental electric heat (j) units which have not had the required yearly maintenance described elsewhere in this limited warranty.

In no event shall we be liable for any incidental, consequential, or special damages or expenses in connection with any use or failure of this unit.

We have not made, do not make, and hereby disclaim any implied condition or implied warranty of fitness for a particular use or purpose, and any implied condition or implied warranty of merchantability, to the fullest extent allowed by law. We make no express or implied warranties except as stated in this Limited Warranty certificate.

No one is authorized to change this Limited Warranty or to create for us any other obligation or liability in connection with this unit. Any implied warranties shall last for the term of the expressed warranty contained herein. Some states and provinces do not allow the exclusion or limitation of incidental or consequential damages or do not allow limitations on how long an implied warranty or condition lasts, so the above limitations or exclusions may not apply to you. The provisions of this Limited Warranty are in addition to and not a modification of or subtraction from any statutory warranties and other rights and remedies provided by law.

Please refer to reverse side of this page for additional terms.

Model No. _____

Serial No. _____ Date Installed _____

Effective on units installed After July 1, 2002.

USA: International Comfort Products Corporation (USA) • 650 Heil-Quaker Avenue • P.O. Box 128 • Lewisburg, Tennessee 37091 • (931-270-4100)
CANADA: International Comfort Products division of UTC Canada Corporation • 6060 Burnside Court, Unit 1, Mississauga, Ontario L5T 2T5 (905-795-8113).

Manufacturers of Airquest, Arcoaire, Clare, Comfortmaker, Dettson, Heil, Keeprite, Lincoln, Tempstar and other quality brand name private label products.

Part No. 401 06 1010 19 (Orig. 9/19/2002)

ADDITIONAL TERMS FOR RESIDENTIAL APPLICATIONS ONLY

The Additional Terms for the components listed below are in addition to, and subject to, the General Terms on the reverse side of this page. Warranty coverage is limited to parts that fail due to defect in materials or workmanship during the specified term.

CENTRAL GAS & OIL FURNACE HEAT EXCHANGERS*

Gas Model Series: C9MPV, H9MPV, T9MPV, C9MPT, H9MPT, T9MPT, C9MPD, H9MPD, T9MPD: Limited Lifetime Warranty on heat exchangers. If a heat exchanger on one of these furnaces fails due to defect in the part, we will provide a replacement part or, at our option, credit toward the purchase of a new furnace manufactured by us. This additional Limited Warranty runs only to the original purchaser, and lasts only for as long as the original purchaser lives in the home where the furnace is initially installed.** It is not transferable to any subsequent owner. If the furnace was not installed in the home owned by the original purchaser, if the original purchaser sells the home to a subsequent owner, or if proof of original purchase cannot be provided, then the limited warranty is only for 20 years from the date of original installation.

Gas Model Series: GDL, GNL, TNE, TDE, NTC7, NDC7, NTP6, NDP6, TDE, NTV6, VNE: A replacement heat exchanger will be provided for any heat exchanger that fails in one of these furnaces due to defect for 25 years from the original date of installation.

Gas Model Series: NTC6, GNE, GDE, NDN6, NTG3, NDN3, FBF, NBF, NDF, NTN3, NTN6, NNE, N9MP1, N9MP2, FUH: A replacement heat exchanger will be provided for any heat exchanger that fails in one of these furnaces due to defect for 20 years from original date of installation.

Oil Model Series: OLR(105, 160, 182), OCF, OLF, OUF, NOLF, NOUF, OLB, OHB, ODH, FLO, MBO, LBO, NOME: Limited Lifetime Warranty on heat exchangers. If a heat exchanger on one of these furnaces fails due to defect in the part, we will provide a replacement part or, at our option, credit toward the purchase of a new furnace manufactured by us. This additional Limited Warranty runs only to the original purchaser, and lasts only for as long as the original purchaser lives in the home where the furnace is initially installed.** It is not transferable to any subsequent owner. If the furnace was not installed in the home of the original purchaser, if the original purchaser sells the home to a subsequent owner, or if proof of original purchase cannot be provided, then the limited warranty is only for 20 years from the date of original installation.

Oil Fired Floor Furnace: NFO: A replacement heat exchanger will be provided for any heat exchanger that fails due to defect for 10 years from installation with the following limitation: during the sixth through tenth year, any credit toward your purchase of a component or toward the purchase of any new unit will be in an amount equal to the distributor's purchase price reduced by 20 percent for each year after the fifth year.

ADDITIONAL TERMS FOR OIL FURNACE APPLICATIONS ONLY

1) **OIL BURNERS - A replacement for 5 years from date of original installation for Oil Burner Parts.**

2) **OPTIONAL ACCESSORIES AND FUNCTIONAL PARTS: A replacement for 5 years from date of original installation. (Refractory and oil nozzles not included)**

GAS/ELECTRIC PACKAGED UNITS HEAT EXCHANGERS

Model series: PGAD, PGAA, PGMD, PGME, PGF, GPFM, PGC, GPCM: A replacement for 10 years from original date of installation.

COMPRESSORS:*

1) **Premium Model Units: HAC0, HAC2, HAC4, CAC0, CAC2, CAC4, KAC0, TCA0, TCA2, TCA4, HHP0, HHP2, HHP4, CHP0, CHP2, CHP4, TCH0, TCH2, TCH4, PGME, PYMC, PHAD, PGAD, PA95, PAPC, PAK, APK:** To the original purchaser a replacement for 10 years from original date of installation, only if the unit is installed with factory matched coils, except air conditioner condensing units with a nominal SEER of 10 may be matched with evaporator coils of the same nominal tonnage regardless of manufacturer and in accordance to factory recommendations. This limited 10-year warranty is not transferable to any subsequent owner. HOWEVER, if the unit was not installed in the home owned by the original purchaser, if the purchaser sells the home to a subsequent owner, or if proof of original purchase cannot be provided, then the limited warranty is only for 5 years from the original date of installation.**

2) **All Other Models: Air Conditioners, Heat Pumps, & Combination Gas/Electric Units: NAC0, NAC2, NHP0, NHP2, AO, A2, HO, H2, PGF, PGC, GPFM, GPCM, PAF, APFM, PHF, HPFM, PGAA, PGMD, PA55, PH55, PAPA, PYPA:** A replacement for 5 years from date of original installation, only if: (a) air conditioner condensing units with SEER rating in the range of 10 to 11 SEER are matched with evaporator coils of the same nominal tonnage regardless of manufacturer and in accordance to factory recommendations, or (b) heat pump condensing units are used with factory matched coils, unless written approval to do otherwise is obtained from manufacturer.

ADDITIONAL TERMS FOR COMMERCIAL APPLICATIONS ONLY

For purposes of this warranty a commercial application is one in which: the product has over 5 tons nominal cooling capacity, or is designed for operation with 3 phase electrical power, or is installed in a commercial establishment such as a beauty or hair salon, hospital, school, restaurant, church, hotel etc..

3-Phase Models: PGF, GPFM, GPF, PGAD, PGME, PGB, PGMG, PGMF, PGS, PGE, APE, PAE, PAB, PAMD, PAS, PAF, APFM, APF, PHB, PHE, PYMD, HPB, PHS, CAC, ACC, CAE, ACE, CHC, HCC, CHE, HCE, CHB, YA:

The additional Terms of the components listed below are in addition to and subject to the General Terms on the reverse side of this page.

1) **GAS FIRED HEAT EXCHANGERS (ALL MODELS):*** A replacement for 10 years from date of original installation.

2) **COMPRESSORS (ALL MODELS):*** A replacement for 5 years from date of original installation.

3) **OPTIONAL ACCESSORIES AND FUNCTIONAL COMPONENT PARTS (ALL MODELS):***

A replacement for 1 year from date of original installation.

4) **COMMERCIAL OIL MODELS: OLR210, OLR350, OTF210, AMT3, AMT4, AMP3:** Ten(10) Year Limited Warranty on heat exchangers.

*To receive advantage of your limited warranty, you must provide proof of yearly service by a qualified service technician.

**To receive advantage of your warranty, you must retain the original records that can establish the installation date and proof of purchase of the unit.

MINI SPLITS:

Summary - Mini Splits Warranted for one (1) year on all replacement parts.

Additional terms for Mini Splits:

The additional Terms of the components listed below are in addition to, and subject to, the General Terms on the reverse side of this page.

1) **Compressors (All Models):** A replacement compressor will be provided for all compressors that fail due to defect for 5 years from date of original installation.

2) **Optional Accessories and Functional Components Parts (All Models):**

A replacement part will be provided for all parts that fail due to defect for one (1) year from date of original installation.

Failure to maintain the equipment through annual maintenance by a qualified service technician shall void the warranty. Proof of service will be required with all warranty claims. Proof of purchase and installation date must be submitted with all claims.